BHP

# South Walker Creek Mulgrave Resource Access: Stage 2C (MRA2C)

## EPBC 2017-7957

# Appendix D: Groundwater Assessment

**REPORT**

# BHP Billiton Mitsui Coal

*Groundwater Impact Assessment for the South Walker Creek Mine MRA2C Project*


Submitted by:

**Golder Associates Pty Ltd**

147 Coronation Drive, Milton, Queensland 4064, Australia

+61 7 3721 5400



1791876-002-R-Rev0 MRA2C GW Impact Assessment

11 June 2018

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**APPENDICES**

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# 1.0 INTRODUCTION

## 1.1 Study Overview

The South Walker Creek Mine (SWC) is located approximately 25 km west-south west of Nebo, Queensland, in the Bowen Basin (Figure 1). The South Walker Creek Mine is an open cut coal mining operation owned by BHP Billiton Mitsui Coal (BMC) and has been in operation for more than 20 years, with construction works commencing in 1996. The South Walker Creek Mine currently consists of five open cut coal mining pits: the Toolah, Walker, Carborough, Mulgrave, and Kemmis Pits (Figure 2). All pits are located within mining lease ML4750.

As part of ongoing operations, BMC is undertaking the Mulgrave Resource Access Project 2C (MRA2C Project, the Project), which proposes to continue mining via continued excavation and mining of the existing Mulgrave pit, with diversion of a section of the ephemeral Walker Creek. The proposed MRA2C Project with respect to the open cut coal mining pits and existing groundwater bores is shown in Figure 2 and is also shown in Figure 3 relative to the mining schedule.

A total of nine pits and extensions are part of the current life-of-mine plan, which lasts through 2073. The footprint of the Project pit progression is around 3700 ha, with depth of mining ranging from approximately 40 to 130 m below ground level (bgl). The Project includes diversion of a section of the ephemeral Walker Creek along the western side of the expansion, as shown in Figure 3, this includes both the MRA2A diversion, approved as part of the MRA2A expansion project, and the planned MRA2C diversion, which is part of the MRA2C project.

The Project has been declared a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The delegate of the Minister for the Department of the Environment and Energy (DOEE) considers that the Project is likely to impact on water resources as a result of potential groundwater drawdown, depressurisation and contamination; cause changes to surface water and groundwater quality from the mining activities; and cause potential changes to surface water and groundwater quality and quantity from the proposed creek diversion. DOEE has requested additional information required for assessment by preliminary documentation.

This Groundwater Impact Assessment (GWIA) is one of several studies that have been developed to support the information request from the DOEE. This study builds on earlier studies undertaken for the South Walker Creek Mine outlined in Section 2.1. The GWIA includes development of a three-dimensional numerical groundwater flow model to evaluate impacts to environmental values of groundwater near the Project during the life of mine and post-mining period and includes consideration of the full South Walker Creek Mine plan which includes all reasonably foreseeable mining activities at the South Walker Creek Mine. Modelling has been undertaken in a manner consistent with the Australian Groundwater Modelling Guidelines (Barnett *et al.,* 2012), and the resulting model is considered to have an upper Class 2 confidence level.

As part of the review process for the Project, the DOEE will refer this study to the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) for advice. The IESC has published guidelines on the type of information they need for assessment of these projects (IESC 2015). This GWIA has been developed in consideration of these guidelines and is designed to meet IESC recommendations for consideration of "all relevant past, present, and reasonable foreseeable actions, programmes, and policies that are likely to impact on water resources" (IESC 2015).

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## LEGEND

- Locality (Bounded)
- Railway
- State Controlled Road
- ML4750

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:150,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

Projection: Transverse Mercator

Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MINING LEASES - QUEENSLAND: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017
3. RAIL NETWORK - QUEENSLAND, BASELINE ROADS AND TRACKS: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017

CLIENT

BHP BILLITON MITSUI COAL

PROJECT

SOUTH WALKER CREEK MRA2C

TITLE

**SITE LOCATION**

CONSULTANT

GOLDER

| DD/MM/YYYY | 6/06/2018 |
|---|---|
| DESIGNED | HG |
| PREPARED | BG |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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**LEGEND**

**Groundwater Bore Location**

*Screened Formation, Bore Owner*

- Alluvium, Bores Monitored by BMC
- Alluvium, Unregistered Landholder Bore
- Coal Seam, Bores Monitored by BMC
- Overburden, Spring
- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore

- State Controlled Road
- Railway

Watercourse
- Major
- Minor

- MRA2C Project
- ML4750
- BHP Agistment Agreement
- BHP Compensation Agreement

0 1,000 2,000 3,000 4,000 5,000 METRES

Scale: 1:90,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
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3. RAIL NETWORK - QUEENSLAND, BASELINE ROADS AND TRACKS, WATERCOURSES: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017
4. TARGET BORES, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**SITE PLAN**

CONSULTANT
GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | BG |
| REVIEWED | JF |
| APPROVED | SF |

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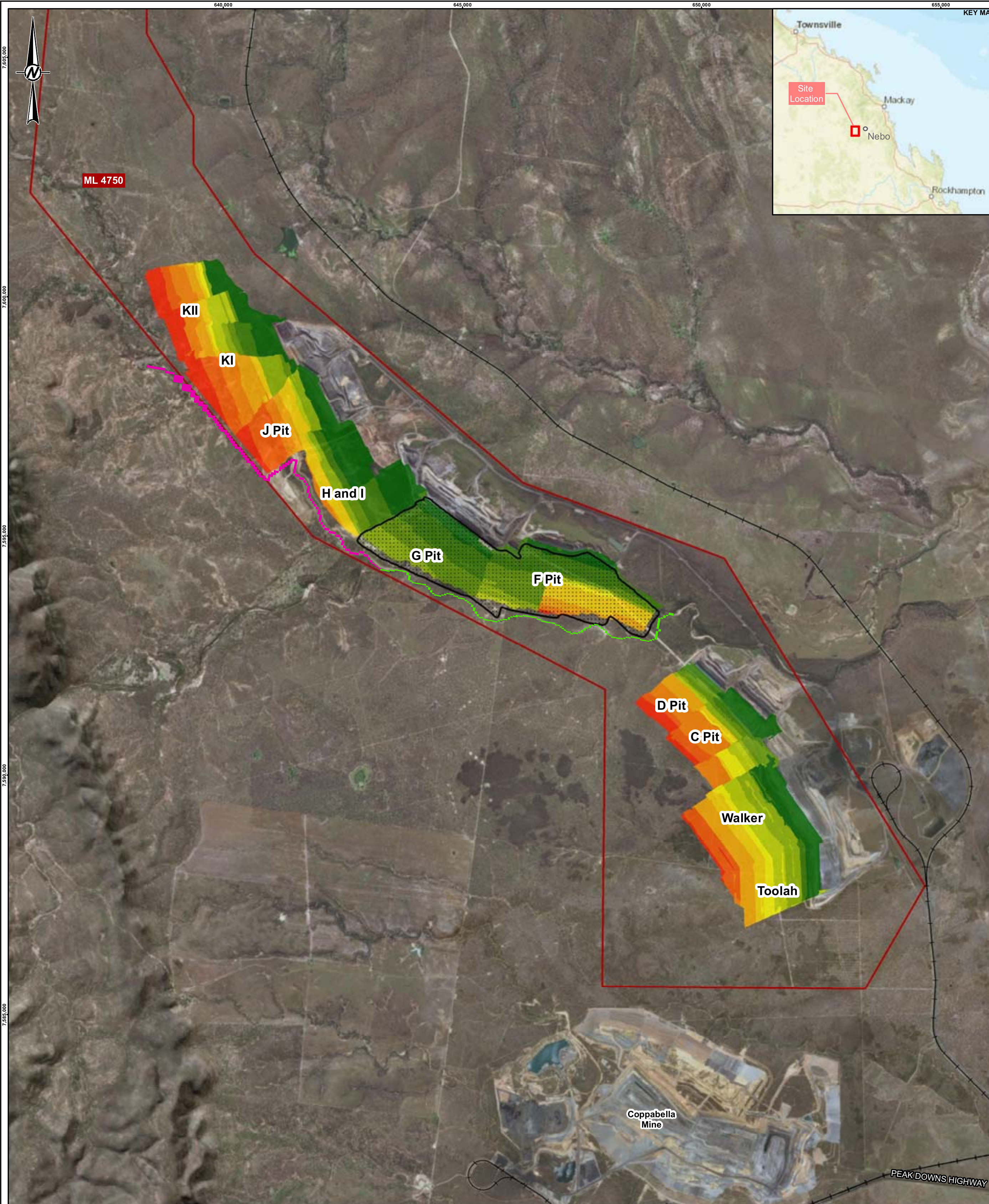


## LEGEND

- State Controlled Road
- Railway
- ML4750
- MRA2C Proposed Pit Area
- MRA2A River Diversion Alignment
- MRA2c River Diversion Alignment

**Mine Plan**

*Financial Year*

- 2018-2022
- 2023-2027
- 2028-2032
- 2033-2037
- 2038-2042
- 2043-2047
- 2048-2052
- 2053-2057
- 2058-2062
- 2063-2067
- 2068-2072

0 1,000 2,000 3,000 4,000 5,000 METRES

Scale: 1:75,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
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3. RAIL NETWORK - QUEENSLAND, BASELINE ROADS AND TRACKS, WATERCOURSES: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017
4. MINE PLAN, MRA2C PIT AREA: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**SOUTH WALKER CREEK MINE PLAN**

CONSULTANT
GOLDER

| | |
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| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | BG |
| REVIEWED | JF |
| APPROVED | SF |

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## 1.2 Structure of the Report

| | |
|---|---|
| Section 1 | Study overview, study components, and phases and structure of the document |
| Section 2 | Provides a list of documents, databases, and models on which the groundwater impact assessment is based |
| Section 3 | Describes the Project setting and nearby mining operations |
| Section 4 | Presents the groundwater framework, including a summary of the conceptual site model and available groundwater data |
| Section 5 | Presents the environmental values of groundwater |
| Section 6 | Describes the development of the numerical groundwater flow model for prediction of impacts to environmental values of groundwater, including descriptions of calibration and sensitivity analyses, predictive simulations, results, and uncertainty analyses |
| Section 7 | Presents identified and potential impacts to groundwater |
| Section 8 | Outlines the proposed management and monitoring programs for identified and potential impacts to groundwater |
| Section 9 | References |

# 2.0 INFORMATION REVIEW

The South Walker Creek Mine has been in operation for more than 20 years, with construction works commencing in 1996. Site-specific hydrogeologic data has been collected as part of exploration drilling works, monitoring network installation, and sampling.

The focus of the information review undertaken during this study was to collate and review data that would assist with conceptualisation of the local hydrogeological systems data or that would inform choice of model parameters. In addition to review of hydrogeologic data, the review focused on other relevant and available data (e.g. climate and surface water data) that relate to how recharge and infiltration are represented in the groundwater model. The overall goal of the information review process was to:

1) Validate or update the conceptual site hydrogeological model;
2) Identify information necessary for groundwater model development, calibration, and simulations; and
3) Identify information that may increase groundwater model validity or decrease uncertainty of simulations.

A range of historical reports, recent and historical groundwater data records, and seam surfaces of the current mine resource model and the proposed mine plan and final void drawings have been made available by BMC to Golder for this study. The specific data and documents provided to Golder are listed in Section 2.1.

## 2.1 Documents and Data Reviewed

The following reports and memos made available by BMC and their consultants have been viewed as part of the study scope:

- Australasian Groundwater & Environmental Consultants Pty Ltd (AGE), 2010. “Report on South Walker Creek Mine, Annual Groundwater Assessment”, report prepared for BHP Mitsui Coal Operations Pty Ltd (BMC), No. G1525, October 2010.
- BMT WBM (2011). “South Walker Creek and Poitrel Mines – Salt and Assimilation Studies, Environmental Values and Water Quality Objectives”, R. B18575.001.00.doc prepared for BMC, October 2011.

- GHD (2012). “South Walker Creek Mine Annual Groundwater Review 2012”, report prepared for BMC, 25 September 2012.
- Douglas Partners (2013). “Kemmis II Groundwater Impact Assessment, South Walker Creek Coal Mine”, report prepared for BMC, P. 80275.00, December 2013.
- Douglas Partners (2013). “South Walker Creek Mine Annual Groundwater Review 2013”, report prepared for BMC, P. 80275.01, September 2013.
- AGE, 2014. “South Walker Creek, Field Report Summary”, prepared for BHP Mitsui Coal (BMC), G1684A, 15 May 2014.
- Douglas Partners (2014). “Establishment of Trigger Levels for Groundwater, South Walker Creek Coal”, report prepared for BMC, P. 80275.04, June 2014.
- Douglas Partners (2014). “South Walker Creek Mine Annual Groundwater Review 2014”, report prepared for BMC, P. 80275.05, November 2014.
- Gauge Industrial and Environmental, (2016). “Proposed Groundwater Trigger Values for South Walker Creek Coal Mine”, report prepared for BMC, February 2016.
- Alluvium (2016). “Functional Design Report: Mulgrave Resource Access Walker Creek Diversion – Stage 2C”, report prepared for BMC, May 2016.
- CDM Smith (2016). “Mulgrave Access Resource Project – MRA2C Groundwater Impact Assessment”, report prepared for BMC, 26 October 2016.
- Adaptive Strategies and Eco Logical Australia (2017). Memorandum: “South Walker Creek MRA2C: EP (Underground Water Management) and Other Legislation Amendment Act Review of CDM Smith Groundwater Impact Assessment Report.” Submitted to BHP Billiton, 05 June 2017.
- CDM Smith (2017). “RE: Kemmis 2 pit groundwater modelling”, letter to BMC, PN: MWS160025.02, 31 January 2017.
- Alluvium (2017). “Summary Design Report: Mulgrave Resource Access Walker Creek Diversion Stage 2C Detailed Design” report prepared for BMC, February 2017.


The following project data and electronic files were provided by BMC and have been viewed as part of the study scope:

- 2017 LiDAR data for pits and stockpiles (December 2017)
- 2017 Digital Elevation Model (DEM) for South Walker Creek (December 2017)
- Mulgrave 2C Leapfrog geologic model files and supporting data
- MRA2C Groundwater model files, including steady state and transient calibration files and model simulations
- “SWC_Model_Log” worksheet file – prepared by CDM Smith, a model log file for their MRA2C groundwater model
- Kemmis 2 Groundwater model files “R7” and “R8” only (predictive Basecase model, Mining model)
- “MWS.160025.02 Kemmis Model Journal – RevB”, prepared by CDM Smith, including a model log, model setup information, and water balance results for the Kemmis 2 model.
- ” Final Life of Asset” topography, provided by BMC: XYZ coordinates in Excel, shapefiles
- A mining plan in the form of shaded areas (shapefiles) indicating planned progression of the open cut mining for all pits over time
- “130411A Bee Ck Historical Discharge_Rainfall”, provided by Alluvium Consulting: Comparison of rainfall to discharge at the Bee Creek stream gauge, 1973-1988.

## 2.2 Groundwater Model Review

As part of the information review, groundwater models constructed previously for the South Walker Creek Mine were reviewed to evaluate whether they could be used to address the information requirements from the DOEE. Two previous groundwater models were made available for review: a groundwater model previously developed by CDM Smith for preliminary assessment of the Project (CDM, 2016) and a second groundwater model developed to evaluate hydrogeologic conditions surrounding the Kemmis II expansion project (CDM 2017).

The intent of the model review was to assess the suitability of the existing models for use in assessing groundwater conditions in the project area, including:

1) Simulation of the cumulative drawdown effects associated with the proposed action with full consideration given to both active and inactive mining at other pits associated with the South Walker Creek Mine, including the Carborough, Walker, and Toolah pits;

2) Detailed representation of all aquifers in the region, including the unconfined alluvial/regolith aquifer that may be locally impacted during mining operations;

3) Post-closure predictive simulations to assess the potential interactions of the final voids with groundwater.

## 2.3 Results of Review

Results of the data and groundwater model review indicate that the conceptual site model (CSM) on which the various existing groundwater models described above is generally based on observations, measurements, and interpretation consistent with guiding principles of the Australian Groundwater Modelling Guidelines (Barnett *et al.,* 2012)

Specific limitations on the available data and data gaps identified during the review process include:

- Hydraulic properties for model parameter estimates are limited to the area of the mining lease
- Limited long-term groundwater monitoring data exists for use in calibrating and validating the groundwater model
- Limited information on the continuity of stratigraphy / geology in the model domain away from the mine site
- Water level data from landholder bores is limited to one or a few measurements.

Notwithstanding these limitations, the amount and quality of the data on the groundwater system is sufficient to satisfy IESC guidelines for assessment of the Project and to meet the objectives of the study. Subsequent to the data review, updated water level data (2016-2018) was provided by BMC for use in development and calibration of a revised groundwater model.

Results of the groundwater model review indicate that the previous groundwater models were not developed to meet the objectives of the current study. Development of a new groundwater model, based in part on previous modelling work, was undertaken as part of this study.

# 3.0 PROJECT SETTING

## 3.1 Relevant Legislation

The Groundwater Impact Assessment (GWIA) for the MRA2C Project was completed with reference to the *Water Act 2000* [Qld] [Water Act], *Environmental Protection and Biodiversity Conservation Act 1999* [Cth] (EPBC Act) and the *Environmental Protection Act 1994* [Qld] (EP Act), and, amendments introduced by the *Environmental Protection (Underground Water Management) and Other Legislation Amendment Act 2016* (EP Amendment Act) to the EP Act.

This GWIA was developed to meet all current regulatory requirements in support of the information request from the DOEE. As discussed in Section 1, this GWIA has been developed in consideration of the IESC guidelines (IESC 2015). Groundwater modelling was undertaken in a manner consistent with Australian Groundwater Modelling Guidelines (Barnett *et al.*, 2012).

## 3.2 Physical Setting

### 3.2.1 Climate

The average climatic condition of the study area is displayed in Table 1 and Figure 4. The presented information is based on long-term daily climate data (1889 to 2017) supplied by the Department of Science, Information Technology, and Innovation (DSITI) Scientific Information for Land Owners (SILO) climate databases. The climate in central Queensland is classified as sub-tropical, with hot, moist summers and warm, dry winters. As shown in Table 1, long-term climate averages indicate that evaporation exceeds rainfall annually, and in each month of the year.

**Table 1: Long-term Climate Averages, 1889-2017**

| Month | Mean Monthly Rainfall | Mean Monthly Evaporation | Mean Maximum Temperature | Mean Minimum Temperature |
|---|---|---|---|---|
| January | 121 | 220 | 32 | 21 |
| February | 115 | 178 | 31 | 20 |
| March | 83 | 185 | 30 | 19 |
| April | 38 | 144 | 28 | 16 |
| May | 32 | 114 | 25 | 13 |
| June | 35 | 92 | 22 | 10 |
| July | 24 | 101 | 22 | 8 |
| August | 23 | 129 | 24 | 9 |
| September | 18 | 172 | 27 | 12 |
| October | 32 | 215 | 30 | 16 |
| November | 55 | 223 | 31 | 18 |
| December | 91 | 231 | 32 | 20 |
| **Annual** | **668** | **2005** | **28** | **15** |

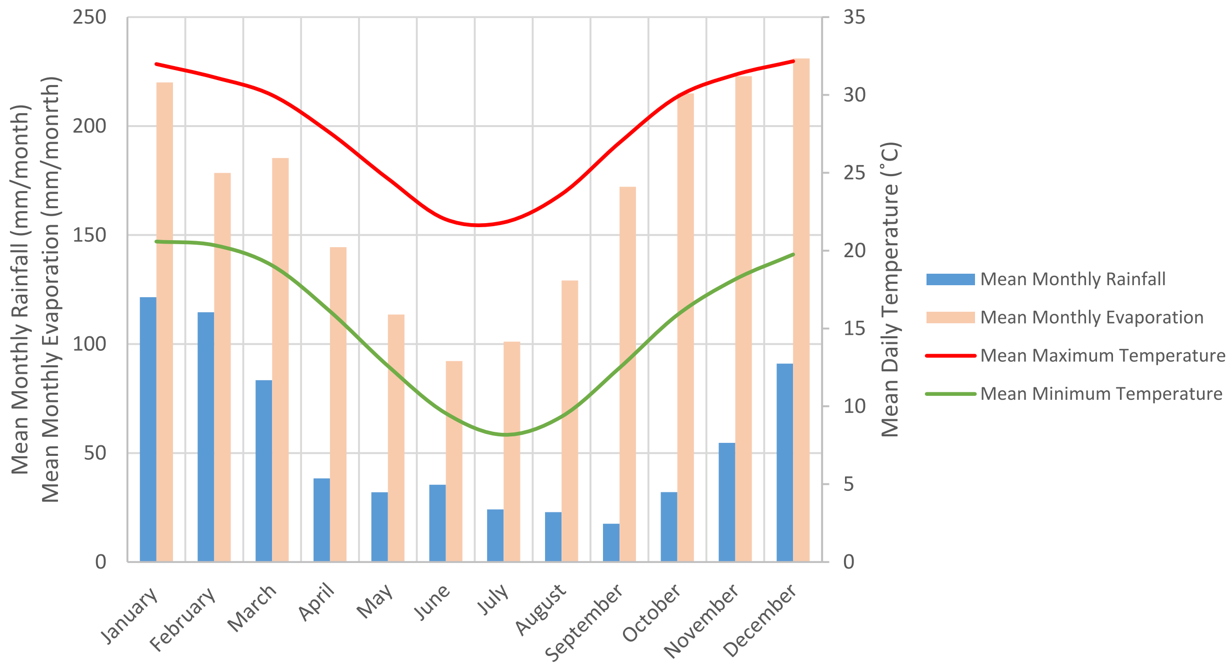


**Figure 4: Average Climatic Conditions**

### 3.2.2 Surface Water Catchments

The site is located in the "Central Tributaries" sub-catchment of the Connors River catchment (Figure 5). In the Project area, the ephemeral Carborough and Walker Creeks flow to Bee Creek, which then flows southeast and south, joining with the Connors River just upstream of its juncture with the Isaac River.

The Isaac and Conner Rivers are major tributaries to the Fitzroy River. The Fitzroy River Basin encompasses over 140,000 square kilometres and is the largest river system to drain Australia's east coast. The basin encompasses six major river systems and drains eventually to Keppel Bay near Rockhampton.

### 3.2.3 Geology

Queensland's coals were deposited during an almost 300-million-year period from the Carboniferous to the Tertiary, with the coal deposits of the Permian being the most commercially important. The exposed Permo-Triassic Bowen Basin extends south from latitude 20º S for over 550 km until it is obscured by the overlying Surat Basin (Wilson, 2017).

Deposition of Bowen Basin sediments commenced in the Early Permian in an extensional setting under fluvial and lacustrine conditions, followed by a basin-wide transgression which allowed for deposition of extensive clastic sediments and coal measures. These were later buried by a thick succession of Later Permian marine and fluvial clastics (Geoscience Australia, accessed May 2018). Wilson (2017) evaluated the depositional and structural history of the basin in detail and divides the basin fill history into three distinct phases: an extensional phase, a thermal subsidence phase, and a foreland loading phase (Hunter-Bowen Orogeny).

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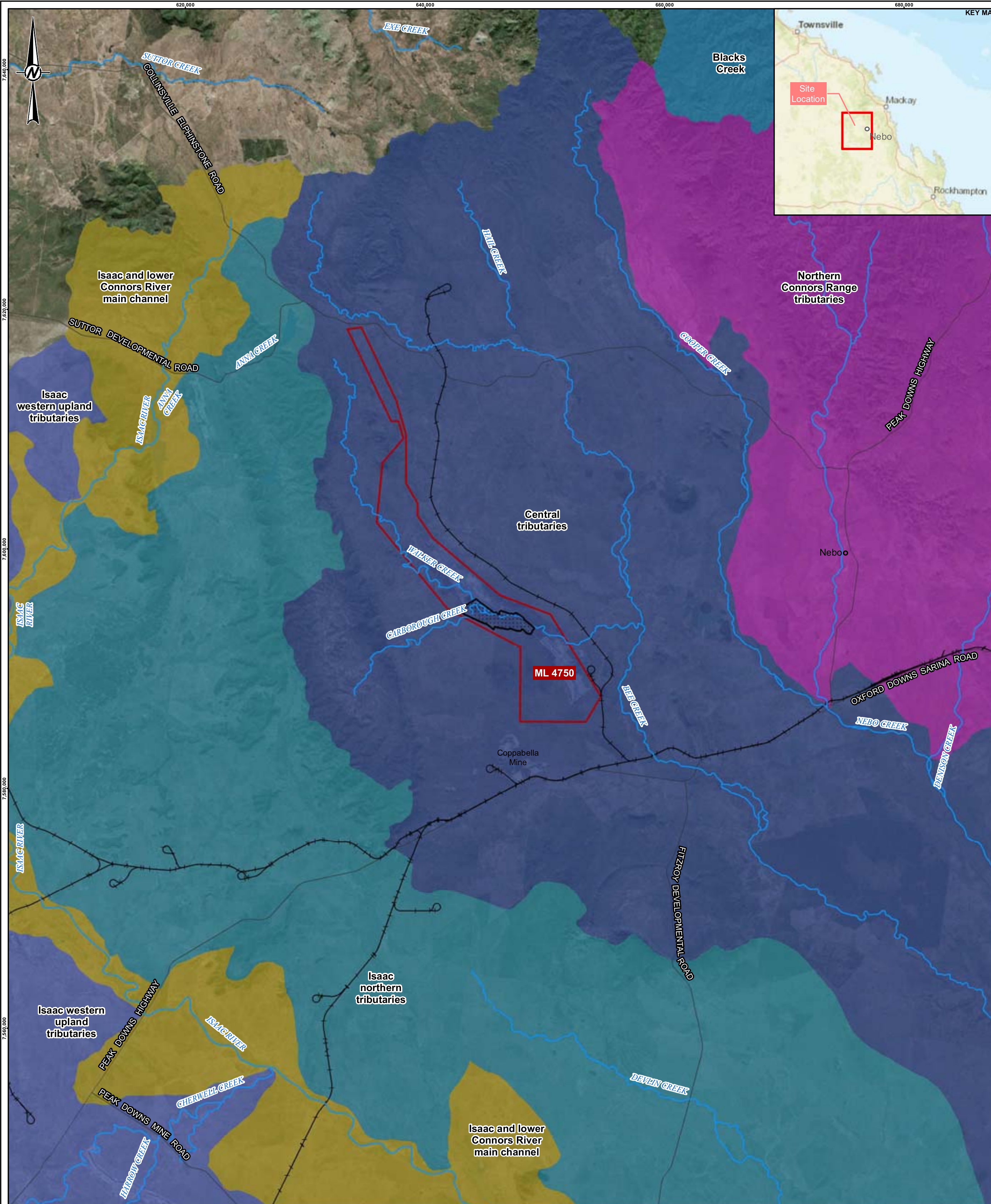


**LEGEND**

- Locality
- State Controlled Road
- Railway
- Watercourse
- ML4750
- MRA2C Project

**Surface Water Subcatchment**

- Blacks Creek
- Central tributaries
- Isaac and lower Connors River main channel
- Isaac northern tributaries
- Isaac western upland tributaries
- Northern Connors Range tributaries
- Pioneer River

0 5,000 10,000 15,000 20,000
METRES

Scale: 1:300,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
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3. RAIL NETWORK - QUEENSLAND, BASELINE ROADS AND TRACKS, WATERCOURSES, PLACE NAMES: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017
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5. ORTHOPHOTO, MRA2C PIT AREA: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**SURFACE WATER CATCHMENTS**

CONSULTANT
GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | BG |
| REVIEWED | JF |
| APPROVED | SF |

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25mm
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## Regional Geology

The South Walker Creek Mine is located on the eastern margin of the northern Bowen Basin, within the Nebo Synclinorium. The rocks in the region have been deformed into northwest to southeast trending anticlinal and synclinal structures, formed in response to the post-deposition compressional tectonic phase during the Triassic. Regionally, Triassic and Permian sedimentary units are overlain by surficial deposits of Tertiary and quaternary age (Figure 6).

Figure 7 presents CSIRO's Bowen Basin structural geology map, which shows bedrock stratigraphy and the location of interpreted folds and faults in the surrounding area. As shown in Figure 7, no faults are identified in the footprint of the MRA2C project. A standard stratigraphic section for the Nebo Synclinorium is shown in Figure 8, although there is some variability across the basin.

Geological stratigraphy in the region and the Project site is characterised by the following units (from youngest to oldest):

- Unconsolidated alluvium and colluvium (Quaternary and Tertiary)
- Rewan Group (Triassic)
- Rangal Coal Measures of the Blackwater Group (Permian)
- Fort Cooper Coal Measures of the Blackwater Group (Late Permian)

Additional, deeper bedrock units beneath the Fort Cooper Coal Measures are not considered relevant to this study.

## Local Geology and Stratigraphy

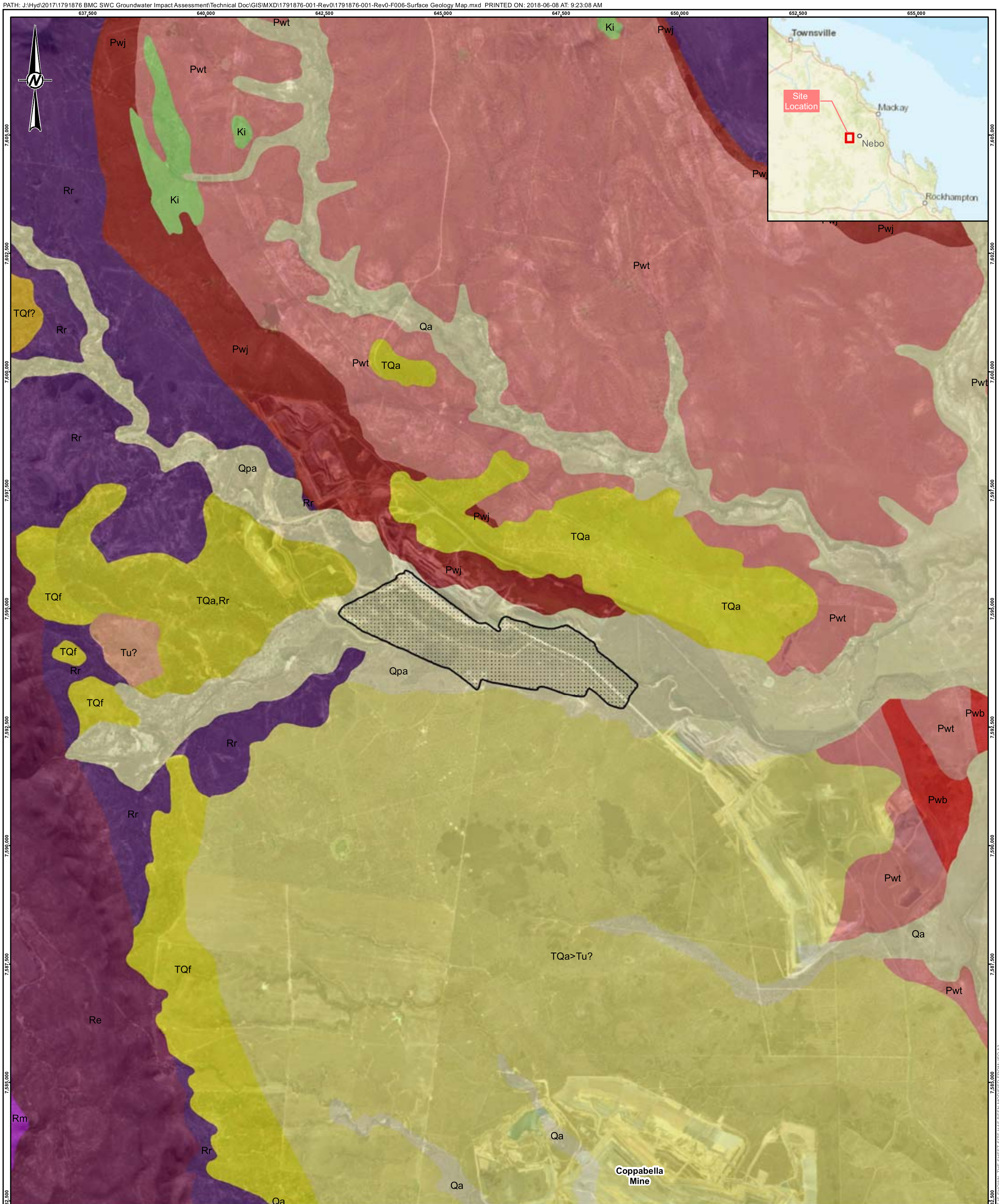
Geological mapping of the site indicates that Quaternary and Tertiary alluvium deposits are present near the Mulgrave, Carborough, Toolah and Walker pits. Alluvium is generally 5 – 10 m thick and comprised of clays, sandy clays and sands. Alluvium deposits generally obtain a maximum thickness in proximity to present creek channels and palaeochannels associated with Walker and Carborough Creeks (Douglas Partners, 2014).

The Rewan Group consists of soft rocks, covered by a thick soil layer, outcropping primarily around streams. The Rewan Group is a thinly interbedded sequence of dense siltstone, claystone, and minor fine-grained green and brown lithic quartz sandstone (Mollan *et al*., 1969).

The Rangal Coal Measures are the target formation for coal mining at the MRA2C Project. They are part of the Blackwater Group and are Late Permian in age. The siliciclastic rocks of this group are similar in composition of the rocks of the Rewan Group, and comprise sandstone, siltstone, mudstone, coal, tuff and conglomerate. The Rangal Coal Measures conformably overlie the Fort Cooper Coal Measures. The strata of the Rangal Coal Measures dip to the west at approximately six degrees in the study area.

The Late Permian Fort Cooper Coal Measures are also classified as part of the Blackwater Group. The Fort Cooper Coal Measures comprise green lithic sandstone, conglomerate, mudstone, carbonaceous mudstone, coal, tuffaceous mudstone and thin beds of greyish white cherty tuff. The coal seams of the Fort Cooper Coal Measures have little or no economic value due to tuffaceous claystone banding throughout the unit. The upper boundary of the Fort Cooper Coal Measures is positioned at the top of the Yarrabee Tuff Bed, a distinctive tuffaceous claystone unit found across the Bowen Basin, which is characterised by its high natural gamma response (Matheson, 1990). The transition between the Fort Cooper Coal Measures and the Rangal Coal Measures is marked by the Yarrabee tuff at South Walker Creek Mine.

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F006-Surface Geology Map.mxd PRINTED ON: 2018-06-08 AT: 9:23:08 AM




## LEGEND

MRA2C Project

**Rock Unit Name**

- Qa-QLD (Quaternary Alluvium) - Qa
- Qpa-QLD (Pleistocene Alluvium) - Qpa
- TQa-QLD ( Late Tertiary - Quaternary Alluvium) - TQa
- TQa-QLD,Rewan Group - TQa,Rr
- TQa-QLD>Suttor Formation? - TQa>Tu?
- TQf-QLD (Late Tertiary - Quaternary Poorly Consolidated Sediments) - TQf
- TQf?-QLD - TQf?
- Suttor Formation? - Tu?
- Ki-8554 (Cretaceous Intrusive Granitoid)- Ki
- Moolayember Formation - Rm
- Clematis Group - Re
- Rewan Group - Rr
- Fort Cooper Coal Measures - Pwt
- Moranbah Coal Measures - Pwb
- Rangal Coal Measures - Pwj

0 500 1,000 1,500 2,000 2,500 METRES

Scale: 1:75,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA - BHP, JANUARY 2018
3. SURFACE AND STRUCTURAL GEOLOGY - © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES, MINES AND ENERGY) 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**SURFACE GEOLOGY MAP**

CONSULTANT
GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | DC |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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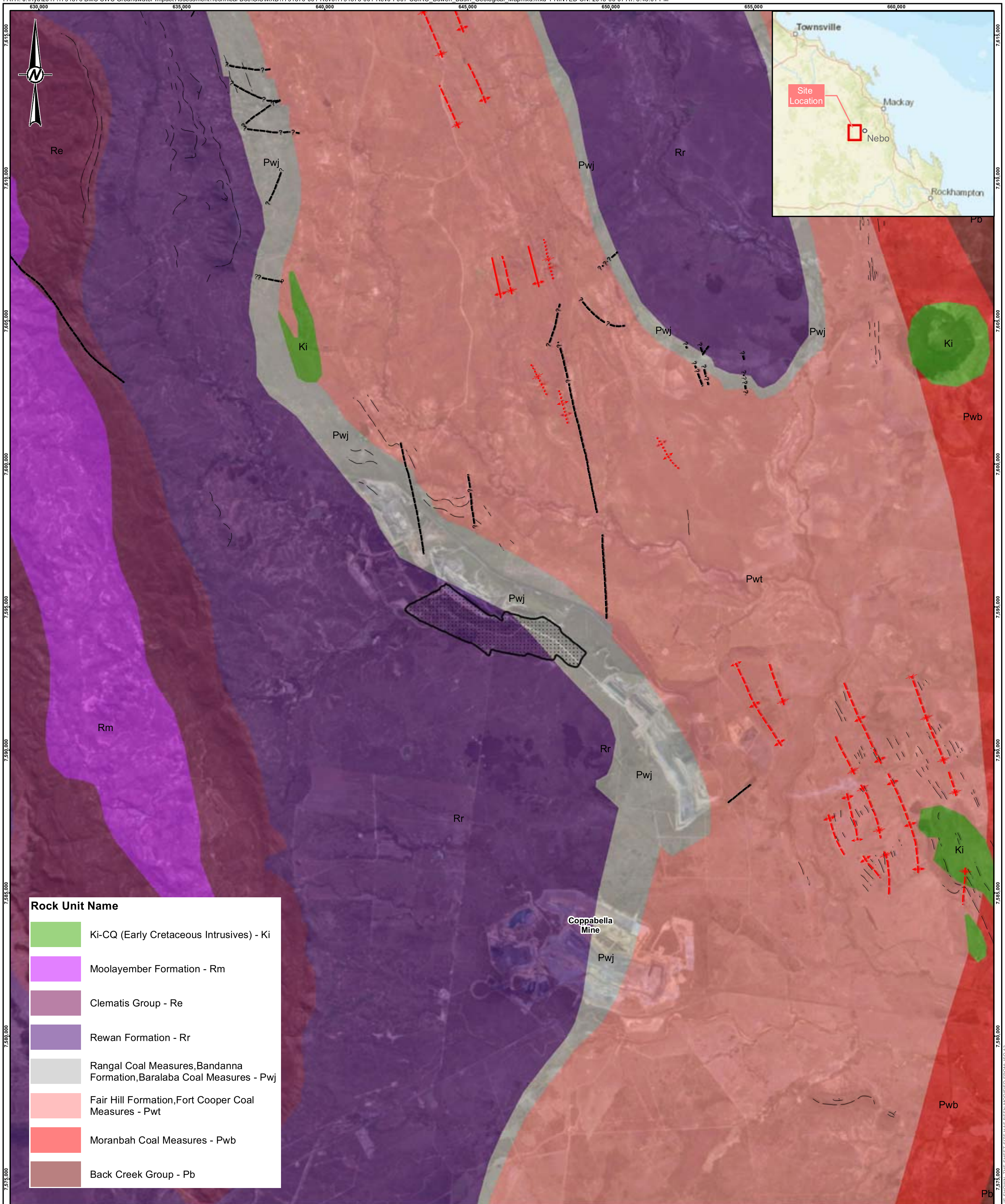


## LEGEND

Geological Structures

- Anticline Accurate
- Anticline Approximate
- Anticline Concealed
- Fault Approximate
- Fault Inferred
- Lineament
- Syncline Approximate
- Syncline Concealed
- Trend Line
- Trend Line Showing Dip
- Trend Line Showing Dip 15 to 45 Degrees
- Trend Line Showing Dip 5 to 15 Degrees
- MRA2C Project

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**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA - BHP, JANUARY 2018
3. SURFACE AND STRUCTURAL GEOLOGY - © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES, MINES AND ENERGY) 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**CSIRO BOWEN BASIN GEOLOGICAL MAP**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | DC |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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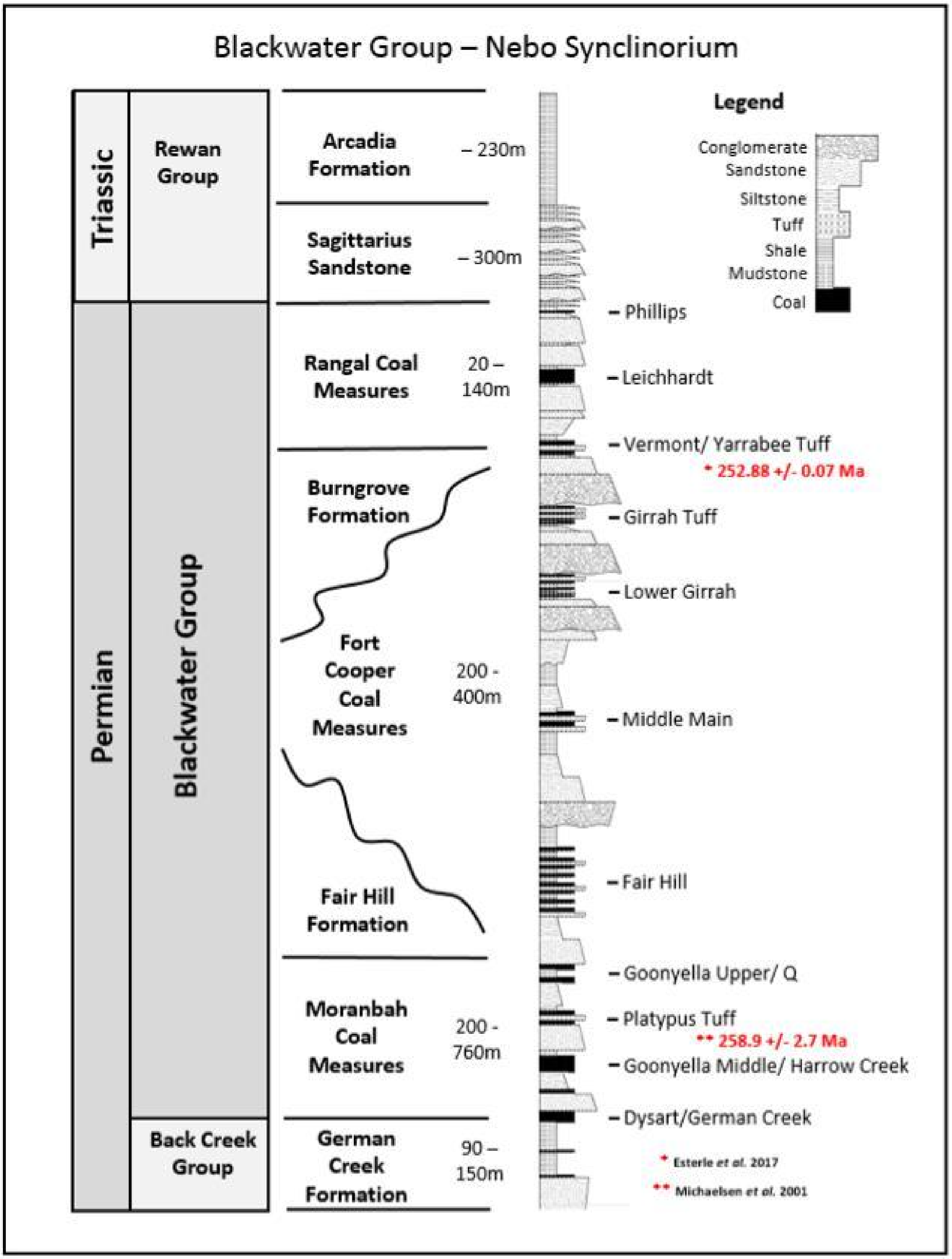



**Figure 8: Example Lithology of Nebo Synclinorium**

**(source: Wilson, 2017)**

## 3.3 Mining Operations

### 3.3.1 Bowen Basin Description

The Bowen Basin is an area of coal reserves that extends over approximately 60,000 square kilometres ($km^2$) in Central Queensland. The Bowen Basin contains much of the known Permian coal resources in Queensland including almost all the known mineable prime coking coal. Annual production exceeds 160 million tons annually from more than 40 active mines (2016 est.), with several additional advanced projects underway (www.dnrm.qld.gov.au, accessed 30 January 2017). The Basin accounts for more than 80% of Queensland's annual production.

### 3.3.2 South Walker Creek Mining Operations

The open cut mining operations of the South Walker Creek Mine began in 1996 with plans for a sequence of open coal pits, a Tailings Storage Facility (Tailings Dam, TSF), and associated infrastructure. The South Walker Creek Mine is located within ML4750 and consists of five open pits: the Walker, Mulgrave, Carborough, Toolah, and Kemmis Pits (Figure 2).

Operations are currently ongoing in each of these areas. The mine operates under Queensland Environmental Authority (EPML00712313).

The South Walker Creek Mine commenced construction and operation prior to the early 2000 enactment of the EPBC Act. BMC currently has several EPBC Act approvals relating to specific projects at South Walker Creek Mine including:

- Kemmis II pit development (EPBC 2013/7025, approval granted on 16 January 2015)
- Mulgrave Resource Access Project 2A (EPBC 2014/7272, approval granted on 16 January 2015)
- Dragline relocation, Goonyella Riverside Mine to South Walker Creek Mine (EPBC 2016/7788, approval granted 2 May 2017)

BMC proposes to continue mining via the progression of the existing Mulgrave Pit. Figure 3 shows the current life-of-asset (LOA) plan for the South Walker Creek Mine, which extends until 2072. The proposed MRA2C Project, which is the focus of this study, includes the "F Pit" and "G Pit" areas in the LOA plan (Figure 3). Under the LOA plan, mining is expected to start between 2018 and 2022 (pending Project approval) and continue through to 2067. The footprint of the Project is around 3700 ha, with a depth of mining ranging from 40 to 130 m bgl. As part of the project, a section of the ephemeral Walker Creek would be diverted to the south around the mining operations.

### 3.3.3 Surrounding Mining Activities

The Coppabella Mine is located approximately 4 km southwest of the Toolah Pit along the Peak Downs Highway (Figure 2). The Coppabella Mine project is a multiple-party joint venture led by Peabody Energy, with four operational pits and reported production of 2.4 million tonnes in 2016 (www.peabodyenergy.com, accessed 30 January 2018). Other nearby mines are located 25 to 30 km from South Walker Creek and include the Ellensfield Mine and Burton Mine to the west and the Hail Creek Mine to the North.

The location of the South Walker Creek Mine relative to other mining projects in the Bowen Basin is shown in Figure 9.

### 3.3.4 Nearby Coal-seam Gas Activities

Arrow Energy is proposing a planned coal-seam gas (CSG) expansion in the Bowen Basin that includes staged development across nine "Authority to Prospect" (ATP) areas over about 40 years. The Environmental Impact Statement (EIS) for the proposed "Bowen Basin Gas Project" (BGP) was submitted to State and Federal Governments in December 2012 (www.arrowenergy.com.au, accessed 17 April 2018).

The project map indicates that parts of Authority to Prospect 1103 are within a few kilometres of the South Walker Creek Mine site to the west, and this ATP overlies parts of the Coppabella Mine lease. According to the indicative conceptual development plan in the BGP EIS, this area was scheduled for development in 2017. However, the following information is provided on Arrow's website under "Bowen Development" (accessed 21 April 2018):

> "Arrow experienced production challenges in the Bowen Basin in 2016. Further technical work is being undertaken to improve production from parts of the Bowen Basin that contain deeper and tighter coals than the Surat Basin.
>
> This work has currently resulted in a delay to Arrow's Bowen development. Until this current work is completed, impacts on project schedule are not yet known."

As stressed by Arrow in the EIS, CSG field development typically proceeds on an incremental basis and will be determined by "the best compromise of environmental, social, technical, and economic outcomes" as the project progresses. At present, the schedule of activities for this area are unclear.

Groundwater modelling undertaken as part of the EIS for Arrow's Bowen Basin indicates that for the base case scenario, which only considers Arrow's BGP operations, the production water from CSG wells is balanced by water taken from storage and storage inflow, and no drawdown of greater than 2 m is predicted to occur in the sedimentary aquifer. Modelling indicates that the 2 m+ drawdown contour will primarily remain within the boundaries of Arrow tenements, closely following the spatial distribution of CSG wells, and within the target coal measures (Ausenco-Norwest Corporation, 2012).

For assessment of cumulative impacts, Arrow considered their BGP, full production from the Moranbah Gas Project (MGP), and future production at maximum allowed water allocations for all users listed as having water rights in the Queensland Water Entitlements Registration Database (WERD) – a highly conservative scenario for various reasons described in their assessment. Results of this scenario indicates that drawdown is significant throughout the basin including several areas outside of Arrow's tenements up to 11 km from the CSG production wells.

However, even in this scenario, drawdown does not reach the South Walker Creek Mine or MRA2C Project area, primarily because there are no production wells planned for the eastern part of ATP 1103 closest to South Walker Creek. The closest area of planned high density CSG production wells are more than 10 km west of the ATP 1103 boundary and therefore any potential impacts associated with CSG projects weren't incorporated into the MRA2C Project cumulative assessment.


**Figure 9: MRA2C Project location relative to other Bowen Basin Coal Mines**

**(source: https://www.bownbasin.cqu.edu.au)**

# 4.0 HYDROGEOLOGY

The hydrogeology of the South Walker Creek Mine has been characterised through several previous studies, field investigations, monitoring programs, and groundwater modelling studies. More than 15 separate studies and several years' worth of monitoring data were considered during development of the groundwater impact assessment (Section 2.1).

### 4.1.1 Conceptual Hydrogeologic Model

The conceptualisation of the groundwater system at the South Walker Creek Mine and the proposed MRA2C Project is shown in Figure 10. This figure is a schematic cross-section, generally aligned from southwest to northeast, that illustrates the processes and pathways of groundwater movement including recharge and discharge, vertical and lateral flow, and flow around the active mine pit.

There are two distinct aquifers identified at the Project site: the unconfined or "water table" aquifer, and the confined coal seam aquifer.

In some other areas of the Bowen Basin, Tertiary basalts overly the coal measures and may form productive aquifers used for irrigation, stock and domestic and town water supplies. However, Tertiary basalts are not present in the Project vicinity.

### 4.1.2 Water Table Aquifer: Alluvium and Regolith

The water table aquifer occurs in two hydrostratigraphic units (HSUs) that are in hydraulic connection: the alluvium and regolith. Alluvium consists of Quaternary and Pleistocene age sediments deposited along the major ephemeral creek systems. The distribution of alluvium is shown in Figure 11. The alluvium is less than 20 m thick in the Project area and has a limited distribution along present creek channels and nearby paleochannels associated with Walker and Carborough Creeks. The localised zones of saturated alluvium are disconnected from one another by bedrock outcrops and high points between stream channels. Where alluvium occurs, it may be locally saturated or unsaturated.

At most locations, saturated thickness of the alluvium generally varies from 5 to 10 m based on the groundwater levels measured in monitoring bores. In the Project area, the greatest saturated thickness of alluvium occurs in the southeast along Bee Creek.

While the alluvium and regolith together comprise the water table aquifer, the distribution of the alluvium is quite limited and localised to stream courses, and the regolith is the main water-bearing unit for the water table aquifer.

As shown in Figure 6, several geologic units outcrop in the Project area, including the Rewan Group, Suttor Formation, Fort Cooper Coal Measures, and others. These fluvial, lacustrine, and shallow marine sedimentary bedrock units are dominated by mudstone, siltstone, and sandstone layers. Where exposed at surface, they are fractured and weathered to form a zone of enhanced permeability up to 60 m thick at the Project site, as evidenced from lithologic logs in exploration boreholes and results of hydraulic testing (Section 4.3). This upper weathered zone of bedrock is collectively referred to as "regolith", irrespective of the source formation. This zone has been observed at numerous sites in the Bowen Basin [this is discussed in more detail in Section 4.3 below].

The water table aquifer is recharged via direct precipitation to outcropping regolith and by ephemeral stream recharge to alluvium during the wet season, as described in Section 4.5. Water levels (Section 4.4) and groundwater chemistry (Section 4.7), indicate that water in the alluvium and regolith are in connection, although groundwater in the water table aquifer underlying streams may be fresher during and after the wet season due to direct recharge. Groundwater from the water table aquifer does not exit to surface water in the Project area. Inflows from ephemeral streams will seep into the alluvium, then drain to the underlying Regolith or be rapidly lost to evaporation.

### 4.1.3 Interburden

Underlying the regolith is the unweathered bedrock, which includes the Triassic Rewan Formation in the MRA2C Project area (Figure 7). The Rewan Formation is dominated by siltstone and claystone and is typically classified as a regional aquitard (a confining layer) due to its low hydraulic conductivity and porosity resulting from diagenetic processes (changes in sedimentary rocks after formation) such as silicification and clay alteration (Bashari 1998).

Underlying the Rewan Formation is a the Rangal Coal Measures, which consist primarily of sedimentary rocks including siltstone and claystone layers (Figure 8). The boundary between these units is correlated to a regionally extensive mudstone marker unit that has been traced from Coppabella, through the Project area, to Hail Creek (Wilson, 2017). Although the coal seams within the Rangal Coal Measures may be water bearing (see below), the sedimentary rocks overlying the coal measures – including the "Marker mudstone" – act as confining layers to the underlying coal seams. In the Nebo Synclinorium, the South Walker Creek Mine area has the greatest thickness of clastic sediments between the top of the coal seams and the Rewan Formation, reaching a thickness greater than 90 meters (Wilson, 2017).

The low-permeability rocks between the water table aquifer and underlying coal seam aquifer – including sedimentary rocks of the Rewan Formation and the upper Rangal Coal Measures – form the hydrostratigraphic unit collectively referred to as the "overburden".

The overburden is thinnest east of the active South Walker Creek Mine where the Rangal Coal Measures outcrop, and gradually thickens to the southwest as the depths of the coal seams deepen, reaching thicknesses of up to 80 m within the footprint of the MRA2C Project.

### 4.1.4 Coal Seam Aquifer

Coal seams of the Rangal Coal Measures have been shown to be aerially extensive at a regional scale (Silwa *et al* 2017). The coal measures of interest at the South Walker Creek Mine correlate to the "Leichhardt" coal seams of the Nebo Synclinorium (Wilson, 2017). These same coal seams are referred to as the "MacArthur" seam at Coppabella and "Elphinstone" seam at Hail Creek.

At the South Walker Creek Mine, the upper coal seam of the Rangal Coal Measures is referred to as the "Main Seam", and is further subdivided on a local scale into the following:

- The Main Top Seam
- The Main Bottom Seam
- Interburden – a sequence of low hydraulic conductivity interburden (siltstone, mudstone and sandstone) recognised in the Project area with potential to locally limit the hydraulic connection between the coal seams.

In this assessment, groundwater occurring in the Main Top Seam and the Main Bottom Seam together form the "confined coal seam aquifer" HSU. Precise demarcation of groundwater conditions between the Main Top Seam relative to the Main Bottom Seam are not possible given data limitations, however, this is not necessary in the context of understanding regional groundwater flow patterns, drawdown, and cumulative impacts.

The confined coal seam aquifer is a regional, low-permeability aquifer (Section 4.3) that occurs within the Rangal Coal Measures associated with the Leichhardt coal seams. The Rangal Coal Measures outcrop along the footprint of the current South Walker Creek Mine (Figure 7) and dip gently to the west where they are overlain by increasing thickness of the Rewan Formation, as described above. The confined coal seam aquifer extends beyond the study area into other parts of the Nebo Synclinorium.

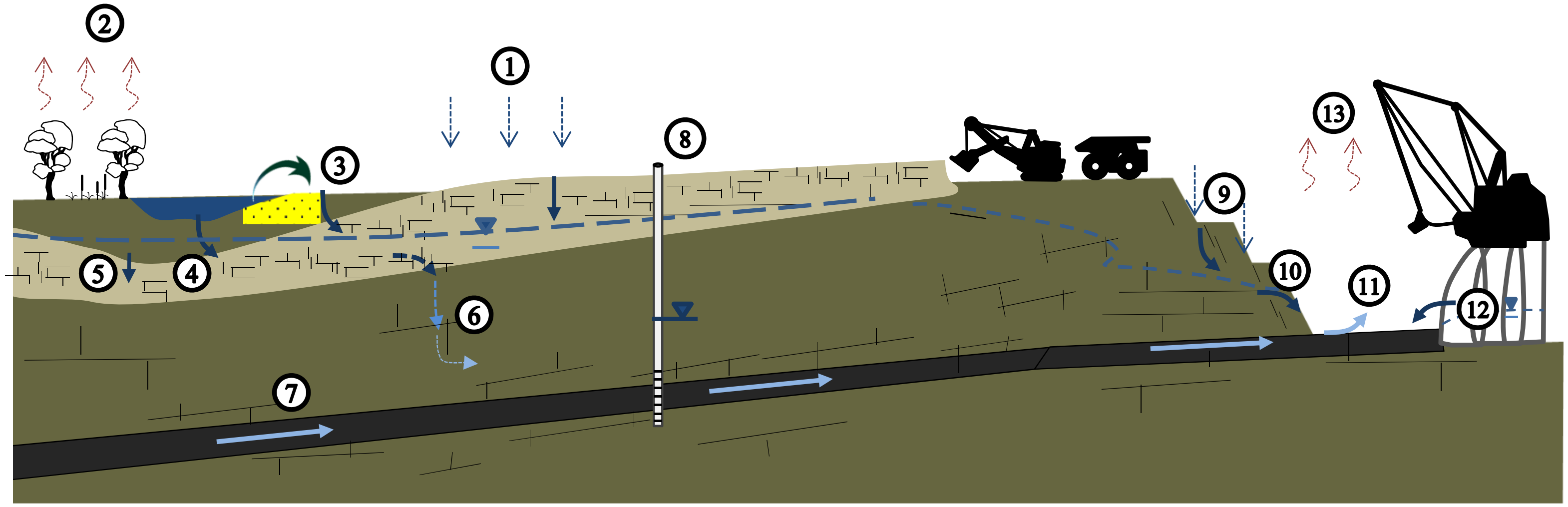
Groundwater at depth within the Rangal Coal Measures preferentially flows via coal seams, along fractures and cleats. At depth, the buried coal seams are interpreted as confined aquifers and the adjoining interbeds are interpreted as aquitards.

There are downward gradients between the water table and coal seam aquifer, as discussed below in Section 4.4 and illustrated graphically in Figure 10.

#### 4.1.5 Underburden

The lithology underlying the Leichhardt coal measures includes mudstone, siltstone, fine to medium grained lithic sandstone, carbonaceous shale, and coal (Staines & Koppe 1979). The full thickness of the underlying Fort Cooper Coal Measures and Moranbah Coal Measures has not been assessed through drilling investigations.

Given that the Main Seam of the Rangal Coal Measures represents the principal coal seam targeted, the remainder of the underlying coal measures are collectively referred to as the “Underburden” representing the lowermost hydrostratigraphic unit considered in this study.




1. Seasonal rainfall infiltration through ground surface and percolation to the water table aquifer (alluvium and regolith)
2. Evapotranspiration from vegetated areas, including fringing riparian vegetation: upwards movement of capillary pore water in the soil cover, evaporation from ponding water in surface depressions
3. Infiltration of overbank flood waters from ephemeral creeks during storm events to recharge alluvium
4. Ephemeral creek discharge to water table aquifer at times when creeks are flowing in the wet season (creek levels are always above groundwater levels in the water table aquifer)
5. Recharge of groundwater in the interconnected network of fissures, joints and bedding parings (secondary porosity) of the regolith.
6. Locally, slow vertical groundwater leakage through low permeability overburden towards confined aquifer
7. Lateral transport of groundwater along confined coal seam aquifer from regional recharge areas due to hydraulic head differential
8. Confined coal seam aquifer bores have hydraulic heads above the elevation of the aquifer, but below the water table aquifer level, indicating downward vertical gradients
9. Infiltration and percolation of rainfall and pit wall runoff into open fractures of the stress release and blast induce fringe behind the pit slope face
10. Groundwater daylighting along open bedding partings, faults, fissure zones and joint-bedding parting intersection
11. Groundwater seepage from intersected coal seams in the highwall and pit floor
12. Groundwater seepage flow from low wall spoil dumps with groundwater recharged during wet seasons and heavy rainfalls
13. Evaporation of groundwater seepage and pit water accumulated in pit floor depressions and low points

| GOLDER | CLIENT: BHP Billiton Mitsui Coal | | | PROJECT: South Walker Creek MRA2C | | |
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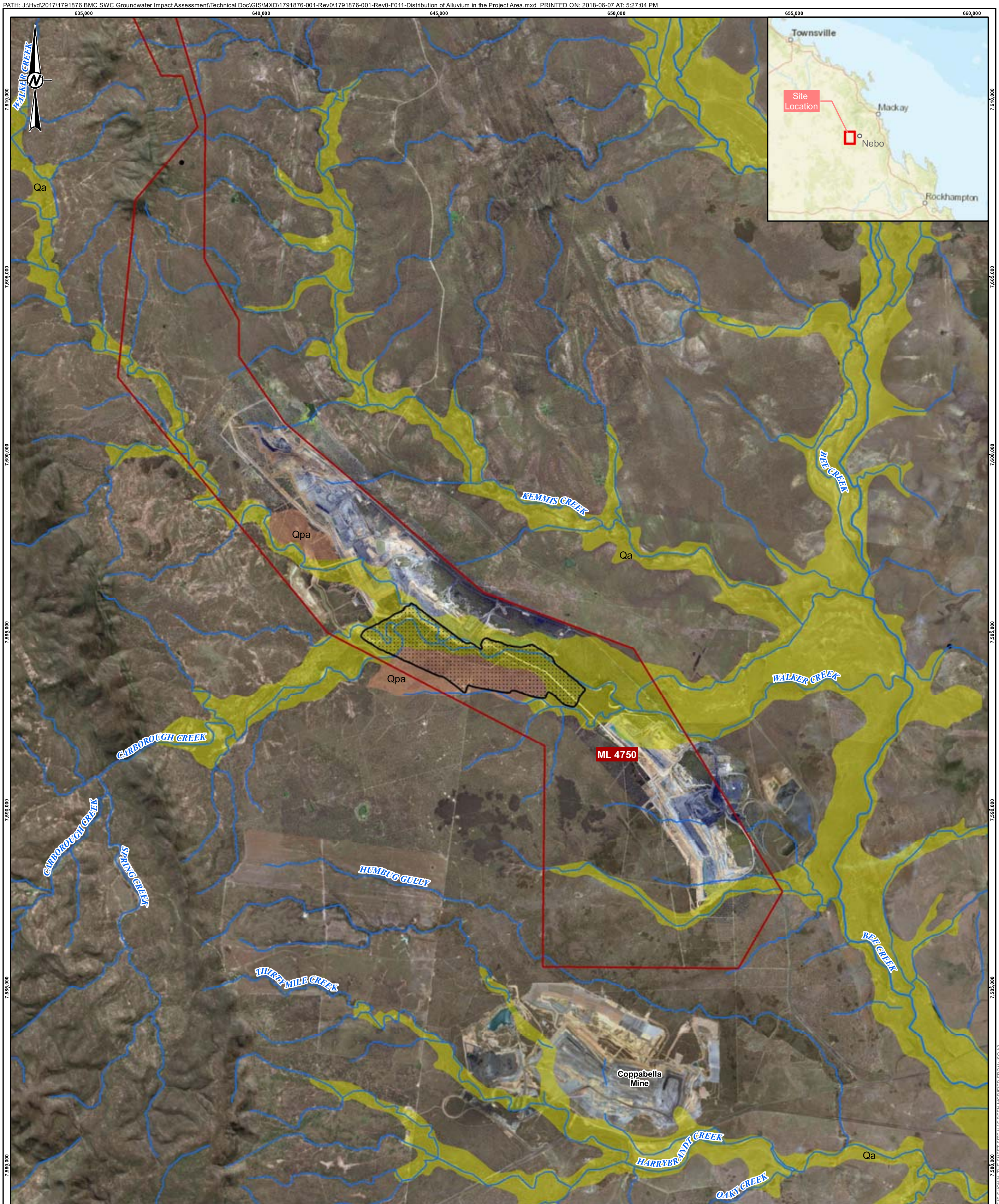


## LEGEND

Watercourse

- Major
- Minor
- ML4750
- MRA2C Project

Rock Unit Name

- Qa-QLD (Quaternary Alluvium) - Qa
- Qpa-QLD (Pleistocene Alluvium) - Qpa

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Scale: 1:100,000 @ A3 METRES

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Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA - BHP, JANUARY 2018
3. SURFACE GEOLOGY, WATERCOURSES, MINING TENEMENT: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DISTRIBUTION OF ALLUVIUM IN THE PROJECT AREA**

CONSULTANT

GOLDER

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| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

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## 4.2 Monitoring Data

Table 2 is a summary of monitoring bore characteristics for bores that are, or have been, part of the BMC groundwater monitoring program at the South Walker Creek Mine. Monitoring Bore locations are shown in Figure 2.

The hydrostratigraphic units (HSUs) monitored by these bores have been identified from the lithological logs, the screen intervals and depth to groundwater. All bore coordinates are presented in AGD84 Z55 projection used by BMC.

**Table 2: Bores monitored by BMC**

| Bore ID | Other ID | AGD84 Z55 | | Surface Elevation (mAHD) | Depth to Water (mbgsl) | Total Depth (mbgsl) | Screen Interval (mbgsl) |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | | | | |
| **Quaternary / Tertiary Alluvium** | | | | | | | |
| MB10 | | 639782 | 7598073 | 232.4 | 5.08 - 5.68 | 11.8 | 1.8 - 11.8 |
| MB11 | | 641513 | 7593749 | 225.8 | 4.15 - 4.92 | 14.3 | 9 - 12 |
| MB13 | | 656766 | 7591177 | 192.9 | 14.76 - 15.1 | 25.3 | 16.2 - 25.2 |
| MB14 | | 657528 | 7584673 | 187.3 | 14.65 - 15.16 | 26.38 | 16.5 - 25.15 |
| **Regolith (Permian)** | | | | | | | |
| MB1 | | 646154 | 7593156 | 219 | Dry (> 15) | 18 | 8 - 14 |
| MB3A | 140085 | 640860 | 7597291 | 226.2 | 2.85 - 3.88 | 16 | 13 – 16 |
| MB3B | | 640866 | 7597282 | 226.1 | 2.8 - 3.58 | 9.5 | 6.5 – 9.5 |
| MB5 | 140082 | 642097 | 7595584 | 238.4 | Dry (> 15) | 16 | 9 – 15 |
| MB6 | 140082 | 644044 | 7595070 | 222.3 | 10.83 - 13.12 | 15 | 9 – 15 |
| MB7 | 140081 | 641965 | 7596654 | 228.2 | 8 - 9.23 | 30 | 12 – 30 |
| MB12 | | 652709 | 7592123 | 206.3 | 10.98 - 11.51 | 15.1 | 9.1 - 15.1 |
| OBS1 | P10672 | 653011 | 7587001 | 203.9 | 26.97 - 28.36 | 39 | 26 – 30 |
| OBS2 | P10680 | 655845 | 7590019 | 190.4 | 11.1 - 13.5 | 34 | 22 – 31 |
| Kiss' Bore | | 642842 | 7596717 | 228.7 | 14.22 | 39.62 | NA |
| Hut Bore | | 643720 | 7595139 | 224.4 | NA | NA | NA |
| **Coal Seam (Permian)** | | | | | | | |
| Gas2/MB3 | P140050 | 640781 | 7597648 | 235.1 | 7.72 - 10.9 | 171.47 | NA |
| MB4 | P140041 | 646166 | 7595932 | 236.1 | 23.59 - 32.24 | 82.0 | NA |
| CB01 | 140084 | 640774 | 7597645 | 203.9 | 12 – 15.26 | 135 | 127 - 133 |

| Bore ID | Other ID | AGD84 Z55 | | Surface Elevation (mAHD) | Depth to Water (mbgsl) | Total Depth (mbgsl) | Screen Interval (mbgsl) |
|---|---|---|---|---|---|---|---|
| | | Easting | Northing | | | | |
| P021 | P9456 | 652421 | 7587613 | 205.8 | 22.2 | NA | NA |

In addition to the bores monitored, a total of 13 unregistered landholder bores have been identified within the Project surrounds during a groundwater census that was undertaken by IESA in April 2014 (Table 3). Kiss' Bore and Hut Bore are unregistered landholder bores owned by BMC and the latter is understood to have been decommissioned.

Depth to water measurements have been obtained from some of these bores when step rate and constant rate pumping tests were undertaken in 2015. Likely due to their unregistered status, the depth of screen interval/open section is not known for these bores; therefore, the screened HSU has been assessed from bore depth, groundwater level (where available), lithological logs and geological maps.

As shown in Figure 2, all "landholder" bores in the Project area are either owned by BMC or are subject to existing Agistment / Compensation agreements. Any potential future impacts to these bores from mining operations or drawdown associated with mining operations have already been considered by BMC, and compensation measures have been negotiated with bore owners and put in place in advance of Project implementation.

**Table 3: Unregistered landholder bores**

| Bore ID | AGD84 Z55 | | Surface Elevation (mAHD) | Depth to Water (mbgsl) | Total Depth (mbgsl) | Interpreted HSU |
|---|---|---|---|---|---|---|
| | Easting | Northing | | | | |
| Bore 1 | 644260 | 7598204 | 243.6 | 15.5 | 39.5 | Regolith |
| Bore 2 | 639895 | 7600690 | 253.9 | 19 | 31.98 | Regolith |
| Bore 3 | 636279 | 7602437 | 257.9 | NA | NA | Alluvium |
| Bore 4 | 633882 | 7600475 | 311.4 | NA | NA | Overburden |
| Bore 5 | 637044 | 7600028 | 253.5 | NA | NA | Alluvium |
| Bore 6 | 637045 | 7600039 | 253.2 | NA | NA | Alluvium |
| Bore 7 | 639925 | 7598198 | 237.9 | 5.41 | 9.85 | Alluvium |
| Bore 8 | 643363 | 7596208 | 222.8 | 10.95 | 33.21 | Regolith |
| Bore 9 | 641636 | 7593910 | 232.1 | 5.61 | 7.57 | Alluvium |
| Bore 10 | 638672 | 7592054 | 242.2 | NA | NA | Alluvium |
| Bore 11 | 637726 | 7596291 | 270.2 | NA | NA | Alluvium |
| Bore 12 | 639752 | 7596163 | 254.9 | 23.78 | 90.5 | Regolith / Overburden |
| Little Walker Creek Bore | 638007 | 7600498 | 250.8 | NA | NA | Alluvium (?) |
| Mitchell's Bore | 640530 | 7598384 | 241.4 | 13.9 | 43 | Regolith |
| Plum Tree Creek Bore | 636278 | 7600384 | 259.4 | NA | NA | Alluvium(?) |

-Surface elevation obtained from the regional Shuttle Radar Topography Mission (SRTM) elevation data except for Bore 8
-Location of Mitchell's Bore is approximate
-Bore 4 is located at the contact between the Clematis Group and Rewan Formation.

According to the IESA bore survey, “Bore 4” is a spring located at the upper contact of the Rewan Formation with the overlying Clematis Group and occurs at an elevation approximately 50 m above the water table aquifer along the fore slope of the Carborough Range.

## 4.3 Hydraulic Properties

Site hydraulic properties compiled from previous studies for the South Walker Creek Mine are summarised below.

### *Bore yield*

Reported yields provide an indication of hydraulic conductivity. Airlift yields recorded during drilling of exploration holes are shown by depth in Figure 12. As shown in Figure 12, airlift yields are generally less than 1.5 L/sec. Although lithology is not plotted in this figure, airlift results from the shallower bores reflect yields for the water table aquifer. The yields are less than 0.5 L/s for tests at depths greater than 120 m.

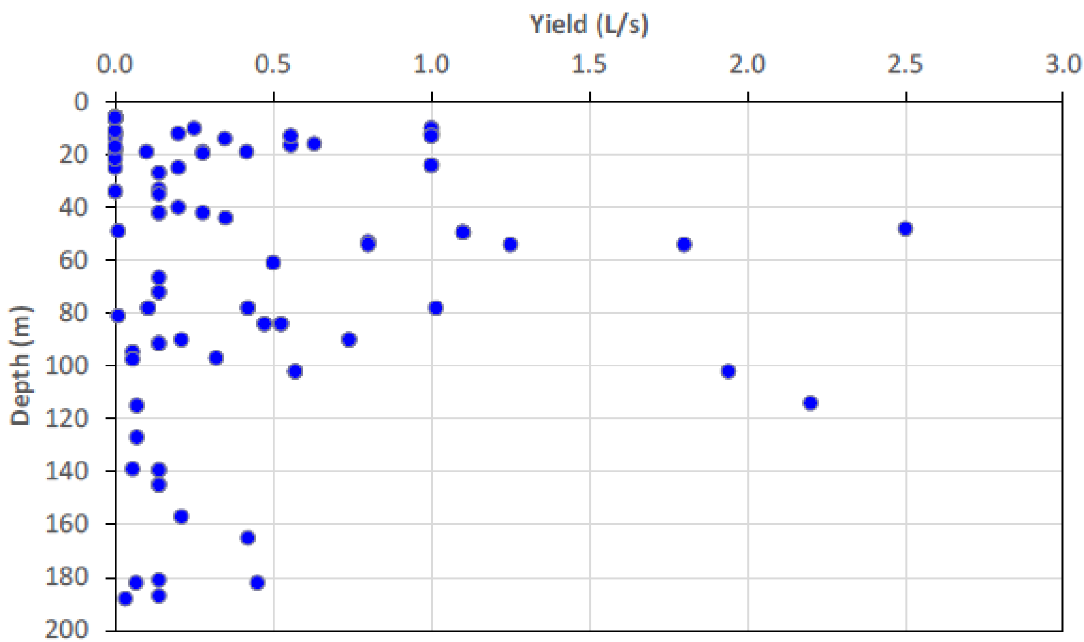


**Figure 12: Bore yields from exploration drilling**

### *Hydraulic testing*

AGE (2014a) carried out falling head slug tests on five monitoring bores screened in the regolith, by rapidly injecting 8 to 200 litres of water near and monitoring the recovery (fall) of the groundwater level towards the static (pre-test) level. In May 2016 BMC conducted falling and rising head slug tests on monitoring bores screened in the alluvium. A summary of the analysis of slug tests is presented in Table 4.

**Table 4: Results of slug test analysis**

| Bore ID | HSU | Screen interval (mbgsl) | Analysis | Hydraulic conductivity (m/d) |
|---|---|---|---|---|
| MB3A | Regolith | 13 – 16 | Bouwer & Rice | 0.046 - 0.057* |
| MB3B | Regolith | 6.5 – 9.5 | Bouwer & Rice | 0.11* |

| Bore ID | HSU | Screen interval (mbgsl) | Analysis | Hydraulic conductivity (m/d) |
|---|---|---|---|---|
| MB5 | Regolith | 9 – 15 | Bouwer & Rice | 0.014* |
| MB6 | Regolith | 9 – 15 | Bouwer & Rice | 0.083* |
| MB7 | Regolith | 12 – 30 | Bouwer & Rice | 0.054* |
| MB11 | Alluvium | 9 - 12 | Bouwer & Rice | 4 – 11 |
| MB13 | Alluvium | 16.2 - 25.2 | Bouwer & Rice | 9 – 17 |
| MB14 | Alluvium | 16.5 - 25.15 | Bouwer & Rice | 9 - 10 |

*Based on analysis undertaken by AGE (2014a)

In June 2015, Airwell Group conducted step rate and constant rate pumping tests on seven nearby unregistered landholder bores. The constant rate tests were two to three hours in duration, followed by recovery tests overnight (around 16 hours). The groundwater level in each test bore was monitored by a pressure transducer every 15 seconds. The results of the pumping tests have been analysed using published solutions (eg. as presented in Kruseman and de Ridder, 2000) to derive estimates of transmissivity and hydraulic conductivity. Results of pumping tests analyses are presented in Table 5.

**Table 5: Results of pumping test analysis**

| Bore ID | Depth to water (mbgsl) | Bore depth (mbgsl) | Pumping rate (L/s) | HSU | Analytical Solution | Transmissivity ($m^2/d$) | *Hydraulic conductivity (m/d) |
|---|---|---|---|---|---|---|---|
| Bore 7 | 5.41 | 9.85 | 0.75 | Alluvium | Cooper - Jacob | 17 | 3.8 |
| | | | | | Theis Recovery | 33.8 | 7.6 |
| Bore 9 | 5.61 | 7.57 | 1.25 | | Cooper - Jacob | 12.3 | 6.3 |
| | | | | | Theis Recovery | 20 | 10 |
| Bore 1 | 15.5 | 39.5 | 3 | Regolith | Cooper - Jacob | 20 | 0.8 |
| | | | | | Theis Recovery | 21.6 | 0.9 |
| Bore 8 | 10.95 | 33.21 | 3 | | Cooper – Jacob | 43 (early time) | 1.9 |
| | | | | | | 11.3 (late time) | 0.5 |
| | | | | | Theis Recovery | 25 | 1.1 |
| Bore 12 | 23.78 | 90.5 | 3.75 | | Cooper - Jacob | 4.7 | 0.07 |
| | | | | | Theis Recovery | 5.2 | 0.08 |
| Kiss' Bore | 14.22 | 37.2 | 1.25 | | Cooper - Jacob | 9 | 0.4 |
| | | | | | Theis Recovery | 4.7 | 0.2 |
| Mitchell's Bore | 13.9 | 43 | 0.5 | | Cooper - Jacob | 1.5 | 0.05 |
| | | | | | Theis Recovery | 0.35 | 0.01 |

*Hydraulic conductivity calculated from transmissivity assuming saturated thickness equal to standing water column

The results of hydraulic testing indicate that the hydraulic conductivity of the Regolith is variable, reflecting the fractured nature of the aquifer and the various rock types that make up the Regolith. Bore 12 and Mitchell's Bore are located at some distance from the existing drainage lines and lower estimates of hydraulic conductivity derived at these two bores are possibly related to a reduced degree of weathering at locations away from surface water courses.

The hydraulic conductivity of the Alluvium is close to a typical range of values for medium to coarse grained sand (Kruseman and de Ridder, 2000; Fetter, 2004), consistent with the observed lithology.

The hydraulic conductivity of the confined coal seam at the South Walker Creek Mine has been estimated from the analysis of Injection Falloff Tests undertaken in four exploration holes drilled into the Main Bottom Seam, producing a mean hydraulic conductivity of 0.015 m/d (Douglas Partners, 2014a).

#### *Literature values*

The hydraulic conductivity of the regolith (the weathered, upper part of the Rewan Formation and Permian coal measures) derived from hydraulic testing of shallow monitoring bores at the nearby Broadlea Coal Mine (37 km southwest) and Hillalong Mine (42 km north) are similar to those derived at the South Walker Creek Mine, ranging from 0.03 to 0.08 m/d and 0.05 to 1.5 m/d respectively (AGE, 2008; CDM Smith, 2016).

The coal seams within the Permian coal measures of the Bowen Basin and elsewhere typically have hydraulic conductivities that are one to three orders of magnitude higher than those of the adjacent siltstone and sandstone interburden, with groundwater preferentially flowing via the coal seams (AGE, 2008; Heritage Computing, 2012; AGE, 2014b). The results of hydraulic testing at the Hail Creek Mine are consistent with this interpretation, supported by a geometric mean hydraulic conductivity of 0.02 m/d for the coal seam compared to 0.00002 m/d for the adjoining interburden (Douglas Partners, 2015).

Hydraulic testing of the Permian coal measures in other parts of the Bowen Basin has also identified a decrease in hydraulic conductivity with an increase in depth of burial. For example, packer testing of the Pollux Seam within the Rangal Coal Measures at the Togara North Project indicated a decrease in hydraulic conductivity from 0.2 m/d near the surface to around 0.03 m/d at 250 m depth (AGE, 2014b). A trend derived from a study combining coal seam hydraulic conductivity data from the Warrior Basin in the USA with data from the Moura (now Dawson) Mine in the Bowen Basin indicates a decrease from around 0.1 m/d at 50 m depth to 0.004 m/d at depths of 300 to 400 m (AGE, 2006).

## 4.4 Groundwater Flow Regime

There are two identified aquifers at the South Walker Creek Mine: the unconfined or “water table” aquifer and the confined coal seam aquifer associated with the Rangal Coal Measures. These are described below.

### 4.4.1 Water Table Aquifer

Water levels in the water table aquifer are shallowest northwest of the MRA2C Project area, where the mining lease is in close proximity to the Carborough Range to the west. The shallowest water levels in this area are along creek channels where the depth to water ranges between 3 and 6 m below ground level (bgs) (Table 2) in alluvial bores MB10 and MB11 and Regolith bores MB3A and MB3B (Figure 2).

Most reported water table aquifer levels in the remainder of the Project area are greater than 10 m bgs, with the deepest levels in the southeast portion. Water levels in Bores MB13 and MB14, screened in the thicker alluvium of Bee Creek, are consistently around 15 m bgs. Figure 13 shows the interpreted hydraulic head in the unconfined aquifer from available groundwater level data in the site vicinity. This figure includes water level measurements from different time periods, including level measurements from unregistered landholder bores taken in 2015 and more recent data from onsite monitoring wells, and as such is intended to provide a generalized map of the water table. Most of the data in Figure 13 was collected between September 2015 and January 2016 and includes water levels taken from bores screened in both the alluvium and regolith.

As shown in Figure 13, the water table in the unconfined aquifer forms a subdued reflection of topography, with groundwater flowing from topographically elevated areas of the Carborough Range northwest of the project site to the southeast towards Bee Creek. Mining operations have a noticeable effect on localized groundwater contours where open cut pits intersect the regolith and alluvium.

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F013-Hydraulic Head Contours_Water Table Aquifer.mxd PRINTED ON: 2018-05-30 AT: 4:19:42 PM


**LEGEND**

Groundwater Bore

MRA2C Project

Groundwater Contour Elevation (m AHD)

- 180
- 190
- 200
- 210
- 220
- 230

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:75,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, USGS, INTERMAP, INCREMENT P CORP., NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI (THAILAND), MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PROPOSED PIT AREA, CALIBRATION BORE DATA: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**HYDRAULIC HEAD CONTOURS - WATER TABLE AQUIFER SEPTEMBER 2015 AND JANUARY 2016**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 12/04/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

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|---|---|---|---|
| 1791876 | 001 | 0 | 13 |

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25mm
0

### 4.4.2 Confined Coal Seam Aquifer

Beneath the alluvium and regolith are the Triassic Rewan Formation and the Permian Upper Rangal Coal Measures. Consolidated low hydraulic conductivity sedimentary rocks of the Rewan Formation and Rangal Coal Measures act as a confining unit to the groundwater in the underlying coal seams and are collectively referred to as the “overburden”. The overburden is approximately 80 m thick at the Project site and forms an aquitard, limiting flow between the water table aquifer from the deeper, confined coal seam aquifer.

At depth, the buried coal seams within the Permian Rangal Coal Measures have hydraulic conductivities that are one to three orders of magnitude higher than adjacent siltstone and sandstone, with groundwater preferentially flowing within the coal seams. The estimated mean hydraulic conductivity of the confined coal seams at the South Walker Creek Mine is 0.015 m/d (Douglas Partners, 2014a).

The confined coal seam aquifer is both thinner and of lower permeability than the water table aquifer. There are insufficient water level data to contour hydraulic head, however, groundwater modelling undertaken by Douglas Partners (2014) indicates groundwater flow directions similar to the shallow groundwater flow directions shown in Figure 13.

## 4.5 Groundwater Recharge and Discharge

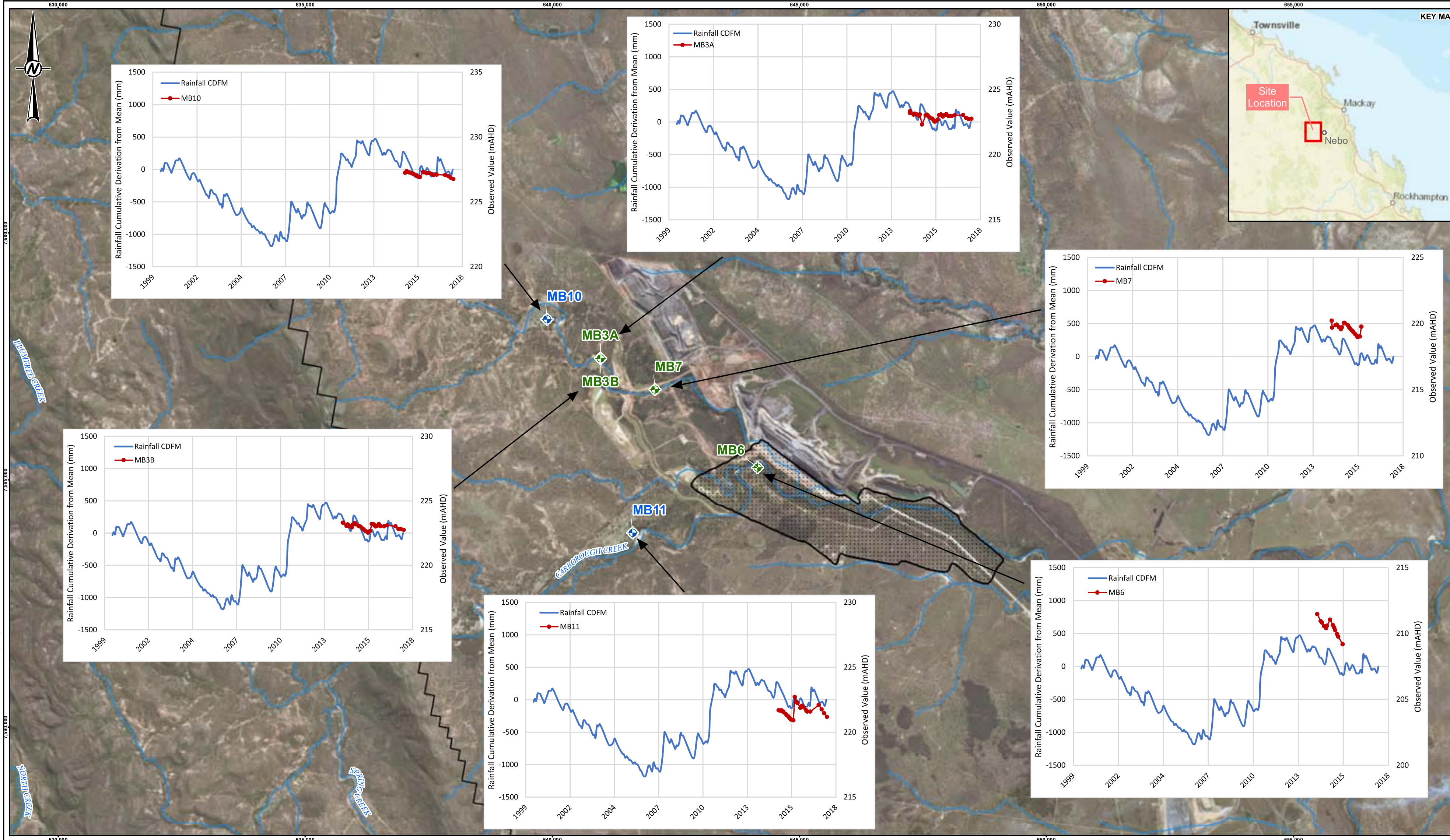
### 4.5.1 Groundwater Recharge

Site-specific recharge rates are not available, but overall net recharge rates are expected to be low.

Recharge to the shallow water table occurs via two mechanisms: direct infiltration of rainfall across a broad area, and infiltration of surface water from ephemeral streams. These two processes are linked, with streamflow present only during periods of high rainfall and runoff. Episodic rainfall and runoff events, especially those that cause flooding along the creeks, temporarily supply recharge to the water table aquifer.

There is an annual net deficit of rainfall (annual evaporation exceeds annual rainfall), and on average monthly deficit for each month of the year (Table 3). Direct infiltration of rainfall to groundwater is unlikely during dry periods, when light rainfall events will be absorbed by soil moisture only to be subsequently lost to evapotranspiration. Recharge is likely to occur in response to higher or more continuous rainfall events, and overall net recharge rates at the site are expected to be low.

Figure 14 and Figure 15 present a comparison of water level hydrographs for bores screened in the water table aquifer to the cumulative departure from mean annual precipitation (CDFM), to illustrate how shallow groundwater levels rise during prolonged periods of high rainfall due to direct infiltration and stream recharge and decline during dry periods with low rainfall. This evaluation also indicates that during seasonal dry periods, soils are not sufficiently saturated to transmit rainfall to the water table, or to produce surface water runoff during small to medium rain events. During these times, episodic rainfall is likely stored temporarily as soil moisture in the upper few meters of the subsurface, and subsequently lost to evapotranspiration.




**LEGEND**

**Calibration Bore Location**

*Screened Formation*

- Alluvium
- Regolith
- Model Domain Outline
- Watercourse
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000 METRES

Scale: 1:75,000
Coordinate System: GDA 1994 MGA Zone 55

REFERENCE(S)
1. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. Target Bores, Orthophoto, MRA2C Pit Area: BHP, January 2018
3. Rainfall Data: SILO Climate Data, © The State of Queensland (Department of Science, Information Technology and Innovation) 2018
4. Watercourses: © State of Queensland (Department of Natural Resources and Mines) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

CONSULTANT

GOLDER

| | |
|---|---|
| YYYY-MM-DD | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | JF |

TITLE
**GROUNDWATER BORE HYDROGRAPHS - NORTH**

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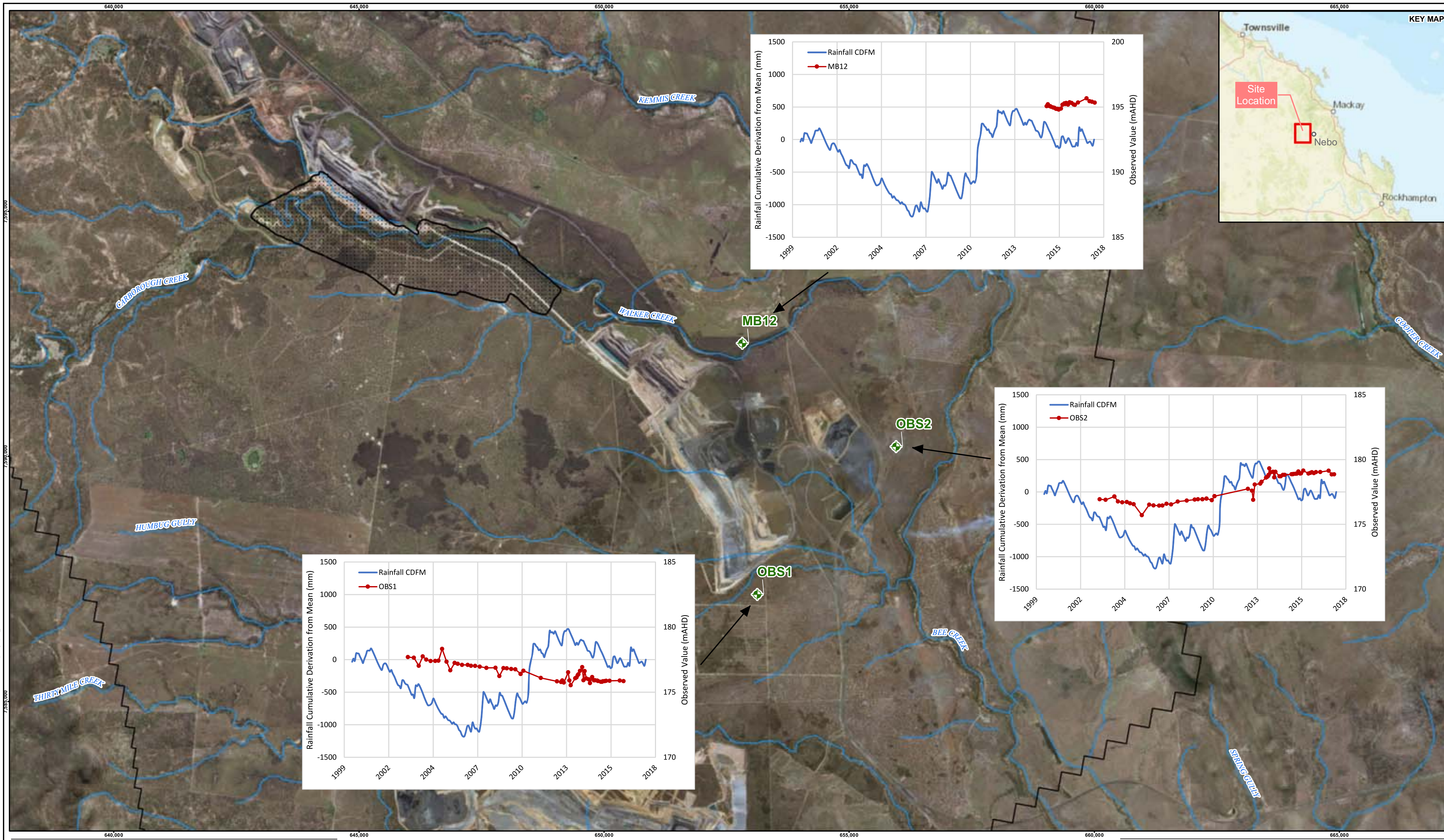


LEGEND

**Calibration Bore Location**

*Screened Formation*

- Regolith
- Model Domain Outline
- Watercourse
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000 METRES

Scale: 1:75,000
Coordinate System: GDA 1994 MGA Zone 55

REFERENCE(S)
1. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. Target Bores, Orthophoto, MRA2C Pit Area: BHP, January 2018
3. Rainfall Data: SILO Climate Data, © The State of Queensland (Department of Science, Information Technology and Innovation) 2018
4. Watercourses: © State of Queensland (Department of Natural Resources and Mines) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

CONSULTANT
GOLDER

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| YYYY-MM-DD | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | JF |

TITLE
**GROUNDWATER BORE HYDROGRAPHS - SOUTH**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 15 |

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### 4.5.2 Rainfall-runoff Relationships

Runoff and recharge only occur during significant rainfall events. Groundwater recharge to the water table occurs episodically from ephemeral streams including Walker Creek and Carborough Creek.

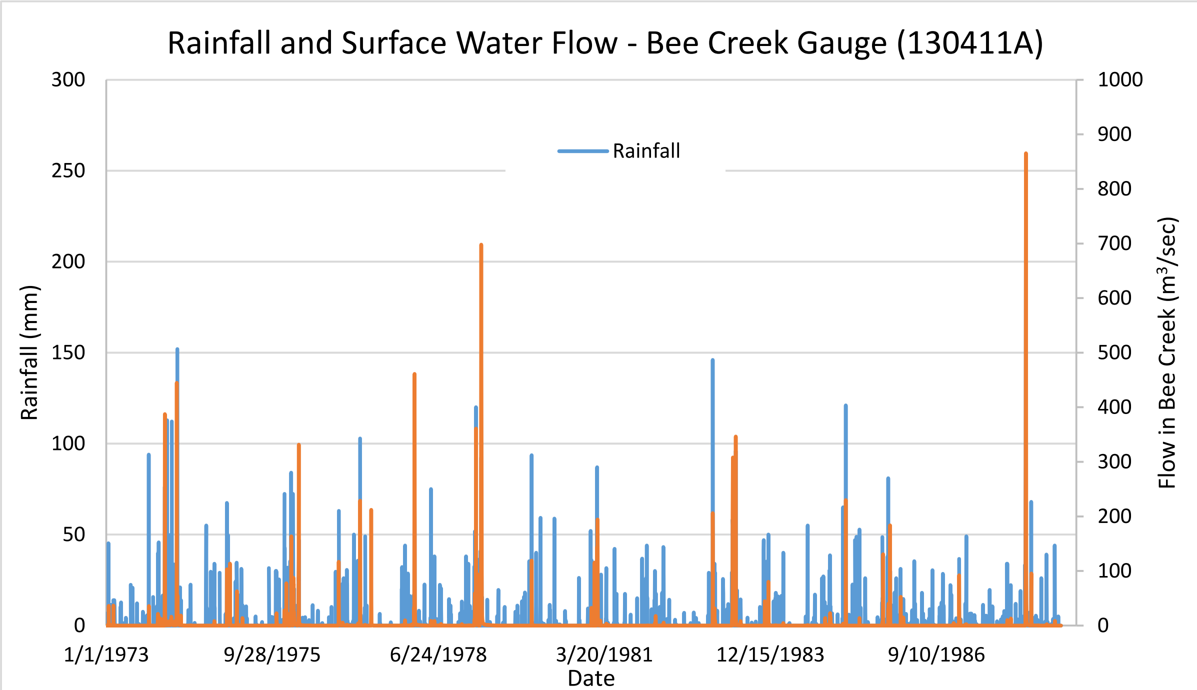
Historically, there has been stream flow data collected from several locations in the vicinity of the mine, notably from Walker Creek prior to the MRA2A diversion. Data records are not available for historic stream gauges on Walker Creek and most recently from Bee Creek. However, the most complete and robust record available is from a previous streamflow gauge situated in Bee Creek just downstream of the confluence with Walker Creek. This gauge provides an indication of surface water response and quality. The gauge was in place between 1972 and 1988 prior to any significant mining operations in the catchment and was used to make a semi-quantitative assessment of rainfall-runoff.

A semi-quantitative review of rainfall-runoff relationships was conducted using the available data from the Bee Creek gauge to evaluate potential threshold precipitation levels necessary to induce runoff, which in turn may approximate likely precipitation levels necessary to initiate groundwater recharge – which, like runoff, occurs once soils reach saturation.

A plot of rainfall and flow in Bee Creek, based on daily records collected during the time period 1973-1988 is shown in Figure 16. The review of rainfall and discharge data during this time indicates that, although rainfall-runoff relationships are complex, some general trends and observations can be noted from the data record:

- In dry months (April – December), single storm events of 70 mm of less (in a 24-hr period) generally do not induce surface water flows in Bee Creek. Typically, storm events more than 90 mm in 24 hrs are required to induce short-term flow in Bee Creek.
- In dry months, rainfall that occurs for multiple days, but in low total amounts (up to 30 mm/day and 120 mm/week) generally does not induce flow in Bee Creek
- In wetter months, (Jan-Mar), 90-130 mm of precipitation received over a short period (< 3 days) is sufficient to generate flow in Bee Creek for approximately 2 to 4 days
- In wetter months, storm events exceeding 150 mm in 3 days or exceeding 200 mm in 5 days will typically induce sustained flow in Bee Creek for an extended period (>5 days).
- The wettest period on record was during 26 February to 5 March 1988, when 503 mm of rainfall was recorded over a 9-day period, resulting in more than 20 consecutive days of flow in Bee Creek Figure 16).
- The longest wet period on record was 24 Jan – 15 Feb 1979, with measurable rainfall for 20 of 23 days (379 mm total), resulting in flow in Bee Creek for 23 consecutive days.

These relationships suggest that during the dry months, groundwater recharge is unlikely during rain events, except during storm events that generate greater than about 90 mm rainfall in a short time period. Groundwater recharge is likely to be more frequent during wet months when the ground is already saturated and sustained rainfall events occur.



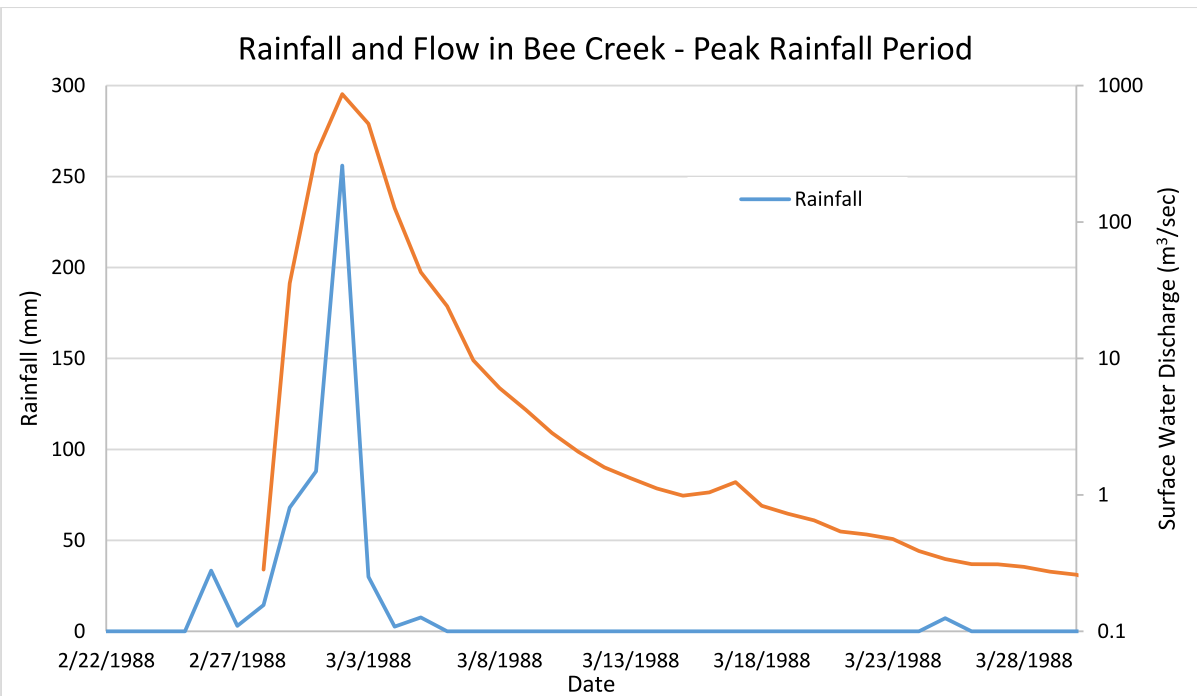




**Figure 16: Site Rainfall and Surface Water Flow in Bee Creek: Top - Data record 1973-1988; Bottom - Peak Rainfall Period in February-March 1988.**

### 4.5.3 Groundwater Discharge

Discharge of groundwater occurs primarily as natural groundwater flow through the basin towards lower hydraulic heads (to the southeast), and as discharge to the open pits. Groundwater discharge to surface water bodies has not been documented.

Evaporative losses from groundwater are expected to be very low. Groundwater depth throughout much of the site is greater than 10 m, which is well beyond the extinction depth of evaporation (Shah et al, 2007).

CDM Smith (2016) analysed pit pumping rates compared to rainfall and noted that, at the Kemmis Pit, pumping rates are high immediately following rainfall, likely due to enhanced surface water runoff into the pit. At the Mulgrave pit, however, pumping of pit water is not required except during the wettest periods, and no pumping was conducted during 2011 or 2012. This data indicates that groundwater seepage rates into the Mulgrave Pit are low and comparable to or lower than the rate of evaporation acting on the pit floor. Flows into the pit are limited by the low hydraulic conductivity of the overburden that form the pit walls, and the limited saturated thicknesses of the water table aquifer and the confined coal seam aquifer.

### 4.5.4 Surface Water – Groundwater Interaction

Walker Creek and Carborough Creek are ephemeral, with moderate to high surface water flows during the wet season. The depth to groundwater measured in monitoring bores located within the vicinity of the creek lines range from 3 to 14 m bgl, with the shallowest level recorded at bores MB3A and MB3B after a period of above average rainfall (from 2011 to 2013), reflecting the influence of ephemeral surface flows.

Depth to water measurements indicate that the creek beds are elevated with respect to the groundwater table, are disconnected from groundwater and, when flowing, act as losing streams locally supplying recharge to the water table during the wet season.

The only documented spring in the Project area is Bore 4, which as discussed in Section 4.2 is a spring located at the contact of the Rewan Formation with the Clematis Group along the fore slope of the Carborough Range. Groundwater from the water table aquifer has not been documented to discharge to surface water in the project area, and no springs are noted in the project area.

## 4.6 Effects of Mining on Water Levels

Groundwater monitoring data records are available from 17 of the monitoring bores listed in Table 2, with different periods of monitoring for these bores. All bores are shown in Figure 2.

Monitoring has been intensified since 2014 with the inclusion of additional monitoring bores. In determining the effect of mining on groundwater levels, the dataset has the following limitations:

- There are no water level measurements before mining.
- Most monitoring bore datasets commence in 2014.
- There are only two bores with long term water level datasets (starting in 2003), both from locations to the south of MRA2C.

These limitations mean that separating groundwater system responses to seasonal events and long term climatic trends from mining related processes (dewatering and seepage from tailings) is difficult and in some areas not possible. These data limitations lead to some uncertainty in the conceptual model, which is addressed during the numerical modelling through sensitivity and uncertainty analyses (Section 6.6).

### 4.6.1 Drawdown in the Water Table Aquifer

The two bores with long term monitoring records (OBS1 and OBS2) are screened in Regolith and have been monitored continuously since 2003. Bore OBS1 is located about 800 meters south of the Toolah Pit, while OBS 2 is located between the tailings dam and Bee Creek (Figure 2). Water levels for these bores are plotted in Figure 17 as the change in head from the original water level at the start of monitoring in 2003. Key operational dates are also illustrated.

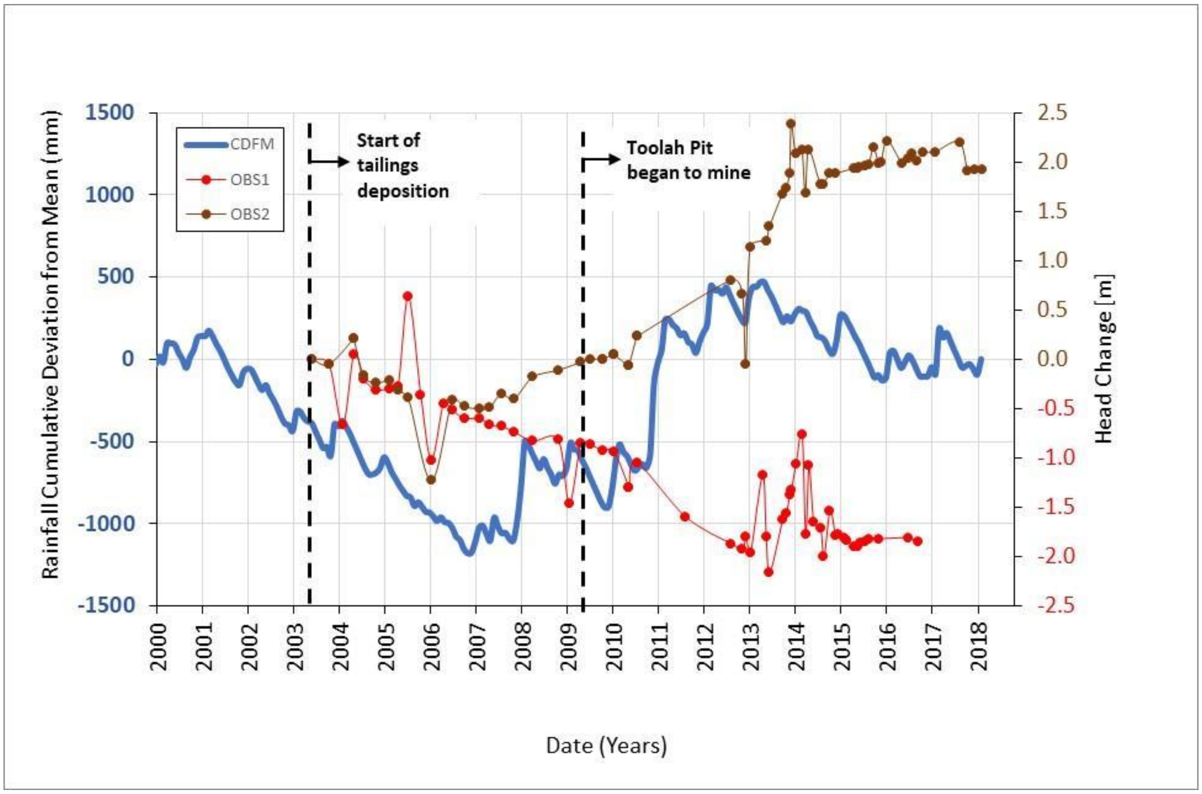



**Figure 17: Water Level Data for OBS1 and OBS2 and Rainfall Cumulative Deviation Curve**

As shown in Figure 17, prior to 2007, water levels in both bores demonstrated very similar declining trends, consistent with a multi-year pattern of below average rainfall as illustrated by the CDFM.

After 2007, water levels in OBS2 increased while water levels in OBS1 continued to decline. It is possible that water levels in OBS2 were responding to seepage infiltration from the nearby tailings facility.

In January 2009, excavation and mining operations began at the Toolah Pit. In response to pit operations, there was an increase in the rate of decline of the observed water levels in OBS1 from 2010 to 2013. During this period, the water level in OBS2 continued to increase, which is interpreted to result from the combined effect of continued higher rainfall than in the 2003 to 2008 period, and potentially influence from the tailings dam (see below).

During the wet years of 2013-2014, both bores show significant short-term fluctuations in water levels in response to rainfall. After this period, water levels in OBS2 continue to rise slightly but remain relatively constant in OBS1. It is interpreted that the drawdown caused by the Toolah Pit at OBS1 is approximately 1.25 m, and that the drawdown reached a steady state at approximately 4 years after the start of mining.

Monitoring bores MB6, MB7 and MB12 are also located relatively close to the pits and could have potentially been impacted by drawdown due to mining. The hydrographs for monitoring bores MB6 and MB7 show generally decreasing groundwater levels between late 2013 and early 2015 (refer to Figure 14), with fluctuations corresponding to rainfall events. The generally decreasing trend in groundwater levels could potentially represent drawdown. It is noted, however, that MB6 is located adjacent to the Mulgrave Pit, where mining commenced in 2001, and it is considered implausible that the relatively rapid decrease in water levels over the relatively short period of record available could be attributed to drawdown associated with mining that commenced 12-13 years previously (any reasonable backwards extrapolation of water levels at MB6 would result in a groundwater level that would be inconsistent with surrounding water levels). It is more likely that the overall decrease in water level in MB6 over the period of monitoring reflects drainage to the adjacent pit, lowering the water table following a temporary increase in groundwater level associated with the preceding period of higher than average rainfall. The rate of decrease is observed to be more rapid than is generally observed for monitoring bores located further from the pit.

In the case of MB7, mining in the adjacent Kemmis Pit commenced in 2012, and it is considered possible that the trend of decreasing water level in this monitoring bore could be related to drawdown caused by the pit. It may also partially reflect a decrease in groundwater level following the preceding period of higher than average rainfall.

In the case of MB12, which is located close to the Carborough Pit where mining commenced in 2008, groundwater levels remained relatively constant over the period of monitoring from 2014 to 2017, and it is considered likely that no drawdown has occurred at this location, considering the distance of this bore compared with OBS1.

Other monitoring bores in the water table aquifer (MB3A, MB3B, MB10 and MB11) are located further from the pits, and do not show any significant change in groundwater level over the period of monitoring (generally 2013-2018).

### 4.6.2 Tailings Dam

The difference in behaviour between OBS1 and OBS2 in the period between 2006 and 2008 suggests that seepage from the tailings storage facility may have been influencing shallow water levels in OBS2.

To further evaluate the potential effects of the tailings dam on water levels in the water table aquifer, water level records from OBS2 were compared to levels from MB13. MB13 is screened in Regolith near Bee Creek but located about 2 km cross-gradient from the tailings dam (Figure 2). This comparison is shown in Figure 18.

Unfortunately, water level data is not available for MB13 for the period (2007-2011) when water levels were rising sharply in OBS2. However, as shown in Figure 18, for the period where concurrent water level data is available (2016-2018), water levels in MB13 appear to be on a slow decline, while water levels in OBS2 continue to rise slowly.

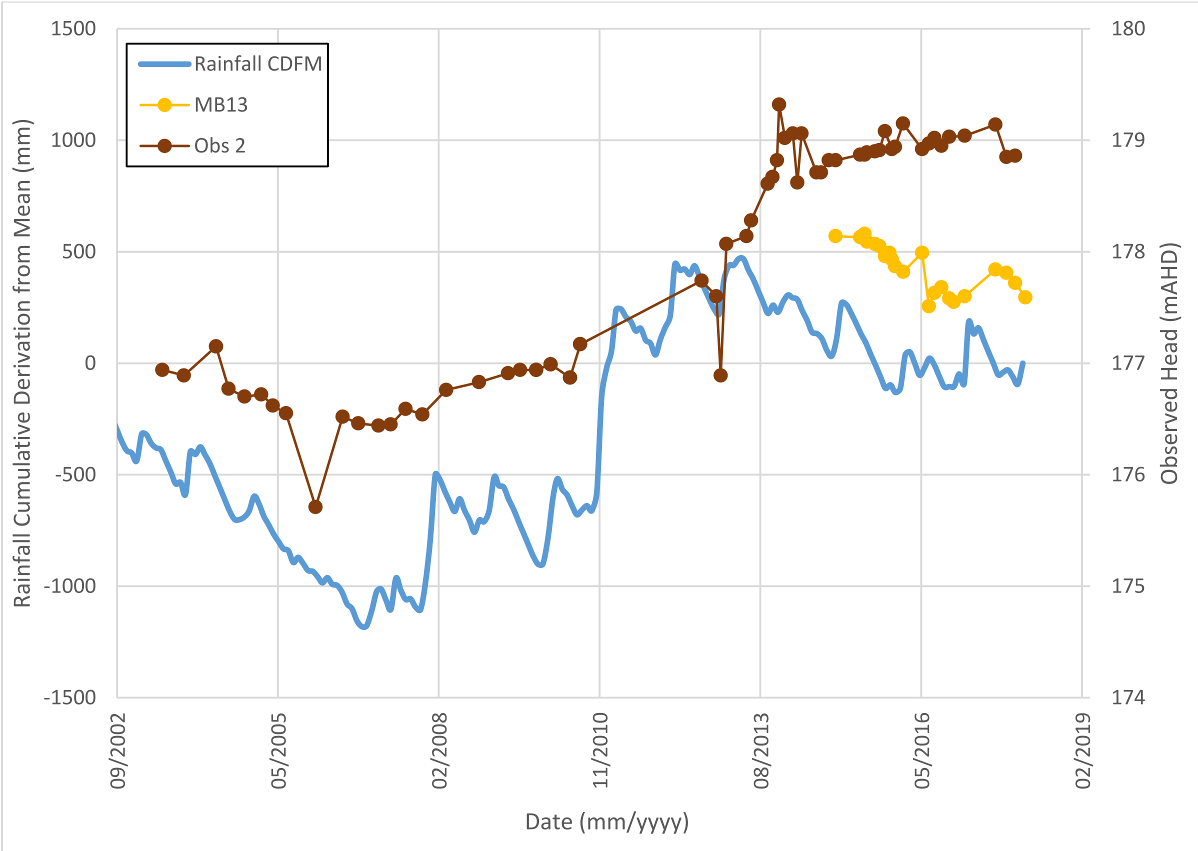



**Figure 18: Water level data for OBS2 and MB13 and Rainfall CDFM Curve**

Further evidence for the influence of the tailings dam on OBS2 is provided by water chemistry, which is discussed in the next section. In particular, OBS2 has the highest TDS, Electrical Conductivity, and sulfate concentrations of any bore sampled on the mining lease. Sulphate concentrations varied from 409-1300 mg/L during the time period this bore was actively monitored for water quality (2012-2016). Concentrations of sulphate have never exceeded 50 mg/L in any other water table aquifer bore (see Section 4.7, below).

### 4.6.3 Drawdown in the Coal Seam Aquifer

There are two bores screened in the coal seam aquifer with relatively continuous water level records: CB01 and MB4. As shown in Figure 2, CB01 is located adjacent to the Kemmis Pit on the west side, and MB4 is located east of the Mulgrave Pit near the limits of the exploitable coal seam. Each bore is located approximately 1000 meters from open pits. A plot of head change over time for these wells is shown in Figure 19.

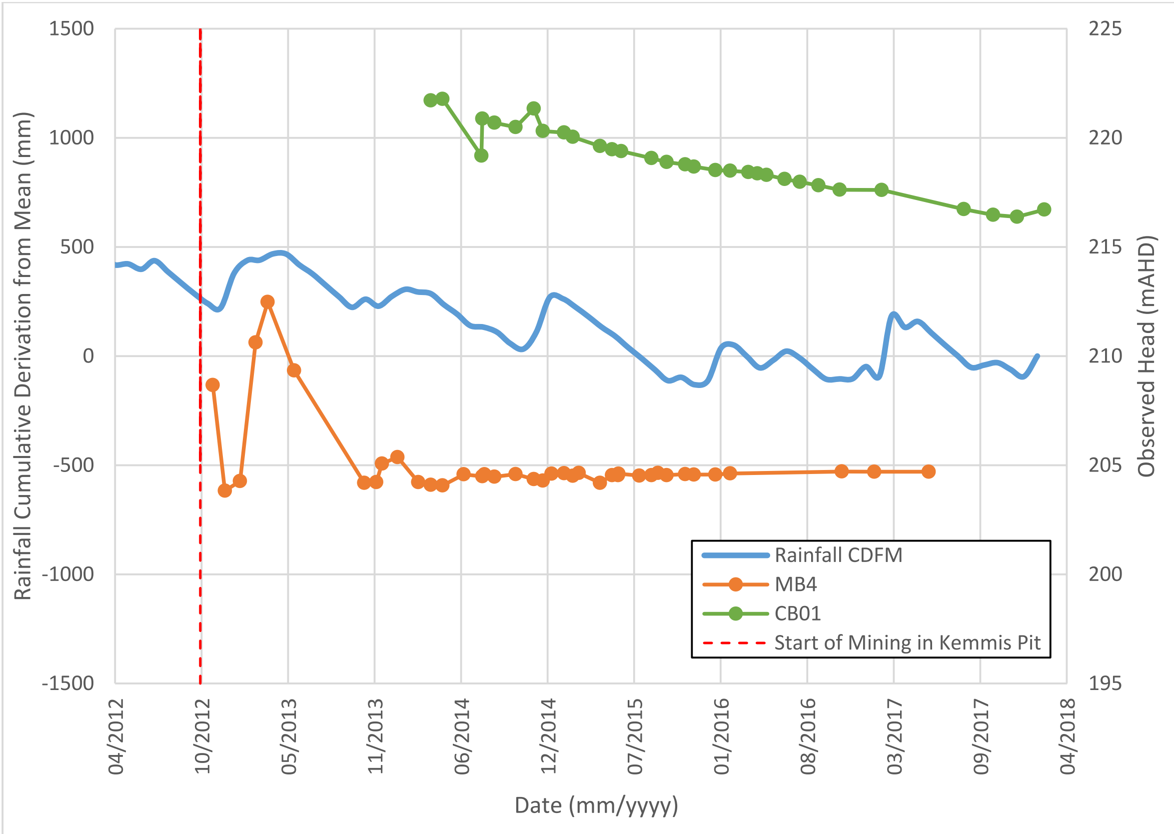



**Figure 19: Water Level Head Data for Coal Seam Bores and Rainfall CDFM Curve**

As shown in Figure 19, water table elevations in MB4 are significantly lower than CB01 despite being located a similar distance away from active mining operations. This is likely due to its position on the northeast side of mining operations near the eastern edge of the coal seam. In this area, the drawdown in the coal seam aquifer cannot be replenished as the position of the pit separates MB4 from the rest of the aquifer located west of the pit. It is likely that the coal seam aquifer was dewatered in this area due to operations at the Mulgrave Pit and Kemmis Pit prior to 2013. At CB01, the water level has declined at a consistent rate since monitoring began in 2013. This decline is clearly related to mining and the position of CB01 within the drawdown influence of the mine.

These observations are consistent with the expected propagation of the drawdown envelope in the coal seam aquifer to the west as mining progresses.

## 4.7 Groundwater Quality

Groundwater samples have been collected by BMC since 2003 and groundwater chemistry trends have been assessed on an annual basis with the findings summarised in annual groundwater review reports (AGE, 2010; GHD, 2011, 2012; Douglas Partners, 2013, 2014b). Groundwater quality data are summarized in Appendix A.

To provide an overview of groundwater quality in the context of potential uses, groundwater chemistry data from the water quality monitoring program are compared against the Australian Drinking Water Guidelines (NHMRC, 2011) and ANZECC/ARMCANZ (2000) trigger values for irrigation, stock watering, and tropical Australia aquatic ecosystems (freshwater species) with 95% protection level (the highest of the range specified in the Significant Impact Guidelines 1.3).

Overall, groundwater quality is suitable for stock watering purposes, but has variable salinity (Section 4.7.1) that makes most water unsuitable for human consumption. The confined coal seam aquifer naturally contains elevated sulfate (Section 4.7.2) at concentrations above ADWG drinking water guidelines, but below ANZECC stock watering guidelines.

### 4.7.1 Groundwater salinity

Groundwater salinity is assessed through direct measurements of total dissolved solids (TDS), or through field or laboratory measurements of electrical conductivity (EC). The following are guideline values for TDS:

- ANZECC/ARMCANZ (2000) guideline values for stock watering requirements are 2000 – 5000 mg/L (with note that some animals may adapt to higher salinity without loss of production);
- ADWG drinking water aesthetic guideline values for "fair quality" drinking water are 600-900 mg/L; and
- ADWG drinking water aesthetic guideline values for "good quality" drinking water are <600 mg/L.

Table 6 summarises the historical range of TDS and EC values for monitoring bores from available data, and salinity ranges in different areas of the site are shown in Figure 20.

The freshest groundwater (lowest TDS values) is found in the water table aquifer along South Walker Creek northwest of the MRA2C Project (e.g. MB6, MB7, MB10), which is likely to reflect the effect of seasonal recharge by surface water and higher infiltration rates to groundwater due to the proximity of this area to recharge sources in the Carborough Range to the West.

As shown in Table 6, bores screened in alluvium exhibit good to moderate water quality with respect to salinity, with one bore (MB14, along Bee Creek) within drinking water quality guidelines for "good quality" water. All bores are within guidelines for stock watering.

Regolith bores exhibit the most variability, ranging from "good quality" water for bores located near creek channels (MB3B, MB6, MB7) to poor quality for bores OBS1 and OBS2 located downgradient of mining operations. All samples from the three landholder bores screened in regolith greatly exceed secondary drinking water criteria but are within the acceptable ranges for stock watering. Notably, water quality is much better at MB3B (screened from 6.5-9 mbgsl) compared to adjacent bore MB3A (screened 13-16 mbgsl), suggesting that "freshening" effects from percolation of surface water from ephemeral streams are limited to the mixing zone in the upper part of the water table aquifer.

A single measurement is available for each of the three bores screened in the confined coal seam aquifer, with TDS ranging from 2740 – 3410 mg/L. With respect to salinity / TDS, the water quality is generally worse in the main seam aquifer than the water table aquifer, with a few exceptions.

**Table 6: Groundwater Salinity**

| Bore | HSU | Total dissolved solids (mg/L) | | | | Electrical Conductivity (µS/cm) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Average | No. of Obs. | Min | Max | Average | No. of Obs. |
| MB10 | Alluvium | 455 | 1090 | 672 | 25 | 745 | 1580 | 993 | 27 |
| MB11 | Alluvium | 789 | 3010 | 2226 | 25 | 737 | 4420 | 3290 | 27 |
| MB13 | Alluvium | 895 | 1180 | 1008 | 22 | 1300 | 1650 | 1479 | 23 |
| MB14 | Alluvium | 505 | 662 | 580 | 27 | 809 | 993 | 880 | 30 |
| MB3A | Regolith | 580 | 1670 | 1239 | 26 | 818 | 2860 | 2437 | 33 |
| MB3B | Regolith | 474 | 613 | 547 | 26 | 805 | 2360 | 893 | 33 |
| MB6 | Regolith | 413 | 464 | 431 | 8 | 640 | 840 | 704 | 13 |
| MB7 | Regolith | 535 | 701 | 602 | 13 | 749 | 1210 | 938 | 19 |
| MB12 | Regolith | 2600 | 4010 | 3562 | 25 | 4000 | 6070 | 5379 | 27 |

| Bore | HSU | Total dissolved solids (mg/L) | | | | Electrical Conductivity (µS/cm) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Average | No. of Obs. | Min | Max | Average | No. of Obs. |
| OBS1 | Regolith | 12700 | 12700 | 12700 | 1 | 13500 | 21500 | 18281 | 20 |
| OBS2 | Regolith | 16800 | 16800 | 16800 | 1 | 17600 | 33300 | 26686 | 21 |
| Hut Bore | Regolith | 2790 | 3030 | 2973 | 8 | No Data | No Data | 4546* | 8 |
| Kiss' Bore | Regolith | 1230 | 1360 | 1290 | 3 | 1400 | 1860 | 1655 | 12 |
| Mitchell's Bore | Regolith | 2470 | 2470 | 2470 | 1 | | | | |
| Gas 2 / MB3 | Main Seam | 3410 | 3410 | 3410 | 1 | 70 | 6590 | 3626 | 10 |
| MB4 | Main Seam | 2740 | 2740 | 2740 | 1 | 3300 | 8400 | 5748 | 19 |
| CB01 | Main Seam | 2800 | 2800 | 2800 | 1 | 4160 | 6670 | 5194 | 7 |

Note: presented information is based on measured values from all available groundwater chemistry data.

* Laboratory analyses not performed, presented values are based on in-situ field analysis.

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## LEGEND

**Groundwater Salinity**

*Total Dissolved Solids (mg/L)*

- 0 - 500
- 500 - 1000
- 1000 - 2000
- 2000 - 5000
- 5000 - 10000
- > 10000

Watercourse

- Major
- Minor
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:70,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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2. MRA2C PROPOSED PIT AREA, AERIAL ORTHOPHOTO: BHP, JANUARY 2018
3. GROUNDWATER SALINITY: BHP, JANUARY 2018
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CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**GROUNDWATER SALINITY**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | DC |
| REVIEWED | JF |
| APPROVED | SF |

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### 4.7.2 Major Ion Chemistry

Nitrate is occasionally detected at very low concentrations in some alluvial bores (Appendix A), well below the drinking water guideline value of 50 mg/L. A few samples from regolith bore MB7 have exceeded guideline values, but typically if detected nitrate concentrations are below 1 mg/L in this bore.

Sulfate concentrations measured in onsite monitoring bores are summarised in Table 7. In general, sulfate concentrations in the water table aquifer are low, while concentrations in the coal seam aquifer bores are higher and frequently exceed the aesthetic drinking water guideline value of 250 mg/L. However, even in the main seam, sulfate levels are below the 1000 mg/L threshold for stock watering in the ANZECC (2000) guidelines.

An exception is OBS2, located downgradient from the TSF, which is a water table bore but has higher sulfate concentrations than any other bores onsite. This is consistent with water level data for this bore which suggests that seepage from the TSF may be impacting groundwater in this area.

**Table 7: Measured Sulfate (as $SO_4{}^{2-}$) in Groundwater**

| Borehole ID | HSU | Minimum Concentration (mg/L) | Maximum Concentration (mg/L) | Average Concentration | Number of Observations |
|---|---|---|---|---|---|
| MB10 | Alluvium | 5 | 25 | 8.8 | 27 |
| MB11 | Alluvium | 30 | 70 | 41.7 | 27 |
| MB13 | Alluvium | 10 | 16 | 12.4 | 25 |
| MB14 | Alluvium | 6 | 10 | 7.7 | 30 |
| MB3A | Regolith | 3 | 20 | 7.5 | 32 |
| MB3B | Regolith | 4 | 16 | 5.6 | 32 |
| MB6 | Regolith | 4 | 8 | 4.9 | 13 |
| MB7 | Regolith | 8 | 27 | 10.7 | 19 |
| MB12 | Regolith | 11 | 35 | 24.7 | 27 |
| OBS1 | Regolith | 5 | 75 | 11.9 | 20 |
| OBS2 | Regolith | 380 | 1300 | 606.9 | 20 |
| Kiss' Bore | Regolith | 2 | 15 | 8.9 | 12 |
| Hut Bore | Regolith | No data | No data | No data | No data |
| Gas 2 / MB3 | Main Seam | 4 | 530 | 114.4 | 10 |
| MB4 | Main Seam | 18 | 1000 | 475.9 | 21 |
| CB01 | Main Seam | No data | No data | No data | No data |

Figure 21 presents a Piper diagram of major ion concentrations. A Piper diagram graphically represents relative proportions of major ions and allows for a direct comparison of different water samples to identify their water types. The major cations in groundwater within the study area are generally of Na-K type and the major anions can be classified as HCO3-Cl type. The water type of Alluvium and Regolith is similar and, in many cases, overlapping.

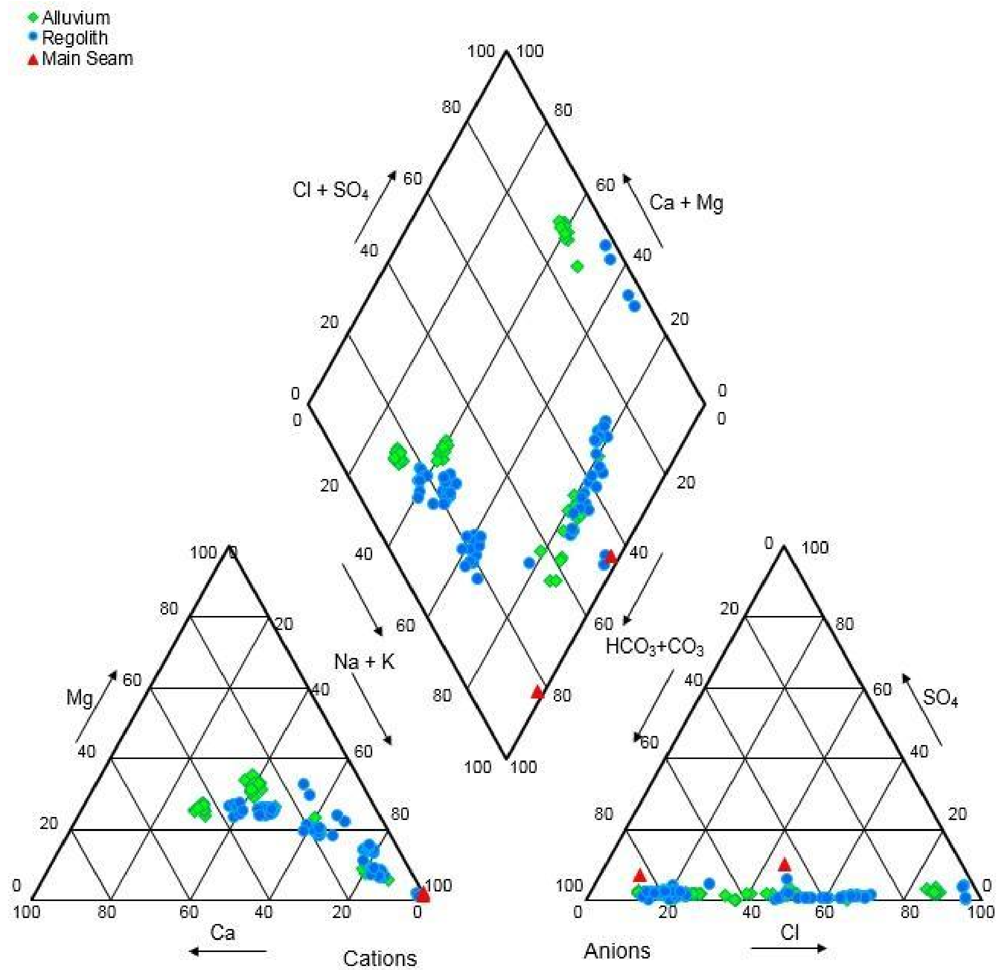


**Figure 21: Groundwater Chemistry - Piper Diagram**

### 4.7.3 Dissolved Metals

Table 8 presents a summary of the dissolved metal concentrations from the laboratory analysis. For metals detected below the laboratory detection limit, the concentrations are assumed to be equal to the detection limits.

In general, water quality meets all ANZECC irrigation and stock watering guidelines for metals, with few exceptions.

Concentrations of aluminium, arsenic, boron, cadmium, copper, iron, lead, manganese, molybdenum, nickel, selenium and zinc were detected above the ANZECC guideline values for aquatic ecosystems with 95% protection level and/or the ADWG guideline.

**Table 8: Summary of dissolved metal concentrations**

| Metals | ADWG* | ANZECC (mg/L) | | | Detected concentrations (mg/L) | | |
|---|---|---|---|---|---|---|---|
| | | Irrigation | Stock | Ecosystems | Min | Max | Average |
| Aluminium | 0.2 | 5 | 5 | 0.0055 | 0.001 | **5.72** | **0.042** |
| Antimony | 0.003 | - | - | - | 0.000001 | 0.001 | 0.001 |
| Arsenic | 0.01 | 0.1 | 0.5 | 0.0024 | 0.000001 | **0.05** | 0.002 |
| Boron | 4 | 0.5 | 5 | 0.37 | 0.1 | 0.690 | 0.247 |
| Cadmium | 0.002 | 0.05 | 5 | 0.0002 | 0.0000001 | **0.005** | 0.0002 |
| Chromium | 0.05 | 0.1 | 0.01 | - | 0.0002 | 0.01 | 0.001 |
| Cobalt | - | 0.05 | 1 | - | 0.001 | 0.01 | 0.002 |
| Copper | 2 | 0.2 | 0.4 | 0.0014 | 0.001 | **0.063** | **0.004** |
| Lead | 0.01 | 2 | 0.1 | 0.0034 | 0.001 | **0.011** | 0.001 |
| Manganese | 0.1 | 10 | - | 0.19 | 0.001 | **1.9** | **0.268** |
| Molybdenum | 0.05 | 0.01 | 0.15 | - | 0.001 | 0.264 | 0.014 |
| Nickel | 0.02 | 0.2 | 1 | 0.011 | 0.001 | **0.102** | 0.005 |
| Selenium | 0.01 | 0.02 | 0.02 | 0.11 | 0.0002 | 0.1 | 0.009 |
| Silver | 0.1 | - | - | 0.05 | 0.001 | 0.01 | 0.001 |
| Vanadium | - | 0.1 | - | - | 0.01 | 0.1 | 0.013 |
| Zinc | 3 | 2 | 20 | 0.008 | 0.002 | **1.3** | **0.054** |
| Iron | 0.3 | 0.2 | - | - | 0.00009 | 9.6 | 0.448 |

*Guideline values for health and aesthetic, whichever is lowest

Bold indicates ANZECC Ecosystem exceedance and grey fill indicates ADWG exceedance

# 5.0 ENVIRONMENTAL VALUES OF GROUNDWATER

This section described the environmental values of groundwater within the project area.

## 5.1 Water Table Aquifer Values

The water table aquifer is considered a groundwater resource, with 13 unregistered landholder bores present within the project site and surrounding areas, as discussed in Section 4.2. All identified bores are presently or were formerly used for stock watering purposes. There are no identified groundwater bores in the area used for human consumption or commercial purposes.

### 5.1.1 Stock Watering

Landholders have historically installed and equipped bores in the shallower water table aquifer owing to its accessibility, production potential, and superior water relative to the deeper aquifers.

A census of existing groundwater facilities at and within the vicinity of the South Walker Creek Mine was undertaken by IESA, in consultation with the surrounding landholders, between 10 and 22 April 2014 (CDM Smith 2016). A total of fifteen unregistered bores were verified in the field: Bores 1 to 12, Mitchell's Bore, Kiss' Bore and Hut Bore. All identified bores are screened in the water table aquifer, with most completed in the upper 40 mbgsl. Kiss' Bore and Hut Bore are unregistered landholder bores owned by BMC and the latter is understood to have been decommissioned. AGE (2014) indicated that, at the time of the survey, 10 of the unregistered bores were active and used for stock watering purposes. A summary of unregistered landholder bores is provided in Table 3.

A search of the Queensland Government database indicates that the groundwater use over the broader area is limited, with the nearest bore registered for water supply located more than 18 km from the MRA2C mining area.

As shown in Figure 2, and discussed in Section 4.2 all landholder bores in the project area are either owned by BMC or are subject to existing Agistment / Compensation agreements. BMC has recognised the potential for mining operations to impact water levels in these bores. Any potential future impacts to these bores from mining operations or drawdown associated with mining operations have already been considered by BMC, and compensation measures have been negotiated with bore owners and put in place in advance of Project implementation.

### 5.1.2 Groundwater-dependent ecosystems

Groundwater-dependent ecosystems (GDEs) are defined as ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide (Richardson et al., 2011).

The Queensland GDE mapping layer available at http://wetlandinfo.ehp.qld.gov.au/wetlands/facts-maps/gde-background does not include coverage for the South Walker Creek Mine at the time of study preparation. The Australian GDE Atlas (www.bom.gov.au/water/groundwater/gde/) provides an initial, first- pass view of where potential GDEs are most likely to occur. GDE Atlas potential GDEs are shown in Figure 22.

The GDE Atlas maps GDEs as three broad types:

- Aquifer and cave ecosystems (Type 1) are underground ecosystems supported by groundwater that provide habitat stygofauna and other living organisms;
- Ecosystems dependent on the surface expression of groundwater (Type 2) include wetlands, lakes, seeps, springs, and river baseflow systems. In these cases, groundwater discharge provides water to support aquatic biodiversity; and
- Ecosystems dependent on subsurface presence of groundwater (Type 3) include terrestrial vegetation which depends on groundwater on a seasonal, episodic or permanent basis. These types of ecosystems can exist wherever the water table capillary fringe is within the root zone of the plants, either permanently or episodically.

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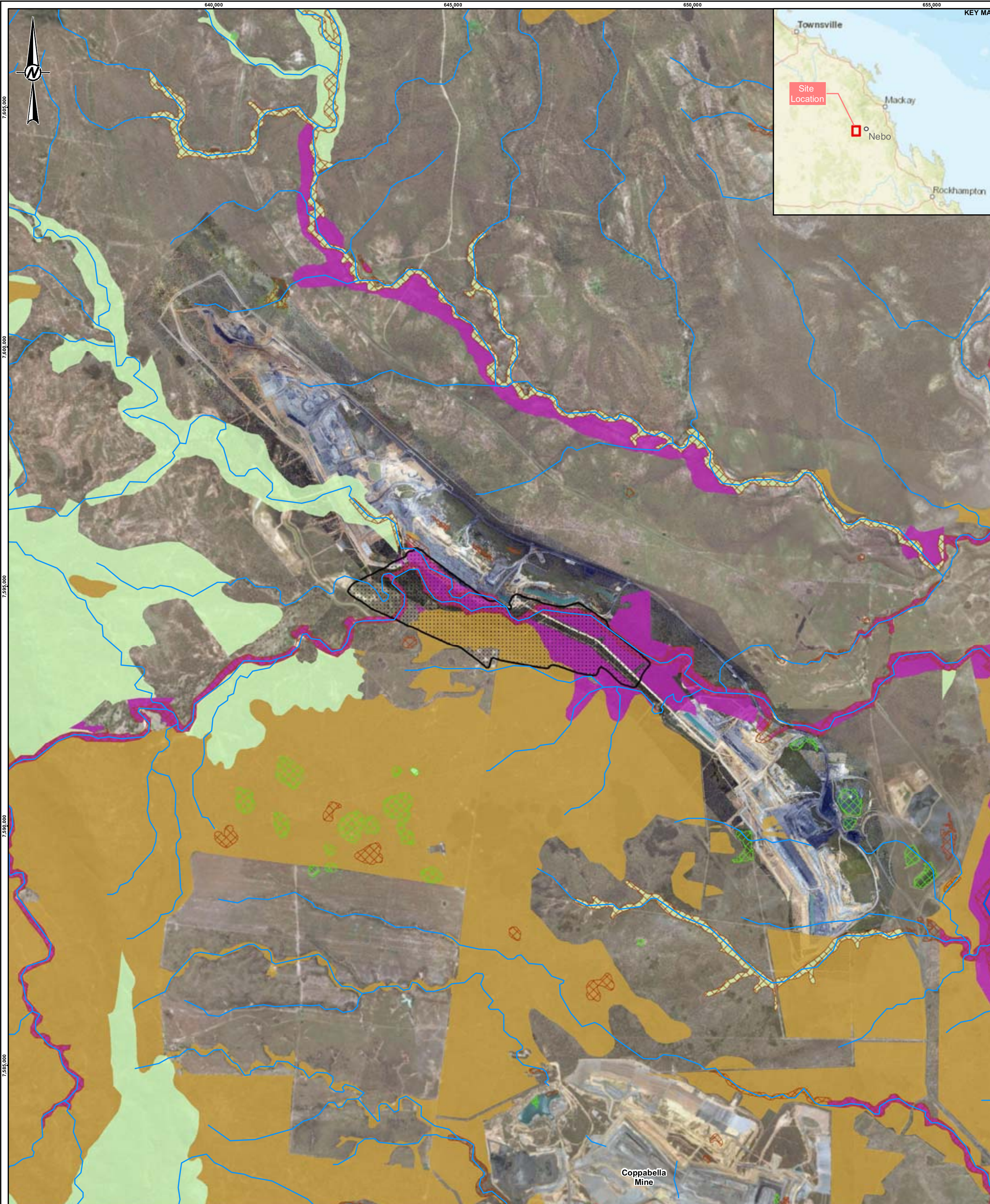


**LEGEND**

MRA2C Project

Potential GDE - Aquatic

Moderate potential GDE - from national assessment

High potential GDE - from national assessment

Potential GDE - Terrestrial

Low potential GDE - from national assessment

Moderate potential GDE - from national assessment

High potential GDE - from national assessment

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Scale: 1:75,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

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CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**GROUNDWATER DEPENDENT ECOSYSTEMS**

CONSULTANT

GOLDER

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|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

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### Type 1 GDEs

Stygofauna are aquatic animals that live in groundwater and have been documented in limestone and fractured rock aquifers but are most abundant in alluvial aquifers (Hancock *et al*, 2005).

The potential for stygofauna habitat in the Project area is limited by the following factors:

- the lack of limestone formations or karstic features within the project study area;
- the lack of surface expression of groundwater in the Project area.

The current version of the GDE Atlas indicates a high potential for Type 1 GDEs to occur in the alluvium along Walker Creek based on the presence of an alluvial aquifer.

A field investigation for the possible presence of stygofauna has not been undertaken. However, as documented in other studies, even where taxa that potentially represent stygofauna have been identified in alluvial aquifers, the lax of development on taxonomy of Queensland stygofauna makes determination uncertain or ambiguous (e.g. Hansen Bailey, 2017).

The site hydrogeology at the Project site is typical of similar sites in the region, and there is a significant extent of alluvial aquifer along other creeks in the area including Kemmis Creek, Bee Creek, and Walker Creek (Figure 11) that are beyond any potential impacts of the project. It is therefore unlikely that any stygofauna, if present in the alluvial aquifer, are endemic to the Project site. As such, any localised potential impacts to stygofauna are not predicted to be significant.

### Type 2 GDEs

Type 2 GDEs are those dependent on the surface expression of groundwater. Potential Type 2 GDEs from the GDE Atlas are shown in Figure 23.

Several areas of the project are classified as 1-50% wetland in the GDE Atlas. A high potential for groundwater discharge to surface water is indicated as occurring along Walker Creek, Carborough Creek and in a palustrine wetland to the immediate south west of the proposed expansion area.

However, as discussed previously in Section 4, water level data from monitoring bores indicates that groundwater is at least several meters below ground surface throughout the study area. This includes data from bores screened along Bee Creek (MB13), Walker Creek (Bore 7, MB10, and others) and Carborough Creek (MB11). Throughout the study area, the base of ephemeral streams and other surface water features are elevated several meters above groundwater, and surface water features are losing streams when flowing. The depth to water for bores screened in the water table aquifer in the project area is also shown in Figure 23.

Only two bores within the entire project area have water levels within 3 meters of ground surface: MB3A and MB3B, located adjacent to the upper reaches of Walker Creek near the Kemmis Pit. A four-year record of water level measurements for these bores is shown in Figure 24. The peak water levels are observed in early 2015 after a significant rain event, illustrating the influence of ephemeral creek discharge to groundwater.

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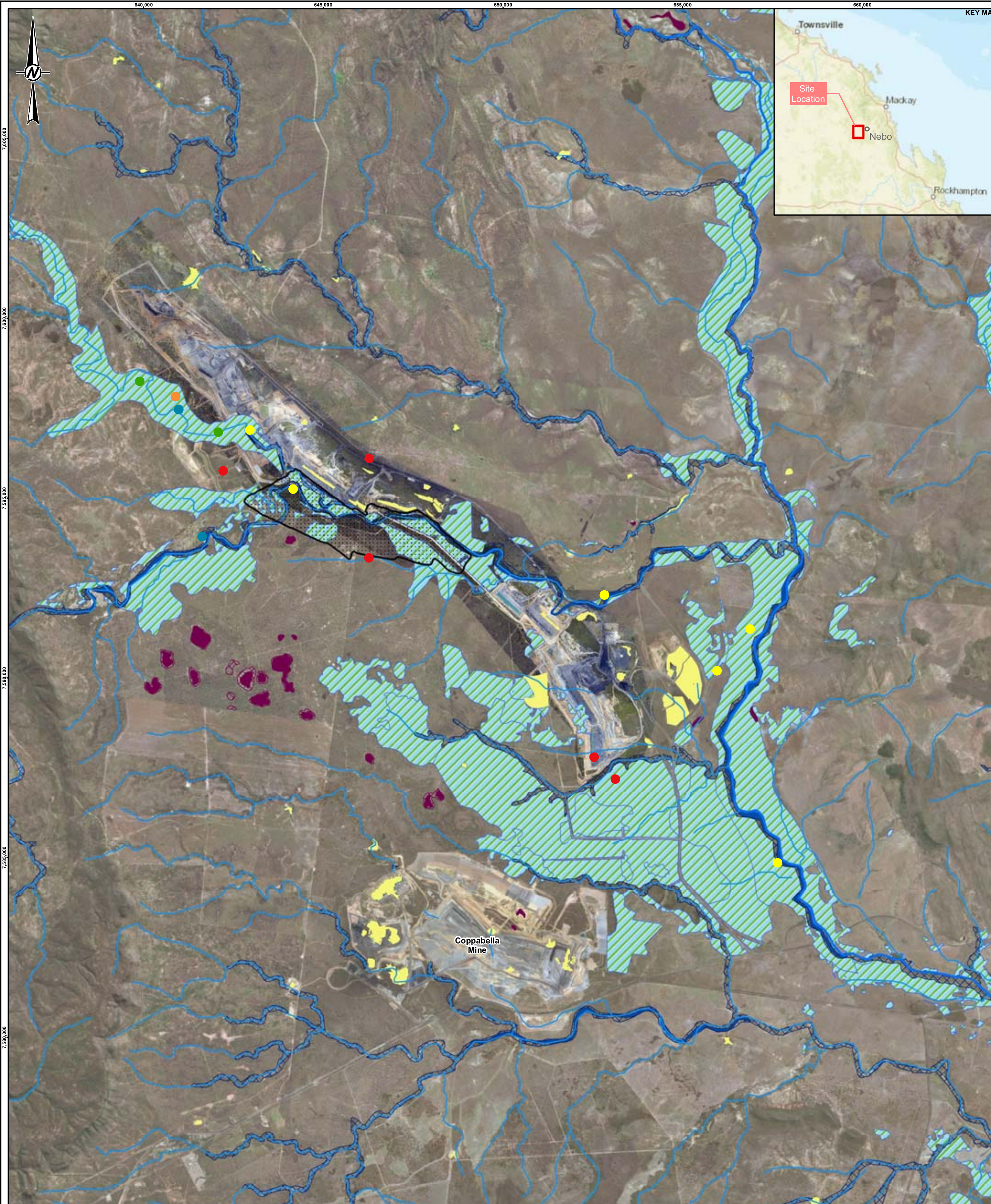


**LEGEND**

Depth to Water (m bgl*)
- <5
- 5 to 10
- 10 to 15
- 15 to 20
- >20

**Watercourse**
- Major
- Minor
- MRA2C Project

**Wetland Classification**
- Riverine Waterbodies
- Lacustrine Waterbodies
- Palustrine Waterbodies
- Riverine RE
- Lacustrine RE
- Palustrine RE
- RE 1-50% Wetland (mosaic units)

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:100,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PROPOSED PIT AREA, AERIAL ORTHOPHOTO: BHP, JANUARY 2018
3. VEGETATION MANAGEMENT REGIONAL ECOSYSTEM AND REMNANTS, WATERCOURSES: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017
4. DEPTH TO WATER CALCULATED USING SRTM-DERIVED 1 SECOND DIGITAL ELEVATION MODEL VERSION 1.0: © COMMONWEALTH OF AUSTRALIA (GEOSCIENCE AUSTRALIA), JANUARY 2000

* m bgl refers to metres below ground level

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**MAPPED WETLANDS AND DEPTH TO WATER**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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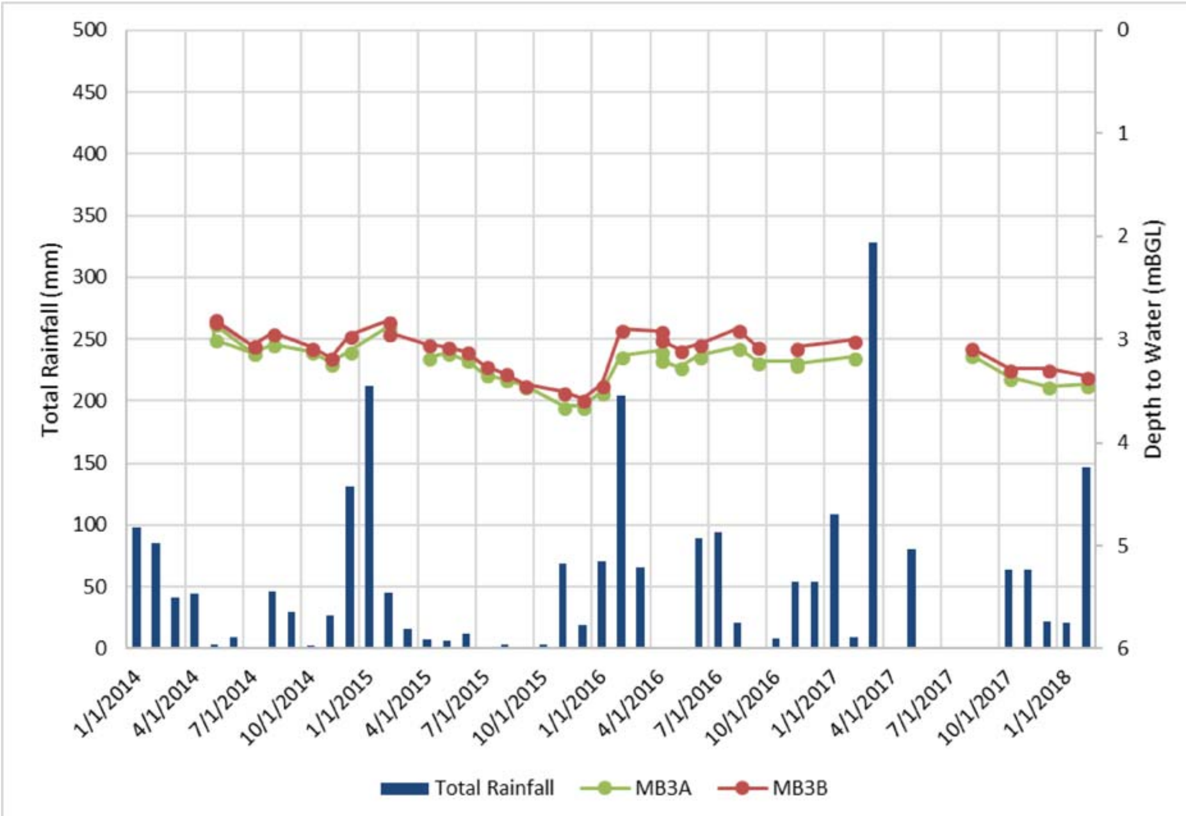



**Figure 24: Water level record for MB3A and MB3B**

As shown in this graphic, the groundwater level never comes close to the surface, and discharge to surface water (i.e. springs) has not been observed or documented in the project area.

Thus, there is no evidence for the presence of Type 2 GDEs, and the likelihood is extremely unlikely in the study area.

## *Type 3 GDEs*

Type 3 GDEs represent vegetation that depends on groundwater. The GDE atlas identifies multiple habitat types near the South Walker Creek Mine, as shown in **Error! Reference source not found.**.

Eco Logical Australia (2017) completed a detailed ecological assessment for the MRA2C Project including Matters of National Environmental Significance for the MRA2C project. Five major habitat types in the project area:

1) Fringing riparian forest occurs on the stream banks of Walker and Carborough Creek;

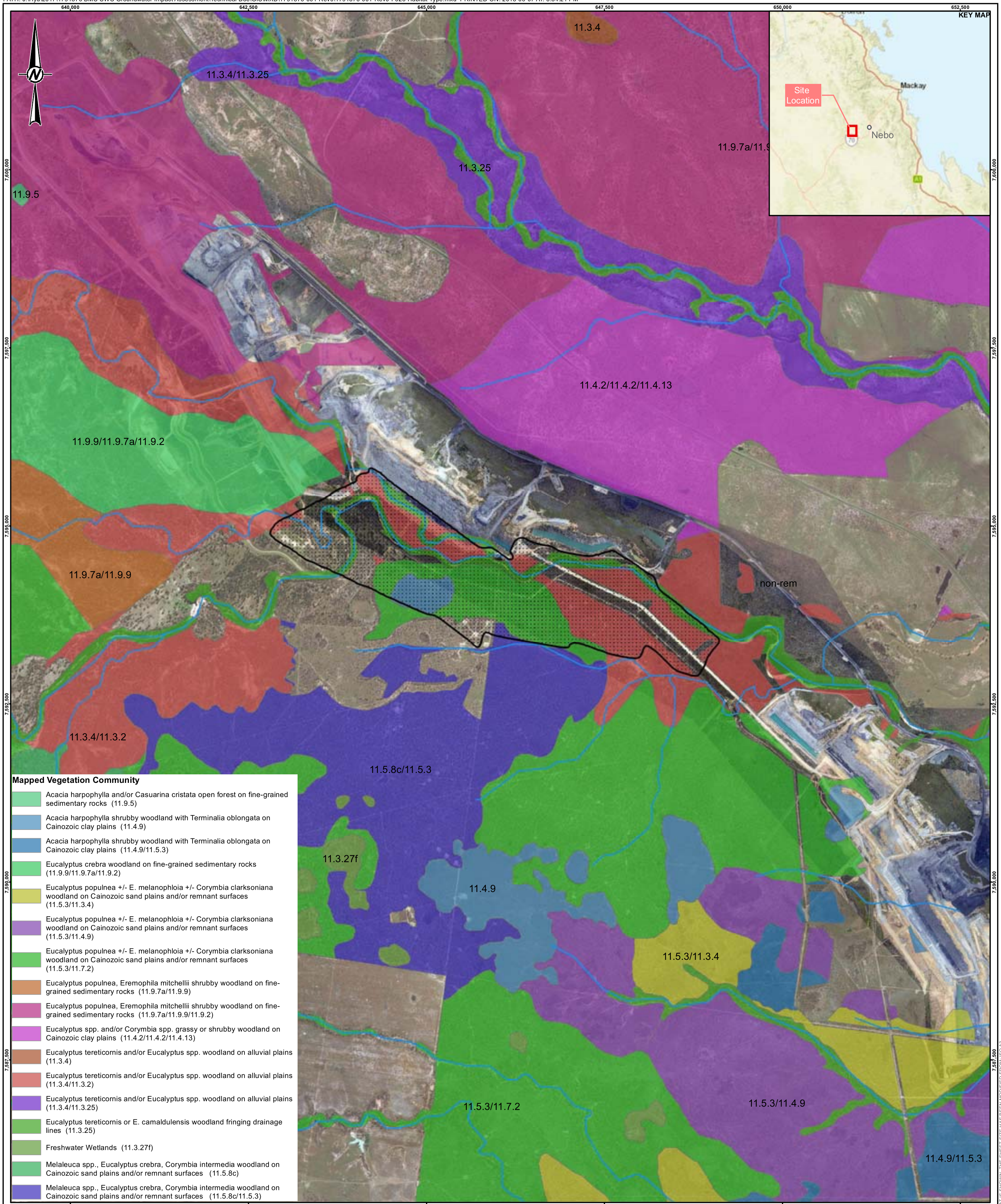
2) Floodplain Eucalypt forest occurs on the active floodplains adjacent to Walker and Carborough Creek;

3) Dry Eucalypt Forest occurs in the majority of the study area and occurs outside of the extent of the currently active floodplain (e.g. on older alluvial terraces);

4) Brigalow Woodland occurs in discrete patches (e.g. towards the southern extent of the proposed expansion area) associated with clay plans; and

5) Wetlands occur in discrete patches and include a palustrine wetland fringed by *Eucalyptus camaldulensis* (river red gum) that occurs to the immediate south west of the proposed expansion area.

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F025-Habitat Type.mxd PRINTED ON: 2018-06-07 AT: 5:34:21 PM




**LEGEND**

Watercourse

Major

Minor

MRA2C Project

0 500 1,000 1,500 2,000 2,500

Scale: 1:50,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PROPOSED PIT AREA, AERIAL ORTHOPHOTO: BHP, JANUARY 2018
3. VEGETATION MANAGEMENT REGIONAL ECOSYSTEM AND REMNANTS, WATERCOURSES: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**HABITAT TYPE**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | FS |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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Based on available monitoring bore data across the SWC Mine, habitats where vegetation could potentially access groundwater (i.e. < 10 m depth to water) (Canadell et al., 1996) is limited to fringing riparian forest and portions of the floodplain Eucalypt forest within the western portion of the MRA2C footprint along Walker Creek. In the broader area across the South Walker Creek Mine where shallow groundwater has also been identified, the habitats present are also limited to these two types. This includes areas within the upper branches of Walker Creek and along Carborough Creek.

For these habitat types, the groundwater that may potentially be accessed would be contained within the water table aquifer. This aquifer system does have limitations as a reliable and consistent groundwater source for vegetation as it is seasonally influenced. During dry periods when vegetation would be more reliant on this source of water, recharge rates and the influx of fresh water decreases, which impacts on water quality and water levels within the aquifer.

Nonetheless, these limitations would not necessarily discount the potential use of groundwater by these habitat types. Particularly for the habitat types that occur within the upper reaches of Walker Creek and along Carborough Creek where depth to water has been recorded at less than 5 m (MBA3A, MBA3B and MB11). Species composition within these habitat types consists of native canopy species that have been recorded to access groundwater between depths of 6 to 10 m (i.e. Eucalyptus calmedulensis and Corymbia clarksoniana) (Orellana et al., 2011).

However, not all areas of these two habitat types occur in areas of shallow groundwater and not all are of similar environmental value. The fringing riparian forest and floodplain Eucalypt forest habitat extends along and adjacent to Walker Creek and Bee Creek where depth to water within the water table aquifer are > 10m. Furthermore, some portions of the fringing riparian forest were identified during field surveys to support Black Ironbox (Eucalyptus raveretiana), which is listed as vulnerable under the EPBC Act. The species was located along sections of Walker Creek and Bee Creek within the SWC mining lease, including within the MRA2C footprint. However, Black Ironbox was found to be absent from upstream fringing riparian habitat areas of Walker Creek and Carborough Creek.

The density of Black Ironbox along Walker and Bee Creek within the SWC mining lease area was also found to vary, but generally increased as the creeks progress downstream. Within the project footprint of MRA2C, the density of Black Ironbox along Walker Creek was found to be approximately 7.6 individuals / 100m2. This progresses to 8.27 individual / 100m2 further downstream along Walker Creek within the mining lease. Along Bee Creek the density of Black Ironbox is substantially greater at 16.5 individuals / 100m2.

The occurrence of Black Ironbox across the SWC Mine occurs within the fringing riparian forest habitat where depth to water within the water table aquifer has been recorded to range from 10 – 15 m from adjacent monitoring bores (MB6, MB12, MB13 and MB14). While the species is within areas of habitat that have access to shallow groundwater (i.e. 10 m), it also occurs outside of these areas and increases in density as groundwater becomes deeper and is therefore less accessible. The species is highly restricted to the riparian zone of watercourses, so indicating a strong level of dependency on water within these watercourses. This suggests that there is little or no dependency on groundwater. The distribution and occurrence also suggest that other factors may contribute to the persistence of the species in the area other than water dependency such as stream characteristics and recruitment strategy (Queensland Herbarium, personal communication, 8 August 2017).

The rooting depth or depth to water table range has not been studied for Black Ironbox so the ability of the species to tap into the groundwater across SWC Mine cannot be negated. However, the level of dependency that the species has on groundwater sources at SWC Mine is not considered to be high. The interaction with groundwater is likely to be intermittent, seasonally and situationally dependent at best. This concept is supported by other examples of the species persistence without groundwater sources, including along watercourse in Collinsville, Queensland where the underlying metamorphic geology prevents access to groundwater and in plantings in non-riparian environments in Biloela, Queensland (Queensland Herbarium, personal communication, 8 August 2017).

Other vegetation values across the SWC Mine recognised as a MNES under the EPBC Act include the Brigalow (Acacia harpophylla dominant and co-dominant) Threatened Ecological Community (TEC). Areas of Brigalow TEC both within the MRA 2C footprint and across the SWC Mine occur where depth to groundwater is much greater (i.e. > 15m). The community is also situated on cracking clay plains and in such scenarios is generally found to rely on trapped surface water or water stored in the unsaturated zone rather than groundwater (IESC, 2018). As such the Brigalow TEC is not considered to be a GDE.

In summary, the SWC Mine may potentially support Type 3 GDEs in areas where shallow groundwater is present. This includes areas of fringing riparian forest and floodplain Eucalypt forest along the upper reaches of Walker Creek and Carborough Creek. The likelihood that these habitat types are Type 3 GDEs is lower along the downstream portions of Walker Creek, as well as along Bee Creek and with increasing distance from the alluvial channels. This is due to the increase in depth to water within the water table aquifer. Significant vegetation values recognised as MNES under the EPBC Act generally occur within such areas. For Black Ironbox, a number of other influencing factors for persistence suggests a lower dependency on groundwater. Brigalow TEC within the SWC Mine is not considered a GDE.

### 5.1.3 Summary

Stock watering is the only identified environmental value of the water table aquifer. Overall, groundwater quality is suitable for stock watering purposes, but has variable salinity (Section 4.7.1) that makes most water unsuitable for human consumption.

Type 1 GDEs (stygofauna) may be present in the alluvial aquifer along Walker Creek; however, if present these are unlikely to be endemic to the Project site and localised potential impacts are not predicted to be significant. There is no evidence for the presence of Type 2 GDEs at the Project site, and the likelihood is considered extremely unlikely in the study area. The South Walker Creek Mine may potentially support Type 3 GDEs in areas where shallow groundwater is present. This includes areas of fringing riparian forest and floodplain Eucalypt forest along the upper reaches of Walker Creek and Carborough Creek.

## 5.2 Confined Coal Seam Aquifer Values

Groundwater quality in the confined coal seam aquifer is generally of lesser quality than the water table aquifer. Salinity (as TDS) ranges from 2740 – 3410 mg/L for bores screened in the confined coal seam aquifer, while salinity in the water table aquifer is less than 1,000 mg/L is several locations. The coal seam aquifer also has high sulfate concentrations (Section 4.7.2)

The coal seam aquifer has limited environmental value due to its low permeability, low saturated thickness, greater depth, and higher salinity. It is beyond the reach of terrestrial vegetation and has insufficient production potential for stock watering.

There are no identified groundwater users of the confined coal seam aquifer in the project vicinity. No environmental values have been identified.

# 6.0 GROUNDWATER MODELLING

This section describes development of a three-dimensional (3D) numerical groundwater flow model for use in assessing the environmental impacts of activities that are related to the proposed MRA2C Project.

## 6.1 Background

In 2016, CDM Smith developed a numerical groundwater flow model for the Project whose primary objectives were to "predict potential rates of mine dewatering, to facilitate planning or operational mine water management, and to predict associated effects on groundwater resources".

In 2017, CDM Smith modified the MRA2C model for use in predicting groundwater inflow rates for the proposed Kemmis II pit expansion, and to provide an indication of the maximum zone of influence on groundwater levels from dewatering of the pit.

Both of these models were suitable for their intended purposes. However, model architecture and simulation setup was undertaken in a manner that focuses on the effects of individual pits and projects. For example, for the MRA2C Project, existing pits were included in the steady-state calibration but were not included in life-of-mine drawdown simulations. These models and simulations were not developed in a manner that allows for assessment of cumulative impacts from the MRA2C Project, Kemmis II expansion, and planned continued mining at other pits in the project area.

The current assessment was undertaken with the intent to develop a comprehensive groundwater model that has a focus on the planned MRA2C expansion, but with the ability and flexibility to assess cumulative impacts from planned mining operations at the South Walker Creek Mine. Groundwater modelling files from the previous MRA2C model, the Kemmis II model, and the LeapFrog geologic/hydrostratigraphic model were provided by BMC for use in model development.

## 6.2 Model Objectives

As discussed previously in Section 1.1 and again in Section 3.1, the overall objectives of the GWIA are to:

- Develop a GWIA to support the information request from the DOEE; and
- Provide sufficient information to satisfy IESC guidelines (IESC 2015).

This GWIA has been developed in consideration of these guidelines and is designed to meet IESC recommendations for consideration of "all relevant past, present, and reasonable foreseeable actions, programmes, and policies that are likely to impact on water resources" (IESC 2015).

The specific objectives of the numerical modelling are to:

- Develop a numerical model that is consistent with Australian Groundwater Modelling Guidelines (Barnett *et al.*, 2012);
- Develop a model that provides an accurate representation of site conditions and the conceptual site model, includes representative and realistic hydraulic properties, and is suitable for use in forward predictive simulations;
- Predict drawdown in the water table and confined coal seam aquifers during the life-of-mine period, including the maximum extent of drawdown for use in estimating potential effect on groundwater resources and receptors; and
- Estimate post-closure water table recovery.

## 6.3 Hydrostratigraphic Model

To provide a basis for groundwater model development, a 3D hydrostratigraphic model was developed for the Project area using Leapfrog Hydro™.

The model incorporates available information from years of mine operation and development. Stratigraphic information has been obtained using a total of 4,864 borehole logs from which the surfaces of HSUs have been delineated. The Main Seam has been split into two units, separated by an Interburden unit, based on the first two coal seams identified in the lithological logs with thicknesses greater than 1 m. The upper and lower seams are interpreted to be equal to the Main Top and Bottom Seams respectively. Stratigraphic contacts and structural lines from the geological maps have been used to define the lateral extent of the HSUs and the geometry of the basin/syncline. HSU descriptions that are incorporated into the hydrostratigraphic model are summarised in Table 9. The top elevation (ground surface) of the hydrostratigraphic model is based on the elevation data from the SRTM Digital Elevation Model (DEM), representing the pre-mining surface.

**Table 9: Hydrostratigraphic units of Leapfrog Hydro model**

| HSU | Description |
|---|---|
| Alluvium | Thickness based on the Quaternary and Tertiary sediments from lithological logs and lateral extent based on geological maps and topography. |
| Overburden | Combined thickness of the Rewan Formation and overburden of the Rangal Coal Measures. |
| Main Seam 1 | The upper coal seam of the Rangal Coal Measures. |
| Interburden | Interburden separating the Main Seams. |
| Main Seam 2 | The lower coal seam of the Rangal Coal Measures. |
| Underburden | Remainder of the underlying units including the Fort Cooper Coal Measures and Moranbah Coal Measures, represented as a unit with a maximum thickness of 1,500 m. |

## 6.4 Numerical Model Development

The finite difference code MODFLOW SURFACT™ (SURFACT) developed by HGL HydroGeoLogic Inc, was selected to simulate the saturated groundwater environment. It is based on the widely used MODFLOW code developed by the Unites States Geological Survey (USGS) (McDonald and Harbaugh, 1988). MODFLOW is one of the most robust and widely-used groundwater modelling codes in use. SURFACT includes several modifications to address recognized limitations of MODFLOW, primarily related to fluctuating unconfined water tables and model cell re-wetting phenomena. The model was constructed based on the available data and conceptual understanding of the hydrogeological system outlined in Section 4.

With the addition of the updated mine plan provided by BMC for the South Walker Creek Mine, and in consideration of modelling objectives, the following key features were included in the further numerical model development carried out for the current assessment:

- Inclusion of all existing mine pits in the Project area during model setup and calibration, including the Mulgrave, Kemmis, Walker, Carborough, and Toolah Pits;
- Inclusion of the Coppabella Mine open cut pit, located southwest of the South Walker Creek Mine, in the model calibration;
- Incorporation of the entire, updated South Walker Creek Mine plan (Figure 3) in development of model predictive simulations; and
- Inclusion of all final voids and spoils in the area.

Final voids have been simulated assuming standard open cut coal mining procedures currently in place, i.e. the MRA2C expansion will advance in a strip-mine fashion, with backfilling of previous mined strips with overburden as mining progresses, with the final strips left open at mine closure. Further details of this representation in the model are discussed below.

### 6.4.1 Approach to Modelling of Cumulative Impacts

The inclusion of the current mine plan, which extends until fiscal year 2071-2072, means that impacts predicted by the model are cumulative impacts for the entire South Walker Creek Mine during the life-of-asset period, and are not limited to impacts from the proposed MRA2C Project.

This approach is designed to meet IESC recommendations for consideration of "all relevant past, present, and reasonable foreseeable actions, programmes, and policies that are likely to impact on water resources" (IESC 2015). It is certain that, given the long duration of the plan, uncertainty of economic factors, etc. the mine plan presented herein will change over time. However, at present, the above activities are the most reasonably foreseeable action for the project site.

Predicative simulations are constructed as a series of time steps involving action (e.g. drain cells are turned on in an area to simulate mining of that zone during that time period). For incorporation of other projects into the model, something must be known regarding the type of action and timing. This information was not available at the time of modelling.

For the Coppabella Mine, the mining operations are simulated by applying the maximum depth of mining from operations to date across the entire footprint of the mine. This approach does not account for potential future expansions (if any) outside of the current mine footprint.

Arrow Energy's proposed CSG field has not been factored in to our numerical model due to following factors:

- the lack of information on project timing, and the fact that the CSG project is currently on hold;
- there are no areas of planned high density CSG production wells within 15 kilometres of the Project area; and
- modelling presented in the Arrow EIS indicates that, even in a highly conservative scenario considering all potential future water users, drawdown will not propagate to the MRA2C Project area.

However, the results from numerical modelling conducted by Arrow as reported in the EIS are considered in our discussion of potential impacts to environmental values of groundwater.

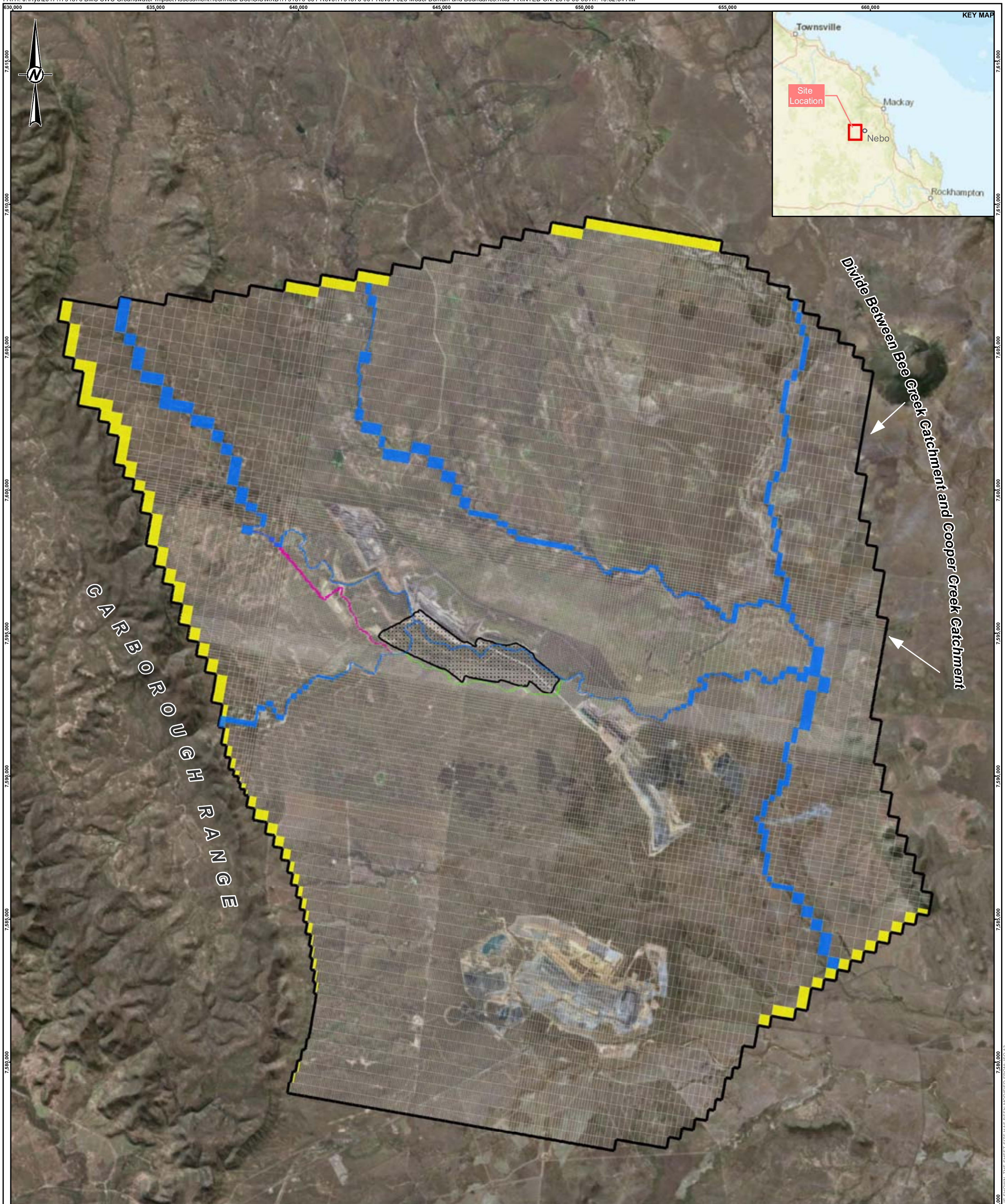
### 6.4.2 Numerical Model Configuration

The groundwater model configuration is shown in plan view in Figure 26. The model grid is rotated approximately 10 degrees from north to align the model cells with the general orientation of the MRA2C mine plan, to allow finer model discretisation in the area of planned mining. The model domain is 30 km long (north – south) and 25 km wide (east – west) and covers an area of approximately 750 $km^2$. The model grid comprises 204 rows, 332 columns and 7 layers (395976 total active cells). The cell size varies across the model domain from a refined grid of 25 meters within the mining area to 400 meters at the model limits.

The boundary of the model has been defined based on the location of the topographical ridges and the expected regional flow lines of the shallow groundwater, and encompasses most of the Bee Creek catchment, excluding the upper reaches. Boundaries are as follows:

- The western boundary is assigned to the ridge line of the Carborough range, consistent with the location of the surface water catchment divide and the limits of the LeapFrog hydrostratigraphic model;
- The eastern boundary is aligned with the eastern limit of the Bee Creek catchment;
- The northern boundary is not assigned to a specific geographic feature, but cuts across several catchments approximately 10 km from the mine domain; and
- The southern model boundary was initially aligned with the ephemeral creek just south of Peak Downs Highway but was extended outward to the south to allow for the inclusion of the Coppabella Mine in model calibration and reduce potential boundary-induced effects to hydraulic heads during model simulations.

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F026-Model Domain and Boundaries.mxd PRINTED ON: 2018-06-08 AT: 10:32:34 AM




## LEGEND

- Model Domain Outline
- Model Grid
- General Head Boundary
- Existing River Boundary
- MRA2A River Diversion Alignment
- MRA2C River Diversion Alignment
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000
METRES

Scale: 1:125,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, AERIAL ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**MODEL DOMAIN AND BOUNDARIES**

CONSULTANT
GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | DC |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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## Model Layering

Each model layer is continuous across the model domain. The hydrogeological properties are assigned to represent hydrostratigraphic units, as shown in Table 10.

**Table 10: Hydrostratigraphic units and corresponding model layers**

| HSU | Model Layers | SURFACT Layer Type |
|---|---|---|
| Alluvium | 1 | LAYCON 3 – unconfined |
| Regolith | 1, 2 | LAYCON 3 – Variably confined/unconfined |
| Overburden | 3 | LAYCON 3 – Variably confined/unconfined |
| Main Seam 1 | 4 | LAYCON 3 – Variably confined/unconfined |
| Interburden | 5 | LAYCON 3 – Variably confined/unconfined |
| Main Seam 2 | 6 | LAYCON 3 – Variably confined/unconfined |
| Underburden | 3 to 7 | LAYCON 3 – Variably confined/unconfined |
| Spoil | 1 to 6 | LAYCON 3 – Variably confined/unconfined |

Model layering is shown in Figure 27. Where a specific lithology pinches out or is not present (e.g. coal seams north of MRA2C), the model layers are given a nominal thickness and assigned properties of the appropriate lithology.

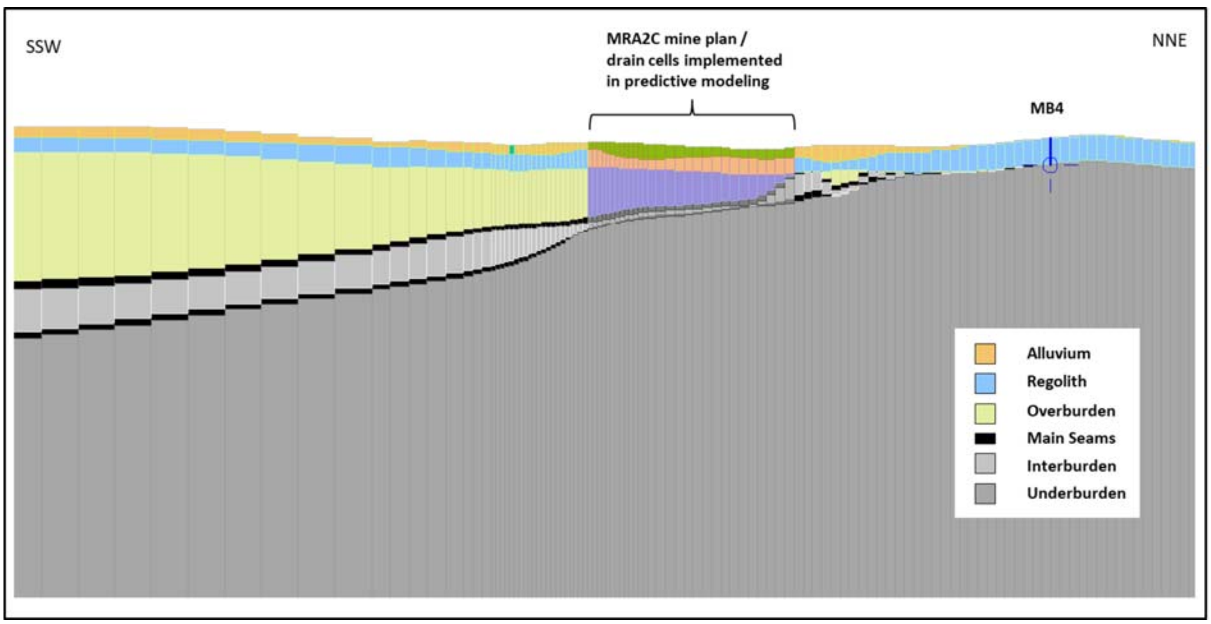



**Figure 27: Cross section showing model layering in central part of model column 179**

## Boundary Conditions

The boundary conditions applied to the model domain are shown in Figure 26 and summarised below.

- A general head boundary condition is prescribed along the parts of the northern and southern boundaries, where the boundaries follow expected regional equipotential lines. This general head boundary condition is assigned to all layers to represent regional flow in and out of the model domain. A head value of 247 mAHD is prescribed at a distance of 5500 m from the northern boundary, based on the groundwater level recorded at a registered bore RN162364. A head value of 165 mAHD is prescribed at a distance of 4700 m from the southern boundary, based on the groundwater level recorded at a registered bore RN13040112.

- A no flow boundary condition is prescribed where the boundary is located along assumed groundwater divides (no flow lines across the divides) and within the aquitards where the flow is assumed to be primarily vertical. A no flow boundary is prescribed to the bottom of the model domain, given the rock mass permeability is assumed to be very low at some depth (about 1000 m) below the lower seams. The downwards /upwards flow is restricted by the low rock mass permeability.
- Along the western edge of the model, a no flow boundary is assigned to the upper two layers to reflect that shallow unconfined groundwater flow is unlikely to cross the surface water divide defined by the Carborough Range. A general head boundary is assigned to deeper layers to allow regional flow in or out of the model domain in the deeper confined coal seam aquifer. The head values of the general head boundary are prescribed based on the calibrated heads along the edge.
- Uniform evapotranspiration (ET) is assigned to the top layer of the model using SURFACT's EVT package. Groundwater is extracted by ET only where the water tables lies above the prescribed ET extinction depth.
- Recharge is assigned to the uppermost active cells. ET and recharge have been estimated during model calibration and are discussed further in Section 6.4.3.
- River boundary conditions are assigned along the alignment of main creeks and are activated for certain stress period. The rate of leakage from the river cells is controlled by the prescribed elevations of river stage and bottom river bed and river conductance. River boundary conditions include the realignment of Walker Creek as part of the existing MRA2A diversion and MRA2C Project diversion (Figure 18).
- The effects of mining operations are simulated by assigning drain cells over the active mining area. The drain cells are activated for each pit at the starting of mining. The elevation of drain cells in each area is set a 0.1 m above the bottom of Main Seam 2, with a sufficient conductance to facilitate the water transfer.

### 6.4.3 Model Calibration

#### *Calibration Approach*

Model calibration involves changing model parameters within a model domain with the objective of matching the model outputs with historical observations. According to the Australian Groundwater Modelling Guidelines (Barnett *et al.* 2012), the following criteria are used to assess the model calibration quality:

- The Scaled Root Mean Squared (SRMS) error is less than 10% as an acceptable match between computed and observed heads;
- The model mass balance error is less than 1%;
- The hydrogeological parameters are realistic and within bounds of estimates derived from field investigations; and
- The model is consistent with the hydrogeological conceptual model.

#### *Calibration Targets*

The primary calibration targets are groundwater level data collected from the monitoring bores. The monitoring bores with available data used in model calibration are shown in Figure 28.

The number of monitoring events varies by bore, with historic data available since 2003. The period modelled for calibration extends from 2000 to 2018. The calibration period has been extended to start from 2000 to account for the response of the hydrogeological system to the cumulative effects of rainfall-derived recharge prior to the start of monitoring and to better take into account the effects of mining prior to the start of monitoring.

### Calibration Process

Calibration of the model was made using manual adjustment of parameter values until a good match between modelled and observed values was achieved. Adjustments to parameter values during model calibration were limited to the range of parameters derived specifically from:

- Field testing, where available; and
- Literature values from similar sites and previous studies.

The range of hydraulic property values used in model calibration are summarised in Section 4.3.

Hydraulic properties of all units were varied within the range of values measured during field testing to achieve a representative best fit to observed values. Many parameters have little to no effect on model calibration results. Several properties were observed to affect model calibration, as follows:

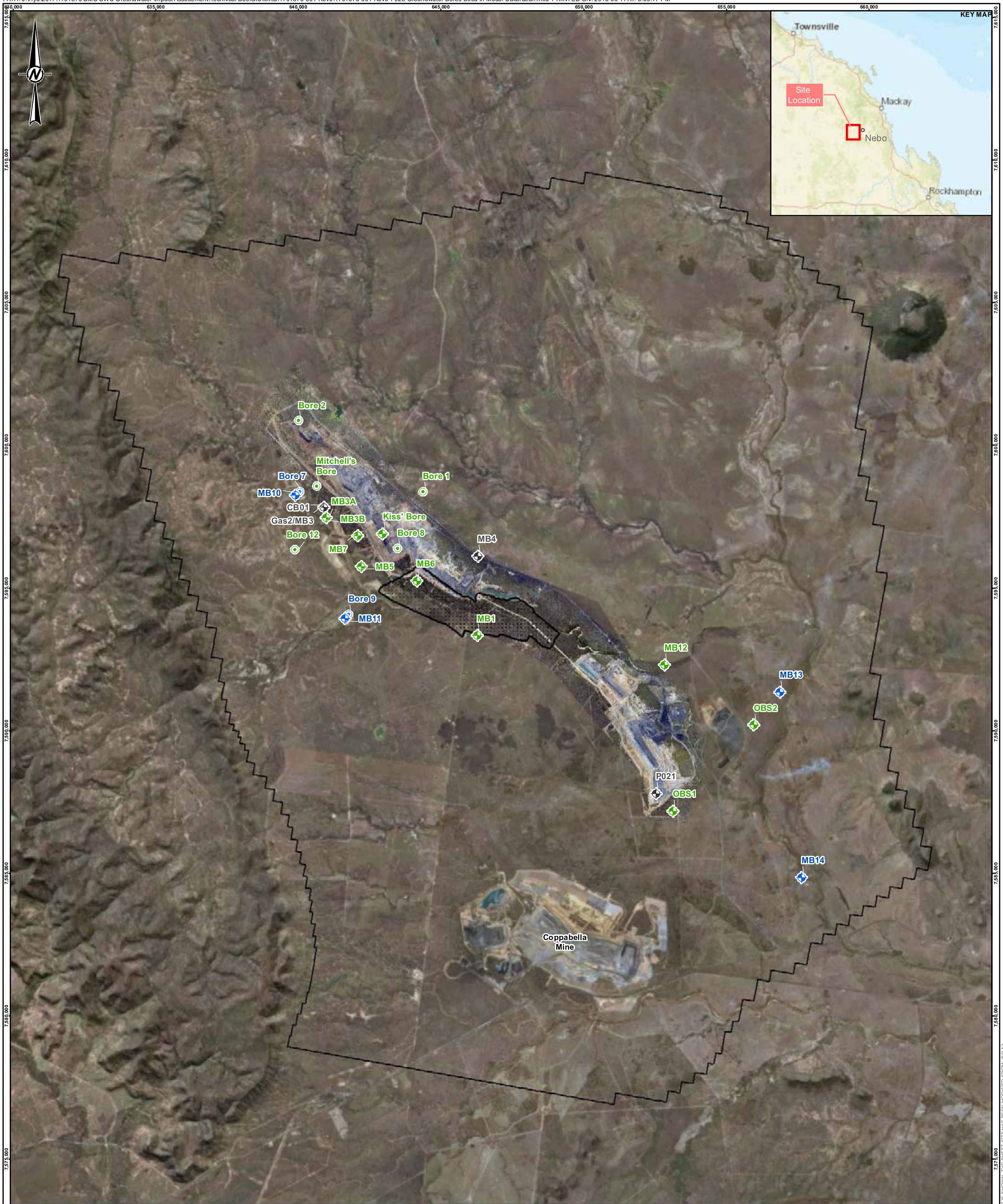
- Recharge, including assumptions about the level of precipitation needed to generate groundwater recharge;
- Hydraulic conductivity of alluvium;
- Hydraulic conductivity of the regolith;
- Hydraulic conductivity of coal seams;
- Specific yield of alluvium and regolith; and
- Specific storage of the coal seams.

During the simulations, the value of hydraulic conductivity, the recharge rate and specific yield were manually altered within representative ranges to guide the model calibration. During each adjustment of the model parameters, parallel runs were set up to assess results for a range of possible parameters values, e.g. three runs were set up with $S_y$ of the regolith set at 0.04, 0.8, and 0.12 and run simultaneously to evaluate the impact of a range of conditions on model performance.

During model calibration, the applied recharge was varied on a monthly basis by using monthly rainfall data records. As discussed in Section 4.5, due to interception of rainfall by dry soils and subsequent evaporation from soil layers, recharge events are likely to occur only in response to events of a sufficient magnitude. In estimating the recharge rates, a base case was applied – the first 60 mm of rainfall in each month is disregarded. The monthly recharge rate is then calculated as 1% of monthly rainfall available to recharge. This threshold was adjusted up and down during calibration, with a final calibrated threshold value of 90 mm. The annual recharge rates for the calibration period range from 0 to 79 mm/year, with an average of 3 mm/year, which is equivalent to 0.5% of annual rainfall during the overall calibration period. The 0.5% percentage of long term average rainfall is used for the transient forward simulations. This is consistent with estimates at other sites in the Bowen Basin (Arris, 2017).

The river boundary conditions are assigned along the alignment of main creeks and are only activated for stress periods when rainfall exceeds the calibrated threshold level, and groundwater recharge is active in the model based on the monthly rainfall data.

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F028-Groundwater Bores Used in Model Calibration.mxd PRINTED ON: 2018-06-11 AT: 3:50:17 PM




## LEGEND

**Groundwater Bore Location**

**Screened Formation, Bore Owner**

- Alluvium, Bores Monitored by BMC
- Alluvium, Unregistered Landholder Bore
- Coal Seam, Bores Monitored by BMC
- Overburden, Spring
- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore
- Model Domain Outline
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:125,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

REFERENCE(S)
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, USGS, INTERMAP, INCREMENT P CORP., NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI (THAILAND), MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, AERIAL ORTHOPHOTO, CALIBRATION BORE LOCATIONS: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**GROUNDWATER BORES USED IN MODEL CALIBRATION**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | DC |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 28 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

### Calibrated Parameters

The calibrated hydrogeological properties are summarised in Table 11. The calibrated values are consistent with the results of hydraulic testing and the literature-derived range of values for representative lithology of each parameters (Section 4.3).

It is noted that the model is based on constant, layer-wide parameter values for each of the model layers/HSUs. For some parameters, field testing indicates a relatively wide range of parameters for the individual HSU, and thus the use of single, layer-wide values for parameters is a simplification with the potential to pose challenges for calibration. However, there is insufficient monitoring and testing data available to provide a basis for development of a model with spatially variable parameters.

**Table 11: Calibrated Hydrogeologic Properties**

| | Horizontal conductivity [m/day] | Vertical conductivity [m/day] | Specific Yield |
|---|---|---|---|
| Alluvium | 10 | 0.1 | 0.25 |
| Regolith | 0.6 | 0.06 | 0.075 |
| Overburden | $1\times10^{-4}$ | $1\times10^{-5}$ | 0.01 |
| Main Seam 1 | 0.03 | 0.003 | 0.05 |
| Interburden | $1\times10^{-4}$ | $1\times10^{-5}$ | 0.01 |
| Main Seam 2 | 0.03 | 0.003 | 0.05 |
| Underburden | $1\times10^{-4}$ | $1\times10^{-5}$ | 0.01 |
| Spoil | $8.64\times10^{-2}$ | $8.64\times10^{-3}$ | 0.4 |

The following key parameter adjustments were made to starting properties during model calibration:

- Hydraulic conductivity is increased from 0.2 to 0.6 m/day for Regolith. Results of pumping tests in this unit report four K values above 0.6 m/day, five values below 0.6 m/day, and two similar values, so this value is consistent with field-derived K values.
- The vertical hydraulic conductivity of the Alluvium is reduced to 0.1, resulting in horizontal-vertical anisotropy of 100, consistent with reported ranges for sedimentary deposits of mixed composition.
- The horizontal and vertical hydraulic conductivities of coal seams are reduced to 0.03 and 0.003 m/day, respectively.
- The specific yield of Alluvium and Regolith are increased to 0.25 and 0.075, respectively, consistent with typical reported ranges for unconfined sedimentary aquifers.

As discussed by AGE (2015), there is a lack of field test data on Sy values of alluvium and regolith in the Bowen Basin. AGE considered the following literature values as reference points for Sy of alluvium:

- 0.5 – 0.25 CDM Smith, 2013
- 0.27 – Kruseman & de Ridder, 1992
- 0.25 – AGE 2006.

The calibrated Sy value in this study for regolith 0.075 (7.5%) is slightly higher than typical studies for the Bowen Basin. Typical values of Sy applied to the water table aquifer in studies in the Bowen Basin range from 0.001 to 0.05 (or 0.1%-5%) for regolith and up to 25% for alluvium (Age, 2015; Arris 2017, CDM, 2013). However, as acknowledged in each of these studies, field test data are not available to support the selected storage values. Recent studies refer to earlier studies, which in turn made assumptions regarding likely Sy values or relied on estimates from literature values.

The higher calibrated Sy value for regolith is consistent with other hydraulic properties (K values) from field testing of Project bores screened in this unit. The K values determined from field testing are elevated compared to typical K values of materials with very low specific yields and may be inconsistent with materials that have Sy < 5% (i.e. clay). This provides indirect evidence that Sy values are likely higher at this site.

### *Calibration Statistics*

Figure 29 presents a scatter plot of observed against computed groundwater levels. The average root mean square (RMS) error is 2.58 m with an overall SRMS error of 4.1%. As shown in Figure 29, the model is well-calibrated for both the water table aquifer (represented by bores screened in Alluvium and Regolith) and the confined coal seam aquifer (bores screened in the main seam).

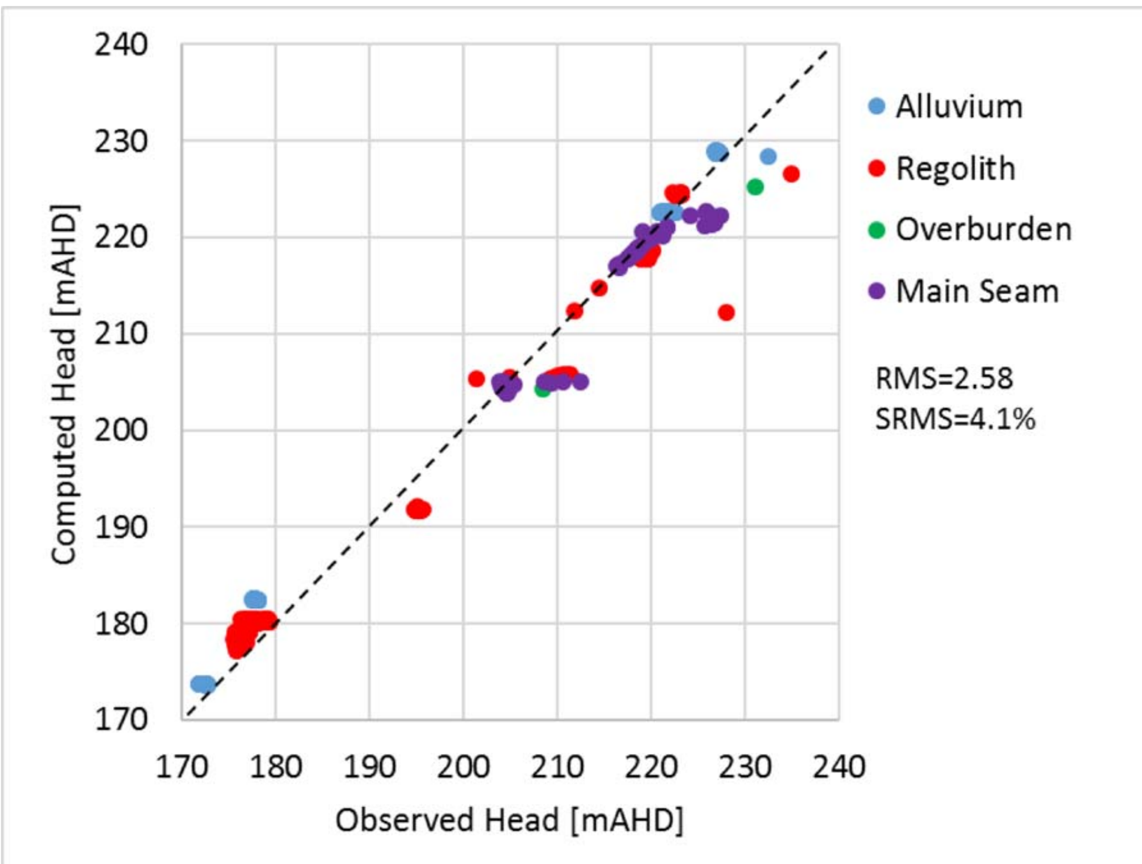



**Figure 29: Model Calibration - computed vs. observed head.**

### *Model Water Balance*

The cumulative mass balance for the calibration period (2000-2018) is presented in Table 12. Mass balance error is less than 1% for all stress periods.

**Table 12: Cumulative water balance through calibration period**

| Component | Cumulative water balance | |
|---|---|---|
| | **Inflow (ML)** | **Outflow (ML)** |
| Recharge | 32,194 | 0 |
| River | 28,738 | 0 |
| Drains (pit inflows) | 0 | 40,862 |
| Evapotranspiration | 0 | 2,668 |
| Through flow (GHB) | 6,477 | 2,234 |
| Storage | 64,006 | 85,656 |
| Total | 131,416 | 131,421 |

### 6.4.4 Overall Quality of Transient Calibration

In addition to the calibration statistics discussed above, the quality of model calibration has been assessed in terms of the qualitative match between the model, and behaviour of interest (for example, drawdown as a result of mining). Figure 30 compares computed and observed bore hydrographs at key monitoring locations in the water table aquifer. The water table at these locations is influenced by both long-term rainfall trend and potentially by the depressurisation caused by Kemmis, Mulgrave, Carborough and Toolah Pits.

At OBS1, the overall declining trend which is interpreted to be caused by drainage to the adjacent Toolah Pit (refer to Section 4.6.1) has been replicated well although the computed water table is about 2 m higher than the observed water table. The drawdown calculated by the model is slightly greater than that assessed to have occurred based on the observation data (refer to Section 4.6), indicating conservatism in relation to this prediction.

The modelling results indicate that drawdown at MB6 as a result of mining would have occurred within approximately 5 years of the commencement of mining, and as discussed in Section 4.6.1, the decreasing trend in groundwater level at this location over the period of monitoring is interpreted to represent lowering of the water table following a temporary increase in level associated with the preceding period of higher than average rainfall. At MB7, the trend in groundwater level predicted by the model matches the observed trend. The model indicates that approximately 4 m of drawdown may have occurred at MB7 since the start of mining for the Kemmis Pit.

At MB12, the model predicts relatively constant groundwater levels over the period of monitoring, which is similar to the observed behaviour. The model indicates that no groundwater drawdown has occurred in the unconfined aquifer as a result of mining in this area (mining in the adjacent Walker Pit commenced in 1996, and mining in the adjacent Carborough Pit commenced in 2008).

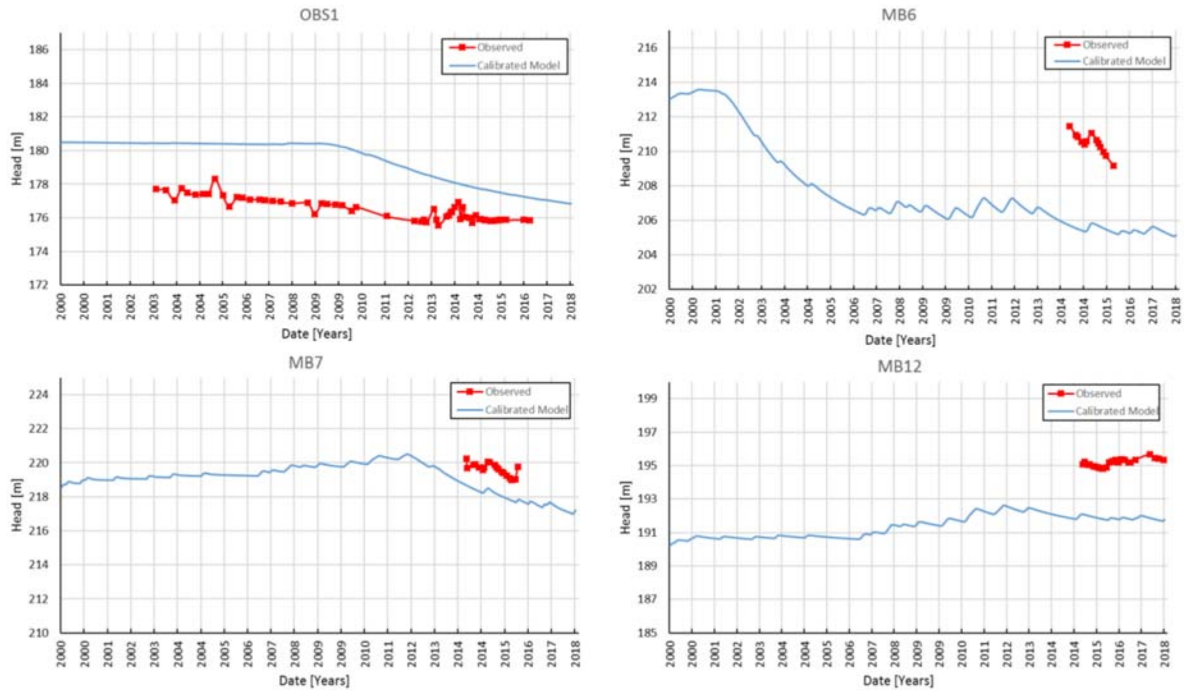



**Figure 30: Model predicted vs. observed water levels – water table aquifer**

MB4 and CB01 are screened in the confined Main seam. Figure 31 shows the modelled drawdown of the piezometric head and the observed head for MB4 and CB01. MB4 is sitting eastern side of the MRA2C pit towards the edge of the main seam near to where it pinches out (Figure 27), and it appears that drawdown may have occurred prior to the start of the monitoring record for this bore, as discussed in Section 4.6. MB4 shows strong fluctuations in groundwater levels in 2013, which are larger than the magnitude of temporal variations observed in other monitoring bores. This temporary spike at MB4 could be anomalous (potentially caused by leakage of surface water at the well head) and is not considered to be representative of aquifer response. Kemmis Pit started operation in 2012, and the associated coal seam dewatering process has been monitored by bore CB01, which is about 1.2 km away from the active pits. The drawdown at CB01 has been well replicated by the model.

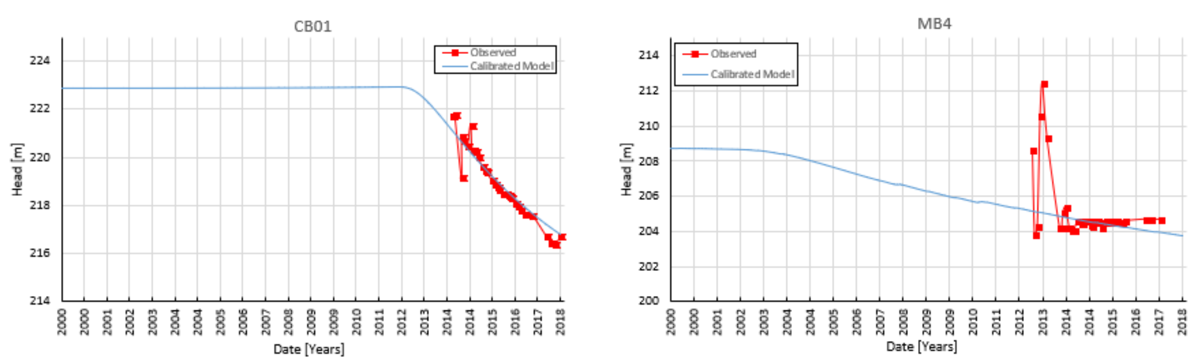



**Figure 31: Model Predicted vs observed water levels -confined coal seam aquifer**

The bore hydrographs indicate that the model is behaving in a manner consistent with the observed groundwater levels and the current hydrogeological conceptualisation. Appendix B presents hydrographs comparing modelled and observed heads for all monitoring bores.

### 6.4.5 Model-computed Head Contours

Figure 32 and 33 present the hydraulic head contours for the water table aquifer and the confined coal seam aquifer respectively at the end of the transient model calibration. Most of the model cells in layer 1 are dry, so the contours for the water table aquifer are based on layer 2.

The water table in the water table aquifer mimics topography, with shallow groundwater flowing towards topographic low points that include existing mine pits and creeks, consistent with the hydrogeological conceptualisation. Drawdown in the water table aquifer is limited to the area immediately surrounding open pits – consistent with monitoring data as discussed above.

In contrast, the hydraulic head contours in the confined coal seam aquifer propagate further from the void boundaries and have a relatively flatter hydraulic gradient in comparison to the steep hydraulic gradient in the water table aquifer.

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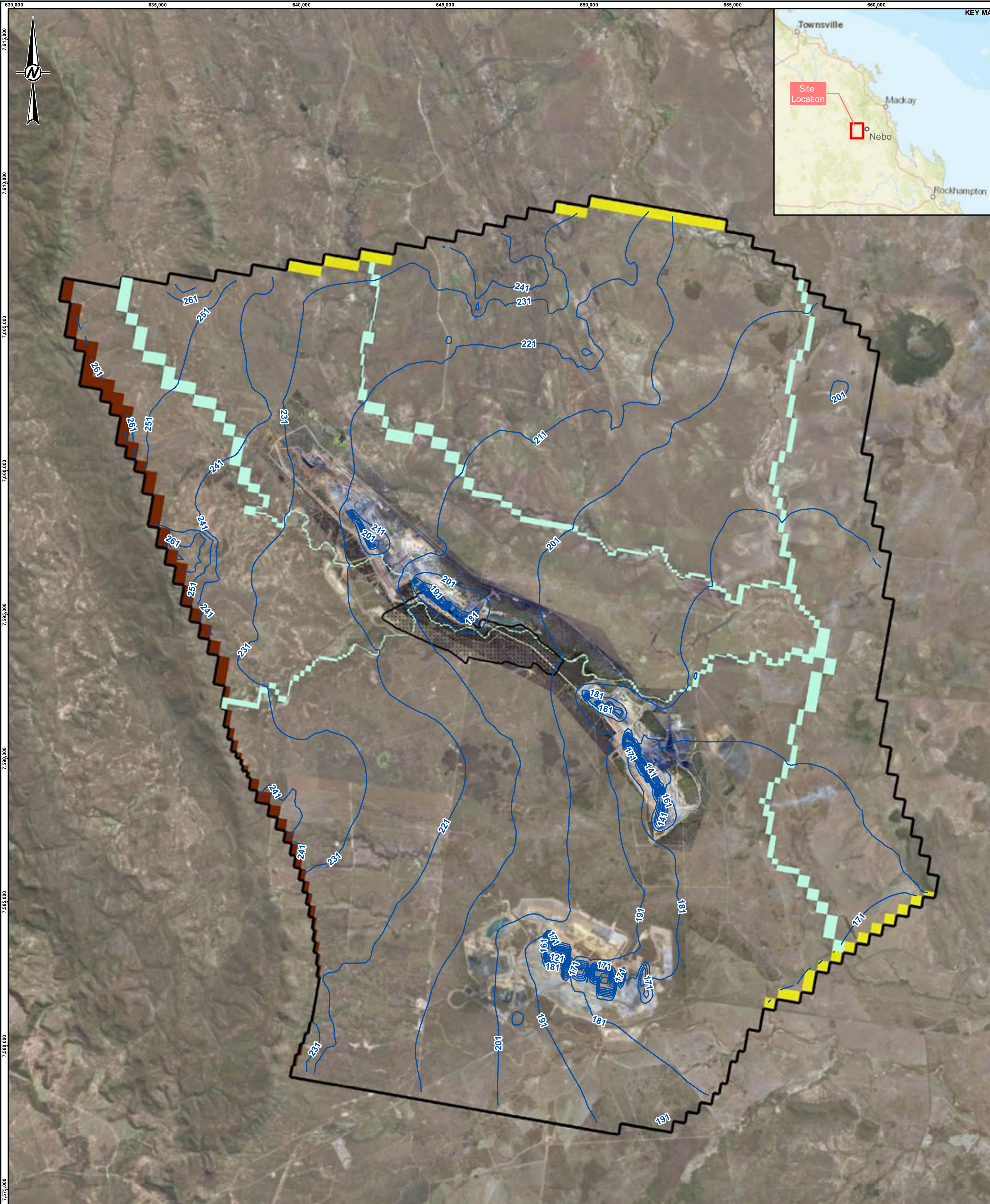


## LEGEND

- Hydraulic Head - Unconfined Aquifer (m AHD)
- Model Domain Outline
- No Flow Boundary
- General Head Boundary
- Existing River Boundary
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:125,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**GROUNDWATER CONTOURS IN WATER TABLE AQUIFER - TRANSIENT CALIBRATION**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 32 |

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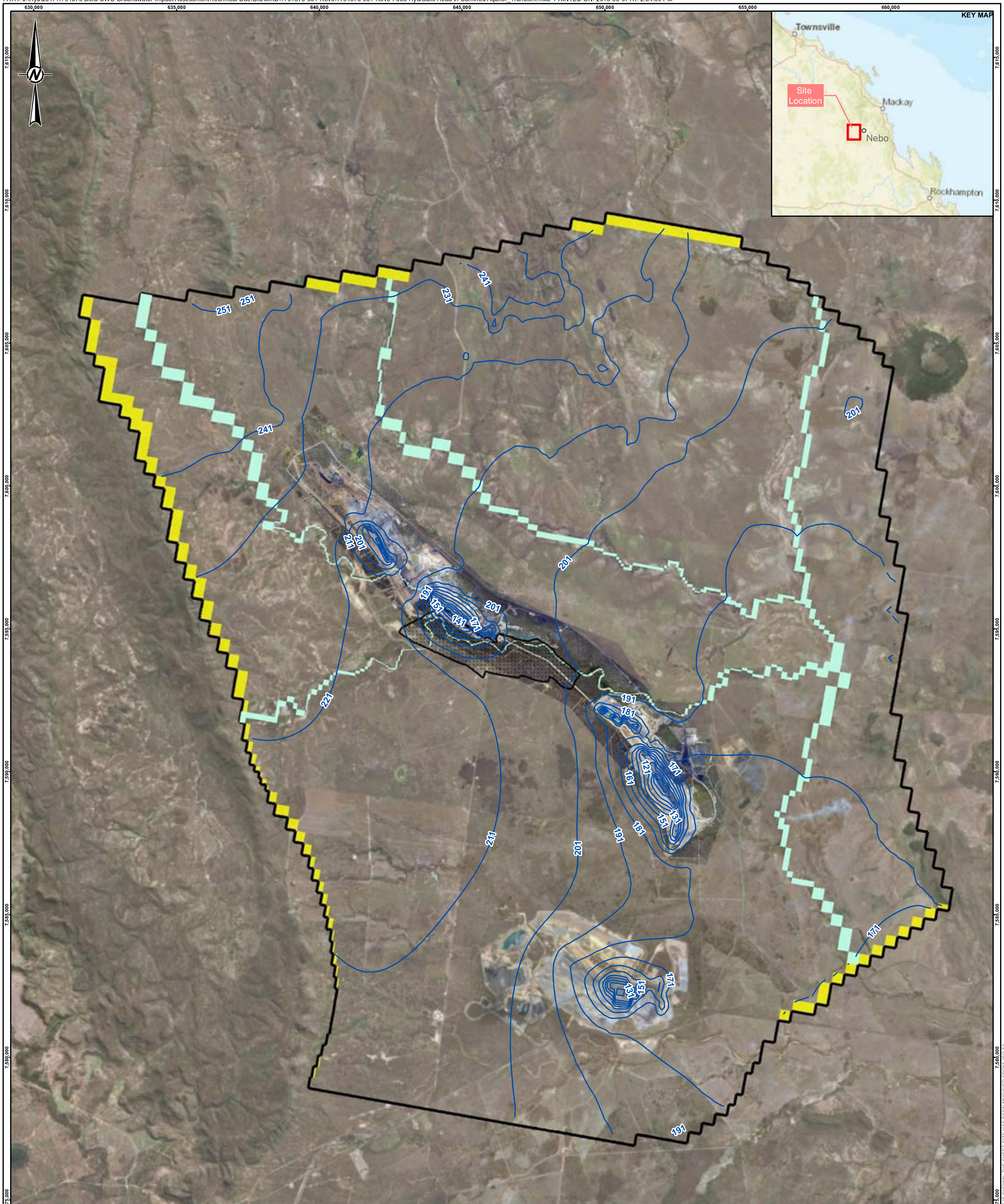
25mm

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F033-Hydraulic Head in Confined Aquifer_Transient.mxd PRINTED ON: 2018-06-07 AT: 2:54:09 PM




**LEGEND**

- Hydraulic Head - Confined Aquifer (m AHD)
- Model Domain Outline
- General Head Boundary
- Existing River Boundary
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:125,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MINE PLAN, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**HYDRAULIC HEAD IN CONFINED AQUIFER - TRANSIENT CALIBRATION**

CONSULTANT

GOLDER

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|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 33 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

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### 6.4.6 Confidence Level Classification

The groundwater modelling has been undertaken in a manner consistent with the Australian Groundwater Modelling Guidelines (Barnett *et al.,* 2012). The Australian Groundwater Modelling Guidelines builds on the Murray Darling Basin Commission Groundwater Flow Modelling Guideline (MDBC, 2001) and has the concept of “model confidence level”, which is defined using a number of modelling criteria. These criteria relate to data availability, design, calibration and performance (predictions). A summary of model confidence class characteristics, taken from NWC 2012, is provided in Table 13.

**Table 13: Groundwater model confidence level classification**

| Class | Data | Calibration | Prediction | Indicators |
|---|---|---|---|---|
| **1** | Not much.<br>Sparse.<br>No metered usage.<br>Remote climate data. | Not possible.<br>Large error statistic.<br>Inadequate data spread.<br>Targets incompatible with model purpose. | Timeframe >> calibration<br>Long stress periods.<br>Transient prediction but steady-state calibration.<br>Bad verification. | Timeframe > 10x<br>Stresses > 5x<br>Mass balance > 1% (or single 5%)<br>Properties <> field measurements<br>Bad discretisation.<br>No review. |
| **2** | Some.<br>Poor coverage.<br>Some usage info<br>Baseflow estimates | Partial performance.<br>Long-term trends wrong<br>Short time record.<br>Weak seasonal replication.<br>No use of targets compatible with model purpose | Timeframe > calibration<br>Long stress periods.<br>New stresses not in calibration.<br>Poor verification. | Timeframe 3-10x<br>Stresses 2-5x<br>Mass balance < 1% (or single 5%)<br>Some properties <> field measurements.<br>Some key coarse discretisation, Review by hydrogeologist |
| **3** | Lots.<br>Good aquifer geometry.<br>Good usage info.<br>K measurements.<br>High-resolution DEM | Good performance statistics, Long-term trends replicated.<br>Seasonal fluctuation reproduced,<br>Present day data targets, head and flux targets. | Timeframe ~ calibration.<br>Similar stress periods.<br>Similar stresses to those in calibration.<br>Steady-state prediction consistent with steady state calibration.<br>Good verification | Timeframe <3x<br>Stresses <2x<br>Mass balance < 0.5%<br>Properties ~ field measurements.<br>Some key coarse discretisation.<br>Review by modeller. |

The groundwater model developed for the MRA2C Project is considered to have some characteristics of Class 2 models, and some of Class 3 models. The aquifer geometry is well established from exploration bores and mining activities. The model is adequately calibrated to the available (albeit limited) data and reproduces important long-term trends as well as some aspects of seasonal fluctuations. The key indicator of Class 2 confidence is the long timeframe for operational predictions that is 3-10x the duration of the calibration period (18 years). Indicators of Class 3 confidence include the mass balance, properties within field measurements, and review by a modeller (a BHP modelling lead not involved with the Project).

The time frame of prediction exceeds the period for which calibration data are available. For these reasons, the model is considered to have an upper Level 2 confidence level classification.

## 6.5 Forward simulation of the Proposed South Walker Creek Mine Development

### 6.5.1 Simulation set up and approach – Life of Mine

The predictive simulation is based on the current mine layout and sequence shown in Figure 3. The mining is simulated using yearly stress periods for the MRA2C pits, with a total of 50 stress periods over the 50-year mining sequence. For other active pits, the progress of mining is simulated in 10-year blocks. Drain cells are implemented in the current model to simulate the mine dewatering process. Drainage to the pits/dewatering is simulated by applying active drain cells to the open void at elevations corresponding to planned mining depths. The activation sequence of the drain cells is based on the mining plan.

During the life of mine simulation, additional drain cells are added as mining progresses, but previous drain cells are not turned off. This simulates progressive coal extraction without backfill, and it considered to be provide a conservative estimation of water level drawdown and maximum impact. It would be possible to produce a less conservative estimation of drawdown by simulating backfilling of the pit as mining progresses, but details of backfill timing and material properties would be required.

The predictive forward simulation period starts at the beginning of 2018, using the heads from the last time step of the calibration period as the initial condition starting head.

The locations of the river boundary have been modified based on the proposed alignment of the planned MRA2C diversion (Figure 26). Details of the planned diversion alignment and streambed properties were selected based on the report by Alluvium Consulting (2018). Rather than increasing the number of stress periods required and representing the transient variations in head condition in the river boundary is the same manner as was done for the calibration period, the river boundaries are set to be active for the whole predictive simulation period. As the leakage from the creeks are expected to occur only during the wet months (typically from December to April), the river conductance has been reduced accordingly to simulate an average steady leakage rate similar to the average of the episodic river leakage in the calibration model. Alluvium Consulting (J. Carter, personal communication) have indicated that the diversion is designed to mimic the original streambed conditions, and similar amounts of infiltration are expected. Similarly, a constant aerial recharge rate (3 mm/year) is applied to the predictive model, based on the long-term average rainfall. A constant evapotranspiration rate has been set at a maximum rate of 800mm/year with an extinction depth of 3 m.

### 6.5.2 Simulation Results – Life of Mine

Figure 34 presents the contours of maximum predicted drawdown[1] of the water table in the unconfined aquifer at the end of mining (EOM) activities for the model domain. Figure 35 shows the same results at a different scale, with focus on the MRA2C Project region. The extent of drawdown extends about 2 km away from the void to the southwest, which is about 1.5 km past the mining lease boundary, and about 2km away from the void to the northeast except where the northeast boundary of the MRA2C pit is coincident with the existing Mulgrave Pit.

The leakage from the diverted section of the creek is predicted to partially offset drawdown to the south of MRA2C. However, the change in the alignment of Walker Creek from its current alignment to the diverted location does not materially affect groundwater contours for two reasons: 1) creek leakage is episodic and limited to wet periods, and 2) the re-aligned creek is losing water to the same general section of the alluvial aquifer, albeit slightly to the south of the original location.

[1] For this figure and other figures that follow, drawdown has been calculated relative to the heads in the steady-state model calibration, which is an estimate of the pre-mining water levels. Actual water levels for the pre-mining condition are not available.

In order to separate out drawdown due to the Coppabella Mine operation, analyses were carried out for cases with and without the Coppabella Mine. Results of these simulations indicate that the Coppabella Mine is too far from the MRA2C operations to impact on drawdown contours in the area of the MRA2C development.

Figure 36 presents the contours of maximum predicted drawdown for the confined coal seam aquifer. Figure 37 shows the same results at a different scale, with focus on the MRA2C Project region.

Drawdown is greater where the coal seam is deeper, with relatively steep hydraulic gradients along the edge of the pit. The predicted drawdown extends approximately 6 km from the active mine areas to the southwest and reaches the western model boundary. The extent of drawdown to the northeast is limited by the extent of the coal seam aquifer which outcrops to the northeast.

Figure 38 illustrates the relationship between drawdown in the water table aquifer at the end of mining and the mapped extent of Black Ironbox near the Project, albeit that as discussed in Section 5.1.2, it is not considered to be groundwater dependent. Along this stretch of the creek, the water table aquifer is on average 10-12 mbgl. At the closest point, the water table is predicted to be approximately 8 m below the base of the creek.

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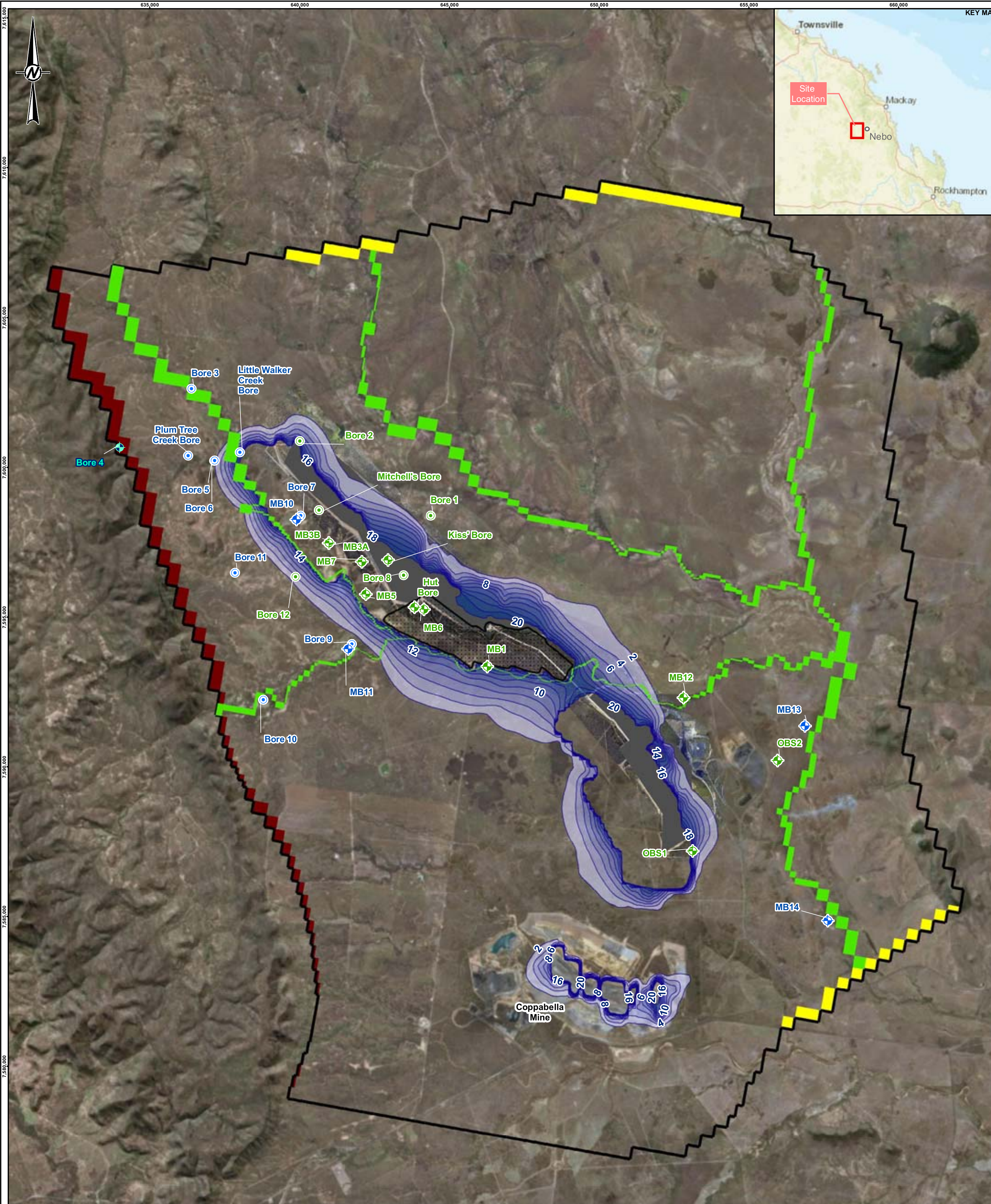


## LEGEND

**Groundwater Bore Location**

**Screened Formation, Bore Owner**

- Alluvium, Bores Monitored by BMC
- Alluvium, Unregistered Landholder Bore
- Overburden, Spring
- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore

- Drawdown in Water Table Aquifer (m AHD)
- Model Domain Outline
- MRA2C Project
- General Head Boundary
- No Flow Boundary
- River Boundary
- Existing Pit Location

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:120,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, ORTHOPHOTO, CALIBRATION BORE LOCATIONS: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN THE WATER TABLE AQUIFER - EOM SIMULATION**

CONSULTANT

GOLDER

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|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 34 |

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25mm

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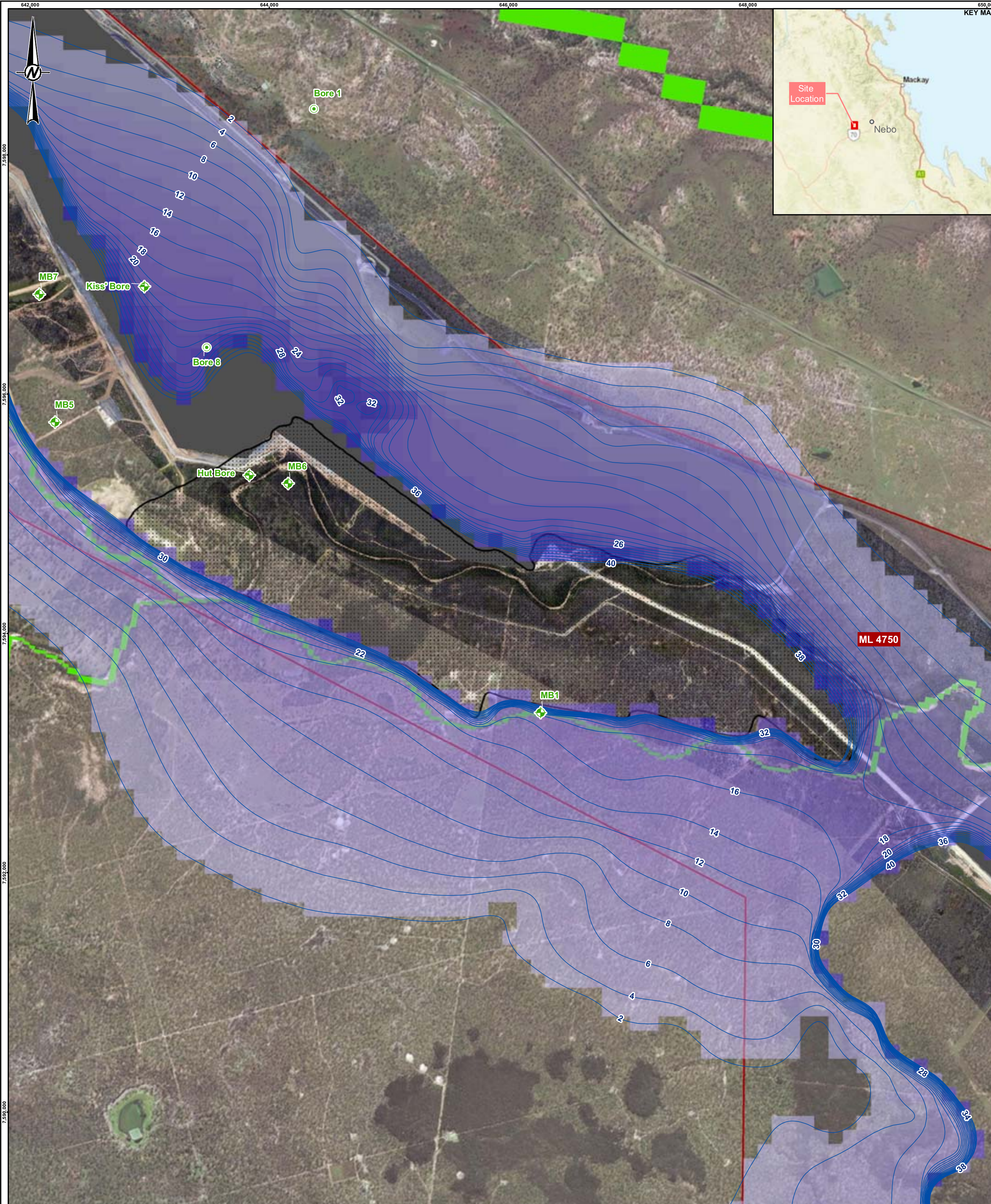


**LEGEND**

**Groundwater Bore Location**

**Screened Formation, Bore Owner**

- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore
- Drawdown in Water Table Aquifer (m AHD)

- MRA2C Project
- River Boundary
- Existing Pit Location

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Scale: 1:30,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, ORTHOPHOTO, CALIBRATION BORE LOCATIONS: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN THE WATER TABLE AQUIFER NEAR MRA2C - EOM SIMULATION**

CONSULTANT
GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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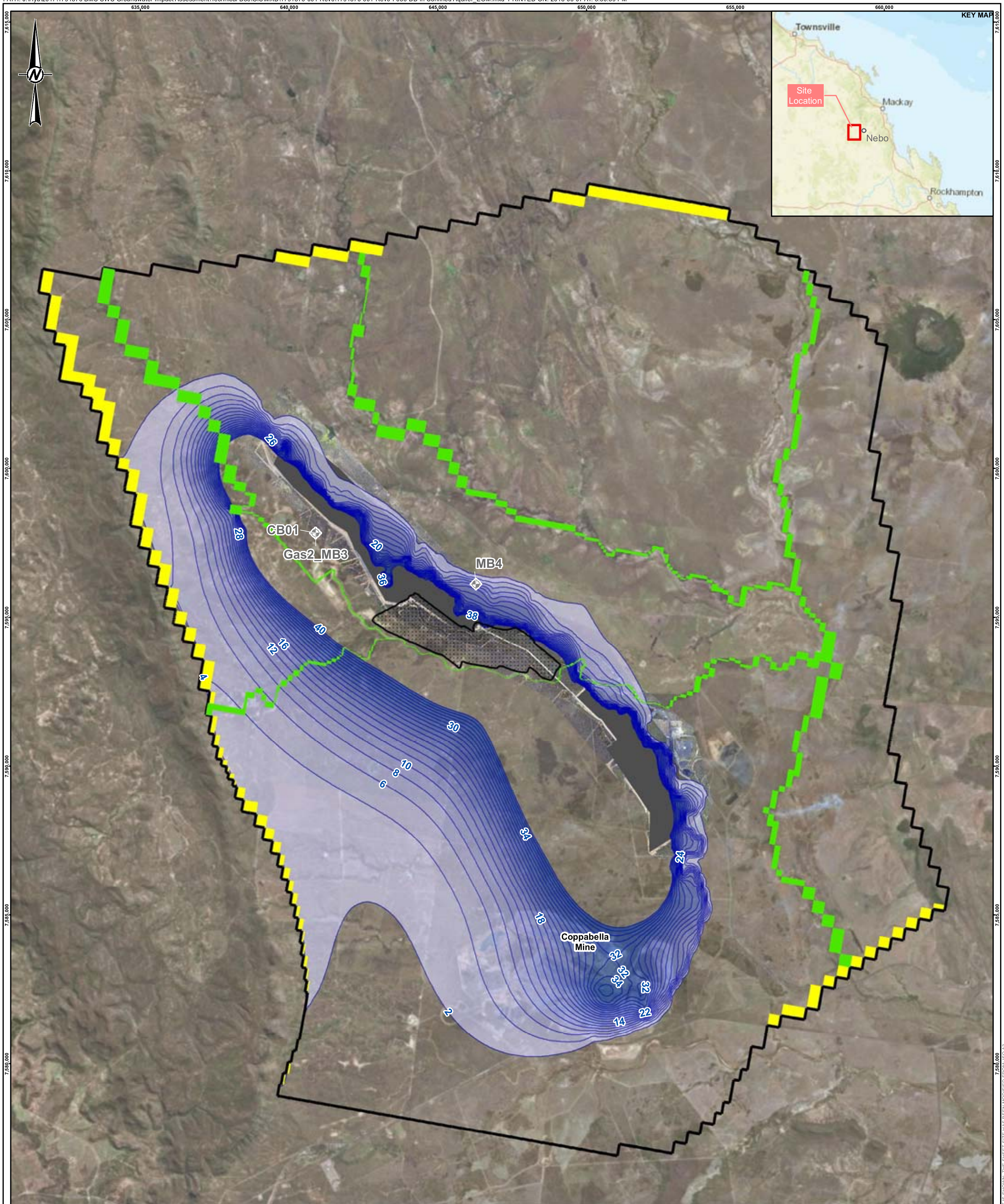


## LEGEND

**Calibration Bore Location**

*Screened Formation*

- Coal Seam
- Drawdown in Confined Aquifer (m AHD)
- Model Domain Outline
- River Boundary
- General Head Boundary
- MRA2C Project
- Existing Pit Location

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:120,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, ORTHOPHOTO, CALIBRATION BORE LOCATIONS: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN THE CONFINED AQUIFER - EOM SIMULATION**

CONSULTANT
GOLDER

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| DD/MM/YYYY | 6/06/2018 |
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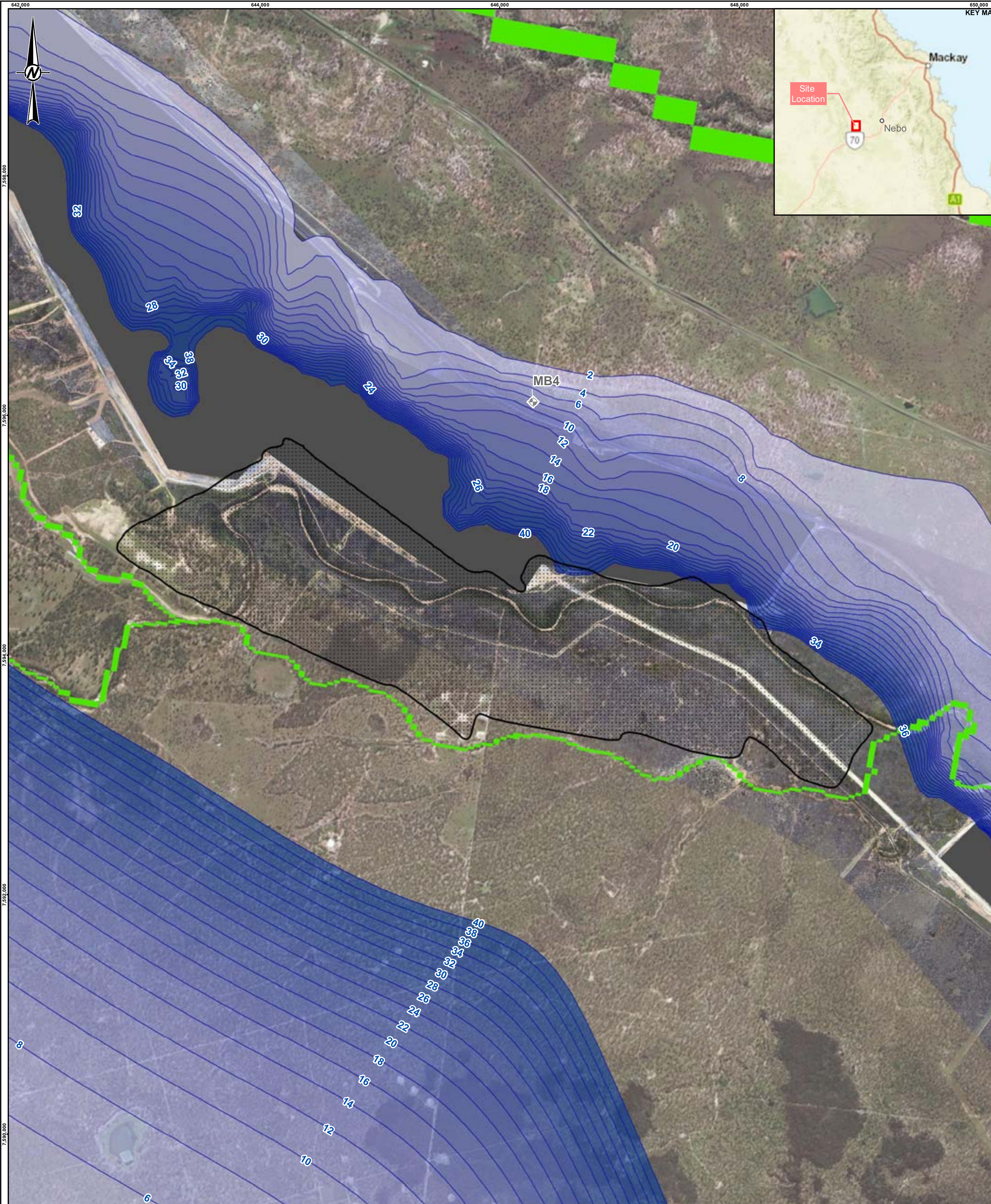


**LEGEND**

**Calibration Bore Location**

*Screened Formation*

- Coal Seam
- Drawdown in Confined Aquifer (m AHD)
- River Boundary
- General Head Boundary
- MRA2C Project
- Existing Pit Location

0 1,000 2,000

Scale: 1:30,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, CALIBRATION BORE LOCATIONS, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN THE CONFINED AQUIFER NEAR MRA2C - EOM SIMULATION**

CONSULTANT

GOLDER

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| DD/MM/YYYY | 6/06/2018 |
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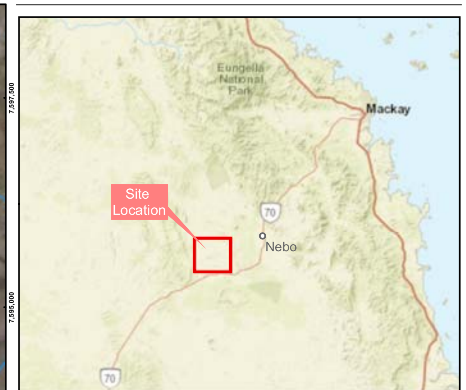


**LEGEND**

**Calibration Bore Location**

*Screened Formation*

- Alluvium

Watercourse

- Major
- Minor

Drawdown in Unconfined Aquifer (Basecase)

Black Ironbox Recorded Occurrence along Creek Lines

Model Domain Boundary

MRA2C Project

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 250 500 1,000 1,500 2,000 2,500
1:60,000 @ A3 METRES

**REFERENCE(S)**

1. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. MRA2C Proposed Pit Area, Calibration Bore Data: BHP, January 2018
3. Watercourses: © State of Queensland (Department of Natural Resources and Mines) 2017
4. Black Ironbox Occurrence: Ecological Australia, 2017. "Mulgrave Stage 2C Ecological Impact Study, Assessment of Matters of National Environmental Significance", prepared for BHP Billiton, 24 October 2017.

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**LOCATION OF BLACK IRONBOX RELATIVE TO DRAWDOWN IN THE WATER TABLE AQUIFER - EOM SIMULATION**

CONSULTANT

GOLDER

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|---|---|
| YYYY-MM-DD | 8/06/2018 |
| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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| 1791876 | 001 | 0 | 38 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

### 6.5.3 Simulation set up and approach – Post-operations (closure)

Once mining operations cease, dewatering will not be required and a slow recovery in groundwater levels in the area will occur. The last strip on the mine to remain open will be oriented northwest-southeast; the final voids will remain open along the southwestern edge of the mine footprint, with an open area of approximately 6 $km^2$ that is up to approximately 175m deep.

The system with the final voids will, over time, achieve a new dynamic-equilibrium. The rate of groundwater recovery, and potential pit lake formation, will be governed by inflows from groundwater, direct precipitation into the void, surface water runoff (controlled or uncontrolled), and losses from the lake surface due to evaporation.

Alluvium Consulting Ltd. (2018) modelled the conditions of the final void in F pit, post-closure, and concluded that during the post-closure period a pit lake is unlikely to form as evaporation rates are significantly higher than rainfall and surface water flows, and inflows never exceed outflows, even with consideration of groundwater inflows. [Alluvium Consulting's assessment considered groundwater inflows based on flux estimates from groundwater modelling conducted as part of this study].

Groundwater modelling was undertaken to simulate post-closure conditions and, explicitly, to evaluate groundwater recovery timeframes and potential extent of long term residual drawdown. Void conditions were simulated considering direct precipitation, groundwater inflow, and evaporation. Groundwater modelling assumes no pit lake formation in accordance with the results of Alluvium's work; as such, the pit remains a groundwater sink indefinitely, and the estimated water level recovery is conservative.
The predictive simulation for the post-operational period is structured as follows:

- The post-operations simulation uses the final heads from the last timestep of the predictive EOM scenario as the starting head for the post-closure recover simulation.
- The simulation period is 200 years after the end of mining.
- The waste rock backfill/spoil areas are represented with a hydraulic conductivity of 0.0864 m/day and specific yield of 0.4 (Fityus and Wells, 2008), with an applied recharge value of 5% average annual rainfall.
- It is assumed that surface water runoff will be negligible as evaporation from the pit void significantly exceeds inflows and there aren't expected to be any permanent pit lakes (Alluvium, 2018).
- The final void elevations are represented directly in the model, with the model grid distorted in layers 1 to 5 to bring the top elevation of the model down to the level of the base of the pit where voids will be present.
- The direct rainfall (604 mm/year) is applied to the final voids. Morton shallow lake evaporation (2000 mm/year potential ×0.6 shadow factor) is used in the final voids with the extinction depth of 3 m.

The recovery model reports a low mass balance error, which is < 1%.
The post-operations recovery simulations include an allowance for rainfall recharge through backfilled materials (spoil) to groundwater. Assigned recharge values to spoil are higher than for undisturbed soil in recognition of the fact that disturbed materials are heterogeneous and uncompacted. As noted above, the recharge value was set at 5% for post-operations simulations. Because of the relatively high hydraulic conductivity of the backfill materials, water infiltrating into the backfill will flow relatively rapidly to the open voids.

Material properties for backfilled materials are highly dependent on the backfill method, any material segregation, consolidation over time, etc. The hydraulic properties of backfilled materials are likely to be highly heterogeneous and this allows a wide range of infiltration rates. To evaluate model sensitivity to the recharge rates applied to backfill, simulations were conducted at 5 %, 10% and 25 % of rainfall to assess the impacts of various recharge rate on the water level recovery in the final void. Results indicate that, even with 25% applied recharge, the total of groundwater inflow and direct rainfall inputs to the final voids is less than that rate of evaporation and a pit lake does not form.

### 6.5.4 Simulation Results – Post-Operations

Figure 39 and Figure 40 present the predicted drawdown in the water table aquifer at the end of the 200-year post-operations recovery simulation in plan view, and Figure 41 and Figure 42 present the predicted drawdown in the coal seam aquifer at the same time.

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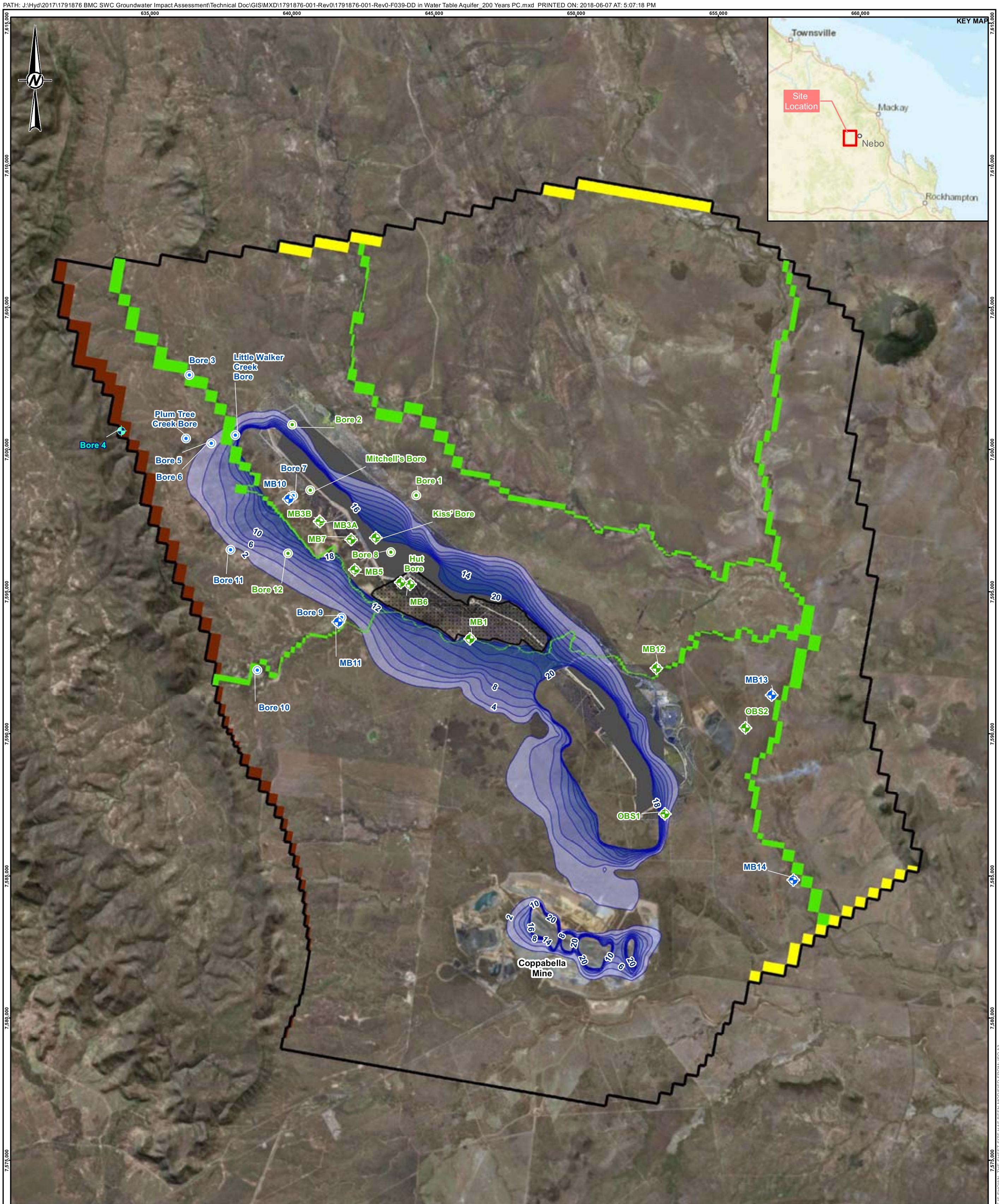


## LEGEND

**Groundwater Bore Location**

**Screened Formation, Bore Owner**

- Alluvium, Bores Monitored by BMC
- Alluvium, Unregistered Landholder Bore
- Overburden, Spring
- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore
- Drawdown in Water Table Aquifer (m AHD)
- Model Domain Outline
- General Head Boundary
- No Flow Boundary
- River Boundary
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:125,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, CALIBRATION BORE LOCATIONS, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN WATER TABLE AQUIFER - 200 YEARS POST-OPERATION**

CONSULTANT
GOLDER

| DD/MM/YYYY | 6/06/2018 |
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| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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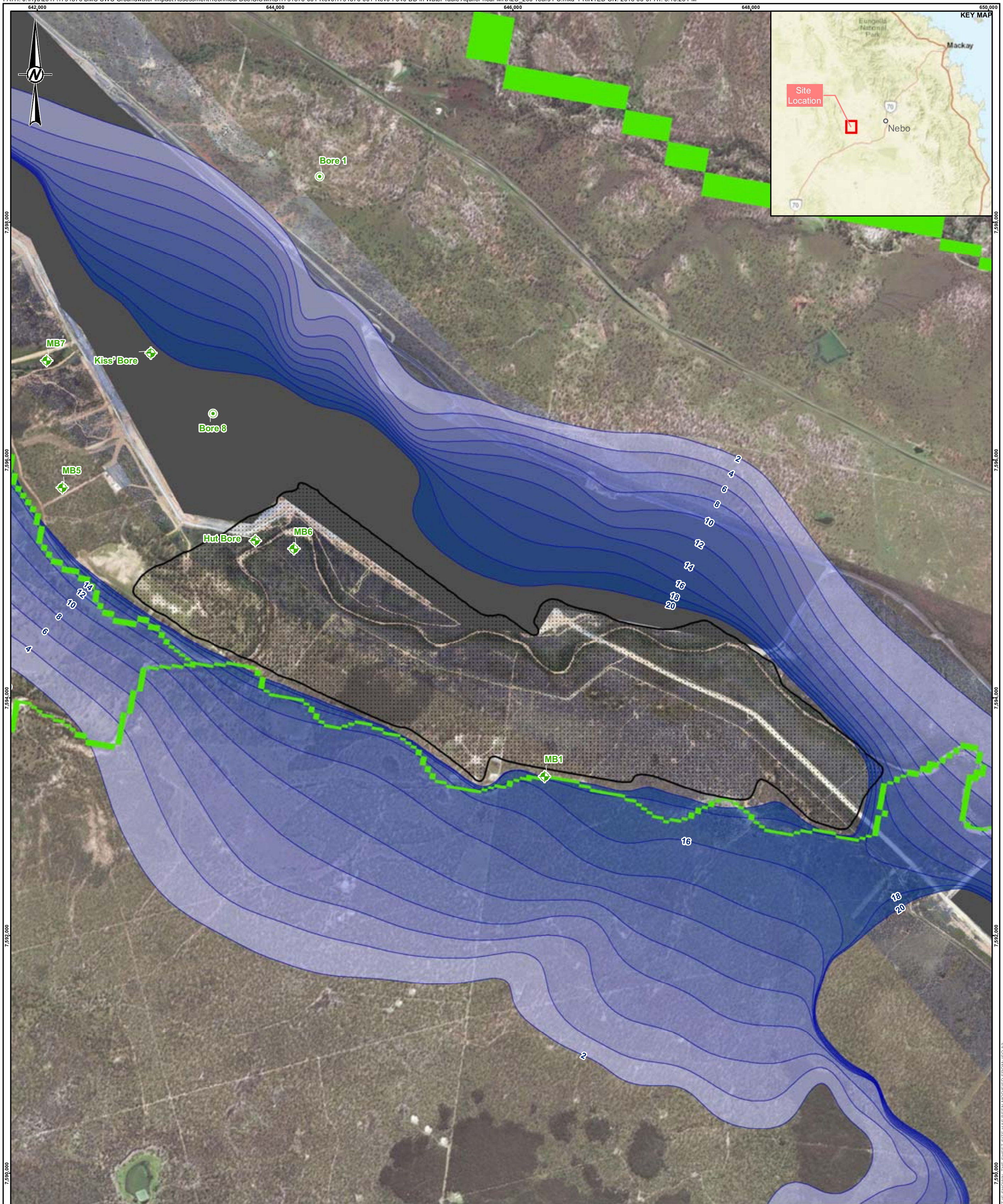


## LEGEND

**Groundwater Bore Location**

**Screened Formation, Bore Owner**

- Alluvium, Bores Monitored by BMC
- Alluvium, Unregistered Landholder Bore
- Overburden, Spring
- Regolith, Bores Monitored by BMC
- Regolith, Unregistered Landholder Bore
- Drawdown in Water Table Aquifer (m AHD)
- River Boundary
- MRA2C Project

0 1,000 2,000

METRES

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**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, CALIBRATION BORE LOCATIONS, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN WATER TABLE AQUIFER NEAR MRA2C - 200 YEARS POST-OPERATION**

CONSULTANT
GOLDER

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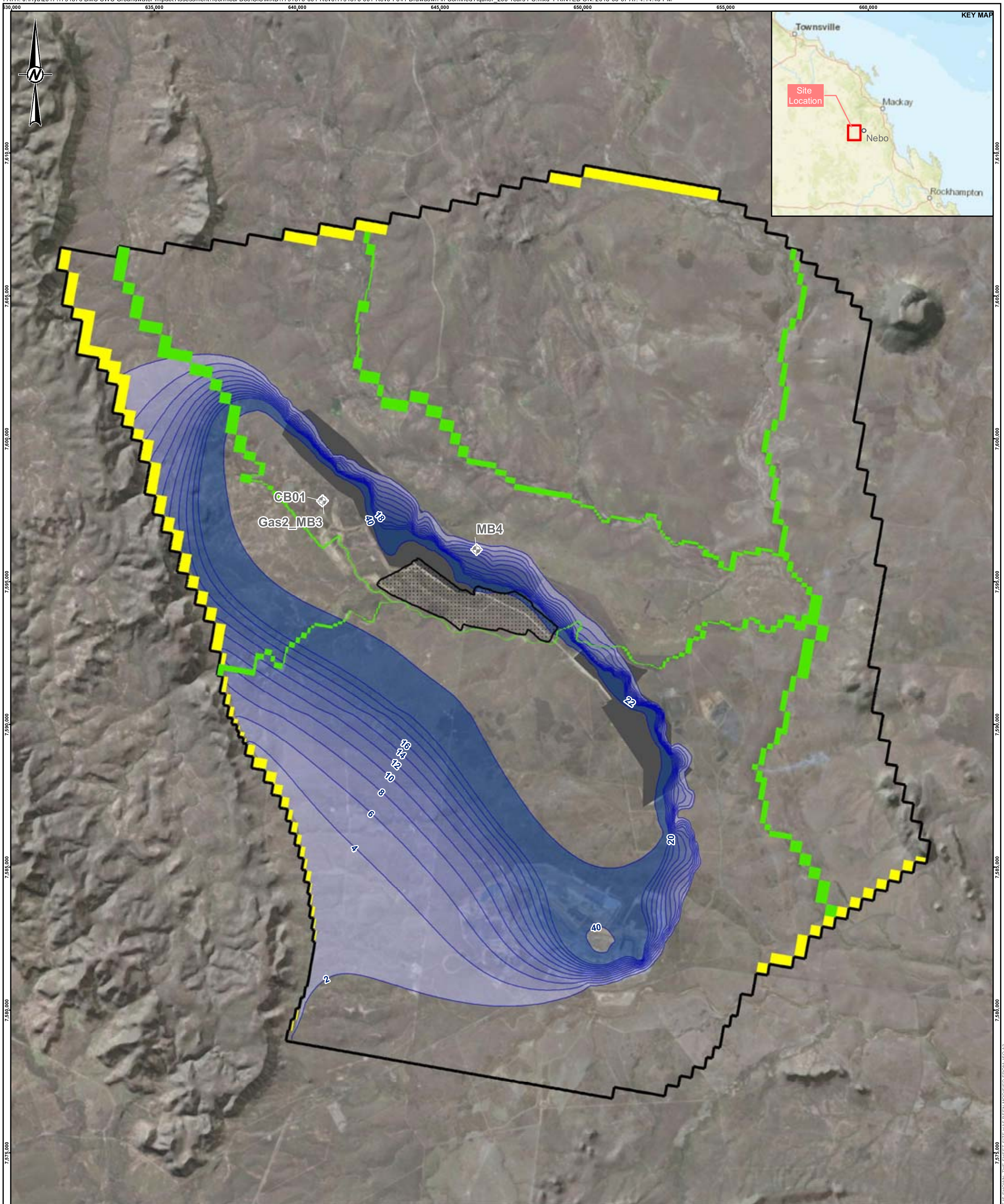


**LEGEND**

Calibration Bore Location

Screened Formation

Coal Seam

Drawdown in Confined Aquifer (m

Model Domain Outline

River Boundary

General Head Boundary

MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:125,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

Projection: Transverse Mercator

Datum: GDA 1994

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1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, CALIBRATION BORE LOCATIONS, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**GROUNDWATER CONTOURS IN CONFINED AQUIFER - 200 YEARS POST- OPERATION**

CONSULTANT

GOLDER

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| DD/MM/YYYY | 6/06/2018 |
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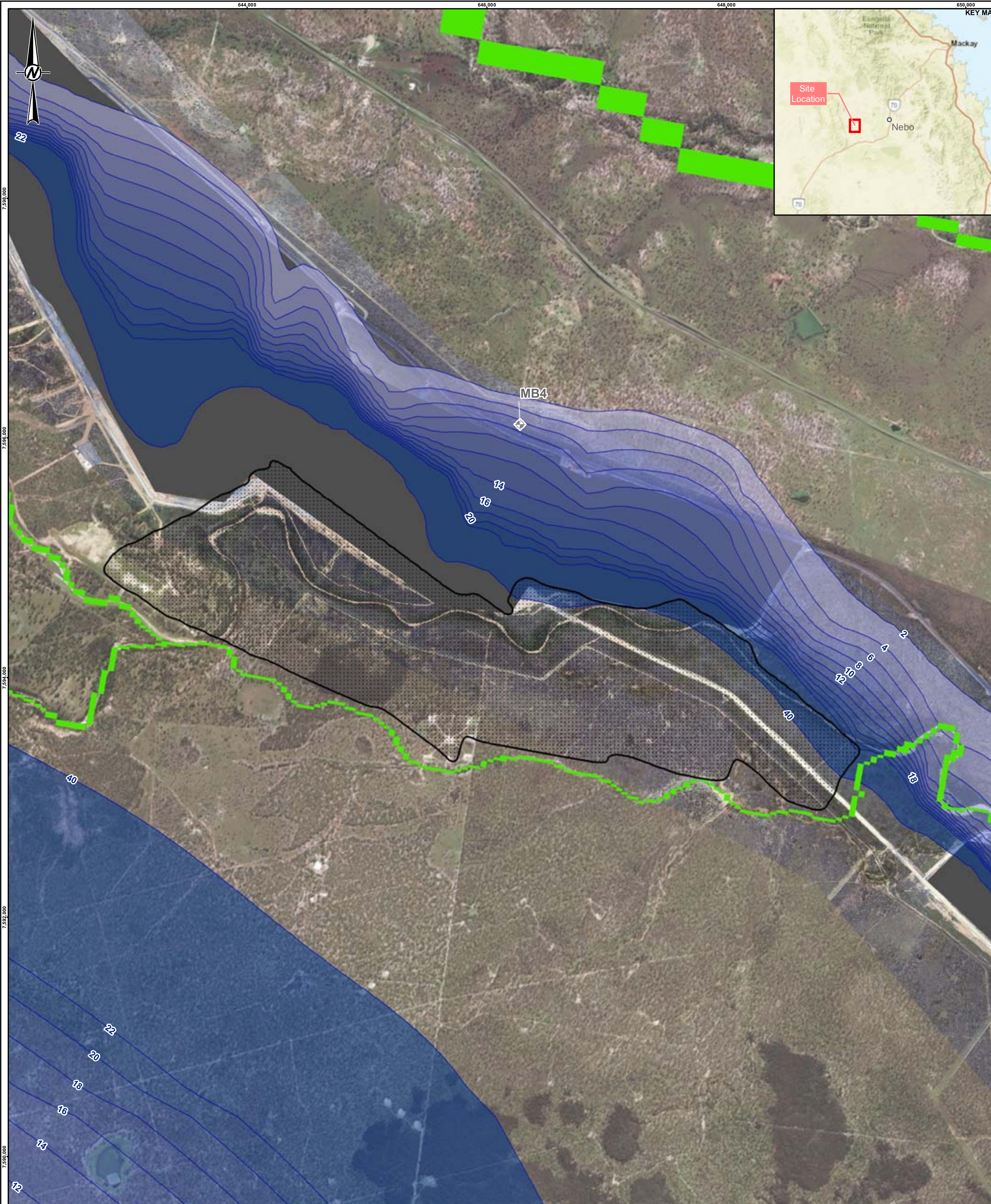


**LEGEND**

**Calibration Bore Location**

*Screened Formation*

Coal Seam

River Boundary

MRA2C Proposed Pit Area

0 1,000 2,000

METRES

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA, EXISTING PIT LOCATIONS, CALIBRATION BORE LOCATIONS, ORTHOPHOTO: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**DRAWDOWN IN CONFINED AQUIFER NEAR MRA2C - 200 YEARS POST-OPERATION**

CONSULTANT

GOLDER

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### 6.5.5 Water Level Recovery

To illustrate the recovery of water levels over time in the post closure period, a series of points within the drawdown cone were selected for detailed evaluation, for both the water table aquifer and the confined coal seam aquifer, as shown in Figure 43. For each point, hydraulic heads were obtained from each time step of the 200-yr model predictive simulation and plotted for comparison. In the post closure simulation, a total of 20-time steps are included at an average interval of ten years.

For the water table aquifer, the points used for illustrative purposes are located along Walker Creek downstream of the MRA2C Project, concurrent with the location of Black Ironbox habitat. A time-series plot of water levels for these points is shown in Figure 44.

For the confined coal seam aquifer, three points were selected to the southwest of MRA2C parallel to the dip of the coal seam, and roughly perpendicular to the predicted drawdown contours at distances of 500 m, 1 km, and 5 km. Results are shown in Figure 45.

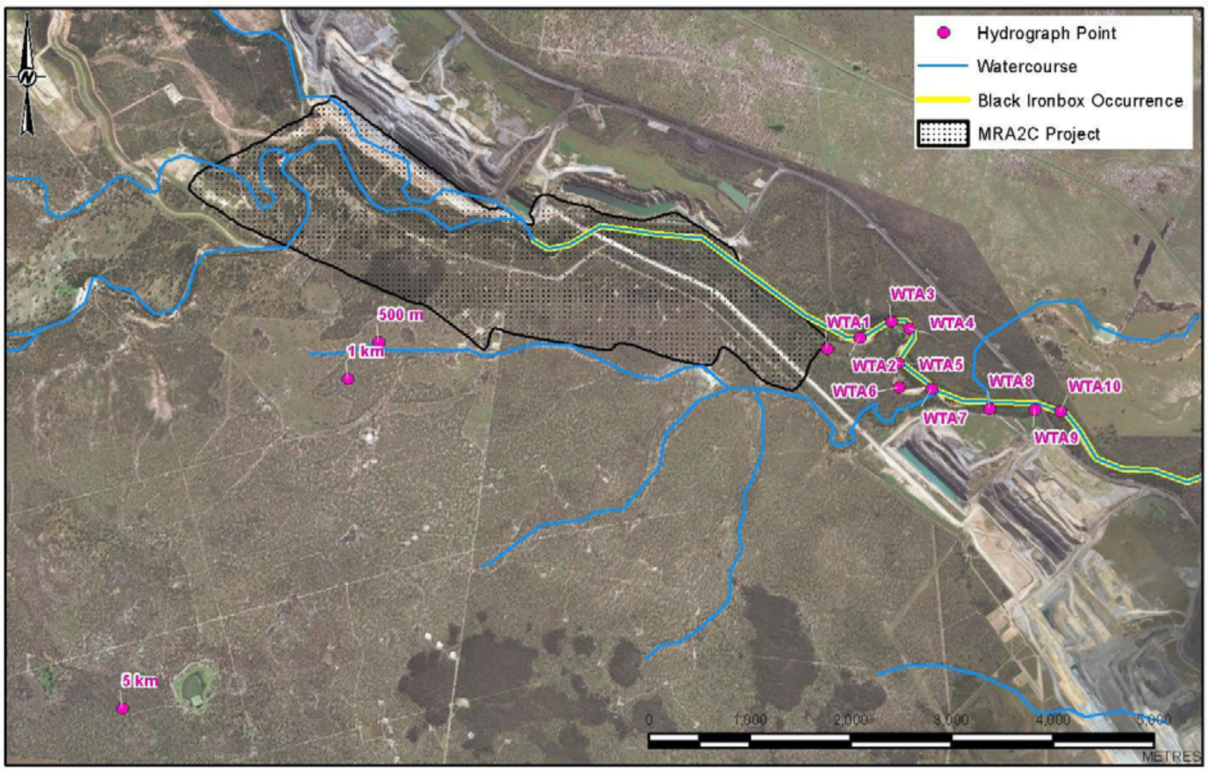


**Figure 43: Point locations used to illustrate post-operation water levels**

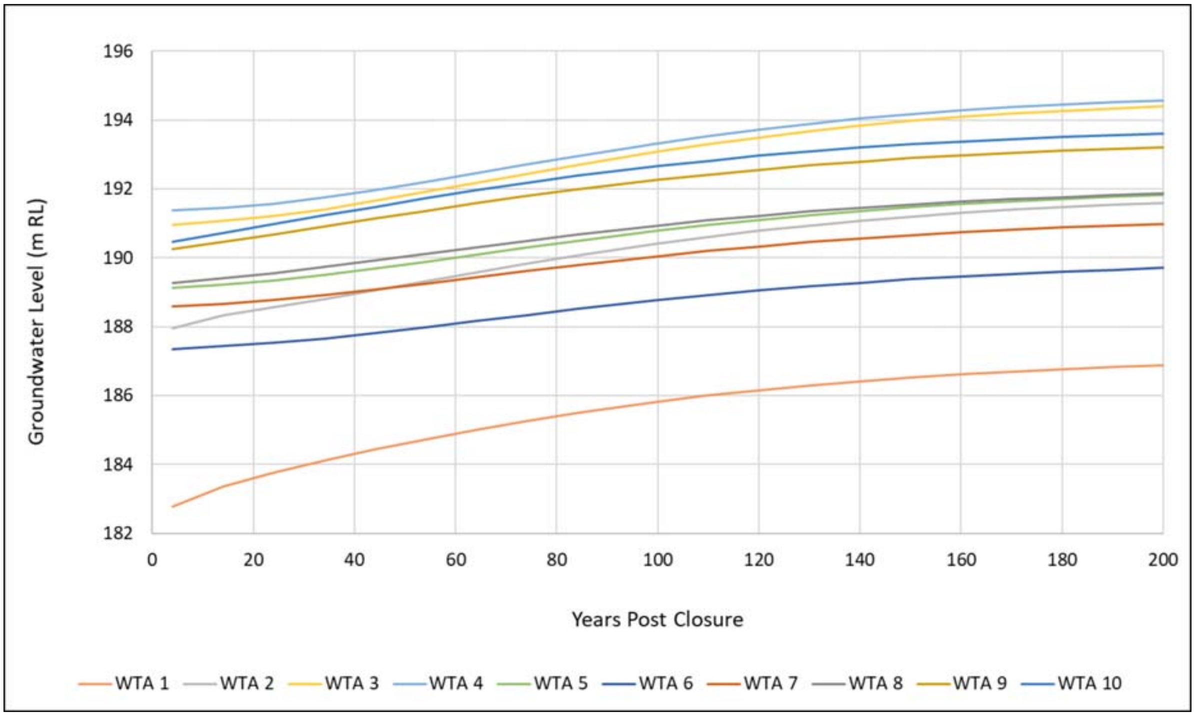


**Figure 44: Water level recovery in the water table aquifer – post-operation period**

As shown in Figure 44, modelled water level recovery rates in the water table aquifer are slow, and equilibrium has not been reached for most points after 200 years. For these points, recovery rates are faster initially and slow down over time. The modelled average total water level recovery over the first 100 years post operations is 2.0 m, while the average total water level recovery over the second 100 years is 1.1 m.

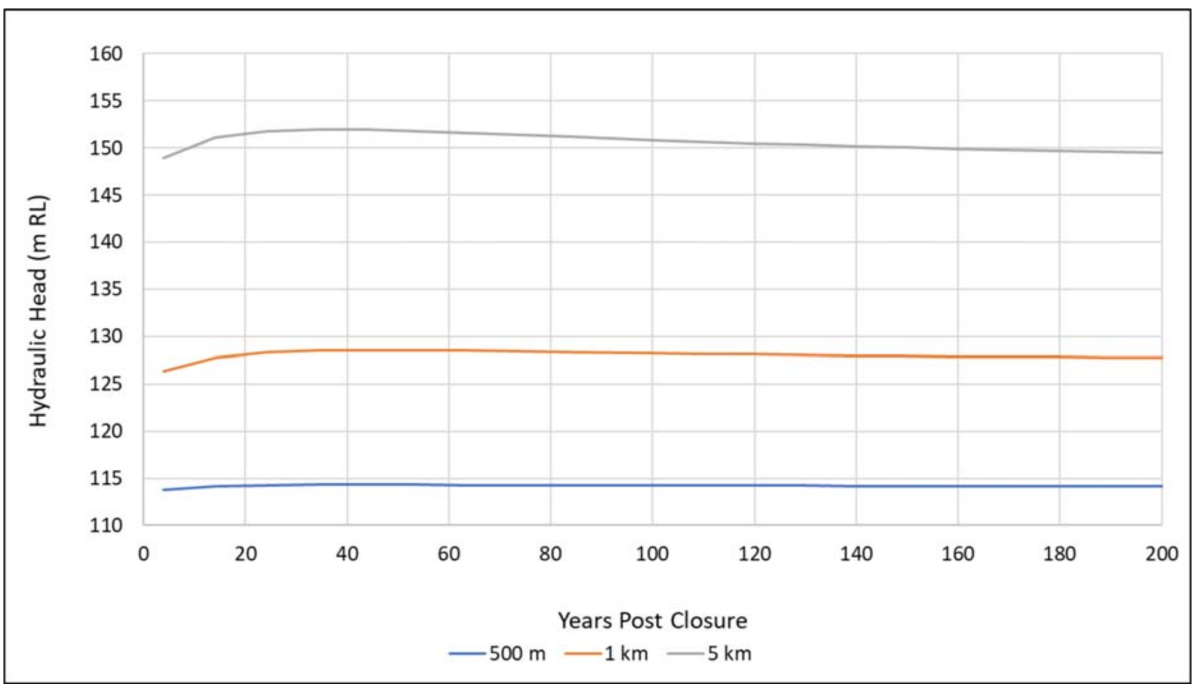


**Figure 45: Hydraulic head in the confined coal seam aquifer – post-operation period.**

For the confined coal seam aquifer, stabilisation of hydraulic head occurs quickly at the 500 m distance, and more slowly further from the Project. Close to the void, for the 500 m scenario, near steady state conditions are reached approximately 50 years after the end of mining operations. Steady state conditions at the 5 km point are not fully reached after 200 years, although the rate of drawdown is very slow.

It is important to note that post-mining water level recovery rates are presented for illustrative purposes at specific points. Actual recovery rates at a given location are a function of various factors, including position relative to the mining sequence and geometry, and model-predicted recovery rates in other areas of the mine may show slight variations to those presented above.

## 6.6 Uncertainty and Sensitivity Analysis

### 6.6.1 Introduction

As shown in Section 6.4, the model has been calibrated to the available groundwater level data and the adopted hydraulic parameter values are generally around the mid-point of their expected ranges. There is therefore some confidence in the predicted outcomes from this model.

However, the model is subject to numerous uncertainties, the influence of which on the predictive outcomes must be considered. These include the following:

- The lack of constraint in the calibration dataset (spatial and temporal limits, mix of climatic and mine related responses and unknown pre-mine heads)
- Natural heterogeneity in the system which is not represented with uniform parameters used in the model
- The importance of fracture-controlled flow in the system, which is approximated by an equivalent porous media approach
- The potential non-uniqueness in the calibrated solution

Due to the relatively long model run time (several hours for the calibration) and the lack of any substantial GDE's that might be significantly impacted by the Project, a manual uncertainty analysis technique was used. This involved sensitivity analyses and uncertainty analyses.

Using the calibration model, a manual sensitivity analysis was undertaken to determine the effect of key hydraulic parameters and boundary conditions on the calibration outcome. A manual uncertainty analysis was undertaken by rerunning the LOM predictive model with sensitivity analysis settings that were shown to:

- Have no or very limited influence on calibration outcomes (which are therefore insensitive and unconstrained by the calibration), or
- Have an acceptable influence on calibration outcomes in some areas of the model (i.e. due to heterogeneity that is not captured by the homogeneous parameter settings) even if they have unacceptable influences in other areas.

Changes to storage parameters have no influence on the steady state solution and therefore no influence on the initial heads for the time variant calibration run. However, changes to all other settings do. Recalibrating the steady state model for each variation in these parameters (i.e. if K is reduced both recharge and creek bed conductance need to be altered to compensate) would take significant time and reduce the number of variations that could be investigated. It was therefore decided not to recalibrate the steady state model and to concentrate on the effect of the changes on the simulated response to mining in the unconfined aquifer, which is the most important factor in relation to the modelling objectives.

### 6.6.2 Sensitivity Analysis

Sensitivity analyses have been carried out as a precursor to uncertainty analyses, to assess the sensitivity of model results to changes in model parameters. The following parameters were considered in the sensitivity analysis:

- Regolith K and S
- Coal seam K
- Overburden Kv
- Recharge
- Streambed conductance

Twelve separate model runs were undertaken. As described above, changes to K, recharge and streambed conductance resulted in variations in the simulated pre-mine water levels. The model was not re-calibrated by changing other parameters to compensate. This had the following consequences:

- The SRMS reflects this more than any improvement / degradation in simulated response to dewatering.
- The qualitative analysis will be undertaken based on water level change, rather than absolute water levels.

#### *Results*

Predicted heads from the sensitivity runs are compared with observed heads at four representative locations in the unconfined aquifer in Figure 46 and Figure 47. These figures show both the head and the change in head over the observation record. This allows for a qualitative analysis of both the sensitivity of the absolute head to the parameter changes and the sensitivity of the predicted response to mining. At bore OBS1 the change in head has been calculated from 2009, which is when drawdown is first observed at that location.

A summary of the sensitivity cases is provided in Table 14, which also includes a qualitative assessment of the level of control parameters have on simulated drawdown.

Generally, the overall quality of the calibration was acceptable for cases where the scaled RMS remained less than approximately 5%. Larger values of scaled RMS tended to be associate with a change in the slope of the best fit line through the observed vs computed heads (i.e. general over-prediction or under-prediction of head), rather than an increased scatter.

**Table 14: Summary of Sensitivity Simulations**

| Sensitivity Simulation ID | HSU/Feature | Change | Basecase Parameter Value | Changed Value | Scaled RMS | Sensitivity (unconfined aquifer response) | Calibration Validity |
|---|---|---|---|---|---|---|---|
| Basecase | - | - | - | - | 4.1% | | |
| 1 | Regolith | Lower hydraulic conductivity | 0.6 [m/day] | 0.05 [m/day] | 7.3% | High | Poor |
| 2 | | Higher hydraulic conductivity | 0.6 [m/day] | 1.9 [m/day] | 6.4% | High | Lower limit of acceptability |
| 3 | Regolith | Lower storage | 0.075 [-] | 0.005 [-] | 6.0% | High | Lower limit of acceptability |
| 4 | | Higher storage | 0.075 [-] | 0.15 [-] | 4.1% | Moderate | Good |
| 5 | Coal Seam | Lower hydraulic conductivity | 0.03 [m/day] | 0.005 [m/day] | 4.4% | None | Good |
| 6 | | Higher hydraulic conductivity | 0.03 [m/day] | 0.05 [m/day] | 4.9% | None | Good |
| 7 | Recharge | Lower recharge rate | 1% | 0.50% | 3.9% | Moderate | Acceptable |
| 8 | | Higher recharge rate | 1% | 4% | 8.5% | Moderate | Poor |
| 9 | Overburden | Higher vertical hydraulic conductivity | 10:1, Kh:Kv | 1:1, Kh:Kv | 4.4% | None | Good |
| 10 | | Lower vertical hydraulic conductivity | 10:1, Kh:Kv | 100:1, Kh:Kv | 4.2% | None | Good |

| Sensitivity Simulation ID | HSU/Feature | Change | Basecase Parameter Value | Changed Value | Scaled RMS | Sensitivity (unconfined aquifer response) | Calibration Validity |
|---|---|---|---|---|---|---|---|
| 11 | Streambed Conductance | Lower conductance | 10-40 [$m^2$/day] | 1 [$m^2$/day] | 4.3% | Moderate | Good |
| 12 | | Higher conductance | 10-40 [$m^2$/day] | 100 [$m^2$/day] | 10.0% | High | Poor |

## *Regolith K and Sy*

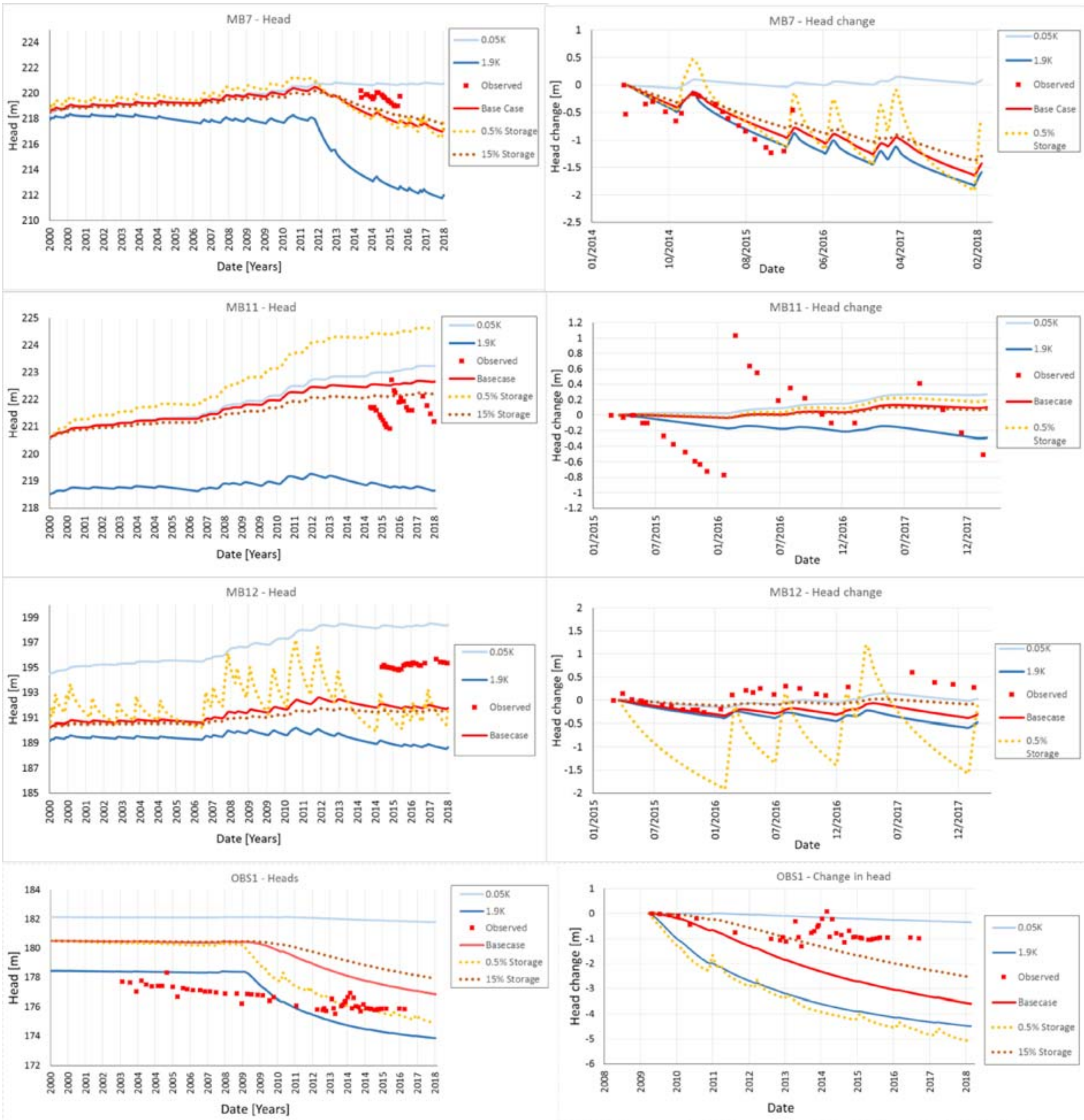


**Figure 46: Sensitivity of response in the water table aquifer to hydraulic conductivity and storage of regolith**

At all locations, the absolute head is very sensitive to the value of Regolith K. It is also sensitive to low Sy, producing very large (generally unrepresentative) increases in head following recharge events. This is reflected in the SRMS values for these runs, with increases from the basecase of 4.1% to between 6.0 and 7.3%.

At MB7, just northwest of the Mulgrave Pit, predicted drawdown is relatively consistent in all of the sensitivity runs apart from the low K scenario. The low Sy setting potentially produces a better match to the recharge response at this location.

At MB11, on a creek line west of the Mulgrave Pit, the predicted response changes little over the sensitivity runs. Drawdown is not thought to have reached this location, and only one (the high K value) of the parameter settings produces drawdown, although very little, over the observation period. All K and Sy sensitivity parameters are therefore possible based on the data and predicted response at this location.

At MB12, east of the Carborough and Walker Pits and on a creek line, the time variant response is very sensitive to low Sy, which produces extreme responses to recharge events (much greater than observed). As it is hard to say exactly how much drawdown is observed at this location over the monitoring period, the other parameter variations, which produce between zero and 0.5 m drawdown between 2015 and 2018, are all equally likely in the area around this bore.

At OBS1, just south of the Toolah Pit, predicted drawdown is very sensitive to both Regolith K and Sy. The low Sy and high K scenarios produce significantly more drawdown than observed and look unlikely in this area. The low K produces too little drawdown and also looks unrepresentative here. A high Sy value however produces an acceptable match to observed drawdown and could well be appropriate in this location.

## *Recharge and Streambed Conductance*

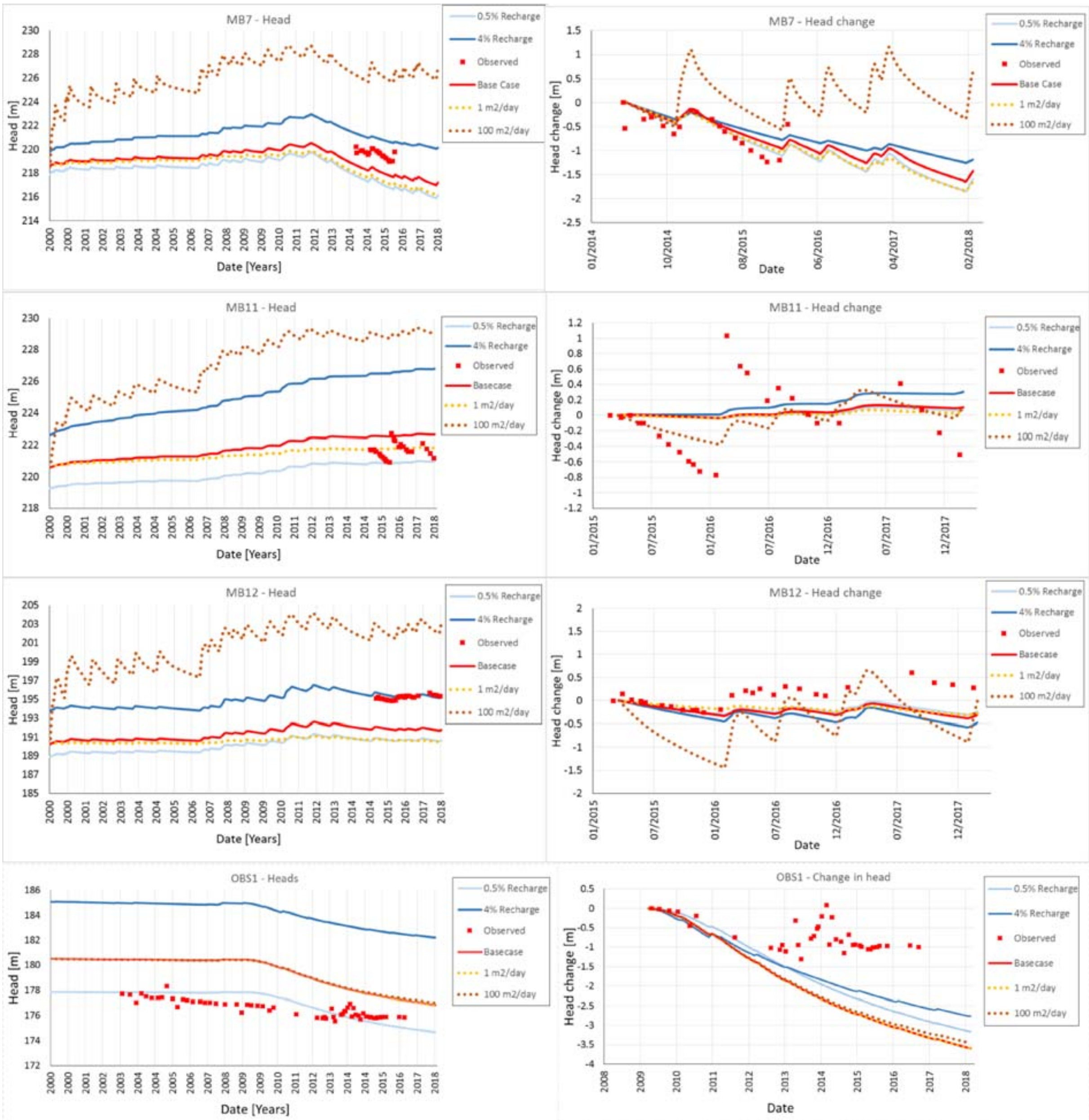


**Figure 47: Sensitivity of the water table to changes in recharge and Streambed conductance**

Absolute heads at all locations are very sensitive to both the diffuse recharge and the streambed conductance value. The higher values of both parameters produce much higher heads, which are reflected in the SRMS values (approaching 10%).

At MB7, just northwest of the Mulgrave Pit, all parameter scenarios other than the high streambed conductance produces a comparable response to mining over the observation period. At this location, the high streambed conductance looks unrepresentative.

At MB11, on a creek line west of the Mulgrave Pit, no drawdown is expected and none is simulated by any of the parameter variations. The two-metre response to creek flow observed is not replicated by any of the parameter variations, even with the high streambed conductance. This data suggests that all parameter variations are possible at this location.

At MB12, east of the Carborough and walker Pits and on a creek line, the results are similar to those at MB11. Here though the high streambed conductance produces a head response much greater than observed and is therefore unlikely to be representative.

At OBS1, just south of the Toolah Pit, the predicted response to mining is relatively uniform for all of the parameter variations, suggesting that all are possible at this location. This is not necessarily a good location to test the validity of these parameters however.

#### *Overburden vertical conductivity, Coal seam conductivity*

The heads in the unconfined aquifer are not sensitive to overburden Kv and Coal Seam K over the calibration time period. All these settings were therefore considered in the uncertainty analysis.

#### *Conclusion*

Due to the model and calibration data limitations described above, most of the sensitivity runs should be considered possible and taken forward to the uncertainty analysis. The runs that most degraded the calibration however, should be considered to be much less likely than the others. These were:

- The low and high Regolith K
- The low Regolith Sy
- The high recharge
- The high streambed conductance

### 6.6.3 Uncertainty Analysis

The results of the uncertainty analysis are presented as:

- Maximum 2 and 5 m predicted drawdown in all uncertainty runs (Figure 48 and Figure 49).
- The maximum predicted vertical flux from the water table aquifer to the coal seam aquifer
- The predicted water levels and drawdown in Walker Creek downstream of the MRA2C Project where Black Ironbox is known to occur.

#### *Uncertainty in extent of drawdown*

As shown in Figure 48, the maximum extent of the 2 m cumulative drawdown line comes from one of three scenarios depending on location;

- the high K and low Sy Regolith cases for most areas, including to the east and west of the South Walker Creek mine pits;
- the high recharge scenario for the southern part of the South Walker Creek Mine; and
- the high Kv overburden scenario for a small area north of the Coppabella pit.

The maximum lateral increase in the extent of the 2-m drawdown contour is about 2 km compared to the base case runs.

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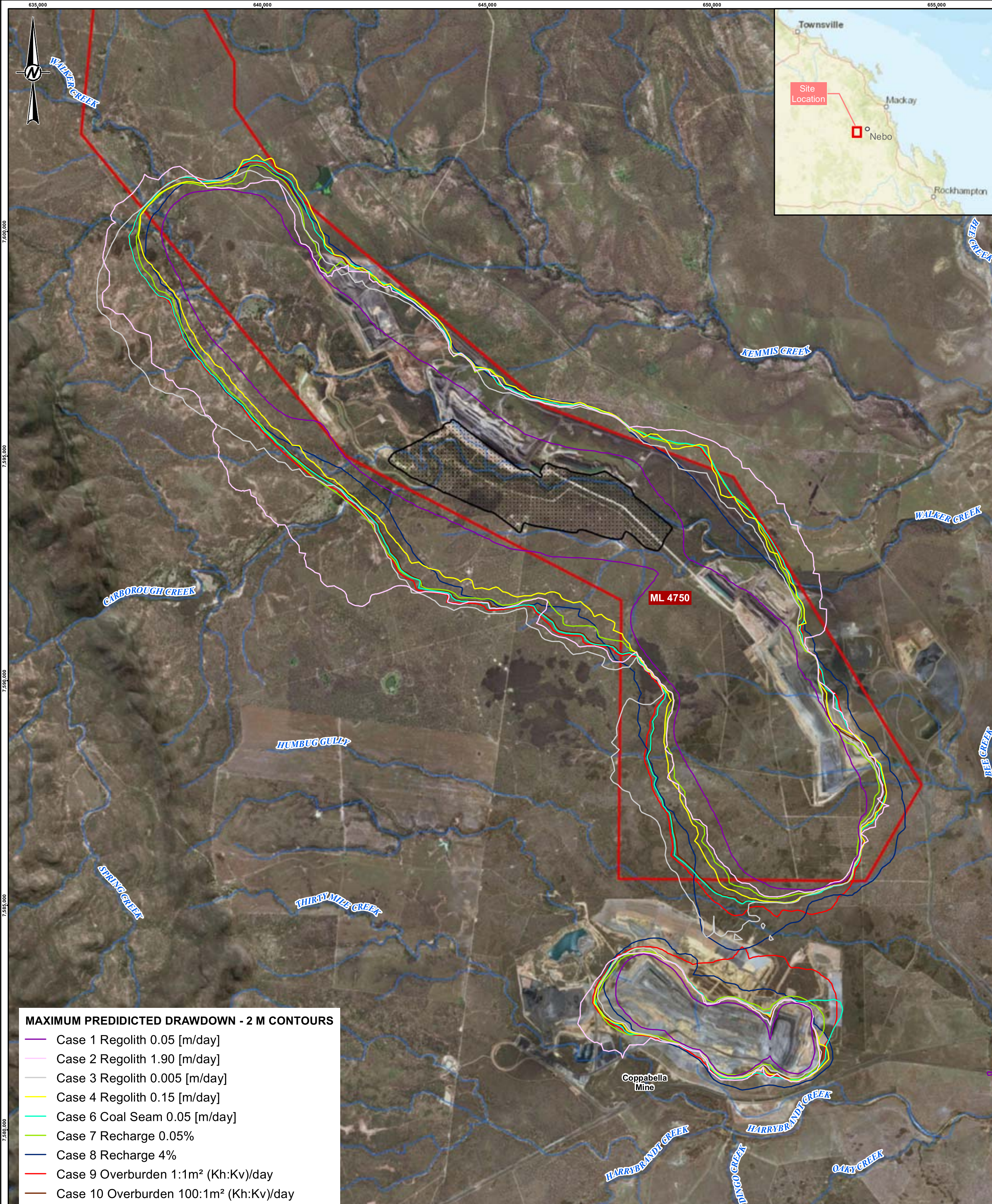


**LEGEND**

Watercourse

Major

Minor

ML4750

MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:80,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MRA2C PIT AREA - BHP, JANUARY 2018
3. SURFACE GEOLOGY, WATERCOURSES, MINING TENEMENT: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**MAXIMUM PREDICTED DRAWDOWN - 2 M CONTOURS FOR UNCERTAINTY ANALYSES**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
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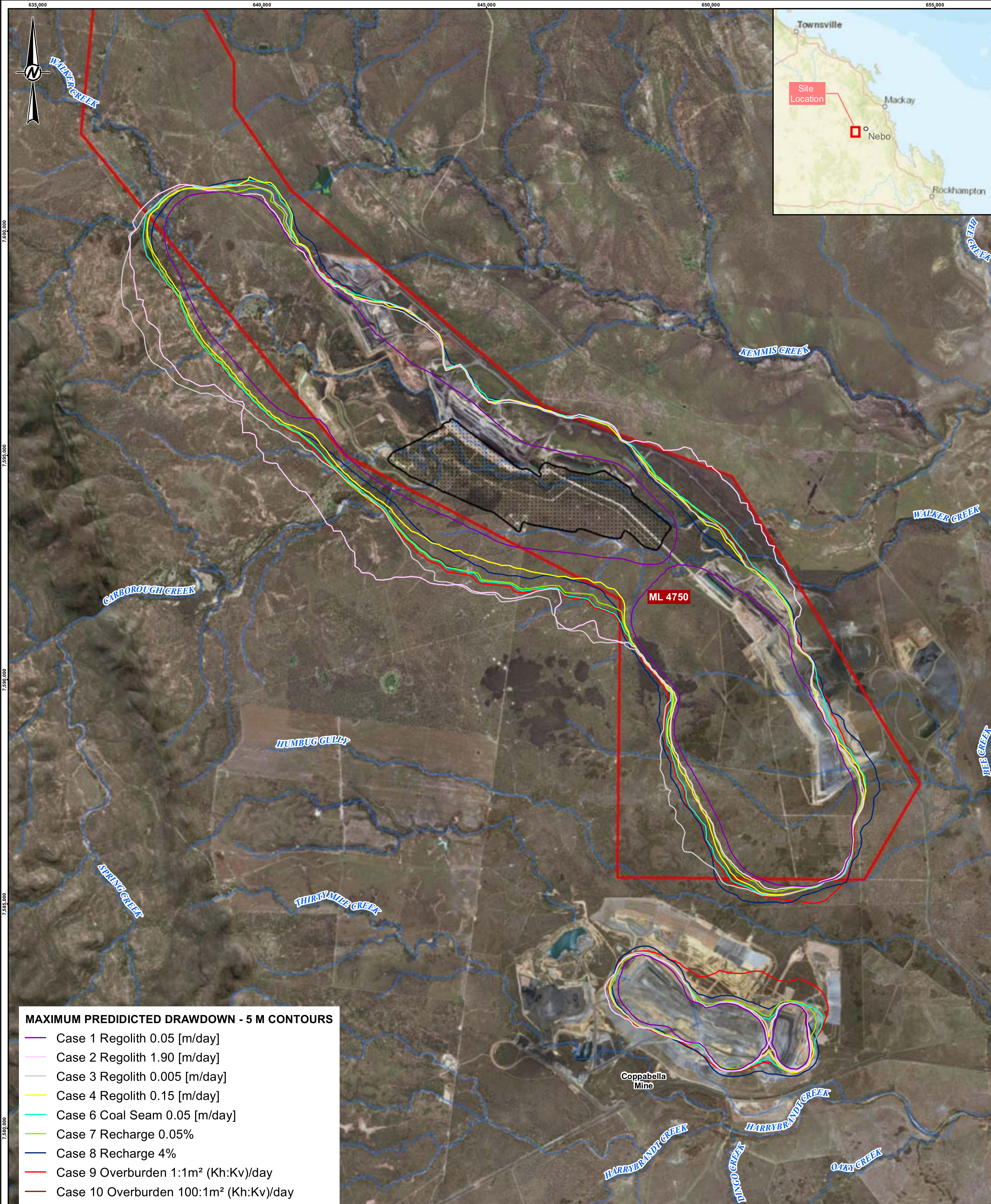


**LEGEND**

Watercourse

- Major
- Minor
- ML4750
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

Scale: 1:80,000 @ A3 METRES

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

**REFERENCE(S)**

1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
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3. SURFACE GEOLOGY, WATERCOURSES, MINING TENEMENT: © STATE OF QUEENSLAND (DEPARTMENT OF NATURAL RESOURCES AND MINES) 2017

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**MAXIMUM PREDICTED DRAWDOWN - 5 M CONTOURS FOR UNCERTAINTY ANALYSES**

CONSULTANT

GOLDER

| | |
|---|---|
| DD/MM/YYYY | 6/06/2018 |
| DESIGNED | HG |
| PREPARED | HB |
| REVIEWED | JF |
| APPROVED | SF |

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### *Uncertainty in vertical leakance*

The effect of uncertainty in model parameters on the vertical leakance between the water table aquifer and the confined coal seam aquifer was assessed using model simulations. For all parameterisations considered in the uncertainty analyses, the change in downwards flux from the water table aquifer, through the overburden to the coal seam aquifer as a result of mining is negligible throughout the life of mine.

For all uncertainty analysis cases, the total flux across the regolith for the whole model domain is in the range of 200-800 $m^3$/day, compared with estimated recharge from rainfall to the water table aquifer of approximately 10,000 $m^3$/day for the base case. Slight variations in these rates were computed throughout the life of mine simulation for any given parameterisation, in response to drawdown in the coal seam aquifer. The maximum increase in flux rate from the steady case for any of the uncertainty analyses, at any stress period through the life of mine scenarios, was less than 100 $m^3$/day (i.e. less than 1% of the total recharge to the unconfined aquifer).

The results indicate that in all cases a relatively small percentage of the areal recharge and streambed inflow to the unconfined aquifer flows downward to the coal seam, and that the leakance changes only slightly for the various cases that were considered in the uncertainty analysis

### 6.6.4 Uncertainty in water level response beneath Walker Creek

As discussed in Section 5.1.2, Black Ironbox is a riparian dependent species, which has been mapped along the reach of Walker Creek to the immediate southeast of the MRA2C pit (Figure 38). Groundwater is not part of the habitat criteria identified for Black Ironbox (Queensland Herbarium, 2012). Eco Logical Australia (2017) interpret that this is not species has little or no dependency on groundwater at the South Walker Creek Mine. However, we have considered the uncertainty of model predictions in this part of Walker Creek to provide insight into the potential impacts of lowered water tables in this area.

Figure 50 illustrates model-predicted water levels along the reach of Walker Creek immediately downstream of the proposed MRA2C pit where Black Ironbox is present, for the calibrated model and for the EOM simulation. Water levels observed in monitoring bore MB12 which is located adjacent to this reach of the creek are also shown. At the closest point, the water table is predicted to be approximately 8 m below the base of the creek (around 1800 m mark in Figure 50), and at this location the predicted drawdown is approximately 12 m.

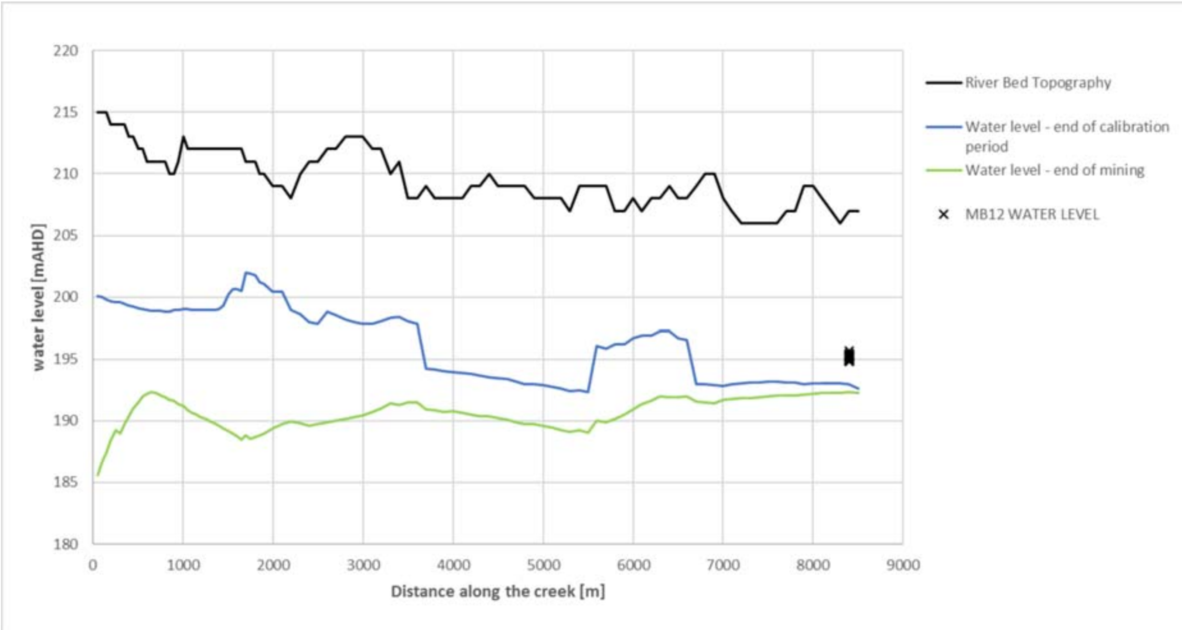


**Figure 50: Profile along Walker Creek southeast of MRA2C, showing groundwater levels in the water table aquifer from the transient calibration and the EOM predictive model**

Profiles of water levels along Walker Creek were established for all uncertainty cases for the transient model calibration and predictive EOM scenarios, to identify the uncertainty cases that had the greatest effect on absolute water levels and drawdown. Water levels along the creek profile were established for all uncertainty cases.

For the uncertainty case with a reduced hydraulic conductivity for the regolith, the water table is predicted to be the highest – approximately 5 m below the base of the creek at the closest point. The largest drawdown is associated with the low K regolith case.

Figure 51 illustrates the predicted water levels and drawdown over the period of mining for these two cases of high and low regolith hydraulic conductivity for comparison. This figure illustrates that:

- For the case with the highest water level, the predicted drawdown is approximately 5 m, and the water table drops to approximately 10 m below the base of the creek during the EOM simulation.
- The largest drawdown is associated with the lowest starting water table, however for this case the starting water table is at least 15 m below the base of the creek at all points in this area.

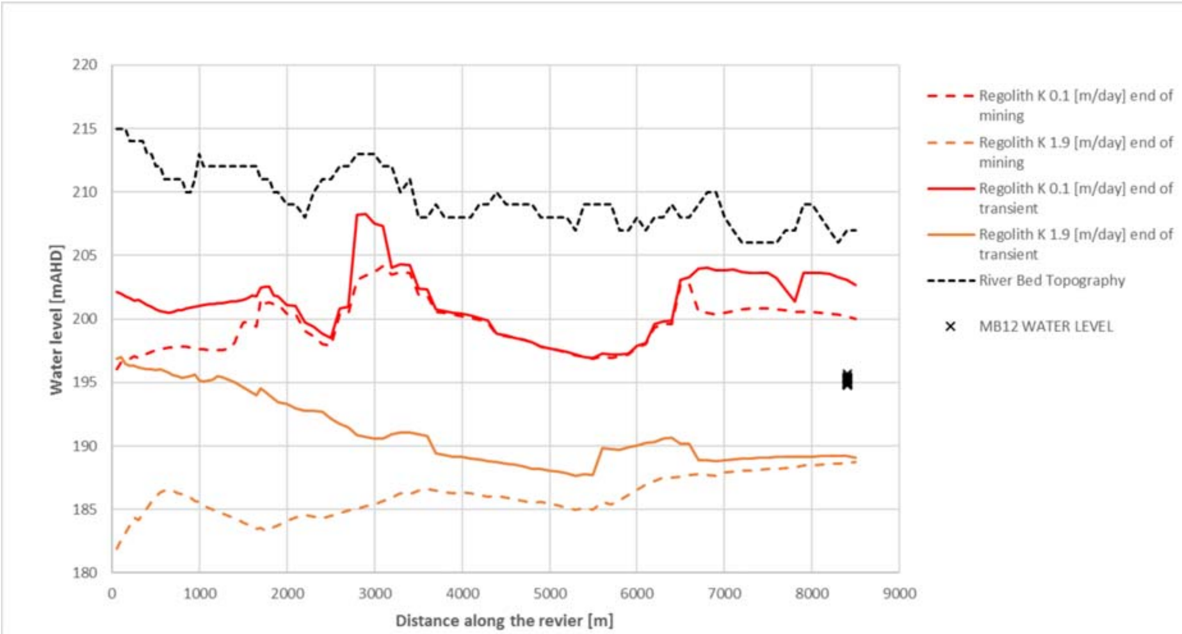


**Figure 51: Profile along Walker Creek southeast of MRA2C, showing drawdown for various uncertainty cases in the EOM scenario.**

### 6.6.5 Uncertainty analysis conclusions

The sensitivity analysis has shown, other than having a significant influence on absolute head levels, that variations of key parameters within realistic bounds does not have an overly negative influence on model calibration performance. This is in most part because the calibration dataset is quite limited temporally and it is difficult to separate climatic and anthropogenic groundwater level responses.

The uncertainty analysis was designed to provide a qualitative assessment of the significance of this limitation in terms of the predictive outcomes. The results of this analysis show that:

- Cumulative drawdown of 2 m may extend up to 2 km further to the west of the SWC mine than simulated in the basecase model.
- The uncertainty makes very little difference to the predicted impacts at landholder bores.
- The results indicate that in all cases a relatively small percentage of the areal recharge and streambed inflow to the water table aquifer flows downward to the confined coal seam aquifer, and that the leakance changes only slightly for the various cases that were considered in the uncertainty analysis
- For all cases, water levels beneath Walker Creek remain below 5 m at all points, likely beyond the range of Black Ironbox.

## 6.7 Model assumptions and limitations

Assumptions have been made for model building and predictive simulation. These assumptions are required to represent a complex system such as a dual seam strip mining operation interacting with a multi-aquifer groundwater system by means of a numerical groundwater modelling code.

Key assumptions are:

- The hydraulic conductivity of the coal seams and the rock mass over-, inter- and under-burden can be approximated by the hydraulic conductivity of a homogeneous equivalent porous media.

- The Permian rocks are at depth practically impervious.
- The underburden, interburden and overburden are assumed to have similar hydrogeological characteristics and are represented by identical model parameters. This assumption is justified by the mine scale homogeneous rock mass comprising mostly thinly bedded mudstones and siltstones with occasionally thicker sandstone beds of the Moranbah Coal Measures.
- A panel segment was modelled as “extracted” by assigning a Modflow Surfact drainage boundary condition to selected grid cells within the panel area, assuming complete drainage of the coal face during seam extraction.
- The coal seams were assumed to form single strata (seam splitting where it occurs was not explicitly modelled).
- The development of strip mine does not influence the hydraulic conductivity and porosity in surrounding aquifer materials.

Key Model Limitations are:

- High head residuals (>5 m) were observed between the transient model calibration and unregistered landholder bores 1, 2, and 12, all screened in Regolith north of MRA2C. Only one round of level measurements is available from these bores (from 2014) for use in the transient calibration, and the water levels may not reflect typical water levels for these locations.
- The lack of constraint in the calibration dataset (spatial and temporal limits, mix of climatic and mine related responses and unknown pre-mine heads)
- Natural heterogeneity in the system which is not represented with uniform parameters used in the model
- Recharge is estimated using a series of assumptions, comparisons to previous studies, and evaluation of the water balance during model calibration runs.
- Estimates of stream recharge to groundwater are limited by the lack of surface water monitoring data.

Notwithstanding these limitations, model sensitivity and uncertainty analyses have been employed to overcome data limitations and increase confidence in model predictions.

# 7.0 GROUNDWATER IMPACT ASSESSMENT

The *Significant Impact Guidelines 1.3: coal seam gas and large coal mining development- impacts on water resources* (DOEE, 2013) (the Guidelines) were developed to assist proponents who propose to take an action which involves a large coal mining development to decide whether the action has or is likely to have a significant impact on a water resource.

The Guidelines indicate a ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the water resource which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

To be ‘likely’, it is not necessary for a significant impact to have a greater than 50 per cent chance of happening. An action is likely to have a significant impact on a water resource if there is a real or not remote chance or possibility that it will directly or indirectly result in a change to:

- the hydrology of a water resource
- the water quality of a water resource

that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.

## 7.1 Significance of MRA2C Project on the Hydrology of Groundwater Resources

A significant impact on the hydrological characteristics of a water resource may occur where there are, because of the action:

a) changes in the water quantity, including the timing of variations in water quantity
b) changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large-scale subsidence)
c) changes in the area or extent of a water resource.

where these changes are of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes.

The following aspects have been considered for assessing potential changes in hydrological characteristics related to groundwater resources related to the MRA2C Project:

- Recharge rates to groundwater;
- Aquifer pressure or pressure relationships between aquifers;
- Groundwater table and potentiometric surface levels;
- Groundwater surface water interactions; and
- Inter-aquifer connectivity.

### 7.1.1 Recharge Rates to Groundwater

Open cut mining involves the removal of overburden and coal seams, creating a void that is progressively backfilled by spoil as mining progresses. The final void is left open, forming a new low point in the landscape. The mining process causes permanent changes to the material properties in the mine domain and the associated aquifer properties. Backfill materials may be higher in hydraulic conductivity and storage properties than the surrounding natural geologic materials, creating a conduit that directs shallow groundwater towards the open void. Backfill material properties evolve over time as waste ages, settles, breaks down into finer materials.

### 7.1.2 Groundwater table and potentiometric surface levels

As presented in Section 6.5, the proposed MRA2C Project will result in lowering of the water table, which causes groundwater to flow toward the voids from the surrounding confined coal seam aquifer and locally from the water table aquifer, therefore changing the extent of the groundwater resource. Life of mine simulations indicate drawdown in the water table aquifer is likely to extend up to about 2 km from the pit voids and up to about 7 km in the confined aquifer (Figure 34 and Figure 36, respectively).

During the post-closure period, it is likely that the water level in the final voids will be lower than the surrounding aquifers and therefore the voids will act as an evaporative sink which maintains groundwater flow towards the final voids resulting in long term residual drawdown in both the water table and alluvium aquifer.

Cumulative drawdown within the water table aquifer has the potential to significantly impact nearby stock watering bores (e.g. Bores 2, 5, & 6). These potentially impacted stock bores as well as all other identified stock bores located within the estimated area of drawdown are located on BMC owned land and on which either Agistment Licences or Compensation Agreements are currently in place. These Licences and Agreements would result in alternative arrangements being put in place should a bore be impacted. Such an arrangement has already occurred for Bores 9 and 12 where an alternative water supply has been established for these locations from the BMC owned Braeside Borefield.

### 7.1.3 Groundwater surface water interactions

Throughout most of the Project, groundwater is deeper than 10 m, and in all cases the shallow water table is below the streambed elevation of ephemeral creeks. There are no known instances in the Project domain where groundwater is discharging to surface water. Therefore, changes in the groundwater levels in the water table aquifer do not impact directly on surface water features.

As discussed in section 5.1, there are no identified groundwater–dependent ecosystems in the MRA2C footprint or planned SWM mine expansion area. As discussed, the process of intermittent recharge to the aquifer along the line of the creek will not change as a result of the proposed Project, hence it is considered highly unlikely that there would be any impact to the riparian vegetation (except where there is direct impact where the creek is diverted).

## 7.2 Significance of the MRA2C Project on the Water Quality of Groundwater Resources

As presented in Section 6.5, the MRA2C project results in localized lowering of the water table, which causes groundwater to flow toward the MRA2C void from the surrounding confined aquifer and locally from the water table aquifer, possibly leading to a mixing of groundwaters with slightly different water quality in the mine void. Furthermore, water balance modelling of F pit final void conducted by Alluvium Consulting (2018) indicated that that any water in the final void will have likely have elevated salinity due to evapo-concentration.

However, there is no predicted discharge from the mine void to the surrounding aquifers as the void is expected to act as a sink for groundwater as is typical for a final void in the Bowen Basin in which there is limited groundwater inflows (i.e. no basalt aquifers) and where overtopping from flood waters is unlikely.

Ephemeral leakage from Walker Creek to shallow groundwater will be maintained along the proposed creek diversion and may lead to a local “freshening” of groundwater in the water table aquifer along the diversion alignment, relative to the conditions currently along the alignment of the diversion. As noted above, the position of the diversion relative to the overall aquifer is not significantly different to the current alignment, and any changes because of the relocation of the creek will not have a significant impact on beneficial uses of groundwater in the shallow aquifer.

## 7.3 Summary of Significance of impacts

The main impact to groundwater resources as a result of the MRA2C Project will be the reduction of water levels in the water table and confined aquifers.

There are no identified groundwater dependent ecosystems within the estimated drawdown extent. Fringing riparian forest and floodplain Eucalypt forest in the upper reaches of Walker Creek and along Carborough Creek may utilise the shallower groundwater in this area. In these areas groundwater is predicted to drawdown between 2 to 20 m. Severity of threat on habitats where drawdown is predicted to be 2 – 4 m is considered to be low; however, where drawdown is greater than 4 m the severity is potentially higher. These habitats are in moderate to good ecological condition and provide ecosystem functions including bank stabilisation, habitat connectivity and fauna habitat. The fringing vegetation is considered to be of moderate value only and occurs widely in the region. The vulnerable Black Ironbox does not occur within these portions of the riparian system. Black Ironbox does occur downstream of the proposed creek diversion, in this area the water table aquifer is 15-20 m deep and beyond reach of surface vegetation. Significant impacts to listed and non-listed vegetation is not expected.

Water for stock purposes is sourced from the water table aquifer and there is potential to impact some stock bores. These bores are however located on BMC owned land on which either an Agistment Licence or

Compensation Agreement is in place which would result in compensation for any impact on the bores. This has already occurred for Bores 9 and 12 in which an alternative water supply has been established for these locations.

There are no identified groundwater users of the confined coal seam aquifer in the Project vicinity nor have any environmental values been identified. This is due primarily to the aquifers relatively poor water quality but also due its greater depth making extraction more costly.

Impacts to groundwater quality will be limited to the potential development of saline pit lakes in final voids during closure timeframes. It’s likely that the voids will act as long term sinks due to outflows (evaporation) significantly exceeding inflows (groundwater inflow, direct rainfall, and runoff) which would inhibit migration of the saline water from the pit void.

Therefore, under the definitions detailed in “Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources”, the development of the MRA2C Project will not result in any significant impacts to groundwater resources.

# 8.0 MANAGEMENT AND MITIGATION

## 8.1 Management of drawdown impacts

Cumulative drawdown within the water table aquifer has the potential to significantly impact nearby stock bores (e.g. Bores 2, 5, & 6). These bores are located on BMC owned land on which either Agistment Licences or Compensation Agreements are currently in place. These Licences and Agreements would result in alternative arrangements being put in place should a bore be impacted. Such an arrangement has already occurred for Bores 9 and 12 where an alternative water supply has been established for these locations from the BMC owned Braeside Borefield.

## 8.2 Management of groundwater quality impacts

SWC Mine management and control measures of potential pollutants and contaminant sources will be maintained to prevent uncontrolled discharge to groundwater, consistent with the existing management strategy. These include provision of appropriate spill control materials at refuelling facilities to contain spills and established procedures to ensure safe and effective storage and handling of fuel, oil and chemicals.

All uncontrolled discharges will be reported to the relevant regulatory authorities in accordance with legislative requirements under the Queensland *Environmental Protection Action 1994.* In the event that groundwater quality impacts are identified, mitigation measures will include rectifying any damages caused to the integrity of the storage unit and, if possible, intercepting the impacted groundwater/pollutant source.

## 8.3 Recommendations

Although there are expected to be no significant impacts to groundwater resources as a result of the Project, there are areas in which additional information or studies could assist with validating and improving the conceptual and numerical models for the South Walker Creek Mine and to more accurately monitor the drawdown extent as the mine progresses.

BMC has already initiated several projects to help improve in these areas, including:

- Installation of data-logging pressure transducers in 11 boreholes across the site; this was completed in mid-April 2018 (Figure 52). This will allow higher frequency measurements of groundwater levels to be collected to better understand rates of recharge and drawdown.
- Installation of 3 vibrating wire piezometers (VWP) near Walker Creek and the MRA2C Project with sensors located within the regolith, overburden, and coal seams (Figure 53). These VWP’s will help with

understanding vertical gradients between hydrostratigraphic units, rainfall/runoff/recharge relationships, and rates of drawdown.

The following items are also recommended:

- Groundwater model predictive capability could be improved with additional information on stream stage and volumetric flow correlated to local rainfall events and shallow, water table aquifer levels. This data set would allow for more accurate representation of ephemeral stream recharge to groundwater in any future model updates.
- Installation of additional monitoring bores in more distal areas to the west of the MRA2C Project area and to the west of the existing southern pits (Carborough, Walker, and Toolah) should be conducted to allow more accurate measurements of the drawdown extent. Proposed locations are shown in Figure 53.
- Routine water level measurements at points around the perimeter of the South Walker Creek Mine, including Bore 1, Bore 2, and Bore 12, would enhance resolution of the water table aquifer and allow for better future understanding of drawdown.
- Although the additional planned groundwater monitoring will help also inform post-mining conditions, additional studies are required to understand the dynamics of the surface water-groundwater system in support of mine closure planning. Given low expected groundwater inflows to voids, best value may be gained from studies related to surface water runoff and catchment dynamics.
- It is understood that BMC is developing a decision framework for comparison of pit void rehabilitation options which will help inform a South Walker Creek specific closure strategy.

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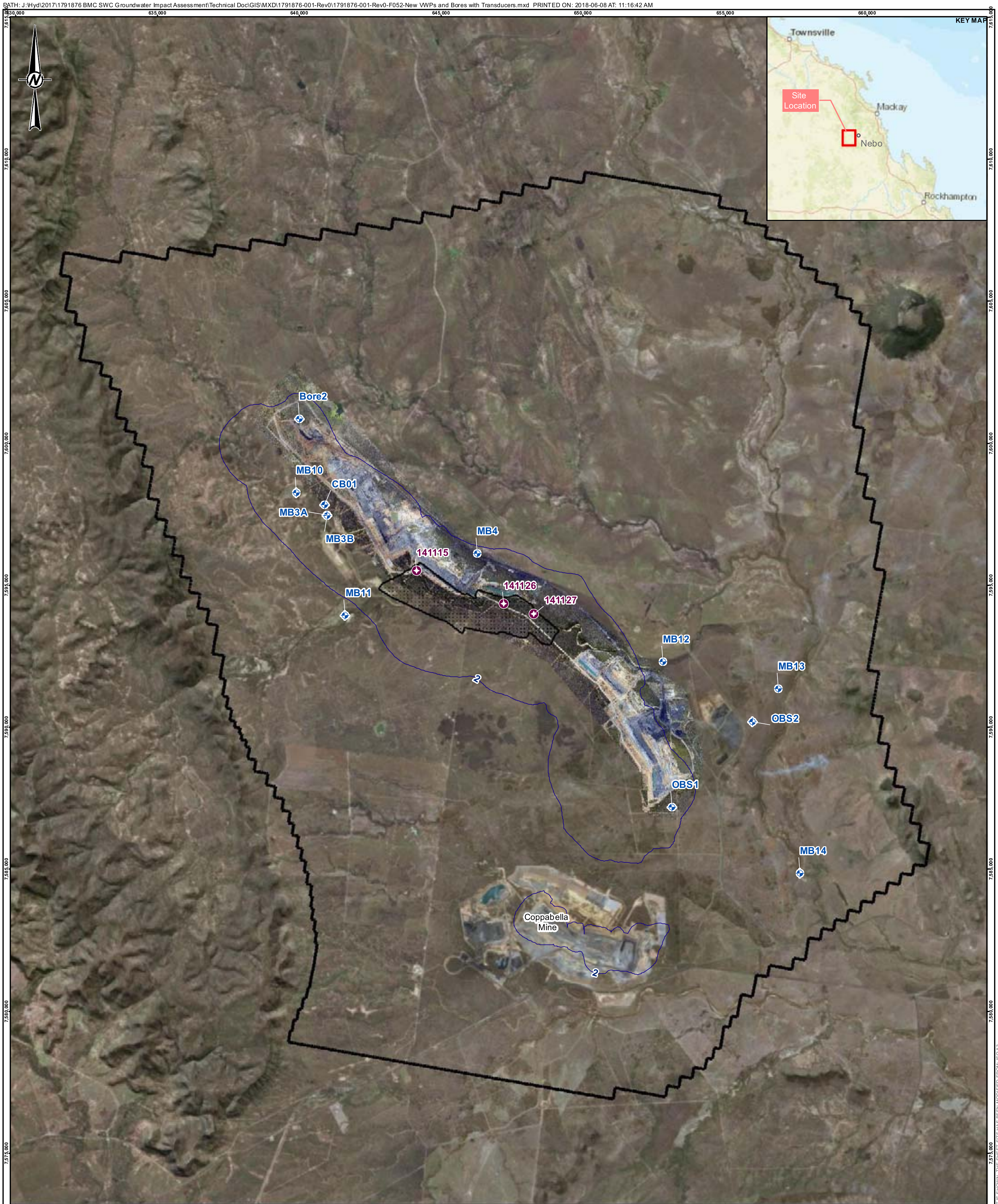



**LEGEND**

- New VWP Location (2018)
- Monitoring Bore with Installed Data Logger
- Drawdown in Water Table Aquifer - EOM Simulation (m AHD)
- Model Domain Outline
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:125,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, USGS, INTERMAP, INCREMENT P CORP., NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI (THAILAND), MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MINE PLAN: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**NEW VWPS AND BORES CURRENTLY OUTFITTED WITH TRANSDUCERS**

CONSULTANT

GOLDER

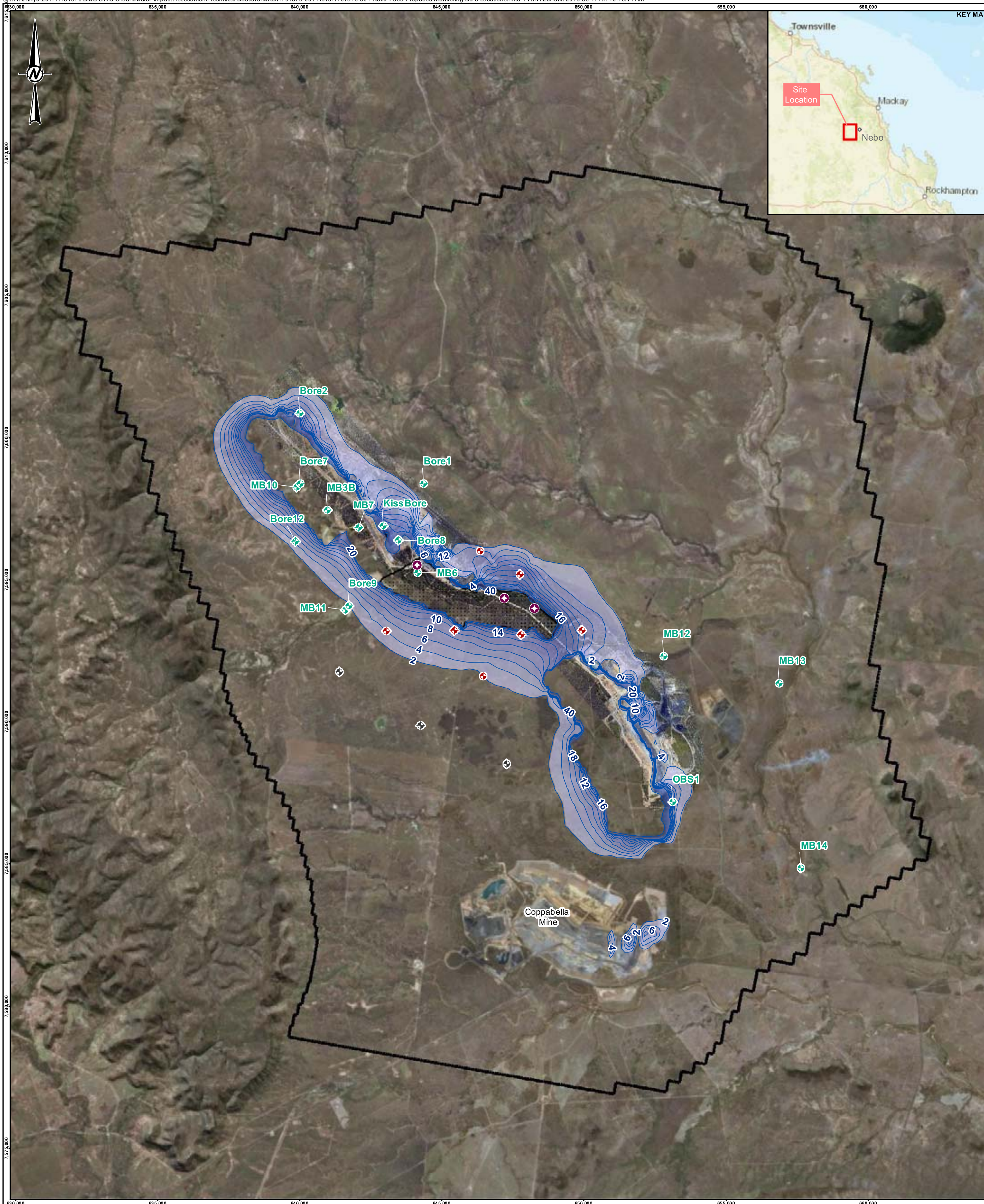
| | |
|---|---|
| YYYY-MM-DD | 8/06/2018 |
| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | JF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 52 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

PATH: J:\Hyd\2017\1791876 BMC SWC Groundwater Impact Assessment\Technical Doc\GIS\MXD\1791876-001-Rev0\1791876-001-Rev0-F053-Proposed Monitoring Bore Locations.mxd PRINTED ON: 2018-06-11 AT: 10:16:44 AM




**LEGEND**

- SWC VWP Location (2018)
- Existing Bore Locations
- Proposed Water Table Aquifer Bore Locations
- Example Coal Seam Bore Locations
- Model Domain Outline
- Drawdown in Water Table Aquifer (m AHD)
- MRA2C Project

0 1,000 2,000 3,000 4,000 5,000

METRES

Scale: 1:125,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

**REFERENCE(S)**
1. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, USGS, INTERMAP, INCREMENT P CORP., NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI (THAILAND), MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. MINE PLAN: BHP, JANUARY 2018

CLIENT
BHP BILLITON MITSUI COAL

PROJECT
SOUTH WALKER CREEK MRA2C

TITLE
**PROPOSED MONITORING BORE LOCATIONS**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 11/06/2018 |
| DESIGNED | HG |
| PREPARED | HG |
| REVIEWED | JF |
| APPROVED | JF |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1791876 | 001 | 0 | 53 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3

25mm

# 9.0 REFERENCES

This list is supplemental to the list of documents and data reviewed, presented in Section 2.1.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# Signature Page

**GOLDER ASSOCIATES PTY LTD**

| | |
|---|---|
| John Fortuna<br>Prinicipal Hydrogeologist | Scott Fidler<br>Principal Hydrogeologist |

JF/SF/KS

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**APPENDIX A**

# Water Chemistry

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blank | 28/06/2016 | 16.68 | 8.22 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | |
| CB01 | 18/02/2018 | | | | | | | 17.07 | | | | | | | | | | | | | | | |
| CB01 | 17/12/2017 | | | | | | | 17.4 | | | | | | | | | | | | | | | |
| CB01 | 23/10/2017 | | | | | | | 17.31 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 16/08/2017 | | | | | | | 17.05 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 07/02/2017 | | | | | | | 16.17 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 2/11/2016 | | | | | | 0 | 16.16 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 14/09/2016 | | | | | | 0 | 15.96 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 2/08/2016 | | | | | | | 15.8 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 28/06/2016 | | | | | | 0 | 15.67 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 17/05/2016 | | | | | | 0 | 15.48 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 26/04/2016 | | | | | | 0 | 15.41 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 5/04/2016 | | | | | | 0 | 15.35 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 23/02/2016 | | | | | | | 15.29 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 20/01/2016 | | | | | | | 15.26 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 1/12/2015 | | | | | | | 15.1 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 11/11/2015 | | | | | | | 15 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 29/09/2015 | | | | | | | 14.89 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 25/08/2015 | | | | | | 0 | 14.71 | 135 | CB01 | Depth Only | | | | | | | | | | | | |
| CB01 | 16/06/2015 | | | | | | | 14.39 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 26/05/2015 | | | | | | | 14.31 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 28/04/2015 | | | | | | | 14.16 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 24/02/2015 | | | | | | | 13.74 | 135 | | Depth Only | | | | | | | | | | | | |
| CB01 | 4/02/2015 | | | | | | | 13.54 | 135 | | Depth Only | | | | | | | | <10 | | | | |
| CB01 | 28/07/2014 | | | | | | | 14.6 | 135 | | Depth Only | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2) | 30/07/2014 | 25.97 | 10.53 | 5010 | 17.3 | | | 12.9 | 135 | 20 | Point source taken from 20m | 10.1 | 4780 | | 20 | 1.5 | 268 | | | | | | |
| Compliance Bore 1 (Gas 2) (p | 30/07/2014 | 28.16 | 11.66 | 5770 | 29.3 | | | 12.9 | 135 | | 25L pumped prior to sample | 11.9 | 6670 | | 26 | 8.6 | 143 | 1220000 | 150 | | 2 | 60 | 3090 |
| Compliance Bore 1 (Gas 2/MI | 17/12/2014 | | | | | | | 13.47 | | | Depth only | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 26/11/2014 | 28.05 | 10.99 | 5420 | 61.6 | 3.41 | ***3410*** | 12.44 | | | Pumped 20L at 30m, Point Source at 63r | 9.98 | 4990 | 2800 | 71 | 13 | 60 | | 80 | <0.001 | <1 | <50 | 1080 |
| Compliance Bore 1 (Gas 2/MI | 15/10/2014 | 28.1 | 10.23 | 5490 | 52.6 | | | 13.29 | | | | 9.96 | 5330 | | 106 | 65 | 90 | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 27/08/2014 | 25.99 | 10.61 | 5340 | 16.6 | | | 13.09 | | | | 10 | 6090 | | 24 | 5.2 | 98 | | <10 | | <1 | <50 | 600 |
| Compliance Bore 1 (Gas 2/MI | 29/04/2014 | 28.24 | 9.65 | 4590 | 39.2 | | | 12 | 135 | | New GW bore drilled to replace Gas 2 | 9.67 | 4340 | | 17 | 3.1 | 342 | 979000 | <10 | | 4 | <50 | 190 |
| Compliance Bore 1 (Gas 2/MI | 2/04/2014 | 27.22 | 9 | 4260 | 39.2 | | | 12.07 | 135 | 20 | Sampled by IESA . New GW Bore replacing Gas 2 | 9.06 | 4160 | | 29 | 6.7 | 430 | 931000 | <10 | | 5 | <50 | 250 |
| Gas 2 | 4/03/2014 | 26.02 | 7.22 | 6450 | 38.7 | | | 9.29 | 171.47 | 20 | | 8.45 | 5550 | | 43 | 7.3 | 23 | 890000 | <10 | | <1 | <50 | 120 |
| Gas 2 | 15/01/2014 | | 7.3 | 4870 | 0 | | | 8.57 | 171.47 | 20 | Water with some sediment | 8.23 | 5310 | | 30 | 7.2 | 13 | 909000 | <10 | | <1 | 1060 | 30 |
| Gas 2 | 10/12/2013 | | 6.91 | 6350 | 5 | | | 8.7 | 171.47 | 20 | | 8.12 | 4070 | | 14 | 5.1 | 10 | 731000 | <10 | | <1 | 860 | 50 |
| Gas 2 | 27/11/2013 | | 6.82 | 6000 | 5.1 | | | 8.3 | 171.47 | 20 | | 7.52 | 5610 | | 37 | 7.7 | 16 | 1050 | <10 | | <1 | 1100 | 30 |
| Gas 2 | 30/10/2013 | | 7.08 | 3610 | 13.2 | | | 8.24 | 171.47 | 20 | | 8.22 | 6590 | | 74 | 11 | 19 | 1120000 | <10 | | <1 | <50 | 260 |
| Gas 2 | 30/09/2013 | | | | | | | | 171.47 | | Not sampled | | | | | | | | | | | | |
| Gas 2 | 19/06/2013 | | 7.3 | 129 | | | | | 171.47 | | Exploration Bore | 7.3 | 77 | | <5 | | 4 | | <10 | | <1 | 3400 | 57 |
| Gas 2 | 21/05/2013 | | 7.27 | 94 | | | | 10.9 | 171.47 | | | 7.6 | 82 | | 47 | | 5 | | <10 | | <1 | 2800 | 67 |
| Gas 2 | 23/04/2013 | | 6.3 | 82 | | | | 7.72 | 171.47 | | | 7.6 | 70 | | 27 | | 4 | | 27 | | <1 | 6600 | 430 |
| Gas 2 | 21/03/2013 | | | | | | | | 171.47 | | No access - too wet | | | | | | | | | | | | |
| Gas 2 | 21/02/2013 | | | | | | | | 171.47 | | No access - too wet | | | | | | | | | | | | |
| Gas 2 | 16/01/2013 | | 8.89 | 4642 | | | | 9.2 | 171.47 | | Bailed | 8.5 | 4400 | | 46 | | 530 | | <10 | | 2 | 650 | 170 |
| Gas 2 | 12/12/2012 | | 9.67 | 4859 | | | | 9.22 | 171.47 | | | 8.5 | 4500 | | 47 | | 520 | | 39 | | 2 | 550 | 280 |
| Hut Bore | 26/06/2015 | 25.1 | 7.5 | 4700 | 7.8 | | 3030 | 8.9 | | | 20,000L Flow Test | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.5 | 7.45 | 4070 | 4.1 | | 3010 | 8.6 | | | 25,000L Flow Test | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.61 | 7.51 | 4650 | 5.1 | | 3030 | 8.2 | | | 30,000L Flow Test | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.58 | 7.49 | 4680 | 3.2 | | 2990 | NT | | | 35,000L Flow Test | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 24 | 7.88 | 4320 | 50 | | 2790 | 15.77 | | | 1,500L Purged | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.5 | 7.46 | 4620 | 34.1 | | 2960 | 10.2 | | | 5,000L Purged 2L/s | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.58 | 7.47 | 4670 | 30.9 | | 2990 | 6.5 | | | 10,000L Purged, 4L/s | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | 25.6 | 7.47 | 4660 | 18.2 | | 2980 | 9.5 | | | 15,000L Purged, 3L/s for 6 hrs | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | 26.69 | 7.07 | 1920 | 19.2 | | 1230 | 15.9 | Tap | | 1.7L/S | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | 26.08 | 6.62 | 2120 | 31.2 | | 1360 | 14.16 | Tap | | flow rate 1.5LS | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | 26.7 | 6.73 | 2000 | 7.8 | | 1280 | 7.6 | Tap | | purged 1000L | | | | | | | | | | | | |
| Kisses Bore | 27/08/2014 | 21.99 | 7.76 | 1760 | 15.6 | | | | Tap | | Not enough water collected to send sample to lab | | | | | | | | | | | | |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kisses Bore | 30/07/2014 | 26.53 | 7.39 | 1890 | 37 | | | | Tap | | | 8.25 | 1860 | | 23 | 4.5 | 15 | 289000 | <10 | | <1 | <50 | <10 |
| Kisses Bore | 28/05/2014 | 26.86 | 6.86 | 1740 | 4.9 | | | | Tap | | Measurement to top of poly pipe | 8.01 | 1470 | | 8 | 80 | 9 | 272000 | <10 | | <1 | 600 | <10 |
| Kisses Bore | 29/04/2014 | | 7.06 | 1860 | 37.7 | | | | Tap | | No depth - automatic bore | 8.22 | 1760 | | <5 | 12 | 12 | 272000 | <10 | | <1 | 300 | <10 |
| Kisses Bore | 2/04/2014 | 28.39 | 7.49 | 1839 | 110 | | | | Tap | | Sampled by IESA / taken from tap | 8.4 | 1660 | | 22 | 77 | 4 | 288000 | <10 | | <1 | 1760 | 30 |
| Kisses Bore | 4/03/2014 | 29 | 7.4 | 1870 | 170 | | | | Tap | | Taken from tap | 8.64 | 1580 | | 27 | 30 | 11 | 249000 | <10 | | <1 | <50 | 40 |
| Kisses Bore | 15/01/2014 | | 7.49 | 2250 | 6.8 | | | | Tap | | Taken from tap | 8.85 | 1740 | | 18 | 26 | 15 | 279000 | <10 | | <1 | 840 | 10 |
| Kisses Bore | 10/12/2013 | | | | | | | | Tap | | Bowl dry | | | | | | | | | | | | |
| Kisses Bore | 27/11/2013 | | 7.32 | 1710 | 157 | | | | Tap | | Taken from tap | 7.88 | 1590 | | 26 | 37 | 9 | 283 | <10 | | <1 | 3870 | <10 |
| Kisses Bore | 30/10/2013 | | | | | | | | Tap | | Bowl dry | | | | | | | | | | | | |
| Kisses Bore | 30/09/2013 | | | | | | | | Tap | | Not sampled | | | | | | | | | | | | |
| Kisses Bore | 19/06/2013 | | | | | | | | Tap | | Bowl dry | | | | | | | | | | | | |
| Kisses Bore | 21/05/2013 | | 7.35 | 1746 | | | | | Tap | | No depth - automatic bore | 7.2 | 1700 | | 42 | | 11 | | <10 | | <1 | 1500 | 120 |
| Kisses Bore | 23/04/2013 | | | | | | | | Tap | | No access - too wet | | | | | | | | | | | | |
| Kisses Bore | 21/03/2013 | | | | | | | | Tap | | No access - too wet | | | | | | | | | | | | |
| Kisses Bore | 21/02/2013 | | | | | | | | Tap | | No Access | | | | | | | | | | | | |
| Kisses Bore | 16/01/2013 | | 7.53 | 1659 | | | | | Tap | | No depth - automatic bore | 7.3 | 1700 | | 22 | | 2 | | <10 | | <1 | 1700 | <10 |
| Kisses Bore | 12/12/2012 | | 8.04 | 1828 | | | | | Tap | | No depth - automatic bore | 7.4 | 1700 | | 22 | | 8 | | <10 | | <1 | 830 | 15 |
| Kisses Bore | 14/11/2012 | | 7.05 | 1664 | | | | | Tap | | No depth - automatic bore | 7.9 | 1700 | | 14 | | 6 | | <10 | | <1 | 890 | <10 |
| Kisses Bore | 17/10/2012 | | | | | | | | Tap | | Not required | | | | | | | | | | | | |
| Kisses Bore | 15/09/2012 | | | | | | | | Tap | | Not required | | | | | | | | | | | | |
| Kisses Bore | 15/08/2012 | | 6.98 | 1644 | | | | | Tap | | No depth - automatic bore | 7.3 | 1400 | | 24 | | 5 | | <10 | | <1 | 9600 | <10 |
| Kisses Bore | 16/07/2012 | | | | | | | | Tap | | Not required | | | | | | | | | | | | |
| Landholder bore 23 | 8/01/2015 | | | | | | | | | | | 7.8 | **3660** | 1920.00 | | 8.80 | <1 | | <10 | <0.001 | 0.01 | 2.10 | 0.21 |
| Landholder bore Middle Well | 9/01/2015 | | | | | | | | | | | 8.23 | 437 | 261.00 | | 3.00 | <1 | | <10 | <0.001 | <0.001 | <50 | 0.12 |
| Landholder Bore Scotts Well | 9/01/2015 | | | | | | | | | | | | | | | | <1 | | <10 | <0.001 | 0.001 | <50 | 0.52 |
| MB10 | 30/11/2016 | 327.38 | 7.80 | 965 | | 0.62 | 619 | 5.38 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.78 | 915 | 510 | <5 | | 10 | 158 | <0.01 | <0.001 | 0.001 | <0.05 | 0.07 |
| MB10 | 16/08/2017 | 26.25 | 7.48 | 1017 | 8.47 | 0.7 | 651 | 5.38 | 10 | Sampled at 10m | | 7.74 | 1050 | 401 | 14 | | 9 | 159 | <0.01 | <0.001 | <0.001 | <0.05 | 0.09 |
| MB10 | 07/02/2017 | 26.9 | 7.2 | 956 | 4.3 | 0.6 | 613 | 5.35 | 10 | Sampled at 10m | | 7.92 | 973 | 558 | <5 | | 8 | 165 | <0.01 | <0.001 | 0.001 | <0.05 | 0.01 |
| MB10 | 18/02/2018 | 26.82 | 8.02 | 1200 | 138.33 | 0.8 | 768 | 5.68 | 10 | Sampled at 10m | | 7.92 | 973 | 558 | <5 | | 8 | 165 | <0.01 | <0.001 | 0.001 | <0.05 | 0.01 |
| MB10 | 17/12/2017 | 26.48 | 8.25 | 1183 | 74.67 | 0.8 | 759 | 5.58 | 10 | Sampled at 10m | | 7.73 | 1180 | 571 | 16 | | 6 | 173 | <0.01 | <0.001 | 0.001 | <0.05 | 0.06 |
| MB10 | 23/10/2017 | 27.00 | 8.44 | 1183 | 13.70 | 0.8 | 756 | 5.45 | 10 | Sampled at 10m | | 8.07 | 1100 | 609 | 9 | | 7 | 183 | <0.01 | 0.001 | 0.001 | <0.05 | 0.12 |
| MB10 | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 8.19 | 966 | 519 | <5 | | 11 | 158 | <0.01 | <0.001 | 0.002 | <0.05 | 0.02 |
| MB10 | 2/11/2016 | 26.64 | 7.49 | 895 | 2.3 | | 572 | 5.33 | 11.8 | | | 8 | 935 | 542 | | 0.8 | 14 | | <0.01 | <0.001 | 0.001 | <0.05 | 0.02 |
| MB10 | 14/09/2016 | 25.39 | 7.43 | 931 | 1.8 | 0.596 | 596 | 5.26 | 11.8 | | | 8.47 | 828 | 457 | | 1.9 | 14 | | <0.01 | <0.001 | 0.002 | 0.1 | 0.01 |
| MB10 | 2/08/2016 | 25.24 | 7.33 | 922 | 1.8 | 0.59 | 590 | 5.23 | 11.8 | 10 | Sampled at 10m - Purged 26.3L | 7.83 | 840 | 463 | | 3.2 | 5 | | <10 | <1 | 4 | 390 | 30 |
| MB10 | 28/06/2016 | 24.95 | 7.25 | 1080 | 35.8 | 0.692 | 692 | 5.25 | 11.8 | | | 7.97 | 949 | 541 | | 2.8 | 6 | | <10 | <1 | 4 | 400 | 20 |
| MB10 | 17/05/2016 | 26.07 | 7.55 | 1100 | 0 | 0.701 | 701 | 11.8 | 11.8 | | | 8.3 | 1100 | 581 | | 2.1 | 8 | | <10 | <1 | 3 | 410 | 20 |
| MB10 | 26/04/2016 | 26.5 | 8.22 | 1300 | 0.6 | 0.834 | 834 | 5.17 | 11.8 | | 26.52L purged | 8.41 | 1200 | 690 | | 2.9 | 12 | | <10 | <1 | 4 | 530 | <10 |
| MB10 | 5/04/2016 | 26.72 | 7.53 | 1450 | 3.4 | 0.926 | 926 | 5.15 | 11.8 | 11 | Sampled at 11m / 26.6L purged | 7.79 | 1260 | 742 | | 4.2 | 12 | | 10 | <1 | 4 | 550 | 20 |
| MB10 | 23/02/2016 | 26.51 | 7.57 | 1700 | 11.5 | 1.09 | 1090 | 3.17 | 11.8 | | | 7.95 | 1580 | 865 | | 3.9 | 8 | | <10 | <1 | 3 | 550 | 60 |
| MB10 | 20/01/2016 | 25.67 | 7.62 | 976 | 3.1 | 0.625 | 625 | 5.55 | 11.8 | | | 7.93 | 942 | 500 | | 1.8 | 7 | 170000 | <10 | <1 | 3 | 200 | 10 |
| MB10 | 1/12/2015 | 26.11 | 7.8 | 820 | 1.6 | 0.53 | 530 | 5.49 | 11.8 | | | 7.97 | 818 | 540 | | 1.6 | 5 | | 10 | <1 | 3 | 210 | 20 |
| MB10 | 11/11/2015 | 26.29 | 7.6 | 908 | 1.71 | 0.58 | 580 | 5.44 | 11.8 | | MB10 | 7.79 | 872 | 481 | | 2 | 7 | | <10 | <1 | 3 | 210 | 10 |
| MB10 | 27/10/2015 | 25.31 | 7.96 | 899 | 2.7 | 0.575 | 575 | 5.37 | 11.8 | | Purged 30L | 7.89 | 745 | 433 | | 8.1 | 6 | | <10 | <1 | 3 | 170 | 30 |
| MB10 | 29/09/2015 | 25.81 | 7.7 | 803 | 1.5 | 0.514 | 514 | 5.35 | 11.8 | | Purged 40L | 7.9 | 809 | 448 | | 1 | 7 | | <10 | <1 | 4 | 180 | 40 |
| MB10 | 25/08/2015 | 27.01 | 7.55 | 960 | 4.8 | 0.614 | 614 | 5.28 | 11.8 | | 26L purged | 7.91 | 946 | 570 | | 2.9 | 6 | | <10 | <1 | **2** | 170 | 20 |
| MB10 | 28/07/2015 | 25.31 | 7.64 | 1050 | 5 | 0.674 | 674 | 5.25 | 11.8 | | Purged 85L | 7.93 | 1000 | 559 | | 2 | 8 | | <10 | <1 | <1 | <50 | 60 |
| MB10 | 9/06/2015 | 25.93 | 7.57 | 710 | 25.5 | | 455 | 5.18 | 11.8 | | Purged >23L | 8.36 | 746 | 429 | | 2.2 | 5 | | <10 | <1 | 6 | 360 | 30 |
| MB10 | 26/05/2015 | 25.9 | 7.71 | 772 | 3.7 | | 494 | 5.18 | 11.8 | | 22.48L to purge (30L purged) | 8.3 | 783 | 482 | | 2.7 | <1 | | <10 | <1 | 6 | 300 | 60 |
| MB10 | 28/04/2015 | 26.05 | 7.58 | 925 | 13 | 0.592 | | 5.15 | 11.8 | | MB10 | 7.95 | 948 | 560 | | 5.2 | 8 | | <10 | <1 | 3 | 180 | 110 |
| MB10 | 31/03/2015 | 25.89 | 7.69 | 1010 | | | ***650*** | 5.08 | 11.8 | | | 7.89 | 1030 | 663 | | 4 | 8 | | <10 | <1 | 4 | 260 | 60 |
| MB10 | 24/02/2015 | 26.25 | 7.72 | 1440 | | 0.922 | ***922*** | 5.21 | 11.8 | | Depth Only | 7.79 | 1330 | 773 | | 31.9 | 25 | | <10 | <1 | 1 | <50 | 550 |
| MB10 | | | | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB11 | 30/11/2016 | 25.83 | 7.32 | 4610 | | 2.81 | 2810 | 4.25 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.43 | 4420 | 3230 | 123 | | 43 | 375 | <0.01 | 0.001 | <0.001 | <0.05 | 1.24 |
| MB11 | 16/08/2017 | 26.18 | 7.09 | 1230 | 4.47 | 0.8 | 789 | 3.74 | 10 | Sampled at 10m | | 7.51 | 1500 | 851 | 12 | | 40 | 112 | <0.01 | <0.001 | 0.002 | 3.22 | 0.02 |
| MB11 | 07/02/2017 | 25.6 | 7.3 | 3883 | 4.0 | 2.5 | 2489 | 4.25 | 10 | Sampled at 10m | | 7.65 | 4310 | 2990 | 14 | | 41 | 338 | <0.01 | <0.001 | <0.001 | 0.63 | <0.01 |
| MB11 | 18/02/2018 | 26.34 | 7.82 | 3590 | 84.70 | 2.3 | 2297 | 4.66 | 10 | Sampled at 10m | | 7.65 | 4310 | 2990 | 14 | | 41 | 338 | <0.01 | <0.001 | <0.001 | 0.63 | <0.01 |
| MB11 | 17/12/2017 | 26.10 | 8.18 | 2960 | 24.83 | 1.9 | 1883 | 4.38 | 10 | Sampled at 10m | | 7.28 | 3530 | 2300 | 18 | | 35 | 233 | <0.01 | <0.001 | 0.001 | 1.94 | <0.01 |
| MB11 | 23/10/2017 | 26.40 | 7.57 | 2630 | 4.63 | 1.7 | 1687 | 4.08 | 10 | Sampled at 10m | | 7.64 | 2360 | 1580 | 5 | | 36 | 216 | <0.01 | <0.001 | 0.001 | 2.6 | 0.02 |
| MB11 | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 7.88 | 737 | 420 | <5 | | 40 | 72 | <0.01 | <0.001 | 0.002 | 2.4 | <0.01 |
| MB11 | 2/11/2016 | 27.49 | 7.02 | 3780 | 2.3 | | 2420 | 4.14 | 14.3 | | | 7.58 | 3980 | 2190 | | 7.1 | 40 | | <0.01 | <0.001 | 0.001 | 0.94 | 0.03 |
| MB11 | 14/09/2016 | 25.16 | 7.01 | 3620 | 1.5 | 2.32 | 2320 | 3.93 | 14.3 | | | 8.12 | 3580 | 2370 | | 6.4 | 39 | | <0.01 | <0.001 | <0.001 | 0.78 | <0.01 |
| MB11 | 2/08/2016 | 24.71 | 6.8 | 3490 | 3 | 2.23 | 2230 | 3.8 | 14.3 | 11 | Sampled at 11m - Purged 32.8L | 7.56 | 3240 | 1960 | | 5.8 | 40 | | <10 | <1 | <1 | 650 | 30 |
| MB11 | 28/06/2016 | 24.37 | 6.79 | 3100 | 38 | 1.98 | 1980 | 3.96 | 14.3 | | | 7.67 | 2940 | 1840 | | 7.1 | 39 | | <10 | <1 | 1 | 990 | 50 |
| MB11 | 17/05/2016 | 25.45 | 7.13 | 1870 | 0 | 1.2 | 1200 | 12 | 14.3 | | | 8 | 1850 | 976 | | 10 | 40 | | <10 | <1 | 1 | 1070 | 10 |
| MB11 | 26/04/2016 | 25.8 | 8.19 | 1830 | 0.1 | 1.17 | 1170 | 3.6 | 14.3 | | 33.6L purged | 8.2 | 1620 | 1150 | | 8 | 41 | | <10 | <1 | 1 | 860 | 10 |
| MB11 | 5/04/2016 | 25.85 | 7.35 | 1450 | 3.8 | 0.927 | 927 | 3.51 | 14.3 | | Purged 33.96L | 7.54 | 1390 | 823 | | 5.3 | 43 | | <10 | <1 | <1 | 870 | 20 |
| MB11 | 23/02/2016 | 26.05 | 7.48 | 2430 | 5.4 | 1.56 | 1560 | 3.12 | 14.3 | | | 7.72 | 2400 | 1540 | | 11.2 | 47 | | <10 | <1 | <1 | 920 | <10 |
| MB11 | 20/01/2016 | 25.24 | 7.11 | 4540 | 1.4 | 2.92 | 2920 | 4.92 | 14.3 | | | 7.53 | 4380 | 2840 | | 4.5 | 44 | 348000 | <10 | <1 | <1 | 260 | 10 |
| MB11 | 1/12/2015 | 25.83 | 7.83 | 4440 | 4 | 2.84 | 2840 | 4.87 | 14.3 | | | 7.72 | 3990 | 2830 | | 4.8 | 44 | | <10 | <1 | <1 | 230 | <10 |
| MB11 | 11/11/2015 | 25.5 | 7.06 | 4580 | 32.3 | 2.93 | 2930 | 4.78 | 14.3 | | MB11 | 7.47 | 4190 | 2570 | | 6.2 | 43 | | <10 | <1 | <1 | 210 | 40 |
| MB11 | 27/10/2015 | 24.96 | 7.34 | 4960 | 0.5 | 2.99 | 2990 | 4.74 | 14.3 | | Purged 40L | 7.47 | 4060 | 2850 | | 4.5 | 44 | | <10 | <1 | <1 | 300 | <10 |
| MB11 | 29/09/2015 | 25.06 | 7.11 | 4710 | 1.7 | 3.01 | 3010 | 4.62 | 14.3 | | purged 40L | 7.51 | 4220 | 2560 | | 3.2 | 43 | | <10 | <1 | <1 | 300 | 50 |
| MB11 | 25/08/2015 | 26.72 | 7.19 | 4320 | 3 | 2.76 | 2760 | 4.52 | 14.3 | | 30L Purged | 7.68 | 3850 | 2370 | | 4.6 | 39 | | <10 | <1 | <1 | 380 | <10 |
| MB11 | 28/07/2015 | 24.55 | 7.11 | 4310 | 11.8 | 2.76 | 2760 | 4.42 | 14.3 | | Purged 60L | 7.56 | 4060 | 2360 | | 4.1 | 46 | | <10 | <1 | <1 | <50 | 170 |
| MB11 | 9/06/2015 | 24.87 | 6.93 | 4090 | 5.5 | | 2620 | 4.25 | 14.3 | | Purged >31L | 7.93 | 3860 | 2210 | | 4.3 | 41 | | <10 | <1 | <1 | 430 | <10 |
| MB11 | 26/05/2015 | 25.01 | 7.11 | 4200 | 11.8 | | 2690 | 4.25 | 14.3 | | 31L to purge (>35L purged) | 7.97 | 3770 | 2710 | | 7.4 | 70 | | <10 | <1 | <1 | 600 | 20 |
| MB11 | 28/04/2015 | 25.11 | 7.05 | 3920 | 10.8 | 2.51 | | 4.15 | 14.3 | | MB11 | 7.51 | 3850 | 2490 | | 6.9 | 38 | | <10 | <1 | <1 | 560 | 30 |
| MB11 | 31/03/2015 | 24.85 | 7.13 | 3730 | | | ***2380*** | 4.18 | 14.3 | | | 7.4 | 3640 | 2010 | | 5.7 | 30 | | <10 | <1 | <1 | 760 | 20 |
| MB11 | 24/02/2015 | 25.86 | 7.22 | 3090 | | 1.98 | ***1980*** | 4.15 | 14.3 | | Depth Only | 7.11 | 2780 | 1610 | | 65.4 | 40 | | <10 | <1 | <1 | 5.7 | 20 |
| MB11 | | | | | | | | | | | | | | | | | | | | | | | |
| MB12 | 30/11/2016 | 26.76 | 7.09 | 5700 | | 3.59 | 3590 | 11.15 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.43 | 5540 | 3080 | 53 | | 30 | 969 | <0.01 | <0.001 | 0.001 | 0.26 | 0.29 |
| MB12 | 17/08/2017 | 23.38 | 7.20 | 4057 | 77.27 | 2.6 | 2600 | 10.65 | 14 | Sampled at 14m | | 7.58 | 4000 | 2220 | 278 | | 19 | 670 | <0.01 | <0.001 | 0.001 | 0.18 | 1.18 |
| MB12 | 06/02/2017 | 27.3 | 7.1 | 5073 | 3.4 | 3.3 | 3252 | 10.97 | 14 | Sampled at 14m | | 7.6 | 5410 | 3000 | 412 | | 15 | 1110 | <0.01 | <0.001 | 0.002 | 0.88 | 4.58 |
| MB12 | 18/02/2018 | 25.99 | 7.45 | 5780 | 225.67 | 3.6 | 3600 | 10.98 | 14 | Sampled at 14m | | 7.6 | 5410 | 3000 | 412 | | 15 | 1110 | <0.01 | <0.001 | 0.002 | 0.88 | 4.58 |
| MB12 | 17/12/2017 | 25.92 | 7.75 | 5720 | 192.00 | 3.6 | 3603 | 10.91 | 14 | Sampled at 14m | | 7.37 | 6070 | 3390 | 121 | | 25 | 937 | <0.01 | <0.001 | 0.002 | 0.52 | 0.1 |
| MB12 | 23/10/2017 | 26.14 | 7.61 | 5420 | 252.33 | 3.4 | 3413 | 10.87 | 14 | Sampled at 14m | | 7.78 | 5190 | 3080 | 181 | | 18 | 918 | <0.01 | <0.001 | 0.001 | 0.4 | 1.21 |
| MB12 | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 8.37 | 5560 | 3170 | 155 | | 20 | 973 | <0.01 | <0.001 | 0.002 | 0.45 | 0.13 |
| MB12 | 2/11/2016 | 26.85 | 6.93 | 5520 | 36.4 | | 3480 | 11.12 | 15.1 | | | 7.68 | 5960 | 3280 | | 14.6 | 30 | | <0.01 | <0.001 | 0.001 | 0.23 | 0.46 |
| MB12 | 14/09/2016 | 25.4 | 7.05 | 5750 | 96.2 | 3.62 | 3620 | 11 | 15.1 | | | 8.58 | 5230 | 3040 | | 21.9 | 16 | | <0.01 | <0.001 | 0.002 | 0.5 | 0.42 |
| MB12 | 2/08/2016 | 24.73 | 6.87 | 5560 | 48.3 | 3.5 | 3500 | 10.95 | 15.1 | 14 | Sampled at 14m - Purged 16.0L | 7.7 | 5520 | 3060 | | 17.4 | 17 | | <10 | <1 | 2 | 850 | 510 |
| MB12 | 28/06/2016 | 23.86 | 6.85 | 6240 | 178 | 3.93 | 3930 | 11.13 | 15.1 | | | 7.76 | 6010 | 3460 | | 28.1 | 30 | | <10 | <1 | 1 | 340 | 600 |
| MB12 | 17/05/2016 | 25.23 | 7.15 | 5620 | 55.5 | 3.54 | 3540 | 11 | 15.1 | | | 8.04 | 5640 | 2820 | | 26.6 | 32 | | <10 | <1 | 1 | 90 | 630 |
| MB12 | 26/04/2016 | 24.48 | 8.06 | 6050 | 104 | 3.81 | 3810 | 11.09 | 15.1 | | Difficult to purge | 8.25 | 5360 | 3030 | | 37.6 | 31 | | <10 | <1 | 2 | 160 | 580 |
| MB12 | 5/04/2016 | 26.09 | 7.24 | 6360 | 10.3 | 4.01 | 4010 | 11.04 | 15.1 | | Purged 15.84L | 7.58 | 5610 | 3050 | | 6 | 21 | | <10 | <1 | 3 | 580 | 80 |
| MB12 | 23/02/2016 | 27.05 | 7.2 | 5590 | 62.3 | 3.52 | 3520 | 11.14 | 15.1 | | | 7.65 | 5470 | 2920 | | 18.5 | 28 | | <10 | <1 | <1 | 130 | 660 |
| MB12 | 20/01/2016 | 26.73 | 7.17 | 5790 | 65.3 | 3.68 | 3680 | 11.44 | 15.1 | | | 7.62 | 5460 | 2870 | | 13.7 | 29 | 952000 | <10 | <1 | <1 | 120 | 70 |
| MB12 | 1/12/2015 | 25.75 | 7.68 | 5590 | 9.8 | 3.53 | 3530 | 11.51 | 15.1 | | | 7.86 | 5070 | 3020 | | 2.7 | 29 | | <10 | <1 | <1 | <50 | 70 |
| MB12 | 11/11/2015 | 25.58 | 7.06 | 5740 | 113 | 3.62 | 3620 | 11.46 | 15.1 | | MB12 | 7.56 | 5250 | 2790 | | 36.1 | 25 | | <10 | <1 | <1 | <50 | 870 |
| MB12 | 27/10/2015 | 26.74 | 7.55 | 5910 | 116 | 3.72 | 3720 | 11.46 | 15.1 | | Purged 15L | 7.47 | 5100 | 2930 | | 52.3 | 30 | | <10 | <1 | <1 | <50 | 1280 |
| MB12 | 29/09/2015 | 25.75 | 7.09 | 6030 | 25.5 | 3.8 | 3800 | 11.45 | 15.1 | | purged 20L | 7.63 | 5410 | 2960 | | 4.9 | 30 | | <10 | <1 | <1 | <50 | 80 |
| MB12 | 25/08/2015 | 25.8 | 7.03 | 5810 | 110 | 3.66 | 3660 | 11.38 | 15.1 | | 15L Purged | 7.79 | 5100 | 2990 | | 38.7 | 26 | | <10 | <1 | <1 | <50 | 550 |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB12 | 28/07/2015 | 24.57 | 6.94 | 5830 | OVA | 3.67 | 3670 | 11.35 | 15.1 | | Purged 30L | 7.6 | 5570 | 2950 | | 921 | 35 | | <10 | <1 | <1 | <50 | 13000 |
| MB12 | 9/06/2015 | 24.29 | 7.03 | 5600 | 270 | | 3520 | 11.29 | 15.1 | | Purged >15L | 8.08 | 5350 | 2970 | | 132 | 30 | | 20 | <1 | <1 | <50 | 1370 |
| MB12 | 26/05/2015 | 25.34 | 7.13 | 5750 | 410 | | 3620 | 11.26 | 15.1 | | 15.36L to purge (20L purged) | 8.13 | 5270 | 2910 | | 284 | 11 | | <10 | <1 | 1 | <50 | 10400 |
| MB12 | 28/04/2015 | 24.82 | 7.04 | 5530 | 598 | 3.49 | | 11.23 | 15.1 | | MB12 | 7.61 | 5430 | 2960 | | 298 | 26 | | <10 | <1 | 1 | <50 | 2070 |
| MB12 | 31/03/2015 | 25.81 | 7.14 | 5320 | | | ***3350*** | 11.11 | 15.1 | | | 7.79 | 5240 | 2780 | | 352 | 23 | | <10 | <1 | 1 | <50 | 3460 |
| MB12 | 4/03/2015 | 25.64 | 7 | 5420 | | 3.41 | ***3410*** | 11.25 | 15.1 | | Used last depth to water. Retest from Feb sampling due to high EC levels. | 8.39 | 4990 | 2890 | | 18.8 | 26 | | <10 | <1 | 1 | <50 | 380 |
| MB12 | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 30/11/2016 | 27.55 | 7.09 | 1600 | | 34.69 | 34687 | 15.37 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.45 | 1510 | 883 | 8 | | 12 | 156 | <0.01 | <0.001 | <0.001 | <0.05 | 0.1 |
| MB13 | 16/08/2017 | 26.95 | 7.33 | 1400 | 2.70 | 0.9 | 895 | 15.08 | 20 | Sampled at 20m | | 7.68 | 1430 | 782 | 6 | | 12 | 142 | <0.01 | <0.001 | <0.001 | <0.05 | 0.05 |
| MB13 | 06/02/2017 | 28.0 | 7.0 | 1420 | 3.2 | 0.9 | 910 | 15.32 | 20 | Sampled at 20m | | 7.76 | 1480 | 867 | 12 | | 12 | 144 | <0.01 | <0.001 | <0.001 | <0.05 | 0.08 |
| MB13 | 18/02/2018 | 26.48 | 7.43 | 1417 | 84.37 | 0.9 | 895 | 15.33 | 20 | Sampled at 20m | | 7.76 | 1480 | 867 | 12 | | 12 | 144 | <0.01 | <0.001 | <0.001 | <0.05 | 0.08 |
| MB13 | 17/12/2017 | 26.47 | 7.67 | 1457 | 15.10 | 0.9 | 933 | 15.2 | 20 | Sampled at 20m | | 7.43 | 1490 | 848 | 15 | | 11 | 139 | <0.01 | <0.001 | <0.001 | <0.05 | 0.03 |
| MB13 | 23/10/2017 | 26.80 | 7.64 | 1477 | 8.27 | 0.9 | 947 | 15.11 | 20 | Sampled at 20m | | 7.84 | 1370 | 832 | 8 | | 11 | 151 | <0.01 | <0.001 | <0.001 | <0.05 | 0.1 |
| MB13 | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 8.05 | 1310 | 802 | <5 | | 11 | 150 | <0.01 | <0.001 | <0.001 | <0.05 | 0.01 |
| MB13 | 2/11/2016 | 27.66 | 7.03 | 1490 | 3.57 | | 951 | 15.34 | 25.25 | | | 7.72 | 1610 | 900 | | 1.2 | 11 | | <0.01 | <0.001 | <0.001 | <0.05 | 0.11 |
| MB13 | 14/09/2016 | 26.85 | 6.96 | 1530 | 3.5 | 0.976 | 976 | 15.24 | 25.25 | | | 8.25 | 1300 | 851 | | 2.4 | 11 | | <0.01 | <0.001 | <0.001 | <0.05 | 0.07 |
| MB13 | 2/08/2016 | 26.28 | 6.93 | 1520 | 2.8 | 0.97 | 970 | 15.29 | 25.25 | 20 | Sampled at 20m - Purged 38.8L | 7.68 | 1470 | 841 | | 2.9 | 12 | | <10 | <1 | <1 | <50 | 90 |
| MB13 | 28/06/2016 | 24.18 | 6.81 | 1610 | 55 | 1.03 | 1030 | 15.41 | 25.25 | | | 7.78 | 1470 | 813 | | 3.6 | 11 | | <10 | <1 | <1 | <50 | 160 |
| MB13 | 17/05/2016 | 26.1 | 7.15 | 1560 | 0 | 1 | 1000 | 14.93 | 25.25 | | | 8.15 | 1520 | 793 | | 1.7 | 12 | | <10 | <1 | <1 | <50 | 60 |
| MB13 | 26/04/2016 | | | | | | 0 | | 25.25 | | Unable to access | | | | | | | | | | | | |
| MB13 | 5/04/2016 | | | | | | 0 | | 25.25 | | No access - track destroyed | | | | | | | | | | | | |
| MB13 | 23/02/2016 | | | | | | 0 | | 25.25 | | No access - road ereoded and tree down | | | | | | | | | | | | |
| MB13 | 20/01/2016 | 27.54 | 7.2 | 1750 | 4.3 | 1.12 | 1120 | 15.1 | 25.25 | | | 7.68 | 1650 | 907 | | 1.6 | 14 | 172000 | <10 | <1 | <1 | <50 | 10 |
| MB13 | 1/12/2015 | 26.94 | 7.98 | 1710 | 2.4 | 1.09 | 1090 | 15.05 | 25.25 | | | 7.85 | 1530 | 911 | | 1.2 | 13 | | <10 | <1 | <1 | <50 | 20 |
| MB13 | 11/11/2015 | 26.98 | 7.06 | 1810 | 2.1 | 1.16 | 1160 | 14.99 | 25.25 | | MB13 | 7.57 | 1630 | 927 | | 1.2 | 14 | | <10 | <1 | <1 | <50 | <10 |
| MB13 | 27/10/2015 | 27.36 | 7.45 | 1850 | 1 | 1.18 | 1180 | 14.93 | 25.25 | | Purged 40L | 7.51 | 1590 | 912 | | 0.8 | 16 | | <10 | <1 | <1 | <50 | 20 |
| MB13 | 29/09/2015 | 26.28 | 6.93 | 1780 | 23.6 | 1.14 | 1140 | 14.96 | 25.25 | | Purged 50L | 7.63 | 1580 | 913 | | 0.4 | 14 | | <10 | <1 | <1 | <50 | 10 |
| MB13 | 25/08/2015 | 26.79 | 7.05 | 1660 | 30.4 | 1.06 | 1060 | 14.87 | 25.25 | | 40L purged | 7.81 | 1480 | 834 | | 2 | 12 | | <10 | <1 | <1 | <50 | 100 |
| MB13 | 28/07/2015 | 25.92 | 6.97 | 1580 | 34.1 | 1.01 | 1010 | 14.85 | 25.25 | | Purged 60L | 7.65 | 1480 | 844 | | 1.3 | 14 | | <10 | <1 | <1 | <50 | 150 |
| MB13 | 9/06/2015 | 26.12 | 6.82 | 1530 | 33.7 | | 980 | 14.83 | 25.25 | | Purged >41L | 8.17 | 1440 | 833 | | 0.5 | 13 | | <10 | <1 | <1 | <50 | <10 |
| MB13 | 26/05/2015 | 26.58 | 6.99 | 1540 | 21.8 | | 986 | 14.76 | 25.25 | | 41L to purge (>45L purged) | 8.13 | 1420 | 840 | | 0.7 | 16 | | <10 | <1 | <1 | <50 | <10 |
| MB13 | 28/04/2015 | 25.93 | 6.99 | 1490 | 2.1 | 0.955 | | 14.79 | 25.25 | | MB13 | 7.58 | 1440 | 770 | | 0.7 | 10 | | <10 | <1 | <1 | <50 | <10 |
| MB13 | 4/02/2015 | | | | | | | | 25.25 | | No Access | | | | | | | | <10 | | | | |
| MB13 | 17/12/2014 | | | | | | | | 25.25 | | No access - wet weather | | | | | | | | | | | | |
| MB13 | 26/11/2014 | 27.36 | 6.83 | 1450 | 3.1 | 0.93 | ***930*** | 14.78 | 25.25 | | 42 L purged | 7.66 | 1340 | 780 | <5 | 3 | 12 | | <10 | <1 | 7 | <50 | 20 |
| MB13 | | | | | | | | | | | | | | | | | | | | | | | |
| MB14 | 30/11/2016 | 27.14 | 7.01 | 954 | | 0.61 | 611 | 15.53 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.45 | 913 | 525 | 10 | | 8 | 67 | <0.01 | <0.001 | <0.001 | <0.05 | 0.12 |
| MB14 | 16/08/2017 | 25.46 | 7.00 | 923 | 2.87 | 0.6 | 588 | 15.16 | 20 | Sampled at 20m | | 7.54 | 943 | 522 | <5 | | 8 | 69 | <0.01 | <0.001 | <0.001 | <0.05 | 0.02 |
| MB14 | 06/02/2017 | 27.7 | 6.9 | 875 | 3.1 | 0.6 | 561 | 15.45 | 20 | Sampled at 20m | | 7.81 | 923 | 523 | <5 | | 7 | 66 | <0.01 | <0.001 | <0.001 | <0.05 | 0.03 |
| MB14 | 18/02/2018 | 25.08 | 7.11 | 920 | 76.20 | 0.6 | 588 | 15.58 | 20 | Sampled at 20m | Clear | 7.81 | 923 | 523 | <5 | | 7 | 66 | <0.01 | <0.001 | <0.001 | <0.05 | 0.03 |
| MB14 | 17/12/2017 | 25.26 | 7.23 | 900 | 9.13 | 0.6 | 576 | 15.43 | 20 | Sampled at 20m | | 7.37 | 949 | 558 | <5 | | 7 | 63 | <0.01 | <0.001 | <0.001 | <0.05 | <0.01 |
| MB14 | 23/10/2017 | 26.57 | 7.63 | 963 | 5.53 | 0.6 | 617 | 15.31 | 20 | Sampled at 20m | | 7.78 | 893 | 544 | <5 | | 8 | 70 | <0.01 | <0.001 | <0.001 | <0.05 | 0.04 |
| MB14 | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 7.98 | 841 | 549 | <5 | | 7 | 71 | <0.01 | <0.001 | <0.001 | <0.05 | <0.01 |
| MB14 | 2/11/2016 | 26.63 | 6.93 | 881 | 2.4 | | 564 | 15.48 | | | | 7.67 | 993 | 593 | | 1.2 | 7 | | <0.01 | <0.001 | <0.001 | <0.05 | 0.05 |
| MB14 | 14/09/2016 | 25.98 | 6.96 | 922 | 1.7 | 0.59 | 590 | 15.36 | 26.38 | | | 8.27 | 809 | 523 | | 1.5 | 7 | | <0.01 | <0.001 | <0.001 | <0.05 | 0.02 |
| MB14 | 2/08/2016 | 25.82 | 6.97 | 876 | 4.7 | 0.561 | 561 | 15.3 | 26.38 | 20 | Sampled at 20m - Purged 38.8L | 7.59 | 883 | 501 | | 3.8 | 8 | | <10 | <1 | <1 | <50 | 110 |
| MB14 | 28/06/2016 | 24.41 | 6.6 | 949 | 53.1 | 0.607 | 607 | 15.43 | 26.38 | | | 7.68 | 892 | 531 | | 5.4 | 7 | | <10 | <1 | <1 | 50 | 250 |
| MB14 | 17/05/2016 | 25.99 | 7.09 | 891 | 0 | 0.57 | 570 | 14.81 | 26.38 | | | 8.06 | 908 | 497 | | 1.1 | 7 | | <10 | <1 | <1 | <50 | 10 |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB14 | 26/04/2016 | 27.65 | 8.28 | 987 | 0 | 0.632 | 632 | 14.8 | 26.38 | | Sampled at 20m / 40.8L purged | 8.23 | 875 | 578 | | 0.9 | 7 | | <10 | <1 | <1 | <50 | <10 |
| MB14 | 5/04/2016 | 24.49 | 7.08 | 1040 | 3.1 | 0.662 | 662 | 14.83 | 26.38 | | | 7.47 | 872 | 466 | | 1 | 8 | | <10 | <1 | <1 | <50 | 10 |
| MB14 | 23/02/2016 | | | | | | 0 | | 26.38 | | | 7.65 | 885 | 530 | | 1.3 | 8 | | <10 | <1 | <1 | 60 | 10 |
| MB14 | 20/01/2016 | 26.98 | 7.17 | 919 | 8 | 0.588 | 588 | 15.16 | 26.38 | | | 7.6 | 885 | 481 | | 2.2 | 8 | 66000 | <10 | <1 | <1 | 50 | 10 |
| MB14 | 1/12/2015 | 25.91 | 8.06 | 914 | 6.3 | 0.584 | 584 | 15.08 | 26.38 | | | 7.79 | 851 | 513 | | 2.1 | 8 | | <10 | <1 | 1 | <50 | 30 |
| MB14 | 11/11/2015 | 25.5 | 6.89 | 948 | 4 | 0.61 | 610 | 15.05 | 26.38 | | MB14 | 7.49 | 884 | 522 | | 2.1 | 8 | | <10 | <1 | <1 | <50 | <10 |
| MB14 | 27/10/2015 | 27.2 | 7.38 | 991 | 0.1 | 0.634 | 634 | 14.98 | 26.38 | | Purged 40L | 7.46 | 862 | 498 | | 0.9 | 9 | | <10 | <1 | <1 | <50 | 40 |
| MB14 | 29/09/2015 | 25.4 | 6.76 | 933 | 29.1 | 0.597 | 597 | 14.98 | 26.38 | | 50L Purged | 7.56 | 881 | 527 | | 0.5 | 8 | | <10 | <1 | <1 | 50 | <10 |
| MB14 | 25/08/2015 | 25.51 | 6.82 | 887 | 27.9 | 0.568 | 568 | 14.92 | 26.38 | | 40L purged | 7.76 | 848 | 531 | | 1.5 | 7 | | <10 | <1 | <1 | 60 | 20 |
| MB14 | 28/07/2015 | 25.27 | 6.81 | 876 | 29.5 | 0.554 | 554 | 14.87 | 26.38 | | Purged 70L | 7.57 | 864 | 495 | | 0.7 | 9 | | <10 | <1 | <1 | <50 | <10 |
| MB14 | 9/06/2015 | 25.21 | 6.49 | 846 | 29.8 | | 542 | 14.82 | 26.38 | | Purged >41L | 8.08 | 846 | 490 | | 0.8 | 9 | | <10 | <1 | <1 | 80 | <10 |
| MB14 | 26/05/2015 | 25.4 | 6.77 | 873 | 27.1 | | 558 | 14.78 | 26.38 | | 41L to purge (50L purged) | 8.09 | 848 | 534 | | 1.2 | 10 | | <10 | <1 | 1 | 90 | <10 |
| MB14 | 28/04/2015 | 25.11 | 6.92 | 878 | 1.5 | 0.562 | | 14.76 | 26.38 | | MB14 | 7.52 | 880 | 518 | | 1.6 | 7 | | <10 | <1 | 1 | 80 | <10 |
| MB14 | 31/03/2015 | 26.68 | 6.82 | 822 | | | ***526*** | 14.7 | 26.38 | | | 7.42 | 869 | 463 | | 1 | 6 | | <10 | <1 | 1 | 80 | <10 |
| MB14 | 24/02/2015 | 25.93 | 6.82 | 872 | | 0.558 | ***558*** | 14.67 | 26.38 | | Depth Only | 7.25 | 834 | 480 | | 1.9 | 8 | | <10 | <1 | 2 | 120 | <10 |
| MB14 | 4/02/2015 | 26.58 | 6.98 | 789 | 8 | 0.505 | ***505*** | 14.65 | 26.38 | | 21.4L Purged | 7.43 | 824 | 538 | | 3.2 | 8 | | <10 | <1 | 2 | 130 | <10 |
| MB14 | 17/12/2014 | 27.41 | 6.81 | 815 | 3.1 | 0.522 | ***522*** | 14.8 | 26.38 | | | 7.43 | 844 | 514 | | 2.3 | 8 | | <10 | <1 | <1 | <50 | 20 |
| MB14 | 26/11/2014 | 27.2 | 6.71 | 903 | 4.2 | 0.577 | ***577*** | 14.76 | 26.38 | | 42 L purged | 7.55 | 883 | 504 | <5 | 2.3 | 8 | | <10 | <1 | 8 | 290 | 40 |
| MB14 | | | | | | | | | | | | | | | | | | | | | | | |
| MB3A | 30/11/2016 | 26.74 | 7.64 | 1750 | | 1.12 | 1123 | 3.24 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.84 | 1680 | 1010 | <5 | | 8 | 342 | <0.01 | <0.001 | <0.001 | 0.06 | <0.01 |
| MB3A | 16/08/2017 | 26.23 | 7.71 | 1570 | 0.43 | 1.0 | 1000 | 3.15 | | at 14m | | 8.02 | 1620 | 912 | <5 | | 10 | 329 | <0.01 | <0.001 | <0.001 | 0.08 | <0.01 |
| MB3A | 07/02/2017 | 26.8 | 7.4 | 1600 | 1.6 | 1.0 | 1025 | 3.17 | 14 | Sampled at 14m | | 8.09 | 1660 | 932 | <5 | | 8 | 342 | 0.01 | <0.001 | <0.001 | 0.1 | <0.01 |
| MB3A | 18/02/2018 | 26.65 | 8.08 | 1270 | 99.53 | 0.8 | 793 | 3.44 | | Sampled at 14m | | 8.09 | 1660 | 932 | <5 | | 8 | 342 | 0.01 | <0.001 | <0.001 | 0.1 | <0.01 |
| MB3A | 17/12/2017 | 26.72 | 8.30 | 1533 | 4.73 | 1.0 | 982 | 3.46 | | Sampled at 14m | | 7.95 | 1600 | 909 | 8 | | 8 | 297 | <0.01 | <0.001 | <0.001 | 0.1 | <0.01 |
| MB3A | 23/10/2017 | 26.83 | 8.07 | 1663 | 0.67 | 1.1 | 1063 | 3.37 | | Sampled at 14m | | 8.1 | 1570 | 982 | <5 | | 9 | 332 | <0.01 | <0.001 | <0.001 | 0.09 | <0.01 |
| MB3A | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 8.53 | 1660 | 928 | <5 | | 8 | 341 | <0.01 | <0.001 | <0.001 | 0.09 | <0.01 |
| MB3A | 2/11/2016 | 26.27 | 7.44 | 1690 | 0.63 | 1.08 | 1080 | 3.22 | 16 | | | 8.07 | 1850 | 1040 | | 0.8 | 8 | | <0.01 | <0.001 | <0.001 | 0.09 | 0.02 |
| MB3A | 14/09/2016 | 25.46 | 7.61 | 1770 | 0.6 | 1.13 | 1130 | 3.22 | 16 | | | 8.7 | 1660 | 941 | | 1.2 | 8 | | <0.01 | <0.001 | <0.001 | 0.09 | <0.01 |
| MB3A | 2/08/2016 | 25.55 | 7.42 | 1660 | 0.8 | 1.07 | 1070 | 3.08 | 16 | | | 7.99 | 1620 | **967** | | 1.1 | 9 | | <10 | <1 | <1 | 100 | <10 |
| MB3A | 28/06/2016 | 24.75 | 7.26 | 1850 | 29.3 | 1.19 | 1190 | 3.16 | 16 | | Pumped 51.36L | 8.08 | 1700 | 971 | | 1.4 | 7 | | <10 | <1 | <1 | 90 | <10 |
| MB3A | 17/05/2016 | 25.37 | 7.54 | 1790 | 0 | 1.14 | 1140 | 3.27 | 16 | | | 8.43 | 1750 | **946** | | 2.5 | 7 | | <10 | <1 | <1 | 90 | <10 |
| MB3A | 26/04/2016 | 26.3 | 8.31 | 1950 | 25.6 | 1.25 | 1250 | 3.2 | 16 | | 51.2L purged | 8.51 | 1730 | **987** | | 1.8 | 8 | | <10 | <1 | <1 | 100 | <10 |
| MB3A | 5/04/2016 | 26.3 | 7.58 | 2000 | 2.2 | 1.28 | 1280 | 3.11 | 16 | | Purged 51.56L | 7.92 | 1740 | **987** | | 0.5 | 8 | | <10 | <1 | <1 | 100 | 10 |
| MB3A | 23/02/2016 | 26.49 | 7.62 | 1950 | 2.8 | 1.25 | 1250 | 3.16 | 16 | | | 7.98 | **1870** | **1120** | | 1.3 | 7 | | <10 | <1 | <1 | 110 | 20 |
| MB3A | 20/01/2016 | 25.6 | 7.58 | 2310 | 16.9 | 1.48 | 1480 | 3.51 | 16 | | | 7.97 | **2150** | **1160** | | 1.8 | 7 | 401000 | <10 | <1 | <1 | 140 | 10 |
| MB3A | 1/12/2015 | 26.15 | 7.66 | 2600 | 1 | 1.67 | 1670 | 3.65 | 16 | | | 7.93 | 818 | 470 | | 1.6 | 4 | | <10 | <1 | <1 | <50 | 20 |
| MB3A | 11/11/2015 | 26.22 | 7.46 | 2.57 | 2570 | 1.64 | 1640 | 3.65 | 16 | | MB3A | 7.83 | **2330** | 1310 | | 3 | 6 | | <10 | <1 | <1 | 160 | <10 |
| MB3A | 29/09/2015 | 25.88 | 7.45 | 2510 | 0 | 1.6 | 1600 | 3.45 | 16 | | purged 60L | 7.9 | **2240** | 1230 | | 1.1 | 7 | | <10 | <1 | <1 | 140 | 20 |
| MB3A | 25/08/2015 | 26.57 | 7.52 | 2210 | 0 | 1.41 | 1410 | 3.39 | 16 | MB3A | 50L Purged | 8.08 | **2000** | 1220 | | 1.1 | 6 | | <10 | <1 | <1 | 140 | 10 |
| MB3A | 28/07/2015 | 25.43 | 7.56 | 2240 | 0.9 | 1.44 | 1440 | 3.34 | 16 | | Purged 60L | 7.97 | **2090** | 1150 | | 1.1 | 7 | | <10 | <1 | <1 | <50 | <10 |
| MB3A | 16/06/2015 | 24.82 | 7.05 | 2090 | 28.9 | | 1340 | 3.2 | 16 | | Purged >52L | 7.8 | **1900** | 1030 | | 0.8 | 7 | | <10 | <1 | <1 | 120 | <10 |
| MB3A | 26/05/2015 | 25.89 | 7.55 | 2030 | 1.2 | | 1300 | 3.13 | 16 | | 51.48L to purge (50L purged) | 8.46 | **1890** | 1070 | | 2.2 | 3 | | <10 | <1 | <1 | 120 | <10 |
| MB3A | 28/04/2015 | 25.84 | 7.48 | 1980 | 0.9 | 1.27 | | 3.18 | 16 | | MB3A | 7.91 | **1950** | 1060 | | 1.1 | 6 | | 20 | <1 | <1 | 120 | <10 |
| MB3A | 24/02/2015 | 26.88 | 7.27 | 906 | | 0.58 | ***580*** | 8.2 | 16 | | Depth Only | 7.71 | **1940** | 1000 | | 1.4 | 20 | | 10 | <1 | <1 | 120 | 1900 |
| MB3A | 4/02/2015 | 27.09 | 7.53 | 2050 | 1.6 | 1.31 | ***1310*** | 3.88 | 16 | | 48.48L Purged | 7.79 | **1980** | 1100 | | 0.9 | 6 | | <10 | <1 | <1 | 120 | <10 |
| MB3A | 17/12/2014 | 27.55 | 7.25 | 2430 | 0 | 1.56 | ***1560*** | 3.11 | 16 | | 52 L purged | 7.79 | **2340** | 1320 | | 3.2 | 6 | | <10 | <1 | <1 | 220 | <10 |
| MB3A | 26/11/2014 | 27.8 | 7.44 | 2360 | 29.9 | 1.51 | ***1510*** | 3.23 | 16 | | 51L Purged | 7.9 | **2310** | 1320 | <5 | 2.4 | 5 | | <10 | <1 | 2 | 230 | <10 |
| MB3A | 15/10/2014 | 26.83 | 7.35 | 2590 | 0 | | | 3.12 | 16 | | | 8.13 | **2620** | | <5 | 4.1 | 7 | | | | | | |
| MB3A | 27/08/2014 | 26.98 | 7.74 | 2530 | 4.1 | | | 3.05 | 16 | | | 8.05 | **2860** | | <5 | 1.4 | 6 | | <10 | | <1 | 120 | 20 |
| MB3A | 30/07/2014 | 25.69 | 7.59 | 1770 | 9.5 | | | 3.13 | 16 | 14 | Point source taken from 14m | 8.64 | 1860 | | 18 | 0.6 | 6 | | | | | | |
| MB3A | 14/05/2014 | 24.8 | 6.27 | 1370 | 24.2 | | | 2.85 | 16 | 3.85 | Measurement to top of poly pipe | 7.76 | 1390 | | 5 | 4.3 | 10 | 239000 | <10 | | <1 | <50 | 360 |
| MB3A | 7/05/2014 | | | | | | | 3 | 16 | | | | | | | | | | | | | | |
| MB3A | | | | | | | | | | | | | | | | | | | | | | | |
| MB3A (pump) | 30/07/2014 | 27.06 | 7.56 | 2430 | 54.5 | | | 3.13 | 16 | | 38L pumped prior to sample | 8.22 | **2480** | | <5 | 1.2 | 6 | 493000 | <10 | | <1 | 190 | 30 |
| MB3B | 30/11/2016 | 27.34 | 7.29 | 870 | | 0.56 | 560 | 3.08 | | | Depth 29/11/2016, sampled 30/11/2016. Ignore insitu cap left on | 7.5 | 845 | 477 | 14 | | 5 | 95 | <0.01 | <0.001 | <0.001 | <0.05 | 0.23 |
| MB3B | 16/08/2017 | 26.39 | 7.32 | 830 | 3.63 | 0.5 | 532 | 3.08 | | Sampled at 7m | | 7.64 | 867 | 490 | 10 | | 5 | 99 | <0.01 | <0.001 | <0.001 | <0.05 | 0.09 |
| MB3B | 07/02/2017 | 26.9 | 7.1 | 868 | 8.9 | 0.6 | 556 | 3.01 | 7 | Sampled at 7m | | 7.7 | 844 | 465 | 44 | | 4 | 95 | 0.01 | <0.001 | <0.001 | <0.05 | 1.66 |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB3B | 18/02/2018 | 27.14 | 7.78 | 750 | 127.40 | 0.5 | 474 | 3.36 | | Sampled at 7m | | 7.7 | 844 | 465 | 44 | | 4 | 95 | 0.01 | <0.001 | <0.001 | <0.05 | 1.66 |
| MB3B | 17/12/2017 | 26.90 | 8.11 | 815 | 47.93 | 0.5 | 521 | 3.29 | | Sampled at 7m | | 7.47 | 844 | 474 | 12 | | 4 | 87 | <0.01 | <0.001 | <0.001 | 0.08 | <0.01 |
| MB3B | 23/10/2017 | 26.54 | 7.63 | 839 | 21.50 | 0.5 | 537 | 3.29 | | Sampled at 7m | | 7.87 | 814 | 450 | <5 | | 4 | 96 | <0.01 | <0.001 | <0.001 | <0.05 | 0.23 |
| MB3B | 09/05/2017 | | | | | | | | | | No field notes received from Blomfield | 8.17 | 819 | 476 | <5 | | 4 | 99 | <0.01 | <0.001 | <0.001 | <0.05 | 0.06 |
| MB3B | 2/11/2016 | 26.89 | 7.16 | 839 | 1.43 | 0.537 | 537 | | 9.5 | | | 7.81 | 929 | 522 | | 0.3 | 4 | | <0.01 | <0.001 | <0.001 | <0.05 | 0.03 |
| MB3B | 14/09/2016 | 26.12 | 7.12 | 871 | 1.3 | 0.557 | 557 | 3.07 | 9.5 | | | 8.5 | 823 | 489 | | 1.3 | 5 | | <0.01 | <0.001 | <0.001 | <0.05 | <0.01 |
| MB3B | 2/08/2016 | 26.18 | 6.97 | 825 | 33.6 | 0.528 | 528 | 2.9 | | | | 7.67 | 837 | 467 | | 84.3 | 5 | | <10 | <1 | <1 | <50 | 5530 |
| MB3B | 28/06/2016 | 25.07 | 6.92 | 906 | 161 | 0.58 | 580 | 3.05 | 9.5 | | Pumped 25.8L | 7.77 | 848 | 480 | | 24.8 | 4 | | <10 | <1 | <1 | <50 | 1440 |
| MB3B | 17/05/2016 | 26.31 | 7.27 | 873 | 82.2 | 0.559 | 559 | 3.1 | 9.5 | | | 8.15 | 902 | 521 | | 85.7 | 6 | | <10 | <1 | <1 | 80 | 3010 |
| MB3B | 26/04/2016 | 27.1 | 8.31 | 950 | 1.5 | 0.608 | 608 | 3 | 9.5 | | 26.0L purged | 8.33 | 844 | 497 | | 1.4 | 5 | | <10 | <1 | <1 | <50 | 10 |
| MB3B | 5/04/2016 | 26.98 | 7.41 | 954 | 7.6 | 0.613 | 613 | 2.92 | 9.5 | | Purge 26.32L | 7.56 | 842 | 444 | | 1.2 | 5 | | <10 | <1 | <1 | <50 | 40 |
| MB3B | 23/02/2016 | 27.29 | 7.27 | 872 | 6.9 | 0.558 | 558 | 2.9 | 9.5 | | | 7.77 | 848 | 466 | | 3.5 | 5 | | <10 | <1 | <1 | <50 | 130 |
| MB3B | 20/01/2016 | | 7.3 | 879 | 130 | 0.561 | 561 | 3.44 | 9.5 | | | 7.68 | 846 | 450 | | 45 | 5 | 96000 | <10 | 1 | <1 | 500 | 370 |
| MB3B | 1/12/2015 | 26.73 | 7.77 | 869 | 2.9 | 0.556 | 556 | 3.58 | 9.5 | | | 8.11 | **2360** | 1330 | | 2.3 | 5 | | 10 | <1 | <1 | 160 | 10 |
| MB3B | 11/11/2015 | 26.38 | 7.22 | 0.91 | 910 | 0.583 | 583 | 3.51 | 9.5 | | MB3B | 7.55 | 849 | 512 | | 22.2 | 5 | | <10 | <1 | <1 | <50 | 770 |
| MB3B | 29/09/2015 | 26.35 | 7.2 | 888 | 0.6 | 0.568 | 568 | 3.44 | 9.5 | | purged 30L - slow | 7.61 | 855 | 471 | | 0.2 | 6 | | 80 | <1 | <1 | <50 | 30 |
| MB3B | 25/08/2015 | 27.42 | 7.19 | 835 | 187 | 0.534 | 534 | 3.33 | 9.5 | MB3B | 25L Purged | 7.9 | 824 | 492 | | 46 | 4 | | <10 | <1 | <1 | <50 | 770 |
| MB3B | 28/07/2015 | 25.78 | 7.07 | 836 | 21.1 | 0.535 | 535 | 3.26 | 9.5 | | Purged >20L | 7.7 | 836 | 460 | | 0.5 | 5 | | <10 | <1 | <1 | <50 | <10 |
| MB3B | 16/06/2015 | 25.32 | 7.03 | 845 | 11.9 | | 549 | 3.12 | 9.5 | | Purged >26L | 7.46 | 832 | 472 | | 0.7 | 5 | | <10 | <1 | <1 | <50 | 40 |
| MB3B | 26/05/2015 | 27 | 7.27 | 831 | 44.8 | | 532 | 3.07 | 9.5 | | 25.72L to purge (30L purged) | 8.16 | 826 | 481 | | 17.7 | <1 | | <10 | <1 | <1 | <50 | 900 |
| MB3B | 28/04/2015 | 26.42 | 7.2 | 838 | 207 | 0.536 | | 3.05 | 9.5 | | MB3B | 7.67 | 854 | 457 | | 156 | 5 | | <10 | <1 | <1 | <50 | 2340 |
| MB3B | 24/02/2015 | 26.98 | 7.28 | 826 | | 0.528 | ***528*** | 2.94 | 9.5 | | Depth Only | 7.34 | 805 | 469 | | 183 | 16 | | <10 | <1 | <1 | <50 | 970 |
| MB3B | 4/02/2015 | 26.91 | 7.24 | 759 | 0.8 | 0.486 | ***486*** | 2.82 | 9.5 | | 26.72L Purged | 7.5 | 810 | 470 | | 2.3 | 4 | | <10 | <1 | <1 | 140 | 20.00 |
| MB3B | 17/12/2014 | 28.01 | 7.03 | 785 | 8.4 | 0.502 | ***502*** | 2.96 | 9.5 | | 26L purged | 7.53 | 814 | 472 | | 3.3 | 6 | | <10 | <1 | <1 | 140 | 70 |
| MB3B | 26/11/2014 | 26.99 | 6.81 | 874 | 43.3 | 0.559 | ***559*** | 3.175 | 9.5 | | 51L Purged | 7.6 | 843 | 443 | 980 | 1050 | 6 | | 20 | <1 | <1 | 130 | 11500 |
| MB3B | 15/10/2014 | 27.02 | 7.09 | 832 | 476 | | | 3.08 | 9.5 | | | 7.93 | 868 | | 169 | 221 | 6 | | | | | | |
| MB3B | 27/08/2014 | 27.1 | 7.61 | 819 | 669 | | | 2.94 | 9.5 | | | 8.02 | 955 | | 696 | 753 | 7 | | <10 | | <1 | <50 | 13900 |
| MB3B | 30/07/2014 | 26 | 7.67 | 890 | 27.9 | | | 3.06 | 9.5 | 8 | Point source taken from 8m | 8.39 | 827 | | 17 | 1.1 | 7 | | | | | | |
| MB3B | 14/05/2014 | 26.25 | 6.02 | 988 | 22.2 | | | 2.82 | 9.5 | 3.82 | Measurement to top of poly pipe | 7.55 | 846 | | 12 | 4.5 | 7 | 96000 | <10 | | <1 | <50 | 370 |
| MB3B | 7/05/2014 | | | | | | | 2.8 | 9.5 | | | | | | | | | | | | | | |
| MB3B | | | | | | | | | | | | | | | | | | | | | | | |
| MB3B (pump) | 30/07/2014 | 28.28 | 7.18 | 907 | OVR | | | 3.06 | 16 | | 19L pumped prior to sample | 8.07 | 861 | | 821 | 706 | 10 | 97000 | 10 | | <1 | <50 | 14000 |
| MB4 | 2/08/2016 | | | | | | | 31.43 | 74.25 | | Depth Only | | | | | | | | | | | | |
| MB4 | 28/06/2016 | | | | | | | 31.46 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 17/05/2016 | | | | | | | 15.48 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 26/04/2016 | | | | | | | 31.49 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 5/04/2016 | | | | | | | 31.49 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 23/02/2016 | | | | | | | 31.45 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 20/01/2016 | | | | | | | 31.5 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 1/12/2015 | | | | | | | 31.5 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 11/11/2015 | | | | | | | 31.48 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 29/09/2015 | | | | | | | 31.53 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 25/08/2015 | | | | | | | 31.53 | 74.25 | MB4 | Depth only | | | | | | | | | | | | |
| MB4 | 28/07/2015 | | | | | | | 31.55 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 9/06/2015 | | | | | | | 31.53 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 26/05/2015 | | | | | | | 31.53 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 28/04/2015 | | | | | | | 31.88 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 24/02/2015 | | | | | | | 31.56 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 4/02/2015 | | | | | | | 31.44 | 74.25 | | Depth only | | | | | | | | | | | | |
| MB4 | 17/12/2014 | | | | | | | 31.78 | 74.25 | | Depth only | | | | | | | | <10 | | | | |
| MB4 | 26/11/2014 | 30.18 | 7.75 | 4340 | 75.2 | 2.74 | 2740 | 31.71 | 74.25 | | Point source at 51m | 8.14 | **3440** | 1970 | 7 | 4 | 18 | | <10 | <1 | 28 | 750 | 80 |
| MB4 | 15/10/2014 | 28.12 | 7.74 | 3620 | 28.5 | | | 31.48 | 74.25 | | | 8.39 | **3650** | | 28 | 22 | 31 | | | | | | |
| MB4 | 27/08/2014 | | | | | | | 31.6 | 74.25 | | Not sampled - only pump available and bore hore details unknown | | | | | | | | | | | | |
| MB4 | 30/07/2014 | 24.58 | 7.51 | 3510 | 205 | | | 31.58 | 74.25 | 51.6 | Point source taken from 51.6m | 8.77 | **3300** | | 43 | 12 | 93 | | | | | | |
| MB4 | 29/04/2014 | 28.57 | 7.25 | 7560 | 35.1 | | | 32 | 74.25 | 55 | Sampled by BMC | 8.02 | **7260** | | 21 | 56 | 660 | 1290000 | <10 | | 32 | 2660 | 340 |
| MB4 | 2/04/2014 | 28.4 | 8.42 | 7310 | 45.4 | | | 31.97 | 74.25 | 55 | Sampled by IESA | 8.02 | **7620** | | 17 | 61 | 704 | 1280000 | 30 | | 38 | 2820 | 160 |
| MB4 | 4/03/2014 | 26.64 | 7.3 | 7800 | 102 | | | 31.85 | 74.25 | 55 | Water smelly and viscous | 8.76 | **7100** | | 29 | 52 | 695 | 1090000 | 10 | | 39 | 2090 | 640 |
| MB4 | 15/01/2014 | | 7.67 | 8410 | 25.5 | | | 30.7 | 74.25 | 55 | Water quite viscous - Biostick added in January | 8.57 | **7290** | | 24 | 72 | 362 | 1190000 | <10 | | 1 | 90 | 240 |
| MB4 | 10/12/2013 | | 7.64 | 7870 | 64.5 | | | 31 | 74.25 | 55 | | 8.4 | **6380** | | 37 | 87 | 379 | 1380000 | <10 | | <1 | 90 | 250 |
| MB4 | 27/11/2013 | | 7.54 | 7280 | 65.4 | | | 31.85 | 74.25 | 55 | | 7.85 | **6720** | | 43 | 123 | 352 | 1240 | 170 | | <1 | 560 | 320 |
| MB4 | 30/10/2013 | | 7.62 | 7870 | 58.7 | | | 31.88 | 74.25 | 55 | | 8.45 | **7860** | | 108 | 67 | 441 | 1350000 | <10 | | <1 | 60 | 540 |
| MB4 | 30/09/2013 | | | | | | | | 74.25 | | Not sampled | | | | | | | | | | | | |
| MB4 | 19/06/2013 | | 7.64 | 7522 | | | | | 74.25 | | Exploration Bore | 7.6 | **6700** | | 6 | | 340 | | <10 | | <1 | 53 | 39 |
| MB4 | 21/05/2013 | | 7.23 | 5995 | | | | 26.73 | 74.25 | | | 7.3 | **5400** | | 41 | | 650 | | <10 | | 1 | 39 | 33 |
| MB4 | 23/04/2013 | | 6.89 | 5730 | | | | | 74.25 | | Could not dip | 7.3 | **5300** | | 14 | | 910 | | <10 | | <1 | 71 | 55 |
| MB4 | 21/03/2013 | | 7.03 | 5654 | | | | 23.59 | 74.25 | | | 7.2 | **5100** | | 38 | | 960 | | | | | | |
| MB4 | 21/02/2013 | | 6.88 | 6121 | | | | 25.45 | 74.25 | | Exploration bore | 7.1 | **6000** | | 32 | | 1000 | | <10 | | 2 | 100 | 140 |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB4 | 16/01/2013 | | 8.46 | 8678 | | | | 31.8 | 74.25 | | Bailed | 8.1 | 8400 | | 180 | | 510 | | <10 | | 10 | 11 | 1000 |
| MB4 | 12/12/2012 | | 10.46 | 4508 | | | | 32.24 | 74.25 | | | 9.5 | 4200 | | 39 | | 410 | | 28 | | 4 | 19 | 140 |
| MB4 | 14/11/2012 | | 9.87 | 4202 | | | | 27.4 | 74.25 | | | 9.1 | 4200 | | 26 | | 440 | | 13 | | 3 | 25 | 1200 |
| MB4 | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 (pump) | 30/07/2014 | 26.3 | 7.83 | 3470 | 337 | | | 31.58 | 74.25 | | 35L pumped prior to sample | 8.28 | 3300 | | 140 | 206 | 87 | 813000 | 90 | | 18 | 440 | 2400 |
| MB5 | 14/05/2014 | | | | | | | | 16 | | Borehole Dry | | | | | | | | | | | | |
| MB5 | 7/05/2014 | | | | | | | | 16 | | | | | | | | | | | | | | |
| MB6 | 2/08/2016 | | | | | | 0 | | | | Unable to access | | | | | | | | | | | | |
| MB6 | 28/06/2016 | | | | | | 0 | | 16 | | Unable to access | | | | | | | | | | | | |
| MB6 | 17/05/2016 | | | | | | 0 | | 16 | | Not accessed | | | | | | | | | | | | |
| MB6 | 26/04/2016 | | | | | | 0 | | 16 | | No access | | | | | | | | | | | | |
| MB6 | 5/04/2016 | | | | | | 0 | | 16 | | No access - creek eroded | | | | | | | | | | | | |
| MB6 | 23/02/2016 | | | | | | | | 16 | | No access | | | | | | | | | | | | |
| MB6 | 20/01/2016 | | | | | | | | 16 | | No Access | | | | | | | | | | | | |
| MB6 | 1/12/2015 | | | | | | | 13.12 | 16 | | Depth too shallow for sampling | | | | | | | | | | | | |
| MB6 | 29/09/2015 | | | | | | | | 16 | | inaccessible | | | | | | | | | | | | |
| MB6 | 25/08/2015 | 27.45 | 7.03 | 681 | 206 | 0.436 | 436 | 12.54 | 16 | MB6 | 9L purged | 7.67 | 661 | 390 | | 23.4 | 4 | | <10 | <1 | <1 | <50 | 2020 |
| MB6 | 28/07/2015 | 24.94 | 7.23 | 666 | 45.3 | 0.426 | 426 | 12:34 | 16 | | Purged >10.64L | 7.62 | 666 | 372 | | 1.4 | 5 | | <10 | <1 | <1 | <50 | 140 |
| MB6 | 16/06/2015 | 25.46 | 6.99 | 661 | 259 | | 423 | 12.04 | 16 | | Purged >12L | 7.36 | 653 | 368 | | 456 | 4 | | 50 | <1 | <1 | 60 | 6270 |
| MB6 | 26/05/2015 | 25.58 | 7.23 | 661 | 545 | | 423 | 11.84 | 16 | | 12.64L to purge | 7.93 | 657 | 397 | | 789 | <1 | | 40 | <1 | <1 | <50 | 10300 |
| MB6 | 28/04/2015 | 25.6 | 7.29 | 677 | | 0.433 | | 11.66 | 16 | | MB6 | 7.51 | 690 | 404 | | 1800 | 4 | | 20 | <1 | <1 | <50 | 6290 |
| MB6 | 24/02/2015 | 26.53 | 7.09 | 680 | | 0.435 | ***435*** | 11.25 | 16 | | 15L purged | 7.3 | 640 | 398 | | 130 | 4 | | <10 | <1 | <1 | <50 | 2.02 |
| MB6 | 4/02/2015 | | | | | | | | 16 | | Depth Only | | | | | | | | | | | | |
| MB6 | 17/12/2014 | 27.8 | 6.98 | 645 | 201 | 0.413 | ***413*** | 11.71 | 16 | | 13.6L purged | 7.45 | 668 | 375 | | 95 | 5 | | <10 | <1 | <1 | 0.14 | 2.19 |
| MB6 | 26/11/2014 | | 6.7 | 726 | OVR | 0.464 | ***464*** | 11.9 | 16 | | 15L purged, very cloudy | 7.49 | 721 | 391 | 986 | 1750 | 5 | | 5720 | <1 | 2 | 3110 | 20400 |
| MB6 | 15/10/2014 | 26.49 | 7 | 705 | 0 | | | 11.74 | 16 | | | 7.94 | 690 | | 554 | 910 | 5 | | | | | | |
| MB6 | 27/08/2014 | 24.63 | 7.54 | 771 | OVR | | | 11.47 | 16 | | | 7.87 | 799 | | 3450 | 4140 | 5 | | <10 | | <1 | <50 | 35400 |
| MB6 | 30/07/2014 | 26.29 | 7.25 | 706 | 42.7 | | | 11.35 | 16 | 13 | Point source taken from 13m | 8.47 | 712 | | 47 | 18 | 5 | | | | | | |
| MB6 | 14/05/2014 | 26.12 | 5.98 | 852 | 206 | | | 10.83 | 16 | 11.83 | Measurement to top of poly pipe | 7.58 | 840 | | 259 | 98 | 8 | 106000 | <10 | | 3 | 360 | 5410 |
| MB6 | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 (pump) | 30/07/2014 | 25.86 | 7.19 | 730 | | | | 11.35 | 16 | | 6L purged (bail) prior to sample | 7.88 | 749 | | 5100 | 5920 | 5 | 82000 | <10 | | <1 | <50 | 55700 |
| MB7 | 2/08/2016 | | | | | | 0 | | | | Tmm Stockpiles / circuit - no access | | | | | | | | | | | | |
| MB7 | 28/06/2016 | | | | | | 0 | | 30 | | Tmm Stockpiles / circuit - no access | | | | | | | | | | | | |
| MB7 | 17/05/2016 | | | | | | 0 | | 30 | | Not accessed - active circuit | | | | | | | | | | | | |
| MB7 | 26/04/2016 | | | | | | 0 | | 30 | | Unable to access - equipment circuit | | | | | | | | | | | | |
| MB7 | 5/04/2016 | | | | | | 0 | | 30 | | No access | | | | | | | | | | | | |
| MB7 | 23/02/2016 | 27.24 | 7.5 | 1090 | 12.3 | 0.701 | 701 | 8.45 | 30 | | | 7.71 | 1030 | 585 | | 3.8 | 10 | | <10 | <1 | 2 | 160 | 60 |
| MB7 | 20/01/2016 | 26.3 | 7.27 | 1000 | 2.9 | 0.642 | 642 | 9.2 | 30 | | | 7.76 | 945 | 554 | | 1.2 | 10 | 140000 | <10 | <1 | <1 | <50 | 10 |
| MB7 | 1/12/2015 | 26.59 | 7.43 | 1010 | 1.2 | 0.64 | 640 | 9.23 | 30 | | | 7.97 | 908 | 536 | | 1.1 | 10 | | <10 | <1 | <1 | 0.09 | <10 |
| MB7 | 11/11/2015 | 26.73 | 7.26 | 1.01 | 1010 | 0.649 | 649 | 9.13 | 30 | | MB7 | 7.68 | 936 | 512 | | 1 | 10 | | <10 | <1 | <1 | <50 | 10 |
| MB7 | 29/09/2015 | 25.79 | 7.22 | 980 | 13.3 | 0.627 | 627 | 8.99 | 30 | | purged 100L | 7.75 | 936 | 515 | | 0.3 | 11 | | <10 | <1 | <1 | <50 | 20 |
| MB7 | 25/08/2015 | 26.99 | 7.21 | 922 | 0.1 | 0.59 | 590 | 8.84 | 30 | | 85L Purged | 7.9 | 903 | 536 | | 0.8 | 9 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 28/07/2015 | 25.46 | 7.29 | 903 | 21.3 | 0.581 | 581 | 8.74 | 30 | | Purged 100L | 7.75 | 907 | 524 | | 1.4 | 11 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 16/06/2015 | 26.8 | 7.06 | 900 | 10.6 | | 576 | 8.6 | 30 | | Purged >86L | 7.55 | 891 | 499 | | 0.8 | 10 | | <10 | <1 | <1 | 50 | 10 |
| MB7 | 26/05/2015 | 26.27 | 7.32 | 884 | 0.1 | | 566 | 8.49 | 30 | | 86.04L to purge (90L) | 8.19 | 884 | 522 | | 1.1 | 8 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 28/04/2015 | 26.36 | 7.22 | 906 | 1.3 | 0.58 | | 8.34 | 30 | | MB7 | 7.69 | 926 | 514 | | 1.5 | 8 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 24/02/2015 | 26.88 | 7.27 | 906 | | 0.58 | ***580*** | 8.2 | 30 | | | 7.41 | 891 | 528 | | 1.4 | 9 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 4/02/2015 | 28.81 | 7.24 | 836 | 0 | 0.535 | ***535*** | 8.16 | 30 | | Depth Only | 7.37 | 880 | 503 | | 1.1 | 9 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 17/12/2014 | 27.8 | 7.11 | 880 | 0.2 | 0.563 | ***563*** | 8.51 | 30 | | 86L urged | 7.59 | 912 | 529 | | 1.6 | 10 | | <10 | <1 | <1 | <50 | <10 |
| MB7 | 26/11/2014 | 27.08 | 6.99 | 899 | 9.2 | 0.576 | ***576*** | 8.65 | 30 | | 89L Purged | 7.72 | 885 | 583 | <5 | 1.3 | 9 | | <10 | <1 | <1 | 80 | <10 |
| MB7 | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) | 15/10/2014 | 27.17 | 7.24 | 893 | 0 | | | 8.485 | | | | 8.12 | 918 | | <5 | 12 | 10 | | | | | | |
| MB7 (MB4) | 27/08/2014 | 24.67 | 7.59 | 918 | 3.5 | | | 8.3 | 31 | | | 7.94 | 1030 | | 8 | 2.2 | 10 | | <10 | | 1 | <50 | 30 |
| MB7 (MB4) | 30/07/2014 | 26.4 | 7.48 | 1250 | 220 | | | 8.34 | 31 | 21 | Point source taken from 21m | 8.6 | 1210 | | 298 | 162 | 27 | | | | | | |
| MB7 (MB4) | 14/05/2014 | 24.49 | 6.34 | 1440 | 39.8 | | | 8.53 | 31 | 7.53 | Measurement to top of poly pipe | 7.74 | 1110 | | 11 | 2.7 | 11 | 186000 | <10 | | <1 | 80 | 60 |
| MB7 (MB4) | 7/05/2014 | | | | | | | 8 | 31 | | | | | | | | | | | | | | |
| MB7 (MB4) (pump) | 30/07/2014 | 26.53 | 7.4 | 877 | 23.3 | | | 8.34 | 31 | | 60L pumped prior to sample | 8.22 | 909 | | 8 | 2.9 | 12 | 146000 | <10 | | 2 | 400 | 170 |
| Middle Well | 29/05/2015 | 25.3 | 7.41 | 4170 | 433 | | 2710 | | | | purged 2000L | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | 10.8 | 6.87 | 3870 | 5.6 | | 2480 | | | Step Test on bore | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | 9.71 | 6.96 | 3800 | 1.5 | | 2430 | | | Step Test on bore | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | 9.65 | 6.93 | 3870 | 1.8 | | 2470 | | | Step Test on bore | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | 9.93 | 6.95 | 3850 | 2.7 | | 2470 | | | Step Test on bore | | | | | | | | | | | | | |
| OBS1 | 2/08/2016 | | | | | | 0 | | | | Not accessed | | | | | | | | | | | | |
| OBS1 | 28/06/2016 | | | | | | 0 | 28.01 | 39.5 | | Depth Only | | | | | | | | | | | | |
| OBS1 | 17/05/2016 | | | | | | 0 | | 39.5 | | Not accessed | | | | | | | | | | | | |
| OBS1 | 26/04/2016 | | | | | | 0 | | 39.5 | | Unable to access | | | | | | | | | | | | |
| OBS1 | 5/04/2016 | | | | | | 0 | | 39.5 | | No Access - blast gate locked | | | | | | | | | | | | |
| OBS1 | 23/02/2016 | | | | | | | | 39.5 | | No Access - blast gate locked | | | | | | | | | | | | |
| OBS1 | 19/01/2016 | | | | | | | | 39.5 | | No Access | | | | | | | | | | | | |
| OBS1 | 1/12/2015 | | | | | | | | 39.5 | | Not accessible - blast gates locked | | | | | | | | | | | | |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS1 | 11/11/2015 | | | | | | | 28.02 | 39.5 | | Depth Only | | | | | | | | | | | | |
| OBS1 | 29/09/2015 | | | | | | | | 39.5 | | Not accessed | | | | | | | | | | | | |
| OBS1 | 25/08/2015 | | | | | | | 28.02 | 39.5 | OBS1 | Only depth taken | | | | | | | | | | | | |
| OBS1 | 28/07/2015 | | | | | | | 28.05 | 39.5 | | Only depth taken | | | | | | | | | | | | |
| OBS1 | 16/06/2015 | | | | | | | 28.06 | 39.5 | | Only depth taken | | | | | | | | | | | | |
| OBS1 | 26/05/2015 | | | | | | | 28.1 | 39.5 | | Depth only | | | | | | | | | | | | |
| OBS1 | 28/04/2015 | | | | | | | 28.1 | 39.5 | | Depth Only | | | | | | | | | | | | |
| OBS1 | 24/02/2015 | | | | | | | 28.04 | 39.5 | | Depth Only | | | | | | | | | | | | |
| OBS1 | 4/02/2015 | | | | | | | 28.01 | 39.5 | | Depth Only | | | | | | | | | | | | |
| OBS1 | 17/12/2014 | | | | | | | 27.98 | 39.5 | | Depth only | | | | | | | | <10 | | | | |
| OBS1 | 26/11/2014 | 30.61 | 6.57 | 20600 | 29.1 | 12.7 | ***12700*** | 27.99 | 39.5 | | Point source sample at 28m | 7.35 | **19100** | 13500 | 17 | 12 | 6 | | <10 | <1 | <1 | 970 | 360 |
| OBS1 | 15/10/2014 | 27.31 | 6.74 | 21800 | 0 | | | 27.735 | 39.5 | | | 7.69 | **20900** | | 22 | 44 | 75 | | | | | | |
| OBS1 | 27/08/2014 | 25.53 | 7.24 | 20300 | 35.7 | | | 28.2 | 39.5 | | | 7.59 | **21500** | | 25 | 7.3 | 6 | | <10 | | <1 | 100 | 500 |
| OBS1 | 30/07/2014 | 26.81 | 6.89 | 14800 | 96.1 | | | 27.91 | 39.5 | 28 | Point source taken from 28m | 8.27 | **13500** | | 44 | 9.1 | 23 | | | | | | |
| OBS1 | 5/06/2014 | 24.95 | 6.21 | 19900 | 38 | | | 27.85 | 39.5 | | | 7.67 | **13500** | | <5 | 14 | 8 | 2940000 | 40 | | <1 | 1280 | <50 |
| OBS1 | 29/04/2014 | | 7.49 | 17600 | 3.9 | | | 27.28 | 39.5 | | | 7.69 | **18200** | | 26 | 4 | 6 | 2980000 | <10 | | <1 | 990 | 140 |
| OBS1 | 2/04/2014 | 26.68 | 6.73 | 20400 | 20.2 | | | 27.98 | 39.5 | 33 | Sampled by IESA | 7.81 | **17700** | | 27 | 34 | 8 | 2760000 | <10 | | <1 | 940 | 130 |
| OBS1 | 5/03/2014 | 26.04 | 7.02 | 20500 | 14.1 | | | 26.97 | 39.5 | 33 | | 8.05 | **18200** | | 26 | 7.4 | 5 | 2900000 | <10 | | <1 | <50 | 50 |
| OBS1 | 15/01/2014 | | 6.85 | 23400 | 0 | | | 27.26 | 39.5 | 33 | | 7.97 | **19100** | | 35 | 21 | 10 | 3060000 | <10 | | <1 | 1000 | 260 |
| OBS1 | 10/12/2013 | | 6.68 | 20700 | 64.8 | | | 27.52 | 39.5 | 33 | | 7.95 | **15500** | | 35 | 13 | 6 | 2980000 | <10 | | <1 | 1120 | 40 |
| OBS1 | 27/11/2013 | | 6.59 | **19500** | 72.1 | | | 27.58 | 39.5 | 33 | | 7.33 | **17000** | | 80 | 30 | 5 | 2980 | <10 | | <1 | 1200 | 880 |
| OBS1 | 30/10/2013 | | 7.16 | **17200** | 140 | | | 27.76 | 39.5 | 33 | | 7.79 | **20500** | | 532 | 414 | 6 | 3040000 | <10 | | <1 | <50 | 10900 |
| OBS1 | 30/09/2013 | | 6.67 | **19400** | | | | 27.83 | 39.5 | 33 | | 7.85 | **19100** | | <5 | 18 | | | | | | | |
| OBS1 | 19/06/2013 | | 8.14 | **21700** | | | | 28.36 | 39.5 | | Bailed 10L | 7.3 | **18000** | | 50 | | <1 | | <10 | | <1 | 810 | 440 |
| OBS1 | 21/05/2013 | | 6.98 | **19920** | | | | 28 | 39.5 | | Bailed 10L | 6.9 | **18000** | | 95 | | 8 | | <10 | | <1 | 950 | 270 |
| OBS1 | 23/04/2013 | | 6.75 | **19680** | | | | 27.37 | 39.5 | | | 6.9 | **19000** | | 7 | | 8 | | <10 | | <1 | 1000 | 320 |
| OBS1 | 21/03/2013 | | | | | | | | 39.5 | | No access - too wet | | | | | | | | | | | | |
| OBS1 | 21/02/2013 | | | | | | | | 39.5 | | No Access | | | | | | | | | | | | |
| OBS1 | 16/01/2013 | | 7.16 | **19650** | | | | 28.16 | 39.5 | | Bailed | 7.1 | **19000** | | 43 | | <1 | | <10 | | <1 | 1100 | 10 |
| OBS1 | 12/12/2012 | | 7.46 | **20520** | | | | 28 | 39.5 | | | 7 | **19000** | | 38 | | 7 | | <10 | | <1 | 910 | 71 |
| OBS1 | 14/11/2012 | | 6.48 | **19550** | | | | 28.12 | 39.5 | | Purged 20L | 7.1 | **19000** | | 49 | | <1 | | <10 | | <1 | <10 | <10 |
| OBS1 | 17/10/2012 | | | | | | | | 39.5 | | Not required | | | | | | | | | | | | |
| OBS1 | 15/09/2012 | | | | | | | | 39.5 | | Not required | | | | | | | | | | | | |
| OBS1 | 15/08/2012 | | 6.72 | 19800 | | | | 28.07 | 39.5 | | | 7.3 | **20000** | | 47 | | 5 | | <10 | | <1 | 780 | 11 |
| OBS1 | 16/07/2012 | | | | | | | | 39.5 | | Not required | | | | | | | | | | | | |
| OBS1 | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 (bail) | 30/07/2014 | 24.98 | 7.00 | 19400 | 76.3 | | | 27.91 | 39.5 | | 6L purged (bailer) from hole prior to samp | 7.79 | **18100** | | 47 | 35 | 11 | 2800000 | 10 | | <1 | 1270 | 830 |
| OBS2 | 2/08/2016 | | | | | | 0 | 11.4 | 135 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 28/06/2016 | | | | | | 0 | 11.45 | 33.5 | | | | | | | | | | | | | | |
| OBS2 | 17/05/2016 | | | | | | 0 | 11.5 | 33.5 | | Depth only | | | | | | | | | | | | |
| OBS2 | 26/04/2016 | | | | | | 0 | | 33.5 | | Unable to access | | | | | | | | | | | | |
| OBS2 | 5/04/2016 | | | | | | 0 | | 33.5 | | No access - road eroded and trees down | | | | | | | | | | | | |
| OBS2 | 23/02/2016 | | | | | | | | 33.5 | | No access - road eroded and trees down | | | | | | | | | | | | |
| OBS2 | 19/01/2016 | | | | | | | 11.27 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 1/12/2015 | | | | | | | 11.48 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 11/11/2015 | | | | | | | 11.5 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 29/09/2015 | | | | | | | 11.34 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 25/08/2015 | | | | | | | 11.51 | 33.5 | OBS2 | Depth Only | | | | | | | | | | | | |
| OBS2 | 28/07/2015 | | | | | | | 11.52 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 9/06/2015 | | | | | | | 11.53 | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 26/05/2015 | | | | | | | 11.55 | 33.5 | | Depth Only | | | | | | | | 1 | | | | |
| OBS2 | 28/04/2015 | | | | | | | 11.55 | 33.5 | | OBS2 | | | | | | | | | | | | |
| OBS2 | 24/02/2015 | | | | | | | | 33.5 | | No access | | | | | | | | | | | | |
| OBS2 | 4/02/2015 | | | | | | | | 33.5 | | Depth Only | | | | | | | | | | | | |
| OBS2 | 17/12/2014 | | | | | | | | 33.5 | | No access - wet weather | | | | | | | | <10 | | | | |
| OBS2 | 26/11/2014 | 27.78 | 5.86 | 27200 | 1 | 16.8 | ***16800*** | 11.6 | 33.5 | | 78L purged | 7.03 | **25400** | 21400 | <5 | 7.1 | 409 | | <10 | <1 | <1 | 1940 | <10 |
| OBS2 | 15/10/2014 | 27.03 | **6.28** | 27300 | 0 | | | 11.6 | 33.5 | | | 7.46 | **26400** | | <5 | 23 | 502 | | | | | | |
| OBS2 | 27/08/2014 | 23.23 | 6.73 | 26800 | 0.7 | | | 11.71 | 33.5 | | | 7.27 | **29300** | | 5 | 7 | 491 | | <10 | | <1 | <50 | <10 |
| OBS2 | 30/07/2014 | 25.77 | 6.34 | 30500 | 34.5 | | | 11.71 | 33.5 | 28 | Point source taken from 28m | 7.86 | **27800** | | 10 | 0.9 | 618 | | | | | | |

| Hole ID | Date | Temp. (oC) | In-situ pH (pH Unit) | In-situ EC (µS/cm) | Turbidity (NTU) | TDS (g/L) | TDS (mg/L) | Depth to Water (mBGL) | Total Depth (mBGL) | Sampling Depth (m) | Comments | pH Value (pH Unit) | Electrical Conductivity (µS/cm) | Total Dissolved Solids (mg/L) | Suspended Solids (SS) (mg/L) | Turbidity (NTU) | Sulfate as SO4 2- (mg/L) | Sodium (µg/L) | Dissolved Aluminium (µg/L) | Dissolved Antimony (µg/L) | Dissolved Arsenic | Dissolved Iron (µg/L) | Total Aluminium (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS2 | 4/06/2014 | | | | | | | | 33.5 | | | 7.47 | 18400 | | 47 | 38 | 572 | 3630000 | <10 | | <1 | 60 | 740 |
| OBS2 | 29/04/2014 | | 6.88 | 27400 | 0.1 | | | 11.36 | 33.5 | | 11.86m depth to tope of poly pipe | 7.5 | 27000 | | <5 | 0.6 | 602 | 3680000 | <500 | | <50 | <500 | <500 |
| OBS2 | 2/04/2014 | 28.7 | 6.12 | 30910 | 0.6 | | | 11.8 | 33.5 | | Sampled by IESA | 7.7 | 28300 | | 37 | 4.6 | 596 | 3580000 | <10 | | <1 | <50 | <10 |
| OBS2 | 5/03/2014 | 24.92 | 6.63 | 29800 | 15.3 | | | 11.36 | 33.5 | 22 | 11.86m depth to tope of poly pipe | 7.83 | 24600 | | 13 | 4.2 | 556 | 3480000 | <10 | | <1 | 470 | 90 |
| OBS2 | 15/01/2014 | | 6.55 | 33500 | 0 | | | 11.4 | 33.5 | 22 | | 7.68 | 27800 | | 34 | 6.4 | 581 | 3780000 | <50 | | <5 | <250 | <50 |
| OBS2 | 10/12/2013 | | 6.42 | 32300 | 15.1 | | | 11.1 | 33.5 | 22 | | 7.78 | 22800 | | 21 | 3.9 | 609 | 4170000 | <50 | | <5 | <250 | 150 |
| OBS2 | 27/11/2013 | | 6.34 | 31200 | 21.4 | | | 11.6 | 33.5 | 22 | | 7.07 | 26400 | | 37 | 6 | 575 | 3960 | <10 | | <1 | <50 | 200 |
| OBS2 | 30/10/2013 | | 6.64 | 34400 | 40.9 | | | 11.75 | 33.5 | 22 | | 7.64 | 33300 | | 85 | 20 | 666 | 4030000 | <10 | | <1 | <50 | 840 |
| OBS2 | 30/09/2013 | | 6.35 | 31900 | | | | 11.81 | 33.5 | 22 | | 7.58 | 31200 | | <5 | 1.7 | | | | | | | |
| OBS2 | 19/06/2013 | | 6.52 | 35290 | | | | 12.14 | 33.9 | | Bailed 40L. Duplicate | 7.1 | 31000 | | 12 | | 620 | | <10 | | <1 | 540 | 110 |
| OBS2 | 21/05/2013 | | 6.54 | 32630 | | | | 12.28 | 33.9 | | Bailed 40L | 6.6 | 27000 | | 120 | | 590 | | <10 | | <1 | 260 | 53 |
| OBS2 | 23/04/2013 | | | | | | | | 33.9 | | No access - too wet | | | | | | | | | | | | |
| OBS2 | 21/03/2013 | | | | | | | | 33.9 | | No access - too wet | | | | | | | | | | | | |
| OBS2 | 21/02/2013 | | | | | | | | 33.9 | | No Access | | | | | | | | | | | | |
| OBS2 | 16/01/2013 | | 6.5 | 28200 | | | | 12.35 | 33.9 | | Duplicate | 6.7 | 28000 | | <5 | | 540 | | <10 | | <1 | 1900 | <10 |
| OBS2 | 12/12/2012 | | 7.05 | 29510 | | | | 13.53 | 33.9 | | Required 139 L. Purged 140L | 6.7 | 27000 | | 24 | | 380 | | <10 | | <1 | 2000 | <10 |
| OBS2 | 14/11/2012 | | 6.16 | 29010 | | | | 12.82 | 33.9 | | Purged 140L | 6.9 | 27000 | | 37 | | 910 | | <10 | | <1 | 2200 | <10 |
| OBS2 | 17/10/2012 | | | | | | | | 33.9 | | Not required | | | | | | | | | | | | |
| OBS2 | 15/09/2012 | | | | | | | | 33.9 | | Not required | | | | | | | | | | | | |
| OBS2 | 15/08/2012 | | 5.99 | 34250 | | | | 12.68 | 33.9 | | | 6.7 | 28000 | | 31 | | 1300 | | <10 | | <1 | 67 | 180 |
| OBS2 | 16/07/2012 | | | | | | | | 33.9 | | Not required | | | | | | | | | | | | |
| OBS2 | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 (pump) | 30/07/2014 | 25.57 | 6.44 | 28500 | 18.5 | | | 11.71 | 33.5 | | 60L pumped prior to sample | 7.25 | 26100 | | 21 | 5.8 | 500 | 3390000 | <10 | | <1 | 1700 | 50 |
| OBS2 (Pump) | 4/06/2014 | | | | | | | | 33.5 | | | 7.51 | 17600 | | 14 | 23 | 520 | 3500000 | <10 | | <1 | 2230 | <50 |
| OBS4 | 28/04/2015 | | | | | | | 31.88 | | | OBS4 | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | 21.7 | 8.1 | 7340 | 52.8 | | 4700 | 2.8 | | | Purged 1000L | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | 22.78 | 8.06 | 7190 | 1.9 | | 4640 | 0.9 | | | 4,000L Purged | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | 23.6 | 7.84 | 7810 | 3.2 | | 5000 | 2.5 | | | 7,000L purged at 0.75l/s | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 27.58 | 7.13 | 188000 | 13.3 | | 11700 | 40 | | | 1000L of 5000L purge | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 27.2 | 7.19 | 18900 | 3.7 | | 11700 | 36 | | | 5000L of 5000L pruge | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 26.97 | 7.13 | 19100 | 5 | | 11800 | 38 | | | 9000L at 2L/S | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 26.8 | 7.13 | 19100 | 2.6 | | 11900 | 32 | | | 13000L, 4L/s | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 26.9 | 7.14 | 18800 | 14.7 | | 11600 | 24 | | | 19000L at 5L/s | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 25.7 | 7.76 | 19600 | 52.8 | | 12160 | 32 | | | 25,000L at 3.75L/S | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 26.3 | 7.66 | 19000 | 25 | | 11800 | 26 | | | 55,000L | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 27.1 | 7.65 | 18700 | 4 | | 11600 | 22.5 | | | 70,000L Purged | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 28.4 | 7.54 | 18100 | 9.5 | | 11200 | 20.9 | | | 85,000L Purged | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | 28.3 | 7.63 | 18000 | 5.3 | | 11100 | NT | | | Nt | | | | | | | | | | | | |
| Well 10 | 1/06/2015 | 23.5 | 7.92 | 6950 | 17.9 | | 4460 | 4.6 | | | 2000L purged | | | | | | | | | | | | |
| Well 11 | 1/06/2015 | 24.4 | 7.9 | 6930 | 3.1 | | 4440 | 3.2 | | | 4000L purged | | | | | | | | | | | | |
| Well 12 | 1/06/2015 | 25.3 | 7.85 | 6950 | 1.7 | | 4450 | 3.2 | | | 6000L Purged | | | | | | | | | | | | |
| Well 13 | 1/06/2015 | 25.3 | 7.77 | 7000 | 2.1 | | 4480 | NT | | | 8000L Purged | | | | | | | | | | | | |
| Well 14 | 1/06/2015 | 26.1 | 7.77 | 7010 | 230 | | 4190 | NT | | | 10,000L Purged | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blank | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 18/02/2018 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 17/12/2017 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 23/10/2017 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 16/08/2017 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 07/02/2017 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 2/11/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 14/09/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 20/01/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 1/12/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 11/11/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 29/09/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 25/08/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 16/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 26/05/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 28/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 24/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CB01 | 28/07/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2) | 30/07/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2) (p | 30/07/2014 | | 4 | 770 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 210 | <100 | <50 | 210 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | 12 | <2 | <2 | <2 |
| Compliance Bore 1 (Gas 2/MI | 17/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 26/11/2014 | 0.003 | 1 | 550 | <0.1 | <0.1 | <0.01 | 30 | 30 | | <20 | <60 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Compliance Bore 1 (Gas 2/MI | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 27/08/2014 | | 1 | 110 | <0.1 | <0.1 | <0.01 | <10 | <10 | | <20 | 90 | <100 | <50 | 90 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | 3 | <2 | <2 | <2 |
| Compliance Bore 1 (Gas 2/MI | 29/04/2014 | | 4 | 370 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | 9 | <2 | <2 | <2 |
| Compliance Bore 1 (Gas 2/MI | 2/04/2014 | | 4 | 1060 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 4/03/2014 | | 1 | 4540 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 15/01/2014 | | <1 | 1930 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 10/12/2013 | | <1 | 1610 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 27/11/2013 | | <1 | 1430 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 30/10/2013 | | <1 | 3440 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 280 | <100 | <50 | 280 | <20 | <20 | 300 | <100 | <100 | 300 | 300 | <1 | <2 | <2 | <2 | <2 |
| Gas 2 | 30/09/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gas 2 | 19/06/2013 | | <1 | 4100 | | | | 0.064 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| Gas 2 | 21/05/2013 | | <1 | 3700 | | | | 0.051 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| Gas 2 | 23/04/2013 | | <1 | 7000 | | | | <0.005 | | | <10 | 61 | 130 | <100 | 191 | | | | | | | | | | | | |
| Gas 2 | 21/03/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gas 2 | 21/02/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gas 2 | 16/01/2013 | | 3 | 2600 | | | | <0.005 | | | 23 | 900 | 1200 | <100 | 2100 | | | | | | | | | | | | |
| Gas 2 | 12/12/2012 | | 3 | 2600 | | | | <0.025 | | | 10 | 520 | 1400 | <100 | <100 | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 27/08/2014 | | | | | | <0.01 | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kisses Bore | 30/07/2014 | | <1 | 3970 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 28/05/2014 | | <1 | 6560 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 29/04/2014 | | <1 | 2380 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 2/04/2014 | | <1 | 15900 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 140 | 110 | <50 | 250 | <20 | <20 | 150 | 110 | <100 | 260 | 150 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 4/03/2014 | | <1 | 8550 | <0.1 | <0.1 | <0.01 | 1 | 1 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 15/01/2014 | | <1 | 3340 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 10/12/2013 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 27/11/2013 | | <1 | 12800 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 60 | <100 | <50 | 60 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Kisses Bore | 30/10/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 30/09/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 19/06/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/05/2013 | | <1 | 4400 | | | | 0.018 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| Kisses Bore | 23/04/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/03/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/02/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 16/01/2013 | | <1 | 2400 | | | | 0.008 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| Kisses Bore | 12/12/2012 | | <1 | 1400 | | | | <0.025 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| Kisses Bore | 14/11/2012 | | <1 | 110 | | | | 0.058 | | | <10 | <50 | 280 | <100 | 280 | | | | | | | | | | | | |
| Kisses Bore | 17/10/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 15/09/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 15/08/2012 | | <1 | 8100 | | | | <0.005 | | | <10 | 190 | <100 | <100 | 190 | | | | | | | | | | | | |
| Kisses Bore | 16/07/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Landholder bore 23 | 8/01/2015 | <0.001 | 0.01 | 4.70 | <0.0001 | <0.0001 | <0.01 | 0.04 | 0.04 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Landholder bore Middle Well | 9/01/2015 | <0.001 | <0.001 | 0.22 | <0.0001 | <0.0001 | <0.01 | 1.77 | 1.77 | 0.06 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Landholder Bore Scotts Well | 9/01/2015 | <0.001 | 0.002 | 3.08 | <0.0001 | <0.0001 | <0.01 | 0.60 | 0.60 | 0.20 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 30/11/2016 | <0.001 | 0.002 | 0.26 | <0.0001 | <0.0001 | | 0.48 | | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 16/08/2017 | <0.001 | 0.001 | 0.16 | <0.0001 | <0.0001 | | 1.67 | | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 07/02/2017 | <0.001 | 0.002 | <0.05 | <0.0001 | <0.0001 | | 0.42 | | 0.06 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 18/02/2018 | <0.001 | 0.002 | <0.05 | <0.0001 | <0.0001 | | 0.42 | | 0.06 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 17/12/2017 | <0.001 | 0.001 | 0.06 | <0.0001 | <0.0001 | | 0.26 | | 0.07 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB10 | 23/10/2017 | <0.001 | 0.002 | 0.17 | <0.0001 | <0.0001 | | 0.4 | | 0.07 | <20 | 50 | <100 | <50 | 50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 09/05/2017 | <0.001 | 0.002 | <0.05 | <0.0001 | <0.0001 | | 3.52 | | 0.05 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 2/11/2016 | <0.001 | 0.002 | <0.05 | <0.0001 | <0.0001 | 0.02 | 2.03 | 2.05 | 0.06 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 14/09/2016 | <0.001 | 0.002 | 0.09 | <0.0001 | <0.0001 | 0.08 | 0.95 | 1.03 | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 2/08/2016 | <1 | 4 | 550 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.09 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 28/06/2016 | <1 | 5 | 570 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.12 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 17/05/2016 | <1 | 4 | 510 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 26/04/2016 | <1 | 5 | 650 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | 0.08 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 5/04/2016 | <1 | 5 | 640 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.07 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 23/02/2016 | <1 | 4 | 680 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.05 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 20/01/2016 | <1 | 3 | 200 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.09 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 1/12/2015 | <1 | 4 | 260 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | 0.12 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 11/11/2015 | <1 | 3 | 240 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.12 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 27/10/2015 | <1 | 3 | 220 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | 0.14 | <20 | <60 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 29/09/2015 | <1 | 3 | 190 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.15 | <20 | 70 | <100 | <50 | 70 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 25/08/2015 | <1 | 2 | 190 | <0.1 | <0.1 | <0.01 | 0.05 | 0.05 | 0.14 | <20 | **60** | <100 | <50 | **60** | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 28/07/2015 | <1 | 3 | 220 | <0.1 | <0.1 | <0.01 | 0.06 | 0.06 | 0.14 | <20 | 130 | <100 | <50 | 130 | <20 | <20 | 130 | <100 | <100 | 130 | 130 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 9/06/2015 | <1 | 6 | 370 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.23 | <20 | 70 | <100 | <50 | 70 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 26/05/2015 | <1 | 6 | 340 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.19 | <20 | 100 | <100 | <50 | 100 | <20 | <20 | 100 | <100 | <100 | 100 | 100 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 28/04/2015 | <1 | 3 | 310 | <0.1 | <0.1 | <0.01 | 0.05 | 0.05 | 0.18 | <20 | 190 | <100 | <50 | 190 | <20 | <20 | 200 | <100 | <100 | 200 | 200 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 31/03/2015 | <1 | 5 | 370 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.24 | <20 | 360 | <100 | <50 | 360 | <20 | <20 | 380 | <100 | <100 | 380 | 380 | <1 | <2 | <2 | <2 | <2 |
| MB10 | 24/02/2015 | <1 | 2 | 490 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | 0.11 | <20 | 1070 | <100 | <50 | 1070 | <20 | <20 | 1090 | <100 | <100 | 1090 | 1090 | <1 | <2 | <2 | <2 | <2 |
| MB10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB11 | 30/11/2016 | <0.001 | <0.001 | 2.41 | <0.0001 | <0.0001 | | 0.02 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 16/08/2017 | <0.001 | 0.002 | 3.16 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 07/02/2017 | <0.001 | <0.001 | 0.5 | <0.0001 | <0.0001 | | 0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 18/02/2018 | <0.001 | <0.001 | 0.5 | <0.0001 | <0.0001 | | 0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 17/12/2017 | <0.001 | 0.001 | 2.26 | <0.0001 | <0.0001 | | 0.02 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB11 | 23/10/2017 | <0.001 | 0.002 | 3.28 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 09/05/2017 | <0.001 | 0.002 | 2.69 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 2/11/2016 | <0.001 | <0.001 | 1.01 | <0.0001 | <0.0001 | <0.01 | 0.01 | 0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 14/09/2016 | <0.001 | <0.001 | 0.86 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 2/08/2016 | <1 | <1 | 850 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 28/06/2016 | <1 | 1 | 1070 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 17/05/2016 | <1 | 1 | 1290 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 26/04/2016 | <1 | 1 | 970 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 5/04/2016 | <1 | 1 | 1060 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 23/02/2016 | <1 | <1 | 1020 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 20/01/2016 | <1 | <1 | 260 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 1/12/2015 | <1 | <1 | 260 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 11/11/2015 | <1 | <1 | 290 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 27/10/2015 | <1 | <1 | 350 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 29/09/2015 | <1 | <1 | 320 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <70 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 25/08/2015 | <1 | <1 | 410 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 28/07/2015 | <1 | <1 | 580 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 9/06/2015 | <1 | <1 | 470 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 26/05/2015 | <1 | <1 | 670 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 28/04/2015 | <1 | <1 | 750 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 31/03/2015 | <1 | <1 | 750 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | 24/02/2015 | <1 | <1 | 5.7 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB11 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB12 | 30/11/2016 | <0.001 | 0.001 | 0.58 | <0.0001 | <0.0001 | | <0.01 | | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 17/08/2017 | <0.001 | 0.002 | 1.86 | <0.0001 | <0.0001 | | <0.01 | | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 06/02/2017 | <0.001 | 0.003 | 5.39 | <0.0001 | <0.0001 | | 0.07 | | 0.02 | <20 | <50 | 220 | 280 | 500 | <20 | <20 | <100 | 410 | 250 | 660 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 18/02/2018 | <0.001 | 0.003 | 5.39 | <0.0001 | <0.0001 | | 0.07 | | 0.02 | <20 | <50 | 220 | 280 | 500 | <20 | <20 | <100 | 410 | 250 | 660 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 17/12/2017 | <0.001 | 0.002 | 0.24 | <0.0001 | <0.0001 | | 0.02 | | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB12 | 23/10/2017 | <0.001 | 0.003 | 1.96 | <0.0001 | <0.0001 | | 0.01 | | 0.03 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 09/05/2017 | <0.001 | 0.002 | 0.76 | <0.0001 | <0.0001 | | 0.11 | | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 2/11/2016 | <0.001 | 0.001 | 0.88 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | 0.03 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 14/09/2016 | <0.001 | 0.002 | 1 | <0.0001 | <0.0001 | <0.01 | 0.06 | 0.06 | 0.05 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 2/08/2016 | <1 | 3 | 1450 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 28/06/2016 | <1 | 2 | 900 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.11 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 17/05/2016 | <1 | 1 | 500 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 26/04/2016 | <1 | 3 | 960 | <0.1 | <0.1 | 0.03 | 0.02 | 0.05 | <0.01 | <20 | 420 | 230 | <50 | 650 | <20 | <20 | 440 | 210 | <100 | 650 | 440 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 5/04/2016 | <1 | 3 | 610 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 23/02/2016 | <1 | 2 | 910 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 20/01/2016 | <1 | 1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.03 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 1/12/2015 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 11/11/2015 | <1 | <1 | 710 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | 0.05 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 27/10/2015 | <1 | <1 | 1100 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.03 | <20 | <50 | 920 | <50 | 920 | <20 | <20 | <100 | 910 | <100 | 910 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 29/09/2015 | <1 | <1 | 70 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 25/08/2015 | <1 | <1 | 430 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.04 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB12 | 28/07/2015 | <1 | 5 | 16000 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.05 | <20 | <50 | 330 | 390 | 720 | <20 | <20 | <100 | 610 | 340 | 950 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 9/06/2015 | <1 | 1 | 1240 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.07 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 26/05/2015 | <1 | 4 | 16300 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.06 | <20 | <60 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 28/04/2015 | <1 | 1 | 1980 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.09 | <20 | <50 | <100 | 90 | 90 | <20 | <20 | <100 | 140 | <100 | 140 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 31/03/2015 | <1 | 2 | 4140 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.09 | <20 | <50 | <100 | 80 | 80 | <20 | <20 | <100 | 120 | <100 | 120 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | 4/03/2015 | <1 | 1 | 260 | <0.1 | <0.1 | <0.01 | 0.08 | 0.08 | 0.09 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB12 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 30/11/2016 | <0.001 | <0.001 | 0.14 | <0.0001 | <0.0001 | | <0.01 | | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 16/08/2017 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | <0.01 | | 0.11 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 06/02/2017 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | <0.01 | | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 18/02/2018 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | <0.01 | | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 17/12/2017 | <0.001 | <0.001 | <0.05 | <0.0001 | <0.0001 | | 0.03 | | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB13 | 23/10/2017 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | <0.01 | | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 09/05/2017 | <0.001 | <0.001 | <0.05 | <0.0001 | <0.0001 | | <0.01 | | 0.09 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 2/11/2016 | <0.001 | <0.001 | 0.07 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | 0.16 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 14/09/2016 | <0.001 | <0.001 | 0.06 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | 0.15 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 2/08/2016 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.15 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 28/06/2016 | <1 | <1 | 140 | <0.1 | <0.1 | 0.01 | <0.01 | <0.01 | 0.15 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 17/05/2016 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.16 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 20/01/2016 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.18 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 1/12/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.2 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 11/11/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.2 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 27/10/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.21 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 29/09/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.21 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 25/08/2015 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.25 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 28/07/2015 | <1 | <1 | 130 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.32 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 9/06/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.28 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 26/05/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.27 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 28/04/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.35 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 17/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB13 | 26/11/2014 | <1 | 6 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB13 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB14 | 30/11/2016 | <0.001 | <0.001 | 0.21 | <0.0001 | <0.0001 | | <0.01 | | 0.08 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 16/08/2017 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | <0.01 | | 0.07 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 06/02/2017 | <0.001 | <0.001 | 0.06 | <0.0001 | <0.0001 | | <0.01 | | 0.09 | <20 | <50 | 150 | <50 | 150 | <20 | <20 | <100 | 170 | <100 | 170 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 18/02/2018 | <0.001 | <0.001 | 0.06 | <0.0001 | <0.0001 | | <0.01 | | 0.09 | <20 | <50 | 150 | <50 | 150 | <20 | <20 | <100 | 170 | <100 | 170 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 17/12/2017 | <0.001 | <0.001 | 0.05 | <0.0001 | <0.0001 | | 0.02 | | 0.08 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB14 | 23/10/2017 | <0.001 | <0.001 | 0.28 | <0.0001 | <0.0001 | | <0.01 | | 0.09 | <20 | 80 | <100 | <50 | 80 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 09/05/2017 | <0.001 | <0.001 | <0.05 | <0.0001 | <0.0001 | | <0.01 | | 0.06 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 2/11/2016 | <0.001 | <0.001 | 0.07 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | 0.17 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 14/09/2016 | <0.001 | <0.001 | 0.05 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 2/08/2016 | <1 | <1 | 140 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 28/06/2016 | <1 | <1 | 260 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 17/05/2016 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.12 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB14 | 26/04/2016 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 5/04/2016 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 23/02/2016 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.1 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 20/01/2016 | <1 | <1 | 50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.13 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 1/12/2015 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.19 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 11/11/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.18 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 27/10/2015 | <1 | <1 | 180 | <0.1 | <0.1 | 0.01 | 0.01 | 0.02 | 0.15 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 29/09/2015 | <1 | <1 | 70 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.21 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 25/08/2015 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.18 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 28/07/2015 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.19 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 9/06/2015 | <1 | 1 | 90 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.24 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 26/05/2015 | <1 | 1 | 100 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.23 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 28/04/2015 | <1 | 1 | 100 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.33 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 31/03/2015 | <1 | 1 | 110 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.44 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 24/02/2015 | <1 | 2 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.58 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 4/02/2015 | <1 | 2 | 110.00 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | 0.60 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 17/12/2014 | <1 | 4 | 230 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 1.39 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 | 26/11/2014 | <1 | 9 | 320 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 |  | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB3A | 30/11/2016 | <0.001 | <0.001 | 0.15 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 16/08/2017 | <0.001 | <0.001 | 0.14 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 07/02/2017 | <0.001 | <0.001 | 0.1 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 18/02/2018 | <0.001 | <0.001 | 0.1 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 17/12/2017 | <0.001 | <0.001 | 0.12 | <0.0001 | <0.0001 |  | 0.04 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB3A | 23/10/2017 | <0.001 | <0.001 | 0.11 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 09/05/2017 | <0.001 | <0.001 | 0.1 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 2/11/2016 | <0.001 | <0.001 | 0.11 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 14/09/2016 | <0.001 | <0.001 | 0.1 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 2/08/2016 | <1 | <1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 28/06/2016 | <1 | <1 | 110 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 17/05/2016 | <1 | <1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 26/04/2016 | <1 | <1 | 100 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 5/04/2016 | <1 | <1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 23/02/2016 | <1 | <1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 20/01/2016 | <1 | <1 | 140 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 1/12/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 11/11/2015 | <1 | <1 | 190 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 29/09/2015 | <1 | <1 | 150 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 25/08/2015 | <1 | <1 | 130 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 28/07/2015 | <1 | <1 | 160 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 16/06/2015 | <1 | <1 | 120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 26/05/2015 | <1 | <1 | 140 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 28/04/2015 | <1 | <1 | 140 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 24/02/2015 | <1 | <1 | 2.37 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 4/02/2015 | <1 | <1 | 0.13 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 17/12/2014 | <1 | <1 | 0.24 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 26/11/2014 | <1 | <1 | 220 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 |  | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 15/10/2014 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB3A | 27/08/2014 |  | <1 | 320 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 |  | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 30/07/2014 |  |  |  |  |  | <0.01 | <0.01 | <0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB3A | 14/05/2014 |  | 1 | 430 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 |  | 480 | <50 | <100 | <50 | <50 | 500 | 500 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3A | 7/05/2014 |  |  |  |  |  | <0.01 | <0.01 | <0.01 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB3A |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB3A (pump) | 30/07/2014 |  | <1 | 250 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 |  | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 30/11/2016 | <0.001 | <0.001 | 0.46 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 16/08/2017 | <0.001 | <0.001 | 0.17 | <0.0001 | <0.0001 |  | 0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 07/02/2017 | <0.001 | <0.001 | 2.11 | <0.0001 | <0.0001 |  | <0.01 |  | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB3B | 18/02/2018 | <0.001 | <0.001 | 2.11 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 17/12/2017 | <0.001 | <0.001 | 0.08 | <0.0001 | <0.0001 | | 0.02 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <1 | <2 |
| MB3B | 23/10/2017 | <0.001 | <0.001 | 0.48 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 09/05/2017 | <0.001 | <0.001 | 0.07 | <0.0001 | <0.0001 | | <0.01 | | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 2/11/2016 | <0.001 | <0.001 | <0.05 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 14/09/2016 | <0.001 | <0.001 | <0.05 | <0.0001 | <0.0001 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 2/08/2016 | <1 | <1 | 6640 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 28/06/2016 | <1 | <1 | 1490 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 17/05/2016 | <1 | <1 | 3490 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 26/04/2016 | <1 | <1 | 50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 5/04/2016 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 23/02/2016 | <1 | <1 | 110 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 20/01/2016 | <1 | <1 | 500 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 1/12/2015 | <1 | <1 | 200 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 11/11/2015 | <1 | <1 | 870 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 29/09/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | ,0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 25/08/2015 | <1 | <1 | 680 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 28/07/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 16/06/2015 | <1 | <1 | 60 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 26/05/2015 | <1 | <1 | 640 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 28/04/2015 | <1 | <1 | 2780 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 24/02/2015 | <1 | <1 | 0.98 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 4/02/2015 | <1 | <1 | 0.12 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 17/12/2014 | <1 | <1 | 0.24 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 26/11/2014 | <1 | 1 | 14000 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | | <20 | <50 | <100 | 150 | 150 | <20 | <20 | <100 | 140 | 180 | 320 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB3B | 27/08/2014 | | 1 | 17000 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 30/07/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| MB3B | 14/05/2014 | | <1 | 310 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB3B | 7/05/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| MB3B | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB3B (pump) | 30/07/2014 | | 1 | 20000 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 20/01/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 1/12/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 11/11/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 29/09/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 25/08/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 28/07/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 9/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 26/05/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 28/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 24/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 17/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 26/11/2014 | <1 | 28 | 850 | <0.1 | <0.1 | 0.03 | 0.02 | 0.05 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 27/08/2014 | | | | | | <0.01 | | | | | | | | | | | | | | | | | | | | |
| MB4 | 30/07/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 29/04/2014 | | 34 | 3330 | 0.2 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 1350 | 2630 | <50 | 3980 | <20 | <20 | 2500 | 1570 | <100 | 4070 | 2500 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 2/04/2014 | | 38 | 3390 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <80 | 1170 | 2020 | <50 | 3190 | <20 | <20 | 2040 | 1190 | <100 | 3230 | 2040 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 4/03/2014 | | 39 | 2960 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <160 | 900 | 1150 | 60 | 2110 | <20 | <20 | 1460 | 700 | <100 | 2160 | 1460 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 15/01/2014 | | 2 | 650 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 260 | 970 | <50 | 1230 | <20 | <20 | 780 | 470 | <100 | 1250 | 780 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 10/12/2013 | | <1 | 680 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 240 | 750 | <50 | 990 | <20 | <20 | 560 | 380 | <100 | 940 | 560 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 27/11/2013 | | 2 | 830 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 140 | 400 | <50 | 540 | <20 | <20 | 380 | 170 | <100 | 550 | 380 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 30/10/2013 | | 2 | 1120 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | 180 | 570 | <50 | 750 | <20 | <20 | 500 | 260 | <100 | 760 | 500 | <1 | <2 | <2 | <2 | <2 |
| MB4 | 30/09/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 | 19/06/2013 | | 2 | 100 | | | | <0.005 | | | <10 | 150 | 660 | <100 | <880 | | | | | | | | | | | | |
| MB4 | 21/05/2013 | | 2 | 110 | | | | <0.005 | | | <10 | 240 | 1200 | 120 | 1560 | | | | | | | | | | | | |
| MB4 | 23/04/2013 | | 1 | 200 | | | | <0.005 | | | <10 | 440 | 2400 | <100 | 2840 | | | | | | | | | | | | |
| MB4 | 21/03/2013 | | | | | | | 0.085 | | | | | | | | | | | | | | | | | | | |
| MB4 | 21/02/2013 | | 4 | 460 | | | | <0.005 | | | <10 | 880 | 4900 | <100 | 5780 | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB4 | 16/01/2013 | | 15 | 1400 | | | | 0.006 | | | <10 | 5200 | 23000 | <100 | 28200 | | | | | | | | | | | | |
| MB4 | 12/12/2012 | | 4 | 130 | | | | <0.025 | | | 40 | <50 | 170 | <100 | <100 | | | | | | | | | | | | |
| MB4 | 14/11/2012 | | 4 | 510 | | | | <0.005 | | | 35 | <50 | 350 | <100 | 385 | | | | | | | | | | | | |
| MB4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB4 (pump) | 30/07/2014 | | 18 | 1630 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB5 | 14/05/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| MB5 | 7/05/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| MB6 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 20/01/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 1/12/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 29/09/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 25/08/2015 | <1 | <1 | 2290 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 28/07/2015 | <1 | <1 | 180 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 16/06/2015 | <1 | 1 | 8740 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | 0.09 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 26/05/2015 | <1 | 2 | 17600 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 28/04/2015 | <1 | 2 | 7960 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 24/02/2015 | <1 | <1 | 2.52 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 17/12/2014 | <1 | <1 | 2.75 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | 0.02 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 26/11/2014 | <1 | 3 | 27900 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 27/08/2014 | | 6 | 48200 | <0.1 | <0.1 | <0.01 | 100 | 100 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | 30/07/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 | 14/05/2014 | | 4 | 6880 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | 60 | <50 | <100 | <50 | <50 | 70 | 70 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB6 (pump) | 30/07/2014 | | 8 | 107000 | <0.1 | <0.1 | <0.01 | 40 | 40 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 | 23/02/2016 | <1 | 2 | 500 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 20/01/2016 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 1/12/2015 | <1 | <1 | 110 | <0.1 | <0.1 | <0.01 | 0.07 | 0.07 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 11/11/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.08 | 0.08 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 29/09/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.09 | 0.09 | 0.01 | <20 | <60 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 25/08/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.1 | 0.1 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 28/07/2015 | <1 | <1 | 150 | <0.1 | <0.1 | <0.01 | 0.09 | 0.09 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 16/06/2015 | <1 | <1 | 70 | <0.1 | <0.1 | <0.01 | 0.07 | 0.07 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 26/05/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.05 | 0.05 | <0.01 | <20 | <60 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 28/04/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | 0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 24/02/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.01 | 0.01 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 4/02/2015 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.02 | 0.02 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 17/12/2014 | <1 | <1 | <50 | <0.1 | <0.1 | <0.01 | 0.03 | 0.03 | <0.01 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | 26/11/2014 | <1 | <1 | 80 | <0.1 | <0.1 | <0.01 | 100 | 100 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) | 27/08/2014 | | 2 | 450 | <0.1 | <0.1 | <0.01 | 40 | 40 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 (MB4) | 30/07/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) | 14/05/2014 | | <1 | 170 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | 110 | <50 | <100 | <50 | <50 | 120 | 120 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| MB7 (MB4) | 7/05/2014 | | | | | | <0.01 | <0.01 | <0.01 | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) (pump) | 30/07/2014 | | 3 | 760 | <0.1 | <0.1 | <0.01 | 60 | 60 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| Middle Well | 29/05/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 19/01/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 1/12/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS1 | 11/11/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 29/09/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 25/08/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/07/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 16/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/05/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 24/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 17/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/11/2014 | <1 | <1 | 1480 | <0.1 | <0.1 | 10 | 90 | 100 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 27/08/2014 | | <1 | 1150 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 30/07/2014 | | | | | | <0.01 | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 5/06/2014 | | <5 | 1220 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 29/04/2014 | | <1 | 1340 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 2/04/2014 | | <1 | 1730 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 5/03/2014 | | <1 | 1190 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 15/01/2014 | | <1 | 1490 | <0.1 | <0.1 | 10 | 10 | 20 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 10/12/2013 | | <1 | 1140 | <0.1 | <0.1 | 10 | 10 | 20 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 27/11/2013 | | <1 | 2130 | <0.1 | 1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | 190 | <50 | 190 | <20 | <20 | 190 | <100 | <100 | 190 | 190 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 30/10/2013 | | 4 | 13600 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS1 | 30/09/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 19/06/2013 | | <1 | 1400 | | | | 0.026 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 21/05/2013 | | <1 | 1300 | | | | 0.06 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 23/04/2013 | | <1 | 1200 | | | | 0.02 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 21/03/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 21/02/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 16/01/2013 | | <1 | 1300 | | | | 0.11 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 12/12/2012 | | <1 | 980 | | | | 0.11 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 14/11/2012 | | <1 | 33 | | | | <0.025 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS1 | 17/10/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 15/09/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | 15/08/2012 | | <1 | 900 | | | | 0.052 | | | <10 | 84 | 980 | <100 | 1064 | | | | | | | | | | | | |
| OBS1 | 16/07/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS1 (bail) | 30/07/2014 | | <1 | 3050 | <0.1 | <0.1 | <0.01 | 350 | 360 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 2/08/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/06/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 17/05/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 5/04/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 23/02/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 19/01/2016 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 1/12/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 11/11/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 29/09/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 25/08/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/07/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 9/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/05/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 24/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 4/02/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 17/12/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/11/2014 | <1 | <1 | 1980 | <0.1 | <0.1 | <0.01 | 70 | 70 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 15/10/2014 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 27/08/2014 | | <1 | 1870 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 30/07/2014 | | | | | | <0.01 | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Antimony (µg/L) | Total Arsenic (µg/L) | Total Iron (µg/L) | Dissolved Mercury (µg/L) | Total Mercury (µg/L) | Nitrite as N (mg/L) | Nitrate as N (mg/L) | Nitrite + Nitrate as N (mg/L) | Reactive Phosphorus as P (mg/L) | TPH C6 - C9 Fraction (µg/L) | TPH C10 - C14 Fraction (µg/L) | TPH C15 - C28 Fraction (µg/L) | TPH C29 - C36 Fraction (µg/L) | TPH C10 - C36 Fraction (sum) (µg/L) | C6 - C10 Fraction (µg/L) | C6 - C10 Fraction minus BTEX (F1) | >C10 - C16 Fraction (µg/L) | >C16 - C34 Fraction (µg/L) | >C34 - C40 Fraction (µg/L) | >C10 - C40 Fraction (sum) (µg/L) | >C10 - C16 Fraction minus Naphthal | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | meta- & para-Xylene (µg/L) | ortho-Xylene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS2 | 4/06/2014 | | <5 | 1520 | <0.1 | 0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 29/04/2014 | | <50 | <500 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 2/04/2014 | | <1 | 190 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 5/03/2014 | | <1 | 630 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 15/01/2014 | | <5 | <260 | <0.1 | <0.1 | <0.01 | 240 | 240 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 10/12/2013 | | <5 | 670 | <0.1 | <0.1 | 20 | 290 | 310 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 27/11/2013 | | <1 | 740 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | 70 | 70 | <20 | <20 | <100 | 100 | <100 | 100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 30/10/2013 | | 1 | 2460 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 | 30/09/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 19/06/2013 | | <1 | 950 | | | | 0.36 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS2 | 21/05/2013 | | <1 | 650 | | | | 0.19 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS2 | 23/04/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 21/03/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 21/02/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 16/01/2013 | | <1 | 2200 | | | | 0.042 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS2 | 12/12/2012 | | <1 | 2300 | | | | 0.021 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS2 | 14/11/2012 | | <1 | 390 | | | | 0.034 | | | <10 | <50 | <100 | <100 | <100 | | | | | | | | | | | | |
| OBS2 | 17/10/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 15/09/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | 15/08/2012 | | <1 | 710 | | | | 0.45 | | | <10 | <50 | <100 | 130 | 130 | | | | | | | | | | | | |
| OBS2 | 16/07/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBS2 (pump) | 30/07/2014 | | <1 | 2000 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS2 (Pump) | 4/06/2014 | | <5 | 2130 | <0.1 | <0.1 | <0.01 | <0.01 | <0.01 | | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 | <100 | <1 | <2 | <2 | <2 | <2 |
| OBS4 | 28/04/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Well 10 | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Well 11 | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Well 12 | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Well 13 | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Well 14 | 1/06/2015 | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blank | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 18/02/2018 | | | | | | | | | | | | | | | | | | |
| CB01 | 17/12/2017 | | | | | | | | | | | | | | | | | | |
| CB01 | 23/10/2017 | | | | | | | | | | | | | | | | | | |
| CB01 | 16/08/2017 | | | | | | | | | | | | | | | | | | |
| CB01 | 07/02/2017 | | | | | | | | | | | | | | | | | | |
| CB01 | 2/11/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 14/09/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 20/01/2016 | | | | | | | | | | | | | | | | | | |
| CB01 | 1/12/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 11/11/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 29/09/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 25/08/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 16/06/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 26/05/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 28/04/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 24/02/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| CB01 | 28/07/2014 | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2) | 30/07/2014 | | | | | | | <1 | 683 | 133 | 816 | 888 | 1 | 13 | 1100 | 54 | 46.9 | 50.4 | 3.47 |
| Compliance Bore 1 (Gas 2) (p | 30/07/2014 | <2 | 12 | <5 | 96.4 | 94.3 | 101 | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 17/12/2014 | | | | | | | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 26/11/2014 | <2 | <1 | <5 | 106 | 106 | 98.6 | <1 | 527 | 199 | 726 | | 2 | 8 | 1140 | 42 | 49.3 | 51.4 | 2.05 |
| Compliance Bore 1 (Gas 2/MI | 15/10/2014 | | | | | | | <1 | 519 | 229 | 749 | 90 | 2 | 9 | 1180 | 42 | 54.4 | 53.2 | 10.7 |
| Compliance Bore 1 (Gas 2/MI | 27/08/2014 | <2 | 3 | <5 | 105 | 101 | 96 | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 29/04/2014 | <2 | 9 | <5 | 110 | 106 | 103 | | | | | | | | | | | | |
| Compliance Bore 1 (Gas 2/MI | 2/04/2014 | <2 | <1 | <5 | 109 | 95.1 | 90.6 | | | | | | | | | | | | |
| Gas 2 | 4/03/2014 | <2 | <1 | <5 | 98.6 | 101 | 106 | | | | | | | | | | | | |
| Gas 2 | 15/01/2014 | <2 | <1 | <5 | 92.2 | 101 | 104 | | | | | | | | | | | | |
| Gas 2 | 10/12/2013 | <2 | <1 | <5 | 92 | 94.8 | 102 | | | | | | | | | | | | |
| Gas 2 | 27/11/2013 | <2 | <1 | <5 | 100 | 88.4 | 86.4 | | | | | | | | | | | | |
| Gas 2 | 30/10/2013 | <2 | <1 | <5 | 94.3 | 103 | 107 | | | | | | | | | | | | |
| Gas 2 | 30/09/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 19/06/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 21/05/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 23/04/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 21/03/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 21/02/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 16/01/2013 | | | | | | | | | | | | | | | | | | |
| Gas 2 | 12/12/2012 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Hut Bore | 26/06/2015 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 27/08/2014 | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kisses Bore | 30/07/2014 | <2 | <1 | <5 | 97.9 | 88.2 | 108 | | | | | | | | | | | | |
| Kisses Bore | 28/05/2014 | <2 | <1 | <5 | 109 | 96 | 88.9 | | | | | | | | | | | | |
| Kisses Bore | 29/04/2014 | <2 | <1 | <5 | 99.4 | 97 | 97.1 | | | | | | | | | | | | |
| Kisses Bore | 2/04/2014 | <2 | <1 | <5 | 121 | 97.6 | 91.6 | | | | | | | | | | | | |
| Kisses Bore | 4/03/2014 | <2 | <1 | <5 | 98.4 | 100 | 106 | | | | | | | | | | | | |
| Kisses Bore | 15/01/2014 | <2 | <1 | <5 | 92.6 | 101 | 102 | | | | | | | | | | | | |
| Kisses Bore | 10/12/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 27/11/2013 | <2 | <1 | <5 | 110 | 99.2 | 92.6 | | | | | | | | | | | | |
| Kisses Bore | 30/10/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 30/09/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 19/06/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/05/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 23/04/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/03/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 21/02/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 16/01/2013 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 12/12/2012 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 14/11/2012 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 17/10/2012 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 15/09/2012 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 15/08/2012 | | | | | | | | | | | | | | | | | | |
| Kisses Bore | 16/07/2012 | | | | | | | | | | | | | | | | | | |
| Landholder bore 23 | 8/01/2015 | <2 | <1 | <5 | 96.4 | 89.7 | 87.3 | <1 | <1 | 693 | 693 | 775 | 88 | 35 | 687 | 4 | 35.7 | 37.2 | 2.1 |
| Landholder bore Middle Well | 9/01/2015 | <2 | <1 | <5 | 87.6 | 84.9 | 83.3 | <1 | <1 | 155 | 155 | 26 | 14 | 12 | 46 | 21 | 4.08 | 4.22 | 1.72 |
| Landholder Bore Scotts Well | 9/01/2015 | <2 | <1 | <5 | 94.9 | 93.6 | 92.1 | <1 | 18 | 215 | 233 | 88 | 18 | 8 | 136 | <1 | 7.3 | 7.47 | 1.1 |
| MB10 | 30/11/2016 | <2 | <1 | <5 | 85.9 | 105 | 97.1 | <1 | <1 | 226 | 226 | 10 | 156 | 18 | 11 | 158 | 9.12 | 8.68 | 2.52 |
| MB10 | 16/08/2017 | <2 | <1 | <5 | 93.7 | 107 | 104 | <1 | <1 | 230 | 230 | 188 | 28 | 19 | | <1 | 10.1 | 9.88 | 1.05 |
| MB10 | 07/02/2017 | <2 | <1 | <5 | 109 | 97.4 | 89.6 | <1 | <1 | 233 | 233 | 170 | 17 | 11 | | <1 | 9.62 | 8.93 | 3.7 |
| MB10 | 18/02/2018 | <2 | <1 | <5 | 109 | 97.4 | 89.6 | <1 | <1 | 233 | 233 | 170 | 17 | 11 | 165 | <1 | 9.62 | 8.93 | 3.7 |
| MB10 | 17/12/2017 | <2 | <2 | <5 | 101 | 100 | 90.6 | <1 | <1 | 233 | 233 | 228 | 30 | 18 | | <1 | 11.2 | 10.5 | 3.26 |
| MB10 | 23/10/2017 | <2 | <1 | <5 | 101 | 98.5 | 80.9 | <1 | <1 | 252 | 252 | 232 | 30 | 17 | | <1 | 11.7 | 10.8 | 3.85 |
| MB10 | 09/05/2017 | <2 | <1 | <5 | 100 | 91.4 | 102 | <1 | <1 | 235 | 235 | 168 | 23 | 16 | | <1 | 9.66 | 9.34 | 1.72 |
| MB10 | 2/11/2016 | <2 | <1 | <5 | 104 | 96 | 97.4 | <1 | <1 | 211 | 211 | 138 | 18 | 11 | 170 | <1 | 8.4 | 9.2 | 4.53 |
| MB10 | 14/09/2016 | <2 | <1 | <5 | 97.3 | 104 | 96.2 | <1 | 24 | 195 | 218 | 122 | 19 | 12 | 161 | <1 | 8.09 | 8.94 | 4.96 |
| MB10 | 2/08/2016 | <2 | <1 | <5 | 100 | 99.3 | 96.2 | <1 | <1 | 244 | 244 | 141 | 18 | 12 | 178 | <1 | 8.96 | 9.58 | 3.35 |
| MB10 | 28/06/2016 | <2 | <1 | <5 | 100 | 98.1 | 96.9 | <1 | <1 | 274 | 274 | 147 | 17 | 12 | 200 | <1 | 9.75 | 9.58 | 0.9 |
| MB10 | 17/05/2016 | <2 | <1 | <5 | 101 | 97.3 | 96.9 | <1 | 3 | 281 | 284 | 182 | 20 | 13 | 198 | 1 | 11 | 10.8 | 0.87 |
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| MB10 | 5/04/2016 | <2 | <1 | <5 | 133 | 96.7 | 94.2 | <1 | <1 | 342 | 342 | 226 | 26 | 16 | 170 | <1 | 13.4 | 13 | 1.89 |
| MB10 | 23/02/2016 | <2 | <1 | <5 | 124 | 97.1 | 92.4 | <1 | <1 | 368 | 368 | 334 | 36 | 24 | 238 | <1 | 16.9 | 15.7 | 3.86 |
| MB10 | 20/01/2016 | <2 | <1 | <5 | 88.1 | 120 | 137 | <1 | <1 | 243 | 243 | 159 | 17 | 10 | 170 | <1 | 9.49 | 9.06 | 2.3 |
| MB10 | 1/12/2015 | <2 | <1 | <5 | 107 | 106 | 105 | <1 | <1 | 229 | 229 | 139 | 14 | 7 | 150 | <1 | 8.6 | 7.8 | 4.92 |
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| MB10 | 27/10/2015 | <2 | <1 | <5 | 93.1 | 97.6 | 101 | <1 | <1 | 222 | 222 | 108 | 13 | 8 | 137 | <1 | 7.61 | 7.27 | 2.33 |
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| MB10 | 9/06/2015 | <2 | <1 | <5 | 122 | 119 | 117 | <1 | 9 | 260 | 269 | 87 | 12 | 6 | 148 | <1 | 7.93 | 7.53 | 2.65 |
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| MB10 | 28/04/2015 | <2 | <1 | <5 | 106 | 106 | 104 | <1 | <1 | 306 | 306 | 126 | 14 | 8 | 182 | <1 | 9.83 | 9.27 | 2.98 |
| MB10 | 31/03/2015 | <2 | <1 | <5 | 120 | 83.5 | 88.9 | <1 | <1 | 347 | 347 | 137 | 16 | 8 | 197 | <1 | 11 | 10 | 4.51 |
| MB10 | 24/02/2015 | <2 | <1 | <5 | 94.1 | 103 | 89.5 | <1 | <1 | 386 | 386 | 236 | 23 | 12 | 261 | 1 | 14.9 | 13.5 | 4.88 |
| MB10 | | | | | | | | | | | | | | | | | | | |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB11 | 30/11/2016 | <2 | <1 | <5 | 86.6 | 99.7 | 97.2 | <1 | <1 | 270 | 270 | 43 | 1160 | 222 | 173 | 375 | 39 | 42 | 3.67 |
| MB11 | 16/08/2017 | <2 | <1 | <5 | 91.9 | 99.4 | 95.4 | <1 | <1 | 210 | 210 | 344 | 56 | 50 | | 5 | 14.7 | 12.1 | 9.7 |
| MB11 | 07/02/2017 | <2 | <1 | <5 | 105 | 93.8 | 91.1 | <1 | <1 | 248 | 248 | 1110 | 155 | 142 | | 10 | 37.1 | 34.4 | 3.83 |
| MB11 | 18/02/2018 | <2 | <1 | <5 | 105 | 93.8 | 91.1 | <1 | <1 | 248 | 248 | 1110 | 155 | 142 | 338 | 10 | 37.1 | 34.4 | 3.83 |
| MB11 | 17/12/2017 | <2 | <2 | <5 | 103 | 104 | 91.8 | <1 | <1 | 201 | 201 | 1020 | 160 | 117 | | 9 | 33.5 | 28 | 9.01 |
| MB11 | 23/10/2017 | <2 | <1 | <5 | 98.5 | 98.3 | 82.5 | <1 | <1 | 202 | 202 | 743 | 129 | 91 | | 10 | 25.7 | 23.6 | 4.39 |
| MB11 | 09/05/2017 | <2 | <1 | <5 | 111 | 92.6 | 100 | <1 | <1 | 196 | 196 | 99 | 30 | 28 | | 4 | 7.54 | 7.04 | 3.47 |
| MB11 | 2/11/2016 | <2 | <1 | <5 | 106 | 97 | 93.7 | <1 | <1 | 232 | 232 | 1020 | 184 | 144 | 321 | 10 | 34.2 | 35.2 | 1.45 |
| MB11 | 14/09/2016 | <2 | <1 | <5 | 95.8 | 106 | 103 | <1 | <1 | 208 | 208 | 1030 | 180 | 144 | 312 | 12 | 34 | 34.7 | 1.01 |
| MB11 | 2/08/2016 | <2 | <1 | <5 | 100 | 99.7 | 99.3 | <1 | <1 | 244 | 244 | 887 | 180 | 143 | 242 | 12 | 30.7 | 35.2 | 6.72 |
| MB11 | 28/06/2016 | <2 | <1 | <5 | 102 | 99.9 | 94.9 | <1 | <1 | 236 | 236 | 825 | 145 | 111 | 156 | 9 | 28.8 | 27.1 | 2.98 |
| MB11 | 17/05/2016 | <2 | <1 | <5 | 103 | 98.9 | 93.4 | <1 | <1 | 214 | 214 | 474 | 91 | 69 | 133 | 7 | 18.5 | 17.2 | 3.62 |
| MB11 | 26/04/2016 | <2 | <1 | <5 | 90.4 | 102 | 98.7 | <1 | <1 | 238 | 238 | 404 | 77 | 59 | 218 | 7 | 17 | 14.7 | 7.39 |
| MB11 | 5/04/2016 | <2 | <1 | <5 | 131 | 96 | 94.4 | <1 | <1 | 236 | 236 | 320 | 68 | 52 | 348 | 6 | 14.6 | 13.7 | 3.16 |
| MB11 | 23/02/2016 | <2 | <1 | <5 | 108 | 98.5 | 92.3 | <1 | <1 | 254 | 254 | 648 | 110 | 91 | 136 | 7 | 24.3 | 22.6 | 3.6 |
| MB11 | 20/01/2016 | <2 | <1 | <5 | 93.2 | 104 | 122 | <1 | <1 | 246 | 246 | 1160 | 241 | 171 | 348 | 12 | 38.6 | 41.5 | 3.75 |
| MB11 | 1/12/2015 | <2 | <1 | <5 | 104 | 102 | 88.9 | <1 | <1 | 231 | 231 | 1220 | 191 | 149 | 312 | 10 | 39.9 | 35.6 | 5.71 |
| MB11 | 11/11/2015 | <2 | <1 | <5 | 107 | 99.4 | 97.9 | <1 | <1 | 240 | 240 | 1140 | 194 | 158 | 314 | 10 | 37.8 | 36.6 | 1.67 |
| MB11 | 27/10/2015 | <2 | <1 | <5 | 96.3 | 106 | 99 | <1 | <1 | 247 | 247 | 1090 | 192 | 156 | 313 | 10 | 36.6 | 36.3 | 0.41 |
| MB11 | 29/09/2015 | <2 | <1 | <5 | 94.6 | 99.5 | 94.8 | <1 | <1 | 235 | 235 | 1280 | 199 | 150 | 319 | 11 | 41.7 | 36.4 | 6.72 |
| MB11 | 25/08/2015 | <2 | <1 | <5 | 104 | 82.8 | 88 | <1 | <1 | 240 | 240 | 1210 | 196 | 140 | 312 | 11 | 39.7 | 35.2 | 6.11 |
| MB11 | 28/07/2015 | <2 | <1 | <5 | 104 | 101 | 97.6 | <1 | <1 | 225 | 225 | 1150 | 202 | 141 | 310 | 11 | 37.9 | 35.4 | 3.32 |
| MB11 | 9/06/2015 | <2 | <1 | <5 | 125 | 122 | 116 | <1 | <1 | 248 | 248 | 1130 | 210 | 152 | 352 | 10 | 37.7 | 38.6 | 1.16 |
| MB11 | 26/05/2015 | <2 | <1 | <5 | 109 | 99.8 | 99.8 | <1 | <1 | 238 | 238 | 1220 | 206 | 161 | 373 | 10 | 40.6 | 40 | 0.75 |
| MB11 | 28/04/2015 | <2 | <1 | <5 | 97.6 | 106 | 98.8 | <1 | <1 | 239 | 239 | 1030 | 183 | 143 | 330 | 9 | 34.6 | 35.5 | 1.24 |
| MB11 | 31/03/2015 | <2 | <1 | <5 | 110 | 91.1 | 91.5 | <1 | <1 | 224 | 224 | 1030 | 172 | 124 | 313 | 9 | 34.2 | 32.6 | 2.27 |
| MB11 | 24/02/2015 | <2 | <1 | <5 | 98.5 | 96.6 | 91.2 | <1 | <1 | 208 | 208 | 809 | 131 | 84 | 280 | 13 | 27.8 | 26 | 3.43 |
| MB11 | | | | | | | | | | | | | | | | | | | |
| MB12 | 30/11/2016 | <2 | <1 | <5 | 86.4 | 99.9 | 97.8 | <1 | <1 | 956 | 956 | 30 | 1180 | 92 | 94 | 969 | 53 | 54.6 | 1.43 |
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| MB12 | 09/05/2017 | <2 | <1 | <5 | 105 | 88.5 | 102 | <1 | 36 | 897 | 933 | 1330 | 68 | 99 | | 3 | 56.6 | 53.9 | 2.38 |
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| MB12 | 26/04/2016 | <2 | <1 | <5 | 95.3 | 101 | 97.5 | <1 | <1 | 917 | 917 | 1300 | 80 | 86 | 988 | 2 | 55.6 | 49.5 | 5.83 |
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| MB12 | 23/02/2016 | <2 | <1 | <5 | 112 | 102 | 94.7 | <1 | <1 | 895 | 895 | 1240 | 92 | 101 | 1040 | 3 | 53.4 | 56 | 2.27 |
| MB12 | 20/01/2016 | <2 | <1 | <5 | 88.6 | 104 | 130 | <1 | <1 | 907 | 907 | 1170 | 97 | 94 | 952 | 3 | 51.7 | 54.1 | 2.18 |
| MB12 | 1/12/2015 | <2 | <1 | <5 | 105 | 126 | 119 | <1 | <1 | 946 | 946 | 1220 | 71 | 81 | 857 | 2 | 53.9 | 47.5 | 6.32 |
| MB12 | 11/11/2015 | <2 | <1 | <5 | 108 | 102 | 97.8 | <1 | <1 | 942 | 942 | 1350 | 73 | 85 | 852 | 3 | 57.4 | 47.8 | 9.2 |
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| MB12 | 29/09/2015 | <2 | <1 | <5 | 91.3 | 96 | 93 | <1 | <1 | 909 | 909 | 1280 | 78 | 85 | 876 | 2 | 54.9 | 49 | 5.65 |
| MB12 | 25/08/2015 | <2 | <1 | <5 | 98.8 | 91.4 | 91.7 | <1 | <1 | 931 | 931 | 1300 | 80 | 81 | 862 | 3 | 55.8 | 48.2 | 7.31 |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB12 | 28/07/2015 | <2 | <1 | <5 | 101 | 100 | 96.6 | <1 | <1 | 860 | 860 | 1300 | 79 | 86 | 867 | 3 | 54.6 | 48.8 | 5.61 |
| MB12 | 9/06/2015 | <2 | <1 | <5 | 132 | 121 | 118 | <1 | <1 | 985 | 985 | 1250 | 82 | 98 | 993 | 3 | 55.6 | 55.4 | 0.15 |
| MB12 | 26/05/2015 | <2 | <1 | <5 | 107 | 87.9 | 92.6 | <1 | <1 | 978 | 978 | 1370 | 77 | 92 | 1050 | 3 | 58.4 | 57.2 | 1.11 |
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| MB12 | 31/03/2015 | <2 | <1 | <5 | 117 | 87.8 | 79.9 | <1 | <1 | 992 | 992 | 1180 | 70 | 94 | 894 | 3 | 53.6 | 50.2 | 3.3 |
| MB12 | 4/03/2015 | <2 | <1 | <5 | 112 | 91.8 | 99.3 | <1 | 37 | 982 | 1020 | 1160 | 64 | 87 | 937 | 3 | 53.6 | 51.2 | 2.37 |
| MB12 | | | | | | | | | | | | | | | | | | | |
| MB13 | 30/11/2016 | <2 | <1 | <5 | 84.9 | 102 | 93.1 | <1 | <1 | 681 | 681 | 12 | 125 | 97 | 65 | 156 | 17.4 | 17 | 1.18 |
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| MB13 | 06/02/2017 | <2 | <1 | <5 | 105 | 93.7 | 90.7 | <1 | <1 | 648 | 648 | 124 | 69 | 56 | | <1 | 16.7 | 14.3 | 7.67 |
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| MB13 | 09/05/2017 | <2 | <1 | <5 | 102 | 85.2 | 98.1 | <1 | <1 | 578 | 578 | 119 | 93 | 66 | | <1 | 15.1 | 16.6 | 4.61 |
| MB13 | 2/11/2016 | <2 | <1 | <5 | 106 | 98.3 | 94.6 | <1 | <1 | 663 | 663 | 126 | 94 | 68 | 166 | <1 | 17 | 17.5 | 1.38 |
| MB13 | 14/09/2016 | <2 | <1 | <5 | 98.8 | 95 | 103 | <1 | <1 | 535 | 535 | 127 | 98 | 68 | 160 | <1 | 14.5 | 17.4 | 9.2 |
| MB13 | 2/08/2016 | <2 | <1 | <5 | 97.8 | 100 | 101 | <1 | <1 | 693 | 693 | 128 | 105 | 74 | 148 | <1 | 17.7 | 19.2 | 4.14 |
| MB13 | 28/06/2016 | <2 | <1 | <5 | 105 | 97.8 | 91.9 | <1 | <1 | 681 | 681 | 121 | 93 | 65 | 156 | <1 | 17.2 | 16.4 | 2.46 |
| MB13 | 17/05/2016 | <2 | <1 | <5 | 105 | 99.7 | 95.7 | <1 | <1 | 646 | 646 | 136 | 94 | 64 | 172 | <1 | 17 | 16.7 | 0.76 |
| MB13 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| MB13 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| MB13 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| MB13 | 20/01/2016 | <2 | <1 | <5 | 82 | 106 | 122 | <1 | <1 | 714 | 714 | 151 | 110 | 72 | 172 | <1 | 18.8 | 18.9 | 0.19 |
| MB13 | 1/12/2015 | <2 | <1 | <5 | 109 | 102 | 106 | <1 | <1 | 699 | 699 | 161 | 89 | 62 | 151 | <1 | 18.8 | 16.1 | 7.66 |
| MB13 | 11/11/2015 | <2 | <1 | <5 | 104 | 98.5 | 94.9 | <1 | <1 | 696 | 696 | 161 | 93 | 68 | 154 | <1 | 18.7 | 16.9 | 5.07 |
| MB13 | 27/10/2015 | <2 | <1 | <5 | 108 | 102 | 87.2 | <1 | <1 | 707 | 707 | 146 | 88 | 68 | 157 | <1 | 18.6 | 16.8 | 5 |
| MB13 | 29/09/2015 | <2 | <1 | <5 | 86.4 | 92.4 | 89.4 | <1 | <1 | 656 | 656 | 143 | 94 | 61 | 152 | <1 | 17.4 | 16.3 | 3.3 |
| MB13 | 25/08/2015 | <2 | <1 | <5 | 91.4 | 85.1 | 99.9 | <1 | <1 | 658 | 658 | 131 | 93 | 60 | 146 | <1 | 17.1 | 15.9 | 3.54 |
| MB13 | 28/07/2015 | <2 | <1 | <5 | 102 | 94.9 | 89.2 | <1 | <1 | 617 | 617 | 132 | 83 | 59 | 136 | <1 | 16.3 | 14.9 | 4.59 |
| MB13 | 9/06/2015 | <2 | <1 | <5 | 134 | 119 | 119 | <1 | <1 | 702 | 702 | 124 | 101 | 64 | 159 | <1 | 17.8 | 17.2 | 1.65 |
| MB13 | 26/05/2015 | <2 | <1 | <5 | 98.1 | 88 | 87.4 | <1 | <1 | 646 | 646 | 123 | 100 | 60 | 163 | <1 | 16.7 | 17 | 0.9 |
| MB13 | 28/04/2015 | <2 | <1 | <5 | 99.6 | 120 | 108 | <1 | <1 | 635 | 635 | 124 | 90 | 63 | 146 | <1 | 16.4 | 16 | 1.15 |
| MB13 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| MB13 | 17/12/2014 | | | | | | | | | | | | | | | | | | |
| MB13 | 26/11/2014 | <2 | <1 | <5 | 97.4 | 105 | 102 | <1 | <1 | 610 | 610 | | 78 | 59 | 151 | <1 | 15.6 | 15.3 | 1.11 |
| MB13 | | | | | | | | | | | | | | | | | | | |
| MB14 | 30/11/2016 | <2 | <1 | <5 | 83 | 106 | 98.3 | <1 | <1 | 453 | 453 | 8 | 41 | 90 | 33 | 67 | 10.4 | 10.1 | 1.23 |
| MB14 | 16/08/2017 | <2 | <1 | <5 | 89.7 | 102 | 95.5 | <1 | <1 | 438 | 438 | 41 | 80 | 36 | | <1 | 10.1 | 9.96 | 0.59 |
| MB14 | 06/02/2017 | <2 | <1 | <5 | 115 | 98.4 | 90.7 | <1 | <1 | 443 | 443 | 41 | 69 | 30 | | <1 | 10.2 | 8.78 | 7.24 |
| MB14 | 18/02/2018 | <2 | <1 | <5 | 115 | 98.4 | 90.7 | <1 | <1 | 443 | 443 | 41 | 69 | 30 | 66 | <1 | 10.2 | 8.78 | 7.24 |
| MB14 | 17/12/2017 | <2 | <2 | <5 | 102 | 102 | 91.8 | <1 | <1 | 409 | 409 | 44 | 94 | 34 | | <1 | 9.56 | 10.2 | 3.39 |
| MB14 | 23/10/2017 | <2 | <1 | <5 | 122 | 101 | 103 | <1 | <1 | 446 | 446 | 50 | 89 | 34 | | <1 | 10.5 | 10.3 | 0.98 |
| MB14 | 09/05/2017 | <2 | <1 | <5 | 101 | 89.2 | 105 | <1 | <1 | 407 | 407 | 43 | 88 | 36 | | <1 | 9.49 | 10.4 | 4.78 |
| MB14 | 2/11/2016 | <2 | <1 | <5 | 107 | 95.9 | 94.3 | <1 | <1 | 438 | 438 | 38 | 88 | 35 | 74 | <1 | 9.97 | 10.5 | 2.55 |
| MB14 | 14/09/2016 | <2 | <1 | <5 | 94.4 | 97.6 | 100 | <1 | <1 | 440 | 440 | 43 | 93 | 35 | 72 | <1 | 10.1 | 10.6 | 2.41 |
| MB14 | 2/08/2016 | <2 | <1 | <5 | 99.8 | 100 | 98.7 | <1 | <1 | 452 | 452 | 41 | 87 | 34 | 64 | <1 | 10.4 | 10.2 | 0.62 |
| MB14 | 28/06/2016 | <2 | <1 | <5 | 102 | 96 | 93.3 | <1 | <1 | 447 | 447 | 39 | 84 | 33 | 71 | <1 | 10.2 | 9.69 | 2.45 |
| MB14 | 17/05/2016 | <2 | <1 | <5 | 102 | 98.3 | 93.8 | <1 | <1 | 421 | 421 | 40 | 86 | 32 | 63 | <1 | 9.68 | 10 | 1.66 |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB14 | 26/04/2016 | <2 | <1 | <5 | 99.7 | 102 | 102 | <1 | <1 | 442 | 442 | 39 | 81 | 31 | 69 | <1 | 10.1 | 9.33 | 3.84 |
| MB14 | 5/04/2016 | <2 | <1 | <5 | 132 | 97.8 | 96.7 | <1 | <1 | 434 | 434 | 40 | 87 | 33 | 66 | <1 | 9.97 | 10.1 | 0.88 |
| MB14 | 23/02/2016 | <2 | <1 | <5 | 109 | 97.8 | 92.9 | <1 | <1 | 437 | 437 | 42 | 86 | 34 | 71 | <1 | 10.1 | 10.1 | 0.03 |
| MB14 | 20/01/2016 | <2 | <1 | <5 | 85.7 | 96.9 | 120 | <1 | <1 | 424 | 424 | 39 | 89 | 32 | 66 | <1 | 9.74 | 9.94 | 1.05 |
| MB14 | 1/12/2015 | <2 | <1 | <5 | 94.7 | 105 | 114 | <1 | <1 | 434 | 434 | 44 | 76 | 29 | 61 | <1 | 10.1 | 8.83 | 6.6 |
| MB14 | 11/11/2015 | <2 | <1 | <5 | 109 | 102 | 96.5 | <1 | <1 | 424 | 424 | 43 | 77 | 30 | 61 | <1 | 9.85 | 8.96 | 4.72 |
| MB14 | 27/10/2015 | <2 | <1 | <5 | 110 | 101 | 89.8 | <1 | <1 | 426 | 426 | 35 | 77 | 30 | 60 | <1 | 9.69 | 8.92 | 4.12 |
| MB14 | 29/09/2015 | <2 | <1 | <5 | 94.1 | 92.8 | 90.2 | <1 | <1 | 407 | 407 | 37 | 79 | 29 | 63 | <1 | 9.34 | 9.07 | 1.49 |
| MB14 | 25/08/2015 | <2 | <1 | <5 | 82.2 | 99.9 | 97.2 | <1 | <1 | 415 | 415 | 39 | 78 | 28 | 58 | <1 | 9.54 | 8.72 | 4.49 |
| MB14 | 28/07/2015 | <2 | <1 | <5 | 106 | 97.2 | 88.6 | <1 | <1 | 389 | 389 | 37 | 82 | 28 | 58 | <1 | 9 | 8.92 | 0.47 |
| MB14 | 9/06/2015 | <2 | <1 | <5 | 130 | 118 | 115 | <1 | <1 | 442 | 442 | 36 | 88 | 31 | 65 | <1 | 10 | 9.77 | 1.34 |
| MB14 | 26/05/2015 | <2 | <1 | <5 | 103 | 116 | 99.2 | <1 | <1 | 419 | 419 | 34 | 86 | 30 | 70 | 1 | 9.54 | 9.83 | 1.5 |
| MB14 | 28/04/2015 | <2 | <1 | <5 | 93.4 | 105 | 103 | <1 | <1 | 421 | 421 | 40 | 78 | 28 | 63 | <1 | 9.68 | 8.94 | 4.03 |
| MB14 | 31/03/2015 | <2 | <1 | <5 | 120 | 80.7 | 77.4 | <1 | <1 | 416 | 416 | 42 | 80 | 29 | 62 | <1 | 9.62 | 9.08 | 2.92 |
| MB14 | 24/02/2015 | <2 | <1 | <5 | 97.1 | 102 | 91.3 | <1 | <1 | 432 | 432 | 40 | 90 | 30 | 64 | <1 | 9.93 | 9.74 | 0.93 |
| MB14 | 4/02/2015 | <2 | <1 | <5 | 99.9 | 90.2 | 88.7 | <1 | <1 | 385 | 385 | 37 | 82 | 27 | 67 | <1 | 8.9 | 9.23 | 1.79 |
| MB14 | 17/12/2014 | <2 | <1 | <5 | 94 | 111 | 105 | <1 | <1 | 415 | 415 | 34 | 80 | 31 | 62 | <1 | 9.42 | 9.24 | 0.96 |
| MB14 | 26/11/2014 | <2 | <1 | <5 | 94.7 | 122 | 101 | <1 | <1 | 422 | 422 | | 83 | 32 | 68 | <1 | 9.84 | 9.73 | 0.55 |
| MB14 | | | | | | | | | | | | | | | | | | | |
| MB3A | 30/11/2016 | <2 | <1 | <5 | 77 | 105 | 96.2 | <1 | <1 | 591 | 591 | 8 | 222 | 25 | 14 | 342 | 18.2 | 17.3 | 2.63 |
| MB3A | 16/08/2017 | <2 | <1 | <5 | 93.5 | 100 | 94.4 | <1 | <1 | 568 | 568 | 206 | 21 | 14 | | 1 | 17.4 | 16.5 | 2.45 |
| MB3A | 07/02/2017 | <2 | <1 | <5 | 105 | 95.3 | 90.6 | <1 | <1 | 570 | 570 | 218 | 20 | 13 | | 1 | 17.7 | 17 | 2.12 |
| MB3A | 18/02/2018 | <2 | <1 | <5 | 105 | 95.3 | 90.6 | <1 | <1 | 570 | 570 | 218 | 20 | 13 | 342 | 1 | 17.7 | 17 | 2.12 |
| MB3A | 17/12/2017 | <2 | <2 | <5 | 101 | 100 | 91.8 | <1 | <1 | 516 | 516 | 200 | 24 | 13 | | 1 | 16.1 | 15.2 | 2.89 |
| MB3A | 23/10/2017 | <2 | <1 | <5 | 100 | 97.8 | 81.1 | <1 | <1 | 573 | 573 | 229 | 25 | 13 | | 1 | 18.1 | 16.8 | 3.76 |
| MB3A | 09/05/2017 | <2 | <1 | <5 | 109 | 87.6 | 99.6 | <1 | 42 | 546 | 587 | 215 | 22 | 14 | | 1 | 18 | 17.1 | 2.43 |
| MB3A | 2/11/2016 | <2 | <1 | <5 | 109 | 95.9 | 94.1 | <1 | <1 | 579 | 579 | 242 | 25 | 15 | 370 | 1 | 18.6 | 18.6 | 0.11 |
| MB3A | 14/09/2016 | <2 | <1 | <5 | 92.2 | 97.4 | 99.2 | <1 | 87 | 453 | 540 | 231 | 25 | 16 | 363 | 2 | 17.5 | 18.4 | 2.56 |
| MB3A | 2/08/2016 | <2 | <1 | <5 | 99.8 | 101 | 101 | <1 | <1 | 595 | 595 | 228 | 27 | 16 | 344 | 1 | 18.5 | 19.7 | 3.18 |
| MB3A | 28/06/2016 | <2 | <1 | <5 | 101 | 97.4 | 99.6 | <1 | <1 | 597 | 597 | 233 | 25 | 15 | 331 | 1 | 18.6 | 16.9 | 4.94 |
| MB3A | 17/05/2016 | <2 | <1 | <5 | 103 | 97.8 | 93 | <1 | 26 | 544 | 570 | 260 | 26 | 15 | 332 | 2 | 18.9 | 17.5 | 3.67 |
| MB3A | 26/04/2016 | <2 | <1 | <5 | 93 | 104 | 100 | <1 | 52 | 512 | 564 | 254 | 25 | 15 | 385 | 1 | 18.6 | 16.9 | 4.69 |
| MB3A | 5/04/2016 | <2 | <1 | <5 | 135 | 97 | 96.8 | <1 | <1 | 581 | 581 | 269 | 28 | 16 | 401 | 1 | 19.4 | 18.4 | 2.48 |
| MB3A | 23/02/2016 | <2 | <1 | <5 | 122 | 95.5 | 92 | <1 | <1 | 582 | 582 | 306 | 30 | 18 | 361 | 1 | 20.4 | 19.8 | 1.67 |
| MB3A | 20/01/2016 | <2 | <1 | <5 | 92.2 | 115 | 140 | <1 | <1 | 553 | 553 | 402 | 42 | 21 | 401 | 2 | 22.5 | 21.3 | 2.81 |
| MB3A | 1/12/2015 | <2 | <1 | <5 | 93.9 | 109 | 110 | <1 | <1 | 366 | 366 | 70 | 48 | 28 | 96 | <1 | 9.37 | 8.88 | 2.74 |
| MB3A | 11/11/2015 | <2 | <1 | <5 | 108 | 101 | 96.6 | <1 | <1 | 527 | 527 | 490 | 38 | 22 | 386 | 2 | 24.5 | 20.5 | 8.76 |
| MB3A | 29/09/2015 | <2 | <1 | <5 | 114 | 110 | 106 | <1 | <1 | 515 | 515 | 449 | 41 | 20 | 385 | 1 | 23.1 | 20.5 | 6.08 |
| MB3A | 25/08/2015 | <2 | <1 | <5 | 93.1 | 111 | 106 | <1 | <1 | 551 | 551 | 369 | 36 | 18 | 374 | 2 | 21.5 | 19.6 | 4.76 |
| MB3A | 28/07/2015 | <2 | <1 | <5 | 103 | 95.3 | 97.4 | <1 | <1 | 528 | 528 | 408 | 36 | 19 | 361 | 2 | 22.2 | 19.1 | 7.51 |
| MB3A | 16/06/2015 | <2 | <1 | <5 | 83.4 | 81.8 | 74.1 | <1 | <1 | 576 | 576 | 322 | 40 | 18 | 448 | 2 | 20.7 | 23 | 5.17 |
| MB3A | 26/05/2015 | <2 | <1 | <5 | 97.4 | 83.7 | 91.5 | <1 | 32 | 550 | 582 | 327 | 35 | 17 | 408 | 1 | 20.9 | 20.9 | 0.03 |
| MB3A | 28/04/2015 | <2 | <1 | <5 | 91.1 | 117 | 114 | <1 | <1 | 585 | 585 | 322 | 34 | 16 | 371 | 1 | 20.9 | 19.2 | 4.33 |
| MB3A | 24/02/2015 | <2 | <1 | <5 | 103 | 103 | 94.1 | <1 | <1 | 590 | 590 | 351 | 42 | 18 | 380 | 1 | 22.1 | 20.1 | 4.71 |
| MB3A | 4/02/2015 | <2 | <1 | <5 | 106 | 93.7 | 98.1 | <1 | <1 | 524 | 524 | 387 | 32 | 18 | 430 | 2 | 21.5 | 21.8 | 0.71 |
| MB3A | 17/12/2014 | <2 | <1 | <5 | 100 | 122 | 115 | <1 | <1 | 550 | 550 | 498 | 39 | 25 | 496 | 2 | 25.20 | 25.60 | 0.89 |
| MB3A | 26/11/2014 | <2 | <1 | <5 | 107 | 104 | 96.9 | <1 | <1 | 536 | 536 | | 37 | 23 | 445 | 2 | 25.4 | 23.1 | 4.61 |
| MB3A | 15/10/2014 | | | | | | | <1 | <1 | 534 | 534 | 564 | 41 | 27 | 518 | 2 | 26.7 | 26.8 | 0.2 |
| MB3A | 27/08/2014 | <2 | <1 | <5 | 102 | 98 | 86.7 | | | | | | | | | | | | |
| MB3A | 30/07/2014 | | | | | | | <1 | 50 | 396 | 446 | 364 | 31 | 20 | 392 | 2 | 19.3 | 20.3 | 2.47 |
| MB3A | 14/05/2014 | <2 | <1 | <5 | 97.8 | 99.5 | 101 | | | | | | | | | | | | |
| MB3A | 7/05/2014 | | | | | | | | | | | | | | | | | | |
| MB3A | | | | | | | | | | | | | | | | | | | |
| MB3A (pump) | 30/07/2014 | <2 | <1 | <5 | 99 | 93.8 | 102 | | | | | | | | | | | | |
| MB3B | 30/11/2016 | <2 | <1 | <5 | 79.3 | 104 | 91.7 | <1 | <1 | 377 | 377 | 5 | 62 | 49 | 28 | 95 | 9.38 | 8.88 | 2.76 |
| MB3B | 16/08/2017 | <2 | <1 | <5 | 94 | 108 | 105 | <1 | <1 | 371 | 371 | 55 | 46 | 31 | | <1 | 9.07 | 9.15 | 0.46 |
| MB3B | 07/02/2017 | <2 | <1 | <5 | 110 | 94.1 | 91.3 | <1 | <1 | 361 | 361 | 62 | 40 | 26 | | <1 | 9.04 | 8.27 | 4.49 |

| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB3B | 18/02/2018 | <2 | <1 | <5 | 110 | 94.1 | 91.3 | <1 | <1 | 361 | 361 | 62 | 40 | 26 | 95 | <1 | 9.04 | 8.27 | 4.49 |
| MB3B | 17/12/2017 | <2 | <2 | <5 | 104 | 100 | 90.4 | <1 | <1 | 333 | 333 | 58 | 54 | 28 | | <1 | 8.37 | 8.78 | 2.39 |
| MB3B | 23/10/2017 | <2 | <1 | <5 | 100 | 100 | 81.2 | <1 | <1 | 371 | 371 | 62 | 50 | 28 | | <1 | 9.24 | 8.98 | 1.48 |
| MB3B | 09/05/2017 | <2 | <1 | <5 | 91.2 | 95.9 | 105 | <1 | <1 | 369 | 369 | 56 | 47 | 31 | | <1 | 9.04 | 9.2 | 0.92 |
| MB3B | 2/11/2016 | <2 | <1 | <5 | 104 | 101 | 98.3 | <1 | <1 | 362 | 362 | 62 | 49 | 30 | 103 | <1 | 9.06 | 9.39 | 1.78 |
| MB3B | 14/09/2016 | <2 | <1 | <5 | 98 | 104 | 96.9 | <1 | 35 | 312 | 347 | 63 | 51 | 30 | 100 | <1 | 8.81 | 9.36 | 3 |
| MB3B | 2/08/2016 | <2 | <1 | <5 | 95.3 | 101 | 100 | <1 | <1 | 380 | 380 | 66 | 52 | 32 | 100 | <1 | 9.56 | 9.88 | 1.64 |
| MB3B | 28/06/2016 | <2 | <1 | <5 | 100 | 92.4 | 97.4 | <1 | <1 | 377 | 377 | 62 | 50 | 30 | 94 | <1 | 9.36 | 9.05 | 1.72 |
| MB3B | 17/05/2016 | <2 | <1 | <5 | 106 | 96.2 | 94.5 | <1 | <1 | 362 | 362 | 66 | 52 | 28 | 92 | <1 | 9.22 | 9.25 | 0.14 |
| MB3B | 26/04/2016 | <2 | <1 | <5 | 92.9 | 105 | 102 | <1 | 22 | 334 | 357 | 65 | 48 | 29 | 99 | <1 | 9.07 | 8.78 | 1.63 |
| MB3B | 5/04/2016 | <2 | <1 | <5 | 133 | 94.5 | 92.2 | <1 | <1 | 361 | 361 | 68 | 52 | 30 | 96 | <1 | 9.24 | 9.46 | 1.17 |
| MB3B | 23/02/2016 | <2 | <1 | <5 | 111 | 101 | 92.8 | <1 | <1 | 370 | 370 | 69 | 51 | 31 | 101 | <1 | 9.44 | 9.4 | 0.24 |
| MB3B | 20/01/2016 | <2 | <1 | <5 | 90.3 | 112 | 129 | <1 | <1 | 352 | 352 | 68 | 52 | 29 | 96 | <1 | 9.06 | 9.16 | 0.54 |
| MB3B | 1/12/2015 | <2 | <1 | <5 | 112 | 114 | 117 | <1 | <1 | 518 | 518 | 546 | 39 | 23 | 409 | 2 | 25.8 | 21.7 | 8.81 |
| MB3B | 11/11/2015 | <2 | <1 | <5 | 109 | 102 | 98 | <1 | <1 | 360 | 360 | 71 | 44 | 27 | 96 | <1 | 9.3 | 8.59 | 3.97 |
| MB3B | 29/09/2015 | <2 | <1 | <5 | 84.7 | 89.5 | 89.3 | <1 | <1 | 347 | 347 | 63 | 48 | 26 | 91 | <1 | 8.84 | 8.49 | 1.99 |
| MB3B | 25/08/2015 | <2 | <1 | <5 | 119 | 91.5 | 96.2 | <1 | <1 | 354 | 354 | 62 | 47 | 26 | 87 | <1 | 8.9 | 8.27 | 3.72 |
| MB3B | 28/07/2015 | <2 | <1 | <5 | 101 | 100 | 92.6 | <1 | <1 | 347 | 347 | 61 | 49 | 27 | 88 | <1 | 8.76 | 8.5 | 1.54 |
| MB3B | 16/06/2015 | <2 | <1 | <5 | 91.7 | 105 | 106 | <1 | <1 | 353 | 353 | 58 | 49 | 28 | 104 | <1 | 8.79 | 9.27 | 2.63 |
| MB3B | 26/05/2015 | <2 | <1 | <5 | 102 | 93.8 | 100 | <1 | <1 | 369 | 369 | 58 | 52 | 28 | 105 | <1 | 9.01 | 0.03 | 2.45 |
| MB3B | 28/04/2015 | <2 | <1 | <5 | 92.9 | 111 | 108 | <1 | <1 | 371 | 371 | 62 | 48 | 26 | 97 | <1 | 9.26 | 8.75 | 2.86 |
| MB3B | 24/02/2015 | <2 | <1 | <5 | 105 | 103 | 98.8 | <1 | <1 | 386 | 386 | 60 | 57 | 30 | 98 | <1 | 9.74 | 9.58 | 0.86 |
| MB3B | 4/02/2015 | <2 | <1 | <5 | 107 | 98.2 | 97.9 | <1 | <1 | 340 | 340 | 56 | 49 | 25 | 93 | <1 | 8.46 | 8.55 | 0.52 |
| MB3B | 17/12/2014 | <2 | <1 | <5 | 86.3 | 105 | 105 | <1 | <1 | 366 | 366 | 52 | 46 | 28 | 98 | <1 | 8.90 | 8.86 | 0.26 |
| MB3B | 26/11/2014 | <2 | <1 | <5 | 96.6 | 123 | 104 | <1 | <1 | 366 | 366 | | 46 | 28 | 111 | <1 | 9.19 | 9.43 | 1.27 |
| MB3B | 15/10/2014 | | | | | | | <1 | <1 | 376 | 376 | 51 | 47 | 28 | 99 | <1 | 9.08 | 8.96 | 0.69 |
| MB3B | 27/08/2014 | <2 | <1 | <5 | 104 | 115 | 112 | | | | | | | | | | | | |
| MB3B | 30/07/2014 | | | | | | | <1 | 23 | 324 | 347 | 54 | 49 | 28 | 93 | <1 | 8.6 | 8.79 | 1.08 |
| MB3B | 14/05/2014 | <2 | <1 | <5 | 91.8 | 102 | 104 | | | | | | | | | | | | |
| MB3B | 7/05/2014 | | | | | | | | | | | | | | | | | | |
| MB3B | | | | | | | | | | | | | | | | | | | |
| MB3B (pump) | 30/07/2014 | <2 | <1 | <5 | 95.2 | 95.7 | 104 | | | | | | | | | | | | |
| MB4 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 20/01/2016 | | | | | | | | | | | | | | | | | | |
| MB4 | 1/12/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 11/11/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 29/09/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 25/08/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 28/07/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 9/06/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 26/05/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 28/04/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 24/02/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| MB4 | 17/12/2014 | | | | | | | | | | | | | | | | | | |
| MB4 | 26/11/2014 | <2 | <1 | <5 | 95.9 | 129 | 106 | <1 | <1 | 1010 | 1010 | | 12 | 5 | 871 | 4 | 38.1 | 39 | 1.08 |
| MB4 | 15/10/2014 | | | | | | | <1 | 25 | 996 | 1020 | 641 | 11 | 5 | 826 | 4 | 39.1 | 37 | 2.82 |
| MB4 | 27/08/2014 | | | | | | | | | | | | | | | | | | |
| MB4 | 30/07/2014 | | | | | | | <1 | 121 | 702 | 823 | 575 | 14 | 8 | 840 | 6 | 34.6 | 38 | 4.7 |
| MB4 | 29/04/2014 | <2 | <1 | <5 | 104 | 95.1 | 91.5 | | | | | | | | | | | | |
| MB4 | 2/04/2014 | <2 | <1 | <5 | 105 | 94 | 92 | | | | | | | | | | | | |
| MB4 | 4/03/2014 | <2 | <1 | <5 | 102 | 90.1 | 79 | | | | | | | | | | | | |
| MB4 | 15/01/2014 | <2 | <1 | <5 | 89.8 | 99.3 | 102 | | | | | | | | | | | | |
| MB4 | 10/12/2013 | <2 | <1 | <5 | 95.2 | 105 | 114 | | | | | | | | | | | | |
| MB4 | 27/11/2013 | <2 | <1 | <5 | 108 | 103 | 99.4 | | | | | | | | | | | | |
| MB4 | 30/10/2013 | <2 | <1 | <5 | 91.5 | 86.4 | 82.6 | | | | | | | | | | | | |
| MB4 | 30/09/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 19/06/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 21/05/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 23/04/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 21/03/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 21/02/2013 | | | | | | | | | | | | | | | | | | |

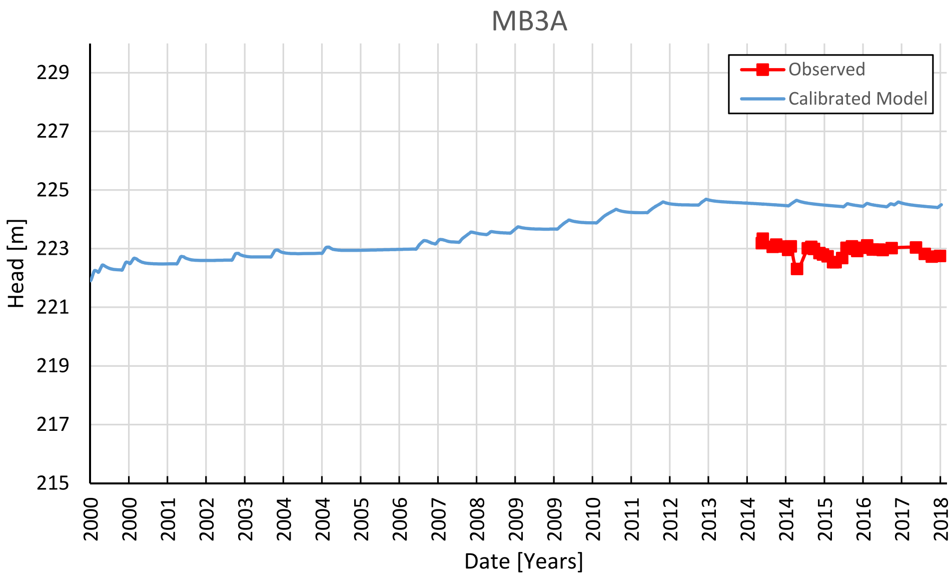
| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB4 | 16/01/2013 | | | | | | | | | | | | | | | | | | |
| MB4 | 12/12/2012 | | | | | | | | | | | | | | | | | | |
| MB4 | 14/11/2012 | | | | | | | | | | | | | | | | | | |
| MB4 | | | | | | | | | | | | | | | | | | | |
| MB4 (pump) | 30/07/2014 | <2 | <1 | <5 | 98.2 | 92.7 | 111 | | | | | | | | | | | | |
| MB5 | 14/05/2014 | | | | | | | | | | | | | | | | | | |
| MB5 | 7/05/2014 | | | | | | | | | | | | | | | | | | |
| MB6 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 20/01/2016 | | | | | | | | | | | | | | | | | | |
| MB6 | 1/12/2015 | | | | | | | | | | | | | | | | | | |
| MB6 | 29/09/2015 | | | | | | | | | | | | | | | | | | |
| MB6 | 25/08/2015 | <2 | <1 | <5 | 83.8 | 93.8 | 93 | <1 | <1 | 303 | 303 | 39 | 50 | 23 | 60 | 2 | 7.24 | 7.05 | 1.33 |
| MB6 | 28/07/2015 | <2 | <1 | <5 | 108 | 102 | 101 | <1 | <1 | 281 | 281 | 35 | 50 | 22 | 57 | 2 | 6.7 | 6.84 | 0.95 |
| MB6 | 16/06/2015 | <2 | <1 | <5 | 80.1 | 85.7 | 79.3 | <1 | <1 | 384 | 384 | 36 | 48 | 22 | 66 | 2 | 6.77 | 7.13 | 2.54 |
| MB6 | 26/05/2015 | <2 | <1 | <5 | 109 | 101 | 104 | <1 | <1 | 322 | 322 | 35 | 52 | 22 | 68 | 2 | 7.42 | 7.41 | 0.06 |
| MB6 | 28/04/2015 | <2 | <1 | <5 | 95 | 113 | 109 | <1 | <1 | 310 | 310 | 42 | 48 | 21 | 62 | 2 | 7.46 | 6.87 | 4.13 |
| MB6 | 24/02/2015 | <2 | <1 | <5 | 102 | 99.3 | 88.7 | <1 | <1 | 310 | 310 | 40 | 55 | 21 | 66 | 2 | 7.4 | 7.39 | 0.08 |
| MB6 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| MB6 | 17/12/2014 | <2 | <1 | <5 | 97.8 | 106 | 104 | <1 | <1 | 312 | 312 | 34 | 49 | 23 | 62 | 2 | 7.30 | 7.09 | 1.48 |
| MB6 | 26/11/2014 | <2 | <1 | <5 | 91.3 | 112 | 100 | <1 | <1 | 321 | 321 | | 55 | 26 | 66 | 3 | 7.73 | 7.83 | 0.64 |
| MB6 | 15/10/2014 | | | | | | | <1 | <1 | 319 | 319 | 36 | 49 | 24 | 64 | 2 | 7.49 | 7.26 | 1.63 |
| MB6 | 27/08/2014 | <2 | <1 | <5 | 108 | 110 | 108 | | | | | | | | | | | | |
| MB6 | 30/07/2014 | | | | | | | <1 | 28 | 282 | 310 | 38 | 46 | 22 | 78 | 3 | 7.37 | 7.58 | 1.36 |
| MB6 | 14/05/2014 | <2 | <1 | <5 | 97.2 | 103 | 99.3 | | | | | | | | | | | | |
| MB6 | | | | | | | | | | | | | | | | | | | |
| MB6 (pump) | 30/07/2014 | <2 | <1 | <5 | 100 | 96.7 | 100 | | | | | | | | | | | | |
| MB7 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| MB7 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| MB7 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| MB7 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| MB7 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| MB7 | 23/02/2016 | <2 | <1 | <5 | 110 | 104 | 97.5 | <1 | <1 | 445 | 445 | 85 | 40 | 29 | 140 | <1 | 11.5 | 11.6 | 0.61 |
| MB7 | 20/01/2016 | <2 | <1 | <5 | 86.4 | 91.6 | 106 | <1 | <1 | 422 | 422 | 60 | 41 | 27 | 140 | <1 | 10.3 | 10.4 | 0.09 |
| MB7 | 1/12/2015 | <2 | <1 | <5 | 119 | 96.2 | 100 | <1 | <1 | 413 | 413 | 73 | 32 | 22 | 130 | <1 | 10.5 | 9.06 | 7.48 |
| MB7 | 11/11/2015 | <2 | <1 | <5 | 107 | 99 | 94.3 | <1 | <1 | 398 | 398 | 63 | 32 | 23 | 138 | <1 | 9.94 | 9.49 | 2.33 |
| MB7 | 29/09/2015 | <2 | <1 | <5 | 106 | 95.1 | 92.9 | <1 | <1 | 386 | 386 | 63 | 35 | 22 | 135 | <1 | 9.72 | 9.43 | 1.54 |
| MB7 | 25/08/2015 | <2 | <1 | <5 | 105 | 90.4 | 98.1 | <1 | <1 | 394 | 394 | 61 | 34 | 23 | 130 | <1 | 9.78 | 9.24 | 2.85 |
| MB7 | 28/07/2015 | <2 | <1 | <5 | 106 | 97.7 | 93.9 | <1 | <1 | 377 | 377 | 59 | 34 | 22 | 123 | <1 | 9.42 | 8.86 | 3.14 |
| MB7 | 16/06/2015 | <2 | <1 | <5 | 85.1 | 83.5 | 77.5 | <1 | <1 | 386 | 386 | 53 | 36 | 23 | 150 | <1 | 9.42 | 10.2 | 4.03 |
| MB7 | 26/05/2015 | <2 | <1 | <5 | 96.8 | 104 | 110 | <1 | <1 | 405 | 405 | 50 | 38 | 23 | 153 | <1 | 9.67 | 10.4 | 3.82 |
| MB7 | 28/04/2015 | <2 | <1 | <5 | 104 | 109 | 106 | <1 | <1 | 422 | 422 | 57 | 36 | 23 | 134 | <1 | 10.2 | 9.52 | 3.52 |
| MB7 | 24/02/2015 | <2 | <1 | <5 | 106 | 106 | 90.4 | <1 | <1 | 445 | 445 | 52 | 41 | 23 | 131 | <1 | 10.5 | 9.64 | 4.53 |
| MB7 | 4/02/2015 | <2 | <1 | <5 | 98.2 | 99.1 | 98 | <1 | <1 | 418 | 418 | 50 | 36 | 23 | 145 | <1 | 9.95 | 10 | 0.2 |
| MB7 | 17/12/2014 | <2 | <1 | <5 | 93.1 | 112 | 114 | <1 | <1 | 433 | 433 | 44 | 36 | 26 | 150 | <1 | 10.10 | 10.50 | 1.71 |
| MB7 | 26/11/2014 | <2 | <1 | <5 | 106 | 122 | 113 | <1 | <1 | 393 | 393 | | 31 | 23 | 141 | <1 | 9.51 | 9.57 | 0.31 |
| MB7 | | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) | 15/10/2014 | | | | | | | <1 | <1 | 408 | 408 | 45 | 28 | 21 | 147 | <1 | 9.63 | 9.52 | 0.62 |
| MB7 (MB4) | 27/08/2014 | <2 | <1 | <5 | 98.4 | 107 | 103 | | | | | | | | | | | | |
| MB7 (MB4) | 30/07/2014 | | | | | | | <1 | 49 | 389 | 438 | 124 | 28 | 18 | 238 | 1 | 12.8 | 13.3 | 1.67 |
| MB7 (MB4) | 14/05/2014 | <2 | <1 | <5 | 90.1 | 100 | 111 | | | | | | | | | | | | |
| MB7 (MB4) | 7/05/2014 | | | | | | | | | | | | | | | | | | |
| MB7 (MB4) (pump) | 30/07/2014 | <2 | <1 | <5 | 93.7 | 95.3 | 110 | | | | | | | | | | | | |
| Middle Well | 29/05/2015 | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | |
| Mitchell Bore | 20/04/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 19/01/2016 | | | | | | | | | | | | | | | | | | |
| OBS1 | 1/12/2015 | | | | | | | | | | | | | | | | | | |

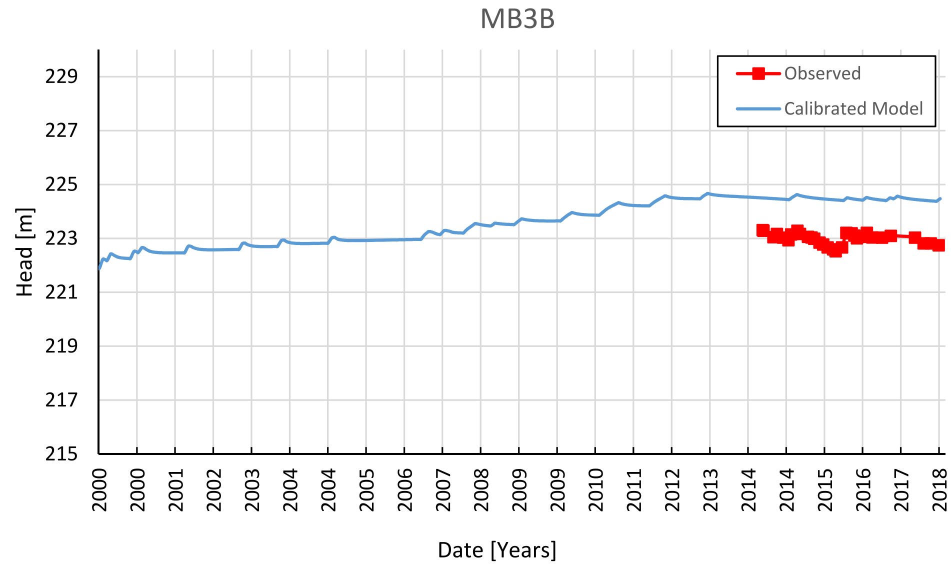
| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS1 | 11/11/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 29/09/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 25/08/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/07/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 16/06/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/05/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 28/04/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 24/02/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| OBS1 | 17/12/2014 | | | | | | | | | | | | | | | | | | |
| OBS1 | 26/11/2014 | <2 | <1 | <5 | 95.9 | 116 | 106 | <1 | <1 | 505 | 505 | | 371 | 532 | 2990 | 15 | 200 | 193 | 1.94 |
| OBS1 | 15/10/2014 | | | | | | | <1 | <1 | 526 | 526 | 7510 | 452 | 600 | 3110 | 11 | 224 | 207 | 3.87 |
| OBS1 | 27/08/2014 | <2 | <1 | <5 | 116 | 96.7 | 102 | | | | | | | | | | | | |
| OBS1 | 30/07/2014 | | | | | | | <1 | <1 | 352 | 352 | 5060 | 272 | 394 | 2280 | 12 | 150 | 145 | 1.62 |
| OBS1 | 5/06/2014 | <2 | <1 | <5 | 113 | 94.8 | 94.4 | | | | | | | | | | | | |
| OBS1 | 29/04/2014 | <2 | <1 | <5 | 102 | 102 | 94.4 | | | | | | | | | | | | |
| OBS1 | 2/04/2014 | <2 | <1 | <5 | 111 | 90.1 | 91.3 | | | | | | | | | | | | |
| OBS1 | 5/03/2014 | <2 | <1 | <5 | 118 | 101 | 89.8 | | | | | | | | | | | | |
| OBS1 | 15/01/2014 | <2 | <1 | <5 | 97.8 | 98.5 | 97.5 | | | | | | | | | | | | |
| OBS1 | 10/12/2013 | <2 | <1 | <5 | 96.9 | 97.5 | 109 | | | | | | | | | | | | |
| OBS1 | 27/11/2013 | <2 | <1 | <5 | 89 | 93.1 | 89.1 | | | | | | | | | | | | |
| OBS1 | 30/10/2013 | <2 | <1 | <5 | 110 | 104 | 109 | | | | | | | | | | | | |
| OBS1 | 30/09/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 19/06/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 21/05/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 23/04/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 21/03/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 21/02/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 16/01/2013 | | | | | | | | | | | | | | | | | | |
| OBS1 | 12/12/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | 14/11/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | 17/10/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | 15/09/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | 15/08/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | 16/07/2012 | | | | | | | | | | | | | | | | | | |
| OBS1 | | | | | | | | | | | | | | | | | | | |
| OBS1 (bail) | 30/07/2014 | <2 | <1 | <5 | 94.2 | 97.2 | 105 | | | | | | | | | | | | |
| OBS2 | 2/08/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/06/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 17/05/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/04/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 5/04/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 23/02/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 19/01/2016 | | | | | | | | | | | | | | | | | | |
| OBS2 | 1/12/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 11/11/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 29/09/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 25/08/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/07/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 9/06/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/05/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 28/04/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 24/02/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 4/02/2015 | | | | | | | | | | | | | | | | | | |
| OBS2 | 17/12/2014 | | | | | | | | | | | | | | | | | | |
| OBS2 | 26/11/2014 | <2 | <1 | <5 | 91.4 | 122 | 100 | <1 | <1 | 568 | 568 | | 806 | 964 | 3330 | 10 | 266 | 265 | 0.22 |
| OBS2 | 15/10/2014 | | | | | | | <1 | <1 | 571 | 571 | 9710 | 800 | 981 | 3480 | 8 | 296 | 272 | 4.14 |
| OBS2 | 27/08/2014 | <2 | <1 | <5 | 102 | 106 | 104 | | | | | | | | | | | | |
| OBS2 | 30/07/2014 | | | | | | | <1 | <1 | 444 | 444 | 10200 | 954 | 1270 | 3870 | 8 | 309 | 321 | 1.78 |

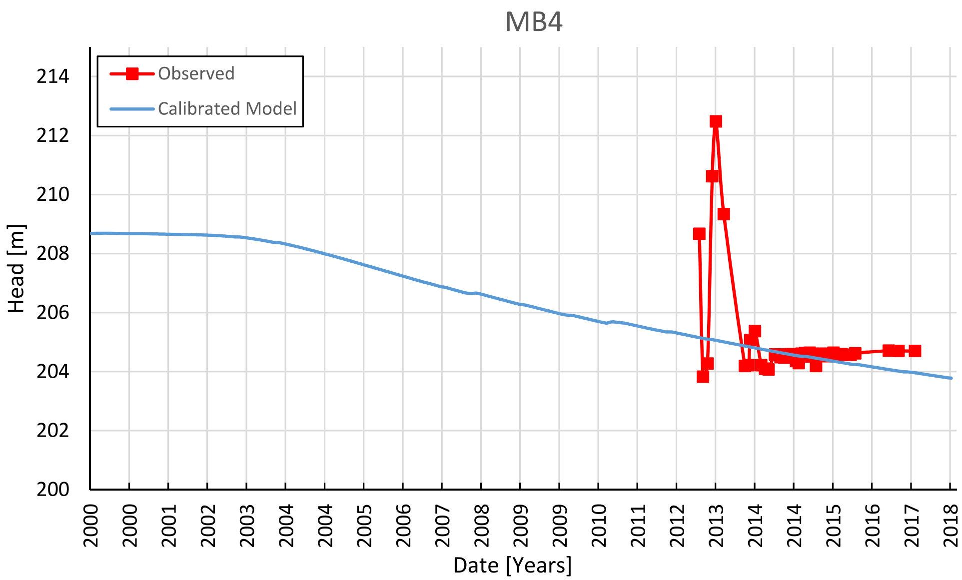
| Hole ID | Date | Total Xylenes (µg/L) | Sum of BTEX (µg/L) | Naphthalene (µg/L) | 1.2-Dichloroethane-D4 (%) | Toluene-D8 (%) | 4-Bromofluorobenzene (%) | Hydroxide Alkalinity as CaCO3 (mg/L) | Carbonate Alkalinity as CaCO3 (mg/L) | Bicarbonate Alkalinity as CaCO3 (mg/L) | Total Alkalinity as CaCO3 (mg/L) | Chloride (mg/L) | (Dissolved Major Cations) Calcium (mg/L) | (Dissolved Major Cations) Magnesium (mg/L) | (Dissolved Major Cations) Sodium (mg/L) | (Dissolved Major Cations) Potassium (mg/L) | Total Anions (meq/L) | Total Cations (meq/L) | Ionic Balance (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OBS2 | 4/06/2014 | <2 | <1 | <5 | 104 | 99.9 | 90.3 | | | | | | | | | | | | |
| OBS2 | 29/04/2014 | <2 | <1 | <5 | 105 | 98.9 | 101 | | | | | | | | | | | | |
| OBS2 | 2/04/2014 | <2 | <1 | <5 | 112 | 89.8 | 93.8 | | | | | | | | | | | | |
| OBS2 | 5/03/2014 | <2 | <1 | <5 | 117 | 96.9 | 88.4 | | | | | | | | | | | | |
| OBS2 | 15/01/2014 | <2 | <1 | <5 | 96.1 | 104 | 105 | | | | | | | | | | | | |
| OBS2 | 10/12/2013 | <2 | <1 | <5 | 92.6 | 98.4 | 103 | | | | | | | | | | | | |
| OBS2 | 27/11/2013 | <2 | <1 | <5 | 105 | 101 | 95.9 | | | | | | | | | | | | |
| OBS2 | 30/10/2013 | <2 | <1 | <5 | 93.9 | 99.7 | 108 | | | | | | | | | | | | |
| OBS2 | 30/09/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 19/06/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 21/05/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 23/04/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 21/03/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 21/02/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 16/01/2013 | | | | | | | | | | | | | | | | | | |
| OBS2 | 12/12/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | 14/11/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | 17/10/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | 15/09/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | 15/08/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | 16/07/2012 | | | | | | | | | | | | | | | | | | |
| OBS2 | | | | | | | | | | | | | | | | | | | |
| OBS2 (pump) | 30/07/2014 | <2 | <1 | <5 | 92.4 | 90.8 | 106 | | | | | | | | | | | | |
| OBS2 (Pump) | 4/06/2014 | <2 | <1 | <5 | 103 | 100 | 90.1 | | | | | | | | | | | | |
| OBS4 | 28/04/2015 | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | |
| Scotts Well | 23/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Unamed Bore | 24/06/2015 | | | | | | | | | | | | | | | | | | |
| Well 10 | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Well 11 | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Well 12 | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Well 13 | 1/06/2015 | | | | | | | | | | | | | | | | | | |
| Well 14 | 1/06/2015 | | | | | | | | | | | | | | | | | | |

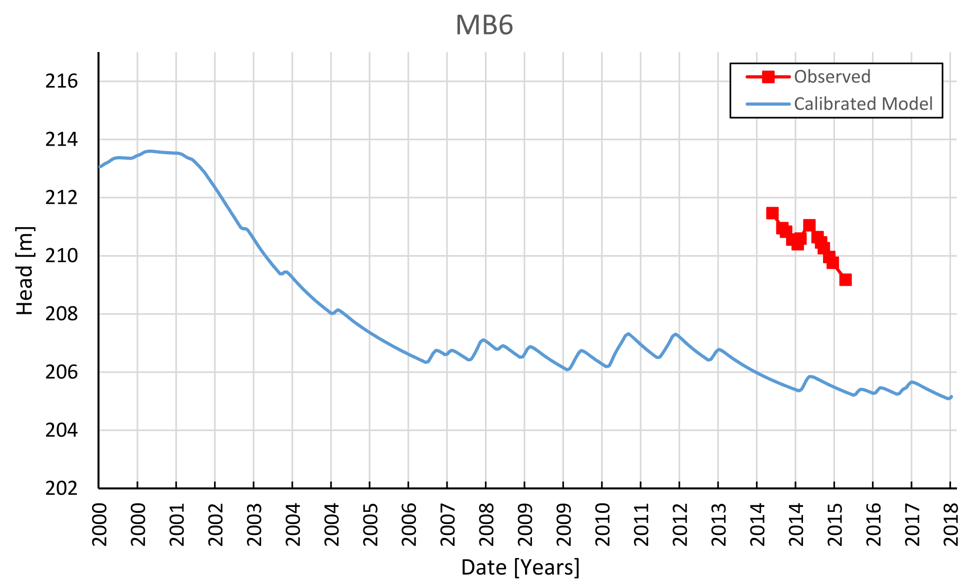
**APPENDIX B**

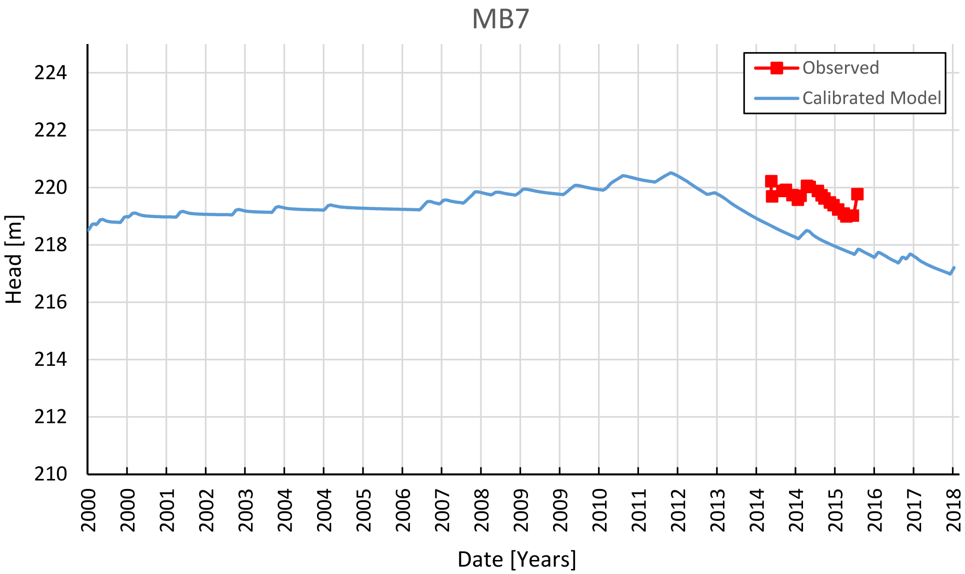
# Hydrographs


MB3A
Observed
Calibrated Model
Head [m]
229
227
225
223
221
219
217
215
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


MB3B
Observed
Calibrated Model
Head [m]
229
227
225
223
221
219
217
215
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


MB4
Observed
Calibrated Model
Head [m]
214
212
210
208
206
204
202
200
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


MB6
Observed
Calibrated Model
Head [m]
216
214
212
210
208
206
204
202
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]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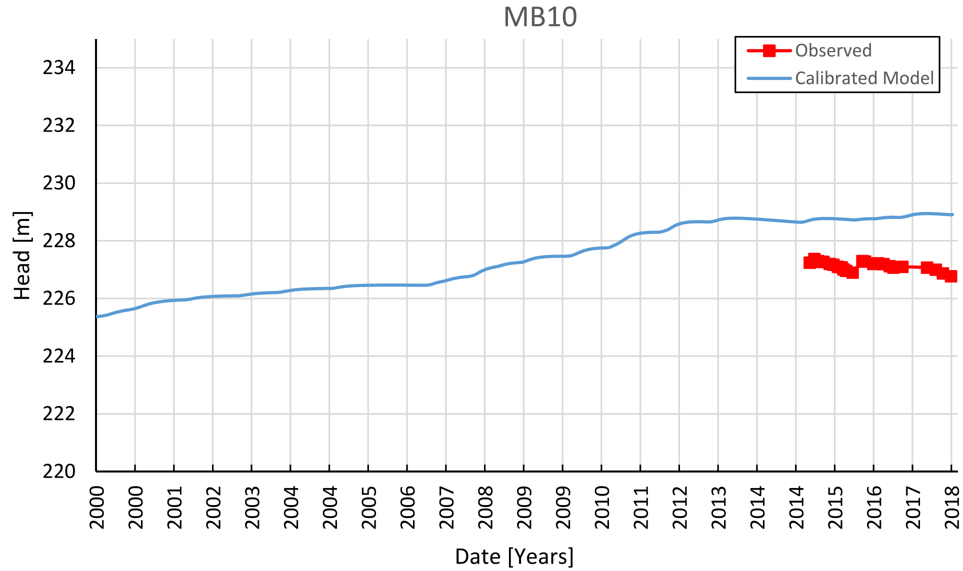
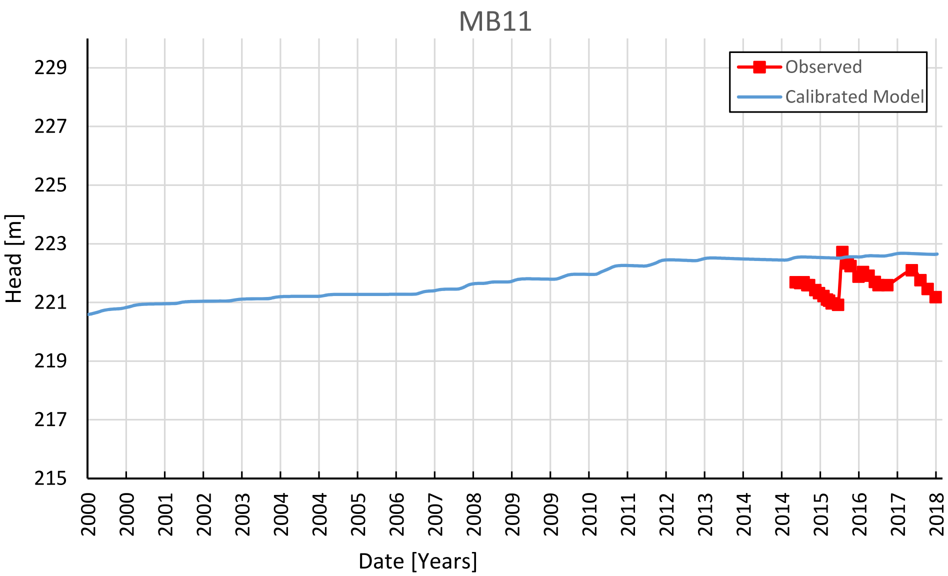
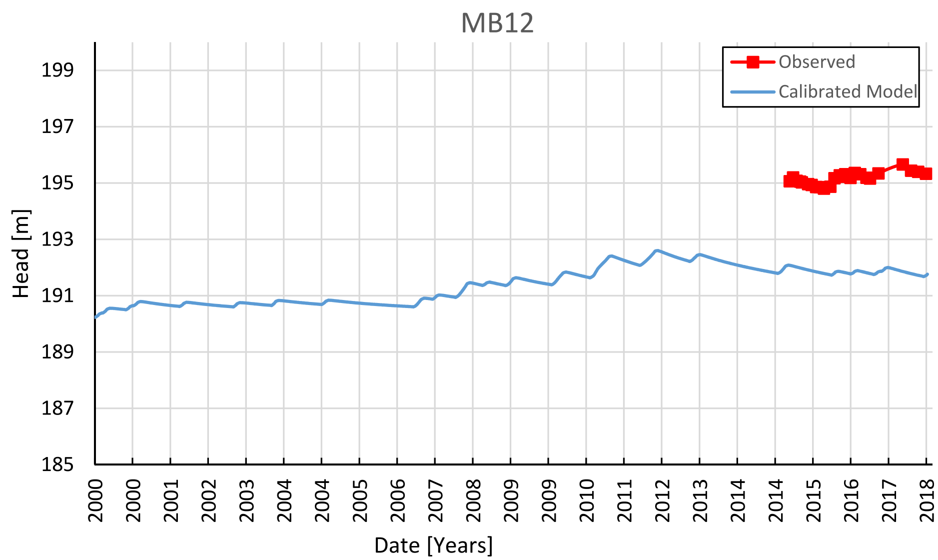
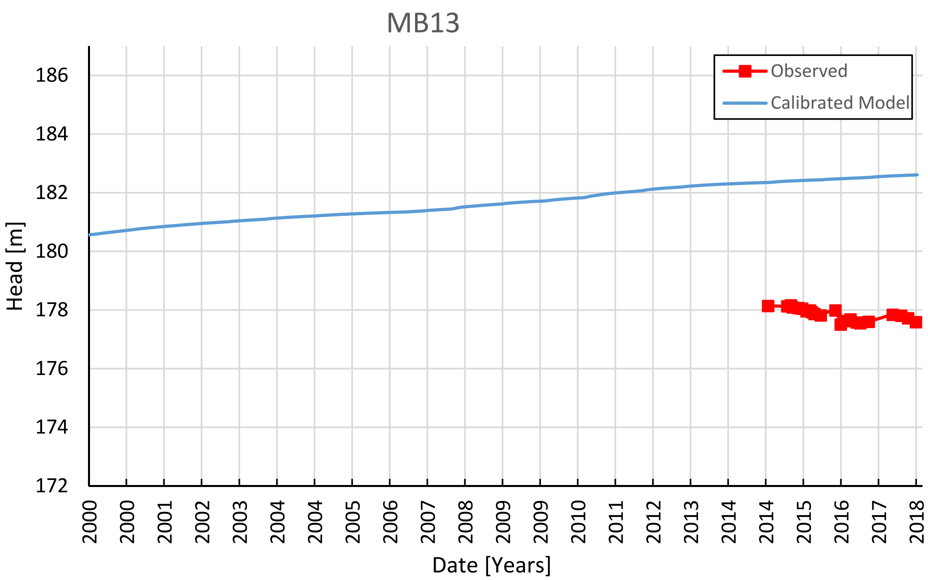
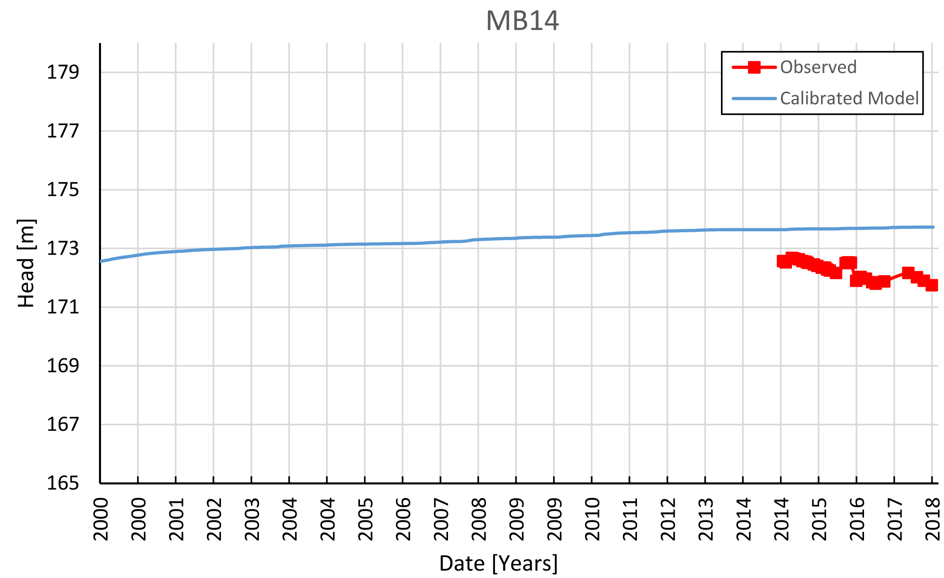
Observed
Calibrated Model
Head [m]
224
222
220
218
216
214
212
210
2000
2000
2001
2002
2003
2004
2004
2005
2006
2007
2008
2009
2009
2010
2011
2012
2013
2014
2014
2015
2016
2017
2018
Date [Years]

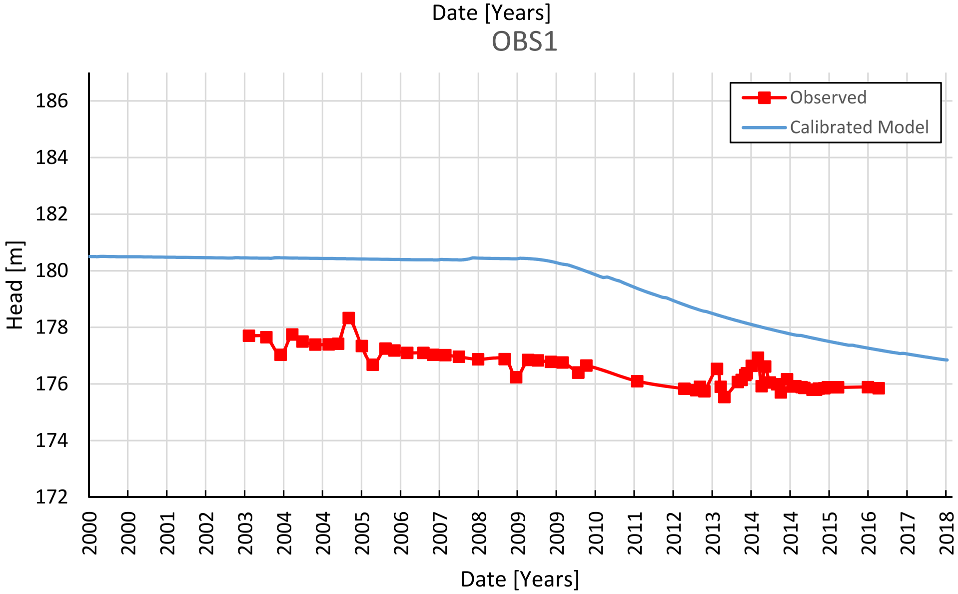

MB10
Observed
Calibrated Model
Head [m]
234
232
230
228
226
224
222
220
2000
2000
2001
2002
2003
2004
2004
2005
2006
2007
2008
2009
2009
2010
2011
2012
2013
2014
2014
2015
2016
2017
2018
Date [Years]

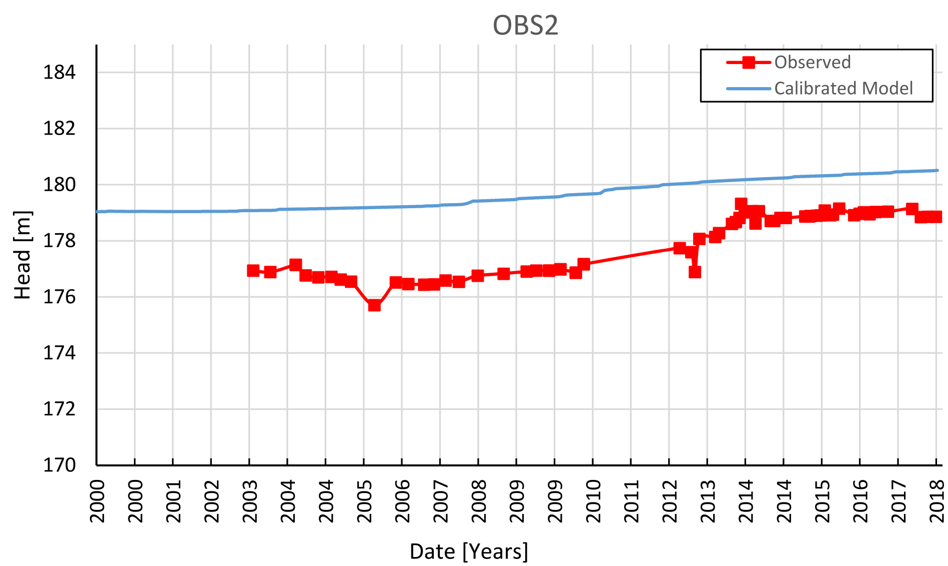

MB11
Observed
Calibrated Model
Head [m]
229
227
225
223
221
219
217
215
2000
2000
2001
2002
2003
2004
2004
2005
2006
2007
2008
2009
2009
2010
2011
2012
2013
2014
2014
2015
2016
2017
2018
Date [Years]

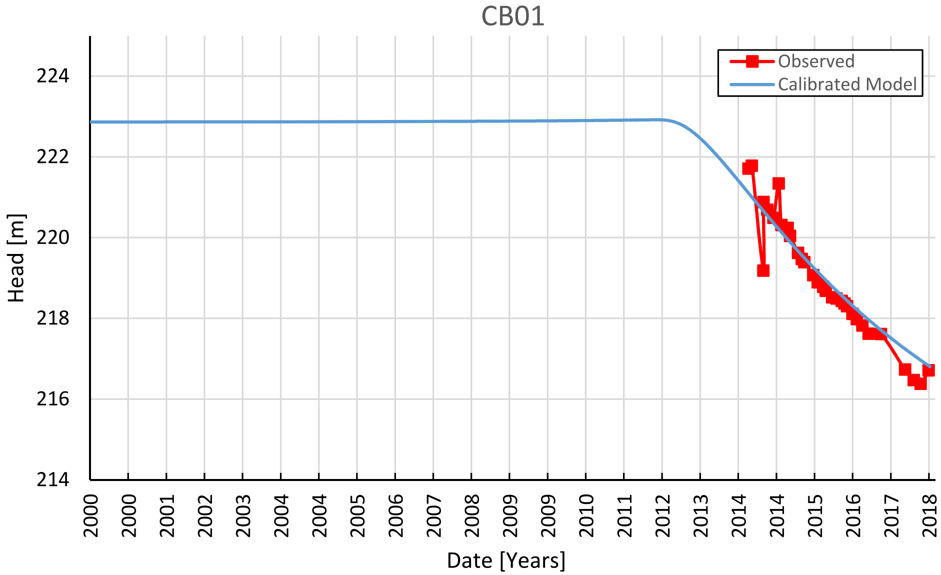

MB12
Observed
Calibrated Model
Head [m]
199
197
195
193
191
189
187
185
2000
2000
2001
2002
2003
2004
2004
2005
2006
2007
2008
2009
2009
2010
2011
2012
2013
2014
2014
2015
2016
2017
2018
Date [Years]


MB13
Observed
Calibrated Model
Head [m]
186
184
182
180
178
176
174
172
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


MB14
Observed
Calibrated Model
Head [m]
179
177
175
173
171
169
167
165
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


OBS1
Observed
Calibrated Model
Head [m]
186
184
182
180
178
176
174
172
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]


OBS2
Observed
Calibrated Model
Head [m]
184
182
180
178
176
174
172
170
2000 2000 2001 2002 2003 2004 2004 2005 2006 2007 2008 2009 2009 2010 2011 2012 2013 2014 2014 2015 2016 2017 2018
Date [Years]



CB01
Observed
Calibrated Model
Head [m]
224
222
220
218
216
214
2000
2000
2001
2002
2003
2004
2004
2005
2006
2007
2008
2009
2009
2010
2011
2012
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2018
Date [Years]

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