Klohn Crippen Berger

Glencore Coal Assets Australia

Hail Creek Open Cut

2025 Brumby Water Holes

Groundwater Model Update

Final

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Glencore Coal Assets Australia
Hail Creek Open Cut
Hail Creek, QLD
4742

Alan Shaw
Environment & Community Manager

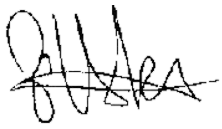
Dear Alan:

Brumby Waterholes
2025 Brumby Water Holes Groundwater Model Update
Final

KCB Australia Pty Ltd (KCB) is pleased to provide the report on the updated site-specific groundwater assessment of the Brumby Waterholes at the Hail Creek Open Cut mining complex. Should you have any queries, please do not hesitate to contact the undersigned on +61 7 3004-0206 or busher@klohn.com.

Yours truly,

KCB AUSTRALIA PTY LTD.



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EXECUTIVE SUMMARY

KCB Australia Pty Ltd (KCB) has been commissioned by Glencore to update the previous groundwater model that was completed on the Brumby Waterhole (BWH) area. BWH is a surface water feature located 1.2km north-west of Exevale pit on a tributary of Hail Creek. The waterhole has significant cultural heritage value for the local Widi Traditional Owners. Specifically, the BWH comprises three individual in-stream waterholes in sandstone bedrock depressions within the ephemeral creek alignment.

Glencore commissioned SLR to complete a regional hydrogeological assessment and groundwater model. In 2023 this larger model was identified to be of an inappropriate scale to reliably predict interactions between the BWH and the local groundwater system over the remaining mine life and after closure. This document reports on the updated predictions of the response of groundwater system near the water holes and the potential interaction with the BWH pools, using local-scale data and modelling. As for the 2023 modelling, KCB used SLR's regional groundwater model results (updated from improved calibration and using multiple model realisations)

Apart from the recent SLR work that is reported elsewhere, BWH has been subject to a number of hydrogeological assessments in the past including AGE 2013, JBT 2015, Jacobs 2020 and WSP 2021.

The BWH occurs in pools in more erosion-resistant sandstone associated with a drop in elevation of approximately 8m over a distance of 70m within an ephemeral creek system. The water level in the upper and middle pools is above the seasonal highest groundwater levels recorded in Permian monitoring bores within ~ 100 m of these ponds. This indicates groundwater is unlikely to recharge or sustain the water level within the upper two ponds, and the ponds do not represent water table windows. The elevation of the water level in the lower pool is generally also above (and distinct from) the water table elevation recorded in nearby monitoring bores.

Key findings from KCB's assessments include:

- For the groundwater model, improved transient calibration was achieved using the refined model that allows for a more discretised and representative assignment of hydraulic parameters near the BWH compared to the regional scale model. The calibrated hydraulic parameters in the region of the water holes are within the same order as the field measurements that have been obtained from previous field campaigns.
- The groundwater model predicts that interaction between the water holes and the regional groundwater system is negligible. The results indicate that under most circumstances there is no contribution from the regional groundwater system to the BWH. The model water balance indicates that that the pools seep to the regional groundwater system at a very low rate (<0.001 L/s) due to the lower local hydraulic conductivity and the heads indicate that the water table is hydraulically disconnected from the pools (total groundwater model water balance for the BWH model area suggests that groundwater recharge across the model domain contributes several orders more water to the groundwater system than leakage from the pools).
- Sensitivity simulations for the groundwater model indicate that recharge into the lower pool may occur for very short periods following major rainfall events.

- The groundwater model results indicate that drawdown in the FCCM will propagate from the mining area toward the BWH (as a result of drawdown predicted in the SLR model). Despite this, the model results indicate that the rates of leakage from the BWH to regional groundwater remain low due to the relatively impermeable base of the middle and lower pool.

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CLARIFICATIONS REGARDING THIS REPORT

This report is an instrument of service of KCB Australia Pty Ltd (KCB). The report has been prepared for the use of Glencore Coal Assets Australia (GCAA) for the specific application to the Hail Creek Eastern Margin Extension (HCEP) application. The report may be disclosed by the Client / GCAA to the Queensland Government.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered; however, the use of this report will be at the user's sole risk absolutely and in all respects, and KCB makes no warranty, express or implied. This report may not be relied upon by any person other than the Client / GCAA or Queensland Government without KCB's written consent.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by the Client or by other parties on behalf of the Client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.
5. This report is electronically signed and sealed, and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

1 INTRODUCTION

KCB Australia Pty Ltd (KCB) prepared a hydrogeological assessment of Brumby Waterhole (BWH) for Hail Creek Open Cut (HCOC) in 2023 (KCB, 2023). The assessment was in support of a Major Environmental Authority Amendment application (EAA) for the Eastern Margin Extension at HCOC (the Project). KCB was commissioned by Hail Creek Coal Holdings Pty Limited (HCC) to update the site-specific groundwater flow model for BWH, in response to an additional information request (IR) from the Department of the Environment, Tourism, Science and Innovation (DETSI) received on 31 July 2025.

BWH is a surface water feature located on a tributary of Hail Creek 1.2 km north-west of the Exevale pit. The BWH comprises three individual in-stream waterholes in sandstone bedrock depressions within the ephemeral creek alignment; this ephemeral tributary is unnamed. The waterhole has significant cultural heritage value for the local Widi Traditional Owners.

HCC commissioned SLR to complete a regional hydrogeological assessment to support the regulatory submissions and the most recent model (SLR, 2025 in preparation) groundwater model update requires re-integration with the larger-scale groundwater model that was completed by SLR. The scale of the SLR-developed HCOC groundwater model as covering the mine site and surrounds was previously identified as not suitable to reliably predict interactions between the BWH and the local groundwater system over the remaining mine life and after closure. As a result, KCB conceptualised and predicted potential interactions between the BWH, the local surface water (in the pools) and the groundwater system near the water holes using local-scale data and modelling as reported in 2023 (KCB, 2023).

This supplementary report forms part of the response to the additional IR and addresses the following tasks :

- Update the previous local-scale 3D groundwater flow model (in MODFLOW) to simulate interaction between surface water within the BWH and groundwater. This model accounts for outputs from: (a) the regional SLR groundwater flow model, and the surface water balance model (KCB, 2023).
- The update includes three (3) sets of results from SLR (10^{th} /50^{th} /90^{th} percentile) for the approved mining, and for the proposed extension. These are applied as boundary conditions within the updated local-scale BWH model.
- Four additional sensitivity scenarios have been completed to assess the potential impact of recharge and the hydraulic conductivity of the BWH sandstone on groundwater responses and/or losses from the waterhole.

Readers should refer to SLR (2023) and KCB's 2023 report for details on the conceptualisation and background; these aspects are not repeated in detail in this report.

1.1 Hail Creek Open Cut and Brumby Waterholes

HCOC is located 120 km south-west of Mackay, in the Bowen Basin, Central Queensland. The location of the mine and associated mining leases (ML) 4738 and ML700026 are presented in Figure 1-1.

SLR (2023) included the BWH as part of their hydrogeological assessment and have provided a succinct summary of previous work completed by EHA (2009), AGE (2013), JBT (2015), Jacobs (2020) and WSP (2021). SLR (2023) is summarised below to provide context for this assessment. KCB's assessment has built on the findings from these studies.

The BWH is located approximately 1.2 km north-west of the current operations at HCOC on ML4738. The BWH consists of three separate pools in a bedrock outcrop of the Fort Cooper Coal Measures. Each waterhole is in-stream within a meandering southward-flowing ephemeral creek. Figure 1-2 and Figure 1-3 show the location of the waterholes and 2023 drone photography of the area.

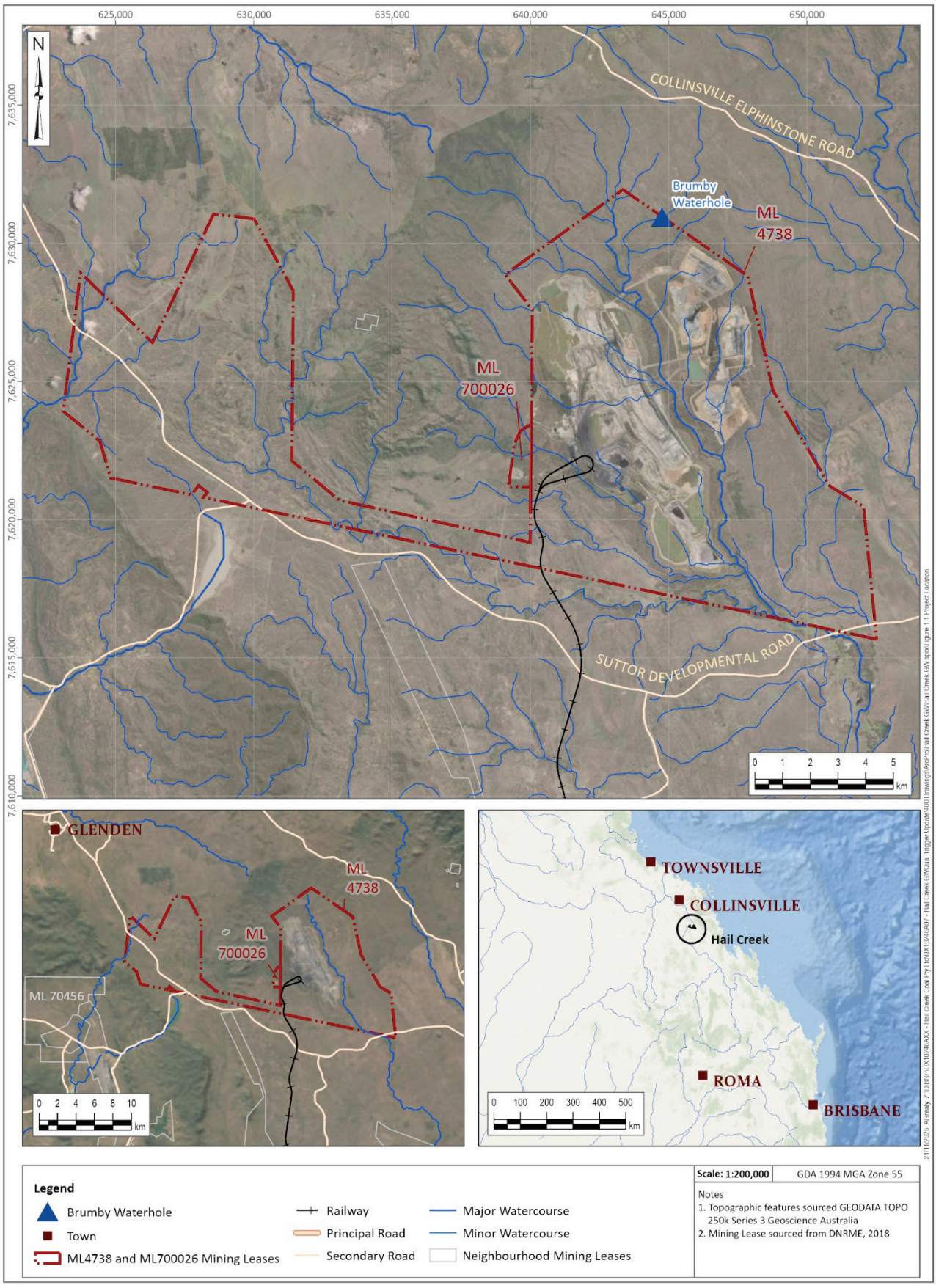


Figure 1-1 BWH Location

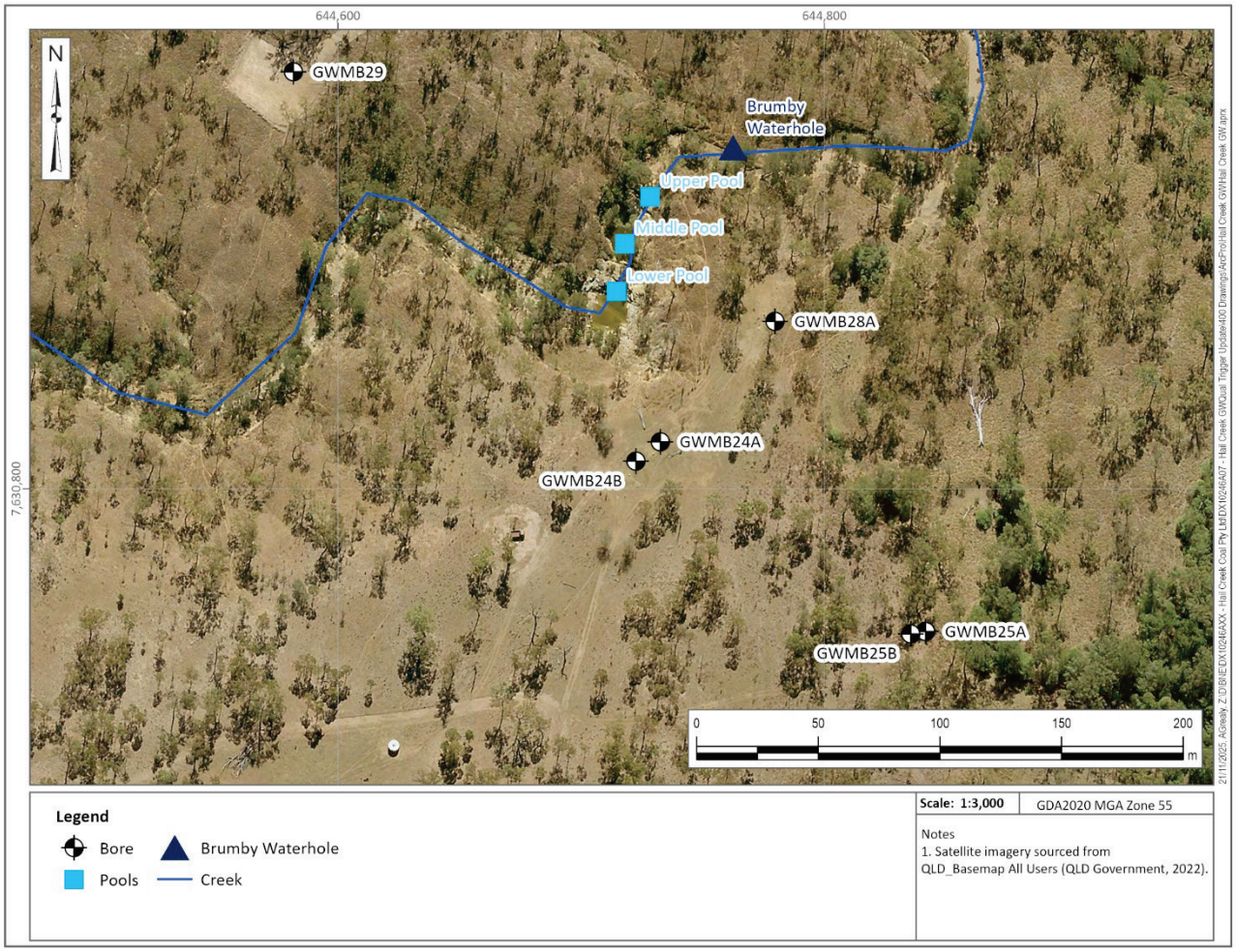


Figure 1-2 Aerial View of Brumby Water Hole System with Closest Bores Shown

At the BWH, the creek flows approximately south-west and perpendicular to the strike of the Fort Cooper Coal Measures (FCCM), which also dip to the south-west. Relatively erosion-resistant strata within the FCCM form local topography highs (presenting as parallel south-easterly striking 'terraces') with rock bars retaining water at the outlet of the individual BWH pools (SLR 2023).

The geological model provided by HCOC indicates that the coal seams near the top of the FCCM (FC3, FC4 and FC5), which are mined in some HCOC pits, sub crop to the south of the waterholes. SLR (2023) provides a cross-section of the area for context (Figure 1-4).

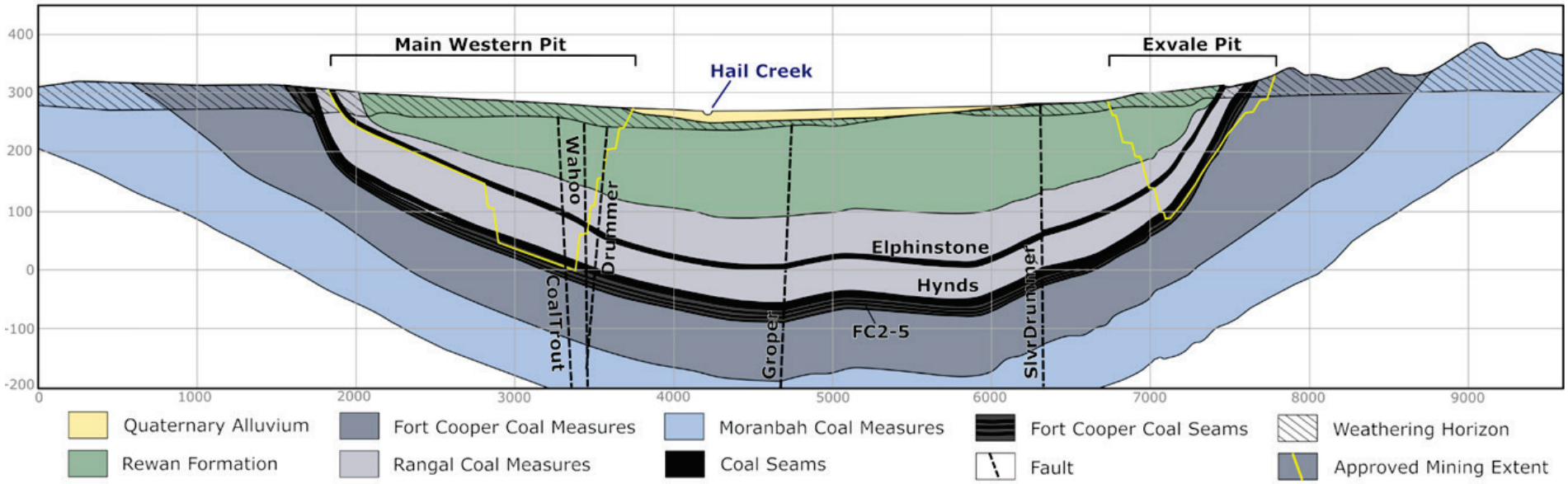


Figure 1-3 SLR (2023) Geological Cross-Section (Roughly West-East); Brumby Waterhole Location at Approximately Chainage 8,500 m

There is a fall in elevation of approximately 8 m, over a distance of 70 m, between the upper pool and the lower pool of the BWH. The uppermost pool is elongated and has a sandy base in the area upstream of the first more resistant sandstone rock bar. The lower two pools are circular and approximately 2 m deep, at capacity. All pools are hosted within the low permeability and lower erodibility FCCM sandstone unit.

The water level in the upper and middle pools is above the seasonal highest groundwater levels recorded in monitoring bores installed in the Permian sediments within approximately 100 m of these ponds. This indicates groundwater is unlikely to recharge or sustain the water level within the upper two pools, and they do not represent water table windows. The elevation of the water level in the lower pool is generally also above (and distinct from) the water table elevation recorded in nearby monitoring bores.

2 SCOPE AND APPROACH

2.1 Assessment Context

This hydrogeological assessment has been completed to support HCOC's response to the additional IR . SLR have completed an assessment of the hydrogeology of HCOC and all connected strata, including the development of a conceptual model of the mine site's groundwater systems. This information was integrated into the design of closure and rehabilitation strategies. The hydrogeological assessment included the following steps:

- Determining the groundwater occurrence including the existence of, and depth to aquifers and aquitards.
- Locating groundwater recharge and discharge locations locally and regionally.
- Groundwater quality within each of the aquifers and from surface expressions (i.e., seeps and springs).
- Current and potential future uses of groundwater including existing groundwater extraction bores.
- Groundwater flow direction and velocity, including field tests to determine hydraulic conductivity.
- The development of potentiometric mapping and hydrostratigraphic cross-sections.
- Development of a 3D numerical model for the broader site (model domain includes the BWHs but due to the scale, the discretisation around the BWH area is insufficient).

SLR was commissioned to complete the hydrogeological assessments and modelling, while KCB's scope focusses on only the BWHs and their interaction with the local surface and groundwater systems.

3 SITE BACKGROUND AND SETTING

HCOC operates on MLs 4738 and 700026 under Environmental Authority (EA) EPML00661913.

3.1 Climate

The climate around HCOC is sub-tropical, with temperatures, rainfall and evaporation being higher in the summer months (December to March). The closest open Bureau of Meteorology (BoM) weather station is located at Nebo Station (station 033054), approximately 33 km to the south-east of HCOC. The second closest station, Dilkera station (33318), is approximately 42 km south south-east of HCOC and has been in operation since 1998. Table 3-1 provides the details of these two operational weather stations.

Table 3-1 Operational BoM Weather Stations near HCOC

Station Name	Site Number	Date Commenced	Easting (GDA 94)	Northing (GDA94)	Elevation (mAHD)	Operational Status	Distance from HCOC
Nebo	033054	01-06-1871	21.69° S	148.69° E	195	Open	33 km SE
Dilkera	33318	01-02-2006	21.81° S	148.69° E	178	Open	42 km SSE

mAHD = metres Australian Height Datum.

A SILO Grid point data (Latitude: -21.45, Longitude: 148.45) was used to assess long-term rainfall trends for the area around BWH. The data indicates the average annual rainfall is approximately 736 mm from 1958 - September 2025.

Potential evaporation data for the area of HCOC has also been derived from SILO and has averaged a total of 1933 mm a year from 1958 to 2025 (Table 3-2). Monthly rainfall typically only exceeds monthly potential evaporation for three months during the late wet season.

Table 3-2 Average Monthly Potential Evaporation (SILO 1958-2025)

PE (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	202.7	165.4	171.3	139.7	114.6	94.0	104.1	131.3	168.2	206.5	213.7	221.4	1932.8
PE = Potential Evaporation.													

SILO rainfall data were used to analyse rainfall trends (SILO 2025). Figure 3-1 presents daily rainfall between 1999 and 2025 and a cumulative rainfall departure (CRD) trend for the same period. CRD trends represent a running deviation of long-term actual rainfall against the overall average. This provides season-scale identification of trends (wet / dry) as well as longer term (e.g., decadal) deviation from average conditions. CRD is useful for correlating rainfall events to groundwater responses. Observations from the CRD trend include:

- The overall rainfall trend is characterised by the cycle between the wet and dry seasons.
- The trend shows a period of decreasing rainfall between ~2000 and 2007, after which a rapid increasing trend until 2014. A more consistent trend is observed from 2015 onwards, with high rainfall events in 2016 and 2017 and below average rainfall from 2021 to current.

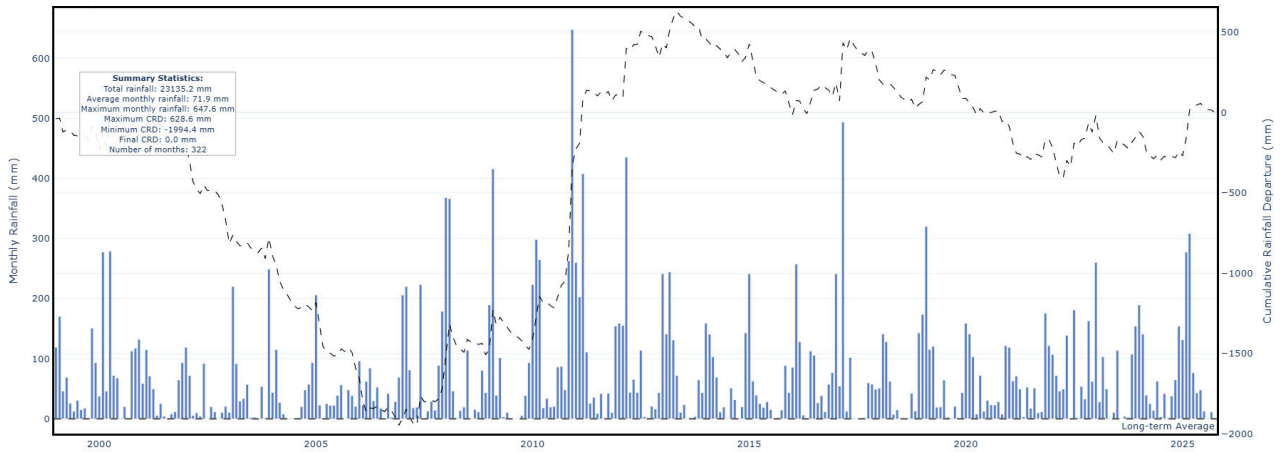


Figure 3-1 Monthly Rainfall and CRD Trend for SILO Location (Latitude: -21.45, Longitude: 148.45)

3.2 Regional Geology

The Brumby Water Holes lie in the northern part of the Bowen Basin. The Collinsville Shelf portion of the Bowen Basin includes the basal Permian aged Back Creek Group, which is comprises generally fine grained clastic sedimentary rocks deposited in a fluvial to shallow marine environment. The Back Creek Group is conformably overlain by the Blackwater Group, which includes the Rangal Coal Measures (RCM), the Fort Cooper Coal Measures (FCCM), and the Moranbah Coal Measures (MCM). The Permian strata are generally unconformably overlain by the Triassic aged terrestrial sedimentary rocks of the Rewan Group. Details are provided in SLR (2023).

3.3 BWH Hydrostratigraphy and Conceptualisation

For context, the local hydrostratigraphy is summarised in this report. WSP (2021) developed three cross-sections through the BWH oriented roughly perpendicular to the surface water flow direction (Figure 3-2 to Figure 3-5). Each individual section intersects the lower, middle, and upper ponds individually and presents the local geology from nearby drill holes and groundwater levels recorded in installed monitoring bores. These sections were updated by SLR in 2023 and provide a representation of the local conditions.

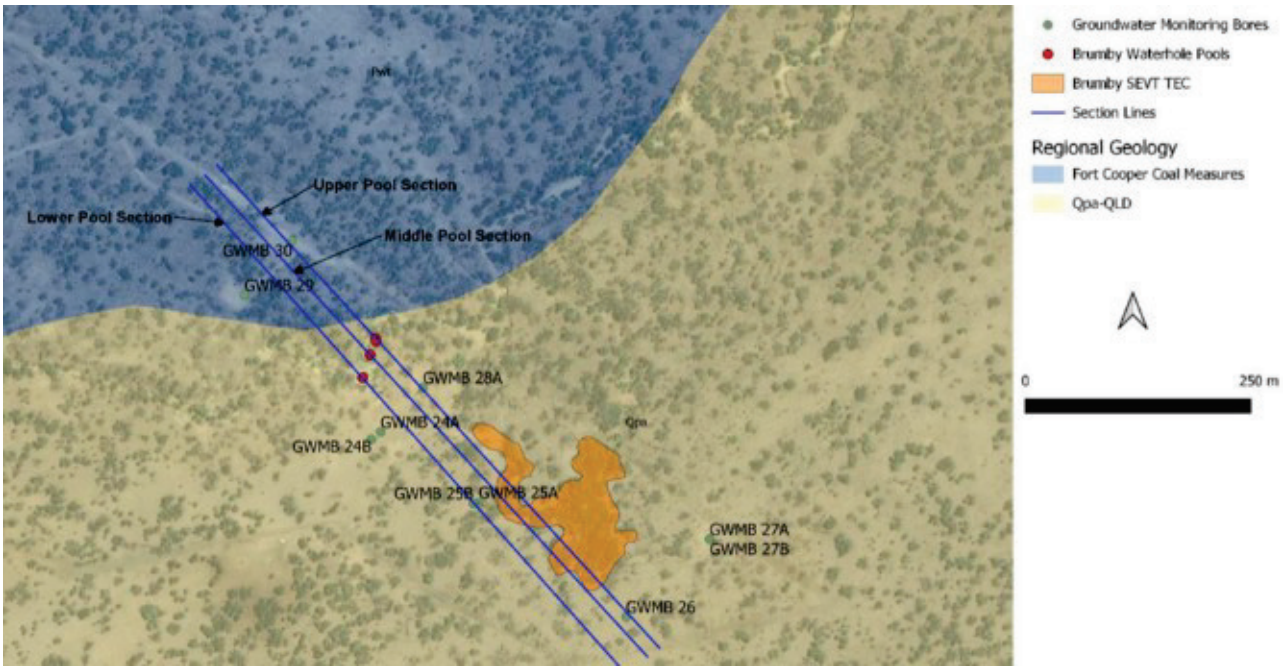


Figure 3-2 Cross-Section Lines Through BWH (Adapted from WSP, 2021 and SLR 2023)

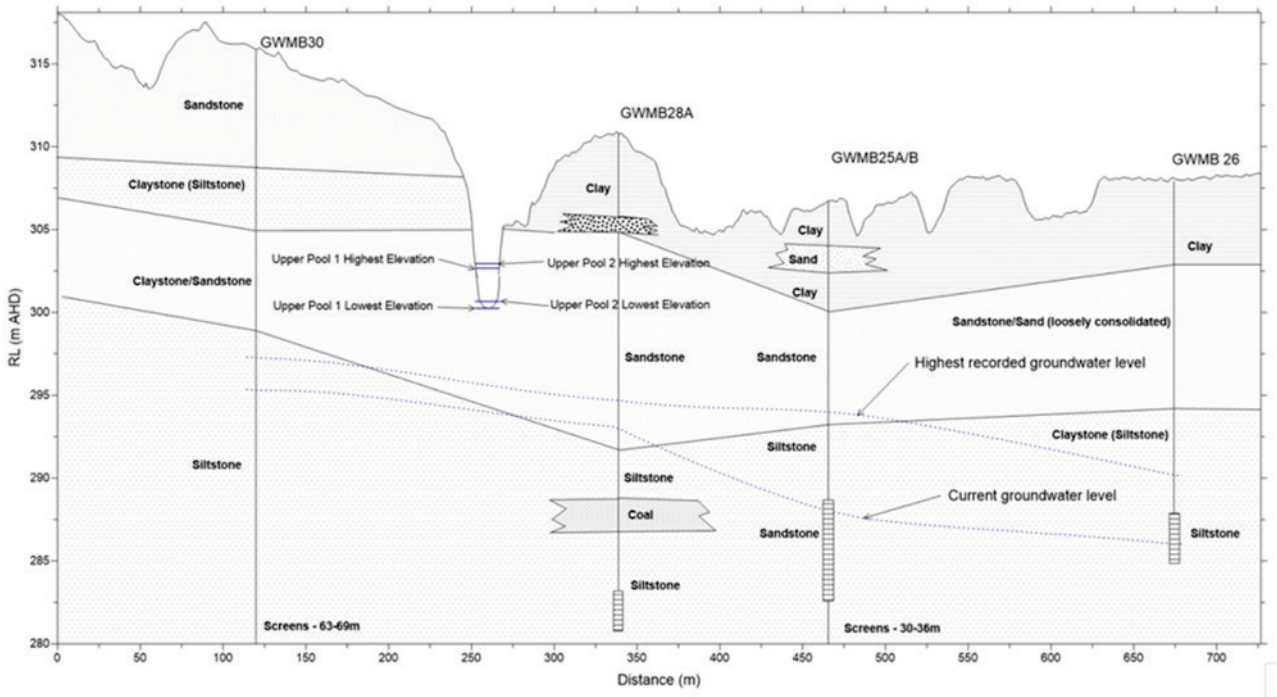


Figure 3-3 Upper BWH Pool Section (Adapted from WSP by SLR 2023)

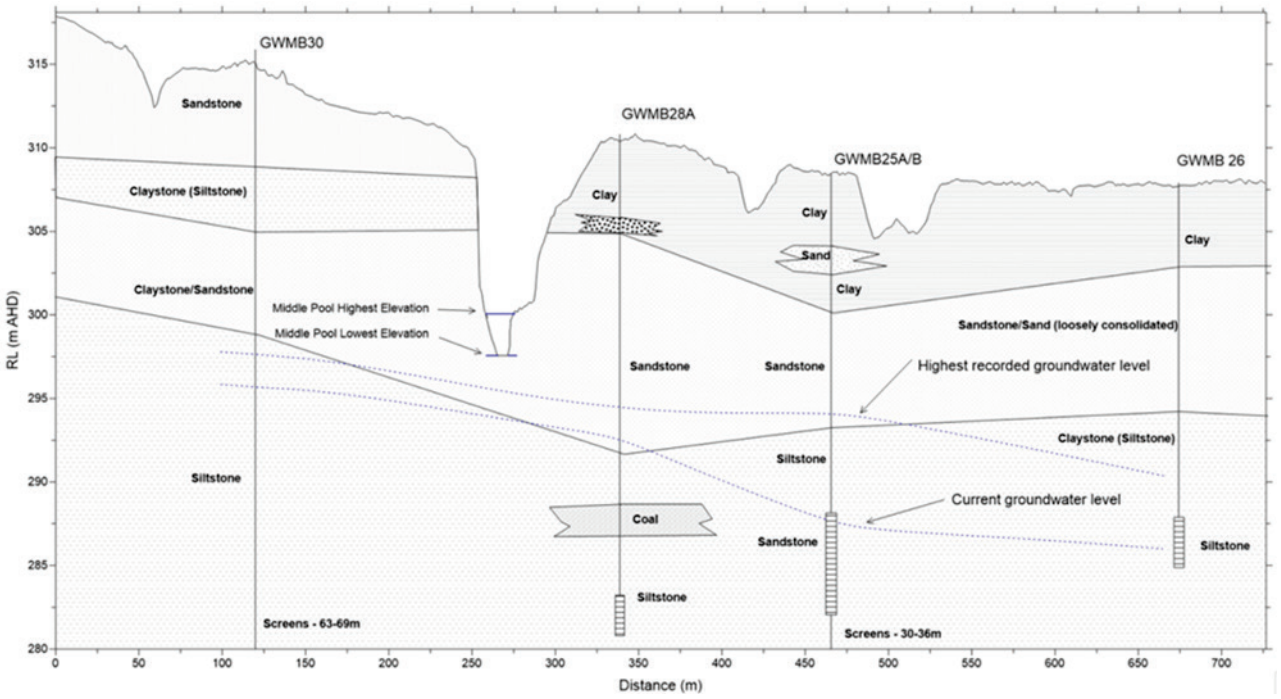


Figure 3-4 Middle BWH Pool Section (Adapted from WSP by SLR 2023)

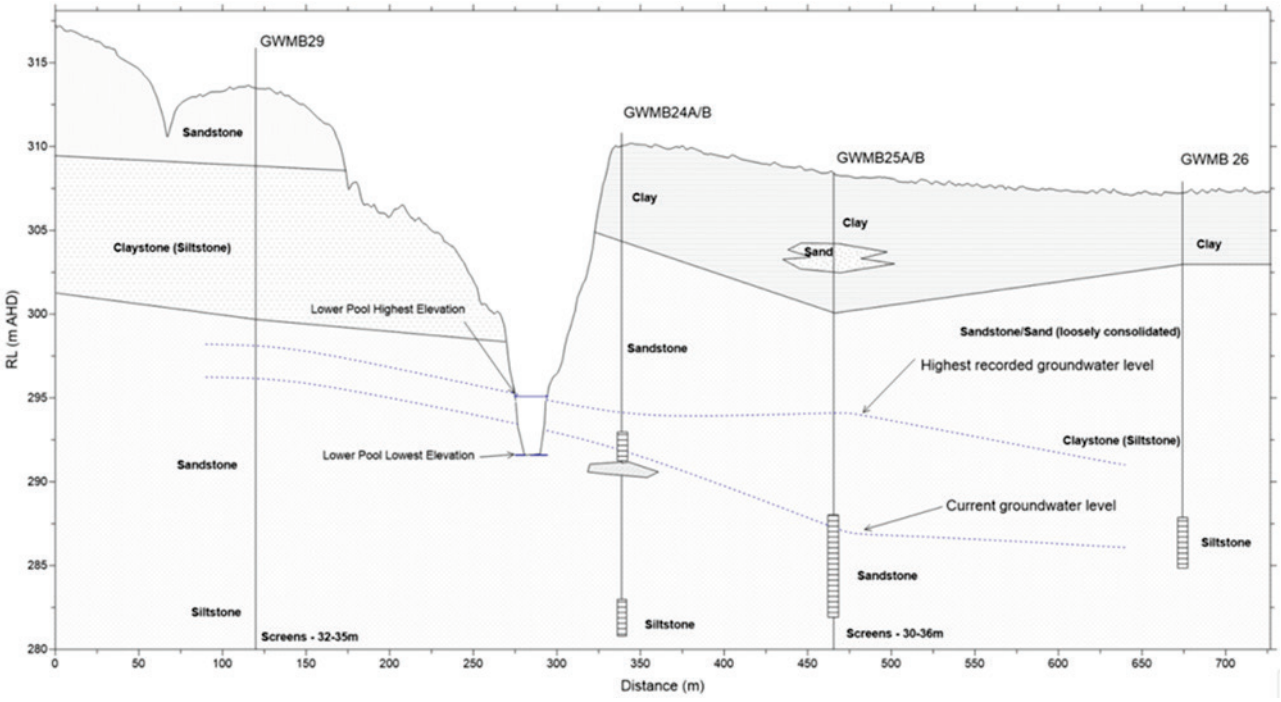


Figure 3-5 Lower BWH Pool Section (Adapted from WSP by SLR 2023)

The cross-sections indicate that the upper and middle pools are above the water table in the local FCCM monitoring bores, but the lower pool has a level similar to the water table.

SLR compiled hydrographs for the BWH pools showing monthly rainfall and the approximate base of pools. These indicate the upper pool and upstream approach channel is 'dry' during periods of relatively low rainfall (and on multiple occasions since 2020). The middle and lower pools typically contain water; however, the middle pool has been recorded as being dry on at least one occasion.

There is a correlation between rainfall volume and event intensity with pond levels typically peaking in summer and receding during the relatively dry winter months (SLR 2023).

Building on the previous conceptualisations and the site visit, a schematic understanding of the important considerations was compiled in the form of a long section, in the direction of flow. The location of the waterholes, with distance markers, as well as the bores of interest, is shown on Figure 3-6 relative to the schematic conceptual section in Figure 3-7.

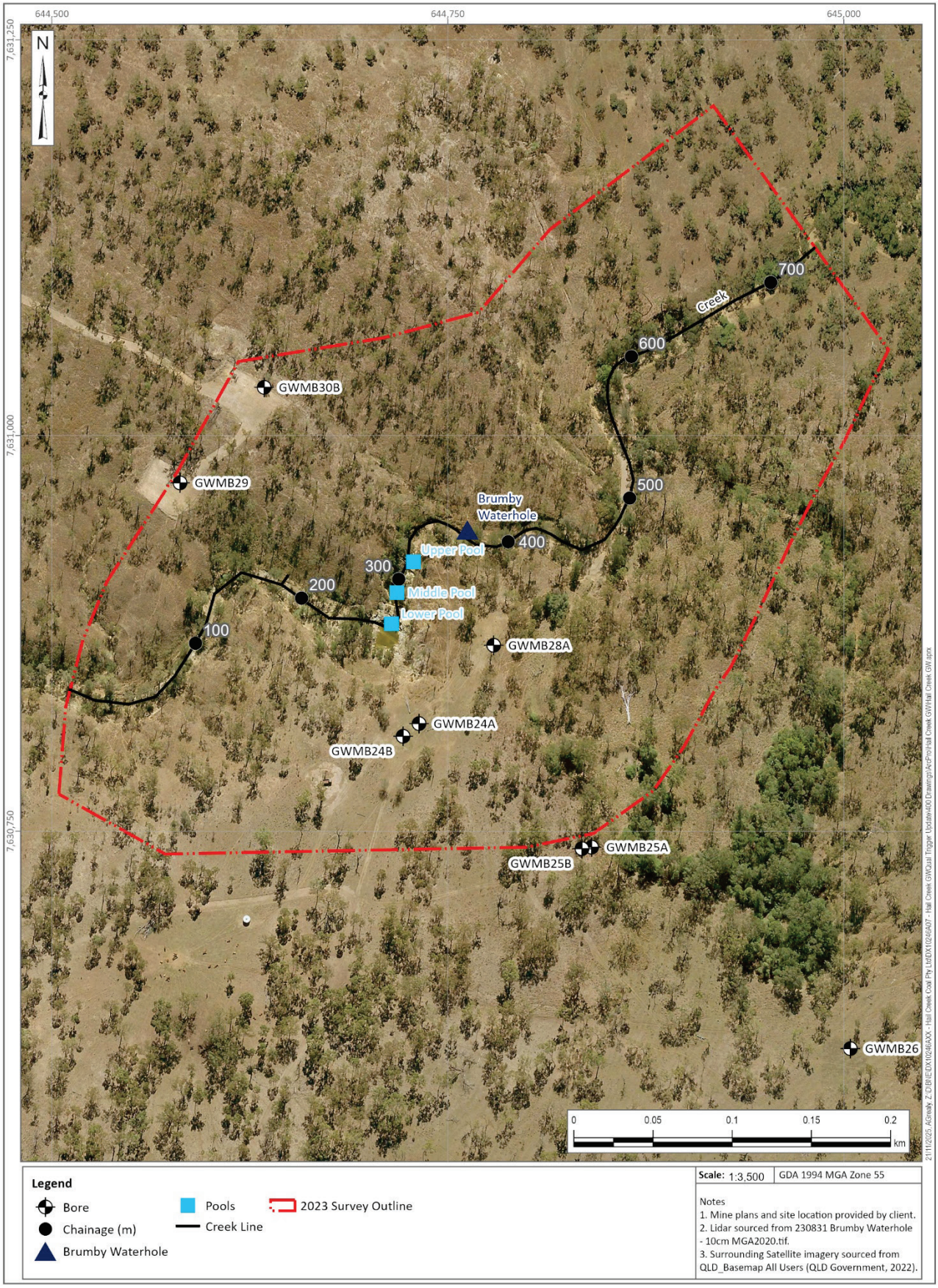


Figure 3-6 BWHs with Monitoring Bores and Position of Long Section

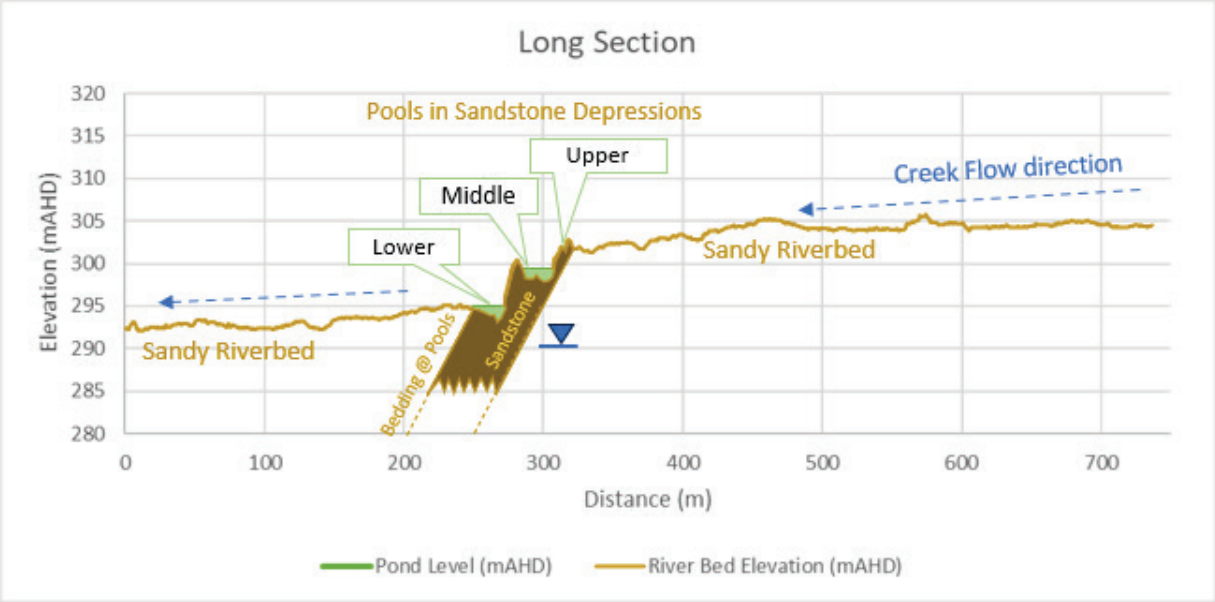


Figure 3-7 Long Section Along Streambed Through BWH pools

The important aspects of this long section along the creek are the presence of the less erodible and apparent low permeability/intact sandstone that outcrops at the BWHs. The pools are located within this unit and, from field observations, this sub-layer of the FCCM plays a controlling role in the occurrence and presence of the pools. In the adjoining sub-unit of the FCCM the material weathers and erodes more rapidly suggesting that the local topography is strongly influenced by differential weathering of the FCCM sandstone interbeds. The field observations also confirmed there is an absence of alluvium in the lower pools of the BWH.

KCB completed a water quality assessment and surface water balance model in 2023, preceded by a field inspection of the site.

The previous work indicated that:

- The BWHs are located in a sandstone layer that is resistant to erosion and, from field inspections, could be expected to be low permeability with no visible evidence of seepage into the pools outside of high rainfall periods.
- The calibrated GoldSim model of the BWH system, using the previously calibrated Australian Water Balance Model parameters that have been used for the site water balance across the site, is able to replicate measured pool elevations based on detailed stage storage curves. Calibration was improved when additional groundwater contributions (inflow or outflow) were reduced to negligible, with the lower pool's most-favourable calibration achieved by the inclusion of a consistent, small loss to groundwater (~0.002 L/s). The water quality assessment suggests that the additional losses are more likely to be groundwater losses rather than additional evaporation. The surface water calibration also indicated that the creek levels only flow sufficiently in high flow periods, as the elevation of the upper pool entry is above the creek level. The water balance model indicates that for most of the available record, the rainfall and runoff from the local catchment of each individual pool is sufficient to match the

observed water levels from the monitoring record, with occasional contributions from surface water in high flow periods.

- The water quality assessment showed that when the creek flows, the water quality in the pools reflects the water quality in the creek. When the pools are fed by the local pool catchments and direct rainfall, the measured variation in salinity correlates with expected contributions from rainfall and evaporation. Regular monitoring of the pools has been undertaken since 2019, and these results indicate that the water quality in the pools is consistently fresher (i.e. lower salinity) than the surrounding regional groundwater. The available records also indicate that the salinity in the middle and lower pools is similar to the upper pool and follows similar time-variant trends. Overall, the isotopic evidence, the monitored data record and the weekly measurements made in August and September 2023 indicate that groundwater contributions to these pools are negligible.

The various lines of evidence supporting the finding that the BWH pools are not sustained by groundwater have been summarised in tabular form in Table 3-3.

Table 3-3 Summary of Aspects Supporting Interpretation of Regional Groundwater Not Sustaining Pools in Dry Season

Aspect	Comments	Interpretation
Measured Groundwater Levels	Data record indicates that the adjacent groundwater levels are already, and under usual conditions, remain lower than the BWH pools. Only the lower pool is in approximately similar elevation to the regional groundwater system.	Regional groundwater currently does not sustain BWH pools.
Low permeability resistive Sandstone Bank	The pools are present because of a sandstone unit that is more resistive to erosion and has a low permeability.	Permeability at the base of the pools is low, limiting leakage from base of the pool.
Hydrochemical Data		
Stable Isotopes	After major floods, pools showed no evidence of evaporation (deuterium and oxygen-18) and coincided with groundwater signature. In 2020, after normal rainfall, stable isotopes showed that pools had a strong evaporative signature and were distinct from groundwater.	While in very wet periods, the creek system upstream of pools floods the horseshoe paleochannel area, leading to increased recharge to groundwater, this is not the usual process. High rainfall and the surface water contributions cause elevated groundwater conditions where groundwater does provide a short-lived contribution to the pools. Under 'normal' (less wet) periods, pools show negligible contribution from groundwater.
Water Quality - Concentrations	Distinct differences between pools and adjacent groundwater in terms of salinity and ion concentrations. Concentrations of dissolved ions in the pools remain low, indicating that the adjacent groundwater units are not contributing to the pools (or if groundwater is contributing this would be a very small relative contribution).	
Water Quality - Trends	Water quality in the pools remains low concentrations. Increases and decreases in EC/TDS are related to timing of rainfall events (very slow and gradual increases between wet periods and rapid drops after rainfall events).	
Modelling		
Surface Water Balance	Using the AWBM parameters for the area that have been calibrated over several years, the surface water balance shows good calibration to measured pool water levels, without the need to include groundwater inflows. Allowing for a small rate of leakage out of the lower pool to groundwater improves calibration.	The surface water balance indicates that the water balance for the pools can be replicated without requiring groundwater inputs.

2023 BWH Groundwater Model (KCB, 2023)	Significant improvement in calibration and replication of measured trends compared to regional model; good calibration obtained to groundwater responses. Resultant groundwater contours indicate regional groundwater levels are below BWH pools.	BWH pools are disconnected from the regional groundwater system. Rate of leakage from pools to groundwater is very low and largely insensitive to deeper groundwater levels. In very wet periods, groundwater can contribute to the pools for the short period when groundwater elevations have increased in the wet periods.
	Calibration and sensitivity indicate that under 'normal' conditions, very low rates of seepage out of the pools would occur. In high recharge periods, short-lived periods of groundwater elevations reaching/exceeding base of the lower pool.	

4 BWH 2025 GROUNDWATER MODELLING ASSESSMENT

The 2025 update of KCB (2023) entailed further modelling of the interaction between approved mining operations, the Project and the BWH. Re-integration with the larger-scale groundwater model completed by SLR allows consistency between the models.

Similar to KCB (2023), SLR's groundwater modelling predictions are used as boundary conditions for the localised BWH model; these have been provided to KCB as electronic files. The scale and resolution of the assessment is such that the local geology, hydrogeology and surface water aspects near the BWH are suitably represented in KCB's more localised and focused assessment.

SLR has completed several simulations as part of their post-2023 updates to the groundwater modelling. This included simulating a range of plausible combinations of model parameters using stochastic approaches to provide a range of outputs for both the approved mining and the Project for the remainder of the mine life. In addition, SLR simulated the Project case and a 'no mining' case for the post-operation stage.

For the 2025 BWH groundwater update, KCB's focused model was updated with the stochastic results from SLR's large scale model. The time-variant heads along the southern boundary of the focused model were updated at the locations where the regional and focused models interact. From SLR's simulations, 10^{th} /50^{th} /90^{th} percentile predicted heads over time were used for the approved mining and for the Project. The 2025 model build, calibration and results are summarised in the following sections.

4.1 Model Objective

The local-scale groundwater model was developed to simulate the influence of the effects of mining on BWH and the local groundwater system. The model does not explicitly simulate mine development but uses the predictions from the SLR model as inputs to correlate regional scale changes in level and flow into the focused model domain.

Once calibrated, the model was used to predict drawdown in groundwater levels underneath the BWHs, and to evaluate the potential for groundwater interaction with the pools. These predictions also considered the uncertainty in hydraulic parameters and variability in potential recharge.

The objective of this localised study was to supplement the site-wide hydrogeological assessment and groundwater modelling completed by SLR (2023, 2025). This was achieved by providing a more detailed assessment and refinement of the hydrogeological and local hydrology systems such that interactions between the BWHs and the regional groundwater system can be assessed, as described previously (KCB, 2023).

4.2 Model Design, Domain and Calibration

4.2.1 Model Code Selection

MODFLOW-USG was used as the modelling platform to represent the groundwater flow through the key hydrogeological units in the sub-catchments surrounding the BWHs and to simulate groundwater flow in the area of the BWHs.

MODFLOW-USG is a control volume finite difference code, which supports the construction of structured and unstructured model grids and contains robust solution methods and simulation capabilities, including the ability to handle complex, variably saturated / unsaturated flow. This enables effective representation of features such as river flow, water storages, perched groundwater systems and the interaction with the underlying groundwater regime.

4.2.2 Model Extent and Boundary Conditions

The BWH groundwater model grid was aligned at an azimuth of 30 degrees, parallel with the local groundwater flow direction. The domain covers a total planar area of ~2.8 km^2. The southeast and northwest extents correspond with natural drainage lines in adjacent sub-catchments (representing conceptual groundwater divides).

The bottom of the model corresponds with base of the FCCM. The FCCM has a thickness of about 500 m at the BWH and thins to the northeast reaching zero thickness about 1,400 m northeast of the BWH. The southwestern model boundary corresponds to the roof of the FCCM (about 15 m above the FC4 seam mined by HCOC).

The groundwater flow conditions provided by the regional SLR model act as boundary conditions for the BWH-focused local model; this interface is located at the southwestern boundary of the BWH model domain.

Table 4-1 provides a summary of the boundaries, boundary descriptions and boundary conditions specified in the hydrogeological model. The model boundaries are shown in Figure 4-1 together with the model domain area and nested grid refinement area, while the local BWH domain, compared to SLR's regional model, is provided in Figure 4-2.

Table 4-1 Correlation of Real-World Boundaries with Adopted Model Boundary Conditions

Boundary	Boundary Description	Boundary Condition
Top Layer	Rainfall Recharge	Recharge applied as % of rainfall to highest active layer
BWH	Brumby Upper (2 pool), Middle and Lower pool areas	RIV boundary (Drain Conductance = 5E-3 m^2/d) with heads representative of the pool levels and limited hydraulic connection to underlying lithologies
Streams	Hail Creek	DRN boundary condition set at surface elevation
Northeast	Inferred outcrop of FCCM. Topographic high area Distance from BWH: 660 m	No-Flow
Southeast	Stream bed to east of BWH Distance from BWH: 830 m	DRN boundary condition set at surface elevation
Southwest	Roof of FCCM Distance from BWH: 210 m	Variable heads representing the predicted heads from the SLR model
Northwest	Stream bed to west of BWH Distance from BWH: 550 m	DRN boundary condition set at surface elevation
Bottom	Floor of FCCM unit 450m deep at BWH	No-Flow

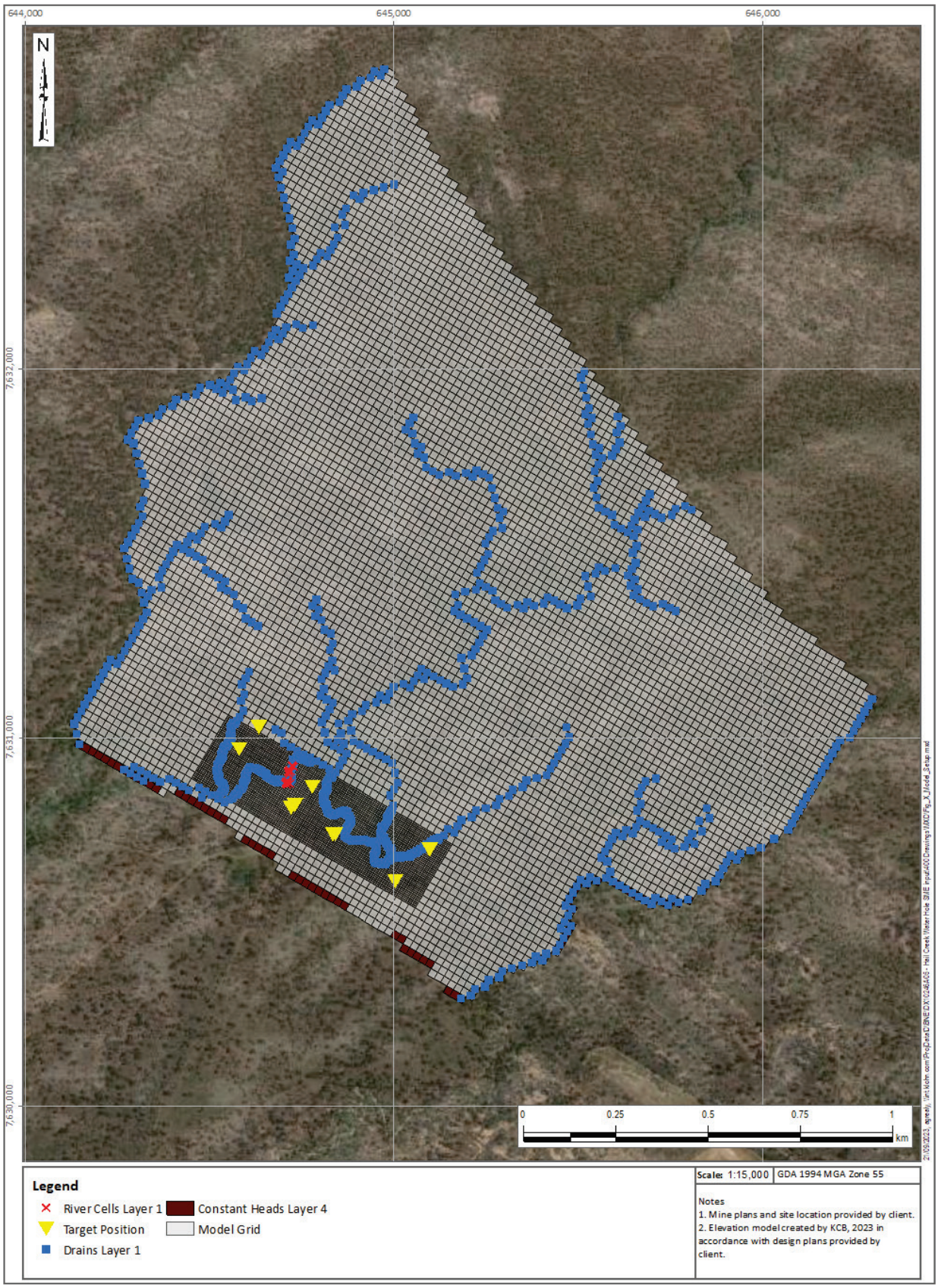


Figure 4-1 Groundwater Model Grid, Boundary Conditions and Calibration Targets

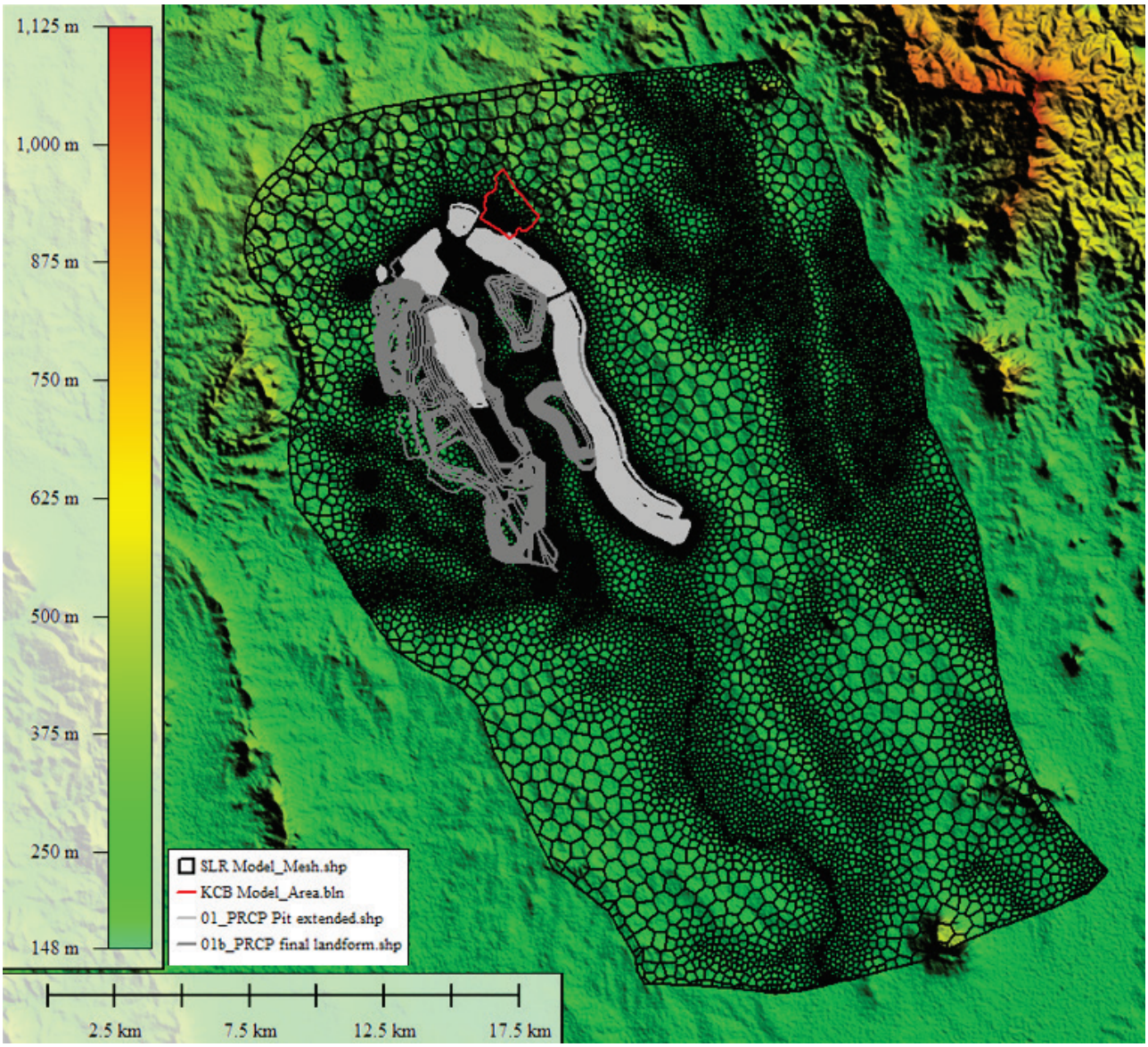


Figure 4-2 SLR and Local BWH Model Domain (Red) Overlain on SLR's Regional Model Domain (Polygon Network) Shown in Black) and the Topography for the Area (Locations of Pits Overlain to Provide Context)

4.2.3 Model Grid and Layers

The model grid for the BWH is oriented at azimuth 30° to align the groundwater flow direction with the principal flow vectors in the groundwater model. The BWHs are represented by a nested area with 5 m x 5 m cells and 21 sublayers (upper 20 m depth represented by 2 m layers). The remainder of the model has 20 m x 20 m cells and seven (7) model layers (Figure 4-3). The domain (Table 4-1) was developed based on a combination of surface, solid and structural geology, with consideration of the topography as far as groundwater divide boundaries could be inferred. The

proposed model boundary also allows for representation of groundwater flow processes in the area surrounding the BWHs, and the interaction with the mining stresses imposed by the regional SLR model.

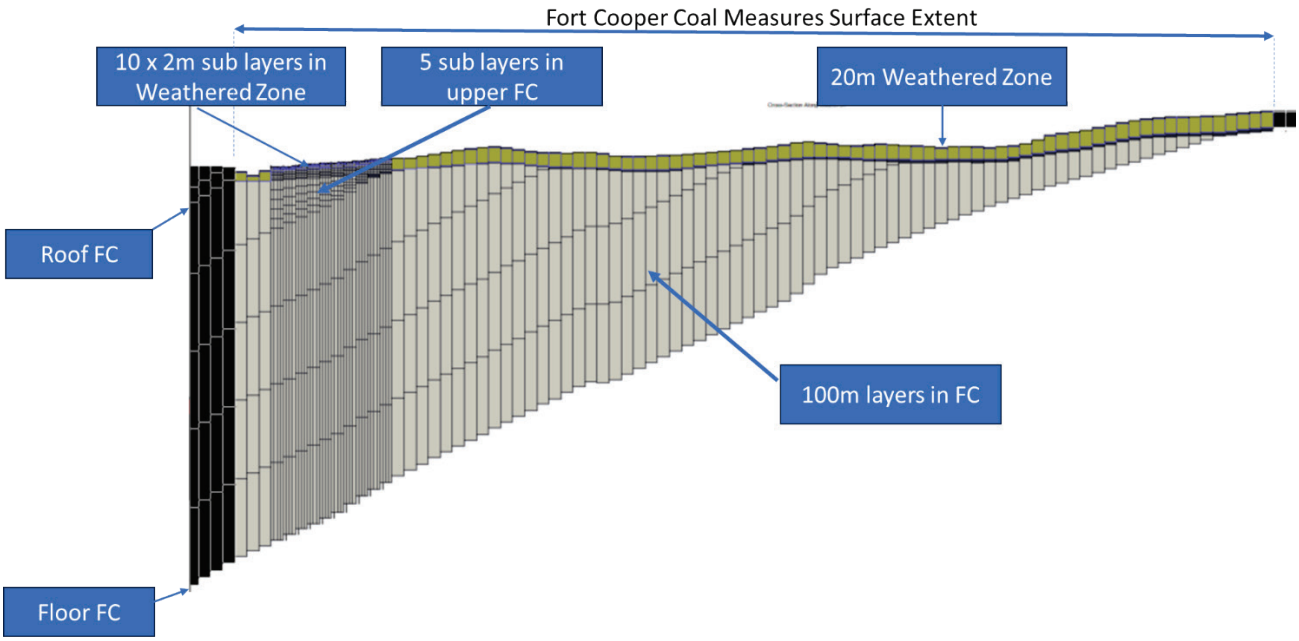


Figure 4-3 North-South Cross-Section through BWH Area Showing Model Layers and Refinement in Nested Area

4.3 2025 Model Calibration

The calibrated and focused model, developed by KCB in 2023, was updated to include an extended monitoring dataset provided by SLR (electronic dataset provided to KCB by SLR). The update consisted of extending the transient calibration model timeline to September 2025, and extending the recharge dataset to the same period, using rainfall data from Glenden Station provided by the SILO database. Hydraulic conductivity and storage property values from KCB's 2023 calibration were used as starting values, with the option of refinement, should the post-2023 data indicate calibration updates were required.

The Australian Groundwater Modelling Guidelines (Barnett et al. 2012) were used to frame the calibration process. The groundwater flow model was calibrated to groundwater levels from nine observation bores, each screened at different depths. The model calibration consisted of an initial steady-state model, followed by a transient model calibration.

The following numerical stability performance measures were evaluated during the calibration of the BWH-focused model:

1. Model Convergence: Model convergence was obtained during calibration and a maximum change in heads between iterations was set to 1.0E-03 m.

2. Water Balance: The model demonstrated an accurate water balance at all times during steady-state simulation. The water balance error was below one percent (<1%).

The steady-state calibration considered results from January to March 2017 when most of the monitoring bores in this area were installed. The steady-state model simulation (which included the influence from the SLR regional model from January to March 2017) was used to establish initial groundwater levels for the transient calibration (Figure 4-4). A scatter plot of predicated versus observed hydraulic heads is shown in Figure 4-4. This shows the Mean Sum of Residuals (MSR) for all the monitoring bores is -0.09 m, the RMS value is 1.15 m and the Scaled Absolute Mean is 9.9%, indicating an acceptable calibration has been achieved in line with Barnett et al. (2012). The steady-state water balance is provided is Table 4-2.

Table 4-2 Steady-State Water-Groundwater Model Balance

	Inflow (m3/d)	Outflow (m3/d)
SLR Boundary Flow	1.6	-157.6
Brumby Water Holes (Riv Boundary)	0.091	0.000
Streams (Drn B)	0.0	-35.9
Recharge	191.96	0.00
Total	**193.61**	**193.61**
Absolute Error	-0.0003	
Error %	0.0002%	

The 2025 transient calibration considered the period from January 2017 to September 2025. This period includes influence of rainfall recharge and regional changes in mining-related stresses at the boundary (from SLR's model) on the groundwater system. Monthly stress periods were adopted to reflect the resolution and variability within the available dataset. The influence of mine development on the water levels within the regional SLR model was applied as time-variant heads at the southwest boundary of the focused model.

The calibration for the 2025 update is again sound and within acceptable bounds (Barnett et al, 2012) (Figure 4-5). The residual error for all monitoring bores over the entire monitoring record is -0.17 m, the RMS error is 1.63 m and the Scaled Absolute Mean is 9%. In addition to achieving appropriate calibration metrics (Table 4-3), the calibrated groundwater levels, vertical gradients and flow patterns are in line with the hydrogeological conceptualisation (Figure 4-5).

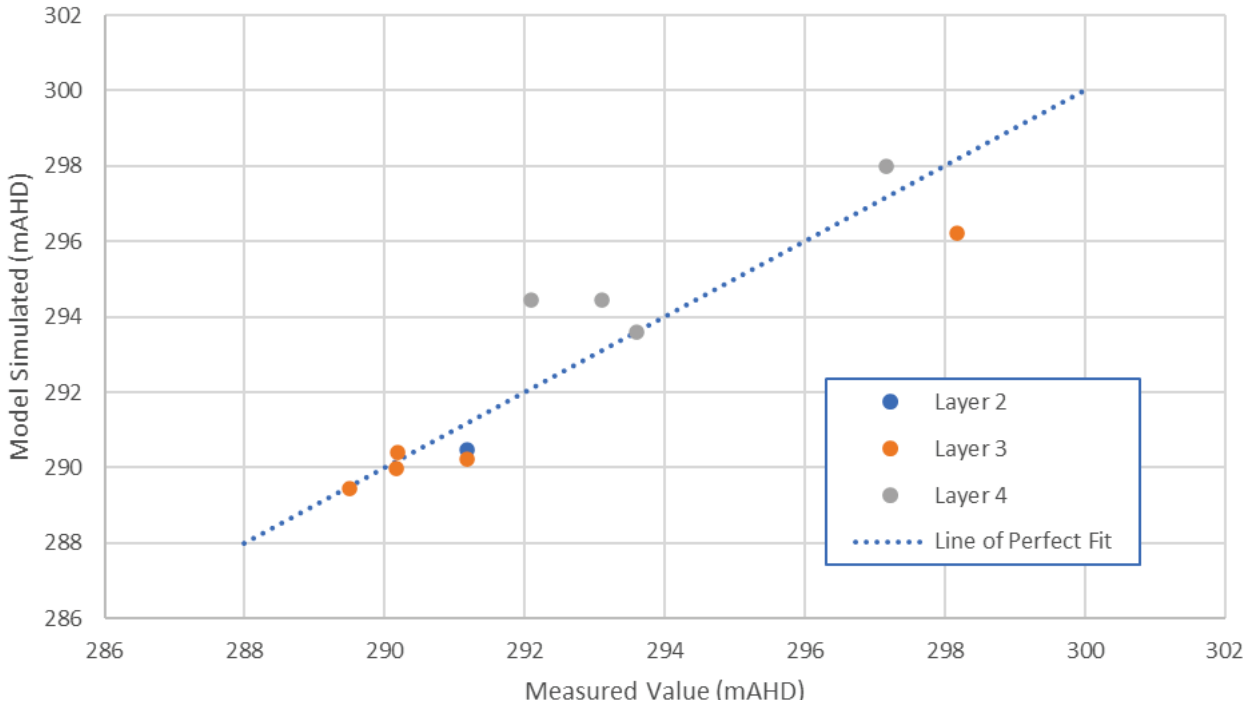


Figure 4-4 Steady-State Calibration - Observed Versus Computed Heads

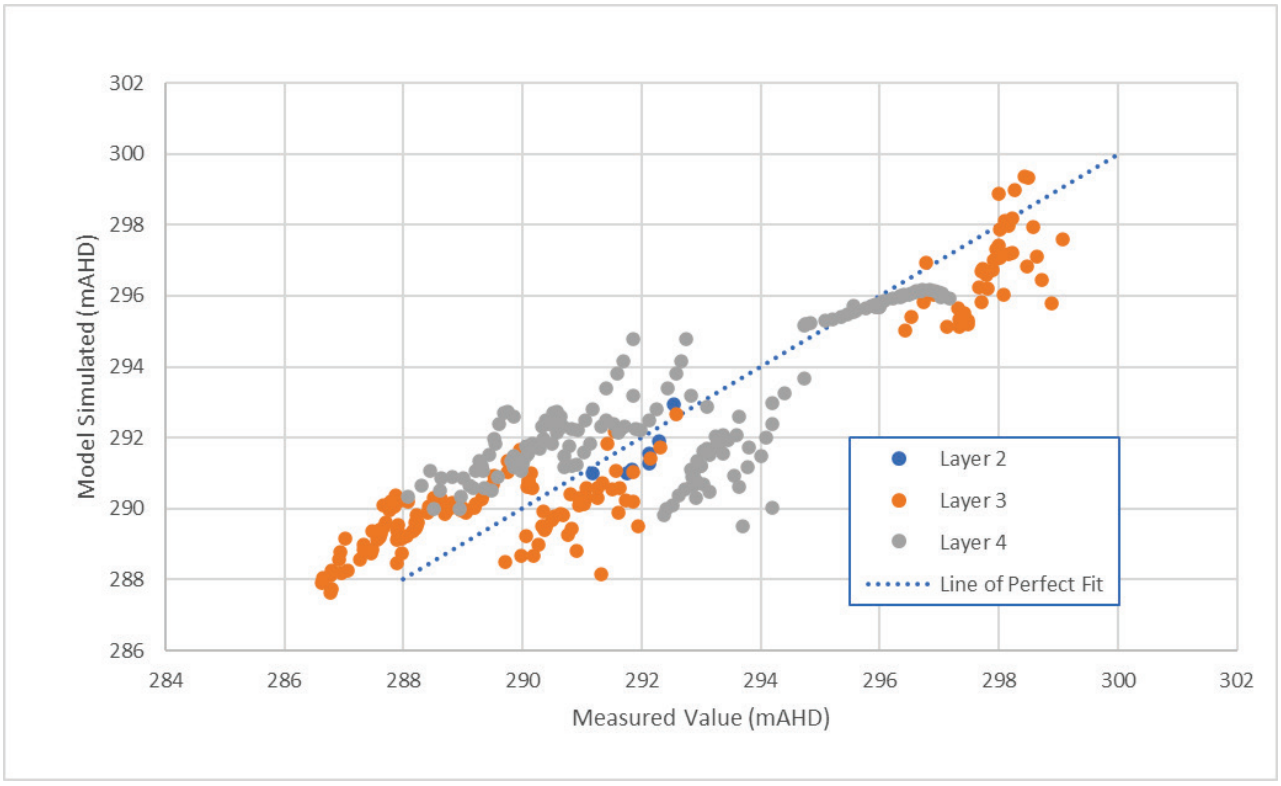


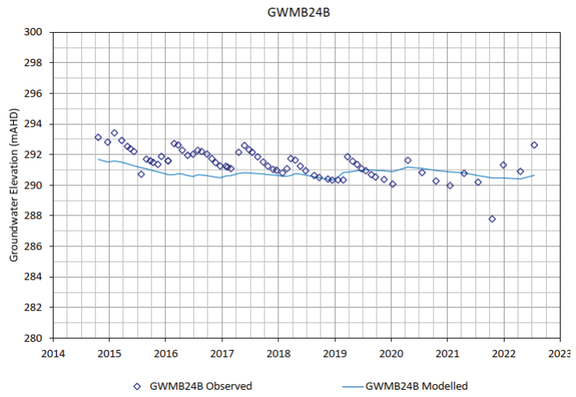
Figure 4-5 Transient Calibration - Observed Versus Computed Heads (2017 to 2025)

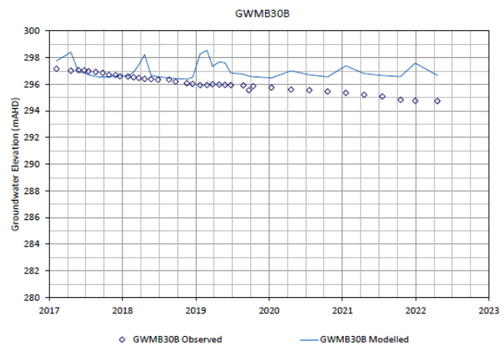
Table 4-3 Transient Calibration Statistics

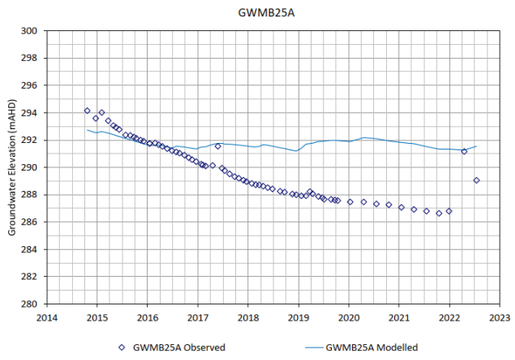
Statistical Metric	Calibration Metrics: Phreatic, Transient-State Model (Units)
Number of Head Calibration Targets	397
Absolute Residual Mean	1.41
Root Mean Square Error	1.63
Residual mean	-0.17
Scaled Residual Mean in %	2.11

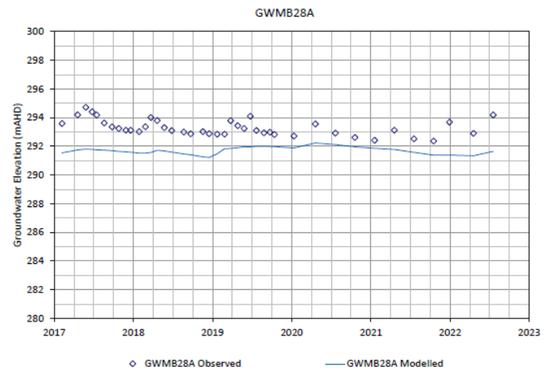
4.4 2025 Transient Calibration

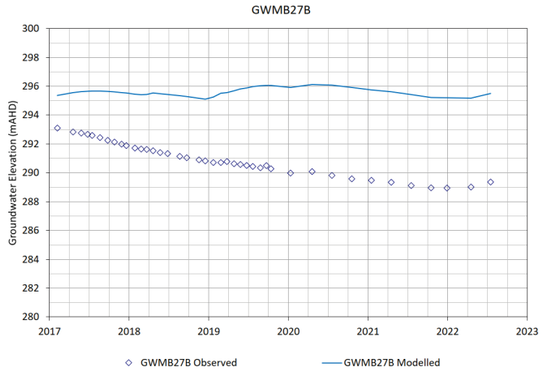
A comparison of the regional model (SLR 2023, Figure 4-6) and the local-scale model (Figure 4-6) transient prediction results indicates that the latter achieves a better match with site observation data. The transient calibration responses indicate that a representative match between observed and predicted groundwater levels has been achieved.

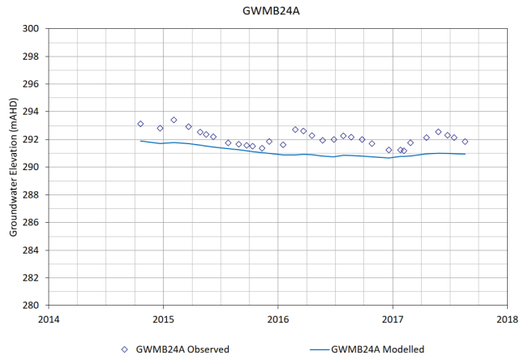


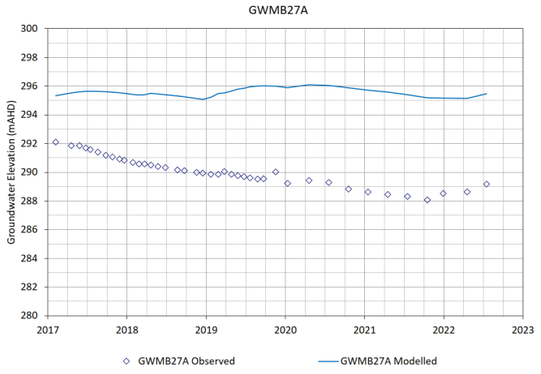


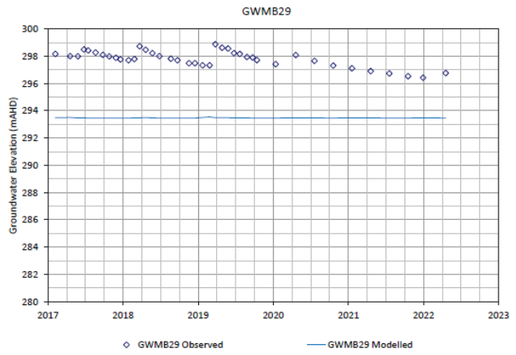












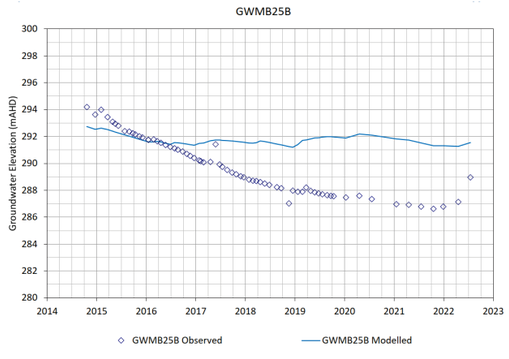
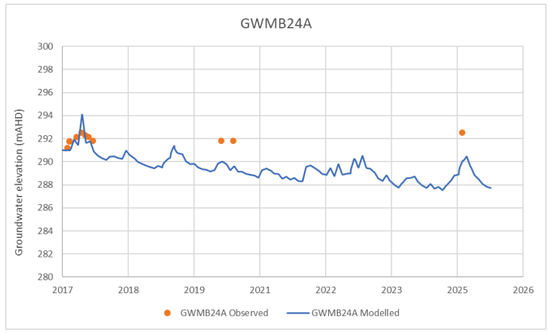
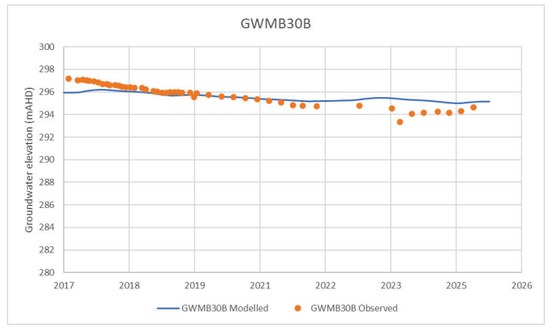
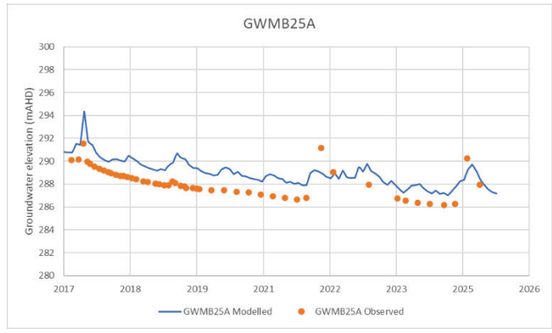
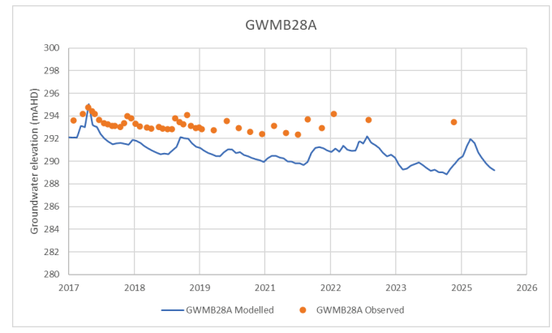


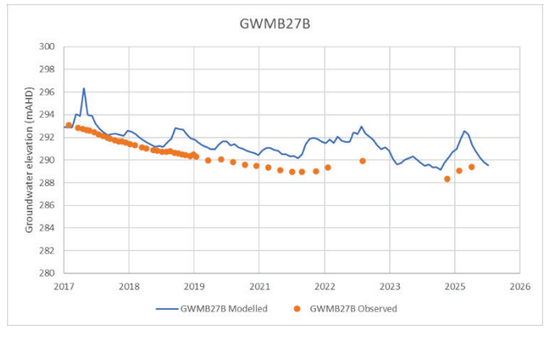
Figure 4-6 SLR's Transient Calibration Showing Observed and Modelled Groundwater Levels (2015-2022) (SLR, 2023)

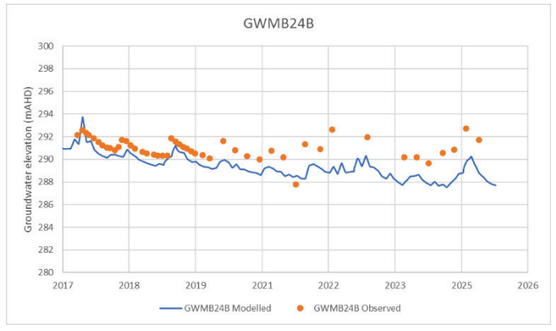


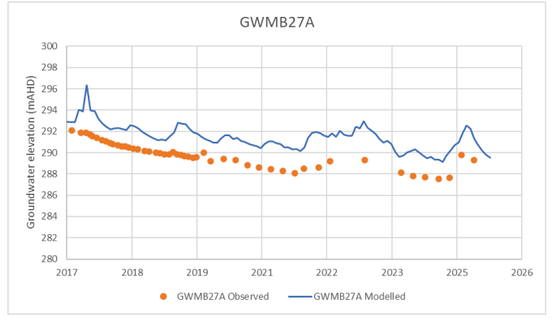


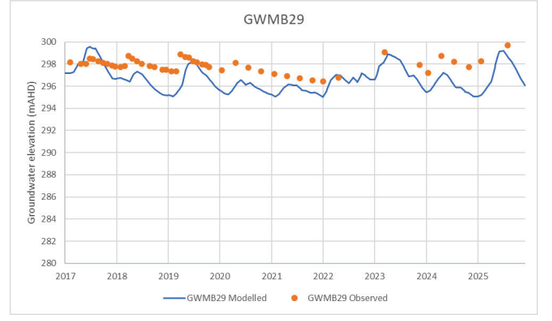












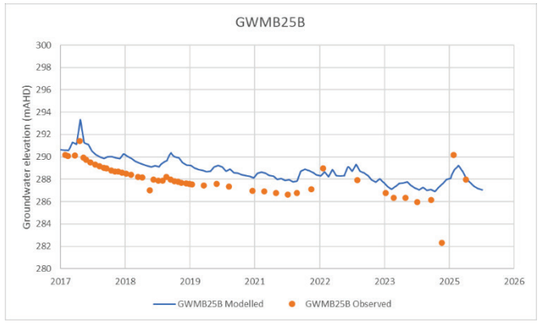


Figure 4-7 Updated Transient Calibration Showing Observed and Modelled Groundwater Levels from Local BWH Model (2017-2025)

Data for 327 measurement points was available for the calibration across nine monitoring bores around the BWHs.

The water balance for the transient calibration indicates (Figure 4-8 to Figure 4-10):

- Discharge to creek lines increase after high rainfall recharge events.
- Seepage from the lower pool to groundwater is relatively constant over time and at a very low rate (<0.001 L/s), which is below bounds of quantification. There is some rainfall recharge and there are changes in storage, influencing the seepage from Layer 1 into the lithologies below the pool.
- The RIV stage elevation in the BWHs is above (and disconnected from) the water table during the calibration period. This represents a 'losing stream' condition within the BWH, whereby the zone beneath the BWHs is unsaturated due to the low permeability of the sandstones in which they are hosted. Water levels stay well below the pools for most of the calibration period, with a downward gradient from Layer 1 to Layer 3. There is a single short period (mid-2017) when the water levels were slightly above the base of the pool corresponding to a rainfall event.
- Recharge from rainfall is the dominant contributor to groundwater recharge within the local-scale model domain, being at least 5 - 6 orders of magnitude greater than the recharge contribution from BWH seepage (Figure 4.9).

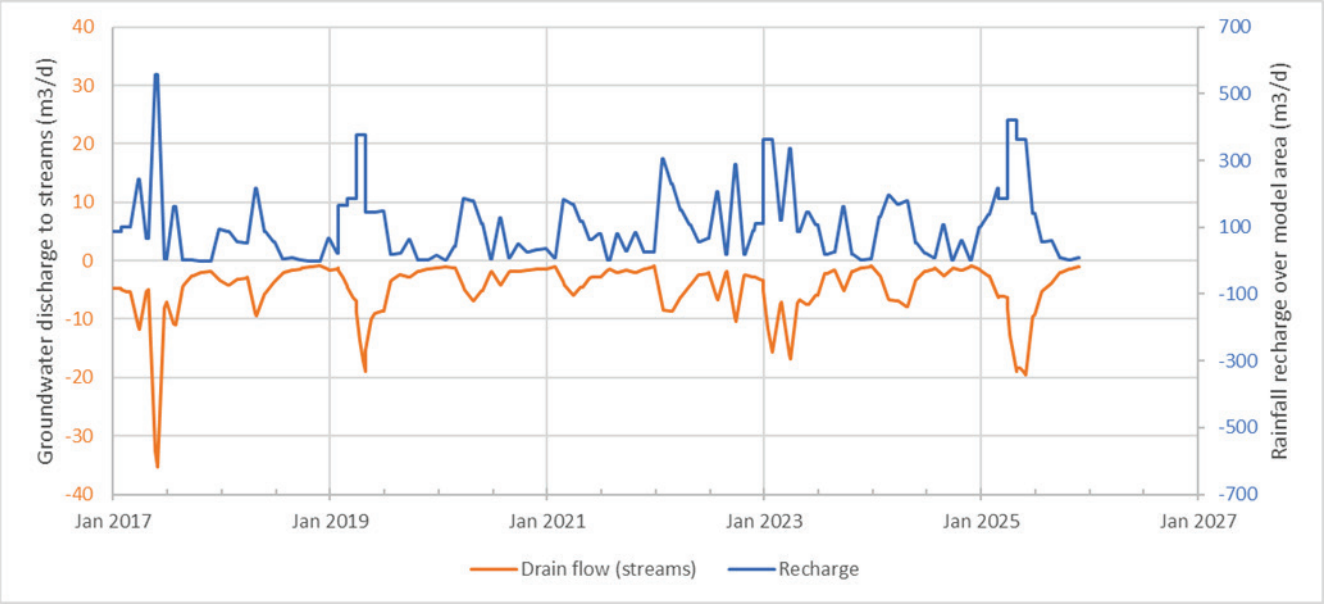


Figure 4-8 Comparison of Water Balance Components Over the Entire Model Area: Groundwater Discharge to Streams vs Rainfall Recharge (Note Units)

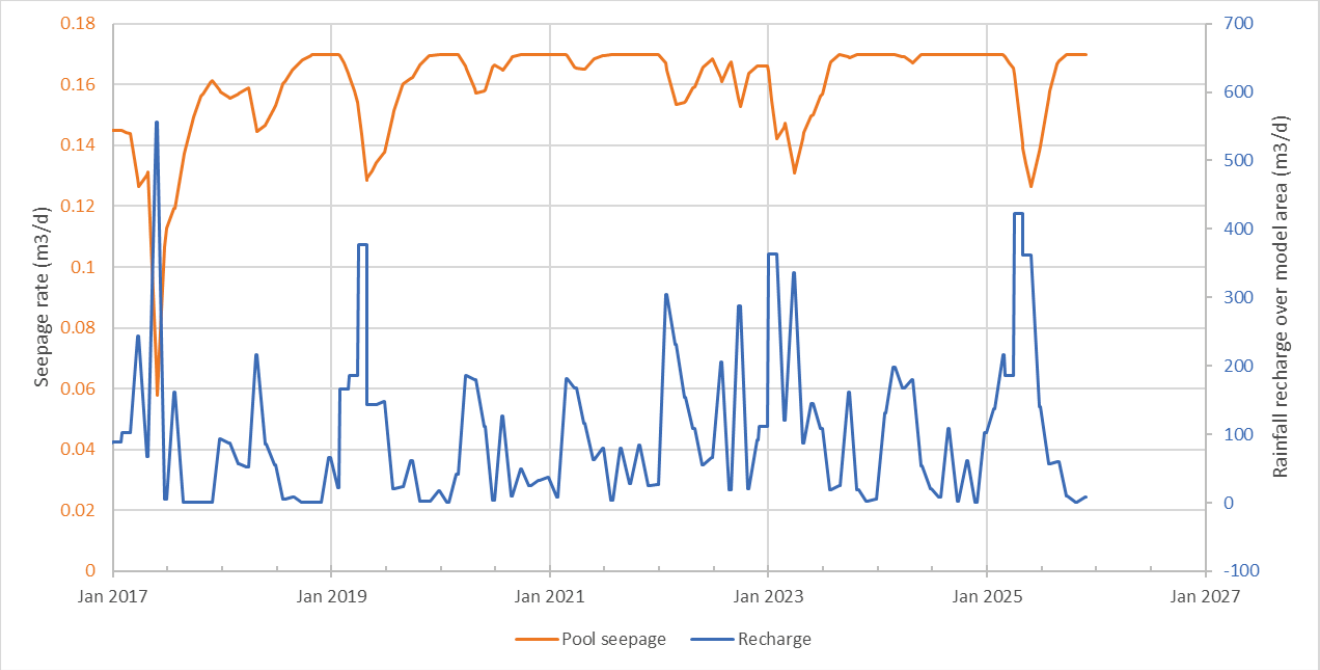


Figure 4-9 Comparison of Water Balance Components over the Entire Model Area: BWH Discharge to Aquifer vs Rainfall Recharge (Note Units)

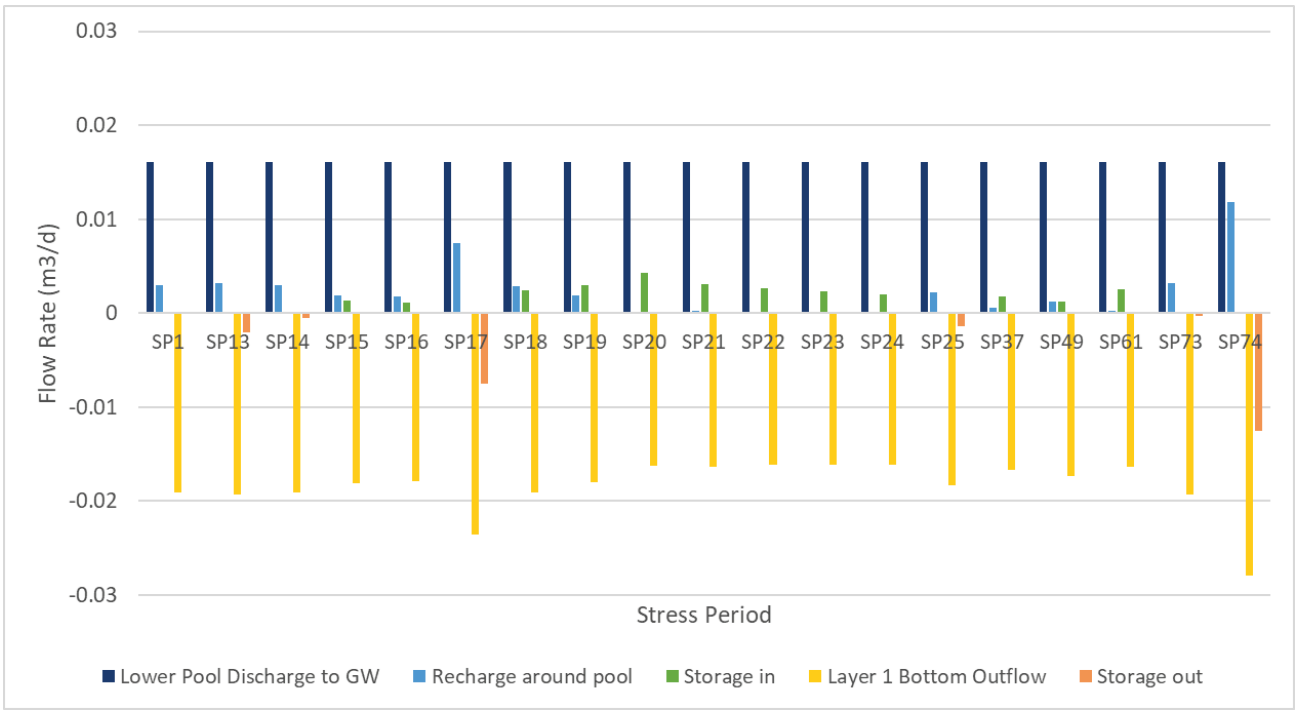


Figure 4-10 Selected Water Balance Extractions for the Brumby Lower Pool

A comparison of the water elevation within the lower pools and groundwater near the pool over the calibration is provided in Figure 4-11. This shows that apart from the very wet period associated with the high rainfall in Q1 of 2017, the groundwater levels have been below and disconnected from the lower pool throughout the calibration period.

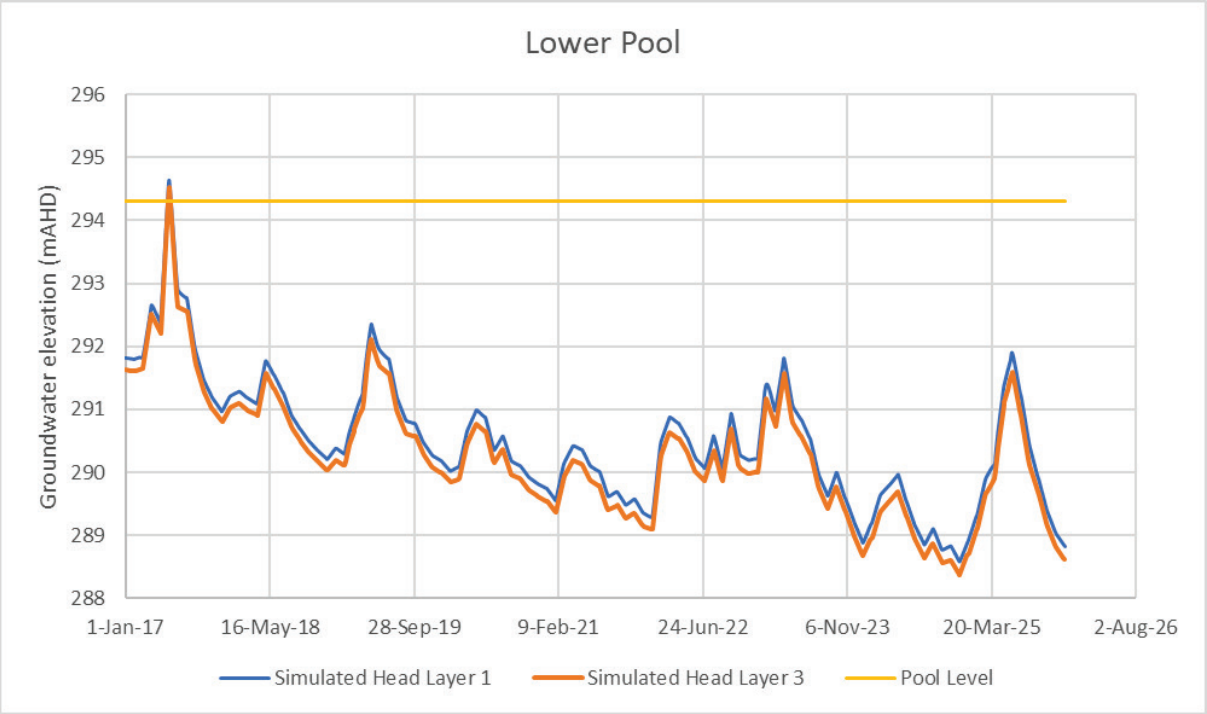


Figure 4-11 Comparison of Heads Immediately Below the Brumby Lower Pool and the Pool Level in Calibration Period

Predicted groundwater contours and flow directions/gradients for end of calibration are similar to those simulated by SLR (2023) and Douglas Partners (2015) for this area (Figure 4-12).

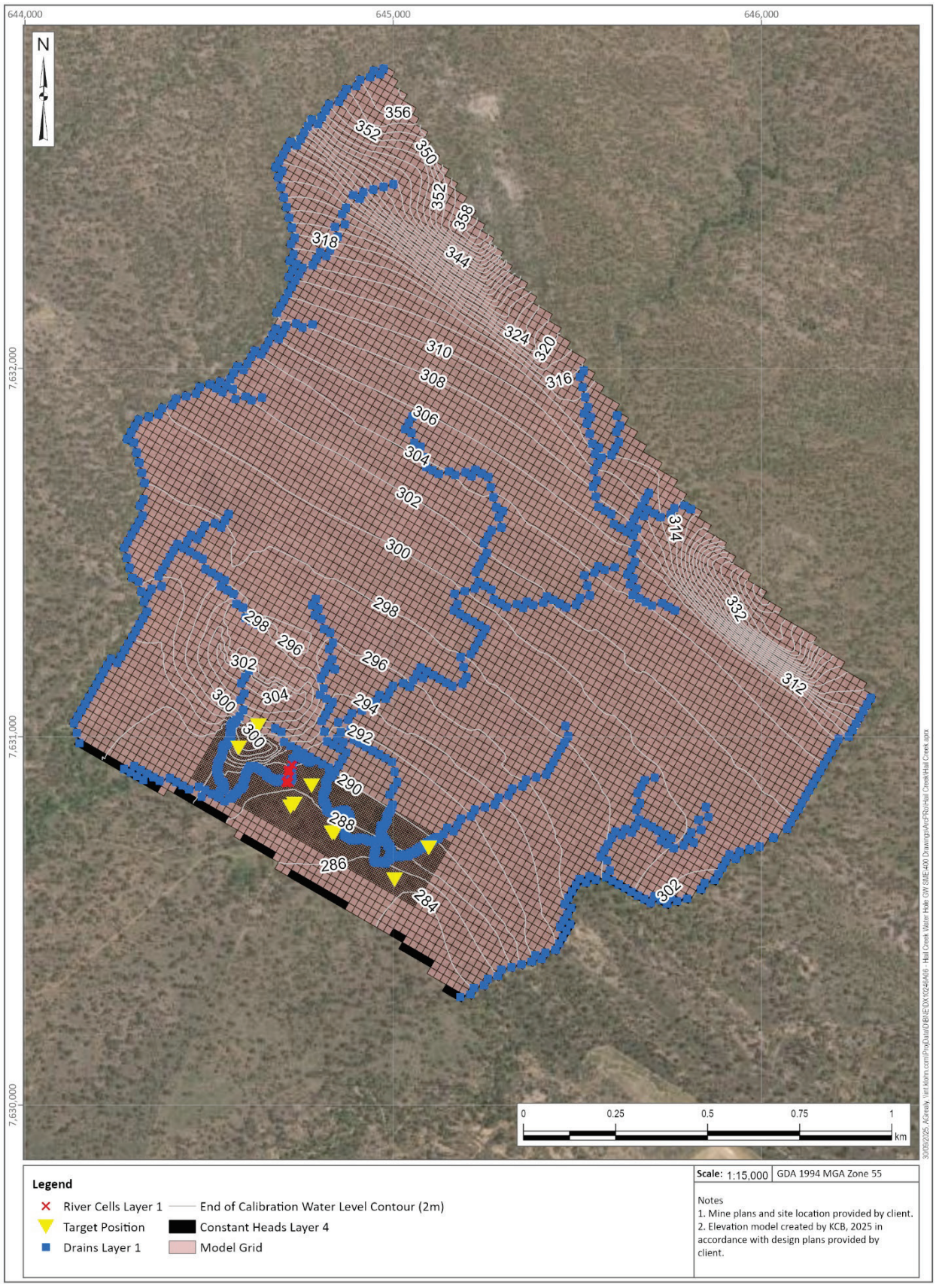


Figure 4-12 Groundwater (Water Table) Contours at the End of Calibration (2025)

The post-calibration parameters for the local-scale model are presented Table 4-4 and indicatively shown (K values only) in the north-south model cross-section on Figure 4-13.

Table 4-4 Calibrated Model Parameters

Zone No	Description	Kx (m/d)	Ky (m/d)	Kz (m/d)	Ss (1/m)	Sy
1	Fort Cooper Interburden	2.0E-02	1.2E-02	5.0E-03	1.0E-06	1.9E-03
2	Weathered Rock	2.0E-01	4.0E-01	2.0E-02	1.0E-07	5.0E-04
4	Low permeability topographic high with thin weathered profile	1.0E-04	1.0E-04	1.0E-04	1.0E-06	1.9E-03
5	Area of negative weathering with no bedding plane outcrop/ in line with regional fault	8.0E-02	2.5E-02	1.0E-02	1.0E-05	3.5E-03
6	Low permeability topographic high to NW of BWH	1.5E-04	1.5E-04	1.0E-04	1.0E-05	3.5E-03

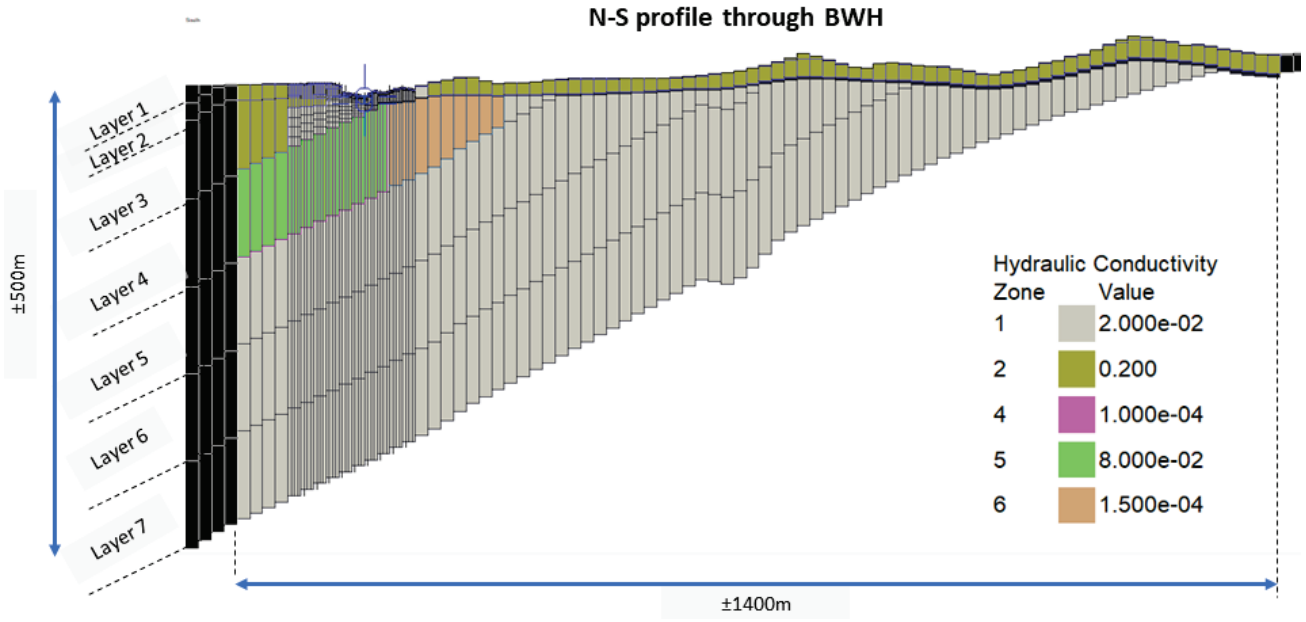


Figure 4-13 Cross-Section Through Model Showing Variation in K Values (m/Day)

5 GROUNDWATER MODEL SIMULATIONS

5.1 Prediction Models

The transient calibrated model was used as a basis for the prediction models, which were developed for the life of mine period (2017-2038), and post-mining (closure) period (2039-2430). Rainfall data for the Glenden rainfall station was extracted from the SILO database and used to generate a rainfall recharge dataset for the prediction models, applying the same recharge rates used in the calibration model.

The southwestern model boundaries (i.e. the time-variant specified head) of the focused model were updated by applying the heads predicted by the SLR regional model for the 10th, 50th and 90th percentiles, which are shown in Figure 5-1 to Figure 5-4, for each of the selected locations. The heads were applied as variable elevation constant head (CH) boundaries that reflect the regional model predictions. Predicted heads below Layer 3 of the regional model were applied at locations where these aligned with the southern boundaries of the focused model.

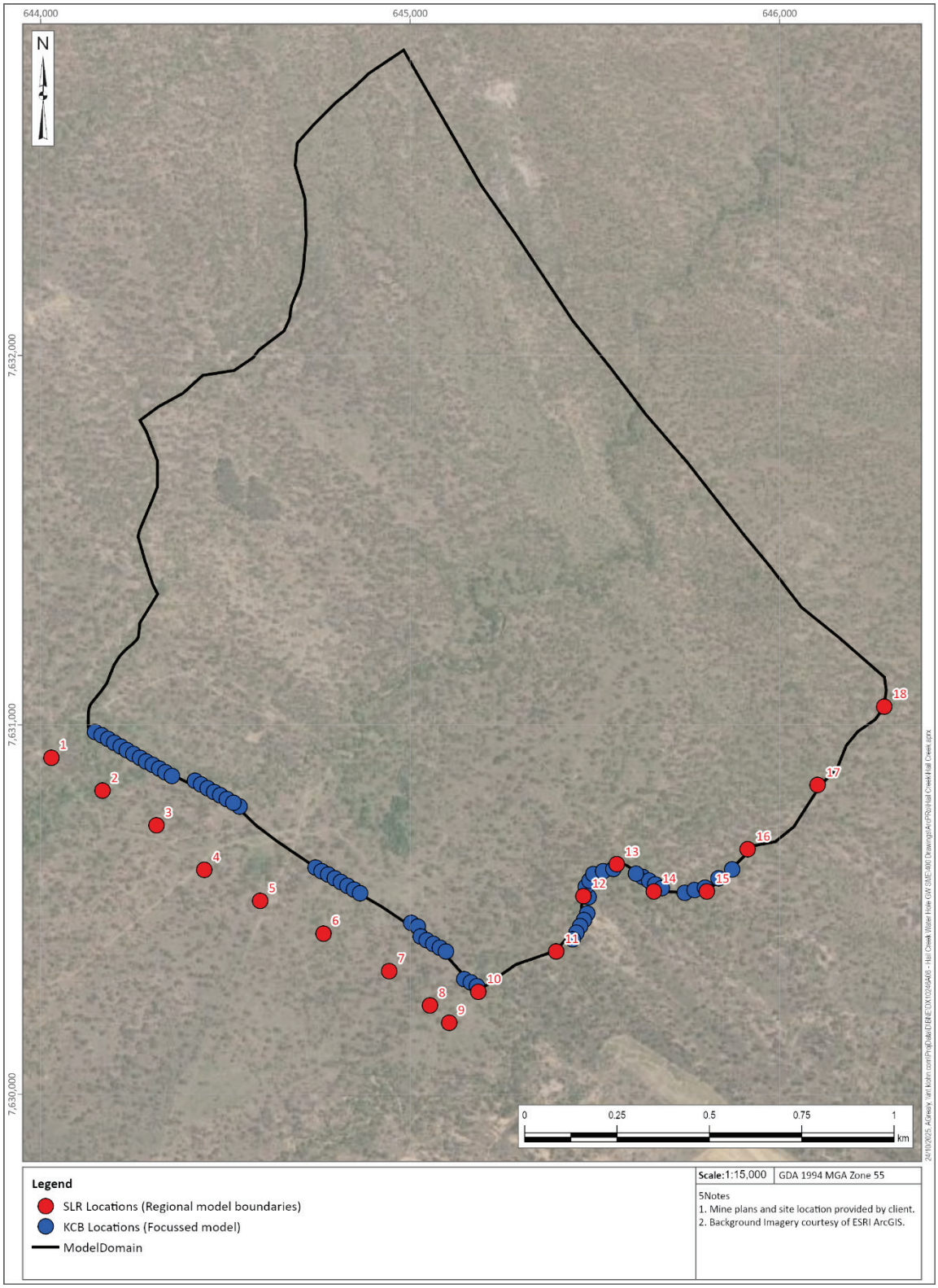


Figure 5-1 Positions Where Data from SLR Models is Extracted and Applied to Local-Scale Model

Six scenarios were applied to the focused model, considering the approved and extension cases, as listed below:

- Approved operations 50th percentile, 2017-2038.
- Approved operations 10th percentile, 2017-2038.
- Approved operations 90th percentile, 2017-2038.
- Extension operations 50th percentile, 2017-2430.
- Extension operations 10th percentile, 2017-2430.
- Extension operations 90th percentile, 2017-2430.

In addition, as a comparison, SRL's 'best-calibrated' model was run from 2017-2430 (Figure 5-7 to 5-8).

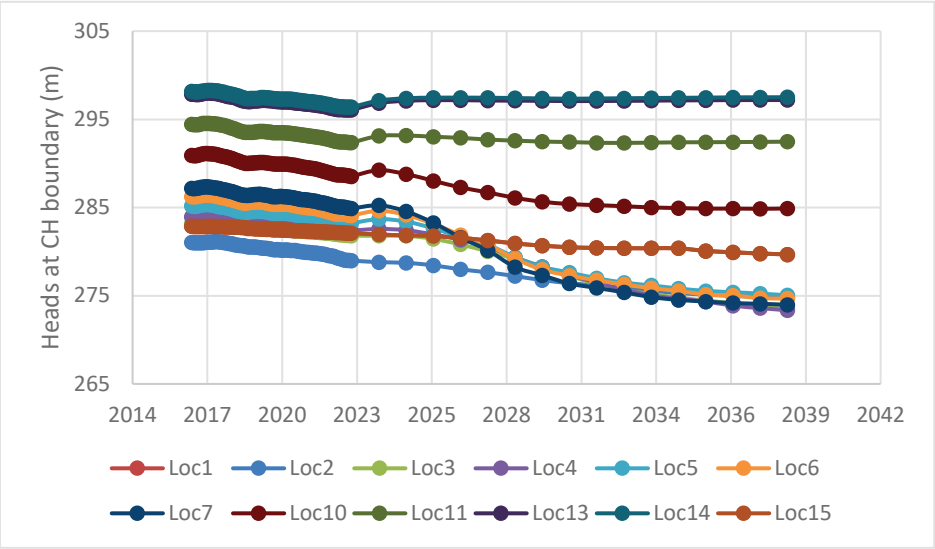


Figure 5-3 Heads Applied in the Approved Case (50th Percentile Case from SLR)

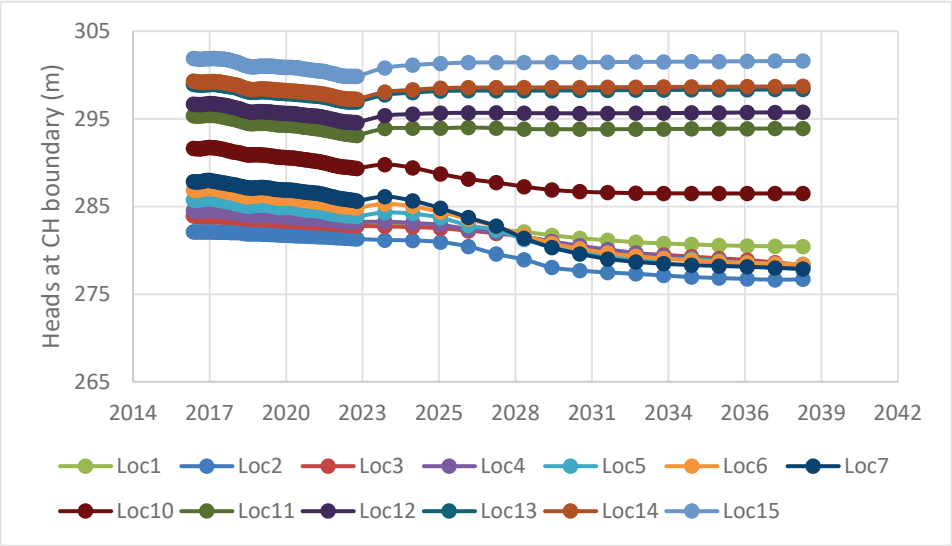


Figure 5-2 Heads Applied in the Approved Case (90th Percentile Case from SLR)

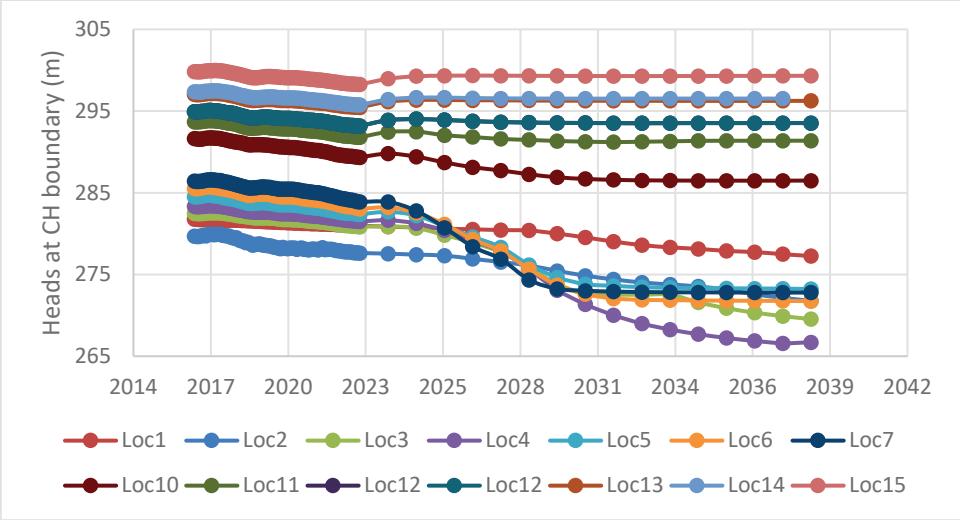


Figure 5-4 Heads Applied in the Approved Case (10th Percentile Case from SLR)

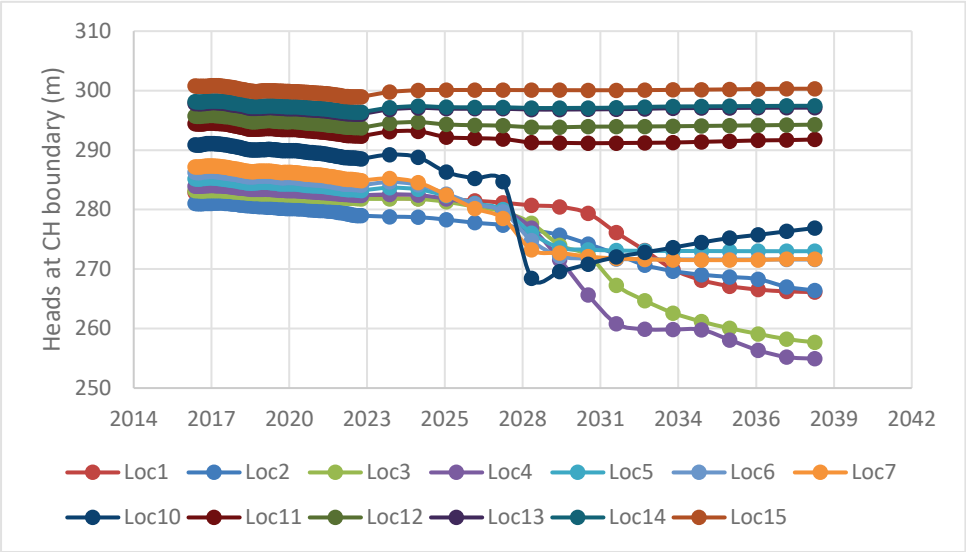


Figure 5-6 **Heads Applied in the Proposed Extension Case (50th Percentile Case)**

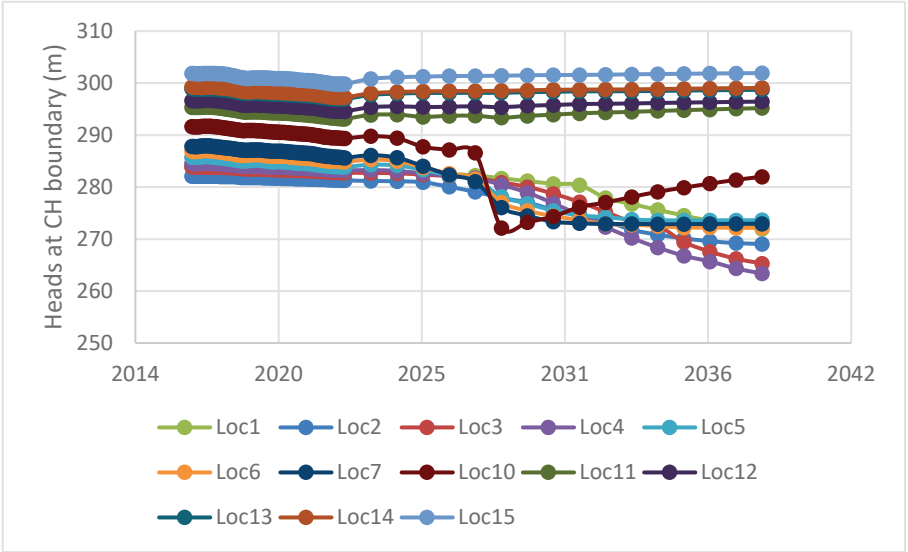


Figure 5-5 **Heads Applied in the Extension Case (90th Percentile)**

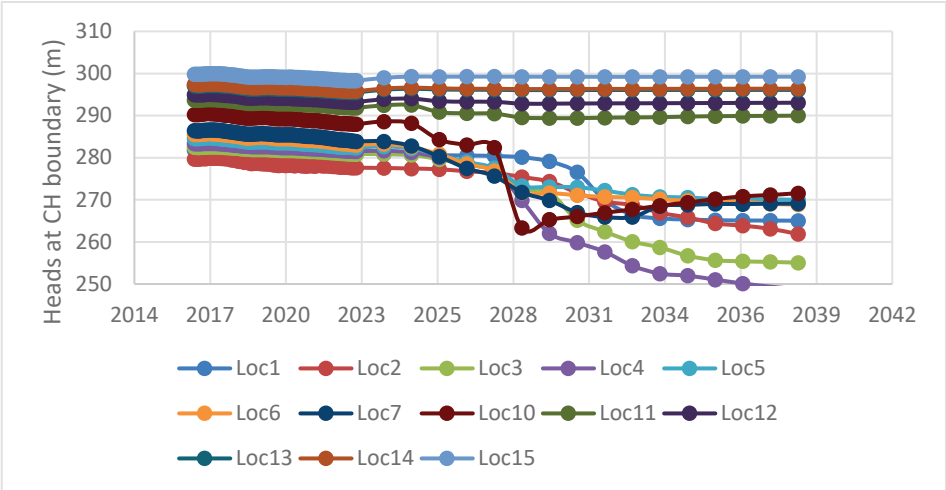


Figure 5-7 **Heads Applied in the Extension Case (10th Percentile)**

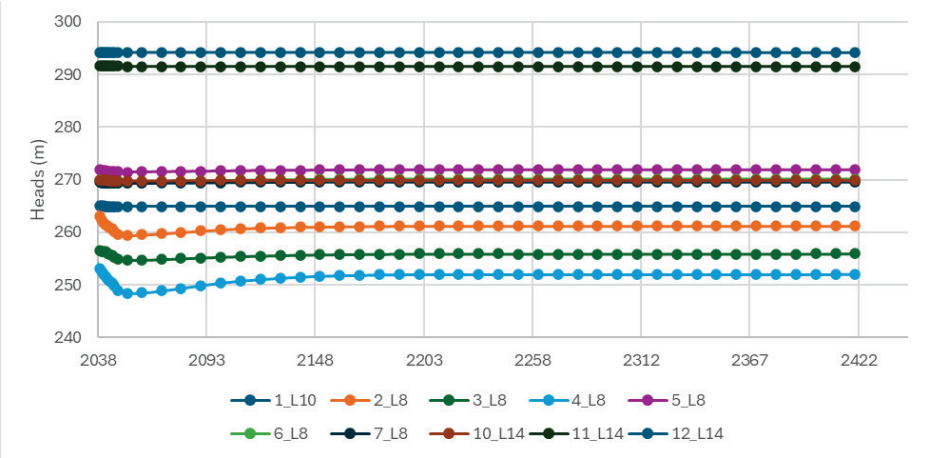


Figure 5-9 **Heads Applied from SLR's Best Calibrated Model (Boundary 1 to 12)**

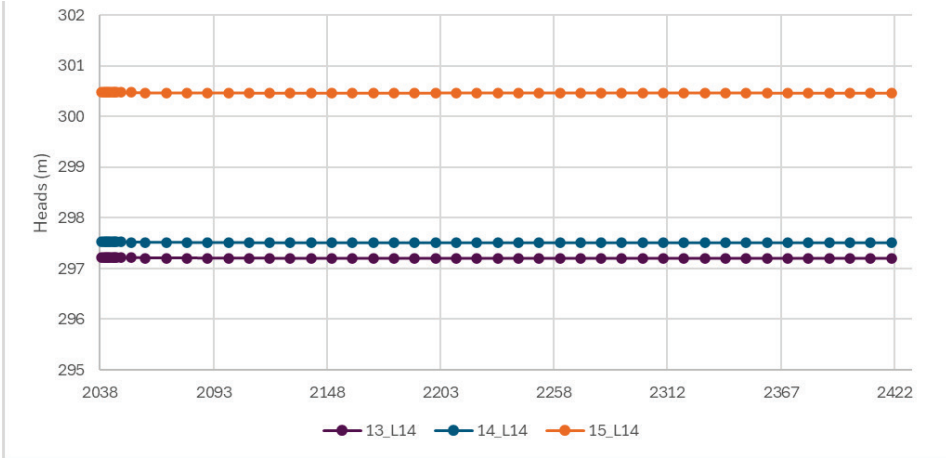


Figure 5-8 **Heads Applied from SLR's Best Calibrated Model (Boundary 13 to 15)**

The model outputs from the 50th percentile cases up to the end of mine life indicate that:

- Predicted groundwater levels at the end of mining (after ~13 years; in 2038) have decreased when compared to the end of calibration, September 2025, for the approved operations case 50th percentile, as indicated by the drawdown contours in Figure 5-11. This is primarily due to open pit dewatering/depressurisation and is due to the SLR-simulated head inputs influencing levels within the local-scale model domain. The results also indicate that drawdown would occur for the extension case at the end of mining for 50th percentile (Figure 5-13). As expected, the extension case results in lower groundwater levels at the boundary of the BWH model which results in increased drawdown compared to the approved case (Figure 5-14).
- Groundwater levels near the Lower pool stay below its base for the entire prediction period, which indicates that the pool remains disconnected from groundwater during the operations period in all the scenarios (Figure 5-14 and Figure 5-15). The seepage rates from the Lower pool to groundwater remain constant for all the simulated cases (Figure 5-15 and Figure 5-16).
- The water balance results are similar for all predictions with results for each case being similar and no significant change to the availability of water to the BWH pools (Figure 5-17 and Figure 5-18).

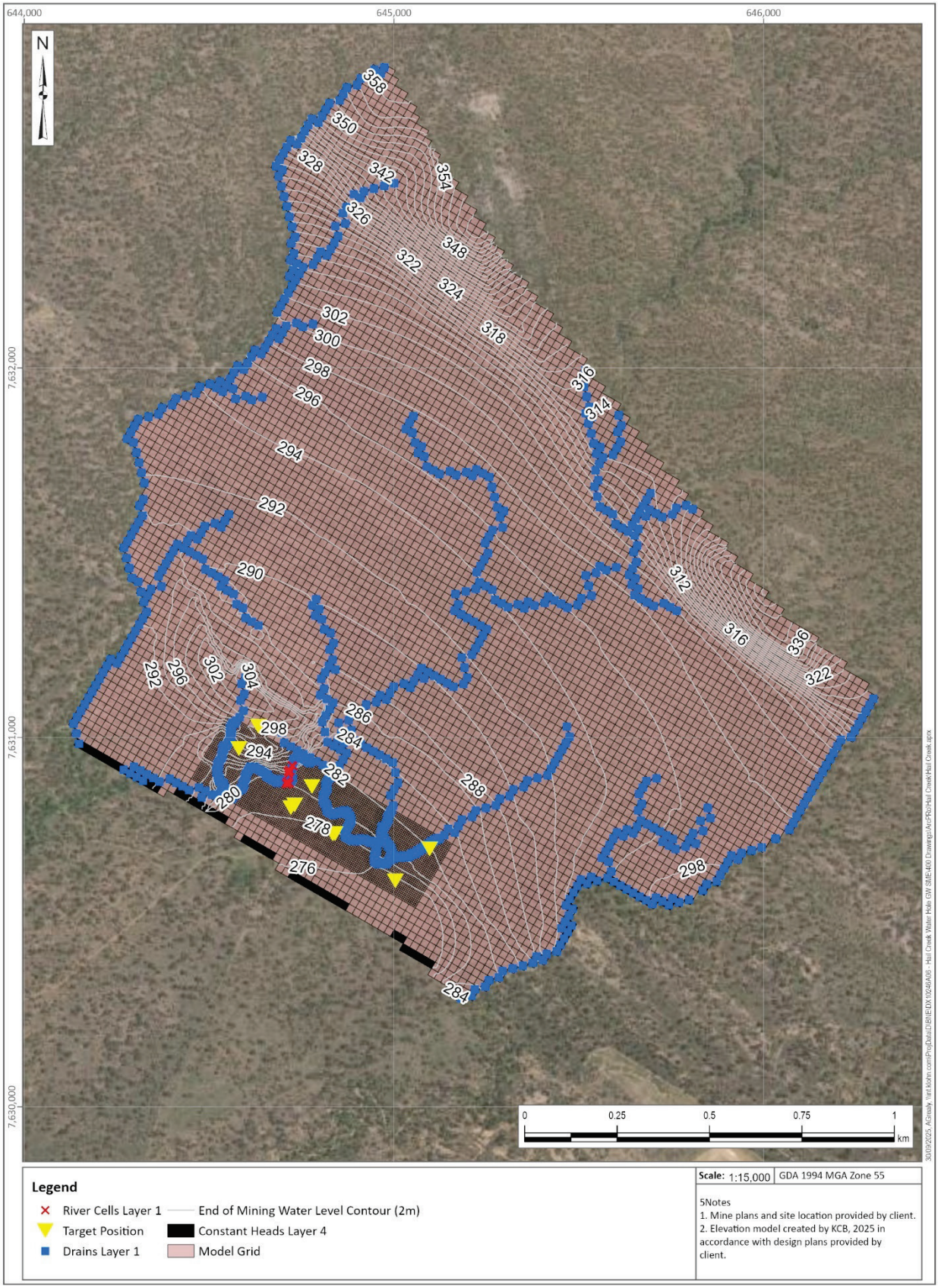


Figure 5-10 Approved Mining: Predicted Groundwater Contours at the End of Mining (2038 - 50th Percentile Case)

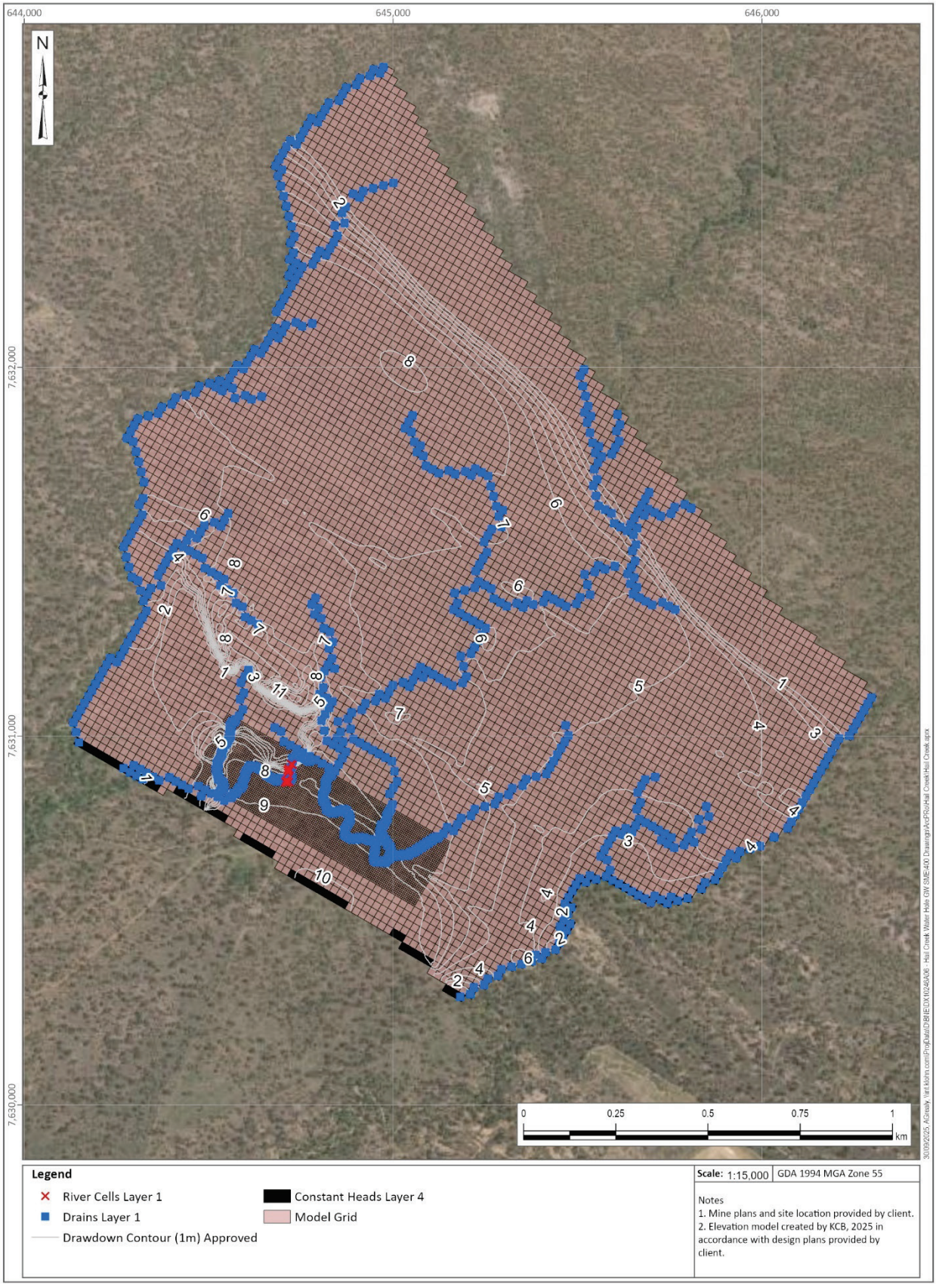


Figure 5-11 Approved Mining: Drawdown Contours for End of Mining Relative to 2025 (2038 - 50th Percentile Case)

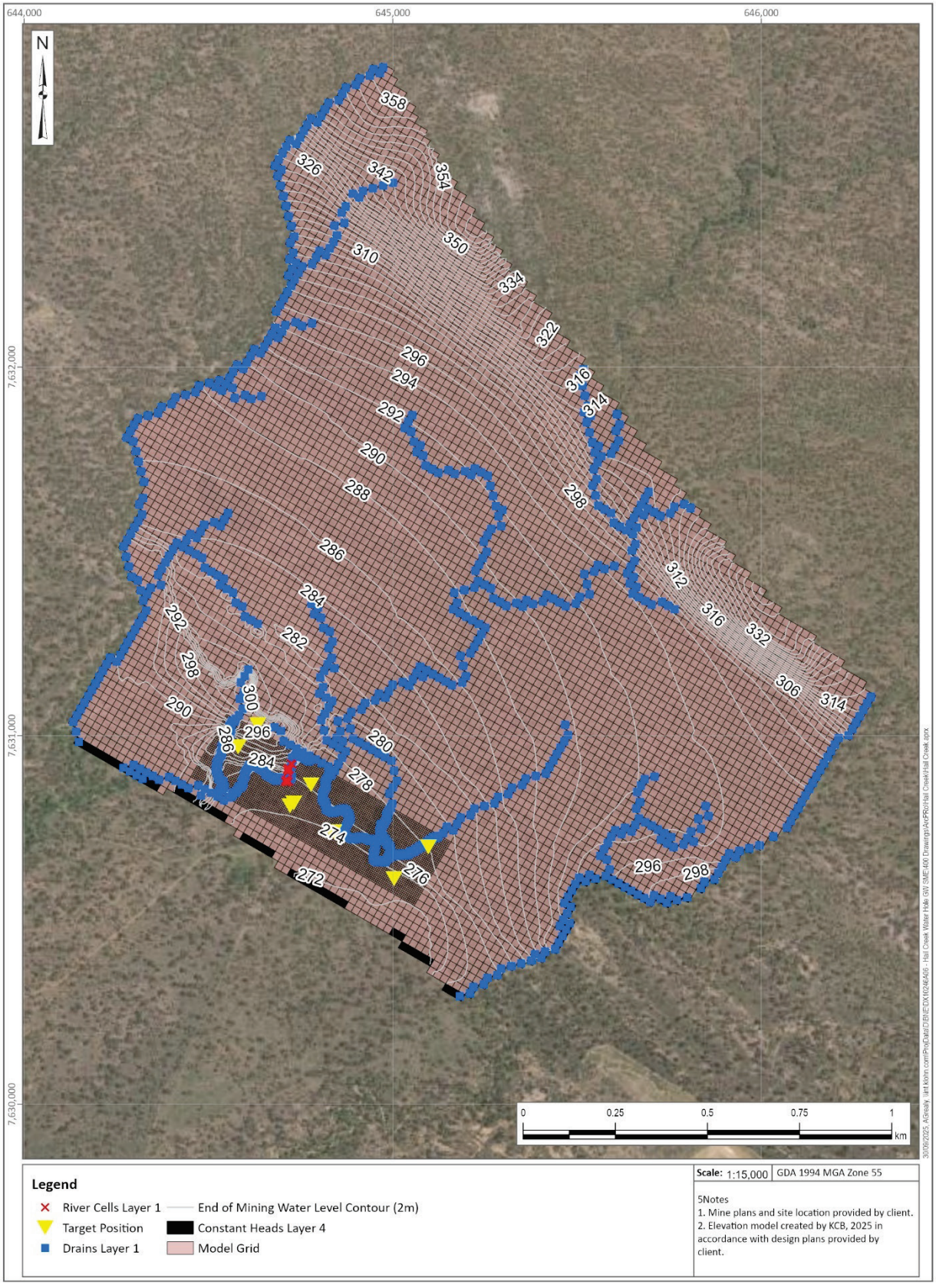


Figure 5-12 Proposed Extension: Predicted Groundwater Contours at the End of Mining (2038 - 50th Percentile Case)

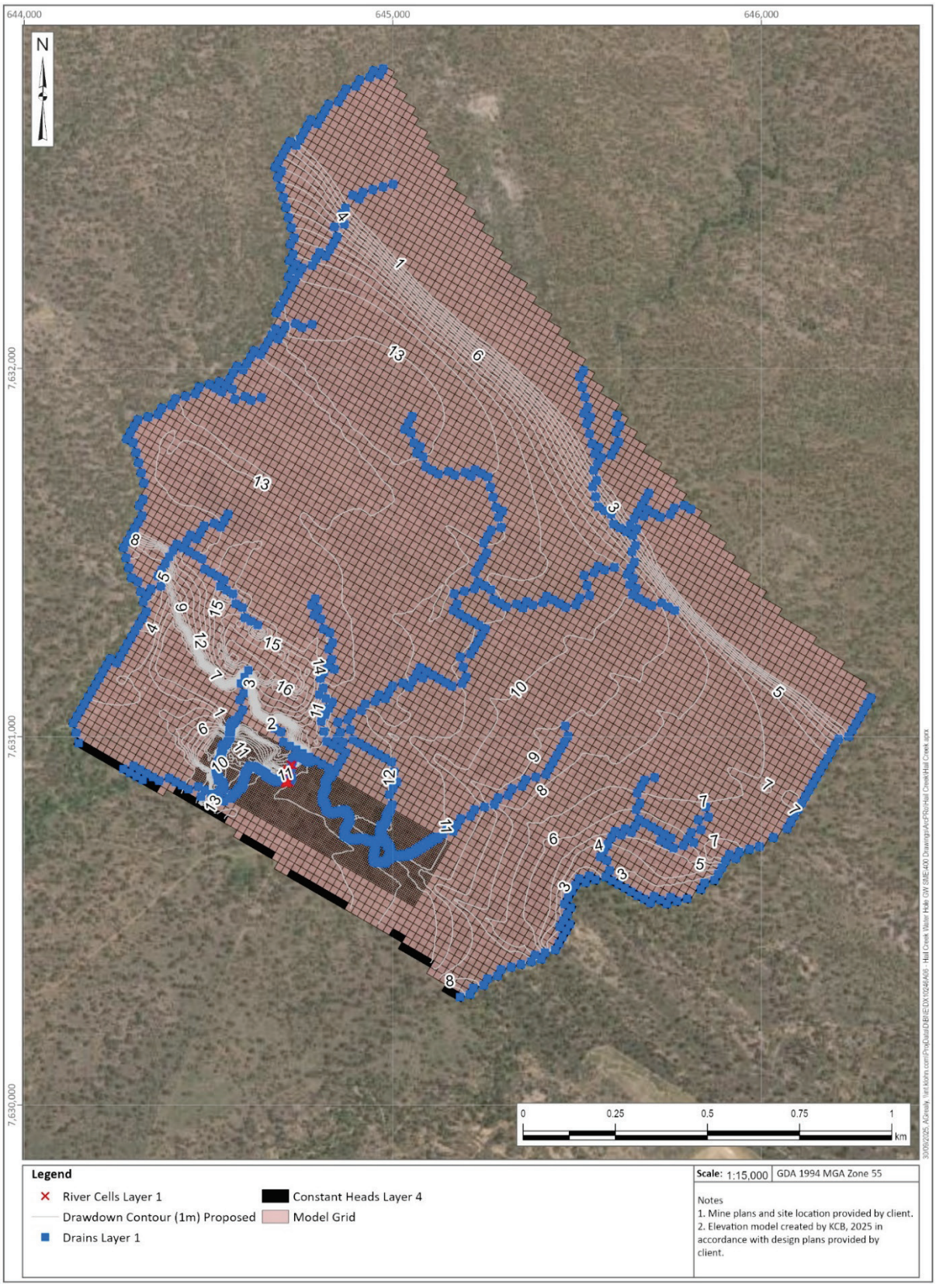


Figure 5-13 Proposed Extension: Drawdown Contours for End of Mining Relative to 2025 (2038 - 50th Percentile Case)

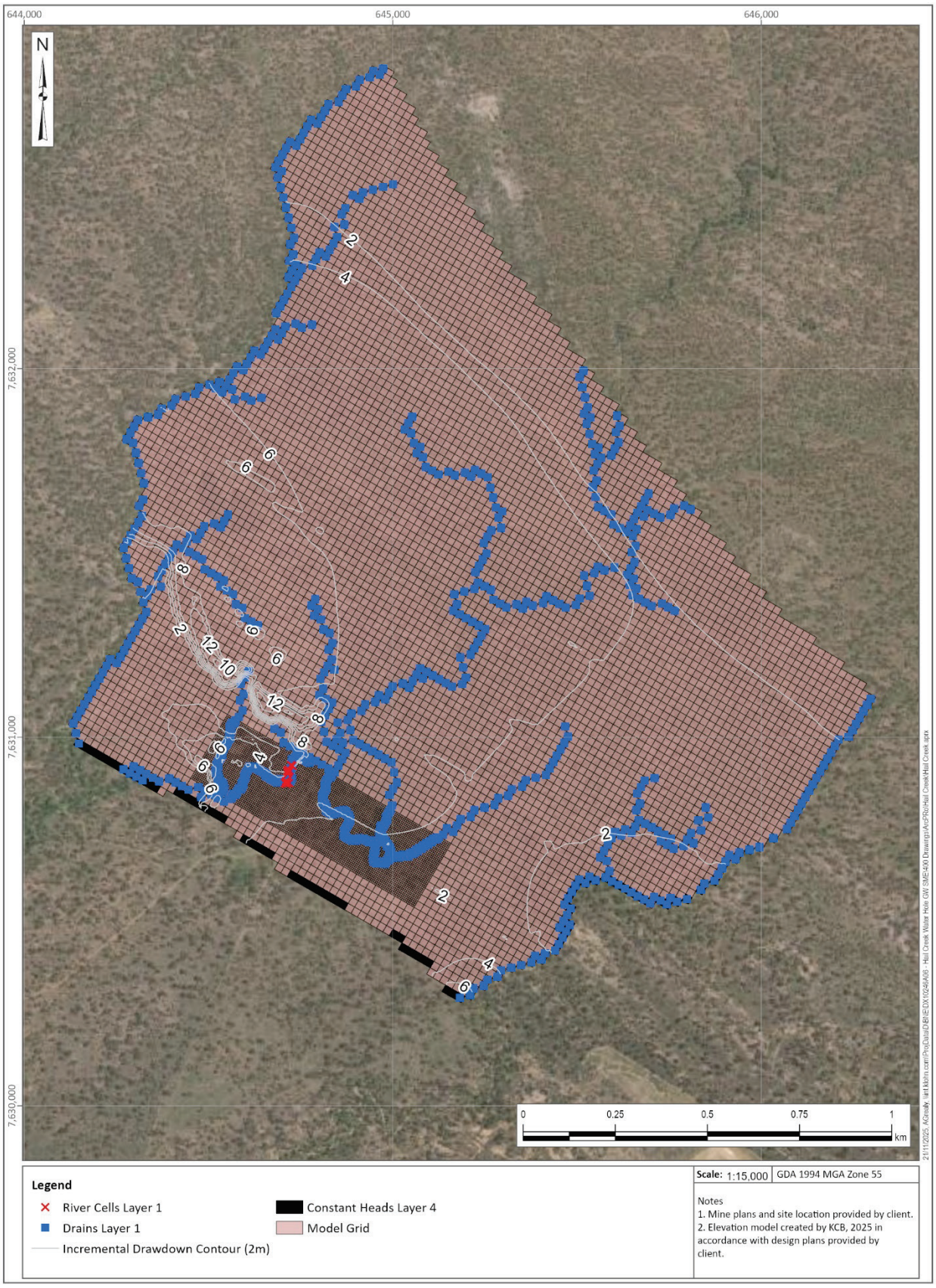


Figure 5-14 Incremental Drawdown of Proposed Case in Relation to Approved Case for End of Mining (2038 - 50th Percentile Case).

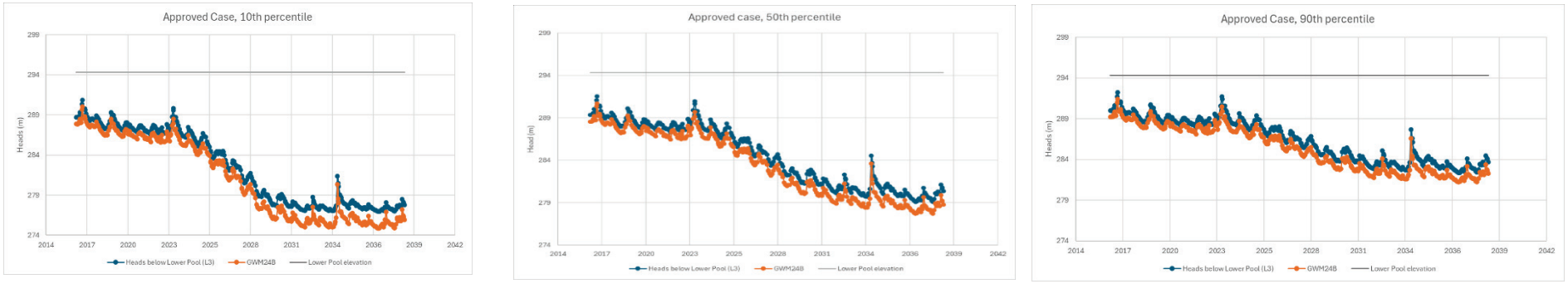


Figure 5-15 Life of Mine Predicted Heads Below Lower Pool, for the Approved Case Scenarios

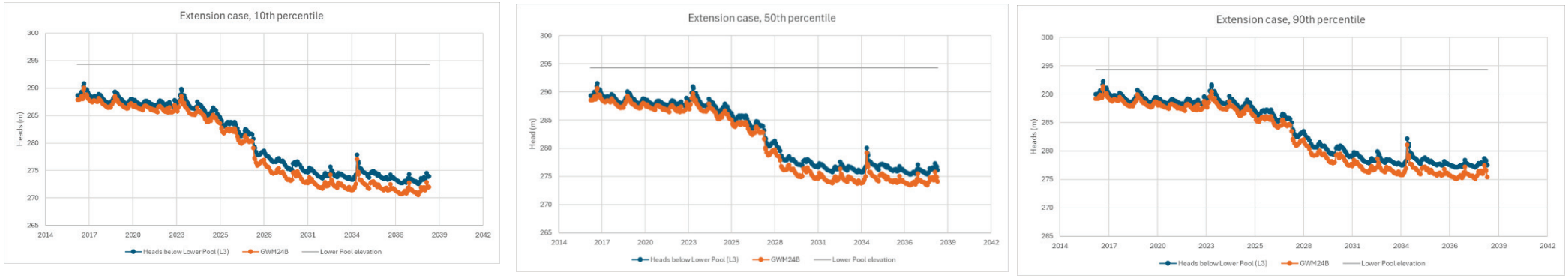


Figure 5-16 Life of Mine Predicted Heads Below Lower Pool, for the Extension Case Scenarios

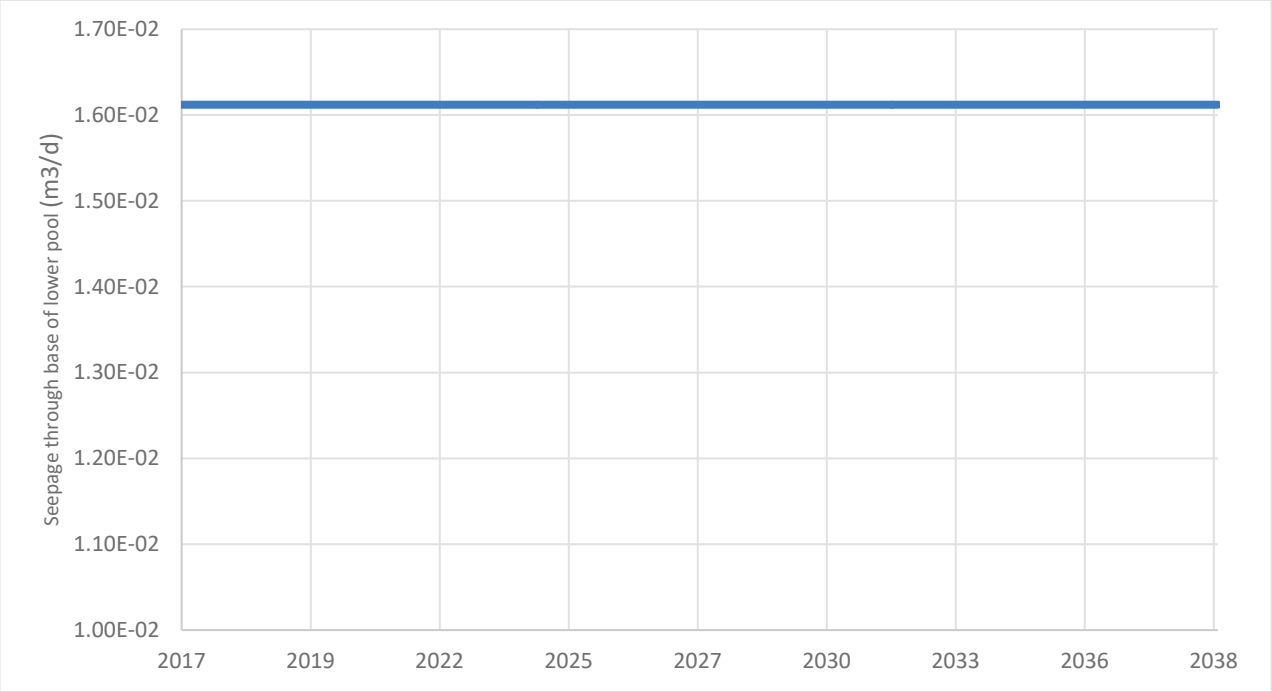


Figure 5-17 Seepage from Lower Pool to Groundwater, for the Approved Case 50th Centile Scenarios (Operations)

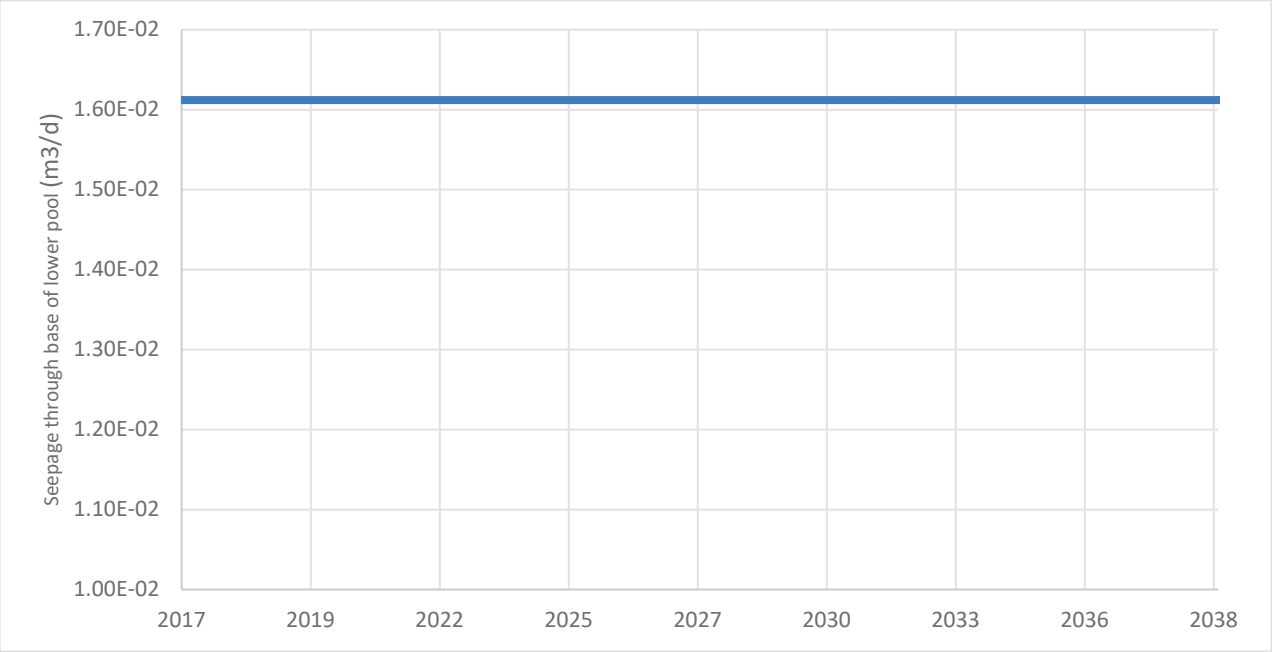


Figure 5-18 Seepage from Lower Pool to Groundwater, for the 50th Centile Extension Case Scenario (Operations)

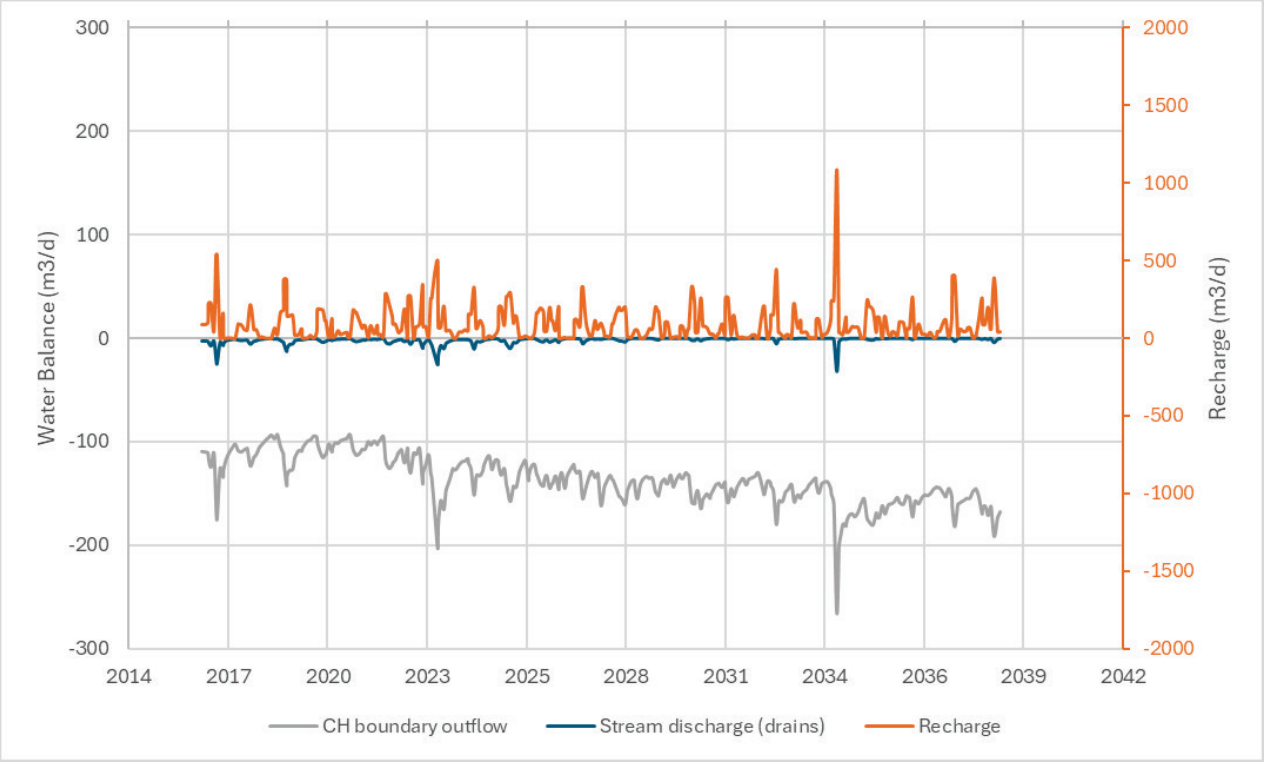


Figure 5-19 Water Balance (Main Components) for Approved 50th Percentile Case

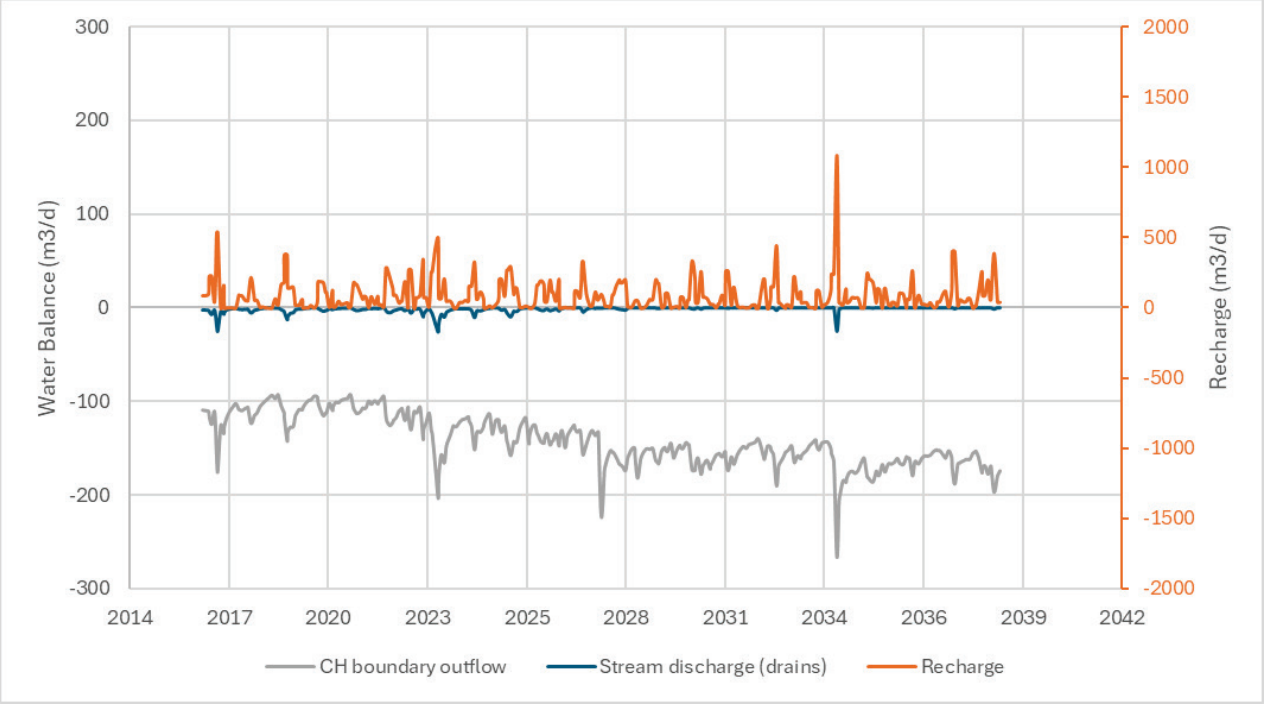


Figure 5-20 Water Balance (Main Components) for Extension 50th Percentile Case

The post-operation case for the Extension Case was simulated using SLR 2025 model results. Predicted heads are presented in Figure 5-19 and Figure 5-20.

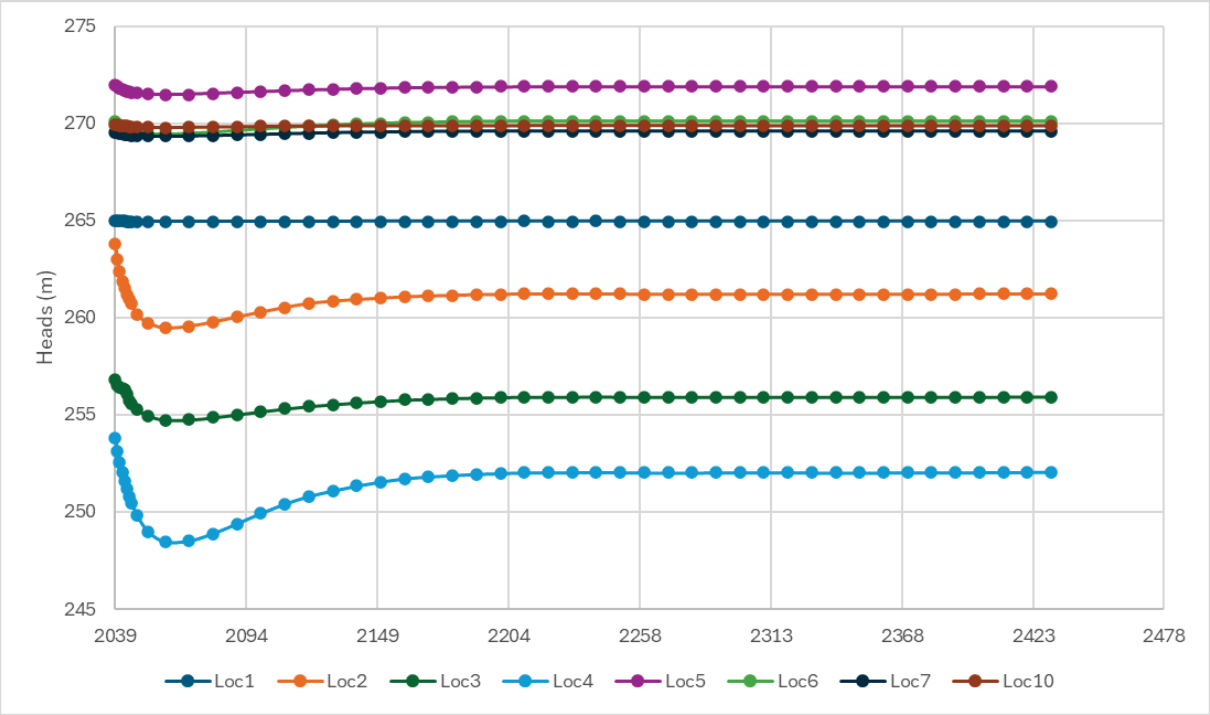


Figure 5-21 Heads Applied in the Post-Mining Period (from 2039) Simulations, Locations 1 to 10

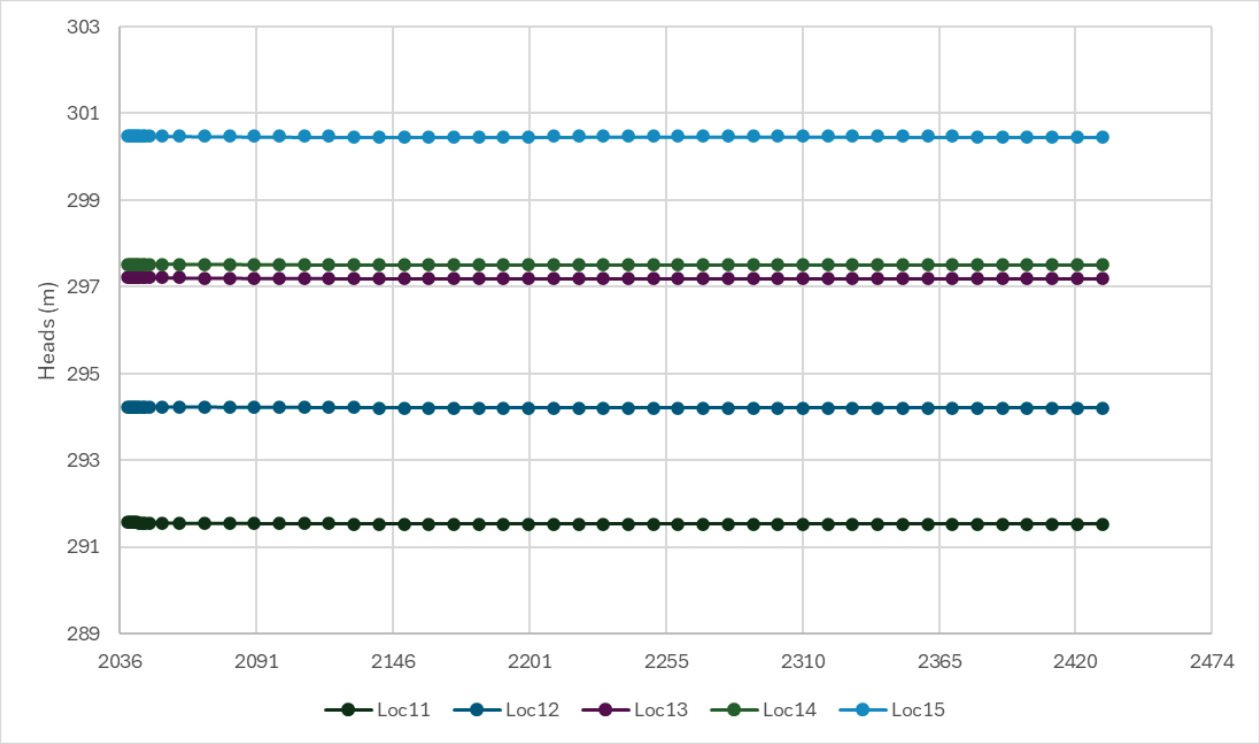


Figure 5-22 Heads Applied in the Post-Mining Period (from 2039) Simulations, Locations 11 to 15

The SLR model results indicate the maximum drawdown occurs after operations have ceased. Recovery of the groundwater system is slow and muted, with predicted water levels at the end of the closure model simulation (Year 2430) being lower than the water levels at the end of the mining. This translates to the local-scale model (and reflected in lower groundwater models in the local-scale model), but results suggest that the water balance in the pools, from a groundwater perspective, remains unchanged. Results for the water levels and simulated loss through the base of the lower pool are provided in Figure 5-22, with the predicted heads near the BWH lower pool over this period shown in Figure 5-23, Figure 5-24 and Figure 5-25 for the 50th, 90th and 10th centile cases respectively.

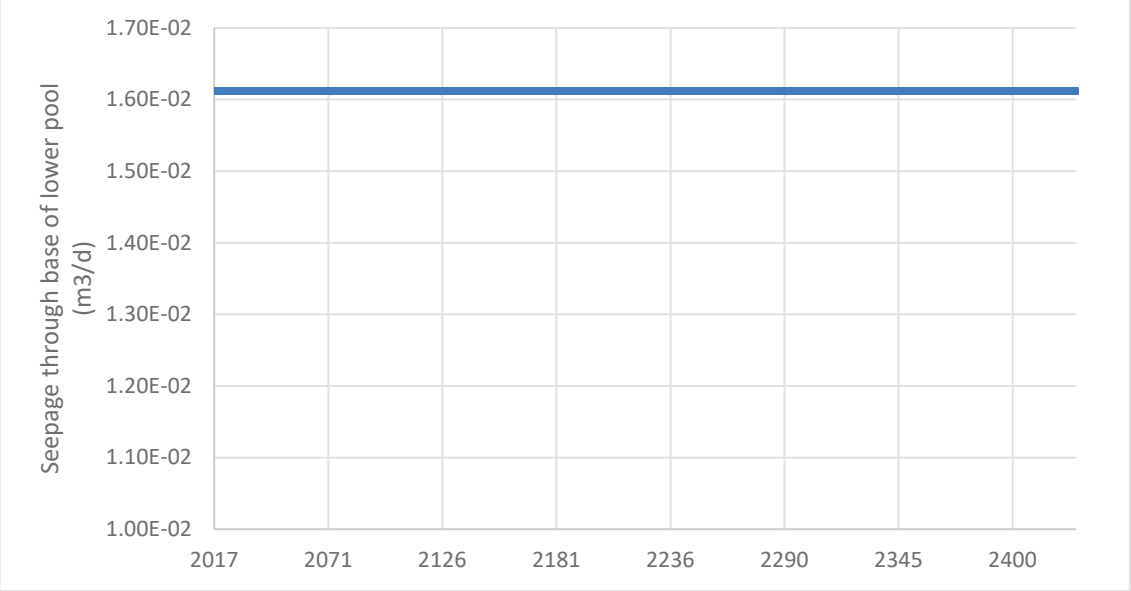


Figure 5-23 Seepage from Lower Pool to Groundwater for the Extension Case 50th Centile Scenarios (Operations and Post-Closure)

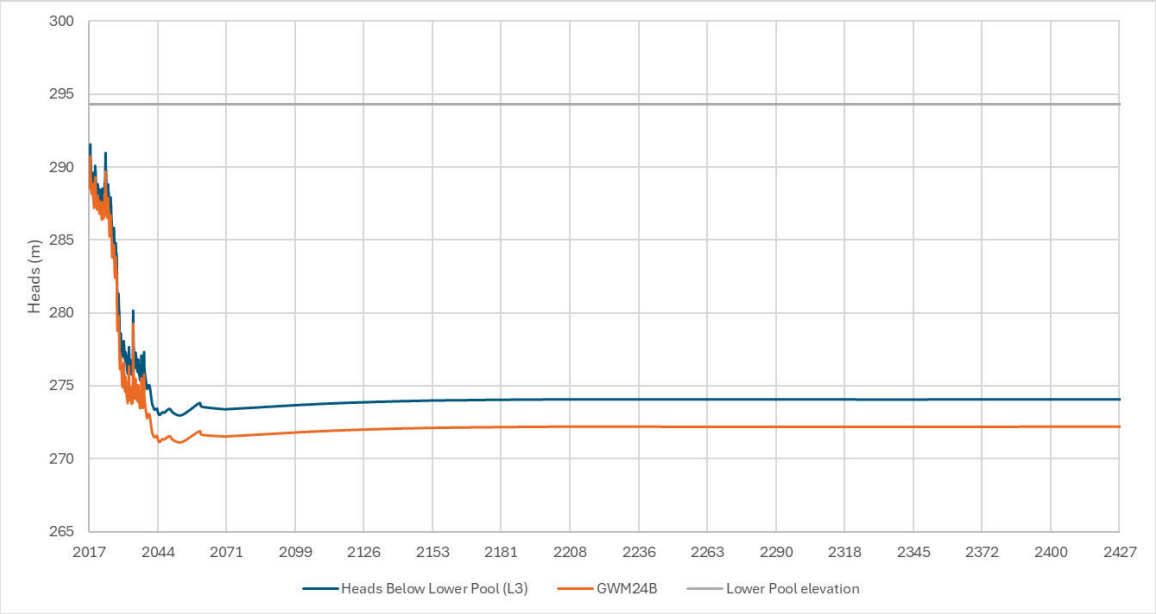


Figure 5-24 Extension Case - Predicted Heads Below Lower Pool for Operations and Closure (50th Percentile Scenario)

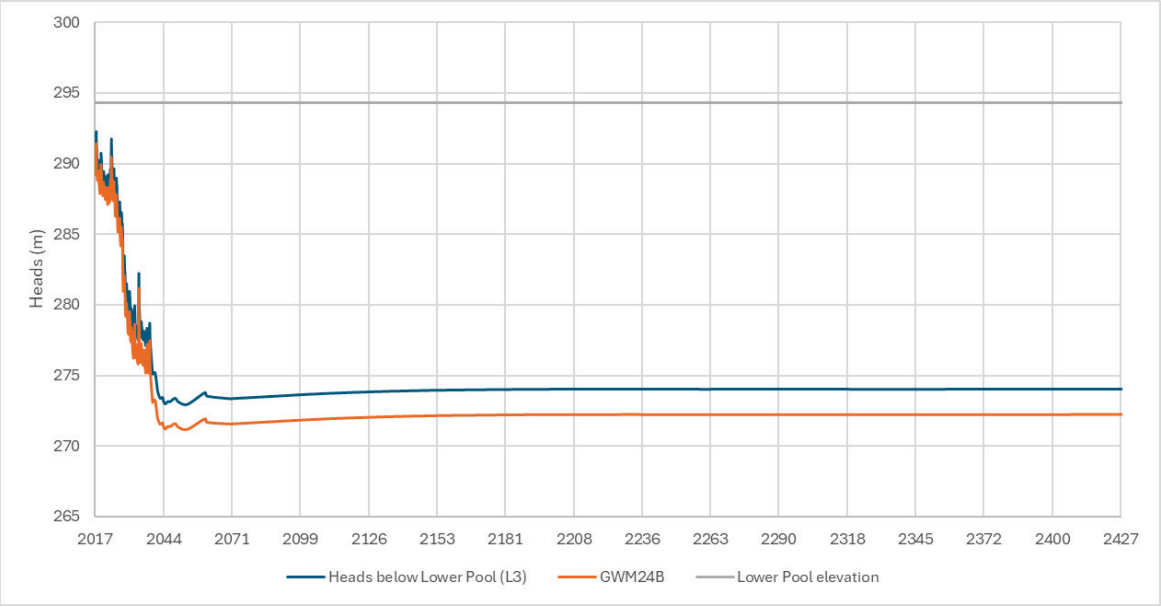


Figure 5-25 Extension Case - Predicted Heads Below Lower Pool for Operations and Closure (90th Percentile Scenario)

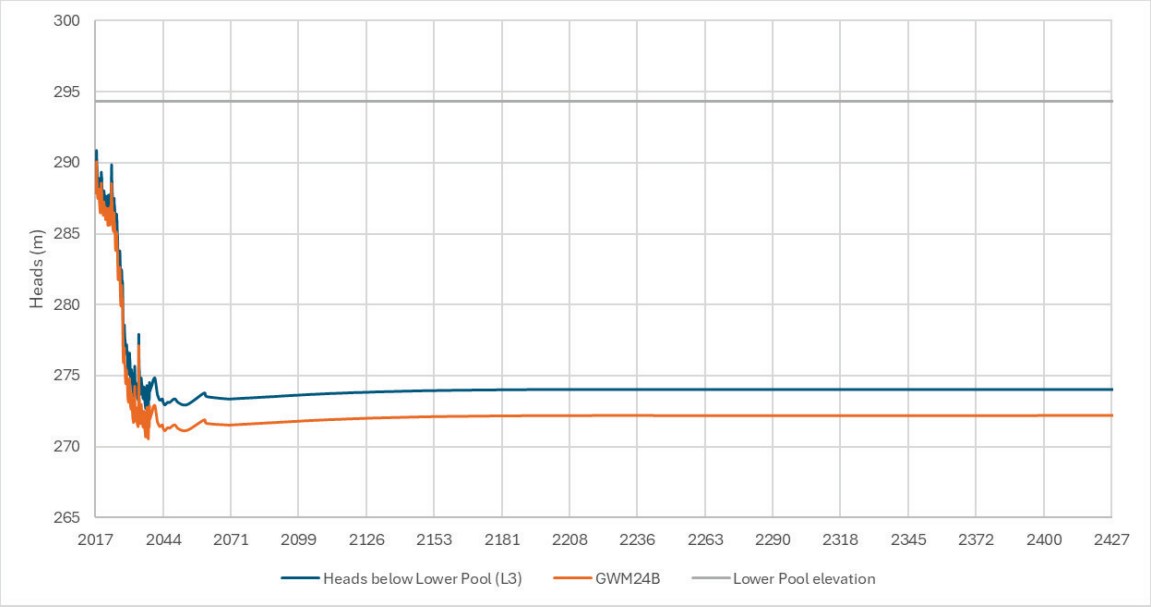


Figure 5-26 Extension Case - Predicted Heads Below Lower Pool for Operations and Closure (10th Percentile Scenario)

5.2 Sensitivity Analysis

Sensitivity simulations were performed by varying parameters that were identified as sensitive to outputs in the model calibration. These were undertaken for individual parameters in isolation, to test the importance of the property on the model results. The 50th percentile simulations from SLR for the approved and extension cases, were assessed for the sensitivity analysis.

As the calibration was achieved for a unique set of parameters, varying one parameter in isolation may result in calibration metrics falling outside of acceptable ranges. The sensitivity results should therefore be considered as indicative only.

The following scenarios were applied to the 50th percentile cases. As these sensitivity trials are modifying a single calibrated parameter in isolation the results may not be quantitatively strictly correct. These sensitivity trials do however provide context on which parameters are important controlling variables within the model.

- Kz1 x 10: Order of magnitude increase in the vertical K applied to the resistive sandstone layer that forms the base of the water holes;
- Kz1/10: Order of magnitude decrease in the vertical K applied to the resistive sandstone layer that forms the base of the water holes;
- +50RE: the recharge rates for all recharge zones were increased by 50%;
- -50RE: the recharge rates for all recharge zones were decreased by 50%.

The results of the simulations indicate that while the change in assumed recharge or hydraulic conductivity of the resistive sandstone unit do have an impact on the results, the changes in the immediate vicinity of the water holes is insignificant. These results indicate that even under these additional stresses, the BWH lower pool is disconnected from the groundwater system. This is illustrated by the following:

- The predicted groundwater levels at the Lower pool and at GWM24B monitoring bore, which is the nearest bore to the Lower pool, stays below the elevation of the base of the pool for the whole calibration and operational period (2017 to 2038) for all scenarios, as represented in Figure 5-25, Figure 5-26, Figure 5-27 and Figure 5-28.
- Only in the increased recharge case is the resultant groundwater level above the base of the Lower Pool. With recharge increased by 50%, short recharge events, groundwater may discharge to the pools (Figure 5-26) (indicated by the negative seepage rates), but after the rainfall peaks the heads at and near the pool decrease and remain below the elevation of the Lower pool. A similar behaviour is observed in the sensitivity scenarios applied to the extension case (Figure 5-30, Figure 5-29, Figure 5-31, and Figure 5-32).
- For the post-closure cases, the variance in recharge and leakage has an insignificant impact (i.e. the effects HCEP heads applied at the boundary continue to dominate) and no additional interaction or leakage from the BWH pools is indicated by the simulations.

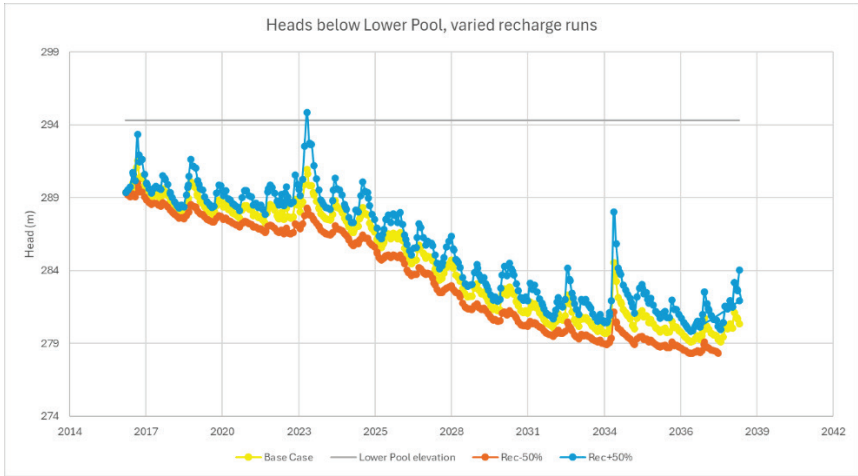


Figure 5-28 **Heads Below Lower Pool for Recharge Sensitivity Scenarios, Approved Case**

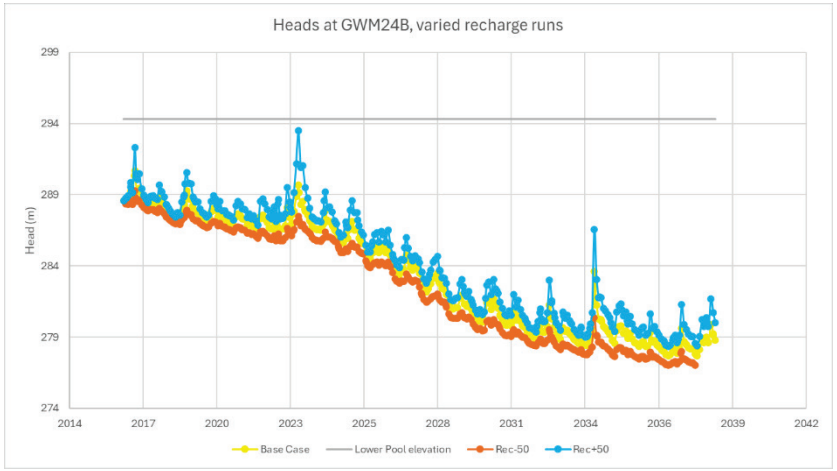


Figure 5-27 **Heads at GWM24B for Recharge Sensitivity Scenarios, Approved Case**

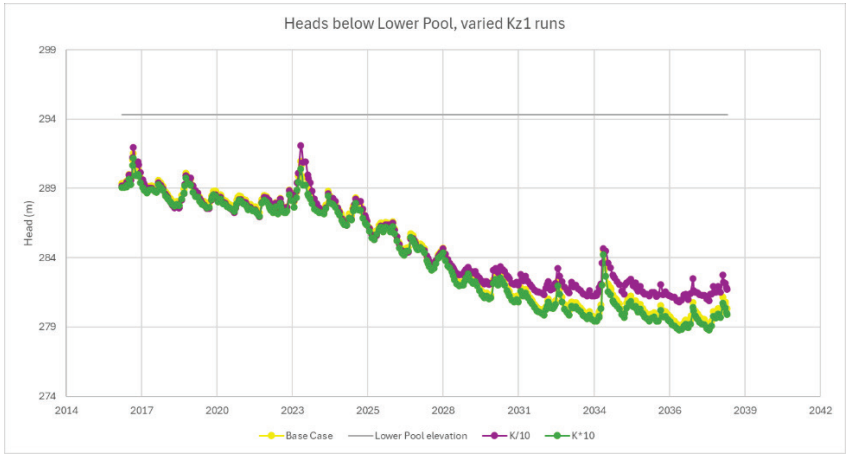


Figure 5-30 **Heads Below Lower Pool for Kz1 Scenarios, Approved Case**

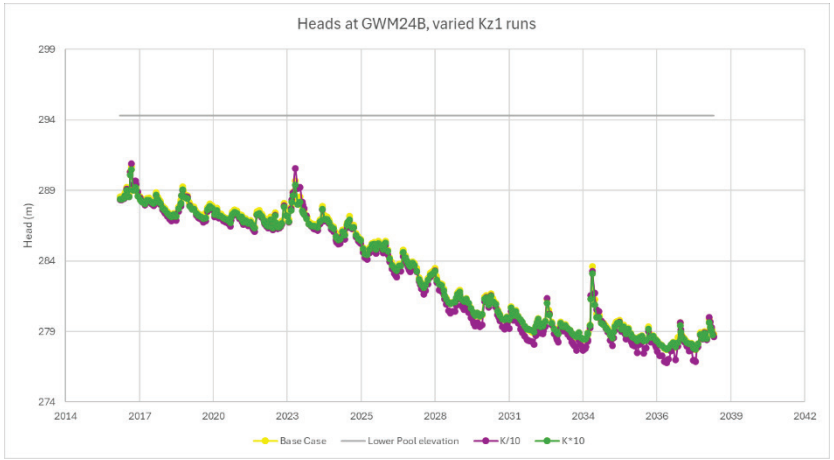


Figure 5-29 **Heads at GWM24B for Kz1 Scenarios, Approved Case**

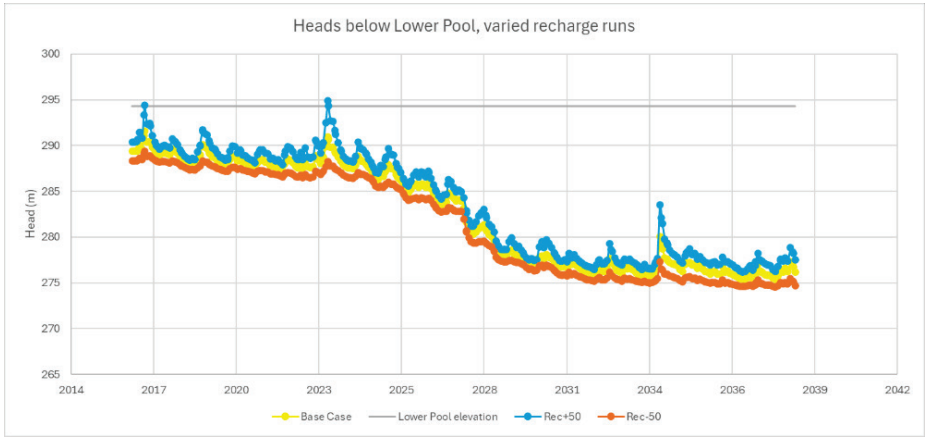


Figure 5-31 **Heads Below Lower Pool for Recharge Sensitivity Scenarios, Extension Case**

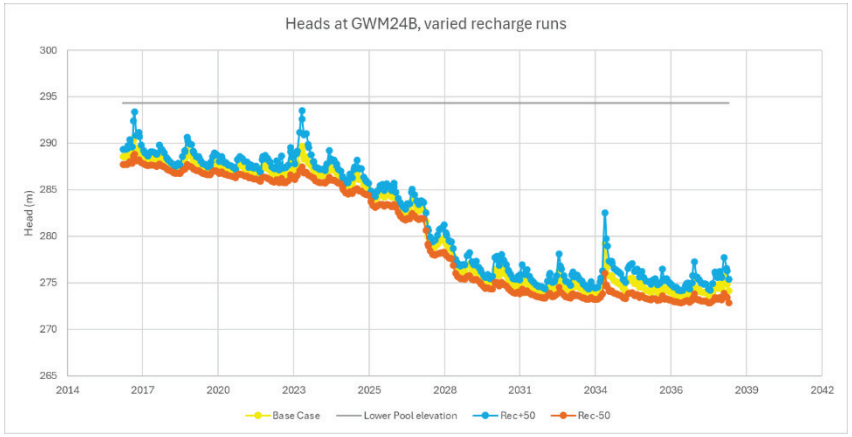


Figure 5-32 **Heads at GWM24B for Recharge Sensitivity Scenarios, Extension Case**

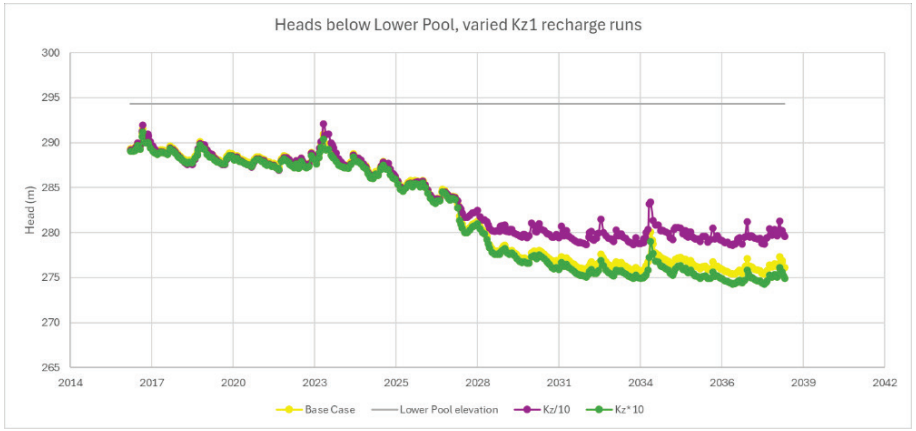


Figure 5-34 **Heads Below Lower Pool for Kz1 Sensitivity Scenarios, Extension Case**

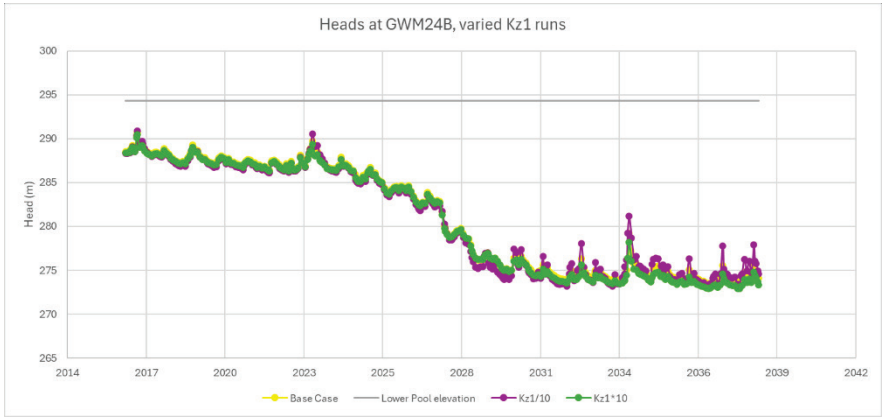


Figure 5-33 **Heads at GWM24B for Kz1 Sensitivity Scenarios, Extension Case**

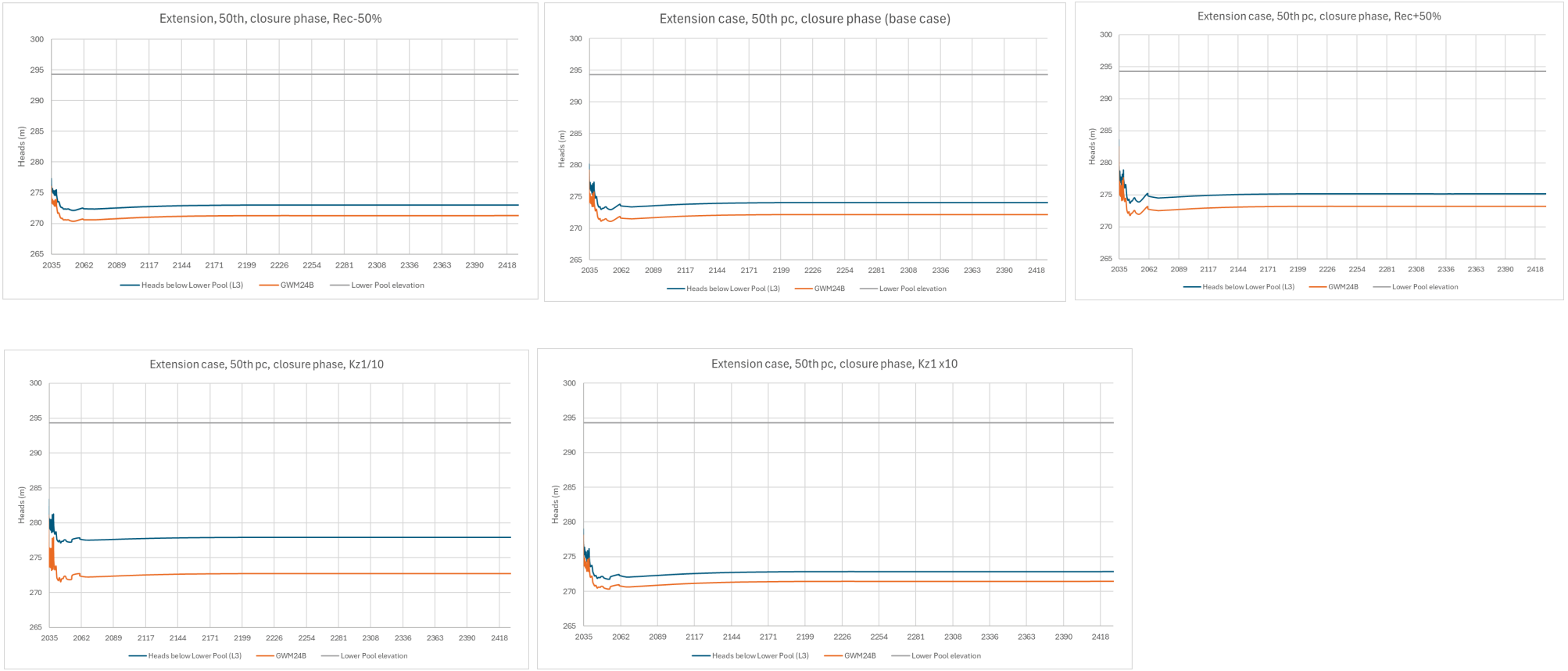


Figure 5-35 Predicted Heads Below Lower Pool for Sensitivity Scenarios, Extension Case (Closure Phase)

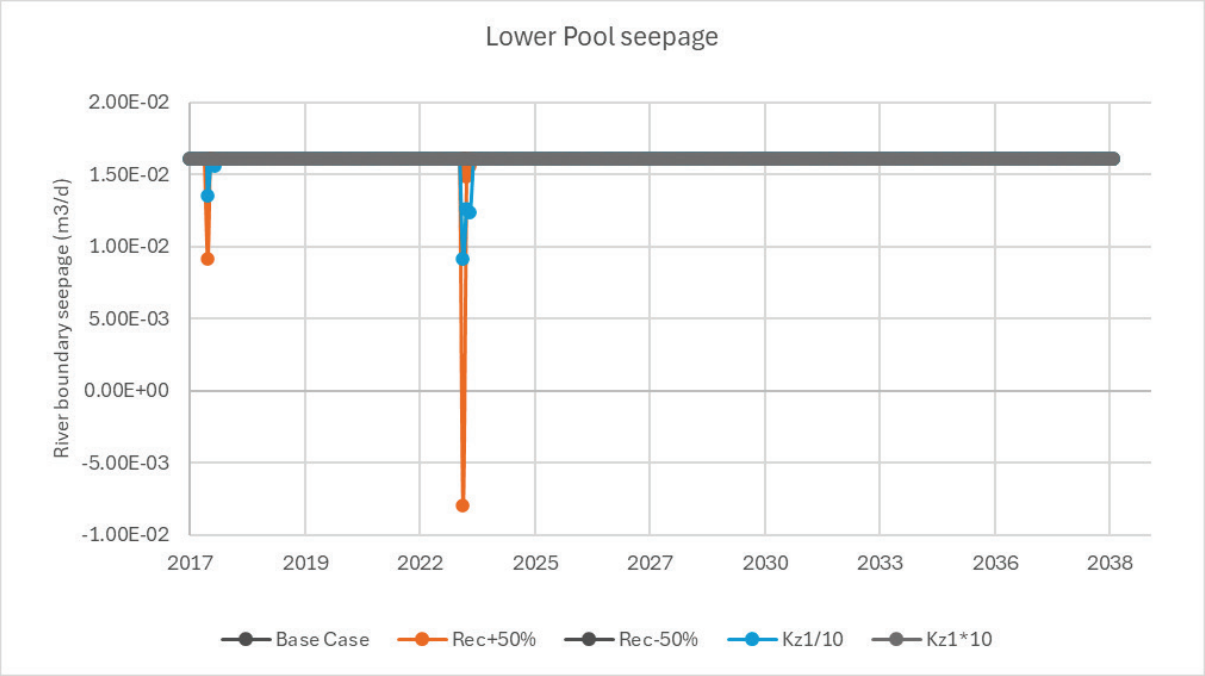


Figure 5-36 Lower Pool Seepage for Sensitivity Scenarios on the Approved 50th Percentile Case

5.3 Model Classification

Barnett et al. (2012) developed a system to classify the confidence level of groundwater flow models based on the calibration process used and the predictive capability of the model. Three classes of model were developed: Class 1, Class 2, and Class 3. A Class 3 model has the greatest confidence level, and a Class 1 model has the least. Factors that are considered when determining model confidence level are:

- Data availability;
- Calibration procedures;
- Consistency between calibration and predictive analyses; and
- Stresses varied on the model.

The model used for the predictions in this report is considered a Class 2 model based on the following:

- Nine groundwater monitoring bores were available for transient calibration, in close vicinity of BWH (in Class 2).
- Key calibration statistics were acceptable (Class 2).
- Transient calibration was undertaken over 6 years, and the long-term trends were replicated.
- Seasonal fluctuations are adequately simulated for the bores (Class 3).

- The transient calibration covered the period (from the year 2017 and 2023), and 334 monitoring observations over this period are used in the calibration (Class 2).
- Model parameters were calibrated within the ranges of conceptualisation (Class 2-3).
- Model water balance error is less than 0.5% (Class 3).
- The predictive model duration is approximately ten times that of the calibration period (Class 2).

The calibration model meets the criteria for a Class 2 model and is suitable for assessing the impacts on BWH from mining based on criteria in Barnett et al. (2012).

6 DISCUSSION/CONCLUSIONS

The update to the local-scale groundwater model for the BWH area indicated the following:

- The detailed numerical groundwater model for the area around the water holes was updated. The model domain was consistent with the 2023 domain. The domain was selected to coincide with SLR's model domain along southern extent of the FCCM to allow for consistency in the models. This also allows the local-scale model to account for the updated predictions (SLR, 2025) of groundwater level responses resulting from mining through the inclusion of time-variant boundary conditions for the local model. The approved mining and the HCEP cases were considered.
- The local-scale model calibration was assessed with an extended monitoring data record and continues to achieve improved transient calibration of the water levels compared to the regional model; this is both in terms of absolute difference between the measured and model-generated water levels and in reflecting the seasonal and other transient responses observed in the monitoring.

The 2025 update indicates:

- The calibration model is within acceptable calibration metrics, according to the guidelines outlined Barnett et al. (2012). The focused model achieved an improved calibration compared to the regional model, as indicated by the statistics and comparative hydrographs (measured vs model).
- The model results indicate that drawdown in the FCCM will propagate from the mining area towards BWH (as a result of drawdown predicted in the SLR model, for both the approved and the Project cases). Despite this, the model results (under the assumed base case and in the sensitivity simulations) indicate that the rates of leakage from the BWH to regional groundwater remain low due to the relatively impermeable base of the middle and lower pools. The simulations show that drawdown of groundwater in the FCCM can be expected in both the approved and Project case, with increased drawdown resulting in the Project case.
- The groundwater model predicts that interaction between the water holes and the regional groundwater system is negligible. This is in line with the conceptualisation as the BWHs are founded on intact sandstones. The results indicate that under most circumstances there is no contribution from the regional groundwater system to the BWH. The model water balance indicates that the pools seep to the regional groundwater system at a very low rate (<0.001 L/s) and the measured heads from the current monitoring as well as from the predictions indicate that the water table is hydraulically disconnected from the pools.
- Rainfall recharge is the main recharge input to the groundwater system in the local-scale model, and seepage from the lower pool is extremely low for all modelled scenarios (even under increased hydraulic conductivity). Results for higher recharge periods (or under cases where the calibrated recharge was increased by 50%) indicate

that when wetter periods arise, short periods of interaction with groundwater beneath the pools may occur when the groundwater elevations increase for brief intervals.

- Sensitivity simulations showed that the focused model is sensitive to recharge and vertical hydraulic conductivity of the shallow sandstone (Layer 1 of the focused model) but that, overall, this does not significantly change the interaction between the pools in the water hole system and the FCCM units. The sensitivity results indicate that recharge into the lower pool may occur for very short periods following major rainfall events. The simulation in which this was predicted to occur increased recharge to rates 50% greater than in the calibrated model; this likely represents an upper bound condition in a simulation that may not meet the calibration performance achieved in the base case predictive simulations.
- The prediction models showed that for all the scenarios using inputs from the regional model (10th, 50th and 90th predicted percentile heads over time), the lower pool is expected to be perched above the adjacent groundwater system with the very low rates of loss through the low permeability sandstone persisting (predicted heads at the lower pool are below the elevation at the base of the pool over life of mine (2017 – 2038) and post-mining phase).
- Overall, the results from the 2025 updated model have not yielded results that are inconsistent with KCB's 2023 assessment. Simulations that considered future mining-induced stresses (represented by the various SLR simulations) did not result in increased rates of water flow from the lower pool to the groundwater system.

Recommendations from this hydrogeological assessment include:

- While the additional modelling reported in this document supports the previous findings, confidence in the outcomes will require continued and regular monitoring of the pools for both elevations and water quality.
- An update of the surface water balance to confirm the rainfall, runoff and surface water contributions to the BWHs should be undertaken as part of HCOC annual review of the water balance model.
- Review of the groundwater trigger levels prior to commencement of the Project, and continued monitoring in the area between the Project and the BWH area. This would allow HCOC to demonstrate that groundwater responses are consistent with the predictions.
- Previous investigations have recommended additional understanding of the groundwater system north/northeast of the lower pool. This would strengthen the conceptual understanding and support the findings. However, this is not feasible given the challenges arising from installing monitoring bores outside of the mine lease.

7 CLOSING

We would like to thank you for the opportunity to work on this assignment. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

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