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**Water Balance Report -
Kerale Dam**

Collinsville Coal Mine

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April 2026

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Water Balance Report - Kerale Dam Collinsville Coal Mine

Glencore

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Acronyms and abbreviations

AHD	Australian Height Datum
AR5	Intergovernmental Panel on Climate Change Fifth Assessment Report
AWBM	Australian Water Balance Model
CCS	Climate Change Scenarios
COL	Collinsville Coal Mine
CWS	Climate Warning Sensitivity
DETSI	Department of Environment, Tourism, Science and Innovation (formerly known as Department of Environment, Science and Innovation – DESI)
EA	Environmental Authority
GCM	Global Climate Models
IPCC	Intergovernmental Panel on Climate Change
PRCP	Progressive Rehabilitation and Closure Plan
QLD	Queensland
RCP	Representative Concentration Pathway
RFC	Representative Future Climate
SCL	Stochastic Climate Library
WBM	Water Balance Model
WSP	WSP Australia Pty Limited

Key terms and definitions

Climate change scenario	Refers to the different climate projections obtained by a specific climate change model and Representative Concentration Pathways
Closure state landform	Refers to the entire integrated rehabilitated surface landform within the mining lease area
Realisation	Water balance model results obtained when adding as an input a specific climate change scenario timeseries of rainfall and evaporation
Pathway	Refers to one of the Representative Concentration Pathways used for climate modelling

1 Introduction

Glencore has engaged WSP Australia Pty Limited (WSP) to undertake an update for the technical studies for closure planning to assist in the compilation of the transitional Progressive Rehabilitation and Closure Plan (PRCP) for Glencore's coal asset, Collinsville Coal Mine (COL) in Queensland (QLD). COL received a not properly made notice from the Department of Environment, Tourism, Science and Innovation (DETSI) that included a requirement to address matters concerning the water balance model (WBM).

COL is an open-cut coal mine, located near the township of Collinsville, QLD in the northern part of the Bowen Basin, approximately 90 kilometres (km) southwest of Bowen. Operations at COL are authorised under Environmental Authority (EA) (EPML00332013). Holders of an EA are required to submit a PRCP that meets requirements under the *Environmental Protection Act 1994 (EP Act)*. Following submission of the transitional PRCP, COL has received a notice that the PRCP was not properly made, that, among other items, required an update to the water balance assessment completed for COL for specific pits.

This report presents the findings of the updated water balance assessment completed for COL – specifically for Kerale Dam. The reporting is aligned to the DETSI *Progressive rehabilitation and closure plan (PRC plans) Guideline (version 3.01)* requirements (referred to as the 'PRCP Guideline'), dated 16 September 2024.

This report is a deliverable for the technical studies for Kerale Dam closure planning. Its content is based on the final iteration of the closure state landform (col_landform_260402_p1_sw.dxf landform shape) (Glencore, 2026). As supporting information changes over time, the relevance and validity of this report's content should be confirmed with relevant WSP or Glencore personnel before use.

2 Scope and objectives

The objective of this assessment is to estimate the risks associated with COL in its closure state, specifically Kerale Dam, which is based on the final closure state topography (hereafter referred to as final closure state landform¹) (Glencore, 2026). The assessment also considers various probability rainfall predictions that account for climate change scenarios (CCS).

This assessment will be used to understand the possible hydrological closure risks posed by the defined closure state landform. From a PRCP perspective, this includes assessing the potential of overtopping into surface water catchments and interaction with groundwater.

¹ In this report, the closure state landform refers to the entire integrated rehabilitated surface landform within the mining lease area, including the Kerale Dam.

3 Concept and modelling approach

WBMs track how the volume of water in a water storage changes with time in response to water inflows and outflows. Three general conceptual WBMs for the long-term behaviour of water in the storages are:

- Concept 1 (Figure 3.1): The groundwater level is above the lake level. This would cause an inflow from groundwater into the dam (resulting in the dam acting as a sink).
- Concept 2 (Figure 3.2): The groundwater and lake levels are very similar. This could possibly permit throughflow to occur from groundwater into the dam and back into the groundwater (sink or source).
- Concept 3 (Figure 3.3): The groundwater level is below the lake level. This would cause an outflow (seepage) from the water inside the dam to the groundwater (resulting in the dam acting as a source).

In Concepts 1, 2, and 3, the following interactions (in addition to groundwater interaction) are possible:

- Inflows to the dam:
 - Rainfall (direct)
 - Surface water runoff (including diversions, catchment, etc.).
- Outflows from the dam:
 - Evaporation.

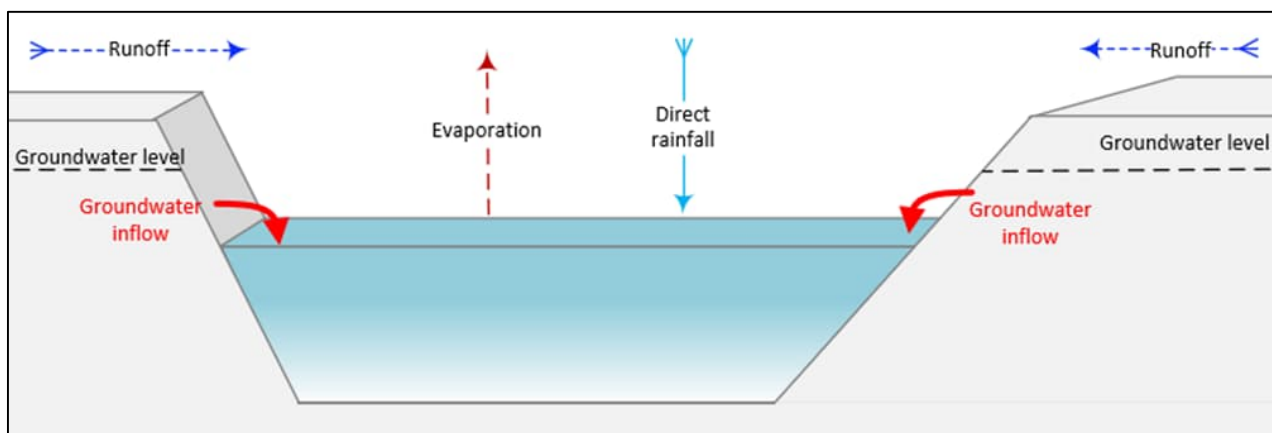


Figure 3.1 Water balance model concept 1: Groundwater levels above lake level (sink)

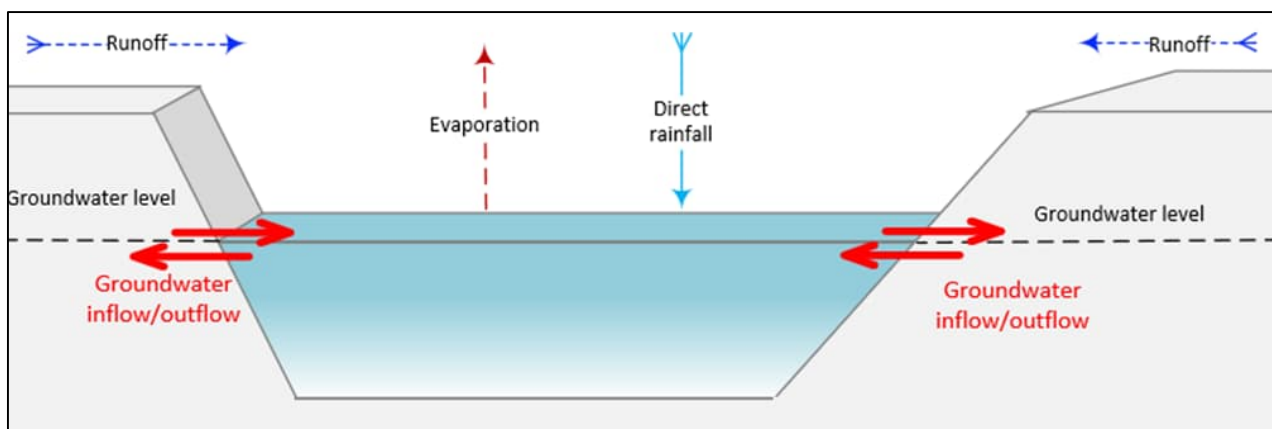


Figure 3.2 Water balance model concept 2: Groundwater levels are equal to lake level (source or sink)

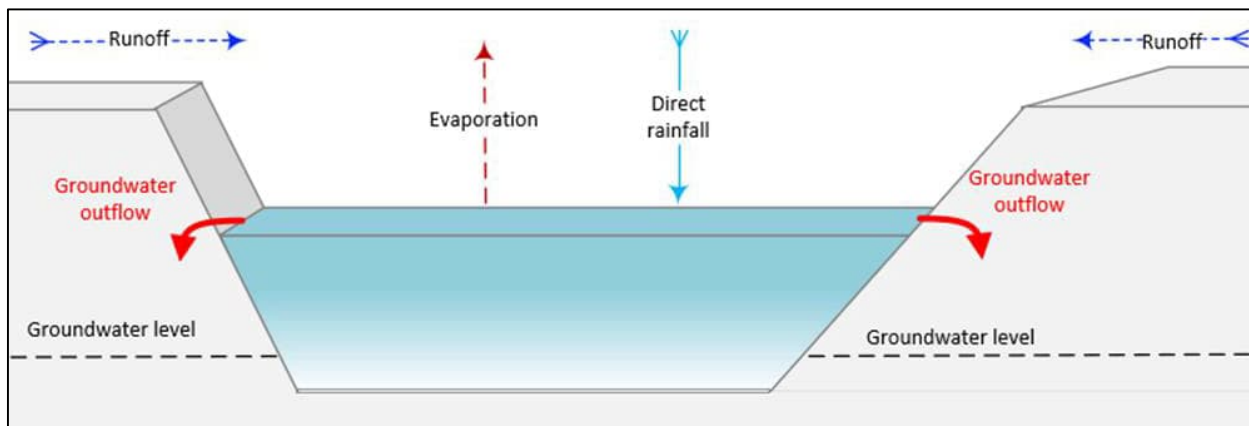


Figure 3.3 Water balance model concept 3: Groundwater levels are below lake level (source)

The WBM approach estimates the change in water volume in the Kerale Dam over the modelled period by adding possible inflows and calculating possible outflows at each time step of the modelled period.

Using *GoldSim* software, WSP developed a WBM for the COL Kerale Dam. The model applies a daily time step over the period from 2038 to 2259 (222 years), based on the mine's closure state condition. No operational processes were considered active for the modelled period, and the closure state landform was considered as an input for the model.

To enable a reasonable representation of future climate conditions, the climate change information obtained from Queensland Future Climate Portal (Queensland Government, 2023) was used to run the different climate change scenarios. This climate change data contains the projections of different climate models under two Representative Concentration Pathways (RCPs)².

For this study's purposes, a single climate change projection for three different pivotal³ years (2030, 2050 and 2070) have been applied within the WBM. This projection was selected to represent the changes caused by climate change over the years and is presented in Section 5.

² RCPs are concentration pathways used in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). They are prescribed pathways for greenhouse gas and aerosol concentrations, together with land use change, that are consistent with a set of broad climate outcomes used by the climate modelling community.

³ Pivotal years represent the future average climate of a decade centred around the pivotal year (CSIRO, 2022).

4 Data review

4.1 Legislation and guidance

The Queensland Government legislation and guidance documents relevant to the water balance assessment include:

- The *EP Act* (State of Queensland, 2023).
- The DETSI Guideline: *Progressive rehabilitation and closure plan (PRC plans) Guideline (version 3.01)* dated 16 September 2024.

4.2 Glencore guidance documents and data reviewed

The following surface water data and models were reviewed:

- Australian Water Balance Model (AWBM) parameters, as extracted from the previous WBM (Glencore, 2024).

The following surface water data were used for this assessment:

- Closure state landform design - PRCP landform surface: from col_landform_260402_p1_sw.dxf (Glencore, 2026).
- Closure year for the dam as informed by Glencore.

The groundwater fluxes into the Kerale Dam provided by Klohn Crippen Berger Australia Pty Ltd (KCB) as per email received in April 2026 (KCB, 2026).

4.3 Climate and surface water

Data from COL (coordinates -20.55, 147.75) for rainfall and evaporation was downloaded from SILO (Queensland Government, 2026).

As presented in Figure 4.1, the monthly mean evaporation exceeds the monthly mean precipitation every month. However, there are a large number of events where rainfall is considerably higher than the average daily evaporation, considering the data available from 1889 to 2025 (Queensland Government, 2026). Therefore, the difference between rainfall and evaporation for these high rainfall days could increase volume in the dam due to generating surface runoff (see Section 5.2).

Whilst the dam lake experiences daily evaporation, the surface area is smaller than the total catchment area of the dam. Therefore, rainfall/runoff needs to be assessed with evaporation to understand long-term trends.

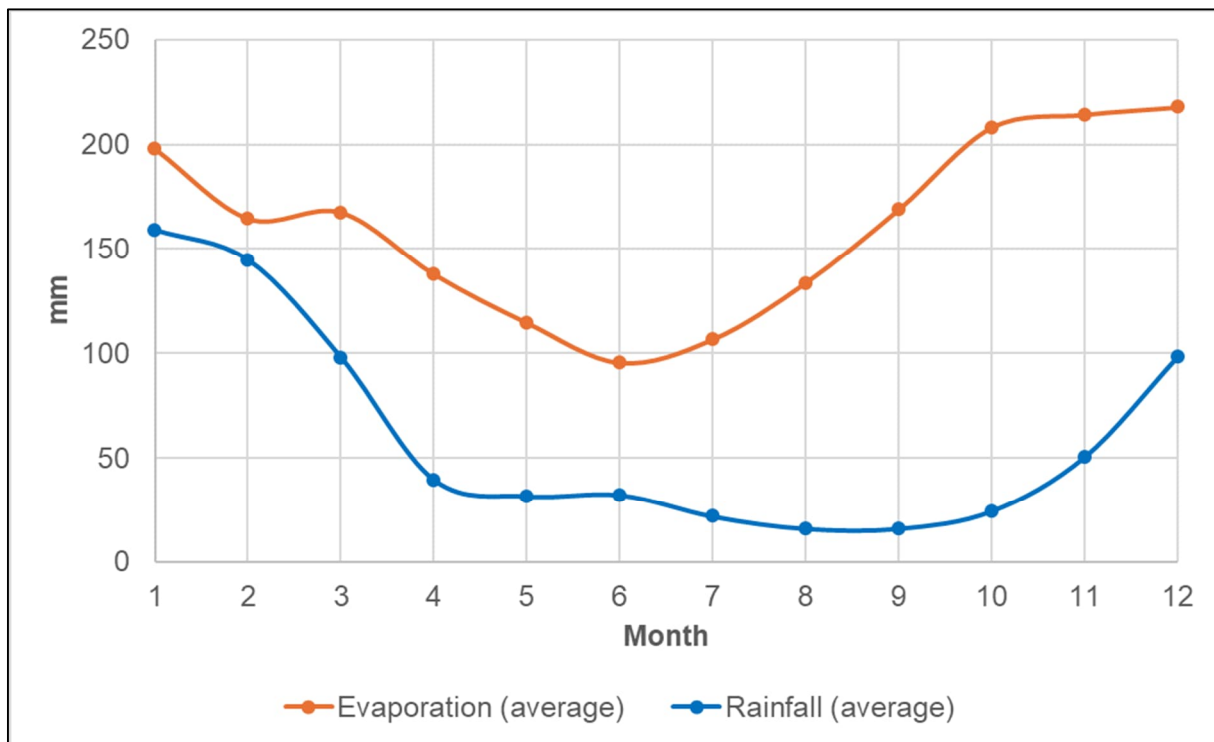


Figure 4.1 COL mean monthly evaporation relative to rainfall (from 1889 to 2025) (Queensland Government, 2026)

5 Water balance model

This section presents the inputs, assumptions and climate change considerations that have been included in the *GoldSim* WBM developed for this assessment. The results from the WBM simulation, including representation of climate scenarios, are also included in this section.

5.1 Closure state landform design

The final closure state landform for Kerale area (Glencore, 2026) was used to generate contour lines and calculate the drainage network of the area to delineate the catchment areas for the dam. It is acknowledged that this final closure state landform may not be realised for years (or decades). However, the WBM simulation has been run for a period from 2038 to 2259 using the available final closure state landform to estimate the water balance behaviour within the dam for the purposes of PRCP development.

The catchment subdivision that drains to Kerale Dam was estimated by analysing a slope map, generated using the software QGIS. This slope map recognises zones with relatively flat slopes and zones with downward slopes. When comparing the projected closure state landform and the current topography of the area, the area was identified as remaining undisturbed through the mine life. The delineation of the catchment area is presented in Figure 5.1 and Table 5.1.

The spill elevation for Kerale Dam was obtained from the supplied analysis of the final closure state landform and is presented in Table 5.2.

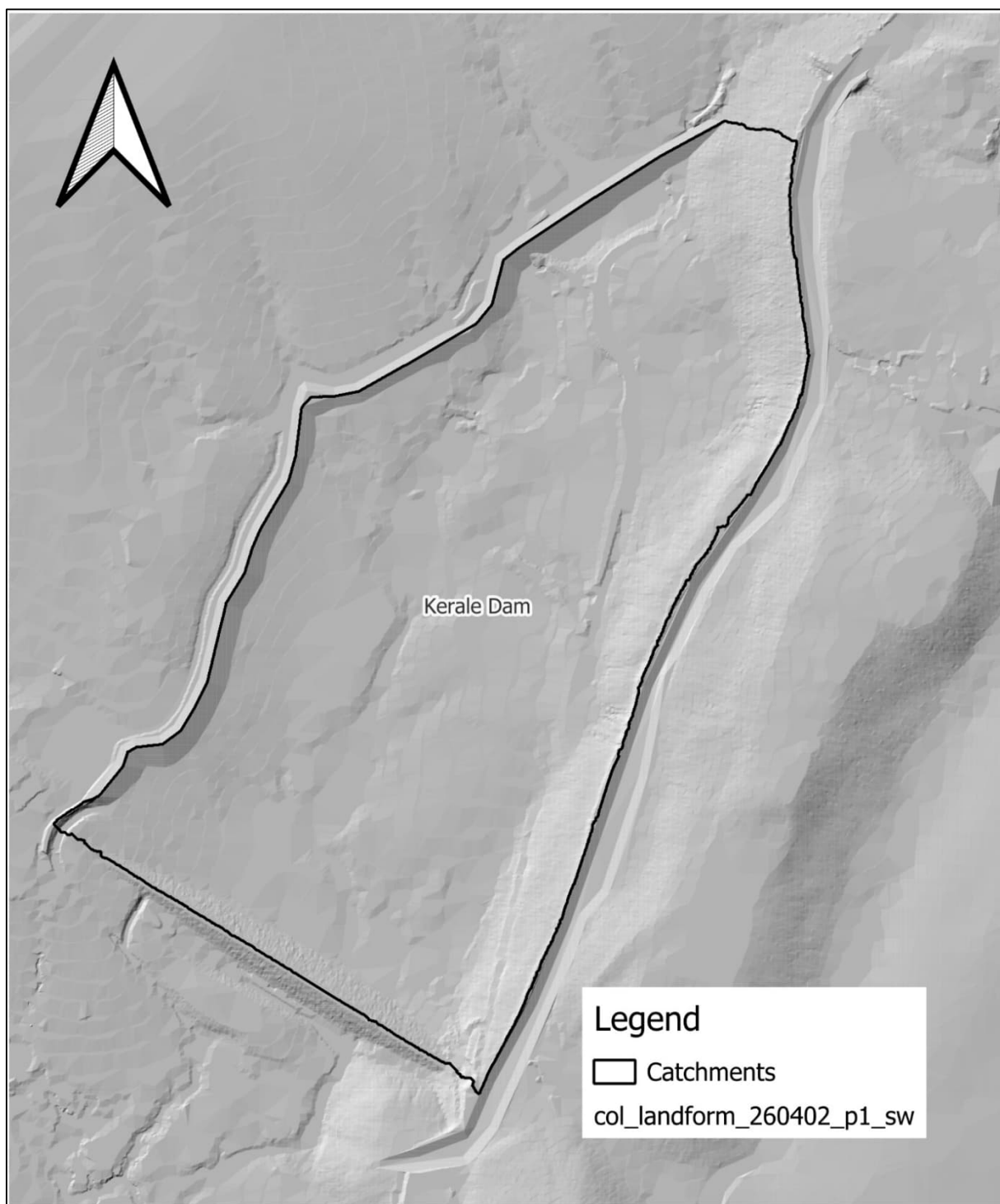


Figure 5.1 Catchment draining to Keral Dam applied to the water balance model

Table 5.1 Catchment area draining to Keral Dam applied to the WBM

Storage	Total (ha)
Keral Dam	64

Table 5.2 Modelled spill elevation for Kerale Dam

Storage	Spill elevation (m AHD)
Kerale Dam	141.5

Stage-storage relationships were derived from the closure state landform (Glencore, 2026) to obtain the relationship between lake elevation and volume/surface of the lake (Figure 5.2). The stage storages were used in the WBM to estimate the lake surface area and elevation from the lake volume for each time step.

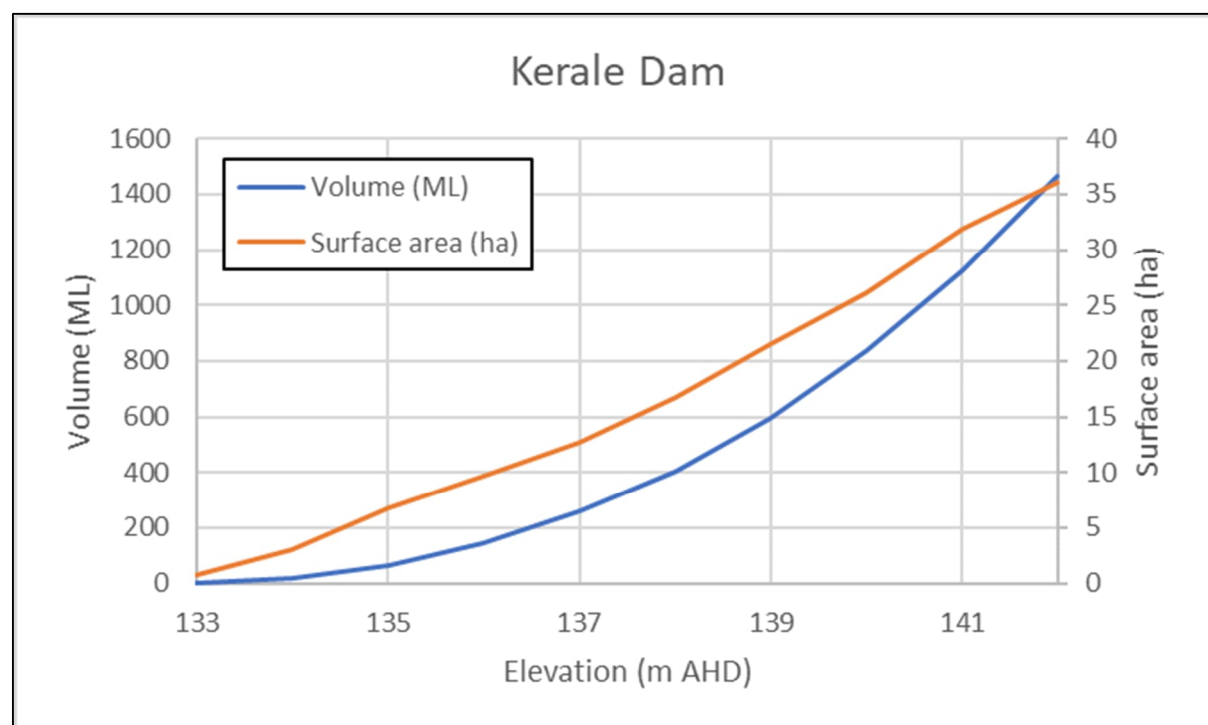


Figure 5.2 Kerale Dam stage-storage relationship

5.2 Surface runoff

As presented in Section 4.3, the volume of surface water runoff resulting from rainfall is calculated using the AWBM. The AWBM parameters applied in the dam catchment area were sourced from the file titled 'QC1001_008_MOD_001_V1.1-COL WBM' (Glencore, 2024)

The AWBM is a catchment WBM that relates daily rainfall and evapotranspiration to runoff and calculates losses from rainfall for flood hydrograph modelling. The model contains the following five storages:

- Three surface storages to simulate partial areas of runoff.
- One baseflow storage.
- One surface runoff routing storage.

The three surface storages have differing capacities (small, medium, and large) for each catchment area, as shown in Figure 5.3 and presented in Table 5.3. Each capacity is added together with fractional areas for weights, which are summarised in Table 5.4.

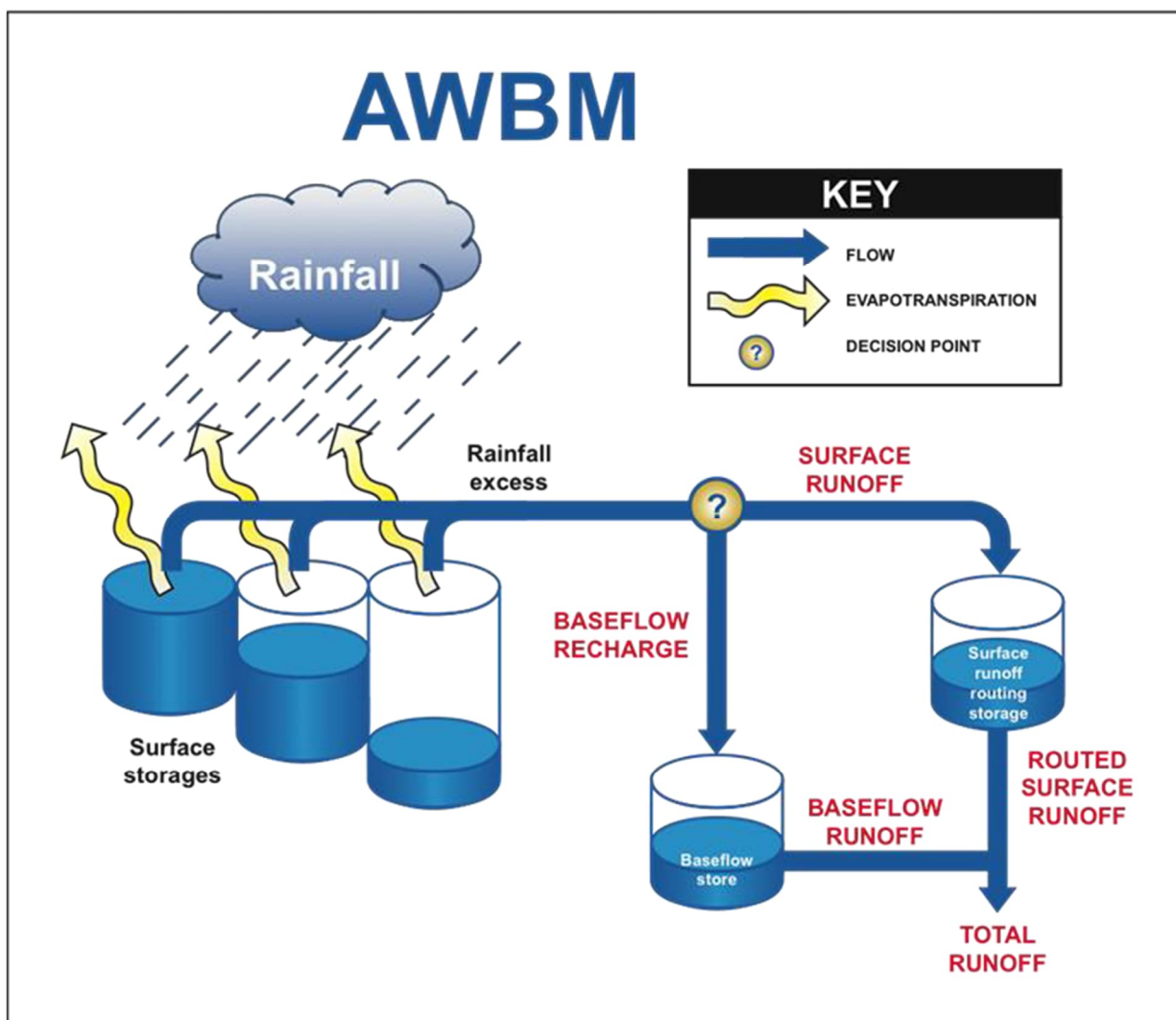


Figure 5.3 Structure of AWBM rainfall-runoff model, including small, medium, and large surface storages

Table 5.3 Surface storage capacities applied to the WBM for COL (Glencore, 2024)

Land use	Storage capacity (mm)		
	Small	Medium	Large
Kerale Dam catchment	16	75	260

Table 5.4 Surface storage proportions applied to the WBM for COL (Glencore, 2024)

Land use	Small	Medium	Large
Kerale Dam catchment	0.07	0.61	0.32

Table 5.5 presents the remaining AWBM parameters (baseflow index, channel coefficient, and baseflow coefficient).

Table 5.5 Baseflow and channel parameters applied to the WBM for COL (Glencore, 2024)

Land use	Baseflow index	Channel coefficient (1/day)	Baseflow coefficient
Kerale Dam catchment	0.055	0.9	0.12

5.3 Groundwater flows

KCB developed a numerical groundwater model that produced a time series indicating groundwater flow rates into the Kerale Dam post-closure. The groundwater flow data provided by KCB (KCB, 2026) was used for this assessment and is presented in Figure 5.4.

The numerical groundwater model data output provided was applied in the WBM climate scenario simulations for Kerale Dam. Groundwater flows remain constant after 2180, which may influence predicted water levels.

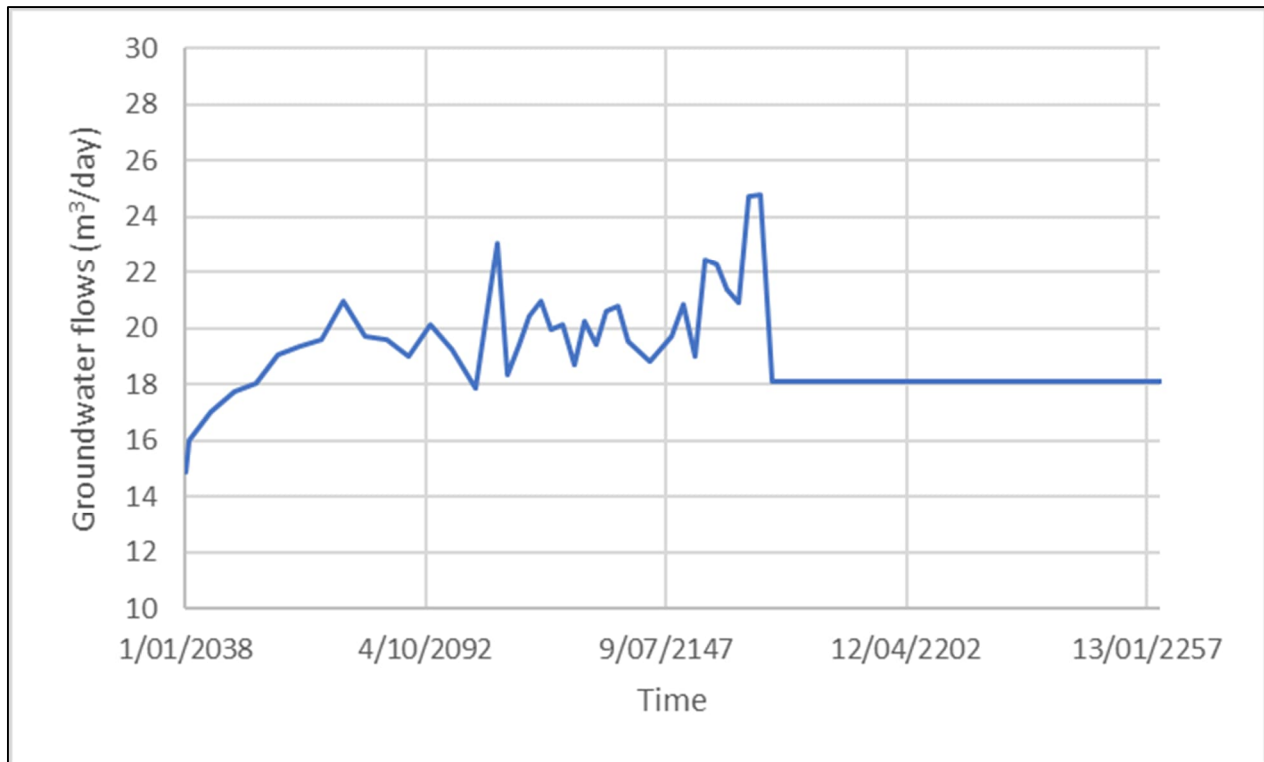


Figure 5.4 Groundwater flow for Kerale Dam WBM (KCB, 2026)

5.4 Assumptions

The following assumptions were incorporated into the WBM:

- Closure date assumed to be 2038 for Kerale Dam.
- Kerale Dam's water volume at closure was assumed to begin at zero, implying that it is considered empty at the start of the simulation.
- Spill level for Kerale Dam was interpreted from the supplied analysis of the final closure state landform (Glencore, 2026).
- Surface water runoff does not include effects of high-intensity and short-duration events, and instead considers flows as daily average flows, suitable to understand long-term trends in inventory.
- Pumping or transfers to/from the assessed structure were considered inactive and/or decommissioned and therefore not included in the WBM.
- Groundwater flows reflect the behaviour of Kerale Dam.
- Spoil storage was excluded from the assessment as it is accounted for in the groundwater model, and consequently, its influence is captured in the groundwater flow inputs to the WBM. This may reflect in groundwater fluctuations early in the simulation that commonly occur during model alignment.

5.5 Climate change considerations

Climate change has been incorporated into the WBM through adjusted rainfall and evaporation inputs, consistent with the guidance provided in Australian Rainfall and Runoff (ARR) 2019 (Ball J et al, 2019) Book 1, Chapter 6. ARR 2019 notes that, unlike event-based design flood estimation, there is currently no fully developed or standardised method for applying climate change to continuous (daily) rainfall models. ARR 2019, therefore, recommends that climate-change adjustments be tailored to the site and modelling objectives.

In accordance with the ARR 2019 guidance, a customised approach was adopted using climate projections derived from the Queensland Future Climate Portal (Queensland Government, 2023), based on historical SILO data and climate scenarios aligned with IPCC AR5. While ARR 2019 includes discussion of Shared Socioeconomic Pathways (SSPs), it does not mandate their exclusive use for continuous simulation, and RCP-based projections remain acceptable and widely applied for long-term hydrologic modelling where internally consistent rainfall and evaporation adjustments are required.

The adopted methodology uses RCP 4.5 and RCP 8.5 projections across multiple climate models, global warming sensitivities, and pivotal years (2030, 2050 and 2070) to capture a broad range of plausible future climates. Rainfall was modelled stochastically using Monte Carlo simulation, reflecting its highly variable and event-driven nature and its dominance as the primary source of uncertainty in the WBM, consistent with ARR's uncertainty-based modelling principles.

Evaporation, which responds more gradually to temperature change, was adjusted using monthly percentage changes relative to historical conditions, as recommended in ARR 2019, rather than being treated stochastically. This approach represents climate-change impacts in a manner that is fit-for-purpose, and consistent with current national guidance, while appropriately addressing uncertainty within a long-term continuous rainfall WBM framework.

5.5.1 Climate change scenarios

To enable a reasonable representation of future climate conditions, three synthetic climate projections were considered for this WBM, as follows:

- RCP: Projections of greenhouse gas concentrations adopted by the IPCC – RCP 4.5 and RCP 8.5.

- Climate Warming Sensitivity (CWS): Estimates the sensitivity of the global temperature in response to carbon dioxide concentrations and are grouped in three ranges: Low (L), Medium (M) and High (H). All three ranges were considered.
- Global Climate Models (GCMs) grouped into four Representative Future Climate (RFC) categories according to the global warming sensitivity and East Indian x West Pacific Ocean temperatures responses. The four RFC categories considered for this analysis were:
 - High, East Indian Ocean (HI).
 - High, West Pacific Ocean (HP).
 - Low, East Indian Ocean (WI).
 - Low, West Pacific Ocean (WP).

Rainfall and evaporation time series data for the combination of the different climate projections were obtained from the Queensland Future Climate Portal (Queensland Government, 2023) for three pivotal projection years (2030, 2050, and 2070), as well as the historical data from 1960 to 2023. The pivotal projection years were selected to project climate variation for the WBM simulation period.

The pivotal years represent the future average climate of a decade centred on the pivotal year; for example, the pivotal year of 2030 projects the climate from 2020 to 2039 (CSIRO, 2022). Three different pivotal years are available at the time of the assessment: 2030 (projections from 2020 to 2039), 2050 (projections from 2040 to 2059) and 2070 (projections from 2060 to 2079). As the data does not extend past the 2070 pivotal year, for the years from 2080 to 2259, the projections from the pivotal year 2070 were applied. For this assessment, all three pivotal years were considered.

The data presents the expected change in rainfall and evaporation based on the historical baseline period between 1960 and 2023. In total, combining the three different climate change considerations (RCP, GCM, and CWS), 24 scenarios for each pivotal year were assessed (a total of 72 scenarios).

To simplify the WBM analytical processes, a single representative climate scenario for each pivotal year was identified. To select the representative scenario for each pivotal year, a data-driven, automated approach was used. Annual net rainfall time series from the 24 scenarios were analysed using unsupervised machine-learning to identify the centroid of the time series. The scenario closest to the cluster centroid was identified, and the final representative scenario was selected. For consistency across the long-term simulation, the same representative scenario was applied to all pivotal years. RCP4.5_M_HI5 was identified as the most representative of the 24 scenarios considering all pivotal years. Figure 5.5 to Figure 5.7 present the climate scenario representative of the approximate middle point of the 24 available scenarios for each pivotal year.

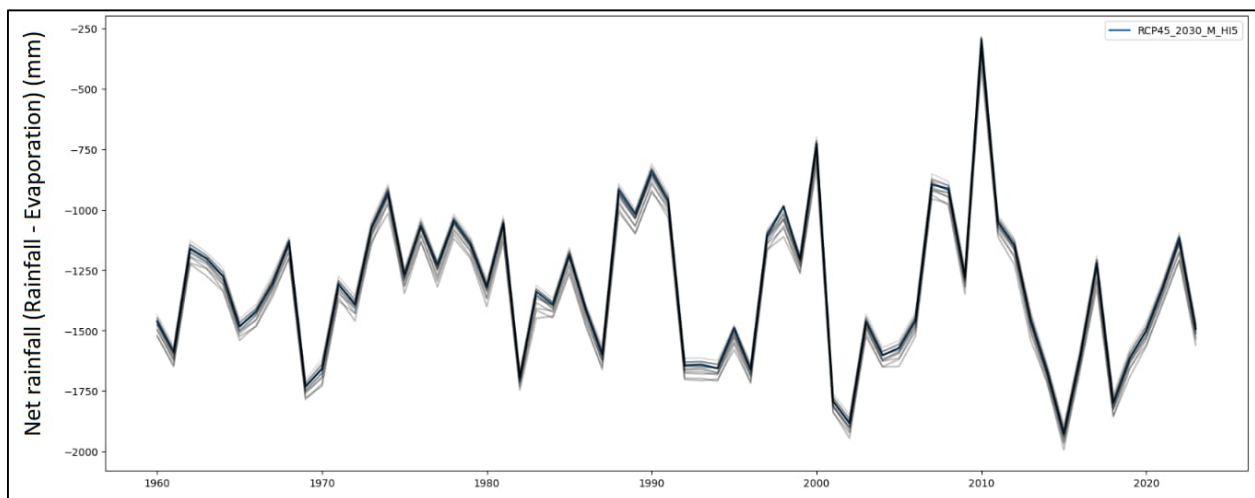


Figure 5.5 Identification of representative model for pivotal year 2030 for application to the COL WBM

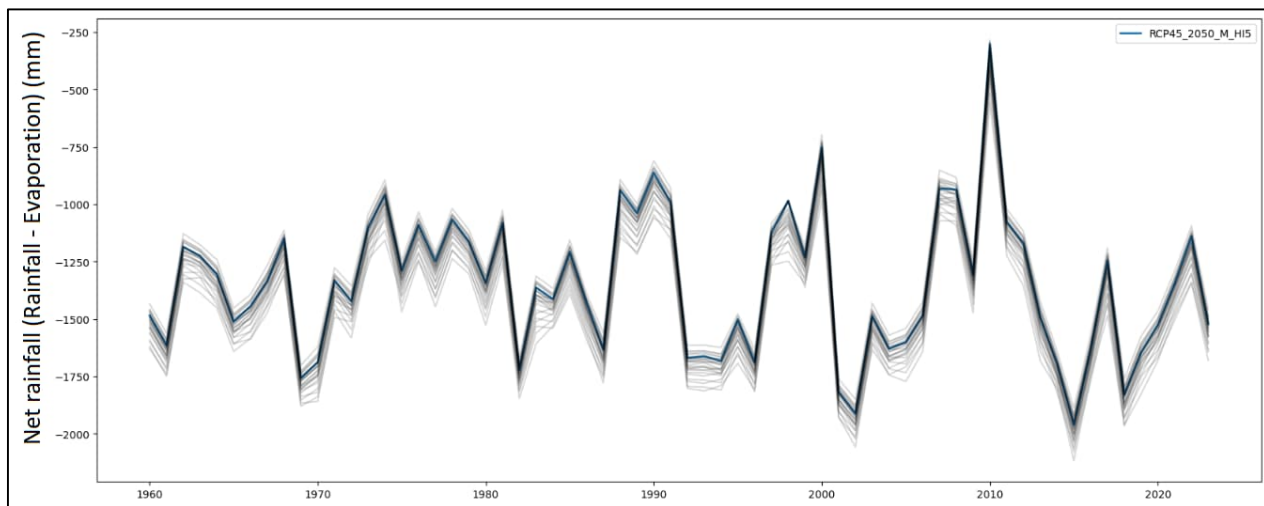


Figure 5.6 Identification of representative model for pivotal year 2050 for application to the COL WBM

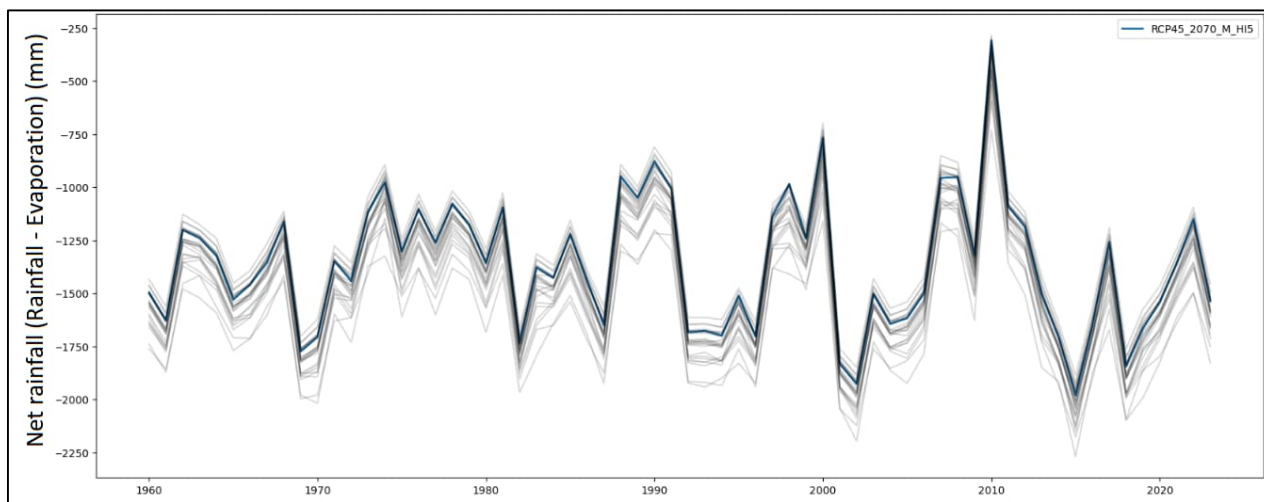


Figure 5.7 Identification of representative model for pivotal year 2070 for application to the COL WBM

5.5.2 Daily rainfall

The rainfall data from the three available pivotal year projections that were considered in the assessment for the simulation period are shown in Table 5.6.

Table 5.6 Rainfall data used for each simulated period in the COL WBM

Scenario	Start date	End date	Period duration (years)
RCP4.5_2030_M_HI5	01-01-2038	31-12-2039	2
RCP4.5_2050_M_HI5	01-01-2040	31-12-2059	20
RCP4.5_2070_M_HI5	01-01-2060	31-12-2079	20
	01-01-2080	31-12-2259	180

The annual mean rainfall for the identified representative climate scenario for each pivotal year identifies an expected decrease in rainfall for this specific location, considering the effects of climate change (Table 5.7).

Table 5.7 Annual rainfall (mm) for SILO and CCS data

Annual	SILO 1960-2023	2030 (2038-2039)	2050 (2040-2059)	2070 (2060-2259)
Average	644	641	638	637

Where model inputs and parameters have a level of inherent uncertainty, the related model results will also reflect a level of uncertainty. GoldSim accounts for these uncertainties by using probabilistic Monte Carlo simulation. Each simulation (realisation) represents a possible outcome based on a single set of input parameter estimates, with the associated results for all realisations. For each realisation, the overall system water balance is quantified. Accumulating the results for all realisations provides an indication of the range of model outcomes that could be expected and an indication of the level of reliability (or probability of exceedance) associated with a model output estimate. The major source of uncertainty within the WBM for the closure state of the dam relates to future rainfall changes as a result of climate change.

The Stochastic Climate Library (SCL) (eWater, n.d.) provides a library of stochastic models for generating climate data, including rainfall at multiple timescales, across single or multiple sites. Climate data generated from stochastic models provides multiple climate sequences representative of site rainfall to quantify uncertainty in environmental systems associated with climate variability. The SCL was accessed to generate 100 realisations of the daily rainfall (utilising CCS time series data) through the Transition Probability Matrix approach (Srikanthan & McMahon, 2000).

For the WBM simulations, probabilistically generated estimates of daily rainfall have been applied using the 100 realisations of stochastic rainfall for forecast modelling, from 2038 (expected closure year for Keral Dam) through to 2259 (the end of the simulation period). Figure 5.8 presents the daily maximum rainfall considered in the WBM simulations.

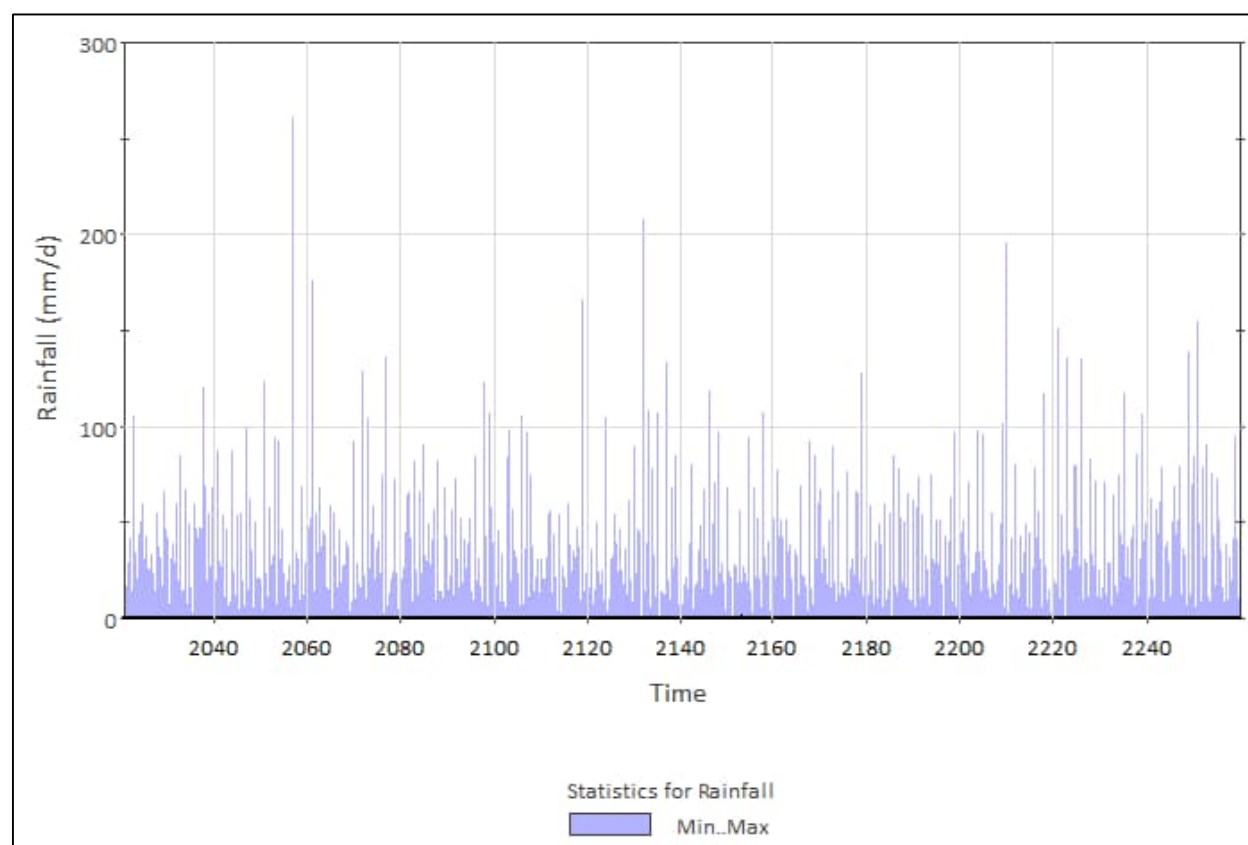


Figure 5.8 Daily maximum rainfall presented in the WBM

In this way, the WBM allows estimates of the water elevation accounting for a level of uncertainty associated with the input rainfall.

5.5.3 Percentage increase in evaporation

The evaporation inputs for the WBM were considered as the percentage change of average monthly evaporation between the CCS time series data and the historical data from 1960 to 2023. The percentage change (increase) of evaporation obtained for each pivotal year is presented in Table 5.8. The percentage increase to evaporation is applied to the historical data to generate evaporation inputs to the WBM to account for climate change.

Table 5.8 Percentage change of average monthly evaporation for each pivotal year

Month	Average daily evaporation (1960-2023) (mm/d)	2030	2050	2070
January	6.39	3.7%	7.3%	13.0%
February	5.84	5.0%	10.0%	17.8%
March	5.43	3.8%	7.6%	11.8%
April	4.69	3.6%	7.1%	10.0%
May	3.76	4.1%	8.3%	11.2%
June	3.19	3.1%	6.2%	8.9%
July	3.46	2.2%	3.5%	5.9%
August	4.37	2.3%	4.4%	5.9%
September	5.71	1.9%	3.9%	5.4%
October	6.70	1.9%	4.0%	4.7%
November	7.17	2.3%	4.5%	6.3%
December	7.07	3.4%	6.7%	11.1%

As presented in Table 5.7 and Table 5.8, on average the expected effects on climate change consist of a reduction in rainfall and an increase in evaporation.

5.6 Water balance modelling results

After the rainfall and evaporation data are input in the model, the WBM simulation generates a probability distribution of possible lake levels and volumes for a 222-year simulation period generating 100 sets of unique results. The results for all realisations are assessed to provide probabilistic results for the applied climate scenario.

The results present the following statistics for the simulation period:

- Minimum: Lowest value out of the entire dataset.
- 50th percentile: 50% likelihood of values being greater or less.
- Maximum: Highest value out of the entire dataset.

5.6.1 Kerale dam

After the year 2180, the mean water levels start to stabilise, reaching a mean water elevation of 134 m AHD (Figure 5.9) and a mean water volume of 47 ML (Figure 5.10) (considering all realisations). This is approximately 8 m below the interpreted spill level (141.5 m AHD), with an average available storage capacity of 1,447 ML before reaching the interpreted spill level.

Calculated for the final 20 years of the simulation (2240 and 2259), the mean annual inflow to Keralé Dam is 62 ML/year, similar to the mean annual outflow of 63 ML/year (Figure 5.11). This indicates that the inflows and outflows reach equilibrium by the end of the simulation period.

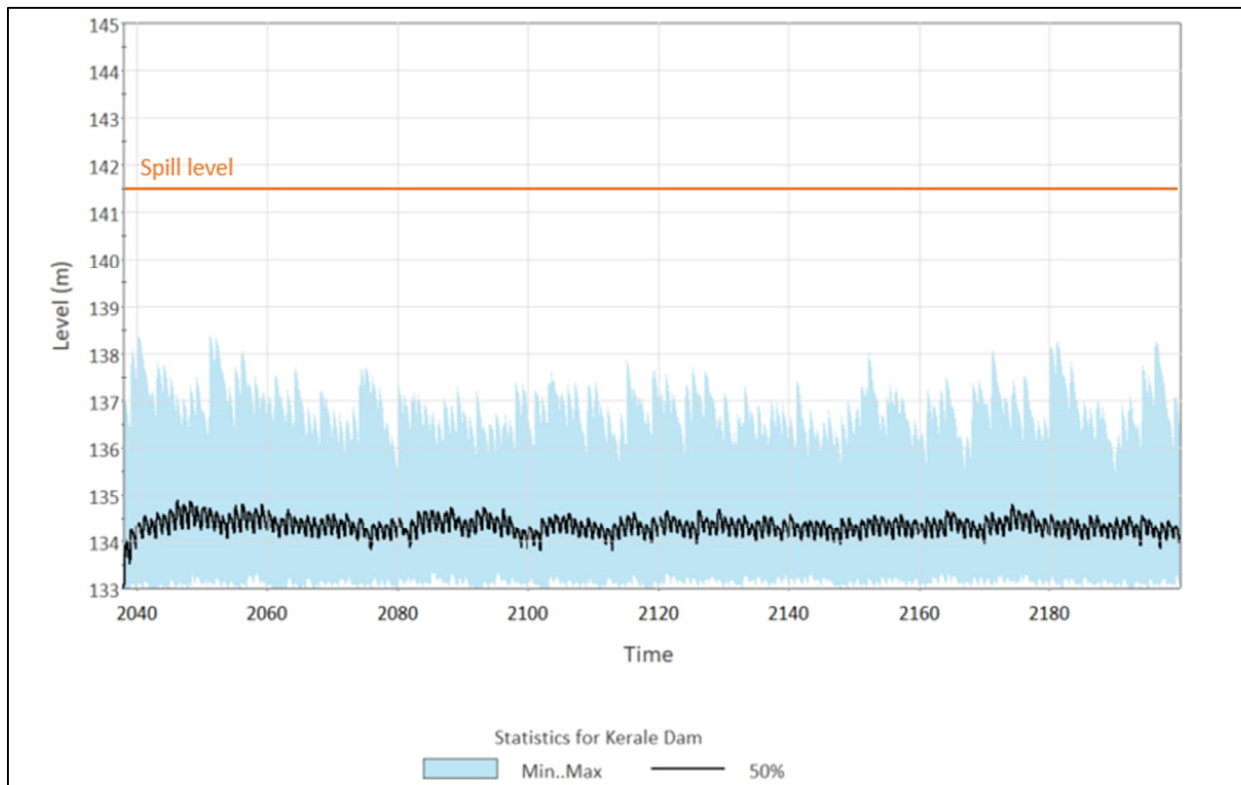


Figure 5.9 Modelled water level and interpreted spill level for the Keralé Dam

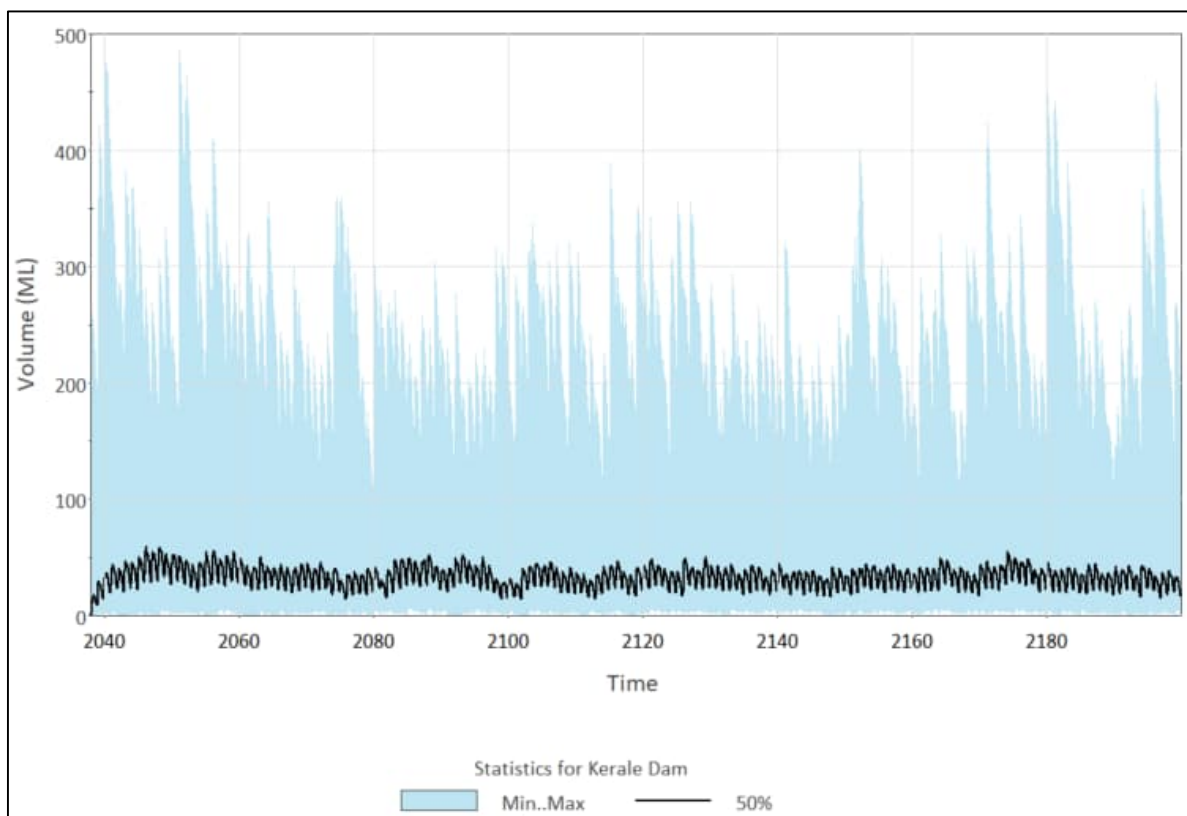


Figure 5.10 Modelled water volumes for the Keral Dam

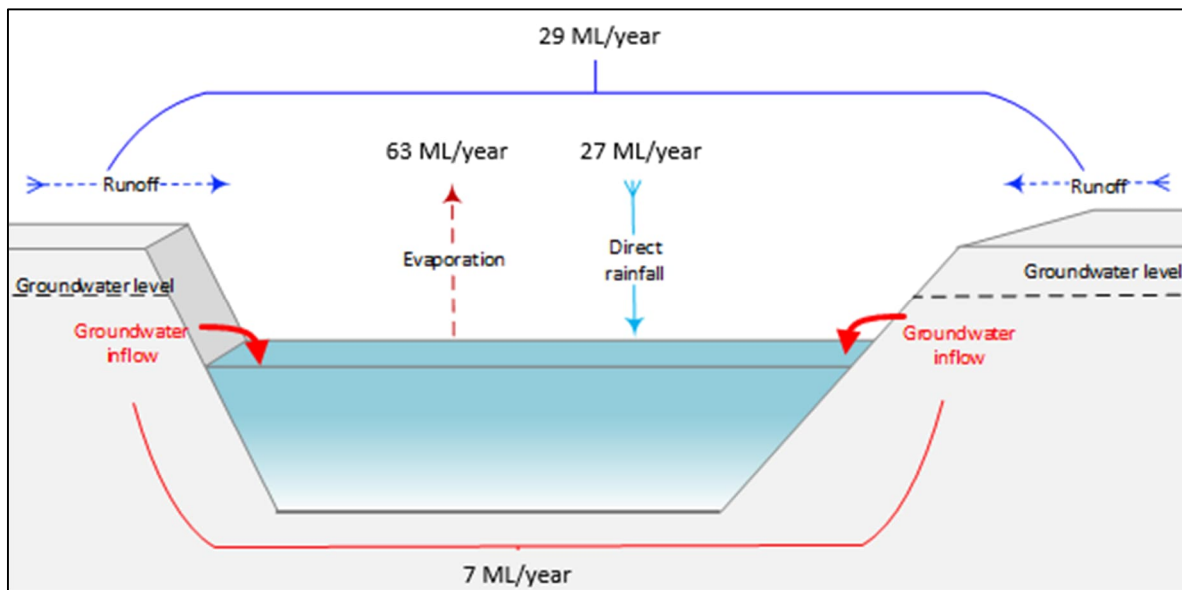


Figure 5.11 Schematic of average inflows/outflows simulated for period from 2240 to 2259 – Keral Dam



6 Conclusions

For Kerale Dam, the results indicate that the difference between mean inflows and mean outflows reduces, and equilibrium is reached at around the year 2180 (about 142 years post-closure).

Based on the water balance model assessment outcomes applying the representative climate change scenario (RCP4.5_M_HI5), the Kerale Dam mean and maximum lake level are likely to remain below the spillway invert level.

7 Limitations

The WBM and assessment relied on inputs provided by several studies and third-party inputs; the accuracy of these studies and inputs has not been verified. Key assumptions relied upon are presented in Section 5.4. The modelling undertaken has the following limitations:

- The WBM does not currently factor in long-term evolution of the closure state landforms, such as erosion and sedimentation. This may be an aspect that is considered in future WBM iterations.
- The WBM does not model extreme rainfall events outside of the daily climate sequences modelled.

Your attention is also drawn to the document titled – “Limitations Statement”, which is included in section 9 of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The limitations statement does not alter the obligations WSP has under the contract between it and its client.

8 Future work

Future works to improve the representation of the interaction between Keralé Dam and groundwater in the long-term and long-term closure behaviour are as follows:

- As the site moves closer to closure and further data becomes available, a review of the WBM simulation and outputs should be considered to confirm the equilibrium state for the water levels in the dam.
- Confirmation of any fluctuations in groundwater inflow/outflows based on the application of the equilibrated, modelled Keralé Dam lake levels to the numerical groundwater model should be undertaken, including further iterations.

9 Limitations statement

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References

- Ball J et al. (2019). *Australian Rainfall and Runoff: A Guide to Flood Estimation*, Commonwealth of Australia.
- CSIRO. (2022). *Climate Change in Australia*. Retrieved from CSIRO: <http://www.csiro.au/en/research/environmental-impacts/climate-change/climate-change-information>.
- eWater. (n.d.). *Stochastic Climate Library*. Retrieved from <https://ewater.org.au/products/ewater-toolkit/tools>
- Glencore. (2024). *GoldSim WBM: QC1001_008_MOD_001_V1.1-COL WBM*.
- Glencore. (2026). PRCP final landform for closure: col_landform_260402_p1_sw.dxf, received on 07 April 2026 from David Curwen.
- KCB. (2026). *Email containing groundwater flows titled "Re: Latest Kerale Dam GW Inflows", sent by Brent Usher on 08 Apr 2026*.
- Queensland Government. (2023). *Biophysical Modelling (CCS): The State of Queensland*.
- Queensland Government. (2026, 04 13). *SILO Australian climate data from 1889 to 2025 for coordinates -20.55, 147.75*. Retrieved from Queensland Government website: <https://www.longpaddock.qld.gov.au/silo/>
- Srikanthan, R., & McMahon, T. (2000). *Stochastic Generation of Climate Data, Report 00/16*. Cooperative Research Centre for Catchment Hydrology.
- State of Queensland. (2023, June 2). *Environmental Protection Act 1994*. Retrieved from <https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1994-062>

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