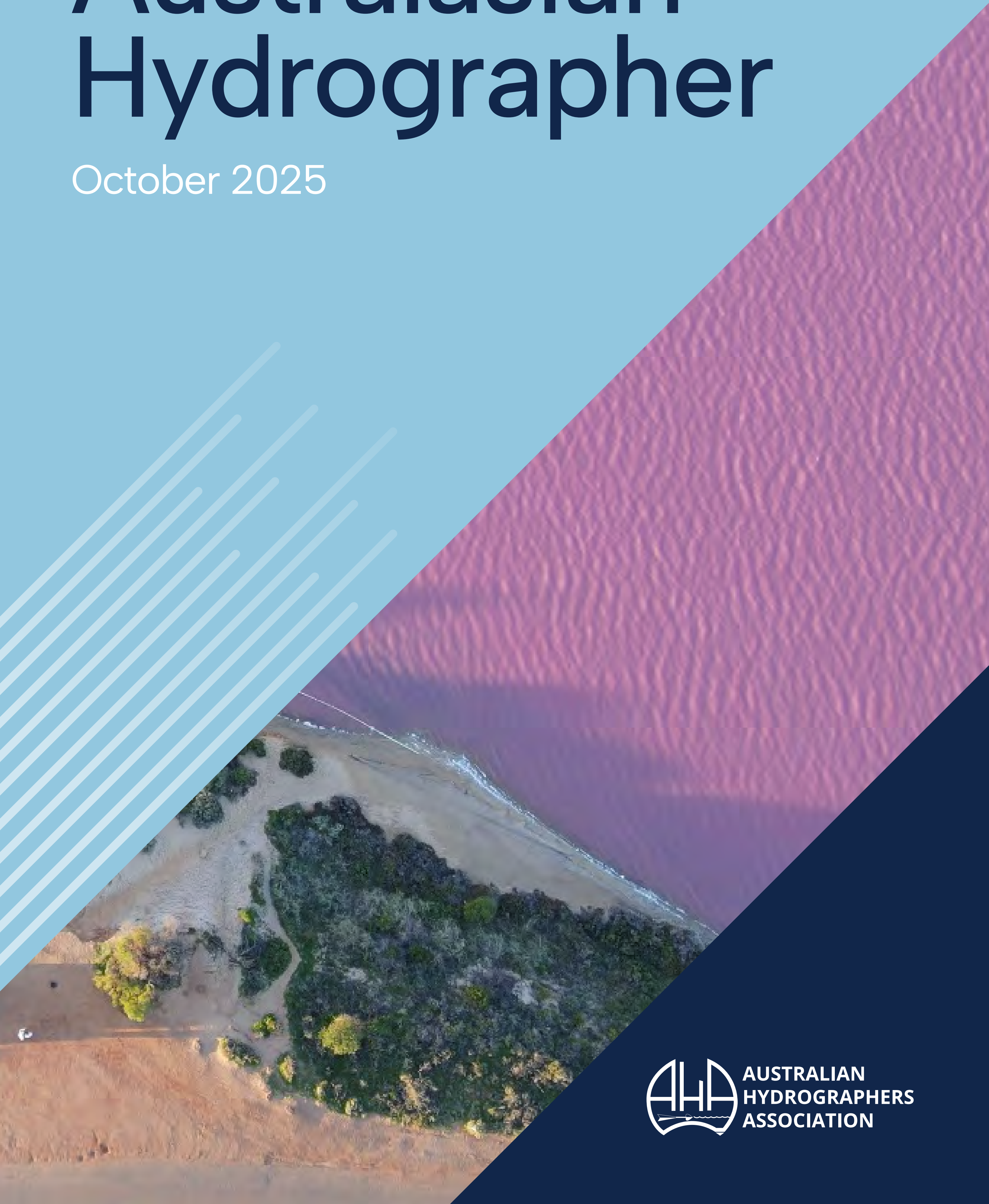
Australasian Hydrographer

October 2025



AUSTRALIAN HYDROGRAPHERS ASSOCIATION

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Zac Ward - EWS Australia
Photo Information: (Cover & Below)
Port Gregory (Pink Lake) – Drone Image

Acknowledgement of Country

The AHA acknowledges the Australian Aboriginal and Torres Strait Islander peoples of this nation. We acknowledge the traditional custodians of the lands on which our association is located and where we conduct our business. We pay our respects to ancestors and Elders past, present and emerging. The AHA is committed to honouring Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to the land, waters and seas and their rich contribution to society.

Contents

From the President

Arran Corbett

As I write this message, I find myself reflecting on what has been a truly rewarding journey. After serving as President of the Australian Hydrographers Association (AHA) since 2019, I will soon be stepping down from the role and working with my successor over the next six months to ensure a smooth and well-managed transition.

It is remarkable to think how much has changed in five and a half years. Together, we have guided the Association through a period of transformation — strengthening our professional community, expanding opportunities for members, and positioning the AHA for a vibrant and sustainable future.

Looking back, it has been a privilege to lead an organisation that continues to evolve, modernise, and strengthen its support for Australia's hydrographic professionals. We have navigated extraordinary change and achieved some significant milestones along the way.

During the COVID-19 era, when the world stood still, the AHA adapted. Our 2020 Virtual Conference kept our community connected and proved that we could innovate even in the toughest of circumstances.

We went on to deliver two outstanding in-person conferences — Penrith in 2023, and Launceston in 2025. The Launceston event was particularly meaningful, demonstrating that regional venues can successfully host large-scale, financially sustainable gatherings that attract and inspire members from across the country.

Our Training Group has expanded and matured, supported by new tools, structure, and a well-considered succession plan. Student participation remains strong, and feedback on course quality continues to improve. The introduction of the off-conference year event — the Technical Workshop, now evolving into the Technical Workshop & Regatta — has been another highlight. The inaugural workshop, held in Darwin in 2024, brought together more than sixty attendees who deepened their skills across groundwater, surface water, and water quality streams, concluding with an unforgettable field session at Berry Springs.

The AHA has also evolved structurally, transitioning from a NSW-registered not-for-profit to a truly national professional body. This shift has provided greater flexibility, improved governance, and a stronger, more unified voice to represent hydrographers across all jurisdictions.

Another significant achievement has been the creation of our new website and member portal — the culmination of more than eighteen months of work by a dedicated sub-committee. The result is a modern, interactive platform that transforms how we connect with members and deliver services.
It enables tracking of Continuing Professional Development points, supports student-first training management, and offers a streamlined, engaging interface for all members. If you have not yet done so, I strongly encourage you to log in and explore the new site.

None of these accomplishments would have been possible without the tireless effort of the Executive, the Committee, the Training Group, and our many volunteers and partners. Your collective commitment, professionalism, and good humour have underpinned every success — including many behind-the-scenes contributions that often go unseen. To our broader membership, thank you for your continued trust, feedback, and participation. You are the heart of the AHA.

While I am stepping down as President, I am not stepping away from hydrography. As I write this, I am preparing to relocate to the United Kingdom to take on a new global role — an exciting next chapter in my professional journey. I will remain an active member of the AHA and continue to serve on the Committee for as long as I can contribute. However, I firmly believe that the AHA President should be based here in Australia, a sentiment shared by the Executive and one that supports a strong and thoughtful leadership transition.

It has truly been an honour, a pleasure, and a privilege to serve as your President.

And in my best gruff, Austrian accent — “I’ll be back.”

Best regards,

Arran Corbett

President, Australian Hydrographers Association

From the Editor-In-Chief

Zac Ward

Given Arran's above announcement it seemed only fitting to give our current AHA President the first page of this months Australasian Hydrographer. A bit of a mic drop moment there Arran haha!

In all seriousness though I'd like to take this opportunity to extend my appreciation and gratitude to Arran and all he has done for the AHA in his stint as President. A momentous legacy of accomplishment and leadership and I wish him all the best for what the next chapter of his journey entails over in the UK. Cheers (Slàinte) Arran

As we approach the end of 2025 and in some cases the beginning of the exciting Wet Season, I find myself reflecting on all the milestones for the AHA this year and what is in-store for 2026. The next edition (December) will contain some Training, Website and Committee updates but for this edition I will lean on the technical side of things with some great submissions from our regular superstar contributors (Mic and Daniel).

One noteworthy submission for those who didn't attend the Launceston Conference in May comes from the winner of the Young Professional Award, Matthew Pilkington. A very detailed, thorough and interesting Project-Based read for which I had the pleasure of assisting in the implementation of this year. It was an absolute pleasure to be involved in the setup of this epic monitoring network and I can't wait to see what's next for Matthew at Queensland Hydro, Hydrography and beyond!

As always please reach out should you have articles/case studies you wish to share with the wider AHA Community (including photo's, etc) and here's to finishing strong for 2025.

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Cheers,

Zac

AHA Conference 2025 Field Day – Flow Measurement Exercise (Thursday 15th May)

Author - Mic Clayton (FAHA, CPH) Cooma, NSW.

Abstract

Comparative streamflow measurement workshops (also known as streamflow regattas) are an essential activity for hydrographers and field hydrologists to compare and review outputs from measuring equipment and the flow measurement processes that they employ in the profession of streamflow measurement.

Practical activities such as this enable:

- Collegiate knowledge sharing within the profession with regards to effective streamflow measurement
- Enable organisations to 'benchmark' their equipment and organisational processes against National Guidelines and Standards for flow measurement, thus providing a quality assurance avenue for flow measurement activities
- Provide exposure to more recent technologies and techniques for flow measurement that practitioners might be able to deploy in situations where normal streamflow measurement might be impractical
- Improve the knowledge and skills of Australian Hydrographers undertaking the important activities involved in measuring water resources, thus contributing to the effective management of the water resources in Australia.

Similar events have been hosted by Snowy Hydro in 2015 and in conjunction with ALS (NSW) in 2017. Australian Hydrographers have also participated in New Zealand Hydrological Society (NZHS) streamflow measurement activities at the Society's Technical Workshops.

Australian Hydrographers Association Conference 2025 Field Day

The AHA Conference Field Day in May 2025, was held at the Hydro Tasmania site at Brumby's Creek regulating weir site and, with the assistance of Hydro Tasmania staff, a 'mini' streamflow measurement exercise was also facilitated on the day.

Staff from "Melbourne Water", "DEECA" (Victoria), "ALS Hydrographic" (Victoria), "Snowy Hydro" (NSW) and "NRE" (Tasmania), participated in the flow measurement exercise, contributing comparative data to the desired outcomes of the activity. Additional flow measurements were also contributed to the comparison dataset by "Xylem" and "HydroSTIV" representatives

For many organisations the logistics of getting equipment to the event for a streamflow measurement exercise was awkward, but coordination between Victorian hydrographic teams and Snowy Hydro saw a number of measurement kits transported collectively in a vehicle heading to the conference in Launceston via the "Spirit of Tasmania"!

Location and setup

Brumby's Creek regulating structure dampens the pulsing flow regime generated by the operation of the upstream Poatina hydroelectric power station. The structure regulates releases from a retarding pond into a rocky, man-made channel before the flow enters the natural Brumby's Creek catchment system.


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Figure 1. General Location

Figure 2. Outflow Stretch from Regulating Structure

For the field day activities, Hydro Tasmania established a number of tether lines for use by participants and vendors on the day down the first part of the man-made channel. The sections setup provided varying hydraulic conditions that required participants to assess appropriateness of the various section options available to measure at prior to a final measurement section being chosen selected by the general group.

The field day reach was unsuitable for wading measurements on the day (approximately 16 cumecs of flow), so activities at the event were restricted to ADCP measurements as well as non-contact techniques. Conditions closer to the weir structure were less favourable for ADCP measurements due to aeration and other sections contained significant eddy conditions created by bankside features.

Figure 3. Chilly Morning View of the Poatina Outlet Channel Upstream of the Field Day Site

The activity highlighted the importance of selecting appropriate streamflow measurement sections. Good data cannot be manufactured from selection of a poor site!

The section chosen for the practical exercise was the second last tether line away from the regulating structure and was used by participants without access to a remote-controlled platform.

The “Xylem Team” collected data using a “Surfbee Autonomous Platform” further downstream of the tethered lines, while the “HydroSTIV Team” collected and processed data using “HydroSTIV” portable techniques adjacent to the tethered line teams. The “HydroSTIV Team” were provided with indicative velocity alphas from tethered team participants for their eventual discharge processing requirements.

Figure 4. Gauging Stretch at the Field Day Site

Measurement Activities

Each team was requested to undertake two measurements, in an attempt to achieve a stationary and moving boat result for each team. The teams using the tethered line were also constrained by time slot limitations – but all achieved results using both gauging techniques.

Not all teams were experienced in both types of deployment (stationary and moving boat), and this is where the collegiate nature of the event shone. Those experienced in both techniques provided suggestions and guidance on the techniques to those less experienced. One of the aims of an event such as this was actually being achieved!

For ADCP measurements, doppler units put through their paces included “SonTek S5”, “SonTek M9” and “SonTek RS5” units. No “TRDI” instrumentation was in use at the event. The non-contact STIV data was collected on a tablet device using STIV Portable Software, a single result available at time of preparation of this report is referred to in results and figures.

The data files from each gauging for each team was collated to assist with preparation of this article. The data was post processed to a basic level using “QRevInt” and “QRevMS” to obtain interpretative data of stream alpha and bed shape comparisons. Higher level post processing was not conducted – the aim being to get a first pass assessment of the raw data for use in this summary report. The post processing conducted identified, in some instances, the proprietary software infilling ‘missing’ ensembles (using the proprietary algorithm corrections to correct for lost ensembles). Post processing with tools such as “QRev” enables field staff to assess why some transects (in moving boat) or verticals (in stationary mode) are ‘out of whack’ with other measurements during the same measurement activity and then make better informed judgements on quality assurance of the measurements that have been undertaken.

Overall Summary of Data Collected

(Note: ADCP data has been de-identified in this article)

The following graph indicates the raw result produced by the proprietary software for each team's pair of measurements. The STIV measurement included in this article (which is not de-identified) used an alpha of approx. 0.78-0.8, based on the alpha derivation from the G1S5 data sets.

The mean of all measurements was 18.6m3/s (indicated by the reference line in the following Figure 5).

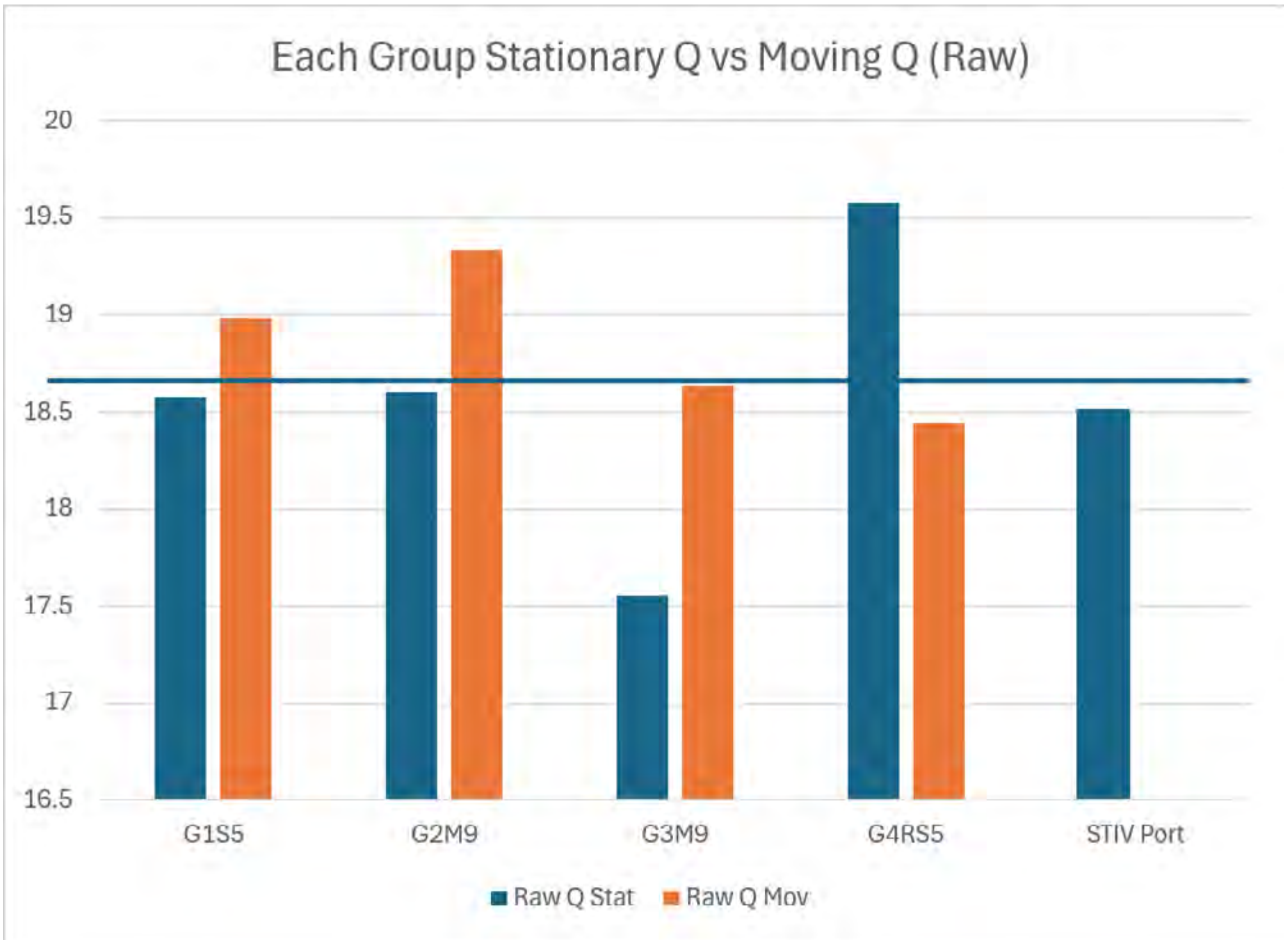


Figure 5. Proprietary Data Results from the Various Streamflow Measurements

In this graphic the outlier for the stationary gauging for G3M9 seems to be an anomaly, but in effect the measurement was just on -6% away from the mean of all the measurements. The G4RS5 stationary was between +4-+5% away from the mean of all measurements as a counterpoint to the low result for G3M9.

The raw data from the various ADCPs was also post processed through "QRevInt" and "QRevMS", but only at a basic first pass level (for the purpose of this article), to assess the raw data files for missing ensembles, lost cells and other warnings generated by the "QRev Smartwares", in effect removing the proprietary algorithms that are applied by the collecting software prior to reporting a discharge result. The STIV result could not be processed using this technique and remains 'as is' in this report.

A point to note in preparing data files for post processing was that it was problematic for moving boat measurements to be undertaken equally.
In either the proprietary software or the post processing software there is latitude for the data operator to deselect 'unwanted' or disliked transects from the analysis.

Deselecting a transect (or actually a pair of transects, one L-R and one R-L, as should be the case) from a moving boat data collection set requires a higher level of experience and knowledge of the 'vibe' of the unwanted transects. Deselection of individual transects prior to postprocessing may differ between individuals. "QRevInt" enables more critical analysis of transects in awkward result situations, but there is still the ability for the operator to make subjective choices about exclusion of transects – but at least the operator will have available a more robust data assessment of individual results to make a final call with.

The GR4S5 collection contained a higher number of moving boat transects taken through the day – so judging what to take out and what to leave in was a slight headache for this article as the data collection processes in this large set (over time) might have been impacted by occasional adjustments of the regulating gate that were observed throughout the day. That in turn may have contributed to flow variations through the day.

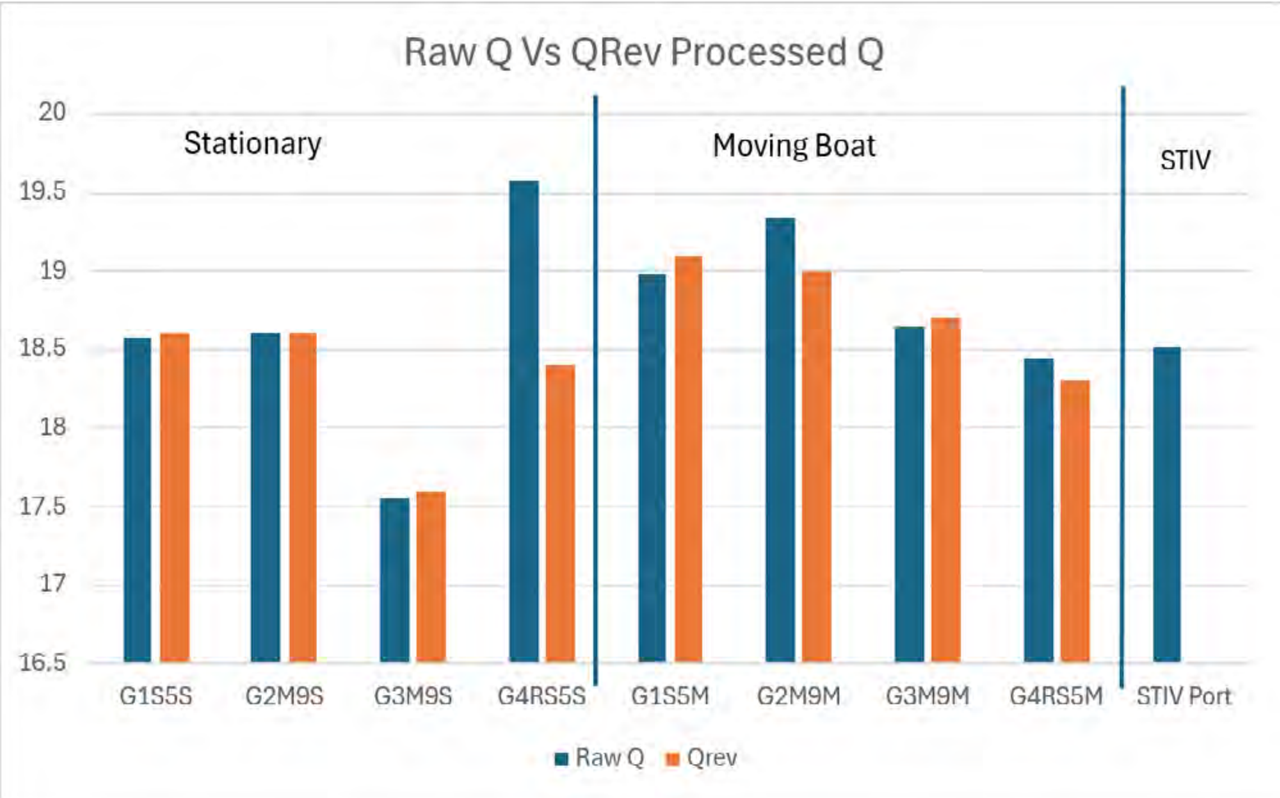


Figure 6. Preliminary Post Processing of Data using "QRevInt" and "QRevMS" Comparison against Raw Proprietary Software Data Results.

Figure 6 compares the discharge values between proprietary software results and post processed through the "QRev Smartwares".

Of particular note is that a number the moving boat measurements, particularly at the tethered line section, were not achieving an adequate left edge measurement – the furthest bank away from the gauging teams. Even more experienced teams suffered from the issue.

The furthest stream edge away from the operator is often identified as an area of contributing to inaccuracy in moving boat transects, particularly with recording an accurate end edge distance for the furthest bank edge. At the tethered line site, a tape measure was attached to the line to overcome this area of uncertainty. At this event though it was observed when teams chose a point in time to 'end edge' on the left bank that, at the time of selecting the action, they were observing suitable cells available for the edge measurement, but in the period of edge measurement the ADCP was impacted by an eddy effect that pushed the platform closer to the left bank into shallower water causing loss of sufficient cells to complete the end edge function satisfactorily on the far side. This resulted in insufficient edge data for this computational component. The large rocks at the edges would not have helped the situation either as the velocity cell calculations are truncated by the shallowest velocity lobes, so a large rock being seen by the sensor closest to the bank would have contributed to the issue as well.

A lesson learnt from this effect – take the time to let the platform settle before activating that far edge! If you lose ensembles adjust the position of the ADCP away from the problem but remember to reassess the edge distance from the shore edge if you relocate.

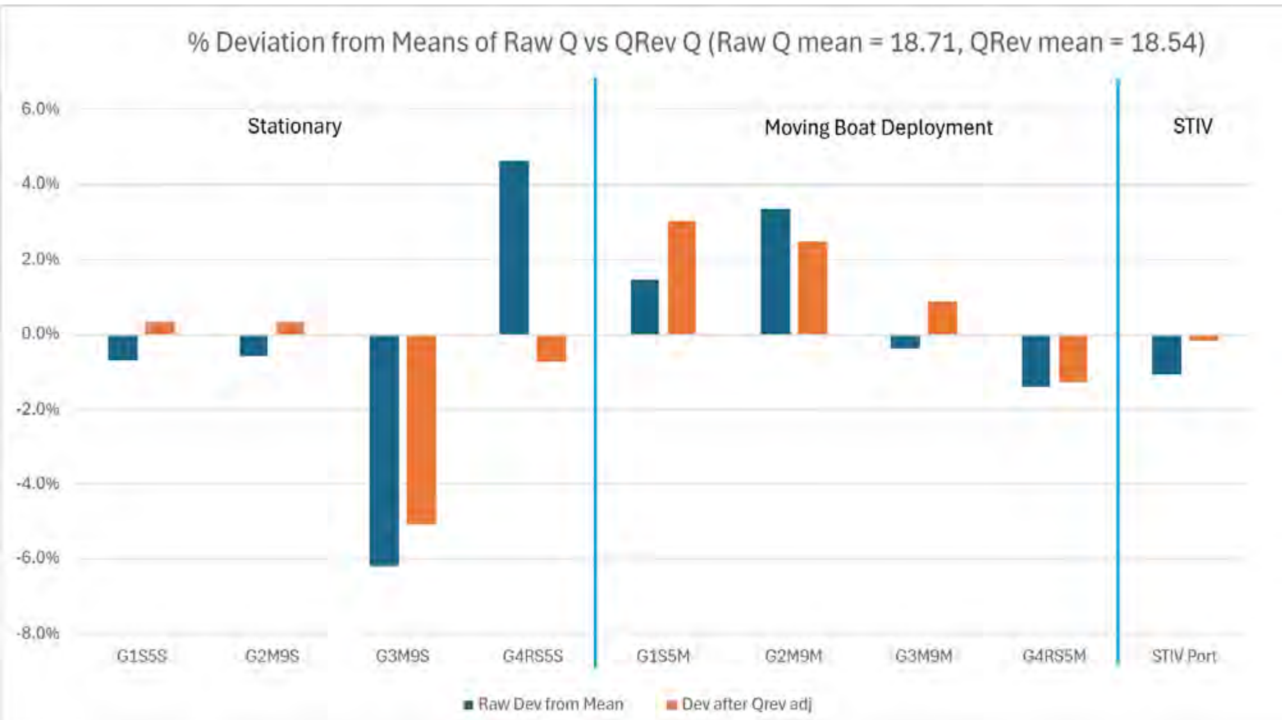


Figure 7. Deviation of Raw (blue) and Post Processed (orange) Data against Mean Data Result for various Techniques. The STIV Deviations are the STIV Result against the Raw QMean and the "QRev" Mean of the ADCP Data

Impact of Stream Section on Velocity Curves

Stream alpha is currently a bit of a buzz theme, particularly in the application of non-contact discharge measurement systems.

This article will not go into depth about stream alpha but the streamflow exercise at the Field Day enabled the effect of stream bed shape and roughness on velocity profiles, and hence alpha estimates, in the stream to be demonstrated.

The stream sections at the tethered line gauging section and the autonomous vessel reach had significantly different stream bed characteristics as demonstrated in the following figures.

The tethered section (Figures 8a and 8b) exhibited rougher bed shape and shallower profile when compared to the autonomous vessel section further downstream (Figures 9a and 9b)

The rougher bed shape at the tethered section was primarily a function of the constructed rock armoured nature of the channel, while the downstream autonomous site was more natural bed features, not being rock armoured.

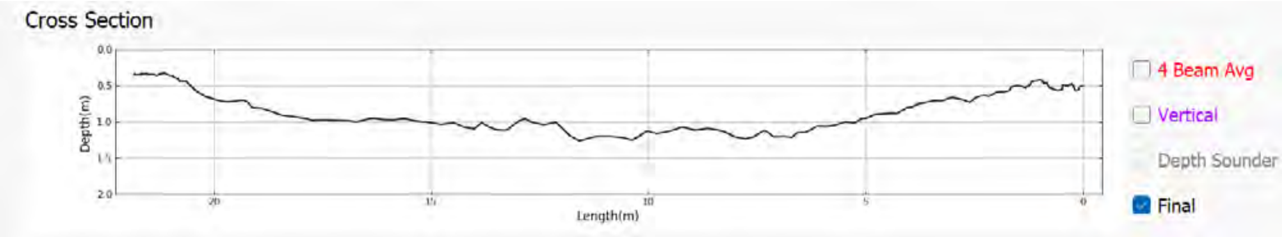


Figure 8a. Tethered Line Cross Section Sample (Final)

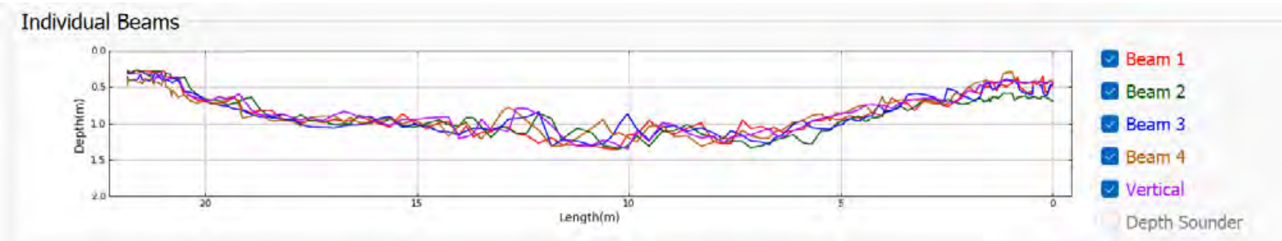


Figure 8b. Tethered Line Cross Section Sample (individual beams)

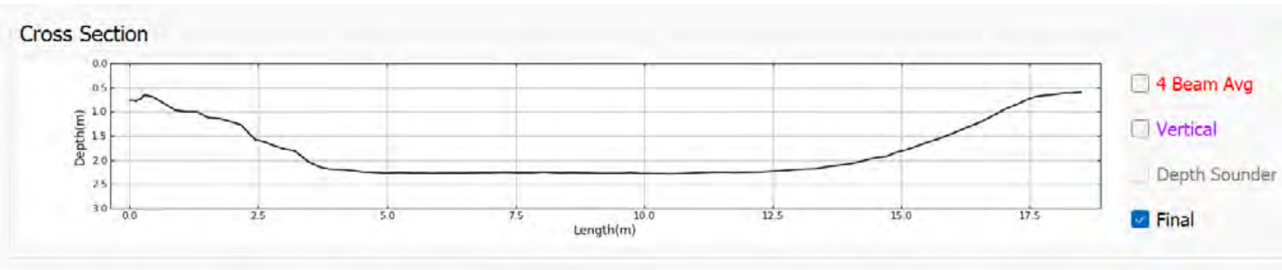


Figure 9a. Autonomous Vessel Cross Section Sample (Final)

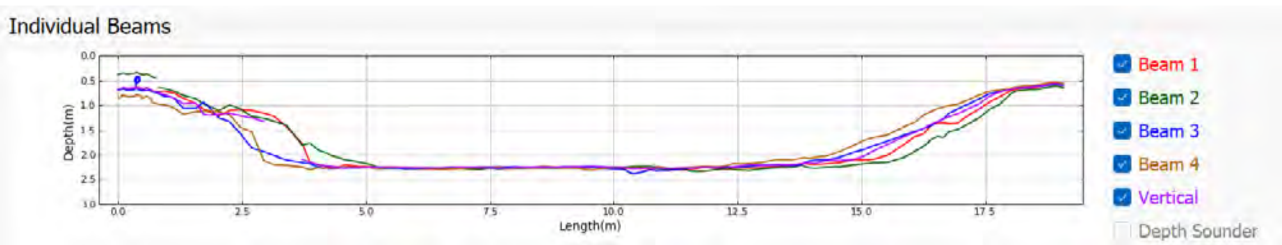


Figure 9b. Autonomous Vessel Cross Section Sample (individual beams)

Assessment of the velocity profiles from these transects demonstrate some of the impacts on velocity profiles caused, to some extent, by stream section characteristics. Figures 10a and 10b display the variation in stream velocity profiles using "QRevInt" extrapolation analysis.

Additional irregularity observed in the tethered velocity profile can also be attributed to turbulence caused by the upstream weir.

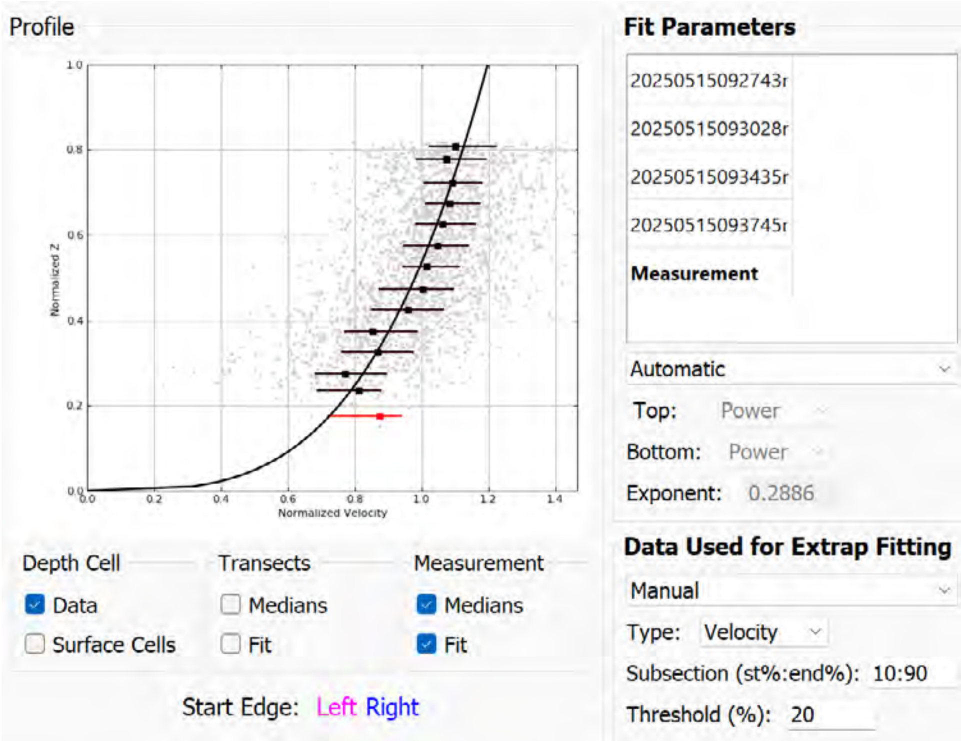


Figure 10a. Tethered Section Velocity Profile Assessment

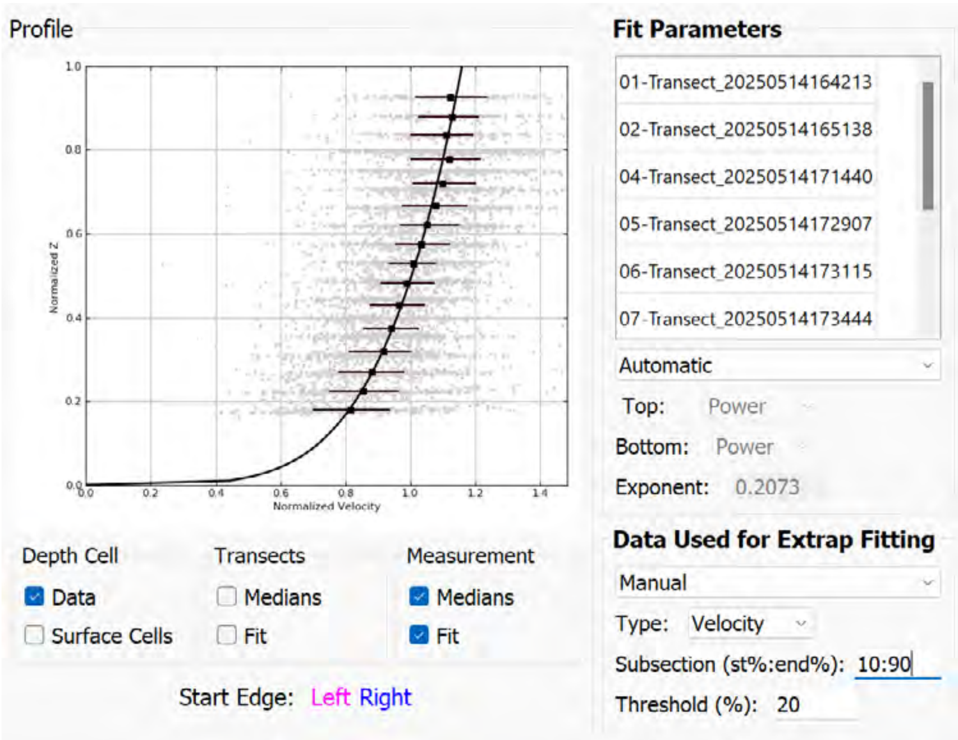


Figure 10b. Autonomous Vessel Section Velocity Profile Assessment

The estimated alpha from the tethered section was between 0.78 and 0.82, while the estimated alpha at the downstream autonomous vessel section came in at around 0.85 as a result of these preliminary analyses.

The ability to interpret appropriate velocity profile extrapolation, and hence estimate stream alpha, is a valuable skill that can be employed from post processing ADCP data through the "QRev Smartwares", to assist with developing meaningful stream alpha relationships for non-contact discharge measurement techniques. For more information on determining alpha, including via "QRev Tools", *River Discharge from surface velocity measurements field guide for selecting alpha* developed by "NIWA" as an "Envirolink" publication (2021) is a handy reference in the area of non-contact discharge measurement techniques.

General Summary of the Stream Measurement Exercise.

Albeit the restriction on time and availability of suitable cross sections the teams who participated on the day achieved comparable results.

Results collated spanned approximately between +/- 5% of the mean of the discharge measurements collated from the day.

As a comparison, at previous Australian streamflow regattas, deviations from the mean were +/-5% (2015 regatta) and up to +/-30% (2017 regatta), though the 2017 regatta was designed as a challenge to procedures and equipment with setup sections providing participants with a variety of good to poor sections and low flow to experiment within, contributing to a wider scatter of results at this event . Reports on these previous regattas are available in the Australian Hydrographers Journal publication (June 2016 and August 2017).

Post processing of results through "QRev" by the author was generally of a preliminary nature for preparation of this article. The ability to statistically assess velocity profiles will greatly assist those working towards non-contact techniques in skills towards assessing appropriate application of stream alphas under a variety of flow conditions.

More experienced practitioners shared skills and knowledge with lesser experienced counterparts at many points through the day. This aspect should be a primary aim of events such as this – providing an opportunity for individuals and organisations to learn and gain more skill and knowledge, as well as enabling those more experienced to refresh their own knowledge and be exposed to fresh ideas and techniques with which to improve their own streamflow measurement techniques!

Time for follow-up and discussion of measurement results was unavailable, the Field Day being the final day of the conference. The author collated results from participants and has provided some collective data observations back to the participating group during preparation of this article in lieu of an assessment session.

Previous Australian regattas have been two-day events - Day 1 for field activities and Day 2 set aside for result evaluations and discussions. While previous events have primarily been ADCP regattas with a small percentage of standard current meter measurements, the availability of emerging technology for alternative measurement techniques should see future events be designed to incorporate all available technologies, in use by the profession, where possible or as the workshop site enables.

The New Zealand Hydrological Society (NZHS) incorporates similar flow measurement workshop components in their annual Hydrological Workshop, this activity assisting organisations to undertake validation processes of ADCPs and associated data processes as per New Zealand's National Environmental Monitoring Standards.

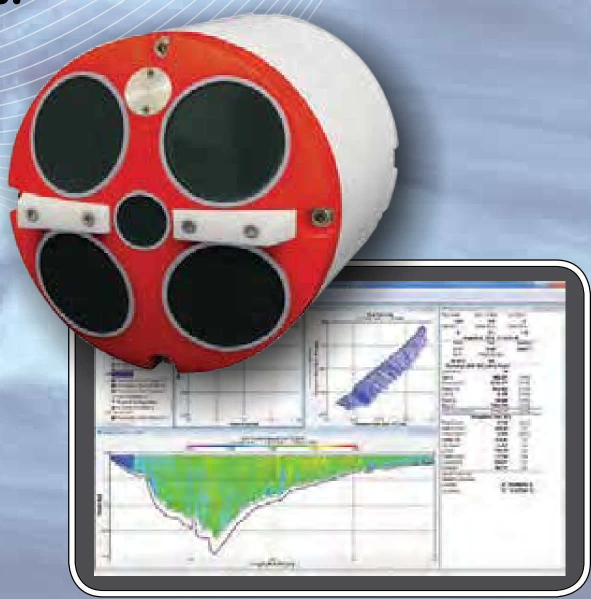
An ideal format for a streamflow measurement workshop should be over two days that empowers participants to test their own equipment and processes against the National Guidelines and group comparison measurements, with published outcomes. In turn these events can contribute to improving National Industry Guidelines and organisational processes.

Yes, effective streamflow measurement workshops require a reasonable amount of organisation, intending participants might need to work out logistics of participating and so on but with reasonable notice and planning these hurdles can be overcome. The coordination between organisations this year to get equipment across Bass Strait is an example of how logistical issues can be overcome to enable wide participation from across the country.

To finish, streamflow measurement is arguably the primary fundamental skill set for hydrographers and field hydrologists. Streamflow measurement workshops can only lead to better water resource monitoring outcomes in Australia through:

- Providing practical learning and skill enhancement opportunities in stream flow measurement
- Benchmarking organisational processes against National Guidelines and Standards, and
- Promoting a collegiate event for hydrographic practitioners to share knowledge as well as gain new knowledge and skills

Thus in-turn, enhancing overall the professionalism of the Australian water monitoring diaspora.



Verification of Acoustic Doppler Instruments

Daniel Wagenaar (Senior Hydrologist – Xylem Water Solutions) &
Dr Xue Fan PhD (Senior Application Engineer – SonTek, a Xylem Brand)

Introduction

If you are a single operator or part of a larger organisation, it's just a matter of time before the question will arise, "should I verify my acoustic Doppler instrument?"

Acoustic Doppler instruments do not drift compared to water quality, water level, and other instruments used within Hydrometry. However, it is important that acoustic Doppler instruments are verified at scheduled intervals for the following reasons:

- Electronic instruments operated in range of environmental conditions, including water, temperature, humidity, and salinity will show signs of wear and tear over time
- Instruments exposed to high levels of movement and vibration from highly turbulent flow conditions to transport of equipment on the back of a Ute need to be checked periodically.
- All Hydrometric data is quality coded and the verification and or calibration of measurement instruments forms a key component of the overall quality assigned to the processed data.

Methods of Verification

a) Regattas

The simplest form of verification is to perform a comparison measurement between two different instruments in the field, with the results within an acceptable margin, as illustrated in Figure 1. Organisations will commonly hold yearly or bi-yearly regattas for the purpose of comparing instruments against each other and a known flow to identify outliers. The verification is highly dependent on the site selection and methodology followed during each of the verification measurements.

Figure 1. ADCP Streamflow Regatta

b) Tow Tank Verification Facilities

Larger organizations have the means and space to perform comprehensive verification tests in custom-built tow tanks. One of the largest facilities is operated by the "USGS" at the Hydrologic Instrumentation Facility (HIF) located in Tuscaloosa, Alabama, USA (formerly Mississippi, USA). The "USGS" performs a rigorous process (outlined in Techniques and Methods 3-A22, USGS) to ensure that all their Acoustic Doppler Current Profiler (ADCP) instruments perform within the manufacturer specifications. All ADCP instruments used by the "USGS" are verified at the HIF and against field comparison measurements when any of the following scenarios occur:

- New instruments purchased
- Repaired instruments (HIF or Manufacturer)
- Approved firmware change
- QA Verification Age Limit (3 Year Cycle)

The HIF QA process for ADCP instruments consists of the following:

- Inspection for physical damage
- Instrument diagnostic self-check tests
- Temperature probe check (must be within ± 2 degrees Celsius of reference)
- Distance made good using bottom track over a fixed distance must meet the manufacturer's specifications (+/-0.25% or +/-1% difference).

Figure 2 shows a "SonTek RS5" being tested at the HIF tow tank facility.

Figure 2. "SonTek RS5" in the Process of being Verified following "USGS" Process at the HIF.

c) Using Bottom Track for Water Track Verification (Distance Made Good)

Bottom Track is the preferred parameter to use for both verification and calibration of ADCP instruments for the following reasons:

- The bottom-track processing algorithm for calculating speed over the ground functions similarly to the water-track velocity calculations. It utilizes the same beam angle transformation matrix and incorporates similar data as used in the water-track velocity calculations.
- The bottom in a tow tank does not move, regardless of facility and water conditions. This principle allows the movement of the ADCP instrument with precise speed over the ground, and or compute the cart average speed by using distance and time travelled. Normally, tow tanks for bottom track verification have a layer of gravel to facilitate the bottom signal.
- The water in the tow tank is impacted by the movement of ADCP resulting in residual currents being generated during each run. Waiting times of up to 30 minutes (tow tank dependent) is required between each run for the residual current to dissipate if water track is measured. By contrast, when using bottom track, water movement does not have an impact on bottom-track / DMG test accuracy.
- Using bottom-track instead of water track eliminates unknown uncertainties due to hydrodynamic effects (wake from instrument in water reflecting off tank walls, temperature gradients causing vertical movement, etc.)
- When measuring water-track velocities, seeding material is required due to the lack of suspended particles in the water. The seeding process disturbs the water surface and settling time is required to allow the seeding material to disperse and for the disturbance to dissipate. There is also a cost associated with seeding material and clean-up process. With bottom tracking, seeding is not required.

Using bottom-track velocity to verify successful operation of an ADCP not only confirms calculations of water velocities, but it also exercises many different parts of the water and bottom detection algorithm, which further confirms that the ADCP is in proper working condition. If any number of the components that go into the final DMG value has issues, the results will be outside of the acceptable manufacturer's specification.

Distance Made Good

'Distance Made Good' is defined as the distance travelled from the start of the measurement to the end if a straight line is drawn through the two points. This is a readily available parameter available in "SonTek" ADCP software ("RiverSurveyor Live", "RSQ") for down-looking ADCPs. It must be calculated for side- and up-looking instruments like the SL and IQ. This parameter is calculated based on bottom-track in a tow tank verification test and used to compare to a tow tank track distance calculated independently as reference.

Figure 3 shows a screen shot of data from a "SonTek RS5" complete run through a tow tank verification test at the HIF. The final DMG value can be seen in the left tabular window. This value is compared to the track distance calculated by the cart mechanism itself.

The DMG test is conducted on each instrument, and each frequency for multi-frequency instruments. Each frequency is tested twice in both forward and backwards directions (4 tows along the tank) at four different angles (0°, 45°, 90°, 135°) to compare different leading beams. A total of 16 tow tank runs is performed for the RS5 in the example above. For a "SonTek M9", the number of runs is doubled to account for the two different frequencies. The HIF and other agencies use special settings files to force the ADCP to measure in a certain way (fixing the frequencies and disabling certain variables, like the magnetic compass).

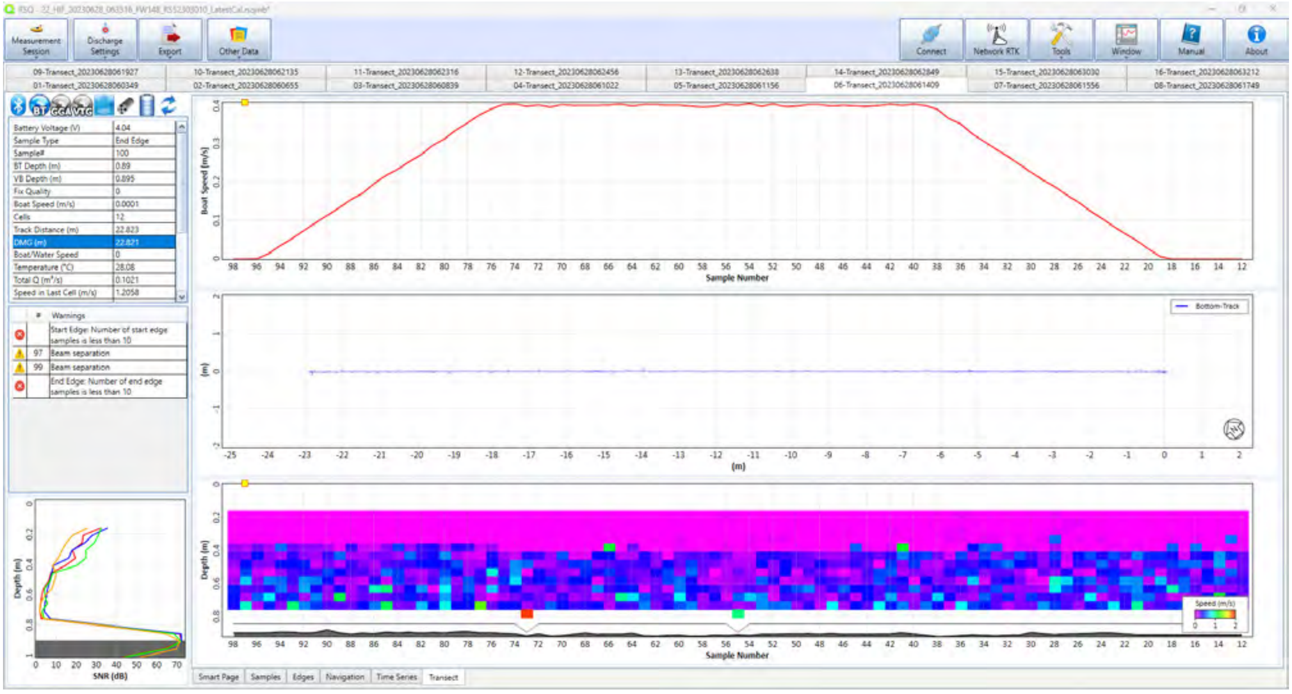


Figure 3. Data from "SonTek RS5" Tow Tank Verification Test.

Aligning with the Manufacturer's Calibration Process

The verification process adopted by organisations for verifying the following acoustic Doppler instruments should align with the processes developed by manufactures to remove any discrepancy in the verification results.

- Acoustic Doppler Current Profiler (e.g. "RiverSurveyor M9", RS5)
- Acoustic Doppler Velocimeter (e.g. "Flow Tracker 2")
- Acoustic Doppler Velocity Meter (e.g. "SonTek IQ", "SonTek SL")

The above process outlined by the HIF and used at other facilities mimics the process each "SonTek" ADCP undergoes for its own beam angle calibration. Figure 4 shows the "SonTek" beam angle calibration tank with a "SonTek M9" undergoing the beam angle calibration process.

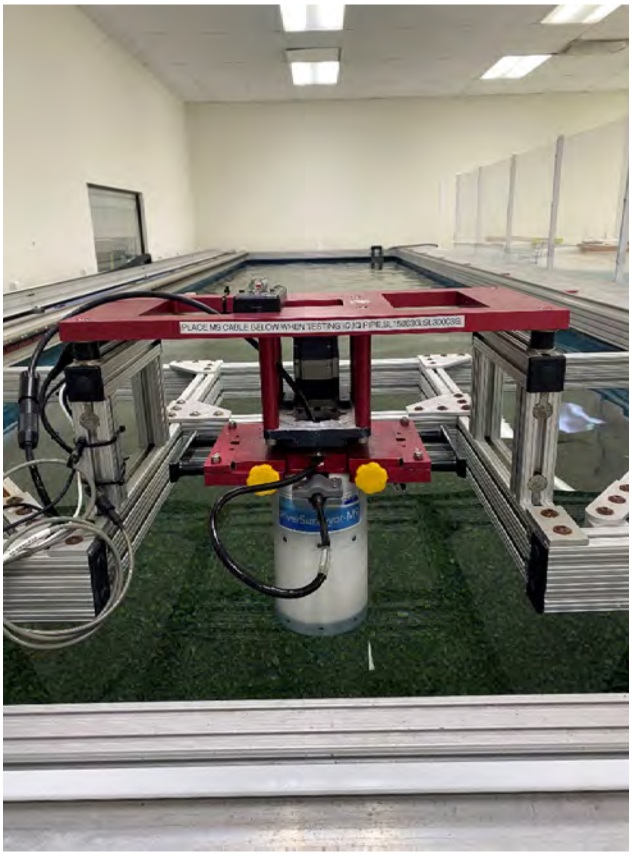


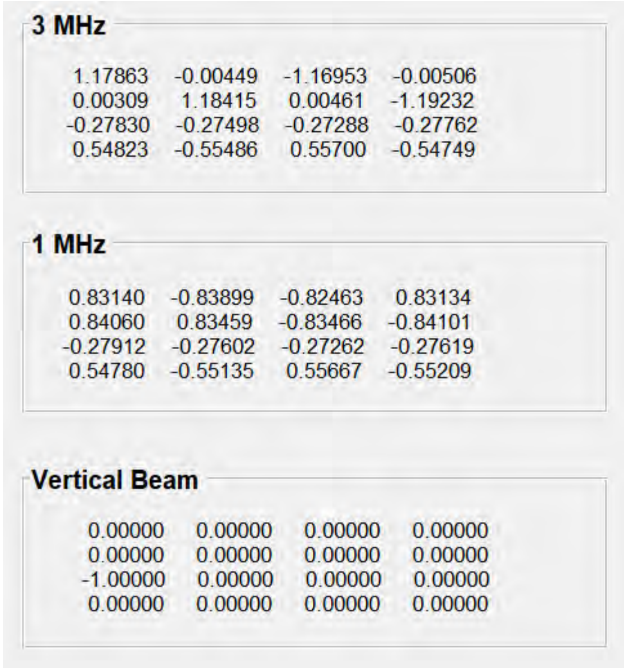
Figure 4. "SonTek" Beam Angle Calibration tank with a "SonTek" M9 undergoing calibration.

During the transducer potting process, micro-variations in transducer builds require each ADCP to undergo a rigorous calibration process. The M9 is rotated through multiple angles at known speeds over multiple tank runs. The result is a matrix transformation that is specific to each ADCP, an example of which is shown in Figure 5. When an ADCP undergoes a tow tank verification test, it is important that these values be used in the bottom-track velocity calculation to verify they still apply. These parameters play a critical role in the passing or failing of a DMG tow tank test to verify an ADCP is in working order.

If your agency is interested in setting up your own ADCP verification, it is important that you be in touch with the manufacturer to understand their processes. Tow tank testing is extremely sensitive to the setup, and it is critical to follow specific processes developed by manufacturers to ensure there are no false failures in tow tank testing results.

For information, contact "SonTek' s Total Care Customer Service" and Technical Support Center or call "SonTek" directly at +1 (858) 546-8327 to speak with one of our Technical Engineers.

Contact SonTek Support



3 MHz

1.17863	-0.00449	-1.16953	-0.00506
0.00309	1.18415	0.00461	-1.19232
-0.27830	-0.27498	-0.27288	-0.27762
0.54823	-0.55486	0.55700	-0.54749

1 MHz

0.83140	-0.83899	-0.82463	0.83134
0.84060	0.83459	-0.83466	-0.84101
-0.27912	-0.27602	-0.27262	-0.27619
0.54780	-0.55135	0.55667	-0.55209

Vertical Beam

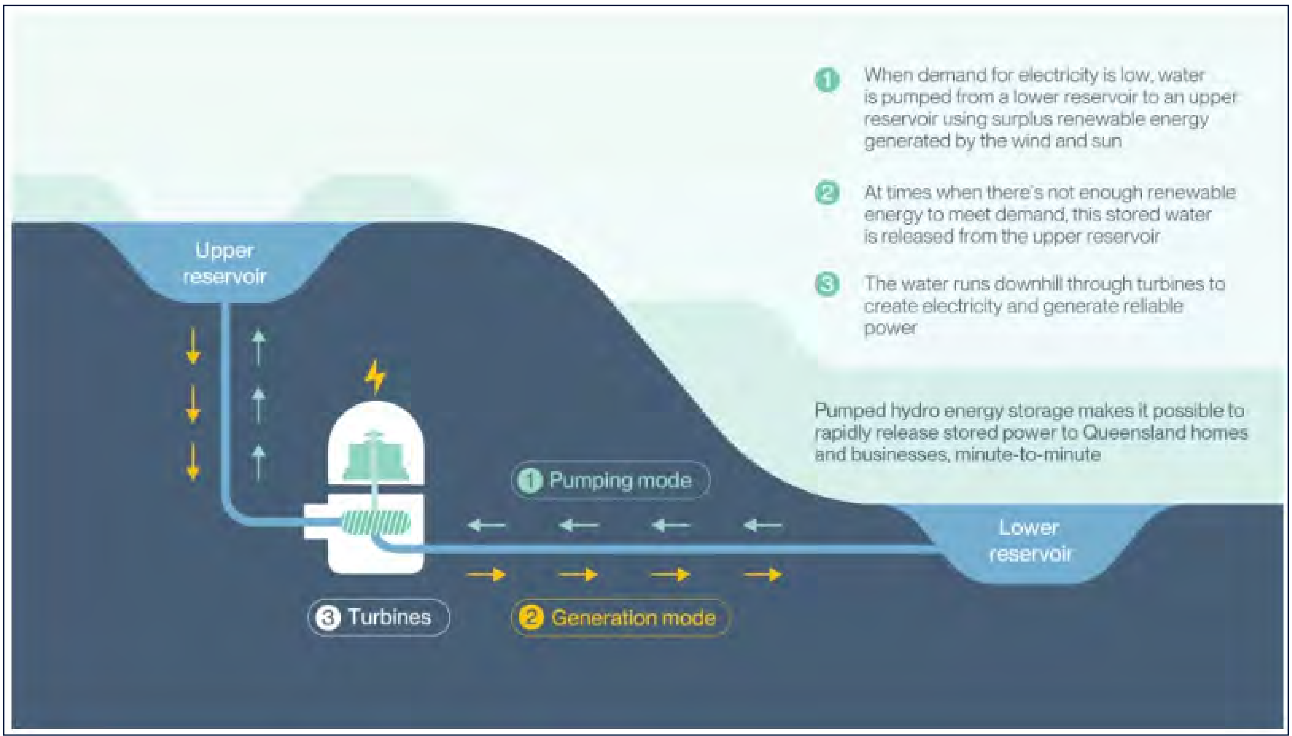
0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000
-1.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000

Figure 5. Typical transformation matrix for a "SonTek M9".

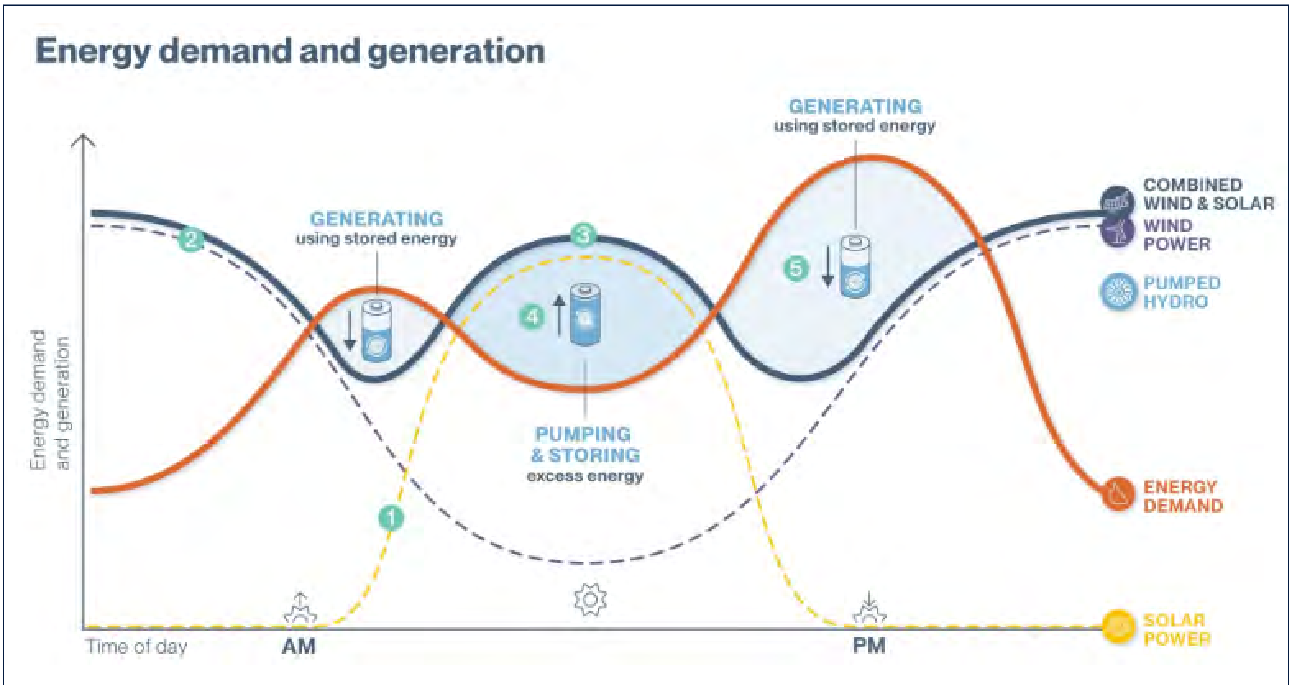
Zero to Flow

A presentation from the AHA Conference 2025

PHS – How it Works:



PHS – Operation:



History of Queensland Hydro and Borumba

In June 2021, Powerlink Queensland was engaged by the Queensland Government to:

- Prepare a Detailed Analytical Report (DAR) for Borumba Pumped Hydro Project (BPHP)
- Undertake Front-End Engineering Design (FEED) for the BPHP
- Primary objective of the BPHP:
- Provide long duration, high-capacity dispatchable energy to the Queensland grid
- Increase system stability and reliability of energy supply

In September 2022, the project was transferred from Powerlink Queensland to Queensland Hydro (QH).

The proposed Borumba Project is expected to advance in two phases: exploratory works and main works. Exploratory works occur first.

The exploratory phase will inform site suitability and project design.

The high-level program of work continues to focus on assessing the design to improve cost and schedule certainty and minimise any potential impacts on natural, cultural and community values. For Queensland Hydro, this scope means a long duration pumped hydro system.

The Queensland Government transferred oversight of Queensland Hydro to Queensland Investment Corporation (QIC).

The current focus is delivering a refreshed business case and commercial assessment for the proposed Borumba Project that is aligned to the Queensland Government's five-year energy roadmap strategy and meets the State's future energy needs. The refreshed business case is expected to be completed by mid-2026.

Borumba Pumped Hydro Energy Storage

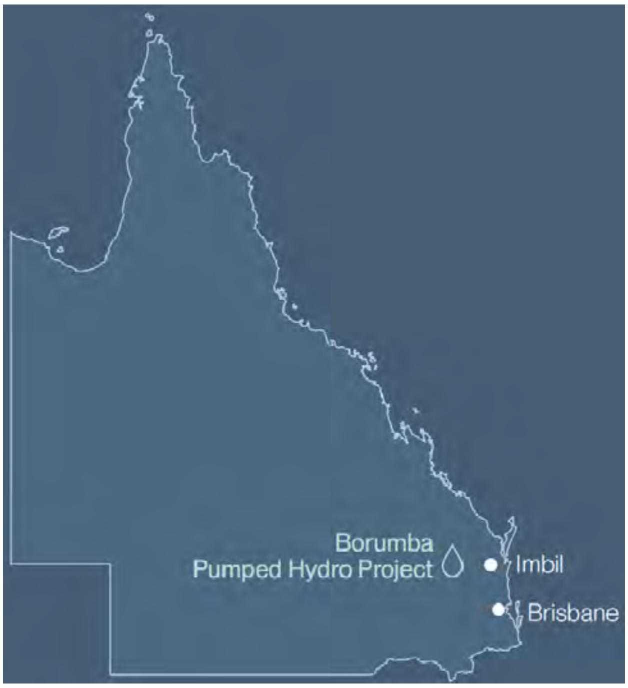
Built across Yabba Creek, the existing Borumba Dam was constructed in 1963, and was upgraded to increase flood storage in 1997.

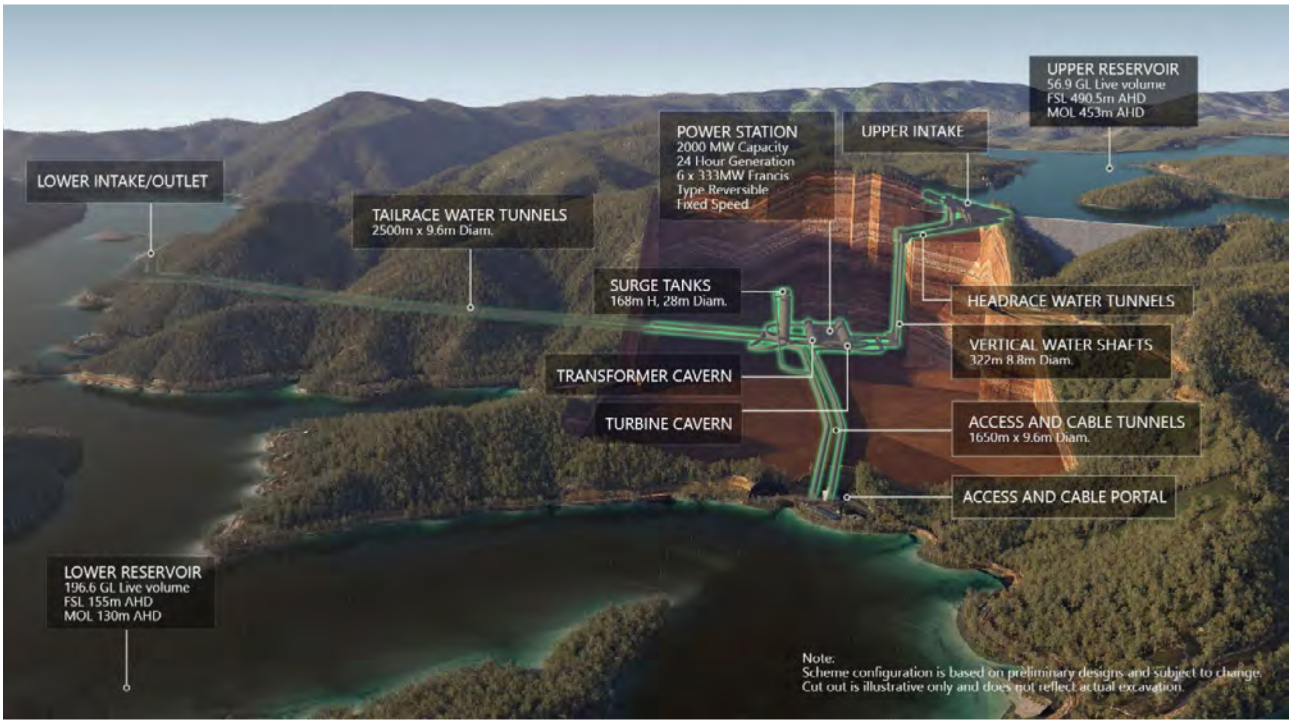
Forms Lake Borumba and is owned and operated by "Seqwater".

Water is currently used within the Mary Valley Water Supply Scheme for drinking water and for irrigation purposes.

Borumba Dam is at 31.1 km AMTD on Yabba Creek and Yabba Creek joins Mary River 226.7 km AMTD from the mouth of the river (and 167.4 km upstream of the tidal barrage).

Land for the pumped hydro scheme was purchased by the state government in 1985



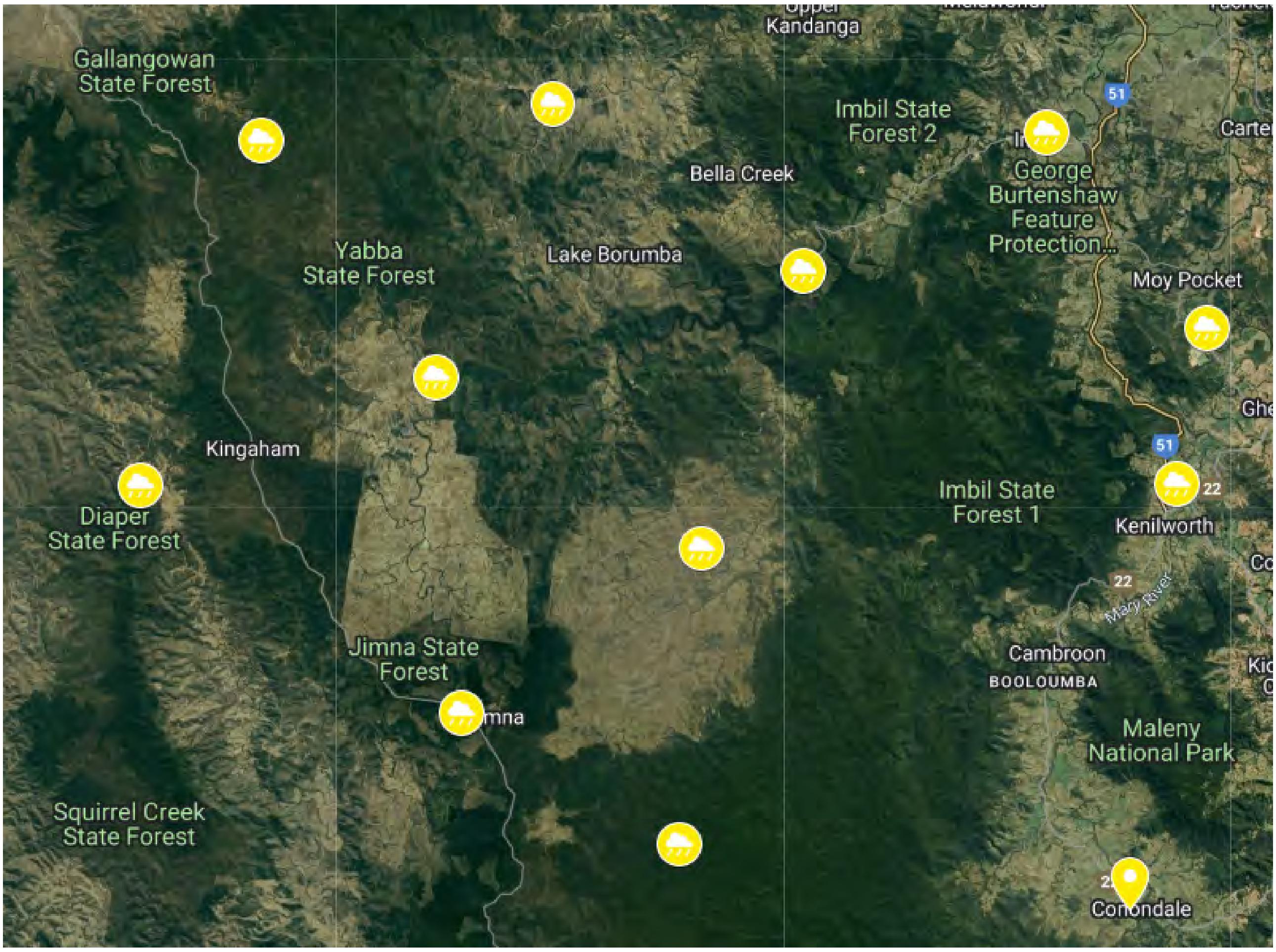

UPPER RESERVOIR
56.9 GL Live volume
FSL 490.5m AHD
MOL 453m AHD
POWER STATION
2000 MW Capacity
24 Hour Generation
6 x 333MW Francis
Type Reversible
Fixed Speed
UPPER INTAKE
LOWER INTAKE/OUTLET
TAILRACE WATER TUNNELS
2500m x 9.6m Diam.
SURGE TANKS
168m H, 28m Diam.
HEADRACE WATER TUNNELS
VERTICAL WATER SHAFTS
322m 8.8m Diam.
TRANSFORMER CAVERN
TURBINE CAVERN
ACCESS AND CABLE TUNNELS
1650m x 9.6m Diam.
ACCESS AND CABLE PORTAL
LOWER RESERVOIR
196.6 GL Live volume
FSL 155m AHD
MOL 130m AHD
Note:
Scheme configuration is based on preliminary designs and subject to change.
Cut out is illustrative only and does not reflect actual excavation.

Existing Monitoring

"Seqwater" Borumba Monitoring includes:

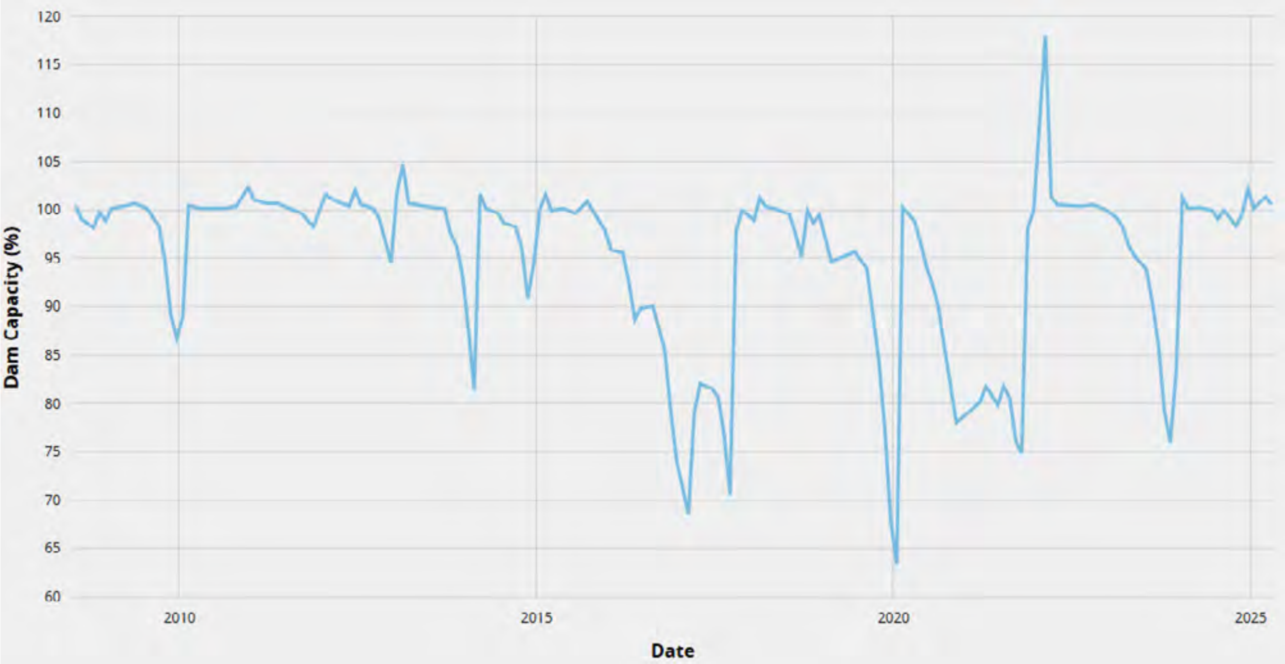
- Series of rain gauges in the upper catchment
- Borumba Dam RL
- Borumba Dam Rain gauge
- Borumba Dam Tailwater gauge

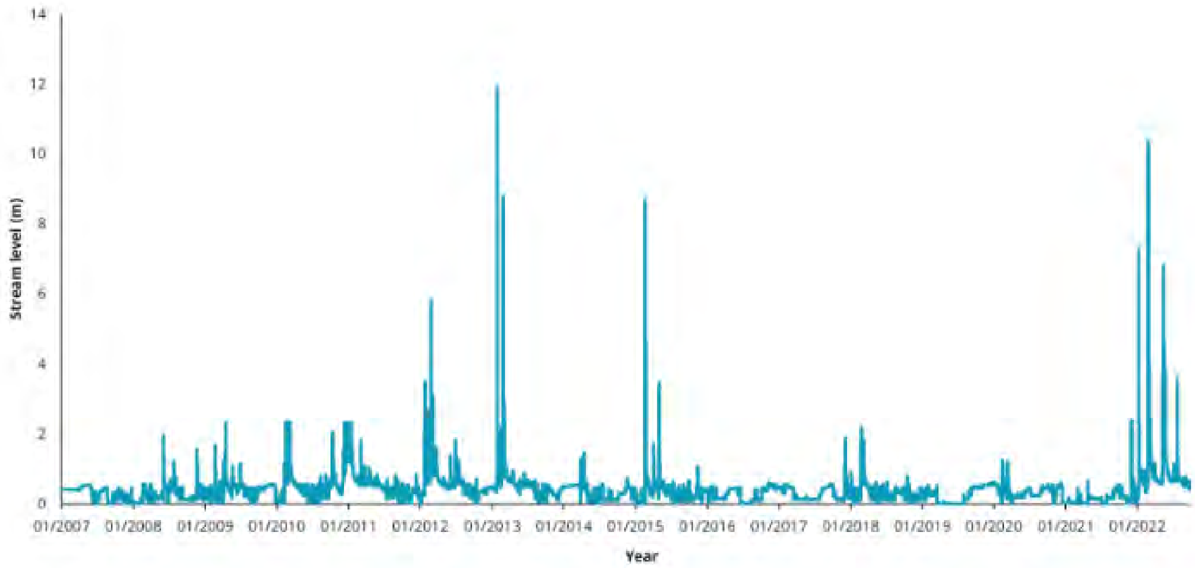
BoM Rain gauges also in vicinity



Borumba Dam Continuous Water Level, and Borumba Tailwater Gauge

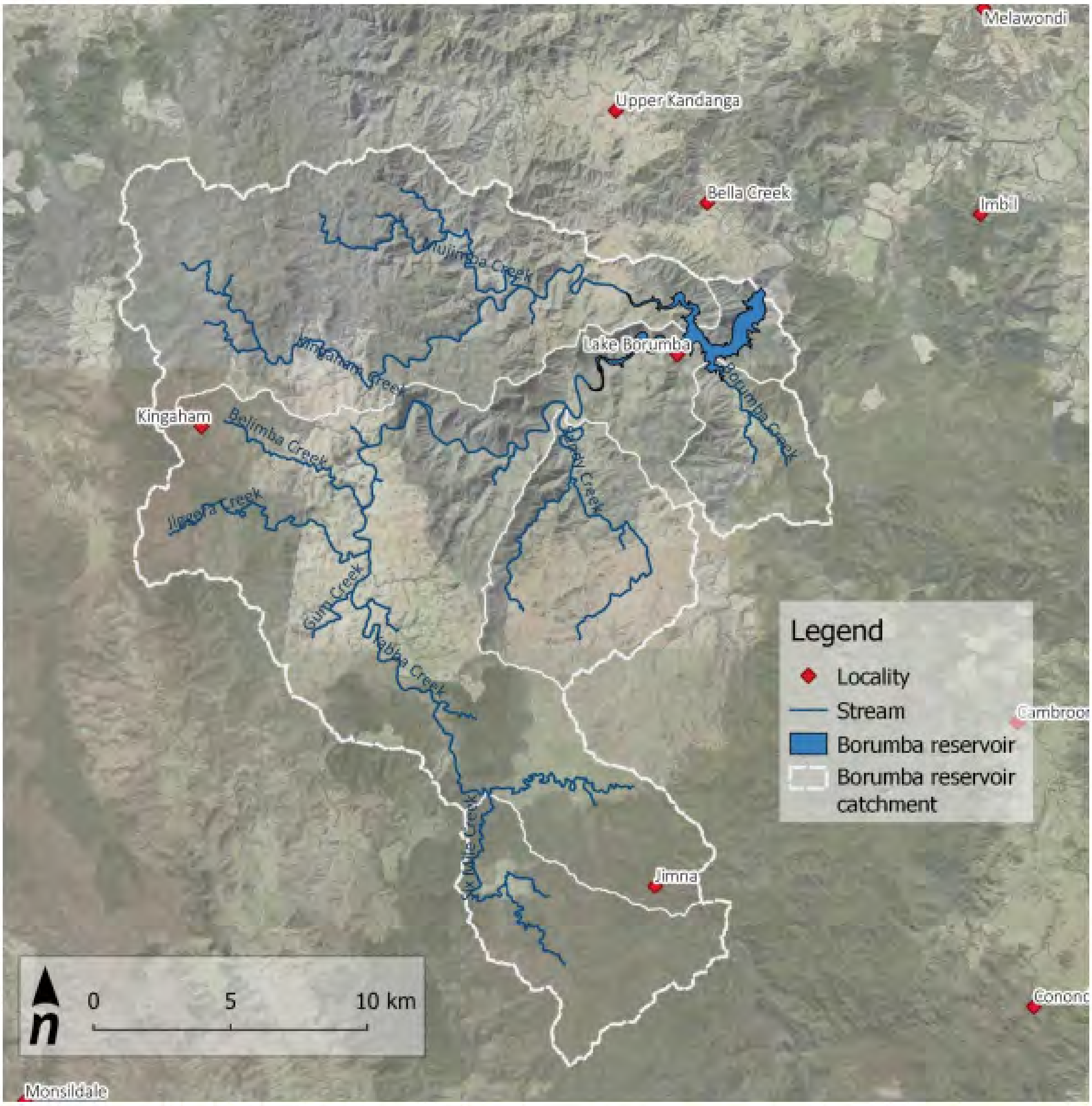
Used as a calibration for hydrologic modelling undertaken by "Queensland Hydro".





Continuous daily Borumba Dam tailwater watercourse level from 2007-2022

Borumba Catchment



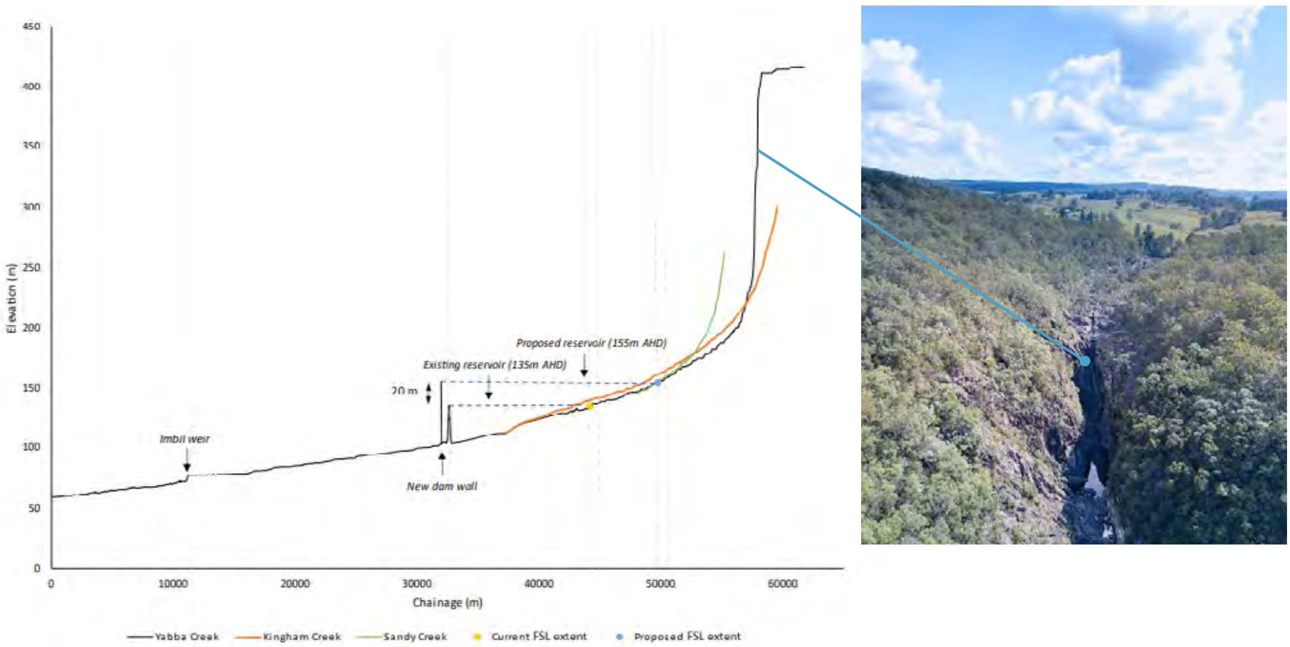


Figure 18. *Bed grade assessment of Yabba Creek and main tributaries Kingaham Creek and Sandy Creek, showing the existing and proposed reservoir full supply levels and geomorphic zones (dotted lines) developed from LiDAR and bathymetric data captured by Powerlink in 2022*


Make Tassie
Your office
Hydro.com.au/careers
Hydro
Tasmania


Bench


Instream timber
Riffle zone
Lomandras
stabilising banks
Cobble banks

Unidata Neon Logger Utility

Connect and Configure using Bluetooth

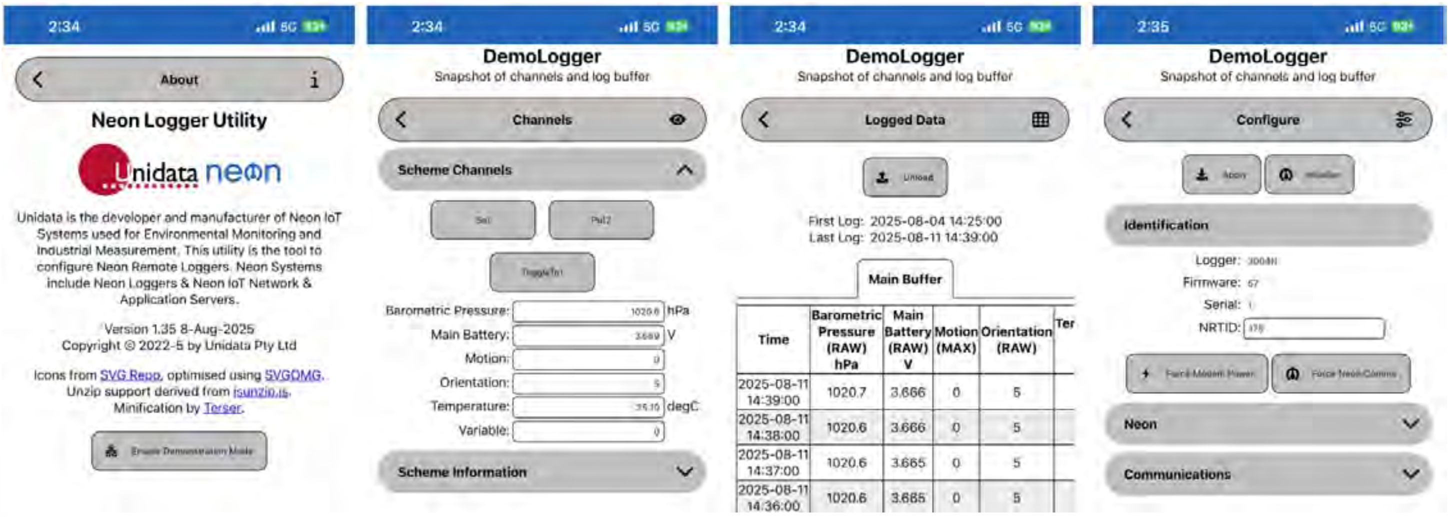
Now available to download across multiple platforms

The Neon Logger Utility is a small application allowing Unidata Neon Remote Loggers (NRLs) to be checked, configured, and programmed in circumstances where the usual Unidata Starlog V4 software is less convenient or cannot be used.

In particular, the Neon Logger Utility can be installed on mobile devices (phones/tablets) and allows wireless access to loggers via Bluetooth.
On larger devices (desktop PCs or laptops), a direct serial USB cable connection is also supported.

Features

- View instrument inputs and scheme channels
- View and unload logged data to CSV files (Micro SD may be required)
- Program schemes
- Configure telemetry settings
- View logger status
- Update logger firmware (Micro SD required)



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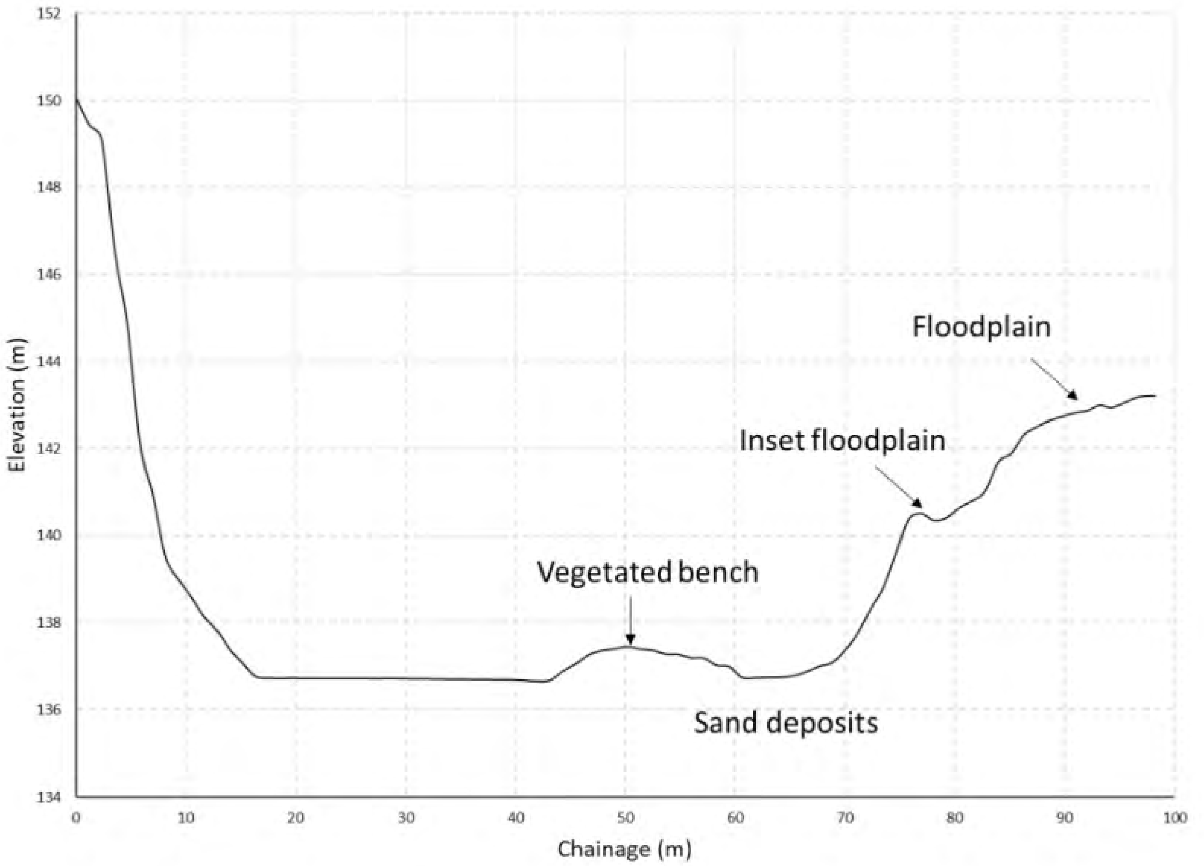
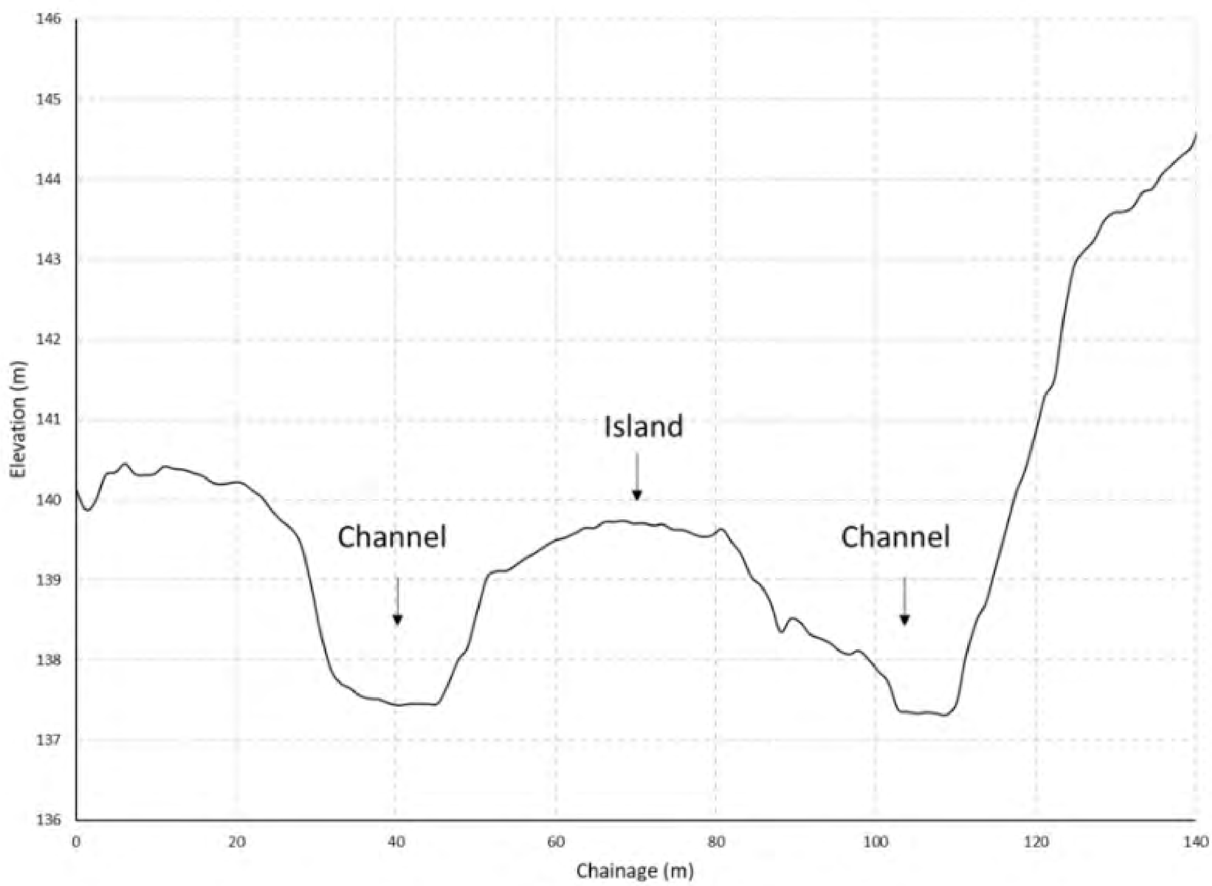

Floodplain
Inset floodplain
Vegetated bench
Sand deposits
Elevation (m)
Chainage (m)


Island
Channel
Channel
Elevation (m)
Chainage (m)

Catchment Hydrology

Modelled flow duration curves show the percent of time the specified discharges were equalled or exceeded.

The median flow rates for the three primary tributaries

Yabba Creek 0.30m3/s

Kingaham Creek 0.13m3/s

Sandy Creek 0.01m3/s

Yabba Creek exceeds 10 m3/s 1.8% of the time.

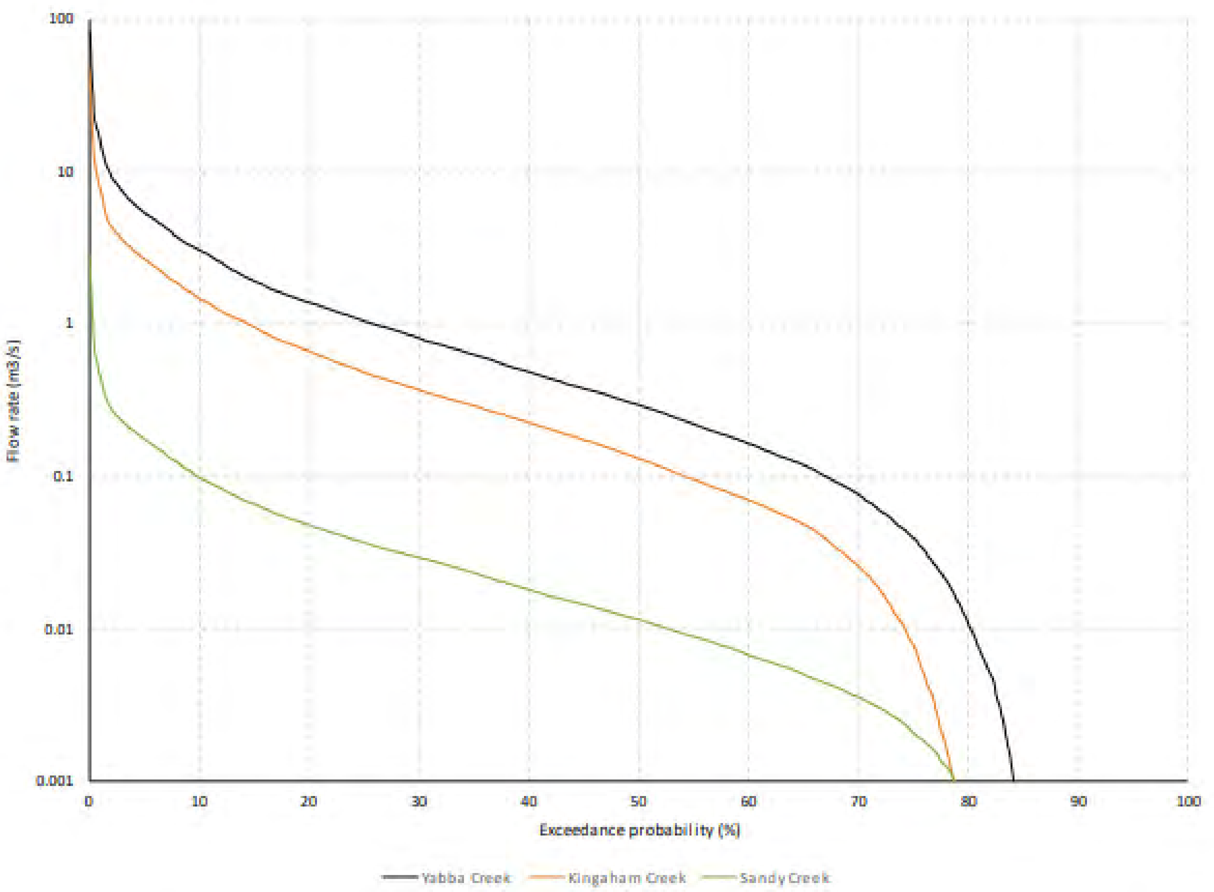
Kingaham Creek 10 m3/s flow 0.7% of the time

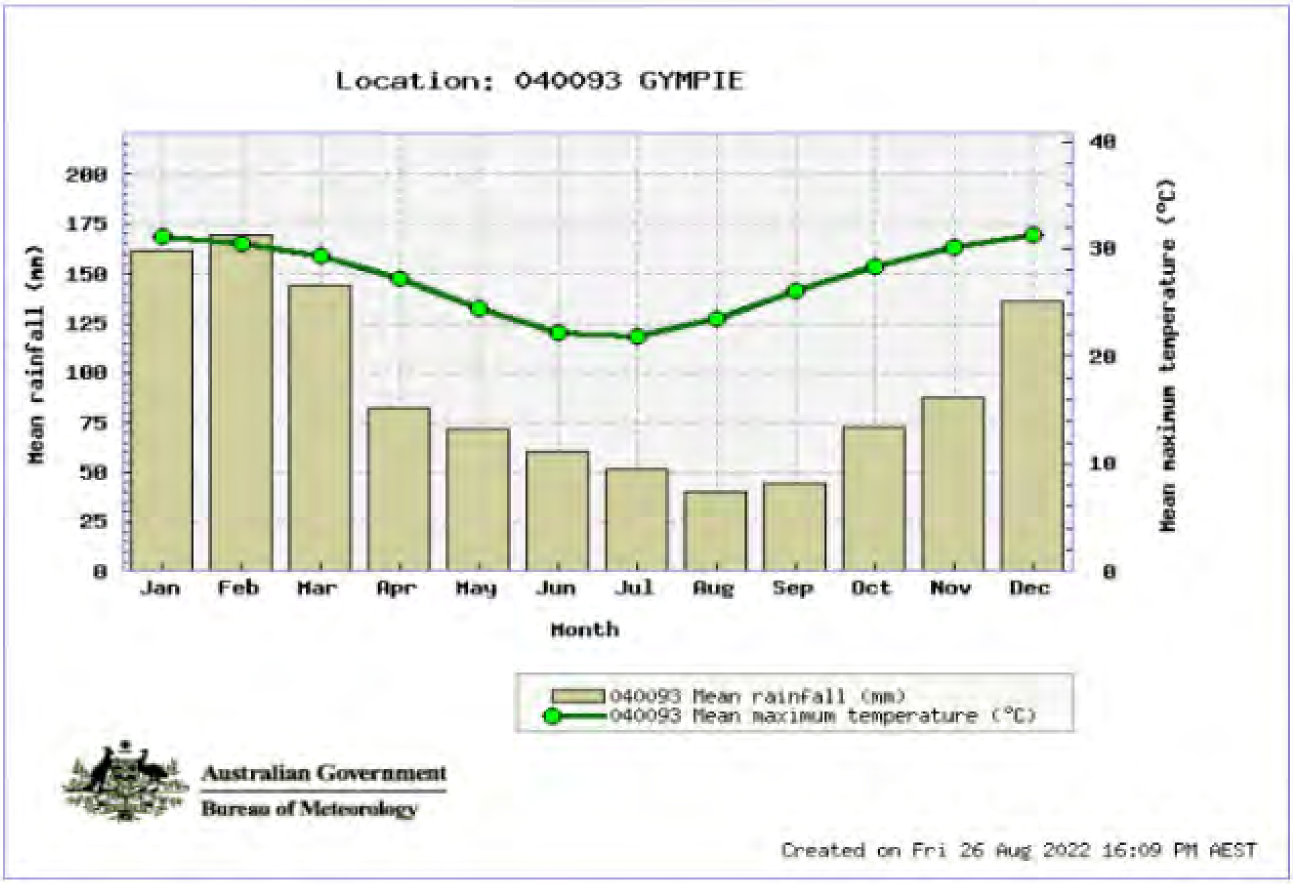
Sandy Creek 10 m3/s 0.2% exceeds of the time.

Catchments of Borumba Dam receive yearly rainfall in excess of 1000mm.

Imbil Forest yearly average = 1169.4mm

Gympie yearly average = 1119.9mm




Location: 040093 GYMPIE
Mean rainfall (mm)
Mean maximum temperature (°C)
200
175
150
125
100
75
50
25
0
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
040093 Mean rainfall (mm)
040093 Mean maximum temperature (°C)
Australian Government
Bureau of Meteorology
Created on Fri 26 Aug 2022 16:09 PM AEST

Monitoring Supporting EIS – Surface Water Sampling

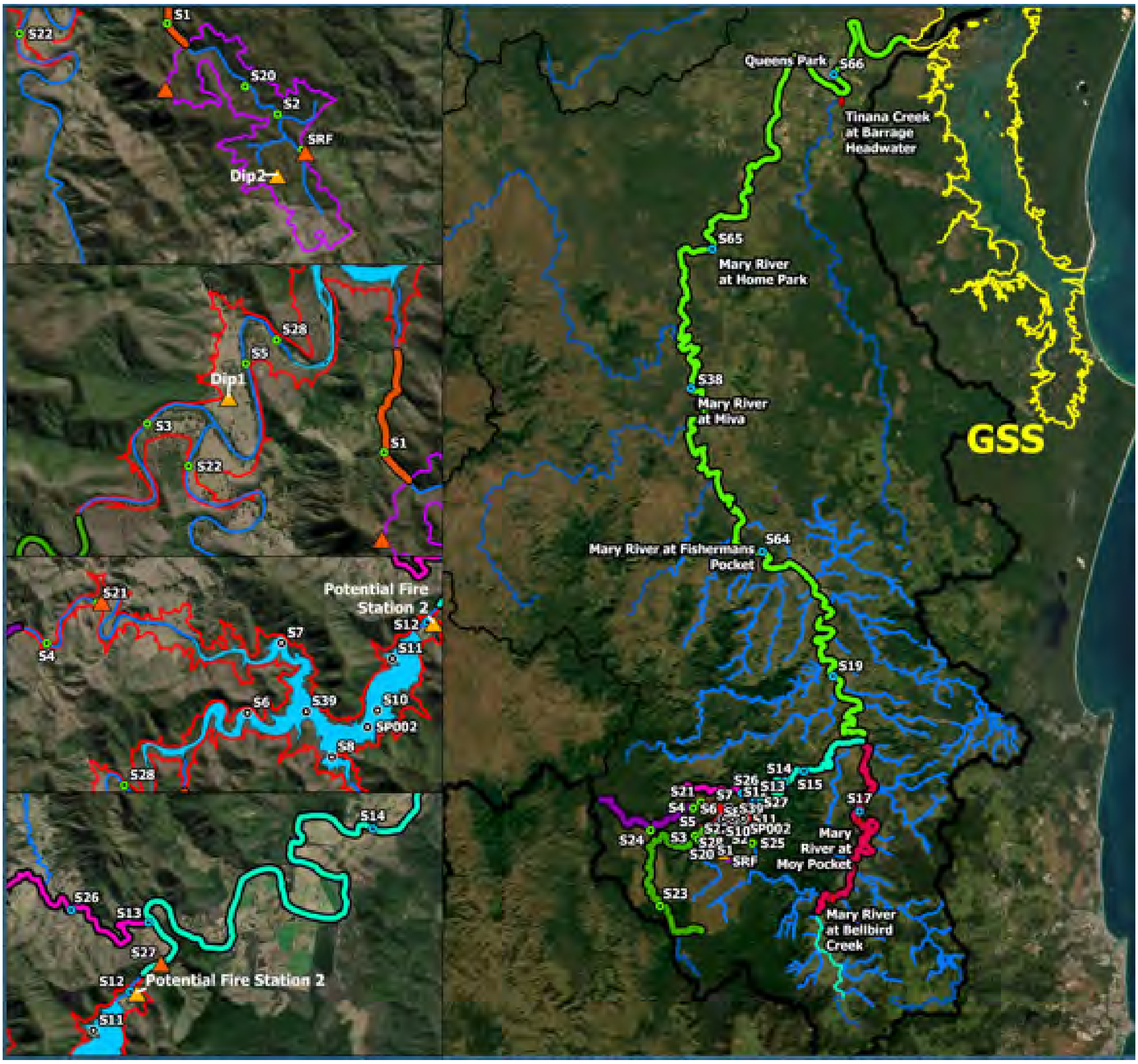
Modelled flow duration curves show the percent of time the specified discharges were equalled or exceeded.

Total 33 sampling locations that capture:

All waterways associated with project area from upper catchment to the coast

References sites

Gov WQ monitoring sites d/s of Mary River

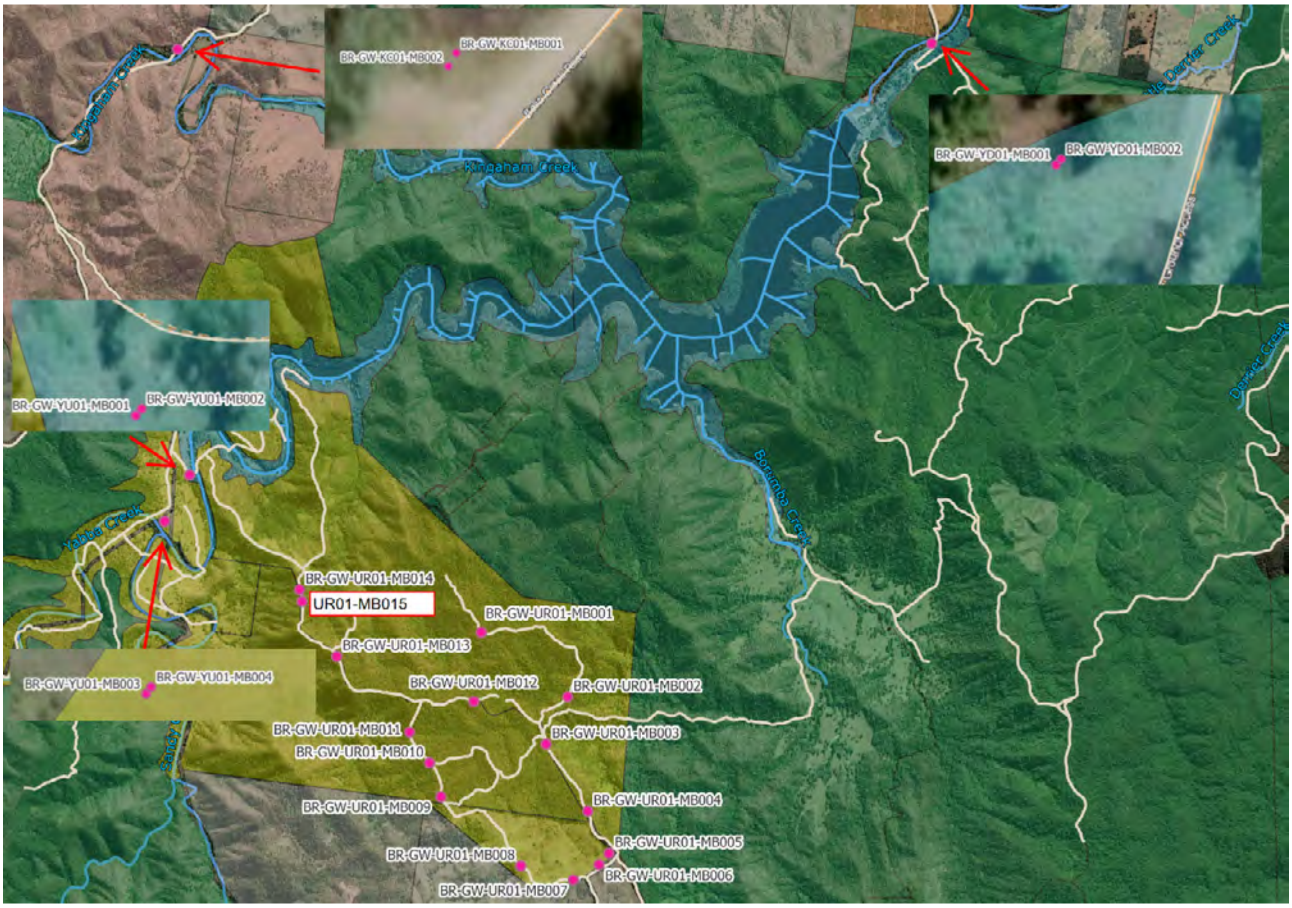


Sampled monthly for baseline water quality.

Continuous loggers recording level and EC hourly.

Springs also sampled were possible to gauge potential Surface water/groundwater interactions

Data has been used to build Depth to Groundwater Table models, and assess groundwater dependent ecosystems



Hydrometric Monitoring Plan

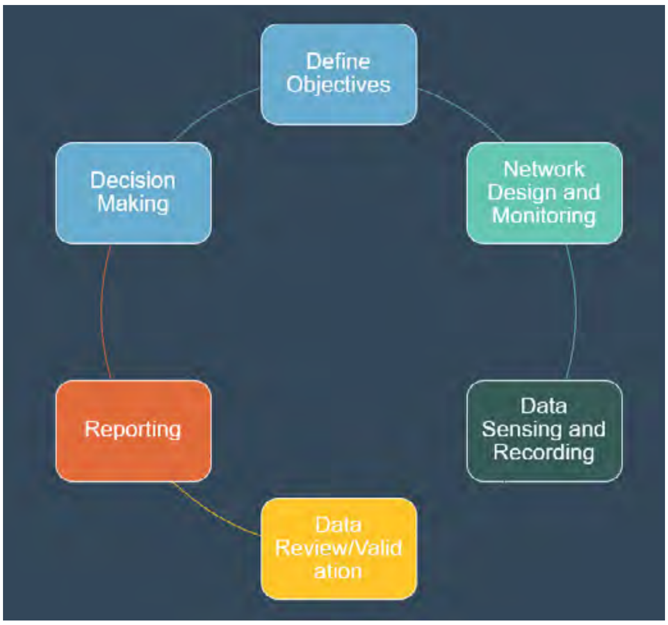
Encompassing continuous surface water monitoring activities in all phases of the project

1. Exploratory works
2. Main works
3. Operations

Monitoring Plan broken down deliverables:

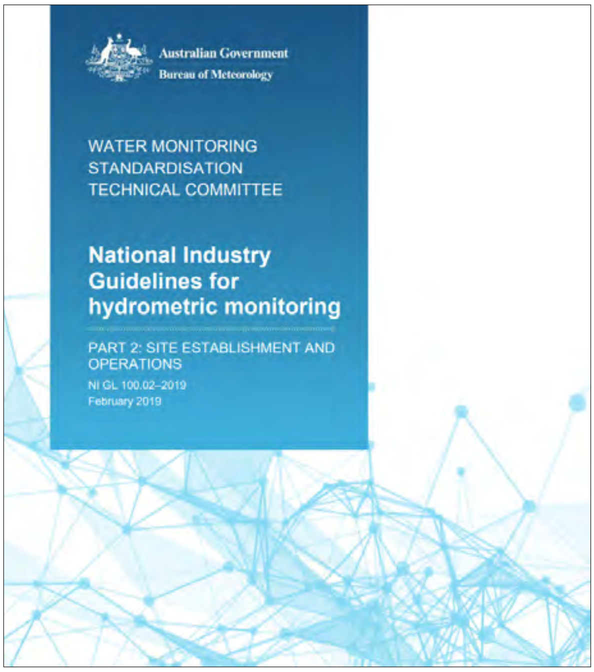
1. Initial Monitoring
2. Site Access Monitoring
3. Longterm Inflow Quantification and Water Quality
4. Dam and Reservoir Monitoring

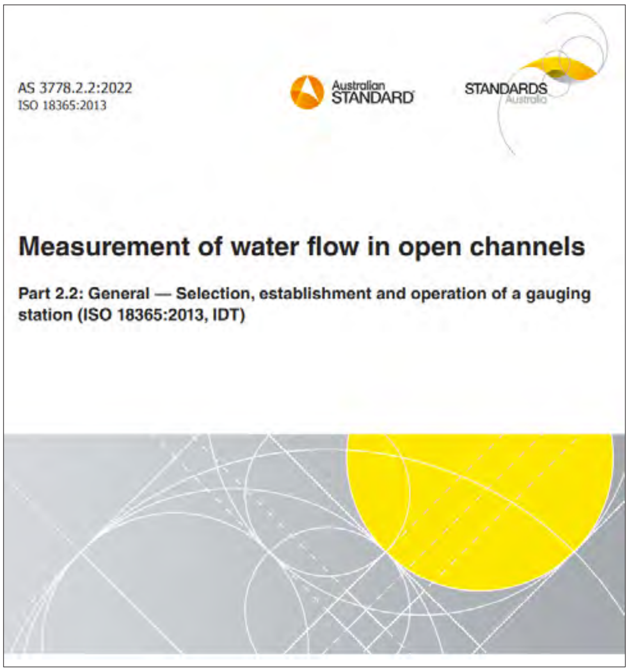
But where do we start to position monitoring assets?



Monitoring Locations Investigations

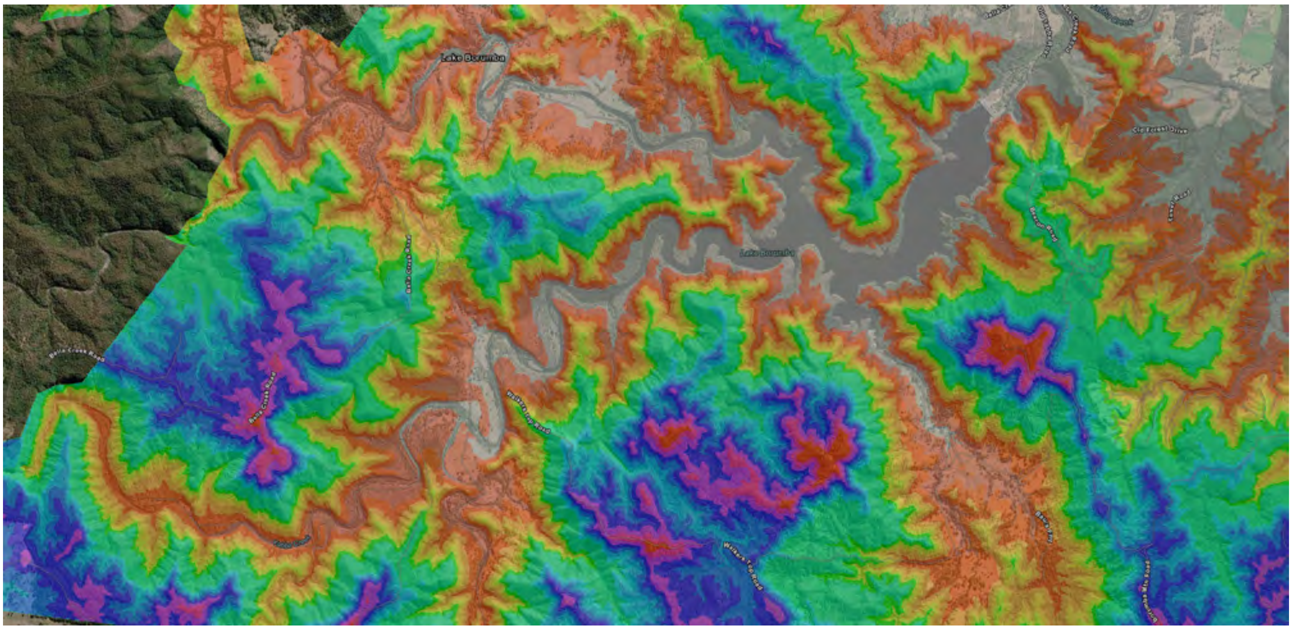
Consulted the standards

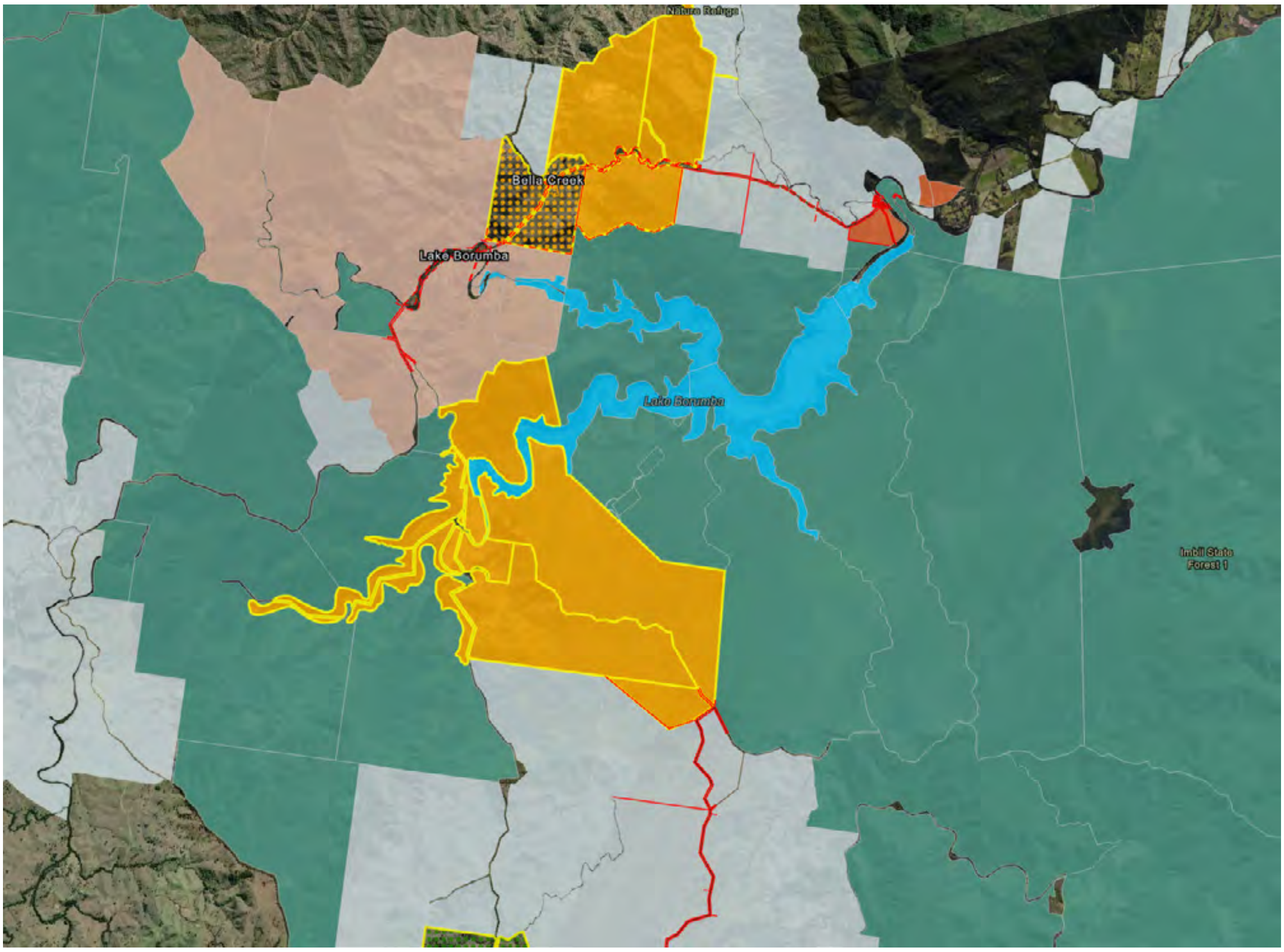




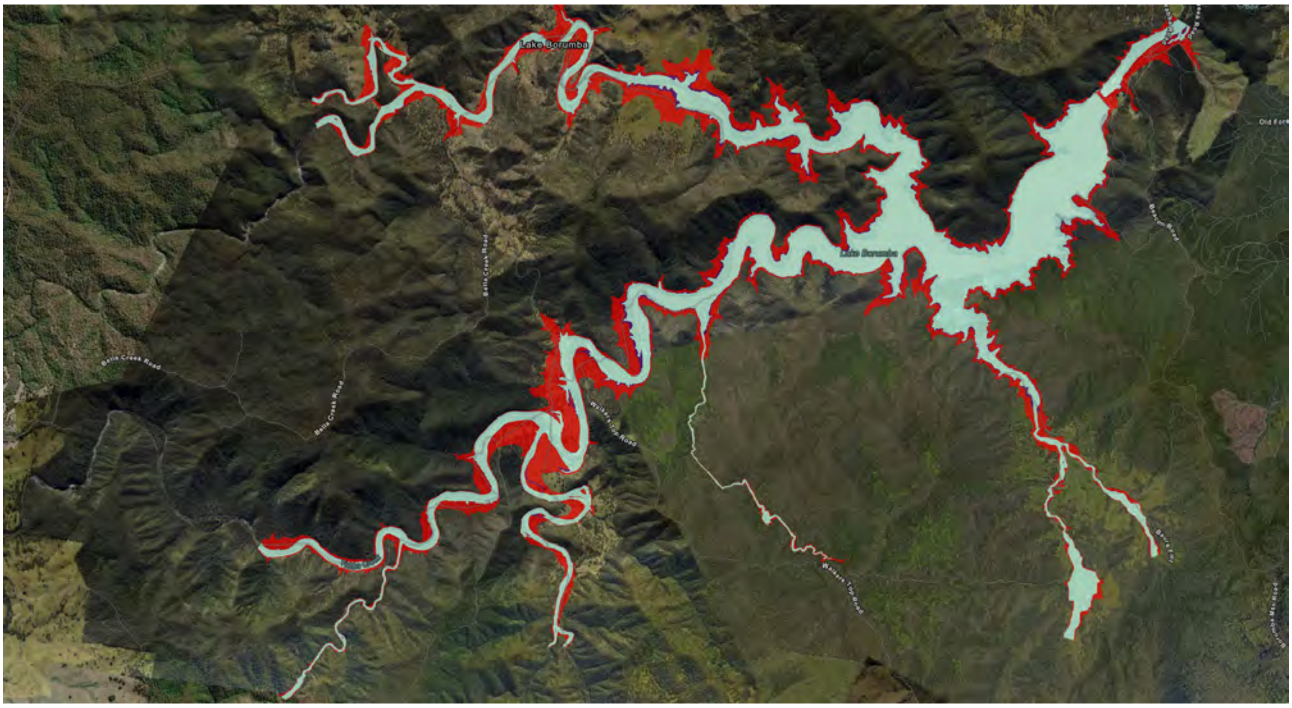
Desktop Assessments

Extensive GIS data available

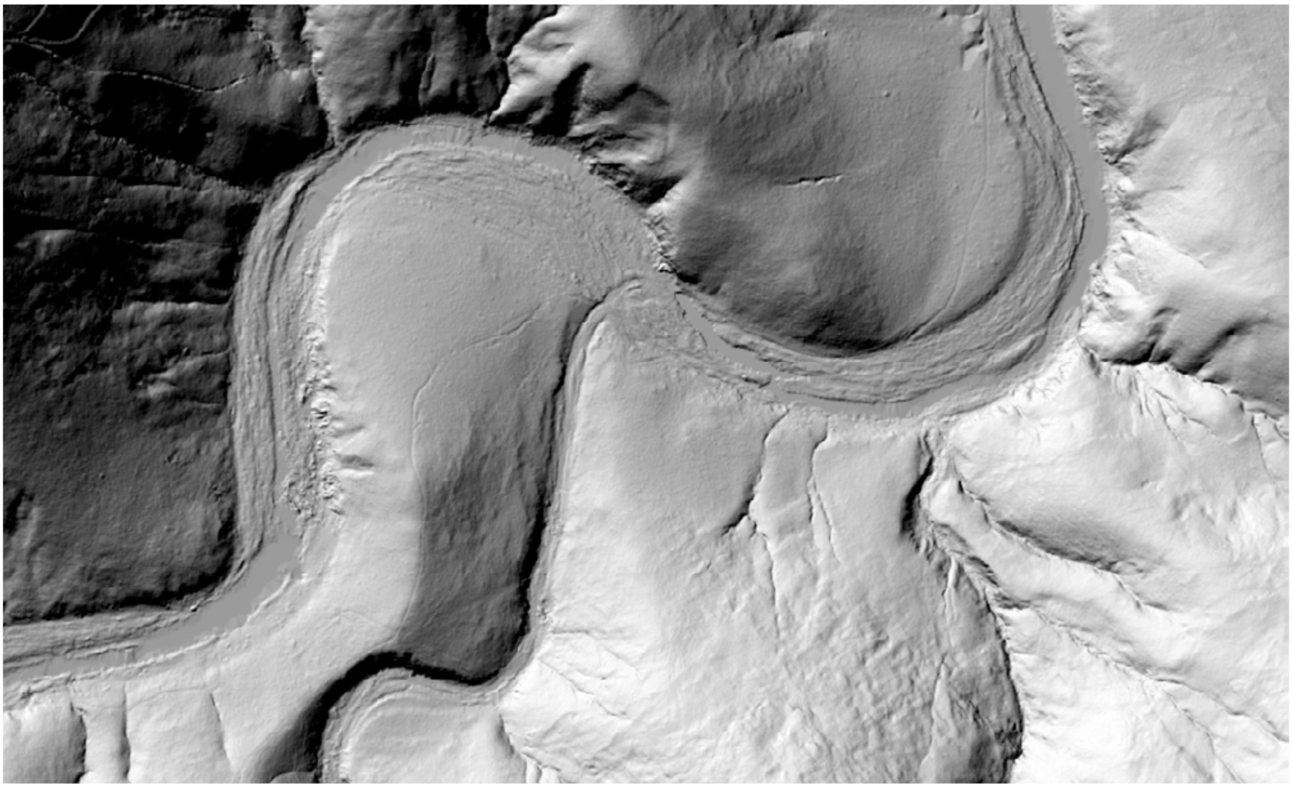

Digital Elevation



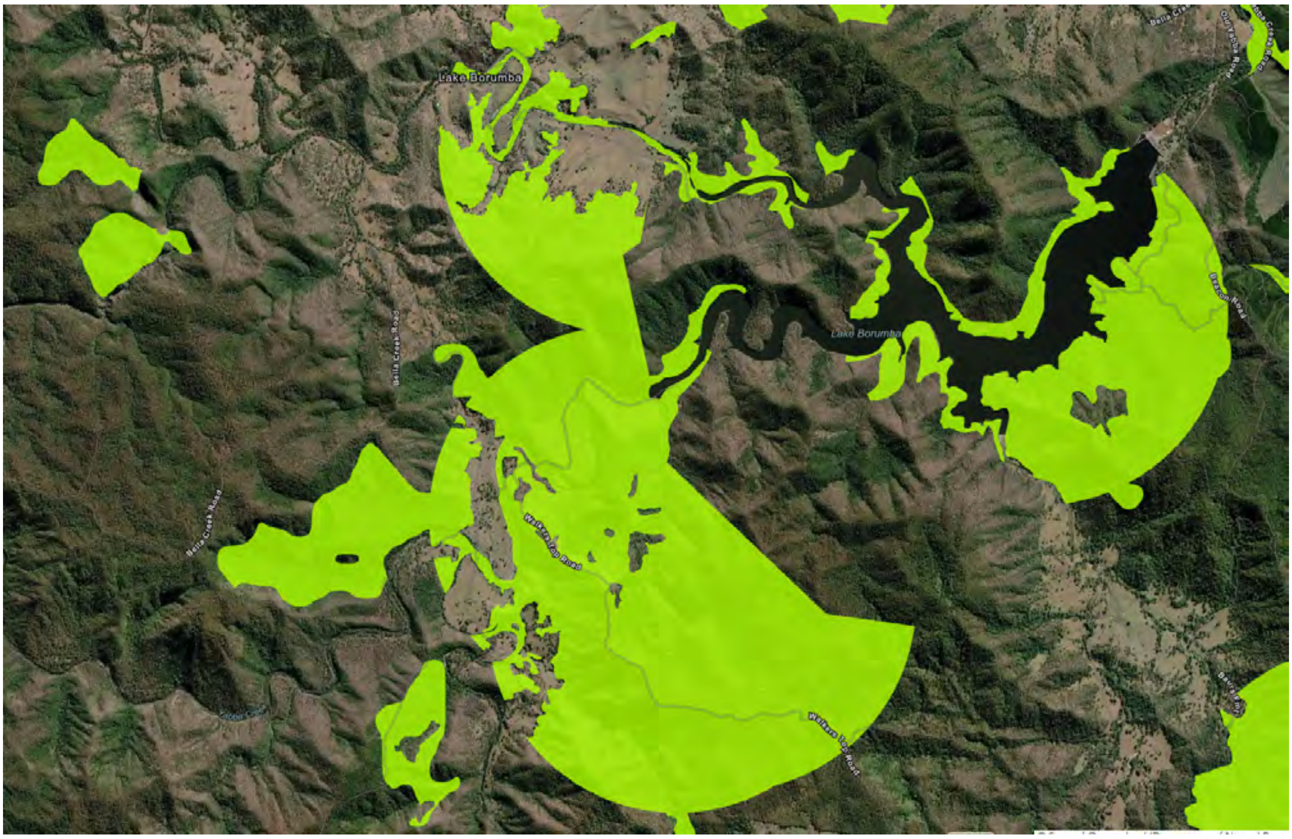
Property and Lands Information



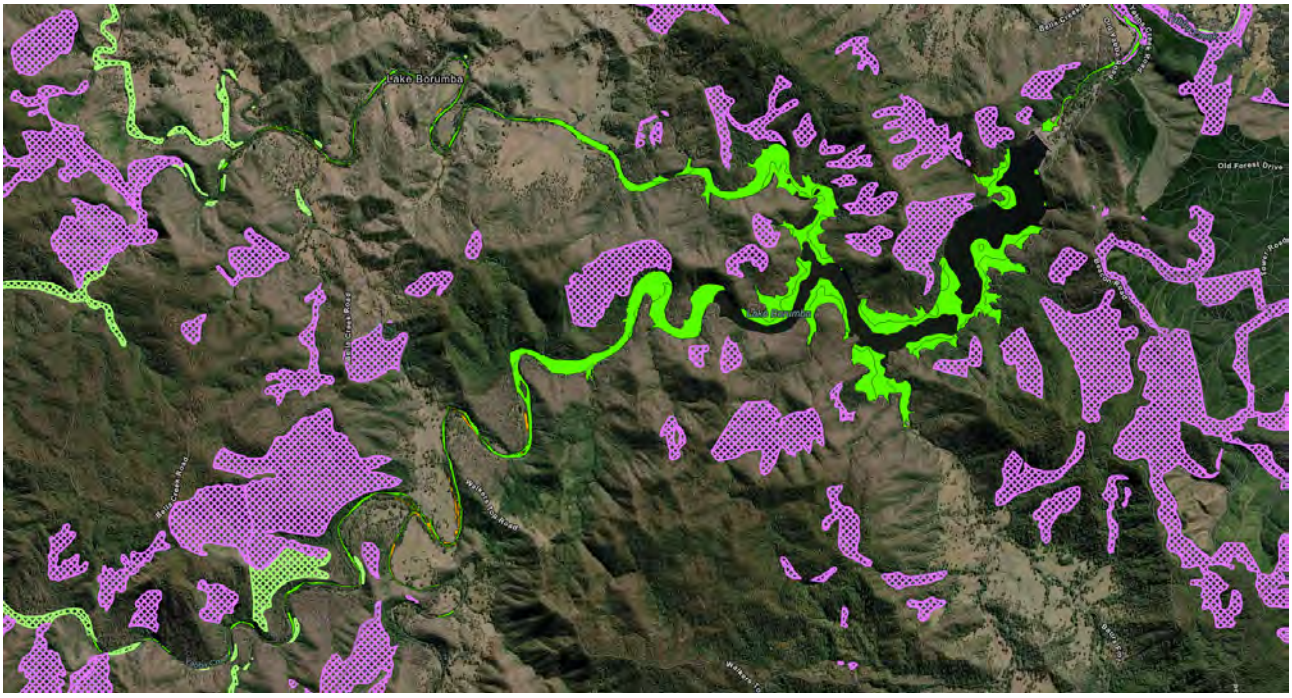
Flood Modelling



LiDAR and Geology



Environmental Considerations – Protected Plant



Threatened Species

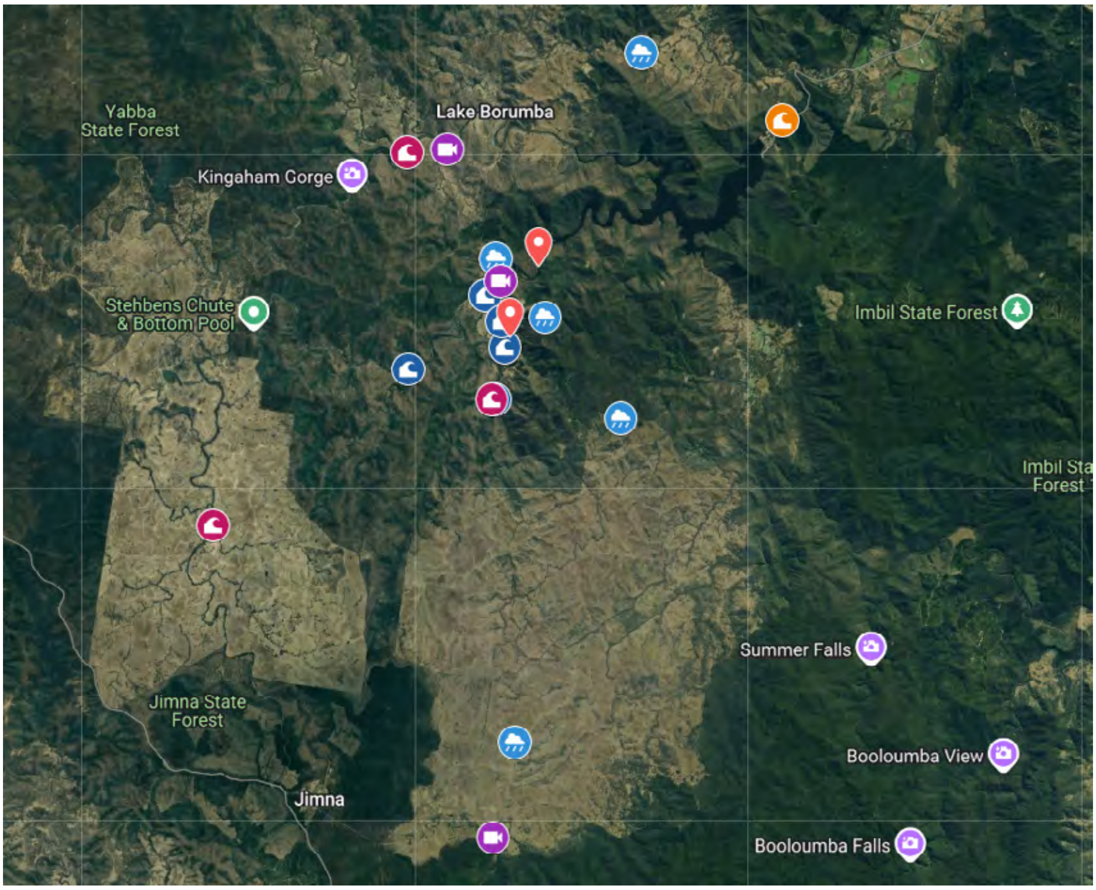
Shortlist of monitoring locations.

Require appropriate approvals to undertake field reconnaissance.

Site visits require the activity to be reviewed for their location and environmental disturbance.

Process **can take up to 6-weeks** from submission of documentation...... even for an observation only visit.

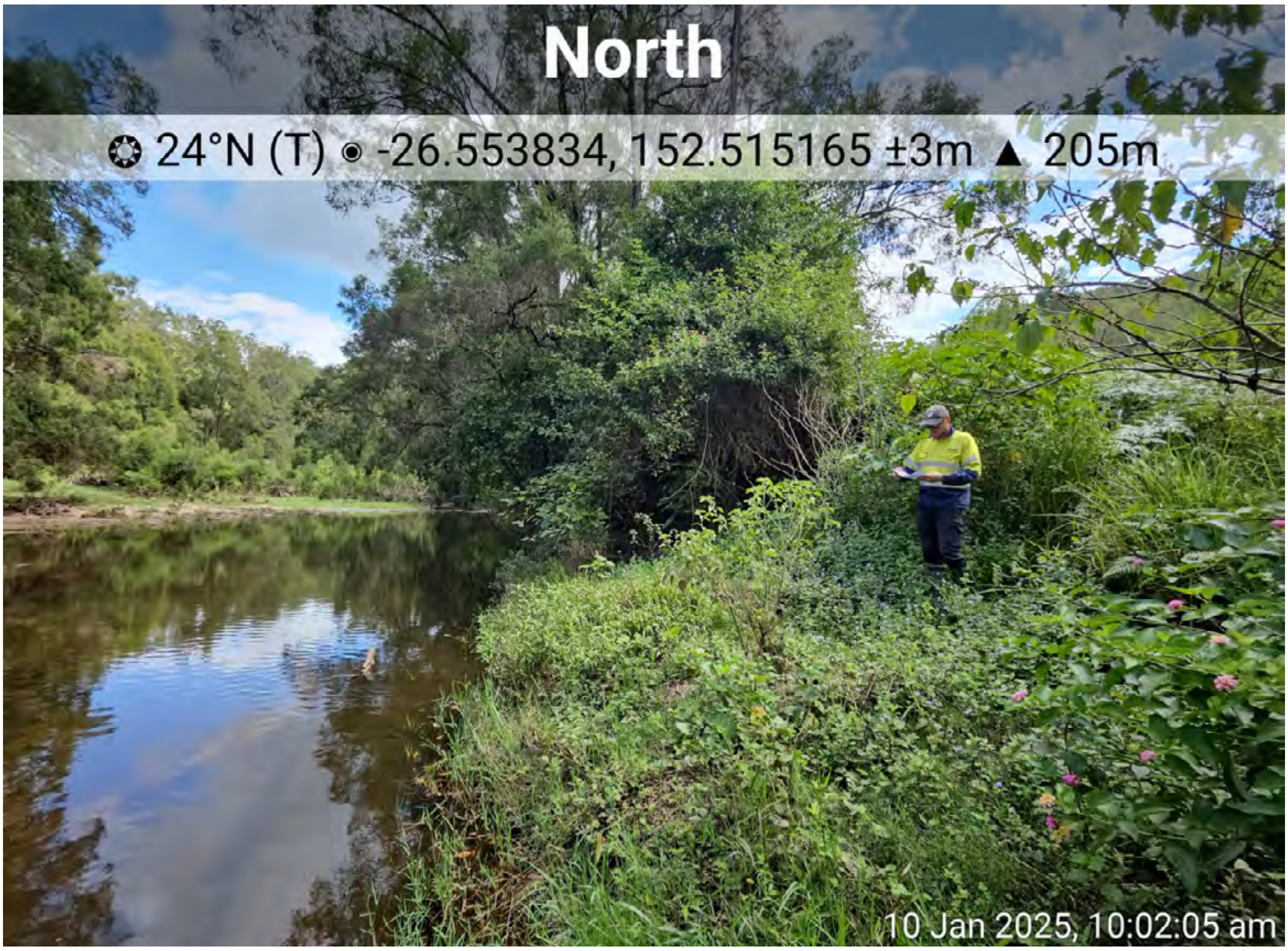
Applies to both QH owned property and external lands.



Site Field Reconaissance

Various "Queensland Hydro Teams" assisted with field observation and documentation to assess site suitability.

And we hiked the rivers....



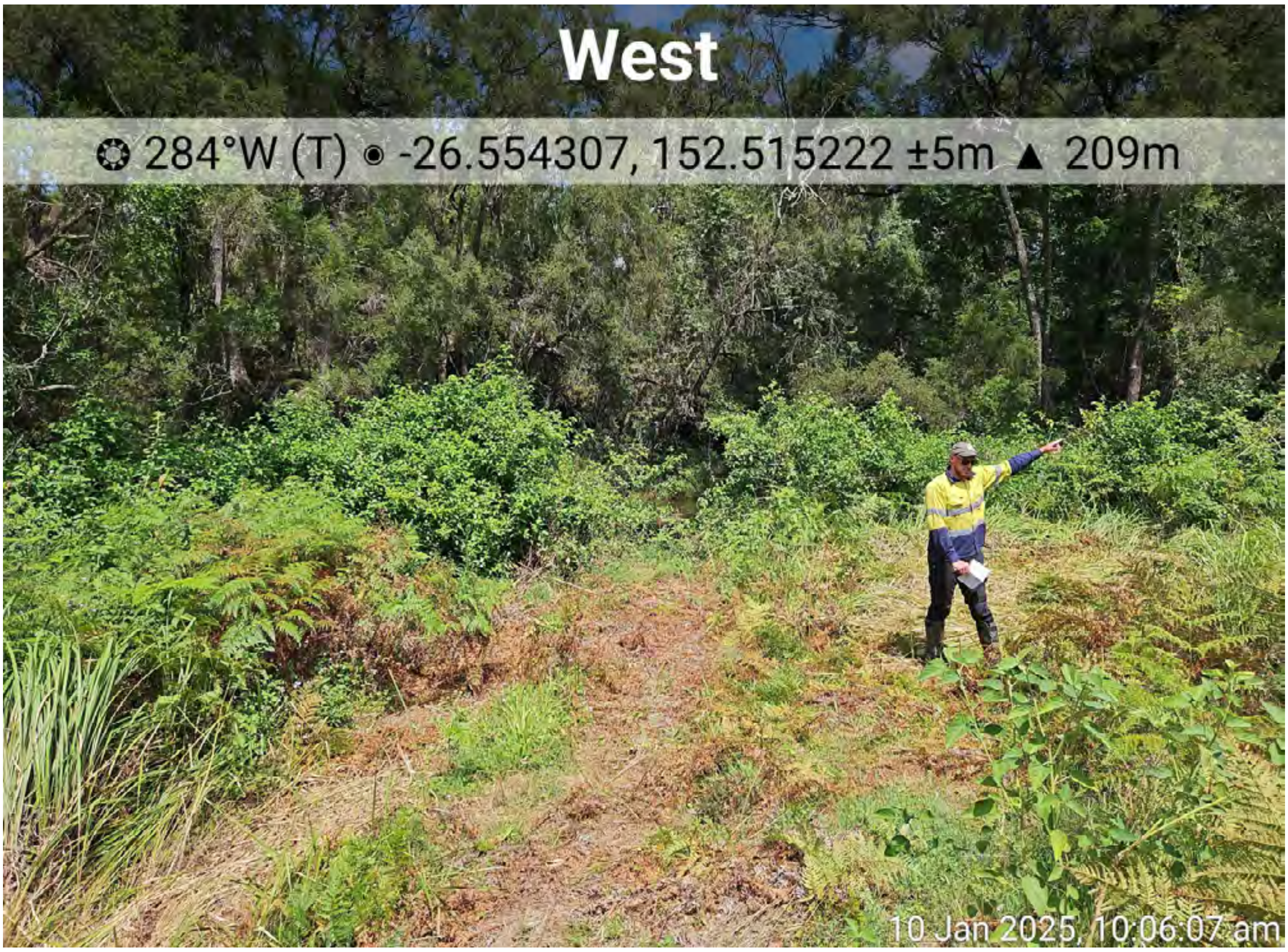

E
90
120
SE
150
S
180
140°SE (T) -26.543212, 152.507813 ±3m ▲ 199m
10 Jan 2025, 9:48:17 am


South Elevation
331°NW (T) -26.506096, 152.502293 ±5m ▲ 203m
17 Apr 2025, 9:13:11 am


West Elevation
128°SE (T) -26.547716, 152.51229 ±4m ▲ 200m
10 Jan 2025, 10:40:12 am


West Elevation
94°E (T) -26.568001, 152.510636 ±3m ▲ 221m
20 Mar 2025, 1:28:48 pm


South Elevation
32°N (T) -26.547936, 152.512104 ±3m ▲ 193m
10 Jan 2025, 10:37:58 am


West
284°W (T) -26.554307, 152.515222 ±5m ▲ 209m
10 Jan 2025, 10:06:07 am

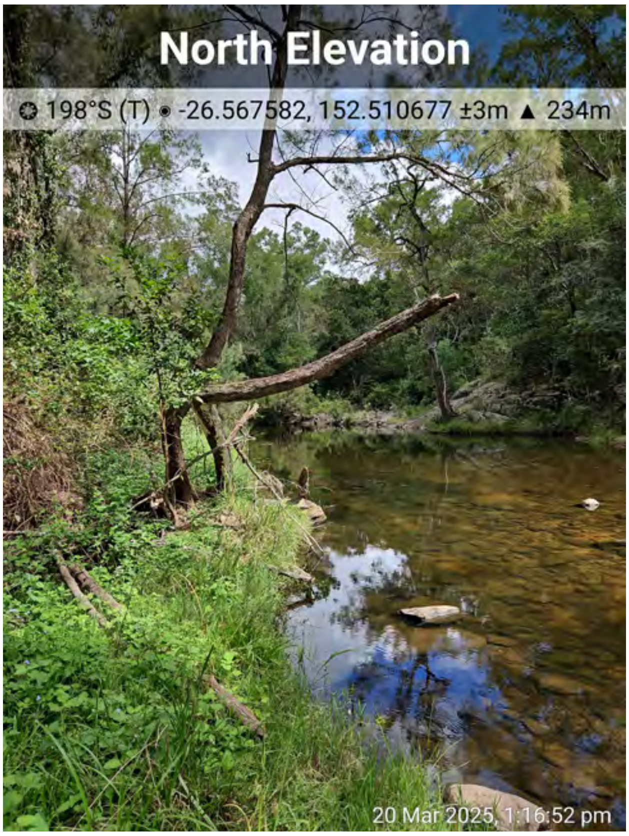

West Elevation
120°E (T) -26.531607, 152.451307 ±3m ▲ 436m
17 Apr 2025, 10:12:58 am

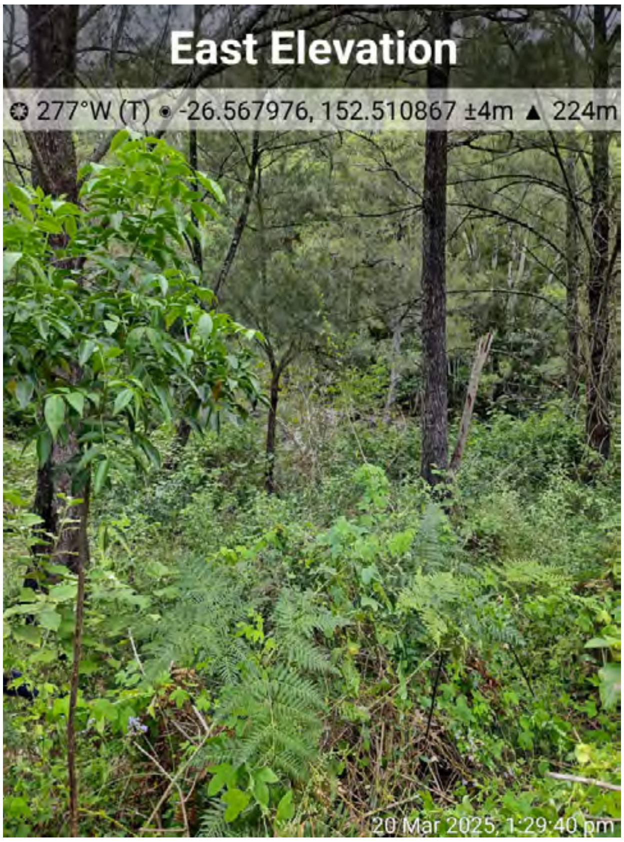
Site Field Reconaissance – Site Access/Safety

October 2024

April 2025

Yabba Creek





Sandy Creek


South Elevation
13°N (T) -26.572389, 152.544009 ±6m ▲ 558m
10 Jan 2025, 11:16:25 am

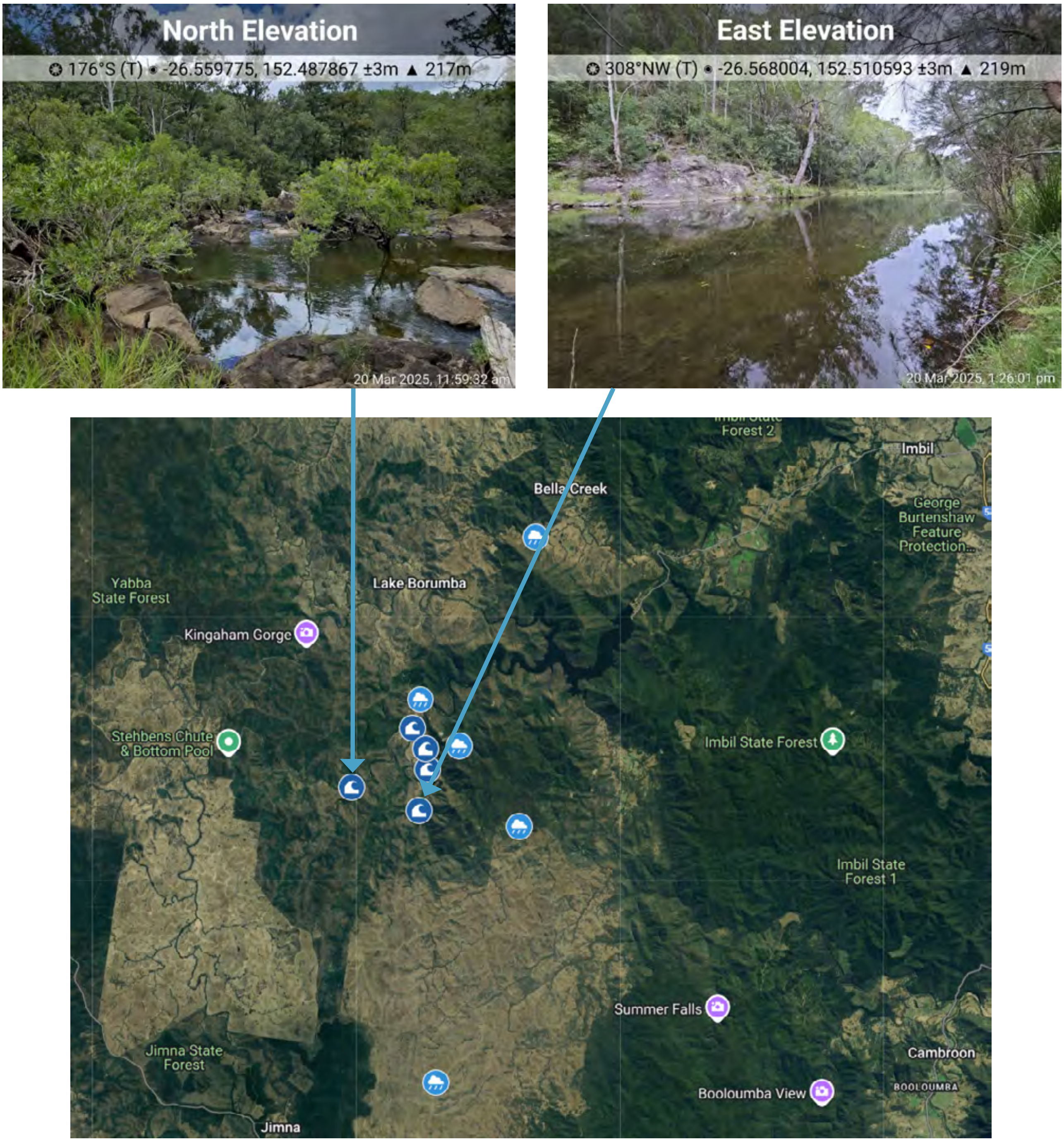

South Elevation
315°NW (T) -26.64906, 152.517362 ±7m ▲ 607m
17 Apr 2025, 1:37:09 pm


East Elevation
238°SW (T) -26.547736, 152.525161 ±5m ▲ 471m
10 Jan 2025, 11:41:50 am

Initial RealTime Monitoring Program

5 Water level monitoring sites (3x Project Creek Crossings and 2x Preliminary Inflow Gauging Stations).

5 Rainfall monitoring sites



Installation of Initial Gauges – May 2025

1. "EWS EMT" Device – Datalogging/Satellite telemetry
2. "In-Situ Level Troll"
3. "Observator NTU Sensor"
4. "EWS Rain Gauge"
5. "Orion Data Platform" – with API, Reporting and Alert Functionality

Data Integration

Hydrological Database for long term review and archiving of monitoring data.

Considerable volumes of water data already collected by the project – to be consolidated into one platform

Date reporting for safety/construction teams, and environmental/compliance purposes.

Integration with external web services via API.

Big project getting the database from project initiation->procurement->implementation.

Future of Hydrographic Services

1. Survey / Gauging campaign at initial River Gauging Stations
2. Hydrometric support facility
3. Site access monitoring / cameras
4. Longterm Inflow Quantification and Continuous Water Quality
5. Dam and Reservoir Monitoring


Ventia.
For when it's essential.

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HYDROGRAPHERS
ASSOCIATION