

Marinus Link

Heybridge Hydrogeological Assessment Report

Marinus Link Pty Ltd



Reference: 754-MELEN215878ML_R19

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MARINUS LINK

Heybridge Hydrogeological Assessment Modelling Report

Report reference number: 754-MELEN215878ML_R19

09 September 2025

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EXECUTIVE SUMMARY

Tetra Tech Coffey was engaged by Marinus Link Pty Ltd (MLPL) to undertake a pre-construction hydrogeological assessment of the proposed Heybridge Converter Station in response to management measure GWMM01 of the Heybridge Groundwater Impact Assessment (GIA, 2024). This additional assessment was requested by EPA Tasmania to provide finer-scale evidence of groundwater behaviour, potential impacts, and management requirements at the site.

The purpose of this assessment is to:

- Improve the characterisation of groundwater levels and quality through new field investigations.
- Develop a revised conceptual hydrogeological model.
- Construct and calibrate a numerical groundwater flow model (MODFLOW-USG) to predict potential changes in groundwater levels and flows during construction.
- Reassess the risks identified in the GIA, considering both new baseline data and modelled predictions.
- Provide recommendations for groundwater management, monitoring, and mitigation measures.

The scope included installation of six new groundwater monitoring wells, hydraulic conductivity testing, continuous groundwater level monitoring, groundwater sampling and quality analysis, and development of a high-resolution groundwater model.

Hydrogeology and Groundwater Behaviour

- The site is underlain by a four-unit hydro-stratigraphic sequence: heterogeneous fill, Quaternary sands and clays, weathered bedrock, and fractured bedrock.
- Groundwater levels are shallow (0.5–3 m bgl) and influenced primarily by rainfall recharge, with limited response to rainfall <4 mm/day.
- Nested wells confirmed a small upward gradient (0.04–0.12 m) from fractured bedrock into the shallow aquifer, demonstrating that the site functions as a groundwater discharge zone.
- Groundwater flow direction is consistently towards Bass Strait; no tidal influence was observed in groundwater levels.

Groundwater Quality

- Groundwater is generally fresh (Total Dissolved Solids (TDS) 260–1,400 mg/L).
- Local exceedances of ecosystem protection criteria were recorded for cobalt, nickel, zinc, and copper.
- PFAS (PFOS up to 0.18 µg/L; PFHxS+PFOS up to 0.31 µg/L) exceeded drinking water and marine ecosystem protection criteria in some wells.
- Low-level TRH hydrocarbons (C10–C36) were detected in groundwater and in the disused Tioxide tunnel.
- No evidence of significant or contiguous contaminant plumes was identified.

Numerical Modelling

- A high-resolution MODFLOW-USG model was developed with 1 m cells across the construction footprint and daily stress periods over three years.
- Calibration met Australian Groundwater Modelling Guidelines (AGMG) Class 2 standards; residuals show a slight upward bias (0.4 m).

- The most severe construction phase (bulk earthworks, piling, HDD pits combined) is predicted to cause a maximum drawdown of 1.6 m after 70 days, with recovery to within 0.1 m of baseline across most of the site within one year.
- Predicted drawdown at the coastline and estuary is <0.05 m, confirming negligible risk to marine interfaces.

Reassessment of Risks

This assessment revisits the risks identified in the GIA using updated monitoring data and predictive modelling:

- **Groundwater Acidification:** Potential exposure of acid sulfate soils is limited by the small drawdown magnitude and short recovery time. Impact significance revised from moderate to low/very low.
- **Saline Groundwater Intrusion:** The upward groundwater gradient, construction elevations above mean sea level, and minimal drawdown at the coastline confirm saline intrusion is not a material risk. Residual significance very low.
- **Mobilisation of Existing Contamination:** While some exceedances of screening criteria were recorded, no significant plumes or sensitive receptors exist. Residual risk remains low.
- **Release of Contaminated Groundwater:** Modelling indicates potential for seasonal groundwater daylighting at the southern site margin, where PFAS is present at low levels. Long-term interception, treatment, and disposal via the stormwater system may be required. This represents the most significant new management consideration compared with the GIA.
- **Horizontal Directional Drilling:** Small, short-lived drawdown (<0.3 m) and the upward gradient prevent saline inflow. Residual risk remains low, contingent on proper sealing of HDD annulus and conduits.
- **Other Construction Risks** (e.g. fuels, chemicals, drilling fluids): No change from GIA; risks remain low, with the implementation of standard measures documented in the Construction Environmental Management Plan (CEMP).

Recommendations

- Maintain quarterly groundwater monitoring for PFAS, metals, hydrocarbons, and nutrients until baseline stability is demonstrated; adopt silica-gel clean-up for TRH analyses.
- Extend groundwater logger program for a full hydrological year to strengthen seasonal understanding and support future model updates.
- Incorporate lined sediment basins, oil–water separation, and vegetated swales into site drainage to manage seasonal groundwater discharge.
- Case bored piles to minimise groundwater inflows during dewatering.
- Update the groundwater model once sufficient baseline data is available to test sensitivity under wet/dry climate sequences and move towards AGMG Class 3 confidence.
- Formalise requirements in a Groundwater Management Plan (GMP), prepared as a sub-plan to the CEMP, addressing both construction and potential long-term groundwater discharge management.

Conclusions

- The site functions as a groundwater discharge zone, with natural gradients towards Bass Strait and limited risk of saline intrusion under natural or project-induced conditions.
- Predicted construction-related drawdown is localised, short-lived, and recovers within one year.

- No significant groundwater contamination was identified; exceedances are localised and manageable.
- The most notable update since the GIA is the identification of seasonal groundwater discharge along the southern boundary, requiring potential long-term management.
- With implementation of the recommended monitoring and management measures, all residual risks are low or very low, and the assessment provides a defensible evidence base for regulatory review and project design.

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1. INTRODUCTION

Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) was engaged by Marinus Link Pty Ltd (MLPL) to undertake a groundwater impact assessment (GIA) (*Marinus Link Heybridge Groundwater Impact Assessment*, Tetra Tech Coffey 2024) for the proposed Heybridge Converter Station and Shore Crossing site, located at Minna Road, Heybridge, Tasmania (the site, Figure 1-1).

The site forms part of the proposed Marinus Link (the project), which comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM). MLPL proposes to redevelop the site as a converter station to convert high-voltage alternating-current (HVAC) electricity from the Tasmanian electrical grid to high-voltage direct-current (HVDC), and connect to sub-sea transmission cables connecting Tasmania to Victoria as part of the wider project.

The GIA was undertaken to characterise the baseline condition of groundwater and to identify and assess potential impacts to groundwater which may arise from proposed project-related activities at the site. It was incorporated into the Environmental Impact Statements (EIS) prepared for the Heybridge Converter Station and Shore Crossing, which was provided to EPA Tasmania for review.

The GIA provided six recommended mitigation and management measures relating to groundwater, which included the requirement to *conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods* (GWMM01).

Following submission of the EIS, EPA Tasmania requested that the recommended additional hydrogeological assessments be completed and that further information on the condition of groundwater at the site (including assessment of potential groundwater contamination) be provided. MLPL has requested that Tetra Tech Coffey develop and complete a scope of work to address the requirements of GWMM01 and satisfy EPA Tasmania's comments.

This pre-construction hydrogeological assessment report has been developed to communicate the outcomes of the additional site hydrogeological investigations, numerical groundwater modelling activities, and updated groundwater impact assessment that has been completed since submission of the GIA to address the requirements of GWMM01.

1.1 PROJECT OVERVIEW

The project is a proposed 1,500 megawatt (MW) HVDC electricity interconnector between Heybridge in North West Tasmania and Waratah Bay in the Latrobe Valley in Victoria (Figure 1-1). The project is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed. This link will increase the energy capacity and security across the National Electricity Market (NEM).

The converter station will facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables would then be trenched, where geotechnical conditions permit. The converter station will comprise:

- HVAC switching station and two HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network, being augmented and upgraded by the North West Transmission Developments (NWTD). Two converter stations are proposed at the site side-by-side (converter 1 and converter 2). While it is understood that converter 2 will be

installed when demand is sufficient, for the purpose of this impact assessment both converter stations have been assumed to be installed at the same time.

- the location of the shore crossing in Tasmania (adjacent to the converter station).

The key components of the converter station that may interact with groundwater include:

- The HDD Launch pads – provisionally comprising of two pits approximately 2 m deep (including entry pits) to allow drilling and installation of the shore crossing conduits.
- The converter station earthworks – which will include the construction of an elevated bench to provide a stable base for the converter station above the 1-in-200-year flood level. The earthworks may also require the removal of fill soils to up to 2.5 m depth to remove geotechnically unsuitable materials.
- The converter station foundations – which may comprise bored pilings below the water table.

These key components relating to potential groundwater impacts are discussed in greater detail in Section 3.

1.2 ASSESSMENT OBJECTIVES

To address management and mitigation measure GWMM01, the objectives of this scope of work were to:

- i. improve the characterisation of existing groundwater conditions at the site (both level and quality) through additional field investigations and develop a revised hydrogeological conceptual model;
- ii. quantify the potential groundwater level impacts associated with the construction and operation of the Heybridge converter station using a numerical groundwater flow model;
- iii. develop appropriate mitigation measures to minimise groundwater impacts that may have unacceptable significance to the protected environmental values of groundwater.

The scope of this assessment includes analysis of change in groundwater flow conditions associated with the proposed construction activities, focussing on:

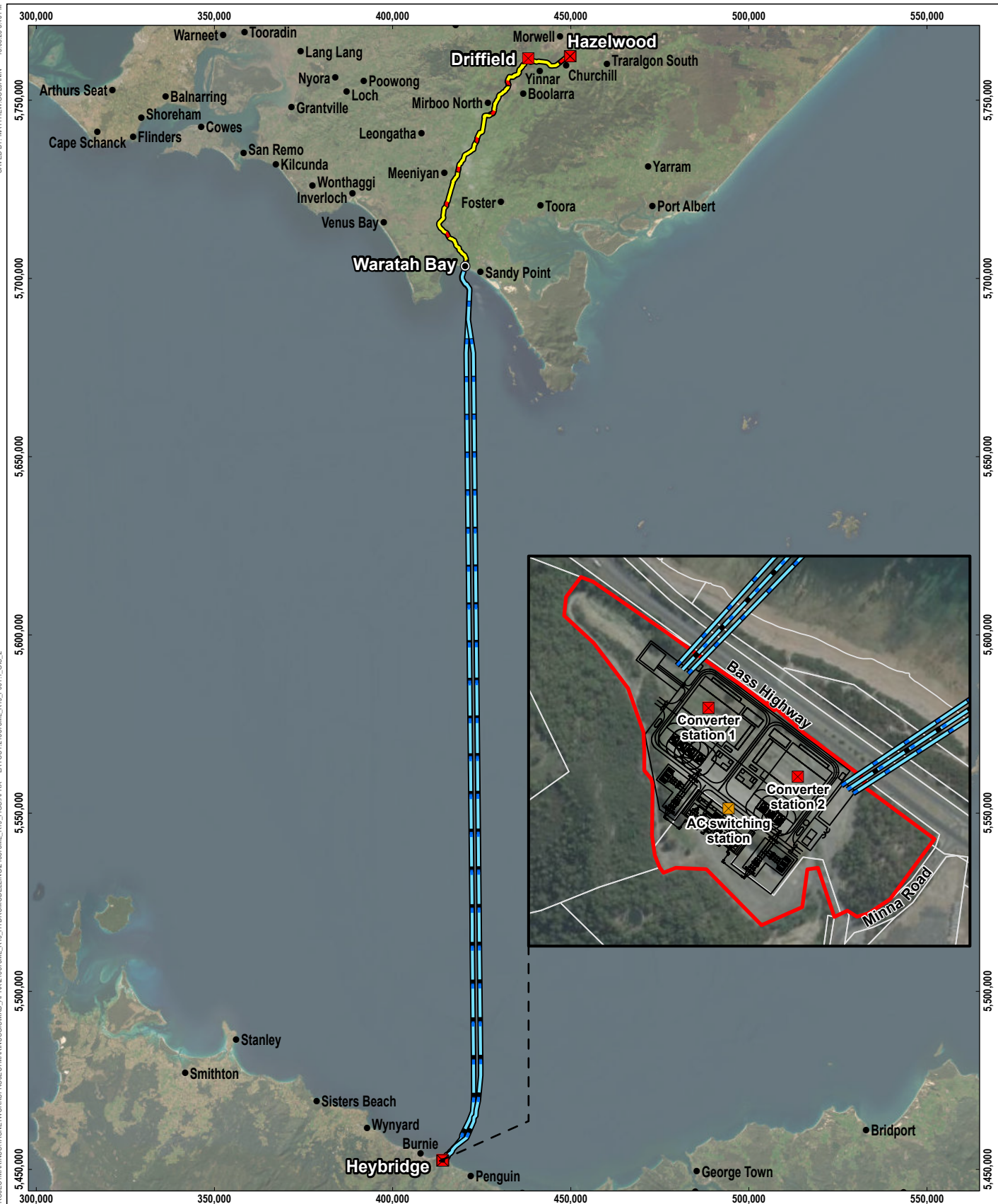
- Undertaking additional drilling and installation of new groundwater monitoring wells, completing additional groundwater monitoring events, and conducting aquifer hydraulic tests to support additional baseline groundwater characterisation,
- Assessing the likely change in groundwater levels and flow direction,
- Quantifying variations in the groundwater balance,
- Forward-projecting the effects of proposed construction works on groundwater levels (unmitigated and mitigated if required), and
- Recommending mitigation measures if necessary.

1.3 SCOPE OF WORK

This further hydrogeological assessment has been designed and implemented in three stages:

1. **Additional site investigations** including installing new groundwater monitoring wells, completing additional groundwater monitoring events, and conducting additional aquifer hydraulic tests;
2. **Numerical modelling** to provide a preliminary groundwater dewatering and drawdown assessment for areas where dewatering is anticipated; and
3. **Hydrogeological interpretive report** that draws on the available site investigation information, numerical modelling results, and results from other relevant studies available at the time of writing to provide an updated groundwater risk assessment for the proposed construction and operation of the Heybridge Converter Station.

The methodology adopted to complete the scope of work and meet the assessment objectives is outlined in Section 4.



LEGEND

- Landfall
- Proposed converter station
- Proposed switching station
- Proposed route
 - HVDC subsea cable
 - Underground HVDC cable
- Heybridge converter station site boundary
- Indicative station layout

MARINUS
LINK



0 10 20 km
SCALE 1:1,500,000
PAGE SIZE: A4
PROJECTION: GDA2020 MGA Zone 55

SOURCE
Proposed route from Tetra Tech Coffey.
Imagery from ESRI Online.

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MARINUS LINK HEYBRIDGE
HYDROGEOLOGICAL ASSESSMENT MODELLING REPORT

FIGURE 1-1

Marinus Link location and overview



DATE: 15.08.25 PROJECT: 754-MELN215878ML FILE: 215878ML_R19_F001.1_GIS

2. LEGISLATION, POLICY AND GUIDELINES

This section outlines the key legislation, policies and guidelines that govern groundwater protection in Tasmania and management relevant to the Heybridge Converter Station. It summarises the Environmental Management and Pollution Control Act 1994 (Tas), the State Policy on Water Quality Management 1997, and the Australian Groundwater Modelling Guidelines (Barnett et al., 2012), which together establish the framework for assessing groundwater impacts at the site.

2.1 ENVIRONMENTAL MANAGEMENT AND POLLUTION CONTROL ACT 1994 (TAS)

The *Environment Management and Pollution Control Act 1994* (Tas) (EMPCA) is the primary environmental protection legislation in Tasmania. It establishes the overarching framework for preventing, reducing and remediating environmental harm, and sets out the general environmental duty (GED, Section 23A), which requires all persons undertaking activities to take all reasonable and practicable measures to minimise adverse environmental impacts. Under the EMPCA, responsibility for environmental management is shared between the Environment Protection Authority (EPA) and local councils, with the EPA regulating projects of state significance such as the proposed Heybridge Converter Station.

For this assessment, the EMPCA provides the statutory basis for identifying and managing potential groundwater impacts. It requires that potential risks from construction activities—such as dewatering, mobilisation of contaminants, or saline intrusion—are evaluated and minimised to the extent practicable through design and management measures.

2.2 STATE POLICY ON WATER QUALITY 1997

Surface waters and groundwater in Tasmania are protected under the *State Policy on Water Quality Management 1997* (State Policy). The State Policy provides a framework for the sustainable management of water quality throughout Tasmania and refers to water quality guidelines and objectives to be implemented.

Section 7.1 of the State Policy defines six protected environmental values (PEV) which are defined as values or uses of the environment which should be protected. These are summarised in Table 2-1 below.

Table 2-1 Protected environmental values of water

	PEV
A	Protection of aquatic ecosystems
	A1 – Surface waters, including estuaries, but not including coastal waters:
	i) Pristine or nearly pristine ecosystems ii) Modified (not pristine) ecosystems (a) from which edible fish, crustacea and shellfish are harvested (b) from which edible fish, crustacea and shellfish are not harvested
	A2 – Coastal waters Coastal waters ecosystems
B	A3 – Groundwaters
	i) Groundwater ecosystems <i>Environmental Value's relevant to groundwater are defined by the observed Total Dissolved Solids (TDS) concentration. Refer to Table 1 of the State Policy.</i>
B	Recreational water quality and aesthetics:
	i) Primary Contact

	PEV
	ii) Secondary Contact iii) Aesthetics only
C	Raw water for town drinking water supply* <i>* All raw water from any surface water source or groundwater source which is to be used for domestic purposes should comply with the Australian Drinking Water Guidelines (NHMRC 2022), at the point of use, regardless of source.</i>
D	Raw water for homestead supply*
E	Agricultural water uses: i) irrigation, and ii) stock watering.
F	Industrial water supply <i>The specific industry type for which the water is to be used must be specified to identify appropriate guidelines (Australian Water Quality Guidelines for Fresh and Marine Water Quality, ANZG 2018)</i>

2.2.1 Environmental values assessment

The State Policy sets PEVs for groundwater based on the reported Total Dissolved Solids (TDS) concentrations. Groundwater PEVs are reproduced in Table 2-2.

Groundwater TDS in the bedrock and Quaternary sands aquifer ranged from 261 mg/L to 1,400 mg/L and would likely be assigned to the Category A band (<1,000 mg/L). Category A groundwaters require all PEVs to be considered (Table 2-2).

Table 2-2 Protected environmental values of groundwater (reproduced from the Department of Natural Resources and Environment (DPIWE), 2000)

Category	A	B	C	D
TDS (mg/L)	Less than 1,000	1,000 – 3,500	3,500 – 13,000	Greater than 13,000
Protected Environmental Value				
Drinking water	✓			
Irrigation	✓	✓		
Industry	✓	✓	✓	
Stock	✓	✓	✓	
Ecosystem Protection	✓	✓	✓	✓

In addition to the PEVs identified by the State Policy in Table 2-2, the additional environmental value of recreational water use has been conservatively adopted, which is commonly recognised in other states of Australia. This environmental value includes the possible use of groundwater to fill swimming pools and exposure to groundwater whilst swimming in baseflow-fed rivers and creeks, and the marine environment.

2.2.2 Applicable screening criteria

The screening criteria adopted to assess the potential quality impacts to the identified environmental values groundwater have been sourced from the following guidelines:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000)
 - Fresh water 95% toxicant trigger values
 - Marine water 95% toxicant trigger values

- Irrigation long term trigger values and livestock drinking water low risk trigger values
- Australian Drinking Water Guidelines, National Health and Medical Research Council, (NHMRC, 2022)
- NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters
- PFAS National Environmental Management Plan (NEMP) 3.0 (HEPA, 2025),
 - Freshwater 95% species protection
 - Interim Marine 95% species protection reference guidelines.

2.3 AUSTRALIAN GROUNDWATER MODELLING GUIDELINES

This assessment has been guided by the principles and framework set out in the Australian Groundwater Modelling Guidelines (Barnett et al., 2012), which outline best practice for the development and application of groundwater models in support of environmental management and decision-making. The Australian Groundwater Modelling Guidelines (AGMG) emphasise the need for models to be clearly documented, conceptually sound, and demonstrably fit for their intended purpose, whether predictive, interpretive, or risk-based.

The AGMG outline a structured modelling workflow that includes the development of a conceptual hydrogeological model, selection of appropriate software, model construction, calibration, sensitivity analysis, and uncertainty evaluation. At each stage, the AGMG advocate for transparency in assumptions, justifications for data use and parameterisation, and consideration of the limitations imposed by data quantity and quality. Calibration targets, performance statistics, and classification criteria are also provided to assist in evaluating model reliability and communicating confidence in predictive outcomes.

A core component of the AGMG is the model classification system (Class 1 to Class 3), which provides a standardised approach for assessing model confidence. This system considers the density and quality of available data, calibration coverage, predictive timeframe, and intended application. Class 2 models, as defined by the AGMG, are suited to environmental assessments where data coverage is adequate but not comprehensive, and where predictions extend beyond the calibration period. This classification also anticipates some reliance on professional judgement and scenario analysis to manage uncertainty.

Discussion of the modelling work completed for this assessment with regard to the AGMG model classification system is provided in Section 7.2.7. By aligning with and reporting against the AGMG, this assessment ensures that the model is defensible and proportionate to the risk of the proposed construction activities. The guidelines have been used not only to shape the technical modelling approach but also to frame the interpretation of results and to identify areas where further work, such as ongoing monitoring for improved model calibration, may be required to support future decision-making or design validation.

3. PROJECT DESCRIPTION

3.1 OVERVIEW

The project is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the NWTG.
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station will facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is HDD to about 10 metre (m) water depth where the cables would then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable would be laid across Bass Strait. The preferred technology for the project is two 750 megawatt (MW) symmetrical monopoles using ± 320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300 m apart at the HDD (offshore) exit to 2 km apart in offshore waters.

This assessment is focused on the Tasmanian terrestrial and shore crossing section of the project. This report will inform the two EISs being prepared to assess the project's potential environmental effects in accordance with the legislative requirements of the Tasmanian government (Figure 3-1).

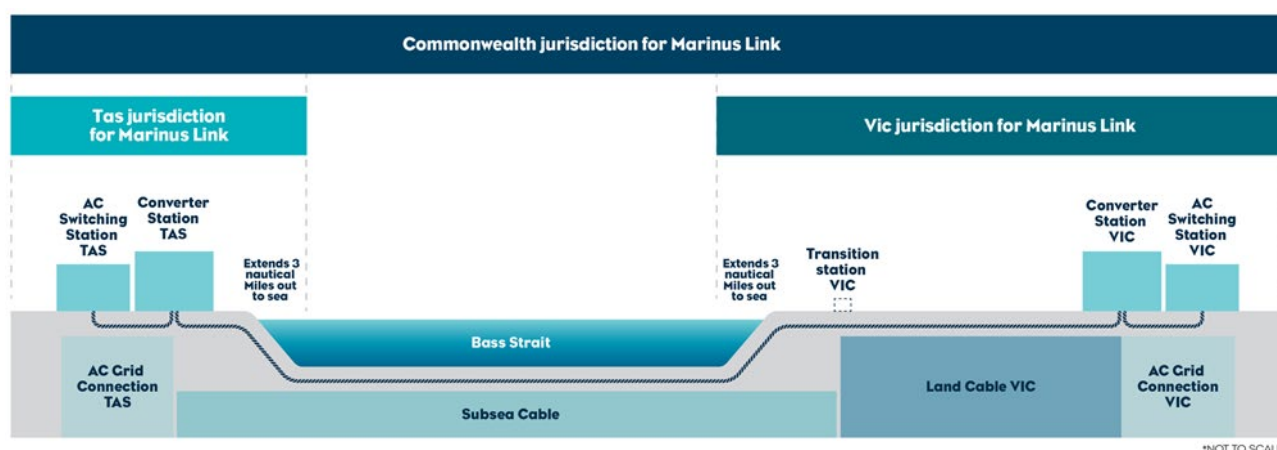


Figure 3-1 Project components considered under applicable jurisdictions (MLPL, 2022)

3.1.1 Project staging

The project is proposed to be constructed in two stages. Stage 1 will include earthworks and site preparation (including foundations) for both converter stations as well as all HDD drilling for the shore crossings for both stages. Stage 1 also includes laying the cables for the Stage 1 cable circuit and construction of the Stage 1 converter station at the Heybridge site. Rehabilitation works will be completed at the end of Stage 1.

Stage two will include installing cables for the Stage 2 cable circuit and construction of the Stage 2 converter station at Heybridge. Stage 2 includes final reinstatement works.

3.2 CONSTRUCTION

This section provides a description of the project's key construction phase activities that may require dewatering and will be assessed by the numerical model simulations.

3.2.1 Horizontal Directional Drilling launch pad and entry pits

The shore crossing will comprise of six HDD bores, one for each cable (two power and one fibre optic per pit) drilled from two drill pads located within the Heybridge Converter Station site (Figure 3-4). The two HDD launch pads (drill pads) are proposed to be located at the converter site to provide subsurface access for deployment of the drill rods. Three ducts will be installed from each of the two drill pads extending out along the subsea project alignment, crossing under Bass Highway and Western Line which are adjacent to the proposed converter site.

The HDD bores will extend approximately 1 km offshore and emerge in approximately 10 m water depth. The subsea cables will be pulled from the cable laying vessel to the converter station HDD drill pads.

The current plan is for the HDD launch pads to be constructed on the existing ground level along the northern site boundary, which is approximately 6.5 m above the Australian Height Datum (mAHD). Each HDD launch pad dimension is indicated to be 20 m x 4 m (*email correspondence between Stockon Drilling Services, Marinus Link and Tetra Tech Coffey; dated 20 June 2025*). Individual entry pits will be excavated in each HDD launch pad for each of the six HDD bores (three entry pits at each pad). The entry pit dimensions are understood to be 4 m wide x 4 m long x 2 m deep (*email correspondence between Stockon Drilling Services, Marinus Link and Tetra Tech Coffey; dated 20 June 2025*). The modelling assessment considers the potential requirement and effect of dewatering the entry pits during HDD.

The site level is proposed to be raised to 8.7 mAHD after the completion of HDD works (refer to Section 3.2.2). During the site level raising civil works, portions of the HDD launch pads will stay open as temporary slot trench for approximately one week to allow the installation of surface casing at each of the six HDD entry pits. This will allow the cable conduit to be brought up to the new, raised ground level. The HDD entry pits and slot trenches would then be backfilled once surface casing installation is complete.

The GIA identified potential impacts associated with the preferential groundwater pathways that may be developed by the HDD between the converter station aquifer and the marine environment. A mitigation and management measure were developed to ensure that the borehole annulus is adequately sealed to prevent saline water moving along the cable conduit and to prevent runoff entering boreholes (GWMM03). The modelling assumes this requirement will be met during construction and potential impacts do not require modelling.

3.2.2 Converter station earthworks

An elevated bench will be constructed to provide a stable base for the converter station and situate it above the 1 in 200-year flood level. A preliminary conceptual design of the Heybridge site's cut and fill requirement

during construction has been provided by Jacobs (2022b). The site development plans propose a finish ground Reduced Level (RL) level of 8.7 mAHD.

The Jacobs (2022b) concept design describes the proposed earthworks which notes excavation of up to approximately 2.5 m depth at the eastern and southwestern margins of the site will be required to level and fill the lower elevations in the centre and north of the site (Figure 3-2). An excavated entryway is also shown in the east with similar maximum cut depths.

The modification of the landscape by excavating the land surface in the red areas and filling in the green areas was identified by the GIA to potentially result in groundwater discharge to the surface where the watertable is expected to rise with topography. Assessment of this scenario has been simulated in the model by modifying the land surface and overland flow elevation.

In addition to the proposed earthworks to level and raise the site, areas of geotechnically unsuitable, previously placed fill material may require excavation and disposed offsite prior to construction. Jacobs (2024) provides further preliminary assessment of the earthworks that may be required to remove existing fill material at the site assuming that it may not be geotechnically suitable for construction. Excavation depths and the corresponding soil volumes that could require offsite disposal have been reproduced in Figure 3-3 (refer Jacobs report for further details). The finished site level would be achieved by importing and compacting clean fill. This additional excavation of fill material and backfilling of the site has not been assessed by the groundwater model.

If contaminated soil is encountered during excavation of fill material and construction of the converter station bench, it will be either remediated prior to onsite reuse or will be disposed offsite to a licenced landfill.

Civil works including station access and internal roads, stormwater drainage system, converter hall (comprising phase reactor, valve and HVDC reactor halls), building foundations, cable trenches and foundations for electrical apparatus and transformer bays, may all potentially encounter shallow groundwater which may be less than 1 m below ground level (mbgl) (refer to Section 6.5).

3.2.3 Converter station foundations

Jacobs (2022b, 2024) provided an assessment of the subsurface geotechnical conditions and concluded that bored piles would likely be adopted for foundations at the converter station which would be anchored to the underlying competent rock to a depth of 7.5 m. Piles would extend below the water table and would require temporary casing or other means to maintain the pile hole stability through the saturated, unconsolidated fill and sediments (where it remains). For the purpose of modelling potential groundwater impacts, bored piles are assumed to be dewatered for up to 30 days to allow for concrete setting in dry conditions.

Figure 3-4 presents the proposed site infrastructure layout including buildings that may require bored piled foundations. Specific piled boreholes are presented in Section 9 forward projection scenarios.

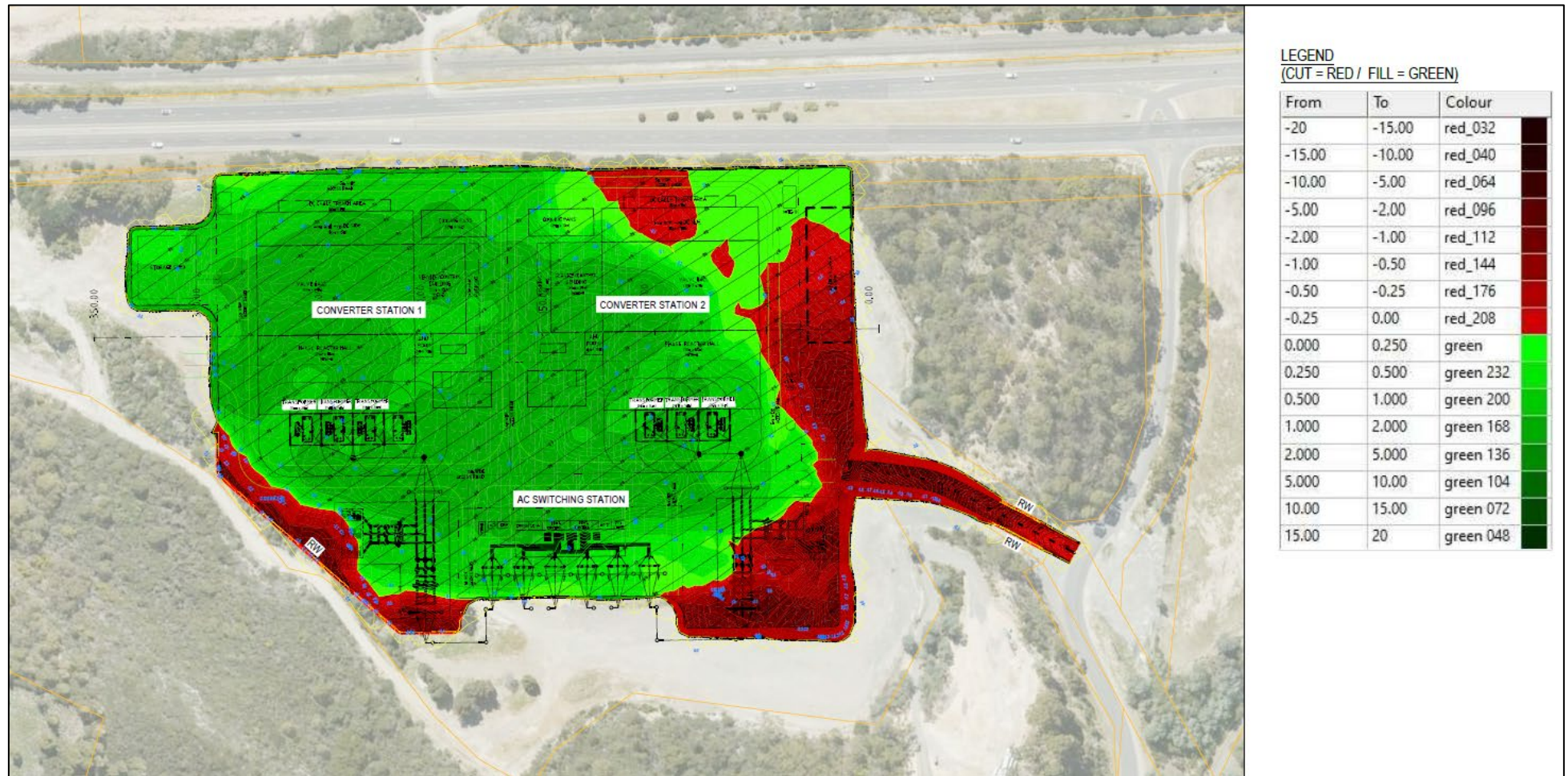


Figure 3-2 Heybridge converter station site cut/fill plan (sourced from Jacobs, 2022b)

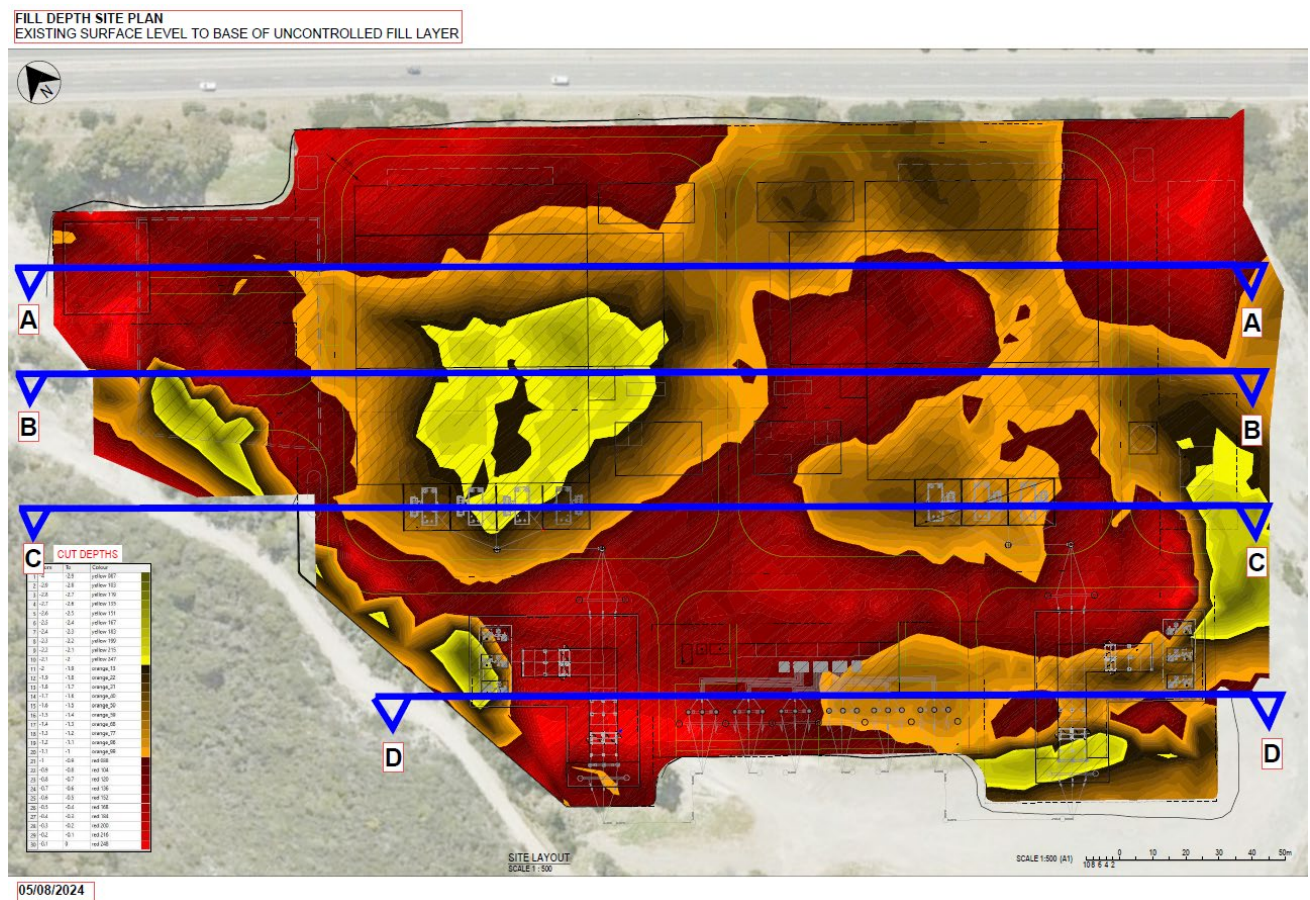
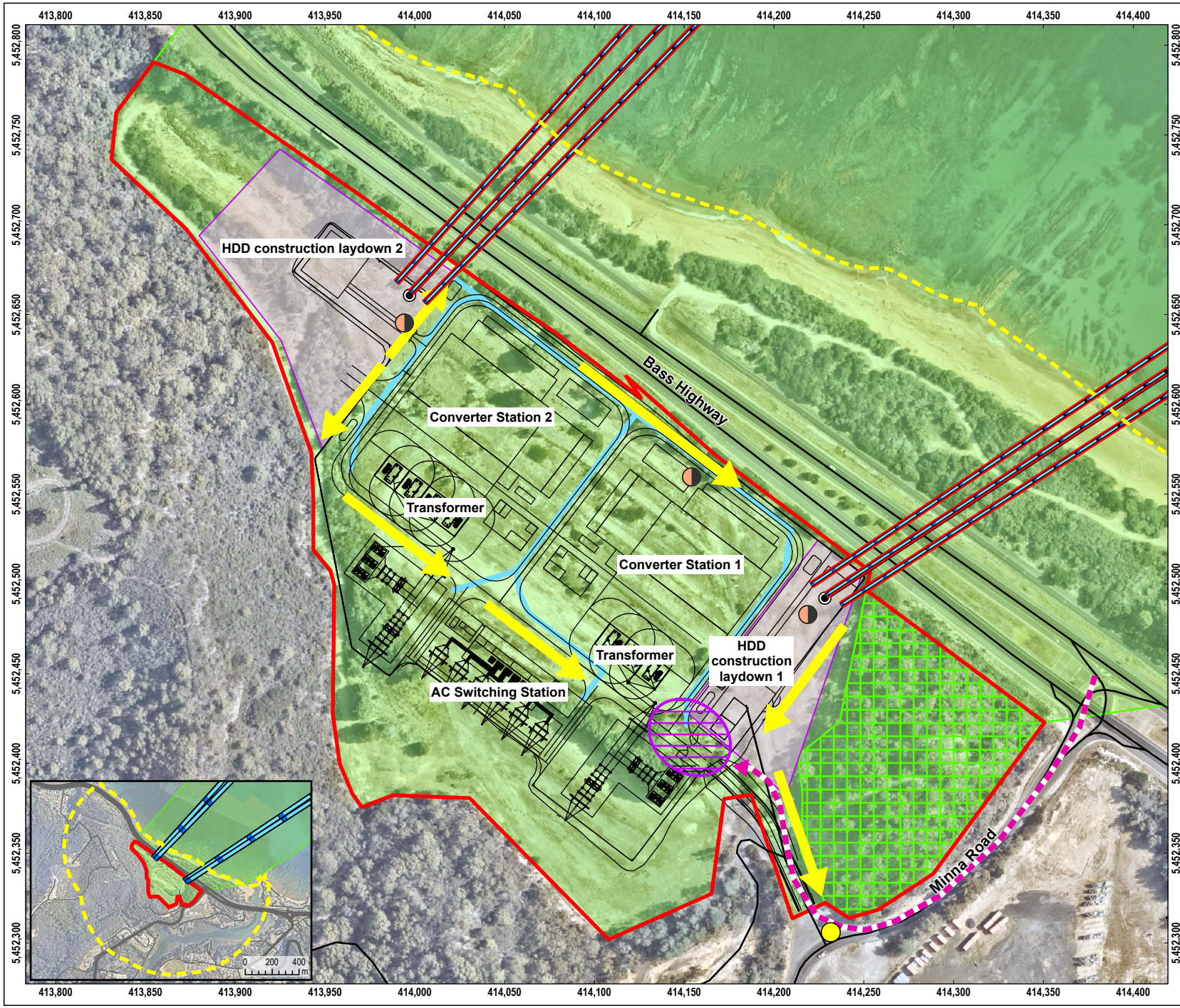


Figure 3-3 Heybridge converter station fill depth plan (sourced from Jacobs, 2024)



LEGEND

- Landfall
- HVDC subsea cable
- HDD
- Diesel generator and oil tank (indicative)
- Emergency assembly point
- ➔ Internal site access - ingress/egress
- ➔ Site access from Bass Highway and Minna Road
- Indicative converter station drainage
- Heybridge converter station layout (Stage 2)
- Heybridge shore crossing laydown area
- Proposed washdown area
- No go zone - priority vegetation
- Heybridge converter station site
- 500 m site buffer
- Marinus Link shore crossing proposal area
- Road

SOURCE

Proposed route from Tetra Tech Coffey.
 Construction layout from MLPL (July 2025).
 Roads from Tas NRE.
 Imagery from Nearmap (07/02/2024).

0 30 60 m

SCALE 1:3,000

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PROJECTION: GDA2020 MGA Zone 55

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FIGURE 3-4
 Heybridge converter station
 infrastructure layout



4. ASSESSMENT METHOD

This section describes the methods used to characterise the existing groundwater conditions at the site and to assess the potential impacts associated with project activities. The assessment methods are aligned with the relevant legislation, policies and guidelines for the project (Section 2).

The assessment method has three key steps:

The first step is the evaluation of the baseline conditions to identify environmental values and potential of impacts. This includes:

- Defining a study area to provide context for identifying potential issue and assessing impacts.
- Baseline characterisation of groundwater quality, uses, levels and influences from factors such as climate, hydrology, existing land uses and geological conditions.
- Understanding the geology and nature of aquifers within and surrounding the project area.
- Developing a conceptual model of groundwater levels and flows.

The second step is the hydrogeological assessment to assess the possible range of changes to groundwater level or quality in response to proposed construction methods, such as groundwater dewatering.

The third step includes the assessment of the sensitivity of groundwater values and aquifers to change, the assessment of the magnitude of potential impacts, and the significance of those impacts. This step also includes considering possible mitigation measures to reduce the impact and assess a residual impact significance after application of further controls.

4.1 STUDY AREA

The hydrogeological assessment study area includes the proposed Marinus Link converter station site located at Heybridge (within the red site boundary Figure 4-1) and the wider upstream and downstream surface water and groundwater catchment which could be affected by activities occurring at the proposed site. The Heybridge converter station site, proposed development footprint, and the study area are shown in Figure 4-1.

This inferred catchment was based on the site's position on a promontory of land that is bounded on three sides by major hydrogeological boundaries: the coastline of Bass Strait to the north, and the Blythe River estuary to the south and east. The remaining south and western boundaries are defined by the steeply rising topography formed by the outcropping bedrock formation which would likely form a groundwater catchment divide or low-flow boundary. Local hydrogeological conditions and catchment study area are discussed further in Section 5.

It is noted that the sub-sea cables and the NWTD project are excluded from the study area.



Figure 4-1 Heybridge converter station site and associated catchment extent

4.2 FIELD INVESTIGATIONS

To close the data gaps identified by the GIA (Tetra Tech Coffey, 2024) and to address comments from EPA Tasmania, additional field investigations were undertaken.

4.2.1 Installation of six new groundwater wells

Six new groundwater monitoring wells were installed at the site to address data gaps and better characterise the groundwater conditions. The locations and purpose of the upgraded monitoring well network considered the previously installed monitoring wells and the available investigation data collected for the site (Jacobs 2022). The upgraded monitoring well network including new monitoring well locations is shown on Figure 4-2. A summary of the new wells and the rationale for their location is provided in Table 4-1.

Table 4-1 Well installation rationale

Well ID	Expected depth to Bedrock (m bgl)	Rationale
HB-MW01	2.6	- Coverage of the northwest corner of the construction area. - Located close to the west HDD Laydown area to obtain data on expected groundwater quality, inflows and impact on groundwater levels during excavation. - Placed on the east side of the Laydown area to better assess impact from dewatering activities across the main site area.
HB-MW02	3.1	- Coverage of the central northern perimeter of the site. - Adjacent to HB-BH02-C to obtain information on groundwater flow/connectivity with the bedrock aquifer. - Placed in the centre-north of the converter station site to provide broad coverage and to assess impacts on groundwater levels towards the coast.
HB-MW03	4.1	- Coverage of the northeast corner of the construction area. - Located in close to the east HDD Laydown area to obtain data on expected water quality, inflows and impact on groundwater levels during excavation. - Bedrock very close to surface at HB-BH03-C. Well location positioned to the west of existing well for improved chance of intercepting groundwater in the overburden.
HB-MW04	1.4 to 2.4	- Assessment of the central-western portion of the construction area. - Located within the area of the expected deepest excavation (Jacobs 2022) to obtain data on expected water quality, inflows and potential impact on groundwater levels during construction.
HB-MW05	3.0+	- Coverage of the central-eastern portion of the construction area. - Located where overburden is inferred to be thickest on site (Jacobs 2022) and maximises potential to intercept overburden aquifer.
HB-MW06	3.0+	- Coverage of the southeast corner of the construction area. - Assess background groundwater quality and potential impact from Bullant Ridge. - Pushed to the west of HB-TP07 (closer to HB-TP06-C) as moving to the west is more likely to intercept groundwater in the overburden and less likelihood of intercepting shallow bedrock.

Following the installation of the new monitoring wells, they were developed and surveyed to allow for the calculation of groundwater elevations and to infer groundwater flow directions.

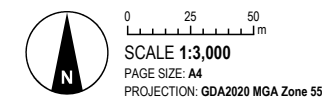


LEGEND

Groundwater monitoring network

- Bedrock monitoring well
- Overburden monitoring well
- HVDC subsea cable
- Heybridge converter and switching station site boundary
- Major road
- Minor road

Source:
 Routes from Tetra Tech Coffey.
 Monitoring locations from Tetra Tech Coffey & Jacobs.
 Roads and watercourses from NRE Tas.
 Imagery from NearMap (7 February 2024).



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FIGURE 4-2
Groundwater monitoring network
 April 2025



4.2.2 Hydraulic testing and continuous groundwater level monitoring

Aquifer hydraulic testing (falling/rising head tests) was conducted at the newly installed wells (HB-MW01 to HB-MW06) where groundwater was encountered, and at the existing well HB-HB06-C(S).

Groundwater level loggers were installed in the new wells logging at hourly interval for continuous groundwater level monitoring.

4.2.3 Groundwater sampling

Groundwater levels in the newly installed wells and the five existing wells were gauged and sampled for laboratory analysis (if water was present). A sample of water retrieved from the remaining section of the tioxide tunnel was also collected for laboratory analysis.

Primary, intra-laboratory duplicate, inter-laboratory duplicate, and rinsate samples were submitted to ALS primary analysis and Eurofins for secondary analysis. The selected laboratories are National Association of Testing Authorities (NATA) certified for the analysis required.

Groundwater samples and the sample of water from the tioxide tunnel were analysed for a selection of major cation and anion concentrations, and a suite of analytes that were previously identified as contaminants of potential concern, including:

- Nitrogen species.
- Dissolved metals.
- Total petroleum hydrocarbons (TPH) and total recoverable hydrocarbons (TRH).
- Benzene, toluene, ethylbenzene, and xylene (BTEX compounds).
- Polycyclic aromatic hydrocarbons (PAH) and phenols.
- Per- and polyfluoroalkyl substances (PFAS).

4.2.4 Calibration of equipment

Water quality meters (WQM) were used during fieldworks. The equipment was calibrated by the supplier (AirMet Scientific) prior to delivery of rental equipment and then by Tetra Tech Coffey daily during field works, in accordance with manufacturers specifications.

4.2.5 Quality Control and decontamination procedures

Quality control replicate samples were collected with replicate samples submitted blind to both the primary and secondary laboratories to evaluate precision and accuracy of the results. Equipment rinsate blank samples were generally collected at a rate of one sample per day (in accordance with the sampling analysis and quality plan developed for the site) to assess decontamination procedures applied.

The following procedures were applied for decontamination of sampling equipment.

- All re-useable sampling and measurement equipment (interface probes, water quality meters, Polyvinyl Chloride (PVC) slug, level loggers) were washed with PFAS free detergent and triple rinsed in deionised water between each sample location. The equipment was decontaminated immediately prior to use at each new location to limit the potential for contact with impacted media.
- New single use equipment (such as nitrile gloves, Hydrasleeves™ etc.) were used at each sampling location and disposed of appropriately following each use.
- Care was taken at all times to handle the cleaned equipment and samples only with new nitrile gloves.

4.3 MODELLING ASSESSMENT METHOD

A numerical groundwater flow model has been developed to predict potential changes to groundwater levels and flows during construction. The modelling methodology, including model design, discretisation, boundary conditions, and calibration procedures, is presented in Section 7.1, alongside the calibration process and model outputs ensures transparency and provides context for how the conceptual understanding of site conditions has been incorporated into quantitative predictions.

5. HYDROGEOLOGICAL SETTING

5.1 PHYSIOGRAPHY

The converter station site is located on a small, lower elevation promontory of land that is bordered by steeply rising topography along the western and part of the southern boundary (Figure 5-1). The study area and surrounding region is characterised by mountain ranges and undulating plateaus dissected by deeply incised rivers and creeks.

Topography within the site boundary is generally flat and slightly dipping towards north-west, whereas the topography around the wider study area is steep and hilly. The elevation ranges between 135 mAHD at the edge of the study boundary to the west and sea level (0 mAHD) along the coastline that runs forms the northern and eastern study area boundary. The proposed construction area is generally flat which has been subject to anthropogenic cut and fill, and is located at the base of the eastern section of Round Hill, shown as the small, isolated hill immediately east of the 'proposal site' in Figure 5-1. Much of the landscape below 10 mAHD is relatively flat which formed during a glacial minimum where sea levels were higher in the Quaternary period. These relatively flat, stranded landscape features between 0 mAHD and 10 mAHD are common in the coastal zones of Tasmania, as described in Cromer (2018).

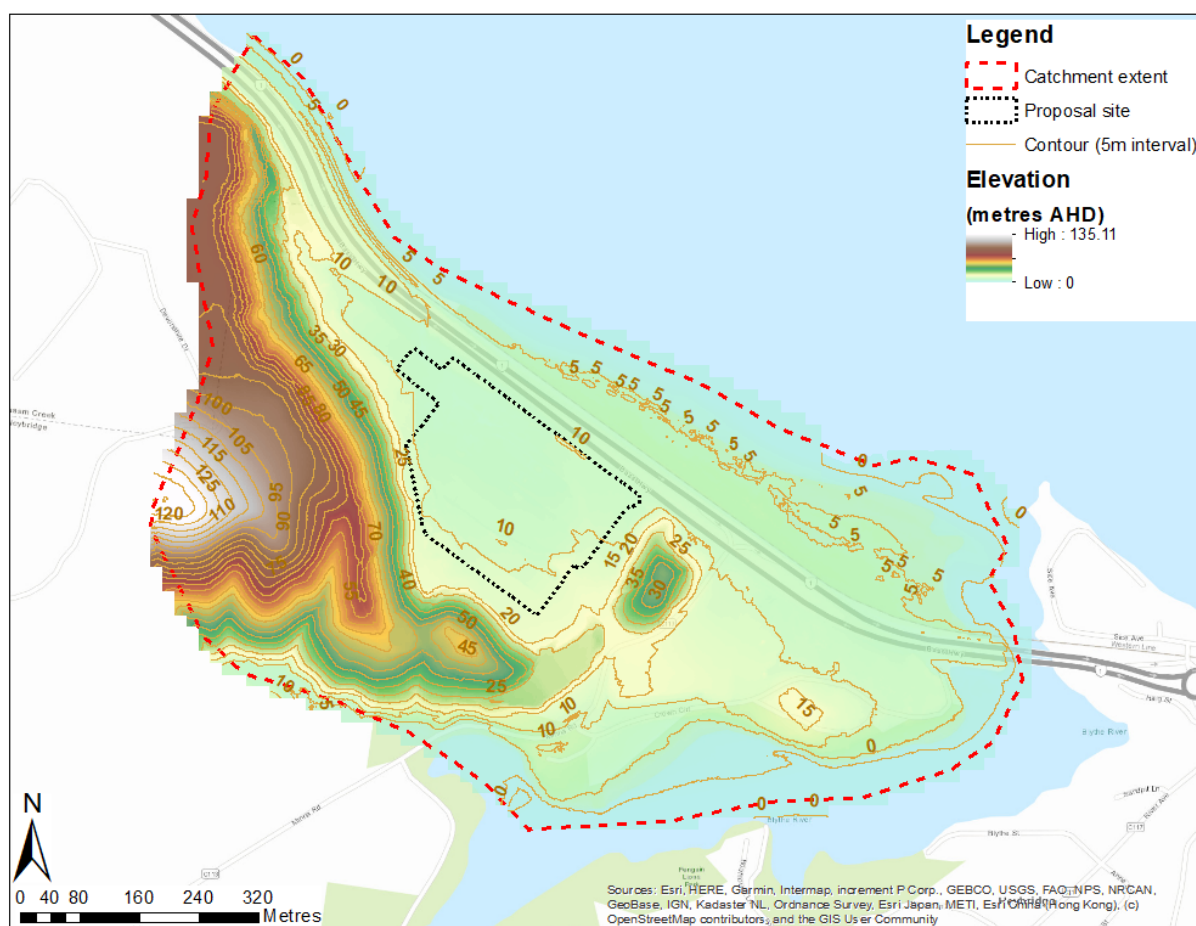


Figure 5-1 Landscape elevation of the catchment domain

5.2 CLIMATE

The nearest Bureau of Meteorology (BOM) daily rainfall monitoring station is located at Burnie (Park Grove) – station number 091355. The Park Grove BOM station is located 8.4 km to the north-west from the site. Climate conditions at the site are considered comparable based upon the similar elevation and short distance from the study area.

The study area experiences a temperate oceanic climate (Köppen classification Cfb) that is moderated by its proximity to the Bass Strait. This maritime influence results in mild summers, cool and wet winters, and relatively stable temperatures throughout the year. Average annual temperatures sit around 11.8°C, with summer (December to February) maximums ranging between 19.3°C and 21.8°C, and minimums from 11.4°C to 13.9°C. In contrast, winter (June to August) temperatures range between 11.3°C and 13.5°C during the day, and can drop to between 3.4°C and 4.1°C overnight. Historically, Burnie has recorded a maximum temperature of 33.8°C (31 January 2009) and a minimum of -2.0°C (14 July 1967).

Rainfall is relatively evenly distributed, with an annual average of approximately 961 mm. The wettest period occurs in winter, particularly July, which averages over 129 mm of rainfall, while January and February tend to be the driest months. Sunshine is moderate, with roughly 52 clear days and over 140 cloudy days annually. The region also experiences moderate humidity year-round, with average afternoon humidity levels exceeding 60%. Sea surface temperatures off Burnie vary seasonally, peaking at around 17.2°C in February and cooling to approximately 12.6°C in September.

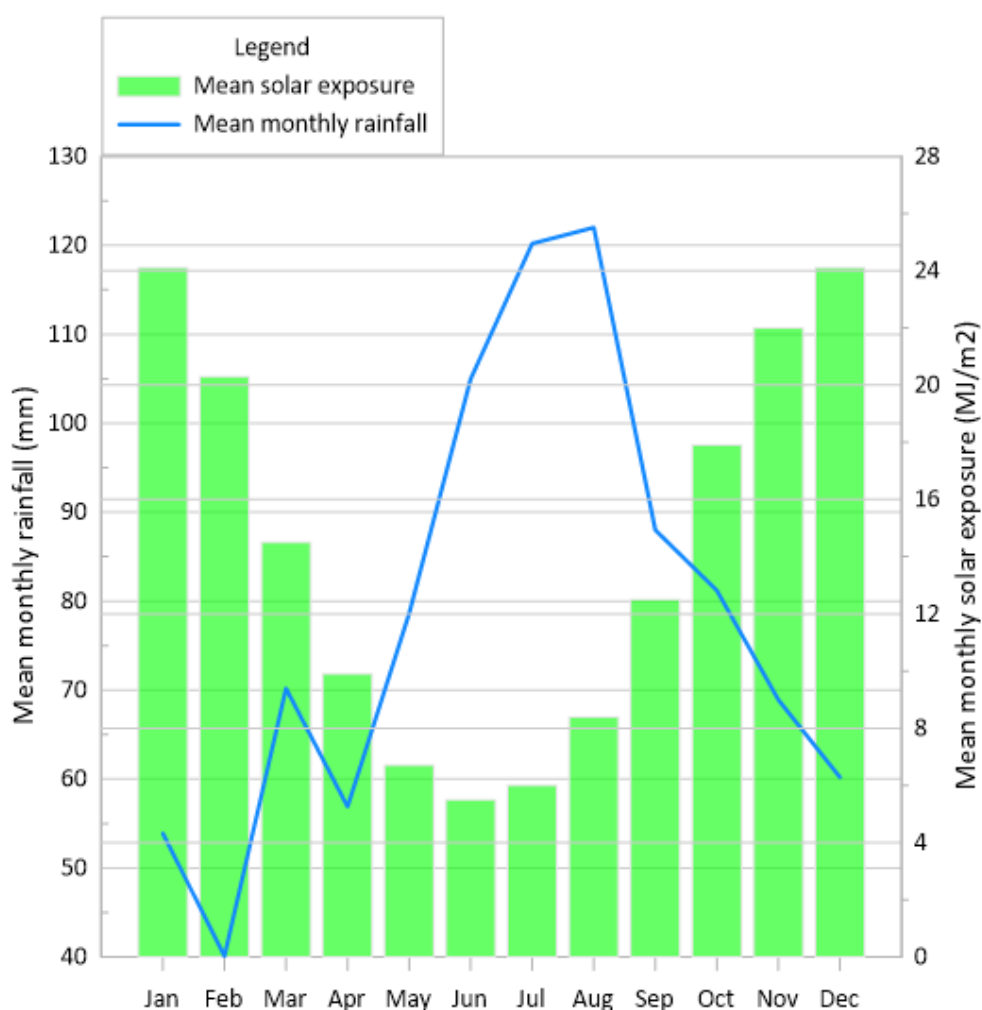


Figure 5-2 Mean monthly rainfall and solar exposure at Burnie

Climate data in recent years indicates a warming trend consistent with broader patterns across Australia, including record-high minimum temperatures in 2024. Mean monthly rainfall and solar radiation at Burnie is presented in Figure 5-2. Information shows on average year rainfall exceeds solar exposure between May and September, where solar radiation is an approximate surrogate of 7% of effective evaporation. Thereby suggesting groundwater recharge is most likely to occur over these months.

5.2.1 Rainfall trend

The cumulative difference between monthly average and actual rainfall is presented in Figure 5-3 for 2010 to present. Information shows for the past five years the rainfall trend is generally stable. This is compared to the previous five years where it was significantly less than average. The near average rainfall trend over the past five years would likely result in groundwater levels being generally stable if it is assumed that groundwater recharge is primarily fed by rainfall (discussed in section 5.5.2).

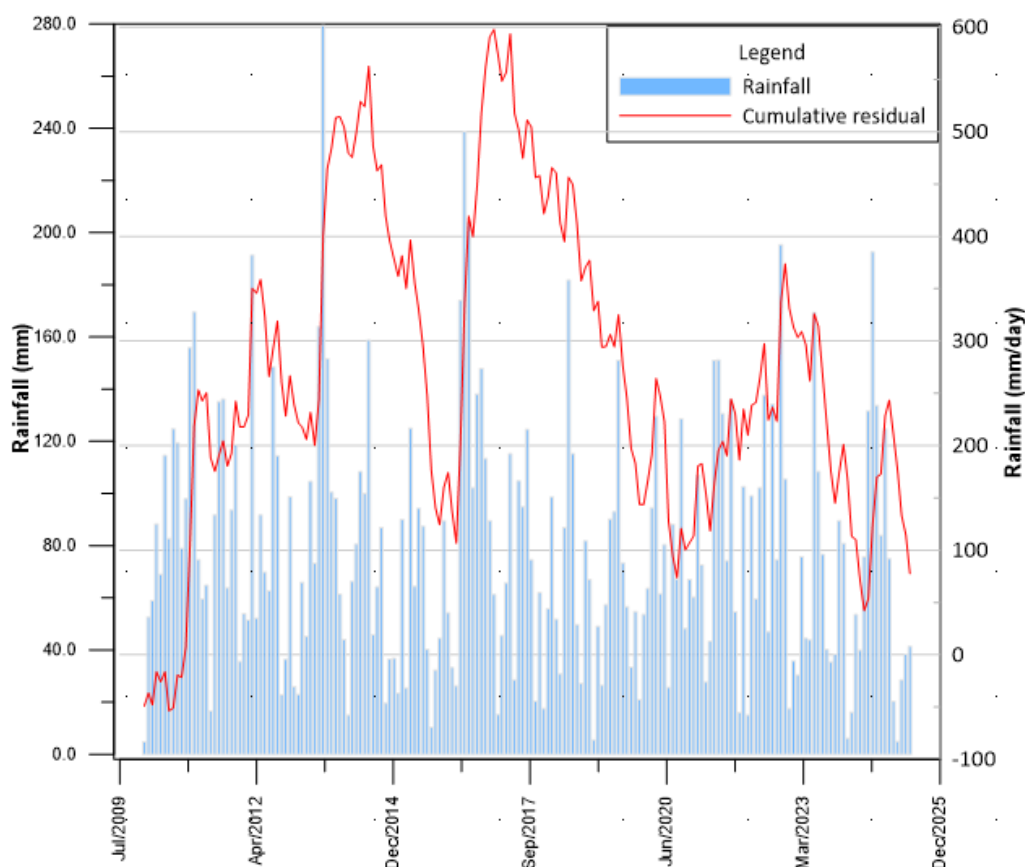


Figure 5-3 Actual and cumulative residual rainfall trend

5.3 HYDROLOGY

There are two noteworthy surface water features within the vicinity of the proposed construction site, the marine interface of Bass Strait (Emu Bay) and the Blythe River. The coastline is located to the north some 100 m away and around 8 m lower in elevation than the proposed construction site (assuming the site elevation is 8 mAHD).

The Blythe River is a perennial watercourse that flows 61 km from its headwaters to the south, to Heybridge where it discharges into Emu Bay. At the river mouth there is an estuarine section that extends roughly 1.3 km upstream to a water supply weir. The lower Blythe River exhibits a confined channel morphology, with flood events largely contained within the floodplain suggesting flood significant groundwater recharge and

interaction is unlikely. Flood mapping for a 0.5% Annual Exceedance Probability (AEP) event indicates ponding can occur beneath the Bass Highway culverts, with water depths reaching up to 1.6 meters.

Overall, both the marine interface and Blythe River are considered as groundwater discharge locations because the elevations are lower than the land surface and measured groundwater levels in the vicinity of the proposed construction area.

There is no evidence to suggest overbank flooding of Blythe River occurs. However, like with the marine sea level, the elevation of the Blythe River is assumed to be a lower drainage elevation limit for water to drain.

5.4 TIOXIDE OUTFALL SYSTEM

The tioxide outfall tunnel and pipeline (which form the outfall tunnel system) were originally constructed in the early 1960s as a waste disposal system for the former Tioxide plant, discharging effluent into Bass Strait. The outfall tunnel system ran from the site beneath the Bass Highway and rail network to the sea, and remained in operation until the plant's closure in 1996. The details of this tioxide outfall system adopted from Pitt & Sherry (2024) is shown in Figure 5-4.

The original precast culvert is inferred to date from the 1960s and was installed to about 6 m deep. Sections of this original culvert running underneath the Bass Highway is inferred to have been replaced around 1995 with 600 mm diameter concrete pipe. The structural integrity of the disused outfall tunnel is not well defined.

The effect that this disused outfall tunnel may have on groundwater has received limited attention apart from recent water quality sampling undertaken during April 2025. A low concentration of TRH C₁₀-C₃₆ (0.29 mg/L) was reported in the water sample collected from the disused tunnel. Refer section 6.4.1 for detailed water quality results regarding the recent monitoring event.



5.5 HYDROGEOLOGY

The hydrogeology of the catchment and proposed construction site is described in several previous reports (Tetra Tech Coffey 2024). This section provides a summary of these previous reports and updated information.

5.5.1 Hydro-stratigraphic framework

The subsurface conditions at the Heybridge site comprise of a four-unit hydro-stratigraphic sequence, each defined by distinct lithological and hydraulic properties. These include anthropogenic fill, unconsolidated Quaternary sediments, weathered bedrock, and fresh fractured bedrock. This classification provides a more nuanced understanding of groundwater flow dynamics at Heybridge site when compared to the original GIA, and reflects the observed site conditions from borehole logs, packer testing, and geotechnical interpretation.

These units are discussed further below.

i. **Unit 1 – Anthropogenic Fill (Heterogeneous Zone)**

This surface layer comprises variable anthropogenic materials, typically 1.5 to 2.5 m thick. It includes reworked clayey soils, construction rubble (brick, concrete, timber), and isolated inclusions of metals. Although generally of low permeability, localised coarse-grained or backfilled zones may provide preferential pathways for shallow infiltration. Due to its heterogeneity and lack of lateral continuity, this unit does not constitute a hydraulically significant aquifer. In addition, the unit is mostly above the water table and is likely to be unsaturated.

ii. **Unit 2 – Quaternary Alluvial and Marine Sediments (Unconfined Aquifer)**

These Holocene sediments comprise silty sands, sandy clays, gravels, and occasional peat lenses. Extending from beneath the fill to depths of approximately 2 to 4 mbgl, this sequence forms the primary unconfined aquifer at the site. It exhibits relatively high hydraulic conductivity (1×10^{-4} to 5×10^{-3} m/s), and the water table is typically shallow (0.5 to 1.5 mbgl). The aquifer is laterally extensive and hydraulically continuous at site scale but is limited by the outcropping bedrock to the south, west and east. The aquifer is recharged predominantly by local rainfall infiltration.

iii. **Unit 3 – Weathered Cambrian Bedrock (Transitional Aquifer Zone)**

Immediately underlying the Quaternary sediments is a variably weathered zone of the Cambrian Oonah Formation, extending 1 to 3 m below the sediment–bedrock interface. This unit is characterised by a gradational transition from extremely weathered, soil-like material to moderately weathered, partially intact rock, exhibiting moderate porosity and secondary permeability due to both weathering and micro-fracturing. Borehole logging and geotechnical testing indicate increased hydraulic conductivity relative to fresh bedrock, with values ranging from 1×10^{-4} to 1×10^{-5} m/s. This zone may act as a semi-confined aquifer under local conditions and can transmit groundwater vertically or laterally, particularly where intersected by natural discontinuities or relic stress relief fractures.

iv. **Unit 4 – Fresh Cambrian Bedrock (Fractured Rock Aquifer)**

At depth, the weathered horizon grades into relatively intact, fresh bedrock of the Oonah Formation. This unit comprises interbedded sandstone and siltstone (dominantly quartzwacke). Two mafic bodies are mapped on the beach to the north of the site which are described as “mafic vesiculate lavas”. This dolerite intrusion has been encountered in well BH2 drilled by Tasman Geotechnics (2024) at depths of about 21 and 28 mbgl. The groundwater movement in this unit is restricted to structural discontinuities such as joints, bedding planes, and faults. Matrix permeability is negligible; however, transmissivity is locally enhanced in zones of intense fracturing or shearing. Hydraulic conductivities within this unit range from 1×10^{-1} to 1×10^{-6} m/s. Groundwater yield is low and variable, and the aquifer is generally

considered hydraulically disconnected from the overlying unconfined system, except where structural pathways provide vertical connectivity.

5.5.2 Groundwater recharge

Groundwater recharge is defined as the process whereby water enters the water table. Further analysis of rainfall data with groundwater level monitoring information is discussed in section 5.5.6.

Groundwater recharge is estimated to be between 2% and 8% of rainfall, with the expected recharge value of approximately 5%, based upon previous experience in similar rainfall climates. The recharge percentage values are used as a range and starting value in model calibration.

5.5.3 Groundwater evapotranspiration

Evapotranspiration can be a major component of groundwater discharge, especially in areas with shallow water tables and dense vegetation. This is typically estimated using pan evaporation data from weather station records.

Pan evaporation information is not available for the study area, but solar radiation is. There is no universal fixed conversion factor between solar radiation and pan evaporation; however, an empirical relationship is commonly used to estimate pan evaporation (E_{pan}) from solar radiation (R_s) in climatological and hydrological studies. This relationship is often expressed as $E_{pan} \approx k \times R_s$, where k is an empirical coefficient typically ranging between 0.45 and 0.55 depending on local conditions. In Australia, a coefficient of approximately 0.48 is used as a general estimate for Class A evaporation pans (BOM 2021). This coefficient accounts for factors such as pan type, local atmospheric conditions, and exposure to wind and radiation (Allen et al., 1998; BOM, 2021). While not exact, this empirical radiation-based method provides an approximation for estimating pan evaporation from solar radiation.

It is expected groundwater evapotranspiration occurs when the water table depth is generally less than 1.4 m within the study area following pasture systems modelling by Hocking (2008) near Longford, in the Back Creek Catchment. The maximum potential groundwater evapotranspiration is expected to be less than the estimated pan evaporation from solar radiation.

5.5.4 Hydraulic conductivity

This section presents the measured, estimated, and likely mean hydraulic conductivity (K) values for the main hydro-stratigraphic units at the Heybridge Converter Station site. The values are based on site-specific data from slug tests, packer testing, and geotechnical descriptions across multiple reports (Tetra Tech Coffey 2024).

Table 5-1 quantifies the hydraulic conductivity values of the hydro-stratigraphic framework at the Heybridge site, with high-permeability zones in the Quaternary sediments and low-permeability in the deeper hard bedrock. The likely mean K values provide a representative starting basis for hydrogeological conceptualisation. All values are expressed in metres per day (m/day).

Table 5-1 Summary of measured hydraulic conductivity values at Heybridge

Hydro-stratigraphic Unit	Description	Measured K values (m/day)	Estimated range (m/day)	Likely mean K (m/day)	Remarks
Fill Material	Heterogeneous reworked soils, demolition waste, gravel, clayey rubble	0.04, 0.08, 0.25	0.01 – 1.0	0.2	Highly variable; permeability depends on texture and compaction
Quaternary Alluvial Sand	Loose to medium dense sands and gravels	12.0, 16.4, 28.7	5 – 30	15	Primary aquifer; high permeability confirmed by slug tests
Quaternary Marine Sediments	Soft to firm silty clays with shell fragments	0.02, 0.07, 0.1	0.01 – 0.5	0.1	Low permeability; may result in semi-confined conditions
Weathered Cambrian Bedrock	Fractured and weathered metasediments (Oonah Formation)	0.5, 1.3, 1.9	0.1 – 2.0	1.0	Fracturing enhances transmissivity; transmissivity declines with depth
Fresh Cambrian Bedrock	Competent quartz wacke, dolerite (mafic intrusion)	0.002, 0.005, 0.009	<0.001 – 0.1	0.005	Flow restricted to fractures; matrix permeability is negligible

5.5.5 Time series water level data

Groundwater level data available at the site ranges between late 2021 to mid-2025. Figure 5-5 presents the frequency distribution of the available groundwater level data showing most water level data has been collected in 2025.

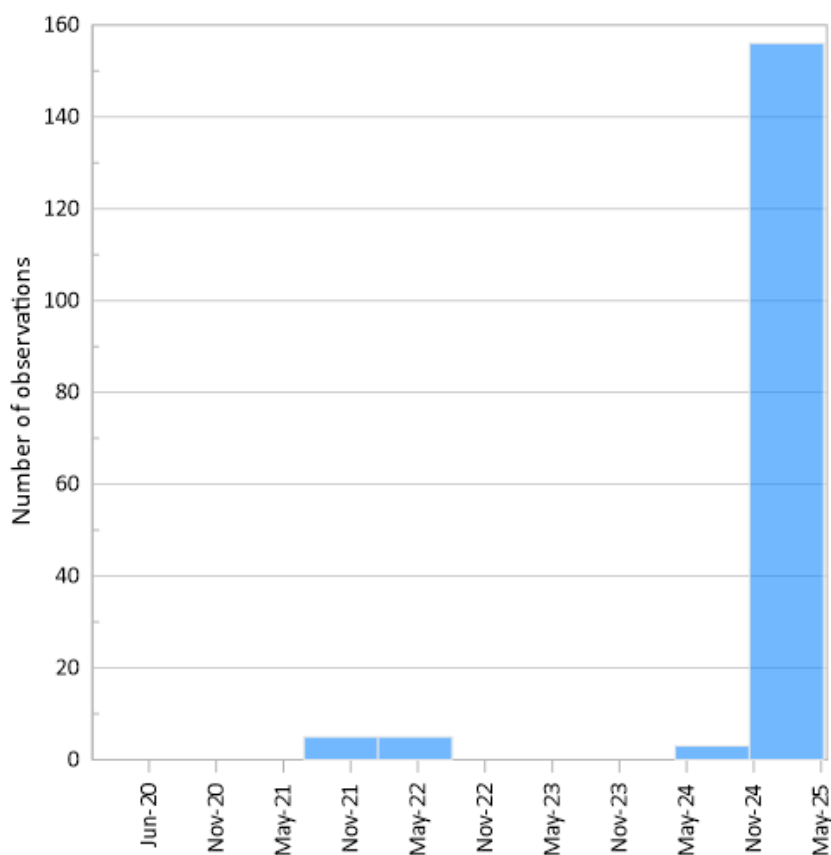


Figure 5-5 Frequency distribution of available groundwater level data at Heybridge site

All available time series groundwater level data is presented in Figure 5-6 and Figure 5-7. Information shows groundwater levels generally range from 5 to 10 mAHD across the site. The available limited data indicates there has been some variation since the initial water level measurements in late 2021/early 2022 to those which have occurred in 2025. It is understood that some initial water level measurements (undertaken by Jacobs 2022) may not have stabilised following well construction, whereas the 2025 water level measurements are more representative of stable groundwater conditions.

It is vital to note that there is very limited site groundwater level monitoring data apart from the recent phase of drilling and monitoring activities undertaken in late 2024 by Tasman Geotechnics and early 2025 by Tasman Geotechnics and Tetra Tech Coffey. Some of the wells have data loggers installed since March 2025 (discussed in 6.6) logging at hourly intervals. These available logger data is used to estimate the groundwater level fluctuations and relationship with rainfall (discussed further in section 5.5.6).

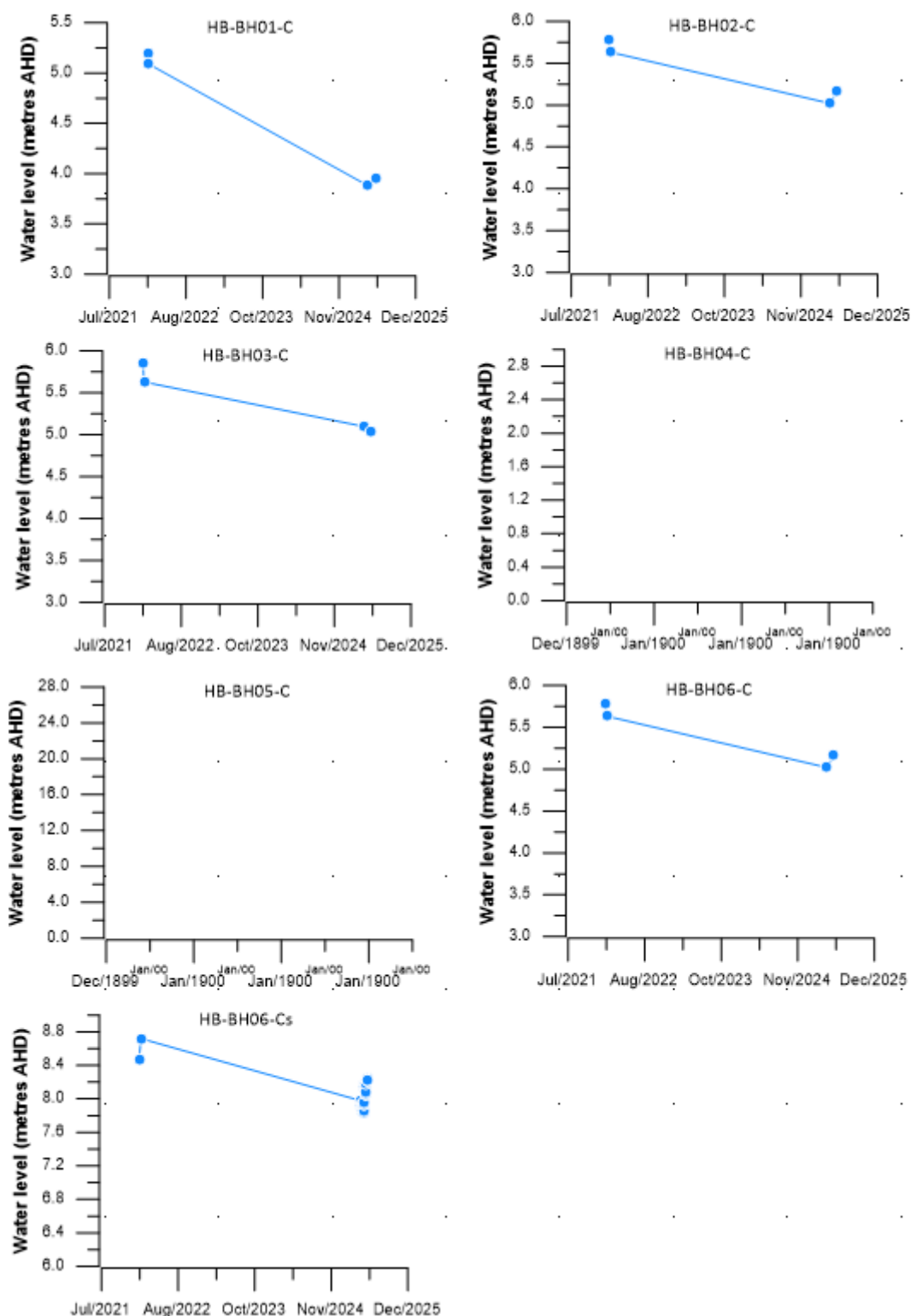


Figure 5-6 Available time series groundwater level data (page 1 of 2)

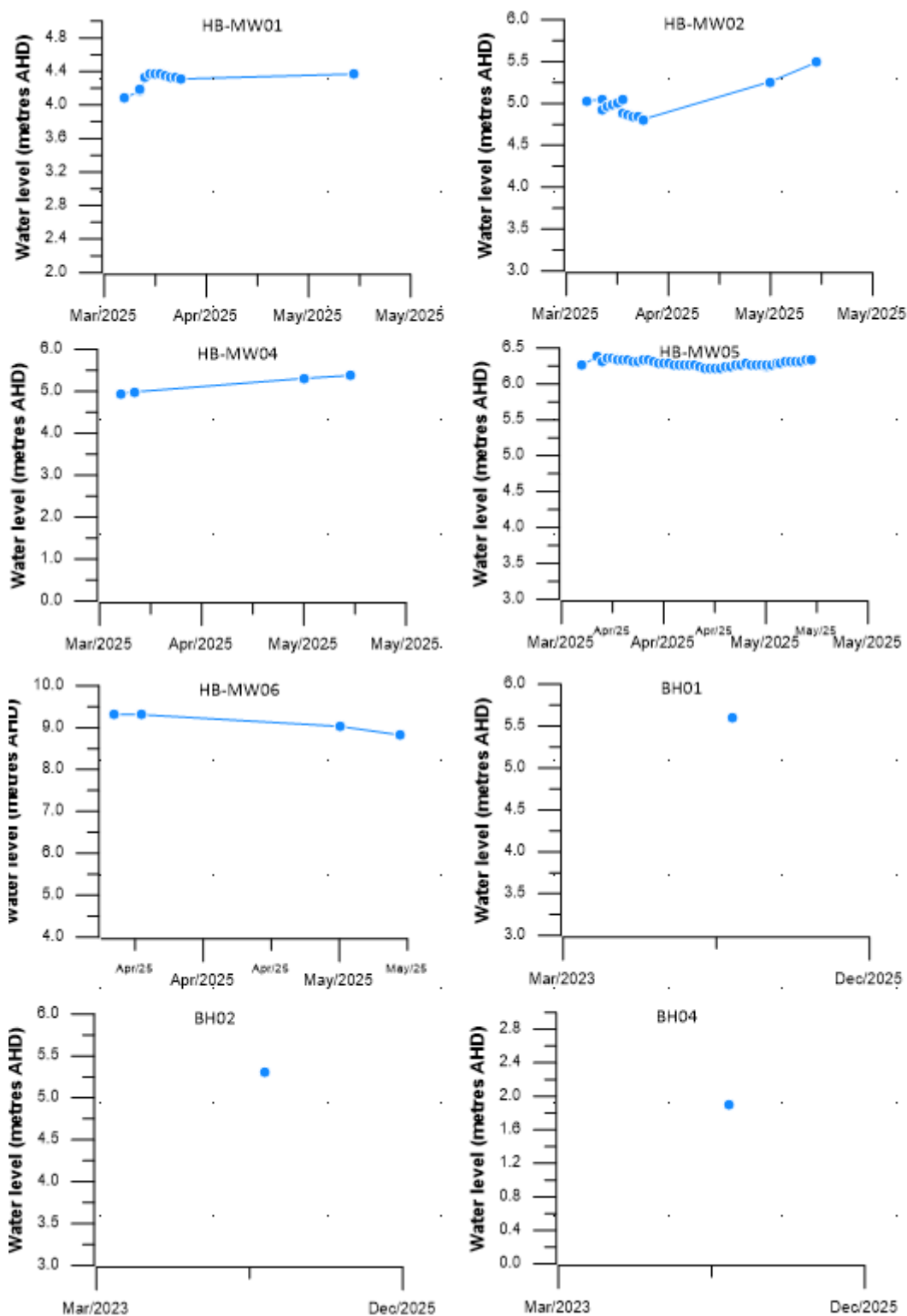


Figure 5-7 Available time series groundwater level data (page 2 of 2)

5.5.6 Rainfall and groundwater level relationship analysis

Figure 5-8a to Figure 5-11 show the results of hourly groundwater level monitoring over approximately 5 months from April to August 2025, at the five wells fitted with groundwater level loggers. Level measurements are plotted against daily rainfall totals measured at Heybridge over the same period. Results show that observed groundwater level rises at several wells correlate with large rainfall events, which indicate that rainfall recharge to the watertable aquifer may be a primary control of groundwater level at the site.

Groundwater monitoring site BH-06 includes both a deep (C – 15 mbgl) and a shallow (C(S) – 2.5 mbgl) nested well. The vertical groundwater gradient between the two wells suggests that there is an upward hydraulic head gradient. This upward gradient suggests that the site is likely in a regional groundwater discharge zone where groundwater is discharging upwards from lower aquifers to the watertable aquifer, and to the marine environment. Therefore, the upward discharge from the bedrock aquifer will also influence the observed groundwater levels in the watertable aquifer.

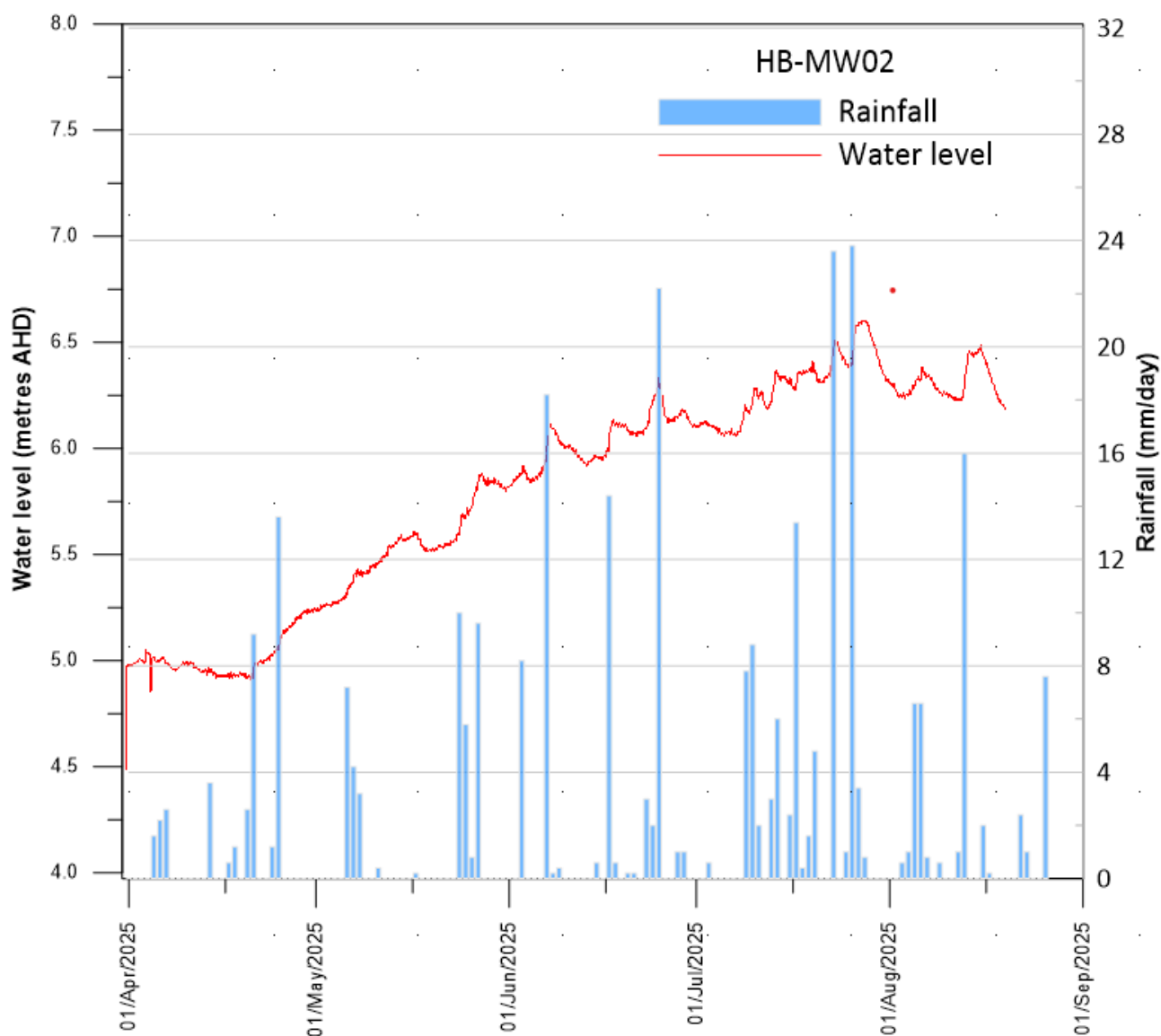


Figure 5-8 Continuous monitored groundwater level versus daily rainfall amount (HB-MW02)

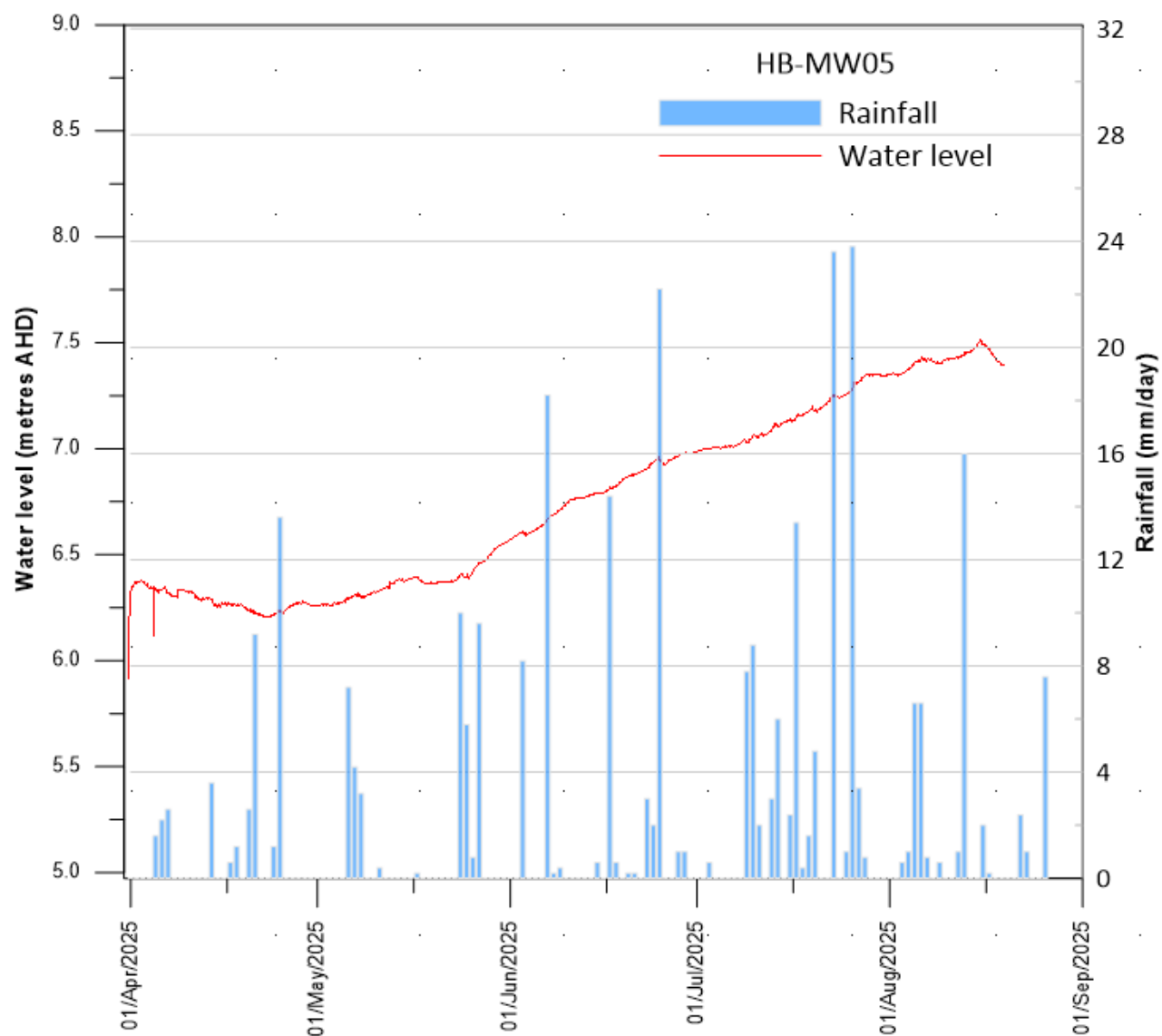


Figure 5-9 Continuous monitored groundwater level versus daily rainfall amount (HB-MW05)

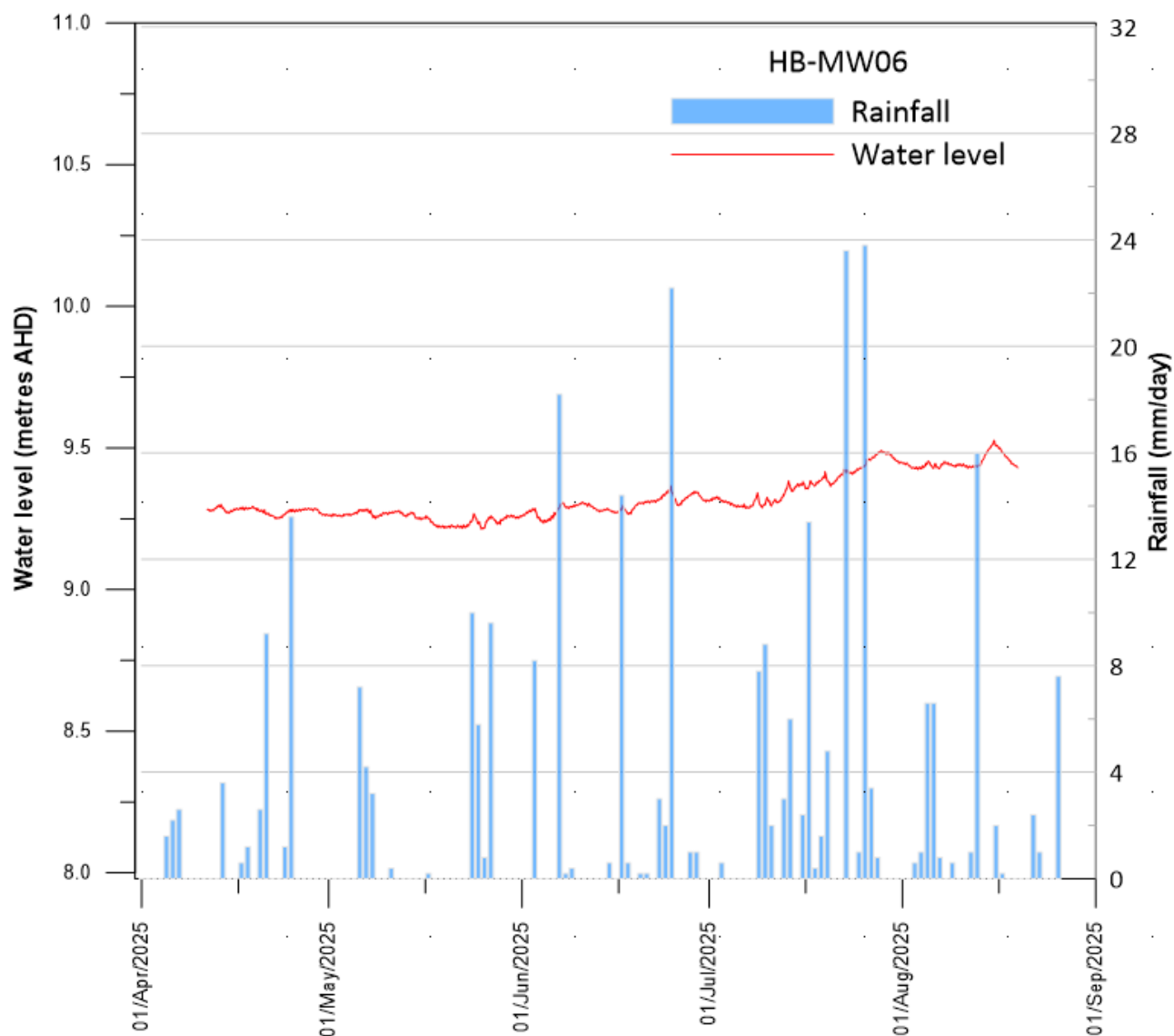


Figure 5-10 Continuous monitored groundwater level versus daily rainfall amount (HB-MW06)

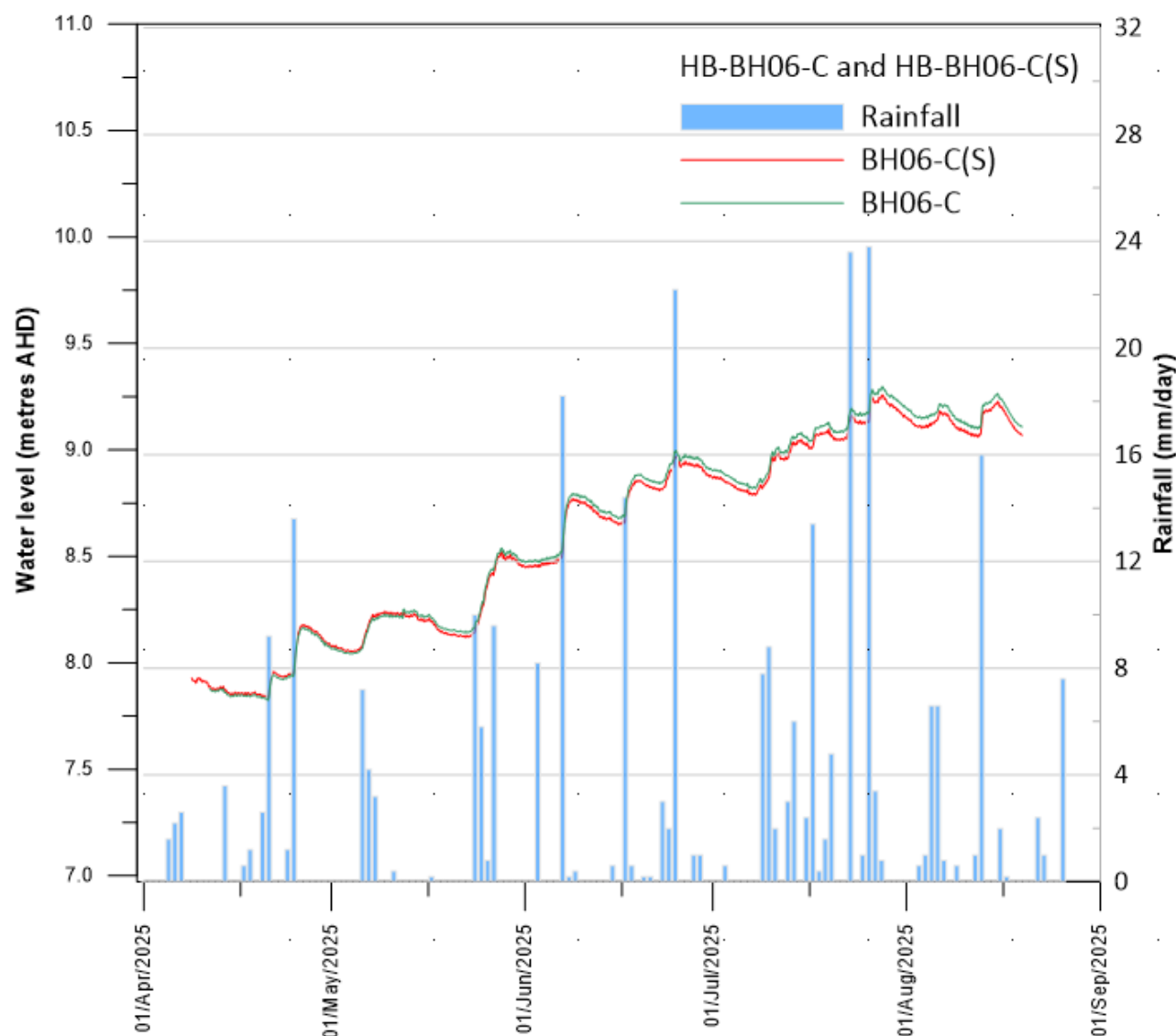


Figure 5-11 Continuous monitored groundwater level versus daily rainfall (BH06-C and BH06-C(S))

5.5.7 Existing site contamination due to former

The existing known site contamination has been discussed in *Heybridge Converter Station and Shore Crossing –Contaminated Land and Acid Sulfate Soils – Addendum Site Assessment* report (Tetra Tech Coffey 2025). Historically, the Heybridge converter station site was used as a paint pigment factory by Tioxide Australia. The factory commenced operation in 1949, and the factory was demolished by 1998. Titanium dioxide pigments were produced at the factory from ilmenite mined in the Capel area in Western Australia. Titanium dioxide is a non-toxic white pigment used in products ranging from paint, plastics, printing ink, paper, flooring, cement products, wall coverings, cosmetics, ceramics, rubber and textiles.

The highly heterogeneous fill soils at the converter station site, have potential to include areas of contamination in soils at depth, including hydrocarbon contamination, metal contamination, acidic soils and asbestos containing materials at concentrations. The majority of hydrocarbon impacts were removed during the factory decommissioning and remediation works undertaken and validated as being below the adopted industrial land-use screening criteria. However, some residual hydrocarbons may remain in soils (either

around former remediation areas or in unidentified areas on the converter station site) that may be odorous and present an aesthetic impact to receptors if disturbed.

A supplementary assessment of the historical site use and potential sources of PFAS contamination identified a fire training area in the southern portion of the site (refer Tetra Tech Coffey 2025). No details regarding the type of chemicals used in the fire training or the frequency of fire training were available. It was noted that there are areas of hydrocarbon contamination in soils in the area used for fire training. This indicates that fuels were likely ignited and extinguished in this area and aqueous film forming foams (AFFF) likely to have been used (Tetra Tech Coffey 2025).

6. FIELD INVESTIGATION RESULTS

This section describes the observations, measurements and results of additional field program, as well as provides:

- Monitoring well logs showing subsurface conditions and well construction details.
- Surveyed well locations and elevations.
- Interpretation of baseline hydrogeological conditions, including groundwater flow directions and groundwater depth across the site.
- An appraisal of the quality and reliability of the monitoring data.

6.1 MONITORING WELL INSTALLATION AND DEVELOPMENT

6.1.1 Monitoring well installation

MLPL contracted Tasman Geotechnics to complete the drilling and installation of the six groundwater monitoring wells. Tetra Tech Coffey provided guidance for the planned location and installation details of the wells.

The six groundwater wells were drilled and installed by Tasman Geotechnics between 27th and 28th March 2025, using a hollow stem auger drilling method with split spoon sampling tool. Monitoring wells were developed on 31st March 2025 using a bailer and groundwater level loggers were installed to record groundwater elevations over time. The locations of the new and existing wells are presented on Figure 5-2. Details of the well installation program, including draft borehole logs and well completion details, are provided in the report from Tasman Geotechnics and included in Appendix B. A summary of well construction details is provided in Table 6-1.

Table 6-1 Well completion details

	Total depth of well (mbgl)	Depth of fill material from surface (mbgl)	Depth to bedrock – Oonah siltstone (mbgl)	Total depth of well (mbgl)	Screen interval (mbgl)	Groundwater level after completion (mbgl)
HB-MW01	2.5	1.0	1.6	2.5	1.0 – 2.5	1.87
HB-MW02	3.5	0.5	2.6	3.5	1.1 – 2.6	1.58
HB-MW03	4.8	2.4	3.5	3.6	1.0 – 3.6	Dry
HB-MW04	2.4	2.0	2.0	2.4	1.0 – 2.0	1.94
HB-MW05	3.9	1.6	3.6	3.9	0.6 – 3.6	1.82
HB-MW06	4.1	2.4	3.0	4.1	1.0 – 3.0	2.04

*mbgl = meters below ground level

6.1.2 Monitoring well development

Tasman Geotechnics developed the newly installed wells using a bailer. Well development records are provided in Appendix B and a summary of field development activities is summarised in Table 6-2.

Table 6-2 Well development details

Well ID	Total depth of well (mbgl)	Screen interval (mbgl)	Groundwater Level on 31 st March 2025 (mbgl)	Approximate volume of water removed during development (L)	Comments
HB-MW01	2.5	1.0 – 2.5	2.11	7	Bailed dry 2 times, silty, well didn't recover, stayed dry.
HB-MW02	3.5	1.1 – 2.6	2.81	24	Bailed to dry 3 times, very silty brown.
HB-MW03	3.6	1.0 – 3.6	>3.60	0	Well Dry
HB-MW04	2.4	1.0 – 2.0	1.95	1	Bailed to dry 1 time, well didn't recover, stayed dry.
HB-MW05	3.9	0.6 – 3.6	1.82	27	Bailed to dry 3 times, cloudy silty.
HB-MW06	4.1	1.0 – 3.0	2.04	7.2	Bailed to dry 3 times, cloudy silty.

6.2 MONITORING WELL SURVEY

The newly installed wells were surveyed by a licensed surveyor (PDA Surveyors, Engineers and Planners) on 7 April 2025. The location and elevation results (relative to the AHD) of the survey are presented in Appendix B and summarised in Table 6-3.

Table 6-3 Well survey details

Well ID	Easting*	Northing*	Top of well PVC casing (TOC) (mAHD)	Ground surface (mAHD)
HB-MW01	414015.903	5452632.282	6.85	6.00
HB-MW02	414110.784	5452562.737	7.61	6.69
HB-MW03	414182.136	5452508.719	9.40	8.50
HB-MW04	414022.240	5452565.142	7.88	6.92
HB-MW05	414116.079	5452455.575	9.18	8.29
HB-MW06	414118.658	5452386.362	12.33	11.43

*Eastings and Northings in MGA2020, vertical datum AHD83

6.3 HYDRAULIC CONDUCTIVITY TESTING

Tetra Tech Coffey staff undertook hydraulic conductivity testing at HB-MW02, HB-MW05, HB-MW06 and existing well HB-BH06-C(S). The new wells HB-MW01, HB-MW03 and HB-MW04 were not able to be tested as there was insufficient water column available.

Rising and falling head tests were undertaken using a solid PVC slug to displace the groundwater head (water level) in the monitoring well and a groundwater level logger was installed to record the change in groundwater head and subsequent recovery.

The change in water level data recorded during the tests was processed using the Aqtesolv software package to estimate the hydraulic conductivity (K) for the screened section of the aquifer at each well.

The Bouwer and Rice (1976) analytical solution for unconfined aquifers was used to estimate a K value for each test. A hydraulic conductivity anisotropy ratio (K vertical/K horizontal) of 0.1 was assumed for the analysis at each location, which is considered appropriate for the Quaternary deposits screened. Where multiple tests were analysed at a single location, an average K value was used to provide an overall estimate of hydraulic conductivity for the tested interval.

A summary of the estimated hydraulic conductivity values for each of the assessed wells is shown in Table 6-4. Corresponding analytical records for each test, including type curve graphs, are included in Appendix C.

Table 6-4 Summary of estimated hydraulic conductivity

Well ID	Screened material	Screen length	Hydraulic conductivity test type	Estimated hydraulic conductivity (m/d – geomean)
HB-MW02	Quaternary sands	1.5	FHT* & RHT*	0.1
HB-MW05	Quaternary sands	3.0	FHT & RHT	0.025
HB-MW06	Quaternary sands	2.0	FHT	3.8
HB-BH06-C(S)	Quaternary sands	1.0	FHT & RHT	1.5

* FHT = Falling head test, RHT = Rising head test

The geometric mean of the estimated hydraulic conductivity values reported at each of the four shallow Quaternary wells with sufficient water column ranged from between 0.025 m/day at HB-MW05 to 3.8 m/day at HB-MW06. The results indicate that values obtained are within the expected range typical for silty sandy material which can vary between 0.0086 m/day to 86 m/day (Freeze and Cherry, 1979), and show that the hydraulic conductivity is likely to be variable across the site over several orders of magnitude and are consistent with the observed stratigraphy identified in the borehole logs.

An assessment of aquifer hydraulic properties was completed by Jacobs (2022a, 2022b), which included the completion of rising and falling head tests at three wells that screen the bedrock aquifer. Estimated hydraulic conductivity results ranged from 0.009 m/day to 13.2 m/day.

6.4 GROUNDWATER SAMPLING

A summary of the groundwater sampling adopted during the site assessment is provided in Table 6-5.

Table 6-5 Groundwater sampling assessment

Activity	Detail
Dates	3 - 5 April 2025
Wells sampled	HB-MW02, HB-MW05, HB-MW06, HB-BH01-C, HB-BH02-C, HB-BH03-C, HB-BH06-C, HB-BH06-C(S), and former effluent tunnel (tioxide tunnel)
Monitoring well gauging	Depth to groundwater and total depth of the well was gauged. Monitoring wells were gauged using a Solinst oil/water interface probe (IP). The IP was decontaminated between each measurement. Groundwater gauging data is provided in Table E1, Appendix E.
Monitoring well purging and sampling	Groundwater sampling was conducted using high-density polyethylene (HDPE) Hydrasleeves™. HDPE was selected rather than low-density polyethylene (LDPE) to minimise the potential for introduction of cross contamination of PFAS compounds and reduce losses from potential adsorption to equipment. Water quality readings were collected from samples recovered from the Hydrasleeves™ and were analysed using a YSI Pro DSS water quality meter. The top of the Hydrasleeves™ were positioned approximately 2 m below the standing water level (if sufficient water). Hydrasleeves™ were left in the well for a period of at least 24 hours. Hydrasleeves™ were removed and decanted into the laboratory supplied and preserved sampling bottles. Once the sample was collected, the remaining sample was used to record ex-situ field water quality parameters (pH, dissolved oxygen, electrical conductivity, oxidation-reduction potential and water temperature). General field observations were recorded including anything of note about the water, colour, sheen or odour. Groundwater quality data is provided in Table E2, Appendix E.
Sample preservation	Samples were placed in laboratory supplied bottles and placed into chilled coolers with ice to keep them cool onsite and in transit to the laboratory.
Quality control sampling	Quality control replicate samples were collected with replicate samples submitted blind to both the primary and secondary laboratories to evaluate precision and accuracy of the results. Equipment rinsate blank samples were generally collected at a rate of one sample per day (in accordance with the sampling analysis and quality plan developed for the site) to assess decontamination procedures applied. The results of the blind replicate and rinsate blanks are presented in Table F1 and F2 of Appendix F, respectively.

6.4.1 Groundwater quality results

6.4.1.1 Field measured parameters

The following field parameter results were measured immediately prior to the collection of groundwater samples for laboratory analysis.

- Water temperature ranged from 15.1°C at BH-06-C to 20.3°C at HB-BH01-C.
- Field pH measurements ranged from 4.38 at HB-BH01-C to 6.76 at HB-MW02. A pH of 6.56 was measured from the sample of water collected from the tioxide tunnel at the access point.
- Field electrical conductivity (EC) measurements ranged between 352.9 µS/cm at HB-BH06-C(S) to 980 µS/cm at HB-MW06. The value recorded at HB-MW02 was an exception to this at 2,784 µS/cm, and the value recorded for the tunnel access point was also elevated at 1,290 µS/cm.

- Field dissolved oxygen (DO) ranged between 0.95 mg/L at HB-MW06(S)-C to 6.76 mg/L at HB-BH02-C. The reported DO value of zero recorded at HB-MW02 is likely to be erroneous and future rounds of monitoring will be used to verify this result.
- Redox potential ranged from -121.7 mV at HB-MW06 to 170.4 mV at HB-MW05.

6.4.1.2 Piper Plot

The major cations and anions result from the groundwater quality analysis are provided in Appendix E and results are presented in the form of a trilinear piper plot in Figure 6-1. The results from the shallow Quaternary aquifer wells are shown in blue and the results from the deeper wells screening the weathered bedrock are shown in purple. The plot shows some correlation with shallow groundwater clustering around Na–Ca–Cl–SO₄ type and deeper aquifer groundwater dominated by more Ca–Mg–SO₄ waters. Results suggests the aquifers are relatively intermixed with variable water quality type across the site, possibly reflecting the localised recharge and geochemical processes that are likely to occur in heterogeneous fill and alluvial systems.

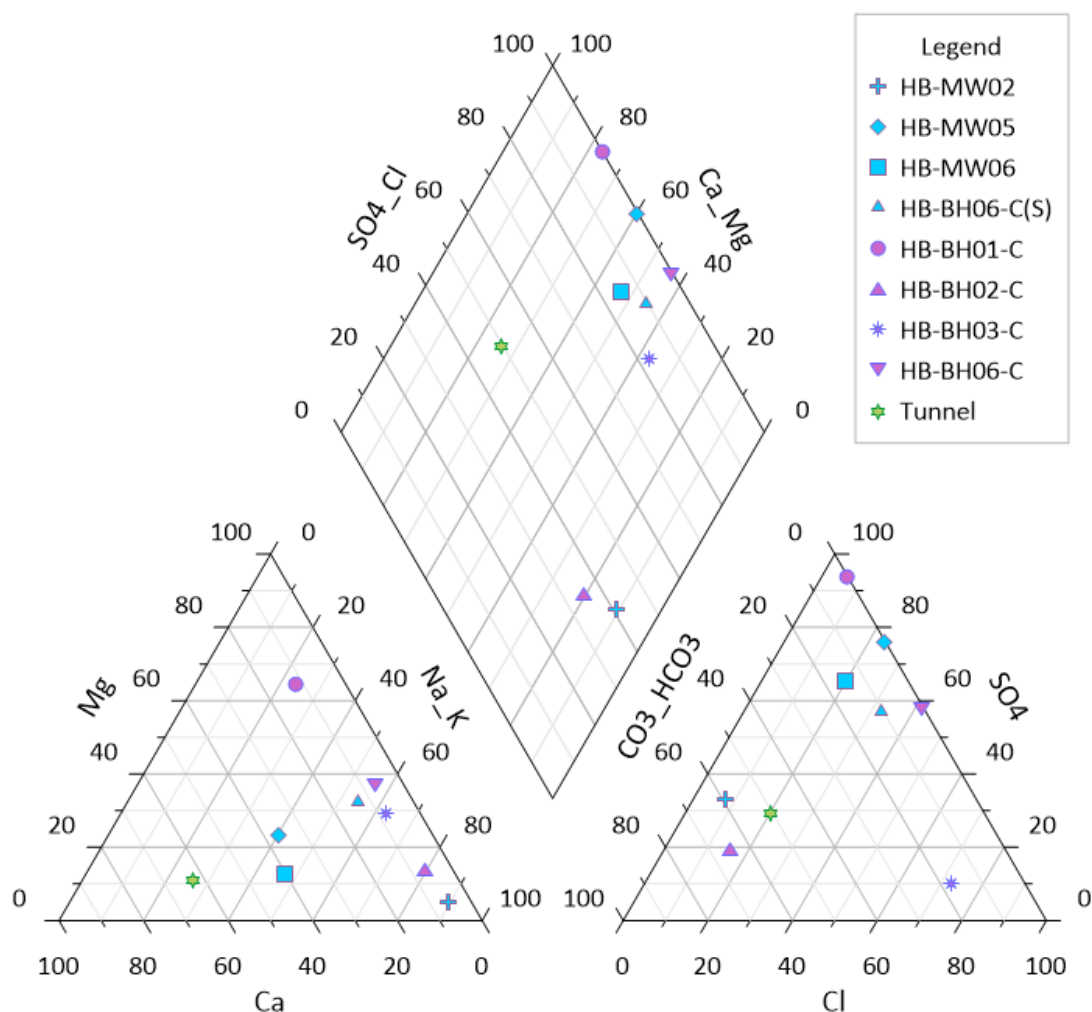


Figure 6-1 Piper plot of major cations and anions

6.4.1.3 Petroleum Hydrocarbons

A range of heavy fraction hydrocarbons (TRH C₁₀-C₃₆) were detected at all locations screening the weathered bedrock and shallow Quaternary aquifers, with the exception of HB-BH06-C(S). Concentrations of TRH (C₁₀-C₃₆) ranged up to a maximum of 1.01 mg/L, consistent with the historical use of hydrocarbon products (such as oils and lubricants) at the site. Concentrations of light fraction hydrocarbons (TRH C₆-C₁₀) and BTEXN compounds were below the Laboratory Limits of Reporting (LOR) in all wells. A similar composition of low concentration TRH C₁₀-C₃₆ (0.29 mg/L) was reported in the water sample collected from the tioxide tunnel.

Additional TRH analysis using silica gel clean up should be performed by the laboratory in future groundwater monitoring rounds to assess whether the heavy fraction TRH reported are likely to be associated with anthropogenic sources of petroleum hydrocarbon contamination or naturally occurring organic matter within the wells or aquifer.

6.4.1.4 Metals

The majority of metals were reported at concentrations below the screening criteria, although concentrations of cobalt, copper, nickel and zinc were reported above the ecosystem protection criteria as summarised in Table 6-6.

The results from this investigation were similar to those reported in Jacobs (2022a).

Table 6-6 Metals concentrations above ecosystem protection criteria (ANZECC 2000 MW 95%)

	Cobalt (0.001 mg/L)	Copper (0.0013 mg/L)	Nickel (0.07 mg/L)	Zinc (0.015 mg/L)
HB-MW02	-	-	0.070	0.068
HB-MW05	0.013	0.010	0.027	0.228
HB-MW06	0.008	0.008	-	0.095
HB-BH01-C	0.108	-	0.206	0.287
HB-BH02-C	-	0.003	-	-
HB-BH03-C	0.011	-	-	-
HB-BH06-C	-	-	-	0.025
HB-BH06-C(S)	-	-	-	0.022
Tioxide tunnel	-	-	-	0.026

6.4.1.5 Nutrients

Concentrations of nutrients, including ammonia, nitrate, nitrite, total kjeldahl nitrogen (TKN), and phosphorous were above their respective LOR at most locations during the April 2025 monitoring event.

Ammonia was present in groundwater at concentrations ranging from <LOR (HB-MW06-C) to 2.39 mg/L at HB-MW02. Whilst present at detectable concentrations in groundwater across the site, ammonia concentrations only exceeded the adopted screening criteria for marine ecosystem protection (0.91 mg/L) at HB-MW02 (2.39 mg/L) and HB-MW06 (1.37 mg/L). The concentration of ammonia in the tioxide tunnel (1.04 mg/L) was also above the ecosystem screening criteria.

Nitrate was also detected in groundwater at all locations except for HB-MW02 and HB-MW05. Concentrations were below the health (11.3 mg/L) and freshwater ecosystem protection value (0.16 mg/L) and the livestock

water criterion of 400 mg/L, at all locations except for the maximum 0.21 mg/L, reported at HB-BH01-C which exceeded the freshwater ecosystem protection criterion.

Phosphorus was also detected in groundwater at all locations except for HB-MW05, ranging from 0.01 mg/L to 8.24 mg/L at HB-MW02, which is located along the central northern boundary of the site. Groundwater beneath the site may not be suitable for long term irrigation, with phosphorus concentrations exceeding the 0.05 long term trigger value at HB-MW02, HB-MW06, HB-BH01-C, and HB-BH06-C(S).

6.4.1.6 Polycyclic aromatic hydrocarbons

Concentrations of all PAH parameters analysed at all sampling locations were below the LOR and the screening criteria.

6.4.1.7 PFAS

Concentrations of all PFAS parameters were compared to the PFAS National Environmental Management Plan (NEMP) 2025 Interim Marine 95% species protection reference guidelines (HEPA, 2025) and drinking water criterion, which are conservatively protective of other health exposure scenarios including irrigation, livestock and domestic use.

Concentrations of PFAS analysed at all sampling locations were generally below the LOR except for samples collected from monitoring wells HB-MW02, HB-BH01-C, HB-BH06-C, and HB-BH06-C(S), where the following PFAS were detected above their respective LORs:

- Perfluorohexane sulfonic acid (PFHxS).
- Perfluorooctanesulfonic acid (PFOS).
- Perfluoropentanoic acid (PFPeA).
- Perfluorohexanoic acid (PFHxA).
- Perfluoroheptanoic acid (PFHpA).
- Perfluorooctanoic acid (PFOA).
- 6:2 Fluorotelomer sulfonic acid (6:2 FTS).

Of these seven compounds detected, PFOS and the combined total of PFOS and PFHxS, exceeded either health (drinking water) or marine ecosystem protection criterion;

- PFOS at HB-BH06-C (0.18 µg/L) and HB-BH06-C(S) (0.15 µg/L) slightly exceeding the 0.13 µg/L marine ecosystem criterion that applies at the point of discharge.
- Sum (PFHxS + PFOS) at HB-MW02 (0.08 µg/L), HB-BH06-C (0.31 µg/L) and HB-BH06-C(S) (0.25 µg/L) exceeding 0.07 µg/L health screening criterion and may not be suitable for extractive uses without treatment.

PFAS were below their respective LOR in the sample collected from the tioxide tunnel.

6.4.2 Quality Assurance/ Quality Control

Tetra Tech Coffey implemented a comprehensive quality assurance/quality control (QA/QC) program as part of our field sampling procedures, based on relevant Australian Standards, EPA Victoria Guidelines and industry practice.

The implemented QA/QC program included the following:

- The use of appropriately qualified/trained environmental scientists to conduct the assessment.
- The use of standardised field records to document the findings of the assessment.

- Appropriate preservation of samples during transport from the field to the laboratory.
- The use of chain of custody documentation to ensure the traceability of sample transport and handling.
- The use of laboratories accredited by the National Association of Testing Authorities Australia (NATA) for the analysis of samples.
- The collection and analysis of field quality control samples.
- Review of internal analysis of laboratory quality control samples.
- The use of appropriate laboratory reporting limits.
- Compliance with sample holding times.
- Comparison of field and analytical data to check for the occurrence of apparently unusual or anomalous results.

A review of the quality assurance and quality control sampling measures implemented as a part of the sampling program has been undertaken to evaluate the precision and accuracy of the results and to assess whether the results can be relied on and is provided in Appendix F.

Table F1, Appendix F, presents the quality control results of Relative Percent Difference (RPD) between the primary and the replicate (intra-laboratory and inter-laboratory splits) samples.

Between the primary sample (HB-BH03-C) and intra-laboratory duplicate (QC01), two RPD exceedances were noted:

- i. phosphorus total with RPD of 67% which is attributed due to the results being at the limit of reporting (LOR) of 0.01, which can result in large RPDs despite small difference in the total concentration. The laboratory QC acceptance criteria suggest that for analytes with results <10 times the LOR, no RPD limit applies. Thus, this RPD exceedance does not affect the quality of the results.

Between the primary sample (HB-BH01-C) and inter-laboratory duplicate (QC02), 16 RPD exceedances were noted of which:

- i. Eight RPD exceedances were observed for the metal analyte analysis. This is attributed to metals not being field filtered but instead laboratory filtered. Further, the samples were analysed on different dates by the two laboratories with different LOR. The primary laboratory-reported metals concentrations were typically higher than the secondary laboratory, which can assume that the adopted results provide a conservative assessment of metals in groundwater. Future monitoring will ensure that the field filtration of metals will be completed to minimise potential effects of different methods affecting results. Given the above, the RPD exceedances for eight metals between the primary and secondary laboratory is not considered to affect the outcomes of the metals results for this instance.
- ii. Seven RPD exceedances were observed for the nutrients analyte analysis. This is attributed to the difference in laboratory analysis methods resulting in slightly different results. The nutrient results from the primary laboratory are within the acceptable RPD range, that has been adopted for reporting purpose.
- iii. One RPD exceedance was observed in the PFAS compound analysis. This is attributed to the result being at the LOR, that aggravates the RPD calculations. The laboratory QC acceptance criteria suggest that for analytes with results <10 times the LOR, no RPD limit applies. Thus, this RPD exceedance does not affect the quality of the results.

Overall, the data quality is acceptable for the purpose of the assessment.

6.5 GROUNDWATER ELEVATION AND FLOW DIRECTION

The recently installed groundwater wells were installed to monitor groundwater levels in the Quaternary sand aquifer (if present) as this is the upper aquifer most likely to be encountered by surface construction works. Further information on the monitoring well rationale is outlined in Section 4.2.1 and Table 4-1.

Groundwater levels were gauged at all monitoring wells on 4 April 2025 prior to groundwater sampling. Gauging results are presented as reduced groundwater levels (relative to AHD) in Appendix E - Table 1, and the groundwater level have been contoured and presented on Figure 6-2.

Quaternary sand screened wells show this unit is variably saturated with no groundwater present at locations HB-MW01, HB-MW03, and HB-MW04 (generally along the northern boundary of the converter station site) at the time of monitoring. Where saturated, groundwater levels in the Quaternary sand (overburden unit) range from maximums of 9.31 mAHD and 7.88 mAHD (HB-MW06 and HB-BH06-C(S), respectively), in the southeast of the site, to 5.05 mAHD (HB-MW02) along the central northern boundary. Results indicate that groundwater occurrence and flow in the Quaternary sand may be laterally discontinuous but indicates a general hydraulic gradient from the southern site boundary towards the coastline to the north-east.

Groundwater wells screening in weathered bedrock aquifer have groundwater elevations recorded between 4.10 mAHD (HB-BH01-C in the northwest) to 7.92 mAHD (in the south of the site), which indicates a general flow direction toward the coast to the north-east.

The groundwater network on the site now includes two pairs of nested wells with one screened in the Quaternary sand and the other weathered bedrock comprising:

- HB-MW02 / HB-BH02-C.
- HB-BH06-C / HB-BH06-C(S).

Groundwater elevations measured at both sets of nested wells (Figure 6-2) indicate a small upward gradient between the weathered bedrock and Quaternary sand aquifers at the time of the sampling. The upward gradient between the nested pair HB-BH06-C / HB-BH06-C(S), toward the South was 0.04 m. The upward gradient between the nested pair HB-MW02 / HB-BH02-C, toward the coast along northern site boundary is 0.12 m. This indicates upward discharge of groundwater from the underlying bedrock aquifer is increasing towards the coast where the groundwater ultimately discharges to the sea.

The relatively small vertical gradients between the two units also suggest that the two formation are likely to be in good hydraulic connection with horizontal flow between the two units generally comparable.

Test pitting by Jacobs (2022a) indicated that there were some potential zones of perched groundwater in shallow overburden material identified at some locations at the site. However, perched water was not encountered during the groundwater monitoring well installation program. Instead, it is understood that the overburden is variably saturated with groundwater occurring in the weathered bedrock unit where the depth to rock is shallow.

Groundwater level loggers were deployed in HB-MW01, HB-MW02, HB-MW03, HB-MW04, HB-MW05, HB-MW06, HB-BH06 and HB-BH06-C(S) to assess long term groundwater level trends, response to rainfall and tidal influence. These are discussed in section 6.6.



LEGEND

Groundwater elevation, April 4, 2025 in mAHD

- Bedrock monitoring well
- Overburden monitoring well
- Inferred groundwater contour (mAHD)
- Inferred groundwater flow direction

Proposed route

- HVDC subsea cable
- Heybridge converter and switching station site boundary
- Major road
- Minor road

Disclaimer:
The groundwater contours shown are one interpretation based on the available data. Other interpretations are possible

Source:
Routes from Tetra Tech Coffey.
Groundwater contours from Tetra Tech Coffey
Monitoring locations from Tetra Tech Coffey & Jacobs.
Roads and watercourses from NRE Tas.
Imagery from NearMap (07/02/2024).



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SCALE 1:3,000
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PROJECTION: GDA2020 MGA Zone 55

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HYDROGEOLOGICAL ASSESSMENT MODELLING REPORT

FIGURE 6-2
Groundwater Elevations, April 4, 2025



6.6 GROUNDWATER HYDROGRAPHS

Groundwater level loggers were deployed in HB-MW01, HB-MW02, HB-MW03, HB-MW04, HB-MW05, HBMW06, HB-BH06 and HB-BH06-C(S) to assess groundwater level responses to short-term environmental events, such as rainfall and tidal influence.

The level loggers were set at one minute logging interval by Tasman Geotechnics on 31 March 2025. The loggers were switched to hourly logging interval by Tetra Tech Coffey on between 3-5 April 2025 during the groundwater sampling round. The data from the level loggers were barometrically compensated and corrected to groundwater elevation in mAHD.

The available manual gauging records have been compiled in Table 6-7 and are plotted against the groundwater level logger hydrographs to compare the logger data with manual gauging data where available. The groundwater hydrographs are presented in Figure 6-3.

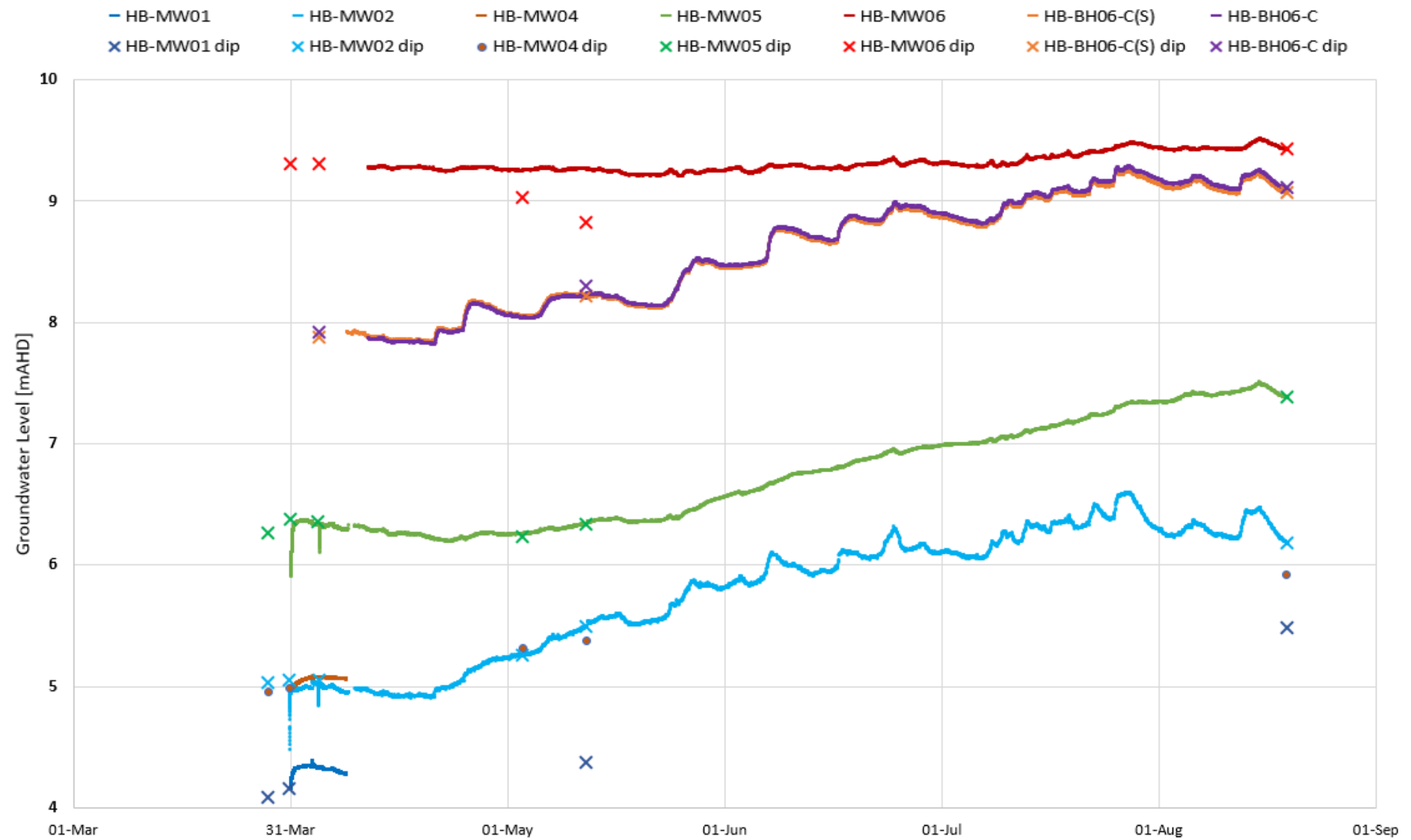
It is observed that the overburden well, HB-MW03, was consistently dry during the monitoring period of between late-April to mid-May 2025. Well HB-MW01 and HBMW04 were intermittently dry, while the remaining overburden wells retained groundwater throughout the monitoring period. The available information shows the groundwater level within the site is generally between 4-10 mAHD. Groundwater monitoring site BH-06 is composed of a deep [C well to 15 m depth] and a shallow [C(S) well to 2.5 m depth] nested well. Groundwater pressure information suggests there is an upward head groundwater gradient between the Quaternary sand and weathered bedrock. This upward groundwater gradient occurs in areas of groundwater discharge, where groundwater is exiting the aquifer. This groundwater discharge condition is expected because of its proximity to the marine interface.

The growing baseline groundwater level monitoring data set provides an indication of the likely seasonal fluctuation range, with levels in most wells rising by at least a metre over the winter period. Further baseline monitoring will continue to provide temporal assessment of groundwater levels at the site. No tidal influence was observed on any of the groundwater level hydrographs from the site.

Further detailed discussions relating to observed groundwater levels in response to rainfall is presented in section 5.5.6.

Table 6-7 Manual groundwater gauging levels

Well	Date	Time	Depth to Water (m below TOC)	Groundwater Elevation (mAHD)	Comments
HB-MW01	31/3/2025	11:15	2.69	4.16	Tasman Geotechnics gauging
	4/4/2025	15:35	dry	dry	Tetra Tech Coffey gauging
	3/5/2025	12:00	dry	dry	Time missing, assumed gauging at noon
	12/5/2025	12:16	2.48	4.37	-
HB-MW02	31/3/2025	12:00	2.56	5.05	Tasman Geotechnics gauging
	4/4/2025	15:00	2.56	5.05	Tetra Tech Coffey gauging
	3/5/2025	12:00	2.35	5.26	Time missing, assumed gauging at noon
	12/5/2025	12:16	2.12	5.49	-
HB-MW03	31/3/2025	13:20	dry	dry	Tasman Geotechnics gauging
	4/4/2025	14:40	dry	dry	Tetra Tech Coffey gauging
	3/5/2025	12:00	dry	dry	Time missing, assumed gauging at noon
	12/5/2025	12:50	dry	dry	-
HB-MW04	31/3/2025	13:40	2.89	4.99	Tasman Geotechnics gauging
	4/4/2025	14:25	dry	dry	Tetra Tech Coffey gauging
	3/5/2025	12:00	2.57	5.31	Time missing, assumed gauging at noon
	12/5/2025	12:19	2.50	5.38	-
HB-MW05	31/3/2025	14:35	2.80	6.38	Tasman Geotechnics gauging
	4/4/2025	14:15	2.82	6.36	Tetra Tech Coffey gauging
	3/5/2025	12:00	2.95	6.23	Time missing, assumed gauging at noon
	12/5/2025	12:59	2.84	6.34	-
HB-MW06	31/3/2025	15:10	3.02	9.31	Tasman Geotechnics gauging
	4/4/2025	16:20	3.02	9.31	Tetra Tech Coffey gauging
	3/5/2025	12:00	3.30	9.03	Time missing, assumed gauging at noon
	12/5/2025	11:22	3.51	8.82	-
HB-BH06-C	4/4/2025	16:40	1.41	7.92	Tetra Tech Coffey gauging
	12/5/2025	11:47	1.12	8.3	-
HB-BH06-C(S)	4/4/2025	16:35	1.48	7.88	Tetra Tech Coffey gauging
	12/5/2025	11:40	1.24	8.22	-

**Figure 6-3 Groundwater hydrographs**

6.7 CONCEPTUAL HYDROGEOLOGICAL MODEL

The site conceptual hydrogeological model, informed by previous studies (Tetra Tech Coffey 2024), recent field investigations (section 6), and the hydrogeological context described above, is presented in Figure 6-4. A summary of the current understanding is provided below.

The site lithology is underlain by Quaternary deposits of aeolian sands, alluvial sands and clays, as well as river and marine gravels deposited during the Holocene period. These Quaternary deposits are overlain by heterogeneous fill, approximately 1.5 to 2.5 m thick, comprising of reworked clayey soils and inclusion of some construction rubble (brick, concrete, timber). Together, the fill and underlying Quaternary deposits, extending to depths of approximately 2 to 4 mbgl, form the shallow unconfined aquifer beneath the site (Jacobs 2022).

Groundwater levels in this aquifer vary spatially, some monitoring wells (HB-MW01, HB-MW03, HB-MW04) show no groundwater presence suggesting high seasonal variability. When groundwater is present, water levels range from approximately 1.5 mbgl (HB-BH06-C(S)) to 3.0 mbgl (HB-MW06), indicating a generally shallow water table. These depths correspond to groundwater elevations ranging from 9.31 mAHD (HB-MW06) in the southeast to 5.05 mAHD (HB-MW02) along the northern boundary.

Previous test pits excavated by Jacobs (2022a) indicated that there were some potential zones of perched groundwater in shallow overburden at some locations on site. However, perched water was not encountered during the current groundwater monitoring well installation program. Instead, it is understood that the overburden is variably saturated with groundwater occurring in the underlying weathered bedrock unit where the depth to rock is shallow.

Beneath the Quaternary deposits lies a variably weathered zone of the Cambrian Oonah Formation extending approximately 1 to 3 m below the sediment–bedrock interface. This transitional zone exhibits moderate porosity and secondary permeability due to weathering and micro-fracturing, grading down into relatively intact fractured bedrock composed of interbedded sandstone and siltstone (dominantly quartzwacke). Together, these units form the fractured bedrock aquifer underlying the Quaternary aquifer.

Groundwater levels measured in wells screening the weathered bedrock range between 4.10 mAHD in the northwest site area to 7.92 mAHD in the southern part of the site. The site groundwater elevation contour (presented in section 6.5) indicates a general groundwater flow direction trending northeast towards the coast.

The current groundwater monitoring well network includes two pairs of nested wells, each pair screening both the Quaternary sands and the underlying weathered bedrock. Groundwater elevations recorded at these nested wells show a small upward hydraulic gradient between the weathered bedrock and Quaternary aquifers. Specifically, the upward gradient measured between well pair HB-BH06-C and HB-BH06-C(S), towards south of the site, is approximately 0.04 m. The gradient between HB-MW02 and HB-BH02-C, towards the coast along the northern site boundary, is approximately 0.12 m. This upward gradient confirms groundwater discharge from the deeper bedrock aquifer into the overlying Quaternary aquifer and becoming more pronounced towards the coastline where groundwater ultimately discharges into Bass Strait.

Recharge to the Quaternary aquifer likely occurs through a combination of rainfall infiltration distributed across the site and upward groundwater discharge from the underlying bedrock aquifer. Conversely, the bedrock aquifer is recharged via direct rainfall infiltration where the bedrock outcrops.

In addition to previous conceptual understandings, this review highlights several key points:

- The site is situated within a groundwater discharge zone characterised by an upward hydraulic gradient, resulting in net groundwater flow towards the land surface.
- Rainfall is the primary source of groundwater recharge, with observed groundwater response lag times of approximately 1 to 2 days.

- Rainfall events below approximately 4 mm generally produce minimal or no measurable groundwater level rises.
- Four distinct hydro-stratigraphic units are recognised across the site area.
- Climatic and groundwater monitoring data indicate that groundwater levels have remained generally stable over the monitoring period, but show potential for seasonal fluctuations of up to 1 m at some locations.

Figure 6-4 Tetra Tech Coffey (2025) site conceptual hydrogeological model

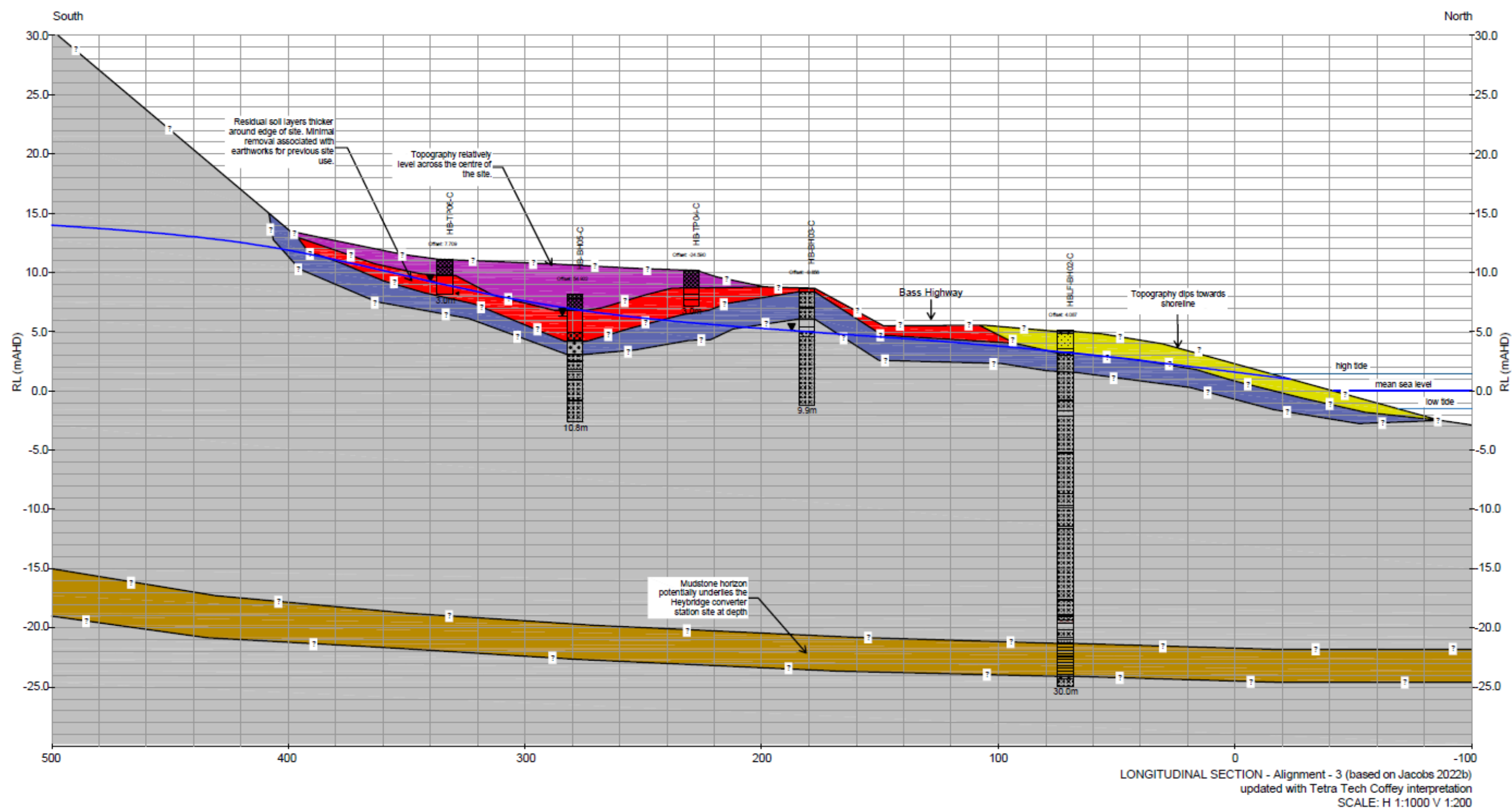


FIGURE 5-10
TETRA TECH COFFEY (2025) SITE CONCEPTUAL HYDROGEOLOGICAL MODEL

7. GROUNDWATER MODELLING ASSESSMENT

7.1 NUMERICAL MODEL DESIGN

7.1.1 Model specifications

To simulate potential groundwater impacts associated with the proposed Heybridge construction activities, a numerical groundwater model has been developed with 1 m surface cell resolution across the project boundary, which is considered suitable to assess the local scale effects of the generally small excavations that are likely to be required (discussed in Section 3.2 and further in Section 7.3.1).

Outside of the proposed construction area, there is less requirement for high-resolution model cells, and a 64 m cell size has been adopted. Groundwater level and mass balance impacts have only been considered from actions within-in the proposed construction area.

7.1.2 Model code, domain geometry and horizontal discretisation

The groundwater model was developed using Groundwater Vistas Graphical User Interface (GUI) modelling software which uses MODFLOW-USG (Unstructured Grid) (Panday et, al., 2013), an industry standard groundwater modelling code. The cell size (model solution resolution) of the groundwater model is variable laterally and uniform vertically. Figure 7-1 presents the lateral cell size variability across the model domain which varies between 1 m cell size within the area of interest (project site) to 64 m cell size at model extremes away from the project site. The total a modelled area is 454 ha and was established based on the study area described in Section 4.1.

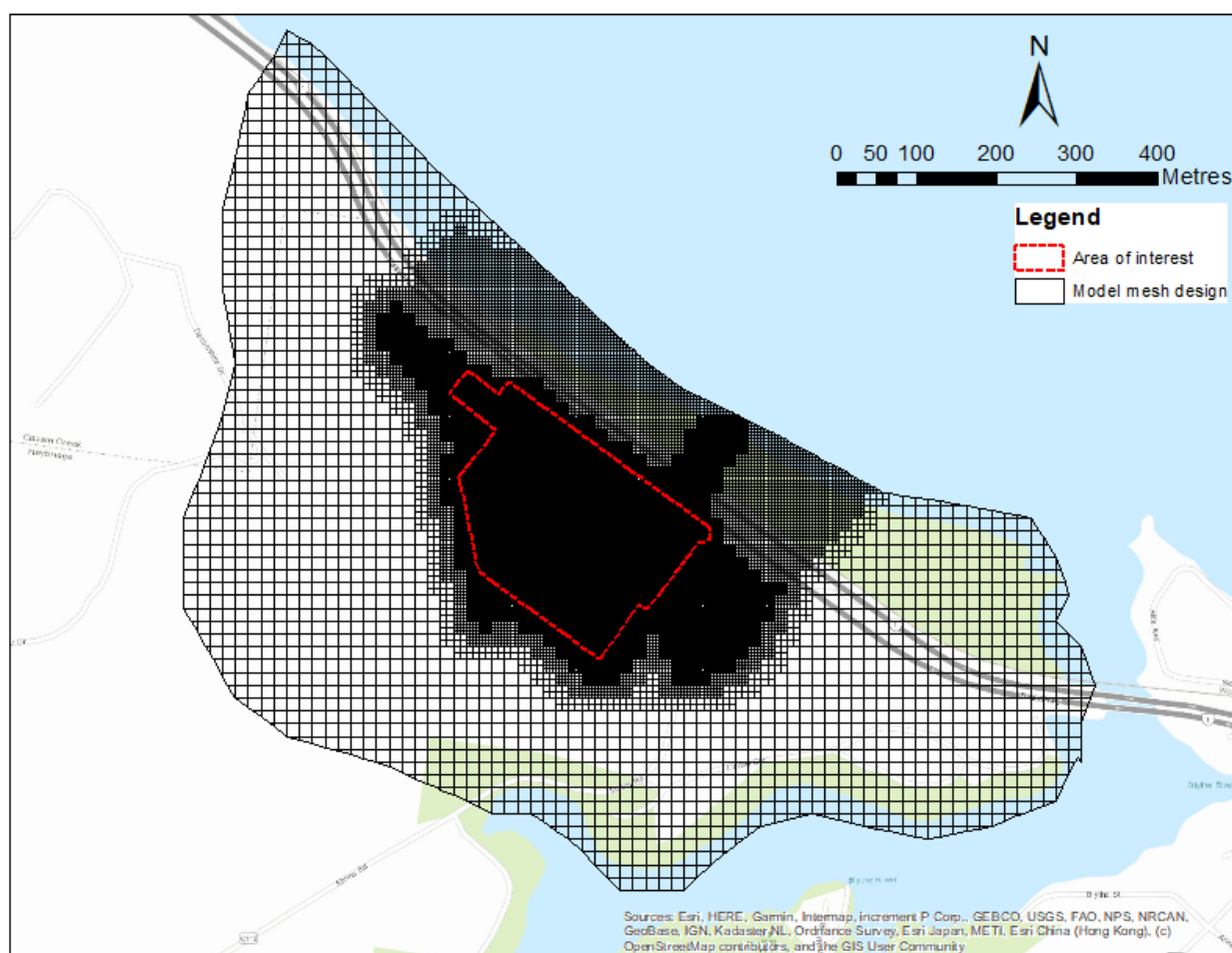


Figure 7-1 Model mesh design and area of interest for impact assessment

7.1.3 Model layers and spatial extent

The model layers have been designed in accordance with the hydro-stratigraphic framework presented in Section 5.5.1. The four-unit hydro-stratigraphic sequence at the study site (described in Section 5.5.1) has been integrated as a three-layer model with unit 1 and unit 2 merged as a single model layer. The model layers are discussed below:

i. Model Layer 1 – Fill and Quaternary sediments (unit 1 and unit 2)

The hydro-stratigraphic unit 1 comprises of heterogeneous fill material, and hydro-stratigraphic unit 2 comprises of unconsolidated Quaternary alluvial and marine sediments. These units are typically shallow, less than 4 m thick, with variable thickness and continuity. The fill unit exhibits high heterogeneity and lacks lateral continuity while being mostly unsaturated above the water table. Thus, this unit 1 has been merged with the underlying unit 2 to better represent a continuous topmost model layer 1.

The combined thickness of the anthropogenic fill and Quaternary sediments based on depth to rock isopaches interpreted by Jacobs (2022b) is presented in Figure 7-2. This combined thickness of unit 1 and 2 has been used as the basis for setting model layer 1 thickness.

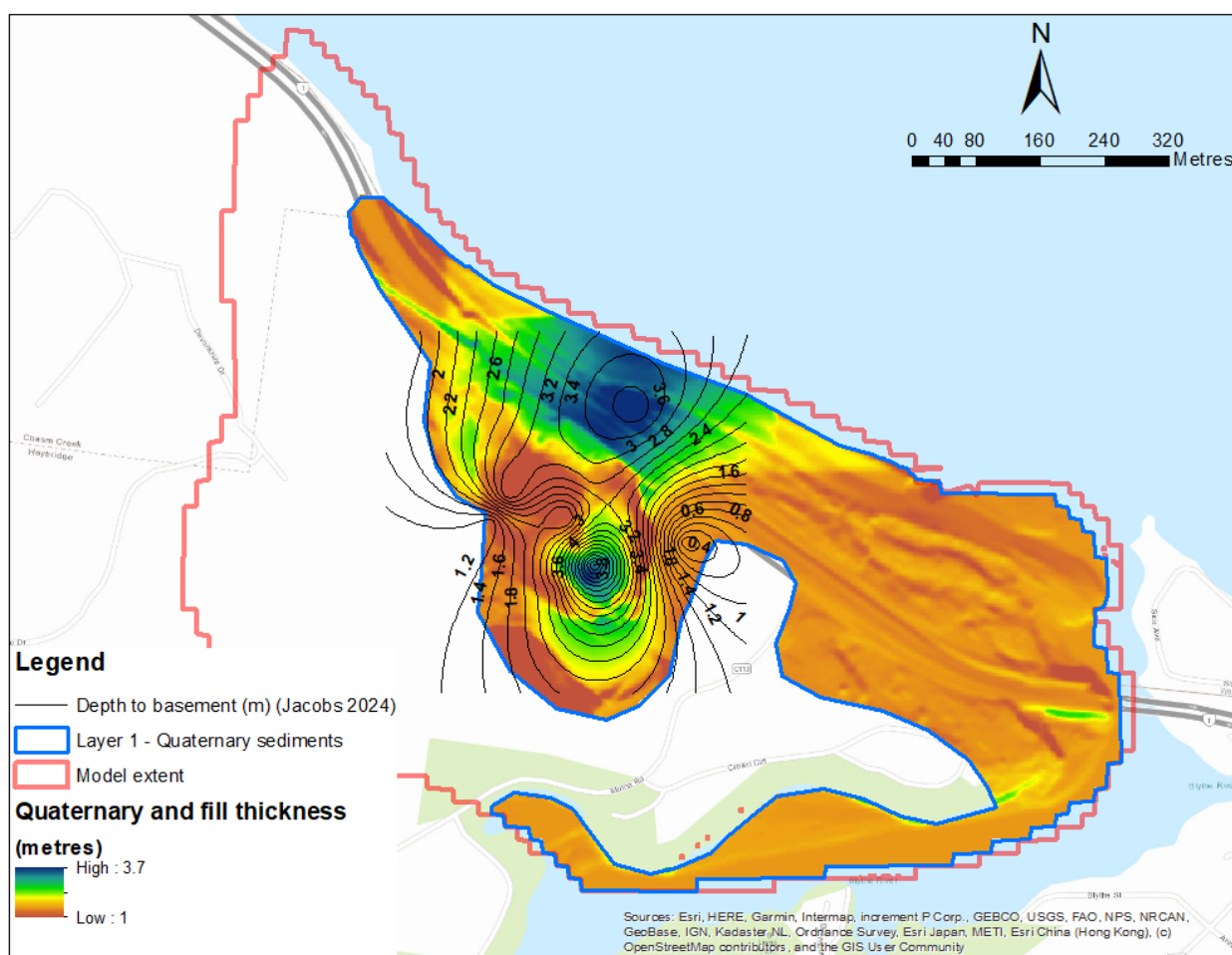


Figure 7-2 Thickness of Fill and Quaternary sediments

ii. Model Layer 2 – Weathered bedrock (unit 3)

Model layer 2 is represented by hydro-stratigraphic unit 3 comprising of the variably weathered zone of Oonah Formation bedrock. A uniform model layer thickness of 1.8 m has been assigned to represent this weathered unit in the model. This thickness was based upon the average thickness of the residual zone from drilling results.

iii. Model Layer 3 – Bedrock (unit 4)

Model layer 3 is represented by hydro-stratigraphic unit 4 comprising of relatively intact bedrock of Oonah Formation. The effective thickness of this model layer has been assigned a value of 20 m based upon the depth of where hard impervious rock (Dolerite) has been intersected at the site (Tasman Geotechnics 2024) and field experience where groundwater inflow rates begin to significantly decrease at around 20 m during drilling.

The extent of the model layers is presented in Figure 7-3. The model layers overlay each other sequentially to form the model layers 1 to 3, where layer pinching of 0.1 m is implemented. The only model layer which extends across the entire model domain is layer 3 (Bedrock). Model layers 1 (Fill and Quaternary sediments) and 2 (Weathered bedrock) are absent in some regions across the model domain where the weathered and fresh bedrock outcrop.

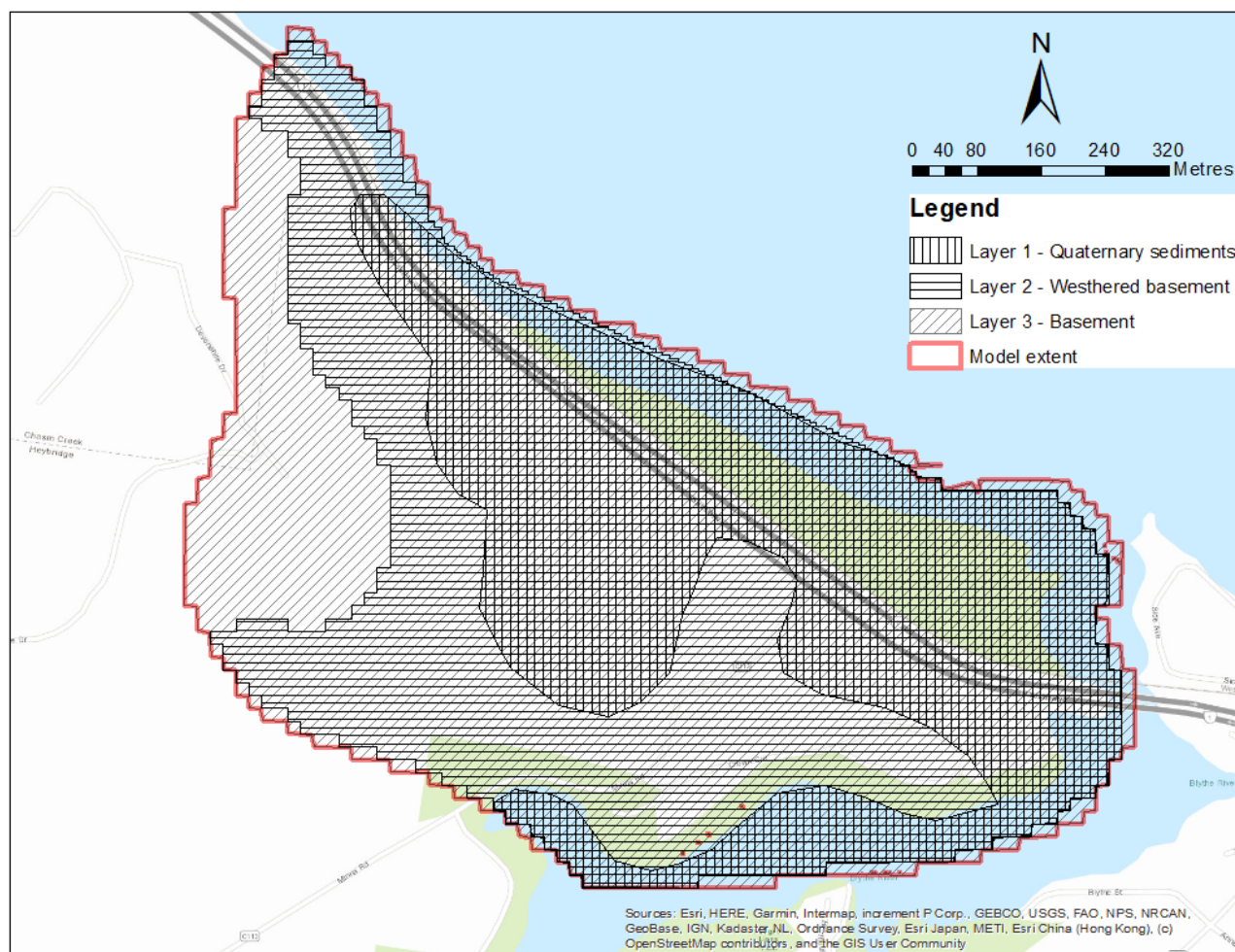


Figure 7-3 Groundwater model layers and model domain extent

7.1.4 Spatial groundwater level

The mean groundwater level data from each location (either borehole or monitoring well) is kriged to provide an indication of the likely groundwater flow direction and gradient (Figure 7-4). This data indicates that the groundwater flow direction is generally to the north-northwest as is shown in in Section 6.5.

Investigation locations (and therefore the datapoints used for kriging) are concentrated within the proposed development site (shown as black crosses in Figure 7-4). This limits insights which can be drawn from the kriging interpolation across the broader model domain. That is, while the overall groundwater flow direction is toward the north within the site boundary, contouring suggests the Blythe River contributes to groundwater throughflow at the proposed construction site. This throughflow is not the case because of the presence of elevated bedrock between Blythe River and the marine interface which provides a local groundwater level high (groundwater divide).

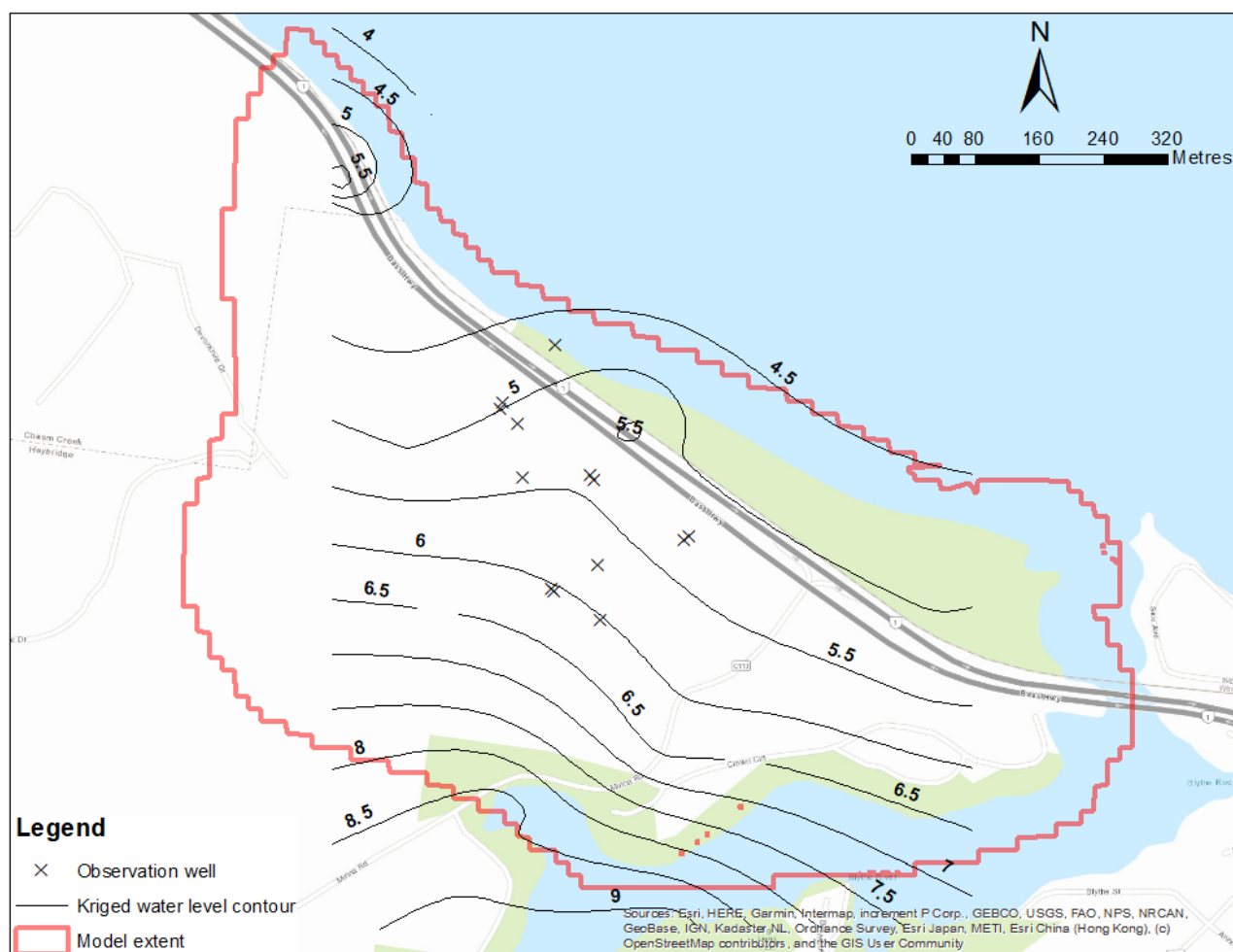


Figure 7-4 Kriged mean groundwater level observation across the model extent

7.1.5 Boundary and initial conditions

Initial groundwater level conditions assigned in the groundwater model were conservatively set at the land surface elevation throughout the model domain. These initial conditions are likely to be higher than the actual water level, but this provides a reasonable starting point for the model calculation to run from.

Boundary conditions in a groundwater model define how the model interacts with its surroundings by specifying the hydraulic constraints at the edges of the model domain. They are often set to represent real-world physical features such as rivers, impermeable boundaries, or constant-head conditions, and are important considerations to realistically simulate groundwater flow.

The southern limit of the groundwater model domain was defined by the topographic (and inferred surface and groundwater) divide to the south-west of the site, oriented broadly parallel to the inferred groundwater flow direction. To the north and east, constant head boundaries were assigned to represent the hydraulic influence of the coastline and the Blythe River estuary. Groundwater flow boundary conditions applied in the model domain are presented in Figure 7-5 and are summarise as:

- Catchment divide – groundwater is assumed to form a divide along the topographically-controlled surface water catchment divide.

- Marine interface – the groundwater level is assumed to occur at a height near that of the marine water level at an average daily constant elevation.
- Blythe River – surface water level in Blythe River is assumed to be the lower most elevation of the groundwater level. This elevation is assumed to be slightly higher than the marine water level.

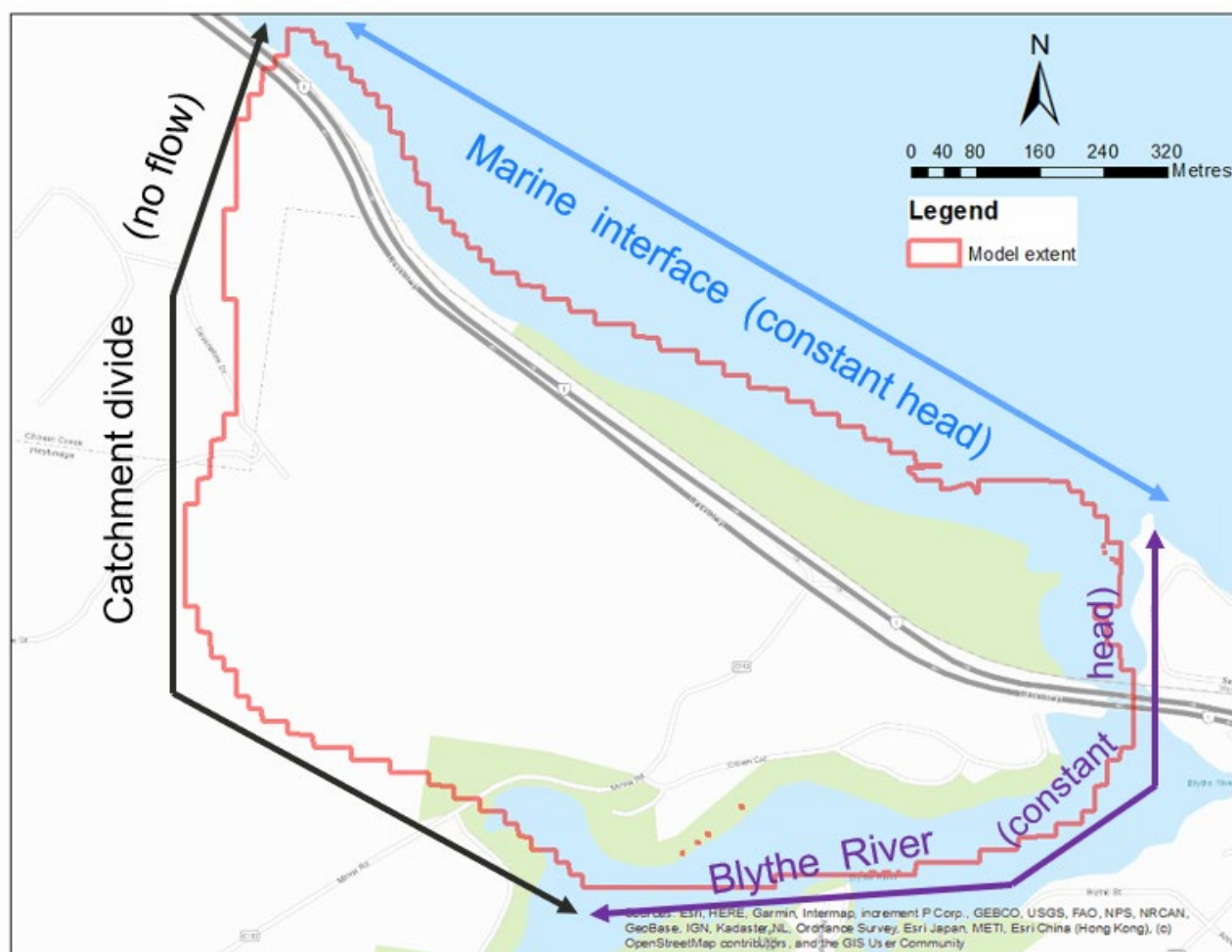


Figure 7-5 Groundwater boundary conditions applied to the model domain

7.1.6 Groundwater recharge and discharge features

Groundwater recharge initially applied to this model is 5% of the BOM Burnie daily rainfall (48 mm/year), consistent with the estimates provided in Section 5.2. A model-calibratable recharge value with a range of 2 to 8 % was ultimately adopted, which is not unexpected based upon previous experience.

Groundwater discharge is expected to occur via groundwater evaporation (either direct evaporation from shallow water tables, or evapotranspiration via vegetation accessing groundwater). This would occur in areas where the water table is shallow (up to 0.5 m below ground surface) and at constant head at discharge locations across the marine interface and the Blythe River. Groundwater evaporation rates have been sourced via the BOM and use solar radiation as equivalent to 70% of pan evaporation (estimated to be 34 mm/year at the site).

Groundwater recharge, evaporation depth and rate are used as calibratable parameters.

7.1.7 Model time frames and calibration data

Stress periods of the model are based upon an initial steady state (SS) followed by transient (TR) conditions. The SS stress period establishes an initial groundwater condition (level and water balance) reflecting current conditions, which is then progressed to time varying TR stress periods to consider movement of water in and out of storage for each stress period as construction activities influence groundwater. TR stress periods are generally aligned with construction activities where different construction dewatering activities take place.

The starting date for the groundwater model was selected to be 1 January 2020 as this timeframe allows for the initial groundwater conditions to stabilise before the use of measured groundwater level data for model calibration.

Table 7-1 presents a summary of the model stress periods used. Initially the model was run at steady state to establish a representative long term average groundwater level (Stress period 1), then for one year (Stress period 2), followed by monthly stress periods to develop seasonal groundwater level fluctuations where calibration data was sparse (Stress period 3 to 41).

Daily stress periods are then used for the model calibration (stress period 42 to 162) and scenario runs (stress period 163 onwards) because the simulated construction scenarios generally occur over periods of weeks rather than months, so daily resolution of groundwater impacts was considered necessary.

Table 7-1 Model stress period types used for calibration

Stress period	Stress period type	Stress period length (days)	Starting date
1	SS	1	01/01/2020
2	TR	364	02/01/2020
3 to 41	TR	30.44	01/01/2021
42 to 162	TR	1	01/03/2025
163 (onwards) scenario period	TR	1	01/06/2025

SS – steady state

TR – transient

The model was calibrated to the available groundwater level monitoring dataset collected for the site. The temporal distribution of these groundwater level measurements shows most data has been collected over the past 6 months. Most of these measurements are sourced from deployed groundwater level data loggers. The first water level measurement was adopted for each day for model calibration purpose. The locations of these monitoring wells are presented in the Section 5.5.

7.2 MODEL CALIBRATION

Groundwater model calibration is the process of adjusting model parameters to ensure that simulated groundwater levels, flows, or concentrations reasonably match observed data. Calibration enhances the model's reliability and predictive capability by aligning it with site-specific conditions and historical behaviour.

This section outlines the approach and outcomes of the calibration process, including the data sources used, the calibration targets, and the methods applied to assess model performance.

7.2.1 Calibration procedure

The numerical model was calibrated using PEST-ENSI (Ensemble Space Inversion) (Doherty 2015) to refine parameter estimation and minimise uncertainty. The calibration process incorporated observed groundwater levels from 13 monitoring locations, totalling 182 data points. Included in the 182 data points is the manual addition of the first water level measurement during steady state (SS). This addition is to ensure the model start-up is as close as possible to the long-term average groundwater level.

The calibration approach of historical water level matching, by adjusting aquifer parameters and boundary conditions (listed in Table 7-2), improved the model's ability to replicate observed hydrogeological behaviour under historic rainfall driven processes.

Table 7-2 Model parameters used for model calibration

Model parameter	Initial value	Calibration range
Groundwater recharge	5% of rainfall	1% to 10% of stress period
Evapotranspiration rate	70% of solar radiation	50 – 90% of solar radiation
Evapotranspiration depth	0.5 m	0.01 to 10 m
Marine water level	0.6 mAHD	0.5 – 0.8 mAHD
Blythe River water level	0.8 mAHD with flow gradient	6.0 – 1.5 mAHD
Hydraulic conductivity lateral pilot points	Variable across layers and zones – 265 points	Guided by slug test range and estimated values
Hydraulic conductivity vertical pilot points	Variable across layers and zones – 65 points	100% variation of initial vertical value listed in section 7.6.2
Storage (Sy & Ss)	Variable across layers and zones – 251 points	50% of initial Sy value 100% of Ss value

7.2.2 Calibrated aquifer parameters

7.2.2.1 Layer calibration

Model calibration was first undertaken using uniform parameter values for each model layer, then these calibrated values were used as a starting value for the pilot point calibration. Layer calibration was undertaken to provide a basis for the likely average model layer value, then this information was used as starting value for pilot point analysis.

7.2.2.2 Pilot point calibration

Pilot point calibration at 50 m uniform spacing was incorporated into the model to account for spatial variability in the aquifers. Calibration was undertaken using the Ensemble Spaced Inversion (ENSI) method (Doherty 2015). A summary of the calibrated aquifer parameters is presented in Table 7-3. Included in the summary are

the range and mean pilot point values for each model layer. No hydraulic conductivity zones were incorporated during the model calibration process, that is, each model layer value departed from the uniform layer value developed during layer calibration.

Table 7-3 Summary of calibrated model parameters following PEST-ENSI calibration

Model parameter	Calibrated value/range
Groundwater recharge	2% of actual daily rainfall
Evapotranspiration rate	4.05e-04 m ³ /day
Evapotranspiration depth	0.812 m
Marine water level	0.74 m AHD
Blythe River water level	0.86 m AHD
Hydraulic conductivity lateral pilot points	1.0 e-03 to 10.1 m/day
Hydraulic conductivity vertical pilot points	1.02e-04 to 1 m/day
Specific Yield	1.0e-03 to 0.12 (-)
Storage Coefficient	1.0e-06 to 4.96e-04 (-)

Spatial outputs resulting from pilot point calibration for vertical hydraulic conductivity, vertical hydraulic conductivity, specific yield and storage coefficient are presented in Appendix J.

The calibrated marine and Blythe River constant head water level results show the groundwater interface elevation is around 0.74 mAHD and 0.86 mAHD respectively, which is within the expected range based upon previous marine simulation experience.

Groundwater recharge is calibrated at 2% of daily rainfall and around 100% of pan evaporation. These values are within the expected range.

Questions regarding the connectivity between the tioxide tunnel and the surrounding aquifer were considered by incorporating pilot point values which aligned with the position of the outflow tunnel to be 10 times higher than the expected aquifer hydraulic conductivity (representing the high capacity of the open tunnel to transmit water when compared to the aquifer). Thereby during the model calibration process, if the groundwater level was seen to be lower in the vicinity of the tunnel the pilot point value would have remained higher. Instead, even though regularisation was used (i.e. a process that penalises the change in value) these higher values did not produce a better calibration (as would be the case if the tunnel was acting as a major discharge feature) and were lowered to achieve the best calibration. The absence of extensive groundwater level monitoring wells adjacent to the outflow tunnel resulted in the use of pilot point uncertainty analysis as the only means in which the influence of the outflow tunnel was determined.

7.2.3 Groundwater balance

Time series groundwater balance and error is presented in Figure 7-6. Results show that rainfall from groundwater recharge is the primary input to the model (consistent with the field investigation results in Section 5.5.6) and that groundwater discharge via groundwater evaporation is the primary outflow. Interestingly, groundwater discharge to the marine environment was estimated at around 5% of total the water balance, which is slightly lower than the expected (typically around 10%) but is likely to be attributed to the low hydraulic conductivity basement aquifer.

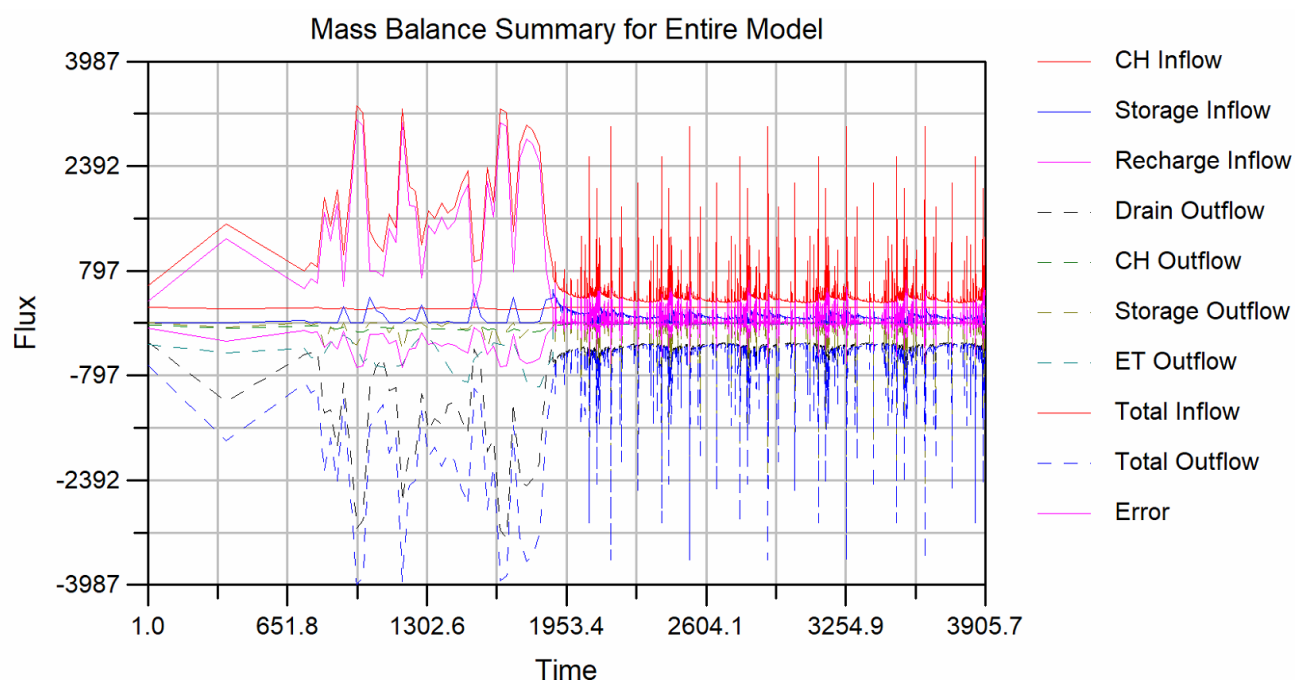


Figure 7-6 Temporal mass balance of entire model period (differing resolution due to differing stress period lengths)

7.2.4 Depth to watertable

Ground water levels for each model layer is presented in Appendix I in mAHD. The depth to water table is calculated by subtracting the uppermost groundwater level from the ground surface elevation (Figure 7-7). Information shows that the shallowest water table occurs around the flanks of the northern, southern and eastern parts of the model domain and coincide with the constant head boundaries. The deepest water table is in the western part of the model area and coincides with the local area of elevated surface topography.

Within the proposed construction area, the depth to groundwater is modelled to range from 5 m bgl to <1 m bgl in places, with the shallowest water table likely to be encountered in the central and western margins of the site. This agrees with the known water table depths of individual wells in the area (Section 6.5).



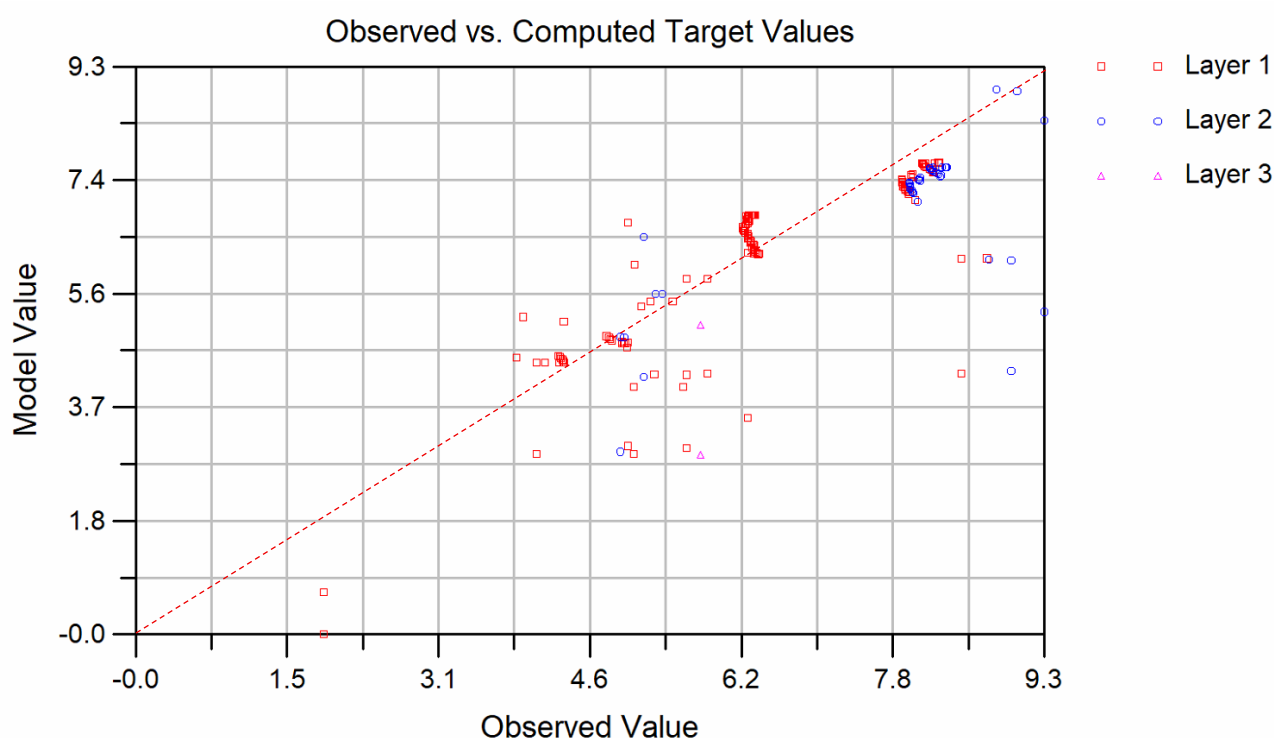
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7.2.5 Groundwater level

To assess model robustness, hydrograph comparisons were conducted between simulated and observed groundwater levels at all 13 monitoring wells. This analysis provides a time-series validation of transient groundwater level trends, assessing the model's ability to replicate observed water level variations under different conditions.

Figure 7-8 (upper chart) presents the simulated versus observed water level in a scatter plot. Results show that most data lie above the 1:1 line, suggesting the simulated groundwater level is generally higher than the observed groundwater level. Figure 7-8 (lower chart) shows the residual error in generally 0.4 to 0.8 m higher than the observed. The elevated groundwater level is likely to be a function of groundwater discharging at the land surface. Individual hydrograph results are provided in Appendix H, presenting full transparency of the calibration performance.

Simulated versus observed groundwater level time series traces for each of the 13 wells are presented in Appendix H. Results show the variability of groundwater level over the modelling period varies according to both the size of the model stress period and the rainfall over that period. In general, simulated groundwater level during April – May 2025 are in good general agreement, whereas the 2019-2022 data is of poorer agreement.



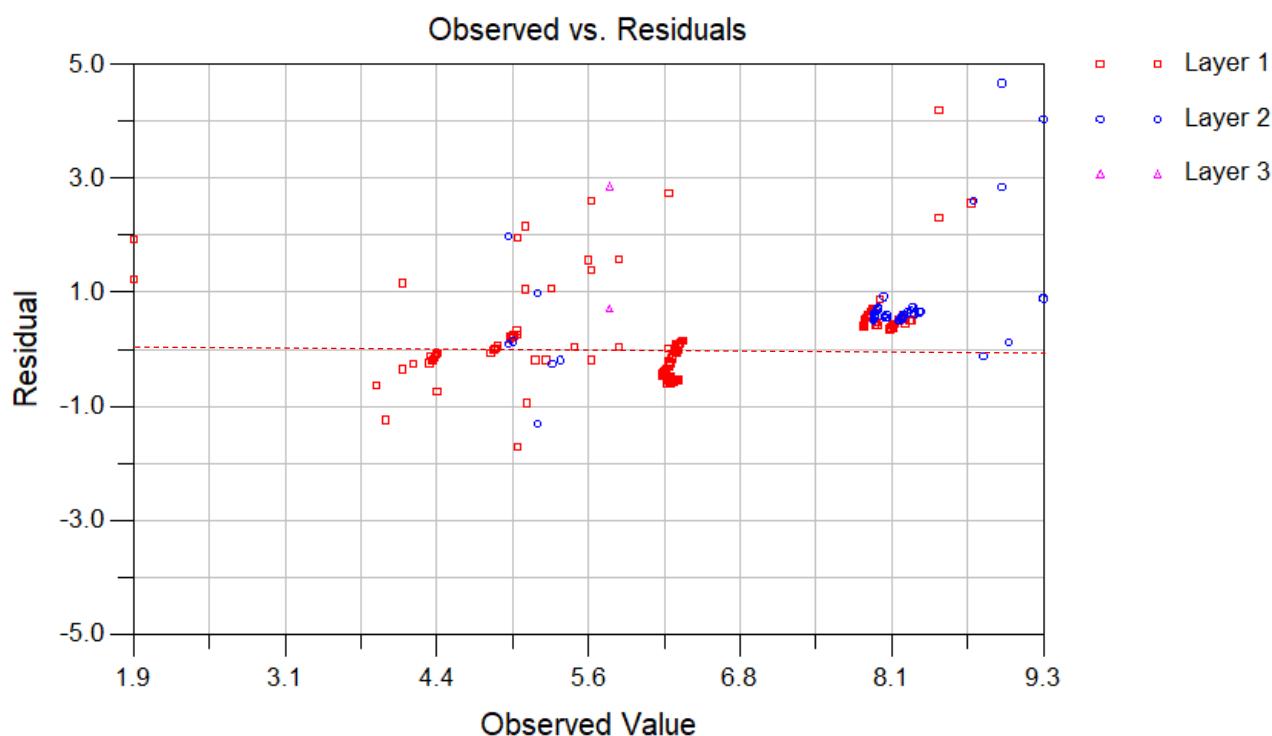


Figure 7-8 Simulated versus observed water level (above) and residual observed error (below)

The model calibration was evaluated using multiple statistical metrics and visual comparisons to ensure that simulated groundwater levels closely matched observed values. Table 7-4 summarises these metrics.

Table 7-4 Statistical summary of transient calibration from 2021 to 2025

Statistical Measure	Result	Comment
Residual Mean	0.40	Minimal bias, indicating a well balanced model
Residual Standard Deviation	0.91	-
Absolute Residual Mean error	0.66	Small average error given the variability in data
Root Mean Square (RMS) error (m)	1.00	-
Scaled RMS (%)	0.135	Error adequate given the variability in data
Residual range (m)	-1.71 to 4.67	-
Number of observations	175	-

A summary of the key model calibration impacts on measured groundwater level information is presented below:

- Simulated water levels align well with observed trends at most monitoring locations, indicating strong model calibration.
- Localised deviations were observed in some areas, attributed to heterogeneities in hydraulic properties, variations in fracture permeability, and limited field data in specific zones.
- Long-term trends show stable model performance, confirming that calibrated parameters adequately reflect aquifer behaviour.

- Temporal fluctuations in groundwater levels were successfully captured, demonstrating that the model can replicate dynamic recharge responses.
- Some monitoring wells show a wider range of simulated water levels, particularly where parameter uncertainty is higher.
- PEST-ENSI optimisations were instrumental in reducing residual errors, particularly in the vicinity of the tioxide tunnel.

The hydrograph comparisons confirm that the numerical model provides a realistic representation of groundwater dynamics, supporting its use in predictive simulations. Future monitoring and additional well data could help further constrain localised heterogeneities and improve the model's predictive capacity.

7.2.6 Model sensitivity

A uniform layer value objective function sensitivity analysis was undertaken to identify the relative sensitivity of each model parameter (Figure 7-9). Results show groundwater recharge is the most sensitive parameter, then lateral conductivity in model layer 3. Groundwater recharge was expected to be the most sensitive parameter due to the generally low hydraulic conductivity in the model domain, where a small variation in recharge results in a large change in groundwater level. Likewise, small changes in lateral hydraulic conductivity in the basement layer has a large impact on groundwater level. Overall, comparison of sensitivity analysis results shows the model parameters are relatively similar, and the expected parameters have impact on the groundwater level.

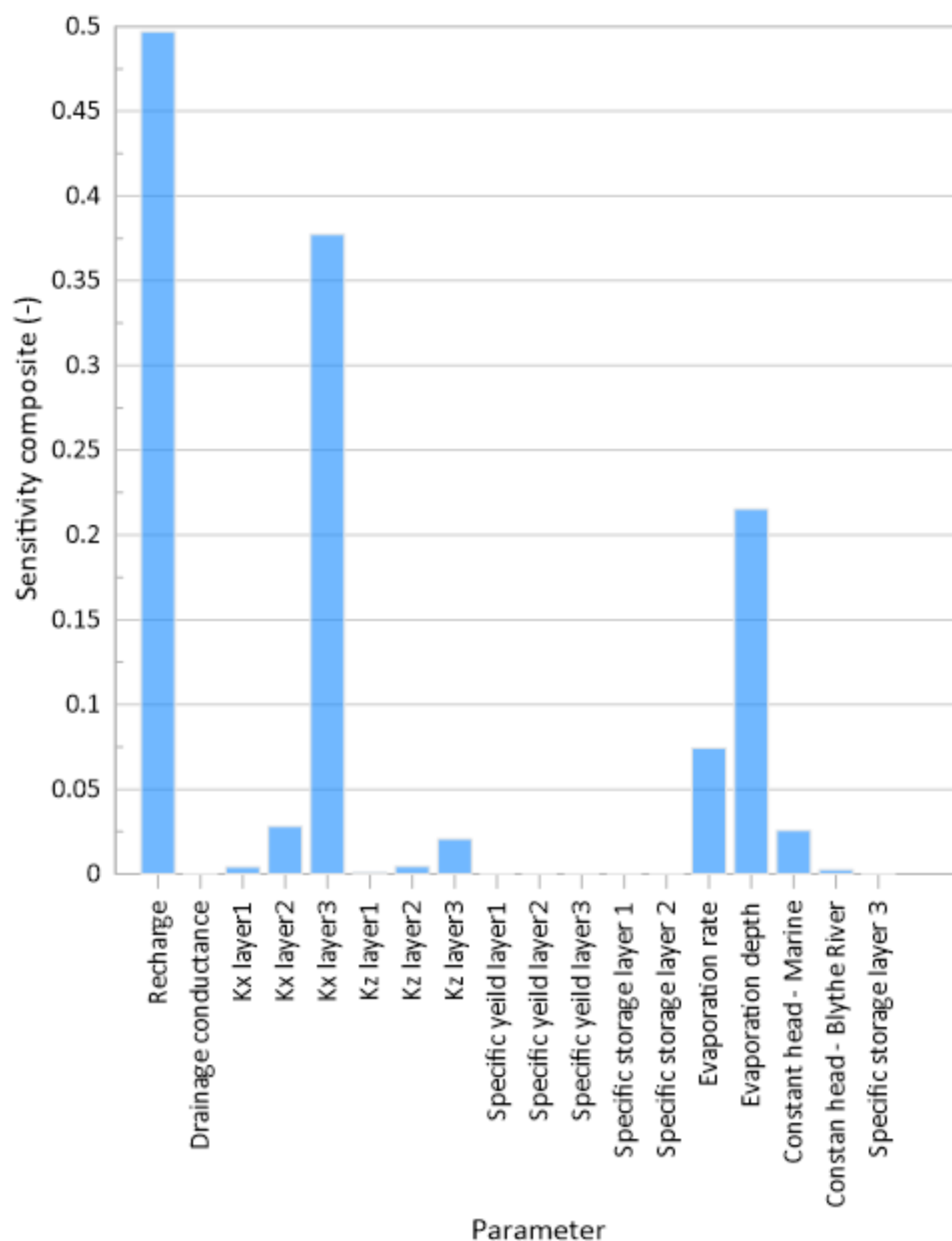


Figure 7-9 Composite sensitivity comparison of broad model parameters

7.2.7 Model classification

In the Australian Groundwater Modelling Guidelines (AGMG Barnett et al., 2012) define a *Class 2* model as a numerical representation that offers moderate predictive confidence. The dataset behind it is “adequate but incomplete” typically there are groundwater-head observations, bore logs, some metered-extraction records and a few stream-flow or base-flow measurements, yet these do not cover the entire model domain either spatially or temporally. Transient calibration is undertaken to historical data, but it may end before present-day conditions, and important long-term or seasonal trends can remain unmatched in parts of the aquifer.

Considering the model construct and model calibration results, this model is best described as a *Class 2* groundwater model (Barnett et al., 2012). Table 7-5 presents the key attributes which describe the model and justify why it is considered as a *Class 2*, which includes daily temporal discretisation, high spatial resolution and existing stratigraphic detail. If there were more groundwater level observation wells with a longer duration of continuous monitoring, say 1-2 years, there could be justification to classify it as a *Class 3* model.

Table 7-5 Key attributes of the model defined as a Class 2 model (red = no; orange = maybe; green = yes)

Model class	Data	Calibration	Prediction	Key indicator
Class 1	Few or poorly distributed existing wells from which to obtain reliable groundwater and geological information Observations and measurements unavailable or sparsely distributed in areas of greatest interest Climate data only available from relatively remote locations	No calibration is possible Calibration illustrates unacceptable levels of error especially in key areas Calibration is based on an inadequate distribution of data	Predictive model time frame far exceeds that of calibration Temporal discretisation is different to that of calibration	Model predictive time frame is more than 10 times longer than transient calibration period Stress period or calculation interval is different from that used in calibration Cumulative mass-balance closure error exceeds 1% or exceeds 5% at any given calculation time Model parameters outside the range expected by the conceptualisation with no further justification The model has not been externally reviewed
Class 2	Groundwater head observations and bore logs are available but may not provide adequate coverage throughout the model domain	Validation is either not undertaken or not demonstrated for the full model domain Calibration statistics are generally reasonable but may suggest significant errors in parts of the model domain	Transient calibration is over a short time frame compared to that of prediction	Model predictive timeframe is between 3 to 10 times the duration of transient calibration Mass balance error is generally less than 1% of total Not all model parameters are consistent with conceptualisation The model has been reviewed and deemed fit for purpose by an independent hydrogeologist Spatial refinement too coarse in key parts of the model domain Mass balance closure error is less than 1% of total.

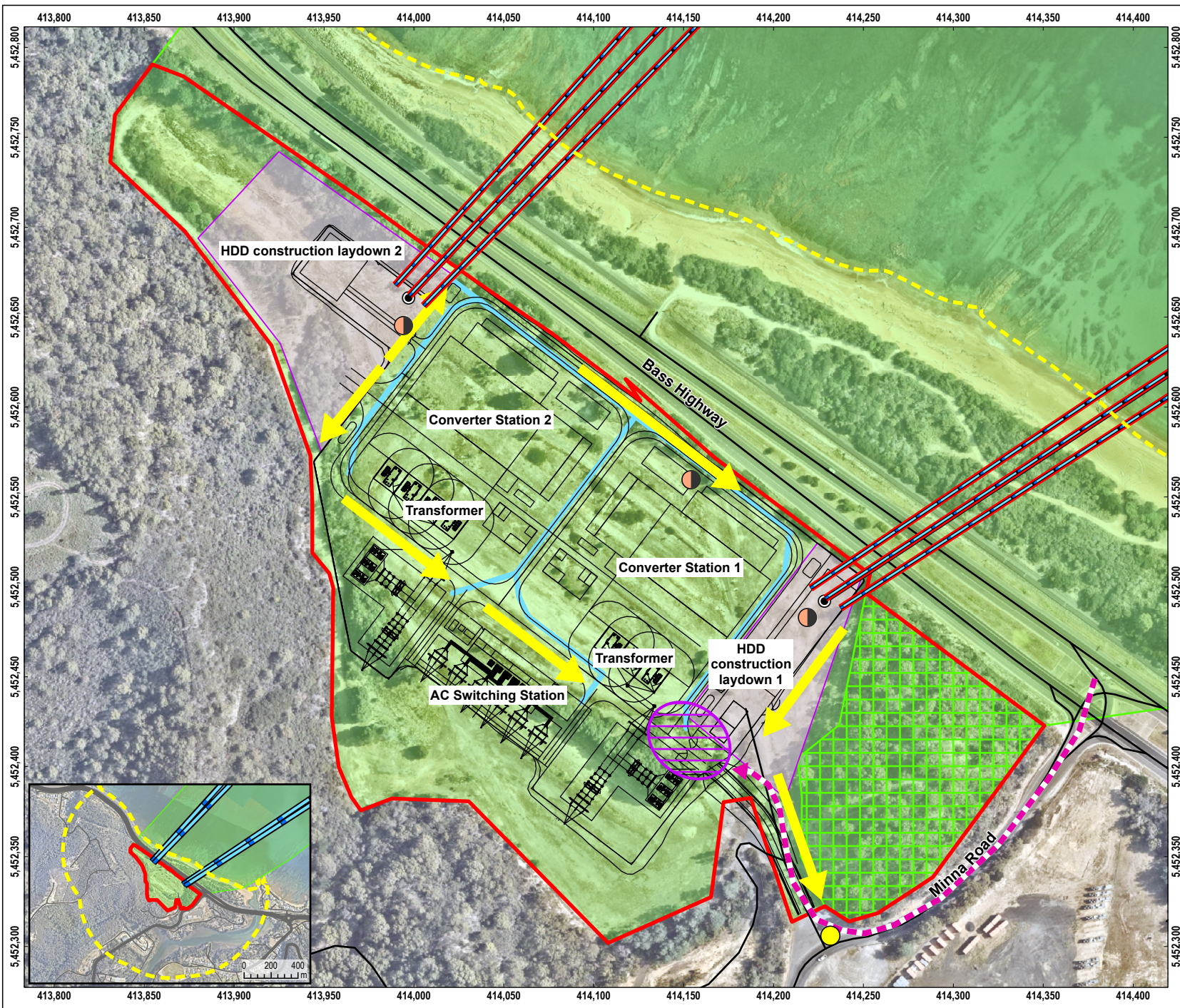
7.3 FORWARD PROJECTION CONSTRUCTION SCENARIO

The forward groundwater impact scenario relates to the proposed onshore construction and operation of the converter station site. The objective of the forward projection scenario is to understand the impact site construction may have on groundwater, then, if required what measure(s) maybe undertaken to minimise or holt those impacts.

The Heybridge site includes two converter stations and one high voltage alternating current (HVAC) switching station. The construction of the first converter station and HVAC will occur initially, then the second converter station as demand increases (which is anticipated to occur within 5 years of the operation of the site).

Figure 7-10 presents the site layout of the converter stations showing each converter (converter 1 and converter 2) and the alternating current (AC) switching station. For this impact assessment modelling exercise, it has been assumed that both converter stations will be constructed simultaneously to conservatively simulate the maximum groundwater impact drawdown resulting from cumulative drawdown effects.

After simulating the proposed construction dewatering scenario, or individual components, the extent and magnitude of groundwater level drawdown impact is assessed over time.



LEGEND

- Landfall
- HVDC subsea cable
- HDD
- Diesel generator and oil tank (indicative)
- Emergency assembly point
- ➔ Internal site access - ingress/egress
- ➔ Site access from Bass Highway and Minna Road
- Indicative converter station drainage
- Heybridge converter station layout (Stage 2)
- Heybridge shore crossing laydown area
- Proposed washdown area
- No go zone - priority vegetation
- Heybridge converter station site
- 500 m site buffer
- Marinus Link shore crossing proposal area
- Road

SOURCE

Proposed route from Tetra Tech Coffey.
Construction layout from MLPL (July 2025).
Roads from Tas NRE.
Imagery from Nearmap (07/02/2024).



0 30 60 m
SCALE 1:3,000
PAGE SIZE: A4
PROJECTION: GDA2020 MGA Zone 55

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MARINUS LINK HEYBRIDGE
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FIGURE 7-10

Heybridge converter station proposed features and operational components



7.3.1 Scenario assumptions

The 2024 daily climate sequence (rainfall and evaporation) was applied during the forward projection model scenario, which is considered appropriate as that year had near average rainfall and no significant climatic events. The impact scenario sequence is considered at daily time steps from 1 June 2025 (using 1 June 2024 onward climatic data) for 3 years (1095 days).

The construction phase includes staged bulk earthworks, foundation bored piling and horizontal directional drilling (HDD) pad excavations. Each potential impact activity and the duration reflected in the model is discussed below.

7.3.1.1 Bulk earthworks

Site leveling information presented by Jacobs (2024) presents there is likely to be a mix of cutting and filling to achieve the desired operational land surface (discussed in Section 3.2.2). Jacobs (2024) proposed up to 2 m of fill and 5 m of cutting would be required at the site. This proposed updated elevation surface is incorporated into the forward projection impact scenario by applying a drainage face elevation of 8.7 mAHD (TBC) which remains constant over the scenario period. These bulk earth works are assumed to occur from 1 June 2025 until the end of the simulation period on 1 January 2028 (1095 days), for the purposes of modelling.

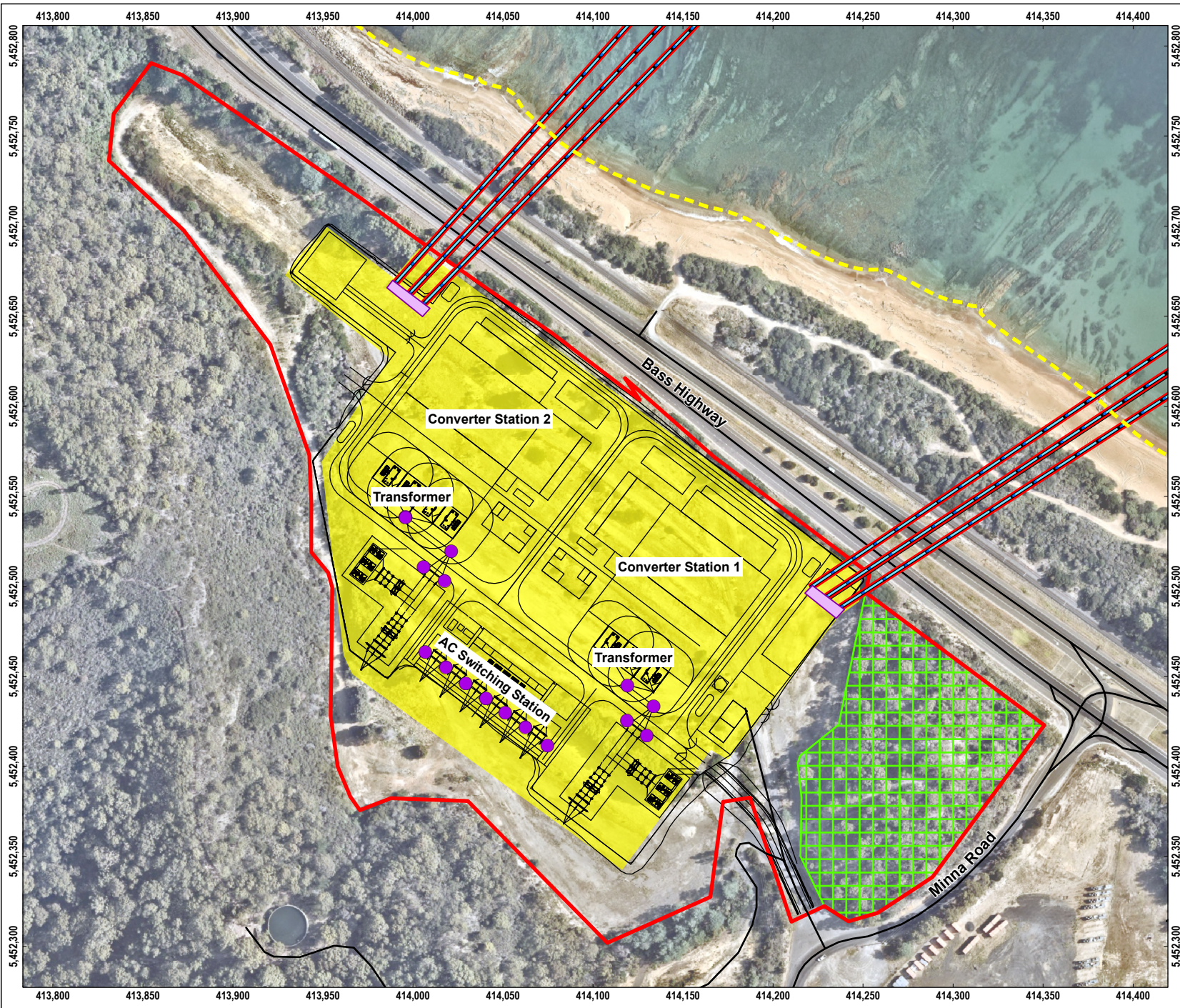
7.3.1.2 Foundation bored piling

Drilled piling foundations are required to support some of the structures, namely the AC switching station. Jacobs (2024a) estimated the drilled foundations will be 7.5 m deep, with a 1.5 m diameter, to anchor into the competent unweathered bedrock. Temporary casing and dewatering of the piles is likely to be required during construction.

In this scenario, the model simulates dewatering of 16 boreholes 1.5 m diameter well 7.5 m below ground surface (8.7 mAHD) for a continuous period of 1 month (30 days). Figure 7-11 presents the location of the proposed drilled pilings which are simulated to be all constructed 1 month (30 days) after bulk earthworks instantly.

7.3.1.3 Horizontal Directional Drill pad excavation

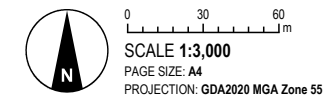
Two HDD pads composing of a battered excavation 20 m wide and 4 m long and approximately 2 m deep would be prepared. This equates for one drill pad for converter station 1 and converter station 2 where there are three horizontal cable connectors at each. At each site, it is unlikely the excavation would intersect with the water table over the long -term, but it may over wet periods, as such the excavation has been considered by applying a drainage face at 6.5 mAHD. The HDD excavations are assumed to occur for 12 months (365 days) and 2 months (61 days) following site bulk earthworks leveling.



LEGEND

- HVDC subsea cable
- HDD
- Drilled piling
- HDD pad excavation
- Heybridge converter station layout
- Proposed development footprint
- No go zone - priority vegetation
- Heybridge converter station site
- 500 m site buffer
- Road

SOURCE
Proposed route and excavations from Tetra Tech Coffey.
Converter station layout and piling from Jacobs (Sept 2022).
Roads from Tas NRE.
Imagery from Nearmap (07 February 2024).



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FIGURE 7-11
Proposed Heybridge converter site excavations – HDD pad and drilled piles



A summary of the proposed construction scenario is presented in Table 7-6. Information shows all active dewatering and drainage starts on day 2010 and stops on day 2130. Site cut and fill extends to the end of the scenario period whereas the piling dewatering and HDD pit excavation are all completed in 90 days. Results of implementing the proposed construction scenario are summarised in this section, each scenario day presented is from day 2010 onward.

Table 7-6 Summary of proposed construction activity and corresponding timing

Activity	Stress period, day start	Stress period, day end (total days)
Site leveling (cut and fill)	163, 2010	On-going
Piling dewatering	194, 2041	283, 2130 (90 days)
HDD pit excavation (both)	224, 2071	589, 2436 (365 days)

7.3.2 Scenario results

The effect of dewatering associated with each construction activity is presented and discussed separately in the following sections. Results are presented as a relative impact assessment. That is, all results that are subtracted from the model solution ran over the same time period but without the construction scenario conditions. This is described as a relative impact assessment.

7.3.2.1 Mass balance

The mass balance difference for the proposed construction scenario compared to without construction is presented in Figure 7-12. Results show dewatering from the piling drilling removes the greatest volume of water while it is required. The HDD excavation in contrast has a relatively small dewatering volume (<1 m³/day).

The planned bulk earthworks to cut and fill (level) the site results in the greatest on-going change in groundwater discharge volume due to the final landform in the southeastern parts of the proposed site being excavated below the water table. The on-going impact of the proposed 8.7 mAHD site leveling is likely to result in active drainage between May to January annually equating to approximately 388 m³/year discharge.

While this represent a change to the groundwater flow system at the site, active drainage to the surface a break of slope is common over these periods throughout much of Tasmania where the water table is generally shallow and groundwater evaporation rates are low.

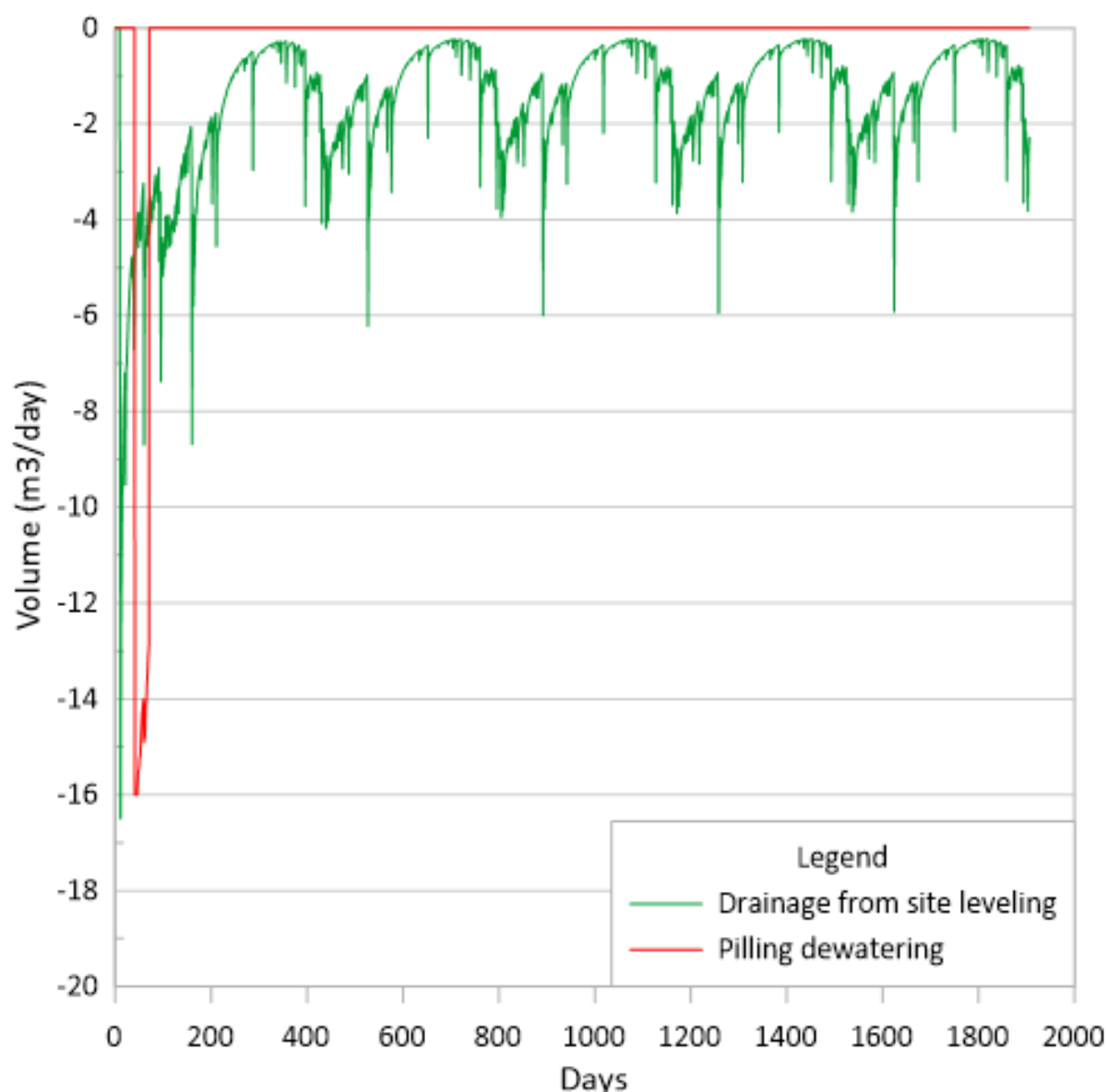


Figure 7-12 Volume impact over time of proposed site works

7.3.2.2 Site point drawdown

Model predicted drawdown at existing groundwater monitoring wells from site construction activities is presented in Figure 7-13 over time. Results show that the greatest drawdown occurs around day 75 (Stress Period (SP) 238) at which point the effects of both piling dewatering and site cut and fill discharge is occurring.

This is before the HDD excavations have commenced. While the greatest water level drawdown of around 1.6 m occurs in well MW06, the long-term impact is generally less than 0.1 m. The seasonal difference in the water level is attributed to active drainage, which is implemented at the construction site, where the seasonal variability is now removed.

Temporal drawdown information shows that the majority of groundwater level impact associated with site construction occurs in the first 365 days, then only seasonal variability occurs. This relatively fast groundwater response shows the groundwater level does recover within 0.1 m following the construction. Individual monitoring well hydrograph information is presented in Appendix K.

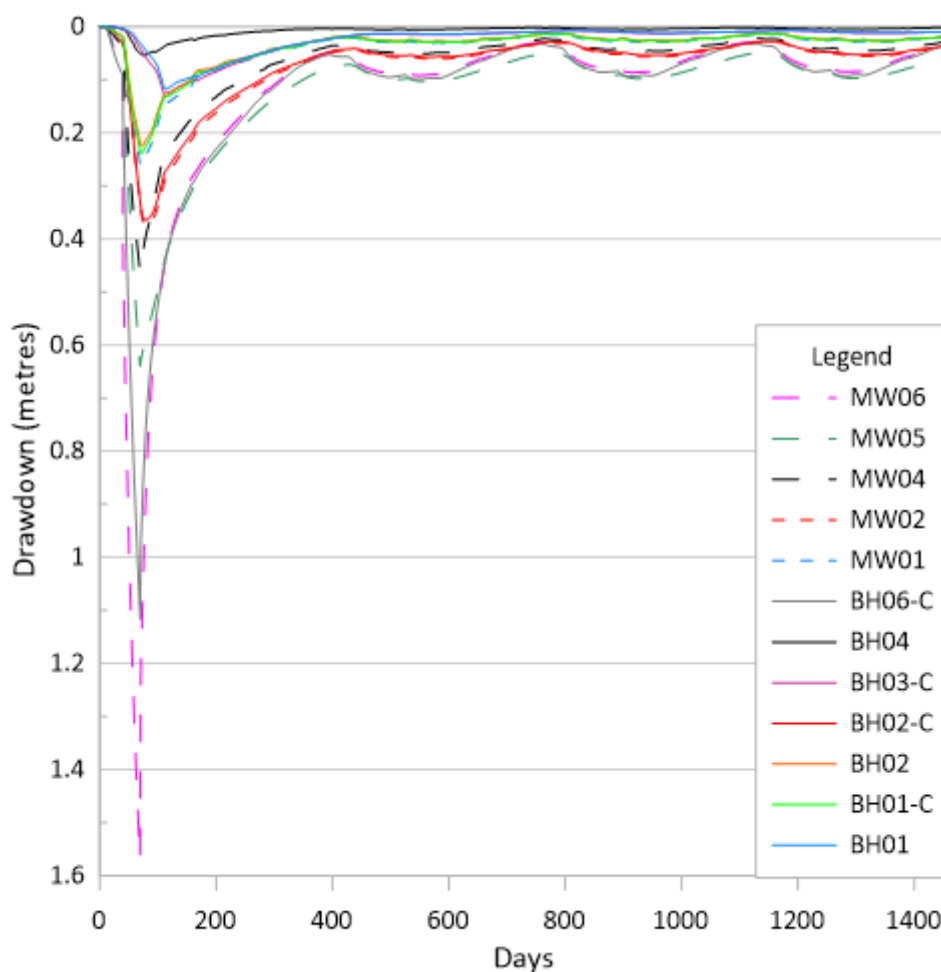


Figure 7-13 Groundwater monitoring well groundwater level drawdown following proposed site construction activities

7.3.2.3 Water level drawdown

Bulk earthworks

To assess the effects of the proposed site levelling on groundwater, this activity has been run in isolation of the other construction activities. Figure 7-14 presents the predicted groundwater level drawdown resulting from the bulk earth works alone two years after completion.

Bulk earthworks are expected to result in long term drawdown of 0.25 m to 0.28 m at points along the southern site boundary where the greatest excavation into the surrounding embankment is required. Drawdown from the average site levels become negligible across the remainder of the site, ranging from 0.1 m to 0.01 m.

The volume of groundwater discharge to surface associated along the southern boundary has been calculated from the maximum rate of discharge of 194 m³/year in the first year, to 24 m³/year after year two, and 4 m³/year after year three. This shows the gradual progression of the groundwater system towards a new steady-state condition that accounts for the altered topography.

Foundation bored piling

The individual impact of dewatering bored piling has been presented in Figure 7-15, where each of the 16, 7.5 m deep bores are assumed to be dewatered for up to 30 days. Collectively the dewatering rate is calculated to be 0.5 L/s across the 15 boreholes where the dewatering rates generally decrease from east to west from 0.02 L/sec to <0.001 L/sec. An estimated average dewatering rate of 43 m³/day is anticipated, equating to a total of 1267 m³ over the 30 day dewatering period. In practice, piling may be done sequentially across the site rather than in parallel as has been modelled.

Modelling results show that temporary drawdown of up 0.5 m to 0.6 m may occur extensively throughout the central portion of the site around the dewatered piles.

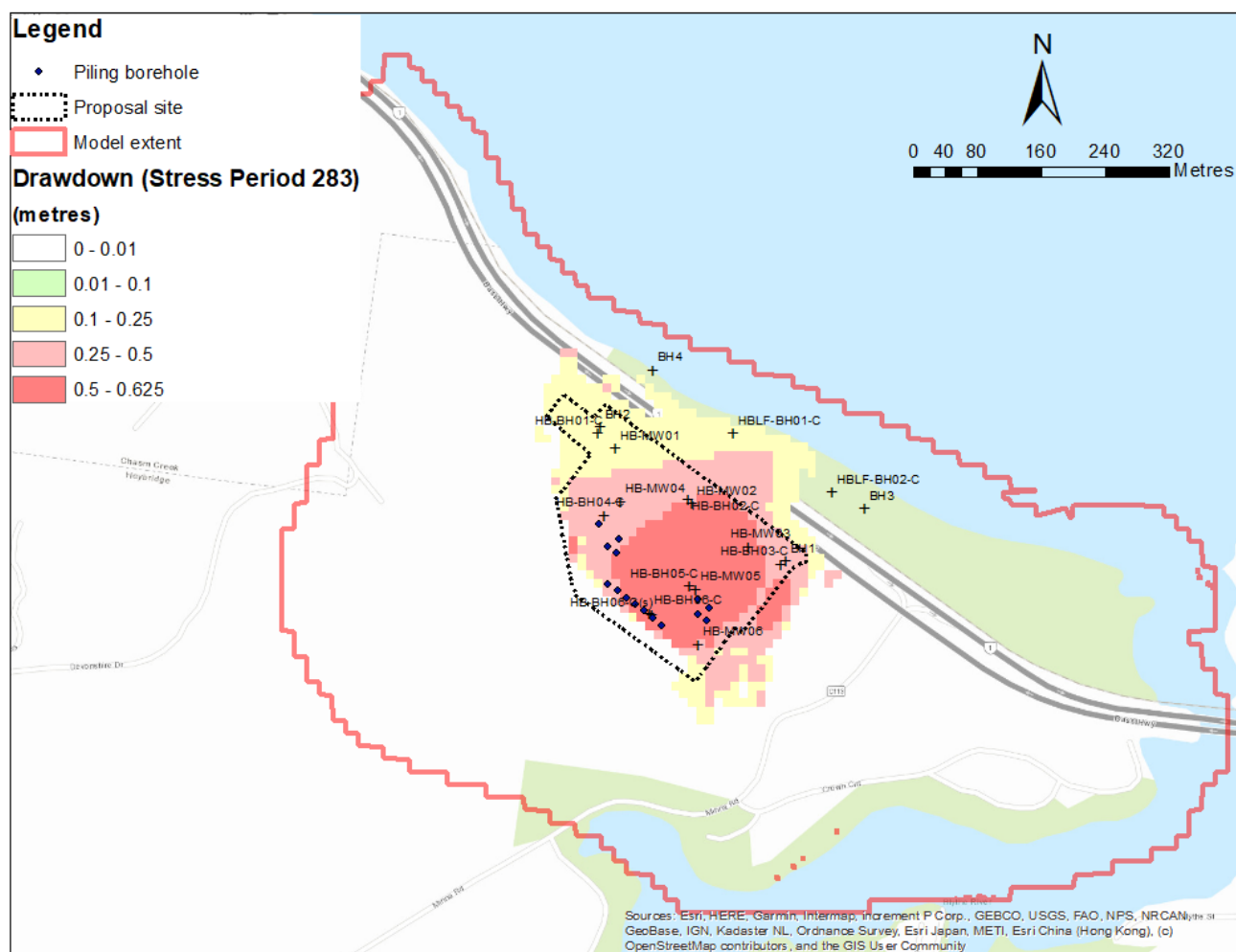


Figure 7-15 Maximum borehole piling dewatering

Horizontal directional drill pad excavation

The specific HDD excavations would occur post site leveling, however, for the purpose of this exercise the HDD pits have been considered independently. That is, for the northwestern HDD pit (pit 1) the original ground surface elevation was around 6.4 mAHD which is lower than the 6.7 m AHD pit depth in the scenario. The southeastern HDD pit (pit2) had an original surface elevation of around 8.6 mAHD which requires excavation of 1.9 m to 6.7 m.

Figure 7-16 presents the maximum temporary drawdown around the HDD activities alone, showing up to 0.28 m drawdown in immediate vicinity of the HDD entry pit, quickly dissipating to <0.1 m drawdown within approximately 20 m from the pit.

An estimated 12 m³ volume of groundwater is predicted to be dewatered during the 14-day excavation period at the northeastern HDD pit. No dewatering is currently anticipated at the northwestern HDD pit, however if conditions changed similar dewatering rates would also be expected at that location.

If HDD is undertaken following the planned bulk earthworks, groundwater levels at the HDD launch pits may be slightly lower (approximately 0.01 m to 0.1 m; see Figure 7-14) due to groundwater drainage along the southern site boundary. As a result, the dewatering requirements at the HDD pits would also be reduced.

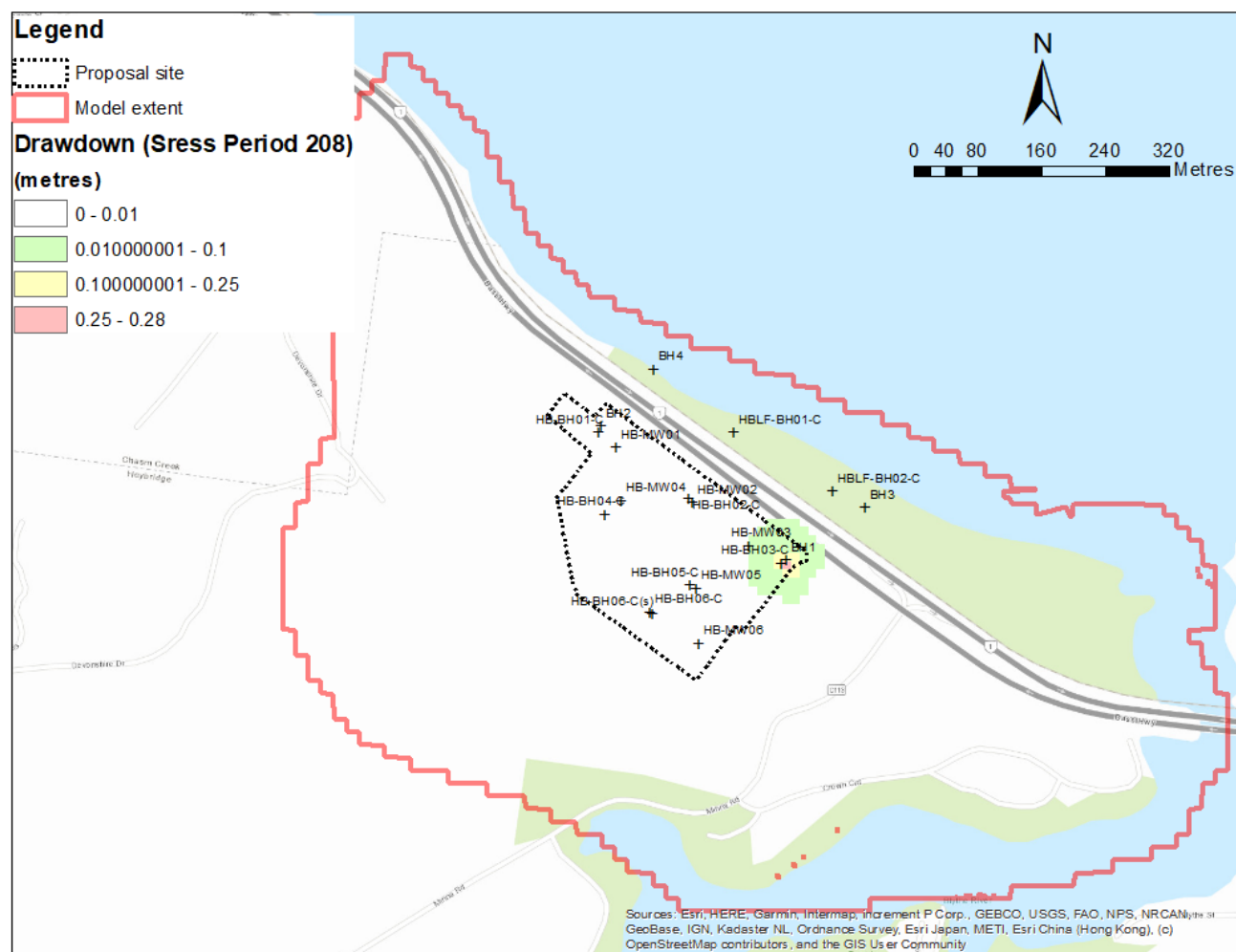


Figure 7-16 HDD dewatering maximum groundwater level drawdown

Cumulative drawdown

Groundwater level drawdown at 69 days of construction (SP 232), 120 days (SP 283), 210 days SP (373), 300 days (SP463) and 805 days (SP 968) show the gradual decrease in drawdown over time. Figure 7-17 shows the maximum groundwater level drawdown on day 75 of the scenario and shows while most of the drawdown is less than 0.5 m there are some locations with a drawdown greater than 0.5 – 0.6 m.

Drawdown at 130 days of construction (stress period 293) of the impact scenario shows that while the depth of drawdown has decreased, the area of impact has increased slightly. Day 283 represents the approximate time where the greatest area of drawdown occurs. Here, the marine interface has less than 0.05 m drawdown and the land north of the highway has a maximum drawdown of 0.25 m.

7.4 MODELLED MITIGATION SCENARIOS

The modelling scope assumed that in some cases, if groundwater drawdown resulted in unacceptable impacts to groundwater mitigation measures may be required to minimise drawdown effects.

The risk assessment presented in Section 8 has not proposed mitigation measures that warrant specific modelling to demonstrate their efficacy or to optimise their design.

Further modelling scenarios have not been completed at this stage.

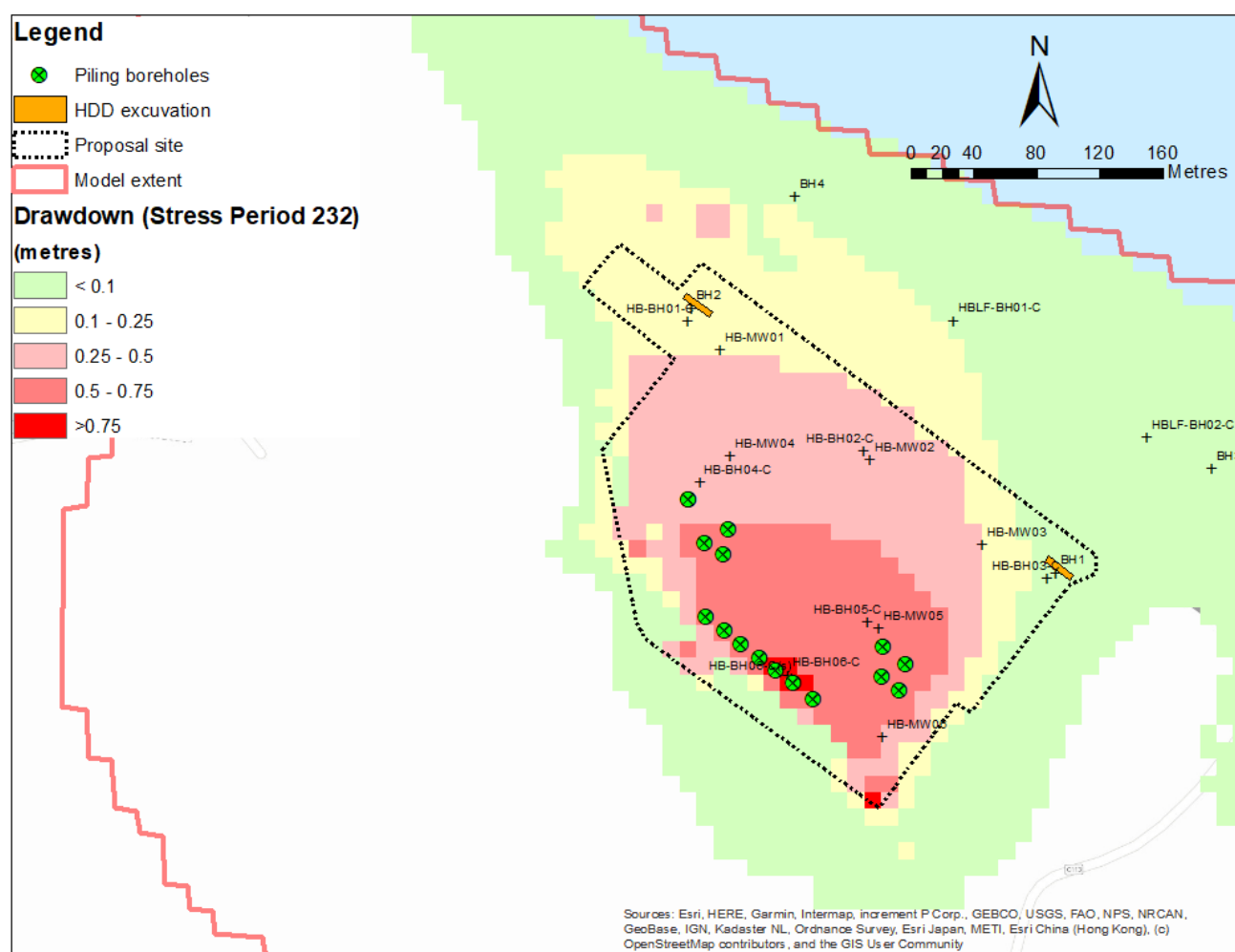


Figure 7-17 Maximum groundwater level drawdown associated with the proposed construction (69 days into construction – note HDD excavation no longer dewatered)

8. RISK ASSESSMENT

This section revisits the groundwater risk assessment originally outlined in the GIA in light of the new baseline monitoring data, field investigations, and numerical modelling results presented in this report.

8.1 UPDATED RISK ASSESSMENT

The purpose of this updated risk assessment is to confirm whether the initial risk rankings remain valid, or whether they require adjustment based on improved characterisation of the hydrogeological setting and more robust predictions of groundwater behaviour during construction.

The updated risk assessment framework is consistent with the approach adopted in the GIA (section 5.4), considering both the sensitivity of groundwater values (including potential groundwater users and dependent ecosystems) and the magnitude of potential impacts arising from project activities. For each identified hazard, the updated risk assessment discusses:

- how the additional baseline information and conceptual model findings influence the risk profile,
- how the calibrated numerical model predictions refine the estimates of potential groundwater drawdown and flow alteration, and
- what residual risks remain after the application of recommended mitigation and management measures.

This section therefore provides a consolidated, updated risk assessment that reflects the most current understanding of site conditions and predictive modelling, ensuring that conclusions and management measures are defensible and proportionate to the actual level of risk.

8.1.1 Groundwater acidification

The GIA (2024) identified the potential for groundwater acidification where excavation or dewatering intersects soils with acid sulfate potential. Subsequent site investigations (Tetra Tech Coffey 2025) confirmed that potential acid sulfate soils (ASS) may occur across parts of the site at depths between 0.5 m and 2.0 m bgl, although some areas did not report concentrations above adopted screening criteria. The detailed risk assessment regarding ASS has been discussed in *Heybridge Converter Station and Shore Crossing - Contaminated Land and Acid Sulfate Soils – Addendum Site Assessment* report (Tetra Tech Coffey 2025).

This assessment provides additional context for potential for groundwater acidification by considering predicted groundwater drawdown magnitudes and durations. Model simulations show that construction activities would generate a maximum drawdown of up to 1.6 m at one well (HB-MW06) during peak piling and bulk earthworks, with drawdown across the majority of the site generally <0.5 m and recovering to within 0.1 m of baseline within 12 months.

From a groundwater acidification risk perspective, these findings indicate that:

- Potential exposure of ASS layers to oxygenated conditions may occur in areas where dewatering drawdown extends below 0.5 m bgl, primarily around the dewatered bored piles.
- Data to date suggests that a large seasonal fluctuation range may be present that would be comparable to the drawdown magnitudes predicted. In this scenario, the acidification potential of aquifer material within ~1 m of the water table would likely have already been subject to oxygenation and ongoing groundwater acidification risks would be low.

- Given the maximum predicted drawdown (≤ 1.6 m) and short recovery times, the spatial and temporal extent of oxidation risk is low, and limited primarily to the shallow Quaternary sediments along the southern excavation faces.
- Any acidic porewater generated is likely to migrate short distances before mixing with neutral groundwater, with discharge directed towards Bass Strait rather than inland receptors.

The updated risk assessment therefore supports the GIA conclusion that groundwater acidification is a credible but low-likelihood risk. The consequence, if unmanaged, could include mobilisation of metals and localised reduction in groundwater quality, with potential discharge to the marine environment. However, the residual risk is low provided that dewatering inflows from ASS zones are tested for pH and metals prior to discharge, and

GWMM02 requires the minimisation of groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. In line with GWMM02, it would be appropriate to recommend that bore piles (which are the highest producer of groundwater during construction) be cased to minimise groundwater ingress.

In summary, while the site does contain areas of potential ASS, the predicted drawdown magnitudes are small, localised, and short-lived, and therefore do not materially increase the risk of groundwater acidification beyond the risk assessed in the GIA (2024). The combination of management controls and monitoring requirements identified in GWMM02 are sufficient to reduce the residual impact to low significance.

8.1.2 Saline groundwater intrusion

The GIA (2024) identified saline groundwater intrusion as a potential risk due to the site's proximity to Bass Strait and the Blythe River estuary, particularly if construction dewatering were to induce sufficient drawdown to reverse local hydraulic gradients. At the stage of drafting the GIA, quantitative assessment was not available, and the risk was conservatively ranked as moderate, prior to the implementation of mitigation measures.

Additional groundwater level and quality monitoring completed at the site confirmed that groundwater flow directions across the site are consistently towards Bass Strait in the north, with nested well data indicating a small upward hydraulic gradient (0.04–0.12 m) from fractured bedrock into the shallow Quaternary aquifer. This demonstrates that the site functions as a groundwater discharge zone, reducing the likelihood of saline inflow under normal or disturbed conditions. Furthermore, continuous level monitoring results from April 2025 to August 2025 confirm the absence of tidal influence on groundwater levels at the site.

Modelled construction scenarios predict a maximum drawdown of 1.6 m at HB-MW06 during piling and bulk earthworks. Drawdown attenuates rapidly with distance, with predicted changes at the coastline and estuary of less than 0.05 m, and recovery to near-baseline conditions within one year. Importantly, the lowest construction dewatering elevation (1.2 mAHD) remains above the average marine water level (~ 0.7 mAHD). This elevation difference, combined with the persistent upward gradient, effectively precludes the possibility of marine water intrusion into the site aquifer system.

While saline intrusion was flagged as a potential risk in the GIA, the improved hydrogeological dataset and Class 2 groundwater model demonstrate that it is not a material risk under the proposed construction scenario. Management controls should focus on routine verification of groundwater levels during dewatering, but no additional saline intrusion mitigation measures are required.

8.1.3 Mobilisation of existing groundwater contamination

The GIA (2024) identified the risk of mobilising of existing groundwater contamination as a moderate, prior to the implementation of mitigating measures, reflecting the site's industrial history (former Ti oxide pigment

plant) and the potential for legacy contaminants to migrate under construction-induced drawdown. Key concerns identified in the GIA (2024) included hydrocarbons, metals, and PFAS, which could be displaced towards dewatering points or released to surface water receptors.

Additional groundwater quality monitoring from April 2025 has identified:

- Localised exceedances of screening criteria for metals (cobalt, nickel, zinc, copper), consistent with imported fill material and historical industrial operations at the site,
- PFAS exceedances (PFOS up to 0.18 µg/L; PFHxS+PFOS up to 0.31 µg/L), and
- Low-level TRH (C10–C36) hydrocarbons, consistent with historic site use.

These exceedances are confined to a small number of wells, with no evidence of significant or contiguous contaminant plumes. The natural groundwater flow systems would result in contaminants being transported downgradient towards the coastline, with dilution and attenuation expected along the pathway before discharge to the marine environment.

Planned dewatering activities during piling, HDD pit construction and bulk earthworks may alter local flow paths temporarily, drawing groundwater toward excavation faces. However:

- Predicted drawdown is shallow and short-lived (<1.6 m maximum, with recovery to within 0.1 m in <12 months).
- There are no groundwater users or sensitive terrestrial GDEs within or downgradient of the site.
- The ultimate discharge point remains the marine environment, where saline conditions and dilution further reduce contaminant risk.

On this basis, the proposed dewatering activities would not materially increase the risk to PEVs or sensitive receptors. While mobilisation of contaminants into temporary dewatering streams is possible, these volumes are small (≤45 m³/day peak) and will be managed under the construction groundwater management plan, including testing prior to disposal (discussed further in Section 8.1.4).

While some local exceedances of groundwater quality criteria have been recorded, significant groundwater contamination has not been identified at the site. The proposed construction dewatering will not result in an increased risk to PEVs and the risk remains low. Routine monitoring (GWMM04, GWMM05) will provide sufficient controls to manage risk of unforeseen contamination being encountered.

8.1.4 Release of contaminated groundwater to the environment

The GIA (2024) identified the risk of releasing contaminated groundwater as a moderate, prior to the implementation of mitigation measures, particularly during temporary dewatering of excavations, where extracted groundwater could contain contaminants such as PFAS, hydrocarbons, or metals. At the stage of drafting the GIA, the impact was considered manageable through controlled storage, testing, and disposal during construction dewatering events.

GWMM01 and GWMM05 required that groundwater investigations be completed in areas where dewatering is likely to be required to ensure adequate information on existing groundwater contamination is available prior to construction commencing.

The updated assessment provides further groundwater quality results and numerical modelling to further assess the risks associated with groundwater disposal. The assessment has concluded that:

- Localised exceedances of marine ecosystem protection criteria were reported for PFAS, some dissolved metals, although no significant groundwater contamination was identified.

- Predicted construction dewatering volumes are modest (≤ 45 m³/day at peak), but site earthworks are expected to result in ongoing (likely seasonal) groundwater discharge along the southern site boundary.
- This discharge is predicted to be recurring in wetter months, with annual volumes reducing from an initial 194 m³ in the first year to 4 m³ after year three.
- Groundwater quality at the southern site margin, where long term discharge may occur corresponds with areas where PFAS impacts are greatest (0.15 µg/L PFOS), which marginally exceed the marine ecosystem protection criterion of 0.13 µg/L.
- There is the potential requirement for long-term interception, treatment, and disposal of groundwater discharge via the site stormwater management system (subject to further assessment and regulatory approval).

At the peak of construction dewatering volumes would not exceed 45 m³/day (HDD 1.2 m³/day, piling 43 m³/day and bulk earthworks 0.5 m³/day), noting that the HDD pit is assumed to be open for 14 days and piling borehole dewatering 30 days.

To comply with GWMM02, bored piles extending below the watertable are cased to minimise groundwater ingress during dewatering. Furthermore, to comply with GWMM04 all groundwater generated must be managed appropriately based on its quality and potential contamination status. This requirement extends to long term groundwater management at the southern boundary should groundwater discharge occur. Ongoing baseline groundwater quality monitoring continuing throughout the duration of the construction phase will be required to characterise the potential long term quality discharging to surface.

Reassessment of the groundwater quality should be completed during detailed design to assess the blended quality of water that may be discharge to surface at the southern boundary. Together, these mitigation and management measures will ensure that the residual magnitude of impact is reduced to Low, maintaining a low impact significance and supporting compliance with the GED.

These requirements will be formalised in a groundwater management plan, as a sub plan to the Construction Environmental Management Plan (CEMP) and implemented during construction.

8.1.5 Groundwater contamination from construction activities

Risks associated with groundwater contamination associated with construction activities remain and will be addressed by the CEMP. These activities are commonly managed through a project specific CEMP that aligns with the minimum standards and regulatory guidance published in relation to these commonly occurring construction activities or broader industry guidance. This potential impact has not materially changed as a result of the additional baseline monitoring or modelling undertaken.

No changes have been made to the assessed risk of contamination impacts from construction activities in the GIA, nor the proposed mitigation and management measures.

8.1.6 Horizontal directional drilling

HDD can create preferential pathways for groundwater movement along the borehole annulus and installed cable conduit, if they are not adequately sealed. The GIA (2024) identified the creation of preferential pathways as a potential risk during HDD, noting that dewatering and associated groundwater level drawdown during construction could induce saline inflow along the HDD annulus towards the shallow on-site aquifer.

This assessment draws on new results available from additional site investigation and numerical modelling when reassessing this risk:

- Monitoring confirms that the site aquifer is a groundwater discharge zone, with an upward gradient from fractured bedrock into the Quaternary sands and net flow towards Bass Strait.
- Modelled drawdown associated with HDD entry pits is small (<0.3 m) and short-lived, with rapid recovery expected once excavations are backfilled.
- Under the maximum drawdown scenario (1.6 m), the water table elevation onsite remains above mean sea level (1.2 mAHD vs 0.7 mAHD), preventing saline inflow under natural gradients.

Based on these findings, the updated risk of saline water migration along the HDD borehole is considered low. However, if the annulus or conduit were left unsealed, preferential pathways for surface runoff or saline water could still develop. This risk is adequately mitigated by the design requirement (GWMM03) to ensure annuli are sealed and drainage around HDD entry pits is controlled.

8.2 UPDATED RESIDUAL IMPACT ASSESSMENT

The purpose of this updated residual impact assessment is to reassess whether initial residual impact assessment remains valid, or whether they require adjustment based on improved characterisation of the hydrogeological setting and more robust predictions of groundwater behaviour during construction

The updated residual impact assessment is consistent with the previous GIA and does not account for implementation of the specified mitigation and management measures. The consolidated summary of the updated residual impact assessment is presented in Table 8-1 and do not change previously suggested mitigation measures in the GIA.

Table 8-1 Summary of updated residual impact assessment

Project phase	Residual impact assessment (GIA, 2024)						Updated residual impact assessment		
	Potential impact	Affected value	Sensitivity	Residual magnitude assessment	Residual significance assessment	Initial justification			
	Magnitude	Significance	Additional results and justification						
Groundwater level and quantity									
Construction	Temporary dewatering of onshore cable trenches, cable joint pits, and HDD entry/exit pits during construction leading to groundwater level drawdown.	Consumptive or productive uses	Low	Negligible	Very low	There are no registered or known unregistered groundwater users located within the study area. It is highly unlikely that any temporary construction dewatering activities would impact on groundwater users.	Unchanged	Very low	The groundwater level drawdown extent generally does not exceed 0.1 m outside of the proposal site throughout the construction and operation period.
		Potential future extractive groundwater users (industrial water use)	Low	Negligible	Very low	Temporary groundwater level drawdown because of construction dewatering would rapidly recover in the highly conductive Quaternary sand aquifer. There would be unlikely to be a measurable effect to the long-term groundwater availability to future users.	Unchanged	Very low	If future groundwater users were to be established in the area (not on the proposal site) the maximum groundwater level decline of 0.1 m would occur. Because of the small, predicted water level decline outside the site, any volumetric impact would be negligible.
		Terrestrial GDEs	Low	Negligible	Very low	There are no known terrestrial GDEs within the study area. In the unlikely event that unplanned drawdown occurred beneath unknown terrestrial GDEs, the proposed short-duration dewatering would be unlikely to have a measurable effect on vegetation health.	Unchanged	Very low	Outside the proposal site groundwater impact modelling has shown groundwater levels would recover within 0.1 m within the first year and stabilise after the second year at a minimum of 0.1 m outside the proposal site. The small water level change is insignificant for any terrestrial GDE if they were to exist.
		Aquatic GDEs – Blythe River estuary	Low	Negligible	Very low	The Blythe River estuary is the primary aquatic GDE that exists within the study area. The drawdown assessment considered that southern and eastern drawdown was likely to be limited by the presence of outcropping bedrock along the site boundaries. However, planned earthworks along these boundaries may feasibly reduce the effectiveness of this hydraulic barrier and permit a degree of drawdown. This could temporarily reduce the freshwater input to the estuarine zone. The aquatic ecosystem of the estuary would be adapted to highly variable salinity and changes to the freshwater input over a short section of the total catchment would have a negligible effect on the aquatic ecosystem.	Unchanged	Very low	Groundwater impact modelling has shown the maximum groundwater level drawdown does not influence the overall groundwater gradient to the north. The groundwater level at the site is elevated above Blythe River throughout the construction and on-going operational period. Modelling indicates that there will be negligible change to the groundwater-surface water interaction expected at Blythe River estuary.
Groundwater quality									
Construction	Mobilisation of existing groundwater contamination towards the project due to temporary groundwater level drawdown	Consumptive or productive uses	Low	Negligible	Very low	There are no existing groundwater users within the study area that would experience an increased risk posed by mobilising known or undetected groundwater contamination.	Unchanged	Very low	Dewatering activities would not materially increase the risk to PEVs or sensitive receptors
		Terrestrial GDEs	Low	Negligible	Very low	There are no terrestrial GDEs that are within the study area that would experience an increased risk of impact if groundwater flow paths were altered.	Unchanged	Very low	Groundwater flow paths are unlikely to be materially altered, with the ultimate discharge point remaining the marine environment. Dewatering activities would not increase the contamination risk to PEVs or sensitive receptors.
		Aquatic GDEs	Low	Minor	Low	The marine environment of Bass Strait is the current groundwater discharge point that is likely to be affected by existing groundwater contamination from the site.	Unchanged	Low	Dewatering activities would not materially increase the risk to PEVs or sensitive receptors. The ultimate discharge point remains the marine environment, where saline conditions and dilution further reduce contaminant risk.
Construction	Release of contaminated	All	Low	Minor	Low	Dewatering activities are likely to generate groundwater that may be contaminated by metals, PFAS and other contaminants that	Unchanged	Low	Additional baseline groundwater quality monitoring completed during 2025 has not identified significantly different quality conditions

Project phase	Residual impact assessment (GIA, 2024)						Updated residual impact assessment		
	Potential impact	Affected value	Sensitivity	Residual magnitude assessment	Residual significance assessment	Initial justification	Magnitude	Significance	Additional results and justification
	groundwater to the environment					may be unsuitable for discharge to the environment without prior treatment. Uncontrolled discharge of impacted groundwater may result in moderate magnitude impacts, corresponding with a low impact where discharge occurs back to the groundwater system. Higher impacts may be realised at aquatic ecosystems if direct discharge of extracted groundwater containing elevated concentrations of some metals (such as cobalt, copper, nickel and zinc) and PFAS (particularly PFOS) occurred to nearby surface water features Blythe River estuary or Bass Strait..			of groundwater (and therefore the assessed risk is unchanged). All groundwater generated must be managed appropriately based on its quality and potential contamination status.
Operation		All	Low	Not assessed	Not assessed	Operational groundwater discharge was not previously anticipated or assessed.	Moderate	Low	The proposed bulk earthworks include areas of excavation (cut) along the southern boundary of the site that the model predicts will result in seasonally shallow groundwater discharging at the ground surface during operation. Without additional controls, groundwater would likely be directed to the site stormwater system, discharging to the Blythe River estuary or Bass Strait. Without mitigation, the direct discharge of groundwater containing elevated concentrations of some metals (such as cobalt, copper, nickel and zinc) and PFAS (particularly PFOS), which exceed ecosystem protection criteria at some locations, could affect aquatic ecosystems. All groundwater generated must be managed appropriately based on its quality and potential contamination status. This requirement extends to long term groundwater management at the southern boundary should groundwater discharge occur. Existing measure GWMM02 requires that MLPL assess the need for engineering controls so that potential impacts to groundwater are avoided. In this case, engineering controls may include: • Raise finished ground levels or locally ramp/bench the southern boundary to avoid intersecting groundwater. • Adopt retaining structures with impermeable walls and/or drained backfill. • Install upslope interceptor drains to lower groundwater levels and avoid generating contaminated groundwater, minimising management requirements. Furthermore, ongoing baseline groundwater level and quality monitoring will continue to characterise the seasonal level and quality range and assess the likelihood of this potential impact of eventuating (GWMM05). Requirements for ongoing groundwater management (if required) will be formalised in the operational groundwater management plan, as a sub plan to the OEMP and implemented during operation (GWMM06).

Project phase	Residual impact assessment (GIA, 2024)						Updated residual impact assessment		
	Potential impact	Affected value	Sensitivity	Residual magnitude assessment	Residual significance assessment	Initial justification	Magnitude	Significance	Additional results and justification
Construction	Groundwater contamination from drilling fluids	All	Low	Minor	Low	Drilling can require the use of relatively low volumes of drilling fluids in addition to potable water. These fluid assist with lubricating and cooling the drill bit, borehole stability, and the removal of drill cuttings from the borehole. It is possible that drilling conducted for purposes other than groundwater investigation (such as HDD and geotechnical drilling) could use alternative drilling fluid additives that might cause contamination by low concentrations of toxic chemicals.	Unchanged	Low	No further assessment provided.
Construction and Operation	Groundwater contamination from construction chemicals and fuels	Consumptive or productive uses	Low	Minor	Low	Construction activities will require the use of light vehicles, drill rigs, earthworks and other construction machinery for planned construction of the converter station and ancillary infrastructure. Hydrocarbon based fuels, lubricants and degreasing agents are likely to be required on site to power and maintain machinery. Low volumes of chemicals and fuels will be required, which will be stored, handled and used in line with the project CEMP and OEMP, legislative requirements, and regulatory guidance.	Unchanged	Low	No further assessment provided.
		Terrestrial GDEs							
		Aquatic GDEs							
Construction	Saline groundwater intrusion due to temporary groundwater level drawdown	Consumptive or productive uses	Low	Negligible	Very low	There would be limited direct impacts as a result of increased groundwater salinity due to the absence of existing local groundwater users and GDEs between the coastline and the site.	Unchanged	Very low	The maximum drawdown at the coastline and estuary will be less than 0.05 m, and recovery to near-baseline conditions within one year. The lowest construction dewatering elevation (1.2 mAHD) remains above the average marine water level (~0.7 mAHD). The possibility of marine water intrusion into the site aquifer system is negligible.
		Terrestrial GDEs							
		Aquatic GDEs							
Construction and Operation	Groundwater acidification due to temporary groundwater level drawdown	Consumptive or productive uses	Low	Moderate	Low	If unmitigated, a degree of groundwater acidification may persist during operation as a result of localised groundwater drawdown. Acidic groundwater, if it were generated, would be relatively limited in extent, but would likely migrate towards Bass Strait coastline, discharging to the marine environment.	Negligible	Very Low	Additional level monitoring indicates a seasonal fluctuation range that is comparable to the drawdown magnitudes predicted. Aquifer material within ~1 m of the watertable would likely have already been subject to oxygenation and ongoing acidification risks from temporary level drawdown would be minor. Predicted drawdown within the seasonal range. Consumptive groundwater users are not present and would be unlikely in the coastal zone downgradient from the site.
		Terrestrial GDEs	Low	Negligible	Very low		Unchanged	Very Low	
		Aquatic GDEs	Low	Moderate	Low		Minor	Low	
Construction and Operation	Groundwater contamination from leaks of hazardous chemicals (e.g., transformer oil, lead acid batteries, and diesel fuel).	All	Low	Minor	Low	Larger volumes of transformer oils and fuels that may be handled at either of the converter station may pose a risk to the environmental values of groundwater if accidental release occurred. While no extractive uses of groundwater are recorded in the local area around the proposed converter station, the aquatic ecosystem of Bass Strait may reasonably be impacted by a spill if it was not adequately remediated.	Unchanged	Low	No further assessment provided.
Construction and Operation	Discharge from the proposed septic tank system causing	All	Low	Minor	Low	In the case of septic tank discharge, contaminants may migrate via groundwater towards Bass Strait coastline and the marine environment (being diluted along the path).	Unchanged	Low	No further assessment provided.

9. DISCUSSION

9.1 PRELIMINARY DEWATERING PREDICTIONS

The preliminary dewatering predictions have considered the construction activities have been implemented concurrently and individually. The calculated individual groundwater impacts are expected to be an overestimate of the actual dewatering volumes because concurrent dewatering will be more efficient at reducing groundwater levels. Summed dewatering impacts are unlikely to exceed 45 m³/day, which would only occur for 30 days, then <2 m³/day (once piling dewatering is completed). The piling depth will determine the actual dewatering volume, scenarios in this assessment assumed 7.5 m deep.

9.2 OVERVIEW OF PREDICTED IMPACTS

Individual and collective predictive site works impacts have been considered over time. Overall, individual impacts are relatively small. The cumulative effect of site works also shows a relatively small impact with a maximum groundwater level draw down of 0.65 m. Outside the proposed work site, predicted groundwater level decline generally does not exceed 0.1 m, except for a small 10 to 20 day window associated with piling borehole dewatering. It is noted that this is likely to be a conservative assessment as it is unlikely all 15 foundation borehole piles would be dewatered for 30 days. Nonetheless, the scenario does provide an indication of the maximum extent piling borehole dewatering could cause.

9.3 RECOMMENDATIONS AND PROPOSED MITIGATIONS

This assessment demonstrates that groundwater behaviour beneath Heybridge is understood well enough for a Class 2 model, yet several findings call for targeted follow-up if the model is to remain defensible through detailed design and construction. Those recommendations are:

- The shallow hydro-stratigraphy is spatially erratic because of historical filling. Thin, discontinuous sand lenses sit above weathered bedrock and create sharp lateral contrasts in hydraulic conductivity. Reliance on the present dataset therefore risks overlooking localised conduits or barriers to flow. To address this uncertainty, three additional nested monitoring well pairs would be recommended on the eastern and western margins of the site with data loggers for a minimum of one full year so that seasonality can be distinguished robustly.
- The ensemble calibration method met the calibration statistics for a Class 2 model, prediction uncertainty remains dominated by sparse storage parameters and a short transient record. Once the ongoing baseline level monitoring data is available, the model should be re-inverted, and a conditional prediction ensemble run under several wet and dry climate sequences. This step would quantify the likelihood of drawdown or mounding outcomes that exceed present design tolerances and could elevate the model to Class 3 confidence.
- During construction, bulk earthworks and short-term pile dewatering will generate the greatest groundwater effects. Simulations indicate a maximum of up to 1.6 m drawdown after roughly 70 days and drainage of the finished 8.7 mAHD platform may continue to intercept about 388 m³ yr⁻¹ from May to January each year. To manage this flux without degrading marine water quality, the construction of drains into lined sediment basins sized for a 24-hour, 20-year rainfall event, followed by discharge through an oil–water separator and vegetated swale before off-site release should be considered. Incorporating trenchless toe-drains along the southern cut-face will also mitigate the small (<0.5 m) drawdown predicted under adjacent freehold land.
- Water-quality monitoring has already detected low-level PFOS + PFHxS above the 0.07 µg L⁻¹ drinking-water criterion proxy at three wells. Although concentrations remain below marine-ecosystem

triggers at the shoreline, an action threshold of $0.05 \mu\text{g L}^{-1}$ should be adopted for trigger-action-response planning during earthworks. Quarterly analyses for PFAS, dissolved metals and TRH (with silica-gel cleanup) should be maintained until two consecutive events fall below the threshold, after which the frequency can drop to a bi-annual basis.

- Because climate projections for North-West Tasmania anticipate a modest intensification of winter rainfall and more frequent high-intensity storms, the Stage 2 model update should include a recharge sensitivity test using Representative Concentration Pathway (RCP) 4.5 and RCP 8.5 rainfall ensembles to 2070. Any predicted rise that would cause groundwater daylighting through the finished pad has been identified as a seasonal risk.

9.4 FUTURE ASSESSMENT AND REPORTING

Ongoing baseline groundwater monitoring will continue at the Heybridge Converter Station site prior to the commencement of construction. As outlined in the Groundwater Management Plan (GMP, Tetra Tech Coffey, 2025), monitoring will include both groundwater level and quality, with data collected through a combination of manual gauging, continuous logging, and periodic sampling for a defined suite of analytes including PFAS, hydrocarbons, metals, and nutrients.

As the dataset develops, periodic assessment and reporting will be undertaken in accordance with the requirements of the final GMP and the overarching Construction Environmental Management Plan (CEMP). The GMP specifies that groundwater level and quality results will be compared against baseline conditions, model predictions, and adopted trigger levels using a traffic-light system. Where exceedances occur, results will be reviewed, and appropriate management actions implemented, which may include additional monitoring, refinement of trigger levels, or targeted mitigation measures.

This pre-construction hydrogeological assessment report is not intended to be revised as further monitoring data becomes available. Instead, ongoing risk assessment and management will be addressed by the periodic reporting cycle described in the GMP, which will provide updated assessment of the risk profile as the monitoring dataset grows.

10. CONCLUSION

The following conclusions are made based upon the information reviewed and conditions modelled:

- The site soil/geological conditions are extremely variable due to the historic excavation and backfill activities. These conditions have resulted in a highly variable stratigraphic sequence in the upper 2 m at the site and some uncertainty in the groundwater processes which may occur.
- The groundwater processes simulated at the site generally matched well with the observed data, even though the duration and frequency of monitoring data was sparse and focused on the site.
- The groundwater model was adequately constructed to meet the requirements of a Class 2 groundwater model. The simulation of groundwater processes on a daily interval, while computationally expensive, has produced a stable and appropriate model for the proposed impact scenario. The model boundary conditions, aquifer parameters and mass balance error were all of suitable quality to justify the model to be classified as a Class 2 groundwater model.
- The tioxide outfall system which extends from the site to the beach area does not significantly influence groundwater processes in the area. This was determined by considering groundwater monitoring level and numerical modelling where the groundwater gradient was found not to grade toward the tunnel.
- The modelled scenarios have shown that the groundwater level will drawdown by up to 1.6 m on 70 days after construction begins but will recover to within 0.1 m in most parts after a year. There are no

known terrestrial GDE locations, however if they were to occur, the modelling has shown there would be a <0.1 m impact for more than 30 days.

- The site leveling associated with the construction of the site foundation is likely to result in groundwater discharging to the surface during the wetter months that may require ongoing management.
- The assessment has incorporated new site investigation data and predictive groundwater modelling, which has increased confidence in the estimated magnitudes and significance of many potential impacts originally identified in the GIA. Most notably:
 - Negligible impact significance is expected as a result of groundwater level drawdown for most potential impacts.
 - Existing contamination is unlikely to be mobilised to a degree that would alter the risk profile to the PEVs of groundwater, resulting in low or very low residual impact significance.
 - The significance of saline water intrusion is very low, due to the limited drawdown magnitude and the relative level of excavations and the marine environment.
 - Groundwater acidification impact significance has been revised down from moderate, to low to very low as a result of the minor drawdown magnitude and improved characterisation of the seasonal level fluctuations at the site.
 - Risk of releasing contaminated groundwater to the environment is now better characterised with modelling indicating the potential need for seasonal groundwater discharge management in areas where low level groundwater contamination exists. The need for further baseline assessment and planning for long term groundwater management has been identified.

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APPENDIX A: STATEMENT OF LIMITATIONS

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY ENVIRONMENTAL REPORT

Introduction

This report has been prepared by Tetra Tech Coffey for you, as Tetra Tech Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice.

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Tetra Tech Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Tetra Tech Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Tetra Tech Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Tetra Tech Coffey should be kept apprised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statutes and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Tetra Tech Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Tetra Tech Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Tetra Tech Coffey prepared the report and has familiarity with the site, Tetra Tech Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Tetra Tech Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

APPENDIX B: MONITORING WELL INSTALLATION FACTUAL REPORT, HEYBRIDGE

**GROUNDWATER MONITORING WELL INSTALLATION
FACTUAL REPORT
BASS HIGHWAY, HEYBRIDGE**

Prepared for: **Marinus Link**

Date: 10 April 2025

Document Reference: TG24218/2 - 01report

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Figure 2 Extract of MRT Geology Map

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- Appendix A Engineering Borehole Logs & Core Tray Photographs
Appendix B Selected Site Photographs
Appendix C Groundwater Monitoring Well Development Record Sheets
Appendix D Groundwater Monitoring Well Survey Report

Version	Date	Prepared by	Reviewed by	Distribution
Original	10 April 2025	Nev Vanderslink	Dr Wayne Griffioen	Electronic

1 INTRODUCTION

Tasman Geotechnics was commissioned by Marinus Link to drill, install and develop 6 groundwater monitoring wells at the proposed Heybridge converter station site in North West Tasmania.

The proposed converter station site is located on the southern side of Bass Highway, at 18 Minna Road, Heybridge (title reference 184295/1). The site was previously a titanium dioxide (tioxide) pigment plant which was operated by Tioxide Australia Pty Ltd between 1948 and 1996, and has since been demolished and rehabilitated. The site is currently not in use.

An interconnector between Tasmania and Victoria, known as Marinus Link, is proposed to provide a second High Voltage Direct Current link between the existing High Voltage Alternating Current electricity grids in Tasmania and Victoria, enabling energy transfer between these regions in the National Electricity Market.

The proposed development will include the construction of a new 220kV converter station at the Heybridge site to support connection of Marinus Link to the transmission network. We understand that Two Horizontal Directional Drilling (HDD) alignments have been proposed to provide access for the Marinus Link undersea cables, with the entry pits to be located at the site.

The approval process for the proposed development requires a comprehensive Groundwater Assessment to understand the hydrogeology at the site, including groundwater level, flow direction, flow rate, contamination, and potential impacts on temporary and permanent excavations.

It is our understanding that groundwater monitoring wells previously installed at the site predominantly target groundwater within the bedrock, thus additional wells were required to assess groundwater within the overburden (fill and natural soils).

Details of the proposed wells (location and construction/development methodology) were provided by the client in consultation with Tetra Tech Coffey.

This report summarises the following:

- Fieldwork completed;
- Surface and subsurface conditions encountered at the site;
- Groundwater monitoring well construction details;
- Measured groundwater levels and water quality field test results.

2 FIELDWORK

The field work was completed during fine weather conditions, and involved the following activities:

- Cable locating completed by NME Services on 27 March 2025 to clear the proposed groundwater monitoring well locations for underground services prior to breaking ground.
- Drilling of 6 boreholes and installation of groundwater monitoring wells (HB-MW01 to HB-MW06) by Tasmanian Drilling Services, between 27 and 28 March 2025, using Hanjin track-mounted drill rig.
 - The boreholes were drilled to bedrock using hollow-flight augers. Termination depths ranged from 2.4m to 4.8m below ground level.
 - Disturbed (split-spoon) samples were collected for logging purposes. Laboratory testing was not required on the soil samples.
 - The borehole drilling and well installation was supervised by a Senior Engineering Geologist from Tasman Geotechnics, who was also responsible for the borehole logging.
 - The proposed well locations were provided by the client and were determined in the field with handheld GPS (+/- 3m accuracy).

- 50mm diameter PVC groundwater monitoring wells were installed with screen depths determined by the supervising Senior Engineering Geologist based on the ground conditions encountered, and in consultation with Tetra Tech Coffey.
- The well details are summarised in Table 1.
- The wells were developed by a Senior Engineering Geologist from Tasman Geotechnics on 31 March 2025.
- Field testing for pH, electrical conductivity, temperature, and dissolved oxygen was conducted on the purged groundwater.
- Groundwater level loggers were installed in all wells and a barometric logger was installed in HB-MW02 only.
- The well locations were surveyed by PDA Surveyors on 4 April 2025, which also included surveying the ground surface level, top of casing level and top of standup monument lid (see Appendix D).

The engineering borehole logs (including well construction details) and core tray photographs are presented in Appendix A, and the borehole locations are shown in Figure 1.

The borehole logging was completed in accordance with AS1726-2017, Geotechnical Site Investigations.

Site photographs are presented in Appendix B.

Table 1: Groundwater Monitoring Well Summary

Well ID	Easting (GDA2020)	Northing (GDA2020)	Ground RL (mAHD)	Top of Casing (mAHD)	Termination Depth (mBGL)
HB-MW01	414015.903	5452632.282	6.00	6.85	2.5
HB-MW02	414110.784	5452562.737	6.69	7.61	3.5
HB-MW03	414182.136	5452508.719	8.50	9.40	4.8
HB-MW04	414022.240	5452565.142	6.93	7.88	2.4
HB-MW05	414116.079	5452455.575	8.30	9.18	3.9
HB-MW06	414118.658	5452386.362	11.44	12.33	4.1

3 RESULTS

3.1 Regional Setting

The proposed development site is located at the old Heybridge tioxide plant site, about 5km to the east of the coastal township of Burnie, in North West Tasmania.

The site is located on a relatively flat coastal plain, at an elevation of between 5m and 15m AHD. A steep to very steep sloping escarpment is located directly to the south and west of the site and rises to a maximum elevation of about 135m AHD.

Bass Highway is located directly to the north of the old tioxide plant and Bass Strait is located on the northern side of the highway. Blythe River is located about 200m to the southeast of the site and drains in a northerly to north-easterly direction into Bass Strait. Blythe Heads is located at the mouth of the river, about 400m to the east of the site.

3.2 Geology

The regional surface geology is taken from the Mineral Resources Tasmania (MRT), Digital Geological Atlas 1:25,000 Series, Burnie Sheet and shows the majority of the site (including the well locations) to be mapped as Quaternary-aged sediments described as “*Older stabilised aeolian sand of predominantly coastal plain...*”.

Underlying bedrock is exposed along the shoreline of the beach to the north of the site. The bedrock is mapped as Neoproterozoic-aged sedimentary rocks, described as “*Undifferentiated Oonah Formation, dominantly quartzwacke turbidites*”, known as the Burnie Formation. The outcropping bedrock strikes towards the southwest, and is inferred to underlie the Quaternary-aged sands mapped at the site. The Burnie Formation forms the bedrock of the escarpment to the south and west of the site.

Two mafic bodies are also mapped on the beach to the north of the site and are described as “*mafic vesiculate lavas*”. Based on previous work, it is our understanding that this unit is more consistent with that of a mafic intrusive (dolerite), rather than mafic extrusive (vesiculate lava) and is inferred to represent the Neoproterozoic-aged ‘Cooee Dolerite’ (Gee, 1977 and Spry, 1957 & 1962).

An extract of the MRT geology map is provided in Figure 2.

3.3 Surface Conditions

The circa 10.4ha site is located approximately 5km to the east of Burnie and is bounded by the Bass Highway directly to the north, Minna Road to the east, and the toe of a steep escarpment to the west and south. The site is accessed from Minna Road via a locked gate to the east of the site.

The slopes of the escarpment to the west and south of the site are not on the site itself but are on adjacent sites (e.g., title references 160924/1 and 177416/3). The escarpment is steeply sloping, with a typical fall varying from about 25° to 40° towards the northeast. The escarpment is covered with dense trees, shrubs and undergrowth.

Most of the site (including the well locations) has little relief and has been graded so that surface water runs off to drainage lines, including a culvert which directs stormwater under Bass Highway and discharges to the beach to the north. The site appears to be well drained in general.

The surface of the site is either vegetated with grasses (HB-MW01) and sparse shrubs/trees, or is relatively bare of vegetation and consists of fill materials predominantly consisting of sands and gravels (HB-MW02-HB0MW06), which are likely old access roads or road base materials. Minor foreign objects, or “cultural artefacts” are scattered across the site including concrete fragments, bricks, pipework (metal, PVC, clay), steel and iron, electrical wiring, plastic sheeting, and timber. The fill materials are remnants from the old Tioxide plant.

Selected site photographs are presented in Appendix B.

3.4 Subsurface Conditions

The subsurface conditions encountered in the boreholes consists of fill of variable thickness, overlying natural soils (colluvium and/or residual soils), overlying natural bedrock.

A summary of the fill, natural soil, and natural rock types encountered in the boreholes is provided in Table 2 and further discussed below.

Table 2: Summary of Subsurface Conditions

Geotechnical Unit	Material Type	Groundwater Monitoring Well ID					
		HB-MW01	HB-MW02	HB-MW03	HB-MW04	HB-MW05	HB-MW06
		Depth to Top of Unit (mBGL)					
Unit 1	Fill	0	0	0	0	0	0
Unit 2	Natural Soil (Colluvium)	1	-	2.4	-	-	-
Unit 3a	Natural Rock (RS)	-	0.5	-	-	1.6	2.4
Unit 3b	Natural Rock (XW)	1.6	2.6	3.5	2	3.6	3
Termination Depth (mBGL)		2.5	3.5	4.8	2.4	3.9	4.1
Termination Reason		Terminated in Siltstone, hard going.	Terminated in Siltstone, hard going.	Terminated in Siltstone, refusal.	Terminated in Sandstone, refusal.	Terminated in Siltstone, refusal.	Terminated in Siltstone, hard going.

Notes:

mBGL = metres below ground level

RS = Residual Soil

XW = Extremely Weathered

The Quaternary-aged aeolian sand mapped by MRT at the site was not encountered in boreholes and was likely removed during construction of the Tioxide plant or later site remediation.

The fill (Unit 1) encountered in the boreholes varies from 0.5m to 2.4m in thickness, and mostly consists of fine to coarse grained (sandy, silty) GRAVEL and low plasticity (sandy, gravelly) SILT. Foreign objects, or “cultural artefacts” within the fill were not encountered in the boreholes; however, these are known to occur across the site and include concrete (blocks, footings, floors), bricks and brick fragments, pipework (metal, PVC, clay), steel and iron (reinforcing, scrap), electrical wiring, plastic sheeting, timber and process wastes including cinders, ash, minor sludge and ilmenite.

The natural colluvium (Unit 2) typically consists of fine to coarse grained (silty) GRAVEL derived from erosion and deposition of the sedimentary bedrock.

The natural bedrock typically consists of Residual Soil (Unit 3a), presenting as medium plasticity (silty) CLAY and high plasticity (gravelly) SILT, overlying Extremely Weathered rock (Unit 3b).

The Extremely Weathered bedrock (Unit 3b) consists of Extremely weathered, Very Low strength SANDSTONE (HB-MW04 only) presenting as (sandy, silty) GRAVEL, or SILTSTONE presenting as high plasticity (gravelly) SILT and (silty) GRAVEL. The bedrock is consistent with the Neoproterozoic-aged Burnie Formation turbidite sequence mapped on the shoreline to the north of the site and the escarpment to the south and west of the site. HB-MW03 to HB-MW05 were terminated due to auger refusal, most likely due to the bedrock becoming fresher and higher strength.

Groundwater inflow was only noted in HB-MW02 and HB-MW05 while drilling, predominantly presenting as a thin wet layer within the natural soils directly overlying the bedrock. However, groundwater was encountered in all wells except HB-MW03 when the wells were dipped soon after installation on 28 March 2025. The groundwater details are further discussed in Section 3.5.

3.5 Groundwater

The groundwater monitoring wells were developed by a Senior Engineering Geologist from Tasman Geotechnics on 31 March 2025. The wells were developed by hand bailing and were bailed three times the well volume or until dry. Groundwater was encountered in all wells except HB-MW03.

The groundwater level (metres below top of casing) was recorded prior to commencing the bailing, and the following details were recorded after the first bail then after each well volume (or until dry):

- Water quality parameters (pH, electrical conductivity, temperature, and dissolved oxygen) using a portable meter;
- Visual observations of the purged groundwater;
- Groundwater level (metres below top of casing).

The well development details including the water quality test results are provided in Appendix C.

Immediately after well development, a groundwater level logger was installed in each well (even if the well was dry). A barometric logger was installed in HB-MW02 only. The data loggers were provided and pre-programmed by Tetra Tech Coffey.

The groundwater levels are summarised in Table 3, based on the measured groundwater depths and surveyed ground level and top of well casing levels.

Table 3: Groundwater Summary

Well ID	Date	Time (24hr)	Ground RL (mAHD)	Top of Casing (mAHD)	Depth to Water Table (mBTOC)	Standing Water Level (mAHD)
HB-MW01	28/03/2025	12:00	6.00	6.85	2.76	4.09
	31/03/2025	11:15			2.69	4.16
HB-MW02	28/03/2025	11:45	6.69	7.61	2.58	5.03
	31/03/2025	12:00			2.56	5.05
HB-MW03	28/03/2025	11:40	8.50	9.4	Dry	Dry
	31/03/2025	13:20			Dry	Dry
HB-MW04	28/03/2025	11:35	6.93	7.88	2.93	4.95
	31/03/2025	13:40			2.89	4.99
HB-MW05	28/03/2025	12:20	8.30	9.18	2.92	6.26
	31/03/2025	14:35			2.80	6.38
HB-MW06	28/03/2025	12:30	11.44	12.33	Dry	Dry
	31/03/2025	15:10			3.02	9.31

Notes:

- mAHD = metres with respect to the Australian Height Datum
- mBTOC = metres below top of casing
- Ground RL & Top of Casing Level surveyed by PDA Surveyors, 4/04/2025

4 REFERENCES

Gee R. D. 1977. Geological Survey Explanatory Report, Geological Atlas 1 mile series. Sheet 28 (8015N), Burnie. Tasmania Department of Mines.

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Spry A. H. 1962. The Precambrian rocks. In: Spry A. and Banks M. R. (eds.). The Geology of Tasmania. Journal of the Geological Society of Australia 9, 107-126.

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Important information about your report

These notes are provided to help you understand the limitations of your report.

Project Scope

Your report has been developed on the basis of your unique project specific requirements as understood by Tasman Geotechnics at the time, and applies only to the site investigated. Tasman Geotechnics should be consulted if there are subsequent changes to the proposed project, to assess how the changes impact on the report's recommendations.

Subsurface Conditions

Subsurface conditions are created by natural processes and the activity of man.

A site assessment identifies subsurface conditions at discrete locations. Actual conditions at other locations may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time.

Nothing can be done to change the conditions that exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, the services of Tasman Geotechnics should be retained throughout the project, to identify variable conditions, conduct additional investigation or tests if required and recommend solutions to problems encountered on site.

Advice and Recommendations

Your report contains advice or recommendations which are based on observations, measurements, calculations and professional interpretation, all of which have a level of uncertainty attached.

The recommendations are based on the assumption that subsurface conditions encountered at the discrete locations are indicative of an area. This can not be substantiated until implementation of the project has commenced. Tasman Geotechnics is familiar with the background information and should be consulted to assess whether or not the report's recommendations are valid, or whether changes should be considered.

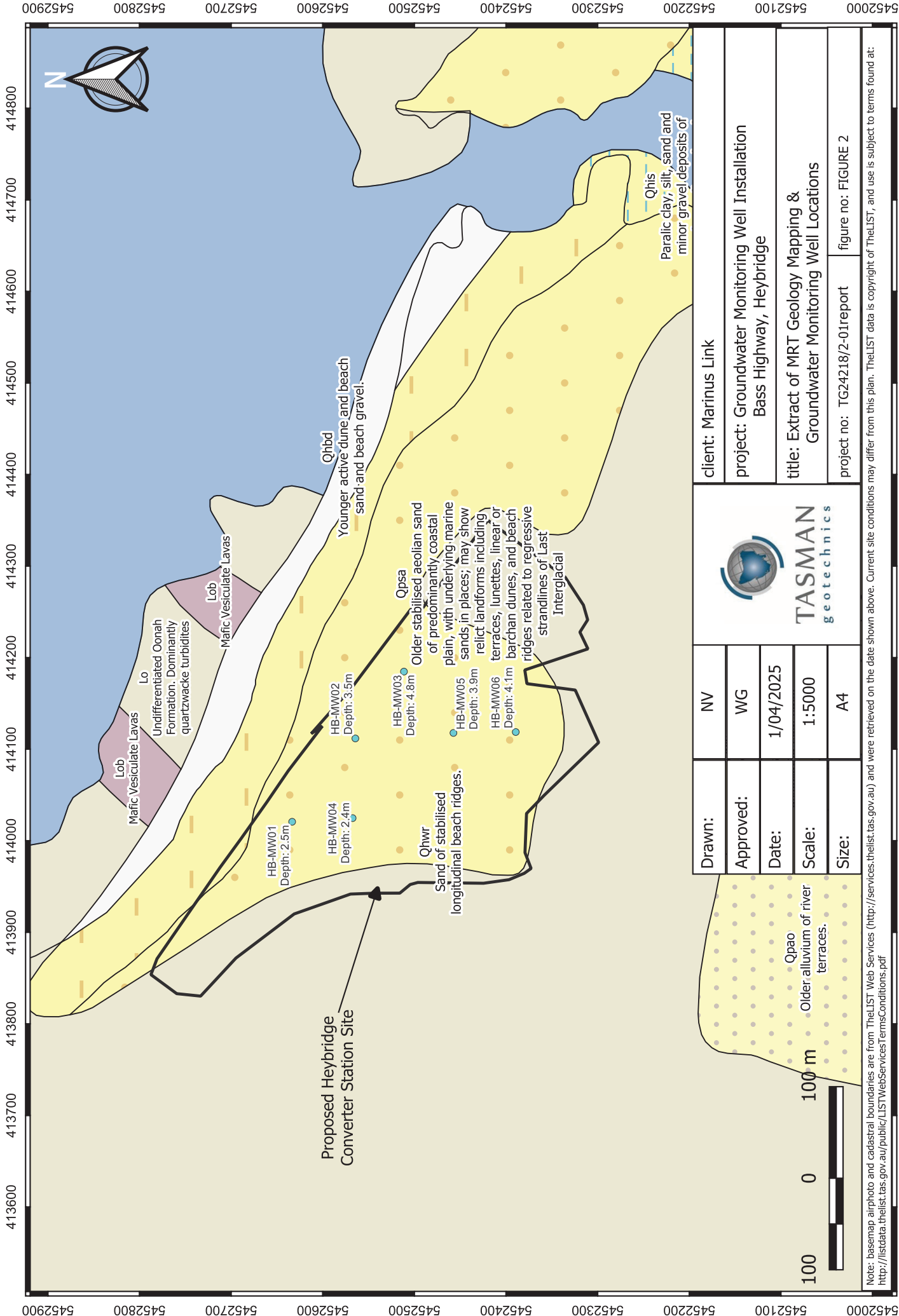
The report as a whole presents the findings of the site assessment, and the report should not be copied in part or altered in any way.



- Tasman Geotechnics Wells (2025)
- Tasman Geotechnics Boreholes (2024)
- Jacobs Boreholes (2022)
- Jacobs Test Pits (2022)
- Cromer Test Pits (2004)

Note: basemap airphoto and cadastral boundaries are from TheLIS Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIS data is copyright of TheLIS, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISWebServicesTermsConditions.pdf>

	Drawn:	NV	client: Marinus Link	
	Approved:	WG	project: Groundwater Monitoring Well Installation Bass Highway, Heybridge	
	Date:	1/04/2025	title: Site Layout & Groundwater Monitoring Well Locations	
	Scale:	1:2500	project no: TG24218/2 - 01report	
	Size:	A4	figure no: FIGURE 1	



client: Marinus Link	
project: Groundwater Monitoring Well Installation Bass Highway, Heybridge	
title: Extract of MRT Geology Mapping & Groundwater Monitoring Well Locations	
project no: TG24218/2-01report	figure no: FIGURE 2

 TASMAN geotechnics	
Drawn:	NV
Approved:	WG
Date:	1/04/2025
Scale:	1:5000
Size:	A4

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>

Appendix A

Engineering Borehole Logs & Core Tray Photographs

Soils are described in accordance with the Unified Soil Classification System (USCS), as shown in the following table.

FIELD IDENTIFICATION

COARSE GRAINED SOILS	more than 65% of material less than 63mm is larger than 0.075mm	GRAVELS	GW	Well graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELLY SOILS	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
		SANDS	SW	Well graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDY SOILS	SM	Silty sand, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines

				DRY STRENGTH	DILATANCY	TOUGHNESS	
FINE GRAINED SOILS	more than 35% of material less than 63mm is less than 0.075mm	SILT & CLAY, liquid limit less than 50%	ML	Inorganic silts, very fine sands or clayey fine sands	None to low	Quick to slow	None
			CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays and silty clays	Medium to high	None to very slow	Medium
			OL	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low
	SILT & CLAY, liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts	Low to medium	Slow to none	Low to medium	
		CH	Inorganic clays of high plasticity, fat clays	High	None	High	
		OH	Organic clays of medium to high plasticity	Medium to high	None to very slow	Low to medium	
PEAT		Pt	Peat muck and other highly organic soils				

Particle size descriptive terms

Name	Subdivision	Size
Boulders		>200mm
Cobbles		63mm to 200mm
Gravel	coarse	19mm to 63mm
	medium	6.7mm to 19mm
	fine	2.36mm to 6.7mm
Sand	coarse	600µm to 2.36mm
	medium	210µm to 600µm
	fine	75µm to 210µm

Moisture Condition

Dry (D)	Looks and feels dry. Cohesive soils are hard, friable or powdery. Granular soils run freely through fingers.
Moist (M)	Soil feels cool, darkened in colour. Cohesive soils are usually weakened by moisture presence, granular soils tend to cohere.
Wet (W)	As for moist soils, but free water forms on hands when sample is handled

Cohesive soils can also be described relative to their plastic limit, ie: <Wp, =Wp, >Wp

The plastic limit is defined as the minimum water content at which the soil can be rolled into a thread 3mm thick.

Consistency of cohesive soils

Term	Undrained strength	Field guide
Very soft VS	<12kPa	A finger can be pushed well into soil with little effort
Soft S	12 - 25kPa	Easily penetrated several cm by fist
Firm F	25 - 50kPa	Soil can be indented about 5mm by thumb
Stiff St	50-100kPa	Surface can be indented but not penetrated by thumb
Very stiff VSt	100-200kPa	Surface can be marked but not indented by thumb
Hard H	>200kPa	Indented with difficulty by thumb nail
Friable Fb	-	Crumbles or powders when scraped by thumb nail

Density of granular soils

Term	Density index
Very loose	<15%
Loose	15 to 35%
medium dense	35 to 65%
Dense	65 to 85%
Very dense	>85%

Minor Components

Term	Proportions	Observed properties
Trace of	Coarse grained: <5% Fine grained: <15%	Presence just detectable by feel or eye. Soil properties little or no different to general properties of primary component.
With some	Coarse grained: 5-12% Fine grained: 15-30%	Presence easily detected by feel or eye. Soil properties little different to general properties of primary component.

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



TASMAN
geotechnics

Borehole no: HB-MW01

Sheet no. 1 of 1

Job no. TG24218/2

Date: 27 March 2025

Logged By: NV

GDA2020 Easting: 414015.903
GDA2020 Northing: 5452632.282
Elevation (mAHD): 6.004

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa	Structure, additional observations
										100 200 300 400 500	
Hollow Stem Auger				0		ML	FILL: Sandy SILT, low plasticity, brown, fine to medium grained sand, with fine to coarse grained angular to subangular sandstone gravel	<Wp	Fb		FILL to 1m
		Split Spoon		0.2		GP		D	MD		
				0.4		GP	FILL: Silty/Sandy GRAVEL, grey/grey-brown, fine to coarse grained angular to subangular sandstone gravel, low plasticity silt, fine to medium grained sand	D	MD		
		Split Spoon		0.6			Becoming dark-brown, fine to medium grained subangular to subrounded sandstone and quartz gravel, low plasticity silt, fine to medium grained sand				
				1.0		GP	Silty GRAVEL, orange/grey, fine to coarse grained angular to subround sandstone and siltstone gravel, with fine to medium grained sand, low plasticity silt	D	MD		Natural from 1m, possible colluvium
		Split Spoon		1.2							
				1.6							
		Split Spoon		1.8							
				2.0			SILTSTONE, Extremely Weathered, presenting as Gravelly SILT, high plasticity, grey/orange, fine to coarse grained friable gravel, trace fine to medium grained sand, Very Low strength, rock textures	<Wp	H/Fb	450	Rock textures from 1.6m (Oonah Formation) No groundwater inflow while drilling but dipped level 1.85m on 31/03/25
		Split Spoon		2.2							
				2.5			Terminated at 2.5m, hard going			600	
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

method DT Diatube AS Auger screwing AD Auger drilling RR Roller/tricone CB Claw/blade bit NMLC NMLC core NQ, HQ Wireline core	water 17/03/18 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	Piezometer Legend Backfill Collapse Bentonite Concrete Sand Packing Screen End Cap	Moisture Condition Dry (D) Moist (M) Wet (W) Cohesive soils can also be described relative to their plastic limit, ie: <Wp =Wp >Wp	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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Drawn	NV	 TASMAN geotechnics	
Approved	WG		
Date	31/03/2025		
Scale	NTS		
Original Size	A4		
Client		Marinus Link	
Project		Groundwater Monitoring Well Installation Bass Highway, Heybridge	
Title		HB-MW01 Core Tray Photographs	
Project No: TG24218/2 - 01memo		Trays: 1-1 (of 1)	Page: 1 of 1

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



TASMAN
geotechnics

Borehole no: HB-MW02

Sheet no. 1 of 1

Job no. TG24218/2

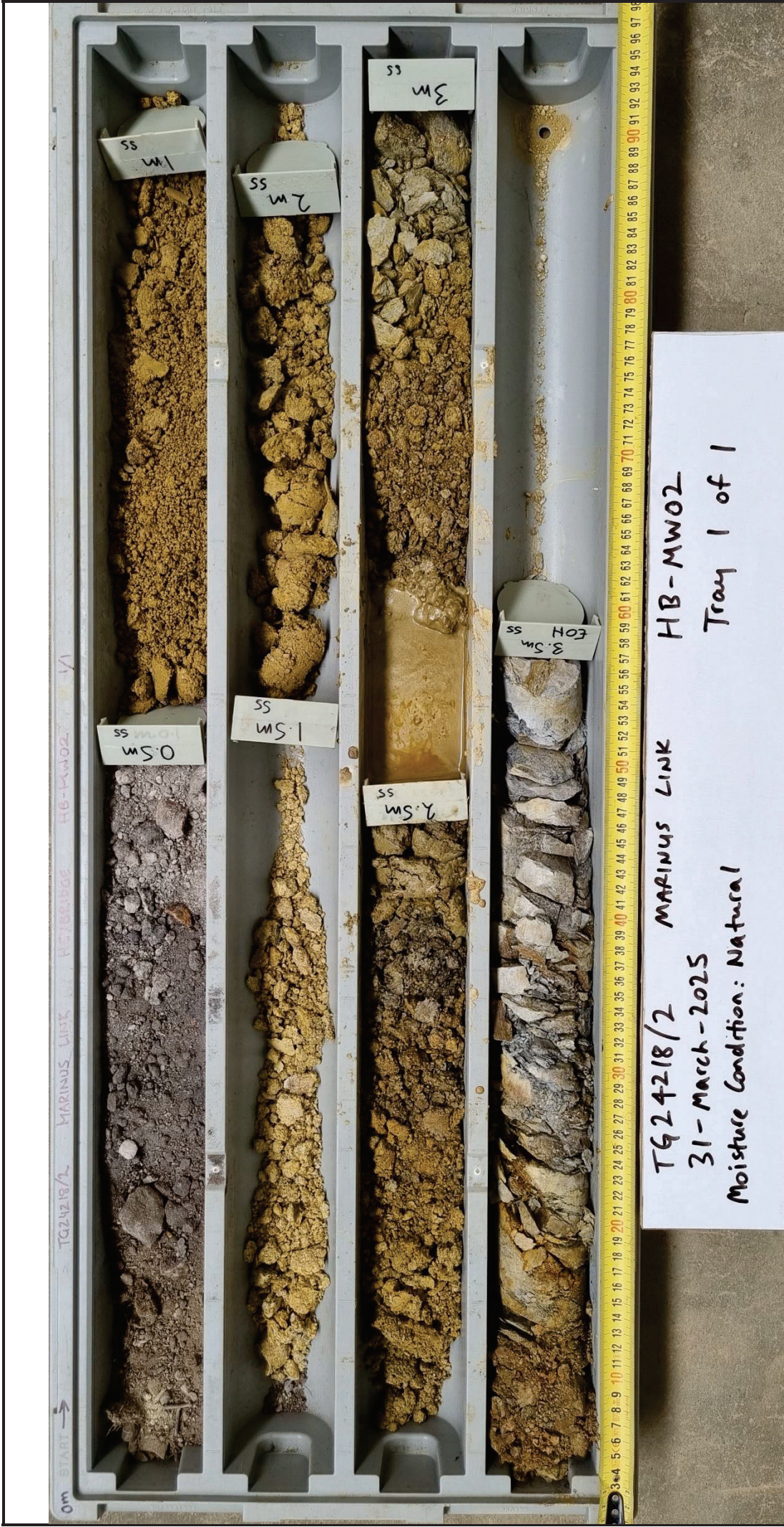
Date: 27 March 2025

Logged By: NV

GDA2020 Easting: 414110.784
GDA2020 Northing: 5452562.737
Elevation (mAHD): 6.694

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa 100 200 300 400 500	Structure, additional observations
Hollow Stem Auger				0		GP	FILL: Sandy/Silty GRAVEL, grey-brown, fine to medium grained subangular to subrounded sandstone and quartz gravel, fine to medium grained sand, low plasticity silt Becoming grey	D	MD/D		FILL to 0.5m
		Split Spoon		0.5		GP		D	MD/D		Auger grinding on possible cobbles
		Split Spoon		1		CI	Silty CLAY, medium plasticity, orange/yellow/grey, trace fine to medium grained sand	>Wp	St		Natural clay from 0.5m
		Split Spoon		1.5							Dipped groundwater level at 1.65m, 31/03/25
		Split Spoon		2							
		Split Spoon		2.5		CI	Becoming wet due to groundwater inflow	>>Wp	F	120	Groundwater inflow at 2.4-2.6m
		Split Spoon		3			SILTSTONE, Extremely Weathered, presenting as Gravelly SILT, high plasticity, orange/yellow/grey, fine to medium grained friable gravel, trace fine to medium grained sand, Very Low strength, rock textures	>Wp	St		Rock textures from 2.6m (Oonah Formation)
		Split Spoon		3.5			Presenting as GRAVEL, medium to coarse grained angular gravel, grey/orange, Very Low strength, rock textures, bedding ~45°	D	D/VD		
				4			Terminated at 3.5m, hard going				
				4.5							
				5							

method DT Diatube AS Auger screwing AD Auger drilling RR Roller/tricone CB Claw/blade bit NMLC NMLC core NQ, HQ Wireline core	water 17/03/18 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	Piezometer Legend Backfill Collapse Bentonite Concrete Sand Packing Screen End Cap	Moisture Condition Dry (D) Moist (M) Wet (W) Cohesive soils can also be described relative to their plastic limit, ie: <Wp =Wp >Wp	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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Drawn	NV	 TASMAN geotechnics	
Approved	WG		
Date	31/03/2025		
Scale	NTS		
Original Size	A4		
Client		Marinus Link	
Project		Groundwater Monitoring Well Installation Bass Highway, Heybridge	
Title		HB-MW02 Core Tray Photographs	
Project No: TG24218/2 - 01memo		Trays: 1-1 (of 1)	Page: 1 of 1

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



TASMAN
geotechnics

Borehole no: HB-MW03

Sheet no. 1 of 1

Job no. TG24218/2

Date: 27 March 2025

Logged By: NV

GDA2020 Easting: 414182.136
GDA2020 Northing: 5452508.719
Elevation (mAHD): 8.504

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa	Structure, additional observations
										100 200 300 400 500	
Hollow Stem Auger				0		GP	FILL: Sandy/Silty GRAVEL, pale-brown/grey-brown, fine to coarse grained angular to subangular sandstone and quartz gravel, fine to medium grained sand, low plasticity silt	D	MD/D		FILL to 2.4m
		Split Spoon		0.5							Auger grinding on possible cobbles
		Split Spoon		1							
		Split Spoon		1.5							
		Split Spoon		2							
		Split Spoon		2.5		GP	Silty GRAVEL, orange/brown, fine to coarse grained subangular to subround sandstone, siltstone and quartz gravel, with fine to medium grained sand, low plasticity silt	D	D		Natural from 2.4m, possible colluvium
		Split Spoon		3							
		Split Spoon		3.5			SILTSTONE, Extremely Weathered, presenting as SILT, high plasticity, pale-orange, trace fine to medium grained sand and fine to medium grained friable gravel, Very Low strength, rock textures	<Wp	Fb		Rock textures from 3.5m (Oonah Formation)
		Split Spoon		4			Presenting as Silty GRAVEL, fine to coarse grained angular gravel, orange/grey, high plasticity silt, Very Low strength, rock textures, bedding ~45°	D	VD		No groundwater inflow & dry when dipped 31/03/25
		Split Spoon		4.5			Becoming grey/orange	D	VD		
				5			Terminated at 4.8m, refusal				

method

DT Diatube
AS Auger screwing
AD Auger drilling
RR Roller/tricone
CB Claw/blade bit
NMLC NMLC core
NQ, HQ Wireline core

water

17/03/18 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss

Piezometer Legend

Backfill Collapse
Bentonite Concrete
Sand Packing Screen
End Cap

Moisture Condition

Dry (D)
Moist (M)
Wet (W)
Cohesive soils can also be described relative to their plastic limit, ie:
<Wp
=Wp
>Wp

Consistency

VS Very soft
S Soft
F Firm
St Stiff
VSt Very stiff
H Hard
Fb Friable
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense



Drawn	NV	 TASMAN geotechnics		Client	Marinus Link
Approved	WG			Project	Groundwater Monitoring Well Installation Bass Highway, Heybridge
Date	31/03/2025			Title	HB-MW03 Core Tray Photographs
Scale	NTS			Project No: TG24218/2 - 01memo	
Original Size	A4			Trays: 1-2 (of 2)	Page: 1 of 1

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



TASMAN
geotechnics

Borehole no: HB-MW04

Sheet no. 1 of 1

Job no. TG24218/2

Date: 27 March 2025

Logged By: NV

GDA2020 Easting: 414022.24
GDA2020 Northing: 5452565.142
Elevation (mAHD): 6.925

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa 100 200 300 400 500	Structure, additional observations
Hollow Stem Auger		Split Spoon		0		GP	FILL: Silty GRAVEL, pale-brown, fine to coarse grained angular to subangular sandstone and quartz gravel, with fine to medium grained sand, low plasticity silt	D	MD/D		FILL to 2m
		Split Spoon		0.5							Auger grinding on possible cobbles
		Split Spoon		1		GP	Becoming brown/grey-brown	M	MD/D		
		No Rec		1.5		GP	No recovery, inferred FILL as above, possible cobbles present	M	D/VD		Rock textures from 2m (Oonah Formation)
		Split Spoon		2			SANDSTONE, Extremely Weathered, presenting as Sandy/Silty GRAVEL, fine to coarse grained angular gravel, orange/grey/brown, fine to medium grained sand, low plasticity silt, Very Low strength, rock textures	D	VD		No groundwater inflow while drilling but dipped level 1.93m on 31/03/25
				2.5			Becoming grey/brown	D	VD		
				3			Terminated at 2.4m, refusal				
				3.5							
				4							
				4.5							
				5							

method DT Diatube AS Auger screwing AD Auger drilling RR Roller/tricone CB Claw/blade bit NMLC NMLC core NQ, HQ Wireline core	water 17/03/18 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	Piezometer Legend Backfill Collapse Bentonite Concrete Sand Packing Screen End Cap	Moisture Condition Dry (D) Moist (M) Wet (W) Cohesive soils can also be described relative to their plastic limit, ie: <Wp =Wp >Wp	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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Drawn	NV	 TASMAN geotechnics		Client	Marinus Link
Approved	WG			Project	Groundwater Monitoring Well Installation Bass Highway, Heybridge
Date	31/03/2025			Title	HB-MW04 Core Tray Photographs
Scale	NTS			Project No: TG24218/2 - 01memo	
Original Size	A4			Trays: 1-1 (of 1)	Page: 1 of 1

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



Borehole no: HB-MW05
Sheet no. 1 of 1
Job no. TG24218/2
Date: 28 March 2025
Logged By: NV

GDA2020 Easting: 414116.079
GDA2020 Northing: 5452455.575
Elevation (mAHD): 8.299

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa	Structure, additional observations
										100 200 300 400 500	
Hollow Stem Auger				0		GP	FILL: Sandy/Silty GRAVEL, pale-brown, fine to coarse grained angular to subangular sandstone gravel, fine to medium grained sand, low plasticity silt	D	MD/D		FILL to 1.6m Auger grinding on possible cobbles
		Split Spoon				GP	Becoming grey/orange	D	MD/D		
				0.5		GP	Becoming dark grey-brown/black	M	MD		
		Split Spoon				ML	FILL: Sandy/Gravelly SILT, low plasticity, dark grey-brown/black, fine to coarse grained sand, fine to coarse grained angular to subround sandstone and quartz gravel	<Wp	Fb		
				1							
		Split Spoon				MH	Gravelly SILT, high plasticity, grey, fine to coarse grained angular siltstone gravel, trace fine to medium grained sand	<Wp	St/Fb	190	Natural from 1.6m, possible Residual Soil Dipped groundwater level at 1.92m, 31/03/25
				1.5							
		Split Spoon				MH	Becoming wet due to groundwater inflow, orange/grey No longer wet, grey/orange	>>Wp ≥Wp	S St/Fb	170	Thin wet zone 2.5-2.55m
				2							
		Split Spoon				MH	Becoming Very Stiff and Friable	≥Wp	VSt/Fb	320	
				2.5							
		Split Spoon				MH	Becoming wet due to groundwater inflow, orange/grey SILTSTONE, Extremely Weathered, presenting as Silty GRAVEL, fine to coarse grained angular gravel, grey/orange/red, high plasticity silt, Very Low strength, rock textures	>>Wp M	S VD		Thin wet zone 3.5-3.6m Rock textures from 3.6m (Oonah Formation)
				3							
		Split Spoon					Terminated at 3.9m, refusal				
				4							
				4.5							
				5							

method DT Diatube AS Auger screwing AD Auger drilling RR Roller/tricone CB Claw/blade bit NMLC NMLC core NQ, HQ Wireline core	water 17/03/18 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	Piezometer Legend Backfill Bentonite Sand Packing End Cap Collapse Concrete Screen	Moisture Condition Dry (D) Moist (M) Wet (W) Cohesive soils can also be described relative to their plastic limit, ie: <Wp =Wp >Wp	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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←

TG24218/2

MARINUS LINK

HEYBRIDGE

HB-MW05

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3.5m ss

3.9m ss EOH

3m ss

2m ss

1m ss

0.5m ss

1.5m ss

2.5m ss

TG24218/2

MARINUS LINK

HB-MW05

Trays 1 of 1

Moisture Condition: Natural

Drawn	NV	 TASMAN geotechnics		Client	Marinus Link
Approved	WG			Project	Groundwater Monitoring Well Installation Bass Highway, Heybridge
Date	31/03/2025			Title	HB-MW05 Core Tray Photographs
Scale	NTS			Project No: TG24218/2 - 01memo	
Original Size	A4			Trays: 1-1 (of 1)	Page: 1 of 1

ENGINEERING BOREHOLE LOG

Client: Marinus Link
Project: Groundwater Monitoring Well Installation
Location: Bass Highway, Heybridge

Drill model: Hanjin D&B-8D
Hole diameter: Hollow Stem Auger
Slope: -90 Bearing: 0



TASMAN
geotechnics

Borehole no: HB-MW06

Sheet no. 1 of 1

Job no. TG24218/2

Date: 28 March 2025

Logged By: NV

GDA2020 Easting: 414118.658
GDA2020 Northing: 5452386.362
Elevation (mAHD): 11.435

Method	Penetration 1 2 3 4	Notes Samples Tests	Piezo	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Pocket Penetro- meter kPa 100 200 300 400 500	Structure, additional observations
Hollow Stem Auger			Split Spoon	0		GP	FILL: Sandy/Silty GRAVEL, yellow-brown, fine to coarse grained subangular to subrounded sandstone, siltstone and quartz gravel, fine to medium grained sand, low plasticity silt	D	MD/D		Auger grinding on possible cobbles
			Split Spoon	0.5		GP	Becoming pale-brown	D	MD/D		
			Split Spoon	1		ML	FILL: Sandy/Gravelly SILT, low plasticity, dark-brown, fine to coarse grained sand, fine to coarse grained subangular to subround sandstone, siltstone and quartz gravel	<Wp	Fb		No groundwater inflow while drilling but dipped level 2.13m on 31/03/25
			Split Spoon	1.5		ML	Becoming black/dark-brown	≤Wp	St/Fb	110	
			Split Spoon	2		MH	Gravelly SILT, high plasticity, grey/orange, fine to coarse grained friable siltstone gravel, trace fine to medium grained sand	≤Wp	St/Fb		Natural from 2.4m, possible Residual Soil
			Split Spoon	2.5							
			Split Spoon	3			SILTSTONE, Extremely Weathered, presenting as Silty GRAVEL, fine to coarse grained angular gravel, grey/orange, high plasticity silt, Very Low strength, rock textures	M	D/VD		Rock textures from 3m (Oonah Formation)
			Split Spoon	3.5							
			Split Spoon	4							
			Split Spoon	4.1			Terminated at 4.1m, hard going				
				4.5							
				5							

method DT Diatube AS Auger screwing AD Auger drilling RR Roller/tricone CB Claw/blade bit NMLC NMLC core NQ, HQ Wireline core	water 17/03/18 water level on date shown water inflow partial drill fluid loss complete drill fluid loss	Piezometer Legend Backfill Bentonite Sand Packing End Cap Collapse Concrete Screen	Moisture Condition Dry (D) Moist (M) Wet (W) Cohesive soils can also be described relative to their plastic limit, ie: <Wp =Wp >Wp	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense
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Drawn	NV	 TASMAN geotechnics	
Approved	WG		
Date	31/03/2025		
Scale	NTS		
Original Size	A4		
Client		Marinus Link	
Project		Groundwater Monitoring Well Installation Bass Highway, Heybridge	
Title		HB-MW06 Core Tray Photographs	
Project No: TG24218/2 - 01memo		Trays: 1-1 (of 1)	Page: 1 of 1

Appendix B

Selected Site Photographs



Photo 1: Groundwater Monitoring Well HB-MW01 location, looking southwest.



Photo 2: Groundwater Monitoring Well HB-MW02 location, looking east-southeast.



Photo 3: Groundwater Monitoring Well HB-MW03 location, looking southeast.



Photo 4: Groundwater Monitoring Well HB-MW04 location, looking ~south.



Photo 5: Groundwater Monitoring Well HB-MW05 location, looking northwest.



Photo 6: Groundwater Monitoring Well HB-MW06 location, looking northwest.

Appendix C

Groundwater Monitoring Well Development Record Sheets



Groundwater Monitoring Well Development Record Sheet

Background Information

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details:

Well ID:	HB-MW01			
Easting (GDA2020):	414015.903			
Northing (GDA2020):	5452632.282			
Ground Elevation (mAHD):	6.004			
Top of Well Casing:	mAHD:	6.849	mAGL:	0.85
Well Termination Depth:	mBGL:	2.50	mBTOC:	3.35
Loggers Installed:	Level Logger (ID: HB-MW01)			

Pre-Bailing Details:

Groundwater Level (mBTOC):	2.69
Time (24hr):	11:15

Bailing & Water Quality Details:

First Bail		Second Bail		Third Bail	
Time (24hr):	11:30	Time (24hr):	11:50	Time (24hr):	13:00
Water Level (mBTOC):	2.95	Water Level (mBTOC):	2.96	Water Level (mBTOC):	Dry
Temperature (°C):	21.1	Temperature (°C):	22.5	Temperature (°C):	-
pH:	4.99	pH:	5.09	pH:	-
Electrical Conductivity (mS/cm³):	1.12	Electrical Conductivity (mS/cm³):	1.08	Electrical Conductivity (mS/cm³):	-
Dissolved Oxygen (mg/L):	5.2	Dissolved Oxygen (mg/L):	6.8	Dissolved Oxygen (mg/L):	-
Observations: Bailed to dry (~5L), very cloudy/silty, grey.		Observations: Bailed to dry (~2L), very cloudy/silty, grey.		Observations: Dipped 1hr & 10 min after second bail, well dry, no groundwater recovered.	

Notes:

Well coordinates and elevations surveyed by PDA Surveyors, 4/04/2025
 mAHD = Elevation in metres with respect to the Australian Height Datum
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing



Groundwater Monitoring Well Development Record Sheet

Background Information

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details:

Well ID:	HB-MW02			
Easting (GDA2020):	414110.784			
Northing (GDA2020):	5452562.737			
Ground Elevation (mAHD):	6.694			
Top of Well Casing:	mAHD:	7.605	mAGL:	0.91
Well Termination Depth:	mBGL:	3.50	mBTOC:	4.41
Loggers Installed:	Level Logger (ID: HB-MW02) & Barometric Logger (ID: HEYBRIDGE-BARO)			

Pre-Bailing Details:

Groundwater Level (mBTOC):	2.56
Time (24hr):	12:00

Bailing & Water Quality Details:

First Bail		Second Bail		Third Bail	
Time (24hr):	12:15	Time (24hr):	12:25	Time (24hr):	12:35
Water Level (mBTOC):	3.74	Water Level (mBTOC):	3.79	Water Level (mBTOC):	3.8
Temperature (°C):	21.8	Temperature (°C):	21.1	Temperature (°C):	21.6
pH:	6.58	pH:	6.7	pH:	6.75
Electrical Conductivity (mS/cm³):	2.88	Electrical Conductivity (mS/cm³):	2.88	Electrical Conductivity (mS/cm³):	2.96
Dissolved Oxygen (mg/L):	1.2	Dissolved Oxygen (mg/L):	1.4	Dissolved Oxygen (mg/L):	2.1
Observations:	Bailed ~15L, very cloudy/silty, brown. Bailed to dry (~4L), very cloudy/silty, brown. Bailed to dry (~5L), very cloudy/silty, brown.				

Notes:

Well coordinates, elevation and casing height have not been surveyed at this stage
 mAHD = Elevation in metres with respect to the Australian Height Datum, obtained from 2013 LiDAR
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing



Groundwater Monitoring Well Development Record Sheet

Background Information

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details

Well ID:	HB-MW03			
Easting (GDA2020):	414182.136			
Northing (GDA2020):	5452508.719			
Ground Elevation (mAHD):	8.504			
Top of Well Casing:	mAHD:	9.400	mAGL:	0.90
Well Termination Depth:	mBGL:	4.80	mBTOC:	5.70
Loggers Installed:	Level Logger (ID: HB-MW03)			

Pre-Bailing Details:

Groundwater Level (mBTOC):	Dry
Time (24hr):	13:20

Bailing & Water Quality Details:

First Bail		Second Bail		Third Bail	
Time (24hr):	-	Time (24hr):	-	Time (24hr):	-
Water Level (mBTOC):	-	Water Level (mBTOC):	-	Water Level (mBTOC):	-
Temperature (°C):	-	Temperature (°C):	-	Temperature (°C):	-
pH:	-	pH:	-	pH:	-
Electrical Conductivity (mS/cm³):	-	Electrical Conductivity (mS/cm³):	-	Electrical Conductivity (mS/cm³):	-
Dissolved Oxygen (mg/L):	-	Dissolved Oxygen (mg/L):	-	Dissolved Oxygen (mg/L):	-
Observations:	Well dry, no groundwater recovered.	Observations:	Well dry, no groundwater recovered.	Observations:	Well dry, no groundwater recovered.

Notes:

Well coordinates, elevation and casing height have not been surveyed at this stage
 mAHD = Elevation in metres with respect to the Australian Height Datum, obtained from 2013 LiDAR
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing



Groundwater Monitoring Well Development Record Sheet

Background Information:

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details:

Well ID:	HB-MW04			
Easting (GDA2020):	414022.240			
Northing (GDA2020):	5452565.142			
Ground Elevation (mAHD):	6.925			
Top of Well Casing:	mAHD:	7.882	mAGL:	0.96
Well Termination Depth:	mBGL:	2.40	mBTOC:	3.36
Loggers Installed:	Level Logger (ID: HB-MW04)			

Pre-Bailing Details:

Groundwater Level (mBTOC):	2.89
Time (24hr):	13:40

Bailing & Water Quality Details:

First Bail		Second Bail		Third Bail	
Time (24hr):	13:50	Time (24hr):	14:00	Time (24hr):	16:00
Water Level (mBTOC):	3.05	Water Level (mBTOC):	Dry	Water Level (mBTOC):	Dry
Temperature (°C):	21.2	Temperature (°C):	-	Temperature (°C):	-
pH:	6.35	pH:	-	pH:	-
Electrical Conductivity (mS/cm³):	1.53	Electrical Conductivity (mS/cm³):	-	Electrical Conductivity (mS/cm³):	-
Dissolved Oxygen (mg/L):	3.2	Dissolved Oxygen (mg/L):	-	Dissolved Oxygen (mg/L):	-
Observations:	Bailed to dry (~1L), cloudy, pale-brown. Well dry, no groundwater recovered. Dipped 2hr after second bail, well dry, no groundwater recovered.				

Notes:

Well coordinates, elevation and casing height have not been surveyed at this stage
 mAHD = Elevation in metres with respect to the Australian Height Datum, obtained from 2013 LiDAR
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing



Groundwater Monitoring Well Development Record Sheet

Background Information:

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details:

Well ID:	HB-MW05			
Easting (GDA2020):	414116.079			
Northing (GDA2020):	5452455.575			
Ground Elevation (mAHD):	8.299			
Top of Well Casing:	mAHD:	9.175	mAGL:	0.88
Well Termination Depth:	mBGL:	3.90	mBTOC:	4.78
Loggers Installed:	Level Logger (ID: HB-MW05)			

Pre-Bailing Details:

Groundwater Level (mBTOC):	2.8
Time (24hr):	14:35

Bailing & Water Quality Details:

First Bail		Second Bail		Third Bail	
Time (24hr):	14:45	Time (24hr):	15:00	Time (24hr):	15:45
Water Level (mBTOC):	4.33	Water Level (mBTOC):	4.48	Water Level (mBTOC):	4.48
Temperature (°C):	22.4	Temperature (°C):	23.0	Temperature (°C):	20.1
pH:	5.72	pH:	5.63	pH:	5.41
Electrical Conductivity (mS/cm³):	1.13	Electrical Conductivity (mS/cm³):	1.1	Electrical Conductivity (mS/cm³):	1.08
Dissolved Oxygen (mg/L):	1.2	Dissolved Oxygen (mg/L):	3.7	Dissolved Oxygen (mg/L):	4.8
Observations: Bailed ~17L, initially clear then becoming very cloudy/silty, brown.		Observations: Bailed to dry (~5L), cloudy, pale-brown.		Observations: Bailed to dry (~5L), slightly cloudy, pale-brown.	

Notes:

Well coordinates, elevation and casing height have not been surveyed at this stage
 mAHD = Elevation in metres with respect to the Australian Height Datum, obtained from 2013 LiDAR
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing



Groundwater Monitoring Well Development Record Sheet

Background Information:

Project Number:	TG24218/2
Location:	Bass Highway, Heybridge
Client:	Marinus Link
Date:	31/03/2025
Person:	Nev.V

Well Details

Well ID:	HB-MW06			
Easting (GDA2020):	414118.658			
Northing (GDA2020):	5452386.362			
Ground Elevation (mAHD):	11.435			
Top of Well Casing:	mAHD:	12.326	mAGL:	0.89
Well Termination Depth:	mBGL:	4.10	mBTOC:	4.99
Loggers Installed:	Level Logger (ID: HB-MW06)			

Pre-Bailing Details

Groundwater Level (mBTOC):	3.02
Time (24hr):	15:10

Bailing & Water Quality Details

First Bail		Second Bail		Third Bail	
Time (24hr):	15:20	Time (24hr):	15:30	Time (24hr):	16:10
Water Level (mBTOC):	4.81	Water Level (mBTOC):	4.8	Water Level (mBTOC):	4.82
Temperature (°C):	21.1	Temperature (°C):	21.0	Temperature (°C):	20.9
pH:	5.53	pH:	5.49	pH:	5.4
Electrical Conductivity (mS/cm³):	0.62	Electrical Conductivity (mS/cm³):	0.59	Electrical Conductivity (mS/cm³):	0.6
Dissolved Oxygen (mg/L):	3.9	Dissolved Oxygen (mg/L):	4.7	Dissolved Oxygen (mg/L):	4.6
Observations: Bailed to dry (~6L), initially clear then becoming cloudy, pale grey-brown.		Observations: Bailed to dry (~1L), slightly cloudy, pale grey-brown.		Observations: Bailed to dry (~200ml), slightly cloudy, pale grey-brown.	

Notes:

Well coordinates, elevation and casing height have not been surveyed at this stage
 mAHD = Elevation in metres with respect to the Australian Height Datum, obtained from 2013 LiDAR
 mAGL = metres above ground level
 mBGL = metres below ground level
 mBTOC = metres below top of casing

Appendix D

Groundwater Monitoring Well Survey Report

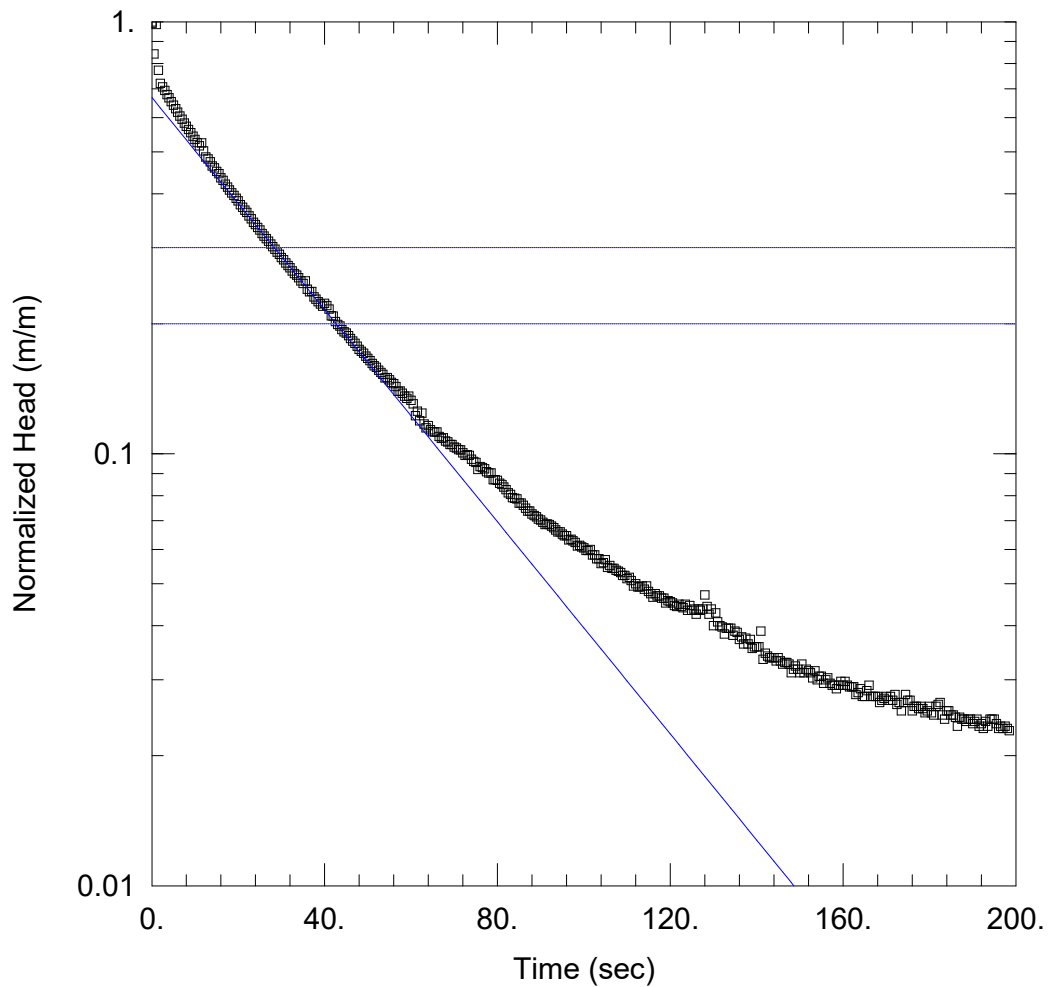
Survey of Water Monitoring Wells



ID	Easting	Northing	Standup Monument Lid	Top of PVC Casing	Ground Level
HB-MW01	414015.903	5452632.282	6.969	6.849	6.004
HB-MW02	414110.784	5452562.737	7.671	7.605	6.694
HB-MW03	414182.136	5452508.719	9.46	9.4	8.504
HB-MW04	414022.24	5452565.142	7.931	7.882	6.925
HB-MW05	414116.079	5452455.575	9.282	9.175	8.299
HB-MW06	414118.658	5452386.362	12.42	12.326	11.435

Horizontal Datum: MGA2020
Vertical Datum: AHD83
Origin per RTK GNSS: SPM10554
Equipment: Trimble Total Station SPS930

APPENDIX C: HYDRAULIC CONDUCTIVITY TESTING ANALYSIS



FALLING HEAD 1

Data Set:

Date: 04/14/25

Time: 12:43:28

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: BH06-C-S

Test Date: 8/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.35 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

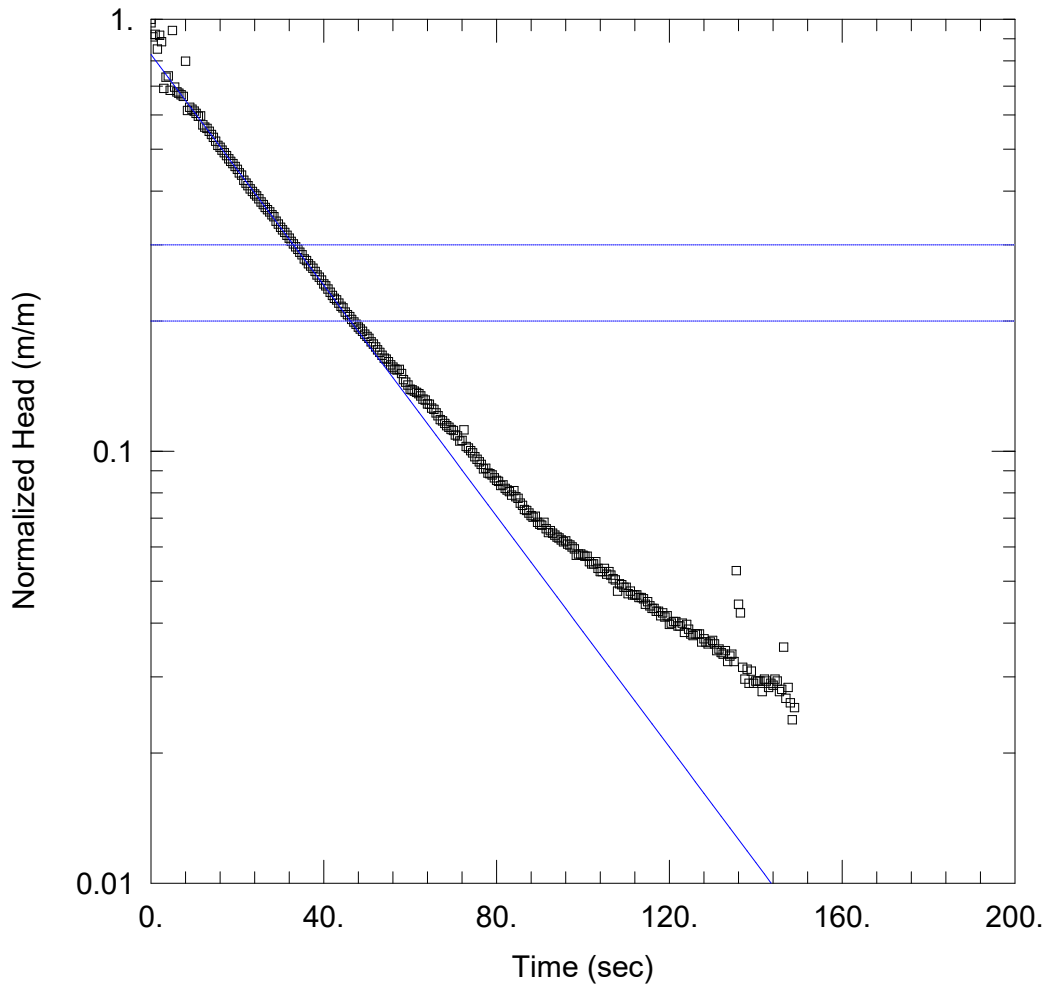
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.576$ m/day

$y_0 = 0.2338$ m



FALLING HEAD 2

Data Set: C:\Users\Desktop\marinus\BH06-C-S-FH2.aqt

Date: 04/14/25

Time: 12:52:59

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: BH06-C-S

Test Date: 8/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.31 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

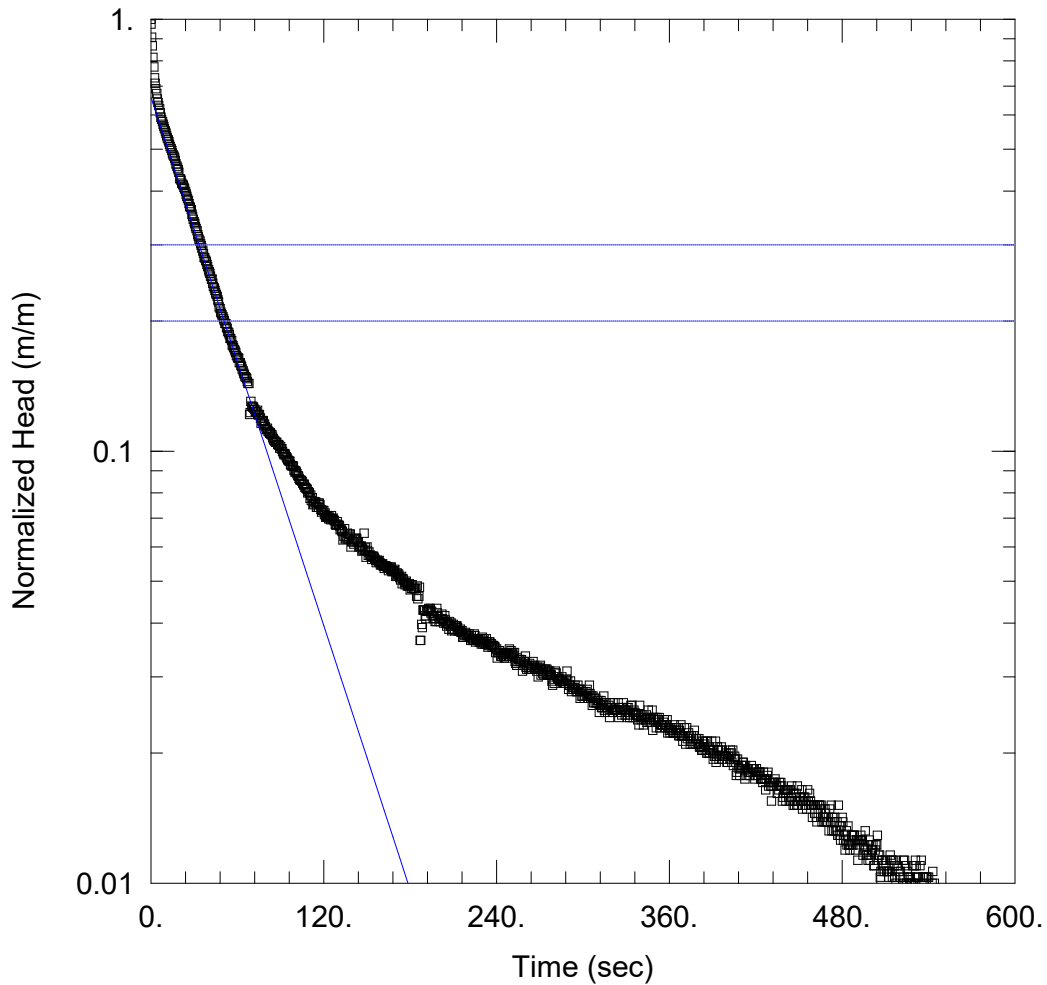
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.715$ m/day

$y_0 = 0.2568$ m



RISING HEAD 1

Data Set: C:\Users\Desktop\marinus\BH06-C-S-RH1.aqt

Date: 04/14/25

Time: 12:50:19

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: BH06-C-S

Test Date: 8/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.31 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

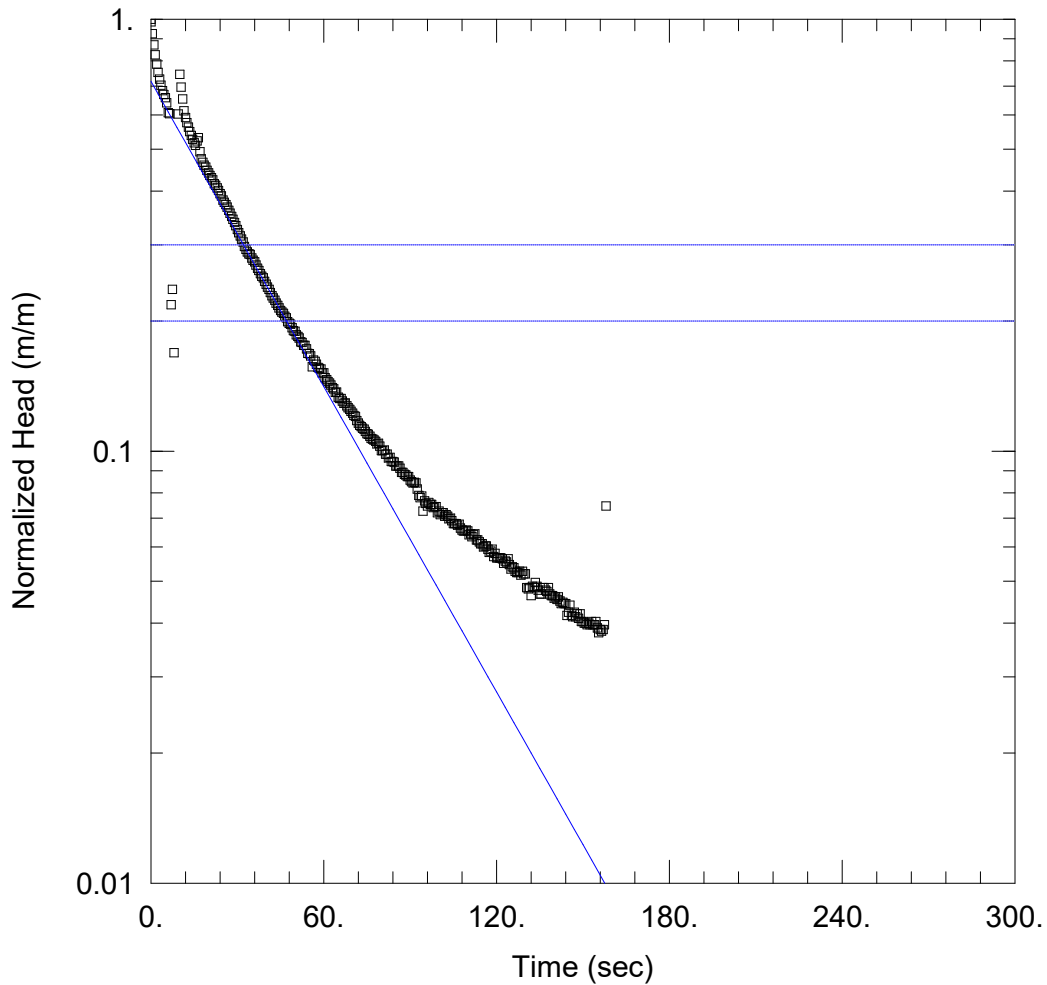
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.308$ m/day

$y_0 = 0.2042$ m



RISING HEAD 2

Data Set: C:\Users\Desktop\marinus\BH06-C-S-RH2.aqt

Date: 04/14/25

Time: 12:56:27

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: BH06-C-S

Test Date: 8/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.3 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

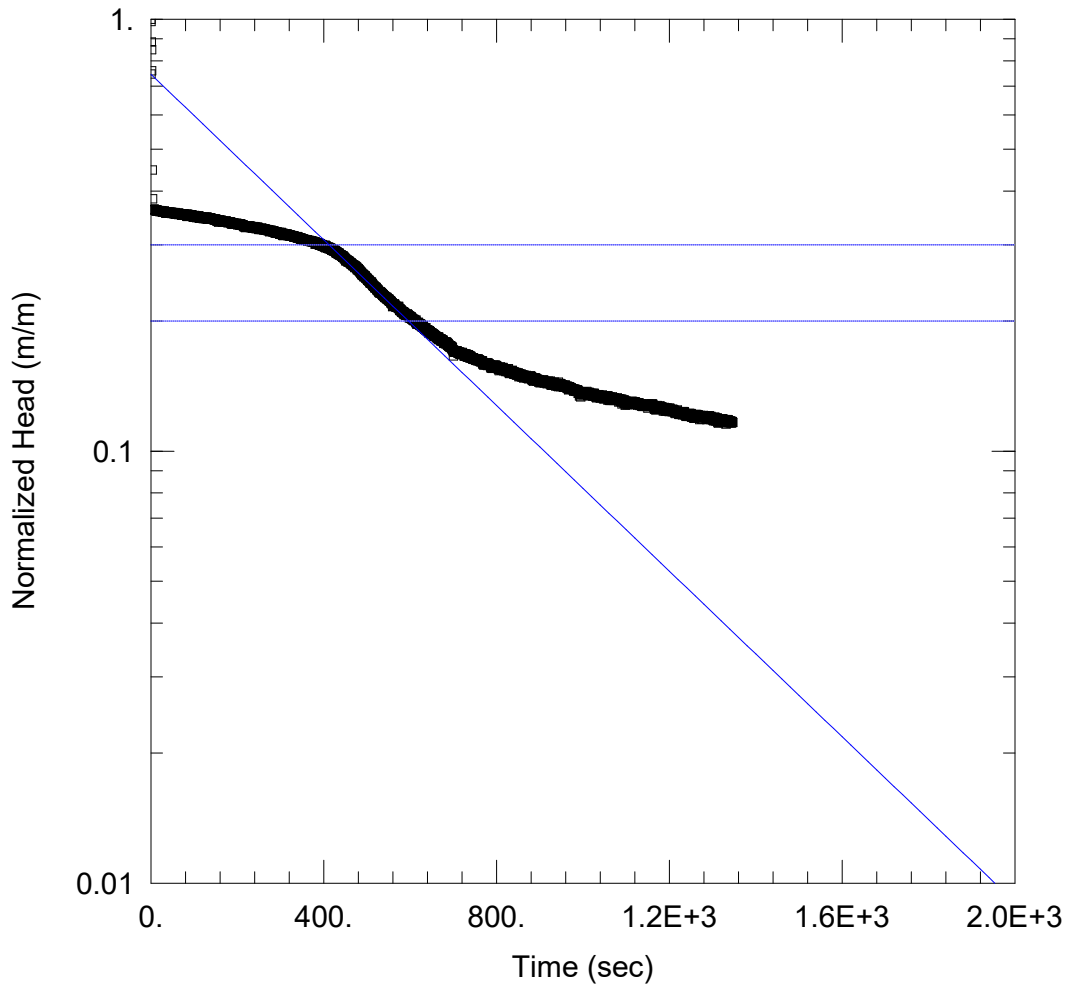
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 1.512$ m/day

$y_0 = 0.2151$ m



FALLING HEAD 1

Data Set: C:\Users\Desktop\marinus\MW02-FH1.aqt

Date: 04/14/25

Time: 13:59:46

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW02

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.31 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

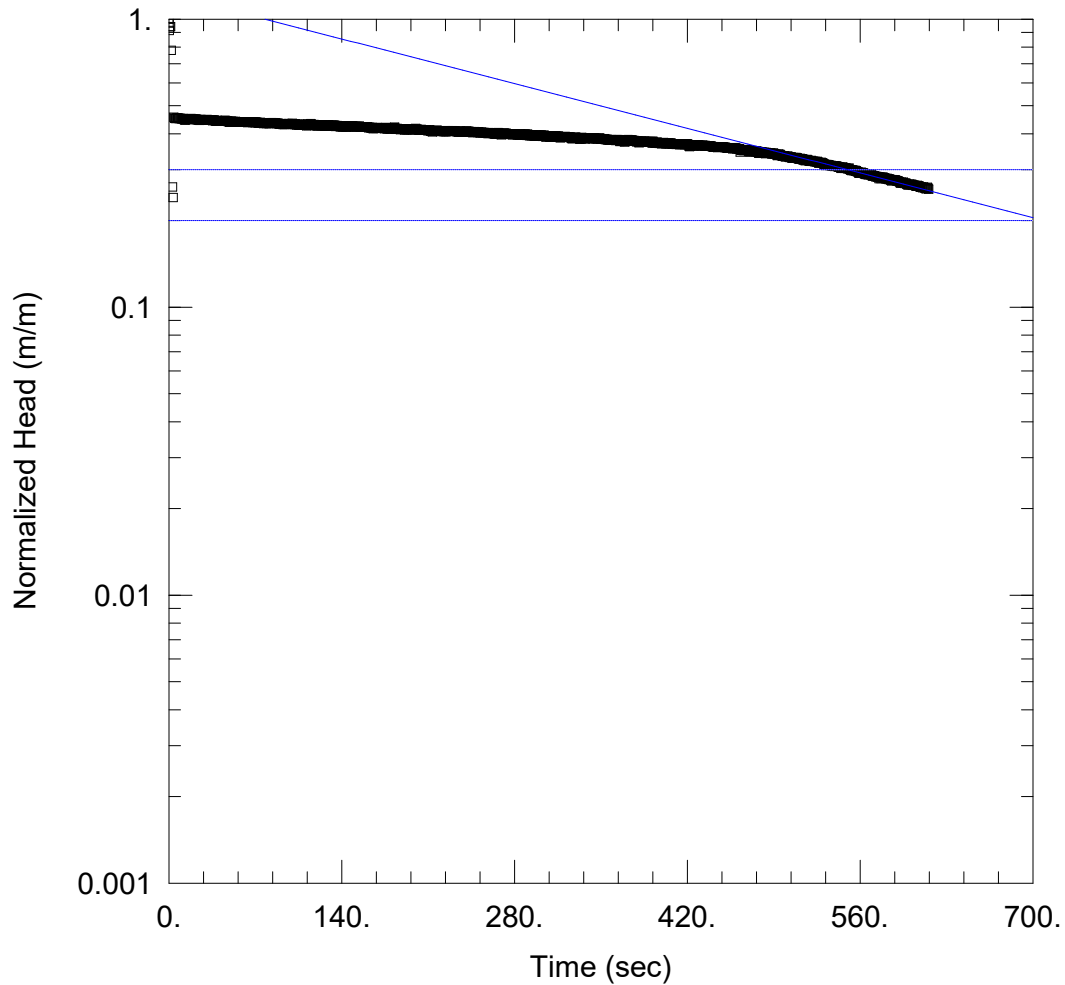
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.123$ m/day

$y_0 = 0.231$ m



FALLING HEAD 2

Data Set: C:\Users\Desktop\marinus\MW02-FH2.aqt

Date: 04/14/25

Time: 14:06:49

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW02

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.2 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

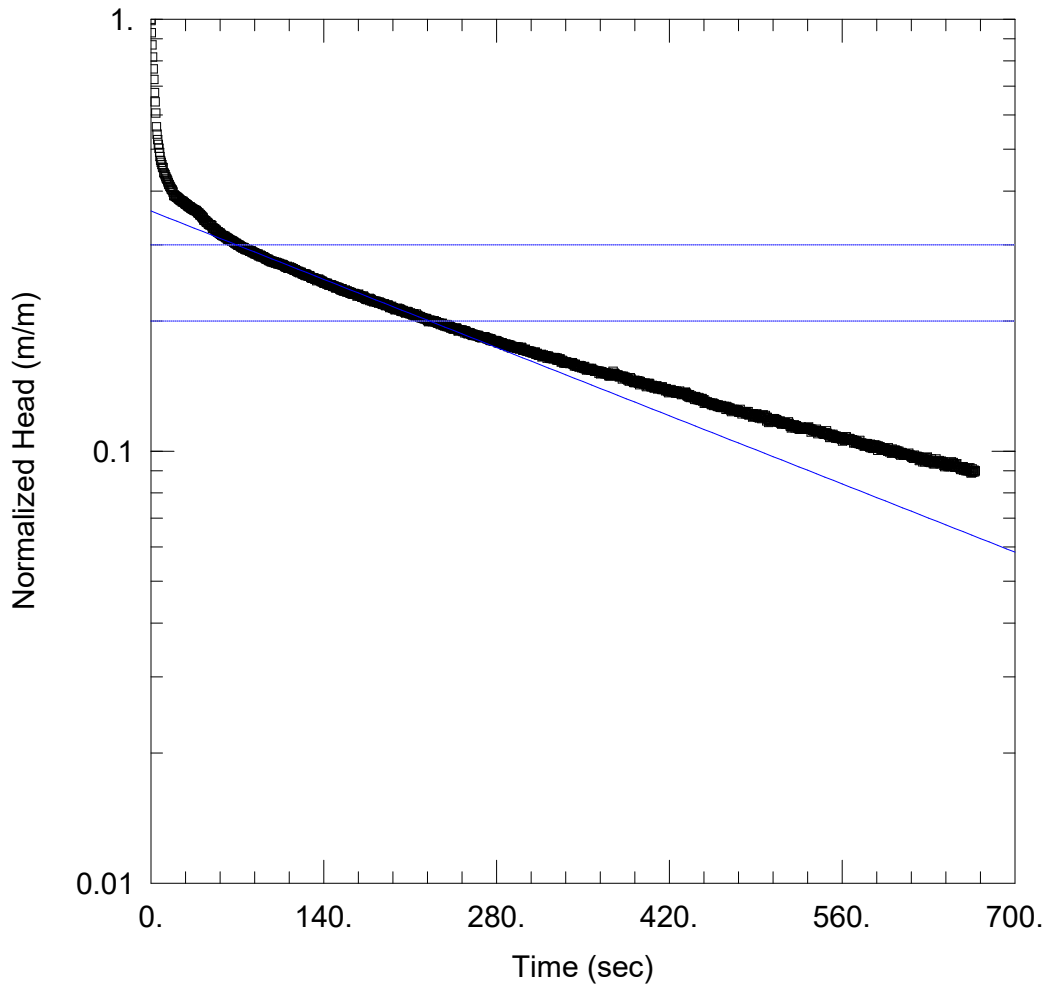
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.1422$ m/day

$y_0 = 0.2439$ m



RISING HEAD 1

Data Set: C:\Users\Desktop\marinus\MW02-RH1.aqt

Date: 04/14/25

Time: 14:02:50

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW02

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.29 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

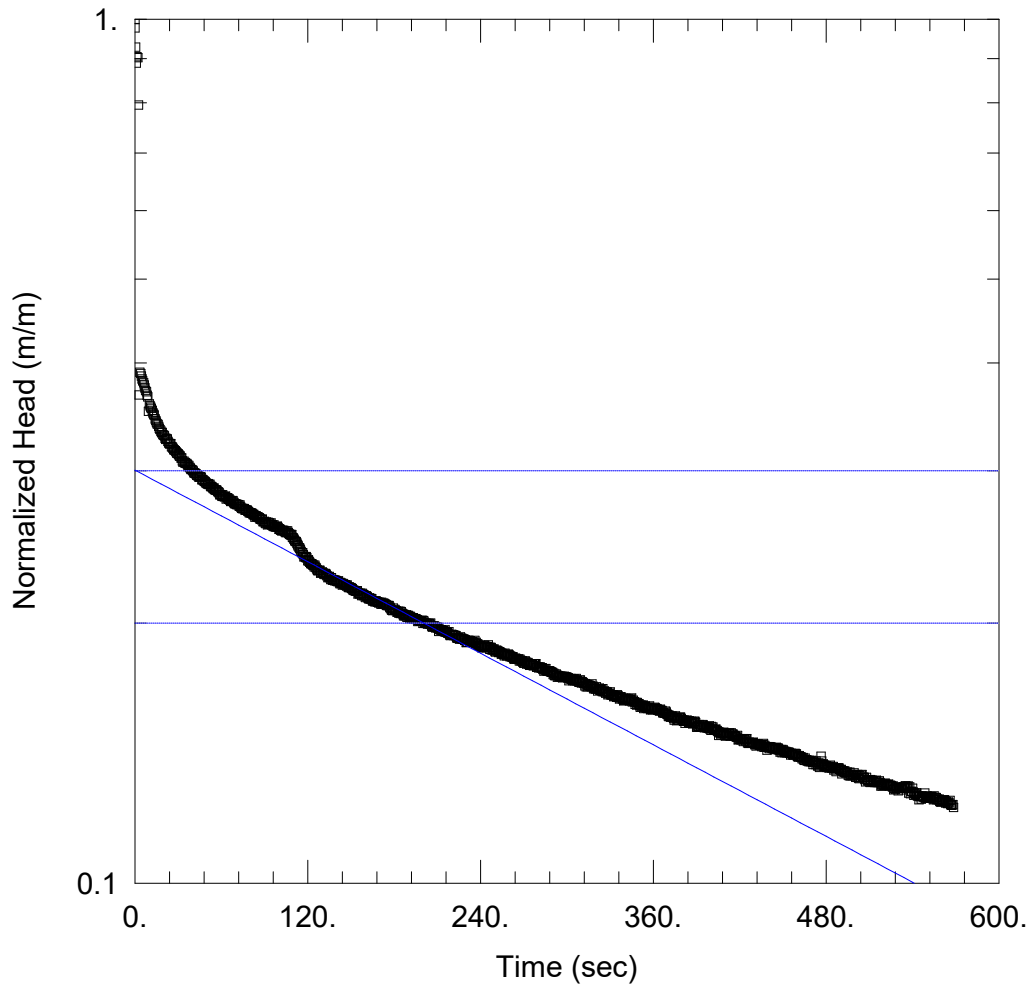
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.1448$ m/day

$y_0 = 0.1042$ m



RISING HEAD 2

Data Set: C:\Users\Desktop\marinus\MW02-RH2.aqt

Date: 04/14/25

Time: 14:08:52

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW02

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.39 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

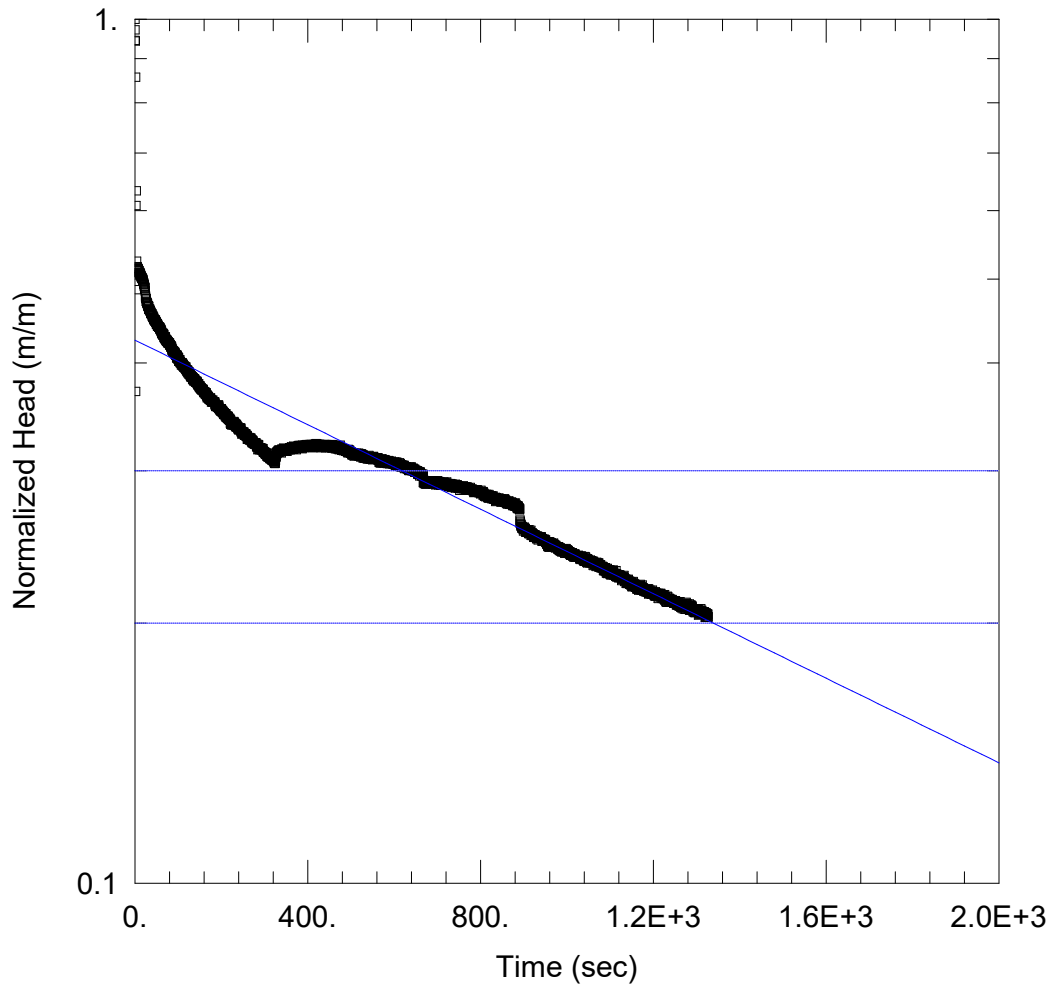
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.1134$ m/day

$y_0 = 0.1172$ m



FALLING HEAD 1

Data Set: C:\Users\Desktop\marinus\MW05-FH1.aqt

Date: 04/14/25

Time: 14:31:17

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW05

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1.8 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.23 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1.8 m

Screen Length: 1.8 m

Casing Radius: 0.025 m

Well Radius: 0.06 m

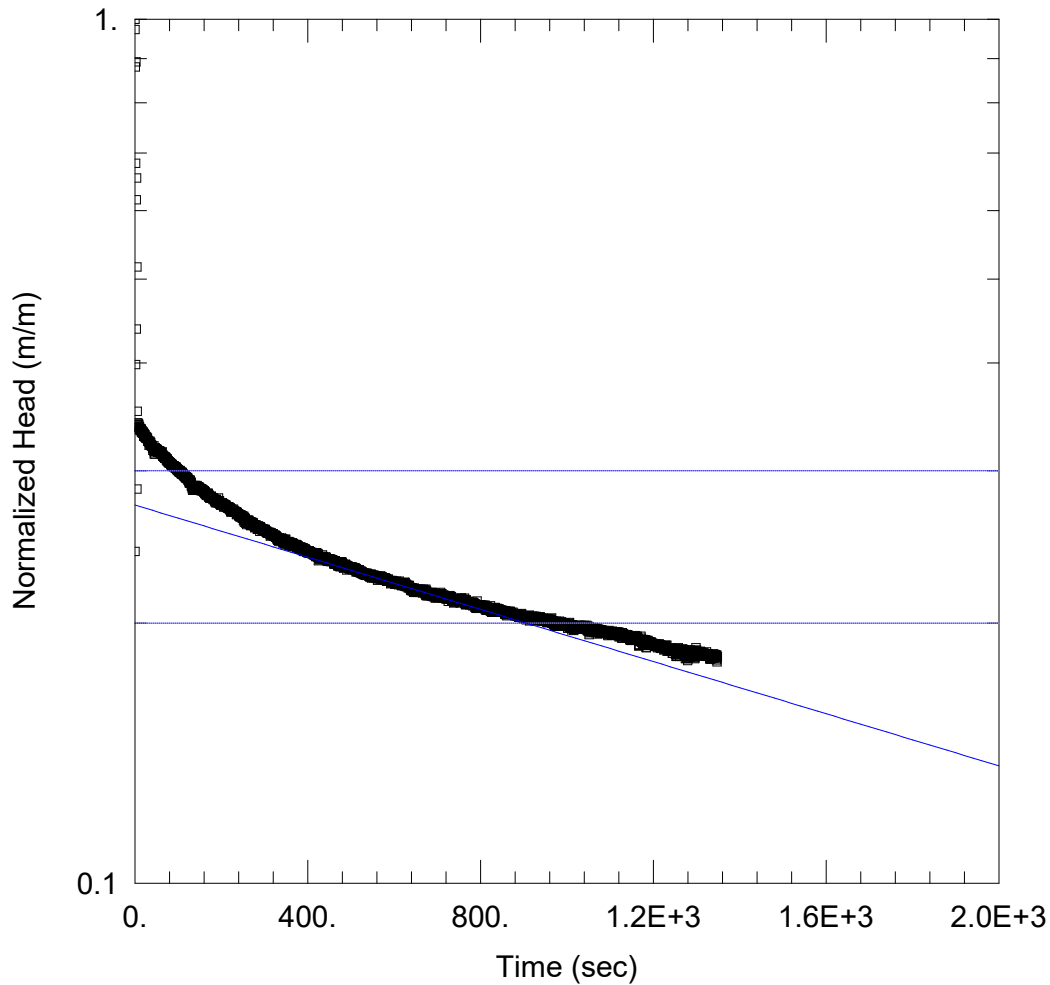
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.02171$ m/day

$y_0 = 0.09775$ m



FALLING HEAD 2

Data Set: C:\Users\Desktop\marinus\MW05-FH2.aqt

Date: 04/14/25

Time: 14:36:53

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW05

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1.8 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.33 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1.8 m

Screen Length: 1.8 m

Casing Radius: 0.025 m

Well Radius: 0.06 m

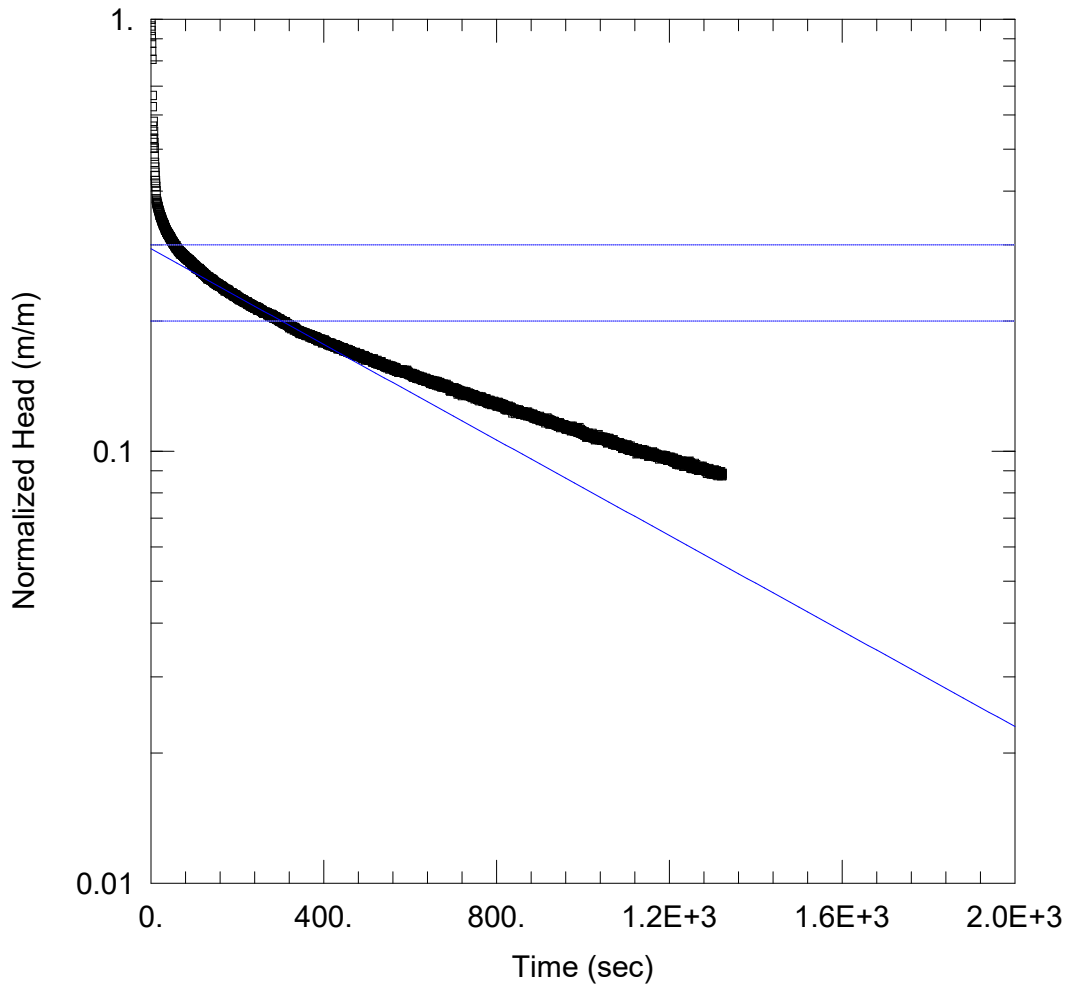
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0134$ m/day

$y_0 = 0.09038$ m



RISING HEAD 1

Data Set: C:\Users\Desktop\marinus\MW05-RH1.aqt

Date: 04/14/25

Time: 14:34:32

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW05

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1.8 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.27 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1.8 m

Screen Length: 1.8 m

Casing Radius: 0.025 m

Well Radius: 0.06 m

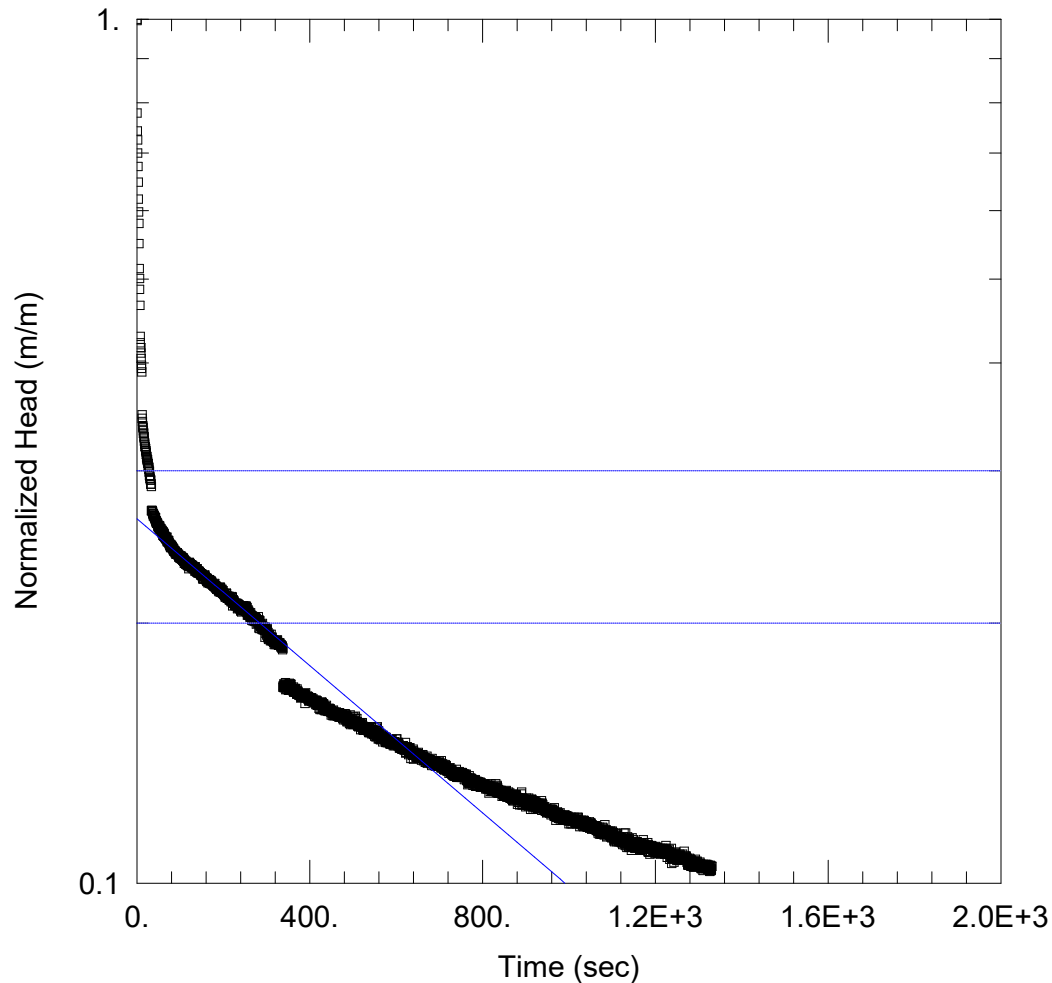
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.04909$ m/day

$y_0 = 0.07935$ m



RISING HEAD 2

Data Set: C:\Users\Desktop\marinus\MW05-RH2.aqt

Date: 04/14/25

Time: 14:39:01

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW05

Test Date: 9/4/25

AQUIFER DATA

Saturated Thickness: 1.8 m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.35 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1.8 m

Screen Length: 1.8 m

Casing Radius: 0.025 m

Well Radius: 0.06 m

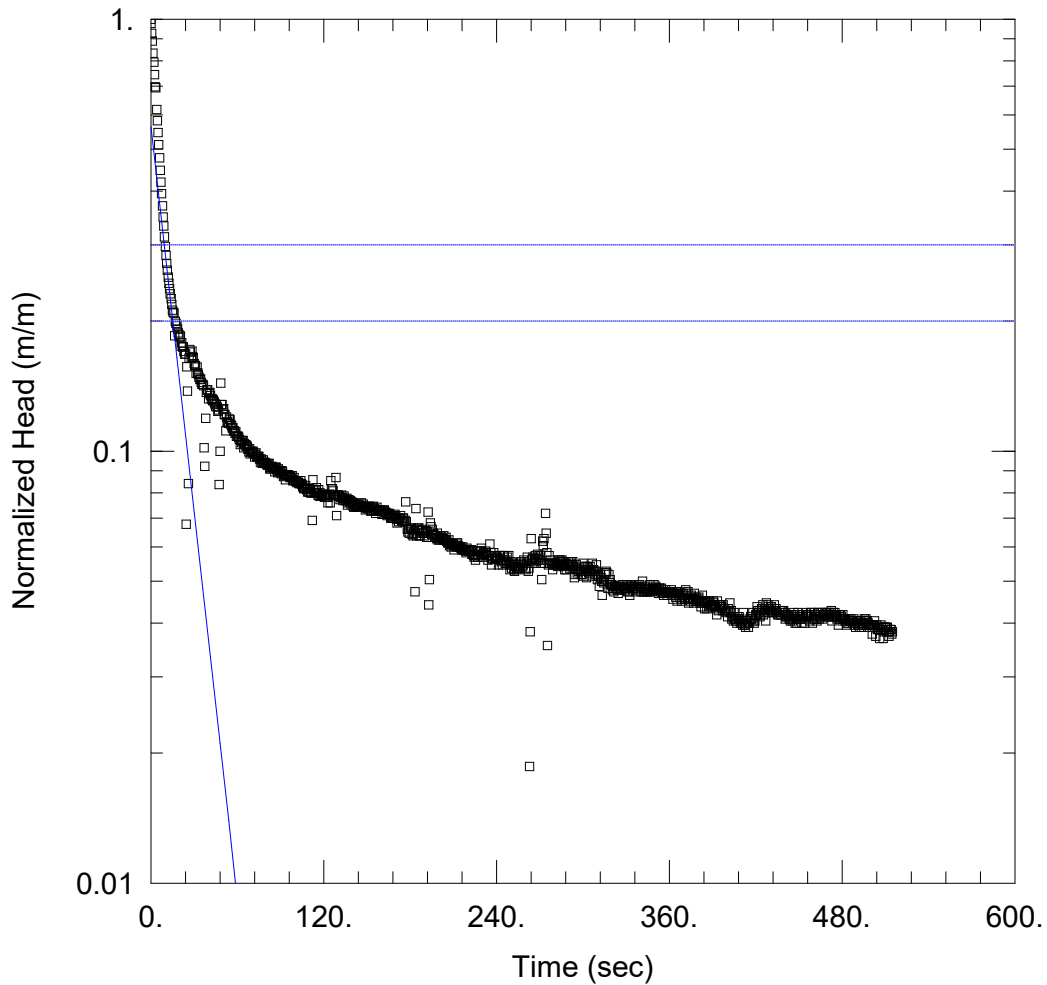
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.03778$ m/day

$y_0 = 0.09244$ m



RISING HEAD

Data Set: C:\Users\Desktop\marinus\MW06-RH1.aqt

Date: 04/14/25

Time: 15:30:26

PROJECT INFORMATION

Company: Tetra Tech Coffey

Client: Marinus Link

Project: 754-MELEN215878

Test Well: MW06

Test Date: 8/4/25

AQUIFER DATA

Saturated Thickness: 1. m

Anisotropy Ratio (K_z/K_r): 0.1

WELL DATA (New Well)

Initial Displacement: 0.22 m

Static Water Column Height: 1. m

Total Well Penetration Depth: 1. m

Screen Length: 1. m

Casing Radius: 0.025 m

Well Radius: 0.06 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 3.818$ m/day

$y_0 = 0.124$ m

APPENDIX D: LABORATORY REPORTS



CERTIFICATE OF ANALYSIS

Work Order : **EM2505846**
Client : **TETRA TECH COFFEY PTY LTD**
Contact : Theresa Pelayo
Address :
Telephone : ----
Project : 754-MELEN215878ML
Order number : 106
C-O-C number : ----
Sampler : Gil PonceRios
Site :
Quote number : EN/000
No. of samples received : 12
No. of samples analysed : 11

Page : 1 of 18
Laboratory : Environmental Division Melbourne
Contact : Graeme Jablonskas
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +6138549 9609
Date Samples Received : 07-Apr-2025 10:25
Date Analysis Commenced : 08-Apr-2025
Issue Date : 09-Apr-2025 18:00



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK059G: EM2505846 #3 Sample required dilution for Nitrite and Nitrate as N (NOx) prior to analysis due to sample matrix. LOR has been raised accordingly.
- EK055G/EK061G: EM2505846 #9. It has been noted that Ammonia is greater than Total Kjeldahl Nitrogen (TKN), however this difference is within the limits of experimental variation.
- EA015H: EM2505846 #2-3 and #5: TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EK057G: EM2505846 #3 and #5, Sample required dilution prior to Nitrite as N analysis due to sample matrix. LOR value has been adjusted accordingly.
- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenzo(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20mL or 125mL bottles have been tested in accordance with the QSM5.4 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EA015H: EM2505846 #5: TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #5 due to analytes not quantified in this report.
- EP0075(SIM): Bias high surrogate deemed acceptable due to relevant samples are less than LOR.
- EG020-F : EM2505846 #3 has been diluted prior to Metals analysis due to sample matrix. LOR values have been adjusted accordingly.
- EG035F: EM2505846 #3, a dilution was required prior to analysis due to sample matrix. LOR has been raised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-MW05	Tunnel	HB-MW02	HB-BH02-C	HB-BH01-C
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-001	EM2505846-002	EM2505846-003	EM2505846-004	EM2505846-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.26	6.56	6.98	6.68	4.91
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1000	998	2560	547	1580
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	779	860	10600	348	1450
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	322	1070	189	<1
Total Alkalinity as CaCO3	----	1	mg/L	<1	322	1070	189	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	396	179	576	55	980
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	92	91	97	32	48
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	70	170	44	8	37
Magnesium	7439-95-4	1	mg/L	27	18	24	10	122
Sodium	7440-23-5	1	mg/L	79	75	793	105	79
Potassium	7440-09-7	1	mg/L	16	11	13	7	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.38	<0.01	25.2	0.19	1.44
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.044	0.011	0.009
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.010	<0.001	0.002
Barium	7440-39-3	0.001	mg/L	0.050	0.008	0.128	0.018	0.032
Cadmium	7440-43-9	0.0001	mg/L	0.0002	<0.0001	<0.0010	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.164	0.003	0.005
Cobalt	7440-48-4	0.001	mg/L	0.013	<0.001	<0.010	0.001	0.108



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-MW05	Tunnel	HB-MW02	HB-BH02-C	HB-BH01-C
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-001	EM2505846-002	EM2505846-003	EM2505846-004	EM2505846-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Copper	7440-50-8	0.001	mg/L	0.010	<0.001	<0.010	0.003	0.001
Lead	7439-92-1	0.001	mg/L	0.002	<0.001	<0.010	0.002	<0.001
Manganese	7439-96-5	0.001	mg/L	1.15	0.754	0.554	0.101	1.42
Nickel	7440-02-0	0.001	mg/L	0.027	0.002	0.070	0.002	0.206
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.10	<0.01	<0.01
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.10	0.02	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.10	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.228	0.026	0.068	0.009	0.287
Boron	7440-42-8	0.05	mg/L	0.11	0.05	<0.10	0.07	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0010	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.30	1.04	2.39	0.19	0.46
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	<0.05
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.14	0.11	<0.20	0.07	<0.05
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.14	0.11	<0.20	0.07	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.7	9.5	48.6	0.6	0.9
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.8	9.6	48.6	0.7	0.9
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.01	3.19	8.24	0.04	0.11
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	10.8	12.7	36.1	5.82	21.8
∅ Total Cations	----	0.01	meq/L	9.56	13.5	39.0	5.97	15.5

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HB-MW05	Tunnel	HB-MW02	HB-BH02-C	HB-BH01-C
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	
Compound	CAS Number	LOR	Unit	EM2505846-001	EM2505846-002	EM2505846-003	EM2505846-004	EM2505846-005	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
ø Ionic Balance	----	0.01	%	6.27	2.98	3.85	1.22	16.7	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20	
C10 - C14 Fraction	----	50	µg/L	<50	50	60	<50	<50	
C15 - C28 Fraction	----	100	µg/L	100	130	340	520	110	
C29 - C36 Fraction	----	50	µg/L	<50	110	90	100	<50	
^ C10 - C36 Fraction (sum)	----	50	µg/L	100	290	490	620	110	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-MW05	Tunnel	HB-MW02	HB-BH02-C	HB-BH01-C
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-001	EM2505846-002	EM2505846-003	EM2505846-004	EM2505846-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	120	200	380	530	140
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	120	200	380	530	140
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.02	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.06	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HB-MW05	Tunnel	HB-MW02	HB-BH02-C	HB-BH01-C
Sampling date / time					04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit		EM2505846-001	EM2505846-002	EM2505846-003	EM2505846-004	EM2505846-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	0.10
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	0.08	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	0.11	<0.01	0.10
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		32.9	32.2	20.8	34.7	36.4
2-Chlorophenol-D4	93951-73-6	1.0	%		81.7	84.4	53.1	90.2	91.7
2,4,6-Tribromophenol	118-79-6	1.0	%		86.3	91.5	60.3	110	94.6
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		97.8	110	61.1	114	112
Anthracene-d10	1719-06-8	1.0	%		96.0	104	59.4	111	110
4-Terphenyl-d14	1718-51-0	1.0	%		102	109	61.6	110	119
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		115	112	116	109	111
Toluene-D8	2037-26-5	2	%		114	115	114	113	112
4-Bromofluorobenzene	460-00-4	2	%		113	115	114	108	112
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		102	98.1	83.6	101	99.2
13C8-PFOA	----	0.02	%		112	97.4	98.1	97.3	116



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-BH06(S)-C	HB-BH06-C	HB-MW06	HB-BH03-C	QC01
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-006	EM2505846-007	EM2505846-008	EM2505846-009	EM2505846-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.61	4.98	5.95	5.75	5.72
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	346	330	544	353	341
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	222	242	370	198	194
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	17	<1	40	27	26
Total Alkalinity as CaCO3	----	1	mg/L	17	<1	40	27	26
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	87	82	168	15	15
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	37	44	38	80	79
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	8	4	48	5	4
Magnesium	7439-95-4	1	mg/L	12	13	9	11	12
Sodium	7440-23-5	1	mg/L	36	36	54	43	44
Potassium	7440-09-7	1	mg/L	4	3	17	3	3
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.08	0.14	0.05	<0.01	<0.01
Arsenic	7440-38-2	0.001	mg/L	0.003	0.013	0.002	<0.001	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	0.032	0.028	0.020	0.010	0.010
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.002	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L	0.001	0.001	0.008	0.011	0.011



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-BH06(S)-C	HB-BH06-C	HB-MW06	HB-BH03-C	QC01
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-006	EM2505846-007	EM2505846-008	EM2505846-009	EM2505846-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.008	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	0.004	0.002	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	0.058	0.039	0.899	0.232	0.231
Nickel	7440-02-0	0.001	mg/L	0.006	0.004	0.008	0.006	0.006
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	7440-32-6	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.022	0.025	0.095	0.007	0.008
Boron	7440-42-8	0.05	mg/L	0.06	<0.05	0.13	<0.05	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.03	<0.01	1.37	0.24	0.18
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.10	0.14	0.02	0.03
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.10	0.15	0.02	0.03
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.1	2.3	0.2	0.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.4	0.2	2.4	0.2	0.3
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.21	0.02	0.11	0.01	0.02
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.19	2.95	5.37	3.11	3.06
∅ Total Cations	----	0.01	meq/L	3.06	2.91	5.92	3.10	3.18

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	HB-BH06(S)-C	HB-BH06-C	HB-MW06	HB-BH03-C	QC01
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	
Compound	CAS Number	LOR	Unit	EM2505846-006	EM2505846-007	EM2505846-008	EM2505846-009	EM2505846-010	
				Result	Result	Result	Result	Result	
EN055: Ionic Balance - Continued									
ø Ionic Balance	----	0.01	%	2.24	----	4.88	0.10	1.88	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20	
C10 - C14 Fraction	----	50	µg/L	<50	<50	100	<50	<50	
C15 - C28 Fraction	----	100	µg/L	<100	230	710	150	130	
C29 - C36 Fraction	----	50	µg/L	<50	100	200	60	<50	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	330	1010	210	130	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-BH06(S)-C	HB-BH06-C	HB-MW06	HB-BH03-C	QC01
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-006	EM2505846-007	EM2505846-008	EM2505846-009	EM2505846-010
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	120	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	320	840	190	160
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	320	960	190	160
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	120	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.10	0.13	<0.01	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.15	0.18	<0.01	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.04	0.05	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.04	0.06	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				HB-BH06(S)-C	HB-BH06-C	HB-MW06	HB-BH03-C	QC01
Sampling date / time				04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00	04-Apr-2025 00:00
Compound	CAS Number	LOR	Unit	EM2505846-006	EM2505846-007	EM2505846-008	EM2505846-009	EM2505846-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.02	<0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.25	0.31	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.35	0.46	<0.01	<0.01	<0.01
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	37.0	33.4	37.8	40.6	34.3
2-Chlorophenol-D4	93951-73-6	1.0	%	91.0	72.6	95.4	103	88.1
2,4,6-Tribromophenol	118-79-6	1.0	%	97.3	101	106	112	105
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	114	100	116	129	108
Anthracene-d10	1719-06-8	1.0	%	115	106	115	131	107
4-Terphenyl-d14	1718-51-0	1.0	%	122	110	122	136	115
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	106	111	114	110	106
Toluene-D8	2037-26-5	2	%	111	115	111	114	117
4-Bromofluorobenzene	460-00-4	2	%	109	111	110	112	112
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	103	104	105	105	101
13C8-PFOA	----	0.02	%	116	115	113	111	110



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
Sampling date / time					04-Apr-2025 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2505846-011	-----	-----	-----	-----
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		5.89	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		<10	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<1	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		<1	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L		<1	----	----	----	----
Sodium	7440-23-5	1	mg/L		<1	----	----	----	----
Potassium	7440-09-7	1	mg/L		<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
Sampling date / time					04-Apr-2025 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2505846-011	-----	-----	-----	-----
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Copper	7440-50-8	0.001	mg/L		<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	----	----	----	----
Titanium	7440-32-6	0.01	mg/L		<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		<0.01	----	----	----	----
ø Total Cations	----	0.01	meq/L		<0.01	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
Sampling date / time					04-Apr-2025 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2505846-011	-----	-----	-----	-----
					Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L		<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	----	----	----	----
Dibenz(a,h)anthracene	53-70-3	1.0	µg/L		<1.0	----	----	----	----
Benzo(g,h,i)perylene	191-24-2	1.0	µg/L		<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	-----	0.5	µg/L		<0.5	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	-----	0.5	µg/L		<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	-----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	-----	50	µg/L		<50	----	----	----	----
C15 - C28 Fraction	-----	100	µg/L		160	----	----	----	----
C29 - C36 Fraction	-----	50	µg/L		70	----	----	----	----
^ C10 - C36 Fraction (sum)	-----	50	µg/L		230	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
Sampling date / time					04-Apr-2025 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2505846-011	-----	-----	-----	-----
					Result	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		170	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		170	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ Total Xylenes	----	2	µg/L		<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		<0.01	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QC03	----	----	----	----
Sampling date / time					04-Apr-2025 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2505846-011	-----	-----	-----	-----
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		37.3	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		93.6	----	----	----	----
2,4,6-Tribromophenol	118-79-6	1.0	%		97.3	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		118	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%		118	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		122	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		106	----	----	----	----
Toluene-D8	2037-26-5	2	%		119	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		113	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		104	----	----	----	----
13C8-PFOA	----	0.02	%		107	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2,4,6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

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[illegible]

Tetra Tech Coffey Pty Ltd VIC
Level 11, 2 Riverside Quay,
Southbank
VIC 3006



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 equivalence of testing, medical testing, calibration,
 inspection, proficiency testing scheme providers and
 reference materials producers reports and certificates.

Attention: **Theresa Pelayo**

Report **1207152-W**
 Project name **MLPL HEYBRIDGE**
 Project ID **754-MELEN215878ML**
 Received Date **Apr 08, 2025**

Client Sample ID			QC02
Sample Matrix			Water
Eurofins Sample No.			M25- Ap0022624
Date Sampled			Apr 04, 2025
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{*N01}	0.05	mg/L	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	99
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	0.001	mg/L	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001
Anthracene	0.001	mg/L	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001
Benzo(b&j)fluoranthene ^{N07}	0.001	mg/L	< 0.001
Benzo(g,h,i)perylene	0.001	mg/L	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001
Chrysene	0.001	mg/L	< 0.001
Dibenz(a,h)anthracene	0.001	mg/L	< 0.001
Fluoranthene	0.001	mg/L	< 0.001
Fluorene	0.001	mg/L	< 0.001

Client Sample ID			QC02
Sample Matrix			Water
Eurofins Sample No.			M25- Ap0022624
Date Sampled			Apr 04, 2025
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001
Naphthalene	0.001	mg/L	< 0.001
Phenanthrene	0.001	mg/L	< 0.001
Pyrene	0.001	mg/L	< 0.001
Total PAH*	0.001	mg/L	< 0.001
2-Fluorobiphenyl (surr.)	1	%	52
p-Terphenyl-d14 (surr.)	1	%	54
Ammonia (as N)	0.01	mg/L	0.68
Chloride	1	mg/L	49
Conductivity (at 25 °C)	10	uS/cm	1200
Nitrate & Nitrite (as N)	0.05	mg/L	0.22
Nitrate (as N)	0.02	mg/L	0.21
Nitrite (as N)	0.02	mg/L	< 0.02
Organic Nitrogen (as N)*	0.2	mg/L	1.32
pH (at 25 °C)	0.1	pH Units	4.6
Sulphate (as SO4)	5	mg/L	640
Total Dissolved Solids Dried at 180 °C ± 2 °C	10	mg/L	1000
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	2.0
Total Nitrogen (as N)*	0.2	mg/L	2.2
Phosphate total (as P)	0.01	mg/L	< 0.01
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	< 20
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20
Total Alkalinity (as CaCO3)	20	mg/L	< 20
Heavy Metals			
Aluminium (filtered)	0.05	mg/L	4.3
Arsenic (filtered)	0.001	mg/L	0.002
Barium (filtered)	0.02	mg/L	0.02
Beryllium (filtered)	0.001	mg/L	0.002
Boron (filtered)	0.05	mg/L	< 0.05
Cadmium (filtered)	0.0002	mg/L	< 0.0002
Chromium (filtered)	0.001	mg/L	0.004
Cobalt (filtered)	0.001	mg/L	0.047
Copper (filtered)	0.001	mg/L	0.003
Lead (filtered)	0.001	mg/L	< 0.001
Manganese (filtered)	0.005	mg/L	0.74
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	0.086
Selenium (filtered)	0.001	mg/L	< 0.001
Titanium (filtered)	0.005	mg/L	< 0.005
Vanadium (filtered)	0.005	mg/L	< 0.005
Zinc (filtered)	0.005	mg/L	0.15
Alkali Metals			
Calcium	0.5	mg/L	35
Magnesium	0.5	mg/L	66
Potassium	0.5	mg/L	7.5
Sodium	0.5	mg/L	46

Client Sample ID			QC02
Sample Matrix			Water
Eurofins Sample No.			M25- Ap0022624
Date Sampled			Apr 04, 2025
Test/Reference	LOR	Unit	
Per- and Polyfluoroalkyl Substances (PFASs) - Short			
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05
13C2-6:2 FTSA (surr.)	1	%	86
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01
18O2-PFHxS (surr.)	1	%	81
13C8-PFOS (surr.)	1	%	107
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01
13C8-PFOA (surr.)	1	%	78
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B4			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Apr 08, 2025	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 08, 2025	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Apr 08, 2025	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Apr 08, 2025	14 Days
- Method: LTM-ORG-2010 BTEX and Volatile TRH			
Polycyclic Aromatic Hydrocarbons	Melbourne	Apr 08, 2025	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P			
Ammonia (as N)	Melbourne	Apr 08, 2025	28 Days
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Nitrate & Nitrite (as N)	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrate (as N)	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrite (as N)	Melbourne	Apr 08, 2025	2 Days
- Method: LTM-INO-4450 Nitrogens by Discrete Analyser			
Organic Nitrogen (as N)*	Melbourne	Apr 08, 2025	7 Days
- Method: APHA 4500 Organic Nitrogen (N)			
Total Kjeldahl Nitrogen (as N)	Melbourne	Apr 08, 2025	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			
Eurofins Suite B11E: Cl/SO4/Alkalinity			
Chloride	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO4)	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Apr 08, 2025	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Conductivity (at 25 °C)	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4030 Conductivity			
pH (at 25 °C)	Melbourne	Apr 08, 2025	6 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Phosphate total (as P)	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Melbourne	Apr 08, 2025	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Mobil Metals : Metals M15	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Apr 08, 2025	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Per- and Polyfluoroalkyl Substances (PFASs) - Short	Melbourne	Apr 09, 2025	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Total Dissolved Solids Dried at 180 °C ± 2 °C	Melbourne	Apr 08, 2025	28 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			



Melbourne 6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079
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Perth 46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370 & 2554
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Auckland 35 O'Rorke Road Penrose Auckland 1061 +64 9 526 4551 IANZ# 1327	Auckland (Focus) Unit C1/4 Pacific Rise Mount Wellington Auckland 1061 +64 9 525 0568 IANZ# 1308	Christchurch 43 Detroit Drive Rolleston Christchurch 7675 +64 3 343 5201 IANZ# 1290	Tauranga 1277 Cameron Road Gate Pa Tauranga 3112 +64 9 525 0568 IANZ# 1402
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Company Name:

Address:

Project Name:

Project ID:

Facility Code:

Tetra Tech Coffey Pty Ltd VIC

Level 11, 2 Riverside Quay,
Southbank
VIC 3006

MLPL HEYBRIDGE

754-MELEN215878ML

Order No.:

Report #:

Phone:

Fax:

1207152

03 9290 7000

Received:

Due:

Priority:

Contact Name:

Apr 8, 2025 4:46 PM

Apr 9, 2025

1 Day

Theresa Pelayo

Eurofins Analytical Services Manager : Onur Mehmet

Sample Detail						Aluminium (filtered)	Arsenic (filtered)	Barium (filtered)	Beryllium (filtered)	Boron (filtered)	Cadmium (filtered)	Chromium (filtered)	Cobalt (filtered)	Conductivity (at 25 °C)	Copper (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	pH (at 25 °C)	Phosphate total (as P)	Selenium (filtered)	Titanium (filtered)	Vanadium (filtered)	Zinc (filtered)	Eurofins Suite B4	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoralkyl Substances (PFASs) - Short	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180 °C ± 2 °C
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
External Laboratory																															
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID																										
1	QC02	Apr 04, 2025		Water	M25-Ap0022624	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ppm: parts per million
µg/L: micrograms per litre	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	Colour: Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g,h,i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a,h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1,2,3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Conductivity (at 25 °C)	uS/cm	< 10			10	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180 °C ± 2 °C	mg/L	< 10			10	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Method Blank							
Heavy Metals							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Aluminium (filtered)	mg/L	< 0.05			0.05	Pass	
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Barium (filtered)	mg/L	< 0.02			0.02	Pass	
Beryllium (filtered)	mg/L	< 0.001			0.001	Pass	
Boron (filtered)	mg/L	< 0.05			0.05	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Cobalt (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Manganese (filtered)	mg/L	< 0.005			0.005	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Selenium (filtered)	mg/L	< 0.001			0.001	Pass	
Titanium (filtered)	mg/L	< 0.005			0.005	Pass	
Vanadium (filtered)	mg/L	< 0.005			0.005	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Per- and Polyfluoroalkyl Substances (PFASs) - Short							
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	94			70-130	Pass	
TRH C10-C14	%	83			70-130	Pass	
TRH C6-C10	%	94			70-130	Pass	
TRH >C10-C16	%	83			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	100			70-130	Pass	
Toluene	%	76			70-130	Pass	
Ethylbenzene	%	95			70-130	Pass	
m&p-Xylenes	%	87			70-130	Pass	
Xylenes - Total*	%	86			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	90			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	70			70-130	Pass	
Acenaphthylene	%	74			70-130	Pass	
Anthracene	%	107			70-130	Pass	
Benz(a)anthracene	%	75			70-130	Pass	
Benzo(a)pyrene	%	76			70-130	Pass	
Benzo(b&j)fluoranthene	%	74			70-130	Pass	
Benzo(g,h,i)perylene	%	80			70-130	Pass	

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(k)fluoranthene				%	88			70-130	Pass	
Chrysene				%	80			70-130	Pass	
Dibenz(a,h)anthracene				%	77			70-130	Pass	
Fluoranthene				%	75			70-130	Pass	
Fluorene				%	75			70-130	Pass	
Indeno(1,2,3-cd)pyrene				%	81			70-130	Pass	
Naphthalene				%	79			70-130	Pass	
Phenanthrene				%	106			70-130	Pass	
Pyrene				%	82			70-130	Pass	
LCS - % Recovery										
Ammonia (as N)				%	94			70-130	Pass	
Chloride				%	106			70-130	Pass	
Conductivity (at 25 °C)				%	98			70-130	Pass	
Nitrate & Nitrite (as N)				%	95			70-130	Pass	
Nitrite (as N)				%	77			70-130	Pass	
Sulphate (as SO4)				%	110			70-130	Pass	
Total Dissolved Solids Dried at 180 °C ± 2 °C				%	94			70-130	Pass	
Total Kjeldahl Nitrogen (as N)				%	91			70-130	Pass	
Phosphate total (as P)				%	94			70-130	Pass	
LCS - % Recovery										
Alkalinity (speciated)										
Carbonate Alkalinity (as CaCO3)				%	95			70-130	Pass	
Total Alkalinity (as CaCO3)				%	96			70-130	Pass	
LCS - % Recovery										
Alkali Metals										
Calcium				%	97			80-120	Pass	
Magnesium				%	103			80-120	Pass	
Potassium				%	101			80-120	Pass	
Sodium				%	90			80-120	Pass	
LCS - % Recovery										
Per- and Polyfluoroalkyl Substances (PFASs) - Short										
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)				%	123			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)				%	108			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)				%	109			50-150	Pass	
Perfluorooctanoic acid (PFOA)				%	102			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Total Recoverable Hydrocarbons					Result 1					
TRH C6-C9	M25-Ap0021918	NCP	%	74				70-130	Pass	
TRH C10-C14	M25-Ap0021818	NCP	%	80				70-130	Pass	
TRH C6-C10	M25-Ap0021918	NCP	%	72				70-130	Pass	
TRH >C10-C16	M25-Ap0021818	NCP	%	79				70-130	Pass	
Spike - % Recovery										
BTEX					Result 1					
Benzene	M25-Ap0021918	NCP	%	78				70-130	Pass	
Toluene	M25-Ap0021918	NCP	%	81				70-130	Pass	
Ethylbenzene	M25-Ap0021918	NCP	%	84				70-130	Pass	
m&p-Xylenes	M25-Ap0021918	NCP	%	76				70-130	Pass	
o-Xylene	M25-Ap0021918	NCP	%	78				70-130	Pass	
Xylenes - Total*	M25-Ap0021918	NCP	%	77				70-130	Pass	
Spike - % Recovery										
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					Result 1					
Naphthalene	M25-Ap0021918	NCP	%	124				70-130	Pass	
Spike - % Recovery										

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M25-Ap0010730	NCP	%	121			70-130	Pass	
Acenaphthylene	M25-Ap0010730	NCP	%	116			70-130	Pass	
Anthracene	M25-Ap0010730	NCP	%	101			70-130	Pass	
Benz(a)anthracene	M25-Ap0010730	NCP	%	100			70-130	Pass	
Benzo(a)pyrene	M25-Ap0010730	NCP	%	120			70-130	Pass	
Benzo(b&j)fluoranthene	M25-Ap0010730	NCP	%	123			70-130	Pass	
Benzo(g,h,i)perylene	M25-Ap0010730	NCP	%	107			70-130	Pass	
Benzo(k)fluoranthene	M25-Ap0010730	NCP	%	96			70-130	Pass	
Chrysene	M25-Ap0010730	NCP	%	108			70-130	Pass	
Dibenz(a,h)anthracene	M25-Ap0010730	NCP	%	122			70-130	Pass	
Fluoranthene	M25-Ap0010730	NCP	%	125			70-130	Pass	
Fluorene	M25-Ap0010730	NCP	%	117			70-130	Pass	
Indeno(1,2,3-cd)pyrene	M25-Ap0010730	NCP	%	105			70-130	Pass	
Naphthalene	M25-Ap0010730	NCP	%	91			70-130	Pass	
Phenanthrene	M25-Ap0010730	NCP	%	92			70-130	Pass	
Pyrene	M25-Ap0010730	NCP	%	120			70-130	Pass	
Spike - % Recovery				Result 1					
Ammonia (as N)	M25-Ap0022647	NCP	%	85			70-130	Pass	
Chloride	M25-Ap0018983	NCP	%	85			70-130	Pass	
Nitrate & Nitrite (as N)	M25-Ap0022647	NCP	%	90			70-130	Pass	
Nitrite (as N)	M25-Ap0022647	NCP	%	92			70-130	Pass	
Sulphate (as SO4)	M25-Ap0015500	NCP	%	81			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	N25-Ap0000070	NCP	%	102			70-130	Pass	
Phosphate total (as P)	M25-Ap0022087	NCP	%	111			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	M25-Ap0018976	NCP	mg/L	0.10	0.09	5.0	30%	Pass	
TRH C10-C14	M25-Ap0021817	NCP	mg/L	0.73	0.60	20	30%	Pass	
TRH C15-C28	M25-Ap0021817	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M25-Ap0021817	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C6-C10	M25-Ap0018976	NCP	mg/L	0.12	0.11	3.0	30%	Pass	
TRH >C10-C16	M25-Ap0021817	NCP	mg/L	0.80	0.65	20	30%	Pass	
TRH >C16-C34	M25-Ap0021817	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	M25-Ap0021817	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M25-Ap0018976	NCP	mg/L	0.006	0.006	8.0	30%	Pass	
Toluene	M25-Ap0018976	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	M25-Ap0018976	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	M25-Ap0018976	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	M25-Ap0018976	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	M25-Ap0018976	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M25-Ap0018976	NCP	mg/L	0.03	0.03	9.0	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Benzo(a)pyrene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Benzo(b&j)fluoranthene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Benzo(g,h,i)perylene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Benzo(k)fluoranthene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Chrysene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Dibenz(a,h)anthracene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Fluoranthene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Fluorene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Naphthalene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Phenanthrene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Pyrene	B25-Ap0017952	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Ammonia (as N)	M25-Ap0022655	NCP	mg/L	0.21	0.19	7.0	30%	Pass
Chloride	M25-Ap0018245	NCP	mg/L	66	59	10	30%	Pass
Conductivity (at 25 °C)	M25-Ap0018978	NCP	uS/cm	1600	1600	3.4	30%	Pass
Nitrate & Nitrite (as N)	M25-Ap0022655	NCP	mg/L	0.26	0.26	2.0	30%	Pass
Nitrite (as N)	M25-Ap0022655	NCP	mg/L	0.13	0.11	16	30%	Pass
pH (at 25 °C)	M25-Ap0018978	NCP	pH Units	4.9	4.9	pass	30%	Pass
Sulphate (as SO ₄)	M25-Ap0018245	NCP	mg/L	< 5	< 5	<1	30%	Pass
Total Kjeldahl Nitrogen (as N)	B25-Ap0012261	NCP	mg/L	9.1	8.7	5.0	30%	Pass
Phosphate total (as P)	M25-Ap0022086	NCP	mg/L	0.06	0.06	5.0	30%	Pass
Duplicate								
Alkalinity (speciated)				Result 1	Result 2	RPD		
Bicarbonate Alkalinity (as CaCO ₃)	M25-Ap0018978	NCP	mg/L	< 20	< 20	<1	30%	Pass
Carbonate Alkalinity (as CaCO ₃)	M25-Ap0018978	NCP	mg/L	< 10	< 10	<1	30%	Pass
Hydroxide Alkalinity (as CaCO ₃)	M25-Ap0018978	NCP	mg/L	< 20	< 20	<1	30%	Pass
Total Alkalinity (as CaCO ₃)	M25-Ap0018978	NCP	mg/L	< 20	< 20	<1	30%	Pass
Duplicate								
Alkali Metals				Result 1	Result 2	RPD		
Calcium	M25-Ap0022635	NCP	mg/L	280	280	<1	30%	Pass
Magnesium	M25-Ap0022635	NCP	mg/L	150	150	1.0	30%	Pass
Potassium	M25-Ap0022635	NCP	mg/L	10	10	1.0	30%	Pass
Sodium	M25-Ap0022635	NCP	mg/L	270	280	1.0	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.

Authorised by:

Onur Mehmet	Analytical Services Manager
Joseph Edouard	Senior Analyst-Organic
Joseph Edouard	Senior Analyst-PFAS
Joseph Edouard	Senior Analyst-Volatile
Luke Holt	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page ____ of ____

TETRA TECH
COFFEY

Consigning Office:

adam.seeley@tetratech.com;
amy.homister@tetratech.com;
theresa.pelayo@tetratech.com

Report Results to:

Mobile:

450505146

Email: theresa.pelayo@tetratech.com

Invoices to:

abtfinv@tetratech.com

Phone:

Email:

Project No: 754-MELEN215878ML Task No: 106

Project Name: MLPL Heybridge Laboratory: ALS

Sampler's Name: Gil PonceRios Project Manager: Vanessa Holloway

Quote number (if different to current quoted prices):

Special Instructions:

Analysis Request Section

General indicators (pH, EC, TDS);
Major cations (calcium, magnesium, sodium, potassium);
Major anions (chloride, sulphate) and speciated alkalinity (bicarbonate, carbonate);
Dissolved metals suite (incl. Al, As, B, Ba, Be, Cd, Cr, Co, Cu, Ni, Pb, Se, Ti, Zn, Hg, Mn, Ti, V);
Nutrients (nitrate, nitrite, Total Nitrogen, Total Kkeldahl Nitrogen, Ammonia, Total Phosphorus);
TRH; BTEXN; PAH; PFAS SHORT SUITE

BTEX

NOTES

Lab Batch Ref	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)
1	HB-MW05	4/04/2025				24 hr
2	Tunnel	4/04/2025				24 hr
3	HB-MW02	4/04/2025				24 hr
4	HB-BH02-C	4/04/2025				24 hr
5	HB-BH01-C	4/04/2025				24 hr
6	HB-BH06(S)-C	4/04/2025				24 hr
7	HB-BH06-C	4/04/2025				24 hr
8	HB-MW06	4/04/2025				24 hr
9	HB-BH03-C	4/04/2025				24 hr
10	QC01	4/04/2025				24 hr
11	QC02	4/04/2025				24 hr
12	QC03	4/04/2025				24 hr
13	DI	4/04/2025				24 hr

LAB-FILTER

BTEX

NOTES

PLEASE SEND TO EUROFINS

RELINQUISHED BY

Name: Gilberto PR Date: 4/04/2025

Coffey Time:

Name: →

Company: Time:

*Container Type & Preservation Codes: P - Plastic, G- Glass Bottle, J - Glass Jar, V- Vial, Z - Ziplock bag
ST - Sodium Thiosulfate, NP - No Preservative

Environmental Division
MelbourneWork Order Reference
EM2505846

Telephone : + 61-3-8549 9600

BY

Nicole (9F)

Date:

8/4/25

Time:

4:46pm

Date:

Time:

Preserved, S - Sulphuric Acid Preserved, I - Ice,

Sample Receipt Advice: (Lab Use Only)

All Samples Received in Good Condition ☒All Documentation is in Proper Order ☐Samples Received Properly Chilled ☒

Lab. Ref/Batch No.

APPENDIX E: GROUNDWATER MONITORING DATA TABLES

Table 1: Groundwater Well Details, Gauging and Field Measured Parameters

			Well Details and Gauging Results						Field Measured Parameters				
			SWL mBTOC	Stick Up (m)	SWL mbgs	Ground surface mAHD	SWL mAHD	Screen Interval mbg	Electrical Conductivity (Field)	DO (Field)	Redox Potential (Field)	Temp (Field)	pH (Field)
									µS/cm	mg/L	mV	oC	-
Location Code	Field ID	Date											
HB.MW01	HB-MW01	04 Apr 2025	Dry	0.85	Dry	6.00	DRY	1.0- 2.5	-	-	-	-	-
HB.MW02	HB-MW-02	04 Apr 2025	2.56	0.92	1.64	6.69	5.05	1.1 - 2.6	2,784	0	-56.6	19.4	6.76
HB.MW03	HB-MW03	04 Apr 2025	Dry	0.90	Dry	8.50	Dry	1.0 - 3.6	-	-	-	-	-
HB.MW04	HB-MW04	04 Apr 2025	Dry	0.96	Dry	6.92	Dry	1.0 - 2.0	-	-	-	-	-
HB.MW05	HB-MW05	04 Apr 2025	2.82	0.89	1.93	8.29	6.36	0.6 - 3.6	980	5.93	170.4	20.1	4.63
HB.MW06	HB-MW6	04 Apr 2025	3.02	0.90	2.12	11.43	9.31	1.0 - 3.0	548	3.01	-121.7	19.1	5.48
HB-BH01-C	HB-BH-01C	04 Apr 2025	2.02	-0.09	2.11	6.21	4.10	5.8 - 11.8	764	2.25	135	20.3	4.38
HB-BH02-C	HB-BH02-C	04 Apr 2025	1.57	-0.09	1.66	6.59	4.93	3.5 - 6.5	557	6.76	6.1	19.5	6.45
HB-BH03-C	HB-BH03C	04 Apr 2025	3.58	-0.10	3.68	8.68	5.00	6.5 - 9.5	358.6	4.74	71.8	18.6	5.62
HB-BH06-C	HB-BH06-C	04 Apr 2025	1.41	-0.09	1.50	9.42	7.92	10.0 - 14.0	364.7	2.87	99.4	15.1	4.99
HB-BH06-C(S)	HB-BH06(S)-C	04 Apr 2025	1.48	-0.10	1.58	9.46	7.88	1.0 - 2.0	352.9	0.95	98.2	19.6	5.23
OTH1	Tunnel	04 Apr 2025	NA	NA	NA	NA	NA	NA	1,290	0.15	-63	18.5	6.56

	Total Recoverable Hydrocarbons							Total Petroleum Hydrocarbons					Benzene
	C6 - C10	F1 (C6 - C10) less BTEX	C10 - C16	F2 C10 - C16 (minus Naphthalene)	F3 (C16 - C34)	F4 (C34 - C40)	C10 - C40 (Sum of total)	C6 - C9	C10 - C14	C15 - C28	C29 - C36	C10 - C36 (Sum of total)	
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.02	0.02	0.05	0.05	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001
ADWG 2022 Health	-	-	-	-	-	-	-	-	-	-	-	-	0.001
ANZECC 2000 FW 95%	-	-	-	-	-	-	-	-	-	-	-	-	0.95
ANZECC 2000 Irrigation Long Term Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 MW 95%	-	-	-	-	-	-	-	-	-	-	-	-	0.7
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	6 6 7	-	-	-	-	-	-	-	-	-	-	5 5 5
NEPM 2013 Table 1C GILs, Drinking Water	-	-	-	-	-	-	-	-	-	-	-	-	0.001
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	-	-	-	-	-	-	-	-	-	0.95
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.38	<0.1	0.38	<0.02	0.06	0.34	0.09	0.49	<0.001
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.12	<0.1	0.12	<0.02	<0.05	0.1	<0.05	0.1	<0.001
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.17	<0.1	0.17	<0.02	<0.05	0.16	0.07	0.23	<0.001
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	<0.02	<0.02	0.12	0.12	0.84	<0.1	0.96	<0.02	0.1	0.71	0.2	1.01	<0.001
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.14	<0.1	0.14	<0.02	<0.05	0.11	<0.05	0.11	<0.001
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	<0.02	<0.02	<0.05	<0.05	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.1	<0.1	<0.001
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.53	<0.1	0.53	<0.02	<0.05	0.52	0.1	0.62	<0.001
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.19	<0.1	0.19	<0.02	<0.05	0.15	0.06	0.21	<0.001
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.16	<0.1	0.16	<0.02	<0.05	0.13	<0.05	0.13	<0.001
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.32	<0.1	0.32	<0.02	<0.05	0.23	0.1	0.33	<0.001
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.05	<0.1	<0.05	<0.05	<0.001
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	<0.02	<0.02	<0.1	<0.1	0.2	<0.1	0.2	<0.02	0.05	0.13	0.11	0.29	<0.001

Statistics																		
Number of Env Standard Exceedances						0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Env Standard Exceedances (Detects Only)						0	0	0	0	0	0	0	0	0	0	0	0	0
% of Detects at or above Env Standards						0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results Below Env Standards or Non-Detect						100	100	100	100	100	100	100	100	100	100	100	100	100

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

	BTEXN												
	Toluene	Ethyl Benzene	m,p-Xylene	o-Xylene	Total Xylenes	Naphthalene (VOC)	Total BTEX	Magnesium	Magnesium (filtered)	Aluminium (filtered)	Arsenic (filtered)	Barium (filtered)	Beryllium (filtered)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.001	0.001	0.002	0.001	0.002	0.005	0.001	0.5	0.5	0.01	0.001	0.001	0.001
ADWG 2022 Health	0.8	0.3	-	-	0.6	-	-	-	-	-	0.01	2	0.06
ANZECC 2000 FW 95%	-	-	-	0.35	-	-	-	-	-	0.055	-	-	-
ANZECC 2000 Irrigation Long Term Trigger Values	-	-	-	-	-	-	-	-	-	5	0.1	-	0.1
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	-	5	0.5	-	-
ANZECC 2000 MW 95%	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	0.8	0.3	-	-	0.6	-	-	-	-	-	0.01	2	0.06
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	0.35	0.55	-	-	-	-	0.055 0.055	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	24	25.2	0.044	0.128	<0.010
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	27	0.38	0.001	0.050	<0.001
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	<1	<0.01	<0.001	<0.001	<0.001
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	9	0.05	0.002	0.020	<0.001
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	122	1.44	0.009	0.032	0.002
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	<0.001	<0.001	<0.002	<0.001	<0.003	<0.01	-	66	-	4.3	0.002	0.02	0.002
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	10	0.19	0.011	0.018	<0.001
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	11	<0.01	<0.001	0.010	<0.001
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	12	<0.01	<0.001	0.010	<0.001
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	13	0.14	0.013	0.028	<0.001
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	12	0.08	0.003	0.032	<0.001
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	-	18	<0.01	<0.001	0.008	<0.001

Statistics														
Number of Env Standard Exceedances	0	0	0	0	0	0	0	0	0	0	7	3	0	0
Number of Env Standard Exceedances (Detects Only)	0	0	0	0	0	0	0	0	0	0	7	3	0	0
% of Detects at or above Env Standards	0	0	0	0	0	0	0	0	0	0	58	25	0	0
% of Results Below Env Standards or Non-Detect	100	100	100	100	100	100	100	100	100	100	42	75	100	100

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

	Metals												
	Boron (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Cobalt (filtered)	Copper (filtered)	Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Selenium (filtered)	Titanium (filtered)	Vanadium (filtered)	Zinc (filtered)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.05	0.0001	0.001	0.001	0.001	0.001	0.001	0.0001	0.001	0.001	0.005	0.005	0.005
ADWG 2022 Health	4	0.002	-	-	2	0.01	0.5	0.001	0.02	0.01	-	-	-
ANZECC 2000 FW 95%	0.37	0.0002	-	-	0.0014	0.0034	1.9	0.0006	0.011	0.011	-	-	0.008
ANZECC 2000 Irrigation Long Term Trigger Values	0.5	0.01	0.1	0.05	0.2	2	0.2	0.002	0.2	0.02	-	0.1	2
ANZECC 2000 Livestock DW Low Risk Trigger Values	5	0.01	1	1	0.4	0.1	-	0.002	1	0.02	-	-	20
ANZECC 2000 MW 95%	-	0.0055	-	0.001	0.0013	0.0044	-	0.0004	0.07	-	-	0.1	0.015
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	4	0.002	-	-	2	0.01	0.5	0.001	0.02	0.01	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters	0.37	0.0002	-	-	0.0014	0.0034	1.9	0.00006	0.011	0.005	-	-	0.008
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	0.06	-	-	-	-	-	-	-	0.86	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	<0.10	<0.0010	0.164	<0.010	<0.010	<0.010	0.554	<0.0010	0.070	<0.10	<0.10	0.10	0.068
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	0.11	0.0002	<0.001	0.013	0.010	0.002	1.15	<0.0001	0.027	<0.01	<0.01	<0.01	0.228
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.01	<0.005
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	0.13	0.0001	0.002	0.008	0.008	0.002	0.899	<0.0001	0.008	<0.01	<0.01	<0.01	0.095
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	<0.05	<0.0001	0.005	0.108	0.001	<0.001	1.42	<0.0001	0.206	<0.01	<0.01	<0.01	0.287
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	<0.05	<0.0002	0.004	0.047	0.003	<0.001	0.74	<0.0001	0.086	<0.001	<0.005	<0.005	0.15
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	0.07	<0.0001	0.003	0.001	0.003	0.002	0.101	<0.0001	0.002	<0.01	0.02	<0.01	0.009
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	<0.05	<0.0001	<0.001	0.011	<0.001	<0.001	0.232	<0.0001	0.006	<0.01	<0.01	<0.01	0.007
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	<0.05	<0.0001	<0.001	0.011	<0.001	<0.001	0.231	<0.0001	0.006	<0.01	<0.01	<0.01	0.008
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	<0.05	<0.0001	0.002	0.001	<0.001	0.004	0.039	<0.0001	0.004	<0.01	<0.01	<0.01	0.025
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	0.06	<0.0001	0.002	0.001	<0.001	<0.001	0.058	<0.0001	0.006	<0.01	<0.01	<0.01	0.022
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	0.05	<0.0001	<0.001	<0.001	<0.001	<0.001	0.754	<0.0001	0.002	<0.01	<0.01	<0.01	0.026

Statistics														
Number of Env Standard Exceedances	0	0	1	6	4	1	8	0	4	0	0	0	0	9
Number of Env Standard Exceedances (Detects Only)	0	0	1	6	4	1	8	0	4	0	0	0	0	9
% of Detects at or above Env Standards	0	0	8	50	33	8	67	0	33	0	0	0	0	75
% of Results Below Env Standards or Non-Detect	100	100	92	50	67	92	33	100	67	100	100	100	100	25

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

	Physical Parameters			Alkalinity				Nutrients					
	Electrical Conductivity @ 25C (lab)	Total Dissolved Solids (TDS)	pH (lab)	Alkalinity (total as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Ammonia as N	Nitrite + Nitrate as N	Nitrate (as NO3-N)	Nitrite (as NO2-N)	Total Kjeldahl Nitrogen (TKN)	Phosphorus total
	µS/cm	mg/L	pH_unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	1	10	0.01	1	1	1	1	0.01	0.01	0.01	0.01	0.1	0.01
ADWG 2022 Health	-	-	6.5-8.5	-	-	-	-	-	-	11.3	0.91	-	-
ANZECC 2000 FW 95%	-	-	-	-	-	-	-	0.9	-	0.1581	-	-	-
ANZECC 2000 Irrigation Long Term Trigger Values	-	-	6.5-8.5	-	-	-	-	-	-	-	-	-	0.05
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	-	400	30	-	-
ANZECC 2000 MW 95%	-	-	-	-	-	-	-	0.91	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	2,560	10,600	6.98	1,070	<1	1,070	<1	2.39	<0.20	<0.20	<0.05	48.6	8.24
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	1,000	779	4.26	<1	<1	<1	<1	0.30	0.14	0.14	<0.01	0.7	0.01
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	1	<10	5.89	<1	<1	<1	<1	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	544	370	5.95	40	<1	40	<1	1.37	0.15	0.14	0.01	2.3	0.11
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	1,580	1,450	4.91	<1	<1	<1	<1	0.46	<0.01	<0.05	<0.05	0.9	0.11
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	1,200	1,000	4.6	<20	<20	<20	<10	0.68	0.22	0.21	<0.02	2.0	<0.01
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	547	348	6.68	189	<1	189	<1	0.19	0.07	0.07	<0.01	0.6	0.04
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	353	198	5.75	27	<1	27	<1	0.24	0.02	0.02	<0.01	0.2	0.01
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	341	194	5.72	26	<1	26	<1	0.18	0.03	0.03	<0.01	0.3	0.02
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	330	242	4.98	<1	<1	<1	<1	<0.01	0.10	0.10	<0.01	0.1	0.02
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	346	222	5.61	17	<1	17	<1	0.03	0.03	0.03	<0.01	0.4	0.21
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	998	860	6.56	322	<1	322	<1	1.04	0.11	0.11	<0.01	9.5	3.19

Statistics																	
Number of Env Standard Exceedances						0	0	9	0	0	0	0	3	0	1	0	5
Number of Env Standard Exceedances (Detects Only)						0	0	9	0	0	0	0	3	0	1	0	5
% of Detects at or above Env Standards						0	0	75	0	0	0	0	25	0	8	0	42
% of Results Below Env Standards or Non-Detect						100	100	25	100	100	100	100	75	100	92	100	58

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

Table2: Groundwater Analytical Results

			Polycyclic Aromatic Hydrocarbons										
	Nitrogen (Organic)	Nitrogen (Total)	PAHs (Vic EPA List)	Benzo(b+i)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (Zero)	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.2	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001	0.001	0.001
ADWG 2022 Health	-	-	-	-	-	-	-	-	0.00001	-	-	-	-
ANZECC 2000 FW 95%	-	1.1	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Irrigation Long Term Trigger Values	-	5	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 MW 95%	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	-	-	-	-	-	-	-	-	0.00001	-	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	0.53	-	1.8	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	-	48.6	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	-	0.8	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	-	<0.1	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	-	2.4	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	-	0.9	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	1.32	2.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	-	0.7	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	-	0.2	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	-	0.3	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	-	0.2	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	-	0.4	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	-	9.6	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010	<0.0010	<0.0010

Statistics														
Number of Env Standard Exceedances						0	4	0	0	0	0	0	0	0
Number of Env Standard Exceedances (Detects Only)						0	4	0	0	0	0	0	0	0
% of Detects at or above Env Standards						0	33	0	0	0	0	0	0	0
% of Results Below Env Standards or Non-Detect						100	67	100	100	100	100	100	100	100

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

Table2: Groundwater Analytical Results

	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	Calcium	Calcium (filtered)	Chloride	Potassium	Potassium (filtered)
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	0.5	0.5	1	0.5	0.5
ADWG 2022 Health	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 FW 95%	-	-	-	-	0.016	-	-	-	-	-	-	-	-
ANZECC 2000 Irrigation Long Term Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	1,000	1,000	-	-	-
ANZECC 2000 MW 95%	-	-	-	-	0.07	-	-	-	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	-	0.016	-	-	-	-	-	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number													
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	44	97	-	13
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	70	92	-	16
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	<1	<1	-	<1
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	48	38	-	17
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	37	48	-	8
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	35	-	49	7.5	-
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	8	32	-	7
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	5	80	-	3
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	4	79	-	3
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	4	44	-	3
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	8	37	-	4
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	-	170	91	-	11

Statistics																		
Number of Env Standard Exceedances						0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Env Standard Exceedances (Detects Only)						0	0	0	0	0	0	0	0	0	0	0	0	0
% of Detects at or above Env Standards						0	0	0	0	0	0	0	0	0	0	0	0	0
% of Results Below Env Standards or Non-Detect						100	100	100	100	100	100	100	100	100	100	100	100	100

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

	Ions							Per and po					
	Sodium	Sodium (filtered)	Sulfate as SO4	Sulfate as SO4 - Turbidimetric (filtered)	Ionic Balance	Anions Total	Cations Total	Perfluorobutane sulfonic acid (PFBS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)
EQL	mg/L	mg/L	mg/L	mg/L	%	meq/L	meq/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	0.5	0.5	5	1	0.01	0.01	0.01	0.02	0.01	0.01	0.1	0.02	0.02
ADWG 2022 Health	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 FW 95%	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Irrigation Long Term Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock DW Low Risk Trigger Values	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC 2000 MW 95%	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water	-	-	500	-	-	-	-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters	-	-	-	-	-	-	-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%	-	-	-	-	-	-	-	-	-	0.13	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number												
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	-	793	-	576	3.85	36.1	39.0	<0.02	0.02	0.06	<0.1	0.02
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	-	79	-	396	6.27	10.8	9.56	<0.02	<0.01	<0.01	<0.1	<0.02
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	-	<1	-	<1	-	<0.01	<0.01	<0.02	<0.01	<0.01	<0.1	<0.02
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	-	54	-	168	4.88	5.37	5.92	<0.02	<0.01	<0.01	<0.1	<0.02
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	-	79	-	980	16.7	21.8	15.5	<0.02	<0.01	<0.01	<0.1	<0.02
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	46	-	640	-	-	-	-	-	<0.01	<0.01	-	-
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	-	105	-	55	1.22	5.82	5.97	<0.02	<0.01	<0.01	<0.1	<0.02
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	-	43	-	15	0.10	3.11	3.10	<0.02	<0.01	<0.01	<0.1	<0.02
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	-	44	-	15	1.88	3.06	3.18	<0.02	<0.01	<0.01	<0.1	<0.02
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	-	36	-	82	-	2.95	2.91	<0.02	0.13	0.18	<0.1	0.05
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	-	36	-	87	2.24	3.19	3.06	<0.02	0.10	0.15	<0.1	0.04
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	-	75	-	179	2.98	12.7	13.5	<0.02	<0.01	<0.01	<0.1	<0.02

Statistics													
Number of Env Standard Exceedances						0	0	1	0	0	0	0	0
Number of Env Standard Exceedances (Detects Only)						0	0	1	0	0	0	0	0
% of Detects at or above Env Standards						0	0	100	0	0	0	0	0
% of Results Below Env Standards or Non-Detect						100	100	0	100	100	100	100	100

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

						lyfluoroalkyl substances						
						Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum (PFHxS + PFOS)
EQL						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADWG 2022 Health						0.02	0.01	0.05	0.05	0.05	0.05	0.01
ANZECC 2000 FW 95%						-	0.56	-	-	-	-	0.07
ANZECC 2000 Irrigation Long Term Trigger Values						-	-	-	-	-	-	-
ANZECC 2000 Livestock DW Low Risk Trigger Values						-	-	-	-	-	-	-
ANZECC 2000 MW 95%						-	-	-	-	-	-	-
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand						-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Drinking Water						-	-	-	-	-	-	-
NEPM 2013 Table 1C GILs, Fresh Waters						-	-	-	-	-	-	-
NHMRC/NRMMC (2008) Guidelines for Managing Risks in Recreational Waters						-	-	-	-	-	-	-
PFAS NEMP 2025 Interim marine 95%						-	220	-	-	-	-	-

Monitoring Zone	Location Code	Sample Type	Field ID	Date	Lab Report Number							
	HB.MW02	Normal	HB-MW02	04 Apr 2025	EM2505846	<0.02	0.01	<0.05	<0.05	<0.05	<0.05	0.08
	HB.MW05	Normal	HB-MW05	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB.MW05	Rinsate	QC03	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB.MW06	Normal	HB-MW06	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB-BH01-C	Normal	HB-BH01-C	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	0.10	<0.05	<0.05	<0.01
	HB-BH01-C	Interlab_D	QC02	04 Apr 2025	1207152	-	<0.01	-	<0.05	-	-	<0.01
	HB-BH02-C	Normal	HB-BH02-C	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB-BH03-C	Normal	HB-BH03-C	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB-BH03-C	Field_D	QC01	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	HB-BH06-C	Normal	HB-BH06-C	04 Apr 2025	EM2505846	0.02	0.02	<0.05	<0.05	<0.05	<0.05	0.31
	HB-BH06-C(S)	Normal	HB-BH06(S)-C	04 Apr 2025	EM2505846	<0.02	0.02	<0.05	<0.05	<0.05	<0.05	0.25
	OTH1	Normal	Tunnel	04 Apr 2025	EM2505846	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01

Statistics							
Number of Env Standard Exceedances						0	3
Number of Env Standard Exceedances (Detects Only)						0	3
% of Detects at or above Env Standards						0	25
% of Results Below Env Standards or Non-Detect						100	75

Environmental Standards
NHMRC, May 2022, ADWG 2022 Health
DoE, 2000, ANZECC 2000 FW 95%
DoE, 2000, ANZECC 2000 Irrigation Long Term Trigger Values
DoE, 2000, ANZECC 2000 Livestock DW Low Risk Trigger Values
DoE, 2000, ANZECC 2000 MW 95%
HEPA, March 2025, PFAS NEMP 2025 Interim marine 95%

APPENDIX F: GROUNDWATER RESULTS QA/QC

Lab Report Number			EM2505846	EM2505846	RPD
Field ID			HB-BH03-C	QC01	
Matrix Type			Water	Water	
Date			04 Apr 2025	04 Apr 2025	
	Unit	EQL			
Total Recoverable Hydrocarbons					
C6 - C10	mg/L	0.02	<0.02	<0.02	0
F1 (C6 - C10) less BTEX	mg/L	0.02	<0.02	<0.02	0
C10 - C16	mg/L	0.05	<0.1	<0.1	0
F2 C10 - C16 (minus Naphthalene)	mg/L	0.05	<0.1	<0.1	0
F3 (C16 - C34)	mg/L	0.1	0.19	0.16	17
F4 (C34 - C40)	mg/L	0.1	<0.1	<0.1	0
C10 - C40 (Sum of total)	mg/L	0.1	0.19	0.16	17
Total Petroleum Hydrocarbons					
C6 - C9	mg/L	0.02	<0.02	<0.02	0
C10 - C14	mg/L	0.05	<0.05	<0.05	0
C15 - C28	mg/L	0.1	0.15	0.13	14
C29 - C36	mg/L	0.05	0.06	<0.05	18
C10 - C36 (Sum of total)	mg/L	0.05	0.21	0.13	47
BTEXN					
Benzene	mg/L	0.001	<0.001	<0.001	0
Toluene	mg/L	0.001	<0.002	<0.002	0
Ethyl Benzene	mg/L	0.001	<0.002	<0.002	0
m,p-Xylene	mg/L	0.002	<0.002	<0.002	0
o-Xylene	mg/L	0.001	<0.002	<0.002	0
Total Xylenes	mg/L	0.002	<0.002	<0.002	0
Naphthalene (VOC)	mg/L	0.005	<0.005	<0.005	0
Total BTEX	mg/L	0.001	<0.001	<0.001	0
Metals					
Magnesium	mg/L	0.5	-	-	-
Magnesium (filtered)	mg/L	0.5	11	12	9
Aluminium (filtered)	mg/L	0.01	<0.01	<0.01	0
Arsenic (filtered)	mg/L	0.001	<0.001	<0.001	0
Barium (filtered)	mg/L	0.001	0.010	0.010	0
Beryllium (filtered)	mg/L	0.001	<0.001	<0.001	0
Boron (filtered)	mg/L	0.05	<0.05	<0.05	0
Cadmium (filtered)	mg/L	0.0001	<0.0001	<0.0001	0
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0
Cobalt (filtered)	mg/L	0.001	0.011	0.011	0
Copper (filtered)	mg/L	0.001	<0.001	<0.001	0
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0
Manganese (filtered)	mg/L	0.001	0.232	0.231	0
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0
Nickel (filtered)	mg/L	0.001	0.006	0.006	0
Selenium (filtered)	mg/L	0.001	<0.01	<0.01	0
Titanium (filtered)	mg/L	0.005	<0.01	<0.01	0
Vanadium (filtered)	mg/L	0.005	<0.01	<0.01	0
Zinc (filtered)	mg/L	0.005	0.007	0.008	13
Physical Parameters					
Electrical Conductivity @ 25C (lab)	µS/cm	1	353	341	3
Total Dissolved Solids (TDS)	mg/L	10	198	194	2
pH (lab)	pH_unit	0.01	5.75	5.72	1
Alkalinity					
Alkalinity (total as CaCO3)	mg/L	1	27	26	4
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0
Bicarbonate Alkalinity as CaCO3	mg/L	1	27	26	4
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	0
Nutrients					
Ammonia as N	mg/L	0.01	0.24	0.18	29
Nitrite + Nitrate as N	mg/L	0.01	0.02	0.03	40
Nitrate (as NO3-N)	mg/L	0.01	0.02	0.03	40
Nitrite (as NO2-N)	mg/L	0.01	<0.01	<0.01	0
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	0.2	0.3	40
Phosphorus total	mg/L	0.01	0.01	0.02	67
Nitrogen (Organic)	mg/L	0.2	-	-	-
Nitrogen (Total)	mg/L	0.1	0.2	0.3	40
Polycyclic Aromatic Hydrocarbons					
PAHs (Vic EPA List)	mg/L	0.001	-	-	-
Benzo(b+j)fluoranthene	mg/L	0.001	<0.0010	<0.0010	0
Acenaphthene	mg/L	0.001	<0.0010	<0.0010	0
Acenaphthylene	mg/L	0.001	<0.0010	<0.0010	0
Anthracene	mg/L	0.001	<0.0010	<0.0010	0
Benz(a)anthracene	mg/L	0.001	<0.0010	<0.0010	0
Benzo(a) pyrene	mg/L	0.0005	<0.0005	<0.0005	0
Benzo(a)pyrene TEQ calc (Zero)	mg/L	0.0005	<0.0005	<0.0005	0
Benzo(g,h,i)perylene	mg/L	0.001	<0.0010	<0.0010	0
Benzo(k)fluoranthene	mg/L	0.001	<0.0010	<0.0010	0
Chrysene	mg/L	0.001	<0.0010	<0.0010	0
Dibenz(a,h)anthracene	mg/L	0.001	<0.0010	<0.0010	0
Fluoranthene	mg/L	0.001	<0.0010	<0.0010	0
Fluorene	mg/L	0.001	<0.0010	<0.0010	0
Indeno(1,2,3-c,d)pyrene	mg/L	0.001	<0.0010	<0.0010	0
Naphthalene	mg/L	0.001	<0.0010	<0.0010	0
Phenanthrene	mg/L	0.001	<0.0010	<0.0010	0
Pyrene	mg/L	0.001	<0.0010	<0.0010	0
PAHs (Sum of total)	mg/L	0.0005	<0.0005	<0.0005	0
Ions					
Calcium	mg/L	0.5	-	-	-
Calcium (filtered)	mg/L	0.5	5	4	22
Chloride	mg/L	1	80	79	1
Potassium	mg/L	0.5	-	-	-
Potassium (filtered)	mg/L	0.5	3	3	0
Sodium	mg/L	0.5	-	-	-
Sodium (filtered)	mg/L	0.5	43	44	2
Sulfate as SO4	mg/L	5	-	-	-
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	1	15	15	0
Ionic Balance	%	0.01	0.10	1.88	180
Anions Total	meq/L	0.01	3.11	3.06	2
Cations Total	meq/L	0.01	3.10	3.18	3
Per and polyfluoroalkyl substances					
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	<0.01	0
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.02	<0.02	<0.02	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05	0
Sum (PFHxS + PFOS)	µg/L	0.01	<0.01	<0.01	0

EM2505846	1207152	RPD
HB-BH01-C	QC02	
Water	Water	
04 Apr 2025	04 Apr 2025	
<0.02	<0.02	0
<0.02	<0.02	0
<0.1	<0.05	0
<0.1	<0.05	0
0.14	<0.1	33
<0.1	<0.1	0
0.14	<0.1	33
<0.02	<0.02	0
<0.05	<0.05	0
0.11	<0.1	10
<0.05	<0.1	0
0.11	<0.1	10
<0.001	<0.001	0
<0.002	<0.001	0
<0.002	<0.001	0
<0.002	<0.002	0
<0.002	<0.001	0
<0.002	<0.003	0
<0.005	<0.01	0
<0.001	-	-
-	66	-
122	-	-
1.44	4.3	100
0.009	0.002	127
0.032	0.02	46
0.002	0.002	0
<0.05	<0.05	0
<0.0001	<0.0002	0
0.005	0.004	22
0.108	0.047	79
0.001	0.003	100
<0.001	<0.001	0
1.42	0.74	63
<0.0001	<0.0001	0
0.206	0.086	82
<0.01	<0.001	0
<0.01	<0.005	0
<0.01	<0.005	0
0.287	0.15	63
1,580	1,200	27
1,450	1,000	37
4.91	4.6	7
<1	<20	0
<1	<20	0
<1	<20	0
<1	<10	0
0.46	0.68	39
<0.01	0.22	183
<0.05	0.21	123
<0.05	<0.02	0
0.9	2.0	76
0.11	<0.01	167
-	1.32	-
0.9	2.2	84
-	<0.001	-
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0005	<0.001	0
<0.0005	-	-
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0010	<0.001	0
<0.0005	-	-
-	35	-
37	-	-
48	49	2
-	7.5	-
8	-	-
-	46	-
79	-	-
-	640	-
980	-	-
16.7	-	-
21.8	-	-
15.5	-	-
<0.02	-	-
<0.01	<0.01	0
<0.01	<0.01	0
<0.1	-	-
<0.02	-	-
<0.02	-	-
<0.02	-	-
<0.01	<0.01	0
<0.05	-	-
0.10	<0.05	67
<0.05	-	-
<0.05	-	-
<0.01	<0.01	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 20 x EQL); 30 (20 - 20 x EQL); 30 (> 20 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

					Total Recoverable Hydrocarbons							Total Petroleum Hydrocarbons							
					C6 - C10	F1 (C6 - C10) less BTEX	C10 - C16	F2 C10 - C16 (minus Naphthalene)	F3 (C16 - C34)	F4 (C34 - C40)	C10 - C40 (Sum of total)	C6 - C9	C10 - C14	C15 - C28	C29 - C36	C10 - C36 (Sum of total)	Benzene	Toluene	Ethyl Benzene
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					0.02	0.02	0.1	0.1	0.1	0.1	0.1	0.02	0.05	0.1	0.05	0.05	0.001	0.002	0.002
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.02	<0.02	<0.1	<0.1	0.17	<0.1	0.17	<0.02	<0.05	0.16	0.07	0.23	<0.001	<0.002	<0.002

					BTEXN					Metals									
					m,p-Xylene	o-Xylene	Total Xylenes	Naphthalene (VOC)	Total BTEX	Magnesium (filtered)	Aluminium (filtered)	Arsenic (filtered)	Barium (filtered)	Beryllium (filtered)	Boron (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Cobalt (filtered)	Copper (filtered)
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					0.002	0.002	0.002	0.005	0.001	1	0.01	0.001	0.001	0.001	0.05	0.0001	0.001	0.001	0.001
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.002	<0.002	<0.002	<0.005	<0.001	<1	<0.01	<0.001	<0.001	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001

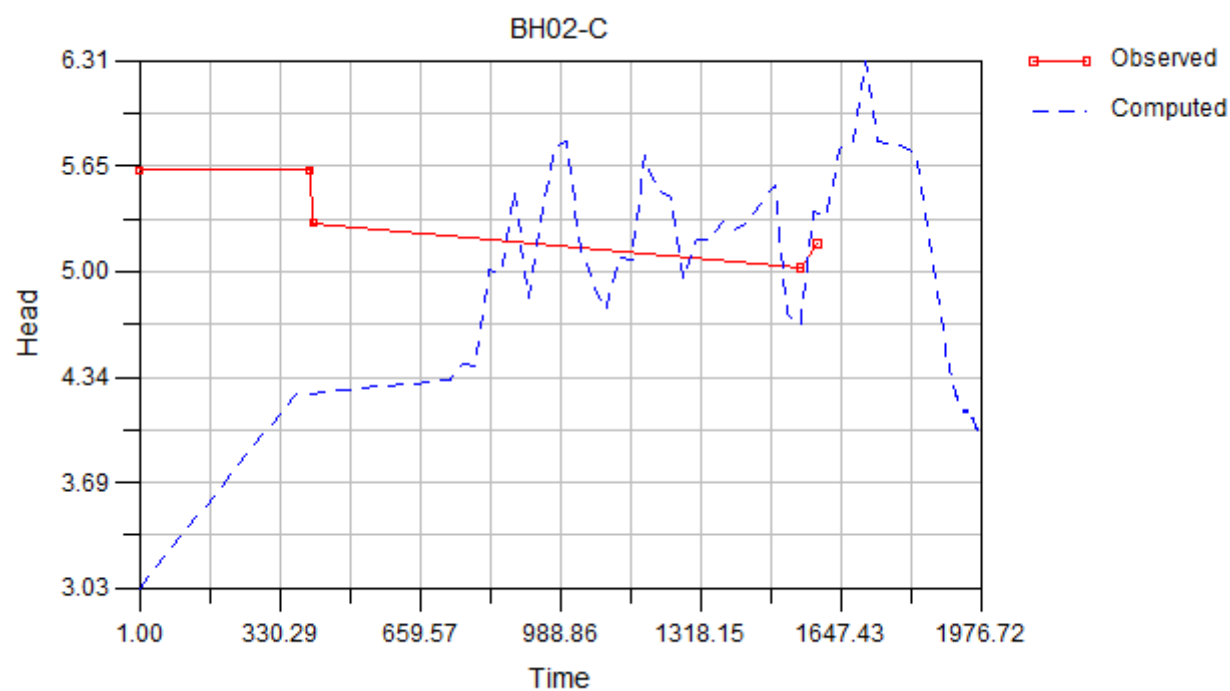
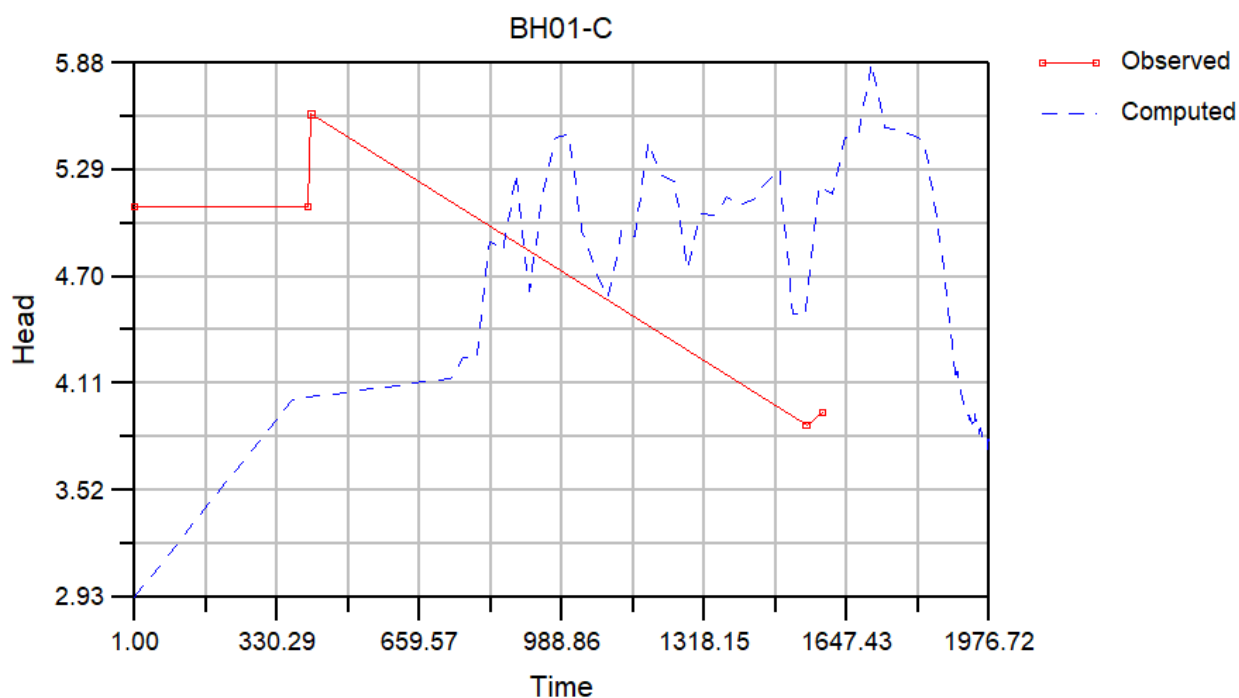
													Physical Parameters			Alkalinity			
					Lead (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Selenium (filtered)	Titanium (filtered)	Vanadium (filtered)	Zinc (filtered)	Electrical Conductivity @ 25C (lab)	Total Dissolved Solids (TDS)	pH (lab)	Alkalinity (total as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Bicarbonate Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	pH_unit	mg/L	mg/L	mg/L	mg/L
EQL					0.001	0.001	0.0001	0.001	0.01	0.01	0.01	0.005	1	10	0.01	1	1	1	1
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.001	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.01	<0.005	1	<10	5.89	<1	<1	<1	<1

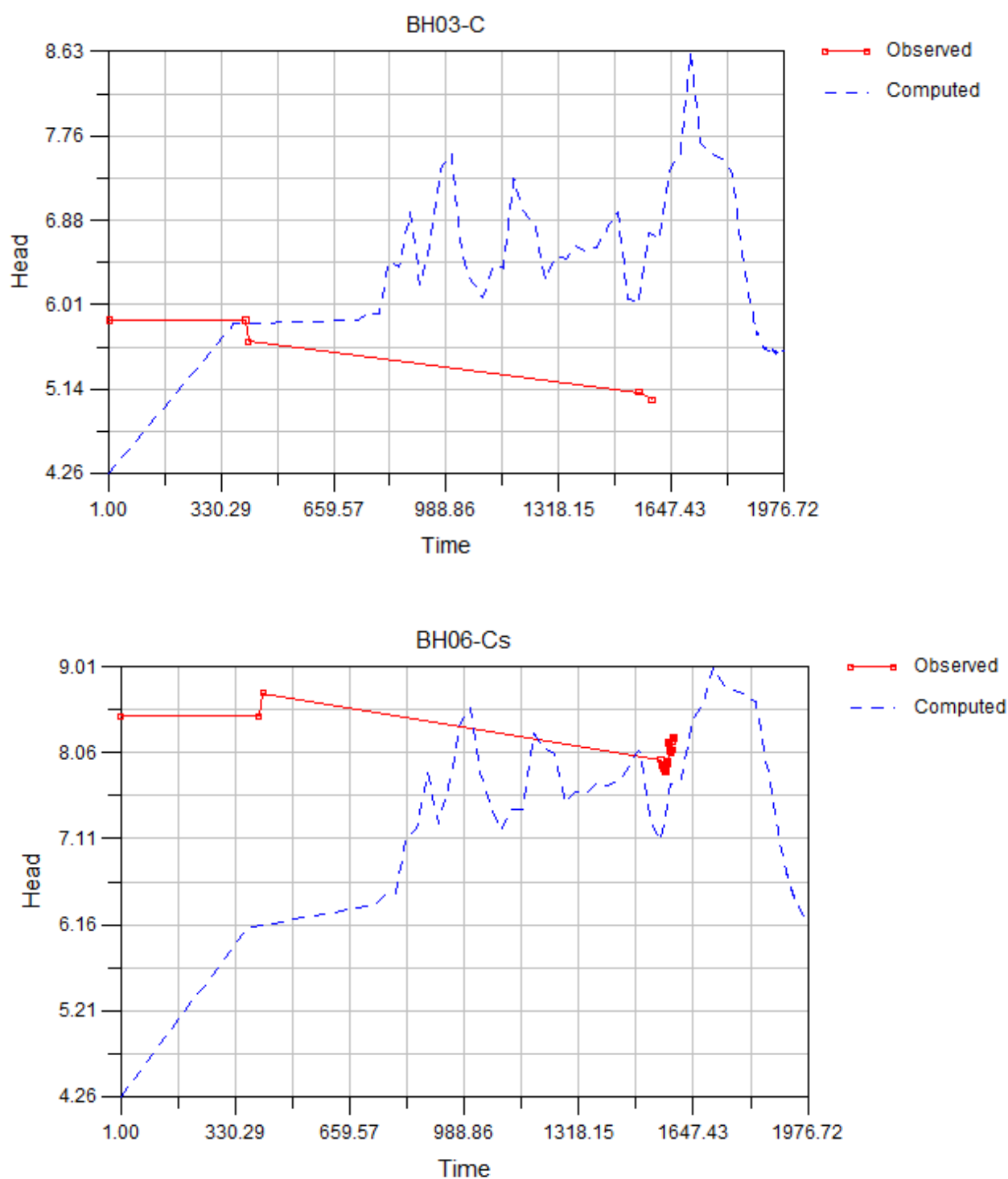
					Nutrients							Polynuclear Aromatic Hydrocarbons (PAHs)							
					Ammonia as N	Nitrite + Nitrate as N	Nitrate (as NO3-N)	Nitrite (as NO2-N)	Total Kjeldahl Nitrogen (TKN)	Phosphorus total	Nitrogen (Total)	Benzo(a)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ calc (Zero)	Benzo(g,h,i)perylene
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					0.01	0.01	0.01	0.01	0.1	0.01	0.1	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005	0.001
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<0.0005	<0.0010

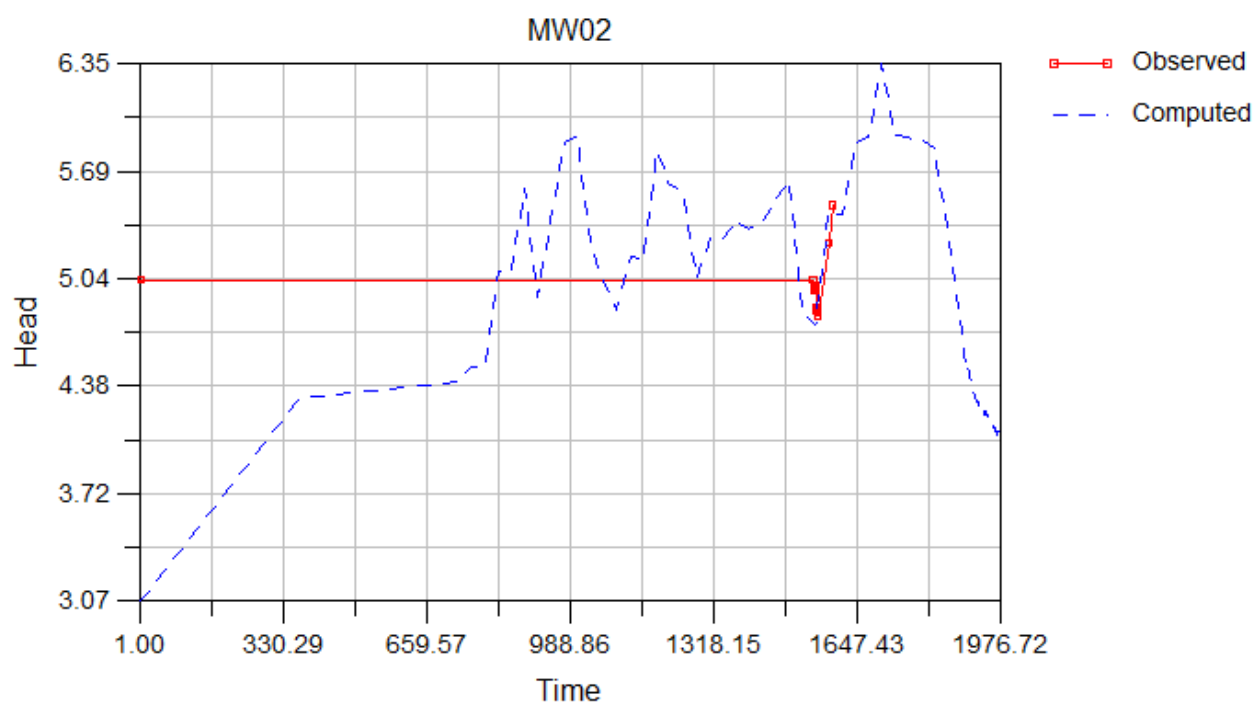
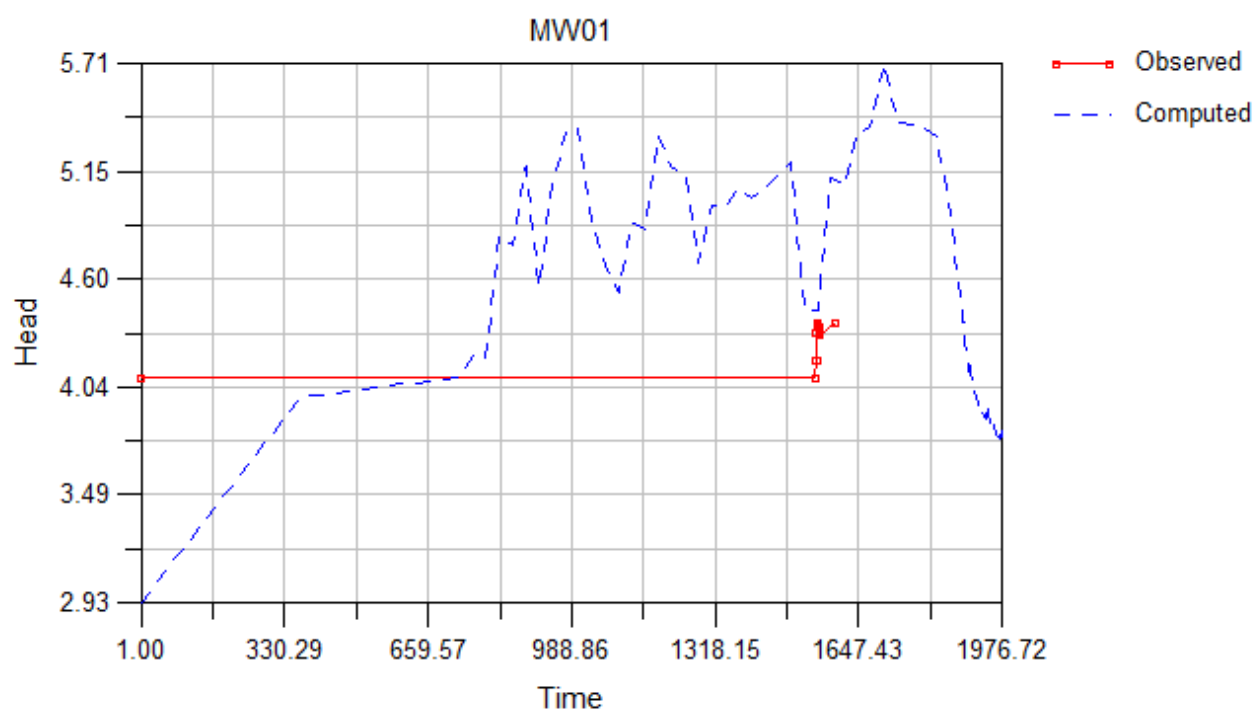
					cyclic Aromatic Hydrocarbons										Ions				
					Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	Calcium (filtered)	Chloride	Potassium (filtered)	Sodium (filtered)	Sulfate as SO4 - Turbidimetric (filtered)
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL					0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0005	1	1	1	1	1
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0005	<1	<1	<1	<1	<1

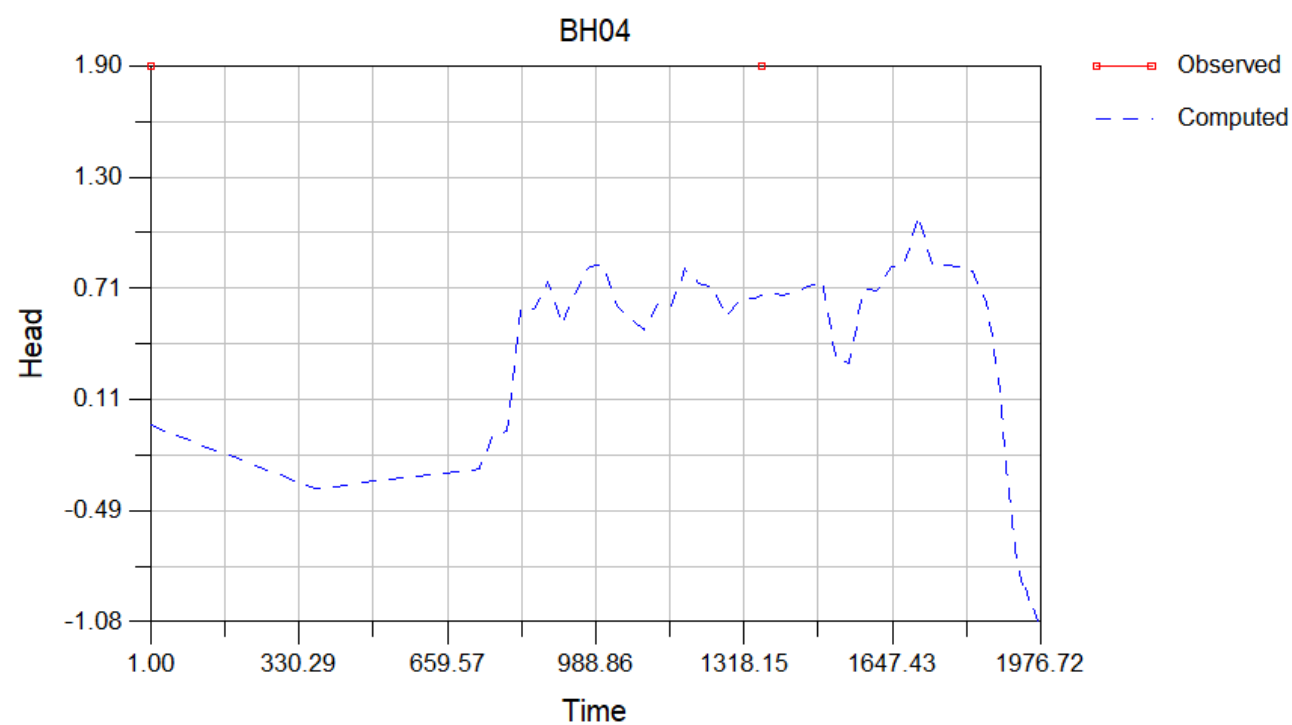
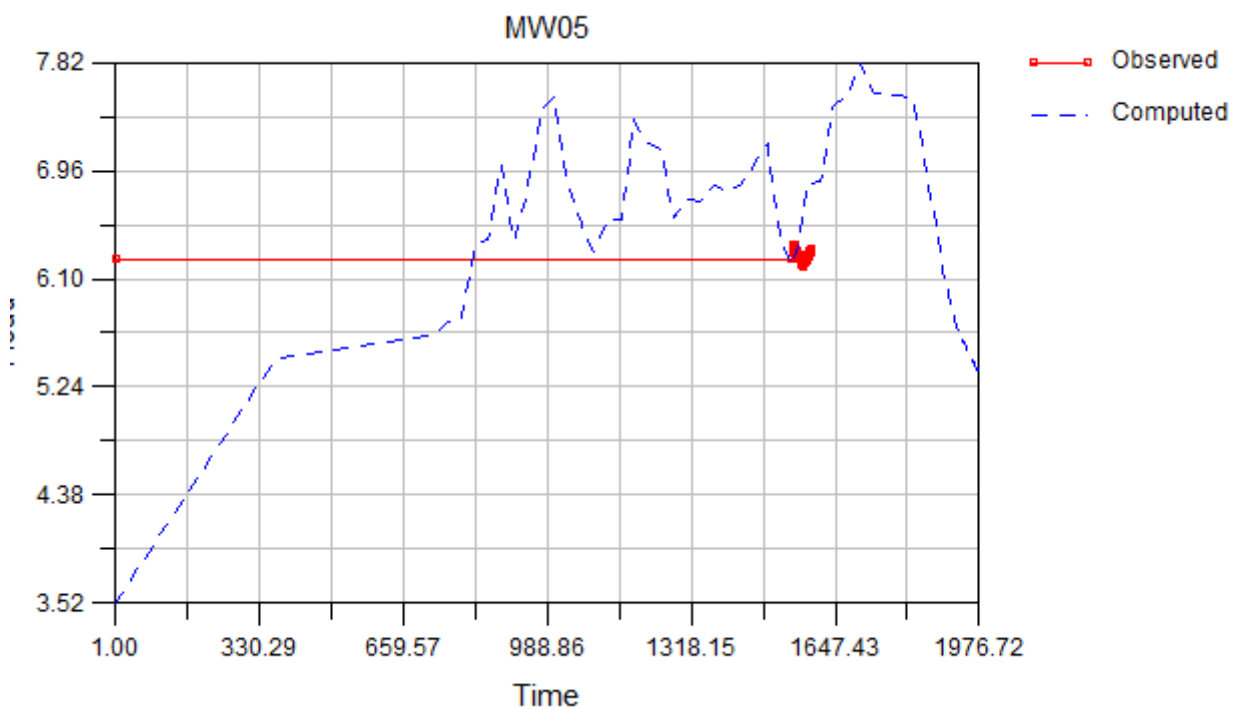
					Per and polyfluoroalkyl substances														
					Anions Total	Cations Total	Perfluorobutane sulfonic acid (PFBS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctanesulfonic acid (PFOS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum (PFHxS + PFOs)
							meq/L	meq/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.01	0.02	0.01	0.01	0.1	0.02	0.02	0.02	0.01	0.05	0.05	0.05	0.05	0.01
Lab Report Number	Field ID	Matrix Type	Date	Sample Type															
EM2505846	QC03	Water	04 Apr 2025	Rinsate	<0.01	<0.01	<0.02	<0.01	<0.01	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01

APPENDIX G: MODELLED VERSUS MEASURED GROUNDWATER LEVEL DATA



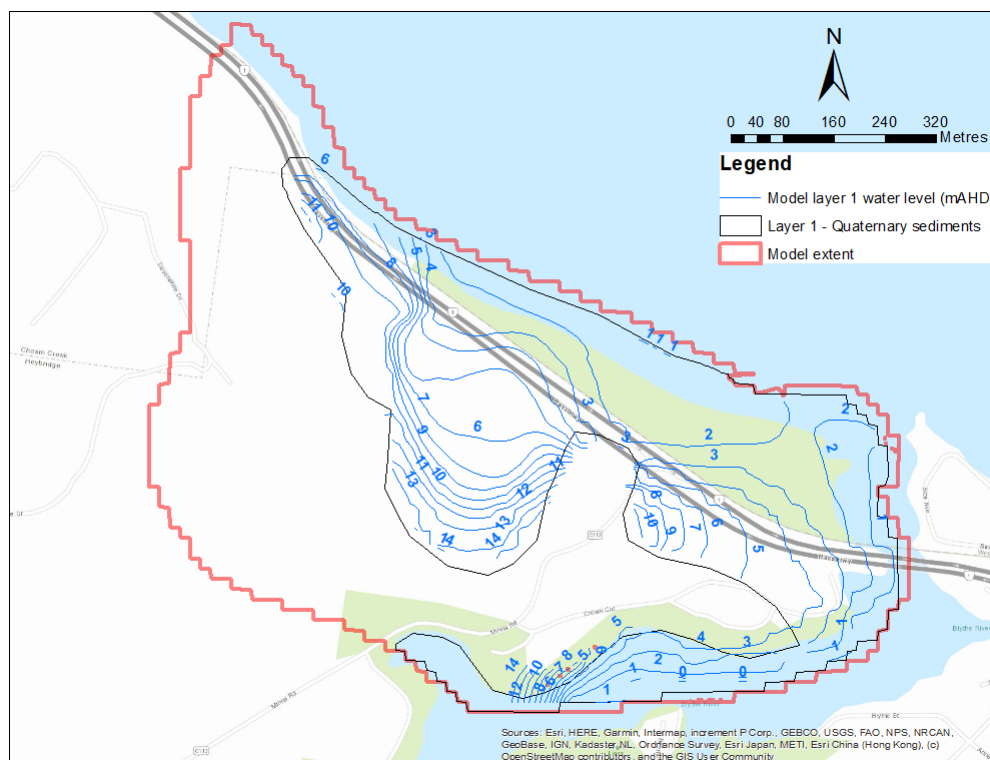




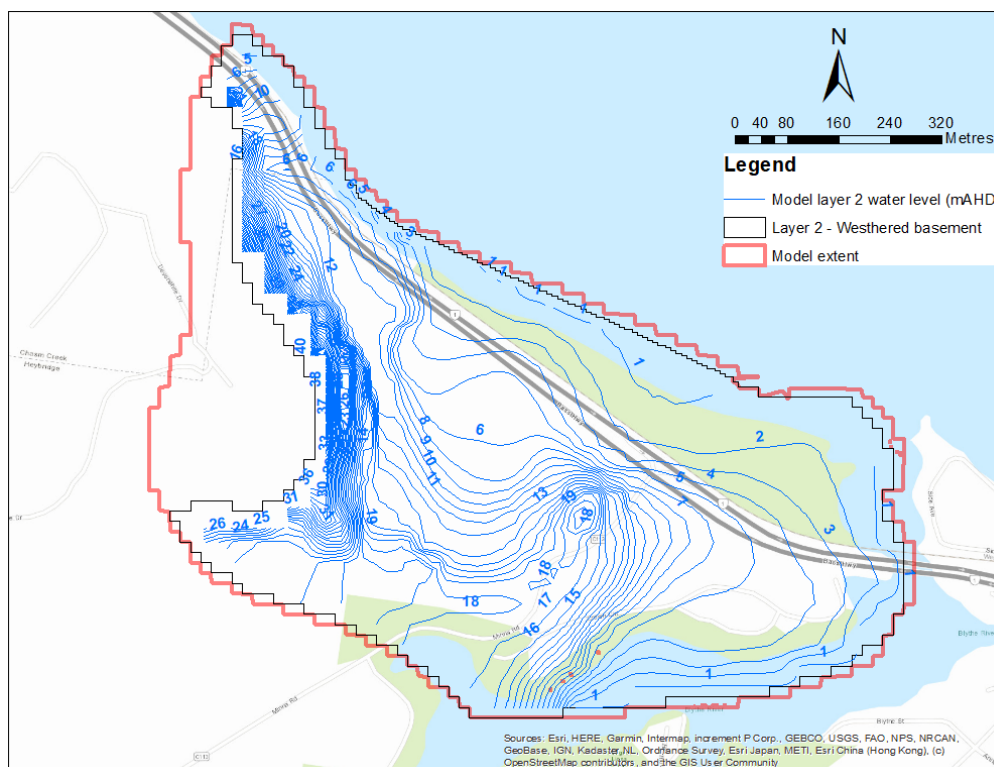


APPENDIX H: MODEL CONTOURED GROUNDWATER LEVEL

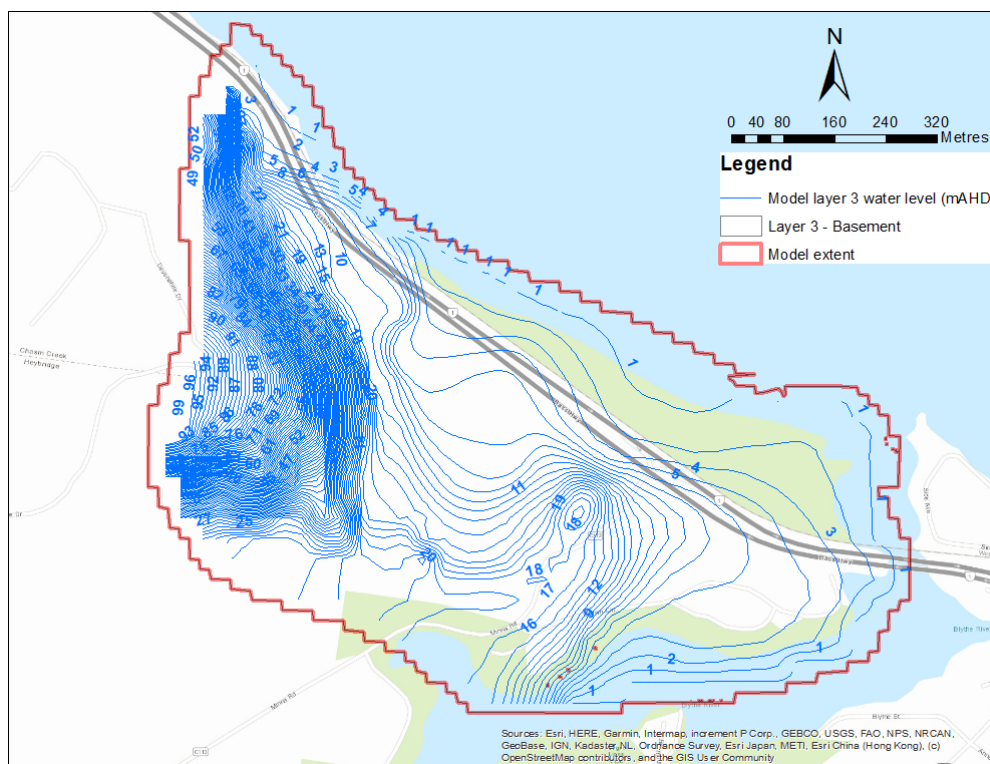
Model layer 1



Model layer 2



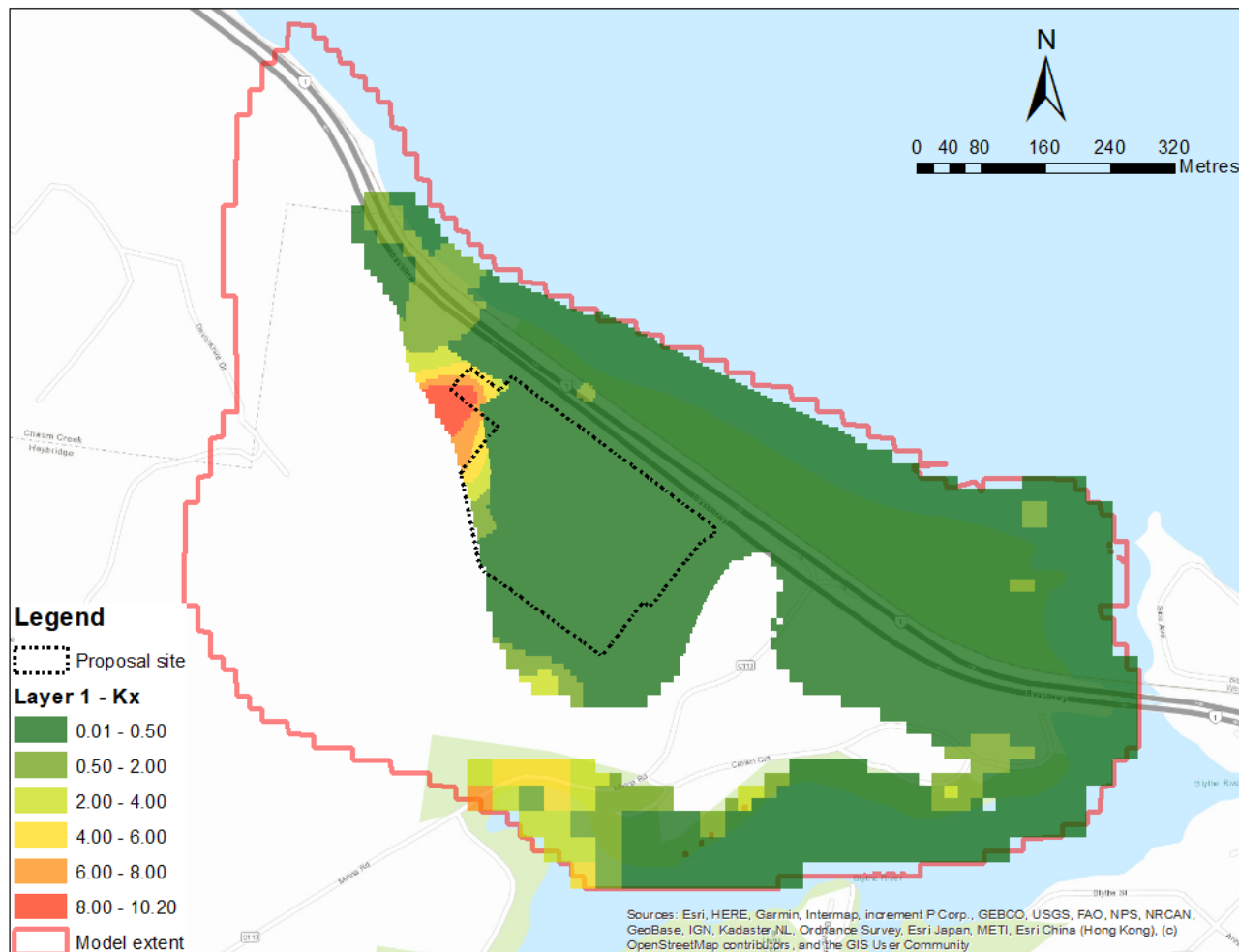
Model layer 3



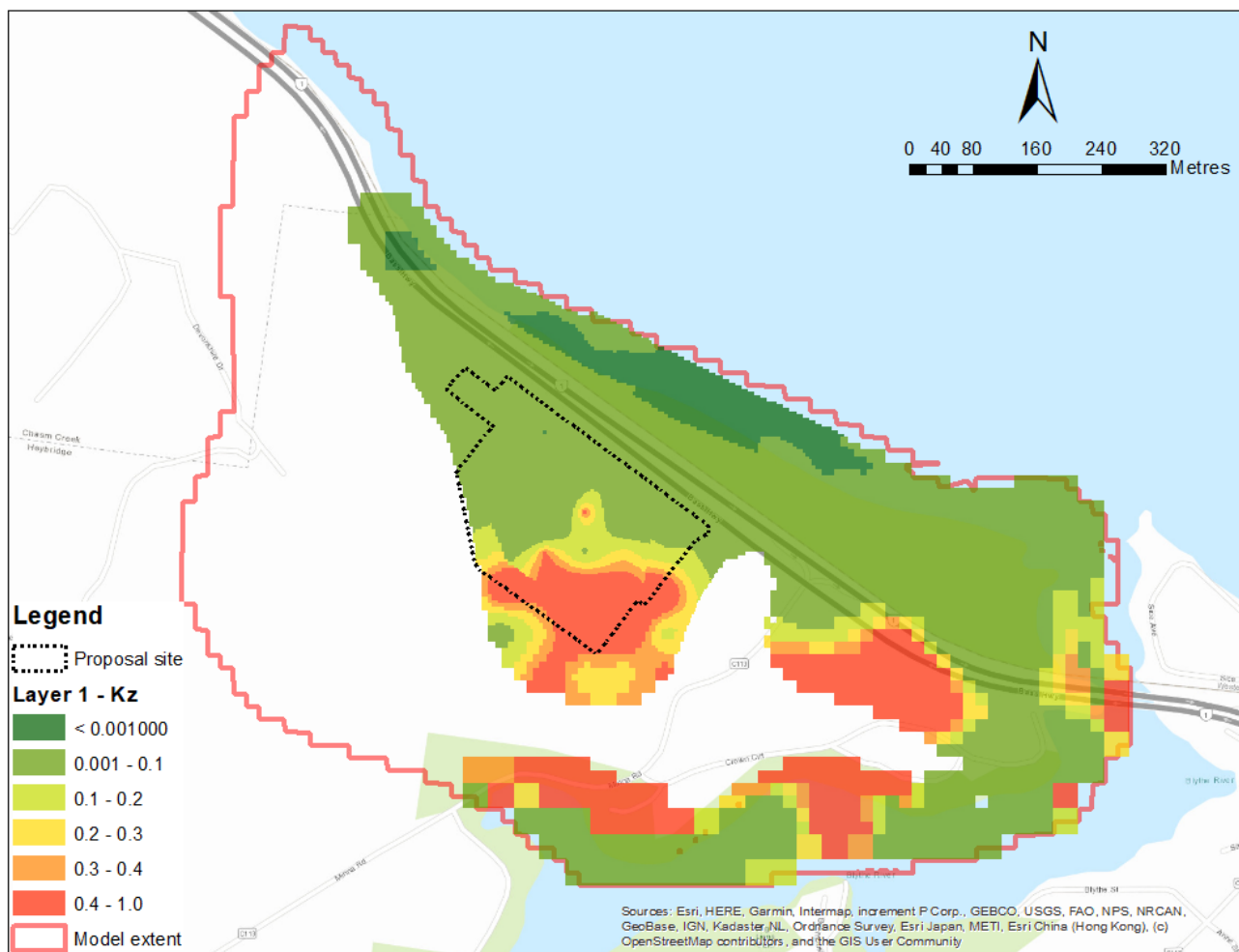
APPENDIX I: CALIBRATED PARAMETERS

I.1 - MODEL LAYER 1

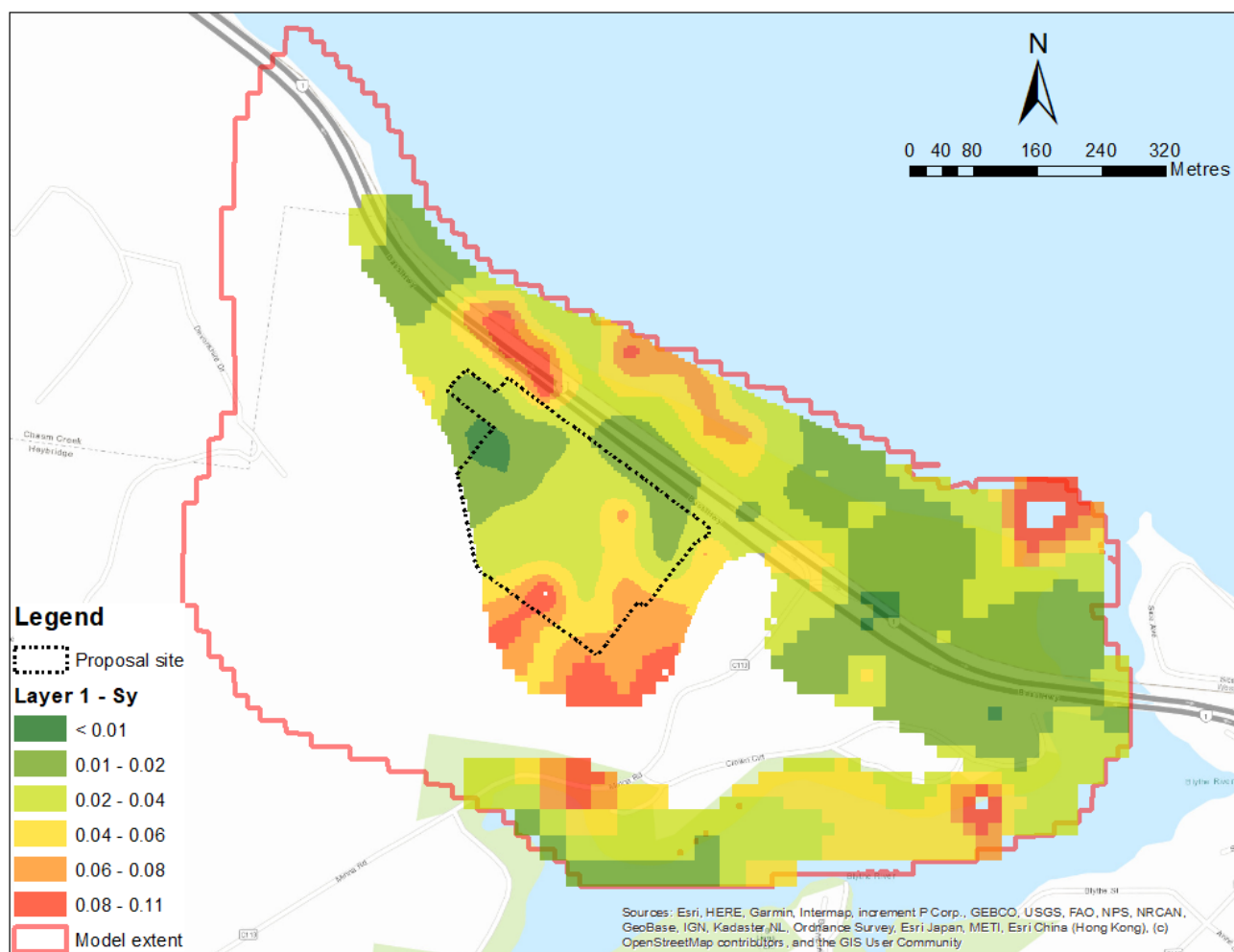
Horizontal hydraulic conductivity



Vertical hydraulic conductivity



Specific yield

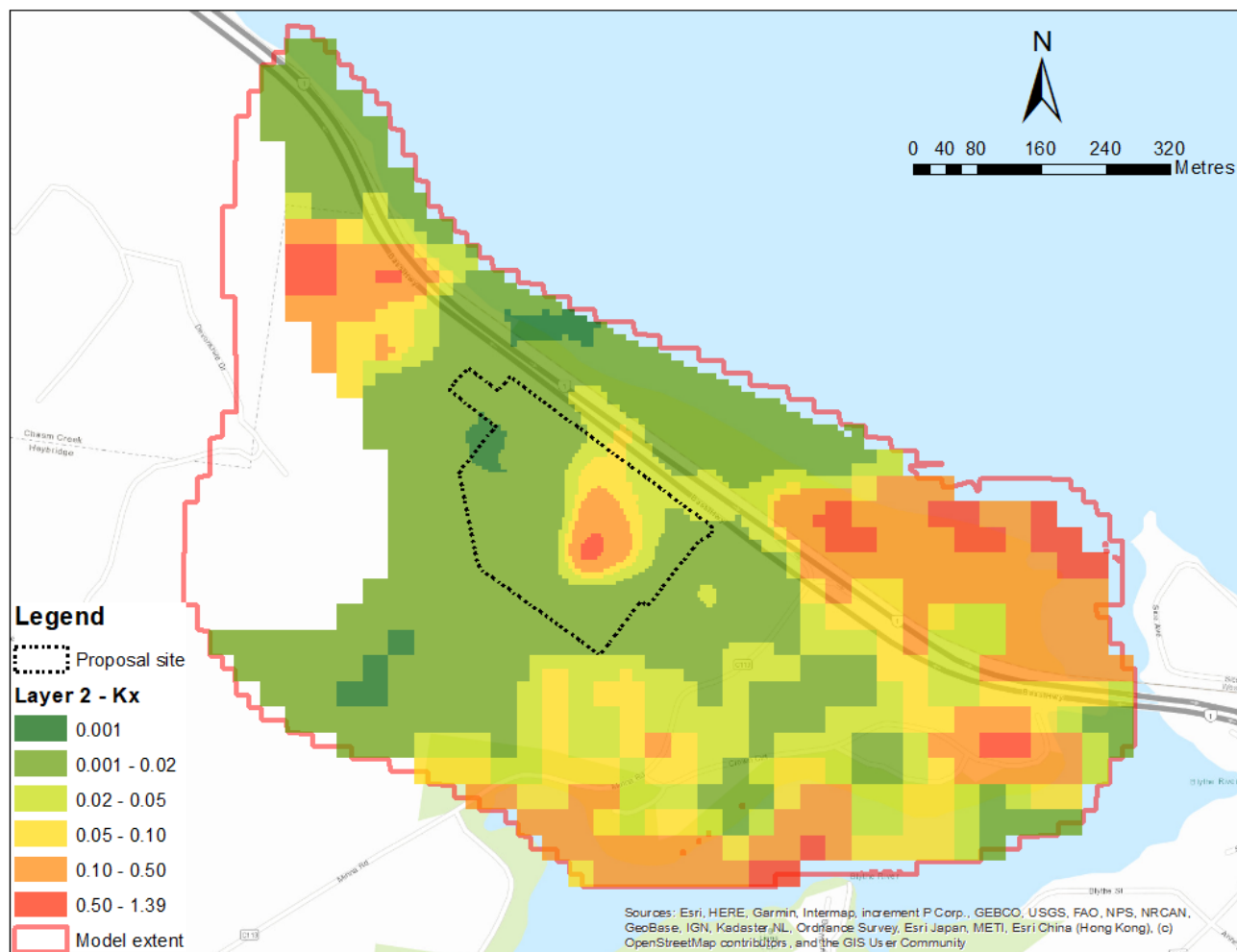


Storage

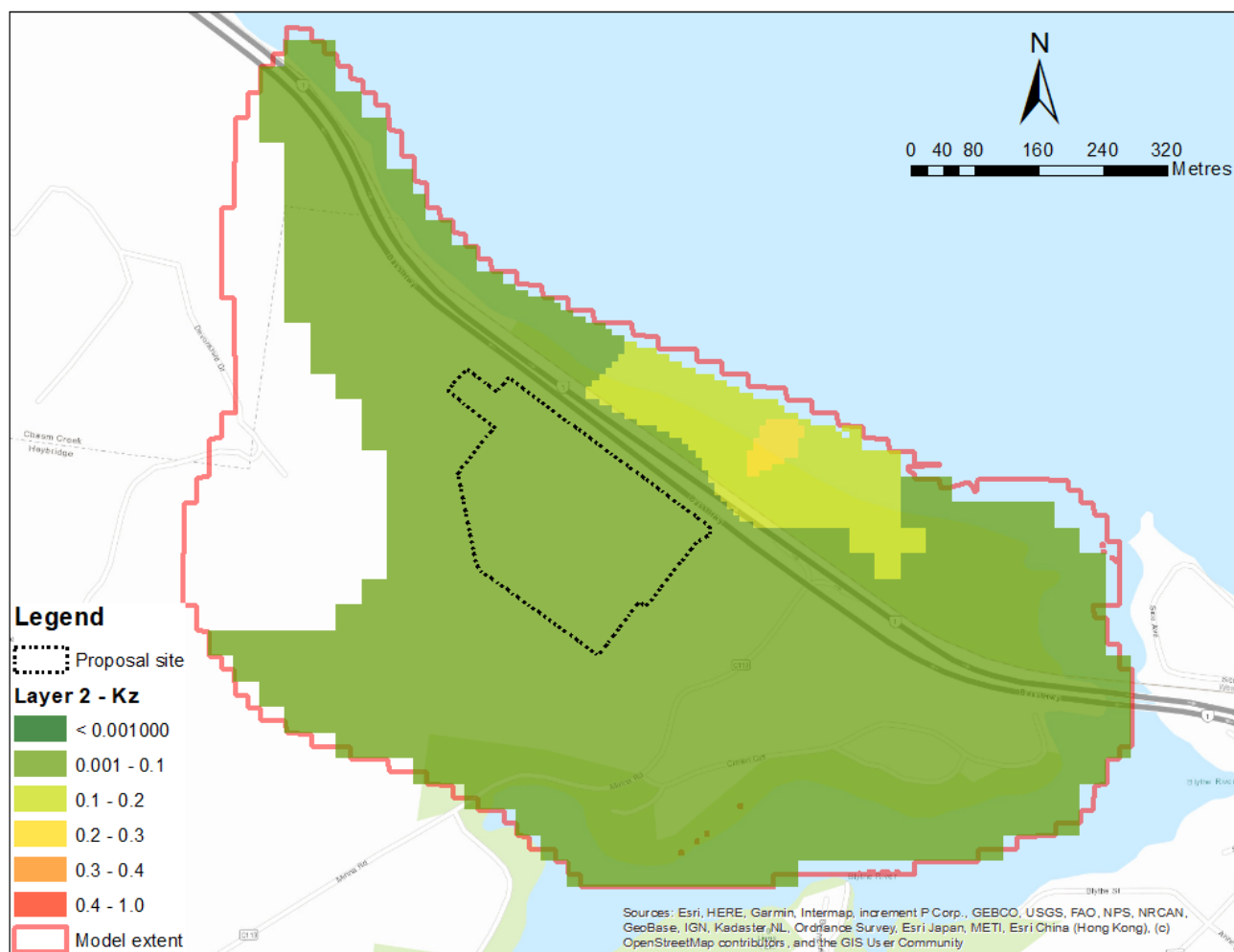
N/A (unconfined)

I.2 - MODEL LAYER 2

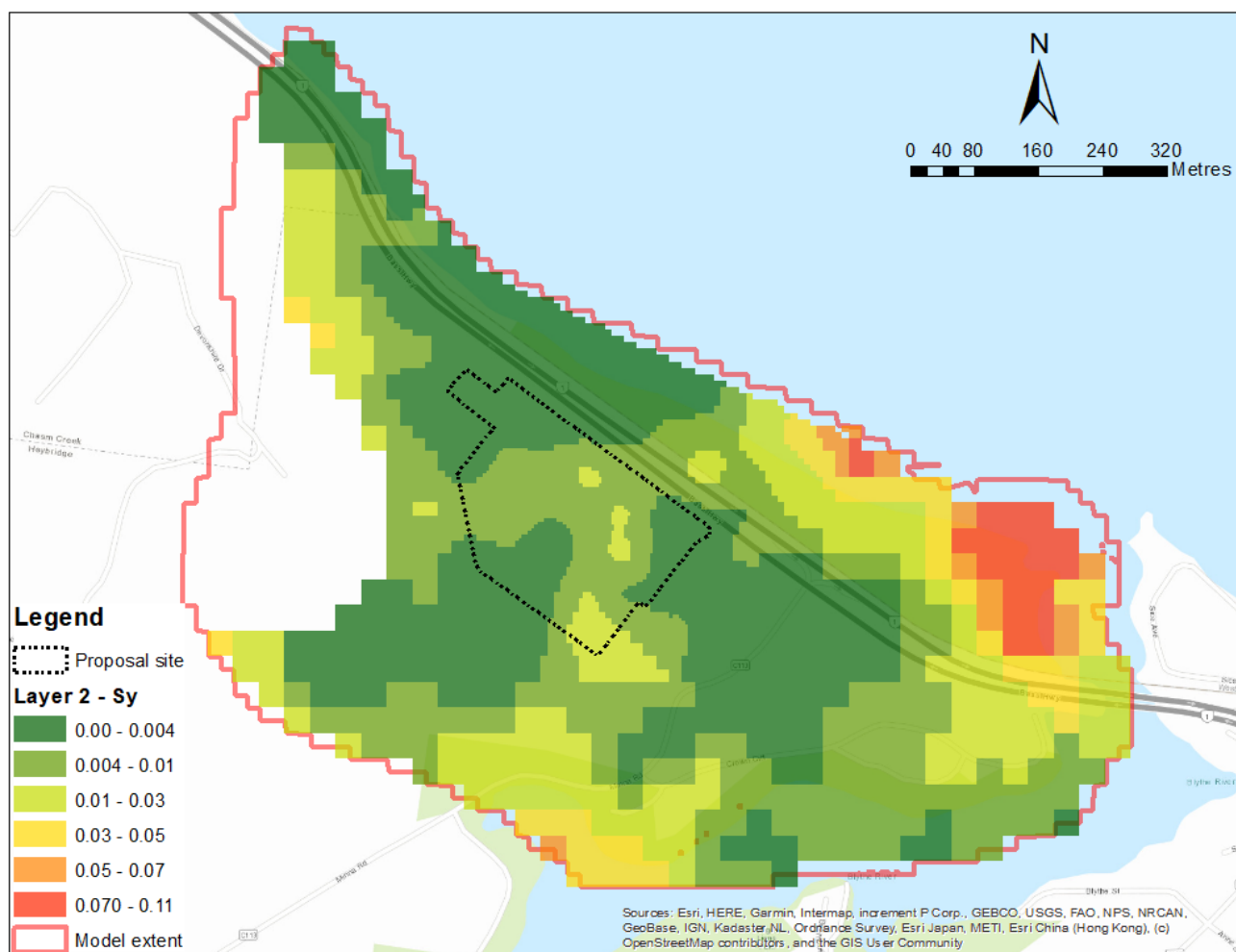
Horizontal hydraulic conductivity



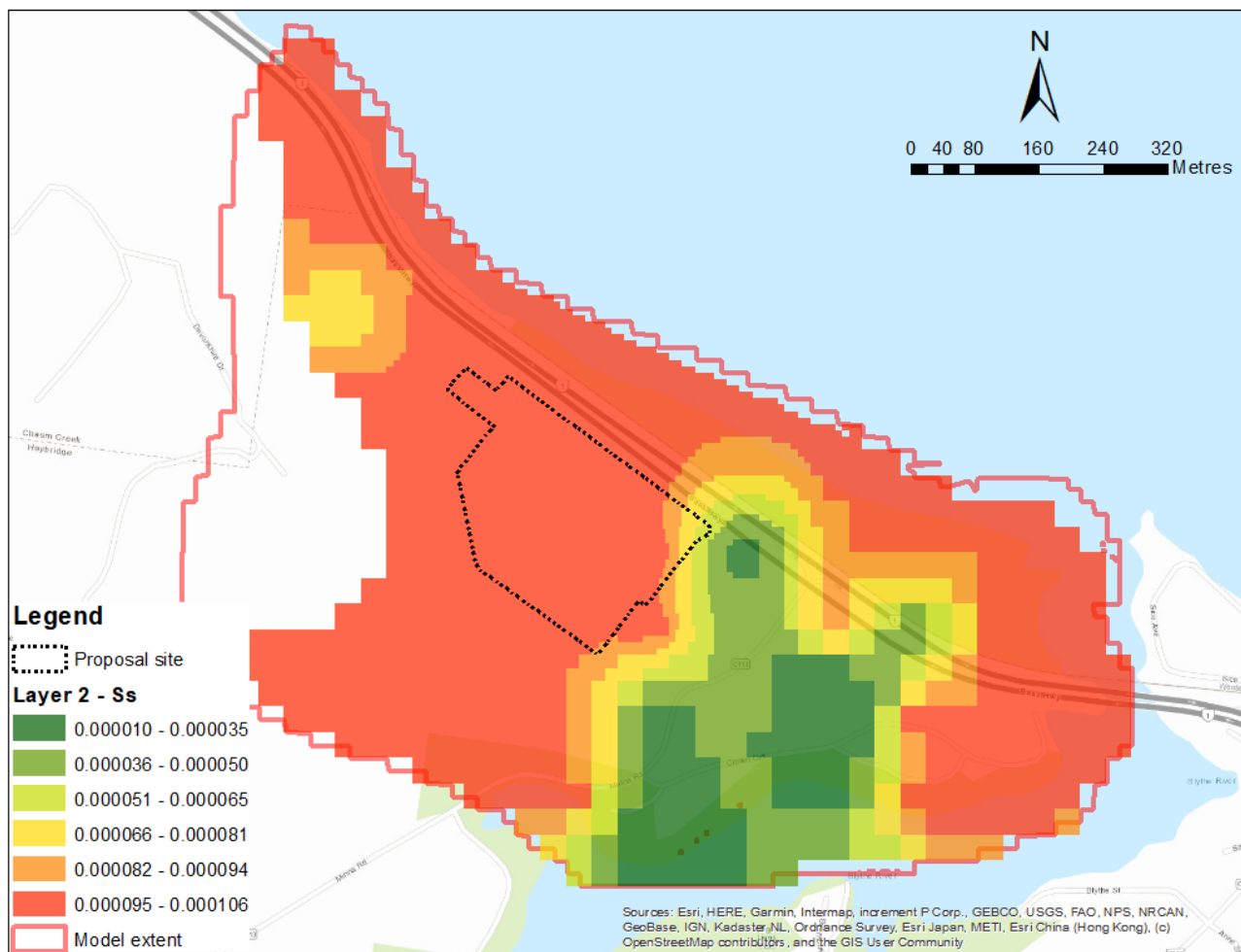
Vertical hydraulic conductivity



Specific yield

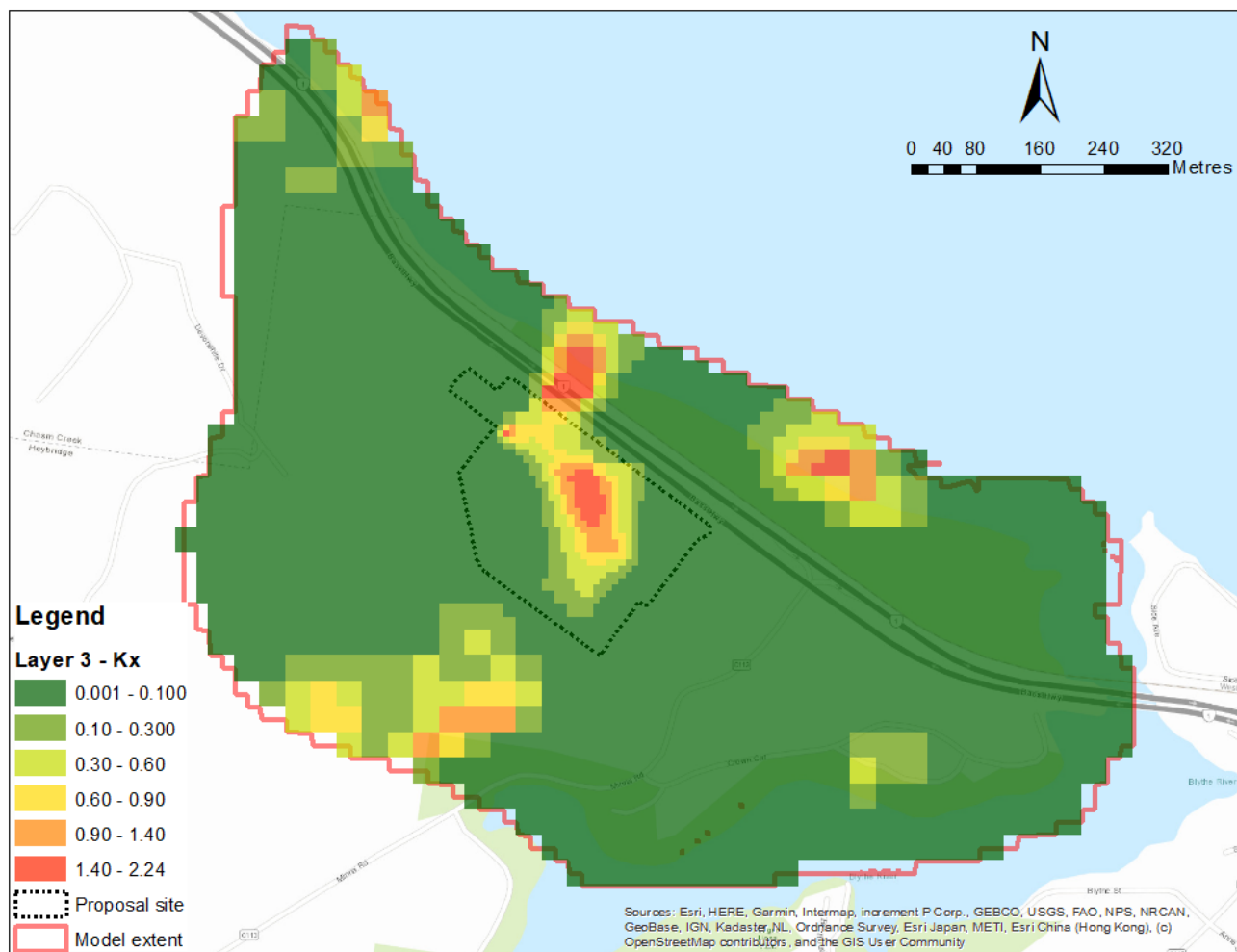


Storage

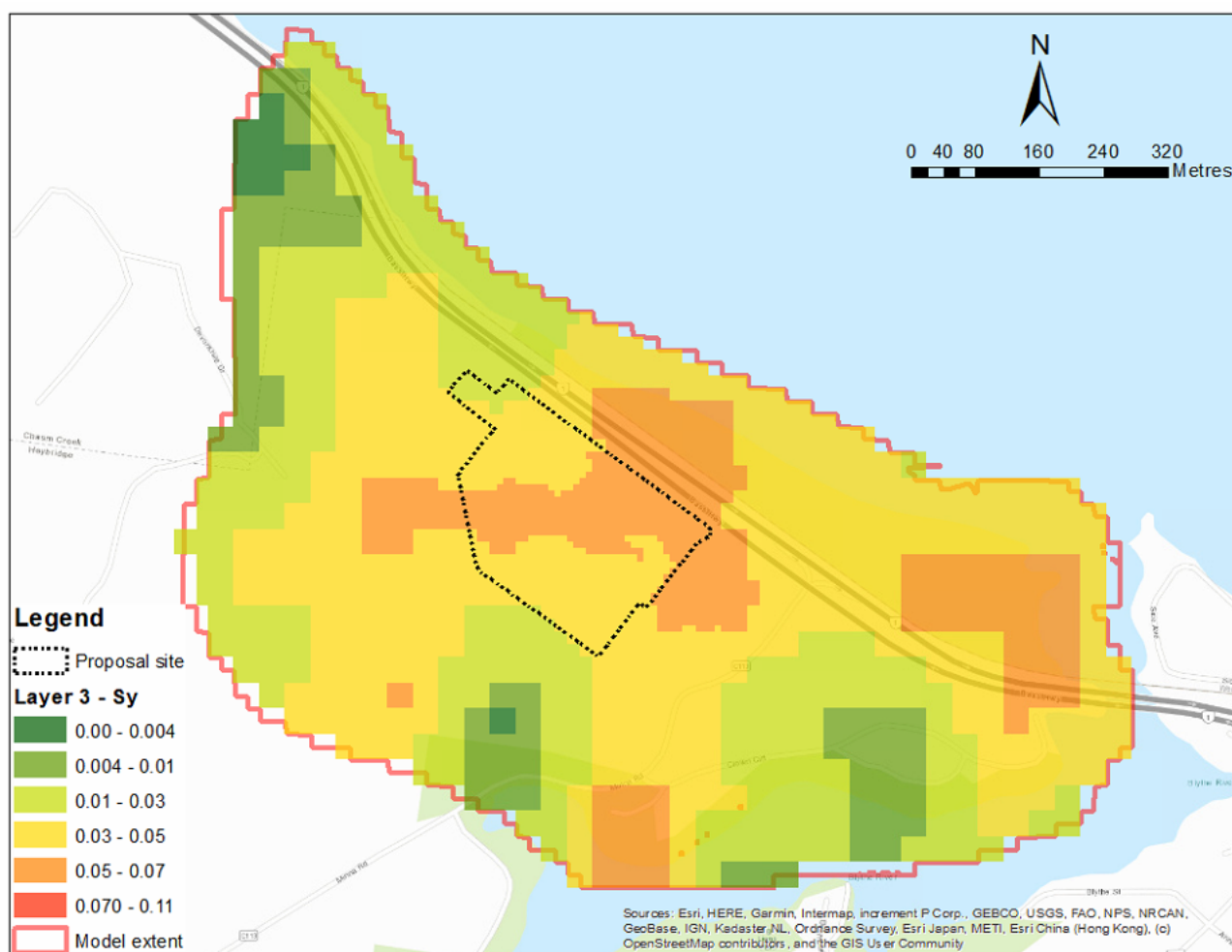


I.3 - MODEL LAYER 3

Horizontal hydraulic conductivity (m/day)



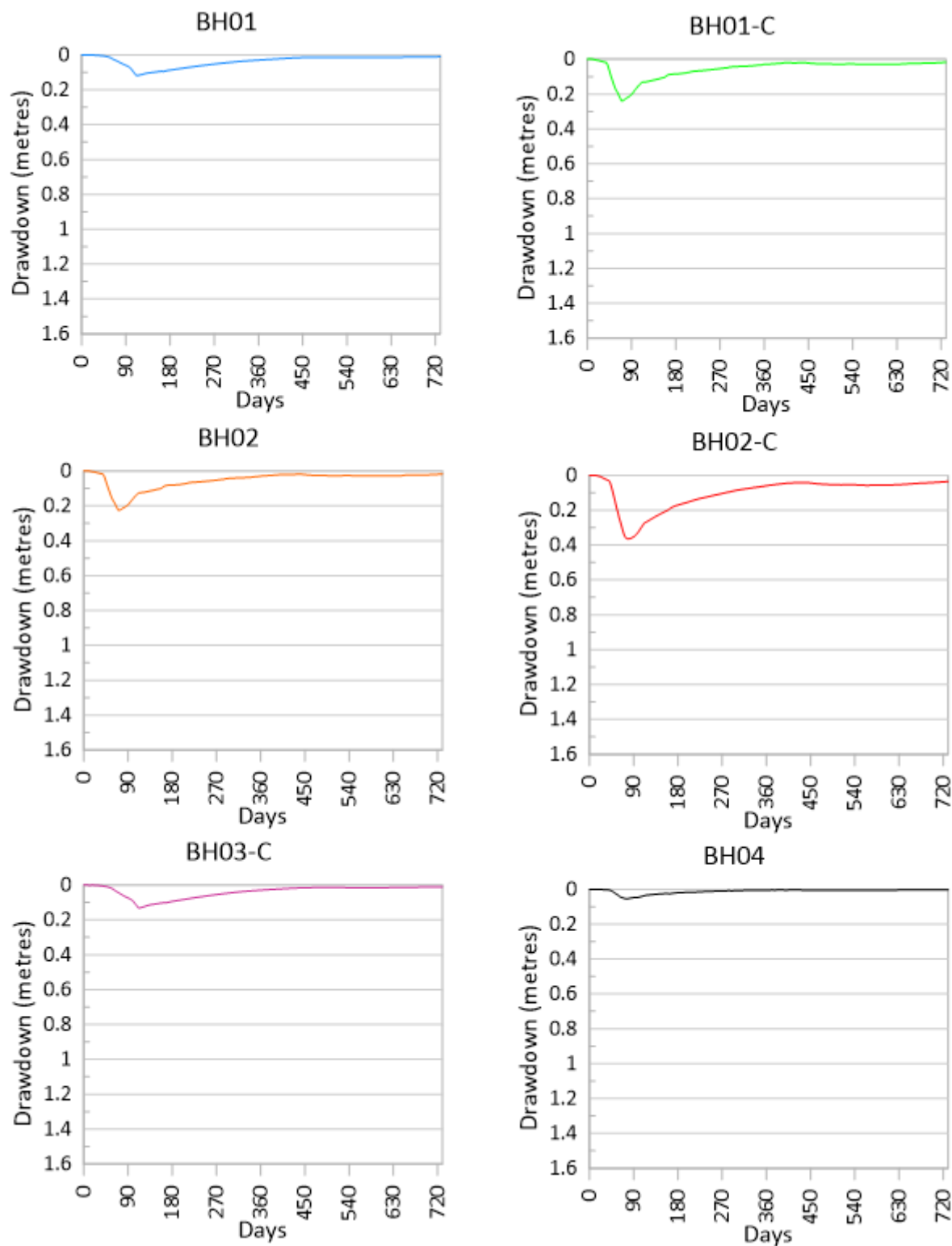
Specific yield (unit less)

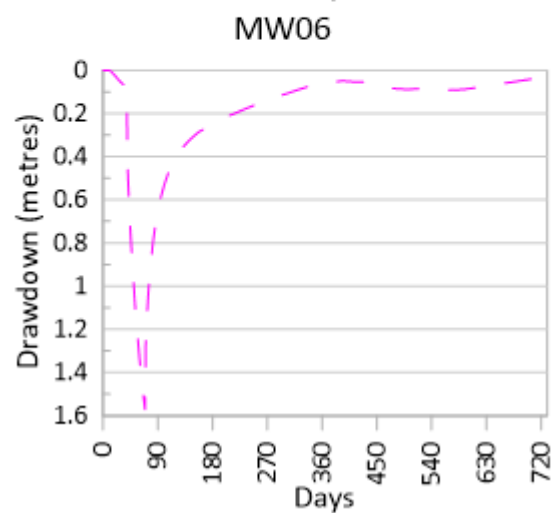
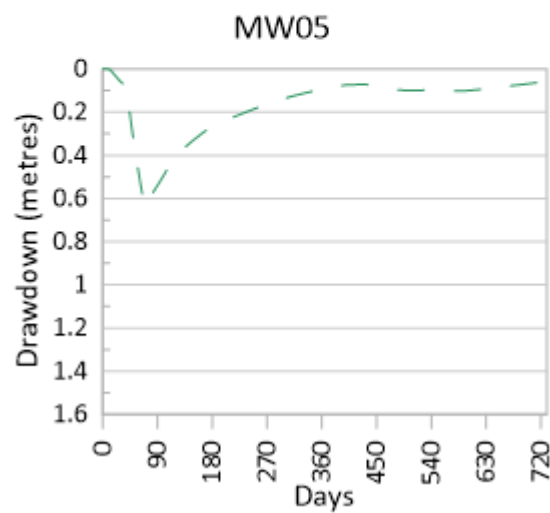
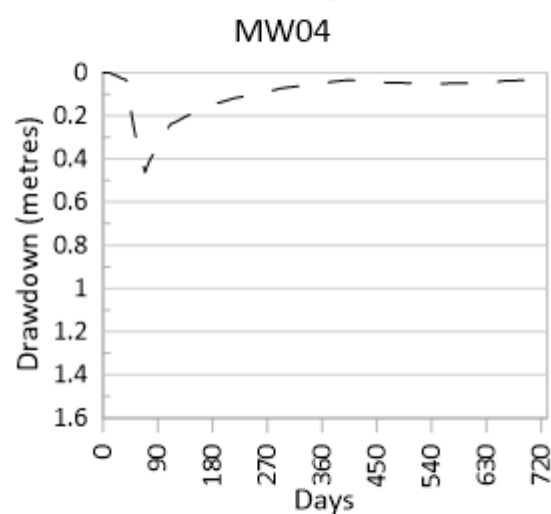
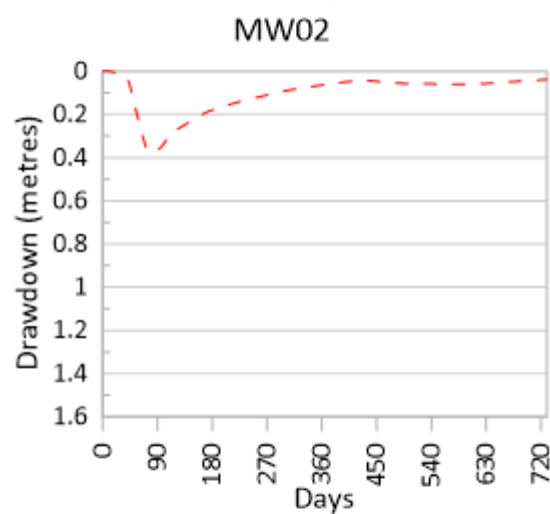
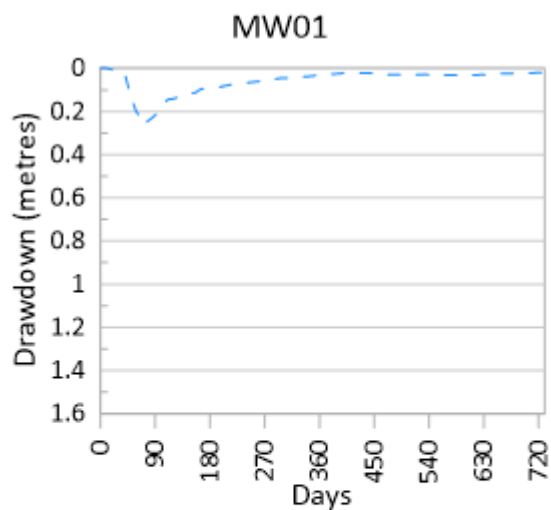
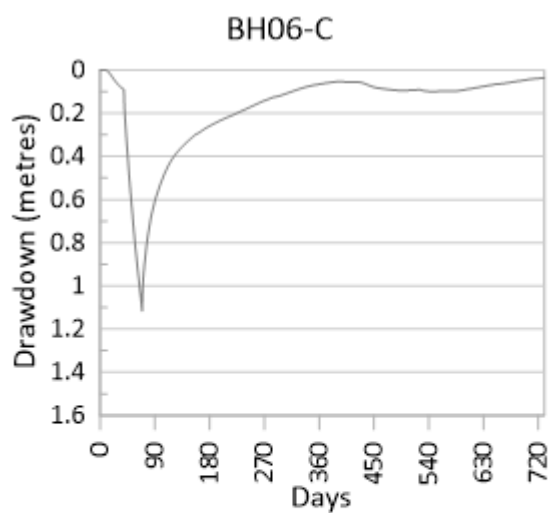


APPENDIX J: PROPOSED GROUNDWATER LEVEL DRAWDOWN

Note: Days are relative to the start of proposed site construction activities

J.1 - MONITORING WELL DRAWDOWN





J.2 - SPATIAL DRAWDOWN

