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GROUNDWATER IMPACT ASSESSMENT

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EXECUTIVE SUMMARY

Project Description

Bowen Basin Coal Pty Ltd (Bowen Basin Coal) proposes to extend the existing Lake Vermont Mine by developing the Lake Vermont Meadowbrook Project (the Project), which comprises underground longwall mining and open cut coal mining of the Leichhardt and Vermont coal seams to the immediate north of the existing Lake Vermont Mine. The Lake Vermont Mine and the associated Meadowbrook Project is located approximately 25 km northeast of Dysart and 160 km southwest of Mackay in the Bowen Basin region of central Queensland.

Available Data

A significant body of regional and site-specific geological and groundwater data was available for the groundwater impact assessment, including:

- Published geological mapping;
- Site-specific geological mapping as well as geological surfaces and structural (fault) data from the site geological model
- Climate data from the SILO data drill for the Project area;
- Hydraulic conductivity data from:
  - Slug testing of groundwater monitoring bores at Meadowbrook and Lake Vermont North (adjacent mining area within the same geology as Meadowbrook); and,
  - Packer testing undertaken on seven cored bores within the Meadowbrook underground area.
- Groundwater data from the Meadowbrook groundwater monitoring bore network as well as the monitoring network for the adjacent Lake Vermont North (LVN) site, including:
  - Groundwater level data; and,
  - Groundwater quality data.

Data Assessment and Conceptual Groundwater Model

- Hydraulic conductivity data is available for all groundwater units that occur at site, with data available for 80 discrete intervals. From review of the data it is concluded that:
  - A decrease in permeability with depth is apparent for the coal seams, Permian interburden and Rewan Group sediments;
  - There is a distinct difference between the hydraulic conductivity of the Tertiary sediments for bores in the Meadowbrook area compared to bores in the LVN area, with bores in the Meadowbrook area generally recording a higher hydraulic conductivity. This is consistent with the general lithology in each area, as has been observed from drilling of geological and groundwater monitoring bores, that the Tertiary at Meadowbrook is distinctly sandier than the Tertiary at LVN
- Groundwater recharge is summarised as:
  - Recharge to the Quaternary alluvium occurs from direct rainfall as well as stream flow events. The occurrence of groundwater within the alluvium is seasonal, with downward seepage to underlying Tertiary sediments occurring that results in the Quaternary alluvium being dry for the majority of the year;
  - Recharge to the coal seams is interpreted to occur where the seams subcrop beneath Tertiary sediments. Enhanced recharge to the coal seams may occur where the seams subcrop beneath surface water drainage; this effect has been observed from LVN monitoring bores adjacent to Phillips Creek

- Groundwater occurrence within the Rewan Group and Permian sediments is compartmentalised by faulting, with major faults (such as the Isaac Fault) completely truncating the sediments of the Rewan Group and Rangal Coal Measures so that the underlying Fort Cooper Coal Measures occur beneath Tertiary sediments to the east of the Isaac Fault
- Groundwater quality is generally poor, with the majority of groundwater monitoring bores at the Meadowbrook and LVN sites recording a groundwater EC >10,000 µS/cm and in many cases >20,000 µS/cm. Occurrences of lower EC groundwater (i.e. <4,000 µS/cm) are associated with groundwater recharge along features such as Phillips Creek and Boomerang Creek. The water type at the lower EC sites tends to be sodium-bicarbonate water type, rather than the sodium-chloride water type that is observed in higher EC bores, which supports an assessment of groundwater recharge at these sites.
- The groundwater flow direction is generally from west to east, i.e. honouring topography and flowing towards the Isaac River. The groundwater flow direction within the coal seams will be generally down-dip from the groundwater recharge areas where the seams subcrop. The presence of major faults that completely truncate the coal seams will result in the movement of water within the coal seams towards regions of lower groundwater pressure, which may be laterally along the fault or upward into overlying groundwater units. The groundwater flow regime is therefore complex and is best resolved via groundwater modelling.

Groundwater Modelling

Three-dimensional numerical groundwater modelling has been undertaken for the Meadowbrook Project by SLR Consulting Australia Pty Ltd (SLR) and reported in SLR (2022), with the modelling report included as Attachment A to this report. The modelling was undertaken using the Olive Downs Project model (the foundational model – Hydrosimulations 2018), which has been expanded over time to include the Moorvale South Project, the Winchester South Project and the Caval Ridge Expansion Project. Detailed information on hydrogeological units, hydraulic properties and groundwater levels was available for each of these projects, which has enabled construction of a regional groundwater model that includes the major mining projects in the vicinity of the Meadowbrook and Lake Vermont North (LVN) Projects, thus allowing assessment of cumulative impacts from mining operations. Assessment of cumulative impacts associated with the approved Bowen Gas Project was undertaken as a sensitivity analysis for the Olive Downs Project numerical groundwater model (HydroSimulations, 2018). The Bowen Gas Project targets coal seams within the Rangal Coal Measures and Moranbah Coal Measures. As the Meadowbrook model uses the same groundwater model as the Olive Downs Project, results from the Olive Downs Project sensitivity analysis are equally applicable to the Meadowbrook model. Results of the assessment were presented in HydroSimulations (2018) and indicate that the assessment of cumulative impacts in the model is sensitive to the inclusion of the Bowen Gas Project, with cumulative drawdown extents in the Rangal Coal Measures extending significantly to the east across the model domain with the inclusion CSG extraction. Cumulative drawdown extents from the Bowen Gas Project were considered conservative and were predicted to be greater than the impacts produced by the Olive Downs Project alone (HydroSimulations, 2018).

The model was updated for the Meadowbrook Project to include:

- Enhanced geological detail (groundwater unit occurrence and elevations, faulting) in the area of the Meadowbrook and LVN Projects;
- Inclusion of the Saraji open pit and underground mines to the west of the Meadowbrook Project. It should be noted that no data were available from these operations at the time of reporting, therefore the operations were not included to the same level of detail as for other operations where data sharing agreements were in place. Nevertheless, the updated Meadowbrook model

includes all known mining operations within the model area and therefore allows assessment of the cumulative impacts from all known operations in the area.

Observations from Data Assessment and Predictive Groundwater Modelling

Observations from the assessment of available data and predictive modelling include:

- At end of mining of the Meadowbrook open cut, the mined void will be partially backfilled with spoil to create a "rehabilitated pit landform" that will contain a depression that is approximately 15 m below the natural ground surface. Surface water modelling predicts that water which collects in the depression will result in long-term seepage away from the depression to the surrounding groundwater system at an average flow rate of ~1.8 L/s (57 M/year). The maximum salinity of the water which may occur in the depression is predicted to be ~950 mg/L (EC of ~1,460 µS/cm) compared to a mean background EC of the groundwater system of between ~17,500 µS/cm (Tertiary sediments) to ~30,000 µS/cm (Permian sediments).
- Quaternary Alluvium:
  - Within the groundwater model, the only location where the alluvium is permanently saturated is the Isaac River alluvium (SLR 2022), which is consistent with available data from landowner groundwater bores (Section 4.6).
  - It is assessed that the Quaternary alluvium in Boomerang Creek and Ripstone Creek is likely to be only seasonally saturated, with downward seepage to underlying units resulting in dry alluvium for the majority of the year.
  - At maximum extent of drawdown the model indicates drawdown in the alluvium near the confluence of Boomerang Creek and Ripstone Creek, which corresponds with the limit of drawdown in the Tertiary sediments in this area (i.e., drawdown within the Tertiary sediments is inducing drawdown in the Quaternary alluvium). As noted above, it is interpreted that the presence of groundwater in the Quaternary sediments at this location is seasonal, with the only perennial groundwater in the alluvium occurring along the Isaac River, where drawdown impacts are not predicted.
  - At post-mining equilibrium it is predicted that the groundwater level will have recovered in the alluvium; i.e., the groundwater level will re-establish in areas where groundwater existed pre-mining.
- Tertiary sediments:
  - The end of mining and maximum drawdown extent contours extend west-east along Boomerang Creek, and to the north beneath Ripstone Creek. As it has been observed and interpreted that the alluvium in these ephemeral creeks is likely to be unsaturated for the majority of the year (except where isolated pockets of groundwater may occur in the alluvium following recharge by rainfall or stream flow, which would then seep downwards to the underlying strata), it is concluded that the Tertiary drawdown contours can be used to indicate the zone within which any water that does occur within the alluvium would have an enhanced potential for downward seepage to the underlying Tertiary sediments.
  - At post-mining equilibrium a groundwater mound exists within the Tertiary sediments due to seepage from the final landform pit landform, which increases the groundwater level in the Tertiary sediments by approximately 4 m above pre-mining levels in the area of the final depression.
- Rewan Group sediments:

- The Rewan Group crops out to the west of the Meadowbrook mining area due to the dip of the strata and is terminated by the Isaac Fault to the west of the mining area. Drawdown within the Rewan Group is therefore terminated to the west and east of the Meadowbrook mining area and extends northward to approximately the northern extent of MDL429.
- At post-mining equilibrium the groundwater level has recovered to pre-mining levels, except for the area of the groundwater mound beneath the final rehabilitated pit landform, where the groundwater level is above the pre-mining level due to seepage from the overlying Tertiary aquifer.

- Leichhardt Coal Seam:
  - Mining-induced drawdown at end of mining is greatest in the central area of underground mining and at maximum extent of drawdown is centred on the northern underground panels, with the maximum extent of at the end of mining centred on the underground panels where mining of the Leichhardt Seam occurs.
  - At end of mining the 5 m drawdown contour extends approximately 1.2 km north of the northern underground mining area, extending to approximately 7.5 km at maximum extent of drawdown. Recovery occurs in the central mining areas immediately post-mining, but drawdown extends laterally for some time as water is sourced from lateral areas to fill the central cone of depression.
  - At post-mining equilibrium the water level in the Leichhardt Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated landform pit of the Meadowbrook open cut. The extent of mounding is similar to that observed for the overlying Tertiary and Rewan Group sediments.
- Vermont Coal Seam:
  - The extent of drawdown at end of mining and maximum extent of mining is similar to that observed for the Leichhardt Seam. However, the depth of drawdown is greater for the Vermont Seam due to the greater depth of mining for this unit.
  - At post-mining equilibrium the water level in the Vermont Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated landform pit of the Meadowbrook open cut. The extent of mounding is similar to that observed for the overlying sediments (Leichhardt Seam, Rewan Group and Tertiary.

Potential Groundwater Impacts

Potential groundwater impacts from the Meadowbrook Project are summarised as follows:

- Existing groundwater users – There is one registered Tertiary groundwater bore (RN 132627) within the zone of predicted 2 m water level impact. There are no registered Rewan Group or Permian groundwater bores within the zone of predicted 5 m water level impact. It is recommended that:
  - The owner of bore 132627 be contacted to establish whether a make-good agreement is required for that bore (which may require a baseline bore survey);
  - Undertake a bore census on properties that are within the zone of potential water level impact to verify whether landowner bores exist that are not contained within the DoR Groundwater Database (from which data has already been obtained); and,
  - The risk to existing groundwater users and mitigation measures be re-assessed as required.

- Impacts to Groundwater Quality - Groundwater modelling predicts that a groundwater mound will develop beneath the rehabilitated pit landform due to the seepage of water constrained within the landform depression. The mound is predicted to be approximately 4 m above the pre-mining groundwater level, resulting in radial seepage from the final landform area to the Tertiary sediments. The predicted rate of seepage from the rehabilitated pit landform depression is approximately 1.8 L/s (~57 ML/year), with a maximum predicted salinity of the water which may occur in the depression being approximately 950 mg/L (EC of ~1,460 µS/cm). This compares to the mean EC of the groundwater system of between ~17,800 µS/cm (Tertiary sediments) to ~ 29,500 µS/cm (Permian sediments). On balance, it is assessed that the seepage of water with an EC of ~1,460 µS/cm at a relatively low rate of ~1.8 L/s to a groundwater system that has a background EC of generally >17,000 µS/cm is unlikely to present a significant risk to groundwater.
- Potential impacts to GDEs – the extent of 1 m drawdown extends to include mapped HES wetlands 2, 7, 8, 9 and 10 (Section 6.2.5). HES wetland 9 has been assessed to be surface feature perched on a clay aquitard that will not be influenced by groundwater drawdown related impacts. A conceptual model has been developed for HES wetland 8 which indicates the presence of a perched lens of fresh groundwater lying at depth below the wetland pan. A GDE monitoring plan will be developed to include HES wetland 8 as the impact of groundwater drawdown is uncertain and will require ongoing seasonal monitoring to identify if impact to hydro-ecological function will be incurred. The GDE monitoring program will also be extended to cover HES wetland 2 and 7 which are likely to be surface features though have not been verified with field assessment (3D Environmental 2022). At post-mining equilibrium, groundwater modelling predicts that groundwater levels will recover to an elevation that is above the pre-mining levels in the area of Boomerang Creek and Phillips Creek to the north and south of the Meadowbrook mining area, due to ongoing seepage from the rehabilitated pit landform, as described above.

Groundwater Management and Mitigation Measures

It is intended that a Groundwater Monitoring and Management Plan (GMMP) be developed for the Meadowbrook Project as a combined update of the existing LVN GMP. The GMMP will continue for the life of the Project and be updated as required. The groundwater monitoring program will include commitments for:

- Locations and frequency of groundwater level and quality monitoring, noting that sampling to date has occurred at monthly intervals from the Meadowbrook Project's groundwater monitoring network, but will be changed to quarterly intervals once trigger levels have been developed;
- Groundwater quality parameters to be collected and assessed;
- The replacement of monitoring bores if/as required;
- The procedure for assessment of data via groundwater level and quality trigger levels;
- Mitigation measures for any observed environmental impacts; and,
- Data management and reporting.

1.0 INTRODUCTION

1.1 Project Overview

Bowen Basin Coal Pty Ltd (Bowen Basin Coal) proposes to extend the existing Lake Vermont Mine by developing the Lake Vermont Meadowbrook Project (the Project), which comprises underground longwall mining and open cut coal mining of coal seams to the immediate north of the existing Lake Vermont Mine. The Lake Vermont Mine and the associated Meadowbrook Project is located approximately 30 km northeast of Dysart and 180 km southwest of Mackay in the Bowen Basin region of central Queensland (Figure 1-1).

The key components of the Project include:

- underground longwall mining of the Leichardt Lower Seam and Vermont Lower Seam; the depth and thickness of the coal seams in the Project area means the coal resource can be extracted using underground mining methods;
- an open cut pit to mine the Vermont Seam and Vermont Lower Seam;
- development of a new infrastructure corridor linking the new mining area to existing infrastructure at the Lake Vermont Mine;
- development of a Mine Infrastructure Area (MIA);
- construction of a drift and shafts to provide access to underground operations; and
- development of other supporting infrastructure and associated activities.

The Project involves the extraction and export of up to 7 Mtpa of ROM coal, equivalent to approximately 5.5 Mtpa of metallurgical product coal. The Project addresses the forecast decline in coal output from the Lake Vermont Mine, by maintaining existing (approved [up to 12 Mtpa ROM]) production levels across an extended life of the mine. The anticipated extension to the life of the Lake Vermont Mine is approximately 25 years.

1.2 Purpose and Structure of Report

1.2.1 Report Purpose

This Groundwater Modelling and Impact Assessment has been undertaken to address the Terms of Reference (TOR) for the Project (Queensland Government 2020). The key groundwater-related requirements are outlined in the following sections of the TOR:

- Section 7.3 – Proposed construction and operations (i.e. providing information on the direct and indirect take of groundwater);
- Section 9.4.1 - Groundwater quality
- Section 9.4.2 - Groundwater resources; and
- Appendix 3 – Matters of national significance, which requires discussion of the conceptual and numerical groundwater modelling undertaken for the Project, as well as assessment of the potential impacts of the operation on any third-party users of the groundwater resource (e.g. groundwater dependent ecosystems, landholders, other mining operations etc.).

In summary, the key objectives of the Groundwater Modelling and Impact Assessment are as follows:

- Describe and map in plan and cross-sections the surficial and solid geology and landforms, including catchments, of the project area. Show geological structures, such as aquifers, faults and economic resources that could have an influence on, or be influenced by, the project's activities.
- Identify and describe the environmental values and characteristics of groundwaters (including seasonal variation) within the area potentially affected by the Project (on and off-site) and at suitable reference locations. Define the relevant water quality objectives applicable to the environmental values.

- Describe the quality, quantity and significance of groundwater in areas potentially affected by the Project.
- Describe present and potential users and uses of water in areas potentially affected by the Project, and the 'make good' provisions for water users adversely impacted by the Project.
- Model and describe the inputs, movements, exchanges and outputs of groundwater that may be affected by the Project. Undertake model sensitivity analysis and uncertainty analysis.
- Assess the frequency (and time lags if any), location, volume and direction of interactions between water resources, including surface water/groundwater connectivity and inter-aquifer connectivity, and provide input to conceptual models for groundwater dependent ecosystems.
- Describe the potential impacts (short-term and long-term), including direct, in-direct and cumulative impacts, of the Project on groundwater (and resultant impact to assets dependent on the resource including groundwater-dependent ecosystems) at the local scale and in a regional context.
- Detail the proposed measures to avoid, minimise, mitigate and monitor impacts on environmental values (including measurable criteria, standards and/or indicators, and corrective actions), and demonstrate how the relevant environmental objectives and performance outcomes will be met.

The assessment of groundwater is to be undertaken in accordance with applicable guidelines, methods and legislation referred to in the TOR. This includes the Australian groundwater modelling guidelines (Barnett et al. 2012), the Independent Expert Scientific Committee (IESC) Information Guidelines for Proponents Preparing Coal Seam Gas and Large Coal Mining Development Proposals (IESC 2018), and any relevant IESC Explanatory Notes.

1.2.2 Great Artesian Basin (GAB) Impacts

It is a requirement of the TOR that the Project is assessed for potential groundwater impacts on aquifers of the GAB. It is noted that the GAB boundary is located approximately 150 km from the closest point of the Project boundary; therefore, based on groundwater modelling data discussed in Section 5.3, it is concluded that there will no impact by the Project on groundwater within the GAB.

1.2.3 Report Structure

This report is structured as follows:

- Section 2 presents and discusses climate data (rainfall, evaporation etc.) for the Project site;
- Section 3 presents and discusses the regional and local geology, including the geological setting, stratigraphy, structure (e.g. faulting), and also presents elevation contours for the major geological surfaces and geological sections to aid the understanding of, for example, the impact of faulting on the regional geology and the occurrence of the coal resource;
- Section 4 presents and discusses the available groundwater data, including a description of the groundwater monitoring bore network, groundwater level and quality data, and hydraulic conductivity data obtained for the Project. The section also presents the conceptual groundwater model for the Project.
- Section 5 presents and discusses the results of numerical groundwater modelling that was undertaken to assess the rate and extent of groundwater drawdown resulting from the Project and other significant groundwater users (i.e. cumulative impacts). This modelling was undertaken by SLR (2022), based on an update to an existing regional groundwater model that included other major mining operations in the region. The update to the model was based on data obtained for the Project (e.g. updated geological surfaces, groundwater level data, hydraulic properties)
- Section 6 discusses the potential groundwater and environmental impacts of the Project, including:
    - The environmental values (EVs) of groundwater in the area impacted by the Project;

  - The potential impacts of the Project on existing groundwater users, groundwater quality, GDEs; and,
  - The cumulative impacts of the Project and other mining operations/sources of groundwater extraction.
- Section 7 presents groundwater management and mitigation measures for assessment and mitigation of environmental impacts that may arise from the Project.
- Section 8 presents conclusions arising from the Groundwater Impact Assessment.

1.2.4 Reference to Specific Assessment Guidelines

The assessments presented in this report have been undertaken with reference to the following guidelines:

- Department of Environment and Science 2022, Water - EIS Information Guideline, ESR/2020/5312, Queensland Government, Brisbane. The guideline contains general requirements for groundwater data that are used to support an EIS. The general requirements, and the locations where the requirements are discussed within this report and/or the Groundwater Modelling Technical Report (Attachment A) are shown below in Table 1-1.

Table 1-1: Report Locations for EIS Information Guideline (Water) Data Requirements

Requirement	Report Section	
	Groundwater Technical Report	**Groundwater Modelling Technical Report (Attachment A)**
Geology, stratigraphy, and geological structures (e.g. faults, folds)	Sections 3.1, 3.3, 3.4, 3.5	Section 2.3, 2.3.1
Aquifer type—such as confined, unconfined, karst or perched	Section 3.3	
Depth to, and thickness of, the aquifers	Section 3.3, Figures 3-4, 3-5, 3-6	Report Appendix E, Figures E-1 to E-5
The significance of the resource at a local and regional scale	Section 4.6	
Depth to water level, and seasonal changes and long-term trends in levels	Section 4.2.1	
Groundwater flow directions (derived from water level contours)	Section 4.2.2	
Water quality and Environmental Values	Section 4.3, 6.1	
Hydraulic characteristics	Section 4.4	Section 3.4, 3.5
Connectivity between aquifers	Section 4.2.1.2	Section 3.2.5
Interaction with surface water, including recharge and discharge (e.g. springs, or bank storage)	Section 3.2, 3.3.1	Section 4.6.2
Recharge and discharge rates	Section 4.5, Section 5.8	Section 2.4.3, 4.6.2
Interaction with groundwater dependent ecosystems	Section 6.2.5	
Interaction with saline water	Not applicable	Not applicable
Vulnerability to pollution	Section 6.2.7	
Any routine injection of water occurring to the aquifer.	Not applicable	Not applicable
Location of potentially affected bores or wells Bore details such as depth and aquifer tapped, hydraulic properties from pumping tests, drawdown and recharge at normal pumping rates, seasonal variations of groundwater levels (if records exist), use of the bore, and estimate of volumes extracted.	Section 4.6 Section 6.2.2	
If a groundwater model is used to describe the impacts of the project on groundwater resources, model water balances for each aquifer to establish the pre-development conditions		Section 3.3 (Calibrated model Section 4.2 (Predictive model)
Describe the monitoring program(s) and sources that provided the data used in the assessment of existing groundwater resources	Section 4.0	
Potential Impacts to surface water/groundwater interactions, groundwater impacts from subsidence, impacts to groundwater supply, cumulative impacts	Section 6.0	Section 4.3, 4.4, 4.5, 4.6

Requirement	Report Section	
	Groundwater Technical Report	Groundwater Modelling Technical Report (Attachment A)
Avoidance and mitigation measures	Section 7.0	

- Groundwater monitoring data. To date (September 2023) a total of 24 sampling events for groundwater level and groundwater quality have been completed for both the Meadowbrook Project and the adjacent Lake Vermont North (LVN) Project. These data provide a high-quality baseline dataset (refer Section 4.2.1 for presentation and discussion of groundwater level data and Section 4.3 for presentation and discussion of groundwater quality data), with data collected and assessed in accordance with the following guidelines:
  - ANZG 2018, *Australian and New Zealand guidelines for fresh and marine water quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australian Capital Territory.
  - Department of Science Information Technology and Innovation 2017. *Using monitoring data to assess groundwater quality and potential environmental impacts*, Queensland Government, Brisbane.
  - Department *of* Environment and Science 2017, *Model mining conditions*, ESR/2016/1936, Department of Environment and Science, Brisbane.
  - Water quality objectives (WQO's) for groundwater under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 and associated Fitzroy Basin Groundwater Zones (WQ1310).
  - Department of Environment and Science 2018, *Monitoring and sampling manual, Environmental Protection (Water) Policy*, Department of Environment and Science, Brisbane.

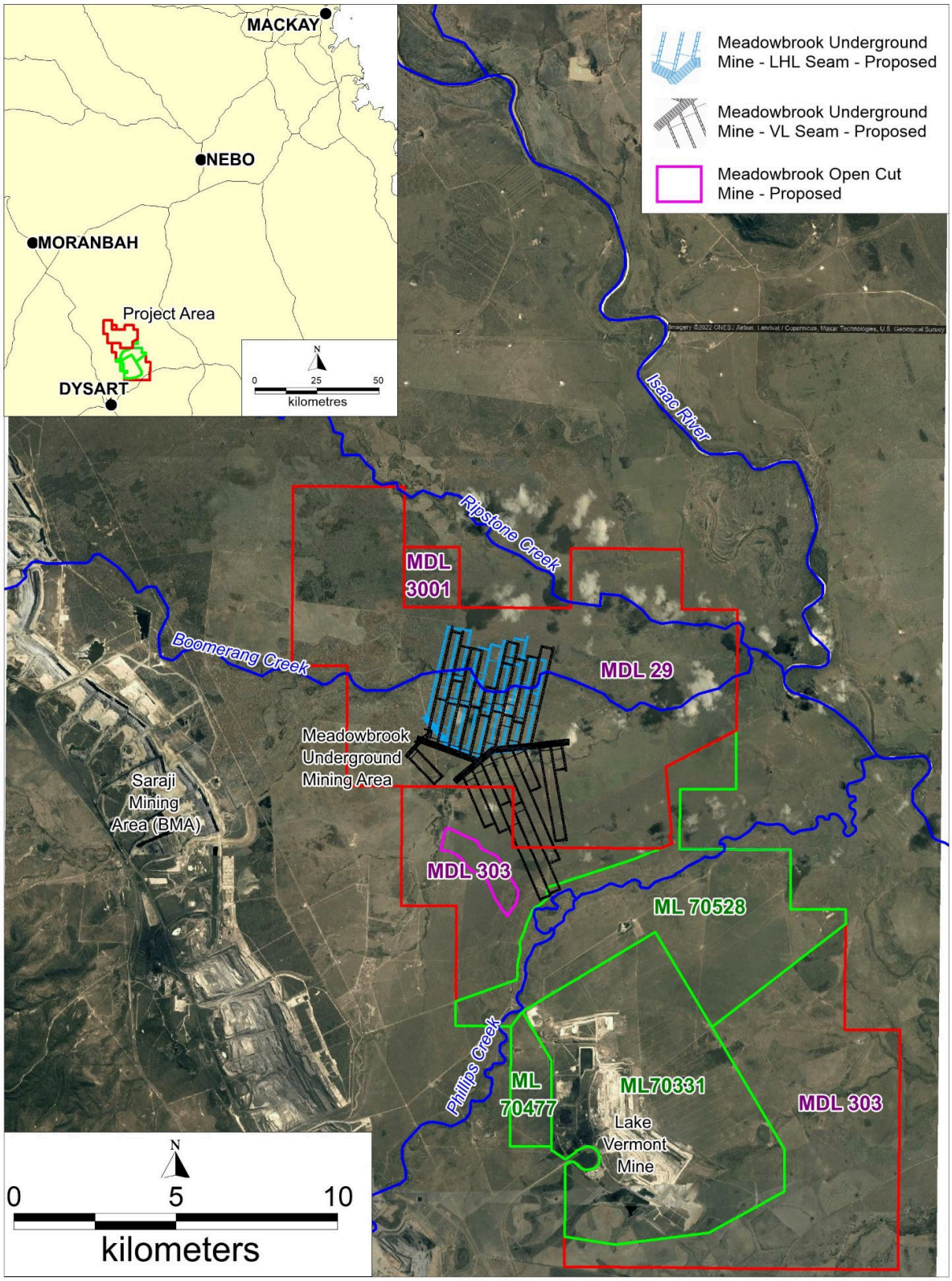


Figure 1-1: Project Location

1.3 Available Data

Data used for this study includes:

- Published geological mapping, including:
  - 1:100,000 scale surface geology and ;
  - Bowen Basin solid geology at 1:500,000 scale (Sliwa et al. 2008)
- A modified solid geology map of the project area, compiled from geological data from the mining area (Minserve 2017);
- Geological surfaces from the mine geological model;
- Fault data from the mine geological model;
- Climate data from the SILO data drill for the Project area;
- Hydraulic conductivity data from:
  - Slug testing of groundwater monitoring bores at Meadowbrook and Lake Vermont North (adjacent mining area within the same geology as Meadowbrook); and,
  - Packer testing undertaken on seven cored bores within the Meadowbrook underground area.
- Groundwater data from the Meadowbrook groundwater monitoring bore network as well as the monitoring network for the adjacent Lake Vermont North site, including:
  - Groundwater level data; and,
  - Groundwater quality data.
- Groundwater modelling undertaken for the Project (SLR 2022).

2.0 CLIMATE DATA

2.1 Rainfall Data

Monthly rainfall data for the Meadowbrook Project area has been obtained. from the Queensland Department of Resources (DoR) SILO Data Drill (Jeffrey et al. 2001). The Data Drill accesses grids of climate data available from surrounding BoM point observations and then creates interpolated climate values for the requested location. The SILO climate data was obtained for coordinates that correspond to the approximate centre of the Project area. Monthly rainfall data for the period from January 2002 to October 2021 is presented in Figure 2-1. The data has been analysed to provide a rainfall residual mass (RRM) curve, which is also plotted on Figure 2-1. The RRM is calculated by subtracting the long-term average monthly rainfall from the actual monthly rainfall, to provide a monthly “departure” from average conditions. If the monthly rainfall is above average the resulting rainfall departure number is positive, whereas if rainfall is below average, the number is negative. The monthly rainfall departures are summed cumulatively to provide the RRM. A number of below-average rainfall months will result in a falling RRM curve, while a number of above average rainfall months will result in a rising RRM curve. The RRM curve is used extensively in groundwater investigations due to the strong correlation at many locations between the RRM and groundwater level trends, especially for areas where groundwater recharge is occurring due to rainfall.

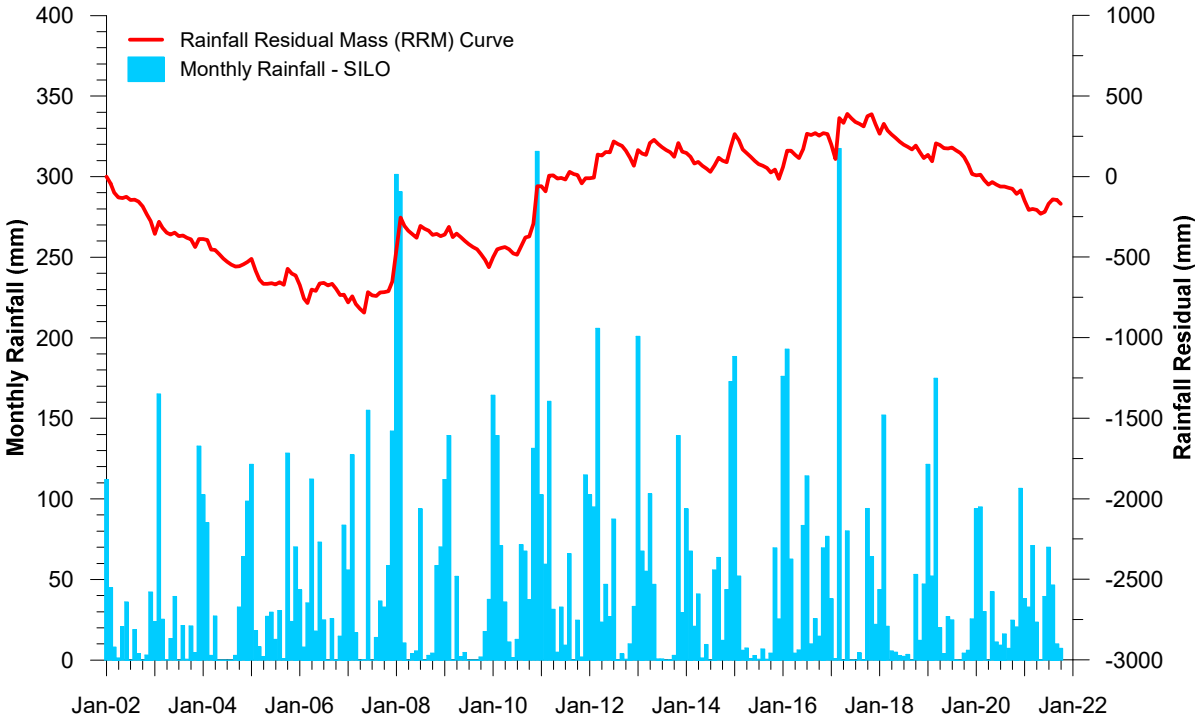


Figure 2-1: Monthly Rainfall Data and Rainfall Residual Mass Curve

2.2 Climograph

The climatic description of the region in which the Meadowbrook Project is located has been compiled using data from the SILO Data Drill (Jeffrey et al. 2001). Summary data for rainfall and evaporation is shown in Table 2-1 and indicates that:

- Mean annual rainfall for the model area is approximately 559 mm; and,
- Mean annual evaporation is approximately 2070 mm and exceeds rainfall for every month of the year.

The data has been utilised to produce a climograph for the model area (Figure 2-2), which shows that:

- rainfall is highly seasonal, with the dry season from April to September-October, and a wet season from October-November through to March;
- evaporation is highest in summer and lowest in winter, with the greatest differential between rainfall and evaporation (i.e. when rainfall is less than 25% of evaporation) occurring between the months of April and November;
- The coldest month of the year is July, with a mean minimum temperature of 8.5 ºC and a mean maximum temperature of 23.5 ºC; and,
- The hottest month of the year is January, with a mean minimum temperature of 21.6 ºC and a mean maximum temperature of 33.6 ºC.

Table 2-1: Average Monthly Rainfall and Evaporation*

Month	Average Rainfall (mm)	Average Evaporation (mm)
January	102.7	223.3
February	90.4	181.7
March	63.8	187.5
April	29.6	150.5
May	25.3	120.2
June	27.5	97.4
July	20.3	107.1
August	17.4	136.6
September	15.1	177.3
October	30.6	218.1
November	53.1	229.2
December	83.1	241.2
Total	**558.9**	**2070.1**

* SILO Data – data for the period 1900 to 2021

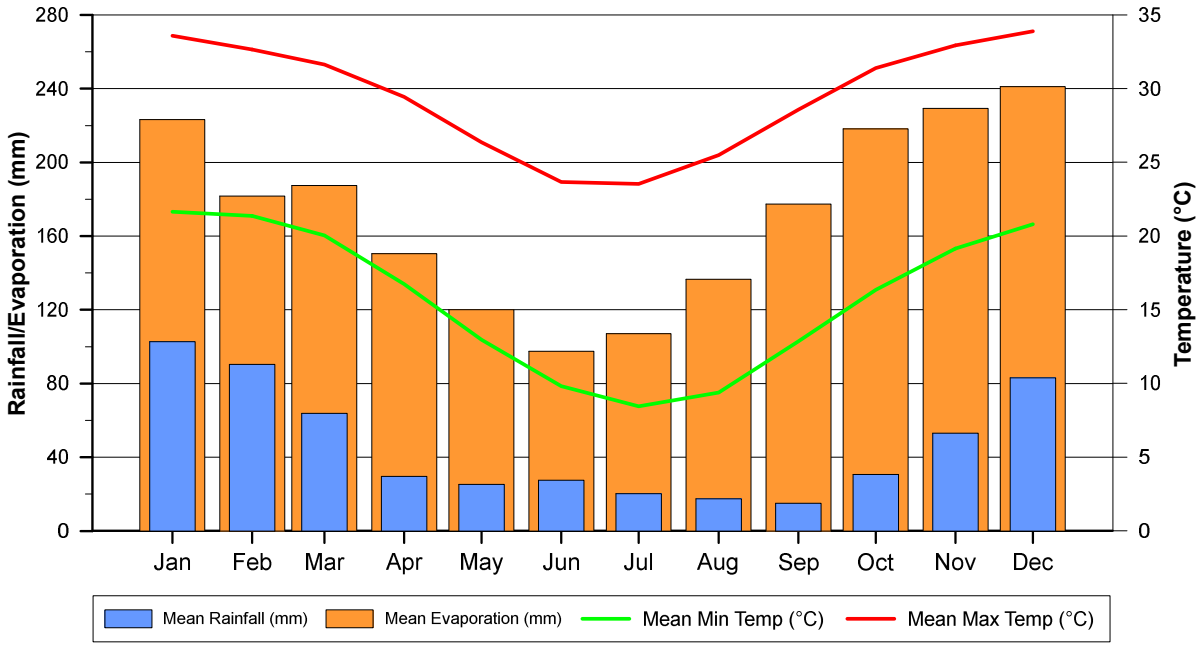


Figure 2-2: Climograph for the Meadowbrook Area

3.0 REGIONAL AND LOCAL GEOLOGY & HYDROGEOLOGY

3.1 Regional Geological Setting & Structure

The following paragraph is a precis of the regional geological structure presented in Minserve (2017). The Project lies on the western limb of the Bowen Basin, a north-south trending retro-arc basin that extends more than 250 km north to south and up to 200 km west to east. The Project is located at the eastern end of the Collinsville Shelf, which is characterised by a thin accumulation of sediments, gentle easterly dips and minor structural deformation. The eastern boundary of the Colinsville Shelf occurs at the Isaac Fault, a major thrust fault which has throws of 150 to 400 m in the Project area. To the east of the Isaac Fault occur intensely folded and faulted sediments (Fort Cooper Coal Measures and Rangal Coal Measures) of the 2 to 3 km wide Isaac Block. The Isaac Block is flanked to the east by another major thrust fault, with sediments to the east occurring in a block known informally as the Central block. A third large thrust fault, with a throw of ~300 m, marks the eastern edge of the Central block. To the east of the third thrust fault occur subcropping sediments of the Rangal Coal Measures and overlying Rewan Group, within a fourth structural block known as the Eastern block.

The relationships discussed above can be observed from the solid geology of the Project area, which is shown below in Figure 3-1. The solid geology map is prepared by removing the Cainozoic (Quaternary and Tertiary) cover sediments, revealing the faulted relationship between the underlying Permian and Triassic rocks of the Project area. Figure 3-1 is based on the Bowen Basin solid geology of Sliwa et al. (2008), but has been modified by the Project geologists (Minserve) based on geological drilling and interpretation within the Project area.

Within the Project area the Permian and Triassic-age sediments of the Bowen Basin are overlain by a veneer of unconsolidated to poorly consolidated Cainozoic sediments. The surface geology for the Project area is shown in Figure 3-2. The detail shown in Figure 3-2 is based on 1:100,000 scale digital geology) of the region and project area, indicating areas where Cainozoic sediments overlay the Permo-Triassic Bowen Basin sediments.

Both Figure 3-1 and Figure 3-2 show the locations of geological sections (two west-east sections that have been oriented across strike and one north-south section that has been oriented through the central area of the proposed underground mining. The west-east sections are shown in Figure 3-7 and the north-south section is shown in Figure 3-8; the sections have been prepared to assist understanding of the stratigraphic and structural relationships that are discussed further in the sections below.

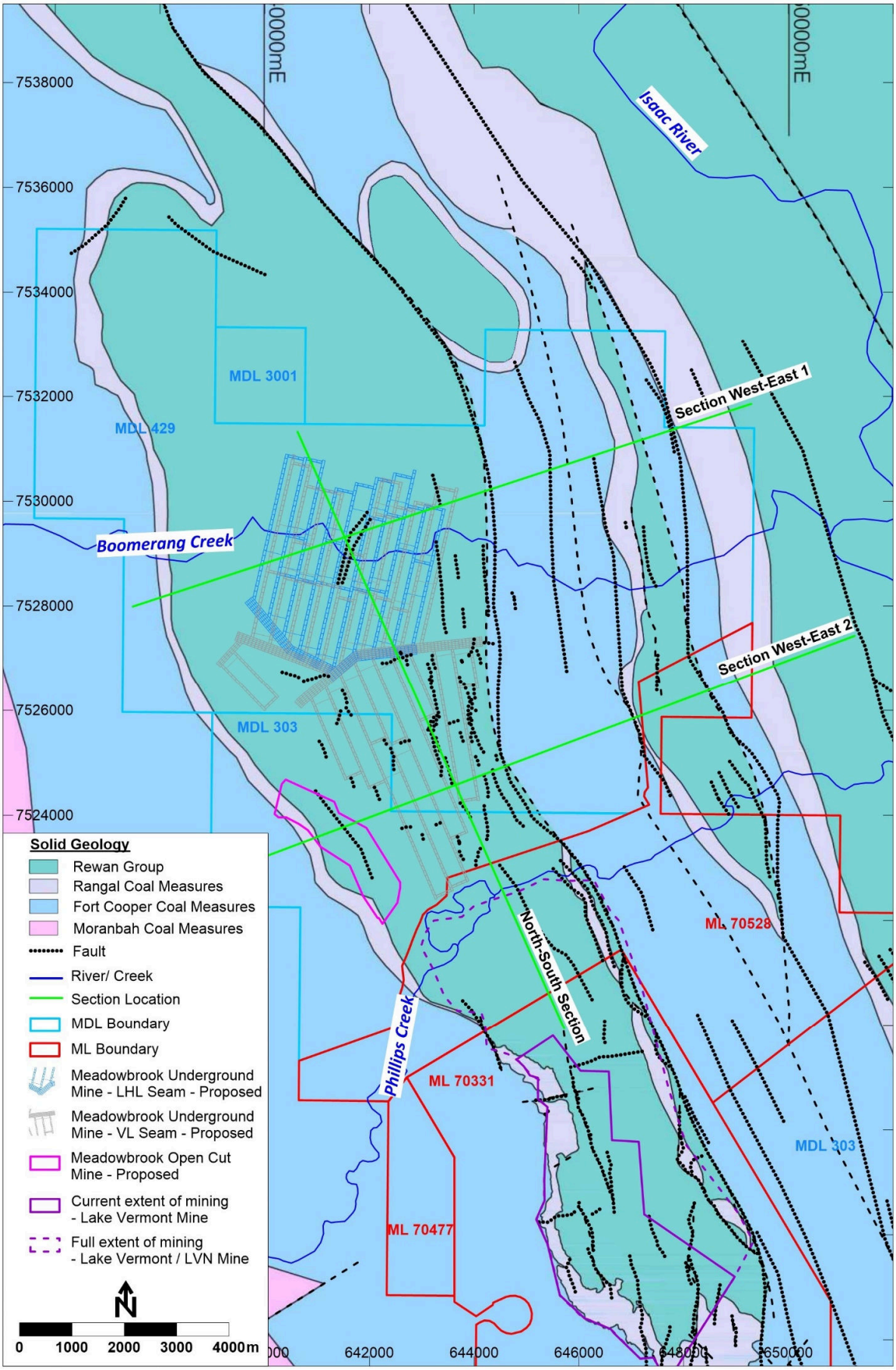


Figure 3-1: Solid Geology

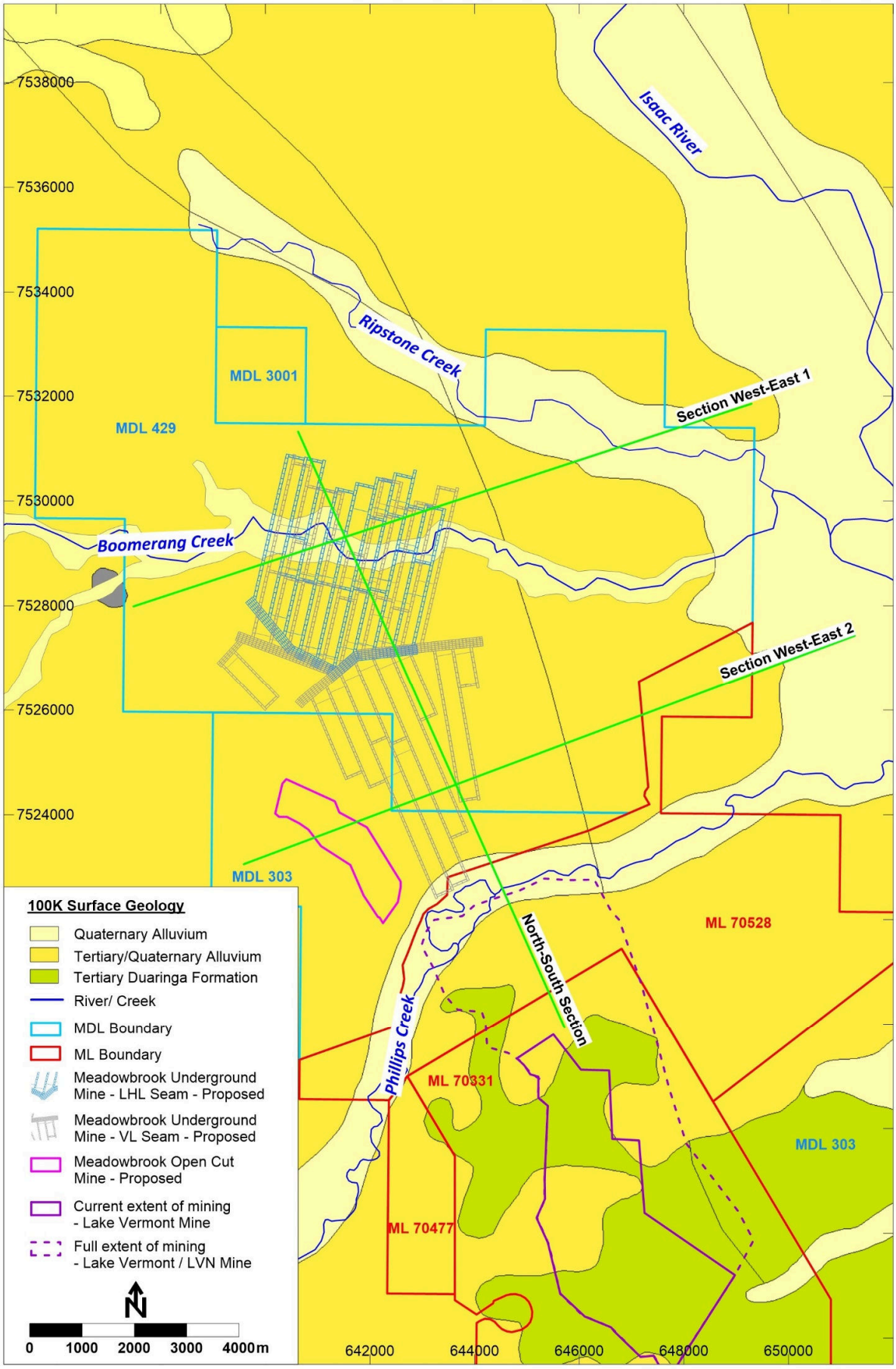


Figure 3-2: Surface Geology at 1:100,000 Scale

3.2 Topography and Surface Drainage

The majority of the Meadowbrook Project is located within a broad, flat floodplain between Phillips Creek and Boomerang Creek (Figure 3-3). The drainage lines of Boomerang Creek and Ripstone Creek are separated by a topographic ridge that is 10-15 m higher than the ground elevation at the creeks. The topography slopes relatively gently from west to east towards the Isaac River, with Boomerang Creek recording an elevation change of approximately 15 m over 15 km through the mining area, a surface gradient of ~0.001.

The main surface drainage features within the Project area, including Ripstone Creek, Boomerang Creek, Phillips Creek, the Isaac River, are ephemeral. Where monitoring data exists the Quaternary alluvium associated with the creeks is generally dry, with the water table being developed generally within the Tertiary sediments (Section 4.2.1.1). The only area where permanent groundwater within the Quaternary alluvium is interpreted is within the alluvium of the Isaac River, which is supported by the presence of private groundwater bores that are constructed within the Isaac River alluvium (Section 6.2.6).

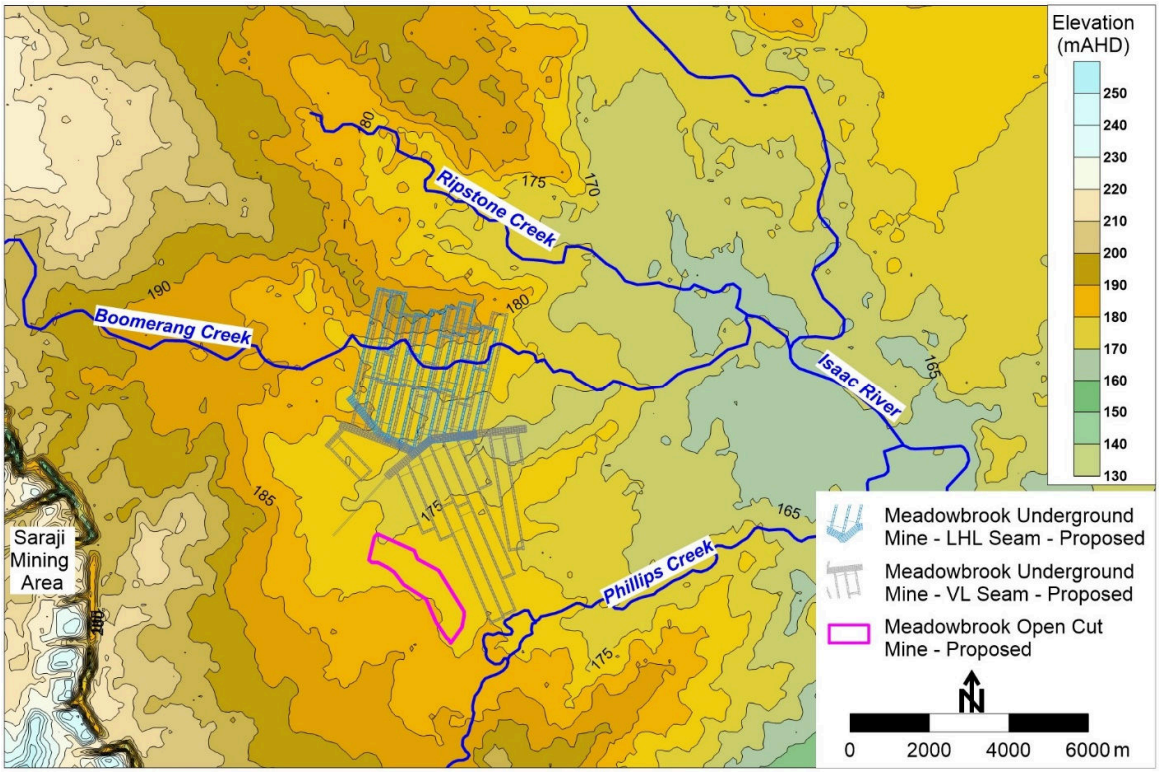


Figure 3-3: Surface Topography and Drainage

3.3 Regional and Local Stratigraphy

The regional stratigraphy of the Bowen Basin contains a number of lateral equivalents which are referred to by different names in the northern and southern areas of the Bowen Basin. The stratigraphic relationship is summarised below in Table 3-1. The local stratigraphy of the Project area is discussed in the sections below.

Table 3-1: Bowen Basin Regional Stratigraphy

Age	Group	Formation	
		Southern Bowen Basin	Northern Bowen Basin
Quaternary		Alluvium	Alluvium
Tertiary		Alluvium	Alluvium
		Duaringa Formation	Duaringa Formation
Triassic	Rewan Group	Arcadia Formation	Arcadia Formation
		Sagittarius Sandstone	Sagittarius Sandstone
Late Permian	Blackwater Group	Rangal Coal Measures	Rangal Coal Measures
		Burngrove Formation	Fort Cooper Coal Measures
		Fairhill Formation	
		MacMillan Formation	Moranbah Coal Measures
		German Creek Formation	
Middle Permian	Back Creek Group	Ingelara Formation	Blenheim Formation

3.3.1 Cainozoic (Quaternary and Tertiary) Sediments

The thickness of Cainozoic sediments, which occur across the entire Project area, is highly variable, ranging from 2 to 80 m and averaging 26 m (Minserve 2017). The Cainozoic sediments mainly comprise alluvial sands, clayey sands and clays, with a basal layer in some locations of sand and gravel, which are interpreted to be prior channels of the various creeks (Minserve 2017). The thickness of Cainozoic sediments within the Project area is show in Figure 3-4 Plot A, based on information contained in the site geological model. In MDL303, gradually thickening through the southern part of MDL429 (generally the area to the south of Boomerang Creek) to 35 – 45 m. In the northern area of MDL 429 and MDL 3001 (generally the area to the north of Boomerang Creek) the Cainozoic thickness increases to more than 60 m, with the area of greatest thickness associated with a topographic high that is north of Boomerang Creek and south of MDL 3001 (Minserve 2017 – refer Figure 3-4, Plot A for Cainozoic thickness contours and Figure 3-6, Plot A for topographic contours).

It has also been observed from geological drilling data and groundwater hydraulic data (Section 4.4.4) that the Tertiary sediments are generally sandier (and therefore have higher hydraulic conductivity) in the area within MDL 429 (and the vicinity of Boomerang Creek) than the area to the south (the area within ML70528 and adjacent to Phillips Creek, where the generally finer-grained Tertiary sediments of the Duaringa Formation occur). It is important to note that this observation relates mainly to the Tertiary sediments, as the thickness and extent of Quaternary alluvium that is associated with Phillips Creek tends to be greater than the interpreted thickness and extent of Quaternary alluvium that is associated with Boomerang Creek. The following additional observations are made with respect to the Quaternary alluvium that occurs within the Project area:

- Figure 3-2 shows the extent of Quaternary alluvium at 1:100,000 scale. For the majority of rivers/creeks shown on Figure 3-2 the alluvium extent is from the mapped 1:100,000 scale digital geology (Grosvenor Downs sheet). The exception is the extent of Quaternary alluvium that is shown for Boomerang Creek, as there was no alluvium shown for Boomerang Creek on the Grosvenor Downs 1:100,000 scale geological sheet.

- Although Boomerang Creek is assessed to be a minor surface drainage system (e.g. compared to Phillips Creek which a more developed and deeply incised system and it is perhaps for this reason that the Boomerang Creek alluvium was not mapped at 1:100,000 scale), it is still interpreted that there is recent (Quaternary) alluvium associated with Boomerang Creek. As such, an attempt has been made for this report to delineate the extent of the Boomerang Creek alluvium, based on interpretation of data from the following sources:
    - Geological and groundwater drilling data in the area of Boomerang Creek;
    - Detailed aerial photography flown for the Project area by Jellinbah Resources; and,
    - Landsat 7 enhanced thematic mapper (ETM) infrared imagery (Earth Explorer 2001). Infrared imagery can be useful for delineating current and prior alluvial channels, although the degree to which the method can provide useful data can be dependent on the moisture content of the ground relative to the acquisition time of the image. This is due to the differential drainage rates of sandy channel sediments relative to finer-grained flood-plain deposits, with moister, clay-rich sediments having a lower infrared reflectance than sandier (well-drained and therefore drier) sediments; recent rainfall/inundation will enhance the effect described above (Morrison & White, 1976).
- From review of geological/ groundwater drilling data in the area of Boomerang Creek, it is observed that the Cainozoic sediments in this area are relatively sandy and that, as such, it is not possible to reliably determine the delineation between recent (Quaternary) alluvium and older (Tertiary) alluvium from prior channels/floodplain deposits. It is also noted that, because there is no silty/clayey base to the sandier recent alluvial deposits, other techniques (e.g. geophysics) would be unlikely to provide a reliable demarcation of the boundary between recent and older alluvial sediments. The challenge of picking the boundary between Quaternary alluvium and Tertiary sediments is evident from a number of bore logs for groundwater bores adjacent to Boomerang Creek (bore construction logs for groundwater Meadowbrook monitoring bores are included in Attachment B). Bores discussed include:
    - Bore W4_MB1 (alluvium) and Bore W4_MB2 (Rewan Group). From review of the bore log for W4_MB2 (which contains the entire Cainozoic sequence), the zone from surface to 14 metres below ground level (mbgl) could potentially be logged as Quaternary alluvium (3 m of clay, sand from 3 to 14 mbgl), with the base of Tertiary logged at 37 mbgl. However, the interval between 14 and 37 mbgl is an alternating sequence of sand and clay and it is possible that the majority of the sequence comprises Tertiary sediments with a very thin veneer of Quaternary. It is not expected that the Quaternary sediments would be very thick at this location due to the shallow creek bed encouraging relatively wide distribution of water during creek flow rather than constraining flow to a high-energy, well defined stream bed where deposition of sand-sized grains rather than fine-grained silts/clays could be expected to occur.
    - Bore W3_MB1 & MB2 – at this site sand is logged from ground surface to the base of Tertiary sands at 26 mbgl; there is nothing in the drilling log to indicate the boundary between Quaternary and Tertiary sand at this site;
    - Bore W14_MB1 & MB2 – at this site, apart from the top 1 m that is logged as soil, sand occurs from 1 to 13 mbgl. From 13 to 43 mbgl there occurs an alternating sequence of clay and sand, with a depth to base of Tertiary logged at 43 mbgl. At this site, where the shallow bore (MB1) screens the Tertiary sand from 15 to 18 mbgl (just below the interpreted base of Quaternary at 13 mbgl), the water level is generally ~14 mbgl, i.e. just below base of alluvium and the electrical conductivity (EC) is < 1,000 µS/cm (the least saline water at site). Groundwater level data is discussed further in Section 4.2 and groundwater quality data is discussed further in Section 4.3)
- Based on interpretation of available data, it is concluded that:

- The geomorphic characteristics of Boomerang Creek (e.g. shallow/narrow creek bed) suggest that the alluvium within Boomerang Creek would be relatively shallow (generally in the range of several metres thickness), though the thickness of alluvium is interpreted to extend up to 14 m in some areas. At some locations the sand can be up to 26 m thick from surface and, while it is not possible to accurately determine the interface between Quaternary and Tertiary sand, it is concluded that the majority of thickness is likely to be Tertiary age;
- The regional watertable is generally developed in the Tertiary sediments below the base of alluvium, and the alluvium is likely to be seasonally saturated following direct rainfall recharge and especially following flow events in Boomerang Creek that will provide more direct recharge to the alluvium.

3.3.2 Triassic Rewan Group

The Sagittarius Sandstone, the basal formation of the Rewan Group, occurs beneath Cainozoic sediments over much of the Project area. The unit is up to 300 m thick (refer Figure 3-4, Plot B) and comprises greyish-green sandstone, siltstone and mudstone. The unit is differentiated from sediments of the underlying Rangal Coal Measures by the greenish tinge of the sediments and also by the presence of a 1 to 3 m thick mudstone that is dark in colour and has a high natural gamma count, which acts as a regional stratigraphic marker for the base of Rewan (Minserve 2017). The upper part of the Rewan Group comprises reddish-brown mudstones and greyish-green sandstone, siltstone and mudstone of the Arcadia Formation, though this unit is absent (due to weathering) over most of the Project area. The areas where the Rewan Group exists within the Project area relative to other units and faults are shown in the solid geology figure (Figure 3-1), with contours for the base of Rewan Group shown in Figure 3-6, Plot C. The west east sections (Figure 3-7) and north-south section (Figure 3-8) demonstrate the structural controls on the occurrence of Rewan Group sediments.

Despite being referred to as the Sagittarius “Sandstone” within the project area, available hydraulic conductivity data for this formation (Section 4.4) confirms that the unit has a low hydraulic conductivity within the Project area (refer Section 4.4) and is more appropriately conceptualised as a low permeability unit.

3.3.3 Rangal Coal Measures

The Late Permian Rangal Coal Measures are coal-bearing sediments that contain the target coal seams for the Meadowbrook Project (Leichhardt Lower and Vermont Lower seams). Within MDL 429 the dip of the coal seams is relatively steep (~ 5° to 10° in the west near the subcrop line), but the dip flattens out to the east as shown in the west-east geological sections (Figure 3-7). In descending stratigraphic order the coal seams comprise:

- Phillips Seam, which generally comprises < 1 m thickness of inferior coal, but which is useful as a stratigraphic marker (Minserve 2017). Elevation contours for the base of Phillips Seam are shown in Figure 3-6, Plot D;
- Leichhardt/ Leichhardt Lower Seams – the Leichhardt Seam thins and deteriorates north of Phillips Creek, with the Leichhardt Lower Seam appearing suddenly within MDL 429 as two thin, clean coal seams that coalesce to the north to form one seam of 2.5 to 4 m thickness (Minserve 2017). The limit of mineable coal in the Leichhardt Lower seam can be seen in Figure 3-1 and Figure 3-2 from the location of the longwall panels for mining of the Leichhardt Lower (LHL) seam. The depth of cover to the top of the Leichhardt Lower Seam is shown in Figure 3-5 (Plot A). Elevation contours for the base of the Leichhardt Lower (LHL) Seam are shown in Figure 3-6, Plot E;
- Vermont/ Lower Vermont seam, which is the principal commercial seam mined in the Project area. The Vermont Seam comprises two relatively minor upper plies (VU1 and VU2), which have split away from the two plies of the Vermont Lower Seam (VL1, VL2), where the thickness of the two seams combined

within MDL 303 and MDL 429 (the Meadowbrook mining area) is in the order of 3 m. The Vermont Seam occurs at a depth of ~100 mbgl in the southwest of the mining area where the seams subcrop (i.e. the area of the proposed Meadowbrook open cut (Figure 3-1, Figure 3-2) but deepens significantly to the north east of the underground area where the depth to the base of the VL2 seam occurs at a depth of ~500 mbgl. The depth of cover above the Vermont Upper Seam is shown in Figure 3-5 (Plot B). Elevation contours for the base of the Vermont 2 lower seam (VL2) are shown in Figure 3-6, Plot E.

The west-east geological sections (Figure 3-7) and north-south geological section (Figure 3-8) show the relationship between the Rangal Coal Measures and overlying and underlying units, and also demonstrate how the Rangal Coal Measures truncate against the Isaac Fault, which forms an eastern limit to underground mining.

3.3.4 Fort Cooper Coal Measures

The Late Permian Fort Cooper Coal Measures stratigraphically underlie the Rangal Coal Measures (Table 3-1); the unit subcrops beneath Tertiary sediments within the Project area due to either the dip of the strata (western area of the Project) or due to faulting (e.g. east of the Isaac Fault – refer Figure 3-1). The uppermost coal seam in the Fort Cooper Coal Measures in the MDL 429 area is the Girrah Seam, which subcrops to the west of the Rangal Coal Measures subcrop line (Figure 3-1). A number of groundwater monitoring bores are screened within the Girrah Seam, (as discussed further in Section 4.1).

3.4 Weathering

Based on information from exploration drilling the base of weathering ranges from 22 to 90 m and averages 45 m depth (Minserve 2017). The base of weathering is generally below the base of Tertiary, as shown in the geological sections (Figure 3-7, Figure 3-8).

3.5 Local-Scale Structure and Intrusives

The coal resources for the Meadowbrook Project occur within a slightly asymmetric, north-northwest trending, north plunging synclinal structure where the coal measures crop out at the west due to the dip of the strata, but which are truncated to the east by the Isaac Fault (Figure 3-1, Figure 3-7).

Within MDL 303 and MDL 429 a number of local-scale faults have been mapped from seismic and drilling data, with the locations of these faults shown in Figure 3-1. These faults can be significant in terms of the deposit geology where the throws of the faults are in the order of 10-15 m and therefore have the potential to completely offset the coal seams. As the coal seams tend to be the conduits for groundwater flow in the Permian sediments, these faults also have the potential to disrupt groundwater flow; this is discussed further in Section 4.2.

The presence of intrusive dykes is inferred in some locations within of the Project area, based on the presence of coked coal which is inferred to be related to heating by magmatic fluids that are associated with the intrusives (Minserve 2017). To date the locations of inferred dykes have not been mapped, therefore the presence of dykes has not been considered in terms of impacts on groundwater occurrence and flow.

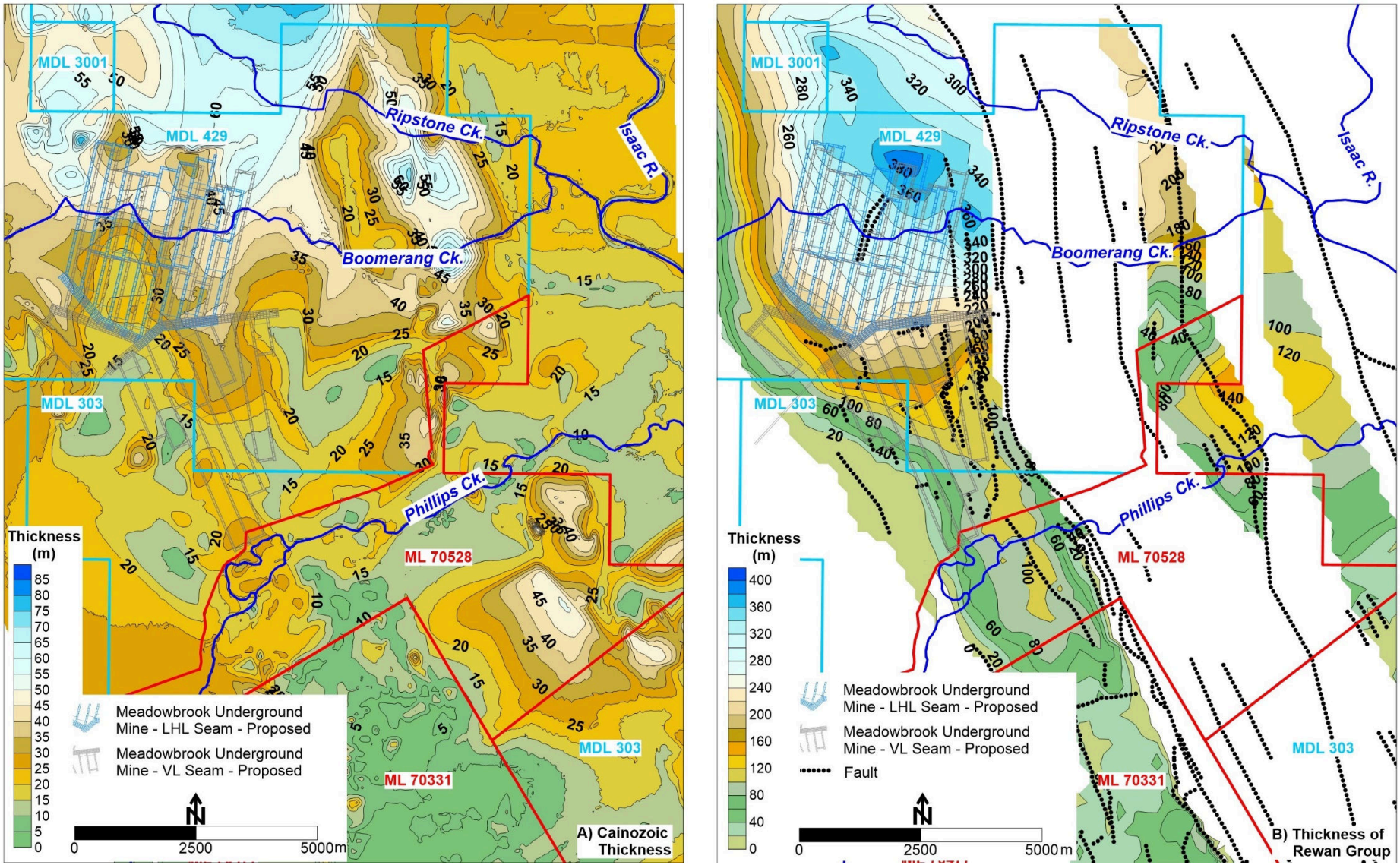


Figure 3-4: Thickness (m) of Cainozoic Sediments and Rewan Group

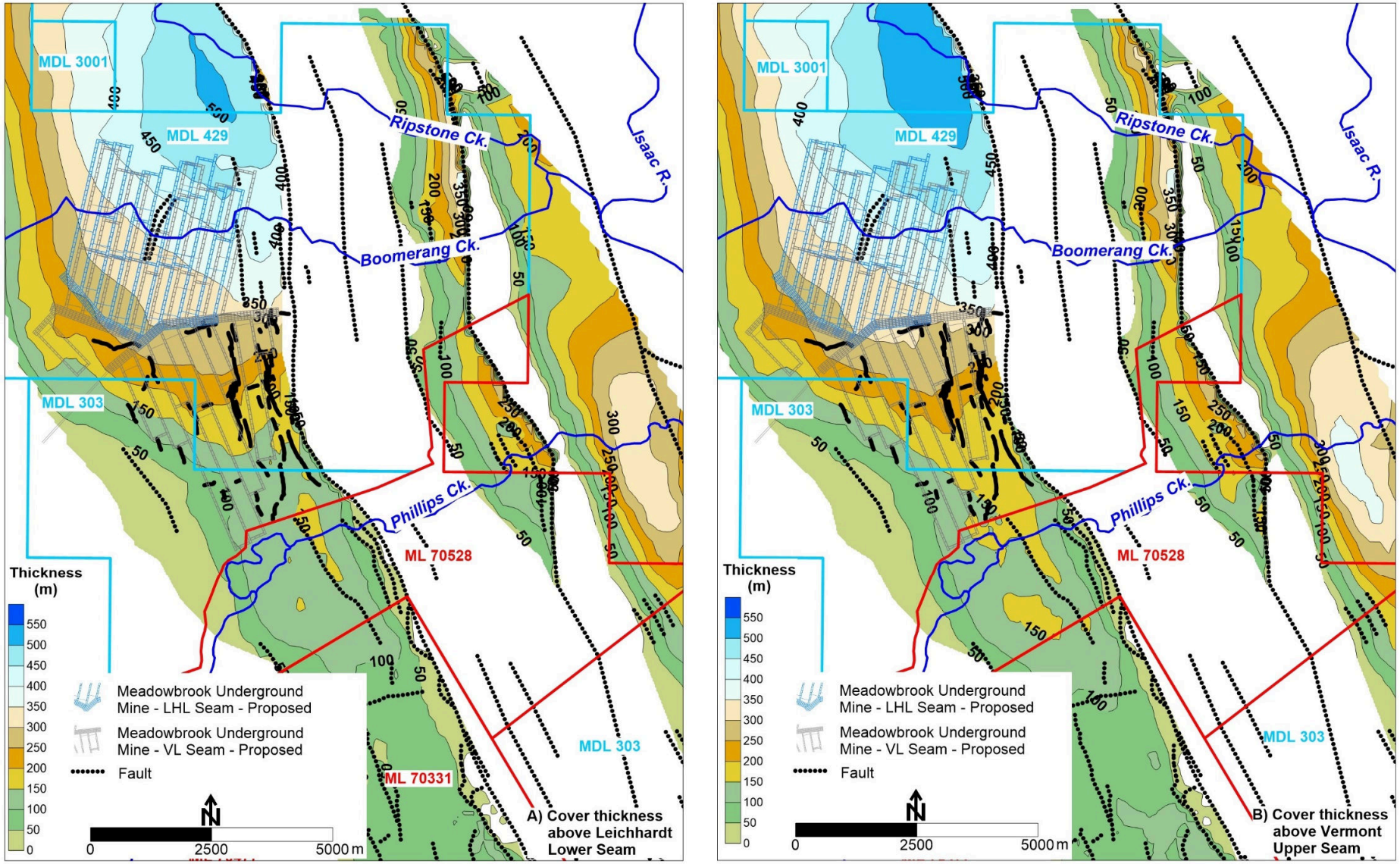


Figure 3-5: Thickness (m) of Cover above Leichhardt Seam and Vermont Seam

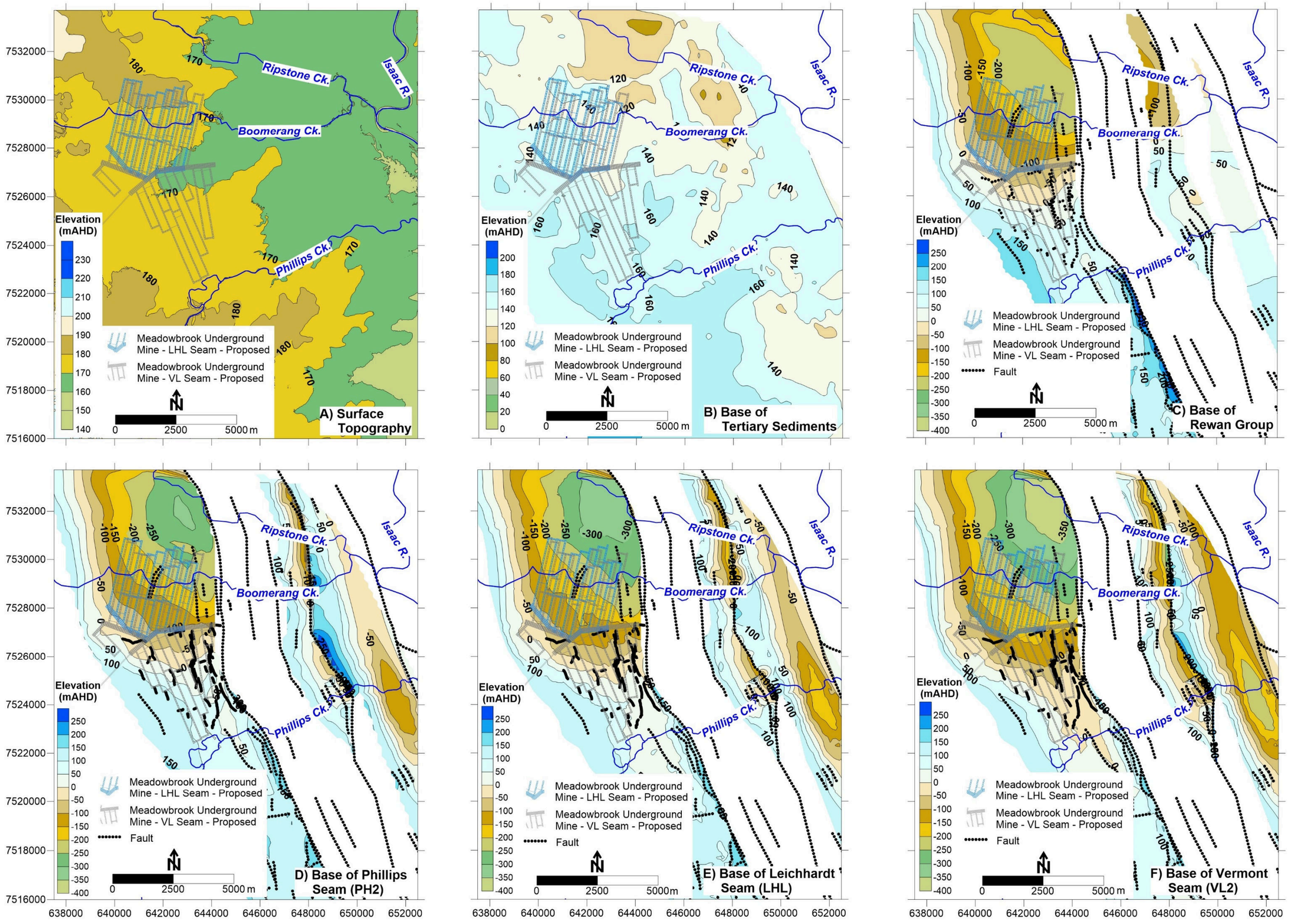


Figure 3-6: Elevation (mAHD) of Formation Surfaces

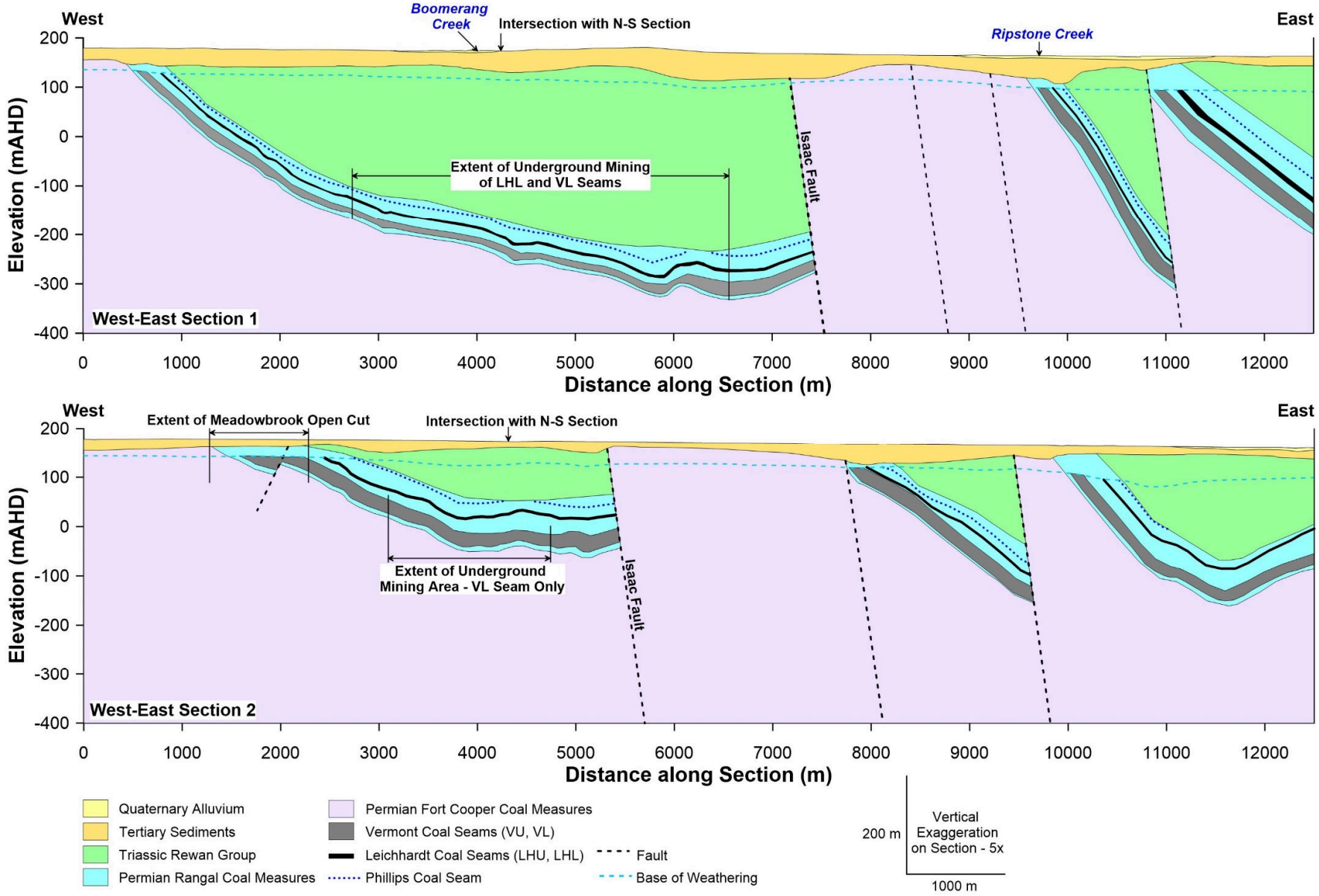


Figure 3-7: West-East Geological Sections

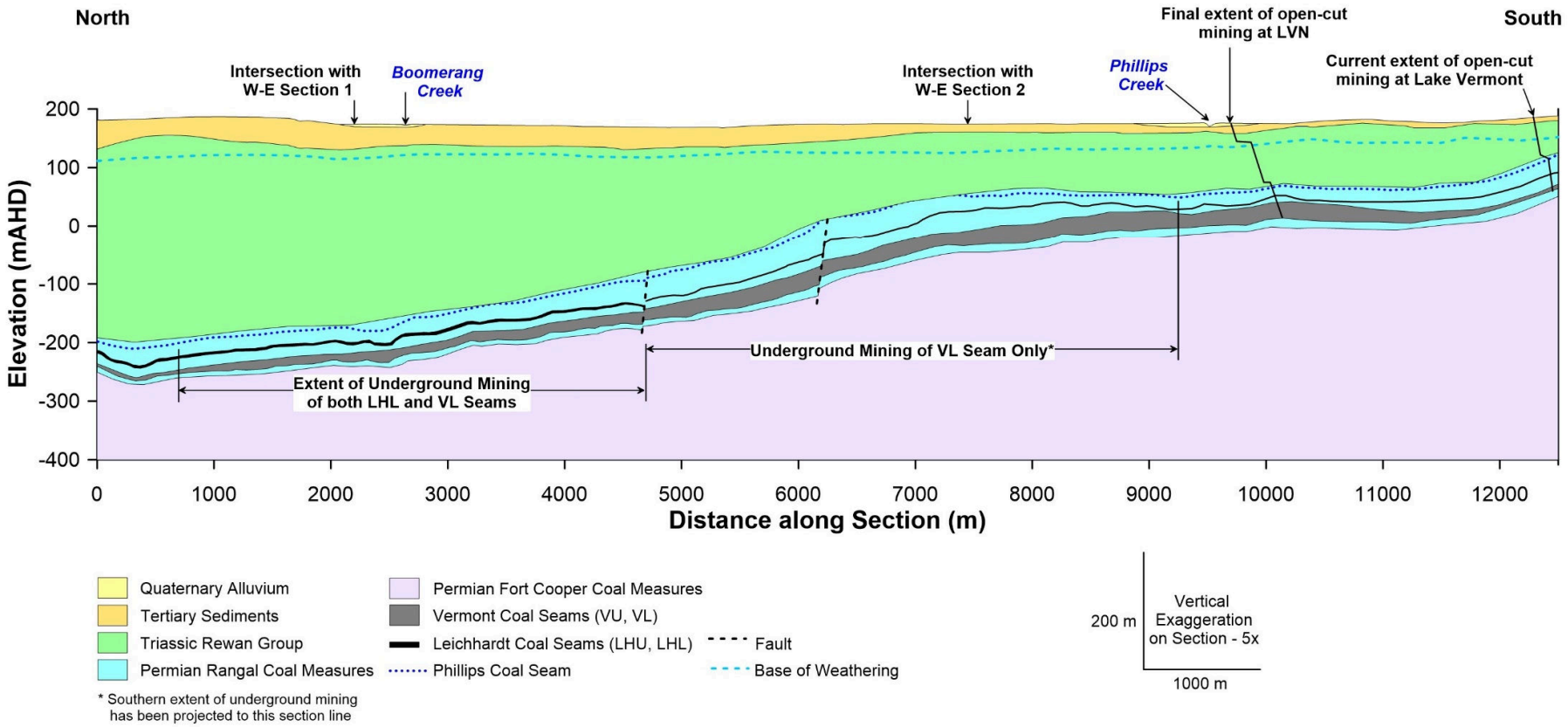


Figure 3-8: North-South Geological Section

4.0 GROUNDWATER DATA & ANALYSIS

4.1 Groundwater Monitoring Bore Network

Available groundwater data is presented and discussed in this report from the groundwater monitoring bore networks at Meadowbrook, as well as the network from the Lake Vermont North site immediately to the south. The locations of groundwater monitoring bores are shown in Figure 4-1. From Figure 4-1 it is evident that the groundwater system in the Meadowbrook/LVN area is compartmentalised by faulting and the dip of the strata into discrete hydrogeological domains. The bore network was therefore designed to provide:

- Spatial coverage across the groundwater domains present in the Meadowbrook/ LVN area;
- Coverage of all groundwater units present at site;
- Vertical coverage of different groundwater units at each location, to establish variability in groundwater quality and water level that can be used to provide information on groundwater recharge and the vertical direction of groundwater flow. Vertical discretisation at individual monitoring locations has been achieved via a combination of:
    - Standpipe monitoring bores that are screened in different groundwater units; and,
    - Vibrating wire piezometer (VWP) bores, which monitor up to four discrete vertical intervals within the same borehole.

Summary construction details for the monitoring bores are provided in Table 4-1 (Meadowbrook monitoring bores) and Table 4-2 (Lake Vermont North monitoring bores). Groundwater level data from the monitoring bores is discussed in Section 4.2 and groundwater quality data is discussed in Section 4.3. Hydraulic testing data obtained from the groundwater monitoring bores and other groundwater investigation bores is discussed in Section 4.3.4.

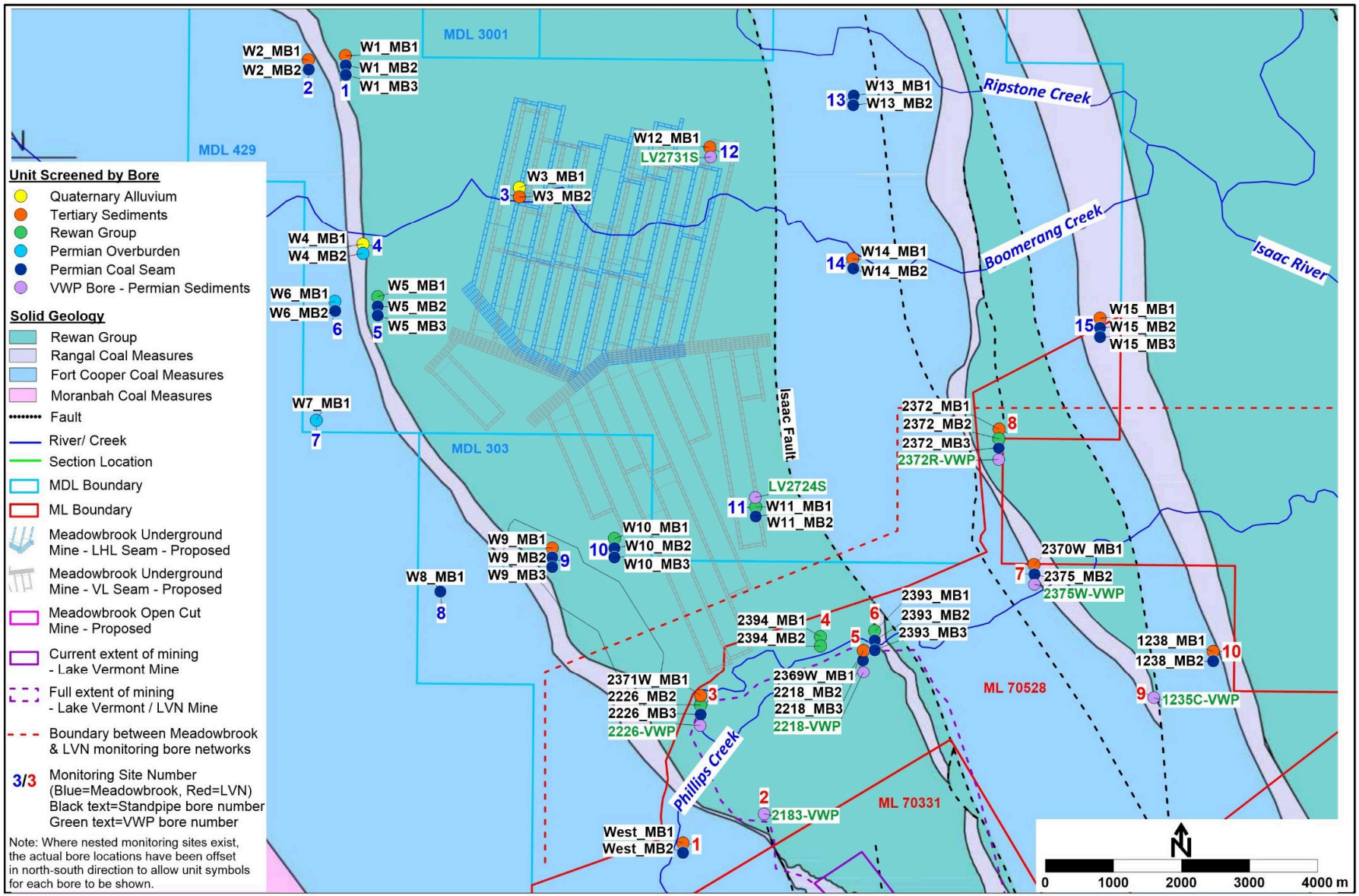


Figure 4-1: Locations of Groundwater Monitoring Bores

Table 4-1: Summary Details for Groundwater Monitoring Bores - Meadowbrook

Site ID	Bore ID	Groundwater Unit	Easting (AGD84)	Northing (AGD84)	Collar RL (mAHD)	Bore Depth (m)	Slotted Interval		Gravel Pack Interval	
							From (mbgl)	To (mbgl)	From (mbgl)	To (mbgl)
1	W1_MB1	Tertiary sediments	637914	7531373	187.09	45.5	43.6	45.1	42.6	45.1
	W1_MB2	Leichhardt Lower Seam	637916	7531372	187.06	84	81.75	83.25	80.75	83.25
	W1_MB3	Vermont Seam	637919	7531372	187.18	124	122.5	124	121.5	124
2	W2_MB1	Tertiary sediments	637368	7531452	187.92	42	34	40	33	40
	W2_MB2	Girah 1 Seam	637370	7531452	187.93	110	104	110	103	110
3	W3_MB1	Quaternary alluvium	640470	7529435	176.80	12	9	12	8	12
	W3_MB2	Tertiary sediments	640468	7529435	176.20	41	35	41	34	41
4	W4_MB1	Quaternary alluvium	638172	7528735	179.00	12	9	12	8	12
	W4_MB2	Permian overburden	638169	7528735	179.25	60	54	60	53	60
5	W5_MB1	Rewan Group	638387	7527823	181.15	50	44	50	43	50
	W5_MB2	Leichhardt Lower Seam	638385	7527820	181.16	71	69.5	71	68.5	71
	W5_MB3	Vermont Seam	638384	7527817	181.14	113	111.5	113	110.5	113
6	W6_MB1	Permian overburden	637758	7527892	179.85	56	50	56	49	56
	W6_MB2	Girah 1 Seam	637761	7527893	179.95	77	75.5	77	74.5	77
7	W7_MB1	Permian overburden	637484	7526145	180.69	60	54	60	53	60
8	W8_MB1	Girah 1 Seam	639306	7523618	177.67	60	54	60	53	60
9	W9_MB1	Tertiary sediments	640953	7524117	177.46	22	19	22	18	22
	W9_MB2	Vermont Upper Seam	640953	7524119	177.42	44.8	42.5	44	41.5	44.8
	W9_MB3	Vermont Lower Seam	640952	7524121	177.42	71	64.5	70.5	63.5	71
10	W10_MB1	Rewan Group	641869	7524259	177.00	28	22	28	21	28
	W10_MB2	Vermont Upper Seam	641869	7524259	177.00	91	88.5	90	87.5	91
	W10_MB3	Vermont Lower Seam	641869	7524261	177.00	119.65	116.65	119	115.65	119.65
11	W11_MB1	Rewan Group	643941	7524860	174.42	120	114	120	113	120
	W11_MB2	Leichhardt Seam	643943	7524861	174.27	139	133.5	135	132.5	139
12	W12_MB1	Tertiary sediments	643268	7530165	166.80	60	54	60	53	60
13	W13_MB1	Vermont Lower Seam	645381	7530927	166.80	46.5	43.5	46.5	42.5	46.5
	W13_MB2	Girah 1 Seam	645379	7530927	166.80	88	82	88	81	88
14	W14_MB1	Tertiary sediments	645373	7528515	166.80	20	15.6	18.6	14.6	18.6
	W14_MB2	Permian Coal Seam	645375	7528515	167.80	68	65	68	64	68
15	W15_MB1	Tertiary sediments	649009	7527504	177.50	23	17	23	16	23
	W15_MB2	Vermont Upper Seam	649009	7527504	177.50	60	58.5	60	57.5	60
	W15_MB3	Vermont Lower Seam	649009	7527504	177.50	105	102	105	101	105

Table 4-2: Summary Details for Standpipe Groundwater Monitoring Bores - LVN

Site ID	Bore ID	Groundwater Unit	Easting (AGD84)	Northing (AGD84)	Collar RL (mAHD)	Bore Depth (m)	Screened Interval (mbgl)	
							From	To
1	West-MB1	Tertiary	642872	7519929	183.97	30	27	30
	West-MB2	Permian Coal Measures	642873	7519932	183.97	80	74	80
2	2183-VWP*	Permian coal measures	644068	7520358	185.16	96	40, 61, 71, 83**	
3	2371W-MB1	Tertiary	643131	7521947	178.92	22	16	22
	2226-MB2	Rewan Group	643134	7521947	178.68	38	32	38
	2226-MB3	Permian (Leichhardt Seam)	643133	7521950	178.68	59	53	59
	2226-VWP*	Rewan Group, Permian coal measures	643129	7521950	178.84	102	38, 56, 74, 94**	
4	2394-MB1	Upper Rewan Group	644898	7522962	173.8	30	24	30
	2394-MB2	Lower Rewan Group	644895	7522962	173.8	123	117	123
5	2369W-MB1	Tertiary	645524	7522752	173.4	20	14	20
	2218-MB2	Rewan Group	645526	7522756	173.17	65	59	65
	2218-MB3	Permian (Leichhardt Seam)	645523	7522754	173.17	88	85	88
	2218-VWP*	Rewan Group, Permian coal measures	645526	7522753	173.29	147	65, 86, 116, 137**	
6	2393-MB1	Rewan Group	645696	7523043	173.07	30	24	30
	2393-MB2	Permian (Leichhardt Seam)	645694	7523043	173.07	41	38	41
	2393-MB3	Permian (Vermont Seam)	645691	7523043	173.07	96	90	96
7	2370W-MB1	Tertiary	648037	7523878	168.3	18.6	12.6	19
	2375-MB2	Permian (Vermont Seam)	648042	7523874	168.18	68	65	68
	2375W-VWP*	Permian coal measures	648040	7523865	168.36	82	50, 67.5, 78**	
8	2372-MB1	Tertiary	647520	7526012	166.75	30	24	30
	2372-MB2	Rewan Group	647519	7526010	166.75	46	40	46
	2372-MB3	Permian (Vermont Seam)	647518	7526008	166.75	129	123	129
	2372R-VWP*	Permian coal measures	647515	7526007	166.91	136	73, 93.5, 108, 125**	
9	1235C-VWP*	Permian coal measures	649799	7522054	170.81	115	58, 72, 90, 107**	
10	1238-MB1	Tertiary	650671	7522741	165.52	30	24	30
	1238-MB2	Permian (Vermont Seam)	650670	7522744	165.52	59	53	59

* VWP = Vibrating Wire Piezometer Bore

** Depth below ground surface of VWP sensor (up to 4 in each bore)

4.2 Groundwater Levels and Flow Direction

4.2.1 Groundwater Levels

4.2.1.1 Depth to Water Table

The groundwater level in Cainozoic (Quaternary and Tertiary sediments) for bores in the Meadowbrook and LVN Project areas is shown in Figure 4-2, which includes the following data:

- The base map shows elevation contours (mAHD) of the Tertiary sediments (i.e. RL base of Cainozoic sediments);
- The bore symbol colours show whether the Cainozoic sediments contain groundwater or else are dry;
- The colour of the bore number text shows whether the bore is a Quaternary sediments bore or a Tertiary sediments bore;
- The red text shows the standing water level as metres below ground level (mbgl) at each location. In the case of dry bores, the text shows the minimum depth to water based on the depth of the bore, and notes that the bore is dry (i.e. the water level at this site is below the base of Tertiary and must occur at some depth below the base of bore);
- The green text shows the saturated thickness of sediments at each location. For Tertiary bores the number shown represents the water level above the base of Tertiary sediments. For Quaternary bores, the number show represents the water level above the interpreted base of Quaternary alluvium (e.g. at site W3, where bore MB1 is screened in the Quaternary alluvium and bore MB2 is screened in the underlying Tertiary sediments);

From review of the data shown in Figure 4-2 the following observations are made:

- At site W3, which is adjacent to Boomerang Creek, the groundwater level in the Quaternary alluvium is perched above the groundwater level in the underlying Tertiary sediments. This supports an assessment that the regional groundwater level is below the base of the alluvium and that the alluvium is likely to become dry during extended dry periods as water seeps into the underlying Tertiary sediments;
- Even for bores that are adjacent to the ephemeral creeks in the Project area (Boomerang Creek and Phillips Creek) the regional groundwater level (i.e. the water level in the Tertiary sediments) occurs at a significant depth below ground level;
- The above two observations support a conclusion that ecosystems adjacent to Boomerang Creek and Phillips Creek are unlikely to be groundwater dependent, or at least that any reliance on groundwater would be limited to seasonal availability of perched water within the shallow Quaternary alluvium;
- In the southern region of the Project area, where elevation of base of Tertiary sediments is relatively high (>RL160 mAHD, as shown by blue contour shading) the Tertiary sediments are either dry or contain a relatively small saturated thickness (i.e. ~5 m saturated thickness of groundwater above base of Tertiary); and,
- In the north of the Project area where the elevation of base of Tertiary sediments is relatively low (<RL140 mAHD, as shown by brown and green contour shading) the saturated thickness of Tertiary sediments increases to ~20 m or greater.

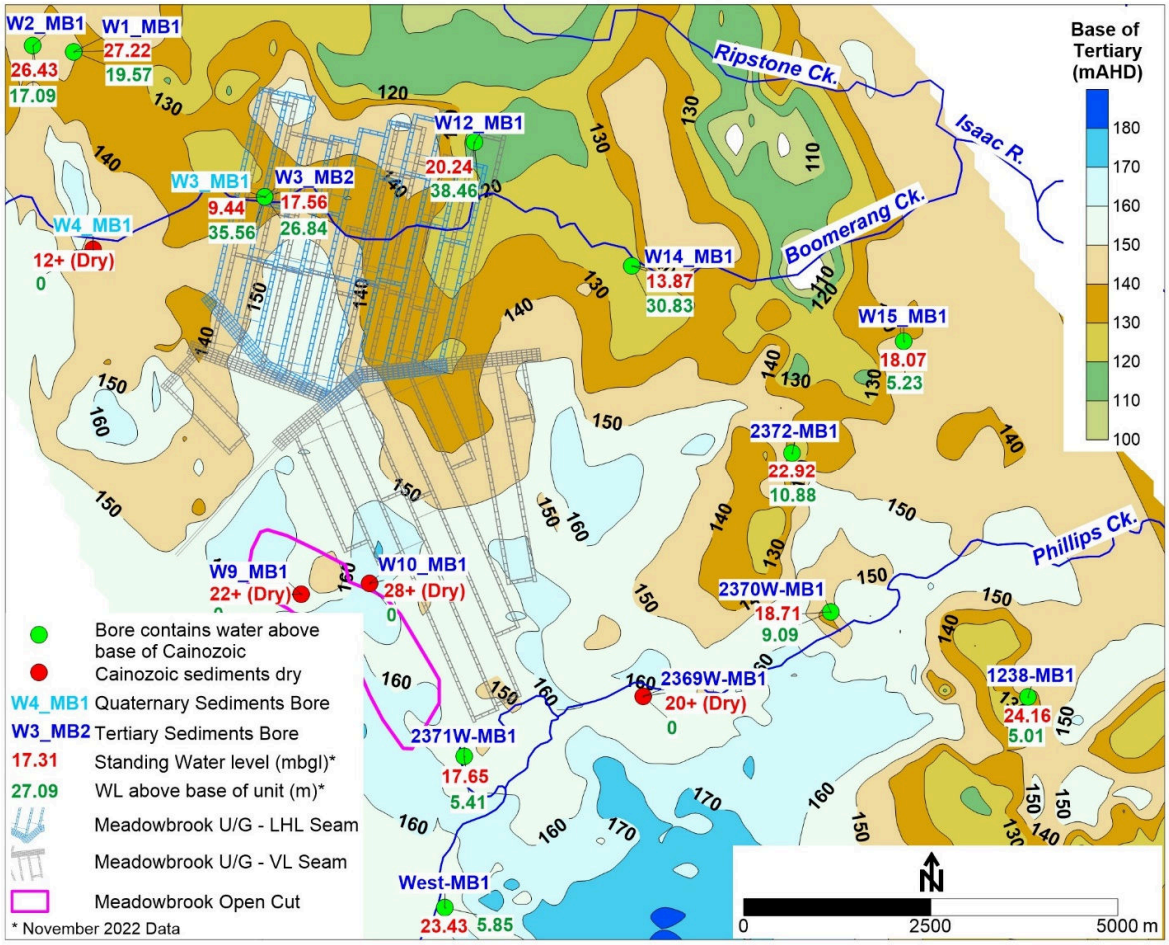


Figure 4-2: Depth to Water Table and RL Base of Tertiary Contours

4.2.1.2 Analysis of Bore Hydrographs

Groundwater level data for each of the groundwater monitoring sites shown in Figure 4-1 is shown in Figure 4-3 to Figure 4-6 (Meadowbrook bores) and Figure 4-7 to Figure 4-9 (LVN bores). Data is presented as hydrographs for all bores at each site (e.g. where a site contains nested bores in the Tertiary sediments, Rewan Group, Permian coal seams etc.) to allow assessment of the potential for vertical groundwater flow direction at each site. From this data it is observed that:

- The groundwater level trend over the period for which data is available is consistent, i.e. the water level is relatively flat and there is no evidence to date of water level variation that could be attributed to either groundwater extraction (from bores), groundwater flow to the Lake Vermont open pit, or groundwater recharge. An exception is site W11 (Figure 4-5), where the water level in bore W11-MB1 recorded a significant decrease, followed by a slow recovery (approximately 9 months) towards the initial groundwater level. It is noted that this bore was re-developed at the time when the water level decreased. During field testing of hydraulic conductivity at this site (Section 4.4.2) it was noted that the water level did not change once the slug was introduced, remaining at the same level for the 5 hours that the bore was observed. No construction issues were noted for this bore; therefore, the slow rate of recovery may be indicative of an extremely low hydraulic conductivity for this site.
- The groundwater flow direction is generally downward (i.e. there is a potential for downward flow from the Tertiary sediments to the underlying sediments) at the following locations - Meadowbrook Site 4 (Figure 4-3) and LVN sites 3 and 5 (Figure 4-7) and sites 6, 7 and 10 (Figure 4-8);

- The groundwater level is similar in all monitored groundwater units at the following Locations – Meadowbrook Sites 1 and 2 (Figure 4-3), sites 5 and 6 (Figure 4-4), sites 9 and 11 (Figure 4-5), sites 13, 14 and 15 (Figure 4-6);
- Bore W14-MB1 (Tertiary sediments) shows a degree of seasonal water level variation that is not observed at other Project monitoring sites, which is interpreted to be related to direct groundwater recharge at this location. This is consistent with other data that is discussed in this report for this site, including:
  - The bore records a significantly lower EC than is recorded at other sites, with a mean EC of 962 µS/cm (Table 5.5) compared to a mean EC for all Tertiary samples of 17,814 µS/cm (Table 4-3); and,
  - The calculated recharge at the location of W14-MB1 (based on mean chloride data and the chloride mass balance method, as discussed in Section 4.5.2) is ~3.3% of average annual rainfall, compared to ~0.08% for Tertiary aquifer overall.
- An upward potential for flow is observed at LVN sites 1 and 4 (Figure 4-7) and site 8 (Figure 4-8).

  It is noted that the potential for upward or downward flow does not necessarily translate to actual groundwater flow. For example, downward flow potential is observed at LVN site 3 (Figure 4-7). However, groundwater quality data indicates that groundwater flow is not occurring from the Tertiary sediments to the underlying Rewan Group or Permian coal measures at this location, as the electrical conductivity (EC) in the Tertiary bore (2371W-MB1) records a mean EC of 25,441 µS/cm, while the Rewan Group bore (2226-MB2) records a mean EC of 3,519 µS/cm and the underlying Permian bore (2226-MB3) records a mean EC of 9,858 µS/cm (refer discussion of water quality data in Section 4.3 and Table 4-5). Review of the bore logs for these sites (Attachment C) indicates that the bore is screened predominantly in Tertiary sands that are separated from the surface by ~10 m of clayey sediments, therefore recharge to the Tertiary sediments is likely to be low. In addition, it has been observed from drilling at site that the Tertiary sediments are generally unsaturated, only containing groundwater in areas where the base elevation of Tertiary (as mAHD) is relatively low. For this reason, it is interpreted that groundwater flow in the Tertiary is impeded by a lack of lateral hydraulic connection and at locations such as bore 2371W-MB1, where the Tertiary sediments are separated from the underlying groundwater units by low-permeability silts and clays, downward flow is also impeded. The high EC in the Tertiary sediments is interpreted to be related to a long residence time for groundwater. In addition, an interpretation of upward or downward flow potential from/to the Tertiary sediments is complicated by the generally disconnected nature of the Tertiary sediments from the other groundwater units that exist in the Project area.
- Only one bore (2183-VWP, at Site 2 in the LVN monitoring network) records a reduction in groundwater level that is interpreted to be related to mining. This bore is located approximately 1,200 m from the advancing face of the Lake Vermont open cut (approaching from the south-east of the bore – refer Figure 4-1), with the water level reduction at this site (Figure 4-7) in excess of the slight reduction in groundwater levels that is observed from other sites (and which is interpreted to be related to climatic conditions). Analysis of the full record of data for 2183-VWP shows that the groundwater level trend was consistent with data from other sites up to mid-2018, at which point an increased rate in water level reduction is observed that is interpreted to be related to mining at Lake Vermont Mine. Site personnel advise that, in June 2018, the crest of the open cut was 1,700 m from 2183-VWP. This gives an indication of the extent of drawdown in the coal seam groundwater unit due to open cut mining.
- The groundwater level in the Vermont Seam in bore 1235C-VWP (Figure 4-9) is significantly lower than is observed in other monitoring bores, or in overlying VWP's within the same borehole. From Figure 4-1

it is observed that 1235C-VWP is located adjacent to a fault, and it is interpreted that the difference in water level may be related to fault impacts at this site. This observation will make the calibration of groundwater model data to this water level difficult, as a regional groundwater model is unlikely to be able to account for this magnitude of water level variation in the absence of other supporting data (e.g. fault properties) that would assist the calibration. This is not regarded as a significant impediment to the calibration of the groundwater model, but is noted as data for this site could potentially be weighted down for the purpose of calculating calibration statistics in the groundwater model.

4.2.2 Groundwater Flow Direction

Groundwater level contours (as mAHD) are presented as follows:

- Groundwater level contours for the Tertiary sediments are presented in Figure 4-10;
- Groundwater level contours for the Leichhardt coal seam are presented in Figure 4-11;
- Groundwater level contours for the Vermont coal seam are presented in Figure 4-12;

The extent of contours has been clipped to the available data. In the case of data for the Leichhardt and Vermont coal seams, the contours were prepared as follows:

- The contours were clipped to the extent of the coal seams, taking into account the dip of the strata (i.e. the Leichhardt and Vermont coal seams do not exist to the west of the underground mining area due to the dip of the strata - refer Figure 3-7) as well as faulting (such as the Isaac Fault) that truncates the strata (refer Figure 4-11, Figure 4-12 and Figure 3-7);
- The contours were prepared using the program Surfer (Golden Software 2021), using the locations of known faults as limits to the gridding of data from bores within different structural regimes. The locations of the distinct gridding/contouring zones is evident from Figure 4-11 and Figure 4-12.

From review of the figures the following observations are made:

- Tertiary sediments:
  - The general groundwater flow direction for the Tertiary sediments is from west to east, i.e. generally following topography and draining towards existing surface water features such as the Isaac River.
  - The Tertiary is not a laterally continuous unit in terms of the extent of saturation. Therefore, the contours are interpreted to be useful in providing an overall sense of flow direction from west to east, but should not be interpreted as indicating a continuously saturated groundwater unit.
- Permian Coal Measures
  - The general flow direction for the Permian coal seams is also from west to east, i.e. from the groundwater recharge areas where the coal seams subcrop beneath Tertiary sediments (refer also Figure 3-7 for cross-sectional representation of the strata) towards areas where the seams truncate, e.g. by the Isaac Fault. Where the coal seams are truncated, it is conceptualised that groundwater flow will be driven either upwards or laterally along the fault and into groundwater units that continue from west to east (e.g. the block of Fort Cooper Coal Measures shown in Figure 4-11 and Figure 4-12 also contains coal seams that may act as conduits for groundwater flow). In general, the groundwater flow direction within the coal seams is interpreted to be from west to east, consistent with the general topographic trend.
  - It is evident from the hydrograph for bore 2183-VWP (Figure 4-7) that the existing Lake Vermont mine is acting as a sink for groundwater flow within the coal seams, i.e. there is a component of groundwater flow that is southwards towards the Lake Vermont open pit. This phenomenon was introduced to the contour data in Figure 4-11 and Figure 4-12 by placing “dummy” points around the perimeter of the Lake Vermont pit at the elevation of the base of the coal seams in the pit wall.

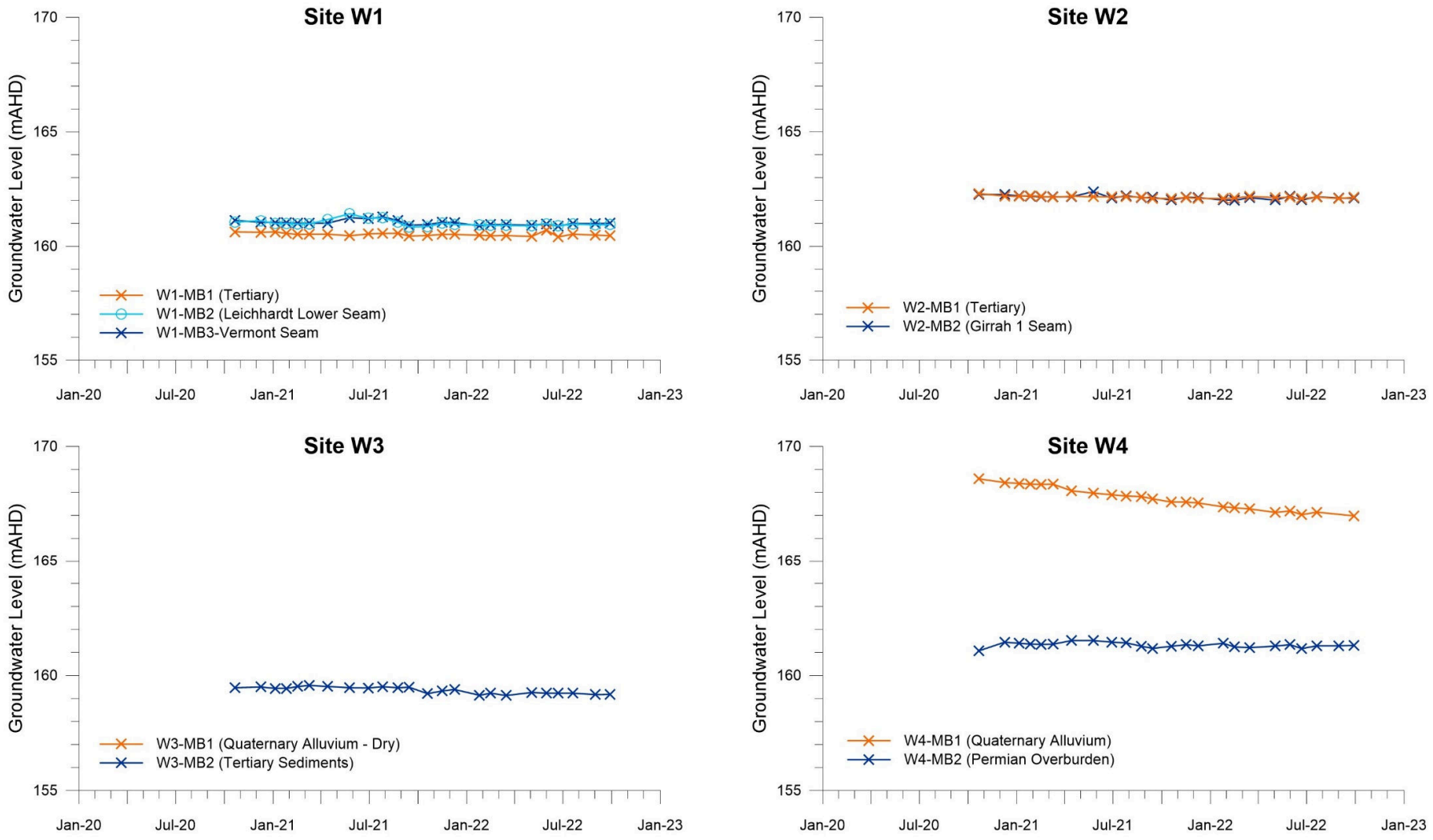


Figure 4-3: Groundwater level Data for Meadowbrook Bores at Sites W1 to W4

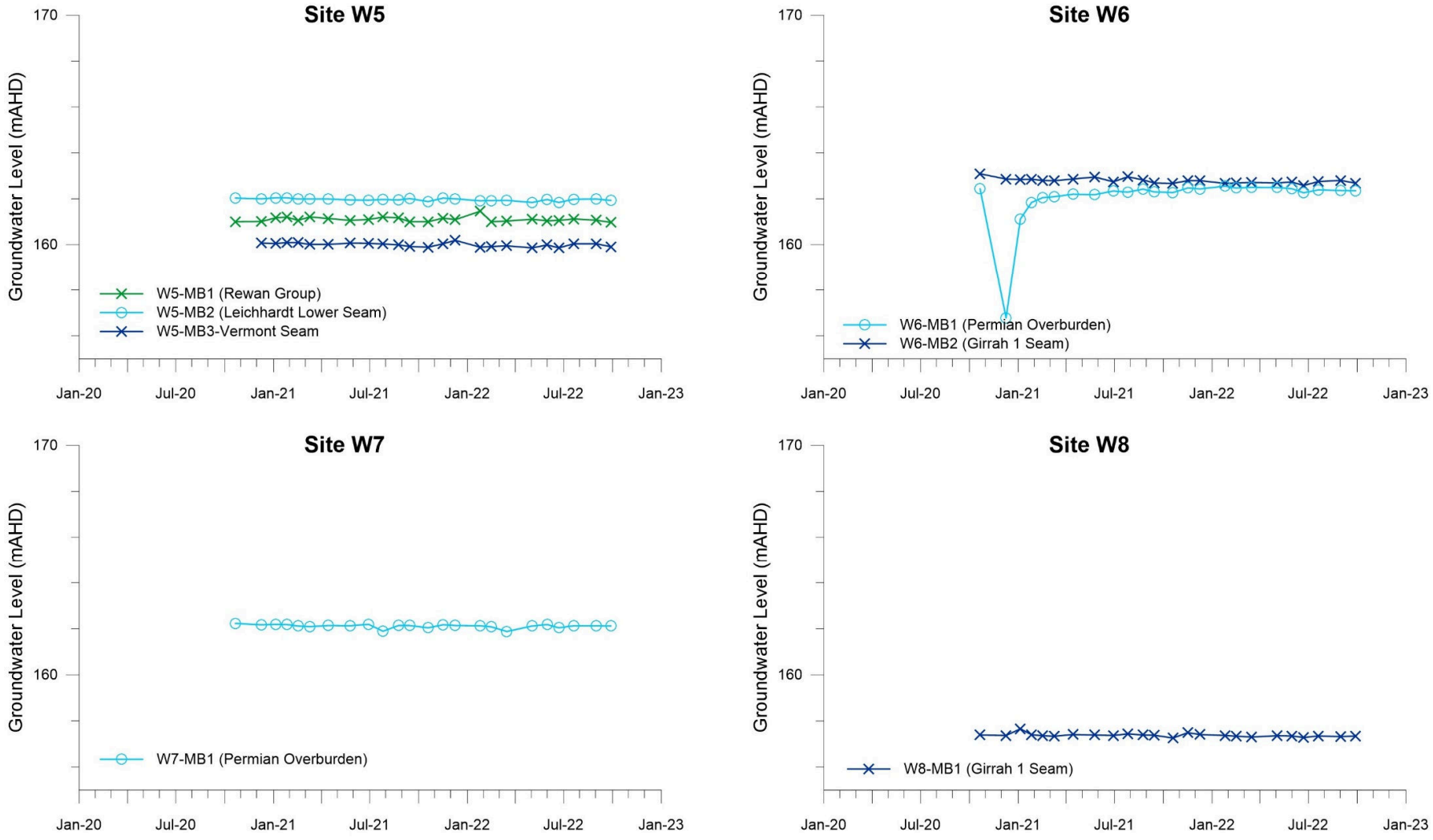


Figure 4-4: Groundwater level Data for Meadowbrook Bores at Sites W5 to W8

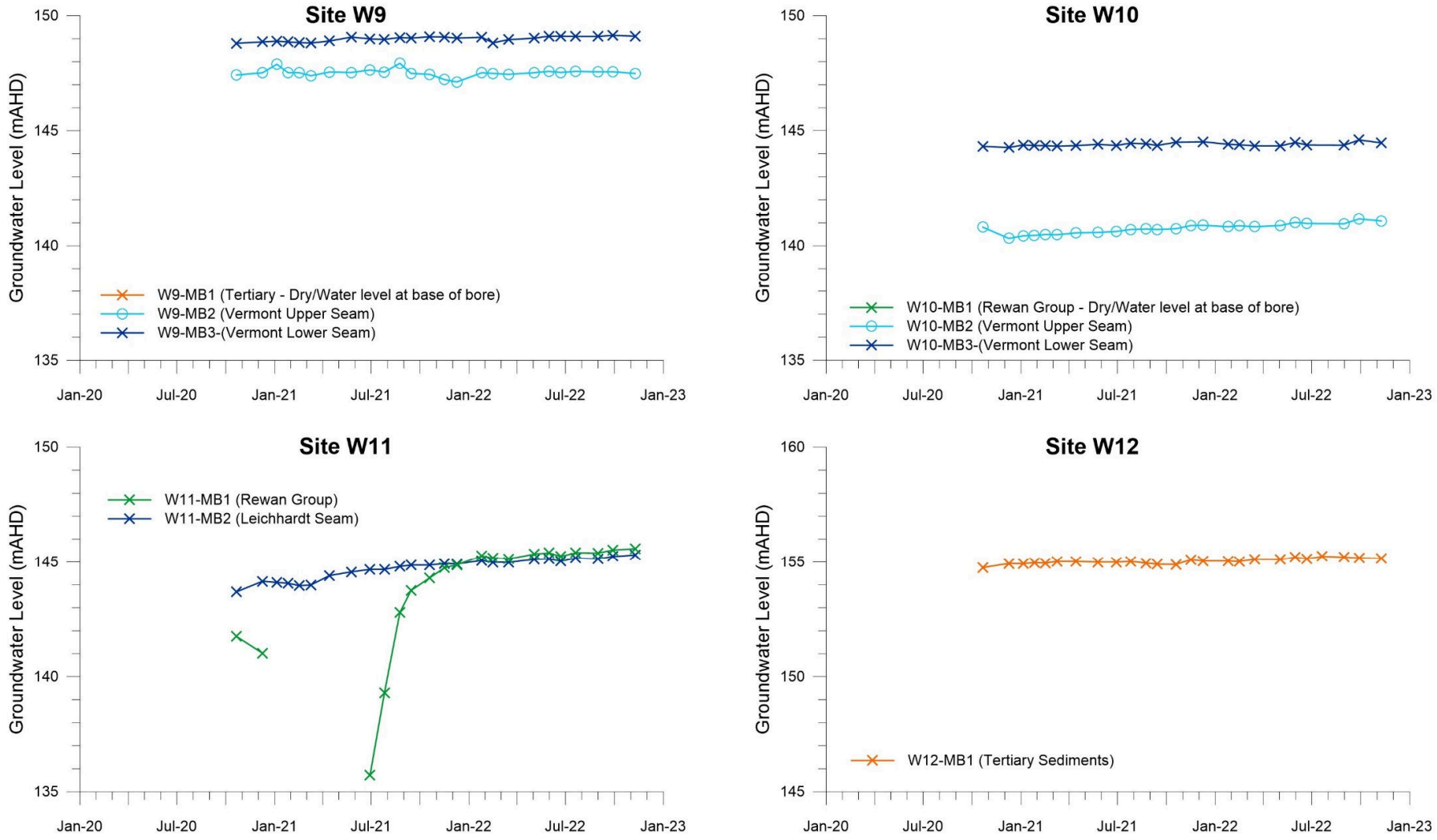


Figure 4-5: Groundwater level Data for Meadowbrook Bores at Sites W9 to W12

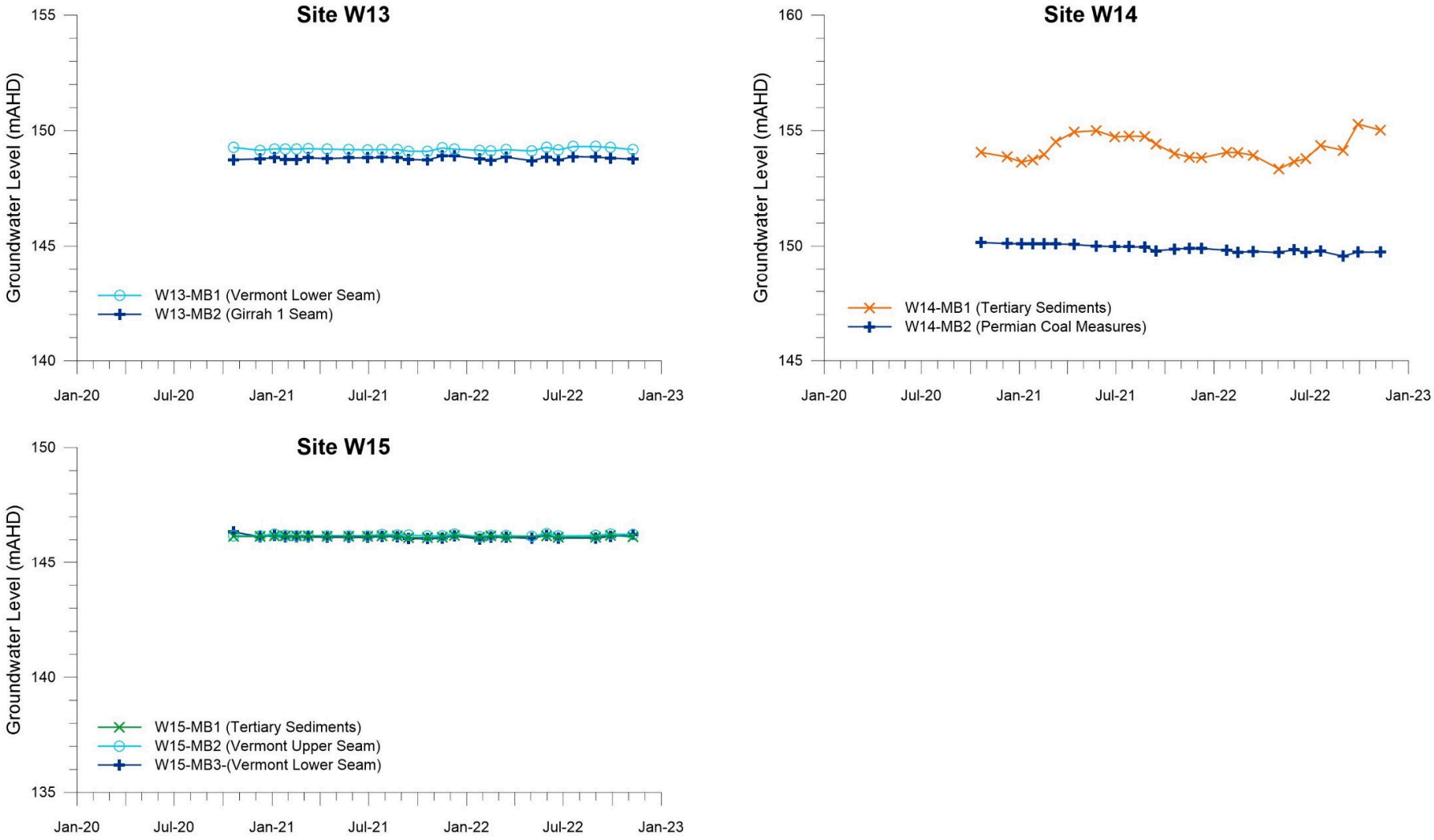


Figure 4-6: Groundwater level Data for Meadowbrook Bores at Sites W13 to W15

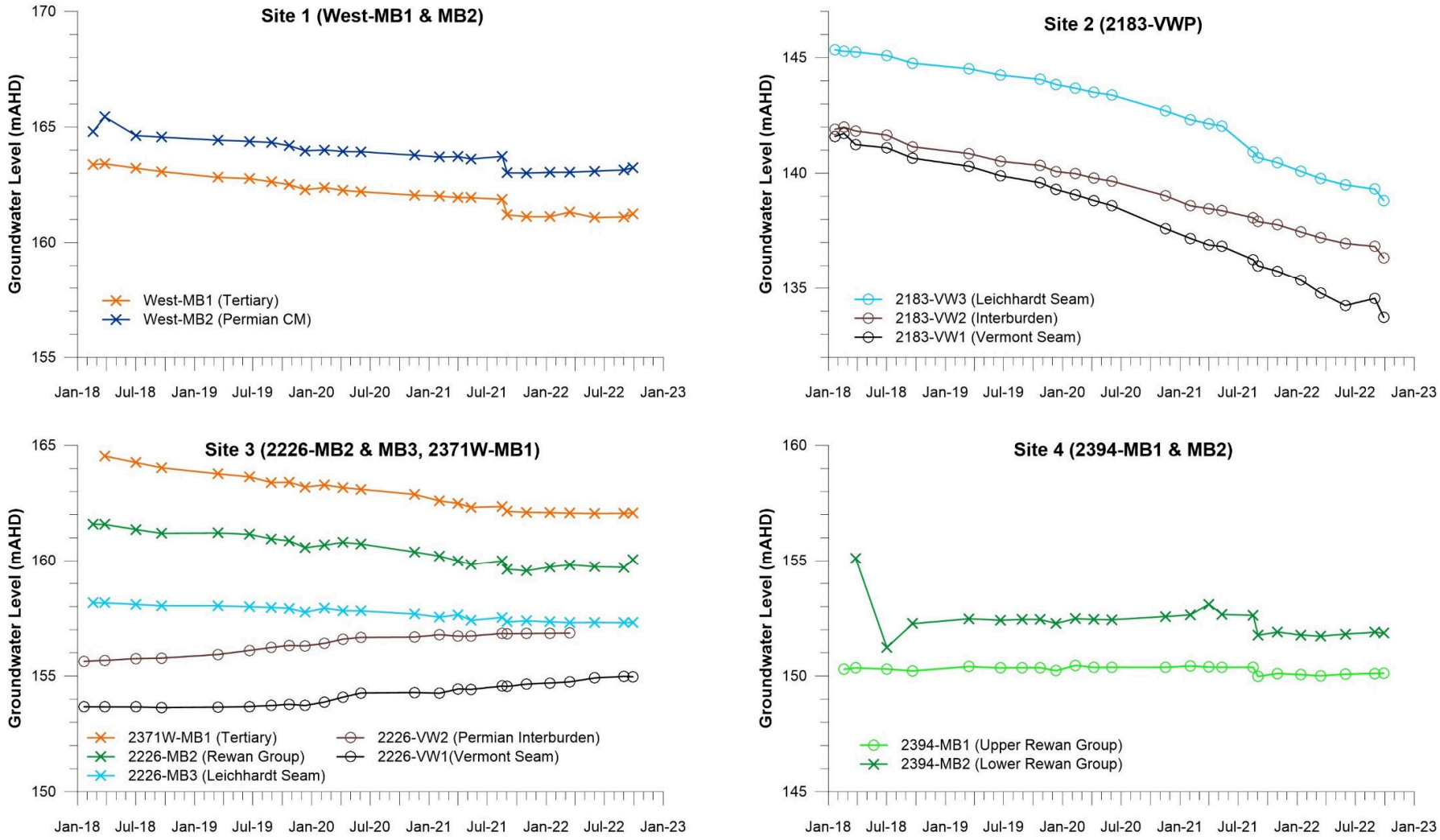


Figure 4-7: Groundwater level Data for LVN Bores at Sites 1 to 4

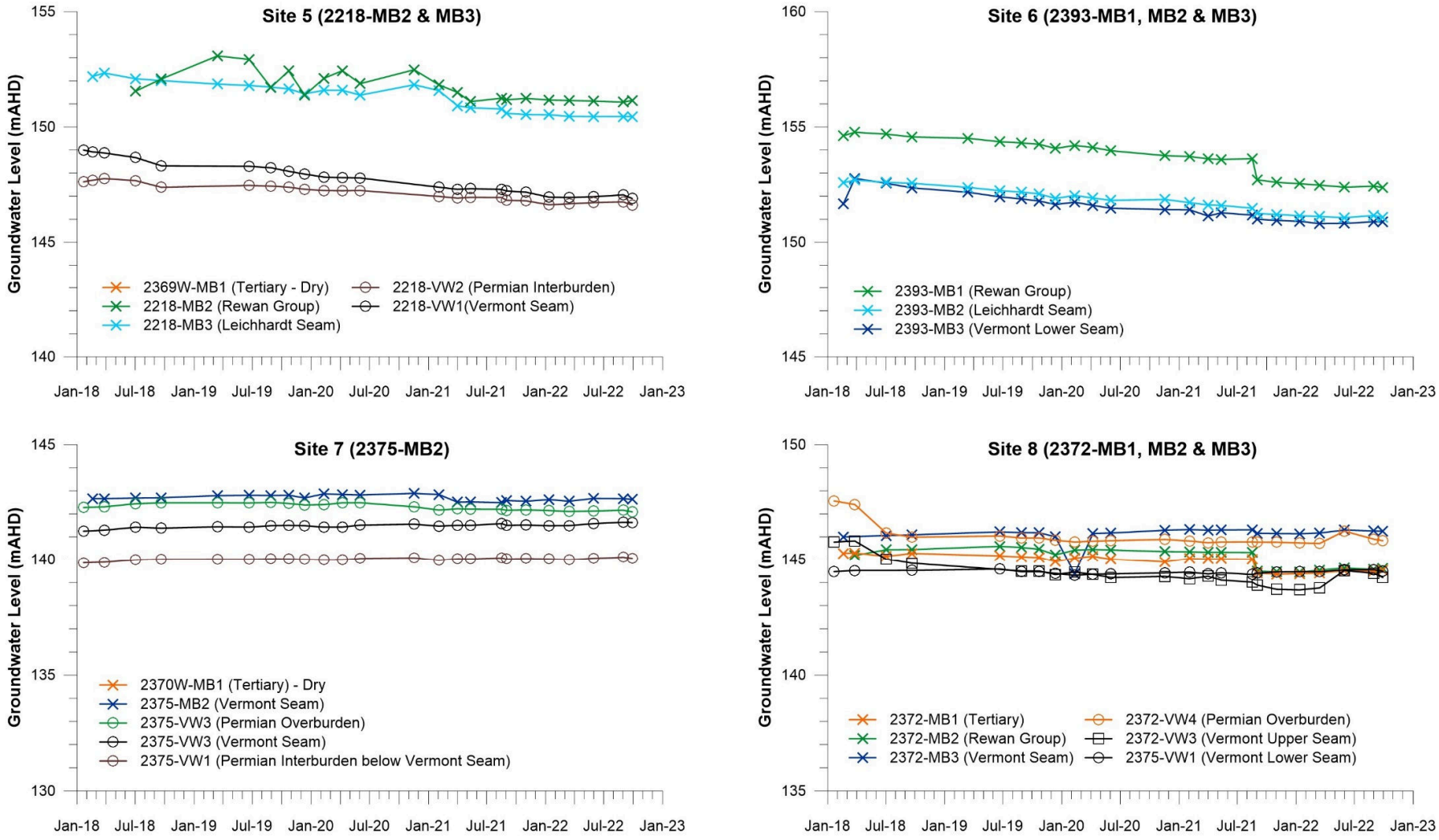


Figure 4-8: Groundwater level Data for LVN Bores at Sites 5 to 8

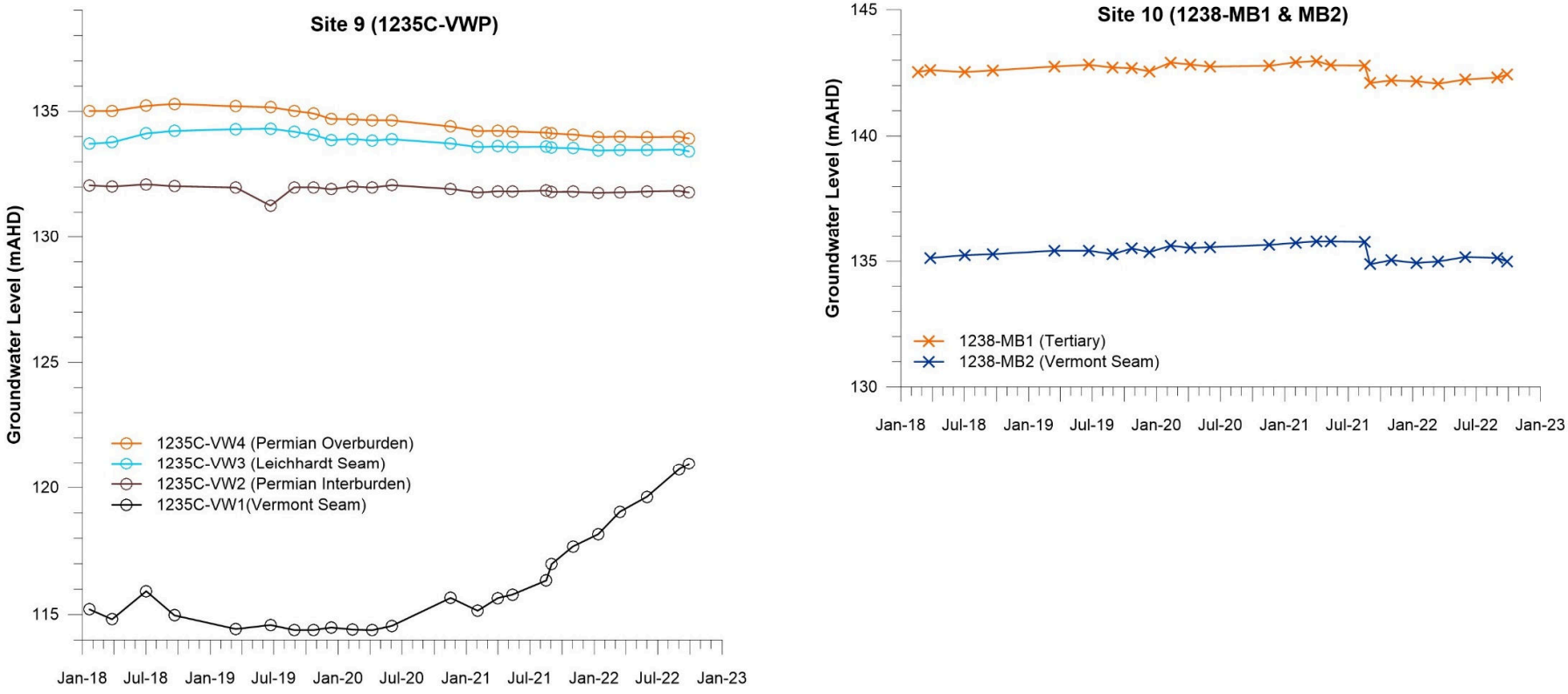


Figure 4-9: Groundwater level Data for LVN Bores at Sites 9 & 10

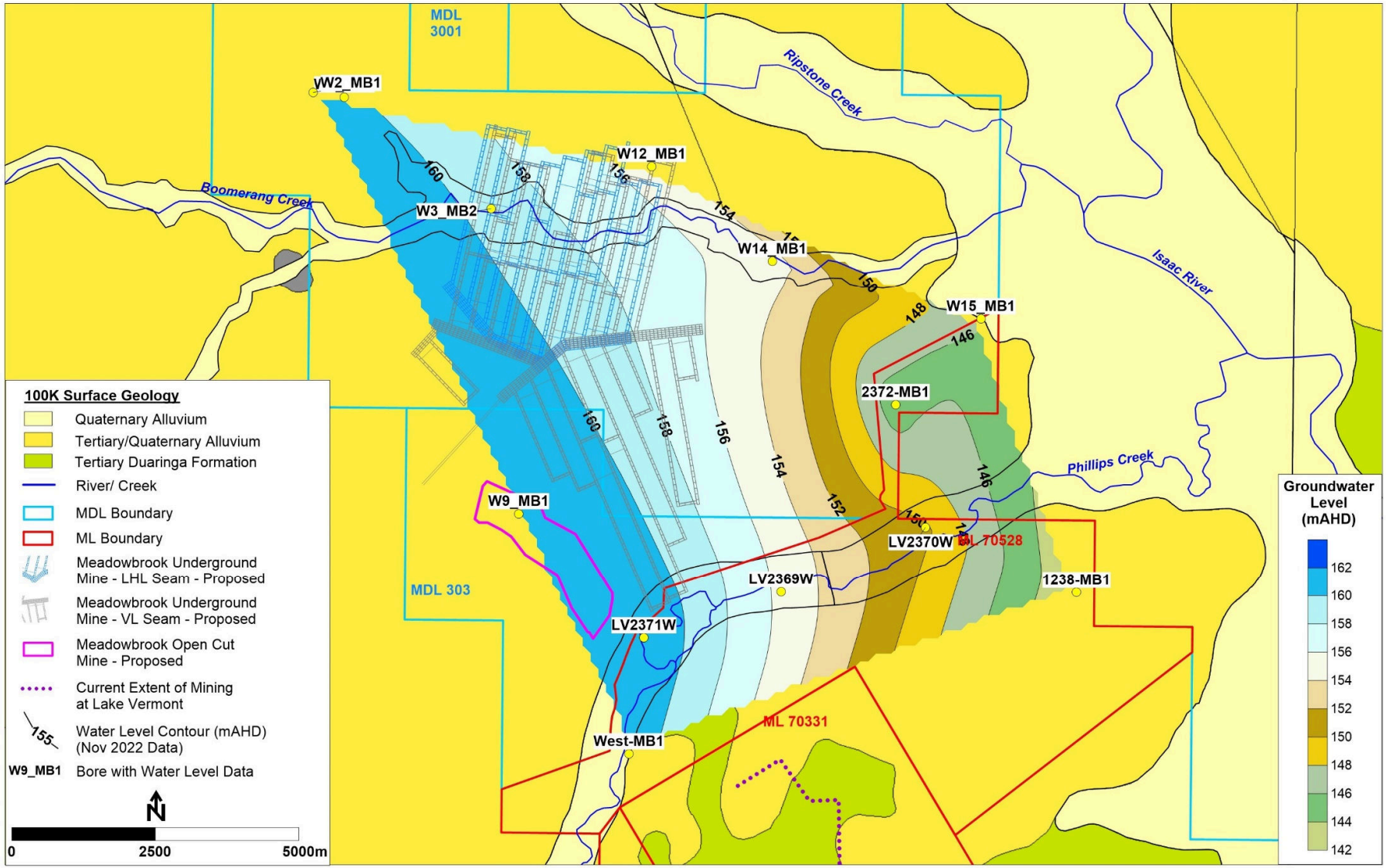


Figure 4-10: Groundwater Level Contours – Tertiary Sediments

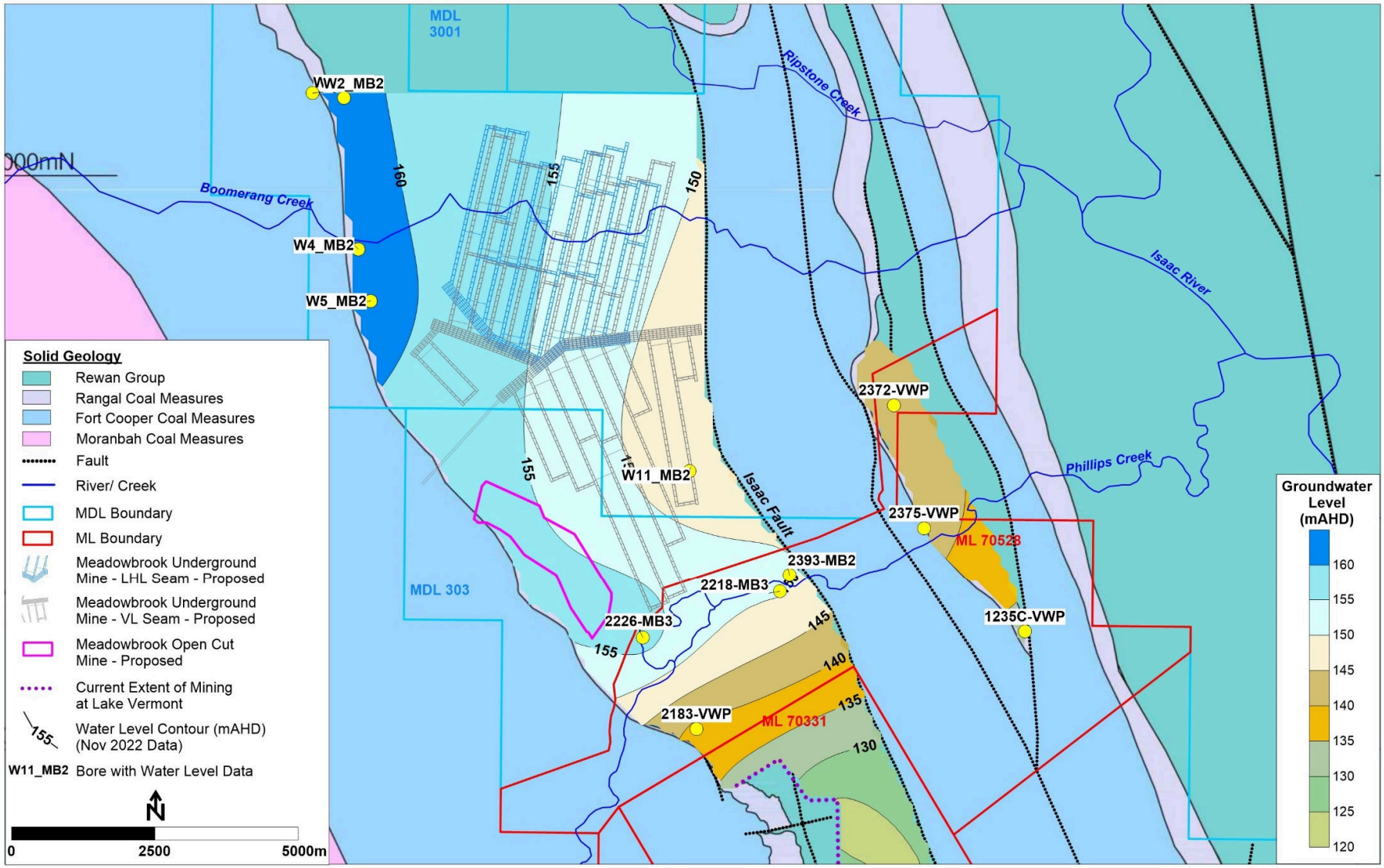


Figure 4-11: Groundwater Level Contours (mAHD) – Leichhardt Seam

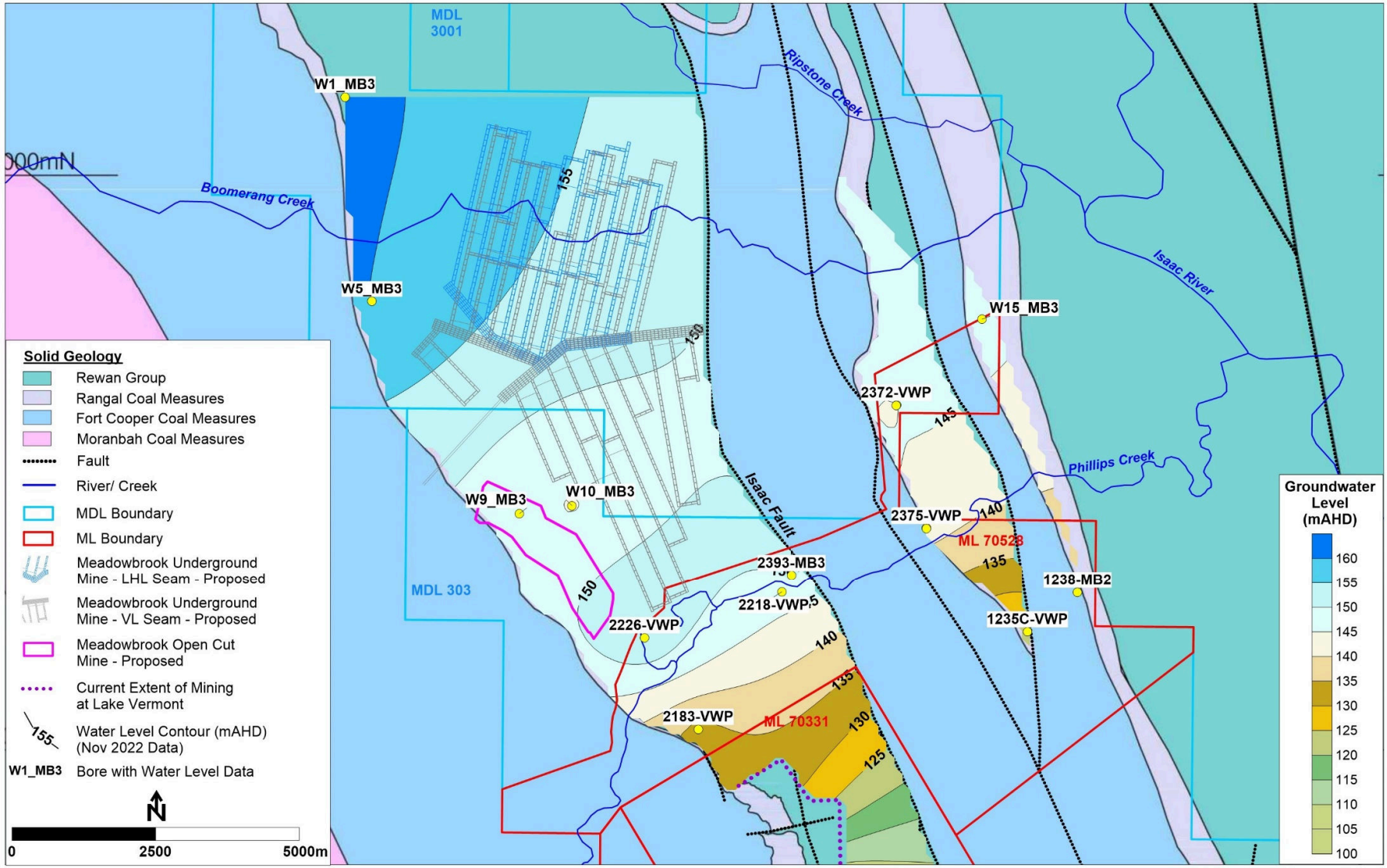


Figure 4-12: Groundwater Level Data (mAHD) – Vermont Seam

4.3 Groundwater Quality

4.3.1 Available Data

Groundwater level and quality monitoring has been undertaken to date from Meadowbrook Project groundwater monitoring bores at monthly intervals for the purpose of establishing a baseline water level and water quality data set. Groundwater monitoring commenced at the Project site in October 2020, following construction of site monitoring bores in March-April 2020. The data set utilised for this report comprises monthly data from 24 monitoring events between October 2020 and September 2022, with data available or the following parameters:

- Laboratory and field pH and electrical conductivity (EC);
- Major ions (sodium, calcium, magnesium, potassium, chloride, sulphate, alkalinity);
- Total and dissolved metals/metalloids (aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, uranium, vanadium, zinc); and,
- Total petroleum hydrocarbons (TPH)

In addition, groundwater quality data is available from the adjacent Lake Vermont North (LVN) Project from monitoring bores that are installed within the same groundwater units as occur at Meadowbrook, for the same parameters listed above, from 24 sampling events between February 2018 and September 2022.

Groundwater quality data is discussed in the sections below, with all available data also presented in:

- Attachment D-1 – Meadowbrook major ion/ pH/ EC data;
- Attachment D-2 - LVN major ion/ pH/ EC data;
- Attachment D-3 – Meadowbrook dissolved metal/metalloid data;
- Attachment D-4 – LVN dissolved metal/metalloid data;
- Attachment D-5 – Meadowbrook total metal/metalloid data; and,
- Attachment D-6 – LVN total metal/metalloid data.

4.3.2 EC Data and Summary Major Ion Statistics

Summary groundwater quality data is presented in the following tables:

- Table 4-3, which includes average (mean) water quality data for pH, electrical conductivity (EC) and major ion parameters calcium, magnesium, sodium, potassium, chloride, sulphate and total alkalinity; and,
- Table 4-4, which includes median data for the same parameters as discussed above.

Both mean and median data is presented to highlight the statistical variability in the data, where a significant difference between mean and median values is reflective of the mean data being skewed by results that are generally from one bore. For example:

- The mean value for EC in Tertiary sediments at Meadowbrook is 17,814 µS/cm, whereas the median value is 19,523 µS/cm. Figure 4-14 shows a box and whisker plot for EC data from groundwater monitoring bores. From this figure it is evident that the mean data is being skewed by data for bore W14_MB1, which records a mean EC <1,000 µS/cm, compared to all other bores where the mean EC is >10,000 µS/cm;
- The mean value for EC in Rewan Group sediments at Meadowbrook is 23,382 µS/cm, compared to a median of 23,905 µS/cm (i.e. the mean and median of the data are similar). At LVN the mean EC is 19,725 µS/cm, whereas the median value is 23,459 µS/cm. From the box and whisker plot for EC (Figure 4-14), it is evident that the difference between mean and median EC values is related to data

from bore 2226-MB2, where the EC range is ~3,000 to 4,000 µS/cm, compared to other sites where the EC is generally >20,000 µS/cm.

The variability in mean EC value across the Meadowbrook and LVN project areas is shown in Figure 4-13, which shows a classed EC plot (i.e. data represented as coloured symbols for different EC ranges) as well as Table 4-5 and Table 4-6, which presents the mean EC value for each monitoring bore site at Meadowbrook and LVN respectively. Observations from Figure 4-13 include:

- For groundwater monitoring sites at Meadowbrook, the mean EC is >20,000 µS/cm at the majority of sites, and >10,000 µS/cm (but less than 20,000 µS/cm) at sites W6_MB1, W4_MB2 and W3_MB2;
- One Tertiary bore at Meadowbrook (W14_MB1) records a distinctly lower EC (mean value of 962 µS/cm – refer also Table 4-5);
- AT the LVN site the majority of sites record an EC >10,000 µS/cm, with a number of sites recording an EC >20,000 µS/cm;
- At a number of sites the EC is distinctly lower, with these sites interpreted to be influenced by recharge from Phillips Creek. Sites include:
    - Site 1 (West-WB1 and West-MB2), where the mean EC is 3,081 µS/cm for the Tertiary bore and 3,583 µS/cm for the deeper Permian coal measures bore.
    - Site 3, where the Rewan Group bore (2226-MB2) records a mean EC of 3,519 µS/cm and the underlying Permian sediments bore (2226-MB3) records and mean EC of 9,858 µS/cm. As noted above in Section 4.2.1.2, the Tertiary bore at this location (2371W-MB1) records a mean EC of 25,441 µS/cm and it is interpreted that the Tertiary at this site is hydraulically isolated from the underlying Rewan Group sediments by impermeable clays. It is interpreted that the Rewan Group at this site is recharged by flow in Phillips Creek, most likely at a location where the Tertiary sediments are sandier, or the Quaternary alluvium is thicker, allowing a more direct connection to the underlying sediments. At the location of Tertiary bore 2371W-MB1 it is interpreted that the sands where the bore is screened are separated from the surface by low-permeability clays, resulting in a high residence time for groundwater in the Tertiary at this location.
    - It is noted that, across both the Meadowbrook and LVN sites, the Tertiary sediments record some of the highest EC on site. This supports an interpretation of a Tertiary groundwater unit that is variably saturated, does not contain continuous lateral flow paths, and has a poor hydraulic connection with the underlying sediments.

Graphs showing EC data for each bore site are shown below as Figure 4-15 to Figure 4-18 (Meadowbrook monitoring bores) and Figure 4-19 to Figure 4-20 (LVN monitoring bores)

Table 4-3: Average Groundwater Quality Data –pH, EC, Major Ions

Groundwater Unit	No. of Samples	pH (Field)	EC (field)*	Ca*	Mg*	Na*	K*	Cl*	SO_4*	Alk.*
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Meadowbrook Groundwater Monitoring Bores										
Tertiary	95	6.43	17814	254	474	3509	37	6451	808	462
Rewan	47	6.75	23382	481	481	4365	26	8158	855	479
Permian	482	7.52	29540	646	780	5414	30	10659	1053	407
Lake Vermont North (LVN) Groundwater Monitoring Bores										
Tertiary	94	6.61	21168	471	846	3414	4	6499	1526	1173
Rewan	143	6.72	19725	343	509	3397	7	6526	459	701
Permian	189	6.67	14668	282	334	2502	9	4825	301	597
Combined Meadowbrook & LVN Data										
Tertiary	189	6.52	19482	361	658	3462	22	6474	1163	814
Rewan	190	6.73	20629	377	502	3636	12	6930	568	646
Permian	671	6.78	25345	544	655	4597	24	9022	834	460

* EC = Electrical Conductivity, Ca = Calcium, Mg = Magnesium, Na – Sodium, K = Potassium, Cl = Chloride, SO_4 = Sulphate, Alk. = Total Alkalinity

Table 4-4: Median Groundwater Quality Data –pH, EC, Major Ions

Groundwater Unit	No. of Samples	pH (Field)	EC (field)*	Ca*	Mg*	Na*	K*	Cl*	SO_4*	Alk.*
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Meadowbrook Groundwater Monitoring Bores										
Tertiary	95	6.52	19523	324	625	3275	41	6770	971	467
Rewan	47	6.73	23905	407	474	4370	30	8010	1460	524
Permian	482	6.61	28230	599	765	5355	27	10250	1060	465
Lake Vermont North (LVN) Groundwater Monitoring Bores										
Tertiary	94	6.48	19740	277	682	2430	4	6285	550	577
Rewan	143	6.79	23459	279	410	4010	6	7920	355	685
Permian	189	6.68	13805	304	291	1875	8	4565	290	552
Combined Meadowbrook & LVN Data										
Tertiary	189	6.52	19523	324	637	3210	8	6465	962	511
Rewan	190	6.78	23759	353	423	4100	12	7990	356	561
Permian	671	6.62	25097	486	654	4465	20	9020	901	484

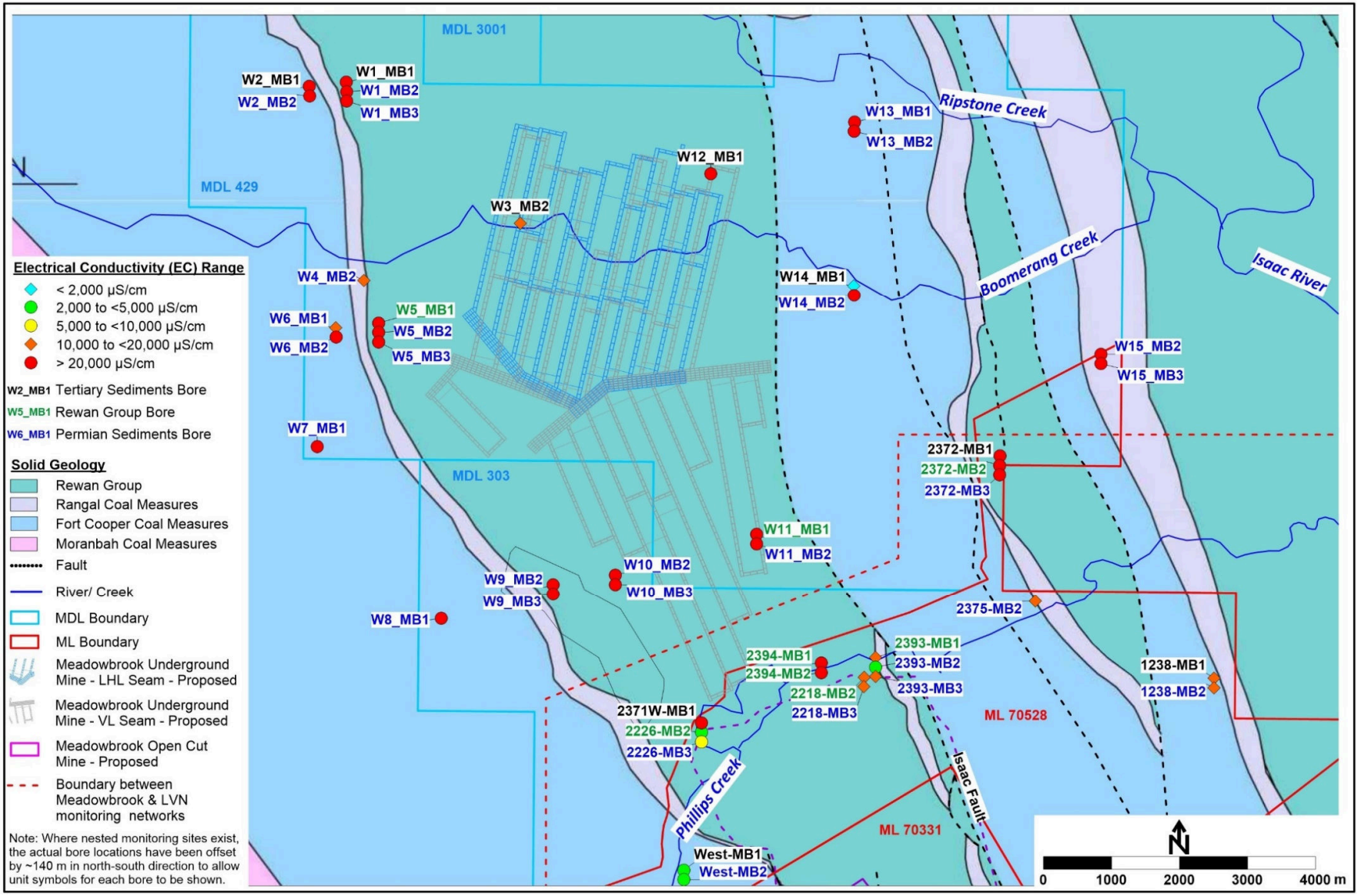


Figure 4-13: Mean Electrical Conductivity (EC) Range – Meadowbrook and LVN Data

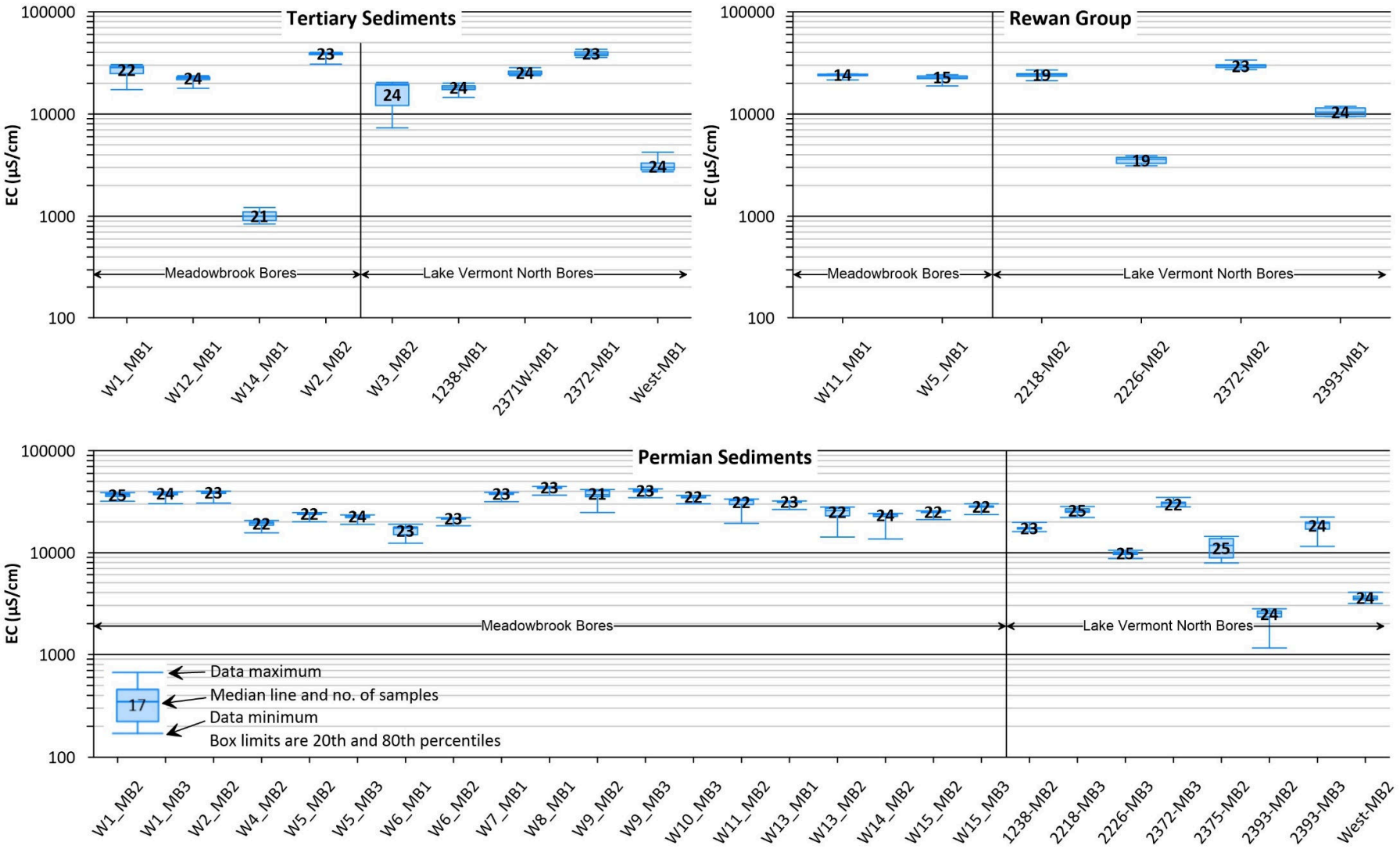


Figure 4-14: Box & Whisker Plots for Electrical Conductivity (EC) Data – Meadowbrook and LVN

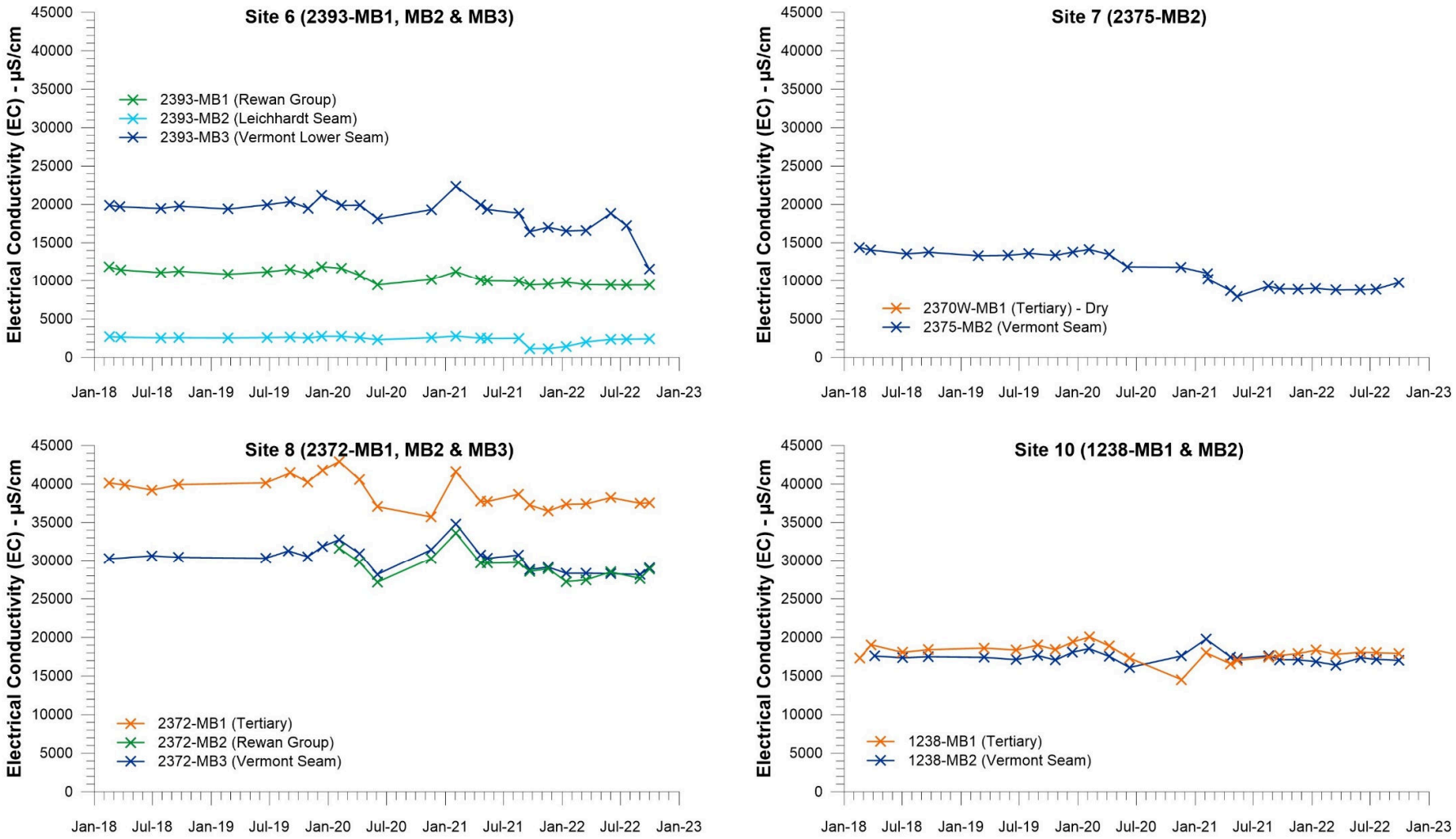


Figure 4-15: Electrical Conductivity (EC) Graphs for Meadowbrook Bores – Sites W1 to W4

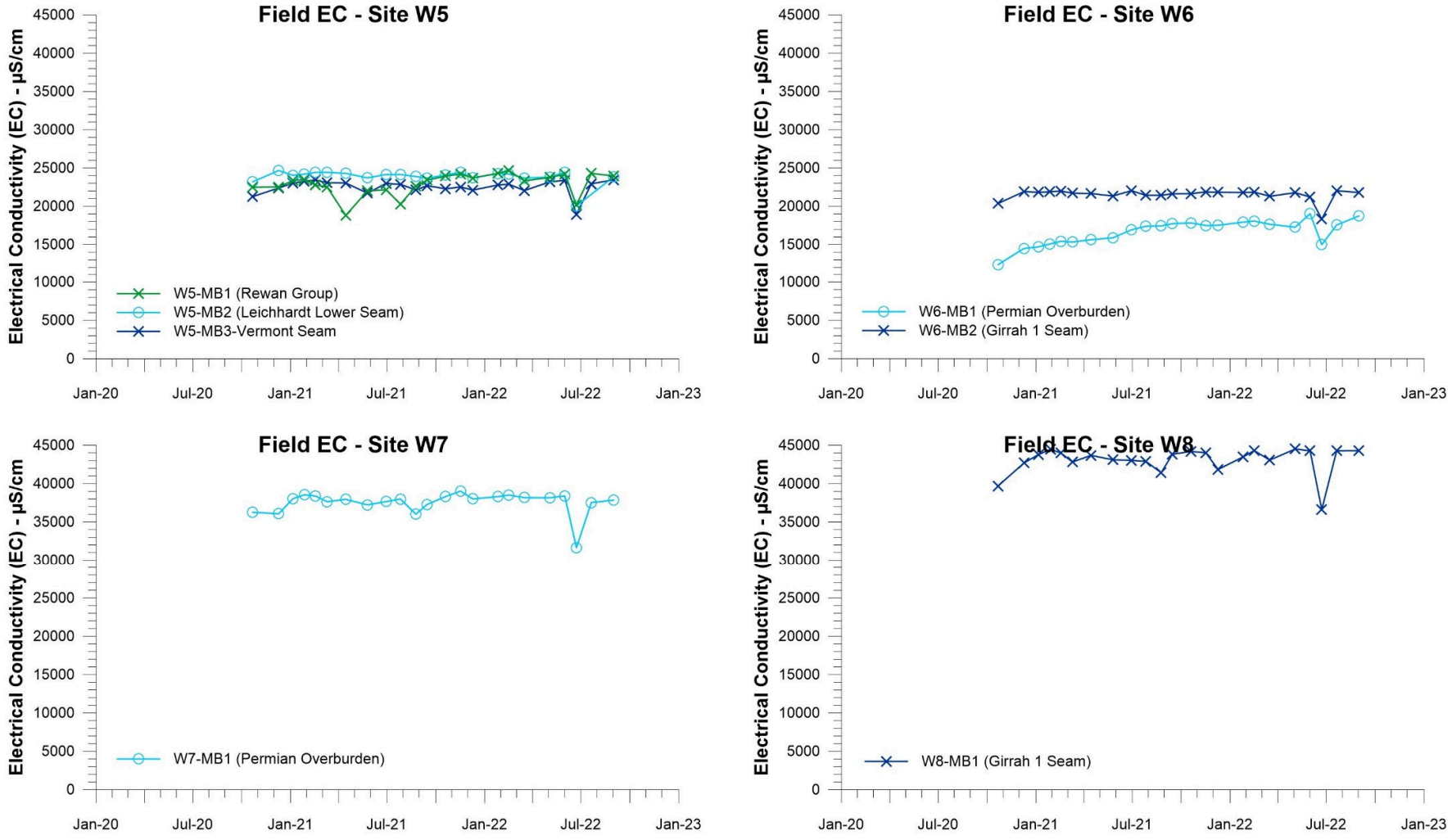


Figure 4-16: Electrical Conductivity (EC) Graphs for Meadowbrook Bores – Sites W5 to W8

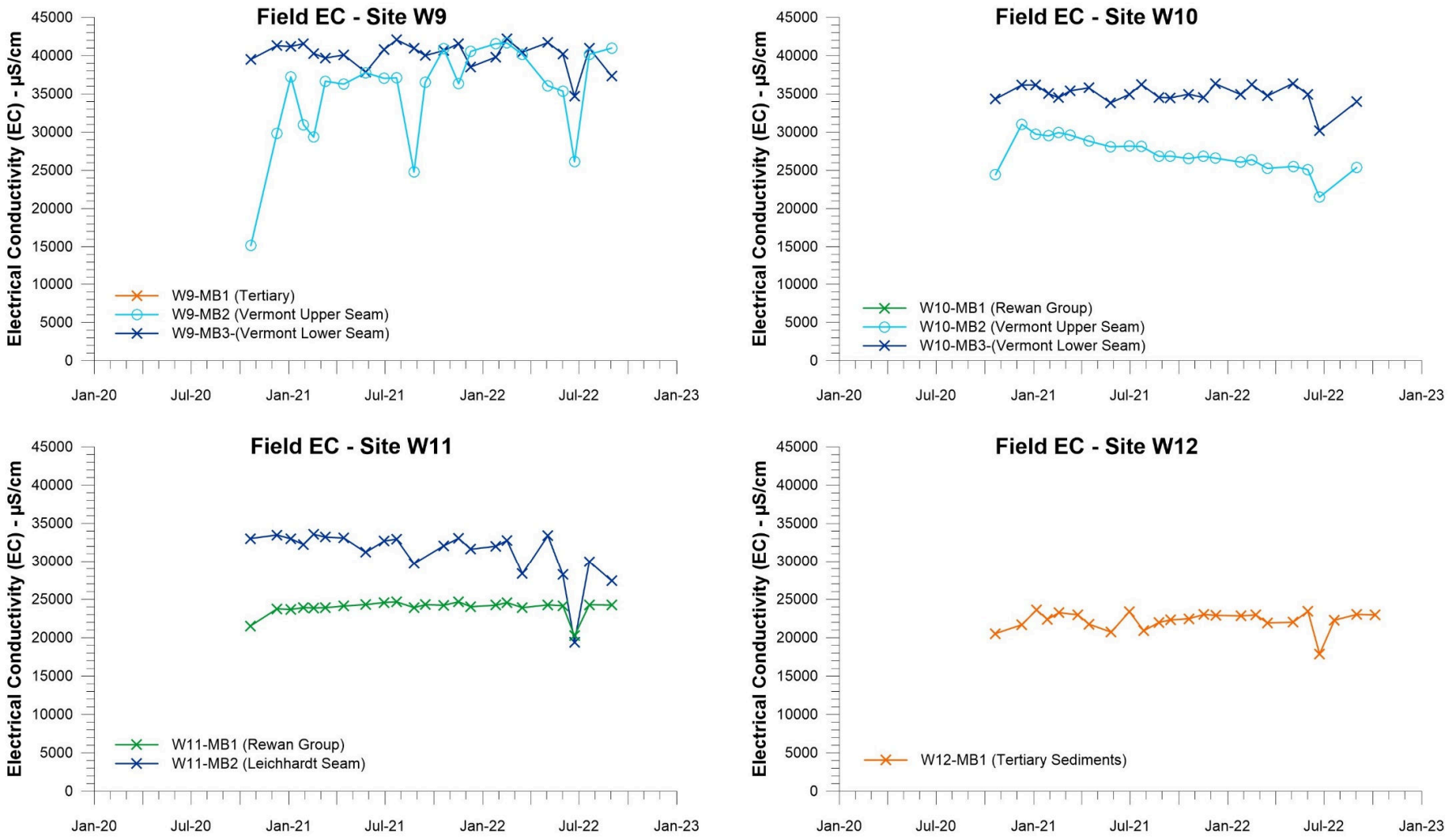
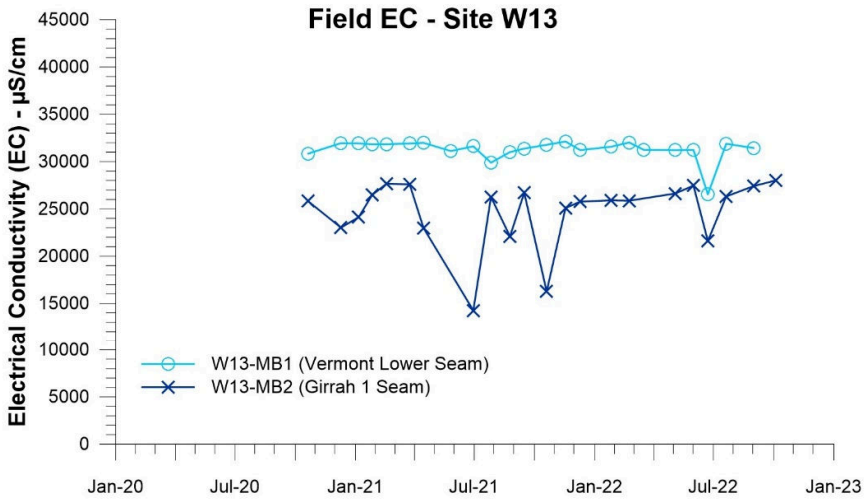
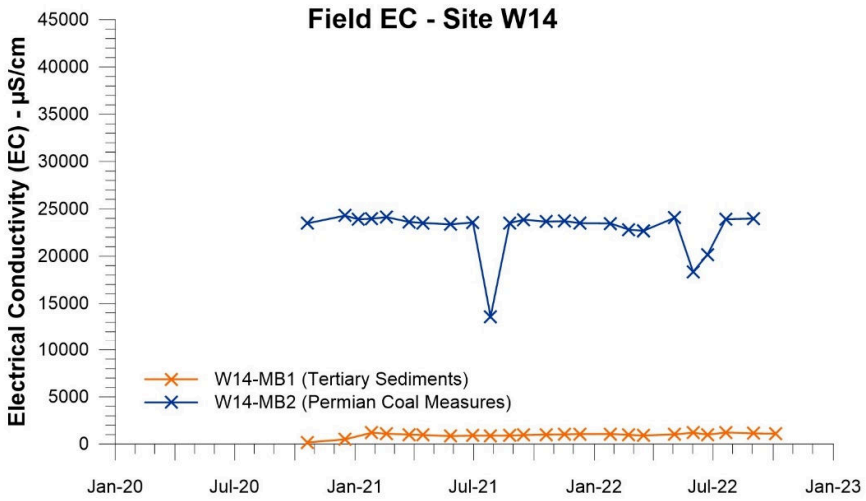


Figure 4-17: Electrical Conductivity (EC) Graphs for Meadowbrook Bores – Sites W9 to W12





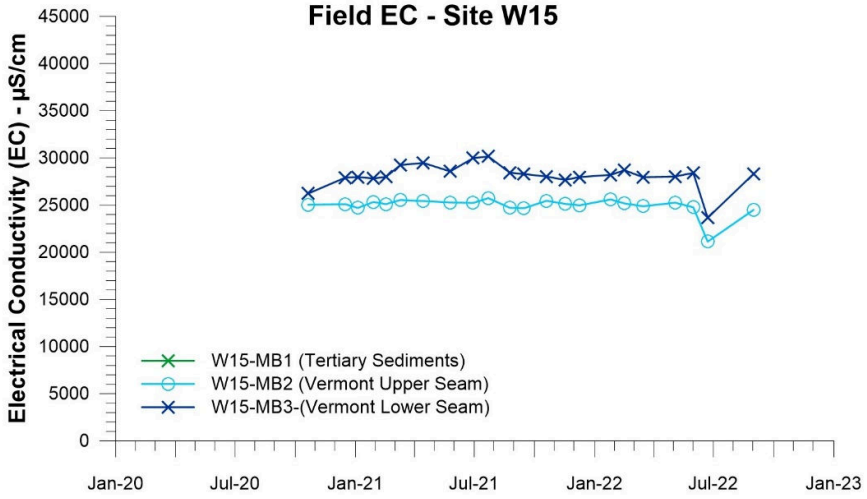


Figure 4-18: Electrical Conductivity (EC) Graphs for Meadowbrook Bores – Sites W13 to W15

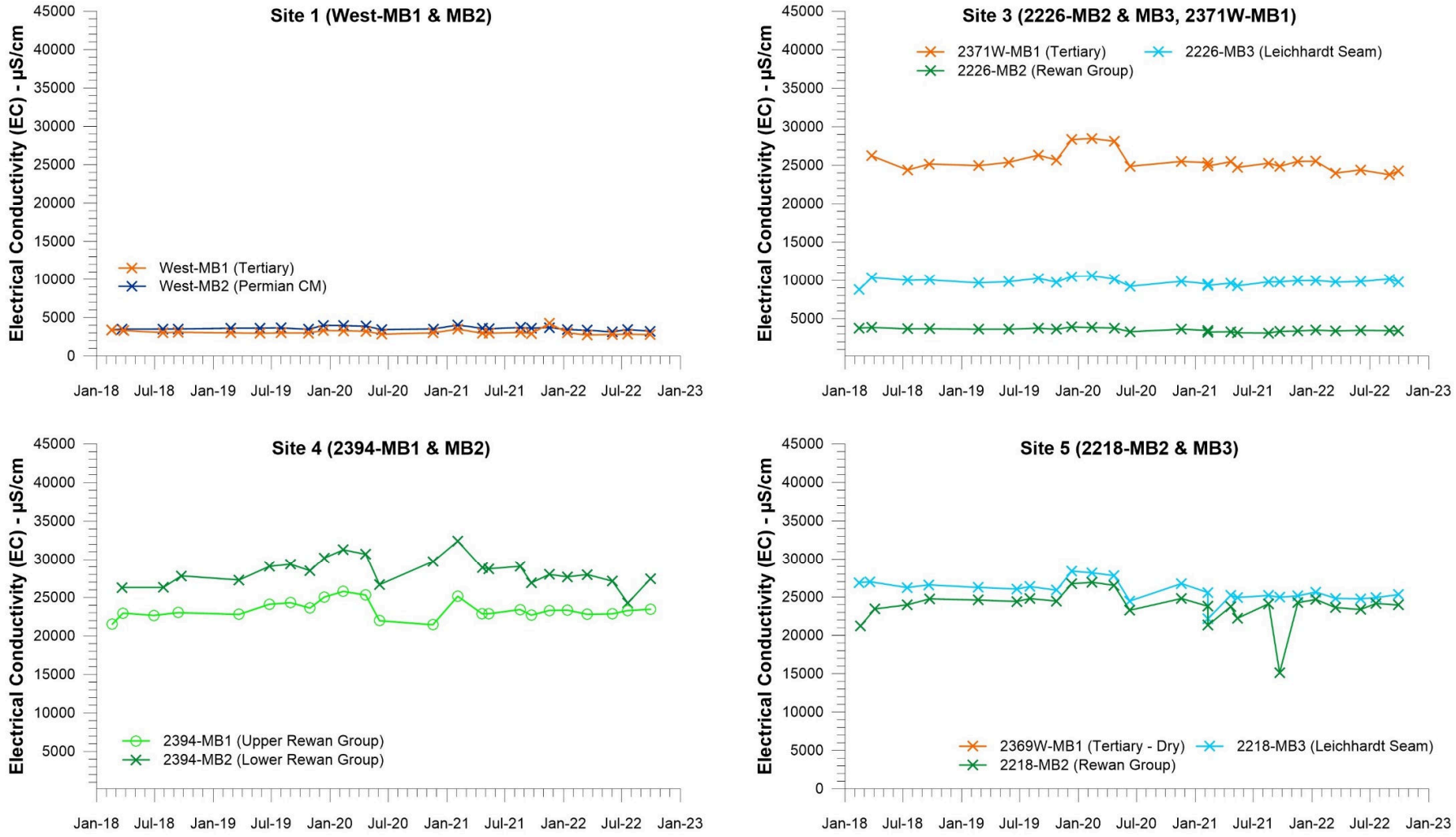


Figure 4-19: Electrical Conductivity (EC) Graphs for LVN Bores – Sites 1, 3, 4 & 5

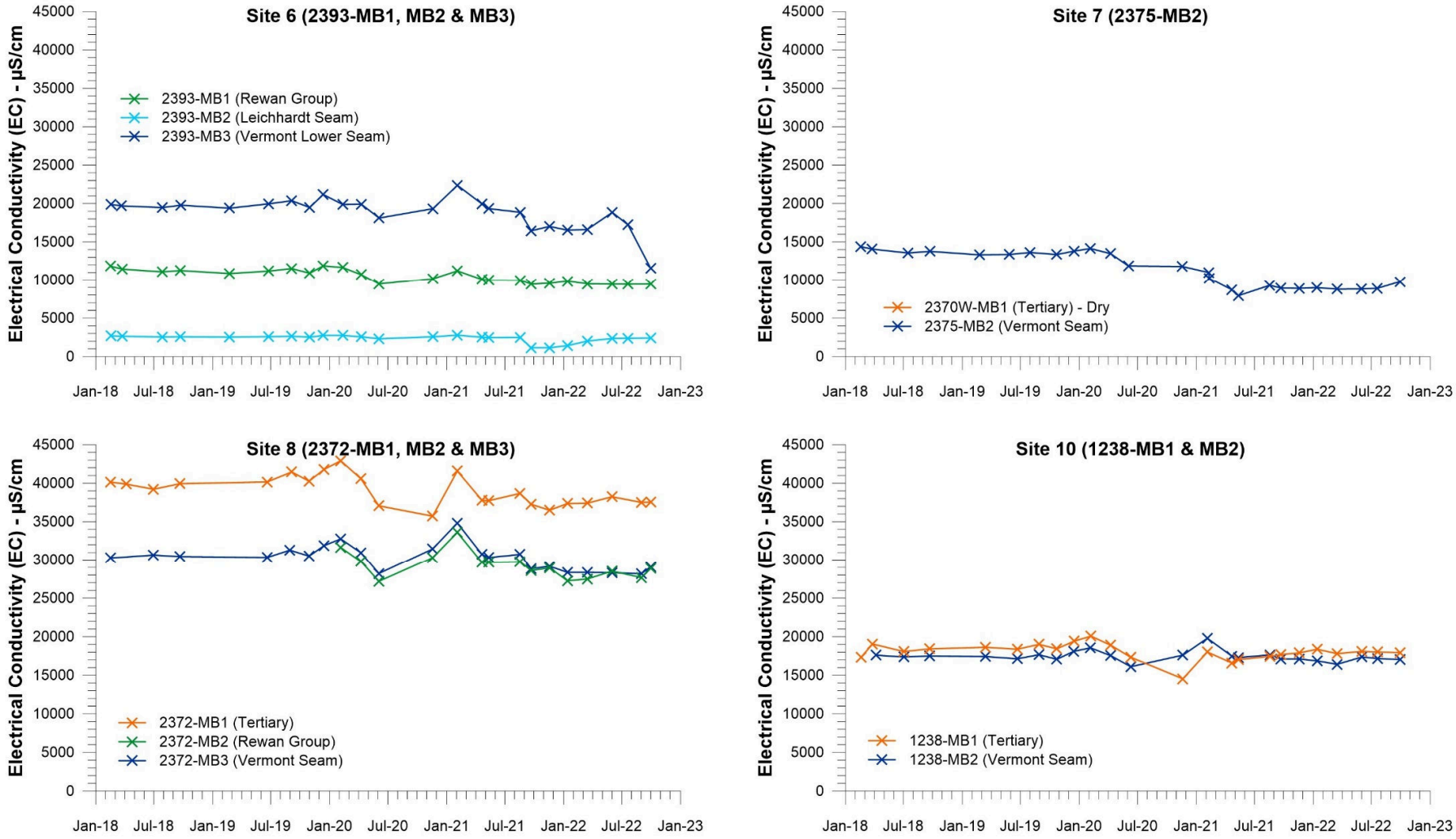


Figure 4-20: Electrical Conductivity (EC) Graphs for LVN Bores – Sites 6, 7, 8 & 10

4.3.3 Piper Ternary Diagrams and Water Type

Mean major ion data for each bore (sodium, magnesium, calcium, potassium, chloride, sulphate, alkalinity) is presented in Table 4-5 (Meadowbrook bores) and Table 4-6 (LVN bores). The data has been converted to milliequivalents to allow plotting on Piper Ternary diagrams, which are presented as Figure 4-21 (Meadowbrook bores) and Figure 4-22 (LVN bores). Data from the Piper diagrams and data summary tables are summarised as follows:

- The upper left plot in each figure shows mean data for all groundwater bores, with the data also presented on separate plots for each groundwater unit (Tertiary, Rewan Group, Permian sediments);
- The mean major ion data for each bore that was used to prepare the Piper diagrams has been converted to % milliequivalent (%meq)), as shown in Table 4-5 and Table 4-6. The data has been colour-shaded to highlight the anions and cations that record >50% of the meq value, which is used to determine the water type. It can be seen from the tables that the majority of bores record >50% meq for sodium and chloride and are therefore sodium-chloride (Na-Cl) water type. However, a number of sites record >50 %meq of the anion bicarbonate (rather than chloride) and are therefore recorded as sodium-bicarbonate water type, or else record a relatively high concentration of both chloride and bicarbonate and are therefore a mixed water type (sodium-bicarbonate-chloride). It is noted that the bores that record a sodium-bicarbonate or sodium-bicarbonate-chloride water type are also the bores that record relatively low EC (i.e. <4,000 µS/cm). It is interpreted that the sodium-carbonate water chemistry is indicative of the chemistry of groundwater recharge areas at this site, due to the relatively high carbonate content of recharge water (i.e. rainwater (H_2O) percolating through the root zone containing a high concentration of free CO2 produces carbonic acid (H_2CO_3); this dissociates on contact with groundwater to produce H^+ and bicarbonate (HCO_3^-) ions, which may further dissociate to carbonate (CO_3^{2-}) ions depending on the pH of the groundwater. In reactions between recharge water and non-carbonate minerals (as is the case at Meadowbrook and LVN), one HCO_3^- ion is produced for each participating CO_2 molecule (Hem, 1985). As recharge water moves further along a flow-line (and with increasing residence time), it is apparent that the salinity of groundwater increases significantly due to water-rock interactions and transitions to sodium-chloride (Na-Cl) water type;
- The relationship described above is evident in the Piper diagrams, as the bores that record a sodium-bicarbonate water type plot in a distinctly different location on the anion plot due to the high bicarbonate concentration relative to the chloride concentration. As the groundwater moves further along the flow line, and transitions to sodium-chloride water type, the data plots further towards the lower right corner of the anion plot;
- The other relationship that is evident, especially for the Permian bores, is that the %meq of sulphate is relatively high in some bores, which manifests as progression along a straight line towards the top of the anion plot. A relatively high %meq of sulphate is also present in some shallow Tertiary bores, such as W14-MB1 (Table 4-5) where it is interpreted that groundwater recharge is occurring. A possible interpretation is that, in these relatively shallow bores within recharge zones, oxidation of sulphide minerals is occurring which increases the %meq of sulphate relative to other ions.

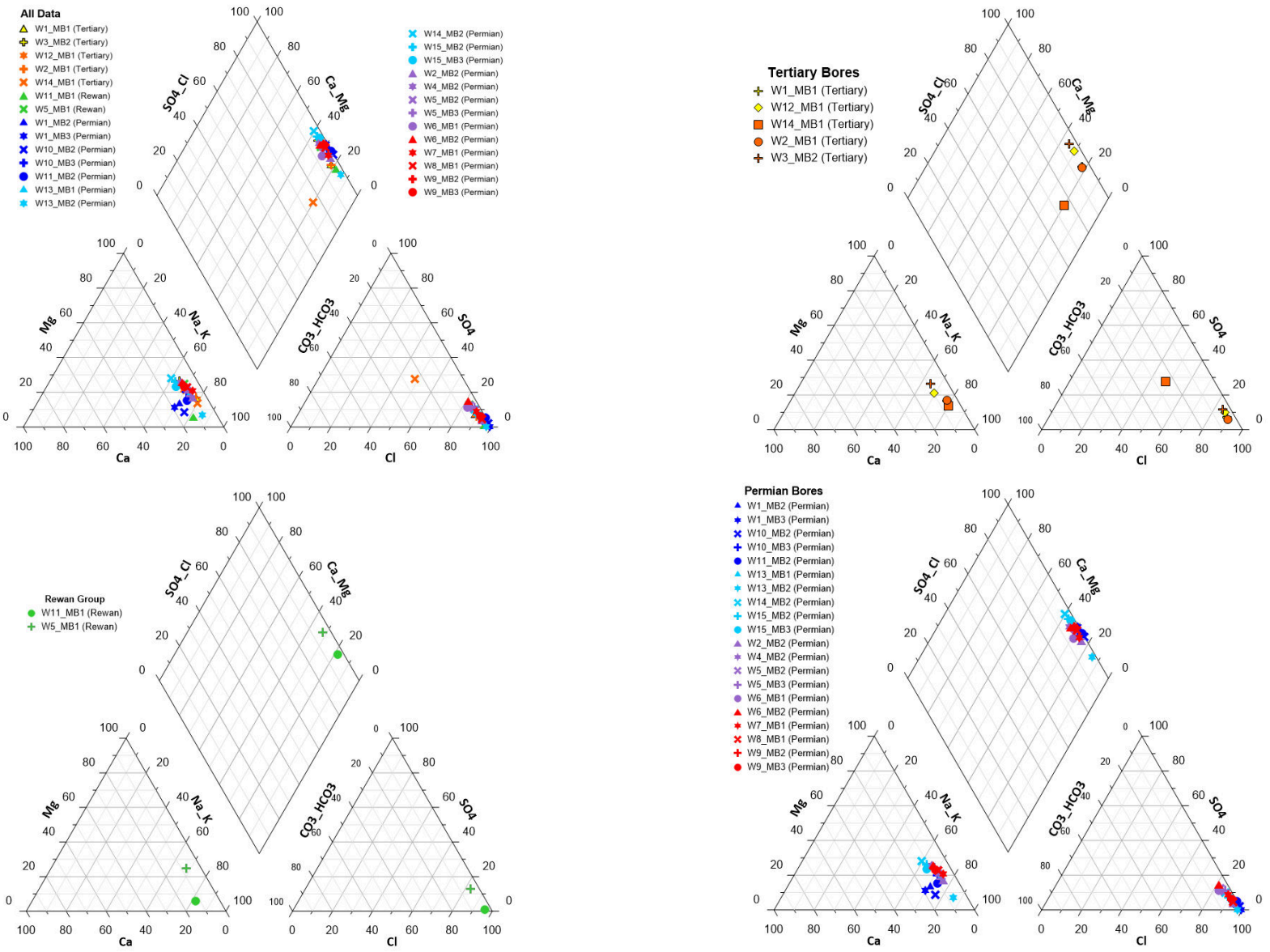


Figure 4-21: Piper Ternary Diagram – Meadowbrook Data

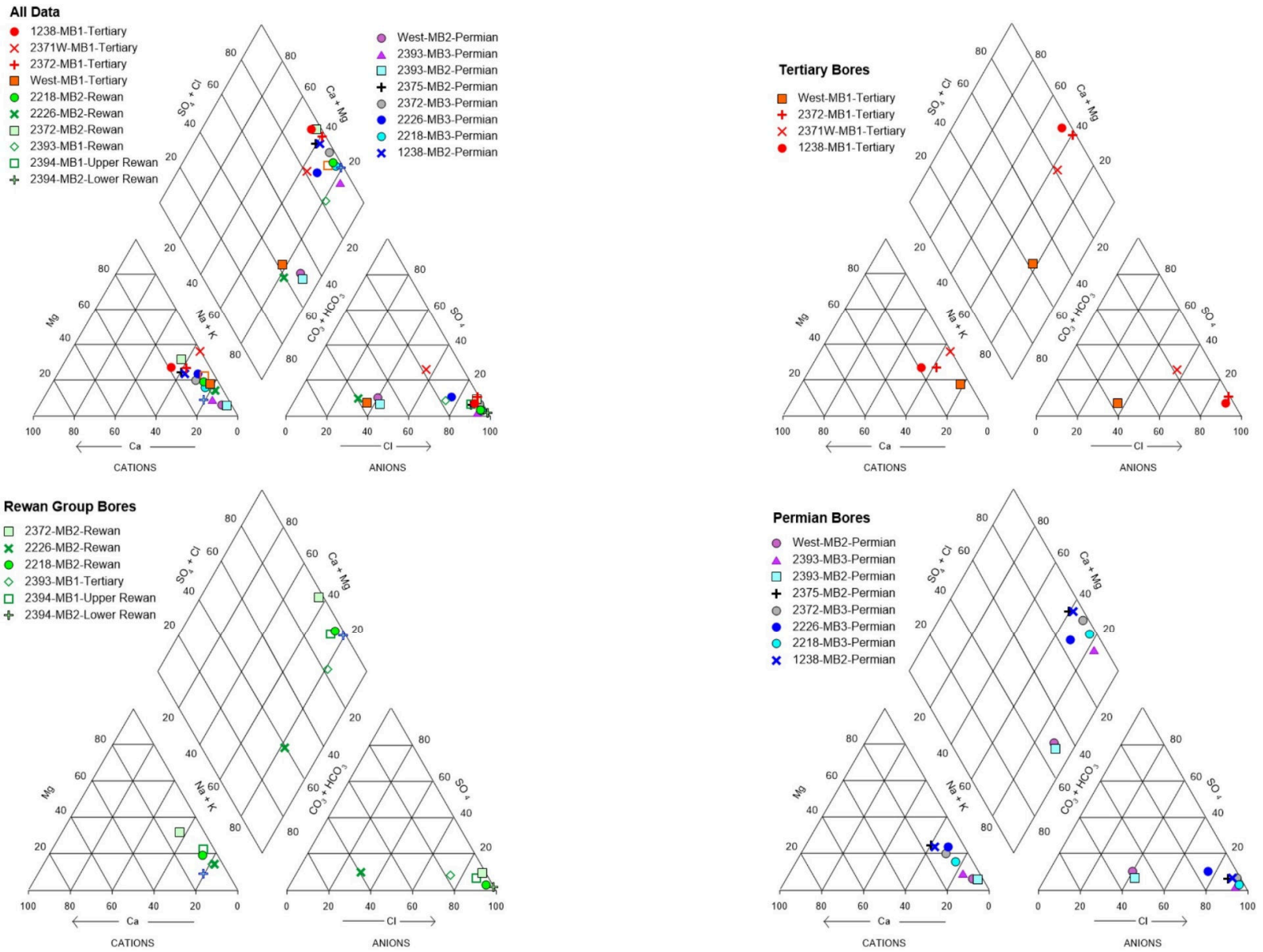


Figure 4-22: Piper Ternary Diagram – Lake Vermont North Data

Table 4-5: Meadowbrook Groundwater Data - Mean Major Ion Data, Converted to % Meq and Water Type

Bore ID	Groundwater Unit	Site ID	Mean EC	Mean Major Ion Concentration (mg/L)								Data Converted to % milliequivalent (%meq)						Water Type
			µS/cm	Ca	Mg	Na	K	Cl	CO_3	HCO_3	SO_4	Ca	Mg	Na + K	Cl	$CO_3 + HCO_3$	SO_4	
W1_MB1	Tertiary	1	25397	310	583	5195	52	9243	0	621	1016	5.3	16.5	78.2	88.6	4.2	7.2	Na-Cl
W1_MB2	Permian		36610	1249	648	6610	36	13700	0	152	393	15.4	13.2	71.4	97.2	0.8	2.1	Na-Cl
W1_MB3	Permian		37552	1538	588	6869	27	14304	0	115	0	18.1	11.4	70.5	99.4	0.6	0.0	Na-Cl
W2_MB1	Tertiary	2	26905	308	609	5386	51	9436	0	658	855	5.1	16.6	78.2	89.6	4.4	6.0	Na-Cl
W2_MB2	Permian		38293	616	914	7738	52	14074	0	575	741	6.9	16.9	76.1	93.6	2.7	3.6	Na-Cl
W3_MB2	Tertiary	3	17293	346	631	2908	37	6251	0	409	1153	8.8	26.4	64.8	84.6	3.9	11.5	Na-Cl
W4_MB2	Permian	4	19087	356	660	3190	26	6764	0	550	1123	8.4	25.7	65.9	84.7	4.9	10.4	Na-Cl
W5_MB1	Rewan	5	22905	375	765	4036	35	7774	0	595	1598	7.2	24.4	68.4	82.9	4.5	12.6	Na-Cl
W5_MB2	Permian		23884	370	735	4256	20	7883	0	613	1615	7.0	22.9	70.2	82.9	4.6	12.5	Na-Cl
W5_MB3	Permian		22558	410	518	4235	45	7709	0	365	1314	8.2	17.2	74.6	86.3	2.9	10.8	Na-Cl
W6_MB1	Permian	6	16623	269	494	2885	36	5637	0	594	982	7.4	22.5	70.0	83.1	6.2	10.7	Na-Cl
W6_MB2	Permian		21507	373	745	3670	30	7033	0	510	1747	7.7	25.5	66.7	81.0	4.2	14.8	Na-Cl
W7_MB1	Permian	7	37527	456	1095	7369	39	13109	0	584	1745	5.2	20.7	74.0	88.5	2.8	8.7	Na-Cl
W8_MB1	Permian	8	43065	676	1384	8136	50	15765	0	499	1025	6.7	22.6	70.6	93.4	2.1	4.5	Na-Cl
W9_MB2	Permian	9	35152	654	1154	6372	16	13486	0	453	1172	8.1	23.4	68.5	91.9	2.2	5.9	Na-Cl
W9_MB3	Permian		40150	749	1325	7411	18	14578	0	490	1324	8.0	23.2	68.8	91.7	2.2	6.1	Na-Cl
W10_MB2	Permian	10	27104	972	251	5085	24	9820	29	43	233	16.7	7.1	76.2	97.8	0.5	1.7	Na-Cl
W10_MB3	Permian		34927	677	958	6498	18	12773	0	434	695	8.5	19.9	71.5	94.0	2.3	3.8	Na-Cl
W11_MB1	Rewan	11	23880	592	185	4709	16	8559	0	358	80	11.8	6.1	82.1	96.5	2.9	0.7	Na-Cl
W11_MB2	Permian		31196	739	614	5742	59	11393	11	47	806	10.9	14.9	74.2	94.7	0.3	4.9	Na-Cl
W12_MB1	Tertiary	12	22217	467	639	3911	25	7789	0	489	1214	9.5	21.3	69.2	86.2	3.8	9.9	Na-Cl
W13_MB1	Permian	13	31285	515	811	6037	25	10852	0	480	1042	7.2	18.8	74.0	90.7	2.8	6.4	Na-Cl
W13_MB2	Permian		24697	393	231	5292	31	9584	0	335	24	7.3	7.1	85.7	97.4	2.4	0.2	Na-Cl
W14_MB1	Tertiary	14	962	17	15	156	8	151	0	128	126	9.1	13.9	77.0	45.0	27.2	27.7	Na-Cl-SO_4-HCO_3
W14_MB2	Permian		22820	632	872	3628	16	8193	0	459	1295	12.1	27.4	60.5	86.5	3.4	10.1	Na-Cl
W15_MB2	Permian	15	24940	610	849	3961	11	8943	0	422	932	11.1	25.6	63.3	90.1	3.0	6.9	Na-Cl
W15_MB3	Permian		28136	763	877	4599	17	10005	0	341	989	12.2	23.2	64.5	91.1	2.2	6.6	Na-Cl

Table 4-6: LVN Groundwater Data - Mean Major Ion Data, Converted to % Meq and Water Type

Bore ID	Groundwater Unit	Site ID	Mean EC	Mean Major Ion Concentration for Each Bore (mg/L)								Data Converted to % milliequivalent (%meq)						Water Type
			µS/cm	Ca	Mg	Na	K	Cl	CO_3	HCO_3	SO_4	Ca	Mg	Na + K	Cl	CO_3 + HCO_3	SO_4	
West-MB1	Tertiary	1	3081	27	67	559	1	435	40	928	86	4.3	17.6	78.1	36.7	57.9	5.4	Na-HCO_3
West-MB2	Permian		3583	29	28	755	4	576	48	933	164	4.0	6.4	89.6	41.4	49.9	8.7	Na-HCO_3
2371W-MB1	Tertiary	3	25441	21	1408	4690	5	6431	935	2962	3849	0.3	36.1	63.6	53.4	23.0	23.6	Na-Cl
2226-MB2	Rewan		3519	29	67	716	1	451	29	1191	153	3.7	14.4	81.9	31.5	60.5	7.9	Na-HCO_3
2226-MB3	Permian		9858	145	284	1555	4	2925	0	724	426	7.3	23.7	68.9	77.9	13.7	8.4	Na-Cl
2394-MB1	Upper Rewan	4	23364	235	651	3948	3	7668	0	868	588	4.9	22.6	72.5	88.0	7.1	5.0	Na-Cl
2394-MB2	Lower Rewan		28332	656	342	5393	14	9900	0	155	2	11.1	9.5	79.4	98.9	1.1	0.0	Na-Cl
2218-MB2	Rewan	5	23874	331	598	4315	12	8417	0	513	186	6.5	19.4	74.1	94.4	4.1	1.5	Na-Cl
2218-MB3	Permian		25769	390	542	4678	15	8973	0	467	166	7.3	16.6	76.1	95.2	3.5	1.3	Na-Cl
2393-MB1	Rewan	6	10439	96	172	1913	3	2830	74	1005	361	4.7	13.8	81.5	73.3	19.8	6.9	Na-Cl
2393-MB2	Permian		2356	12	18	516	2	394	72	656	57	2.4	5.9	91.7	41.4	54.2	4.4	Na-HCO_3-Cl
2393-MB3	Permian		18756	260	209	3615	17	6508	21	613	3	6.9	9.2	83.9	93.5	6.5	0.0	Na-Cl
2375-MB2	Permian	7	11263	361	337	1631	9	3939	0	410	320	15.4	23.7	60.9	88.2	6.5	5.3	Na-Cl
2372-MB1	Tertiary	8	38934	1182	1346	6376	4	13400	0	0	0	13.2	24.8	62.0	100.0	0.0	0.0	Na-Cl
2372-MB2	Rewan		29455	738	1270	4238	6	10192	0	0	1121	11.3	32.1	56.6	92.5	0.0	7.5	Na-Cl
2372-MB3	Permian		30254	628	825	5230	19	10438	0	452	777	9.6	20.7	69.7	92.1	2.8	5.1	Na-Cl
1238-MB1	Tertiary	10	18015	671	594	2228	3	6038	0	485	475	18.7	27.3	54.1	89.7	5.1	5.2	Na-Cl
1238-MB2	Permian		17421	477	508	2504	7	5829	0	463	435	13.6	23.9	62.4	90.0	5.1	5.0	Na-Cl

Dominant anion/cation

4.3.4 Metal/Metalloid Data

Dissolved and total metal/metalloid data is collected for both the Meadowbrook Project and the Lake Vermont North Project, for the parameters shown below in Table 4-7. Table 4-7 shows summary statistics for each parameter, for the combined data set for Meadowbrook and LVN. All available data for both Projects is presented in Attachment D-3 and Attachment D-5 (Meadowbrook dissolved and total metal/metalloid data) and Attachment D-4 and Attachment D-6 (Lake Vermont North dissolved and total metal/metalloid data). Observations from Table 4-7 include:

- For the majority of parameters, the majority of samples return metal/metalloid concentrations that are below the limit of reporting (LOR); parameters where the number of samples above the LOR is less than 10% of the total sample count include aluminium, cadmium, chromium, lead, mercury, selenium, silver and vanadium;
- The number of parameters where >80% of samples are above the LOR is relatively small and includes boron, iron and magnesium;
- The mean and median of the data has only been calculate for parameters where the percentage of samples above the LOR was in excess of 50%. From Table 4-7 it can be seen, visually, that the number of parameters >50% of the data is above the LOR is highest in the Tertiary sediments and lowest in the Permian coal measures.

Table 4-7: Summary Statistics for Metals/Metalloids – Combined Meadowbrook & LVN Data

Statistic	Al*	As*	B*	Cd*	Cr*	Co*	Cu*	Fe*	Pb*	Mn*	Hg*	Mo*	Ni*	Se*	Ag*	U*	V*	Zn*
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Tertiary Sediments																		
Total no. of samples	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
No. Samples >LOR**	5	32	188	6	19	109	35	151	0	190	2	58	169	0	1	159	5	52
% of Samples >LOR	2.6	16.8	98.9	3.2	10.0	57.4	18.4	79.5	0.0	100.0	1.1	30.5	88.9	0.0	0.5	83.7	2.6	27.4
Minimum (mg/L)***	0.030	0.001	0.060	0.0001	0.001	0.001	0.001	0.050		0.006	0.0001	0.001	0.001		0.009	0.001	0.010	0.005
Maximum (mg/L)	0.100	0.034	3.100	0.0002	0.006	0.027	0.122	5.700		0.995	0.0002	0.027	0.590		0.009	0.258	0.060	0.122
Mean (mg/L)****			0.946			0.005		0.736		0.149			0.036			0.034		
Median (mg/L)****			0.615			0.005		0.340		0.052			0.009			0.009		
Rewan Group																		
Total no. of samples	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190
No. Samples >LOR**	7	67	189	16	20	69	43	131	0	190	0	86	106	0	3	119	0	37
% of Samples >LOR	3.7	35.3	99.5	8.4	10.5	36.3	22.6	68.9	0.0	100.0	0.0	45.3	55.8	0.0	1.6	62.6	0.0	19.5
Minimum (mg/L)	0.010	0.001	0.150	0.0001	0.001	0.001	0.001	0.050		0.010		0.001	0.001		0.001	0.001		0.005
Maximum (mg/L)	0.060	0.014	1.540	0.0003	0.011	0.045	0.300	6.150		1.340		0.058	0.420		0.003	0.022		0.291
Mean (mg/L)****			0.574					1.999		0.460			0.023			0.008		
Median (mg/L)****			0.520					0.900		0.454			0.005			0.008		
Permian Sediments																		
Total no. of samples	671	671	671	671	671	671	671	671	671	671	671	671	671	671	671	671	671	671
No. Samples >LOR**	34	172	655	16	51	120	69	561	0	668	0	254	232	0	5	185	0	98
% of Samples >LOR	5.1	25.6	97.6	2.4	7.6	17.9	10.3	83.6	0.0	99.6	0.0	37.9	34.6	0.0	0.7	27.6	0.0	14.6
Minimum (mg/L)	0.010	0.001	0.050	0.0001	0.001	0.001	0.001	0.050		0.005		0.001	0.001		0.001	0.001	0.000	0.005
Maximum (mg/L)	0.130	0.044	2.340	0.0016	0.084	0.029	0.647	7.320		1.780		0.109	0.153		0.006	0.060	0.000	0.531
Mean (mg/L)****			0.639					1.696		0.324								
Median (mg/L)****			0.490					1.120		0.212								

* Al=Aluminium, As=Arsenic, B=Boron, Cd=Cadmium, Cr=Chromium, Co=Cobalt, Cu=Copper, Fe=Iron, Mn=Manganese, Hg=Mercury, Mo=Molybdenum, Ni=Nickel, Se=Selenium, Ag=Silver, U=Uranium, V=Vanadium, Zn=Zinc

** LOR = Limit of Reporting

*** The minimum value is the minimum value recorded above the LOR. As shown from the difference between the total number of samples for each parameter and the number of samples > LOR, the majority of samples for most parameters are < LOR

**** The mean and median of the data have only been calculated for values > LOR, and only for parameters where the number of samples > LOR is approximately 50% or greater

4.4 Hydraulic Conductivity Data

4.4.1 Available Data

Site-specific hydraulic conductivity data is available from field investigations undertaken at both the Meadowbrook site as well as the adjacent Lake Vermont North site, where monitoring bores have been constructed within the same stratigraphic horizons as those that occur at Meadowbrook. The available data includes:

- Falling head (slug) testing from:
  - 27 sites at Meadowbrook; and,
  - 15 sites at Lake Vermont North.
- Packer testing of cored geological exploration bores at Meadowbrook, which included:
  - Drill Stem Tests (DST's) or Injection Fall Off Tests (IFOT's) within coal seams (with the type of test based on the permeability of the coal seam); and,
  - Lugeon Tests within selected interburden/ overburden units, targeting a range of interburden lithologies as well as fractured/unfractured interburden zones.to provide site-specific groundwater parameters for upcoming groundwater modelling studies.

A summary of the field testing undertaken at each site is provided in references JBT 2021a (Meadowbrook data) and JBT 2021b (Lake Vermont North data). The data is summarised in the sections below. The packer testing (DST's, IFOT's, lugeon tests) was undertaken by SCT and reported in SCT (2020a), with the data summarised below in Section 4.4.3.

4.4.2 Slug Testing Data

Falling head (slug) tests were undertaken on each of the standpipe monitoring bores at Meadowbrook and LVN (with the exception of dry bores). The testing and analysis methodology is presented and discussed in the field testing reports for each site (JBT 2021a, 2021b). The results are summarised below in Table 4-8 (Meadowbrook data) and Table 4-9 (LVN data).

Table 4-8: Meadowbrook - Hydraulic Conductivity Results from Falling Head (Slug) Tests

Bore ID	Stratigraphic Interval	Lithology	Screened Interval		Hydraulic Conductivity (m/day)
			From (mbgl)	To (mbgl)	
W1_MB1	Tertiary sediments	Gravel	43.6	45.1	4.52E-01
W1_MB2	Leichhardt Lower Seam	Coal	81.75	83.25	8.07E-02
W1_MB3	Vermont Seam	Coal	122.5	124	6.41E-02
W2_MB1	Tertiary sediments	Sandy Clay	34	40	4.46E-01
W2_MB2	Girrah 1 Seam	Coal	104	110	1.20E-02
W3_MB1	Quaternary alluvium	Sand	9	12	4.74E-02
W3_MB2	Tertiary sediments	Clay	35	41	5.25E-02
W4_MB1	Quaternary alluvium	Sand	9	12	9.80E-03
W4_MB2	Permian overburden	Sandstone	54	60	No Test
W5_MB1	Rewan Group	Siltstone	44	50	1.43E-02
W5_MB2	Leichhardt Lower Seam	Coal	69.5	71	4.94E-02
W5_MB3	Vermont Seam	Coal	111.5	113	5.18E-02
W6_MB1	Permian overburden	Sandstone/ Siltstone	50	56	No Test
W6_MB2	Girrah 1 Seam	Coal	75.5	77	4.81E-02
W7_MB1	Permian overburden	Sandstone	54	60	3.64E-02
W8_MB1	Girrah 1 Seam	Coal, underlying sandstone	54	60	6.62E-02

Bore ID	Stratigraphic Interval	Lithology	Screened Interval		Hydraulic Conductivity (m/day)
			From (mbgl)	To (mbgl)	
W9_MB1	Tertiary sediments	Sand	19	22	No Test (Bore Dry)
W9_MB2	Vermont Upper Seam	Coal	42.5	44	4.98E-02
W9_MB3	Vermont Lower Seam	Coal	64.5	70.5	8.99E-02
W10_MB1	Rewan Group	Sandstone/ Siltstone	22	28	No Test (Bore Dry)
W10_MB2	Vermont Upper Seam	Coal	88.5	90	1.52E-03
W10_MB3	Vermont Lower Seam	Coal	116.65	119	1.02E-02
W11_MB1	Rewan Group	Siltstone	114	120	No Test
W11_MB2	Leichhardt Seam	Coal/ Siltstone	133.5	135	No Test
W12_MB1	Tertiary sediments	Sand	54	60	2.73E-03
W13_MB1	Vermont Lower Seam	Coal	43.5	46.5	1.03E-01
W13_MB2	Girrah 1 Seam	Coal	82	88	2.62E-01
W14_MB1	Tertiary sediments	Sand	15.6	18.6	4.53E-01
W14_MB2	Permian Coal Seam	Coal	65	68	4.04E-01
W15_MB1	Tertiary sediments	Sand	17	23	1.37E+00
W15_MB2	Vermont Upper Seam	Coal	58.5	60	9.80E-01
W15_MB3	Vermont Lower Seam	Coal	102	105	8.48E-01

Table 4-9: LVN - Hydraulic Conductivity Results from Falling Head (Slug) Tests

Bore	Stratigraphic Interval	Lithology	Screened Interval		K (m/day)
			From (mbgl)	To (mbgl)	
1238_MB1	Tertiary	Clay	24	30	Recovery rate too slow
1238_MB2	Vermont Seam	Coal	53	59	4.11E-02
2372_MB1	Tertiary	Clay, silt	24	30	4.50E-03
2372_MB2	Rewan Group	Very fine sandstone, siltstone	40	46	Recovery rate too slow
2372_MB3	Vermont Seam	Coal	123	129	4.95E-01
2393_MB1	Rewan Group	Fine sandstone, siltstone	24	30	1.88E-02
2393_MB2	Leichhardt Seam	Coal	38	41	1.77E-01
2393_MB3	Vermont Lower Seam	Coal	90	96	3.72E-01
2394_MB1	Upper Rewan, below base of Tertiary	Fine Sandstone	24	30	1.03E-03
2394_MB2	Lower Rewan Group	Sandstone, siltstone	117	123	1.34E-03
West_MB1	Tertiary	Clay, siltstone	27	30	6.39E-02
West_MB2	Permian Coal Measures	Coal, siltstone	74	80	2.38E-02
2371W_MB1	Tertiary	Clay, sand	16	22	3.45E-03
2375_MB2	Vermont Seam	Coal	65	68	1.83E-01
2226_MB2	Rewan Group	Fine Sandstone	32	38	5.58E-02
2226_MB3	Leichhardt Seam	Coal	53	59	9.92E-01
2218_MB2	Rewan Group	Very fine sandstone, siltstone	59	65	Recovery rate too slow
2218_MB3	Leichhardt Seam	Coal	85	88	7.19E-02
2369W_MB1	Tertiary	Clay, sand	14	20	Dry
2370W_MB1	Tertiary	Sand, sandy clay	12.6	18.6	Dry

4.4.3 Packer Testing Data

A program of packer testing was undertaken at Meadowbrook to provide data for:

- permeability at a depth that is greater than could be achieved with conventional PVC standpipe monitoring bores (i.e. >~150 mbgl);
- the variability of permeability with depth at a single location; and,
- the permeability of interburden units (including fractured and non-fractured zones) that are not regularly targeted by groundwater monitoring bores

The program included:

- testing of the coal seam permeability using either drill stem tests (DST's) or injection fall off tests (DFO's), with the decision on which test to utilise being made by SCT field personnel based on initial testing of the permeability. The DST/IFOT test intervals are shown in Table 4-10; and,
- lugeon testing of interburden/overburden intervals within each bore (including fractured and non-fractured intervals), with the number of tests in each bore shown in Table 4-10.

The packer testing program was undertaken by SCT and the results are included in separate reports for the testing of the coal seams (SCT2020a) as well as the testing of the interburden (SCT 2020b).

A summary table of hydraulic conductivity data from the packer testing program is presented below in Table 4-10.

Table 4-10: Hydraulic Conductivity Results from Packer Testing

Hole ID	Stratigraphic Interval	Lithology	Test Interval (mbgl)		Test Type	Hydraulic Conductivity (K) (m/day)
			From	To		
LV2724S	Rewan Group	Siltstone	80	86	Lugeon	1.04E-03
		Sandstone	102	108	Lugeon	1.81E-03
		Siltstone	112	118	Lugeon	1.99E-03
	Interburden between Leichhardt Seam and Vermont Lower Seam	Sandstone – no jointing	129	135	Lugeon	2.51E-03
		Sandstone – no jointing	142	148	Lugeon	2.42E-03
		Sandstone – no jointing	162	168	Lugeon	8.64E-02
		Siltstone – some jointing toward base	171	177	Lugeon	1.64E-03
		Siltstone – numerous joints and faults logged	177	183	Lugeon	1.99E-03
		Mudstone/Siltstone - jointed	186	192	Lugeon	1.90E-03
		Sandstone/Siltstone – no jointing	193	199	Lugeon	1.47E-03
	Vermont Lower Seam	Coal	204.7	209.01	DST	9.14E-02
LV2730S	Rewan Group	Sandstone	180.2	186.2	Lugeon	3.46E-04
		Sandstone	229.7	235.7	Lugeon	2.25E-03
		Siltstone	288.2	294.2	Lugeon	6.74E-04
		Sandstone	307.7	313.7	Lugeon	7.69E-04
	Interburden between Leichhardt Seam and Vermont Lower Seam	Sandstone – no jointing	331.7	337.7	Lugeon	2.42E-03
		Sandstone – no jointing	340.7	346.7	Lugeon	2.94E-03
		Siltstone – no jointing	346.7	352.7	Lugeon	4.84E-04
	Leichhardt Lower Seam	Coal	353.58	358.16	IFOT	2.99E-04
	Interburden between Phillips Seam & Leichhardt Seam	Siltstone/Mudstone – Shear zone at 363 mbgl	360	366	Lugeon	5.01E-04
		Siltstone/Sandstone – no jointing	367.5	373.5	Lugeon	1.30E-04
		Siltstone/Sandstone – no jointing	376.5	382.5	Lugeon	1.47E-03
	Vermont Lower Seam	Coal	382.85	387.01	IFOT	8.31E-05
LV2731S	Rewan Group	Siltstone	410.7	416.7	Lugeon	3.28E-05
	Permian Overburden	Sandstone	419.7	425.7	Lugeon	7.34E-05
	Interburden between Phillips & Vermont Lower Seams	Siltstone/Shale	437.7	443.7	Lugeon	8.64E-07
		Sandstone - Faulted	448	454	Lugeon	1.21E-04
		Shale/Mudstone – Faults and joints, calcite infill	454.2	460.2	Lugeon	3.46E-04
		Siltstone/Mudstone – Joints throughout, approx. 50% calcite-filled	463.2	469.2	Lugeon	3.28E-04
		Mudstone/Claystone	475.2	481.2	Lugeon	1.30E-04
		Mudstone/Sandstone – Joints throughout	484.2	490.2	Lugeon	2.25E-04
	Vermont Lower Seam	Coal	502.8	507.31	IFOT	2.16E-04
	Interburden between Phillips & Vermont Lower Seams	Sandstone/Siltstone – joints infilled with calcite	502.2	508.2	Lugeon	1.81E-03
LV2720S	Leichhardt Lower Seam	Coal	288.5	293.69	DST/IFOT*	5.27E-03
	Vermont Lower Seam	Coal	320.4	325.59	DST/IFOT*	9.37E-04
LV2846	Leichhardt Lower Seam	Coal	269.0	274.19	DST/IFOT*	3.28E-03
	Vermont Lower Seam	Coal	305.5	310.69	DST/IFOT*	1.76E-02
LV2734	Vermont Lower Seam	Coal	301.65	306.84	DST/IFOT*	9.37E-03
LV2711S	Vermont Lower Seam	Coal	204.0	209.19	DST/IFOT*	1.17E-02

* Average of data from DST/IFOT testing, converted from millidarcy to m/day

4.4.4 Summary of Hydraulic Conductivity Data

Summary statistics for hydraulic conductivity data are presented below in Table 4-11, with data for individual bores/ test intervals plotted in Figure 4-23 as hydraulic conductivity vs. depth. From review of the data in Figure 4-23 it is observed that:

- Allowing for slight differences that may be inherent in data from different test types (i.e. packer/lugeon tests vs. slug tests) a decrease in permeability with depth is apparent for the coal seams, Permian interburden and Rewan Group sediments;
- There is a distinct difference between the hydraulic conductivity for Tertiary sediments from bores in the Meadowbrook area compared to bores in the LVN area, with bores in the Meadowbrook area generally recording a higher hydraulic conductivity. This is consistent with observations from drilling data for each area, with the distinction also evident in the groundwater monitoring bore construction logs that are presented in Attachment B (Meadowbrook bores) and Attachment C (LVN bores).

In bore LV27330S, where packer testing of the Rewan Group was undertaken over four discrete intervals (Table 4-10), three of the intervals were logged as “sandstone” while one interval was logged as “siltstone”. However, the overall permeability of these units was low, with the “sandstone” sections recording a relatively low hydraulic conductivity that ranged from 3.46E-04 to 2.25E-03 m/day. This relatively low hydraulic conductivity suggests that, despite containing sandstone lenses, the primary porosity has been reduced (e.g. by the presence of either silt or cementation within the matrix) and that, overall, the Rewan Group can be regarded as a low-permeability unit.

The spatial variability of hydraulic conductivity data is shown in Figure 4-24, which shows:

- The average hydraulic conductivity for each tested groundwater unit at each location (i.e. if there are a number of data points within the Rewan Group of Permian sediments, these data points have been averaged for display in Figure 4-24; data for discrete intervals is provided in Table 4-8, Table 4-9 and Table 4-10); and,
- The average depth below ground level from which the data were obtained (if multiple data points are available for the same groundwater unit at the same location, the depth data was averaged as described above).

It is difficult to discern a spatial trend for the Permian coal measures due to the variability of K with depth (as shown in Figure 4-23). The most evident trend is the overall lower K of Tertiary sediments in the LVN area relative to the Meadowbrook area; these data have been obtained from similar depth, therefore the trend is reflective of the generally sandier Tertiary sediments that are observed in the Meadowbrook area relative to the LVN area.

Table 4-11: Summary Statistics for Available Hydraulic Conductivity Data

Groundwater Unit	No. of Samples	Hydraulic Conductivity (m/day)					
		Min. Value	Max. Value	Arithmetic Mean	Harmonic Mean	Median	Standard Deviation
Quaternary Alluvium	2	9.80E-03	4.74E-02	2.86E-02	2.03E-02	2.86E-02	2.66E-02
Tertiary Sediments	9	2.73E-03	1.37E+00	3.16E-01	6.09E-03	6.39E-02	4.46E-01
Rewan Group	13	3.28E-05	5.58E-02	7.71E-03	6.56E-05	1.34E-03	1.56E-02
Permian Coal Measures < 130 mbgl	25	1.52E-03	9.92E-01	2.21E-01	2.24E-02	7.19E-02	3.01E-01
Permian Coal Measures > 130 mbgl	25	8.64E-07	9.14E-02	8.05E-03	2.03E-05	5.01E-04	2.44E-02
Permian Coal Measures - All	50	8.64E-07	9.92E-01	1.14E-01	4.05E-05	1.11E-02	2.37E-01

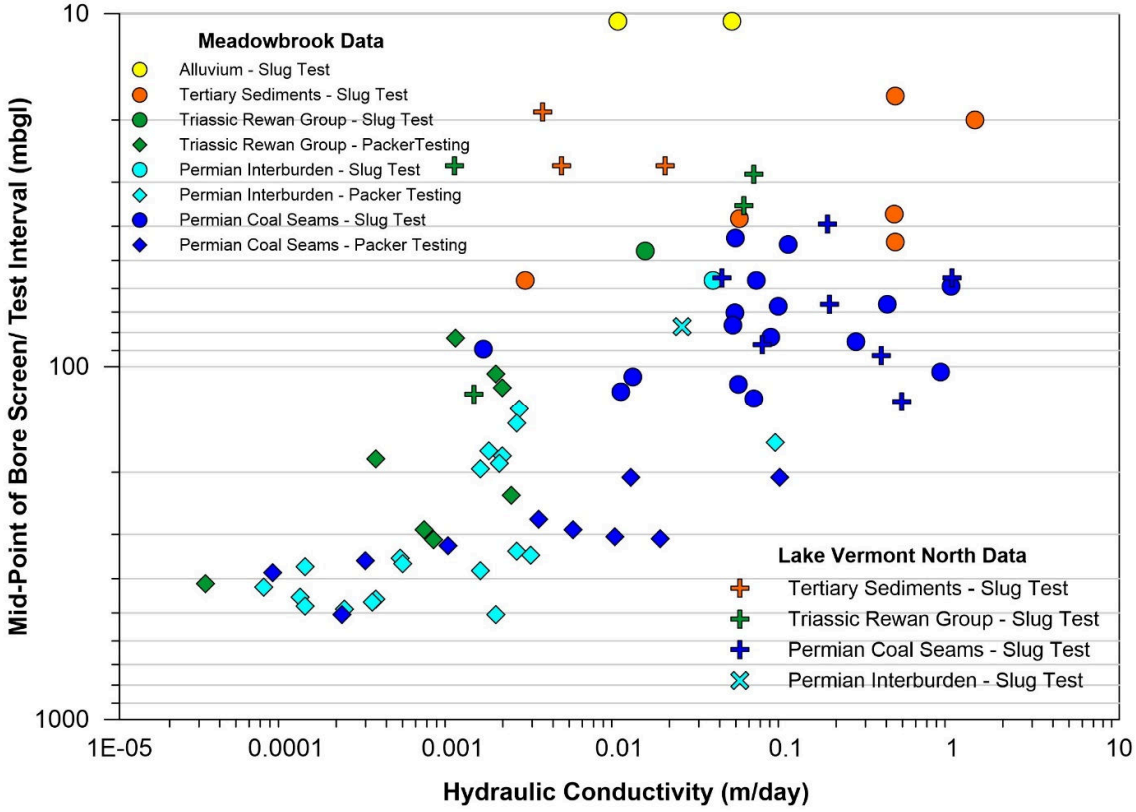


Figure 4-23: Plot of Hydraulic Conductivity Versus Depth

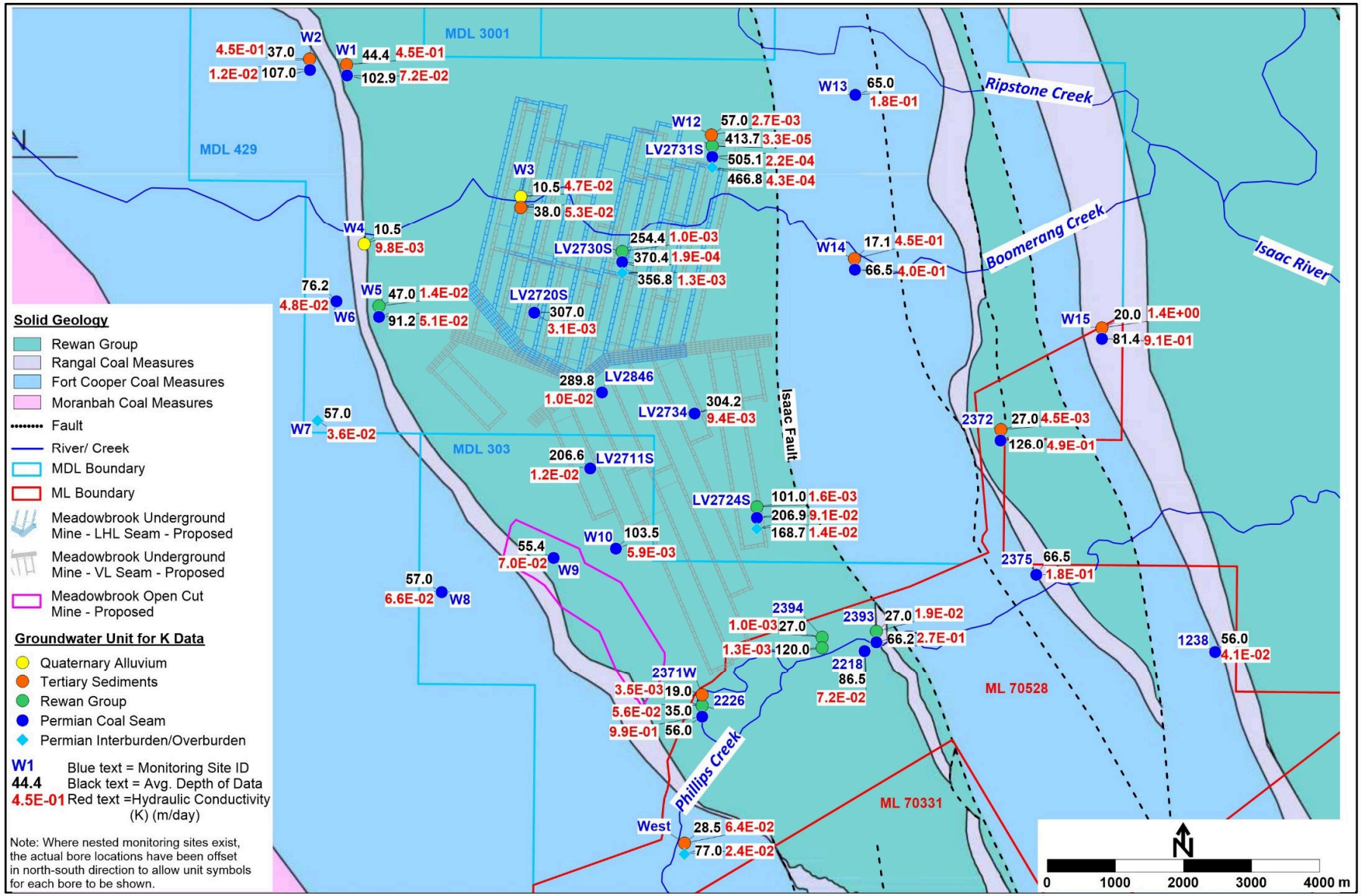


Figure 4-24: Spatial Distribution of Hydraulic Conductivity Data

4.5 Groundwater Recharge and Discharge

4.5.1 Assumptions

Recharge to the groundwater system within the model area is interpreted to be as follows:

- Recharge is predominantly via rainfall and downward seepage from ephemeral creeks following creek flow;
- Recharge occurs directly to the Tertiary and Quaternary groundwater units, with the Permian coal measures being preferentially recharged in areas where the coal seams subcrop beneath Tertiary or Quaternary sediments. As noted in Section 4.3.1, recharge to the coal seams appears to be enhanced where the creeks, particularly Phillips Creek, flow over the subcrop area.

Discharge from the groundwater system is assessed to occur as follows:

- The majority of creeks are ephemeral, but may receive baseflow to the alluvium from the groundwater system particularly in topographically lower areas (e.g. the alluvium of the Isaac River to the east of the Project area);
- Groundwater within coal seams moves generally down dip from the subcrop recharge areas, but flow is terminated against faults where the seams are completely truncated. In these cases the groundwater movement is expected to be towards areas of lower pressure, which may involve upward movement to shallower groundwater systems where lateral movement can occur that is generally in the direction of topography. Ultimately, groundwater movement is interpreted to honour topography, therefore discharge towards major surface water systems such as the Isaac River is expected to occur. It is noted that the Isaac River is ephemeral and therefore generally a losing steam; therefore groundwater elevation contours in the area of the river would be expected to vee downstream toward discharge areas at the base of the Isaac River alluvium.
- Groundwater extraction occurs from landholder bores, but no data exists on flow rates. It is assessed that groundwater extraction via landholder bores is likely to be intermittent and that the volume of groundwater extracted is minor. Groundwater extraction from landholder bores is therefore ignored in the groundwater model.

4.5.2 Estimation of Groundwater Recharge via CMB Method

Groundwater data from Meadowbrook and LVN groundwater monitoring bores has been used to provide an estimate of groundwater recharge based on the chloride mass balance (CMB) method (Anderson, 1945), which utilises the concentration of chloride in rainfall and the concentration of chloride in groundwater to provide an estimate of the net recharge rate to groundwater. The CMB equation is given as:

$$R = \frac{PCp}{Cg}$$

Where: R = Recharge (mm/year).

P = Rainfall (mm/year).

Cp = Chloride concentration in rainfall (mg/L).

Cg = Chloride concentration in groundwater (mg/L).

Utilising the above formula, the recharge rates for each groundwater unit were calculated using the following input data:

- Average chloride concentration in rainfall for the Meadowbrook site of 4.7 mg/L, based on the following inputs and calculations:

- An average chloride deposition rate for the Meandu Mine site of 26.6 kg/ha/year (CSIRO 2014);
- An average annual rainfall at Meadowbrook (from SILO data) gauge of 563 mm/year; and,
- 26.6 kg/ha/year = 2,660 mg/m^2/year divided by 563 mm/year rainfall = chloride in rainfall of 4.7 mg/L.

Average chloride concentration of groundwater (combined Meadowbrook/LVN data – refer Table 4-12) of:

- 6,404 mg/L for the Tertiary sediments;
- 6,804 mg/L for the Rewan Group; and,
- 8,786 mg/L for the Permian Coal Measures.

The calculated recharge rates to groundwater are relatively low, being less than 0.1% of average annual rainfall for each groundwater unit and are shown below in Table 4-12

However, as noted above, it is interpreted that recharge is occurring preferentially at sites along Boomerang Creek (W14-MB1) and Phillips Creek (2226-MB2, West-MB1, West-MB2); therefore recharge rates have been calculated separately for these sites using mean chloride concentration data for each site (Table 4-5, Table 4-6), with this data also shown below in Table 4-12.

From Table 4-12 it can be seen that the calculated recharge rate at these sites is significantly higher than the calculated average for the individual groundwater unit, which supports the interpretation of recharge at these sites that is also inferred from other groundwater quality data (Section 4.3)

Table 4-12: Calculated Recharge via CMB Method

Calculation for Individual Groundwater Units				
Parameter	**Description**	**Tertiary**	**Rewan Group**	**Permian Coal Measures**
Cg	Mean chloride concentration in groundwater (mg/L)	6404	6804	8786
Cp	mg/L chloride in rainfall	4.8	4.8	4.8
P	Annual average rainfall (mm)	558.9	558.9	558.9
R	Annual average recharge (mm)	0.42	0.40	0.31
	Recharge as % of average annual rainfall	0.075	0.071	0.055

Calculation for Individual Bores where Recharge is Interpreted					
Parameter	**Description**	**W14_MB1 (Tertiary)**	**2226-MB2 (Rewan Group)**	**West-MB1 (Tertiary)**	**West-MB2 (Permian Coal Measures)**
Cg	Mean chloride concentration in groundwater (mg/L)	147	440	435	545
Cp	mg/L chloride in rainfall	4.8	4.8	4.8	4.8
P	Annual average rainfall (mm)	558.9	558.9	558.9	558.9
R	Annual average recharge (mm)	18.40	6.14	6.21	4.95
	Recharge as % of average annual rainfall	3.29	1.10	1.11	0.89

4.6 Regional Groundwater Use

The locations of known private groundwater bores in the model area are shown in Figure 4-25.

The bore locations are taken from the DoR Groundwater Database (version current to October 2021). The groundwater unit that is screened by each bore is also shown in Table 4-13 and is based on:

- Information contained within the Groundwater Database; or,
- Where no information exists, the groundwater unit is interpreted based on bore location and bore depth, and is based on the geological data discussed in Section 3.2

Groundwater use in the region is understood to include:

- Livestock watering; and,
- Domestic use.

As shown from Table 4-13, the groundwater units that are utilised by landowner bores within the area shown in Figure 4-25 include the Isaac River alluvium, Tertiary and Permian sediments.

Available groundwater quality data for the registered groundwater bores shown in Figure 4-25 are shown below in Table 4-13 (based on available data from the DoR groundwater database). For the majority of bores that are screened within the Isaac River alluvium, the water quality within the groundwater database is simply described as "good". For bores within the Permian sediments the groundwater quality, in terms of EC, ranges from 4,000 to ~7,000 µS/cm, which would make the bores of marginal value for livestock watering use. It is noted that the data from the registered bores comprises only one data value and tends to be of lower EC than the groundwater units encountered at site (Section 4.3.1), with the exception of groundwater monitoring bores that are close to creeks where it is interpreted that groundwater recharge is occurring.

Table 4-13: Summary Bore Information from DoR Groundwater Database

RN	Easting (AGD84)	Northing (AGD84)	Aquifer	Screened Interval (mbgl)	Water Quality*	Drilled Date	Original Bore Name
67216	655250	7526106	Isaac River Alluvium	3.66 - 4.57	Good	Jun-1996	Black Tank Spear
67217	656650	7522490	Isaac River Alluvium	0 - 3.3	Good	Oct-1984	Red Spear
67218	658515	7521249	Isaac River Alluvium	0 - 3.3		Oct-1984	Blue Spear
97180	654580	7527016	Isaac River Alluvium	15.24 - 16.4	Good	Jun-1996	Top bore
97181	656320	7523808	Isaac River Alluvium	17.37 - 18.29	Good	Jun-1996	Cutter Bore
97182	657833	7521659	Isaac River Alluvium	17.37 - 18.29	Good	Jun-1996	5 Blue Pump
97183	657305	7522099	Isaac River Alluvium	17.68 - 18.29	Good	Jun-1996	8 Blue Pump
122458	644869	7526590	Permian Sediments	38.5 - 50.5	4000	Mar-2006	
132627	649450	7524848	Duaringa Formation	35 - 40		Apr-2007	
132628	648106	7523872	Permian Sediments	85 - 95		Apr-2007	
132631	635326	7527999	Permian Sediments	316 - 325	7290	Jan-2007	
136689	635754	7528054	Permian Sediments	316 - 325	7290	Jan-2007	
165975	634482	7525801	Quaternary-Undefined	6.5 - 9.5		Oct-2019	
165976	631380	7530499	Quaternary-Undefined	6.5 - 9.5	6217	Oct-2019	
165977	635771	7527621	Permian Sediments	231 - 237	Brackish	Oct-2019	
165978	635831	7527462	Quaternary-Undefined	7.2 - 10.2	6172	Oct-2019	
165979	635640	7527466	Permian Sediments	27.5 - 36.5	5596	Oct-2019	

* Water quality descriptions are from the DoR Groundwater Database. In some cases only a description such as "Good" or "Brackish" is provided. Where a numerical value is provided, the value is Electrical Conductivity (EC) in units of µS/cm.

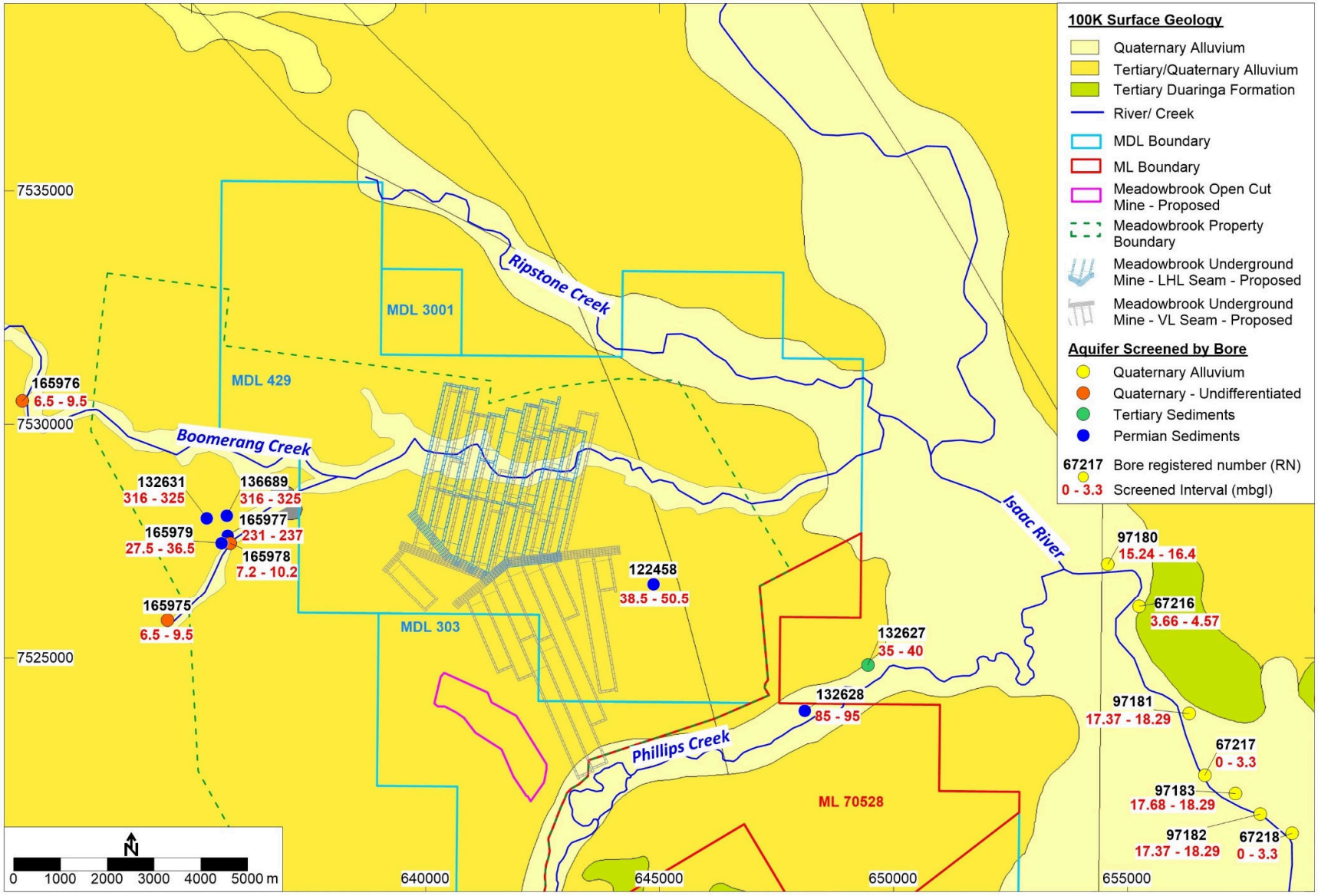


Figure 4-25: Locations of Registered Private Bores

4.7 Conceptual Groundwater Model – Pre-Mining

Essential elements of the pre-mining conceptual model that have informed the groundwater model are shown below in Figure 4-26 and are summarised as follows:

- Groundwater Units
  - The surface geology in the Project area comprises mainly Tertiary-age alluvium (poorly consolidated sand, silt and clay associated with prior meanderings of the current surface water system), with recent (Quaternary) alluvium (sand, silt, clay) associated with the current location of surface water features such as Boomerang Creek, Phillips Creek, Ripstone Creek and the Isaac River. The Tertiary sediments tend to be sandier (and of higher permeability) in the Meadowbrook Project area and siltier (and of lower permeability) in the LVN Project area, generally south of Phillips Creek.
  - All surface water features in the Project area (including the Isaac River) are ephemeral. The alluvium of creeks such as Boomerang Creek, Phillips Creek and Ripstone Creek tends to be dry, though the Quaternary alluvium may contain seasonal perched groundwater following wet season rainfall and flow events that recharge the alluvium.
  - The Tertiary/Quaternary sediments are underlain by generally low-permeability sediments of the Triassic Rewan Group and low permeability Permian sediments that are overburden/interburden to the higher permeability coal seams that tend to act as the groundwater conduits within the Permian strata. As shown in Figure 4-26, the Triassic/Permian strata dip generally from west to east and tend to pinch out in the west (due to erosional weathering and the dip of the strata) and be truncated to the east by faulting. Therefore, the Triassic/Permian unit that directly underlies the Tertiary sediments changes across the Project area (refer also the solid geology, Figure 3-1); this impacts on the recharge potential of the Triassic/Permian units, as discussed further below.
- Groundwater recharge and discharge:
  - Recharge to the groundwater system occurs either as direct recharge (in the case of Quaternary and Tertiary groundwater units), or via diffuse downward recharge from overlying units. For the Permian coal seams, groundwater recharge occurs preferentially where the coal seams subcrop beneath Tertiary sediments and especially where the subcrop areas coincide with the locations of ephemeral creeks, where recharge may occur in response to seasonal creek flow events;
  - Groundwater within coal seams moves generally down dip from the subcrop recharge areas, but flow is terminated against faults where the seams are completely truncated. In these cases the groundwater movement is expected to be towards areas of lower pressure, which may involve upward movement to shallower groundwater systems where lateral movement can occur that is generally in the direction of topography.
  - Ultimately, groundwater movement is interpreted to honour topography, therefore discharge towards major surface water systems such as the Isaac River is expected to occur. It is noted that the Isaac River is ephemeral and therefore generally a losing steam; therefore groundwater elevation contours in the area of the river would be expected to vee downstream toward discharge areas at the base of the Isaac River alluvium.
- Hydraulic conductivity data:
  - Allowing for slight differences that may be inherent in data from different test types (i.e. packer/lugeon tests vs. slug tests) a decrease in permeability with depth is apparent for the coal seams, Permian interburden and Rewan Group sediments;

  - There is a distinct difference between the hydraulic conductivity for Tertiary sediments from bores in the Meadowbrook area compared to bores in the LVN area, with bores in the Meadowbrook area generally recording a higher hydraulic conductivity. This is consistent with observations from drilling data for each area, with the distinction also evident in the groundwater monitoring bore construction logs that are presented in Attachment B (Meadowbrook bores) and Attachment C (LVN bores).

- Groundwater quality
  - Groundwater quality is generally poor, with the majority of groundwater monitoring bores at the Meadowbrook and LVN sites recording a groundwater EC >10,000 µS/cm and in many cases >20,000 µS/cm. Occurrences of lower EC groundwater (i.e. <4,000 µS/cm) are associated with groundwater recharge along features such as Phillips Creek and Boomerang Creek. The water type at the lower EC sites tends to be sodium-bicarbonate water type, rather than the sodium-chloride water type that is observed in higher EC bores, which supports an assessment of groundwater recharge at these sites.

The post-mining conceptual groundwater model is presented in Section 5.8 and Figure 5-15.

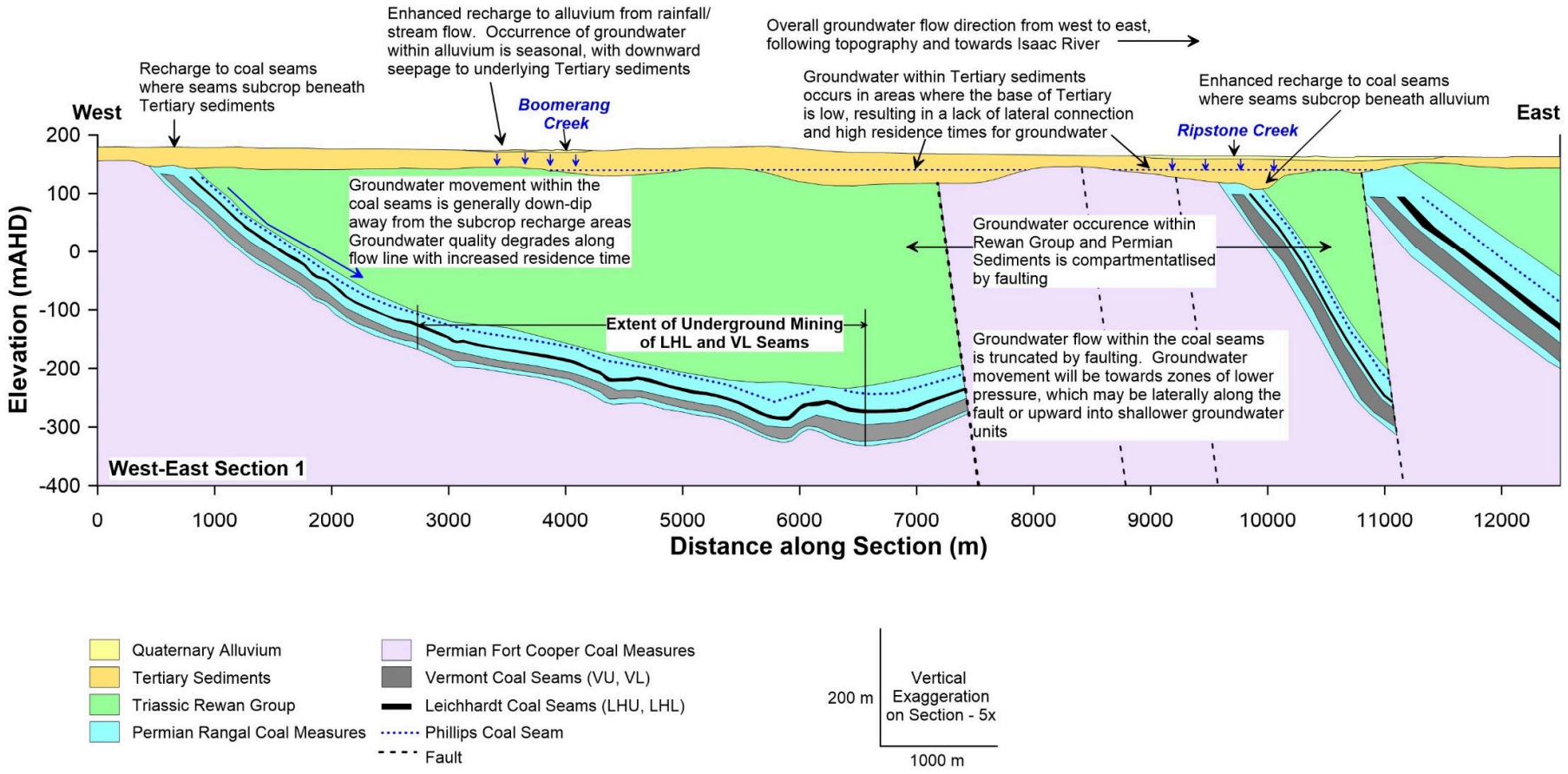


Figure 4-26: Pre-Mining Conceptual Groundwater Model

5.0 GROUNDWATER MODELLING

5.1 Introduction

Three-dimensional numerical groundwater modelling has been undertaken for the Meadowbrook Project by SLR Consulting Australia Pty Ltd (SLR) and reported in SLR (2022), with the modelling report included as Attachment A to this report. The modelling was undertaken using the Olive Downs Project model (the foundational model – Hydrosimulations 2018), which has been expanded over time to include the Moorvale South Project (SLR 2019), the Winchester South Project (SLR 2020) and the Caval Ridge Expansion Project (SLR 2021). Detailed information on hydrogeological units, hydraulic properties and groundwater levels was available for each of these projects, which has enabled construction of a regional groundwater model that includes the major mining projects in the vicinity of the Meadowbrook and Lake Vermont North (LVN) Projects, thus allowing assessment of cumulative impacts from mining operations. The model area, as well as the mining projects that are included in the model, are shown below in Figure 5-1.

In addition to the projects discussed above, the updated Meadowbrook groundwater model includes:

- Enhanced geological detail (groundwater unit occurrence and elevations, faulting) in the area of the Meadowbrook and LVN Projects;
- Inclusion of the Saraji open pit and underground mines to the west of the Meadowbrook Project. It should be noted that no data were available from these operations at the time of reporting, therefore the operations were not included to the same level of detail as for other operations where data sharing agreements were in place. Nevertheless, the updated Meadowbrook model includes all known mining operations within the model area and therefore allows assessment of the cumulative impacts from all operations shown in Figure 5-1 and discussed in Section 6.2.8.

The groundwater model includes 19 layers, as shown in Table 5-1. The main units that are present in the Meadowbrook/LVN area are represented by Layers 1 to 11.

Construction of the groundwater model, including detail of the steady-state and transient calibration process, sensitivity analysis and uncertainty analysis, are discussed in the groundwater modelling technical report (SLR 2022, Attachment A) and is not discussed further in this report. The results of predictive groundwater modelling are discussed in Section 5.3 below.

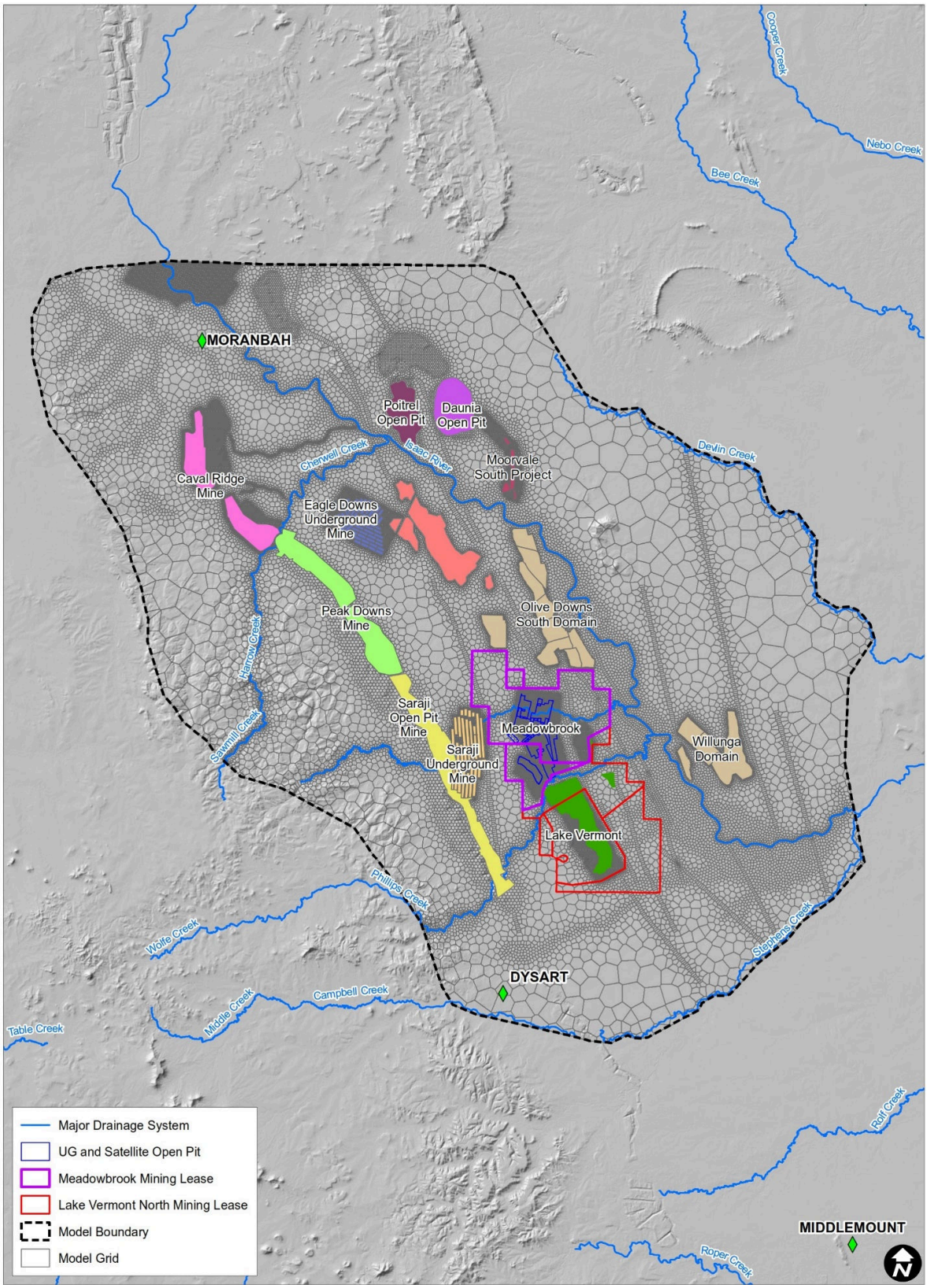


Figure 5-1: Model Domain (Source: SLR 2022)

Table 5-1: Model Layers and Thicknesses (adapted from SLR 2022)

Model Layer	Formation	Unit	Average Thickness (m)	Comment
1	Alluvium, colluvium, Tertiary basalt	Surface cover	6.5	
2	Tertiary sediments, Tertiary basalt	Tertiary and minor Triassic Clematis, weathered Permian, Tertiary basalt	16.5	
3	Rewan Group	Triassic	139.0	
4	Rangal Coal Measures	Leichhardt overburden	36.0	
5		Leichhardt seam	4.9	Coal seam mined at Meadowbrook
6		Interburden	36.5	
7		Vermont seam	4.0	Coal seam mined at Meadowbrook
8		Vermont underburden	26.5	
9	Fort Cooper Coal Measures	Fort Cooper overburden	61.5	
10		Fort Cooper seams (combined)	61.5	
11		Fort Cooper underburden	60.0	
12	Moranbah Coal Measures	Q Seam	1.5	
13		Interburden	17.0	
14		P Seam	2.5	
15		Interburden	41.0	
16		H Seam	4.5	
17		Interburden	65.5	
18		D Seam	8.5	
19		Interburden	100.0	

5.2 Mining Sequence

Underground mining at Meadowbrook will involve mining of both the Leichhardt Lower (LHL) and the underlying Vermont Lower (VL) coal seams, with open cut mining of the coal seams planned in the southwest of the Meadowbrook area where the seams subcrop.

The sequence of underground mining for both the Leichhardt Lower and Vermont Lower coal seams is shown in Figure 5-2. Mining of the Leichhardt Lower seam occurs only in the northern Project area, within MDL429, as the seam thins and becomes uneconomic to the south of the mining area (refer also geological cross sections Figure 3-7 and Figure 3-8.

The mining sequence shown in Figure 5-2 was incorporated into the groundwater model (SLR 2022). Output from the predictive modelling is discussed below in Section 5.3.

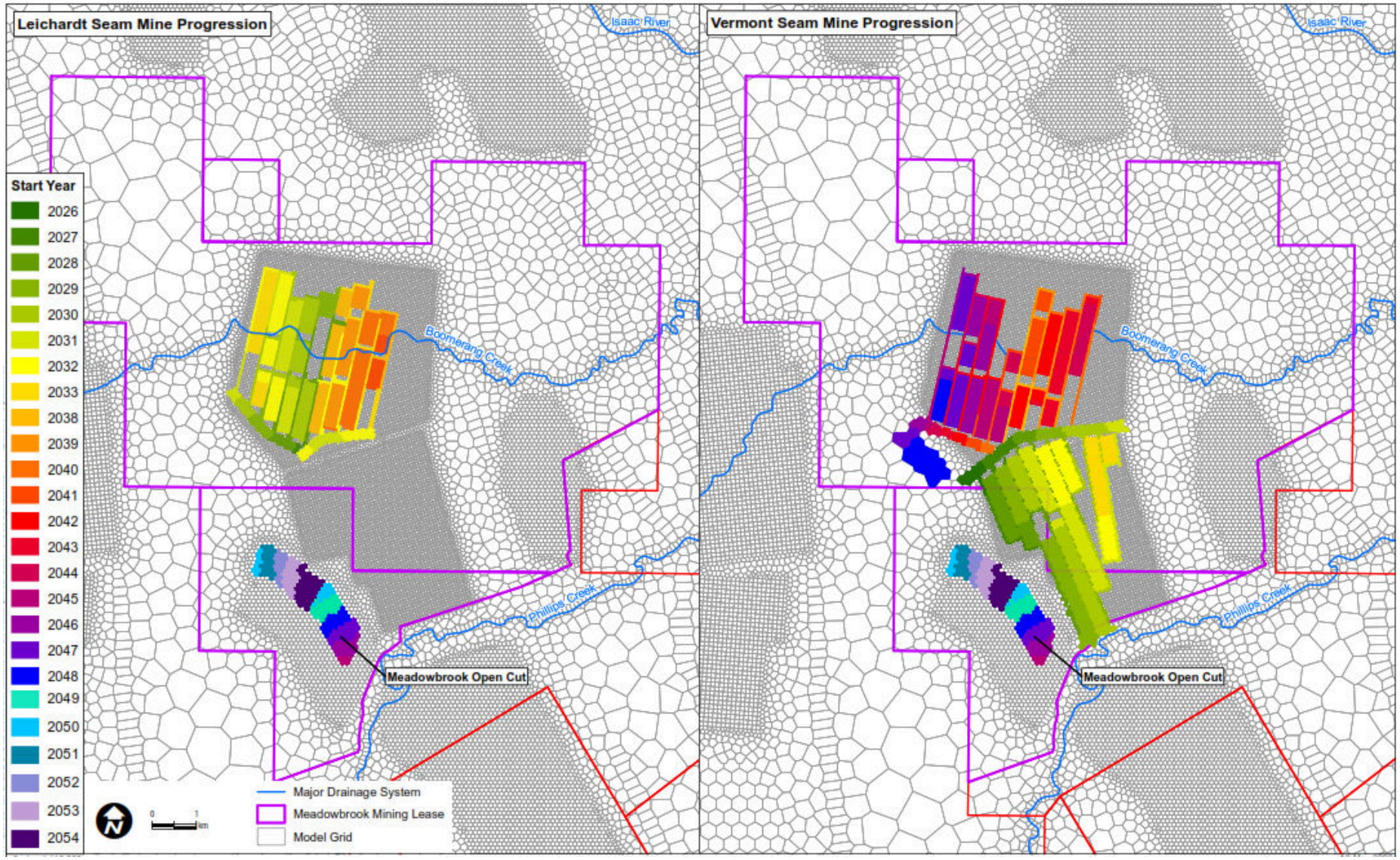


Figure 5-2: Mining Sequence for Leichhardt Lower (LHL) and Vermont Lower (VL) Seams (source: SLR 2022)

5.3 Predictive Modelling

5.3.1 Modelled Scenarios

The procedure for Predictive modelling is discussed in the groundwater modelling report (SLR 2022). Output from the predictive modelling phase is presented and discussed as follows:

- The predictive model "base-case" that is discussed in this section involves:
  - Incorporation of mining of the Meadowbrook underground in accordance with the mining schedule discussed in Section 5.2;
  - Inclusion of mining in the Meadowbrook open cut (discussed in SLR 2022 as the "Satellite Pit")
- It should be noted that the base-case that is discussed in the groundwater modelling report (SLR 2022) is different from the base-case scenario that is discussed in this report, with differences summarised as follows:
  - The base-case in the modelling report (SLR 2022) included all approved and foreseeable mining in the region and at Lake Vermont Mine, but excluded mining at the Meadowbrook underground mine and satellite pit;
  - The base-case discussed in this report included only mining at Meadowbrook underground mine and the satellite pit. This data set was created for JBT by SLR to enable the distinct impacts of the Meadowbrook operation to be discussed in this report;
  - The cumulative case in the modelling report (SLR 2022) included all approved and foreseeable mining in the region and at Lake Vermont/LVN mine, as well as the Meadowbrook underground mine and satellite pit. This is the same cumulative mining case that is presented and discussed in Section 6.2.8 of this report.

5.3.2 Discussion of Results

Predictive modelling results are discussed below in terms of groundwater level drawdown in:

- Model Layer 1 (Quaternary Alluvium)
- Model Layer 2 (Tertiary sediments)
- Model Layer 3 (Rewan Group)
- Model Layer 5 (Leichhardt Coal Seam); and,
- Model Layer 7 (Vermont Coal Seam)

5.3.2.1 Layer 1 – Quaternary Alluvium

Contours of predicted drawdown at end of mining in the Quaternary alluvium are shown in Figure 5-3, which contains three plots:

- The upper left plot shows the predicted groundwater level drawdown at the end of mining;
- The upper right plot shows the predicted drawdown at the maximum extent of drawdown (i.e. the maximum lateral extent), which occurs after the end of mining; and,
- The lower left plot shows the post-mining equilibrium drawdown, i.e. the steady-state water level drawdown when the full extent of post-mining recovery has occurred.

With reference to Figure 5-3, the water level discussion in Section 4.2.1 of this report, and the groundwater modelling report (SLR 2022) it is observed that:

- The two alluvium monitoring bores along Boomerang Creek are W4_MB1 and W3_MB1. Available groundwater monitoring data indicates that the water level is close to the base of bore. The water level in the calibrated groundwater model underpredicted the water level in these bores by 6 – 8 m

(i.e. the water level in the model was below the observed water level in the bore), making the alluvium dry at these locations in the model.

- The location where Layer 1 was partially saturated in the model (i.e. the modelled water level was above the base of alluvium) is at bore W14_MB1, which is a Tertiary monitoring bore. As noted in Section 3.3.1, this site contains sand from surface to approximately 18 mbgl, with the boundary between Quaternary alluvial sands and the underlying Tertiary sands difficult to determine. The groundwater model predicted a water level within the alluvium at this location, but at all other locations within the Meadowbrook project area the alluvium is dry. This is why drawdown within the alluvium is centred at this location.
- At the maximum extent of drawdown, which occurs post-mining, an area of drawdown is observed at the confluence of Boomerang Creek and Ripstone Creek, which coincides with the maximum extent of drawdown in the underlying Tertiary aquifer (Figure 5-4). As discussed in Section 3.3.1 and Section 4.2.1, it is assessed that the Quaternary alluvium in Boomerang Creek and Ripstone Creek is likely to be only seasonally saturated, with downward seepage to underlying units resulting in dry alluvium for the majority of the year. The implications of this observation for potential groundwater dependent ecosystems is discussed below in Section 5.3.2.2 and also in Section 6.2.1.
- At post-mining equilibrium, the residual drawdown is less than 1 m and, in the area of bore W14_MB1, the Quaternary water level is approximately 1 m higher than the pre-mining level. This is due to seepage to the groundwater system from depression in the final rehabilitated pit landform to the Tertiary sediments (refer to Section 5.7 for discussion of post-mining groundwater level recovery).

5.3.2.2 Layer 2 - Tertiary sediments

Contours of predicted drawdown in the Tertiary sediments are shown in Figure 5-4, which contains three plots as discussed above for the Quaternary alluvium figure. Observations include:

- At end of mining the 20 m drawdown contour is centred on the area of underground mining. It is noted that this is the approximate saturated thickness of the Tertiary sediments in that area, indicating that the Tertiary sediments have been drained in the central area of mining.
- At maximum extent of drawdown the 20 m drawdown contour has expanded to include the majority of the underground mining area and the 1 m drawdown contour has extended east to the confluence of Boomerang Creek and Ripstone Creek.
- The post-mining equilibrium drawdown plot shows a groundwater mound, approximately 4 m above the pre-mining groundwater level, that is centred on the rehabilitated landform pit of the Meadowbrook open cut (refer Section 5.7 for further discussion), with the 1 m limit of mounding extending to the north-east extent of underground mining.

5.3.2.3 Layer 3 - Rewan Group

Contours of predicted drawdown in the Rewan Group sediments are shown in Figure 5-5, which contains three plots as discussed above for the Quaternary alluvium figure. Observations include:

- The drawdown contours in each plot have been clipped to the extent of the Rewan Group sediments, i.e. the Rewan Group crops out to the west due to the dip of the strata, and is terminated by the Isaac Fault to the west of the mining area (refer also to the west-east cross sections (Figure 3-7)). Drawdown within the Rewan Group is therefore terminated at the western and eastern extents of the formation.
- Mining-induced drawdown at end of mining is greatest in the central area of underground mining and at maximum extent of drawdown is centred on the northern underground panels; and,

- At post-mining equilibrium the water level in the Rewan Group has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated pit landform of the Meadowbrook open cut (refer Section 5.7 for further discussion). The 1 m limit of mounding extends almost to the north-east extent of underground mining, but the extent is slightly less than observed in the overlying Tertiary sediments.

5.3.2.4 Layer 5 - Leichhardt Coal Seam

Contours of predicted drawdown in the Leichhardt Coal Seam are shown in Figure 5-6, which contains three plots as described above. The drawdown contours have also been clipped to the formation extent of the coal measures, as described above for the Rewan Group contours. From Figure 5-6 it is observed that:

- Mining-induced drawdown at end of mining is greatest in the central area of underground mining and at maximum extent of drawdown is centred on the northern underground panels., with the maximum extent of at the end of mining is centred on the underground panels where mining of the Leichhardt Seam occurs, as would be expected. At end of mining the 5 m drawdown contour extends approximately 1.2 km north of the northern underground mining area, extending to approximately 7.5 km at maximum extent of drawdown. From Figure 5-6 (Section 5.7) it is observed that recovery occurs in the central mining areas immediately post-mining, but drawdown extends laterally for some time as water is sourced from lateral areas to fill the central cone of depression.
- At post-mining equilibrium the water level in the Leichhardt Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated pit landform of the Meadowbrook open cut (refer Section 5.7 for further discussion). The extent of mounding is similar to that observed for the overlying Tertiary and Rewan Group sediments.

5.3.2.5 Layer 7 - Vermont Coal Seam

Contours of predicted drawdown in the Vermont Coal Seam are shown Figure 5-7, which contains three plots as described above. The drawdown contours have also been clipped to the formation extent of the coal measures, as described above for the Rewan Group contours. From Figure 5-7 it is observed that:

- The extent of drawdown at end of mining and maximum extent of drawdown is similar to that observed for the Leichhardt Seam. However, the depth of drawdown is greater for the Vermont Seam due to the greater depth of mining for this unit.
- At post-mining equilibrium the water level in the Vermont Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated landform pit of the Meadowbrook open cut (refer Section 5.7 for further discussion). The extent of mounding is similar to that observed for the overlying sediments (Leichhardt Seam, Rewan Group and Tertiary.

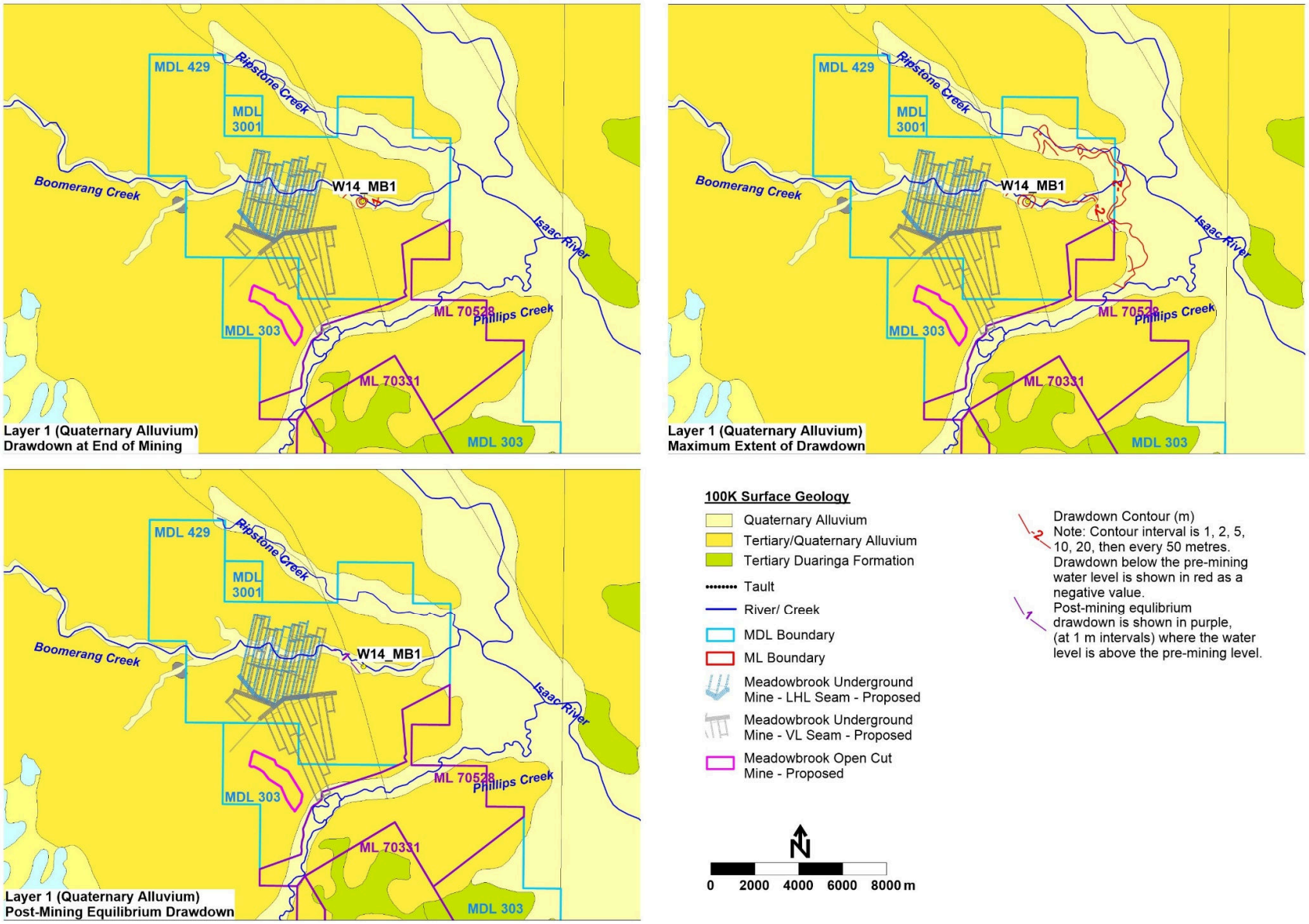


Figure 5-3: Predicted Water Level Drawdown and Recovery – Layer 1 (Quaternary Alluvium)

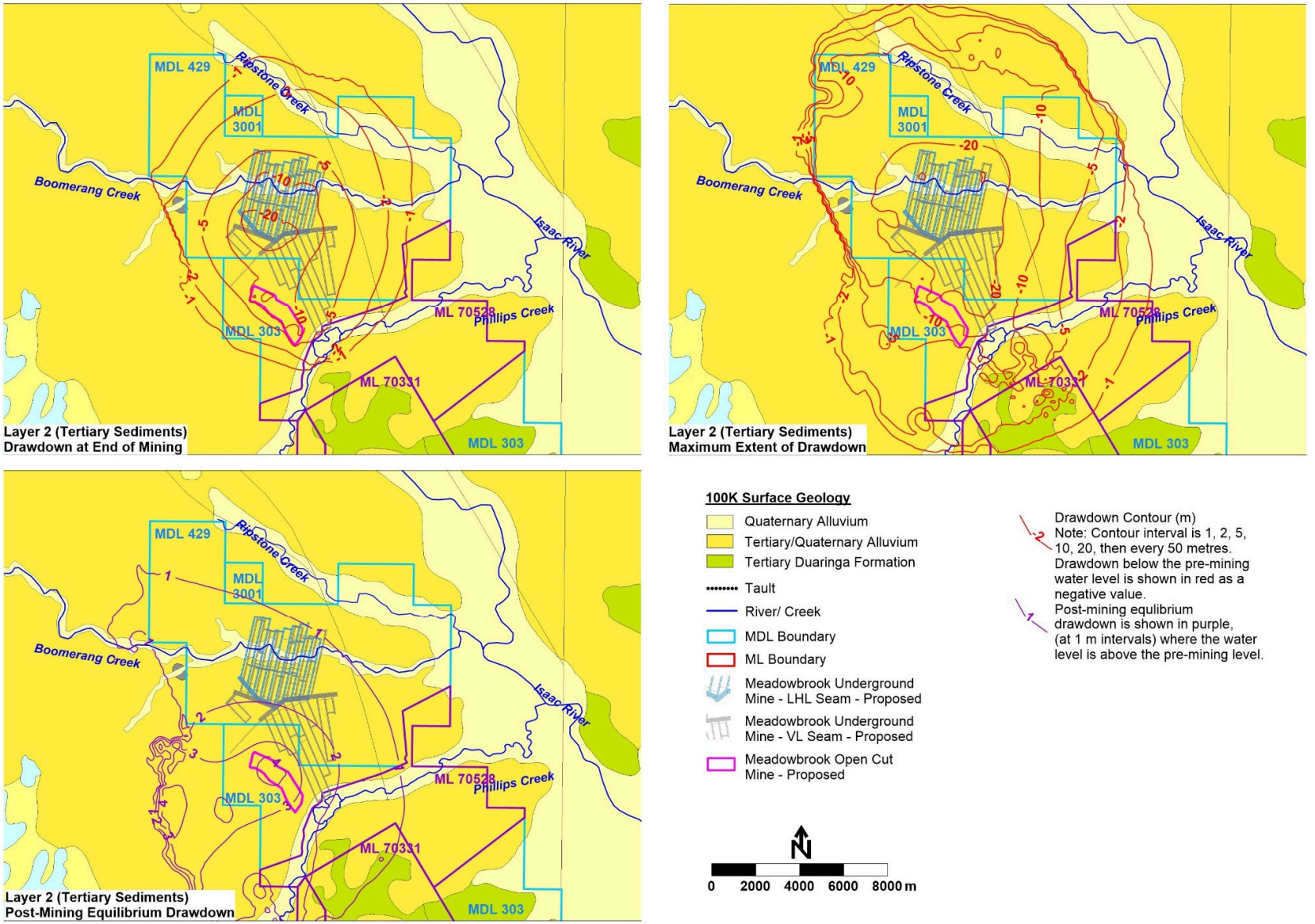


Figure 5-4: Predicted Water Level Drawdown and Recovery – Layer 2 (Tertiary Sediments)

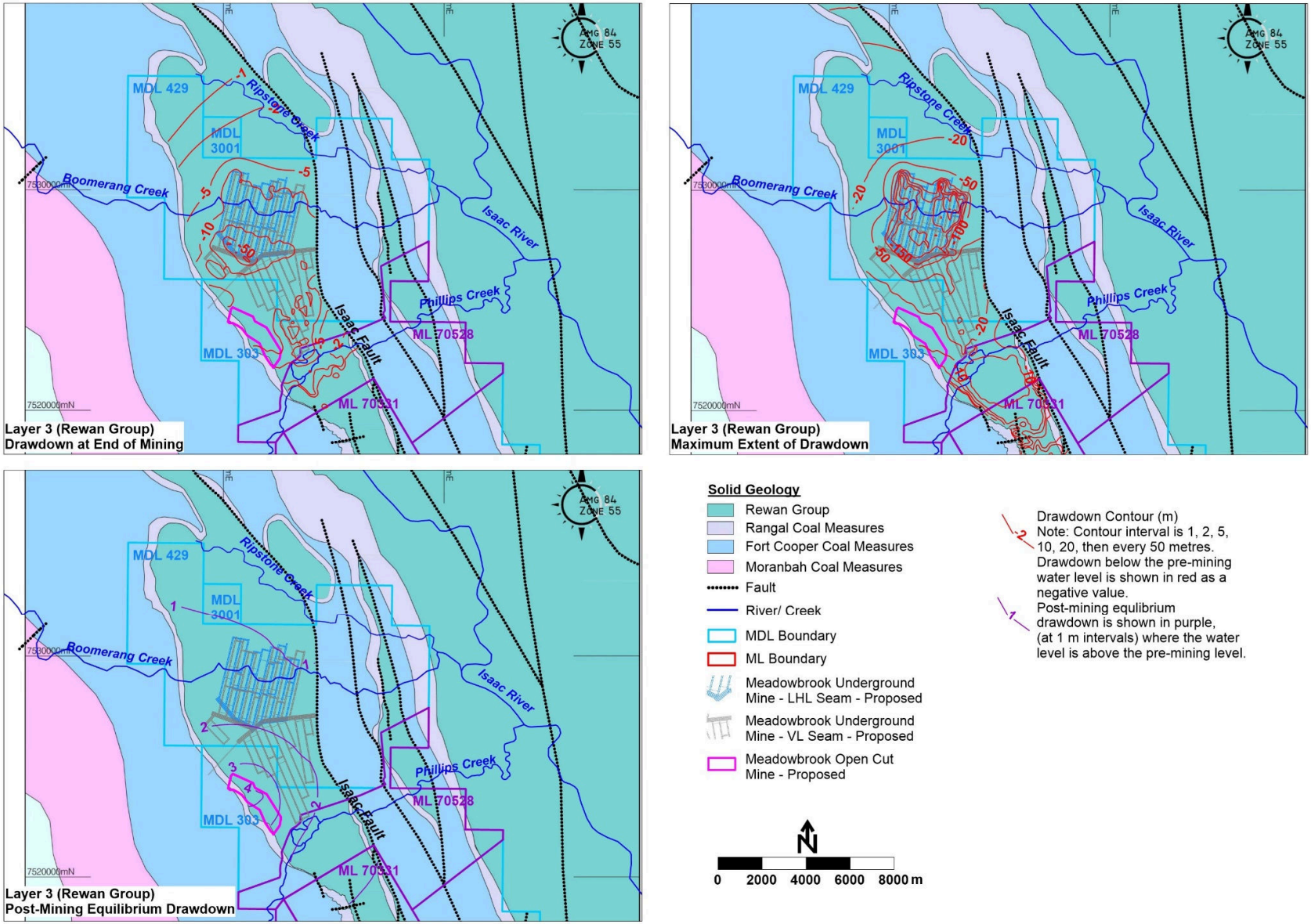


Figure 5-5: Predicted Water Level Drawdown and Recovery – Layer 3 (Rewan Group)

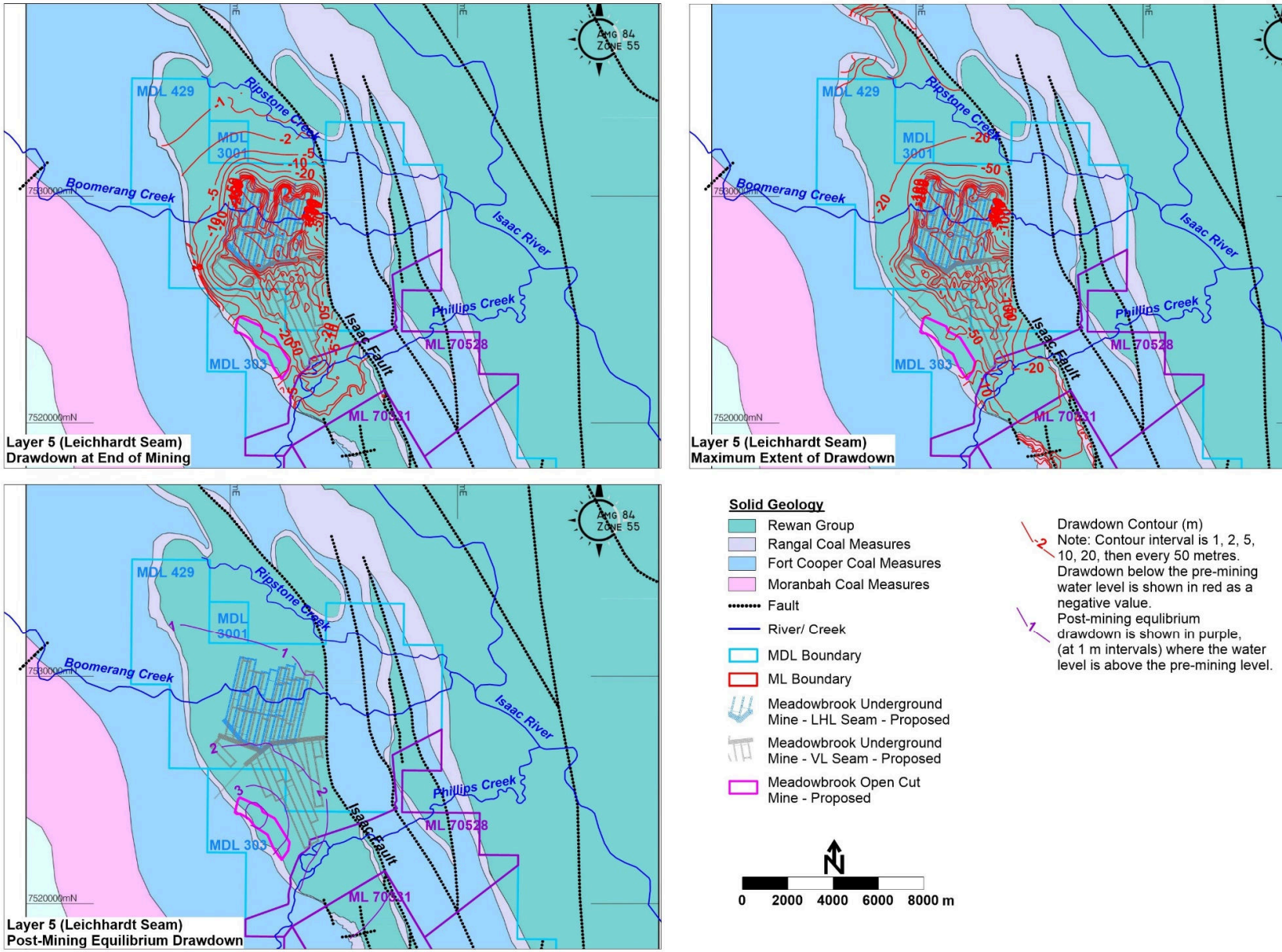


Figure 5-6: Predicted Water Level Drawdown and Recovery – Layer 5 (Leichhardt Seam)

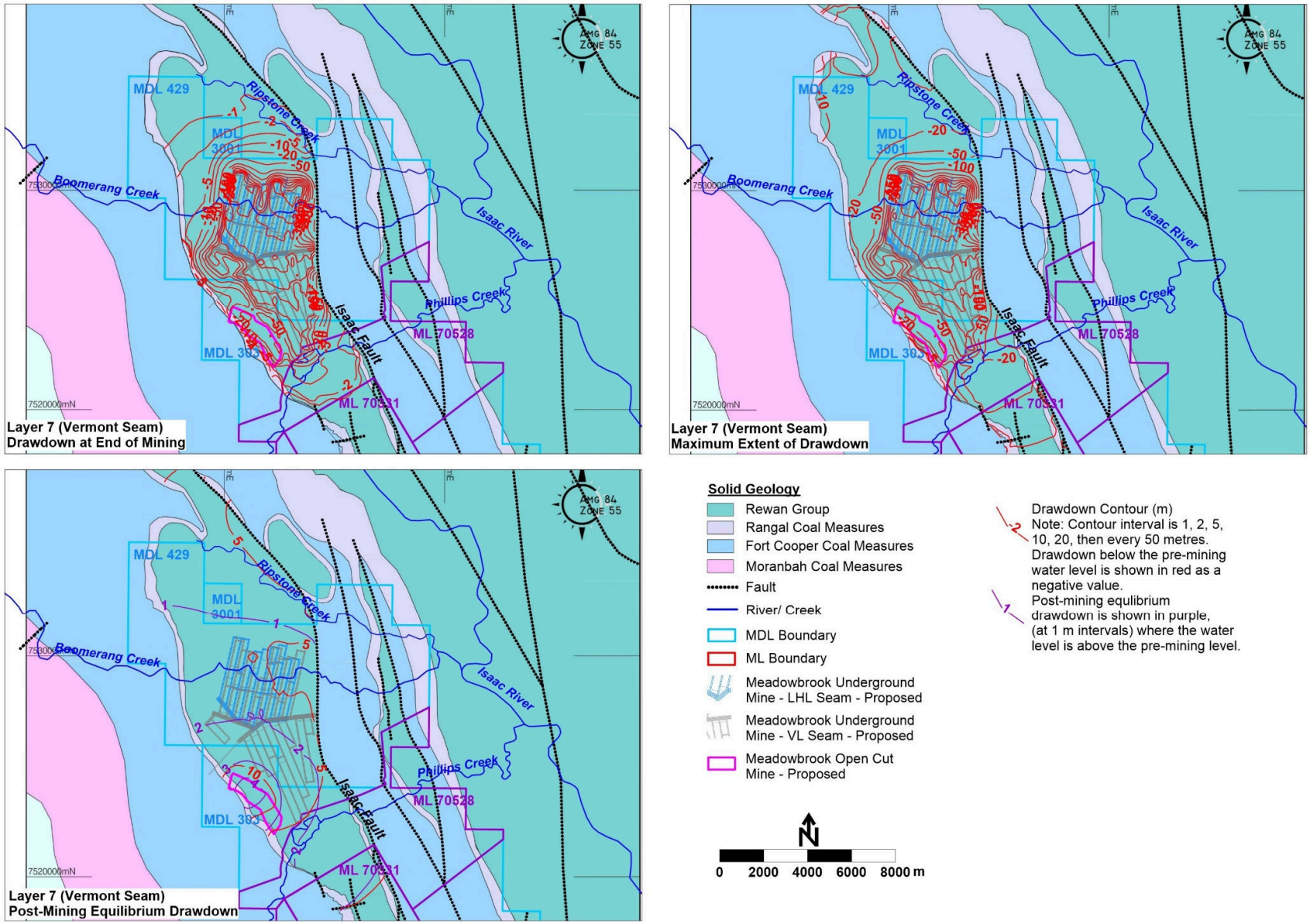


Figure 5-7: Predicted Water Level Drawdown and Recovery – Layer 7 (Vermont Seam)

5.4 Sensitivity Analysis and Uncertainty Analysis

Sensitivity analysis and uncertainty analysis has been carried out on the numerical groundwater model, with the methodology and results discussed in the Groundwater Modelling Technical Report (SLR 2022), which is included as Attachment A to this report.

5.5 Additional Sensitivity Scenario – Fracturing to Surface

The SLR base-case model (SLR 2022) assumed height of fracturing scenarios from the Meadowbrook subsidence prediction report (Gordon Geotechnics 2022) as follows:

- For a single-seam mining scenario (e.g. areas where only the Vermont Lower Seam is extracted), a zone of continuous fracturing extending to approximately 120 m above the extracted seam; and,
- For a dual-seam mining scenario (e.g. areas where bore the Vermont Lower and Leichhardt Lower seams are extracted), zone of continuous fracturing extending to approximately 180 m above the extracted seam.

Over most of the mining area, the above scenario resulted in the extension of continuous fracturing through the coal seams and Leichhardt overburden and into the basal portion of the Rewan Group (refer Section 2.4.5.2 of SLR 2022). However, it was assessed as best practice for the subsidence report to include a worst-case sensitivity assumption of continuous fracturing to surface; therefore a sensitivity scenario was included in the numerical groundwater model (SLR 2022) that included an assumption of fracturing to surface. The difference in drawdown compared to the base-case drawdown (Section 5.3.1) is shown below in Figure 5-8 (Layer 2 - Tertiary Sediments), Figure 5-9 (Layer 3 - Rewan Group) and Figure 5-10 (Layer 5 - Leichhardt Seam). No contours have been prepared for:

- the Quaternary sediments (Layer 1) as this layer is mostly dry and the impacts on shallow groundwater are therefore assessed via Layer 2 (Tertiary) drawdown; or,
- the Vermont Seam (Layer 7), as the results for this seam were unchanged for either scenario (as this unit was fully fractured for each scenario)

Each of the figures shows the following:

- The baseline drawdown contours (left plot);
- The fracture-to-surface scenario drawdown contours (middle plot); and,
- The difference in drawdown between the two scenarios.

From the figures it is observed that:

- The extent of drawdown (as defined by the 1 m drawdown contour) is similar for each scenario, i.e. the extent of drawdown has not significantly increased;
- The majority of additional drawdown for the fracture-to-surface scenario is observed in the area above the mining panels.

Implications for changes to mine inflow rate are discussed in Section 5.6 below.

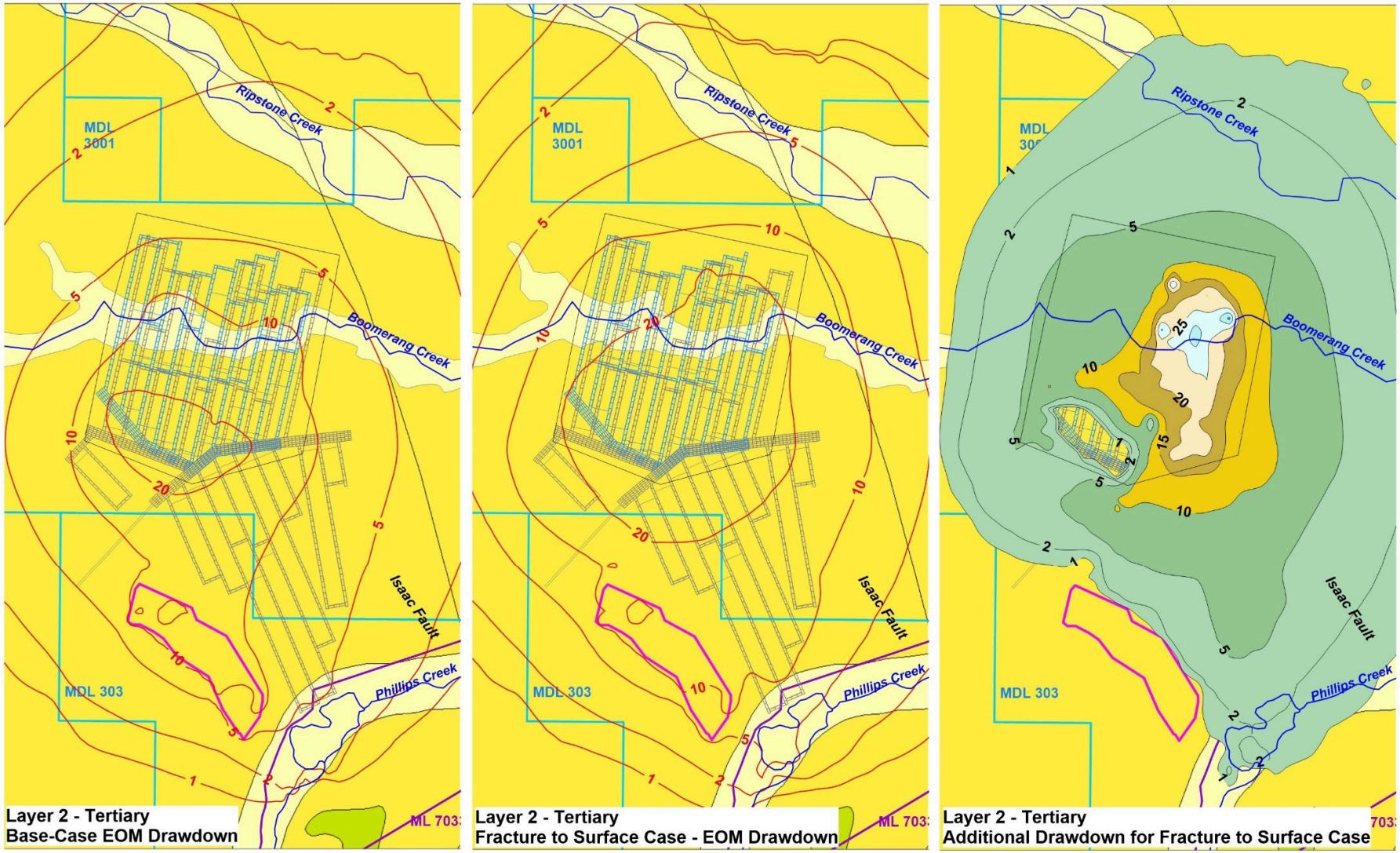


Figure 5-8: Difference Between Base-Case and Fracture to Surface Drawdown – Layer 2 (Tertiary Sediments)

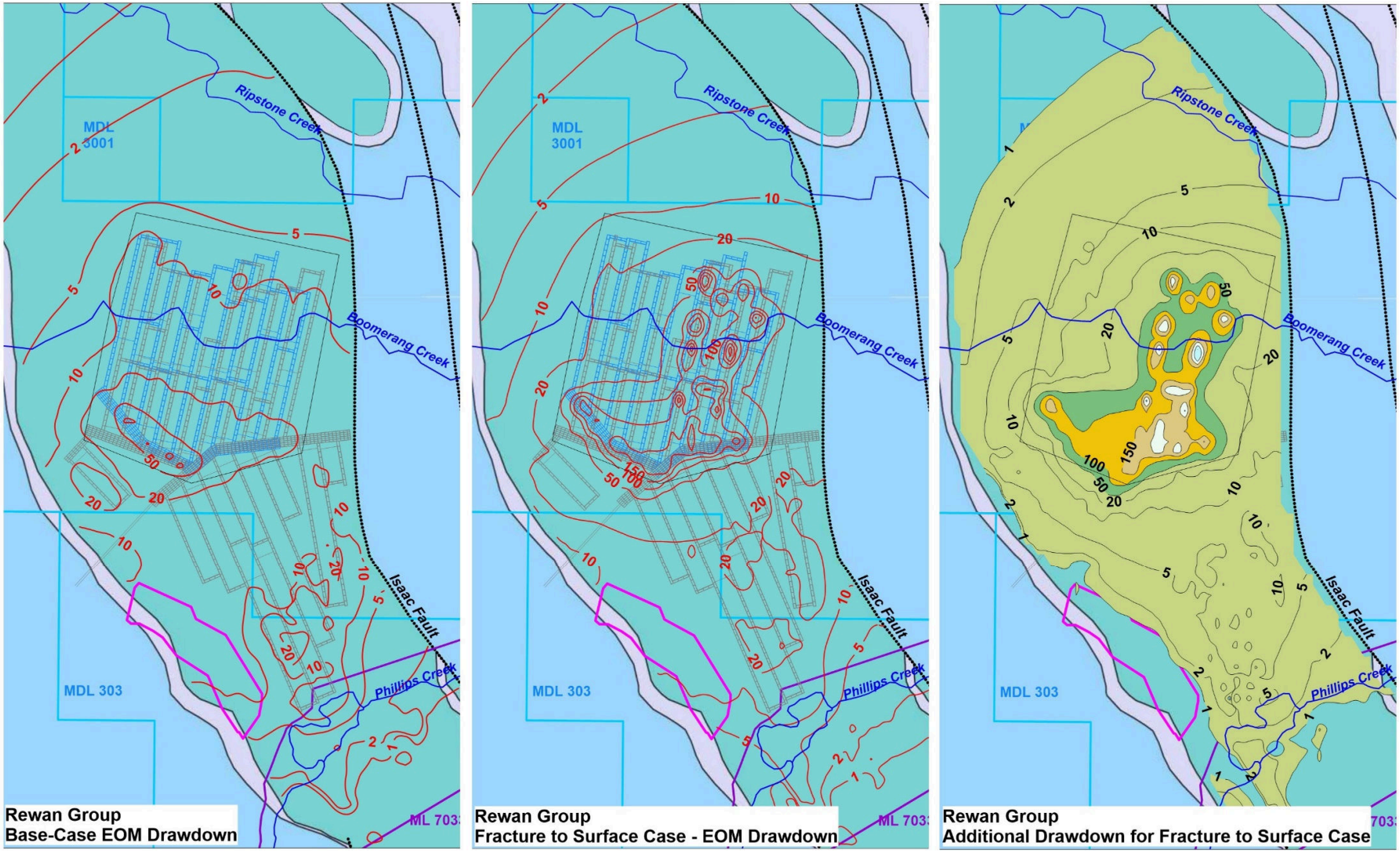


Figure 5-9: Difference Between Base-Case and Fracture to Surface Drawdown – Layer 3 (Rewan Group

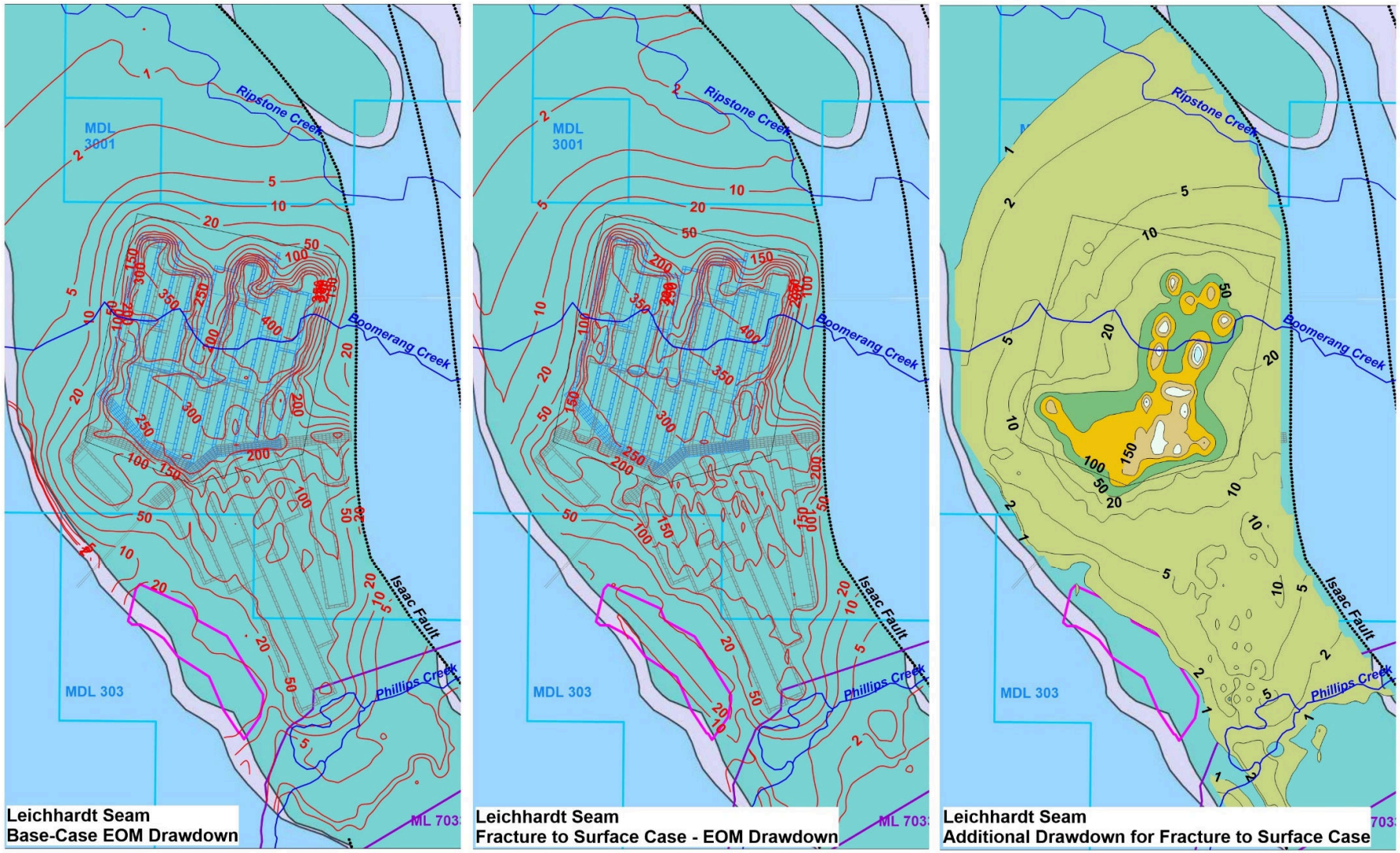


Figure 5-10: Difference Between Base-Case and Fracture to Surface Drawdown – Layer 5 (Leichhardt Seam)

5.6 Predicted Mine Inflows

The numerical groundwater model was utilised to provide prediction of groundwater inflow rates to the underground workings as well as the rehabilitated pit landform. The mine inflow predictions are presented in Section 4.5 of the groundwater modelling technical report (SLR 2022). For the purpose of mine water balance modelling the predicted underground inflows for the base-case model were modified to an overall lower inflow rate. The reason for this, and the rationale behind the change, is discussed below.

The predicted groundwater inflow rates include predicted inflow from the formations adjacent to and overlying the mining areas; these rates can be used as required to inform the groundwater take for the Project's Associated Water Licence under s1283 of the *Water Act 2000*.

5.6.1 Inflow Rates to Underground Workings

The rate of groundwater inflow to the underground workings for the base-case model (SLR 2022, Section 5.3.1) is shown below in Figure 5-11 and Table 5-2. For the purpose of water balance modelling, inflow rates to the underground workings were modified from the base case, based on the following assumptions and reasoning:

- Based on observations from geological, geotechnical and groundwater drilling at the Project site, it is observed that the occurrence of groundwater is pervasive within the coal seams (below the elevation of the regional watertable); however, within the Permian interburden as well as the overlying Rewan Group sediments, which make up the greatest volume of sediments above the coal seams (i.e. the zone within which mining-induced fracturing occurs), groundwater occurs within discrete fractures rather than pervasively throughout the formation (i.e. groundwater occurs predominantly within the secondary porosity of fractures, rather than with the primary porosity of the formation);
- Groundwater models assume a continuous porous medium, i.e. that groundwater occurs and can be drained from the total pore volume above the area of underground mining;
- When mine-induced fracturing is simulated by the numerical groundwater model, this is achieved by increasing the horizontal and especially vertical hydraulic conductivity within the area above the mine workings. This has the effect of allowing drainage of all water within the volume of sediment above the mine workings, even though field observations suggest that the majority of the rock mass is relatively dry, with groundwater occurring predominantly within fractures that make up a relatively small proportion of the total rock mass;
- It is concluded that groundwater models tend to over-estimate the volume of mine inflows to underground workings when compared to actual inflows observed during the mining process. During mining it tends to be observed that the general rate of groundwater inflow is relatively low, with inrushes of water observed when mining through intensely jointed or sheared zones that represent high yield, low storage groundwater zones (i.e. inflow rates may be relatively high due to the high permeability of the fractured zones, but the duration of inflow is relatively short as the zones store relatively small volumes of water and, once drained, the zones will not recharge except at the relatively low rate allowed by the unfractured, lower-permeability rock mass). Therefore, once drained, the zones will tend to drain at the rate observed from the majority of the rock mass.
- It is noted that the observations above relate only to the modelled rate of inflow to the underground workings and not to the extent of drawdown calculated by the model. The extent of drawdown in the area beyond the underground workings is sensitive to the horizontal and vertical hydraulic conductivity, which is unchanged in the zone beyond the mine workings. Therefore, the extent of drawdown contours for the area beyond the mine workings is not called into question by the above observations.

- For the reasons outlined above, the calculated rate of mine inflows for the purpose of water balance modelling have been based on the calculated rate of inflow for a sensitivity scenario that was run in the numerical groundwater model (SLR 2022) where the increase in vertical hydraulic conductivity for the goaf zone above the underground workings was limited to two orders of magnitude above the unfractured hydraulic conductivity (the 2-order of magnitude vertical K increase case); from discussions with the numerical groundwater modellers (A. Mohajeri pers. comm.), this assumption is more in line with assumptions from other groundwater models, noting that the increase in hydraulic conductivity due to fracturing was based on a graph from the subsidence report (Gordon Geotechnics 2022, Figure 47) that has not previously been subjected to a groundwater model calibration process;
- The calculated inflow rates for the 2-order of magnitude vertical K increase case, compared to the base-case scenario, are presented in Figure 5-11 and Table 5-2; this case represents the assumed inflow rate to the underground workings for the purpose of water balance modelling.
- From Table 5-2 it is noted that, for the 2-order of magnitude vertical K increase case, the total volume of groundwater that is predicted to be taken over the life of the Meadowbrook underground mine is 5,110 ML, at an average of approximately 204 ML/year.

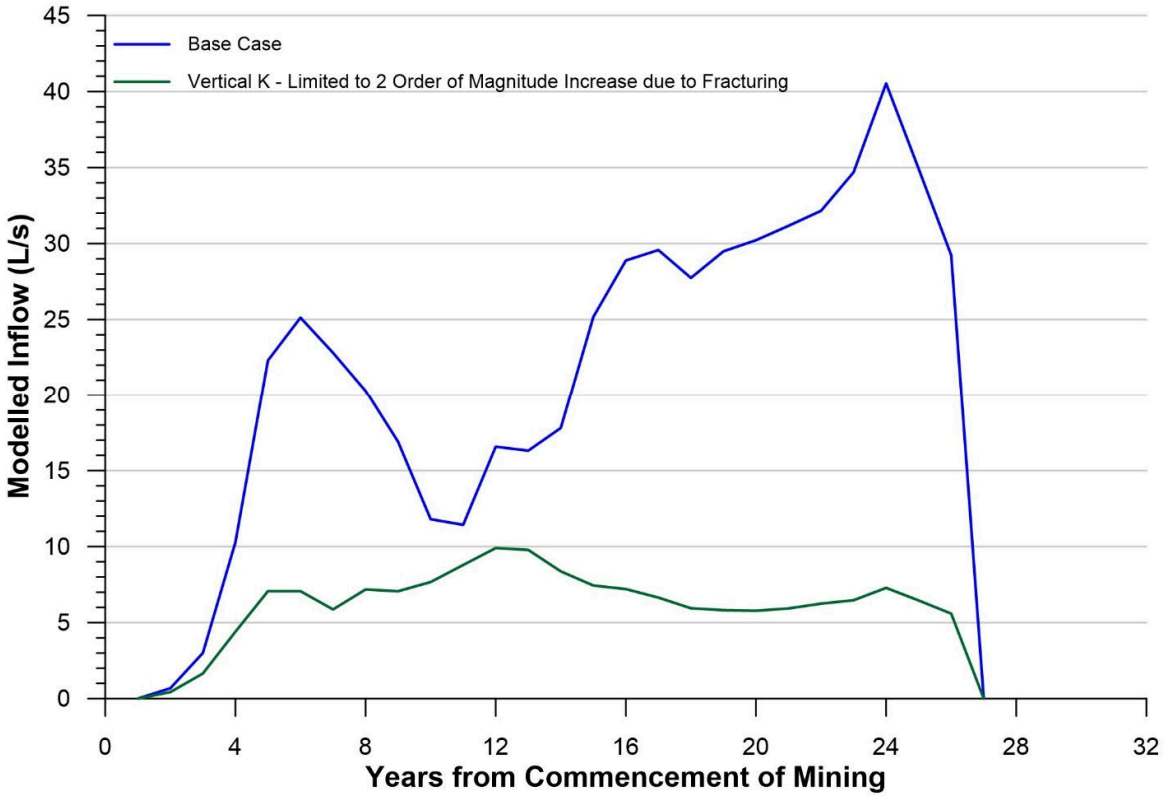


Figure 5-11: Predicted and Design Allowance Inflow Rates to Underground Workings

Table 5-2: Predicted and Design Allowance Inflow Rates to Underground Workings

Project Year	Base Case	Vertical K - 2 Order of Magnitude Limit	Base Case	Vertical K - 2 Order of Magnitude Limit
	Megalitres per Year (ML/Year)		Litres per Second (L/s)	
1	0	0	0	0.0
2	21	13	1	0.4
3	95	52	3	1.7
4	324	139	10	4.4
5	704	223	22	7.1
6	792	223	25	7.1
7	719	185	23	5.9
8	640	226	20	7.2
9	533	223	17	7.1
10	372	242	12	7.7
11	361	277	11	8.8
12	523	312	17	9.9
13	514	309	16	9.8
14	562	264	18	8.4
15	794	235	25	7.4
16	911	227	29	7.2
17	933	210	30	6.6
18	875	187	28	5.9
19	930	183	29	5.8
20	953	182	30	5.8
21	983	187	31	5.9
22	1014	197	32	6.2
23	1094	204	35	6.5
24	1278	230	41	7.3
25	1101	204	35	6.5
26	922	176	29	5.6
27	0	0	0	0.0
Total (ML)	**17,948**	**5,110**		
Average		**204 ML/year**	**23**	**6**
Minimum			**1**	**0.4**
Maximum			**41**	**10**

5.6.2 Inflow Rates to Meadowbrook Open Cut and Final Landform

The Meadowbrook open cut is a relatively small open cut that is located in the western subcrop area of the mine lease (Figure 3-1). The open cut is planned to commence operations towards the end of mine life for the underground operation, producing coal for approximately 10 Years. Groundwater inflow rates to the open cut during the operational phase are shown in Table 5-3 and Figure 5-12.

For the purpose of rehabilitated pit landform water balance modelling (WRM 2022), groundwater inflow rates were calculated for the active period of mining, with inflow rates based on output from the groundwater model (SLR 2022) and taking evaporation into account. The inflow rates were calculated as follows:

- The inflows to the open cut were calculated from the Groundwater Model (SLR 2022). The modelled inflow rates represent the volume removed from the formation, but do not take evaporation into account;
- SLR calculated the pit perimeter for the start of each year of active pit operations, based on the mine schedule provided by Jellinbah, and provided the data to JBT for review;
- A pan evaporation rate of 2,050 mm/year (2.05 m/year) was used for calculation purposes, based on SILO climate data for the Project site (Section 2.2);
- The maximum pit depth is approximately 120 m from surface. The annual evaporation volume was calculated based on:
    - The evaporation rate and pit perimeter, as discussed above;
    - An assumption that evaporation was applied over a 60 m seepage face (half the pit depth) at a rate equivalent to 50% of pan evaporation.

The calculated evaporation rate, as well as the net pit inflows (modelled model inflow rates less evaporation) are presented below in Table 5-3. From Table 5-3 it is observed that:

- The total volume of water removed from the formation during the active phase of mining is calculated at 2,086 ML; and,
- Allowing for calculated evaporation of ~1,460 ML, the net pit inflow over the active period of mining is ~620 ML.

As a means of assessing the validity of the inflow predictions, the predicted inflow rates for the Meadowbrook open cut pit (average inflow rate during the active mining phase of 2.5 L/s with evaporation taken into account) can be compared to the observed inflow rates for the existing Lake Vermont Mine. At Lake Vermont Mine it is observed that groundwater inflow generally occurs at a low rate (i.e. groundwater inflow is generally not observed, though inflows of several L/s are observed from time to time from joints and other discontinuities in the pit wall, especially following rainfall). This suggests that groundwater inflow occurs at a rate that generally less than the rate of evaporation, leading to the impression of a dry pit, except where localised inflows occur at rates that are higher than evaporation. As the planned Meadowbrook pit is to be approximately the same depth as the nearby Lake Vermont pit (maximum depth of approximately 120 mbgl at Meadowbrook compared to ~130 mbgl at Lake Vermont) the modelled inflow rate to the Meadowbrook open cut are assessed to be of the appropriate order based on the observations from the adjacent Lake Vermont operation.

During mining the pit is progressively backfilled with waste rock (spoil). On completion of mining the final area of mining is backfilled with spoil and a final landform created (the rehabilitated pit landform) that leaves a shallow depression in the central mining area with a floor elevation of ~RL160 mAHD at the deepest point (i.e. ~15 m below the natural surface). Figure 5-13 shows the base elevation of mining of the Meadowbrook open cut (left plot), the surface elevation of the final landform (middle plot) and the thickness of spoil within the pit and the out-of-pit dump (right plot).

Final landform water balance modelling (WRM 2022) predicts that water constrained within the depression in the final rehabilitated pit landform (SLR 2022, Section 5.7 of this report) will result in the development of a groundwater mound that will result in seepage from the final landform to the Tertiary sediments and underlying formations. This is discussed further in Section 5.7.

Table 5-3: Predicted Inflow Rates to Meadowbrook Open Cut – Active Mining Phase

Project Year	Modelled Inflow		Pit Perimeter (m)	Evaporation (ML/year)	Net Pit Inflow	
	ML/Year	L/s			ML/Year	L/s
19	0	0.0	0	0	0	0.0
20	74	2.3	973	60	14	0.4
21	206	6.5	2843	177	29	0.9
22	223	7.1	3218	200	23	0.7
23	272	8.6	3566	221	51	1.6
24	326	10.3	3551	221	106	3.4
25	344	10.9	4153	258	86	2.7
26	327	10.4	2657	165	162	5.1
27	314	10.0	2600	161	152	4.8
Total	**2086**			**1463**	**623**	
Annual Average	**261**	**8.3**		**183**	**78**	**2.5**

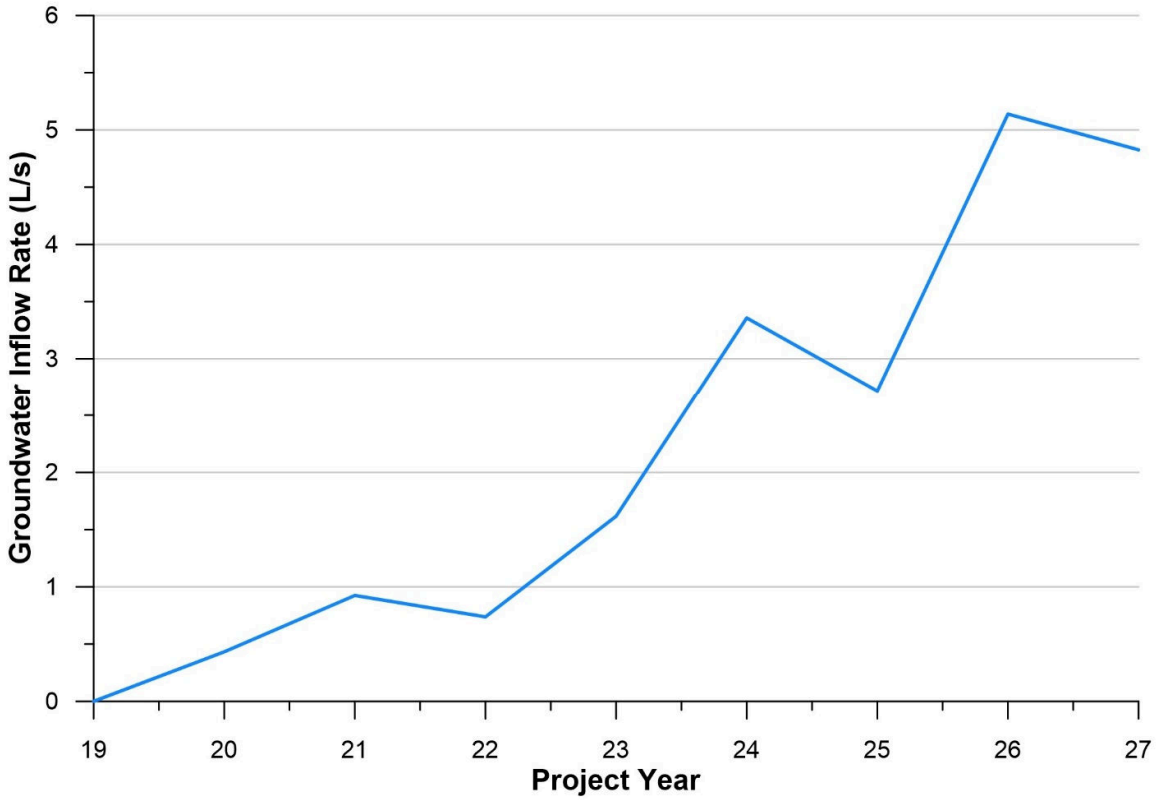


Figure 5-12: Groundwater Inflow Rate to Meadowbrook Open Cut

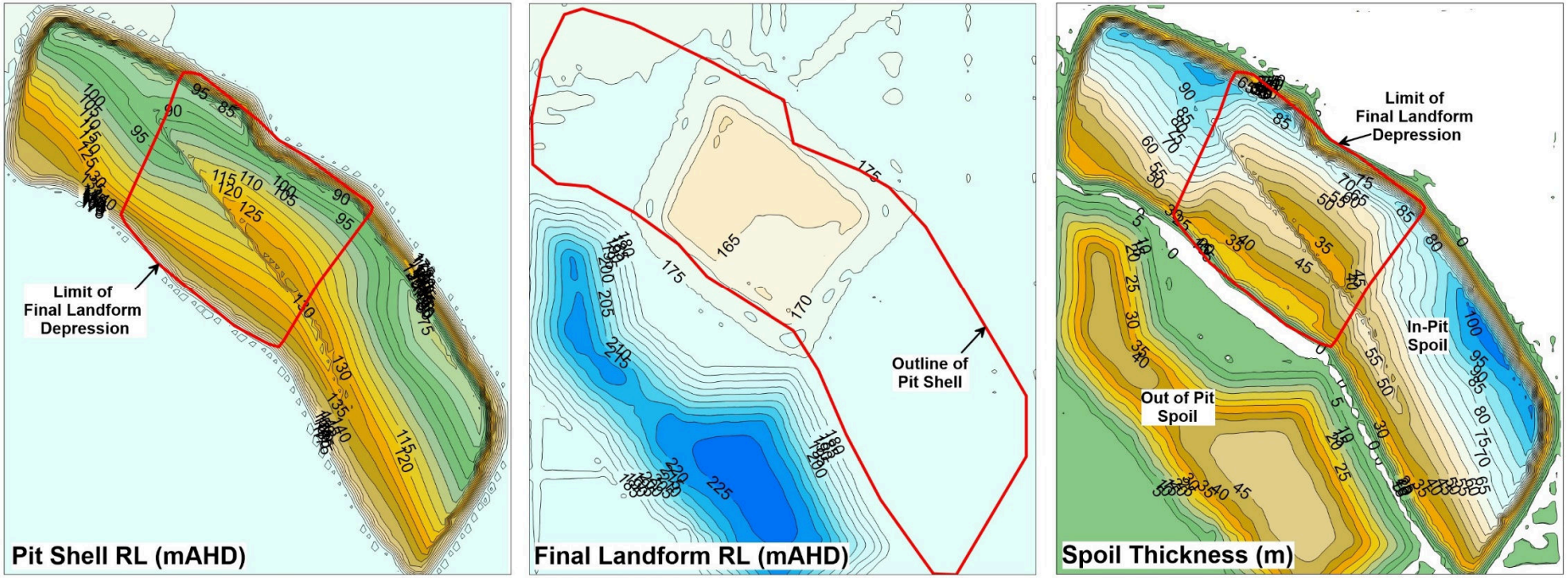


Figure 5-13: Rehabilitated Pit Landform Elevation Contours and In-Pit Spoil Thickness

5.7 Groundwater Level Recovery to Underground Workings and Rehabilitated Pit Landform

Observations with respect to the rate and extent of post-mining groundwater level recovery are as follows:

- The modelled rate of groundwater recovery in the Meadowbrook Project area is presented and discussed in Section 4.7 of the groundwater modelling technical report (SLR 2022, Attachment A of this report).
- The end of mining equilibrium drawdown in shown in this report in the following figures:
  - Figure 5-3 (Layer 1 – Quaternary Allluvium)
  - Figure 5-4 (Layer 2 – Tertiary Sediments)
  - Figure 5-5 (Layer 3 – Rewan Group)
  - Figure 5-6 (Layer 5 – Leichhardt Seam)
  - Figure 5-7 (Layer 7 – Vermont Seam)
- The elevation of the Meadowbrook open cut void at the end of mining is shown above in Figure 5-13. The rehabilitated pit landform will be partially backfilled with spoil to approximately 15 m from surface (refer middle plot in Figure 5-13, which shows the rehabilitated pit landform floor elevation at ~160 mAHD at the deepest point, compared to a crest elevation of ~175 mAHD).
- The spoil thickness within the rehabilitated pit landform will vary from ~10 m in the low wall area to ~85 m in the deepest (highwall) area of the rehabilitated pit landform (refer lower plot in Figure 5-13).
- The floor elevation of the rehabilitated pit landform was set at an elevation of ~RL160 mAHD to encourage long-term seepage away from the landform, in order to prevent the development of a saline lake within the final landform. The extent of the final rehabilitated pit landform depression is shown in Figure 6-2.
- The water constrained within the rehabilitated pit landform was modelled in Modflow's River package, which allows simulation of seepage from the final landform depression to the underlying spoil at a rate allowed by the properties of the spoil, with the water level in the spoil increasing over time due to a combination of seepage from the rehabilitated pit landform depression and inflow to the spoil from the adjacent groundwater system. The groundwater level beneath the final landform recovers to an elevation of ~162 mAHD (approximately 1 m lower than the maximum level of water constrained within the depression) within 10 years of development of the final landform (Figure 5-14);
- Above the northern longwall panels the groundwater level recovers to ~80% of the final equilibrium level after approximately 200 years, and to ~95% of the final equilibrium level after approximately 270 years (Figure 5-14). The final predicted equilibrium groundwater elevation in this area is ~161 mAHD, i.e., approximately 2 m lower than the elevation of the base of the final landform depression and approximately 1.5 m above the pre-mining water level for both the Leichhardt and Vermont Seams in the central area of the northern longwall panels (refer Figure 5-6 and Figure 5-7 respectively).
- Above the southern longwall panels the groundwater level recovers to ~80% of the final equilibrium level after approximately 120 years and to ~95% of the final equilibrium level after approximately 135 years (Figure 5-14). The final predicted equilibrium groundwater elevation in this area is ~160.5 mAHD, i.e., approximately 2.5 m lower than the elevation of the final landform depression and approximately 2.3 m above the pre-mining water level for both the Leichhardt and Vermont Seams in the central area of the southern longwall panels (refer Figure 5-6 and Figure 5-7 respectively).
- The faster rate of water level recovery above the southern underground panels is interpreted to be related to:

- The proximity of the southern underground panels to the Meadowbrook rehabilitated pit landform (where the rate and elevation of groundwater level recovery is greatest) and/or;
- The greater fracture height and specific yield of the deformed area above the northern underground panels (and hence a greater volume to be filled by recovering groundwater), due to the mining of two seams in this area (both Leichhardt and Vermont Seams) compared to the single seam mining of the Vermont Seam in the south.

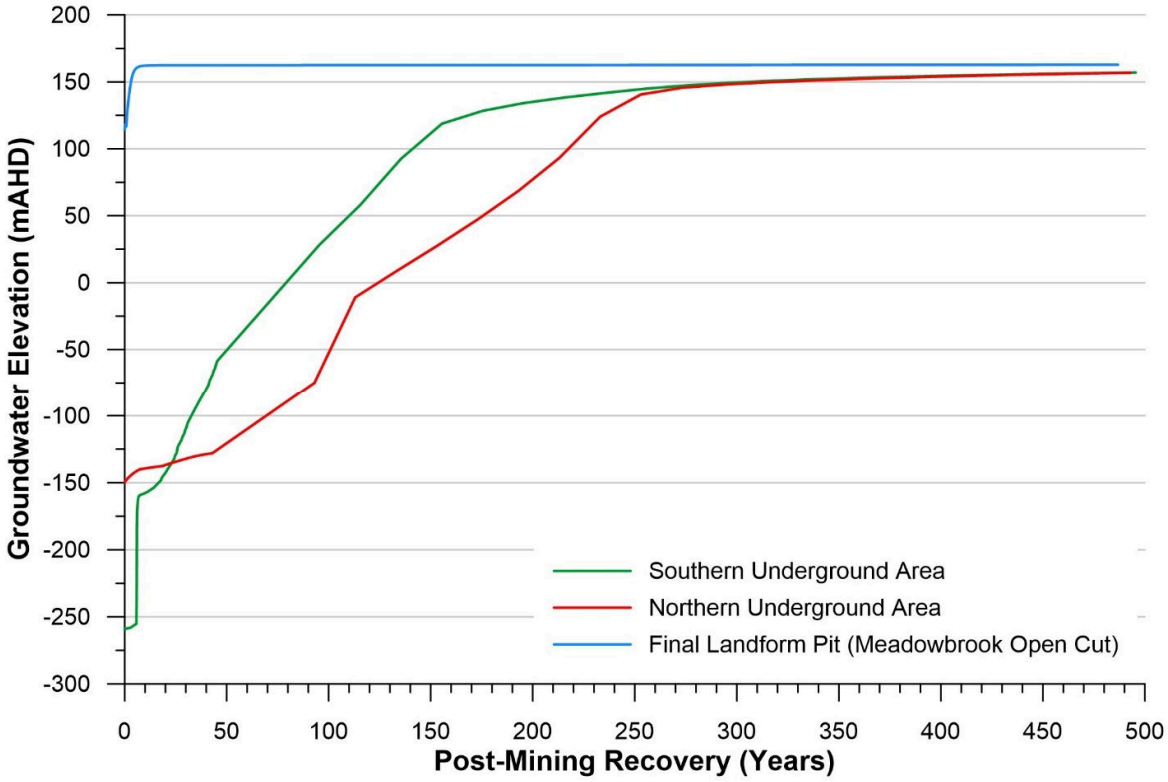


Figure 5-14: Water Level Recovery – Meadowbrook Open Cut

5.8 Post-Mining Conceptual Groundwater Model

The post-mining conceptual groundwater model is shown in Figure 5-15. Essential elements of the post-mining conceptual groundwater model, with reference to the pre-mining conceptual groundwater model that is discussed in Section 4.7 and shown in Figure 4-26, include:

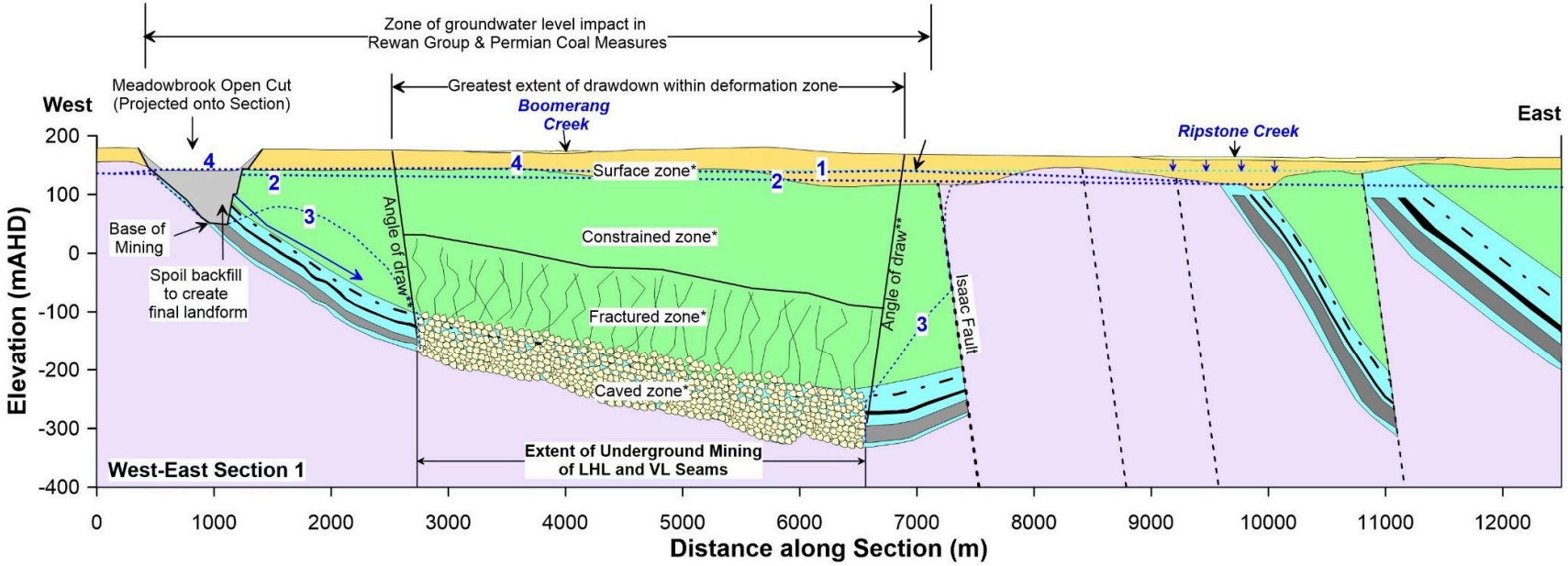
- Above the underground mining area a zone of enhanced permeability occurs due to goafing/caving into the underground workings. The zones shown in Figure 5-15 are based on the deformation zones from Ditton and Merrick (2014). The characteristics of the zones include:
  - Caved zone – the zone above the extracted coal seam where total roof failure and detachment creates a highly fragmented regime with higher hydraulic conductivity and porosity.
  - Fractured zone – a zone of continuous, highly connected fracturing that becomes less connected with increasing height above the extracted seam. Enhanced vertical permeability in this zone promotes depressurisation of the strata. In the upper portion of the fractured zone and lower portion of the constrained zone (refer below) (coincident with the B-zone (lower dilated zone) of Ditton & Merrick 2014), vertical and horizontal cracking becomes less connected and groundwater within this zone is tortuous. According to Guy et. al (2006):

    > *This zone has layers of high conductivity separated by zones of low conductivity. Flow in this zone requires an interconnected network of vertical and horizontal fractures to form. Flow would be tortuous and this section forms the effective flow control zone between the intermediate zone (*upper part of the constrained zone – refer below*) and the surface aquifer.*

  - Constrained zone – a zone of disconnected fracturing, where there may be enhanced horizontal permeability but negligible enhancement of vertical permeability.
  - Surface zone – a zone where vertical surface fractures and subsidence is evident. The surface fractures are of limited extent and, due to the silts/clays that are present in the sediments, have a tendency to self-heal (i.e. the enhanced permeability due to surface cracking reduces over time, so that long-term downward flow, e.g. from surface water bodies or enhanced recharge, does not tend to occur)
- Groundwater level impacts from underground mining are summarised as:
  - The main groundwater level impacts that relate to deformation of the strata are restricted to the zone within the angle of draw, i.e. the angle between the end of the underground workings and the point on the ground surface to which subsidence may extend).
  - Groundwater level drawdown due to mining will also occur beyond the limits of the angle of draw, but the drawdown limits will be constrained to the west by the pinching-out of the coal-bearing strata of the Rangal Coal Measures, and to the east by truncation of the Rangal Coal Measures and Triassic Rewan Group by the Isaac Fault;
- The Meadowbrook Open Cut has been projected onto the post-mining conceptual groundwater model section (refer Figure 3-1 for the actual location of the open cut relative to the section location). Observations with respect to the post-mining impacts of the open cut include:
  - The open cut, which will attain a maximum depth of ~120 m from ground surface, is to be backfilled with spoil to ~15 m from ground surface to create a final landform feature that is referred to as the "rehabilitated pit landform". Water may be constrained within the depression in the base of the rehabilitated pit landform at an RL of ~161.3 - 163 mAHD (a long-term water level for all climate scenarios of 161.3 mAHD is predicted in the final rehabilitated landform water balance report (WRM 2022) with a level of up to 163 mAHD modelled for earlier model runs with slightly different

catchment assumptions). A long-term water level within the final landform depression of RL 163 mAHD was assumed for the groundwater modelling as discussed throughout this report.

- Groundwater modelling indicates that the groundwater level will recover to the base of the rehabilitated pit landform, to a level of approximately RL162 mAHD, which is above the base of unconsolidated Tertiary sediments in this area. This will allow seepage to the adjacent groundwater system via the base of Tertiary and result in a groundwater mound that is approximately 4 m higher than the pre-mining groundwater level immediately below the final landform depression. The groundwater mound extends to all groundwater units, resulting in a long-term groundwater level in the mining area that is above the pre-mining groundwater level for each formation.
- Long-term seepage will occur from the base of the final rehabilitated pit landform to the groundwater system at a rate of approximately 1.8 L/s (56 ML/year), at a maximum salinity of approximately 950 mg/L (~1,460 µS/cm). This compares to a mean background EC in the surrounding groundwater units that ranges from ~17,500 µS/cm in the Tertiary sediments to ~30,000 µS/cm in the Permian sediments.



Quaternary Alluvium
Tertiary Sediments
Triassic Rewan Group
Permian Rangal Coal Measures
Permian Fort Cooper Coal Measures
Vermont Coal Seams (VU, VL)
Leichhardt Coal Seams (LHU, LHL)
Phillips Coal Seam
Fault

200 m
Vertical Exaggeration on Section - 5x
1000 m

***Deformation zones above mined seams (after Ditton & Merrick 2014)**
***Surface Zone**
- Occurrence of surface cracking of limited extent
- Surface subsidence occurs

***Constrained Zone**
- Zone of disconnected fracturing
- Negligible enhancement of vertical K, horizontal K may be enhanced

***Fractured Zone**
- Zone of relatively free drainage,
- Highly connected fracturing above caved zone, becoming less interconnected with increasing height above seam
- Enhanced vertical permeability promotes depressurisation of strata

***Caved Zone**
- Goaf zone - total failure and roof detachment
- Highly fragmented regime (increased permeability and porosity)

****Angle of Draw**
- The angle between the end of underground workings and the point on the ground surface to which subsidence may extend (26.5°, based on subsidence report (Gordon Geotechnics 2022) and allowing for vertical exaggeration of section)

Groundwater Level Impacts

1 - Tertiary/Quaternary groundwater levels
- Quaternary alluvium generally dry, as per pre-mining conditions
- Tertiary groundwater has potential to drain to underlying formations due to enhanced vertical flow potential, especially in deformation zone from underground mining

2 - Pre-mining groundwater level in Permian/Triassic formations

3 - Groundwater level in Permian/Triassic formations during active mining phase
- Groundwater level lowered to base of underground mining due to enhanced potential for downward drainage, with flow to mine workings captured within mine water management system
- Drawdown to base of mining in Meadowbrook Open Cut
- Western limit of drawdown is the coal measures subcrop
- Eastern limit of drawdown is Isaac Fault, where mined coal seams are truncated.
- Limited extent of drawdown into adjacent formation (Fort Cooper Coal Measures)

4 - Post-mining equilibrium water level
- Mine workings flood and groundwater level recovers over time
- A final landform develops with water at the base, at a level that is ~4 m above the pre-mining groundwater level
- The Tertiary, Triassic and Permian groundwater units recover to a level that is above the pre-mining water level due to seepage from the final landform lake to the groundwater system, with the greatest increase above the pre-mining level (~4 m) centred on the final landform lake
- The Quaternary alluvium, which only contains groundwater in discrete areas pre-mining (i.e. is generally unsaturated) recovers to pre-mining water levels, with a small area centred on bore W14_MB1 being ~1 m higher than pre-mining levels
- The salinity of seepage from the final landform lake is predicted to be ~600 mg/L (~920 µS/cm) compared to mean salinity of the Tertiary, Rewan Gp and Permian sediments of ~17,500 µS/cm, 23,000 µS/cm and 30,000 µS/cm respectively

Figure 5-15: Post-Mining Conceptual Groundwater Model

6.0 POTENTIAL GROUNDWATER IMPACTS

6.1 Groundwater Environmental Values

6.1.1 EPP Water

The Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water and Wetland Biodiversity) exists to achieve the object of the *Environmental Protection Act 1994* (EP Act) in relation to waters and wetlands. That is, protecting Queensland's water environment while allowing for development that is ecologically sustainable. The EP Act guideline – Application requirements for activities with impacts to water (Queensland Government, 2021) – provides guidance on the identification and quantification of impacts to the environmental values of water and the development of management strategies that achieve a balance between the benefits of the development and the protection of the environmental values of the receiving environment.

Environmental values (EVs) define the uses of the water by aquatic ecosystems and for a range of human uses (e.g. drinking water, irrigation, aquaculture, recreation).

6.1.2 Groundwater Environmental Values and Water Quality Objectives (WQO's)

The Project lies within the Isaac Conners groundwater Management Area (GMA) and includes the following groundwater units:

- Isaac Conners Groundwater Unit 1 (Quaternary alluvium); and,
- Isaac Conners Groundwater Unit 2 (all subartesian aquifers other than Groundwater Unit 1)

The environmental values (EV's) and water quality objectives (WQO's) for the Project area are defined in EPP (2009)[1]. The Project area lies to the north of Phillips Creek and west of the Isaac River, in an area that is not shaded with a groundwater chemistry zone[2]; however, it is noted that:

- The WQO's apply to deep and shallow groundwater systems, where shallow groundwater systems are defined as being <30 m depth and deep groundwater systems are >30 m depth. Within the Project area it is assessed that shallow groundwater units would logically include the unconsolidated Cainozoic (Tertiary and Quaternary) sediments and the deep groundwater units would comprise consolidated sediments of the Triassic Rewan Group and Permian coal measures.
- The management intent of the WQO's is to maintain the 20th, 50th and 80th percentile values of a range of parameters that include EC, pH, major ions and metals (iron, manganese, zinc and copper). For initial assessment purposes the EC values for applicable groundwater chemistry zones are discussed below;
- The Isaac River is included in groundwater chemistry zone 34 (to the immediate east of the Project area) where the 20th, 50th and 80th percentile values for EC are:
    - Shallow groundwater system – 498, 2150 and 8,910 µS/cm respectively; and,
    - Deep groundwater system – 3,419, 6,100 and 16,000 µS/cm respectively.

[1] Environment Protection (Water) Policy – Fitzroy River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin. Department of Environment and Heritage Protection, September 2011.

[2] With reference to WQ1310 – Fitzroy Basin Groundwater Zones – Basin 130 https://environment.des.qld.gov.au/__data/assets/pdf_file/0030/88815/fitzroy_groundwater_plan_300811.pdf

- The area to the south of Phillips Creek (which lies within the LVN Project area but is south of the Meadowbrook Project area) is included in groundwater chemistry zone 23, where the 20th, 50th and 80th percentile values for EC are:
  - Shallow groundwater system – 461, 793 and 1,146 µS/cm respectively; and,
  - Deep groundwater system – 2,496, 3,465 and 7,450 µS/cm respectively.
- Within the Meadowbrook Project area (i.e. Meadowbrook groundwater monitoring bores only), the 20th, 50th and 80th percentile values for field EC are:
  - Shallow groundwater system (i.e. Cainozoic sediments) – 1,753, 20,716 and 26,902 µS/cm respectively; and,
  - Deep groundwater system (i.e. Rewan Group and Permian sediments) – 22,693, 28,057 and 37,656 µS/cm respectively.
- For the combined data set of Meadowbrook and LVN bores, the 20th, 50th and 80th percentile values for field EC are:
  - Shallow groundwater system (i.e. Cainozoic sediments) – 3,300, 20,624 and 28,199 µS/cm respectively; and,
  - Deep groundwater system (i.e. Rewan Group and Permian sediments) – 13,804, 24,219 and 33,018 µS/cm respectively.
- Apart from isolated zones where recharge is assessed to be occurring and the EC is less than ~4,000 µS/cm, the groundwater within both the shallow and deep zones is of significantly higher EC than the WQO's for the groundwater chemistry zones that are immediately adjacent to the Project area (water quality zones 34 and 23)

Despite the above assessment, and with reference to the groundwater quality data discussed in Section 4.3, the groundwater EVs for the creeks in the Meadowbrook Project area (Boomerang Creek, Phillips Creek, Ripstone Creek) are assessed to include:

- Aquatic ecosystems (slightly to moderately disturbed); and,
- Agricultural purposes, farm supply and stock watering.

As noted above however, the areas that contain groundwater that conforms to the above EVs are restricted to zones adjacent to the ephemeral creeks where it is interpreted that groundwater recharge is occurring. Over the majority of the Project area, and especially within the Permian groundwater unit, the groundwater quality (in terms of electrical conductivity (EC)) is poor and is assessed to be unsuitable for the EV's listed above (i.e. stock watering and aquatic ecosystem support).

The process for defining Project-specific WQO's and trigger levels is discussed below Section 7.1.2

6.2 Potential Groundwater Impacts from Mining

6.2.1 Subsidence-Related Impacts

Groundwater level impacts will occur as a result of mining-induced subsidence. Subsidence-related impacts on groundwater levels have been predicted by groundwater modelling and are discussed in Section 5.3 as well as in the groundwater modelling technical report (Attachment A). The predicted extent of subsidence due to underground mining (based on subsidence modelling reported in Gordon Geotechniques 2022) is shown below in Figure 6-1, which includes for reference the locations of HSE wetlands (discussed below in Section 6.2.5), gilgai wetlands (which are surface water features and not groundwater-related) and surface water systems. The impacts of subsidence on surface water systems are discussed in WRM (2022).

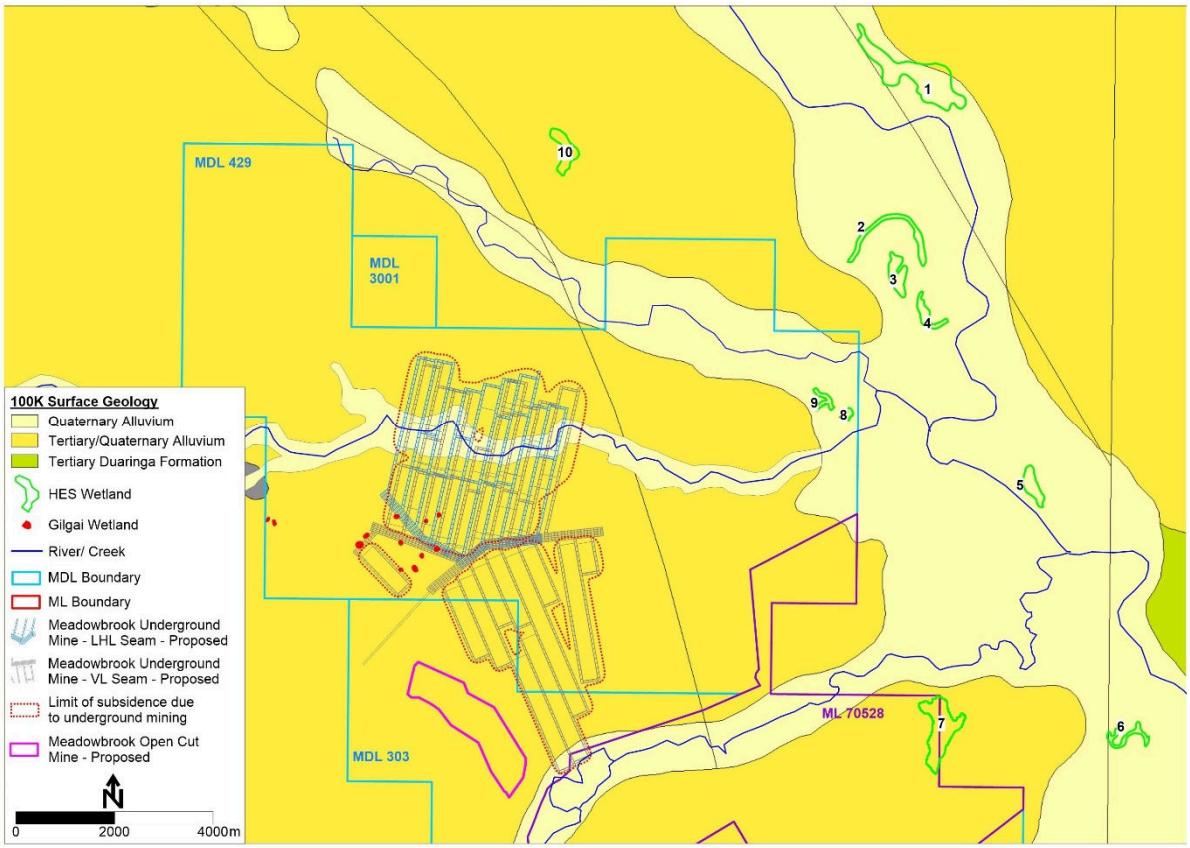


Figure 6-1: Limit of Subsidence Impacts in Relation to Surface Features

6.2.2 Impacts to Surface Water Systems

It is interpreted that the surface water systems in the area of groundwater drawdown impact from mining are not maintained or influenced by groundwater flow. Therefore, groundwater-related impacts to surface water are not predicted to occur. Surface water impacts related to mining are discussed in the EIS surface water assessment report (WRM 2022).

6.2.3 Groundwater Impacts from Final Landform

As noted in Section 5.7 the Meadowbrook final landform base will be set at an elevation to encourage long-term seepage away from the landform. There may be potential for water within the rehabilitated pit landform to impact the shallow groundwater system if the water accumulates in the rehabilitated pit landform depression and rises above the base of unconsolidated Tertiary sediments and if an outlet exists via the base of Tertiary. An assessment has therefore been undertaken for the potential for water within the rehabilitated pit landform to exit the final landform area via the base of Tertiary, with the relevant components of the assessment shown below in Figure 6-2 and discussed as follows:

- The colour-shaded contours show the base of Tertiary (i.e. base of unconsolidated sediments), based on data from the Project's geological model. The lowest elevation where a potential outlet exists via the base of Tertiary is ~154.5 mAHD and occurs in the northern area of the rehabilitated pit landform;
- The extent of water which may be contained in the base of the rehabilitated pit landform depression at RL163 mAHD is also shown. A long-term water level for all climate scenarios of 161.3 mAHD is predicted in the final rehabilitated landform water balance report (WRM 2022) with a level of up to 163 mAHD modelled for earlier model runs with slightly different catchment assumptions. A long-term water

level within the final landform depression of RL 163 mAHD was assumed for the groundwater modelling (SLR 2022) as discussed throughout this report.

- The right-hand plot in Figure 6-2 shows the areas (in blue shading) where outflow from the final landform and/or saturated spoil within the mining area would be possible via the base of unconsolidated Tertiary sediments with a water level in the final landform depression at RL163 mAHD. The figure shows that a number of potential outflow paths exist from the final landform depression to the unconsolidated Tertiary sediments. The post-mining groundwater level impacts are discussed in Section 5.7 and potential impacts to the groundwater system and sensitive environmental receptors are discussed in Section 6.2.5 (groundwater dependent ecosystems) and 6.2.7 (groundwater quality).

6.2.4 Groundwater impacts from Waste Dumps

The potential for seepage impacts from out of pit storage of mined waste material (e.g. overburden, interburden, coal rejects and coal material) has been considered in the EIS geochemical assessment report (RGS 2021). The report concluded that the waste materials to be mined at Meadowbrook pose a low risk as the materials:

- have a low sulphur content
- have an excess acid neutralising capacity (ANC)
- comprise non acid-forming (NAF) material
- are likely to generate runoff/seepage that is slightly alkaline to alkaline and with a low level of salinity
- are unlikely to generate unacceptable concentrations of metals/metalloids in runoff/seepage

It is intended that, once the waste dumps are formed, monitoring of shallow groundwater in areas between the waste dumps and receptors such as creeks may be undertaken, following assessment of the requirements by a suitably qualified person. These commitments are discussed in Section 7.1.3.

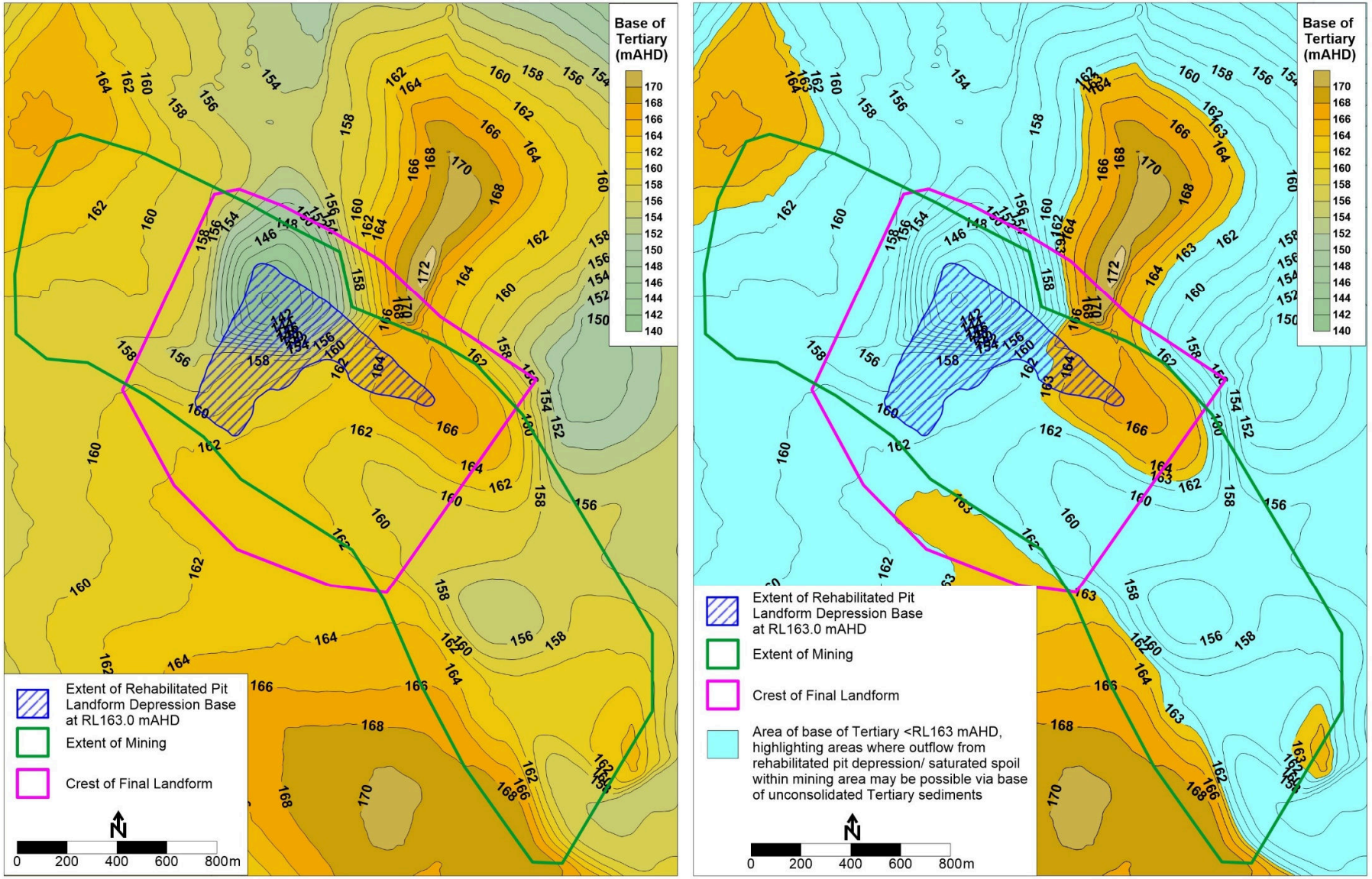


Figure 6-2: Rehabilitated Pit Landform Depression Extent at Maximum Level, Relative to Base of Tertiary

6.2.5 Impacts to Groundwater Dependent Ecosystems (GDEs)

From review data within the Queensland Government Wetlands Mapping website[1], it is noted that there are no mapped surface expression or terrestrial GDEs within the area potentially impacted by the Meadowbrook Project (defined by the drawdown map that is shown below in Figure 6-3. There are, however, a number of high ecological significance (HES) wetlands within the project area, as shown in Figure 6-3, which contains two plots, as follows:

- An upper plot, which shows the locations of the HES wetlands, the maximum groundwater level drawdown contours for the Tertiary groundwater unit, with an underlying satellite image (Landsat 7 enhanced thematic mapper (ETM) 7,4,2 RGB image – refer Attachment E for an explanation of the image features). In short, the satellite image incorporates data from two infrared bands, as well as one visible band (visible blue, which is used to enhance water bodies). For the reasons described in Attachment E, the infrared image can be useful for delineating both current water bodies as well as prior drainage channels; and,
- A lower plot, which shows the same data described above, but with an underlying image of the 1:100,000 scale surface geology (Tertiary and Quaternary sediments).

From review of the upper and lower plots in Figure 6-3 it is observed that:

- The HES wetlands within the plot area have been numbered 1 to 10;
- Wetlands 1 and 5 and associated with the flood plain of the Isaac River and are likely to be seasonally inundated (and therefore predominantly associated with river flow);
- Wetlands 2, 3, 4 and 6 are associated with prior drainage channels of the Isaac River, e.g. with Wetland 2 associated with a distinct oxbow (prior meander channel);
- Wetland 7 is Lake Vermont;
- Wetlands 8 and 9 are associated with flood channels that occur near the confluence of Boomerang Creek and Ripstone Creek; and,
- Wetland 10 is associated with an unnamed surface drainage system that drains to Ripstone Creek.

It is understood that the wetlands shown in Figure 6-3 are ephemeral and tend to contain water following significant rainfall or surface flow events.

With respect for the potential for groundwater level impacts at the HES wetland sites due to mining at the Meadowbrook Project it is observed and concluded that:

- The groundwater level in the Meadowbrook Project area tends to be below the base of alluvium, and in the range of 10 to 20 m below ground surface (Section 4.2.1);
- As noted in Section 5.3.2.1, the groundwater model predicted almost no drawdown in the Quaternary alluvium, but this is because the alluvium (Layer 1 of the groundwater model) was mostly dry within the Project area. Therefore, the extent of drawdown in model layer 2 (Tertiary sediments) is used to infer the extent where water level impacts on the Quaternary alluvium could occur via an enhanced potential for downward drainage from the Quaternary alluvium to the underlying Tertiary sediments (i.e. where impacts could occur either to isolated pockets of water within the Quaternary alluvium that is not captured at model scale, or where seasonal water within the alluvium would have enhanced potential for downward flow due to a lower groundwater level within the underlying Tertiary sediments);
- HES wetlands that are within the zone of potential impact from drawdown within the Tertiary sediments are wetlands 8, 9 and 10 (Figure 6-3), where the predicted drawdown in the Tertiary sediments is approximately 3 to 4 metres at wetlands 8 and 9 and ~9 m at wetland 10. The 1 m drawdown contour just extends to the limit of wetlands 2 and 7. Therefore it is concluded that there is potential for groundwater level impacts at the locations of HES wetlands 8, 9 and 10, with limited potential

[1] https://wetlandinfo.des.qld.gov.au/wetlandmaps/

groundwater level impact at the location of wetlands 2 and 7 and no impact at the other wetland locations. HES wetland 9 has been assessed to be surface feature perched on a clay aquitard that will not be influenced by groundwater drawdown related impacts. A conceptual model has been developed for HES wetland 8 which indicates the presence of a perched lens of fresh groundwater lying at depth below the wetland pan. A GDE monitoring plan will be developed to include HES wetland 8 as the impact of groundwater drawdown is uncertain and will require ongoing seasonal monitoring to identify if impact to hydro-ecological function will be incurred. The GDE monitoring program will also be extended to cover HES wetland 2 and 7 which are likely to be surface features though have not been verified with field assessment (3D Environmental 2022).

- As noted in Section 5.7, at post-mining equilibrium the groundwater level in the Cainozoic (Tertiary and Quaternary sediments) recovers to pre-mining levels and a groundwater mound exists below the final landform depression that locally increases groundwater levels above the pre-mining elevation by approximately 4 m.

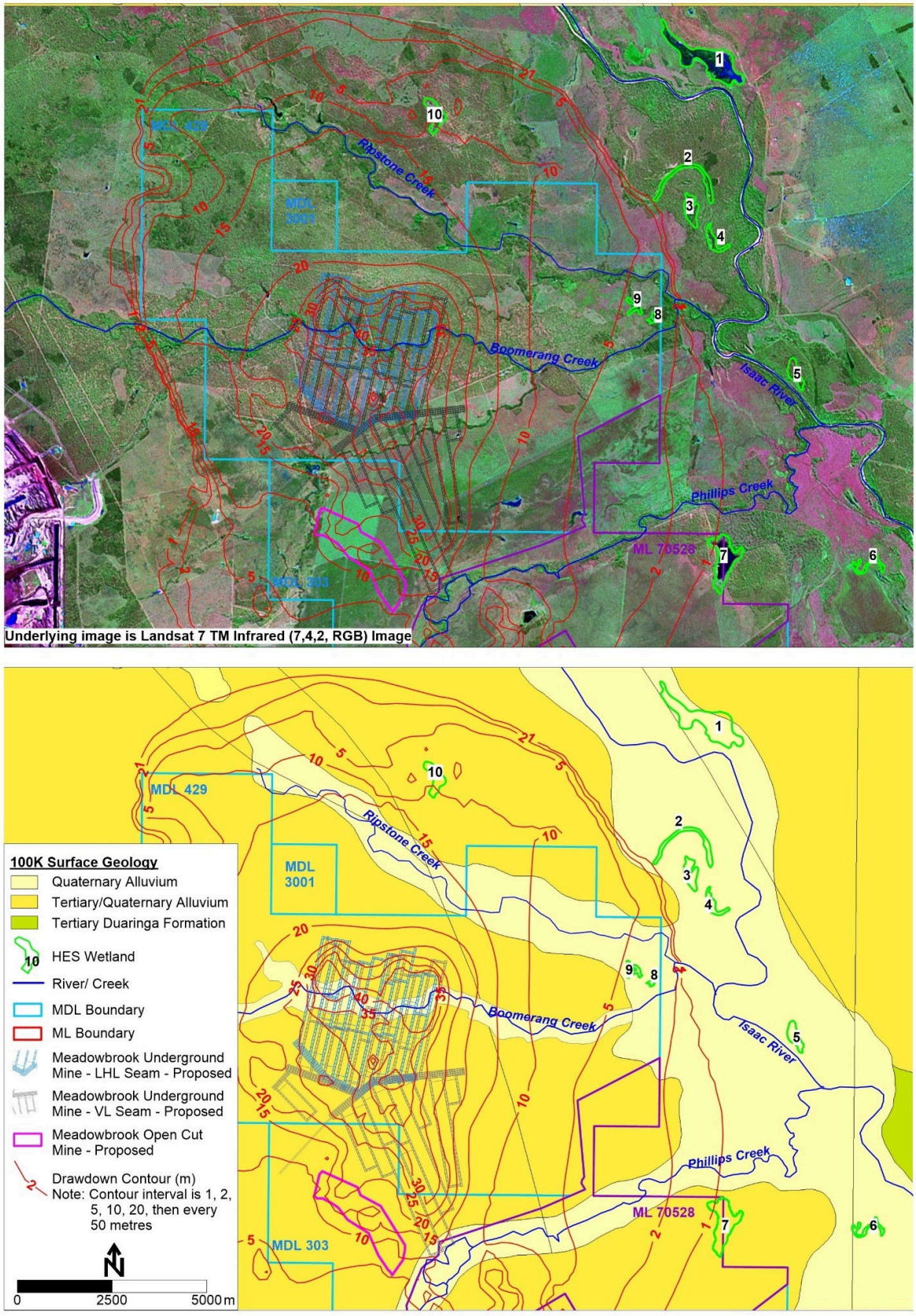


Figure 6-3: Locations of HES Wetlands with Respect to Tertiary Drawdown Contours

6.2.6 Impacts to Existing Groundwater Users

Potential groundwater level impacts to registered groundwater bores (based on data from the DoR groundwater database, current to November 2021) are shown below in Figure 6-4 (maximum extent of drawdown in Tertiary sediments) and Figure 6-5 (maximum extent of drawdown in consolidated sediments), with observations as follows:

- Cainozoic (Quaternary and Tertiary sediments (Figure 6-4):
  - The contours shown in Figure 6-4 are the maximum observed water level impact in the Tertiary sediments. As noted above in Section 4.2.1.1, the Quaternary sediments tend to be dry in the Project area, therefore the drawdown that is predicted for the Tertiary drawdown can be regarded as being the maximum extent of drawdown observed in the Cainozoic (either Quaternary or Tertiary) units.
  - The Cainozoic sediments are unconsolidated and are therefore assessed against the *Water Act 2000* bore trigger threshold[2] for an unconsolidated aquifer of 2 m;
  - There is one registered Tertiary bore (132627) within the extent of the 2 metre drawdown contour (refer Table 4-13 for available bore details);
  - The 2 m drawdown contour extends to the west towards a cluster of registered bores where one bore (165978) is a Tertiary bore. These bores are within the boundary of the Meadowbrook property, but outside the boundary of MDL429 and MDL303. Jellinbah Resources owns the land within the Meadowbrook property that is also within MDL429/303, with BHP Coal Pty Ltd (BHP) owning the parcel of land to the west of MDL429/303 but within the Meadowbrook property (i.e. the area where these bores exist). The owner of these bores is therefore BHP and it is understood that there is no concern with potential groundwater impacts at these bores (noting, however, that these bores are outside the predicted 2 metre drawdown contour.
- Consolidated groundwater units (Figure 6-5):
  - In the Project area the consolidated sediments are taken to include the Rewan Group and the Permian Coal Measures. The contours presented in Figure 6-5 have been generated by:
    - Gridding the maximum modelled extent of drawdown data for the Rewan Group (model layer 3), the Leichhardt Seam (model layer 5) and the Vermont Seam (model layer 7), using the standard kriging algorithm in Surfer v23 (Golden Software, 2022) and consistent grid extent and spacing for each layer;
    - For each grid point, selecting the maximum drawdown value from the Layer 3, 5 and 7 data to create a dataset that comprised the maximum modelled drawdown at each grid point;
    - Re-gridding and contouring the data to obtain the contours that are shown in Figure 6-5; and,
    - Clipping the extent of drawdown to the extent of the Rewan Group and Rangal Coal Measures.
  - The Rewan Group sediments (Triassic) and Permian Rangal Coal Measures are consolidated and are therefore assessed against the *Water Act 2000* bore trigger threshold[4] for a consolidated aquifer of 5 m;
  - There are no registered Rewan Group or Permian bores within the extent of the 5 metre drawdown contour;

[2] Refer Section s362, definition of “bore trigger threshold” from the Water Act 2000

  - One bore (122458) occurs relatively close to the eastern extent of drawdown. It is noted that this bore is located within land owned by Jellinbah Resources, therefore impacts to this bore do not need to be considered;

- The main areas where there is a potential to impact private bores is assessed to be to the east (where Tertiary bore 132627 is located) and to the north, where both the 2 m drawdown contour (for the Tertiary aquifer) and 5 m drawdown contour (for consolidated strata) extend into private land. While it is noted that there are no registered groundwater bores within the area of predicted water level drawdown to the north, it cannot be confirmed that no private groundwater bores exist in this area until a bore survey is completed.
- It is therefore recommended that:
  - The owner of bore 132627 be contacted to establish whether a make-good agreement is required for that bore (which may require a baseline bore survey); and,
  - a bore survey be undertaken for the private property to the north of the Meadowbrook property, to establish whether any bores exist that are within the area of predicted groundwater level impact. Should any private bores exist within the predicted water level impact area, the landowner will need to be approached to establish whether a make-good water supply agreement is required.

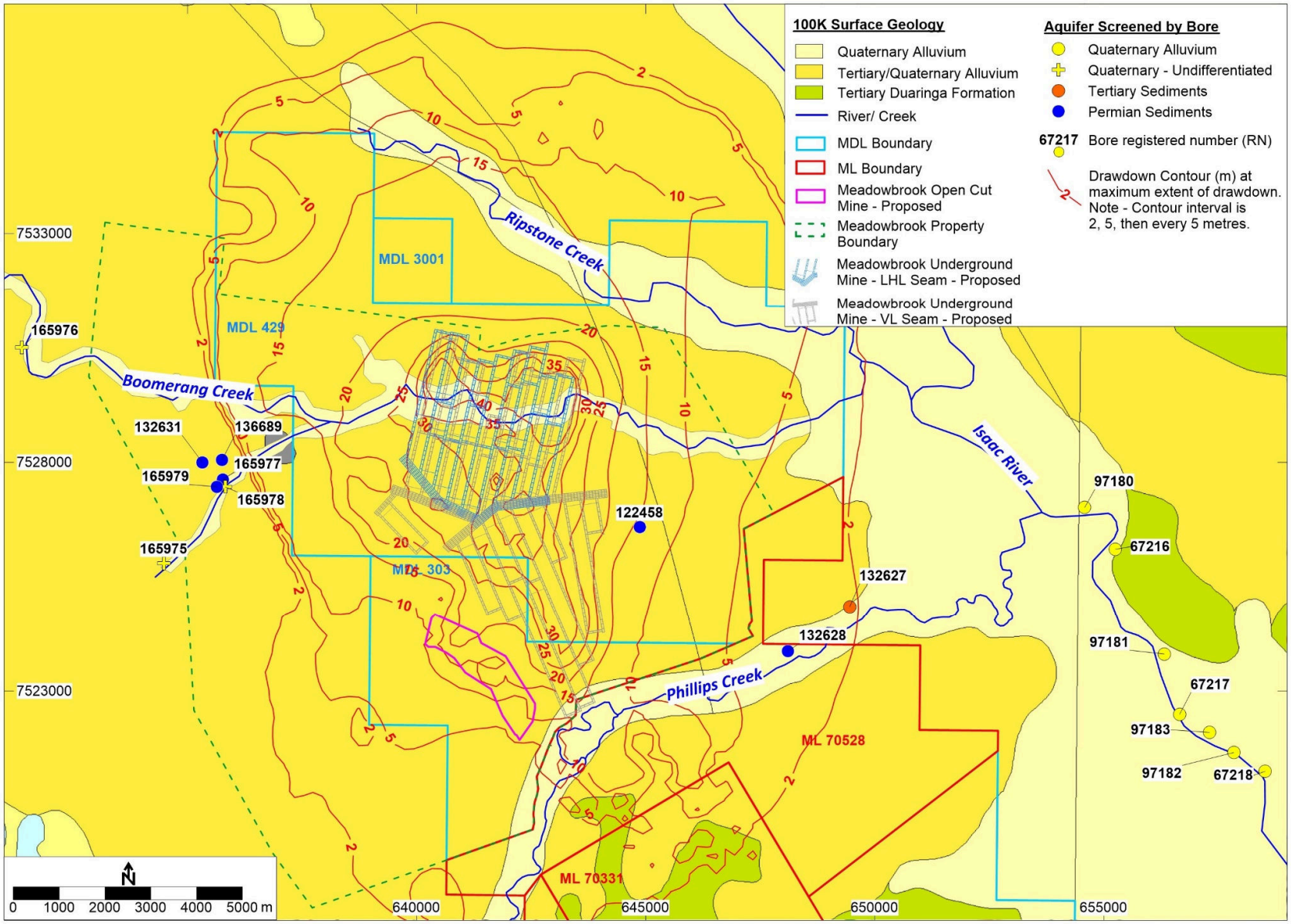


Figure 6-4: Potential Water Level Impacts to Existing Registered Bores – Unconsolidated (Cainozoic) Aquifers

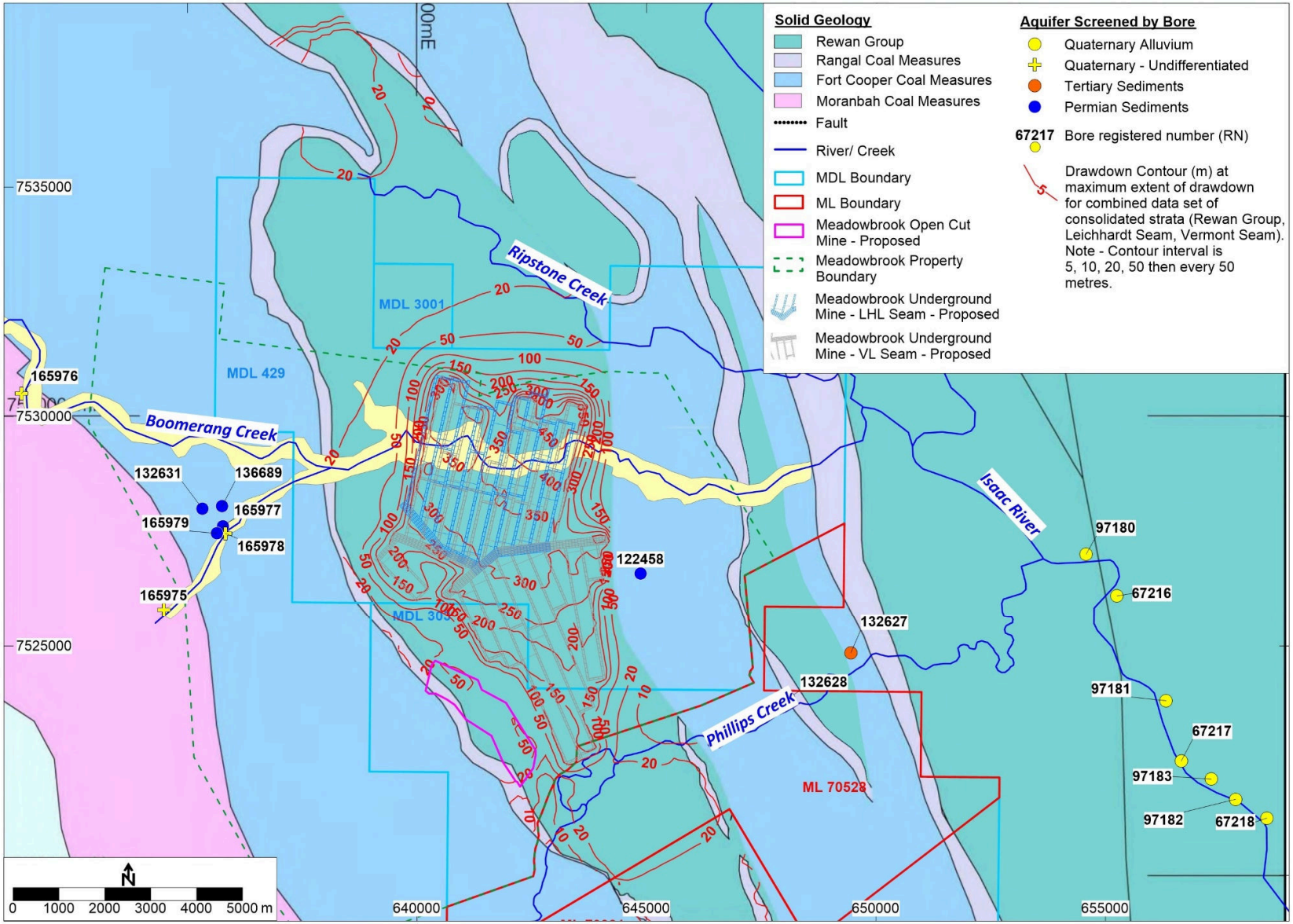


Figure 6-5: Potential Water Level Impacts to Existing Registered Bores – Consolidated (Triassic/Permian) Units

6.2.7 Impacts to Groundwater Quality

6.2.7.1 Final Landform Impacts

The EPP guideline for application requirements for activities with impacts to water (Queensland Government, 2021) requires identification of the background quality of groundwater that may be affected by a development, for projects that pose a significant risk of impacting groundwater quality through direct or indirect releases.

Groundwater modelling (Section 5.3) predicts that a groundwater mound will develop beneath the rehabilitated pit landform due to seepage of water located at the depression at the base of the landform. The mound is predicted to be approximately 4 m above the pre-mining groundwater level, resulting in radial seepage from the final landform area to the Tertiary sediments (refer Figure 5-4). With respect to the impact on groundwater quality the following observations are made:

- The predicted rate of seepage from the rehabilitated pit landform depression is approximately 1.8 L/s (~57 ML/year – SLR 2022).
- The maximum salinity of water seeping from the rehabilitated pit landform depression is predicted to be approximately 950 mg/L (EC of ~1,460 µS/cm). This compares to the mean EC of the groundwater system (Section 4.3.2) of:
    - 17,518 µS/cm in the Tertiary sediments (noting that bore W14_MB1 records a mean EC of 879 µS/cm – with the 11 samples for W14_MB1 removed, the remaining 56 samples record a mean EC of 21,381 µS/cm);
    - 23,197 µS/cm in the Rewan Group sediments; and,
    - 29,995 µS/cm in the Permian sediments.
- Quaternary alluvium bore W4_MB1 has only one water quality sample, as the water level is at the base of bore and there is too little water to obtain a sample. The laboratory EC of the available sample (Attachment D) was 18,800 µS/cm.
- On balance, it is assessed that the seepage of water with an EC of ~1,460 µS/cm at a relatively low rate of ~1.8 L/s to a groundwater system that has a background EC of generally >17,000 µS/cm is unlikely to present a significant risk.
- However, ongoing monitoring of the surface water in the base of the final landform depression with respect to water quality and seepage rates is recommended for validation of the modelling assumptions and assessment of the potential for long-term risks to groundwater quality.

The groundwater mound predicted by groundwater modelling will attain a maximum height above pre-mining groundwater levels of ~4 m beneath the final landform depression, reducing to ~1 m above pre-mining groundwater levels in the area of Boomerang Creek (Figure 5-4). The mound will be developed within the Tertiary sediments and underlying groundwater units (Figure 5-5 to Figure 5-7)and is not predicted to impact the Quaternary alluvium above pre-mining levels, with the exception of a small area in Boomerang Creek at bore W14_MB1 (Figure 5-3). The groundwater mound is therefore not predicted to impact GDE's or surface water hydrology. However, monitoring of groundwater in shallow sediments (Quaternary, Tertiary) will be undertaken prior to, during and post mining. A GDE management plan is to be developed that will consider the groundwater monitoring requirements in areas where GDE's may exist, and monitoring commitments will be consistent with the commitments within the GMMP (Section 7.3.1).

Final landform impacts to groundwater quality (e.g. from seepage) are expected to be minor as the EIS geochemistry assessment report (RGS 2021) assessed the waste material as:

- having a low sulphur content

- having an excess acid neutralising capacity (ANC)
- comprising non acid-forming (NAF) material
- being likely to generate runoff/seepage that is slightly alkaline to alkaline and with a low level of salinity
- being unlikely to generate unacceptable concentrations of metals/metalloids in runoff/seepage

It is intended that, once the waste dumps are formed, monitoring of shallow groundwater in areas between the waste dumps and receptors such as creeks may be undertaken, following assessment of the requirements by a suitably qualified person. These commitments are discussed in Section 7.1.3.

6.2.8 Cumulative Impacts

6.2.8.1 Introduction

Cumulative impact assessment is an approach to environmental impact assessment that aims to consider the effects of multiple actions or impacts on the environment (MCA 2015). Cumulative impact assessments are highly specific to the impact under analysis and may consider, for example, the following (Franks et al., 2010):

- Multiple areas of groundwater abstraction (e.g. adjacent mining operations);
- Overlapping cones of drawdown;
- Dewatering discharge locations;
- Distribution of ecosystems around the groundwater model area; and,
- Catchment-scale groundwater levels.

A cumulative impact assessment, which included all current and known future coal mining operations, has been undertaken as part of the groundwater modelling study for the Meadowbrook Project (SLR, 2022). The cumulative drawdown contours that are discussed in this section include all of the mining operations that are shown in Figure 5-1.

Assessment of cumulative impacts associated with the approved Bowen Gas Project was undertaken as a sensitivity analysis for the Olive Downs Project numerical groundwater model (HydroSimulations, 2018). The Bowen Gas Project targets coal seams within the Rangal Coal Measures and Moranbah Coal Measures. As the Meadowbrook model uses the same groundwater model as the Olive Downs Project, results from the Olive Downs Project sensitivity analysis are equally applicable to the Meadowbrook model. Results of the assessment were presented in HydroSimulations (2018) and indicate that the assessment of cumulative impacts in the model is sensitive to the inclusion of the Bowen Gas Project, with cumulative drawdown extents in the Rangal Coal Measures extending significantly to the east across the model domain with the inclusion CSG extraction. Cumulative drawdown extents from the Bowen Gas Project were considered conservative and were predicted to be greater than the impacts produced by the Olive Downs Project alone (HydroSimulations, 2018).

For the reasons outlined above in Section 5.3.2.1, cumulative drawdown is not assessed for the Quaternary alluvium as the unit is generally dry in the Meadowbrook project area and the modelling report (SLR 2022) predicts little to no drawdown to alluvial groundwater units in the area, including no impacts from the Meadowbrook Project to the Isaac River alluvium. Therefore the units discussed in this section include the Tertiary sediments (Layer 2), the Rewan Group (Layer 3), the Leichhardt Coal Seam (Layer 5) and the Vermont Coal Seam (Layer 7).

6.2.8.2 Layer 2 – Tertiary Sediments

Cumulative drawdown contours for the Tertiary sediments are shown in Figure 6-6. Observations include:

- The upper plot in Figure 6-6 shows end of mining groundwater contours for mining at Meadowbrook only, which have been discussed above in Section 5.3.2.2. These are included to allow comparison with the cumulative drawdown contours.
- The lower plot in Figure 6-6 shows the cumulative drawdown contours for all operations shown in Figure 5-1. It is observed that:
  - drawdown from Olive Downs South and Eagle Downs extends southward to coalesce with the drawdown from the Meadowbrook operation, resulting in an additional 2 to 10 m of drawdown beneath Boomerang Creek and an additional 2 to 15 m of drawdown beneath Ripstone Creek;
  - Cumulative drawdown contours from the operations at Olive Downs South and Willunga extend beneath the Isaac River. None of the drawdown beneath the Isaac River is attributable to the Meadowbrook Project.

6.2.8.3 Layer 3 – Rewan Group

Cumulative drawdown contours for the Rewan Group sediments are shown in Figure 6-7. Observations include:

- The upper plot in Figure 6-7 shows end of mining groundwater contours for mining at Meadowbrook only, which have been discussed above in Section 5.3.2.3. These are included to allow comparison with the cumulative drawdown contours.
- The lower plot in Figure 6-7 shows the cumulative drawdown contours for all operations shown in Figure 5-1. It is observed that:
  - Drawdown contours south of Boomerang Creek are relatively unchanged for the cumulative drawdown scenario, i.e. the drawdown in this area is attributable to the Meadowbrook Project.
  - To the north of the Meadowbrook underground mining area the drawdown contours from Eagle Downs and Olive Downs South coalesce with the drawdown from Meadowbrook to increase the drawdown in this area by 5 to 50 metres.
  - The drawdown that is observed in the eastern block of Rewan Formation is attributable to Olive Downs South and Willunga. Mining at Meadowbrook does not contribute to this drawdown as the Rewan Group sediments are truncated to the east of the Meadowbrook mining area by the Isaac Fault (refer also Figure 3-7).

6.2.8.4 Layer 5 – Leichhardt Seam

Cumulative drawdown contours for the Leichhardt Coal Seam are shown in Figure 6-8. Observations include:

- The upper plot in Figure 6-8 shows end of mining groundwater contours for mining at Meadowbrook only, which have been discussed above in Section 5.3.2.4. These are included to allow comparison with the cumulative drawdown contours.
- The lower plot in Figure 6-8 shows the cumulative drawdown contours for all operations shown in Figure 5-1. It is observed that:
  - Drawdown to the north of the Meadowbrook underground mining area increases by 10 to 50 m, with this drawdown attributable to mining at Eagle Downs and Olive Downs South.
  - The drawdown that is observed in the eastern block of Permian Coal Measures is attributable to Olive Downs South and Willunga. Mining at Meadowbrook does not contribute to this drawdown as the Rangal Coal Measures are truncated to the east of the Meadowbrook mining area by the Isaac Fault (refer also Figure 3-7).

6.2.8.5 Layer 7 – Vermont Seam

Cumulative drawdown contours for the Vermont Coal Seam are shown in Figure 6-9. Observations include:

- The upper plot in Figure 6-9 shows end of mining groundwater contours for mining at Meadowbrook only, which have been discussed above in Section 5.3.2.5. These are included to allow comparison with the cumulative drawdown contours.
- The lower plot in Figure 6-9 shows the cumulative drawdown contours for all operations shown in Figure 5-1. It is observed that:
  - Drawdown to the north of the Meadowbrook underground mining area increases by 10 to 50 m, with this drawdown attributable to mining at Eagle Downs and Olive Downs South.
  - The drawdown that is observed in the eastern block of Permian Coal Measures is attributable to Olive Downs South and Willunga. Mining at Meadowbrook does not contribute to this drawdown as the Rangal Coal Measures are truncated to the east of the Meadowbrook mining area by the Isaac Fault (refer also Figure 3-7).

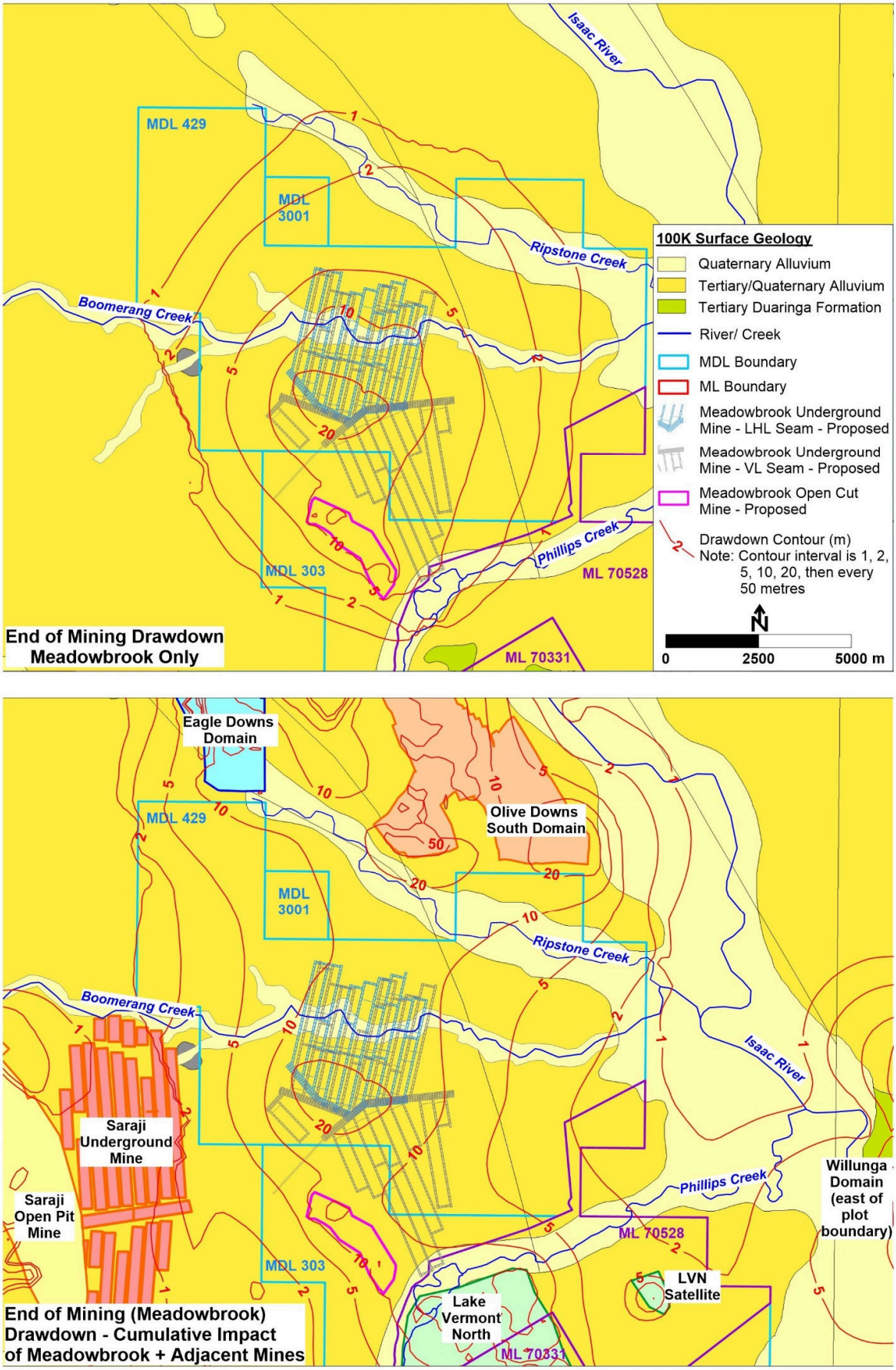


Figure 6-6: Meadowbrook Drawdown vs Cumulative Impacts – Layer 2 (Tertiary Sediments)

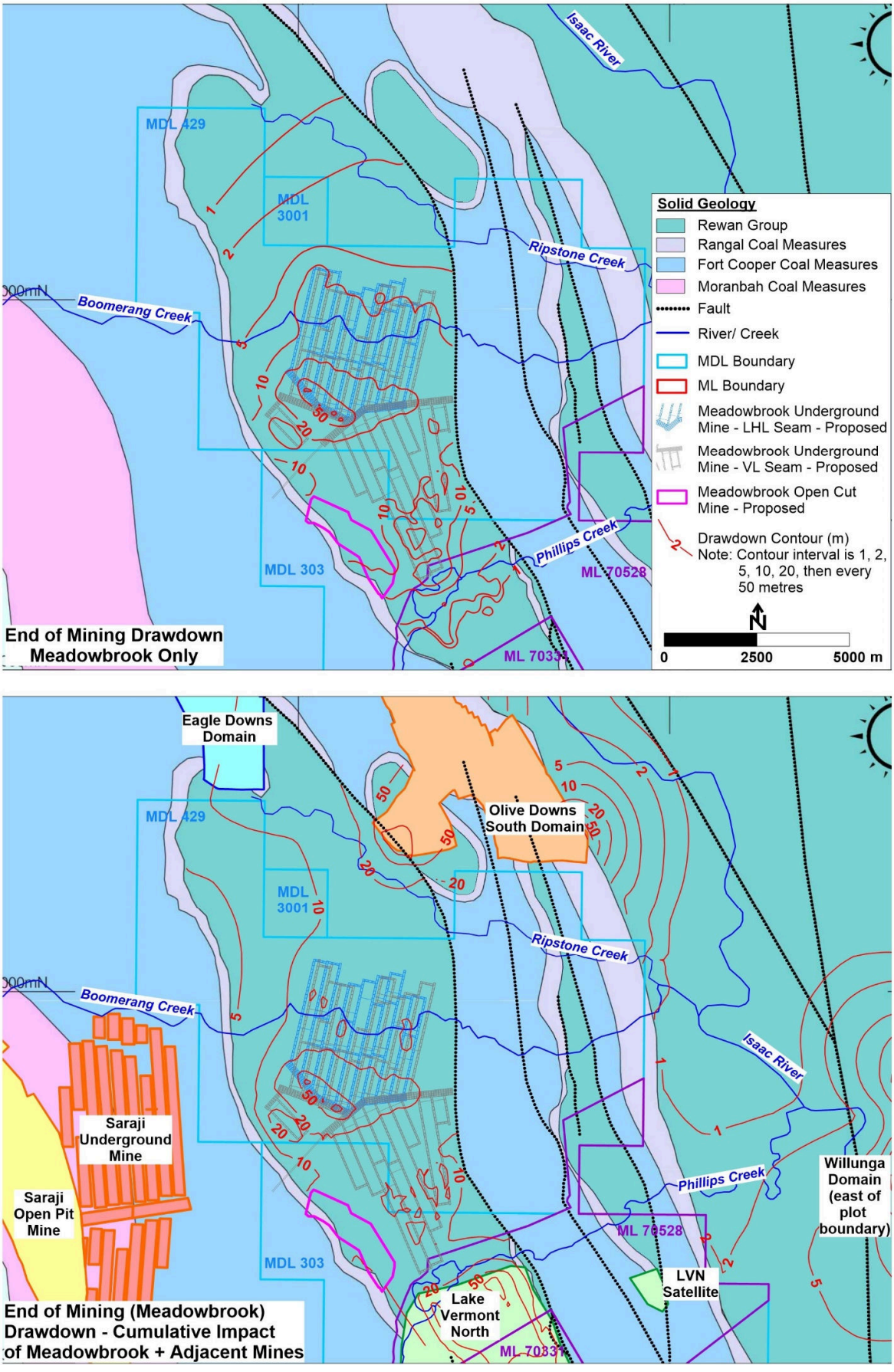


Figure 6-7: Meadowbrook Drawdown vs Cumulative Impacts – Layer 3 (Rewan Group)

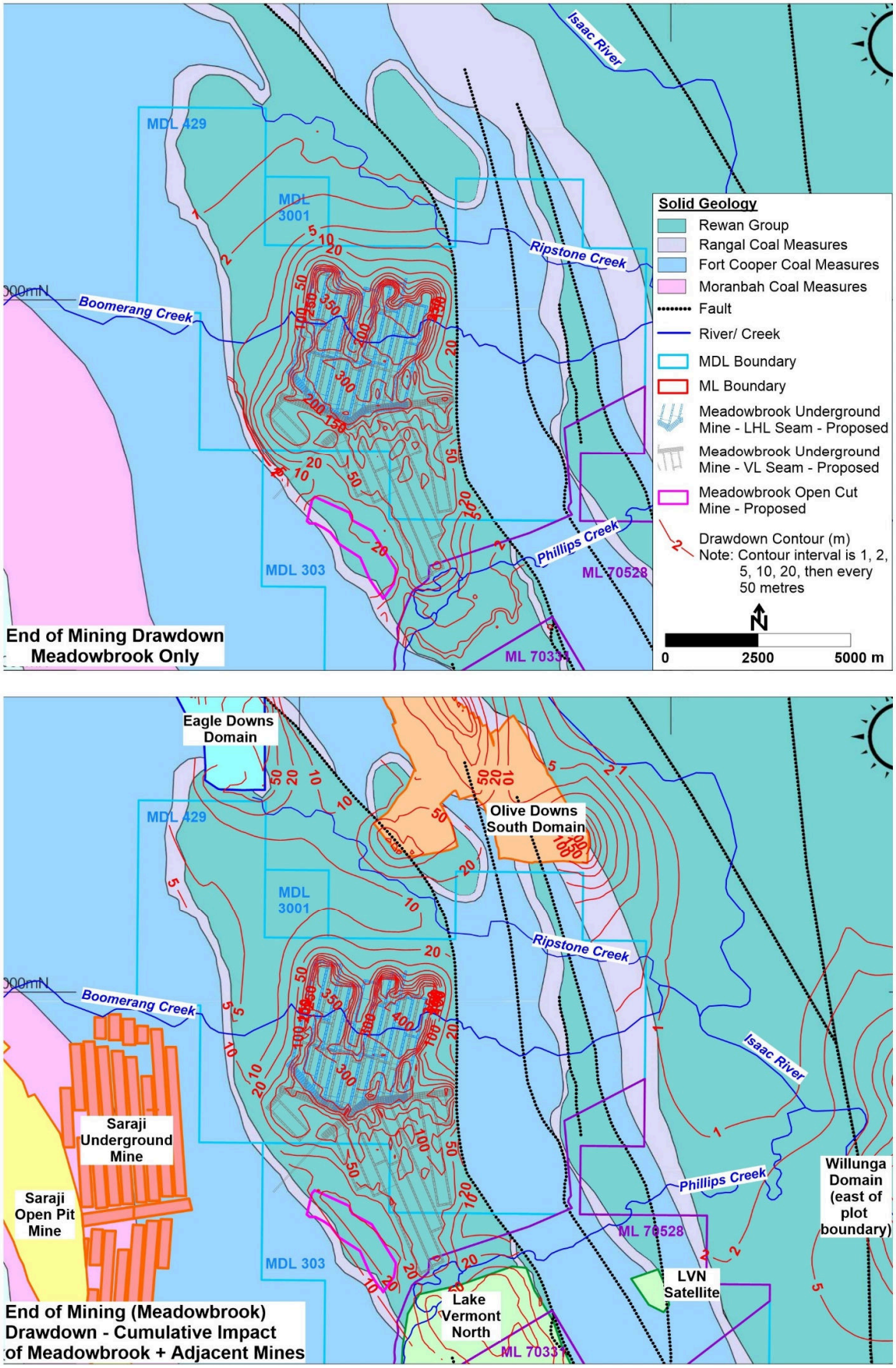
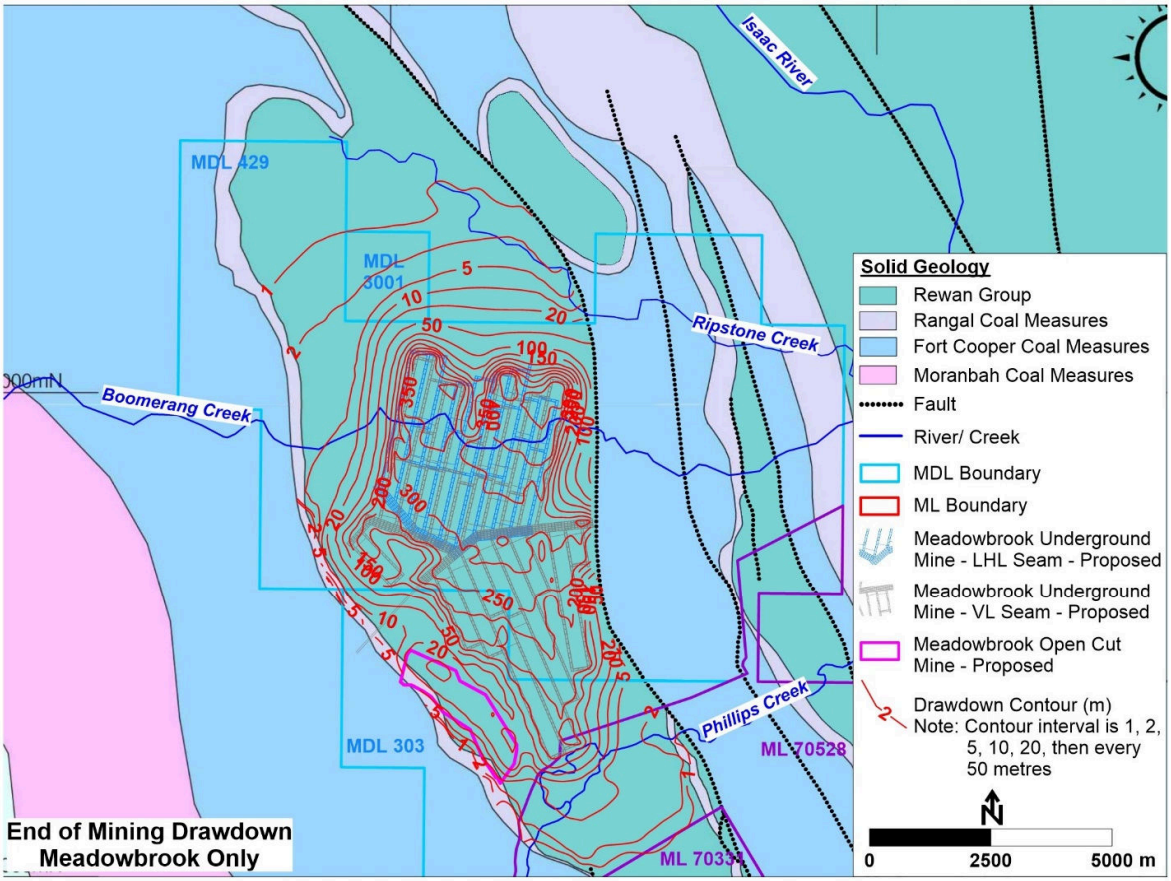


Figure 6-8: Meadowbrook Drawdown vs Cumulative Impacts – Layer 5 (Leichhardt Seam)



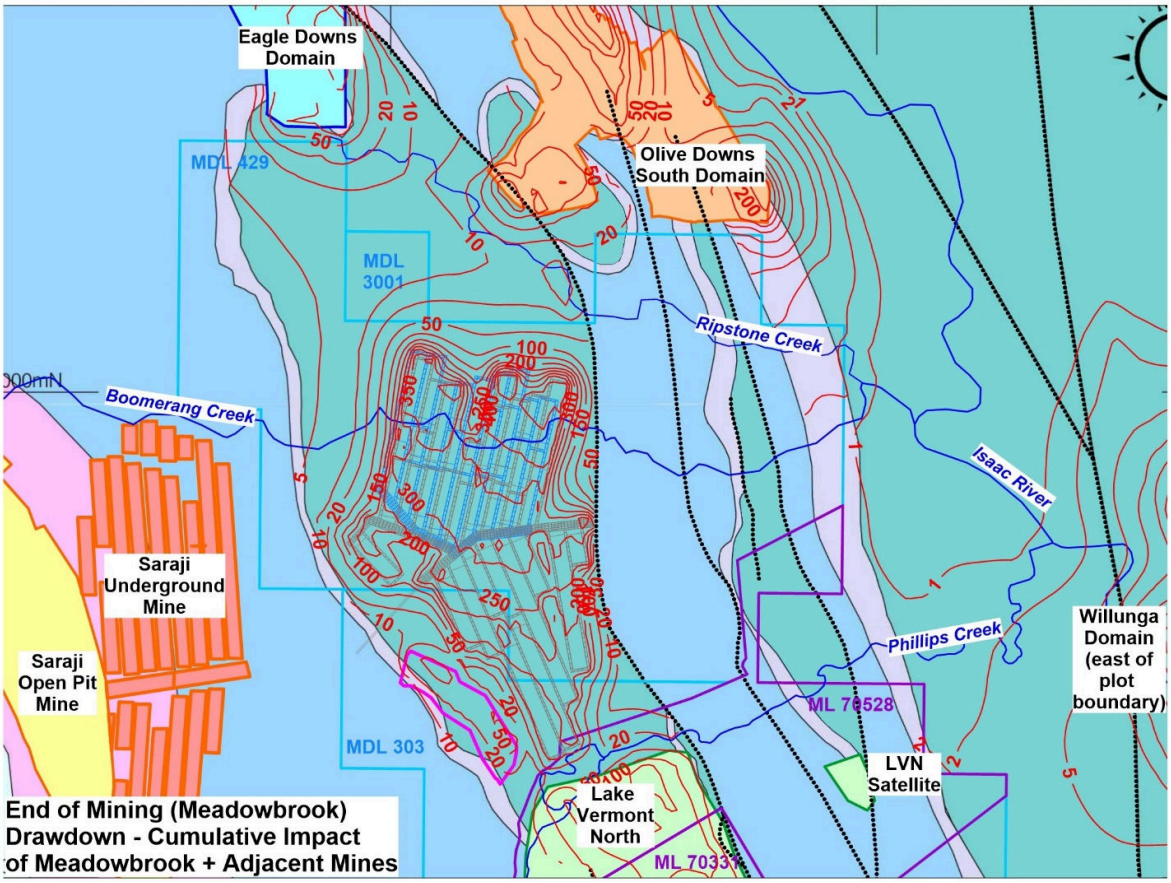


Figure 6-9: Meadowbrook Drawdown vs Cumulative Impacts – Layer 7 (Vermont Seam)

6.2.9 Assessment of Risk

A risk assessment of the potential groundwater impacts from mining of the Meadowbrook Project is presented below in Table 6-1, based on assessment of the various categories in Table 6-1 against the risk categories in Figure 6-10. It is noted that, for the majority of categories discussed, the assessed risk rating is "Low". It is noted that the assessment of "Low" for GDE impacts from the Meadowbrook Project is reliant on the conclusion that the HES wetlands in the project area are not reliant on groundwater. A moderate assessment for risk to GDEs from cumulative drawdown is assessed on the basis that additional drawdown will be observed in the area of HES wetlands but that these systems are not assessed as being groundwater dependent. Cumulative drawdown contours for the Tertiary sediments extend beneath the Isaac River alluvium, but none of this drawdown is attributable to the Meadowbrook Project. Therefore, the risk to GDEs associated with the Isaac River are not assessed.

		Consequence				
		Negligible 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	5 Almost certain	Moderate 5	High 10	Extreme 15	Extreme 20	Extreme 25
	4 Likely	Moderate 4	High 8	High 12	Extreme 16	Extreme 20
	3 Possible	Low 3	Moderate 6	High 9	High 12	Extreme 15
	2 Unlikely	Low 2	Moderate 4	Moderate 6	High 8	High 10
	1 Rare	Low 1	Low 2	Low 3	Moderate 4	Moderate 5

Figure 6-10: Risk Matrix

Table 6-1: Potential Impacts from Mining – Risk Assessment

Groundwater Impacts from Mining	Potential Consequence/ Impact	Likely Cause	Existing Controls/ Conditions	Residual Risk	Planned Activities	Consequence (1 to 5) considering controls	Likelihood (1 to 5) considering controls	Risk rank – Consequence x Likelihood (1 to 25)	Assessed risk rating (low, moderate, high or extreme)
Impacts to existing groundwater users.	Impacts on quantity (access) and quality of groundwater to end users (e.g. stock and domestic supply etc.).	Drawdown (cone of depression) extends to landowner bore, resulting in a reduction in available supply due to a reduction in available drawdown at the landowner bore.	• There is one registered Tertiary groundwater bore (RN 132627) within the zone of predicted 2 m water level impact (Figure 6-4). • There are no registered Permian groundwater bores within the zone of predicted 5 m water level impact (Figure 6-5)	• Assessed to be limited risk to existing groundwater users.	• Contact the owner of bore 132627 to establish whether a make-good agreement is required for that bore (which may require a baseline bore survey); • Undertake a bore census on properties that are within the zone of potential water level impact to verify whether landowner bores exist that are not contained within the DoR Groundwater Database (from which data has already been obtained). • Re-assess risk and mitigation measures as required.	3	1	3	Low
Impacts to groundwater quality.	Impacts on groundwater quality that are due to the Meadowbrook Project and that may impact existing groundwater users or GDEs.	Water quality impacts from mining operations extend beyond the operation to impact existing groundwater users or GDEs.	• Groundwater modelling predicts that a groundwater mound will develop beneath the rehabilitated pit landform due to the presence seepage of water constrained within the base of the landform. The mound is predicted to be approximately 4 m above the pre-mining groundwater level, resulting in seepage from the final landform area to the Tertiary sediments and underlying units. • It is predicted that the maximum EC of the water that may be constrained in the base of the landform will be ~1,500 µS/cm and that seepage to the adjacent groundwater system will occur at a relatively low rate of ~1.8 L/s. • The range of background groundwater quality is from ~17,500 µS/cm in the Tertiary sediments to ~30,000 µS/cm in the Permian sediments	• Assessed to be low risk potential to existing groundwater users or GDEs, due to the low rate of seepage and low salinity relative to background groundwater quality	• Monitor groundwater quality from bores in the existing groundwater monitoring network. • Monitor and assess the water quality of water that may be constrained in the final landform base and seepage rates to the groundwater system as a means of validating model predictions • Ongoing review of groundwater quality data over time will provide information on any changes to water quality over time. • Re-assess risk and mitigation measures as required.	2	3	6	Moderate
Impacts to GDEs.	Reduction in the availability of groundwater to GDEs.	Groundwater level drawdown due to mining at the Meadowbrook Project reduces the availability of groundwater to GDEs (e.g. mapped low confidence derived terrestrial GDEs.	• The creeks in the Project area are ephemeral and the regional groundwater level is assessed to be approximately 10 to 15 m below ground surface. • It is assessed that the Quaternary alluvium that is associated with ephemeral creeks such as Boomerang Creek and Ripstone Creek will be dry for the majority of the year, but will contain groundwater on a seasonal basis, especially following significant rainfall periods when the creeks are in flow and recharge to the alluvium will have occurred. During the dry season it is interpreted that any groundwater within the alluvium will drain downwards into the underlying Tertiary sediments. • The 1 m Alluvium/Tertiary drawdown contours associated with the Meadowbrook Project only just extend to HES wetlands 9 and 10 (Figure 6-3), therefore drawdown impacts from the Project are assessed to be minor. • At post-mining equilibrium the groundwater level is predicted to recover to pre-mining levels and to be several metres above pre-mining water levels in the mining area	• It is assessed as unlikely that the HES wetlands along Boomerang and Ripstone Creek are reliant on groundwater.	• Ongoing monitoring of groundwater monitoring bores to establish whether groundwater level reduction is occurring that could be attributable to the Meadowbrook Project. • Compare actual drawdown data at groundwater monitoring bores with predictions from the groundwater model. • Undertake model verification and/or recalibration as required and re-assess risk and any required mitigation measures.	3	1	3	Low
Cumulative Impacts.	Impacts on quantity (access) of groundwater to end users (e.g. stock and domestic supply etc.) or to GDEs.	Drawdown impacts from other mining areas/ groundwater extraction sources coalesce with the drawdown cone from the Meadowbrook Project, increasing the drawdown beyond what is predicted for the Meadowbrook Project alone.	• Drawdown contours for all assessed groundwater units (Tertiary, Rewan Group, Leichhardt and Vermont Coal Seams) coalesce to the north of the Meadowbrook mining area with drawdown contours from Eagle Downs and Olive Downs South mining domains. • A low “likelihood” assessment of cumulative impacts is reliant on the assessment that ecosystems within the impacted zone are not assessed to be groundwater dependent. • The Tertiary drawdown contours from other projects to the north/east of Meadowbrook extend beneath the Isaac River (Figure 6-6) and may therefore impact GDEs; however, the Meadowbrook Project does not contribute to drawdown beneath the Isaac River.	• Assessed to be limited risk to GDEs as it is interpreted that the HES wetlands in the Project area are not groundwater dependent.	• Continue to monitor groundwater level data in response to mining; • Periodically assess actual drawdown with model predicted drawdown; • Re-assess risk and mitigation measures as required.	3	2	6	Moderate

7.0 GROUNDWATER MANAGEMENT AND MITIGATION MEASURES

7.1 Management Measures

7.1.1 Existing Groundwater Monitoring

Groundwater level and quality monitoring has been undertaken to date from Meadowbrook Project groundwater monitoring bores at monthly intervals for the purpose of establishing a baseline water level and water quality data set. Groundwater monitoring commenced at the Project site in October 2020, following construction of site monitoring bores in March-April 2020. The data set utilised for this report comprises monthly data from 13 monitoring events between October 2020 and November 201, with data available or the following parameters:

- Laboratory and field pH and electrical conductivity (EC);
- Major ions (sodium, calcium, magnesium, potassium, chloride, sulphate, alkalinity);
- Total and dissolved metals/metalloids (aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, uranium, vanadium, zinc); and,
- Total petroleum hydrocarbons (TPH)

Monthly monitoring of groundwater data will continue at the Meadowbrook Project site until a final baseline dataset has been compiled for determination of groundwater trigger levels (refer Section 7.1.2 below); after this it is intended that groundwater level and quality monitoring be undertaken at quarterly (3-monthly) intervals for the duration of the Project.

A commitment is made to installing additional groundwater monitoring bores within the Quaternary and Tertiary sediments a the confluence of Ripstone and Boomerang Creeks, at sites that are adjacent to the identified HES wetlands (i.e. at the locations of HES wetlands 8 and 9, as shown in Figure 6-3).

7.1.2 Groundwater Trigger Levels and Limits

Groundwater trigger levels and limits will be developed by a suitably qualified person for both groundwater level and quality, utilising data from the baseline dataset as applicable, with assessment criteria documented in the Project's Groundwater Management and Monitoring Program (Section 7.1.3).

Groundwater quality trigger levels will be developed with consideration of the following documents:

- DES (2021). Using monitoring data to assess groundwater quality and potential environmental impacts (Current version – Version 2 at time of report preparation);
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
- Water quality objectives (WQO's) for groundwater under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 and associated Fitzroy Basin Groundwater Zones (WQ1310), which are discussed above in Section 6.1.2.

It is intended that a Groundwater Monitoring and Management Plan (GMMP) will be developed for the Meadowbrook Project that extends on the existing LVN Project's Groundwater Monitoring Program (GMP). The combined GMMP will include the groundwater commitments and trigger levels for the Meadowbrook Project, as discussed in the following section.

7.1.3 Groundwater Monitoring and Management Plan

It is intended that a Groundwater Monitoring and Management Plan (GMMP) be developed for the Meadowbrook Project as a combined update of the existing LVN GMP. The GMMP will continue for the life of the Project and be updated as required. The groundwater monitoring program will include commitments for:

- Groundwater level monitoring, to be undertaken at quarterly intervals. Initially, groundwater level monitoring will be continued from the current Meadowbrook Project monitoring bores, at the locations shown in Figure 4-1 and Table 4-1. Groundwater level monitoring will also continue at the adjacent LVN Project site, in accordance with the requirements of the Project's EA.
- Groundwater quality monitoring, to be undertaken at quarterly intervals, for the following parameters:
  - Laboratory and field pH and electrical conductivity (EC);
  - Major ions (sodium, calcium, magnesium, potassium, chloride, sulphate, alkalinity);
  - Total and dissolved metals/metalloids (aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, uranium, vanadium, zinc); and,
  - Total petroleum hydrocarbons (TPH)

  Initially, groundwater quality monitoring will be continued from the current Meadowbrook Project monitoring bores, at the locations shown in Figure 4-1 and Table 4-1. The monitoring bore list may be modified during preparation of the Project's GMMP and finalisation of the Project's EA. Groundwater quality monitoring will also continue at the adjacent LVN Project site, in accordance with the requirements of the Project's EA.
- The procedure for assessment of data via groundwater level and quality trigger levels (Section 7.1.2);
- Assessment of the adequacy of the groundwater monitoring network and groundwater trigger levels, as well as processes and procedures for amendments and improvements when it has been assessed that they are required.
- Expansion of the monitoring network as required (e.g. the installation of additional bores adjacent to surface water features, downgradient of waste storage facilities/ waste dumps etc., with the assessment of monitoring bore requirements being undertaken by a suitably qualified person);
- The replacement of monitoring bores if and as required (e.g. if bores are destroyed or become unserviceable for any reason);
- Mitigation measures for any observed environmental impacts (Section 7.2);
- Reporting (Section 7.1.4), including:
  - Publishing of groundwater level and quality data;
  - Trigger level assessment and reporting;
  - Preparation of an annual groundwater report

7.1.4 Data Management and Reporting

All monitoring results will be compiled and kept for a minimum of at least five years.

Monitoring data that is collected under the GMMP will be published in accordance with the requirements of the Project's EA and/or associated water licence (AWL).

Groundwater level and quality data will be assessed against trigger levels, with any exceedances reported and assessed in accordance with the Project's EA.

An Annual Monitoring Report will be prepared by an appropriately qualified person and will include, as a minimum:

(a) the water levels in the monitoring bores;

(b) any changes in water quality in the monitoring bores;

(c) maps showing the actual water level drawdown contours caused by the take of associated water for each aquifer;

(d) details of any review undertaken of the numerical underground water model since the previous Annual Monitoring Report;

(e) an assessment of any differences between the actual water level impact and the impact predicted for the same period in the most current numerical underground water model;

(f) details of any private (i.e. landowner) bores which are predicted by the most current numerical underground water model to be located in the affected area; and

(g) raw data provided in a format as required by the Project's EA.

7.1.5 Future Numerical Groundwater Modelling

As outlined above, the change in water level will be assessed on an annual basis against model predictions by a suitably qualified person. The numerical groundwater model will be re-run every five years if required (e.g. if the actual vs. predicted water level variation is assessed as being significant by a suitably qualified person).

7.2 Mitigation Measures

Groundwater mitigation measures will be presented in the GMMP (Section 7.1.3) and will be assessed for:

- Potential for impacts from mine-affected water;
- Impacts to existing groundwater users;
- Impacts to GDEs (noting that a specific GDE management plan will be developed separately and that groundwater monitoring commitments will be made separately in this management plan that will be consistent with the GMMP).

8.0 CONCLUSIONS

8.1 Observations from Data Assessment & Predictive Groundwater Modelling

Observations from the assessment of available data and predictive modelling include:

- Quaternary Alluvium:
  - Within the groundwater model, the only location where the alluvium is permanently saturated is the Isaac River alluvium (SLR 2022, Section 4.3), which is consistent with available data from landowner groundwater bores (Section 4.6).
  - It is assessed that the Quaternary alluvium in Boomerang Creek and Ripstone Creek is likely to be only seasonally saturated, with downward seepage to underlying units resulting in dry alluvium for the majority of the year.
  - At maximum extent of drawdown the model indicates drawdown in the alluvium near the confluence of Boomerang Creek and Ripstone Creek, which corresponds with the limit of drawdown in the Tertiary sediments in this area (i.e., drawdown within the Tertiary sediments is inducing drawdown in the Quaternary alluvium). As noted above, it is interpreted that the presence of groundwater in the Quaternary sediments at this location is seasonal, with the only perennial groundwater in the alluvium occurring along the Isaac River, where drawdown impacts are not predicted.
  - At post-mining equilibrium it is predicted that the groundwater level will have recovered in the alluvium; i.e., the groundwater level will re-establish in areas where groundwater existed pre-mining.
- Tertiary sediments:
  - The end of mining and maximum drawdown extent contours extend west-east along Boomerang Creek, and to the north beneath Ripstone Creek. As it has been observed and interpreted that the alluvium in these ephemeral creeks is likely to be unsaturated for the majority of the year (except where isolated pockets of groundwater may occur in the alluvium following recharge by rainfall or stream flow, which would then seep downwards to the underlying strata), it is concluded that the

Tertiary drawdown contours can be used to indicate the zone within which any water that does occur within the alluvium would have an enhanced potential for downward seepage to the underlying Tertiary sediments.

  - At post-mining equilibrium a groundwater mound exists within the Tertiary sediments due to seepage from water constrained in the base of the final landform, which increases the groundwater level in the Tertiary sediments by approximately 4 m above pre-mining levels in the area of the final landform.

- Rewan Group sediments:
  - The Rewan Group crops out to the west of the Meadowbrook mining area due to the dip of the strata, and is terminated by the Isaac Fault to the west of the mining area. Drawdown within the Rewan Group is therefore terminated to the west and east of the Meadowbrook mining area and extends northward to approximately the northern extent of MDL429.
  - At post-mining equilibrium the groundwater level has recovered to pre-mining levels, with the exception of the area of the groundwater mound beneath the final base of the rehabilitated landform, where the groundwater level is above the pre-mining level due to seepage from the overlying Tertiary aquifer.
- Leichhardt Coal Seam:
  - Mining-induced drawdown at end of mining is greatest in the central area of underground mining and at maximum extent of drawdown is centred on the northern underground panels., with the maximum extent of at the end of mining is centred on the underground panels where mining of the Leichhardt Seam occurs.
  - At end of mining the 5 m drawdown contour extends approximately 1.2 km north of the northern underground mining area, extending to approximately 7.5 km at maximum extent of drawdown. Recovery occurs in the central mining areas immediately post-mining, but drawdown extends laterally for some time as water is sourced from lateral areas to fill the central cone of depression.
  - At post-mining equilibrium the water level in the Leichhardt Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated landform pit of the Meadowbrook open cut. The extent of mounding is similar to that observed for the overlying Tertiary and Rewan Group sediments.
- Vermont Coal Seam:
  - The extent of drawdown at end of mining and maximum extent of mining is similar to that observed for the Leichhardt Seam. However, the depth of drawdown is greater for the Vermont Seam due to the greater depth of mining for this unit.
  - At post-mining equilibrium the water level in the Vermont Seam has fully recovered and a groundwater mound, approximately 4 m above the pre-mining groundwater level, is centred on the rehabilitated landform pit of the Meadowbrook open cut The extent of mounding is similar to that observed for the overlying sediments (Leichhardt Seam, Rewan Group and Tertiary.

8.2 Potential Groundwater Impacts

Potential groundwater impacts from the Meadowbrook Project are summarised as follows:

- Existing groundwater users – There is one registered Tertiary groundwater bore (RN 132627) within the zone of predicted 2 m water level impact. There are no registered Rewan Group or Permian groundwater bores within the zone of predicted 5 m water level impact. It is recommended that:

  - The owner of bore 132627 be contacted to establish whether a make-good agreement is required for that bore (which may require a baseline bore survey);
  - Undertake a bore census on properties that are within the zone of potential water level impact to verify whether landowner bores exist that are not contained within the DoR Groundwater Database (from which data has already been obtained); and,
  - The risk to existing groundwater users and mitigation measures be re-assessed as required.
- Impacts to Groundwater Quality - Groundwater modelling predicts that a groundwater mound will develop beneath the rehabilitated pit landform due to the presence of seepage of water constrained within the base of the landform. The mound is predicted to be approximately 4 m above the pre-mining groundwater level, resulting in radial seepage from the final landform area to the Tertiary sediments. The predicted rate of seepage from the rehabilitated pit landform base is approximately 1.8 L/s (~57 ML/year), with a maximum predicted salinity of the seepage water being approximately 950 mg/L (EC of ~1,460 µS/cm). This compares to the mean EC of the groundwater system of between ~17,500 µS/cm (Tertiary sediments) to ~ 30,000 µS/cm (Permian sediments). On balance, it is assessed that the seepage of water with an EC of ~1,460 µS/cm at a relatively low rate of ~1.8 L/s to a groundwater system that has a background EC of generally >17,000 µS/cm is unlikely to present a significant risk to groundwater.
- Potential impacts to GDEs – the extent of 1 m drawdown extends to include mapped HES wetlands 2, 7, 8, 9 and 10 (Section6.2.5. HES wetland 9 has been assessed to be surface feature perched on a clay aquitard that will not be influenced by groundwater drawdown related impacts. A conceptual model has been developed for HES wetland 8 which indicates the presence of a perched lens of fresh groundwater lying at depth below the wetland pan. A GDE monitoring plan will be developed to include HES wetland 8 as the impact of groundwater drawdown is uncertain and will require ongoing seasonal monitoring to identify if impact to hydro-ecological function will be incurred. The GDE monitoring program will also be extended to cover HES wetland 2 and 7 which are likely to be surface features though have not been verified with field assessment (3D Environmental 2022). At post-mining equilibrium, groundwater modelling predicts that groundwater levels will recover to an elevation that is above the pre-mining levels in the area of Boomerang Creek and Phillips Creek to the north and south of the Meadowbrook mining area, due to ongoing seepage from the rehabilitated landform, as described in the dot point above.
- Cumulative impacts – groundwater level drawdown contours for all assessed groundwater units (Tertiary sediments, Rewan Group, Leichhardt and Vermont coal seams) at the Meadowbrook Project coalesce to the north of the mining area with drawdown contours from the Eagle Downs and Olive Downs South mining areas.

8.3 Groundwater Management and Mitigation Measures

It is intended that a Groundwater Monitoring and Management Plan (GMMP) be developed for the Meadowbrook Project as a combined update of the existing LVN GMP. The GMMP will continue for the life of the Project and be updated as required. The groundwater monitoring program will include commitments for:

- Locations and frequency of groundwater level and quality monitoring, noting that sampling to date has occurred at monthly intervals from the Meadowbrook Project's groundwater monitoring network, but will be changed to quarterly intervals once trigger levels have been developed;
- Groundwater quality parameters to be collected and assessed;
- The replacement of monitoring bores if/as required;

- The procedure for assessment of data via groundwater level and quality trigger levels;
- Mitigation measures for any observed environmental impacts; and,
    - Data management and reporting..

9.0 REFERENCES

Anderson V.G. (1945) Some effects of atmospheric evaporation and transpiration on the composition of natural water in Australia (continued). 4. Underground waters in riverless areas. Journal and Proceedings of the Australian Chemical Institute 12, 83–98.

ANZG (2018) Australian & New Zealand Guidelines for Fresh and Marine Water Quality. https://www.waterquality.gov.au/anz-guidelines.

Barnett B, Townley LR, Post V, Evans RE, Hunt RJ, Peeters L, Richardson S, Werner AD, Knapton A and Boronkay A. (2012) Australian groundwater modelling guidelines, Waterlines report, National Water Commission, Canberra

CSIRO 2014 - Australian Chloride Deposition Rate https://doi.org/10.4225/08/545BEE54CD4FC

DES (2021). Using monitoring data to assess groundwater quality and potential environmental impacts. Version 2. Department of Environment and Science (DES), Queensland Government, Brisbane.

Ditton, S. and Merrick, N. 2014, A new subsurface fracture height prediction model for longwall mines in the NSW coalfields. Geological Society of Australia, 2014 Australian Earth Sciences Convention (AESC), Sustainable Australia. Abstract No 03EGE-03 of the 22nd Australian Geological Convention, Newcastle City Hall and Civic Theatre, Newcastle, New South Wales. July 7 - 10. Page 136.

Earth Explorer (2001) Landsat 7 Enhanced Thematic Mapper (ETM) imagery, entity ID MES-55-20_UR_2000 https://earthexplorer.usgs.gov/

EPP (2009) Environment Protection (Water) Policy – Fitzroy River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin. Department of Environment and Heritage Protection, September 2011.

EPP (2019) EPP Water - Environmental Protection (Water and Wetland Biodiversity) Policy 2019. Environmental Protection Act 1994. Queensland Government.

Franks, D.M., Brereton, D., Moran, C.J., Sarker, T. & Cohen, T. (2010). Cumulative Impacts – A Good Practice Guide for the Australian Coal Mining Industry. Centre for Social Responsibility in Mining & Centre of Water in the Minerals Industry, Sustainable Minerals Institute, The University of Queensland. Australian Coal Association Research Program, Brisbane.

Gordon Geotechnics (2022) Subsidence Prediction Report for the Meadowbrook Underground Project. Report prepared for Lake Vermont Resources Pty Ltd, March 2022.

Guy, G., Gale, W., Sinclair, B., Fergusson, D. & Farnworth, B. (2006). An investigation into Underground Mine Interaction with Overlying Aquifers, Huntly East Mine, New Zealand. In Aziz, N (ed), Coal 2006: Coal Operators' Conference, University of Wollongong & the Australian Institute of Mining and Metallurgy, 2006, pp 164-174

Hem, J.D. (1985) Study and Interpretation of the Chemical Characteristics of Natural Water, 3rd Edition. U.S. Geological Survey Water-Supply Paper 2254.

HydroSimulations, 2018. Olive Downs South and Willunga. Appendix B. Modelling Appendix. Report for Pembroke Resources Pty Ltd. 2018.

IESC (2018) Information Guidelines for Proponents Preparing Coal Seam Gas and Large Coal Mine Development Proposals, Independent Expert Scientific Committee on Coal Seam and large Coal Mining Development, Commonwealth of Australia 2018.

JBT (2021a) Summary of Groundwater Monitoring Bore construction and Field Testing. Memorandum from JBT Consulting to Jellinbah Resources, Report JBT01-076-004, January 2021.

JBT (2021b) Summary of Slug Testing of Groundwater Monitoring Bores. Memorandum from JBT Consulting to Jellinbah Resources, Report JBT01-036-016, July 2021.

Jeffrey, S.J., Carter, J.O., Moodie, K.B. and Beswick, A.R. (2001). *Using spatial interpolation to construct a comprehensive archive of Australian climate data*, Environmental Modelling and Software, Vol 16/4, pp 309-330. DOI: 10.1016/S1364-8152(01)00008-1.

MCA (2015) Cumulative Environmental Impact Assessment - Industry Guide. Report prepared by Eco Logical Pty Ltd for the Minerals Council of Australia, July 2015.

Minserve (2017) ML7052//MDL303/MDL429/MDL3001 (Lake Vermont Northwest) - Statement of Coal Resources North of ML70331 and West of the Isaac Fault. Report prepared by the Minserve Group Pty Ltd for Bowen Basin Coal Pty Ltd, January 2017.

Morrison, R. B. and White, P. G. (1976) Monitoring Flood Inundation. *In:* ERTS-1, A New Window on Our Planet, USGS Professional Paper 929, pp. 196–208.

Queensland Government (2021) Application Requirements for Activities with Impacts to Water. Environmental Protection Act 1994, Guideline ESR/2015/1837.

Queensland Government (2019) Environmental Protection (Water and Wetland Biodiversity) Policy 2019. Environmental Protection Act 1994.

SCT (2020a) Well Test Report for Borehole LV2724S, LV2730S and LV2731S at Meadowbrook. Report prepared by SCT Operations Pty Ltd for Jellinbah Group Pty Ltd. Report MED5050, 10 September 2020.

SCT (2020b) Lugeon Test Report for Borehole LV2724S, LV2730S and LV2731S at Meadowbrook. Report prepared by SCT Operations Pty Ltd for Jellinbah Group Pty Ltd. Report MED5050A, 21 September 2020.

Sliwa, R., Hamilton, S., Hodgkinson, J. & Draper, J. (2008) Bowen Basin Structural Geology. CSIRO and Queensland Department of Mines and Energy, 2008.

SLR, 2019. Moorvale South Groundwater Assessment. Appendix B1 Groundwater Modelling Technical Appendix. Report for Peabody Energy. 2019.

SLR, 2020. Winchester South Project EIS. Groundwater Impact Assessment Baseline Report. Report for Whitehaven Coal. 2020.

SLR, 2021. Caval Ridge Mine Horse Pit Extension Project. Groundwater Assessment Report. Report for BMA. 2021.

SLR (2022) Meadowbrook Underground – Groundwater Modelling Technical Report. Report prepared by SLR Consulting Australia Pty Ltd for Jellinbah Group Pty Ltd, March 2022.

Water Act (2000). Queensland Government.

WRM (2022) Lake Vermont Meadowbrook EOS – Rehabilitated Pit Landform Lake Water Balance. Report prepared by WRM Water and Environment for Bowen Basin Coal Pty Ltd, May 2022.

ATTACHMENT A

Groundwater Modelling Technical Report

MEADOWBROOK UNDERGROUND

Groundwater Modelling Technical Report

Prepared for:

Jellinbah Group Pty Ltd
12 Creek Street
Brisbane Qld 4000



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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Jellinbah Group Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
620.30592.00000-R01-v3.0	1 July 2022	Arash Mohajeri	Brian Rask	Brian Rask
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620.30592.00000-R01-v1.0	26 November 2021	Arash Mohajeri	Brian Rask	Brian Rask

EXECUTIVE SUMMARY

The proposed Meadowbrook Underground Project (the Project) is in central Queensland, approximately 18 km north-east of Dysart and 240 km west of Mackay. The Project consists of an underground, multi-seam, longwall coal mining development adjoining the north of the existing Lake Vermont open cut operations. The Project also includes a relatively small open-cut pit located to the southwest of the proposed longwalls. As a part of the Groundwater Assessment, numerical groundwater modelling was undertaken to predict impacts of the Project on the local groundwater regime.

SLR used the existing MODFLOW-USG numerical model developed for the Olive Downs South Project EIS model (the foundational model) (HydroSimulations, 2018) as a foundation for the Meadowbrook model. The Olive Downs South model was subsequently updated for the Moorvale South Project in 2019 (SLR, 2019), for the Winchester South Project in 2020 (SLR, 2020) and most recently for Caval Ridge Horse Pit Expansion Project (CVM) (SLR, 2021). The most recent version of the Olive Downs South Project model is peer reviewed and is a widely regulator-accepted model. Jellinbah Mining established groundwater data sharing agreements with the owners of each of these projects/mines, which allowed for the sharing of groundwater data, models, and documentation.

Due to some limitations in the foundational model, updates were made to the model extent, model grid and model structure. The Meadowbrook model includes more recent observed data and groundwater stresses (i.e., recharge, rivers, and mining) as well as approved and foreseeable operations in the region. The purpose of the model is to predict groundwater impacts and quantify groundwater take for proposed operations.

The groundwater model captured mining operations at Lake Vermont, Olive Downs South, Saraji, Peak Downs, Winchester South, Moorvale South and Caval Ridge. The model layers at site were developed based on site geological models and key features, like the extent of alluvium, were refined from site specific drill data. Transient calibration was conducted to replicate observed groundwater level trends from December 2007 to December 2020. The transient model was run with quarterly stress periods for the calibration period using observed rainfall and streamflow for the Isaac River. Annual stress periods were used in the predictive model, which used long-term annual averaged rainfall and streamflow.

The key outcomes of the groundwater modelling for Meadowbrook included:

- Groundwater inflows due to the proposed Meadowbrook Underground mine are predicted to reach a peak of 1278.1 ML/year in 2049 (3.49 ML/day). The peak inflow to the proposed open cut pit is predicted to occur in 2050 at a rate of 343.6 ML/year (0.94 ML/day). The predicted total inflow rates increase to a maximum peak of 1,604.5 ML in 2049 (4.39 ML/day), as a result of the mining of the satellite pit and Meadowbrook Underground. The average total inflow over the entire prediction period us 685.6 ML/year (1.87 ML/day).
- Planned mining operations at the Project will not intercept Quaternary alluvium at any of the proposed pits.
- Substantial reduction in potentiometric head with depressurisation is predicted in the fractured and porous rock groundwater sources in the near vicinity of the proposed satellite pit and Meadowbrook Underground. The extents of maximum predicted incremental drawdown in the Rangal coal seams are between 1 to 2 km to the north and south of the Project mine lease. Predicted drawdowns are constrained to the west and east by the coal seam outcrop.

EXECUTIVE SUMMARY

- Predicted incremental drawdown in the alluvium as a result of mining at the Project is limited to a small area along the Boomerang Creek to the east of the proposed longwall panels.
- Minimal changes to alluvial groundwater levels are predicted due to the mining at the Project.
- Over the extent of Quaternary alluvium, there is a predicted average loss of 0.01 ML/day from the alluvium as a result of exercising the underground water rights for the Project.
- The modelling results showed that over the life of mine, the change in the exchange of water between Isaac River and the alluvium is negligible, which is consistent with the predicted water balance. The model predicted no change in the net river flux in Philips Creek and Boomerang Creek due to the Project.
- A 500-year recovery simulation was run. The recovery results showed groundwater levels in the open-cut pit recovered to 162 mAHD, while the underground workings recovered to an elevation of approximately 161 mAHD. These results indicate a gradient from the open pit towards the underground mine at equilibrium conditions.
- Type III uncertainty analysis was conducted and included 250 calibrated realisations.
- The uncertainty analysis results for the mine inflows showed that the calibrated predictions model aligns with the 50th percentile results and is considered appropriate to use as a most likely case for assessing the impacts. The maximum mine inflow in the uncertainty analysis was 1,316 ML/year (3.61 ML/day) for 2031 (very unlikely outcome is larger than this value). The 5th to 95th percentile range in mine inflows for 2031 was 147.1 ML/year (0.40 ML/day) to 992.6 ML/year (2.72 ML/day).
- The uncertainty analysis results generally predicted higher alluvium flux change than what is reported for the calibrated prediction model. The difference between the calibrated model inflow and the 50th percentile is likely due to calibrated specific yield adopted for alluvium in the calibrated prediction model. The specific yield value for the alluvium in the calibrated model is at the lower end of the parameter range. While the value of 2.5% for specific yield for alluvium is reasonable and consistent with the literature, there were no measured inflow data available to constrain this parameter during the calibration.
- The uncertainty analysis results showed that the 95th percentile drawdown in the Rangal Coal Measures extends between 8 and 10 km to the north the Project area.

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Appendix C Hydraulic Parameters and Recharge Zone Distribution
Appendix D Uncertainty Analysis Parameter Distribution
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Jellinbah Mining Pty Ltd (Jellinbah) to undertake groundwater modelling support for the groundwater impact assessment and EPBC approvals for Lake Vermont Meadowbrook Project (the Project).

Bowen Basin Coal Pty Ltd (Bowen Basin Coal), a wholly owned subsidiary of Jellinbah, proposes to extend the existing Lake Vermont Mine by developing the Lake Vermont Meadowbrook Project (the Project), which comprises underground longwall mining and open cut coal mining of coal seams to the immediate north of the existing Lake Vermont Mine.

The Lake Vermont Mine and the associated Meadowbrook Project is located approximately 30 km northeast of Dysart and 180 km southwest of Mackay in the Bowen Basin region of central Queensland. The Project location is shown in Figure 1 1 of *Meadowbrook Groundwater Impact Assessment* (JBT, 2021).

The key components of the Project include:

- Underground longwall mining of the Leichardt Lower Seam and Vermont Lower Seam; the depth and thickness of the coal seams in the Project area means the coal resource can be extracted using underground mining methods.
- An open cut pit to mine the Vermont Seam and Vermont Lower Seam.
- Development of a new infrastructure corridor linking the new mining area to existing infrastructure at the Lake Vermont Mine.
- Development of a Mine Infrastructure Area (MIA).
- Construction of a drift and shafts to provide access to underground operations.
- Development of other supporting infrastructure and associated activities.

The Project involves the extraction and export of up to 7 Mtpa of ROM coal, equivalent to approximately 5.5 Mtpa of metallurgical product coal. The Project addresses the forecast decline in coal output from the Lake Vermont Mine, by maintaining existing production levels across an extended life of the mine. The anticipated extension to the life of the Lake Vermont Mine is approximately 25 years.

Conceptualisation of the groundwater regime and the calibration of the model against observed data are key to achieving a reliable numerical model. Conceptualisation is a simplified overview of the groundwater regime (i.e. the distribution and flow of groundwater) based on available data and experience. Consistency between numerical model results and the conceptual understanding of the groundwater regime increases the credibility of the numerical model predictions. The conceptualisation of the groundwater regime was carried out by JBT Consulting Ltd (JBT) in 2022 and is reported in the *Meadowbrook Groundwater Impact Assessment* (JBT, 2021) of which this groundwater modelling technical report forms an appendix.

Confidence in the numerical model is increased by calibration of numerical model results against observed data. A well calibrated model has demonstrated the ability to simulate groundwater levels that approximate observed levels at specific locations.

The numerical groundwater model for the Project builds on the Olive Downs Project model (the foundational model) (HydroSimulations, 2018). The foundational model was subsequently updated for the Moorvale South Project in 2019 (SLR, 2019), for the Winchester South Project in 2020 (SLR, 2020) and most recently for Caval Ridge Horse Pit Expansion Project (CVM) (SLR, 2021). Jellinbah Mining has established groundwater data sharing agreements with the owners of each of these projects/mines, which allows for the sharing of groundwater data, models and documentation. Under these agreements, the groundwater models developed as part of each project/mine's groundwater assessment have been adopted as a base for the Project groundwater assessment where relevant.

The SLR (2021) groundwater model was deemed to be fit for purpose and used for the Meadowbrook Groundwater Modelling for the following reasons:

- Model extent and grid –The SLR (2021) model included refinement around Meadowbrook underground and the Lake Vermont Mine.
- Model layers – The SLR (2021) model included the deepest mined seams at Meadowbrook and Lake Vermont North (LVN), and captured stratification of alluvium. SLR (2021) model structure included the Meadowbrook and LVN geological model surfaces, Meadowbrook and LVN fault mapping, and updated LiDAR data.
- Calibration data set – The SLR (2021) included all the observations from the LVN and Meadowbrook monitoring bores until December 2020.
- Stresses – The SLR (2021) included most recent and site-specific data (i.e. mining at LVN and Meadowbrook).

Further detail on the model design is discussed in **Section 2**. **Section 2** of this modelling report presents how the conceptualisation has been developed as a numerical groundwater model, and **Section 3** presents how well the model replicates observed data (calibration). Details on how the model represents the Project and other future approved and foreseeable activities within the region are outlined within **Section 4**.

2 Model Construction and Development

2.1 Model Code

MODFLOW-USG Transport was used as the model code (Panday et al. 2013). MODFLOW-USG is a recent version of industry standard MODFLOW code and was assumed to be the most suitable modelling code for accomplishing the model objectives. MODFLOW-USG optimises the model grid and increases numerical stability by using unstructured, variably sized cells. These cells take any polygonal shape, with variable size constraints allowing for refinement in areas of interest (i.e. geological or mining features).

Where previous MODFLOW versions restricted interlayer flow to vertical connectivity, MODFLOW-USG offers lateral connectivity between model layers. Lateral connectivity enables more accurate representations of hydrostratigraphic units, particularly those that pinch out, outcrop, or cross geological faults.

MODFLOW-USG is also able to simulate unsaturated conditions, allowing progressive mine dewatering and post closure rewetting to be represented by the model. For the Project model, vadose zone properties have been excluded, and the unsaturated zone was simulated using the upstream-weighting method.

Fortran code and a MODFLOW-USG edition of the Groundwater Data Utilities (Watermark Numerical Computing) were used to construct the MODFLOW-USG input files.

2.2 Model Extent and Mesh Design

The groundwater model extent is shown in **Figure 2-1**. The model boundaries were set sufficiently distant from the Project so as not to affect the modelling results (i.e. no edge effects). The model domain is designed large enough to allow the adjacent mines/projects to be assessed for potential cumulative impacts.

To reduce the number of the model cells away from the Project area, the eastern boundary of the model was brought in to follow the Devlin Creek. Elsewhere along the model perimeter, boundary locations are consistent with those of the CVM model (SLR, 2021).

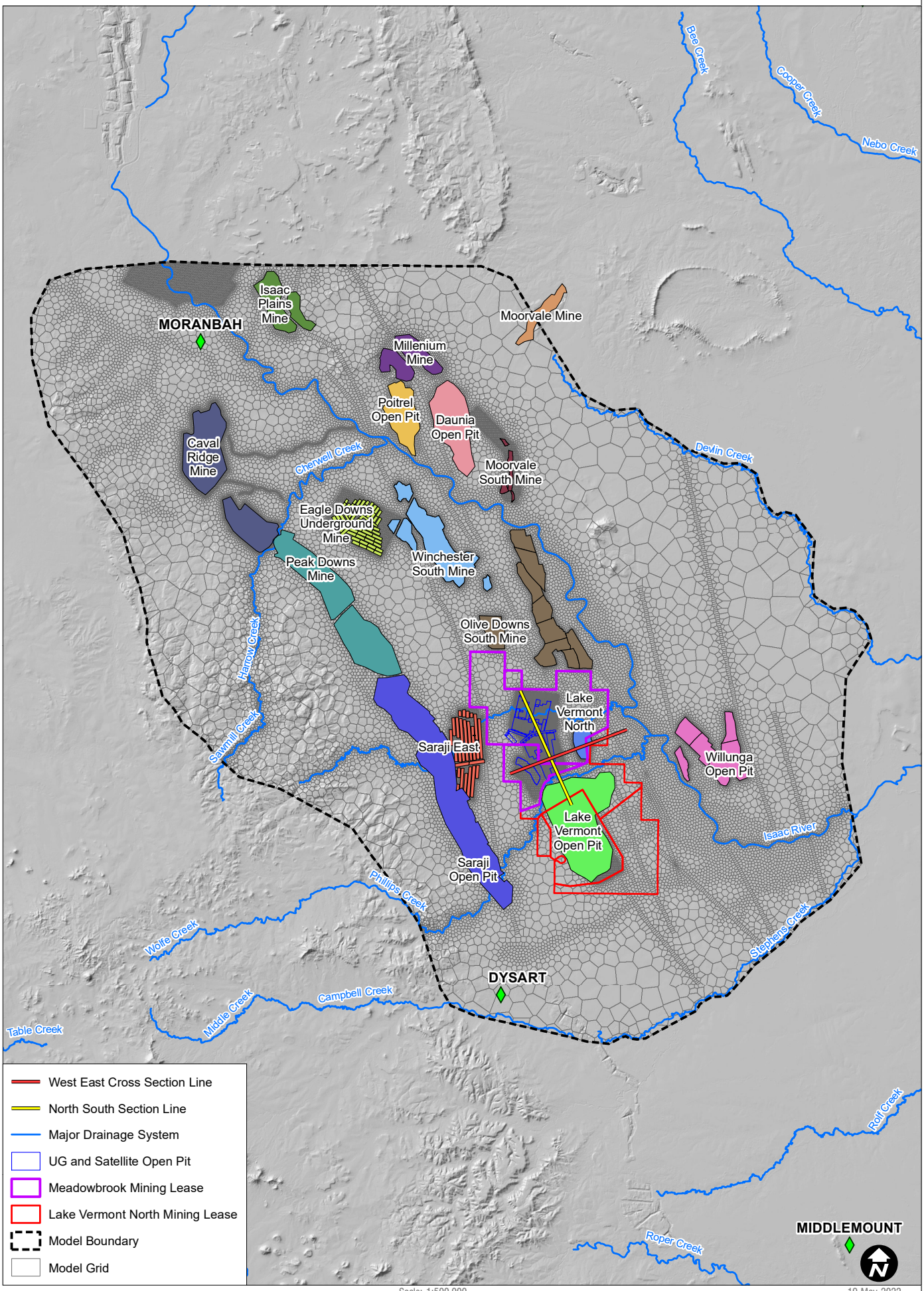
The model encompasses the Project and elongation is in the direction of geological strike (northwest to southeast). At its widest extents, the model is approximately 62 x 95 km. The model domain was selected based on the following considerations:

- The western boundary is represented by the outcrop boundary of the Back Creek Group, which is considered the regional low permeability basement for the purpose of this modelling.
- The northern boundary contains the primary aquifers being mined by the Project and is expected to be far outside the range of predicted Project related drawdown.
- The southern boundary is set along the Stephens Creek and is 27 km away from the Project.

To allow stable numerical modelling of the large spatial area of the model domain, an unstructured grid with varying Voronoi cell sizes was designed using Algomesh (HydroAlgorithmics, 2014). Varying Voronoi cell sizes allowed refinement around areas of interest, while a coarser resolution elsewhere reduces the total cell count to a manageable size. The model domain was vertically discretised into 19 layers, each layer comprising a cell count to 77,639. The total number of cells in the model is 1137811. This is after pinching out areas in Layer 3 to 19 where a layer is not present based on the structural geology.

The following features have been included in the grid design:

- The Isaac River is represented in the model with a 50 metre (m) Voronoi cell size constraint.
- Open cut mining for the Project is represented with a 100 m cell size constraint.
- Open cut mine areas for Caval Ridge Mine (CVM), the Winchester South Project and Olive Downs Project have a 100 m Voronoi cell size constraint.
- Open cut mining at Poitrel, Daunia, Peak Downs and the Moorvale South Project have a maximum cell size of 200 m.
- Open cut mining at Saraji has a maximum cell size of 400 m.
- Longwall mining at Grosvenor and Eagle Downs has an oriented regular grid of 100 m width squares to represent longwalls. Proposed mining at Saraji East is represented similarly by 100 m squares.
- Faults are represented using a 100 m Voronoi cell constraint.



Model Domain

FIGURE 2-1

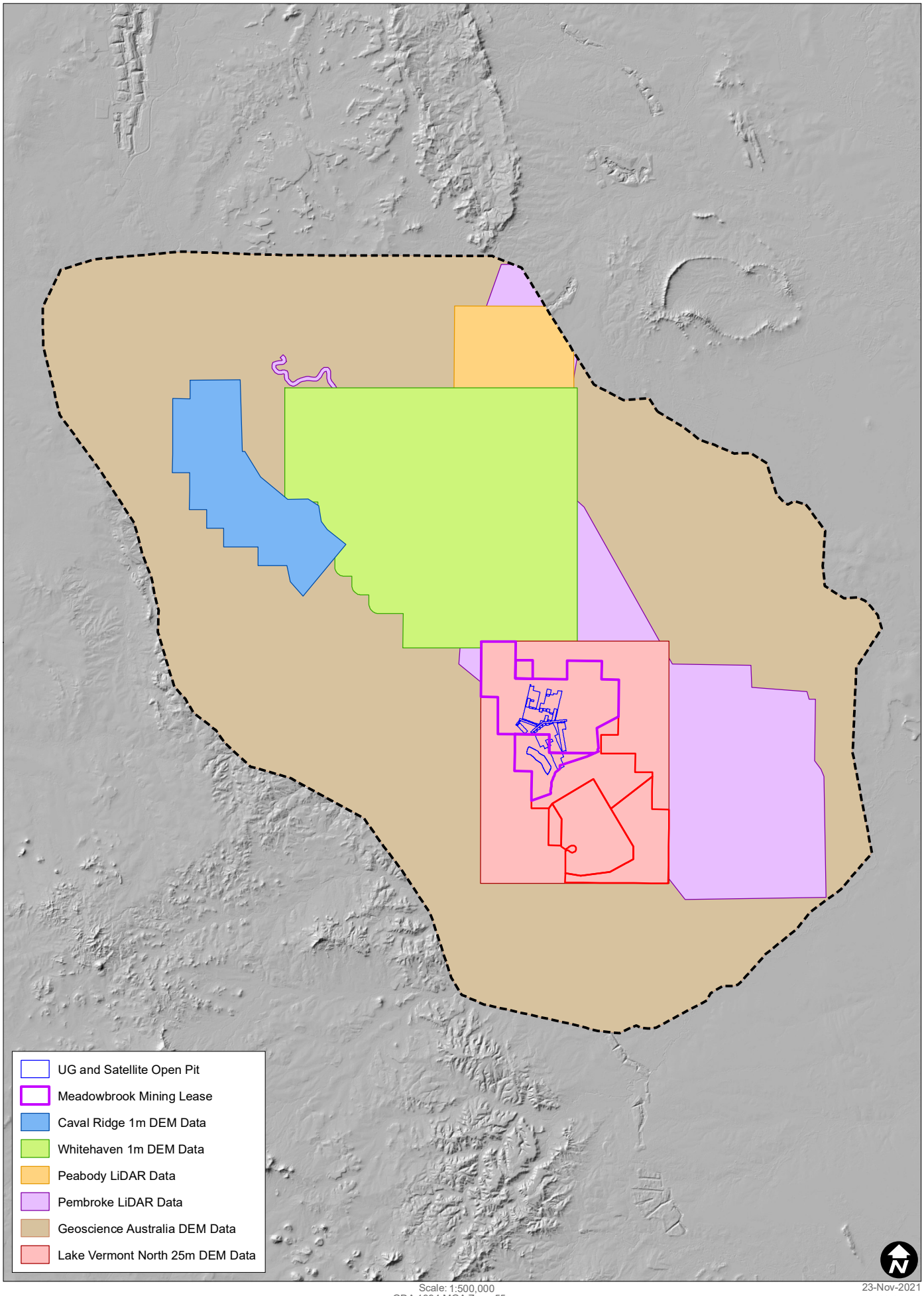
2.3 Model Layers

Topography within the model domain has been defined using numerous sources of varying accuracy. Data extents of the sources used to construct model topography are shown in **Figure 2-2**.

High resolution (1 m) Digital Elevation (DEM) Model data, provided by Jellinbah, was used to define local surface elevation within the Project area. Outside the extents of the DEM dataset for the Project, LiDAR data from the Moorvale South Project, Winchester South Project, Caval Ridge Mine, and the Olive Downs Project were used to define surface elevation, where available. Public domain 25 m DEM data sourced from Geoscience Australia (with 3m subtracted for consistency between datasets) was used to define topography in the remainder of the model domain.

The model domain is discretised into 19 layers, as listed in **Table 2-1**. Model layer extents (lateral and vertical) have been defined using data from the following sources:

- Jellinbah Mining Pty Ltd, Meadowbrook and Lake Vermont North site geological model.
- Jellinbah Mining Pty Ltd, Meadowbrook and Lake Vermont North bore logs.
- BMA, Caval Ridge Mine (CVM) site geological model.
- BMA, Caval Ridge Mine (CVM) site bore hole logs.
- Whitehaven Coal Pty Ltd - Winchester South Project groundwater model (as of November 2019).
- CSIRO Regolith depth survey.
- Queensland Globe bore hole logs.
- Queensland surface geology and basement geological maps.


UG and Satellite Open Pit
Meadowbrook Mining Lease
Caval Ridge 1m DEM Data
Whitehaven 1m DEM Data
Peabody LiDAR Data
Pembroke LiDAR Data
Geoscience Australia DEM Data
Lake Vermont North 25m DEM Data
N
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620.30592
Sheet Size : A4
0
5
10
15
Kilometers
SLR
www.slrconsultingaustralia.com
Topography Data Extents
FIGURE 2-2

Model layer 1 is fully extensive across the model with an average thickness of 6.5 m. In the model expansion, the base of layer 1 was interpreted from Queensland Globe bore log lithology data. Base of Layer 1 was also updated using the bore logs available for the Project area.

Model layer 2 is also fully present across the model area with a minimum thickness of 1 m. The Winchester South Project model and the Meadowbrook and Lake Vermont North site geology models were used to define the base of model layer 2. In the model, the base of layer 2 was interpreted from CSIRO regolith survey depths and Queensland Globe bore log lithology data.

The underlying Triassic and Permian layers are present only to their outcrop extents, with some inference made for the presence of older units beneath the surface outcrop due to folding and faulting. The geological layering representing the layers above Moranbah Coal Measures is generally consistent with the Winchester South Project model. However, updates have been made to Layers 1 to 8 using the Lake Vermont North and Meadowbrook site-specific geology model.

With the availability of the geology model at CVM, all the target seams in Moranbah Coal Measures were included in the model and therefore the number of layers representing the Moranbah Coal Measures was increased to 8.

It is not possible to represent every individual coal seam (typically <1 m thickness) in a regional groundwater model, therefore a “combined thickness” totalling the individual seam thicknesses for each relevant seam has been simulated. Site specific information for the Leichardt and Vermont seams at the Project, has been included in the model. The following values were used to define the combined seam thicknesses in the local geology at the Project:

- Leichardt Seam thickness: 4.5 m
- Vermont Seam Thickness: 5.0 m

The Back Creek Group is considered the regional low-permeability basement for the purpose of this modelling and defines the base of the model, and the western and eastern model boundaries.

Table 2-1 presents the average and minimum thicknesses across the model domain for each layer.

Table 2-1 Model Layers and Thicknesses

Model Layer	Formation	Unit	Average Thickness (m)	Minimum Thickness (m)
1	Alluvium, colluvium, Tertiary basalt	Surface cover	6.5	0.20
2	Tertiary sediments, Tertiary basalt	Tertiary and minor Triassic Clematis, weathered Permian, Tertiary basalt	16.5	0.10
3	Rewan Group	Triassic	139.0	0.10
4	Rangal Coal Measures	Leichhardt overburden	36.0	0.10
5		Leichhardt seam	4.9	0.05
6		Interburden	36.5	0.05
7		Vermont seam	4.0	0.05
8		Vermont underburden	26.5	0.05
9	Fort Cooper Coal Measures	Fort Cooper overburden	61.5	0.14
10		Fort Cooper seams (combined)	61.5	0.18
11		Fort Cooper underburden	60.0	0.15
12	Moranbah Coal Measures	Q Seam	1.5	0.16
13		Interburden	17.0	0.21
14		P Seam	2.5	0.06
15		Interburden	41.0	0.07
16		H Seam	4.5	0.09
17		Interburden	65.5	0.05
18		D Seam	8.5	0.18
19		Interburden	100.0	100.0

Figure 2-3 and **Figure 2-4** show the model layers in a horizontal and a vertical cross-section through Meadowbrook Mine. The location of the cross-sections is shown in in **Figure 2-1**.

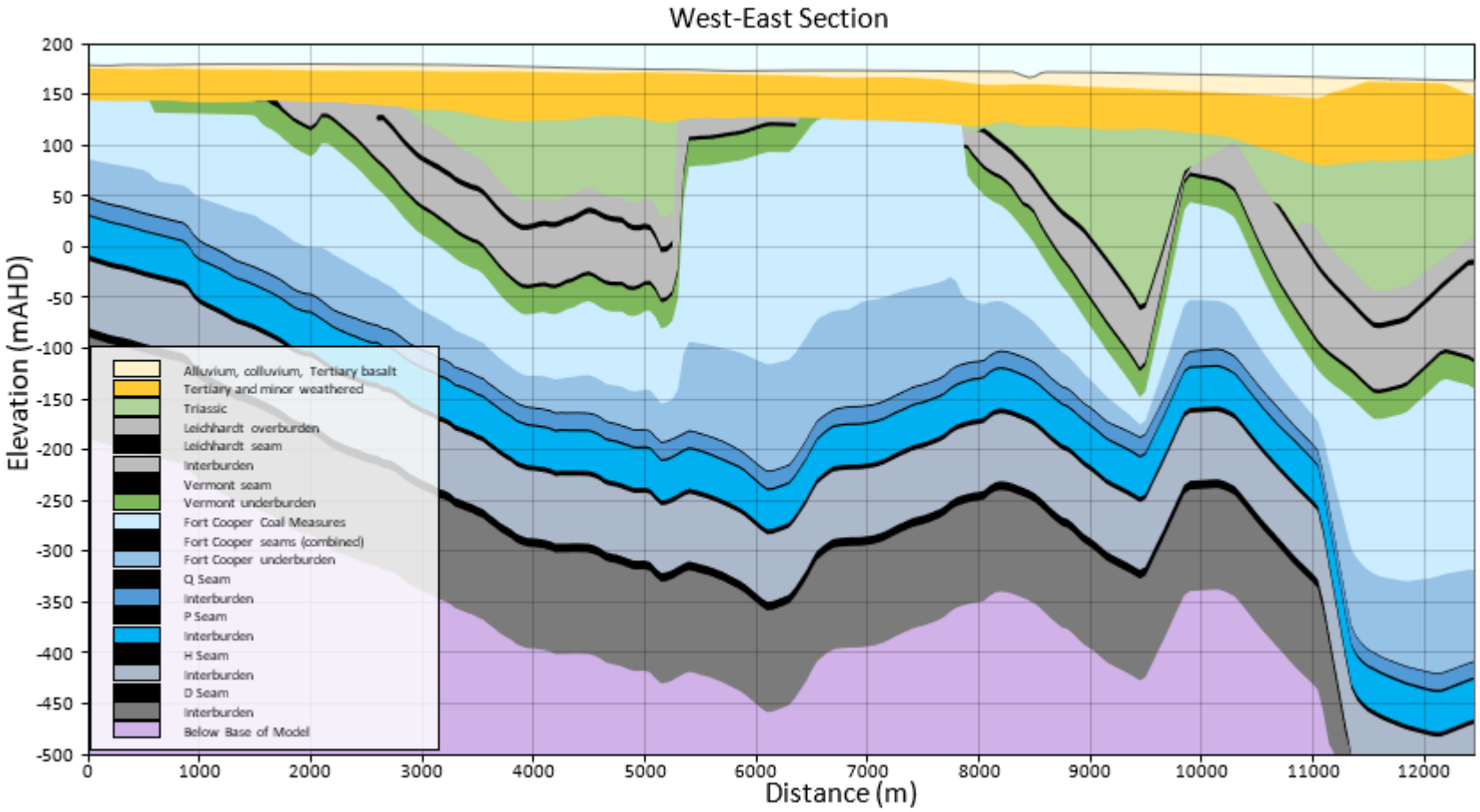


Figure 2-3 Model Layers Cross Section – West East

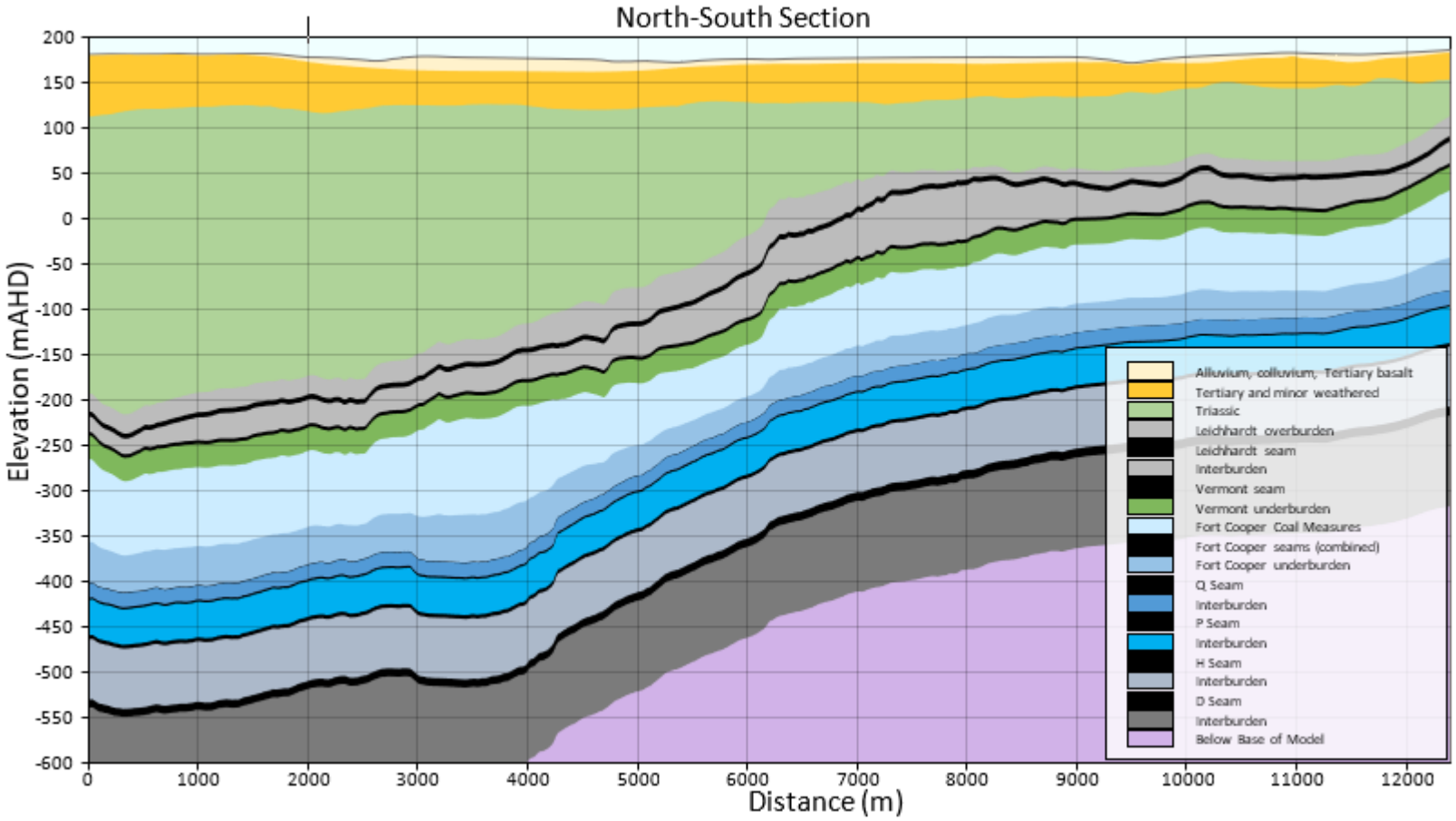


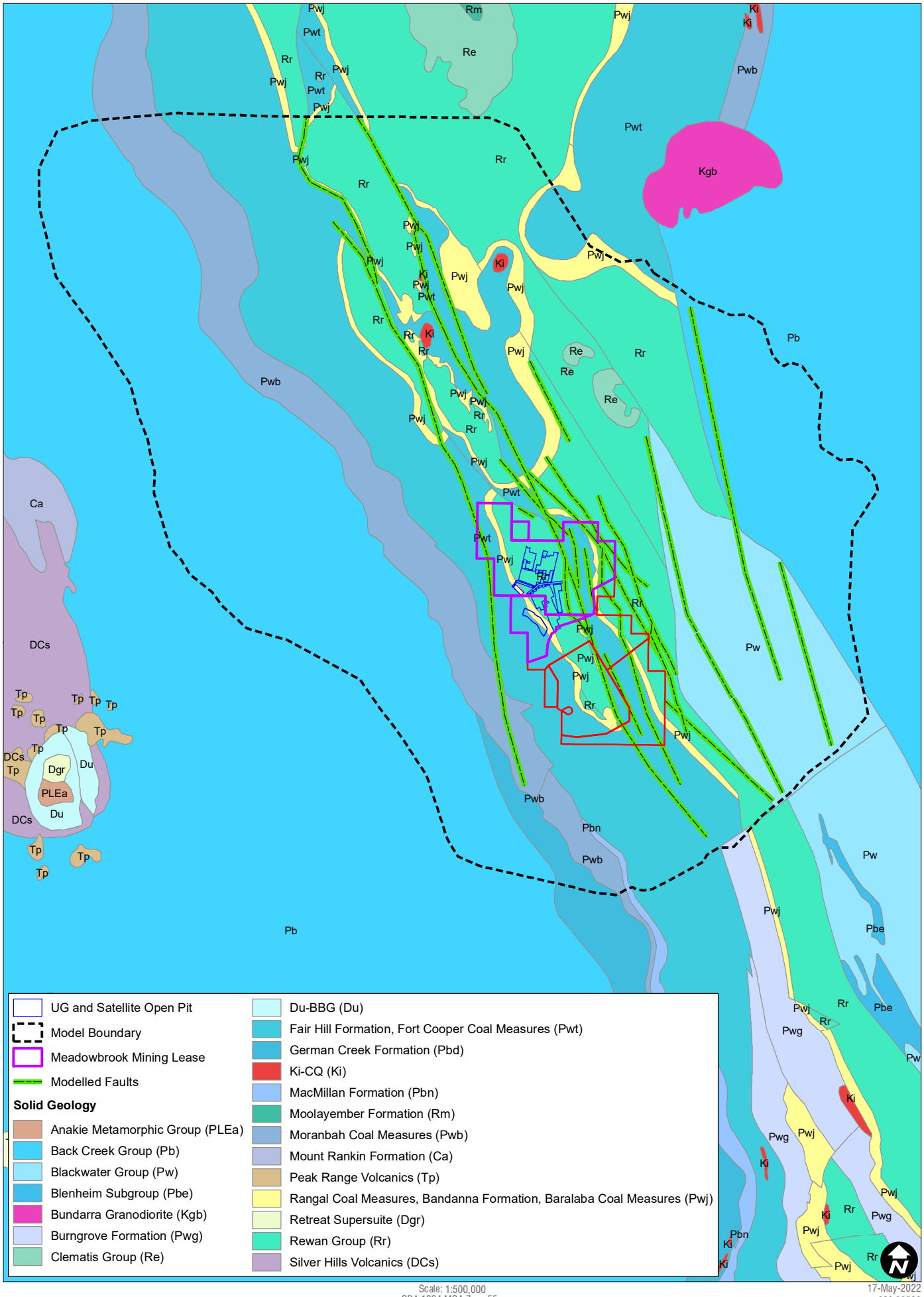
Figure 2-4 Model Layers Cross Section-North South

2.3.1 Geological Faults

As discussed in the conceptualisation report (JBT, 2021), there are major faults mapped within and around the Project area. The main structural feature is the Isaac Fault that passes north-south through the Meadowbrook and Lake Vermont area and separates relatively undisturbed sediments to the west from a complex zone of folded and faulted sediments to the east. Smaller faults are also mapped within the Project area.

The majority of mining is planned to occur to the west of the Isaac Fault, within an asymmetric, north-west trending, north plunging synclinal structure where the Rangal Coal Measure (RCM) are overlain by sediments of the Rewan Group (JBT, 2021). Jellinbah provided a map of local mapped faults within the Project area.

Major regional faults and local scale faults from the Jellinbah's fault mapping and the site-specific geology model are included in the model. Mesh refinement (100 m) has been used along fault lines to allow for isolated changes of hydraulic properties along fault zones during calibration. **Figure 2-5** shows the locations of geological fault zones represented in the model.



Scale: 1:500,000
GDA 1994 MGA Zone 55

17-May-2022
620.30592

Sheet Size : A4

0 5 10 15 km

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Modelled Fault Zones

FIGURE 2-5

2.4 Model Stresses and Boundary Conditions

2.4.1 Regional Groundwater Flow

General Head Boundary (GHB) conditions have been specified along the eastern, southern and part of the northern model boundaries. The GHB boundary condition is used to represent the regional flow into and out of the model area and has been assigned using GHB cells in all layers using pre-mining head elevations. Groundwater will enter the model where the head set in the GHB is higher than the modelled water levels in the adjacent cell and will leave the model when the water level is lower in the GHB. GHB conductance is calculated using the hydraulic conductivity and the dimensions of each GHB cell and is therefore variable in this model due to variable cell-size.

No flow boundary was applied to the western boundary of the model that represents the outcrop of the Back Creek Group.

A drain boundary condition was used in the northern model boundary to simulate the mining at the Grosvenor mine.

2.4.2 Watercourses

Major rivers (including Isaac River) as well as minor creeks were built into the model using MODFLOW-USG RIV package. River cells in the model are shown in **Figure 2-6**. The rivers within and around the project that were included in the RIV package are presented in **Table 2-2**.

Surveyed river stage data was available at several locations along the Isaac River. The closest gauging station to the site, located at Deverill, records average monthly water levels as shown in **Table 2-2**. This data was extrapolated to provide continuous stage elevations.

River and creek widths, thickness and conductance values were adopted from the CVM model (SLR, 2021). The rivers are set with the river bed 1 to 11 m below the surrounding topography to represent the steep-banked incised channels. The river widths were assumed to be fixed for each river in the model. The river widths were estimated using aerial photography and aligned with assumptions within the CVM Project model (SLR, 2021).

The river conductance was calculated using river width, river length, riverbed thickness, and the vertical hydraulic conductivity of river bed material (Kz). Therefore, the river conductance is variable due to the non-constant spatial discretisation in each of the model river cells. The vertical hydraulic conductivity of river beds for different rivers in the model were adopted from the CVM Project model (SLR, 2021).

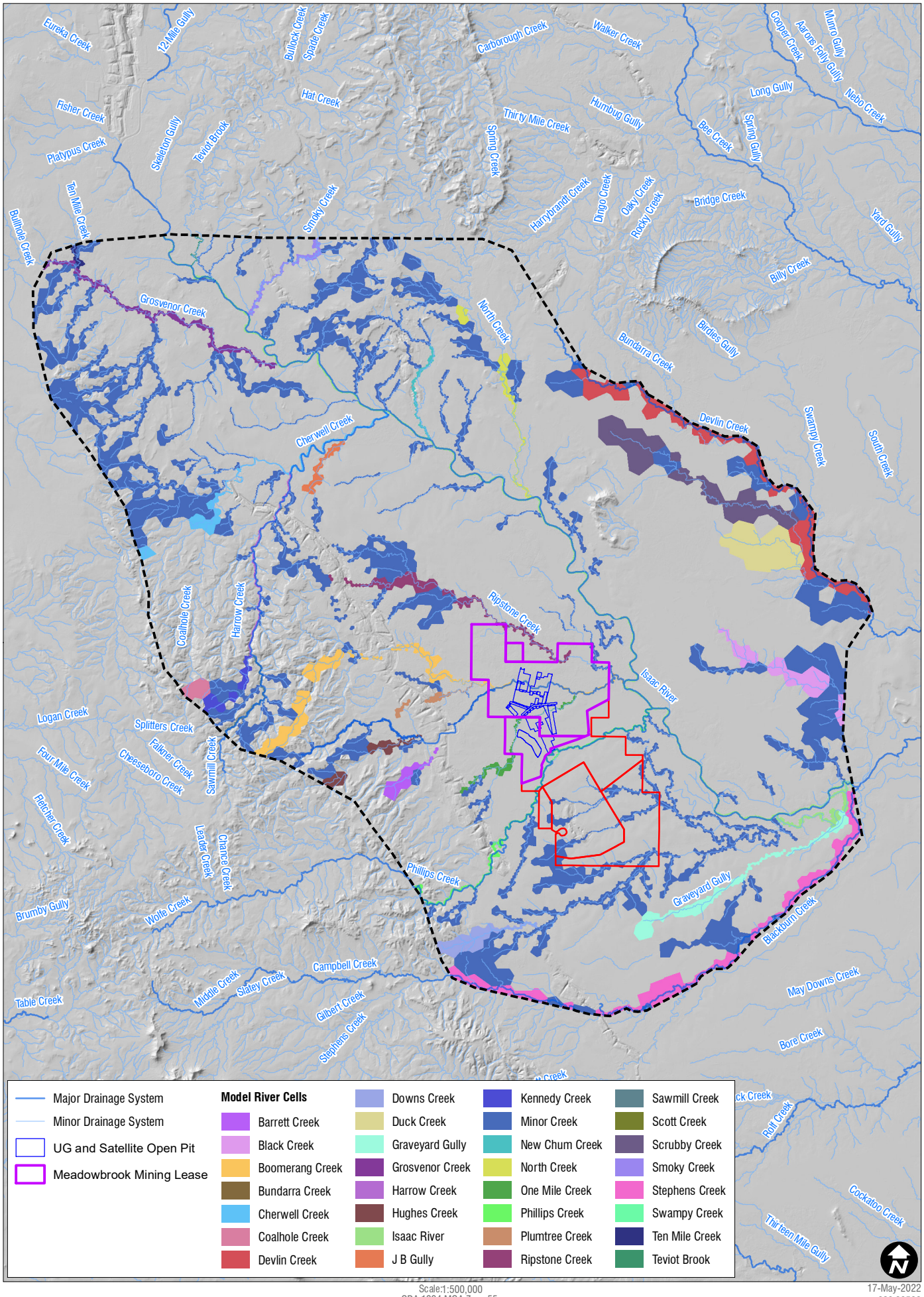
The river stage height in the minor tributaries or drainage lines was set to 0 m (i.e. river stage elevation was equal to river bottom elevation). Therefore, the minor tributaries or drainage lines act as drains to the groundwater system and do not result in any recharge.

Table 2-2 Average Stage Heights (m) Used to Develop Transient Sequence

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Isaac at Deveril	0.46	0.89	0.68	0.39	0.23	0.15	0.16	0.10	0.08	0.02	0.09	0.41	0.31

Table 2-3 River and Surface Water Features in the Meadowbrook Model

Boundary	River Stage (m)	River Bed Kz (m/day)
Isaac River	Warm Up Simulation - Long term Average (2008-2020) Calibration simulation - Historical Quarterly Averages Prediction simulation- Fixed Stage Height- Long term Average (2008-2020)	1.0×10^{-2}
Boomerang Creek	0	1.0×10^{-1}
Philips Creek	0	8.0×10^{-2}
One Mile Creek	0	1.0×10^{-1}
Other Minor Creeks	0	1.0×10^{-2}-1.0×10^{-1}



River Cells

FIGURE 2-6

2.4.3 Rainfall Recharge

The dominant mechanism for recharge to the groundwater system is through diffuse infiltration of rainfall through the soil profile and subsequent deep drainage to underlying groundwater systems. Diffuse rainfall recharge to the model was represented using the MODFLOW-USG Recharge package (RCH).

The recharge rates were established through the calibration process, with bounds based on the conceptual understanding of the system and comparing them with other groundwater models prepared for the region. The starting values adopted in the calibration process were from the Winchester South Project model (SLR, 2020). Rainfall recharge was imposed as a percentage of actual rainfall from the SILO Grid Point observations. Long-term average rainfall was used for the steady-state model. For the transient calibration model, quarterly averages of the historical rainfall data were used (2008 to 2020). For the prediction model, annual averages of 1990-2020 rainfall data were used.

The model included 7 recharge zones as listed below:

- Isaac River Flood Plain Alluvium.
- Isaac River Channel Alluvium.
- Alluvium– Rest of the model (including Boomerang Creek, Philips Creek and One Mile Creek).
- Regolith.
- Basalt.
- Duaringa Formation.
- Weathered Permian.

An enhanced recharge of 100% is applied to the final voids in the prediction model. The recharge to the spoil is set to 1% of actual rainfall.

The recharge zones adopted in the model are presented in **Appendix C**. The calibrated recharge rates are discussed in **Section 3.6**.

2.4.4 Evapotranspiration

The MODFLOW Evapotranspiration (EVT) package was used to simulate evapotranspiration from the groundwater system.

Extinction depths were set to 2 m below ground across the model domain. Potential EVT rates were set using actual evapotranspiration values (from the Bureau of Meteorology), with the average value (600 mm/year) used as the transient calibration evapotranspiration rate. An EVT rate of 0 was assigned to the model cells representing the rivers.

2.4.5 Mining

The MODFLOW Drain (DRN) package is used to simulate mine dewatering in the model for the Project and surrounding mines. Boundary conditions for drain cells allow one-way flow of water out of the model. When the computed head drops below the stage elevation of the drain, the drain cells become inactive. This is an effective way of theoretically representing removal of water seeping into a mine over time, with the actual removal of water being via pumping and evaporation.

To simulate open cut mines in the model, drain cells are applied to all active layers from the surface to the base of the lowermost mined seam (Layer 7 for the Project). Longwall extraction at Meadowbrook is represented as drain cells in model layers 5 and 7. The drain cells representing the surrounding mines were interpolated from mine schedule information available from the previous groundwater model, the previous reports, publicly available EIS documentation and aerial photography.

2.4.5.1 Variation in Hydraulic Properties - Open Cut Mining

For open cut mining, Hawkins (1998) and Mackie (2009) indicate that spoil and waste rock are more permeable than the undisturbed strata. Completed open cut mining areas will be backfilled with waste overburden as the extraction proceeds. Backfilling of open cut mine areas with spoil was also modelled using the TVM package. The model cell properties were updated to spoil properties guided by operational mine plans. Horizontal hydraulic conductivity of 0.3 m/day and vertical hydraulic conductivity of 0.1 m/day is applied to the spoil. The storage parameters used for the spoil were a specific yield of 0.1 and a specific storage of 1.0 x 10-5 m-1.

The hydraulic properties were varied with time using the Time-variant materials (TVM) package of MODFLOW-USG Transport.

2.4.5.2 Variation in Hydraulic Properties - Longwall Mining

As longwall mining progresses through the coal seam, the void left behind (goaf) fills with collapsed rock from the formations directly above the coal seam. There is a sag in the bedded formations above the goaf zone and the deformation causes generally vertical fractures to occur. These fractures reduce in size and frequency the higher up the profile they go. These fractures can provide new flow paths for groundwater and alter the permeability of the strata overlying longwall mining areas. Therefore, they are included in the groundwater model.

Most longwall panels in the Leichhardt Seam are 310 m wide. Three panels have been narrowed to 270 m wide to maximise recovery between the faults. In the Vermont Seam, the panel width is also 310 m except in the two narrower 290 m wide (solid) panels in the northern part of the area.

The Leichhardt Seam occurs at depths from 250 m in the western part of the mine area and approaching 500 m in the north-eastern corner of the Meadowbrook underground mine area. The Vermont Seam occurs at depths greater than 500 m in the north-eastern corner of the longwall area. In the southern part of the proposed longwall area, the depths decrease to less than 150 m. The extraction height at Meadowbrook Underground Mine is between 3 to 4.5 m. The extraction height at Meadowbrook Underground Mine is between 3 to 4.5 m.

There are not site measurements available on the height and properties of the fractured zone about the longwalls. The geotechnical study for the Project used the predicted a fracture zone up to 120 m in the single seam extraction areas and up to 180 m above the Vermont Seam in dual seam extraction areas at the Project area. These predictions were based on the measured data, microseismic monitoring and empirical guidelines (Gordon Geotechniques, 2021).

Figure 2-7 shows in which model layers the height of fracture is potentially extending across the Project area. **Figure 2-7** also shows the corresponding highest fractured layer in the model within the underground mine footprint. As shown in the figure, the fracturing mainly reached Layers 3 and 4 of the model, except a small area within the southern longwalls where the fracturing reached Layer 2.

There are other empirically based equations developed for the purpose calculating the height of fractured zone and/or the zone of complete groundwater depressurisation. In Australia, two of these equations or models are used most frequently:

- The Tammetta Equation (Tammetta, 2013) based on a groundwater depressurization approach and,
- The Ditton Equation (Ditton & Merrick, 2014), based on a geotechnical approach.

Both methods estimate the height of their conceptualised disturbance zones based on panel width, thickness of overlaying overburden, and the seam extraction height. Depending on the physical property and the location of the longwalls, the two methods can result in similar or very different estimation of fracture height.

Limitations associated with the Tammetta equation is that the formulation is only for single seam mining. Moreover, the equation is not considered suitable for calculation of fracture height in seams with extraction height more than 3.4 m as the Tammetta power equation can result in unrealistic fracture heights (up to 400 m at the Meadowbrook Mine southern panels) as the Tammetta calibration database did not include thicker seams.

For the proposed Meadowbrook Underground Mine, the Ditton method estimates the facture height to be more than 120 m in the single seam extraction areas (140 to 220m) and more than 180 m above the Vermont Seam in dual seam extraction areas (230 to 340m). The Ditton method estimates the facture height can reach the ground surface in the southwest corner of the mine where the depth of cover is the shallowest.

To understand the sensitivity of the model predictions to the height of fracture zone, a worst-case sensitivity was carried out where the cracking was simulated to reach the surface. The results from this sensitivity analysis are presented in Section 5.5 of the Groundwater Impact Assessment Report (JBT Consulting, 2022).

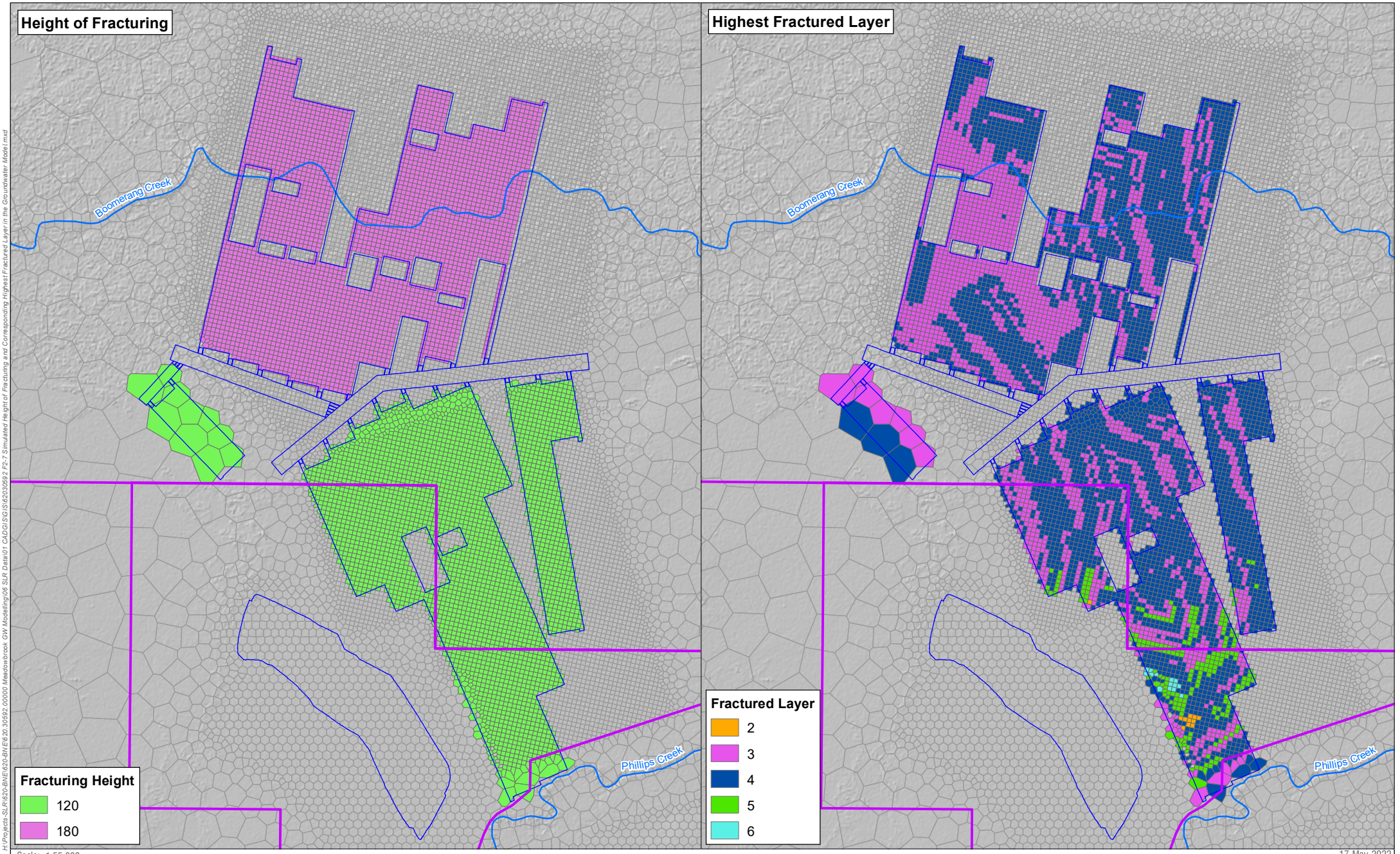
The fracture zone is represented in the groundwater model via an increase in the horizontal and vertical hydraulic conductivity of the model layers above previously mined coal seam using the TVM package of MODFLOW-USG. Within the mined coal seam (goaf) the specific yield is modified to a value of 0.1 or 10%. This value provides for an increased storage capacity by removal of coal, but also accounts for reduced volume in the workings from collapse of overlying strata into the void space left by the removal of coal.

The horizontal hydraulic conductivity in the fractured zone was set twice higher than the host horizontal hydraulic conductivity. The change in vertical hydraulic conductivity in the fracture zone was varied with the height above the seam using the following equation:

- Fractured Kz (m/day) = $86400 \times e^{(-0.14 \times H)}$ (Eq. 1)
- Where H is the height above the seam.

The above equation derived to match the values in **Figure 2-8** as reported by Gale (2008) and suggested by the Meadowbrook geotechnical study to be suitable to use for the Project (Gordon Geotechniques, 2021). Gale (2008) study was focused on Oaky Creek area and showed a distinct decrease in the vertical conductivity to 10-6 m/s, at beyond 90 to 100 m above the coal seam. It also reported a progressive reduction in vertical conductivity from 1 m/s close to the extracted seam, decreasing to 10-4 m/s at the top of fractured zone. It should be noted that the values estimated from the Gale (2008) study are considered very conversative and higher compared to other studies such as Tammetta (2015), which suggests an increase factor of 10 to 100 in vertical conductivity in the fracture zone.

The dash line in **Figure 2-8**, shows the values resulted from **Equation 1. Figure 2-8** show Gale (2008) predicted a higher vertical conductivity (10-6 m/s) beyond 90 to 100 m above the coal seam than that estimated for the modelling by Equation 1.



H:\Projects-SLR\620-BNE\BNE620-BNE20.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620306592 F2-7 Simulated Height of Fracturing and Corresponding Highest Fractured Layer in the Groundwater Model.mxd

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Major Drainage System
UG and Satellite Open Pit
Meadowbrook Mining Lease
Model Grid

Simulated Height of Fracturing and Corresponding Highest Fractured Layer in the Groundwater Model

FIGURE 2-7

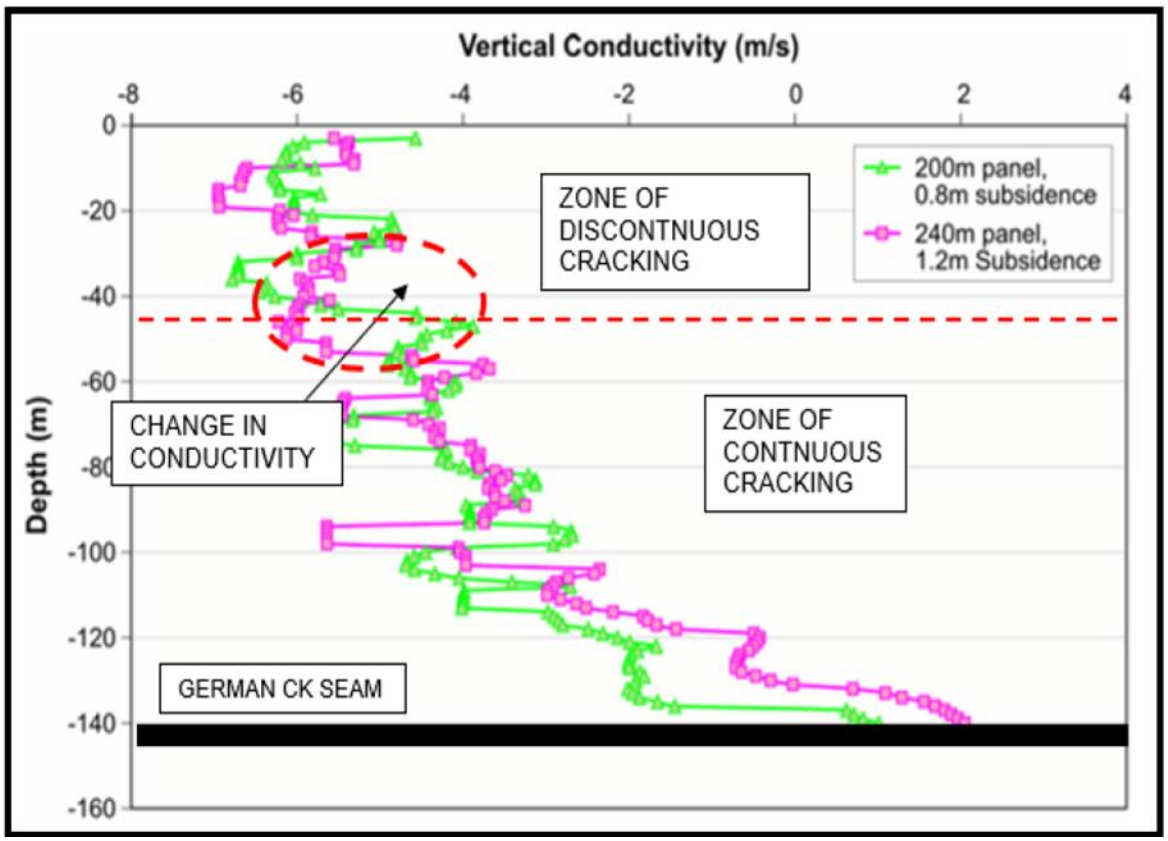


Figure 2-8 Fractured Zone Vertical Conductivity vs Depth to Roof of Seam (Gale, 2008) vs Meadowbrook Groundwater Model

2.5 Timing

A combined transient warm up and transient calibration model was developed, as follows:

- A steady state model to represent pre-mining conditions.
- A transient warm-up model from January 1988 to December 2007 conditions with 20 yearly time interval.
- Transient calibration model from December 2007 to December 2020 with quarterly time intervals to replicate influence of historical mining.
- Transient predictive model from January 2021 to March 2060 with annual and 5 yearly time intervals.

The transient warm-up model was built to incorporate pre-2008 mining activities and their impacts on groundwater levels around the Project area. The warm-up model provided appropriate starting conditions for the calibration model (i.e. starting water levels and hydraulic properties).

Together, the warm-up and transient calibrations comprise 54 stress periods. **Table 3-1** summarises the calibration model stress periods and simulated active mine timings. As shown in **Table 3-1** the first stress period of the warm-up model was steady- state and did not include any mining. This was to simulate the pre-mining conditions within the model domain.

To assist the model in overcoming potential numerical difficulties, MODFLOW-USG Adaptive Time-Stepping (ATS) option was used. ATS option of MODFLOW automatically decreases time-step size when the simulation becomes difficult and increases it when the difficulty passes. The minimum time step size used in the simulations was 1 day.

3 Model Calibration

Automated calibration utility PEST ++ (Doherty 2019) and manual calibration were used to match the available transient water level data. The groundwater levels recorded between January 2008 to December 2020 were used for the model calibration. In all, 4342 target water levels were established for 400 bores from the following sites:

- Meadowbrook and Lake Vermont: included 74 groundwater level observations sites and VWPs.
- CVM included 43 groundwater level observations sites and VWPs.
- Winchester South bores: 20 bores including 2 VWPs.
- Olive Downs South bores; included 46 groundwater level observations sites and VWPs.
- Moorvale South: 16 observations sites.
- Other bores: 207 other bores, including available data from Saraji Mine, Eagle Downs Mine, Poitrel Mine, Daunia Mine, Grosvenor Mine, Moranbah South Mine and newly added Queensland Globe bore monitoring observations.

Groundwater targets were selected where:

- Valid information on bore construction or geology information was available for the site.
- Data was collected prior to 1988 or reasonably around 1988 to reflect baseline condition at the start of the model.

Groundwater bores used for the calibration were weighted as 1 each in the calibration. Details on each of the observation points and their residuals are presented in **Appendix A** of this report. The locations of these bores are shown in **Figure 3-4**. The hydraulic properties (i.e., horizontal, vertical conductivity, specific yield and specific storage) and recharge rates were adjusted during the calibration to provide best match between the measurements and model simulated water levels.

Table 3-1 Calibration Model Stress Period Setup

Calibration Period	Interval	Stress Period	Date (from)	Date (to)	Moorvale South (OC)	CVM (OC)	Peak Downs (OC)	Saraji (OC)	Grosvenor (UG)	Poitrel (OC)	Daunia (OC)
Steady-State		1	Steady-state								
Warm- up	20 Years	2	Transient Warm up					x		x	
Transient	Quarterly	3	01-01-2008	01-04-2008				x		x	
	Quarterly	4	01-04-2008	01-07-2008				x		x	
	Quarterly	5	02-07-2008	01-10-2008				x		x	
	Quarterly	6	01-10-2008	31-12-2008				x	x	x	
	Quarterly	7	31-12-2008	01-04-2009				x	x	x	
	Quarterly	8	02-04-2009	02-07-2009				x	x	x	
	Quarterly	9	02-07-2009	01-10-2009				x	x	x	
	Quarterly	10	01-10-2009	31-12-2009				x	x	x	
	Quarterly	11	01-01-2010	02-04-2010			x	x	x	x	
	Quarterly	12	02-04-2010	02-07-2010			x	x	x	x	
	Quarterly	13	02-07-2010	01-10-2010			x	x	x	x	
	Quarterly	14	01-10-2010	31-12-2010			x	x	x	x	
	Quarterly	15	01-01-2011	02-04-2011			x	x	x	x	
	Quarterly	16	02-04-2011	02-07-2011			x	x	x	x	
	Quarterly	17	02-07-2011	01-10-2011			x	x	x	x	
	Quarterly	18	02-10-2011	01-01-2012			x	x	x	x	
	Quarterly	19	01-01-2012	01-04-2012			x	x	x	x	

Calibration Period	Interval	Stress Period	Date (from)	Date (to)	Moorvale South (OC)	CVM (OC)	Peak Downs (OC)	Saraji (OC)	Grosvenor (UG)	Poitrel (OC)	Daunia (OC)
	Quarterly	20	01-04-2012	01-07-2012			x	x	x	x	
	Quarterly	21	02-07-2012	01-10-2012			x	x	x	x	
	Quarterly	22	01-10-2012	31-12-2012			x	x	x	x	
	Quarterly	23	31-12-2012	01-04-2013			x	x	x	x	
	Quarterly	24	02-04-2013	02-07-2013			x	x	x	x	x
	Quarterly	25	02-07-2013	01-10-2013			x	x	x	x	x
	Quarterly	26	01-10-2013	31-12-2013			x	x	x	x	x
	Quarterly	27	01-01-2014	02-04-2014		x	x	x	x	x	x
	Quarterly	28	02-04-2014	02-07-2014		x	x	x	x	x	x
	Quarterly	29	02-07-2014	01-10-2014		x	x	x	x	x	x
	Quarterly	30	01-10-2014	31-12-2014		x	x	x	x	x	x
	Quarterly	31	01-01-2015	02-04-2015		x	x	x	x	x	x
	Quarterly	32	02-04-2015	02-07-2015		x	x	x	x	x	x
	Quarterly	33	02-07-2015	01-10-2015		x	x	x	x	x	x
	Quarterly	34	02-10-2015	01-01-2016		x	x	x	x	x	x
	Quarterly	35	01-01-2016	01-04-2016		x	x	x	x	x	x
	Quarterly	36	01-04-2016	01-07-2016		x	x	x	x	x	x
	Quarterly	37	02-07-2016	01-10-2016		x	x	x	x	x	x
	Quarterly	38	01-10-2016	31-12-2016		x	x	x	x	x	x
	Quarterly	39	31-12-2016	01-04-2017		x	x	x	x	x	x

Calibration Period	Interval	Stress Period	Date (from)	Date (to)	Moorvale South (OC)	CVM (OC)	Peak Downs (OC)	Saraji (OC)	Grosvenor (UG)	Poitrel (OC)	Daunia (OC)
	Quarterly	40	02-04-2017	02-07-2017		x	x	x	x	x	x
	Quarterly	41	02-07-2017	01-10-2017		x	x	x	x	x	x
	Quarterly	42	01-10-2017	31-12-2017		x	x	x	x	x	x
	Quarterly	43	31-12-2017	01-04-2018		x	x	x	x	x	x
	Quarterly	44	01-04-2018	01-07-2018		x	x	x	x	x	x
	Quarterly	45	01-07-2018	30-09-2018		x	x	x	x	x	x
	Quarterly	46	30-09-2018	31-12-2018		x	x	x	x	x	x
	Quarterly	47	31-12-2018	01-04-2019		x	x	x	x	x	x
	Quarterly	48	01-04-2019	01-07-2019		x	x	x	x	x	x
	Quarterly	49	01-07-2019	01-10-2019		x	x	x	x	x	x
	Quarterly	50	01-10-2019	31-12-2019		x	x	x	x	x	X
	Quarterly	51	31-12-2019	31-03-2020	x	x	x	x	x	x	x
	Quarterly	52	31-03-2020	30-06-2020	x	x	x	x	x	x	x
	Quarterly	53	30-06-2020	30-09-2020	x	x	x	x		x	x
	Quarterly	54	30-09-2020	30-12-2020	x	x	x	x		x	x

3.1 Calibration Statistics

One of the industry standard methods to evaluate the calibration of the model is to examine the statistical parameters associated with the calibration. This is done by assessing the error between the modelled and observed (measured) water levels in terms of the root mean square (RMS). A root mean square (RMS) is expressed as:

$$RMS = \left[1/n \sum (h_o - h_m)_i^2\right]^{0.5}$$

where: n = number of measurements

ho = observed water level

hm = simulated water level

RMS is considered to be the best measure of error if errors are normally distributed. The RMS error calculated for the calibrated model is 12.5 m.

The acceptable value for the calibration criterion depends on the magnitude of the change in water levels over the model domain. If the ratio of the RMS error to the total head change in the system is small, the errors are considered small in relation to the overall model response(s). The total measured head change across the model domain is 223 m; therefore, the ratio of RMS to the total head loss (SMRS) is 5.4%. While there is no recommended universal SRMS error, The Australian Groundwater Modelling Guidelines suggests that setting Scaled RMS targets such as 5 or 10% may be appropriate in some circumstances (Barnett et al., 2012).

The RMS for the Meadowbrook and LVN bores is 9.15 m, which is lower than the RMS for the entire model (12.5m). SRMS for the Meadowbrook and LVN bores is 16.8%. The higher SRMS comparing to the SRMS across the model domain (5.4%) is due to the narrower range of groundwater measurements at site.

Figure 3-1 presents the observed and simulated groundwater levels graphically as a scattergram for the initial and historical transient calibration (1988 to 2020). As it can be seen in **Figure 3-1**, the model was not able to closely match the variability in observed groundwater levels at Lake Vermont (LV) bores located to the East of the Project area. The Lake Vermont bores observed levels vary between 120-170 mAHD while the model simulated heads in these bores at around 160 mAHD. This model inability to match the observed levels is considered to likely be a result of the complexity of the structural geology (e.g. faulting) in the east of the Project. While the model simulates the major faults, it remains a simplification of reality and unable to replicate all details in the geological structure.

Figure 3-2 shows the Meadowbrook and LV bores with contribution (>0) to sum of squares of the calibration and the overall and site SRMS. As it can be seen in the **Figure 3-2**, 1235C VWP1 to VWP4 significantly impact the calibration error. The 1235C VWPs are all located adjacent to the faults to the east of site. It is likely that groundwater levels in these bores are influenced by the complex structural geology (i.e. faulting). The residual error in these bores is resulting from the inability of the model to fully replicate this complexity. The model is a simplification of reality in this regard as the grid resolution will never be of the finite degree required to replicate all the structure.

Figure 3-3 shows the distribution of calibration residuals. As shown in the figure the calibration residuals in majority of the calibration data points are within ± 20 m. **Figure 3-3** indicates that in general the model tends to overpredict the groundwater levels.

The spatial distribution of average residuals for each bore from the transient calibration is shown in **Figure 3-4**. The size of the bore symbol in **Figure 3-4** is proportional to the residual (i.e. larger residual has a larger symbol size). **Figure 3-4** shows regionally there is a good match between the observed and simulated groundwater levels. **Figure 3-5** shows the inset from **Figure 3-4** with an overlay of the local fault traces. As it can be seen in **Figure 3-5**, the average residuals are generally higher for bores located to the east of the project area and near the faults.

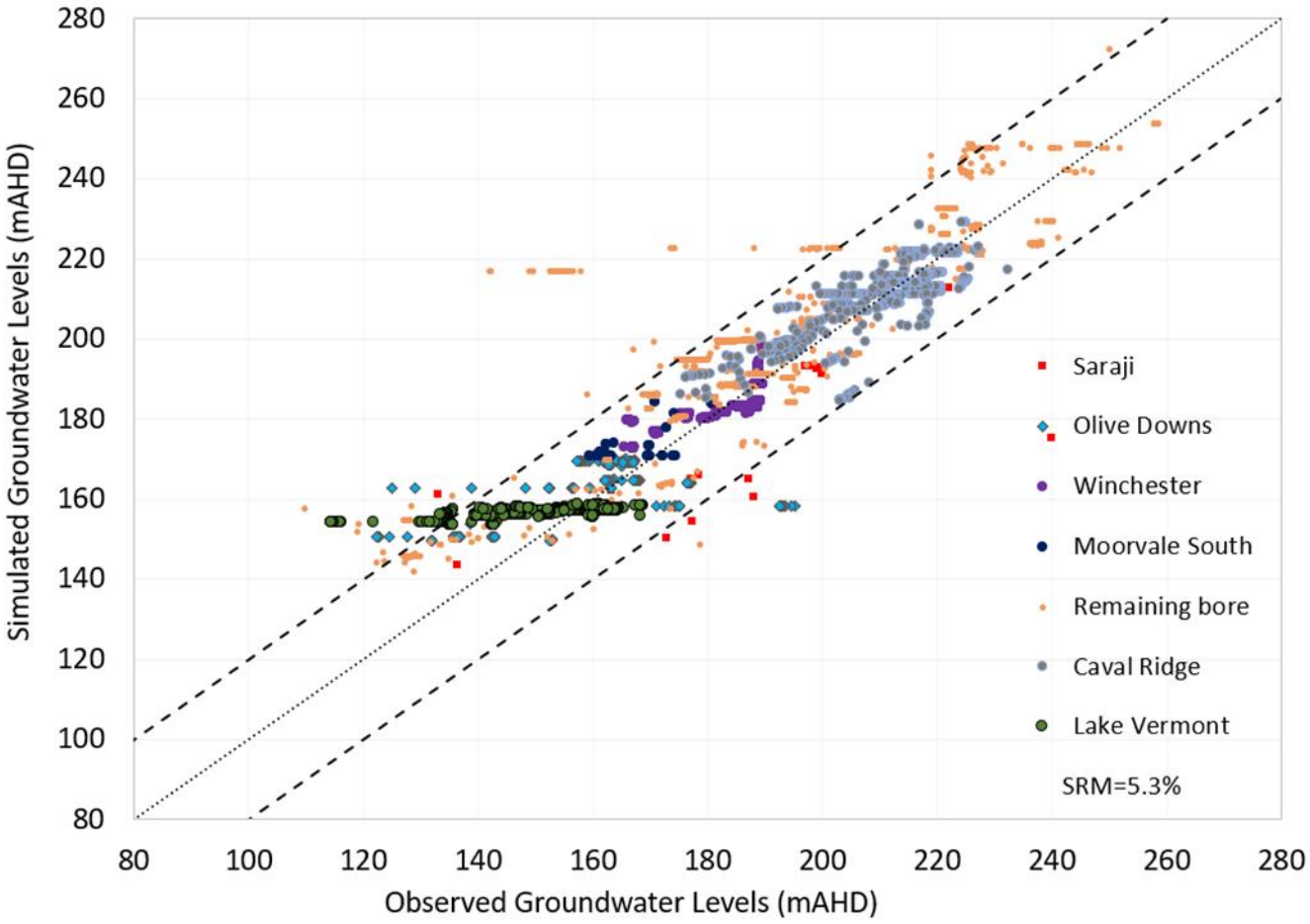


Figure 3-1 Calibration Scattergram – Modelled vs Observed Groundwater Levels (All Bores)

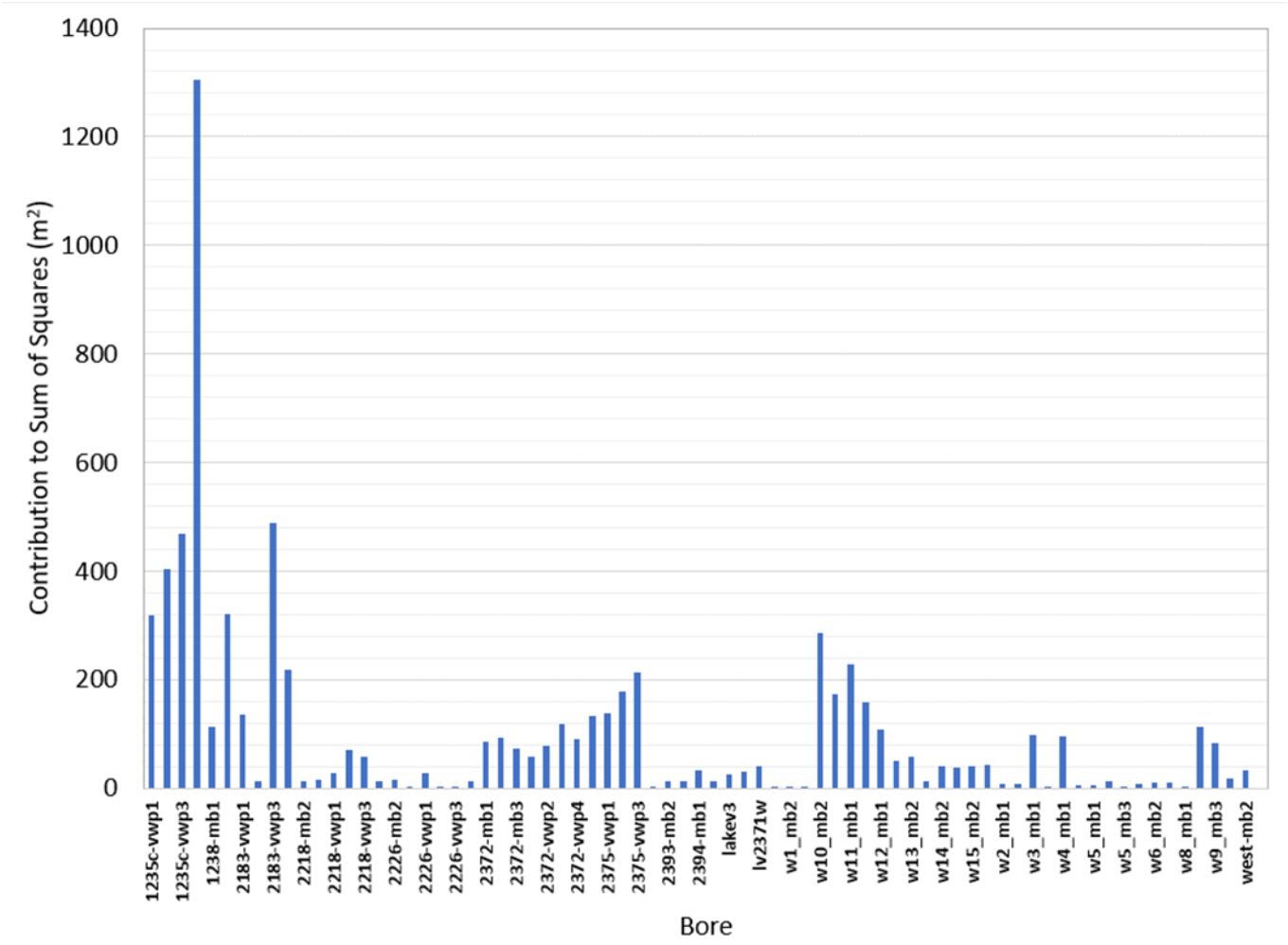


Figure 3-2 Contribution to Sum of Squares (m2)- Site Bores

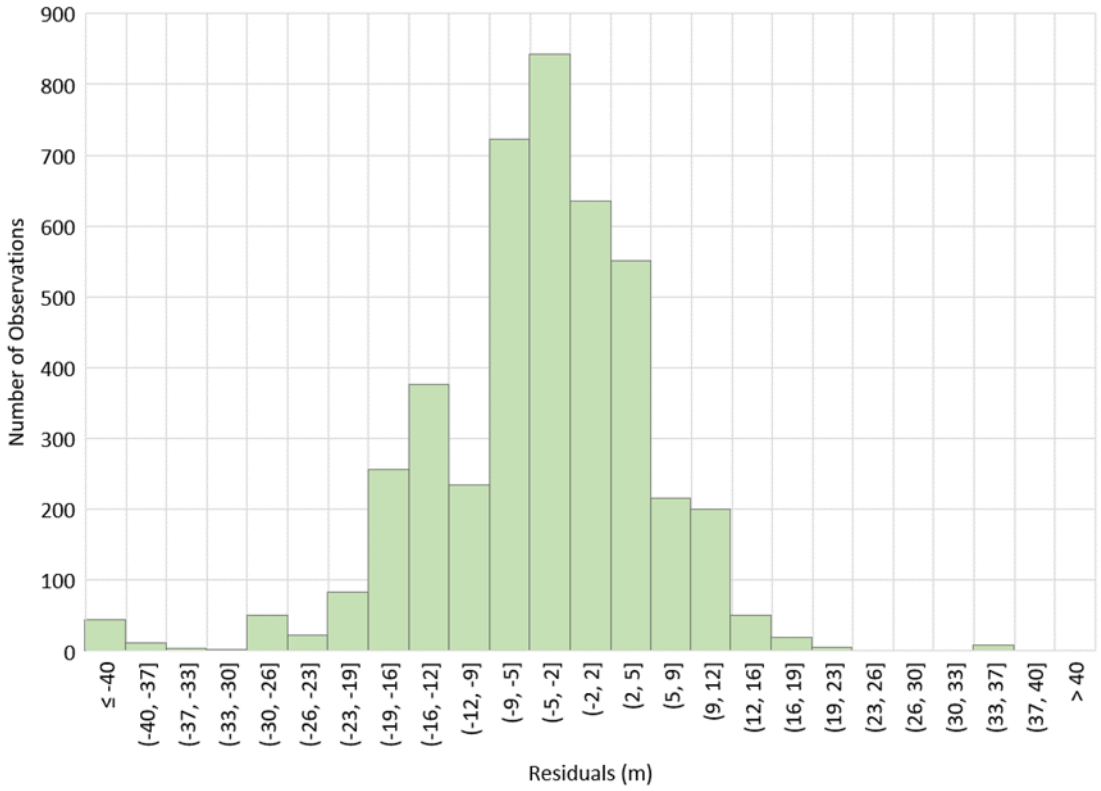
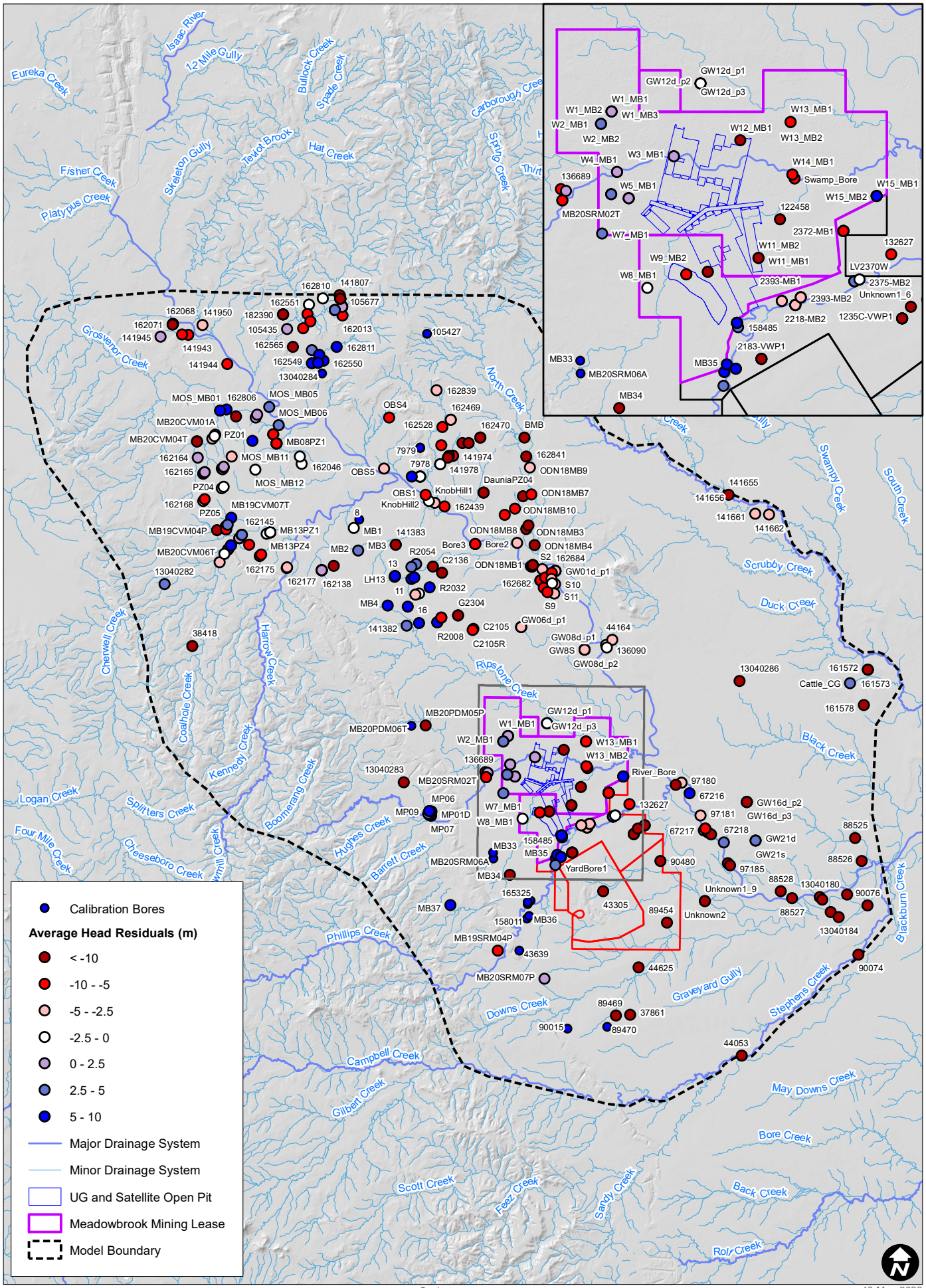


Figure 3-3 Calibration Residual Histogram Scattergram



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Calibration Avegrage Head Residuals

Figure 3-4

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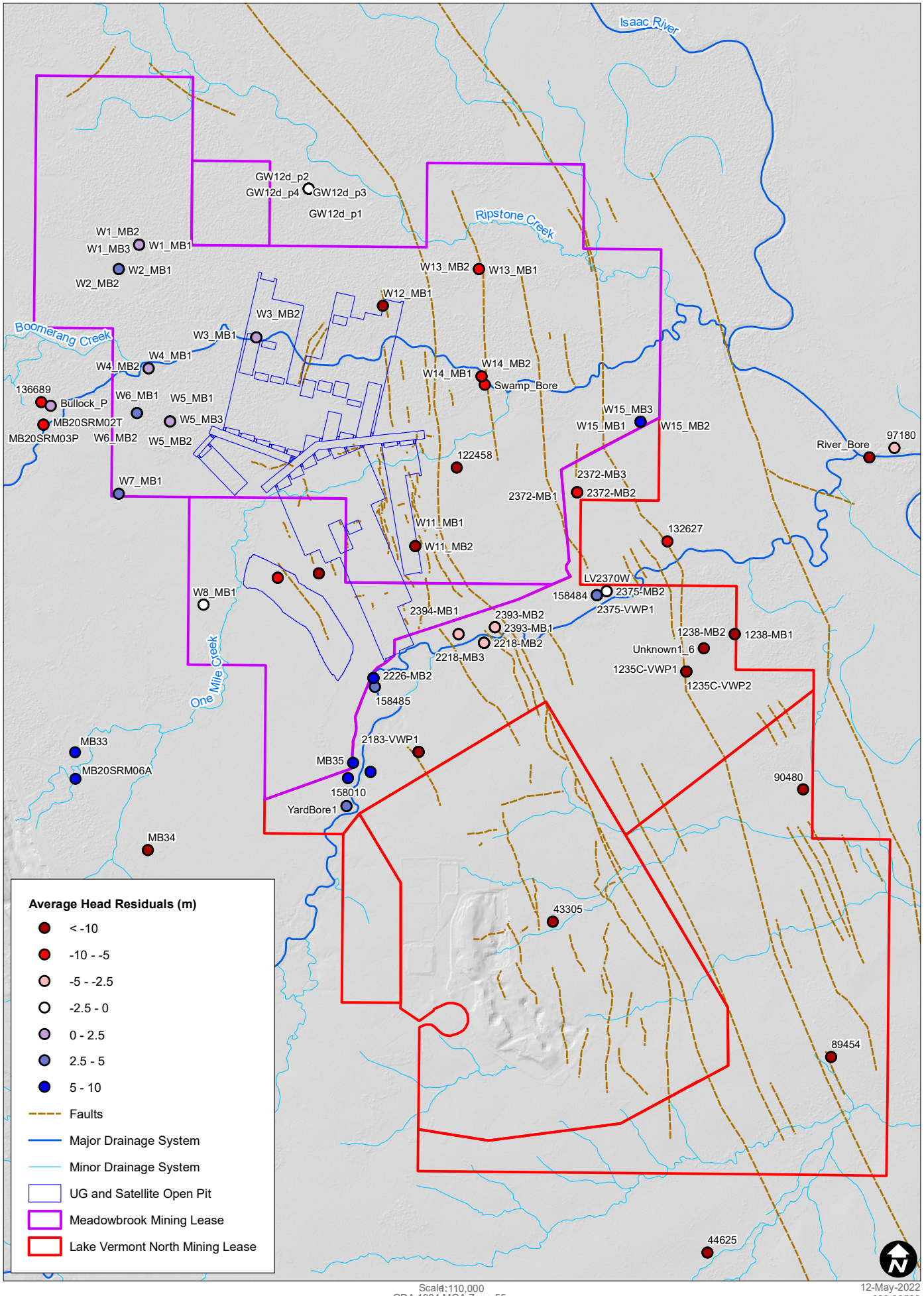

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Calibration Average Head Residuals and the Faults

Figure 3-5

The overall transient calibration statistics are presented in **Table 3-2**. As shown in the table 95% (4127/4342) of the calibration targets are within ±20 m of the observed measurements. This provides an indication of reasonable fit for the large regional dataset; however, further discussion on the fit between modelled and observed trends is included in **Section 3.2**.

Table 3-3 shows the average calibration residual and absolute average residual per each model layer. The residual is the difference between the measured and the modelled water level at each bore. A negative residual represents an over estimation of water levels, while a positive residual represents an underestimate. **Table 3-3** shows an overall overestimation of water levels in the model layers across the model domain. The table shows Layer 10 (Fort Cooper coal seams) has the highest average and absolute average residual. The table also shows overall the simulated groundwater levels are closer to the observed groundwater levels in the model layers representing the Moranbah Coal Measures (Layers 12 to 18).

Table 3-4 shows the average calibration residual and absolute average residual per each site within the model domain. As indicated in the table, there is an average overestimation of 7.4 m in the Meadowbrook and LVN bores. The table shows the Saraji bores have the highest average absolute residuals.

Table 3-2 Calibration Statistics

Statistic	Value
Sum of Squares (m2)	651579.9
Mean of Squares (m)	156.9
Square Root of Mean of Squares (RMS) (m)	12.5
Scaled Root Mean Square (SRMS) (%)	5.4 %
Root Mean Fraction Square (RMFS) (%)*	15.9 %
Scaled Root Mean Fraction Square (SRMFS) (%) **	12.6 %
Sum of Residuals (m)	34116.1
Mean Residual (m)	8.2
Scaled Mean Residual (%)	3.5 %
Coefficient of Determination (tend to unity)	1.3
Targets within ±2m	893
Targets within ±5m	2036
Targets within ±20m	4137

* RMFS represents the sample standard deviation of the differences between predicted values and observed values as a fraction of the observed value expressed as a percentage.

** SRMFS scales the RMFS error by the ratio of the mean observed value to the range of the observed values expressed as a percentage

Table 3-3 Average Residual by Model Layer

Model Layer	Formation	Unit	Average Residual (m)	Average Absolute Residual (m)	Number of Observation Targets	Number of bores
1	Alluvium, colluvium, Tertiary basalt	Surface cover	-3.1	7.0	1198	114
2	Tertiary sediments, Tertiary basalt	Tertiary and minor Triassic Clematis, weathered Permian, Tertiary basalt	-1.7	8.5	362	64
3	Rewan Group	Triassic	-6.8	9.3	325	23
4	Rangal Coal Measures	Leichhardt overburden	-8.1	9.5	274	10
5		Leichhardt seam	-5.2	7.7	319	35
6		Interburden	-7.1	9.6	199	10
7		Vermont seam	-9.0	10.7	435	34
8		Vermont underburden	-5.2	5.7	119	11
9	Fort Cooper Coal Measures	Fort Cooper overburden	-3.0	4.4	124	24
10		Fort Cooper seams (combined)	-20.2	20.5	171	13
11		Fort Cooper underburden	0.8	17.2	11	3
12	Moranbah Cooper Coal Measures	Q Seam	-3.3	4.5	66	12
13		Interburden	0.7	4.7	409	12
14		P Seam	-6.2	10.7	13	13
15		Interburden	-3.5	4.2	85	3
16		H Seam	6.3	6.3	61	2
17		Interburden	-6.8	8.4	53	9
18		D Seam	-2.2	4.7	98	7
19		Interburden	-5.0	5.6	20	3

Table 3-4 Average Residual by Site

Site	Average Residual (m)	Average Absolute Residual (m)	Number of Observation Targets	Number of Bores
Meadowbrook and LVN and Lake Vermont North	-8.7	9.8	593	74
Saraji	5.1	16.1	24	24
CVM	-0.2	4.3	928	43
Olive Downs	-4.2	6.8	443	38
Winchester South	-2.2	4.9	622	20
Moorvale South	-7.2	11.0	24	16
Other monitoring bores	-6.0	6.9	1708	187

3.2 Calibration Fit

This section provides discussion on the modelled to observed groundwater level trends (calibration hydrographs) for key bores across the site. Calibration hydrographs for the full calibration dataset is presented as **Appendix B**.

3.2.1 Alluvium

Figure 3-6 presents the fit between simulated and observed water levels in alluvium bores W3_MB1 and W4_MB1.

The hydrograph for bore W3_MB1 located within the Meadowbrook Underground Mine footprint shows the model underpredicts groundwater levels at this bore by 8 m. The bottom elevation of Layer 1 (i.e. base of alluvium layer) is 155.5 mAHD indicating the modelled alluvium cells are saturated at W3_MB1 which is consistent with observations.

In bore W4_MB1, 1.7km to the north of Meadowbrook, modelled groundwater levels are within the alluvium layer (bottom elevation of Layer 1 is 166 mAHD). The hydrograph for W4_MB1 shows the model underpredict observed water levels at this bore by 6m.

As shown in the hydrographs in **Appendix B**, regionally there is a good match between the simulated and measured groundwater levels in alluvial bores such as Olive Downs S series, Winchester South ODN series and Caval Ridge. In bores downloaded from QLD Government dataset, the match between the simulated and measured water levels varies between 5 m over and under prediction.

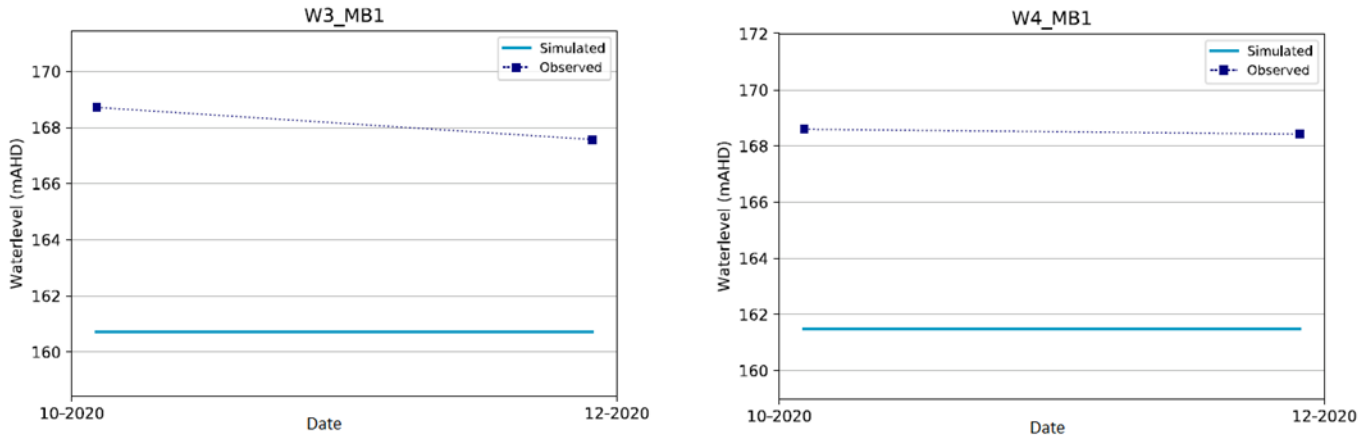


Figure 3-6 Calibration Fit - Alluvium Bores

3.2.2 Permian Coal Measures

The hydrographs for some of the Permian bores are shown in **Figure 3-7** and **Figure 3-7**. The hydrographs shown in **Figure 3-7** for bores 2372-MB3, 2375-MB2 (located in the east of the project site) and W1-MB3 (located in north-east of the project site) in the Vermont seam. The hydrographs indicate an overall overprediction of groundwater levels toward the east but a good match to the north of the proposed underground mine. The model overpredicts groundwater levels by 8m at bore 2372-MB3 and 12m at bore 2375-MB2.

The hydrographs shown in **Figure 3-8** for Leichhardt seam bores 2393-MB2, 2226-MB3, W1-MB2 and W11-MB2 located on different sides of the project area. 2393-MB2, 2226-MB3, W1-MB2 show a close fit between modelled and observed groundwater levels while the model overpredicts groundwater levels at W11_MB2 by approximately 10 m.

The hydrographs for the rest of the Meadowbrook and LVN monitoring bores in the Permian are shown in **Appendix B** of this report. As shown in the appendix, within and around the project area, the model overpredicts groundwater levels between 1 m to 15m when comparing to the observed groundwater levels in the bores monitoring the Rangal Coal Measures. There is a good match between simulated and observed groundwater levels to the west and north of the proposed underground mine. However, further to the east and south from the proposed underground mine (i.e. west of the Isaac Fault), the model shows more overprediction of the groundwater levels.

The objective of the transient-state calibration was to replicate, as closely as possible, observed groundwater hydrographs for the period 2008 to 2020. **Appendix B** shows that the model simulates the water level trends in most of the Meadowbrook and LVN bores but does not match the absolute water level elevations at all bores. The hydrographs highlight the challenge in simulating groundwater levels in the very complex groundwater system where it is generally not possible to replicate the local scale change in hydraulic properties from faults within the project area (JBT, 2021). The poor calibration at some the bores is likely due to the regional model not being able to capture the local complexities of the groundwater system. However, as shown in **Appendix B**, on a regional scale the model replicates the flow directions and water level fluctuations well. Across the entire model domain, the average head difference between simulated and observed water levels is less than 10 m in all the layers representing the Rangal Coal Measures. This average difference is considered a small variance in head for a regional-scale model.

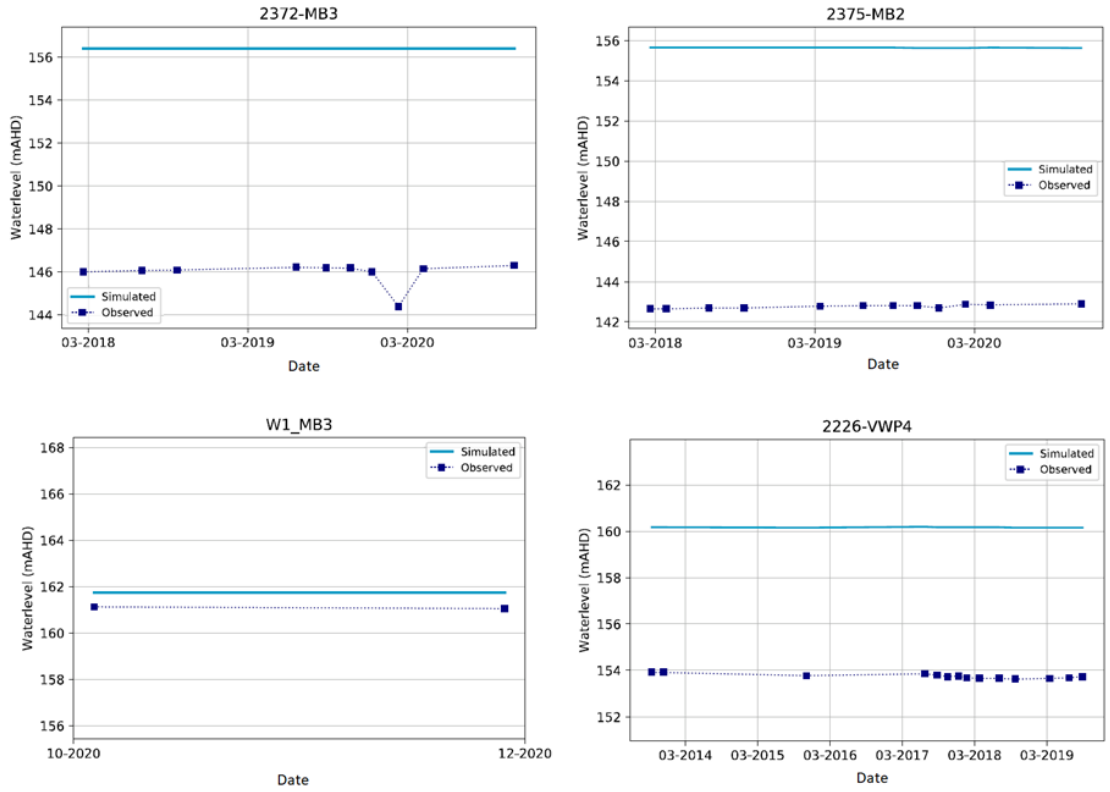


Figure 3-7 Calibration Fit - Permian, Vermont Seam Bores (2372-MB3, 2375-MB2, W1_MB3 and 2226-VWP4)

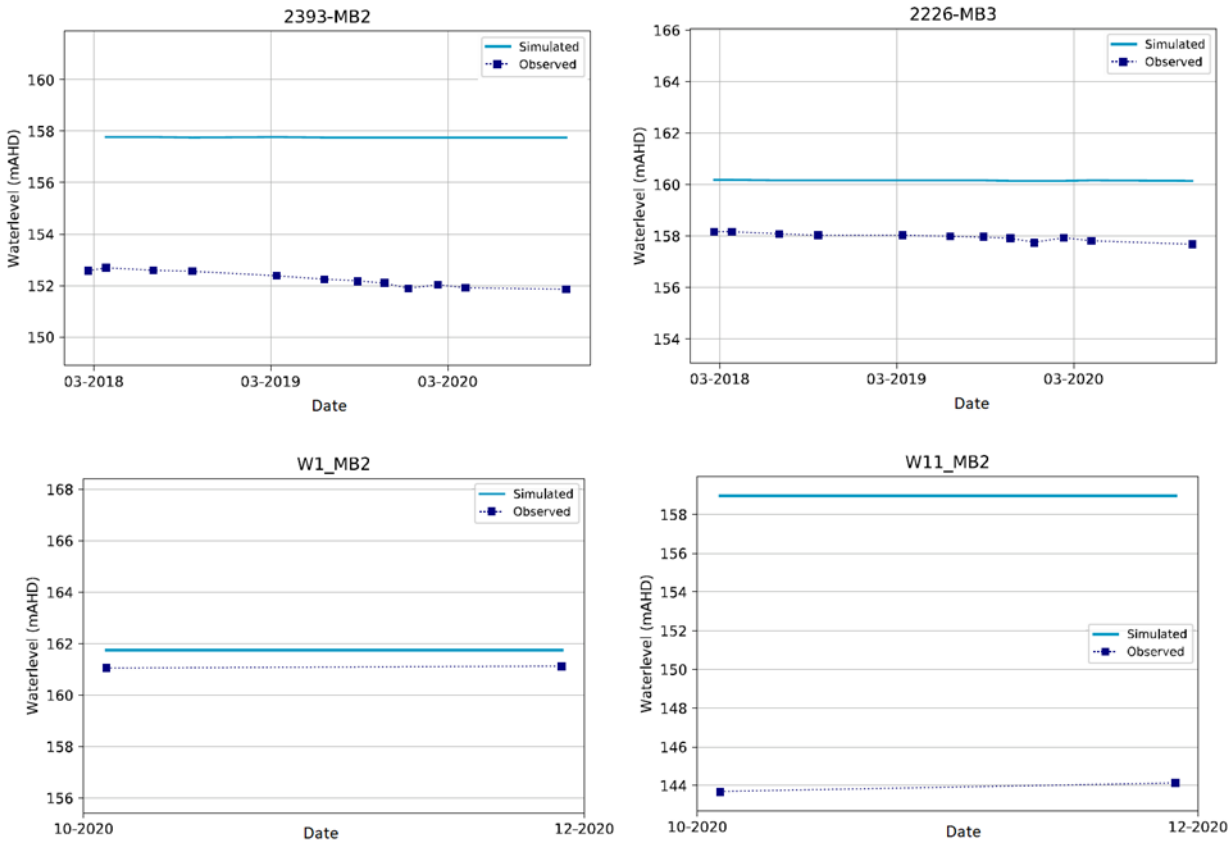


Figure 3-8 Calibration Fit - Permian, Leichardt Seam Bores (2393-MB2, 2226-MB3, W1-MB2 and W11-MB2)

3.2.3 Tertiary Sediments Bores

Figure 3-9 shows the hydrographs for Tertiary Sediments site monitoring bores 1238-MB1, LV2371W located to the east of the Project area. The hydrographs show that in bore 1238-MB1 the model overpredicts groundwater levels by 10m and for bore LV2371W underpredicts by 3m. As shown in hydrographs for bores W1-MB1 and W2-MB1 in the north-west (**Figure 3-9**), and also the hydrographs presented in Appendix B, the model replicated the observed water levels well within the Meadowbrook and LVN Project area.

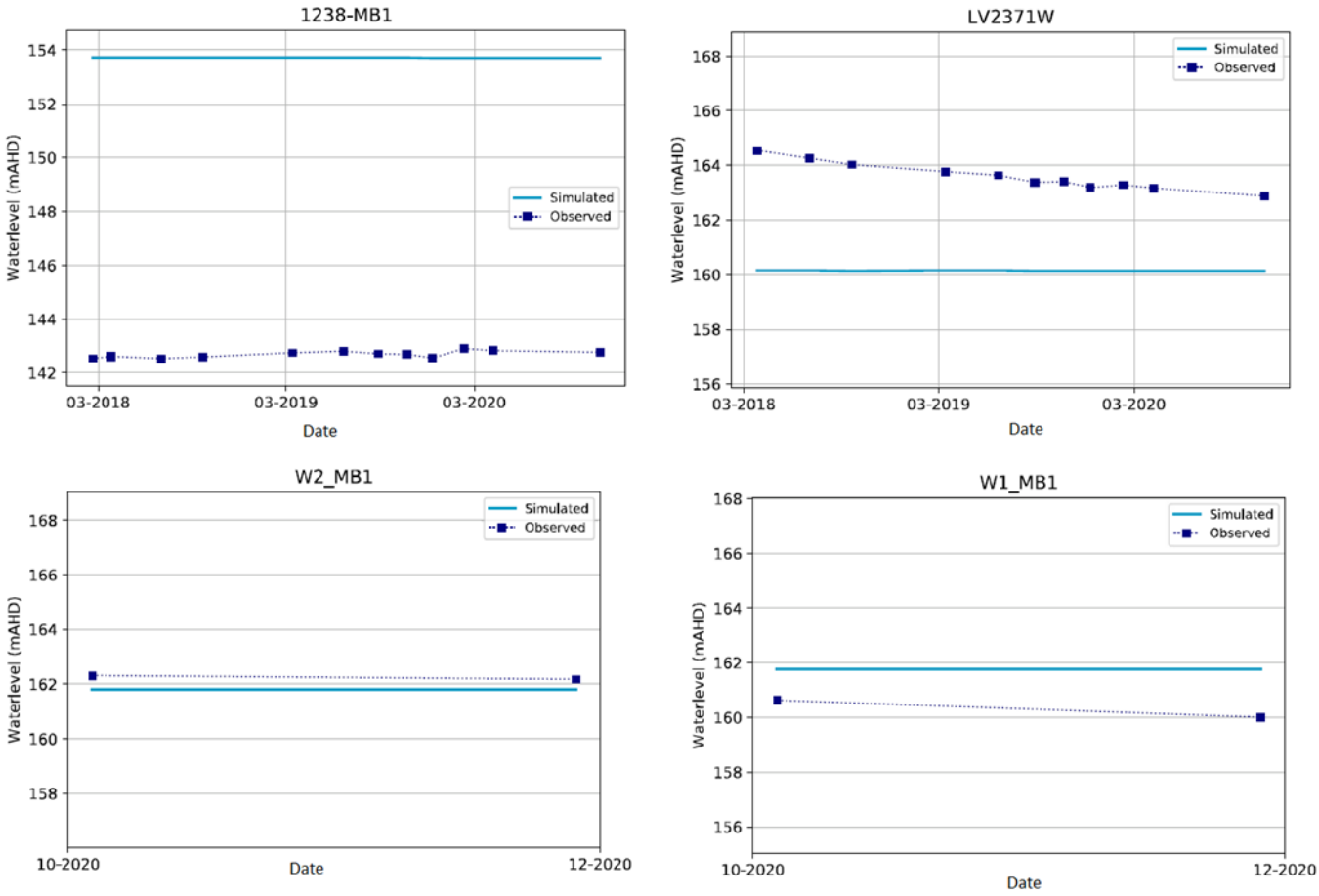


Figure 3-9 Calibration Fit - Tertiary Bores (1238-MB1, LV2371W, W2-MB1 and W1-MB1)

3.2.4 Rewan Group Bores

Figure 3-10 shows the hydrographs for monitoring bores 2226-MB2, 2394-MB2, W5-MB1 and W11-MB1 in the Rewan Group. The hydrographs for 2226-MB2, 2394-MB2, W5-MB1 show that the model provides a reasonable fit between modelled and observed groundwater levels (± 5 m). The model underpredicts the groundwater levels by 15 m at W11-MB1 close to Isaac Fault.

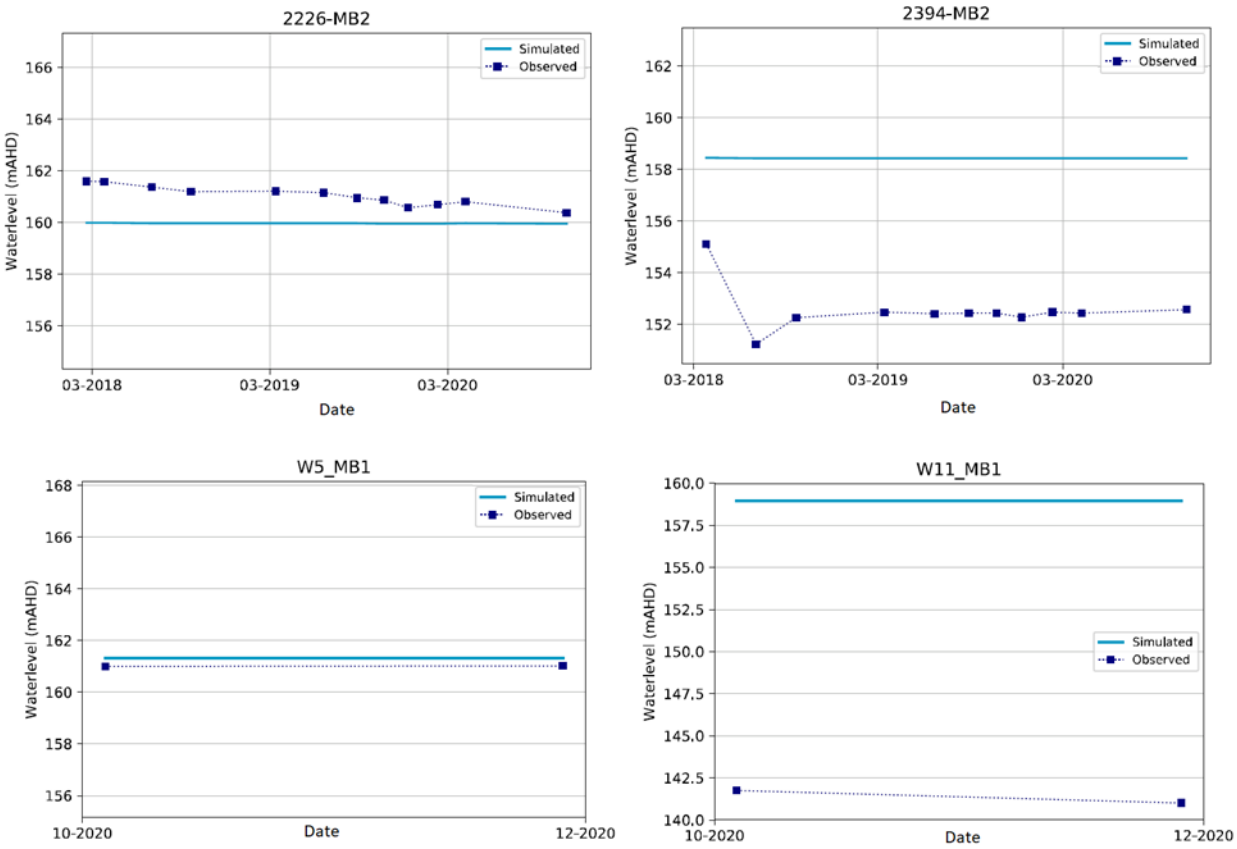


Figure 3-10 Calibration Fit - Rewan Group Bores (2226-MB2, 2394-MB2, W5_MB1 and W11_MB1)

3.2.5 Vertical Head Differences

Groundwater flow systems are strongly influenced by heterogeneity and anisotropy of hydraulic conductivity. Vertical head difference can form due to the low vertical hydraulic conductivity or high anisotropy (Kx/Kz).

Generally, the bores across the site show vertical head differences less than 8 m. As discussed in Section 4 of the Impact Assessment Report (JBT Consulting, 2022), there is a downward gradient from the Tertiary sediments to the underlying sediments. **Figure 3-11** shows the observed against simulated water levels for 2226 VWP1 to VWP1 located to the south of the proposed longwall panels. **Figure 3-12** shows the observed against simulated water levels for W14 MB1 to MB2 located to the east of the proposed longwall panels. A downward gradient can be seen in observed groundwater levels in the VWPs for 2226 and W14 where the shallower sensors showing the higher groundwater level.

Figure 3-11 and **Figure 3-12** show that while the model was able to match the observed groundwater levels at the bore by ±6, it was not able to capture the vertical head difference at 2226 and W14. The model weak match in vertical head difference can also be seen is other bores at site with observed vertical head difference. The model inability to match the vertical head difference is likely due to structural simplifications in the model, including the vertical discretization of the model and resulting 'coarse' representation of features and hydraulic gradients at scales of a model cell (or layer) or less.

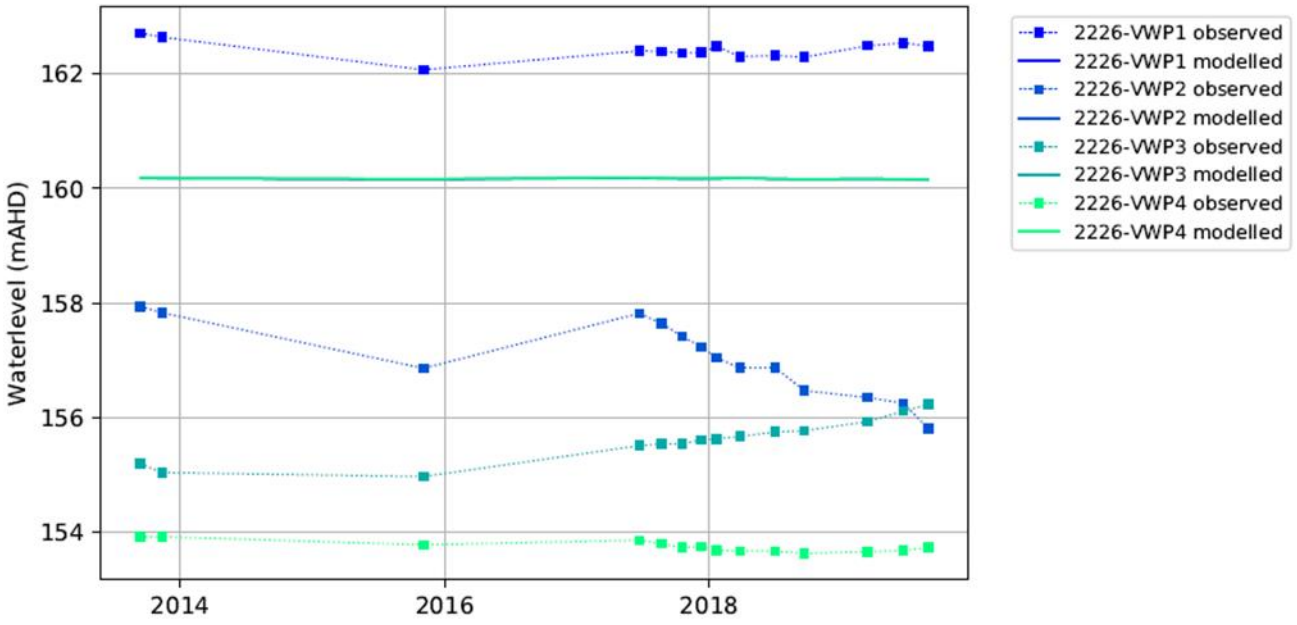


Figure 3-11 Calibration Fit - 2226

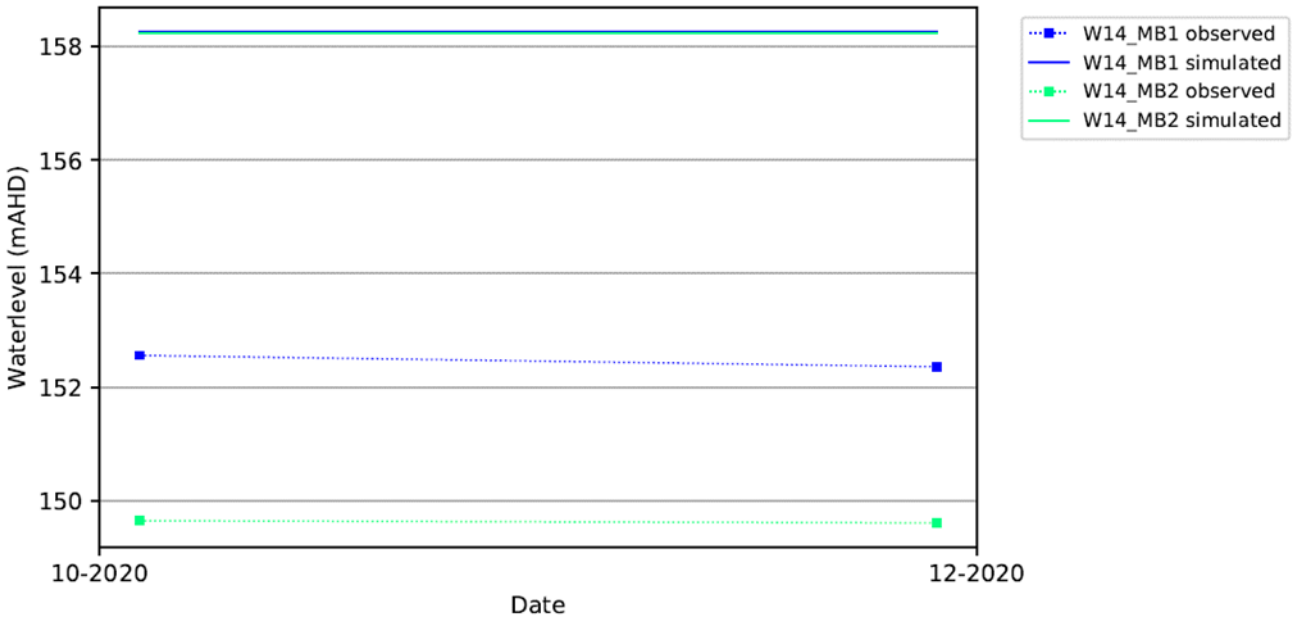


Figure 3-12 Calibration Fit – W14

3.3 Water Balance

3.3.1 Steady State Calibration

The water balance for the steady state model calibration is shown in **Table 3-5**. The water balance for the steady-state model indicates that recharge was the largest net inflow contributor to the model (3.47 ML/d). Regional groundwater inflow and outflow are 0.12 and 0.93 ML/day respectively, indicating that groundwater leaves the model domain through this boundary.

A net outflow of 0.62 ML/d from the model occurs due to baseflow seepage to the Isaac River (i.e. surface water and groundwater interaction in the Isaac River). Other factors that contribute to outflow from the groundwater system are evapotranspiration (0.54 ML/d outflow) and baseflow seepage to minor drainage systems (1.50 ML/d outflow). The mass balance error for the steady state calibration is 0.00%, within the error threshold recommended by the Australian Groundwater Modelling Guidelines (Barnett et al., 2012), and indicating the model is stable and achieves an accurate numerical solution.

Table 3-5 Steady-State Model Water Balance

Component	Inflow (ML/day)	Percent of Total Inflow (%)	Outflow (ML/day)	Percent of Total Inflow (%)
Recharge (RCH)	3.47	45.5	0.00	0.0
ET (from GW) (EVT)	0.00	0.0	0.54	7.1
SW-GW Interaction Isaac River (RIV)	4.03	52.9	4.65	61.0
SW-GW Interaction other rivers (RIV)*	0.00	0.0	1.50	19.7
Regional GW Flow (GHB)	0.12	1.6	0.93	12.2
Mines (DRN)	0.00	0.0	0.00	0.0
Storage	-	-	-	-
Total	7.62	100.0	7.62	100.0

* The other tributaries or drainage lines in the model are set as drains to the groundwater system and do not result in any recharge.

3.3.2 Transient Calibration

The water balance for the transient simulation averaged over the duration of the calibration period is presented in **Table 3-6**. The mass balance error, that is the difference between calculated model inflows and outflows at the completion of the transient calibration, was 0.00%, which indicates the model is stable and achieves an accurate numerical solution. The water balance for the transient model indicates that recharge was the largest net inflow contributor to the model, contributing an average of 3.67 ML/d to the groundwater system. **Table 3-6** shows 0.55 ML/day is lost to evapotranspiration in areas where the water table is within 2 m of the land surface. In total 6.68 ML/day is discharged via surface drainages.

A net flow loss of approximately 0.90 ML/day occurs to the Isaac River indicating a gaining condition in the river. The Isaac River net flow presented in **Table 3-9** is for the entire length of the river within the model domain. However, the model outputs showed that to the south of the project area the net flow to the Isaac River is negative indicating Isaac River is a losing system in some part of the model domain. This is consistent with the previous conceptual studies, where Isaac River was discussed to largely be a losing system around RN13040180 located near the Willunga Mine (HydroSimulations, 2018).

Other rivers contribute to a loss of approximately 1.50 ML/day from the groundwater system with no inflow component. The fluxes from the GHB component (inflow and outflow) are 0.16 and 0.94 ML/day respectively. The GHB net flow is less than 1 % of the total flow in water balance for all the scenarios indicating that a small volume of water leaves the model domain through this boundary and therefore, this boundary condition does not have an overly large influence on the model predictions.

6.30 ML/day is removed from the model by the Drain boundary condition that represents historical mining (1988-2020) in the model. The average simulated historical inflows for mines during the calibration period when the mine is active are:

- Lake Vermont – 0.61 ML/day
- CVM – 0.28 ML/day
- Poitrel – 0.96 ML/day
- Daunia – 0.46 ML/day
- Peak Downs – 0.65 ML/day
- Millennium – 1.84 ML/day
- Moorvale – 0.1 ML/day
- Grosvenor – 0.4 ML/day
- Saraji – 1.0 ML/day

The simulated historical inflow rates are consistent with the previous studies in the region (e.g. Olive Downs South and Willunga EIS 2018, Grosvenor EIS 2016, Saraji EIS 2012).

Table 3-6 Transient Model Water Balance

Component	Inflow (ML/day)	Percent of Total Inflow (%)	Outflow (ML/day)	Percent of Total Inflow (%)
Recharge (RCH)	3.67	21.5	0.00	0.0
ET (from GW) (EVT)	0.00	0.0	0.55	3.2
SW-GW Interaction Isaac River (RIV)	4.28	25.0	5.18	30.3
SW-GW Interaction other rivers (RIV)*	0.00	0.0	1.50	8.8
Regional GW Flow (GHB)	0.16	0.9	0.94	5.5
Mines (DRN)	0.00	0.0	6.30	36.6
Storage	9.01	52.6	2.65	15.6
Total	17.12	100.0	17.12	100.0

* The other tributaries or drainage lines in the model are set as drains to the groundwater system and do not result in any recharge.

3.4 Calibrated Hydraulic Parameters

Table 3-7 provides a summary of the calibrated values for horizontal and vertical hydraulic conductivity used in the model. The hydraulic parameter zones in all the model layers are presented in **Appendix C.**

Table 3-7 Calibrated Hydraulic Parameters

Model Layer	Formation	Unit	Horizontal Hydraulic Conductivity (m/day)	Anisotropy Kz/Kx
1	Alluvium	Surface cover	12.0	0.2
1	Regolith	Surface cover	1.0	0.1
1	Weathered Permian	Surface cover	0.6	0.06
1	Duaringa Formation	Surface cover	0.5	0.05
1 & 2	Tertiary Basalt	Tertiary basalt	3.2	0.1
2	Regolith	Surface cover	1.0	0.03
3	Rewan Group	Triassic	2.0×10^{-3}	0.07
4	Rangal Coal Measures	Leichhardt overburden	1.0×10^{-5} to 1.0×10^{-2}	0.09
5		Leichhardt seam	1.0×10^{-4} to 9.0×10^{-2}	0.002
6		Interburden	5.0×10^{-5} to 1.0×10^{-2}	0.01
7		Vermont seam	1.0×10^{-4} to 1.0×10^{-2}	0.03
8		Vermont underburden	5.0×10^{-5} to 1.0×10^{-3}	0.002
9	Fort Cooper Coal Measures	Fort Cooper overburden	5.0×10^{-5} to 1.0×10^{-3}	0.1
10		Fort Cooper seam	$1.0 \times 10^{-4}$to 7.0×10^{-3}	0.1
11		Fort Cooper underburden	5.0×10^{-5} to 6.0×10^{-3}	0.1
12	Moranbah Coal Measures	Q Seam	$1.0 \times 10^{-4}$to 8.0×10^{-2}	0.1
13		Interburden	$5.0 \times 10^{-5}$to 7.0×10^{-3}	0.2
14		P Seam	$1.0 \times 10^{-4}$to 1.0×10^{-1}	0.05
15		Interburden	5.0×10^{-5} to 9.0×10^{-3}	0.04
16		H Seam	$1.0 \times 10^{-4}$to 9.0×10^{-2}	0.007
17		Interburden	$5.0 \times 10^{-5}$to 6.0×10^{-3}	0.006
18		D Seam	$1.0 \times 10^{-4}$to 9.0×10^{-2}	0.03
19		Interburden	1.0×10^{-5} to 1.0×10^{-4}	0.05
	Faults		5.0×10^{-5} to 1.0×10^{-2}	0.1
-	Spoil		3.0×10^{-1}	0.2

The hydraulic conductivity of the Permian interburden material in the Rangal Coal Measures, Fort Cooper Coal Measures and Moranbah Coal Measures reduces with depth to reflect field observations. As the decrease of Kx within the interburden rock units is driven by an increase in overburden pressure, the relationship between Kx and depth is different from that of coal seams. The hydraulic conductivity for the interburden material is capped at a minimum of 5.0 x 10-5 m/day and the hydraulic conductivity of the coal seams is capped at a minimum of 1.0 x 10-4 m/day.

The hydraulic conductivity of the interburden/overburden and coal seam layers decreases with depth according to Equations 2, 3 (exponential) and Equation 4 (power). Equations 2 and 3 were adopted from the Winchester South Project groundwater model. Equations 4 was suggested by AGE (2016) for the interburden units within the Moranbah Coal Measures based upon recent studies in the area:

Coal: $HC = HC0 \times e^{(-0.015 \times depth)}$ (Eq. 2)

Interburden (RCM and FCCM): $HC = HC0 \times e^{(-0.018 \times depth)}$ (Eq. 3)

Interburden (MCM): $HC = HC0 \times -2.1depth$ (Eq. 4)

Where:

- HC is horizontal hydraulic conductivity at specific depth;
- HC0 is horizontal hydraulic conductivity at depth of 0 m (intercept of the curve);
- depth is depth of the floor of the layer (thickness of the cover material);
- slope is a term representing slope of the formula (steepness of the curve).

HC_0 was estimated in the calibration. It varies for the coal seams and for the interburden and overburden units in the model. The slope function and coefficient of the coal and interburden depth dependence equations were not calibrated. The Kx vs depth relationships for the interburden/overburden are presented in **Figure 3-13**, while the calibrated relationships for coal units are presented in **Figure 3-14**. The figures present the Meadowbrook and Lake Vermont North site data (JBT, 2021), Olive Downs site data (2018), Winchester South site data and Coffey (2014) Bowen Basin data. The AGE (2016) and the CVM hydraulic conductivity measurements in the Moranbah Coal Measures are also shown in the figures.

Figure 3-14 presents the coal horizontal conductivity against depth relationship for the Leichhardt and the Vermont Seams. It was not possible to represent every individual coal seam in the Fort Cooper Coal Measures in the model. Therefore, a "combined thickness" totalling the individual seam thicknesses for each relevant seam has been simulated. **Figure 3-14** also shows the lower and upper range for coal horizontal conductivity against depth relationship in Moranbah Coal Measures estimated during the calibration.

Figure 3-15 illustrates the range in horizontal hydraulic conductivity obtained from site testing and publicly available data. The data are focused on the key site units, being the alluvium, regolith, Rewan Group and the coal and interburden sequences of the Rangal and Moranbah Coal Measures. The data are compared to the horizontal hydraulic conductivity values used in the model. A depth dependence equation for the coal measures was used in the numerical groundwater model and therefore the calibrated hydraulic conductivity values vary across the model domain. For layers with depth dependence equation such as Rangal Coal Measures, the average values are presented in **Figure 3-15**. As shown in **Figure 3-15**, the modelled horizontal hydraulic conductivity values are all within the range of field data.

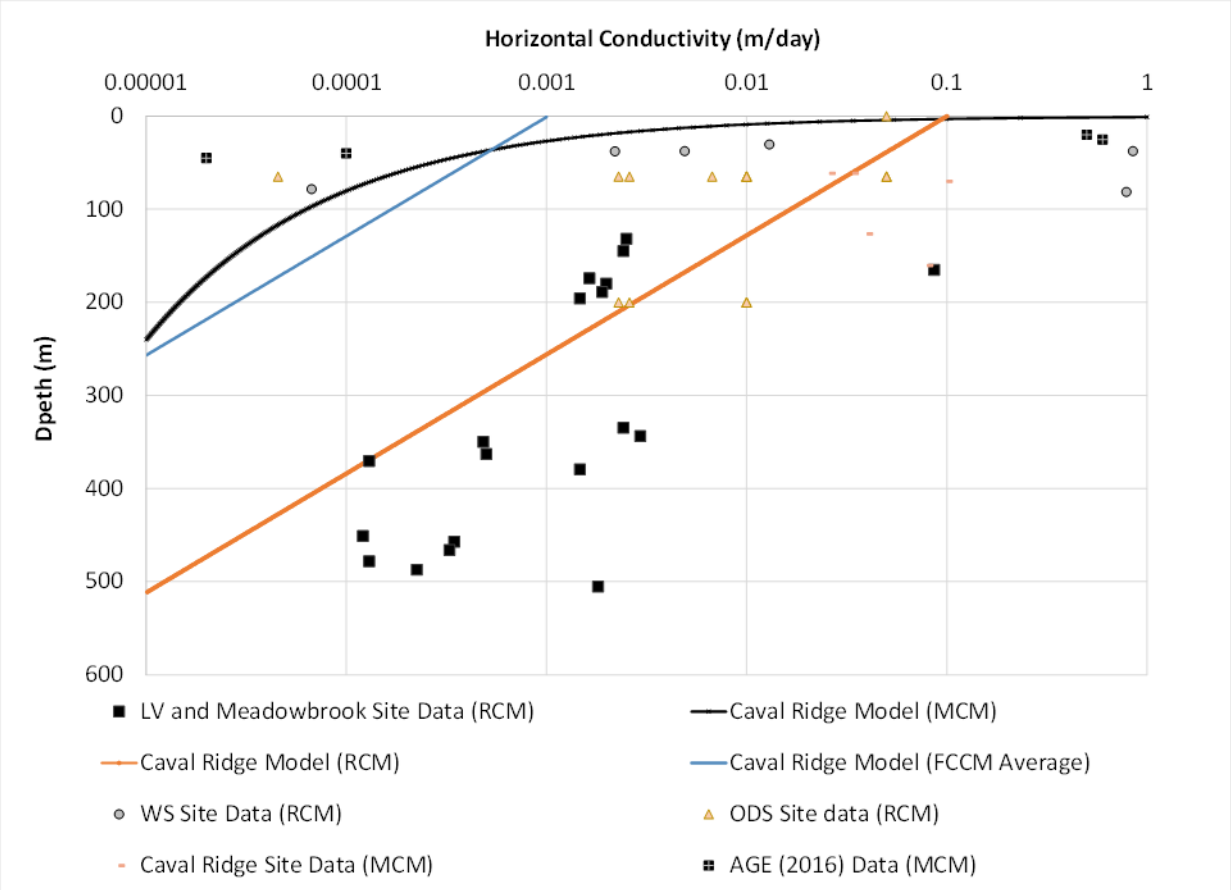


Figure 3-13 Horizontal Hydraulic Conductivity vs Depth – Interburden/Overburden

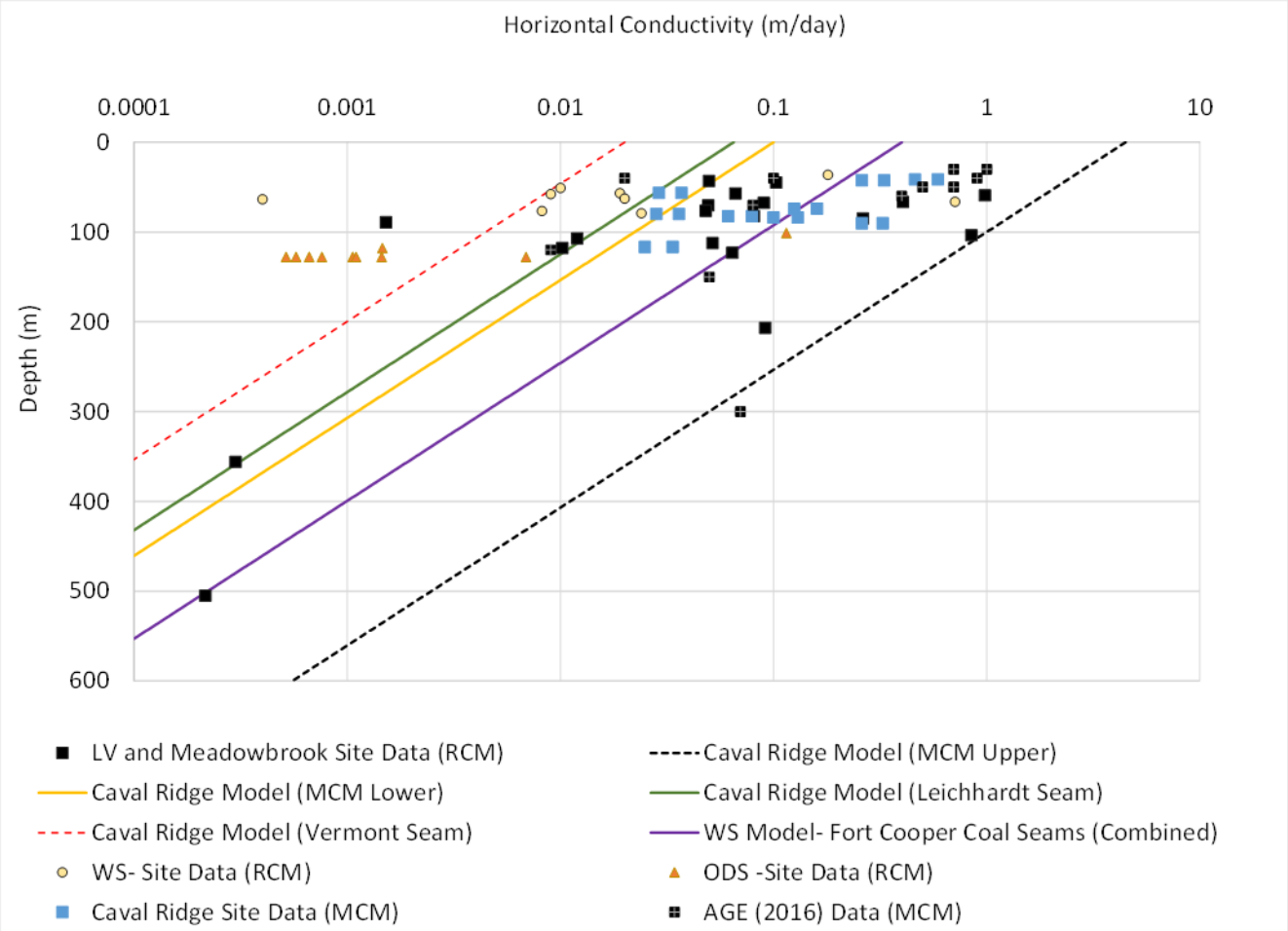


Figure 3-14 Horizontal Hydraulic Conductivity vs Depth – Coal

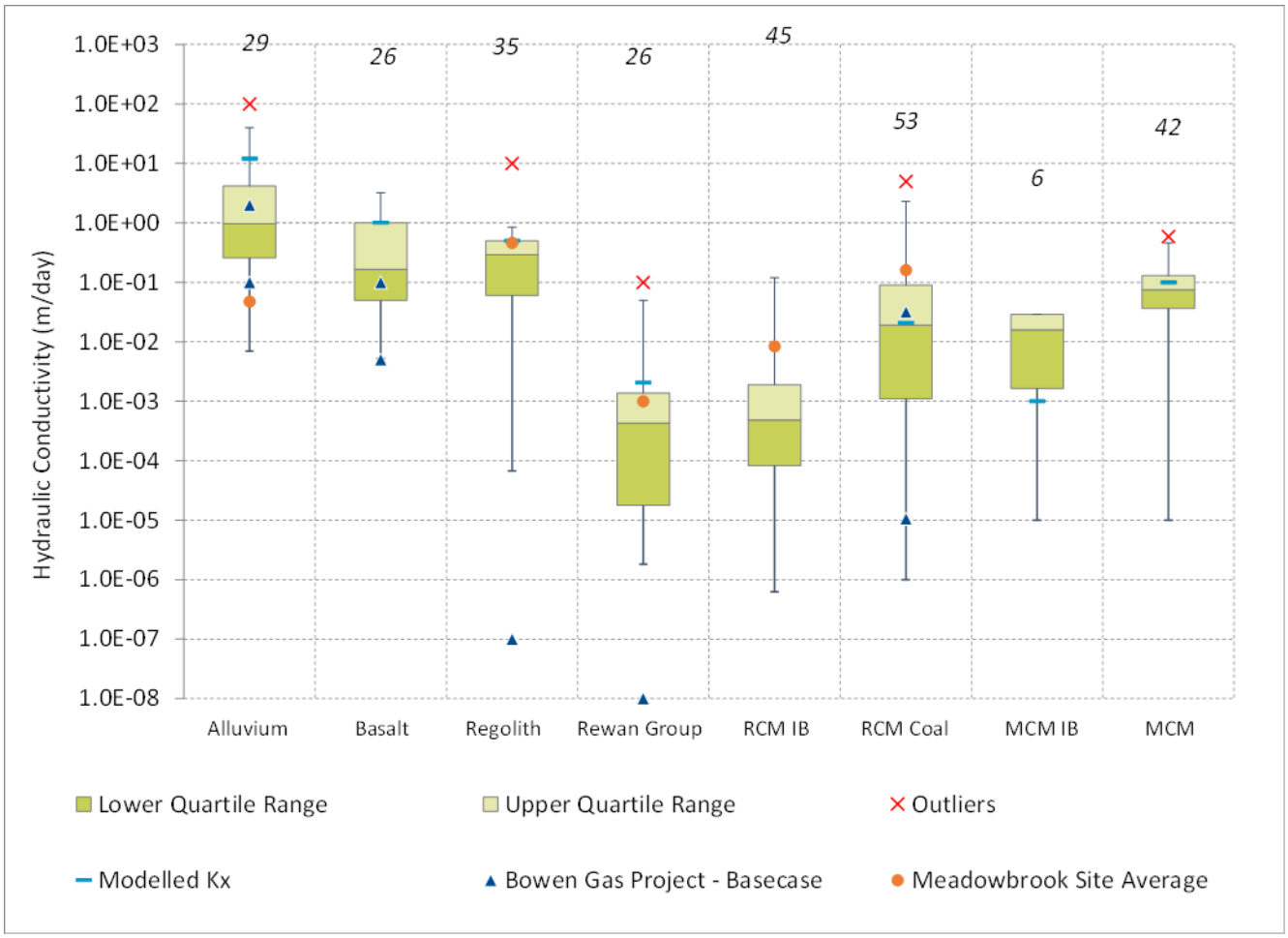


Figure 3-15 Hydraulic Parameters Estimates vs Calibrated Hydraulic Parameters

3.5 Calibrated Storage Properties

Table 3-8 summarises the calibrated values for specific storage and specific yield.

Table 3-8 Calibrated Storage Parameters

Model Layer	Formation	Unit	Specific Yield Sy (%)	Specific Storage Ss (m^{-1})
1	Alluvium	Surface cover	2.5	1.0×10^{-6}
1	Regolith	Surface cover	2.1	3.0×10^{-6}
1	Weathered Permian	Surface cover	0.2	1.0×10^{-7}
1	Duaringa Formation	Surface cover	1.9	4.0×10^{-7}
1 & 2	Tertiary Basalt	Tertiary basalt	1.8	6.0×10^{-7}
2	Regolith	Surface cover	2.0	2.0×10^{-7}
3	Rewan Group	Triassic	0.9	5.0×10^{-7}
4	Rangal Coal Measures	Leichhardt overburden	0.1	3.0×10^{-6}

Model Layer	Formation	Unit	Specific Yield Sy (%)	Specific Storage Ss (m^{-1})
5		Leichhardt Seam	0.1	5.0×10^{-7}
6		Interburden	0.1	5.0×10^{-7}
7		Vermont Seam	0.2	5.0×10^{-7}
8		Vermont underburden	0.4	1.0×10^{-6}
9	Fort Cooper Coal Measures	Fort Cooper overburden	0.1	5.0×10^{-7}
10		Fort Cooper seam	0.3	2.0×10^{-6}
11		Fort Cooper underburden	0.4	2.0×10^{-6}
12	Moranbah Coal Measures	Q Seam	0.1	2.0×10^{-6}
13		Interburden	0.2	3.0×10^{-6}
14		P Seam	0.2	2.0×10^{-6}
15		Interburden	0.2	4.0×10^{-6}
16		H Seam	0.2	6.0×10^{-7}
17		Interburden	0.2	1.0×10^{-6}
18		D Seam	0.3	7.0×10^{-7}
19		Interburden	0.9	5.0×10^{-7}
	Fault		0.2 to 0.8	7.0×10^{-7} to 2.0×10^{-6}
	Spoil		5	1.0×10^{-5}

3.6 Calibrated Recharge

Table 3-9 compares the calibrated recharge rates for each geological unit in the model against the recharge rates estimated for the site using the chloride mass balance (CMB) method (JBT, 2021). The CMB calculations were based on available water quality results (chloride concentrations) collected from the monitoring bores at Meadowbrook and Lake Vermont North monitoring bores. The CMB calculation assumed average annual rainfall of 580.0 millimetres (mm). The calculations also assumed a mean annual rainfall chloride flux of 4.7 milligrams per litre (mg/L). No site data is available for the Duaringa Formation or Alluvium. Outliers were excluded from the calculations and were identified as readings more than four standard deviations above the mean (USEPA, 2009).

As per the conceptual model, higher recharge occurs through the alluvium and lower recharge in regolith and Permian outcrops. Increased recharge through the alluvium of the Isaac River channel has been used to simulate the potential for the Isaac River to provide rapid recharge to the alluvial groundwater system during rainfall events. For comparison, other nearby projects have used modelled recharge as a default value across the domain, with Lake Vermont simulating recharge equivalent of 2% mean annual rainfall, and Isaac Plains simulating 0.5% to alluvium and 0.25% elsewhere. These values indicate overall rainfall recharge to the groundwater system is limited.

The calibrated recharge rates presented in **Table 3-9** have been adopted into the predictive model.

Table 3-9 Calibrated Rainfall Recharge

Model Geology Zone	(mm/year)	% Annual Rainfall	CMB Estimated (mm/year)
Isaac River Channel Alluvium	3	0.52	-
Isaac River Flood Plain Alluvium	1.3	0.23	-
Other Alluvium	1.3	0.23	-
Duaringa Formation	0.1	0.01	-
Tertiary basalts	1.7	0.3	-
Weathered Permian	0.1	0.01	0.85
Regolith	0.1	0.01	1.07-3.17

4 Predictive Modelling

4.1 Timing and Mining

Transient predictive modelling was used to simulate the proposed mining at the Project as well as mining at other approved and foreseeable mines within the model domain. As discussed in **Section 1**, The mining at the project includes the proposed Meadowbrook underground longwall panels plus the Meadowbrook open cut which is a relatively small open cut located in the western subcrop area of the mine lease. The open cut is planned to commence operations towards the end of mine life for the underground operation, producing coal for approximately 10 Years. The simulated predictive mine progression for the Project is presented **Figure 4-1**.

The predictive part of the model comprises annual stress periods starting from January 2021 until January 2056, followed by a 5 yearly stress period from January 2056 until January 2060. Mining cells progress annually consistent with stress period duration. The predictive model stress period setup is detailed in **Table 4-1**, alongside simulated mine-timings.

Transient predictive models were developed for model scenarios:

- Base Case - all approved and foreseeable mining in region and at Lake Vermont Mine.
- Cumulative – all approved and foreseeable mining in region and at Lake Vermont Mine, plus the proposed Meadowbrook underground and the satellite pit.
- Null Run – no mining within region from January 2008 (end of transient warmup).

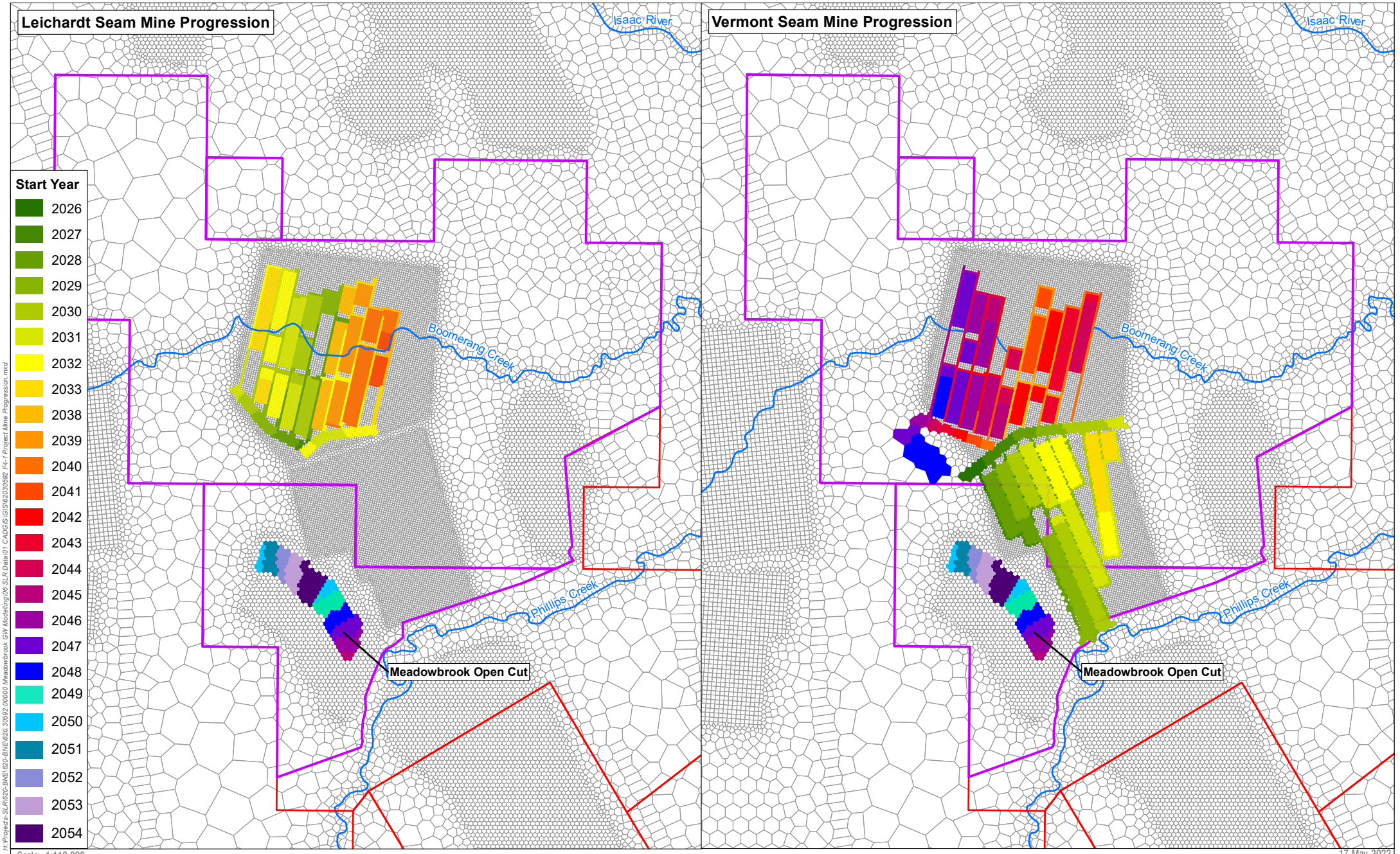
Timings of active drain cells at the Project were based on annual mine progression stage plans. The drain cells were projected down to the base of the lowermost target coal seam (i.e. the Vermont seam). As discussed in **Section 2.4.5**, the MODFLOW Time Varying Materials (TVM) package was used to assign spoil properties to the cells simulating open cut mining and goaf and fracture properties to cells representing underground mining.

Table 4-1 details simulated mine timings for the Project and surrounding mines used in the predictive model. All mines included in the model were simulated using the MODFLOW Drain (DRN) package. A nominally high drain conductance of 100 square metres per day (m^2/day) was applied to drain cells to simulate rapid removal of water from the system.

Table 4-1 Predictive Model Stress Period Setup and Mining

Interval	Stress Period	Date (from)	Date (to)	WS and MVS (OC)	Meadowbrook (UG)	ODS (OC)	CVM (OC)	Peak Downs (OC)	Saraji (OC)	Saraji East (UG)	Grosvenor (UG)	LVN (OC)	Eagle Downs (UG)	Poitrel (OC)	Daunia (OC)
Annually	55	30/12/2020	30/12/2021			x	x	x	x		x	x		x	x
Annually	56	30/12/2021	30/12/2022			x	x	x	x		x	x		x	x
Annually	57	30/12/2022	30/12/2023			x	x	x	x	x	x	x		x	x
Annually	58	30/12/2023	29/12/2024	x		x	x	x	x	x	x	x		x	x
Annually	59	29/12/2024	30/12/2025	x		x	x	x	x	x	x	x		x	x
Annually	60	30/12/2025	30/12/2026	x	x	x	x	x	x	x	x	x		x	x
Annually	61	30/12/2026	30/12/2027	x	x	x	x	x	x	x	x	x		x	x
Annually	62	30/12/2027	29/12/2028	x	x	x	x	x	x	x	x	x	x	x	x
Annually	63	29/12/2028	30/12/2029	x	x	x	x	x	x	x	x	x	x	x	x
Annually	64	30/12/2029	30/12/2030	x	x	x	x	x	x	x	x	x	x	x	x
Annually	65	30/12/2030	30/12/2031	x	x	x	x	x	x	x	x	x	x	x	x
Annually	66	30/12/2031	29/12/2032	x	x	x	x	x	x	x	x	x	x	x	x
Annually	67	29/12/2032	30/12/2033	x	x	x	x	x	x	x	x	x	x	x	x
Annually	68	30/12/2033	30/12/2034	x	x	x	x	x	x	x	x	x	x	x	x
Annually	69	30/12/2034	30/12/2035	x	x	x	x	x	x	x	x	x	x	x	x
Annually	70	30/12/2035	29/12/2036	x	x	x	x	x	x	x	x	x	x	x	x
Annually	71	29/12/2036	30/12/2037	x	x	x	x	x	x	x	x	x	x	x	x
Annually	72	30/12/2037	30/12/2038	x	x	x	x	x	x	x	x	x	x	x	x
Annually	73	30/12/2038	30/12/2039	x	x	x	x	x	x	x	x	x	x	x	x

Interval	Stress Period	Date (from)	Date (to)	WS and MVS (OC)	Meadowbrook (UG)	ODS (OC)	CVM (OC)	Peak Downs (OC)	Saraji (OC)	Saraji East (UG)	Grosvenor (UG)	LVN (OC)	Eagle Downs (UG)	Poitrel (OC)	Daunia (OC)
Annually	74	30/12/2039	29/12/2040	x	x	x	x	x	x	x	x	x	x	x	x
Annually	75	29/12/2040	30/12/2041	x	x	x	x	x	x	x	x	x	x	x	x
Annually	76	30/12/2041	30/12/2042	x	x	x	x	x	x	x	x	x	x	x	x
Annually	77	30/12/2042	30/12/2043	x	x	x	x	x	x	x	x	x	x	x	x
Annually	78	30/12/2043	29/12/2044	x	x	x	x	x	x	x	x	x	x	x	x
Annually	79	29/12/2044	30/12/2045	x	x	x	x	x	x	x	x	x	x	x	x
Annually	80	30/12/2045	30/12/2046	x	x	x	x	x	x	x	x	x	x	x	x
Annually	81	30/12/2046	30/12/2047	x	x	x	x	x	x	x	x	x	x	x	x
Annually	82	30/12/2047	29/12/2048	x	x	x	x	x	x	x	x	x	x	x	x
Annually	83	29/12/2048	30/12/2049	x	x	x	x	x	x	x	x	x	x	x	x
Annually	84	30/12/2049	30/12/2050	x	x	x	x	x	x	x	x	x	x	x	x
Annually	85	30/12/2050	30/12/2051	x	x	x	x	x	x	x	x	x	x	x	x
Annually	86	30/12/2051	29/12/2052	x	x	x	x	x	x	x	x	x	x	x	x
Annually	87	29/12/2052	30/12/2053	x	x	x	x	x	x	x	x	x	x	x	x
Annually	88	30/12/2053	30/12/2054	x	x	x	x	x	x	x	x	x	x	x	x
Annually	89	31/12/2054	31/12/2055	x	x	x	x	x	x	x	x	x	x	x	x
5 Yearly	90	31/12/2055	30/12/2060			x			x	x	x		x	x	



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Major Drainage System
Meadowbrook Mining Lease
Model Grid

Project Mine Progression

FIGURE 4-1

4.2 Water Balance

Table 4-2 to **Table 4-4** summarise average flow rates for water transfer into and out of the predictive model (January 2021 until December 2060) for the predictive scenarios. The mass balance errors for all three scenarios were 0.0% indicating that the model was stable and achieved an accurate numerical solution. All the scenarios maintained mass balance errors below 1% for all time steps throughout the simulations. The low error achieved indicates that the predictive model is stable, and the solution achieved is accurate (Barnett et al., 2012).

The tables show that simulated recharge increased from 3.46 ML/d in the Null scenario to 6.68 ML/day in the Base Case scenario and 6.69 ML/day for the Cumulative scenario. The increase in recharge is due to the presence of open cut mining and enhanced recharge through the spoil to the groundwater system in the Base Case and Cumulative scenario.

Table 4-2 to **Table 4-4** show in all the three predictive scenarios, groundwater leaving the model through regional groundwater flow (GHB). The netflow out of the model decreased from an average of 0.78 ML/day in the Null scenario to 0.41 ML/day in the Base Case and Cumulative scenarios. The GHB netflow is less than 2% of the total flow in water balance for the Base Case and approved scenarios indicating the model boundary conditions have negligible influence on the model predictions.

Evapotranspiration for the predictive models is approximately 0.5 ML/day. The loss to evapotranspiration occurs where the water table is within 2 m of the land surface across the model domain, which is mainly along the saturated extent of Isaac River alluvium near alignment of the Isaac River.

Table 4-4 shows a negative river net flow (-1.95 ML/day) in the Null Run indicating flow from the groundwater system to rivers. However, **Table 4-2** and **Table 4-3** show that in the Cumulative and Base Case scenarios, the net river exchange flux (RIV) is positive (approximately 3 ML/day), which indicates that overall, the rivers (i.e., Isaac River) are losing water to the groundwater system. The difference in river net fluxes is likely due to the modelled influence from mining activities from 2021, resulting in lower groundwater levels and an increase in modelled leakage from the Isaac River to the groundwater system. **Table 4-3** shows that net river flux in the Base Case scenario is similar to the net river exchange flux in the Cumulative scenario indicating that the proposed mining activities at Meadowbrook Underground and the satellite pit do not impact the flow from Isaac River.

Groundwater outflow from the model mostly occurs via drain cells, used to simulate open cut and underground mining activity in the model. **Table 4-2** to **Table 4-4** show that the mining in the Meadowbrook and the satellite pit resulted in an increase in the average drain outflow 19.45 ML/day respectively, from 18.12 ML/day predicted for the Base Case scenario

Table 4-2 Average Simulated Water Balance over the Prediction Period- Cumulative

Component	Inflow (ML/d)	Percent of Total Inflow (%)	Outflow (ML/d)	Percent of Total Inflow (%)
Recharge (direct rainfall)	6.69	16.05	-	-
Evapotranspiration (ET)	-	-	0.42	1.01
SW/GW Interaction Isaac River (RIV)	7.51	18.03	3.27	7.85
SW/GW Interaction Other Rivers (RIV)*	0.00	0.00	1.23	2.95
Regional GW flow (GHB)	0.44	1.06	0.85	2.04
Drains (Mine inflows)	-	-	19.45	46.69
Storage	27.02	64.86	16.44	39.46
Total	41.66	100.00	41.66	100.00

* the other tributaries or drainage lines in the model are set as drains to the groundwater system and do not result in any recharge.

Table 4-3 Average Simulated Water Balance over the Prediction Period- Base Case

Component	Inflow (ML/d)	Percent of Total Inflow (%)	Outflow (ML/d)	Percent of Total Inflow (%)
Recharge (direct rainfall)	6.68	17.02	-	-
Evapotranspiration (ET)	-	-	0.42	1.07
SW/GW Interaction Isaac River (RIV)	7.51	19.14	3.27	8.36
SW/GW Interaction Other Rivers (RIV)*	0.00	0.00	1.25	3.16
Regional GW flow (GHB)	0.44	1.12	0.85	2.17
Drains (Mine inflows)	-	-	18.12	46.18
Storage	24.61	62.72	15.33	39.06
Total	39.24	100.00	37.47	100.00

* the other tributaries or drainage lines in the model are set as drains to the groundwater system and do not result in any recharge.

Table 4-4 Average Simulated Water Balance over the Prediction Period- Null Run

Component	Inflow (ML/d)	Percent of Total Inflow (%)	Outflow (ML/d)	Percent of Total Inflow (%)
Recharge (direct rainfall)	3.46	44.76	-	-
Evapotranspiration (ET)	-	-	0.53	6.83
SW/GW Interaction Isaac River (RIV)	4.10	52.95	4.65	60.07
SW/GW Interaction Other Rivers (RIV)*	0.00	0.03	1.40	18.07
Regional GW flow (GHB)	0.13	1.67	0.91	11.72
Drains (Mine inflows)	-	-	0.00	0.00
Storage	0.05	0.59	0.26	3.30
Total	7.74	100.00	7.74	100.00

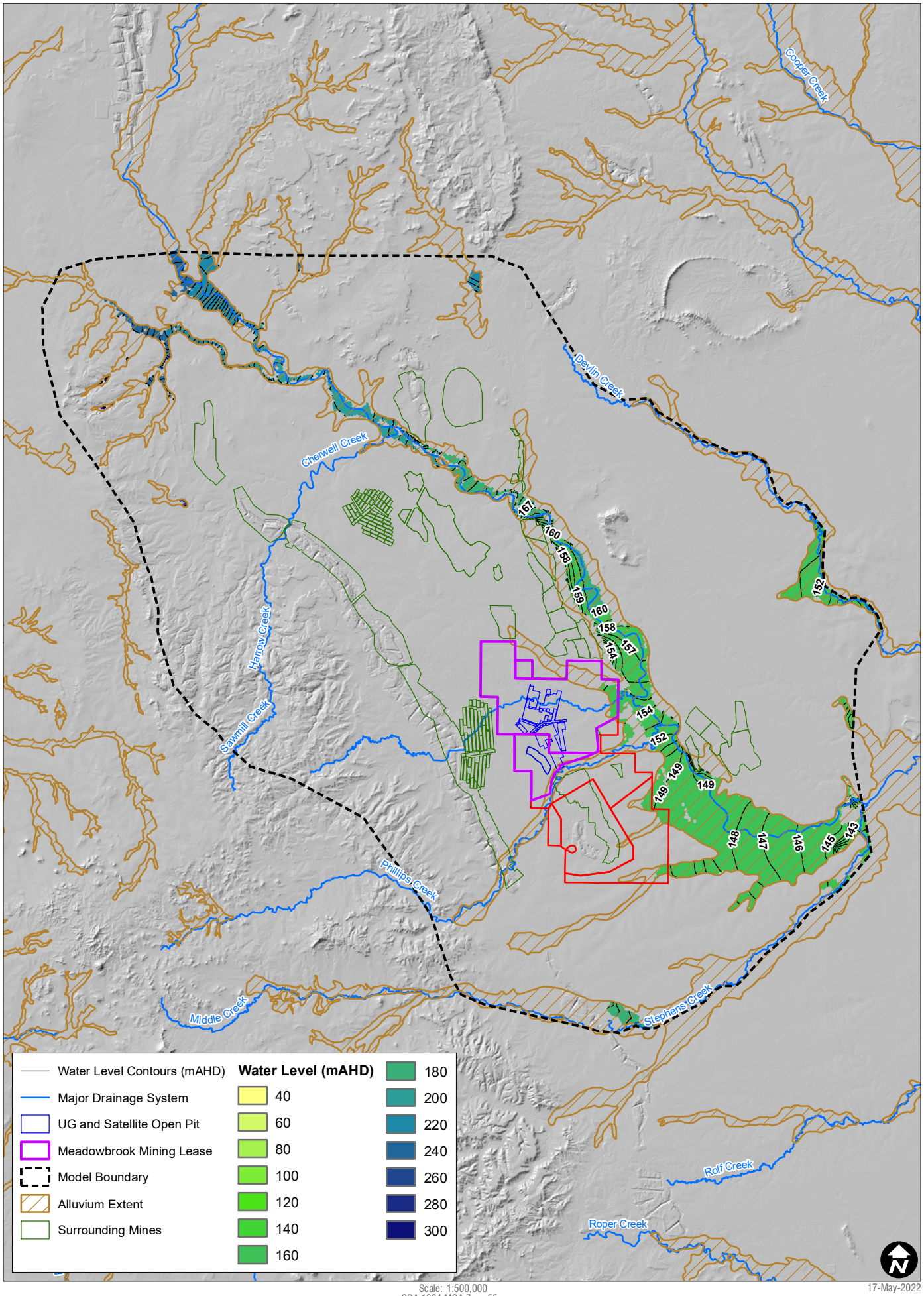
* the other tributaries or drainage lines in the model are set as drains to the groundwater system and do not result in any recharge.

4.3 Predicted Groundwater Levels

Predicted groundwater levels at the end of mining operations for the Base Case and Cumulative scenarios are provided in **Figure 4-2** to **Figure 4-7**. The gaps in the water level grids represent unsaturated areas (i.e. where the simulated water level elevation is below the base of cell).

Minimal changes to alluvial groundwater levels are predicted between the Base Case and Cumulative mining scenarios (**Figure 4-2**and **Figure 4-5**). **Figure 4-3** and **Figure 4-6** show predicted groundwater levels in the regolith at the end of mining for the two scenarios. Depressurization of the regolith caused by the proposed mining at the Project is evident by the larger desaturated zone within the Meadowbrook mine lease for the Cumulative mining scenario (**Figure 4-6**), relative to the Base Case scenario (**Figure 4-3**).

Figure 4-4 and **Figure 4-7** show the predicted water levels at the base of the Rangal coal measures (Layer 9) at the end of mining for the Base Case and Cumulative mining scenarios. This unit has been chosen to represent water levels in the Permian Coal Measures due to its regional extent. A regional south-easterly hydraulic gradient can be observed, reflecting the downstream flow gradient of the Isaac River. Zones of depressurisation at the Project and surrounding mines are shown to cause localised interruptions to the regional flow gradient. Discussion on groundwater drawdown within the Permian Coal Measures is included in **Section 4.4**.



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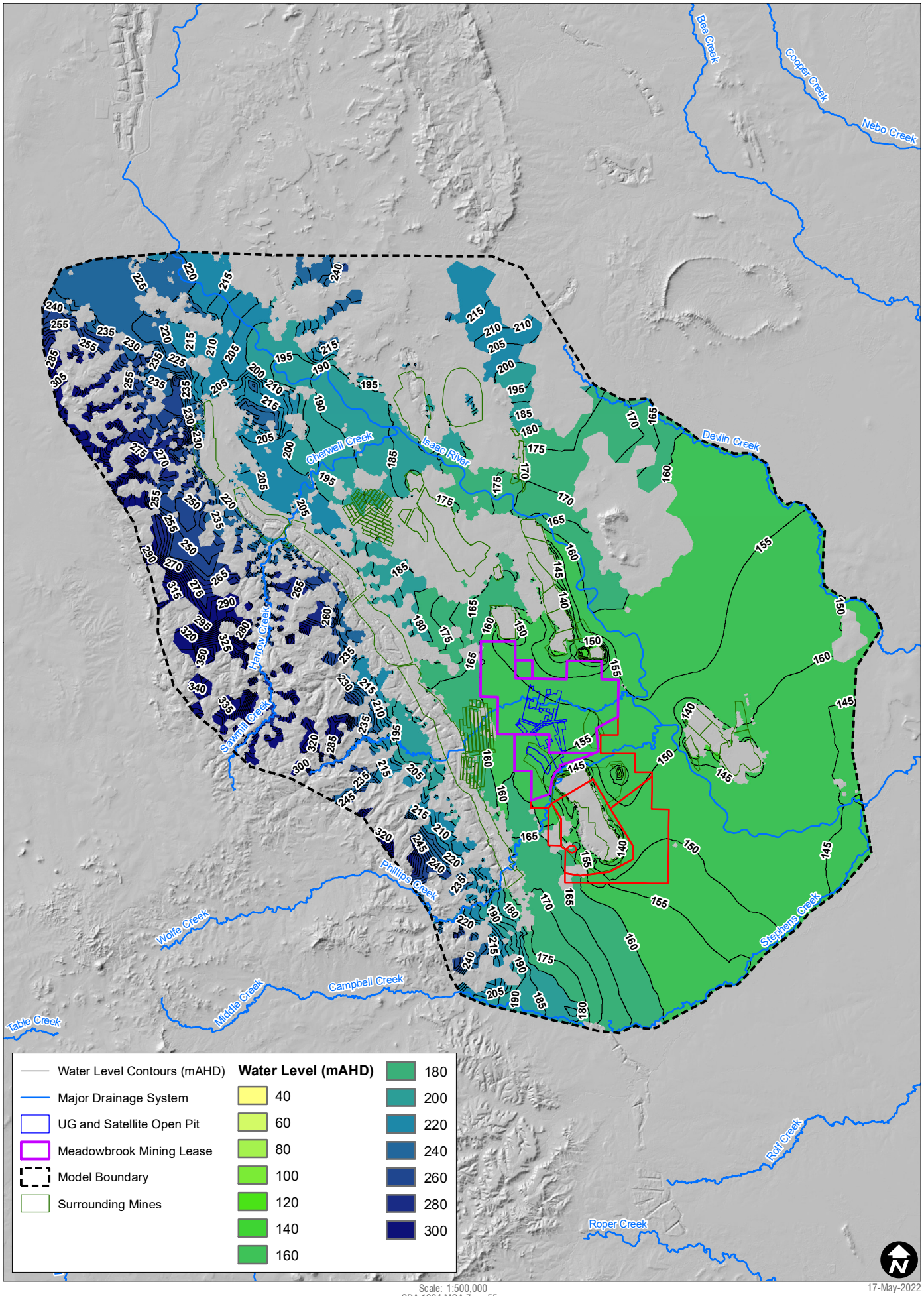
Predicted Water Level within Quaternary Alluvium (Layer 1) at End of Mining – Base Case

FIGURE 4-2



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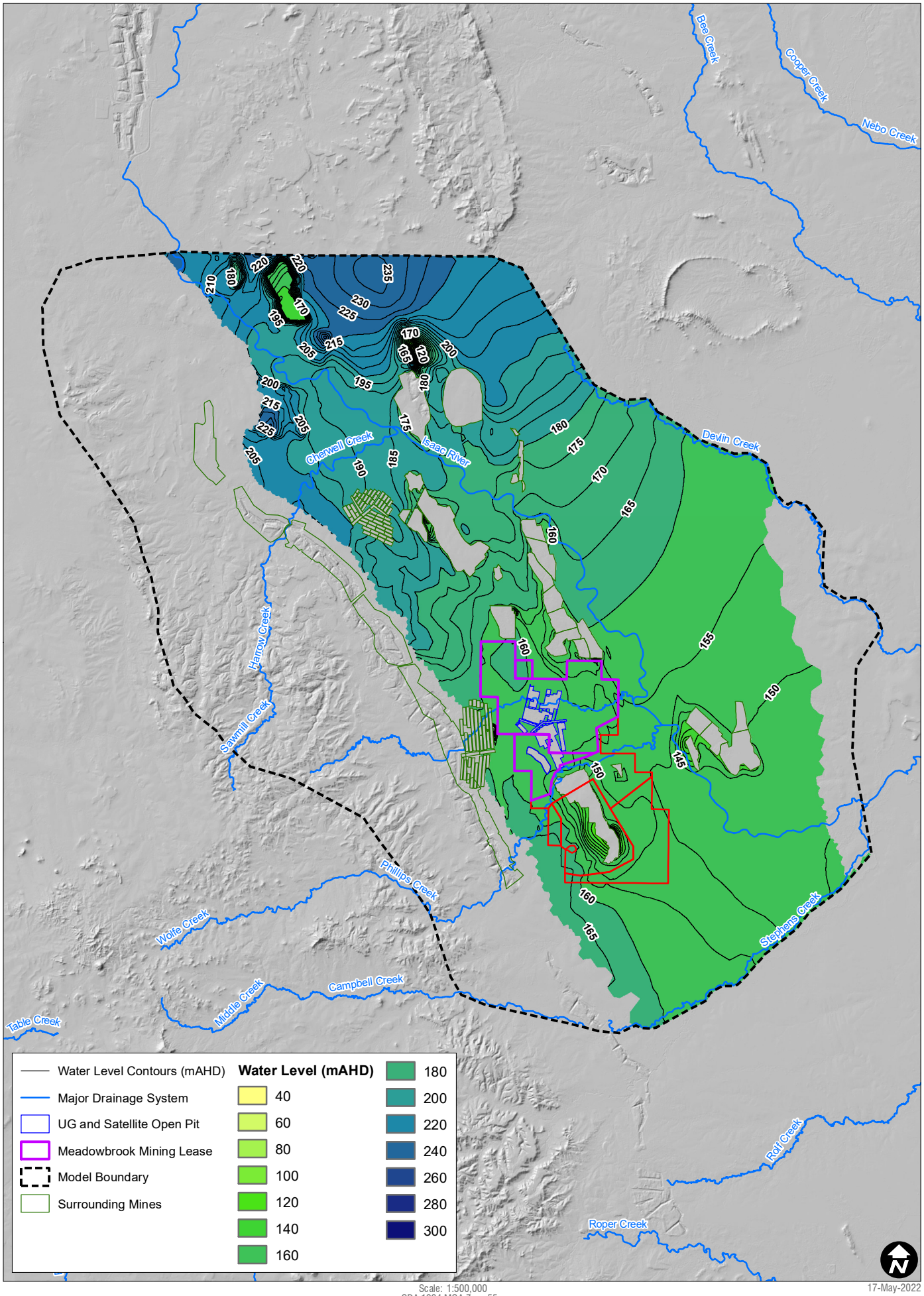
Predicted Water Level within Regolith (Layer 2) at End of Mining – Base Case

FIGURE 4-3



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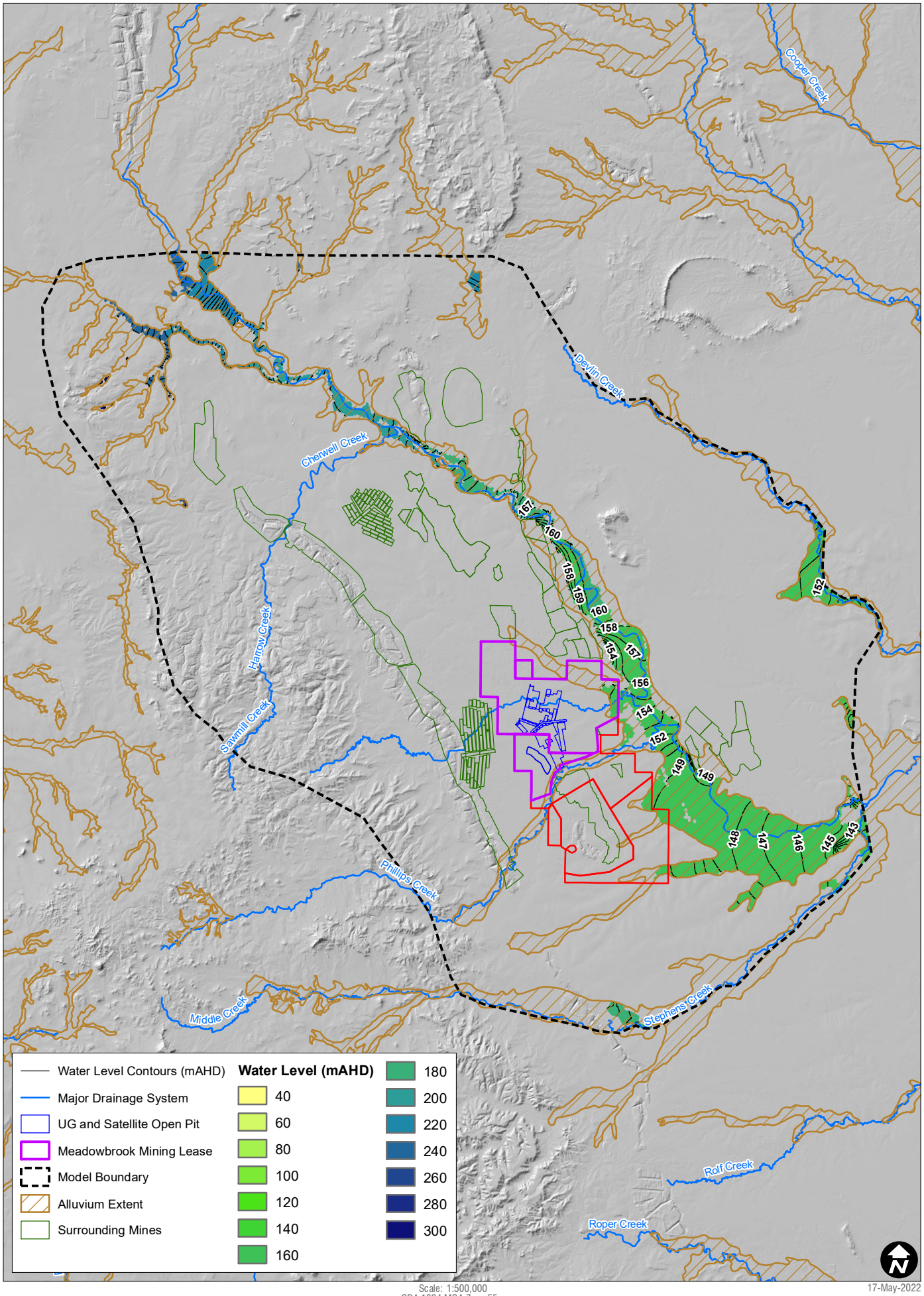
Predicted Water Level within Permian Coal Measures (Layer 9) at End of Mining – Base Case

FIGURE 4-4



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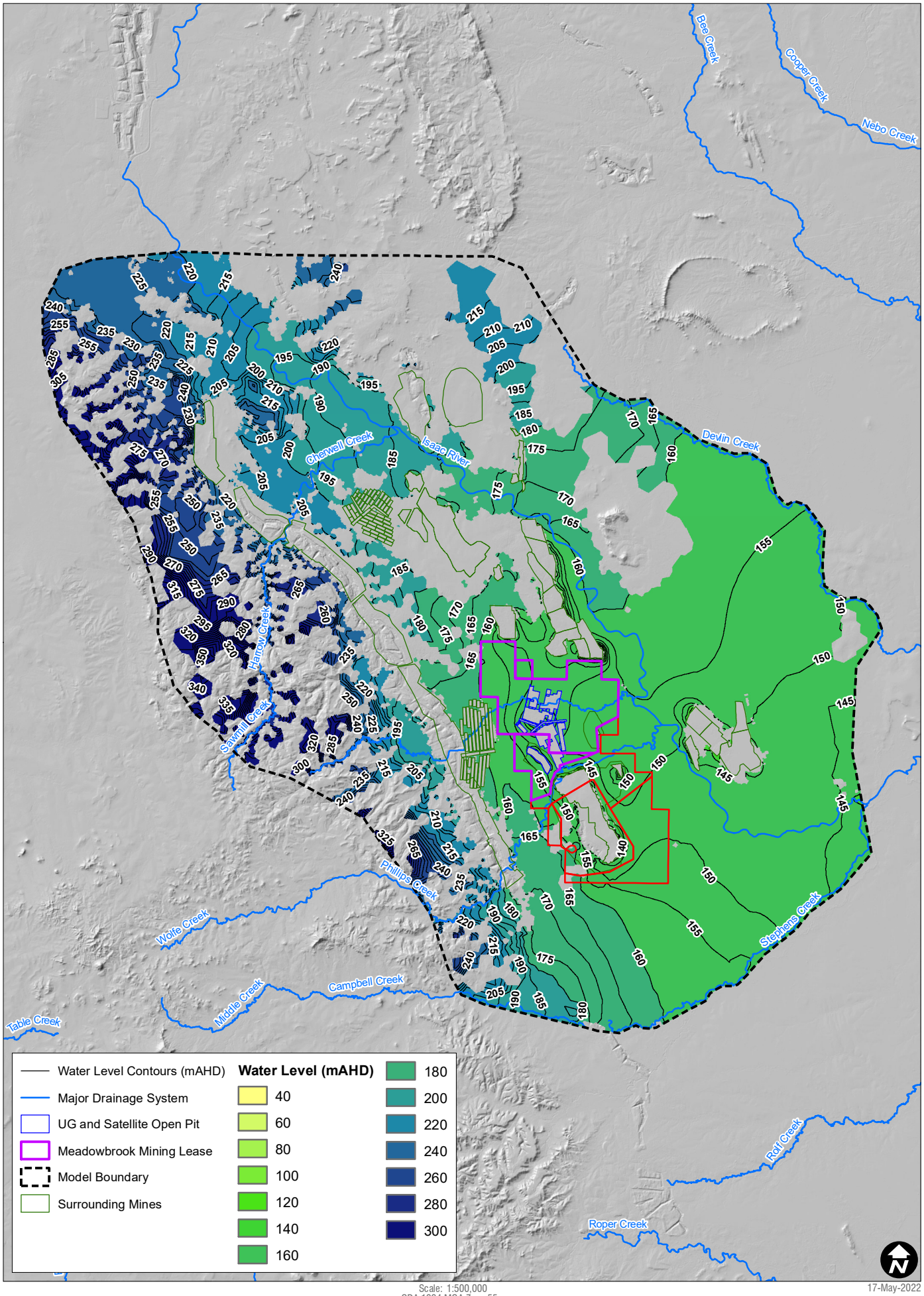
Predicted Water Level within Quaternary Alluvium (Layer 1) at End of Mining – Cumulative Scenario

FIGURE 4-5



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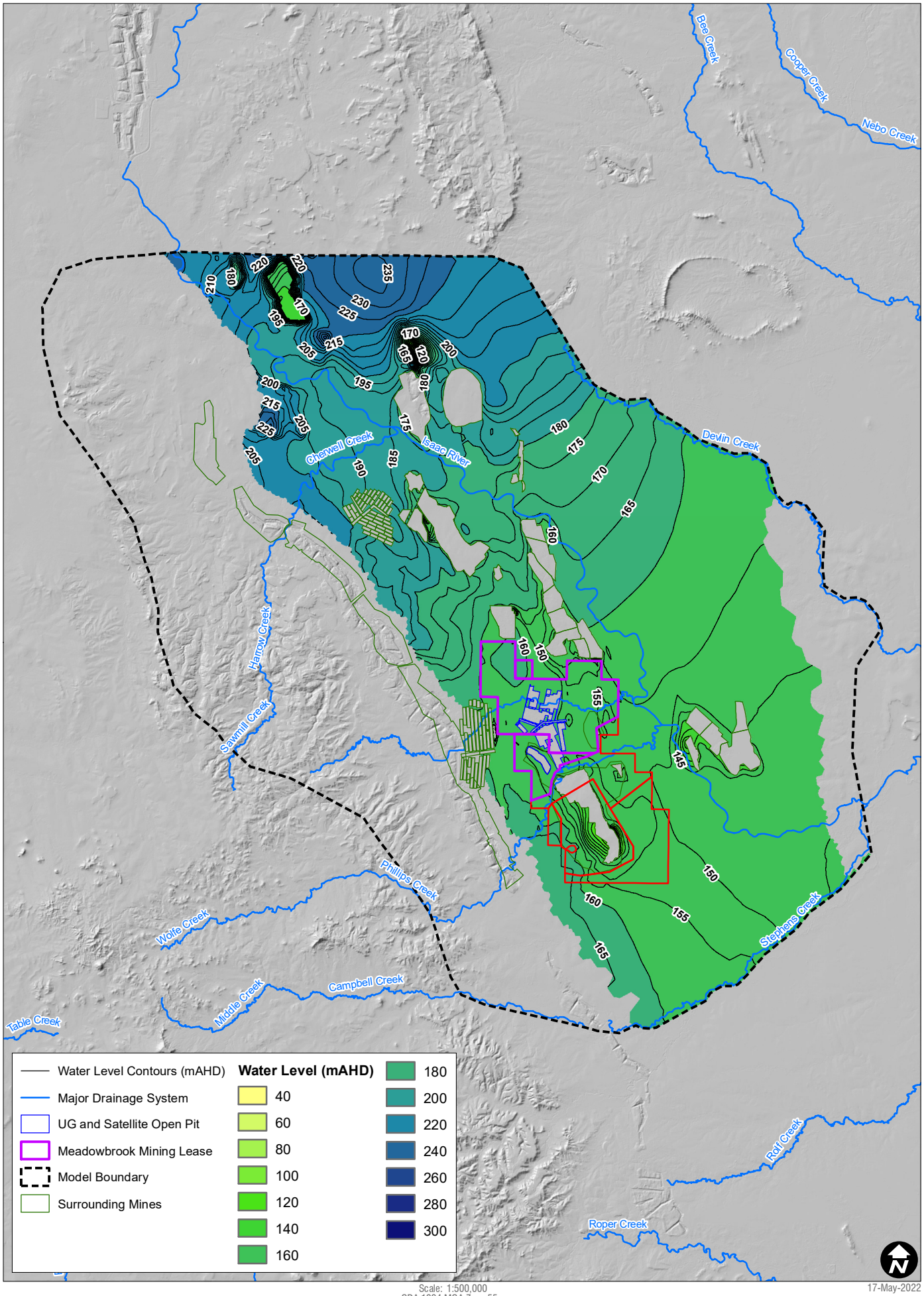
Predicted Water Level within Regolith (Layer 2) at End of Mining – Cumulative Scenario

FIGURE 4-6



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H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 F4-7 Predicted Water Level within Permian Coal Measures (Layer 9) at End of Mining – Cumulative Scenario.mxd

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Predicted Water Level within RCM Permian Coal Measures (Layer 9) at End of Mining – Cumulative Scenario

FIGURE 4-7

4.4 Maximum Predicted Drawdowns

The process of mining directly removes water from the groundwater system and reduces water levels in surrounding groundwater units. The extent of the zone affected is dependent on the properties of the aquifers/aquitards and is referred to as the zone of drawdown. Aquifer drawdown is greatest at the working coal-face and decreases with distance from the mine.

Maximum incremental drawdown refers to the drawdown impact associated with the Project and is obtained by comparing the difference in predicted aquifer groundwater levels for the Base Case model scenario and the Cumulative model scenario at matching times. The maximum drawdown represents the maximum drawdown values recorded at each model cell at any time over the model duration. Predicted drawdown figures (**Figure 4-8** and **Figure 4-15**) show where maximum drawdown impacts are predicted to exceed 2 m in alluvium. In areas within the 2 m drawdown contour, the unit is considered impacted by drawdown.

Figure 4-8 shows incremental drawdown in the alluvium as a result of mining at the Project is limited to a small area along the Boomerang Creek to the east of the proposed longwall panels. For a discussion on the potential incidental water impacts on the Quaternary alluvium, see **Section 4.6.1**.

The maximum predicted incremental drawdowns associated with the Project within the regolith is shown in **Figure 4-9**. The incremental drawdown extents within the regolith (Layer 2) are influenced by the distribution of predicted saturated zones in the regolith. The 2 m drawdown influence is predicted to extend 1 km east and west of the mine lease boundary.

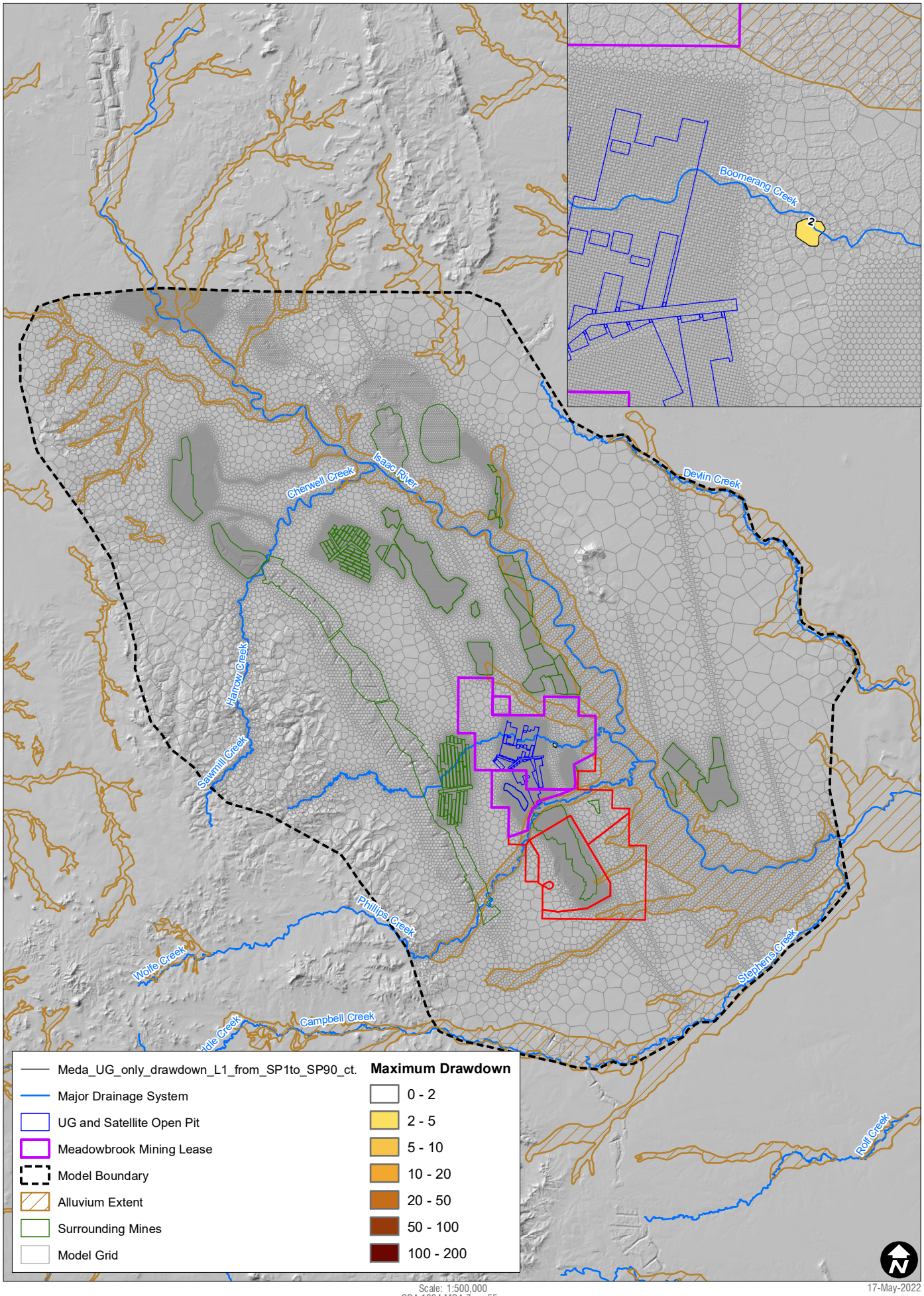
The coal seams of the Rangal Coal Measures are the primary aquifers targeted by the Project and will experience drawdowns as a direct result of mining at the Project. Groundwater level drawdown within the mined coal seams is influenced by unit structure and is confined to unit extents. **Figure 4-10** to **Figure 4-11** show the maximum predicted incremental drawdown for Leichhardt seam and Vermont seam in the Rangal Coal Measures. The figures show the extent of maximum predicted depressurization of the Permian coal measures is limited due by the structural geology (i.e. coal seams subcrop). The extents of maximum predicted incremental drawdown in the Rangal coal seams are between 1 to 2 km to the north and south of the Project mine lease. The cone of depression is predicted to be steepest at the working coal face.

Maximum Cumulative drawdown impacts are shown in **Figure 4-12** to **Figure 4-15**. These drawdowns represent the total impact of mining to model groundwater levels by comparing the maximum difference in aquifer groundwater levels for the Cumulative model scenario with those in a theoretical “No Mining” or Null Run scenario, for all times during the predictive model period.

Figure 4-12 shows the maximum cumulative drawdowns predicted for the Quaternary alluvium on the eastern boundary of the Project mine lease are connecting with the drawdown impacts in the Isaac River alluvium caused by the Olive Downs South Operations.

Cumulative impacts within the regolith can be seen connecting the Project-related drawdown to the drawdown impacts at the Lake Vermont mine to the South and Olive Downs Mine to north of the Project (**Figure 4-13**). For the Leichhardt and Vermont coal seams, there were drawdown interactions between the Project and the proposed LVN mine which also target the Rangal Coal Measures (**Figure 4-14** and **Figure 4-15**).

Figure 4-14 and **Figure 4-15** show there is no interaction between the zones of impact from the Project and the Saraji East Mine as Saraji targets the Moranbah coal seams which are deeper than Rangal coal measure targets at the Project.



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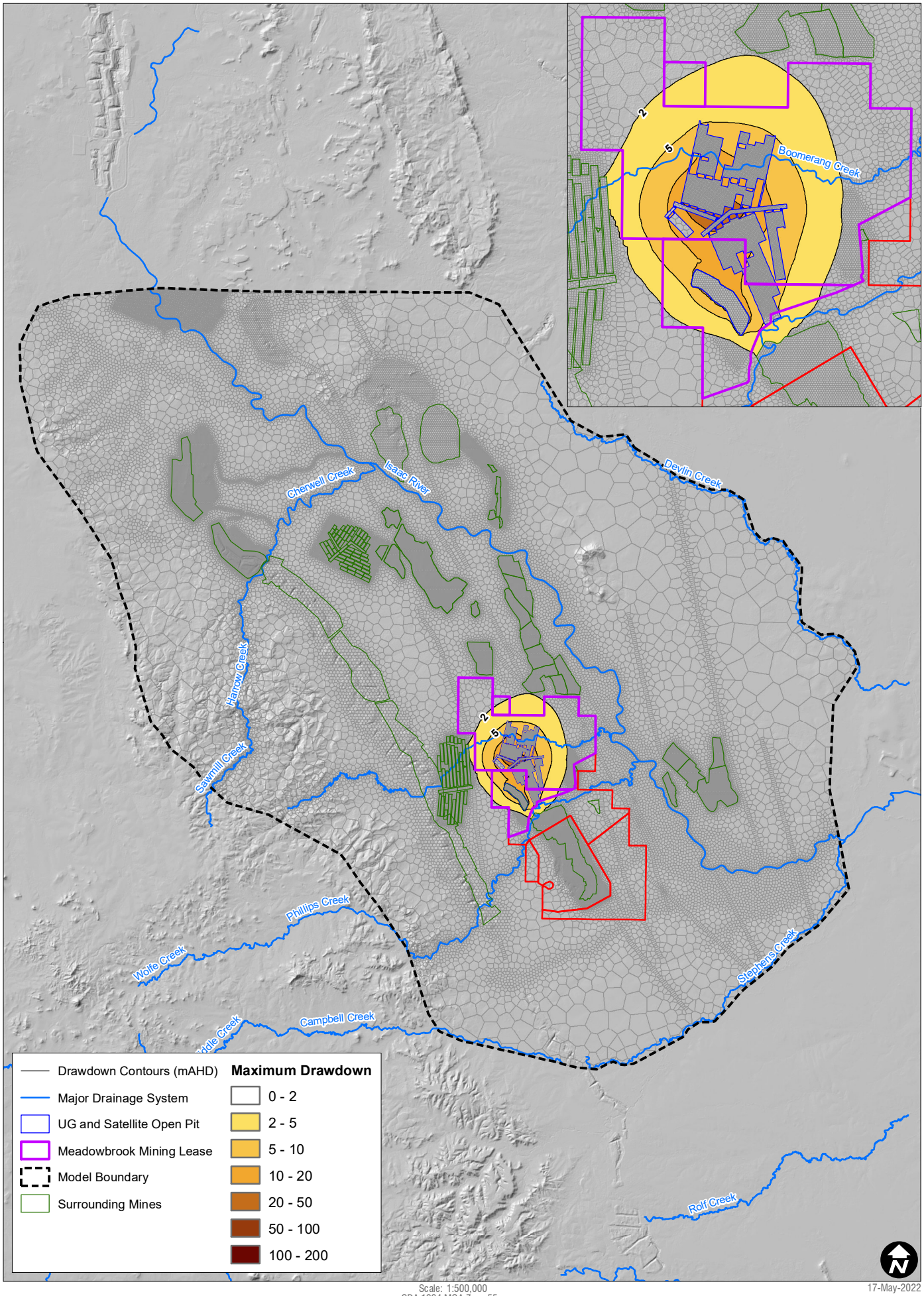
Maximum Incremental Drawdown in Alluvium (Layer 1)

FIGURE 4-8



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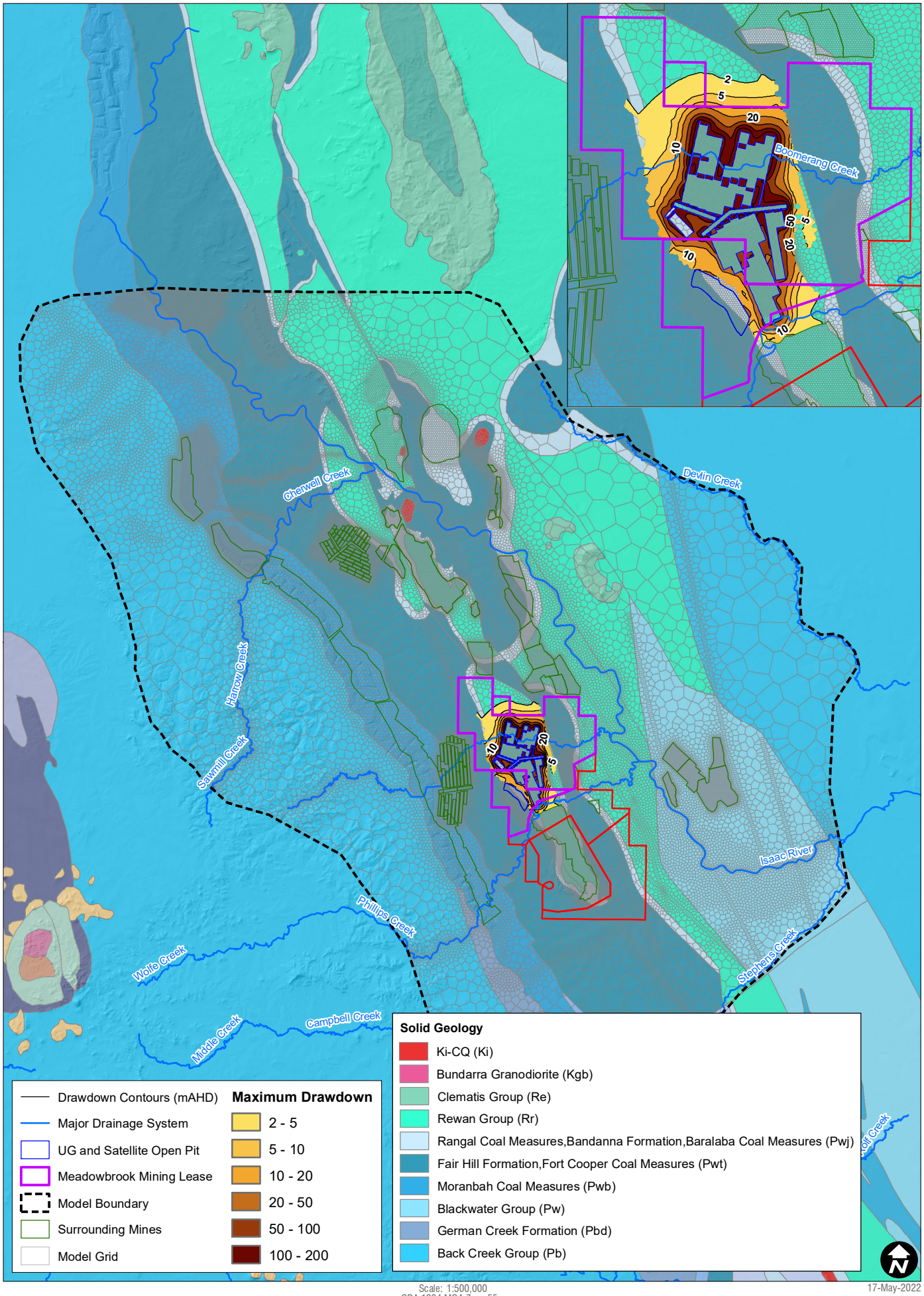
Maximum Incremental Drawdown in Regolith (Layer 2)

FIGURE 4-9



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 F4-10 Maximum Incremental Drawdown in Leichardt Seam (Layer 5).mxd

Scale: 1:500,000
GDA 1994 MGA Zone 55

17-May-2022
620.30592

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0 10 km

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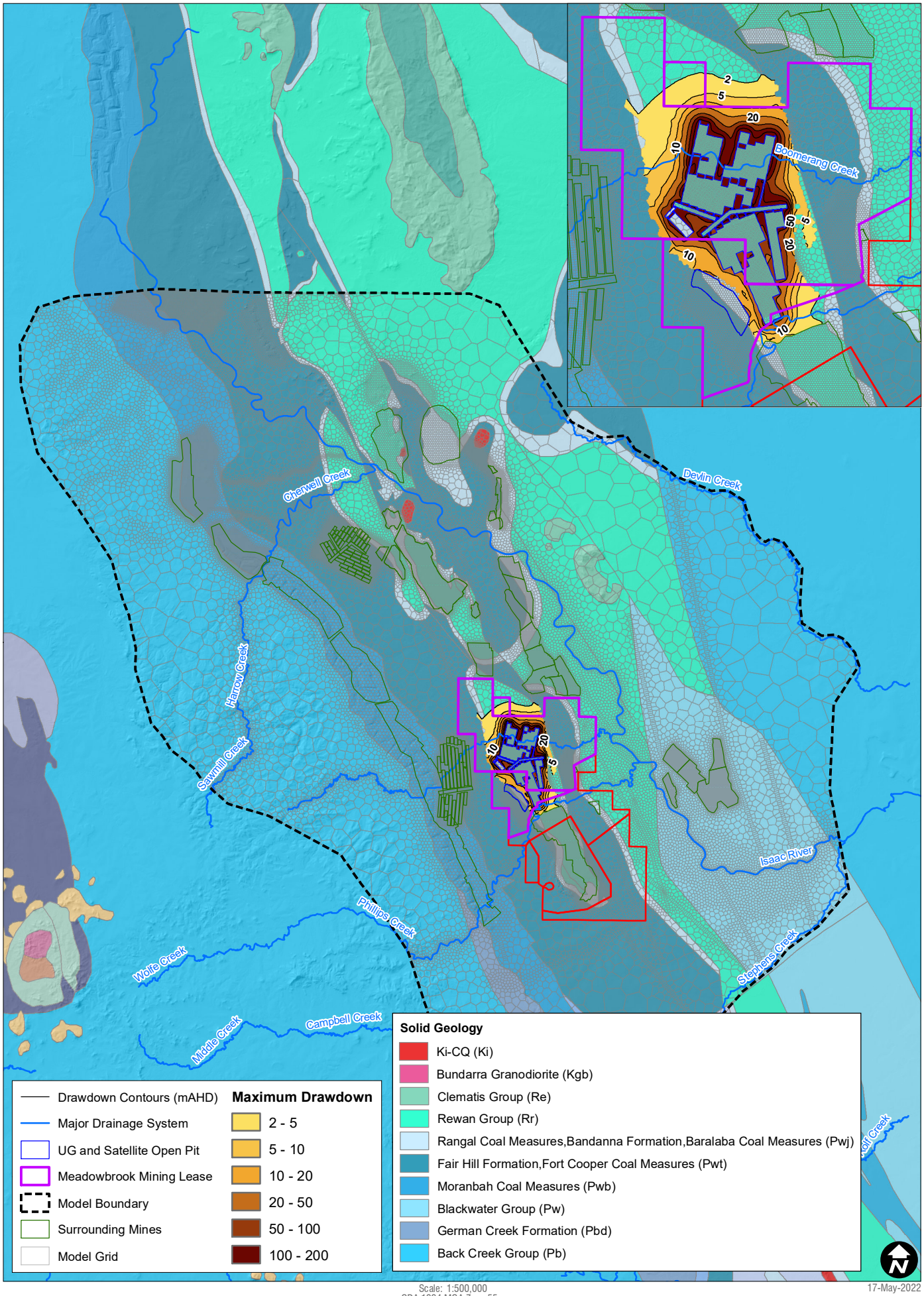
Maximum Incremental Drawdown in Leichardt Seam (Layer 5)

FIGURE 4-10



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Scale: 1:500,000
GDA 1994 MGA Zone 55

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0 10 km

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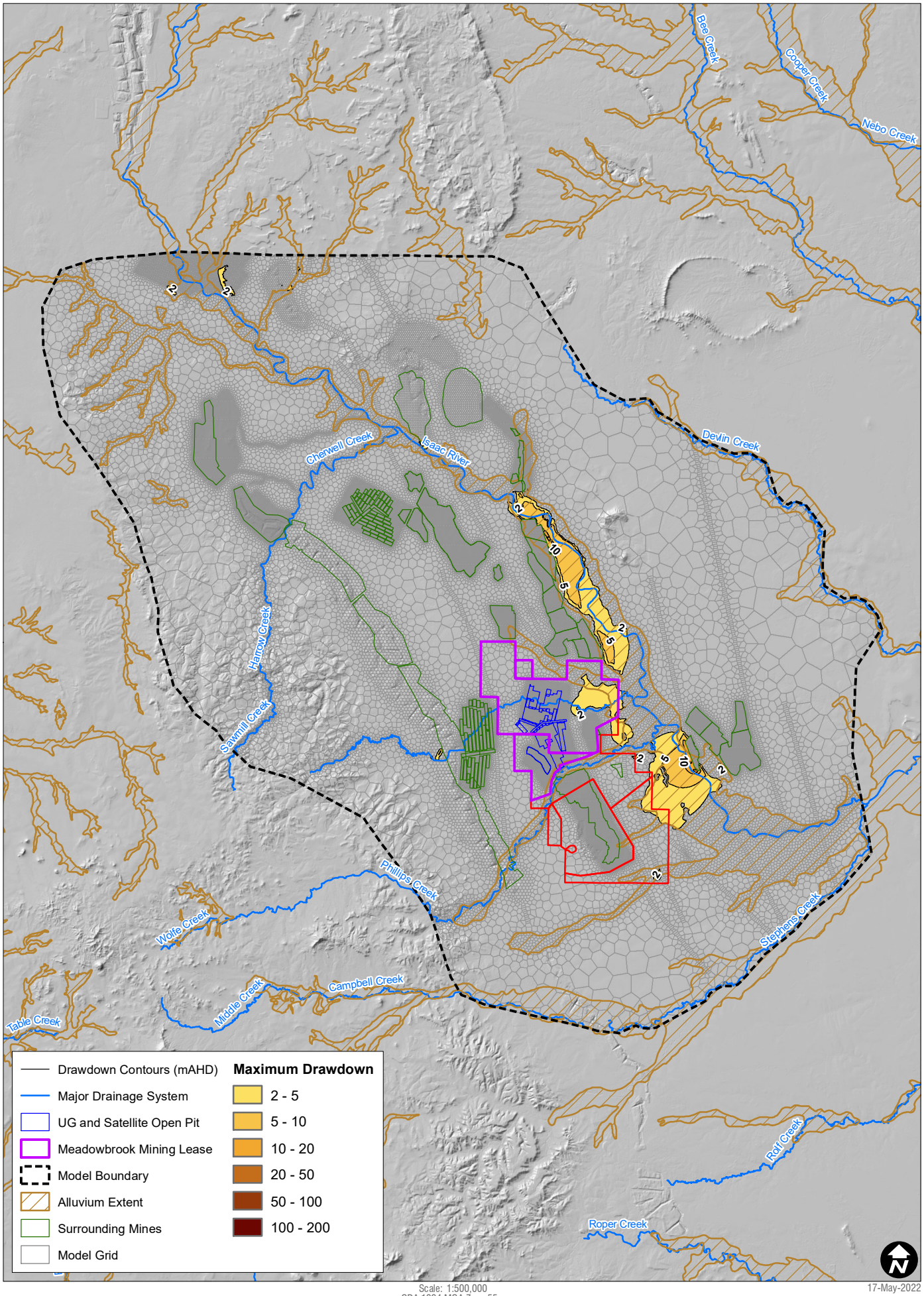
Maximum Incremental Drawdown in Vermont Seam (Layer 7)

FIGURE 4-11



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620305922 F4-12 Maximum Cumulative Drawdown in Quaternary Alluvium (Layer 1).mxd

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GDA 1994 MGA Zone 55

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0 10 km

SLR
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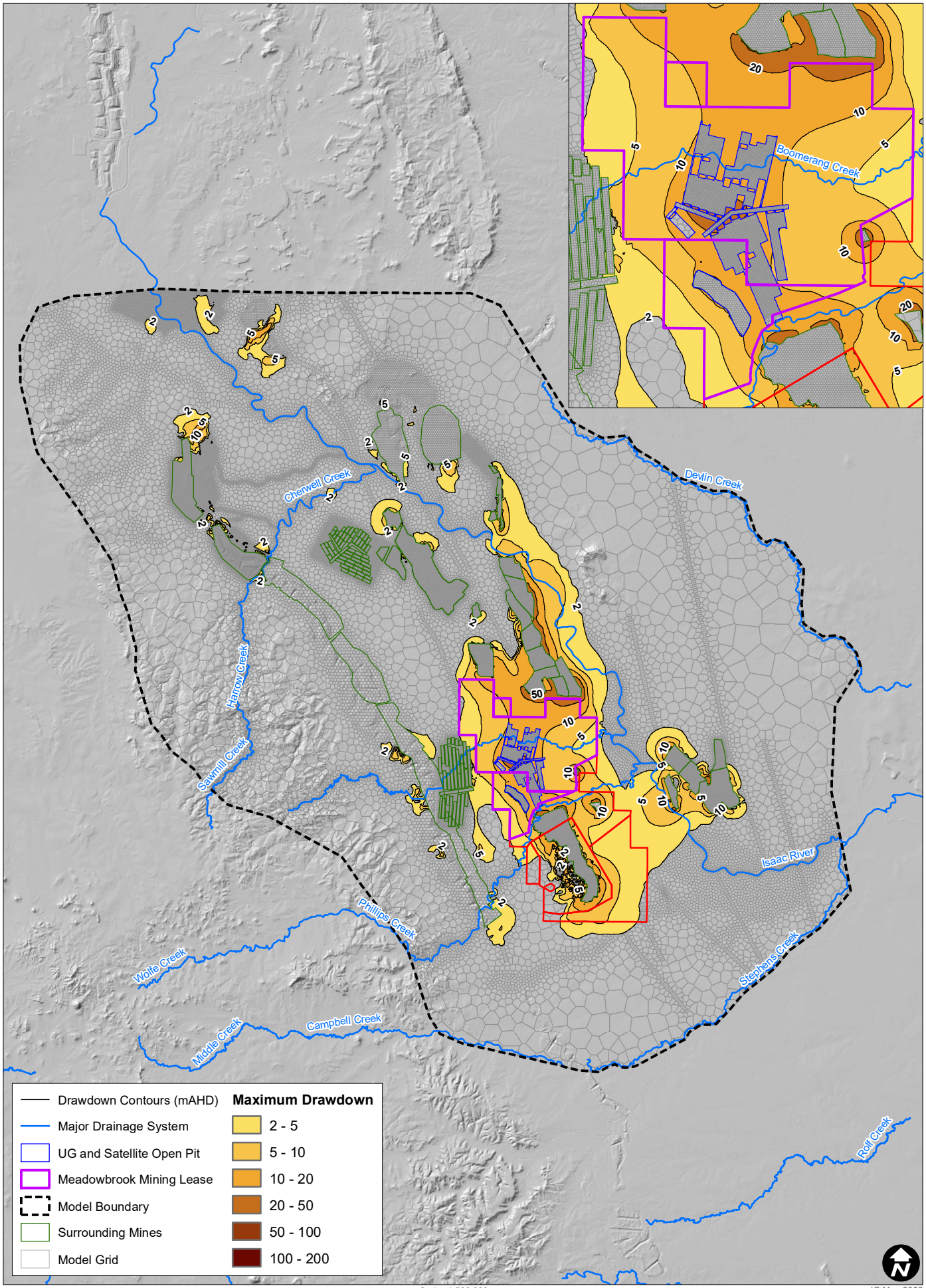
Maximum Cumulative Drawdown in Quaternary Alluvium (Layer 1)

FIGURE 4-12



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Scale: 1:500,000
GDA 1994 MGA Zone 55

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0 10 km

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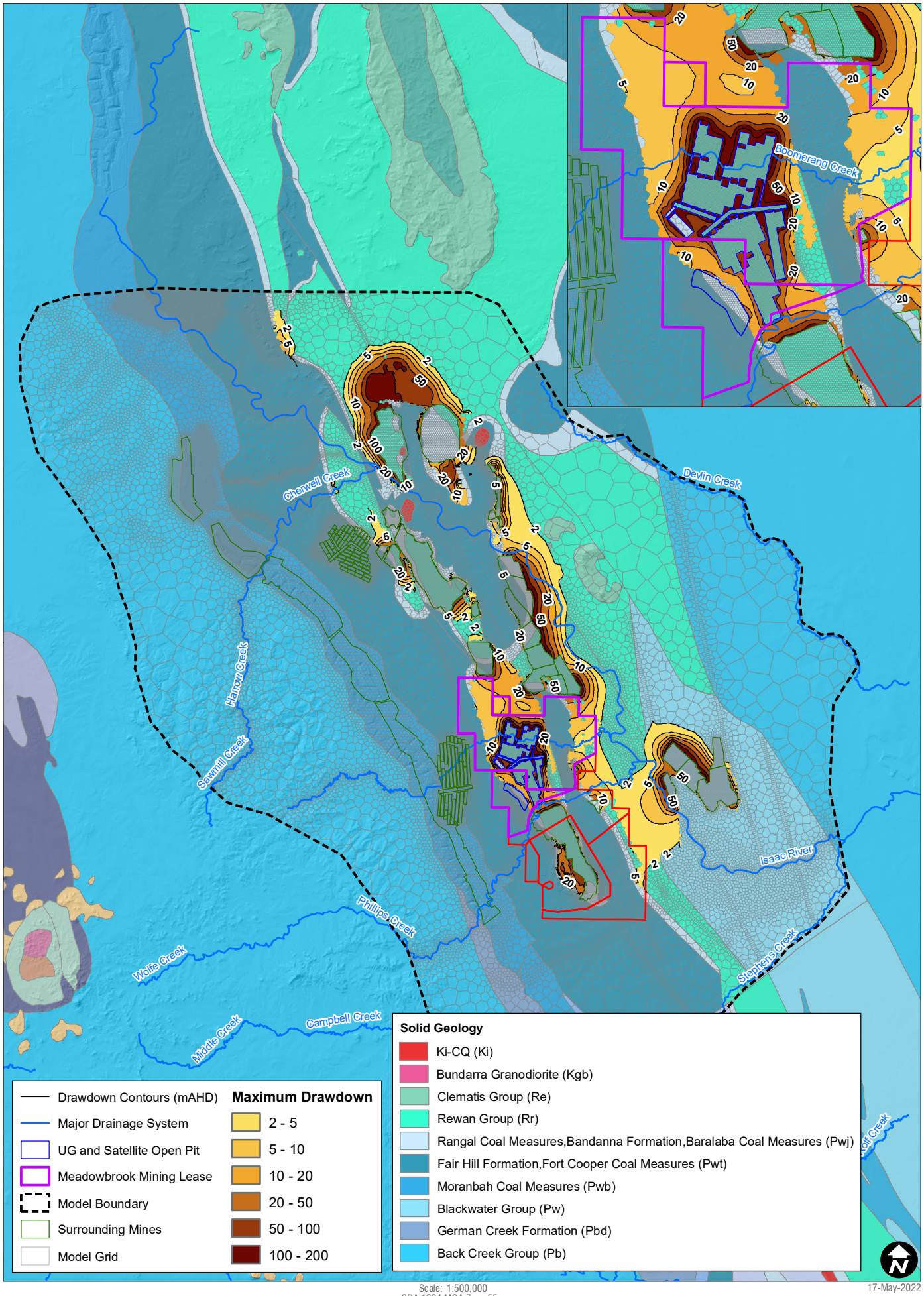
Maximum Cumulative Drawdown in Regolith (Layer 2)

FIGURE 4-13



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 F4-14 Maximum Cumulative Drawdown in Leichhardt Seam (Layer 5).mxd

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GDA 1994 MGA Zone 55

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0 10 km

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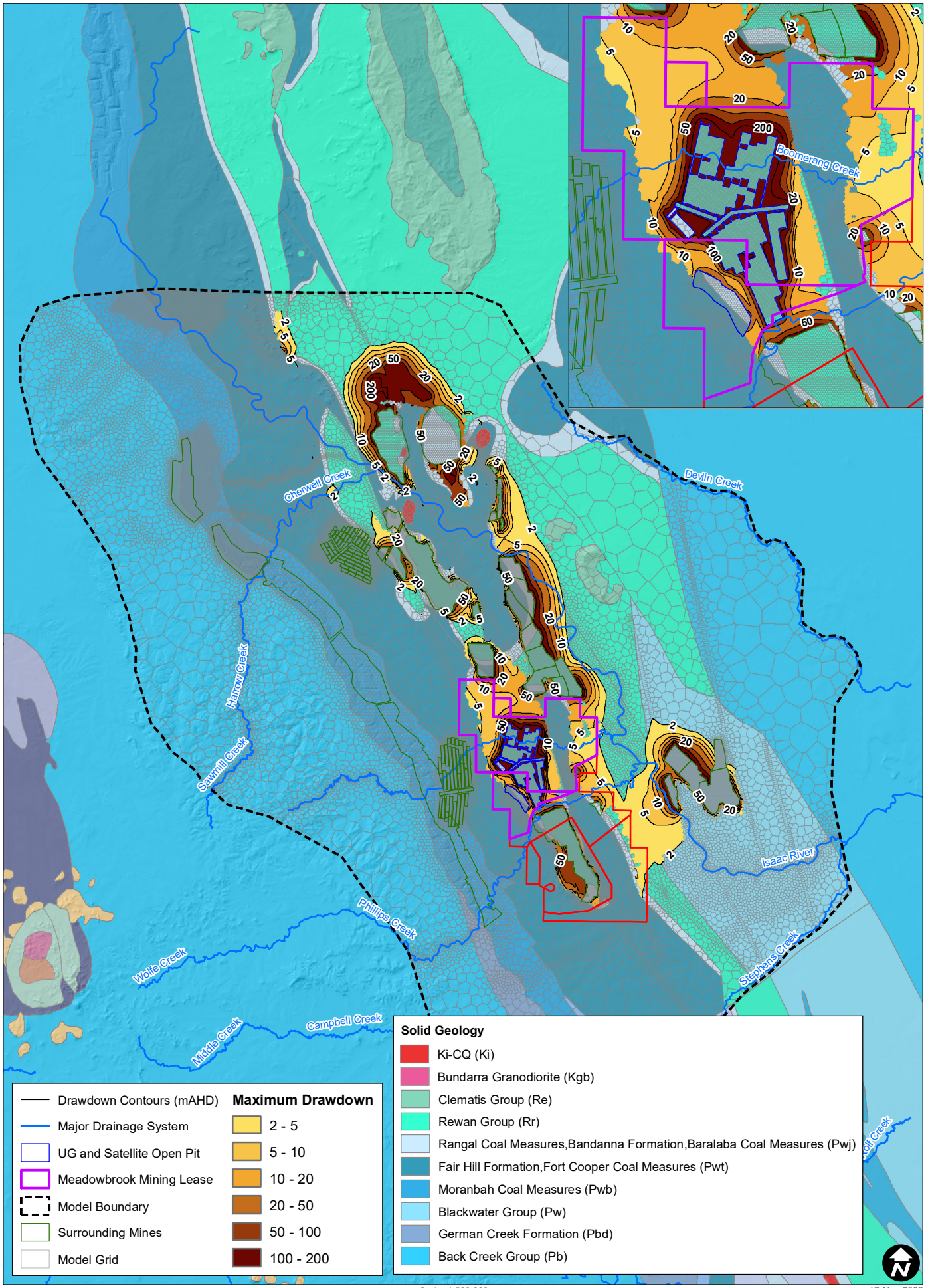
Maximum Cumulative Drawdown in Leichhardt Seam (Layer 5)

FIGURE 4-14



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Scale: 1:500,000
GDA 1994 MGA Zone 55

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Sheet Size : A4

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Maximum Cumulative Drawdown in Vermont Seam (Layer 7)

FIGURE 4-15

4.5 Predicted Groundwater Interception

Project mine pit inflow volumes have been calculated as time weighted averages of the outflow reported by ZoneBudget software for Project drain cells. The predicted inflows for the proposed Meadowbrook Underground and the satellite pits, and the total inflows are presented in **Figure 4-16**.

Inflows to the proposed Meadowbrook underground mine are predicted to reach a peak in 2049, with 1278 ML inflow predicted for the year (3.49 ML/day). The peak inflow to the proposed satellite pit is predicted to occur in 2050 at a rate of 343.6 ML/year (0.94 ML/day). The predicted total inflow rates increase to a maximum peak of 1604 ML in 2049 (4.39 ML/day), as a result of the mining of the satellite pit and Meadowbrook Underground. The average total inflow over the entire prediction period us 685.6 ML/year (1.87 ML/day).

The Water Plan (Fitzroy Basin) 2011 groundwater area consists of the following:

- Groundwater Unit 1 (containing aquifers of the Quaternary alluvium).
- Groundwater Unit 2 (sub-artesian aquifers).

Planned mining operations at the Project will not intercept Quaternary alluvium at any of the proposed pits. As such, all direct groundwater take predicted by the model is from Groundwater Unit 2. This means the model predicts alluvial groundwater will not enter the mine workings. If any changes are predicted in alluvial groundwater systems, it will be due to the Permian strata becoming depressurised due to mining and the corresponding changes in volume of groundwater flowing from the Quaternary alluvium to the Permian units.

For the satellite pit, it should be noted that the simulated inflows include water removed in rock material with mining, as well as water evaporated from the open pit surface. It is therefore an over-estimate of water that could report to the site water balance. Indicative calculations of the highwall surface area and average evaporation rates indicates at least 50 % of predicted inflows could be lost through evaporation and rock extraction. Further details of evaporation of ET contribution have been discussed in the *Meadowbrook Groundwater Impact Assessment* (JBT, 2021).

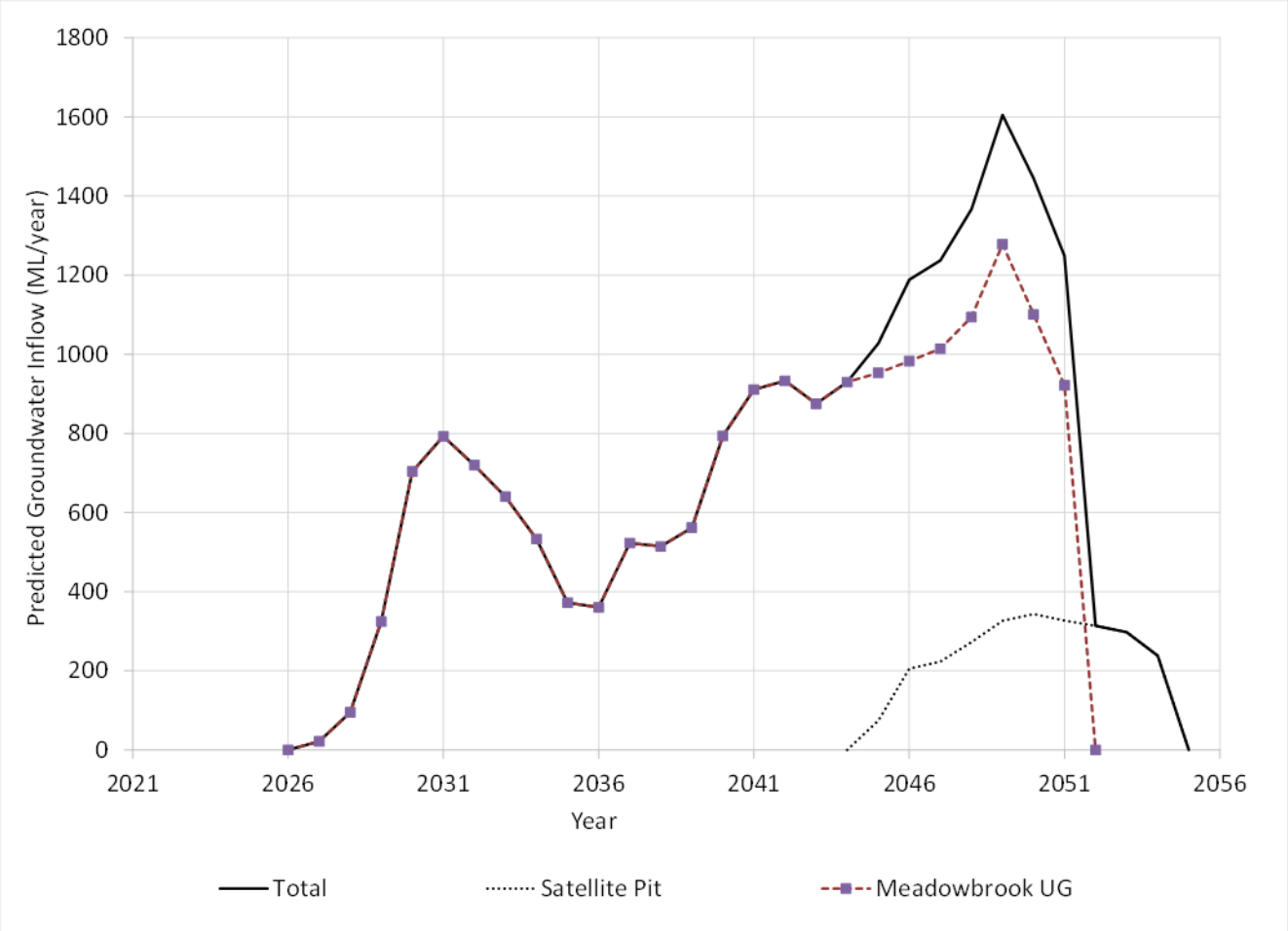


Figure 4-16 Predicted Project Mine Inflows

4.6 Incidental Water Impacts

4.6.1 Influence on Alluvium

The change in alluvial water resources was estimated by comparing water budgets for alluvial zones using the Base Case and Cumulative scenarios of the predictive model that excluded and included the Project, respectively.

Over the extent of Quaternary alluvium, there is a predicted average loss of 0.01 ML/day from the alluvium as a result of exercising the underground water rights for the Project. Interference of the alluvial groundwater largely relates to increased leakage to the underlying Permian coal measures that are depressurised as a result of the Project, which is distinct from direct interception of alluvial groundwater within the proposed pit.

4.6.2 Groundwater – Surface Water Interaction

The change in river leakage due to the Project was calculated by comparing the river flow budgets for Isaac River in the Base Case against the Cumulative Case. This calculation showed that over the life of mine, the change in the Isaac River to the alluvium is insignificant which is consistent with the predicted water balance in **Section 4.2**.

As discussed in **Section 2.4.2**, Philips Creek and Boomerang Creek located within the Project area are both set up with a stage height of 0.0 which means they are simulated as only potentially gaining systems (i.e., negative net flow). Comparing the river flow budgets for Philips Creek and Boomerang Creek in the Cumulative against the Base Case indicated no change in the net flux in these two creeks due to the Project.

4.7 Recovery Modelling

The post-mining recovery modelling included recovery in the underground mine and in the Meadowbrook open cut pit.

A 500-year transient model was created to ascertain post-mining recovery. All drain cells in the Project area were removed at the start of the recovery period to allow groundwater levels in the underground working and the overlying water-bearing strata, and in the open cut to recover.

In the open pit, the properties of the final void cells were converted to values representative of a void. The final void cells were assigned high horizontal and vertical hydraulic conductivities (1000 m/day) and storage parameters based on the compressibility of water (specific yield of 1.0, storage coefficient of 5.0 x 10^{-6} m^{-1}), to simulate free water movement within the cells. This approach is often referred to as a 'high-K' lake. The location of the final void at the Project is provided in Figure 5.2 and 5.13 of the Impact Assessment Report (JBT Consulting Ltd, 2022).

In the underground mine area, the parameters adopted in the model cells to reflect mined-out areas and goaf effects were consistent with the properties at the end the prediction model that includes enhanced vertical and horizontal hydraulic conductivity in the fractured layers overlying longwall panels and specific yield set at 0.1 (10%) in the mined seam to replicate increased storage. The Caved Zone located immediately above the mined seam was simulated by increasing the specific yield of the cells within the Caved Zone to 0.7 (7%) in the recovery model. The Caved Zone was assigned to the interburden layer above the mined seams (Layers 4 and 6 for double seam mining panels and Layer 6 for single seam mining panels).

Groundwater inflows to the final void pit cells during recovery were incorporated in the site water balance model for the Project's Surface Water Assessment (WRM, 2022). The pit lake recovery level and timings were predicted by the surface water balance modelling. These elevation and recovery timing derived from the surface water modelling was replicated within the numerical groundwater model using the MODFLOW-USG River boundary condition (RIV). This recovery model was then re-run for 500 years. The inflow rates to Meadowbrook open cut and final landform are presented in within the *Meadowbrook Groundwater Impact Assessment* (JBT Consulting Ltd, 2022).

A hydrograph for the Meadowbrook Open Pit final void water level is provided as **Figure 4-17**. As shown in the figure, the average predicted equilibrated final void water level in Meadowbrook final void was 162 mAHD. **Figure 4-18** shows the simulated fillings of the underground mine over time. **Figure 4-18** shows the model predicts the groundwater system will reach equilibrium approximately 500 years post-mining. As shown in **Figure 4-18**, above the northern longwall panels the groundwater level recovers to approximately 161 mAHD which is 1.5 m above the pre-mining groundwater levels. **Figure 4-18** shows above the southern longwall panels the groundwater level recovers to 160.5 mAHD which is 2.3 m above the pre-mining groundwater levels. Comparison between **Figure 4-17** and **Figure 4-18** shows that in post-mining equilibrium there will gradient from the open cut towards the underground mine.

The equilibrium groundwater levels, and more discussion of the post-mining recovery are discussed in *Meadowbrook Groundwater Impact Assessment* (JBT Consulting Ltd, 2022).

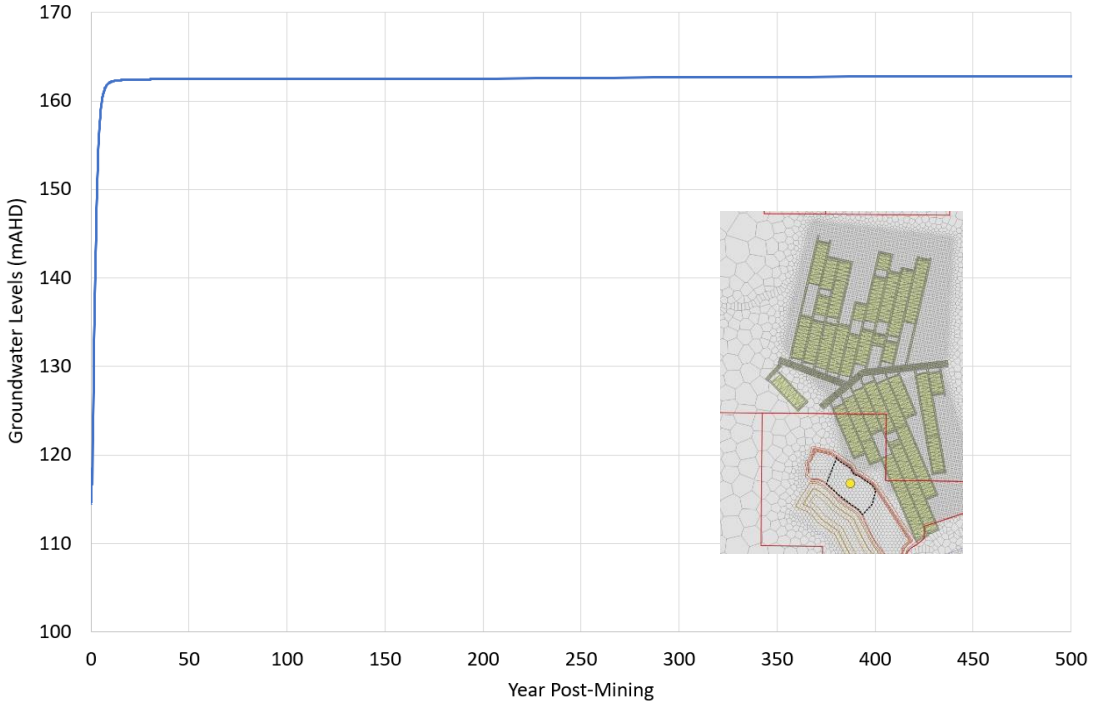


Figure 4-17 Recovery of the Proposed Open Cut

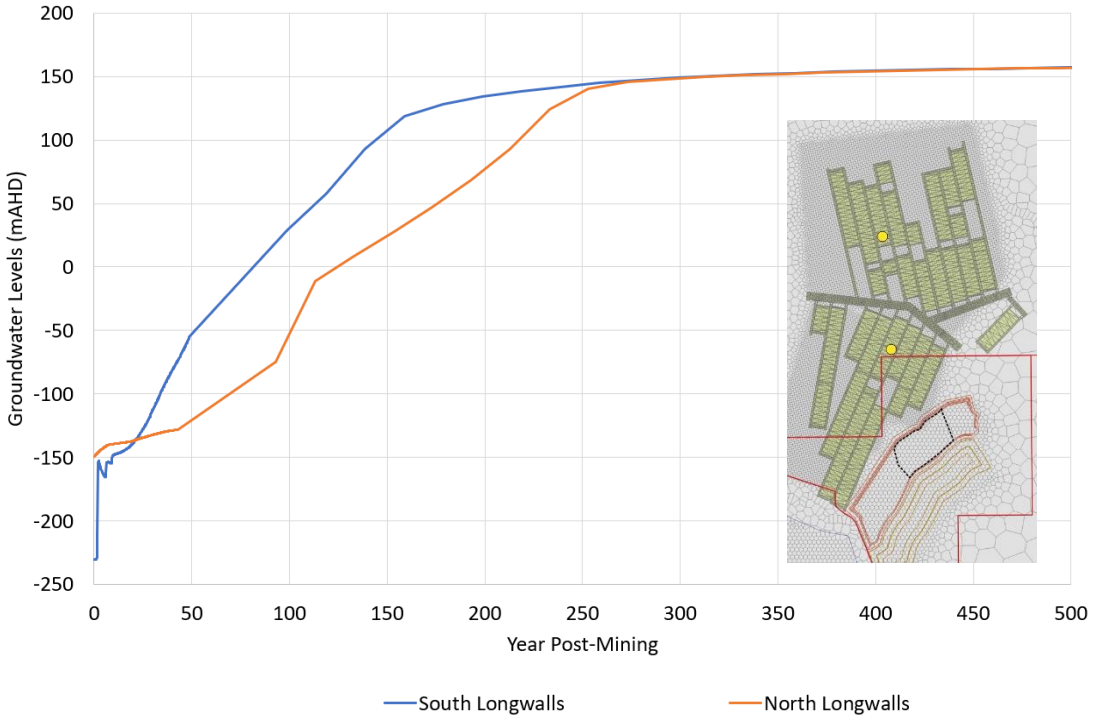


Figure 4-18 Recovery of the Proposed Underground Mine

5 Sensitivity Analysis

5.1 Calibration Sensitivity

As an additional step in the calibration process a parameter sensitivity file containing the "composite sensitivity" of each parameter with respect to all observations was generated. The Relative Composite Sensitivity (RCS) of a parameter is obtained by multiplying its composite sensitivity by the magnitude of the value of the parameter. Therefore, RCS is a measure of the composite changes in model outputs that are incurred by a fractional change in the value of the parameter (PEST Manual, Doherty 2010).

Composite parameter sensitivities are used in identifying those parameters that may be degrading the performance of the parameter estimation process through lack of sensitivity to model outcomes. Relative Composite Sensitivity is a measure of the composite changes in the model outputs that have resulted by a change in the value of the parameter. RCS is also an indication of how much the model calibration is sensitive to an input parameter. The groundwater model is more sensitive to the parameters that have high RCS value. Where parameters have low RCS (<1), the model calibration is less sensitive to those, which also could indicate a greater uncertainty associated with them.

The composite sensitivity values were calculated during the PEST calibration and are presented in **Figure 5-1** and **Figure 5-2**. **Figure 5-1** shows the RCS for the horizontal conductivity, anisotropy (Kz/Kx) and the slope used in the depth dependence equations used in the model (Section 3.4). Figure 5 2 shows the RCS for the specific yield, specific storage, and recharge.

Most parameters shown **Figure 5-1** have RCS of less 1. The only expectation is the slope in depth dependence equation for Q Seam in the Moranbah Coal Measures that shows the regional calibration is highly sensitive to this parameter. All the storage parameters in Rangal Coal Measure layers and recharge parameters have an RCS of less than 1 indicating the model has a relatively low sensitivity to these parameters (**Figure 5-2**).

As discussed in **Section 6**, the uncertainty analysis is guided by the results of this sensitivity analysis to explore more extreme values within the constraints of the model calibration statistics.

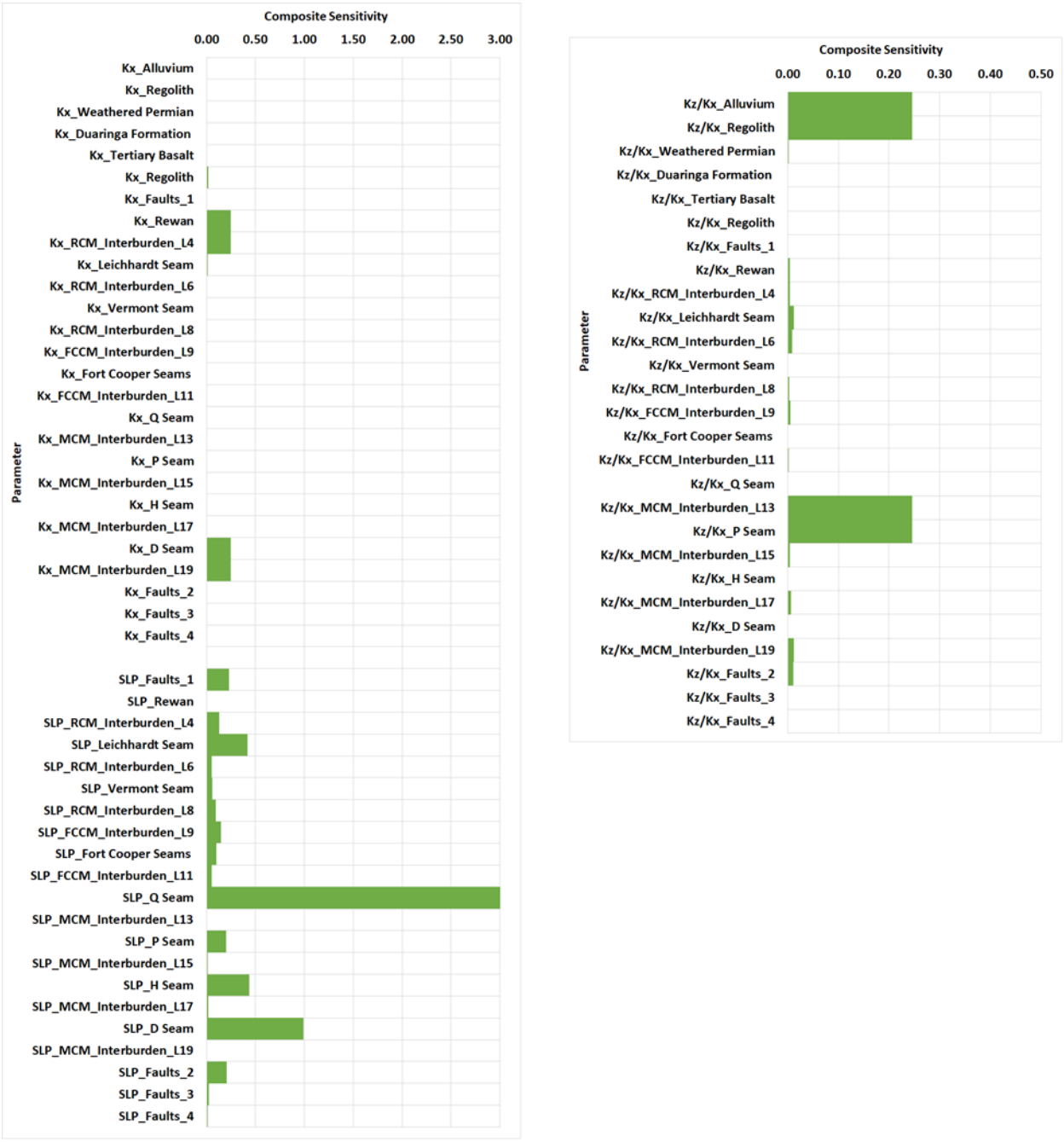


Figure 5-1 Composite Sensitivity – Kx, Kz/Kx and Slope

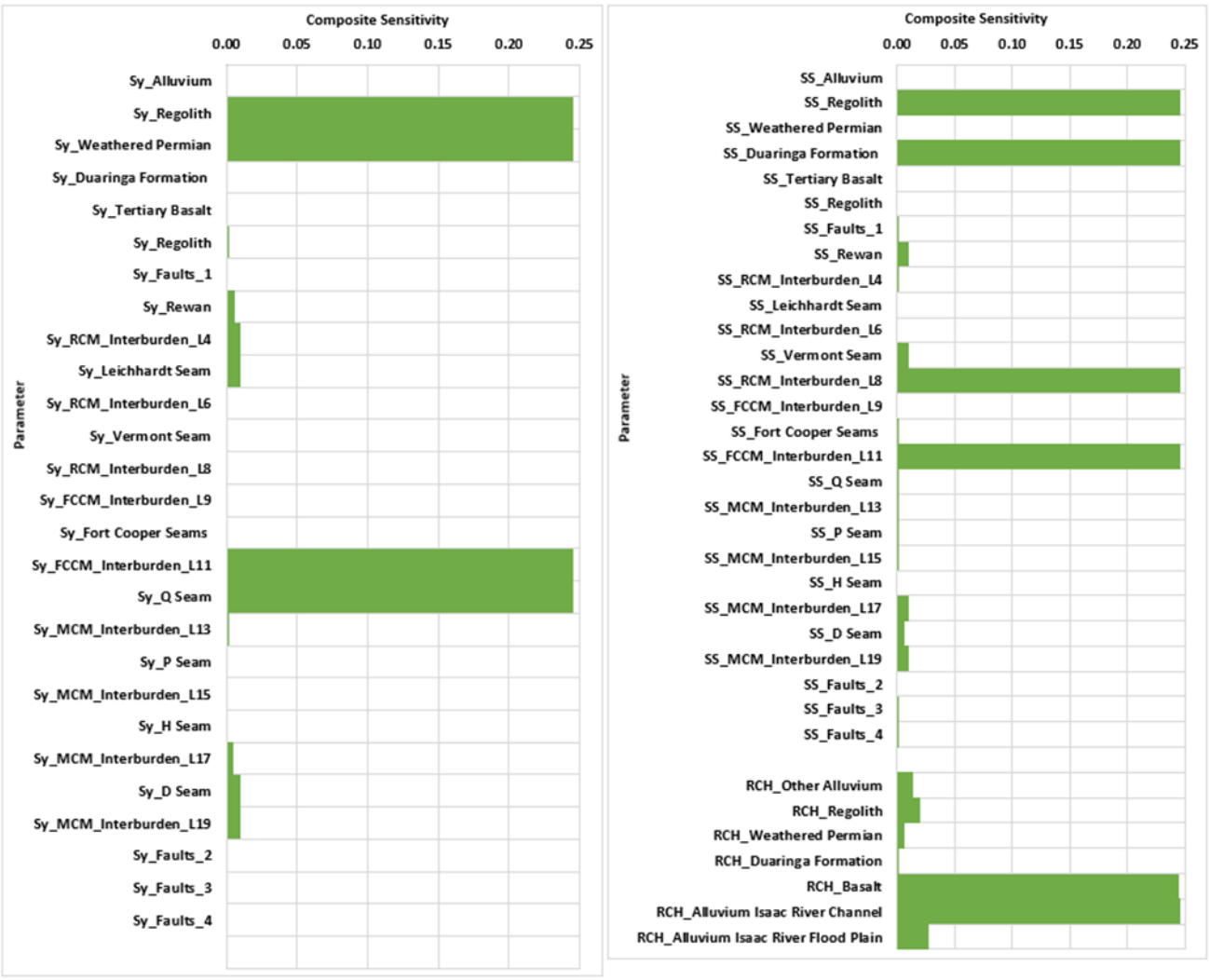


Figure 5-2 Composite Sensitivity – Sy, SS and Recharge

5.2 Calibrations Identifiability

Identifiability describes a parameter's capability to be constrained by the model calibration. Identifiability values range from zero to one. As identifiability approaches one, the parameter is increasingly able to be constrained. Likewise, as values approach zero the parameter is increasingly unable to be constrained by the calibration and uncertainty of model results is not reduced through calibration.

The PEST utility GENLINPRED was used to provide an estimate of parameter identifiability for each of the model parameters. Estimated identifiability values for the calibrated parameters horizontal hydraulic conductivity, anisotropy, specific yield and recharge are summarised in **Figure 5-3** through **Figure 5-7**.

Figure 5-3 indicates that in general the calibration process was successful in constraining the horizonal conductivity. Notably, the conductivity of alluvium, Rewan Group, Leichhardt Seam, Vermont Seam, D Seam and Q Seam units are well constrained by calibration (high identifiability values above 0.80). The horizontal hydraulic conductivity of most of the faults generally has not been able to be constrained well during calibration, relative to their surrounding unit. The exception to this is the Isaac Fault zone, which has been constrained during the calibration.

Identifiability of hydraulic conductivity anisotropy for model zones is presented in **Figure 5-4**. Anisotropy in the weathered Permian, Moranbah Coal Measures interburden, Fort Cooper Coal Measures overburden and Moranbah Coal Measures overburden have high identifiability values indicating these can be constrained and contribute to reducing model uncertainty. All other zones feature low values (equal to and below 0.40) and are less constrained by calibration.

In general, specific yield and specific storage of other zones in the model domain have low identifiability (**Figure 5-5** and **Figure 5-6**). **Figure 5-6**shows that, apart from the D Seam and the interburden unit above the D seam, the calibration was not able to constrain this parameter.

The recharge zones for all the zones except the Isaac River Channel Alluvium, are highly constrained by the calibration. The other zones have low identifiability (**Figure 5-7**). Note that the stream channel alluvium represents a narrow zone along the Isaac River, with a small area relative to the other recharge zones. It is, therefore, considered less impactful to model predictions.

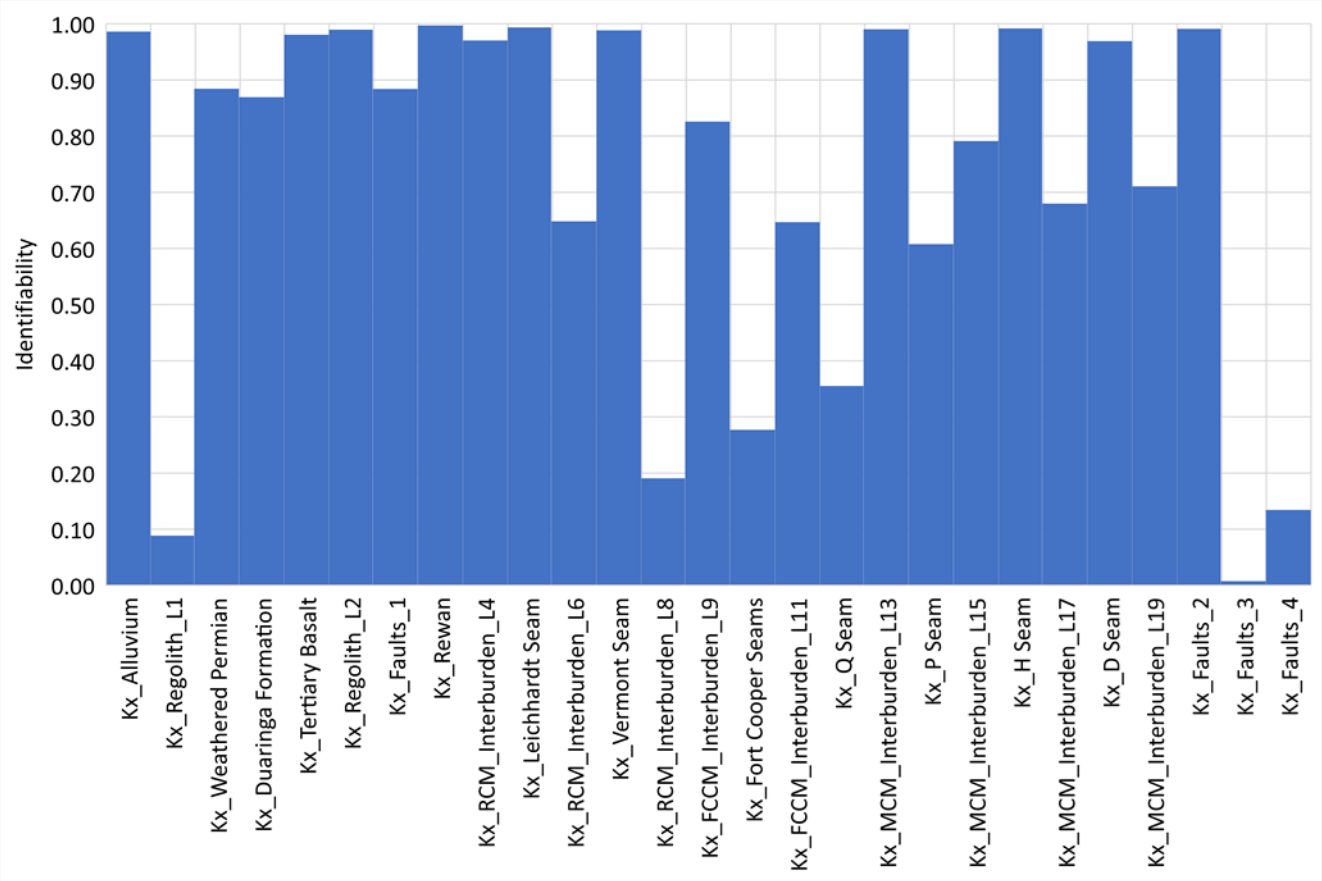


Figure 5-3 Identifiability – Horizontal Hydraulic Conductivity (Kx)

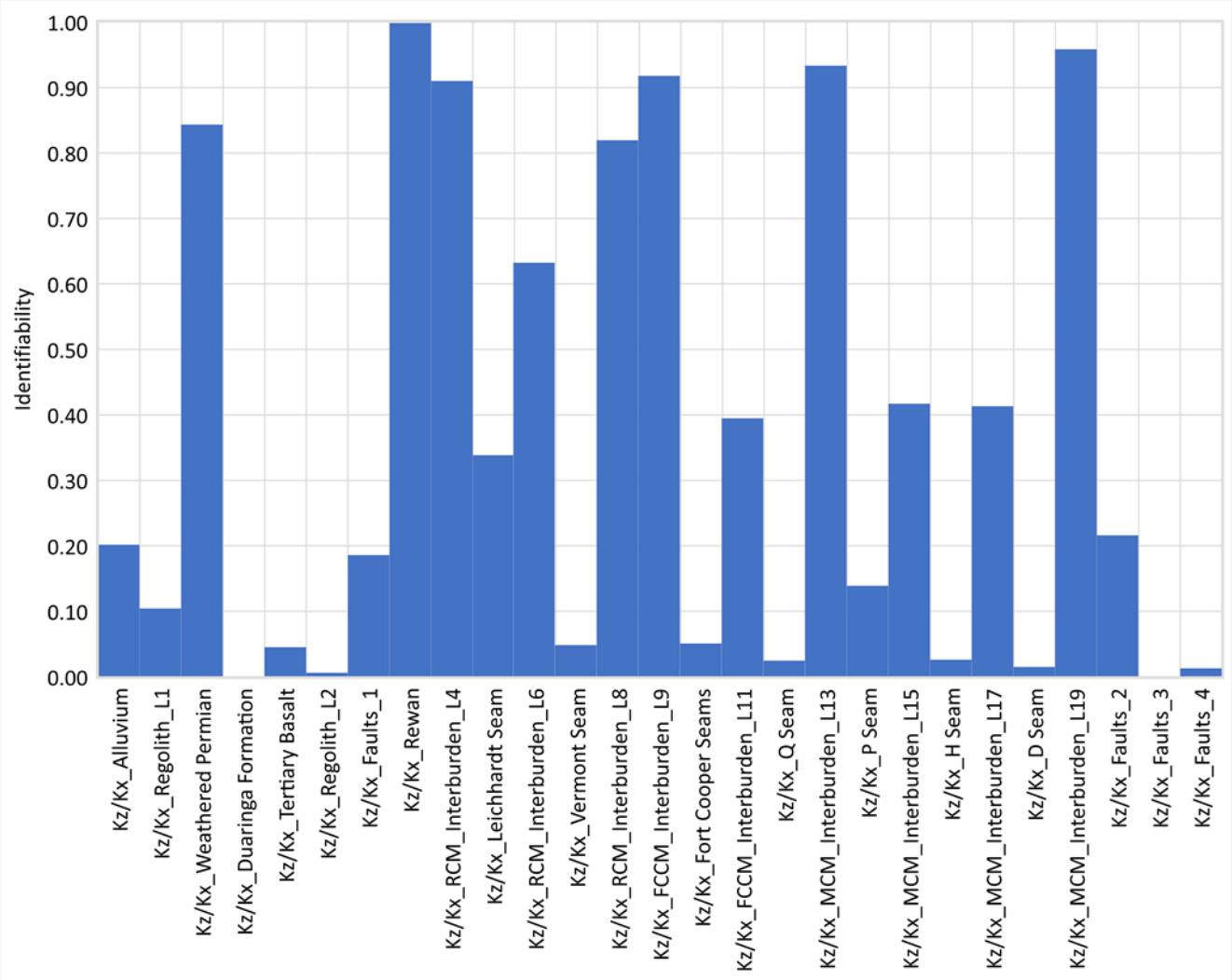


Figure 5-4 Identifiability – Anisotropy (Kz/Kx)

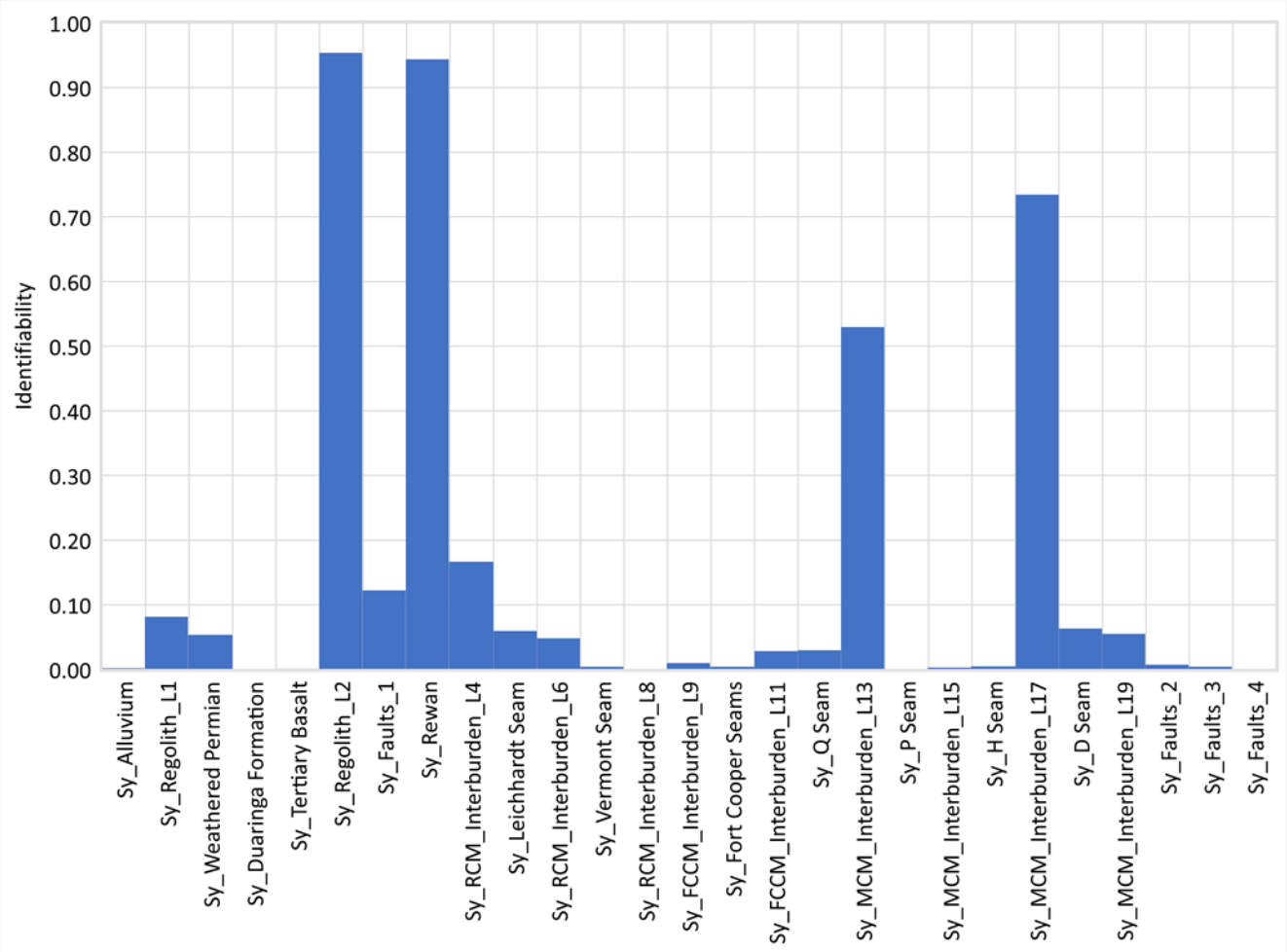


Figure 5-5 Identifiability – Specific Yield (Sy)

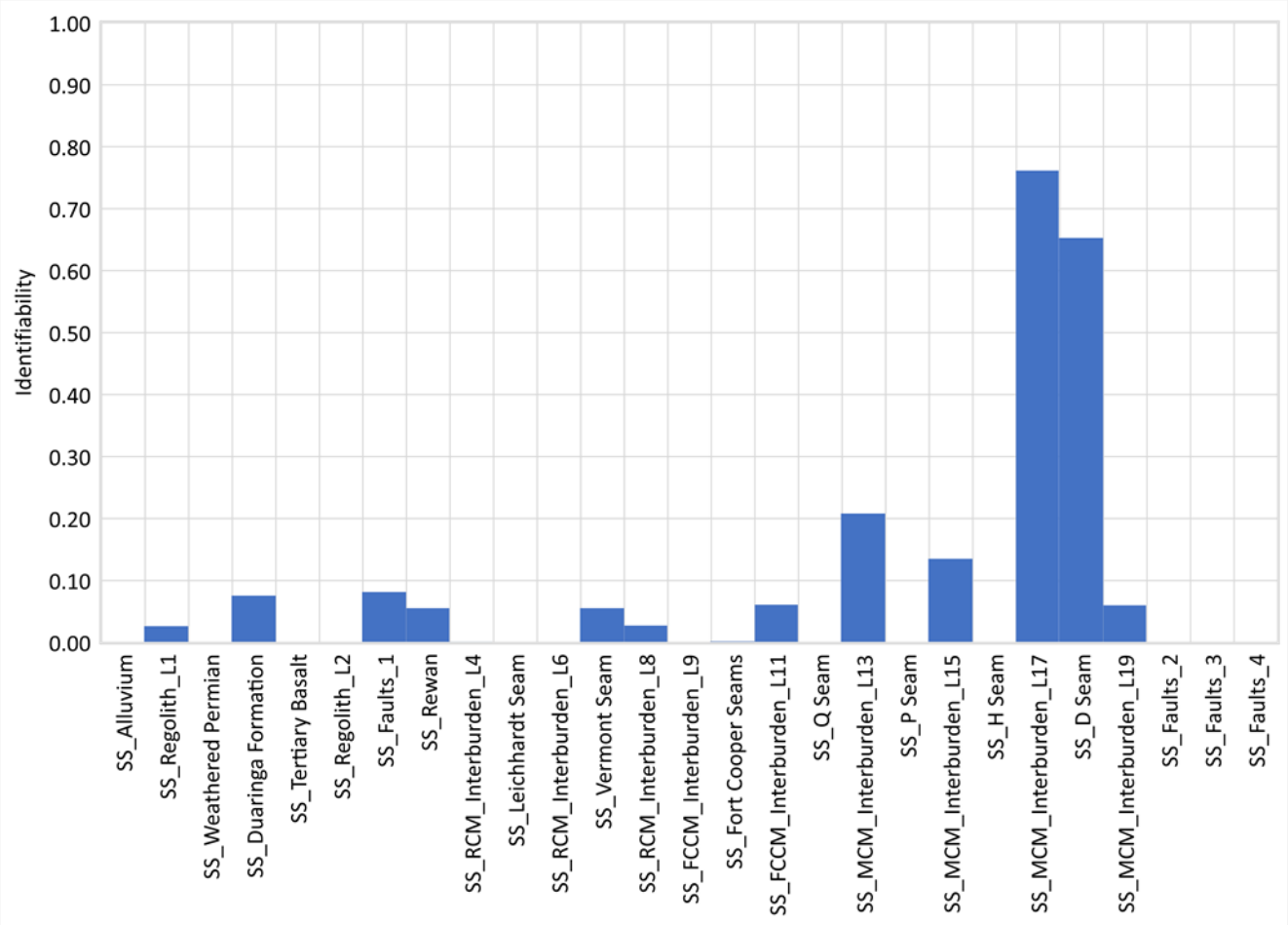


Figure 5-6 Identifiability – Specific Storage (SS)

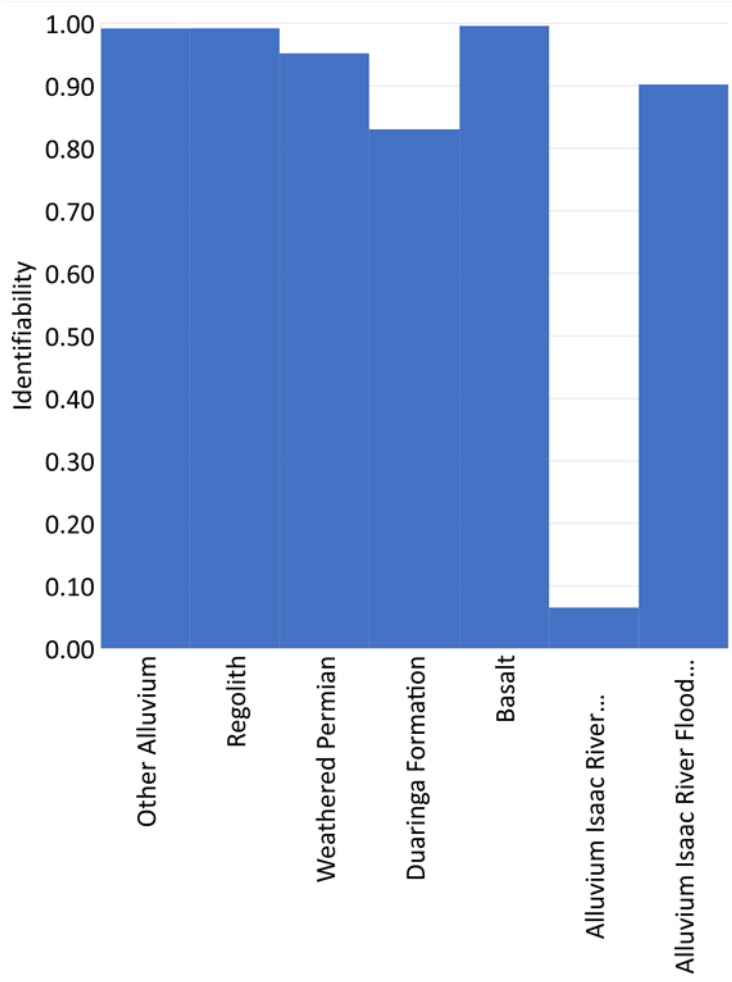


Figure 5-7 Identifiability – Recharge (RCH)

5.3 Prediction Identifiability

Section 5.2 presented calibration Identifiability which describes a parameter's capability to be constrained by the model calibration.

Prediction identifiability describes a parameter's capability on impacting the model predictions. To calculate the prediction identifiability the predictive groundwater model is run once per each parameter. The predictions included in the analysis were the project only inflows and maximum cumulative drawdown. The analysis then utilised the GENLINPRED utility to provide an estimate of parameter identifiability for each of the model parameters.

As identifiability approaches one, the parameter is increasingly able to change model predictions. Likewise, as values approach zero the parameter is increasingly unable to change model predictions.

The Murray Darling Basin Modelling Guidelines (MDBC, 2000) recommends classifying sensitivity by the resultant changes (or contribution) to the model calibration and predictions. According to this process models can be classified as one of the four main types:

- Type I: Insignificant changes to calibration (low identifiability) and prediction (low uncertainty contribution).
- Type II: Significant changes to calibration (high identifiability) – insignificant changes to predictions (low uncertainty contribution).
- Type III: Significant changes to calibration (high identifiability) –significant changes to predictions (high uncertainty contribution).
- Type IV: Insignificant changes to calibration (low identifiability) –significant changes to predictions (high uncertainty contribution).

Types I-III are of less concern, as these Types either have an insignificant impact on model predictions and\or are well constrained by calibration. Type IV is classed as 'a cause for concern' as non-uniqueness in a model input might allow a range of valid calibrations but the choice of value impacts significantly on a prediction (MDBC, 2000).

To classify the sensitivity contribution to the model calibration and predictions for each model parameter, the calibration and prediction Identifiability were compared against each other for each parameter.

Figure 5-8 presents the relationship between the identifiability of predicted Project only inflow and the identifiability of the calibration. Sensitivity classifications for the sensitivity types have been assigned using judgement based on the range of the identifiability. Specific yield of the Rangal Coal Measures is the only Type IV parameter identified as it pertains to estimating inflows.

As shown in **Figure 5-8**, for the inflow predictions most parameters are classified as Type I or Type II which indicates they have low uncertainty contribution in inflow predictions.

Figure 5-9 presents the relationship between identifiability of maximum predicted drawdown within the alluvium and the identifiability of the calibration. Sensitivity classifications for the sensitivity types have been assigned using judgement based on the range of the posterior predictions. The horizontal conductivity of the faults near the Project area is the only Type IV parameter identified as it pertains to the maximum drawdown extent within the alluvium.

Figure 5-9 shows horizontal conductivity parameters in the model are mostly classified as Type II indicating they significantly impact the model calibration but have insignificant contribution in reducing uncertainty of the maximum drawdown.

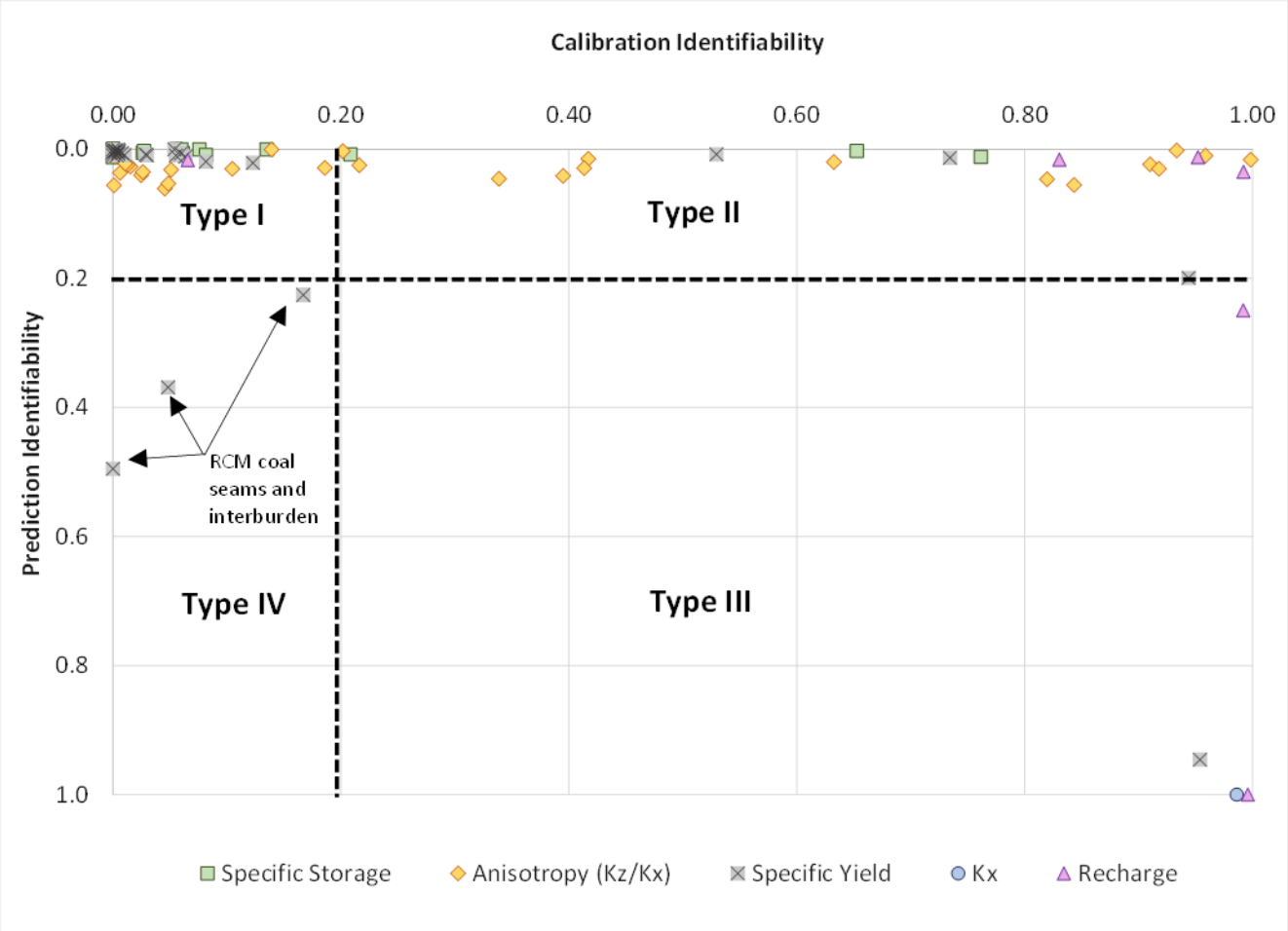


Figure 5-8 Uncertainty Contribution (Predicted Inflow) versus Identifiability

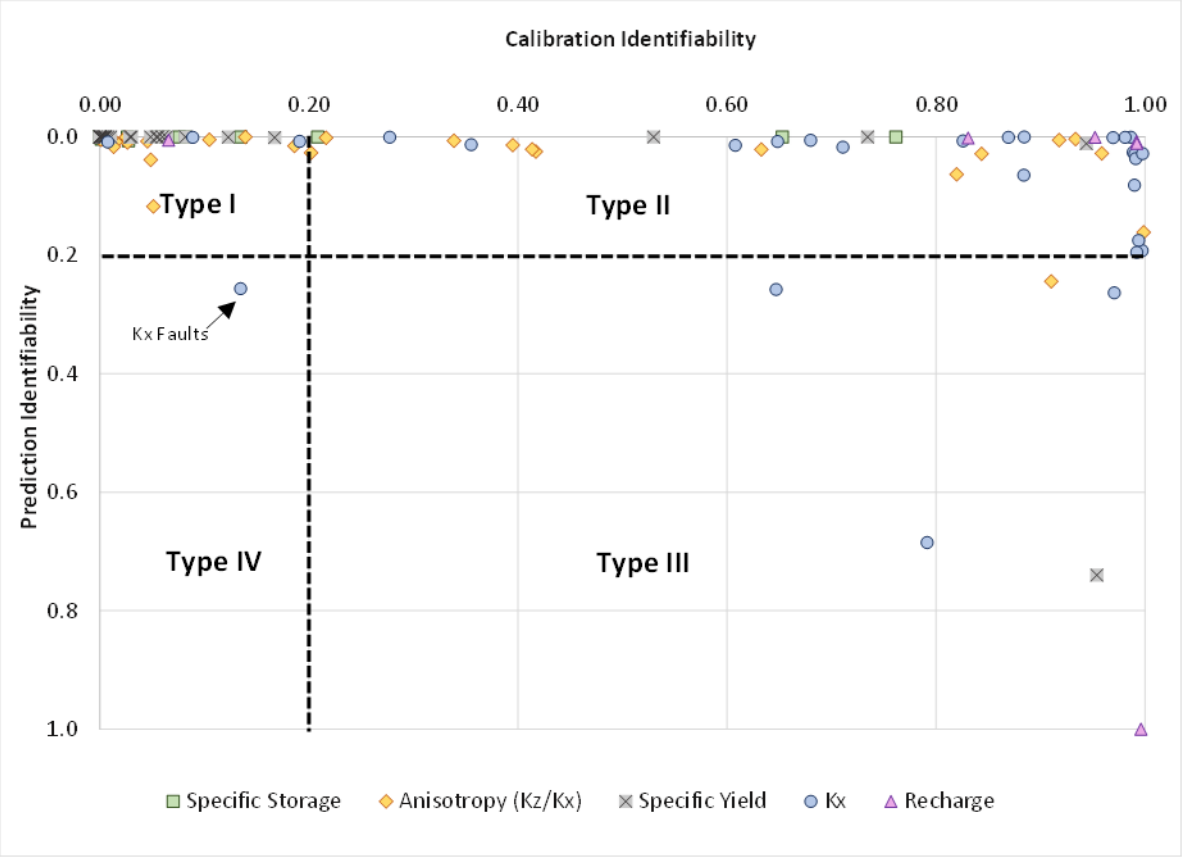


Figure 5-9 Uncertainty Contribution (Maximum Cumulative Drawdown) versus Identifiability

6 Uncertainty Analysis

A Type 3 Monte Carlo uncertainty analysis (IESC, 2018) was undertaken to estimate the uncertainty in the future impacts predicted by the model. This method operates by generating numerous alternative sets of input parameters to the deterministic groundwater flow model (realisations), executing the model independently for each realisation, and then aggregating the results for statistical analysis.

The first step in Monte Carlo analysis is to define the parameter distribution and range. For this project, the parameters are assumed to be log-normally distributed around the optimum value derived from the calibration and the standard deviation attributed to the log (base 10) of parameter is 0.5. The distributions for each parameter were checked and constrained such that upper or lower ranges do not go beyond ranges in literature for physical constraints. 1100 model realisations were generated, each having differing values of key parameters. The realisations were run, and calibration quality was assessed. In this case, models were considered to have an acceptable calibration if they achieved an SRMS less or equal to calibration SRMS of 5.4 %. Of the 1100 model runs, 250 model runs were found to be meet the above criteria. These were used in all model scenarios (calibration, Cumulative Mining, Base Case Mining, and No Mining) and statistically analysed for uncertainty analysis.

6.1 Parameter Distribution

Table 6-1 to **Table 6-6** show the parameter ranges explored during the sensitivity and uncertainty analysis simulation. Parameters were assumed to possess a log-Normal distribution. Instead of simple random sampling, the Latin Hypercube Sampling (LHS) method was used to create random realisations from parameter distribution. LHS aims to spread the sample points evenly across all possible values. In doing so, it divides parameter space into N intervals of equal probability and chooses one sample from each interval. The generated random numbers derived from LHS approach is distributed sufficiently across the parameter space even at the small sample size. The main advantage of LHS over simple random sampling is that a lower number of realisations are needed to obtain a reasonable convergence of the uncertainty results. The parameter distribution for the initial parameter distribution and converged and calibrated model runs are provided as **Appendix D**.

Table 6-1 Uncertainty Parameter Range for Horizontal Hydraulic Conductivity

Zone	Layer - Unit	Horizontal Hydraulic Conductivity (m/day)	
		Mean (Log10)	Constraint
1	Layer 1 - Alluvium	1.08	>0.1
2	Layer 1 - Regolith	0.00	< Kx_Alluvium, >0.01
3	Layer 1 - Weathered Permian	-0.19	< Kx_Alluvium, >0.01
4	Layer 1 - Duaringa Formation	-0.30	< Kx_Alluvium, >0.01
5	Layer 1/2 - Tertiary Basalt	0.51	>0.01
6	Layer 2 - Regolith	0.00	= L1 regolith
7	Layer 3-19- Faults_zone1	-0.91	>0.00001
8	Layer 3-Rewan	-2.63	< Kx_Alluvium, Regolith, Weathered Permian, Duaringa, Basalt
9	Layer 4 - RCM O/B	-2.16	< Kx_Alluvium,L5

Zone	Layer - Unit	Horizontal Hydraulic Conductivity (m/day)	
		Mean (Log10)	Constraint
10	Layer 5 - Leichhardt Seam	-1.02	< Kx_Alluvium
11	Layer 6 - RCM I/B	-2.93	< Kx_Alluvium,L5
12	Layer 7 - Vermont Seam	-1.96	< Kx_Alluvium
13	Layer 8 - RCM U/B	-3.00	< Kx_Alluvium,L7
14	Layer 9 - FCCM O/B	-3.00	< Kx_Alluvium,L10
15	Layer 10 - FCCM Seam	-2.94	< Kx_Alluvium
16	Layer 11 - FCCM U/B	-0.39	< Kx_Alluvium,L10
17	Layer 12 - Q Seam	-1.00	< Kx_Alluvium
18	Layer 13 - MCM U/B	0.69	< Kx_Alluvium,L12
19	Layer 14 - P Seam	0.69	< Kx_Alluvium
20	Layer 15 -MCM I/B	-0.52	< Kx_Alluvium,L14
21	Layer 16 - H Seam	-0.98	< Kx_Alluvium
22	Layer 17 - MCM I/B	-0.65	< Kx_Alluvium,L16
23	Layer 18 - D Seam	-1.00	< Kx_Alluvium
24	Layer 19 - MCM U/B	-0.56	< Kx_Alluvium,L18
25	Layer 3-19 - Faults zone 2	-0.46	>0.00001
26	Layer 7 - Faults zone 3	-0.32	>0.00001
27	Layer 8 - Faults zone 4	-0.40	>0.00001
28	Layer 2 - Regolith under alluvium	0.00	= L1 regolith

Standard deviation = 0.5 order of magnitude for all units.
O/B = Overburden.
I/B = Interburden.
U/B = Underburden.
RCM = Rangal Coal Measures.
FCCM = Fort Cooper Coal Measures.
MCM = Moranbah Coal Measures.

Table 6-2 Uncertainty Parameter Range for Vertical to Horizontal Conductivity (Kz/Kx)

Zone	Layer - Unit	Anisotropy (Kv/Kx)	
		Mean (Log10)	Constraint
1	Layer 1 - Alluvium	-0.70	< 0.5, >0.001
2	Layer 1 - Regolith	-1.00	< 0.5, >0.001
3	Layer 1 - Weathered Permian	-1.18	< 0.5, >0.001
4	Layer 1 - Duaringa Formation	-1.25	< 0.5, >0.001
5	Layer 1/2 - Tertiary Basalt	-1.00	< 0.5, >0.001
6	Layer 2 - Regolith	-1.52	< 0.5, >0.001
7	Layer 3-19- Faults zone1	-1.02	< 0.5, >0.0001
8	Layer 3-Rewan	-1.11	< 0.5, >0.0001
9	Layer 4 - RCM O/B	-1.01	< 0.5, >0.0001
10	Layer 5 - Leichhardt Seam	-2.66	< 0.5, >0.001
11	Layer 6 - RCM I/B	-0.97	< 0.5, >0.0001
12	Layer 7 - Vermont Seam	-1.43	< 0.5, >0.001
13	Layer 8 - RCM U/B	-2.65	< 0.5, >0.0001
14	Layer 9 - FCCM O/B	-1.00	< 0.5, >0.001
15	Layer 10 - FCCM Seam	-0.79	< 0.5, >0.001
16	Layer 11 - FCCM U/B	-2.33	< 0.5, >0.0001
17	Layer 12 - Q Seam	-0.70	< 0.5, >0.001
18	Layer 13 - MCM U/B	-0.70	< 0.5, >0.001
19	Layer 14 - P Seam	-1.29	< 0.5, >0.001
20	Layer 15 -MCM I/B	-1.33	< 0.5, >0.0001
21	Layer 16 - H Seam	-2.14	< 0.5, >0.001
22	Layer 17 - MCM I/B	-1.21	< 0.5, >0.0001
23	Layer 18 - D Seam	-1.42	< 0.5, >0.001
24	Layer 19 - MCM U/B	-2.23	< 0.5, >0.0001
25	Layer 3-19 - Faults zone 2	-1.02	< 0.5, >0.0001
26	Layer 7 - Faults zone 3	-2.99	< 0.5, >0.0001
27	Layer 8 - Faults zone 4	-2.21	< 0.5, >0.0001
28	Layer 2 - Regolith under alluvium	-2.11	< 0.5, >0.001

Standard deviation = 0.5 order of magnitude for all units.

Table 6-3 Uncertainty Parameter Range for Specific Yield

Zone	Layer - Unit	Anisotropy (Kv/Kx)	
		Mean (Log10)	Constraint
1	Layer 1 - Alluvium	-1.60	> 0.025 ; < 0.15
2	Layer 1 - Regolith	-1.67	< Sy_Alluvium, > 0.02, < 0.15
3	Layer 1 - Weathered Permian	-2.73	< Sy_Alluvium, > 0.001, < 0.15
4	Layer 1 - Duaringa Formation	-1.71	< Sy_Alluvium, > 0.01, < 0.05
5	Layer 1/2 - Tertiary Basalt	-1.74	< Sy_Alluvium, > 0.02, < 0.1
6	Layer 2 - Regolith	-1.30	< Sy_Alluvium, > 0.05, < 0.15
7	Layer 3-19- Faults_zone 1	-2.09	< Sy_Alluvium, > 0.008, < 0.05
8	Layer 3-Rewan	-2.02	< Sy_Alluvium, > 0.008, < 0.1
9	Layer 4 - RCM O/B	-2.00	< Sy_Alluvium, > 0.001, < 0.05
10	Layer 5 - Leichhardt Seam	-3.00	< Sy_Alluvium, > 0.001, < 0.05
11	Layer 6 - RCM I/B	-2.00	< Sy_Alluvium, > 0.01, < 0.05
12	Layer 7 - Vermont Seam	-2.68	< Sy_Alluvium, > 0.001, < 0.05
13	Layer 8 - RCM U/B	-2.40	< Sy_Alluvium, > 0.001, < 0.05
14	Layer 9 - FCCM O/B	-2.98	< Sy_Alluvium, > 0.001, < 0.05
15	Layer 10 - FCCM Seam	-2.46	< Sy_Alluvium, > 0.001, < 0.05
16	Layer 11 - FCCM U/B	-2.34	< Sy_Alluvium, > 0.001, < 0.05
17	Layer 12 - Q Seam	-3.00	< Sy_Alluvium, > 0.001, < 0.05
18	Layer 13 - MCM U/B	-2.76	< Sy_Alluvium, > 0.001, < 0.05
19	Layer 14 - P Seam	-2.80	< Sy_Alluvium, > 0.001, < 0.05
20	Layer 15 -MCM I/B	-2.57	< Sy_Alluvium, > 0.001, < 0.05
21	Layer 16 - H Seam	-2.74	< Sy_Alluvium, > 0.001, < 0.05
22	Layer 17 - MCM I/B	-2.99	< Sy_Alluvium, > 0.001, < 0.05
23	Layer 18 - D Seam	-3.00	< Sy_Alluvium, > 0.001, < 0.05
24	Layer 19 - MCM U/B	-2.42	< Sy_Alluvium, > 0.001, < 0.05
25	Layer 3-19 - Faults zone 2	-2.59	< Sy_Alluvium, > 0.002, < 0.05
26	Layer 7 - Faults zone 3	-2.22	< Sy_Alluvium, > 0.005, < 0.05
27	Layer 8 - Faults zone 4	-2.67	< Sy_Alluvium, > 0.002, < 0.05
28	Layer 2 - Regolith under alluvium	-2.77	< Sy_Alluvium, > 0.005, < 0.15

Standard deviation = 0.5 order of magnitude for all units.

Table 6-4 Uncertainty Parameter Range for Specific Storage (1/m)

Zone	Layer - Unit	Specific Storage (SS) 1/m	
		Mean (Log10)	Constraint
1	Layer 1 - Alluvium	-5.83	> 5 x 10-7
2	Layer 1 - Regolith	-5.55	< SS_Alluvium, > 1 x 10-7
3	Layer 1 - Weathered Permian	-6.99	< SS_Alluvium, > 1 x 10-7
4	Layer 1 - Duaringa Formation	-6.49	< SS_Alluvium, > 1 x 10-7
5	Layer 1/2 - Tertiary Basalt	-6.17	< SS_Alluvium, > 1 x 10-7
6	Layer 2 - Regolith	-6.75	< SS_Alluvium, > 1 x 10-7
7	Layer 3-19- Faults zone1	-5.52	< SS_Alluvium, > 5 x 10-8
8	Layer 3-Rewan	-6.25	< SS_Alluvium;< 5 x 10-5
9	Layer 4 - RCM O/B	-5.48	< SS_Alluvium;< 5 x 10-5
10	Layer 5 - Leichhardt Seam	-6.30	< SS_Alluvium;< 5 x 10-5
11	Layer 6 - RCM I/B	-6.30	< SS_Alluvium;< 5 x 10-5
12	Layer 7 - Vermont Seam	-6.30	< SS_Alluvium;< 5 x 10-5
13	Layer 8 - RCM U/B	-5.89	< SS_Alluvium;< 5 x 10-5
14	Layer 9 - FCCM O/B	-6.28	< SS_Alluvium;< 5 x 10-5
15	Layer 10 - FCCM Seam	-5.64	< SS_Alluvium;< 5 x 10-5
16	Layer 11 - FCCM U/B	-5.66	< SS_Alluvium;< 5 x 10-5
17	Layer 12 - Q Seam	-5.60	< SS_Alluvium;< 5 x 10-5
18	Layer 13 - MCM U/B	-5.43	< SS_Alluvium;< 5 x 10-5
19	Layer 14 - P Seam	-5.64	< SS_Alluvium;< 5 x 10-5
20	Layer 15 -MCM I/B	-5.30	< SS_Alluvium;< 5 x 10-5
21	Layer 16 - H Seam	-6.16	< SS_Alluvium;< 5 x 10-5
22	Layer 17 - MCM I/B	-5.87	< SS_Alluvium;< 5 x 10-5
23	Layer 18 - D Seam	-5.32	< SS_Alluvium;< 5 x 10-5
24	Layer 19 - MCM U/B	-6.15	< SS_Alluvium;< 5 x 10-5
25	Layer 3-19 - Faults zone 2	-6.24	< SS_Alluvium, > 5 x 10-8
26	Layer 7 - Faults zone 3	-5.42	< SS_Alluvium, > 5 x 10-8
27	Layer 8 - Faults zone 4	-6.13	< SS_Alluvium, > 5 x 10-8
28	Layer 2 - Regolith under alluvium	-5.03	< SS_Alluvium, > 5 x 10-6

Standard deviation = 0.5 order of magnitude for all units.

Table 6-5 Uncertainty Ranges for Recharge Rates

Zone	Unit	Mean % of rainfall	Constraints
1	Other Alluvium	0.23	>Regolith >Weathered Permian >Duaringa Formation > 1 x 10^{-4}
2	Regolith	0.01	> 1 x 10^{-5}
3	Weathered Permian	0.01	> 1 x 10^{-5}
4	Duaringa Formation	0.01	> 1 x 10^{-5}
5	Tertiary Basalt	0.30	> 1 x 10^{-4}
6	Alluvium Isaac River Channel	0.52	>Regolith >Weathered Permian >Duaringa Formation > 1 x 10^{-4}
7	Alluvium Isaac River	0.23	>Regolith >Weathered Permian >Duaringa Formation > 1 x 10^{-4}

Standard deviation = 0.5 order of magnitude for all units.

6.2 Number of realisations

As discussed above, 250 realisations met the calibration criteria and were selected as calibrated realisations. The predictive model was run using the 250 parameters sets. The results from the predictive model were used to conduct statistical analyses to assess if additional realisations were likely to provide results that would significantly change the reported predictive results. The 95 % confidence interval was calculated for the mine inflows and the maximum drawdown.

Figure 6-1 and **Figure 6-2** show the 95 % confidence intervals of the median and maximum drawdown and predicted inflows, as well as the variance of the median and maximum drawdown and predicted inflows as more realisations are added to the uncertainty analysis. For example, the 95% confidence interval for the maximum drawdown is calculated by first estimating the maximum drawdown for each realisation and then calculating the 95 % confidence interval of the maximum drawdowns as each realisation is added to the dataset. As shown in **Figure 6-1** and **Figure 6-2**, additional realisations are unlikely to significantly increase or decrease the confidence intervals of predictions of mine inflows and maximum drawdowns. Therefore, the results from the 250 realisations are considered representative and used for predicted drawdown and indirect water take (alluvium and surface water).

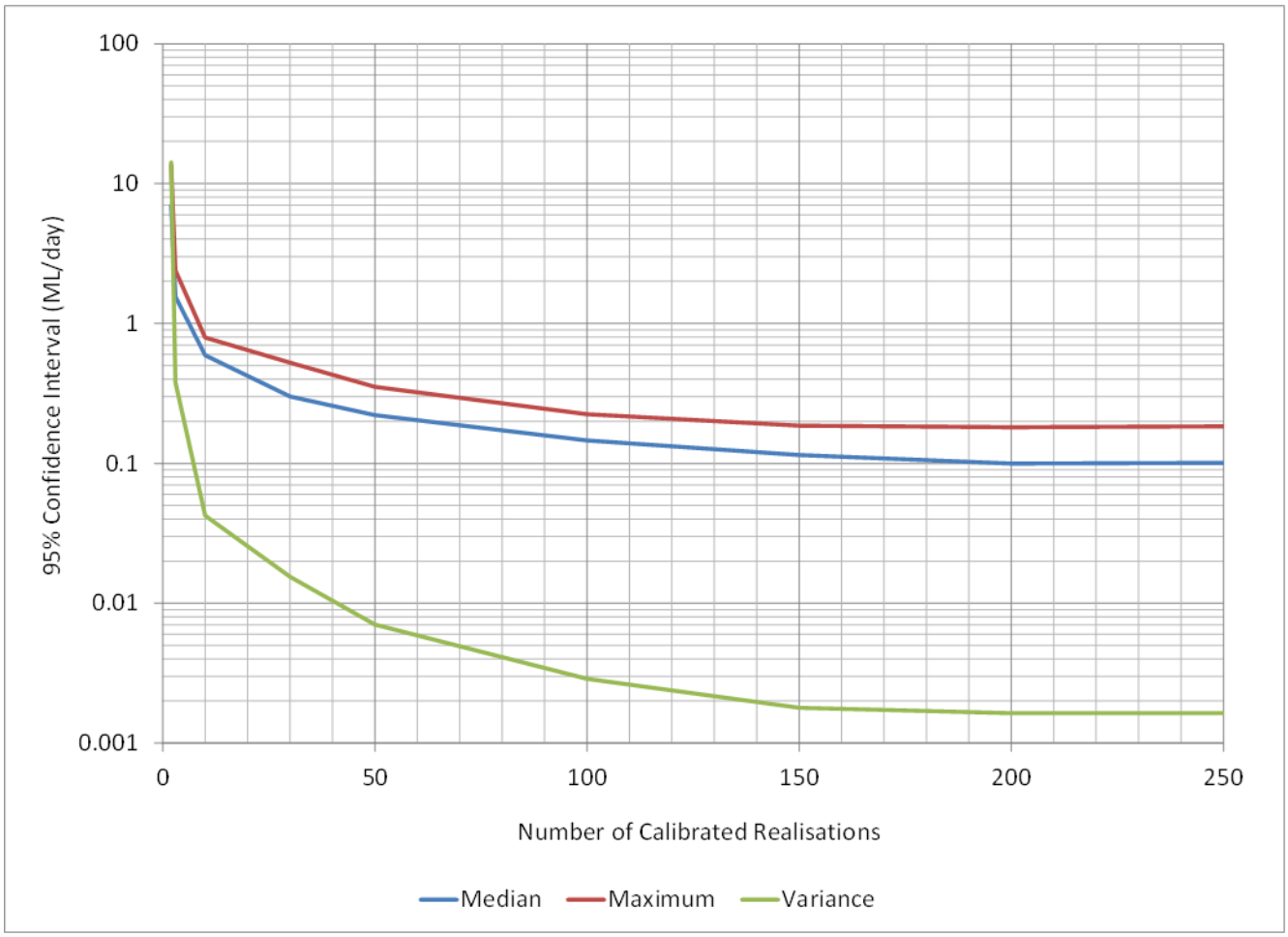


Figure 6-1 95 % Confidence Interval for Pit Inflows

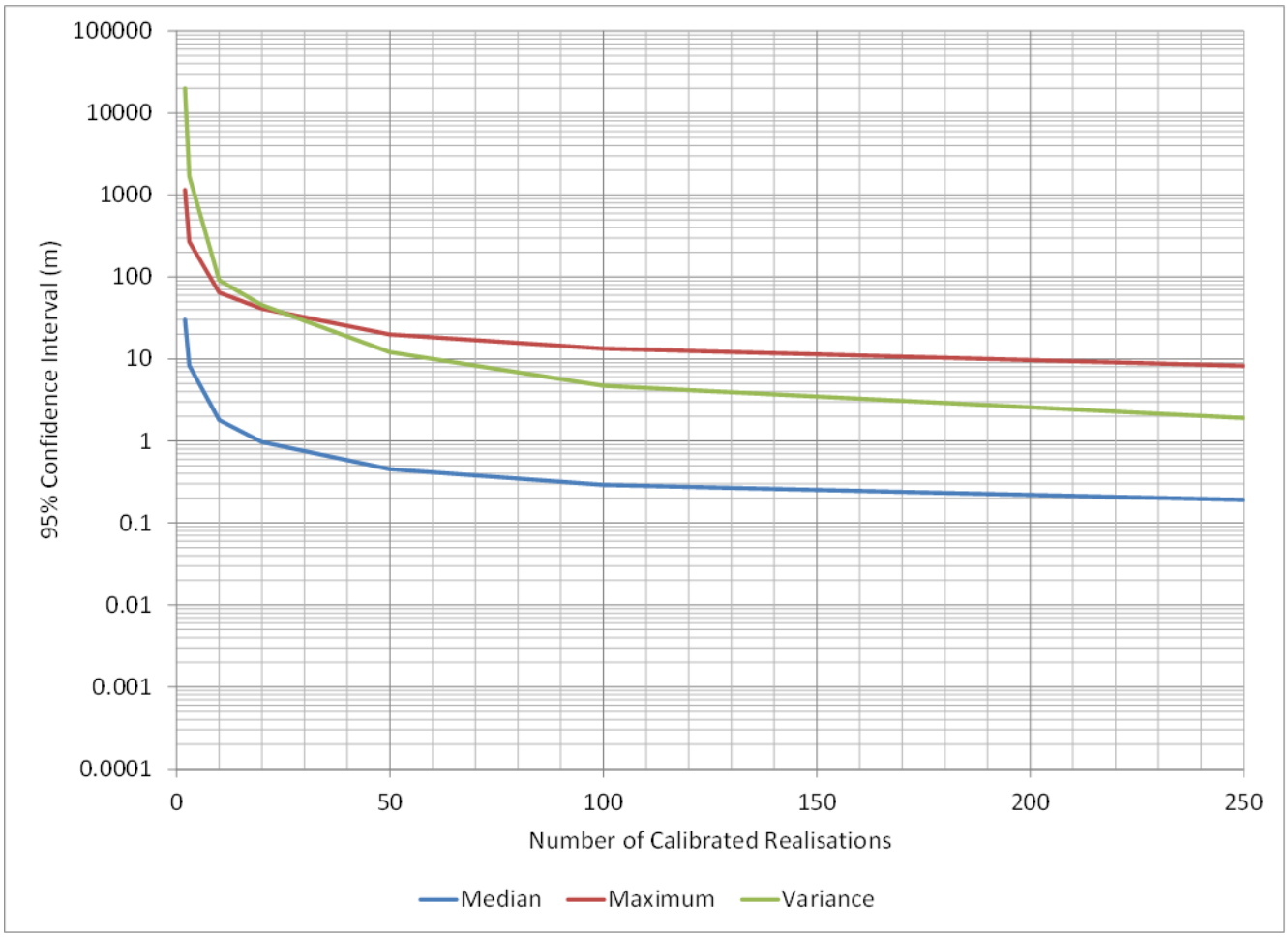


Figure 6-2 95 % Confidence Interval for Maximum Drawdowns

6.3 Uncertainty Results

6.3.1 Uncertainty of Mine Inflows

Figure 6-3 presents the uncertainty of groundwater inflow into the mine due to the proposed Meadowbrook Underground mining from start of the Project (January 2025) to the end of the mining at the proposed underground (January 2055). The figure shows the predicted inflows for the calibrated prediction model and different percentiles including 5th, 33th, 50th, 66th and 95th prediction bounds. Based on the IESC (2018) guidelines these represent:

- 5th percentile indicates it is very likely the outcome is larger than this value.
- 5th – 33rd indicates it is likely that the outcome is larger than this value.
- 33rd - 66th indicate it is as likely as not that the outcome is larger or smaller than this value.
- 67th - 95th indicates it is unlikely that the outcome is larger than this value.
- 95th percentile indicates it is very unlikely the outcome is larger than this value.

The bounds in the figure demonstrate the uncertainty within the predicted inflow rate. The bounds show that the calibrated prediction model is very close to the 50th percentile.

Figure 6-3shows that, the realisations created in uncertainty analysis provide a reasonable fit to calibration datasets and they generally predict inflows close to what is reported for the calibrated prediction model (**Section 4.5**). This can be seen in the figure by comparing the predicted inflow in the calibrated prediction model and the 50th percentile predicted inflow.

As shown in **Figure 6-3**, The maximum mine inflow in the uncertainty analysis was 1,316 ML/year (3.61 ML/day) for 2031 (very unlikely outcome is larger than this value). The 5th to 95th range in mine inflows for the year 2031 was 147.1 ML/year (0.40 ML/day) to 992.6 ML/year (2.72 ML/day).

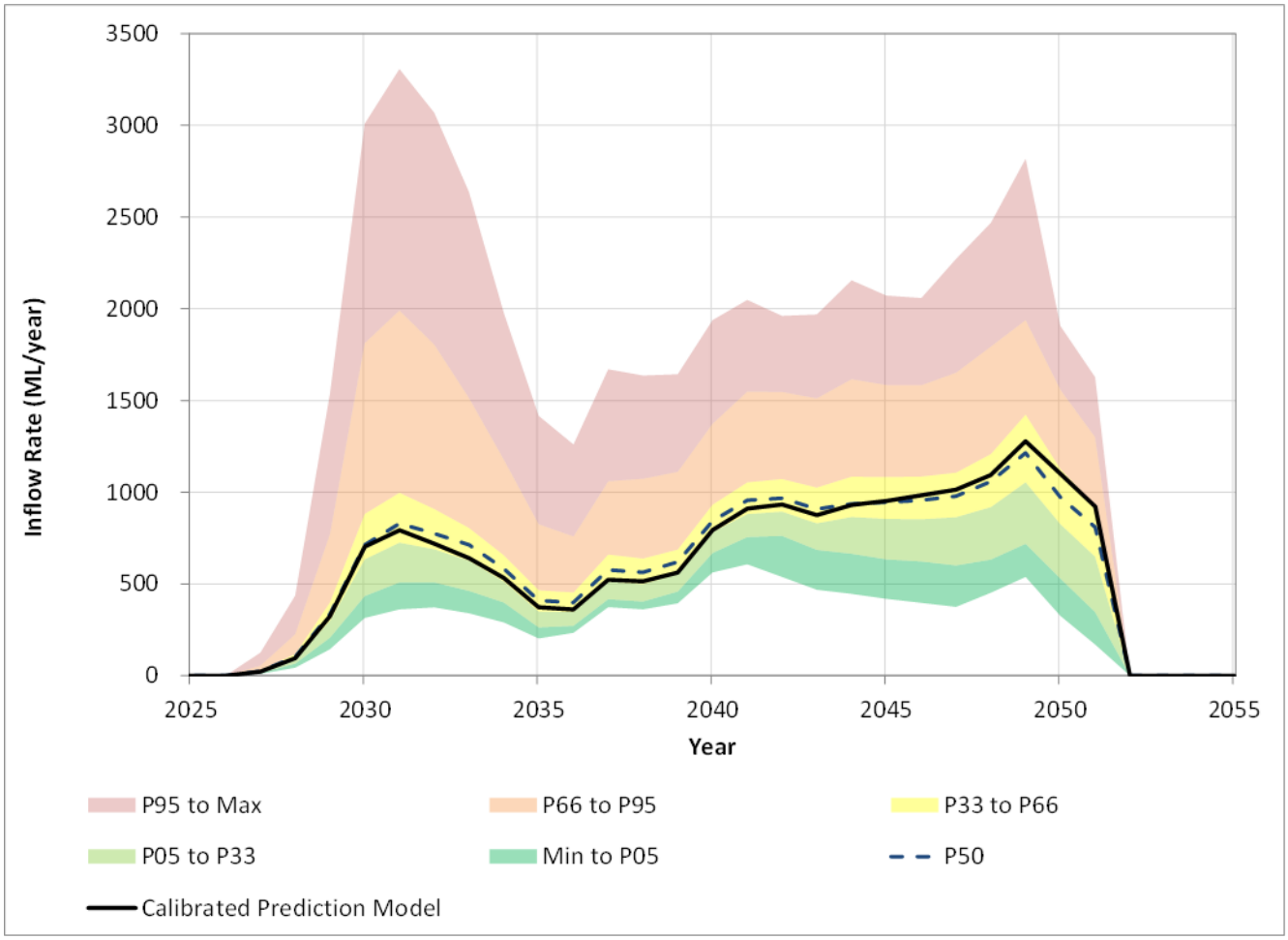


Figure 6-3 Mine Inflow Uncertainty

6.3.2 Uncertainty Of Changes in Fluxes from Alluvium

Figure 6-4 show the uncertainty in predicted change in fluxes from alluvium due to the Project. As discussed in **Section 4.6.1**, there is a predicted average loss of 0.01 ML/day from the alluvium in the calibrated prediction model.

As shown in **Figure 6-4**, the uncertainty results generally predict higher alluvium flux change than what is reported for the calibrated prediction model. This can be seen in the figure by comparing the predicted inflow in the calibrated prediction model and the 50th percentile predicted inflow. The difference between the calibrated model inflow and the 50th percentile is likely due to calibrated specific yield adopted for alluvium in the calibrated prediction model. A shown in **Table 6-3**, the specific yield value for the alluvium in the calibrated model is at the lower end of the parameter range. Therefore, the uncertainty analysis has tested the model with higher values for specific yield for the alluvium and this resulted in higher 50th percentile inflow comparing to the calibrated prediction model. While the value of 2.5% for specific yield for alluvium is reasonable and consistent with the literature, there were no measured inflow data available to constrain this parameter during the calibration. Therefore, the uncertainty analysis has tested the model with higher values for specific yield and this resulted in higher 50th percentile inflow comparing to the calibrated prediction model (see **Appendix D**).

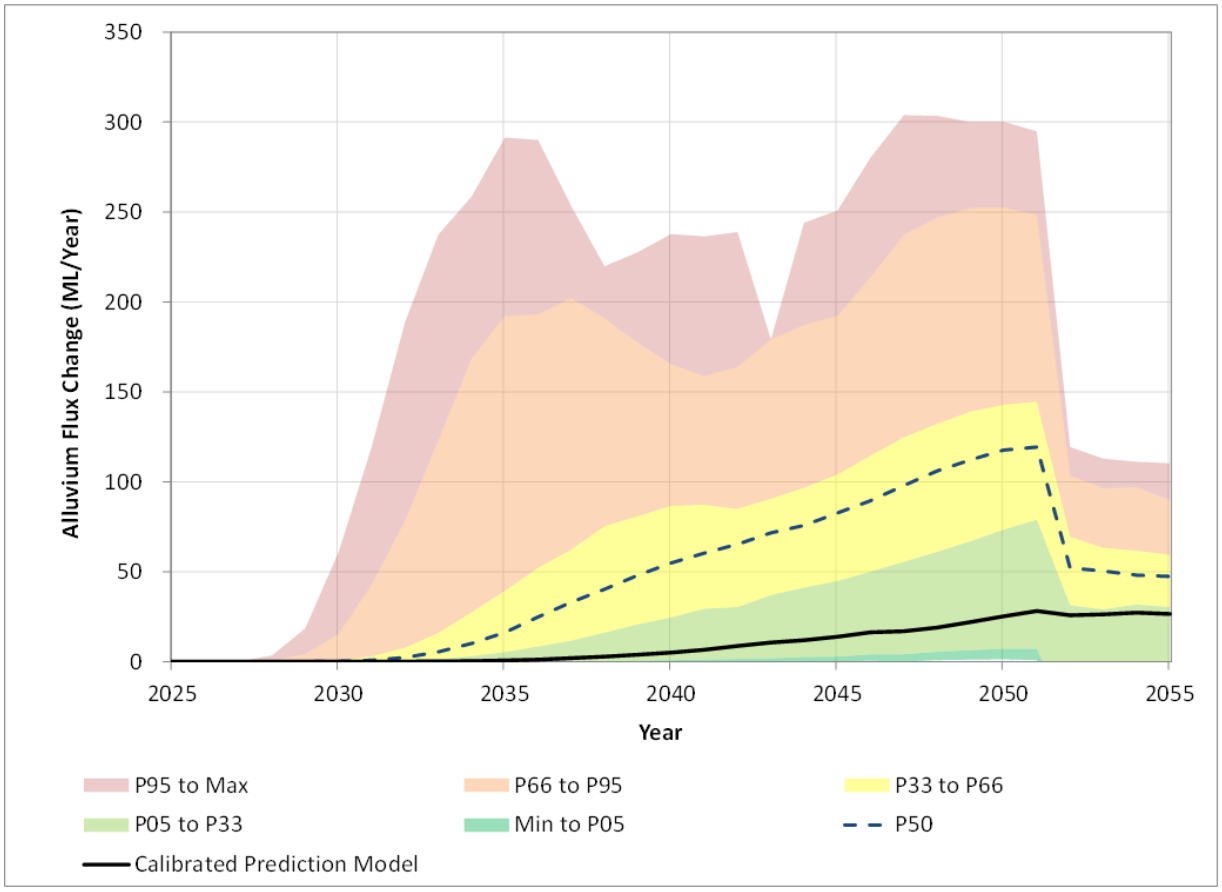


Figure 6-4 Uncertainty in Predicted Groundwater Fluxes From Alluvium

6.3.3 Uncertainty of Influence on Surface Water Flow

Table 6-6 shows the uncertainty range in river flow change. The uncertainty results indicate that the maximum increase in leakage from the Isaac River due to the Project could reach up to 90 ML/year (95th percentile).

Table 6-6 Uncertainty Base Flow Take (ML/year)

	5th percentile	50th percentile	Calibrated Model	95th percentile
Baseflow	0.0	33	0.0	90

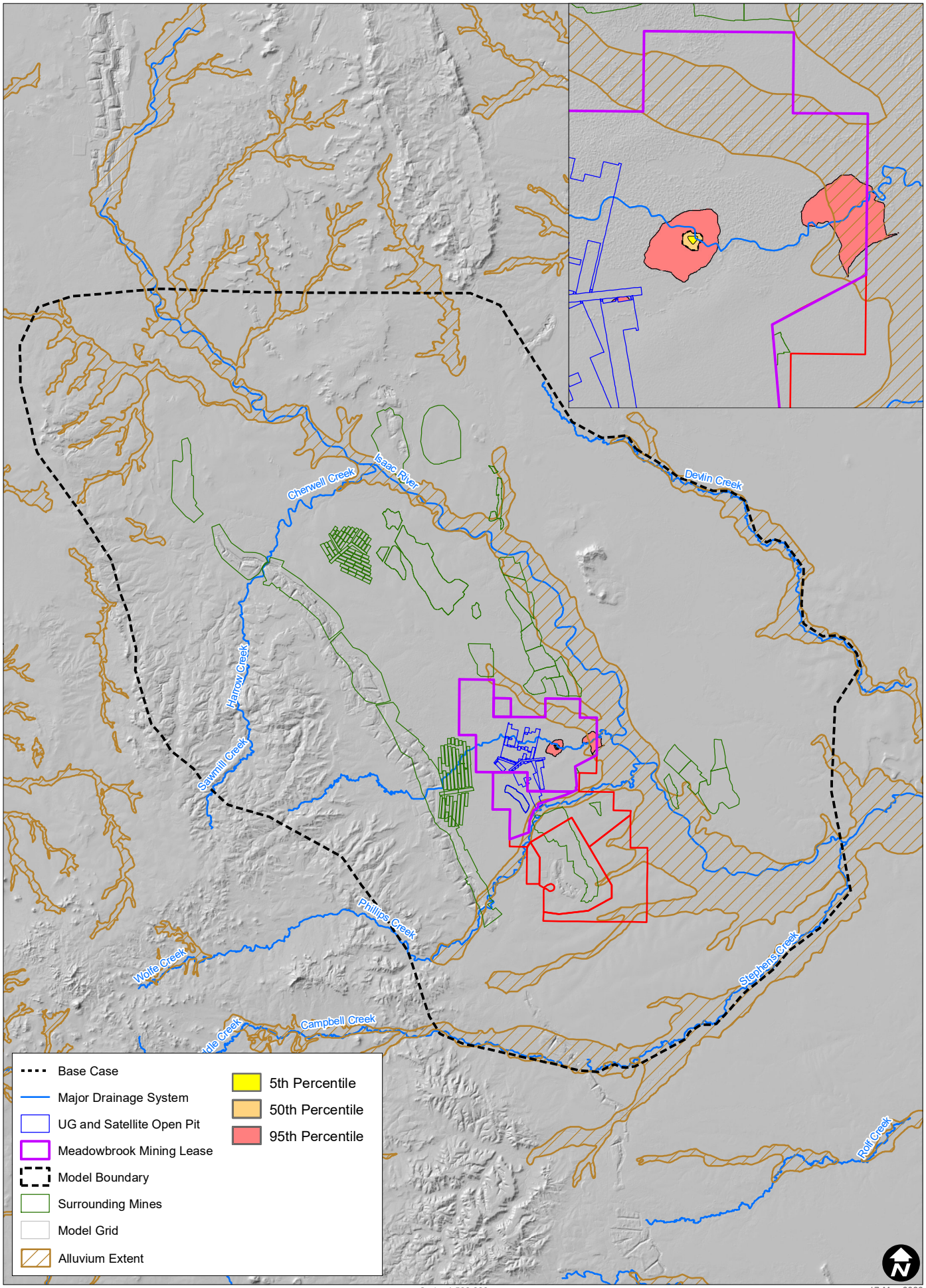
6.3.4 Uncertainty of Groundwater Drawdowns

To illustrate the level of uncertainty in the extent of predicted drawdown due to the Project, the calibrated prediction model maximum drawdown and the 50th percentile maximum drawdown extent were compared to the maximum drawdown extent for the 5th and 95th percentiles.

Figure 6-5 shows the uncertainty analysis for the predicted incremental drawdown impacts greater than 2 m for the Quaternary alluvium as a result of mining at the Project. The figure shows that the 95th percentile drawdown in alluvium along the Boomerang Creek extended further to the east and reached the boundary of the mine lease.

Figure 6-6 shows the uncertainty in the extent of predicted 2 m maximum incremental drawdown in regolith. As shown in this figure, the 5th, 50th and 95th percentile maximum drawdowns in the regolith are localised in the northern boundary of the Project area.

Figure 6-7 and **Figure 6-8** show the uncertainty in the extent of predicted 2 m maximum incremental drawdown in the Leichhardt Seam and Vermont Seam. The figures show that the 95th percentile drawdown in Leichhardt Seam and Vermont Seam between 8 and 10 km to the north the Project area (down-dip).



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620305892 F6-5 Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Alluvium (Layer1).mxd

Scale: 1:500,000
GDA 1994 MGA Zone 55

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620.30592

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SLR
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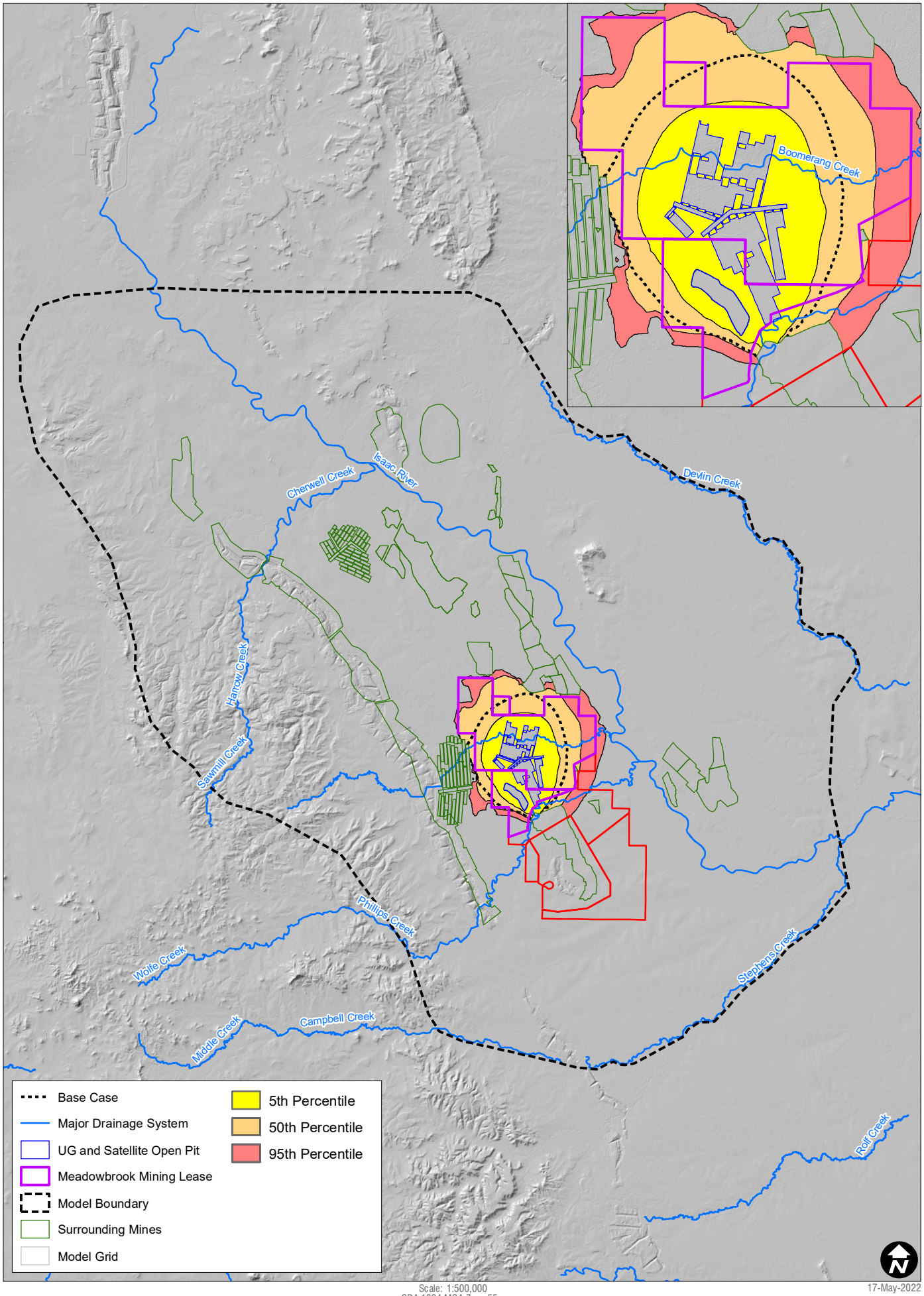
0 10 km

Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Alluvium (Layer1)

FIGURE 6-5



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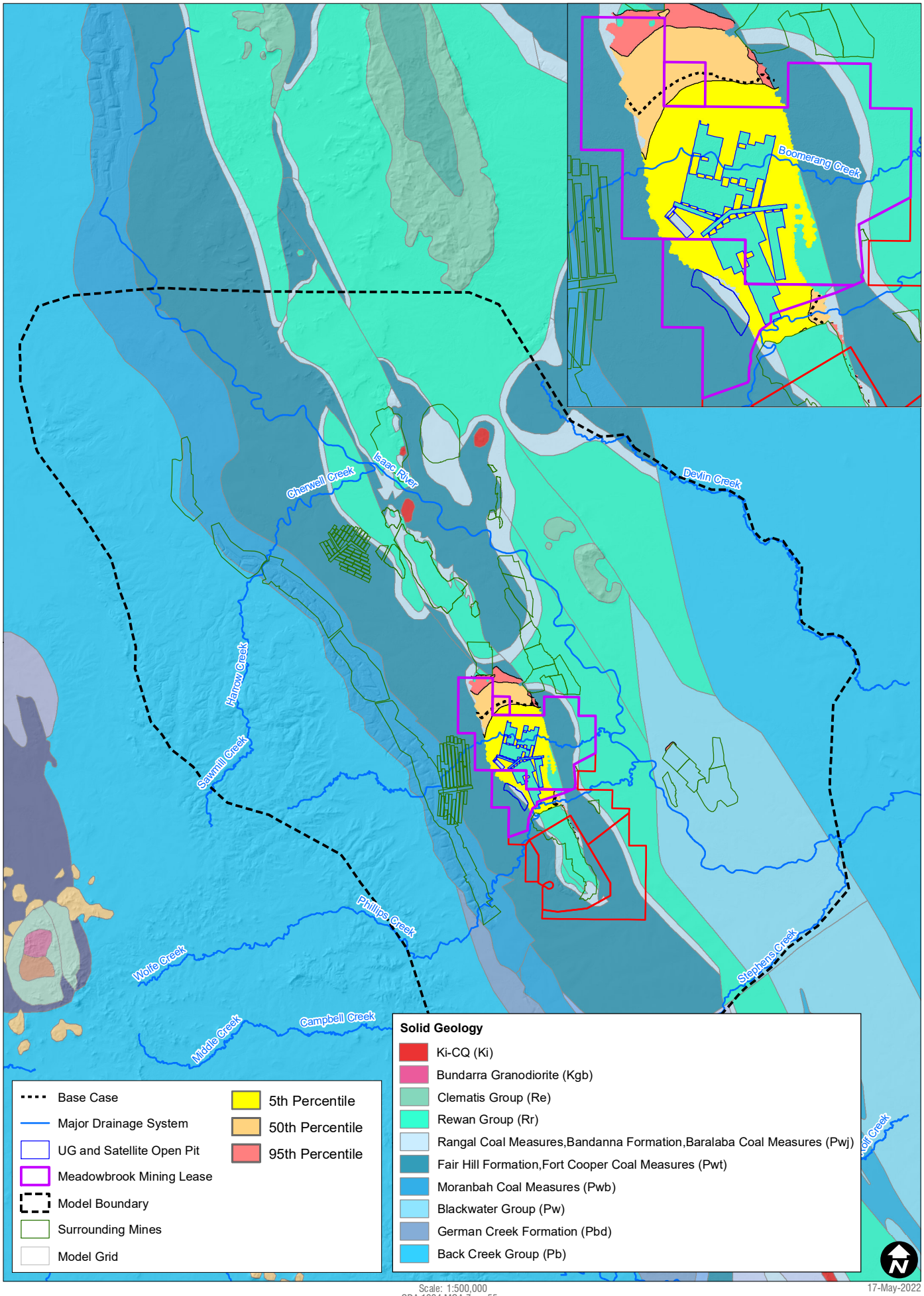
0 10 km

Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Regolith (Layer 2)

FIGURE 6-6



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 F6-7 Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Leichardt Seam (Layer 5).mxd

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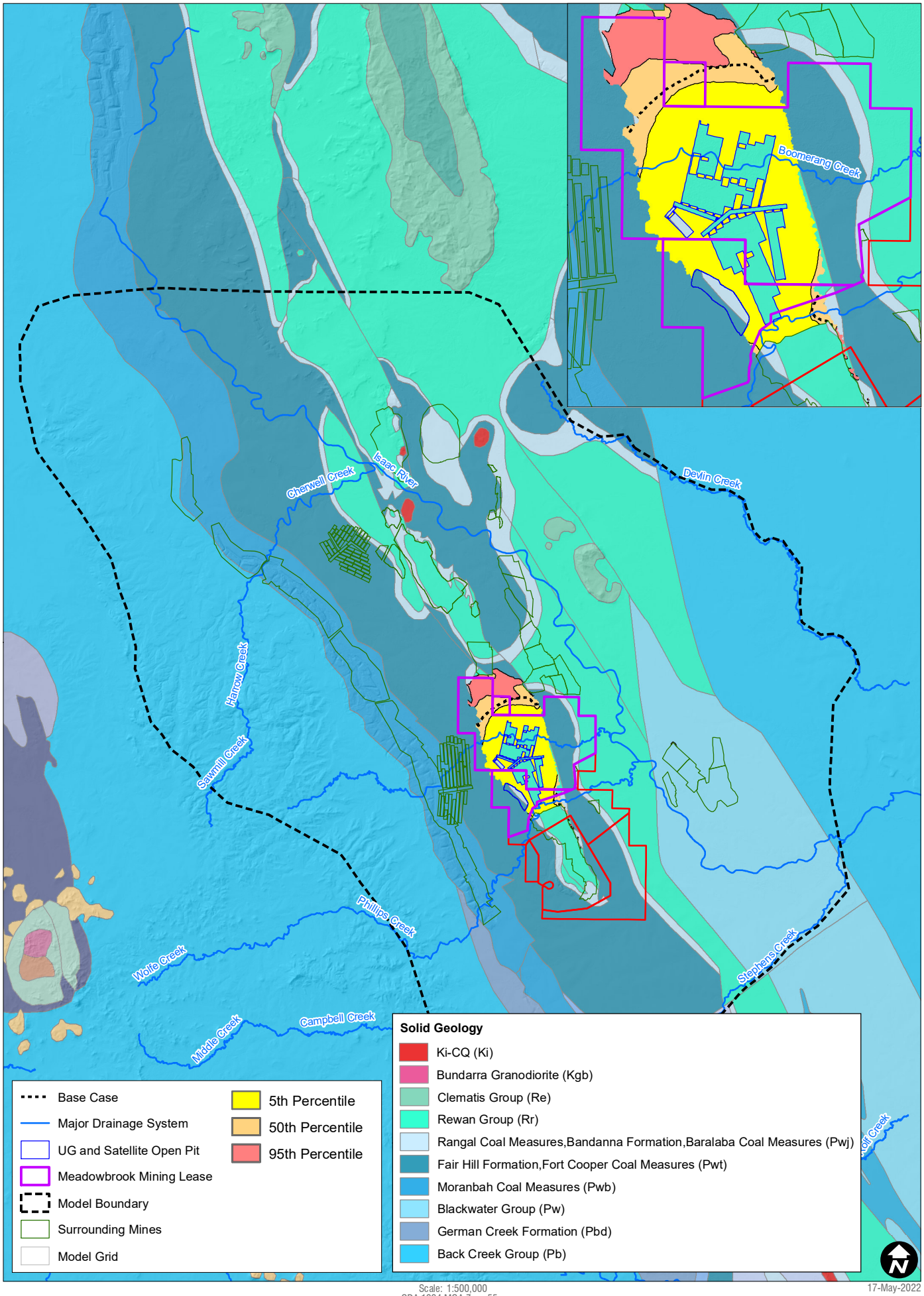
Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Leichardt Seam (Layer 5)

FIGURE 6-7



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 F6-8 Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Vermont Seam (Layer 7).mxd

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GDA 1994 MGA Zone 55

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Sheet Size : A4

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Uncertainty in Predicted 2 m Maximum Incremental Drawdown in Vermont Seam (Layer 7)

FIGURE 6-8

7 Model Confidence Level Classification

The groundwater modelling was conducted in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al. 2012), the MDBC Groundwater Flow Modelling Guideline (MDBC 2001) and the released IESC Explanatory Note for Uncertainty Analysis (IESC 2018). These are mostly generic guides and do not include specific guidelines on special applications, such as underground coal mine modelling.

The Australian Groundwater Modelling Guidelines has replaced the model complexity classification of the previous MDBC Groundwater Flow Modelling Guideline by a "model confidence level" (Class 1, Class 2 or Class 3 in order of increasing confidence) typically depending on:

- Available data (and the accuracy of that data) for the conceptualisation, design and construction.
- Calibration procedures that are undertaken during model development.
- Consistency between the calibration and predictive analysis.
- Level of stresses applied in predictive models.

It is generally expected that a model confidence level of Class 2 is required for mining environmental impact assessment. **Table 7-1** (based on Table 2.1, Barnett et al. 2012) summarises the classification criteria and shows a scoring system allowing model classification. The groundwater model developed for this Groundwater Assessment may be classified as primarily Class 2 (effectively “medium confidence”) with some items meeting the higher Class 3 criteria, and therefore the model is considered fit for purpose for this Project context.

Table 7-1 Groundwater Model Classification Table

Class	Data	Calibration	Prediction	Indicators	Total
1	Not much. Spares. **Not metered usage.** Remote climate data.	Not Possible. Large error statistics. Inadequate data spread. Targets incompatible with model purpose.	Timeframe>>calibration. Long stress periods. Transient prediction but steady state calibration. Bad verification.	Timeframe>10x. Stresses>5x. Mass balance>1% (or single 5%). Properties<>Field. Bad discretisation. No review.	
Count	1	0	0	0	**1**
2	**Some.** **Poor coverage.** Some usage info. Baseflow estimates.	**Partial performance.** Long-term trends wrong. Short time record. **Weak seasonal replication.** No use of targets compatible with model purpose.	**Timeframe>calibration.** **Long stress periods.** New stresses not in calibration. Poor verification.	**Timeframe=3-10x.** **Stresses=2-5x.** **Mass balance<1%.** **Properties<>Field measurements.** **Some key coarse discretisation.** **Reviewed by hydrogeo.**	
Count	2	2	2	6	**12**

Class	Data	Calibration	Prediction	Indicators	Total
3	Lots. Good aquifer geometry. Good usage info. **Local climate info.** **K measurements** **Hi –res DEM.**	Good performance stats. Long-term trends replicated. Seasonal fluctuations OK. **Present day data targets.** **Head and flux targets.**	Timeframe~calibration. Similar stress periods. Similar stresses to those in calibration. Steady state prediction consistent with steady state calibration. Good verification.	Timeframe<3x. Stresses<2x. **Mass balance<0.5%** Properties~Field measurements. Some key coarse discretisation. **Reviewed by modeller.**	
Count	3	1	0	2	**6**

8 Groundwater Model and Data Limitations

The IESC Uncertainty analysis – Guidance for groundwater modelling within a risk management framework (2018) identifies four key sources of scientific uncertainty affecting groundwater model simulations:

- Structural/conceptual.
- Parameterisation.
- Measurement error.
- Scenario uncertainties.

These four sources of scientific uncertainty have been qualitatively assessed with regards key aspects of the Meadowbrook groundwater model, as presented **Table 8-1**.

Overall, the model captures depressurisation due to active mining. The model is numerically stable with no mass balance error. The model shows a good fit between observed and modelled groundwater levels (Section 3.1). A depth dependence function was used for hydraulic conductivity, with the calibrated values showing a good fit to observed data as presented in **Section 3.4**. Overall, the model is considered fit for purpose to achieve the objectives outlined in **Section 1** based on the data provided and the project timeframe.

In case of future use of the model, updates could be conducted to further refine the model if it was deemed that an increase in model confidence level was required, but the applicability of this would be dependent on the purpose of the future modelling and availability of data to inform future changes. As it stands, the current model is deemed fit for purpose for the Project impact assessment.

Table 8-1 Groundwater Model and Data Limitations

Type	Part	Status	Comment
Structural/ Conceptual	Grid and Model Extent	Fit for purpose	The model has an unstructured Voronoi grid that includes detailed cell refinement around site, neighbouring mines and along drainage features.
	Layers	Fit for purpose	Top of layer 1 incorporates site LiDAR data
		Fit for purpose	Representation of alluvium based on CSIRO (2015) regolith mapping and refined based on site drill data.
	Conceptualisation – Geological Structure	Fit for purpose	The local structure of the geology is based on detailed data at site (Lake Vermont Mine geology model), and regional model geometry (outside of site) interpolated based on neighbouring mines geology models (Caval Ridge, Winchester South, Meadowbrook, Moorvale South and Olive Downs South) and geological mapping. There are major faults mapped within and around the Project area. The main structural feature is the Isaac Fault that passes north-south through the Lake Vermont area and separates relatively undisturbed sediments to the west from a complex zone of folded and faulted sediments to the east. Smaller faults are also mapped within the Project area. The faults have been included within the Project area in the model using conductivity zones and also through layer displacements from the site geological model.
	Conceptualisation – GDEs	Fit for purpose, future improvements possible if new data collected	AARC (2021) undertook an environment assessment of the condition of the aquatic ecosystems in the vicinity of the Project Area in 2021. This data on known GDEs (location and interaction) have been considered and incorporated.
	Conceptualisation – Surface Water Groundwater Interactions	Fit for purpose	The Permian coal measures outcrop along the eastern and western edge of the site. Therefore, how this is captured within the model influences the model predictions. The structure of the coal seams was checked to ensure it matches observed and mapped geology. The predictions of drawdown adjacent to mining was checked and the model shows a good fit between modelled and observed trends.

Type	Part	Status	Comment
	Conceptualisation – Saturated Extent of Alluvium and Regolith	Fit for purpose	Site monitoring network includes 2 bores mapped within alluvium that were used to inform saturated extent of alluvium locally at site and for calibration targets. The model underpredicts groundwater levels in alluvium, but generally within 8 m of observed levels. For the extent of alluvium in the vicinity of the Project Area (i.e., alluvium along Boomerang Creek), bore logs and Google satellite images were used. Any additional data or study on alluvium extent and thickness at Meadowbrook should be reviewed and captured (where relevant) in future updates of the model. Such improvements are not deemed required for the Project impact assessment however.
Parameterisation	Hydraulic Conductivity – Depth Dependence	Fit for purpose, future improvements possible	Field testing of hydraulic conductivity (horizontal and to a lesser extent vertical) has been conducted in the area. Hydraulic conductivity test results from the other sites within the model domain were also considered. The data shows a general decline in hydraulic conductivity with depth that is replicated in the model. Further conductivity tests and measurements of storage properties can improve model calibration and refine model predictions but are not deemed required for the Project impact assessment.
	Spoil Properties	Fit for purpose, future improvements possible	No site-specific data is available for the spoil. Spoil properties were adopted using the previous studies in the region. Further conductivity tests and measurements of storage properties of spoil can improve with refining model predictions but are not deemed required for the Project impact assessment.
	Pumping	Fit for purpose,	Landholder bores discharges were not included in the model due to lack of any information about the pumping rates from the bores.
	Rivers	Fit for purpose, future improvements possible	Isaac River stage height is changed temporally in the historical calibration model based on observed levels from government stream gauges, and long term annual average level assumed in the predictive model. Watercourses within and in the vicinity of the Project Area such as Boomerang Creek, Philips Creek and One Mile Creek are ephemeral and only flow briefly after rainfall. Therefore, river stage height of zero was assigned to these watercourses in the model. Measurements of flow rates and stage height in the rivers can help with improving the model calibration and refining the model predictions, but are not deemed required for the Project impact assessment.

Type	Part	Status	Comment
	Recharge	Fit for purpose	Recharge zonation is based on mapped surface geology and calibrated recharge rates. Conceptualised recharge from episodic flows in ephemeral streams is not included in the model due to very short period of flow in the creeks (much smaller scale comparing to the model time slices).
Measurement Error	Observation Data Quality	Fit for purpose	Bore logs and construction details available for most site bores, and long-term site water level data available for some units. Further data for the new monitoring bores at Meadowbrook will help with refining the model calibration in the future updates of the model.
	Landholder Bore Data Quality	Fit for purpose	Impacts on registered landholder bores are influenced by the assumptions of the bore design, target geology and use.
	Temporal spread	Fit for purpose	Timeseries water level data from the site as well as the neighbouring mines (Winchester South, Moorvale South, Olive Downs South, Caval Ridge, Peak Downs, Moranbah South) for the alluvium and Permian coal measures.
Scenario Uncertainties Future stresses/ conditions	Calibration	Fit for purpose	Transient warm-up (1988-2008) and transient (2008 to 2020) calibration model set up and a depth dependence function used and calibration to water levels conducted using automated (PEST) and manual methods.
	Predictive	Fit for purpose	Model captures proposed underground and open cut mining at Meadowbrook. The model also includes future mining at Lake Vermont, Sarajii, Peak Downs, Caval Ridge and Grosvenor based on site data or publicly available data. The actual future mine progression for some of these sites may vary.
	Sensitivity and uncertainty	Fit for purpose	Uncertainty analysis has been conducted by stochastic modelling using an adapted Monte Carlo method with modern software packages. The Latin Hypercube Sampling (LHS) method was used to create random realisations from parameter distributions and PEST++ was used to orchestrate the model runs. The uncertainty analysis quantified the variability in predictions with changes in maximum predicted drawdowns, mine inflows, impact on alluvium flow and impacts on surface water flow.

9 Conclusions

The numerical groundwater model developed for the Project successfully achieved the modelling objectives, as outlined in **Section 1**. Model calibration statistics are within suggested guidelines (Middlemis et al., 2001) and mass balance errors remain low, through the model calibration and predictive modelling. Model construction considers all available data, including the current site mine plan and site geological model for the Project Area.

While the site has a good data set for hydraulic conductivity measurements, limited site-specific information on aquifer storage and specific yield parameters were available during calibration. As more site-specific hydraulic data becomes available, new data should be compared with the calibrated parameters achieved and the validity of the model calibration should be assessed. Additional site-specific data is expected to "tighten" uncertainty bounds for model prediction results. Predictive sensitivity indicates that mine inflows are most sensitive to the specific yield values of the Rangal Coal Measures. However, calibration sensitivity to these parameters is relatively low. Future work could consider opportunities to further constrain values of these parameters. However, as it stands, the model is deemed fit for purpose for the Project impact assessment without such improvements.

Uncertainty analysis has demonstrated there is a likelihood for the Project to impact on alluvial water levels, with drawdown to areas primarily contained within the Project Area. The model serves as a suitable representation of possible transient groundwater conditions within the Study Area, over the life of the Project; however, the uncertainty in predictions should be acknowledged.

10 References

AGE (2012), Saraji East Project Groundwater Impact Assessment, For Sinclair Knight Merz, Project No. G1549, March 2012

AGE (2016), G200s Project Grosvenor Groundwater Impact Assessment Report, For Hansen Bailey Pty Ltd, Project Number G1807A, September 2016.

Barnett, B., Townley, L.R., Post, V., Evans, R.E., Hunt, R.J., Peters, L., Richardson, S., Werner, A.D., Knapton, A. and Boronkay, A., 2012. Australian Groundwater Modelling Guidelines. Waterlines Report Series No. 82, June 2012.

Ditton Geotechnical Services (2013). Sub-Surface Fracture Height Review and Predictions for the Proposed Longwalls 42 to 47, 51 and 52 at West Wallsend Colliery, Killingworth. Prepared for West Wallsend Colliery. Report WWD-012/8b 30th Aug 2013.

Ditton and Merrick, 2014. A New Sub-Surface Fracture Height Prediction Model for Longwall Mines in the NSW Coalfields. Presentation given at Australian Earth Sciences Convention, Newcastle (04/07/2014).

Doherty, J., 2010. PEST - Model Independent Parameter Estimation. User Manual 5th Edition. Watermark Numerical Computing.

Gale, W. (2008). Aquifer inflow prediction above longwall panels. ACARP Project C13013.

GHB, 2017, Caval Ridge Mine Numerical Groundwater Model, Prepared for BHP, Project number 31/34006/03, December 2017

Groundwater Imaging Pty Ltd (Allen, D), 2018. Moorvale South AgTEM survey for Groundwater Investigation, near Coppabella, Bowen Basin, QLD. Report for Peabody Energy. 2018.

Hawkins, J.W., 1998. Hydrogeologic characteristics of surface-mine spoil. In Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania, ed. Brady, Smithy and Schueck. Harrisburg, Pennsylvania. Available at: http://www.techtransfer.osmre.gov/nttmainsite/Library/pub/cmdpppp/chapter3.pdf.

HydroAlgorithmics, 2018. AlgoCompute web site, https://www.algocompute.com/. Accessed 8 May, 2018.

HydroSimulations, 2018. Olive Downs South and Willunga. Appendix B. Modelling Appendix. Report for Pembroke Resources Pty Ltd. 2018.

JBT Consulting Pty Ltd, Meadowbrook Project Groundwater Impact Assessment, for Jellinbah Resources, JBT01-076-006, June 2022.

Mackie, C.D., 2009. Hydrogeological characterisation of Coal Measures and overview of impacts of coal mining on groundwater systems in the upper Hunter Valley of NSW. PhD thesis at University of Technology, Sydney.

MDBC (Middlemis, H., Merrick, N., and Ross, J.), 2001. Murray-Darling Basin Commission – Groundwater Flow Modelling Guideline. Report for MDBC. January 2001.

Merrick, D. and Merrick, N., 2015. AlgoMesh: A new software tool for building unstructured grid models. In Proc. MODFLOW and More, Golden, Colorado.

Merrick, D., 2017. AlgoCompute: Large-scale calibration and uncertainty analysis made easy in the cloud. In Proc. MODFLOW and More, Golden, Colorado.

Panday, S., Langevin, C.D., Niswonger, R.G., Ibaraki, M., and Hughes, J.D., 2013., MODFLOW–USG version 1: An unstructured grid version of MODFLOW for simulating groundwater flow and tightly coupled processes using a control volume finite-difference formulation: USGS Techniques and Methods 6-A45.

SLR, 2019. Moorvale South Groundwater Assessment. Appendix B1 Groundwater Modelling Technical Appendix. Report for Peabody Energy. 2019.

SLR, 2020. Winchester South Project EIS. Groundwater Impact Assessment Baseline Report. Report for Whitehaven Coal. 2020.

SLR, 2021. Caval Ridge Mine Horse Pit Extension Project. Groundwater Assessment Report. Report for BMA. 2021.

Tammetta, P., 2013. Estimation of the height of complete groundwater drainage above mined longwall panels. Groundwater, Volume 51, No. 5, p. 723–734. Paper accepted 2012, published 2013.

Tammetta, P. (2015), Estimation of the change in hydraulic conductivity above mined longwall panels, Groundwater, ISSN:1745-6584, 53(1):122-129

USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance, EPA 530-R-09-007, Washington, DC: Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency.

APPENDIX A

Calibration Residuals

ID	Layer	Easting	Northing	Average Residual	Min	
8	1	623790.2	7552348.9	11.3	11.3	11.3
11	2	627177.2	7546881.1	6.8	6.8	6.8
13	2	627219.4	7546972.0	7.5	7.5	7.5
14	2	628779.2	7546673.0	9.7	9.7	9.7
15	8	629073.7	7546802.0	8.1	8.1	8.1
16	12	628425.3	7544023.0	7.8	7.8	7.8
7978	5	629633.4	7556463.5	-1.8	-1.8	-1.8
7979	7	629633.4	7559234.5	11.7	11.7	11.7
7987	4	629633.4	7559234.5	11.6	11.6	11.6
7998	7	629633.4	7556463.5	-1.9	-1.9	-1.9
37861	10	649695.8	7505004.6	-27.0	-27.0	-27.0
38418	1	607829.6	7540275.4	-22.6	-22.6	-22.6
43305	8	647097.6	7516801.5	-30.9	-30.9	-30.9
43639	14	639103.3	7511121.5	29.4	29.4	29.4
44053	1	660370.1	7501087.5	-21.5	-21.5	-21.5
44161	1	647409.4	7540369.3	-1.0	-1.0	-1.0
44164	2	647977.5	7540860.5	-3.5	-3.5	-3.5
44625	9	650488.2	7509533.8	-32.1	-32.1	-32.1
67216	1	655389.1	7526202.6	7.4	7.4	7.4
67217	1	656736.8	7522643.0	1.5	1.5	1.5
67218	1	658631.7	7521477.3	3.3	3.3	3.3
88525	2	671181.5	7521895.5	-20.9	-20.9	-20.9
88526	2	671831.6	7519720.8	-21.9	-21.9	-21.9
88527	1	665168.1	7516140.8	-17.4	-17.4	-17.4
88528	9	664074.0	7516803.1	-23.6	-23.6	-23.6
89454	9	653205.5	7513829.3	-35.0	-35.0	-35.0
89469	12	648324.8	7504929.1	-21.2	-21.2	-21.2
89470	1	647480.7	7503867.5	10.3	10.3	10.3
90015	1	643693.1	7503665.0	13.3	13.3	13.3
90074	12	671494.7	7510763.1	-17.1	-17.1	-17.1
90076	15	672363.0	7515470.4	-13.3	-13.3	-13.3
90480	8	652589.0	7519704.0	-31.8	-31.8	-31.8
97180	1	654589.0	7527206.3	-4.0	-4.0	-4.0
97181	1	656420.9	7524049.7	-2.8	-2.8	-2.8
97182	1	657134.9	7522439.1	-10.4	-10.4	-10.4
97183	1	657439.9	7522249.8	-10.3	-10.3	-10.3
97184	1	659035.3	7519506.0	-15.7	-15.7	-15.7

ID	Layer	Easting	Northing	Average Residual	Min	
97185	1	659228.7	7519277.0	-15.3	-15.3	-15.3
105427	1	630296.9	7570136.8	15.9	15.9	15.9
105435	1	616912.6	7570594.3	1.0	1.0	1.0
105677	1	621977.3	7573484.3	-0.4	-0.4	-0.4
122458	8	644983.0	7526770.0	-16.8	-16.8	-16.8
132627	2	649608.9	7525155.5	-12.7	-12.7	-12.7
136090	2	647449.5	7540132.3	-1.9	-1.9	-1.9
136689	2	635867.6	7528211.2	-11.1	-11.1	-11.1
141382	12	628342.1	7542223.0	3.7	3.7	3.7
141383	1	627298.9	7549948.3	-15.7	-26.4	-15.0
141457	1	621977.3	7573484.3	-0.4	-0.4	-0.4
141458	1	622157.5	7572706.2	-11.6	-11.6	-11.6
141655	7	659112.1	7554720.1	-47.9	-47.9	-47.9
141656	2	659112.1	7554720.1	15.7	15.7	15.7
141661	2	661637.3	7552900.8	-4.9	-4.9	-4.9
141662	2	662958.1	7552840.0	-4.6	-4.6	-4.6
141685	1	631548.7	7557652.0	-4.0	-6.7	-1.7
141807	1	621938.0	7573812.1	-10.5	-12.5	-9.3
141808	1	621457.8	7572382.5	5.3	5.3	5.3
141864	1	622157.5	7572706.2	-14.4	-22.0	-7.3
141865	1	622157.5	7572706.2	-6.3	-6.3	-6.3
141942	1	607476.6	7570034.7	-7.0	-7.0	-7.0
141943	1	606865.4	7570053.5	-5.6	-5.6	-5.6
141944	1	611199.6	7567224.3	-10.1	-10.1	-10.1
141945	1	604828.7	7569831.1	1.2	1.2	1.2
141950	1	608807.5	7570968.8	-3.9	-3.9	-3.9
141974	1	633658.8	7559660.0	-30.5	-30.5	-30.5
141975	5	632758.8	7558447.5	3.1	3.1	3.1
141976	5	632758.8	7558447.5	-8.1	-8.1	-8.1
141977	1	634258.8	7559660.0	-28.7	-28.7	-28.7
141978	5	632358.8	7558447.5	-8.8	-8.8	-8.8
141981	1	621977.3	7573484.3	2.3	2.3	2.3
158010	9	642598.4	7519951.8	-4.8	-4.8	-4.8
158011	12	639841.3	7514207.2	4.5	4.5	4.5
158484	2	648056.4	7523971.3	-9.4	-9.4	-9.4
158485	9	643191.0	7521957.0	-5.9	-5.9	-5.9
161572	2	672413.8	7537992.6	-15.2	-15.2	-15.2

ID	Layer	Easting	Northing	Average Residual	Min	
161573	2	672413.8	7537992.6	-14.4	-14.4	-14.4
161578	2	672024.2	7534618.9	-16.5	-16.5	-16.5
162011	1	622157.5	7572706.2	4.1	4.1	4.1
162012	1	622157.5	7572706.2	1.8	1.8	1.8
162013	3	622186.9	7571874.5	-5.4	-14.2	-2.7
162014	1	622157.5	7572706.2	1.1	1.1	1.1
162016	2	621457.8	7572382.5	2.7	2.7	2.7
162017	2	621457.8	7572382.5	2.5	2.5	2.5
162020	2	621977.3	7573484.3	-1.0	-1.0	-1.0
162041	3	621977.3	7573484.3	-19.3	-27.6	-13.2
162043	2	613588.7	7559886.1	7.2	7.2	7.2
162044	2	615579.5	7560524.4	-5.6	-5.6	-5.6
162046	10	618307.7	7557682.1	-0.3	-0.3	-0.3
162068	1	606007.8	7571075.3	-11.0	-11.0	-11.0
162070	1	606007.8	7571075.3	-11.6	-11.6	-11.6
162071	1	605947.6	7570995.5	-11.3	-11.3	-11.3
162138	12	620223.4	7547524.7	2.6	2.6	2.6
162141	1	613923.6	7562122.8	0.8	0.8	0.8
162145	10	614939.2	7550983.9	3.0	3.0	3.0
162163	15	609750.7	7560104.5	-5.3	-8.6	13.6
162164	1	608381.8	7558287.5	0.5	-4.1	14.0
162165	2	608881.8	7556728.5	-1.5	-6.8	2.7
162166	17	608881.8	7556728.5	-7.4	-9.3	-0.7
162167	13	610681.8	7555343.0	-1.5	-2.2	-0.9
162168	2	608881.8	7554130.5	-1.2	-1.5	-0.9
162169	2	611045.8	7551706.5	5.3	5.0	5.9
162170	13	611045.8	7551706.5	1.4	1.3	1.4
162171	1	612345.4	7550593.3	2.6	2.6	2.7
162172	13	612345.4	7550593.3	2.7	1.7	4.2
162174	17	611258.8	7549492.5	-7.8	-9.2	-6.7
162175	13	614308.8	7548886.5	-4.9	-13.2	-1.3
162177	12	616874.8	7547722.0	-2.3	-10.5	1.9
162234	5	629633.4	7559234.5	16.3	16.3	16.3
162235	5	629633.4	7559234.5	12.6	12.6	12.6
162236	5	629633.4	7556463.5	-1.8	-1.8	-1.8
162237	5	629633.4	7556463.5	-1.8	-1.8	-1.8
162439	1	631965.8	7553593.0	-5.4	-5.4	-5.4

ID	Layer	Easting	Northing	Average Residual	Min	
162469	10	632558.8	7561911.5	-5.0	-8.8	-3.9
162470	4	635358.8	7560179.5	-14.0	-18.1	-10.2
162471	6	632258.8	7558274.0	-13.2	-14.9	-3.5
162472	10	635699.4	7554944.4	-15.8	-16.1	-15.0
162504	1	610681.8	7557248.0	3.7	3.3	4.7
162505	1	610731.8	7557161.5	2.0	0.8	4.1
162527	19	632558.8	7561911.5	-0.6	-0.8	-0.4
162528	9	631758.8	7561218.5	-7.4	-10.7	-5.5
162547	3	618426.4	7570661.4	-8.4	-8.7	-8.1
162548	3	619273.9	7568558.3	2.6	2.3	2.9
162549	1	619280.6	7567287.0	9.4	8.2	9.9
162550	2	620379.5	7567546.5	6.4	5.8	6.7
162551	3	619004.7	7572915.2	-0.9	-1.3	-0.2
162552	3	618855.2	7571993.7	-5.1	-5.7	-4.6
162565	10	617475.5	7568865.6	-63.8	-75.0	-59.1
162682	1	641132.5	7546549.5	-7.0	-7.5	-6.8
162684	1	642541.9	7547447.5	-3.4	-3.7	-3.1
162806	1	611126.2	7562863.9	9.8	9.8	9.8
162810	1	620314.7	7573518.7	-1.5	-2.3	-0.8
162811	1	621651.4	7568874.3	9.1	8.0	10.1
162812	1	621651.4	7568874.3	10.5	9.5	10.7
162839	1	631184.4	7564729.5	-4.3	-4.3	-4.3
162841	1	639766.9	7558393.5	-11.3	-15.7	-6.9
162992	19	631629.4	7559452.0	-8.2	-8.7	-7.5
165325	12	640164.7	7515922.0	1.4	1.4	1.4
182077	3	619119.6	7571315.4	-9.7	-9.9	-9.4
182078	2	619978.6	7568093.1	-0.3	-9.0	4.7
182079	2	619978.6	7568093.1	5.3	4.8	5.7
182080	2	619863.6	7567330.7	6.2	6.0	6.3
182390	1	616511.8	7571966.5	-20.4	-24.7	-9.9
182391	1	616511.8	7571966.5	-46.3	-49.2	-34.5
182392	1	616511.8	7571966.5	-22.4	-25.8	-19.8
13040180	1	667814.0	7516270.0	-17.4	-19.2	-16.1
13040181	1	668052.0	7516020.9	-15.9	-15.9	-15.9
13040183	1	668871.5	7514836.3	-17.4	-17.4	-17.4
13040184	1	669622.7	7514341.8	-17.9	-17.9	-17.9
13040282	1	605198.6	7546183.1	4.3	3.9	4.6

ID	Layer	Easting	Northing	Average Residual	Min	
13040283	1	628059.5	7527241.5	-17.4	-19.7	-14.8
13040284	1	620258.8	7566342.2	13.7	12.2	14.4
13040286	2	660153.0	7536920.6	-27.3	-28.0	-26.9
1235C-VWP1	4	650028.0	7522291.5	-17.2	-18.2	-9.8
1235C-VWP2	5	650028.0	7522291.5	-19.5	-23.1	-18.7
1235C-VWP3	6	650028.0	7522291.5	-21.1	-22.8	-19.9
1235C-VWP4	7	650028.0	7522291.5	-35.1	-38.8	-20.7
1238-MB1	2	651084.9	7523115.5	-10.7	-10.8	-10.5
1238-MB2	7	651084.9	7523115.5	-18.0	-18.2	-17.7
2183-VWP1	4	644147.6	7520525.5	-23.0	-23.1	-22.9
2183-VWP2	5	644147.6	7520525.5	-14.6	-16.4	-12.4
2183-VWP3	6	644147.6	7520525.5	-33.5	-34.6	-32.3
2183-VWP4	7	644147.6	7520525.5	-26.0	-28.2	-22.9
2218-MB2	3	645582.8	7522925.3	-12.1	-12.9	-11.2
2218-MB3	5	645582.8	7522925.3	-12.3	-12.7	-11.9
2218-VWP1	5	645582.8	7522925.3	-13.6	-14.9	-13.1
2218-VWP2	6	645582.8	7522925.3	-16.7	-17.1	-16.4
2218-VWP3	7	645582.8	7522925.3	-15.8	-17.3	-15.1
2218-VWP4	7	645582.8	7522925.3	-11.6	-12.6	-10.6
2226-MB2	3	643155.5	7522152.0	-5.9	-6.5	-5.3
2226-MB3	5	643155.5	7522152.0	-8.9	-9.2	-8.7
2226-VWP1	4	643155.5	7522152.0	-4.5	-4.8	-4.2
2226-VWP2	5	643155.5	7522152.0	-9.9	-11.1	-9.0
2226-VWP3	6	643155.5	7522152.0	-11.3	-11.9	-10.7
2226-VWP4	7	643155.5	7522152.0	-13.2	-13.3	-13.0
2372-MB1	2	647627.7	7526233.0	-14.3	-14.5	-14.1
1238-MB2	7	651084.9	7523115.5	-18.0	-18.2	-17.7
2183-VWP1	4	644147.6	7520525.5	-23.0	-23.1	-22.9
2183-VWP2	5	644147.6	7520525.5	-14.6	-16.4	-12.4
2183-VWP3	6	644147.6	7520525.5	-33.5	-34.6	-32.3
2183-VWP4	7	644147.6	7520525.5	-26.0	-28.2	-22.9
2218-MB2	3	645582.8	7522925.3	-12.1	-12.9	-11.2
2218-MB3	5	645582.8	7522925.3	-12.3	-12.7	-11.9
2218-VWP1	5	645582.8	7522925.3	-13.6	-14.9	-13.1
2218-VWP2	6	645582.8	7522925.3	-16.7	-17.1	-16.4
2218-VWP3	7	645582.8	7522925.3	-15.8	-17.3	-15.1
2218-VWP4	7	645582.8	7522925.3	-11.6	-12.6	-10.6

ID	Layer	Easting	Northing	Average Residual	Min	
2226-MB2	3	643155.5	7522152.0	-5.9	-6.5	-5.3
2226-MB3	5	643155.5	7522152.0	-8.9	-9.2	-8.7
2226-VWP1	4	643155.5	7522152.0	-4.5	-4.8	-4.2
2226-VWP2	5	643155.5	7522152.0	-9.9	-11.1	-9.0
2226-VWP3	6	643155.5	7522152.0	-11.3	-11.9	-10.7
2226-VWP4	7	643155.5	7522152.0	-13.2	-13.3	-13.0
2372-MB1	2	647627.7	7526233.0	-14.3	-14.5	-14.1
2372-MB2	3	647627.7	7526233.0	-14.5	-19.8	-13.8
2372-MB3	7	647627.7	7526233.0	-13.5	-15.1	-13.2
2393-MB1	2	645820.4	7523264.1	-9.1	-9.7	-8.8
2393-MB2	5	645820.4	7523264.1	-11.5	-11.8	-11.1
2393-MB3	7	645820.4	7523264.1	-11.6	-12.1	-10.8
2394-MB1	1	645024.3	7523114.7	-14.3	-14.4	-14.2
2394-MB2	3	645024.3	7523114.7	-12.1	-13.4	-9.6
BMB	7	639590.5	7560206.8	-17.9	-155.1	1.9
Bore2	1	634878.9	7550015.4	-5.6	-5.6	-5.6
Bore3	10	634878.9	7550015.4	-5.7	-5.7	-5.7
Bore7	9	637698.0	7552820.4	-5.9	-5.9	-5.9
Bullock_P	10	636076.7	7528132.0	-3.4	-3.4	-3.4
C2105	5	634696.8	7541900.5	-7.2	-8.6	-7.0
C2105R	5	634646.8	7541814.0	-7.5	-7.5	-7.5
C2136	5	631696.8	7547270.0	-13.7	-14.0	-13.5
Cattle_CG	17	670715.1	7536720.3	4.7	4.7	4.7
DauniaPZ02	7	635358.8	7560179.5	-25.6	-152.6	-11.9
DauniaPZ04	7	635699.4	7554944.4	-19.7	-158.9	-12.6
G2304	7	633246.8	7543199.5	-13.2	-13.2	-13.2
G2304R	7	633246.8	7543199.5	-13.1	-13.1	-13.1
G2307	7	630846.8	7547876.0	-12.7	-12.7	-12.4
GW01d_p1	7	642541.9	7547447.5	-7.8	-8.9	-6.4
GW01d_p2	5	642541.9	7547447.5	-11.6	-12.4	-10.2
GW01d_p3	3	642541.9	7547447.5	-6.1	-6.4	-5.6
GW01d_p4	3	642541.9	7547447.5	-4.0	-4.1	-3.2
GW01s	1	642541.9	7547447.5	-2.7	-2.9	-2.4
GW02d	7	641132.5	7546549.5	-7.0	-7.2	-7.0
GW02s	1	641132.5	7546549.5	-7.1	-7.1	-7.0
GW06d_p1	11	639273.5	7542068.1	8.7	8.3	9.0
GW06d_p2	10	639273.5	7542068.1	-0.3	-0.9	0.1

ID	Layer	Easting	Northing	Average Residual	Min	
GW06d_p3	10	639273.5	7542068.1	-0.8	-1.0	-0.6
GW06d_p4	9	639273.5	7542068.1	-5.2	-5.9	-3.0
GW08d_p1	5	645324.1	7539903.3	-12.1	-14.9	-10.5
GW08d_p2	4	645324.1	7539903.3	-6.5	-6.7	-6.3
GW08d_p3	3	645324.1	7539903.3	0.1	0.1	0.2
GW08d_p4	3	645324.1	7539903.3	-32.1	-38.1	-24.2
GW12d_p1	5	641732.7	7532894.0	-2.7	-3.8	1.8
GW12d_p2	5	641732.7	7532894.0	-7.6	-8.4	-6.2
GW12d_p3	4	641732.7	7532894.0	10.8	7.9	12.0
GW12d_p4	3	641732.7	7532894.0	30.3	29.3	32.1
GW12s	2	641732.7	7532894.0	-6.5	-6.6	-6.5
GW16d_p1	7	660840.1	7525340.5	-26.9	-28.3	-23.0
GW16d_p2	5	660840.1	7525340.5	-14.9	-15.0	-14.8
GW16d_p3	3	660840.1	7525340.5	-14.6	-14.8	-14.3
GW16d_p4	3	660840.1	7525340.5	-13.9	-14.0	-13.7
GW18d	7	656866.6	7522819.5	-8.1	-8.2	-8.1
GW18s	1	656866.6	7522819.5	-7.6	-7.7	-7.5
GW21d	9	661694.6	7521666.9	-17.8	-17.8	-17.7
GW21s	2	661694.6	7521666.9	2.8	2.7	2.9
GW8S	1	645324.1	7539903.3	-3.5	-3.6	-3.4
KnobHill1	1	631021.0	7553963.0	-3.9	-4.1	-3.7
KnobHill2	1	630446.4	7554123.5	-0.5	-1.0	0.7
LakeV3	2	648056.4	7523971.3	-1.1	-1.1	-1.1
LH13	2	627219.4	7546972.0	9.2	5.4	10.2
LV2370W	2	648272.6	7524055.9	-7.7	-9.6	8.0
LV2371W	2	643155.5	7522152.0	-3.3	-4.0	-2.4
MB08PZ1	14	615892.5	7559621.0	-12.0	-12.0	-12.0
MB08PZ2	14	615892.5	7559621.0	-12.1	-12.1	-12.1
MB08PZ3	14	615892.5	7559621.0	-13.5	-13.5	-13.5
MB08PZ4	14	615892.5	7559621.0	-14.0	-14.0	-14.0
MB1	13	623291.3	7551562.0	-0.8	-2.8	1.7
MB13PZ1	14	615290.2	7551152.6	-7.7	-7.7	-7.7
MB13PZ2	14	615290.2	7551152.6	-6.9	-6.9	-6.9
MB13PZ3	14	615290.2	7551152.6	-6.9	-6.9	-6.9
MB13PZ4	14	615290.2	7551152.6	-9.3	-9.3	-9.3
MB15PZ1	14	620223.4	7547524.7	-3.6	-3.6	-3.6
MB15PZ2	14	620223.4	7547524.7	-5.6	-5.6	-5.6

ID	Layer	Easting	Northing	Average Residual	Min	
MB15PZ3	14	620223.4	7547524.7	-6.3	-6.3	-6.3
MB15PZ4	14	620223.4	7547524.7	-3.4	-3.4	-3.4
MB19CVM01A	1	610442.3	7548263.7	-6.5	-6.8	-6.0
MB19CVM03T	2	610213.3	7551337.7	4.6	3.8	5.4
MB19CVM04P	17	610214.3	7551343.7	-18.3	-18.3	-18.3
MB19CVM05T	2	611081.3	7551427.7	-4.6	-6.4	-2.3
MB19CVM06P	13	611074.3	7551428.7	-8.2	-10.7	-5.2
MB19CVM07T	2	611577.3	7552536.7	8.4	8.1	8.8
MB19CVM08P	16	611578.3	7552525.7	22.5	22.0	23.3
MB19CVM09A	1	612559.3	7550878.7	7.2	6.9	7.9
MB19CVM10P	12	613293.3	7549947.7	-6.7	-7.8	-4.1
MB19SRM01A	1	639911.6	7515595.9	13.4	13.4	13.4
MB19SRM02T	2	639891.2	7515766.0	3.4	3.4	3.4
MB19SRM03P	18	639891.2	7515766.0	8.6	8.6	8.6
MB19SRM04P	2	637053.3	7511150.3	-9.5	-9.5	-9.5
MB2	13	623708.7	7549381.3	6.0	4.6	6.5
MB20CVM01A	1	610028.3	7560467.7	0.5	0.0	1.5
MB20CVM04T	2	608307.3	7559830.7	2.6	2.2	3.3
MB20CVM05P	17	608312.3	7559825.7	-16.2	-17.6	-14.4
MB20CVM06T	2	610921.3	7549068.7	-1.7	-3.3	-1.3
MB20PDM03P	2	621377.3	7547930.5	-11.3	-11.3	-11.3
MB20PDM05P	11	630142.3	7532676.4	-91.4	-91.4	-91.4
MB20PDM06T	2	628778.3	7532642.0	64.3	64.3	64.3
MB20SRM02T	2	635918.1	7527713.9	-5.1	-5.1	-5.1
MB20SRM03P	18	635918.1	7527713.9	5.5	5.5	5.5
MB20SRM06A	2	636616.5	7519935.1	17.2	17.2	17.2
MB20SRM07P	18	641517.0	7508438.2	0.5	0.5	0.5
MB3	3	627298.9	7549948.3	-15.4	-16.9	-14.3
MB33	17	636608.9	7520518.6	4.7	4.7	4.7
MB34	17	638204.5	7518375.8	-38.7	-38.7	-38.7
MB35	17	642713.1	7520289.2	-1.5	-1.5	-1.5
MB36	17	640051.7	7514430.7	4.6	4.6	4.6
MB37	19	632499.0	7515493.2	5.7	5.7	5.7
MB4	13	626534.6	7544131.9	9.4	8.7	10.1
MB5	13	628342.1	7542223.0	10.2	-2.8	11.0
MOS_MB01	2	610501.7	7562777.0	5.2	5.2	5.2
MOS_MB02	12	612012.5	7562219.2	-16.8	-16.8	-16.8

ID	Layer	Easting	Northing	Average Residual	Min	
MOS_MB04	2	614038.0	7562394.1	0.9	0.9	0.9
MOS_MB05	2	615192.8	7563121.5	4.4	4.4	4.4
MOS_MB06	2	616114.7	7561371.3	3.5	3.5	3.5
MOS_MB07	2	615579.5	7560524.4	-5.6	-5.6	-5.6
MOS_MB08b	10	615892.5	7559621.0	-5.5	-5.5	-5.5
MOS_MB09b	10	618119.9	7558372.9	-1.3	-1.3	-1.3
MOS_MB11	12	611597.0	7558392.4	-2.9	-2.9	-2.9
MOS_MB12	2	613875.4	7557129.4	-2.5	-2.5	-2.5
MOS_MB14	10	615290.2	7551152.6	3.3	3.3	3.3
MOS_MB16	12	620223.4	7547524.7	2.1	2.1	2.1
MP01D	1	630685.3	7524218.0	6.6	6.6	6.6
MP02D	1	630685.3	7524218.0	6.4	6.4	6.4
MP03D	1	630685.3	7524218.0	6.1	6.1	6.1
MP04D	1	630685.3	7524218.0	6.0	6.0	6.0
MP05D	1	630589.6	7524245.0	6.5	6.5	6.5
MP06	1	630703.3	7524458.0	8.3	8.3	8.3
MP07	1	630651.0	7524026.4	6.1	6.1	6.1
MP07D	1	630494.9	7524468.6	7.0	7.0	7.0
MP08	1	630483.3	7524093.9	3.7	3.7	3.7
MP09	1	630395.9	7524227.0	4.9	4.9	4.9
MP10	1	630494.9	7524468.6	6.3	6.3	6.3
OBS1	4	630153.6	7554713.2	-5.5	-6.2	-4.4
OBS2	9	631548.7	7557652.0	-1.5	-2.1	-0.2
OBS4	4	626659.2	7562129.0	-6.5	-9.1	-5.8
OBS5	1	626162.3	7557241.9	-4.8	-8.8	-4.1
OBS6	5	628833.4	7556463.5	8.6	8.1	9.2
ODN18MB1	5	640309.8	7547851.0	-8.7	-8.8	-8.6
ODN18MB10	9	639463.5	7554574.0	-13.3	-13.3	-13.3
ODN18MB11	9	638684.1	7553398.2	-7.2	-7.2	-7.2
ODN18MB12	7	640214.9	7547881.0	-1.0	-1.3	-0.7
ODN18MB2	1	640214.9	7547881.0	1.5	1.5	1.5
ODN18MB3	5	639763.5	7551456.0	-11.6	-11.6	-11.6
ODN18MB4	1	640563.6	7549899.8	-10.1	-10.5	-9.7
ODN18MB6	5	639963.5	7551802.5	-10.3	-10.3	-10.3
ODN18MB7	1	640263.5	7554747.0	-5.2	-5.2	-5.2
ODN18MB8	1	638907.4	7550142.9	-3.4	-3.5	-3.4
ODN18MB9	5	640105.8	7557334.2	-3.3	-3.3	-3.3

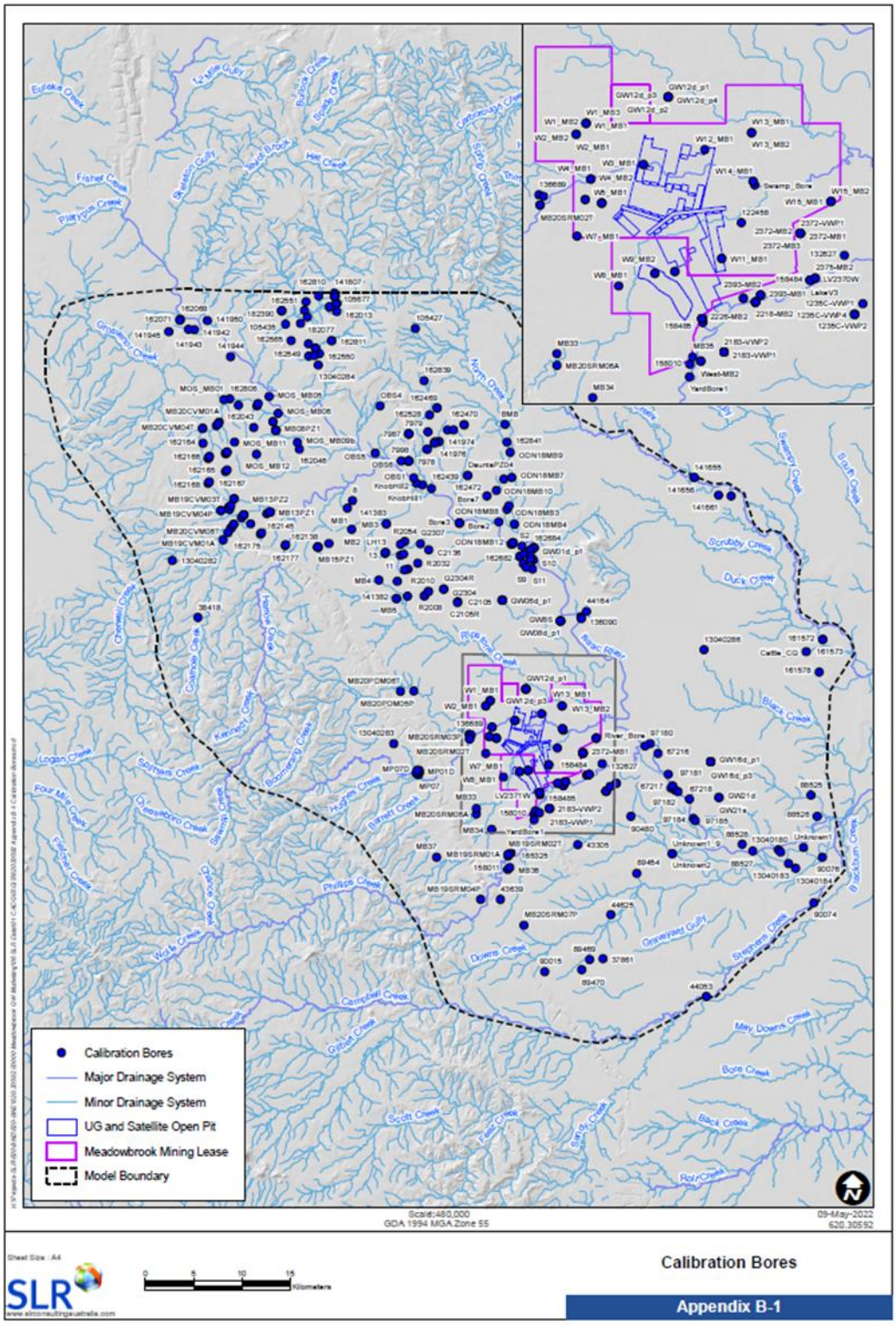
ID	Layer	Easting	Northing	Average Residual	Min	
ODN18TB1	5	640381.2	7547984.1	-7.6	-7.9	-7.3
ODN18TB2	1	640309.8	7547851.0	3.6	3.4	3.9
ODN18VWP3	4	640381.2	7547984.1	-10.1	-10.1	-10.1
PZ01	18	609954.3	7560324.7	-1.4	-6.2	12.8
PZ03-D	18	609029.3	7556891.7	-7.0	-9.1	-2.1
PZ03-S	1	609028.3	7556895.7	-3.9	-9.7	0.1
PZ04	13	610844.3	7555505.7	-1.7	-2.4	-1.1
PZ05	18	609030.3	7554297.7	-8.7	-11.9	0.8
PZ06-S	1	611237.3	7551855.7	5.9	5.1	9.2
PZ07-D	16	612578.3	7550883.7	3.1	1.6	4.1
PZ07-S	1	612584.3	7550882.7	6.6	6.3	7.5
PZ08-D	18	611526.3	7549892.7	-3.4	-9.6	5.6
PZ08-S	1	611524.3	7549888.7	6.1	3.0	7.7
PZ09	13	614439.3	7549001.7	-5.4	-15.3	-0.5
PZ11-D	15	616904.2	7547779.7	-2.9	-10.7	1.7
PZ12-D	13	610834.3	7557343.7	-0.4	-1.5	2.1
PZ12-S	1	610825.3	7557398.7	2.5	2.2	3.2
R2008	7	631248.8	7542520.0	1.0	0.1	1.2
R2009	6	631248.8	7542520.0	4.9	4.6	5.3
R2010	7	631643.7	7542970.3	-5.1	-6.5	-4.8
R2010R	5	631643.7	7542970.3	-5.4	-5.4	-5.4
R2032	5	630539.6	7545862.8	5.3	2.2	5.7
R2034	8	629523.2	7545279.0	-0.2	-1.0	0.8
R2035	7	629167.1	7545184.3	-5.0	-9.4	-3.1
R2054	6	629223.7	7548101.5	3.2	-1.9	4.3
R2055	7	628773.7	7547841.5	4.5	3.3	4.7
River_Bore	3	654039.4	7526997.0	-12.1	-12.1	-12.1
S10	1	642519.5	7546193.5	-3.5	-3.5	-3.5
S11	1	642428.0	7545276.4	-3.0	-3.0	-3.0
S2	1	641305.8	7547611.2	-4.4	-4.4	-4.4
S4	1	641582.5	7546809.0	-7.2	-8.8	-7.1
S5	1	642184.5	7547258.0	-5.7	-5.7	-5.7
S6	1	642170.1	7546664.5	-3.9	-4.0	-3.9
S7	1	641432.5	7545856.5	-7.1	-7.1	-7.0
S8	1	642224.1	7546257.8	-1.9	-2.1	-1.9
S9	1	641782.5	7545423.5	-5.8	-5.8	-5.8
Swamp_Bore	9	645603.3	7528594.1	-12.1	-12.1	-12.1

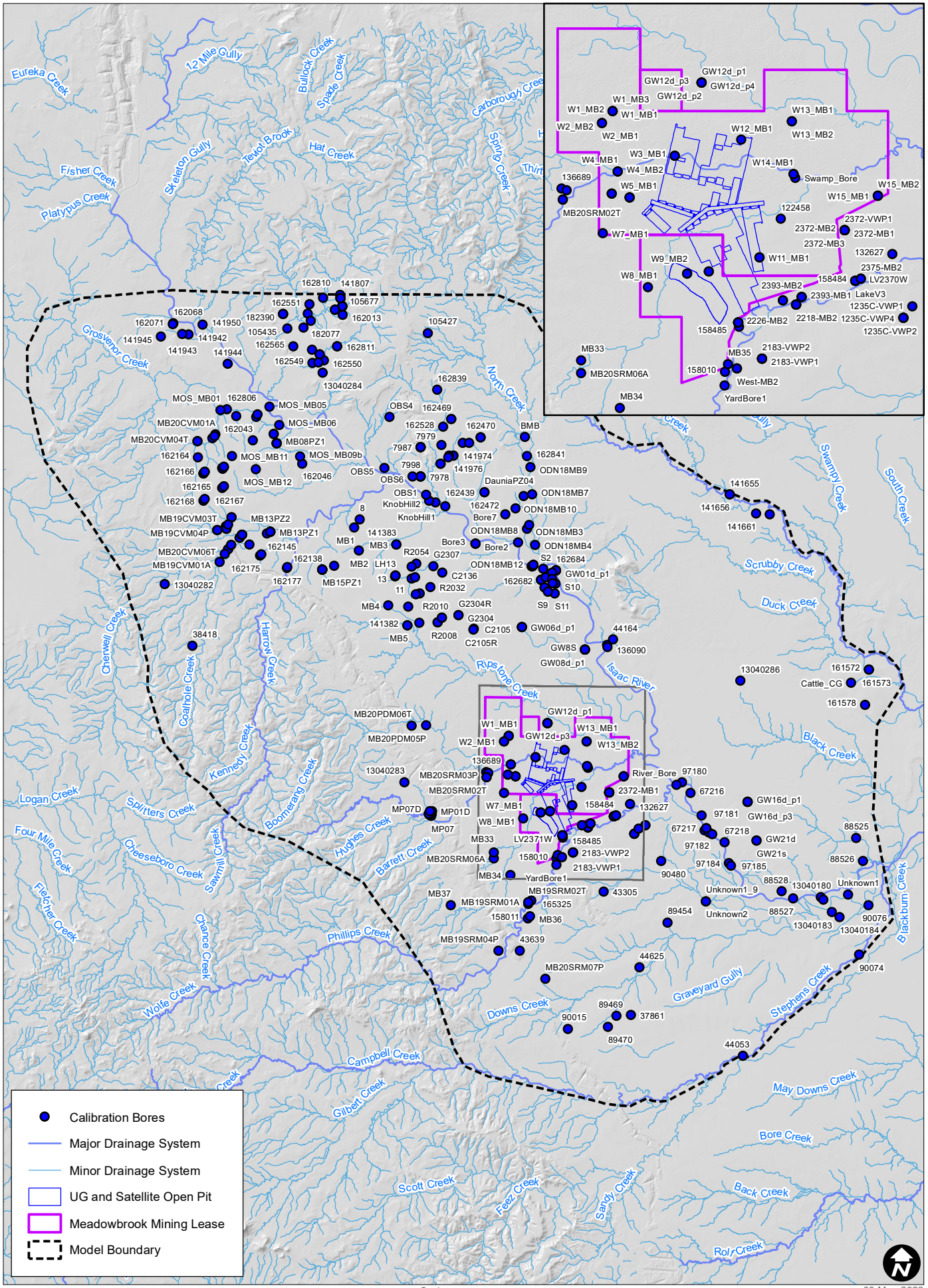
ID	Layer	Easting	Northing	Average Residual	Min	
Unknown1	1	670435.8	7516502.4	-10.6	-10.6	-10.6
Unknown1_6	6	650407.4	7522800.9	-14.8	-14.8	-14.8
Unknown1_9	9	656842.6	7515864.0	-10.4	-10.4	-10.4
Unknown2	2	656842.6	7515864.0	-17.5	-17.5	-17.5
W1_MB1	2	638017.7	7531666.6	-4.7	-5.0	-4.4
W1_MB2	5	638017.7	7531666.6	-3.9	-3.9	-3.9
W1_MB3	7	638017.7	7531666.6	-3.9	-4.0	-3.9
PZ05	18	609030.3	7554297.7	-8.7	-11.9	0.8
PZ06-S	1	611237.3	7551855.7	5.9	5.1	9.2
PZ07-D	16	612578.3	7550883.7	3.1	1.6	4.1
PZ08-S	1	611524.3	7549888.7	6.1	3.0	7.7
PZ09	13	614439.3	7549001.7	-5.4	-15.3	-0.5
PZ11-D	15	616904.2	7547779.7	-2.9	-10.7	1.7
PZ12-D	13	610834.3	7557343.7	-0.4	-1.5	2.1
PZ12-S	1	610825.3	7557398.7	2.5	2.2	3.2
R2008	7	631248.8	7542520.0	1.0	0.1	1.2
R2009	6	631248.8	7542520.0	4.9	4.6	5.3
R2010	7	631643.7	7542970.3	-5.1	-6.5	-4.8
R2010R	5	631643.7	7542970.3	-5.4	-5.4	-5.4
R2032	5	630539.6	7545862.8	5.3	2.2	5.7
R2034	8	629523.2	7545279.0	-0.2	-1.0	0.8
R2035	7	629167.1	7545184.3	-5.0	-9.4	-3.1
R2054	6	629223.7	7548101.5	3.2	-1.9	4.3
R2055	7	628773.7	7547841.5	4.5	3.3	4.7
River_Bore	3	654039.4	7526997.0	-12.1	-12.1	-12.1
S10	1	642519.5	7546193.5	-3.5	-3.5	-3.5
S11	1	642428.0	7545276.4	-3.0	-3.0	-3.0
S2	1	641305.8	7547611.2	-4.4	-4.4	-4.4
S4	1	641582.5	7546809.0	-7.2	-8.8	-7.1
S5	1	642184.5	7547258.0	-5.7	-5.7	-5.7
S6	1	642170.1	7546664.5	-3.9	-4.0	-3.9
S7	1	641432.5	7545856.5	-7.1	-7.1	-7.0
S8	1	642224.1	7546257.8	-1.9	-2.1	-1.9
S9	1	641782.5	7545423.5	-5.8	-5.8	-5.8
Unknown1	1	670435.8	7516502.4	-10.6	-10.6	-10.6
Unknown1_6	6	650407.4	7522800.9	-14.8	-14.8	-14.8
Unknown1_9	9	656842.6	7515864.0	-10.4	-10.4	-10.4

ID	Layer	Easting	Northing	Average Residual	Min	
Unknown2	2	656842.6	7515864.0	-17.5	-17.5	-17.5
W1_MB1	2	638017.7	7531666.6	-4.7	-5.0	-4.4
W1_MB2	5	638017.7	7531666.6	-3.9	-3.9	-3.9
W1_MB3	7	638017.7	7531666.6	-3.9	-4.0	-3.9
W10_MB2	3	641956.5	7524449.8	-25.3	-25.5	-25.0
W10_MB3	8	641956.5	7524449.8	-22.1	-22.2	-22.1
W11_MB1	3	644071.7	7525050.2	-22.7	-23.1	-22.3
W11_MB2	5	644071.7	7525050.2	-20.2	-20.4	-19.9
W12_MB1	2	643364.7	7530326.2	-15.5	-15.6	-15.4
W13_MB1	9	645471.9	7531129.0	-11.5	-11.6	-11.5
W13_MB2	9	645471.9	7531129.0	-12.0	-12.0	-12.0
W14_MB1	2	645525.9	7528779.5	-8.6	-8.7	-8.5
W14_MB2	9	645525.9	7528779.5	-11.3	-11.3	-11.3
W15_MB1	2	649018.5	7527774.9	3.9	3.9	3.9
W15_MB2	7	649018.5	7527774.9	3.8	3.8	3.8
W15_MB3	8	649018.5	7527774.9	3.4	3.3	3.5
W2_MB1	2	637568.5	7531128.7	-3.1	-3.2	-3.0
W2_MB2	9	637568.5	7531128.7	-3.4	-3.4	-3.4
W3_MB1	1	640587.6	7529633.2	4.1	3.6	4.7
W3_MB2	2	640587.6	7529633.2	-4.5	-4.5	-4.5
W4_MB1	1	638219.2	7528952.5	3.3	3.2	3.4
W4_MB2	2	638219.2	7528952.5	-4.0	-4.2	-3.8
W5_MB1	3	638695.5	7527785.2	-4.7	-4.7	-4.7
W5_MB2	5	638695.5	7527785.2	-3.6	-3.7	-3.6
W5_MB3	7	638695.5	7527785.2	-5.6	-5.6	-5.6
W6_MB1	9	637965.1	7527970.4	-6.6	-9.4	-3.8
W6_MB2	9	637965.1	7527970.4	-4.0	-4.0	-4.0
W7_MB1	9	637566.7	7526198.4	-5.5	-5.6	-5.5
W8_MB1	9	639428.1	7523760.1	-11.0	-11.0	-11.0
W9_MB2	7	641060.4	7524350.5	-19.4	-19.4	-19.3
W9_MB3	8	641060.4	7524350.5	-18.4	-18.4	-18.3
West-MB1	2	643089.8	7520088.8	-7.0	-7.7	-6.4
West-MB2	9	643089.8	7520088.8	-5.5	-7.0	-4.3
WhiteTank	9	629513.0	7542450.6	6.5	6.5	6.5
WinnetBore	1	634878.9	7550015.4	-5.3	-6.5	-4.8
YardBore1	11	642566.2	7519335.4	-7.1	-7.1	-7.1

APPENDIX B

Calibration Hydrographs


Calibration Bores
Major Drainage System
Minor Drainage System
UG and Satellite Open Pit
Meadowbrook Mining Lease
Model Boundary
Scale:480,000
GDA 1994 MGA Zone 55
09-May-2022
620.30592
Calibration Bores
Appendix B-1



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Scale: 1:480,000
GDA 1994 MGA Zone 55

09-May-2022
620.30592

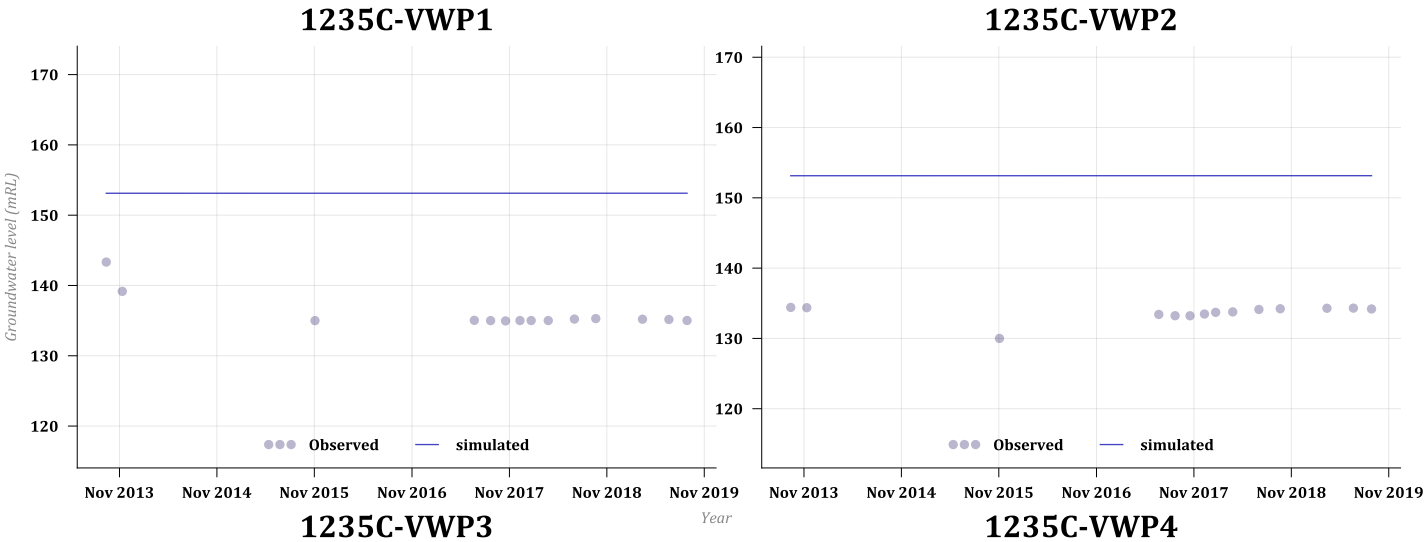
Sheet Size : A4

0 5 10 15 Kilometers

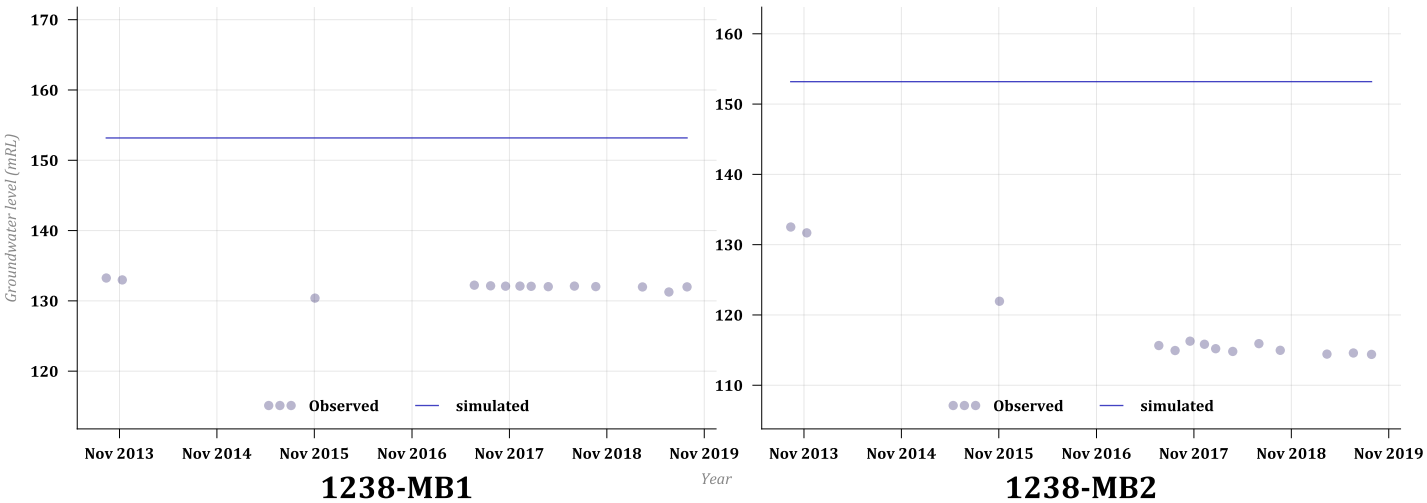
SLR
www.slrconsultingaustralia.com

Calibration Bores

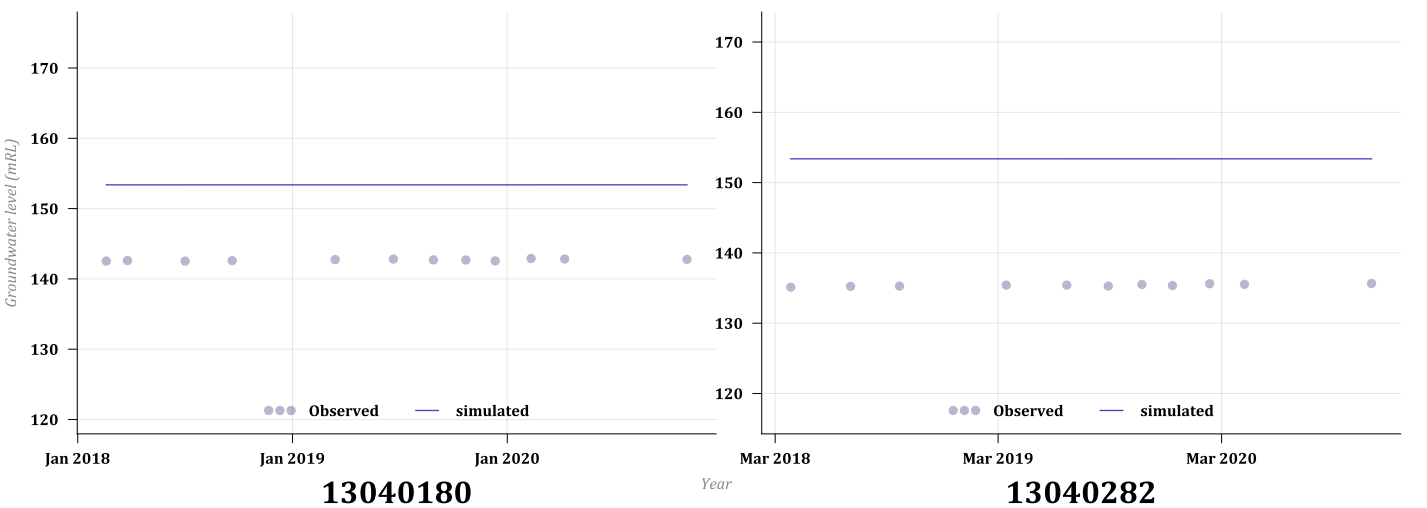
Appendix B-1


1235C-VWP1
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

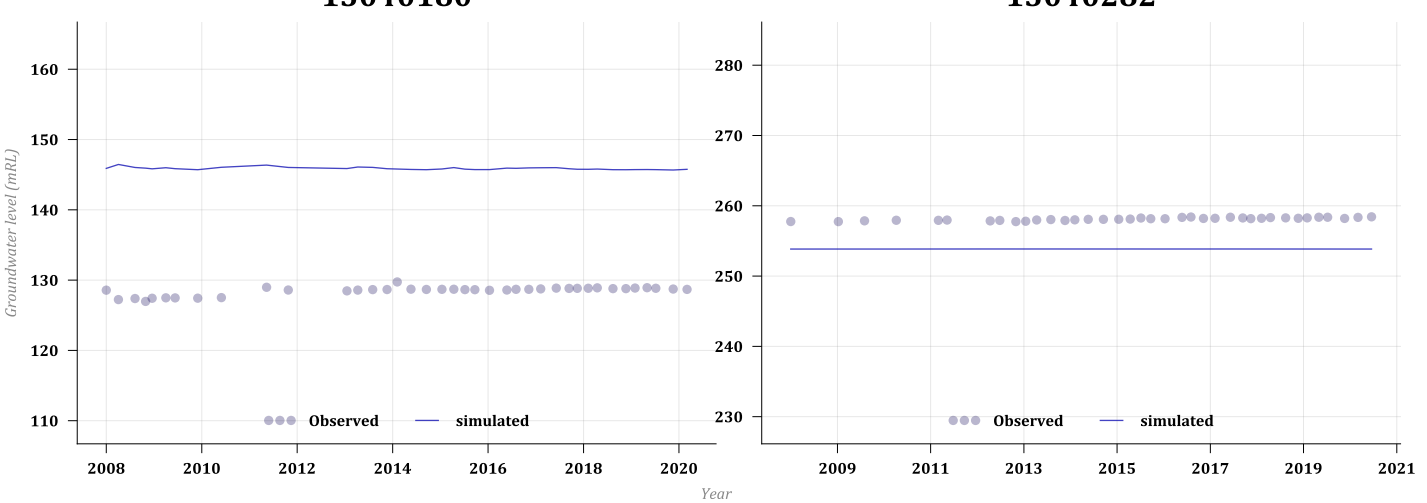
1235C-VWP2
170
160
150
140
130
120
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019


1235C-VWP3
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

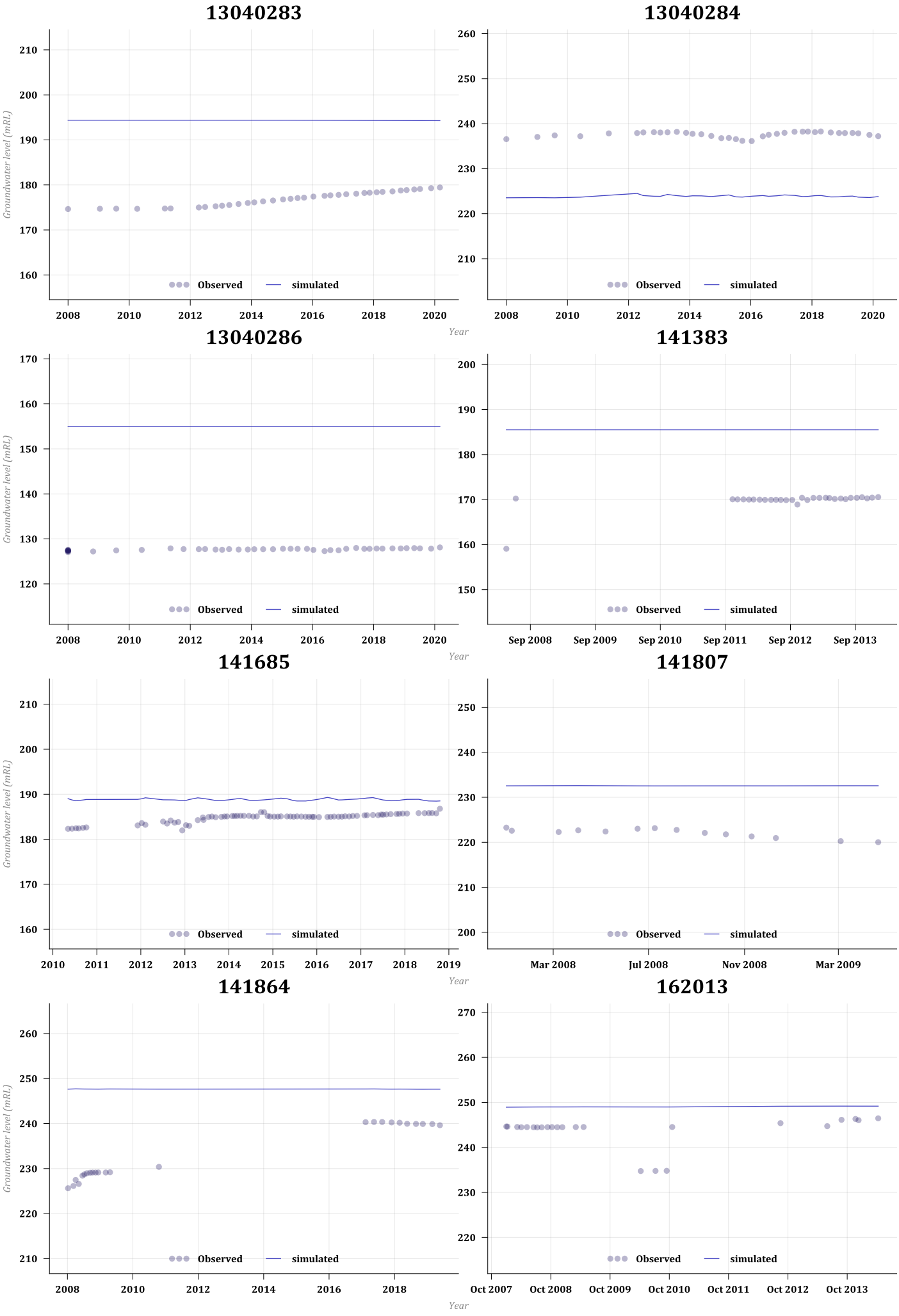
1235C-VWP4
160
150
140
130
120
110
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

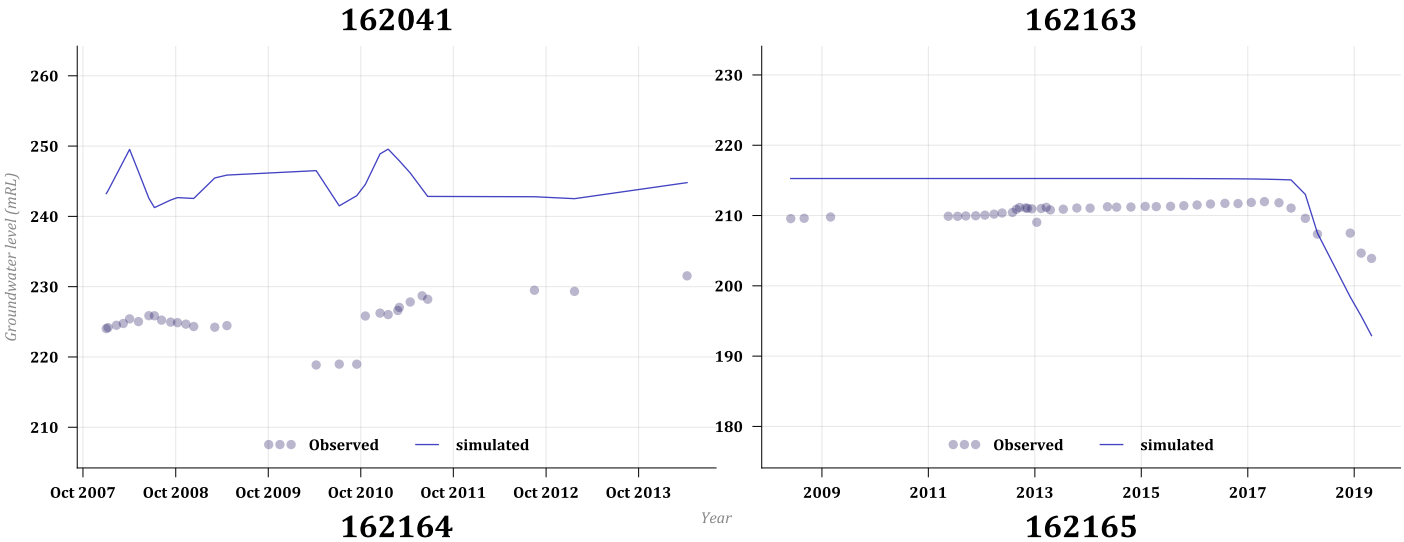

1238-MB1
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year

1238-MB2
170
160
150
140
130
120
Observed
simulated
Mar 2018
Mar 2019
Mar 2020

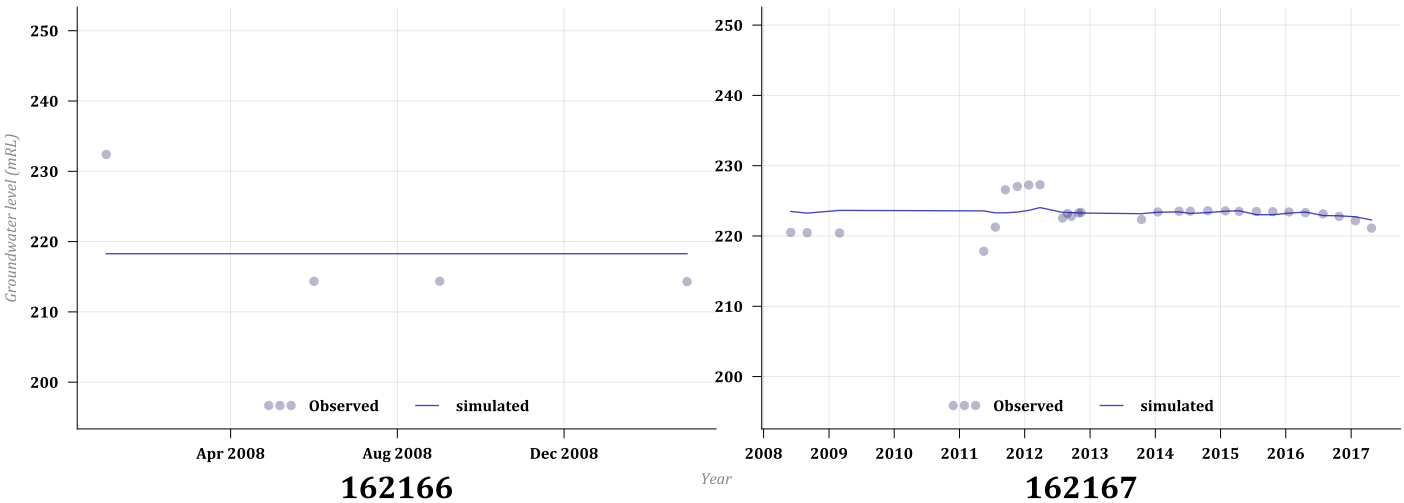

13040180
Groundwater level (mRL)
160
150
140
130
120
110
Observed
simulated
2008
2010
2012
2014
2016
2018
2020
Year

13040282
280
270
260
250
240
230
Observed
simulated
2009
2011
2013
2015
2017
2019
2021

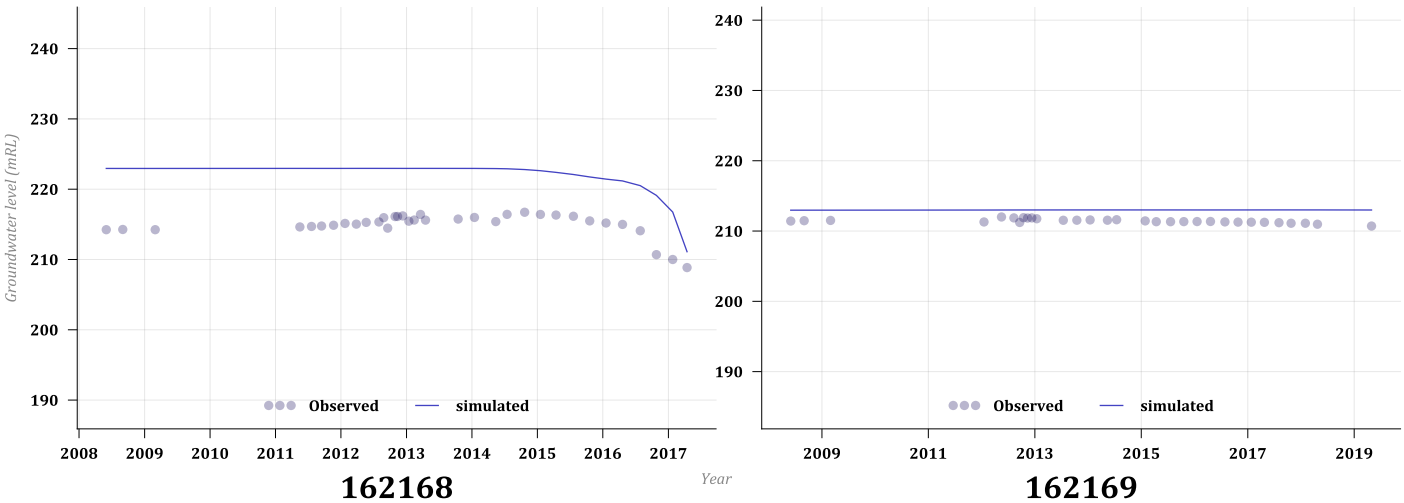

13040283
13040284
13040286
141383
141685
141807
141864
162013
Groundwater level (mRL)
Year
Observed
simulated



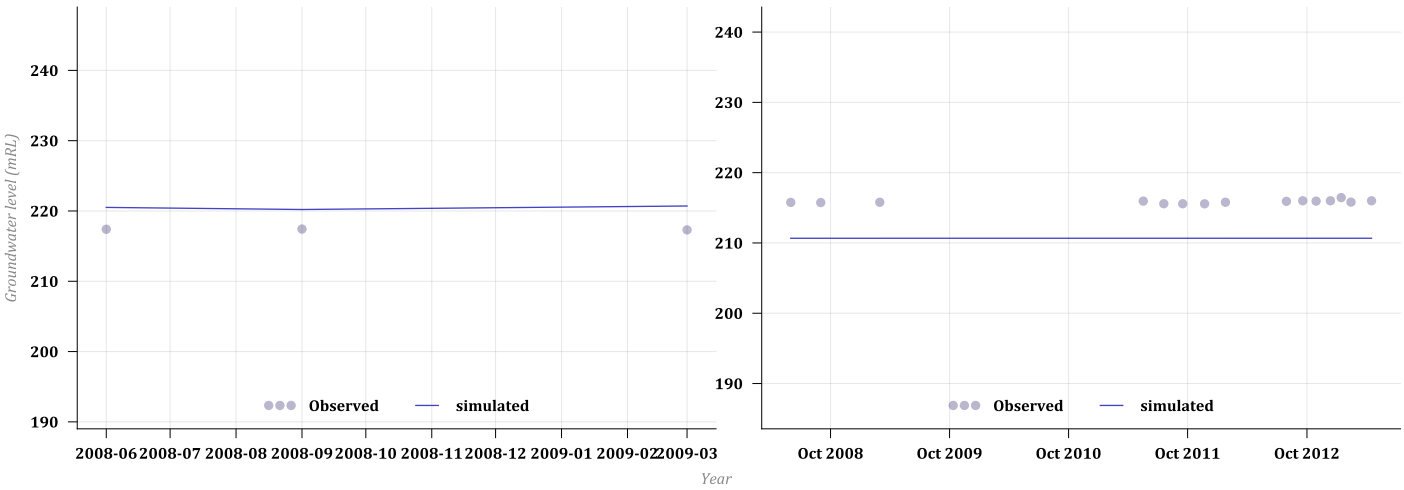
Year



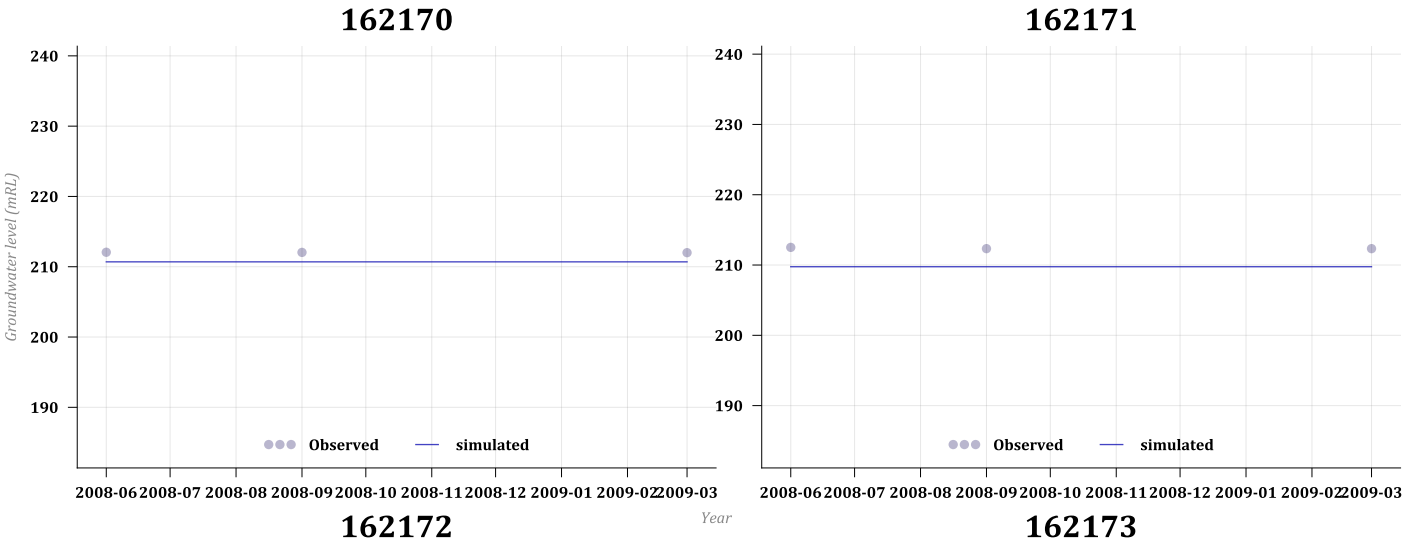
Year



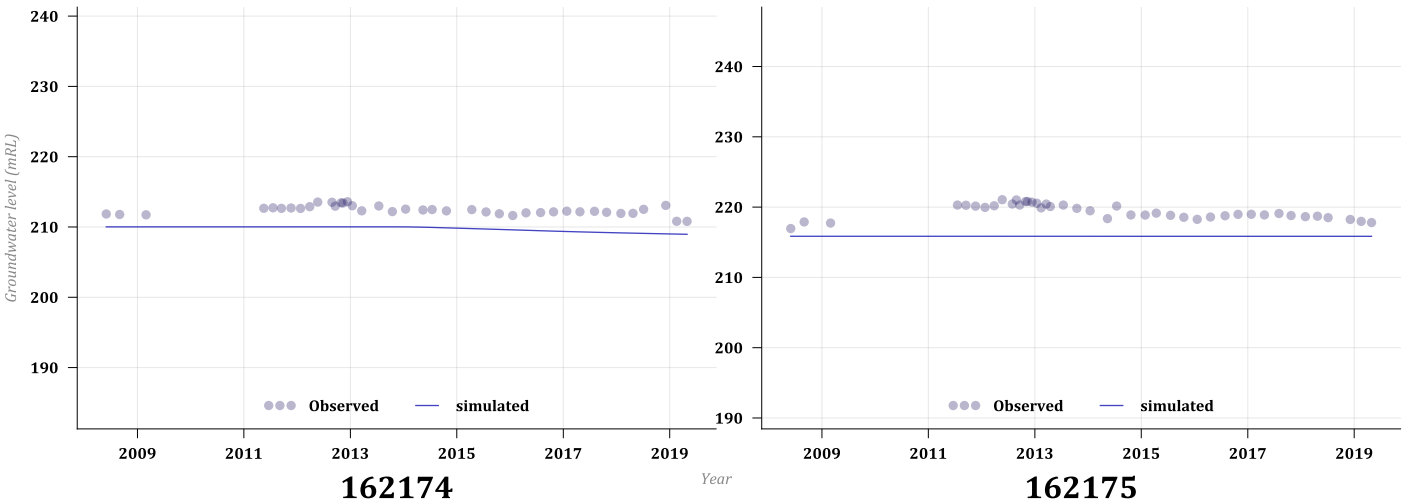
Year



Year


162170
Groundwater level (mRL)
240
230
220
210
200
190
Observed
simulated
2008-06 2008-07 2008-08 2008-09 2008-10 2008-11 2008-12 2009-01 2009-02 2009-03
Year

162171
240
230
220
210
200
190
Observed
simulated
2008-06 2008-07 2008-08 2008-09 2008-10 2008-11 2008-12 2009-01 2009-02 2009-03


162172
Groundwater level (mRL)
240
230
220
210
200
190
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

162173
240
230
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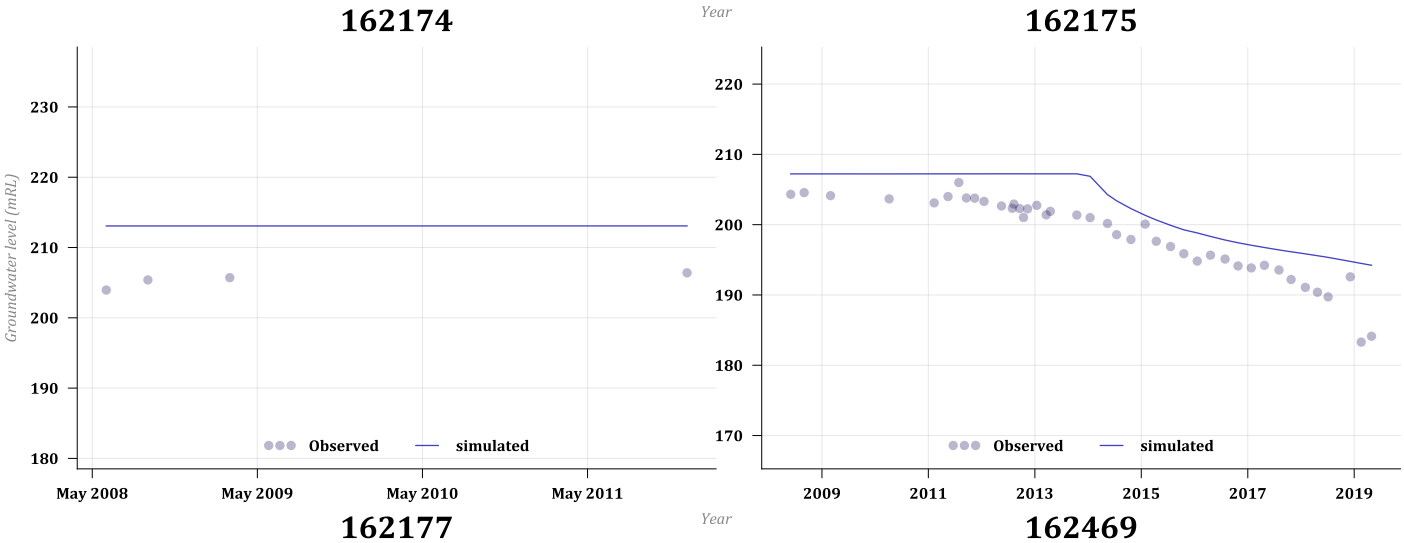
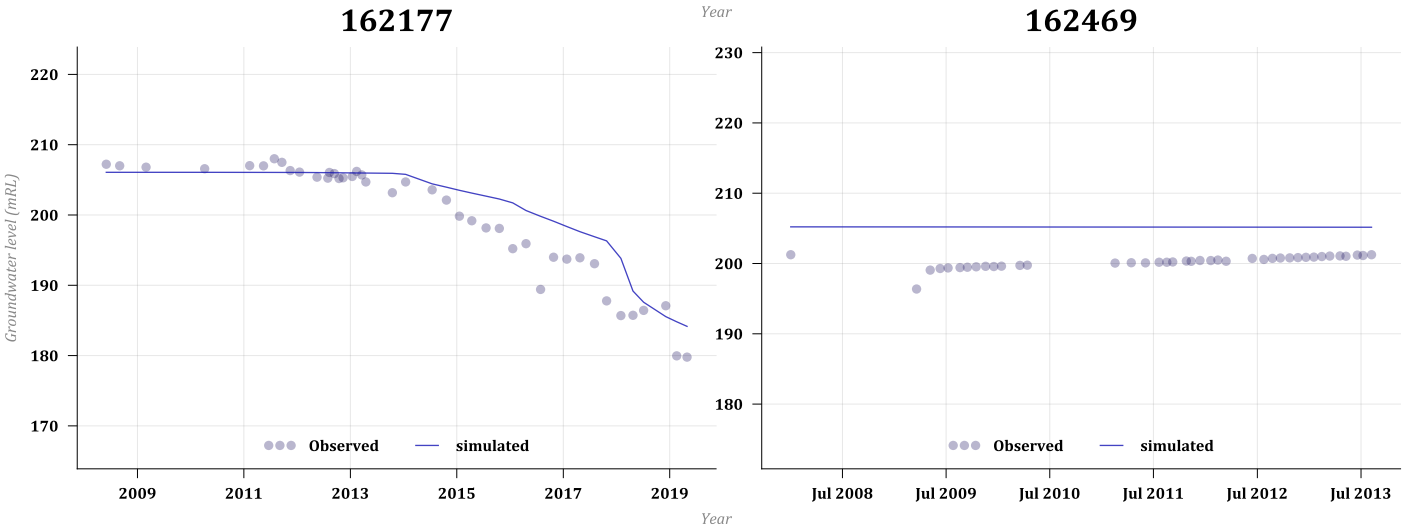
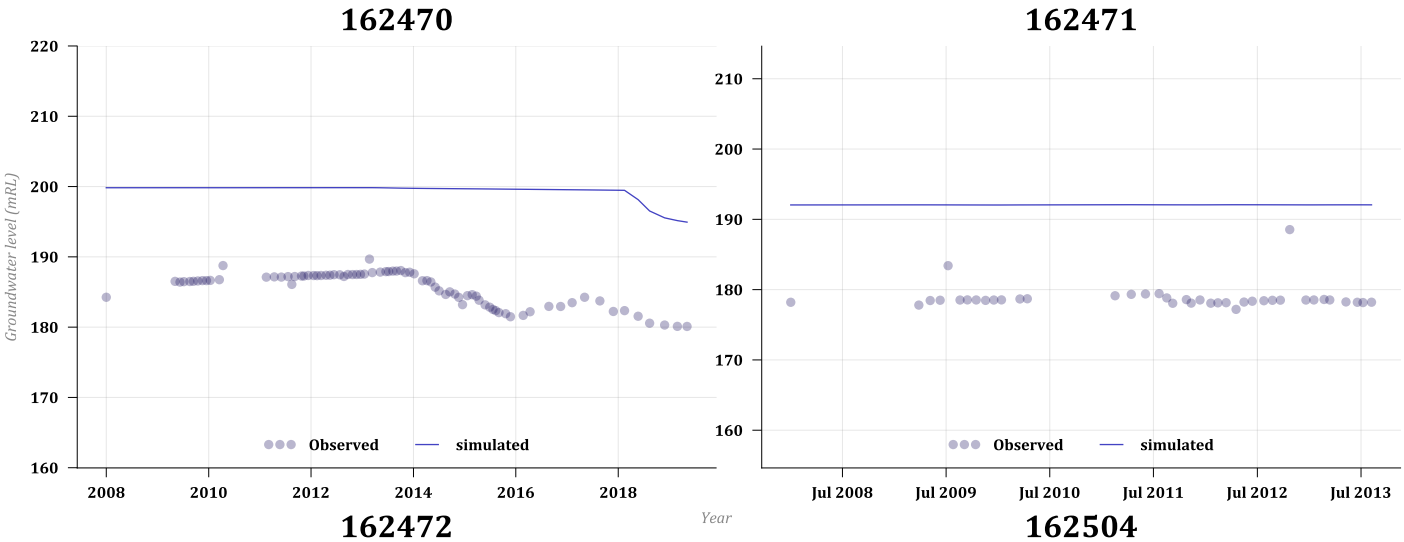
210
200
190
Observed
simulated
2009
2011
2013
2015
2017
2019


162174
Groundwater level (mRL)
230
220
210
200
190
180
Observed
simulated
May 2008
May 2009
May 2010
May 2011
Year

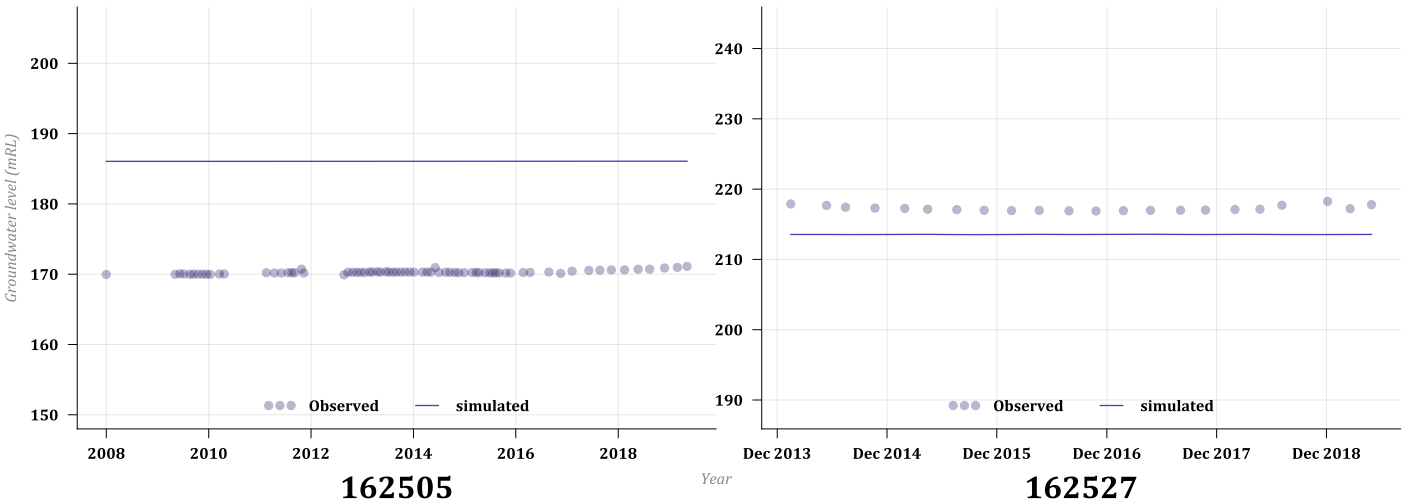
162175
220
210
200
190
180
170
Observed
simulated
2009
2011
2013
2015
2017
2019


162177
Groundwater level (mRL)
220
210
200
190
180
170
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

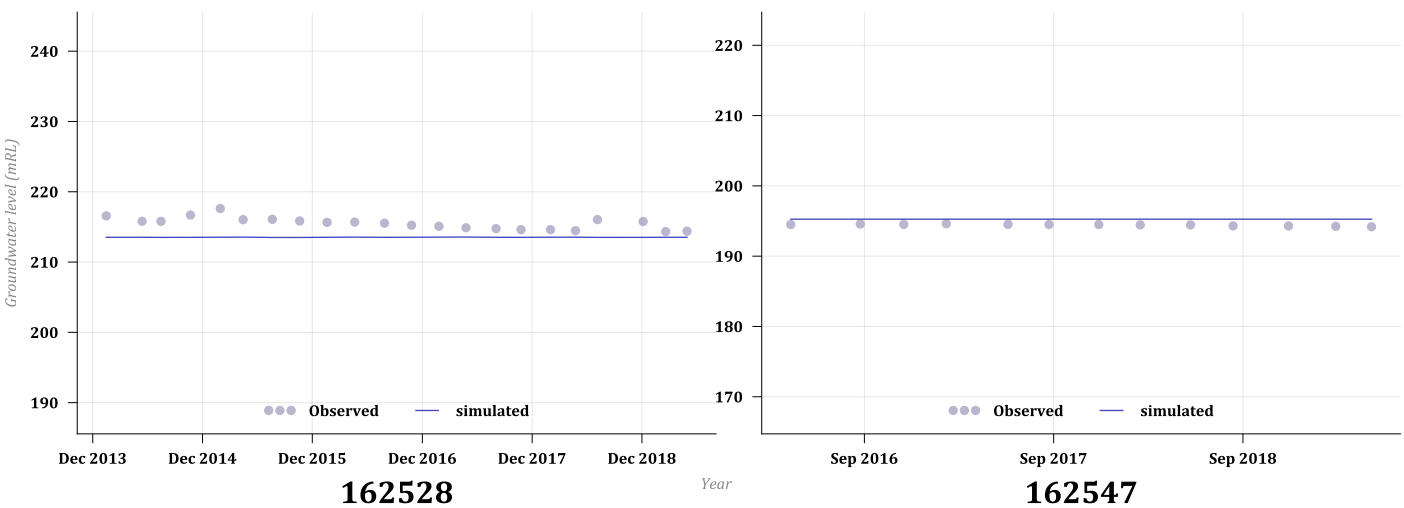
162469
230
220
210
200
190
180
Observed
simulated
Jul 2008
Jul 2009
Jul 2010
Jul 2011
Jul 2012
Jul 2013



Year



Year



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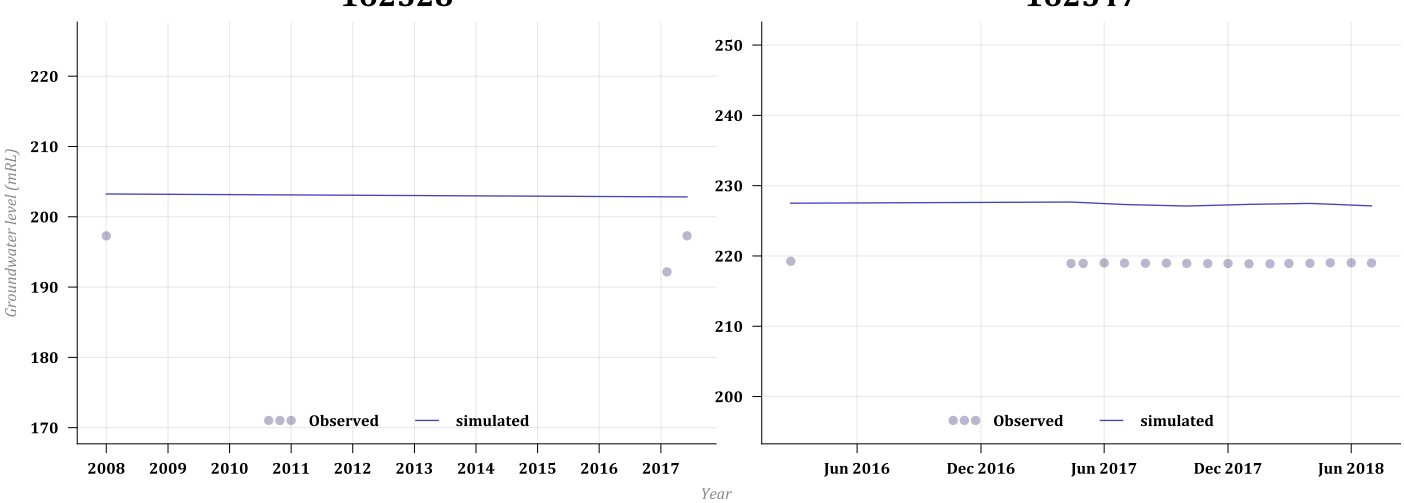
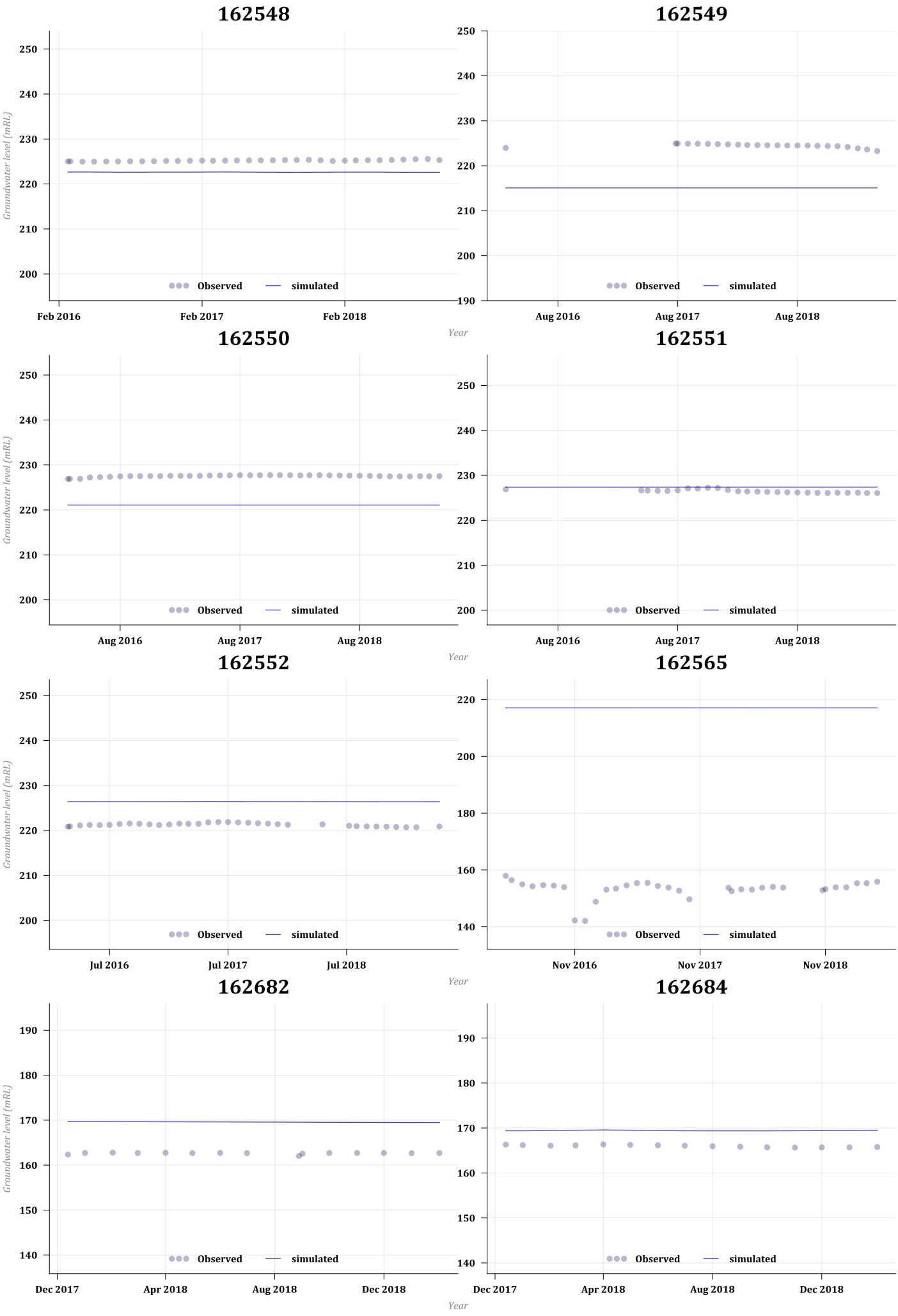
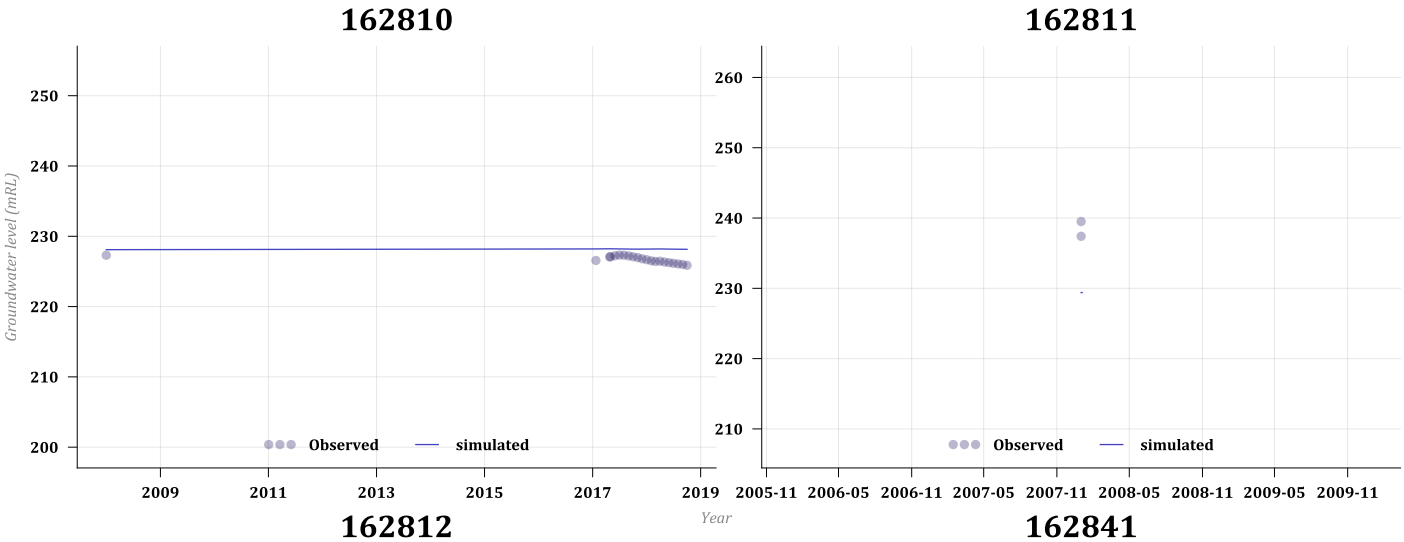
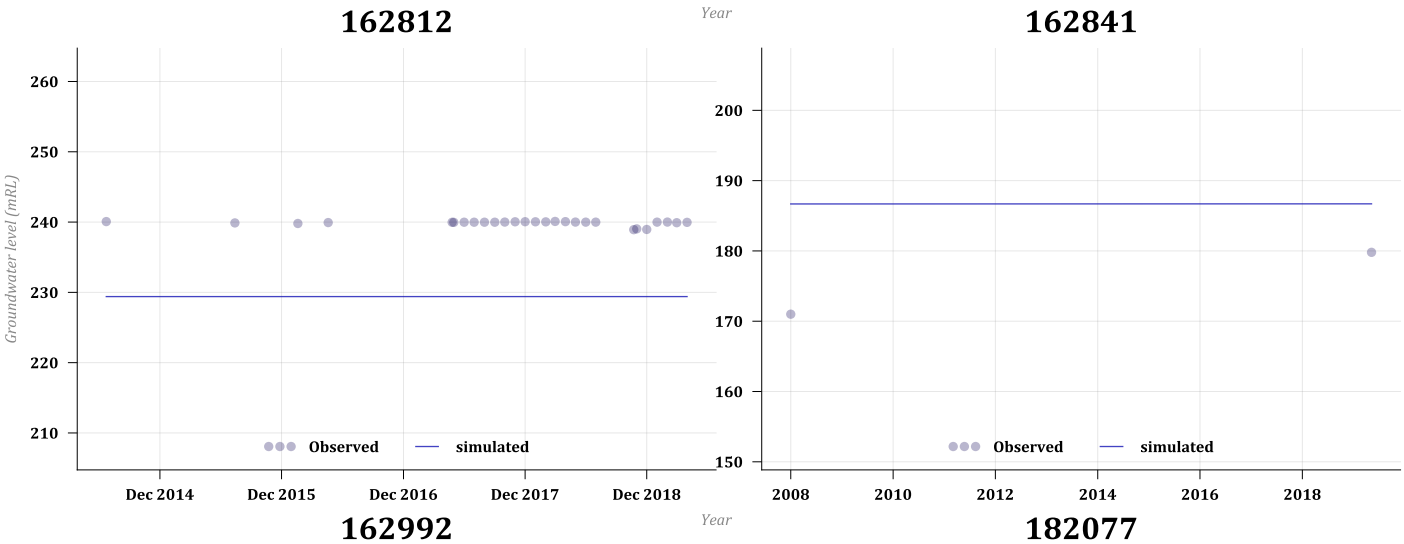


Year

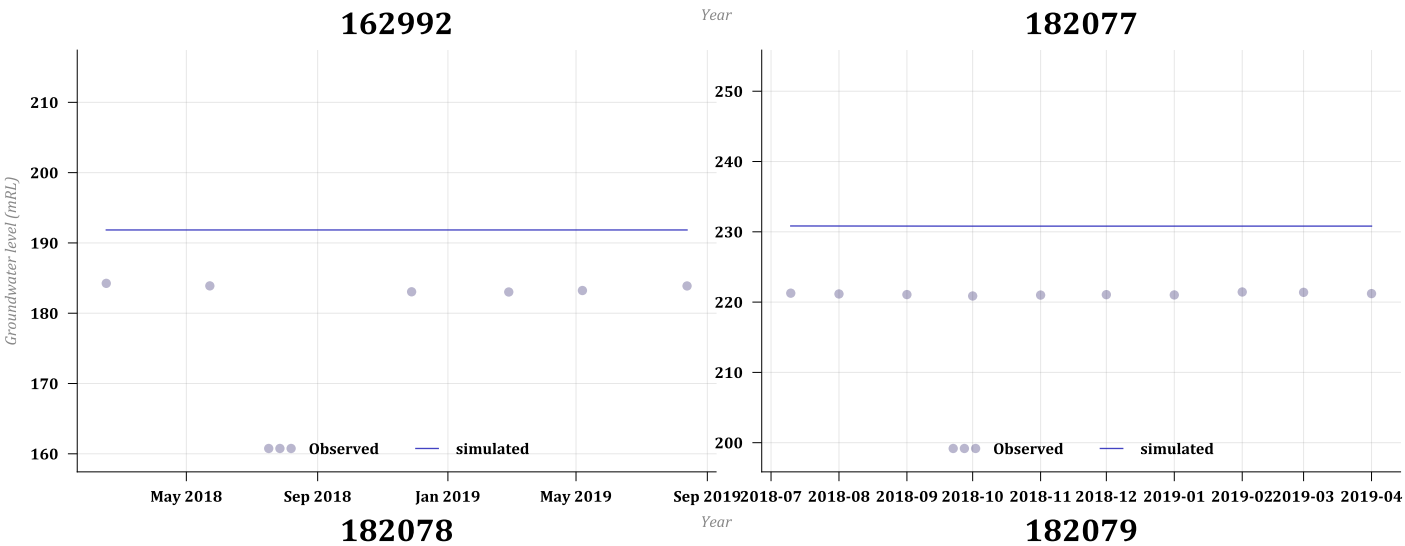

162548
162549
162550
162551
162552
162565
162682
162684
Groundwater level (mRL)
Year
Observed
simulated
Feb 2016
Feb 2017
Feb 2018
Aug 2016
Aug 2017
Aug 2018
Jul 2016
Jul 2017
Jul 2018
Nov 2016
Nov 2017
Nov 2018
Dec 2017
Apr 2018
Aug 2018
Dec 2018


162810
Groundwater level (mRL)
250
240
230
220
210
200
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

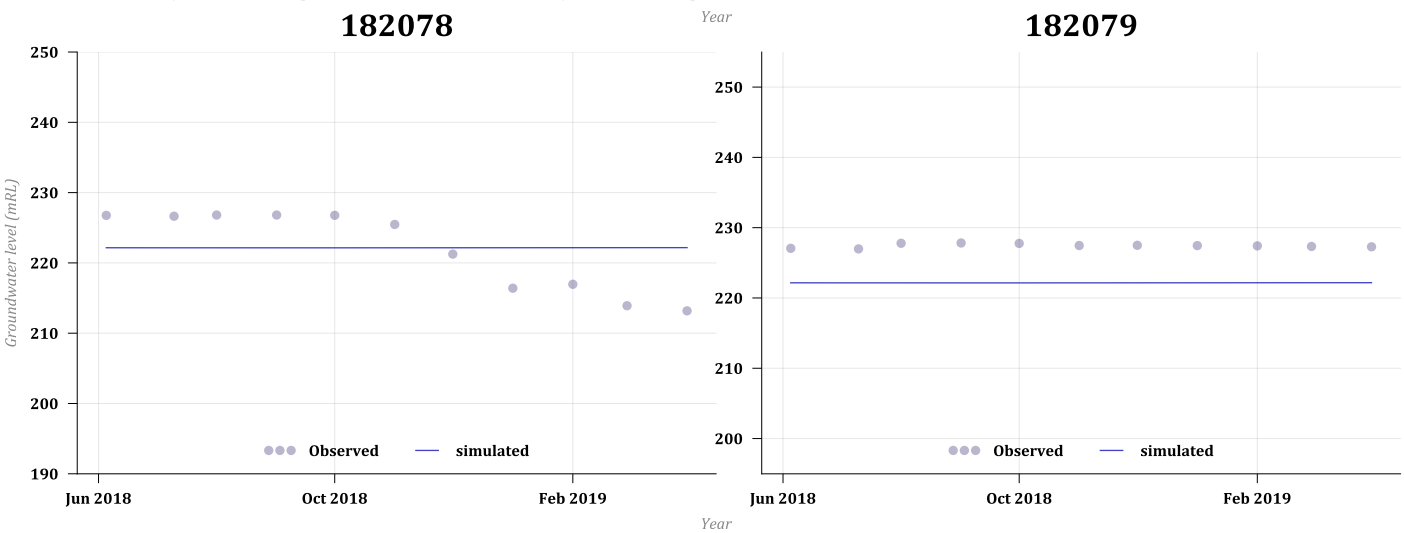
162811
260
250
240
230
220
210
Observed
simulated
2005-11
2006-05
2006-11
2007-05
2007-11
2008-05
2008-11
2009-05
2009-11


162812
Groundwater level (mRL)
260
250
240
230
220
210
Observed
simulated
Dec 2014
Dec 2015
Dec 2016
Dec 2017
Dec 2018
Year

162841
200
190
180
170
160
150
Observed
simulated
2008
2010
2012
2014
2016
2018


162992
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
May 2018
Sep 2018
Jan 2019
May 2019
Sep 2019
Year

182077
250
240
230
220
210
200
Observed
simulated
2018-07
2018-08
2018-09
2018-10
2018-11
2018-12
2019-01
2019-02
2019-03
2019-04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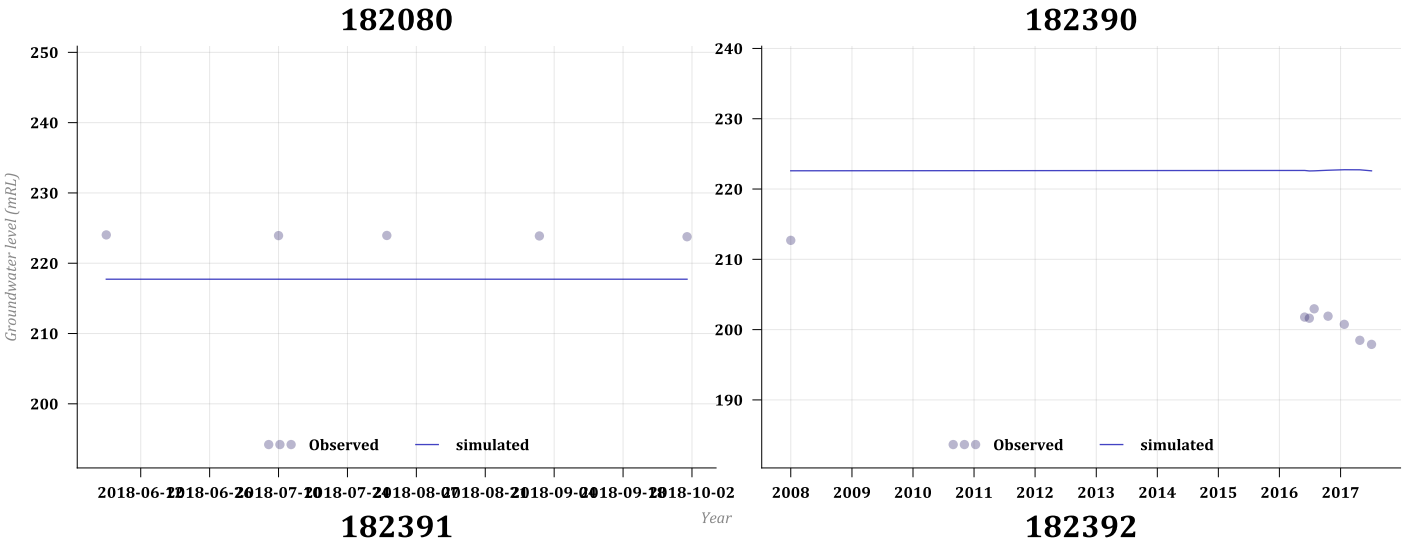
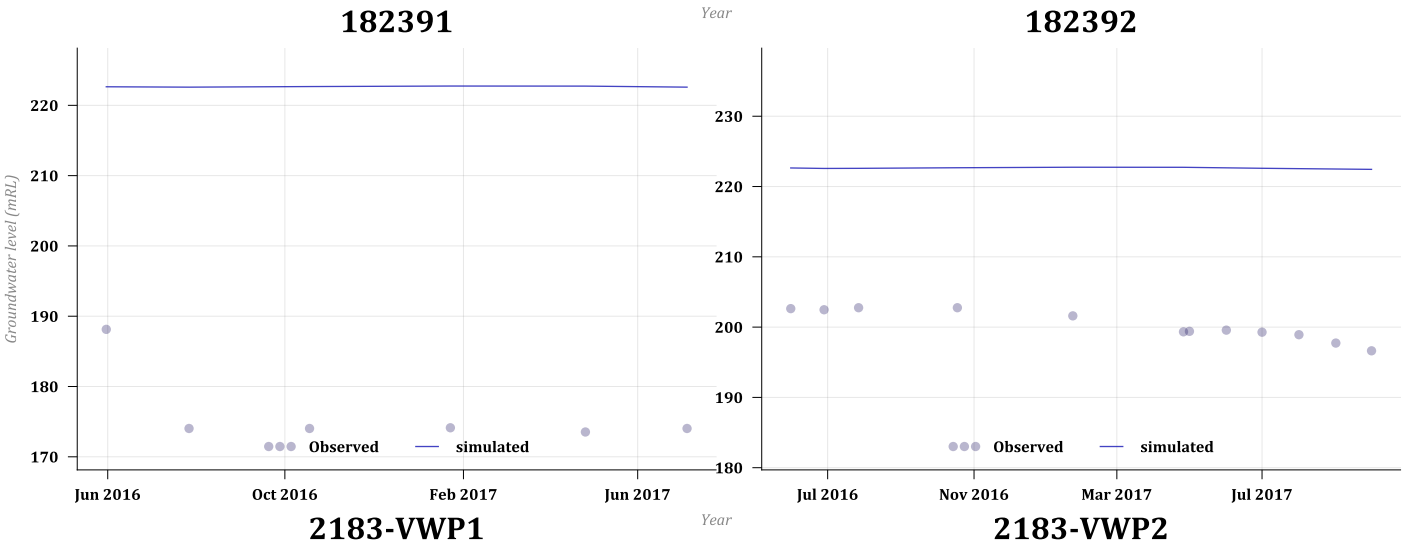
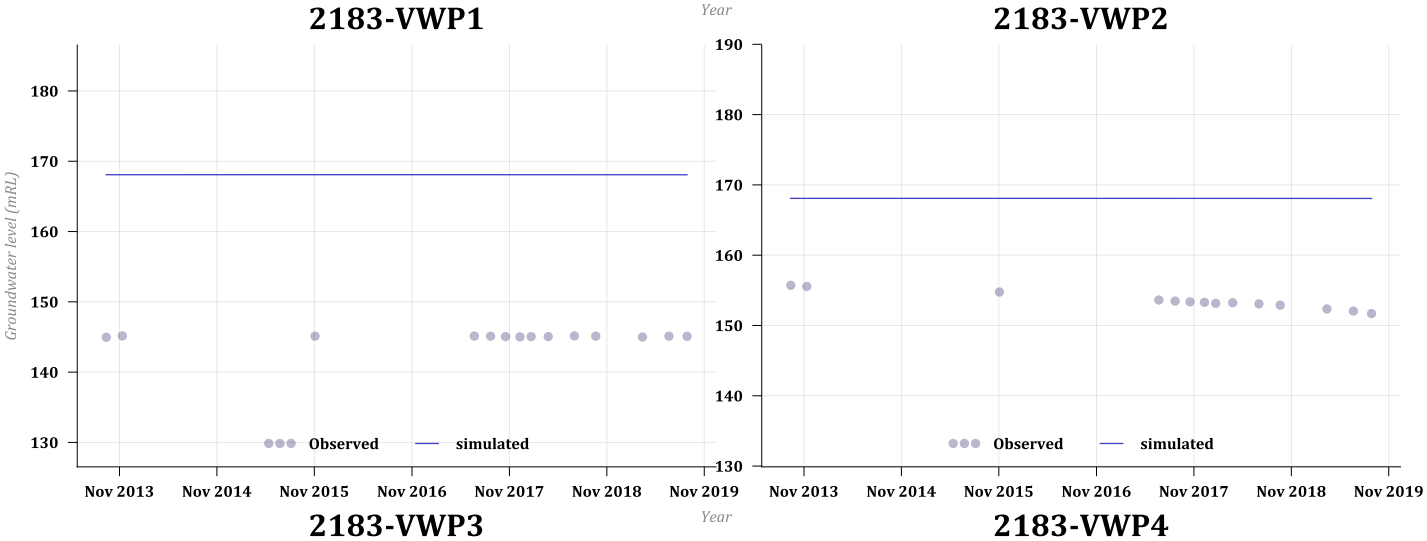
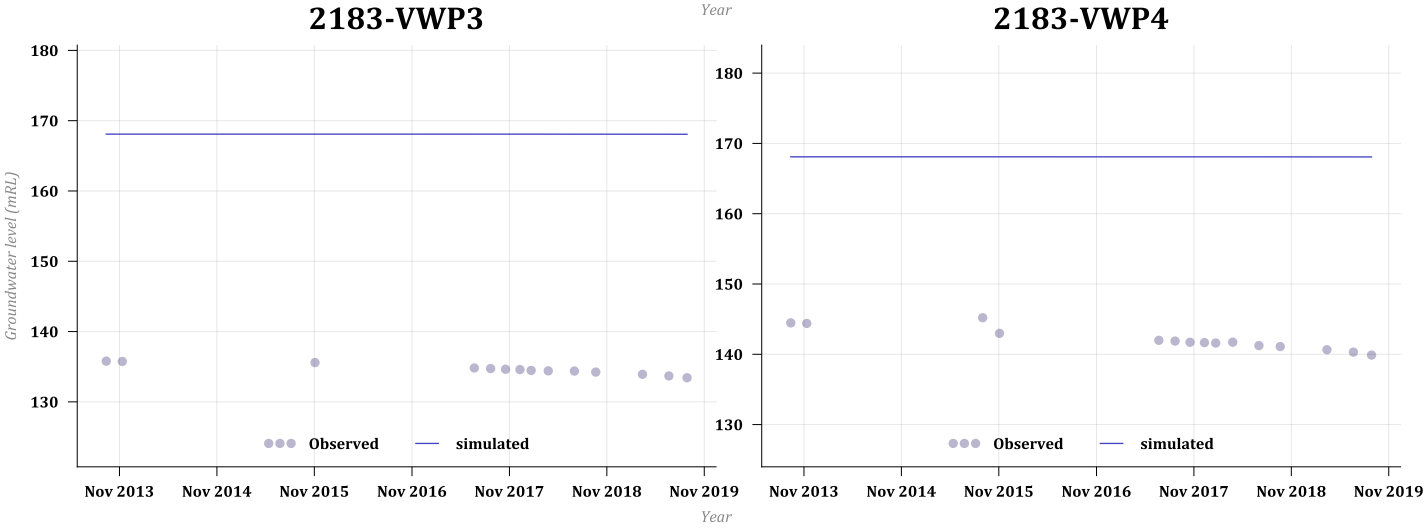
Groundwater level (mRL)
250
240
230
220
210
200
190
Observed
simulated
Jun 2018
Oct 2018
Feb 2019
Year

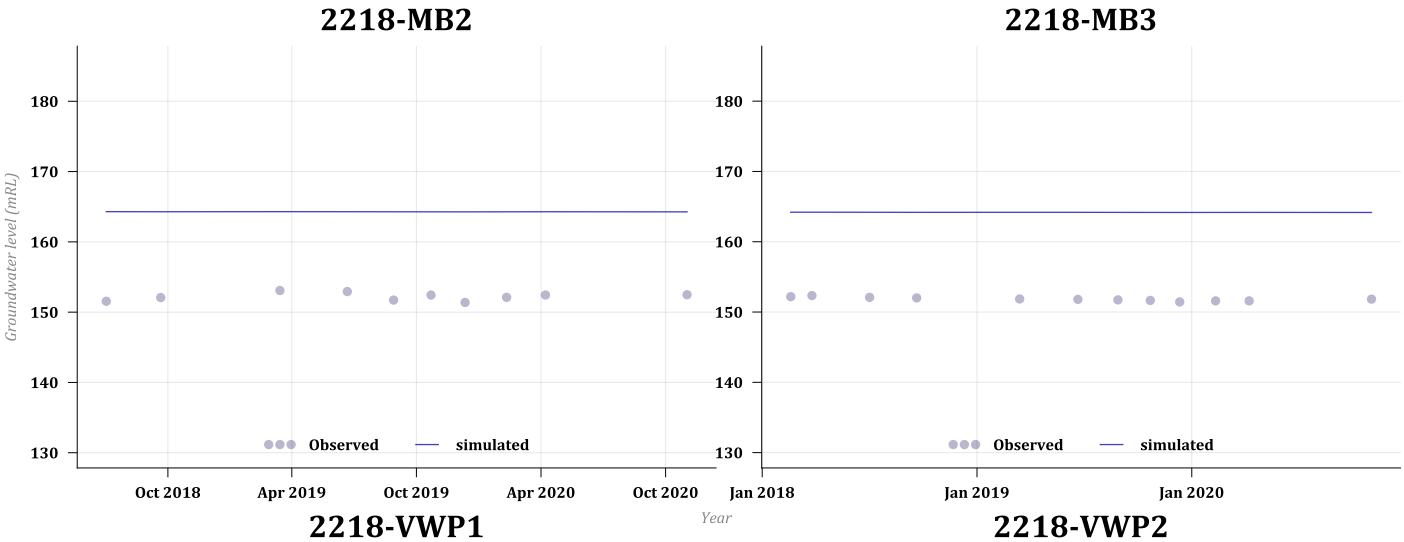
182079
250
240
230
220
210
200
Observed
simulated
Jun 2018
Oct 2018
Feb 2019


182080
Groundwater level (mRL)
Observed
simulated
182390
Observed
simulated
Year

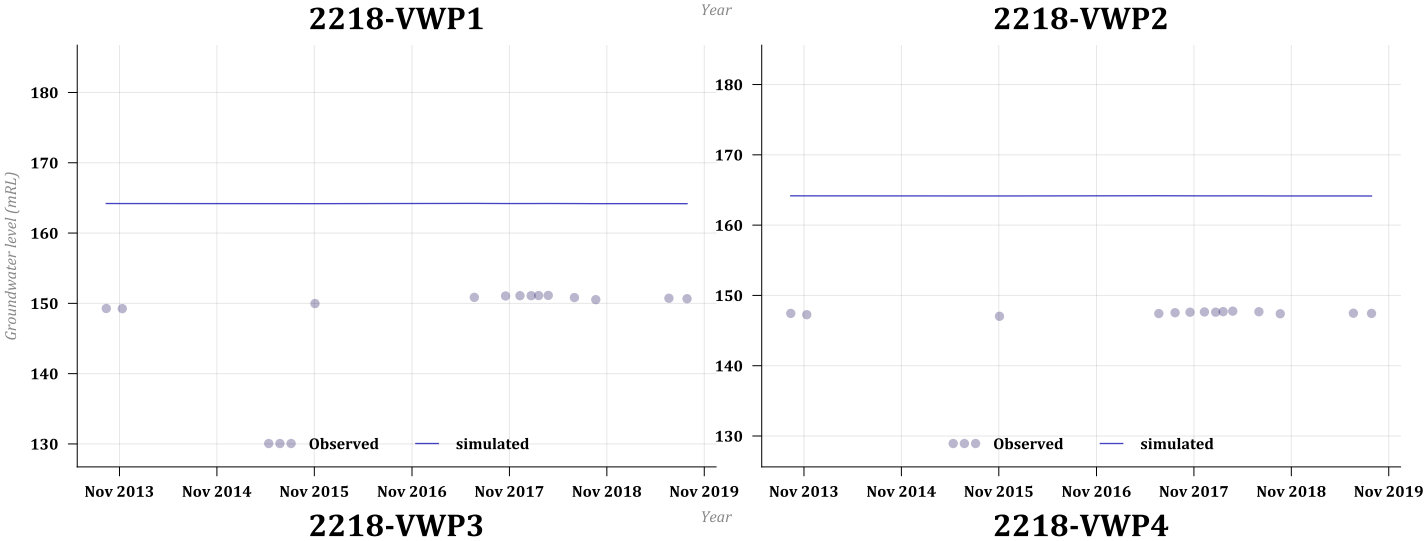

182391
Groundwater level (mRL)
Observed
simulated
182392
Observed
simulated
Year


2183-VWP1
Groundwater level (mRL)
Observed
simulated
2183-VWP2
Observed
simulated
Year

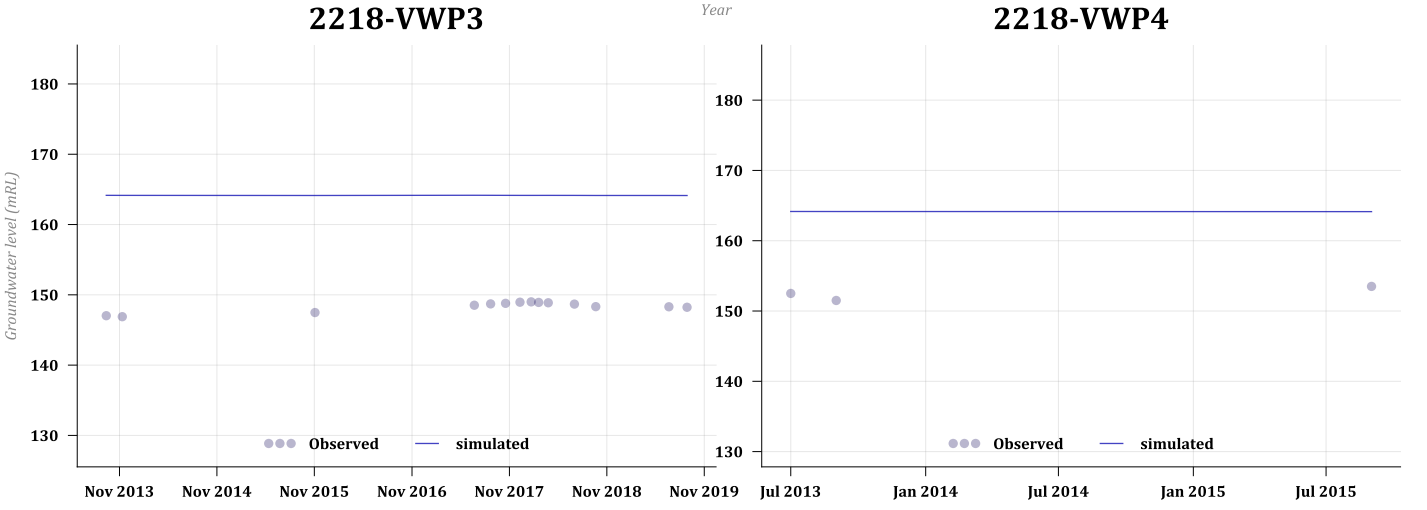

2183-VWP3
Groundwater level (mRL)
Observed
simulated
2183-VWP4
Observed
simulated
Year


2218-MB2
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Oct 2018
Apr 2019
Oct 2019
Apr 2020
Oct 2020

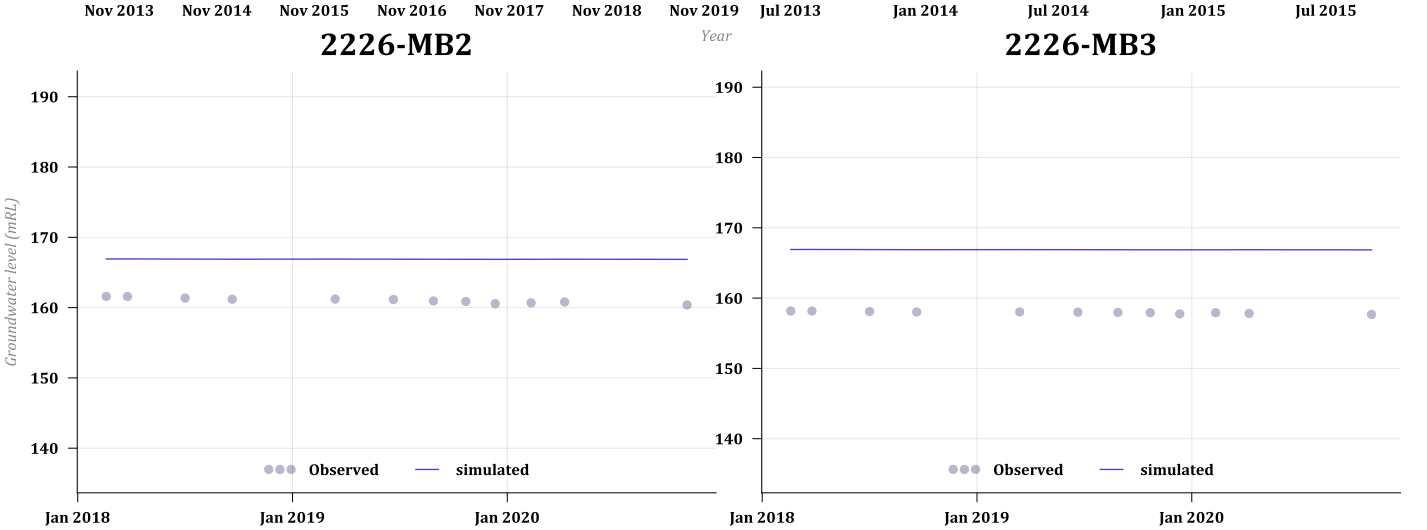
2218-MB3
180
170
160
150
140
130
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year


2218-VWP1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

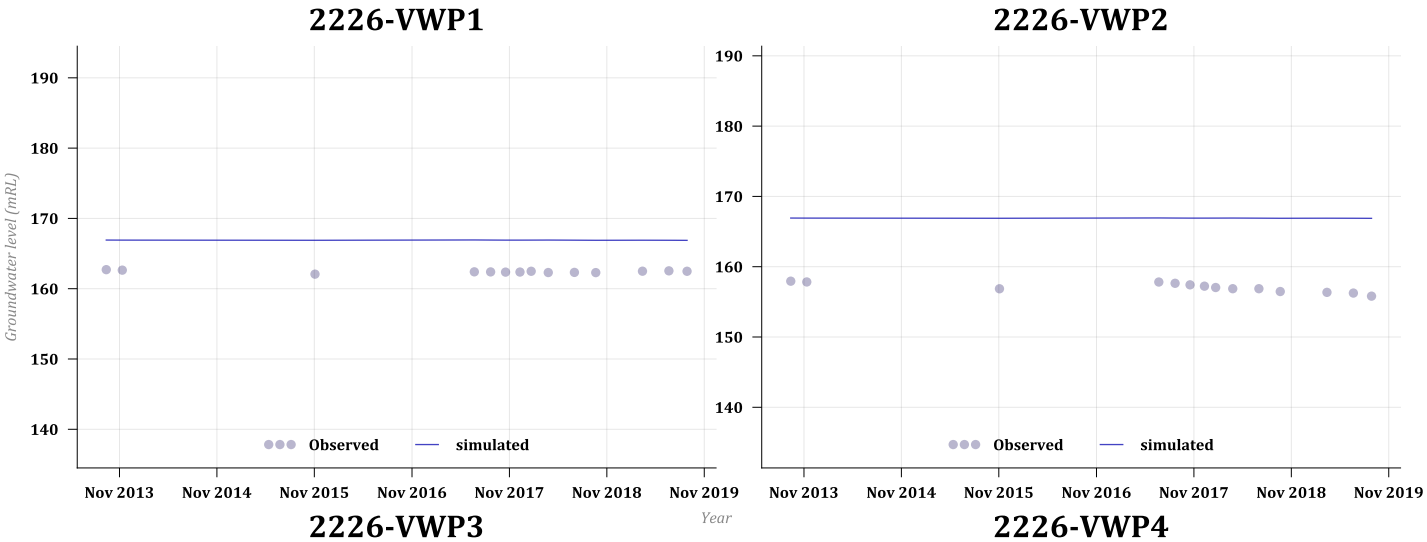
2218-VWP2
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year


2218-VWP3
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

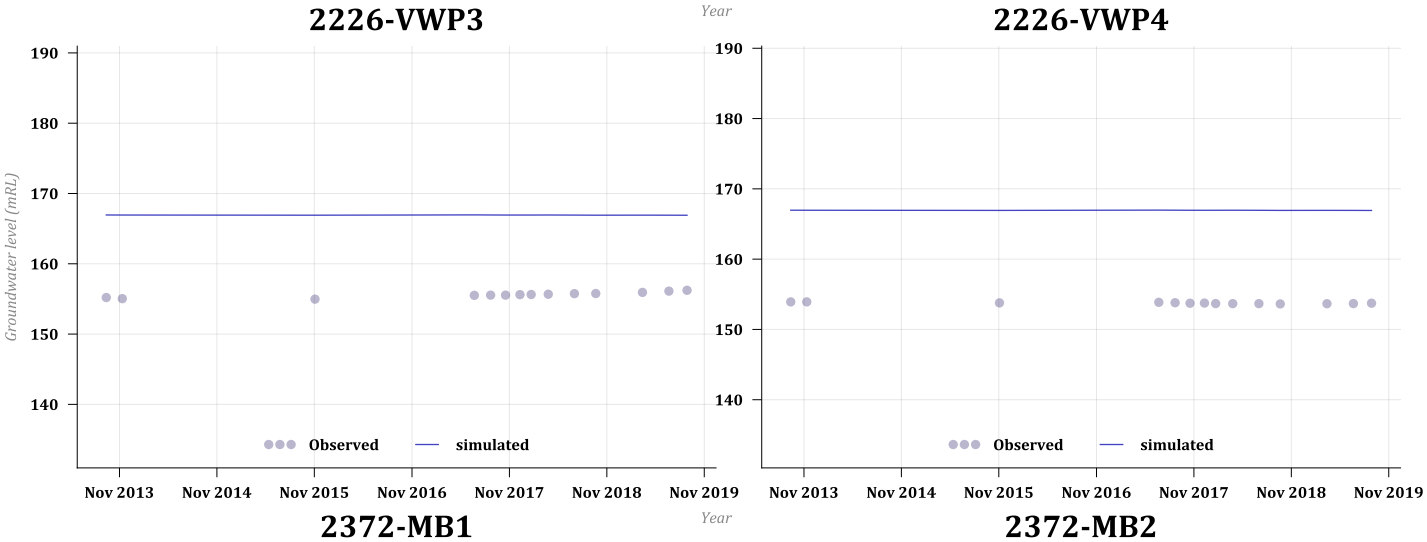
2218-VWP4
180
170
160
150
140
130
Observed
simulated
Jul 2013
Jan 2014
Jul 2014
Jan 2015
Jul 2015
Year


2226-MB2
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
Jan 2018
Jan 2019
Jan 2020

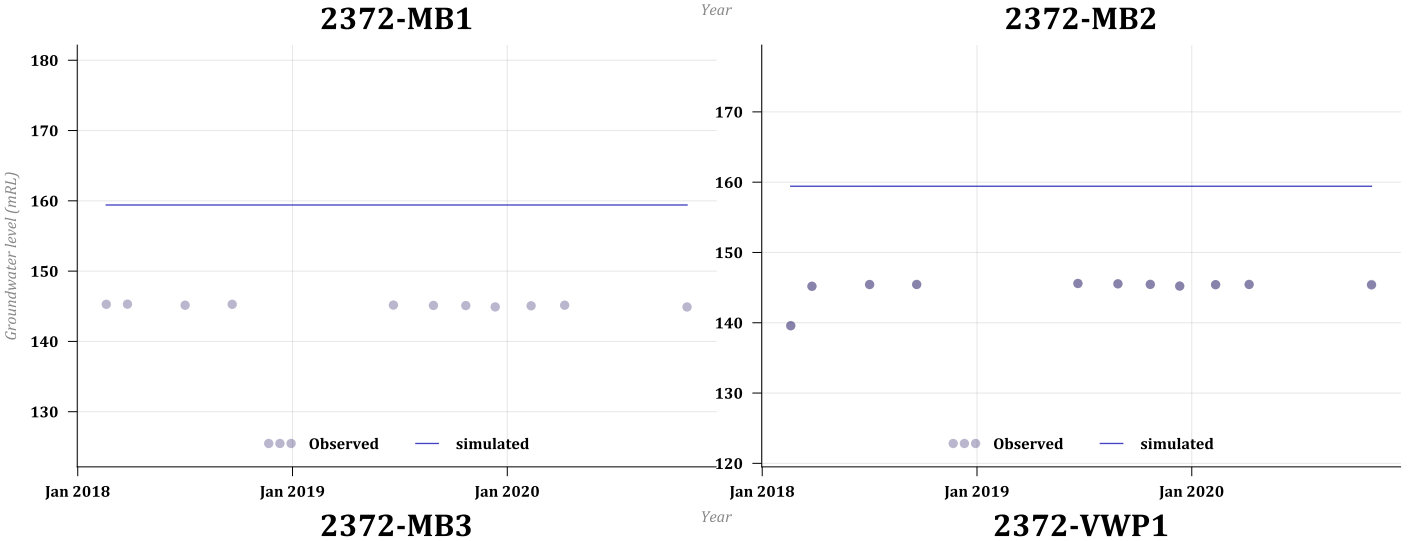
2226-MB3
190
180
170
160
150
140
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year


2226-VWP1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

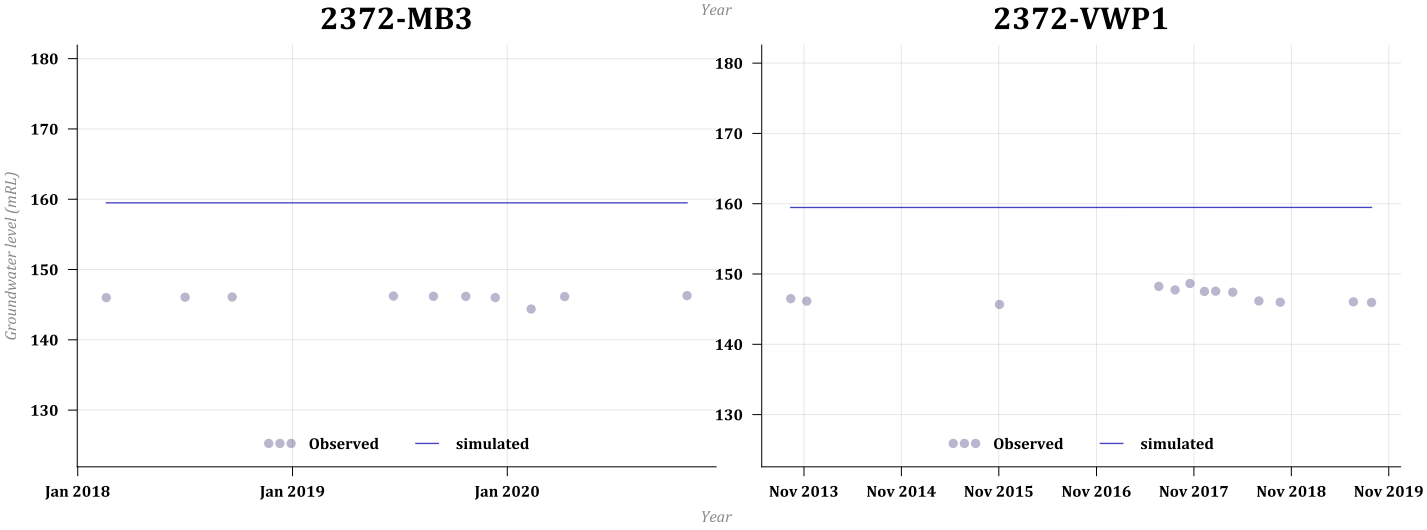
2226-VWP2
190
180
170
160
150
140
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019


2226-VWP3
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

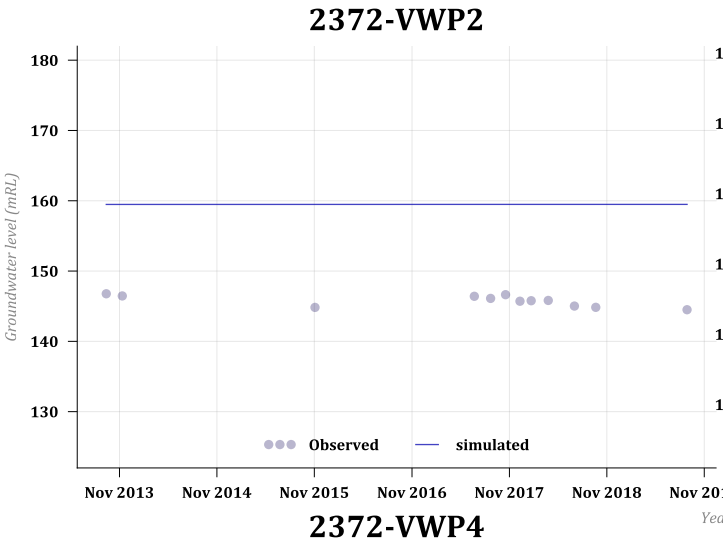
2226-VWP4
190
180
170
160
150
140
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

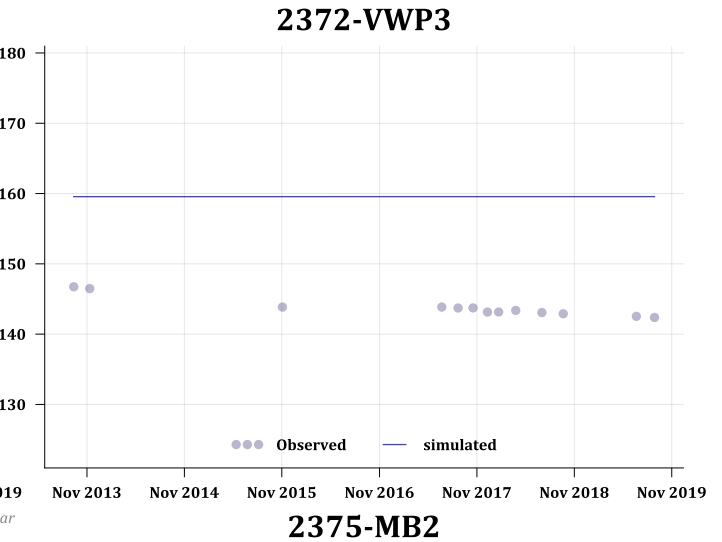

2372-MB1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year

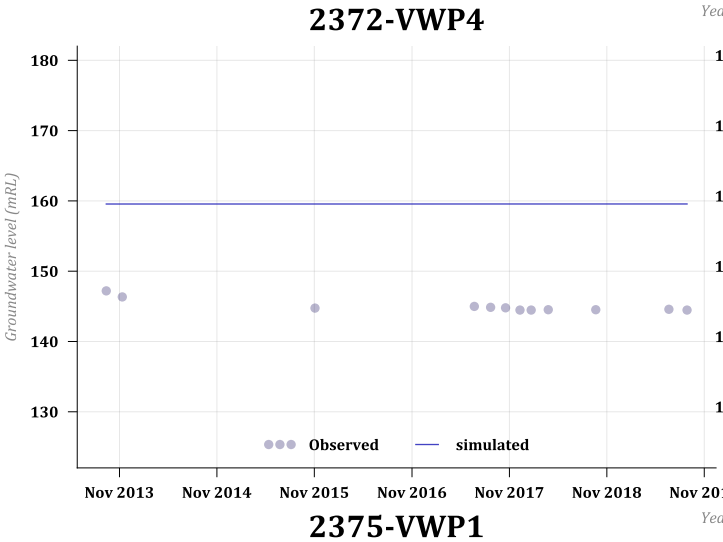
2372-MB2
180
170
160
150
140
130
120
Observed
simulated
Jan 2018
Jan 2019
Jan 2020

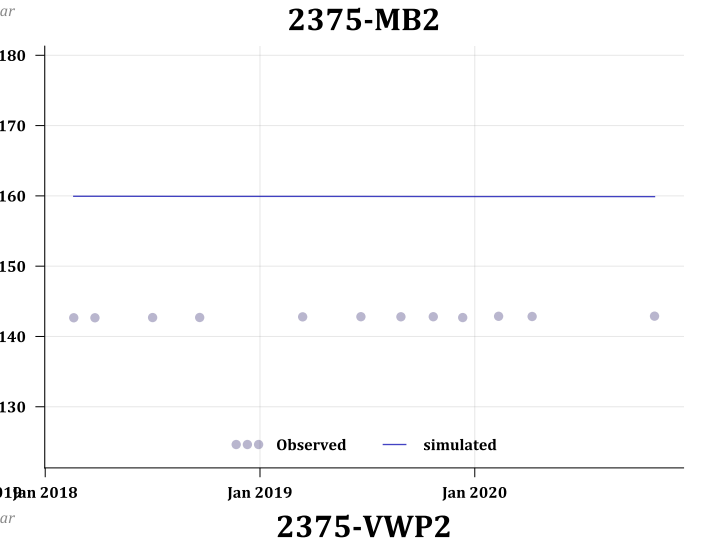

2372-MB3
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year

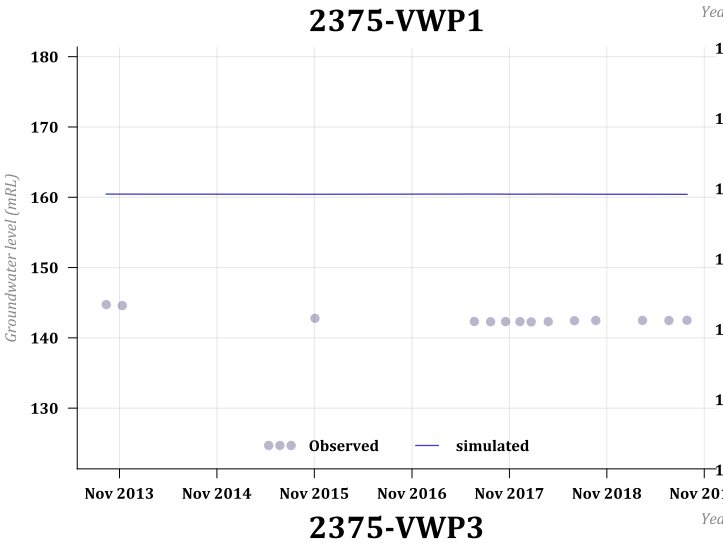
2372-VWP1
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

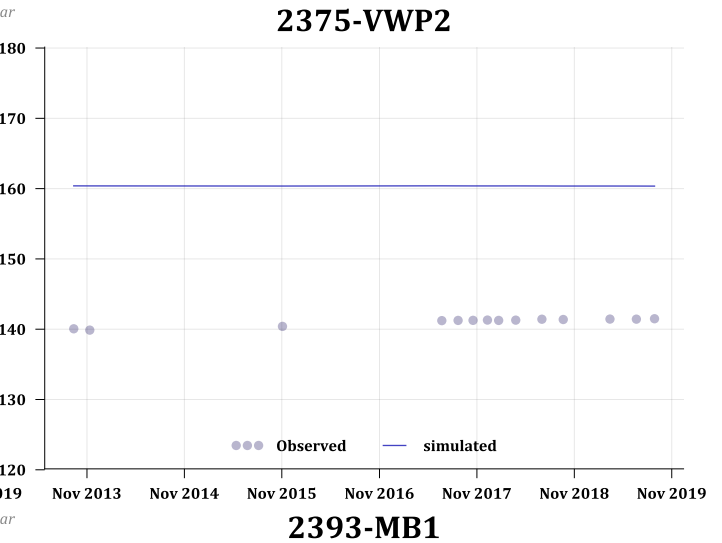

2372-VWP2
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

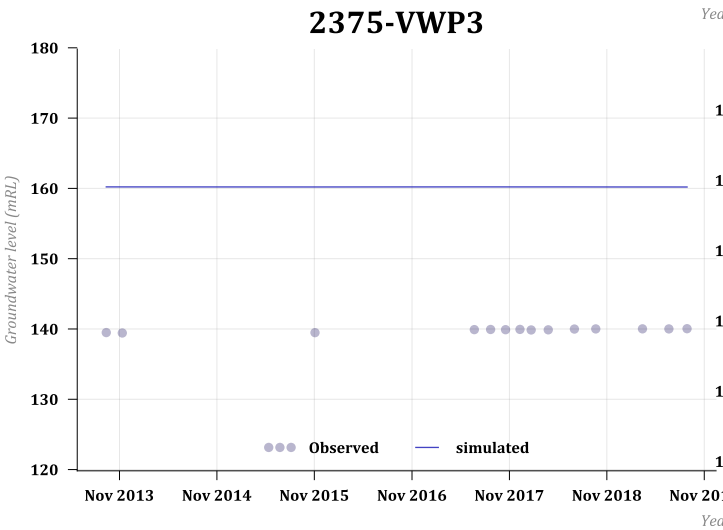

2372-VWP3
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

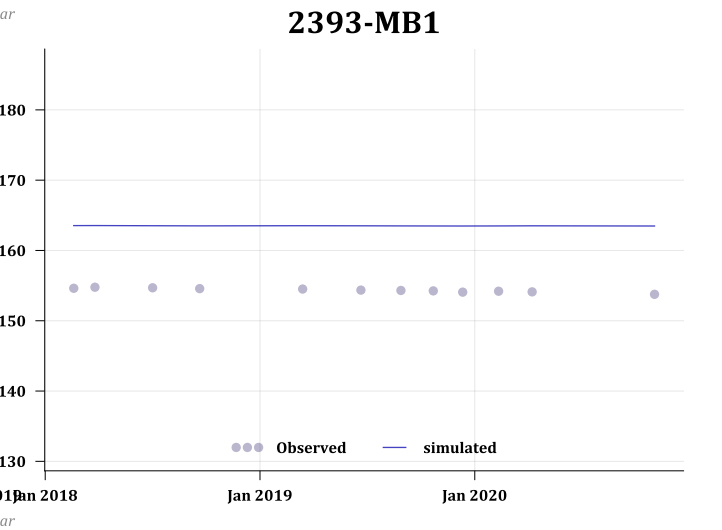

2372-VWP4
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year

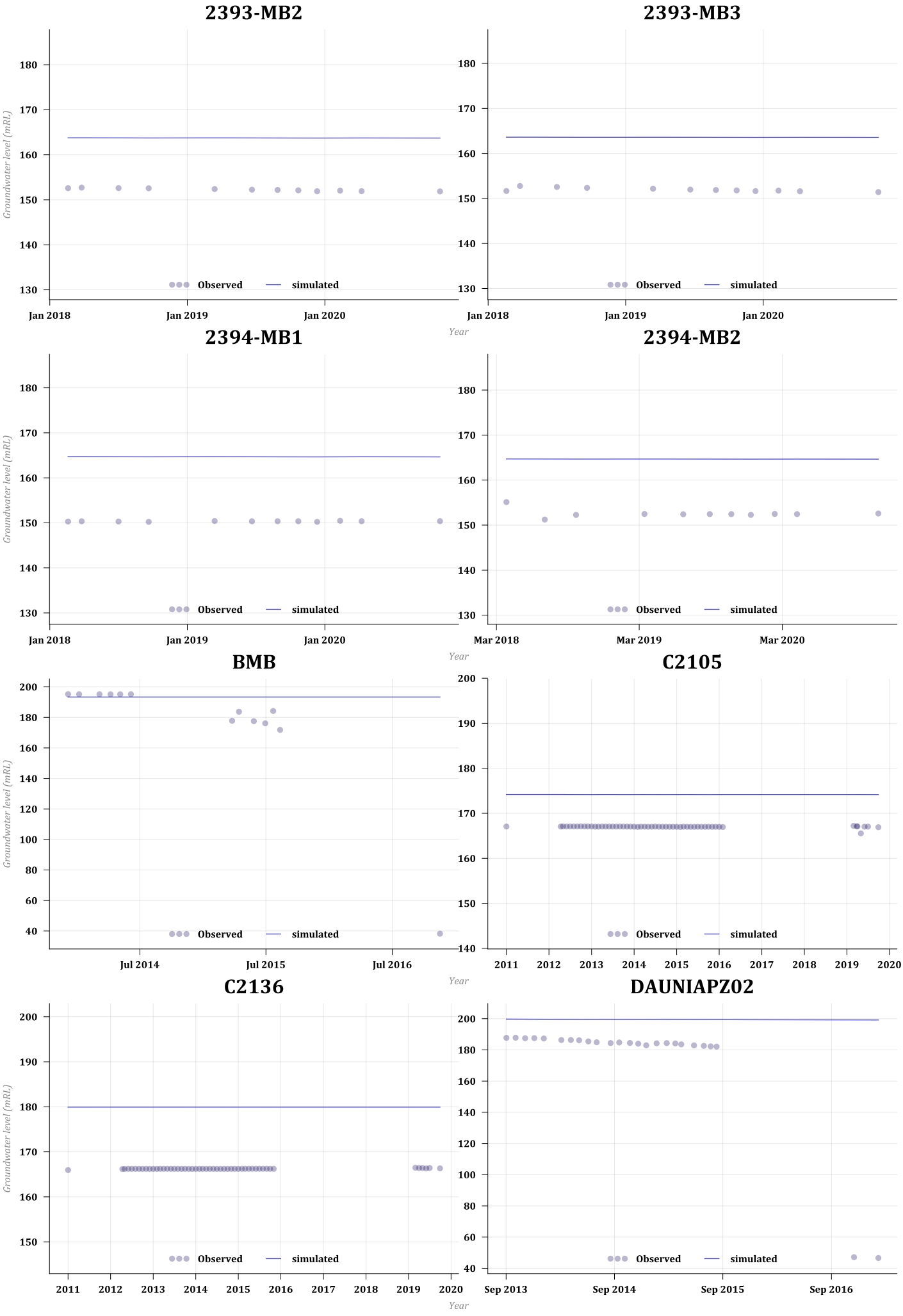

2375-MB2
180
170
160
150
140
130
Observed
simulated
Jan 2018
Jan 2019
Jan 2020

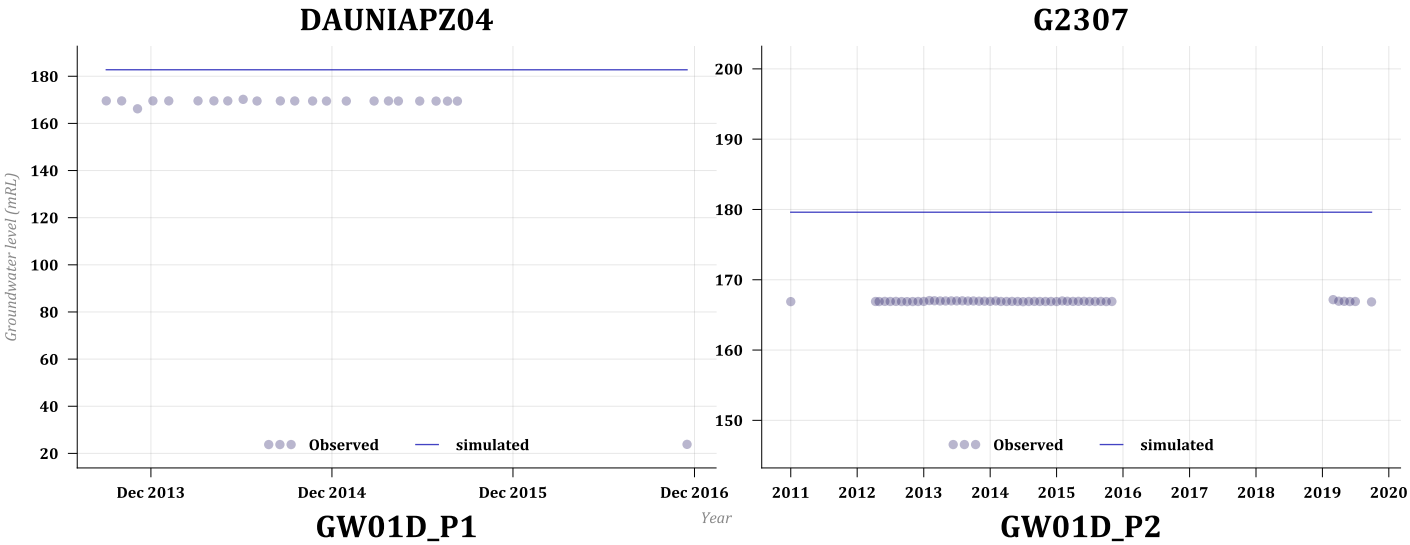

2375-VWP1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year


2375-VWP2
180
170
160
150
140
130
120
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019

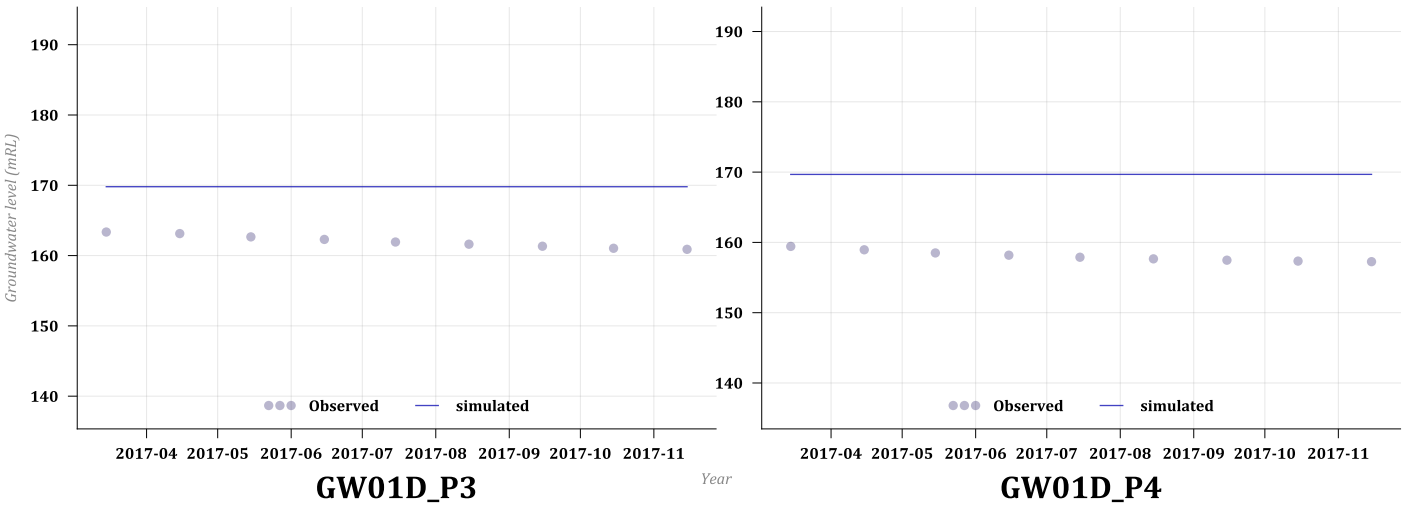

2375-VWP3
Groundwater level (mRL)
180
170
160
150
140
130
120
Observed
simulated
Nov 2013
Nov 2014
Nov 2015
Nov 2016
Nov 2017
Nov 2018
Nov 2019
Year


2393-MB1
180
170
160
150
140
130
Observed
simulated
Jan 2018
Jan 2019
Jan 2020

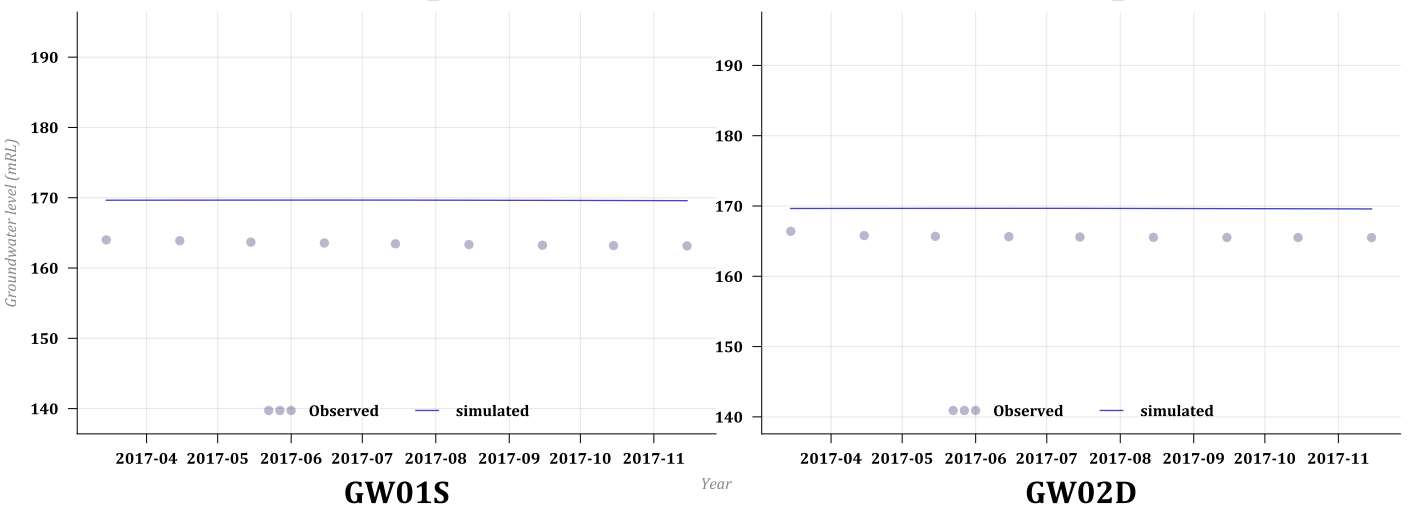

2393-MB2
2393-MB3
2394-MB1
2394-MB2
BMB
C2105
C2136
DAUNIAPZ02
Groundwater level (mRL)
Year
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Mar 2018
Mar 2019
Mar 2020
Jul 2014
Jul 2015
Jul 2016
Sep 2013
Sep 2014
Sep 2015
Sep 2016


DAUNIAPZ04
Groundwater level (mRL)
Observed
simulated
Dec 2013
Dec 2014
Dec 2015
Dec 2016
Year

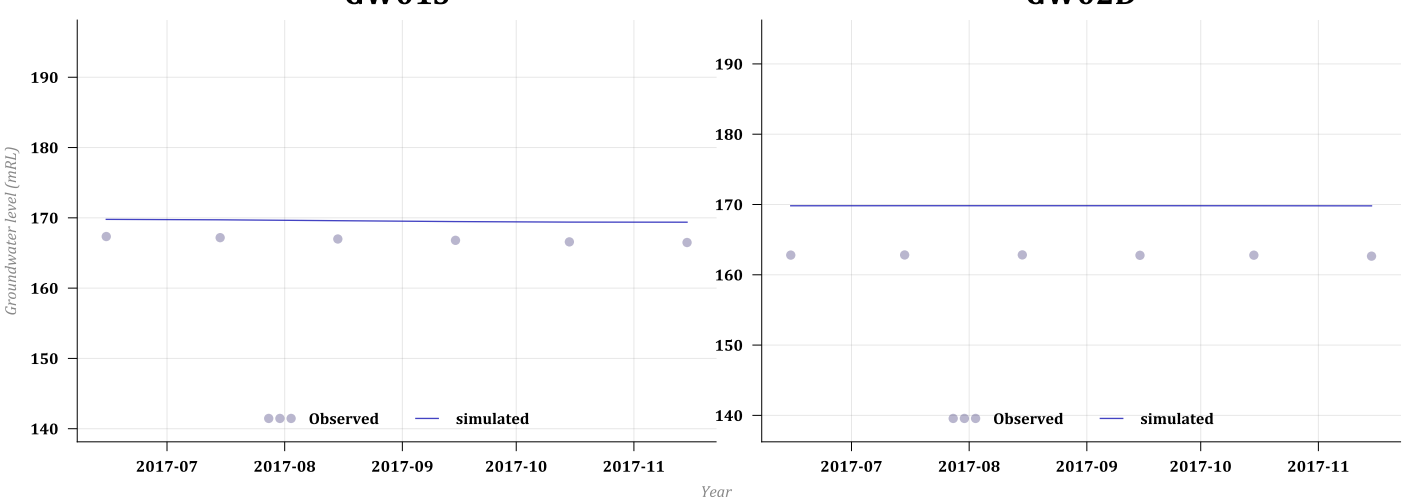
G2307
Observed
simulated
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020


GW01D_P1
Groundwater level (mRL)
Observed
simulated
2017-04
2017-05
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11
Year

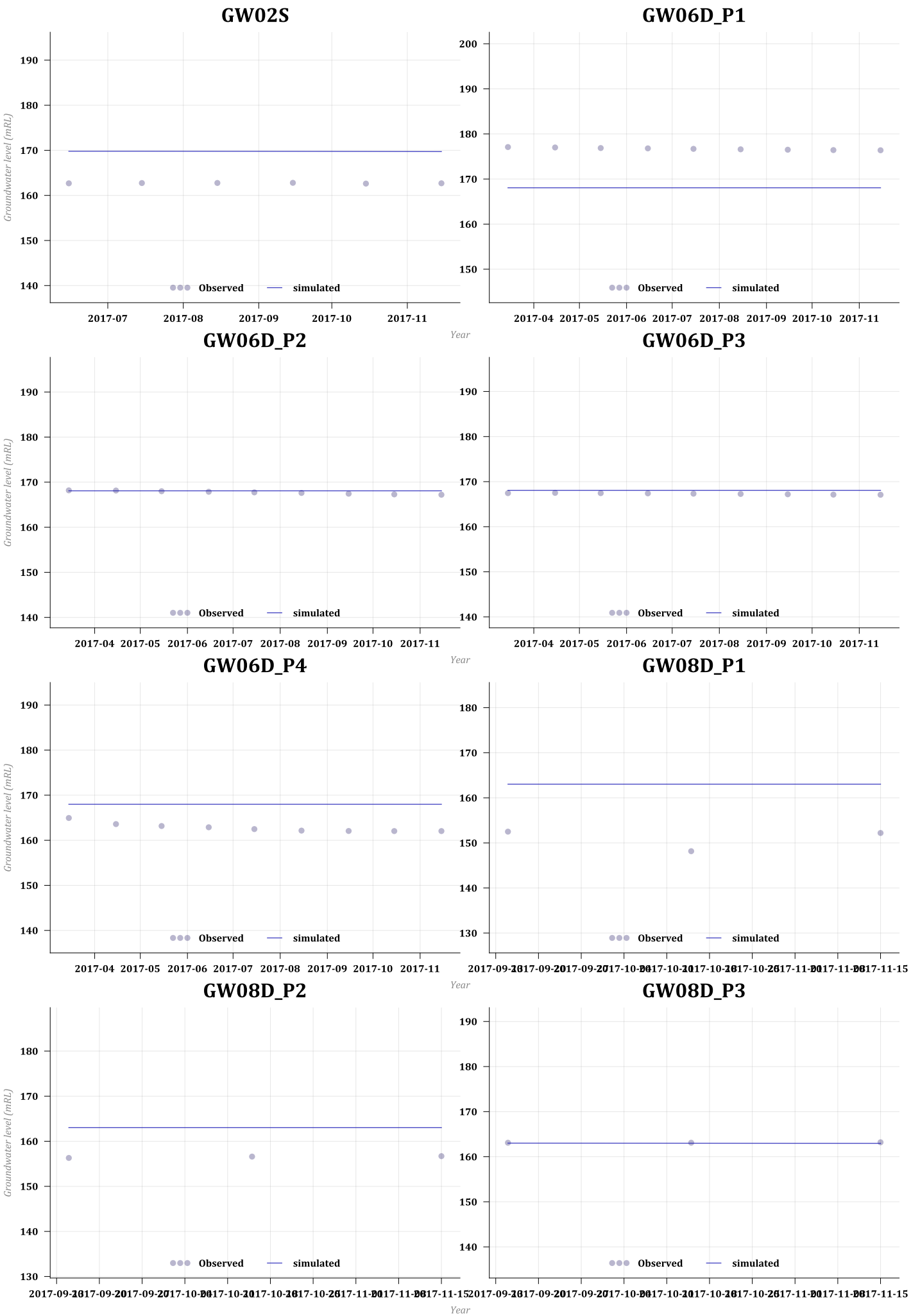
GW01D_P2
Observed
simulated
2017-04
2017-05
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11

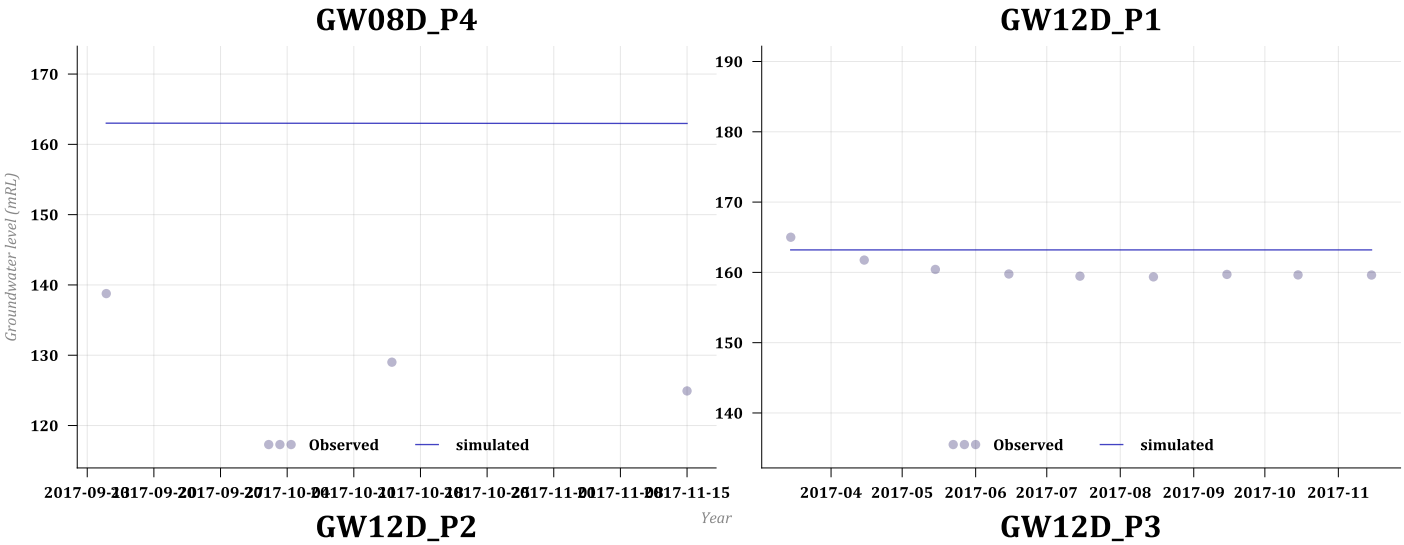

GW01D_P3
Groundwater level (mRL)
Observed
simulated
2017-04
2017-05
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11
Year

GW01D_P4
Observed
simulated
2017-04
2017-05
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11

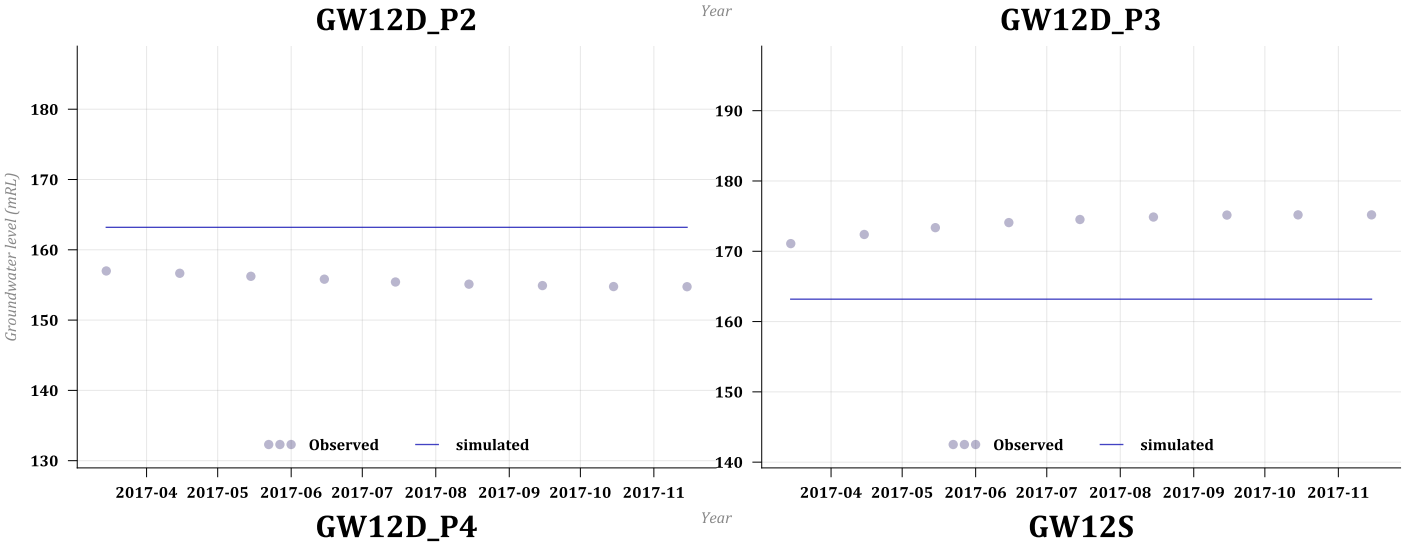

GW01S
Groundwater level (mRL)
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11
Year

GW02D
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11

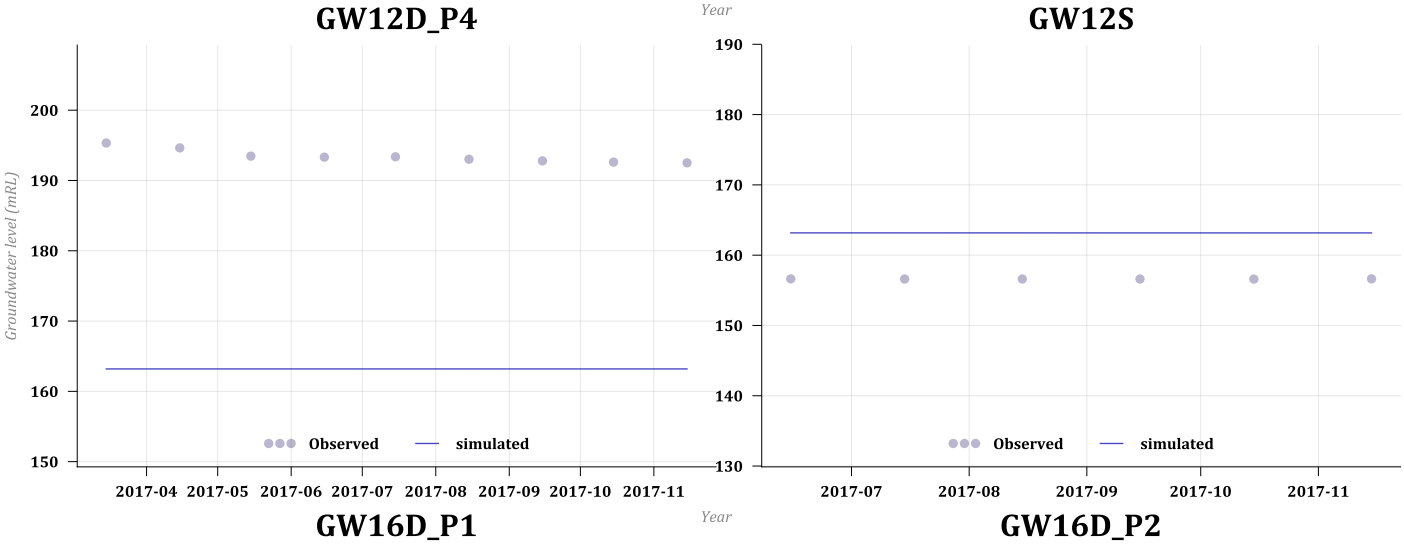

GW02S
GW06D_P1
GW06D_P2
GW06D_P3
GW06D_P4
GW08D_P1
GW08D_P2
GW08D_P3
Groundwater level (mRL)
Year
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11
2017-04
2017-05
2017-06
2017-11-15


GW08D_P4
Groundwater level (mRL)
Observed
simulated
Year

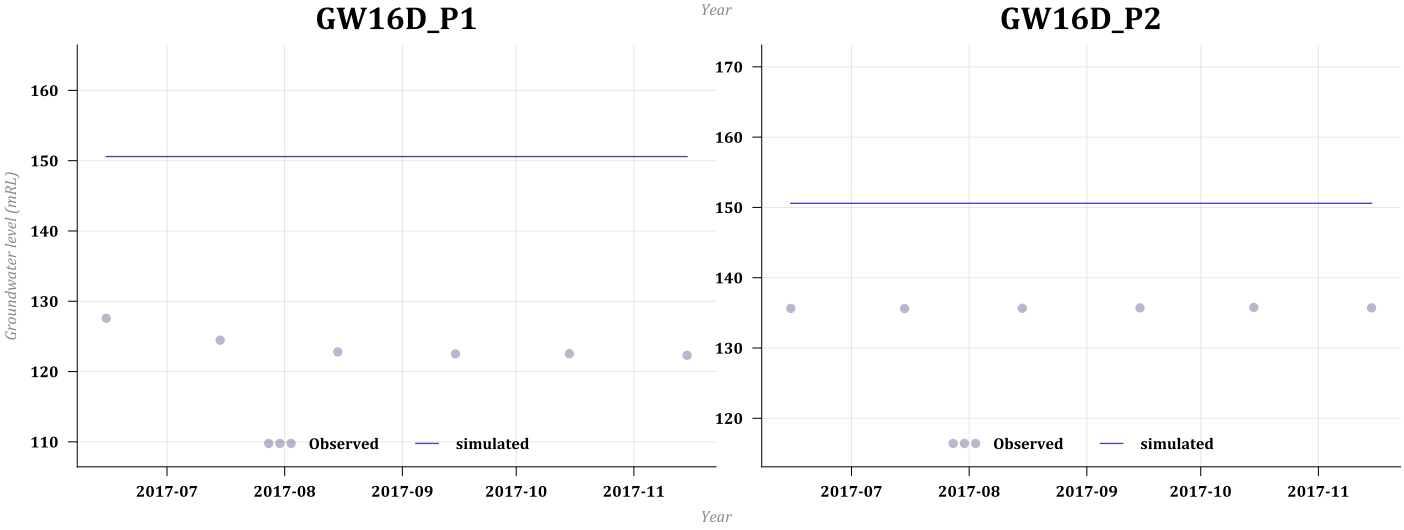
GW12D_P1
Observed
simulated


GW12D_P2
Groundwater level (mRL)
Observed
simulated
Year

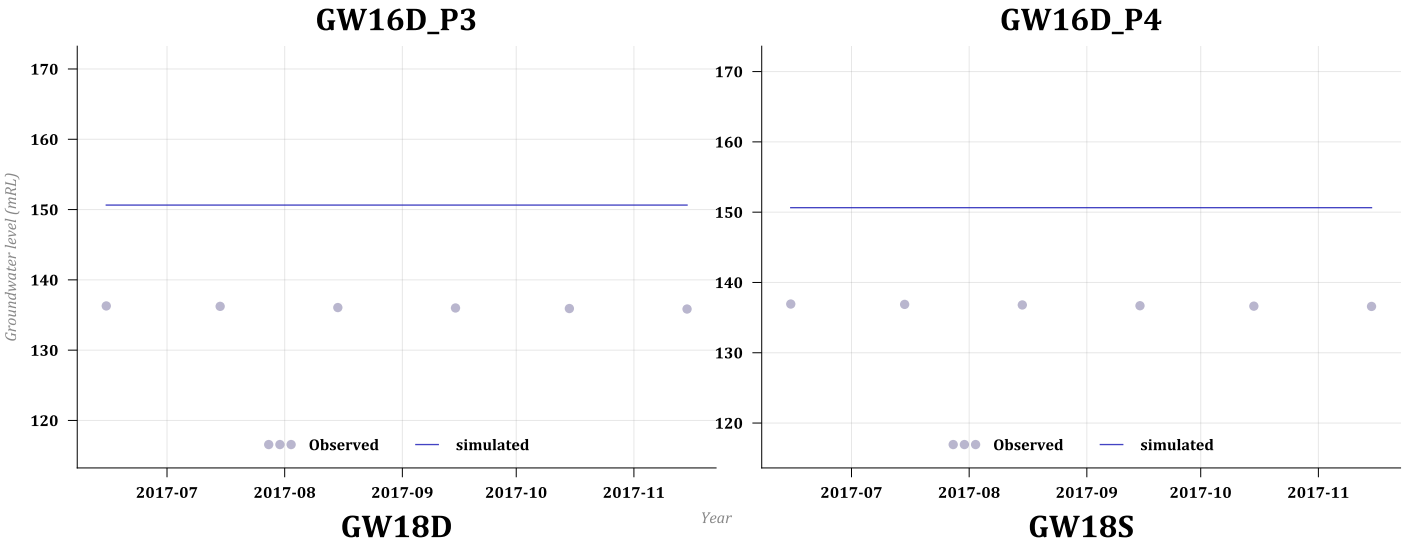
GW12D_P3
Observed
simulated


GW12D_P4
Groundwater level (mRL)
Observed
simulated
Year

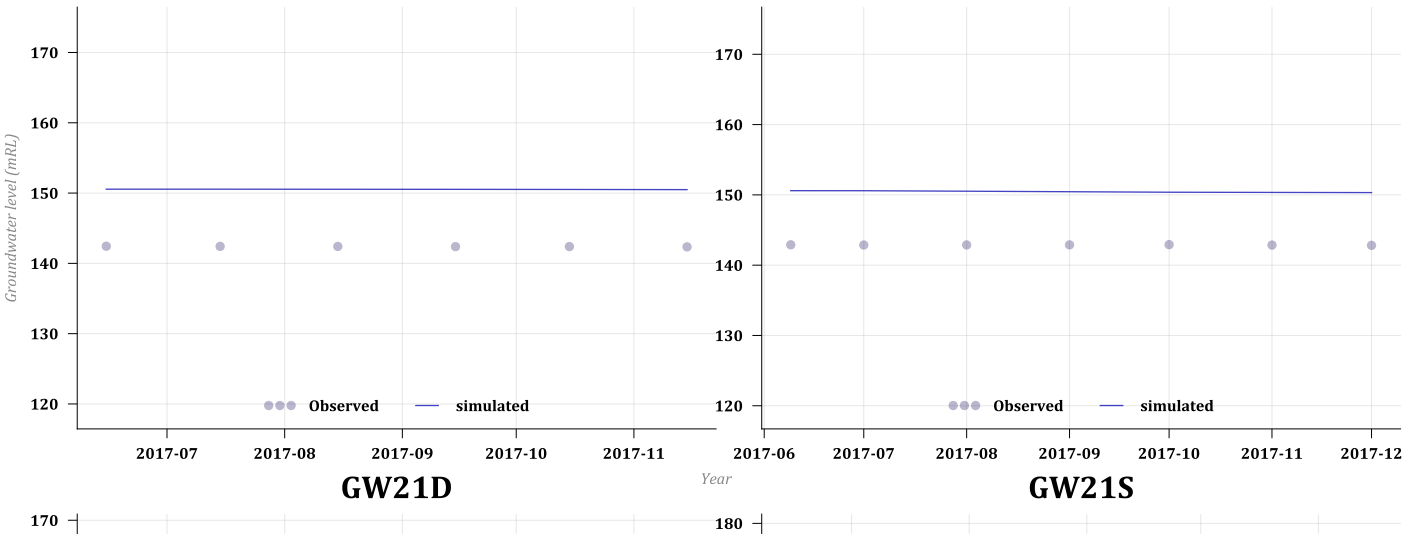
GW12S
Observed
simulated


GW16D_P1
Groundwater level (mRL)
Observed
simulated
Year

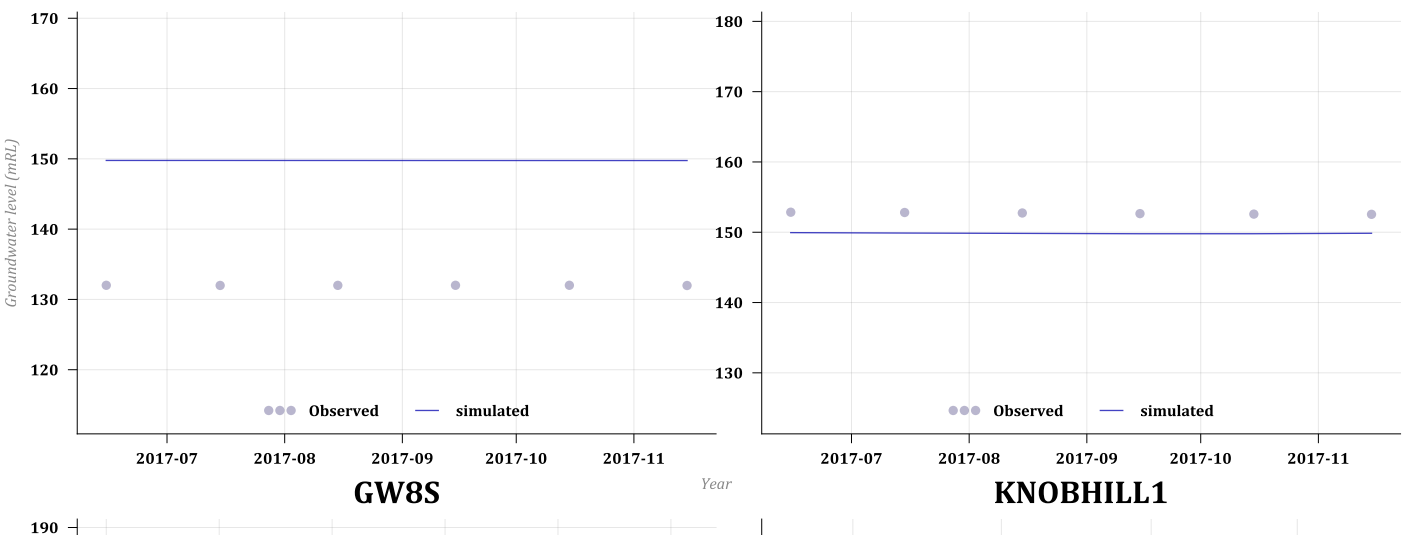
GW16D_P2
Observed
simulated


GW16D_P3
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11
Year

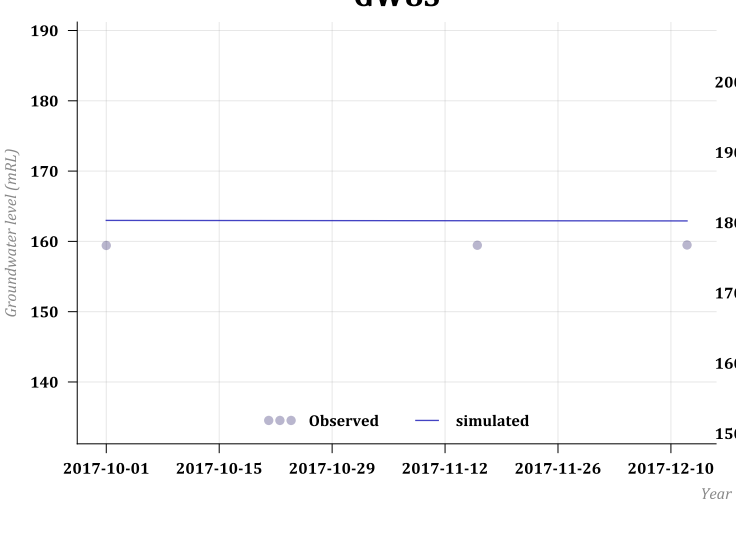
GW16D_P4
170
160
150
140
130
120
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11

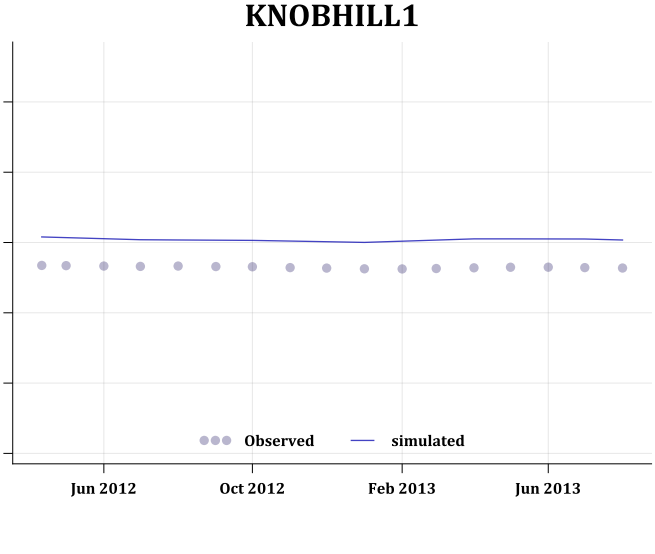

GW18D
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11
Year

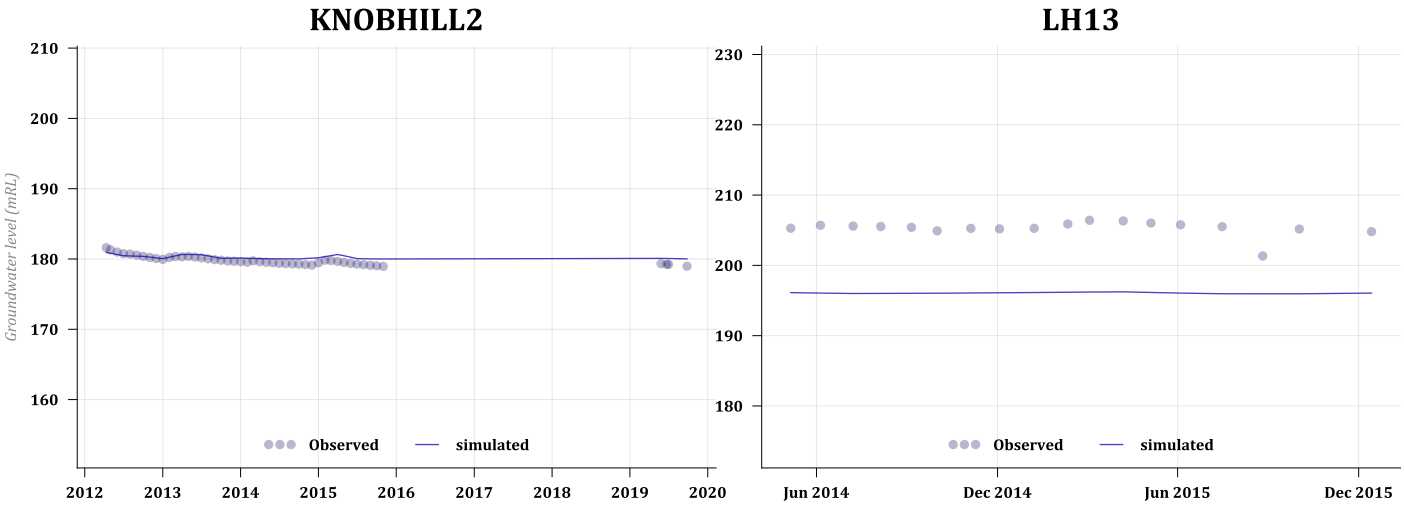
GW18S
170
160
150
140
130
120
Observed
simulated
2017-06
2017-07
2017-08
2017-09
2017-10
2017-11
2017-12


GW21D
Groundwater level (mRL)
170
160
150
140
130
120
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11
Year

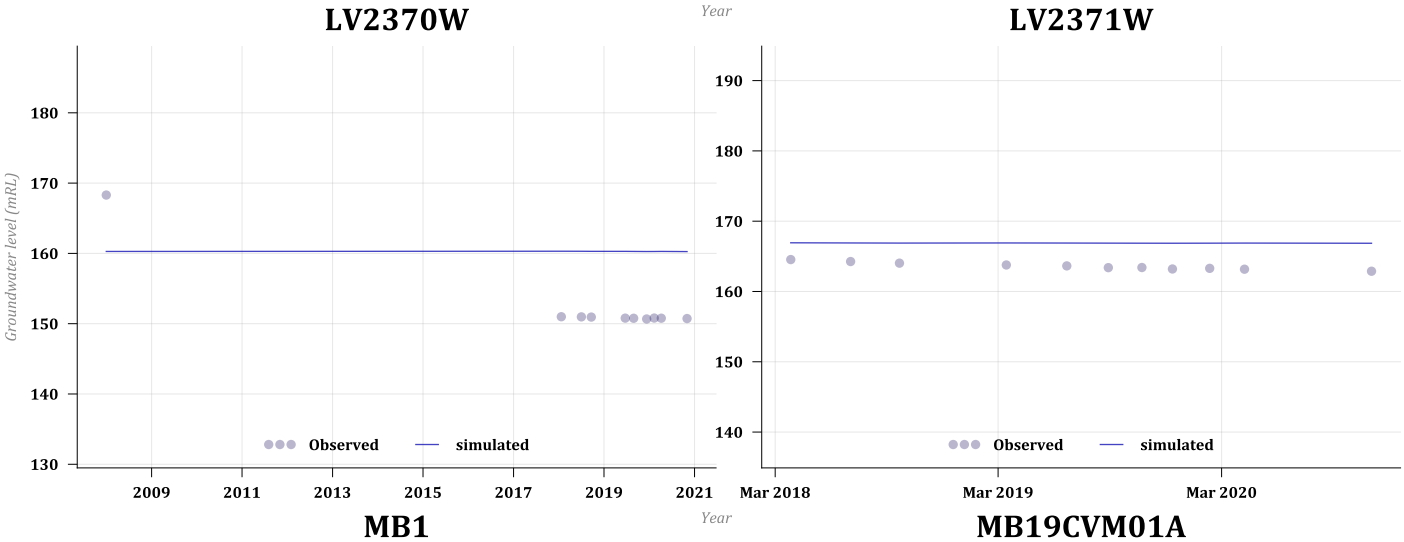
GW21S
180
170
160
150
140
130
Observed
simulated
2017-07
2017-08
2017-09
2017-10
2017-11


GW8S
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2017-10-01
2017-10-15
2017-10-29
2017-11-12
2017-11-26
2017-12-10
Year

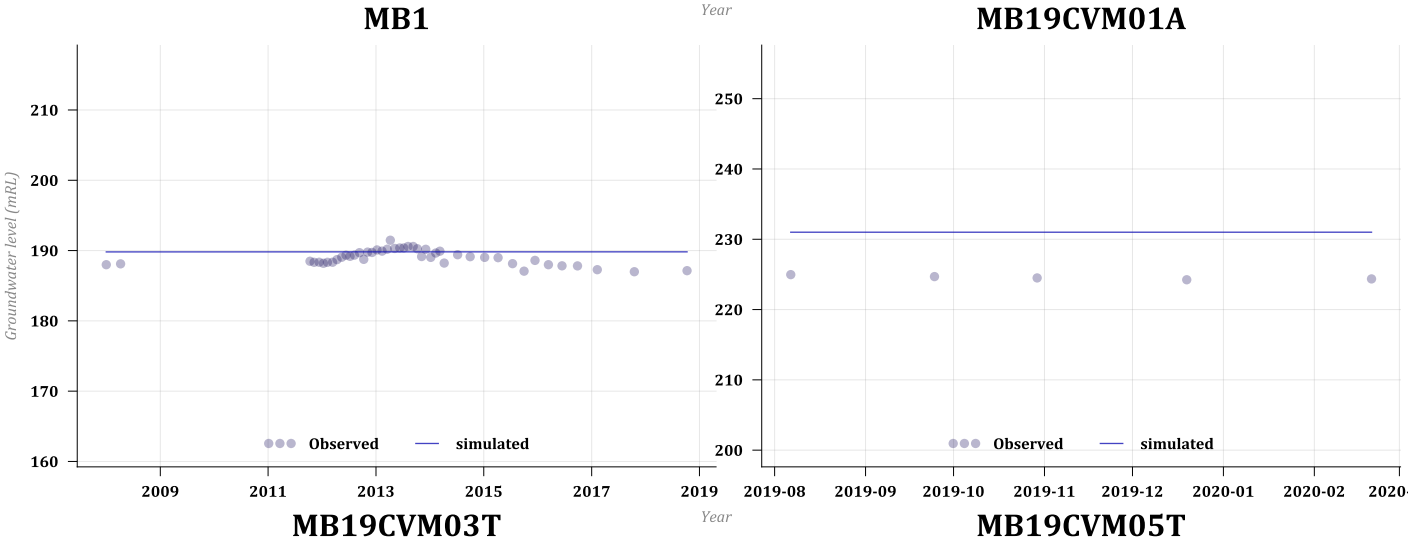

KNOBHILL1
200
190
180
170
160
150
Observed
simulated
Jun 2012
Oct 2012
Feb 2013
Jun 2013


KNOBHILL2
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

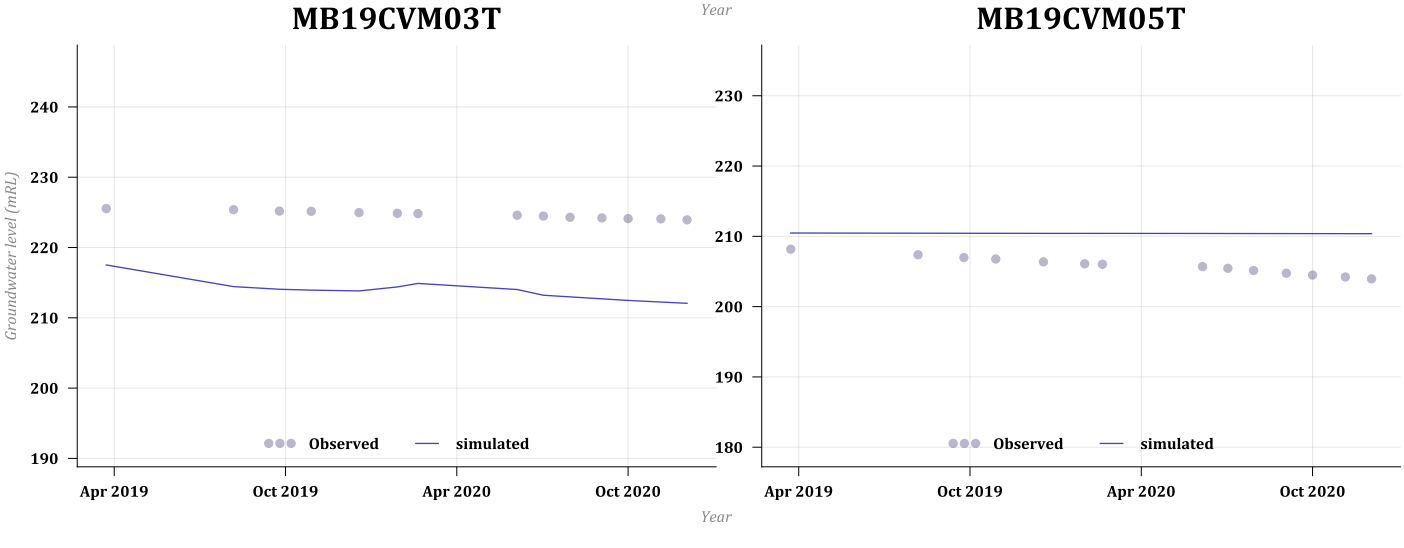
LH13
230
220
210
200
190
180
Observed
simulated
Jun 2014
Dec 2014
Jun 2015
Dec 2015


LV2370W
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2009
2011
2013
2015
2017
2019
2021
Year

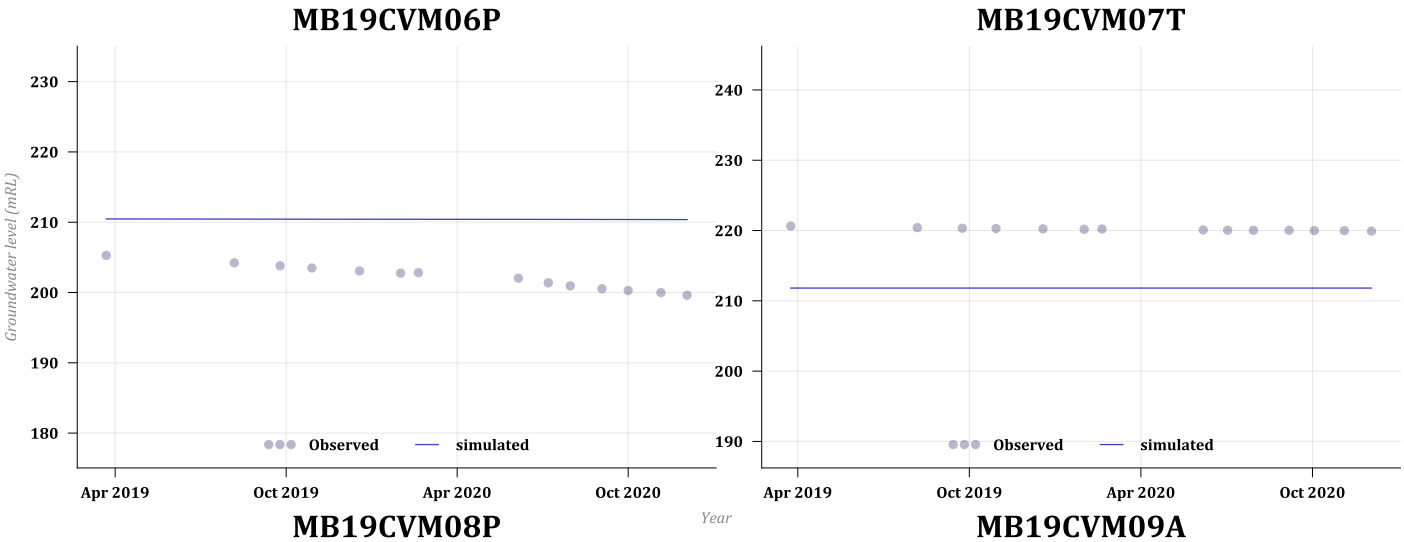
LV2371W
190
180
170
160
150
140
Observed
simulated
Mar 2018
Mar 2019
Mar 2020


MB1
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

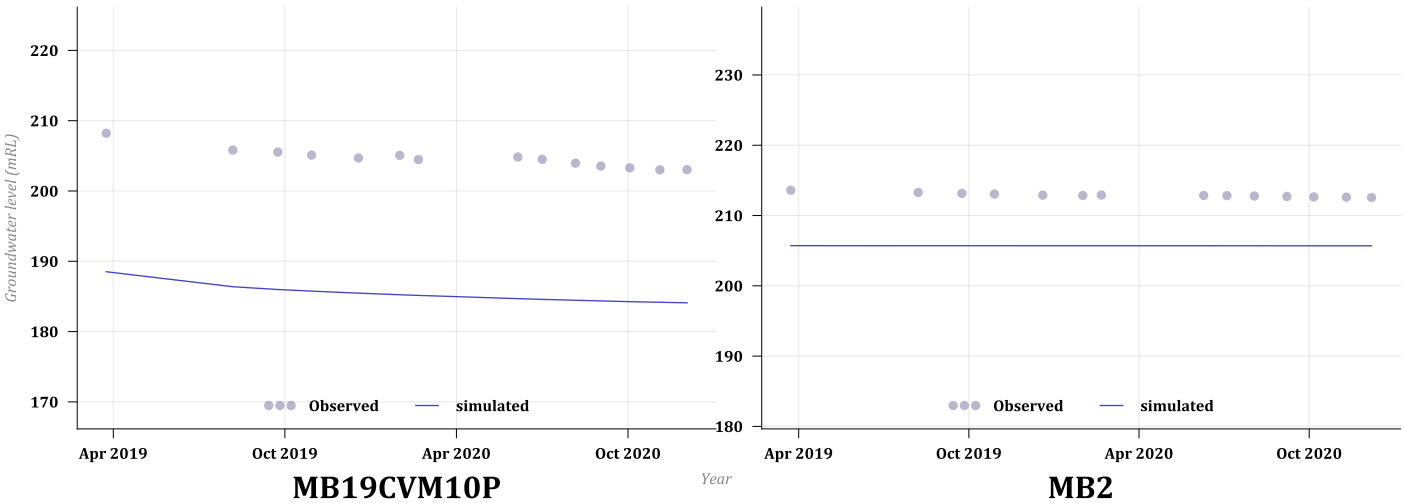
MB19CVM01A
250
240
230
220
210
200
Observed
simulated
2019-08
2019-09
2019-10
2019-11
2019-12
2020-01
2020-02
2020-03


MB19CVM03T
Groundwater level (mRL)
240
230
220
210
200
190
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020
Year

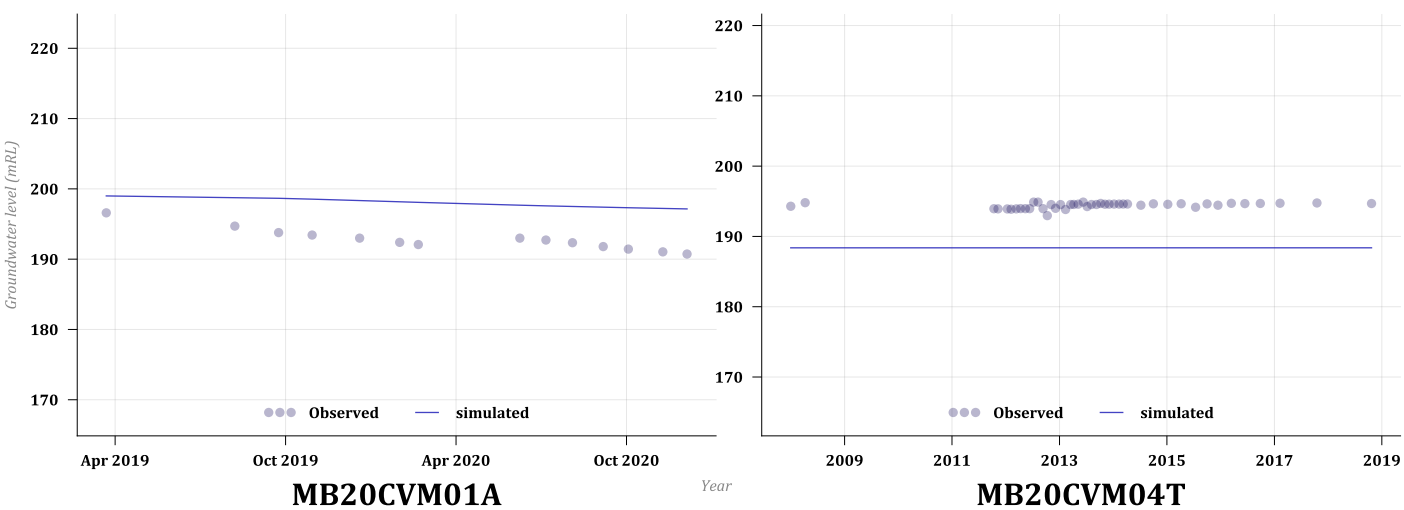
MB19CVM05T
230
220
210
200
190
180
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020


MB19CVM06P
Groundwater level (mRL)
230
220
210
200
190
180
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020
Year

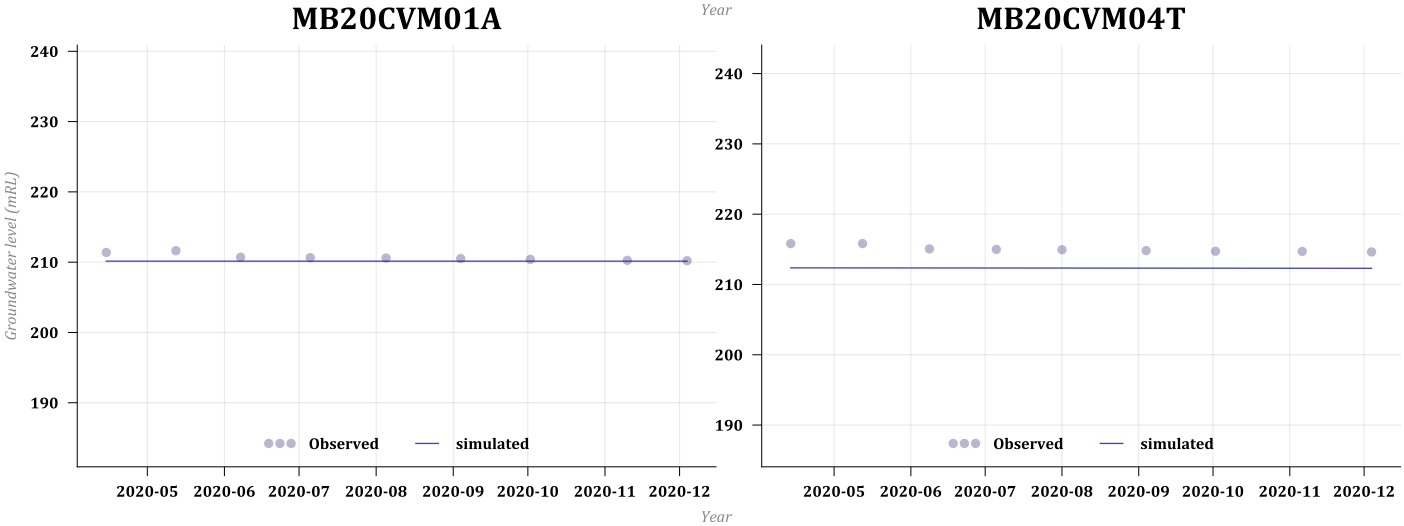
MB19CVM07T
240
230
220
210
200
190
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020


MB19CVM08P
Groundwater level (mRL)
220
210
200
190
180
170
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020
Year

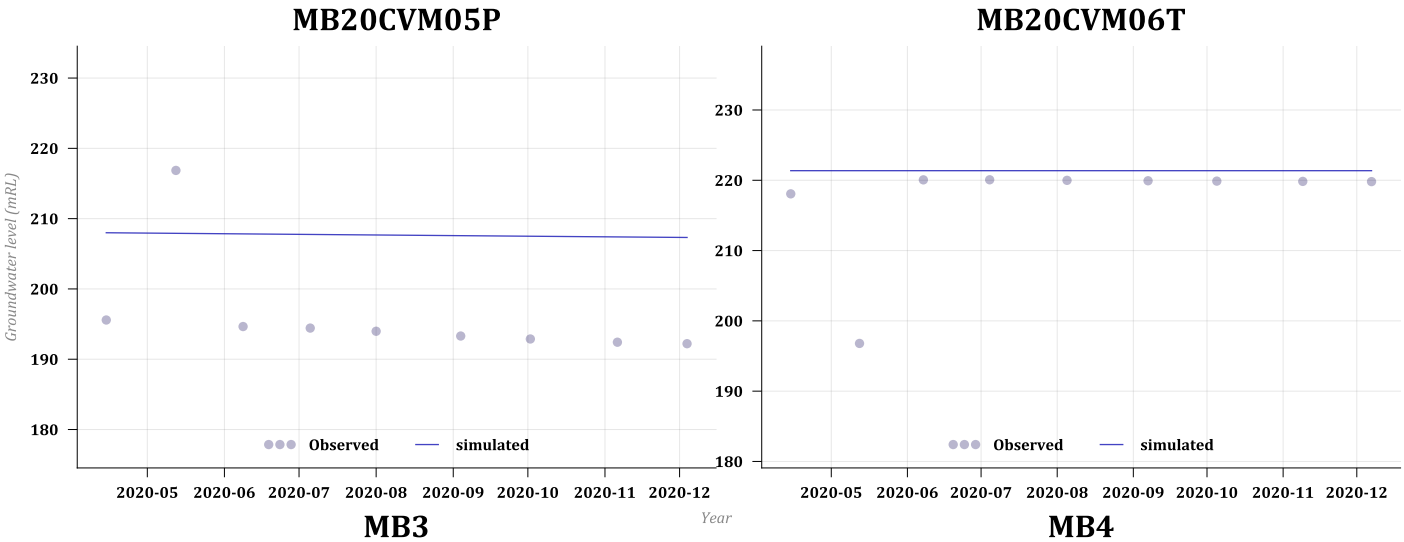
MB19CVM09A
230
220
210
200
190
180
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020


MB19CVM10P
Groundwater level (mRL)
220
210
200
190
180
170
Observed
simulated
Apr 2019
Oct 2019
Apr 2020
Oct 2020
Year

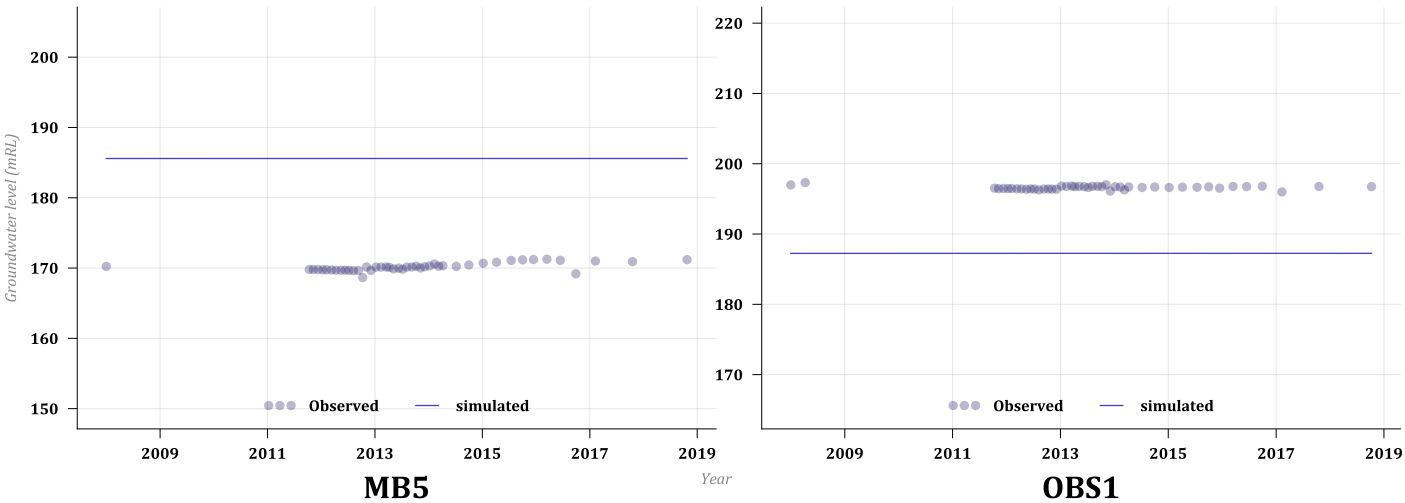
MB2
220
210
200
190
180
170
Observed
simulated
2009
2011
2013
2015
2017
2019


MB20CVM01A
Groundwater level (mRL)
240
230
220
210
200
190
Observed
simulated
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12
Year

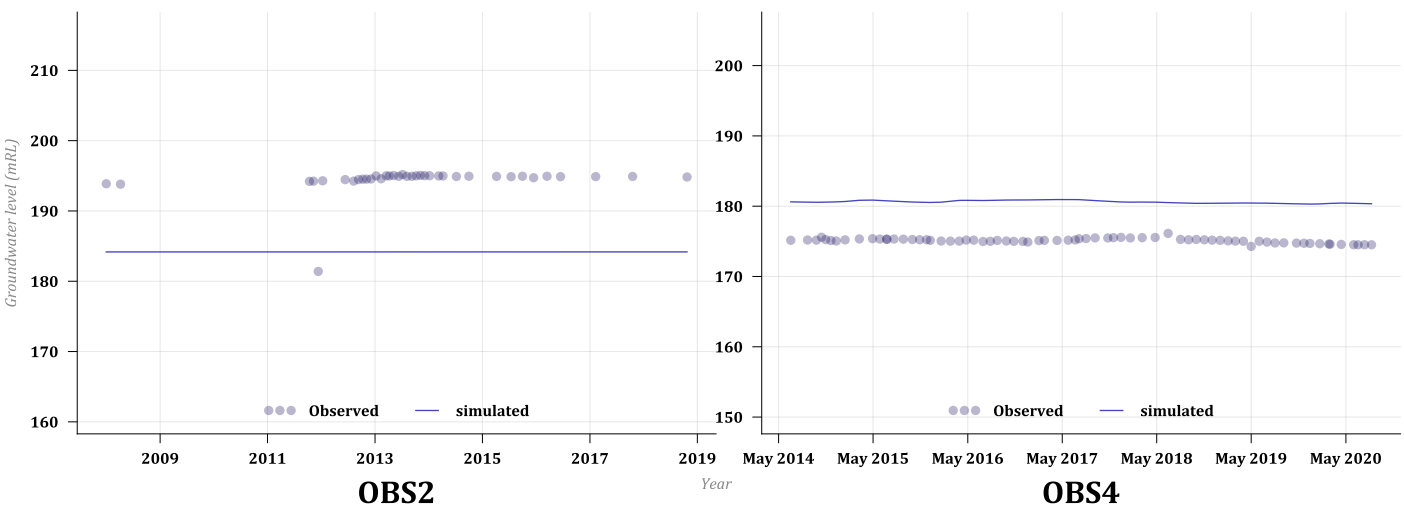
MB20CVM04T
240
230
220
210
200
190
Observed
simulated
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12


MB20CVM05P
Groundwater level (mRL)
230
220
210
200
190
180
Observed
simulated
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12
Year

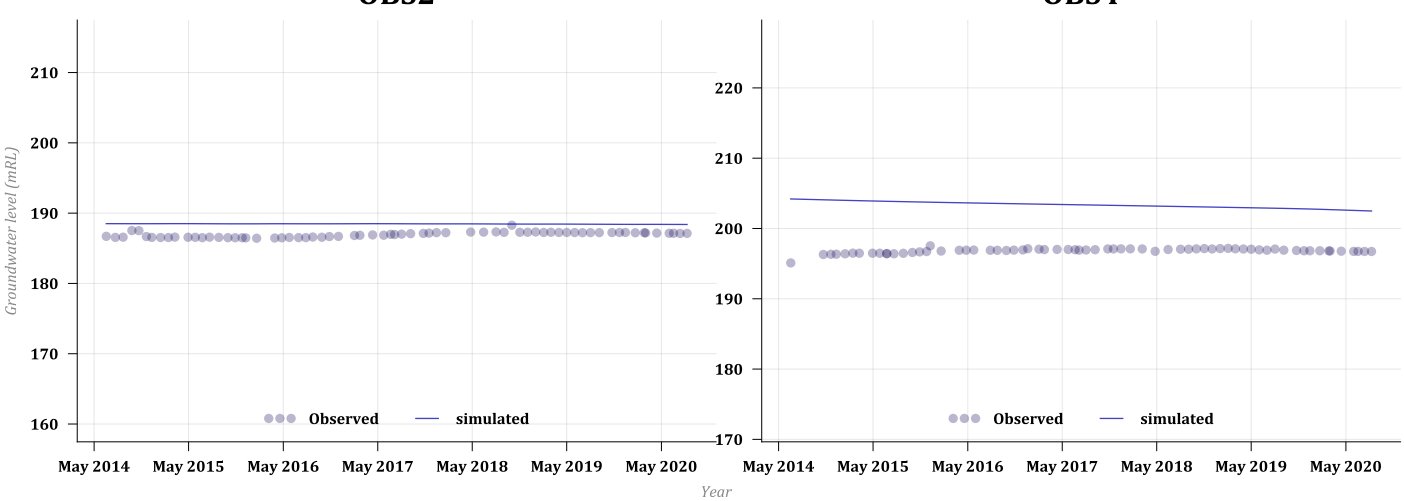
MB20CVM06T
230
220
210
200
190
180
Observed
simulated
2020-05
2020-06
2020-07
2020-08
2020-09
2020-10
2020-11
2020-12


MB3
Groundwater level (mRL)
200
190
180
170
160
150
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

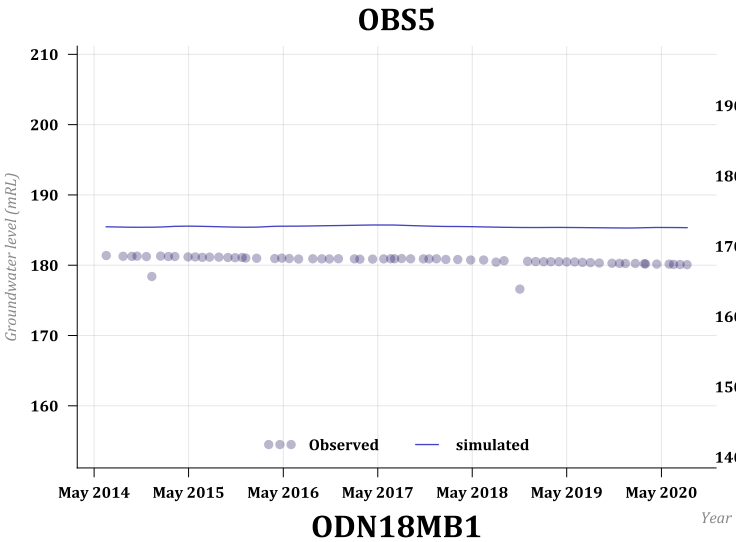
MB4
220
210
200
190
180
170
Observed
simulated
2009
2011
2013
2015
2017
2019

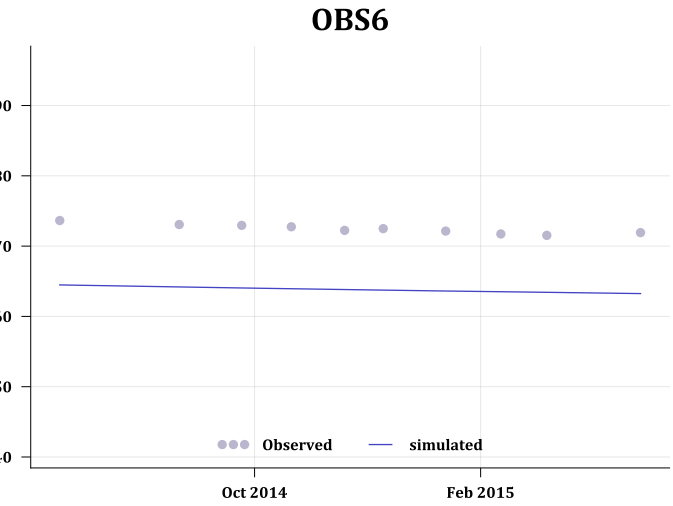

MB5
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
2009
2011
2013
2015
2017
2019
Year

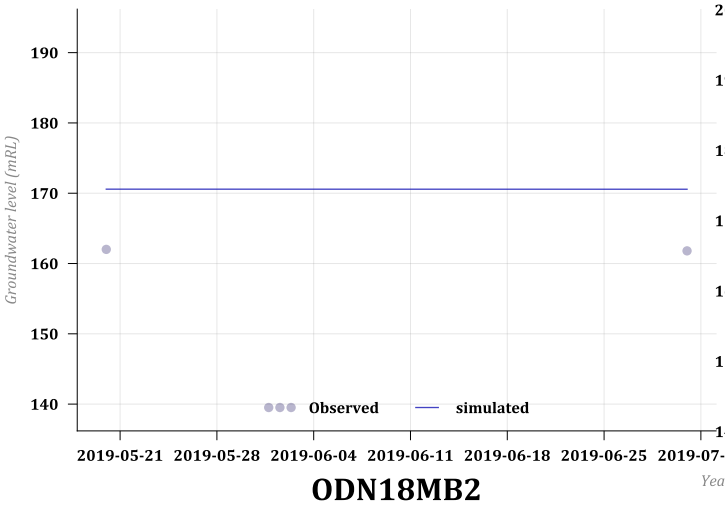
OBS1
200
190
180
170
160
150
Observed
simulated
May 2014
May 2015
May 2016
May 2017
May 2018
May 2019
May 2020

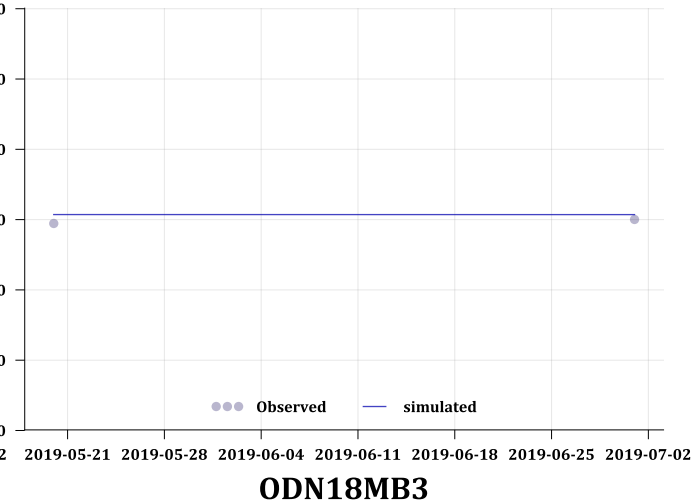

OBS2
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
May 2014
May 2015
May 2016
May 2017
May 2018
May 2019
May 2020
Year

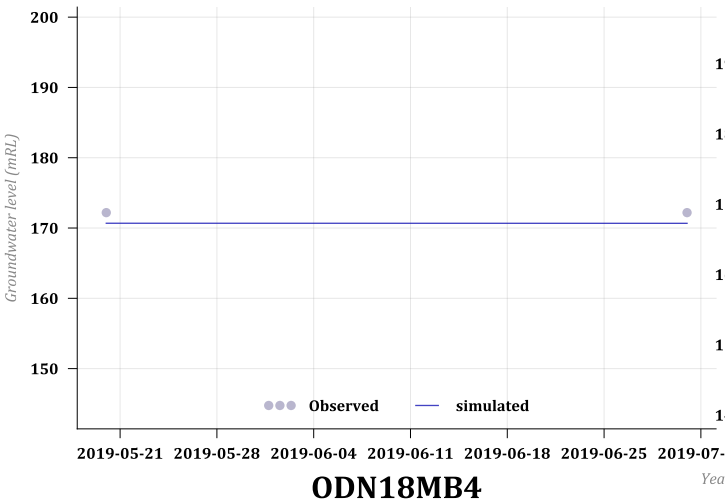
OBS4
220
210
200
190
180
170
Observed
simulated
May 2014
May 2015
May 2016
May 2017
May 2018
May 2019
May 2020

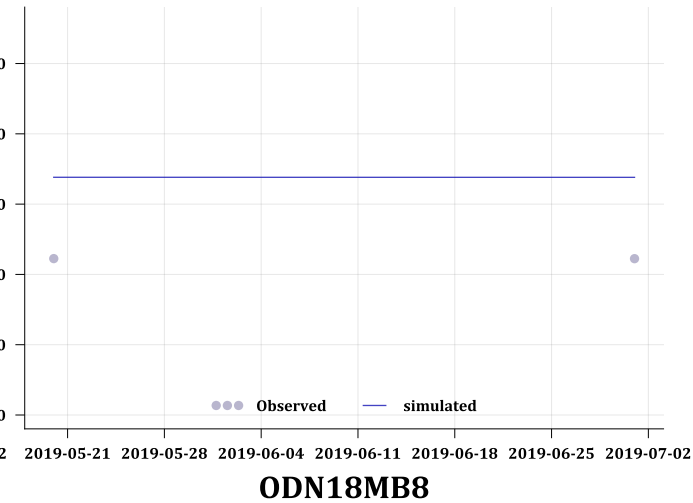

OBS5
Groundwater level (mRL)
210
200
190
180
170
160
Observed
simulated
May 2014
May 2015
May 2016
May 2017
May 2018
May 2019
May 2020
Year

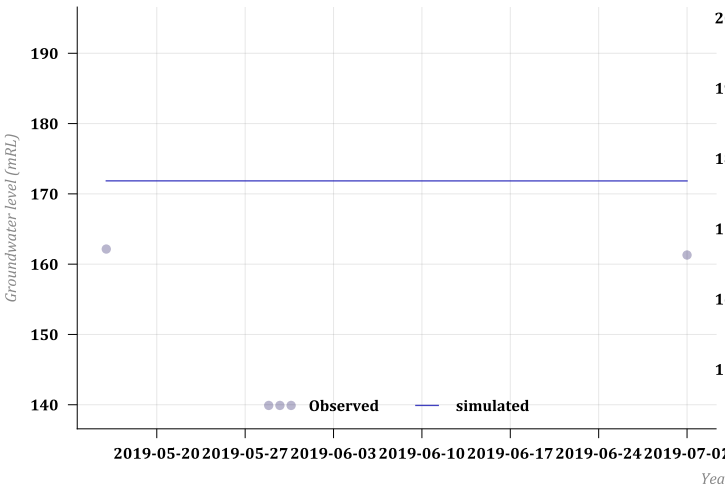

OBS6
190
180
170
160
150
140
Observed
simulated
Oct 2014
Feb 2015

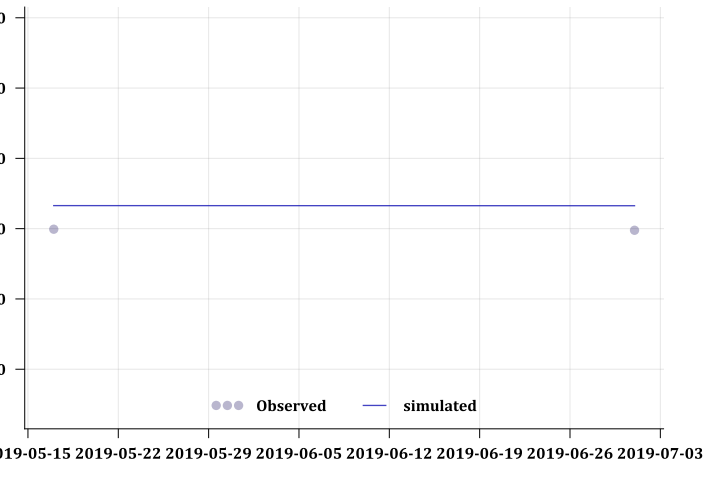

ODN18MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2019-05-21
2019-05-28
2019-06-04
2019-06-11
2019-06-18
2019-06-25
2019-07-02
Year


ODN18MB12
200
190
180
170
160
150
140
Observed
simulated
2019-05-21
2019-05-28
2019-06-04
2019-06-11
2019-06-18
2019-06-25
2019-07-02

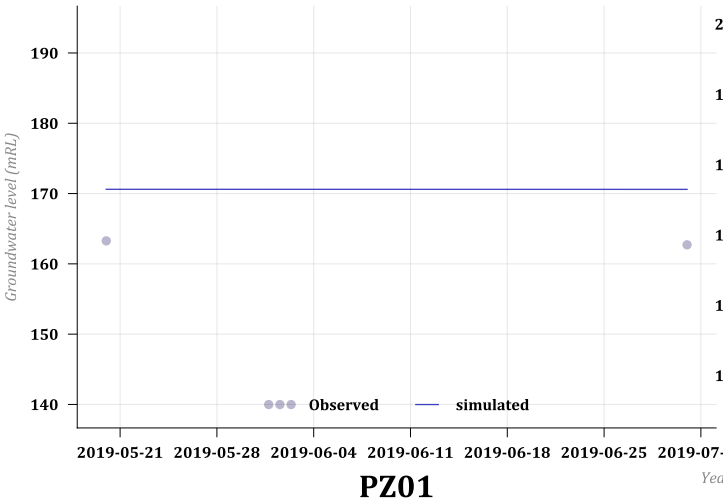

ODN18MB2
Groundwater level (mRL)
200
190
180
170
160
150
Observed
simulated
2019-05-21
2019-05-28
2019-06-04
2019-06-11
2019-06-18
2019-06-25
2019-07-02
Year


ODN18MB3
190
180
170
160
150
140
Observed
simulated
2019-05-21
2019-05-28
2019-06-04
2019-06-11
2019-06-18
2019-06-25
2019-07-02

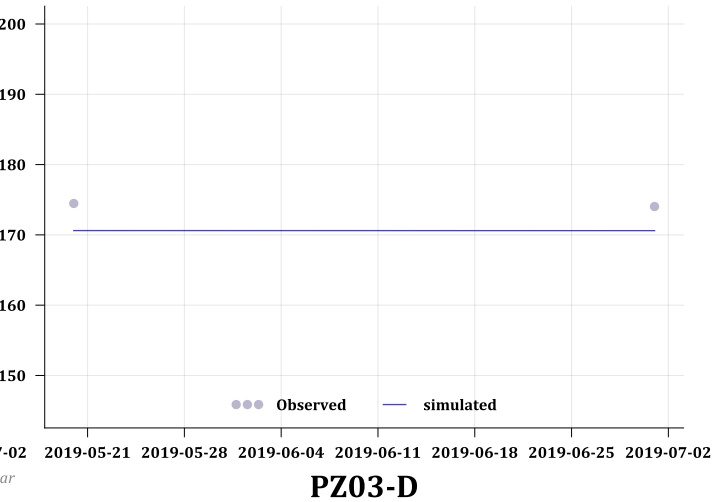

ODN18MB4
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2019-05-20
2019-05-27
2019-06-03
2019-06-10
2019-06-17
2019-06-24
2019-07-01
Year


ODN18MB8
200
190
180
170
160
150
Observed
simulated
2019-05-15
2019-05-22
2019-05-29
2019-06-05
2019-06-12
2019-06-19
2019-06-26
2019-07-03

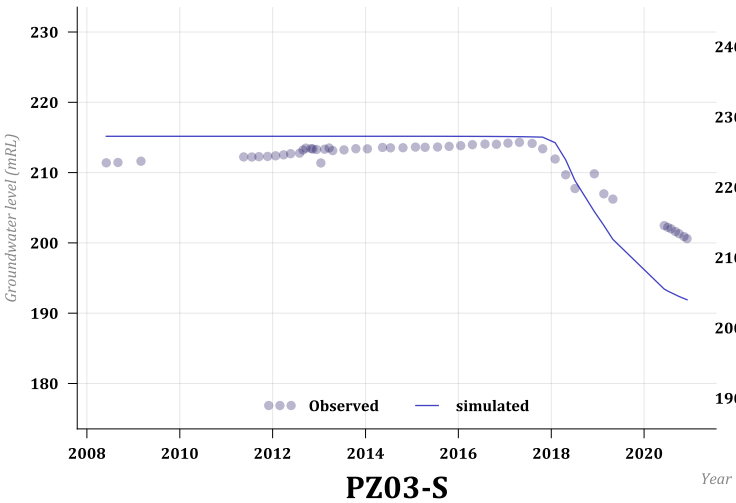
ODN18TB1



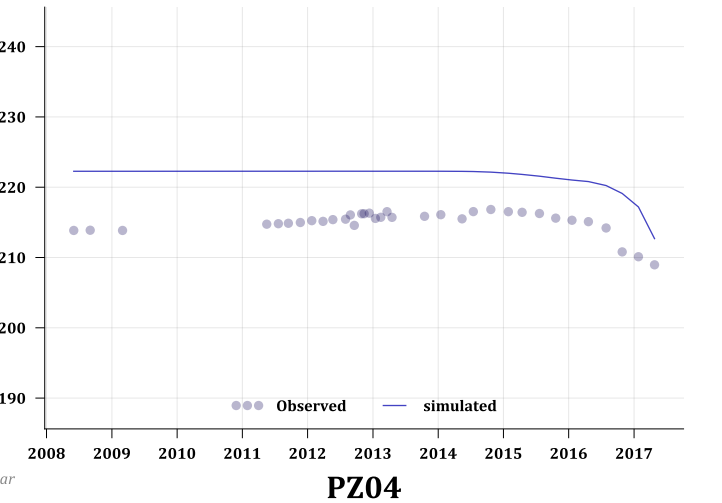
ODN18TB2



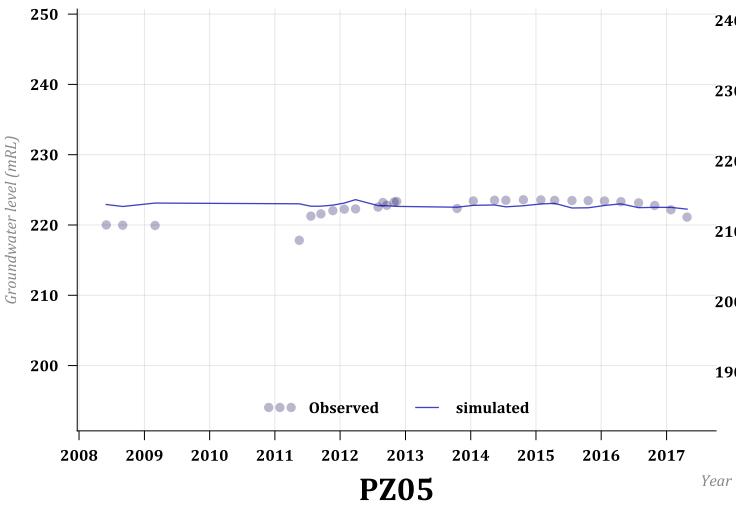
PZ01



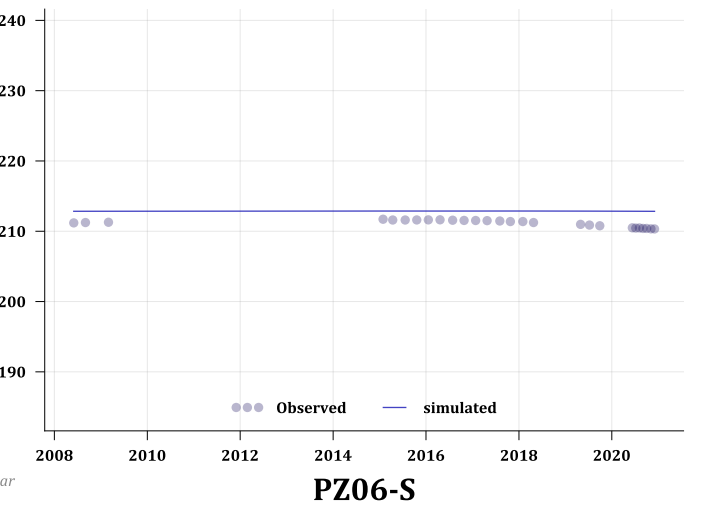
PZ03-D



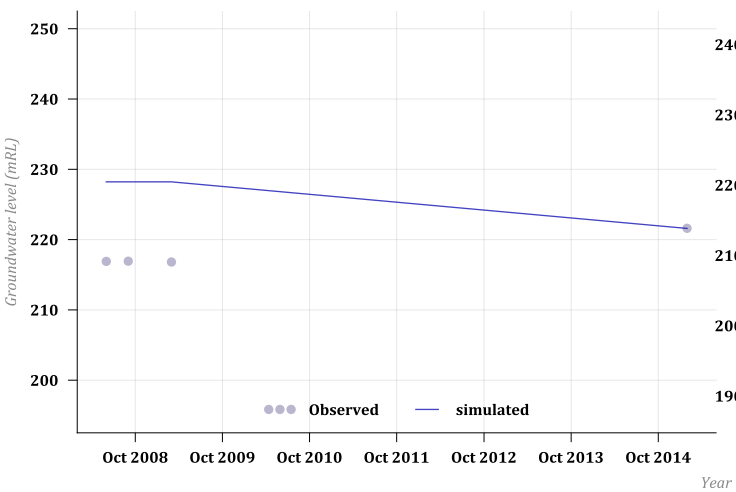
PZ03-S



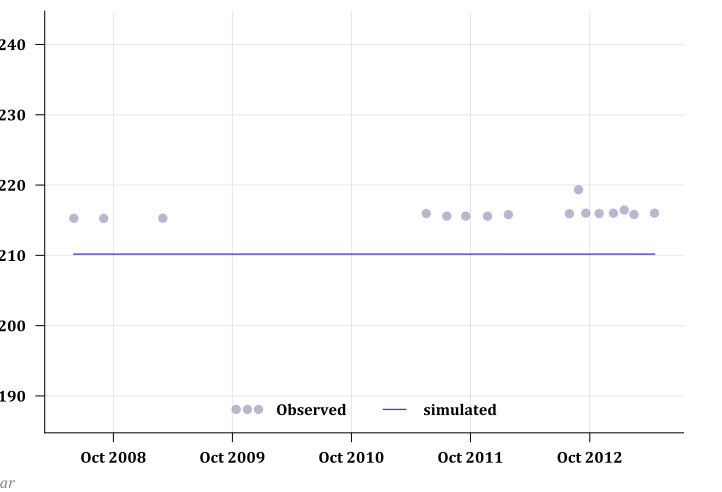
PZ04

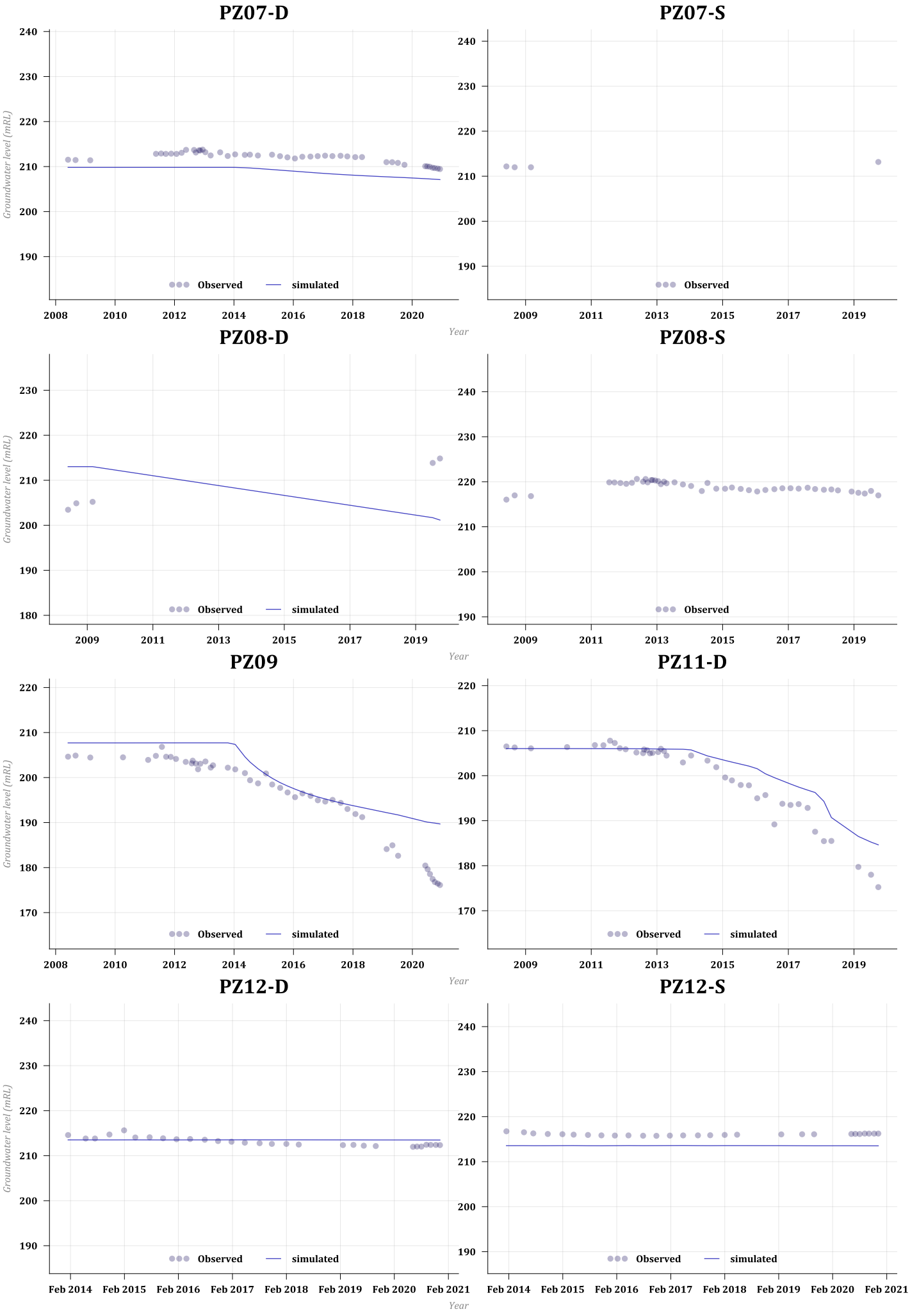


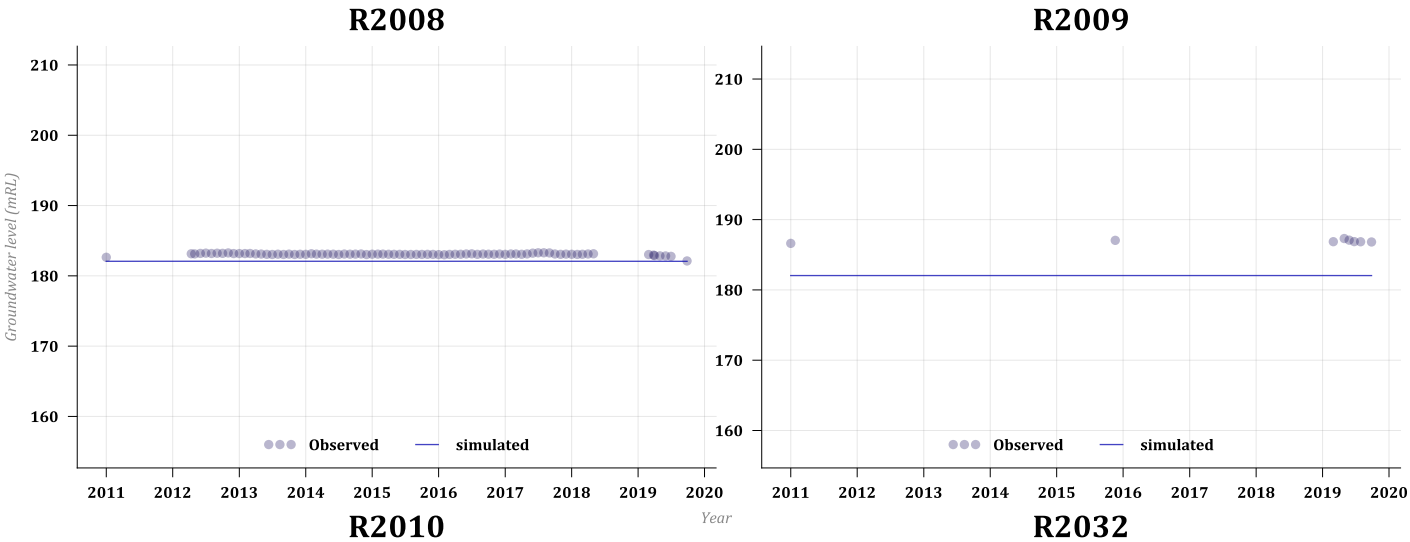
PZ05



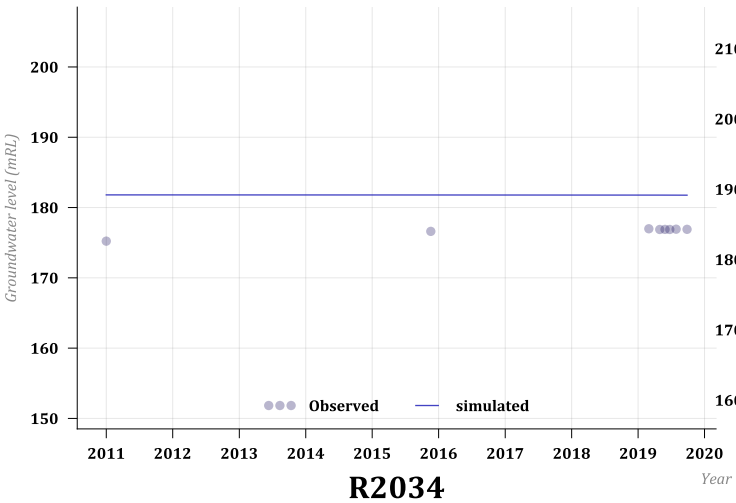
PZ06-S

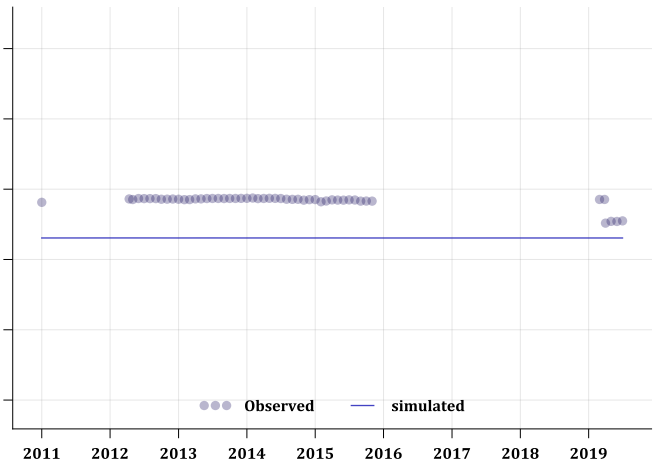


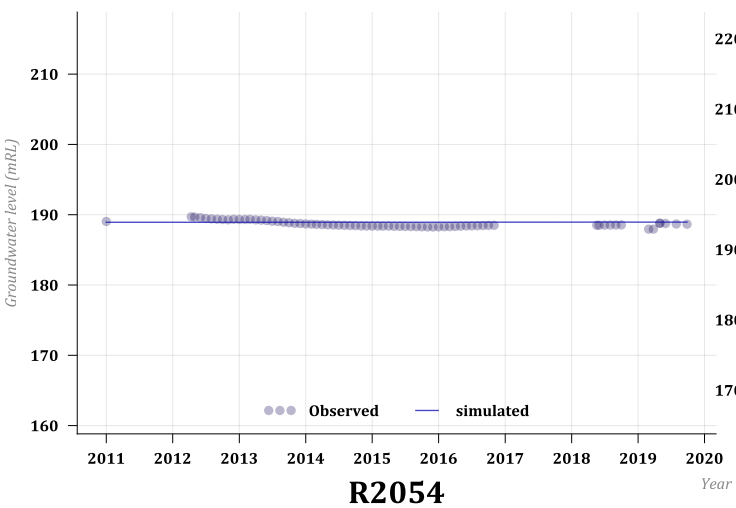

PZ07-D
PZ07-S
PZ08-D
PZ08-S
PZ09
PZ11-D
PZ12-D
PZ12-S
Groundwater level (mRL)
Year
Observed
simulated

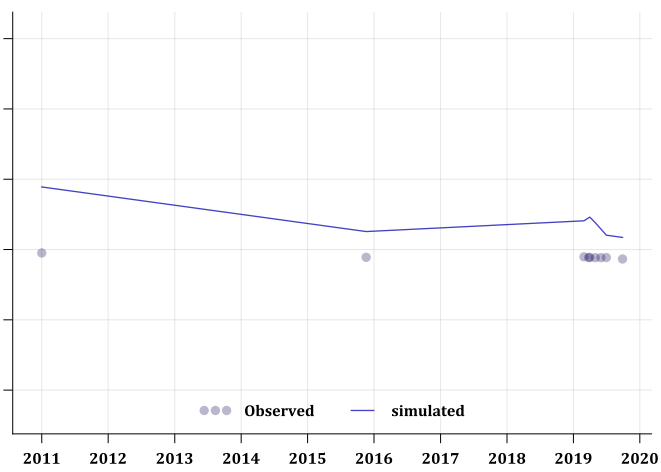

R2008
Groundwater level (mRL)
Observed
simulated
Year

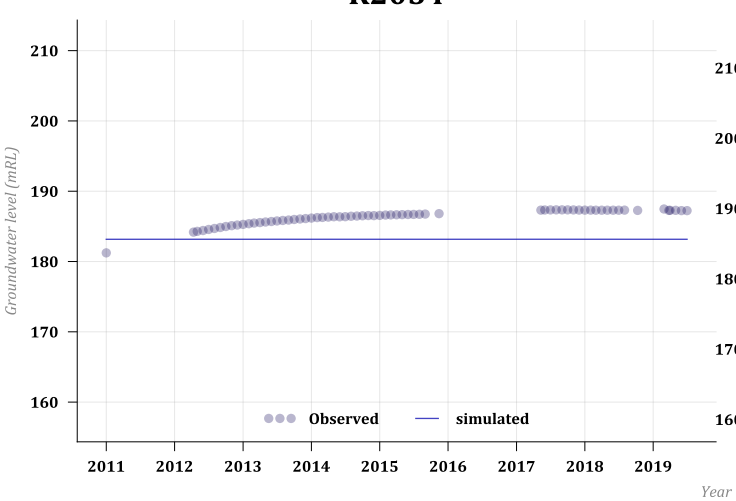
R2009
Observed
simulated

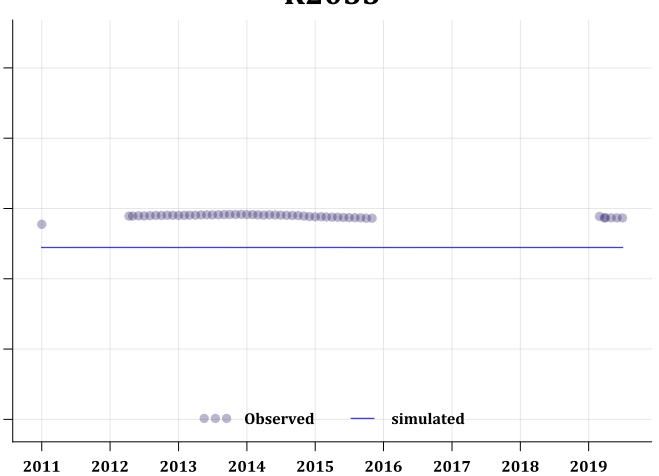

R2010
Groundwater level (mRL)
Observed
simulated
Year

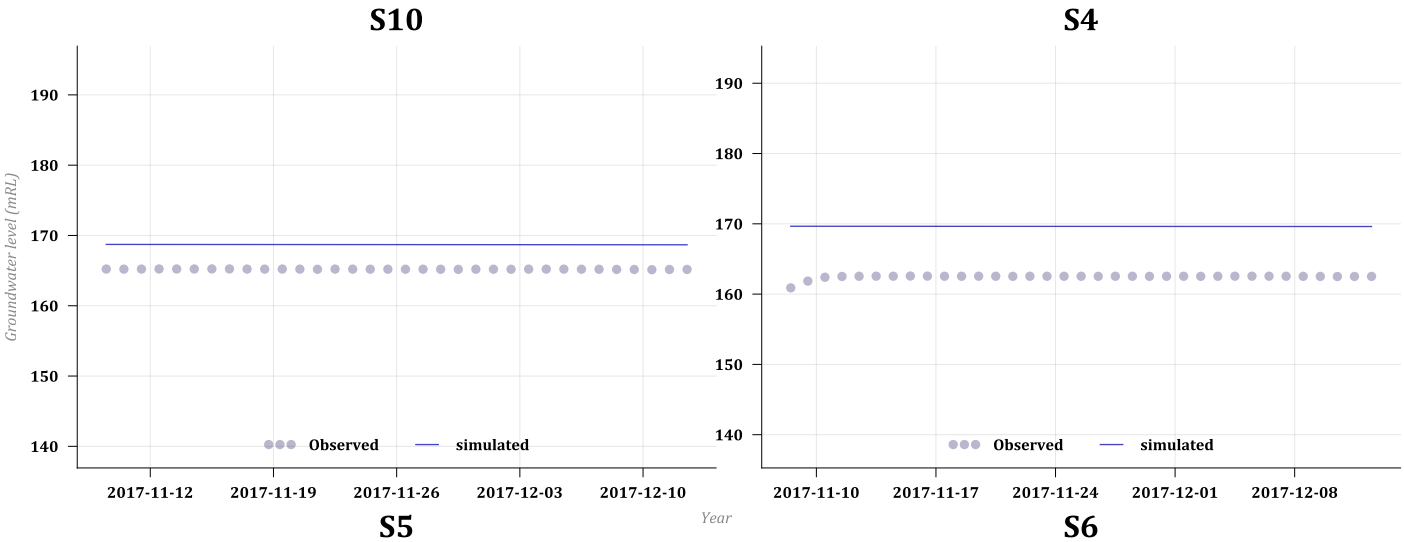

R2032
Observed
simulated


R2034
Groundwater level (mRL)
Observed
simulated
Year

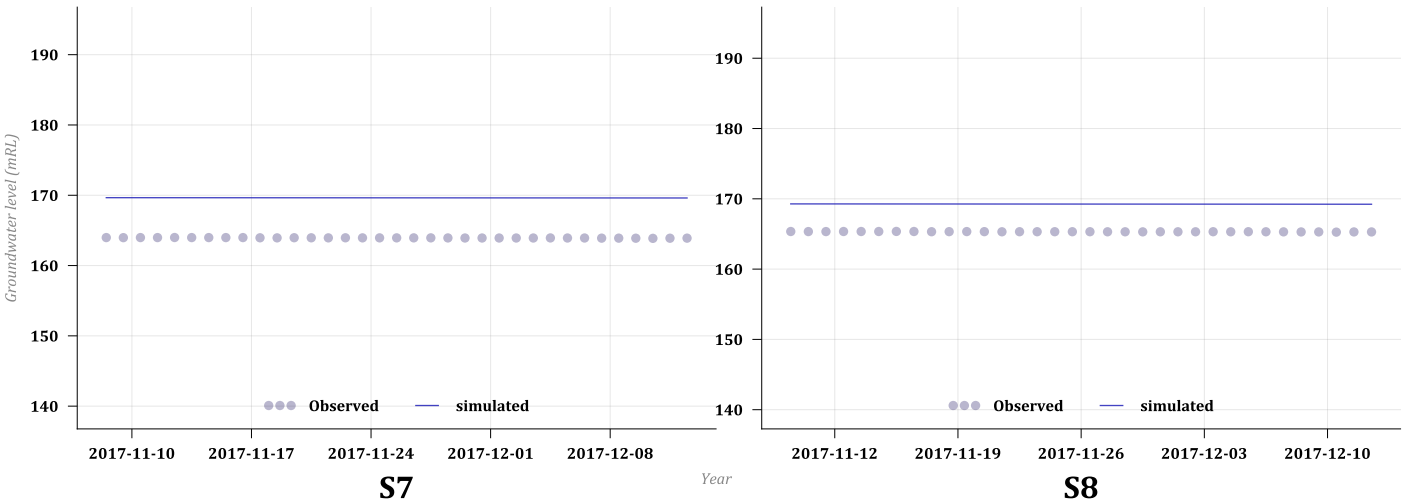

R2035
Observed
simulated


R2054
Groundwater level (mRL)
Observed
simulated
Year

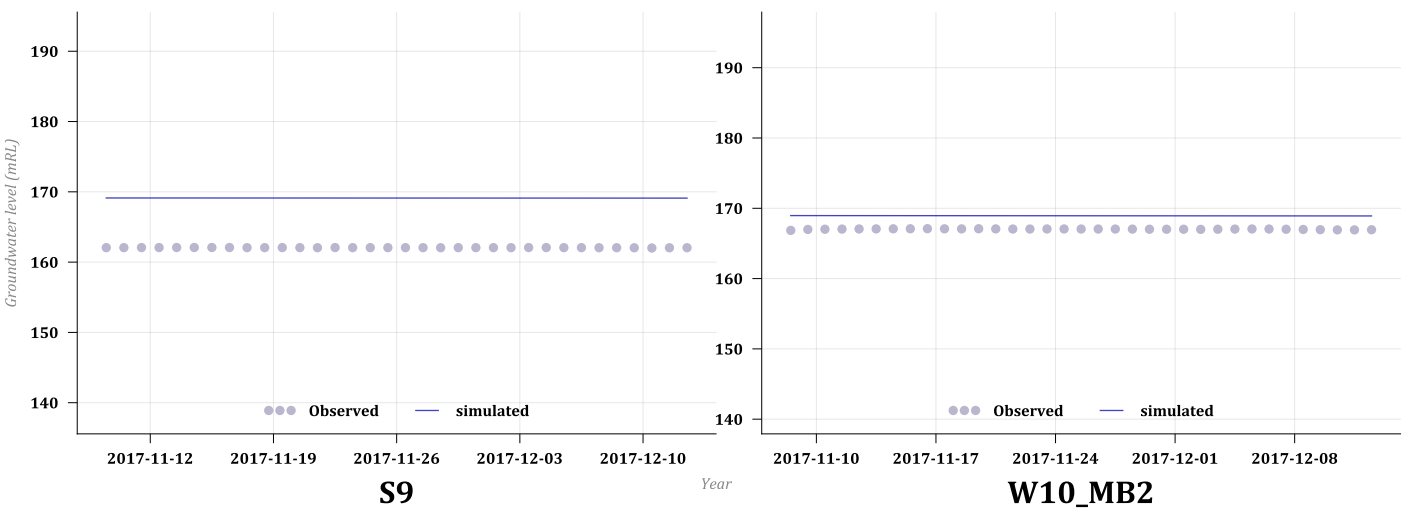

R2055
Observed
simulated


S10
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2017-11-12
2017-11-19
2017-11-26
2017-12-03
2017-12-10
Year

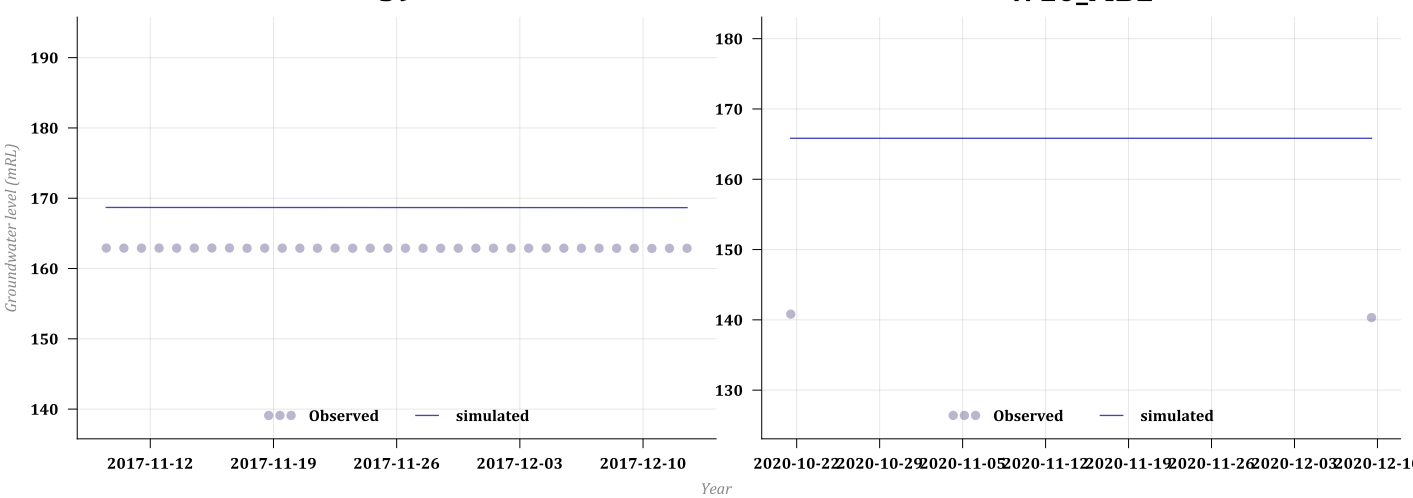
S4
190
180
170
160
150
140
Observed
simulated
2017-11-10
2017-11-17
2017-11-24
2017-12-01
2017-12-08


S5
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2017-11-10
2017-11-17
2017-11-24
2017-12-01
2017-12-08
Year

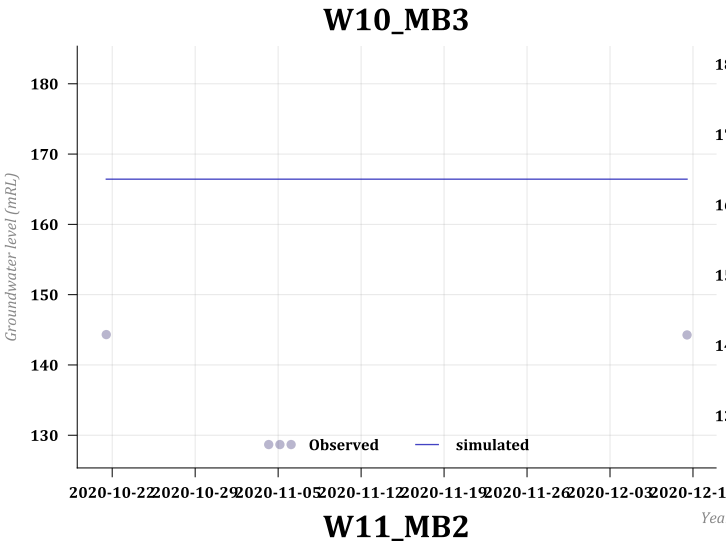
S6
190
180
170
160
150
140
Observed
simulated
2017-11-12
2017-11-19
2017-11-26
2017-12-03
2017-12-10

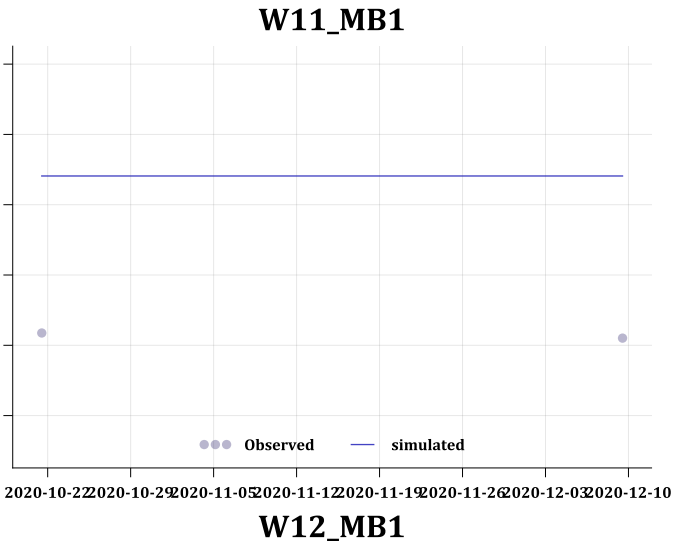

S7
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2017-11-12
2017-11-19
2017-11-26
2017-12-03
2017-12-10
Year

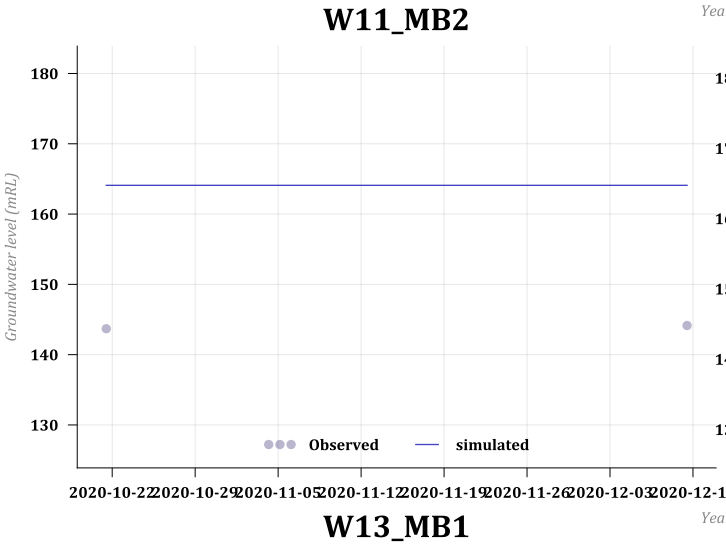
S8
190
180
170
160
150
140
Observed
simulated
2017-11-10
2017-11-17
2017-11-24
2017-12-01
2017-12-08

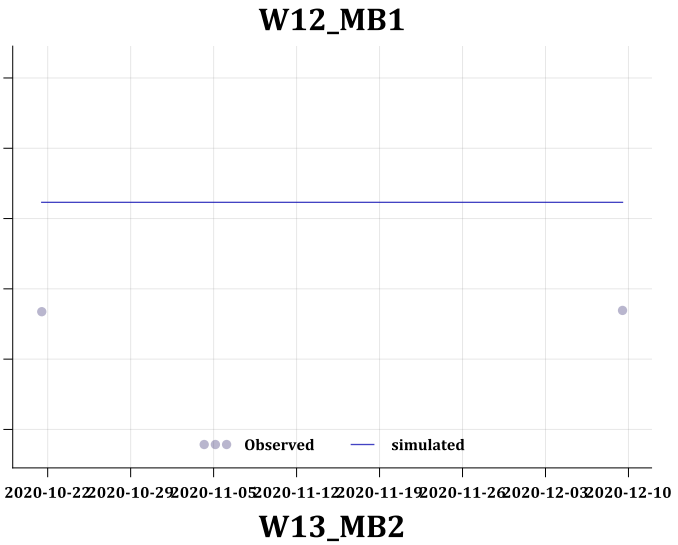

S9
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2017-11-12
2017-11-19
2017-11-26
2017-12-03
2017-12-10
Year

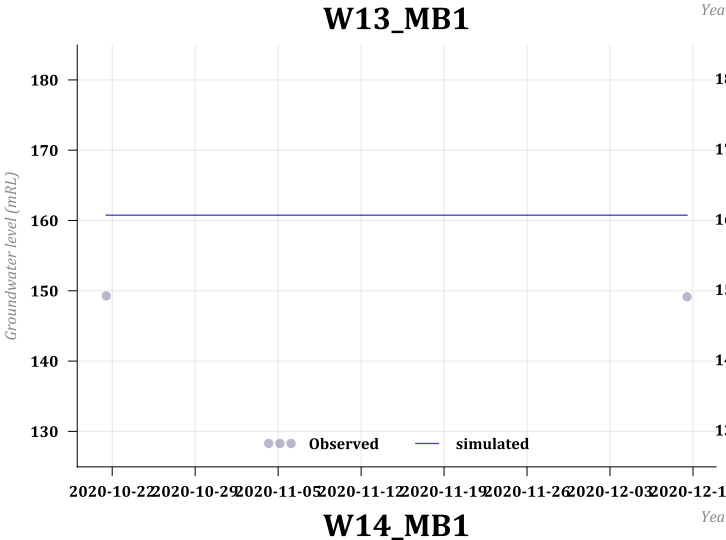
W10_MB2
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

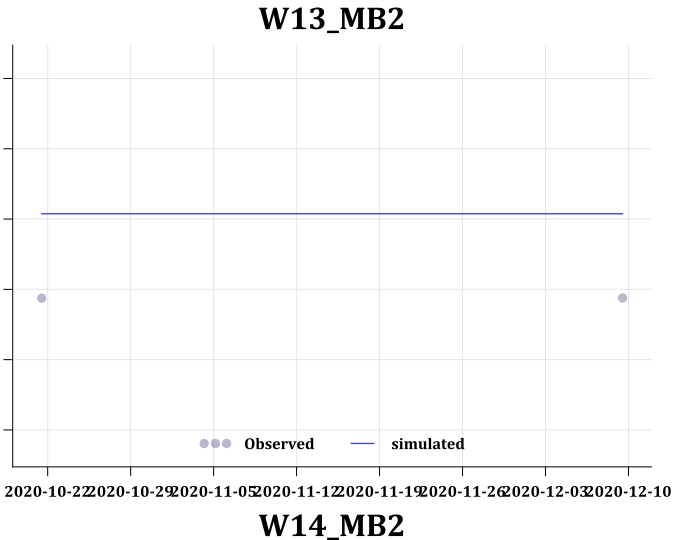

W10_MB3
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

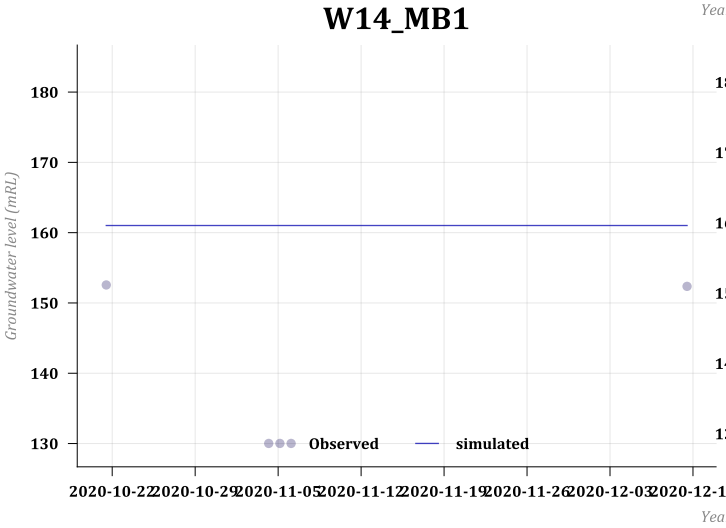

W11_MB1
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

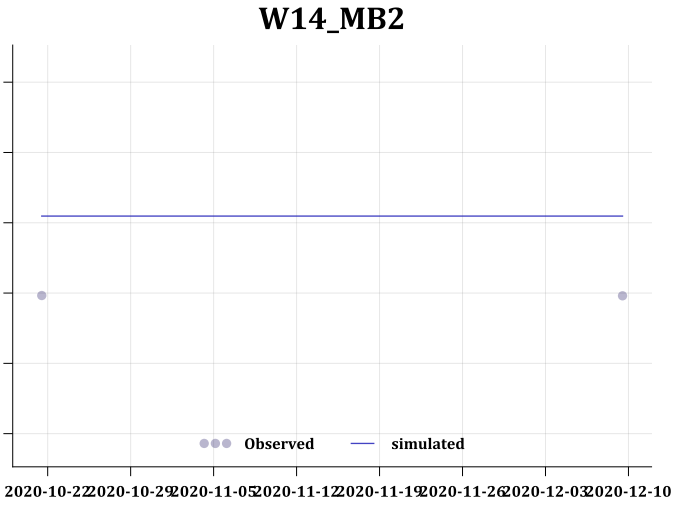

W11_MB2
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

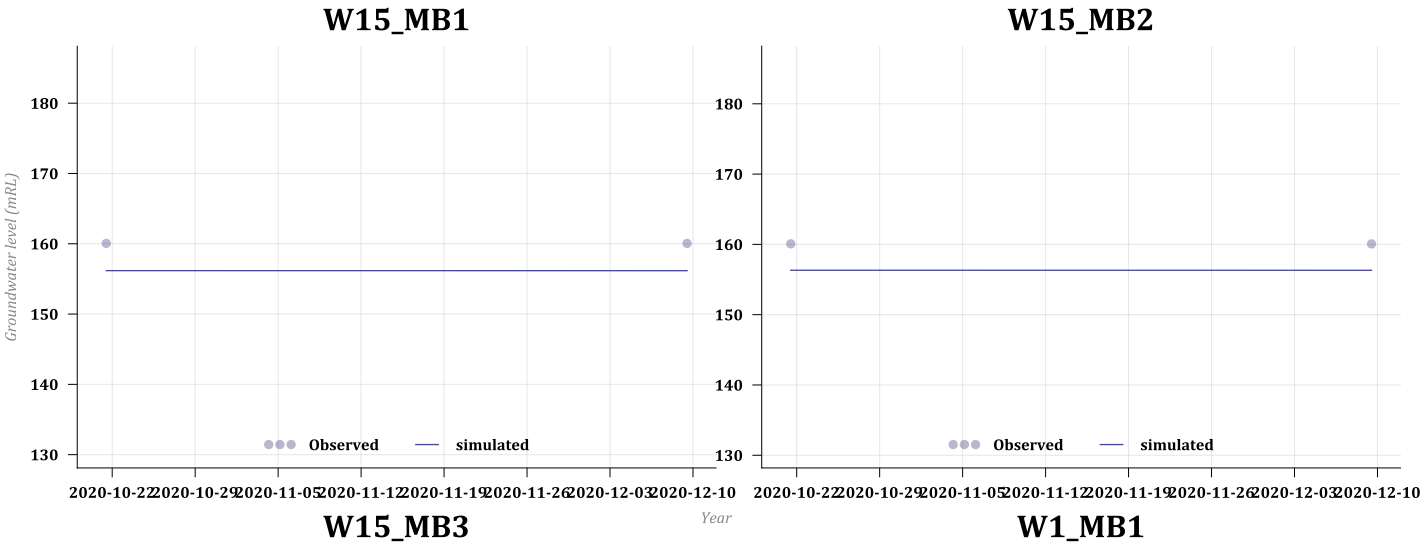

W12_MB1
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10


W13_MB1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

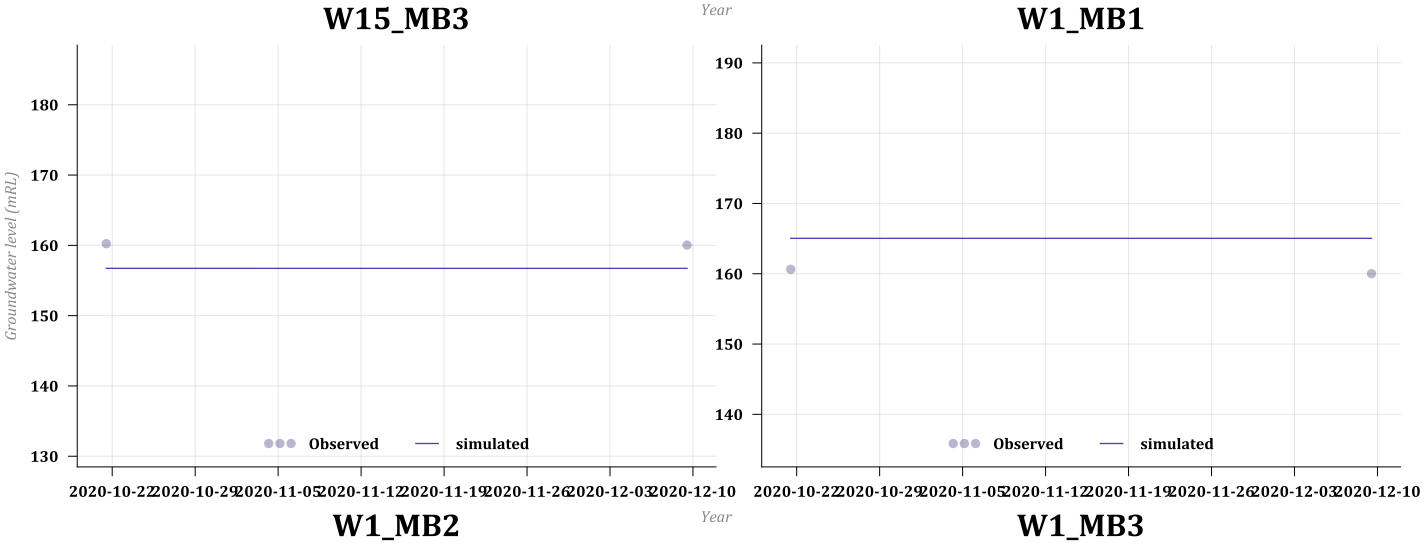

W13_MB2
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10


W14_MB1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

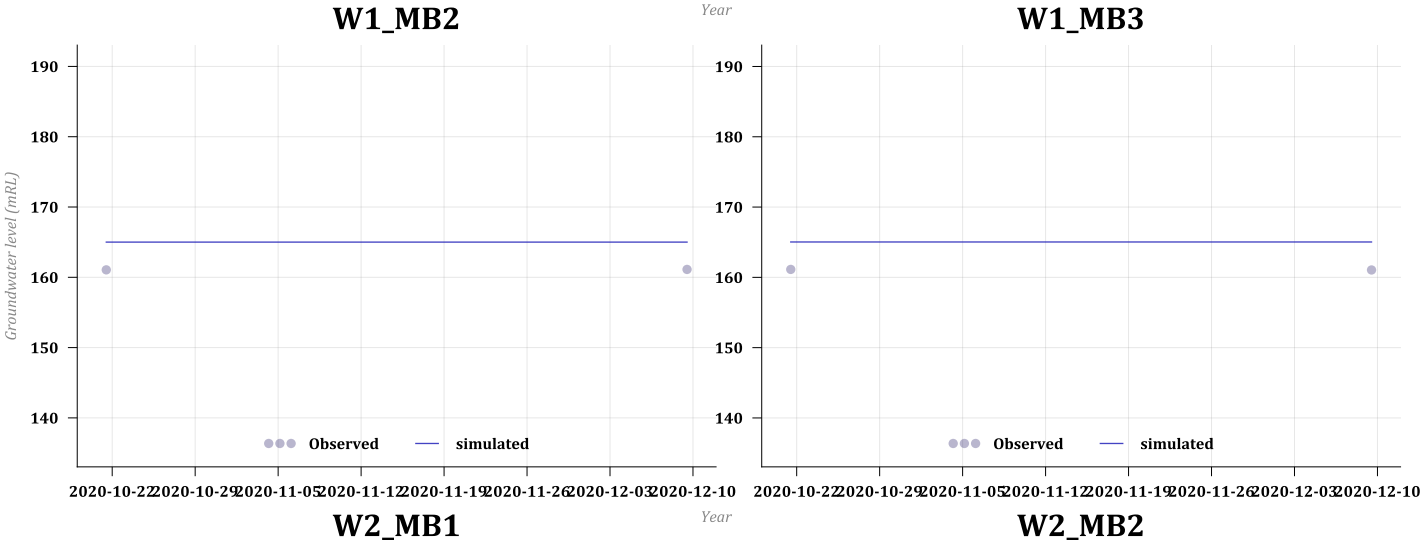

W14_MB2
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10


W15_MB1
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

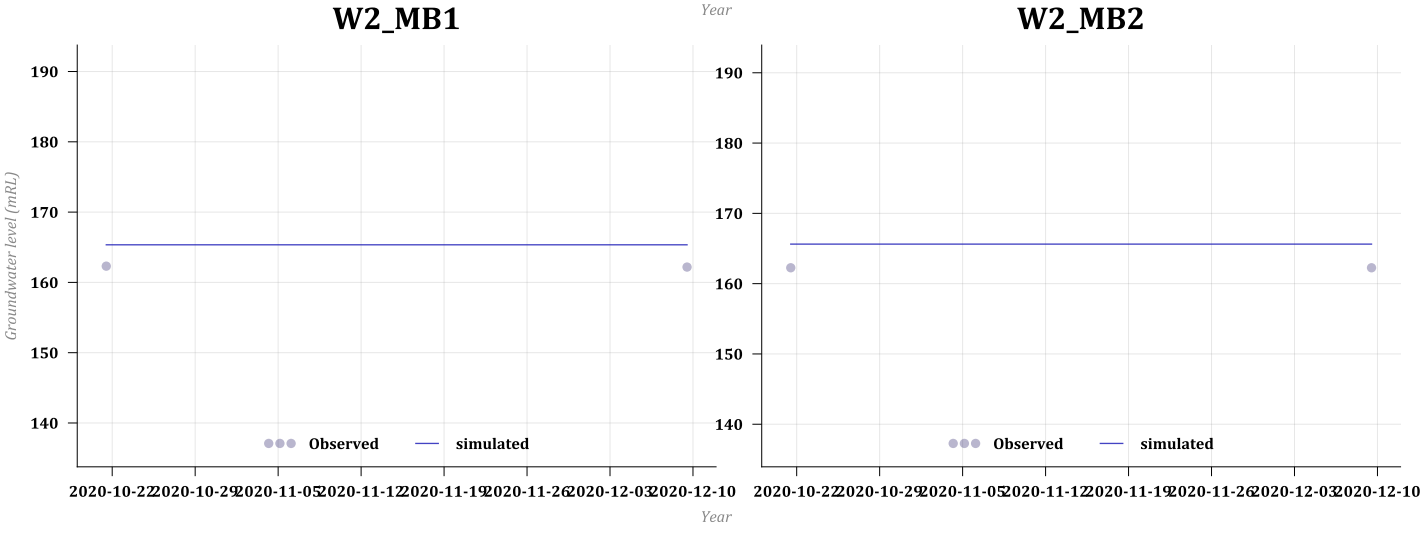
W15_MB2
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10


W15_MB3
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

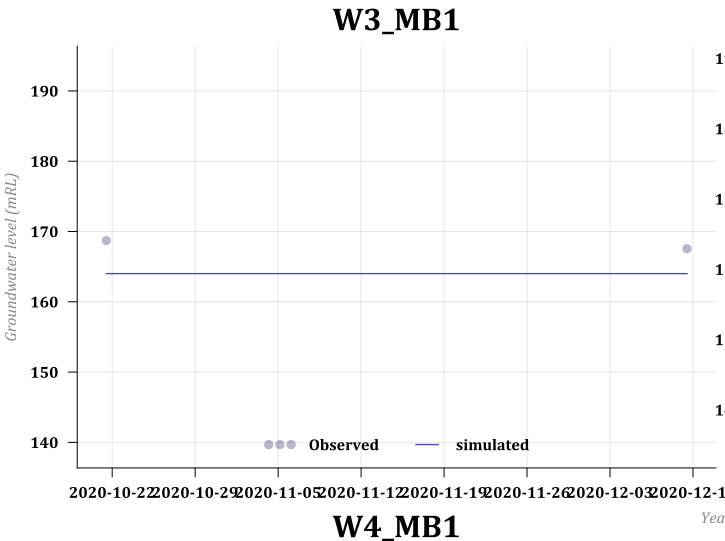
W1_MB1
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

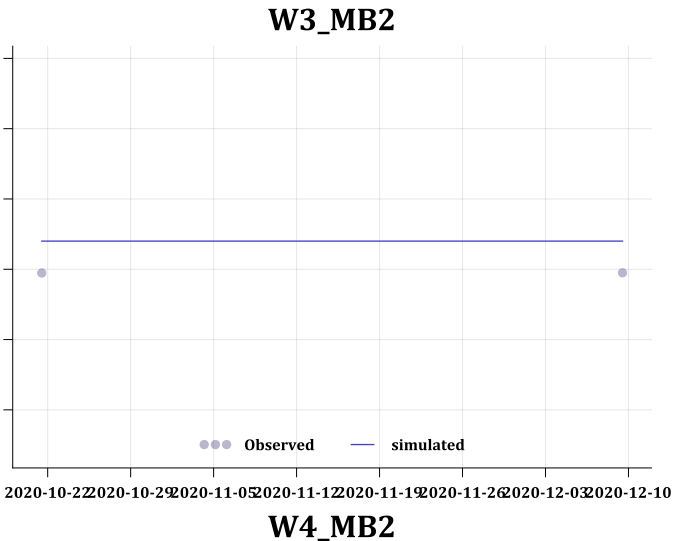

W1_MB2
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

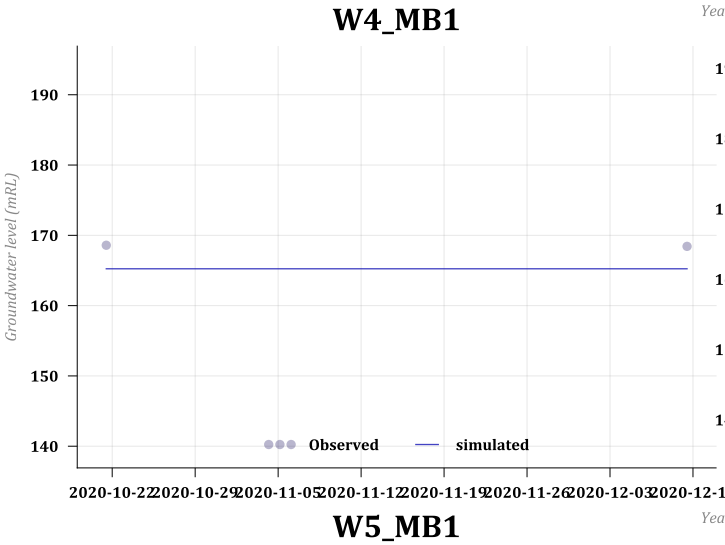
W1_MB3
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

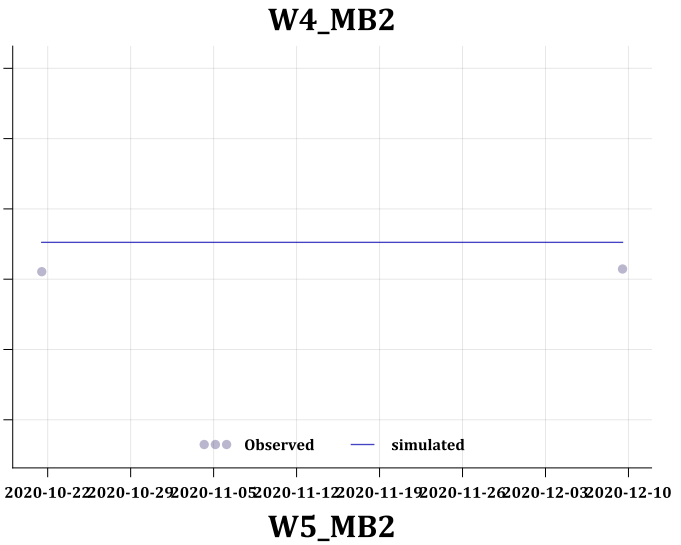

W2_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

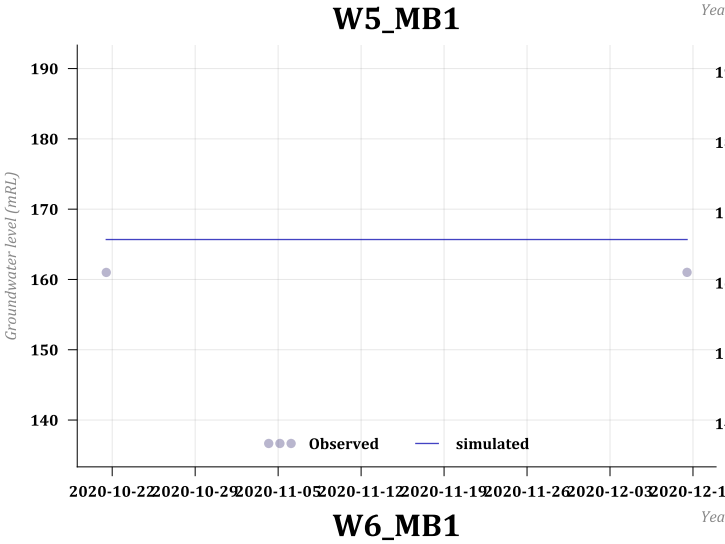
W2_MB2
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

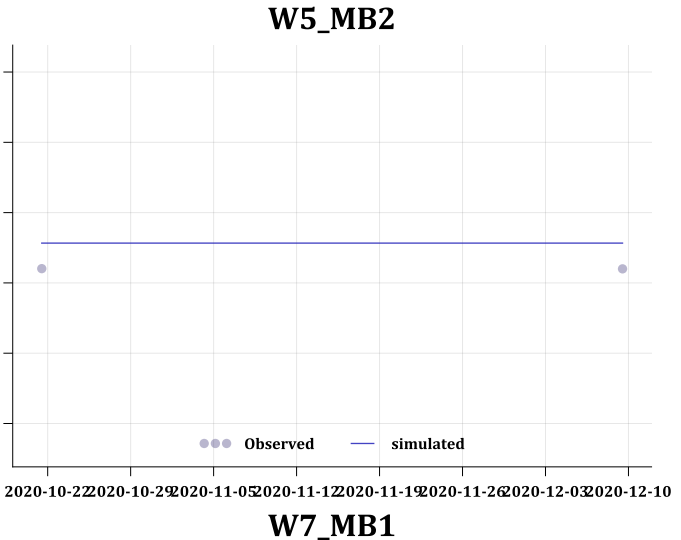

W3_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

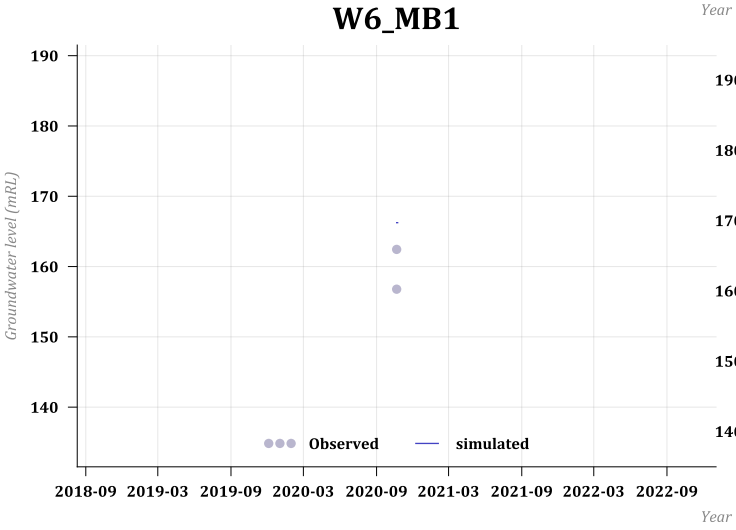

W3_MB2
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

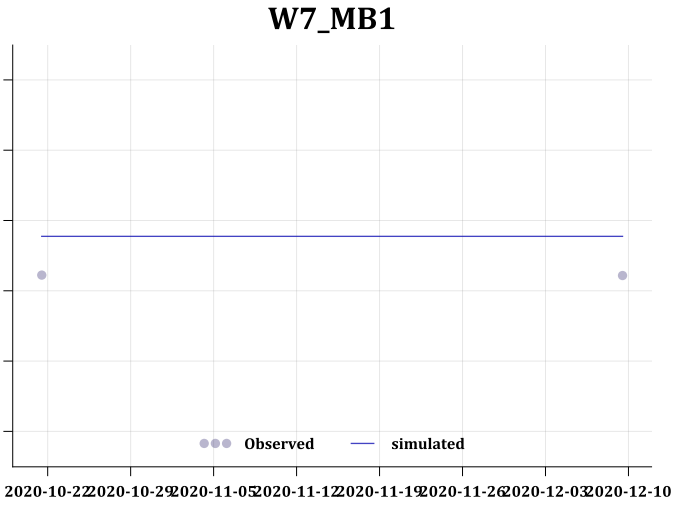

W4_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

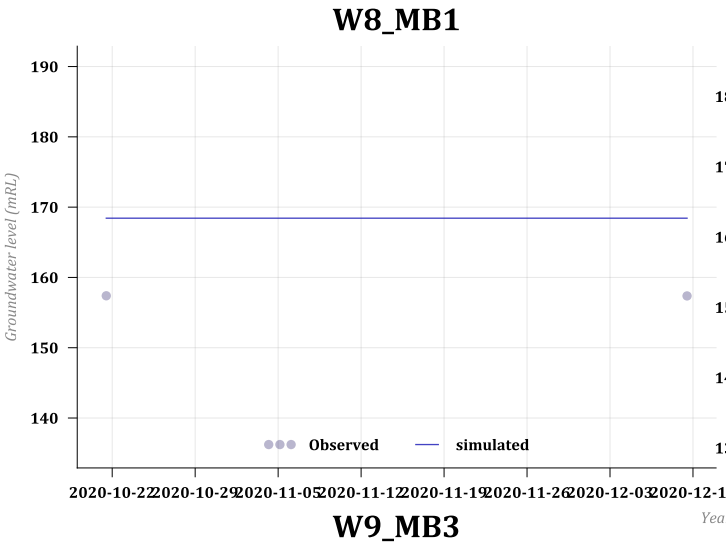

W4_MB2
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

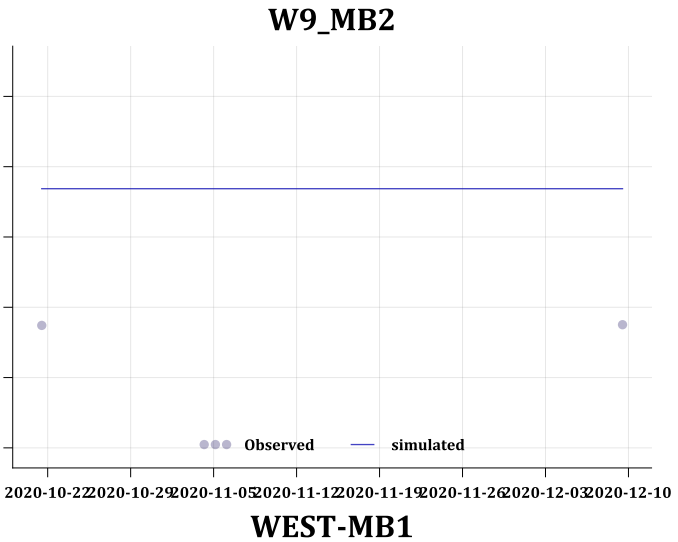

W5_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

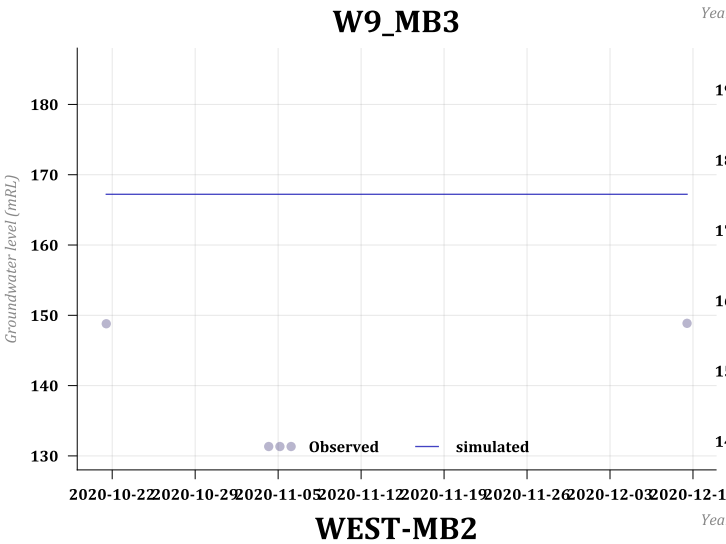

W5_MB2
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

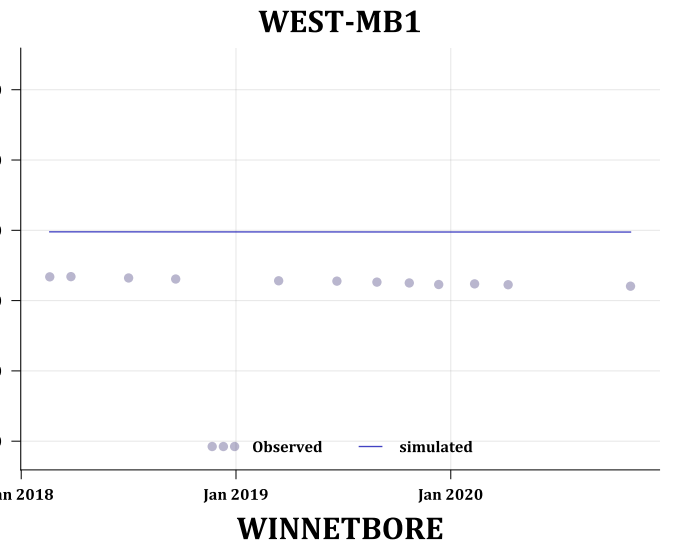

W6_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2018-09
2019-03
2019-09
2020-03
2020-09
2021-03
2021-09
2022-03
2022-09
Year

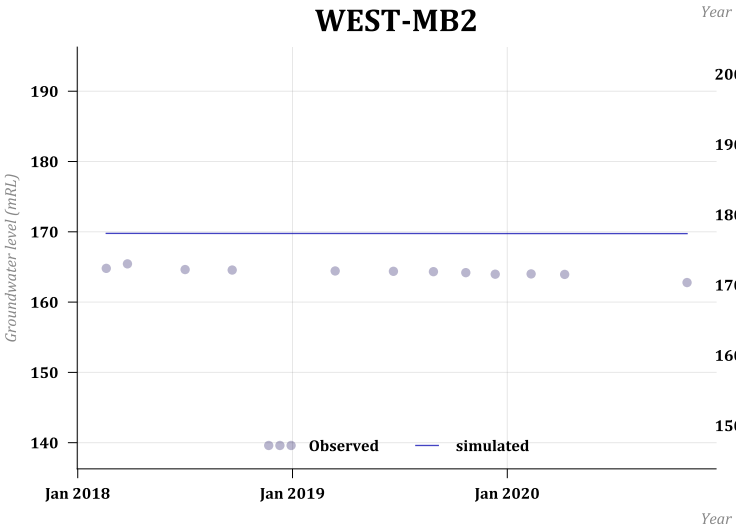

W7_MB1
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10

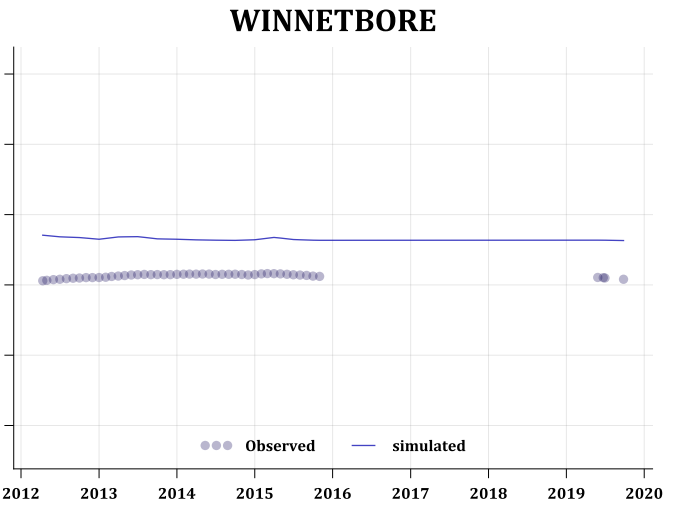

W8_MB1
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year


W9_MB2
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10


W9_MB3
Groundwater level (mRL)
180
170
160
150
140
130
Observed
simulated
2020-10-22
2020-10-29
2020-11-05
2020-11-12
2020-11-19
2020-11-26
2020-12-03
2020-12-10
Year

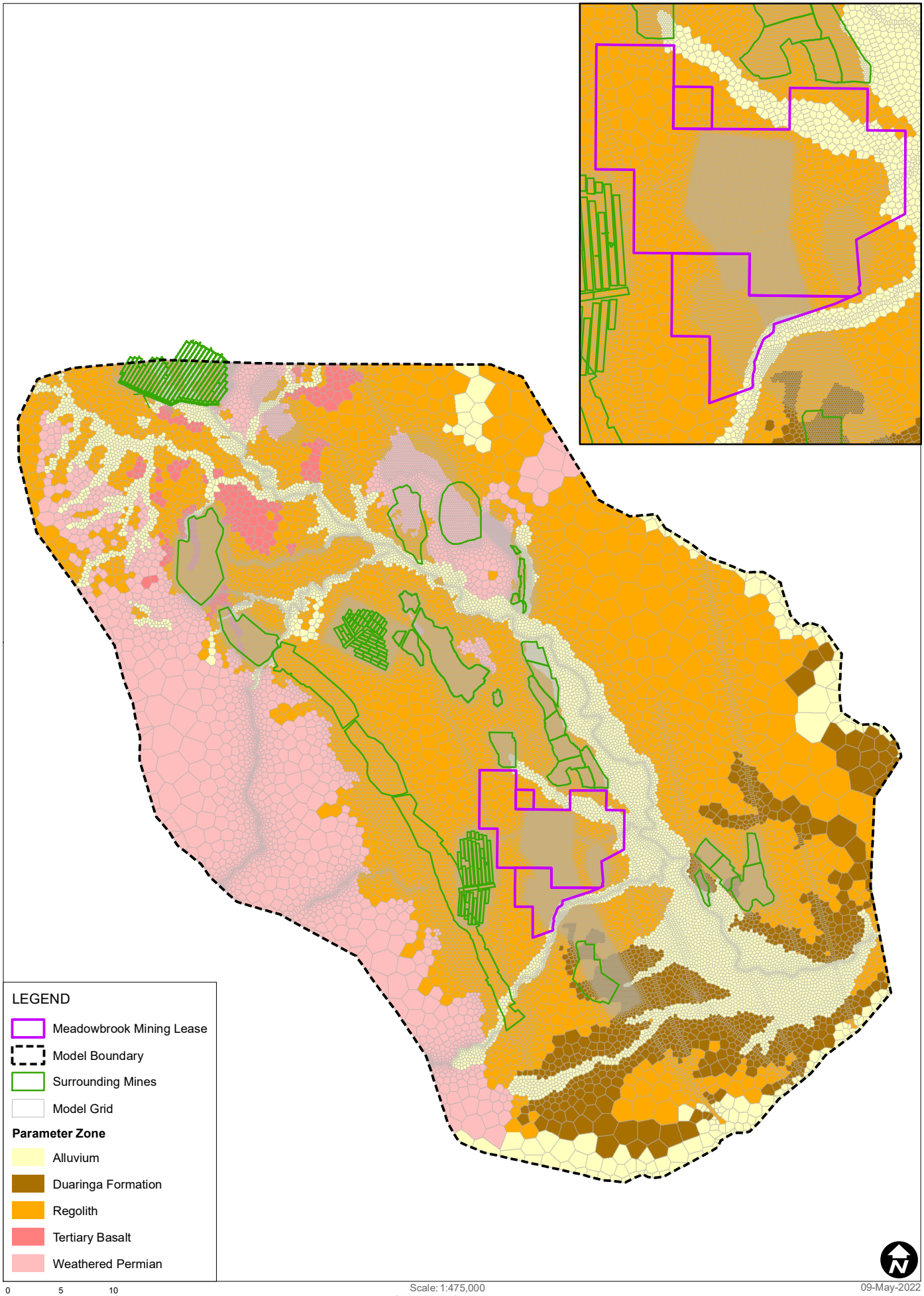

WEST-MB1
190
180
170
160
150
140
Observed
simulated
Jan 2018
Jan 2019
Jan 2020


WEST-MB2
Groundwater level (mRL)
190
180
170
160
150
140
Observed
simulated
Jan 2018
Jan 2019
Jan 2020
Year


WINNETBORE
200
190
180
170
160
150
Observed
simulated
2012
2013
2014
2015
2016
2017
2018
2019
2020

APPENDIX C

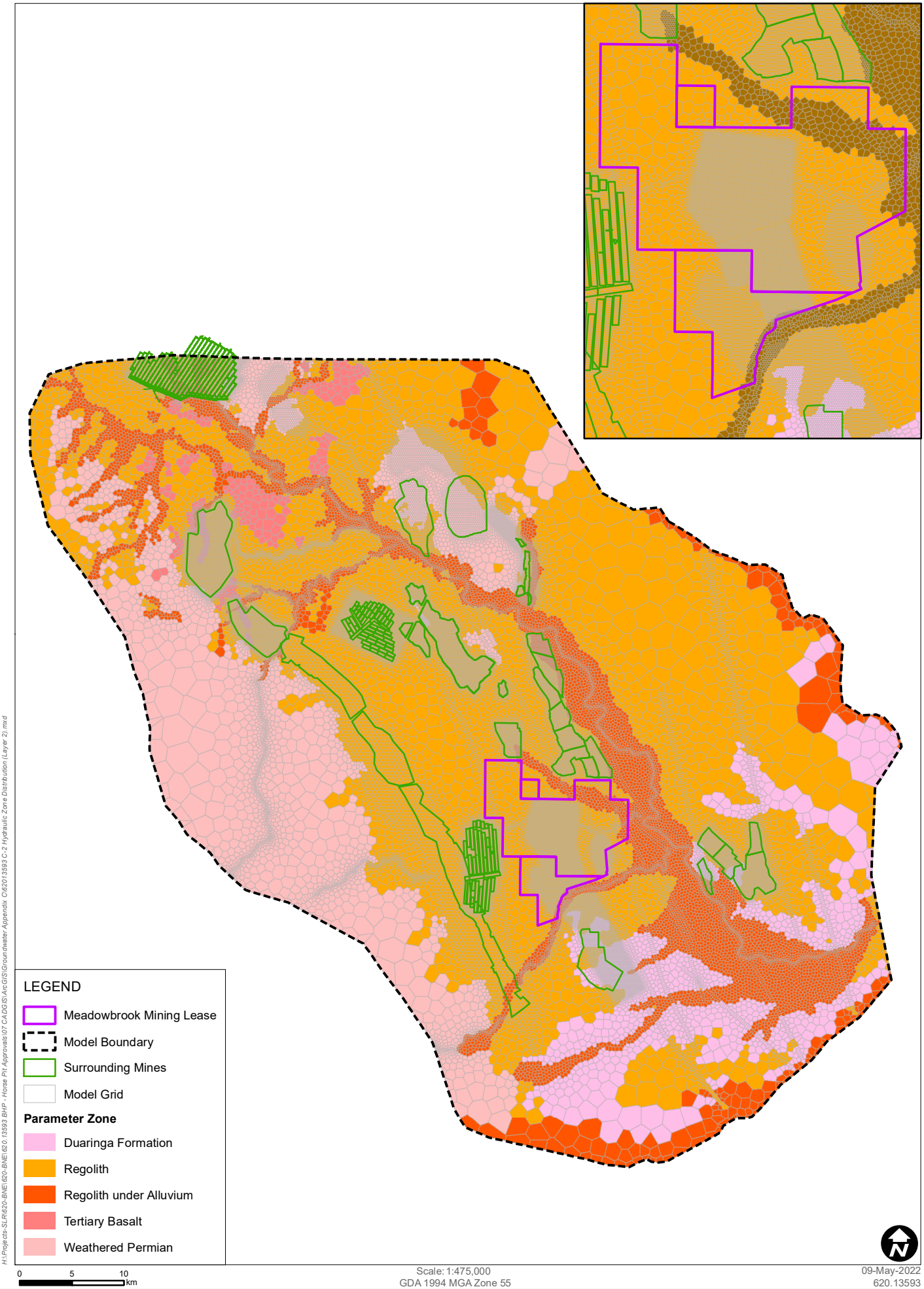
Hydraulic Parameters and Recharge Zone Distribution



SLR

Hydraulic Parameter Zone Distribution Layer 1

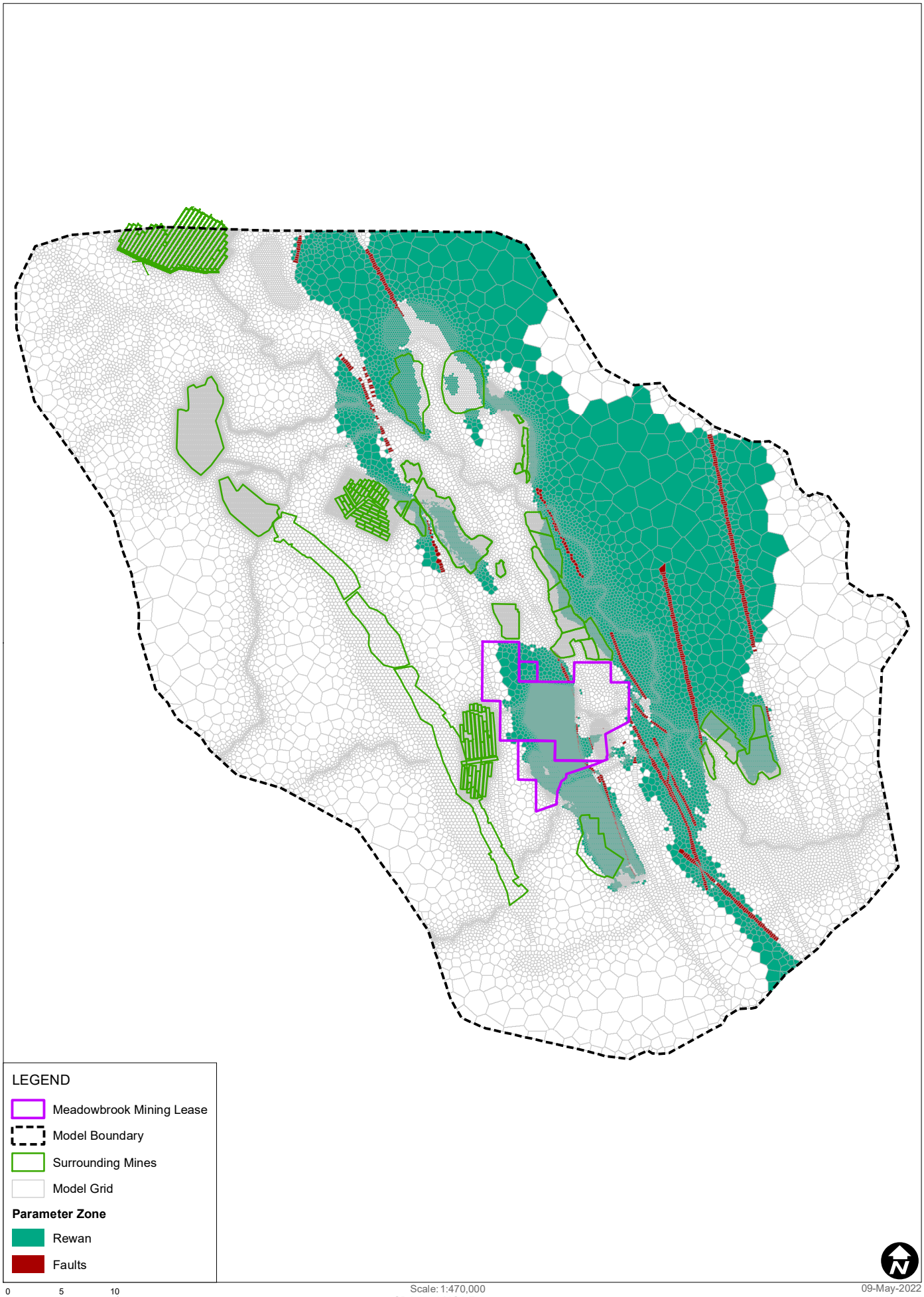
FIGURE C-1



SLR

Hydraulic Parameter Zone Distribution Layer 2

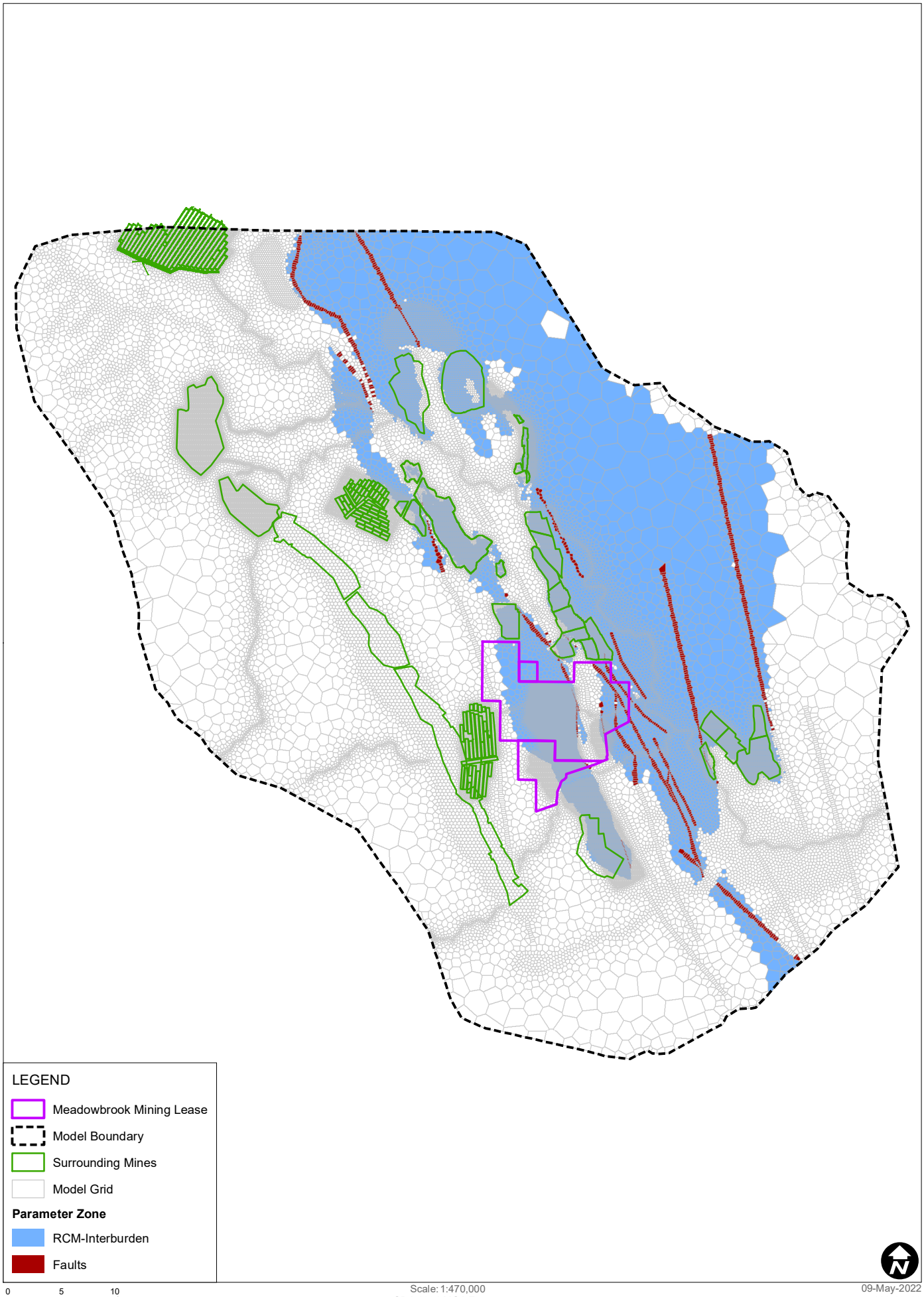
FIGURE C-2



SLR

Hydraulic Parameter Zone Distribution Layer 3

FIGURE C-3



H:\Projects-SLR\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CAD\GIS\ArcGIS\Groundwater Appendix C\620.13593 C-4 Hydraulic Zone Distribution (Layer 4).mxd

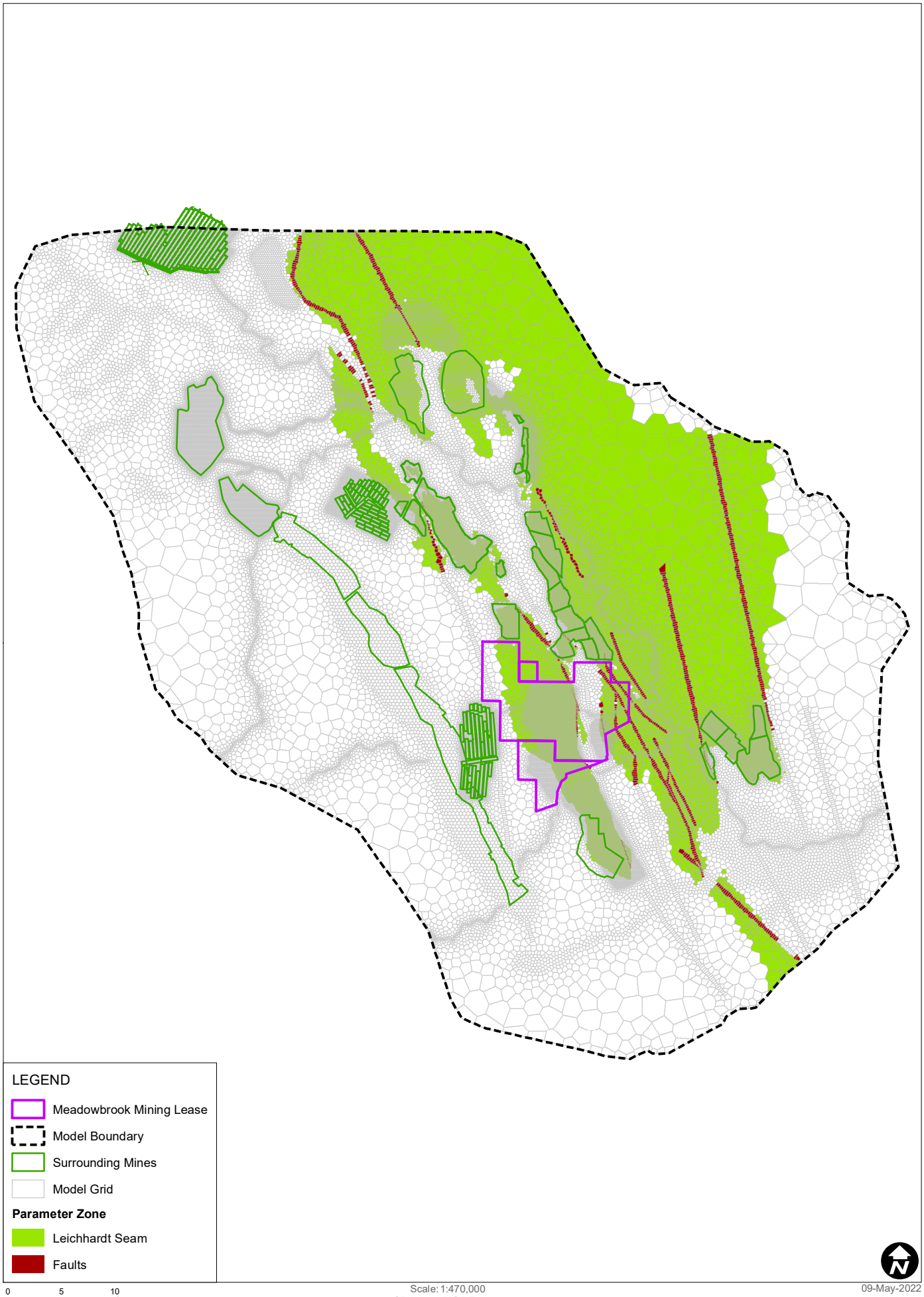
Scale: 1:470,000
GDA 1994 MGA Zone 55

09-May-2022
620.13593

SLR

Hydraulic Parameter Zone Distribution Layer 4

FIGURE C-4



H:\Projects-SLR\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CAD\GIS\ArcGIS\Groundwater Appendix C\620.13593 C-5 Hydraulic Zone Distribution (Layer 5).mxd

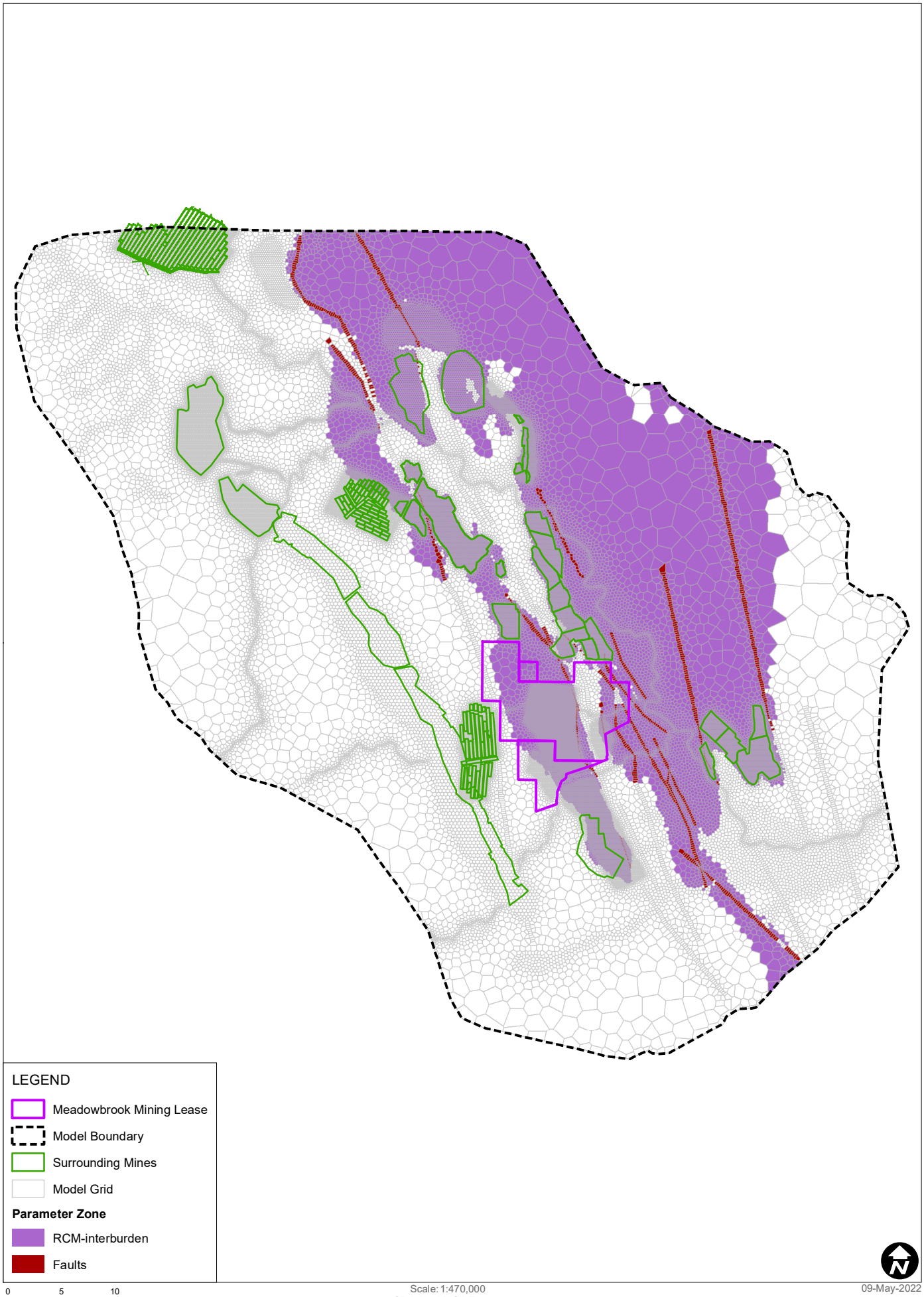
Scale: 1:470,000
GDA 1994 MGA Zone 55

09-May-2022
620.13593

SLR

Hydraulic Parameter Zone Distribution Layer 5

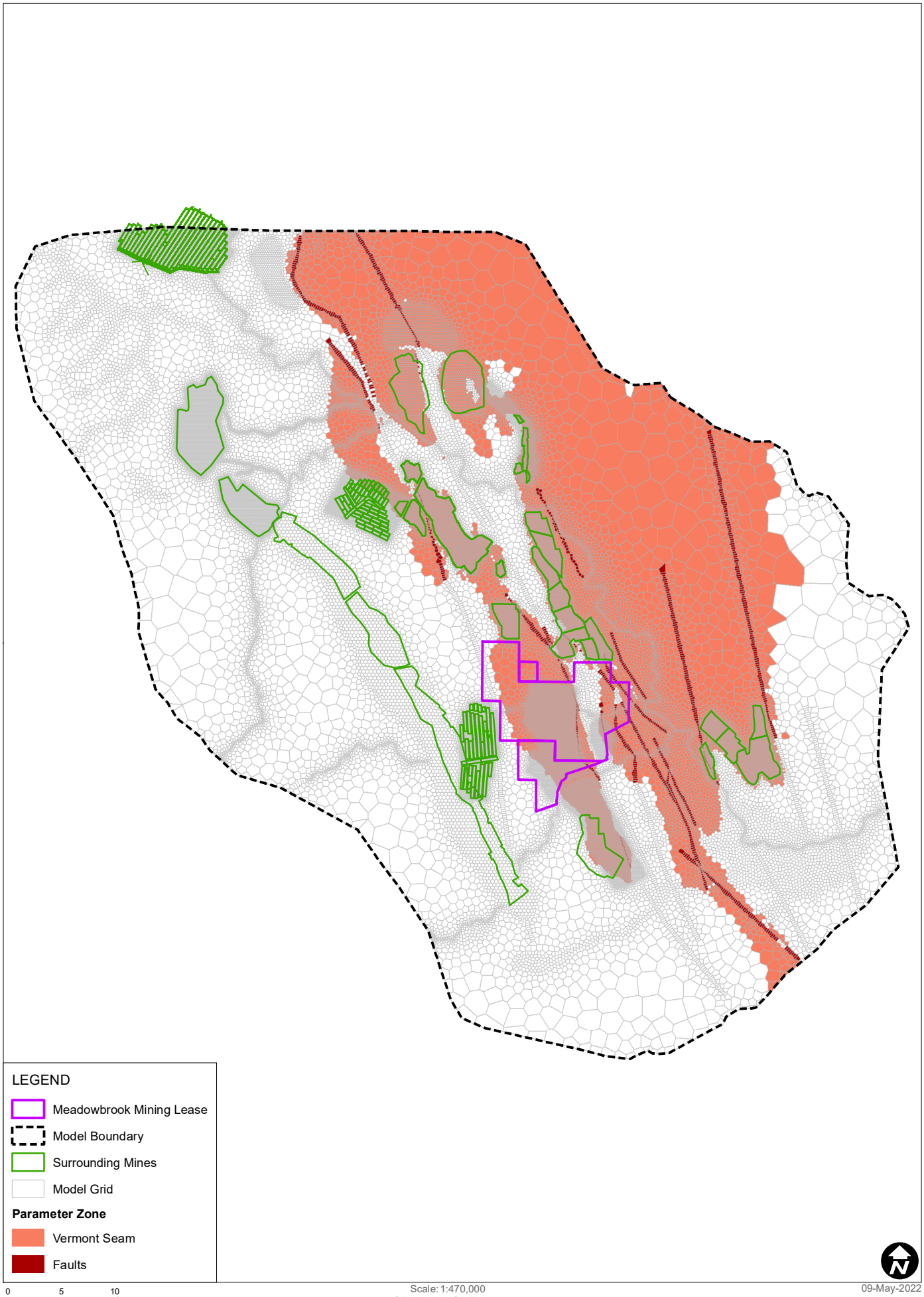
FIGURE C-5



SLR

Hydraulic Parameter Zone Distribution Layer 6

FIGURE C-6



H:\Projects-SLR\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CAD\GIS\ArcGIS\Groundwater Appendix C\620.13593 C-7 Hydraulic Zone Distribution (Layer 7).mxd

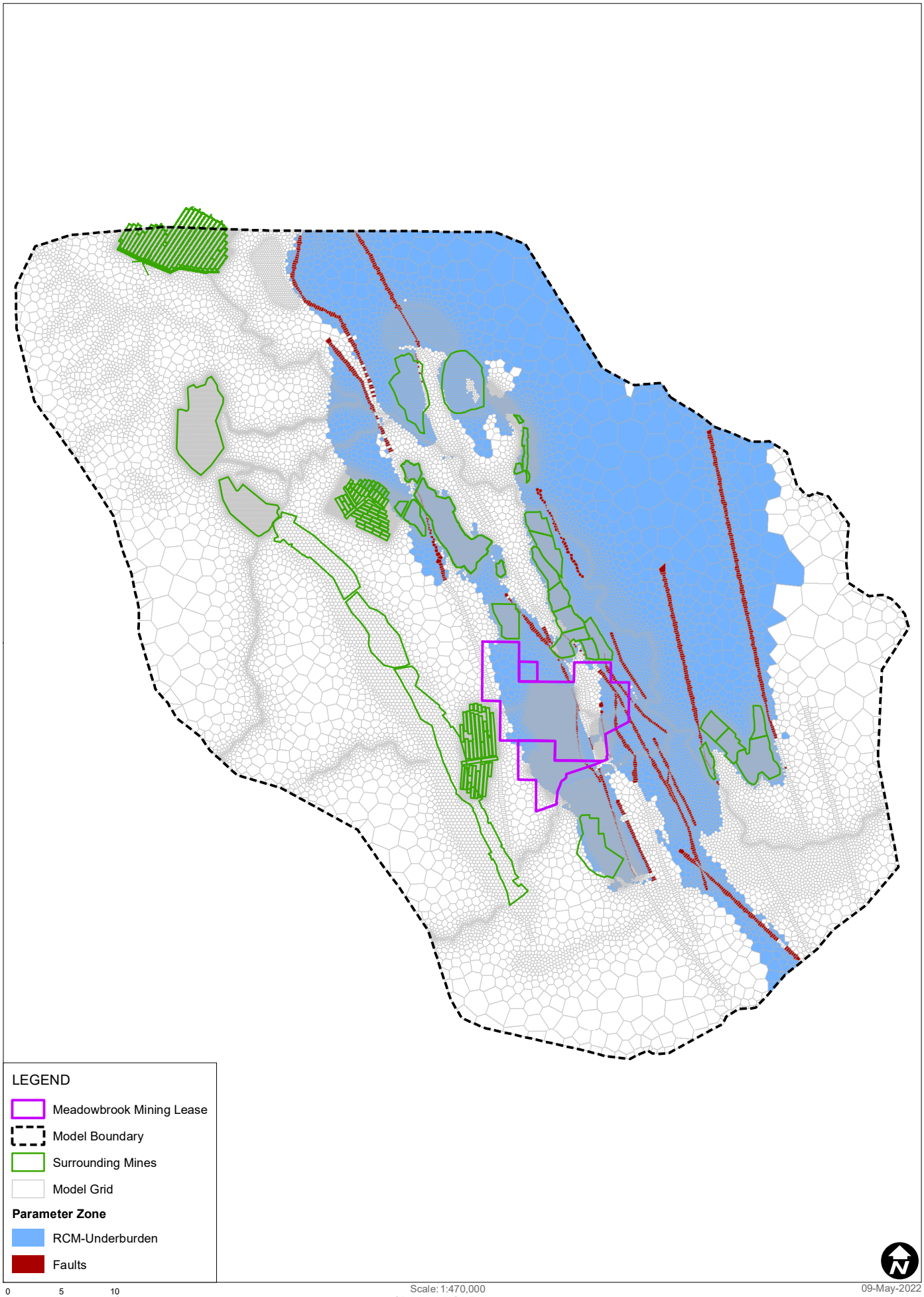
Scale: 1:470,000
GDA 1994 MGA Zone 55

09-May-2022
620.13593

SLR

Hydraulic Parameter Zone Distribution Layer 7

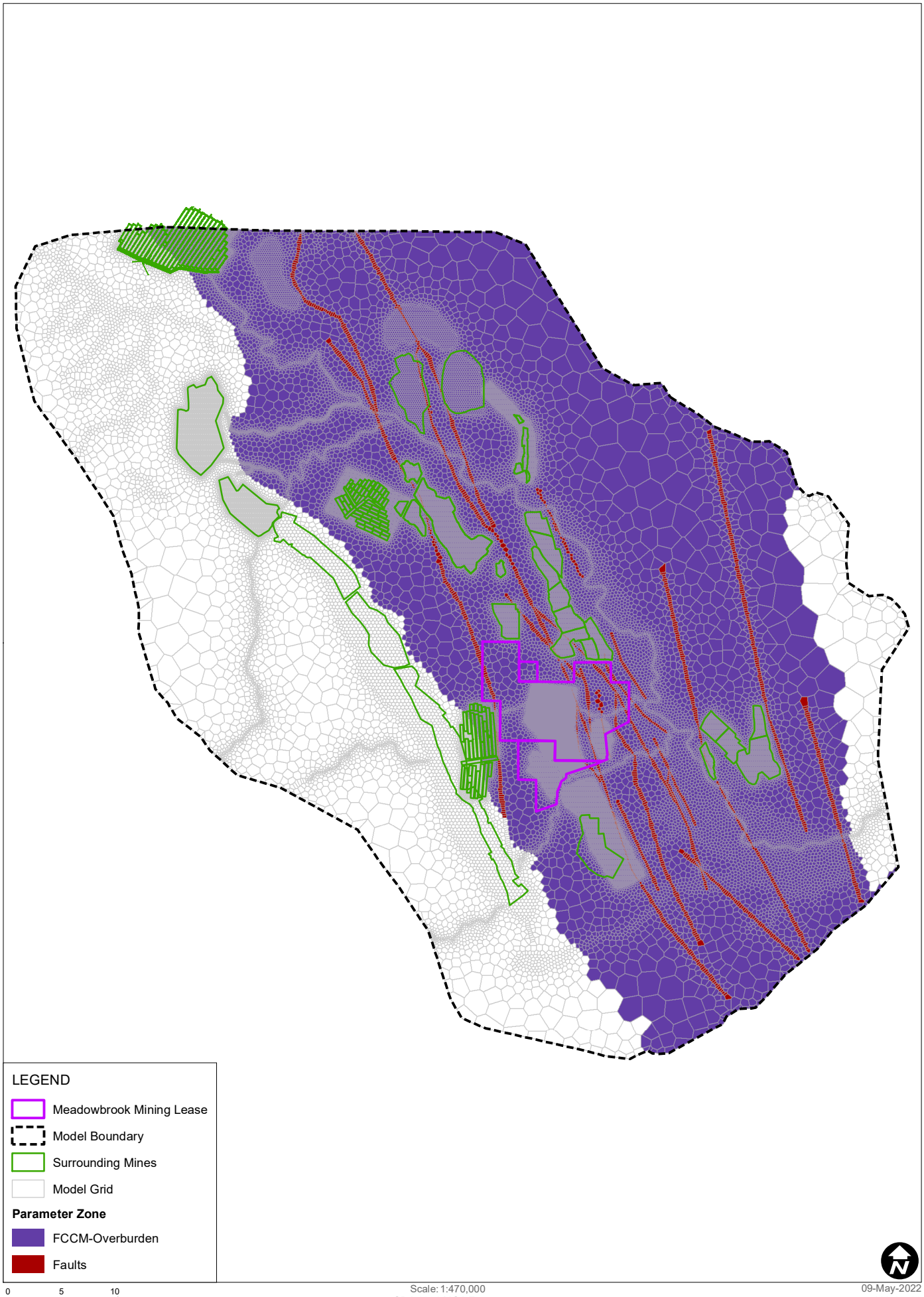
FIGURE C-7



SLR

Hydraulic Parameter Zone Distribution Layer 8

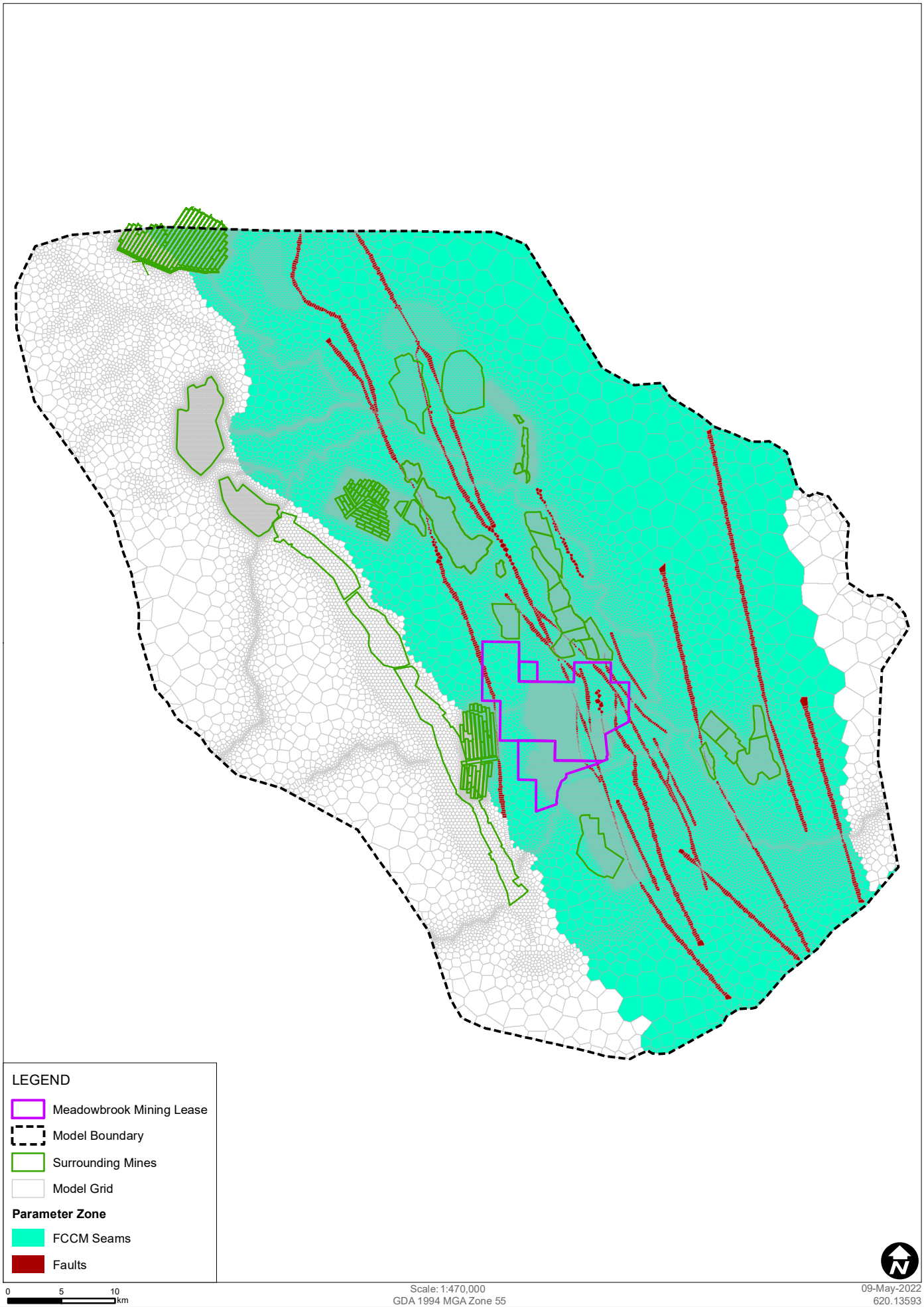
FIGURE C-8



SLR

Hydraulic Parameter Zone Distribution Layer 9

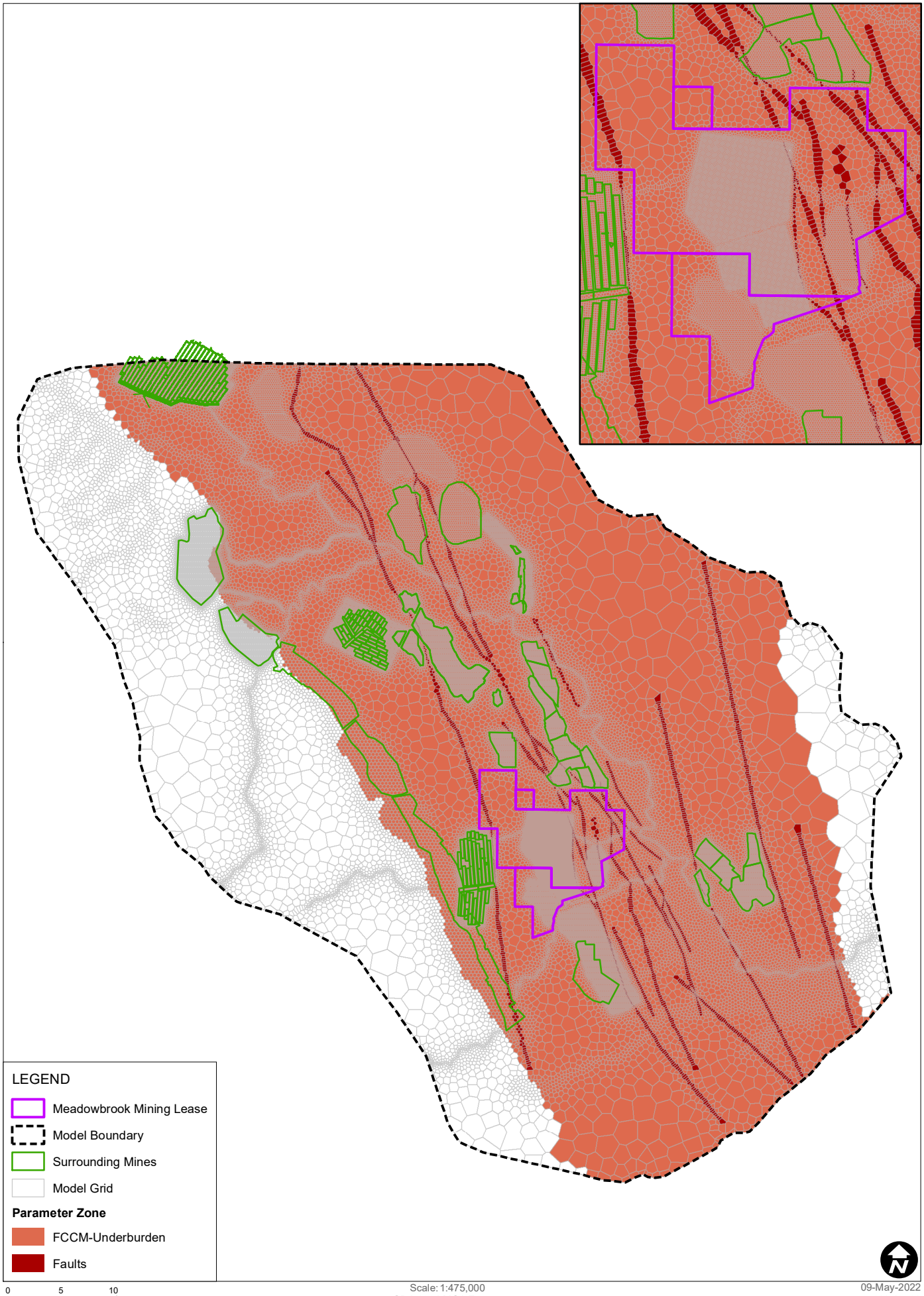
FIGURE C-9



SLR

Hydraulic Parameter Zone Distribution Layer 10

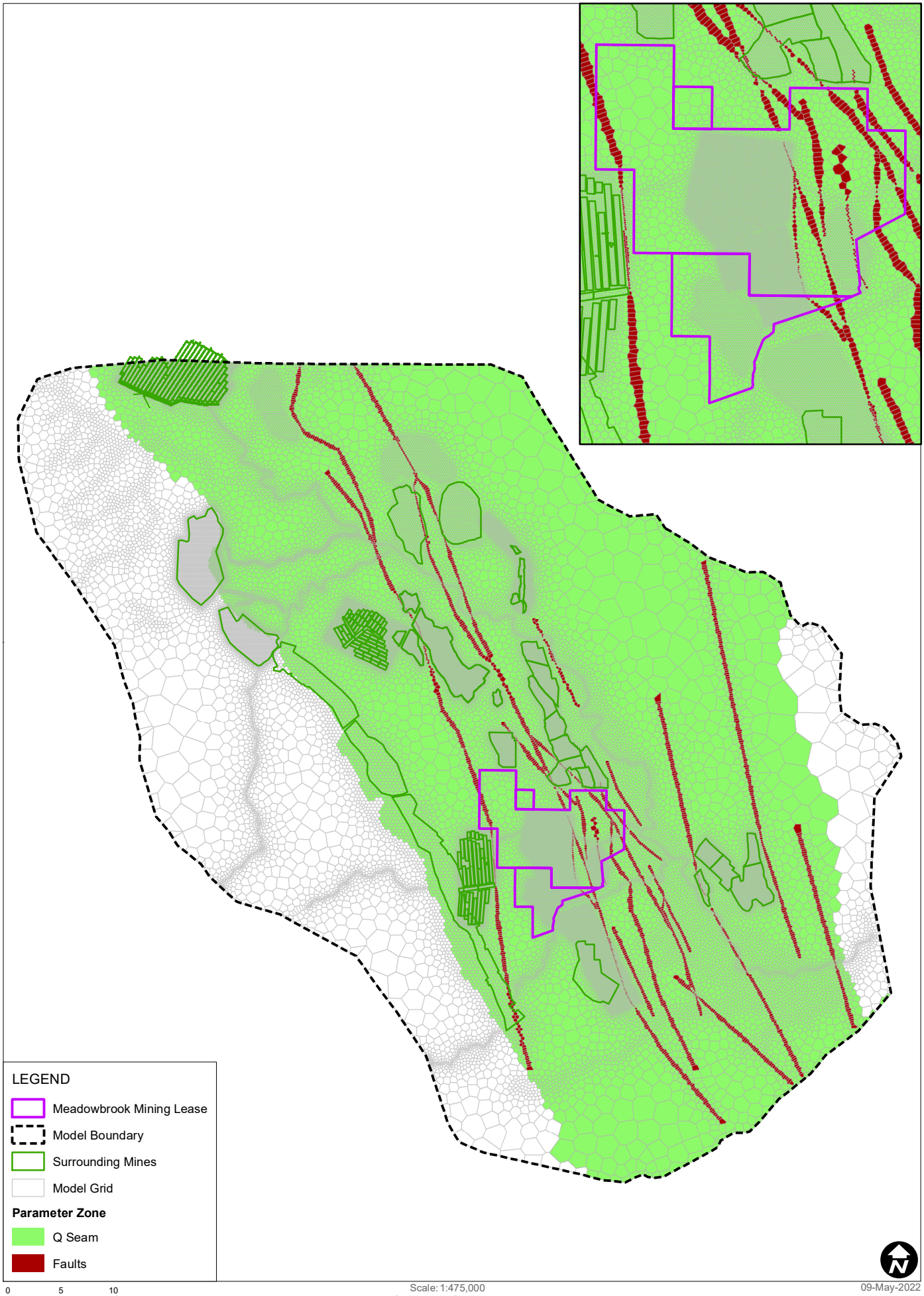
FIGURE C-10



SLR

Hydraulic Parameter Zone Distribution Layer 11

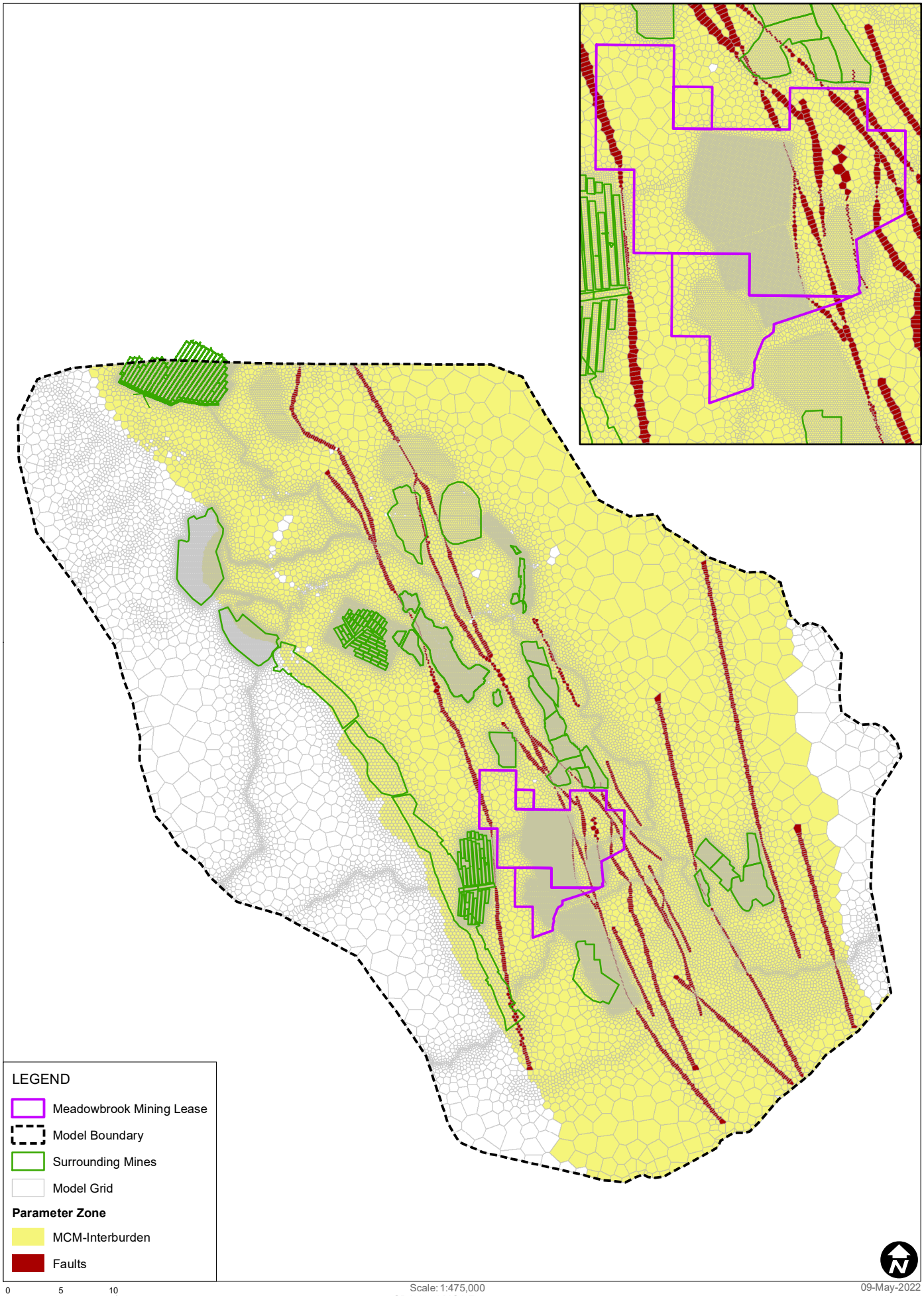
FIGURE C-11



SLR

Hydraulic Parameter Zone Distribution Layer 12

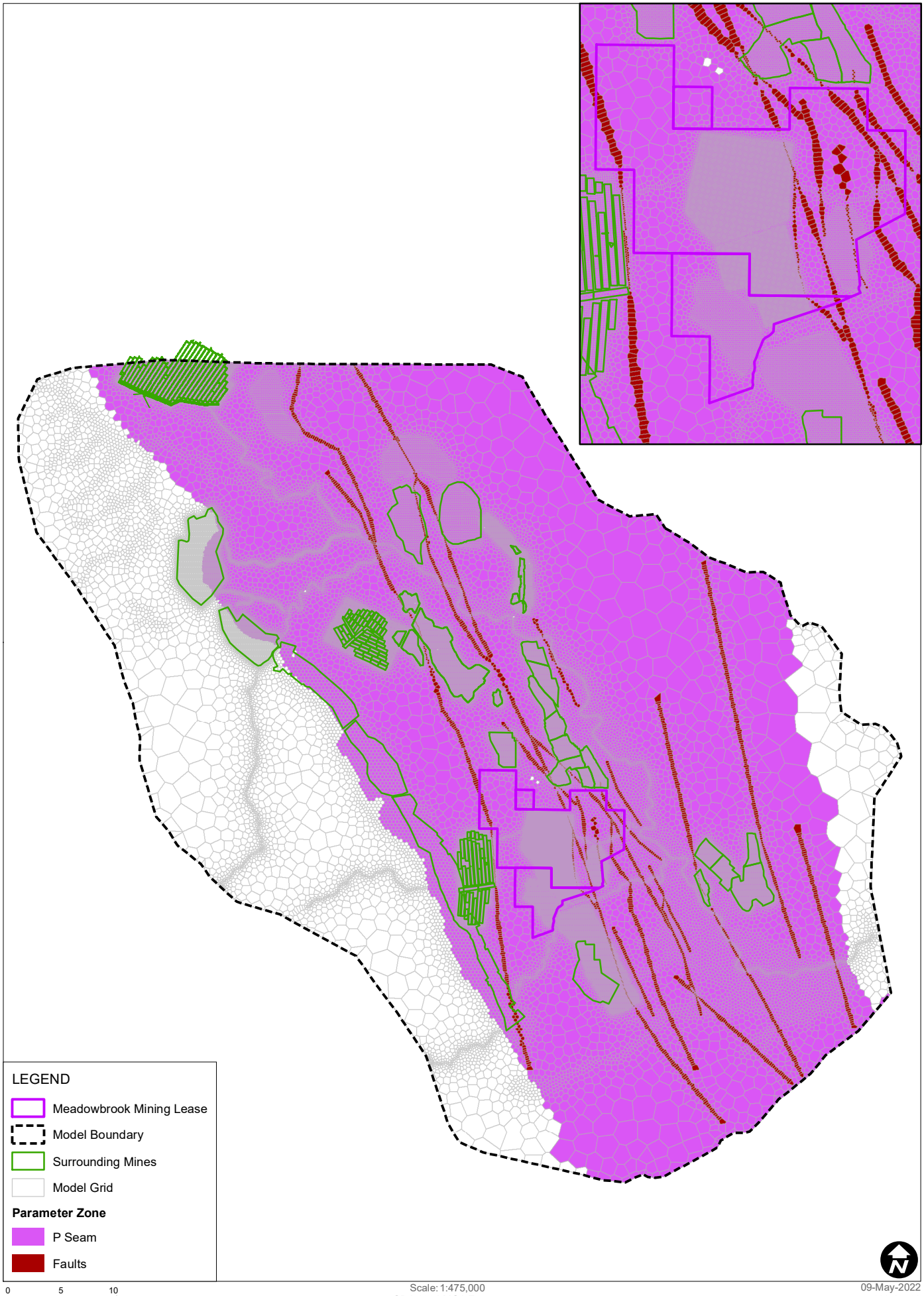
FIGURE C-12



SLR

Hydraulic Parameter Zone Distribution Layer 13

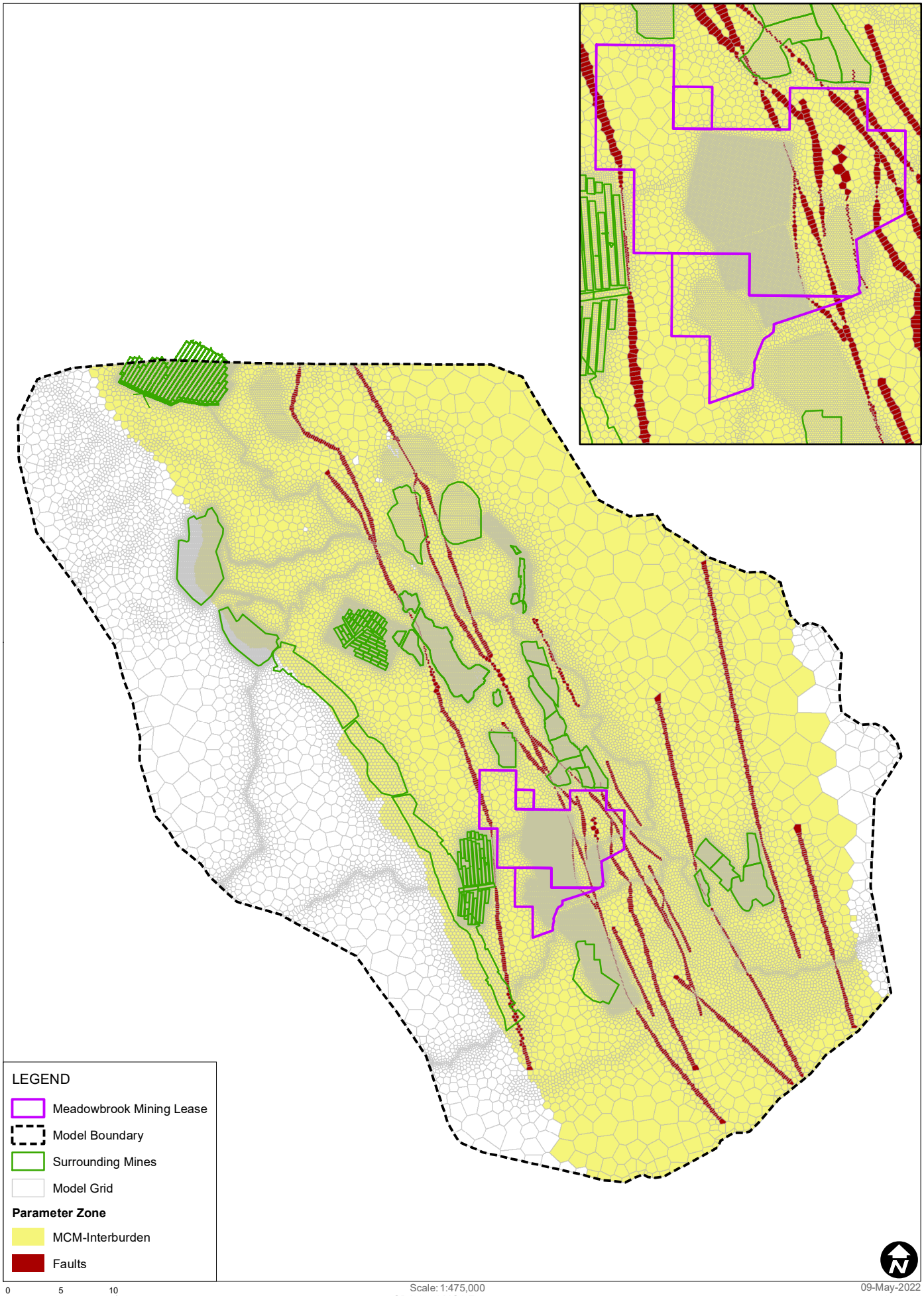
FIGURE C-13



SLR

Hydraulic Parameter Zone Distribution Layer 14

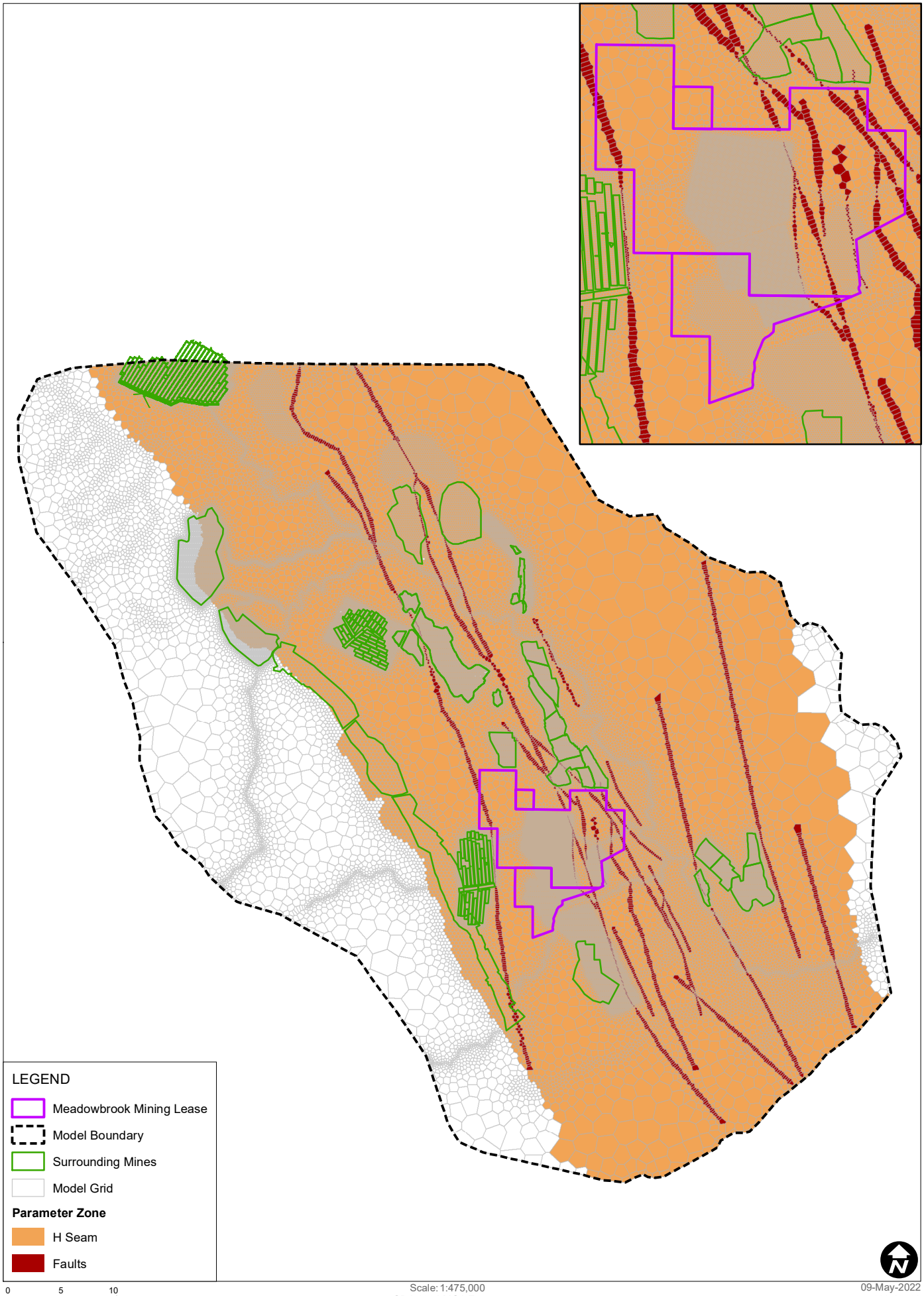
FIGURE C-14



SLR

Hydraulic Parameter Zone Distribution Layer 15

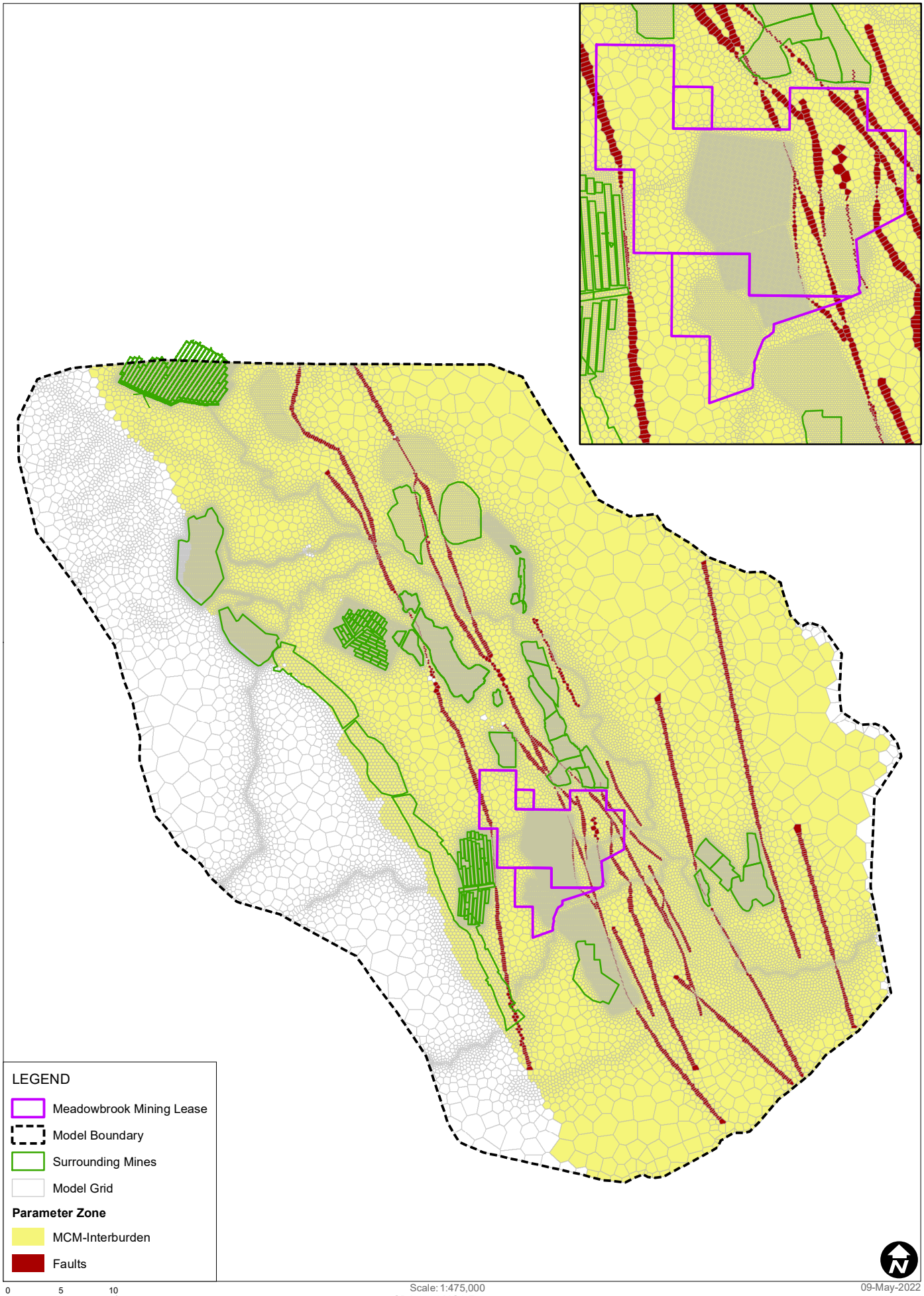
FIGURE C-15



SLR

Hydraulic Parameter Zone Distribution Layer 16

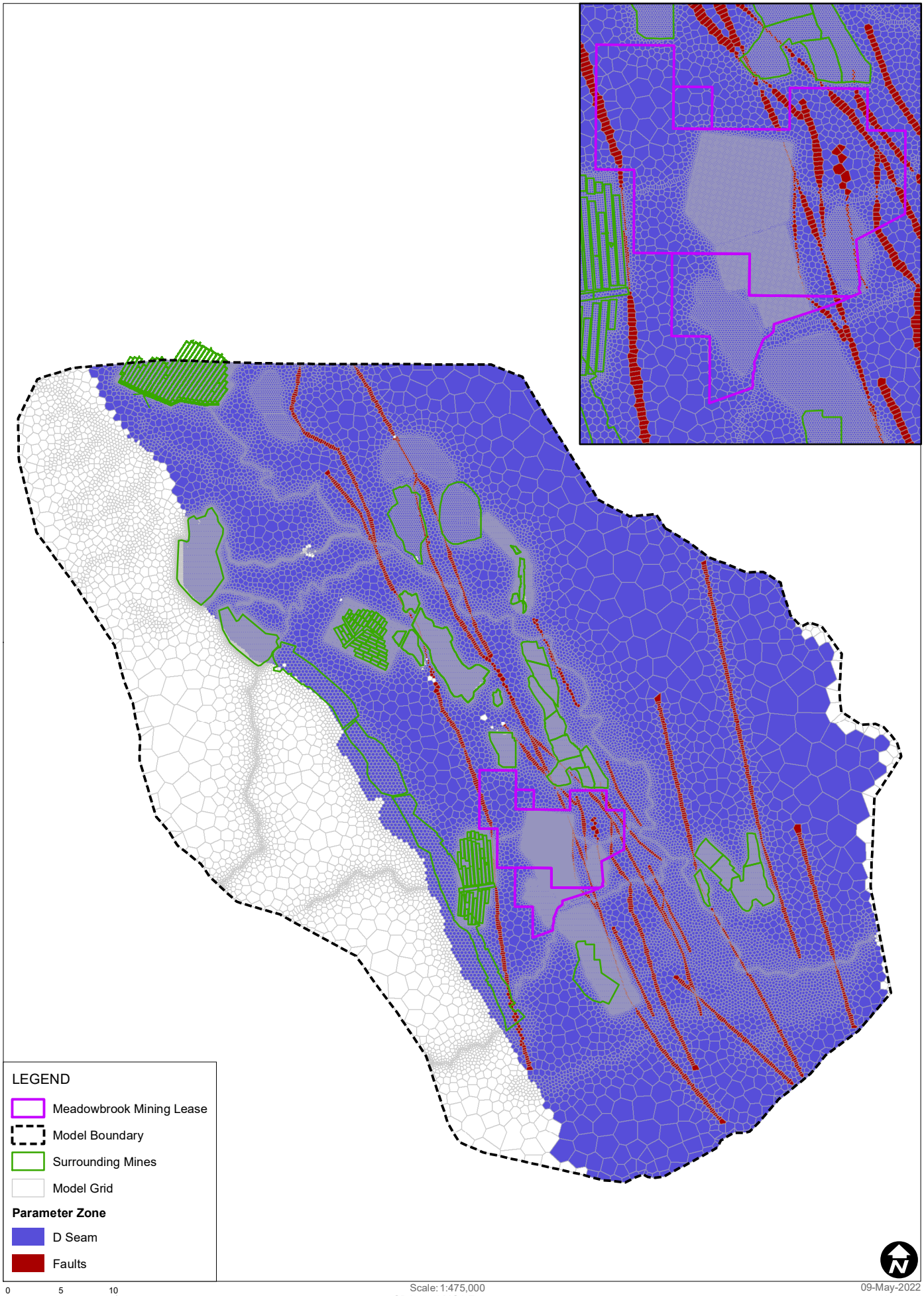
FIGURE C-16



SLR

Hydraulic Parameter Zone Distribution Layer 17

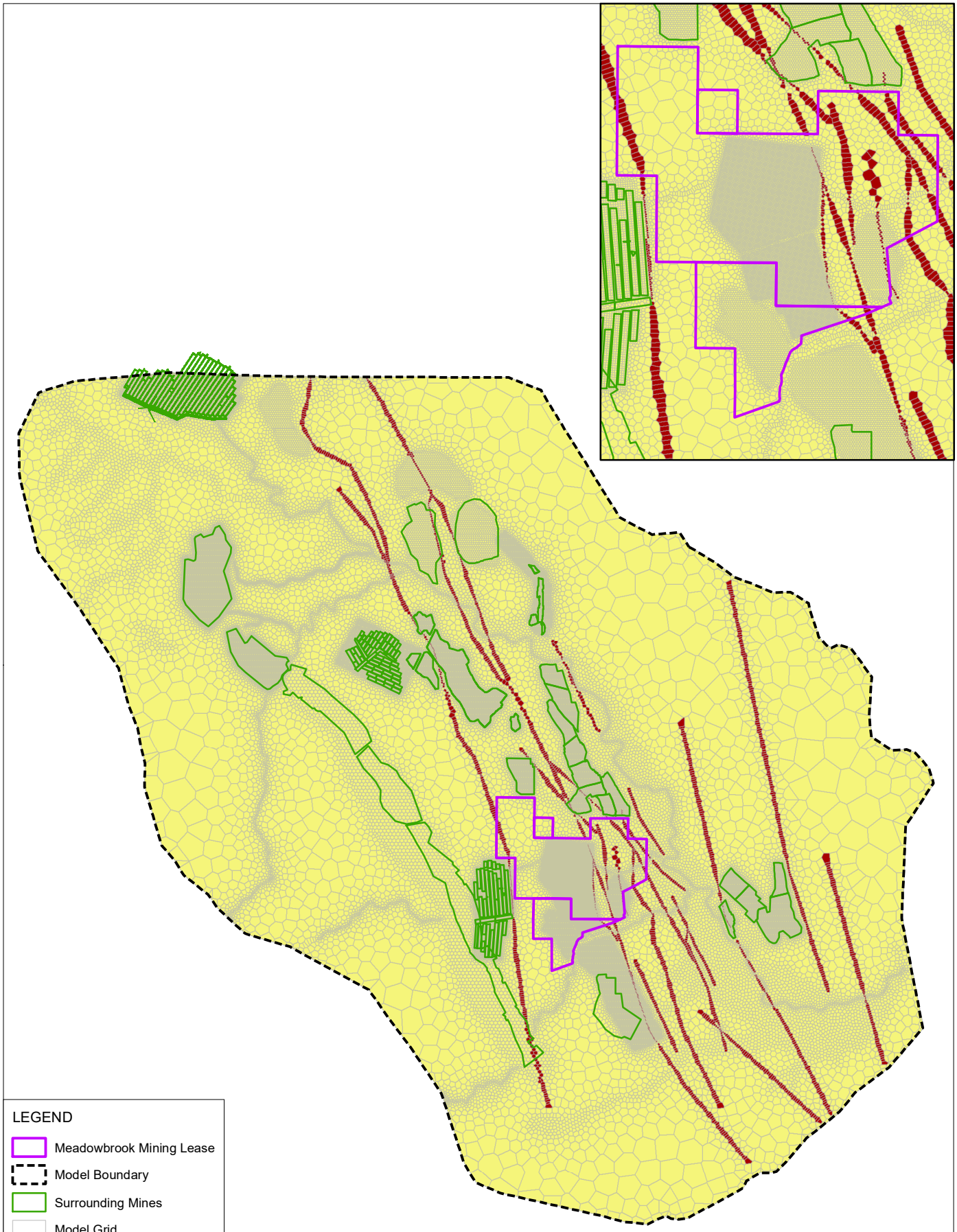
FIGURE C-17



SLR

Hydraulic Parameter Zone Distribution Layer 18

FIGURE C-18



H:\Projects-SLR\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CAD\GIS\ArcGIS\Groundwater Appendix C\620.13593 C-19 Hydraulic Zone Distribution (Layer 19).mxd

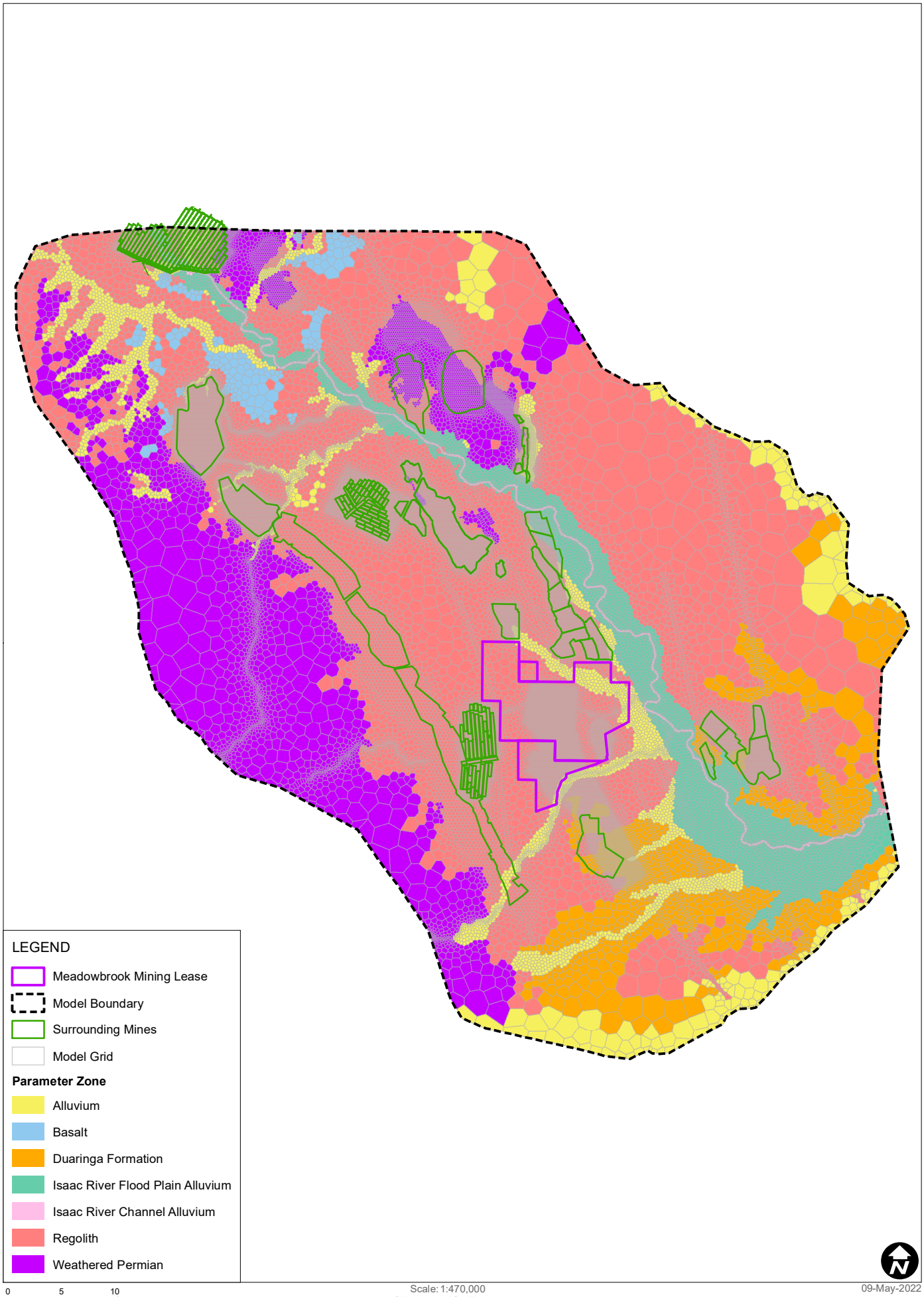
Scale: 1:475,000
GDA 1994 MGA Zone 55

09-May-2022
620.13593

SLR

Hydraulic Parameter Zone Distribution Layer 19

FIGURE C-19



H:\Projects-SLR\620-BNE\620.13593 BHP - Horse Pit Approvals\07 CAD\GIS\ArcGIS\Groundwater Appendix C\620.13593 C-20 Recharge Zone Distribution.mxd

Scale: 1:470,000
GDA 1994 MGA Zone 55

09-May-2022
620.13593

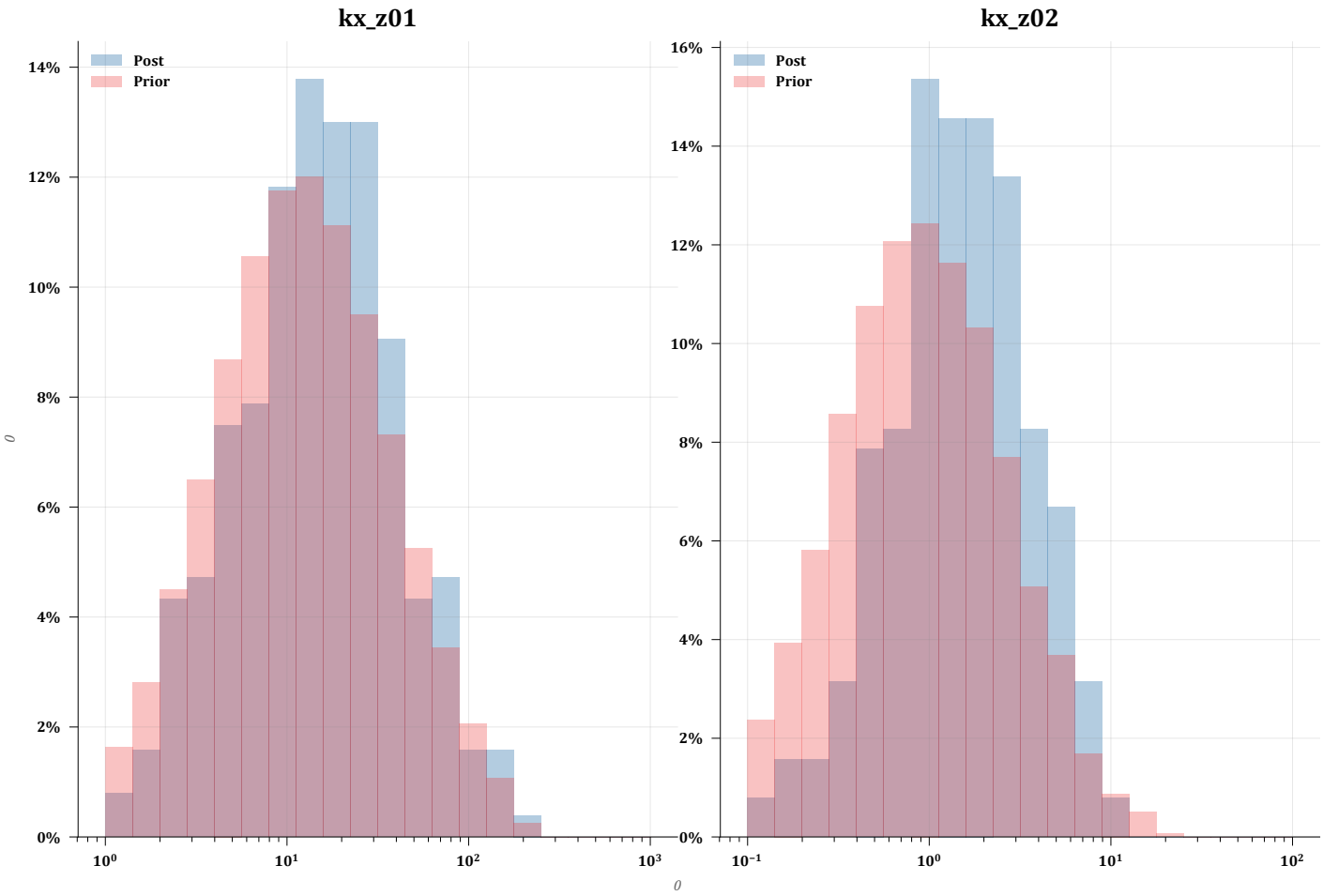
SLR

Recharge Zone Distribution

FIGURE C-20

APPENDIX D

Uncertainty Analysis Parameter Distribution


kx_z01
Post
Prior
14%
12%
10%
8%
6%
4%
2%
0%
10^0
10^1
10^2
10^3
0
kx_z02
Post
Prior
16%
14%
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10%
8%
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4%
2%
0%
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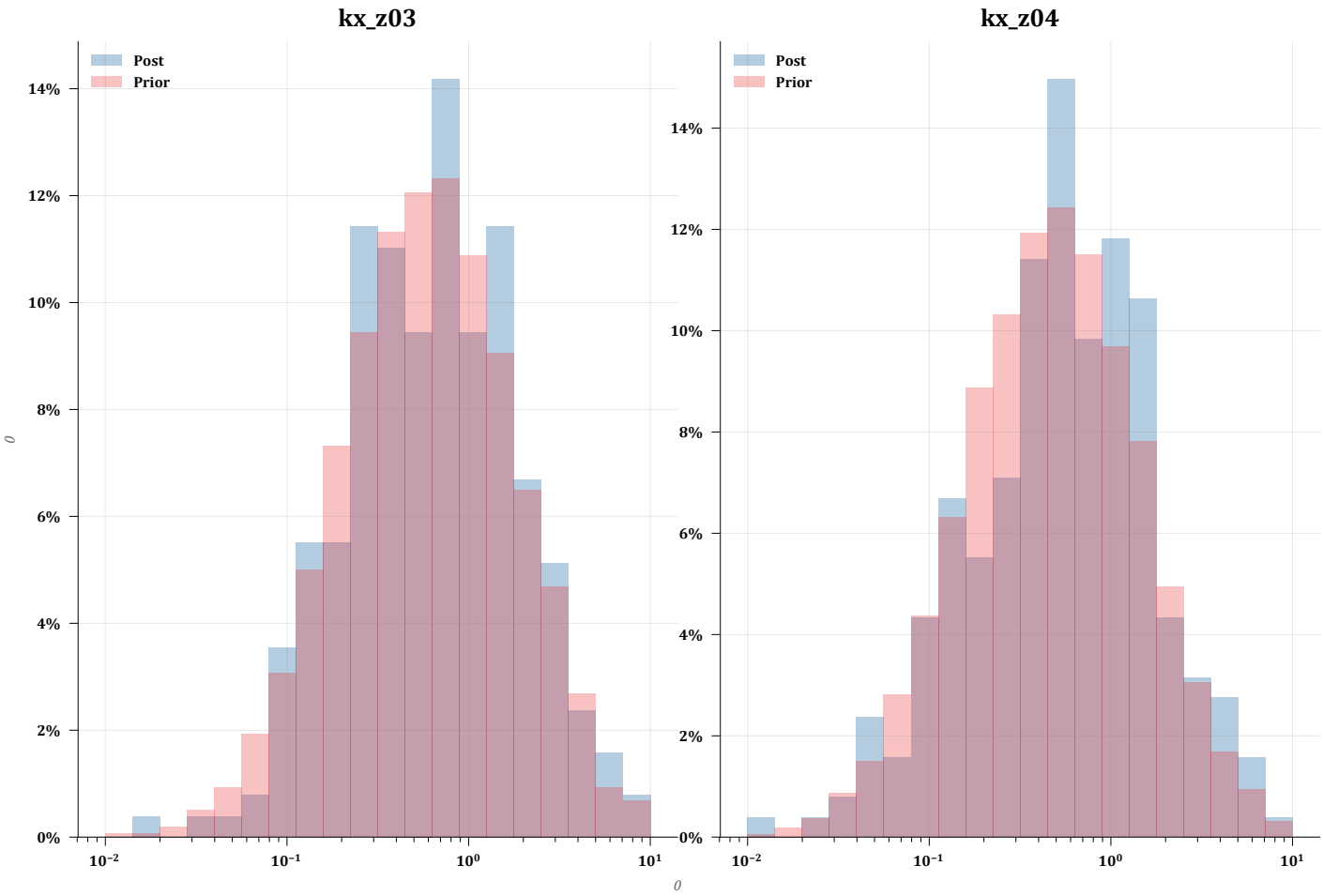
10^1
10^2
0


kx_z03
Post
Prior
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10^{-1}
10^0
10^1
0
kx_z04
Post
Prior
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4%
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10^1
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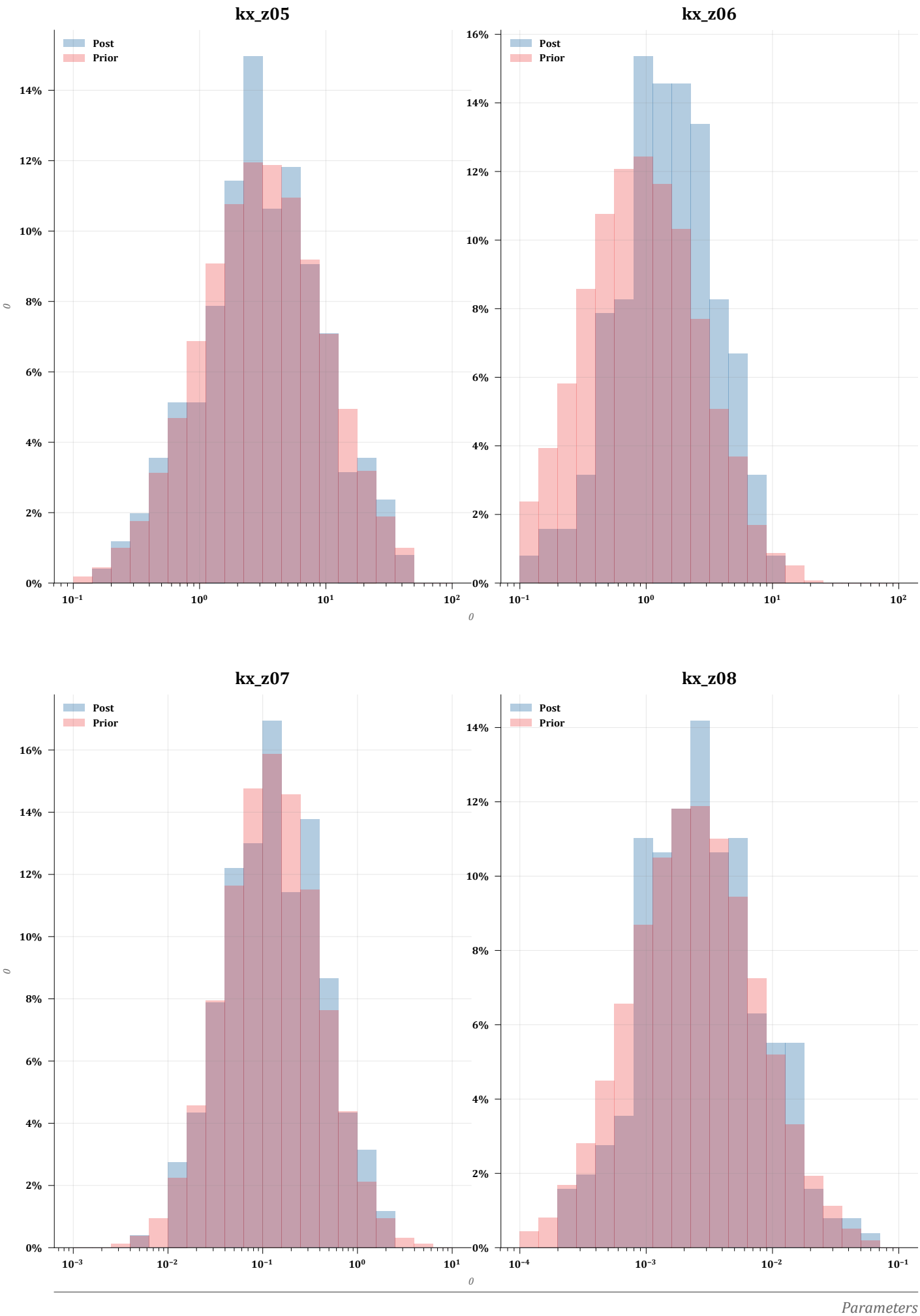
Parameters


kx_z05
kx_z06
kx_z07
kx_z08
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2%
4%
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8%
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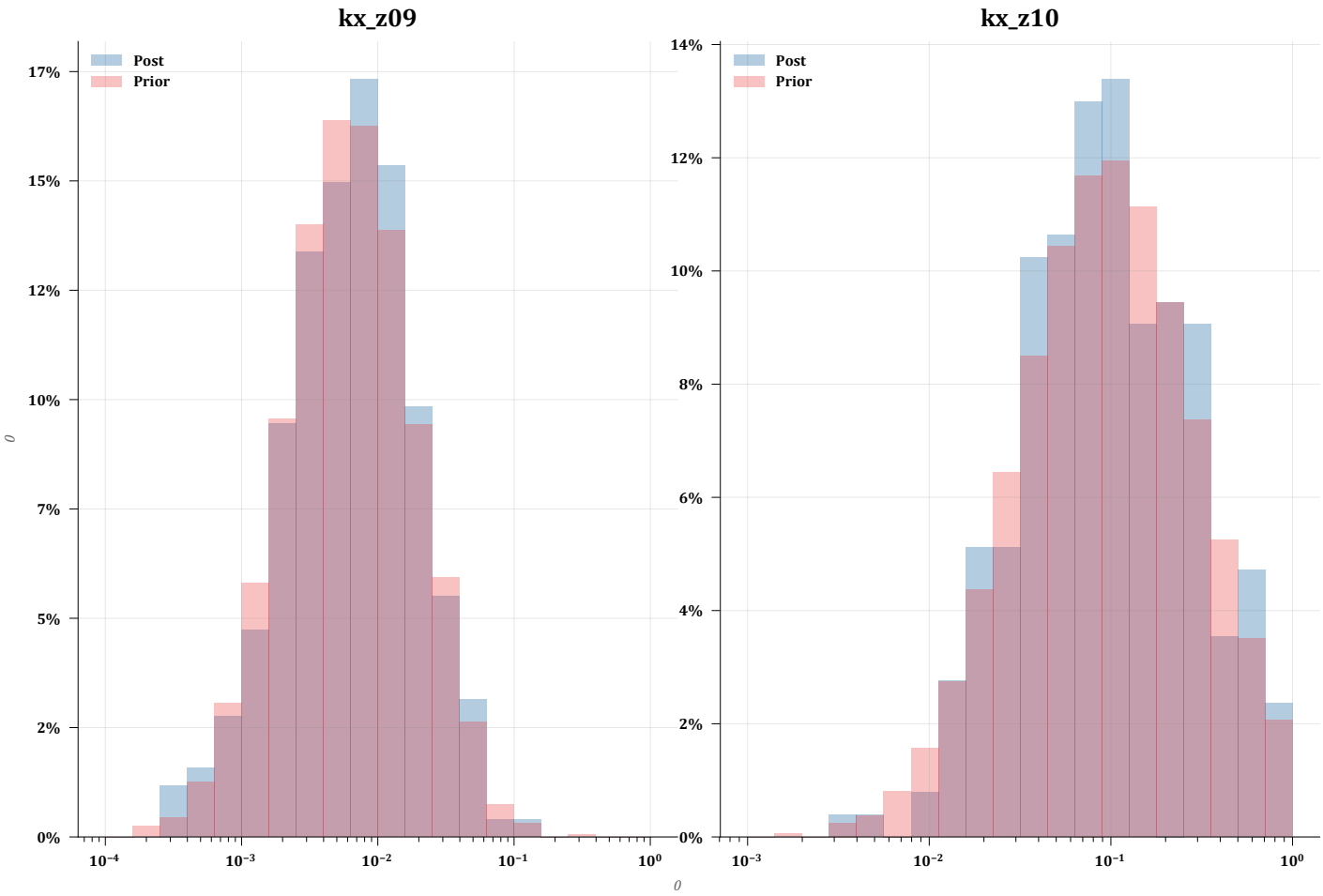
14%
16%
Parameters


kx_z09
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10^{-3}
10^{-2}
10^{-1}
10^{0}
0

kx_z10
Post
Prior
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0%
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10^{-1}
10^{0}
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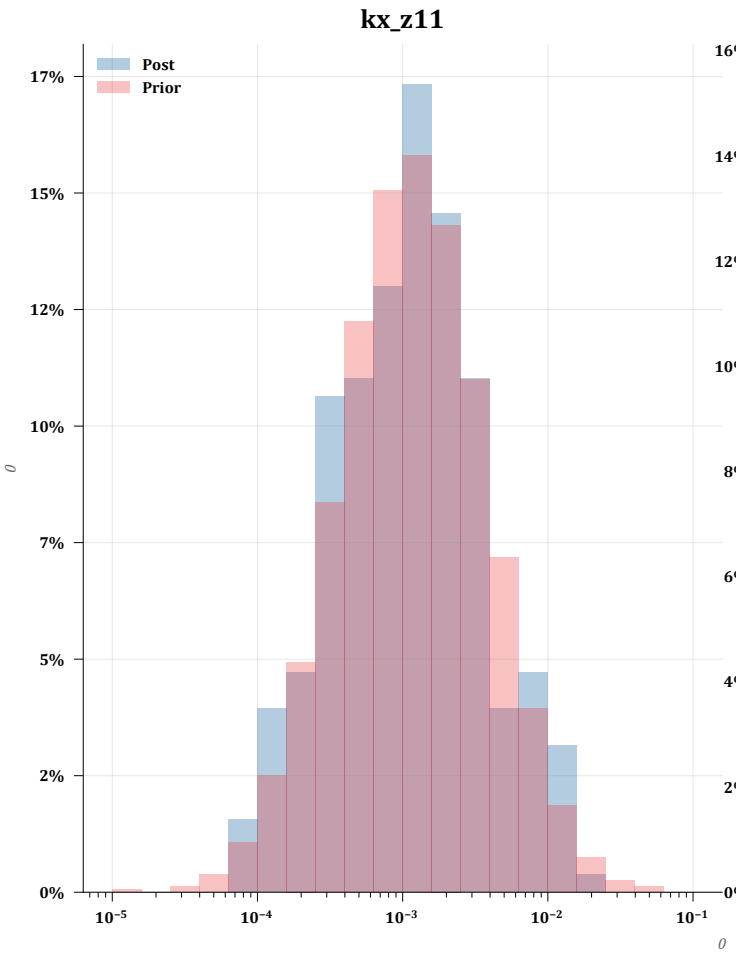
kx_z11
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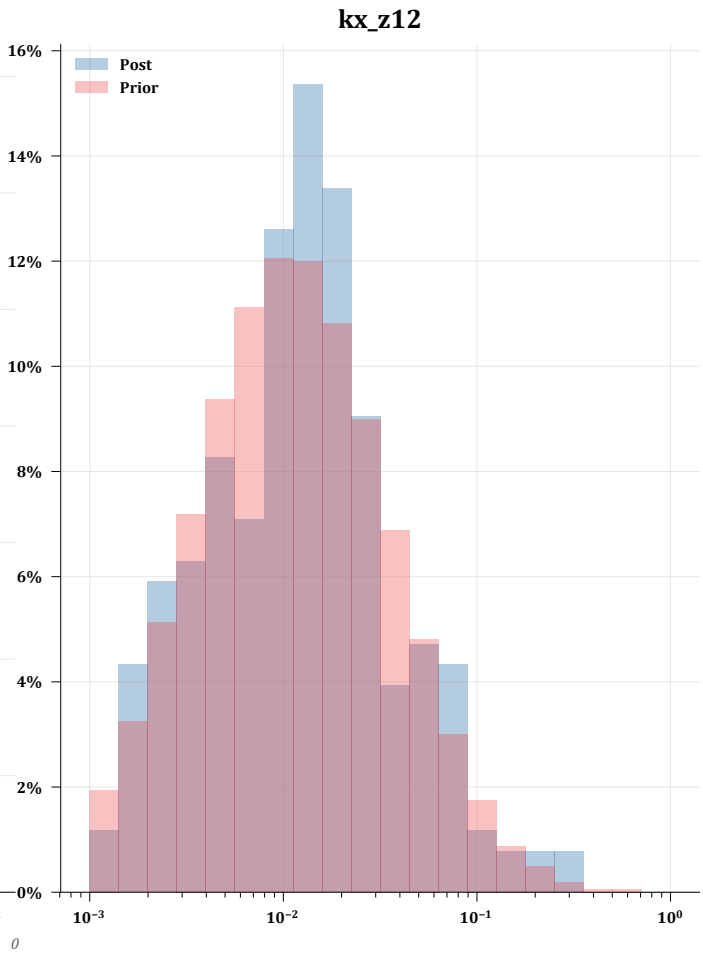
kx_z12
Post
Prior
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6%
4%
2%
0%
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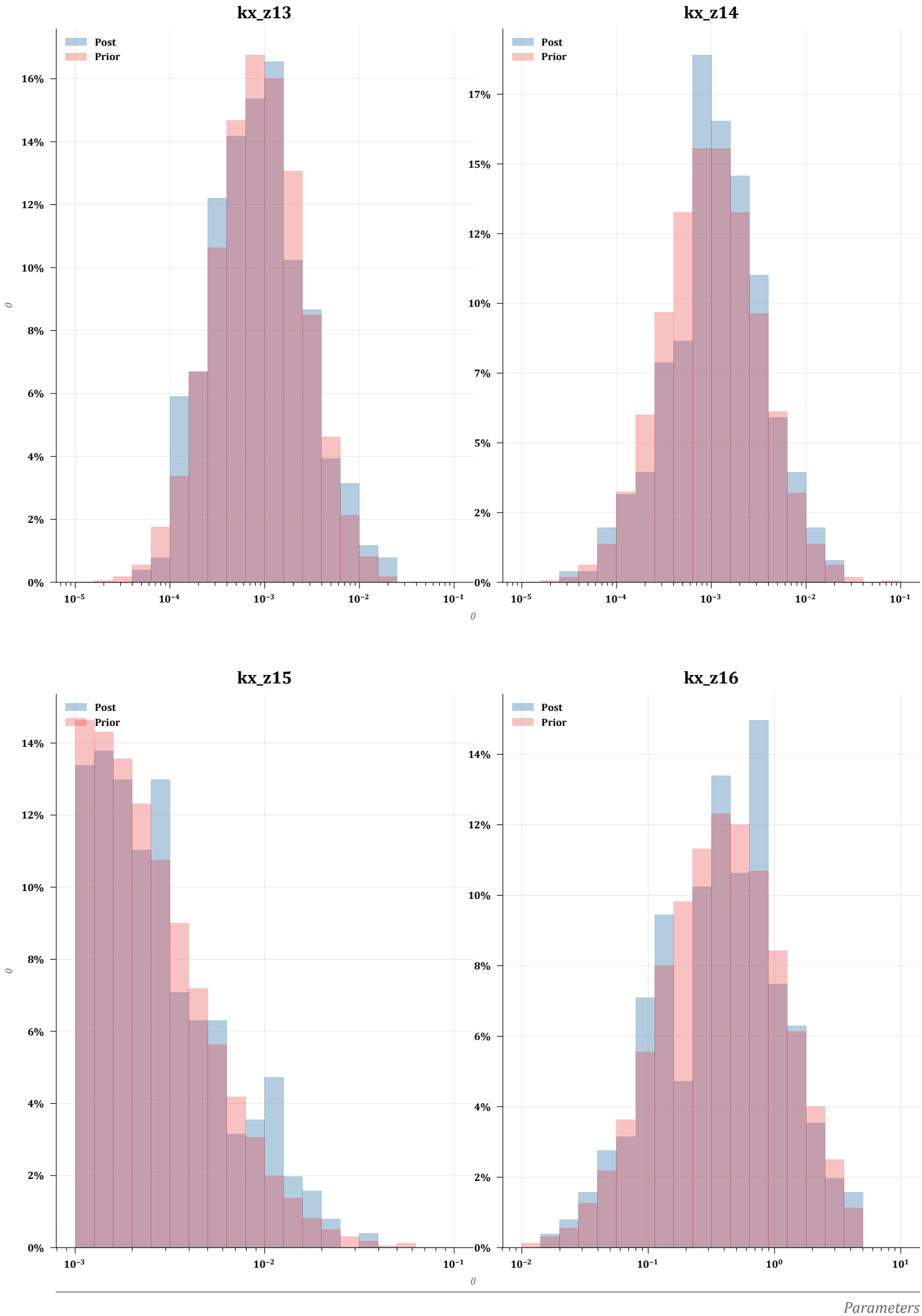
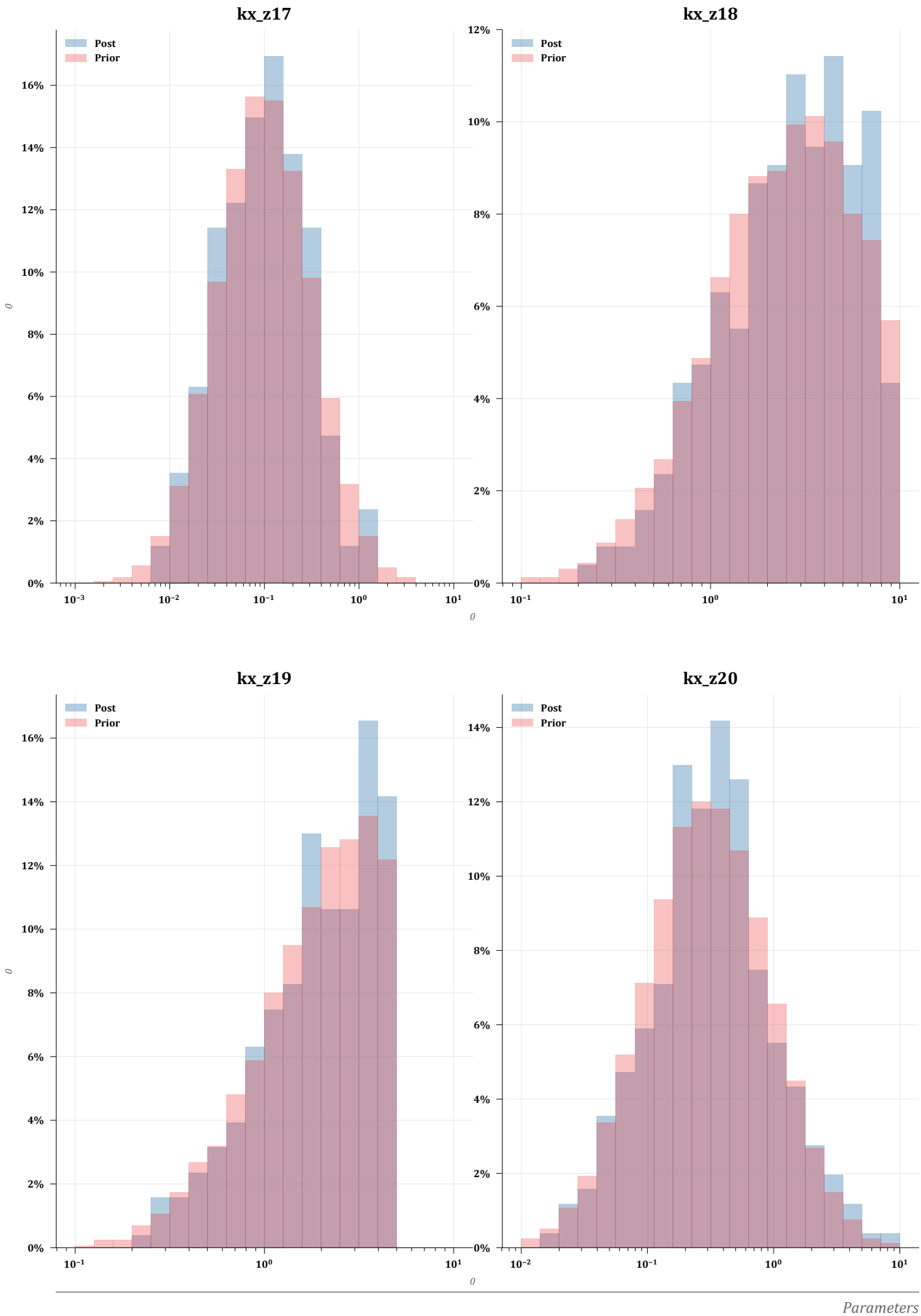
10^{-2}
10^{-1}
10^{0}
0

Parameters


kx_z13
kx_z14
kx_z15
kx_z16
Post
Prior
0
Parameters


kx_z17
kx_z18
kx_z19
kx_z20
Post
Prior
0%
2%
4%
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12%
14%
16%
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10^{1}
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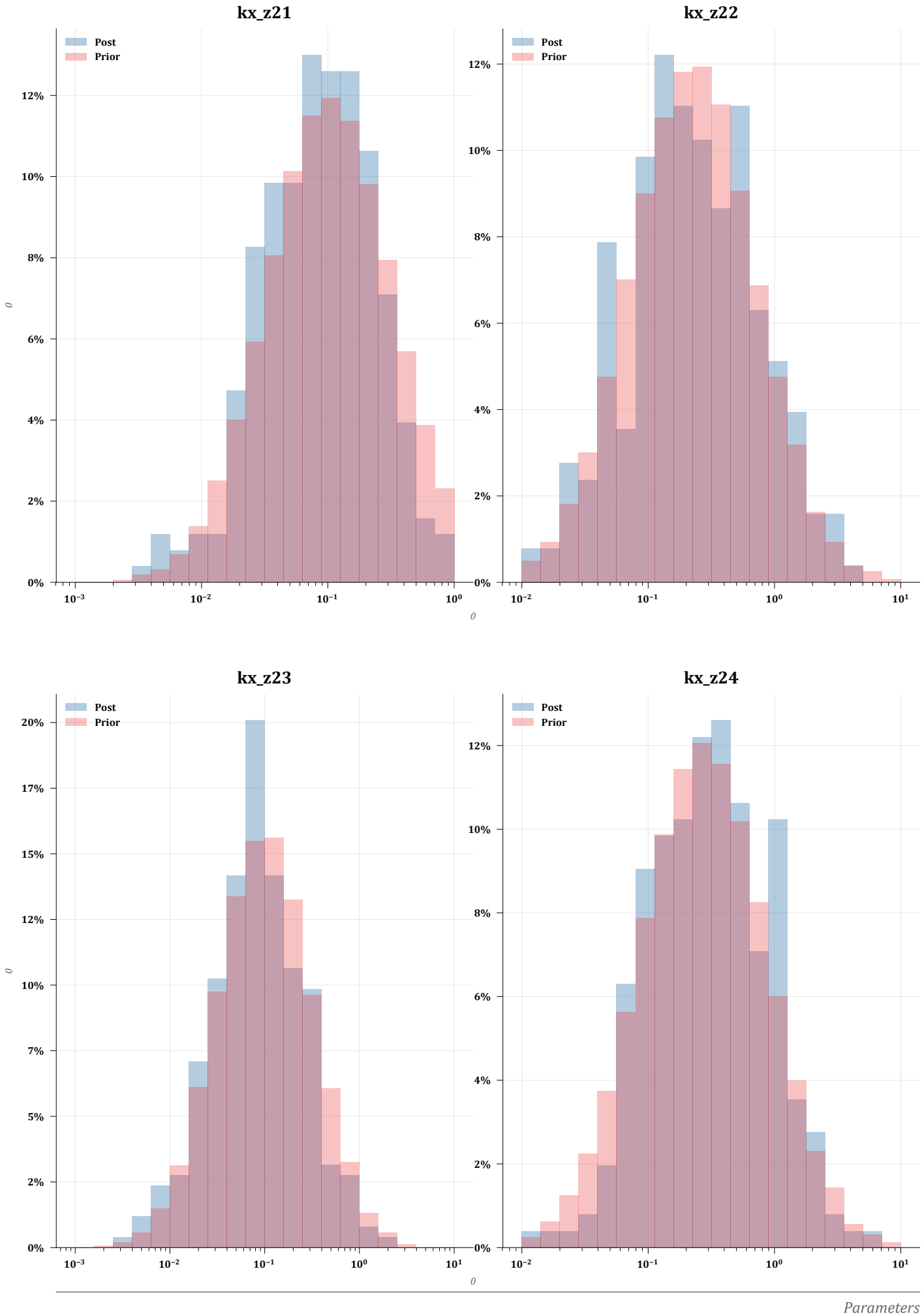
Parameters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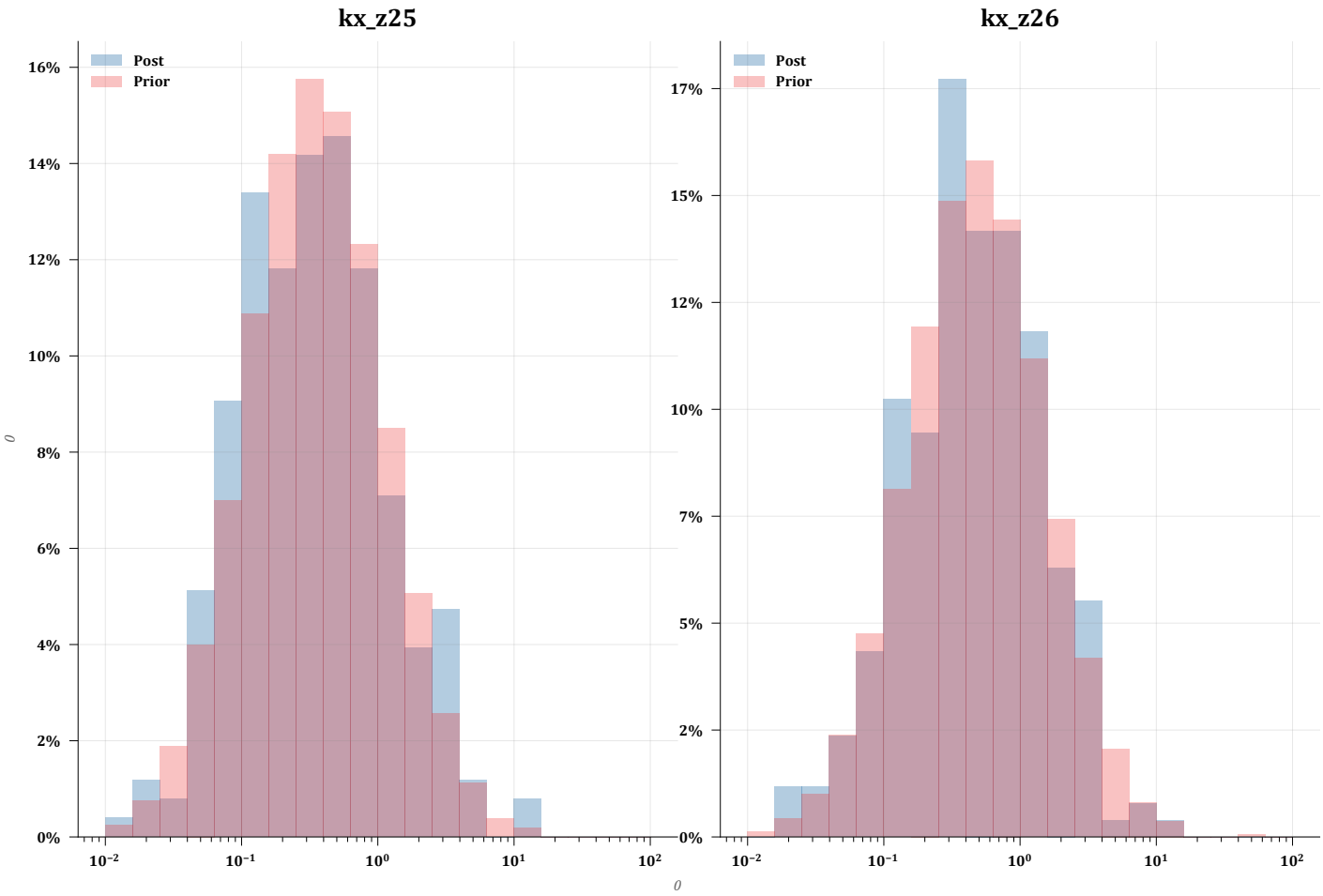
kx_z22
kx_z23
kx_z24
Post
Prior
0
Parameters


kx_z25
Post
Prior
16%
14%
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8%
6%
4%
2%
0%
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
0

kx_z26
Post
Prior
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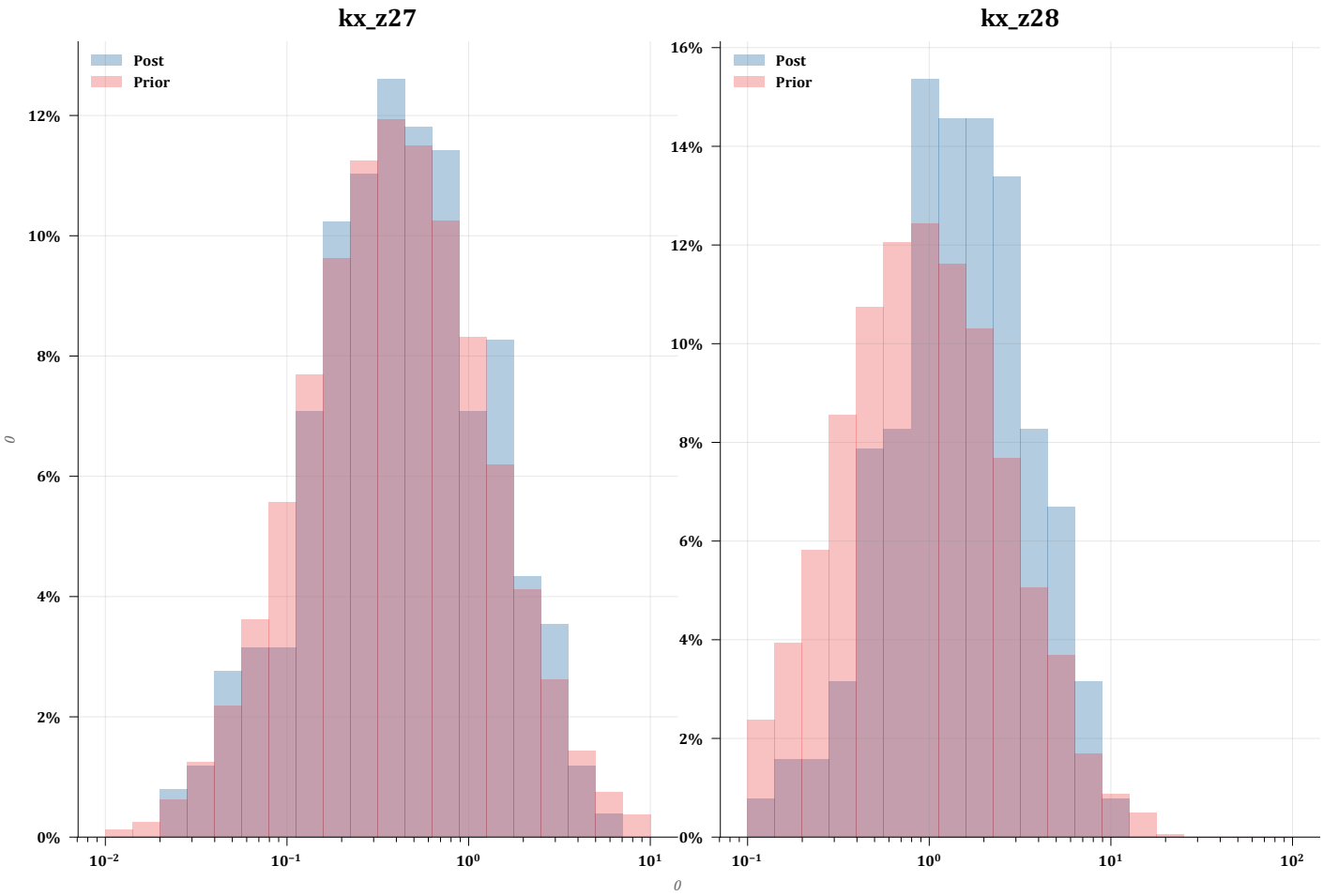
10^{-1}
10^{0}
10^{1}
10^{2}


kx_z27
Post
Prior
12%
10%
8%
6%
4%
2%
0%
10^{-2}
10^{-1}
10^{0}
10^{1}
0

kx_z28
Post
Prior
16%
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6%
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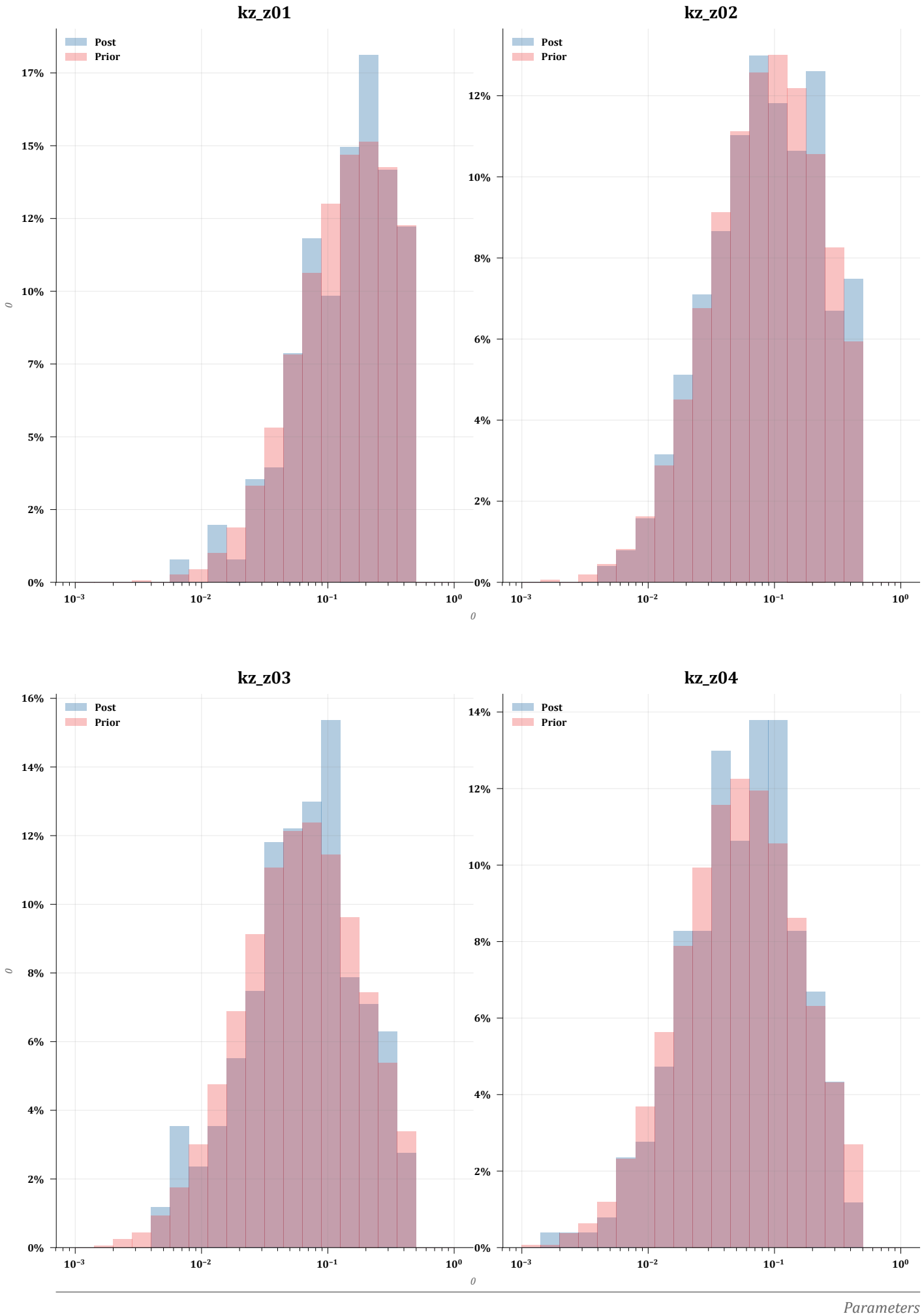
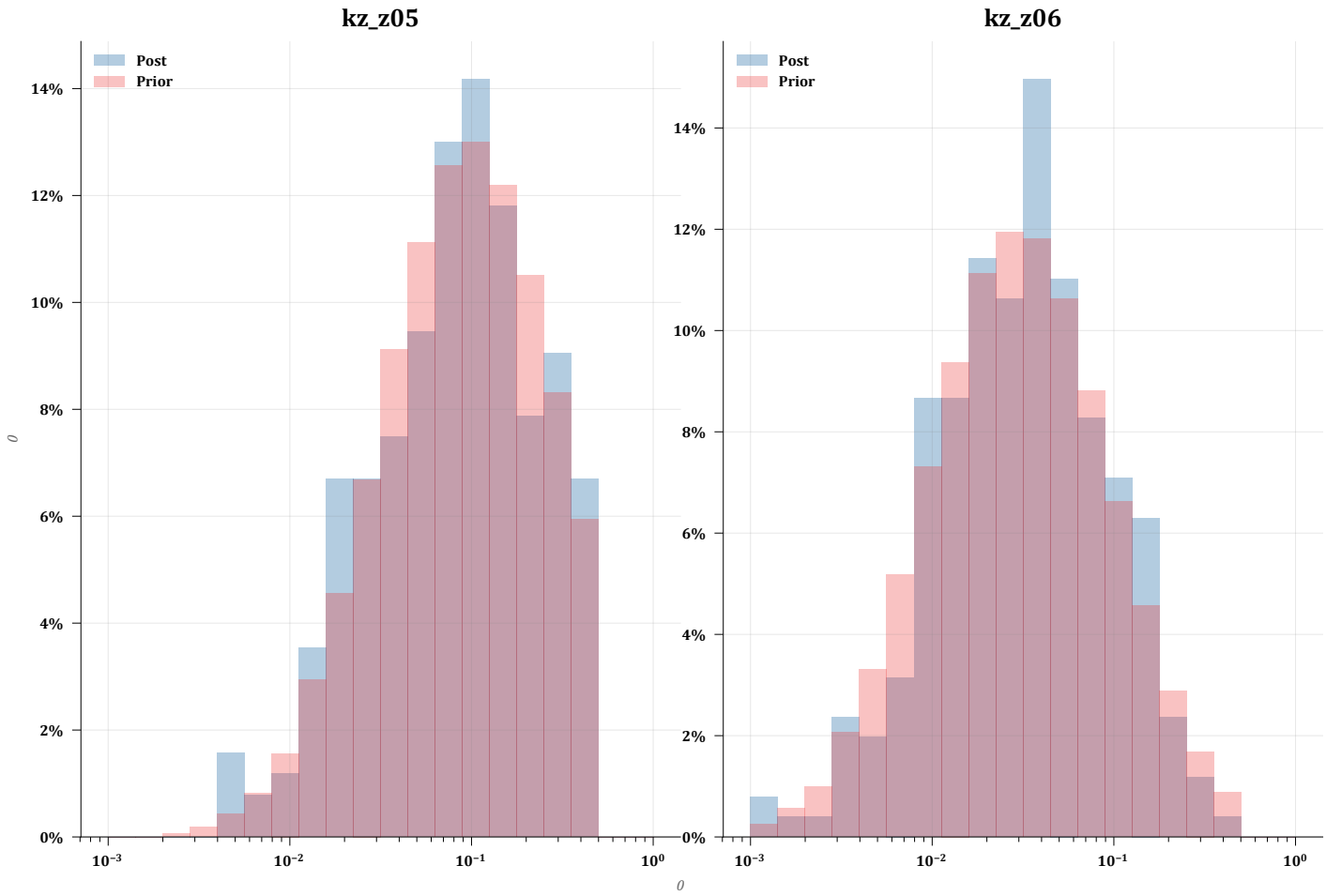
0%
10^{-1}
10^{0}
10^{1}
10^{2}

Parameters


kz_z01
kz_z02
kz_z03
kz_z04
Post
Prior
0
Parameters


kz_z05
Post
Prior
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10%
8%
6%
4%
2%
0%
0
10^{-3}
10^{-2}
10^{-1}
10^{0}
0

kz_z06
Post
Prior
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10%
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6%
4%
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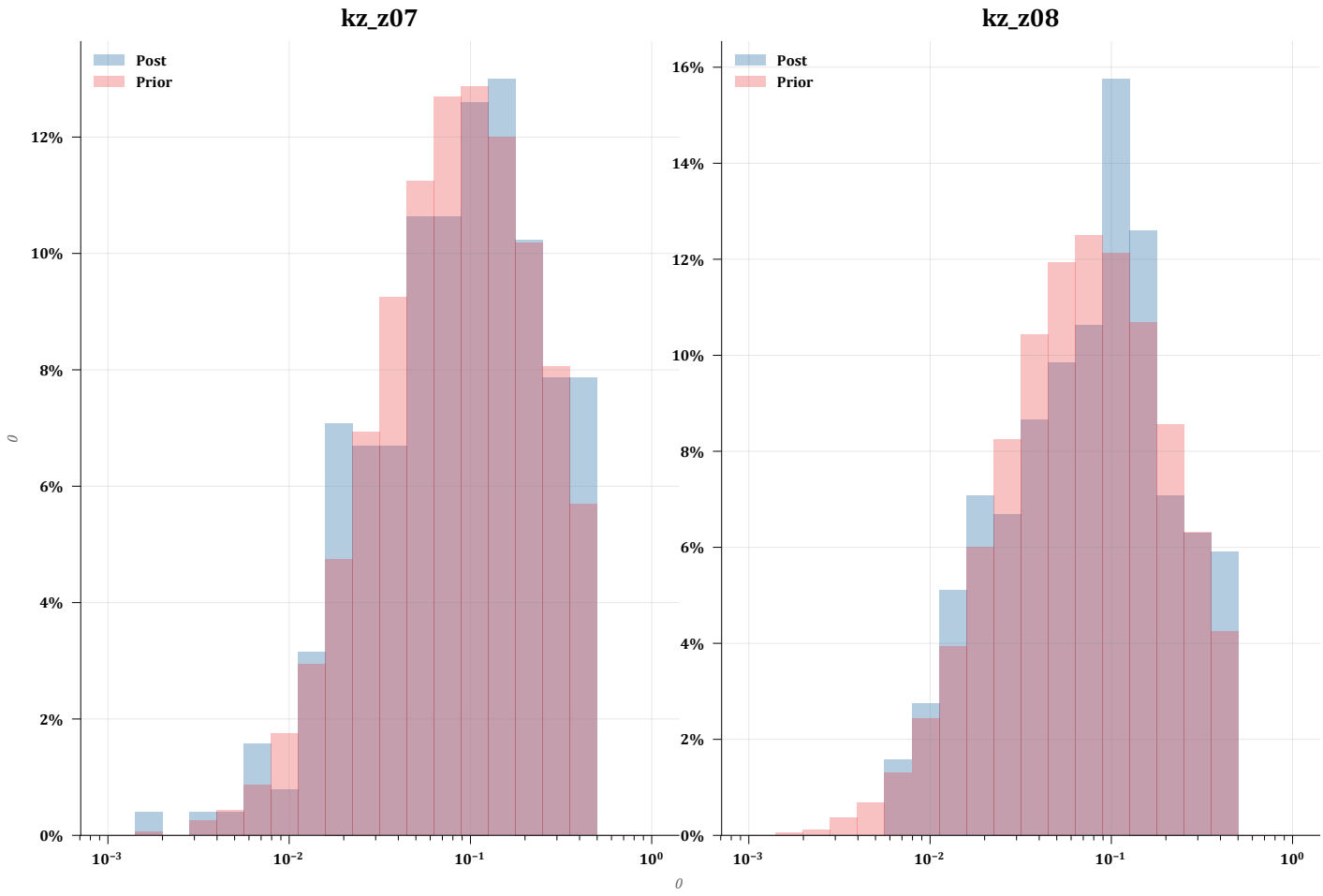
0%
10^{-3}
10^{-2}
10^{-1}
10^{0}


kz_z07
Post
Prior
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8%
6%
4%
2%
0%
0
10^{-3}
10^{-2}
10^{-1}
10^{0}
0

kz_z08
Post
Prior
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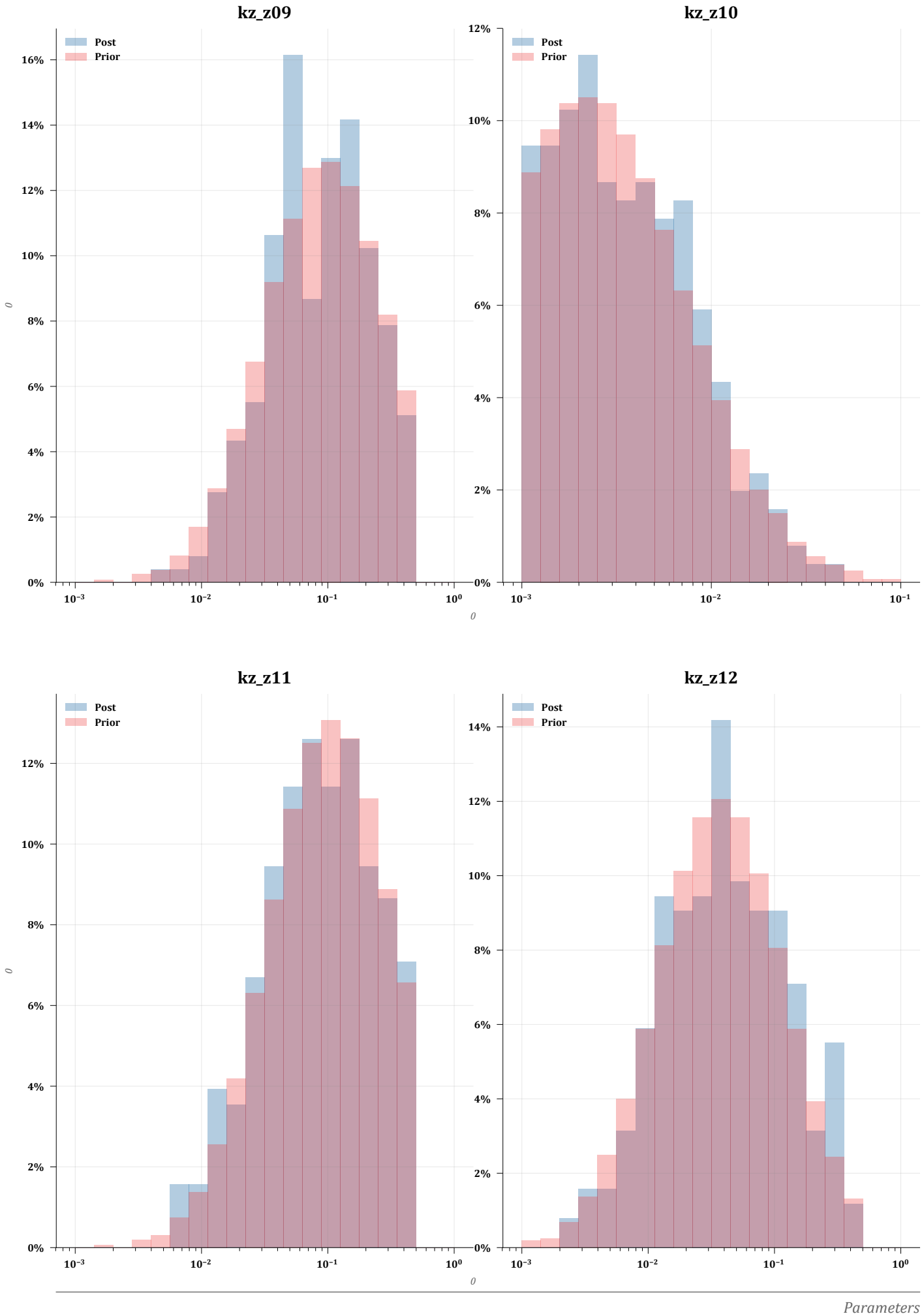
0%
10^{-3}
10^{-2}
10^{-1}
10^{0}

Parameters


kz_z09
kz_z10
kz_z11
kz_z12
Post
Prior
0%
2%
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12%
14%
16%
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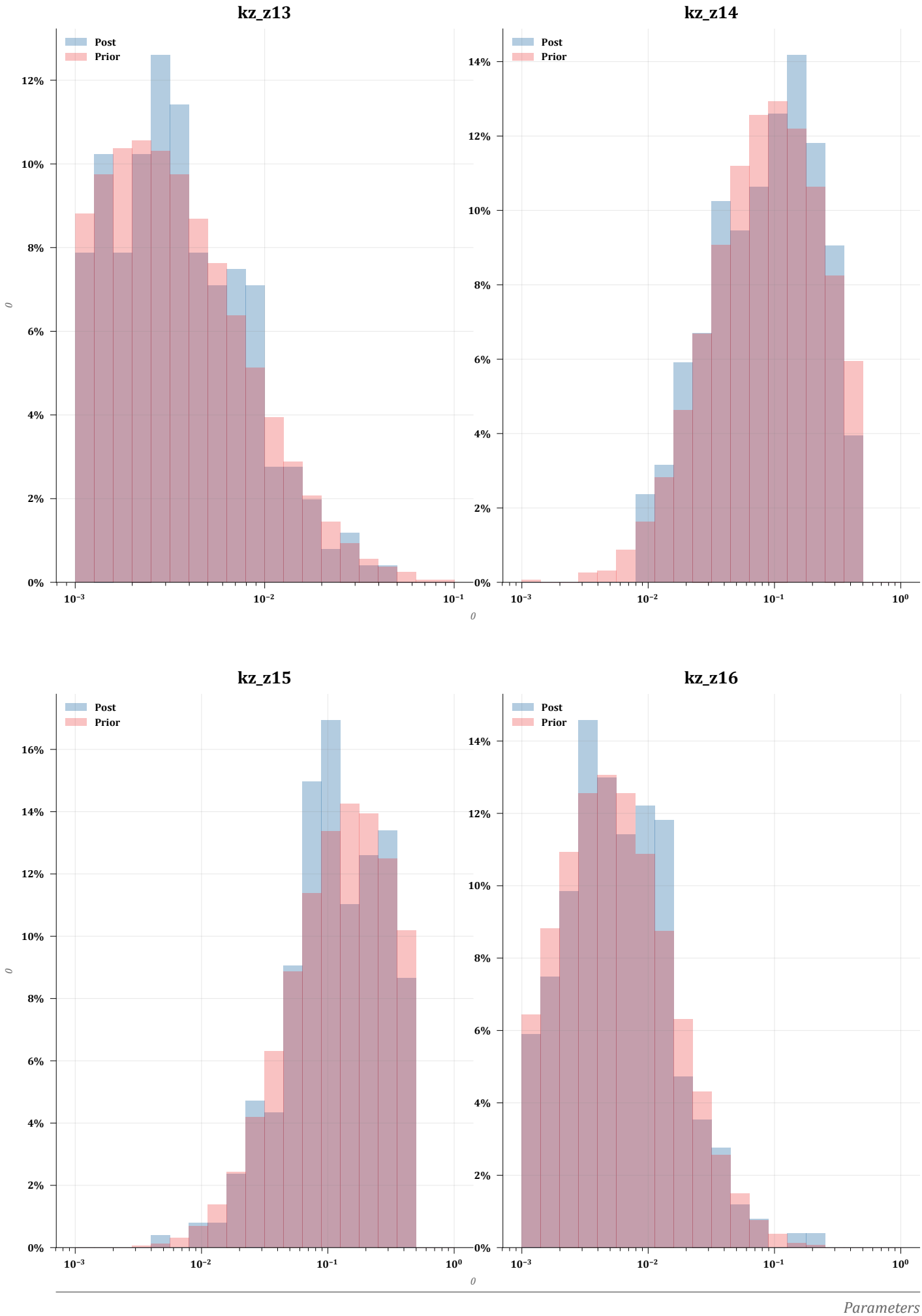
10^{0}
0
Parameters


kz_z13
kz_z14
kz_z15
kz_z16
Post
Prior
0%
2%
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10%
12%
14%
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10^{-2}
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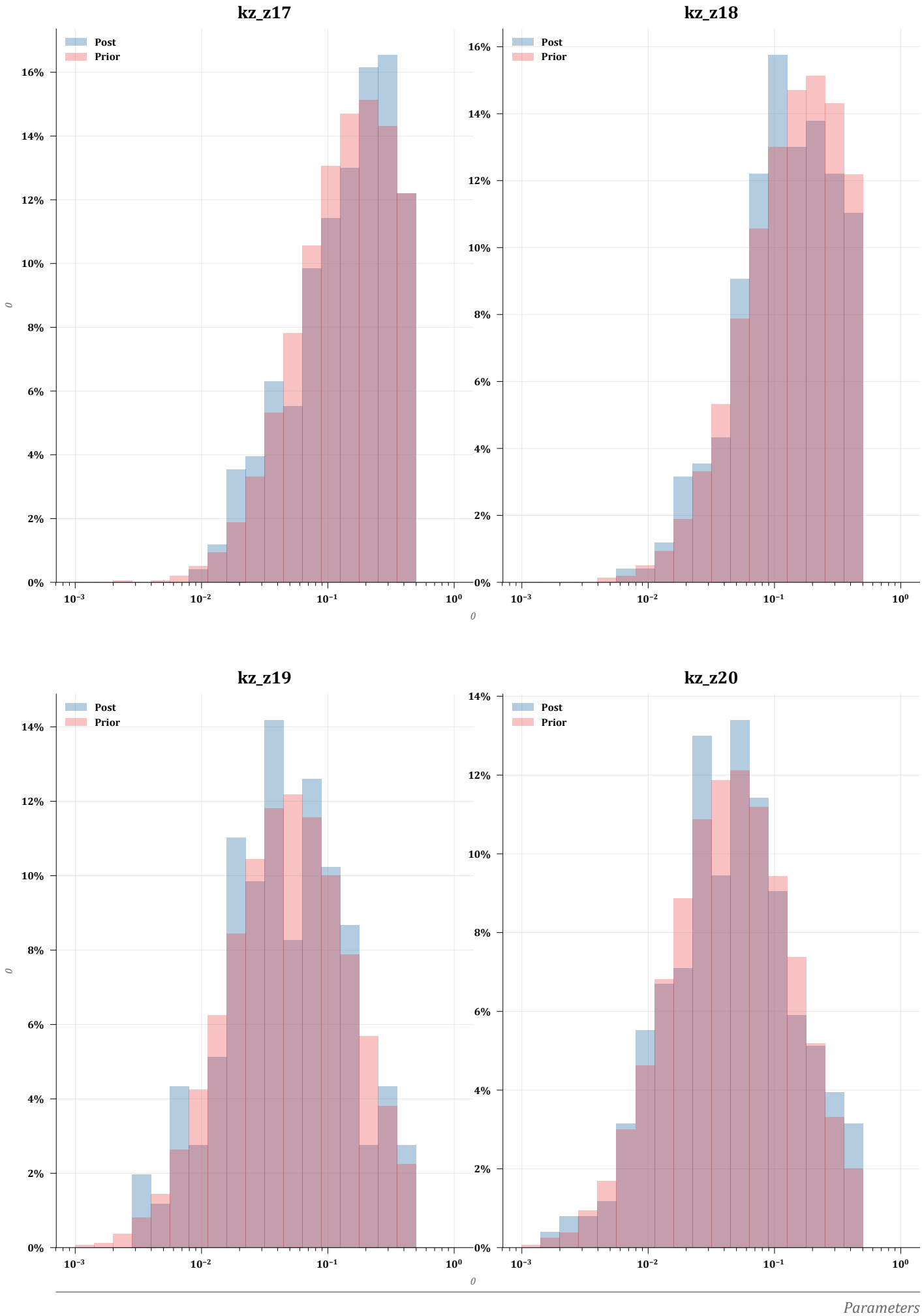
10^{0}
0
Parameters


kz_z17
kz_z18
kz_z19
kz_z20
Post
Prior
0%
2%
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6%
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10%
12%
14%
16%
10^{-3}
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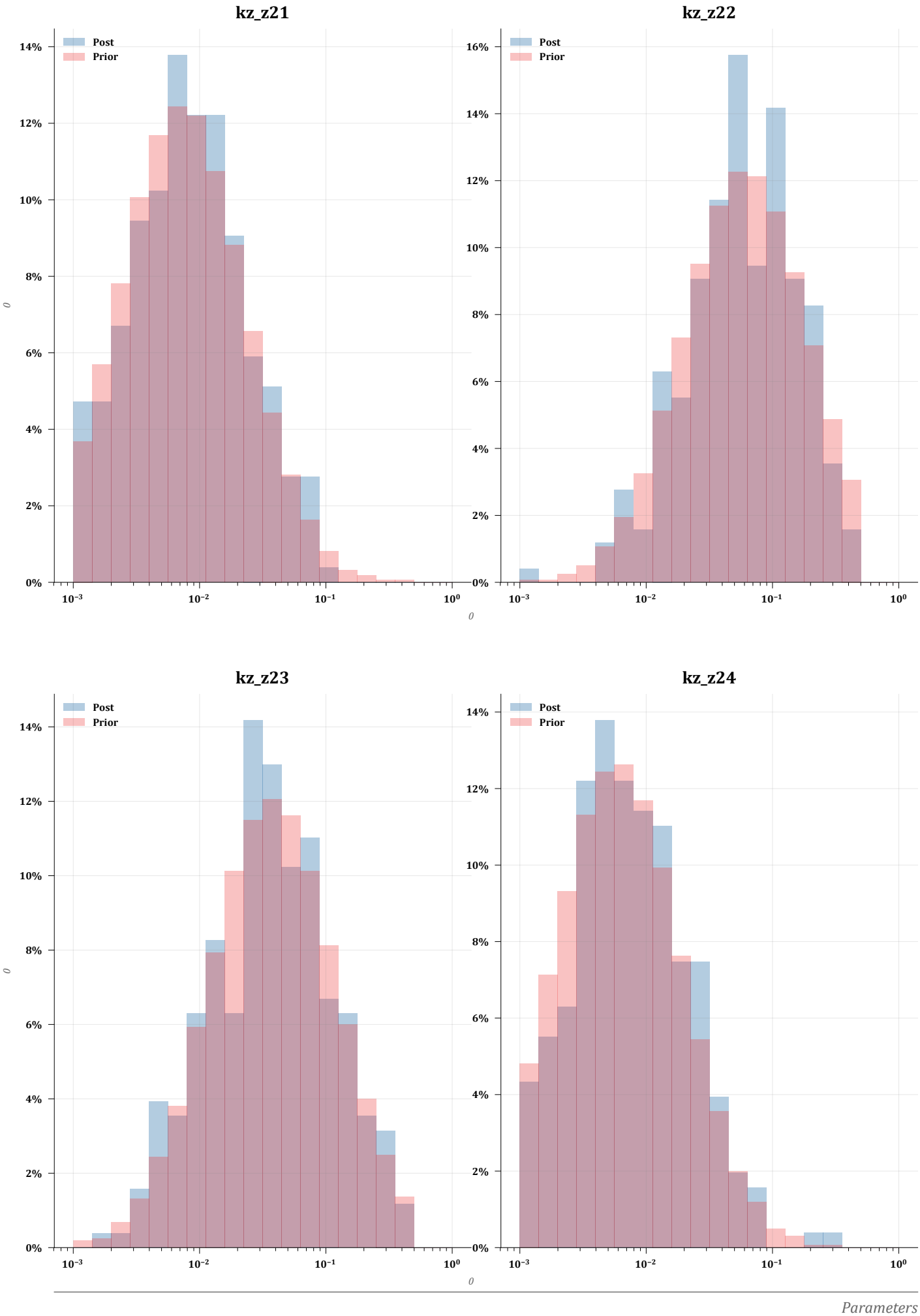
10^{0}
0
Parameters


kz_z21
kz_z22
kz_z23
kz_z24
Post
Prior
0%
2%
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10%
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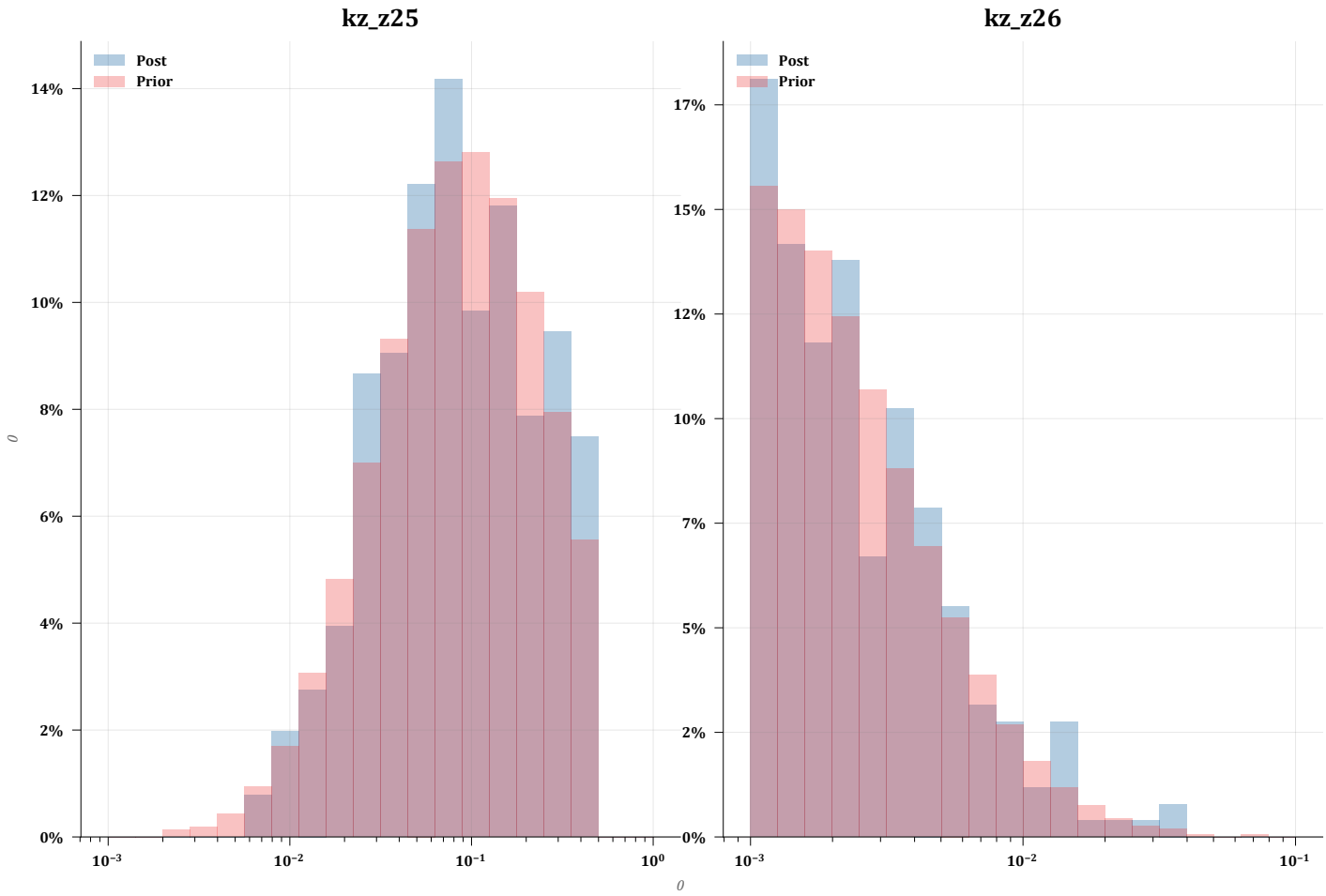
10^{0}
0
Parameters


kz_z25
Post
Prior
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0%
10^{-3}
10^{-2}
10^{-1}
10^{0}
0

kz_z26
Post
Prior
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15%
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7%
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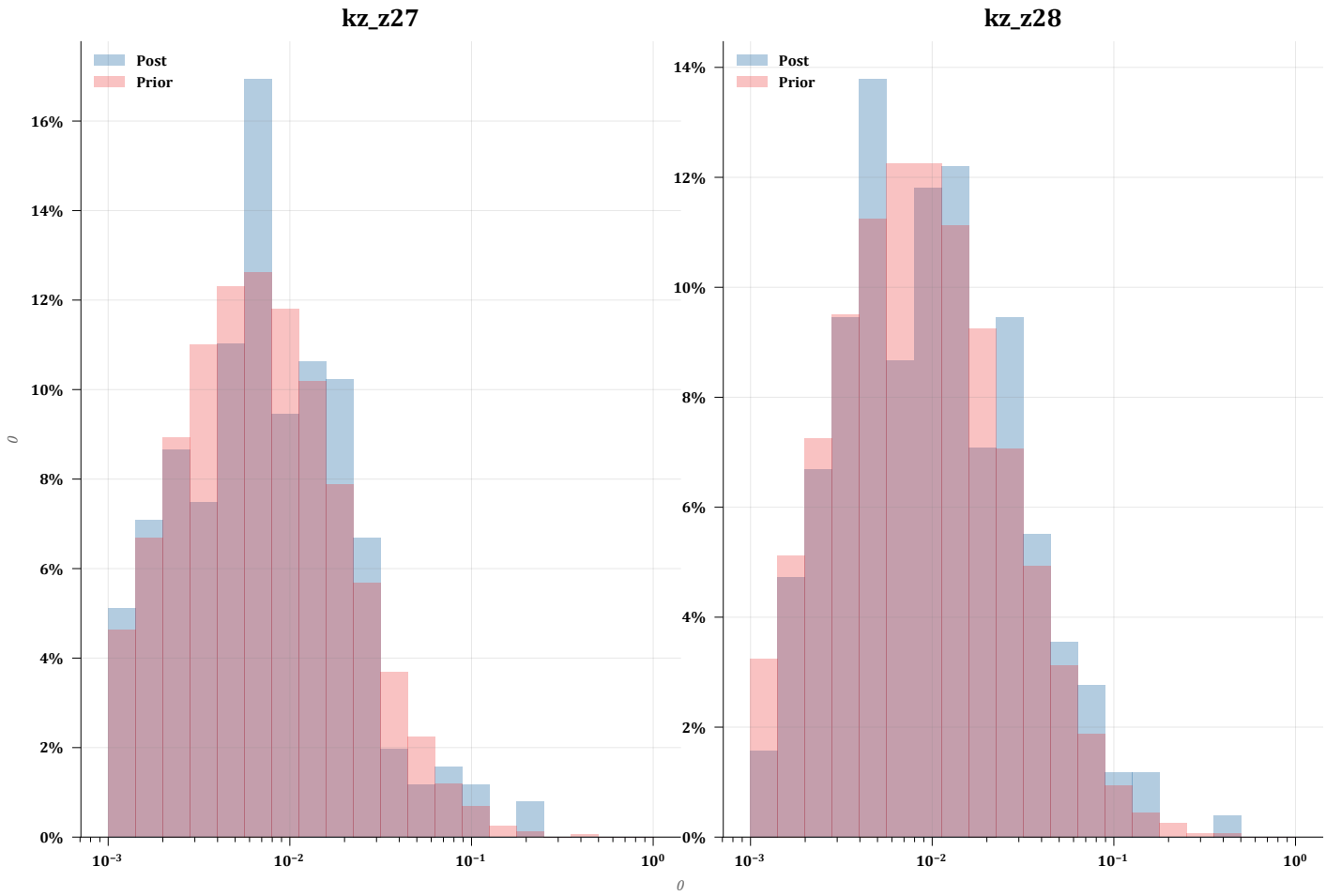
2%
0%
10^{-3}
10^{-2}
10^{-1}


kz_z27
Post
Prior
16%
14%
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4%
2%
0%
10^{-3}
10^{-2}
10^{-1}
10^{0}
0

kz_z28
Post
Prior
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0%
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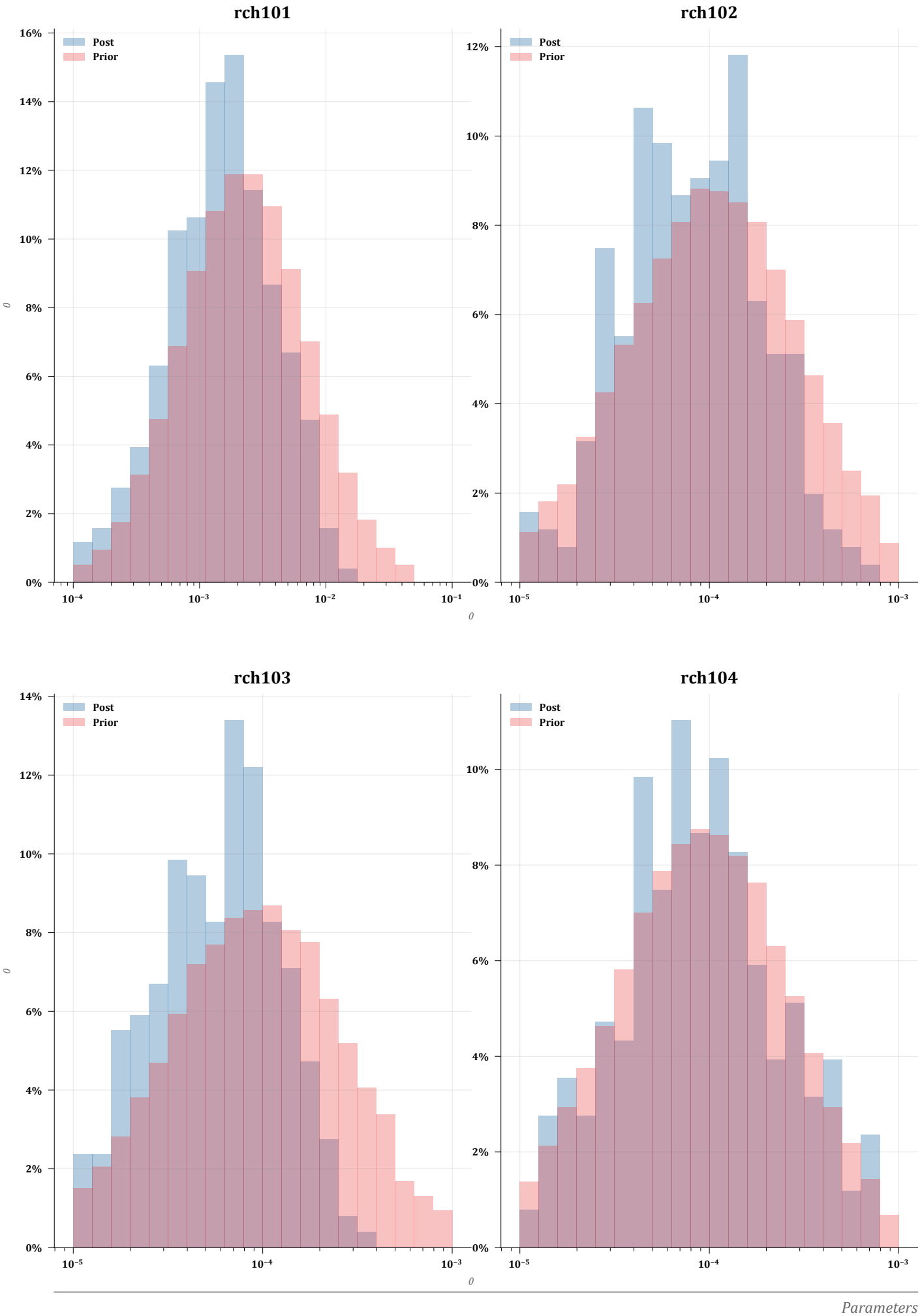
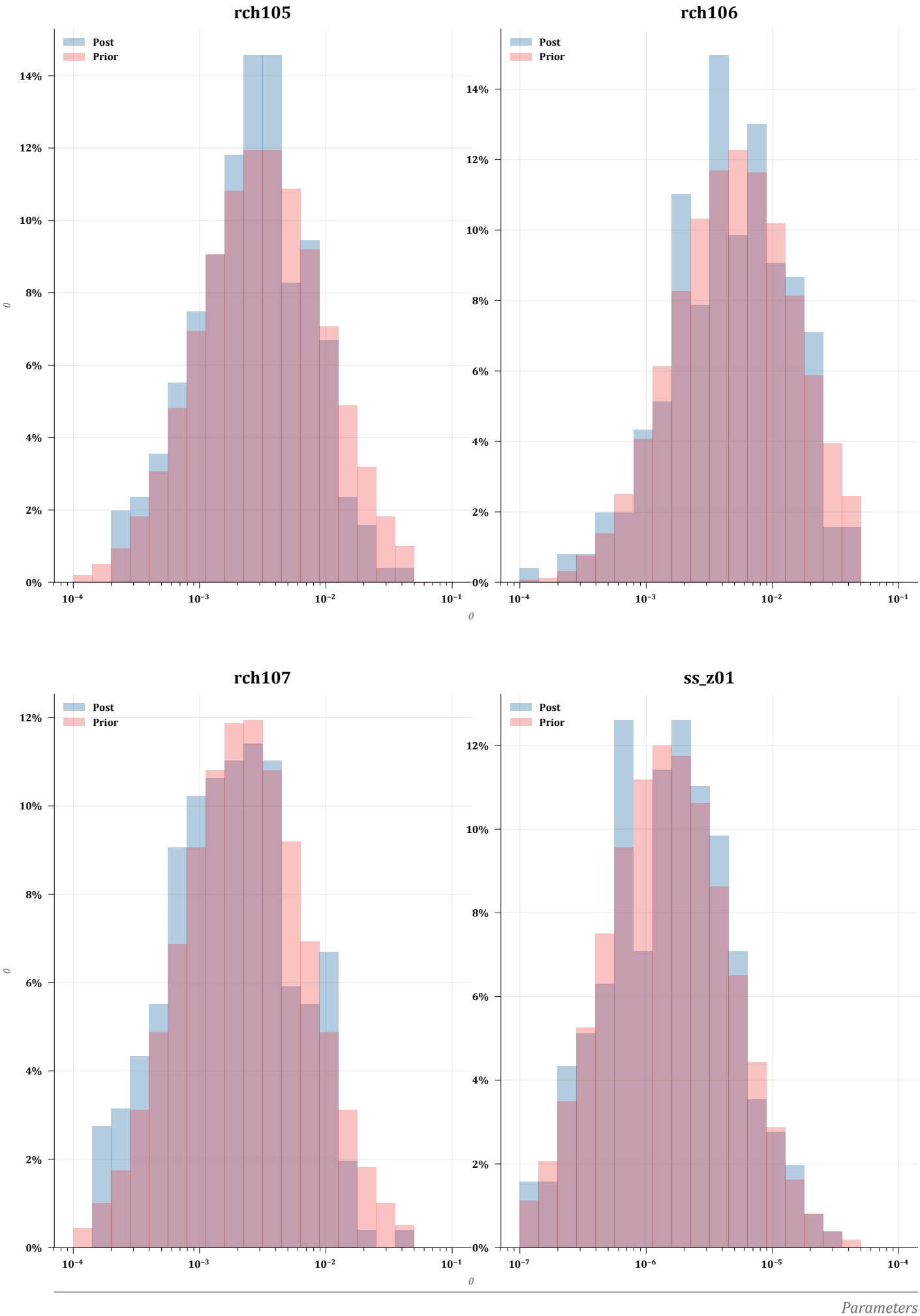
10^{-2}
10^{-1}
10^{0}

Parameters


rch101
rch102
rch103
rch104
Post
Prior
0
Parameters


rch105
rch106
rch107
ss_z01
Post
Prior
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2%
4%
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8%
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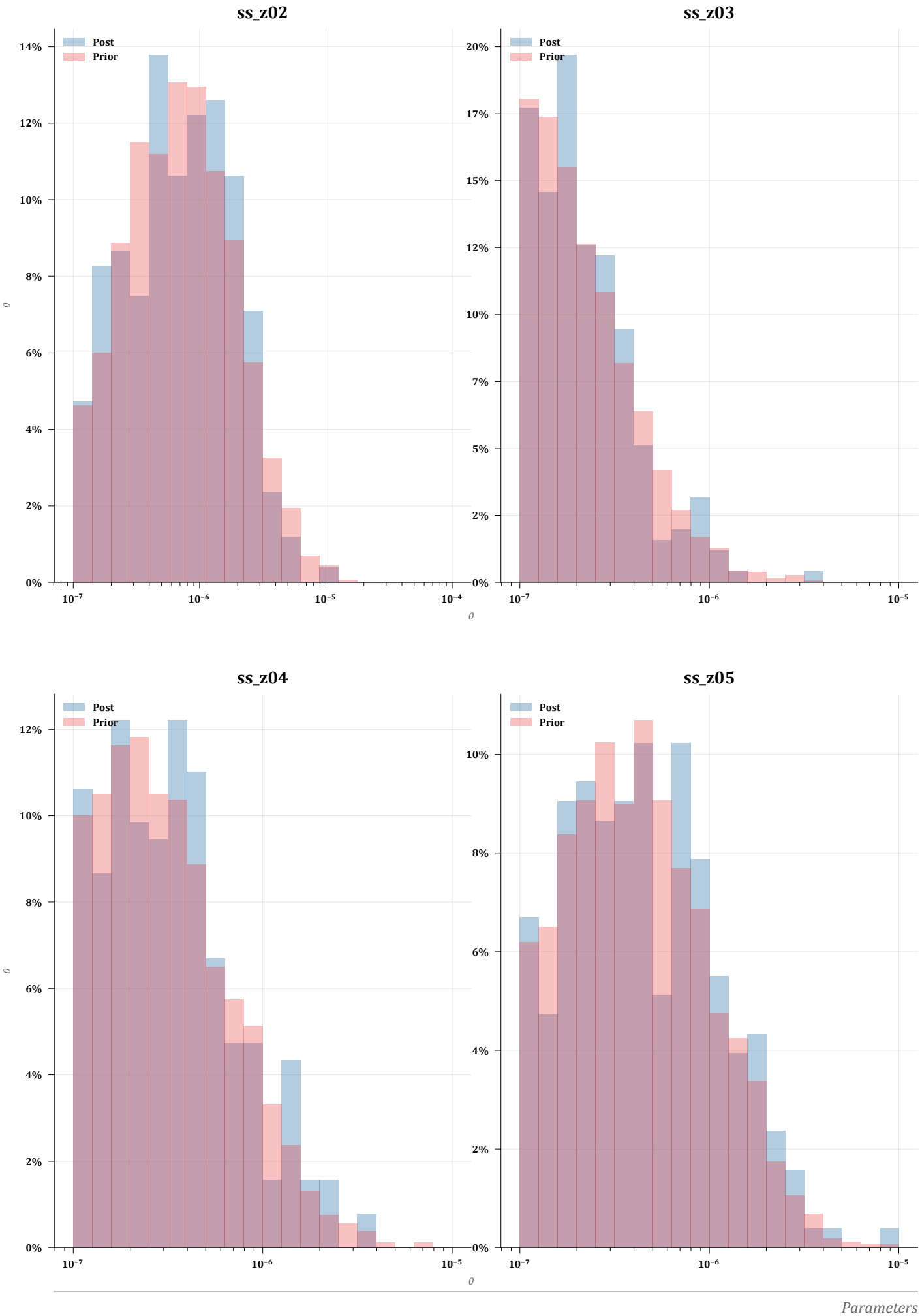
Parameters


ss_z02
Post
Prior
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10^{-5}
10^{-4}
ss_z03
Post
Prior
20%
17%
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0%
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10^{-6}
10^{-5}
ss_z04
Post
Prior
12%
10%
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ss_z05
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Prior
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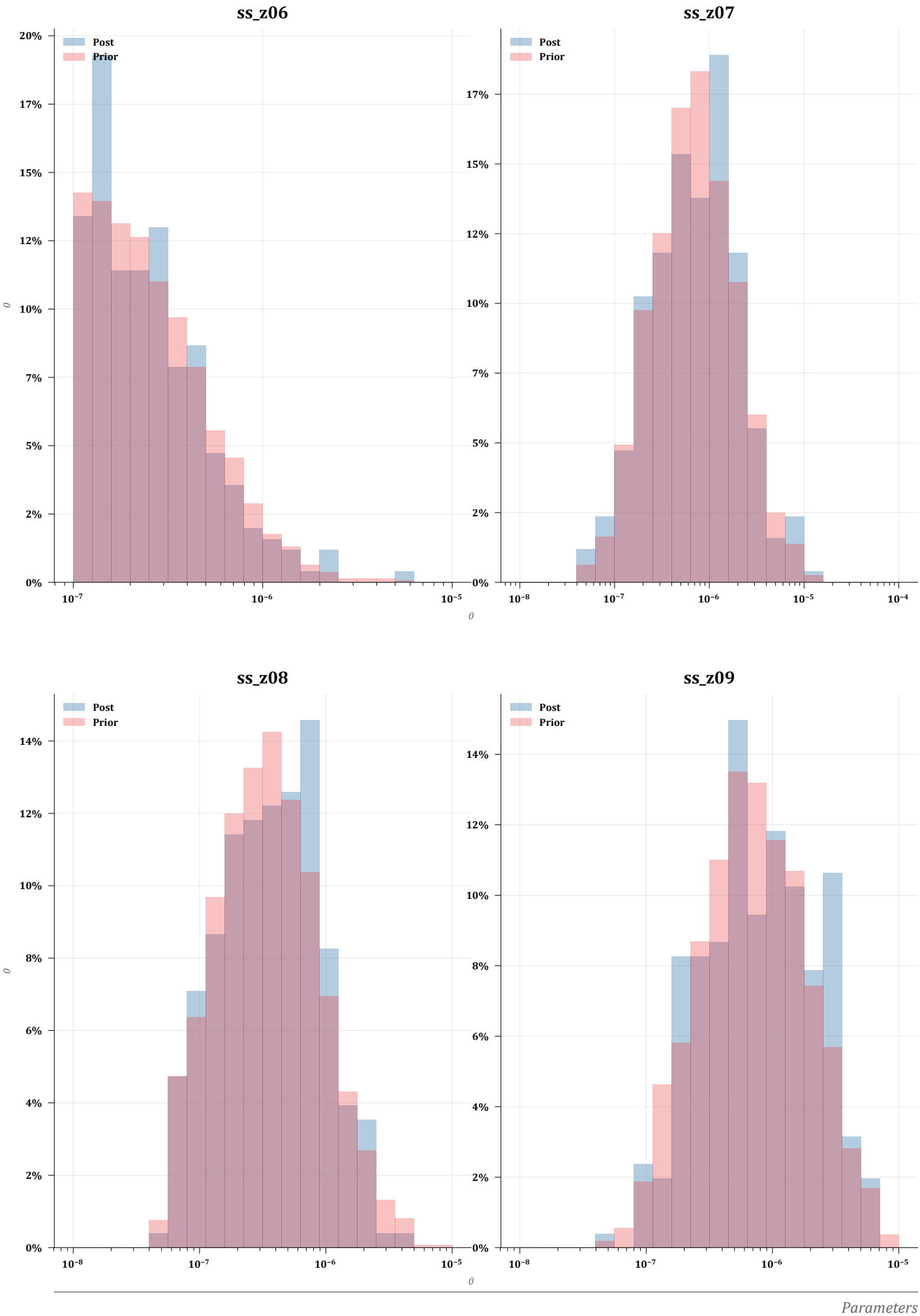
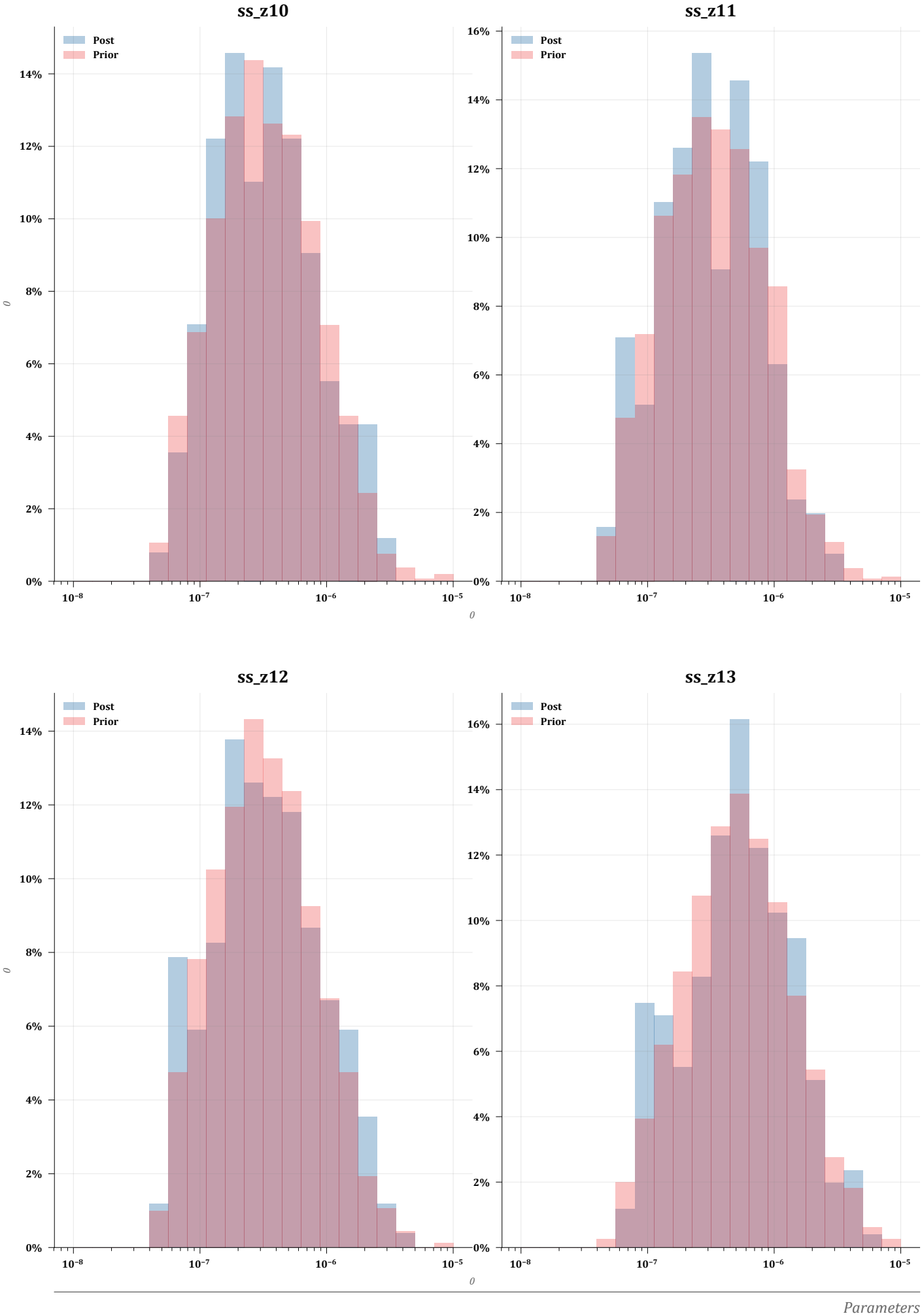
Parameters


ss_z06
ss_z07
ss_z08
ss_z09
Post
Prior
0
Parameters


ss_z10
ss_z11
ss_z12
ss_z13
Post
Prior
0%
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8%
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12%
14%
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10^{-5}
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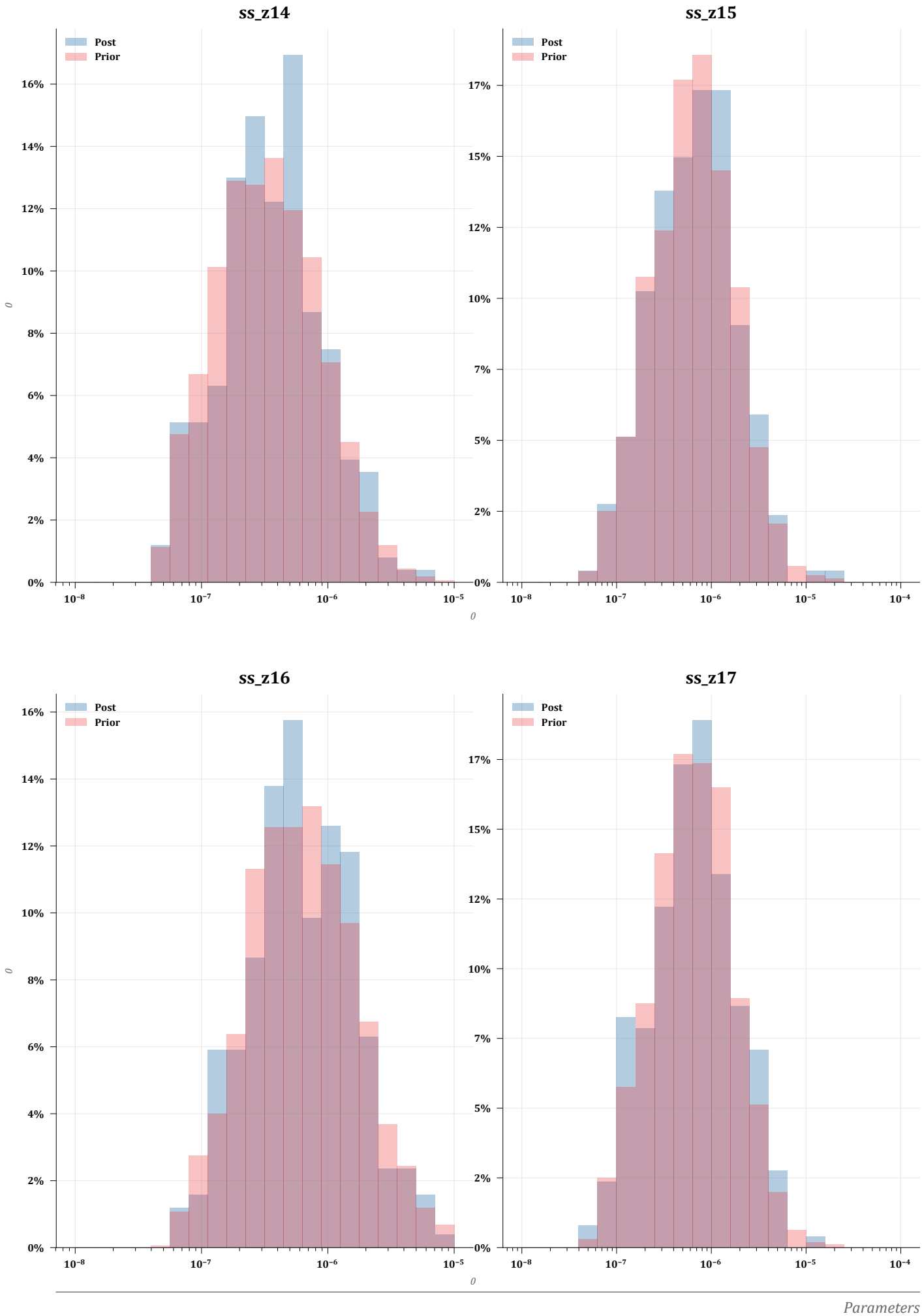
Parameters


ss_z14
ss_z15
ss_z16
ss_z17
Post
Prior
0%
2%
4%
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7%
8%
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17%
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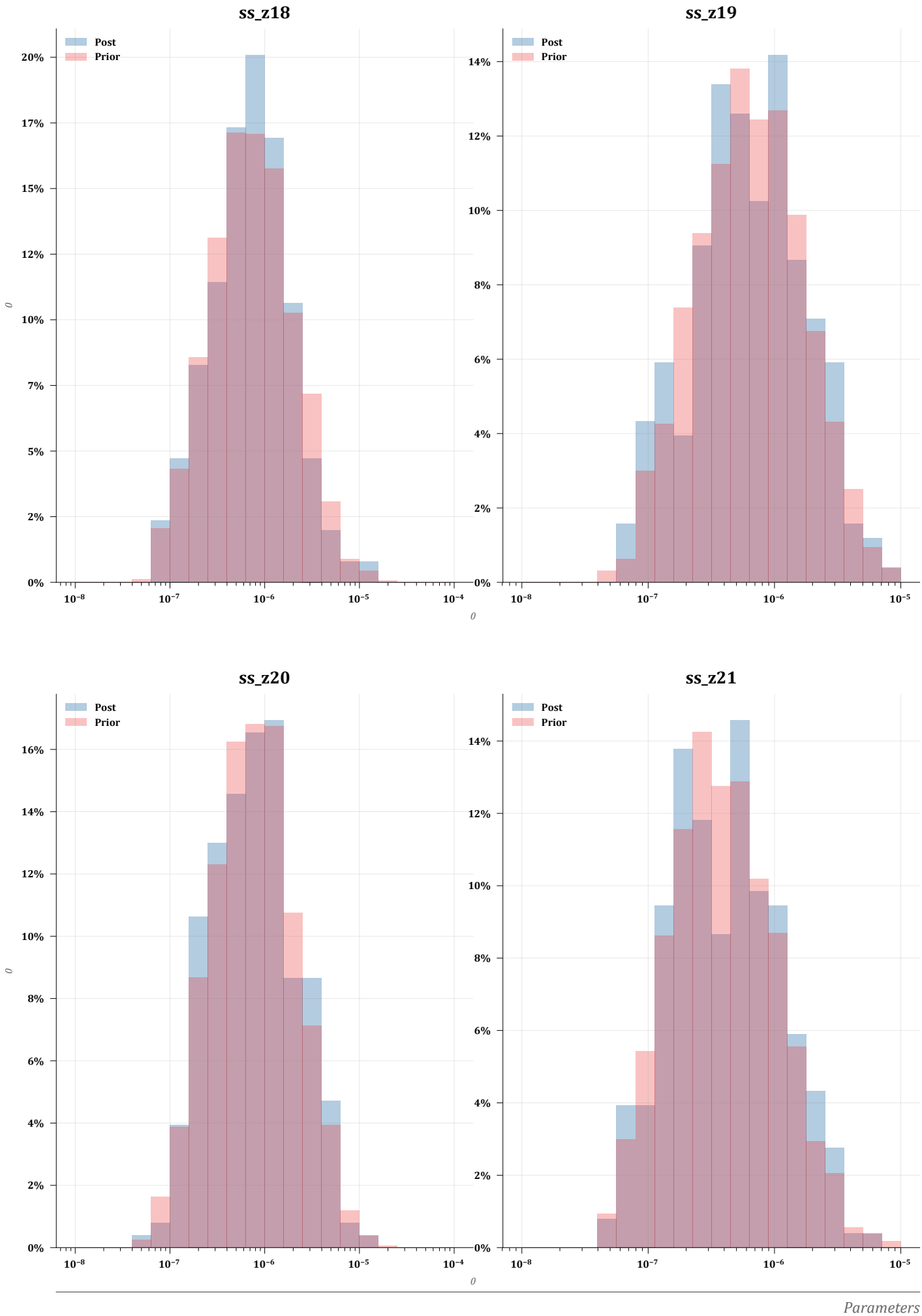
Parameters


ss_z18
ss_z19
ss_z20
ss_z21
Post
Prior
0%
2%
4%
6%
7%
8%
10%
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17%
20%
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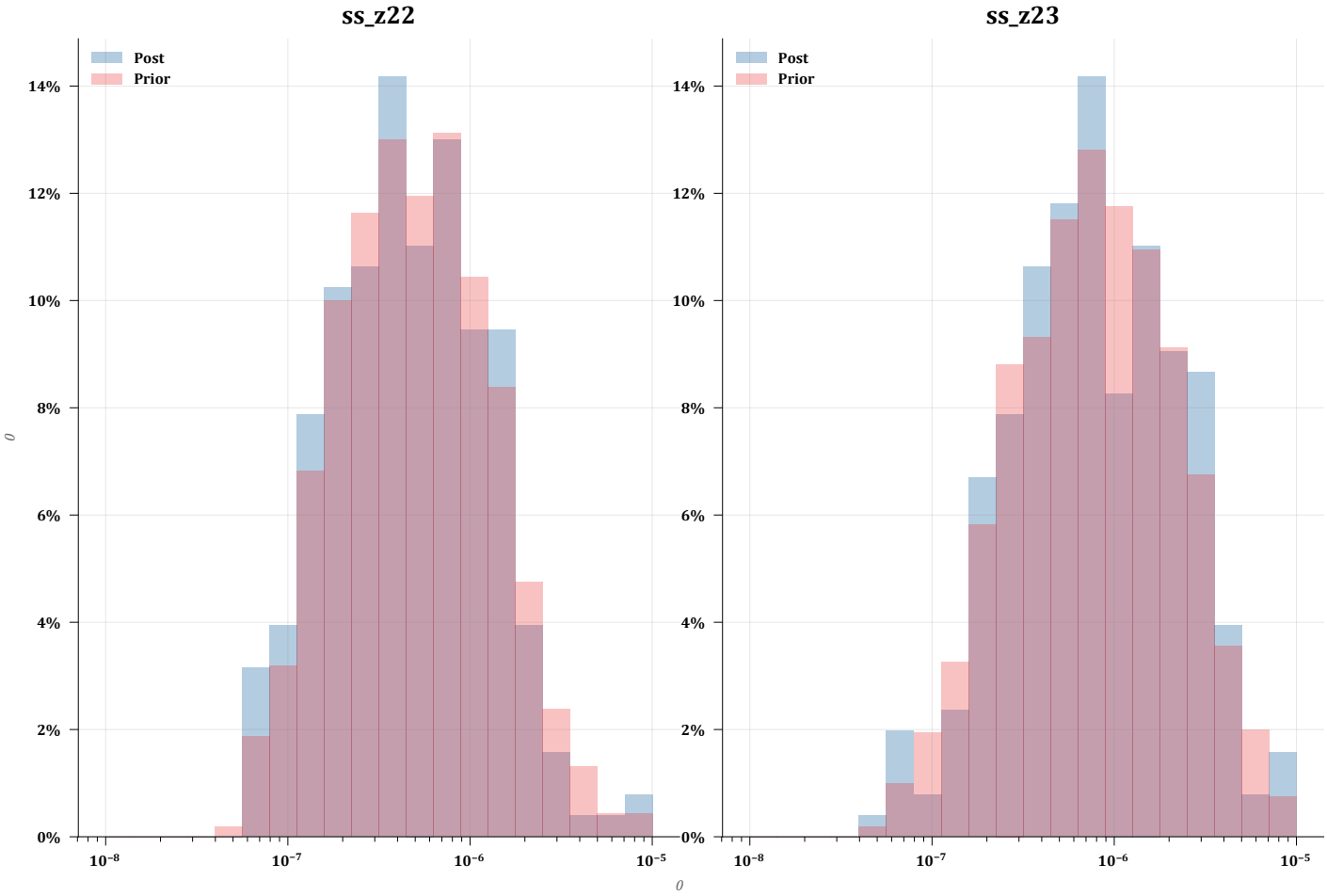
Parameters


ss_z22
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6%
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2%
0%
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10^{-5}
0

ss_z23
Post
Prior
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10%
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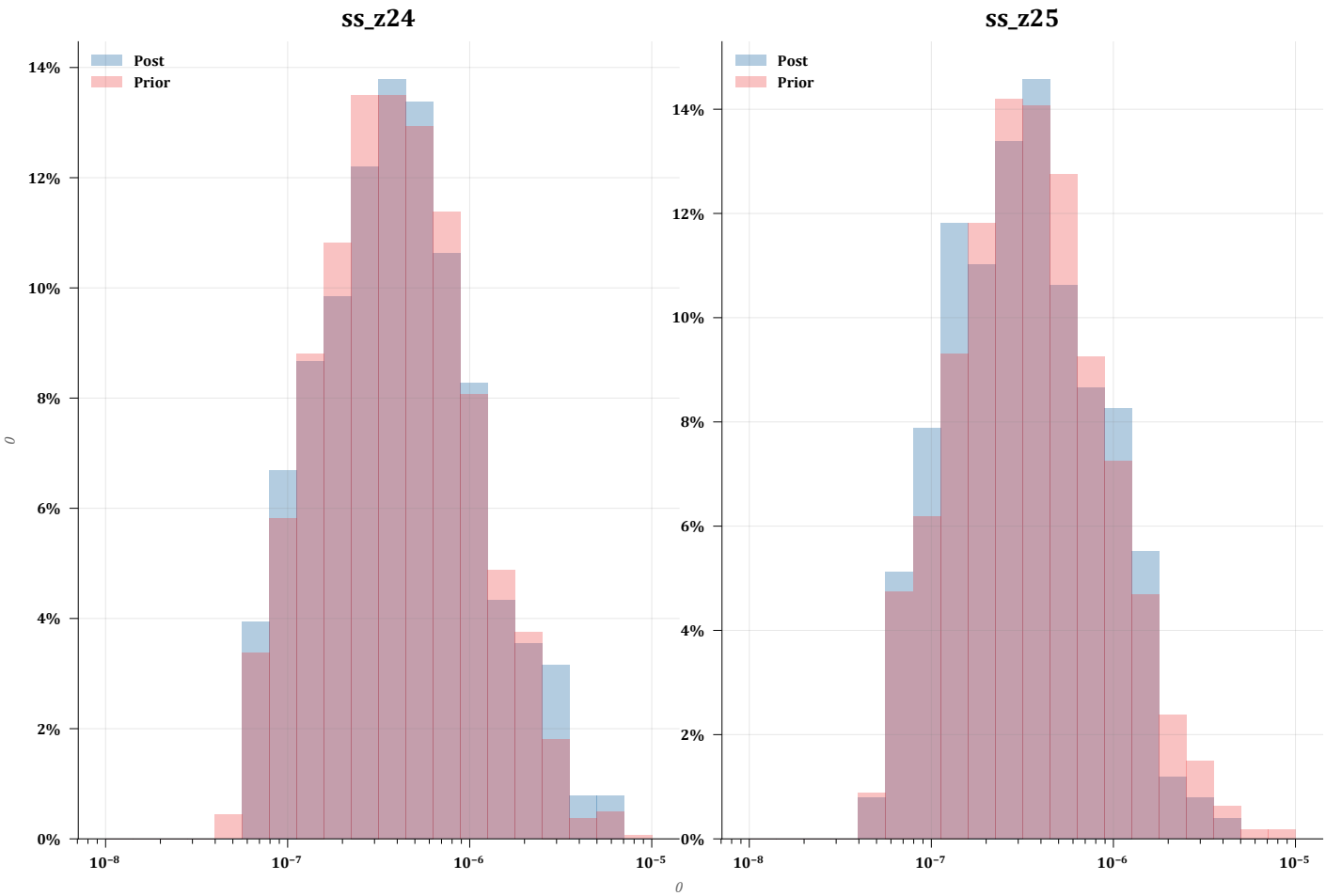
10^{-6}
10^{-5}


ss_z24
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Prior
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10^{-5}
0

ss_z25
Post
Prior
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0%
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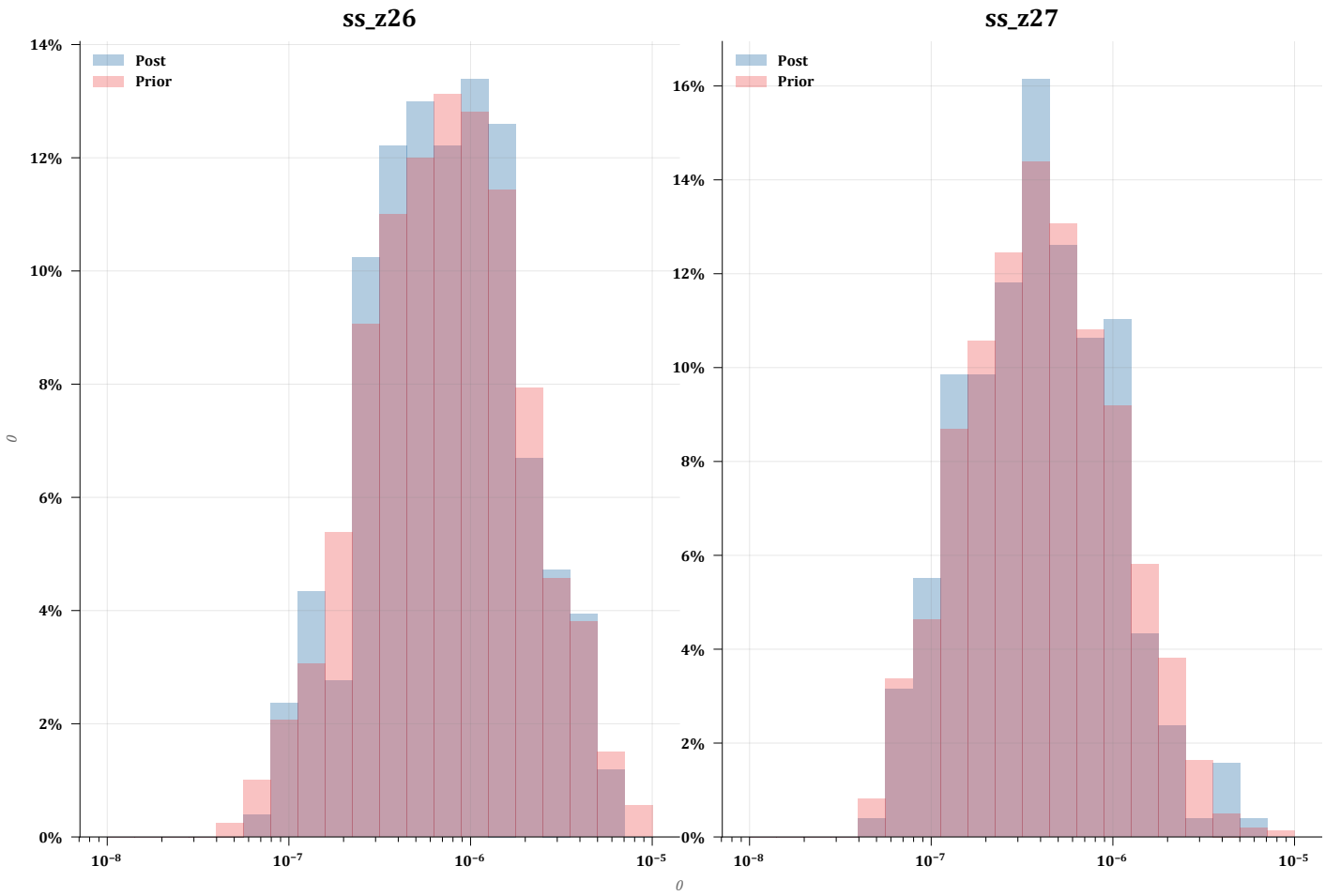
10^{-5}

Parameters


ss_z26
Post
Prior
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10^{-5}
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ss_z27
Post
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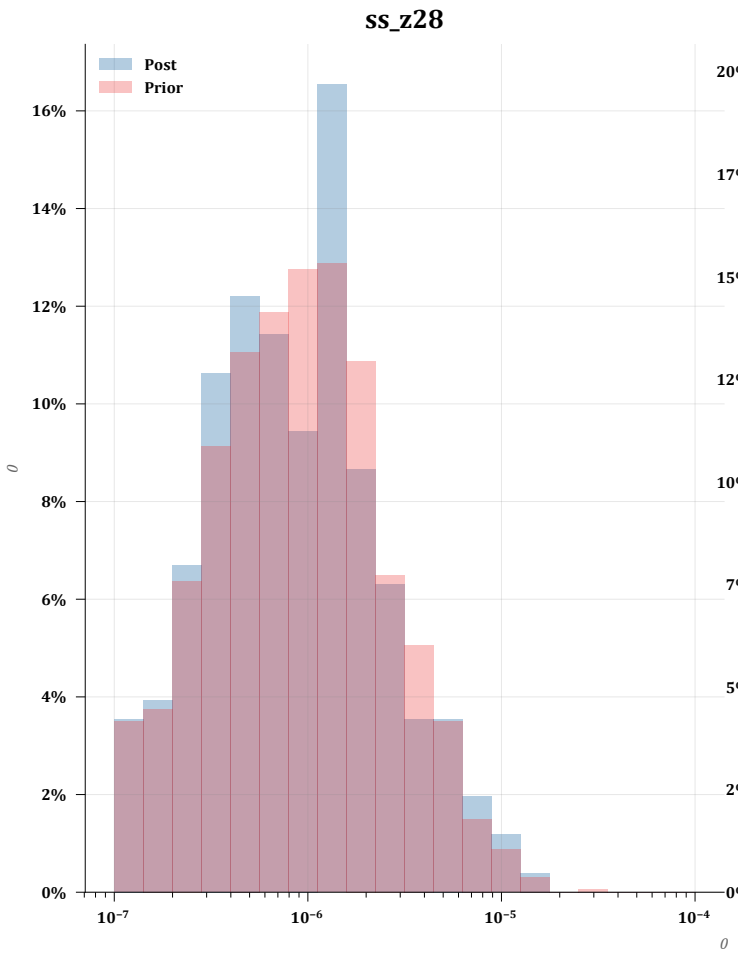
ss_z28
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Prior
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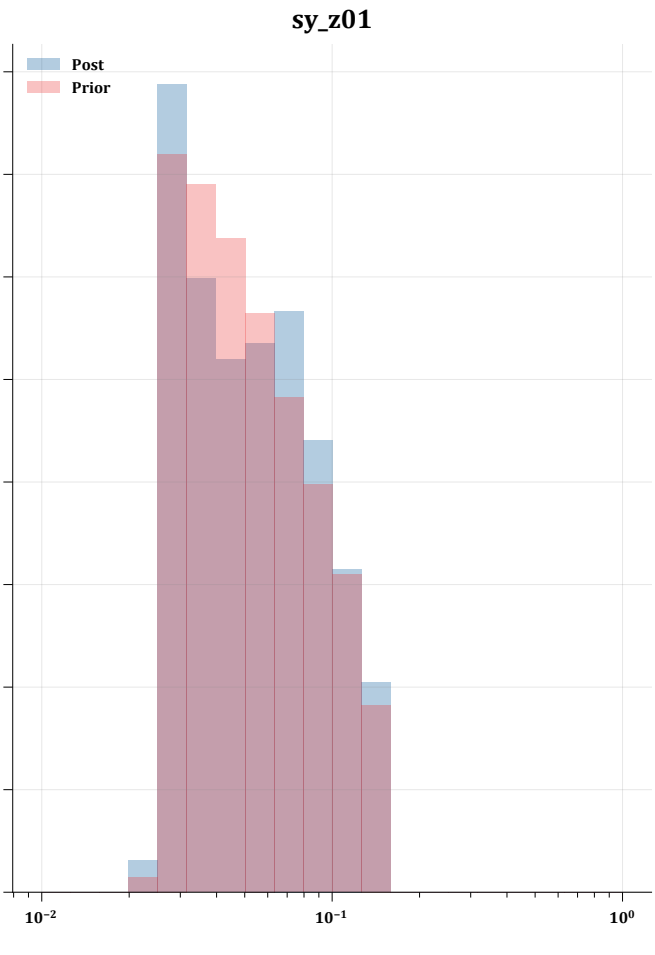
sy_z01
Post
Prior
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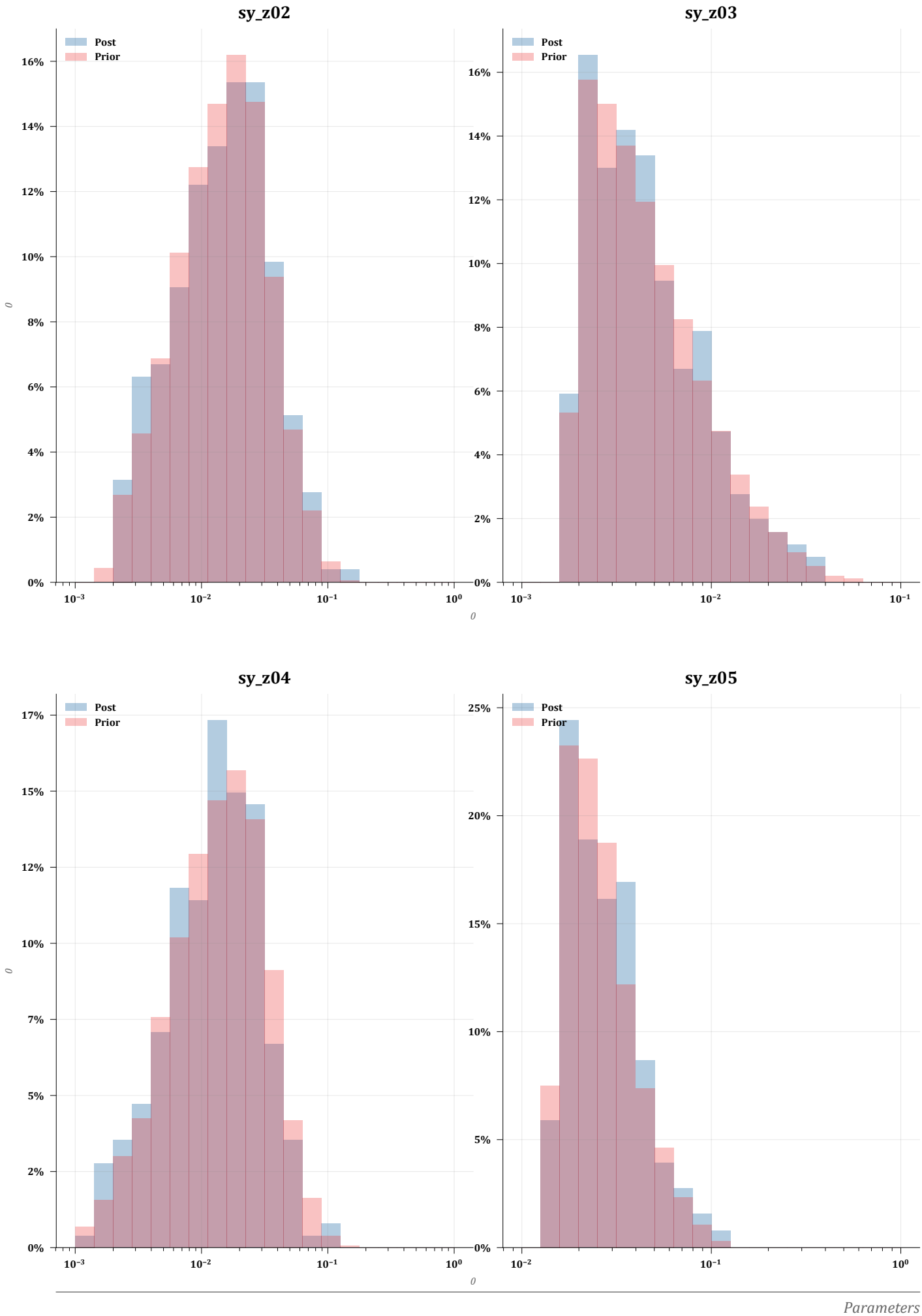
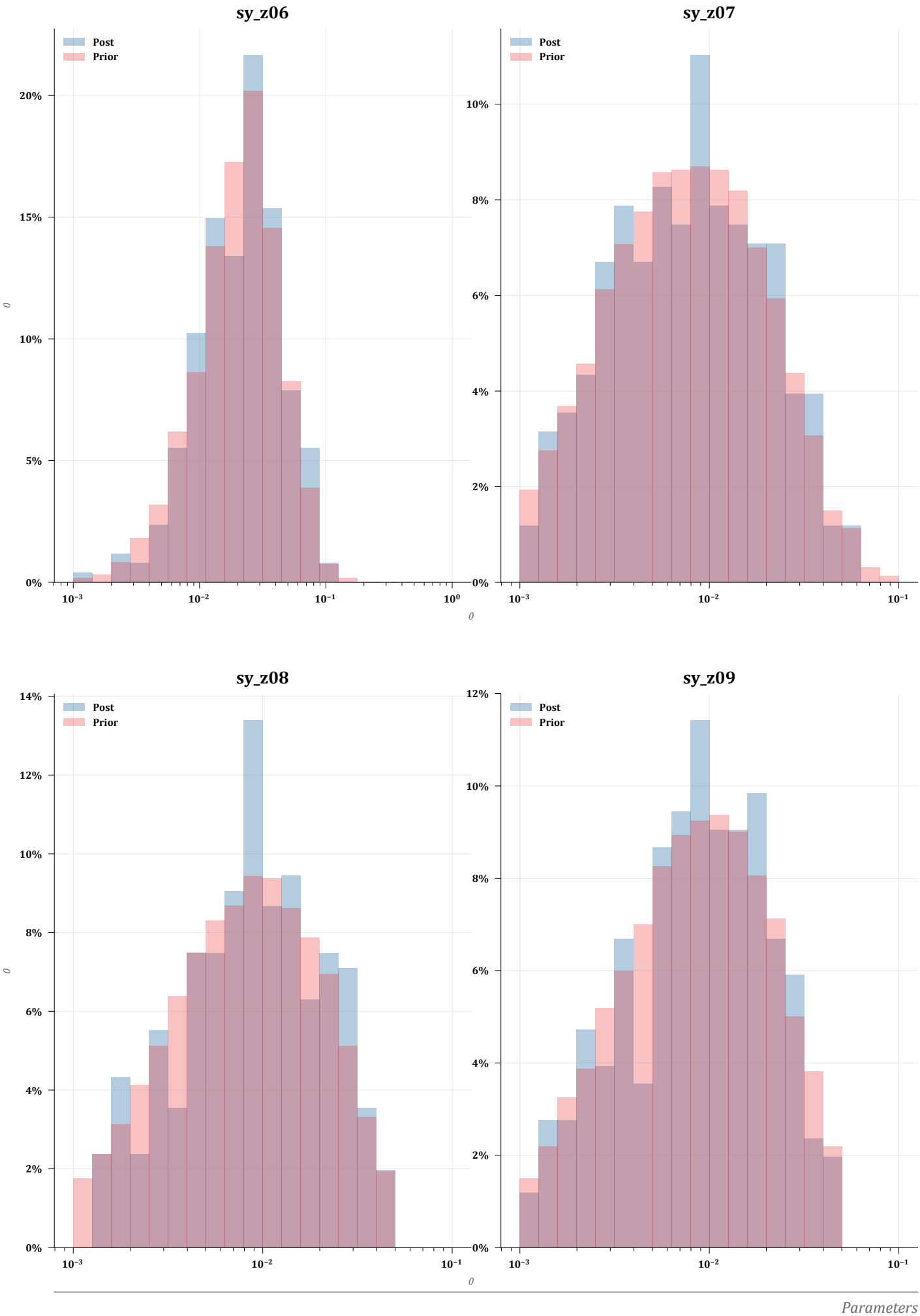
10^{0}

Parameters


sy_z02
sy_z03
sy_z04
sy_z05
Post
Prior
0
Parameters


sy_z06
sy_z07
sy_z08
sy_z09
Post
Prior
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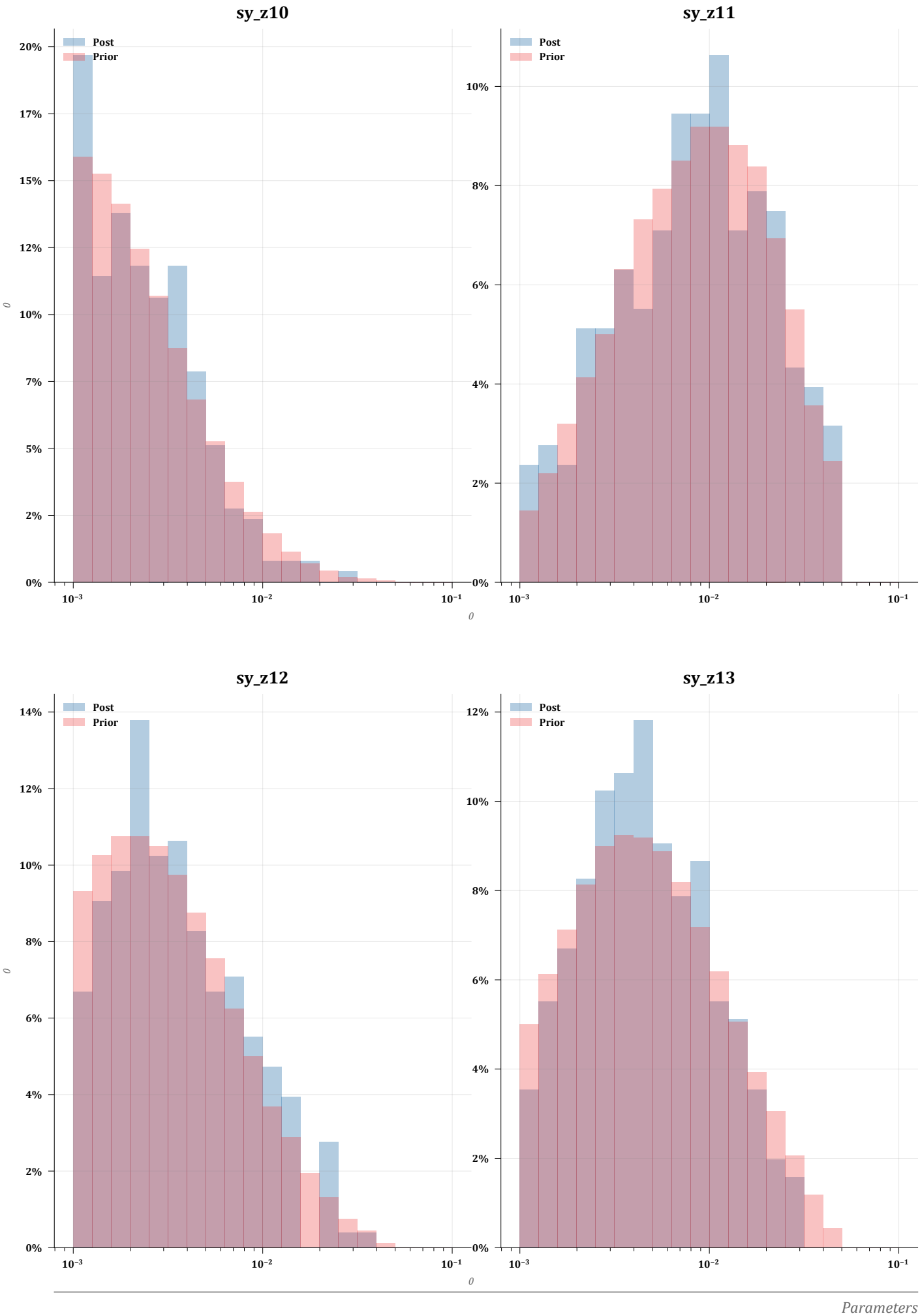
Parameters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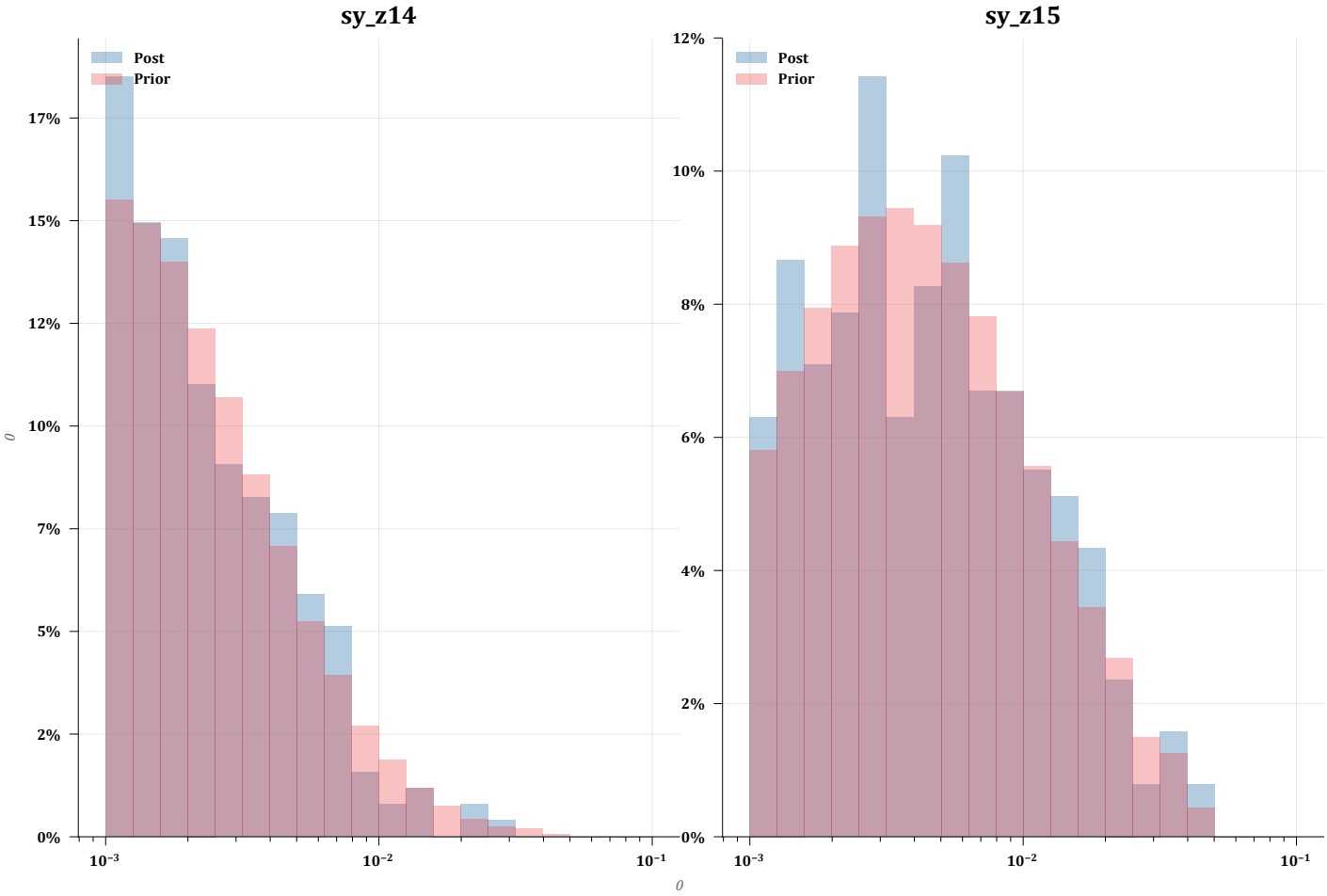
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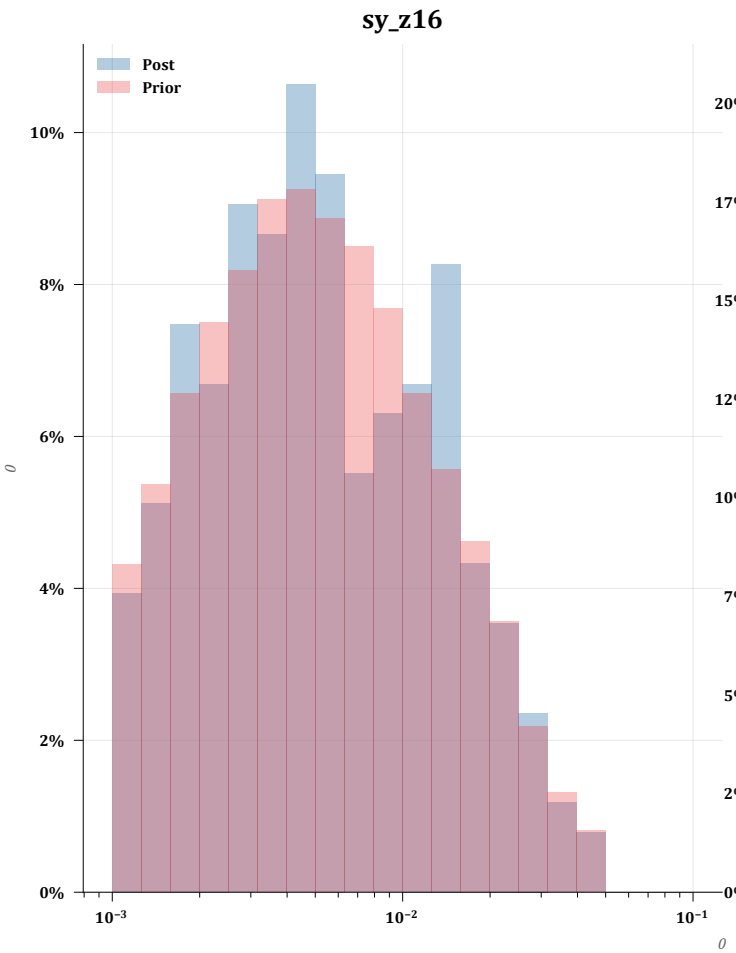
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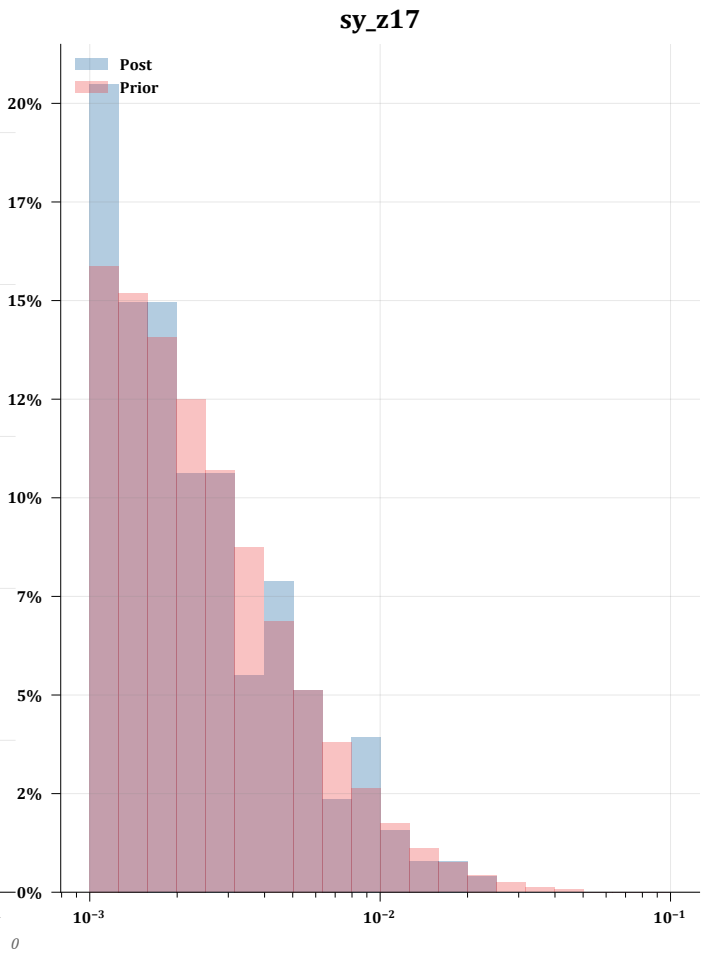
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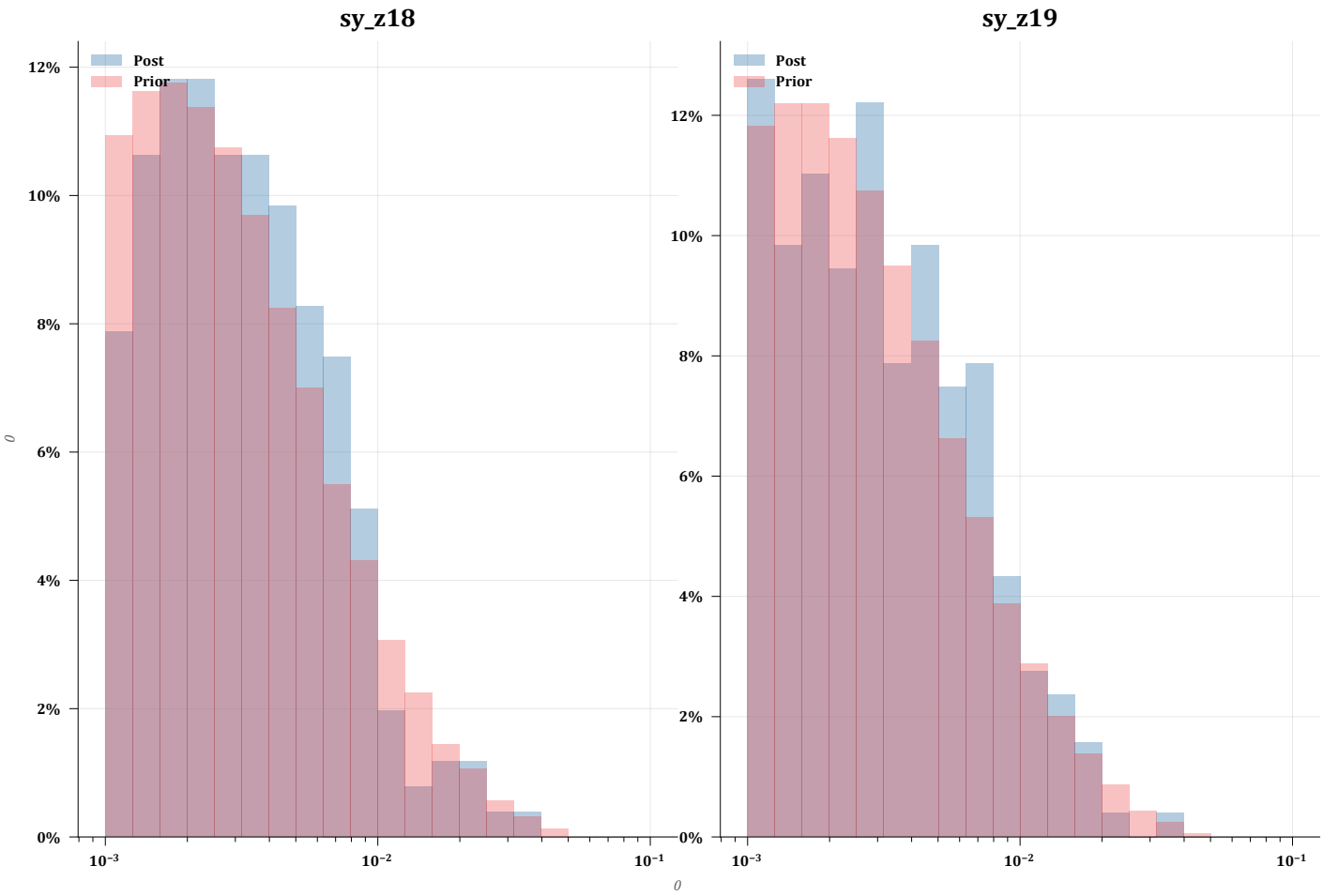
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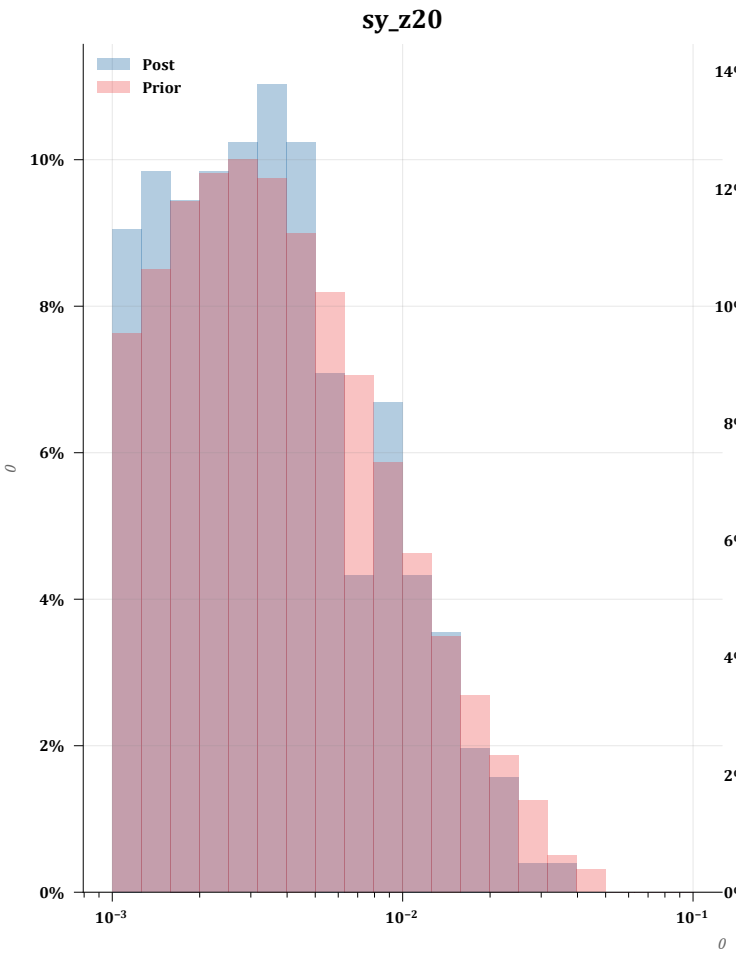
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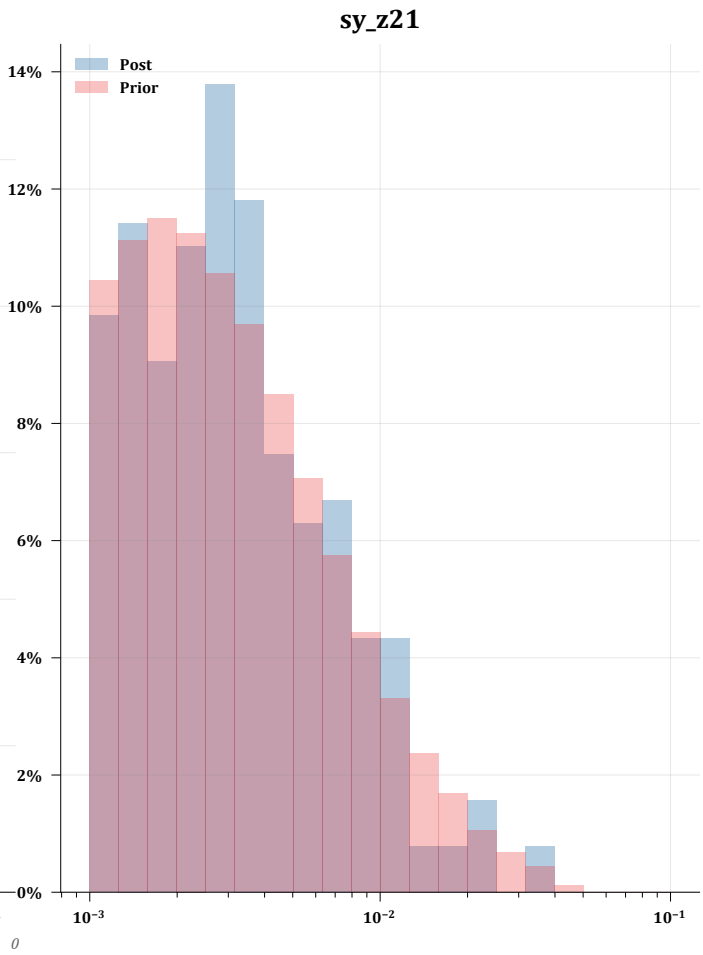
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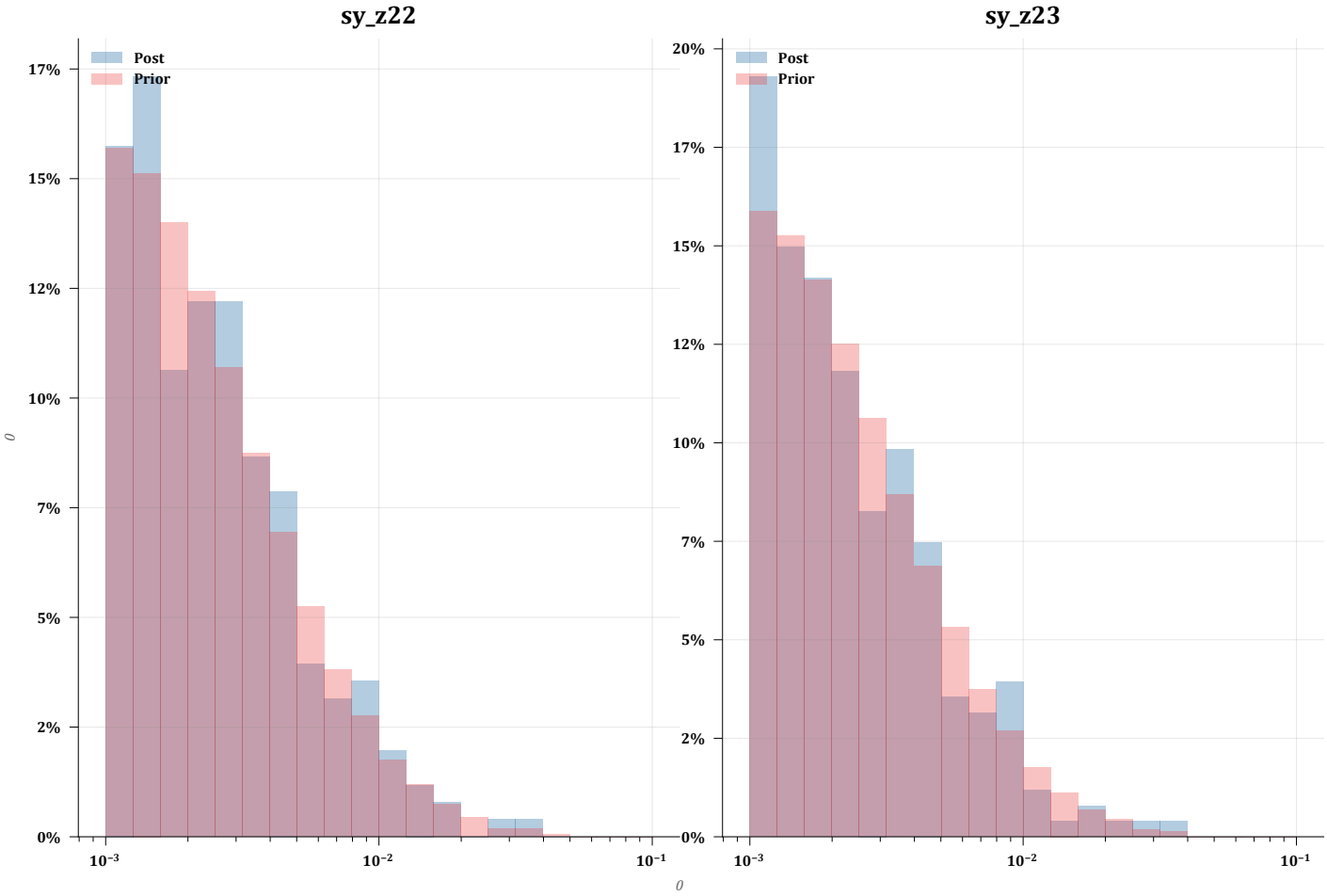
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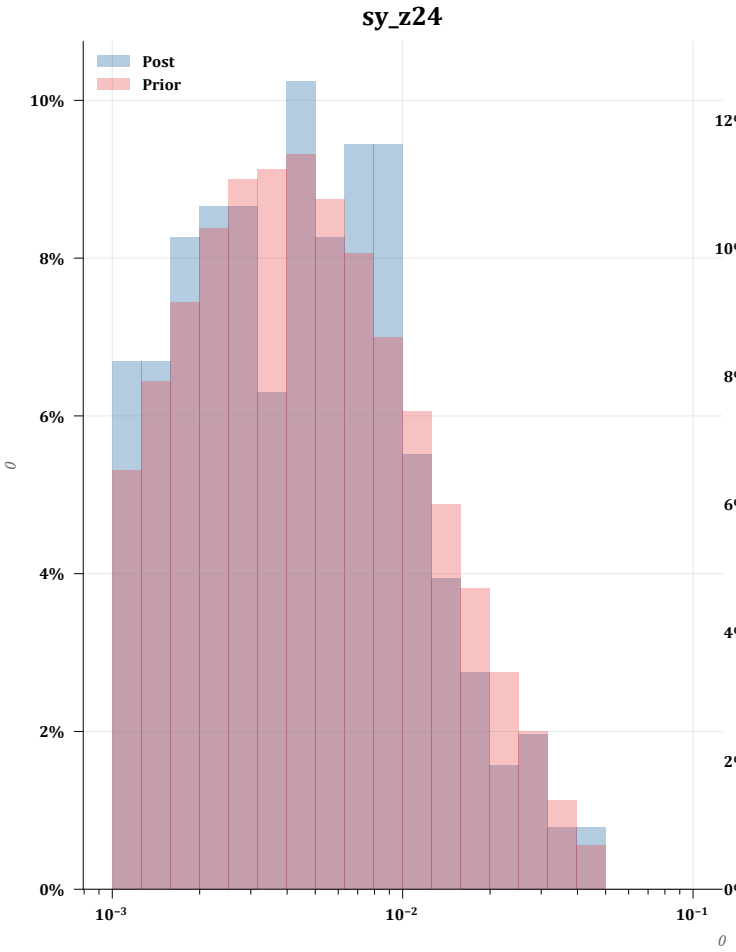
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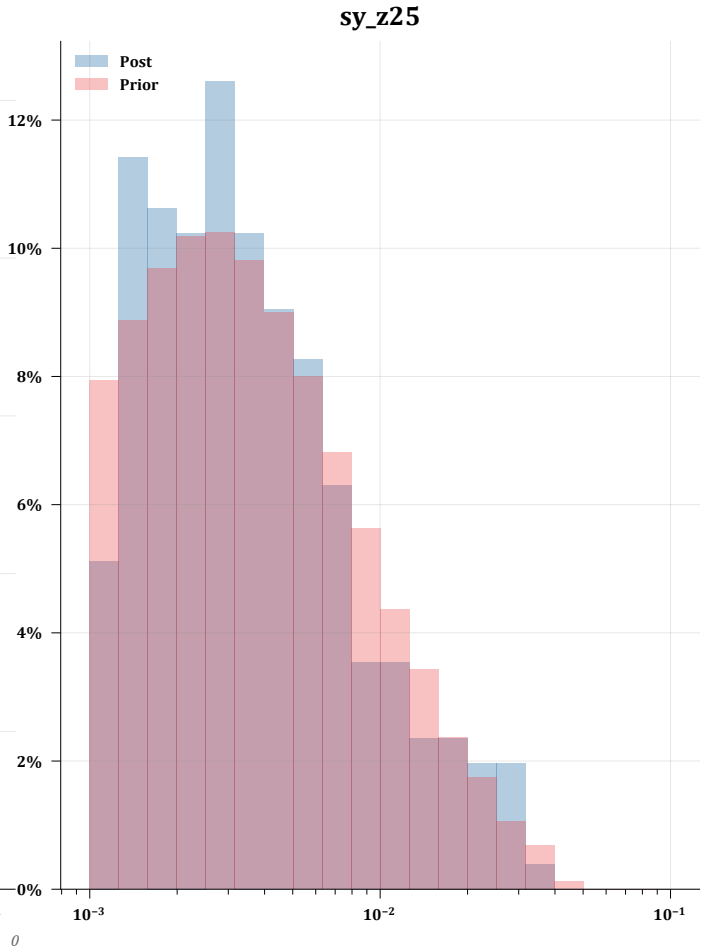
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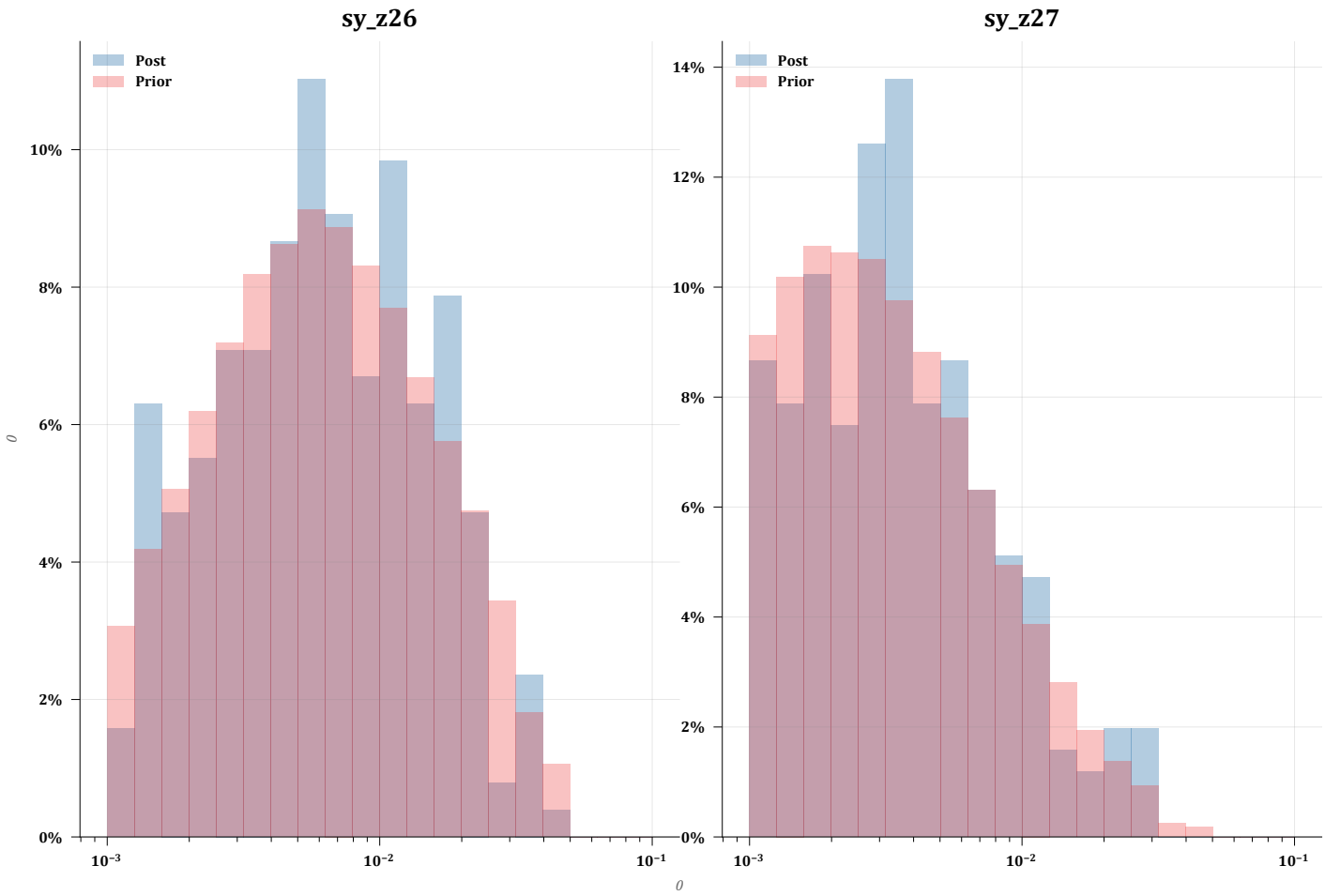
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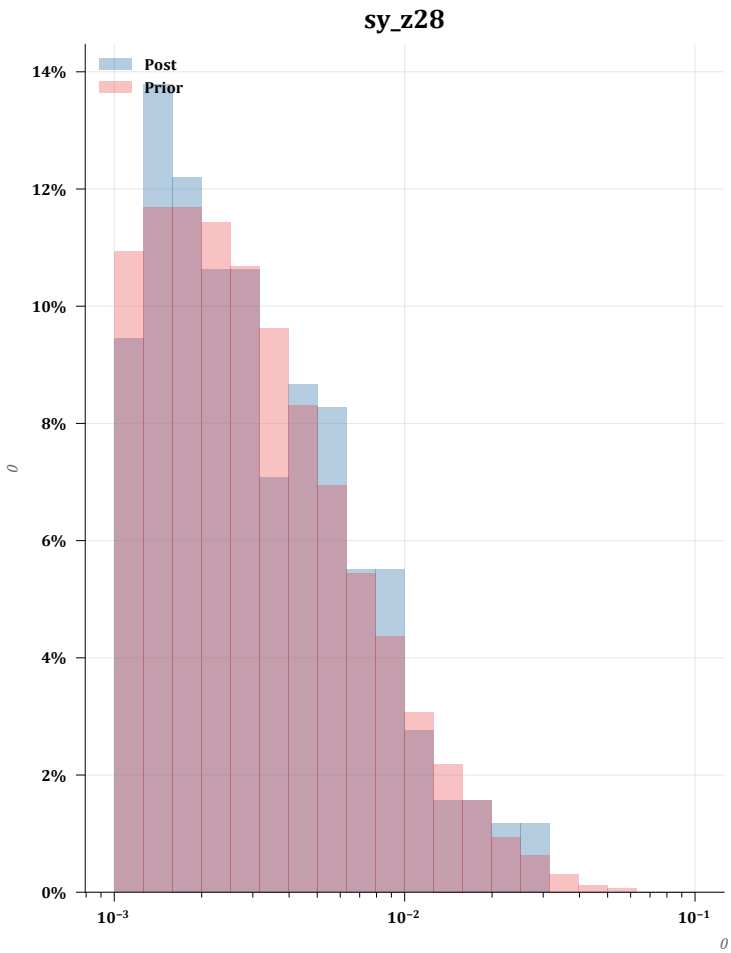
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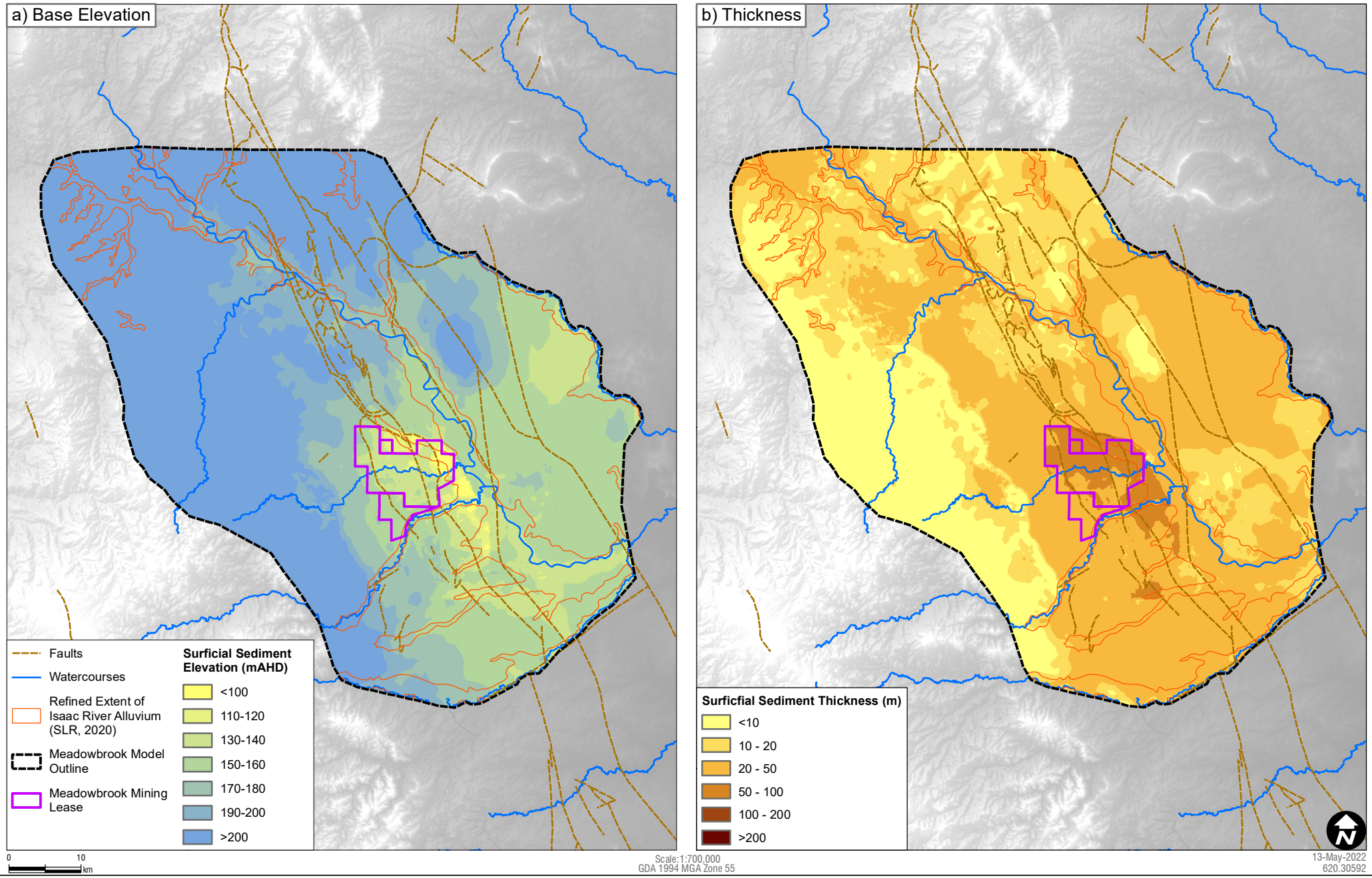
Parameters

APPENDIX E

Model Layer Structure Contour and Isopach Maps



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CADGIS\GIS\620.30592 Appendix E-1 Base Elevation and Thickness of Surficial Units in the Model.mxd

Sheet Size : A4

SLR
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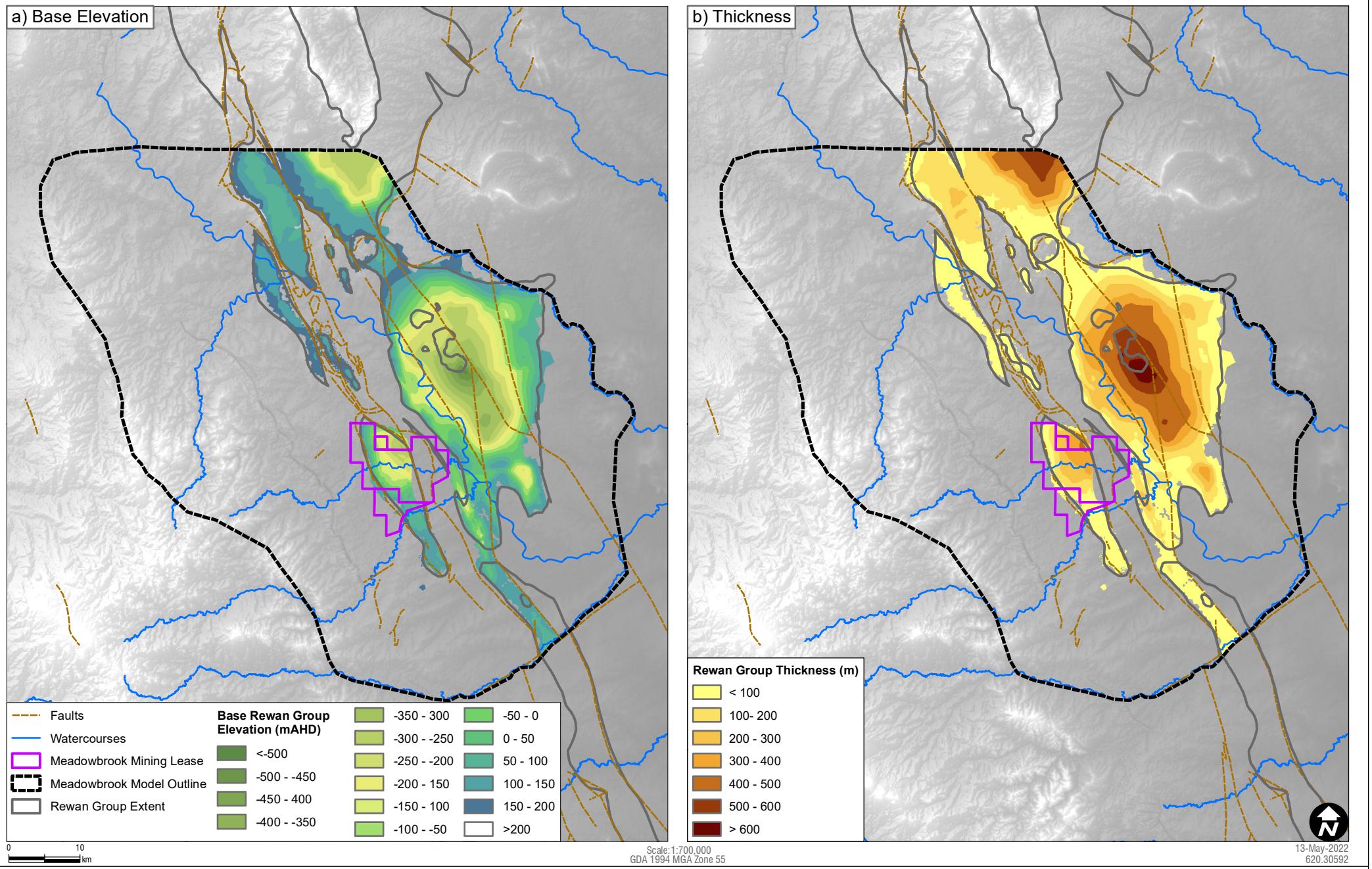
Base Elevation and Thickness of Surficial Units in the Model

FIGURE E-1



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CADGIS\GIS\620305920 Appendix E-2 Structure and Thickness of the Triassic Rewan Group in the Model.mxd

Sheet Size : A4

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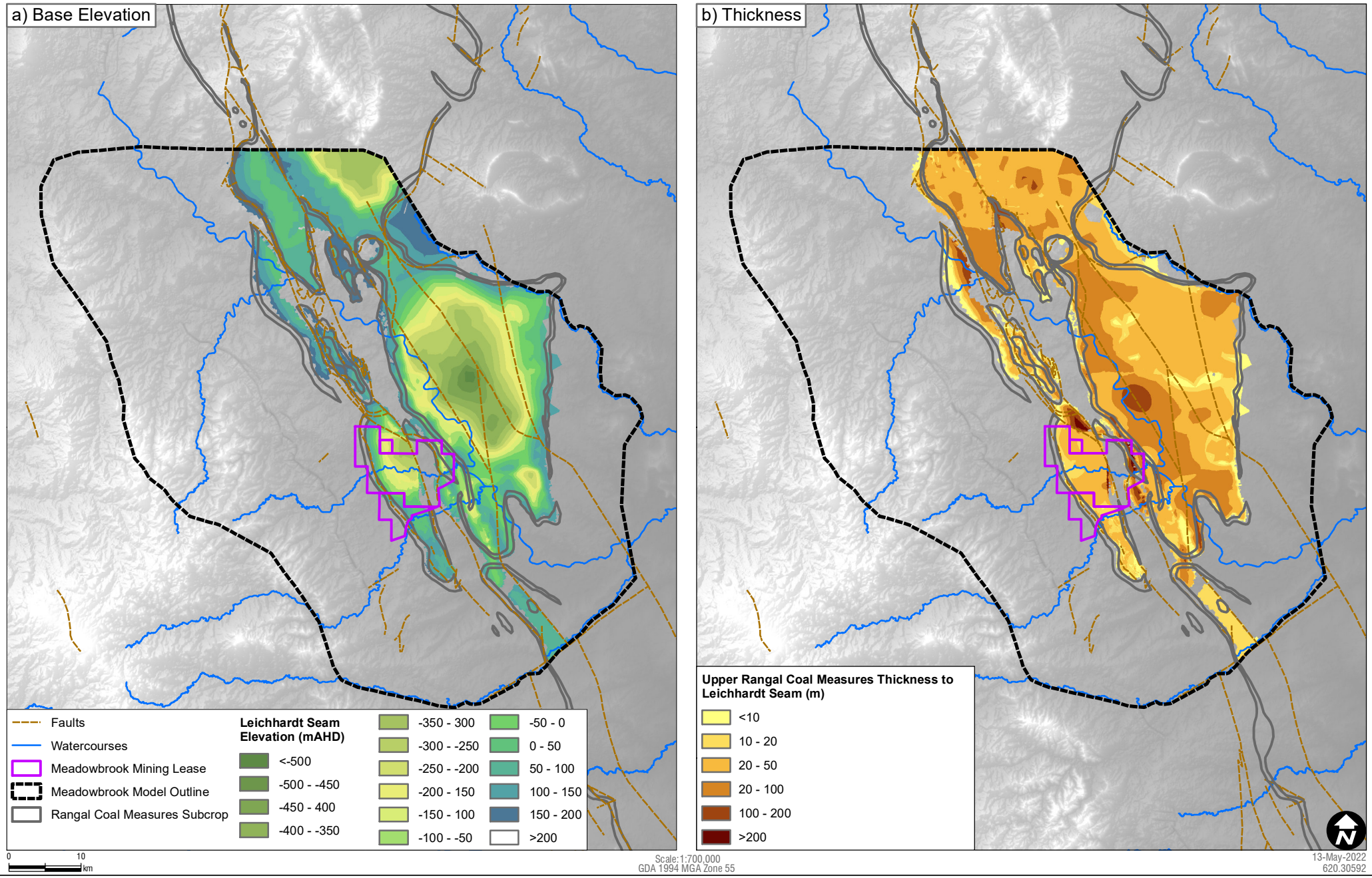
Structure and Thickness of the Triassic Rewan Group in the Model

FIGURE E-2



H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CAD\GIS\GIS\620.30592 Appendix E-3 Base Elevation of the Leichhardt Seam and Thickness of the Rangal Coal Measures to the Le

Sheet Size : A4

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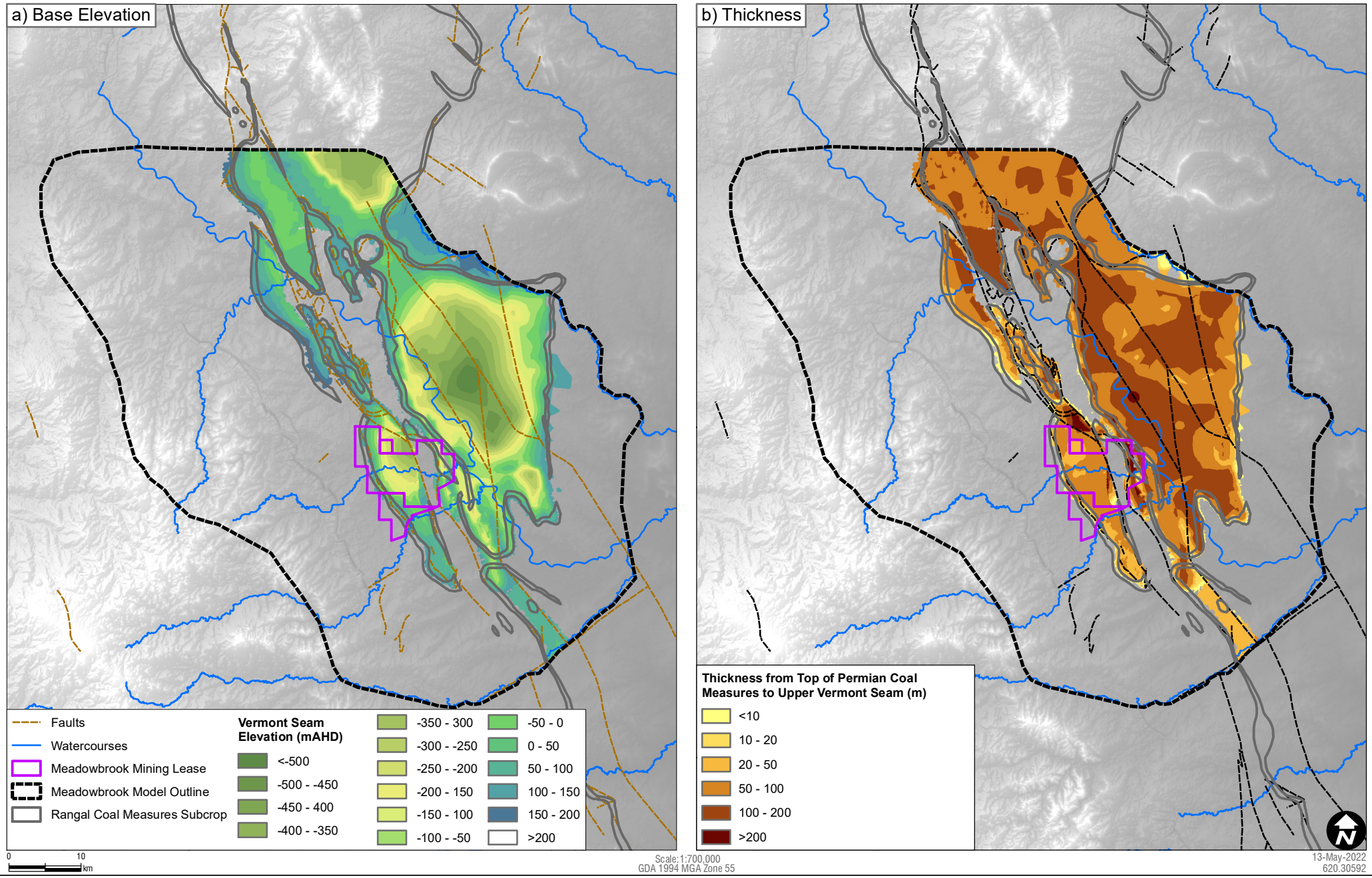
Base Elevation of the Leichhardt Seam and Thickness of the Rangal Coal Measures to the Leichhardt Seam in the Model

FIGURE E-3



Scale:1:700,000
GDA 1994 MGA Zone 55

13-May-2022
620.30592

Sheet Size : A4

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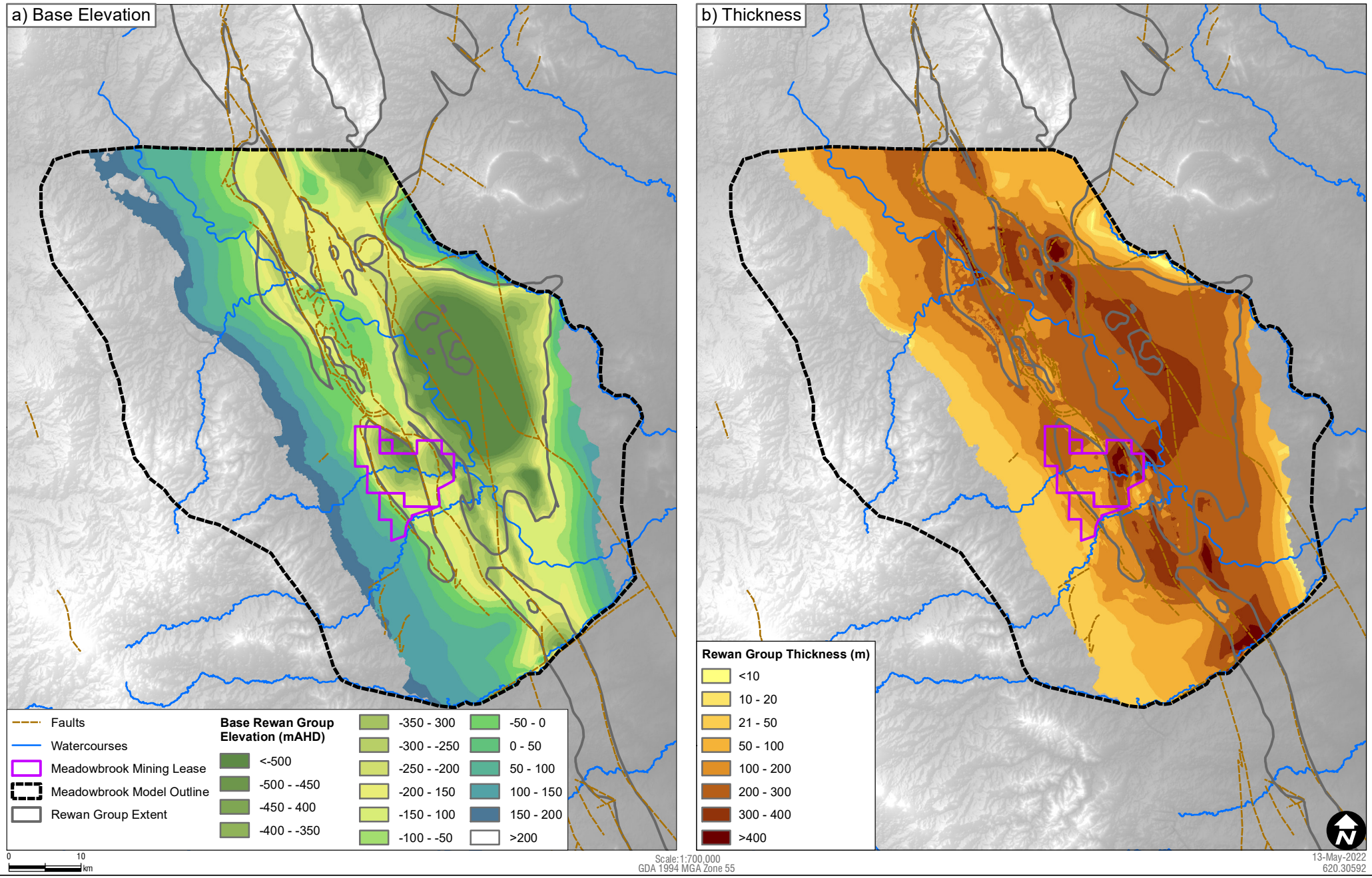
Base Elevation of the Vermont Seam and Thickness of the Rangal Coal Measures to the Vermont Seam in the Model

FIGURE E-4

H:\Projects-SLR\620-BNE\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CADGIS\GIS\62030592 Appendix E-4 Base Elevation of the Vermont Seam and Thickness of the Rangal Coal Measures to the Ver

H:\Projects-SLR\620-BNE\620.30592.00000 Meadowbrook GW Modelling\06 SLR Data\01 CADGIS\GIS\620305592 Appendix E-5 Base Elevation of the Fort Cooper Coal Measures and Thickness of the Fort Cooper Coal Measures in the Model.mxd



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13-May-2022
620.30592

Sheet Size : A4

SLR
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Base Elevation of the Fort Cooper Coal Measures and Thickness of the Fort Cooper Coal Measures in the Model

FIGURE E-5

ASIA PACIFIC OFFICES

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Adelaide SA 5000
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BRISBANE
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Brisbane QLD 4000
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CANBERRA
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Canberra ACT 2600
Australia
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F: +61 2 9427 8200

DARWIN
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Parap NT 0820
Australia
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F: +61 8 9370 0101

GOLD COAST
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MELBOURNE
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T: +61 3 9249 9400
F: +61 3 9249 9499

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Sub Base Platypus
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F: +61 7 4722 8001

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UoW Innovation Campus
North Wollongong NSW 2500
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T: +61 2 4249 1000

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Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203

ATTACHMENT B

Bore Construction Logs – Meadowbrook Project

Project: Meadowbrook

Bore ID: W1_MB1

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0	188		Casing Stickup - m
SAND, fine to medium-grained, light orange-brown		4, 8, 12, 16	184, 180, 176, 172		Grout from surface to 41.6 mbgl
CLAY, light brown		20	168		50 mm Class 18 PVC Environmental Casing
SAND, light brownish-grey		24	164		Water level - 27.08 mTOC (Dec-2020)
CLAY, light brown-grey		28	160, 156		
SAND, medium brown, quartz grains		32, 36, 40	152, 148		
GRAVEL, medium brown. Base of Tertiary at 45.1 mbgl		44	144		Bentonite Seal - 41.6 to 42.6 mbgl Gravel Pack - 42.6 to 45.1 mbgl
		48	140		Screen - machine-slotted 50 mm PVC - 43.6 to 45.1 mbgl

JBT consulting

Easting: 637913.6

Northing: 7531373

Collar RL (mAHD): 187.09

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 45.5

Project: Meadowbrook

Bore ID: W1_MB2

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0	190		Casing Stickup - m
SAND, fine to medium-grained, light orange-brown		5	185		
		10	180		
		15	175		Grout from surface to 79.75 mbgl
CLAY, light brown		20	170		
SAND, light brownish-grey		25	165		Water level - 26.54 mTOC (Dec-2020)
CLAY, light brown-grey		30	160		
SAND, medium brown, quartz grains		35	155		
		40	150		50 mm Class 18 PVC Environmental Casing
GRAVEL, medium brown. Base of Tertiary at 45.5 mbgl		45	145		
SILTSTONE, medium brown		50	140		
SANDSTONE, medium brown, very fine grained becoming fine to medium grained towards base		55	135		
		60	130		
SILTSTONE, medium brownish-grey Base of Weathering at 62 mbgl		65	125		
CARBONACEOUS SILTSTONE, black		70	120		
SANDSTONE, light grey		75	115		
		80	110		Bentonite Seal - 79.75 to 80.75 mbgl
SILTSTONE, medium grey			105		Gravel Pack - 80.75 to 83.25 mbgl
COAL, Leichhardt Lower Seam					Screen - machine-slotted 50 mm PVC - 81.75 to 83.25 mbgl

JBT consulting

Easting: 637915.9

Northing: 7531372

Collar RL (mAHD): 187.06

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 84

Project: Meadowbrook

Bore ID: W1_MB3

Drilled Date: 20-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0			Casing Stickup - m
SAND, fine to medium-grained, light orange-brown		10			
CLAY, light brown		20			
SAND, light brownish-grey					Water level - 26.73 mTOC (Dec-2020)
CLAY, light brown-grey		30			
SAND, medium brown, quartz grains		40			Grout from surface to 120.5 mbgl
GRAVEL, medium brown. Base of Tertiary at 45.5 mbgl					
SILTSTONE, medium brown		50			
SANDSTONE, medium brown, very fine grained becoming fine to medium grained towards base		60			
SILTSTONE, medium brownish-grey Base of Weathering at 62 mbgl					50 mm Class 18 PVC Environmental Casing
CARBONACEOUS SILTSTONE, black		70			
SANDSTONE, light grey					
SILTSTONE, medium grey		80			
COAL, Leichhardt Lower Seam					
CARBONACEOUS SILTSTONE, black					
SILTSTONE, medium grey					
SANDSTONE, fine to medium grained, light grey		90			
		100			
COAL, Vermont Upper Seam					
SANDSTONE, fine to medium grained, light grey					
SILTSTONE, medium grey		110			
SANDSTONE, fine to medium grained, light grey					
SILTSTONE, dark grey		120			Bentonite Seal - 120.5 to 121.5 mbgl
COAL, Vermont Seam					Gravel Pack - 121.5 to 124 mbgl
CARBONACEOUS SILTSTONE, black					Screen - machine-slotted 50 mm PVC - 122.5 to 124 mbgl
COAL, Vermont Lower Seam		130			

10 190 180 170 160 150 140 130 120 110 100 90 80 70 60

JBT consulting

Easting: 637918.9

Northing: 7531372

Collar RL (mAHD): 187.18

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 124

Project: Meadowbrook

Bore ID: W2_MB1

Drilled Date: 21-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0	188		Casing Stickup - m
CLAY, medium greyish-brown		2	186		
		4	184		
SAND, medium orange-brown		6	182		
		8	180		
CLAY, mottled orange-brown		10	178		Grout from surface to 32 mbgl
		12	176		
		14	174		
		16	172		50 mm Class 18 PVC Environmental Casing
SAND, medium orange-brown		18	170		
		20	168		
		22	166		
		24	164		
CLAY, sandy, mottled orange-brown Base of Tertiary at 40 mbgl		26	162		Water level - 26.33 mTOC (Dec-2020)
		28	160		
		30	158		
		32	156		Bentonite Seal - 32 to 33 mbgl
		34	154		Gravel Pack - 33 to 40 mbgl
		36	152		
		38	150		Screen - machine-slotted 50 mm PVC - 34 to 40 mbgl
		40	148		

JBT consulting

Easting: 637368.1

Northing: 7531452

Collar RL (mAHD): 187.92

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 165

Total Depth (m): 42

Project: Meadowbrook

Bore ID: W2_MB2

Drilled Date: 20-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown CLAY, medium greyish-brown		0	190	Casing Stickup - m	
SAND, medium orange-brown		10	180		
CLAY, mottled orange-brown		20	170		
SAND, medium orange-brown		30	160	Water level - 26.27 mTOC (Dec-2020)	
CLAY, sandy, mottled orange-brown Base of Tertiary at 42 mbgl		40	150		
SILTSTONE, variegated orange-brown		50	140	Grout from surface to 102 mbgl	
SANDSTONE, orange-brown Base of Weathering at 58 mbgl		60	130		
SANDSTONE, fine to medium-grained, light grey		70	120	50 mm Class 18 PVC Environmental Casing	
		80	110		
SILTSTONE, dark grey		90	100		
COAL, Girah 1 Seam		100	90	Bentonite Seal - 102 to 103 mbgl Gravel Pack - 103 to 110 mbgl Screen - machine-slotted 50 mm PVC - 104 to 110 mbgl	
		110	80		

JBT consulting

Easting: 637370.2

Northing: 7531452

Collar RL (mAHD): 187.93

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 110

Project: Meadowbrook

Bore ID: W3_MB1

Drilled Date: 23-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		1	177		Casing Stickup - m
SAND, light to medium brown		0			
		1	176		
SAND, fine-grained, light orange-brown, ferruginous					
		2	175		Grout from surface to 7 mbgl
SAND, fine-grained, light brown					
		3	174		
		4	173		50 mm Class 18 PVC Environmental Casing
		5	172		
		6	171		
		7	170		Bentonite Seal - 7 to 8 mbgl
SAND, medium-grained, light brown		8	169		Gravel Pack - 8 to 12 mbgl
		9	168		Water level - 9.84 mTOC (Dec-2020)
		10	167		
		11	166		Screen - machine-slotted 50 mm PVC - 9 to 12 mbgl
		12	165		

JBT consulting

Easting: 640470

Northing: 7529435

Collar RL (mAHD): 176.8

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 150

Total Depth (m): 12

Project: Meadowbrook

Bore ID: W3_MB2

Drilled Date: 27-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SAND, light to medium brown		0	176		Casing Stickup - m
SAND, fine-grained, light orange-brown, ferruginous					
SAND, fine-grained, light brown		4	172		Grout from surface to 33 mbgl
SAND, medium-grained, light brown		8	168		
SAND, fine to medium-grained, light orange-brown, clayey in places		12	164		50 mm Class 18 PVC Environmental Casing
		16	160		Water level - 17.3 mTOC (Dec-2020)
		20	156		
SAND, fine to medium-grained, light reddish-brown, clayey in places		24	152		
CLAY, light to medium reddish-brown, sandy in places		28	148		
CLAY, light greyish-white		32	144		Bentonite Seal - 33 to 34 mbgl
		36	140		Gravel Pack - 34 to 41 mbgl
CLAY, light to medium reddish-brown		40	136		Screen - machine-slotted 50 mm PVC - 35 to 41 mbgl

JBT consulting

Easting: 640468

Northing: 7529435

Collar RL (mAHD): 176.2

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 41

Project: Meadowbrook

Bore ID: W4_MB1

Drilled Date: 28-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		1	180		Casing Stickup - m
SOIL, medium greyish-brown		0	179		
CLAY, light to medium reddish-brown, sandy in places		1	178		
		2	177		Grout from surface to 7 mbgl
SAND, light to medium brown		3	176		
		4	175		
		5	174		50 mm Class 18 PVC Environmental Casing
SAND, light yellowish-brown		6	173		
		7	172		Bentonite Seal - 7 to 8 mbgl
		8	171		Gravel Pack - 8 to 12 mbgl
		9	170		
		10	169		Screen - machine-slotted 50 mm PVC - 9 to 12 mbgl
SAND, light to medium orange-brown, clayey towards base of unit		11	168		Water level - 11.17 mTOC (Dec-2020)
		12	167		

JBT consulting

Easting: 638171.8

Northing: 7528735

Collar RL (mAHD): 179

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 165

Total Depth (m): 12

Project: Meadowbrook

Bore ID: W4_MB2

Drilled Date: 28-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium greyish-brown CLAY, light to medium reddish-brown, sandy in places		0 4	180 176		Casing Stickup - m
SAND, light to medium yellow to orange-brown		4 8 12	176 172 168		
CLAY, light to medium brownish-grey		16	164		Water level - 18.4 mTOC (Dec-2020)
SAND, light brown		20	160		
CLAY, light to medium greyish-brown		24	156		Grout from surface to 52 mbgl
SAND, light yellowish-brown, clayey in places Base of Tertiary at 37 mbgl		28 32	152 148		50 mm Class 18 PVC Environmental Casing
SILTSTONE, light grey to yellowish-brown		36 40	144 140		
SANDSTONE, fine-grained, light grey Base of Weathering at 48 mbgl		44	136		
SANDSTONE, fine-grained, light grey		48	132		
SILTSTONE, light to medium-grey		52	128		Bentonite Seal - 52 to 53 mbgl
SANDSTONE, light to medium-grey		56	124		Gravel Pack - 53 to 60 mbgl Screen - machine-slotted 50 mm PVC - 54 to 60 mbgl
		60	120		

JBT consulting

Easting: 638168.6

Northing: 7528735

Collar RL (mAHD): 179.25

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 60

Project: Meadowbrook

Bore ID: W5_MB1

Drilled Date: 30-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium brown		0	180		Casing Stickup - m
CLAY, sandy, medium orange-brown		4	176		
SAND, fine-grained, dark orange-brown		8	172		Grout from surface to 42 mbgl
SAND, fine to medium-grained, light grey		12	168		
CLAY, light grey Base of Tertiary at 34 mbgl		16	164		50 mm Class 18 PVC Environmental Casing
		20	160		Water level - 20.74 mTOC (Dec-2020)
		24	156		
		28	152		
		32	148		
SILTSTONE, medium brown Base Rewan Group at 50 mbgl		36	144		
		40	140		Bentonite Seal - 42 to 43 mbgl
		44	136		Gravel Pack - 43 to 50 mbgl
		48	132		Screen - machine-slotted 50 mm PVC - 44 to 50 mbgl
		52			

JBT consulting

Easting: 638387.1

Northing: 7527823

Collar RL (mAHD): 181.15

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 50

Project: Meadowbrook

Bore ID: W5_MB2

Drilled Date: 31-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium brown		0	180		Casing Stickup - m
CLAY, sandy, medium orange-brown		4	176		
SAND, fine-grained, dark orange-brown		8	172		
SAND, fine to medium-grained, light grey		12	168		
CLAY, light grey Base of Tertiary at 34 mbgl		20	160		Water level - 19.76 mTOC (Dec-2020)
		24	156		Grout from surface to 67.5 mbgl
		28	152		
		32	148		
SILTSTONE, medium brown Base Rewan Group at 50 mbgl		36	144		50 mm Class 18 PVC Environmental Casing
		40	140		
		44	136		
		48	132		
CARBONACEOUS CLAYSTONE, dark grey Base of Weathering at 52 mbgl		52	128		
SILTSTONE, medium grey		56	124		
COAL, Phillips 1 Seam		60	120		
CARBONACEOUS SILTSTONE, dark grey		64	116		Bentonite Seal - 67.5 to 68.5 mbgl
COAL, Leichhardt Seam		68	112		Gravel Pack - 68.5 to 71 mbgl
SILTSTONE, light to medium grey		72			Screen - machine-slotted 50 mm PVC - 69.5 to 71 mbgl
SANDSTONE, fine to medium-grained, medium grey					
COAL, Leichhardt Lower Seam					

JBT consulting

Easting: 638385.5

Northing: 7527820

Collar RL (mAHD): 181.16

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

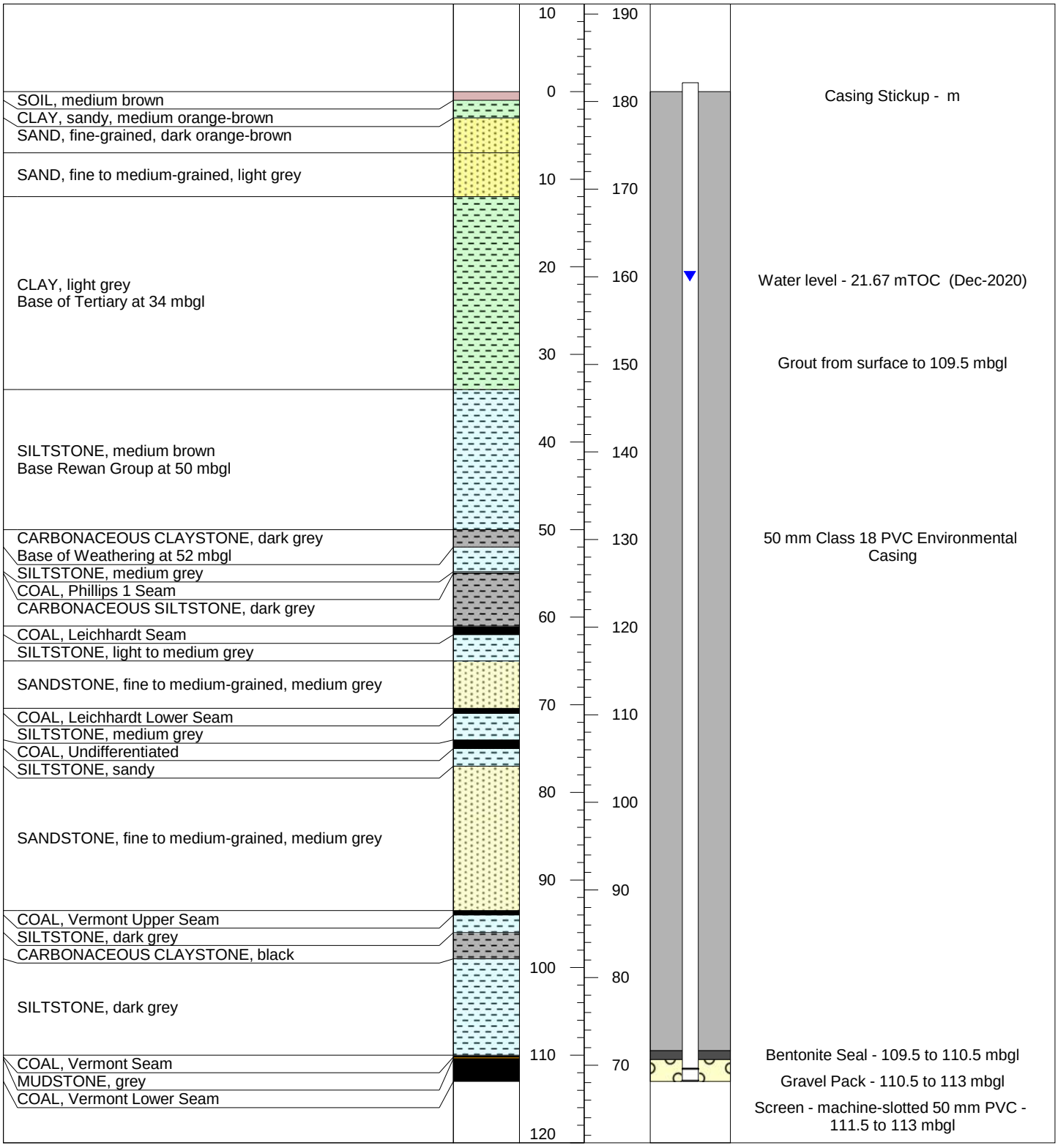
Hole Diameter (mm): 120

Total Depth (m): 71

Project: Meadowbrook

Bore ID: W5_MB3

Drilled Date: 30-Mar-2020



JBT consulting

Easting: 638383.8

Northing: 7527817

Collar RL (mAHD): 181.14

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 113

Project: Meadowbrook

Bore ID: W6_MB1

Drilled Date: 29-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		4			
SOIL, medium brown		0	180		Casing Stickup - m
SAND, fine to medium-grained, medium brown		4	176		
SAND, very fine-grained, light creamy brown		8	172		Grout from surface to 48 mbgl
SAND, medium to coarse-grained, light creamy brown		12	168		
CLAY, light grey Base of Tertiary at 22 mbgl		16	164		
		20	160		
SANDSTONE, medium-grained, medium brown		24	156		Water level - 23.67 mTOC (Dec-2020) 50 mm Class 18 PVC Environmental Casing
		28	152		
		32	148		
SANDSTONE, fine-grained, medium brown		36	144		
COALY SILTSTONE, black		40	140		
SANDSTONE, fine-grained, medium brown					
SILTSTONE, dark grey Base of Weathering at 44 mbgl		44	136		
SANDSTONE, fine-grained, light grey		48	132		Bentonite Seal - 48 to 49 mbgl Gravel Pack - 49 to 56 mbgl
		52	128		Screen - machine-slotted 50 mm PVC - 50 to 56 mbgl
SILTSTONE, medium grey					
CARBONACEOUS MUDSTONE, dark brownish-grey		56	124		

JBT consulting

Easting: 637758

Northing: 7527892

Collar RL (mAHD): 179.85

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 56

Project: Meadowbrook

Bore ID: W6_MB2

Drilled Date: 29-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium brown		0	180		Casing Stickup - m
SAND, fine to medium-grained, medium brown		4	176		
SAND, very fine-grained, light creamy brown		8	172		
SAND, medium to coarse-grained, light creamy brown		12	168		
CLAY, light grey Base of Tertiary at 22 mbgl		16 20	164 160		Water level - 17.69 mTOC (Dec-2020)
SANDSTONE, medium-grained, medium brown		24 28 32	156 152 148		Grout from surface to 73.5 mbgl
SANDSTONE, fine-grained, medium brown		36	144		50 mm Class 18 PVC Environmental Casing
COALY SILTSTONE, black		40	140		
SANDSTONE, fine-grained, medium brown					
SILTSTONE, dark grey Base of Weathering at 44 mbgl		44	136		
SANDSTONE, fine-grained, light grey		48 52	132 128		
SILTSTONE, medium grey					
CARBONACEOUS MUDSTONE, dark brownish-grey		56	124		
CLAYSTONE, brownish					
CARBONACEOUS CLAYSTONE, dark blackish-grey					
COALY SILTSTONE, dark grey		60	120		
MUDSTONE, dark grey					
COAL, Girah 1 Seam		64 68 72	116 112 108		
		76	104		Bentonite Seal - 73.5 to 74.5 mbgl Gravel Pack - 74.5 to 77 mbgl Screen - machine-slotted 50 mm PVC - 75.5 to 77 mbgl
		80	100		

JBT consulting

Easting: 637761.2

Northing: 7527893

Collar RL (mAHD): 179.95

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 77

Project: Meadowbrook

Bore ID: W7_MB1

Drilled Date: 02-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown		0	180		Casing Stickup - m
CLAY, medium to dark brown					
SAND, medium to dark orange-brown		4	176		
CLAY, medium to dark reddish-brown, sandy		8	172		Grout from surface to 52 mbgl
		12	168		
SAND, medium to dark reddish-brown, becoming light grey towards base		16	164		Water level - 19.12 mTOC (Dec-2020)
		20	160		
CLAY, medium reddish-brown, becoming light grey and sandy towards base		24	156		50 mm Class 18 PVC Environmental Casing
SAND, light brownish-yellow Base of Tertiary at 31 mbgl		28	152		
SILTSTONE, light to medium brownish-grey		32	148		
SANDSTONE, fine-grained, medium reddish-brown		36	144		
		40	140		
SILTSTONE, medium grey, sandstone in places		44	136		
SANDSTONE, fine-grained, light grey		48	132		
SILTSTONE, medium to dark grey		52	128		Bentonite Seal - 52 to 53 mbgl
SANDSTONE, fine-grained, light grey		56	124		Gravel Pack - 53 to 60 mbgl
		60			Screen - machine-slotted 50 mm PVC - 54 to 60 mbgl

JBT consulting

Easting: 637484.2

Northing: 7526145

Collar RL (mAHD): 180.69

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 60

Project: Meadowbrook

Bore ID: W8_MB1

Drilled Date: 03-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown, clayey sand		0	180		Casing Stickup - m
CLAY, dark brown		4	176		
SAND, clayey, light orange-brown		8	172		
		12	168		Grout from surface to 52 mbgl
CLAY, light yellow-brown Base of Tertiary at 24 mbgl		16	164		
		20	160		
		24	156		Water level - 20.9 mTOC (Dec-2020)
MUDSTONE, light brown		28	152		
		32	148		50 mm Class 18 PVC Environmental Casing
SILTSTONE, light grey Base of Weathering at 34 mbgl		36	144		
SANDSTONE, fine-grained, light grey		40	140		
COAL, Girah 1 Seam		44	136		
MUDSTONE, light to medium grey		48	132		
SANDSTONE, fine-grained, light grey		52	128		
COAL, Girah 1 Seam		56	124		Bentonite Seal - 52 to 53 mbgl
SILTSTONE, light to medium grey		60	120		Gravel Pack - 53 to 60 mbgl
SANDSTONE, fine-grained, light grey					Screen - machine-slotted 50 mm PVC - 54 to 60 mbgl

JBT consulting

Easting: 639305.7

Northing: 7523618

Collar RL (mAHD): 177.67

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 60

Project: Meadowbrook

Bore ID: W9_MB1

Drilled Date: 04-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		2	178		Casing Stickup - m
SOIL, dark reddish-brown		0			
		2	176		
CLAY, medium brown		4	174		Grout from surface to 17 mbgl
		6	172		
		8	170		
		10	168		50 mm Class 18 PVC Environmental Casing
SILT, medium orange-brown		12	166		
		14	164		
SAND, fine-grained, medium orange		16	162		Water level - Dry (Dec-2020)
		18	160		Bentonite Seal - 17 to 18 mbgl
SAND, fine to coarse-grained, variegated orange		20	158		Gravel Pack - 18 to 22 mbgl
SAND, fine-grained, medium brownish-orange Base of Tertiary at 22 mbgl		22	156		Screen - machine-slotted 50 mm PVC - 19 to 22 mbgl

JBT consulting

Easting: 640952.8

Northing: 7524117

Collar RL (mAHD): 177.46

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 165

Total Depth (m): 22

Project: Meadowbrook

Bore ID: W9_MB2

Drilled Date: 04-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark reddish-brown		0	176		Casing Stickup - m
CLAY, medium brown		4	172		
SILT, medium orange-brown		8	168		Grout from surface to 40.5 mbgl
SAND, fine-grained, medium orange		12	164		
SAND, fine to coarse-grained, variegated orange		16	160		50 mm Class 18 PVC Environmental Casing
SAND, fine-grained, medium brownish-orange Base of Tertiary at 22 mbgl		20	156		
SILTSTONE, light grey		24	152		
CARBONACEOUS MUDSTONE, dark blackish-grey SILTSTONE, light to medium brownish-grey		28	148		Water level - 30.5 mTOC (Dec-2020)
SANDSTONE, fine grained, medium orange		32	144		
SILTSTONE, orange-brown		36	140		
SANDSTONE, fine to medium-grained, brownish-grey Base of Weathering at 40.5 mbgl		40	136		Bentonite Seal - 40.5 to 41.5 mbgl
SILTSTONE, medium grey		44	132		Gravel Pack - 41.5 to 44.8 mbgl
COAL, Vermont Upper Seam SILTSTONE, medium grey		48			Screen - machine-slotted 50 mm PVC - 42.5 to 44 mbgl

JBT consulting

Easting: 640952.6

Northing: 7524119

Collar RL (mAHD): 177.42

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 44.8

Project: Meadowbrook

Bore ID: W9_MB3

Drilled Date: 03-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark reddish-brown		0	176		Casing Stickup - m
CLAY, medium brown		4	172		
SILT, medium orange-brown		8	168		Grout from surface to 62.5 mbgl
SAND, fine-grained, medium orange		12	164		
SAND, fine to coarse-grained, variegated orange		16	160		
SAND, fine-grained, medium brownish-orange Base of Tertiary at 22 mbgl		20	156		50 mm Class 18 PVC Environmental Casing
SILTSTONE, light grey		24	152		
CARBONACEOUS MUDSTONE, dark blackish-grey		28	148		Water level - 29.16 mTOC (Dec-2020)
SILTSTONE, light to medium brownish-grey					
SANDSTONE, fine grained, medium orange		32	144		
SILTSTONE, orange-brown		36	140		
SANDSTONE, fine to medium-grained, brownish-grey Base of Weathering at 40.5 mbgl		40	136		
SILTSTONE, medium grey		44	132		
COAL, Vermont Upper Seam		48	128		
SILTSTONE, medium grey		52	124		
		56	120		
		60	116		Bentonite Seal - 62.5 to 63.5 mbgl
		64	112		Gravel Pack - 63.5 to 71 mbgl
COAL, Vermont Lower Seam		68	108		Screen - machine-slotted 50 mm PVC - 64.5 to 70.5 mbgl
MUDSTONE, brownish-grey		72			

JBT consulting

Easting: 640952.4

Northing: 7524121

Collar RL (mAHD): 177.42

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 71

Project: Meadowbrook

Bore ID: W10_MB1

Drilled Date: 19-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		2	178		Casing Stickup - m
SOIL, light to medium reddish-brown		0	176		
		2			
SAND, fine-grained, orange Base of Tertiary at 5.5 mbgl		4	174		
			172		
SILTSTONE, medium to dark brownish-grey		6	170		
		8	168		
		10	166		Grout from surface to 20 mbgl
SANDSTONE, fine-grained, orange-brown		12	164		
		14	162		50 mm Class 18 PVC Environmental Casing
SILTSTONE, variegated yellowish-red		16	160		
SANDSTONE, fine to medium-grained, orange-grey		18	158		Water level - Dry (Dec-2020)
		20	156		Bentonite Seal - 20 to 21 mbgl
		22	154		Gravel Pack - 21 to 28 mbgl
SILTSTONE, medium to dark orange-grey		24	152		
SANDSTONE, medium-grained, variegated reddish-grey Rewan Group		26	150		Screen - machine-slotted 50 mm PVC - 22 to 28 mbgl
		28			

JBT consulting

Easting: 641869

Northing: 7524259

Collar RL (mAHD): 177

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 28

Project: Meadowbrook

Bore ID: W10_MB2

Drilled Date: 05-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, light to medium reddish-brown		0	175		Casing Stickup - m
SAND, fine-grained, orange Base of Tertiary at 5.5 mbgl		5	170		
SILTSTONE, medium to dark brownish-grey		10	165		Grout from surface to 86.5 mbgl
SANDSTONE, fine-grained, orange-brown		15	160		
SILTSTONE, variegated yellowish-red		20	155		
SANDSTONE, fine to medium-grained, orange-grey		25	150		50 mm Class 18 PVC Environmental Casing
SILTSTONE, medium to dark orange-grey		30	145		
SANDSTONE, medium-grained, variegated reddish-grey		35	140		Water level - 37.28 mTOC (Dec-2020)
MUDSTONE, dark grey Base of Rewan Group at 31 mbgl		40	135		
SILTSTONE, dark greyish-brown		45	130		
COAL, weathered, Phillips 1 Seam		50	125		
SILTSTONE, dark grey Base of Weathering at 40 mbgl		55	120		
COAL, Leichhardt Seam		60	115		
SILTSTONE, medium grey		65	110		
SANDSTONE, fine to medium-grained, medium grey		70	105		
SILTSTONE, medium grey		75	100		
SANDSTONE, fine to medium-grained, medium grey		80	95		
COAL, undifferentiated		85	90		Bentonite Seal - 86.5 to 87.5 mbgl
SANDSTONE, fine-grained, medium grey		90	85		Gravel Pack - 87.5 to 91 mbgl
CARBONACEOUS MUDSTONE, dark grey		95			Screen - machine-slotted 50 mm PVC - 88.5 to 90 mbgl
SILTSTONE, medium grey					
COAL, Vermont Upper Seam					
MUDSTONE, dark grey					

JBT consulting

Easting: 641869

Northing: 7524259

Collar RL (mAHD): 177

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 91

Project: Meadowbrook

Bore ID: W10_MB3

Drilled Date: 05-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, light to medium reddish-brown		0			Casing Stickup - m
SAND, fine-grained, orange Base of Tertiary at 5.5 mbgl					
SILTSTONE, medium to dark brownish-grey		10			
SANDSTONE, fine-grained, orange-brown					
SILTSTONE, variegated yellowish-red		20			
SANDSTONE, fine to medium-grained, orange-grey					
SILTSTONE, medium to dark orange-grey		30			
SANDSTONE, medium-grained, variegated reddish-grey					
MUDSTONE, dark grey Base of Rewan Group at 31 mbgl					
SILTSTONE, dark greyish-brown		40			Water level - 33.33 mTOC (Dec-2020)
COAL, weathered, Phillips 1 Seam					
SILTSTONE, dark grey Base of Weathering at 40 mbgl					Grout from surface to 114.65 mbgl
COAL, Leichhardt Seam		50			
SILTSTONE, medium grey					
SANDSTONE, fine to medium-grained, medium grey		60			
SILTSTONE, medium grey					50 mm Class 18 PVC Environmental Casing
SANDSTONE, fine to medium-grained, medium grey		70			
COAL, undifferentiated					
SANDSTONE, fine-grained, medium grey		80			
CARBONACEOUS MUDSTONE, dark grey					
SILTSTONE, medium grey		90			
COAL, Vermont Upper Seam					
MUDSTONE, dark grey		100			
SANDSTONE, fine to medium-grained, dark grey		110			
COAL, Vermont Lower Seam		120			Bentonite Seal - 114.65 to 115.65 mbgl Gravel Pack - 115.65 to 119.65 mbgl Screen - machine-slotted 50 mm PVC - 116.65 to 119 mbgl

Elevation (mAHD): 180, 170, 160, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60

JBT consulting

Easting: 641869

Northing: 7524261

Collar RL (mAHD): 177

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

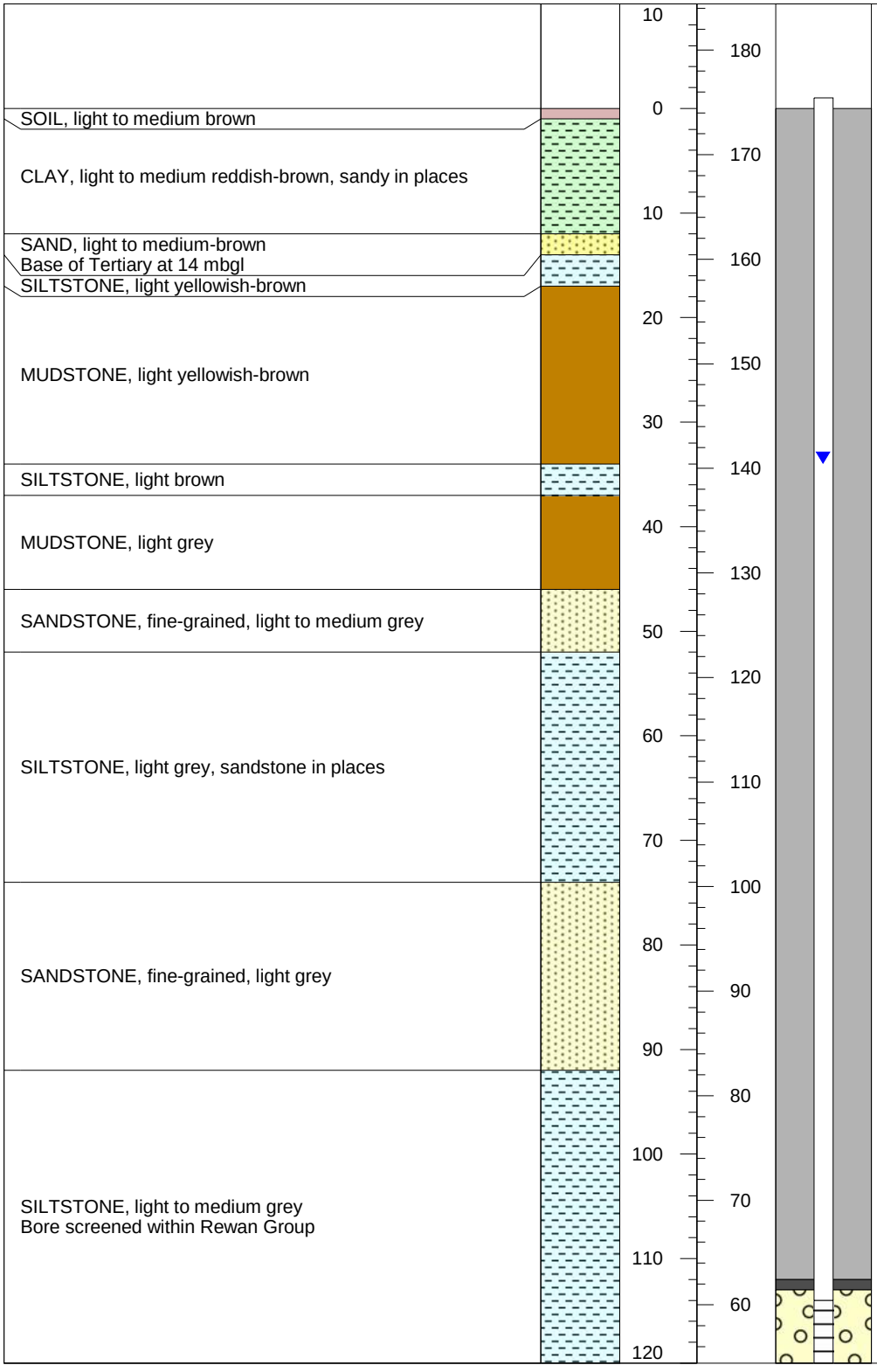
Total Depth (m): 119.65

Project: Meadowbrook

Bore ID: W11_MB1

Drilled Date: 27-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, light to medium brown					
CLAY, light to medium reddish-brown, sandy in places					
SAND, light to medium-brown					
Base of Tertiary at 14 mbgl					
SILTSTONE, light yellowish-brown					
MUDSTONE, light yellowish-brown					
SILTSTONE, light brown					
MUDSTONE, light grey					
SANDSTONE, fine-grained, light to medium grey					
SILTSTONE, light grey, sandstone in places					
SANDSTONE, fine-grained, light grey					
SILTSTONE, light to medium grey Bore screened within Rewan Group					



JBT consulting

Easting: 643940.7

Northing: 7524860.2

Collar RL (mAHD): 174.42

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 120

Project: Meadowbrook

Bore ID: W11_MB2

Drilled Date: 26-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, light to medium brown		0	180		Casing Stickup - m
CLAY, light to medium reddish-brown, sandy in places		10	170		
SAND, light to medium-brown					
Base of Tertiary at 14 mbgl		10	160		
SILTSTONE, light yellowish-brown		20	150		
MUDSTONE, light yellowish-brown		30	140		Water level - 30.72 mTOC (Dec-2020)
SILTSTONE, light brown		40	130		
MUDSTONE, light grey		50	120		Grout from surface to 131.5 mbgl
SANDSTONE, fine-grained, light to medium grey		60	110		
SILTSTONE, light grey, sandstone in places		70	100		
SANDSTONE, fine-grained, light grey		80	90		50 mm Class 18 PVC Environmental Casing
		90	80		
SILTSTONE, light to medium grey		100	70		
		110	60		
SANDSTONE, fine-grained, light grey		120	50		
Base of Rewan Group at 124 mbgl					
SILTSTONE, light to medium grey		130	40		Bentonite Seal - 131.5 to 132.5 mbgl
COAL, Phillips Seam					Gravel Pack - 132.5 to 139 mbgl
SILTSTONE, light to medium grey					Screen - machine-slotted 50 mm PVC - 133.5 to 135 mbgl
COAL, Leichhardt Seam					
SANDSTONE, fine-grained, light grey		140			

JBT consulting

Easting: 643943.2

Northing: 7524861.4

Collar RL (mAHD): 174.27

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 139

Project: Meadowbrook

Bore ID: W12_MB1

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0	168		Casing Stickup - m
CLAY, medium to dark reddish-brown, sandy		4	164		
SAND, medium to dark reddish-brown, clayey		4	160		
CLAY, medium to dark reddish-brown, sandy		8			
SAND, medium to dark reddish-brown, clayey		8	156		
CLAY, medium to dark greyish-brown, sandy in places		12	152		
		16			
		20	148		Water level - 20.47 mTOC (Dec-2020)
		24	144		
SAND, light to medium orange-brown, clayey in places		28	140		Grout from surface to 52 mbgl
		32	136		
		36	132		
		40	128		50 mm Class 18 PVC Environmental Casing
		44	124		
		48	120		
		52	116		Bentonite Seal - 52 to 53 mbgl
		56	112		Gravel Pack - 53 to 60 mbgl
		60	108		Screen - machine-slotted 50 mm PVC - 54 to 60 mbgl

JBT consulting

Easting: 643268

Northing: 7530165

Collar RL (mAHD): 174.7

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 60

Project: Meadowbrook

Bore ID: W13_MB1

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown		0 – 4	168 – 164		Casing Stickup - m
CLAY, greyish-brown Base of Tertiary at 22 mbgl		4 – 20	164 – 148		Grout from surface to 41.5 mbgl 50 mm Class 18 PVC Environmental Casing Water level - 18.25 mTOC (Dec-2020)
SILTSTONE, medium brown		20 – 24	148 – 144		
SANDSTONE, medium grained, light brown		24 – 36	144 – 132		
SILTSTONE, brownish-grey		36 – 40	132 – 128		Bentonite Seal - 41.5 to 42.5 mbgl
COAL, Vermont Lower Seam, weathered Base of Weathering at 44 mbgl		40 – 44	128 – 124		Gravel Pack - 42.5 to 46.5 mbgl
COAL, Vermont Lower Seam		44 – 48	124 – 120		Screen - machine-slotted 50 mm PVC - 43.5 to 46.5 mbgl

JBT consulting

Easting: 645381

Northing: 7530927

Collar RL (mAHD): 166.8

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

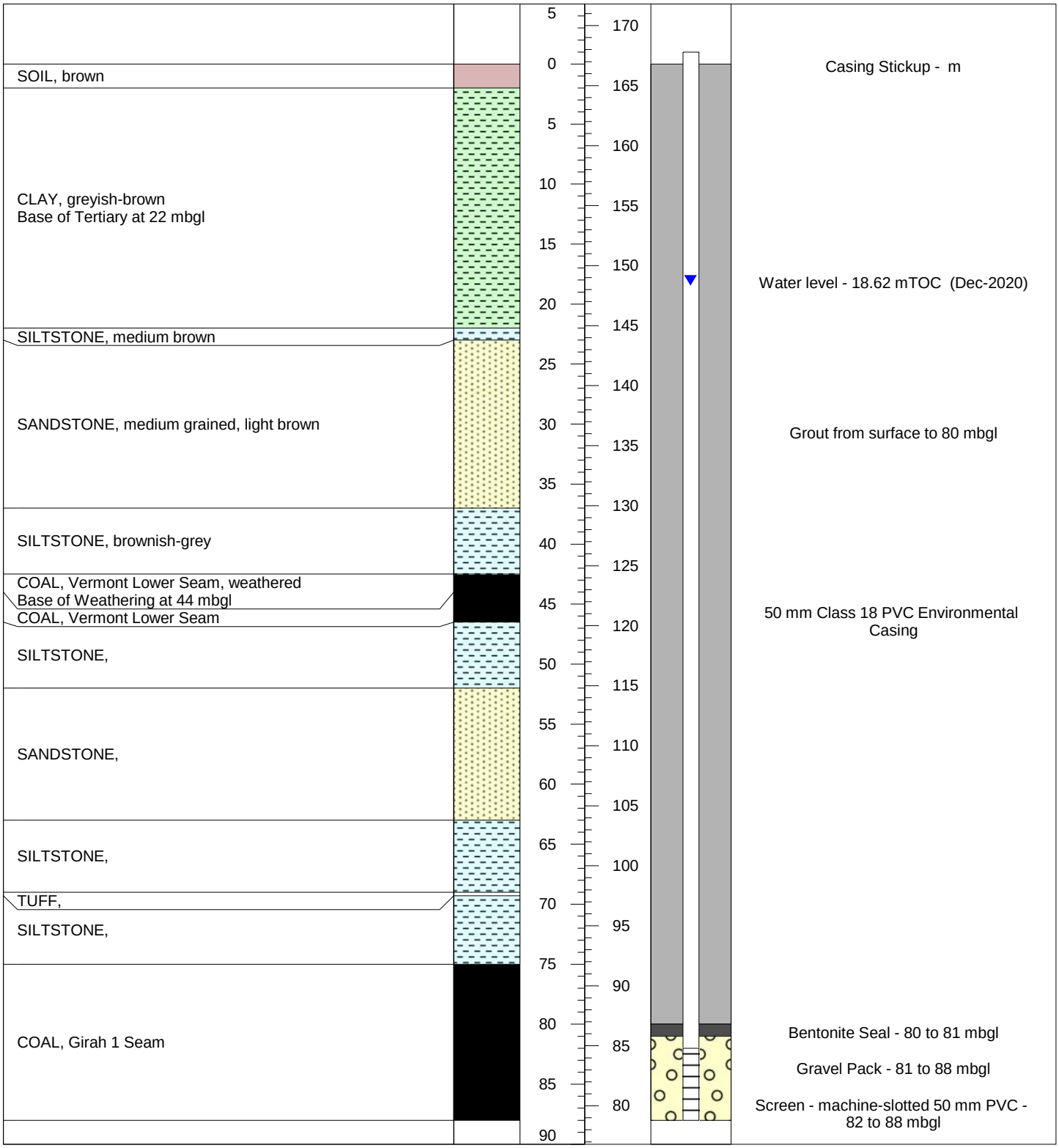
Total Depth (m): 46.5

Project: Meadowbrook

Bore ID: W13_MB2

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes



JBT consulting

Easting: 645379

Northing: 7530927

Collar RL (mAHD): 166.8

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 88

Project: Meadowbrook

Bore ID: W14_MB1

Drilled Date: 22-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		1	167		Casing Stickup - m
SOIL		0			
		1	166		
		2	165		
SAND, fine-grained, light orange-brown		3	164		
		4	163		
		5	162		Grout from surface to 13.6 mbgl
		6	161		
		7	160		
SAND, fine to medium-grained, light orange-brown, ferruginous near base of unit		8	159		
		9	158		50 mm Class 18 PVC Environmental Casing
		10	157		
		11	156		
SAND, medium-grained, light orange-brown		12	155		
		13	154		
CLAY, light brownish-grey, sandy		14	153		Bentonite Seal - 13.6 to 14.6 mbgl
		15	152		Water level - 15.04 mTOC (Dec-2020)
SAND, medium-grained, light orange-brown		16	151		Gravel Pack - 14.6 to 18.6 mbgl
		17	150		
		18	149		
CLAY, light grey, sandy		19	148		Screen - machine-slotted 50 mm PVC - 15.6 to 18.6 mbgl

JBT consulting

Easting: 645373

Northing: 7528515

Collar RL (mAHD): 168.3

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 20

Project: Meadowbrook

Bore ID: W14_MB2

Drilled Date: 23-Mar-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL		0	168		Casing Stickup - m
SAND, fine-grained, light orange-brown		4	164		
SAND, fine to medium-grained, light orange-brown, ferruginous near base of unit		8	160		
SAND, medium-grained, light orange-brown		12	156		
CLAY, light brownish-grey, sandy					
SAND, medium-grained, light orange-brown		16	152		
CLAY, light grey, sandy					Water level - 18.79 mTOC (Dec-2020)
SAND, medium-grained, light brown, becoming coarser towards base		20	148		
		24	144		Grout from surface to 63 mbgl
CLAY, light brownish-grey		28	140		
SAND, fine-grained, light brown					50 mm Class 18 PVC Environmental Casing
CLAY, light greyish-brown Base of Tertiary at 43 mbgl		32	136		
		36	132		
		40	128		
SILTSTONE, light brown Base of Weathering at 49 mbgl		44	124		
		48	120		
SANDSTONE, fine-grained, light grey, siltstone in places		52	116		
		56	112		
MUDSTONE, light to medium-grey		60	108		
CARBONACEOUS MUDSTONE, dark grey					Bentonite Seal - 63 to 64 mbgl
COAL, undefined		64	104		Gravel Pack - 64 to 68 mbgl
COAL, undefined					Screen - machine-slotted 50 mm PVC - 65 to 68 mbgl
		68	100		

JBT consulting

Easting: 645375

Northing: 7528515

Collar RL (mAHD): 168.3

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 68

Project: Meadowbrook

Bore ID: W15_MB1

Drilled Date: 19-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		2	178		Casing Stickup - m
SOIL, dark brown		0			
SAND, medium-grained, medium brown		2	176		
		4	174		
CLAY, light to medium greyish-brown		6	172		Grout from surface to 15 mbgl
		8	170		
SAND, fine to medium-grained, light orange-brown		10	168		50 mm Class 18 PVC Environmental Casing
		12	166		
SAND, coarse to extremely coarse-grained, orange-brown		14	164		
		16	162		Bentonite Seal - 15 to 16 mbgl
		18	160		Water level - 18.05 mTOC (Dec-2020)
		20	158		Gravel Pack - 16 to 23 mbgl
SAND, extremely coarse-grained, light to medium orange-brown Base of Tertiary at 23 mbgl		22	156		Screen - machine-slotted 50 mm PVC - 17 to 23 mbgl
		24	154		

JBT consulting

Easting: 649009

Northing: 7527504

Collar RL (mAHD): 163.6

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 125

Total Depth (m): 23

Project: Meadowbrook

Bore ID: W15_MB2

Drilled Date: 19-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown		0	176		Casing Stickup - m
SAND, medium-grained, medium brown		4	172		
CLAY, light to medium greyish-brown		8	168		
SAND, fine to medium-grained, light orange-brown		12	164		
SAND, coarse to extremely coarse-grained, orange-brown		16	160		Water level - 18.03 mTOC (Dec-2020)
SAND, extremely coarse-grained, light to medium orange-brown Base of Tertiary at 23 mbgl		20	156		
SILTSTONE, light to medium orange-brown		24	152		Grout from surface to 56.5 mbgl
SANDSTONE, fine to coarse-grained, becoming extremely coarse-grained towards base		28 32 36	148 144 140		50 mm Class 18 PVC Environmental Casing
SILTSTONE, brownish-grey Base of Weathering at 44 mbgl		40	136		
SANDSTONE, fine-grained, medium to dark grey		44	132		
CARBONACEOUS SILTSTONE, dark grey		48	128		
SILTSTONE, medium to dark grey					
SANDSTONE, fine-grained, light grey		52 56	124 120		Bentonite Seal - 56.5 to 57.5 mbgl Gravel Pack - 57.5 to 60 mbgl
COAL, Vermont Upper Seam		60			Screen - machine-slotted 50 mm PVC - 58.5 to 60 mbgl

JBT consulting

Easting: 649009

Northing: 7527504

Collar RL (mAHD): 163.6

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 60

Project: Meadowbrook

Bore ID: W15_MB3

Drilled Date: 04-Apr-2020

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown		0	180		Casing Stickup - m
SAND, medium-grained, medium brown					
CLAY, light to medium greyish-brown			170		
SAND, fine to medium-grained, light orange-brown		10			
SAND, coarse to extremely coarse-grained, orange-brown			160		Water level - 18.06 mTOC (Dec-2020)
SAND, extremely coarse-grained, light to medium orange-brown		20			
Base of Tertiary at 23 mbgl					
SILTSTONE, light to medium orange-brown			150		
SANDSTONE, fine to coarse-grained, becoming extremely coarse-grained towards base		30			Grout from surface to 100 mbgl
			140		
SILTSTONE, brownish-grey		40			
Base of Weathering at 44 mbgl					
SANDSTONE, fine-grained, medium to dark grey					
CARBONACEOUS SILTSTONE, dark grey			130		
SILTSTONE, medium to dark grey		50			50 mm Class 18 PVC Environmental Casing
SANDSTONE, fine-grained, light grey					
COAL, Vermont Upper Seam			120		
SILTSTONE, medium to dark grey		60			
SANDSTONE, fine-grained, light grey			110		
		70			
SILTSTONE, medium to dark grey			100		
SANDSTONE, fine-grained, light grey		80			
			90		
		90			
SILTSTONE, medium to dark grey			80		Bentonite Seal - 100 to 101 mbgl
MUDSTONE, dark grey		100			Gravel Pack - 101 to 105 mbgl
COAL, Vermont Lower Seam					Screen - machine-slotted 50 mm PVC - 102 to 105 mbgl

JBT consulting

Easting: 649009

Northing: 7527504

Collar RL (mAHD): 163.6

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig:

Hole Diameter (mm): 120

Total Depth (m): 105

ATTACHMENT C

Bore Construction Logs – Lake Vermont North Project

Project: Lake Vermont Northern Extension

Bore ID: 1238_MB1

Drilled Date: 22-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown, clayey, soft.		0 – 2	166 – 164		Casing stickup 0.77m
Clayey SAND, medium orangey-brown, very soft.		2 – 6	164 – 160		
CLAY, medium yellowish-brown, soft, Tertiary		6 – 12	160 – 154		Grout from surface to 22 mbgl
CLAY, light brownish-cream, soft, Tertiary		12 – 22	154 – 144		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, light purplish-brown to light yellowish brown, stiff, Tertiary		22 – 30	144 – 136		Bentonite Seal - 22 to 23 mbgl Depth to water 22.9 mbgl (Sep 2018) Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 23 to 30 mbgl Screen - machine-slotted 50 mm PVC Environmental Screen - 24 to 30 mbgl

JBT consulting

Easting: 650670.9

Northing: 7522741

Collar RL (mAHD): 165.52

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 30

Project: Lake Vermont Northern Extension **Bore ID: 1238_MB2**

Drilled Date: 22-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown, clayey, soft.		0	164		Casing stickup 0.74 m
Clayey SAND, medium orangey-brown, very soft.		4	160		
CLAY, medium yellowish-brown to light brownish-cream, soft.		8	156		Grout from surface to 51 mbgl
CLAY, light purplish-brown to light yellowish brown, stiff.		16	148		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, medium brown. Base of Tertiary at 42 mbgl		40	124		Depth to water 30.07 mbgl (Sep 2018)
MUDSTONE, medium greyish-brown, clayey, extremely weathered.		44	120		
SANDSTONE, medium yellowish-brown, clayey, slightly weathered.		48	116		Bentonite Seal - 51 to 52 mbgl
COAL, Vermont Lower Seam weathered, dark greyish-black, sooty, muddy bands, slightly weathered, Base of Weathering		52	112		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 52 to 59 mbgl
SANDSTONE, very fine, medium grey, fresh.		56	108		Screen - machine-slotted 50 mm PVC Environmental Screen - 53 to 59 mbgl
		60			

JBT consulting

Easting: 650670.4

Northing: 7522744

Collar RL (mAHD): 165.52

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 58

Project: Lake Vermont Northern Extension

Bore ID: 2218_MB2

Drilled Date: 24-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL brown, soft, Piezo inserted into this hole.		0	172		Casing stickup 0.59 m
Sandy CLAY, brown, firm.		4	168		
SAND, very fine to medium creamy-brown, clayey, friable.		8	164		
Sandy CLAY, cream to light reddish-cream, firm.		12	160		Grout from surface to 57 mbgl
CLAY reddish-cream, firm.		16	156		
Sandy CLAY, reddish-cream, firm.					50 mm PVC - Class 18 threaded Environmental Casing
CLAY cream, firm. Base of Tertiary		20	152		Depth to water 21.07 mbgl (Sep 2018)
SANDSTONE, very fine orange-brown to reddish-brown, extremely weathered.		24	148		
SILTSTONE brownish-grey, extremely weathered.					
SANDSTONE, fine brownish-orange, extremely weathered.		28	144		
SILTSTONE creamy-grey to red, extremely weathered.		32	140		
SANDSTONE, very fine light brownish-grey, extremely weathered. Base of Weathering at 35 mbgl		36	136		
SANDSTONE, very fine grey, fresh.		40	132		
SILTSTONE medium grey, fresh.		44	128		
SANDSTONE, very fine to fine grey, fresh.		48	124		
SILTSTONE medium grey, fresh.		52	120		
SANDSTONE, fine grey, fresh.		56	116		Bentonite Seal - 57 to 58 mbgl
SILTSTONE medium grey, fresh.					Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 58 to 65 mbgl
SANDSTONE, very fine to fine grey, fresh.		60	112		
SILTSTONE medium grey, fresh.					Screen - machine-slotted 50 mm PVC Environmental Screen - 59 to 65 mbgl
SANDSTONE, very fine grey, silty, fresh. Triassic Rewan Group		64	108		
		68			

JBT consulting

Easting: 650670.4

Northing: 7522744

Collar RL (mAHD): 165.52

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 58

Project: Lake Vermont Northern Extension

Bore ID: 2218_MB3

Drilled Date: 24-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL brown, soft, Piezo inserted into this hole.		0	175		Casing stickup 0.75 m
Sandy CLAY, brown, firm.		5	170		
SAND, very fine to medium creamy-brown, clayey, friable.		10	165		Grout from surface to 83 mbgl
Sandy CLAY, cream to light reddish-cream, firm.		15	160		
CLAY reddish-cream, firm.		20	155		
Sandy CLAY, reddish-cream, firm.		25	150		Depth to water 21.11 mbgl (Sep 2018)
CLAY cream, firm. Base of Tertiary		30	145		
SANDSTONE, very fine orange-brown to reddish-brown, extremely weathered.		35	140		50 mm PVC - Class 18 threaded Environmental Casing
SILTSTONE brownish-grey, extremely weathered.		40	135		
SANDSTONE, fine brownish-orange, extremely weathered.		45	130		
SILTSTONE creamy-grey to red, extremely weathered.		50	125		
SANDSTONE, very fine light brownish-grey, extremely weathered. Base of Weathering at 35 mbgl		55	120		
SANDSTONE, very fine grey, fresh.		60	115		
SILTSTONE medium grey, fresh.		65	110		
SANDSTONE, very fine to fine grey, fresh.		70	105		
SILTSTONE medium grey, fresh.		75	100		
SANDSTONE, very fine grey, fresh.		80	95		
SILTSTONE medium grey, fresh.		85	90		
SANDSTONE, very fine to fine grey, fresh.		90	85		
SILTSTONE medium grey, fresh.					
SANDSTONE, fine grey, fresh.					
SILTSTONE medium grey, fresh.					
SANDSTONE, very fine to fine grey, fresh.					
SILTSTONE medium grey, fresh.					
SANDSTONE, very fine grey, silty, fresh. Base of Triassic Rewan Group					
MUDSTONE dark grey, fresh.					
SANDSTONE, very fine to fine grey, silty, fresh.					
SILTSTONE medium grey, fresh.					
SANDSTONE, fine to medium light grey, fresh.					
COAL, Phillips 1 seam black, fresh.					
SANDSTONE, very fine to fine medium grey, silty, fresh.					
SILTSTONE medium grey, fresh.					
SANDSTONE, very fine light grey, fresh.					
SANDSTONE, fine to medium light grey, fresh.					
CARBONACEOUS MUDSTONE dark blackish-grey, fresh.					
COAL, Leichhardt seam black, fresh.					
COALY SHALE black, fresh.					Bentonite Seal - 83 to 84 mbgl Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 84 to 88 mbgl Screen - machine-slotted 50 mm PVC Environmental Screen - 85 to 88 mbgl

JBT consulting

Easting: 645523

Northing: 7522754

Collar RL (mAHD): 173.17

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 88

Project: Lake Vermont Northern Extension

Bore ID: 2226_MB2

Drilled Date: 23-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown, soft.		0 – 2	180 – 178		Casing stickup 0.72 m
SAND, coarse, dark brown, loose.		2 – 6	178 – 172		Grout from surface to 30 mbgl
SAND, coarse, dark brown, clayey, soft, injected.		6 – 10	172 – 168		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, sandy, reddish-brown, soft.		10 – 14	168 – 164		
CLAY, sandy, light reddish-cream, in part, soft. Base of Tertiary		14 – 22	164 – 156		Depth to water 17.46 mbgl (Sep 2018)
SANDSTONE, very fine, reddish-orange, extremely weathered.		22 – 26	156 – 152		
SANDSTONE, very fine, orangey-brown, extremely weathered.		26 – 28	152 – 150		
SILTSTONE, brownish-grey, extremely weathered.		28 – 30	150 – 148		Bentonite Seal - 30 to 31 mbgl
SANDSTONE, very fine, orangey-brown, extremely weathered.		30 – 32	148 – 146		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 31 to 382 mbgl
SANDSTONE, fine, creamy-brown, extremely weathered.		32 – 36	146 – 142		Screen - machine-slotted 50 mm PVC Environmental Screen - 32 to 38 mbgl
SILTSTONE, light brownish-grey, slightly weathered.		36 – 38	142 – 140		
SANDSTONE, very fine, grey, slightly weathered. Triassic Rewan Group		38 – 40	140		

JBT consulting

Easting: 643134.1

Northing: 7521947

Collar RL (mAHD): 178.68

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

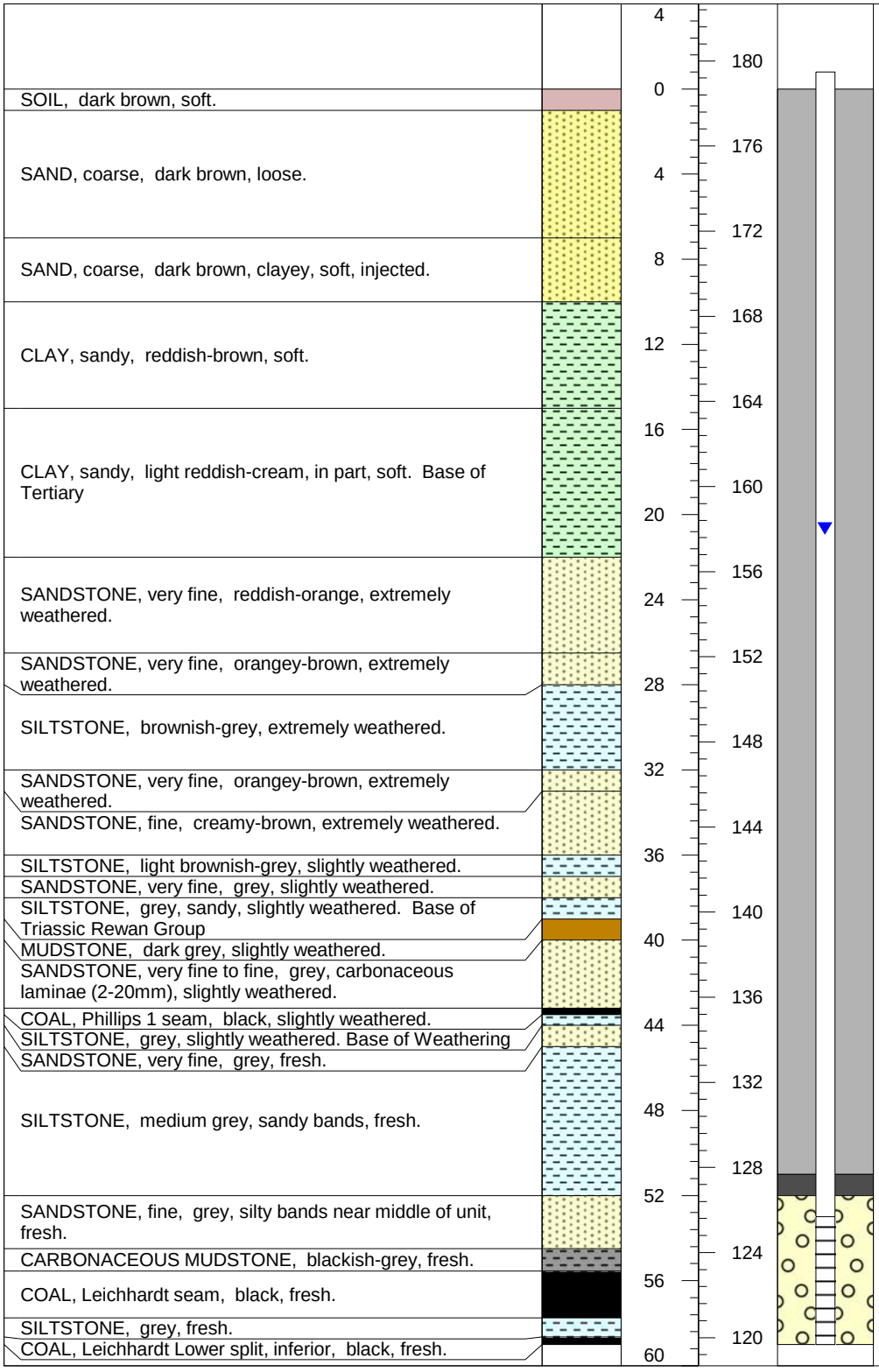
Total Depth (m): 38

Project: Lake Vermont Northern Extension

Bore ID: 2226_MB3

Drilled Date: 23-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, dark brown, soft.		0			Casing stickup 0.65 m
SAND, coarse, dark brown, loose.		4			
SAND, coarse, dark brown, clayey, soft, injected.		8			Grout from surface to 51 mbgl
CLAY, sandy, reddish-brown, soft.		12			50 mm PVC - Class 18 threaded Environmental Casing
CLAY, sandy, light reddish-cream, in part, soft. Base of Tertiary		16			
SANDSTONE, very fine, reddish-orange, extremely weathered.		20			Depth to water 20.65 mbgl (Sep 2018)
SANDSTONE, very fine, orangey-brown, extremely weathered.		24			
SILTSTONE, brownish-grey, extremely weathered.		28			
SANDSTONE, very fine, orangey-brown, extremely weathered.		32			
SANDSTONE, fine, creamy-brown, extremely weathered.		36			
SILTSTONE, light brownish-grey, slightly weathered.		40			
SANDSTONE, very fine, grey, slightly weathered.		44			
SILTSTONE, grey, sandy, slightly weathered. Base of Triassic Rewan Group		48			
MUDSTONE, dark grey, slightly weathered.		52			
SANDSTONE, very fine to fine, grey, carbonaceous laminae (2-20mm), slightly weathered.		56			
COAL, Phillips 1 seam, black, slightly weathered.		60			
SILTSTONE, grey, slightly weathered. Base of Weathering					
SANDSTONE, very fine, grey, fresh.					
SILTSTONE, medium grey, sandy bands, fresh.					
SANDSTONE, fine, grey, silty bands near middle of unit, fresh.					
CARBONACEOUS MUDSTONE, blackish-grey, fresh.					
COAL, Leichhardt seam, black, fresh.					
SILTSTONE, grey, fresh.					
COAL, Leichhardt Lower split, inferior, black, fresh.					



JBT consulting

Easting: 643133.3

Northing: 7521950

Collar RL (mAHD): 178.68

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 59

Project: Lake Vermont Northern Extension

Bore ID: 2372_MB1

Drilled Date: 21-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown, clayey, soft, injected with foam.		0	166		Casing stickup 0.73 m
CLAY, sandy, orangey-brown, loose.		2	164		
CLAY, reddish-grey, lateritic in part, soft.		4	162		
CLAY, sandy, brown, firm.		6	160		
SAND, fine, creamy-brown, clayey, loose.		8	158		Grout from surface to 22 mbgl
SAND, coarse, orangey-brown, loose.		10	156		
CLAY, sandy, brown to whitish-brow, soft, Tertiary		12	154		50 mm PVC - Class 18 threaded Environmental Casing
		14	152		
		16	150		
		18	148		
		20	146		Depth to water 21.39 mbgl (Sep 2018)
SILT, mottled grey to reddish-grey, firm, Tertiary.		22	144		Bentonite Seal - 22 to 23 mbgl
		24	142		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 23 to 30 mbgl
CLAY, white to mottled reddish-grey, firm, Tertiary.		26	140		
		28	138		Screen - machine-slotted 50 mm PVC Environmental Screen - 24 to 30 mbgl
		30	136		
		32			

JBT consulting

Easting: 647519.8

Northing: 7526012

Collar RL (mAHD): 166.75

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 30

Project: Lake Vermont Northern Extension

Bore ID: 2372_MB2

Drilled Date: 21-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, brown, clayey, soft, injected with foam.		0	168		Casing stickup 0.73 m
CLAY, sandy, orangey-brown, loose.					
CLAY, reddish-grey, lateritic in part, soft.		4	164		
CLAY, sandy, brown, firm.					
SAND, fine, creamy-brown, clayey, loose.		8	160		Grout from surface to 38 mbgl
SAND, coarse, orangey-brown, with granules, penny bands (<2mm), loose.					
CLAY, sandy, whitish-brown to brown, soft.		12	156		50 mm PVC - Class 18 threaded Environmental Casing
		16	152		
			148		
		20			Depth to water 21.26 mbgl (Sep 2018)
SILT, mottled grey to reddish-grey, firm.		24	144		
CLAY, white, firm.					
CLAY, mottled reddish-grey, firm.		28	140		
CLAY, greyish-white, soft.		32	136		
CLAY, mottled reddish-grey, firm. Base of Tertiary at 39 mbgl		36	132		
			128		Bentonite Seal - 38 to 39 mbgl
SANDSTONE, very fine to fine, brownish-grey, extremely weathered.		40			Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 39 to 46 mbgl
			124		Screen - machine-slotted 50 mm PVC Environmental Screen - 40 to 46 mbgl
SILTSTONE, brownish-grey, extremely weathered.		44			
SANDSTONE, very fine, brownish-grey, slightly weathered. Base of Triassic Rewan Group at 46 mbgl			120		
		48			

JBT consulting

Easting: 647519.3

Northing: 7526010

Collar RL (mAHD): 166.75

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

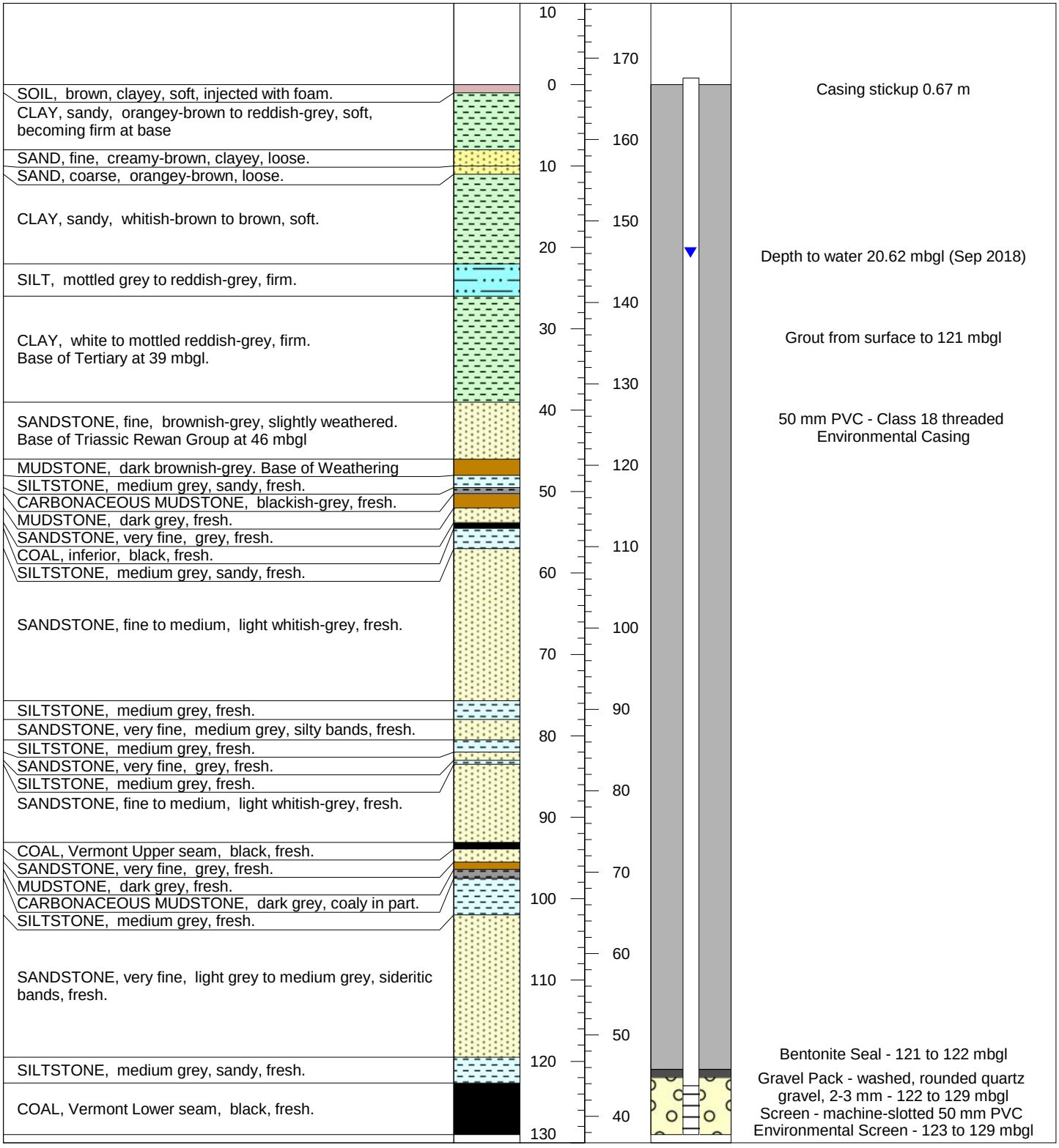
Total Depth (m): 46

Project: Lake Vermont Northern Extension

Bore ID: 2372_MB3

Drilled Date: 20-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes



Easting: 647517.7

Northing: 7526008

Collar RL (mAHD): 166.75

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 129

Project: Lake Vermont Northern Extension **Bore ID: 2375_MB2**

Drilled Date: 19-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		4	172		
CLAY, sandy, brown, loose.		0	168		Casing stickup 0.64 m
CLAY, sandy, dark brown, stiff.		4	164		
SAND, clayey, dark brown, loose.		8	160		
SAND, fine to medium, orangey-brown, loose.					
SAND, fine to medium, greyish-brown, loose.					Grout from surface to 63 mbgl
CLAY, greyish-brown, stiff.		12	156		
SAND, fine to medium, creamy-brown, clayey, loose.		16	152		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, sandy, reddish-brown, loose, injected with foam.					
CLAY, sandy, orangey-cream, soft.		20	148		
CLAY, sandy, cream, soft.					
CLAY, sandy, orangey-cream, soft.		24	144		Depth to water 25.49 mbgl (Sep 2018)
CLAY, sandy, reddish-cream, lateritic in part, soft.		28	140		
CLAY, reddish-cream, lateritic in part, soft.		32	136		
CLAY, sandy, dark orangey-cream, soft. Base of Tertiary		36	132		
SANDSTONE, very fine, brownish-orange, extremely weathered.					
SANDSTONE, fine, brownish-orange, extremely weathered.		40	128		
SANDSTONE, very fine to fine, greyish-brown, extremely weathered.		44	124		
SANDSTONE, fine, greyish-brown, extremely weathered. Base of Weathering		48	120		
SANDSTONE, fine, light whitish-grey, fresh.					
SANDSTONE, very fine, grey, fresh.		52	116		
SANDSTONE, fine, light whitish-grey, fresh, end injection.		56	112		
SILTSTONE, medium grey, sandy, fresh.		60	108		Bentonite Seal - 63 to 64 mbgl
COAL, Vermont seam, black, fresh.		64	104		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 64 to 68 mbgl
		68			Screen - machine-slotted 50 mm PVC Environmental Screen - 65 to 68 mbgl

JBT consulting

Easting: 648041.7

Northing: 7523874

Collar RL (mAHD): 168.18

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 68

Project: Lake Vermont Northern Extension

Bore ID: 2393_MB1

Drilled Date: 19-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
		2	174		Casing stickup 0.71 m
SOIL, creamy-brown, sandy, stiff.		0	172		
CLAY, sandy, medium orangey-brown, soft.		2	170		
SAND, coarse, medium orangey-brown, clayey, loose.		4	168		Grout from surface to 22 mbgl
CLAY, sandy, medium orangey-brown, firm.		6	166		
SAND, fine to coarse, orangey-brown, clayey, loose.		8	164		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, orangey-cream, extremely weathered. Base of Tertiary		10	162		
SILTSTONE, creamy-orange, extremely weathered.		12	160		
SILTSTONE, brownish-cream, extremely weathered.		14	158		
SANDSTONE, fine to medium, dark orangey-brown, clayey, extremely weathered.		16	156		
SILTSTONE, greyish-brown, extremely weathered.		18	154		Depth to water 18.54 mbgl (Sep 2018)
SANDSTONE, very fine, greyish-brown, extremely weathered.		20	152		
SILTSTONE, orangey-brown, extremely weathered.		22	150		Bentonite Seal - 22 to 23 mbgl
SANDSTONE, very fine to fine, orangey-brown, extremely weathered.		24	148		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 23 to 30 mbgl
SILTSTONE, dark orangey-brown, extremely weathered.		26	146		
SANDSTONE, fine, dark brownish-orange, extremely weathered.		28	144		Screen - machine-slotted 50 mm PVC Environmental Screen - 24 to 30 mbgl
SILTSTONE, medium brownish-cream, extremely weathered.		30			
SANDSTONE, fine to medium, brown, extremely weathered.					
SILTSTONE, medium grey, slightly weathered.					
SANDSTONE, very fine, medium grey, silty, slightly weathered.					

JBT consulting

Easting: 645696.1

Northing: 7523043

Collar RL (mAHD): 173.07

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 30

Project: Lake Vermont Northern Extension

Bore ID: 2393_MB2

Drilled Date: 18-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, creamy-brown, sandy, stiff.		0	172		Casing stickup 0.65 m
CLAY, sandy, medium orangey-brown, soft.					
SAND, coarse, medium orangey-brown, clayey, loose.		4	168		
CLAY, sandy, medium orangey-brown, firm.					
SAND, fine to coarse, orangey-brown, clayey, loose.					
CLAY, orangey-cream, extremely weathered. Base of Tertiary		8	164		Grout from surface to 36 mbgl
SILTSTONE, creamy-orange, extremely weathered.					
SANDSTONE, fine to medium, dark orangey-brown, clayey, extremely weathered.					
SILTSTONE, greyish-brown, extremely weathered.		12	160		50 mm PVC - Class 18 threaded Environmental Casing
SANDSTONE, very fine, greyish-brown, extremely weathered.					
SILTSTONE, orangey-brown, extremely weathered.		16	156		
SANDSTONE, very fine to fine, orangey-brown, extremely weathered.					
SILTSTONE, dark orangey-brown, extremely weathered.					
SANDSTONE, fine, dark brownish-orange, extremely weathered.		20	152		Depth to water 20.62 mbgl (Sep 2018)
SILTSTONE, medium brownish-cream, extremely weathered.					
SANDSTONE, fine to medium, brown, extremely weathered.		24	148		
SILTSTONE, medium grey.					
SANDSTONE, very fine, medium grey, silty. Water Struck		28	144		
SILTSTONE, grey, carbonaceous laminae (2-20mm).					
SANDSTONE, fine, grey.		32	140		
SILTSTONE, brownish-grey. Base of Weathering					
SILTSTONE, medium grey, carbonaceous near base of unit, fresh.		36	136		Bentonite Seal - 36 to 37 mbgl
COAL, Leichhardt seam, black, fresh, shaley and stoney at base.					Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 37 to 41 mbgl
SILTSTONE, dark grey, fresh.		40	132		Screen - machine-slotted 50 mm PVC Environmental Screen - 38 to 41 mbgl

JBT consulting

Easting: 645693.5

Northing: 7523043

Collar RL (mAHD): 173.07

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 41

Project: Lake Vermont Northern Extension

Bore ID: 2393_MB3

Drilled Date: 18-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, creamy-brown, sandy, stiff.		0	175		Casing stickup 0.64 m
CLAY, sandy, medium orangey-brown, soft.		5	170		
SAND, coarse, medium orangey-brown, clayey, loose.					
CLAY, sandy, medium orangey-brown, firm.					
SAND, fine to coarse, orangey-brown, clayey, loose.		10	165		
CLAY, orangey-cream. Base of Tertiary					
SILTSTONE, creamy-orange.					
SANDSTONE, very fine, greyish-brown.		15	160		
SILTSTONE, orangey-brown.					
SANDSTONE, very fine to fine, orangey-brown.					
SILTSTONE, dark orangey-brown.		20	155		Depth to water 20.80 mbgl (Sep 2018)
SANDSTONE, fine, dark brownish-orange.					
SILTSTONE, medium brownish-cream.					
SANDSTONE, fine to medium, brown.		25	150		
SILTSTONE, medium grey, slightly weathered.					
SANDSTONE, very fine, medium grey, silty. Water Struck		30	145		Grout from surface to 88 mbgl
SILTSTONE, grey.					
SANDSTONE, fine, grey.					
SILTSTONE, brownish-grey. Base of Weathering		35	140		
COAL, Leichhardt seam, black,shaley and stoney at base.					
SILTSTONE, dark grey, fresh.		40	135		
CARBONACEOUS MUDSTONE, blackish-grey.					
SILTSTONE, dark grey, carbonaceous bands.		45	130		
CARBONACEOUS MUDSTONE, dark greyish-black.					
COAL, Leichhardt Lower split, stony, black, shaly.		50	125		50 mm PVC - Class 18 threaded Environmental Casing
CARBONACEOUS MUDSTONE, blackish-grey.					
SANDSTONE, fine, light grey.		55	120		
		60	115		
MUDSTONE, dark grey, carbonaceous phases.		65	110		
SANDSTONE, fine, medium grey, carbonaceous in part.					
MUDSTONE, dark blackish-grey, carbonaceous.		70	105		
SILTSTONE, medium grey, muddy, sandy bands.		75	100		
SANDSTONE, very fine, medium grey, silty.		80	95		
		85	90		
CARBONACEOUS MUDSTONE, dark blackish-grey.		90	85		Bentonite Seal - 88 to 89 mbgl
COAL, Vermont Lower seam, black.					Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 89 to 96 mbgl
MUDSTONE, dark grey.		95	80		Screen - machine-slotted 50 mm PVC Environmental Screen - 90 to 96 mbgl
		100	75		

JBT consulting

Easting: 645690.9

Northing: 7523043

Collar RL (mAHD): 173.07

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 96

Project: Lake Vermont Northern Extension

Bore ID: 2394_MB1

Drilled Date: 17-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium brown, clayey, soft.		0	174		Casing stickup 0.64 m
CLAY, sandy, light to medium creamy-brown, firm.		2	172		
CLAY, light to dark brown, firm.		4	170		
CLAY, light to dark creamy-brown, firm.		6	168		Grout from surface to 22 mbgl
CLAY, sandy, orangey-brown, firm.		8	166		
CLAY, creamy-brown, firm.		10	164		
CLAY, sandy, creamy-brown, firm.		12	162		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, mottled brownish-grey, firm. Base of Tertiary at 18 mbgl (Dry)		14	160		
SILTSTONE, medium brown, extremely weathered.		16	158		
		18	156		
		20	154		
		22	152		Bentonite Seal - 22 to 23 mbgl
		24	150		Depth to water 23.56 mbgl (Sep 2018)
SANDSTONE, fine, light to medium brownish-grey, extremely weathered. Upper section of Triassic Rewan Group		26	148		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 23 to 30 mbgl
		28	146		
		30	144		Screen - machine-slotted 50 mm PVC Environmental Screen - 24 to 30 mbgl
		32	142		

JBT consulting

Easting: 644897.8

Northing: 7522962

Collar RL (mAHD): 173.8

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 30

Project: Lake Vermont Northern Extension

Bore ID: 2394_MB2

Drilled Date: 17-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, medium brown, clayey, soft.		0	180		Casing stickup 0.4 m
CLAY, sandy, light to medium creamy-brown, firm.					
CLAY, light to dark creamy-brown, firm.			170		
CLAY, sandy, orangey-brown, firm.		10			
CLAY, creamy-brown, firm.			160		
CLAY, sandy, creamy-brown, firm.					
CLAY, mottled brownish-grey, firm.					
Base of Tertiary at 18 mbgl		20	150		Depth to water 21.54 mbgl (Sep 2018)
SILTSTONE, medium brown, extremely weathered.					
SANDSTONE, fine, light to medium brownish-grey, extremely weathered.		30	140		
SILTSTONE, medium brownish-grey, slightly weathered.					
SANDSTONE, fine, brownish-grey, slightly weathered.		40	130		Grout from surface to 115 mbgl
SILTSTONE, brownish-grey, slightly weathered.					
SANDSTONE, fine, light to medium brownish-grey.		50	120		
SILTSTONE, brownish-grey, slightly weathered.					
SANDSTONE, brownish-grey. Base of Weathering					
SILTSTONE, medium to dark grey, fresh.		60	110		50 mm PVC - Class 18 threaded Environmental Casing
SANDSTONE, fine, grey, coarser near middle of unit.					
SILTSTONE, medium to dark grey.					
SANDSTONE, fine, grey.					
SILTSTONE, medium to dark grey.		70	100		
SANDSTONE, fine, medium to dark grey.					
SILTSTONE, grey, sandstone bands near middle of unit.		80	90		
SANDSTONE, fine, grey, abundant (30-60%) siltstone bands.					
SANDSTONE, fine to medium, light to medium grey.					
SILTSTONE, medium to dark grey, sandstone bands near middle of unit.		90	80		
SANDSTONE, fine, grey, siltstone bands.					
SILTSTONE, grey.		100	70		
SANDSTONE, fine to medium, grey, siltstone bands.					
SILTSTONE, medium to dark grey, sandstone bands near base of unit.					
SANDSTONE, fine to medium, grey, siltstone bands near middle of unit.		110	60		Bentonite Seal - 115 to 116 mbgl
SILTSTONE, medium to dark grey.					Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 116 to 123 mbgl
SANDSTONE, fine to medium, grey, siltstone bands.		120	50		Screen - machine-slotted 50 mm PVC Environmental Screen - 117 to 123 mbgl
SILTSTONE, dark grey, abundant (30-60%) sandstone bands.					
Lower section of Triassic Rewan Group		130			

JBT consulting

Easting: 644895.2

Northing: 7522962

Collar RL (mAHD): 173.8

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 123

Project: Lake Vermont Northern Extension

Bore ID: West_MB1

Drilled Date: 24-Nov-2017

Lithological Description	Graphic Log	Depth (m)	Elevation (mAHD)	Bore Design	Bore Construction/ General Drilling Notes
SOIL, light brown, soft.		0	184		Casing stickup 0.72 m
CLAY, light brown, sandstone, firm.		2	182		
CLAY, creamy-brown, firm.		4	180		
CLAY, cream, firm.		6	178		Grout from surface to 25 mbgl
CLAY, mottled reddish-brown, firm.		8	176		
CLAY, cream, stiff.		10	174		50 mm PVC - Class 18 threaded Environmental Casing
CLAY, cream, with sandy granules, stiff.		12	172		
CLAY, mottled greyish-brown, stiff. Base of Tertiary at 27 mbgl.		14	170		
		16	168		
		18	166		
		20	164		Depth to water 20.89 mbgl (Sep 2018)
		22	162		
		24	160		
		26	158		Bentonite Seal - 25 to 26 mbgl
		28	156		Gravel Pack - washed, rounded quartz gravel, 2-3 mm - 26 to 30 mbgl
SILTSTONE, brown, extremely weathered.		30	154		Screen - machine-slotted 50 mm PVC Environmental Screen - 27 to 30 mbgl

JBT consulting

Easting: 642872.3

Northing: 7519929

Collar RL (mAHD): 183.97

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

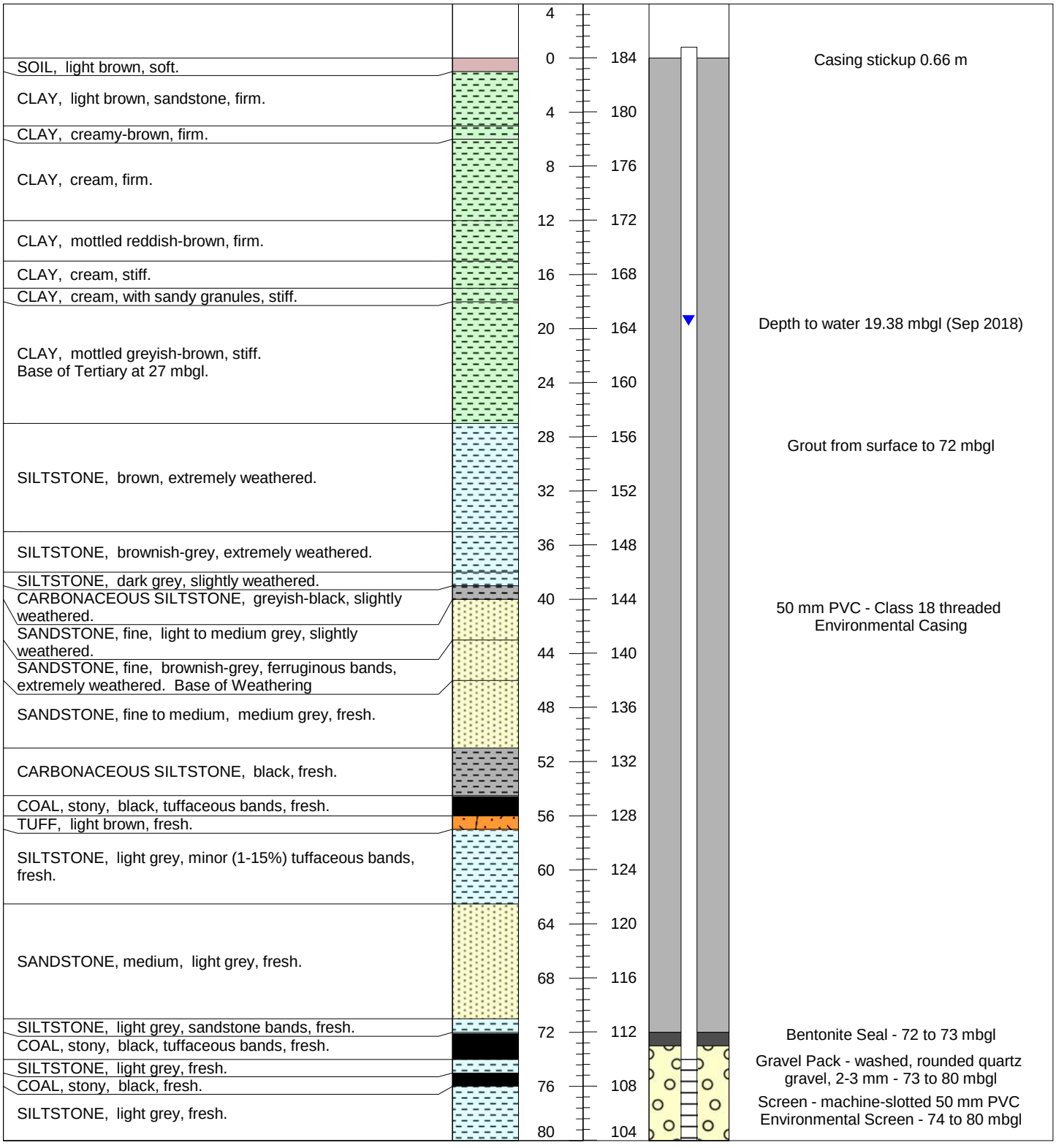
Hole Diameter (mm): 125

Total Depth (m): 30

Project: Lake Vermont Northern Extension

Bore ID: West_MB2

Drilled Date: 23-Nov-2017



Easting: 642872.9

Northing: 7519932

Collar RL (mAHD): 183.97

Co-ord System: AGD84

Drilling Company: Hodge Drilling

Drill Rig: Gardener Denver 1400

Hole Diameter (mm): 125

Total Depth (m): 80

ATTACHMENT D

Groundwater Quality Data

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W1_MB1	20-Oct-2020	Tertiary sediments	6.77	7.32	500	524	296	16	11	71	2	127	16	<1	<1	47	47	<20	<50	<100	<50	<50
W1_MB1	09-Dec-2020	Tertiary sediments	6.79	7.31	8817	8250	5240	86	148	1330	15	2820	300	<1	<1	204	204	<20	<50	<100	<50	<50
W1_MB1	05-Jan-2021	Tertiary sediments	6.82	7.26	17339	25800	18600	367	682	5900	60	9220	1010	<1	<1	565	565	<20	<50	<100	<50	<50
W1_MB1	26-Jan-2021	Tertiary sediments	6.7	7.33	27524	27900	17700	248	470	4110	41	9750	1070	<1	<1	640	640	<20	<50	<100	<50	<50
W1_MB1	17-Feb-2021	Tertiary sediments	6.67	7.19	24171	27900	18600	282	548	4720	48	10000	1080	<1	<1	653	653	<20	<50	<100	<50	<50
W1_MB1	24-Mar-2021	Tertiary sediments	6.71	7.19	27160	27200	20000	316	593	5260	52	9530	1110	<1	<1	629	629	<20	<50	<100	<50	<50
W1_MB1	14-Apr-2021	Tertiary sediments	6.65	7.68	24503	28100	18300	321	557	4880	54	9800	1060	<1	<1	654	654	<20	<50	<100	<50	<50
W1_MB1	26-May-2021	Tertiary sediments	6.76	7.6	23665	27500	19900	260	553	4740	47	9800	1080	<1	<1	668	668	<20	<50	<100	<50	<50
W1_MB1	29-Jun-2021	Tertiary sediments	6.51	7.41	28371	28400	20000	340	670	5960	60	9860	1080	<1	<1	666	666	<20	<50	<100	<50	<50
W1_MB1	26-Jul-2021	Tertiary sediments	6.58	7.77	27454	28700	21300	343	671	5870	59	10100	1130	<1	<1	665	665	<20	<50	<100	<50	<50
W1_MB1	24-Aug-2021	Tertiary sediments	6.54	7.54	26085	29000	21600	321	566	4790	54	10300	1070	<1	<1	622	622	<20	<50	<100	<50	<50
W1_MB1	14-Sep-2021	Tertiary sediments	6.5	7.23	26115	28500	19700	292	571	5180	54	9820	1140	<1	<1	638	638	<20	<50	<100	<50	<50
W1_MB1	19-Oct-2021	Tertiary sediments	6.59	7.65	30151	30000	21000	331	684	6240	60	9600	1010	<1	<1	706	706	<20	<50	<100	<50	<50
W1_MB1	16-Nov-2021	Tertiary sediments	6.37	7.48	28576	27600	21100	334	653	5660	58	10000	1070	<1	<1	701	701	<20	<50	<100	<50	<50
W1_MB1	09-Dec-2021	Tertiary sediments	6.22	7.56	28568	29300	21900	398	706	6560	64	10400	1130	<1	<1	701	701	<20	<50	<100	<50	<50
W1_MB1	25-Jan-2022	Tertiary sediments	6.27	7.77	29013	29900	21300	357	673	5970	60	10300	1140	<1	<1	709	709	<20	<50	<100	<50	<50
W1_MB1	15-Feb-2022	Tertiary sediments	6.68	7.76	29407	23900	20400	374	669	5950	60	10100	988	<1	<1	638	638	<20	<50	<100	<50	<50
W1_MB1	16-Mar-2022	Tertiary sediments	6.69	7.51	28667	33000	21900	345	647	5870	57	10200	1090	<1	<1	660	660	<20	<50	<100	<50	<50
W1_MB1	03-May-2022	Tertiary sediments	6.67	7.35	30047	28700	21900	408	622	5520	60	9830	1080	<1	<1	704	704	<20	<50	<100	<50	<50
W1_MB1	31-May-2022	Tertiary sediments	6.61	7.69	30429	29400	20700	378	716	6500	61	9910	1140	<1	<1	649	649	<20	<50	<100	<50	<50
W1_MB1	22-Jun-2022	Tertiary sediments	6.65	7.62	24870	29800	21300	343	692	6320	63	9830	1160	<1	<1	688	688	<20	<50	<100	<50	<50
W1_MB1	20-Jul-2022	Tertiary sediments	6.62	7.42	30317	30600	22400	352	649	5980	58	10100	1130	<1	<1	722	722	<20	<50	<100	<50	<50
W1_MB1	31-Aug-2022	Tertiary sediments	6.58	7.49	28893	29400	21300	337	629	5600	54	10500	1150	<1	<1	651	651	<20	<50	<100	<50	<50
W1_MB1	06-Oct-2022	Tertiary sediments	6.62	7.93	28874	29400	21200	301	622	5690	55	9940	1150	<1	<1	728	728	<20	<50	<100	<50	<50
W12_MB1	20-Oct-2020	Tertiary sediments	6.69	7.68	20531	23000	15700	439	545	3440	29	7610	1290	<1	<1	399	399	<20	<50	<100	<50	<50
W12_MB1	09-Dec-2020	Tertiary sediments	6.89	7.51	21685	22900	15900	508	716	4400	31	8120	1250	<1	<1	463	463	<20	<50	<100	<50	<50
W12_MB1	05-Jan-2021	Tertiary sediments	6.88	7.33	23609	22400	16800	475	652	4010	27	8000	1260	<1	<1	442	442	<20	<50	<100	<50	<50
W12_MB1	26-Jan-2021	Tertiary sediments	6.79	7.34	22395	22700	15400	489	668	4070	26	7920	1240	<1	<1	475	475	<20	<50	<100	<50	<50
W12_MB1	17-Feb-2021	Tertiary sediments	6.73	7.28	23249	22300	17100	483	666	4000	26	8110	1240	<1	<1	482	482	<20	<50	<100	<50	<50
W12_MB1	24-Mar-2021	Tertiary sediments	6.77	7.29	22982	21700	17000	483	655	4150	24	7580	1240	<1	<1	464	464	<20	<50	<100	<50	<50
W12_MB1	14-Apr-2021	Tertiary sediments	6.8	7.72	21757	22500	15800	436	549	3270	24	7760	1200	<1	<1	488	488	<20	<50	<100	<50	<50
W12_MB1	26-May-2021	Tertiary sediments	6.88	7.51	20716	21800	15900	422	548	3360	25	7770	1180	<1	<1	484	484	<20	<50	<100	<50	<50
W12_MB1	29-Jun-2021	Tertiary sediments	6.62	7.46	23395	22600	16600	470	608	3820	26	7920	1210	<1	<1	503	503	<20	<50	<100	<50	<50
W12_MB1	26-Jul-2021	Tertiary sediments	6.73	7.76	20900	22600	17800	512	716	4260	25	7880	1250	<1	<1	499	499	<20	<50	<100	<50	<50
W12_MB1	24-Aug-2021	Tertiary sediments	6.59	7.74	21990	22600	17200	511	637	3820	27	7790	1190	<1	<1	460	460	<20	<50	<100	<50	<50
W12_MB1	15-Sep-2021	Tertiary sediments	6.48	7.33	22315	22500	16600	418	579	3650	24	7850	1250	<1	<1	483	483	<20	<50	<100	<50	<50
W12_MB1	19-Oct-2021	Tertiary sediments	6.61	7.68	22465	23400	17000	434	609	3740	24	7500	1090	<1	<1	509	509	<20	<50	<100	50	50
W12_MB1	16-Nov-2021	Tertiary sediments	6.4	7.52	23010	22000	17200	480	655	4260	24	7600	1170	<1	<1	513	513	<20	<50	<100	<50	<50
W12_MB1	09-Dec-2021	Tertiary sediments	6.28	7.61	22907	22700	17200	510	644	4100	23	7920	1210	<1	<1	516	516	<20	<50	<100	<50	<50
W12_MB1	25-Jan-2022	Tertiary sediments	6.32	7.8	22828	23100	17600	434	622	3790	24	7920	1200	<1	<1	528	528	<20	<50	<100	<50	<50
W12_MB1	22-Feb-2022	Tertiary sediments	6.56	7.25	22966	22400	16800	496	660	3730	24	7630	1200	<1	<1	499	499	<20	<50	<100	<50	<50
W12_MB1	16-Mar-2022	Tertiary sediments	6.7	7.6	21911	27500	17700	491	678	3990	24	8100	1180	<1	<1	494	494	<20	<50	<100	<50	<50
W12_MB1	03-May-2022	Tertiary sediments	6.7	7.49	22015	22900	18200	502	653	3720	24	7560	1180	<1	<1	530	530	<20	<50	<100	<50	<50
W12_MB1	31-May-2022	Tertiary sediments	6.62	7.65	23439	22600	16000	473	695	4220	25	7670	1190	<1	<1	484	484	<20	<50	<100	<50	<50
W12_MB1	22-Jun-2022	Tertiary sediments	6.65	7.29	17871	23000	16800	462	695	4240	24	7570	1230	<1	<1	503	503	<20	<50	<100	<50	<50
W12_MB1	20-Jul-2022	Tertiary sediments	6.61	7.56	22278	23800	17100	435	659	4180	24	7790	1200	<1	<1	533	533	<20	<50	<100	<50	<50
W12_MB1	31-Aug-2022	Tertiary sediments	6.57	7.45	23025	21400	17300	415	584	3770	22	7800	1270	<1	<1	472	472	<20	<50	<100	<50	<50
W12_MB1	04-Oct-2022	Tertiary sediments	6.64	7.92	22960	24200	17100	439	638	3880	24	7570	1220	<1	<1	517	517	<20	<50	<100	<50	<50
W14_MB1	20-Oct-2020	Tertiary sediments	6.48	7.28	178.8	144	89	9	4	15	2	17	1	<1	<1	35	35	<20	<50	120	70	190
W14_MB1	16-Dec-2020	Tertiary sediments	6.56	7.28	491	528	323	11	10	85	7	97	44	<1	<1	75	75	<20	<50	170	70	240
W14_MB1	26-Jan-2021	Tertiary sediments	6.07	6.95	1202	1410	880	17	23	206	10	223	210	<1	<1	213	213	<20	<50	<100	<50	<50
W14_MB1	17-Feb-2021	Tertiary sediments	5.77	6.66	1099	1090	715	12	17	170	9	178	148	<1	<1	140	140	<20	<50	<100	<50	<50
W14_MB1	24-Mar-2021	Tertiary sediments	5.84	6.62	999	941	611	10	14	155	8	158	130	<1	<1	98	98	<20	<50	<100	<50	<50
W14_MB1	14-Apr-2021	Tertiary sediments	5.81	7.05	963	918	589	10	16	160	8	164	130	<1	<1	100	100	<20	<50	<100	<50	<50
W14_MB1	26-May-2021	Tertiary sediments	6.03	6.99	842	842	558	9	13	149	7	146	117	<1	<1	90	90	<20	<50	<100	<50	<50
W14_MB1	29-Jun-2021	Tertiary sediments	5.98	7.04	893	874	1430	9	12	154	8	155	115	<1	<1	104	104	<20	<50	<100	<50	<50
W14_MB1	26-Jul-2021	Tertiary sediments	6.06	7.45	889	909	744	9	14	164	8	153	116	<1	<1	100	100	<20	<50	<100	<50	<50
W14_MB1	24-Aug-2021	Tertiary sediments	5.89	7.03	903	880	579	9	12	139	8	144	112	<1	<1	91	91	<20	<50	<100	<50	<50
W14_MB1	15-Sep-2021	Tertiary sediments	5.83	6.65	955	896	586	8	12	148	8	153	123	<1	<1	105	105	<20	<50	<100	<50	<50
W14_MB1	19-Oct-2021	Tertiary sediments	5.88	7.26	1001	912	936	11	15	169	9	160	122	<1	<1	106	106	<20	<50	<100	<50	<50
W14_MB1	16-Nov-2021	Tertiary sediments	5.62	6.8	1012	973	593	11	17	190	9	160	130	<1	<1	99	99	<20	<50	<100	<50	<50
W14_MB1	09-Dec-2021	Tertiary sediments	5.69	6.99	1063	1040	779	12	17	181	8	177	145	<1	<1	121	121	<20	<50	<100	<50	<50
W14_MB1	25-Jan-2022	Tertiary sediments	5.8	7.32	1060	1140	725	14	16	171	8	168	149	<1	<1	172	172	<20	<50	<100	<50	<50
W14_MB1	22-Feb-2022	Tertiary sediments	5.84	6.79	972	961	788	11	16	154	8	138	121	<1	<1	135	135	<20	<50	<100	<50	<50
W14_MB1	16-Mar-2022	Tertiary sediments	6.11	6.84	911	912	679	11	14	160	8	146	124	<1	<1	119	119	<20	<50	<100	<50	<50
W14_MB1	03-May-2022	Tertiary sediments	6.09	6.69	1024	917	765	10	14	154	8	142	124	<1	<1	121	121	<20	<50	<100	<50	<50
W14_MB1	31-May-2022	Tertiary sediments	6.41	7.36	1207	1160	846	19	19	178	9	151	143	<1	<1	188	188	<20	<50	<100	<50	<50
W14_MB1	22-Jun-2022	Tertiary sediments	6.47	6.98	999	1160	767	51	23	187	9	173	158	<1	<1	220	220	<20	<50	<100	<50	<50
W14_MB1	20-Jul-2022	Tertiary sediments	6.46	7.34	1220	1200	779	56	20	169	8	161	151	<1	<1	210	210	<20	<50	<100	<50	<50
W14_MB1	31-Aug-2022	Tertiary sediments	6.38	7.03	1129	1130	693	45	18	163	8	150	152	<1	<1	182	182	<20	<50	<100	<50	<50
W14_MB1	04-Oct-2022	Tertiary sediments	6.38	7.7	1105	31400	23000	497	779	6760	26	10800	1040	<1	<1	494	494	<20	<50	<100	<50	<50
W2_MB1	20-Oct-2020	Tertiary sediments	6.77	7.54	2121	3920	2200	57	62	660	16	1140	76	<1	<1	142	142	40	<50	<100	<50	<50
W2_MB1	09-Dec-2020	Tertiary sediments	6.7	7.22	12004	13100	8360	133	272	2390	26	4610	378	<1	<1	342	342	<20	<50	<100	<50	<50
W2_MB1	05-Jan-2021	Tertiary sediments	6.78	7.16	19500	21400	15500	214	412	3580	37	7870	710	<1	<1	496	496	<20	<50	<100	<50	<50
W2_MB1	26-Jan-2021	Tertiary sediments	6.67	7.33	25411	26200	16100	284	570	4910	46	9190	849	<1	<1	590	590	<20	<50	<100	<50	<50
W2_MB1	17-Feb-2021	Tertiary sediments	6.61	7.13	26933	27700	20200	320	659	5680	53	10000	962	<1	<1	684	684	<20	<50	<100	<50	<50
W2_MB1	24-Mar-2021	Tertiary sediments	6.62	7.18	29328	27400	20500	320	633	5660	50	9770	869	<1	<1	653	653	<20	<50	<100	<50	<50
W2_MB1	14-Apr-2021	Tertiary sediments	6.62	7.67	26882	27200	18000	335	598	5230	54	9520	853	<1	<1	670	670	<20	<50	<100	<50	<50
W2_MB1	26-May-2021	Tertiary sediments	6.72	7.43	27320	27800	19300	290	660	5660	51	9970	889	<1	<1	699	699	<20	<50	<100	<50	<50
W2_MB1	29-Jun-2021	Tertiary sediments	6.53	7.42	23776	23100	16500	239	472	4090	43	8240	774	<1	<1	594	594	<20	<50	<100	<50	<50
W2_MB1	26-Jul-2021	Tertiary sediments	6.56	7.76	29704	28900	21400	417	658	5360	50	10200	929	<1	<1	698	698	<20	<50	<100	<50	<50
W2_MB1	24-Aug-2021	Tertiary sediments	6.46	7.6	29997	30200	23400	362	675	5770	60	10600	962	<1	<1	704	704	<20	<50	<100	<50	<50
W2_MB1	14-Sep-2021	Tertiary sediments	6.39	7.15	30059	30300	20900	302	587	5290	48	10400	958	<1	<1	703	703	<20	<50	<100	<50	<50
W2_MB1	19-Oct-2021	Tertiary sediments	6.52	7.6	29453	29900	20900	323	631	6170	56	9960	915	<1	<1	718	718	<20	<50	<100	<50	<50
W2_MB1	16-Nov-2021	Tertiary sediments	6.32	7.33	29711	28400	21100	324	665	5720	54	10100	944	<1	<1	726	726	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W2_MB1	09-Dec-2021	Tertiary sediments	6.17	7.4	30904	31000	22800	351	685	6110	56	10600	931	<1	<1	758	758	<20	<50	<100	<50	<50
W2_MB1	25-Jan-2022	Tertiary sediments	6.25	7.66	30819	30800	22300	341	702	6090	56	10500	943	<1	<1	756	756	<20	<50	<100	<50	<50
W2_MB1	22-Feb-2022	Tertiary sediments	6.3	7.23	30991	30700	23400	304	692	6030	54	10300	982	<1	<1	738	738	<20	<50	<100	<50	<50
W2_MB1	16-Mar-2022	Tertiary sediments	6.59	7.46	30122	34700	22400	295	667	5630	50	10900	910	<1	<1	712	712	<20	<50	<100	<50	<50
W2_MB1	03-May-2022	Tertiary sediments	6.61	7.35	30110	30200	24200	383	662	5870	58	10200	916	<1	<1	773	773	<20	<50	<100	<50	<50
W2_MB1	31-May-2022	Tertiary sediments	6.57	7.58	30851	29800	21000	376	768	6810	60	10200	922	<1	<1	692	692	<20	<50	<100	<50	<50
W2_MB1	22-Jun-2022	Tertiary sediments	6.58	7.22	25277	31200	21800	328	729	6500	60	10400	955	<1	<1	741	741	<20	<50	<100	<50	<50
W2_MB1	20-Jul-2022	Tertiary sediments	6.51	7.33	30383	31400	21100	346	698	6320	55	10700	943	<1	<1	777	777	<20	<50	<100	<50	<50
W2_MB1	31-Aug-2022	Tertiary sediments	6.48	7.34	31230	28400	22200	377	743	6400	58	10600	954	<1	<1	680	680	<20	<50	<100	<50	<50
W2_MB1	04-Oct-2022	Tertiary sediments	6.53	7.96	32825	32300	22100	374	720	7340	64	10500	997	<1	<1	756	756	<20	<50	<100	<50	<50
W3_MB2	20-Oct-2020	Tertiary sediments	6.41	7.43	11685	13000	8830	248	442	1990	27	4180	821	<1	<1	248	248	<20	<50	<100	<50	<50
W3_MB2	09-Dec-2020	Tertiary sediments	6.62	7.17	11400	16800	11700	327	656	2940	37	5820	1010	<1	<1	371	371	<20	<50	<100	<50	<50
W3_MB2	05-Jan-2021	Tertiary sediments	6.7	7.2	15749	17500	13600	291	521	2420	31	6280	1160	<1	<1	371	371	<20	<50	<100	<50	<50
W3_MB2	26-Jan-2021	Tertiary sediments	6.61	7.3	17618	18900	12600	336	607	2790	36	6540	1180	<1	<1	422	422	<20	<50	<100	<50	<50
W3_MB2	17-Feb-2021	Tertiary sediments	6.6	7.16	12118	14300	10700	279	495	2320	30	5000	979	<1	<1	334	334	<20	<50	<100	<50	<50
W3_MB2	24-Mar-2021	Tertiary sediments	6.59	7.16	19463	18700	14700	382	692	3210	40	6490	1240	<1	<1	421	421	<20	140	<100	<50	140
W3_MB2	14-Apr-2021	Tertiary sediments	6.56	7.66	18547	19900	13600	378	686	3020	38	6770	1220	<1	<1	459	459	<20	70	<100	<50	70
W3_MB2	26-May-2021	Tertiary sediments	6.65	7.4	7311	9280	5910	172	298	1340	18	3050	590	<1	<1	237	237	<20	<50	<100	<50	<50
W3_MB2	29-Jun-2021	Tertiary sediments	6.45	7.36	12116	19300	14400	358	619	2910	41	6620	1310	<1	<1	447	447	<20	<50	<100	<50	<50
W3_MB2	26-Jul-2021	Tertiary sediments	6.52	7.67	19177	19500	15400	388	735	3340	42	6770	1240	<1	<1	444	444	<20	<50	<100	<50	<50
W3_MB2	24-Aug-2021	Tertiary sediments	6.43	7.51	19523	19600	15300	412	702	3100	44	6680	1200	<1	<1	427	427	<20	50	<100	<50	50
W3_MB2	15-Sep-2021	Tertiary sediments	6.31	7.28	19966	20100	14800	354	648	3090	40	6910	1300	<1	<1	447	447	<20	<50	<100	<50	<50
W3_MB2	21-Oct-2021	Tertiary sediments	6.48	7.59	19595	20100	14800	374	697	3210	42	6380	1140	<1	<1	455	455	<20	<50	<100	<50	<50
W3_MB2	16-Nov-2021	Tertiary sediments	6.25	7.43	19445	19000	14700	384	700	3390	40	6520	1150	<1	<1	458	458	<20	<50	<100	<50	<50
W3_MB2	09-Dec-2021	Tertiary sediments	6.16	7.47	18682	19600	14900	382	626	3050	36	6670	1220	<1	<1	458	458	<20	<50	<100	<50	<50
W3_MB2	25-Jan-2022	Tertiary sediments	6.21	7.91	19365	17500	14000	349	658	3040	39	6710	1250	<1	<1	270	270	<20	<50	<100	<50	<50
W3_MB2	22-Feb-2022	Tertiary sediments	6.44	7.25	19377	19700	15900	380	680	2900	37	6680	1220	<1	<1	453	453	<20	<50	<100	<50	<50
W3_MB2	16-Mar-2022	Tertiary sediments	6.62	7.46	18838	22600	15200	354	653	3090	40	6620	1160	<1	<1	428	428	<20	<50	<100	<50	<50
W3_MB2	03-May-2022	Tertiary sediments	6.58	7.43	20368	19500	16300	364	624	2860	38	6620	1210	<1	<1	474	474	<20	<50	<100	<50	<50
W3_MB2	31-May-2022	Tertiary sediments	6.57	7.61	19634	20000	14300	352	670	3150	38	6640	1200	<1	<1	416	416	<20	<50	<100	<50	<50
W3_MB2	22-Jun-2022	Tertiary sediments	6.58	7.27	16465	19800	15200	371	724	3370	41	6570	1220	<1	<1	445	445	<20	<50	<100	<50	<50
W3_MB2	20-Jul-2022	Tertiary sediments	6.51	7.35	19178	20100	15100	354	661	3180	40	6680	1220	<1	<1	476	476	<20	<50	<100	<50	<50
W3_MB2	31-Aug-2022	Tertiary sediments	6.49	7.36	19964	18500	15600	354	668	3000	37	6470	1220	<1	<1	417	417	<20	<50	<100	<50	<50
W3_MB2	04-Oct-2022	Tertiary sediments	6.57	7.55	19448	19700	14800	360	681	3090	39	6360	1200	<1	<1	447	447	<20	<50	<100	<50	<50
W4_MB1	10-Mar-2021	Quaternary alluvium		7.34		18800	10900	362	616	2930	26	6800	1170	<1	<1	507	507	20	<50	<100	<50	<50
W11_MB1	20-Oct-2020	Rewan Group	6.91	7.8	21523	23200	15100	344	186	4060	13	8010	164	<1	<1	262	262	<20	<50	510	110	620
W11_MB1	09-Dec-2020	Rewan Group	7.1	7.67	23743	23100	15400	466	204	4850	15	8620	117	<1	<1	298	298	<20	<50	340	80	420
W11_MB1	04-Jan-2021	Rewan Group	6.98	7.27	23667	21800	16200	561	163	4610	16	8420	108	<1	<1	236	236	<20	<50	280	<50	280
W11_MB1	28-Jan-2021	Rewan Group	6.93	7.43	23911	22700	17200	686	160	4700	16	8690	121	<1	<1	254	254	<20	<50	360	<50	360
W11_MB1	16-Feb-2021	Rewan Group	6.86	7.27	23870	22700	16300	630	161	4860	18	8640	128	<1	<1	259	259	<40	<50	300	<50	300
W11_MB1	10-Mar-2021	Rewan Group	6.81	7.33	23898	22300	15400	653	140	4260	18	8590	143	<1	<1	254	254	30	<50	180	<50	180
W11_MB1	14-Apr-2021	Rewan Group	6.9	7.64	24120	23800	14800	700	134	4160	16	8640	166	<1	<1	258	258	<20	<50	160	<50	160
W11_MB1	25-May-2021	Rewan Group	7	7.51	24298	23300	16100	780	174	4990	18	8720	172	<1	<1	241	241	<20	<50	180	<50	180
W11_MB1	29-Jun-2021	Rewan Group	6.8	7.42	24573	23500	15900	680	179	5120	19	8650	140	<1	<1	262	262	<20	<50	150	<50	150
W11_MB1	22-Jul-2021	Rewan Group	6.87	7.48	24653	23400	16300	767	191	5340	19	8800	138	<1	<1	232	232	<20	<50	180	<50	180
W11_MB1	24-Aug-2021	Rewan Group	6.82	7.57	23911	23300	17000	674	185	4660	18	8280	108	<1	<1	242	242	<20	<50	130	<50	130
W11_MB1	14-Sep-2021	Rewan Group	6.72	7.6	24289	23600	15800	519	170	4490	15	8730	96	<1	<1	267	267	<20	<50	200	<50	200
W11_MB1	19-Oct-2021	Rewan Group	6.91	7.5	24215	22100	16800	562	187	4670	16	8360	3	<1	<1	2000	2000	<20	<50	1020	720	1740
W11_MB1	16-Nov-2021	Rewan Group	6.73	7.59	24664	22600	16600	588	197	4740	16	8620	45	<1	<1	322	322	<20	<50	370	<50	370
W11_MB1	09-Dec-2021	Rewan Group	6.63	7.69	24024	22600	17700	624	194	4790	16	8600	38	<1	<1	328	328	<20	<50	160	<50	160
W11_MB1	25-Jan-2022	Rewan Group	6.64	7.86	24225	23900	17700	495	192	4640	15	8600	30	<1	<1	330	330	<50	<50	130	<50	130
W11_MB1	15-Feb-2022	Rewan Group	6.82	7.9	24568	20700	16400	589	200	4740	15	8710	24	<1	<1	304	304	<40	<50	160	<50	160
W11_MB1	16-Mar-2022	Rewan Group	7.18	7.66	23905	27400	17000	570	214	4970	14	8820	24	<1	<1	310	310	<20	<50	200	<50	200
W11_MB1	03-May-2022	Rewan Group	7.17	7.6	24263	23200	17500	522	178	4200	14	8470	16	<1	<1	330	330	<20	<50	240	<50	240
W11_MB1	31-May-2022	Rewan Group	7.14	7.79	24165	23300	19400	573	209	4880	15	8390	16	<1	<1	294	294	<20	<50	230	<50	230
W11_MB1	22-Jun-2022	Rewan Group	7.18	7.48	20250	23600	16800	504	208	4840	15	8320	14	<1	<1	317	317	<20	<50	160	<50	160
W11_MB1	20-Jul-2022	Rewan Group	7.1	7.65	24280	23800	16200	520	200	4710	14	8500	13	<1	<1	332	332	<20	<50	190	<50	190
W11_MB1	31-Aug-2022	Rewan Group	7.06	7.49	24231	22900	16700	606	222	5020	16	8670	17	<1	<1	291	291	<20	<50	240	50	290
W5_MB1	21-Oct-2020	Rewan Group	6.83	7.7	22477	22800	15800	365	474	3740	37	7410	1460	<1	<1	391	391	<20	<50	<100	<50	<50
W5_MB1	09-Dec-2020	Rewan Group	6.78	7.42	22528	21700	15500	382	732	3580	35	7510	1590	<1	<1	535	535	<20	<50	<100	<50	<50
W5_MB1	05-Jan-2021	Rewan Group	6.78	7.17	23363	21600	17100	403	852	4060	42	7670	1700	<1	<1	524	524	<20	<50	<100	<50	<50
W5_MB1	26-Jan-2021	Rewan Group	6.74	7.41	23500	22700	16800	407	860	4100	42	7700	1710	<1	<1	575	575	<20	<50	<100	<50	<50
W5_MB1	16-Feb-2021	Rewan Group	6.65	7.16	22776	22200	17000	375	814	3850	39	7850	1680	<1	<1	579	579	<20	<50	<100	<50	<50
W5_MB1	16-Feb-2021	Rewan Group	6.65	7.15	22776	22000	16900	374	816	3870	39	7880	1690	<1	<1	584	584	<20	<50	<100	<50	<50
W5_MB1	10-Mar-2021	Rewan Group	6.59	7.31	22511	22200	14300	358	699	3450	36	7890	1620	<1	<1	598	598	20	<50	<100	<50	<50
W5_MB1	14-Apr-2021	Rewan Group	6.68	7.7	18810	23100	15800	374	808	3900	35	7930	1630	<1	<1	625	625	<20	<50	<100	<50	<50
W5_MB1	25-May-2021	Rewan Group	6.68	7.51	22009	22600	16800	352	689	3540	32	7870	1580	<1	<1	630	630	<20	<50	<100	<50	<50
W5_MB1	29-Jun-2021	Rewan Group	6.52	7.52	22151	22800	16900	345	668	3500	35	7720	1580	<1	<1	617	617	<20	<50	<100	<50	<50
W5_MB1	26-Jul-2021	Rewan Group	6.67	7.71	20293	22400	16400	343	735	3720	33	7710	1600	<1	<1	606	606	<20	<50	<100	<50	<50
W5_MB1	24-Aug-2021	Rewan Group	6.57	7.49	22606	22800	17400	393	755	3830	39	7620	1550	<1	<1	560	560	<20	<50	<100	<50	<50
W5_MB1	14-Sep-2021	Rewan Group	6.47	7.12	23409	23100	16500	337	745	4050	35	7900	1650	<1	<1	595	595	<20	<50	<100	<50	<50
W5_MB1	19-Oct-2021	Rewan Group	6.5	7.54	23939	24100	16700	376	811	4370	37	7630	1520	<1	<1	638	638	<20	<50	<100	<50	<50
W5_MB1	16-Nov-2021	Rewan Group	6.31	7.26	24219	22400	17600	398	788	4490	35	7770	1530	<1	<1	637	637	<20	<50	110	<50	110
W5_MB1	09-Dec-2021	Rewan Group	6.21	7.36	23699	23400	17800	390	759	4290	30	7830	1540	<1	<1	643	643	<20	<50	<100	<50	<50
W5_MB1	25-Jan-2022	Rewan Group	6.23	7.73	24288	23700	17900	347	764	4150	33	7890	1590	<1	<1	640	640	<20	<50	<100	<50	<50
W5_MB1	15-Feb-2022	Rewan Group	6.59	7.77	24664	20000	17500	396	795	4250	34	7990	1540	<1	<1	596	596	<20	<50	<100	<50	<50
W5_MB1	16-Mar-2022	Rewan Group	6.61	7.38	23321	27800	17900	400	841	4400	34	8050	1540	<1	<1	606	606	<20	<50	<100	<50	<50
W5_MB1	03-May-2022	Rewan Group	6.64	7.25	23775	23100	18800	412	756	4020	34	7810	1580	<1	<1	651	651	<20	<50	<100	<50	<50
W5_MB1	31-May-2022	Rewan Group	6.58	7.58	24192	23000	16600	388	827	4540	33	7650	1570	<1	<1	588	588	<20	<50	<100	<50	<50
W5_MB1	22-Jun-2022	Rewan Group	6.62	7.07	20164	23500	17500	361	798	4330	30	7630	1640	<1	<1	618	618	<20	<50	<100	<50	<50
W5_MB1	20-Jul-2022	Rewan Group	6.57	7.3	24294	24300	17500	365	775	4320	31	7860	1620	<1	<1	656	656	<20	<50	<100	<50	<50
W5_MB1	31-Aug-2022	Rewan Group	6.54	7.33	23967	21800	18400	352	795	4520	30	7800	1640	<1	<1	577	577	<20	<50	<100	<50	<50
W1_MB2	20-Oct-2020	Leichhardt Lower Seam	6.59	7.39	36574	37800	27200	1210	661	6890	39	13700	<1	<1	<1	121	121	<20	<50	<100	<50	<50
W1_MB2	09-Dec-2020	Leichhardt Lower Seam	6.75	7.2	38882	38000	28400	1320	663	6910	38	14500	<5	<1	<1	140	140	<20	<50	<100	<50	<50
W1_MB2	05-Jan-2021	Leichhardt Lower Seam	6.81	7.13	37952	37400	30000	1320	653	6940	38	13900	<1	<1	<1	130	130	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W1_MB2	26-Jan-2021	Leichhardt Lower Seam	6.75	7.26	37541	37100	25000	1470	637	6590	37	13800	<1	<1	<1	139	139	<20	<50	<100	<50	<50
W1_MB2	17-Feb-2021	Leichhardt Lower Seam	6.68	6.92	37860	38600	30100	592	934	7810	52	14400	779	<1	<1	582	582	<20	<50	<100	<50	<50
W1_MB2	17-Feb-2021	Leichhardt Lower Seam	6.68	7.14	37860	37000	30000	1270	706	7220	40	14100	<1	<1	<1	142	142	<20	<50	<100	<50	<50
W1_MB2	24-Mar-2021	Leichhardt Lower Seam	6.69	7.14	37109	35200	27800	1180	616	6560	35	13400	<5	<1	<1	130	130	<20	<50	<100	<50	<50
W1_MB2	14-Apr-2021	Leichhardt Lower Seam	6.66	7.51	35670	37700	25800	1400	620	6450	37	13800	<1	<1	<1	139	139	<20	<50	<100	<50	<50
W1_MB2	26-May-2021	Leichhardt Lower Seam	6.75	7.38	36131	36200	27800	1340	665	6750	36	13900	<1	<1	<1	136	136	<20	<50	<100	<50	<50
W1_MB2	29-Jun-2021	Leichhardt Lower Seam	6.51	7.24	37109	37000	27300	1190	702	7340	40	13600	<1	<1	<1	138	138	<20	<50	<100	<50	<50
W1_MB2	26-Jul-2021	Leichhardt Lower Seam	6.61	7.56	36961	36300	27500	2190	608	5730	33	13600	<1	<1	<1	132	132	<20	<50	<100	<50	<50
W1_MB2	24-Aug-2021	Leichhardt Lower Seam	6.56	7.26	35400	36100	29900	1280	638	5980	38	13400	<5	<1	<1	130	130	<20	<50	<100	<50	<50
W1_MB2	14-Sep-2021	Leichhardt Lower Seam	6.48	7.18	36406	36600	27100	1210	552	5810	31	13400	<10	<1	<1	166	166	<20	<50	<100	<50	<50
W1_MB2	19-Oct-2021	Leichhardt Lower Seam	6.52	7.54	37067	39300	29700	1140	658	6990	36	13300	<1	<1	<1	134	134	<20	<50	<100	<50	<50
W1_MB2	16-Nov-2021	Leichhardt Lower Seam	6.42	7.43	37869	34300	30000	1180	644	6560	36	13600	<1	<1	<1	134	134	<20	<50	<100	<50	<50
W1_MB2	09-Dec-2021	Leichhardt Lower Seam	6.23	7.35	36460	38900	28800	1330	617	6770	35	13900	<1	<1	<1	133	133	<20	<50	<100	<50	<50
W1_MB2	25-Jan-2022	Leichhardt Lower Seam	6.27	7.54	36430	37300	26800	1010	624	6440	34	13900	7	<1	<1	137	137	<20	<50	<100	<50	<50
W1_MB2	15-Feb-2022	Leichhardt Lower Seam	6.69	7.62	37196	24800	28300	1280	627	6480	35	13700	<1	<1	<1	127	127	<20	<50	<100	<50	<50
W1_MB2	16-Mar-2022	Leichhardt Lower Seam	6.75	7.34	34859	43700	31600	1100	626	6340	33	14100	<1	<1	<1	127	127	<20	<50	<100	<50	<50
W1_MB2	03-May-2022	Leichhardt Lower Seam	6.73	7.23	35642	38000	32000	1490	609	6310	36	13600	<1	<1	<1	137	137	<20	<50	<100	<50	<50
W1_MB2	31-May-2022	Leichhardt Lower Seam	6.71	7.47	35001	36800	27400	1270	635	6710	36	13500	<1	<1	<1	126	126	<20	<50	<100	<50	<50
W1_MB2	22-Jun-2022	Leichhardt Lower Seam	6.73	7.19	31929	37300	28300	930	640	6770	37	12800	<10	<1	<1	133	133	<20	<50	<100	<50	<50
W1_MB2	20-Jul-2022	Leichhardt Lower Seam	6.67	7.24	35580	47100	27800	1040	620	6550	35	13800	<5	<1	<1	136	136	<20	<50	<100	<50	<50
W1_MB2	31-Aug-2022	Leichhardt Lower Seam	6.66	7.16	37053	33600	27600	1290	591	6090	32	13400	<1	<1	<1	123	123	<20	<50	<100	<50	<50
W1_MB2	04-Oct-2022	Leichhardt Lower Seam	6.64	7.4	38697	38100	28000	1190	651	6270	33	13400	<1	<1	<1	137	137	<20	<50	<100	<50	<50
W1_MB3	20-Oct-2020	Vermont Seam	6.48	7.24	37668	39000	27200	1300	588	6750	25	14100	<1	<1	<1	97	97	30	<50	<100	140	140
W1_MB3	09-Dec-2020	Vermont Seam	6.73	7.05	36478	39100	29700	1440	525	6260	25	14800	<5	<1	<1	113	113	<20	<50	<100	70	70
W1_MB3	05-Jan-2021	Vermont Seam	6.8	6.97	39283	38300	31100	1430	586	6940	26	14400	<1	<1	<1	104	104	<20	<50	<100	80	80
W1_MB3	26-Jan-2021	Vermont Seam	6.75	7.19	38115	38400	28400	1750	600	6890	26	14400	<1	<1	<1	116	116	<20	<50	<100	<50	<50
W1_MB3	17-Feb-2021	Vermont Seam	6.66	7.1	39149	38200	30900	1480	665	7650	28	14800	<1	<1	<1	121	121	<20	50	<100	80	130
W1_MB3	24-Mar-2021	Vermont Seam	6.67	7.1	39256	36700	28400	1400	586	6870	25	14100	<5	<1	<1	112	112	<20	<50	<100	<50	<50
W1_MB3	14-Apr-2021	Vermont Seam	6.65	7.37	37221	38900	26600	1640	567	6640	29	14300	<1	<1	<1	120	120	<20	<50	<100	<50	<50
W1_MB3	26-May-2021	Vermont Seam	6.77	7.25	35390	36900	28700	1410	565	6440	27	14200	<1	<1	<1	116	116	<20	<50	<100	<50	<50
W1_MB3	29-Jun-2021	Vermont Seam	6.58	7.23	38303	38200	28700	1320	649	7640	29	14000	<1	<1	<1	119	119	<20	<50	<100	<50	<50
W1_MB3	26-Jul-2021	Vermont Seam	6.69	7.5	36966	37300	28100	3680	592	6280	26	14800	<1	<1	<1	113	113	<20	<50	<100	<50	<50
W1_MB3	24-Aug-2021	Vermont Seam	6.6	7.07	37109	37600	31600	1480	562	6490	30	14000	<5	<1	<1	106	106	<20	<50	<100	<50	<50
W1_MB3	14-Sep-2021	Vermont Seam	6.55	7.12	37160	38000	27700	1380	509	6030	24	14000	<10	<1	<1	138	138	<20	<50	<100	<50	<50
W1_MB3	19-Oct-2021	Vermont Seam	6.58	7.44	38065	41300	32700	1300	607	7200	27	14200	<1	<1	<1	117	117	<20	<50	<100	<50	<50
W1_MB3	16-Nov-2021	Vermont Seam	6.49	7.24	38289	35600	30700	1360	597	6800	28	14000	<1	<1	<1	116	116	<20	<50	<100	50	50
W1_MB3	09-Dec-2021	Vermont Seam	6.29	7.24	38370	39900	30100	1660	598	7180	28	14200	<1	<1	<1	114	114	<20	<50	<100	<50	<50
W1_MB3	25-Jan-2022	Vermont Seam	6.31	7.54	39245	39400	27400	1160	604	6940	26	14500	<1	<1	<1	125	125	<20	<50	<100	<50	<50
W1_MB3	15-Feb-2022	Vermont Seam	6.69	7.54	38970	28800	30200	1490	587	6800	27	14400	<1	<1	<1	112	112	<20	<50	<100	<50	<50
W1_MB3	16-Mar-2022	Vermont Seam	6.81	7.15	37186	44600	32600	1220	588	6640	27	14800	<1	<1	<1	109	109	<20	<50	<100	<50	<50
W1_MB3	03-May-2022	Vermont Seam	6.78	7.13	36727	38600	34200	1790	567	6430	26	14100	<1	<1	<1	118	118	<20	<50	<100	<50	<50
W1_MB3	31-May-2022	Vermont Seam	6.74	7.34	37316	38400	28000	1570	623	7300	30	14100	<1	<1	<1	112	112	<20	<50	<100	<50	<50
W1_MB3	22-Jun-2022	Vermont Seam	6.76	7.12	30229	38800	28400	1100	620	7360	29	13400	<10	<1	<1	117	117	<20	<50	<100	<50	<50
W1_MB3	20-Jul-2022	Vermont Seam	6.71	7.16	38173	49100	29400	1340	583	6900	28	14500	<5	<1	<1	117	117	<20	<50	<100	<50	<50
W1_MB3	31-Aug-2022	Vermont Seam	6.65	7.05	39436	35900	30100	1650	593	6870	27	14800	<1	<1	<1	106	106	<20	<50	<100	<50	<50
W1_MB3	04-Oct-2022	Vermont Seam	6.74	7.16	37134	38500	30000	1570	558	7560	32	14400	<1	<1	<1	117	117	<20	<50	<100	<50	<50
W10_MB2	20-Oct-2020	Vermont Upper Seam	8.84	9.52	24428	28800	18700	1010	79	4460	36	10200	406	<1	20	4	24	<20	<50	140	<50	140
W10_MB2	09-Dec-2020	Vermont Upper Seam	7.07	9.13	31021	29400	19800	724	612	5670	21	11100	436	<1	39	21	60	<20	<50	<100	<50	<50
W10_MB2	04-Jan-2021	Vermont Upper Seam	7.66	7.83	29730	28200	20700	849	471	5730	24	10600	374	<1	<1	126	126	<20	<50	<100	<50	<50
W10_MB2	28-Jan-2021	Vermont Upper Seam	7.74	7.83	29511	28600	21600	913	434	5920	26	10900	325	<1	<1	51	51	<20	50	<100	<50	50
W10_MB2	16-Feb-2021	Vermont Upper Seam	7.72	8.16	29942	27900	20500	849	394	5560	26	10800	309	<1	<1	34	34	<20	<50	<100	<50	<50
W10_MB2	10-Mar-2021	Vermont Upper Seam	7.94	7.4	29608	27500	19200	977	390	5640	26	10500	295	<1	<1	29	29	20	60	<100	<50	60
W10_MB2	14-Apr-2021	Vermont Upper Seam	7.95	7.61	28821	28500	18700	987	342	5340	25	10500	281	<1	<1	22	22	<20	<50	<100	<50	<50
W10_MB2	25-May-2021	Vermont Upper Seam	8.82	8.59	28089	26700	18600	1010	324	5480	25	10200	258	<1	5	9	14	<20	<50	<100	<50	<50
W10_MB2	29-Jun-2021	Vermont Upper Seam	8.94	9	28164	27100	18600	986	302	5680	26	10000	244	<1	17	4	21	<20	<50	<100	<50	<50
W10_MB2	22-Jul-2021	Vermont Upper Seam	8.95	8.94	28133	26800	19000	1100	294	5780	27	10100	229	<1	20	8	28	<20	<50	<100	<50	<50
W10_MB2	24-Aug-2021	Vermont Upper Seam	9	8.08	26837	26000	19100	1000	235	4850	24	9540	216	<1	<1	23	23	<20	<50	<100	<50	<50
W10_MB2	14-Sep-2021	Vermont Upper Seam	8.86	9.4	26858	26300	18200	852	190	4320	20	9720	214	<1	13	38	51	<20	<50	<100	<50	<50
W10_MB2	19-Oct-2021	Vermont Upper Seam	8.96	9.5	26547	27300	18600	894	202	5050	22	9260	185	<1	39	2	41	<20	<50	100	<50	100
W10_MB2	16-Nov-2021	Vermont Upper Seam	8.91	9.63	26830	24400	18800	979	192	4910	23	9300	178	<1	43	141	184	<20	60	240	60	360
W10_MB2	08-Dec-2021	Vermont Upper Seam	8.65	9.41	26588	26200	20400	985	174	4930	22	9480	183	<1	35	<1	35	<20	<50	<100	<50	<50
W10_MB2	25-Jan-2022	Vermont Upper Seam	8.84	9.28	26066	25800	19200	988	159	4810	23	9390	165	<1	29	7	36	<20	<50	180	<50	180
W10_MB2	15-Feb-2022	Vermont Upper Seam	8.9	9.24	26389	22000	18200	1100	176	5060	23	9320	159	<1	27	4	31	<30	<50	160	<50	160
W10_MB2	16-Mar-2022	Vermont Upper Seam	9.79	9.62	25253	29200	18400	1040	140	4800	21	9520	153	<1	33	86	119	<20	<50	150	<50	150
W10_MB2	04-May-2022	Vermont Upper Seam	9.74	9.66	25510	24700	18800	1050	111	4370	23	9030	138	<1	38	131	169	<20	<50	<100	<50	<50
W10_MB2	31-May-2022	Vermont Upper Seam	9.74	9.48	25098	24500	16600	1060	116	4830	23	8900	128	<1	29	4	33	<20	<50	210	<50	210
W10_MB2	22-Jun-2022	Vermont Upper Seam	9.99	9.73	21493	24700	17800	992	103	4360	20	8880	138	<1	42	146	188	<20	<50	160	<50	160
W10_MB2	31-Aug-2022	Vermont Upper Seam	9.83	9.48	25363	23600	17200	1030	87	4330	22	8800	116	<1	32	7	38	<20	140	670	60	870
W10_MB3	20-Oct-2020	Vermont Lower Seam	6.34	7.38	34333	35600	25000	632	922	6120	18	12500	690	<1	<1	372	372	<20	<50	<100	<50	<50
W10_MB3	09-Dec-2020	Vermont Lower Seam	6.47	7.17	36153	35900	27000	751	994	6730	19	13300	702	<1	<1	428	428	<20	<50	<100	<50	<50
W10_MB3	04-Jan-2021	Vermont Lower Seam	6.57	6.96	36162	34400	28500	723	993	6780	19	12800	710	<1	<1	400	400	<20	<50	<100	<50	<50
W10_MB3	28-Jan-2021	Vermont Lower Seam	6.55	7.11	35025	34900	28800	661	924	6450	18	13300	720	<1	<1	441	441	<20	<50	<100	<50	<50
W10_MB3	16-Feb-2021	Vermont Lower Seam	6.47	6.97	34495	34400	27300	624	937	6330	18	13000	709	<1	<1	442	442	<20	<50	<100	<50	<50
W10_MB3	10-Mar-2021	Vermont Lower Seam	6.43	7	35413	33900	25900	716	1020	6900	18	12800	700	<1	<1	438	438	<20	<50	<100	<50	<50
W10_MB3	14-Apr-2021	Vermont Lower Seam	6.46	7.55	35784	35800	25600	761	960	6430	19	12900	700	<1	<1	453	453	<20	<50	<100	<50	<50
W10_MB3	25-May-2021	Vermont Lower Seam	6.56	7.37	33815	33800	25900	702	964	6400	17	12800	703	<1	<1	449	449	<20	<50	<100	<50	<50
W10_MB3	29-Jun-2021	Vermont Lower Seam	6.39	7.21	34930	34800	26100	620	1000	6870	19	12600	700	<1	<1	452	452	<20	<50	<100	<50	<50
W10_MB3	22-Jul-2021	Vermont Lower Seam	6.44	7.16	36204	35000	26200	732	1010	6900	19	12900	690	<1	<1	412	412	<20	<50	<100	<50	<50
W10_MB3	24-Aug-2021	Vermont Lower Seam	6.37	7.33	34547	34200	28500	694	945	6270	19	12600	688	<1	<1	404	404	<20	<50	<100	<50	<50
W10_MB3	14-Sep-2021	Vermont Lower Seam	6.26	7.18	34478	35000	27000	649	835	5800	16	13000	700	<1	<1	436	436	<20	<50	<100	<50	<50
W10_MB3	19-Oct-2021	Vermont Lower Seam	6.25	7.44	34956	37400	26300	603	967	6720	17	12500	670	<1	<1	450	450	<20	<50	<100	<50	<50
W10_MB3	16-Nov-2021	Vermont Lower Seam	6.26	7.12	34517	33100	28800	604	934	6230	18	12600	668	<1	<1	452	452	<20	<50	<100	<50	<50
W10_MB3	08-Dec-2021	Vermont Lower Seam	6.14	7.27	36313	32800	28400	699	902	6290	18	12700	698	<1	<1	454	454	<20	<50	<100	<50	<50
W10_MB3	25-Jan-2022	Vermont Lower Seam	6.17	7.57	34910	35700	25100	569	938	6250	18	12900	714	<1	<1	459	459	<20	<50	<100	<50	<50
W10_MB3	15-Feb-2022	Vermont Lower Seam	6.53	7.68	36194	25800	27600	684	963	6560	18	12800	612	<1	<1	415	415	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W10_MB3	16-Mar-2022	Vermont Lower Seam	6.56	7.34	34731	42400	29200	670	1030	6850	18	13100	706	<1	<1	436	436	<20	<50	<100	<50	<50
W10_MB3	03-May-2022	Vermont Lower Seam	6.55	7.17	36359	33400	30600	785	949	6280	19	12500	702	<1	<1	462	462	<20	<50	<100	<50	<50
W10_MB3	31-May-2022	Vermont Lower Seam	6.54	7.47	34953	34600	25200	730	1010	6910	19	12300	704	<1	<1	426	426	<20	<50	<100	<50	<50
W10_MB3	22-Jun-2022	Vermont Lower Seam	6.55	7.15	30162	34900	25800	563	994	6820	19	12200	694	<1	<1	446	446	<20	<50	<100	<50	<50
W10_MB3	31-Aug-2022	Vermont Lower Seam	6.45	7.19	33963	32400	27800	714	891	6070	18	12900	716	<1	<1	415	415	<20	<50	<100	<50	<50
W11_MB2	20-Oct-2020	Leichhardt Seam	8.66	8.91	33018	33900	23900	759	675	6170	66	11800	933	<1	15	20	35	<20	170	2680	240	3090
W11_MB2	09-Dec-2020	Leichhardt Seam	9.09	9.1	33485	33800	25400	859	738	6530	69	12400	932	<1	25	36	61	<20	180	2720	290	3190
W11_MB2	04-Jan-2021	Leichhardt Seam	8.89	9.05	32985	32500	26300	838	721	6530	68	12000	946	<1	18	19	37	<20	<50	280	80	360
W11_MB2	28-Jan-2021	Leichhardt Seam	8.68	8.81	32238	33000	27700	790	689	6280	67	12200	928	<1	10	25	36	<20	140	300	60	500
W11_MB2	16-Feb-2021	Leichhardt Seam	8.61	8.76	33570	32500	25200	791	736	6530	70	12200	920	<1	7	27	34	<40	100	270	80	450
W11_MB2	10-Mar-2021	Leichhardt Seam	8.46	8.18	33207	31700	24300	825	700	6200	66	11900	882	<1	<1	34	34	20	90	160	50	300
W11_MB2	14-Apr-2021	Leichhardt Seam	8.75	8.37	33091	33400	23600	852	682	6270	69	12000	870	<1	3	35	38	<20	70	140	60	270
W11_MB2	25-May-2021	Leichhardt Seam	8.66	8.6	31212	32000	22500	780	677	6040	61	11900	842	<1	7	30	37	<20	90	210	70	370
W11_MB2	29-Jun-2021	Leichhardt Seam	8.42	8.51	32683	32600	23600	736	681	6310	65	11800	868	<1	5	34	39	<20	80	210	50	340
W11_MB2	22-Jul-2021	Leichhardt Seam	8.45	8.5	32933	32700	24900	846	701	6460	66	12100	835	<1	8	36	45	<20	90	150	<50	240
W11_MB2	24-Aug-2021	Leichhardt Seam	8.12	7.65	29708	31700	25700	734	588	5340	60	11400	821	<1	<1	41	41	<20	90	140	<50	230
W11_MB2	14-Sep-2021	Leichhardt Seam	6.71	7.65	NM	10500	7090	206	164	1520	16	3730	234	<1	<1	94	94	<20	<50	<100	<50	<50
W11_MB2	19-Oct-2021	Leichhardt Seam	8.11	8.2	32066	34200	27000	759	634	6570	65	11600	807	<1	<1	39	39	<20	130	2120	240	2490
W11_MB2	16-Nov-2021	Leichhardt Seam	7.89	8.22	33045	31200	25900	767	649	6010	62	11700	803	<1	<1	45	45	<30	180	2490	300	2970
W11_MB2	09-Dec-2021	Leichhardt Seam	7.67	7.36	31613	32300	26200	803	602	5990	61	11700	817	<1	<1	40	40	<20	110	200	<50	310
W11_MB2	25-Jan-2022	Leichhardt Seam	7.46	7.58	32007	33200	27200	735	625	5860	59	12000	849	<1	<1	44	44	<80	160	1680	200	2040
W11_MB2	15-Feb-2022	Leichhardt Seam	7.69	7.81	32754	24200	26000	777	622	5920	59	11800	734	<1	<1	50	50	<120	130	1860	310	2300
W11_MB2	16-Mar-2022	Leichhardt Seam	7.86	7.48	28356	38400	26100	661	560	5260	50	11900	793	<1	<1	50	50	<20	110	250	<50	360
W11_MB2	03-May-2022	Leichhardt Seam	8.16	7.86	33382	30800	26300	723	521	5110	52	11200	765	<1	<1	64	64	<30	140	300	60	500
W11_MB2	31-May-2022	Leichhardt Seam	7.7	8.13	28230	31800	23200	736	536	5150	51	11300	778	<1	<1	62	62	<20	90	200	<50	290
W11_MB2	22-Jun-2022	Leichhardt Seam	7.46	8.05	19400	28800	21000	499	442	4290	42	10200	672	<1	<1	90	90	<20	80	150	<50	230
W11_MB2	20-Jul-2022	Leichhardt Seam	7.75	8.08	29937	32500	24500	684	548	5390	52	11600	757	<1	<1	78	78	<20	120	210	<50	330
W11_MB2	31-Aug-2022	Leichhardt Seam	7.49	8.19	27394	30400	24500	831	642	6340	60	11600	761	<1	<1	97	97	<20	130	200	<50	330
W13_MB1	20-Oct-2020	Vermont Lower Seam	6.25	7.42	30841	31200	23500	481	793	5860	24	10600	1200	<1	<1	407	407	<20	<50	<100	130	130
W13_MB1	09-Dec-2020	Vermont Lower Seam	6.37	7.08	31953	31500	22900	574	878	6390	27	11300	1140	<1	<1	469	469	<20	<50	<100	110	110
W13_MB1	05-Jan-2021	Vermont Lower Seam	6.49	7	31931	30500	23900	527	828	6150	26	10900	1120	<1	<1	443	443	<20	<50	<100	<50	<50
W13_MB1	26-Jan-2021	Vermont Lower Seam	6.51	7.11	31822	30800	21200	536	828	6100	25	11000	1080	<1	<1	478	478	<20	<50	<100	<50	<50
W13_MB1	17-Feb-2021	Vermont Lower Seam	6.43	7.03	31830	30500	23700	497	818	5980	25	11200	1090	<1	<1	488	488	<20	<50	<100	<50	<50
W13_MB1	24-Mar-2021	Vermont Lower Seam	6.48	7.04	31918	29200	23100	494	784	5890	24	10700	1070	<1	<1	464	464	<20	<50	<100	<50	<50
W13_MB1	14-Apr-2021	Vermont Lower Seam	6.48	7.56	31985	31000	20600	561	808	5990	27	11000	1060	<1	<1	506	506	<20	<50	<100	<50	<50
W13_MB1	26-May-2021	Vermont Lower Seam	6.55	7.48	31113	29900	22900	527	847	6130	25	10900	1050	<1	<1	502	502	<20	<50	<100	<50	<50
W13_MB1	29-Jun-2021	Vermont Lower Seam	6.39	7.31	31617	30700	22900	522	880	6620	28	10900	1040	<1	<1	487	487	<20	<50	<100	<50	<50
W13_MB1	26-Jul-2021	Vermont Lower Seam	6.51	7.67	29887	30300	24600	710	835	5800	24	10900	1050	<1	<1	481	481	<20	<50	<100	<50	<50
W13_MB1	24-Aug-2021	Vermont Lower Seam	6.4	7.53	31006	30600	23800	532	815	5850	27	10800	996	<1	<1	448	448	<20	<50	<100	<50	<50
W13_MB1	15-Sep-2021	Vermont Lower Seam	6.24	7.23	31376	30800	22300	481	721	5510	22	10900	1050	<1	<1	486	486	<20	<50	<100	<50	<50
W13_MB1	19-Oct-2021	Vermont Lower Seam	6.43	7.63	31776	31800	25500	474	808	6190	24	10800	950	<1	<1	493	493	<20	<50	<100	<50	<50
W13_MB1	17-Nov-2021	Vermont Lower Seam	6.23	7.4	32128	29700	23900	486	797	5880	25	10800	998	<1	<1	497	497	<20	<50	<100	<50	<50
W13_MB1	09-Dec-2021	Vermont Lower Seam	6.14	7.49	31217	30400	23500	525	788	6150	26	10800	997	<1	<1	500	500	<20	<50	<100	<50	<50
W13_MB1	25-Jan-2022	Vermont Lower Seam	6.18	7.68	31567	31100	23400	479	786	5800	24	11100	1010	<1	<1	510	510	<20	70	<100	<50	70
W13_MB1	22-Feb-2022	Vermont Lower Seam	6.45	7.18	32022	30800	23600	448	804	6040	25	10600	1020	<1	<1	489	489	<20	<50	<100	<50	<50
W13_MB1	16-Mar-2022	Vermont Lower Seam	6.55	7.43	31249	37300	24600	526	854	6300	26	11200	997	<1	<1	476	476	<20	<50	<100	<50	<50
W13_MB1	03-May-2022	Vermont Lower Seam	6.54	7.43	31222	31000	24000	550	778	5650	25	10600	984	<1	<1	510	510	<20	<50	<100	<50	<50
W13_MB1	31-May-2022	Vermont Lower Seam	6.55	7.58	31235	30600	22400	512	857	6500	26	10500	985	<1	<1	460	460	<20	<50	<100	<50	<50
W13_MB1	22-Jun-2022	Vermont Lower Seam	6.54	7.26	26541	31100	23600	441	802	6210	27	10400	1030	<1	<1	484	484	<20	<50	<100	<50	<50
W13_MB1	20-Jul-2022	Vermont Lower Seam	6.5	7.39	31878	31600	23600	480	780	6060	24	10800	1010	<1	<1	511	511	<20	<50	<100	<50	<50
W13_MB1	31-Aug-2022	Vermont Lower Seam	6.46	7.36	31437	29100	23800	476	771	5800	25	10900	1030	<1	<1	457	457	<20	<50	<100	<50	<50
W13_MB2	20-Oct-2020	Girrah 1 Seam	7.36	7.86	25814	28000	17900	552	150	5390	37	9760	180	<1	<1	22	22	<20	<50	<100	<50	<50
W13_MB2	09-Dec-2020	Girrah 1 Seam	7.16	7.71	23021	27000	18100	380	197	4770	32	10000	74	<1	<1	214	214	20	<50	<100	<50	<50
W13_MB2	05-Jan-2021	Girrah 1 Seam	7.17	7.56	24124	26000	18300	345	207	4970	31	9680	54	<1	<1	238	238	<20	<50	<100	<50	<50
W13_MB2	26-Jan-2021	Girrah 1 Seam	7.03	7.63	26487	26600	16700	416	236	5540	34	9830	42	<1	<1	285	285	<20	<50	<100	<50	<50
W13_MB2	17-Feb-2021	Girrah 1 Seam	6.95	7.51	27675	26700	18200	378	242	5600	34	9960	32	<1	<1	316	316	<20	<50	<100	<50	<50
W13_MB2	24-Mar-2021	Girrah 1 Seam	6.98	7.49	27590	25500	18000	384	240	5520	32	9610	21	<1	<1	319	319	<20	<50	<100	<50	<50
W13_MB2	14-Apr-2021	Girrah 1 Seam	6.95	7.84	22984	25700	16500	377	221	4830	32	9340	13	<1	<1	355	355	<20	<50	<100	<50	<50
W13_MB2	29-Jun-2021	Girrah 1 Seam	6.85	7.64	14260	26700	17700	311	232	4990	32	9780	9	<1	<1	382	382	<20	<50	<100	<50	<50
W13_MB2	26-Jul-2021	Girrah 1 Seam	6.95	7.87	26254	26600	18600	347	278	5790	30	9760	8	<1	<1	393	393	<20	<50	<100	<50	<50
W13_MB2	24-Aug-2021	Girrah 1 Seam	6.83	7.75	22096	25900	18300	324	214	4310	28	9350	8	<1	<1	357	357	<20	<50	<100	<50	<50
W13_MB2	15-Sep-2021	Girrah 1 Seam	6.67	7.55	26702	26900	18600	373	234	4960	25	9910	6	<1	<1	390	390	<20	<50	<100	<50	<50
W13_MB2	19-Oct-2021	Girrah 1 Seam	7.17	7.92	16265	25000	17200	460	233	5380	33	8720	18	<1	<1	297	297	<20	<50	<100	<50	<50
W13_MB2	17-Nov-2021	Girrah 1 Seam	6.62	7.71	25092	25700	18500	344	251	5250	30	9560	5	<1	<1	405	405	<20	<50	<100	<50	<50
W13_MB2	09-Dec-2021	Girrah 1 Seam	6.47	7.74	25763	27100	19800	421	238	5350	29	9720	5	<1	<1	404	404	<20	<50	<100	<50	<50
W13_MB2	25-Jan-2022	Girrah 1 Seam	6.48	7.86	25904	27500	19700	344	246	5360	30	9800	5	<1	<1	398	398	<20	<50	<100	<50	<50
W13_MB2	22-Feb-2022	Girrah 1 Seam	6.75	7.39	25867	27200	19800	343	250	5560	30	9570	5	<1	<1	390	390	<20	<50	<100	<50	<50
W13_MB2	03-May-2022	Girrah 1 Seam	6.86	7.6	26624	26500	18800	474	231	5160	34	9330	8	<1	<1	350	350	<20	<50	140	<50	140
W13_MB2	31-May-2022	Girrah 1 Seam	6.86	7.78	27460	27100	18500	468	256	5930	31	9520	4	<1	<1	370	370	<20	<50	<100	<50	<50
W13_MB2	22-Jun-2022	Girrah 1 Seam	6.9	7.54	21609	27100	18700	346	246	5720	33	9330	6	<1	<1	376	376	<20	<50	<100	<50	<50
W13_MB2	20-Jul-2022	Girrah 1 Seam	6.8	7.63	26317	28100	18500	440	239	5470	30	9830	5	<1	<1	410	410	<20	<50	<100	<50	<50
W13_MB2	31-Aug-2022	Girrah 1 Seam	6.76	7.59	27415	24900	18300	453	233	5240	29	9360	7	<1	<1	347	347	<20	<50	<100	<50	<50
W13_MB2	04-Oct-2022	Girrah 1 Seam	6.81	7.92	28015	25600	17200	367	209	5340	32	9130	7	<1	<1	360	360	<20	<50	<100	<50	<50
W14_MB2	20-Oct-2020	Permian Coal Seam	6.37	7.51	23476	23900	17200	609	802	3240	16	8050	1470	<1	<1	388	388	<20	<50	110	<50	110
W14_MB2	16-Dec-2020	Permian Coal Seam	6.66	7.52	24285	25700	17000	596	864	3940	11	9480	905	<1	<1	423	423	<20	<50	<100	<50	<50
W14_MB2	05-Jan-2021	Permian Coal Seam	6.65	7.14	23904	23100	18100	651	908	3560	16	8340	1400	<1	<1	413	413	<20	<50	<100	<50	<50
W14_MB2	26-Jan-2021	Permian Coal Seam	6.58	7.12	23957	23400	15600	668	932	3720	16	8270	1400	<1	<1	444	444	<20	<50	<100	<50	<50
W14_MB2	17-Feb-2021	Permian Coal Seam	6.48	7.04	24130	23100	18200	654	924	3660	16	8460	1400	<1	<1	453	453	<20	<50	<100	<50	<50
W14_MB2	24-Mar-2021	Permian Coal Seam	6.56	7.13	23614	22300	17400	648	893	3680	16	7920	1370	<1	<1	442	442	<20	<50	<100	<50	<50
W14_MB2	14-Apr-2021	Permian Coal Seam	6.46	7.54	23514	23500	16600	641	818	3200	15	8290	1370	<1	<1	472	472	<20	<50	<100	<50	<50
W14_MB2	26-May-2021	Permian Coal Seam	6.58	7.35	23356	22800	17000	645	848	3370	15	8240	1330	<1	<1	462	462	<20	<50	<100	<50	<50
W14_MB2	29-Jun-2021	Permian Coal Seam	6.44	7.31	23569	23200	17600	661	840	3490	16	8160	1330	<1	<1	454	454	<20	<50	<100	<50	<50
W14_MB2	26-Jul-2021	Permian Coal Seam	6.53	7.73	13607	23100	17100	683	969	3810	16	8200	1360	<1	<1	446	446	<20	<50	<100	<50	<50
W14_MB2	24-Aug-2021	Permian Coal Seam	6.43	7.6	23506	23100	18400	708	929	3480	17	7980	1310	<1	<1	428	428	<20	<50	<100	<50	<50
W14_MB2	15-Sep-2021	Permian Coal Seam	6.33	7.25	23849	23300	17400	590	827	3400	15	8300	1360	<1	<1	443	443	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W14_MB2	19-Oct-2021	Permian Coal Seam	6.45	7.68	23661	24200	18400	634	927	3670	16	8020	1200	<1	<1	485	485	<20	<50	<100	<50	<50
W14_MB2	16-Nov-2021	Permian Coal Seam	6.3	7.54	23700	22000	18000	667	914	3810	16	8030	1220	<1	<1	503	503	<20	<50	<100	<50	<50
W14_MB2	09-Dec-2021	Permian Coal Seam	6.23	7.58	23495	22600	18000	674	860	3580	14	8190	1250	<1	<1	508	508	<20	<50	<100	<50	<50
W14_MB2	25-Jan-2022	Permian Coal Seam	6.16	7.73	23460	23700	17800	597	890	3480	15	8140	1270	<1	<1	515	515	<20	<50	<100	<50	<50
W14_MB2	22-Feb-2022	Permian Coal Seam	6.52	7.21	22813	23000	17400	651	897	3270	15	7990	1320	<1	<1	492	492	<20	<50	<100	<50	<50
W14_MB2	16-Mar-2022	Permian Coal Seam	6.63	7.93	22674	26100	15800	317	192	4350	29	8290	10	<1	<1	296	296	<20	<50	<100	<50	<50
W14_MB2	16-Mar-2022	Permian Coal Seam	6.63	7.61	22674	27800	19000	727	1020	3880	17	8360	1230	<1	<1	486	486	<20	<50	<100	<50	<50
W14_MB2	03-May-2022	Permian Coal Seam	6.62	7.5	24061	23200	20100	679	870	3300	16	7870	1220	<1	<1	519	519	<20	<50	<100	<50	<50
W14_MB2	31-May-2022	Permian Coal Seam	6.65	7.66	18351	23000	16500	646	976	3840	18	7900	1230	<1	<1	468	468	<20	<50	<100	<50	<50
W14_MB2	22-Jun-2022	Permian Coal Seam	6.62	7.31	20155	23400	17300	617	963	3770	16	7990	1270	<1	<1	495	495	<20	<50	<100	<50	<50
W14_MB2	20-Jul-2022	Permian Coal Seam	6.56	7.54	23906	24100	18000	617	962	3920	16	8130	1250	<1	<1	520	520	<20	<50	<100	<50	<50
W14_MB2	01-Sep-2022	Permian Coal Seam	6.53	7.52	23971	22300	18700	598	894	3640	15	8030	1310	<1	<1	465	465	<20	<50	<100	<50	<50
W15_MB2	20-Oct-2020	Vermont Upper Seam	6.41	7.5	25030	26300	18800	638	878	4020	12	9070	966	<1	<1	366	366	<20	<50	<100	<50	<50
W15_MB2	16-Dec-2020	Vermont Upper Seam	6.61	7.53	25096	23600	17300	641	887	3560	15	8540	1370	<1	<1	439	439	<20	<50	<100	<50	<50
W15_MB2	04-Jan-2021	Vermont Upper Seam	6.64	6.96	24697	24200	19200	596	859	3930	10	9110	968	<1	<1	437	437	<20	<50	<100	<50	<50
W15_MB2	28-Jan-2021	Vermont Upper Seam	6.6	7.12	25329	25200	20400	645	874	4000	10	9410	946	<1	<1	424	424	<20	<50	<100	<50	<50
W15_MB2	16-Feb-2021	Vermont Upper Seam	6.47	6.99	25105	24900	18500	603	920	4190	12	9190	976	<1	<1	431	431	<20	<50	<100	<50	<50
W15_MB2	10-Mar-2021	Vermont Upper Seam	6.42	7.09	25540	24200	17000	602	812	3710	11	9020	920	<1	<1	418	418	40	<50	<100	<50	<50
W15_MB2	14-Apr-2021	Vermont Upper Seam	6.53	7.48	25427	25100	17500	655	888	4060	11	9040	877	<1	<1	440	440	<20	<50	<100	<50	<50
W15_MB2	25-May-2021	Vermont Upper Seam	6.63	7.33	25281	24500	18100	607	827	3790	10	8920	883	<1	<1	442	442	<20	<50	<100	<50	<50
W15_MB2	29-Jun-2021	Vermont Upper Seam	6.44	7.29	25224	24700	17800	553	832	3880	11	9050	912	<1	<1	435	435	<20	<50	<100	<50	<50
W15_MB2	22-Jul-2021	Vermont Upper Seam	6.45	7.11	25740	24900	18300	567	800	3760	10	9120	876	<1	<1	401	401	<20	<50	<100	<50	<50
W15_MB2	24-Aug-2021	Vermont Upper Seam	6.43	7.38	24710	24600	19400	605	856	3890	11	8690	912	<1	<1	403	403	<20	<50	<100	<50	<50
W15_MB2	14-Sep-2021	Vermont Upper Seam	6.31	7.2	24662	25100	18200	518	783	3780	10	9000	897	<1	<1	423	423	<20	<50	<100	<50	<50
W15_MB2	19-Oct-2021	Vermont Upper Seam	6.38	7.32	25456	25300	18600	546	836	3900	11	8640	866	<1	<1	448	448	<20	<50	<100	<50	<50
W15_MB2	16-Nov-2021	Vermont Upper Seam	6.28	7.43	25135	24200	18000	605	842	4180	11	8730	885	<1	<1	450	450	<20	<50	<100	<50	<50
W15_MB2	08-Dec-2021	Vermont Upper Seam	6.15	7.23	24970	24000	21300	637	849	4140	11	8790	893	<1	<1	452	452	<20	<50	<100	<50	<50
W15_MB2	25-Jan-2022	Vermont Upper Seam	6.11	7.52	25597	25300	17200	527	819	3840	10	9020	938	<1	<1	456	456	<20	<50	<100	<50	<50
W15_MB2	15-Feb-2022	Vermont Upper Seam	6.16	7.85	25175	23700	20000	821	834	4610	18	9900	935	<1	<1	266	266	<20	<50	<100	<50	<50
W15_MB2	15-Mar-2022	Vermont Upper Seam	6.56	7.23	24873	28400	19400	614	897	4040	10	9050	910	<1	<1	430	430	<20	<50	<100	<50	<50
W15_MB2	03-May-2022	Vermont Upper Seam	6.58	7.43	25253	24500	21300	646	817	3740	12	8650	881	<1	<1	458	458	<20	<50	<100	<50	<50
W15_MB2	31-May-2022	Vermont Upper Seam	6.6	7.44	24760	24500	17400	568	832	3910	10	8650	924	<1	<1	417	417	<20	<50	<100	<50	<50
W15_MB2	22-Jun-2022	Vermont Upper Seam	6.61	6.98	21124	24800	18000	571	802	3900	10	8480	848	<1	<1	440	440	<20	<50	<100	<50	<50
W15_MB2	31-Aug-2022	Vermont Upper Seam	6.52	7.16	24493	24700	17600	648	934	4320	12	8670	922	<1	<1	415	415	<20	<50	<100	<50	<50
W15_MB3	20-Oct-2020	Vermont Lower Seam	6.96	7.79	26224	27200	18600	533	596	3690	20	9290	860	<1	<1	308	308	<20	<50	130	110	240
W15_MB3	16-Dec-2020	Vermont Lower Seam	6.9	7.66	27914	27300	20400	648	874	4520	15	10100	1070	<1	<1	423	423	<20	<50	<100	<50	<50
W15_MB3	04-Jan-2021	Vermont Lower Seam	6.87	7.19	27973	26100	20200	653	908	4730	15	9820	955	<1	<1	423	423	<20	<50	<100	<50	<50
W15_MB3	28-Jan-2021	Vermont Lower Seam	6.8	7.41	27821	27000	22000	730	896	4680	15	10100	957	<1	<1	422	422	<20	<50	<100	<50	<50
W15_MB3	16-Feb-2021	Vermont Lower Seam	6.86	7.36	27993	26600	20500	631	911	4720	17	9950	949	<1	<1	416	416	<20	<50	<100	<50	<50
W15_MB3	10-Mar-2021	Vermont Lower Seam	7.03	7.59	29243	28000	19700	863	1040	5000	17	10500	1080	<1	<1	434	434	<20	<50	<100	<50	<50
W15_MB3	14-Apr-2021	Vermont Lower Seam	7.12	7.87	29472	29700	20400	855	983	4870	18	10600	1080	<1	<1	430	430	<20	<50	<100	<50	<50
W15_MB3	25-May-2021	Vermont Lower Seam	7.09	7.66	28570	28300	20700	748	894	4500	17	10500	1060	<1	<1	348	348	<20	<50	<100	<50	<50
W15_MB3	29-Jun-2021	Vermont Lower Seam	6.97	7.6	29976	29200	22600	836	1030	5120	19	10600	1170	<1	<1	387	387	<20	<50	<100	<50	<50
W15_MB3	22-Jul-2021	Vermont Lower Seam	7.01	7.6	30156	28700	20400	916	1020	5210	20	10600	1000	<1	<1	342	342	<20	<50	<100	<50	<50
W15_MB3	24-Aug-2021	Vermont Lower Seam	6.93	7.67	28434	28000	24500	878	888	4630	20	10200	967	<1	<1	310	310	<20	<50	<100	<50	<50
W15_MB3	14-Sep-2021	Vermont Lower Seam	6.72	7.7	28295	28300	20600	765	770	4300	16	10300	993	<1	<1	307	307	<20	<50	<100	<50	<50
W15_MB3	19-Oct-2021	Vermont Lower Seam	6.83	7.74	28025	29200	20200	740	815	4500	17	10000	929	<1	<1	298	298	<20	<50	<100	<50	<50
W15_MB3	16-Nov-2021	Vermont Lower Seam	6.68	7.75	27670	25800	21700	809	872	4700	18	9770	922	<1	<1	308	308	<20	<50	<100	<50	<50
W15_MB3	08-Dec-2021	Vermont Lower Seam	6.54	7.61	27971	26000	23500	834	824	4690	17	9850	998	<1	<1	285	285	<20	<50	<100	<50	<50
W15_MB3	25-Jan-2022	Vermont Lower Seam	6.56	7.77	28204	28100	19500	780	843	4520	18	10000	979	<1	<1	282	282	<20	<50	<100	<50	<50
W15_MB3	15-Feb-2022	Vermont Lower Seam	6.65	7.55	28692	22800	17500	600	856	3980	11	8850	814	<1	<1	422	422	<20	<50	<100	<50	<50
W15_MB3	15-Mar-2022	Vermont Lower Seam	7.13	7.63	27957	32600	21500	757	806	4450	17	10300	957	<1	<1	260	260	<20	<50	<100	<50	<50
W15_MB3	03-May-2022	Vermont Lower Seam	7.11	7.78	28035	27500	22900	873	741	4150	18	9700	937	<1	<1	252	252	<20	<50	<100	<50	<50
W15_MB3	31-May-2022	Vermont Lower Seam	7.18	7.71	28407	27200	15800	842	880	4870	22	9710	976	<1	<1	228	228	<20	<50	<100	<50	<50
W15_MB3	22-Jun-2022	Vermont Lower Seam	7.17	7.42	23650	27600	20800	757	897	4790	19	9590	1050	<1	<1	249	249	<20	<50	<100	<50	<50
W15_MB3	31-Aug-2022	Vermont Lower Seam	6.93	7.47	28308	26300	22600	733	952	4550	18	9770	1050	<1	<1	377	377	<20	<50	<100	<50	<50
W2_MB2	20-Oct-2020	Girrah 1 Seam	6.37	7.23	38079	39700	27300	586	873	7830	50	13800	713	<1	<1	491	491	<20	<50	<100	<50	<50
W2_MB2	09-Dec-2020	Girrah 1 Seam	6.39	6.96	39511	40000	28700	652	954	8020	53	14700	742	<1	<1	554	554	<20	<50	<100	<50	<50
W2_MB2	05-Jan-2021	Girrah 1 Seam	6.52	6.92	36823	38100	29900	583	856	7380	49	14000	761	<1	<1	511	511	<20	<50	<100	<50	<50
W2_MB2	26-Jan-2021	Girrah 1 Seam	6.45	7.07	39221	39100	26300	680	933	7880	52	14200	745	<1	<1	564	564	<20	<50	<100	<50	<50
W2_MB2	24-Mar-2021	Girrah 1 Seam	6.42	6.94	39487	37100	28900	584	900	7840	49	13800	691	<1	<1	558	558	<20	<50	<100	<50	<50
W2_MB2	14-Apr-2021	Girrah 1 Seam	6.38	7.43	38558	39500	28000	670	924	7540	55	14000	720	<1	<1	594	594	<20	<50	<100	<50	<50
W2_MB2	26-May-2021	Girrah 1 Seam	6.53	7.26	38612	38000	28800	631	957	7960	51	14100	735	<1	<1	591	591	<20	<50	<100	<50	<50
W2_MB2	29-Jun-2021	Girrah 1 Seam	6.31	7.3	40032	39100	29100	608	1000	8570	58	13800	755	<1	<1	604	604	<20	<50	<100	90	90
W2_MB2	26-Jul-2021	Girrah 1 Seam	6.47	7.5	34666	39300	30600	902	906	7040	48	14000	753	<1	<1	593	593	<20	<50	<100	80	80
W2_MB2	24-Aug-2021	Girrah 1 Seam	6.34	7.37	38334	38400	30900	642	868	7210	56	13800	731	<1	<1	538	538	<20	<50	<100	<50	<50
W2_MB2	14-Sep-2021	Girrah 1 Seam	6.26	7.02	39323	39000	26400	567	787	6810	45	14100	749	<1	<1	578	578	<20	<50	<100	<50	<50
W2_MB2	19-Oct-2021	Girrah 1 Seam	6.27	7.62	40125	40300	31700	581	974	8430	54	14200	735	<1	<1	609	609	<20	<50	120	130	250
W2_MB2	16-Nov-2021	Girrah 1 Seam	6.16	7.15	39505	39400	27800	606	944	7940	55	14000	730	<1	<1	596	596	<20	<50	110	80	190
W2_MB2	09-Dec-2021	Girrah 1 Seam	6.03	7.28	39181	41400	30300	653	877	7650	52	14000	744	<1	<1	600	600	<20	<50	<100	<50	<50
W2_MB2	25-Jan-2022	Girrah 1 Seam	6.07	7.55	30652	39800	28600	560	920	7700	52	14400	762	<1	<1	599	599	<20	<50	<100	<50	<50
W2_MB2	22-Feb-2022	Girrah 1 Seam	6.24	7.1	39685	39400	30000	515	922	7820	51	13900	727	<1	<1	586	586	<20	<50	<100	<50	<50
W2_MB2	16-Mar-2022	Girrah 1 Seam	6.43	7.35	39469	47300	31400	620	982	8120	52	14400	759	<1	<1	568	568	<20	<50	<100	<50	<50
W2_MB2	03-May-2022	Girrah 1 Seam	6.45	7.17	39157	39300	33500	679	844	7110	52	13900	744	<1	<1	608	608	<20	<50	<100	<50	<50
W2_MB2	31-May-2022	Girrah 1 Seam	6.41	7.48	39341	38900	28200	630	958	8220	54	14100	752	<1	<1	557	557	<20	<50	<100	<50	<50
W2_MB2	22-Jun-2022	Girrah 1 Seam	6.4	7.17	32366	39400	30800	525	962	8320	55	13300	738	<1	<1	582	582	<20	<50	<100	<50	<50
W2_MB2	20-Jul-2022	Girrah 1 Seam	6.34	7.18	39541	49600	26300	567	902	7910	51	14300	759	<1	<1	609	609	<20	<50	<100	<50	<50
W2_MB2	31-Aug-2022	Girrah 1 Seam	6.33	7.15	39865	35800	30600	531	872	7420	47	14600	769	<1	<1	546	546	<20	<50	<100	<50	<50
W2_MB2	04-Oct-2022	Girrah 1 Seam	6.39	7.71	39202	51100	29700	587	911	7260	51	14300	727	<1	<1	592	592	<20	<50	<100	<50	<50
W4_MB2	21-Oct-2020	Permian overburden	6.69	7.63	17219	18000	12200	298	511	2590	24	5770	1140	<1	<1	398	398	<20	<50	120	<50	120
W4_MB2	09-Dec-2020	Permian overburden	6.84	7.31	16549	19100	13500	349	714	3370	27	6620	1160	<1	<1	496	496	<20	<50	150	<50	150
W4_MB2	05-Jan-2021	Permian overburden	6.85	7.18	19458	18900	14600	356	660	3090	26	6730	1200	<1	<1	469	469	<20	<50	<100	<50	<50
W4_MB2	26-Jan-2021	Permian overburden	6.75	7.35	20112	19800	14100	374	676	3250	27	6810	1210	<1	<1	512	512	<20	<50	<100	<50	<50
W4_MB2	16-Feb-2021	Permian overburden	6.72	7.19	18918	19200	14800	357	636	2990	27	6880	1190	<1	<1	501	501	<40	<50	<100	<50	<50
W4_MB2	14-Apr-2021	Permian overburden	6.73	7.68	18797	20200	13800	371	701	3190	25	6920	1180	<1	<1	554	554	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W4_MB2	25-May-2021	Permian overburden	6.78	7.46	17802	19400	13900	337	582	2740	23	6770	1160	<1	<1	532	532	<20	<50	<100	<50	<50
W4_MB2	29-Jun-2021	Permian overburden	6.62	7.52	19921	19900	14800	344	618	3060	26	6810	1180	<1	<1	536	536	<20	<50	<100	<50	<50
W4_MB2	26-Jul-2021	Permian overburden	6.73	7.73	19944	19800	14200	384	750	3510	28	6860	1220	<1	<1	527	527	<20	<50	<100	<50	<50
W4_MB2	24-Aug-2021	Permian overburden	6.62	7.62	19399	19500	15000	393	666	3120	28	6690	1130	<1	<1	490	490	<20	100	120	<50	220
W4_MB2	14-Sep-2021	Permian overburden	6.54	7.24	19285	19800	14300	309	612	3030	24	6780	1180	<1	<1	541	541	<20	<50	<100	<50	<50
W4_MB2	19-Oct-2021	Permian overburden	6.65	7.68	19804	20400	15800	363	727	3440	28	6760	1040	<1	<1	597	597	<20	<50	<100	<50	<50
W4_MB2	16-Nov-2021	Permian overburden	6.46	7.39	19785	19500	16000	368	654	3350	25	6690	1050	<1	<1	621	621	<20	<50	190	<50	190
W4_MB2	09-Dec-2021	Permian overburden	6.34	7.47	19858	19800	15700	384	650	3270	24	6880	1080	<1	<1	616	616	<20	<50	110	<50	110
W4_MB2	25-Jan-2022	Permian overburden	6.37	7.77	20372	20400	15400	343	678	3260	26	6980	1080	<1	<1	639	639	<40	<50	120	<50	120
W4_MB2	15-Feb-2022	Permian overburden	6.74	7.81	20108	17200	14900	356	712	3450	28	6960	1040	<1	<1	571	571	<40	<50	<100	<50	<50
W4_MB2	16-Mar-2022	Permian overburden	6.79	7.43	19168	24100	15600	356	668	3270	27	7020	1040	<1	<1	590	590	<20	<50	<100	<50	<50
W4_MB2	03-May-2022	Permian overburden	6.84	7.43	18620	20000	16600	387	664	3220	26	6840	1050	<1	<1	634	634	<20	<50	<100	<50	<50
W4_MB2	31-May-2022	Permian overburden	6.76	7.65	18741	19800	13900	347	636	3100	24	6700	1050	<1	<1	561	561	<20	<50	<100	<50	<50
W4_MB2	22-Jun-2022	Permian overburden	6.76	7.22	15657	20100	14800	363	726	3520	28	6560	1090	<1	<1	591	591	<20	<50	140	<50	140
W4_MB2	20-Jul-2022	Permian overburden	6.68	7.44	19757	20600	15400	342	685	3440	26	6910	1080	<1	<1	626	626	<20	<50	<100	<50	<50
W4_MB2	31-Aug-2022	Permian overburden	6.6	7.38	20643	19200	15800	337	646	3190	25	6840	1110	<1	<1	549	549	<20	<50	100	<50	100
W5_MB2	21-Oct-2020	Leichhardt Lower Seam	6.49	7.45	23193	23700	16200	307	587	3660	18	7730	1670	<1	<1	519	519	<20	<50	<100	<50	<50
W5_MB2	09-Dec-2020	Leichhardt Lower Seam	6.6	7.26	24671	23600	17000	377	793	4580	20	8180	1600	<1	<1	593	593	<20	<50	<100	<50	<50
W5_MB2	05-Jan-2021	Leichhardt Lower Seam	6.73	7.16	24045	22800	17400	372	745	4320	19	8040	1640	<1	<1	560	560	<20	<50	<100	<50	<50
W5_MB2	26-Jan-2021	Leichhardt Lower Seam	6.71	7.43	24204	23500	15600	384	784	4510	20	7990	1600	<1	<1	606	606	<20	<50	<100	<50	<50
W5_MB2	16-Feb-2021	Leichhardt Lower Seam	6.63	7.24	24424	22900	17200	367	758	4340	20	8150	1660	<1	<1	622	622	<20	<50	<100	<50	<50
W5_MB2	10-Mar-2021	Leichhardt Lower Seam	6.6	7.35	24430	22600	14000	366	693	4030	20	7960	1640	<1	<1	618	618	20	<50	<100	<50	<50
W5_MB2	14-Apr-2021	Leichhardt Lower Seam	6.76	7.8	24304	23800	16200	366	687	3840	18	8030	1630	<1	<1	637	637	<20	<50	<100	<50	<50
W5_MB2	25-May-2021	Leichhardt Lower Seam	6.77	7.62	23710	22600	16700	355	672	3880	18	7960	1620	<1	<1	637	637	<20	<50	<100	<50	<50
W5_MB2	29-Jun-2021	Leichhardt Lower Seam	6.61	7.44	24159	23200	17300	354	690	4030	20	7950	1640	<1	<1	637	637	<20	<50	<100	<50	<50
W5_MB2	26-Jul-2021	Leichhardt Lower Seam	6.79	7.83	24156	23200	16800	376	812	4600	21	7920	1670	<1	<1	618	618	<20	<50	<100	<50	<50
W5_MB2	24-Aug-2021	Leichhardt Lower Seam	6.63	7.64	23885	23200	17800	410	759	4130	22	7800	1580	<1	<1	593	593	<20	<50	<100	<50	<50
W5_MB2	14-Sep-2021	Leichhardt Lower Seam	6.54	7.3	23683	23200	16400	330	700	4250	20	8000	1690	<1	<1	596	596	<20	<50	<100	<50	<50
W5_MB2	19-Oct-2021	Leichhardt Lower Seam	6.63	7.74	24089	24400	18400	365	766	4440	21	7750	1570	<1	<1	640	640	<20	<50	<100	<50	<50
W5_MB2	16-Nov-2021	Leichhardt Lower Seam	6.43	7.45	24443	22900	18300	404	759	4700	20	7920	1570	<1	<1	646	646	<20	<50	<100	<50	<50
W5_MB2	09-Dec-2021	Leichhardt Lower Seam	6.33	7.56	23715	23500	17700	388	713	4380	19	7910	1590	<1	<1	653	653	<20	<50	<100	<50	<50
W5_MB2	25-Jan-2022	Leichhardt Lower Seam	6.35	7.8	24278	23900	17900	341	727	4250	20	7900	1630	<1	<1	656	656	<20	<50	<100	<50	<50
W5_MB2	15-Feb-2022	Leichhardt Lower Seam	6.7	7.84	24213	20000	17300	391	750	4320	20	7970	1550	<1	<1	593	593	<20	<50	<100	<50	<50
W5_MB2	16-Mar-2022	Leichhardt Lower Seam	6.75	7.62	23681	27300	17800	359	757	4270	19	7960	1600	<1	<1	620	620	<20	<50	<100	<50	<50
W5_MB2	03-May-2022	Leichhardt Lower Seam	6.76	7.36	23814	23200	18600	415	720	4060	21	7710	1580	<1	<1	663	663	<20	<50	<100	<50	<50
W5_MB2	31-May-2022	Leichhardt Lower Seam	6.71	7.68	24457	21800	15400	365	722	4300	19	7200	1460	<1	<1	564	564	<20	<50	<100	<50	<50
W5_MB2	22-Jun-2022	Leichhardt Lower Seam	6.76	7.26	20040	23500	17600	375	806	4470	22	7690	1670	<1	<1	635	635	<20	<50	<100	<50	<50
W5_MB2	31-Aug-2022	Leichhardt Lower Seam	6.71	7.48	23845	22100	18100	373	770	4280	22	7710	1660	<1	<1	586	586	<20	50	<100	<50	50
W5_MB3	21-Oct-2020	Vermont Seam	6.6	7.61	21254	21700	15300	383	764	3820	38	6950	1610	<1	<1	439	439	<20	<50	<100	<50	<50
W5_MB3	09-Dec-2020	Vermont Seam	8.4	7.65	22396	23000	15800	457	629	4640	38	7940	1400	<1	<1	522	522	<20	<50	<100	<50	<50
W5_MB3	05-Jan-2021	Vermont Seam	7.25	7.54	23023	22000	16700	395	611	4340	38	7800	1470	<1	<1	490	490	<20	<50	<100	<50	<50
W5_MB3	26-Jan-2021	Vermont Seam	7.34	7.65	23271	22600	15300	400	608	4310	38	7750	1460	<1	<1	520	520	<20	<50	<100	<50	<50
W5_MB3	16-Feb-2021	Vermont Seam	7.57	7.47	23421	22100	16500	398	570	4350	43	7860	1440	<1	<1	502	502	<20	<50	<100	<50	<50
W5_MB3	10-Mar-2021	Vermont Seam	7.5	7.69	23085	21600	12500	341	524	3790	40	7680	1360	<1	<1	439	439	<20	<50	<100	<50	<50
W5_MB3	14-Apr-2021	Vermont Seam	8.13	8.23	23039	22400	15200	277	463	3670	44	7760	1410	<1	<1	246	246	<20	<50	<100	<50	<50
W5_MB3	25-May-2021	Vermont Seam	9.97	8	21711	21400	15300	586	270	4370	65	7700	1250	<1	<1	140	140	<20	<50	<100	<50	<50
W5_MB3	29-Jun-2021	Vermont Seam	8.38	7.92	22988	22100	15900	310	504	3910	49	7740	1280	<1	<1	194	194	<20	<50	<100	<50	<50
W5_MB3	26-Jul-2021	Vermont Seam	8.57	8.08	22867	22000	16600	361	546	4470	50	7980	1300	<1	<1	165	165	<20	<50	<100	<50	<50
W5_MB3	24-Aug-2021	Vermont Seam	7.95	7.9	22130	22000	16500	316	555	4170	50	7660	1210	<1	<1	199	199	<20	<50	<100	<50	<50
W5_MB3	14-Sep-2021	Vermont Seam	8.33	7.95	22693	22200	15800	354	502	4350	50	7760	1310	<1	<1	181	181	<20	<50	<100	<50	<50
W5_MB3	19-Oct-2021	Vermont Seam	8.99	8.06	22284	22700	16200	482	371	4190	57	7600	1180	<1	<1	166	166	<20	<50	<100	<50	<50
W5_MB3	16-Nov-2021	Vermont Seam	8.15	7.89	22527	21800	17000	400	502	4510	48	7690	1200	<1	<1	821	821	<20	<50	<100	<50	<50
W5_MB3	09-Dec-2021	Vermont Seam	8.02	7.86	22117	22500	16300	431	453	4310	45	7670	1200	<1	<1	240	240	<20	<50	<100	<50	<50
W5_MB3	25-Jan-2022	Vermont Seam	7.85	8.02	22773	22800	16700	409	466	4190	46	7720	1260	<1	<1	254	254	<40	<50	<100	<50	<50
W5_MB3	15-Feb-2022	Vermont Seam	8.05	8.06	22885	19400	16200	380	503	4450	49	7820	1200	<1	<1	285	285	<100	<50	<100	<50	<50
W5_MB3	16-Mar-2022	Vermont Seam	8.02	7.84	22052	26800	16400	620	321	4240	52	7890	1200	<1	<1	600	600	<20	<50	<100	<50	<50
W5_MB3	03-May-2022	Vermont Seam	7.46	7.9	23197	22400	17600	476	382	3740	45	7480	1170	<1	<1	305	305	<20	<50	<100	<50	<50
W5_MB3	31-May-2022	Vermont Seam	7.27	7.92	23387	22200	15600	354	638	4610	42	7520	1260	<1	<1	297	297	<20	<50	<100	<50	<50
W5_MB3	22-Jun-2022	Vermont Seam	8.95	7.79	18952	22600	17000	328	603	4330	38	7640	1280	<1	<1	373	373	<20	<50	<100	<50	<50
W5_MB3	20-Jul-2022	Vermont Seam	8.57	7.47	22933	24000	17200	385	775	4460	23	7870	1630	<1	<1	668	668	<20	<50	<100	<50	<50
W5_MB3	20-Jul-2022	Vermont Seam	8.57	7.8	22933	22900	16800	569	357	4280	49	7730	1190	<1	<1	374	374	<20	<50	<100	<50	<50
W5_MB3	31-Aug-2022	Vermont Seam	7.09	7.86	23462	21200	16900	425	522	4140	40	7800	1260	<1	<1	342	342	<20	<50	<100	<50	<50
W6_MB1	21-Oct-2020	Permian overburden	7.03	8.04	12370	13000	9370	198	275	2280	28	3480	1500	<1	<1	648	648	40	110	950	80	1140
W6_MB1	09-Dec-2020	Permian overburden	6.92	7.54	14486	14200	9420	184	341	2680	30	4930	598	<1	<1	437	437	30	<50	490	50	540
W6_MB1	05-Jan-2021	Permian overburden	7.05	7.46	14692	13900	10000	206	346	2600	30	5010	652	<1	<1	434	434	30	<50	390	<50	390
W6_MB1	26-Jan-2021	Permian overburden	6.99	7.68	15060	15000	9740	220	381	2710	32	5030	695	<1	<1	505	505	30	<50	410	<50	410
W6_MB1	16-Feb-2021	Permian overburden	6.93	7.42	15425	14900	10600	223	382	2630	34	5180	783	<1	<1	541	541	<40	<50	450	<50	450
W6_MB1	10-Mar-2021	Permian overburden	6.93	7.62	15334	14600	8820	222	362	2450	33	5180	826	<1	<1	526	526	30	70	400	<50	470
W6_MB1	14-Apr-2021	Permian overburden	6.97	7.84	15624	16400	11200	263	490	2700	34	5420	973	<1	<1	591	591	<20	<50	250	<50	250
W6_MB1	25-May-2021	Permian overburden	7.03	7.66	15880	16400	11700	246	428	2620	33	5500	1010	<1	<1	585	585	<20	<50	340	<50	340
W6_MB1	29-Jun-2021	Permian overburden	6.83	7.48	16918	16900	12200	269	483	2760	37	5650	1070	<1	<1	604	604	<20	50	520	80	650
W6_MB1	26-Jul-2021	Permian overburden	6.95	7.82	17385	17800	12500	313	594	3170	39	5980	1270	<1	<1	569	569	<20	<50	200	<50	200
W6_MB1	24-Aug-2021	Permian overburden	6.82	7.69	17433	17700	13600	324	561	2960	41	5940	1200	<1	<1	531	531	<20	100	180	<50	280
W6_MB1	14-Sep-2021	Permian overburden	6.75	7.43	17720	18000	12800	278	524	2940	37	5990	1220	<1	<1	557	557	<20	80	240	<50	320
W6_MB1	19-Oct-2021	Permian overburden	6.86	7.76	17830	18400	13400	296	569	3110	40	5770	998	<1	<1	639	639	<20	0	0	0	0
W6_MB1	16-Nov-2021	Permian overburden	6.65	7.63	17479	17500	13500	294	528	3150	37	5860	982	<1	<1	657	657	<40	50	340	<50	390
W6_MB1	09-Dec-2021	Permian overburden	6.51	7.68	17509	17700	13600	310	519	2990	35	5990	999	<1	<1	663	663	20	<50	240	<50	240
W6_MB1	25-Jan-2022	Permian overburden	6.6	7.88	17926	18200	13300	284	545	2980	38	6040	956	<1	<1	669	669	<60	<50	260	<50	260
W6_MB1	15-Feb-2022	Permian overburden	6.98	7.9	18063	15700	12900	282	579	3180	41	6170	920	<1	<1	609	609	<120	<50	200	<50	200
W6_MB1	16-Mar-2022	Permian overburden	7	7.63	17647	21700	13800	289	560	3020	40	6160	948	<1	<1	638	638	<30	<50	200	<50	200
W6_MB1	03-May-2022	Permian overburden	7.04	7.56	17262	17700	15000	306	530	2740	38	5990	949	<1	<1	680	680	<40	<50	220	<50	220
W6_MB1	31-May-2022	Permian overburden	6.89	7.75	19026	18000	12600	301	604	3230	40	5940	970	<1	<1	619	619	<20	<50	260	<50	260
W6_MB1	22-Jun-2022	Permian overburden	6.97	7.4	14975	18400	13400	309	637	3310	42	6030	1010	<1	<1	653	653	<20	<50	250	<50	250
W6_MB1	20-Jul-2022	Permian overburden	6.95	7.6	17547	18400	13500	288	560	3010	39	6080	996	<1	<1	694	694	<20	<50	280	<50	280
W6_MB1	31-Aug-2022	Permian overburden	6.82	7.49	18737	17400	14100	285	565	3140	37	6320	1060	<1	<1	614	614	<20	<50	270	<50	270

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W6_MB2	21-Oct-2020	Girrah 1 Seam	6.52	7.48	20364	21600	15000	292	575	3050	26	6750	1720	<1	<1	454	454	<20	<50	<100	<50	<50
W6_MB2	09-Dec-2020	Girrah 1 Seam	6.62	7.17	21918	21500	15400	376	776	3860	30	7260	1720	<1	<1	502	502	<20	<50	<100	<50	<50
W6_MB2	05-Jan-2021	Girrah 1 Seam	6.74	7.11	21832	20400	15700	380	751	3740	30	7160	1740	<1	<1	464	464	<20	<50	<100	<50	<50
W6_MB2	26-Jan-2021	Girrah 1 Seam	6.67	7.37	21890	21200	13800	393	790	3870	31	7080	1760	<1	<1	506	506	<20	<50	<100	<50	<50
W6_MB2	16-Feb-2021	Girrah 1 Seam	6.61	7.08	21981	20600	15700	375	772	3750	30	7280	1770	<1	<1	528	528	<20	<50	<100	<50	<50
W6_MB2	10-Mar-2021	Girrah 1 Seam	6.57	7.31	21717	20300	12000	385	699	3480	30	7140	1730	<1	<1	518	518	20	<50	<100	<50	<50
W6_MB2	14-Apr-2021	Girrah 1 Seam	6.64	7.71	21660	21400	15000	383	693	3320	27	7110	1750	<1	<1	535	535	<20	<50	<100	<50	<50
W6_MB2	25-May-2021	Girrah 1 Seam	6.71	7.54	21338	20800	15500	380	704	3450	28	7110	1730	<1	<1	538	538	<20	<50	<100	<50	<50
W6_MB2	29-Jun-2021	Girrah 1 Seam	6.54	7.42	22035	21000	15900	361	686	3490	31	7060	1760	<1	<1	533	533	<20	<50	<100	<50	<50
W6_MB2	26-Jul-2021	Girrah 1 Seam	6.67	7.72	21430	21000	15700	378	820	3920	31	7190	1820	<1	<1	516	516	<20	<50	<100	<50	<50
W6_MB2	24-Aug-2021	Girrah 1 Seam	6.53	7.56	21437	20800	16200	412	769	3460	33	7090	1690	<1	<1	473	473	<20	<50	<100	<50	<50
W6_MB2	14-Sep-2021	Girrah 1 Seam	6.49	7.35	21620	21100	15600	310	708	3570	29	7040	1800	<1	<1	502	502	<20	<50	<100	<50	<50
W6_MB2	19-Oct-2021	Girrah 1 Seam	6.53	7.63	21646	22000	16500	364	781	3800	32	6800	1670	<1	<1	528	528	<20	<50	<100	<50	<50
W6_MB2	16-Nov-2021	Girrah 1 Seam	6.41	7.39	21875	20400	16800	418	763	3950	30	6900	1660	<1	<1	529	529	<20	<50	<100	<50	<50
W6_MB2	09-Dec-2021	Girrah 1 Seam	6.31	7.47	21838	20800	16800	398	734	3740	28	6970	1710	<1	<1	531	531	<20	<50	<100	<50	<50
W6_MB2	25-Jan-2022	Girrah 1 Seam	6.3	7.76	21795	21400	16200	333	735	3600	29	7090	1740	<1	<1	534	534	<20	<50	<100	<50	<50
W6_MB2	15-Feb-2022	Girrah 1 Seam	6.7	7.78	21844	18100	16000	385	802	3850	32	7120	1690	<1	<1	484	484	<20	<50	<100	<50	<50
W6_MB2	16-Mar-2022	Girrah 1 Seam	6.7	7.49	21299	25700	16500	383	765	3840	31	7090	1700	<1	<1	504	504	<20	70	<100	<50	70
W6_MB2	03-May-2022	Girrah 1 Seam	6.72	7.36	21781	20900	17400	382	685	3270	29	6880	1740	<1	<1	534	534	<20	<50	<100	<50	<50
W6_MB2	31-May-2022	Girrah 1 Seam	6.66	7.63	21210	20900	15200	394	815	3920	31	6850	1780	<1	<1	487	487	<20	<50	<100	<50	<50
W6_MB2	22-Jun-2022	Girrah 1 Seam	6.66	7.27	18319	21400	16200	373	795	3850	32	6940	1830	<1	<1	511	511	<20	<50	<100	<50	<50
W6_MB2	20-Jul-2022	Girrah 1 Seam	6.65	7.39	22018	21600	16200	354	774	3860	30	6920	1800	<1	<1	538	538	<20	<50	<100	<50	<50
W6_MB2	31-Aug-2022	Girrah 1 Seam	6.62	7.35	21807	19900	16500	370	752	3780	30	6940	1860	<1	<1	475	475	<20	<50	<100	<50	<50
W7_MB1	21-Oct-2020	Permian overburden	6.49	7.47	36274	37600	26000	437	1100	7320	39	12800	1810	<1	<1	497	497	<20	<50	<100	<50	<50
W7_MB1	09-Dec-2020	Permian overburden	6.7	7.24	36074	37800	28500	451	1080	7210	39	13500	1740	<1	<1	576	576	<20	<50	<100	<50	<50
W7_MB1	05-Jan-2021	Permian overburden	6.75	7.08	38050	36600	29600	481	1150	7820	41	13200	1780	<1	<1	533	533	<20	<50	<100	<50	<50
W7_MB1	26-Jan-2021	Permian overburden	6.7	7.35	38549	37200	27600	480	1130	7630	41	13100	1790	<1	<1	587	587	<20	<50	<100	<50	<50
W7_MB1	16-Feb-2021	Permian overburden	6.6	7.13	38394	36900	29000	430	1100	7380	39	13400	1800	<1	<1	596	596	<20	<50	<100	60	60
W7_MB1	10-Mar-2021	Permian overburden	6.59	7.25	37650	35800	27000	418	1120	7520	40	13100	1750	<1	<1	580	580	<20	60	100	70	230
W7_MB1	14-Apr-2021	Permian overburden	6.58	7.69	37956	37900	26300	492	1110	7440	43	13200	1780	<1	<1	609	609	<20	<50	<100	<50	<50
W7_MB1	25-May-2021	Permian overburden	6.67	7.34	37239	36200	28300	466	1130	7540	38	13100	1760	<1	<1	595	595	<20	<50	<100	<50	<50
W7_MB1	29-Jun-2021	Permian overburden	6.67	7.29	37656	37100	27800	421	1100	7470	40	12800	1760	<1	<1	619	619	<20	<50	<100	<50	<50
W7_MB1	26-Jul-2021	Permian overburden	6.64	7.66	38002	37100	28500	599	1090	6880	37	13000	1810	<1	<1	588	588	<20	<50	<100	70	70
W7_MB1	24-Aug-2021	Permian overburden	6.53	7.49	36022	36500	29500	448	1020	6790	40	12800	1680	<1	<1	543	543	<20	<50	<100	<50	<50
W7_MB1	14-Sep-2021	Permian overburden	6.44	7.16	37284	37200	26400	433	1020	6980	36	13200	1780	<1	<1	563	563	<20	<50	<100	<50	<50
W7_MB1	19-Oct-2021	Permian overburden	6.54	7.52	38324	39000	30700	418	1040	7670	39	13200	1650	<1	<1	611	611	<20	<50	<100	<50	<50
W7_MB1	16-Nov-2021	Permian overburden	6.33	7.23	39030	37700	30600	439	1130	7570	40	12800	1650	<1	<1	609	609	<20	<50	<100	<50	<50
W7_MB1	09-Dec-2021	Permian overburden	6.28	7.44	38007	38100	29300	502	1140	7700	41	13100	1720	<1	<1	605	605	<20	<50	<100	<50	<50
W7_MB1	25-Jan-2022	Permian overburden	6.28	7.6	38308	37900	27600	438	1140	7610	40	13200	1760	<1	<1	616	616	<20	<50	<100	<50	<50
W7_MB1	15-Feb-2022	Permian overburden	6.62	7.71	38511	26300	29600	461	1110	7420	39	13100	1620	<1	<1	566	566	<20	<50	<100	<50	<50
W7_MB1	16-Mar-2022	Permian overburden	6.66	7.32	38180	45600	29700	445	1140	7430	38	13600	1690	<1	<1	585	585	<20	<50	<100	<50	<50
W7_MB1	03-May-2022	Permian overburden	6.69	7.26	38161	37900	31700	478	1010	6940	39	13300	1720	<1	<1	623	623	<20	<50	<100	<50	<50
W7_MB1	31-May-2022	Permian overburden	6.61	7.55	38400	37100	27400	485	1090	7270	37	12900	1720	<1	<1	562	562	<20	<50	<100	<50	<50
W7_MB1	22-Jun-2022	Permian overburden	6.66	7.11	31654	38000	28400	402	1130	7780	40	12500	1780	<1	<1	593	593	<20	<50	<100	<50	<50
W7_MB1	20-Jul-2022	Permian overburden	6.6	7.33	37533	47900	28700	454	1130	7650	40	13400	1790	<1	<1	625	625	<20	<50	<100	<50	<50
W7_MB1	31-Aug-2022	Permian overburden	6.58	7.27	37857	34300	29500	410	967	6470	34	13200	1790	<1	<1	550	550	<20	<50	<100	<50	<50
W8_MB1	21-Oct-2020	Girrah 1 Seam	6.21	7.24	39697	43800	31700	592	1280	7650	46	15600	1080	<1	<1	436	436	<20	<50	100	60	160
W8_MB1	09-Dec-2020	Girrah 1 Seam	6.43	7.01	42701	44200	32700	688	1390	8210	49	16400	1040	<1	<1	492	492	<20	<50	<100	<50	<50
W8_MB1	05-Jan-2021	Girrah 1 Seam	6.51	6.87	43787	42800	35300	719	1450	8720	52	15800	1050	<1	<1	464	464	<20	<50	<100	<50	<50
W8_MB1	28-Jan-2021	Girrah 1 Seam	6.48	7.11	44481	43800	35600	689	1410	8530	52	16500	1060	<1	<1	514	514	<20	<50	<100	60	60
W8_MB1	16-Feb-2021	Girrah 1 Seam	6.4	6.88	44002	42900	33200	635	1370	8100	49	16000	1070	<1	<1	504	504	<20	<50	<100	50	50
W8_MB1	10-Mar-2021	Girrah 1 Seam	6.35	7.02	42829	41500	31600	672	1390	8030	49	15700	1020	<1	<1	498	498	<20	50	<100	<50	50
W8_MB1	14-Apr-2021	Girrah 1 Seam	6.39	7.39	43685	44200	31100	735	1380	8020	54	15700	1030	<1	<1	527	527	<20	<50	<100	<50	<50
W8_MB1	25-May-2021	Girrah 1 Seam	6.47	7.19	43118	42000	32200	709	1450	8320	49	15800	1030	<1	<1	522	522	<20	<50	<100	<50	<50
W8_MB1	29-Jun-2021	Girrah 1 Seam	6.31	7.1	43030	43000	32900	605	1410	8340	51	15300	1020	<1	<1	513	513	<20	<50	<100	<50	<50
W8_MB1	26-Jul-2021	Girrah 1 Seam	6.5	7.51	42918	42800	33800	942	1380	7610	44	15600	1040	<1	<1	502	502	<20	<50	<100	<50	<50
W8_MB1	24-Aug-2021	Girrah 1 Seam	6.33	7.27	41435	42100	34700	635	1320	7340	49	15300	1000	<1	<1	453	453	<20	<50	<100	<50	<50
W8_MB1	14-Sep-2021	Girrah 1 Seam	6.21	7.07	43835	43300	32000	589	1130	6890	41	16100	1070	<1	<1	497	497	<20	<50	<100	<50	<50
W8_MB1	19-Oct-2021	Girrah 1 Seam	6.28	7.36	44202	46000	36600	629	1450	8710	51	15600	962	<1	<1	525	525	<20	<50	<100	<50	<50
W8_MB1	16-Nov-2021	Girrah 1 Seam	6.15	7.09	44021	43800	34700	631	1400	8090	50	15500	988	<1	<1	519	519	<20	<50	<100	<50	<50
W8_MB1	09-Dec-2021	Girrah 1 Seam	6.06	7.15	41855	44900	35700	678	1300	8040	48	15300	964	<1	<1	514	514	<20	<50	<100	<50	<50
W8_MB1	25-Jan-2022	Girrah 1 Seam	6.04	7.52	43490	44000	31400	639	1460	8440	52	16300	1030	<1	<1	524	524	<20	<50	<100	<50	<50
W8_MB1	15-Feb-2022	Girrah 1 Seam	6.41	7.58	44315	29000	33600	676	1370	8040	49	15400	961	<1	<1	469	469	<20	<50	<100	<50	<50
W8_MB1	16-Mar-2022	Girrah 1 Seam	6.47	7.13	43072	51100	35800	646	1420	8120	48	16500	1000	<1	<1	494	494	<20	<50	<100	<50	<50
W8_MB1	03-May-2022	Girrah 1 Seam	6.42	7.07	44515	42900	38000	740	1280	7560	50	15700	1010	<1	<1	525	525	<20	<50	<100	<50	<50
W8_MB1	31-May-2022	Girrah 1 Seam	6.38	7.4	44291	42900	31200	688	1460	8650	51	15600	1010	<1	<1	483	483	<20	<50	<100	<50	<50
W8_MB1	22-Jun-2022	Girrah 1 Seam	6.45	6.92	36626	44000	32700	581	1440	8620	53	15000	1050	<1	<1	504	504	<20	<50	<100	<50	<50
W8_MB1	20-Jul-2022	Girrah 1 Seam	6.35	7.12	44281	55200	33800	685	1410	8480	52	16100	1030	<1	<1	530	530	<20	<50	<100	<50	<50
W8_MB1	31-Aug-2022	Girrah 1 Seam	6.33	7.03	44303	39400	34200	752	1480	8610	52	15800	1060	<1	<1	466	466	<20	<50	<100	<50	<50
W9_MB2	21-Oct-2020	Vermont Upper Seam	6.42	7.33	15157	24000	15900	421	745	4270	11	8270	745	<1	<1	245	245	<20	<50	140	<50	140
W9_MB2	09-Dec-2020	Vermont Upper Seam	6.61	7.22	29837	28700	19800	556	947	5160	15	10500	908	<1	<1	345	345	<20	<50	<100	<50	<50
W9_MB2	04-Jan-2021	Vermont Upper Seam	6.56	6.9	37232	35600	29500	715	1240	6810	17	13100	1140	<1	<1	407	407	<20	<50	<100	<50	<50
W9_MB2	28-Jan-2021	Vermont Upper Seam	6.57	7.06	30962	31900	27400	574	985	5460	14	12000	1000	<1	<1	400	400	<20	<50	<100	<50	<50
W9_MB2	16-Feb-2021	Vermont Upper Seam	6.5	6.9	29343	36700	30000	528	973	5280	14	14600	1240	<1	<1	468	468	<20	<50	200	120	320
W9_MB2	10-Mar-2021	Vermont Upper Seam	6.42	7.05	36653	38000	29300	714	1220	6580	16	14200	1250	<1	<1	477	477	<20	<50	<100	<50	<50
W9_MB2	14-Apr-2021	Vermont Upper Seam	6.45	7.51	36281	40300	27600	752	1220	6580	18	14400	1280	<1	<1	502	502	<20	<50	<100	<50	<50
W9_MB2	25-May-2021	Vermont Upper Seam	6.53	7.34	37763	38200	29800	724	1280	6850	16	14300	1260	<1	<1	494	494	<20	<50	<100	<50	<50
W9_MB2	29-Jun-2021	Vermont Upper Seam	6.37	7.25	37027	39600	30900	671	1290	7120	18	14200	1270	<1	<1	496	496	<20	<50	<100	<50	<50
W9_MB2	22-Jul-2021	Vermont Upper Seam	6.41	7.29	37106	39400	31000	724	1250	6890	18	14500	1220	<1	<1	452	452	<20	<50	<100	<50	<50
W9_MB2	24-Aug-2021	Vermont Upper Seam	6.37	7.24	24766	24000	18100	234	403	2180	7	10000	774	<1	<1	293	293	<20	<50	<100	<50	<50
W9_MB2	14-Sep-2021	Vermont Upper Seam	6.21	6.98	36499	40000	29200	617	1040	5820	14	14600	1320	<1	<1	481	481	<20	<50	<100	<50	<50
W9_MB2	19-Oct-2021	Vermont Upper Seam	6.29	7.48	40898	42200	34400	688	1230	7350	18	14000	1180	<1	<1	501	501	<20	<50	<100	<50	<50
W9_MB2	16-Nov-2021	Vermont Upper Seam	6.21	7.07	36336	40200	32600	644	1200	6470	16	14100	1200	<1	<1	494	494	<20	<50	<100	<50	<50
W9_MB2	09-Dec-2021	Vermont Upper Seam	6.08	7.18	40562	40400	33400	821	1320	7630	19	14200	1250	<1	<1	504	504	<20	<50	<100	<50	<50
W9_MB2	25-Jan-2022	Vermont Upper Seam	6.09	7.46	41559	40600	33600	645	1220	6630	17	14600	1280	<1	<1	508	508	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-1: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
W9_MB2	15-Feb-2022	Vermont Upper Seam	6.45	7.51	41650	27400	31700	760	1340	7350	18	14200	1220	<1	<1	466	466	<20	<50	<100	<50	<50
W9_MB2	16-Mar-2022	Vermont Upper Seam	6.48	7.22	40152	48000	32800	692	1270	6780	16	14800	1250	<1	<1	480	480	<20	<50	<100	<50	<50
W9_MB2	03-May-2022	Vermont Upper Seam	6.52	7.2	36065	35200	34300	711	1100	5940	17	13600	1170	<1	<1	496	496	<20	<50	950	<50	950
W9_MB2	31-May-2022	Vermont Upper Seam	6.47	7.44	35365	39000	28100	681	1220	6680	17	13900	1240	<1	<1	464	464	<20	<50	<100	<50	<50
W9_MB2	22-Jun-2022	Vermont Upper Seam	6.53	6.93	26134	40600	30700	660	1350	7560	19	13800	1300	<1	<1	490	490	<20	<50	<100	<50	<50
W9_MB2	20-Jul-2022	Vermont Upper Seam	6.42	7.13	40170	50400	31700	736	1350	7700	18	14500	1270	<1	<1	518	518	<20	<50	<100	<50	<50
W9_MB2	31-Aug-2022	Vermont Upper Seam	6.37	7.15	40986	34500	29300	782	1360	7460	20	13800	1190	<1	<1	434	434	<20	<50	<100	<50	<50
W9_MB3	21-Oct-2020	Vermont Lower Seam	6.33	7.25	39506	40900	30400	726	1280	7400	18	14200	1350	<1	<1	431	431	<20	<50	160	130	290
W9_MB3	09-Dec-2020	Vermont Lower Seam	6.25	7.17	41294	41200	31300	786	1350	7480	18	15100	1360	<1	<1	495	495	<20	<50	<100	<50	<50
W9_MB3	04-Jan-2021	Vermont Lower Seam	6.51	6.83	41209	39800	32600	821	1420	8020	19	14600	1340	<1	<1	458	458	<20	<50	<100	<50	<50
W9_MB3	28-Jan-2021	Vermont Lower Seam	6.49	7.13	41565	40500	34700	804	1410	8000	19	15100	1340	<1	<1	501	501	<20	<50	<100	<50	<50
W9_MB3	16-Feb-2021	Vermont Lower Seam	6.39	6.95	40284	39800	31600	734	1370	7510	18	14800	1330	<1	<1	493	493	<20	<50	<100	<50	<50
W9_MB3	10-Mar-2021	Vermont Lower Seam	6.46	7.04	39695	38500	29900	766	1320	7320	17	14400	1300	<1	<1	491	491	<20	<50	<100	<50	<50
W9_MB3	14-Apr-2021	Vermont Lower Seam	6.41	7.4	40094	41000	28700	818	1310	7110	19	14700	1340	<1	<1	511	511	<20	<50	<100	<50	<50
W9_MB3	25-May-2021	Vermont Lower Seam	6.47	7.24	37845	39400	30300	719	1280	7000	14	14700	1340	<1	<1	505	505	<20	<50	<100	<50	<50
W9_MB3	29-Jun-2021	Vermont Lower Seam	6.3	7.18	40814	40300	31200	721	1420	7960	20	14300	1320	<1	<1	502	502	<20	<50	<100	<50	<50
W9_MB3	22-Jul-2021	Vermont Lower Seam	6.36	7.11	42074	40600	29800	823	1400	7810	19	14800	1300	<1	<1	465	465	<20	<50	<100	<50	<50
W9_MB3	24-Aug-2021	Vermont Lower Seam	6.28	7.31	40958	39600	32900	795	1330	7260	19	14200	1320	<1	<1	444	444	<20	<50	<100	<50	<50
W9_MB3	14-Sep-2021	Vermont Lower Seam	6.21	7.04	40010	40300	29400	681	1130	6480	15	14600	1370	<1	<1	486	486	<20	<50	<100	<50	<50
W9_MB3	19-Oct-2021	Vermont Lower Seam	6.26	7.4	40666	42800	34900	640	1270	7230	16	14600	1260	<1	<1	511	511	<20	<50	<100	<50	<50
W9_MB3	16-Nov-2021	Vermont Lower Seam	6.16	7.01	41568	41000	34200	718	1350	7360	18	14500	1270	<1	<1	511	511	<20	<50	<100	<50	<50
W9_MB3	09-Dec-2021	Vermont Lower Seam	6.1	7.26	38527	42100	33700	763	1240	7230	17	14400	1300	<1	<1	510	510	<20	<50	<100	<50	<50
W9_MB3	25-Jan-2022	Vermont Lower Seam	6.05	7.48	39808	41100	29800	706	1330	7370	18	14900	1340	<1	<1	517	517	<20	<50	<100	<50	<50
W9_MB3	15-Feb-2022	Vermont Lower Seam	6.37	7.65	42197	27600	32300	770	1320	7420	18	14500	1320	<1	<1	475	475	<20	<50	<100	<50	<50
W9_MB3	16-Mar-2022	Vermont Lower Seam	6.47	7.16	40457	49200	34100	749	1380	7620	17	15300	1310	<1	<1	489	489	<20	<50	<100	<50	<50
W9_MB3	03-May-2022	Vermont Lower Seam	6.46	7.15	41708	39400	35900	794	1230	6800	18	14300	1280	<1	<1	517	517	<20	<50	<100	<50	<50
W9_MB3	31-May-2022	Vermont Lower Seam	6.64	7.43	40230	40100	29800	731	1340	7470	18	14300	1310	<1	<1	481	481	<20	<50	<100	<50	<50
W9_MB3	22-Jun-2022	Vermont Lower Seam	6.53	6.91	34673	41300	32400	665	1370	7770	19	13900	1370	<1	<1	500	500	<20	<50	<100	<50	<50
W9_MB3	20-Jul-2022	Vermont Lower Seam	6.36	7.14	40957	51600	32100	721	1340	7630	17	14700	1330	<1	<1	524	524	<20	<50	<100	<50	<50
W9_MB3	31-Aug-2022	Vermont Lower Seam	6.39	7.15	37309	36900	34300	779	1290	7200	19	14400	1360	<1	<1	462	462	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1238-MB1	18-Feb-2018	Tertiary	6.45	7.47	17329	17000	13400	657	522	1990	3	5820	489	<1	<1	454	454	<20	70	<100	<50	70
1238-MB1	26-Mar-2018	Tertiary	6.39	7.58	19050	17200	12200	660	570	2220	3	6060	498	<1	<1	460	460	20	<50	<100	<50	<50
1238-MB1	02-Jul-2018	Tertiary	6.46	7.11	18068	17400	11400	622	582	2240	3	6450	494	<1	<1	479	479	20	<50	<100	<50	<50
1238-MB1	20-Sep-2018	Tertiary	6.45	7.06	18417	17400	12800	744	693	2420	3	6020	495	<1	<1	516	516	<20	<50	<100	<50	<50
1238-MB1	14-Mar-2019	Tertiary	6.44	7.14	18625	18400	11800	730	595	2240	3	6100	459	<1	<1	502	502	<20	<50	<100	<50	<50
1238-MB1	21-Jun-2019	Tertiary	5.13	7.52	18375	18200	12700	760	641	2400	3	6390	516	<1	<1	489	489	<20	150	<100	<50	150
1238-MB1	28-Aug-2019	Tertiary	6.49	7.69	19002	18500	12600	718	614	2260	3	6170	567	<1	<1	502	502	<20	100	<100	<50	100
1238-MB1	22-Oct-2019	Tertiary	6.43	7.55	18420	17400	12900	644	579	2250	3	6210	470	<1	<1	484	484	<20	80	<100	<50	80
1238-MB1	15-Dec-2019	Tertiary	6.35	7.01	19415	17800	12600	701	619	2340	3	6220	533	<1	<1	488	488	<20	60	<100	<50	60
1238-MB1	06-Feb-2020	Tertiary	6.33	7.29	20064	18000	15600	800	670	2390	3	6420	520	<1	<1	488	488	<20	<50	<100	<50	<50
1238-MB1	08-Apr-2020	Tertiary	6.2	7.35	18883	18900	12900	720	620	2170	3	6140	511	<1	<1	490	490	<20	100	<100	60	160
1238-MB1	09-Jun-2020	Tertiary	5.93	7.4	17335	18400	12400	717	658	2440	4	6250	499	<1	<1	508	508	<30	90	<100	<50	90
1238-MB1	19-Nov-2020	Tertiary	6.43	6.97	14536	13000	9580	511	464	1820	3	4800	322	<1	<1	370	370	<20	<50	<100	<50	<50
1238-MB1	03-Feb-2021	Tertiary	6.38	7.06	18009	14800	11100	583	488	1880	3	5380	388	<1	<1	377	377	<20	<50	<100	<50	<50
1238-MB1	21-Apr-2021	Tertiary	6.39	8.05	16584	15500	11200	590	531	2020	3	5530	415	<1	<1	444	444	<20	<50	<100	<50	<50
1238-MB1	12-May-2021	Tertiary	6.42	7.33	17028	15900	11600	671	590	2280	3	5590	429	<1	<1	419	419	<20	<50	120	<50	120
1238-MB1	18-Aug-2021	Tertiary	6.3	7.71	17447	17000	14200	677	578	2120	3	5890	452	<1	<1	462	462	20	<50	<100	<50	<50
1238-MB1	21-Sep-2021	Tertiary	6.28	7.37	17675	17800	14200	695	597	2180	3	6220	500	<1	<1	504	504	<20	<50	<100	<50	<50
1238-MB1	17-Nov-2021	Tertiary	6.12	7.13	17898	17000	14300	618	581	2110	3	6020	471	<1	<1	540	540	<20	<50	<100	<50	<50
1238-MB1	12-Jan-2022	Tertiary	6.46	6.89	18364	18300	16600	661	601	2260	3	6460	511	<1	<1	522	522	<20	<50	<100	<50	<50
1238-MB1	15-Mar-2022	Tertiary	6.43	6.95	17803	20500	14200	643	599	2400	4	6340	497	<1	<1	513	513	<20	<50	<100	<50	<50
1238-MB1	01-Jun-2022	Tertiary	6.41	7.77	18090	15500	12700	632	614	2300	3	5980	493	<1	<1	474	474	<20	<50	<100	<50	<50
1238-MB1	20-Jul-2022	Tertiary	6.33	6.97	18011	17800	13500	702	643	2400	4	6350	509	<1	<1	540	540	<20	<50	<100	<50	<50
1238-MB1	28-Sep-2022	Tertiary	6.41	7.81	17926	19200	14200	656	611	2330	3	6110	369	<1	<1	614	614	<20	<50	<100	<50	<50
2371W-MB1	25-Mar-2018	Tertiary	7.06	7.49	26220	23600	17500	34	1220	4300	5	6350	3450	<1	<1	2990	2990	<20	<50	<100	<50	<50
2371W-MB1	15-Jul-2018	Tertiary	7.07	7.43	24383	24700	17000	42	1200	4200	5	6370	3610	<1	<1	2940	2940	<20	<50	120	<50	120
2371W-MB1	22-Sep-2018	Tertiary	7.02	7.77	25164	23600	17900	17	1380	3500	4	6150	3340	<1	<1	299	299	<20	<50	<100	<50	<100
2371W-MB1	23-Feb-2019	Tertiary	7.11	7.62	24954	24600	18600	33	1270	4110	5	6290	4100	<1	<1	3080	3080	<20	<50	<100	<50	<50
2371W-MB1	28-May-2019	Tertiary	7.15	7.4	25379	24300	18500	38	1600	4690	6	6680	3870	<1	<1	3140	3140	<20	<50	<100	<50	<50
2371W-MB1	28-Aug-2019	Tertiary	7.1	8.08	26306	25300	18600	28	1260	4000	4	6430	4040	<1	<1	3040	3040	<20	<50	<100	<50	<50
2371W-MB1	24-Oct-2019	Tertiary	7.08	7.87	25687	23900	19500	35	1270	4460	5	6470	3330	<1	<1	3070	3070	<20	<50	<100	<50	<50
2371W-MB1	11-Dec-2019	Tertiary	6.89	7.66	28335	25300	19000	24	1540	4950	5	6670	3680	<1	<1	3090	3090	<20	<50	<100	<50	<50
2371W-MB1	12-Feb-2020	Tertiary	6.98	7.62	28473	25500	19000	15	1420	4780	6	6420	3820	<1	935	2270	3210	<20	<50	<100	<50	<50
2371W-MB1	22-Apr-2020	Tertiary	6.92	7.54	28108	25800	19200	22	1530	4980	6	6830	3940	<1	<1	3540	3540	<20	<50	<100	<50	<50
2371W-MB1	10-Jun-2020	Tertiary	6.59	8.01	24861	26300	20000	14	1470	4910	6	6700	4180	<1	<1	2920	2920	<20	<50	<100	<50	<50
2371W-MB1	18-Nov-2020	Tertiary	7.12	7.64	25497	23000	17100	20	1280	5020	5	6290	3720	<1	<1	2780	2780	<20	<50	<100	<50	<50
2371W-MB1	08-Feb-2021	Tertiary	7.1	7.59	25324	24500	18900	15	1430	5000	6	6600	3930	<1	<1	3010	3010	<20	<50	<100	<50	<50
2371W-MB1	09-Feb-2021	Tertiary	7.06	7.56	24907	24200	18800	14	1410	4920	7	6480	3840	<1	<1	3110	3110	<20	<50	<100	<50	<50
2371W-MB1	21-Apr-2021	Tertiary	7.13	8.38	25461	24600	17800	17	1420	4780	5	6540	4120	<1	<1	4240	4240	<20	<50	<100	<50	<50
2371W-MB1	12-May-2021	Tertiary	7.17	7.88	24726	24400	19100	23	1520	5100	6	6280	3980	<1	<1	2990	2990	<20	<50	<100	<50	<50
2371W-MB1	18-Aug-2021	Tertiary	6.97	8.01	25273	24800	18600	12	1440	5120	5	6400	4330	<1	<1	3070	3070	<20	<50	<100	<50	<50
2371W-MB1	21-Sep-2021	Tertiary	6.94	7.93	24861	24700	18300	17	1700	5680	6	6410	3810	<1	<1	3070	3070	<20	<50	<100	<50	<50
2371W-MB1	17-Nov-2021	Tertiary	6.63	7.81	25506	24000	16300	14	1380	4550	4	6210	3870	<1	<1	3310	3310	<20	<50	<100	<50	<50
2371W-MB1	12-Jan-2022	Tertiary	7.08	7.55	25519	24600	18700	12	1280	4440	5	6510	3890	<1	<1	3230	3230	<20	<50	<100	<50	<50
2371W-MB1	15-Mar-2022	Tertiary	7.13	7.61	23984	28100	18400	21	1440	4850	4	6470	3790	<1	<1	3060	3060	<20	<50	<100	<50	<50
2371W-MB1	01-Jun-2022	Tertiary	7.14	8.19	24396	20700	18700	26	1510	5020	5	6070	3740	<1	<1	2350	2350	<20	<50	<100	<50	<50
2371W-MB1	31-Aug-2022	Tertiary	7.03	7.89	23764	24800	18500	15	1320	4280	4	6230	3740	<1	<1	3290	3290	<20	<50	<100	<50	<50
2371W-MB1	28-Sep-2022	Tertiary	7.1	8.27	24266	25000	18600	16	1320	4530	4	6410	3850	<1	<1	3220	3220	<20	<50	<100	<50	<50
2372-MB1	15-Feb-2018	Tertiary	6.94	7.67	40151	38100	28800	982	1820	6440	3	12900	1940	<1	<1	454	454	<20	<50	120	<50	120
2372-MB1	05-Apr-2018	Tertiary	6.4	7.19	39879	38700	28100	952	1680	6150	4	13500	2040	<1	<1	449	449	20	<50	<100	<50	<50
2372-MB1	30-Jun-2018	Tertiary	6.47	7.16	39219	37800	25100	758	1550	6470	4	14000	1910	<1	<1	424	424	40	<50	<100	<50	<50
2372-MB1	20-Sep-2018	Tertiary	6.4	7.12	39934	37400	30600	834	1720	6720	4	13100	1990	<1	<1	450	450	30	<50	<100	<50	<50
2372-MB1	19-Jun-2019	Tertiary	5.83	7.31	40162	39200	31100	1170	1540	6720	4	14000	1920	<1	<1	341	341	<20	<50	<100	<50	<50
2372-MB1	04-Sep-2019	Tertiary	6.41	8.06	41460	37800	29600	1120	1460	6240	4	14000	1830	<1	<1	351	351	<20	<50	<100	<50	<50
2372-MB1	28-Oct-2019	Tertiary	6.36	6.94	40261	39100	28300	1140	1470	6590	4	13800	1850	<1	<1	327	327	<20	<50	<100	<50	<50
2372-MB1	14-Dec-2019	Tertiary	6.3	6.91	41787	38400	31700	1110	1400	6180	4	13600	1790	<1	<1	339	339	<20	<50	<100	<50	<50
2372-MB1	04-Feb-2020	Tertiary	6.26	7.24	42906	38100	35200	1160	1380	6290	4	14100	1920	<1	<1	326	326	<20	<50	<100	<50	<50
2372-MB1	07-Apr-2020	Tertiary	6.15	7.21	40580	39900	28800	1390	1490	6960	5	13500	1960	<1	<1	305	305	<20	<50	<100	<50	<50
2372-MB1	02-Jun-2020	Tertiary	6.09	6.88	37062	37400	27800	1270	1340	6540	4	13600	1900	<1	<1	328	328	30	<50	<100	<50	<50
2372-MB1	17-Nov-2020	Tertiary	6.43	7.12	35721	32500	24000	940	1100	5320	4	12000	1360	<1	<1	264	264	30	<50	<100	<50	<50
2372-MB1	02-Feb-2021	Tertiary	6.37	7.1	41580	35000	29000	1110	1280	6360	5	12800	1580	<1	<1	260	260	<20	<50	<100	<50	<50
2372-MB1	20-Apr-2021	Tertiary	6.39	7.95	37777	36200	26500	1300	1320	6680	5	12800	1650	<1	<1	281	281	<20	<50	<100	<50	<50
2372-MB1	11-May-2021	Tertiary	6.41	7.33	37726	36400	28800	1160	1180	5900	4	12900	1680	<1	<1	254	254	<20	<50	<100	<50	<50
2372-MB1	17-Aug-2021	Tertiary	6.24	7.62	38678	37800	30100	1190	1260	6850	5	13100	1740	<1	<1	274	274	<20	<50	<100	<50	<50
2372-MB1	21-Sep-2021	Tertiary	6.22	7.27	37264	38000	30300	1240	1250	6070	5	13400	1740	<1	<1	347	347	<20	<50	<100	<50	<50
2372-MB1	17-Nov-2021	Tertiary	6.11	7.05	36490	35100	30300	1410	1200	6280	4	13000	1730	<1	<1	305	305	<20	<50	<100	<50	<50
2372-MB1	12-Jan-2022	Tertiary	6.39	6.71	37360	35700	34000	1230	1130	5880	4	13800	1770	<1	<1	252	252	<20	<50	<100	<50	<50
2372-MB1	15-Mar-2022	Tertiary	6.39	6.94	37410	43000	32900	1370	1230	6330	4	13900	1790	<1	<1	245	245	<20	<50	<100	50	50
2372-MB1	31-May-2022	Tertiary	6.44	7.64	38239	34400	28900	1300	1250	6680	4	13200	1940	<1	<1	241	241	<20	<50	<100	<50	<50
2372-MB1	31-Aug-2022	Tertiary	6.3	7.22	37506	44500	31100	1500	1240	6540	5	13400	1860	<1	<1	264	264	<20	<50	<100	<50	<50
2372-MB1	29-Sep-2022	Tertiary	6.34	7.81	37551	47000	31900	1350	1140	6530	5	13300	1950	<1	<1	253	253	<20	<50	<100	<50	<50
West-MB1	17-Feb-2018	Tertiary	6.81	7.77	3390	3170	1900	29	62	583	<1	466	118	<1	<1	977	977	<20	<50	<100	<50	<50
West-MB1	26-Mar-2018	Tertiary	6.78	7.75	3319	3010	1690	34	83	546	1	454	72	<1	<1	1000	1000	<20	<50	<100	<50	<50
West-MB1	27-Jul-2018	Tertiary	6.8	7.69	3038	2990	1810	33	79	580	<1	445	67	<1	<1	997	997	<20	<50	<100	<50	<50
West-MB1	13-Sep-2018	Tertiary	6.84	8.03	3086	3020	1760	26	70	550	<1	443	78	<1	<1	1060	1060	<20	<50	<100	<50	<50
West-MB1	24-Feb-2019	Tertiary	6.84	7.15	3009	2940	1700	29	69	548	<1	428	86	<1	<1	958	958	<20	<50	<100	<50	<50
WEST-MB1	26-May-2019	Tertiary	6.86	7.3	2960	2800	1690	32	77	539	<1	448	65	<1	<1	907	907	<20	<50	<100	<50	<50
WEST-MB1	01-Aug-2019	Tertiary	5.81	7.65	3007	2990	1660	33	70	524	<1	420	67	<1	<1	1010	1010	<20	<50	<100	<50	<50
WEST-MB1	25-Oct-2019	Tertiary	6.89	7.91	2987	2880	1780	28	64	567	<1	420	96	<1	<1	931	931	<20	<50	<100	<50	<50
WEST-MB1	10-Dec-2019	Tertiary	6.7	7.76	3313	2880	1700	28	72	631	1	415	111	<1	<1	967	967	<20	<50	<100	<50	<50
WEST-MB1	11-Feb-2020	Tertiary	6.79	7.49	3280	2870	1860	24	65	613	<1	411	105	<1	<1	903	903	<20	<50	<100	<50	<50
WEST-MB1	22-Apr-2020	Tertiary	6.74	7.43	3218	2950	1710	23	62	565	<1	435	104	<1	<1	795	795	<20	<50	<100	<50	<50
WEST-MB1	10-Jun-2020	Tertiary	6.42	7.87	2841	2970	1750	27	64	603	1	437	103	<1	<1	919	919	<20	<50	<100	<50	<50
WEST-MB1	18-Nov-2020	Tertiary	7.02	7.54	3012	2700	1700	23	57	583	1	430	118	<1	<1	773	773	<20	<50	<100	<50	<50
WEST-MB1	03-Feb-2021	Tertiary	6.93	7.59	3498	2860	1730	25	55	575	1	444	125	<1	<1	777	777	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WEST-MB1	22-Apr-2021	Tertiary	6.88	8.52	2948	2760	1660	22	52	471	<1	424	84	<1	<1	898	898	<20	<50	<100	<50	<50
WEST-MB1	12-May-2021	Tertiary	6.85	7.83	2966	2760	1700	26	66	587	<1	416	73	<1	<1	853	853	<20	<50	<100	<50	<50
WEST-MB1	18-Aug-2021	Tertiary	6.8	8.18	3070	2910	1690	27	62	565	1	496	71	<1	<1	945	945	20	<50	<100	<50	<50
WEST-MB1	21-Sep-2021	Tertiary	6.72	7.79	2913	2960	1800	26	58	572	1	448	86	<1	<1	940	940	<20	<50	<100	<50	<50
WEST-MB1	17-Nov-2021	Tertiary	6.67	7.52	4237	2920	1810	24	60	587	1	414	107	<1	<1	967	967	<20	<50	110	60	170
West-MB1	12-Jan-2022	Tertiary	6.88	7.36	3010	3070	1820	24	57	569	1	474	109	<1	<1	961	961	<20	<50	<100	60	60
West-MB1	15-Mar-2022	Tertiary	6.88	7.23	2729	2730	1710	27	66	535	1	455	68	<1	<1	950	950	<20	<50	<100	<50	<50
West-MB1	01-Jun-2022	Tertiary	6.88	8.09	2793	2740	1680	28	74	501	1	423	67	<1	<1	864	864	<20	<50	<100	<50	<50
West-MB1	19-Jul-2022	Tertiary	6.81	7.3	2844	2750	1710	25	76	537	<1	438	63	<1	<1	1010	1010	<20	<50	<100	50	50
West-MB1	28-Sep-2022	Tertiary	6.83	8.39	2774	2790	1640	27	76	520	<1	384	58	<1	40	956	996	<20	<50	<100	<50	<50
2218-MB2	18-Feb-2018	Rewan Group	6.84	7.74	21225	21000	13900	304	436	3220	10	7200	202	<1	<1	468	468	<20	<50	170	70	240
2218-MB2	04-Apr-2018	Rewan Group	6.79	7.39	23440	22900	14300	354	560	3960	11	7990	208	<1	<1	487	487	<20	<50	<100	<50	<50
2218-MB2	14-Jul-2018	Rewan Group	6.83	7.16	23970	24400	14000	373	570	4260	12	8500	194	<1	<1	518	518	<20	<50	<100	<50	<50
2218-MB2	22-Sep-2018	Rewan Group	6.8	7.34	24752	23200	15700	356	575	4100	11	8480	184	<1	<1	538	538	<20	<50	<100	<50	<50
2218-MB2	21-Feb-2019	Rewan Group	6.86	7.15	24597	24100	15800	378	591	4050	12	8360	207	<1	<1	515	515	<20	60	150	<50	210
2218-MB2	22-Jun-2019	Rewan Group	6.36	7.82	24414	24100	16300	398	574	4250	12	8580	153	<1	<1	512	512	<20	<50	<100	<50	<50
2218-MB2	02-Aug-2019	Rewan Group	6.22	7.56	24785	24300	16700	410	600	4220	12	8710	185	<1	<1	543	543	<20	<50	<100	<50	<50
2218-MB2	24-Oct-2019	Rewan Group	6.82	7.73	24463	22900	16200	329	526	3990	10	8360	166	<1	<1	504	504	<20	<50	<100	<50	<50
2218-MB2	11-Dec-2019	Rewan Group	6.66	7.43	26726	24200	15200	332	648	4520	12	8320	105	<1	<1	547	547	<20	<50	120	<50	120
2218-MB2	12-Feb-2020	Rewan Group	6.7	7.31	26924	23900	16800	360	638	4580	13	8160	186	<1	<1	507	507	<20	<50	<100	<50	<50
2218-MB2	21-Apr-2020	Rewan Group	6.65	7.27	26515	24300	15100	320	643	4460	12	8750	189	<1	<1	439	439	<20	<50	<100	<50	<50
2218-MB2	09-Jun-2020	Rewan Group	6.32	7.71	23266	24700	16000	327	608	4500	13	8510	191	<1	<1	513	513	<20	<50	<100	<50	<50
2218-MB2	18-Nov-2020	Rewan Group	6.9	7.38	24799	22100	15000	311	575	4170	12	8170	213	<1	<1	464	464	<20	<50	160	<50	160
2218-MB2	08-Feb-2021	Rewan Group	6.87	7.26	23793	22800	15500	291	587	4160	12	8570	205	<1	<1	502	502	<20	<50	<100	<50	<50
2218-MB2	09-Feb-2021	Rewan Group	6.72	7.27	21319	20700	14100	270	525	3670	11	7580	168	<1	<1	457	457	<20	<50	170	160	330
2218-MB2	21-Apr-2021	Rewan Group	6.83	8.19	23738	23700	17000	288	558	4120	12	8550	203	<1	<1	514	514	<20	<50	<100	<50	<50
2218-MB2	12-May-2021	Rewan Group	6.89	7.67	22218	23500	15800	344	587	4260	13	8280	202	<1	<1	472	472	<20	<50	100	60	160
2218-MB2	18-Aug-2021	Rewan Group	6.76	7.93	24119	24200	16600	291	623	4740	13	8460	190	<1	<1	522	522	<20	<50	<100	<50	<50
2218-MB2	21-Sep-2021	Rewan Group	6.71	7.71	15120	24000	17200	354	732	5290	14	8570	183	<1	<1	521	521	<20	<50	140	50	190
2218-MB2	17-Nov-2021	Rewan Group	6.48	7.5	24258	23800	16500	283	556	3940	11	8340	179	<1	<1	559	559	<20	<50	100	<50	100
2218-MB2	12-Jan-2022	Rewan Group	6.84	7.24	24669	24500	18300	279	564	4180	12	8740	186	<1	<1	553	553	<20	<50	<100	<50	<50
2218-MB2	15-Mar-2022	Rewan Group	6.86	7.38	23616	27900	17300	325	634	4560	13	8780	186	<1	<1	532	532	<20	<50	<100	<50	<50
2218-MB2	01-Jun-2022	Rewan Group	6.87	8.02	23366	20600	15700	343	654	4680	13	8120	193	<1	<1	463	463	<20	<50	150	<50	150
2218-MB2	19-Jul-2022	Rewan Group	6.79	7.33	24144	24000	16800	334	626	4580	14	8520	184	<1	<1	569	569	<20	<50	180	<50	180
2218-MB2	28-Sep-2022	Rewan Group	6.77	8.03	23957	25300	17000	284	591	4330	12	8600	192	<1	<1	560	560	<20	<50	160	<50	160
2226-MB2	14-Feb-2018	Rewan Group	7.13	7.76	3762	3540	2140	29	62	639	<1	415	162	<1	<1	1210	1210	<20	<50	510	490	1000
2226-MB2	25-Mar-2018	Rewan Group	7.08	8.17	3846	3470	2110	28	64	721	<1	442	155	<1	<1	1210	1210	<20	<50	<100	<50	<50
2226-MB2	15-Jul-2018	Rewan Group	7.14	7.55	3668	3700	2100	40	70	753	1	490	162	<1	<1	1200	1200	<20	<50	<100	<50	<50
2226-MB2	22-Sep-2018	Rewan Group	7.09	7.77	3688	3600	2100	32	73	753	<1	469	147	<1	<1	1260	1260	<20	<50	<100	<50	<50
2226-MB2	23-Feb-2019	Rewan Group	7.15	7.44	3609	3580	2160	30	70	714	<1	453	205	<1	<1	1200	1200	<20	<50	<100	<50	<50
2226-MB2	28-May-2019	Rewan Group	7.16	7.66	3627	3490	2190	32	72	771	<1	482	164	<1	<1	1180	1180	<20	<50	<100	<50	<50
2226-MB2	28-Aug-2019	Rewan Group	7.16	8.33	3752	3520	2080	29	63	681	<1	440	163	<1	20	1220	1240	<20	<50	<100	<50	<50
2226-MB2	24-Oct-2019	Rewan Group	7.12	8.03	3612	3440	2160	28	63	693	<1	428	163	<1	<1	1180	1180	<20	<50	<100	<50	<50
2226-MB2	10-Dec-2019	Rewan Group	6.93	7.56	3913	3440	2120	30	74	796	<1	421	147	<1	<1	1180	1180	<20	<50	<100	<50	<50
2226-MB2	12-Feb-2020	Rewan Group	6.99	7.92	3841	3400	2100	26	68	780	<1	399	141	<1	<1	1200	1200	<20	<50	<100	<50	<50
2226-MB2	22-Apr-2020	Rewan Group	6.95	7.69	3769	3500	2160	23	64	684	<1	421	140	<1	<1	1050	1050	<20	<50	<100	<50	<50
2226-MB2	10-Jun-2020	Rewan Group	6.61	8.11	3299	3490	2120	27	64	727	<1	418	139	<1	<1	1210	1210	<20	<50	<100	<50	<50
2226-MB2	18-Nov-2020	Rewan Group	7.19	7.7	3615	3260	2120	26	67	755	<1	414	147	<1	<1	1140	1140	<20	<50	<100	<50	<50
2226-MB2	08-Feb-2021	Rewan Group	7.14	7.55	3474	3310	2180	24	65	710	<1	426	144	<1	<1	1220	1220	<20	<50	<100	<50	<50
2226-MB2	09-Feb-2021	Rewan Group	7.19	7.47	3244	3130	2020	29	67	641	1	461	141	<1	<1	1020	1020	<20	<50	200	150	350
2226-MB2	21-Apr-2021	Rewan Group	7.17	8.54	3287	3540	2240	27	58	625	1	514	175	<1	<1	1170	1170	<20	<50	<100	<50	<50
2226-MB2	12-May-2021	Rewan Group	7.19	7.95	3167	3350	2170	28	70	741	<1	439	155	<1	<1	1090	1090	<20	<50	<100	80	80
2226-MB2	18-Aug-2021	Rewan Group	7	8.12	3123	3430	2110	29	60	639	1	445	144	<1	<1	1180	1180	<20	<50	140	130	270
2226-MB2	21-Sep-2021	Rewan Group	7.01	7.94	3352	3480	2120	30	63	690	<1	455	145	<1	<1	1210	1210	<20	<50	<100	<50	<50
2226-MB2	17-Nov-2021	Rewan Group	6.7	7.79	3379	3510	2420	26	64	677	<1	426	143	<1	<1	1300	1300	<20	<50	<100	<50	<50
2226-MB2	12-Jan-2022	Rewan Group	7.11	7.59	3509	3640	2180	29	65	701	<1	487	150	<1	<1	1260	1260	<20	<50	<100	70	70
2226-MB2	15-Mar-2022	Rewan Group	7.17	7.55	3385	3550	2150	28	62	717	<1	492	150	<1	<1	1200	1200	<20	<50	<100	<50	<50
2226-MB2	01-Jun-2022	Rewan Group	7.19	8.32	3473	3420	2180	29	69	706	1	454	155	<1	18	1160	1170	<20	<50	<100	<50	<50
2226-MB2	31-Aug-2022	Rewan Group	7.12	7.88	3428	3460	2130	26	73	729	<1	494	152	<1	<1	1320	1320	<20	<50	<100	<50	<50
2226-MB2	28-Sep-2022	Rewan Group	7.17	8.39	3393	3560	2120	28	69	768	<1	448	152	<1	49	1230	1280	<20	<50	<100	60	60
2372-MB2	15-Feb-2018	Rewan Group	6.43	7.35	30982	29300	22100	769	1110	3880	6	9920	1270	<1	<1	430	430	<20	60	260	<50	320
2372-MB2	05-Apr-2018	Rewan Group	6.39	7.12	30174	29300	19500	779	1240	4170	6	10200	1290	<1	<1	426	426	<20	<50	<100	<50	<50
2372-MB2	30-Jun-2018	Rewan Group	6.42	7.08	29546	28300	17000	661	1130	4010	5	10500	1240	<1	<1	416	416	<20	<50	160	<50	160
2372-MB2	20-Sep-2018	Rewan Group	6.37	7.01	29629	28000	21400	752	1190	4030	6	10200	1170	<1	<1	449	449	<20	<50	130	<50	130
2372-MB2	19-Jun-2019	Rewan Group	5.26	7.32	29271	28800	21500	830	1410	4490	6	10300	1210	<1	<1	430	430	<20	<50	<100	<50	<50
2372-MB2	29-Aug-2019	Rewan Group	6.42	7.67	30197	29400	20800	711	1250	3880	6	10000	1270	<1	<1	428	428	<20	<50	<100	<50	<50
2372-MB2	28-Oct-2019	Rewan Group	6.37	6.88	29458	28800	19300	796	1310	4310	6	10100	1160	<1	<1	392	392	<20	<50	<100	<50	<50
2372-MB2	14-Dec-2019	Rewan Group	6.3	6.92	30830	28500	20100	706	1160	4090	6	9910	1100	<1	<1	401	401	<20	<50	<100	<50	<50
2372-MB2	04-Feb-2020	Rewan Group	6.28	7.11	31636	28000	22500	745	1260	4310	6	10300	1150	<1	<1	403	403	<20	<50	<100	<50	<50
2372-MB2	07-Apr-2020	Rewan Group	6.17	7.2	29788	29400	19800	897	1410	4650	7	9990	1160	<1	<1	412	412	<20	<50	<100	<50	<50
2372-MB2	02-Jun-2020	Rewan Group	6.11	6.93	27180	27200	18500	715	1260	4030	6	10100	1150	<1	<1	428	428	20	<50	<100	<50	<50
2372-MB2	17-Nov-2020	Rewan Group	6.45	7.12	30293	27400	21000	741	1290	4280	6	10200	1030	<1	<1	407	407	20	<50	<100	<50	<50
2372-MB2	02-Feb-2021	Rewan Group	6.38	7.08	33601	28200	21900	774	1390	4680	7	10500	1100	<1	<1	390	390	<20	<50	<100	<50	<50
2372-MB2	20-Apr-2021	Rewan Group	6.4	8.03	29680	28300	20700	669	1220	4180	6	10100	1100	<1	<1	443	443	<20	<50	<100	<50	<50
2372-MB2	11-May-2021	Rewan Group	6.42	7.29	29679	28600	21100	767	1320	4440	6	9970	1100	<1	<1	400	400	<20	<50	<100	<50	<50
2372-MB2	17-Aug-2021	Rewan Group	6.26	7.71	29746	29200	21100	610	1200	4220	6	10300	1070	<1	<1	451	451	<20	<50	<100	<50	<50
2372-MB2	21-Sep-2021	Rewan Group	6.25	7.38	28578	28900	23800	792	1280	4320	6	10300	1060	<1	<1	438	438	<20	<50	110	<50	110
2372-MB2	17-Nov-2021	Rewan Group	6.15	7.14	28930	26800	23400	776	1330	4300	6	10100	1060	<1	<1	473	473	<20	<50	<100	<50	<50
2372-MB2	12-Jan-2022	Rewan Group	6.43	6.81	27254	28800	27700	605	1100	3760	6	10400	1050	<1	<1	469	469	<20	<50	110	60	170
2372-MB2	15-Mar-2022	Rewan Group	6.42	6.95	27475	33300	22300	703	1290	4280	6	10400	1060	<1	<1	438	438	<20	<50	100	70	170
2372-MB2	31-May-2022	Rewan Group	6.45	7.81	28504	26100	20400	798	1460	4880	7	9950	993	<1	<1	346	346	<20	<50	130	<50	130
2372-MB2	31-Aug-2022	Rewan Group	6.35	7.28	27669	29500	22700	704	1140	3550	6	10200	1060	<1	<1	475	475	<20	<50	150	80	230
2372-MB2	29-Sep-2022	Rewan Group	6.39	7.64	28884	31300	22600	699	1300	4380	7	10200	1080	<1	<1	457	457	<20	<50	<100	<50	<50
2393-MB1	16-Feb-2018	Rewan Group	6.91	7.8	11836	11200	6960	122	191	1980	2	3160	372	<1	<1	1060	1060	<20	<50	<100	<50	<50
2393-MB1	24-Mar-2018	Rewan Group	6.89	7.98	11454	10800	6320	113	190	2020	3	3190	390	<1	<1	1050	1050	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
2393-MB1	27-Jul-2018	Rewan Group	6.86	7.71	11099	10800	6490	110	196	2110	3	3160	362	<1	<1	1040	1040	<20	<50	<100	<50	<50
2393-MB1	21-Sep-2018	Rewan Group	6.84	7.45	11270	10800	5950	107	205	2080	3	3150	364	<1	<1	1110	1110	<20	<50	<100	<50	<50
2393-MB1	22-Feb-2019	Rewan Group	6.88	7.25	10875	10700	6230	115	192	1960	2	3020	404	<1	<1	1060	1060	<20	<50	<100	<50	<50
2393-MB1	24-Jun-2019	Rewan Group	5.91	8.06	11199	10900	6740	120	188	2070	2	3060	383	<1	<1	1040	1040	<20	<50	<100	<50	<50
2393-MB1	04-Sep-2019	Rewan Group	6.81	8.5	11526	10600	6420	120	166	1790	2	3130	376	<1	106	938	1040	<20	<50	<100	<50	<50
2393-MB1	30-Oct-2019	Rewan Group	6.8	7.33	10921	10500	6260	119	185	2020	3	3040	390	<1	<1	984	984	<20	<50	<100	<50	<50
2393-MB1	11-Dec-2019	Rewan Group	6.65	7.66	11876	10500	6220	102	203	2170	3	2920	366	<1	<1	1120	1120	<20	<50	<100	<50	<50
2393-MB1	10-Feb-2020	Rewan Group	6.72	7.38	11663	10300	6110	100	190	2100	3	2890	357	<1	<1	1030	1030	<20	<50	<100	<50	<50
2393-MB1	08-Apr-2020	Rewan Group	6.59	7.67	10717	10400	6000	100	178	1920	3	2800	358	<1	<1	1000	1000	<20	<50	<100	<50	<50
2393-MB1	03-Jun-2020	Rewan Group	6.56	7.35	9462	9810	5840	92	183	1930	3	2820	365	<1	<1	1020	1020	<20	<50	<100	<50	<50
2393-MB1	18-Nov-2020	Rewan Group	6.9	7.45	10173	9010	5490	89	163	1870	3	2620	341	<1	<1	922	922	20	<50	<100	<50	<50
2393-MB1	02-Feb-2021	Rewan Group	6.78	7.48	11224	9020	5910	73	137	1530	2	2600	341	<1	<1	840	840	<20	<50	<100	<50	<50
2393-MB1	20-Apr-2021	Rewan Group	6.81	8.41	10082	9340	5610	79	146	1750	3	2700	361	<1	41	948	990	<20	<50	<100	<50	<50
2393-MB1	11-May-2021	Rewan Group	6.83	7.72	9977	9270	5750	103	176	2070	2	2620	347	<1	<1	898	898	<20	<50	<100	<50	<50
2393-MB1	17-Aug-2021	Rewan Group	6.71	7.97	9951	9670	5480	88	157	1790	3	2740	350	<1	<1	996	996	<20	<50	<100	<50	<50
2393-MB1	21-Sep-2021	Rewan Group	6.68	7.73	9443	9670	5800	92	155	1810	3	2730	347	<1	<1	1010	1010	<20	<50	<100	<50	<50
2393-MB1	17-Nov-2021	Rewan Group	6.54	7.55	9555	9490	5700	78	152	1700	2	2570	334	<1	<1	1080	1080	<20	<50	<100	<50	<50
2393-MB1	12-Jan-2022	Rewan Group	6.83	7.28	9823	9630	5710	82	157	1840	2	2780	356	<1	<1	1060	1060	<20	<50	<100	<50	<50
2393-MB1	15-Mar-2022	Rewan Group	6.89	7.32	9481	9110	5680	81	154	1930	3	2670	353	<1	<1	1010	1010	<20	<50	<100	<50	<50
2393-MB1	01-Jun-2022	Rewan Group	6.9	8.18	9443	8720	5610	80	163	1820	3	2610	346	<1	<1	831	831	<20	<50	<100	<50	<50
2393-MB1	20-Jul-2022	Rewan Group	6.88	7.42	9432	9360	5540	83	159	1860	3	2670	352	<1	<1	1080	1080	<20	<50	<100	<50	<50
2393-MB1	29-Sep-2022	Rewan Group	6.84	7.96	9450	10300	5660	72	156	1870	2	2590	361	<1	<1	1040	1040	<20	50	160	<50	210
2394-MB1	18-Feb-2018	Upper Rewan Group	6.71	7.78	21523	21200	14200	241	550	3340	3	7090	518	<1	<1	806	806	<20	<50	<100	<50	<50
2394-MB1	24-Mar-2018	Upper Rewan Group	6.69	7.82	22963	21500	14800	232	592	3670	3	7440	576	<1	<1	846	846	<20	290	<100	<50	290
2394-MB1	29-Jun-2018	Upper Rewan Group	6.7	7.43	22667	21700	13300	206	620	3870	3	7850	582	<1	<1	868	868	<20	60	<100	<50	60
2394-MB1	13-Sep-2018	Upper Rewan Group	6.65	7.85	23027	22600	14600	204	622	3790	3	7490	583	<1	<1	953	953	<20	<50	<100	<50	<50
2394-MB1	22-Mar-2019	Upper Rewan Group	6.84	0	22794	23000	15200	274	656	3970	3	7720	601	<1	<1	929	929	<20	50	<100	<50	50
2394-MB1	25-Jun-2019	Upper Rewan Group	5.8	7.89	24118	23300	15200	284	654	4020	3	7800	621	<1	<1	899	899	<20	<50	<100	<50	<50
2394-MB1	30-Aug-2019	Upper Rewan Group	6.7	7.94	24314	23700	16700	251	620	3730	3	7820	615	<1	<1	920	920	<20	<50	<100	<50	<50
2394-MB1	30-Oct-2019	Upper Rewan Group	6.64	7.18	23624	23000	14800	273	638	3760	3	7860	674	<1	<1	830	830	<20	<50	<100	<50	<50
2394-MB1	14-Dec-2019	Upper Rewan Group	6.55	7.18	25055	23000	15600	243	641	4100	3	7580	564	<1	<1	870	870	<20	<50	<100	<50	<50
2394-MB1	11-Feb-2020	Upper Rewan Group	6.54	7.29	25786	22800	15500	252	713	4260	3	7570	571	<1	<1	883	883	<20	<50	<100	<50	<50
2394-MB1	21-Apr-2020	Upper Rewan Group	6.47	7.2	25313	23600	14500	246	769	4410	3	8010	590	<1	<1	784	784	<20	<50	<100	<50	<50
2394-MB1	03-Jun-2020	Upper Rewan Group	6.36	7.26	21973	22300	14900	243	729	4160	3	7920	599	<1	<1	903	903	<20	<50	<100	<50	<50
2394-MB1	17-Nov-2020	Upper Rewan Group	6.64	7.29	21452	19000	13200	195	536	3460	3	6890	483	<1	<1	685	685	30	<50	<100	<50	<50
2394-MB1	03-Feb-2021	Upper Rewan Group	6.62	7.23	25156	20900	14600	196	622	3620	3	7570	552	<1	<1	701	701	<20	420	<100	<50	420
2394-MB1	20-Apr-2021	Upper Rewan Group	6.62	8.22	22880	21400	15300	208	600	3810	3	7600	557	<1	<1	797	797	<20	70	<100	<50	70
2394-MB1	11-May-2021	Upper Rewan Group	6.64	7.55	22884	21900	14900	263	708	4200	3	7530	559	<1	<1	749	749	<20	100	<100	<50	100
2394-MB1	17-Aug-2021	Upper Rewan Group	6.52	7.87	23426	22800	15300	237	661	3930	3	7770	603	<1	<1	904	904	<20	60	<100	<50	60
2394-MB1	21-Sep-2021	Upper Rewan Group	6.48	7.51	22696	22600	16000	253	642	3970	3	7690	580	<1	<1	891	891	<20	80	<100	<50	80
2394-mb1	16-Nov-2021	Upper Rewan Group	6.33	7.3	23310	21900	15600	213	640	3750	3	7560	591	<1	<1	962	962	<20	<50	<100	<50	<50
2394-MB1	12-Jan-2022	Upper Rewan Group	6.69	7.12	23350	23100	17000	216	655	3990	3	8060	620	<1	<1	942	942	<20	<50	<100	<50	<50
2394-MB1	15-Mar-2022	Upper Rewan Group	6.69	7.19	22807	25900	16400	217	670	4410	3	7900	618	<1	<1	903	903	<20	<50	<100	<50	<50
2394-MB1	01-Jun-2022	Upper Rewan Group	6.69	7.95	22866	19900	15500	232	710	4090	3	7640	617	<1	<1	881	881	<20	70	<100	<50	70
2394-MB1	20-Jul-2022	Upper Rewan Group	6.63	7.21	23300	23200	16100	238	696	4400	3	7920	616	<1	<1	972	972	<20	60	<100	<50	60
2394-MB1	29-Sep-2022	Upper Rewan Group	6.63	7.96	23459	24900	16800	221	671	4040	3	7750	627	<1	<1	954	954	<20	70	<100	<50	70
2394-MB2	21-Mar-2018	Lower Rewan Group	6.99	7.68	26290	24700	18300	466	225	4670	13	8730	5	<1	<1	287	287	<20	<50	<100	70	70
2394-MB2	28-Jul-2018	Lower Rewan Group	7.05	7.77	26297	25100	16000	573	253	4900	12	9130	1	<1	<1	261	261	<20	<50	<100	<50	<50
2394-MB2	23-Sep-2018	Lower Rewan Group	6.97	7.38	27814	26000	17100	579	335	4940	16	9000	<1	<1	<1	210	210	<20	<50	<100	<50	<100
2394-MB2	22-Mar-2019	Lower Rewan Group	7.2	0	27281	27200	18000	919	383	5810	14	9670	1	<1	<1	170	170	<20	<50	100	<50	100
2394-MB2	25-Jun-2019	Lower Rewan Group	6.06	7.78	29056	28300	20500	843	323	5210	13	10000	<1	<1	<1	148	148	<20	<50	<100	<50	<50
2394-MB2	30-Aug-2019	Lower Rewan Group	7.01	7.84	29340	28900	18200	735	347	4920	13	10100	<1	<1	<1	147	147	<20	<50	<100	<50	<50
2394-MB2	30-Oct-2019	Lower Rewan Group	6.99	7.28	28485	28300	17600	813	358	5480	14	10100	<1	<1	<1	131	131	<20	<50	<100	<50	<50
2394-MB2	30-Oct-2019	Lower Rewan Group	6.72	7.25	19490	19200	11600	389	204	3530	16	6760	2	<1	<1	562	562	<20	<50	<100	<50	<50
2394-MB2	14-Dec-2019	Lower Rewan Group	6.83	7.27	30203	27800	15400	643	313	5080	13	9900	1	<1	<1	133	133	<20	<50	<100	<50	<50
2394-MB2	11-Feb-2020	Lower Rewan Group	6.88	7.27	31272	27800	19500	701	365	5660	14	9800	<1	<1	<1	134	134	<20	<50	<100	<50	<50
2394-MB2	21-Apr-2020	Lower Rewan Group	6.8	7.24	30691	28000	17800	715	368	5490	13	10200	<1	<1	<1	116	116	<20	<50	<100	<50	<50
2394-MB2	03-Jun-2020	Lower Rewan Group	6.69	7.29	26666	27000	18500	627	335	5010	14	10200	<10	<1	<1	137	137	<20	<50	<100	<50	<50
2394-MB2	17-Nov-2020	Lower Rewan Group	7.04	7.38	29705	26600	17700	686	348	5420	14	10100	<1	<1	<1	144	144	<20	<50	<100	<50	<50
2394-MB2	03-Feb-2021	Lower Rewan Group	7.03	7.49	32399	26800	19100	672	388	6260	15	10200	<1	<1	<1	149	149	<20	<50	<100	<50	<50
2394-MB2	21-Apr-2021	Lower Rewan Group	7.02	8.08	28893	27400	17800	556	326	5150	13	10100	<1	<1	<1	150	150	<20	<50	<100	<50	<50
2394-MB2	11-May-2021	Lower Rewan Group	6.97	7.58	28743	27800	18200	736	368	5540	15	9970	<1	<1	<1	124	124	<20	<50	<100	<50	<50
2394-MB2	17-Aug-2021	Lower Rewan Group	6.81	7.84	29070	28500	18800	530	359	5820	14	10200	<1	<1	<1	142	142	<20	<50	<100	<50	<50
2394-MB2	21-Sep-2021	Lower Rewan Group	6.84	7.63	26906	28000	19200	644	410	6280	16	10000	<1	<1	<1	141	141	<20	<50	230	100	330
2394-mb2	16-Nov-2021	Lower Rewan Group	6.65	7.39	27996	26400	20700	594	333	5120	13	9900	<1	<1	<1	149	149	<20	<50	140	110	250
2394-MB2	12-Jan-2022	Lower Rewan Group	6.96	7.16	27694	27600	23000	507	315	5090	13	10400	<1	<1	<1	147	147	<20	<50	120	70	190
2394-MB2	15-Mar-2022	Lower Rewan Group	7.05	7.22	27985	32000	20700	665	360	5670	14	10300	<1	<1	<1	137	137	<20	<50	110	80	190
2394-MB2	01-Jun-2022	Lower Rewan Group	7.06	7.83	27130	23900	19000	668	354	5540	14	9670	<1	<1	<1	116	116	<20	<50	250	70	320
2394-MB2	20-Jul-2022	Lower Rewan Group	7.04	7.31	24266	28300	19600	659	364	5570	15	10100	<1	<1	<1	155	155	<20	<50	140	120	260
2394-MB2	29-Sep-2022	Lower Rewan Group	6.95	7.72	27449	31900	20100	555	338	5410	14	9930	<1	<1	<1	146	146	<20	<50	180	60	240
1238-MB2	05-Apr-2018	Vermont Seam	6.46	7.26	17597	17200	12000	530	524	2500	7	5900	428	<1	<1	463	463	<20	<50	<100	<50	<50
1238-MB2	02-Jul-2018	Vermont Seam	6.49	7.17	17367	16600	10300	446	478	2430	7	6200	427	<1	<1	465	465	<20	<50	<100	<50	<50
1238-MB2	20-Sep-2018	Vermont Seam	6.46	7.13	17495	16500	11800	486	552	2550	8	5550	424	<1	<1	488	488	<20	<50	<100	<50	<50
1238-MB2	14-Mar-2019	Vermont Seam	6.48	7.15	17419	17300	11300	508	488	2410	7	5680	396	<1	<1	467	467	<20	<50	<100	<50	<50
1238-MB2	21-Jun-2019	Vermont Seam	5.14	7.63	17129	17100	10700	552	521	2610	7	5860	438	<1	<1	452	452	<20	<50	<100	<50	<50
1238-MB2	27-Aug-2019	Vermont Seam	6.45	7.76	17658	17200	11100	503	502	2450	7	5770	479	<1	<1	475	475	<20	<50	<100	<50	<50
1238-MB2	22-Oct-2019	Vermont Seam	6.43	7.51	17065	16300	12100	460	474	2390	6	5650	403	<1	<1	456	456	<20	<50	<100	<50	<50
1238-MB2	14-Dec-2019	Vermont Seam	6.34	6.98	18095	16600	12000	476	482	2530	7	5720	422	<1	<1	451	451	<20	<50	<100	<50	<50
1238-MB2	04-Feb-2020	Vermont Seam	6.34	7.35	18548	16800	13900	514	511	2470	8	6030	437	<1	<1	444	444	<20	<50	<100	<50	<50
1238-MB2	08-Apr-2020	Vermont Seam	6.22	7.38	17533	17600	11800	494	499	2400	7	5730	426	<1	<1	449	449	<20	<50	<100	<50	<50
1238-MB2	09-Jun-2020	Vermont Seam	5.98	7.5	16109	17200	11600	465	501	2520	7	5800	433	<1	<1	460	460	<20	<50	<100	<50	<50
1238-MB2	19-Nov-2020	Vermont Seam	6.51	7.14	17604	16100	11300	464	530	2570	7	5910	436	<1	<1	423	423	<20	<50	<100	<50	<50
1238-MB2	03-Feb-2021	Vermont Seam	6.45	7.14	19793	16700	12000	483	559	2690	8	6020	451	<1	<1	416	416	<20	<50	<100	<50	<50
1238-MB2	21-Apr-2021	Vermont Seam	6.47	8.13	17468	16600	11900	453	485	2460	7	5910	450	<1	<1	464	464	<20	<50	<100	<50	<50
1238-MB2	12-May-2021	Vermont Seam	6.49	7.4	17289	16400	11800	507	530	2640	7	5600	433	<1	<1	426	426	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1238-MB2	18-Aug-2021	Vermont Seam	6.37	7.77	17639	17100	12100	494	508	2430	8	5850	447	<1	<1	468	468	<20	<50	<100	<50	<50
1238-MB2	21-Sep-2021	Vermont Seam	6.26	7.61	17108	16900	12700	494	486	2420	7	5770	425	<1	<1	475	475	<20	<50	<100	<50	<50
1238-MB2	17-Nov-2021	Vermont Seam	6.26	7.28	17108	16600	13400	427	485	2290	7	5760	421	<1	<1	487	487	<20	<50	<100	<50	<50
1238-MB2	13-Jan-2022	Vermont Seam	6.53	7.03	16857	17100	14200	445	496	2440	7	6080	446	<1	<1	491	491	<20	<50	<100	<50	<50
1238-MB2	15-Mar-2022	Vermont Seam	6.51	7.09	16415	19700	13300	448	497	2620	8	6040	440	<1	<1	471	471	<20	<50	<100	<50	<50
1238-MB2	01-Jun-2022	Vermont Seam	6.52	7.87	17363	14800	11700	462	525	2580	7	5650	439	<1	<1	464	464	<20	<50	<100	<50	<50
1238-MB2	20-Jul-2022	Vermont Seam	6.43	7.07	17159	17000	12400	500	566	2720	8	5860	449	<1	<1	504	504	<20	<50	<100	<50	<50
1238-MB2	28-Sep-2022	Vermont Seam	6.49	7.92	17035	17900	13000	410	505	2470	7	5790	447	<1	<1	479	479	<20	<50	<100	<50	<50
2218-MB3	13-Feb-2018	Leichhardt Seam	6.69	7.35	26871	25600	16300	496	373	4560	15	8680	214	<1	<1	507	507	40	<50	140	<50	140
2218-MB3	20-Mar-2018	Leichhardt Seam	6.69	7.47	26988	26000	17800	430	379	4700	17	8780	149	<1	<1	506	506	<20	<50	100	<50	100
2218-MB3	14-Jul-2018	Leichhardt Seam	6.64	6.96	26227	27000	15800	545	386	4720	16	9410	42	<1	<1	452	452	<20	<50	<100	<50	<50
2218-MB3	19-Sep-2018	Leichhardt Seam	6.64	7.19	26585	25100	17100	437	450	4700	20	8900	23	<1	<1	437	437	<20	<50	<100	<50	<50
2218-MB3	21-Feb-2019	Leichhardt Seam	6.71	7.04	26246	25700	16200	493	492	4520	14	9010	129	<1	<1	441	441	<20	70	160	<50	230
2218-MB3	22-Jun-2019	Leichhardt Seam	5.44	7.73	26042	25600	16800	480	534	4580	14	9230	192	<1	<1	461	461	<20	<50	<100	<50	<50
2218-MB3	02-Aug-2019	Leichhardt Seam	5.89	7.47	26358	25800	17900	494	562	4630	14	9170	176	<1	<1	501	501	<20	<50	<100	<50	<50
2218-MB3	24-Oct-2019	Leichhardt Seam	6.65	7.67	25892	24300	17500	397	486	4350	13	8650	176	<1	<1	463	463	<20	<50	<100	<50	<50
2218-MB3	11-Dec-2019	Leichhardt Seam	6.46	7.36	28379	25400	16200	387	628	5000	15	9090	194	<1	<1	518	518	<20	<50	<100	<50	<50
2218-MB3	12-Feb-2020	Leichhardt Seam	6.54	7.24	28154	25200	17900	400	582	4830	15	8700	178	<1	<1	469	469	<20	<50	<100	<50	<50
2218-MB3	21-Apr-2020	Leichhardt Seam	6.49	7.2	27788	25500	15700	360	591	4780	14	9070	181	<1	<1	396	396	<20	<50	<100	<50	<50
2218-MB3	09-Jun-2020	Leichhardt Seam	6.17	7.65	24470	25800	17100	360	558	4790	15	8940	184	<1	<1	475	475	<20	<50	<100	<50	<50
2218-MB3	18-Nov-2020	Leichhardt Seam	6.73	7.36	26747	24500	16700	373	547	4480	15	9190	182	<1	<1	439	439	<20	<50	<100	<50	<50
2218-MB3	08-Feb-2021	Leichhardt Seam	6.7	7.21	25579	24900	17000	334	550	4460	14	9330	172	<1	<1	457	457	<20	<50	<100	<50	<50
2218-MB3	09-Feb-2021	Leichhardt Seam	6.6	7.23	22155	21400	14600	306	487	3910	13	7930	153	<1	<1	397	397	<20	<50	<100	<50	<50
2218-MB3	21-Apr-2021	Leichhardt Seam	6.7	8.19	25207	25000	17700	323	510	4320	14	8990	184	<1	<1	473	473	<20	<50	<100	<50	<50
2218-MB3	12-May-2021	Leichhardt Seam	6.79	7.64	24933	25100	16700	410	580	4740	16	8700	189	<1	<1	435	435	<20	<50	<100	<50	<50
2218-MB3	18-Aug-2021	Leichhardt Seam	6.57	7.93	25186	25600	17100	321	588	5070	15	9030	185	<1	<1	478	478	<20	<50	<100	<50	<50
2218-MB3	21-Sep-2021	Leichhardt Seam	6.53	7.66	24961	25400	17900	402	706	5690	17	9040	180	<1	<1	485	485	<20	<50	<100	<50	<50
2218-MB3	17-Nov-2021	Leichhardt Seam	6.47	7.43	25142	24800	17400	314	526	4230	14	8780	176	<1	<1	508	508	<20	<50	<100	<50	<50
2218-MB3	12-Jan-2022	Leichhardt Seam	6.72	7.17	25644	26100	19800	306	538	4500	14	9330	188	<1	<1	502	502	<20	<50	<100	<50	<50
2218-MB3	15-Mar-2022	Leichhardt Seam	6.73	7.27	24808	28700	18200	374	583	4820	15	9470	189	<1	<1	478	478	<20	<50	<100	<50	<50
2218-MB3	01-Jun-2022	Leichhardt Seam	6.74	8	24750	21700	16800	398	597	4890	15	8640	188	<1	<1	442	442	<20	<50	<100	<50	<50
2218-MB3	19-Jul-2022	Leichhardt Seam	6.66	7.2	24917	25400	18000	382	580	4820	16	8900	186	<1	<1	509	509	<20	<50	<100	<50	<50
2218-MB3	28-Sep-2022	Leichhardt Seam	6.64	8.09	25308	28200	18600	328	570	4750	16	9060	188	<1	<1	497	497	<20	<50	<100	<50	<50
2226-MB3	14-Feb-2018	Leichhardt Seam	6.81	7.56	8758	8290	4840	125	209	1150	2	2110	414	<1	<1	788	788	<20	<50	<100	<50	<50
2226-MB3	25-Mar-2018	Leichhardt Seam	6.76	7.92	10336	9410	5820	149	259	1460	3	2800	439	<1	<1	765	765	<20	<50	<100	<50	<50
2226-MB3	15-Jul-2018	Leichhardt Seam	6.81	7.23	9977	9810	5640	167	278	1570	4	2960	418	<1	<1	758	758	<20	<50	<100	<50	<50
2226-MB3	22-Sep-2018	Leichhardt Seam	6.77	7.49	10032	9520	5270	142	303	1610	4	2870	434	<1	<1	788	788	<20	<50	<100	<50	<50
2226-MB3	23-Feb-2019	Leichhardt Seam	6.88	7.14	9634	9560	5990	166	286	1500	3	2740	474	<1	<1	746	746	<20	<50	<100	<50	<50
2226-MB3	28-May-2019	Leichhardt Seam	6.86	7.39	9809	9530	6080	160	295	1600	4	2920	448	<1	<1	717	717	<20	<50	<100	<50	<50
2226-MB3	28-Aug-2019	Leichhardt Seam	6.83	8.03	10226	9520	6060	156	262	1450	3	2840	448	<1	<1	749	749	<20	<50	<100	<50	<50
2226-MB3	24-Oct-2019	Leichhardt Seam	6.78	7.77	9730	9400	6350	149	267	1500	3	2830	415	<1	<1	717	717	<20	<50	<100	<50	<50
2226-MB3	10-Dec-2019	Leichhardt Seam	6.6	7.57	10494	9430	5650	150	309	1640	4	2700	416	<1	<1	778	778	<20	<50	<100	<50	<50
2226-MB3	12-Feb-2020	Leichhardt Seam	6.68	7.51	10570	9500	6070	151	301	1640	4	2700	398	<1	<1	720	720	<20	<50	<100	<50	<50
2226-MB3	22-Apr-2020	Leichhardt Seam	6.62	7.39	10134	9570	5490	143	277	1490	3	2870	406	<1	<1	646	646	<20	<50	<100	<50	<50
2226-MB3	10-Jun-2020	Leichhardt Seam	6.3	7.81	9196	9840	6110	147	286	1590	4	2840	477	<1	<1	735	735	<20	<50	<100	<50	<50
2226-MB3	18-Nov-2020	Leichhardt Seam	6.85	7.39	9849	9010	5770	144	285	1540	4	2810	426	<1	<1	688	688	<20	<50	<100	<50	<50
2226-MB3	08-Feb-2021	Leichhardt Seam	6.85	7.34	9503	9280	5820	128	276	1500	4	2820	405	<1	<1	738	738	<20	<50	<100	<50	<50
2226-MB3	09-Feb-2021	Leichhardt Seam	6.76	7.24	9317	9040	6010	124	266	1450	4	2840	380	<1	<1	653	653	<20	<50	240	180	420
2226-MB3	21-Apr-2021	Leichhardt Seam	6.83	8.28	9600	9850	6570	146	292	1610	4	3050	443	<1	<1	715	715	<20	<50	<100	<50	<50
2226-MB3	12-May-2021	Leichhardt Seam	6.88	7.67	9260	9610	6240	150	290	1640	4	2920	426	<1	<1	650	650	<20	<50	<100	60	60
2226-MB3	18-Aug-2021	Leichhardt Seam	6.69	7.97	9772	10100	6180	150	288	1560	4	3070	436	<1	<1	723	723	<20	<50	<100	90	90
2226-MB3	21-Sep-2021	Leichhardt Seam	6.69	7.72	9764	10100	6630	159	280	1540	4	3120	414	<1	<1	716	716	<20	<50	<100	70	70
2226-MB3	17-Nov-2021	Leichhardt Seam	6.48	7.56	9942	10000	6840	133	278	1500	4	2940	413	<1	<1	772	772	<20	<50	<100	70	70
2226-MB3	12-Jan-2022	Leichhardt Seam	6.83	7.34	9958	10700	6840	132	279	1560	4	3180	435	<1	<1	751	751	<20	<50	<100	<50	<50
2226-MB3	15-Mar-2022	Leichhardt Seam	6.85	7.3	9739	11700	6560	134	277	1640	4	3120	416	<1	<1	712	712	<20	<50	<100	50	50
2226-MB3	01-Jun-2022	Leichhardt Seam	6.87	8.1	9834	9220	6290	142	294	1580	4	2980	411	<1	<1	610	610	<20	<50	100	<50	100
2226-MB3	31-Aug-2022	Leichhardt Seam	6.77	7.71	10135	10300	6600	124	292	1530	4	3150	418	<1	<1	779	779	<20	<50	<100	<50	<50
2226-MB3	28-Sep-2022	Leichhardt Seam	6.83	8.25	9783	10400	6730	128	284	1630	4	3120	416	<1	<1	756	756	<20	<50	<100	<50	<50
2372-MB3	15-Feb-2018	Vermont Seam	6.67	NM	30268	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
2372-MB3	30-Jun-2018	Vermont Seam	6.56	7.25	30656	29200	18600	611	726	4940	18	10800	725	<1	<1	459	459	<20	<50	<100	<50	<50
2372-MB3	20-Sep-2018	Vermont Seam	6.52	7.15	30456	28900	20800	748	769	5000	18	10100	720	<1	<1	482	482	<20	<50	<100	<50	<50
2372-MB3	19-Jun-2019	Vermont Seam	5.23	7.49	30339	29900	21200	767	876	5510	20	10600	801	<1	<1	461	461	<20	<50	<100	<50	<50
2372-MB3	29-Aug-2019	Vermont Seam	6.57	7.8	31296	30600	22100	706	802	4810	18	10300	764	<1	<1	464	464	<20	<50	<100	<50	<50
2372-MB3	28-Oct-2019	Vermont Seam	6.5	7.06	30520	29900	18700	774	820	5320	19	10400	834	<1	<1	424	424	<20	<50	<100	<50	<50
2372-MB3	14-Dec-2019	Vermont Seam	6.42	7.09	31891	29400	19700	619	749	5140	18	10200	756	<1	<1	441	441	<20	<50	<100	<50	<50
2372-MB3	04-Feb-2020	Vermont Seam	6.4	7.22	32758	29100	23200	673	784	4920	19	10800	772	<1	<1	427	427	<20	<50	<100	<50	<50
2372-MB3	07-Apr-2020	Vermont Seam	6.3	7.37	30953	30800	21000	682	863	5480	22	10300	756	<1	<1	433	433	<20	<50	<100	<50	<50
2372-MB3	02-Jun-2020	Vermont Seam	6.24	7.13	28197	28600	19600	583	789	5050	19	10500	747	<1	<1	458	458	<20	<50	<100	<50	<50
2372-MB3	17-Nov-2020	Vermont Seam	6.56	7.27	31450	28800	20500	682	830	5390	20	10600	785	<1	<1	428	428	<20	<50	<100	<50	<50
2372-MB3	02-Feb-2021	Vermont Seam	6.5	7.25	34826	29400	19400	682	1000	6620	23	10700	801	<1	<1	413	413	<20	<50	<100	<50	<50
2372-MB3	20-Apr-2021	Vermont Seam	6.52	8.1	30735	29400	21400	518	753	5060	18	10400	786	<1	<1	458	458	<20	<50	<100	<50	<50
2372-MB3	11-May-2021	Vermont Seam	6.54	7.5	30334	29500	21000	672	837	5330	20	10300	779	<1	<1	412	412	<20	<50	<100	<50	<50
2372-MB3	17-Aug-2021	Vermont Seam	6.38	7.76	30736	30000	21300	490	853	5830	20	10600	812	<1	<1	460	460	<20	<50	<100	<50	<50
2372-MB3	21-Sep-2021	Vermont Seam	6.42	7.69	28823	29400	22800	715	840	5010	19	10500	791	<1	<1	450	450	<20	<50	<100	<50	<50
2372-MB3	17-Nov-2021	Vermont Seam	6.31	7.26	29141	28300	22100	483	879	5260	20	10200	755	<1	<1	489	489	<20	<50	<100	<50	<50
2372-MB3	12-Jan-2022	Vermont Seam	6.58	7.13	28337	28900	23900	460	768	4710	16	10700	801	<1	<1	475	475	<20	<50	<100	<50	<50
2372-MB3	15-Mar-2022	Vermont Seam	6.59	7.15	28339	34500	22200	608	854	5000	18	10600	803	<1	<1	455	455	<20	<50	<100	<50	<50
2372-MB3	31-May-2022	Vermont Seam	6.62	7.89	28301	26200	20800	646	871	5230	18	10000	724	<1	<1	426	426	<20	<50	<100	<50	<50
2372-MB3	31-Aug-2022	Vermont Seam	6.54	7.5	28167	30700	22200	535	817	5160	20	10400	815	<1	<1	496	496	<20	<50	<100	<50	<50
2372-MB3	29-Sep-2022	Vermont Seam	6.56	7.72	29074	32200	22100	542	838	5070	18	10200	792	<1	<1	476	476	<20	<50	<100	<50	<50
2375-MB2	17-Feb-2018	Vermont Seam	6.45	7.42	14396	13500	9560	430	384	1810	7	4490	410	<1	<1	545	545	<20	<50	<100	<50	<50
2375-MB2	24-Mar-2018	Vermont Seam	6.51	7.62	14068	13300	9140	409	388	1890	8	4490	374	<1	<1	569	569	<20	<50	<100	<50	<50
2375-MB2	15-Jul-2018	Vermont Seam	6.49	6.87	13562	13400	7700	431	400	1860	8	4660	282	<1	<1	537	537	<20	<50	<100	<50	<50
2375-MB2	21-Sep-2018	Vermont Seam	6.45	6.99	13774	13300	8490	388	459	1960	8	4530	281	<1	<1	549	549	<20	<50	<100	<50	<50
2375-MB2	24-Feb-2019	Vermont Seam	6.53	6.83	13314	13100	8270	392	367	1600	7	4380	308	<1	<1	501	501	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
2375-MB2	28-May-2019	Vermont Seam	6.52	6.89	13366	13200	8740	417	413	1860	8	4600	300	<1	<1	492	492	<20	<50	<100	<50	<50
2375-MB2	31-Jul-2019	Vermont Seam	5.98	7.3	13629	13500	9200	484	437	1940	8	4620	325	<1	<1	529	529	<20	<50	<100	<50	<50
2375-MB2	22-Oct-2019	Vermont Seam	6.43	7.43	13357	12900	9050	383	387	1860	7	4350	290	<1	<1	487	487	<20	<50	<100	<50	<50
2375-MB2	15-Dec-2019	Vermont Seam	6.36	6.98	13805	12800	8420	390	379	1820	8	4300	298	<1	<1	503	503	<20	<50	<100	<50	<50
2375-MB2	04-Feb-2020	Vermont Seam	6.35	7.25	14143	13000	9740	420	407	1830	9	4470	308	<1	<1	485	485	<20	<50	<100	<50	<50
2375-MB2	07-Apr-2020	Vermont Seam	6.24	7.3	13476	13100	8630	400	393	1750	8	4260	296	<1	<1	479	479	<20	<50	<100	<50	<50
2375-MB2	02-Jun-2020	Vermont Seam	6.22	7.06	11864	12500	8740	362	418	1820	8	4340	299	<1	<1	510	510	<20	<50	<100	<50	<50
2375-MB2	17-Nov-2020	Vermont Seam	6.53	7.14	11794	10900	7640	350	319	1560	9	3880	327	<1	<1	391	391	<20	<50	<100	<50	<50
2375-MB2	08-Feb-2021	Vermont Seam	6.58	6.98	11004	10600	7220	321	300	1510	9	3500	306	<1	<1	352	352	<20	<50	<100	<50	<50
2375-MB2	09-Feb-2021	Vermont Seam	6.4	6.97	10218	9930	6420	290	296	1390	8	3460	272	<1	<1	345	345	<20	<50	<100	<50	<50
2375-MB2	20-Apr-2021	Vermont Seam	6.49	8.01	8714	10200	7260	328	280	1540	12	3490	359	<1	<1	293	293	<20	<50	<100	<50	<50
2375-MB2	11-May-2021	Vermont Seam	6.7	7.41	7922	8880	6080	302	182	1210	14	2980	377	<1	<1	142	142	<20	<50	<100	<50	<50
2375-MB2	17-Aug-2021	Vermont Seam	6.52	7.75	9271	10700	6880	331	287	1520	9	3580	334	<1	<1	323	323	<20	<50	<100	<50	<50
2375-MB2	21-Sep-2021	Vermont Seam	6.45	7.43	8924	10700	7370	332	300	1520	9	3600	327	<1	<1	342	342	<20	<50	<100	<50	<50
2375-MB2	17-Nov-2021	Vermont Seam	6.39	7.22	8896	10400	7840	307	297	1430	9	3440	330	<1	<1	346	346	<20	<50	<100	<50	<50
2375-MB2	12-Jan-2022	Vermont Seam	6.63	6.92	8970	11300	8550	321	312	1520	8	3620	331	<1	<1	361	361	<20	<50	<100	<50	<50
2375-MB2	15-Mar-2022	Vermont Seam	6.68	7.09	8781	11800	7700	322	306	1540	9	3520	342	<1	<1	315	315	<20	<50	<100	<50	<50
2375-MB2	31-May-2022	Vermont Seam	6.72	7.83	8800	9850	6690	285	216	1300	12	3360	353	<1	<1	236	236	<20	<50	<100	<50	<50
2375-MB2	19-Jul-2022	Vermont Seam	6.63	7.03	8880	11000	7550	390	299	1530	9	3480	337	<1	<1	347	347	<20	<50	<100	<50	<50
2375-MB2	29-Sep-2022	Vermont Seam	6.61	7.79	9774	11600	8190	299	256	1380	11	3620	335	<1	<1	404	404	<20	<50	<100	<50	<50
2393-MB2	16-Feb-2018	Leichhardt Seam	7.06	8.06	2698	2500	1500	13	18	516	1	411	65	<1	<1	694	694	<20	<50	<100	<50	<50
2393-MB2	24-Mar-2018	Leichhardt Seam	7.11	8.22	2648	2490	1470	13	19	542	2	422	68	<1	<1	705	705	<20	<50	<100	<50	<50
2393-MB2	27-Jul-2018	Leichhardt Seam	7.11	7.98	2545	2490	1410	13	19	544	1	415	60	<1	<1	685	685	<20	<50	<100	<50	<50
2393-MB2	21-Sep-2018	Leichhardt Seam	7.09	7.66	2569	2500	1380	13	20	576	2	412	59	<1	<1	726	726	<20	<50	<100	<50	<50
2393-MB2	22-Feb-2019	Leichhardt Seam	7.15	7.56	2526	2510	1440	13	19	519	2	413	68	<1	<1	680	680	<20	<50	<100	<50	<50
2393-MB2	24-Jun-2019	Leichhardt Seam	6.19	8.25	2588	2470	1390	14	18	538	1	407	61	<1	<1	678	678	<20	<50	<100	<50	<50
2393-MB2	04-Sep-2019	Leichhardt Seam	7.13	8.76	2644	2450	1450	15	16	470	2	412	62	<1	102	589	692	<20	<50	<100	<50	<50
2393-MB2	30-Oct-2019	Leichhardt Seam	7.11	7.62	2523	2390	1400	14	18	529	2	409	63	<1	<1	641	641	<20	<50	<100	<50	<50
2393-MB2	11-Dec-2019	Leichhardt Seam	6.92	7.89	2753	2390	1400	12	20	570	2	390	62	<1	<1	710	710	<20	<50	<100	<50	<50
2393-MB2	10-Feb-2020	Leichhardt Seam	6.64	7.29	19876	18800	12200	252	211	3670	17	6360	2	<1	<1	596	596	<20	<50	<100	<50	<50
2393-MB2	08-Apr-2020	Leichhardt Seam	6.86	7.99	2572	2500	1420	12	19	561	2	399	61	<1	<1	653	653	<20	<50	<100	<50	<50
2393-MB2	03-Jun-2020	Leichhardt Seam	6.78	7.68	2318	2400	1420	11	20	553	2	402	60	<1	<1	687	687	<20	<50	<100	<50	<50
2393-MB2	18-Nov-2020	Leichhardt Seam	7.19	7.8	2571	2340	1390	11	19	547	2	407	57	<1	<1	646	646	<20	<50	<100	<50	<50
2393-MB2	02-Feb-2021	Leichhardt Seam	7.02	7.62	2787	2380	1400	12	17	499	2	405	58	<1	<1	592	592	<20	<50	<100	<50	<50
2393-MB2	20-Apr-2021	Leichhardt Seam	7.07	8.56	2509	2340	1390	10	16	482	1	400	59	<1	42	639	681	<20	<50	<100	<50	<50
2393-MB2	11-May-2021	Leichhardt Seam	7.08	8.07	2472	2260	1380	11	17	503	1	381	56	<1	<1	638	638	<20	<50	<100	<50	<50
2393-MB2	17-Aug-2021	Leichhardt Seam	6.98	8.29	2496	2400	1390	11	17	510	2	403	52	<1	<1	670	670	<20	<50	<100	<50	<50
2393-MB2	21-Sep-2021	Leichhardt Seam	6.79	7.93	1157	2370	1350	12	17	498	2	392	55	<1	<1	670	670	<20	<50	140	<50	140
2393-MB2	17-Nov-2021	Leichhardt Seam	6.79	7.83	1157	1440	909	7	9	302	2	201	32	<1	<1	435	435	<20	<50	<100	<50	<50
2393-MB2	17-Nov-2021	Leichhardt Seam	6.79	7.78	1157	1770	1170	8	12	388	2	268	39	<1	<1	555	555	<20	<50	<100	<50	<50
2393-MB2	13-Jan-2022	Leichhardt Seam	7.03	7.59	1437	2300	1370	11	18	521	2	395	51	<1	<1	696	696	<20	<50	<100	<50	<50
2393-MB2	15-Mar-2022	Leichhardt Seam	7.22	7.59	2022	2090	1380	11	15	466	2	388	54	<1	<1	642	642	<20	<50	<100	<50	<50
2393-MB2	01-Jun-2022	Leichhardt Seam	7.24	8.29	2361	2240	1380	11	17	476	2	363	52	<1	<1	502	503	<20	<50	<100	<50	<50
2393-MB2	20-Jul-2022	Leichhardt Seam	7.19	7.68	2373	2330	1410	11	17	542	2	413	56	<1	<1	716	716	<20	<50	<100	<50	<50
2393-MB2	29-Sep-2022	Leichhardt Seam	7.19	8.19	2413	2410	1380	10	18	549	1	367	52	<1	<1	699	699	<20	<50	<100	<50	<50
2393-MB3	16-Feb-2018	Vermont Lower Seam	6.69	7.8	19885	18700	11400	329	191	3210	15	6380	6	<1	<1	613	613	<20	<50	<100	<50	<50
2393-MB3	21-Mar-2018	Vermont Lower Seam	6.79	7.62	19700	19100	12900	250	200	3440	16	6740	3	<1	<1	593	593	<20	<50	<100	<50	<50
2393-MB3	28-Jul-2018	Vermont Lower Seam	6.77	7.68	19478	18900	11700	315	218	3740	17	6740	2	<1	<1	590	590	<20	<50	<100	<50	<50
2393-MB3	23-Sep-2018	Vermont Lower Seam	6.7	7.45	19783	18600	11600	243	229	3680	20	6300	3	<1	<1	624	624	<20	<50	<100	<50	<100
2393-MB3	22-Feb-2019	Vermont Lower Seam	6.81	7.15	19397	19200	11700	346	218	3560	16	6620	4	<1	<1	602	602	<20	<50	<100	<50	<50
2393-MB3	24-Jun-2019	Vermont Lower Seam	5.96	7.86	19964	19200	12800	374	206	3640	17	6620	4	<1	<1	598	598	<20	<50	<100	<50	<50
2393-MB3	04-Sep-2019	Vermont Lower Seam	6.76	8.35	20366	18700	12200	374	188	3270	16	6740	4	<1	21	576	596	<20	<50	<100	<50	<50
2393-MB3	11-Dec-2019	Vermont Lower Seam	6.57	7.53	21179	18800	11700	285	236	4050	17	6520	3	<1	<1	649	649	<20	<50	<100	<50	<50
2393-MB3	10-Feb-2020	Vermont Lower Seam	6.94	7.76	2750	2410	1500	10	16	478	1	404	56	<1	<1	665	665	<20	<50	<100	<50	<50
2393-MB3	08-Apr-2020	Vermont Lower Seam	6.49	7.65	19912	20100	12300	263	220	3800	18	6470	1	<1	<1	580	580	<20	<50	<100	<50	<50
2393-MB3	03-Jun-2020	Vermont Lower Seam	6.44	7.33	18111	18600	11700	240	224	3700	17	6730	<1	<1	<1	610	610	<20	<50	<100	<50	<50
2393-MB3	18-Nov-2020	Vermont Lower Seam	6.8	7.44	19332	18200	12300	259	205	3590	16	6620	<1	<1	<1	586	586	<20	<50	<100	<50	<50
2393-MB3	02-Feb-2021	Vermont Lower Seam	6.71	7.38	22372	18800	12000	285	271	4770	21	6840	<1	<1	<1	540	540	<20	<50	<100	<50	<50
2393-MB3	20-Apr-2021	Vermont Lower Seam	6.73	8.29	19948	18900	12600	218	209	3700	16	6750	<1	<1	<1	606	606	<20	<50	<100	<50	<50
2393-MB3	11-May-2021	Vermont Lower Seam	6.73	7.66	19341	18700	11900	302	234	4040	19	6430	<1	<1	<1	601	601	<20	<50	<100	<50	<50
2393-MB3	17-Aug-2021	Vermont Lower Seam	6.61	7.97	18861	19100	11900	229	205	3520	17	6600	<1	<1	<1	619	619	<20	<50	<100	<50	<50
2393-MB3	21-Sep-2021	Vermont Lower Seam	6.61	7.63	16460	18000	11000	240	178	3120	14	6180	3	<1	<1	630	630	<20	<50	200	<50	200
2393-MB3	17-Nov-2021	Vermont Lower Seam	6.5	7.42	17024	17700	11700	175	178	3020	14	6050	3	<1	<1	686	686	<20	<50	180	50	230
2393-MB3	12-Jan-2022	Vermont Lower Seam	6.76	7.19	16535	17900	11700	199	211	3610	16	6430	2	<1	<1	669	669	<20	<50	170	60	230
2393-MB3	15-Mar-2022	Vermont Lower Seam	6.82	7.31	16628	20700	11700	174	178	3400	15	6430	1	<1	<1	641	641	<20	<50	250	70	320
2393-MB3	01-Jun-2022	Vermont Lower Seam	6.83	8.05	18845	16200	11500	210	192	3220	16	6240	<1	<1	<1	612	612	<20	<50	260	<50	260
2393-MB3	20-Jul-2022	Vermont Lower Seam	6.78	7.31	17238	18400	12000	191	196	3540	15	6310	<1	<1	<1	680	680	<20	<50	<100	<50	<50
2393-MB3	29-Sep-2022	Vermont Lower Seam	6.86	8.02	11547	19900	11800	178	200	3540	16	6200	<1	<1	<1	658	658	<20	<50	170	<50	170
West-MB2	17-Feb-2018	Permian coal measures	7.14	8.19	3392	3170	1950	37	24	656	3	451	130	<1	<1	956	956	20	<50	<100	<50	<50
West-MB2	20-Mar-2018	Permian coal measures	7.24	8.01	3490	3340	2080	29	24	707	4	501	136	<1	<1	948	948	<20	<50	<100	<50	<50
West-MB2	27-Jul-2018	Permian coal measures	7.22	8.02	3505	3430	1930	37	29	762	4	541	144	<1	<1	952	952	<20	<50	<100	<50	<50
West-MB2	13-Sep-2018	Permian coal measures	7.21	8.36	3521	3480	2060	29	27	714	3	558	149	<1	24	1020	1050	<20	<50	<100	<50	<50
West-MB2	24-Feb-2019	Permian coal measures	7.21	7.59	3608	3560	2110	42	29	741	4	569	190	<1	<1	969	969	<20	<50	<100	<50	<50
WEST-MB2	26-May-2019	Permian coal measures	7.21	7.63	3622	3430	2250	42	29	772	4	596	156	<1	<1	920	920	<20	<50	<100	<50	<50
WEST-MB2	01-Aug-2019	Permian coal measures	6.09	8.02	3645	3640	2090	59	31	814	4	558	167	<1	<1	1000	1000	<20	<50	<100	<50	<50
WEST-MB2	25-Oct-2019	Permian coal measures	7.2	8.13	0	3480	2110	48	27	754	4	546	160	<1	<1	919	919	<20	<50	<100	<50	<50
WEST-MB2	10-Dec-2019	Permian coal measures	7.01	8	3981	3500	2100	30	34	858	4	542	171	<1	<1	995	995	<20	<50	<100	<50	<50
WEST-MB2	11-Feb-2020	Permian coal measures	7.1	7.8	3952	3470	2100	24	30	826	4	534	149	<1	<1	947	947	<20	<50	<100	<50	<50
WEST-MB2	22-Apr-2020	Permian coal measures	7.04	7.66	3886	3600	1990	27	29	764	4	574	158	<1	<1	905	905	<20	<50	<100	<50	<50
WEST-MB2	10-Jun-2020	Permian coal measures	6.73	8.11	3421	3580	2150	17	29	775	4	565	157	<1	<1	951	951	<20	<50	<100	<50	<50
WEST-MB2	19-Nov-2020	Permian coal measures	7.33	7.77	3519	3230	2090	33	29	752	4	542	158	<1	<1	885	885	<20	<50	<100	<50	<50
WEST-MB2	03-Feb-2021	Permian coal measures	7.22	7.8	4031	3370	2010	10	24	588	3	559	163	<1	<1	846	846	<20	<50	300	<50	300
WEST-MB2	22-Apr-2021	Permian coal measures	7.24	8.64	3591	3350	2060	25	28	740	4	550	167	<1	88	852	939	<20	<50	<100	<50	<50
WEST-MB2	12-May-2021	Permian coal measures	7.24	8.07	3547	3290	2080	30	30	800	4	527	163	<1	<1	866	866	<20	<50	<100	<50	<50
WEST-MB2	18-Aug-2021	Permian coal measures	7.11	8.45	3700	3460	2070	25	28	736	4	579	160	<1	40	906	946	<20	<50	<100	<50	<50

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-2: pH, EC, TDS, Major Ions, Hydrocarbon Data

Bore ID	Sample Date	Groundwater Unit	pH		Electrical Conductivity		TDS	Major Ions										Total Petroleum Hydrocarbons				
			Field	Lab	Field	Lab	Total Dissolved Solids (TDS)	Calcium	Magnesium	Sodium	Potassium	Chloride	Sulfate	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
			pH	pH	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WEST-MB2	21-Sep-2021	Permian coal measures	7.06	8.1	3621	4020	2390	36	29	758	4	755	180	<1	<1	892	892	<20	<50	<100	<50	<50
WEST-MB2	17-Nov-2021	Permian coal measures	6.94	7.88	3691	3990	2420	18	28	736	4	668	178	<1	<1	988	988	<20	<50	130	100	230
West-MB2	12-Jan-2022	Permian coal measures	7.15	7.72	3440	3740	2200	15	27	711	4	646	178	<1	<1	968	968	<20	<50	<100	<50	<50
West-MB2	15-Mar-2022	Permian coal measures	7.29	7.7	3359	3430	2160	29	27	745	4	648	180	<1	<1	929	929	<20	<50	140	110	250
West-MB2	01-Jun-2022	Permian coal measures	7.31	8.35	3137	3380	2090	26	30	781	4	546	176	<1	22	877	899	<20	<50	150	80	230
West-MB2	19-Jul-2022	Permian coal measures	7.24	7.76	3452	3480	2150	28	29	793	4	615	175	<1	<1	1010	1010	<20	<50	110	90	200
West-MB2	28-Sep-2022	Permian coal measures	7.27	8.57	3219	3590	2040	14	28	727	4	532	168	<1	65	920	985	<20	<50	<100	<50	<50

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W1_MB1	20-Oct-2020	Tertiary sediments	<0.01	0.001	<0.05	<0.0001	<0.001	0.002	0.001	0.16	<0.001	0.056	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W1_MB1	09-Dec-2020	Tertiary sediments	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	0.58	<0.001	0.079	<0.0001	<0.001	0.027	<0.01	<0.001	0.002	<0.01	<0.005
W1_MB1	05-Jan-2021	Tertiary sediments	<0.01	<0.001	0.98	<0.0001	<0.001	0.002	<0.001	0.39	<0.001	0.072	<0.0001	<0.001	0.132	<0.01	<0.001	0.005	<0.01	<0.005
W1_MB1	26-Jan-2021	Tertiary sediments	<0.01	0.001	1.19	<0.0001	<0.001	0.001	0.002	0.46	<0.001	0.073	<0.0001	<0.001	0.092	<0.01	<0.001	0.006	<0.01	<0.005
W1_MB1	17-Feb-2021	Tertiary sediments	<0.05	<0.005	1.94	<0.0005	<0.005	<0.005	<0.005	0.57	<0.005	0.074	<0.0001	<0.005	0.085	<0.05	<0.005	0.008	<0.05	<0.025
W1_MB1	24-Mar-2021	Tertiary sediments	<0.05	<0.005	2.14	<0.0005	<0.005	<0.005	<0.005	0.29	<0.005	0.076	<0.0001	<0.005	0.051	<0.05	<0.005	0.008	<0.05	<0.025
W1_MB1	14-Apr-2021	Tertiary sediments	<0.05	<0.005	1.75	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.085	<0.0001	<0.005	0.11	<0.05	<0.005	0.008	<0.05	<0.025
W1_MB1	26-May-2021	Tertiary sediments	<0.05	<0.005	2.04	<0.0005	<0.005	<0.005	<0.005	0.18	<0.005	0.087	<0.0001	<0.005	0.178	<0.05	<0.005	0.008	<0.05	0.121
W1_MB1	29-Jun-2021	Tertiary sediments	<0.05	<0.005	1.96	<0.0005	0.006	<0.005	<0.005	0.19	<0.005	0.121	<0.0001	<0.005	0.009	<0.05	<0.005	0.008	<0.05	<0.025
W1_MB1	26-Jul-2021	Tertiary sediments	<0.01	0.001	1.55	<0.0001	<0.001	0.003	0.008	0.62	<0.001	0.154	<0.0001	0.001	0.014	<0.01	<0.001	0.011	<0.01	<0.005
W1_MB1	24-Aug-2021	Tertiary sediments	<0.05	<0.005	1.76	<0.0005	<0.005	<0.005	<0.005	0.49	<0.005	0.114	<0.0001	<0.005	0.006	<0.05	<0.005	0.009	<0.05	<0.025
W1_MB1	14-Sep-2021	Tertiary sediments	<0.05	<0.005	1.54	<0.0005	<0.005	<0.005	<0.005	0.31	<0.005	0.104	<0.0001	<0.005	0.009	<0.05	<0.005	0.005	<0.05	<0.025
W1_MB1	19-Oct-2021	Tertiary sediments	<0.05	<0.005	2.04	<0.0005	<0.005	<0.005	<0.005	0.4	<0.005	0.257	<0.0001	<0.005	<0.005	<0.05	<0.005	0.008	<0.05	<0.025
W1_MB1	16-Nov-2021	Tertiary sediments	<0.05	<0.005	2.09	<0.0005	<0.005	<0.005	<0.005	0.35	<0.005	0.342	<0.0001	<0.005	<0.005	<0.05	<0.005	0.009	<0.05	<0.025
W1_MB1	09-Dec-2021	Tertiary sediments	<0.05	<0.005	2.2	<0.0005	<0.005	<0.005	<0.005	0.61	<0.005	0.754	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.025
W1_MB1	25-Jan-2022	Tertiary sediments	<0.05	<0.005	2.48	<0.0005	<0.005	<0.005	<0.005	0.45	<0.005	0.521	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.025
W1_MB1	15-Feb-2022	Tertiary sediments	<0.05	<0.005	2.21	<0.0005	<0.005	<0.005	<0.005	0.34	<0.005	0.402	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.025
W1_MB1	16-Mar-2022	Tertiary sediments	<0.05	<0.005	2.23	<0.0005	<0.005	0.008	<0.005	0.26	<0.005	0.27	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.025
W1_MB1	03-May-2022	Tertiary sediments	<0.05	<0.005	2.08	<0.0005	<0.005	0.008	<0.005	0.34	<0.005	0.263	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.025
W1_MB1	31-May-2022	Tertiary sediments	<0.05	<0.005	1.87	<0.0005	<0.005	0.009	<0.005	0.12	<0.005	0.187	<0.0001	<0.005	0.006	<0.05	<0.005	0.012	<0.05	<0.025
W1_MB1	22-Jun-2022	Tertiary sediments	<0.05	<0.005	2.34	<0.0005	<0.005	0.008	<0.005	0.14	<0.005	0.16	<0.0001	<0.005	0.008	<0.05	<0.005	0.01	<0.05	<0.025
W1_MB1	20-Jul-2022	Tertiary sediments	<0.05	<0.005	2.49	<0.0005	<0.005	0.008	<0.005	0.1	<0.005	0.111	<0.0001	<0.005	0.005	<0.05	<0.005	0.011	<0.05	<0.025
W1_MB1	31-Aug-2022	Tertiary sediments	<0.05	<0.005	2.23	<0.0005	<0.005	0.006	<0.005	0.23	<0.005	0.104	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.025
W1_MB1	06-Oct-2022	Tertiary sediments	<0.05	<0.005	2.34	<0.0005	<0.005	<0.005	<0.005	0.18	<0.005	0.112	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.025
W12_MB1	20-Oct-2020	Tertiary sediments	0.03	<0.001	0.39	<0.0001	<0.001	0.008	<0.001	0.09	<0.001	0.331	<0.0001	0.017	<0.001	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	09-Dec-2020	Tertiary sediments	0.02	<0.001	0.34	<0.0001	<0.001	0.002	<0.001	0.16	<0.001	0.314	<0.0001	0.006	0.012	<0.01	<0.001	0.014	<0.01	<0.005
W12_MB1	05-Jan-2021	Tertiary sediments	0.01	<0.001	0.43	<0.0001	0.001	0.002	0.001	0.63	<0.001	0.453	<0.0001	0.005	0.004	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	26-Jan-2021	Tertiary sediments	0.01	<0.001	0.48	<0.0001	0.001	0.003	0.001	0.92	<0.001	0.572	<0.0001	0.007	0.003	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	17-Feb-2021	Tertiary sediments	<0.05	<0.005	0.6	<0.0005	<0.005	<0.005	<0.005	1.97	<0.005	0.602	<0.0001	0.008	0.006	<0.05	<0.005	0.026	<0.05	<0.025
W12_MB1	24-Mar-2021	Tertiary sediments	<0.01	<0.001	0.43	<0.0001	<0.001	0.002	<0.001	3.88	<0.001	0.588	<0.0001	0.005	<0.001	<0.01	<0.001	0.023	<0.01	<0.005
W12_MB1	14-Apr-2021	Tertiary sediments	<0.01	<0.001	0.44	<0.0001	<0.001	0.002	<0.001	2.72	<0.001	0.439	<0.0001	0.007	<0.001	<0.01	<0.001	0.021	<0.01	<0.005
W12_MB1	26-May-2021	Tertiary sediments	0.01	<0.001	0.36	<0.0001	<0.001	0.001	<0.001	2.25	<0.001	0.509	<0.0001	0.008	0.001	<0.01	<0.001	0.021	<0.01	<0.005
W12_MB1	29-Jun-2021	Tertiary sediments	<0.01	<0.001	0.4	<0.0001	0.001	0.002	<0.001	2.36	<0.001	0.562	<0.0001	0.008	0.004	<0.01	<0.001	0.026	<0.01	<0.005
W12_MB1	26-Jul-2021	Tertiary sediments	<0.01	<0.001	0.35	<0.0001	<0.001	0.003	0.005	2.28	<0.001	0.705	<0.0001	0.012	0.009	<0.01	<0.001	0.031	<0.01	<0.005
W12_MB1	24-Aug-2021	Tertiary sediments	<0.05	<0.005	0.39	<0.0005	<0.005	<0.005	<0.005	0.68	<0.005	0.578	<0.0001	0.009	<0.005	<0.05	<0.005	0.028	<0.05	<0.025
W12_MB1	15-Sep-2021	Tertiary sediments	<0.01	<0.001	0.4	<0.0001	<0.001	0.003	0.009	0.54	<0.001	0.566	<0.0001	0.011	0.002	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	19-Oct-2021	Tertiary sediments	<0.01	<0.001	0.42	<0.0001	<0.001	0.002	0.002	0.63	<0.001	0.649	<0.0001	0.005	0.001	<0.01	<0.001	0.024	<0.01	0.014
W12_MB1	16-Nov-2021	Tertiary sediments	<0.01	<0.001	0.3	<0.0001	<0.001	0.002	0.001	0.68	<0.001	0.706	<0.0001	0.004	<0.001	<0.01	<0.001	0.023	<0.01	<0.005
W12_MB1	09-Dec-2021	Tertiary sediments	<0.01	<0.001	0.49	<0.0001	<0.001	0.002	<0.001	0.7	<0.001	0.85	<0.0001	0.007	<0.001	<0.01	<0.001	0.025	<0.01	<0.005
W12_MB1	25-Jan-2022	Tertiary sediments	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	0.002	0.49	<0.001	0.816	<0.0001	0.005	<0.001	<0.01	<0.001	0.022	<0.01	<0.005
W12_MB1	22-Feb-2022	Tertiary sediments	<0.01	<0.001	0.51	<0.0001	<0.001	<0.001	<0.001	0.46	<0.001	0.85	<0.0001	0.005	<0.001	<0.01	<0.001	0.023	<0.01	<0.005
W12_MB1	16-Mar-2022	Tertiary sediments	<0.05	<0.005	0.57	<0.0005	<0.005	<0.005	<0.005	0.46	<0.005	0.721	<0.0001	0.007	<0.005	<0.05	<0.005	0.023	<0.05	<0.025
W12_MB1	03-May-2022	Tertiary sediments	<0.05	<0.005	0.68	<0.0005	<0.005	<0.005	<0.005	0.56	<0.005	0.864	<0.0001	0.008	<0.005	<0.05	<0.005	0.027	<0.05	<0.025
W12_MB1	31-May-2022	Tertiary sediments	<0.05	<0.005	0.61	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.66	<0.0001	0.006	<0.005	<0.05	<0.005	0.025	<0.05	<0.025
W12_MB1	22-Jun-2022	Tertiary sediments	<0.01	<0.001	0.52	<0.0001	<0.001	0.002	0.004	0.42	<0.001	0.701	<0.0001	0.008	<0.001	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	20-Jul-2022	Tertiary sediments	<0.01	0.001	0.62	<0.0001	<0.001	0.002	<0.001	0.37	<0.001	0.618	<0.0001	0.007	<0.001	<0.01	<0.001	0.024	<0.01	<0.005
W12_MB1	31-Aug-2022	Tertiary sediments	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.33	<0.001	0.622	<0.0001	0.007	<0.001	<0.01	<0.001	0.025	<0.01	<0.005
W12_MB1	04-Oct-2022	Tertiary sediments	<0.01	<0.001	0.55	<0.0001	<0.001	0.003	<0.001	0.36	<0.001	0.647	<0.0001	0.009	0.002	<0.01	<0.001	0.025	<0.01	<0.005
W14_MB1	20-Oct-2020	Tertiary sediments	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.016	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	16-Dec-2020	Tertiary sediments	<0.01	<0.001	0.08	<0.0001	<0.001	<0.001	<0.001	0.14	<0.001	0.048	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	26-Jan-2021	Tertiary sediments	<0.01	<0.001	0.16	<0.0001	<0.001	0.002	<0.001	0.37	<0.001	0.177	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	17-Feb-2021	Tertiary sediments	<0.01	<0.001	0.1	<0.0001	<0.001	0.001	<0.001	0.14	<0.001	0.138	<0.0001	<0.001	0.007	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	24-Mar-2021	Tertiary sediments	<0.01	<0.001	0.11	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.111	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	14-Apr-2021	Tertiary sediments	<0.01	<0.001	0.11	<0.0001	<0.001	<0.001	0.001	<0.05	<0.001	0.107	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	26-May-2021	Tertiary sediments	<0.01	<0.001	0.07	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.094	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	29-Jun-2021	Tertiary sediments	<0.01	0.001	0.08	<0.0001	<0.001	0.001	<0.001	0.26	<0.001	0.115	<0.0001	<0.001	0.013	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	26-Jul-2021	Tertiary sediments	<0.01	<0.001	0.11	<0.0001	<0.001	0.001	<0.001	0.12	<0.001	0.11	<0.0001	<0.001	0.028	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	24-Aug-2021	Tertiary sediments	<0.01	<0.001	0.08	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.095	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	15-Sep-2021	Tertiary sediments	<0.01	<0.001	0.07	<0.0001	<0.001	<0.001	0.006	0.1	<0.001	0.104	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	19-Oct-2021	Tertiary sediments	<0.01	<0.001	0.16	<0.0001	<0.001	0.001	<0.001	0.19	<0.001	0.127	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.007
W14_MB1	16-Nov-2021	Tertiary sediments	<0.01	<0.001	0.06	<0.0001	<0.001	0.001	<0.001	0.16	<0.001	0.122	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	09-Dec-2021	Tertiary sediments	<0.01	<0.001	0.12	<0.0001	<0.001	0.001	<0.001	0.1	<0.001	0.15	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	25-Jan-2022	Tertiary sediments	<0.01	<0.001	0.14	<0.0001	<0.001	0.001	<0.001	0.13	<0.001	0.179	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.006
W14_MB1	22-Feb-2022	Tertiary sediments	<0.01	<0.001	0.12	<0.0001	<0.001	0.001	<0.001	0.07	<0.001	0.14	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	16-Mar-2022	Tertiary sediments	<0.01	<0.001	0.1	<0.0001	<0.001	0.001	<0.001	0.05	<0.001	0.123	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	03-May-2022	Tertiary sediments	<0.01	<0.001	0.14	<0.0001	<0.001	0.001	<0.001	0.17	<0.001	0.127	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	31-May-2022	Tertiary sediments	<0.01	<0.001	0.13	<0.0001	<0.001	0.002	<0.001	0.07	<0.001	0.188	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W14_MB1	22-Jun-2022	Tertiary sediments	<0.01	<0.001	0.13	<0.0001	<0.001	<0.001	0.003	<0.05	<0.001	0.116	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	0.021
W14_MB1	20-Jul-2022	Tertiary sediments	<0.01	<0.001	0.09	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.028	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	31-Aug-2022	Tertiary sediments	<0.01	<0.001	0.11	<0.0001	<0.001	0.001	<0.001	0.05	<0.001	0.183	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	04-Oct-2022	Tertiary sediments	<0.05	<0.005	0.77	<0.0005	<0.005	0.006	<0.005	0.59	<0.005	0.995	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB1	20-Oct-2020	Tertiary sediments	<0.01	<0.001	0.13	<0.0001	<0.001	<0.001	0.007	<0.05	<0.001	0.032	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	0.036
W2_MB1	09-Dec-2020	Tertiary sediments	<0.01	<0.001	0.9	<0.0001	<0.001	0.002	<0.001	0.27	<0.001	0.078	<0.0001	<0.001	0.237	<0.01	<0.001	0.002	<0.01	0.006
W2_MB1	05-Jan-2021	Tertiary sediments	<0.01	<0.001	1.05	<0.0001	<0.001	0.002	0.001	0.33	<0.001	0.05	<0.0001	<0.001	0.105	<0.01	<0.001	0.005	<0.01	<0.005
W2_MB1	26-Jan-2021	Tertiary sediments	<0.01	0.002	1.44	<0.0001	<0.001	0.001	0.002	1.79	<0.001	0.044	<0.0001	<0.001	0.047	<0.01	<0.001	0.007	<0.01	<0.005
W2_MB1	17-Feb-2021	Tertiary sediments	<0.05	<0.005	2.32	<0.0005	<0.005	<0.005	<0.005	2.86	<0.005	0.038	<0.0001	<0.005	0.208	<0.05	<0.005	0.008	<0.05	<0.025
W2_MB1	24-Mar-2021	Tertiary sediments	<0.05	<0.005	2.42	<0.0005	<0.005	<0.005	<0.005	5.04	<0.005	0.034	<0.0001	<0.005	0.048	<0.05	<0.005	0.008	<0.05	<0.025
W2_MB1	14-Apr-2021	Tertiary sediments	<0.05	<0.005	1.94	<0.0005	<0.005	<0.005	<0.005	5.13	<0.005	0.041	<0.0001	<0.005	0.027	<0.05	<0.005	0.007	<0.05	<0.025
W2_MB1	26-May-2021	Tertiary sediments	0.09	<0.005	2.44	<0.0005	<0.005	<0.005	<0.005	5.14	<0.005	0.036	<0.0001	<0.005	0.024	<0.05	<0.005	0.007	<0.05	<0.025
W2_MB1	29-Jun-2021	Tertiary sediments	<0.01	<0.001	1.51	<0.0001	<0.001	0.008	<0.001	1.57	<0.001	0.278	<0.0001	<0.001	0.034	<0.01	<0.001	0.006	<0.01	<0.005
W2_MB1	26-Jul-2021	Tertiary sediments	<0.05	<0.005	1.76	<0.0005	<0.005	0.007	<0.005	1.22	<0.005	0.125	<0.0001	<0.005	0.36	<0.05	<0.005	0.008	<0.05	0.043
W2_MB1	24-Aug-2021	Tertiary sediments	<0.05	<0.005	2.17	<0.0005	<0.005	<0.005	<0.005	0.58	<0.005	0.077	<0.0001	<0.005	0.049	<0.05	<0.005	0.009	<0.05	<0.025
W2_MB1	14-Sep-2021	Tertiary sediments	<0.05	<0.005	2.04	<0.0005	<0.005	<0.005	<0.005	0.34	<0.005	0.057	<0.0001	<0.005	0.015	<0.05	<0.005	0.006	<0.05	<0.025
W2_MB1	19-Oct-2021	Tertiary sediments	<0.05	<0.005	1.85	<0.0005	<0.005	0.006	<0.005	0.2	<0.005	0.132	<0.0001	<0.005	0.013	<0.05	<0.005	0.008	<0.05	<0.025
W2_MB1	16-Nov-2021	Tertiary sediments	<0.05	<0.005	2.24	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.142	<0.0001	<0.005	0.012	<0.05	<0.005	0.008	<0.05	<0.025
W2_MB1	09-Dec-2021	Tertiary sediments	<0.05	<0.005	2.15	<0.0005	<0.005	<0.005	<0.005	0.38	<0.005	0.121	<0.0001	<0.005	0.009	<0.05	<0.005	0.01	<0.05	<0.025
W2_MB1	25-Jan-2022	Tertiary sediments	<0.05	<0.005	2.63	<0.0005	<0.005	<0.005	<0.005	0.39	<0.005	0.1	<0.0001	<0.005	0.011	<0.05	<0.005	0.01	<0.05	<0.025
W2_MB1	22-Feb-2022	Tertiary sediments	<0.05	<0.005	2.41	<0.0005	<0.005	<0.005	<0.005	0.31	<0.005	0.086	<0.0001	<0.005	0.008	<0.05	<0.005	0.009	<0.05	0.027
W2_MB1	16-Mar-2022	Tertiary sediments	<0.05	<0.005	2.12	<0.0005	<0.005	<0.005	<0.005	0.26	<0.005	0.07	<0.0001	<0.005	0.008	<0.05	<0.005	0.009	<0.05	<0.025
W2_MB1	03-May-2022	Tertiary sediments	<0.05	<0.005	2.16	<0.0005	<0.005	<0.005	<0.005	0.28	<0.005	0.077	<0.0001	<0.005	0.024	<0.05	<0.005	0.01	<0.05	<0.025
W2_MB1	31-May-2022	Tertiary sediments	<0.05	<0.005	2.38	<0.0005	<0.005	0.006	<0.005	0.17	<0.005	0.059	<0.0001	<0.005	0.075	<0.05	<0.005	0.009	<0.05	0.049
W2_MB1	22-Jun-2022	Tertiary sediments	<0.05	<0.005	2.53	<0.0005	<0.005	<0.005	<0.005	0.16	<0.005	0.052	<0.0001	<0.005	0.04	<0.05	<0.005	0.008	<0.05	<0.025
W2_MB1	20-Jul-2022	Tertiary sediments	<0.05	<0.005	2.86	<0.0005	<0.005	<0.005	<0.005	0.2	<0.005	0.059	<0.0001	<0.005	0.019	<0.05	<0.005	0.009	<0.05	<0.025
W2_MB1	31-Aug-2022	Tertiary sediments	<0.05	<0.005	2.65	<0.0005	<0.005	<0.005	<0.005	0.16	<0.005	0.052	<0.0001	<0.005	0.075	<0.05	<0.005	0.01	<0.05	0.027
W2_MB1	04-Oct-2022	Tertiary sediments	<0.05	<0.005	3.1	<0.0005	<0.005	<0.005	<0.005	0.13	<0.005	0.05	<0.0001	<0.005	0.03	<0.05	<0.005	0.01	<0.05	<0.025
W3_MB2	20-Oct-2020	Tertiary sediments	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.027	<0.0001	<0.001	0.004	<0.01	<0.001	0.003	<0.01	0.048
W3_MB2	09-Dec-2020	Tertiary sediments	<0.01	<0.001	0.64	<0.0001	<0.001	<0.001	<0.001	0.25	<0.001	0.025	<0.0001	<0.001	0.01	<0.01	<0.001	0.002	<0.01	<0.005
W3_MB2	05-Jan-2021	Tertiary sediments	<0.01	<0.001	0.78	<0.0001	0.001	<0.001	0.001	0.32	<0.001	0.022	<0.0001	<0.001	0.021	<0.01	<0.001	0.003	<0.01	<0.005
W3_MB2	26-Jan-2021	Tertiary sediments	<0.01	<0.001	0.92	<0.0001	<0.001	0.001	0.001	0.22	<0.001	0.026	<0.0001	<0.001	0.184	<0.01	<0.001	0.004	<0.01	0.034
W3_MB2	17-Feb-2021	Tertiary sediments	<0.01	<0.001	0.54	<0.0001	0.001	<0.001	<0.001	0.54	<0.001	0.029	<0.0001	<0.001	0.066	<0.01	<0.001	0.002	<0.01	0.011
W3_MB2	24-Mar-2021	Tertiary sediments	<0.01	<0.001	0.89	<0.0001	<0.001	0.001	0.003	0.15	<0.001	0.019	<0.0001	<0.001	0.419	<0.01	<0.001	0.004	<0.01	0.088
W3_MB2	14-Apr-2021	Tertiary sediments	<0.01	<0.001	1.14	0.0002	<0.001	0.001	0.004	0.08	<0.001	0.018	<0.0001	<0.001	0.336	<0.01	<0.001	0.004	<0.01	0.056
W3_MB2	26-May-2021	Tertiary sediments	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	0.57	<0.001	0.036	<0.0001	<0.001	0.144	<0.01	<0.001	0.001	<0.01	0.008
W3_MB2	29-Jun-2021	Tertiary sediments	<0.01	<0.001	1.01	0.0001	<0.001	0.002	0.004	0.08	<0.001	0.05	<0.0001	<0.001	0.59	<0.01	0.009	0.005	<0.01	0.115
W3_MB2	26-Jul-2021	Tertiary sediments	<0.01	<0.001	0.92	0.0001	<0.001	0.002	0.005	0.21	<0.001	0.056	<0.0001	0.001	0.267	<0.01	<0.001	0.005	<0.01	0.104
W3_MB2	24-Aug-2021	Tertiary sediments	<0.05	<0.005	1.07	<0.0005	<0.005	<0.005	<0.005	0.64	<0.005	0.04	<0.0001	<0.005	0.05	<0.05	<0.005	<0.005	<0.05	<0.025
W3_MB2	15-Sep-2021	Tertiary sediments	<0.01	<0.001	1.04	<0.0001	<0.001	0.001	0.008	0.3	<0.001	0.034	<0.0001	<0.001	0.045	<0.01	<0.001	0.005	<0.01	<0.005
W3_MB2	21-Oct-2021	Tertiary sediments	<0.01	<0.001	0.93	<0.0001	<0.001	0.002	<0.001	1.03	<0.001	0.089	<0.0001	<0.001	0.035	<0.01	<0.001	0.005	<0.01	<0.005
W3_MB2	16-Nov-2021	Tertiary sediments	<0.01	<0.001	0.84	<0.0001	<0.001	0.001	0.001	0.41	<0.001	0.044	<0.0001	<0.001	0.037	<0.01	<0.001	0.004	<0.01	<0.005
W3_MB2	09-Dec-2021	Tertiary sediments	<0.01	<0.001	1	<0.0001	<0.001	0.002	<0.001	0.25	<0.001	0.056	<0.0001	<0.001	0.05	<0.01	<0.001	0.004	<0.01	<0.005
W3_MB2	25-Jan-2022	Tertiary sediments	<0.01	<0.001	1.02	<0.0001	<0.001	0.002	0.002	<0.05	<0.001	0.046	<0.0001	<0.001	0.043	<0.01	<0.001	0.004	<0.01	<0.005
W3_MB2	22-Feb-2022	Tertiary sediments	<0.01	<0.001	1.18	<0.0001	<0.001	0.001	<0.001	0.16	<0.001	0.041	<0.0001	<0.001	0.029	<0.01	<0.001	0.004	<0.01	<0.005
W3_MB2	16-Mar-2022	Tertiary sediments	<0.01	<0.001	0.86	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.03	<0.0001	<0.001	0.03	<0.01	<0.001	0.004	<0.01	0.018
W3_MB2	03-May-2022	Tertiary sediments	<0.01	<0.001	0.98	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.036	<0.0001	<0.001	0.033	<0.01	<0.001	0.005	<0.01	0.022
W3_MB2	31-May-2022	Tertiary sediments	<0.01	<0.001	1.01	<0.0001	<0.001	0.001	<0.001	0.08	<0.001	0.034	<0.0001	<0.001	0.03	<0.01	<0.001	0.005	<0.01	0.008
W3_MB2	22-Jun-2022	Tertiary sediments	<0.01	<0.001	1.12	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.029	<0.0001	<0.001	0.027	<0.01	<0.001	0.004	<0.01	0.012
W3_MB2	20-Jul-2022	Tertiary sediments	<0.01	<0.001	1.11	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.029	<0.0001	<0.001	0.03	<0.01	<0.001	0.004	<0.01	0.02
W3_MB2	31-Aug-2022	Tertiary sediments	<0.01	<0.001	1.04	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.032	<0.0001	<0.001	0.032	<0.01	<0.001	0.005	<0.01	0.026
W3_MB2	04-Oct-2022	Tertiary sediments	<0.01	<0.001	1.26	0.0002	<0.001	0.001	<0.001	0.1	<0.001	0.035	<0.0001	0.001	0.035	<0.01	<0.001	0.005	<0.01	0.015
W4_MB1	10-Mar-2021	Quaternary alluvium	<0.01	0.034	0.5	<0.0001	<0.001	<0.001	<0.001	5.7	<0.001	0.237	<0.0001	0.002	0.001	<0.01	<0.001	0.004	<0.01	<0.005
W11_MB1	20-Oct-2020	Rewan Group	0.02	0.01	0.28	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.879	<0.0001	<0.001	<0.001	<0.01	<0.001	0.011	<0.01	0.006
W11_MB1	09-Dec-2020	Rewan Group	<0.01	0.006	0.21	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.618	<0.0001	0.01	0.001	<0.01	<0.001	0.006	<0.01	<0.005
W11_MB1	04-Jan-2021	Rewan Group	0.01	0.004	0.25	<0.0001	<0.001	<0.001	0.001	0.14	<0.001	0.568	<0.0001	0.023	0.001	<0.01	<0.001	0.005	<0.01	<0.005
W11_MB1	28-Jan-2021	Rewan Group	<0.05	<0.005	0.33	<0.0005	<0.005	<0.005	<0.005	0.28	<0.005	0.677	<0.0001	0.023	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	16-Feb-2021	Rewan Group	<0.05	<0.005	0.33	<0.0005	<0.005	<0.005	<0.005	0.33	<0.005	0.647	<0.0001	0.025	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	10-Mar-2021	Rewan Group	<0.01	0.001	0.21	<0.0001	0.002	<0.001	<0.001	0.2	<0.001	0.586	<0.0001	0.031	0.008	<0.01	<0.001	0.003	<0.01	<0.005
W11_MB1	14-Apr-2021	Rewan Group	<0.01	0.001	0.25	<0.0001	<0.001	<0.001	<0.001	0.16	<0.001	0.56	<0.0001	0.041	0.001	<0.01	<0.001	0.002	<0.01	<0.005
W11_MB1	25-May-2021	Rewan Group	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	0.36	<0.005	0.602	<0.0001	0.046	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	29-Jun-2021	Rewan Group	<0.05	<0.005	0.26	<0.0005	0.009	<0.005	<0.005	0.76	<0.005	0.691	<0.0001	0.016	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	22-Jul-2021	Rewan Group	<0.05	<0.005	0.49	<0.0005	<0.005	<0.005	<0.005	0.44	<0.005	0.685	<0.0001	0.019	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	24-Aug-2021	Rewan Group	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	0.35	<0.005	0.603	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	14-Sep-2021	Rewan Group	<0.01	<0.001	0.22	<0.0001	<0.001	<0.001	0.009	0.09	<0.001	0.604	<0.0001	0.004	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W11_MB1	19-Oct-2021	Rewan Group	<0.01	<0.001	0.21	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.644	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W11_MB1	16-Nov-2021	Rewan Group	<0.05	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.592	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W11_MB1	09-Dec-2021	Rewan Group	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.607	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	25-Jan-2022	Rewan Group	<0.01	<0.001	0.27	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.504	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.016
W11_MB1	15-Feb-2022	Rewan Group	<0.05	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.506	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	16-Mar-2022	Rewan Group	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	0.05	<0.005	0.458	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	03-May-2022	Rewan Group	<0.01	<0.001	0.29	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.487	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.009
W11_MB1	31-May-2022	Rewan Group	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.453	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	22-Jun-2022	Rewan Group	<0.01	0.001	0.28	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.463	<0.0001	0.004	<0.001	<0.01	<0.001	<0.001	<0.01	0.007
W11_MB1	20-Jul-2022	Rewan Group	<0.05	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.413	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB1	31-Aug-2022	Rewan Group	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.504	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	21-Oct-2020	Rewan Group	<0.01	0.001	0.69	<0.0001	0.006	<0.001	<0.001	0.82	<0.001	0.37	<0.0001	0.058	<0.001	<0.01	<0.001	0.004	<0.01	<0.005
W5_MB1	09-Dec-2020	Rewan Group	<0.01	<0.001	1.11	<0.0001	<0.001	0.002	<0.001	0.29	<0.001	0.48	<0.0001	<0.001	0.015	<0.01	<0.001	0.003	<0.01	<0.005
W5_MB1	05-Jan-2021	Rewan Group	<0.01	<0.001	1.06	<0.0001	<0.001	0.003	0.002	0.31	<0.001	0.481	<0.0001	<0.001	0.013	<0.01	<0.001	0.004	<0.01	<0.005
W5_MB1	26-Jan-2021	Rewan Group	0.01	<0.001	1.07	<0.0001	<0.001	0.006	0.001	0.23	<0.001	0.527	<0.0001	<0.001	0.374	<0.01	<0.001	0.004	<0.01	<0.005
W5_MB1	16-Feb-2021	Rewan Group	<0.05	<0.005	1.34	<0.0005	<0.005	<0.005	<0.005	0.27	<0.005	0.532	<0.0001	<0.005	0.42	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	16-Feb-2021	Rewan Group	<0.05	<0.005	1.31	<0.0005	<0.005	<0.005	<0.005	0.26	<0.005	0.528	<0.0001	<0.005	0.419	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	10-Mar-2021	Rewan Group	<0.01	<0.001	0.87	<0.0001	<0.001	0.003	0.135	0.06	<0.001	0.473	<0.0001	<0.001	0.23	<0.01	<0.001	0.003	<0.01	0.291
W5_MB1	14-Apr-2021	Rewan Group	<0.01	<0.001	1.02	<0.0001	0.001	0.004	0.3	<0.05	<0.001	0.391	<0.0001	0.002	0.315	<0.01	<0.001	0.002	<0.01	0.265
W5_MB1	25-May-2021	Rewan Group	<0.01	<0.001	0.94	<0.0001	0.002	<0.001	<0.001	0.51	<0.001	0.546	<0.0001	<0.001	0.02	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB1	29-Jun-2021	Rewan Group	<0.01	<0.001	1.09	<0.0001	<0.001	<0.001	<0.001	1.06	<0.001	0.473	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB1	26-Jul-2021	Rewan Group	<0.01	<0.001	0.85	<0.0001	<0.001	0.003	0.003	0.78	<0.001	0.504	<0.0001	0.002	0.06	<0.01	<0.001	0.002	<0.01	0.088
W5_MB1	24-Aug-2021	Rewan Group	<0.05	<0.005	1.13	<0.0005	<0.005	<0.005	<0.005	0.6	<0.005	0.502	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	14-Sep-2021	Rewan Group	<0.01	<0.001	1.1	<0.0001	<0.001	<0.001	0.007	0.46	<0.001	0.506	<0.0001	<0.001	0.001	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB1	19-Oct-2021	Rewan Group	<0.01	<0.001	1.02	<0.0001	<0.001	0.005	0.001	0.73	<0.001	0.713	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB1	16-Nov-2021	Rewan Group	<0.01	<0.001	0.98	<0.0001	<0.001	0.005	0.001	0.56	<0.001	0.578	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB1	09-Dec-2021	Rewan Group	<0.01	<0.001	0.99	<0.0001	<0.001	0.004	<0.001	0.45	<0.001	0.491	<0.0001	<0.001	0.001	<0.01	<0.001	0.001	<0.01	<0.005
W5_MB1	25-Jan-2022	Rewan Group	<0.01	0.001	1.15	<0.0001	<0.001	0.004	0.002	0.39	<0.001	0.446	<0.0001	<0.001	0.001	<0.01	<0.001	0.001	<0.01	<0.005
W5_MB1	15-Feb-2022	Rewan Group	<0.05	<0.005	1.36	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.452	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	16-Mar-2022	Rewan Group	<0.05	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.415	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	03-May-2022	Rewan Group	<0.05	<0.005	1.54	<0.0005	<0.005	<0.005	<0.005	0.56	<0.005	0.5	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	31-May-2022	Rewan Group	<0.05	<0.005	1.19	<0.0005	<0.005	<0.005	<0.005	0.42	<0.005	0.429	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	22-Jun-2022	Rewan Group	<0.05	<0.005	1.47	<0.0005	<0.005	<0.005	<0.005	0.57	<0.005	0.39	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	20-Jul-2022	Rewan Group	<0.05	<0.005	1.53	<0.0005	<0.005	<0.005	<0.005	0.57	<0.005	0.353	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB1	31-Aug-2022	Rewan Group	<0.05	<0.005	0.89	<0.0005	<0.005	<0.005	<0.005	0.53	<0.005	0.403	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W1_MB2	20-Oct-2020	Leichhardt Lower Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	1.63	<0.005	0.358	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.05
W1_MB2	09-Dec-2020	Leichhardt Lower Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	1.53	<0.005	0.332	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.061
W1_MB2	05-Jan-2021	Leichhardt Lower Seam	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	1.71	<0.005	0.319	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.036
W1_MB2	26-Jan-2021	Leichhardt Lower Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	2.3	<0.005	0.344	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.054
W1_MB2	17-Feb-2021	Leichhardt Lower Seam	<0.05	<0.005	1.62	<0.0005	<0.005	<0.005	<0.005	3.87	<0.005	0.25	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W1_MB2	17-Feb-2021	Leichhardt Lower Seam	<0.05	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	2.54	<0.005	0.342	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.045
W1_MB2	24-Mar-2021	Leichhardt Lower Seam	<0.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	2.55	<0.005	0.3	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.056
W1_MB2	14-Apr-2021	Leichhardt Lower Seam	<0.05	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	2.53	<0.005	0.301	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.056
W1_MB2	26-May-2021	Leichhardt Lower Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	2.97	<0.005	0.302	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.05
W1_MB2	29-Jun-2021	Leichhardt Lower Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	2.8	<0.005	0.317	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.054
W1_MB2	26-Jul-2021	Leichhardt Lower Seam	<0.05	<0.005	0.05	<0.0005	<0.005	<0.005	<0.005	2.56	<0.005	0.274	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.05
W1_MB2	24-Aug-2021	Leichhardt Lower Seam	<0.05	<0.005	0.11	<0.0005	<0.005	<0.005	<0.005	3	<0.005	0.279	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.048
W1_MB2	14-Sep-2021	Leichhardt Lower Seam	<0.05	<0.005	0.11	<0.0005	<0.005	<0.005	<0.005	2.72	<0.005	0.249	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.046
W1_MB2	19-Oct-2021	Leichhardt Lower Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	2.96	<0.005	0.288	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.049
W1_MB2	16-Nov-2021	Leichhardt Lower Seam	<0.05	<0.005	0.08	<0.0005	<0.005	<0.005	<0.005	3.01	<0.005	0.297	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.049
W1_MB2	09-Dec-2021	Leichhardt Lower Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	3.42	<0.005	0.321	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.056
W1_MB2	25-Jan-2022	Leichhardt Lower Seam	<0.05	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	3.2	<0.005	0.291	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.031
W1_MB2	15-Feb-2022	Leichhardt Lower Seam	<0.05	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	3.06	<0.005	0.295	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.045
W1_MB2	16-Mar-2022	Leichhardt Lower Seam	<0.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	3.01	<0.005	0.259	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.03
W1_MB2	03-May-2022	Leichhardt Lower Seam	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	3.43	<0.005	0.341	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.072
W1_MB2	31-May-2022	Leichhardt Lower Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	3.03	<0.005	0.267	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.036
W1_MB2	22-Jun-2022	Leichhardt Lower Seam	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	3.29	<0.005	0.312	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.031
W1_MB2	20-Jul-2022	Leichhardt Lower Seam	<0.05	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	3.16	<0.005	0.305	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.051
W1_MB2	31-Aug-2022	Leichhardt Lower Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	3.07	<0.005	0.293	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.064
W1_MB2	04-Oct-2022	Leichhardt Lower Seam	<0.20	<0.020	<0.20	<0.0020	<0.020	<0.020	<0.020	3.03	<0.020	0.253	<0.0001	<0.020	<0.020	<0.20	<0.020	<0.020	<0.20	<0.100
W1_MB3	20-Oct-2020	Vermont Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	6.51	<0.005	0.298	<0.0001	<0.005	<0.005	<0.05	0.005	<0.005	<0.05	0.094
W1_MB3	09-Dec-2020	Vermont Seam	0.13	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	5.93	<0.005	0.283	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.107
W1_MB3	05-Jan-2021	Vermont Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	5.81	<0.005	0.256	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.06
W1_MB3	26-Jan-2021	Vermont Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	7.27	<0.005	0.278	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.088
W1_MB3	17-Feb-2021	Vermont Seam	<0.05	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	7.14	<0.005	0.268	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.088
W1_MB3	24-Mar-2021	Vermont Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	6.61	<0.005	0.232	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.087
W1_MB3	14-Apr-2021	Vermont Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	5.91	<0.005	0.22	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.096
W1_MB3	26-May-2021	Vermont Seam	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	6.22	<0.005	0.203	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.089
W1_MB3	29-Jun-2021	Vermont Seam	<0.05	<0.005	0.17	<0.0005	0.006	<0.005	<0.005	6.84	<0.005	0.238	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	0.1

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W1_MB3	26-Jul-2021	Vermont Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	6.12	<0.005	0.201	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.094
W1_MB3	24-Aug-2021	Vermont Seam	<0.05	<0.005	0.07	<0.0005	<0.005	<0.005	<0.005	6.46	<0.005	0.195	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.081
W1_MB3	14-Sep-2021	Vermont Seam	<0.05	<0.005	0.11	<0.0005	<0.005	<0.005	<0.005	5.43	<0.005	0.171	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.076
W1_MB3	19-Oct-2021	Vermont Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	6.39	<0.005	0.2	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.084
W1_MB3	16-Nov-2021	Vermont Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	6.19	<0.005	0.211	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.081
W1_MB3	09-Dec-2021	Vermont Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	7.19	<0.005	0.219	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.101
W1_MB3	25-Jan-2022	Vermont Seam	<0.05	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	6.68	<0.005	0.202	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.059
W1_MB3	15-Feb-2022	Vermont Seam	<0.05	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	6.51	<0.005	0.199	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.089
W1_MB3	16-Mar-2022	Vermont Seam	<0.05	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	6.23	<0.005	0.181	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.056
W1_MB3	03-May-2022	Vermont Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	7.21	<0.005	0.237	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.128
W1_MB3	31-May-2022	Vermont Seam	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	6.39	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.07
W1_MB3	22-Jun-2022	Vermont Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	6.98	<0.005	0.211	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.048
W1_MB3	20-Jul-2022	Vermont Seam	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	6.13	<0.005	0.186	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.082
W1_MB3	31-Aug-2022	Vermont Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	6.56	<0.005	0.183	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.076
W1_MB3	04-Oct-2022	Vermont Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	6.45	<0.005	0.187	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.078
W10_MB2	20-Oct-2020	Vermont Upper Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.008	<0.0001	0.021	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	09-Dec-2020	Vermont Upper Seam	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	1.9	<0.005	0.385	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	04-Jan-2021	Vermont Upper Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	0.11	<0.005	0.092	<0.0001	0.014	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	28-Jan-2021	Vermont Upper Seam	<0.05	<0.005	0.16	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.074	<0.0001	0.019	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	16-Feb-2021	Vermont Upper Seam	<0.05	<0.005	0.16	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.06	<0.0001	0.021	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	10-Mar-2021	Vermont Upper Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.05	<0.0001	0.023	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	14-Apr-2021	Vermont Upper Seam	<0.05	<0.005	0.13	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.037	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	25-May-2021	Vermont Upper Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.026	<0.0001	0.015	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	29-Jun-2021	Vermont Upper Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.022	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	22-Jul-2021	Vermont Upper Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.019	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	24-Aug-2021	Vermont Upper Seam	<0.05	<0.005	0.06	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.015	<0.0001	0.013	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	14-Sep-2021	Vermont Upper Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.011	<0.0001	0.01	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	19-Oct-2021	Vermont Upper Seam	<0.05	<0.005	0.06	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.01	<0.0001	0.01	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	16-Nov-2021	Vermont Upper Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.008	<0.0001	0.019	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	08-Dec-2021	Vermont Upper Seam	<0.05	<0.005	0.12	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.006	<0.0001	0.018	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	25-Jan-2022	Vermont Upper Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.005	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	15-Feb-2022	Vermont Upper Seam	0.02	<0.001	0.11	<0.0001	0.038	<0.001	<0.001	0.09	<0.001	0.028	<0.0001	0.016	<0.001	<0.01	<0.005	<0.005	<0.01	<0.005
W10_MB2	16-Mar-2022	Vermont Upper Seam	<0.05	<0.005	0.11	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	04-May-2022	Vermont Upper Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.008	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	31-May-2022	Vermont Upper Seam	<0.05	<0.005	0.13	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.014	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	22-Jun-2022	Vermont Upper Seam	<0.05	<0.005	0.1	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.006	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	31-Aug-2022	Vermont Upper Seam	<0.05	<0.005	0.08	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.0001	0.012	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	20-Oct-2020	Vermont Lower Seam	<0.05	<0.005	0.45	<0.0005	<0.005	<0.005	<0.005	1.2	<0.005	0.178	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	09-Dec-2020	Vermont Lower Seam	<0.05	<0.005	0.81	<0.0005	<0.005	<0.005	<0.005	1.09	<0.005	0.167	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	04-Jan-2021	Vermont Lower Seam	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	1.06	<0.005	0.174	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	28-Jan-2021	Vermont Lower Seam	<0.05	<0.005	0.61	<0.0005	<0.005	<0.005	<0.005	0.76	<0.005	0.17	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	16-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.76	<0.0005	<0.005	<0.005	<0.005	1.24	<0.005	0.169	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	10-Mar-2021	Vermont Lower Seam	<0.05	<0.005	0.59	<0.0005	<0.005	<0.005	<0.005	1.19	<0.005	0.177	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	14-Apr-2021	Vermont Lower Seam	<0.05	<0.005	0.66	<0.0005	<0.005	<0.005	<0.005	1.23	<0.005	0.174	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	25-May-2021	Vermont Lower Seam	<0.05	<0.005	0.72	<0.0005	<0.005	<0.005	<0.005	1.17	<0.005	0.175	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	29-Jun-2021	Vermont Lower Seam	<0.05	<0.005	0.6	<0.0005	<0.005	<0.005	<0.005	1.19	<0.005	0.179	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	22-Jul-2021	Vermont Lower Seam	<0.05	<0.005	0.95	<0.0005	<0.005	<0.005	<0.005	1.1	<0.005	0.176	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	24-Aug-2021	Vermont Lower Seam	<0.05	<0.005	0.6	<0.0005	<0.005	<0.005	<0.005	1.27	<0.005	0.16	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	14-Sep-2021	Vermont Lower Seam	<0.05	<0.005	0.52	<0.0005	<0.005	<0.005	<0.005	1.01	<0.005	0.143	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	19-Oct-2021	Vermont Lower Seam	<0.05	<0.005	0.52	<0.0005	<0.005	<0.005	<0.005	1.17	<0.005	0.168	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	16-Nov-2021	Vermont Lower Seam	<0.05	<0.005	0.56	<0.0005	<0.005	<0.005	<0.005	1.13	<0.005	0.164	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	08-Dec-2021	Vermont Lower Seam	<0.05	<0.005	0.6	<0.0005	<0.005	<0.005	<0.005	1.3	<0.005	0.175	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	25-Jan-2022	Vermont Lower Seam	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	1.29	<0.005	0.169	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	15-Feb-2022	Vermont Lower Seam	<0.05	<0.005	0.63	<0.0005	<0.005	<0.005	<0.005	1.2	<0.005	0.166	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	16-Mar-2022	Vermont Lower Seam	<0.05	<0.005	0.68	<0.0005	<0.005	<0.005	<0.005	1.24	<0.005	0.167	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	03-May-2022	Vermont Lower Seam	<0.05	<0.005	0.81	<0.0005	<0.005	<0.005	<0.005	1.43	<0.005	0.195	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	31-May-2022	Vermont Lower Seam	<0.05	<0.005	0.76	<0.0005	<0.005	<0.005	<0.005	1.37	<0.005	0.175	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	22-Jun-2022	Vermont Lower Seam	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	1.42	<0.005	0.18	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	31-Aug-2022	Vermont Lower Seam	<0.05	<0.005	0.58	<0.0005	<0.005	<0.005	<0.005	1.3	<0.005	0.173	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	20-Oct-2020	Leichhardt Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.088	<0.0005	0.087	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	09-Dec-2020	Leichhardt Seam	<0.05	0.009	0.23	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.072	<0.0001	0.078	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	04-Jan-2021	Leichhardt Seam	<0.05	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.068	<0.0001	0.077	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	28-Jan-2021	Leichhardt Seam	<0.05	<0.005	0.16	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.056	<0.0001	0.084	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	16-Feb-2021	Leichhardt Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.053	<0.0001	0.082	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	10-Mar-2021	Leichhardt Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.049	<0.0001	0.081	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	14-Apr-2021	Leichhardt Seam	<0.05	<0.005	0.13	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.044	<0.0001	0.07	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	25-May-2021	Leichhardt Seam	<0.05	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.042	<0.0001	0.065	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W11_MB2	29-Jun-2021	Leichhardt Seam	<0.05	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.04	<0.0001	0.077	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	22-Jul-2021	Leichhardt Seam	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.036	<0.0001	0.051	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	24-Aug-2021	Leichhardt Seam	<0.05	<0.005	0.12	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.033	<0.0001	0.056	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	14-Sep-2021	Leichhardt Seam	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	0.006	0.06	<0.001	0.044	<0.0001	0.013	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W11_MB2	19-Oct-2021	Leichhardt Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.026	<0.0001	0.109	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	16-Nov-2021	Leichhardt Seam	<0.05	<0.005	0.06	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.033	<0.0001	0.07	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	09-Dec-2021	Leichhardt Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.034	<0.0001	0.041	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	25-Jan-2022	Leichhardt Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.031	<0.0001	0.039	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	15-Feb-2022	Leichhardt Seam	<0.05	<0.005	0.16	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.027	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	16-Mar-2022	Leichhardt Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.029	<0.0001	0.015	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	03-May-2022	Leichhardt Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.037	<0.0001	0.015	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	31-May-2022	Leichhardt Seam	<0.05	0.007	0.16	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.038	<0.0005	0.029	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	22-Jun-2022	Leichhardt Seam	<0.01	0.003	0.11	<0.0001	<0.001	<0.001	0.003	<0.05	<0.001	0.05	<0.0001	0.02	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W11_MB2	20-Jul-2022	Leichhardt Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.035	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	31-Aug-2022	Leichhardt Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.034	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	20-Oct-2020	Vermont Lower Seam	<0.05	<0.005	0.53	<0.0005	<0.005	0.006	<0.005	0.28	<0.005	0.877	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	09-Dec-2020	Vermont Lower Seam	<0.05	0.006	0.74	<0.0005	<0.005	<0.005	<0.005	0.82	<0.005	0.561	<0.0001	<0.005	0.026	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	05-Jan-2021	Vermont Lower Seam	<0.05	<0.005	0.66	<0.0005	<0.005	<0.005	<0.005	0.64	<0.005	0.619	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	26-Jan-2021	Vermont Lower Seam	<0.05	<0.005	0.81	<0.0005	<0.005	<0.005	<0.005	0.65	<0.005	0.734	<0.0001	<0.005	0.015	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	17-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.71	<0.0005	<0.005	<0.005	<0.005	0.66	<0.005	0.724	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	24-Mar-2021	Vermont Lower Seam	<0.05	<0.005	0.67	<0.0005	<0.005	<0.005	<0.005	0.6	<0.005	0.755	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	14-Apr-2021	Vermont Lower Seam	<0.05	<0.005	0.6	0.0005	<0.005	<0.005	<0.005	0.57	<0.005	0.819	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	26-May-2021	Vermont Lower Seam	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	0.61	<0.005	0.838	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	29-Jun-2021	Vermont Lower Seam	<0.05	<0.005	0.46	<0.0005	0.005	<0.005	<0.005	0.73	<0.005	0.902	<0.0001	<0.005	0.023	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	26-Jul-2021	Vermont Lower Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	0.71	<0.005	0.875	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	24-Aug-2021	Vermont Lower Seam	<0.05	<0.005	0.5	<0.0005	<0.005	0.005	<0.005	0.76	<0.005	0.853	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	15-Sep-2021	Vermont Lower Seam	<0.05	<0.005	0.5	<0.0005	<0.005	<0.005	<0.005	0.61	<0.005	0.786	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	19-Oct-2021	Vermont Lower Seam	<0.05	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	0.7	<0.005	0.883	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	17-Nov-2021	Vermont Lower Seam	<0.05	<0.005	0.48	<0.0005	<0.005	0.005	<0.005	0.66	<0.005	0.958	<0.0001	<0.005	0.015	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	09-Dec-2021	Vermont Lower Seam	<0.05	<0.005	0.56	<0.0005	<0.005	0.005	<0.005	0.74	<0.005	1.04	<0.0001	<0.005	0.015	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	25-Jan-2022	Vermont Lower Seam	<0.05	<0.005	0.66	<0.0005	<0.005	0.005	<0.005	0.74	<0.005	0.971	<0.0001	<0.005	0.011	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	22-Feb-2022	Vermont Lower Seam	<0.05	<0.005	0.64	<0.0005	<0.005	0.006	<0.005	0.72	<0.005	1	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	0.025
W13_MB1	16-Mar-2022	Vermont Lower Seam	<0.05	<0.005	0.65	<0.0005	<0.005	0.005	<0.005	0.66	<0.005	0.962	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	03-May-2022	Vermont Lower Seam	<0.05	<0.005	0.85	<0.0005	<0.005	0.006	<0.005	0.76	<0.005	1.15	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	31-May-2022	Vermont Lower Seam	<0.05	<0.005	0.79	<0.0005	<0.005	0.005	<0.005	0.68	<0.005	0.974	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	22-Jun-2022	Vermont Lower Seam	<0.05	0.006	0.65	<0.0005	<0.005	<0.005	<0.005	0.77	<0.005	1.06	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	20-Jul-2022	Vermont Lower Seam	<0.05	<0.005	0.74	<0.0005	<0.005	0.005	<0.005	0.59	<0.005	0.925	<0.0001	<0.005	0.011	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	31-Aug-2022	Vermont Lower Seam	<0.05	<0.005	0.67	<0.0005	<0.005	0.006	0.006	0.78	<0.005	1.01	<0.0001	0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	20-Oct-2020	Girrah 1 Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.022	<0.0001	0.034	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	09-Dec-2020	Girrah 1 Seam	<0.05	<0.005	0.33	<0.0005	<0.005	<0.005	<0.005	0.19	<0.005	0.036	<0.0001	0.009	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	05-Jan-2021	Girrah 1 Seam	<0.01	<0.001	0.23	<0.0001	<0.001	<0.001	0.002	0.27	<0.001	0.037	<0.0001	0.005	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W13_MB2	26-Jan-2021	Girrah 1 Seam	<0.05	<0.005	0.39	<0.0005	<0.005	<0.005	<0.005	0.39	<0.005	0.041	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	17-Feb-2021	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.55	<0.005	0.046	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	24-Mar-2021	Girrah 1 Seam	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	0.75	<0.005	0.053	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	14-Apr-2021	Girrah 1 Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	0.64	<0.005	0.064	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	29-Jun-2021	Girrah 1 Seam	<0.01	<0.001	0.27	<0.0001	<0.001	<0.001	<0.001	1.04	<0.001	0.072	<0.0001	0.005	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W13_MB2	26-Jul-2021	Girrah 1 Seam	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	0.007	1.33	<0.001	0.084	<0.0001	0.005	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
W13_MB2	24-Aug-2021	Girrah 1 Seam	<0.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	0.81	<0.005	0.058	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	15-Sep-2021	Girrah 1 Seam	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	0.88	<0.005	0.064	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	19-Oct-2021	Girrah 1 Seam	<0.01	<0.001	0.22	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.048	<0.0001	0.019	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
W13_MB2	17-Nov-2021	Girrah 1 Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	0.86	<0.005	0.075	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	09-Dec-2021	Girrah 1 Seam	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	1.03	<0.005	0.084	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	25-Jan-2022	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.95	<0.005	0.082	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	22-Feb-2022	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.97	<0.005	0.086	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	0.036
W13_MB2	03-May-2022	Girrah 1 Seam	<0.05	<0.005	0.43	<0.0005	<0.005	<0.005	<0.005	0.67	<0.005	0.082	<0.0001	0.013	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	31-May-2022	Girrah 1 Seam	<0.05	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	1.02	<0.005	0.095	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	22-Jun-2022	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.86	<0.005	0.09	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	20-Jul-2022	Girrah 1 Seam	<0.05	<0.005	0.39	<0.0005	<0.005	<0.005	<0.005	0.87	<0.005	0.089	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	31-Aug-2022	Girrah 1 Seam	<0.05	<0.005	0.34	<0.0005	<0.005	<0.005	<0.005	0.84	<0.005	0.09	<0.0001	0.01	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB2	04-Oct-2022	Girrah 1 Seam	<0.05	<0.005	0.41	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.06	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W14_MB2	20-Oct-2020	Permian Coal Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	1.64	<0.001	1.12	<0.0001	<0.001	<0.001	<0.01	<0.001	0.016	<0.01	<0.005
W14_MB2	16-Dec-2020	Permian Coal Seam	<0.01	0.023	0.41	<0.0001	<0.001	0.003	<0.001	3.24	<0.001	0.258	<0.0001	0.002	0.002	<0.01	<0.001	0.006	<0.01	<0.005
W14_MB2	05-Jan-2021	Permian Coal Seam	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	0.001	2.46	<0.001	1.2	<0.0001	<0.001	<0.001	<0.01	<0.001	0.012	<0.01	<0.005
W14_MB2	26-Jan-2021	Permian Coal Seam	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	2.91	<0.001	1.35	<0.0001	<0.001	<0.001	<0.01	<0.001	0.011	<0.01	<0.005
W14_MB2	17-Feb-2021	Permian Coal Seam	<0.05	<0.005	0.75	<0.0005	<0.005	<0.005	<0.005	3.77	<0.005	1.62	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.025
W14_MB2	24-Mar-2021	Permian Coal Seam	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	4.07	<0.001	1.45	<0.0001	<0.001	<0.001	<0.01	<0.001	0.01	<0.01	<0.005
W14_MB2	14-Apr-2021	Permian Coal Seam	<0.01	<0.001	0.58	<0.0001	0.001	<0.001	<0.001	4.54	<0.001	1.58	<0.0001	<0.001	<0.001	<0.01	<0.001	0.009	<0.01	<0.005

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W14_MB2	26-May-2021	Permian Coal Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	4.36	<0.001	1.78	<0.0001	<0.001	<0.001	<0.01	<0.001	0.008	<0.01	<0.005
W14_MB2	29-Jun-2021	Permian Coal Seam	<0.01	<0.001	0.59	<0.0001	<0.001	<0.001	<0.001	4.24	<0.001	1.59	<0.0001	<0.001	<0.001	<0.01	<0.001	0.008	<0.01	<0.005
W14_MB2	26-Jul-2021	Permian Coal Seam	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	4.9	<0.001	1.71	<0.0001	<0.001	<0.001	<0.01	<0.001	0.007	<0.01	<0.005
W14_MB2	24-Aug-2021	Permian Coal Seam	<0.05	<0.005	0.55	<0.0005	<0.005	<0.005	<0.005	4.75	<0.005	1.55	<0.0001	<0.005	<0.005	<0.05	<0.005	0.006	<0.05	<0.025
W14_MB2	15-Sep-2021	Permian Coal Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	0.009	4.22	<0.001	1.51	<0.0001	<0.001	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
W14_MB2	19-Oct-2021	Permian Coal Seam	<0.01	<0.001	0.52	<0.0001	<0.001	<0.001	<0.001	2.05	<0.001	1.63	<0.0001	<0.001	<0.001	<0.01	<0.001	0.004	<0.01	<0.005
W14_MB2	16-Nov-2021	Permian Coal Seam	<0.01	<0.001	0.4	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	1.39	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W14_MB2	09-Dec-2021	Permian Coal Seam	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	1.44	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W14_MB2	25-Jan-2022	Permian Coal Seam	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	0.001	0.33	<0.001	1.3	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W14_MB2	22-Feb-2022	Permian Coal Seam	<0.01	<0.001	0.6	<0.0001	<0.001	<0.001	<0.001	0.47	<0.001	1.28	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	16-Mar-2022	Permian Coal Seam	<0.01	<0.001	0.21	<0.0001	<0.001	<0.001	<0.001	0.43	<0.001	0.055	<0.0001	0.013	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
W14_MB2	16-Mar-2022	Permian Coal Seam	<0.05	<0.005	0.66	<0.0005	<0.005	<0.005	<0.005	0.62	<0.005	1.31	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W14_MB2	03-May-2022	Permian Coal Seam	<0.05	<0.005	0.77	<0.0005	<0.005	<0.005	<0.005	0.87	<0.005	1.43	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W14_MB2	31-May-2022	Permian Coal Seam	<0.05	<0.005	0.75	<0.0005	<0.005	<0.005	<0.005	0.9	<0.005	1.18	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W14_MB2	22-Jun-2022	Permian Coal Seam	<0.01	<0.001	0.6	<0.0001	<0.001	<0.001	0.002	0.94	<0.001	1.28	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W14_MB2	20-Jul-2022	Permian Coal Seam	<0.01	0.001	0.64	<0.0001	<0.001	<0.001	<0.001	1.02	<0.001	1.14	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	01-Sep-2022	Permian Coal Seam	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	1.12	<0.001	1.12	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W15_MB2	20-Oct-2020	Vermont Upper Seam	0.01	0.021	0.32	<0.0001	<0.001	0.005	<0.001	3.6	<0.001	0.32	<0.0001	<0.001	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
W15_MB2	16-Dec-2020	Vermont Upper Seam	<0.01	<0.001	0.56	<0.0001	<0.001	<0.001	<0.001	2.45	<0.001	1.34	<0.0001	<0.001	<0.001	<0.01	<0.001	0.014	<0.01	<0.005
W15_MB2	04-Jan-2021	Vermont Upper Seam	<0.01	0.024	0.34	<0.0001	<0.001	0.003	<0.001	2.91	<0.001	0.254	<0.0001	0.002	0.003	<0.01	<0.001	0.005	<0.01	<0.005
W15_MB2	28-Jan-2021	Vermont Upper Seam	<0.05	0.024	0.44	<0.0005	<0.005	<0.005	<0.005	3.24	<0.005	0.28	<0.0001	<0.005	<0.005	<0.05	<0.005	0.005	<0.05	<0.025
W15_MB2	16-Feb-2021	Vermont Upper Seam	<0.05	0.025	0.54	<0.0005	<0.005	<0.005	<0.005	3.29	<0.005	0.285	<0.0001	<0.005	<0.005	<0.05	<0.005	0.006	<0.05	<0.025
W15_MB2	10-Mar-2021	Vermont Upper Seam	<0.01	0.024	0.34	<0.0001	<0.001	0.002	<0.001	3.19	<0.001	0.28	<0.0001	0.002	0.001	<0.01	<0.001	0.005	<0.01	<0.005
W15_MB2	14-Apr-2021	Vermont Upper Seam	<0.05	0.025	0.45	<0.0005	<0.005	<0.005	<0.005	3.27	<0.005	0.301	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	25-May-2021	Vermont Upper Seam	<0.01	0.024	0.34	<0.0001	<0.001	0.002	<0.001	3.89	<0.001	0.286	<0.0001	0.002	0.002	<0.01	<0.001	0.005	<0.01	<0.005
W15_MB2	29-Jun-2021	Vermont Upper Seam	<0.01	0.022	0.38	<0.0001	<0.001	0.001	<0.001	3.34	<0.001	0.278	<0.0001	0.002	0.002	<0.01	<0.001	0.004	<0.01	<0.005
W15_MB2	22-Jul-2021	Vermont Upper Seam	<0.01	0.021	0.45	<0.0001	<0.001	0.001	<0.001	3.52	<0.001	0.276	<0.0001	0.025	0.002	<0.01	<0.001	0.004	<0.01	<0.005
W15_MB2	24-Aug-2021	Vermont Upper Seam	<0.05	0.021	0.47	<0.0005	<0.005	<0.005	<0.005	3.69	<0.005	0.281	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	14-Sep-2021	Vermont Upper Seam	<0.01	0.018	0.34	<0.0001	<0.001	<0.001	0.009	3.37	<0.001	0.29	<0.0001	<0.001	0.001	<0.01	<0.001	0.004	<0.01	<0.005
W15_MB2	19-Oct-2021	Vermont Upper Seam	<0.01	0.016	0.36	<0.0001	<0.001	<0.001	<0.001	3.32	<0.001	0.308	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W15_MB2	16-Nov-2021	Vermont Upper Seam	<0.01	0.013	0.25	<0.0001	<0.001	<0.001	<0.001	3.15	<0.001	0.279	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W15_MB2	08-Dec-2021	Vermont Upper Seam	<0.05	0.013	0.39	<0.0005	<0.005	<0.005	<0.005	3.57	<0.005	0.317	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	25-Jan-2022	Vermont Upper Seam	<0.01	0.008	0.43	<0.0001	<0.001	<0.001	<0.001	3.3	<0.001	0.287	<0.0001	<0.001	<0.001	<0.01	0.002	0.003	<0.01	<0.005
W15_MB2	15-Feb-2022	Vermont Upper Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.3	<0.005	0.135	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	15-Mar-2022	Vermont Upper Seam	<0.05	0.006	0.43	<0.0005	<0.005	<0.005	<0.005	3.4	<0.005	0.271	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	03-May-2022	Vermont Upper Seam	<0.05	<0.005	0.53	<0.0005	<0.005	<0.005	<0.005	3.49	<0.005	0.326	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB2	31-May-2022	Vermont Upper Seam	<0.01	0.003	0.38	<0.0001	<0.001	<0.001	<0.001	3.51	<0.001	0.303	<0.0001	0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W15_MB2	22-Jun-2022	Vermont Upper Seam	<0.01	0.003	0.46	<0.0001	0.003	<0.001	<0.001	3.21	<0.001	0.298	<0.0001	0.003	0.01	<0.01	<0.001	0.002	<0.01	<0.005
W15_MB2	31-Aug-2022	Vermont Upper Seam	<0.05	<0.005	0.53	<0.0005	<0.005	<0.005	<0.005	3.5	<0.005	0.32	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	20-Oct-2020	Vermont Lower Seam	0.02	<0.001	0.23	<0.0001	0.001	<0.001	<0.001	0.2	<0.001	0.108	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W15_MB3	16-Dec-2020	Vermont Lower Seam	0.01	<0.001	0.35	<0.0001	<0.001	<0.001	<0.001	1.19	<0.001	0.132	<0.0001	0.007	0.002	<0.01	<0.001	<0.001	<0.01	0.007
W15_MB3	04-Jan-2021	Vermont Lower Seam	0.01	<0.001	0.32	<0.0001	<0.001	<0.001	0.001	1.4	<0.001	0.123	<0.0001	0.005	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W15_MB3	28-Jan-2021	Vermont Lower Seam	<0.05	<0.005	0.44	<0.0005	<0.005	<0.005	<0.005	1.09	<0.005	0.142	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	16-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.47	<0.0005	<0.005	<0.005	<0.005	0.33	<0.005	0.135	<0.0001	0.01	0.012	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	10-Mar-2021	Vermont Lower Seam	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	1.35	<0.005	0.16	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	14-Apr-2021	Vermont Lower Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	0.44	<0.005	0.152	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	25-May-2021	Vermont Lower Seam	0.01	<0.001	0.29	<0.0001	<0.001	<0.001	<0.001	0.36	<0.001	0.129	<0.0001	0.003	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
W15_MB3	29-Jun-2021	Vermont Lower Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.36	<0.005	0.141	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	22-Jul-2021	Vermont Lower Seam	<0.05	<0.005	0.61	<0.0005	<0.005	<0.005	<0.005	0.27	<0.005	0.119	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	24-Aug-2021	Vermont Lower Seam	<0.05	<0.005	0.34	<0.0005	<0.005	<0.005	<0.005	0.2	<0.005	0.094	<0.0001	0.006	0.015	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	14-Sep-2021	Vermont Lower Seam	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	0.18	<0.005	0.087	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	19-Oct-2021	Vermont Lower Seam	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	0.34	<0.001	0.117	<0.0001	0.019	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W15_MB3	16-Nov-2021	Vermont Lower Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	0.4	<0.005	0.14	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	08-Dec-2021	Vermont Lower Seam	<0.05	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	0.37	<0.005	0.148	<0.0001	0.026	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	25-Jan-2022	Vermont Lower Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	0.28	<0.005	0.141	<0.0001	0.022	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	15-Feb-2022	Vermont Lower Seam	<0.05	0.006	0.52	<0.0005	<0.005	<0.005	<0.005	3.29	<0.005	0.285	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	15-Mar-2022	Vermont Lower Seam	<0.05	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	0.27	<0.005	0.127	<0.0001	0.019	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	03-May-2022	Vermont Lower Seam	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	0.22	<0.005	0.151	<0.0001	0.031	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	31-May-2022	Vermont Lower Seam	<0.05	<0.005	0.35	<0.0005	<0.005	<0.005	<0.005	0.2	<0.005	0.149	<0.0001	0.043	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	22-Jun-2022	Vermont Lower Seam	<0.05	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	0.49	<0.005	0.171	<0.0001	0.052	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W15_MB3	31-Aug-2022	Vermont Lower Seam	<0.05	<0.005	0.44	<0.0005	<0.005	<0.005	<0.005	1.77	<0.005	0.197	<0.0001	0.037	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	20-Oct-2020	Girrah 1 Seam	<0.05	<0.005	1.16	<0.0005	<0.005	<0.005	<0.005	3.48	<0.005	0.252	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	09-Dec-2020	Girrah 1 Seam	<0.05	<0.005	1.77	<0.0005	<0.005	<0.005	<0.005	3.2	<0.005	0.241	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	05-Jan-2021	Girrah 1 Seam	<0.05	<0.005	1.48	<0.0005	<0.005	<0.005	<0.005	2.96	<0.005	0.221	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	26-Jan-2021	Girrah 1 Seam	<0.05	<0.005	1.65	<0.0005	<0.005	<0.005	<0.005	3.93	<0.005	0.264	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	24-Mar-2021	Girrah 1 Seam	<0.05	<0.005	1.66	<0.0005	<0.005	<0.005	<0.005	3.7	<0.005	0.246	<0.0001	<0.005	<0.005	<0.05	0.006	<0.005	<0.05	<0.025
W2_MB2	14-Apr-2021	Girrah 1 Seam	<0.05	<0.005	1.42	<0.0005	<0.005	<0.005	<0.005	3.3	<0.005	0.239	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W2_MB2	26-May-2021	Girrah 1 Seam	<0.05	<0.005	1.69	<0.0005	<0.005	<0.005	<0.005	3.36	<0.005	0.211	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	29-Jun-2021	Girrah 1 Seam	<0.05	<0.005	1.22	<0.0005	0.005	<0.005	<0.005	3.09	<0.005	0.219	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	26-Jul-2021	Girrah 1 Seam	<0.05	<0.005	1.23	<0.0005	<0.005	<0.005	<0.005	2.65	<0.005	0.185	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	24-Aug-2021	Girrah 1 Seam	<0.05	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	2.66	<0.005	0.174	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	14-Sep-2021	Girrah 1 Seam	<0.05	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	2.23	<0.005	0.156	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	19-Oct-2021	Girrah 1 Seam	<0.05	<0.005	1.41	<0.0005	<0.005	<0.005	<0.005	2.83	<0.005	0.193	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	16-Nov-2021	Girrah 1 Seam	<0.05	<0.005	1.52	<0.0005	<0.005	<0.005	<0.005	2.64	<0.005	0.189	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	09-Dec-2021	Girrah 1 Seam	<0.05	<0.005	1.45	<0.0005	<0.005	<0.005	<0.005	2.94	<0.005	0.206	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	25-Jan-2022	Girrah 1 Seam	<0.05	<0.005	1.8	<0.0005	<0.005	<0.005	<0.005	2.77	<0.005	0.188	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	22-Feb-2022	Girrah 1 Seam	<0.05	<0.005	1.53	<0.0005	<0.005	<0.005	<0.005	2.68	<0.005	0.186	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.027
W2_MB2	16-Mar-2022	Girrah 1 Seam	<0.05	<0.005	1.58	<0.0005	<0.005	<0.005	<0.005	2.66	<0.005	0.172	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	03-May-2022	Girrah 1 Seam	<0.05	<0.005	1.78	<0.0005	<0.005	<0.005	<0.005	2.64	<0.005	0.191	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	31-May-2022	Girrah 1 Seam	<0.05	<0.005	1.69	<0.0005	<0.005	<0.005	<0.005	2.47	<0.005	0.165	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	22-Jun-2022	Girrah 1 Seam	<0.05	<0.005	1.66	<0.0005	<0.005	<0.005	<0.005	2.64	<0.005	0.173	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	20-Jul-2022	Girrah 1 Seam	<0.05	<0.005	1.7	<0.0005	<0.005	<0.005	<0.005	2.32	<0.005	0.153	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	31-Aug-2022	Girrah 1 Seam	<0.05	<0.005	1.51	<0.0005	<0.005	<0.005	<0.005	2.21	<0.005	0.164	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W2_MB2	04-Oct-2022	Girrah 1 Seam	<0.05	<0.005	1.6	<0.0005	<0.005	<0.005	<0.005	2.15	<0.005	0.171	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W4_MB2	21-Oct-2020	Permian overburden	0.02	0.01	0.62	<0.0001	0.001	0.002	<0.001	0.75	<0.001	0.362	<0.0001	0.002	0.002	<0.01	<0.001	0.018	<0.01	<0.005
W4_MB2	09-Dec-2020	Permian overburden	0.01	0.003	0.58	<0.0001	0.001	<0.001	<0.001	0.53	<0.001	0.32	<0.0001	<0.001	0.003	<0.01	<0.001	0.01	<0.01	<0.005
W4_MB2	05-Jan-2021	Permian overburden	0.01	0.022	0.56	<0.0001	<0.001	<0.001	<0.001	4.78	<0.001	0.272	<0.0001	0.001	0.002	<0.01	<0.001	0.005	<0.01	<0.005
W4_MB2	26-Jan-2021	Permian overburden	<0.01	0.033	0.61	<0.0001	<0.001	<0.001	0.001	4.49	<0.001	0.255	<0.0001	0.002	0.002	<0.01	<0.001	0.005	<0.01	<0.005
W4_MB2	16-Feb-2021	Permian overburden	0.01	0.028	0.5	<0.0001	<0.001	<0.001	<0.001	4.91	<0.001	0.223	<0.0001	0.003	0.002	<0.01	<0.001	0.004	<0.01	<0.005
W4_MB2	14-Apr-2021	Permian overburden	<0.01	0.028	0.65	<0.0001	<0.001	<0.001	<0.001	7.17	<0.001	0.225	<0.0001	0.002	0.001	<0.01	<0.001	0.004	<0.01	<0.005
W4_MB2	25-May-2021	Permian overburden	<0.01	0.022	0.49	<0.0001	<0.001	<0.001	<0.001	7.32	<0.001	0.218	<0.0001	0.002	0.002	<0.01	<0.001	0.004	<0.01	<0.005
W4_MB2	29-Jun-2021	Permian overburden	<0.01	0.02	0.55	<0.0001	<0.001	<0.001	<0.001	6.6	<0.001	0.233	<0.0001	0.002	0.003	<0.01	<0.001	0.004	<0.01	<0.005
W4_MB2	26-Jul-2021	Permian overburden	<0.01	0.022	0.54	<0.0001	<0.001	<0.001	0.003	6.18	<0.001	0.265	<0.0001	0.002	0.002	<0.01	<0.001	0.005	<0.01	<0.005
W4_MB2	24-Aug-2021	Permian overburden	<0.05	0.013	0.66	<0.0005	<0.005	<0.005	<0.005	2.68	<0.005	0.225	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W4_MB2	14-Sep-2021	Permian overburden	<0.01	0.01	0.63	<0.0001	<0.001	<0.001	0.005	1.1	<0.001	0.21	<0.0001	<0.001	<0.001	<0.01	<0.001	0.004	<0.01	<0.005
W4_MB2	19-Oct-2021	Permian overburden	<0.01	0.003	0.61	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.219	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W4_MB2	16-Nov-2021	Permian overburden	<0.01	0.002	0.52	<0.0001	0.001	<0.001	<0.001	0.05	<0.001	0.196	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	09-Dec-2021	Permian overburden	<0.01	0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.05	<0.001	0.2	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	25-Jan-2022	Permian overburden	<0.01	0.001	0.7	<0.0001	0.001	<0.001	0.002	0.11	<0.001	0.198	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	15-Feb-2022	Permian overburden	<0.01	<0.001	0.62	<0.0001	0.001	<0.001	<0.001	0.06	<0.001	0.205	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	16-Mar-2022	Permian overburden	<0.01	<0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.05	<0.001	0.183	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	03-May-2022	Permian overburden	0.01	<0.001	0.58	<0.0001	0.001	<0.001	<0.001	0.13	<0.001	0.222	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	31-May-2022	Permian overburden	<0.01	<0.001	0.58	<0.0001	0.002	<0.001	<0.001	0.05	<0.001	0.221	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	<0.005
W4_MB2	22-Jun-2022	Permian overburden	<0.01	0.001	0.63	0.0002	0.002	<0.001	0.003	0.08	<0.001	0.202	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	20-Jul-2022	Permian overburden	<0.01	0.001	0.66	<0.0001	0.001	<0.001	<0.001	0.12	<0.001	0.182	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W4_MB2	31-Aug-2022	Permian overburden	<0.01	<0.001	0.61	<0.0001	0.001	<0.001	<0.001	0.15	<0.001	0.177	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB2	21-Oct-2020	Leichhardt Lower Seam	<0.01	<0.001	0.96	<0.0001	<0.001	0.004	<0.001	<0.05	<0.001	0.176	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.043
W5_MB2	09-Dec-2020	Leichhardt Lower Seam	<0.01	<0.001	1.08	<0.0001	<0.001	0.006	<0.001	0.73	<0.001	0.234	<0.0001	<0.001	0.07	<0.01	<0.001	<0.001	<0.01	0.01
W5_MB2	05-Jan-2021	Leichhardt Lower Seam	<0.01	<0.001	0.98	<0.0001	<0.001	0.009	0.002	0.42	<0.001	0.221	<0.0001	0.001	0.059	<0.01	<0.001	0.001	<0.01	0.015
W5_MB2	26-Jan-2021	Leichhardt Lower Seam	<0.01	0.002	1.03	<0.0001	<0.001	0.014	0.082	0.49	<0.001	0.329	<0.0001	0.001	0.067	<0.01	<0.001	0.001	<0.01	0.132
W5_MB2	16-Feb-2021	Leichhardt Lower Seam	<0.05	<0.005	1.35	<0.0005	<0.005	0.014	0.647	<0.05	<0.005	0.361	<0.0001	<0.005	0.073	<0.05	<0.005	<0.005	<0.05	0.531
W5_MB2	10-Mar-2021	Leichhardt Lower Seam	<0.01	<0.001	0.86	<0.0001	<0.001	0.018	0.133	<0.05	<0.001	0.491	<0.0001	0.002	0.051	<0.01	<0.001	0.002	<0.01	0.16
W5_MB2	14-Apr-2021	Leichhardt Lower Seam	<0.01	<0.001	1.23	<0.0001	0.002	0.008	0.131	<0.05	<0.001	0.223	<0.0001	0.001	0.153	<0.01	<0.001	<0.001	<0.01	0.132
W5_MB2	25-May-2021	Leichhardt Lower Seam	<0.01	<0.001	0.99	<0.0001	<0.001	0.013	0.159	0.07	<0.001	0.393	<0.0001	0.002	0.127	<0.01	<0.001	0.001	<0.01	0.133
W5_MB2	29-Jun-2021	Leichhardt Lower Seam	<0.01	0.001	1.07	<0.0001	<0.001	0.017	0.147	<0.05	<0.001	0.669	<0.0001	0.002	0.106	<0.01	0.004	0.002	<0.01	0.13
W5_MB2	26-Jul-2021	Leichhardt Lower Seam	<0.01	0.001	0.99	<0.0001	0.001	0.012	0.238	<0.05	<0.001	0.399	<0.0001	0.002	0.142	<0.01	<0.001	0.001	<0.01	0.207
W5_MB2	24-Aug-2021	Leichhardt Lower Seam	<0.05	<0.005	1.16	<0.0005	<0.005	0.018	0.162	<0.05	<0.005	0.589	<0.0001	<0.005	0.117	<0.05	<0.005	<0.005	<0.05	0.164
W5_MB2	14-Sep-2021	Leichhardt Lower Seam	<0.01	0.001	1.12	<0.0001	<0.001	0.019	0.129	<0.05	<0.001	0.715	<0.0001	0.002	0.095	<0.01	<0.001	0.001	<0.01	0.12
W5_MB2	19-Oct-2021	Leichhardt Lower Seam	<0.01	0.002	1.02	<0.0001	<0.001	0.023	0.1	0.16	<0.001	0.876	<0.0001	0.002	0.082	<0.01	<0.001	0.002	<0.01	0.105
W5_MB2	16-Nov-2021	Leichhardt Lower Seam	<0.01	0.002	0.94	<0.0001	<0.001	0.023	0.068	<0.05	<0.001	0.835	<0.0001	0.002	0.068	<0.01	<0.001	0.002	<0.01	0.079
W5_MB2	09-Dec-2021	Leichhardt Lower Seam	<0.01	0.001	0.99	<0.0001	<0.001	0.024	0.058	0.06	<0.001	0.899	<0.0001	0.002	0.063	<0.01	<0.001	0.002	<0.01	0.072
W5_MB2	25-Jan-2022	Leichhardt Lower Seam	<0.01	0.005	1.16	<0.0001	<0.001	0.024	0.003	1.76	<0.001	0.929	<0.0001	0.002	0.046	<0.01	<0.001	0.002	<0.01	0.013
W5_MB2	15-Feb-2022	Leichhardt Lower Seam	<0.05	<0.005	1.33	<0.0005	<0.005	0.024	<0.005	1.95	<0.005	0.981	<0.0001	<0.005	0.044	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB2	16-Mar-2022	Leichhardt Lower Seam	<0.05	<0.005	1.29	<0.0005	<0.005	0.021	<0.005	1.37	<0.005	0.87	<0.0001	<0.005	0.034	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB2	03-May-2022	Leichhardt Lower Seam	<0.05	<0.005	1.49	<0.0005	<0.005	0.022	<0.005	1.12	<0.005	1.1	<0.0001	<0.005	0.028	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB2	31-May-2022	Leichhardt Lower Seam	<0.01	0.001	1.04	<0.0001	<0.001	0.023	<0.001	0.4	<0.001	1.11	<0.0001	0.002	0.027	<0.01	<0.001	0.002	<0.01	<0.005
W5_MB2	22-Jun-2022	Leichhardt Lower Seam	<0.05	<0.005	1.56	<0.0005	<0.005	0.021	<0.005	0.08	<0.005	1	<0.0001	<0.005	0.025	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB2	31-Aug-2022	Leichhardt Lower Seam	<0.01	0.001	1.12	<0.0001	<0.001	0.008	0.005	<0.05	<0.001	0.803	<0.0001	0.003	0.021	<0.01	<0.001	0.002	<0.01	0.017
W5_MB3	21-Oct-2020	Vermont Seam	<0.01	<0.001	0.91	<0.0001	0.002	0.002	0.002	<0.05	<0.001	0.378	<0.0001	0.003	0.005	<0.01	<0.001	0.003	<0.01	0.054
W5_MB3	09-Dec-2020	Vermont Seam	<0.01	<0.001	0.52	<0.0001	0.03	<0.001	<0.001	<0.05	<0.001	0.101	<0.0001	0.061	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	05-Jan-2021	Vermont Seam	<0.01	0.002	0.81	<0.0001	0.005	<0.001	0.001	1.66	<0.001	0.279	<0.0001	0.034	0.001	<0.01	<0.001	0.001	<0.01	<0.005
W5_MB3	26-Jan-2021	Vermont Seam	<0.01	0.002	0.84	<0.0001	0.005	<0.001	0.001	1.46	<0.001	0.292	<0.0001	0.031	0.001	<0.01	<0.001	0.001	<0.01	<0.005
W5_MB3	16-Feb-2021	Vermont Seam	<0.05	<0.005	0.96	<0.0005	<0.005	<0.005	<0.005	1.15	<0.005	0.289	<0.0001	0.046	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	10-Mar-2021	Vermont Seam	<0.01	0.002	0.69	<0.0001	0.002	<0.001	<0.001	0.83	<0.001	0.266	<0.0001	0.038	<0.001	<0.01	<0.001	0.001	<0.01	<0.005

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W5_MB3	14-Apr-2021	Vermont Seam	<0.01	0.001	0.89	<0.0001	0.063	<0.001	<0.001	<0.05	<0.001	0.056	<0.0001	0.056	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	25-May-2021	Vermont Seam	<0.05	<0.005	0.72	<0.0005	0.084	<0.005	<0.005	<0.05	<0.005	0.005	<0.0001	0.068	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	29-Jun-2021	Vermont Seam	<0.01	0.001	0.8	<0.0001	0.008	<0.001	<0.001	<0.05	<0.001	0.11	<0.0001	0.027	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	26-Jul-2021	Vermont Seam	<0.01	0.002	0.61	<0.0001	0.008	<0.001	0.004	<0.05	<0.001	0.123	<0.0001	0.028	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	24-Aug-2021	Vermont Seam	<0.05	<0.005	0.94	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.12	<0.0001	0.013	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	14-Sep-2021	Vermont Seam	<0.01	0.001	0.88	<0.0001	0.002	<0.001	0.007	<0.05	<0.001	0.115	<0.0001	0.024	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	19-Oct-2021	Vermont Seam	<0.01	0.001	0.63	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	0.079	<0.0001	0.034	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	16-Nov-2021	Vermont Seam	<0.01	0.001	0.71	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	0.112	<0.0001	0.016	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	09-Dec-2021	Vermont Seam	<0.01	<0.001	0.85	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	0.115	<0.0001	0.024	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	25-Jan-2022	Vermont Seam	<0.01	<0.001	0.84	<0.0001	0.002	<0.001	0.003	<0.05	<0.001	0.116	<0.0001	0.018	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	15-Feb-2022	Vermont Seam	<0.01	<0.001	0.77	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.113	<0.0001	0.014	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	16-Mar-2022	Vermont Seam	<0.05	<0.005	0.7	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.055	<0.0001	0.04	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	03-May-2022	Vermont Seam	<0.01	<0.001	0.68	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	0.122	<0.0001	0.026	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	31-May-2022	Vermont Seam	<0.05	<0.005	1.18	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.15	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	22-Jun-2022	Vermont Seam	<0.05	<0.005	1.3	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.149	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	20-Jul-2022	Vermont Seam	<0.05	<0.005	1.45	<0.0005	<0.005	0.017	<0.005	<0.05	<0.005	0.876	<0.0001	<0.005	0.022	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	20-Jul-2022	Vermont Seam	<0.05	<0.005	0.89	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.081	<0.0001	0.023	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W5_MB3	31-Aug-2022	Vermont Seam	<0.01	<0.001	0.86	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.128	<0.0001	0.01	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W6_MB1	21-Oct-2020	Permian overburden	0.03	0.02	0.7	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.927	<0.0001	0.004	0.012	<0.01	<0.001	0.06	<0.01	<0.005
W6_MB1	09-Dec-2020	Permian overburden	0.01	0.044	0.52	<0.0001	<0.001	<0.001	<0.001	0.05	<0.001	0.382	<0.0001	0.004	0.008	<0.01	<0.001	0.007	<0.01	<0.005
W6_MB1	05-Jan-2021	Permian overburden	0.02	0.037	0.56	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.356	<0.0001	0.003	0.006	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	26-Jan-2021	Permian overburden	0.02	0.027	0.58	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.372	<0.0001	0.001	0.006	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	16-Feb-2021	Permian overburden	0.02	0.016	0.47	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.333	<0.0001	0.001	0.006	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	10-Mar-2021	Permian overburden	0.02	0.021	0.55	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.35	<0.0001	0.002	0.005	<0.01	<0.001	0.005	<0.01	<0.005
W6_MB1	14-Apr-2021	Permian overburden	0.02	0.02	0.74	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.337	<0.0001	0.001	0.005	<0.01	<0.001	0.006	<0.01	<0.005
W6_MB1	25-May-2021	Permian overburden	0.02	0.019	0.65	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.337	<0.0001	<0.001	0.005	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	29-Jun-2021	Permian overburden	<0.01	0.021	0.74	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.344	<0.0001	0.002	0.006	<0.01	<0.001	0.005	<0.01	<0.005
W6_MB1	26-Jul-2021	Permian overburden	0.01	0.02	0.72	<0.0001	<0.001	<0.001	0.002	0.06	<0.001	0.39	<0.0001	0.002	0.005	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	24-Aug-2021	Permian overburden	<0.05	0.013	0.92	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.329	<0.0001	<0.005	0.021	<0.05	<0.005	<0.005	<0.05	<0.025
W6_MB1	14-Sep-2021	Permian overburden	<0.01	0.016	0.78	<0.0001	0.001	<0.001	0.006	<0.05	<0.001	0.344	<0.0001	0.001	0.004	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	19-Oct-2021	Permian overburden	<0.01	0.005	0.81	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.356	<0.0001	0.001	0.002	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB1	16-Nov-2021	Permian overburden	<0.01	0.011	0.71	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.33	<0.0001	0.001	0.004	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	09-Dec-2021	Permian overburden	0.01	0.009	0.81	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.318	<0.0001	<0.001	0.004	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB1	25-Jan-2022	Permian overburden	<0.01	0.011	0.84	<0.0001	0.001	<0.001	0.002	0.06	<0.001	0.293	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB1	15-Feb-2022	Permian overburden	<0.01	0.005	0.86	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.305	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB1	16-Mar-2022	Permian overburden	<0.01	0.007	0.7	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.255	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB1	03-May-2022	Permian overburden	<0.01	0.004	0.76	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.285	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB1	31-May-2022	Permian overburden	0.01	0.004	0.92	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.248	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB1	22-Jun-2022	Permian overburden	<0.01	0.008	0.86	<0.0001	0.002	<0.001	0.003	<0.05	<0.001	0.265	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB1	20-Jul-2022	Permian overburden	<0.01	0.006	0.79	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.249	<0.0001	<0.001	0.004	<0.01	<0.001	0.005	<0.01	<0.005
W6_MB1	31-Aug-2022	Permian overburden	0.02	0.009	0.82	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.276	<0.0001	<0.001	0.004	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	21-Oct-2020	Girrah 1 Seam	<0.01	<0.001	0.76	<0.0001	<0.001	<0.001	<0.001	0.38	<0.001	0.34	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB2	09-Dec-2020	Girrah 1 Seam	<0.01	<0.001	0.89	<0.0001	<0.001	<0.001	<0.001	1.25	<0.001	0.355	<0.0001	0.001	0.049	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	05-Jan-2021	Girrah 1 Seam	<0.01	<0.001	0.83	<0.0001	<0.001	<0.001	0.001	0.61	<0.001	0.357	<0.0001	<0.001	0.038	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	26-Jan-2021	Girrah 1 Seam	<0.01	<0.001	0.95	<0.0001	<0.001	<0.001	<0.001	0.68	<0.001	0.387	<0.0001	<0.001	0.037	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	16-Feb-2021	Girrah 1 Seam	<0.05	<0.005	1.11	<0.0005	<0.005	<0.005	<0.005	0.78	<0.005	0.39	<0.0001	<0.005	0.028	<0.05	<0.005	<0.005	<0.05	<0.025
W6_MB2	10-Mar-2021	Girrah 1 Seam	<0.01	<0.001	0.77	<0.0001	<0.001	<0.001	<0.001	0.7	<0.001	0.374	<0.0001	<0.001	0.017	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	14-Apr-2021	Girrah 1 Seam	<0.01	<0.001	1.05	<0.0001	0.004	<0.001	<0.001	0.8	<0.001	0.374	<0.0001	<0.001	0.013	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	25-May-2021	Girrah 1 Seam	<0.01	<0.001	0.86	<0.0001	<0.001	<0.001	<0.001	0.89	<0.001	0.384	<0.0001	<0.001	0.007	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	29-Jun-2021	Girrah 1 Seam	<0.01	<0.001	0.96	<0.0001	<0.001	<0.001	<0.001	0.99	<0.001	0.372	<0.0001	<0.001	0.003	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB2	26-Jul-2021	Girrah 1 Seam	<0.01	<0.001	0.83	<0.0001	<0.001	<0.001	0.003	1.08	<0.001	0.415	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB2	24-Aug-2021	Girrah 1 Seam	<0.05	<0.005	1	<0.0005	<0.005	<0.005	<0.005	0.89	<0.005	0.343	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W6_MB2	14-Sep-2021	Girrah 1 Seam	<0.01	<0.001	0.97	<0.0001	<0.001	<0.001	0.004	0.76	<0.001	0.35	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB2	19-Oct-2021	Girrah 1 Seam	<0.01	<0.001	0.92	<0.0001	<0.001	<0.001	<0.001	0.21	<0.001	0.378	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB2	16-Nov-2021	Girrah 1 Seam	<0.01	<0.001	0.81	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.336	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB2	09-Dec-2021	Girrah 1 Seam	<0.01	<0.001	0.98	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.346	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W6_MB2	25-Jan-2022	Girrah 1 Seam	<0.01	<0.001	0.98	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.322	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W6_MB2	15-Feb-2022	Girrah 1 Seam	<0.01	<0.001	0.94	<0.0001	<0.001	<0.001	<0.001	0.05	<0.001	0.335	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W6_MB2	16-Mar-2022	Girrah 1 Seam	<0.01	<0.001	0.87	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.286	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W6_MB2	03-May-2022	Girrah 1 Seam	<0.01	<0.001	0.87	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.347	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
W6_MB2	31-May-2022	Girrah 1 Seam	<0.01	<0.001	1.09	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.288	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W6_MB2	22-Jun-2022	Girrah 1 Seam	<0.01	<0.001	0.95	<0.0001	<0.001	<0.001	0.004	0.06	<0.001	0.314	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W6_MB2	20-Jul-2022	Girrah 1 Seam	<0.01	0.001	1.12	<0.0001	<0.001	<0.001	<0.001	0.05	<0.001	0.298	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W6_MB2	31-Aug-2022	Girrah 1 Seam	<0.01	<0.001	0.91	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.311	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W7_MB1	21-Oct-2020	Permian overburden	<0.05	<0.005	1.82	<0.0005	<0.005	0.007	<0.005	0.79	<0.005	0.234	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	0.034
W7_MB1	09-Dec-2020	Permian overburden	<0.05	<0.005	2.26	<0.0005	<0.005	<0.005	<0.005	1.82	<0.005	0.218	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	05-Jan-2021	Permian overburden	<0.05	<0.005	2.26	<0.0005	<0.005	0.005	<0.005	2.16	<0.005	0.238	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W7_MB1	26-Jan-2021	Permian overburden	<0.05	<0.005	2.22	<0.0005	<0.005	<0.005	<0.005	2.23	<0.005	0.256	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	16-Feb-2021	Permian overburden	<0.05	<0.005	2.06	<0.0005	<0.005	<0.005	<0.005	1.77	<0.005	0.23	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	10-Mar-2021	Permian overburden	<0.05	<0.005	1.38	<0.0005	<0.005	<0.005	<0.005	1.38	<0.005	0.23	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	14-Apr-2021	Permian overburden	<0.05	<0.005	1.91	<0.0005	<0.005	<0.005	<0.005	1.37	<0.005	0.247	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	25-May-2021	Permian overburden	<0.05	<0.005	2.24	<0.0005	<0.005	<0.005	<0.005	1.32	<0.005	0.237	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	29-Jun-2021	Permian overburden	<0.05	<0.005	1.72	<0.0005	<0.005	<0.005	<0.005	1.23	<0.005	0.233	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	26-Jul-2021	Permian overburden	<0.05	<0.005	1.73	<0.0005	<0.005	<0.005	<0.005	1.26	<0.005	0.223	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	24-Aug-2021	Permian overburden	<0.05	<0.005	1.69	<0.0005	<0.005	<0.005	<0.005	1.15	<0.005	0.216	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	14-Sep-2021	Permian overburden	<0.05	<0.005	1.66	<0.0005	<0.005	<0.005	<0.005	1.17	<0.005	0.21	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	19-Oct-2021	Permian overburden	<0.05	<0.005	1.68	<0.0005	<0.005	<0.005	<0.005	1.31	<0.005	0.208	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	16-Nov-2021	Permian overburden	<0.05	<0.005	2	<0.0005	<0.005	<0.005	<0.005	1.35	<0.005	0.249	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	09-Dec-2021	Permian overburden	<0.05	<0.005	2.01	<0.0005	<0.005	<0.005	<0.005	1.8	<0.005	0.274	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	25-Jan-2022	Permian overburden	<0.05	<0.005	2.34	<0.0005	<0.005	<0.005	<0.005	1.82	<0.005	0.252	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	15-Feb-2022	Permian overburden	<0.05	<0.005	1.99	<0.0005	<0.005	<0.005	<0.005	1.95	<0.005	0.241	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	16-Mar-2022	Permian overburden	<0.05	<0.005	1.93	<0.0005	<0.005	<0.005	<0.005	1.81	<0.005	0.225	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	03-May-2022	Permian overburden	<0.05	<0.005	1.8	<0.0005	<0.005	<0.005	<0.005	1.5	<0.005	0.274	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	31-May-2022	Permian overburden	<0.05	<0.005	2.08	<0.0005	<0.005	<0.005	0.009	1.36	<0.005	0.234	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	22-Jun-2022	Permian overburden	<0.05	<0.005	2.15	<0.0005	<0.005	<0.005	<0.005	1.89	<0.005	0.254	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	20-Jul-2022	Permian overburden	<0.05	<0.005	2.18	<0.0005	<0.005	<0.005	<0.005	1.82	<0.005	0.235	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	31-Aug-2022	Permian overburden	<0.05	<0.005	2.08	<0.0005	<0.005	<0.005	<0.005	1.96	<0.005	0.234	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	21-Oct-2020	Girrah 1 Seam	<0.05	0.007	1	<0.0005	<0.005	0.027	<0.005	2.33	<0.005	0.544	<0.0001	<0.005	0.02	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	09-Dec-2020	Girrah 1 Seam	0.08	0.007	1.63	<0.0005	<0.005	0.029	<0.005	2.22	<0.005	0.521	<0.0001	<0.005	0.03	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	05-Jan-2021	Girrah 1 Seam	<0.05	0.005	1.47	<0.0005	<0.005	0.026	<0.005	2.25	<0.005	0.548	<0.0001	<0.005	0.023	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	28-Jan-2021	Girrah 1 Seam	<0.05	0.006	1.27	<0.0005	<0.005	0.024	<0.005	2.21	<0.005	0.573	<0.0001	<0.005	0.02	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	16-Feb-2021	Girrah 1 Seam	<0.05	0.005	1.28	<0.0005	<0.005	0.017	<0.005	2.78	<0.005	0.552	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	10-Mar-2021	Girrah 1 Seam	<0.05	<0.005	1.07	<0.0005	<0.005	0.014	<0.005	2.81	<0.005	0.527	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	14-Apr-2021	Girrah 1 Seam	<0.05	<0.005	1.25	<0.0005	<0.005	0.013	<0.005	2.99	<0.005	0.566	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	25-May-2021	Girrah 1 Seam	<0.05	0.005	1.49	<0.0005	<0.005	0.011	<0.005	3.47	<0.005	0.552	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	29-Jun-2021	Girrah 1 Seam	<0.05	0.005	1.27	<0.0005	<0.005	0.011	<0.005	3.35	<0.005	0.553	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	26-Jul-2021	Girrah 1 Seam	<0.05	<0.005	1.28	<0.0005	<0.005	0.009	<0.005	2.97	<0.005	0.496	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	24-Aug-2021	Girrah 1 Seam	<0.05	<0.005	1.09	<0.0005	<0.005	0.01	<0.005	3.5	<0.005	0.48	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	14-Sep-2021	Girrah 1 Seam	<0.05	<0.005	0.96	<0.0005	<0.005	0.008	<0.005	3.12	<0.005	0.43	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	19-Oct-2021	Girrah 1 Seam	<0.05	0.005	1.17	<0.0005	<0.005	0.009	<0.005	3.93	<0.005	0.555	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	16-Nov-2021	Girrah 1 Seam	<0.05	0.005	1.24	<0.0005	<0.005	0.008	<0.005	4.06	<0.005	0.554	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	09-Dec-2021	Girrah 1 Seam	<0.05	<0.005	1.22	<0.0005	<0.005	0.007	<0.005	4.28	<0.005	0.576	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	25-Jan-2022	Girrah 1 Seam	<0.05	0.007	1.59	<0.0005	<0.005	0.007	<0.005	4.9	<0.005	0.576	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	15-Feb-2022	Girrah 1 Seam	<0.05	0.005	1.35	<0.0005	<0.005	0.006	<0.005	4.39	<0.005	0.534	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	16-Mar-2022	Girrah 1 Seam	<0.05	0.008	1.32	<0.0005	<0.005	0.005	<0.005	5.08	<0.005	0.493	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	03-May-2022	Girrah 1 Seam	<0.05	0.007	1.53	<0.0005	<0.005	0.006	<0.005	5.18	<0.005	0.615	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	31-May-2022	Girrah 1 Seam	<0.05	0.006	1.35	<0.0005	<0.005	<0.005	<0.005	5.11	<0.005	0.514	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	22-Jun-2022	Girrah 1 Seam	<0.05	0.006	1.44	<0.0005	<0.005	<0.005	<0.005	5.18	<0.005	0.544	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	20-Jul-2022	Girrah 1 Seam	<0.05	0.006	1.52	<0.0005	<0.005	<0.005	<0.005	4.75	<0.005	0.502	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	31-Aug-2022	Girrah 1 Seam	<0.05	0.007	1.49	<0.0005	<0.005	<0.005	<0.005	5.43	<0.005	0.608	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	21-Oct-2020	Vermont Upper Seam	<0.01	0.001	0.33	<0.0001	<0.001	0.001	<0.001	0.91	<0.001	0.13	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W9_MB2	09-Dec-2020	Vermont Upper Seam	<0.05	<0.005	0.9	<0.0005	<0.005	<0.005	<0.005	1.43	<0.005	0.186	<0.0001	<0.005	0.02	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	04-Jan-2021	Vermont Upper Seam	<0.05	<0.005	1.03	<0.0005	<0.005	<0.005	<0.005	1.88	<0.005	0.226	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	28-Jan-2021	Vermont Upper Seam	<0.05	<0.005	0.77	<0.0005	<0.005	<0.005	<0.005	1.45	<0.005	0.194	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	16-Feb-2021	Vermont Upper Seam	<0.05	<0.005	0.9	<0.0005	<0.005	<0.005	<0.005	1.82	<0.005	0.187	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	10-Mar-2021	Vermont Upper Seam	<0.05	<0.005	0.86	<0.0005	<0.005	<0.005	<0.005	1.94	<0.005	0.222	<0.0001	<0.005	0.096	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	14-Apr-2021	Vermont Upper Seam	<0.05	<0.005	0.94	<0.0005	<0.005	<0.005	<0.005	2.13	<0.005	0.226	<0.0001	<0.005	0.048	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	25-May-2021	Vermont Upper Seam	<0.05	<0.005	1.1	<0.0005	<0.005	<0.005	<0.005	2.48	<0.005	0.232	<0.0001	<0.005	0.035	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	29-Jun-2021	Vermont Upper Seam	<0.05	<0.005	1	<0.0005	0.006	<0.005	<0.005	2.32	<0.005	0.232	<0.0001	<0.005	0.079	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	22-Jul-2021	Vermont Upper Seam	<0.05	<0.005	1.12	<0.0005	<0.005	<0.005	<0.005	2.07	<0.005	0.224	<0.0001	<0.005	0.045	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	24-Aug-2021	Vermont Upper Seam	<0.05	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	0.65	<0.005	0.081	<0.0001	<0.005	0.024	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	14-Sep-2021	Vermont Upper Seam	<0.05	<0.005	0.95	<0.0005	<0.005	<0.005	<0.005	1.28	<0.005	0.173	<0.0001	<0.005	0.056	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	19-Oct-2021	Vermont Upper Seam	<0.05	<0.005	0.8	<0.0005	<0.005	<0.005	<0.005	1.6	<0.005	0.203	<0.0001	<0.005	0.036	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	16-Nov-2021	Vermont Upper Seam	<0.05	<0.005	0.82	<0.0005	<0.005	<0.005	<0.005	1.66	<0.005	0.218	<0.0001	<0.005	0.028	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	09-Dec-2021	Vermont Upper Seam	<0.05	<0.005	0.95	<0.0005	<0.005	<0.005	<0.005	1.74	<0.005	0.245	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	25-Jan-2022	Vermont Upper Seam	<0.05	<0.005	1.08	<0.0005	<0.005	<0.005	<0.005	1.69	<0.005	0.212	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	15-Feb-2022	Vermont Upper Seam	<0.05	<0.005	1.05	<0.0005	<0.005	<0.005	<0.005	1.56	<0.005	0.23	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	16-Mar-2022	Vermont Upper Seam	<0.05	<0.005	0.95	<0.0005	<0.005	<0.005	<0.005	1.5	<0.005	0.205	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	03-May-2022	Vermont Upper Seam	<0.05	<0.005	1.13	<0.0005	<0.005	<0.005	<0.005	0.95	<0.005	0.236	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	31-May-2022	Vermont Upper Seam	<0.05	<0.005	0.94	<0.0005	<0.005	<0.005	<0.005	1.02	<0.005	0.208	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	22-Jun-2022	Vermont Upper Seam	<0.05	<0.005	1.11	<0.0005	<0.005	<0.005	<0.005	1.51	<0.005	0.228	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	20-Jul-2022	Vermont Upper Seam	<0.05	<0.005	1.33	<0.0005	<0.005	<0.005	<0.005	1.57	<0.005	0.214	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	31-Aug-2022	Vermont Upper Seam	<0.05	<0.005	1.26	<0.0005	<0.005	<0.005	<0.005	1.25	<0.005	0.242	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	21-Oct-2020	Vermont Lower Seam	<0.05	0.005	0.83	<0.0005	<0.005	<0.005	<0.005	2.41	<0.005	0.329	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Meadowbrook - Groundwater Quality Monitoring
Attachment D-3: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W9_MB3	09-Dec-2020	Vermont Lower Seam	<0.05	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	0.96	<0.005	0.308	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	04-Jan-2021	Vermont Lower Seam	<0.05	<0.005	1.25	<0.0005	<0.005	<0.005	<0.005	3.75	<0.005	0.311	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	28-Jan-2021	Vermont Lower Seam	<0.05	<0.005	1.08	<0.0005	<0.005	<0.005	<0.005	3.73	<0.005	0.308	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	16-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.76	<0.0005	<0.005	<0.005	<0.005	3.84	<0.005	0.268	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	10-Mar-2021	Vermont Lower Seam	<0.05	<0.005	0.85	<0.0005	<0.005	<0.005	<0.005	3	<0.005	0.257	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	14-Apr-2021	Vermont Lower Seam	<0.05	<0.005	1.05	<0.0005	<0.005	<0.005	<0.005	3.42	<0.005	0.216	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	25-May-2021	Vermont Lower Seam	<0.05	<0.005	1.16	<0.0005	<0.005	<0.005	<0.005	3.26	<0.005	0.188	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	29-Jun-2021	Vermont Lower Seam	<0.05	<0.005	1.02	<0.0005	<0.005	<0.005	<0.005	3.29	<0.005	0.216	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	22-Jul-2021	Vermont Lower Seam	<0.05	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	2.95	<0.005	0.202	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	24-Aug-2021	Vermont Lower Seam	<0.05	<0.005	1.02	<0.0005	<0.005	<0.005	<0.005	3.03	<0.005	0.181	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	14-Sep-2021	Vermont Lower Seam	<0.05	<0.005	1	<0.0005	<0.005	<0.005	<0.005	2.25	<0.005	0.159	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	19-Oct-2021	Vermont Lower Seam	<0.05	<0.005	0.85	<0.0005	<0.005	<0.005	<0.005	2.46	<0.005	0.163	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	16-Nov-2021	Vermont Lower Seam	<0.05	<0.005	1	<0.0005	<0.005	<0.005	<0.005	2.51	<0.005	0.185	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	09-Dec-2021	Vermont Lower Seam	<0.05	<0.005	0.95	<0.0005	<0.005	<0.005	<0.005	2.45	<0.005	0.201	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	25-Jan-2022	Vermont Lower Seam	<0.05	<0.005	1.25	<0.0005	<0.005	<0.005	<0.005	2.58	<0.005	0.197	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	15-Feb-2022	Vermont Lower Seam	<0.05	<0.005	1.13	<0.0005	<0.005	<0.005	<0.005	2.5	<0.005	0.184	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	16-Mar-2022	Vermont Lower Seam	<0.05	<0.005	1.08	<0.0005	<0.005	<0.005	<0.005	2.52	<0.005	0.166	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	03-May-2022	Vermont Lower Seam	<0.05	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	2.72	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	31-May-2022	Vermont Lower Seam	<0.05	<0.005	1.22	<0.0005	<0.005	<0.005	<0.005	0.46	<0.005	0.266	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	22-Jun-2022	Vermont Lower Seam	<0.05	<0.005	1.17	<0.0005	<0.005	<0.005	<0.005	2.8	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	20-Jul-2022	Vermont Lower Seam	<0.05	<0.005	1.3	<0.0005	<0.005	<0.005	<0.005	2.6	<0.005	0.163	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	31-Aug-2022	Vermont Lower Seam	<0.05	<0.005	1.21	<0.0005	<0.005	<0.005	<0.005	2.69	<0.005	0.18	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1238-MB1	18-Feb-2018	Tertiary	<0.01	<0.001	0.36	<0.0001	<0.001	0.027	<0.001	3.56	<0.001	0.147	<0.0001	0.002	0.016	<0.01	<0.001	0.021	<0.01	0.105
1238-MB1	26-Mar-2018	Tertiary	<0.01	0.001	0.39	<0.0001	<0.001	0.021	<0.001	1.81	<0.001	0.127	<0.0001	0.001	0.014	<0.01	<0.001	0.015	<0.01	0.044
1238-MB1	02-Jul-2018	Tertiary	<0.01	0.002	0.36	<0.0001	0.003	0.015	0.002	1.58	<0.001	0.098	<0.0001	0.002	0.012	<0.01	<0.001	0.015	<0.01	0.005
1238-MB1	20-Sep-2018	Tertiary	<0.01	<0.001	0.42	<0.0001	0.006	NM	<0.001	0.35	<0.001	0.054	<0.0001	0.002	0.02	<0.01	<0.001	0.016	<0.01	0.023
1238-MB1	14-Mar-2019	Tertiary	<0.01	<0.001	0.34	<0.0001	0.006	0.01	0.007	0.22	<0.001	0.037	<0.0001	0.001	0.017	<0.01	<0.001	0.015	<0.01	0.008
1238-MB1	21-Jun-2019	Tertiary	<0.01	<0.001	0.35	<0.0001	0.003	0.006	0.001	<0.05	<0.001	0.015	<0.0001	0.002	0.014	<0.01	<0.001	0.017	<0.01	0.015
1238-MB1	28-Aug-2019	Tertiary	<0.01	<0.001	0.42	<0.0001	0.003	0.006	0.001	<0.05	<0.001	0.008	<0.0001	0.001	0.013	<0.01	<0.001	0.016	<0.01	0.009
1238-MB1	22-Oct-2019	Tertiary	<0.01	<0.001	0.37	<0.0001	0.004	0.006	0.001	<0.05	<0.001	0.008	<0.0001	0.002	0.019	<0.01	<0.001	0.015	<0.01	0.009
1238-MB1	15-Dec-2019	Tertiary	<0.01	<0.001	0.36	<0.0001	0.004	0.007	<0.001	<0.05	<0.001	0.008	<0.0001	0.001	0.02	<0.01	<0.001	0.015	<0.01	0.008
1238-MB1	06-Feb-2020	Tertiary	<0.01	<0.001	0.24	<0.0001	0.004	0.006	<0.001	<0.05	<0.001	0.006	0.0002	0.002	0.02	<0.01	<0.001	0.015	<0.01	0.007
1238-MB1	08-Apr-2020	Tertiary	<0.01	<0.001	0.2	<0.0001	0.002	0.005	<0.001	<0.05	<0.001	0.007	0.0001	<0.001	0.015	<0.01	<0.001	0.01	<0.01	0.01
1238-MB1	09-Jun-2020	Tertiary	<0.01	0.002	0.38	<0.0001	0.003	0.017	<0.001	2.11	<0.001	0.082	<0.0001	<0.001	0.012	<0.01	<0.001	0.014	<0.01	<0.005
1238-MB1	19-Nov-2020	Tertiary	0.03	<0.001	0.31	<0.0001	<0.001	0.006	<0.001	1.05	<0.001	0.014	<0.0001	0.001	0.008	<0.01	<0.001	0.007	<0.01	0.014
1238-MB1	03-Feb-2021	Tertiary	<0.01	0.001	0.42	<0.0001	0.001	0.011	0.002	1	<0.001	0.018	<0.0001	0.001	0.018	<0.01	<0.001	0.009	<0.01	0.022
1238-MB1	21-Apr-2021	Tertiary	<0.01	0.001	0.34	<0.0001	<0.001	0.007	<0.001	0.74	<0.001	0.013	<0.0001	<0.001	0.007	<0.01	<0.001	0.01	<0.01	0.017
1238-MB1	12-May-2021	Tertiary	<0.01	<0.001	0.31	<0.0001	<0.001	0.007	<0.001	0.61	<0.001	0.017	<0.0001	<0.001	0.008	<0.01	<0.001	0.009	<0.01	0.031
1238-MB1	18-Aug-2021	Tertiary	<0.01	<0.001	0.22	0.0002	0.002	0.006	0.001	0.3	<0.001	0.009	<0.0001	<0.001	0.011	<0.01	<0.001	0.012	<0.01	0.012
1238-MB1	21-Sep-2021	Tertiary	<0.01	0.001	0.28	<0.0001	<0.001	0.01	<0.001	1.05	<0.001	0.049	<0.0001	<0.001	0.011	<0.01	<0.001	0.015	<0.01	0.026
1238-MB1	17-Nov-2021	Tertiary	<0.01	0.002	0.27	<0.0001	<0.001	0.006	<0.001	1.57	<0.001	0.041	<0.0001	<0.001	0.005	<0.01	<0.001	0.012	<0.01	0.006
1238-MB1	12-Jan-2022	Tertiary	<0.01	0.002	0.43	<0.0001	<0.001	0.006	<0.001	1.7	<0.001	0.042	<0.0001	<0.001	0.005	<0.01	<0.001	0.013	<0.01	0.01
1238-MB1	15-Mar-2022	Tertiary	<0.01	0.001	0.33	<0.0001	<0.001	0.005	0.001	1.17	<0.001	0.036	<0.0001	<0.001	0.003	<0.01	<0.001	0.012	<0.01	<0.005
1238-MB1	01-Jun-2022	Tertiary	<0.01	0.001	0.36	<0.0001	<0.001	0.005	<0.001	1.88	<0.001	0.036	<0.0005	<0.001	0.004	<0.01	<0.001	0.012	<0.01	<0.005
1238-MB1	20-Jul-2022	Tertiary	<0.01	0.001	0.39	<0.0001	<0.001	0.005	<0.001	1.42	<0.001	0.032	<0.0001	<0.001	0.003	<0.01	<0.001	0.013	<0.01	<0.005
1238-MB1	28-Sep-2022	Tertiary	<0.01	<0.001	0.42	<0.0001	<0.001	0.002	<0.001	0.76	<0.001	0.042	<0.0001	<0.001	0.001	<0.01	<0.001	0.009	<0.01	<0.005
2371W-MB1	25-Mar-2018	Tertiary	<0.01	<0.001	1.34	<0.0001	<0.001	0.001	0.006	<0.05	<0.001	0.021	<0.0001	0.002	0.006	<0.01	<0.001	0.15	0.06	0.013
2371W-MB1	15-Jul-2018	Tertiary	<0.01	<0.001	1.44	<0.0001	0.001	NM	<0.001	0.1	<0.001	0.052	<0.0001	0.003	0.008	<0.01	<0.001	0.146	0.01	<0.005
2371W-MB1	22-Sep-2018	Tertiary	<0.01	0.001	1.47	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.053	<0.0001	0.003	0.009	<0.01	<0.001	0.187	<0.01	<0.005
2371W-MB1	23-Feb-2019	Tertiary	<0.01	<0.001	1.19	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.047	<0.0001	0.002	0.007	<0.01	<0.001	0.205	<0.01	<0.005
2371W-MB1	28-May-2019	Tertiary	<0.01	0.001	1.17	<0.0001	0.001	0.004	0.003	<0.05	<0.001	0.049	<0.0001	0.003	0.008	<0.01	<0.001	0.182	<0.01	<0.005
2371W-MB1	28-Aug-2019	Tertiary	<0.01	<0.001	1.29	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.042	<0.0001	0.003	0.005	<0.01	<0.001	0.185	<0.01	<0.005
2371W-MB1	24-Oct-2019	Tertiary	<0.01	<0.001	1.1	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.046	<0.0001	0.004	0.007	<0.01	<0.001	0.164	<0.01	<0.005
2371W-MB1	11-Dec-2019	Tertiary	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.035	<0.0005	0.006	0.007	<0.05	<0.005	0.154	<0.05	<0.025
2371W-MB1	12-Feb-2020	Tertiary	<0.01	<0.001	0.08	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.026	<0.0001	<0.001	0.005	<0.01	<0.001	0.035	<0.01	<0.005
2371W-MB1	22-Apr-2020	Tertiary	<0.05	<0.005	1.18	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.035	<0.0001	<0.005	0.013	<0.05	<0.005	0.212	<0.05	<0.025
2371W-MB1	10-Jun-2020	Tertiary	<0.05	<0.005	1.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.033	<0.0001	0.005	0.006	<0.05	<0.005	0.144	<0.05	<0.025
2371W-MB1	18-Nov-2020	Tertiary	<0.05	<0.005	1.18	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.028	<0.0001	<0.005	0.006	<0.05	<0.005	0.193	<0.05	<0.025
2371W-MB1	08-Feb-2021	Tertiary	<0.05	<0.005	1.78	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.019	<0.0001	<0.005	0.01	<0.05	<0.005	0.16	<0.05	<0.025
2371W-MB1	09-Feb-2021	Tertiary	<0.05	<0.005	1.78	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.023	<0.0001	<0.005	0.013	<0.05	<0.005	0.17	<0.05	<0.025
2371W-MB1	21-Apr-2021	Tertiary	<0.01	<0.001	1.24	<0.0001	<0.001	0.002	0.122	<0.05	<0.001	0.025	<0.0001	0.01	0.008	<0.01	<0.001	0.109	0.01	0.122
2371W-MB1	12-May-2021	Tertiary	<0.05	<0.005	1.26	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.024	<0.0001	<0.005	0.005	<0.05	<0.005	0.258	<0.05	<0.025
2371W-MB1	18-Aug-2021	Tertiary	<0.05	<0.005	1.4	<0.0005	<0.005	<0.005	<0.005	0.08	<0.005	0.03	<0.0001	<0.005	0.006	<0.05	<0.005	0.216	<0.05	<0.025
2371W-MB1	21-Sep-2021	Tertiary	0.07	<0.005	1.44	<0.0005	<0.005	<0.005	<0.005	0.06	<0.005	0.024	<0.0001	<0.005	<0.005	<0.05	<0.005	0.249	<0.05	<0.025
2371W-MB1	17-Nov-2021	Tertiary	<0.05	<0.005	1.26	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.021	<0.0001	<0.005	0.006	<0.05	<0.005	0.155	<0.05	<0.025
2371W-MB1	12-Jan-2022	Tertiary	0.05	<0.001	1.21	<0.0001	<0.001	0.002	0.004	<0.05	<0.001	0.019	<0.0001	0.004	0.006	<0.01	<0.001	0.247	0.01	0.016
2371W-MB1	15-Mar-2022	Tertiary	<0.05	<0.005	1.2	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.015	<0.0001	<0.005	<0.005	<0.05	<0.005	0.233	<0.05	<0.025
2371W-MB1	01-Jun-2022	Tertiary	<0.05	<0.005	1.52	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.013	<0.0001	<0.005	0.005	<0.05	<0.005	0.25	<0.05	<0.025
2371W-MB1	31-Aug-2022	Tertiary	<0.01	<0.001	1.25	<0.0001	<0.001	0.001	0.002	<0.05	<0.001	0.011	<0.0001	0.002	0.005	<0.01	<0.001	0.258	0.01	<0.005
2371W-MB1	28-Sep-2022	Tertiary	0.1	<0.005	1.38	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.012	<0.0001	<0.005	<0.005	<0.05	<0.005	0.228	<0.05	<0.025
2372-MB1	15-Feb-2018	Tertiary	<0.01	0.002	0.53	<0.0001	<0.001	0.011	<0.001	1.69	<0.001	0.501	<0.0001	0.003	0.015	<0.01	<0.001	0.025	<0.01	0.025
2372-MB1	05-Apr-2018	Tertiary	<0.05	<0.005	0.57	<0.0005	<0.005	0.012	<0.005	2.81	<0.005	0.475	<0.0001	<0.005	0.015	<0.05	<0.005	0.024	<0.05	<0.025
2372-MB1	30-Jun-2018	Tertiary	<0.01	0.002	0.52	<0.0001	0.003	0.012	0.008	4.32	<0.001	0.58	<0.0001	0.003	0.02	<0.01	<0.001	0.022	<0.01	0.006
2372-MB1	20-Sep-2018	Tertiary	<0.10	<0.010	0.64	<0.0010	<0.010	NM	<0.010	2.9	<0.010	0.658	<0.0001	<0.010	0.016	<0.10	<0.010	0.021	<0.10	<0.050
2372-MB1	19-Jun-2019	Tertiary	<0.05	<0.005	0.62	<0.0005	<0.005	0.009	<0.005	1.2	<0.005	0.92	<0.0001	<0.005	0.009	<0.05	<0.005	0.016	<0.05	<0.025
2372-MB1	04-Sep-2019	Tertiary	<0.05	<0.005	0.62	<0.0005	<0.005	0.008	<0.005	1.33	<0.005	0.706	<0.0001	0.005	0.007	<0.05	<0.005	0.016	<0.05	<0.025
2372-MB1	28-Oct-2019	Tertiary	<0.05	<0.005	0.59	<0.0005	<0.005	0.007	<0.005	0.93	<0.005	0.605	<0.0001	<0.005	0.005	<0.05	<0.005	0.018	<0.05	<0.025
2372-MB1	14-Dec-2019	Tertiary	<0.05	<0.005	0.59	<0.0005	<0.005	0.007	<0.005	0.95	<0.005	0.603	<0.0001	<0.005	0.007	<0.05	<0.005	0.018	<0.05	<0.025
2372-MB1	04-Feb-2020	Tertiary	<0.05	<0.005	0.43	<0.0005	<0.005	0.007	<0.005	0.55	<0.005	0.5	<0.0005	<0.005	0.028	<0.05	<0.005	0.016	<0.05	<0.025
2372-MB1	07-Apr-2020	Tertiary	<0.05	<0.005	0.46	<0.0005	<0.005	0.009	<0.005	0.51	<0.005	0.63	<0.0001	<0.005	0.008	<0.05	<0.005	0.014	<0.05	<0.025
2372-MB1	02-Jun-2020	Tertiary	<0.05	<0.005	0.38	<0.0005	<0.005	0.006	<0.005	0.52	<0.005	0.651	<0.0001	<0.005	0.008	<0.05	<0.005	0.016	<0.05	<0.025
2372-MB1	17-Nov-2020	Tertiary	<0.05	<0.005	0.35	<0.0005	<0.005	0.015	<0.005	3.52	<0.005	0.709	<0.0001	<0.005	0.346	<0.05	<0.005	0.008	<0.05	<0.025
2372-MB1	02-Feb-2021	Tertiary	<0.05	<0.005	0.66	<0.0005	<0.005	0.009	<0.005	1.03	<0.005	0.639	<0.0001	0.006	0.057	<0.05	<0.005	0.008	<0.05	<0.025
2372-MB1	20-Apr-2021	Tertiary	<0.05	<0.005	0.61	<0.0005	<0.005	0.008	<0.005	0.66	<0.005	0.776	<0.0001	0.011	0.044	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB1	11-May-2021	Tertiary	<0.05	<0.005	0.53	<0.0005	<0.005	0.006	<0.005	0.38	<0.005	0.641	<0.0001	0.027	0.028	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB1	17-Aug-2021	Tertiary	<0.05	<0.005	0.4	<0.0005	<0.005	0.008	0.005	0.54	<0.005	0.706	<0.0001	0.008	0.038	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB1	21-Sep-2021	Tertiary	<0.05	<0.005	0.44	<0.0005	<0.005	0.007	<0.005	1.16	<0.005	0.655	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.025
2372-MB1	17-Nov-2021	Tertiary	<0.05	<0.005	0.5	<0.0005	<0.005	0.008	<0.005	1.63	<0.005	0.791	<0.0001	<0.005	0.011	<0.05	<0.005	0.01	<0.05	<0.025

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2372-MB1	12-Jan-2022	Tertiary	<0.05	<0.005	0.55	<0.0005	<0.005	0.007	<0.005	1.72	<0.005	0.728	<0.0001	<0.005	0.012	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB1	15-Mar-2022	Tertiary	<0.05	<0.005	0.47	<0.0005	<0.005	0.007	<0.005	1.25	<0.005	0.622	<0.0001	<0.005	0.01	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB1	31-May-2022	Tertiary	<0.05	<0.005	0.64	<0.0005	<0.005	0.007	<0.005	1.31	<0.005	0.642	<0.0001	<0.005	0.008	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB1	31-Aug-2022	Tertiary	<0.05	<0.005	0.49	<0.0005	<0.005	0.006	<0.005	1.35	<0.005	0.548	<0.0001	<0.005	0.008	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB1	29-Sep-2022	Tertiary	<0.05	<0.005	0.52	<0.0005	<0.005	0.005	<0.005	1.45	<0.005	0.585	<0.0001	<0.005	<0.005	<0.05	<0.005	0.007	<0.05	<0.025
West-MB1	17-Feb-2018	Tertiary	<0.01	0.002	0.47	<0.0001	<0.001	0.002	<0.001	0.26	<0.001	0.048	<0.0001	0.002	0.004	<0.01	<0.001	0.005	<0.01	0.03
West-MB1	26-Mar-2018	Tertiary	<0.01	0.002	0.47	<0.0001	<0.001	<0.001	<0.001	0.29	<0.001	0.026	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	27-Jul-2018	Tertiary	<0.01	0.002	0.48	<0.0001	0.002	NM	<0.001	0.43	<0.001	0.05	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	13-Sep-2018	Tertiary	<0.01	0.001	0.47	<0.0001	<0.001	NM	<0.001	0.19	<0.001	0.058	<0.0001	0.002	0.004	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	24-Feb-2019	Tertiary	<0.01	0.001	0.43	<0.0001	<0.001	<0.001	<0.001	0.35	<0.001	0.031	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	26-May-2019	Tertiary	<0.01	0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.39	<0.001	0.031	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	01-Aug-2019	Tertiary	<0.01	0.001	0.52	<0.0001	<0.001	0.001	<0.001	0.38	<0.001	0.046	<0.0001	0.001	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	25-Oct-2019	Tertiary	<0.01	0.001	0.46	<0.0001	<0.001	0.001	<0.001	0.16	<0.001	0.055	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	10-Dec-2019	Tertiary	<0.01	<0.001	0.38	<0.0001	<0.001	0.001	<0.001	0.08	<0.001	0.045	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	11-Feb-2020	Tertiary	<0.01	<0.001	0.47	<0.0001	<0.001	0.001	<0.001	0.08	<0.001	0.048	<0.0001	0.003	0.002	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB1	22-Apr-2020	Tertiary	<0.01	<0.001	0.4	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.032	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	10-Jun-2020	Tertiary	<0.01	<0.001	0.49	<0.0001	<0.001	0.001	<0.001	0.1	<0.001	0.026	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB1	18-Nov-2020	Tertiary	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.024	<0.0001	0.003	0.002	<0.01	<0.001	0.001	<0.01	0.007
WEST-MB1	03-Feb-2021	Tertiary	<0.01	<0.001	0.57	<0.0001	<0.001	0.001	0.001	<0.05	<0.001	0.019	<0.0001	0.004	0.002	<0.01	<0.001	0.001	<0.01	0.008
WEST-MB1	22-Apr-2021	Tertiary	<0.01	<0.001	0.06	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.015	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB1	12-May-2021	Tertiary	<0.01	<0.001	0.34	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.018	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB1	18-Aug-2021	Tertiary	<0.01	<0.001	0.34	0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.021	<0.0001	0.002	0.005	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	21-Sep-2021	Tertiary	<0.01	<0.001	0.36	<0.0001	<0.001	<0.001	<0.001	0.17	<0.001	0.02	<0.0001	0.002	0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	17-Nov-2021	Tertiary	<0.01	0.001	0.36	<0.0001	<0.001	<0.001	<0.001	0.21	<0.001	0.022	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB1	12-Jan-2022	Tertiary	<0.01	<0.001	0.55	<0.0001	<0.001	<0.001	<0.001	0.22	<0.001	0.019	<0.0001	0.002	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB1	15-Mar-2022	Tertiary	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.23	<0.001	0.017	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB1	01-Jun-2022	Tertiary	<0.01	0.001	0.4	<0.0001	<0.001	<0.001	<0.001	0.26	<0.001	0.016	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB1	19-Jul-2022	Tertiary	<0.01	0.001	0.39	<0.0001	<0.001	<0.001	<0.001	0.23	<0.001	0.014	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB1	28-Sep-2022	Tertiary	<0.01	<0.001	0.38	<0.0001	<0.001	<0.001	<0.001	0.22	<0.001	0.013	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	18-Feb-2018	Rewan Group	<0.01	0.01	0.28	<0.0001	<0.001	0.002	<0.001	2.65	<0.001	1.34	<0.0001	0.009	0.004	<0.01	<0.001	0.004	<0.01	<0.005
2218-MB2	04-Apr-2018	Rewan Group	<0.01	0.006	0.31	<0.0001	<0.001	<0.001	<0.001	3.52	<0.001	0.912	<0.0001	0.001	0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	14-Jul-2018	Rewan Group	<0.01	0.004	0.34	<0.0001	<0.001	NM	<0.001	4.3	<0.001	0.746	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	22-Sep-2018	Rewan Group	<0.01	0.002	0.28	<0.0001	<0.001	NM	<0.001	4.27	<0.001	0.787	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	21-Feb-2019	Rewan Group	<0.01	0.001	0.26	<0.0001	<0.001	<0.001	<0.001	4.16	<0.001	0.751	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	22-Jun-2019	Rewan Group	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	4.14	<0.001	0.63	<0.0001	<0.001	<0.001	<0.01	0.003	<0.001	<0.01	<0.005
2218-MB2	02-Aug-2019	Rewan Group	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	4.67	<0.001	0.584	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	24-Oct-2019	Rewan Group	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	0.44	<0.001	0.522	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	11-Dec-2019	Rewan Group	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	3.37	<0.005	0.486	<0.0005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	12-Feb-2020	Rewan Group	<0.05	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	5.58	<0.005	0.499	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	21-Apr-2020	Rewan Group	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	5.33	<0.005	0.5	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	09-Jun-2020	Rewan Group	<0.01	0.006	0.27	<0.0001	<0.001	<0.001	<0.001	3.93	<0.001	0.441	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	18-Nov-2020	Rewan Group	<0.01	0.004	0.27	<0.0001	<0.001	<0.001	<0.001	6.15	<0.001	0.81	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	08-Feb-2021	Rewan Group	<0.01	0.002	0.32	<0.0001	<0.001	<0.001	<0.001	5.72	<0.001	0.44	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	09-Feb-2021	Rewan Group	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	3.8	<0.001	0.522	<0.0001	0.004	0.023	<0.01	<0.001	<0.001	<0.01	0.019
2218-MB2	21-Apr-2021	Rewan Group	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	5.34	<0.001	0.455	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	12-May-2021	Rewan Group	<0.05	<0.005	0.3	<0.0005	<0.005	<0.005	<0.005	4.36	<0.005	0.424	<0.0001	0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	18-Aug-2021	Rewan Group	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	4.45	<0.005	0.433	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	21-Sep-2021	Rewan Group	0.06	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	5.28	<0.005	0.449	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	17-Nov-2021	Rewan Group	<0.01	<0.001	0.22	<0.0001	<0.001	<0.001	<0.001	4.32	<0.001	0.362	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	12-Jan-2022	Rewan Group	<0.01	<0.001	0.33	<0.0001	<0.001	<0.001	0.002	4.7	<0.001	0.373	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	15-Mar-2022	Rewan Group	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	4.86	<0.005	0.386	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	01-Jun-2022	Rewan Group	<0.05	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	4.42	<0.005	0.362	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	19-Jul-2022	Rewan Group	<0.05	<0.005	0.39	<0.0005	<0.005	<0.005	<0.005	4.92	<0.005	0.338	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	28-Sep-2022	Rewan Group	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	4.79	<0.005	0.361	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2226-MB2	14-Feb-2018	Rewan Group	<0.01	<0.001	0.53	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.444	<0.0001	0.003	0.004	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	25-Mar-2018	Rewan Group	<0.01	<0.001	0.62	<0.0001	<0.001	<0.001	<0.001	0.17	<0.001	0.203	<0.0001	0.002	0.002	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	15-Jul-2018	Rewan Group	<0.01	<0.001	0.64	<0.0001	<0.001	NM	<0.001	0.13	<0.001	0.268	<0.0001	0.003	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	22-Sep-2018	Rewan Group	<0.01	<0.001	0.65	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.173	<0.0001	0.003	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	23-Feb-2019	Rewan Group	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.101	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	28-May-2019	Rewan Group	<0.01	<0.001	0.6	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.08	<0.0001	0.002	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	28-Aug-2019	Rewan Group	<0.01	<0.001	0.64	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.046	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	24-Oct-2019	Rewan Group	<0.01	<0.001	0.71	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.034	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	10-Dec-2019	Rewan Group	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.03	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	12-Feb-2020	Rewan Group	<0.01	<0.001	0.57	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.011	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	22-Apr-2020	Rewan Group	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.01	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	10-Jun-2020	Rewan Group	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.01	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2226-MB2	18-Nov-2020	Rewan Group	<0.01	<0.001	0.6	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.01	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	08-Feb-2021	Rewan Group	<0.01	<0.001	0.6	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.026	<0.0001	0.002	0.002	<0.01	<0.001	0.005	<0.01	0.005
2226-MB2	09-Feb-2021	Rewan Group	<0.01	<0.001	0.51	<0.0001	<0.001	0.002	0.001	<0.05	<0.001	0.134	<0.0001	0.002	0.007	<0.01	<0.001	0.005	<0.01	0.009
2226-MB2	21-Apr-2021	Rewan Group	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.035	<0.0001	0.002	0.005	<0.01	<0.001	0.004	<0.01	0.005
2226-MB2	12-May-2021	Rewan Group	<0.01	<0.001	0.51	<0.0001	<0.001	<0.001	0.001	0.26	<0.001	0.033	<0.0001	0.005	0.02	<0.01	<0.001	0.005	<0.01	0.006
2226-MB2	18-Aug-2021	Rewan Group	<0.01	<0.001	0.38	0.0002	<0.001	<0.001	<0.001	0.39	<0.001	0.062	<0.0001	0.006	0.016	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	21-Sep-2021	Rewan Group	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	0.2	<0.001	0.034	<0.0001	0.003	0.002	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	17-Nov-2021	Rewan Group	<0.01	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	0.035	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	12-Jan-2022	Rewan Group	<0.01	<0.001	0.66	<0.0001	<0.001	<0.001	<0.001	0.26	<0.001	0.061	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	15-Mar-2022	Rewan Group	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	0.17	<0.001	0.034	<0.0001	0.002	<0.001	<0.01	<0.001	0.008	<0.01	<0.005
2226-MB2	01-Jun-2022	Rewan Group	<0.01	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	0.22	<0.001	0.045	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	31-Aug-2022	Rewan Group	<0.01	<0.001	0.57	<0.0001	<0.001	<0.001	<0.001	0.19	<0.001	0.033	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	28-Sep-2022	Rewan Group	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	0.16	<0.001	0.036	<0.0001	0.001	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2372-MB2	15-Feb-2018	Rewan Group	<0.01	0.004	0.5	<0.0001	<0.001	0.045	<0.001	2.56	<0.001	1.06	<0.0001	0.001	0.011	<0.01	<0.001	0.022	<0.01	<0.005
2372-MB2	05-Apr-2018	Rewan Group	<0.01	0.007	0.52	<0.0001	<0.001	0.018	0.001	5.6	<0.001	1.13	<0.0001	<0.001	0.004	<0.01	<0.001	0.016	<0.01	<0.005
2372-MB2	30-Jun-2018	Rewan Group	<0.01	0.009	0.5	<0.0001	<0.001	0.031	0.004	4.25	<0.001	1.1	<0.0001	0.001	0.006	<0.01	<0.001	0.014	<0.01	<0.005
2372-MB2	20-Sep-2018	Rewan Group	<0.01	0.009	0.47	<0.0001	<0.001	NM	<0.001	3.51	<0.001	1.03	<0.0001	<0.001	0.006	<0.01	<0.001	0.011	<0.01	<0.005
2372-MB2	19-Jun-2019	Rewan Group	<0.05	0.009	0.6	<0.0005	<0.005	0.035	<0.005	2.67	<0.005	0.91	<0.0001	<0.005	0.008	<0.05	<0.005	0.012	<0.05	<0.025
2372-MB2	29-Aug-2019	Rewan Group	<0.05	0.009	0.51	<0.0005	<0.005	0.033	<0.005	2	<0.005	0.832	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB2	28-Oct-2019	Rewan Group	<0.05	0.006	0.56	<0.0005	<0.005	0.031	<0.005	1.5	<0.005	0.828	<0.0001	<0.005	0.005	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB2	14-Dec-2019	Rewan Group	<0.01	0.006	0.46	<0.0001	<0.001	0.038	<0.001	0.9	<0.001	0.721	<0.0001	<0.001	0.009	<0.01	<0.001	0.011	<0.01	0.008
2372-MB2	04-Feb-2020	Rewan Group	<0.01	0.008	0.44	<0.0001	0.011	0.034	<0.001	1.24	<0.001	0.876	<0.0005	0.01	0.054	<0.01	<0.001	0.011	<0.01	0.006
2372-MB2	07-Apr-2020	Rewan Group	<0.05	0.009	0.38	<0.0005	<0.005	0.043	<0.005	1.01	<0.005	0.809	<0.0001	<0.005	0.009	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB2	02-Jun-2020	Rewan Group	<0.05	0.007	0.49	<0.0005	<0.005	0.032	<0.005	0.97	<0.005	0.763	<0.0001	<0.005	0.008	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB2	17-Nov-2020	Rewan Group	<0.05	0.008	0.45	<0.0005	<0.005	0.036	<0.005	0.87	<0.005	0.67	<0.0001	<0.005	0.01	<0.05	<0.005	0.008	<0.05	<0.025
2372-MB2	02-Feb-2021	Rewan Group	<0.05	0.008	0.7	<0.0005	<0.005	0.039	<0.005	0.75	<0.005	0.69	<0.0001	<0.005	0.009	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB2	20-Apr-2021	Rewan Group	<0.01	0.007	0.43	<0.0001	<0.001	0.029	<0.001	0.9	<0.001	0.681	<0.0001	<0.001	0.007	<0.01	<0.001	0.011	<0.01	<0.005
2372-MB2	11-May-2021	Rewan Group	<0.05	<0.005	0.59	<0.0005	<0.005	0.027	<0.005	0.55	<0.005	0.724	<0.0001	<0.005	0.005	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB2	17-Aug-2021	Rewan Group	<0.05	0.007	0.47	<0.0005	<0.005	0.026	<0.005	0.42	<0.005	0.639	<0.0001	<0.005	0.007	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB2	21-Sep-2021	Rewan Group	<0.05	0.008	0.54	<0.0005	<0.005	0.029	<0.005	1.57	<0.005	0.733	<0.0001	<0.005	0.006	<0.05	<0.005	0.011	<0.05	<0.025
2372-MB2	17-Nov-2021	Rewan Group	<0.05	0.007	0.41	<0.0005	<0.005	0.028	<0.005	1.15	<0.005	0.707	<0.0001	<0.005	0.008	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB2	12-Jan-2022	Rewan Group	<0.01	0.006	0.52	<0.0001	<0.001	0.017	0.001	5.07	<0.001	0.669	<0.0001	<0.001	0.004	<0.01	<0.001	0.009	<0.01	<0.005
2372-MB2	15-Mar-2022	Rewan Group	<0.05	0.007	0.45	<0.0005	<0.005	0.027	<0.005	3.77	<0.005	0.751	<0.0001	<0.005	<0.005	<0.05	<0.005	0.009	<0.05	<0.025
2372-MB2	31-May-2022	Rewan Group	<0.05	0.006	0.59	<0.0005	<0.005	0.034	<0.005	3.72	<0.005	0.888	<0.0001	<0.005	0.009	<0.05	<0.005	0.01	<0.05	<0.025
2372-MB2	31-Aug-2022	Rewan Group	<0.01	0.007	0.41	<0.0001	<0.001	0.03	<0.001	2.34	<0.001	0.806	<0.0001	<0.001	0.007	<0.01	<0.001	0.009	<0.01	<0.005
2372-MB2	29-Sep-2022	Rewan Group	<0.05	0.007	0.52	<0.0005	<0.005	0.032	<0.005	1.97	<0.005	0.783	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.025
2393-MB1	16-Feb-2018	Rewan Group	<0.01	0.014	0.73	<0.0001	<0.001	0.001	0.013	<0.05	<0.001	0.254	<0.0001	0.003	0.006	<0.01	0.001	0.012	<0.01	0.046
2393-MB1	24-Mar-2018	Rewan Group	<0.01	0.01	0.78	0.0001	<0.001	0.001	0.002	<0.05	<0.001	0.27	<0.0001	0.002	0.006	<0.01	<0.001	0.01	<0.01	0.005
2393-MB1	27-Jul-2018	Rewan Group	<0.01	0.007	0.88	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.26	<0.0001	0.002	0.004	<0.01	<0.001	0.012	<0.01	<0.005
2393-MB1	21-Sep-2018	Rewan Group	<0.01	0.004	0.89	<0.0001	0.007	NM	<0.001	0.26	<0.001	0.248	<0.0001	0.002	0.062	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	22-Feb-2019	Rewan Group	<0.01	0.003	0.77	0.0001	0.002	0.001	0.001	<0.05	<0.001	0.206	<0.0001	0.005	0.011	<0.01	<0.001	0.01	<0.01	<0.005
2393-MB1	24-Jun-2019	Rewan Group	<0.01	0.003	0.77	<0.0001	0.003	0.002	0.001	<0.05	<0.001	0.306	<0.0001	0.02	0.013	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	04-Sep-2019	Rewan Group	<0.01	0.004	0.86	<0.0001	0.002	0.001	0.002	<0.05	<0.001	0.201	<0.0001	0.008	0.012	<0.01	<0.001	0.011	<0.01	0.005
2393-MB1	30-Oct-2019	Rewan Group	<0.01	0.004	0.67	0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.17	<0.0001	0.008	0.008	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	11-Dec-2019	Rewan Group	<0.01	0.003	0.56	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.157	<0.0001	0.007	0.005	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	10-Feb-2020	Rewan Group	<0.01	0.003	0.74	0.0001	<0.001	<0.001	0.001	<0.05	<0.001	0.189	<0.0001	0.005	0.004	<0.01	<0.001	0.01	<0.01	<0.005
2393-MB1	08-Apr-2020	Rewan Group	<0.01	0.003	0.59	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.103	<0.0001	0.003	0.003	<0.01	<0.001	0.01	<0.01	<0.005
2393-MB1	03-Jun-2020	Rewan Group	<0.01	0.003	0.74	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.16	<0.0001	0.005	0.005	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	18-Nov-2020	Rewan Group	<0.01	0.003	0.72	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.214	<0.0001	0.003	0.005	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	02-Feb-2021	Rewan Group	<0.01	0.006	0.75	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.246	<0.0001	0.002	0.003	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	20-Apr-2021	Rewan Group	<0.01	0.007	0.56	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.216	<0.0001	0.004	0.002	<0.01	<0.001	0.007	<0.01	<0.005
2393-MB1	11-May-2021	Rewan Group	<0.01	0.007	0.74	<0.0001	<0.001	0.001	0.002	<0.05	<0.001	0.269	<0.0001	0.002	0.003	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	17-Aug-2021	Rewan Group	<0.01	0.006	0.56	0.0002	<0.001	0.002	<0.001	<0.05	<0.001	0.266	<0.0001	0.002	0.004	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	21-Sep-2021	Rewan Group	<0.01	0.006	0.7	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.326	<0.0001	0.002	0.002	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	17-Nov-2021	Rewan Group	<0.01	0.005	0.46	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.317	<0.0001	0.001	0.002	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	12-Jan-2022	Rewan Group	<0.01	0.004	0.89	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.316	<0.0001	0.001	0.002	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	15-Mar-2022	Rewan Group	<0.01	0.004	0.77	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.296	<0.0001	0.001	0.002	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	01-Jun-2022	Rewan Group	0.01	0.003	0.76	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.258	<0.0001	0.001	0.002	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	20-Jul-2022	Rewan Group	<0.01	0.003	0.67	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.258	<0.0001	0.001	0.002	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	29-Sep-2022	Rewan Group	<0.01	0.002	0.94	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.248	<0.0001	<0.001	0.001	<0.01	<0.001	0.008	<0.01	<0.005
2394-MB1	18-Feb-2018	Upper Rewan Group	<0.01	<0.001	0.8	0.0003	0.002	0.005	0.022	<0.05	<0.001	0.145	<0.0001	0.002	0.016	<0.01	<0.001	0.011	<0.01	0.079
2394-MB1	24-Mar-2018	Upper Rewan Group	<0.01	<0.001	0.86	<0.0001	<0.001	0.012	0.003	0.17	<0.001	0.263	<0.0001	0.001	0.007	<0.01	0.001	0.01	<0.01	0.014
2394-MB1	29-Jun-2018	Upper Rewan Group	<0.01	<0.001	0.84	<0.0001	0.003	0.011	0.006	0.37	<0.001	0.259	<0.0001	0.004	0.008	<0.01	<0.001	0.012	<0.01	0.005
2394-MB1	13-Sep-2018	Upper Rewan Group	<0.01	<0.001	0.93	0.0001	0.004	NM	<0.001	0.25	<0.001	0.201	<0.0001	0.001	0.009	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	22-Mar-2019	Upper Rewan Group	<0.01	<0.001	0.86	0.0002	0.003	0.006	0.002	0.14	<0.001	0.131	<0.0001	0.001	0.009	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	25-Jun-2019	Upper Rewan Group	<0.01	<0.001	0.86	0.0002	0.003	0.004	0.003	<0.05	<0.001	0.085	<0.0001	0.001	0.012	<0.01	<0.001	0.012	<0.01	<0.005

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2394-MB1	30-Aug-2019	Upper Rewan Group	<0.01	<0.001	0.92	0.0001	0.002	0.004	0.003	<0.05	<0.001	0.072	<0.0001	<0.001	0.01	<0.01	<0.001	0.01	<0.01	<0.005
2394-MB1	30-Oct-2019	Upper Rewan Group	<0.01	<0.001	0.56	<0.0001	0.002	0.004	0.002	<0.05	<0.001	0.056	<0.0001	<0.001	0.013	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	14-Dec-2019	Upper Rewan Group	<0.01	<0.001	0.83	<0.0001	<0.001	0.004	0.001	<0.05	<0.001	0.055	<0.0001	<0.001	0.003	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	11-Feb-2020	Upper Rewan Group	<0.01	<0.001	0.77	<0.0001	<0.001	0.003	0.002	<0.05	<0.001	0.058	<0.0001	<0.001	0.002	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	21-Apr-2020	Upper Rewan Group	<0.05	<0.005	0.91	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.051	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.025
2394-MB1	03-Jun-2020	Upper Rewan Group	<0.01	<0.001	0.86	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.038	<0.0001	<0.001	0.003	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	17-Nov-2020	Upper Rewan Group	<0.01	<0.001	0.7	0.0002	<0.001	0.002	0.001	0.05	<0.001	0.038	<0.0001	<0.001	0.003	<0.01	<0.001	0.007	<0.01	0.005
2394-MB1	03-Feb-2021	Upper Rewan Group	<0.01	<0.001	1.11	0.0001	0.001	0.002	0.001	<0.05	<0.001	0.036	<0.0001	0.001	0.003	<0.01	<0.001	0.009	<0.01	<0.005
2394-MB1	20-Apr-2021	Upper Rewan Group	<0.01	<0.001	0.85	0.0001	0.002	0.001	0.002	<0.05	<0.001	0.022	<0.0001	<0.001	0.003	<0.01	<0.001	0.008	<0.01	0.005
2394-MB1	11-May-2021	Upper Rewan Group	<0.01	<0.001	0.66	0.0002	0.002	<0.001	0.003	<0.05	<0.001	0.011	<0.0001	0.001	0.004	<0.01	<0.001	0.008	<0.01	0.009
2394-MB1	17-Aug-2021	Upper Rewan Group	<0.01	0.001	0.6	0.0003	<0.001	0.003	0.001	<0.05	<0.001	0.056	<0.0001	<0.001	0.004	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	21-Sep-2021	Upper Rewan Group	<0.01	<0.001	0.81	<0.0001	<0.001	0.004	<0.001	0.21	<0.001	0.059	<0.0001	<0.001	0.002	<0.01	<0.001	0.012	<0.01	<0.005
2394-mb1	16-Nov-2021	Upper Rewan Group	<0.01	<0.001	0.66	<0.0001	<0.001	0.006	0.001	0.34	<0.001	0.133	<0.0001	<0.001	0.002	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	12-Jan-2022	Upper Rewan Group	<0.01	0.001	0.97	<0.0001	<0.001	0.005	0.001	0.26	<0.001	0.113	<0.0001	<0.001	0.002	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	15-Mar-2022	Upper Rewan Group	<0.01	<0.001	0.76	<0.0001	<0.001	0.005	0.002	0.16	<0.001	0.107	<0.0001	<0.001	0.002	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	01-Jun-2022	Upper Rewan Group	<0.01	<0.001	0.84	<0.0001	<0.001	0.004	<0.001	0.13	<0.001	0.077	<0.0001	<0.001	0.002	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	20-Jul-2022	Upper Rewan Group	<0.01	<0.001	0.77	<0.0001	<0.001	0.004	<0.001	0.13	<0.001	0.072	<0.0001	<0.001	0.001	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	29-Sep-2022	Upper Rewan Group	<0.01	<0.001	0.97	<0.0001	<0.001	0.004	<0.001	0.11	<0.001	0.075	<0.0001	<0.001	0.001	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB2	21-Mar-2018	Lower Rewan Group	<0.01	0.003	0.34	<0.0001	<0.001	<0.001	<0.001	2.68	<0.001	0.603	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	0.006
2394-MB2	28-Jul-2018	Lower Rewan Group	0.01	0.002	0.35	<0.0001	<0.001	NM	<0.001	3.2	<0.001	0.698	<0.0001	0.006	0.002	<0.01	<0.001	<0.001	<0.01	0.01
2394-MB2	23-Sep-2018	Lower Rewan Group	<0.01	0.001	0.3	<0.0001	<0.001	NM	<0.001	3.69	<0.001	0.838	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.014
2394-MB2	22-Mar-2019	Lower Rewan Group	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	3.6	<0.001	0.871	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.028
2394-MB2	25-Jun-2019	Lower Rewan Group	<0.01	<0.001	0.21	<0.0001	<0.001	<0.001	<0.001	3.83	<0.001	0.915	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.033
2394-MB2	30-Aug-2019	Lower Rewan Group	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	3.93	<0.005	0.947	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.03
2394-MB2	30-Oct-2019	Lower Rewan Group	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	3.99	<0.005	0.958	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	30-Oct-2019	Lower Rewan Group	<0.01	<0.001	0.22	<0.0001	<0.001	<0.001	<0.001	1.29	<0.001	0.114	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.018
2394-MB2	14-Dec-2019	Lower Rewan Group	<0.01	<0.001	0.22	<0.0001	<0.001	<0.001	<0.001	3.57	<0.001	0.823	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.034
2394-MB2	11-Feb-2020	Lower Rewan Group	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	4.75	<0.005	0.938	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.044
2394-MB2	21-Apr-2020	Lower Rewan Group	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	4.21	<0.005	1.01	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.036
2394-MB2	03-Jun-2020	Lower Rewan Group	<0.05	<0.005	0.16	<0.0005	<0.005	<0.005	<0.005	3.96	<0.005	0.972	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	17-Nov-2020	Lower Rewan Group	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	4.06	<0.005	0.914	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.039
2394-MB2	03-Feb-2021	Lower Rewan Group	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	2.52	<0.005	0.91	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.038
2394-MB2	21-Apr-2021	Lower Rewan Group	<0.01	<0.001	0.2	<0.0001	<0.001	<0.001	<0.001	3.67	<0.001	0.853	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.019
2394-MB2	11-May-2021	Lower Rewan Group	<0.05	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	3.34	<0.005	0.886	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	17-Aug-2021	Lower Rewan Group	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	3.94	<0.005	0.958	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.028
2394-MB2	21-Sep-2021	Lower Rewan Group	0.06	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	3.98	<0.005	0.968	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-mb2	16-Nov-2021	Lower Rewan Group	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	3.9	<0.005	0.907	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	12-Jan-2022	Lower Rewan Group	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	0.003	3.76	<0.001	0.87	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.017
2394-MB2	15-Mar-2022	Lower Rewan Group	<0.05	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	4.04	<0.005	0.929	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.04
2394-MB2	01-Jun-2022	Lower Rewan Group	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	3.5	<0.005	0.868	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	20-Jul-2022	Lower Rewan Group	<0.05	<0.005	0.33	<0.0005	<0.005	<0.005	<0.005	4.11	<0.005	0.887	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	29-Sep-2022	Lower Rewan Group	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	3.92	<0.005	0.943	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
1238-MB2	05-Apr-2018	Vermont Seam	<0.01	0.001	0.38	<0.0001	<0.001	0.007	<0.001	0.22	<0.001	1.23	<0.0001	<0.001	0.004	<0.01	<0.001	0.003	<0.01	<0.005
1238-MB2	02-Jul-2018	Vermont Seam	<0.01	0.002	0.36	<0.0001	<0.001	0.007	0.002	0.3	<0.001	1.24	<0.0001	<0.001	0.003	<0.01	<0.001	0.003	<0.01	<0.005
1238-MB2	20-Sep-2018	Vermont Seam	<0.01	0.002	0.4	<0.0001	<0.001	NM	<0.001	0.13	<0.001	1.09	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	14-Mar-2019	Vermont Seam	<0.01	0.001	0.34	<0.0001	<0.001	0.006	0.002	0.38	<0.001	1.14	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	21-Jun-2019	Vermont Seam	0.01	0.001	0.35	0.0001	<0.001	0.006	<0.001	0.18	<0.001	1.17	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	27-Aug-2019	Vermont Seam	<0.01	0.001	0.42	0.0001	<0.001	0.006	<0.001	0.1	<0.001	1.19	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	22-Oct-2019	Vermont Seam	<0.01	0.001	0.37	0.0001	<0.001	0.006	<0.001	0.1	<0.001	1.07	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	14-Dec-2019	Vermont Seam	<0.01	0.001	0.35	0.0002	<0.001	0.007	<0.001	<0.05	<0.001	1.05	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	0.005
1238-MB2	04-Feb-2020	Vermont Seam	<0.01	0.001	0.17	0.0002	0.012	0.007	<0.001	0.09	<0.001	1.07	<0.0001	0.008	0.059	<0.01	<0.001	0.001	<0.01	<0.005
1238-MB2	08-Apr-2020	Vermont Seam	<0.01	0.001	0.2	0.0002	<0.001	0.007	<0.001	0.06	<0.001	1.29	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	09-Jun-2020	Vermont Seam	<0.01	0.001	0.36	0.0002	<0.001	0.008	<0.001	0.07	<0.001	1.09	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	19-Nov-2020	Vermont Seam	<0.01	0.001	0.35	<0.0001	<0.001	0.006	<0.001	0.14	<0.001	1.1	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	03-Feb-2021	Vermont Seam	<0.05	<0.005	0.43	<0.0005	<0.005	0.008	<0.005	0.48	<0.005	1.2	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
1238-MB2	21-Apr-2021	Vermont Seam	<0.01	0.001	0.34	<0.0001	<0.001	0.007	<0.001	0.51	<0.001	1.05	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	12-May-2021	Vermont Seam	<0.01	0.001	0.22	<0.0001	<0.001	0.006	<0.001	0.44	<0.001	1.14	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
1238-MB2	18-Aug-2021	Vermont Seam	<0.01	0.002	0.22	0.0002	<0.001	0.006	<0.001	0.22	<0.001	1.08	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	21-Sep-2021	Vermont Seam	<0.01	0.001	0.3	<0.0001	<0.001	0.007	<0.001	0.33	<0.001	1.08	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	17-Nov-2021	Vermont Seam	<0.01	0.002	0.25	<0.0001	<0.001	0.006	<0.001	0.16	<0.001	0.968	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	13-Jan-2022	Vermont Seam	<0.01	0.002	0.41	<0.0001	<0.001	0.006	<0.001	0.15	<0.001	1.03	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	15-Mar-2022	Vermont Seam	<0.01	0.001	0.32	<0.0001	<0.001	0.005	<0.001	0.12	<0.001	0.872	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	01-Jun-2022	Vermont Seam	<0.01	0.002	0.4	0.0003	<0.001	0.007	0.002	<0.05	<0.001	0.993	<0.0001	0.002	0.003	<0.01	<0.001	0.002	<0.01	0.006
1238-MB2	20-Jul-2022	Vermont Seam	<0.05	<0.005	0.43	<0.0005	<0.005	0.007	<0.005	0.18	<0.005	1.02	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
1238-MB2	28-Sep-2022	Vermont Seam	<0.01	<0.001	0.36	0.0016	<0.001	0.004	0.007	<0.05	<0.001	0.848	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	0.032
2218-MB3	13-Feb-2018	Leichhardt Seam	<0.01	0.002	0.52	<0.0001	<0.001	<0.001	<0.001	0.29	<0.001	0.292	<0.0001	0.002	0.002	<0.01	<0.001	0.004	<0.01	<0.005

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2218-MB3	20-Mar-2018	Leichhardt Seam	<0.01	0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.56	<0.001	0.353	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	14-Jul-2018	Leichhardt Seam	<0.01	<0.001	0.49	<0.0001	<0.001	NM	<0.001	0.72	<0.001	0.433	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	19-Sep-2018	Leichhardt Seam	<0.01	<0.001	0.51	<0.0001	<0.001	NM	<0.001	0.72	<0.001	0.402	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB3	21-Feb-2019	Leichhardt Seam	<0.01	<0.001	0.31	<0.0001	<0.001	<0.001	<0.001	0.46	<0.001	0.476	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	22-Jun-2019	Leichhardt Seam	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	0.28	<0.001	0.191	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	02-Aug-2019	Leichhardt Seam	<0.01	<0.001	0.35	<0.0001	<0.001	<0.001	<0.001	0.28	<0.001	0.214	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	24-Oct-2019	Leichhardt Seam	<0.01	<0.001	0.27	<0.0001	<0.001	<0.001	<0.001	0.29	<0.001	0.201	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB3	11-Dec-2019	Leichhardt Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	0.21	<0.005	0.194	<0.0005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	12-Feb-2020	Leichhardt Seam	<0.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	0.21	<0.005	0.194	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	21-Apr-2020	Leichhardt Seam	<0.05	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	0.23	<0.005	0.204	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	09-Jun-2020	Leichhardt Seam	<0.01	<0.001	0.24	<0.0001	<0.001	0.001	<0.001	0.24	<0.001	0.18	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	18-Nov-2020	Leichhardt Seam	<0.01	<0.001	0.24	<0.0001	<0.001	<0.001	<0.001	1.1	<0.001	0.109	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	08-Feb-2021	Leichhardt Seam	<0.01	<0.001	0.31	<0.0001	<0.001	<0.001	<0.001	0.9	<0.001	0.123	<0.0001	0.002	0.007	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	09-Feb-2021	Leichhardt Seam	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	0.92	<0.001	0.106	<0.0001	0.005	0.009	<0.01	<0.001	<0.001	<0.01	0.011
2218-MB3	21-Apr-2021	Leichhardt Seam	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	1.64	<0.001	0.118	<0.0001	0.004	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	12-May-2021	Leichhardt Seam	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	1.75	<0.005	0.109	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	18-Aug-2021	Leichhardt Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	1.45	<0.005	0.109	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	21-Sep-2021	Leichhardt Seam	0.07	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	1.28	<0.005	0.119	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	17-Nov-2021	Leichhardt Seam	<0.01	<0.001	0.18	<0.0001	<0.001	<0.001	<0.001	1.07	<0.001	0.094	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	12-Jan-2022	Leichhardt Seam	<0.01	0.001	0.31	<0.0001	<0.001	<0.001	0.002	1.19	<0.001	0.097	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	15-Mar-2022	Leichhardt Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	1.27	<0.005	0.104	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	01-Jun-2022	Leichhardt Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.8	<0.005	0.11	<0.0001	0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	19-Jul-2022	Leichhardt Seam	<0.05	<0.005	0.35	<0.0005	<0.005	<0.005	<0.005	1.17	<0.005	0.095	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	28-Sep-2022	Leichhardt Seam	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	1.17	<0.005	0.099	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2226-MB3	14-Feb-2018	Leichhardt Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.218	<0.0001	<0.001	0.004	<0.01	<0.001	0.003	<0.01	<0.005
2226-MB3	25-Mar-2018	Leichhardt Seam	<0.01	<0.001	0.55	<0.0001	<0.001	<0.001	<0.001	0.46	<0.001	0.079	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	15-Jul-2018	Leichhardt Seam	<0.01	<0.001	0.56	<0.0001	<0.001	NM	<0.001	0.48	<0.001	0.064	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	22-Sep-2018	Leichhardt Seam	<0.01	<0.001	0.53	<0.0001	<0.001	NM	<0.001	0.45	<0.001	0.056	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	23-Feb-2019	Leichhardt Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.058	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	28-May-2019	Leichhardt Seam	<0.01	<0.001	0.52	<0.0001	<0.001	<0.001	<0.001	0.51	<0.001	0.057	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	28-Aug-2019	Leichhardt Seam	<0.01	<0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.47	<0.001	0.053	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	24-Oct-2019	Leichhardt Seam	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.055	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	10-Dec-2019	Leichhardt Seam	<0.01	<0.001	0.4	<0.0001	<0.001	<0.001	<0.001	0.48	<0.001	0.05	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	12-Feb-2020	Leichhardt Seam	<0.01	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	0.6	<0.001	0.053	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	22-Apr-2020	Leichhardt Seam	<0.01	<0.001	0.43	<0.0001	<0.001	<0.001	<0.001	0.42	<0.001	0.054	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	10-Jun-2020	Leichhardt Seam	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.051	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	18-Nov-2020	Leichhardt Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.54	<0.001	0.052	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	08-Feb-2021	Leichhardt Seam	<0.01	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.056	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	09-Feb-2021	Leichhardt Seam	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.48	<0.001	0.071	<0.0001	0.002	0.009	<0.01	<0.001	<0.001	<0.01	0.009
2226-MB3	21-Apr-2021	Leichhardt Seam	<0.01	<0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.68	<0.001	0.069	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2226-MB3	12-May-2021	Leichhardt Seam	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.73	<0.001	0.069	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	18-Aug-2021	Leichhardt Seam	<0.01	<0.001	0.35	0.0001	<0.001	<0.001	<0.001	0.58	<0.001	0.069	<0.0001	0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	21-Sep-2021	Leichhardt Seam	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	0.61	<0.001	0.067	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	17-Nov-2021	Leichhardt Seam	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.057	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	12-Jan-2022	Leichhardt Seam	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	0.56	<0.001	0.061	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	15-Mar-2022	Leichhardt Seam	<0.01	<0.001	0.52	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.058	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	01-Jun-2022	Leichhardt Seam	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.06	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	31-Aug-2022	Leichhardt Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.062	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	28-Sep-2022	Leichhardt Seam	<0.01	<0.001	0.62	<0.0001	<0.001	<0.001	<0.001	0.53	<0.001	0.061	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	30-Jun-2018	Vermont Seam	<0.01	0.004	0.36	<0.0001	<0.001	0.005	0.006	0.82	<0.001	0.127	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	20-Sep-2018	Vermont Seam	<0.01	0.003	0.34	<0.0001	<0.001	NM	<0.001	0.81	<0.001	0.112	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	19-Jun-2019	Vermont Seam	<0.05	<0.005	0.44	<0.0005	<0.005	<0.005	<0.005	0.8	<0.005	0.116	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	29-Aug-2019	Vermont Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.74	<0.005	0.113	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	28-Oct-2019	Vermont Seam	<0.05	<0.005	0.41	<0.0005	<0.005	<0.005	<0.005	0.74	<0.005	0.11	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	14-Dec-2019	Vermont Seam	<0.01	0.002	0.36	<0.0001	<0.001	0.003	<0.001	0.78	<0.001	0.104	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	04-Feb-2020	Vermont Seam	<0.01	0.002	0.22	<0.0001	0.001	0.003	<0.001	0.76	<0.001	0.103	<0.0005	0.001	0.006	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	07-Apr-2020	Vermont Seam	<0.05	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	0.69	<0.005	0.106	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	02-Jun-2020	Vermont Seam	<0.05	<0.005	0.35	<0.0005	<0.005	<0.005	<0.005	0.77	<0.005	0.113	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	17-Nov-2020	Vermont Seam	<0.05	<0.005	0.33	<0.0005	<0.005	<0.005	<0.005	0.93	<0.005	0.107	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	02-Feb-2021	Vermont Seam	<0.05	<0.005	0.57	<0.0005	<0.005	<0.005	<0.005	0.75	<0.005	0.122	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	20-Apr-2021	Vermont Seam	<0.01	0.002	0.29	<0.0001	<0.001	0.002	<0.001	0.9	<0.001	0.104	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	11-May-2021	Vermont Seam	<0.05	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	0.77	<0.005	0.106	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	17-Aug-2021	Vermont Seam	<0.05	<0.005	0.44	<0.0005	<0.005	<0.005	<0.005	0.98	<0.005	0.112	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.03
2372-MB3	21-Sep-2021	Vermont Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	0.8	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	17-Nov-2021	Vermont Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	0.83	<0.005	0.17	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	12-Jan-2022	Vermont Seam	<0.01	0.002	0.43	<0.0001	<0.001	0.001	0.002	0.73	<0.001	0.174	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2372-MB3	15-Mar-2022	Vermont Seam	<0.05	<0.005	0.35	<0.0005	<0.005	<0.005	<0.005	0.77	<0.005	0.176	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	31-May-2022	Vermont Seam	<0.05	<0.005	0.43	<0.0005	<0.005	<0.005	<0.005	0.82	<0.005	0.161	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	31-Aug-2022	Vermont Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	0.97	<0.005	0.116	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2372-MB3	29-Sep-2022	Vermont Seam	<0.05	<0.005	0.44	<0.0005	<0.005	<0.005	<0.005	0.85	<0.005	0.177	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2375-MB2	17-Feb-2018	Vermont Seam	<0.01	<0.001	0.42	<0.0001	<0.001	0.007	<0.001	3.36	<0.001	0.427	<0.0001	0.004	0.003	<0.01	<0.001	0.006	<0.01	<0.005
2375-MB2	24-Mar-2018	Vermont Seam	<0.01	0.001	0.45	<0.0001	<0.001	0.004	<0.001	3.46	<0.001	0.338	<0.0001	0.002	0.004	<0.01	<0.001	0.004	<0.01	<0.005
2375-MB2	15-Jul-2018	Vermont Seam	<0.01	<0.001	0.45	<0.0001	<0.001	NM	<0.001	3.75	<0.001	0.372	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	21-Sep-2018	Vermont Seam	<0.01	0.001	0.43	<0.0001	<0.001	NM	<0.001	3.27	<0.001	0.294	<0.0001	<0.001	0.002	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	24-Feb-2019	Vermont Seam	<0.01	<0.001	0.35	<0.0001	<0.001	0.004	0.001	3.28	<0.001	0.259	<0.0001	<0.001	0.002	<0.01	<0.001	0.001	<0.01	0.008
2375-MB2	28-May-2019	Vermont Seam	<0.01	0.001	0.37	<0.0001	<0.001	0.005	<0.001	3.96	<0.001	0.287	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	31-Jul-2019	Vermont Seam	<0.01	0.001	0.42	<0.0001	<0.001	0.005	<0.001	3.56	<0.001	0.284	<0.0001	0.001	0.002	<0.01	0.001	0.001	<0.01	<0.005
2375-MB2	22-Oct-2019	Vermont Seam	<0.01	0.001	0.36	<0.0001	<0.001	0.005	0.001	3.34	<0.001	0.258	<0.0001	<0.001	0.003	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	15-Dec-2019	Vermont Seam	<0.01	0.002	0.38	<0.0001	<0.001	0.004	<0.001	3.48	<0.001	0.256	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	04-Feb-2020	Vermont Seam	<0.01	0.002	0.31	<0.0001	0.002	0.003	<0.001	3.97	<0.001	0.274	<0.0001	0.002	0.01	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	07-Apr-2020	Vermont Seam	<0.01	0.002	0.22	<0.0001	<0.001	0.004	<0.001	3.94	<0.001	0.282	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	02-Jun-2020	Vermont Seam	<0.01	0.002	0.3	<0.0001	<0.001	0.003	<0.001	3.7	<0.001	0.259	<0.0001	<0.001	0.001	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	17-Nov-2020	Vermont Seam	<0.01	0.001	0.28	<0.0001	<0.001	<0.001	<0.001	2.63	<0.001	0.266	<0.0001	0.027	0.001	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	08-Feb-2021	Vermont Seam	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	1.21	<0.001	0.261	<0.0001	0.033	0.005	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	09-Feb-2021	Vermont Seam	<0.01	<0.001	0.29	<0.0001	<0.001	0.001	<0.001	1.93	<0.001	0.252	<0.0001	0.019	0.009	<0.01	<0.001	<0.001	<0.01	0.013
2375-MB2	20-Apr-2021	Vermont Seam	<0.01	<0.001	0.09	<0.0001	<0.001	<0.001	<0.001	0.97	<0.001	0.184	<0.0001	0.071	0.006	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	11-May-2021	Vermont Seam	<0.01	<0.001	0.09	<0.0001	<0.001	<0.001	0.001	0.66	<0.001	0.176	<0.0001	0.037	0.004	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	17-Aug-2021	Vermont Seam	<0.01	<0.001	0.1	0.0002	<0.001	<0.001	<0.001	0.5	<0.001	0.22	<0.0001	0.018	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	21-Sep-2021	Vermont Seam	<0.01	<0.001	0.13	<0.0001	<0.001	<0.001	<0.001	0.29	<0.001	0.206	<0.0001	0.027	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	17-Nov-2021	Vermont Seam	<0.01	<0.001	0.11	<0.0001	<0.001	<0.001	<0.001	0.21	<0.001	0.184	<0.0001	0.027	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	12-Jan-2022	Vermont Seam	<0.01	<0.001	0.21	<0.0001	<0.001	<0.001	0.001	0.27	<0.001	0.19	<0.0001	0.025	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	15-Mar-2022	Vermont Seam	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	0.166	<0.0001	0.026	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	31-May-2022	Vermont Seam	<0.01	<0.001	0.17	<0.0001	<0.001	<0.001	<0.001	0.19	<0.001	0.18	<0.0001	0.024	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	19-Jul-2022	Vermont Seam	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	<0.001	0.21	<0.001	0.182	<0.0001	0.019	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2375-MB2	29-Sep-2022	Vermont Seam	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	0.32	<0.001	0.198	<0.0001	0.012	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	16-Feb-2018	Leichhardt Seam	<0.01	0.002	0.46	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.202	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	0.015
2393-MB2	24-Mar-2018	Leichhardt Seam	<0.01	0.002	0.48	<0.0001	<0.001	<0.001	<0.001	0.2	<0.001	0.184	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	27-Jul-2018	Leichhardt Seam	<0.01	0.002	0.48	<0.0001	<0.001	NM	<0.001	0.18	<0.001	0.172	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	21-Sep-2018	Leichhardt Seam	<0.01	0.002	0.5	<0.0001	<0.001	NM	<0.001	0.17	<0.001	0.165	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	22-Feb-2019	Leichhardt Seam	<0.01	0.002	0.42	<0.0001	<0.001	<0.001	0.001	0.14	<0.001	0.162	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.016
2393-MB2	24-Jun-2019	Leichhardt Seam	<0.01	0.001	0.43	<0.0001	<0.001	<0.001	<0.001	0.11	<0.001	0.155	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	04-Sep-2019	Leichhardt Seam	<0.01	0.002	0.49	<0.0001	<0.001	<0.001	<0.001	0.11	<0.001	0.161	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	30-Oct-2019	Leichhardt Seam	<0.01	0.002	0.35	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.158	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	11-Dec-2019	Leichhardt Seam	0.01	0.001	0.35	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.15	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	10-Feb-2020	Leichhardt Seam	<0.01	<0.001	0.05	<0.0001	<0.001	<0.001	<0.001	0.53	<0.001	0.045	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	08-Apr-2020	Leichhardt Seam	<0.01	0.001	0.35	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.176	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	03-Jun-2020	Leichhardt Seam	<0.01	0.001	0.47	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.161	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	18-Nov-2020	Leichhardt Seam	<0.01	0.001	0.42	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.164	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	02-Feb-2021	Leichhardt Seam	<0.01	0.003	0.6	<0.0001	<0.001	0.002	<0.001	0.07	<0.001	0.25	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	20-Apr-2021	Leichhardt Seam	<0.01	0.002	0.23	<0.0001	<0.001	<0.001	<0.001	0.25	<0.001	0.185	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	11-May-2021	Leichhardt Seam	<0.01	0.002	0.21	<0.0001	<0.001	<0.001	0.001	0.21	<0.001	0.173	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	17-Aug-2021	Leichhardt Seam	<0.01	0.002	0.38	<0.0001	<0.001	<0.001	<0.001	0.28	<0.001	0.19	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	21-Sep-2021	Leichhardt Seam	<0.01	0.002	0.43	<0.0001	<0.001	<0.001	<0.001	0.33	<0.001	0.182	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	17-Nov-2021	Leichhardt Seam	<0.01	0.004	0.21	<0.0001	<0.001	<0.001	<0.001	0.27	<0.001	0.114	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	17-Nov-2021	Leichhardt Seam	<0.01	0.004	0.24	<0.0001	<0.001	<0.001	<0.001	0.25	<0.001	0.111	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	13-Jan-2022	Leichhardt Seam	<0.01	0.004	0.35	<0.0001	<0.001	<0.001	<0.001	0.49	<0.001	0.138	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	15-Mar-2022	Leichhardt Seam	<0.01	0.002	0.45	<0.0001	<0.001	<0.001	<0.001	0.34	<0.001	0.16	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	01-Jun-2022	Leichhardt Seam	<0.01	0.002	0.43	<0.0001	<0.001	<0.001	<0.001	0.47	<0.001	0.176	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	20-Jul-2022	Leichhardt Seam	<0.01	0.002	0.46	<0.0001	<0.001	<0.001	<0.001	0.54	<0.001	0.19	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	29-Sep-2022	Leichhardt Seam	<0.01	0.002	0.45	<0.0001	<0.001	<0.001	<0.001	0.39	<0.001	0.179	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	16-Feb-2018	Vermont Lower Seam	<0.01	<0.001	0.36	<0.0001	<0.001	<0.001	<0.001	1.35	<0.001	0.081	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	21-Mar-2018	Vermont Lower Seam	<0.01	<0.001	0.4	<0.0001	<0.001	<0.001	<0.001	1.58	<0.001	0.11	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	28-Jul-2018	Vermont Lower Seam	<0.01	<0.001	0.39	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.121	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB3	23-Sep-2018	Vermont Lower Seam	<0.01	<0.001	0.38	<0.0001	<0.001	NM	<0.001	1.16	<0.001	0.09	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB3	22-Feb-2019	Vermont Lower Seam	<0.01	<0.001	0.32	<0.0001	<0.001	<0.001	<0.001	1.54	<0.001	0.126	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.01
2393-MB3	24-Jun-2019	Vermont Lower Seam	<0.01	<0.001	0.33	<0.0001	<0.001	<0.001	<0.001	1.47	<0.001	0.121	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.013
2393-MB3	04-Sep-2019	Vermont Lower Seam	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	1.28	<0.001	0.121	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.016
2393-MB3	11-Dec-2019	Vermont Lower Seam	<0.01	<0.001	0.24	<0.0001	<0.001	<0.001	<0.001	1.41	<0.001	0.112	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.011
2393-MB3	10-Feb-2020	Vermont Lower Seam	<0.01	0.001	0.34	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.156	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	08-Apr-2020	Vermont Lower Seam	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	1.41	<0.001	0.103	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	03-Jun-2020	Vermont Lower Seam	<0.01	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	1.34	<0.001	0.092	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	18-Nov-2020	Vermont Lower Seam	<0.01	<0.001	0.34	<0.0001	<0.001	<0.001	<0.001	2.06	<0.001	0.151	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.014

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-4: Dissolved Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Dissolved Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2393-MB3	02-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.59	<0.0005	<0.005	<0.005	<0.005	1.41	<0.005	0.132	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2393-MB3	20-Apr-2021	Vermont Lower Seam	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	1.66	<0.001	0.099	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB3	11-May-2021	Vermont Lower Seam	<0.05	<0.005	0.45	<0.0005	<0.005	<0.005	<0.005	1.89	<0.005	0.127	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2393-MB3	17-Aug-2021	Vermont Lower Seam	<0.01	0.001	0.27	0.0003	<0.001	<0.001	<0.001	2.32	<0.001	0.168	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.008
2393-MB3	21-Sep-2021	Vermont Lower Seam	<0.01	<0.001	0.36	<0.0001	<0.001	<0.001	<0.001	1.69	<0.001	0.168	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.008
2393-MB3	17-Nov-2021	Vermont Lower Seam	<0.01	<0.001	0.37	<0.0001	<0.001	<0.001	<0.001	1.6	<0.001	0.154	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB3	12-Jan-2022	Vermont Lower Seam	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	0.001	1.63	<0.001	0.162	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	15-Mar-2022	Vermont Lower Seam	<0.01	<0.001	0.37	<0.0001	<0.001	<0.001	<0.001	1.28	<0.001	0.144	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB3	01-Jun-2022	Vermont Lower Seam	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	1.6	<0.001	0.147	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.007
2393-MB3	20-Jul-2022	Vermont Lower Seam	<0.01	0.001	0.42	<0.0001	<0.001	<0.001	<0.001	1.79	<0.001	0.159	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.005
2393-MB3	29-Sep-2022	Vermont Lower Seam	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	1.55	<0.001	0.146	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	17-Feb-2018	Permian coal measures	0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.2	<0.001	0.043	<0.0001	0.004	0.001	<0.01	<0.001	0.002	<0.01	<0.005
West-MB2	20-Mar-2018	Permian coal measures	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.14	<0.001	0.046	<0.0001	0.002	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
West-MB2	27-Jul-2018	Permian coal measures	<0.01	<0.001	0.49	<0.0001	<0.001	NM	<0.001	0.06	<0.001	0.035	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB2	13-Sep-2018	Permian coal measures	<0.01	<0.001	0.47	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.031	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB2	24-Feb-2019	Permian coal measures	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.022	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	26-May-2019	Permian coal measures	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.022	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	01-Aug-2019	Permian coal measures	<0.01	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.021	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	25-Oct-2019	Permian coal measures	<0.01	<0.001	0.51	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.016	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	10-Dec-2019	Permian coal measures	<0.01	<0.001	0.37	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.016	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	11-Feb-2020	Permian coal measures	<0.01	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.024	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	22-Apr-2020	Permian coal measures	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.019	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	10-Jun-2020	Permian coal measures	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.018	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	19-Nov-2020	Permian coal measures	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.038	<0.0001	0.002	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB2	03-Feb-2021	Permian coal measures	<0.01	<0.001	0.37	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.046	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	22-Apr-2021	Permian coal measures	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.034	<0.0001	0.002	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB2	12-May-2021	Permian coal measures	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.036	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	18-Aug-2021	Permian coal measures	<0.01	<0.001	0.36	0.0002	<0.001	<0.001	<0.001	0.07	<0.001	0.03	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	21-Sep-2021	Permian coal measures	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	0.16	<0.001	0.032	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	17-Nov-2021	Permian coal measures	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.022	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	12-Jan-2022	Permian coal measures	<0.01	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.031	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	15-Mar-2022	Permian coal measures	<0.01	<0.001	0.51	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.026	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	01-Jun-2022	Permian coal measures	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.03	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	19-Jul-2022	Permian coal measures	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.02	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
West-MB2	28-Sep-2022	Permian coal measures	<0.01	<0.001	0.58	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.03	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W1_MB1	20/Oct/2020	Tertiary sediments	0.24	<0.001	<0.05	<0.0001	<0.001	0.003	0.004	0.37	<0.001	0.096	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.01
W1_MB1	09/Dec/2020	Tertiary sediments	0.34	<0.001	0.62	<0.0001	0.001	0.002	0.047	1.28	<0.001	0.078	<0.0001	<0.001	0.063	<0.01	<0.001	0.002	<0.01	0.061
W1_MB1	05/Jan/2021	Tertiary sediments	0.22	<0.001	0.98	<0.0001	0.001	0.003	0.008	0.84	<0.001	0.072	<0.0001	<0.001	0.145	<0.01	<0.001	0.005	<0.01	0.016
W1_MB1	26/Jan/2021	Tertiary sediments	0.05	<0.001	1.19	<0.0001	<0.001	0.002	0.007	0.56	<0.001	0.072	<0.0001	0.001	0.125	<0.01	<0.001	0.007	<0.01	0.008
W1_MB1	17/Feb/2021	Tertiary sediments	<0.05	<0.005	1.76	<0.0005	<0.005	<0.005	<0.005	0.62	<0.005	0.075	<0.0001	<0.005	0.106	<0.05	<0.005	0.008	<0.05	<0.026
W1_MB1	24/Mar/2021	Tertiary sediments	0.08	<0.005	2.37	<0.0005	<0.005	<0.005	0.018	0.52	<0.005	0.081	<0.0001	<0.005	0.095	<0.05	<0.005	0.01	<0.05	<0.026
W1_MB1	14/Apr/2021	Tertiary sediments	<0.05	<0.005	2.07	<0.0005	<0.005	<0.005	0.07	0.55	<0.005	0.09	<0.0001	<0.005	0.13	<0.05	<0.005	0.008	<0.05	0.04
W1_MB1	26/May/2021	Tertiary sediments	0.21	<0.005	2.29	<0.0005	0.006	0.006	1.02	0.87	<0.005	0.09	<0.0001	<0.005	0.194	<0.05	<0.005	0.01	<0.05	0.465
W1_MB1	29/Jun/2021	Tertiary sediments	0.17	<0.005	2.06	<0.0005	<0.005	<0.005	0.024	0.62	<0.005	0.119	<0.0005	<0.005	0.01	<0.05	<0.005	0.01	<0.05	0.052
W1_MB1	26/Jul/2021	Tertiary sediments	0.17	<0.001	1.68	<0.0001	<0.001	0.003	0.043	0.84	<0.001	0.13	<0.0001	<0.001	0.014	<0.01	<0.001	0.009	<0.01	0.053
W1_MB1	24/Aug/2021	Tertiary sediments	0.15	<0.005	1.68	<0.0005	<0.005	<0.005	0.019	0.53	<0.005	0.111	<0.0001	<0.005	0.009	<0.05	<0.005	0.008	<0.05	<0.024
W1_MB1	14/Sep/2021	Tertiary sediments	<0.05	<0.005	2.27	<0.0005	<0.005	<0.005	0.011	0.45	<0.005	0.112	<0.0001	<0.005	0.01	<0.05	<0.005	0.009	<0.05	<0.026
W1_MB1	19/Oct/2021	Tertiary sediments	0.58	<0.005	1.84	<0.0005	<0.005	<0.005	0.02	2.03	<0.005	0.257	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	0.062
W1_MB1	16/Nov/2021	Tertiary sediments	0.13	<0.005	1.8	<0.0005	<0.005	<0.005	<0.005	0.52	<0.005	0.298	<0.0001	<0.005	<0.005	<0.05	<0.005	0.009	<0.05	<0.026
W1_MB1	09/Dec/2021	Tertiary sediments	0.6	<0.005	2.17	<0.0005	<0.005	0.009	0.017	1.87	<0.005	0.654	<0.0001	<0.005	0.008	<0.05	<0.005	0.01	<0.05	0.071
W1_MB1	25/Jan/2022	Tertiary sediments	0.05	<0.005	2.16	<0.0005	<0.005	<0.005	<0.005	0.37	<0.005	0.506	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.026
W1_MB1	15/Feb/2022	Tertiary sediments	<0.05	<0.005	2.08	<0.0005	<0.005	<0.005	<0.005	0.21	<0.005	0.426	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.026
W1_MB1	16/Mar/2022	Tertiary sediments	<0.05	<0.005	2.11	<0.0005	<0.005	<0.005	<0.005	0.19	<0.005	0.345	<0.0005	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.026
W1_MB1	03/May/2022	Tertiary sediments	0.1	<0.005	2.2	<0.0005	<0.005	0.009	0.013	0.57	<0.005	0.239	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.026
W1_MB1	31/May/2022	Tertiary sediments	<0.05	<0.005	1.56	<0.0005	<0.005	<0.005	<0.005	0.15	<0.005	0.259	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.026
W1_MB1	22/Jun/2022	Tertiary sediments	0.08	<0.005	2.49	<0.0005	<0.005	0.008	0.022	0.34	<0.005	0.159	<0.0001	<0.005	0.006	<0.05	<0.005	0.011	<0.05	<0.026
W1_MB1	20/Jul/2022	Tertiary sediments	0.15	<0.005	2.31	<0.0005	<0.005	<0.005	0.01	0.15	<0.005	0.153	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.026
W1_MB1	31/Aug/2022	Tertiary sediments	<0.05	<0.005	3.03	<0.0005	<0.005	0.005	0.007	0.4	<0.005	0.127	<0.0001	<0.005	<0.005	<0.05	<0.005	0.011	<0.05	<0.026
W1_MB1	06/Oct/2022	Tertiary sediments	0.06	<0.005	2.9	<0.0005	<0.005	0.008	0.013	0.3	<0.005	0.093	<0.0001	<0.005	0.009	<0.05	<0.005	0.012	<0.05	<0.026
W12_MB1	20/Oct/2020	Tertiary sediments	0.2	<0.001	0.41	<0.0001	0.006	0.008	0.007	0.23	<0.001	0.315	<0.0001	0.02	0.003	<0.01	<0.001	0.024	<0.01	0.021
W12_MB1	09/Dec/2020	Tertiary sediments	0.25	<0.001	0.53	<0.0001	0.004	0.002	0.008	0.28	<0.001	0.335	<0.0001	0.008	0.015	<0.01	<0.001	0.024	<0.01	0.017
W12_MB1	05/Jan/2021	Tertiary sediments	0.12	<0.001	0.47	<0.0001	0.004	0.004	0.009	0.77	<0.001	0.46	<0.0001	0.012	0.008	<0.01	<0.001	0.026	<0.01	0.022
W12_MB1	26/Jan/2021	Tertiary sediments	0.15	<0.001	0.45	<0.0001	0.005	0.005	0.018	1.07	<0.001	0.546	<0.0001	0.015	0.008	<0.01	<0.001	0.026	<0.01	0.035
W12_MB1	17/Feb/2021	Tertiary sediments	0.14	<0.005	0.41	<0.0005	<0.005	<0.005	0.014	2.09	<0.005	0.602	<0.0001	0.012	0.006	<0.05	<0.005	0.024	<0.05	0.032
W12_MB1	24/Mar/2021	Tertiary sediments	0.25	<0.001	0.32	<0.0001	0.006	0.005	0.012	4.26	<0.001	0.594	<0.0001	0.011	0.004	<0.01	<0.001	0.022	<0.01	0.025
W12_MB1	14/Apr/2021	Tertiary sediments	0.39	<0.001	0.38	<0.0001	0.011	0.004	0.034	2.67	<0.001	0.398	<0.0001	0.015	0.005	<0.01	<0.001	0.022	<0.01	0.041
W12_MB1	26/May/2021	Tertiary sediments	0.22	<0.005	0.5	<0.0005	0.007	<0.005	0.024	2.7	<0.005	0.489	<0.0001	0.012	<0.005	<0.05	<0.005	0.023	<0.05	<0.026
W12_MB1	29/Jun/2021	Tertiary sediments	1.57	0.002	0.4	<0.0001	0.008	0.006	0.074	3.6	0.001	0.574	<0.0001	0.014	0.013	<0.01	<0.001	0.024	<0.01	0.155
W12_MB1	26/Jul/2021	Tertiary sediments	0.45	0.001	0.38	<0.0001	0.005	0.005	0.026	2.2	<0.001	0.612	<0.0001	0.014	0.012	<0.01	<0.001	0.026	<0.01	0.114
W12_MB1	24/Aug/2021	Tertiary sediments	0.3	<0.005	0.47	<0.0005	<0.005	0.005	0.012	0.9	<0.005	0.574	<0.0001	0.014	0.007	<0.05	<0.005	0.026	<0.05	0.044
W12_MB1	15/Sep/2021	Tertiary sediments	0.3	0.001	0.39	<0.0001	0.006	0.005	0.014	0.89	<0.001	0.591	<0.0001	0.015	0.006	<0.01	<0.001	0.027	<0.01	0.04
W12_MB1	19/Oct/2021	Tertiary sediments	1.38	0.002	0.27	<0.0001	0.006	0.006	0.013	1.91	0.002	0.643	<0.0001	0.008	0.008	<0.01	<0.001	0.026	<0.01	0.053
W12_MB1	16/Nov/2021	Tertiary sediments	0.72	0.001	0.52	<0.0001	0.005	0.006	0.01	1.56	<0.001	0.944	<0.0001	0.01	0.007	<0.01	<0.001	0.031	<0.01	0.036
W12_MB1	09/Dec/2021	Tertiary sediments	0.3	<0.001	0.34	<0.0001	0.002	0.004	0.003	0.98	<0.001	0.833	<0.0001	0.01	0.003	<0.01	<0.001	0.026	<0.01	0.019
W12_MB1	25/Jan/2022	Tertiary sediments	0.27	<0.001	0.45	<0.0001	0.003	0.005	0.001	1.24	<0.001	0.958	<0.0001	0.009	<0.001	<0.01	<0.001	0.024	<0.01	0.009
W12_MB1	22/Feb/2022	Tertiary sediments	0.2	<0.001	0.56	<0.0001	0.003	0.003	0.002	0.94	<0.001	0.91	<0.0001	0.009	0.003	<0.01	<0.001	0.025	<0.01	0.014
W12_MB1	16/Mar/2022	Tertiary sediments	0.2	<0.005	0.52	<0.0005	<0.005	<0.005	<0.005	0.98	<0.005	0.878	<0.0001	0.01	<0.005	<0.05	<0.005	0.026	<0.05	<0.026
W12_MB1	03/May/2022	Tertiary sediments	0.31	0.001	0.55	<0.0001	0.004	0.005	0.006	1.14	<0.001	0.751	<0.0001	0.012	0.004	<0.01	<0.001	0.025	<0.01	0.018
W12_MB1	31/May/2022	Tertiary sediments	0.2	0.001	0.46	<0.0001	0.004	0.005	0.006	1.06	<0.001	0.794	<0.0001	0.012	0.004	<0.01	<0.001	0.027	<0.01	0.018
W12_MB1	22/Jun/2022	Tertiary sediments	0.17	<0.001	0.56	<0.0001	0.004	0.006	0.003	0.91	<0.001	0.737	<0.0001	0.012	0.004	<0.01	<0.001	0.027	<0.01	0.017
W12_MB1	20/Jul/2022	Tertiary sediments	0.2	0.001	0.54	<0.0001	0.003	0.004	0.004	0.7	<0.001	0.641	<0.0001	0.011	0.003	<0.01	<0.001	0.026	<0.01	0.008
W12_MB1	31/Aug/2022	Tertiary sediments	0.21	<0.001	0.41	0.0001	0.003	0.002	0.004	0.58	<0.001	0.699	<0.0001	0.01	0.002	<0.01	<0.001	0.024	<0.01	0.015
W12_MB1	04/Oct/2022	Tertiary sediments	0.09	<0.001	0.56	<0.0001	0.002	0.004	0.002	0.46	<0.001	0.65	<0.0001	0.011	0.004	<0.01	<0.001	0.026	<0.01	0.016
W14_MB1	20/Oct/2020	Tertiary sediments	0.05	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	0.11	<0.001	0.016	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
W14_MB1	16/Dec/2020	Tertiary sediments	0.5	<0.001	0.05	<0.0001	0.002	<0.001	0.004	0.67	<0.001	0.052	<0.0001	<0.001	0.008	<0.01	<0.001	<0.001	<0.01	0.027
W14_MB1	26/Jan/2021	Tertiary sediments	0.97	<0.001	0.16	<0.0001	0.003	0.002	0.005	1.48	<0.001	0.178	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	0.017
W14_MB1	17/Feb/2021	Tertiary sediments	1.25	<0.001	0.12	<0.0001	0.004	0.002	0.005	1.48	<0.001	0.137	<0.0001	<0.001	0.009	<0.01	<0.001	<0.001	<0.01	0.022
W14_MB1	24/Mar/2021	Tertiary sediments	1.56	<0.001	0.11	<0.0001	0.009	0.002	0.008	2.07	<0.001	0.122	<0.0001	0.004	0.029	<0.01	<0.001	<0.001	<0.01	0.015
W14_MB1	14/Apr/2021	Tertiary sediments	1.29	<0.001	0.12	<0.0001	0.004	0.001	0.01	1.22	<0.001	0.104	<0.0001	<0.001	0.008	<0.01	<0.001	<0.001	<0.01	0.011
W14_MB1	26/May/2021	Tertiary sediments	1.33	<0.001	0.08	<0.0001	0.004	0.002	0.017	1.52	<0.001	0.106	<0.0001	<0.001	0.012	<0.01	<0.001	<0.001	<0.01	0.025
W14_MB1	29/Jun/2021	Tertiary sediments	1.94	0.001	0.06	<0.0001	0.004	0.002	0.006	1.41	<0.001	0.116	<0.0001	<0.001	0.018	<0.01	<0.001	<0.001	<0.01	0.012
W14_MB1	26/Jul/2021	Tertiary sediments	1	<0.001	0.08	<0.0001	0.003	0.002	0.008	1.18	<0.001	0.104	<0.0001	<0.001	0.031	<0.01	<0.001	<0.001	<0.01	0.024
W14_MB1	24/Aug/2021	Tertiary sediments	1.86	<0.001	0.06	<0.0001	0.006	0.002	0.007	2.14	0.001	0.097	<0.0001	<0.001	0.008	<0.01	<0.001	<0.001	<0.01	0.009
W14_MB1	15/Sep/2021	Tertiary sediments	2.36	<0.001	0.08	<0.0001	0.008	0.002	0.006	2.84	0.001	0.116	<0.0001	<0.001	0.008	<0.01	<0.001	<0.001	<0.01	0.013
W14_MB1	19/Oct/2021	Tertiary sediments	1.47	<0.001	0.07	<0.0001	0.005	0.002	0.005	2.08	0.001	0.116	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.011
W14_MB1	16/Nov/2021	Tertiary sediments	1.32	<0.001	0.06	<0.0001	0.004	0.002	0.005	1.63	<0.001	0.12	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.012
W14_MB1	09/Dec/2021	Tertiary sediments	0.91	<0.001	0.07	<0.0001	0.003	0.002	0.002	1.13	<0.001	0.158	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.01
W14_MB1	25/Jan/2022	Tertiary sediments	2.04	<0.001	0.11	<0.0001	0.008	0.003	0.003	2.92	0.001	0.22	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.007
W14_MB1	22/Feb/2022	Tertiary sediments	0.84	<0.001	0.13	<0.0001	0.003	0.002	0.001	1.04	<0.001	0.158	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	16/Mar/2022	Tertiary sediments	1.55	<0.001	0.12	<0.0001	0.005	0.002	0.003	1.8	<0.001	0.147	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.01
W14_MB1	03/May/2022	Tertiary sediments	1.25	<0.001	0.14	<0.0001	0.004	0.002	0.002	1.63	<0.001	0.129	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.006
W14_MB1	31/May/2022	Tertiary sediments	1.97	<0.001	0.12	<0.0001	0.006	0.003	0.004	2.33	0.001	0.211	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	0.008

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W14_MB1	22/Jun/2022	Tertiary sediments	1.09	<0.001	0.14	<0.0001	0.005	0.001	0.006	1.47	0.001	0.135	<0.0001	<0.001	0.008	<0.01	<0.001	0.001	<0.01	0.029
W14_MB1	20/Jul/2022	Tertiary sediments	2.05	<0.001	0.15	<0.0001	0.008	0.001	0.004	2.23	0.002	0.049	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	<0.005
W14_MB1	31/Aug/2022	Tertiary sediments	4.17	<0.001	0.08	<0.0001	0.018	0.003	0.006	4.5	0.002	0.184	<0.0001	<0.001	0.01	<0.01	<0.001	<0.001	0.01	0.017
W14_MB1	04/Oct/2022	Tertiary sediments	0.2	<0.005	0.56	<0.0005	<0.005	0.006	<0.005	1.4	<0.005	1.02	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB1	20/Oct/2020	Tertiary sediments	0.15	<0.001	0.13	<0.0001	<0.001	<0.001	0.012	0.18	<0.001	0.039	<0.0001	0.001	0.008	<0.01	<0.001	<0.001	<0.01	0.045
W2_MB1	09/Dec/2020	Tertiary sediments	0.12	<0.001	0.9	<0.0001	<0.001	0.002	0.012	0.5	<0.001	0.079	<0.0001	0.001	0.231	<0.01	<0.001	0.003	<0.01	0.078
W2_MB1	05/Jan/2021	Tertiary sediments	0.05	<0.001	1.13	<0.0001	<0.001	0.002	0.01	0.41	<0.001	0.049	<0.0001	<0.001	0.114	<0.01	<0.001	0.006	<0.01	0.028
W2_MB1	26/Jan/2021	Tertiary sediments	0.12	0.001	1.38	<0.0001	<0.001	0.001	0.011	2.25	<0.001	0.043	<0.0001	0.001	0.051	<0.01	<0.001	0.007	<0.01	0.035
W2_MB1	17/Feb/2021	Tertiary sediments	0.27	<0.005	2.28	<0.0005	<0.005	<0.005	0.01	3.28	<0.005	0.041	<0.0001	<0.005	0.217	<0.05	<0.005	0.008	<0.05	0.039
W2_MB1	24/Mar/2021	Tertiary sediments	0.13	<0.005	2.61	<0.0005	<0.005	<0.005	0.006	5.67	<0.005	0.038	<0.0001	<0.005	0.05	<0.05	<0.005	0.009	<0.05	<0.026
W2_MB1	14/Apr/2021	Tertiary sediments	0.17	<0.005	2.28	<0.0005	<0.005	<0.005	0.01	6.25	<0.005	0.047	<0.0001	<0.005	0.034	<0.05	<0.005	0.007	<0.05	0.067
W2_MB1	26/May/2021	Tertiary sediments	0.18	<0.005	2.37	<0.0005	<0.005	<0.005	0.025	5.19	<0.005	0.04	<0.0001	<0.005	0.027	<0.05	<0.005	0.008	<0.05	0.038
W2_MB1	29/Jun/2021	Tertiary sediments	1.58	0.002	1.36	<0.0001	0.004	0.011	0.014	5.22	0.001	0.286	<0.0001	<0.001	0.039	<0.01	<0.001	0.006	<0.01	0.054
W2_MB1	26/Jul/2021	Tertiary sediments	2.79	<0.005	1.82	<0.0005	0.007	0.008	0.01	3.67	0.009	0.141	<0.0001	<0.005	0.391	<0.05	<0.005	0.008	<0.05	0.074
W2_MB1	24/Aug/2021	Tertiary sediments	0.75	<0.005	1.96	<0.0005	<0.005	<0.005	<0.005	2.32	<0.005	0.081	<0.0001	<0.005	0.05	<0.05	<0.005	0.008	<0.05	<0.024
W2_MB1	14/Sep/2021	Tertiary sediments	0.8	<0.005	2.76	<0.0005	<0.005	<0.005	<0.005	2.11	<0.005	0.068	<0.0001	<0.005	0.022	<0.05	<0.005	0.009	<0.05	<0.026
W2_MB1	19/Oct/2021	Tertiary sediments	1.36	<0.005	1.85	<0.0005	<0.005	0.007	0.006	3.86	<0.005	0.155	<0.0001	<0.005	0.017	<0.05	<0.005	0.008	<0.05	0.055
W2_MB1	16/Nov/2021	Tertiary sediments	0.58	<0.005	2.12	<0.0005	<0.005	<0.005	<0.005	1.65	<0.005	0.128	<0.0001	<0.005	0.012	<0.05	<0.005	0.009	<0.05	<0.026
W2_MB1	09/Dec/2021	Tertiary sediments	0.65	<0.005	2.27	<0.0005	<0.005	<0.005	<0.005	1.86	<0.005	0.109	<0.0001	<0.005	0.011	<0.05	<0.005	0.009	<0.05	0.026
W2_MB1	25/Jan/2022	Tertiary sediments	0.56	<0.005	2.42	<0.0005	<0.005	<0.005	<0.005	1.72	<0.005	0.103	<0.0001	<0.005	0.015	<0.05	<0.005	0.009	<0.05	<0.026
W2_MB1	22/Feb/2022	Tertiary sediments	1.64	<0.005	2.43	<0.0005	0.007	<0.005	<0.005	1.47	<0.005	0.089	<0.0001	<0.005	0.009	<0.05	<0.005	0.01	<0.05	<0.026
W2_MB1	16/Mar/2022	Tertiary sediments	0.65	<0.005	2.04	<0.0005	<0.005	<0.005	<0.005	1.8	<0.005	0.092	<0.0001	<0.005	<0.005	<0.05	<0.005	0.01	<0.05	<0.026
W2_MB1	03/May/2022	Tertiary sediments	0.69	<0.005	2.42	<0.0005	0.006	<0.005	<0.005	1.78	<0.005	0.075	<0.0001	<0.005	0.026	<0.05	<0.005	0.01	<0.05	<0.026
W2_MB1	31/May/2022	Tertiary sediments	0.88	<0.005	2.47	<0.0005	<0.005	0.007	<0.005	0.8	<0.005	0.065	<0.0001	<0.005	0.075	<0.05	<0.005	0.01	<0.05	0.068
W2_MB1	22/Jun/2022	Tertiary sediments	0.5	<0.005	2.69	<0.0005	0.006	<0.005	<0.005	1.34	<0.005	0.059	<0.0001	<0.005	0.045	<0.05	<0.005	0.01	<0.05	0.048
W2_MB1	20/Jul/2022	Tertiary sediments	0.44	<0.005	2.47	<0.0005	<0.005	<0.005	0.007	1.06	<0.005	0.07	<0.0001	<0.005	0.025	<0.05	<0.005	0.009	<0.05	0.028
W2_MB1	31/Aug/2022	Tertiary sediments	0.29	<0.005	2.58	<0.0005	<0.005	<0.005	0.009	0.75	<0.005	0.058	<0.0001	<0.005	0.08	<0.05	<0.005	0.011	<0.05	0.031
W2_MB1	04/Oct/2022	Tertiary sediments	0.46	<0.005	2.81	<0.0005	<0.005	<0.005	<0.005	0.95	<0.005	0.048	<0.0001	<0.005	0.033	<0.05	<0.005	0.009	<0.05	0.03
W3_MB2	20/Oct/2020	Tertiary sediments	0.36	<0.001	0.63	0.0001	0.003	<0.001	0.008	0.38	<0.001	0.03	<0.0001	<0.001	0.007	<0.01	<0.001	0.003	<0.01	0.158
W3_MB2	09/Dec/2020	Tertiary sediments	0.16	<0.001	0.64	<0.0001	0.003	<0.001	0.006	0.42	<0.001	0.028	<0.0001	<0.001	0.026	<0.01	<0.001	0.003	<0.01	0.161
W3_MB2	05/Jan/2021	Tertiary sediments	0.08	<0.001	0.78	<0.0001	0.002	<0.001	0.006	0.41	<0.001	0.023	<0.0001	<0.001	0.027	<0.01	<0.001	0.004	<0.01	0.065
W3_MB2	26/Jan/2021	Tertiary sediments	0.15	<0.001	0.9	<0.0001	0.003	0.001	0.007	0.41	<0.001	0.026	<0.0001	<0.001	0.197	<0.01	<0.001	0.004	<0.01	0.09
W3_MB2	17/Feb/2021	Tertiary sediments	0.04	<0.001	0.55	<0.0001	0.002	<0.001	0.004	0.54	<0.001	0.028	<0.0001	<0.001	0.064	<0.01	<0.001	0.002	<0.01	0.042
W3_MB2	24/Mar/2021	Tertiary sediments	0.14	<0.001	0.8	0.0002	0.002	0.002	0.009	0.42	<0.001	0.02	<0.0001	<0.001	0.407	<0.01	<0.001	0.004	<0.01	0.103
W3_MB2	14/Apr/2021	Tertiary sediments	0.2	<0.001	1.22	<0.0001	0.003	<0.001	0.009	0.34	<0.001	0.018	<0.0001	<0.001	0.331	<0.01	<0.001	0.004	<0.01	0.057
W3_MB2	26/May/2021	Tertiary sediments	0.13	<0.001	0.37	0.0001	0.003	0.001	0.018	0.7	<0.001	0.039	<0.0001	<0.001	0.178	<0.01	<0.001	0.001	<0.01	0.026
W3_MB2	29/Jun/2021	Tertiary sediments	2.56	<0.001	0.88	0.0001	0.005	0.002	0.019	1.76	0.002	0.054	<0.0001	<0.001	0.584	<0.01	<0.001	0.004	<0.01	0.136
W3_MB2	26/Jul/2021	Tertiary sediments	0.88	<0.001	0.98	<0.0001	0.003	0.002	0.007	1	<0.001	0.052	<0.0001	<0.001	0.23	<0.01	<0.001	0.004	<0.01	0.096
W3_MB2	24/Aug/2021	Tertiary sediments	2.65	<0.005	1.14	<0.0005	0.012	<0.005	0.007	1.24	<0.005	0.04	<0.0001	<0.005	0.054	<0.05	<0.005	<0.005	<0.05	0.043
W3_MB2	15/Sep/2021	Tertiary sediments	0.78	<0.001	0.98	<0.0001	0.011	<0.001	0.006	0.77	<0.001	0.034	<0.0001	<0.001	0.05	<0.01	<0.001	0.005	<0.01	0.034
W3_MB2	21/Oct/2021	Tertiary sediments	0.78	<0.001	0.94	<0.0001	0.002	0.002	0.003	1.56	<0.001	0.076	<0.0001	<0.001	0.032	<0.01	<0.001	0.005	<0.01	0.09
W3_MB2	16/Nov/2021	Tertiary sediments	0.75	<0.001	1.01	<0.0001	0.002	0.001	0.004	0.72	<0.001	0.046	<0.0001	<0.001	0.039	<0.01	<0.001	0.004	<0.01	0.032
W3_MB2	09/Dec/2021	Tertiary sediments	0.57	<0.001	0.71	<0.0001	0.002	0.002	0.006	0.54	<0.001	0.056	<0.0001	<0.001	0.046	<0.01	<0.001	0.004	<0.01	0.041
W3_MB2	25/Jan/2022	Tertiary sediments	0.54	<0.001	0.99	<0.0001	0.002	0.002	<0.001	0.3	<0.001	0.055	<0.0001	<0.001	0.048	<0.01	<0.001	0.004	<0.01	0.011
W3_MB2	22/Feb/2022	Tertiary sediments	0.52	<0.001	1.14	<0.0001	0.002	0.002	<0.001	0.37	<0.001	0.046	<0.0001	<0.001	0.032	<0.01	<0.001	0.004	<0.01	0.012
W3_MB2	16/Mar/2022	Tertiary sediments	0.59	<0.001	0.97	<0.0001	0.002	0.001	<0.001	0.33	<0.001	0.032	<0.0001	<0.001	0.032	<0.01	<0.001	0.005	<0.01	0.025
W3_MB2	03/May/2022	Tertiary sediments	0.47	<0.001	1.03	<0.0001	0.002	0.002	0.001	0.29	<0.001	0.033	<0.0001	<0.001	0.034	<0.01	<0.001	0.004	<0.01	0.025
W3_MB2	31/May/2022	Tertiary sediments	0.36	<0.001	1.16	<0.0001	0.002	0.001	0.002	0.35	<0.001	0.032	<0.0001	<0.001	0.028	<0.01	<0.001	0.005	<0.01	0.011
W3_MB2	22/Jun/2022	Tertiary sediments	0.52	<0.001	1.05	<0.0001	0.003	0.001	<0.001	0.49	<0.001	0.034	<0.0001	<0.001	0.032	<0.01	<0.001	0.005	<0.01	0.022
W3_MB2	20/Jul/2022	Tertiary sediments	0.79	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	0.41	<0.005	0.03	<0.0001	<0.005	0.033	<0.05	<0.005	<0.005	<0.05	<0.026
W3_MB2	31/Aug/2022	Tertiary sediments	0.72	<0.001	1.35	<0.0001	0.001	0.001	<0.001	0.17	<0.001	0.033	<0.0001	<0.001	0.036	<0.01	<0.001	0.004	<0.01	0.034
W3_MB2	04/Oct/2022	Tertiary sediments	0.43	<0.001	1.11	<0.0001	0.002	0.001	0.001	0.25	<0.001	0.033	<0.0001	<0.001	0.034	<0.01	<0.001	0.005	<0.01	0.022
W4_MB1	10/Mar/2021	Quaternary alluvium	0.13	0.037	0.57	<0.0001	0.001	0.003	0.005	5.97	<0.001	0.254	<0.0001	0.005	0.009	<0.01	<0.001	0.004	<0.01	0.029
W11_MB1	20/Oct/2020	Rewan Group	0.34	0.01	0.24	<0.0001	0.001	<0.001	0.004	1.78	<0.001	0.789	<0.0001	0.007	0.002	<0.01	<0.001	0.012	<0.01	0.02
W11_MB1	09/Dec/2020	Rewan Group	0.07	0.008	0.37	<0.0001	<0.001	<0.001	0.001	0.57	<0.001	0.785	<0.0001	0.027	0.002	<0.01	0.001	0.009	<0.01	0.008
W11_MB1	04/Jan/2021	Rewan Group	0.07	0.005	0.29	<0.0001	<0.001	<0.001	0.004	0.4	<0.001	0.564	<0.0001	0.048	0.002	<0.01	<0.001	0.005	<0.01	0.006
W11_MB1	28/Jan/2021	Rewan Group	0.07	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	0.68	<0.005	0.649	<0.0001	0.046	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	16/Feb/2021	Rewan Group	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	0.63	<0.005	0.584	<0.0001	0.043	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	10/Mar/2021	Rewan Group	0.02	0.002	0.24	<0.0001	<0.001	<0.001	<0.001	0.36	<0.001	0.616	<0.0001	0.044	0.001	<0.01	<0.001	0.004	<0.01	0.006
W11_MB1	14/Apr/2021	Rewan Group	0.03	0.001	0.21	<0.0001	<0.001	<0.001	<0.001	0.28	<0.001	0.474	<0.0001	0.053	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
W11_MB1	25/May/2021	Rewan Group	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	0.52	<0.005	0.616	<0.0001	0.062	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	29/Jun/2021	Rewan Group	1.92	<0.005	0.32	<0.0005	0.006	<0.005	0.007	4.7	<0.005	0.703	<0.0001	0.026	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	22/Jul/2021	Rewan Group	1.17	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	2.85	<0.005	0.666	<0.0001	0.032	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	24/Aug/2021	Rewan Group	1.93	<0.005	0.28	<0.0005	<0.005	<0.005	0.006	3.16	<0.005	0.601	<0.0001	0.024	<0.005	<0.05	<0.005	<0.005	<0.05	0.024
W11_MB1	14/Sep/2021	Rewan Group	1.14	0.002	0.18	<0.0001	0.003	0.001	0.013	3.51	<0.001	0.646	<0.0001	0.029	0.004	<0.01	<0.001	0.001	<0.01	0.018
W11_MB1	19/Oct/2021	Rewan Group	3.86	0.003	0.1	<0.0001	0.008	0.003	0.012	9.67	0.003	0.742	<0.0001	0.011	0.007	<0.01	<0.001	0.001	0.01	0.038
W11_MB1	16/Nov/2021	Rewan Group	0.61	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	1.44	<0.005	0.6	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W11_MB1	09/Dec/2021	Rewan Group	0.94	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	1.88	<0.005	0.608	<0.0001	0.009	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	25/Jan/2022	Rewan Group	0.55	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	1.42	<0.005	0.556	<0.0001	0.01	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	15/Feb/2022	Rewan Group	0.32	<0.005	0.34	<0.0005	<0.005	<0.005	<0.005	0.94	<0.005	0.505	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	16/Mar/2022	Rewan Group	0.54	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	1.45	<0.005	0.542	<0.0001	0.009	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	03/May/2022	Rewan Group	0.56	0.001	0.32	<0.0001	0.002	<0.001	0.003	1.6	<0.001	0.473	<0.0001	0.011	0.002	<0.01	<0.001	<0.001	<0.01	0.017
W11_MB1	31/May/2022	Rewan Group	0.43	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	1.13	<0.005	0.527	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	22/Jun/2022	Rewan Group	0.44	0.001	0.29	0.0002	0.003	0.001	0.003	1.49	<0.001	0.494	<0.0001	0.011	0.002	<0.01	<0.001	<0.001	<0.01	0.022
W11_MB1	20/Jul/2022	Rewan Group	0.58	<0.005	0.3	<0.0005	<0.005	<0.005	<0.005	1.33	<0.005	0.506	<0.0001	0.009	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB1	31/Aug/2022	Rewan Group	0.43	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	1.07	<0.005	0.508	<0.0001	0.007	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB1	21/Oct/2020	Rewan Group	0.32	0.002	0.74	<0.0001	0.085	0.001	0.002	2.09	<0.001	0.469	<0.0001	0.08	0.001	<0.01	<0.001	0.005	<0.01	0.006
W5_MB1	09/Dec/2020	Rewan Group	0.14	<0.001	1.26	<0.0001	0.001	0.003	0.004	0.5	<0.001	0.531	<0.0001	0.002	0.029	<0.01	<0.001	0.004	<0.01	0.058
W5_MB1	05/Jan/2021	Rewan Group	0.06	<0.001	1.06	<0.0001	<0.001	0.004	0.004	0.36	<0.001	0.478	<0.0001	<0.001	0.016	<0.01	<0.001	0.005	<0.01	0.018
W5_MB1	26/Jan/2021	Rewan Group	0.03	<0.001	1.07	<0.0001	<0.001	0.005	0.034	0.32	<0.001	0.486	<0.0001	0.001	0.126	<0.01	<0.001	0.004	<0.01	0.034
W5_MB1	16/Feb/2021	Rewan Group	0.14	<0.005	1.27	<0.0005	<0.005	<0.005	0.125	0.38	<0.005	0.507	<0.0001	<0.005	0.666	<0.05	<0.005	<0.005	<0.05	0.087
W5_MB1	16/Feb/2021	Rewan Group	0.12	<0.005	1.32	<0.0005	<0.005	<0.005	0.126	0.38	<0.005	0.515	<0.0001	<0.005	0.674	<0.05	<0.005	<0.005	<0.05	0.077
W5_MB1	10/Mar/2021	Rewan Group	0.12	0.001	1	<0.0001	<0.001	0.004	0.79	0.38	<0.001	0.513	<0.0001	<0.001	0.315	<0.01	<0.001	0.003	<0.01	0.324
W5_MB1	14/Apr/2021	Rewan Group	0.13	0.002	1.04	<0.0001	0.049	0.008	1.13	1.76	<0.001	0.446	<0.0001	0.002	0.525	<0.01	<0.001	0.002	<0.01	0.484
W5_MB1	25/May/2021	Rewan Group	0.16	<0.005	1.37	<0.0005	0.02	<0.005	0.485	1.27	<0.005	0.54	<0.0001	<0.005	0.066	<0.05	<0.005	<0.005	<0.05	0.127
W5_MB1	29/Jun/2021	Rewan Group	1.26	0.001	0.92	<0.0001	0.01	0.003	0.123	3.11	0.001	0.489	<0.0001	<0.001	0.049	<0.01	<0.001	0.002	<0.01	0.108
W5_MB1	26/Jul/2021	Rewan Group	0.59	0.002	0.98	<0.0001	0.016	0.004	0.606	1.91	<0.001	0.437	<0.0001	0.002	0.06	<0.01	<0.001	0.002	<0.01	0.345
W5_MB1	24/Aug/2021	Rewan Group	0.13	<0.005	1.01	<0.0005	<0.005	<0.005	0.051	0.61	<0.005	0.455	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	0.044
W5_MB1	14/Sep/2021	Rewan Group	0.13	<0.001	1	<0.0001	0.003	0.001	0.051	0.69	<0.001	0.465	<0.0001	<0.001	0.009	<0.01	<0.001	0.002	<0.01	0.042
W5_MB1	19/Oct/2021	Rewan Group	1.21	0.001	1	<0.0001	0.005	0.007	0.03	2.53	0.002	0.632	<0.0001	<0.001	0.01	<0.01	<0.001	0.002	<0.01	0.086
W5_MB1	16/Nov/2021	Rewan Group	0.09	<0.001	1.28	<0.0001	<0.001	0.005	0.004	0.7	<0.001	0.617	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	0.017
W5_MB1	09/Dec/2021	Rewan Group	0.07	<0.001	1.12	<0.0001	<0.001	0.004	0.002	0.55	<0.001	0.491	<0.0001	<0.001	0.002	<0.01	<0.001	0.001	<0.01	0.021
W5_MB1	25/Jan/2022	Rewan Group	0.35	0.002	1.1	<0.0001	0.002	0.008	0.013	1.15	<0.001	0.541	<0.0001	0.001	0.007	<0.01	<0.001	0.001	<0.01	0.118
W5_MB1	15/Feb/2022	Rewan Group	<0.05	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	0.51	<0.005	0.467	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB1	16/Mar/2022	Rewan Group	<0.05	<0.005	1.16	<0.0005	<0.005	<0.005	<0.005	0.48	<0.005	0.461	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB1	03/May/2022	Rewan Group	0.2	0.001	1.1	<0.0001	0.001	0.005	0.009	0.88	<0.001	0.43	<0.0001	<0.001	0.004	<0.01	<0.001	0.001	<0.01	0.063
W5_MB1	31/May/2022	Rewan Group	0.18	<0.005	1.43	<0.0005	<0.005	<0.005	<0.005	0.4	<0.005	0.453	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.027
W5_MB1	22/Jun/2022	Rewan Group	0.12	<0.005	1.47	<0.0005	<0.005	<0.005	0.006	0.87	<0.005	0.424	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB1	20/Jul/2022	Rewan Group	<0.05	<0.005	1.43	<0.0005	<0.005	<0.005	<0.005	0.77	<0.005	0.43	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB1	31/Aug/2022	Rewan Group	0.06	<0.005	1.38	<0.0005	<0.005	<0.005	<0.005	0.7	<0.005	0.454	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W1_MB2	20/Oct/2020	Leichhardt Lower Seam	0.21	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	2.65	<0.005	0.366	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.05
W1_MB2	09/Dec/2020	Leichhardt Lower Seam	0.18	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	2.27	<0.005	0.293	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.07
W1_MB2	05/Jan/2021	Leichhardt Lower Seam	0.13	<0.005	0.28	<0.0005	<0.005	<0.005	0.009	2.46	<0.005	0.303	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.042
W1_MB2	26/Jan/2021	Leichhardt Lower Seam	0.94	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	4.38	<0.005	0.354	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	0.045
W1_MB2	17/Feb/2021	Leichhardt Lower Seam	0.73	<0.005	1.54	<0.0005	<0.005	<0.005	0.026	5.27	<0.005	0.27	<0.0001	0.016	0.008	<0.05	<0.005	<0.005	<0.05	0.036
W1_MB2	17/Feb/2021	Leichhardt Lower Seam	0.18	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	3.43	<0.005	0.338	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.051
W1_MB2	24/Mar/2021	Leichhardt Lower Seam	0.28	<0.005	0.3	<0.0005	<0.005	<0.005	<0.005	4.45	<0.005	0.317	<0.0001	0.01	0.015	<0.05	<0.005	<0.005	<0.05	0.039
W1_MB2	14/Apr/2021	Leichhardt Lower Seam	0.08	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	3.48	<0.005	0.32	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.044
W1_MB2	26/May/2021	Leichhardt Lower Seam	0.08	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	3.43	<0.005	0.32	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.055
W1_MB2	29/Jun/2021	Leichhardt Lower Seam	0.1	<0.005	0.2	<0.0005	0.006	<0.005	<0.005	3.33	<0.005	0.299	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	0.037
W1_MB2	26/Jul/2021	Leichhardt Lower Seam	0.11	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	3.17	<0.005	0.278	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.053
W1_MB2	24/Aug/2021	Leichhardt Lower Seam	0.11	<0.005	0.13	<0.0005	<0.005	<0.005	<0.005	3.26	<0.005	0.264	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.039
W1_MB2	14/Sep/2021	Leichhardt Lower Seam	0.13	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	3.81	<0.005	0.267	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.048
W1_MB2	19/Oct/2021	Leichhardt Lower Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	0.008	3.72	<0.005	0.296	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.038
W1_MB2	16/Nov/2021	Leichhardt Lower Seam	0.07	<0.005	0.07	<0.0005	<0.005	<0.005	<0.005	3.18	<0.005	0.268	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.053
W1_MB2	09/Dec/2021	Leichhardt Lower Seam	0.14	<0.005	0.1	<0.0005	<0.005	<0.005	<0.005	3.77	<0.005	0.298	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.065
W1_MB2	25/Jan/2022	Leichhardt Lower Seam	0.09	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	3.59	<0.005	0.296	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.046
W1_MB2	15/Feb/2022	Leichhardt Lower Seam	0.09	<0.005	0.3	<0.0005	<0.005	<0.005	<0.005	3.69	<0.005	0.306	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W1_MB2	16/Mar/2022	Leichhardt Lower Seam	<0.05	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	3.37	<0.005	0.291	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.054
W1_MB2	03/May/2022	Leichhardt Lower Seam	0.12	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	4.14	<0.005	0.324	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.064
W1_MB2	31/May/2022	Leichhardt Lower Seam	0.08	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	3.78	<0.005	0.314	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.039
W1_MB2	22/Jun/2022	Leichhardt Lower Seam	0.1	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	3.51	<0.005	0.309	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.028
W1_MB2	20/Jul/2022	Leichhardt Lower Seam	0.06	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	3.28	<0.005	0.294	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.064
W1_MB2	31/Aug/2022	Leichhardt Lower Seam	0.08	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	3.67	<0.005	0.314	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.054
W1_MB2	04/Oct/2022	Leichhardt Lower Seam	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	3.01	<0.005	0.261	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.051
W1_MB3	20/Oct/2020	Vermont Seam	1.22	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	10.9	<0.005	0.335	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.121
W1_MB3	09/Dec/2020	Vermont Seam	0.59	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	6.38	<0.005	0.232	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.143
W1_MB3	05/Jan/2021	Vermont Seam	0.91	<0.005	0.21	<0.0005	<0.005	<0.005	0.012	8.09	<0.005	0.262	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.072
W1_MB3	26/Jan/2021	Vermont Seam	0.76	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	8.91	<0.005	0.274	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.083
W1_MB3	17/Feb/2021	Vermont Seam	0.42	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	7.58	<0.005	0.265	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.09
W1_MB3	24/Mar/2021	Vermont Seam	0.32	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	8.03	<0.005	0.259	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.1
W1_MB3	14/Apr/2021	Vermont Seam	0.15	<0.005	0.23	<0.0005	<0.005	<0.005	<0.005	7.13	<0.005	0.239	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.088
W1_MB3	26/May/2021	Vermont Seam	0.07	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	6.33	<0.005	0.215	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.088
W1_MB3	29/Jun/2021	Vermont Seam	0.31	<0.005	0.08	<0.0005	0.009	<0.005	0.006	7.03	<0.005	0.222	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	0.139

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W1_MB3	26/Jul/2021	Vermont Seam	0.34	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	5.98	<0.005	0.194	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.137
W1_MB3	24/Aug/2021	Vermont Seam	0.11	<0.005	0.11	<0.0005	<0.005	<0.005	<0.005	5.98	<0.005	0.184	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.101
W1_MB3	14/Sep/2021	Vermont Seam	0.07	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	6.28	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.112
W1_MB3	19/Oct/2021	Vermont Seam	0.14	<0.005	<0.05	<0.0005	<0.005	<0.005	0.009	6.93	<0.005	0.206	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.138
W1_MB3	16/Nov/2021	Vermont Seam	0.19	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	6.19	<0.005	0.185	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.153
W1_MB3	09/Dec/2021	Vermont Seam	0.12	<0.005	0.09	<0.0005	<0.005	<0.005	<0.005	6.39	<0.005	0.201	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.161
W1_MB3	25/Jan/2022	Vermont Seam	0.11	<0.005	0.23	<0.0005	<0.005	<0.005	0.008	7.03	<0.005	0.212	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.134
W1_MB3	15/Feb/2022	Vermont Seam	0.08	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	6.76	<0.005	0.203	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.065
W1_MB3	16/Mar/2022	Vermont Seam	<0.05	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	6.46	<0.005	0.206	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.136
W1_MB3	03/May/2022	Vermont Seam	0.06	<0.005	0.19	<0.0005	<0.005	<0.005	<0.005	7.16	<0.005	0.214	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.142
W1_MB3	31/May/2022	Vermont Seam	0.07	<0.005	0.24	<0.0005	<0.005	<0.005	<0.005	6.89	<0.005	0.213	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.148
W1_MB3	22/Jun/2022	Vermont Seam	<0.05	<0.005	0.22	<0.0005	<0.005	<0.005	<0.005	6.69	<0.005	0.212	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.08
W1_MB3	20/Jul/2022	Vermont Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	6.58	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.139
W1_MB3	31/Aug/2022	Vermont Seam	<0.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	6.04	<0.005	0.196	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.106
W1_MB3	04/Oct/2022	Vermont Seam	<0.05	<0.005	0.18	<0.0005	<0.005	<0.005	<0.005	6.15	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.118
W10_MB2	20/Oct/2020	Vermont Upper Seam	<0.05	<0.005	<0.05	<0.0005	0.154	<0.005	<0.005	0.36	<0.005	0.125	<0.0001	0.038	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	09/Dec/2020	Vermont Upper Seam	<0.05	<0.005	0.35	<0.0005	0.007	<0.005	0.008	2.11	<0.005	0.35	<0.0005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	04/Jan/2021	Vermont Upper Seam	0.07	<0.005	0.25	<0.0005	0.032	<0.005	0.011	0.76	<0.005	0.11	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	28/Jan/2021	Vermont Upper Seam	<0.05	<0.005	0.19	<0.0005	0.074	<0.005	0.007	0.75	<0.005	0.098	<0.0001	0.024	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	16/Feb/2021	Vermont Upper Seam	<0.05	<0.005	0.22	<0.0005	0.026	<0.005	<0.005	0.24	<0.005	0.069	<0.0001	0.023	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	10/Mar/2021	Vermont Upper Seam	0.07	<0.005	0.13	<0.0005	0.122	<0.005	0.014	0.92	<0.005	0.095	<0.0001	0.025	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	14/Apr/2021	Vermont Upper Seam	<0.05	<0.005	0.2	<0.0005	0.076	<0.005	<0.005	0.46	<0.005	0.062	<0.0001	0.022	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	25/May/2021	Vermont Upper Seam	0.06	<0.005	0.16	<0.0005	0.1	<0.005	<0.005	0.53	<0.005	0.062	<0.0001	0.023	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	29/Jun/2021	Vermont Upper Seam	0.06	<0.005	0.16	<0.0005	0.132	<0.005	<0.005	0.47	<0.005	0.056	<0.0001	0.024	0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	22/Jul/2021	Vermont Upper Seam	<0.05	<0.005	0.06	<0.0005	0.103	<0.005	<0.005	0.38	<0.005	0.041	<0.0001	0.022	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	24/Aug/2021	Vermont Upper Seam	<0.05	<0.005	0.09	<0.0005	0.056	<0.005	<0.005	0.2	<0.005	0.032	<0.0001	0.019	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W10_MB2	14/Sep/2021	Vermont Upper Seam	<0.05	<0.005	0.13	<0.0005	0.018	<0.005	<0.005	0.06	<0.005	0.018	<0.0001	0.021	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	19/Oct/2021	Vermont Upper Seam	<0.05	<0.005	<0.05	<0.0005	0.056	<0.005	<0.005	0.22	<0.005	0.034	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB2	16/Nov/2021	Vermont Upper Seam	<0.05	<0.005	0.06	<0.0005	0.046	<0.005	<0.005	0.14	<0.005	0.029	<0.0001	0.026	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	08/Dec/2021	Vermont Upper Seam	0.09	<0.005	0.15	<0.0005	0.032	<0.005	<0.005	0.09	<0.005	0.024	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	25/Jan/2022	Vermont Upper Seam	<0.05	<0.005	0.16	<0.0005	0.009	<0.005	<0.005	0.05	<0.005	0.012	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	15/Feb/2022	Vermont Upper Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.0001	0.018	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	16/Mar/2022	Vermont Upper Seam	<0.05	<0.005	0.11	<0.0005	0.029	<0.005	<0.005	0.08	<0.005	0.024	<0.0001	0.02	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	04/May/2022	Vermont Upper Seam	<0.05	<0.005	0.14	<0.0005	0.037	<0.005	<0.005	0.13	<0.005	0.025	<0.0001	0.018	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	31/May/2022	Vermont Upper Seam	<0.05	<0.005	0.12	<0.0005	0.039	<0.005	<0.005	<0.05	<0.005	0.028	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	22/Jun/2022	Vermont Upper Seam	<0.05	<0.005	0.13	<0.0005	0.022	<0.005	<0.005	0.08	<0.005	0.02	<0.0001	0.011	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB2	31/Aug/2022	Vermont Upper Seam	<0.05	<0.005	0.15	<0.0005	0.038	<0.005	<0.005	0.19	<0.005	0.034	<0.0001	0.016	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	20/Oct/2020	Vermont Lower Seam	1.56	<0.005	0.38	<0.0005	0.009	<0.005	0.006	4.99	<0.005	0.229	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	09/Dec/2020	Vermont Lower Seam	0.59	0.006	0.73	<0.0005	<0.005	<0.005	0.017	1.97	<0.005	0.154	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.027
W10_MB3	04/Jan/2021	Vermont Lower Seam	0.5	<0.005	0.72	<0.0005	<0.005	<0.005	0.03	2.35	<0.005	0.186	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	28/Jan/2021	Vermont Lower Seam	0.36	<0.005	0.68	<0.0005	<0.005	<0.005	<0.005	1.88	<0.005	0.175	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	16/Feb/2021	Vermont Lower Seam	0.44	<0.005	0.67	<0.0005	<0.005	<0.005	<0.005	1.88	<0.005	0.188	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	10/Mar/2021	Vermont Lower Seam	0.36	<0.005	0.69	<0.0005	<0.005	<0.005	<0.005	2.12	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	14/Apr/2021	Vermont Lower Seam	0.33	<0.005	0.72	<0.0005	<0.005	<0.005	<0.005	2.13	<0.005	0.191	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	25/May/2021	Vermont Lower Seam	0.19	<0.005	0.71	<0.0005	<0.005	<0.005	0.025	1.89	<0.005	0.192	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	29/Jun/2021	Vermont Lower Seam	0.11	<0.005	0.63	<0.0005	<0.005	<0.005	0.007	1.4	<0.005	0.172	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	22/Jul/2021	Vermont Lower Seam	<0.05	<0.005	0.52	<0.0005	<0.005	<0.005	<0.005	1.34	<0.005	0.165	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	24/Aug/2021	Vermont Lower Seam	0.24	<0.005	0.49	<0.0005	<0.005	<0.005	<0.005	1.71	<0.005	0.162	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W10_MB3	14/Sep/2021	Vermont Lower Seam	0.2	<0.005	0.67	<0.0005	<0.005	<0.005	<0.005	1.89	<0.005	0.177	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	19/Oct/2021	Vermont Lower Seam	0.12	<0.005	0.43	<0.0005	<0.005	<0.005	0.006	1.51	<0.005	0.156	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W10_MB3	16/Nov/2021	Vermont Lower Seam	0.22	<0.005	0.6	<0.0005	<0.005	<0.005	<0.005	1.7	<0.005	0.166	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	08/Dec/2021	Vermont Lower Seam	0.26	<0.005	0.68	<0.0005	<0.005	<0.005	<0.005	1.79	<0.005	0.168	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	25/Jan/2022	Vermont Lower Seam	0.19	<0.005	0.68	<0.0005	<0.005	<0.005	0.006	1.7	<0.005	0.174	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	15/Feb/2022	Vermont Lower Seam	0.07	<0.005	0.68	<0.0005	<0.005	<0.005	<0.005	1.42	<0.005	0.176	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	16/Mar/2022	Vermont Lower Seam	0.18	<0.005	0.63	<0.0005	<0.005	<0.005	<0.005	1.64	<0.005	0.178	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	03/May/2022	Vermont Lower Seam	0.23	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	1.84	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	31/May/2022	Vermont Lower Seam	0.47	<0.005	0.83	<0.0005	<0.005	<0.005	0.007	2.1	<0.005	0.202	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W10_MB3	22/Jun/2022	Vermont Lower Seam	0.18	<0.005	0.75	<0.0005	<0.005	<0.005	0.006	1.6	<0.005	0.184	<0.0001	<0.005	0.117	<0.05	<0.005	<0.005	<0.05	0.115
W10_MB3	31/Aug/2022	Vermont Lower Seam	0.13	<0.005	0.7	<0.0005	<0.005	<0.005	<0.005	1.83	<0.005	0.196	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	20/Oct/2020	Leichhardt Seam	0.13	<0.005	<0.05	<0.0005	0.006	<0.005	<0.005	0.38	<0.005	0.13	<0.0001	0.112	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	09/Dec/2020	Leichhardt Seam	0.14	<0.005	0.21	<0.0005	0.006	<0.005	<0.005	0.33	<0.005	0.1	<0.0001	0.069	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	04/Jan/2021	Leichhardt Seam	0.09	<0.005	0.27	<0.0005	0.006	<0.005	<0.005	0.25	<0.005	0.106	<0.0001	0.131	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	28/Jan/2021	Leichhardt Seam	0.07	<0.005	0.18	<0.0005	0.006	<0.005	<0.005	0.23	<0.005	0.084	<0.0001	0.1	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	16/Feb/2021	Leichhardt Seam	0.08	<0.005	0.2	<0.0005	0.006	<0.005	<0.005	0.21	<0.005	0.088	<0.0001	0.086	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	10/Mar/2021	Leichhardt Seam	0.1	<0.005	0.16	<0.0005	0.008	<0.005	<0.005	0.33	<0.005	0.098	<0.0001	0.09	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	14/Apr/2021	Leichhardt Seam	0.14	<0.005	0.22	<0.0005	0.014	<0.005	<0.005	0.4	<0.005	0.116	<0.0001	0.08	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	25/May/2021	Leichhardt Seam	0.23	<0.005	0.17	<0.0005	0.016	<0.005	<0.005	0.48	<0.005	0.133	<0.0001	0.086	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W11_MB2	29/Jun/2021	Leichhardt Seam	0.15	<0.005	0.19	<0.0005	0.02	<0.005	<0.005	0.44	<0.005	0.121	<0.0001	0.09	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	22/Jul/2021	Leichhardt Seam	<0.05	<0.005	<0.05	<0.0005	0.01	<0.005	0.01	0.23	<0.005	0.08	<0.0001	0.094	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	24/Aug/2021	Leichhardt Seam	0.07	<0.005	0.12	<0.0005	0.008	<0.005	<0.005	0.17	<0.005	0.067	<0.0001	0.082	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W11_MB2	14/Sep/2021	Leichhardt Seam	0.09	<0.001	<0.05	<0.0001	0.002	<0.001	0.008	0.21	<0.001	0.049	<0.0001	0.018	0.003	<0.01	<0.001	<0.001	<0.01	0.006
W11_MB2	19/Oct/2021	Leichhardt Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.032	<0.0001	0.115	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W11_MB2	16/Nov/2021	Leichhardt Seam	0.12	<0.005	0.09	<0.0005	0.014	<0.005	<0.005	0.28	<0.005	0.098	<0.0001	0.106	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	09/Dec/2021	Leichhardt Seam	0.1	<0.005	0.1	<0.0005	0.012	<0.005	<0.005	0.21	<0.005	0.084	<0.0001	0.086	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	25/Jan/2022	Leichhardt Seam	0.07	<0.005	0.2	<0.0005	0.007	<0.005	<0.005	0.14	<0.005	0.065	<0.0001	0.072	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	15/Feb/2022	Leichhardt Seam	0.06	<0.005	0.21	<0.0005	0.01	<0.005	<0.005	0.12	<0.005	0.057	<0.0001	0.092	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	16/Mar/2022	Leichhardt Seam	<0.05	<0.005	0.15	<0.0005	<0.005	<0.005	<0.005	0.09	<0.005	0.06	<0.0001	0.067	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	03/May/2022	Leichhardt Seam	0.06	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	0.12	<0.005	0.062	<0.0005	0.066	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	31/May/2022	Leichhardt Seam	0.07	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	0.13	<0.005	0.064	<0.0001	0.071	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	22/Jun/2022	Leichhardt Seam	0.03	0.002	0.12	<0.0001	0.002	<0.001	0.002	0.09	<0.001	0.059	<0.0001	0.041	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W11_MB2	20/Jul/2022	Leichhardt Seam	0.12	<0.005	0.15	<0.0005	0.006	<0.005	<0.005	0.17	<0.005	0.065	<0.0001	0.053	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W11_MB2	31/Aug/2022	Leichhardt Seam	0.06	<0.005	0.19	<0.0005	0.008	<0.005	<0.005	0.15	<0.005	0.072	<0.0001	0.056	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	20/Oct/2020	Vermont Lower Seam	0.3	<0.005	0.56	<0.0005	<0.005	0.008	0.008	1.51	<0.005	1.06	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	0.038
W13_MB1	09/Dec/2020	Vermont Lower Seam	0.38	<0.005	0.66	<0.0005	<0.005	<0.005	0.006	2.06	<0.005	0.486	<0.0001	<0.005	0.025	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	05/Jan/2021	Vermont Lower Seam	0.32	<0.005	0.62	<0.0005	<0.005	<0.005	0.015	1.08	<0.005	0.55	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	26/Jan/2021	Vermont Lower Seam	0.36	<0.005	0.71	<0.0005	<0.005	<0.005	0.014	1.22	<0.005	0.75	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	17/Feb/2021	Vermont Lower Seam	0.12	<0.005	0.6	<0.0005	<0.005	<0.005	0.014	1.02	<0.005	0.719	<0.0001	<0.005	0.019	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	24/Mar/2021	Vermont Lower Seam	0.28	<0.005	0.7	<0.0005	<0.005	<0.005	0.017	1.99	<0.005	0.811	<0.0001	<0.005	0.023	<0.05	<0.005	<0.005	<0.05	0.08
W13_MB1	14/Apr/2021	Vermont Lower Seam	0.15	<0.005	0.74	<0.0005	<0.005	<0.005	0.012	1.4	<0.005	0.884	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	0.034
W13_MB1	26/May/2021	Vermont Lower Seam	0.12	<0.005	0.69	<0.0005	<0.005	<0.005	0.092	1.29	<0.005	0.908	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	0.041
W13_MB1	29/Jun/2021	Vermont Lower Seam	0.28	<0.005	0.46	<0.0005	0.008	<0.005	0.151	2	<0.005	0.865	<0.0001	<0.005	0.028	<0.05	<0.005	<0.005	<0.05	0.083
W13_MB1	26/Jul/2021	Vermont Lower Seam	0.74	<0.005	0.37	<0.0005	<0.005	<0.005	0.077	1.46	<0.005	0.833	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	0.08
W13_MB1	24/Aug/2021	Vermont Lower Seam	0.14	<0.005	0.58	<0.0005	<0.005	<0.005	0.018	1.24	<0.005	0.815	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	<0.024
W13_MB1	15/Sep/2021	Vermont Lower Seam	0.48	<0.005	0.66	<0.0005	<0.005	0.006	0.03	1.5	<0.005	0.954	<0.0001	<0.005	0.021	<0.05	<0.005	<0.005	<0.05	0.03
W13_MB1	19/Oct/2021	Vermont Lower Seam	0.07	<0.005	0.4	<0.0005	<0.005	<0.005	0.02	1.37	<0.005	0.902	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.025
W13_MB1	17/Nov/2021	Vermont Lower Seam	0.06	<0.005	0.46	<0.0005	<0.005	<0.005	<0.005	0.92	<0.005	0.822	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	09/Dec/2021	Vermont Lower Seam	0.08	<0.005	0.49	<0.0005	<0.005	<0.005	0.008	1.08	<0.005	0.948	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	25/Jan/2022	Vermont Lower Seam	<0.05	<0.005	0.65	<0.0005	<0.005	<0.005	<0.005	0.9	<0.005	1.01	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	22/Feb/2022	Vermont Lower Seam	0.31	<0.005	0.74	<0.0005	<0.005	<0.005	0.008	0.99	<0.005	0.997	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	16/Mar/2022	Vermont Lower Seam	0.08	<0.005	0.58	<0.0005	<0.005	<0.005	<0.005	1.21	<0.005	0.997	<0.0001	<0.005	0.011	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	03/May/2022	Vermont Lower Seam	0.14	<0.005	0.61	<0.0005	<0.005	0.006	0.007	1.4	<0.005	1.07	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	31/May/2022	Vermont Lower Seam	0.22	<0.005	0.82	<0.0005	<0.005	0.007	0.006	1.72	<0.005	1.15	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	22/Jun/2022	Vermont Lower Seam	0.08	<0.005	0.69	<0.0005	<0.005	0.006	<0.005	1.08	<0.005	1.09	<0.0001	<0.005	0.015	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	20/Jul/2022	Vermont Lower Seam	0.1	<0.005	0.72	<0.0005	<0.005	0.006	<0.005	1.18	<0.005	1.17	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB1	31/Aug/2022	Vermont Lower Seam	0.1	<0.001	0.51	<0.0001	0.001	0.005	0.002	0.96	<0.001	1.1	<0.0001	<0.001	0.012	<0.01	<0.001	<0.001	<0.01	0.006
W13_MB2	20/Oct/2020	Girrah 1 Seam	<0.05	<0.005	<0.05	<0.0005	<0.005	<0.005	<0.005	0.21	<0.005	0.031	<0.0001	0.046	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	09/Dec/2020	Girrah 1 Seam	<0.05	<0.005	0.29	<0.0005	0.006	<0.005	<0.005	0.45	<0.005	0.046	<0.0001	0.019	0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	05/Jan/2021	Girrah 1 Seam	0.04	<0.001	0.25	<0.0001	0.006	<0.001	0.006	0.48	<0.001	0.04	<0.0001	0.015	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W13_MB2	26/Jan/2021	Girrah 1 Seam	0.06	<0.005	0.37	<0.0005	0.008	<0.005	<0.005	0.76	<0.005	0.045	<0.0001	0.011	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	17/Feb/2021	Girrah 1 Seam	<0.05	<0.005	0.3	<0.0005	0.009	<0.005	<0.005	0.96	<0.005	0.053	<0.0001	0.011	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	24/Mar/2021	Girrah 1 Seam	0.1	<0.005	0.43	<0.0005	0.009	<0.005	<0.005	1.3	<0.005	0.064	<0.0001	0.013	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	14/Apr/2021	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	0.006	<0.005	<0.005	0.96	<0.005	0.07	<0.0001	0.015	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	29/Jun/2021	Girrah 1 Seam	0.1	<0.001	0.2	<0.0001	0.008	<0.001	0.006	1.46	<0.001	0.078	<0.0001	0.018	0.002	<0.01	<0.001	<0.001	<0.01	0.026
W13_MB2	26/Jul/2021	Girrah 1 Seam	0.03	<0.001	0.22	<0.0001	0.006	<0.001	0.001	1.34	<0.001	0.074	<0.0001	0.014	0.007	<0.01	<0.001	<0.001	<0.01	0.008
W13_MB2	24/Aug/2021	Girrah 1 Seam	0.07	<0.005	0.27	<0.0005	0.006	<0.005	<0.005	1.06	<0.005	0.066	<0.0001	0.017	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W13_MB2	15/Sep/2021	Girrah 1 Seam	<0.05	<0.005	0.34	<0.0005	<0.005	<0.005	<0.005	1.33	<0.005	0.081	<0.0001	0.011	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	19/Oct/2021	Girrah 1 Seam	0.01	<0.001	0.08	<0.0001	<0.001	<0.001	0.002	0.11	<0.001	0.042	<0.0001	0.026	<0.001	<0.01	<0.001	<0.001	<0.01	0.006
W13_MB2	17/Nov/2021	Girrah 1 Seam	<0.05	<0.005	0.17	<0.0005	<0.005	<0.005	<0.005	0.98	<0.005	0.067	<0.0001	0.012	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	09/Dec/2021	Girrah 1 Seam	0.06	<0.005	0.5	<0.0005	0.007	<0.005	<0.005	1.31	<0.005	0.09	<0.0001	0.014	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	25/Jan/2022	Girrah 1 Seam	<0.05	<0.005	0.34	<0.0005	0.006	<0.005	<0.005	1.18	<0.005	0.088	<0.0001	0.014	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	22/Feb/2022	Girrah 1 Seam	0.06	<0.005	0.36	<0.0005	0.008	<0.005	<0.005	1.16	<0.005	0.088	<0.0001	0.014	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	03/May/2022	Girrah 1 Seam	0.08	<0.005	0.31	<0.0005	0.006	<0.005	<0.005	0.89	<0.005	0.082	<0.0001	0.021	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	31/May/2022	Girrah 1 Seam	<0.05	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	1.36	<0.005	0.116	<0.0001	0.011	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	22/Jun/2022	Girrah 1 Seam	<0.05	<0.005	0.36	<0.0005	<0.005	<0.005	<0.005	0.98	<0.005	0.096	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	20/Jul/2022	Girrah 1 Seam	<0.05	<0.005	0.35	<0.0005	<0.005	<0.005	<0.005	1.11	<0.005	0.107	<0.0001	0.012	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W13_MB2	31/Aug/2022	Girrah 1 Seam	0.02	<0.001	0.24	<0.0001	0.003	<0.001	<0.001	0.89	<0.001	0.095	<0.0001	0.014	<0.001	<0.01	<0.001	<0.001	<0.01	0.018
W13_MB2	04/Oct/2022	Girrah 1 Seam	0.02	<0.001	0.22	<0.0001	0.001	<0.001	<0.001	0.45	<0.001	0.064	<0.0001	0.022	<0.001	<0.01	<0.001	<0.001	<0.01	0.015
W14_MB2	20/Oct/2020	Permian Coal Seam	0.35	<0.001	0.5	<0.0001	<0.001	<0.001	0.001	2.48	<0.001	1.08	<0.0001	0.001	<0.001	<0.01	<0.001	0.016	<0.01	<0.005
W14_MB2	16/Dec/2020	Permian Coal Seam	0.19	0.029	0.43	<0.0001	<0.001	0.005	0.077	3.04	0.001	0.25	<0.0001	0.005	0.011	<0.01	<0.001	0.006	<0.01	0.116
W14_MB2	05/Jan/2021	Permian Coal Seam	0.3	0.001	0.55	<0.0001	<0.001	<0.001	0.039	3.24	<0.001	1.2	<0.0001	0.001	0.003	<0.01	<0.001	0.013	<0.01	0.031
W14_MB2	26/Jan/2021	Permian Coal Seam	0.31	<0.001	0.55	<0.0001	<0.001	<0.001	0.058	3.92	<0.001	1.3	<0.0001	0.002	0.003	<0.01	0.001	0.013	<0.01	0.05
W14_MB2	17/Feb/2021	Permian Coal Seam	0.42	<0.005	0.71	<0.0005	<0.005	<0.005	0.284	5.2	<0.005	1.58	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	0.122
W14_MB2	24/Mar/2021	Permian Coal Seam	0.23	0.001	0.46	<0.0001	<0.001	<0.001	0.317	5.14	<0.001	1.48	<0.0001	0.001	0.003	<0.01	<0.001	0.01	<0.01	0.15
W14_MB2	14/Apr/2021	Permian Coal Seam	0.13	<0.001	0.55	<0.0001	<0.001	<0.001	0.026	4.18	<0.001	1.34	<0.0001	<0.001	<0.001	<0.01	<0.001	0.009	<0.01	0.024

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																	
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W14_MB2	26/May/2021	Permian Coal Seam	0.15	<0.005	0.69	<0.0005	<0.005	<0.005	0.071	5.19	<0.005	1.74	<0.0001	<0.005	<0.005	<0.05	<0.005	0.009	<0.05	0.03
W14_MB2	29/Jun/2021	Permian Coal Seam	0.33	0.002	0.49	<0.0001	<0.001	<0.001	0.086	5.46	<0.001	1.55	<0.0001	<0.001	0.054	<0.01	<0.001	0.007	<0.01	0.037
W14_MB2	26/Jul/2021	Permian Coal Seam	0.06	<0.001	0.56	<0.0001	<0.001	<0.001	0.05	4.75	<0.001	1.56	<0.0001	<0.001	0.002	<0.01	<0.001	0.007	<0.01	0.016
W14_MB2	24/Aug/2021	Permian Coal Seam	0.13	<0.005	0.58	<0.0005	<0.005	<0.005	0.029	5.45	<0.005	1.51	<0.0001	<0.005	<0.005	<0.05	<0.005	0.006	<0.05	0.038
W14_MB2	15/Sep/2021	Permian Coal Seam	0.18	0.001	0.49	<0.0001	<0.001	<0.001	0.035	5.75	<0.001	1.53	<0.0001	0.001	0.003	<0.01	<0.001	0.006	<0.01	0.024
W14_MB2	19/Oct/2021	Permian Coal Seam	0.06	<0.001	0.56	<0.0001	<0.001	<0.001	0.006	2.66	<0.001	1.55	<0.0001	<0.001	0.001	<0.01	<0.001	0.004	<0.01	<0.005
W14_MB2	16/Nov/2021	Permian Coal Seam	0.08	<0.001	0.57	<0.0001	<0.001	<0.001	0.007	1.14	<0.001	1.55	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	0.006
W14_MB2	09/Dec/2021	Permian Coal Seam	0.02	<0.001	0.41	<0.0001	<0.001	<0.001	0.004	0.78	<0.001	1.44	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	25/Jan/2022	Permian Coal Seam	0.08	<0.001	0.57	<0.0001	<0.001	<0.001	0.009	3.89	<0.001	1.59	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	22/Feb/2022	Permian Coal Seam	0.04	<0.001	0.64	<0.0001	<0.001	<0.001	0.001	0.9	<0.001	1.43	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	16/Mar/2022	Permian Coal Seam	0.07	<0.001	0.24	<0.0001	0.004	<0.001	0.003	0.62	<0.001	0.062	<0.0001	0.026	0.002	<0.01	<0.001	<0.001	<0.01	0.022
W14_MB2	16/Mar/2022	Permian Coal Seam	<0.05	<0.005	0.61	<0.0005	<0.005	<0.005	<0.005	1.01	<0.005	1.42	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W14_MB2	03/May/2022	Permian Coal Seam	0.03	<0.001	0.63	<0.0001	<0.001	<0.001	0.005	1.42	<0.001	1.27	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	<0.005
W14_MB2	31/May/2022	Permian Coal Seam	0.04	<0.001	0.54	<0.0001	<0.001	<0.001	0.004	1.94	<0.001	1.4	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	0.007
W14_MB2	22/Jun/2022	Permian Coal Seam	0.04	<0.001	0.64	<0.0001	<0.001	<0.001	0.002	1.98	<0.001	1.32	<0.0001	<0.001	0.001	<0.01	<0.001	0.003	<0.01	0.006
W14_MB2	20/Jul/2022	Permian Coal Seam	<0.05	<0.005	0.66	<0.0005	<0.005	<0.005	<0.005	1.86	<0.005	1.19	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W14_MB2	01/Sep/2022	Permian Coal Seam	<0.05	<0.005	0.61	<0.0005	<0.005	<0.005	<0.005	1.66	<0.005	1.13	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB2	20/Oct/2020	Vermont Upper Seam	0.1	0.021	0.3	<0.0001	<0.001	0.005	0.002	3.36	<0.001	0.273	<0.0001	0.002	0.004	<0.01	<0.001	0.006	<0.01	0.007
W15_MB2	16/Dec/2020	Vermont Upper Seam	0.47	0.001	0.63	<0.0001	<0.001	<0.001	0.014	2.84	<0.001	1.37	<0.0001	0.002	0.008	<0.01	<0.001	0.014	<0.01	0.039
W15_MB2	04/Jan/2021	Vermont Upper Seam	0.13	0.025	0.4	<0.0001	<0.001	0.004	0.034	3.18	<0.001	0.253	<0.0001	0.004	0.009	<0.01	<0.001	0.006	<0.01	0.015
W15_MB2	28/Jan/2021	Vermont Upper Seam	0.21	0.027	0.48	<0.0005	<0.005	0.005	0.057	3.82	<0.005	0.282	<0.0001	0.006	0.016	<0.05	<0.005	0.006	<0.05	0.046
W15_MB2	16/Feb/2021	Vermont Upper Seam	0.21	0.026	0.44	<0.0005	<0.005	<0.005	0.033	3.67	<0.005	0.3	<0.0001	0.006	0.014	<0.05	<0.005	<0.005	<0.05	0.035
W15_MB2	10/Mar/2021	Vermont Upper Seam	0.22	0.025	0.36	<0.0001	<0.001	0.004	0.059	3.43	<0.001	0.29	<0.0001	0.004	0.012	<0.01	<0.001	0.006	<0.01	0.031
W15_MB2	14/Apr/2021	Vermont Upper Seam	0.32	0.026	0.5	<0.0005	<0.005	<0.005	0.266	4.21	<0.005	0.292	<0.0001	0.006	0.024	<0.05	<0.005	<0.005	<0.05	0.126
W15_MB2	25/May/2021	Vermont Upper Seam	0.39	0.028	0.5	<0.0005	<0.005	<0.005	0.116	4.49	<0.005	0.314	<0.0001	0.006	0.024	<0.05	<0.005	<0.005	<0.05	0.043
W15_MB2	29/Jun/2021	Vermont Upper Seam	0.59	0.025	0.39	<0.0001	<0.001	0.003	0.11	3.95	0.001	0.271	<0.0001	0.005	0.016	<0.01	<0.001	0.004	<0.01	0.065
W15_MB2	22/Jul/2021	Vermont Upper Seam	0.26	0.024	0.43	<0.0001	0.001	0.003	0.111	4.07	<0.001	0.295	<0.0001	0.01	0.015	<0.01	<0.001	0.004	<0.01	0.06
W15_MB2	24/Aug/2021	Vermont Upper Seam	0.2	0.022	0.47	<0.0005	<0.005	<0.005	0.026	3.87	<0.005	0.276	<0.0001	0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.024
W15_MB2	14/Sep/2021	Vermont Upper Seam	0.21	0.02	0.33	<0.0001	0.001	0.002	0.022	3.78	<0.001	0.285	<0.0001	0.003	0.01	<0.01	<0.001	0.004	<0.01	0.019
W15_MB2	19/Oct/2021	Vermont Upper Seam	0.2	0.018	0.32	<0.0001	<0.001	0.001	0.017	3.57	<0.001	0.278	<0.0001	0.002	0.008	<0.01	<0.001	0.003	<0.01	0.018
W15_MB2	16/Nov/2021	Vermont Upper Seam	0.12	0.014	0.39	<0.0001	<0.001	<0.001	0.014	3.41	<0.001	0.284	<0.0001	0.002	0.005	<0.01	<0.001	0.003	<0.01	0.014
W15_MB2	08/Dec/2021	Vermont Upper Seam	0.14	0.012	0.48	<0.0005	<0.005	<0.005	0.008	3.78	<0.005	0.311	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB2	25/Jan/2022	Vermont Upper Seam	0.12	0.009	0.49	<0.0001	<0.001	<0.001	0.011	3.81	<0.001	0.31	<0.0001	0.002	0.004	<0.01	<0.001	0.003	<0.01	0.016
W15_MB2	15/Feb/2022	Vermont Upper Seam	0.28	<0.005	0.38	<0.0005	0.007	<0.005	0.01	1.01	<0.005	0.145	<0.0001	0.052	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB2	15/Mar/2022	Vermont Upper Seam	<0.05	<0.005	0.45	<0.0005	<0.005	<0.005	0.006	3.62	<0.005	0.295	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB2	03/May/2022	Vermont Upper Seam	0.11	0.005	0.44	<0.0001	<0.001	<0.001	0.01	3.38	<0.001	0.282	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	0.01
W15_MB2	31/May/2022	Vermont Upper Seam	0.17	0.005	0.34	<0.0001	0.001	<0.001	0.015	3.98	<0.001	0.32	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	0.02
W15_MB2	22/Jun/2022	Vermont Upper Seam	0.1	0.004	0.47	<0.0001	<0.001	<0.001	0.008	3.51	<0.001	0.297	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	0.014
W15_MB2	31/Aug/2022	Vermont Upper Seam	0.1	0.003	0.43	<0.0001	0.001	<0.001	0.008	3.54	<0.001	0.304	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	0.018
W15_MB3	20/Oct/2020	Vermont Lower Seam	0.23	<0.001	0.23	<0.0001	0.033	<0.001	0.001	1.24	<0.001	0.113	<0.0001	0.015	<0.001	<0.01	<0.001	<0.001	<0.01	0.019
W15_MB3	16/Dec/2020	Vermont Lower Seam	0.09	<0.001	0.4	<0.0001	0.003	<0.001	0.005	1.34	<0.001	0.126	<0.0001	0.009	0.003	<0.01	<0.001	<0.001	<0.01	0.069
W15_MB3	04/Jan/2021	Vermont Lower Seam	0.12	<0.001	0.36	<0.0001	0.004	<0.001	0.037	1.72	<0.001	0.131	<0.0001	0.008	0.002	<0.01	<0.001	<0.001	<0.01	0.042
W15_MB3	28/Jan/2021	Vermont Lower Seam	0.11	<0.005	0.42	<0.0005	<0.005	<0.005	0.01	1.47	<0.005	0.132	<0.0001	0.009	<0.005	<0.05	<0.005	<0.005	<0.05	0.04
W15_MB3	16/Feb/2021	Vermont Lower Seam	0.12	<0.005	0.43	<0.0005	<0.005	<0.005	0.007	1.96	<0.005	0.15	<0.0001	0.013	0.009	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	10/Mar/2021	Vermont Lower Seam	0.19	<0.005	0.4	<0.0005	0.006	<0.005	0.113	2.87	<0.005	0.177	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.145
W15_MB3	14/Apr/2021	Vermont Lower Seam	0.11	<0.005	0.46	<0.0005	<0.005	<0.005	0.015	2.4	<0.005	0.165	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	0.09
W15_MB3	25/May/2021	Vermont Lower Seam	0.08	<0.005	0.44	<0.0005	<0.005	<0.005	0.009	1.95	<0.005	0.148	<0.0001	0.006	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	29/Jun/2021	Vermont Lower Seam	0.11	<0.005	0.38	<0.0005	<0.005	<0.005	0.019	1.9	<0.005	0.134	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	22/Jul/2021	Vermont Lower Seam	0.17	<0.005	0.27	<0.0005	<0.005	<0.005	0.012	2.08	<0.005	0.126	<0.0001	0.008	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	24/Aug/2021	Vermont Lower Seam	0.18	<0.005	0.34	<0.0005	<0.005	<0.005	0.013	1.91	<0.005	0.105	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	0.024
W15_MB3	14/Sep/2021	Vermont Lower Seam	0.13	<0.005	0.38	<0.0005	<0.005	<0.005	0.014	1.41	<0.005	0.11	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	19/Oct/2021	Vermont Lower Seam	0.18	0.001	0.2	<0.0001	0.003	<0.001	0.01	1.28	<0.001	0.11	<0.0001	0.026	0.003	<0.01	<0.001	<0.001	<0.01	0.012
W15_MB3	16/Nov/2021	Vermont Lower Seam	0.26	<0.005	0.22	<0.0005	<0.005	<0.005	0.01	1.11	<0.005	0.125	<0.0001	0.047	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	08/Dec/2021	Vermont Lower Seam	0.32	<0.005	0.36	<0.0005	0.007	<0.005	0.012	1.21	<0.005	0.155	<0.0001	0.058	0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	25/Jan/2022	Vermont Lower Seam	0.22	<0.005	0.37	<0.0005	<0.005	<0.005	0.012	0.87	<0.005	0.144	<0.0001	0.051	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	15/Feb/2022	Vermont Lower Seam	0.17	0.008	0.49	<0.0005	<0.005	<0.005	0.014	3.77	<0.005	0.3	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	15/Mar/2022	Vermont Lower Seam	0.26	<0.005	0.34	<0.0005	<0.005	<0.005	0.007	0.94	<0.005	0.15	<0.0001	0.047	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	03/May/2022	Vermont Lower Seam	0.38	<0.005	0.28	<0.0005	<0.005	<0.005	0.01	1.18	<0.005	0.15	<0.0001	0.056	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	31/May/2022	Vermont Lower Seam	0.4	<0.005	0.3	<0.0005	0.006	<0.005	0.014	1.4	<0.005	0.17	<0.0001	0.06	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	22/Jun/2022	Vermont Lower Seam	0.27	<0.005	0.38	<0.0005	<0.005	<0.005	0.008	1.48	<0.005	0.174	<0.0001	0.065	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W15_MB3	31/Aug/2022	Vermont Lower Seam	0.41	<0.005	0.48	<0.0005	<0.005	<0.005	0.007	2.98	<0.005	0.223	<0.0001	0.047	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	20/Oct/2020	Girrah 1 Seam	0.28	<0.005	1.22	<0.0005	<0.005	<0.005	<0.005	4.31	<0.005	0.27	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	09/Dec/2020	Girrah 1 Seam	0.3	<0.005	1.62	<0.0005	<0.005	<0.005	0.006	3.26	<0.005	0.212	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	05/Jan/2021	Girrah 1 Seam	0.4	<0.005	1.47	<0.0005	<0.005	<0.005	0.016	4.24	<0.005	0.235	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	26/Jan/2021	Girrah 1 Seam	0.84	<0.005	1.53	<0.0005	<0.005	<0.005	0.013	5.46	<0.005	0.263	<0.0001	0.015	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	24/Mar/2021	Girrah 1 Seam	0.76	<0.005	1.74	<0.0005	<0.005	<0.005	0.041	5.32	<0.005	0.243	<0.0001	0.016	0.006	<0.05	<0.005	<0.005	<0.05	0.047
W2_MB2	14/Apr/2021	Girrah 1 Seam	0.66	<0.005	1.73	<0.0005	<0.005	<0.005	0.037	5.18	<0.005	0.249	<0.0001	0.015	0.006	<0.05	<0.005	<0.005	<0.05	0.038

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W2_MB2	26/May/2021	Girrah 1 Seam	0.39	<0.005	1.61	<0.0005	<0.005	<0.005	0.049	3.95	<0.005	0.227	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	29/Jun/2021	Girrah 1 Seam	0.62	<0.005	1.49	<0.0005	0.005	<0.005	0.033	6.12	<0.005	0.214	<0.0001	0.008	0.005	<0.05	<0.005	<0.005	<0.05	0.103
W2_MB2	26/Jul/2021	Girrah 1 Seam	0.7	<0.005	1.26	<0.0005	0.005	<0.005	0.046	5.06	<0.005	0.201	<0.0001	0.007	0.006	<0.05	<0.005	<0.005	<0.05	0.124
W2_MB2	24/Aug/2021	Girrah 1 Seam	0.41	<0.005	1.37	<0.0005	0.005	<0.005	0.018	4.4	<0.005	0.184	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	0.095
W2_MB2	14/Sep/2021	Girrah 1 Seam	0.21	<0.005	1.74	<0.0005	<0.005	<0.005	0.011	3.29	<0.005	0.163	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	0.054
W2_MB2	19/Oct/2021	Girrah 1 Seam	0.58	<0.005	1.33	<0.0005	<0.005	<0.005	0.017	5.94	<0.005	0.192	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.141
W2_MB2	16/Nov/2021	Girrah 1 Seam	0.45	<0.005	1.33	<0.0005	<0.005	<0.005	0.01	4.44	<0.005	0.169	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.084
W2_MB2	09/Dec/2021	Girrah 1 Seam	0.25	<0.005	1.4	<0.0005	<0.005	<0.005	0.007	3.74	<0.005	0.189	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.067
W2_MB2	25/Jan/2022	Girrah 1 Seam	0.15	<0.005	1.66	<0.0005	<0.005	<0.005	0.008	3.52	<0.005	0.2	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.048
W2_MB2	22/Feb/2022	Girrah 1 Seam	0.14	<0.005	2.23	<0.0005	<0.005	<0.005	<0.005	3.53	<0.005	0.204	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.042
W2_MB2	16/Mar/2022	Girrah 1 Seam	0.08	<0.005	1.42	<0.0005	<0.005	<0.005	<0.005	3.21	<0.005	0.196	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.026
W2_MB2	03/May/2022	Girrah 1 Seam	0.17	<0.005	1.55	<0.0005	<0.005	<0.005	0.008	3.75	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.05
W2_MB2	31/May/2022	Girrah 1 Seam	0.14	<0.005	1.87	<0.0005	<0.005	<0.005	<0.005	3.44	<0.005	0.191	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.042
W2_MB2	22/Jun/2022	Girrah 1 Seam	0.41	<0.005	1.79	<0.0005	0.006	<0.005	0.007	3.56	<0.005	0.182	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.037
W2_MB2	20/Jul/2022	Girrah 1 Seam	0.08	<0.005	1.79	<0.0005	<0.005	<0.005	<0.005	3.08	<0.005	0.19	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W2_MB2	31/Aug/2022	Girrah 1 Seam	0.12	<0.005	1.55	<0.0005	<0.005	<0.005	<0.005	2.95	<0.005	0.178	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.032
W2_MB2	04/Oct/2022	Girrah 1 Seam	0.07	<0.005	1.45	<0.0005	<0.005	<0.005	<0.005	2.42	<0.005	0.162	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W4_MB2	21/Oct/2020	Permian overburden	0.11	0.012	0.52	<0.0001	0.002	0.007	<0.001	0.99	<0.001	0.363	<0.0001	0.009	0.011	<0.01	<0.001	0.02	<0.01	0.019
W4_MB2	09/Dec/2020	Permian overburden	0.12	0.008	0.66	<0.0001	0.002	0.004	0.023	0.98	<0.001	0.344	<0.0001	0.005	0.025	<0.01	<0.001	0.014	<0.01	0.033
W4_MB2	05/Jan/2021	Permian overburden	0.06	0.025	0.62	<0.0001	0.001	0.002	0.01	5.04	<0.001	0.267	<0.0001	0.003	0.014	<0.01	<0.001	0.006	<0.01	0.018
W4_MB2	26/Jan/2021	Permian overburden	0.13	0.041	0.63	<0.0001	0.002	0.004	0.012	5.84	<0.001	0.251	<0.0001	0.006	0.015	<0.01	<0.001	0.005	<0.01	0.043
W4_MB2	16/Feb/2021	Permian overburden	0.14	0.032	0.5	<0.0001	0.001	0.003	0.005	5.72	<0.001	0.219	<0.0001	0.006	0.017	<0.01	<0.001	0.005	<0.01	0.04
W4_MB2	14/Apr/2021	Permian overburden	0.19	0.026	0.57	<0.0001	0.002	0.003	0.007	6.42	<0.001	0.208	<0.0001	0.006	0.009	<0.01	<0.001	0.004	<0.01	0.04
W4_MB2	25/May/2021	Permian overburden	0.1	0.027	0.7	<0.0005	<0.005	<0.005	0.006	8	<0.005	0.252	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	<0.026
W4_MB2	29/Jun/2021	Permian overburden	0.1	0.023	0.52	<0.0001	0.002	0.002	0.012	7.15	<0.001	0.231	<0.0001	0.004	0.014	<0.01	<0.001	0.004	<0.01	0.021
W4_MB2	26/Jul/2021	Permian overburden	0.1	0.019	0.59	<0.0001	0.001	0.002	0.01	5.62	<0.001	0.231	<0.0001	0.004	0.017	<0.01	<0.001	0.004	<0.01	0.02
W4_MB2	24/Aug/2021	Permian overburden	0.08	0.014	0.6	<0.0005	<0.005	<0.005	<0.005	2.58	<0.005	0.197	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W4_MB2	14/Sep/2021	Permian overburden	0.06	0.013	0.57	<0.0001	0.002	<0.001	0.012	1.6	<0.001	0.218	<0.0001	0.002	0.004	<0.01	<0.001	0.004	<0.01	0.022
W4_MB2	19/Oct/2021	Permian overburden	0.07	0.005	0.41	<0.0001	<0.001	0.001	0.004	0.75	<0.001	0.19	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	0.014
W4_MB2	16/Nov/2021	Permian overburden	0.05	0.003	0.6	<0.0001	0.002	<0.001	0.004	0.34	<0.001	0.202	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	0.012
W4_MB2	09/Dec/2021	Permian overburden	0.07	0.002	0.68	<0.0001	0.002	<0.001	0.003	0.39	<0.001	0.209	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	0.016
W4_MB2	25/Jan/2022	Permian overburden	0.06	0.002	0.63	<0.0001	0.002	<0.001	0.004	0.45	<0.001	0.23	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	0.02
W4_MB2	15/Feb/2022	Permian overburden	0.05	0.002	0.65	<0.0001	0.002	<0.001	0.004	0.32	<0.001	0.209	<0.0001	0.001	0.003	<0.01	<0.001	0.002	<0.01	0.015
W4_MB2	16/Mar/2022	Permian overburden	0.06	0.001	0.61	<0.0001	0.002	<0.001	0.002	0.24	<0.001	0.204	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	0.014
W4_MB2	03/May/2022	Permian overburden	0.09	0.002	0.65	<0.0001	0.002	0.001	0.004	0.42	<0.001	0.195	<0.0001	<0.001	0.003	<0.01	<0.001	0.001	<0.01	0.019
W4_MB2	31/May/2022	Permian overburden	0.09	0.002	0.66	<0.0001	0.003	<0.001	0.004	0.32	<0.001	0.212	<0.0001	0.001	0.003	<0.01	<0.001	0.003	<0.01	0.02
W4_MB2	22/Jun/2022	Permian overburden	0.13	0.002	0.69	<0.0001	0.004	0.001	0.005	0.72	<0.001	0.211	<0.0001	0.001	0.005	<0.01	<0.001	0.002	<0.01	0.033
W4_MB2	20/Jul/2022	Permian overburden	0.08	<0.005	0.73	<0.0005	<0.005	<0.005	<0.005	0.48	<0.005	0.184	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W4_MB2	31/Aug/2022	Permian overburden	0.11	0.001	0.7	<0.0001	0.003	<0.001	0.003	0.56	<0.001	0.182	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	0.022
W5_MB2	21/Oct/2020	Leichhardt Lower Seam	0.77	0.001	1.09	<0.0001	<0.001	0.005	0.002	1.56	<0.001	0.196	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.049
W5_MB2	09/Dec/2020	Leichhardt Lower Seam	1.26	0.001	1.33	<0.0001	0.003	0.008	0.011	4.22	<0.001	0.273	<0.0001	0.001	0.082	<0.01	<0.001	0.001	<0.01	0.024
W5_MB2	05/Jan/2021	Leichhardt Lower Seam	0.3	0.001	0.99	<0.0001	<0.001	0.009	0.016	0.88	<0.001	0.213	<0.0001	0.001	0.062	<0.01	<0.001	0.001	<0.01	0.022
W5_MB2	26/Jan/2021	Leichhardt Lower Seam	0.62	0.002	1.05	<0.0001	0.001	0.015	0.155	1.35	<0.001	0.319	<0.0001	0.002	0.074	<0.01	<0.001	0.001	<0.01	0.172
W5_MB2	16/Feb/2021	Leichhardt Lower Seam	0.32	<0.005	1.31	<0.0005	<0.005	0.015	0.662	1.38	<0.005	0.354	<0.0001	<0.005	0.076	<0.05	<0.005	<0.005	<0.05	0.583
W5_MB2	10/Mar/2021	Leichhardt Lower Seam	0.35	0.003	1	<0.0001	0.001	0.019	0.222	1.63	<0.001	0.531	<0.0001	0.002	0.056	<0.01	<0.001	0.002	<0.01	0.162
W5_MB2	14/Apr/2021	Leichhardt Lower Seam	0.2	<0.001	1.36	<0.0001	0.026	0.007	0.171	1.58	<0.001	0.218	<0.0001	0.002	0.142	<0.01	<0.001	<0.001	<0.01	0.126
W5_MB2	25/May/2021	Leichhardt Lower Seam	0.11	<0.005	1.44	<0.0005	0.019	0.015	0.228	1.37	<0.005	0.429	<0.0001	<0.005	0.148	<0.05	<0.005	<0.005	<0.05	0.174
W5_MB2	29/Jun/2021	Leichhardt Lower Seam	0.26	0.003	1.04	<0.0001	0.028	0.019	0.214	2.28	<0.001	0.67	<0.0001	0.002	0.105	<0.01	<0.001	0.002	<0.01	0.157
W5_MB2	26/Jul/2021	Leichhardt Lower Seam	0.37	0.002	1.1	<0.0001	0.027	0.011	0.305	2.51	0.002	0.355	<0.0001	0.002	0.124	<0.01	<0.001	0.001	<0.01	0.19
W5_MB2	24/Aug/2021	Leichhardt Lower Seam	0.52	<0.005	1.23	<0.0005	0.021	0.017	0.236	2.35	<0.005	0.58	<0.0001	<0.005	0.11	<0.05	<0.005	<0.005	<0.05	0.175
W5_MB2	14/Sep/2021	Leichhardt Lower Seam	0.25	0.004	1.06	<0.0001	0.019	0.019	0.201	2.1	0.001	0.734	<0.0001	0.002	0.101	<0.01	<0.001	0.002	<0.01	0.139
W5_MB2	19/Oct/2021	Leichhardt Lower Seam	0.25	0.004	1.01	<0.0001	0.014	0.02	0.141	1.76	0.001	0.801	<0.0001	0.002	0.077	<0.01	<0.001	0.002	<0.01	0.097
W5_MB2	16/Nov/2021	Leichhardt Lower Seam	0.1	0.002	1.19	<0.0001	0.006	0.022	0.089	0.73	<0.001	0.878	<0.0001	0.002	0.068	<0.01	<0.001	0.002	<0.01	0.085
W5_MB2	09/Dec/2021	Leichhardt Lower Seam	0.16	0.003	1.06	<0.0001	0.01	0.024	0.086	1.08	<0.001	0.909	<0.0001	0.003	0.063	<0.01	<0.001	0.002	<0.01	0.084
W5_MB2	25/Jan/2022	Leichhardt Lower Seam	0.19	0.006	1.19	<0.0001	0.012	0.029	0.124	2.82	0.001	1.07	<0.0001	0.003	0.057	<0.01	<0.001	0.002	<0.01	0.083
W5_MB2	15/Feb/2022	Leichhardt Lower Seam	0.12	<0.005	1.34	<0.0005	0.008	0.024	0.086	2.26	<0.005	0.999	<0.0001	<0.005	0.043	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB2	16/Mar/2022	Leichhardt Lower Seam	0.15	<0.005	1.19	<0.0005	<0.005	0.023	0.117	1.8	<0.005	0.997	<0.0001	<0.005	0.03	<0.05	<0.005	<0.005	<0.05	0.07
W5_MB2	03/May/2022	Leichhardt Lower Seam	0.09	<0.005	1.31	<0.0005	<0.005	0.023	0.061	1.39	<0.005	1.03	<0.0001	<0.005	0.03	<0.05	<0.005	<0.005	<0.05	0.041
W5_MB2	31/May/2022	Leichhardt Lower Seam	0.27	0.005	1.23	<0.0001	0.008	0.023	0.137	2.39	0.002	1.08	<0.0001	0.003	0.03	<0.01	<0.001	0.002	<0.01	0.067
W5_MB2	22/Jun/2022	Leichhardt Lower Seam	0.13	<0.005	1.4	<0.0005	<0.005	0.021	0.036	0.48	<0.005	0.956	<0.0001	<0.005	0.025	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB2	31/Aug/2022	Leichhardt Lower Seam	0.16	0.002	1.35	<0.0001	0.003	0.008	0.048	1.14	0.002	0.844	<0.0001	0.003	0.024	<0.01	<0.001	0.002	<0.01	0.025
W5_MB3	21/Oct/2020	Vermont Seam	0.22	<0.001	0.96	<0.0001	0.004	0.002	0.004	0.22	<0.001	0.438	<0.0001	0.005	0.006	<0.01	<0.001	0.003	<0.01	0.067
W5_MB3	09/Dec/2020	Vermont Seam	0.06	<0.001	0.7	0.0001	0.201	<0.001	0.003	0.98	<0.001	0.188	<0.0001	0.089	0.001	<0.01	<0.001	0.001	<0.01	<0.005
W5_MB3	05/Jan/2021	Vermont Seam	0.23	0.002	0.9	<0.0001	0.047	<0.001	0.122	2.36	<0.001	0.316	<0.0001	0.046	0.004	<0.01	<0.001	0.002	<0.01	0.028
W5_MB3	26/Jan/2021	Vermont Seam	0.29	0.003	0.8	<0.0001	0.054	<0.001	0.046	2.4	<0.001	0.332	<0.0001	0.047	0.003	<0.01	<0.001	0.002	<0.01	0.024
W5_MB3	16/Feb/2021	Vermont Seam	0.13	<0.005	0.98	<0.0005	0.073	<0.005	0.055	2.15	<0.005	0.293	<0.0001	0.046	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB3	10/Mar/2021	Vermont Seam	0.14	0.002	0.81	<0.0001	0.067	<0.001	0.043	1.83	<0.001	0.338	<0.0001	0.042	0.002	<0.01	<0.001	0.002	<0.01	0.012

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W5_MB3	14/Apr/2021	Vermont Seam	0.04	0.001	0.74	<0.0001	0.09	<0.001	0.004	0.34	<0.001	0.078	<0.0001	0.065	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	25/May/2021	Vermont Seam	0.05	<0.005	0.66	<0.0005	0.144	<0.005	<0.005	0.51	<0.005	0.081	<0.0001	0.08	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB3	29/Jun/2021	Vermont Seam	0.08	0.002	0.74	<0.0001	0.055	<0.001	0.006	0.79	<0.001	0.127	<0.0001	0.039	0.001	<0.01	<0.001	<0.001	<0.01	0.01
W5_MB3	26/Jul/2021	Vermont Seam	0.08	0.002	0.8	0.0003	0.045	0.001	0.005	0.62	0.001	0.121	<0.0001	0.035	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	24/Aug/2021	Vermont Seam	0.06	<0.005	0.82	<0.0005	0.02	<0.005	<0.005	0.32	<0.005	0.113	<0.0001	0.018	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W5_MB3	14/Sep/2021	Vermont Seam	0.08	0.001	0.78	<0.0001	0.034	<0.001	0.01	0.51	<0.001	0.124	<0.0001	0.034	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	19/Oct/2021	Vermont Seam	0.02	0.001	0.62	<0.0001	0.019	<0.001	0.002	0.22	<0.001	0.09	<0.0001	0.044	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	16/Nov/2021	Vermont Seam	0.02	0.001	0.84	<0.0001	0.014	<0.001	0.002	0.23	<0.001	0.114	<0.0001	0.022	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	09/Dec/2021	Vermont Seam	0.07	<0.001	0.63	<0.0001	0.019	<0.001	<0.001	0.36	<0.001	0.13	<0.0001	0.029	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	25/Jan/2022	Vermont Seam	0.03	0.001	0.84	<0.0001	0.013	<0.001	0.001	0.28	<0.001	0.14	<0.0001	0.027	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	15/Feb/2022	Vermont Seam	0.04	0.001	0.79	<0.0001	0.015	<0.001	0.002	0.26	<0.001	0.126	<0.0001	0.026	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	16/Mar/2022	Vermont Seam	<0.05	<0.005	0.66	<0.0005	0.006	<0.005	<0.005	0.11	<0.005	0.08	<0.0001	0.051	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB3	03/May/2022	Vermont Seam	0.05	<0.001	0.78	<0.0001	0.015	<0.001	0.002	0.27	<0.001	0.122	<0.0001	0.036	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	31/May/2022	Vermont Seam	<0.05	<0.005	1.16	<0.0005	0.012	<0.005	<0.005	0.16	<0.005	0.165	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB3	22/Jun/2022	Vermont Seam	0.11	<0.005	1.23	<0.0005	0.019	<0.005	<0.005	0.4	<0.005	0.175	<0.0001	0.008	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W5_MB3	20/Jul/2022	Vermont Seam	0.21	0.003	1.22	<0.0001	0.005	0.018	0.067	0.93	0.002	0.918	<0.0001	0.003	0.025	<0.01	<0.001	0.002	<0.01	0.022
W5_MB3	20/Jul/2022	Vermont Seam	0.05	<0.001	0.79	<0.0001	0.021	<0.001	0.002	0.2	<0.001	0.102	<0.0001	0.043	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W5_MB3	31/Aug/2022	Vermont Seam	0.05	<0.001	1.1	<0.0001	0.015	<0.001	<0.001	0.24	<0.001	0.148	<0.0001	0.021	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
W6_MB1	21/Oct/2020	Permian overburden	0.13	0.08	0.71	<0.0001	<0.001	0.004	<0.001	0.27	<0.001	0.848	<0.0025	0.032	0.025	<0.01	<0.001	0.064	<0.01	<0.005
W6_MB1	09/Dec/2020	Permian overburden	0.04	0.108	0.61	<0.0001	<0.001	0.001	0.004	0.24	<0.001	0.474	<0.0001	0.012	0.128	<0.01	<0.001	0.011	<0.01	0.016
W6_MB1	05/Jan/2021	Permian overburden	0.06	0.052	0.6	<0.0001	0.002	<0.001	0.01	0.22	<0.001	0.357	<0.0001	0.004	0.014	<0.01	<0.001	0.005	<0.01	0.014
W6_MB1	26/Jan/2021	Permian overburden	0.07	0.033	0.64	<0.0001	0.002	<0.001	0.004	0.26	<0.001	0.356	<0.0001	0.005	0.014	<0.01	<0.001	0.005	<0.01	<0.005
W6_MB1	16/Feb/2021	Permian overburden	0.09	0.02	0.52	<0.0001	0.003	<0.001	0.004	0.33	<0.001	0.317	<0.0001	0.004	0.013	<0.01	<0.001	0.004	<0.01	0.008
W6_MB1	10/Mar/2021	Permian overburden	0.06	0.023	0.61	<0.0001	0.001	<0.001	0.002	0.21	<0.001	0.388	<0.0001	0.004	0.011	<0.01	<0.001	0.006	<0.01	<0.005
W6_MB1	14/Apr/2021	Permian overburden	0.05	0.015	0.62	<0.0001	<0.001	<0.001	0.001	0.16	<0.001	0.318	<0.0001	0.004	0.008	<0.01	<0.001	0.005	<0.01	<0.005
W6_MB1	25/May/2021	Permian overburden	0.07	0.019	0.85	<0.0005	<0.005	<0.005	<0.005	0.42	<0.005	0.371	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.026
W6_MB1	29/Jun/2021	Permian overburden	4.5	0.028	0.71	<0.0001	0.008	0.005	0.034	6.19	0.003	0.397	<0.0001	0.012	0.041	<0.01	<0.001	0.005	0.01	0.054
W6_MB1	26/Jul/2021	Permian overburden	0.4	0.018	0.82	<0.0001	0.002	<0.001	0.003	1.06	<0.001	0.341	<0.0001	0.002	0.009	<0.01	<0.001	0.004	<0.01	0.012
W6_MB1	24/Aug/2021	Permian overburden	0.16	0.013	0.84	<0.0005	<0.005	<0.005	<0.005	0.3	<0.005	0.314	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W6_MB1	14/Sep/2021	Permian overburden	0.1	0.014	0.78	<0.0001	0.003	<0.001	0.007	0.31	<0.001	0.346	<0.0001	0.002	0.006	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB1	19/Oct/2021	Permian overburden	0.56	0.01	0.54	<0.0001	0.002	0.001	0.003	1.22	<0.001	0.327	<0.0001	0.002	0.007	<0.01	<0.001	0.003	<0.01	0.025
W6_MB1	16/Nov/2021	Permian overburden	0.24	0.016	0.8	<0.0001	0.002	<0.001	0.003	0.56	<0.001	0.33	<0.0001	0.002	0.007	<0.01	<0.001	0.004	<0.01	0.016
W6_MB1	09/Dec/2021	Permian overburden	0.26	0.013	0.6	<0.0001	0.002	<0.001	0.002	0.57	<0.001	0.329	<0.0001	0.002	0.006	<0.01	<0.001	0.004	<0.01	0.02
W6_MB1	25/Jan/2022	Permian overburden	0.12	0.011	0.82	<0.0001	0.002	<0.001	0.001	0.33	<0.001	0.344	<0.0001	0.002	0.006	<0.01	<0.001	0.003	<0.01	0.017
W6_MB1	15/Feb/2022	Permian overburden	0.14	0.012	0.83	<0.0001	0.001	<0.001	<0.001	0.3	<0.001	0.301	<0.0001	0.002	0.005	<0.01	<0.001	0.003	<0.01	0.009
W6_MB1	16/Mar/2022	Permian overburden	0.12	0.012	0.74	<0.0001	<0.001	<0.001	<0.001	0.26	<0.001	0.29	<0.0001	0.002	0.004	<0.01	<0.001	0.003	<0.01	0.007
W6_MB1	03/May/2022	Permian overburden	0.12	0.009	0.88	<0.0001	0.001	<0.001	0.001	0.24	<0.001	0.258	<0.0001	0.002	0.004	<0.01	<0.001	0.002	<0.01	0.006
W6_MB1	31/May/2022	Permian overburden	0.13	0.01	0.85	<0.0001	0.002	<0.001	0.003	0.26	<0.001	0.271	<0.0001	0.002	0.006	<0.01	<0.001	0.002	<0.01	0.01
W6_MB1	22/Jun/2022	Permian overburden	0.11	0.008	0.97	<0.0001	0.002	<0.001	0.001	0.28	<0.001	0.276	<0.0001	0.002	0.004	<0.01	<0.001	0.002	<0.01	0.009
W6_MB1	20/Jul/2022	Permian overburden	0.1	0.009	0.95	<0.0005	<0.005	<0.005	<0.005	0.21	<0.005	0.288	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W6_MB1	31/Aug/2022	Permian overburden	0.03	0.007	0.86	<0.0001	0.001	<0.001	<0.001	0.08	<0.001	0.276	<0.0001	<0.001	0.004	<0.01	<0.001	0.004	<0.01	<0.005
W6_MB2	21/Oct/2020	Girrah 1 Seam	0.4	<0.001	0.92	<0.0001	<0.001	<0.001	<0.001	0.56	<0.001	0.369	<0.0001	0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
W6_MB2	09/Dec/2020	Girrah 1 Seam	1.65	0.001	1.19	<0.0001	0.002	0.001	0.019	3.04	0.005	0.448	<0.0001	0.002	0.057	<0.01	<0.001	0.006	<0.01	0.035
W6_MB2	05/Jan/2021	Girrah 1 Seam	0.27	<0.001	0.95	<0.0001	0.003	<0.001	0.012	0.74	<0.001	0.355	<0.0001	<0.001	0.044	<0.01	<0.001	0.005	<0.01	0.022
W6_MB2	26/Jan/2021	Girrah 1 Seam	0.32	0.001	0.94	<0.0001	0.002	<0.001	0.012	0.81	<0.001	0.367	<0.0001	<0.001	0.047	<0.01	<0.001	0.005	<0.01	0.027
W6_MB2	16/Feb/2021	Girrah 1 Seam	0.06	<0.005	1.07	<0.0005	<0.005	<0.005	<0.005	0.78	<0.005	0.389	<0.0001	<0.005	0.034	<0.05	<0.005	<0.005	<0.05	<0.026
W6_MB2	10/Mar/2021	Girrah 1 Seam	0.19	<0.001	0.86	<0.0001	<0.001	<0.001	0.007	0.83	<0.001	0.415	<0.0001	<0.001	0.028	<0.01	<0.001	0.005	<0.01	0.017
W6_MB2	14/Apr/2021	Girrah 1 Seam	0.12	<0.001	0.9	<0.0001	<0.001	<0.001	0.007	0.69	<0.001	0.341	<0.0001	0.02	<0.01	<0.001	0.004	<0.01	0.011
W6_MB2	25/May/2021	Girrah 1 Seam	0.12	<0.005	1.11	<0.0005	<0.005	<0.005	0.034	1.06	<0.005	0.441	<0.0001	<0.005	0.021	<0.05	<0.005	<0.005	<0.05	<0.026
W6_MB2	29/Jun/2021	Girrah 1 Seam	0.35	<0.001	0.81	<0.0001	<0.001	<0.001	0.012	1.19	<0.001	0.369	<0.0001	<0.001	0.016	<0.01	<0.001	0.003	<0.01	0.015
W6_MB2	26/Jul/2021	Girrah 1 Seam	0.21	<0.001	0.92	<0.0001	<0.001	<0.001	0.014	1.1	<0.001	0.352	<0.0001	<0.001	0.018	<0.01	<0.001	0.003	<0.01	0.018
W6_MB2	24/Aug/2021	Girrah 1 Seam	0.11	<0.005	0.95	<0.0005	<0.005	<0.005	0.008	0.85	<0.005	0.309	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.024
W6_MB2	14/Sep/2021	Girrah 1 Seam	0.27	<0.001	0.87	<0.0001	<0.001	<0.001	0.02	1.04	<0.001	0.353	<0.0001	<0.001	0.02	<0.01	<0.001	0.002	<0.01	0.013
W6_MB2	19/Oct/2021	Girrah 1 Seam	0.1	<0.001	0.62	<0.0001	<0.001	<0.001	0.012	0.5	<0.001	0.337	<0.0001	<0.001	0.01	<0.01	<0.001	0.002	<0.01	0.009
W6_MB2	16/Nov/2021	Girrah 1 Seam	0.1	<0.001	0.96	<0.0001	<0.001	<0.001	0.009	0.76	<0.001	0.335	<0.0001	<0.001	0.011	<0.01	<0.001	0.002	<0.01	0.012
W6_MB2	09/Dec/2021	Girrah 1 Seam	0.12	<0.001	0.66	<0.0001	<0.001	<0.001	0.012	1.09	<0.001	0.348	<0.0001	<0.001	0.014	<0.01	<0.001	0.002	<0.01	0.016
W6_MB2	25/Jan/2022	Girrah 1 Seam	0.08	<0.001	0.98	<0.0001	0.001	<0.001	0.009	1.19	<0.001	0.374	<0.0001	<0.001	0.014	<0.01	<0.001	0.001	<0.01	0.017
W6_MB2	15/Feb/2022	Girrah 1 Seam	0.08	<0.001	1	<0.0001	<0.001	<0.001	0.006	0.72	<0.001	0.339	<0.0001	<0.001	0.008	<0.01	<0.001	0.001	<0.01	0.006
W6_MB2	16/Mar/2022	Girrah 1 Seam	0.06	<0.001	0.93	<0.0001	<0.001	<0.001	0.006	0.57	<0.001	0.324	<0.0001	<0.001	0.006	<0.01	<0.001	0.001	<0.01	0.008
W6_MB2	03/May/2022	Girrah 1 Seam	0.07	<0.001	0.98	<0.0001	<0.001	<0.001	0.008	0.76	<0.001	0.308	<0.0001	<0.001	0.01	<0.01	<0.001	<0.001	<0.01	0.009
W6_MB2	31/May/2022	Girrah 1 Seam	0.06	<0.001	1.04	<0.0001	<0.001	<0.001	0.009	0.42	<0.001	0.318	<0.0001	<0.001	0.007	<0.01	<0.001	<0.001	<0.01	0.007
W6_MB2	22/Jun/2022	Girrah 1 Seam	0.06	<0.001	1.02	<0.0001	<0.001	<0.001	0.01	0.96	<0.001	0.33	<0.0001	<0.001	0.011	<0.01	<0.001	<0.001	<0.01	0.012
W6_MB2	20/Jul/2022	Girrah 1 Seam	0.03	<0.001	1	<0.0001	<0.001	<0.001	0.004	0.26	<0.001	0.316	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.007
W6_MB2	31/Aug/2022	Girrah 1 Seam	<0.05	<0.005	1.14	<0.0005	<0.005	<0.005	<0.005	0.24	<0.005	0.306	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	21/Oct/2020	Permian overburden	0.25	<0.005	1.75	<0.0005	<0.005	0.007	<0.005	2.06	<0.005	0.258	<0.0001	<0.005	0.011	<0.05	<0.005	<0.005	<0.05	0.059
W7_MB1	09/Dec/2020	Permian overburden	0.13	<0.005	2.06	<0.0005	<0.005	<0.005	<0.005	2.11	<0.005	0.199	<0.0001	<0.005	0.019	<0.05	<0.005	<0.005	<0.05	0.053
W7_MB1	05/Jan/2021	Permian overburden	0.07	<0.005	2.33	<0.0005	<0.005	0.005	<0.005	3.04	<0.005	0.252	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W7_MB1	26/Jan/2021	Permian overburden	0.33	<0.005	2.08	<0.0005	<0.005	0.006	<0.005	2.72	<0.005	0.253	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	0.081
W7_MB1	16/Feb/2021	Permian overburden	0.34	<0.005	2.12	<0.0005	<0.005	0.008	<0.005	2.18	<0.005	0.252	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	0.103
W7_MB1	10/Mar/2021	Permian overburden	0.42	<0.005	1.87	<0.0005	<0.005	0.008	<0.005	2.35	<0.005	0.252	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	0.095
W7_MB1	14/Apr/2021	Permian overburden	0.22	<0.005	2.33	<0.0005	<0.005	0.006	<0.005	1.96	<0.005	0.263	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	0.061
W7_MB1	25/May/2021	Permian overburden	0.15	<0.005	2.28	<0.0005	<0.005	<0.005	<0.005	1.82	<0.005	0.256	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	0.029
W7_MB1	29/Jun/2021	Permian overburden	0.16	<0.005	1.76	<0.0005	0.006	<0.005	0.008	1.65	<0.005	0.233	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	0.056
W7_MB1	26/Jul/2021	Permian overburden	0.21	<0.005	1.65	<0.0005	<0.005	0.006	0.01	1.7	<0.005	0.229	<0.0001	<0.005	0.011	<0.05	<0.005	<0.005	<0.05	0.052
W7_MB1	24/Aug/2021	Permian overburden	0.15	<0.005	1.81	<0.0005	<0.005	0.006	0.007	1.46	<0.005	0.214	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	0.044
W7_MB1	14/Sep/2021	Permian overburden	<0.05	<0.005	2.31	<0.0005	<0.005	<0.005	<0.005	1.54	<0.005	0.216	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	19/Oct/2021	Permian overburden	<0.05	<0.005	1.54	<0.0005	<0.005	<0.005	0.006	1.41	<0.005	0.219	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W7_MB1	16/Nov/2021	Permian overburden	<0.05	<0.005	1.93	<0.0005	<0.005	<0.005	<0.005	1.38	<0.005	0.226	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	09/Dec/2021	Permian overburden	<0.05	<0.005	1.84	<0.0005	<0.005	<0.005	<0.005	1.61	<0.005	0.243	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	25/Jan/2022	Permian overburden	<0.05	<0.005	2.09	<0.0005	<0.005	<0.005	0.006	1.94	<0.005	0.251	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	15/Feb/2022	Permian overburden	<0.05	<0.005	2.1	<0.0005	<0.005	<0.005	<0.005	2.05	<0.005	0.25	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	16/Mar/2022	Permian overburden	<0.05	<0.005	1.82	<0.0005	<0.005	<0.005	<0.005	1.97	<0.005	0.252	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	03/May/2022	Permian overburden	<0.05	<0.005	2.02	<0.0005	<0.005	<0.005	<0.005	1.68	<0.005	0.262	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	31/May/2022	Permian overburden	<0.05	<0.005	2.12	<0.0005	<0.005	<0.005	<0.005	1.5	<0.005	0.255	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	22/Jun/2022	Permian overburden	<0.05	<0.005	2.3	<0.0005	<0.005	<0.005	<0.005	1.98	<0.005	0.258	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	20/Jul/2022	Permian overburden	<0.05	<0.005	2.2	<0.0005	<0.005	<0.005	<0.005	2.19	<0.005	0.276	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W7_MB1	31/Aug/2022	Permian overburden	0.06	<0.005	2.63	<0.0005	<0.005	<0.005	<0.005	2.69	<0.005	0.287	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	21/Oct/2020	Girrah 1 Seam	0.21	0.008	0.9	<0.0005	<0.005	0.03	<0.005	2.91	<0.005	0.597	<0.0001	0.007	0.025	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	09/Dec/2020	Girrah 1 Seam	0.33	0.008	1.5	<0.0005	<0.005	0.033	<0.005	2.37	<0.005	0.472	<0.0001	<0.005	0.03	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	05/Jan/2021	Girrah 1 Seam	0.12	<0.005	1.41	<0.0005	<0.005	0.023	<0.005	2.93	<0.005	0.563	<0.0001	<0.005	0.021	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	28/Jan/2021	Girrah 1 Seam	0.19	0.006	1.43	<0.0005	<0.005	0.022	<0.005	3.06	<0.005	0.56	<0.0001	<0.005	0.018	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	16/Feb/2021	Girrah 1 Seam	0.49	0.006	1.35	<0.0005	<0.005	0.022	<0.005	3.3	<0.005	0.56	<0.0001	<0.005	0.021	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	10/Mar/2021	Girrah 1 Seam	0.14	<0.005	1.37	<0.0005	<0.005	0.016	<0.005	3.36	<0.005	0.57	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	14/Apr/2021	Girrah 1 Seam	0.08	0.006	1.5	<0.0005	<0.005	0.016	<0.005	3.7	<0.005	0.595	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	25/May/2021	Girrah 1 Seam	0.11	<0.005	1.33	<0.0005	<0.005	0.013	<0.005	3.28	<0.005	0.504	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	29/Jun/2021	Girrah 1 Seam	0.1	0.006	1.23	<0.0005	<0.005	0.013	<0.005	3.27	<0.005	0.536	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	26/Jul/2021	Girrah 1 Seam	0.21	<0.005	1.47	<0.0005	<0.005	0.012	0.006	3.31	<0.005	0.497	<0.0001	<0.005	0.017	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	24/Aug/2021	Girrah 1 Seam	0.09	<0.005	1.24	<0.0005	<0.005	0.01	<0.005	3.51	<0.005	0.498	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	<0.024
W8_MB1	14/Sep/2021	Girrah 1 Seam	0.06	0.006	1.63	<0.0005	<0.005	0.011	<0.005	3.92	<0.005	0.531	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	19/Oct/2021	Girrah 1 Seam	<0.05	0.006	1.04	<0.0005	<0.005	0.01	<0.005	3.84	<0.005	0.51	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.025
W8_MB1	16/Nov/2021	Girrah 1 Seam	0.12	<0.005	1.12	<0.0005	<0.005	0.01	<0.005	4.02	<0.005	0.495	<0.0001	<0.005	0.016	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	09/Dec/2021	Girrah 1 Seam	0.1	<0.005	1.24	<0.0005	<0.005	0.009	<0.005	3.89	<0.005	0.526	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	25/Jan/2022	Girrah 1 Seam	0.07	0.006	1.39	<0.0005	<0.005	0.008	0.006	4.77	<0.005	0.555	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	15/Feb/2022	Girrah 1 Seam	0.12	0.006	1.36	<0.0005	<0.005	0.009	<0.005	4.84	<0.005	0.559	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	16/Mar/2022	Girrah 1 Seam	<0.05	0.008	1.22	<0.0005	<0.005	0.006	<0.005	5.22	<0.005	0.564	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	03/May/2022	Girrah 1 Seam	<0.05	0.007	1.32	<0.0005	<0.005	0.006	<0.005	5.12	<0.005	0.564	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	31/May/2022	Girrah 1 Seam	0.09	0.008	1.4	<0.0005	<0.005	0.006	<0.005	5.5	<0.005	0.561	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	22/Jun/2022	Girrah 1 Seam	0.07	0.006	1.49	<0.0005	<0.005	0.005	<0.005	4.94	<0.005	0.55	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	20/Jul/2022	Girrah 1 Seam	<0.05	0.009	1.48	<0.0005	<0.005	<0.005	<0.005	5.29	<0.005	0.57	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W8_MB1	31/Aug/2022	Girrah 1 Seam	<0.05	0.007	1.7	<0.0005	<0.005	<0.005	<0.005	5.4	<0.005	0.592	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	21/Oct/2020	Vermont Upper Seam	0.36	0.002	0.21	<0.0001	<0.001	<0.001	0.003	1.24	<0.001	0.116	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	0.009
W9_MB2	09/Dec/2020	Vermont Upper Seam	0.35	<0.005	0.85	<0.0005	<0.005	<0.005	<0.005	2.44	<0.005	0.203	<0.0001	<0.005	0.029	<0.05	<0.005	<0.005	<0.05	0.084
W9_MB2	04/Jan/2021	Vermont Upper Seam	<0.05	<0.005	0.99	<0.0005	<0.005	<0.005	<0.005	2.2	<0.005	0.23	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	28/Jan/2021	Vermont Upper Seam	0.14	<0.005	0.82	<0.0005	<0.005	<0.005	<0.005	2.03	<0.005	0.187	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	16/Feb/2021	Vermont Upper Seam	<0.05	<0.005	0.75	<0.0005	<0.005	<0.005	<0.005	1.62	<0.005	0.191	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	10/Mar/2021	Vermont Upper Seam	0.15	<0.005	0.91	<0.0005	<0.005	<0.005	<0.005	2.36	<0.005	0.231	<0.0001	<0.005	0.103	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	14/Apr/2021	Vermont Upper Seam	<0.05	<0.005	1.05	<0.0005	<0.005	<0.005	<0.005	2.63	<0.005	0.237	<0.0001	<0.005	0.052	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	25/May/2021	Vermont Upper Seam	0.1	<0.005	1.08	<0.0005	<0.005	<0.005	<0.005	3.02	<0.005	0.248	<0.0001	<0.005	0.035	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	29/Jun/2021	Vermont Upper Seam	<0.05	<0.005	0.89	<0.0005	<0.005	<0.005	<0.005	2.28	<0.005	0.22	<0.0001	<0.005	0.076	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	22/Jul/2021	Vermont Upper Seam	<0.05	<0.005	0.74	<0.0005	<0.005	<0.005	<0.005	2.35	<0.005	0.218	<0.0001	<0.005	0.043	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	24/Aug/2021	Vermont Upper Seam	2.98	<0.005	0.29	<0.0005	<0.005	<0.005	0.057	2.44	<0.005	0.081	<0.0001	<0.005	0.026	<0.05	<0.005	<0.005	<0.05	0.047
W9_MB2	14/Sep/2021	Vermont Upper Seam	0.12	<0.005	1.15	<0.0005	<0.005	<0.005	<0.005	1.91	<0.005	0.191	<0.0001	<0.005	0.063	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	19/Oct/2021	Vermont Upper Seam	<0.05	<0.005	0.51	<0.0005	<0.005	<0.005	<0.005	1.61	<0.005	0.188	<0.0001	<0.005	0.047	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB2	16/Nov/2021	Vermont Upper Seam	2.1	<0.005	0.85	<0.0005	<0.005	<0.005	0.011	5.51	<0.005	0.227	<0.0001	<0.005	0.034	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	09/Dec/2021	Vermont Upper Seam	0.53	<0.005	1.03	<0.0005	<0.005	<0.005	<0.005	2.69	<0.005	0.23	<0.0001	<0.005	0.012	<0.05	<0.005	<0.005	<0.05	0.028
W9_MB2	25/Jan/2022	Vermont Upper Seam	0.69	<0.005	0.98	<0.0005	<0.005	<0.005	0.007	3.03	<0.005	0.221	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	0.026
W9_MB2	15/Feb/2022	Vermont Upper Seam	0.76	<0.005	1.06	<0.0005	<0.005	<0.005	<0.005	3.19	<0.005	0.243	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	16/Mar/2022	Vermont Upper Seam	0.67	<0.005	1	<0.0005	<0.005	<0.005	<0.005	2.66	<0.005	0.253	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	03/May/2022	Vermont Upper Seam	0.15	<0.005	0.94	<0.0005	<0.005	<0.005	<0.005	1.24	<0.005	0.223	<0.0001	<0.005	0.009	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	31/May/2022	Vermont Upper Seam	0.84	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	3.17	<0.005	0.268	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	22/Jun/2022	Vermont Upper Seam	0.86	<0.005	1.16	<0.0005	<0.005	<0.005	<0.005	3.2	<0.005	0.254	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	20/Jul/2022	Vermont Upper Seam	0.93	<0.005	1.18	<0.0005	<0.005	<0.005	0.007	3.66	<0.005	0.265	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB2	31/Aug/2022	Vermont Upper Seam	0.56	<0.005	1.26	<0.0005	<0.005	<0.005	<0.005	2.16	<0.005	0.257	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	21/Oct/2020	Vermont Lower Seam	0.64	0.007	0.72	<0.0005	<0.005	<0.005	<0.005	4.42	<0.005	0.38	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026

Meadowbrook - Groundwater Quality Monitoring
Attachment D5: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
W9_MB3	09/Dec/2020	Vermont Lower Seam	0.14	<0.005	1.31	<0.0005	<0.005	<0.005	<0.005	1.36	<0.005	0.276	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	04/Jan/2021	Vermont Lower Seam	0.21	<0.005	1.22	<0.0005	<0.005	<0.005	<0.005	5.79	<0.005	0.333	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	28/Jan/2021	Vermont Lower Seam	0.33	<0.005	1.15	<0.0005	<0.005	<0.005	<0.005	6.3	<0.005	0.298	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	16/Feb/2021	Vermont Lower Seam	0.25	<0.005	0.86	<0.0005	<0.005	<0.005	<0.005	5.07	<0.005	0.286	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	10/Mar/2021	Vermont Lower Seam	0.19	<0.005	1.12	<0.0005	<0.005	<0.005	<0.005	4.26	<0.005	0.287	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	14/Apr/2021	Vermont Lower Seam	0.14	<0.005	1.22	<0.0005	<0.005	<0.005	<0.005	4.73	<0.005	0.238	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	25/May/2021	Vermont Lower Seam	0.07	<0.005	1.11	<0.0005	<0.005	<0.005	<0.005	3.46	<0.005	0.208	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	29/Jun/2021	Vermont Lower Seam	0.36	<0.005	1.04	<0.0005	<0.005	<0.005	0.021	4.4	<0.005	0.205	<0.0001	<0.005	0.014	<0.05	<0.005	<0.005	<0.05	0.03
W9_MB3	22/Jul/2021	Vermont Lower Seam	0.06	<0.005	0.9	<0.0005	<0.005	<0.005	0.011	3.54	<0.005	0.193	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	24/Aug/2021	Vermont Lower Seam	0.17	<0.005	1.02	<0.0005	<0.005	<0.005	0.009	3.68	<0.005	0.181	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.024
W9_MB3	14/Sep/2021	Vermont Lower Seam	<0.05	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	2.82	<0.005	0.184	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	19/Oct/2021	Vermont Lower Seam	<0.05	<0.005	0.78	<0.0005	<0.005	<0.005	0.006	2.9	<0.005	0.164	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
W9_MB3	16/Nov/2021	Vermont Lower Seam	0.1	<0.005	1.04	<0.0005	<0.005	<0.005	<0.005	3.17	<0.005	0.178	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.031
W9_MB3	09/Dec/2021	Vermont Lower Seam	0.07	<0.005	0.96	<0.0005	<0.005	<0.005	<0.005	2.44	<0.005	0.181	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	25/Jan/2022	Vermont Lower Seam	0.1	<0.005	1.12	<0.0005	<0.005	<0.005	0.008	3.04	<0.005	0.189	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	15/Feb/2022	Vermont Lower Seam	<0.05	<0.005	1.2	<0.0005	<0.005	<0.005	<0.005	2.8	<0.005	0.194	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	16/Mar/2022	Vermont Lower Seam	0.1	<0.005	1.02	<0.0005	<0.005	<0.005	0.005	3.4	<0.005	0.193	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	03/May/2022	Vermont Lower Seam	0.11	<0.005	1.14	<0.0005	<0.005	<0.005	<0.005	3.25	<0.005	0.183	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	31/May/2022	Vermont Lower Seam	0.06	<0.005	1.33	<0.0005	<0.005	<0.005	<0.005	0.78	<0.005	0.312	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	22/Jun/2022	Vermont Lower Seam	0.11	<0.005	1.23	<0.0005	<0.005	<0.005	<0.005	3.31	<0.005	0.186	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	20/Jul/2022	Vermont Lower Seam	0.23	<0.005	1.32	<0.0005	<0.005	<0.005	<0.005	3.05	<0.005	0.167	<0.0001	0.013	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
W9_MB3	31/Aug/2022	Vermont Lower Seam	0.1	<0.005	1.4	<0.0005	<0.005	<0.005	<0.005	3.46	<0.005	0.204	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1238-MB1	18-Feb-2018	Tertiary	1.45	0.001	0.39	<0.0001	0.012	0.027	0.022	5.71	0.001	0.146	<0.0001	0.002	0.018	<0.01	<0.001	0.023	<0.01	0.117
1238-MB1	26-Mar-2018	Tertiary	0.46	0.001	0.4	<0.0001	0.003	0.022	0.003	2.55	<0.001	0.136	<0.0001	0.002	0.016	<0.01	<0.001	0.018	<0.01	0.044
1238-MB1	02-Jul-2018	Tertiary	1.74	0.002	0.38	<0.0001	0.013	0.016	0.005	2.91	<0.001	0.102	<0.0001	0.002	0.015	<0.01	<0.001	0.014	<0.01	0.015
1238-MB1	20-Sep-2018	Tertiary	0.49	0.001	0.42	<0.0001	0.018	NM	<0.001	0.82	<0.001	0.056	<0.0001	0.004	0.02	<0.01	<0.001	0.017	<0.01	0.024
1238-MB1	14-Mar-2019	Tertiary	0.36	<0.001	0.38	<0.0001	0.016	0.011	0.002	0.56	<0.001	0.039	<0.0005	0.003	0.017	<0.01	<0.001	0.016	<0.01	0.013
1238-MB1	21-Jun-2019	Tertiary	0.28	<0.001	0.34	<0.0001	0.012	0.007	0.002	0.38	<0.001	0.016	0.0004	0.002	0.014	<0.01	<0.001	0.017	<0.01	0.016
1238-MB1	28-Aug-2019	Tertiary	0.19	<0.001	0.39	0.0002	0.011	0.009	0.002	0.28	<0.001	0.012	0.0005	0.002	0.016	<0.01	<0.001	0.017	<0.01	0.015
1238-MB1	22-Oct-2019	Tertiary	0.14	<0.001	0.36	<0.0001	0.02	0.007	0.001	0.29	<0.001	0.011	0.0003	0.003	0.02	<0.01	<0.001	0.016	<0.01	0.01
1238-MB1	15-Dec-2019	Tertiary	0.09	<0.001	0.37	<0.0001	0.009	0.007	<0.001	0.18	<0.001	0.011	0.0003	0.002	0.018	<0.01	<0.001	0.017	<0.01	0.009
1238-MB1	06-Feb-2020	Tertiary	0.15	<0.001	0.34	<0.0001	0.004	0.008	<0.001	0.27	<0.001	0.008	0.0001	<0.001	0.015	<0.01	<0.001	0.017	<0.01	0.008
1238-MB1	08-Apr-2020	Tertiary	0.04	<0.001	0.26	<0.0001	0.002	0.007	<0.001	0.08	<0.001	0.008	0.0002	<0.001	0.019	<0.01	<0.001	0.016	<0.01	0.012
1238-MB1	09-Jun-2020	Tertiary	0.02	0.002	0.34	<0.0001	0.006	0.016	<0.001	2.32	<0.001	0.089	<0.0001	<0.001	0.012	<0.01	<0.001	0.015	<0.01	0.016
1238-MB1	19-Nov-2020	Tertiary	0.07	<0.001	0.28	<0.0001	0.002	0.006	0.001	1.23	<0.001	0.016	<0.0001	<0.001	0.009	<0.01	<0.001	0.007	<0.01	0.013
1238-MB1	03-Feb-2021	Tertiary	0.15	0.001	0.34	<0.0001	0.003	0.009	0.002	1.26	<0.001	0.016	<0.0001	<0.001	0.014	<0.01	<0.001	0.009	<0.01	0.023
1238-MB1	21-Apr-2021	Tertiary	0.04	0.001	0.37	<0.0001	0.002	0.007	<0.001	0.78	<0.001	0.01	<0.0001	<0.001	0.008	<0.01	<0.001	0.01	<0.01	0.019
1238-MB1	12-May-2021	Tertiary	0.05	0.001	0.27	<0.0001	0.002	0.007	<0.001	0.68	<0.001	0.019	<0.0001	<0.001	0.008	<0.01	<0.001	0.012	<0.01	0.036
1238-MB1	18-Aug-2021	Tertiary	0.02	<0.001	0.31	<0.0001	0.002	0.006	0.001	0.32	<0.001	0.008	<0.0001	<0.001	0.011	<0.01	<0.001	0.011	<0.01	0.012
1238-MB1	21-Sep-2021	Tertiary	0.54	0.002	0.38	<0.0001	0.002	0.01	0.003	1.55	<0.001	0.05	<0.0001	<0.001	0.012	<0.01	<0.001	0.013	<0.01	0.033
1238-MB1	17-Nov-2021	Tertiary	0.62	0.002	0.3	<0.0001	0.002	0.007	0.002	2.1	<0.001	0.043	<0.0001	<0.001	0.006	<0.01	<0.001	0.013	<0.01	0.013
1238-MB1	12-Jan-2022	Tertiary	1.3	0.002	0.57	<0.0001	0.004	0.008	0.002	2.67	<0.001	0.05	<0.0001	<0.001	0.007	<0.01	<0.001	0.014	<0.01	0.024
1238-MB1	15-Mar-2022	Tertiary	0.77	0.002	0.37	<0.0001	0.002	0.007	0.001	2.16	<0.001	0.042	<0.0001	<0.001	0.004	<0.01	<0.001	0.014	<0.01	0.012
1238-MB1	01-Jun-2022	Tertiary	0.64	0.002	0.37	<0.0001	0.002	0.006	0.002	3.14	<0.001	0.044	<0.0005	<0.001	0.006	<0.01	<0.001	0.014	<0.01	0.011
1238-MB1	20-Jul-2022	Tertiary	0.75	<0.005	0.41	<0.0005	<0.005	0.007	<0.005	2.09	<0.005	0.037	<0.0001	<0.005	<0.005	<0.05	<0.005	0.013	<0.05	<0.026
1238-MB1	28-Sep-2022	Tertiary	0.26	<0.001	0.32	<0.0001	0.001	0.003	<0.001	1.58	<0.001	0.046	<0.0001	<0.001	0.003	<0.01	<0.001	0.01	<0.01	0.006
2371W-MB1	25-Mar-2018	Tertiary	0.08	<0.001	1.38	<0.0001	<0.001	0.001	0.006	0.06	<0.001	0.022	<0.0001	0.003	0.008	<0.01	<0.001	0.188	0.06	0.011
2371W-MB1	15-Jul-2018	Tertiary	0.02	<0.001	1.48	<0.0001	0.002	NM	0.002	0.12	<0.001	0.056	<0.0001	0.004	0.009	<0.01	<0.001	0.166	0.02	<0.005
2371W-MB1	22-Sep-2018	Tertiary	0.03	<0.001	1.46	<0.0001	0.002	NM	<0.001	0.08	<0.001	0.055	<0.0001	0.003	0.008	<0.01	<0.001	0.2	<0.01	<0.005
2371W-MB1	23-Feb-2019	Tertiary	0.02	<0.001	1.31	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.05	<0.0001	0.003	0.007	<0.01	<0.001	0.248	<0.01	<0.005
2371W-MB1	28-May-2019	Tertiary	<0.01	<0.001	1.41	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.047	<0.0001	0.003	0.007	<0.01	<0.001	0.234	<0.01	<0.005
2371W-MB1	28-Aug-2019	Tertiary	<0.01	<0.001	1.11	0.0002	<0.001	0.004	0.001	<0.05	<0.001	0.047	<0.0001	0.004	0.009	<0.01	<0.001	0.229	<0.01	<0.005
2371W-MB1	24-Oct-2019	Tertiary	0.02	0.002	1.02	<0.0001	<0.001	0.003	<0.001	<0.05	<0.001	0.041	<0.0001	0.003	0.007	<0.01	<0.001	0.253	<0.01	<0.005
2371W-MB1	11-Dec-2019	Tertiary	<0.05	<0.005	1.49	<0.0005	<0.005	<0.005	<0.005	0.13	<0.005	0.041	<0.0005	<0.005	0.008	<0.05	<0.005	0.235	<0.05	<0.026
2371W-MB1	12-Feb-2020	Tertiary	<0.01	<0.001	1.85	<0.0001	<0.001	0.003	0.001	<0.05	<0.001	0.041	<0.0001	0.004	0.008	<0.01	<0.001	0.304	<0.01	<0.005
2371W-MB1	22-Apr-2020	Tertiary	<0.05	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	<0.05	<0.005	0.037	<0.0001	<0.005	0.017	<0.05	<0.005	0.296	<0.05	<0.026
2371W-MB1	10-Jun-2020	Tertiary	0.08	<0.005	1.07	<0.0005	<0.005	<0.005	<0.005	0.13	<0.005	0.038	<0.0001	<0.005	<0.005	<0.05	<0.005	0.279	<0.05	<0.026
2371W-MB1	18-Nov-2020	Tertiary	0.04	<0.001	0.85	<0.0001	0.002	0.002	0.001	0.08	<0.001	0.028	<0.0001	0.004	0.008	<0.01	<0.001	0.246	0.01	<0.005
2371W-MB1	08-Feb-2021	Tertiary	0.22	<0.005	1.55	<0.0005	<0.005	<0.005	<0.005	0.32	<0.005	0.029	<0.0001	<0.005	0.009	<0.05	<0.005	0.291	<0.05	<0.026
2371W-MB1	09-Feb-2021	Tertiary	3.5	<0.005	1.54	<0.0005	0.014	<0.005	0.008	5.56	<0.005	0.043	<0.0001	<0.005	0.015	<0.05	<0.005	0.278	<0.05	<0.026
2371W-MB1	21-Apr-2021	Tertiary	1.41	0.001	1.36	<0.0001	0.004	0.002	0.251	1.99	<0.001	0.026	<0.0001	0.004	0.012	<0.01	<0.001	0.278	0.02	0.145
2371W-MB1	12-May-2021	Tertiary	0.82	<0.005	1.35	<0.0005	<0.005	<0.005	0.02	1.37	<0.005	0.028	<0.0001	<0.005	0.007	<0.05	<0.005	0.262	<0.05	<0.026
2371W-MB1	18-Aug-2021	Tertiary	0.88	<0.005	1.22	<0.0005	<0.005	<0.005	0.007	1.3	<0.005	0.03	<0.0001	<0.005	0.006	<0.05	<0.005	0.226	<0.05	<0.024
2371W-MB1	21-Sep-2021	Tertiary	0.46	<0.005	1.38	<0.0005	<0.005	<0.005	<0.005	0.64	<0.005	0.026	<0.0001	<0.005	<0.005	<0.05	<0.005	0.273	<0.05	<0.026
2371W-MB1	17-Nov-2021	Tertiary	0.63	<0.005	1.28	<0.0005	<0.005	<0.005	<0.005	1.05	<0.005	0.022	<0.0001	<0.005	0.009	<0.05	<0.005	0.238	<0.05	<0.026
2371W-MB1	12-Jan-2022	Tertiary	0.78	<0.005	1.4	<0.0005	<0.005	<0.005	<0.005	1.2	<0.005	0.023	<0.0001	<0.005	0.005	<0.05	<0.005	0.251	<0.05	<0.026
2371W-MB1	15-Mar-2022	Tertiary	0.48	<0.005	1.41	<0.0005	<0.005	<0.005	<0.005	0.7	<0.005	0.017	<0.0001	<0.005	<0.005	<0.05	<0.005	0.248	<0.05	<0.026
2371W-MB1	01-Jun-2022	Tertiary	2.64	<0.005	1.81	<0.0005	<0.005	<0.005	0.006	1.53	<0.005	0.02	<0.0001	<0.005	0.008	<0.05	<0.005	0.267	<0.05	<0.026
2371W-MB1	31-Aug-2022	Tertiary	0.96	<0.005	1.3	<0.0005	<0.005	<0.005	<0.005	0.52	<0.005	0.015	<0.0001	<0.005	0.007	<0.05	<0.005	0.215	<0.05	<0.026
2371W-MB1	28-Sep-2022	Tertiary	1.29	<0.001	1.16	<0.0001	0.004	0.003	0.005	2.38	<0.001	0.022	<0.0001	0.003	0.007	<0.01	<0.001	0.256	0.02	0.009
2372-MB1	15-Feb-2018	Tertiary	0.86	0.003	0.55	<0.0001	0.009	0.011	0.029	3.31	0.002	0.478	<0.0001	0.004	0.017	<0.01	<0.001	0.027	<0.01	0.048
2372-MB1	05-Apr-2018	Tertiary	0.15	<0.005	0.63	<0.0005	<0.005	0.013	<0.005	3.18	<0.005	0.495	<0.0001	<0.005	0.013	<0.05	<0.005	0.027	<0.05	0.031
2372-MB1	30-Jun-2018	Tertiary	0.02	0.002	0.54	<0.0001	0.011	0.012	0.003	4.31	<0.001	0.588	<0.0001	0.003	0.019	<0.01	<0.001	0.02	<0.01	0.007
2372-MB1	20-Sep-2018	Tertiary	<0.10	<0.010	0.63	<0.0010	<0.010	NM	<0.010	2.65	<0.010	0.641	<0.0001	<0.010	0.012	<0.10	<0.010	0.022	<0.10	<0.050
2372-MB1	19-Jun-2019	Tertiary	<0.05	<0.005	0.66	<0.0005	<0.005	0.009	<0.005	1.43	<0.005	0.908	<0.0001	<0.005	0.009	<0.05	0.009	0.017	<0.05	<0.026
2372-MB1	04-Sep-2019	Tertiary	<0.05	<0.005	0.5	<0.0005	<0.005	0.008	<0.005	1.56	<0.005	0.739	<0.0001	<0.005	0.01	<0.05	<0.005	0.017	<0.05	<0.026
2372-MB1	28-Oct-2019	Tertiary	<0.05	<0.005	0.57	<0.0005	0.008	0.007	<0.005	1.36	<0.005	0.694	<0.0001	<0.005	0.007	<0.05	<0.005	0.02	<0.05	<0.026
2372-MB1	14-Dec-2019	Tertiary	<0.05	<0.005	0.48	<0.0005	0.011	0.007	<0.005	1.17	<0.005	0.572	<0.0001	<0.005	0.007	<0.05	<0.005	0.018	<0.05	<0.026
2372-MB1	04-Feb-2020	Tertiary	0.15	<0.005	<0.05	<0.0005	<0.005	0.007	<0.005	0.74	<0.005	0.496	<0.0001	0.006	0.009	<0.05	<0.005	0.018	<0.05	<0.026
2372-MB1	07-Apr-2020	Tertiary	<0.05	<0.005	0.5	<0.0005	<0.005	0.006	<0.005	0.81	<0.005	0.685	<0.0001	<0.005	0.007	<0.05	<0.005	0.017	<0.05	<0.026
2372-MB1	02-Jun-2020	Tertiary	<0.05	<0.005	0.48	<0.0005	<0.005	0.006	<0.005	0.49	<0.005	0.665	<0.0001	<0.005	0.01	<0.05	<0.005	0.017	<0.05	<0.026
2372-MB1	17-Nov-2020	Tertiary	0.11	0.006	0.33	<0.0005	0.032	0.021	<0.005	3.71	<0.005	0.71	<0.0001	<0.005	0.422	<0.05	<0.005	0.01	<0.05	<0.026
2372-MB1	02-Feb-2021	Tertiary	<0.05	<0.005	0.56	<0.0005	0.057	0.007	<0.005	1.58	<0.005	0.733	<0.0001	0.013	0.057	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB1	20-Apr-2021	Tertiary	0.06	<0.005	0.48	0.0015	0.212	0.009	0.01	1.58	<0.005	0.764	<0.0001	0.034	0.055	<0.05	<0.005	0.011	<0.05	<0.026
2372-MB1	11-May-2021	Tertiary	<0.05	0.012	0.46	<0.0005	0.294	0.007	0.006	1.71	<0.005	0.713	<0.0001	0.032	0.036	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB1	17-Aug-2021	Tertiary	<0.05	<0.005	0.4	<0.0005	0.231	0.007	0.008	1.52	<0.005	0.66	<0.0001	0.026	0.042	<0.05	<0.005	0.01	<0.05	<0.024
2372-MB1	21-Sep-2021	Tertiary	0.48	<0.005	0.47	<0.0005	0.039	0.008	<0.005	3.09	<0.005	0.694	<0.0001	<0.005	0.005	<0.05	<0.005	0.014	<0.05	<0.026
2372-MB1	17-Nov-2021	Tertiary	0.58	<0.005	0.39	<0.0005	0.046	0.007	<0.005	2.49	<0.005	0.724	<0.0001	<0.005	0.013	<0.05	<0.005	0.01	<0.05	<0.026

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2372-MB1	12-Jan-2022	Tertiary	0.35	<0.005	0.54	<0.0005	0.021	0.008	<0.005	2.36	<0.005	0.724	<0.0001	<0.005	0.011	<0.05	<0.005	0.01	<0.05	<0.026
2372-MB1	15-Mar-2022	Tertiary	0.44	<0.005	0.51	<0.0005	0.013	0.007	<0.005	1.89	<0.005	0.674	<0.0001	<0.005	0.009	<0.05	<0.005	0.011	<0.05	<0.026
2372-MB1	31-May-2022	Tertiary	0.71	<0.005	0.59	<0.0005	0.022	0.007	<0.005	2.5	<0.005	0.671	<0.0001	<0.005	0.012	<0.05	<0.005	0.01	<0.05	<0.026
2372-MB1	31-Aug-2022	Tertiary	0.79	<0.005	0.6	<0.0005	0.023	0.008	<0.005	2.48	<0.005	0.659	<0.0001	<0.005	0.012	<0.05	<0.005	0.011	<0.05	<0.026
2372-MB1	29-Sep-2022	Tertiary	0.14	<0.005	0.58	<0.0005	<0.005	0.006	<0.005	1.56	<0.005	0.555	<0.0001	<0.005	0.009	<0.05	<0.005	0.008	<0.05	<0.026
West-MB1	17-Feb-2018	Tertiary	0.39	0.002	0.52	<0.0001	<0.001	0.002	0.006	0.4	<0.001	0.048	<0.0001	0.004	0.004	<0.01	<0.001	0.006	<0.01	0.032
West-MB1	26-Mar-2018	Tertiary	0.09	0.002	0.48	<0.0001	<0.001	<0.001	<0.001	0.34	<0.001	0.028	<0.0001	0.002	0.004	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	27-Jul-2018	Tertiary	0.02	0.003	0.48	0.0002	<0.001	NM	<0.001	0.28	<0.001	0.052	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	13-Sep-2018	Tertiary	0.02	0.001	0.47	<0.0001	<0.001	NM	<0.001	0.23	<0.001	0.063	<0.0001	0.002	0.003	<0.01	<0.001	0.002	<0.01	<0.005
West-MB1	24-Feb-2019	Tertiary	<0.01	0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.32	<0.001	0.033	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB1	26-May-2019	Tertiary	<0.01	0.002	0.5	<0.0001	<0.001	<0.001	<0.001	0.44	<0.001	0.031	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	01-Aug-2019	Tertiary	<0.01	0.002	0.6	<0.0001	<0.001	0.001	<0.001	0.4	<0.001	0.051	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	25-Oct-2019	Tertiary	<0.01	<0.001	0.45	<0.0001	<0.001	0.001	<0.001	0.16	<0.001	0.054	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	10-Dec-2019	Tertiary	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.046	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	11-Feb-2020	Tertiary	<0.01	<0.001	0.66	<0.0001	<0.001	0.001	<0.001	0.07	<0.001	0.04	<0.0001	0.003	0.002	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB1	22-Apr-2020	Tertiary	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.035	<0.0001	0.003	0.002	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	10-Jun-2020	Tertiary	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.03	<0.0001	0.003	0.002	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB1	18-Nov-2020	Tertiary	0.02	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.024	<0.0001	0.003	0.002	<0.01	<0.001	0.001	<0.01	0.005
WEST-MB1	03-Feb-2021	Tertiary	0.04	<0.001	0.51	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.024	<0.0001	0.004	0.002	<0.01	<0.001	0.001	<0.01	0.011
WEST-MB1	22-Apr-2021	Tertiary	0.04	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.016	<0.0001	0.002	0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	12-May-2021	Tertiary	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.02	<0.0001	0.002	0.001	<0.01	<0.001	0.001	<0.01	0.005
WEST-MB1	18-Aug-2021	Tertiary	<0.01	<0.001	0.44	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.02	<0.0001	0.002	0.005	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB1	21-Sep-2021	Tertiary	1.56	<0.001	0.5	<0.0001	0.003	<0.001	0.006	0.59	0.002	0.023	<0.0001	0.002	0.003	<0.01	<0.001	0.001	<0.01	0.013
WEST-MB1	17-Nov-2021	Tertiary	1.23	0.002	0.4	<0.0001	0.002	<0.001	0.004	0.59	<0.001	0.026	<0.0001	0.003	0.002	<0.01	<0.001	<0.001	<0.01	0.018
West-MB1	12-Jan-2022	Tertiary	1.58	0.001	0.59	<0.0001	0.003	<0.001	0.004	0.64	0.001	0.024	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	0.019
West-MB1	15-Mar-2022	Tertiary	0.81	<0.001	0.52	<0.0001	<0.001	<0.001	0.009	0.46	<0.001	0.018	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.019
West-MB1	01-Jun-2022	Tertiary	1.41	0.002	0.42	<0.0001	0.003	<0.001	0.005	0.78	0.001	0.02	<0.0001	0.002	0.003	<0.01	<0.001	0.001	<0.01	0.023
West-MB1	19-Jul-2022	Tertiary	1.64	0.001	0.42	<0.0001	0.003	<0.001	0.004	0.76	0.002	0.018	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	0.019
West-MB1	28-Sep-2022	Tertiary	1.1	0.001	0.38	<0.0001	0.002	<0.001	0.003	0.66	<0.001	0.014	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	0.013
2218-MB2	18-Feb-2018	Rewan Group	1.74	0.013	0.31	<0.0001	0.004	0.004	0.025	6	0.002	1.33	<0.0001	0.014	0.007	<0.01	<0.001	0.005	<0.01	0.036
2218-MB2	04-Apr-2018	Rewan Group	0.64	0.007	0.33	<0.0001	<0.001	<0.001	0.002	4.25	<0.001	0.919	<0.0001	0.002	0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	14-Jul-2018	Rewan Group	0.3	0.004	0.29	<0.0001	<0.001	NM	<0.001	4.62	<0.001	0.777	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	22-Sep-2018	Rewan Group	0.2	0.003	0.33	<0.0001	<0.001	NM	<0.001	4.66	<0.001	0.801	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	21-Feb-2019	Rewan Group	0.32	0.001	0.3	<0.0001	0.001	<0.001	<0.001	4.66	<0.001	0.768	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	22-Jun-2019	Rewan Group	0.16	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	4.52	<0.001	0.568	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	02-Aug-2019	Rewan Group	0.24	<0.001	0.33	<0.0001	<0.001	<0.001	<0.001	4.89	<0.001	0.599	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	24-Oct-2019	Rewan Group	0.17	<0.001	0.3	<0.0001	<0.001	<0.001	<0.001	4.32	<0.001	0.53	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	11-Dec-2019	Rewan Group	0.5	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	4.16	<0.005	0.536	<0.0005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	12-Feb-2020	Rewan Group	0.19	<0.005	0.48	<0.0005	<0.005	<0.005	<0.005	5.98	<0.005	0.553	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB2	21-Apr-2020	Rewan Group	0.18	<0.005	0.4	<0.0005	<0.005	<0.005	<0.005	5.58	<0.005	0.509	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	09-Jun-2020	Rewan Group	0.32	0.007	0.18	<0.0001	<0.001	<0.001	<0.001	6.56	<0.001	0.516	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	18-Nov-2020	Rewan Group	0.29	0.004	0.19	<0.0001	0.002	<0.001	0.001	7.18	<0.001	0.834	<0.0001	0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB2	08-Feb-2021	Rewan Group	0.52	0.003	0.33	<0.0001	0.003	<0.001	0.004	6.94	<0.001	0.421	<0.0001	0.002	0.005	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB2	09-Feb-2021	Rewan Group	4.15	0.002	0.27	<0.0001	0.01	0.004	0.013	8.58	0.003	0.478	<0.0001	0.005	0.038	<0.01	<0.001	<0.001	0.01	0.052
2218-MB2	21-Apr-2021	Rewan Group	0.74	<0.001	0.29	<0.0001	0.002	<0.001	0.12	6.6	<0.001	0.469	<0.0001	0.003	0.113	<0.01	<0.001	<0.001	<0.01	0.07
2218-MB2	12-May-2021	Rewan Group	2.94	<0.005	0.21	<0.0005	0.005	<0.005	0.019	9.37	<0.005	0.488	<0.0001	0.005	0.02	<0.05	<0.005	<0.005	<0.05	0.041
2218-MB2	18-Aug-2021	Rewan Group	1.19	<0.005	0.2	<0.0005	<0.005	<0.005	<0.005	5.77	<0.005	0.402	<0.0001	<0.005	0.005	<0.05	<0.005	<0.005	<0.05	<0.024
2218-MB2	21-Sep-2021	Rewan Group	1.48	<0.005	0.25	<0.0005	<0.005	<0.005	<0.005	7.57	<0.005	0.449	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	17-Nov-2021	Rewan Group	0.8	<0.001	0.23	<0.0001	0.002	<0.001	0.003	6.29	<0.001	0.386	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	0.007
2218-MB2	12-Jan-2022	Rewan Group	2.16	0.001	0.39	<0.0001	0.004	<0.001	0.007	7.37	<0.001	0.478	<0.0001	0.002	0.015	<0.01	<0.001	<0.001	<0.01	0.016
2218-MB2	15-Mar-2022	Rewan Group	1.02	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	6.58	<0.005	0.395	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	01-Jun-2022	Rewan Group	1.19	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	7.51	<0.005	0.397	<0.0001	<0.005	0.007	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	19-Jul-2022	Rewan Group	2.18	0.005	0.3	<0.0005	<0.005	<0.005	<0.005	6.51	<0.005	0.347	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB2	28-Sep-2022	Rewan Group	1.39	<0.001	0.25	<0.0001	0.002	<0.001	0.003	7.27	<0.001	0.385	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.009
2226-MB2	14-Feb-2018	Rewan Group	2.55	<0.001	0.62	0.0001	0.007	0.004	0.01	3.12	0.004	0.551	<0.0001	0.003	0.009	<0.01	<0.001	0.007	<0.01	0.049
2226-MB2	25-Mar-2018	Rewan Group	0.4	<0.001	0.64	<0.0001	0.01	0.001	0.002	0.68	<0.001	0.204	<0.0001	0.004	0.006	<0.01	<0.001	0.007	<0.01	0.011
2226-MB2	15-Jul-2018	Rewan Group	0.01	<0.001	0.58	<0.0001	<0.001	NM	<0.001	0.14	<0.001	0.271	<0.0001	0.003	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	22-Sep-2018	Rewan Group	<0.01	<0.001	0.64	<0.0001	<0.001	NM	<0.001	<0.05	<0.001	0.168	<0.0001	0.003	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	23-Feb-2019	Rewan Group	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.096	<0.0001	0.003	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	28-May-2019	Rewan Group	0.05	<0.001	0.67	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.068	<0.0001	0.003	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	28-Aug-2019	Rewan Group	<0.01	<0.001	0.59	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.061	<0.0001	0.002	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	24-Oct-2019	Rewan Group	0.28	<0.001	0.59	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.047	<0.0001	0.002	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	10-Dec-2019	Rewan Group	<0.01	<0.001	0.62	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.032	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	12-Feb-2020	Rewan Group	<0.01	<0.001	0.88	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.013	<0.0001	0.002	<0.001	<0.01	<0.001	0.007	<0.01	<0.005
2226-MB2	22-Apr-2020	Rewan Group	<0.01	<0.001	0.61	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.012	<0.0001	0.002	<0.001	<0.01	<0.001	0.006	<0.01	<0.005
2226-MB2	10-Jun-2020	Rewan Group	<0.01	<0.001	0.65	<0.0001	<0.001	<0.001	0.003	<0.05	<0.001	0.012	<0.0001	0.002	<0.001	<0.01	<0.001	0.006	<0.01	<0.005

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																	
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2226-MB2	18-Nov-2020	Rewan Group	0.13	<0.001	0.56	<0.0001	0.002	<0.001	0.003	0.12	<0.001	0.014	<0.0001	0.002	<0.001	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	08-Feb-2021	Rewan Group	0.3	<0.001	0.61	<0.0001	0.001	<0.001	0.002	0.15	<0.001	0.027	<0.0001	0.002	0.003	<0.01	<0.001	0.005	<0.01	<0.005
2226-MB2	09-Feb-2021	Rewan Group	3.06	<0.001	0.53	<0.0001	0.028	0.012	0.016	3.23	0.006	0.256	<0.0001	0.002	0.019	<0.01	<0.001	0.005	0.01	0.036
2226-MB2	21-Apr-2021	Rewan Group	0.81	<0.001	0.55	<0.0001	0.002	<0.001	0.012	0.62	<0.001	0.04	<0.0001	0.002	0.008	<0.01	<0.001	0.005	<0.01	0.014
2226-MB2	12-May-2021	Rewan Group	1.8	<0.001	0.58	<0.0001	0.007	0.002	0.018	1.68	0.001	0.056	<0.0001	0.006	0.026	<0.01	<0.001	0.005	<0.01	0.027
2226-MB2	18-Aug-2021	Rewan Group	10.8	<0.001	0.42	<0.0001	0.013	0.003	0.008	4.14	0.003	0.089	<0.0001	0.006	0.022	<0.01	<0.001	0.005	0.02	0.022
2226-MB2	21-Sep-2021	Rewan Group	1.37	<0.001	0.62	<0.0001	0.002	<0.001	0.004	0.88	<0.001	0.044	<0.0001	0.004	0.005	<0.01	<0.001	0.006	<0.01	0.007
2226-MB2	17-Nov-2021	Rewan Group	0.92	<0.001	0.54	<0.0001	0.002	<0.001	0.002	0.8	<0.001	0.04	<0.0001	0.003	0.003	<0.01	<0.001	0.005	<0.01	0.005
2226-MB2	12-Jan-2022	Rewan Group	1.8	<0.001	0.7	<0.0001	0.004	<0.001	0.004	1.45	0.001	0.084	<0.0001	0.003	0.008	<0.01	<0.001	0.005	<0.01	0.01
2226-MB2	15-Mar-2022	Rewan Group	1	<0.001	0.61	<0.0001	0.001	<0.001	0.002	0.71	<0.001	0.042	<0.0001	0.003	0.002	<0.01	<0.001	0.005	<0.01	0.006
2226-MB2	01-Jun-2022	Rewan Group	1.12	<0.001	0.69	<0.0001	0.003	<0.001	0.003	1.09	0.001	0.065	<0.0001	0.003	0.004	<0.01	<0.001	0.005	<0.01	0.012
2226-MB2	31-Aug-2022	Rewan Group	0.98	<0.001	0.76	<0.0001	0.002	<0.001	0.002	1	<0.001	0.046	<0.0001	0.002	0.003	<0.01	<0.001	0.005	<0.01	0.008
2226-MB2	28-Sep-2022	Rewan Group	1.27	<0.001	0.57	<0.0001	0.003	<0.001	0.003	1.37	0.001	0.048	<0.0001	0.002	0.005	<0.01	<0.001	0.005	<0.01	0.012
2372-MB2	15-Feb-2018	Rewan Group	0.2	0.005	0.57	<0.0001	0.001	0.049	0.032	2.91	0.002	1.02	<0.0001	0.002	0.014	<0.01	<0.001	0.025	<0.01	0.05
2372-MB2	05-Apr-2018	Rewan Group	0.02	0.008	0.53	<0.0001	0.002	0.019	0.002	5.93	<0.001	1.14	<0.0001	0.001	0.004	<0.01	<0.001	0.017	<0.01	<0.005
2372-MB2	30-Jun-2018	Rewan Group	<0.01	0.01	0.5	<0.0001	0.001	0.032	0.003	4.44	<0.001	1.23	<0.0001	0.001	0.006	<0.01	<0.001	0.013	<0.01	<0.005
2372-MB2	20-Sep-2018	Rewan Group	<0.01	0.009	0.54	<0.0001	<0.001	NM	<0.001	3.56	<0.001	1.04	<0.0001	<0.001	0.007	<0.01	<0.001	0.013	<0.01	<0.005
2372-MB2	19-Jun-2019	Rewan Group	<0.05	0.008	0.6	<0.0005	<0.005	0.034	<0.005	2.72	<0.005	0.869	<0.0001	<0.005	0.007	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	29-Aug-2019	Rewan Group	<0.05	0.011	0.58	<0.0005	<0.005	0.033	<0.005	2.62	<0.005	0.855	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	28-Oct-2019	Rewan Group	<0.05	0.008	0.55	<0.0005	<0.005	0.036	<0.005	2.18	<0.005	0.868	<0.0001	<0.005	0.007	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	14-Dec-2019	Rewan Group	<0.01	0.008	0.51	<0.0001	<0.001	0.038	<0.001	1.52	<0.001	0.843	<0.0001	<0.001	0.008	<0.01	<0.001	0.012	<0.01	0.007
2372-MB2	04-Feb-2020	Rewan Group	<0.01	0.008	0.41	<0.0001	<0.001	0.038	<0.001	1.29	<0.001	0.751	<0.0001	0.002	0.012	<0.01	<0.001	0.012	<0.01	0.007
2372-MB2	07-Apr-2020	Rewan Group	<0.05	0.007	0.45	<0.0005	<0.005	0.036	<0.005	1.57	<0.005	0.865	<0.0001	<0.005	0.009	<0.05	<0.005	0.011	<0.05	<0.026
2372-MB2	02-Jun-2020	Rewan Group	<0.05	0.008	0.42	<0.0005	<0.005	0.032	<0.005	1.25	<0.005	0.756	<0.0001	<0.005	0.008	<0.05	<0.005	0.011	<0.05	<0.026
2372-MB2	17-Nov-2020	Rewan Group	0.23	0.008	0.4	<0.0005	<0.005	0.037	<0.005	1.35	<0.005	0.666	<0.0001	<0.005	0.01	<0.05	0.006	0.013	<0.05	<0.026
2372-MB2	02-Feb-2021	Rewan Group	0.07	0.014	0.56	<0.0005	<0.005	0.031	<0.005	2.71	<0.005	0.699	<0.0001	<0.005	0.008	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	20-Apr-2021	Rewan Group	0.05	0.009	0.52	<0.0001	<0.001	0.029	<0.001	1.48	<0.001	0.688	<0.0001	0.002	0.007	<0.01	<0.001	0.011	<0.01	0.008
2372-MB2	11-May-2021	Rewan Group	<0.05	0.011	0.43	<0.0005	<0.005	0.03	<0.005	0.91	<0.005	0.759	<0.0001	<0.005	0.006	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	17-Aug-2021	Rewan Group	<0.05	0.007	0.41	<0.0005	<0.005	0.028	<0.005	0.93	<0.005	0.653	<0.0001	<0.005	0.007	<0.05	<0.005	0.01	<0.05	<0.024
2372-MB2	21-Sep-2021	Rewan Group	0.28	0.008	0.48	<0.0005	<0.005	0.03	<0.005	1.95	<0.005	0.785	<0.0001	<0.005	<0.005	<0.05	<0.005	0.012	<0.05	<0.026
2372-MB2	17-Nov-2021	Rewan Group	0.2	0.007	0.44	<0.0005	<0.005	0.028	<0.005	1.41	<0.005	0.659	<0.0001	<0.005	0.014	<0.05	<0.005	0.011	<0.05	0.03
2372-MB2	12-Jan-2022	Rewan Group	0.46	0.008	0.59	<0.0001	0.003	0.022	0.005	6.37	<0.001	0.777	<0.0001	<0.001	0.007	<0.01	<0.001	0.009	<0.01	0.043
2372-MB2	15-Mar-2022	Rewan Group	0.38	0.007	0.51	<0.0005	<0.005	0.03	<0.005	4.31	<0.005	0.729	<0.0001	<0.005	0.006	<0.05	<0.005	0.009	<0.05	0.053
2372-MB2	31-May-2022	Rewan Group	0.48	0.011	0.73	<0.0005	<0.005	0.037	<0.005	4.38	<0.005	0.881	<0.0001	<0.005	0.011	<0.05	<0.005	0.012	<0.05	0.073
2372-MB2	31-Aug-2022	Rewan Group	0.46	0.009	0.49	<0.0005	<0.005	0.031	<0.005	2.86	<0.005	0.815	<0.0001	<0.005	0.01	<0.05	<0.005	0.012	<0.05	0.042
2372-MB2	29-Sep-2022	Rewan Group	0.27	0.008	0.48	<0.0005	<0.005	0.033	<0.005	2.29	<0.005	0.735	<0.0001	<0.005	0.009	<0.05	<0.005	0.01	<0.05	0.027
2393-MB1	16-Feb-2018	Rewan Group	1.28	0.016	0.96	0.0002	0.015	0.002	0.019	1.51	0.003	0.298	<0.0001	0.005	0.016	<0.01	<0.001	0.015	<0.01	0.063
2393-MB1	24-Mar-2018	Rewan Group	0.51	0.01	0.83	0.0001	0.002	0.002	0.003	0.49	<0.001	0.306	<0.0001	0.004	0.009	<0.01	<0.001	0.013	<0.01	0.009
2393-MB1	27-Jul-2018	Rewan Group	0.06	0.006	0.9	<0.0001	<0.001	NM	<0.001	0.09	<0.001	0.275	<0.0001	0.002	0.004	<0.01	<0.001	0.012	<0.01	0.006
2393-MB1	21-Sep-2018	Rewan Group	0.03	0.004	0.88	<0.0001	0.027	NM	0.001	0.38	<0.001	0.259	<0.0001	0.003	0.07	<0.01	<0.001	0.012	<0.01	<0.005
2393-MB1	22-Feb-2019	Rewan Group	0.01	0.003	0.86	0.0001	0.013	0.001	0.002	<0.05	<0.001	0.214	<0.0001	0.01	0.012	<0.01	<0.001	0.012	<0.01	<0.005
2393-MB1	24-Jun-2019	Rewan Group	<0.01	0.003	0.79	<0.0001	0.012	0.002	0.002	<0.05	<0.001	0.285	<0.0001	0.021	0.012	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	04-Sep-2019	Rewan Group	0.02	0.004	0.88	<0.0001	0.045	0.002	0.003	0.13	<0.001	0.222	<0.0001	0.02	0.017	<0.01	<0.001	0.012	<0.01	<0.005
2393-MB1	30-Oct-2019	Rewan Group	0.01	0.003	0.67	<0.0001	0.023	<0.001	0.001	0.06	<0.001	0.168	<0.0001	0.015	0.01	<0.01	<0.001	0.013	<0.01	<0.005
2393-MB1	11-Dec-2019	Rewan Group	0.01	0.003	0.78	<0.0001	0.009	<0.001	<0.001	<0.05	<0.001	0.178	<0.0001	0.008	0.006	<0.01	<0.001	0.011	<0.01	<0.005
2393-MB1	10-Feb-2020	Rewan Group	<0.01	0.003	1.01	0.0002	0.004	<0.001	0.001	<0.05	<0.001	0.174	<0.0001	0.007	0.005	<0.01	<0.001	0.012	<0.01	<0.005
2393-MB1	08-Apr-2020	Rewan Group	<0.01	0.003	0.68	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.095	<0.0001	0.004	0.004	<0.01	<0.001	0.01	<0.01	<0.005
2393-MB1	03-Jun-2020	Rewan Group	<0.01	0.003	0.78	<0.0001	0.004	<0.001	<0.001	<0.05	<0.001	0.158	<0.0001	0.011	0.023	<0.01	<0.001	0.01	<0.01	0.006
2393-MB1	18-Nov-2020	Rewan Group	0.07	0.003	0.67	<0.0001	0.02	0.001	0.002	0.11	<0.001	0.263	<0.0001	0.006	0.006	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	02-Feb-2021	Rewan Group	<0.01	0.006	0.69	<0.0001	0.002	<0.001	<0.001	<0.05	<0.001	0.218	<0.0001	0.002	0.004	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	20-Apr-2021	Rewan Group	0.02	0.007	0.8	<0.0001	0.011	0.001	<0.001	<0.05	<0.001	0.25	<0.0001	0.005	0.003	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	11-May-2021	Rewan Group	0.02	0.007	0.79	<0.0001	0.004	0.001	<0.001	<0.05	<0.001	0.294	<0.0001	0.003	0.003	<0.01	<0.001	0.009	<0.01	<0.005
2393-MB1	17-Aug-2021	Rewan Group	<0.01	0.006	0.62	<0.0001	0.006	0.001	0.001	<0.05	<0.001	0.24	<0.0001	0.004	0.004	<0.01	<0.001	0.008	<0.01	<0.005
2393-MB1	21-Sep-2021	Rewan Group	0.52	0.008	0.78	<0.0001	0.004	0.003	0.003	0.66	<0.001	0.368	<0.0001	0.002	0.004	<0.01	<0.001	0.009	<0.01	0.006
2393-MB1	17-Nov-2021	Rewan Group	1.03	0.005	0.74	0.0002	0.001	0.004	0.003	0.58	<0.001	0.338	<0.0001	0.002	0.004	<0.01	<0.001	0.009	<0.01	0.007
2393-MB1	12-Jan-2022	Rewan Group	1.26	0.005	0.94	<0.0001	0.002	0.003	0.004	0.89	0.001	0.367	<0.0001	0.002	0.006	<0.01	<0.001	0.009	<0.01	0.01
2393-MB1	15-Mar-2022	Rewan Group	0.93	0.006	0.74	<0.0001	<0.001	0.004	0.002	0.73	<0.001	0.327	<0.0001	0.001	0.004	<0.01	<0.001	0.009	<0.01	0.008
2393-MB1	01-Jun-2022	Rewan Group	1.44	0.005	0.72	<0.0001	0.002	0.003	0.004	1.4	0.002	0.329	<0.0001	0.002	0.007	<0.01	<0.001	0.009	<0.01	0.014
2393-MB1	20-Jul-2022	Rewan Group	3.49	<0.005	0.89	<0.0005	<0.005	<0.005	<0.005	1.73	<0.005	0.323	<0.0001	<0.005	0.006	<0.05	<0.005	0.009	<0.05	<0.026
2393-MB1	29-Sep-2022	Rewan Group	0.86	0.004	0.68	<0.0001	0.001	0.002	0.002	0.83	<0.001	0.273	<0.0001	0.002	0.004	<0.01	<0.001	0.008	<0.01	0.007
2394-MB1	18-Feb-2018	Upper Rewan Group	0.45	<0.001	0.91	0.0005	0.013	0.006	0.028	0.47	0.001	0.15	<0.0001	0.003	0.022	<0.01	<0.001	0.013	<0.01	0.111
2394-MB1	24-Mar-2018	Upper Rewan Group	0.19	0.001	0.93	<0.0001	0.003	0.013	0.004	0.48	<0.001	0.292	<0.0001	0.002	0.01	<0.01	<0.001	0.012	<0.01	0.013
2394-MB1	29-Jun-2018	Upper Rewan Group	0.27	<0.001	0.93	0.0001	0.009	0.011	0.005	0.76	<0.001	0.259	<0.0001	0.002	0.009	<0.01	<0.001	0.011	<0.01	0.009
2394-MB1	13-Sep-2018	Upper Rewan Group	0.23	<0.001	0.86	0.0002	0.01	NM	0.002	0.6	<0.001	0.21	<0.0001	0.002	0.01	<0.01	<0.001	0.013	<0.01	0.006
2394-MB1	22-Mar-2019	Upper Rewan Group	0.13	<0.001	0.86	0.0002	0.009	0.007	0.002	0.32	<0.001	0.132	<0.0001	0.002	0.009	<0.01	<0.001	0.013	<0.01	<0.005
2394-MB1	25-Jun-2019	Upper Rewan Group	0.09	<0.001	0.87	0.0002	0.014	0.005	0.003	0.24	<0.001	0.086	<0.0001	0.002	0.012	<0.01	<0.001	0.013	<0.01	0.008

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2394-MB1	30-Aug-2019	Upper Rewan Group	0.05	<0.001	0.72	0.0002	0.013	0.006	0.004	0.15	<0.001	0.09	<0.0001	0.002	0.015	<0.01	<0.001	0.013	<0.01	0.008
2394-MB1	30-Oct-2019	Upper Rewan Group	0.06	<0.001	0.58	<0.0001	0.01	0.004	0.002	0.13	<0.001	0.062	<0.0001	0.002	0.014	<0.01	<0.001	0.013	<0.01	<0.005
2394-MB1	14-Dec-2019	Upper Rewan Group	0.09	<0.001	0.78	<0.0001	<0.001	0.004	0.001	0.15	<0.001	0.064	<0.0001	<0.001	0.003	<0.01	<0.001	0.013	<0.01	<0.005
2394-MB1	11-Feb-2020	Upper Rewan Group	0.03	<0.001	1.12	<0.0001	<0.001	0.003	0.002	0.11	<0.001	0.05	<0.0001	<0.001	0.002	<0.01	<0.001	0.012	<0.01	<0.005
2394-MB1	21-Apr-2020	Upper Rewan Group	<0.05	<0.005	0.9	<0.0005	<0.005	<0.005	<0.005	0.1	<0.005	0.053	<0.0001	<0.005	<0.005	<0.05	<0.005	0.014	<0.05	<0.026
2394-MB1	03-Jun-2020	Upper Rewan Group	0.02	<0.001	0.86	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.033	<0.0001	<0.001	0.004	<0.01	<0.001	0.012	<0.01	0.008
2394-MB1	17-Nov-2020	Upper Rewan Group	0.02	<0.001	0.63	0.0002	<0.001	0.003	0.002	0.12	<0.001	0.042	<0.0001	<0.001	0.003	<0.01	<0.001	0.008	<0.01	<0.005
2394-MB1	03-Feb-2021	Upper Rewan Group	<0.01	<0.001	0.98	0.0001	0.002	0.002	<0.001	<0.05	<0.001	0.032	<0.0001	<0.001	0.002	<0.01	<0.001	0.009	<0.01	0.006
2394-MB1	20-Apr-2021	Upper Rewan Group	0.01	<0.001	0.96	0.0001	0.002	0.001	0.002	<0.05	<0.001	0.019	<0.0001	<0.001	0.003	<0.01	<0.001	0.009	<0.01	0.007
2394-MB1	11-May-2021	Upper Rewan Group	0.02	<0.001	0.89	0.0002	0.002	<0.001	0.001	0.06	<0.001	0.013	<0.0001	<0.001	0.003	<0.01	<0.001	0.011	<0.01	0.008
2394-MB1	17-Aug-2021	Upper Rewan Group	0.04	<0.001	0.7	<0.0001	<0.001	0.003	0.001	0.09	<0.001	0.054	0.0002	<0.001	0.003	<0.01	<0.001	0.011	<0.01	<0.005
2394-MB1	21-Sep-2021	Upper Rewan Group	0.74	0.001	0.9	<0.0001	0.003	0.004	0.005	1.17	<0.001	0.066	<0.0001	<0.001	0.004	<0.01	<0.001	0.012	<0.01	0.01
2394-mb1	16-Nov-2021	Upper Rewan Group	1.5	0.001	0.83	0.0002	0.004	0.008	0.006	2.26	<0.001	0.148	<0.0001	0.002	0.01	<0.01	0.002	0.011	<0.01	0.027
2394-MB1	12-Jan-2022	Upper Rewan Group	0.87	0.001	1.11	<0.0001	0.002	0.007	0.005	1.06	<0.001	0.133	<0.0001	<0.001	0.004	<0.01	<0.001	0.012	<0.01	0.014
2394-MB1	15-Mar-2022	Upper Rewan Group	1.05	<0.001	0.93	0.0002	0.001	0.007	0.003	1.38	<0.001	0.134	<0.0001	<0.001	0.004	<0.01	<0.001	0.013	<0.01	0.018
2394-MB1	01-Jun-2022	Upper Rewan Group	0.64	<0.001	0.98	0.0001	0.002	0.006	0.003	1.11	<0.001	0.106	<0.0001	<0.001	0.004	<0.01	<0.001	0.014	<0.01	0.011
2394-MB1	20-Jul-2022	Upper Rewan Group	1.01	<0.005	1.07	<0.0005	<0.005	0.006	<0.005	0.77	<0.005	0.085	<0.0001	0.005	0.011	<0.05	<0.005	0.012	<0.05	<0.026
2394-MB1	29-Sep-2022	Upper Rewan Group	0.41	<0.001	0.88	<0.0001	0.001	0.005	0.002	0.71	<0.001	0.086	<0.0001	<0.001	0.003	<0.01	<0.001	0.013	<0.01	0.009
2394-MB2	21-Mar-2018	Lower Rewan Group	0.82	0.003	0.31	<0.0001	0.002	<0.001	0.004	3.7	<0.001	0.589	<0.0001	0.001	0.005	<0.01	<0.001	<0.001	<0.01	0.027
2394-MB2	28-Jul-2018	Lower Rewan Group	0.02	0.002	0.38	<0.0001	<0.001	NM	<0.001	3.03	<0.001	0.708	<0.0001	0.006	0.002	<0.01	<0.001	<0.001	<0.01	0.021
2394-MB2	23-Sep-2018	Lower Rewan Group	<0.01	0.001	0.3	<0.0001	<0.001	NM	<0.001	3.3	<0.001	0.847	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.013
2394-MB2	22-Mar-2019	Lower Rewan Group	<0.01	<0.001	0.23	<0.0001	0.001	<0.001	<0.001	3.96	<0.001	0.866	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.014
2394-MB2	25-Jun-2019	Lower Rewan Group	<0.01	<0.001	0.21	<0.0001	<0.001	<0.001	<0.001	3.77	<0.001	0.916	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.031
2394-MB2	30-Aug-2019	Lower Rewan Group	<0.05	<0.005	0.3	<0.0005	<0.005	<0.005	0.005	3.92	<0.005	0.952	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2394-MB2	30-Oct-2019	Lower Rewan Group	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	4.35	<0.005	1.03	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2394-MB2	30-Oct-2019	Lower Rewan Group	<0.01	<0.001	0.25	<0.0001	<0.001	<0.001	<0.001	1.33	<0.001	0.11	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.02
2394-MB2	14-Dec-2019	Lower Rewan Group	<0.01	<0.001	0.23	<0.0001	<0.001	<0.001	<0.001	3.77	<0.001	0.918	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.03
2394-MB2	11-Feb-2020	Lower Rewan Group	<0.05	<0.005	0.28	<0.0005	<0.005	<0.005	<0.005	4.66	<0.005	0.803	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2394-MB2	21-Apr-2020	Lower Rewan Group	<0.05	<0.005	0.34	<0.0005	<0.005	<0.005	<0.005	4.09	<0.005	1.02	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.047
2394-MB2	03-Jun-2020	Lower Rewan Group	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	4.32	<0.005	0.974	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.04
2394-MB2	17-Nov-2020	Lower Rewan Group	<0.05	<0.005	0.26	<0.0005	0.01	<0.005	<0.005	4.38	<0.005	0.967	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.035
2394-MB2	03-Feb-2021	Lower Rewan Group	<0.05	<0.005	0.37	<0.0005	<0.005	<0.005	<0.005	3.48	<0.005	0.919	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2394-MB2	21-Apr-2021	Lower Rewan Group	<0.01	<0.001	0.27	<0.0001	0.011	<0.001	<0.001	3.99	<0.001	0.876	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.016
2394-MB2	11-May-2021	Lower Rewan Group	<0.05	<0.005	0.14	<0.0005	<0.005	<0.005	<0.005	3.93	<0.005	0.944	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.038
2394-MB2	17-Aug-2021	Lower Rewan Group	<0.05	<0.005	0.12	<0.0005	<0.005	<0.005	<0.005	3.7	<0.005	0.885	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
2394-MB2	21-Sep-2021	Lower Rewan Group	1.05	<0.005	0.21	<0.0005	<0.005	<0.005	<0.005	5.52	<0.005	0.997	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2394-mb2	16-Nov-2021	Lower Rewan Group	1.69	<0.005	0.18	<0.0005	0.006	<0.005	0.006	6.22	<0.005	0.925	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	0.03
2394-MB2	12-Jan-2022	Lower Rewan Group	1.28	<0.005	0.29	<0.0005	0.005	<0.005	<0.005	5.89	<0.005	0.968	<0.0001	<0.005	0.006	<0.05	<0.005	<0.005	<0.05	0.032
2394-MB2	15-Mar-2022	Lower Rewan Group	1.48	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	6.05	<0.005	0.983	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	0.055
2394-MB2	01-Jun-2022	Lower Rewan Group	2.46	<0.005	0.4	<0.0005	0.006	<0.005	0.006	7.95	<0.005	1.11	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	0.056
2394-MB2	20-Jul-2022	Lower Rewan Group	3.35	<0.005	0.29	<0.0005	0.015	<0.005	0.006	7.85	<0.005	1.04	<0.0001	0.017	0.042	<0.05	<0.005	<0.005	<0.05	0.047
2394-MB2	29-Sep-2022	Lower Rewan Group	1.65	<0.005	0.22	<0.0005	0.005	<0.005	<0.005	6.03	<0.005	0.998	<0.0001	<0.005	0.01	<0.05	<0.005	<0.005	<0.05	0.028
1238-MB2	05-Apr-2018	Vermont Seam	0.27	0.002	0.39	<0.0001	<0.001	0.008	0.001	0.44	<0.001	1.25	<0.0001	<0.001	0.004	<0.01	<0.001	0.004	<0.01	<0.005
1238-MB2	02-Jul-2018	Vermont Seam	0.09	0.002	0.38	0.0001	0.001	0.007	0.004	0.37	<0.001	1.31	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	20-Sep-2018	Vermont Seam	0.04	0.002	0.41	<0.0001	<0.001	NM	<0.001	0.2	<0.001	1.17	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	14-Mar-2019	Vermont Seam	0.07	0.002	0.38	0.0001	<0.001	0.007	<0.001	0.49	<0.001	1.19	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	21-Jun-2019	Vermont Seam	0.1	0.001	0.35	0.0001	<0.001	0.006	<0.001	0.26	<0.001	1.16	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	27-Aug-2019	Vermont Seam	0.1	0.001	0.4	0.0002	<0.001	0.008	<0.001	0.17	<0.001	1.14	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	22-Oct-2019	Vermont Seam	0.04	0.001	0.37	0.0001	0.002	0.006	<0.001	0.14	<0.001	1.1	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	14-Dec-2019	Vermont Seam	0.06	0.001	0.36	0.0002	<0.001	0.007	<0.001	0.09	<0.001	1.23	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	04-Feb-2020	Vermont Seam	0.02	0.001	0.31	0.0002	0.001	0.008	<0.001	0.12	<0.001	1.1	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	08-Apr-2020	Vermont Seam	0.02	0.001	0.23	0.0002	<0.001	0.008	<0.001	0.06	<0.001	1.1	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	09-Jun-2020	Vermont Seam	0.04	<0.001	0.29	0.0002	<0.001	0.007	<0.001	0.1	<0.001	1.12	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	0.008
1238-MB2	19-Nov-2020	Vermont Seam	0.73	0.002	0.32	0.0003	0.003	0.006	0.006	1.4	<0.001	1.1	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	0.007
1238-MB2	03-Feb-2021	Vermont Seam	1.08	0.002	0.36	0.0003	0.002	0.008	0.004	1.15	<0.001	1.21	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	0.006
1238-MB2	21-Apr-2021	Vermont Seam	0.5	0.001	0.37	0.0002	<0.001	0.007	0.002	0.93	<0.001	1.17	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	0.006
1238-MB2	12-May-2021	Vermont Seam	0.32	0.002	0.36	0.0001	<0.001	0.007	<0.001	0.65	<0.001	1.16	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	18-Aug-2021	Vermont Seam	0.63	0.002	0.3	<0.0001	<0.001	0.006	0.002	0.36	<0.001	0.983	<0.0001	<0.001	0.004	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	21-Sep-2021	Vermont Seam	0.07	0.002	0.38	<0.0001	<0.001	0.007	0.003	0.42	<0.001	1.16	<0.0001	0.001	0.002	<0.01	<0.001	0.002	<0.01	0.006
1238-MB2	17-Nov-2021	Vermont Seam	0.76	0.002	0.28	0.0005	0.001	0.007	0.008	1.03	<0.001	1	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	0.018
1238-MB2	13-Jan-2022	Vermont Seam	0.53	0.002	0.44	0.0002	<0.001	0.007	0.003	0.44	<0.001	1.18	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	0.006
1238-MB2	15-Mar-2022	Vermont Seam	0.73	0.002	0.37	0.0002	<0.001	0.006	0.005	0.68	<0.001	0.998	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	0.009
1238-MB2	01-Jun-2022	Vermont Seam	0.09	0.002	0.34	<0.0001	<0.001	0.007	0.003	0.28	<0.001	1.1	<0.0001	<0.001	0.003	<0.01	<0.001	0.002	<0.01	<0.005
1238-MB2	20-Jul-2022	Vermont Seam	1.16	<0.005	0.42	<0.0005	<0.005	0.007	<0.005	0.49	<0.005	1.08	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
1238-MB2	28-Sep-2022	Vermont Seam	0.26	0.001	0.27	<0.0001	<0.001	0.007	0.002	0.5	<0.001	1.17	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	13-Feb-2018	Leichhardt Seam	0.1	0.003	0.58	<0.0001	0.003	<0.001	0.002	0.79	<0.001	0.333	<0.0001	0.001	0.004	<0.01	<0.001	0.004	<0.01	0.01

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																	
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2218-MB3	20-Mar-2018	Leichhardt Seam	0.08	0.001	0.54	<0.0001	0.002	<0.001	0.002	0.74	<0.001	0.338	<0.0001	<0.001	0.003	<0.01	<0.001	0.001	<0.01	0.011
2218-MB3	14-Jul-2018	Leichhardt Seam	0.01	<0.001	0.45	<0.0001	<0.001	NM	<0.001	0.76	<0.001	0.388	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.005
2218-MB3	19-Sep-2018	Leichhardt Seam	<0.01	0.001	0.48	<0.0001	<0.001	NM	<0.001	0.64	<0.001	0.371	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB3	21-Feb-2019	Leichhardt Seam	<0.01	<0.001	0.38	<0.0001	<0.001	<0.001	<0.001	0.48	<0.001	0.456	<0.0001	<0.001	<0.001	<0.01	<0.001	0.003	<0.01	<0.005
2218-MB3	22-Jun-2019	Leichhardt Seam	<0.01	<0.001	0.24	<0.0001	<0.001	<0.001	<0.001	0.28	<0.001	0.183	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	02-Aug-2019	Leichhardt Seam	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	0.27	<0.001	0.211	<0.0001	<0.001	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
2218-MB3	24-Oct-2019	Leichhardt Seam	<0.01	<0.001	0.28	<0.0001	<0.001	<0.001	<0.001	0.27	<0.001	0.198	<0.0001	<0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
2218-MB3	11-Dec-2019	Leichhardt Seam	<0.05	<0.005	0.31	<0.0005	<0.005	<0.005	<0.005	0.24	<0.005	0.2	<0.0005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	12-Feb-2020	Leichhardt Seam	<0.05	<0.005	0.5	<0.0005	<0.005	<0.005	<0.005	0.26	<0.005	0.205	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.025
2218-MB3	21-Apr-2020	Leichhardt Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	0.26	<0.005	0.196	<0.0001	0.012	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	09-Jun-2020	Leichhardt Seam	<0.01	<0.001	0.16	<0.0001	<0.001	<0.001	<0.001	0.29	<0.001	0.217	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	18-Nov-2020	Leichhardt Seam	<0.01	<0.001	0.18	<0.0001	0.001	<0.001	<0.001	1.14	<0.001	0.11	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	08-Feb-2021	Leichhardt Seam	0.03	0.001	0.32	<0.0001	0.002	<0.001	<0.001	0.8	<0.001	0.117	<0.0001	0.002	0.01	<0.01	<0.001	<0.001	<0.01	<0.005
2218-MB3	09-Feb-2021	Leichhardt Seam	0.39	0.001	0.28	<0.0001	0.014	0.002	0.007	1.42	<0.001	0.104	<0.0001	0.009	0.033	<0.01	<0.001	<0.001	<0.01	0.037
2218-MB3	21-Apr-2021	Leichhardt Seam	0.12	<0.001	0.29	<0.0001	0.005	<0.001	0.003	2	<0.001	0.117	<0.0001	0.006	0.031	<0.01	<0.001	<0.001	<0.01	0.022
2218-MB3	12-May-2021	Leichhardt Seam	0.23	<0.005	0.18	<0.0005	0.01	<0.005	0.037	2.76	<0.005	0.132	<0.0001	0.007	0.035	<0.05	<0.005	<0.005	<0.05	0.043
2218-MB3	18-Aug-2021	Leichhardt Seam	0.1	<0.005	0.16	<0.0005	0.005	<0.005	0.011	1.64	<0.005	0.1	<0.0001	<0.005	0.013	<0.05	<0.005	<0.005	<0.05	<0.024
2218-MB3	21-Sep-2021	Leichhardt Seam	0.29	<0.005	0.26	<0.0005	<0.005	<0.005	0.008	2.01	<0.005	0.119	<0.0001	0.006	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	17-Nov-2021	Leichhardt Seam	0.14	0.001	0.22	<0.0001	0.006	0.001	0.006	1.57	<0.001	0.097	<0.0001	0.004	0.013	<0.01	<0.001	<0.001	<0.01	0.013
2218-MB3	12-Jan-2022	Leichhardt Seam	0.15	0.002	0.34	<0.0001	0.008	<0.001	0.007	1.92	<0.001	0.121	<0.0001	0.004	0.014	<0.01	<0.001	<0.001	<0.01	0.017
2218-MB3	15-Mar-2022	Leichhardt Seam	0.12	<0.005	0.3	<0.0005	<0.005	<0.005	<0.005	1.66	<0.005	0.105	<0.0001	0.005	0.01	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	01-Jun-2022	Leichhardt Seam	0.12	<0.005	0.28	<0.0005	0.006	<0.005	<0.005	1.39	<0.005	0.13	<0.0001	0.008	0.016	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	19-Jul-2022	Leichhardt Seam	0.16	<0.005	0.34	<0.0005	0.008	<0.005	<0.005	1.96	<0.005	0.105	<0.0001	0.008	0.019	<0.05	<0.005	<0.005	<0.05	<0.026
2218-MB3	28-Sep-2022	Leichhardt Seam	0.14	<0.001	0.23	<0.0001	0.008	<0.001	0.003	1.79	<0.001	0.103	<0.0001	0.007	0.018	<0.01	<0.001	<0.001	<0.01	0.018
2226-MB3	14-Feb-2018	Leichhardt Seam	0.3	<0.001	0.56	<0.0001	0.017	<0.001	0.009	1.06	0.002	0.204	<0.0001	0.002	0.007	<0.01	<0.001	0.003	<0.01	0.064
2226-MB3	25-Mar-2018	Leichhardt Seam	0.13	<0.001	0.58	<0.0001	0.003	<0.001	0.001	0.7	<0.001	0.091	<0.0001	0.001	0.004	<0.01	<0.001	0.001	<0.01	0.006
2226-MB3	15-Jul-2018	Leichhardt Seam	<0.01	<0.001	0.52	<0.0001	<0.001	NM	<0.001	0.49	<0.001	0.064	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	22-Sep-2018	Leichhardt Seam	<0.01	<0.001	0.56	<0.0001	<0.001	NM	<0.001	0.51	<0.001	0.06	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	23-Feb-2019	Leichhardt Seam	<0.01	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.06	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	28-May-2019	Leichhardt Seam	<0.01	<0.001	0.57	<0.0001	<0.001	<0.001	<0.001	0.56	<0.001	0.056	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	28-Aug-2019	Leichhardt Seam	<0.01	<0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.06	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	24-Oct-2019	Leichhardt Seam	<0.01	<0.001	0.52	<0.0001	<0.001	<0.001	<0.001	0.5	<0.001	0.053	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	10-Dec-2019	Leichhardt Seam	<0.01	<0.001	0.55	<0.0001	<0.001	<0.001	<0.001	0.46	<0.001	0.052	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	12-Feb-2020	Leichhardt Seam	<0.01	<0.001	0.91	<0.0001	<0.001	<0.001	<0.001	0.66	<0.001	0.064	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	22-Apr-2020	Leichhardt Seam	<0.01	<0.001	0.49	<0.0001	<0.001	<0.001	<0.001	0.53	<0.001	0.06	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	10-Jun-2020	Leichhardt Seam	<0.01	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	0.58	<0.001	0.062	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	18-Nov-2020	Leichhardt Seam	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.55	<0.001	0.053	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	08-Feb-2021	Leichhardt Seam	0.02	<0.001	0.53	<0.0001	<0.001	<0.001	0.001	0.45	<0.001	0.055	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2226-MB3	09-Feb-2021	Leichhardt Seam	2.26	0.002	0.53	<0.0001	0.019	0.005	0.016	3.23	0.006	0.106	<0.0001	0.003	0.031	<0.01	<0.001	<0.001	<0.01	0.135
2226-MB3	21-Apr-2021	Leichhardt Seam	0.59	<0.001	0.54	<0.0001	0.002	<0.001	0.008	1.59	<0.001	0.074	<0.0001	0.002	0.026	<0.01	<0.001	<0.001	<0.01	0.022
2226-MB3	12-May-2021	Leichhardt Seam	0.66	<0.001	0.4	<0.0001	0.003	<0.001	0.027	1.56	0.001	0.082	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	0.021
2226-MB3	18-Aug-2021	Leichhardt Seam	1.39	<0.001	0.46	<0.0001	0.006	0.002	0.01	2.18	0.002	0.076	<0.0001	0.002	0.01	<0.01	<0.001	<0.001	<0.01	0.034
2226-MB3	21-Sep-2021	Leichhardt Seam	0.82	<0.001	0.58	<0.0001	0.004	0.001	0.007	1.59	0.001	0.082	<0.0001	0.001	0.006	<0.01	<0.001	<0.001	<0.01	0.024
2226-MB3	17-Nov-2021	Leichhardt Seam	0.55	<0.001	0.46	<0.0001	0.003	<0.001	0.004	1.42	<0.001	0.068	<0.0001	<0.001	0.005	<0.01	<0.001	<0.001	<0.01	0.018
2226-MB3	12-Jan-2022	Leichhardt Seam	0.48	<0.001	0.65	<0.0001	0.002	<0.001	0.003	1.39	<0.001	0.08	<0.0001	<0.001	0.004	<0.01	<0.001	<0.001	<0.01	0.016
2226-MB3	15-Mar-2022	Leichhardt Seam	0.29	<0.001	0.57	<0.0001	<0.001	<0.001	0.002	1.14	<0.001	0.072	<0.0001	0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.009
2226-MB3	01-Jun-2022	Leichhardt Seam	0.33	<0.001	0.68	<0.0001	0.002	<0.001	0.002	1.57	<0.001	0.082	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.013
2226-MB3	31-Aug-2022	Leichhardt Seam	0.36	<0.001	0.48	<0.0001	0.002	<0.001	0.002	1.32	<0.001	0.074	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.01
2226-MB3	28-Sep-2022	Leichhardt Seam	0.26	<0.001	0.46	<0.0001	0.002	<0.001	0.002	1.24	<0.001	0.074	<0.0001	0.001	0.003	<0.01	<0.001	<0.001	<0.01	0.01
2372-MB3	15-Feb-2018	Vermont Seam	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
2372-MB3	30-Jun-2018	Vermont Seam	0.08	0.004	0.36	<0.0001	0.001	0.005	0.004	0.92	<0.001	0.132	<0.0001	<0.001	0.006	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	20-Sep-2018	Vermont Seam	0.06	0.003	0.4	<0.0001	<0.001	NM	<0.001	0.9	<0.001	0.12	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	19-Jun-2019	Vermont Seam	<0.05	<0.005	0.46	<0.0005	<0.005	<0.005	<0.005	0.82	<0.005	0.112	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	29-Aug-2019	Vermont Seam	<0.05	<0.005	0.41	<0.0005	<0.005	<0.005	<0.005	0.72	<0.005	0.113	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	28-Oct-2019	Vermont Seam	<0.05	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	0.88	<0.005	0.121	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	14-Dec-2019	Vermont Seam	<0.01	0.002	0.36	<0.0001	<0.001	0.003	<0.001	0.82	<0.001	0.111	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	04-Feb-2020	Vermont Seam	<0.01	0.002	0.26	<0.0001	0.002	0.003	<0.001	0.86	<0.001	0.104	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	07-Apr-2020	Vermont Seam	<0.05	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	0.97	<0.005	0.124	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	02-Jun-2020	Vermont Seam	<0.05	<0.005	0.29	<0.0005	<0.005	<0.005	<0.005	0.95	<0.005	0.111	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	17-Nov-2020	Vermont Seam	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	0.92	<0.005	0.103	<0.0001	<0.005	0.007	<0.05	0.01	<0.005	<0.05	<0.026
2372-MB3	02-Feb-2021	Vermont Seam	<0.05	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	0.81	<0.005	0.104	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	20-Apr-2021	Vermont Seam	0.04	0.002	0.38	<0.0001	0.002	0.002	<0.001	0.85	<0.001	0.104	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2372-MB3	11-May-2021	Vermont Seam	<0.05	<0.005	0.26	<0.0005	<0.005	<0.005	<0.005	0.9	<0.005	0.107	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	17-Aug-2021	Vermont Seam	<0.05	<0.005	0.27	<0.0005	<0.005	<0.005	<0.005	0.93	<0.005	0.107	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.024
2372-MB3	21-Sep-2021	Vermont Seam	0.41	<0.005	0.38	<0.0005	<0.005	<0.005	<0.005	1.47	<0.005	0.198	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	17-Nov-2021	Vermont Seam	0.31	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	1.4	<0.005	0.157	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2372-MB3	12-Jan-2022	Vermont Seam	0.11	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	1.04	<0.005	0.184	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	15-Mar-2022	Vermont Seam	0.14	<0.005	0.42	<0.0005	<0.005	<0.005	<0.005	1.04	<0.005	0.181	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	31-May-2022	Vermont Seam	0.18	<0.005	0.47	<0.0005	<0.005	<0.005	<0.005	1.24	<0.005	0.187	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	31-Aug-2022	Vermont Seam	0.26	<0.005	0.53	<0.0005	<0.005	<0.005	<0.005	1.56	<0.005	0.148	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2372-MB3	29-Sep-2022	Vermont Seam	0.22	<0.005	0.32	<0.0005	<0.005	<0.005	<0.005	1.2	<0.005	0.18	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2375-MB2	17-Feb-2018	Vermont Seam	0.27	0.002	0.46	<0.0001	0.001	0.008	0.005	3.72	<0.001	0.438	<0.0001	0.006	0.008	<0.01	<0.001	0.008	<0.01	0.043
2375-MB2	24-Mar-2018	Vermont Seam	0.5	0.002	0.49	<0.0001	0.006	0.005	0.003	5.57	<0.001	0.361	<0.0001	0.032	0.018	<0.01	<0.001	0.005	<0.01	0.042
2375-MB2	15-Jul-2018	Vermont Seam	0.02	0.001	0.4	<0.0001	<0.001	NM	<0.001	3.85	<0.001	0.392	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	21-Sep-2018	Vermont Seam	0.02	0.001	0.42	<0.0001	<0.001	NM	<0.001	3.43	<0.001	0.313	<0.0001	<0.001	0.002	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	24-Feb-2019	Vermont Seam	<0.01	<0.001	0.38	<0.0001	<0.001	0.005	<0.001	3.77	<0.001	0.298	<0.0001	0.002	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	28-May-2019	Vermont Seam	<0.01	0.001	0.4	<0.0001	<0.001	0.005	<0.001	4.3	<0.001	0.278	<0.0001	0.002	0.003	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	31-Jul-2019	Vermont Seam	<0.01	0.001	0.46	<0.0001	<0.001	0.005	<0.001	3.52	<0.001	0.286	<0.0001	0.002	0.002	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	22-Oct-2019	Vermont Seam	<0.01	0.001	0.38	<0.0001	<0.001	0.005	<0.001	3.52	<0.001	0.256	<0.0001	0.001	0.002	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	15-Dec-2019	Vermont Seam	<0.01	0.002	0.39	<0.0001	<0.001	0.004	<0.001	3.86	<0.001	0.3	<0.0001	<0.001	0.093	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	04-Feb-2020	Vermont Seam	<0.01	0.002	0.33	<0.0001	<0.001	0.003	<0.001	3.58	<0.001	0.253	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	07-Apr-2020	Vermont Seam	<0.01	0.002	0.28	<0.0001	<0.001	0.005	<0.001	3.43	<0.001	0.251	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	02-Jun-2020	Vermont Seam	<0.01	0.002	0.35	<0.0001	<0.001	0.003	<0.001	3.94	<0.001	0.255	<0.0001	<0.001	0.002	<0.01	<0.001	0.002	<0.01	<0.005
2375-MB2	17-Nov-2020	Vermont Seam	0.01	0.001	0.27	<0.0001	<0.001	<0.001	<0.001	2.71	<0.001	0.276	<0.0001	0.03	0.001	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	08-Feb-2021	Vermont Seam	<0.01	0.002	0.34	<0.0001	<0.001	<0.001	<0.001	1.09	<0.001	0.258	<0.0001	0.038	0.005	<0.01	<0.001	0.001	<0.01	<0.005
2375-MB2	09-Feb-2021	Vermont Seam	0.21	0.001	0.33	<0.0001	0.004	0.003	0.004	2.26	<0.001	0.244	<0.0001	0.023	0.015	<0.01	<0.001	0.002	<0.01	0.033
2375-MB2	20-Apr-2021	Vermont Seam	0.28	<0.001	0.11	<0.0001	0.004	0.002	0.258	2.19	<0.001	0.192	<0.0001	0.092	0.019	<0.01	<0.001	<0.001	<0.01	0.04
2375-MB2	11-May-2021	Vermont Seam	0.07	<0.001	0.1	<0.0001	0.001	<0.001	0.014	0.92	<0.001	0.184	<0.0001	0.046	0.006	<0.01	<0.001	<0.001	<0.01	0.013
2375-MB2	17-Aug-2021	Vermont Seam	0.14	0.001	0.14	<0.0001	0.002	<0.001	0.003	0.89	<0.001	0.194	<0.0001	0.032	0.004	<0.01	<0.001	<0.001	<0.01	0.007
2375-MB2	21-Sep-2021	Vermont Seam	0.09	<0.001	0.17	<0.0001	0.001	<0.001	0.003	0.78	<0.001	0.218	<0.0001	0.035	0.004	<0.01	<0.001	<0.001	<0.01	0.006
2375-MB2	17-Nov-2021	Vermont Seam	0.1	<0.001	0.12	<0.0001	0.001	<0.001	0.002	0.7	<0.001	0.194	<0.0001	0.035	0.004	<0.01	<0.001	0.001	<0.01	0.051
2375-MB2	12-Jan-2022	Vermont Seam	0.07	<0.001	0.23	<0.0001	0.001	<0.001	0.003	0.6	<0.001	0.222	<0.0001	0.034	0.005	<0.01	<0.001	<0.001	<0.01	0.01
2375-MB2	15-Mar-2022	Vermont Seam	0.06	<0.001	0.18	<0.0001	<0.001	<0.001	0.001	0.5	<0.001	0.187	<0.0001	0.034	0.002	<0.01	<0.001	<0.001	<0.01	0.008
2375-MB2	31-May-2022	Vermont Seam	0.07	<0.001	0.21	<0.0001	<0.001	<0.001	0.001	0.59	<0.001	0.206	<0.0001	0.034	0.003	<0.01	<0.001	<0.001	<0.01	0.01
2375-MB2	19-Jul-2022	Vermont Seam	0.05	<0.001	0.17	<0.0001	<0.001	<0.001	0.001	0.39	<0.001	0.198	<0.0001	0.027	0.002	<0.01	<0.001	<0.001	<0.01	0.011
2375-MB2	29-Sep-2022	Vermont Seam	0.05	<0.001	0.15	<0.0001	<0.001	<0.001	<0.001	0.63	<0.001	0.212	<0.0001	0.019	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	16-Feb-2018	Leichhardt Seam	0.52	0.002	0.51	<0.0001	<0.001	<0.001	0.003	0.5	<0.001	0.214	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.023
2393-MB2	24-Mar-2018	Leichhardt Seam	0.04	0.002	0.5	<0.0001	<0.001	<0.001	<0.001	0.26	<0.001	0.196	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	27-Jul-2018	Leichhardt Seam	<0.01	0.002	0.51	<0.0001	<0.001	NM	<0.001	0.18	<0.001	0.176	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	21-Sep-2018	Leichhardt Seam	<0.01	0.001	0.49	<0.0001	<0.001	NM	<0.001	0.19	<0.001	0.166	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	22-Feb-2019	Leichhardt Seam	<0.01	0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.14	<0.001	0.161	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	24-Jun-2019	Leichhardt Seam	<0.01	0.001	0.47	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.164	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	04-Sep-2019	Leichhardt Seam	<0.01	0.002	0.51	<0.0001	<0.001	<0.001	<0.001	0.13	<0.001	0.175	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	30-Oct-2019	Leichhardt Seam	0.02	0.001	0.43	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.164	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	11-Dec-2019	Leichhardt Seam	<0.01	0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.163	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	10-Feb-2020	Leichhardt Seam	<0.01	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	1.64	<0.001	0.127	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.011
2393-MB2	08-Apr-2020	Leichhardt Seam	<0.01	0.001	0.37	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.159	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.007
2393-MB2	03-Jun-2020	Leichhardt Seam	<0.01	0.001	0.47	<0.0001	0.002	<0.001	<0.001	0.06	<0.001	0.153	<0.0001	0.004	0.009	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	18-Nov-2020	Leichhardt Seam	0.13	0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.18	<0.001	0.171	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	02-Feb-2021	Leichhardt Seam	5.03	0.003	0.44	<0.0001	0.009	0.004	0.005	5.32	0.002	0.304	<0.0001	0.002	0.009	<0.01	<0.001	<0.001	0.01	0.018
2393-MB2	20-Apr-2021	Leichhardt Seam	0.8	0.002	0.48	<0.0001	0.001	0.001	<0.001	0.84	<0.001	0.216	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	11-May-2021	Leichhardt Seam	0.31	0.002	0.48	<0.0001	<0.001	<0.001	<0.001	0.42	<0.001	0.215	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	17-Aug-2021	Leichhardt Seam	0.32	0.002	0.42	<0.0001	<0.001	<0.001	<0.001	0.43	<0.001	0.176	<0.0001	0.002	0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	21-Sep-2021	Leichhardt Seam	0.52	0.002	0.47	<0.0001	<0.001	<0.001	0.002	1.12	<0.001	0.193	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB2	17-Nov-2021	Leichhardt Seam	3.4	0.004	0.25	<0.0001	0.006	0.002	0.005	3.76	0.002	0.14	<0.0001	0.002	0.008	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB2	17-Nov-2021	Leichhardt Seam	2.28	0.004	0.22	<0.0001	0.004	0.002	0.004	2.32	0.002	0.133	<0.0001	0.002	0.006	<0.01	<0.001	<0.001	<0.01	0.01
2393-MB2	13-Jan-2022	Leichhardt Seam	0.56	0.004	0.35	<0.0001	0.001	0.001	0.002	1.01	<0.001	0.15	<0.0001	0.002	0.003	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB2	15-Mar-2022	Leichhardt Seam	1.6	0.002	0.48	<0.0001	0.002	<0.001	0.002	1.84	<0.001	0.182	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	0.007
2393-MB2	01-Jun-2022	Leichhardt Seam	2.53	0.002	0.58	<0.0001	0.005	0.001	0.004	3.2	0.001	0.225	<0.0001	0.003	0.005	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB2	20-Jul-2022	Leichhardt Seam	1.86	0.002	0.46	<0.0001	0.004	<0.001	0.002	2.3	<0.001	0.203	<0.0001	0.002	0.004	<0.01	<0.001	<0.001	<0.01	0.006
2393-MB2	29-Sep-2022	Leichhardt Seam	0.61	0.002	0.42	<0.0001	0.001	<0.001	<0.001	1.14	<0.001	0.195	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	16-Feb-2018	Vermont Lower Seam	0.09	<0.001	0.4	<0.0001	0.001	<0.001	0.006	1.68	<0.001	0.09	<0.0001	<0.001	0.001	<0.01	<0.001	<0.001	<0.01	0.021
2393-MB3	21-Mar-2018	Vermont Lower Seam	0.03	<0.001	0.38	<0.0001	<0.001	<0.001	0.002	1.62	<0.001	0.113	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	28-Jul-2018	Vermont Lower Seam	<0.01	<0.001	0.41	<0.0001	<0.001	NM	<0.001	1.48	<0.001	0.117	<0.0001	<0.001	0.002	<0.01	<0.001	<0.001	<0.01	0.011
2393-MB3	23-Sep-2018	Vermont Lower Seam	<0.01	<0.001	0.4	<0.0001	<0.001	NM	<0.001	1.22	<0.001	0.098	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.008
2393-MB3	22-Feb-2019	Vermont Lower Seam	<0.01	<0.001	0.37	<0.0001	<0.001	<0.001	<0.001	1.54	<0.001	0.127	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.01
2393-MB3	24-Jun-2019	Vermont Lower Seam	<0.01	<0.001	0.33	<0.0001	<0.001	<0.001	<0.001	1.54	<0.001	0.122	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.013
2393-MB3	04-Sep-2019	Vermont Lower Seam	<0.01	<0.001	0.41	<0.0001	<0.001	<0.001	<0.001	1.41	<0.001	0.13	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.017
2393-MB3	11-Dec-2019	Vermont Lower Seam	<0.01	<0.001	0.38	<0.0001	<0.001	<0.001	<0.001	1.42	<0.001	0.123	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.01
2393-MB3	10-Feb-2020	Vermont Lower Seam	<0.01	0.001	0.56	<0.0001	<0.001	<0.001	<0.001	0.09	<0.001	0.149	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	08-Apr-2020	Vermont Lower Seam	<0.01	<0.001	0.26	<0.0001	<0.001	<0.001	<0.001	1.18	<0.001	0.088	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	03-Jun-2020	Vermont Lower Seam	<0.01	<0.001	0.35	<0.0001	<0.001	<0.001	<0.001	1.16	<0.001	0.089	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.011

Lake Vermont North - Groundwater Quality Monitoring
Attachment D-6: Total Metals/Metalloids Data

Bore ID	Sample Date	Groundwater Unit	Total Metals																
			Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2393-MB3	18-Nov-2020	Vermont Lower Seam	0.01	<0.001	0.27	<0.0001	<0.001	<0.001	0.002	1.84	<0.001	0.146	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.012
2393-MB3	02-Feb-2021	Vermont Lower Seam	<0.05	<0.005	0.47	<0.0005	<0.005	<0.005	<0.005	1.37	<0.005	0.126	<0.0001	<0.005	<0.005	<0.05	<0.005	<0.005	<0.05	<0.026
2393-MB3	20-Apr-2021	Vermont Lower Seam	<0.01	<0.001	0.39	<0.0001	<0.001	<0.001	<0.001	1.77	<0.001	0.096	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
2393-MB3	11-May-2021	Vermont Lower Seam	<0.01	<0.001	0.38	<0.0001	<0.001	<0.001	<0.001	2.11	<0.001	0.134	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.011
2393-MB3	17-Aug-2021	Vermont Lower Seam	<0.01	<0.001	0.34	<0.0001	<0.001	<0.001	<0.001	2.02	<0.001	0.149	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01	0.007
2393-MB3	21-Sep-2021	Vermont Lower Seam	0.82	0.001	0.44	<0.0001	0.014	0.001	0.007	3.16	<0.001	0.185	<0.0001	0.003	0.015	<0.01	<0.001	<0.001	<0.01	0.035
2393-MB3	17-Nov-2021	Vermont Lower Seam	1.28	0.002	0.35	<0.0001	0.016	0.002	0.01	4.56	0.002	0.188	<0.0001	0.003	0.017	<0.01	<0.001	<0.001	<0.01	0.045
2393-MB3	12-Jan-2022	Vermont Lower Seam	0.94	0.002	0.5	<0.0001	0.009	0.002	0.008	4.15	0.001	0.21	<0.0001	0.002	0.013	<0.01	<0.001	<0.001	<0.01	0.035
2393-MB3	15-Mar-2022	Vermont Lower Seam	0.43	<0.001	0.45	<0.0001	0.003	<0.001	0.004	2.82	<0.001	0.176	<0.0001	0.002	0.005	<0.01	<0.001	<0.001	<0.01	0.024
2393-MB3	01-Jun-2022	Vermont Lower Seam	0.51	0.002	0.37	<0.0001	0.005	0.001	0.007	3.47	0.001	0.191	<0.0001	0.002	0.009	<0.01	<0.001	<0.001	<0.01	0.027
2393-MB3	20-Jul-2022	Vermont Lower Seam	0.57	<0.005	0.49	<0.0005	<0.005	<0.005	<0.005	3.1	<0.005	0.176	<0.0001	<0.005	0.008	<0.05	<0.005	<0.005	<0.05	<0.026
2393-MB3	29-Sep-2022	Vermont Lower Seam	0.22	<0.001	0.37	<0.0001	0.002	<0.001	0.002	2.45	<0.001	0.168	<0.0001	<0.001	0.003	<0.01	<0.001	<0.001	<0.01	0.016
West-MB2	17-Feb-2018	Permian coal measures	0.27	0.001	0.49	<0.0001	<0.001	<0.001	0.001	0.34	0.001	0.045	<0.0001	0.005	0.001	<0.01	<0.001	0.002	<0.01	0.037
West-MB2	20-Mar-2018	Permian coal measures	0.24	<0.001	0.48	<0.0001	<0.001	<0.001	0.001	0.22	<0.001	0.045	<0.0001	0.003	0.001	<0.01	<0.001	0.002	<0.01	<0.005
West-MB2	27-Jul-2018	Permian coal measures	0.06	<0.001	0.5	<0.0001	<0.001	NM	<0.001	0.08	<0.001	0.036	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB2	13-Sep-2018	Permian coal measures	0.08	<0.001	0.44	<0.0001	<0.001	NM	<0.001	0.07	<0.001	0.033	<0.0001	0.001	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
West-MB2	24-Feb-2019	Permian coal measures	0.04	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.022	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	26-May-2019	Permian coal measures	0.05	<0.001	0.53	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.022	<0.0001	0.001	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	01-Aug-2019	Permian coal measures	0.05	<0.001	0.57	<0.0001	<0.001	<0.001	0.003	<0.05	<0.001	0.021	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	25-Oct-2019	Permian coal measures	0.05	<0.001	0.46	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.016	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	10-Dec-2019	Permian coal measures	0.01	<0.001	0.48	<0.0001	<0.001	<0.001	0.004	0.07	<0.001	0.02	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	11-Feb-2020	Permian coal measures	<0.01	<0.001	0.63	<0.0001	<0.001	<0.001	<0.001	0.1	<0.001	0.02	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	0.005
WEST-MB2	22-Apr-2020	Permian coal measures	<0.01	<0.001	0.43	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.021	<0.0001	0.002	<0.001	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	10-Jun-2020	Permian coal measures	<0.01	<0.001	0.45	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.022	<0.0001	0.002	0.002	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	19-Nov-2020	Permian coal measures	<0.01	<0.001	0.47	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.038	<0.0001	0.003	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB2	03-Feb-2021	Permian coal measures	<0.01	<0.001	0.52	<0.0001	<0.001	<0.001	<0.001	0.06	<0.001	0.042	<0.0001	0.003	<0.001	<0.01	<0.001	0.002	<0.01	<0.005
WEST-MB2	22-Apr-2021	Permian coal measures	0.02	<0.001	0.48	<0.0001	<0.001	<0.001	<0.001	0.08	<0.001	0.032	<0.0001	0.003	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB2	12-May-2021	Permian coal measures	<0.01	<0.001	0.5	<0.0001	<0.001	<0.001	<0.001	0.07	<0.001	0.04	<0.0001	0.003	<0.001	<0.01	<0.001	0.001	<0.01	<0.005
WEST-MB2	18-Aug-2021	Permian coal measures	<0.01	<0.001	0.48	<0.0001	0.001	<0.001	<0.001	0.08	<0.001	0.029	<0.0001	0.003	0.004	<0.01	<0.001	<0.001	<0.01	<0.005
WEST-MB2	21-Sep-2021	Permian coal measures	0.52	<0.001	0.5	<0.0001	0.005	<0.001	0.003	0.7	<0.001	0.036	<0.0001	0.004	0.005	<0.01	<0.001	<0.001	<0.01	0.01
WEST-MB2	17-Nov-2021	Permian coal measures	0.83	<0.001	0.45	<0.0001	0.004	<0.001	0.003	0.82	0.001	0.031	<0.0001	0.004	0.004	<0.01	<0.001	<0.001	<0.01	0.014
West-MB2	12-Jan-2022	Permian coal measures	0.35	<0.001	0.54	<0.0001	0.002	<0.001	0.001	0.3	<0.001	0.037	<0.0001	0.003	0.002	<0.01	<0.001	<0.001	<0.01	0.008
West-MB2	15-Mar-2022	Permian coal measures	0.73	<0.001	0.48	<0.0001	0.002	<0.001	0.002	0.57	0.001	0.031	<0.0001	0.003	0.002	<0.01	<0.001	<0.001	<0.01	0.012
West-MB2	01-Jun-2022	Permian coal measures	0.87	<0.001	0.59	<0.0001	0.004	<0.001	0.002	0.82	0.001	0.042	<0.0001	0.004	0.003	<0.01	<0.001	<0.001	<0.01	0.013
West-MB2	19-Jul-2022	Permian coal measures	1.5	<0.001	0.54	<0.0001	<0.005	<0.001	0.002	0.53	0.002	0.031	<0.0001	0.004	<0.005	<0.01	<0.001	<0.001	<0.01	0.015
West-MB2	28-Sep-2022	Permian coal measures	0.41	<0.001	0.46	<0.0001	0.002	<0.001	<0.001	0.34	<0.001	0.032	<0.0001	0.004	0.003	<0.01	<0.001	<0.001	<0.01	<0.005

ATTACHMENT E

Interpretation of Landsat 7 Enhanced Thematic Mapper (ETM) Imagery

Interpretation of Landsat 7 Enhanced Thematic Mapper (ETM) Imagery

The satellite image presented in this report is a Landsat 7 Enhanced Thematic Mapper (ETM) image, which was downloaded from the United States Geological Survey (USGS) Earth Explorer web site. The interpretation of satellite imagery is relatively complex, therefore this section includes an introduction to the type of data collected by Landsat 7, as well as a brief description of the data collected by the three bands that have been combined to create the image.

The Landsat 7 satellite is operated by NASA and managed by the USGS. Broadly, the purpose of the Landsat program is to provide an archive of remote sensing data as a resource for researchers in the fields of agriculture, geology, forestry, education, regional planning, mapping, and global change.

Data from the satellite is collected via 8 channels which comprise:

- Reflected light electromagnetic (EM) bands in the visible spectrums of blue, green and red, as well as near infrared (NIR) and mid infrared (MIR). This data is collected via bands 1 to 5 and 7 at a resolution (pixel size) of 30 m x 30 m;
- A thermal infrared channel (band 6) with a resolution of 60 m; and,
- A panchromatic band (band 8) with a resolution of 15 m.

The panchromatic band is used to provide underlying detail to the image, while a combination of three other bands (which are applied to red, green, and blue image channels) is used to create images that highlight specific physical features.

The image type is known as a "7,4,2 RGB" image. This means that information from spectral band 7 (short wave infrared) is coloured red, band 4 (near infrared) is coloured green, and band 2 (visible blue-green) is coloured blue. Therefore, with the exception of band 2, the image is based on infrared data, i.e. data beyond the visible portion of the EM spectrum.

The features of each band are discussed below. The responses of each band are dependent on prevailing conditions; therefore a full interpretation requires review of the area over different climatic conditions (e.g. drought, recent rainfall) and ground-truthing of observations.

Band 7. The spectral response of Band 7 is within the short-wave infrared (SWIR) portion of the EM spectrum (2.09 to 2.35 µm). This portion of the EM spectrum is sensitive to variations in moisture content and is also useful for thermal mapping. The reflectance response of a number of physical features (dry bare soil, vegetation, and water) at different EM wavelengths is shown below in Figure 1. From Figure 1 it can be seen that an EM wavelength range of 2.09 to 2.35 µm has a high reflectance for dry bare soil.

Band 7 has been falsely coloured red in the 742 RGB image and where this band dominates the resultant image will be seen as combinations of red and brown. This band can be used to discriminate:

- Changes in mineralogy, including the presence of hydrous minerals (e.g. clays), which will show up as various shades of red and orange;
- Heat sources - for example TM Band 7 has been used extensively for mapping of forest fires, with actively burning vegetation displaying as a bright red, and burn scars showing as a duller red;
- Presence of bare ground or dry ground with sparse vegetation cover (e.g. cleared areas, fields where crops are not actively growing, urban areas, fire scars); and,

- Prior channels within flood-plain alluvium. The ability for the image to define the locations of prior channels is, to a degree, dependent on the timing of image acquisition relative to recent rainfall (USGS, 1976)[1]. For example, prior channels are likely to show up better in situations where:
    - There is a permeability contrast between sand and silt deposits within the floodplain;
    - Recent rainfall has saturated the ground, enhancing the contrast between clay/silt soils (that retain moisture) and sandier channels (where water movement/drainage is enhanced, such that these zones have a lower moisture content)

Band 4. The spectral response of Band 4 is within the Near Infrared Red (NIR) portion of the EM spectrum (0.77 to 0.90 µm). Near infrared radiation is reflected to a high degree from leafy vegetation since chlorophyll (the green pigment in green vegetation) reflects much of the NIR that reaches it (refer Figure 1).

In the image Band 4 has been falsely coloured green; therefore actively growing vegetation will show up as shades of green. Areas of fast-growing vegetation (e.g. crops) are bright green, with more mature vegetation (e.g. established trees, forests) showing up as a duller green.

Band 2. The spectral response of Band 2 is within the visible portion of the EM spectrum that corresponds with blue-green light (0.52 to 0.60 µm). This band is capable of being transmitted further through water than other visible bands, so the blue-green light detected by the sensor is actually light that has been transmitted through the water and then reflected off the bottom of a water body (other bands having been filtered out). As such, shallow water is bright blue as most of the blue-green band is reflected, whereas deep water is dark blue (less light returned) to black (where no light is reflected back to the sensor).

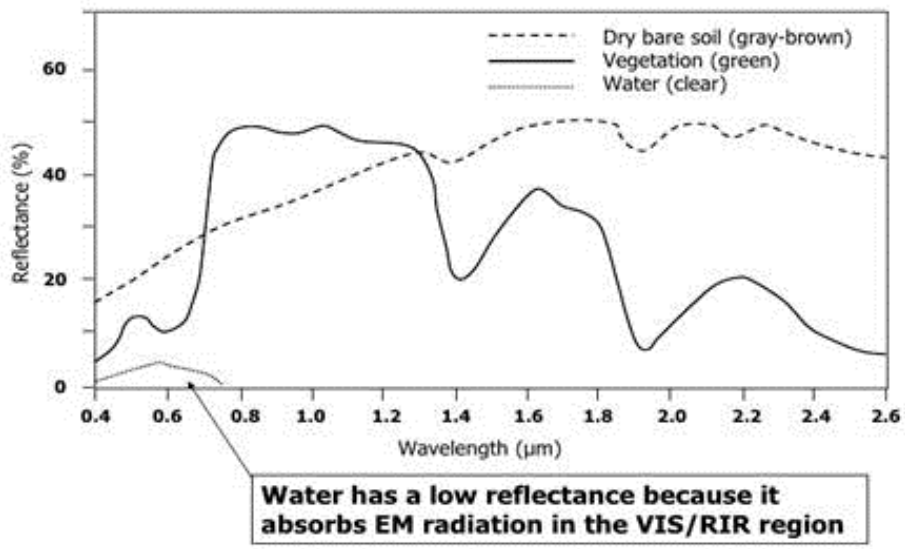


Figure 1: Reflectance of selected features at various EM wavelengths (Source: Lillesand & Kiefer 1994[2]

[1] ERTS-1 – A New Window on Our Planet. United States Geological Survey (USGS) Professional Paper 929, United States Government Printing Office, Washington, 1976.

[2] Lillesand, T. M. & Kiefer, R. W (1994) *Remote Sensing and Image Interpretation, 3rd ed.* John Wiley & Sons, Publishers.