Jimblebar Hydrogeological Assessment

7 December 2023

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1 Introduction

1.1 Overview

The Jimblebar mining operations is located in the Pilbara region, approximately 40km east of the town Newman. There are currently three approved proposals:

- Jimblebar Iron Ore Project (Revised Proposal) MS1126
- Orebody 31 Iron Ore Project MS1021
- Orebody 18 Iron Ore Mine MS439 (as amended by MS1012).

Under the approved Jimblebar Iron Ore Project (Revised Proposal), the mine features Wheelarra Hill, South Jimblebar and Hashimoto deposits. Jimblebar mine is situated on Mineral Licence M266SA and Miscellaneous Licences L52/108 and L52/109. Operations are situated in the East Pilbara sub-area of the Pilbara groundwater allocation plan (DoW, 2013) and underlain by fractured rock aquifers.

BHP refers to OB18 and OB31 mines collectively as the Shovelanna operations (Figure 1).

Key approved water activities are relating to Jimblebar (excluding Shovelanna) are:

- Mining above and below the water table
- Abstraction for groundwater for water supply and dewatering
- Surplus water management
    - Discharge of surplus water to Ophthalmia Dam from the Jimblebar and OB31 mines
    - Discharge of surplus water to Caramulla Managed Aquifer Recharge (MAR)
    - Discharge of surplus water to Caramulla Creek and Jimblebar Creek.

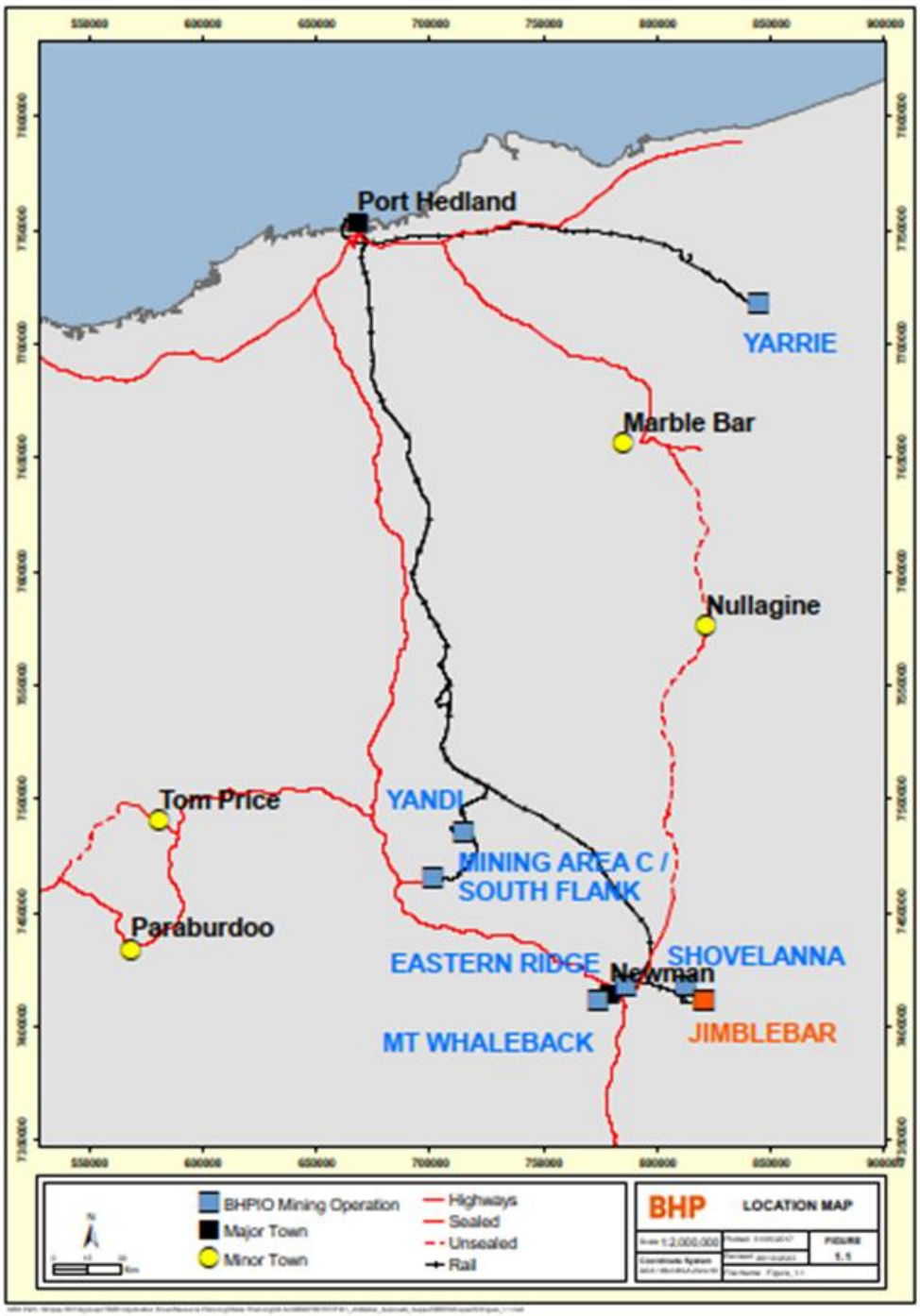


Fig 1.1: Location of operations

1.2 Jimblebar 5C Licence

Jimblebar operations current 5C Licence to Take Water issued under the *Rights in Water and Irrigation Act 1914* GWL158795(11) allows for an annual abstraction of 26,300,000 kL/a (26.3 GL/a) to align with the approved Jimblebar Optimisation Project. BHP WAIO will be referring the Jimblebar Hub Iron Ore Mining Operations Significant Amendment in late 2023 to the Environmental Protection Authority. The proposal will include the following key activities:

- Above and below water table mining at East Jimblebar
- Mine dewatering and surplus water at Jimblebar
- New overburden storage areas north of East Jimblebar
- New haul roads and creek crossings if required
- New beneficiation plant at Jimblebar and associated in-pit tailing storage facilities at OB18, OB31 and Jimblebar.

This H3 report (prepared in accordance with Operational policy no 5.12, (DoW, 2009) has been compiled to support the above project with BHP WAIO seeking a licence amendment of GWL158795(11) to an annual water entitlement of 51,100,000kL/a. The H3 level assessment supports the licence application assessing the drawdown, migration and magnitude from dewatering at a maximum rate of 140 ML/d via:

- Compilation and review of existing geological and hydrogeological data
- Update of the conceptual hydrogeological model of the Jimblebar area
- Update of the numerical groundwater model
- Calibration of the numerical model to available groundwater level data
- Predictive model runs to estimate the potential range in regional drawdown due to mine dewatering; and
- Review of potential impacts and management approach including update of a groundwater license operating strategy (GWOS), which will be submitted following this application.

2 Climate and rainfall

The nearest BoM weather station is located about 45 km southwest at Newman Airport. The Jimblebar mine site has a weather station installed at Wheelarra Hill, which has been in operation since 2000. Observed rainfall data (Figure 2.1) includes Wheelarra Hill and Newman Airport, gaps in the Newman Airport record have been infilled with data from the now closed Newman weather station.

The regional climate in the Jimblebar area is semi-arid. Rainfall is typically dominated by the influence of subtropical highs located to the south of the Pilbara. Rainfall throughout the year is variable, with distinct wet and dry seasons. The wettest months of the year are typically January to March, producing 60% of annual rainfall within the area (CSIRO, 2015). The larger summer rainfall events are generally associated with tropical lows, which develop from degrading tropical cyclones formed off the northwest coast of Western Australia (Charles et al, 2015). The mean annual distribution of rainfall across the Pilbara (during the period 1911–2012) is approximately 299 mm. There is a large year-to year variability with annual rainfall ranging from 48 mm in 1924 to 731 mm in 2000 (CSIRO, 2015).

The Pilbara is characterised by high evaporation rates and a generally low soil infiltration capacity. This results in recharge occurring exclusively during major rainfall events (15–25 mm/d). Within the Upper Fortescue region, this recharge is dominated by leakage from streambeds (Charles et al, 2015). The closest station which recorded evaporation was the Wittenoom BoM station 002056, located approximately 190 km northwest of Newman. Average

annual evaporation data from 1967 to August 2019 (station closure) for Wittenoom was 3,139 mm/yr, which exceeds annual rainfall by about 2,800 mm/yr.

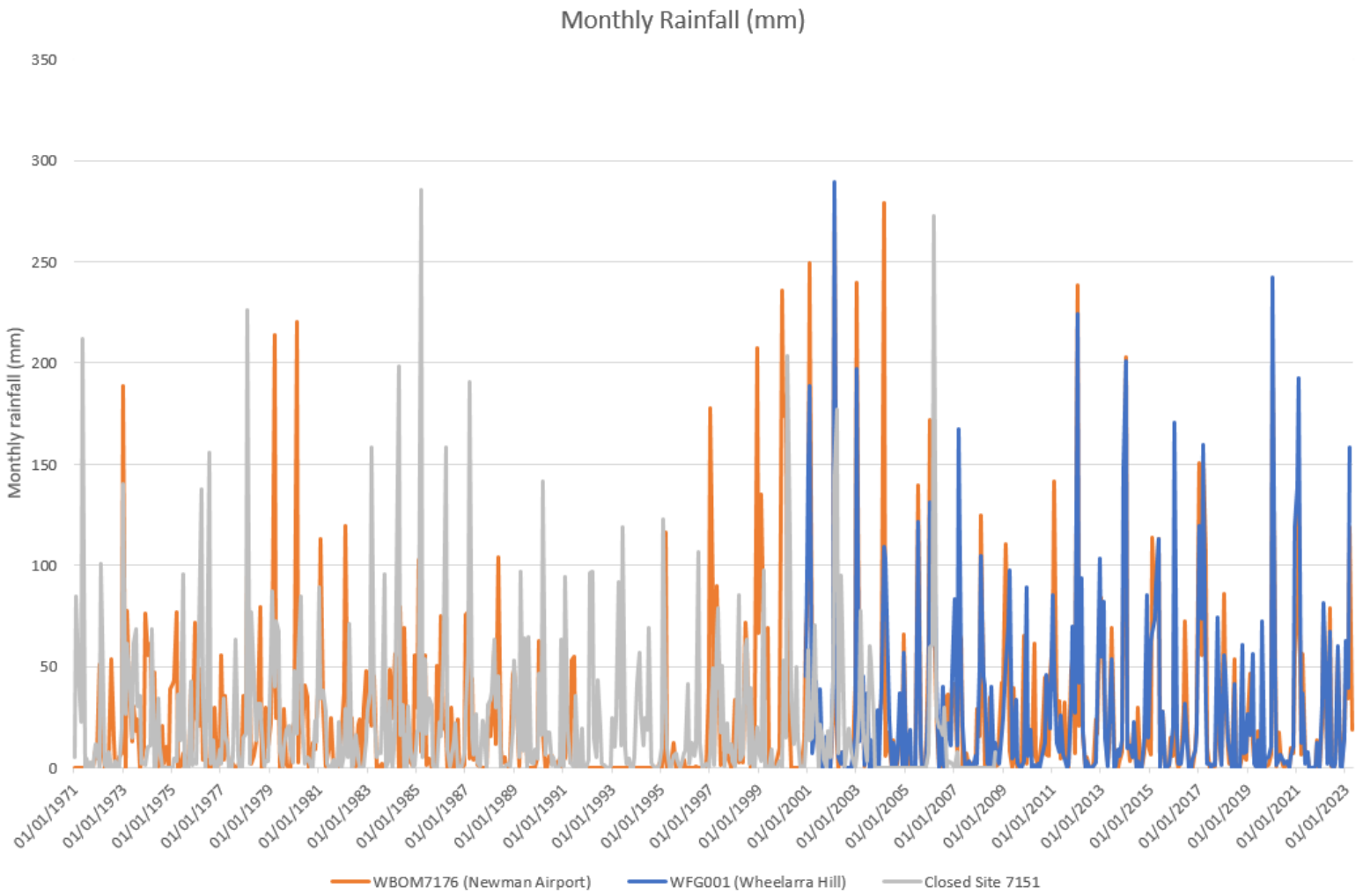


Fig 2.1: Summary of Jimblebar and Newman Rainfall

3 Hydrogeology

3.1 Introduction

An overview of the regional setting, conceptual model and key uncertainties is provided below. The evidence for all aspects of the conceptual model are provided in Appendix A.

3.2 Topography and Surface Water Drainage

The topography of the Jimblebar area is generally characterized by the prominent Wheelarra Hill in the north western part of the area and the lower lying hills of the Marra Mamba and Jeerinah Formations to the south (Figure 3.1). To the east the topography varies very little as far as the hills that rise just east of Thirteen Creek. The lowest topography is associated with the Tertiary filled valley between the Brockman orebodies in the north and the Marra Mamba orebodies in the south. In the valley area the topography is highest in the west. From just east of the Wheelarra Fault the ground surface falls from about 550 mRL to about 515 mRL by Capricorn / WHASH. From here to the east it falls very gently, reaching about 510 mRL roughly halfway between Caramulla Creek and Thirteen Creek. Towards Thirteen Creek it increases again slightly, reaching about 515 mRL by the creek.

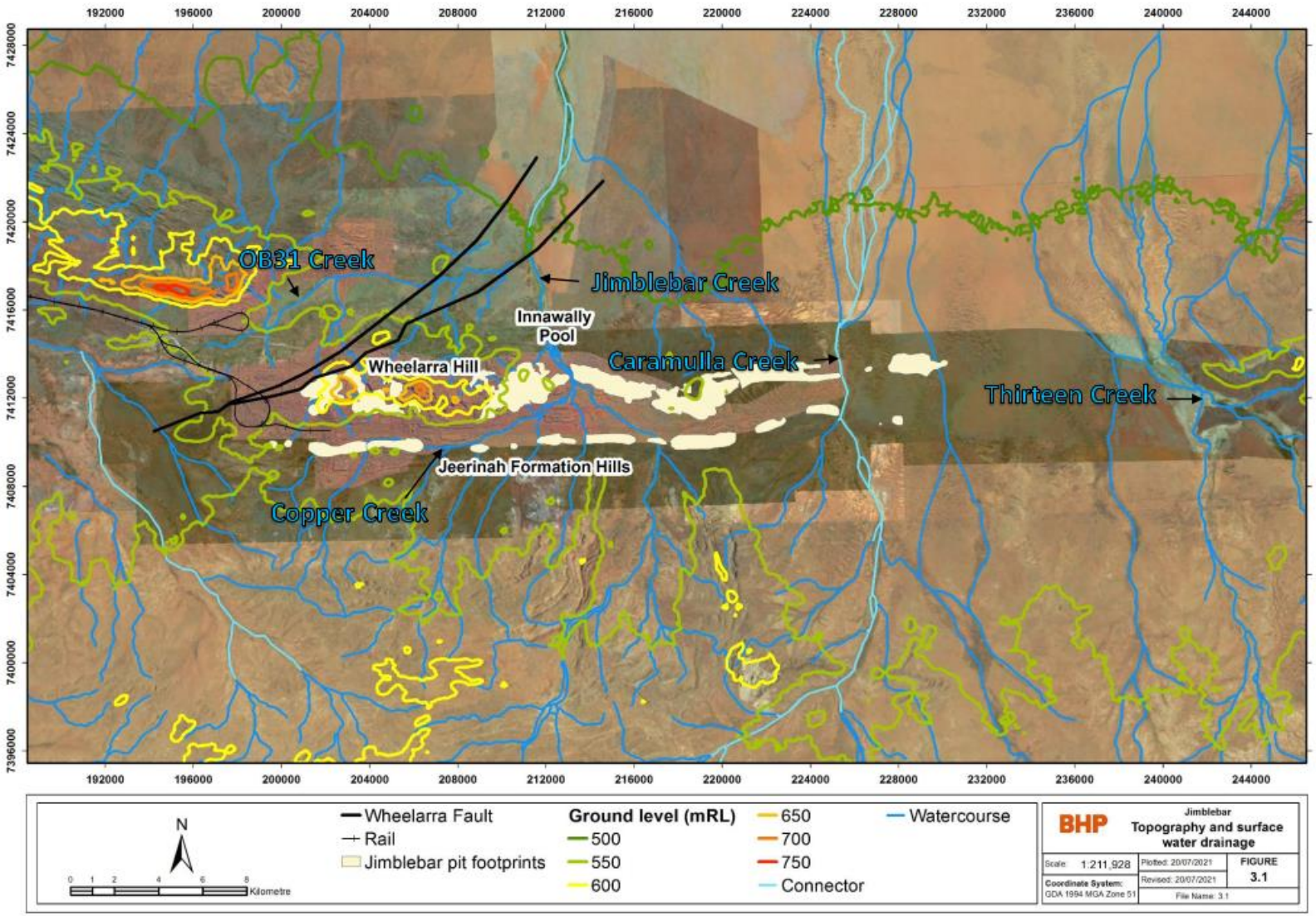


Figure 3.1: Jimblebar topography and surface water drainage

The Wheelarra Hill consists of outcropping Brockman Iron Formation units with topographic highs in the order of ~700 mRL. Topographic highs in the lower lying Marra Mamba and Jeerinah Formation hills to the south are in the order of 560 mRL in the Mindoona area, with a gentle slope to the east. Ground elevation in the Tertiary filled valley is around 530 mRL.

The area is drained towards the north by the Jimblebar, Caramulla and Thirteen Creeks which have their headwaters along the southern margins of the project area. The main channel of the Jimblebar Creek passes adjacent to the eastern most South Jimblebar orebody. Copper Creek is the main tributary to the Jimblebar Creek in the area and it drains the broad valley between Wheelarra Hill and the South Jimblebar orebody. Figure 3.1 summarises the surface water drainage and topography.

The southern flank of the Wheelarra Hill and the broad area of Jimblebar ridge drain towards Copper Creek. The northern side of Wheelarra Hill is drained by numerous, northward flowing small channels and valleys, which then flow eastwards to join Jimblebar Creek. As with most of the rivers and creeks in the Pilbara, these channels are ephemeral and predominantly dry outside of seasonal rainfall events.

Innawally Pool is located where Jimblebar Creek passes through the WHASH/HASH deposits and forms a significant ephemeral wetland feature. The pool is fed by surface water from a localized, shallow, perched aquifer. The pool is hydraulically disconnected from the regional water table, which sits some 50 m below ground level.

3.3 Conceptual model

3.3.1 Introduction

The main conceptual model components are shown in Figure 3.2 and described below. The greatest detail is provided for the area encompassing Mindoona, Sylvania, Capricorn, WH123, WHASH and HASH deposits, as these are the areas with the most data.

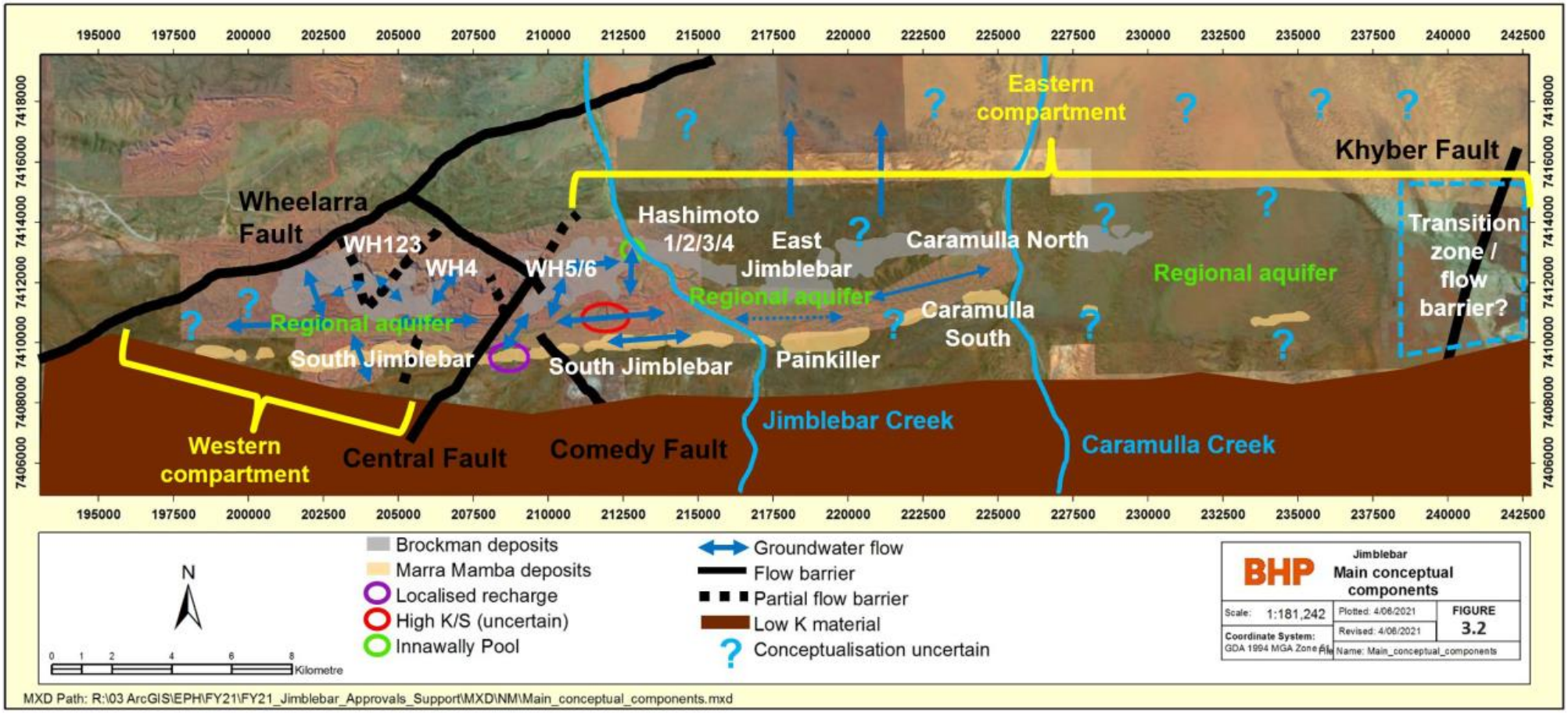


Figure 3.2: Jimblebar main conceptual components

3.3.2 Hydrostratigraphy and relationships

The main aquifers in the area are:

- Orebody aquifers made up of mineralised and submineralised material of the:
    - Marra Mamba Formation, which forms an almost continuous east/west striking aquifer in the south. As per the FY22 Life of Asset (LoA) mine plan, some of these orebodies reach depths of about 350 mRL (~110 m below water table (BWT)).
    - Brockman Iron Formation, which also forms an almost continuous east/west striking aquifers in the north. Whilst they are discontinuous, they can be very large, as in the case of the WHASH orebody. As per the FY22 LoA mine plan, the WH123 orebody reaches a maximum depth of about 354 mRL (~110 m BWT) and the WHASH orebody reaches as low as 324 mRL (~140 m BWT).
- Regional aquifers, which are located through the central valleys of the Jimblebar area and are made up of:
    - Weathered Paraburdoo (and Bee Gorge) Members of the Wittenoom Formation. The Paraburdoo dolomite in particular can be karstic and highly permeable.
    - Sand and gravel occurrences in the Tertiary Detritals. The detritals are very thick in places, reaching up to 360 m thick immediately north of Mindoona and reaching as low as 200 mRL.

The orebody and regional bedrock aquifers are separated by the various shale members of the Wittenoom Formation and Brockman Iron Formation. The Mt McRae and Mt Sylvia Shale Formations are present to the south of the Brockman orebodies and the West Angela Shale is found to the north of the Marra Mamba orebodies. In some areas the Tertiary Detrital aquifers are in direct contact with the orebody aquifers whereas in others they too are separated by the shale formations.

Even with the presence of these conceptually lower permeability shale materials, at a regional scale, all the aquifers present a high degree of hydraulic connection. For example, dewatering of the southern Marra Mamba orebodies has been observed to significantly reduce groundwater levels in the northern Brockman orebodies.

However the Central Fault (which is orientated NE-SW) effectively divides the Jimblebar groundwater system in half and allows very little flow across it. Under dewatering conditions, these western and eastern compartments can be thought of as separate entities.

Dewatering of the Mindoona pit has shown that water levels in virtually all lithologies local to the orebody in this location respond very well and uniformly to dewatering. These observations suggest that the connection between the regional and orebody aquifers is through the rock mass, rather than being structurally controlled. Clays of the Tertiary Detritals are the only lithologies that show variable responses to dewatering (in some locations they don't respond at all).

The bedrock to the south of the Marra Mamba orebodies is made up of shales and dolerites of the Jeerinah Formation and granites of the Sylvania Inlier. Whilst the Jeerinah Formation may have a moderate permeability, particularly in the west of the area, the granites form a hydraulic barrier to the south of Jimblebar as evidenced by the very high groundwater levels and lack of an obvious response to dewatering.

The bedrock north of the Brockman orebodies consists of Yandicoogina Shale and Weeli Wolli Formation. These units are conceptually low to moderate permeability. The permeability of this material may be higher than the granites to the south however, as evidenced by the flatter groundwater heads in this material and the hypothesised throughflow out of the catchment to the north beneath WHASH.

The regional aquifer systems generally exhibit high transmissivity and high storage. However, the system between Caramulla Patterson and Lawson deposits shows signs of being high transmissivity but also low storage.

Hydraulic parameter values characteristic of the various aquifer units are summarised in Table 3.1 (adopted from the groundwater modelling described in Section 9). There is likely a significant degree of heterogeneity within hydrostratigraphic units across the Jimblebar area however.

Table 3.1: Summary of key hydraulic parameters

Material	Hydraulic conductivity	Specific yield
Marra Mamba orebody aquifer	0.5 to 50 m/d	1 to 20%
Brockman orebody aquifer	5 to 100 m/d	5 to 20%
Regional aquifer (weathered dolomite)	20 m/d	5%
Regional aquifer (Tertiary Detritals)	0.001 to 50 m/d	5 to 15%

3.3.3 Structures and flow barriers

Regional and local structures play a significant role in the Jimblebar groundwater system and generally behave as barriers to flow.

There is little or no flow across the Wheelarra Fault and this forms the western boundary to the Jimblebar groundwater catchment. The NE-SW trending structures (including the Khyber Fault) that pass through Caramulla in the far east of the catchment are shown by observed water levels to be significant (although as yet untested by drawdown and either acting on their own or part of a transition zone of lower transmissivity material) and are likely to define the eastern boundary to the system.

Locally there are several structures that, as shown by the propagation of drawdown, provide either partial or complete barriers to groundwater flow. These include:

- The Central Fault which clearly separates all the aquifers into a western and eastern compartment. This may happen through a combination of dyke infill (dolerite) in the bedrock part of the fault and low permeability clay in the Tertiary Detritals immediately above it. This is important because the Tertiary Detritals are saturated in this area and would otherwise enable unimpeded flow between the eastern and western sides of the fault (which does not happen).
- The Comedy Fault (infilled with dolerite), which seems to be significant in the Marra Mamba orebody of South Jimblebar.
- The Monster Fault and an unnamed fault that form a downward V shape around WH2/3 form a partial barrier to groundwater flow.

There may be other structures that are hydraulically significant in the eastern part of the Jimblebar area (e.g. the Khyber Fault) but these are only likely to become apparent after several years of dewatering of the eastern orebodies.

3.3.4 Regional flows and heads

Pre-development groundwater levels were relatively flat in the Jimblebar area, particularly in the areas of the orebody and regional aquifers. It is therefore likely that regional throughflow and recharge into the catchment is very low.

The general groundwater flow direction was probably from the orebody aquifers, where heads are slightly elevated (i.e. at WH123 they are about 463 mRL) into the valley aquifers (Tertiary Detritals and weathered Paraburdoo) where the water levels are around 462 mRL. Groundwater then flowed from the valley aquifers to the north and out of the catchment. The extent of outflow to the north is unknown due to limited pre-development head data, and it is hypothesised that groundwater may also flow in a northerly direction beneath the WHASH, HASH, East Jimblebar and Caramulla North orebodies where heads are marginally lower (range from 454 – 459 mRL).

There may be some inflow from the southern bedrock into the Marra Mamba orebodies where heads are significantly higher (530 mRL) but the rocks are most likely very low permeability.

3.3.5 Recharge and discharge mechanisms

Rainfall recharge is likely to occur into this system, but the mechanism and rate is uncertain. In fact, the evidence is contradictory, with very limited recharge suggested by:

- The extremely flat pre-development groundwater levels.
- The lack of response in time variant groundwater levels to rainfall events (although this analysis is complicated by the dewatering response).
- The significant depth to groundwater (generally 50 – 100 m below ground surface).

However the potential for significant recharge is suggested by the:

- Discrepancy between average heads observed in exploration drill holes taken before the very wet 1999/2000 period, which are roughly 2 m lower than those taken after.
- Relatively fresh nature of groundwater as evidenced by the observed EC values.
- The very fresh groundwater encountered where Copper Creek crosses South Jimblebar (most likely a localised recharge area).
- Extreme fluctuation in orebody and dolomite EC following the start of mining in 2014. The permeable bedrock has been opened to direct rainfall recharge and this seems to be significant.

Recharge to the system via regional throughflow is estimated to be low, given the various low permeability barriers that bound the system to the west, south and east.

Due to the depth to water, discharge via evapotranspiration is not likely to contribute anything to the water balance. It is therefore likely that all discharge from the system prior to mining was via flow to the north in the central part of the Jimblebar catchment (i.e. beneath WHASH, HASH, East Jimblebar and Caramulla).

A significant amount of groundwater discharge now occurs via abstraction for both mine dewatering (with abstraction rates reaching just above 30 ML/d in 2020). Some recharge is also provided by the injection of surplus water to the three injection bores on the eastern side of the Central Fault.

3.3.6 Change in groundwater levels

The change in groundwater levels since 1994, as described by the difference between pre-development and 2021 head observations, is shown in Figure 3.3. The main conceptual elements are highlighted by this data:

- The barrier effect of the Wheelarra and Central Faults.
- The widespread and uniform drawdown throughout the western compartment.
- The widespread drawdown in the eastern compartment.
- The lack of discernible drawdown observed to the south of the Jimblebar catchment.

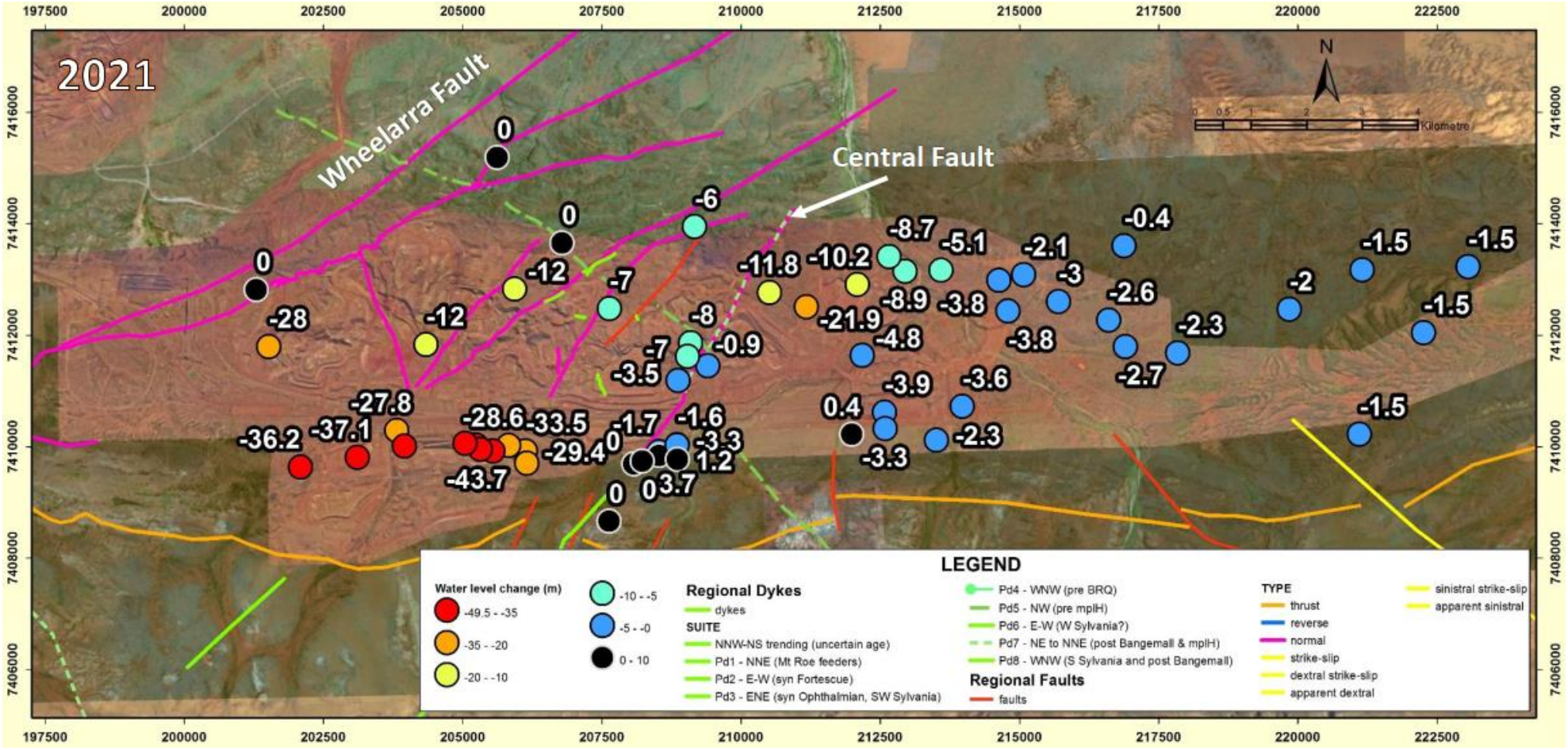


Figure 3.3: Change in groundwater levels

3.3.7 Groundwater / surface water interaction

The opportunity for direct interaction between the groundwater and surface water systems in the Jimblebar area is limited by the significant depth to groundwater over the entire area. Pre-development depth to groundwater was:

- WH123: ~100 m
- WH4: >110 m
- WHASH: > 80 m
- HASH: >70 m
- East Jimblebar: >90 m
- South Jimblebar (Sylvania, Mindoona): ~80 m
- Capricorn: ~70 m
- Painkiller: ~70 m
- Caramulla: ~65 m
- Valley alluvial fill (Tertiary Detritals):
    - South Jimblebar area: 100 m (west) to 50 m (east)
    - East Jimblebar / Caramulla area: 50 m

3.3.8 Groundwater chemistry

Electrical conductivity (EC) and pH observations in the Jimblebar area are shown in Figures 3.4 and 3.5 with data points coloured by lithology and location. A corresponding location map is shown in Figure 3.6. Where field EC and pH were not available (i.e. HASH, East Jimblebar and Caramulla), laboratory EC and pH were plotted.

The figures show:

- The following ranges of groundwater chemistry are present:
    - pH primarily between 7.0 - 8.0, with data existing within a wider range of 6.0 - 10.0
    - EC between 250 and 2,000 µS/cm (fresh to brackish)
- EC can be further broken into two main groups:
    - 250 – 750 µS/cm: fresh groundwater located in the western region of the Capricorn orebody, in close proximity to Copper Creek. This may be an indication of enhanced rainfall recharge (via Copper Creek) at this location compared to elsewhere in Jimblebar.
    - 1000+ µS/cm: brackish groundwater is found in all other locations within the Jimblebar groundwater system.
- There is a good history of monitoring dating back to 1995, particularly within the Mindoona and Capricorn water supply bores.
- There is no obvious correlation between lithology and chemistry (EC and pH).
- Most bores in the regional system (Tertiary Detritals and Dolomite) show EC and pH values not too dissimilar from the orebody aquifers.
- Once dewatering commences, the pH and EC dataset shows significant variability with time. It is difficult to determine whether this variability corresponds to dewatering stressors and/or reflects the natural variation in chemistry data from increased spatial monitoring.

- Post 2013, chemistry in the three Capricorn MAR bores is representative of the Mindoona/Sylvania groundwater. Monitoring in the western region of Capricorn (near Copper Creek) shows the influence of MAR - i.e. the fresh water near Copper Creek mixing with the higher EC water from Mindoona/Sylvania.
- Post 2014, EC values (and to a lesser extent pH) show significant variability. This does not appear to correspond to major changes in the dewatering regime, but does seem to occur consistently throughout Jimblebar (i.e. WH123 and WHASH data is aligned with South Jimblebar chemistry). This suggests potential changes in groundwater chemistry in the system, but the mechanism behind it and the implications are currently unknown.

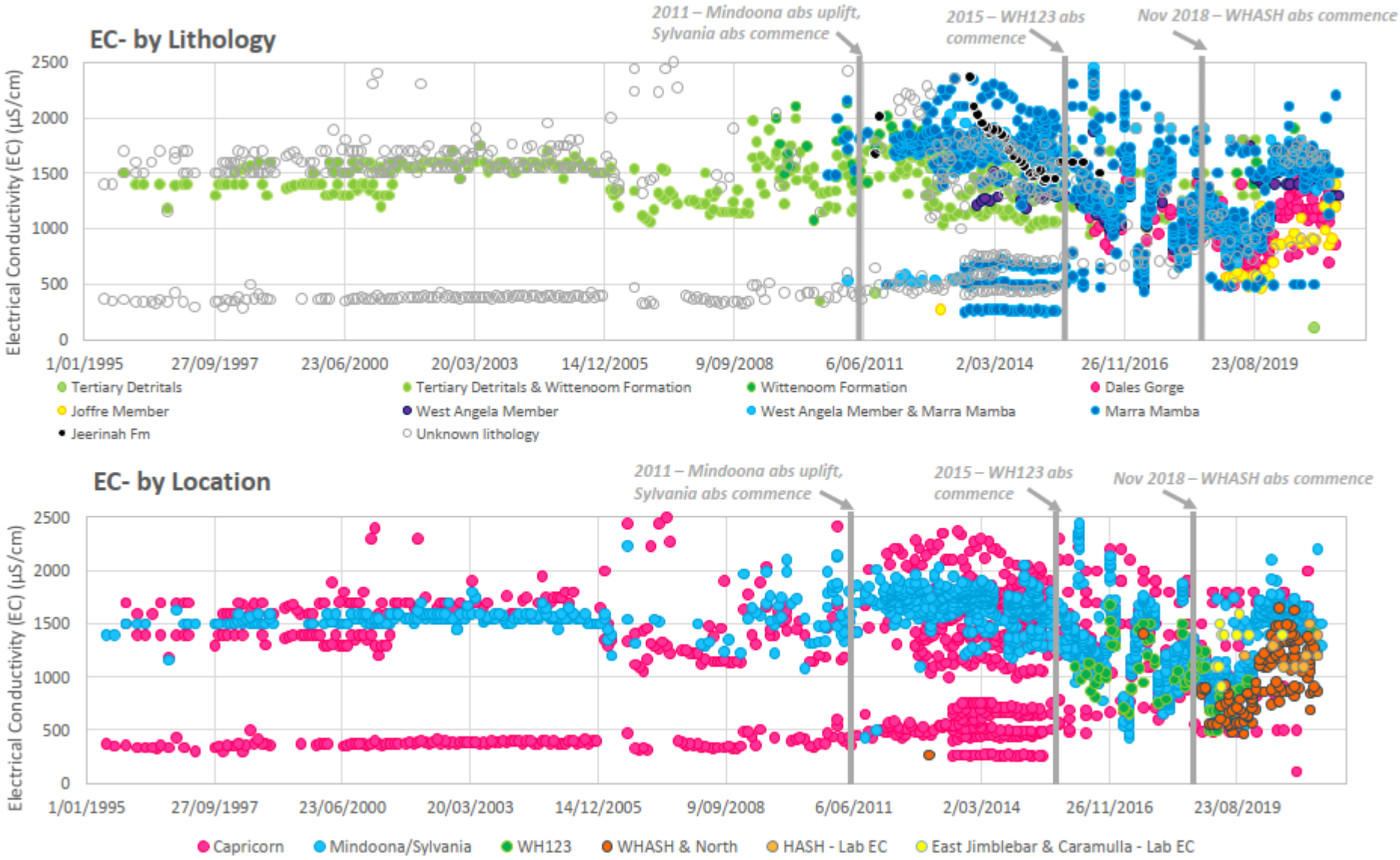


Figure 3.4: Groundwater chemistry – Electrical Conductivity

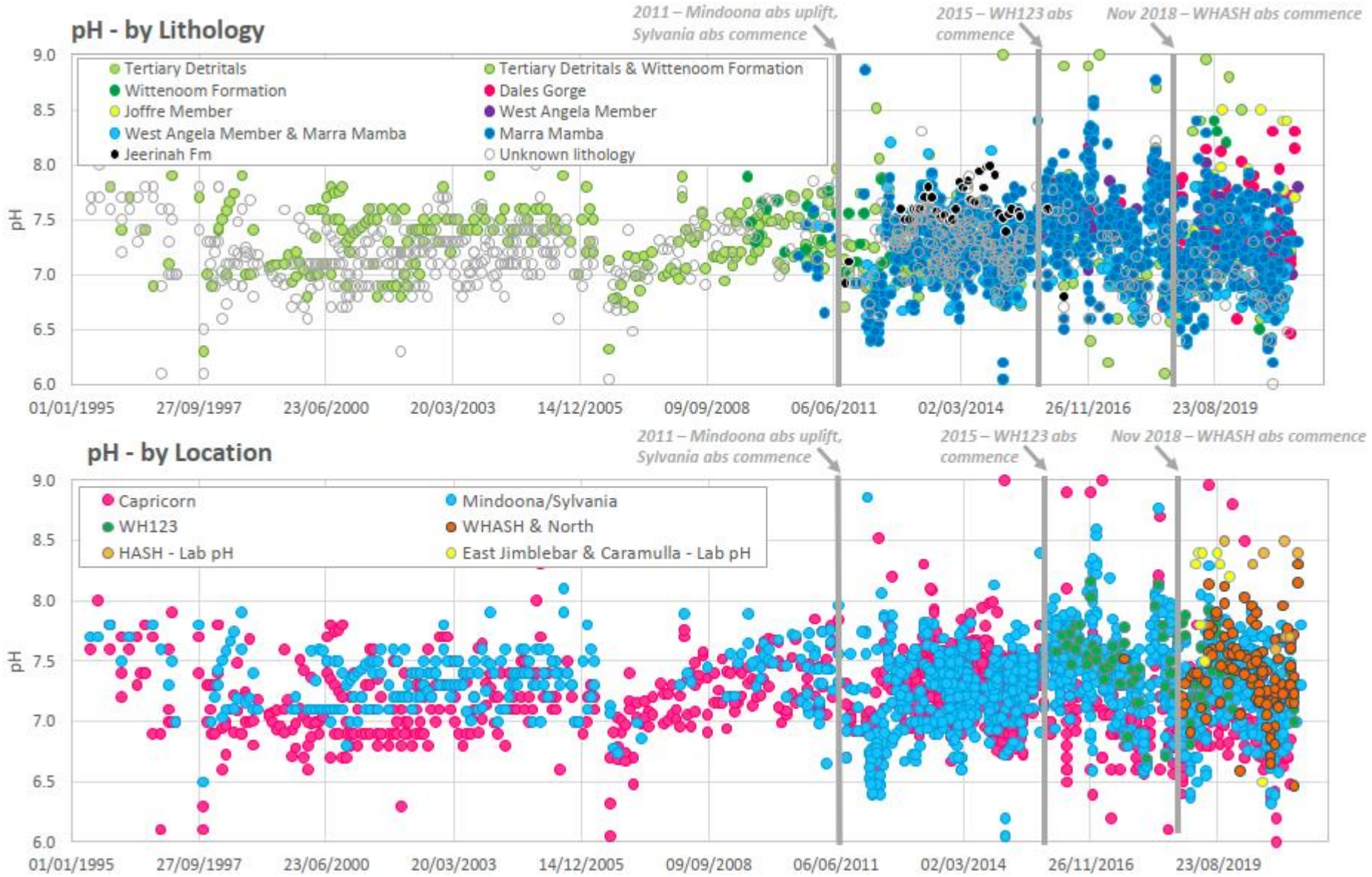


Figure 3.5: Groundwater chemistry -pH

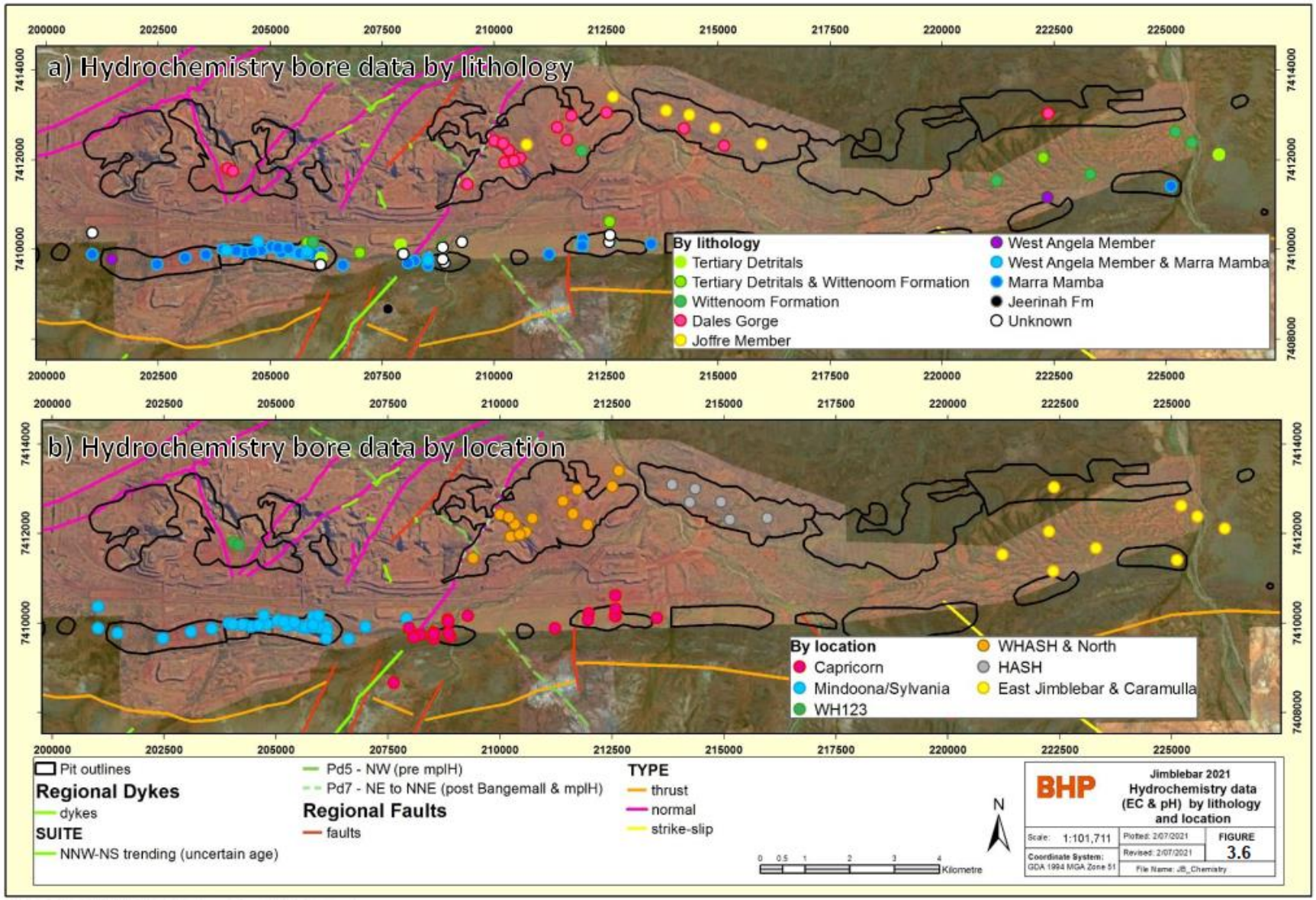


Figure 3.6 Jimblebar Hydrochemistry data by lithology and location

3.3.9 Receptors

There are no groundwater dependent receptors within 22 km (Ethel Gorge TEC to the west being the closest) of the Jimblebar mining area. The main environmental values in the area are Innawally Pool and Jimblebar Creek, which, due to the significant depth to the water table, are not groundwater dependent. There are a number of third party bores in proximity to Jimblebar please refer to section 4.

3.3.10 Data gaps and uncertainties

As dewatering has been ongoing at significant rates for 10 years, the main uncertainties remaining in the area exist outside of the dewatering zone of influence or where monitoring infrastructure is not in place to observe a response.

The main uncertainties remaining in the Jimblebar area that are relevant to future dewatering requirements and drawdown predictions are:

- To the east of Capricorn and HASH, where, even though pre-development water levels suggest a relatively flat water table, structures and/or aquifer heterogeneity may influence flows and dewatering rates significantly.
- Also to the east of Capricorn and HASH, aquifer characteristics (including geometry) are poorly defined due to lack of testing and the storage / transmissive potential of these areas is uncertain.
- To the north of the Brockman Iron Formation the uncertainties are high. Drawdown does not appear to have migrated far in this direction but monitoring is limited. The water table is still relatively flat to the north, and if this is the mechanism of outflow from the system, it follows that drawdown could propagate in this direction. There are no groundwater receptors in the immediate vicinity however and the connection to the north would have to be very high (not currently conceptualised) to have a major impact on dewatering rates.
- The mechanisms and rate of recharge into the system remains uncertain, with apparently contradictory evidence available in the observed dataset. In terms of the prediction of the impacts of dewatering, the precise determination of recharge will not have a major control on the outcomes. The uncertainty will be more relevant however when considering the timeframe for recovery following mine closure.
- As water levels become lower in the western compartment the currently good hydraulic connection throughout this area may become compromised if aquifers become disconnected. This may happen because of basement highs and the presence of clays in the detritals at depth.
- Most of the uncertainty associated with the behaviour of the Central Fault is in the pre-development state (and will have little impact on its role during dewatering), specifically:
    - How it was hidden in the water levels (which are flat)
    - How water could have passed through it to discharge to the north.
- The hydrostratigraphic understanding of the entire detrital sequence is quite poor. It is defined based on limited data as it generally lies outside of the attention of resource drilling (and therefore the geological models). As the clay occurrences within this material have the potential to disrupt local hydraulic connection, a lack of knowledge as to their whereabouts and continuity may become more important as dewatering progresses.

4 Existing Groundwater Users

The location of nearby groundwater users is shown in Figure 4.1 and described below.

4.1 Third party groundwater users

4.1.1 Pastoral Station Bores

Nearby pastoral bores are situated on Sylvania Station (owned by BHP) shown in Figure 4.1. These bores to the west and southwest of the Jimblebar Hub mining area and are underlain by granites and shales. The bores are shallow and target shallow alluvial systems and regional fault system. These bores range in depth from 13 m to 30 m.

4.1.2 Mining/Unknown Companies

The DWER Water Information Reporting (WIR) tool indicates one Atlas Iron bore is situated in proximity to Jimblebar situated to the north. Information states the bore is drilled to 64 mbgl with lithology noted as colluvium. There is limited information regarding a Rio Tinto bore drilled in 1999 to a depth of 34 mbgl which is situated approximately 21 km south east of South Jimblebar production bores. Whilst an unknown bore is located approximately 18 km south of the lowest BHP tenure boundary.

4.1.3 Jigalong Aboriginal Reserve

Bore information provided form the WIR tool lists within 30km of Jimblebar 14 bores owned by the Jigalong Community. Records indicate all bores at a shallow depth with two bores being approximately 30 m in depth with the majority under 20 mbgl. Of the 14 records two are classed as Windmills and all other bores are described as unequipped, collapsed or abandoned.

4.2 Local and Regional Context

4.2.1 Surface Water Features

Innawally Pool is located in the main channel of Jimblebar Creek. The pool is a perched water feature and is not connected with the regional aquifer. The pool's extent changes seasonally receiving runoff from the upstream creek system and some minor local drainage lines. Depth to water is approximately 70 to 80 mbgl with the nearest active dewatering bore located over 400 m to the west. Measurements taken in the wet season (March 2015) and dry season (July 2016) indicate that the pool is fresh (salinity less than 200 mg/L), with a pH of approximately 7.8. Nutrient levels exceed ANZECC guidelines (Ecologia, 2017).

Jinerabar Pool, an intermittent pool located on Jimblebar Creek (Ethel Creek Station). The pool is located approximately 41 km downstream of the northern boundary of the current Jimblebar MS1126 Development Envelope and1.5km upstream of the confluence between Jimblebar and Caramulla Creeks.

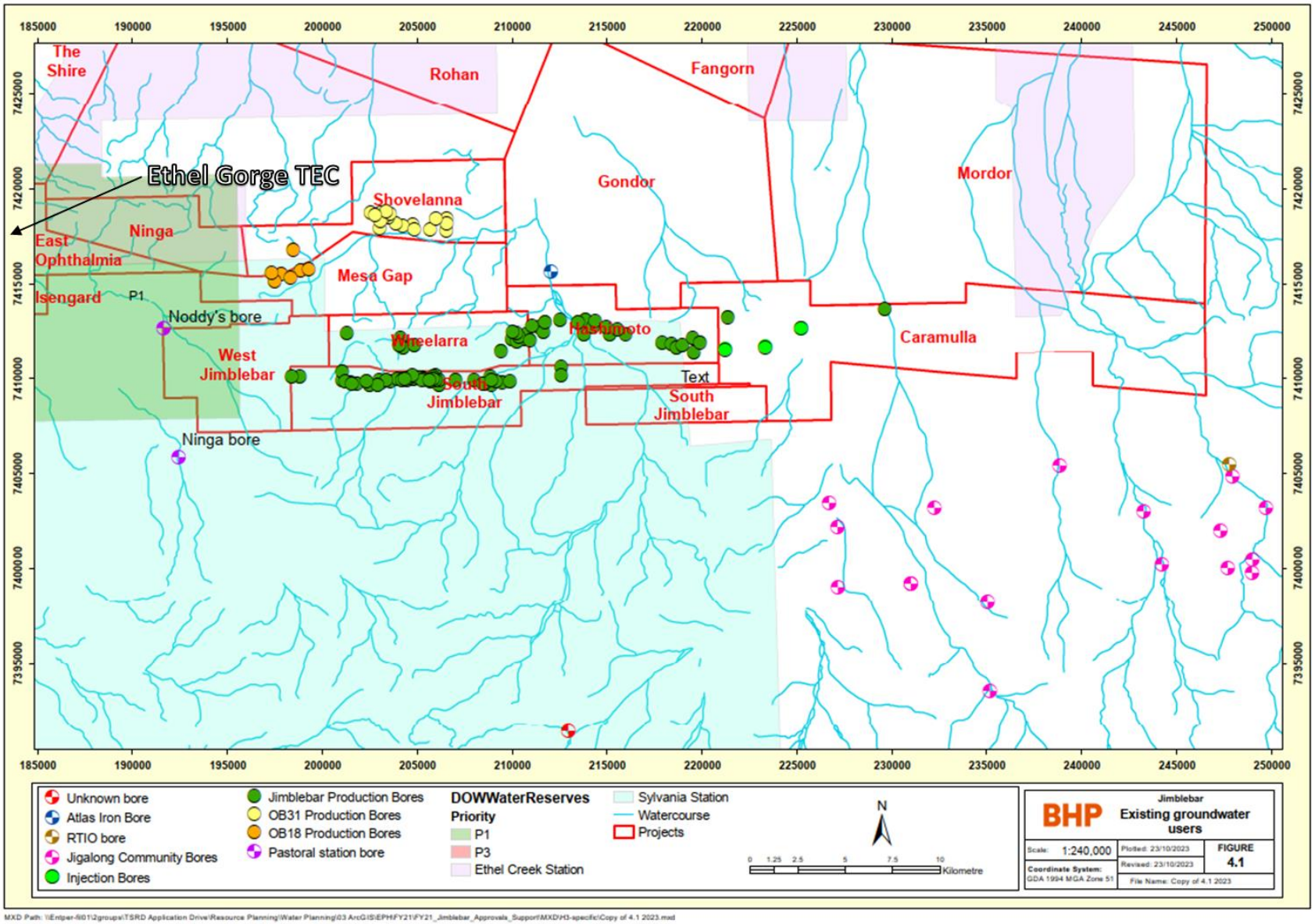


Figure 4.1 Existing Groundwater Users

4.2.2 Ethel Gorge

The Ethel Gorge aquifer Stygobiont community Threatened Ecological Community (Ethel Gorge TEC) is situated 20 km to the west. The Ophthalmia Dam located 5 km upstream of Ethel Gorge is a managed aquifer recharge scheme to maintain groundwater levels within the Ethel Gorge aquifer. Discharge from Jimblebar to Ophthalmia Dam of up to 16.425 GL/a is authorised under MS1126.

4.2.3 Newman Water Reserve

A Priority 1 Public Drinking Water Source Area of the Newman Water Reserve overlays Newman town, BHP Whaleback and Eastern Ridge mines with the boundary extending to a small portion of Jimblebar West. Groundwater is abstracted from the BHP operated Ophthalmia and Homestead borefields to provide drinking water for the Newman town water supply.

4.3 Other operations

4.3.1 Shovelanna operations

Current Shovelanna operational mining areas consist of OB18 and OB31. The OB18 supply borefield is south of the OB18 mine and provides water for construction and processing facilities. These production bores draw water from Wittenoom Paraburdoo Member whilst mine dewatering target Brockman and Marra Mamba Iron Formations. The borefield is permitted annual abstraction of 1,861,500kL under GWL 156786(10) which is valid to 2028. Total groundwater abstraction for FY23 was 98,722 kL/a. The OB18 mine operates under Ministerial Statement 439 (as amended by Ministerial Statement 1012). There are no specific groundwater related conditions for operations in Ministerial Statement 439 however long term water quality for closure is a requirement.

The OB31 dewatering borefield provides water for mining, dust suppression and exploratory drilling operations. The production bores draw water from the local mineralised and submineralised Brockman orebody aquifer. The borefield is permitted annual abstraction of 16,200,000kL under the GWL 181025(4) valid to 2028. Total groundwater abstraction for FY23 was 12,017,317 kL/a. The OB31 mine operates under Ministerial Statement 1021 which there are no groundwater conditions. Surplus dewatering management requirements and the associated outcome based provisions are detailed in the updated BHP Jimblebar Water Management Plan as part of the Significant Amendment proposal referred to the Environmental Protection Authority in late 2023.

4.3.2 Warrawandu Village

Warrawandu Village is a camp accommodation facility located approximately 20 km east of Newman. The village was constructed in 2012 to support mining operations. A dedicated potable production borefield supplies Warrawandu Village. Two monitoring bores (HEOP0003M and HEOP0004M) were drilled and constructed in August 2009 for the purpose to confirm geology and monitor groundwater levels and quality. Based on this work, three production bores, HEOP0001P, HEOP0002P and HEOP0005P were drilled and constructed in the Paraburdoo Dolomite Member and overlying Tertiary Detritals. The occupancy levels of the camp determines the overall water demand and currently has annual entitlement of 946,080 kL/a under GWL171330(4) (renewal application dated 30 March 2023 is currently in progress).

4.3.3 Eastern Pilbara Operations

BHP WAIO operate a number of nearby mines and associated rail infrastructure (see Figure 1). Other mining operations located in the Eastern Pilbara are BHP's Eastern Ridge (Orebodies 23, 24 and 25), 8 km northeast of Newman and located 5km west of Newman is Whaleback (Whaleback Pit North and South, Orebodies 29 30 and 35).

5 Groundwater Investigations

The history of groundwater abstraction in the Jimblebar area has been accompanied by many targeted hydrogeological investigations. These have come in the form of desktop studies, test pumping and hydrodynamic trials. By far the greatest amount of information has derived from the monitoring of groundwater response to dewatering of South Jimblebar (since 2008), Wheelarra (since 2015) and Hashimoto (since 2020); and surplus water injection at South Jimblebar (since 2013).

The combined data from all of these activities, particularly dewatering response, has been utilised to build the conceptualisation presented in Section 3 which is described in more detail in Appendix A.

6 Drilling

Over 100 production bores and 600 monitoring bores have been drilled in the Jimblebar area which have been used to observe the groundwater system. The locations of all Jimblebar production and monitoring bores are shown in Figure 6.1 and the borehole logs since the latest increase of annual entitlement (2021) are provided in Appendix B.

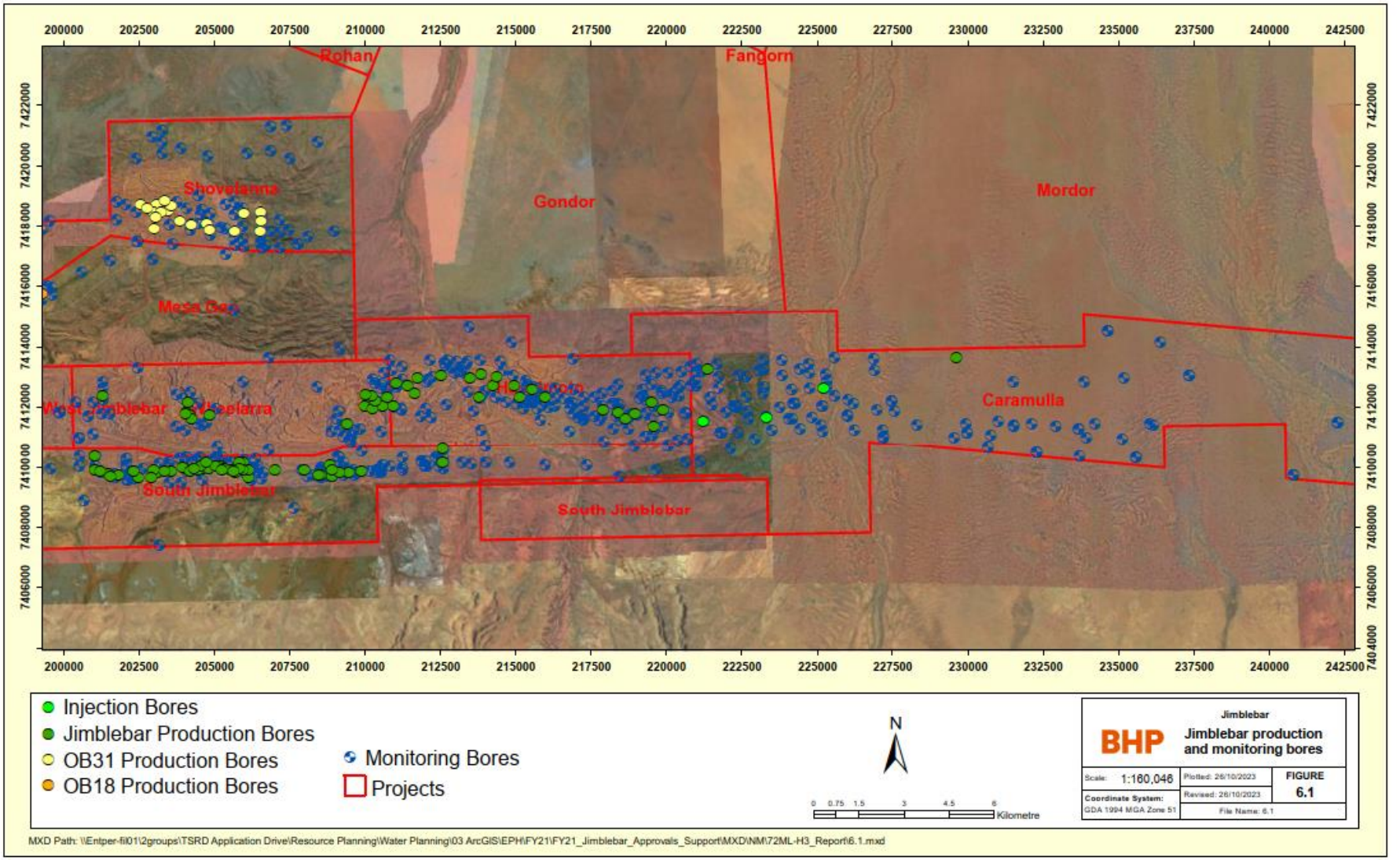


Figure 6.1 Jimblebar Production and monitoring bores

7 Test Pumping

The Jimblebar area has been subject to extensive and a high rate dewatering. The response of the groundwater system to this stress has been monitored in over a hundred production boreholes. This data reveals far more about the groundwater system than test pumping analysis and thus informs the conceptualisation provided in Section 3.

8 Groundwater Chemistry

Groundwater chemistry is discussed in Section 3.3.8. Monitoring results are presented in the WAIO FY23 Annual Aquifer Review (AAR) (BHP, 2023a) for Jimblebar provided in Appendix C.

9 Groundwater Modelling

9.1 Introduction

A numerical groundwater model has been used to predict the likely dewatering and drawdown outcomes from the full life of the Jimblebar mine and recovery of groundwater levels post closure.

The numerical modelling described in this report represents a form of hypothesis testing; the hypothesis was provided by the site hydrogeologists who suggested that the combined Jimblebar dewatering requirements could reach 140 ML/d.

The modelling was therefore focused on exploring the plausible high-case dewatering rates for Jimblebar.

The following process was followed to achieve this:

1. Update and simplify the hydrostratigraphy of the existing model and extend the domain to east.
2. Validate the updated model against observation and abstraction data until the end of 2020.
3. Make changes to hydraulic parameters and hydrostratigraphic zonation to produce an optimum match between observed and simulated heads (a base case).
4. Use this ‘base-case’ model to investigate the sensitivity of the simulated heads at the observation bores to changes in key hydraulic parameters.
5. Use the results of the sensitivity analysis to home in on plausible parameter combinations that will produce high-case dewatering predictions (and still honour the observation data).
6. Run the dewatering model with these combinations and analyse the results.

9.2 Conceptual update

The project used the existing regional-scale Jimblebar Numerical Model that incorporates the Mindoona, Sylvania, Capricorn, WH123, WHASH and HASH, East Jimblebar and Caramulla mining areas. It was originally developed as part of the hydrogeological assessment for the Jimblebar Iron Ore Project (Aquaterra, 2009) and has been updated several times. The most recent update relevant to this study was in 2017 when the OB18 and OB31 mining areas to the west of the Wheelarra Fault were removed from the model domain and the WH123 hydrogeological area was

updated against steady state pre-mining and short term (10 day) test pumping data (BHP, 2017). Since then, a significant amount of time-series data has been collected that shows a strong response to the dewatering in the WHASH mining area. This data has contributed to a major update to the local and sub-regional conceptual model and an update to hydrostratigraphy in the area. The conceptual model (BHP, 2021) is described in full and this should be read in conjunction with this document. Brief descriptions of the main conceptual elements are provided below and shown in Figure 3.2.

- The regional aquifer is comprised of the Paraburdoo dolomite and the Tertiary detritrals and this extends all the way from the Wheelarra Fault in the west to what observation data suggest is a flow boundary roughly 40 km to the east. The local aquifers are made up of the Brockman Formation orebodies in the north and the Marra Mamba Formation orebodies in the south (with the regional aquifer between them).
- The Central Fault (a dolerite dyke) behaves as a barrier to groundwater flow through both the regional and local aquifers. This separates the Jimblebar groundwater system into two compartments; a western compartment (containing the Mindoona, Sylvania and WH123 mining areas) and an eastern compartment (containing the Capricorn, WHASH, HASH and East Jimblebar mining areas). There is some connection across the dyke in the area of WHASH, but this is unlikely to have a significant impact on the dewatering outcomes.
- The orebody and regional aquifers in the western compartment are well connected to each other, with significant dewatering drawdown being observed throughout this area. The structures in the area of WH2/3 provide a partial barrier to flow.
- The orebody and regional aquifers in the eastern compartment also seem well connected although there is still significant uncertainty. The data indicate that the northern orebodies may be well connected along strike i.e. WHASH, HASH, East Jimblebar and Caramulla (Patterson).
- The groundwater levels south of the Marra Mamba orebodies are much higher than the local and regional aquifer levels and show no response to dewatering. This suggests the presence of low permeability rocks to the south.
- In the east, there is no evidence of any flow barriers until the location roughly 30 km east of the Central Fault where water levels abruptly change.
- To the north data is scarce and it cannot be ruled out that some permeability (either within the rock mass or through structures) persists in that direction.

9.3 Model design

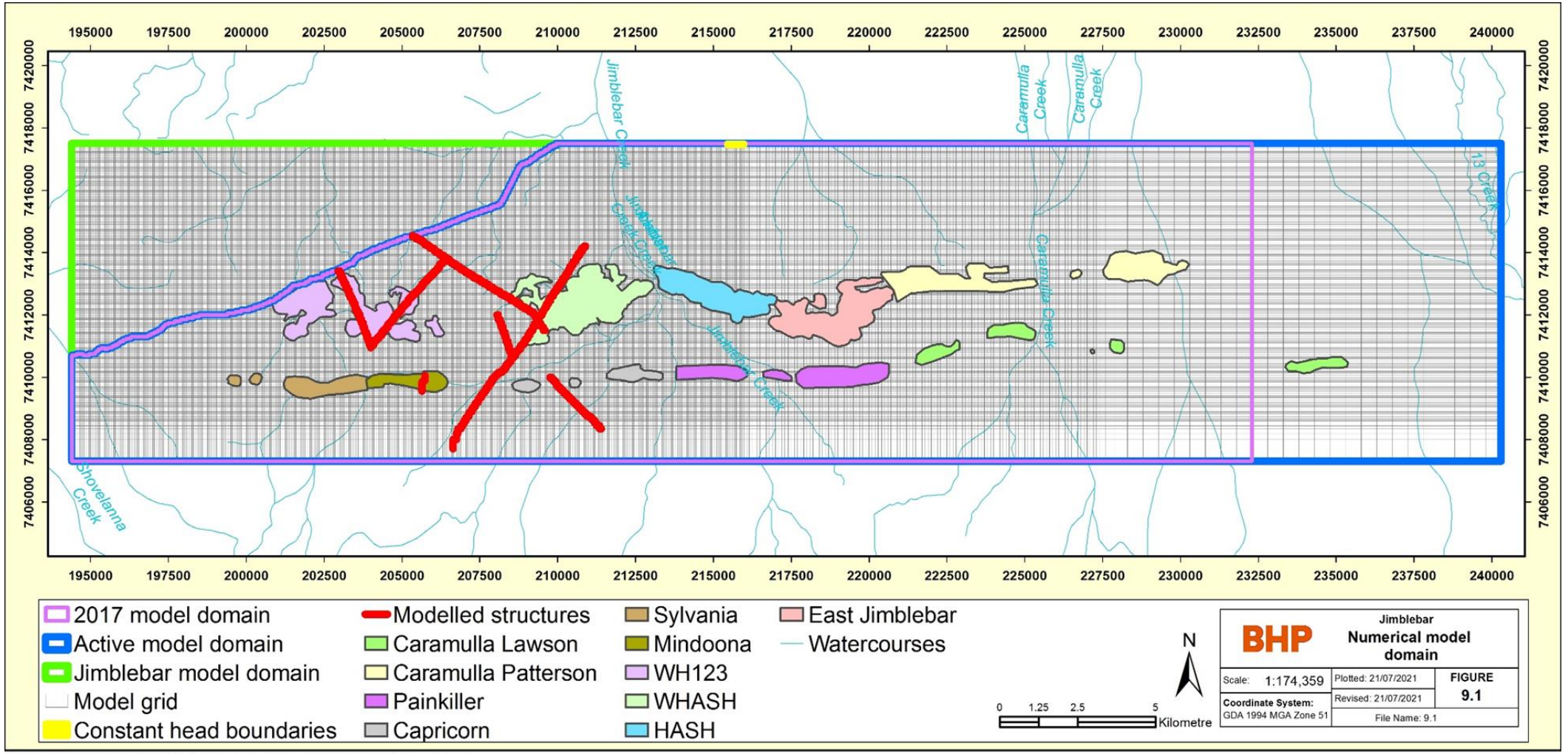
9.3.1 Introduction

The numerical groundwater model was developed using the Modflow USG code operating under the Groundwater Vistas graphical user interface (Rumbaugh and Rumbaugh, 2011).

The last model version (BHP, 2017) was used as the basis for this project. The model domain was extended several kilometres to the east and evapotranspiration was removed completely (it plays no role in this model). Other than this, no changes were made to the model grid or boundary conditions (including no flow boundaries). The model domain and grid and the location of model boundary conditions are shown in Figure 9.1.

Significant changes were made to the hydrostratigraphy in the eastern part of the model, which is described in more detail below.

From this point on in the document, “model” refers to the version used exclusively for this project.



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Figure 9.1 Jimblebar Numerical model domain

9.3.2 Numerical solver

The Sparse Matrix Solver (SMS) was used as the numerical equation solver. The following settings were used:

- Outer iterations: 250
- Inner iterations: 600
- Head Change Criterion for outer iterations: 0.005 m
- Head Change Criterion for inner iterations: 0.0005 m
- Linear solution method: XMD solver

9.3.3 Model domain, grid and layers

The model uses a variable grid size. The minimum model grid size is 50 m by 50 m and the maximum is 400 m by 500 m. The domain is divided into 185 rows and 573 columns. The model covers an area of 46 km (west to east) by 10 km (south to north). The model and all associated data are specified using the GDA94 Zone 51 coordinate system. The coordinates of the southwestern corner are 194,400, 7,407,300.

The hydrostratigraphy is represented by seven model layers as summarised in Table 9.1. The entire model domain consists of a total of 742,035 cells, or which 562,891 cells are active and 179,144 cells are inactive (Figure 9.1). Layer 1 has a variable thickness as defined by the top of the layer which is based on the natural topographic level and a base set at 458 mRL, whilst the thicknesses of the remaining layers are uniform.

Table 9.1 - Representation of Model Hydrogeological Layers

Layer	Description	Thickness
1 - 3	Tertiary Detritals / alluvium. Upper sections of orebody aquifers. Weathered basement rocks.	Layer 1: maximum thickness 260 m, minimum 60 m (base at 458 mRL) Layer 2: 36 m thick (base at 422 mRL) Layer 3: 36 m thick (base at 386 mRL)
4 - 5	Lower sections of orebody aquifers. Deeper Tertiary Detritals. Weathered dolomite aquifer (Paraburdoo Member). Basement rocks surrounding the weathered dolomite and orebody aquifers.	Layer 4: 30 m thick (base at 356 mRL) Layer 5: 30 m thick (base at 326 mRL)
6	Fresh dolomite aquifer (Paraburdoo Member). South Jimblebar orebody aquifer. Basement rocks surrounding the dolomite and orebody aquifers.	Layer 6: 24 m thick (base at 302 mRL)
7	Basement rocks.	Layer 7: 52 m thick (base at 250 mRL)

Where the data was available, the extent of the orebody aquifers was assigned consistent with high-grade (typically >57% Fe) and low-grade (typically 48%>Fe<57%) mineralisation shells. The term “regional aquifer” predominantly represents the weathered dolomite of the Paraburdoo Member and most units of the Tertiary Detritals.

9.3.4 Hydrostratigraphic updates

The hydrostratigraphy for this model iteration has undergone several updates, which are summarised below:

1. The eastern-most extent of the model (primarily orebody geology in East Jimblebar, Caramulla, Painkiller, Capricorn, and basement geology in the Valley) has been updated using exploration drillholes, geological wireframes and grade shells.
2. QA/QC and further update of orebody geology in the eastern-most extent of model based on pit shells/depths and nearby orebodies.
3. Simplification of the regional aquifer in the valley east of Central Fault, to standardise zones and align with the western extent of the model. This is based on six N-S cross sections east of the Central Fault (shown in Figure 2.2).
4. QA/QC of simplified valley hydrostratigraphy, through thorough assessment of exploration and hydrogeology holes within the area - resulting in reducing the extent of the lower K zones (clay "pods" and extent of Bee Gorge/Shaly Bee Gorge in the north of the valley).

9.3.5 Groundwater inflow and outflow

Introduction

Non anthropogenic groundwater inflow is provided exclusively by rainfall recharge and outflow by constant head boundary conditions (set at 440 mRL) along the northern model boundary (Figure 9.1).

All other model boundaries are assigned as no-flow and are aligned with catchment boundaries (including the Wheelarra Fault) or perpendicular to the inferred direction of groundwater flow.

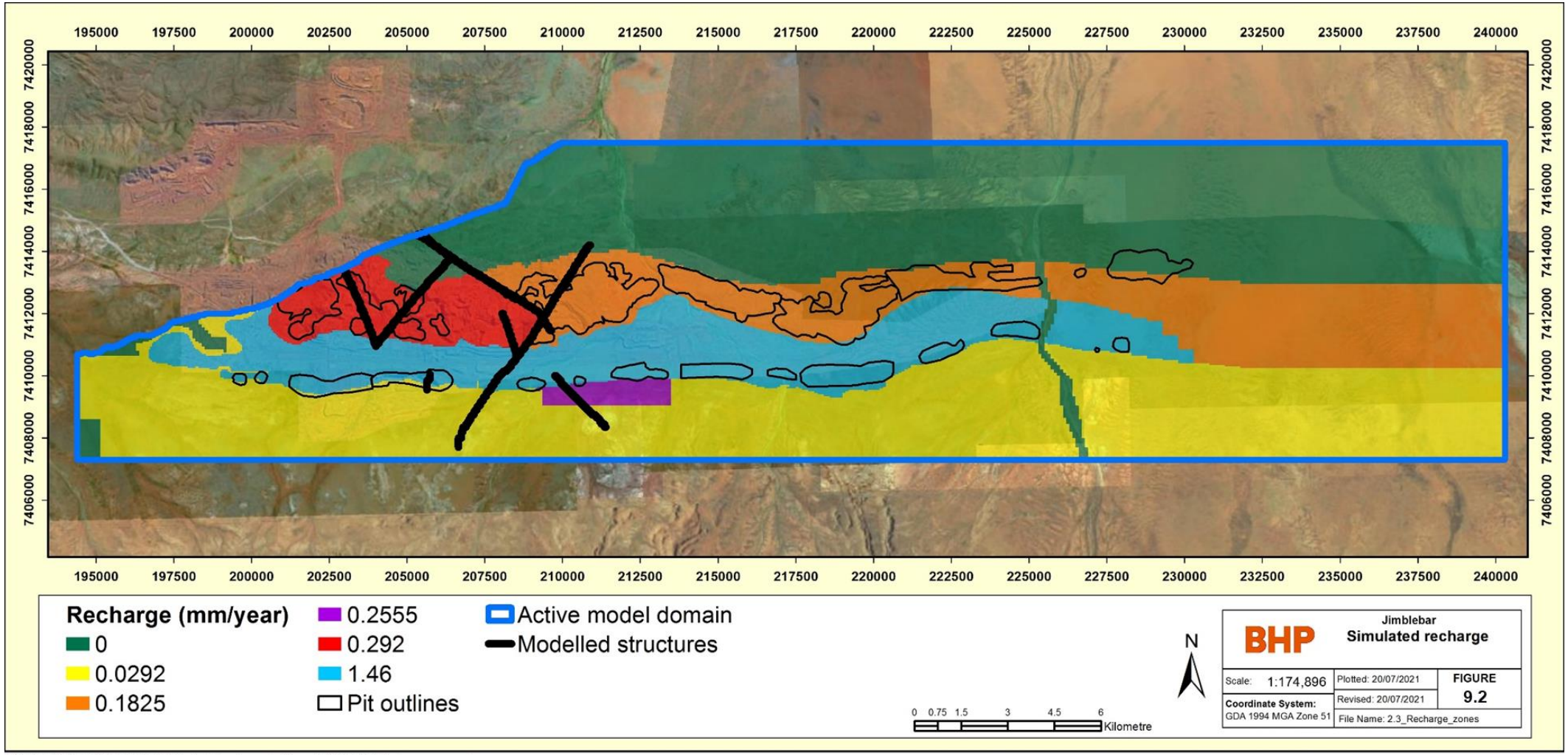
The extension of the model to the east was undertaken to better align the model eastern boundary with the position of the head change (and assumed associated hydraulic boundary).

Rainfall recharge

Recharge has been assigned as a proportion of recorded average annual rainfall (310 mm per year) to the following areas (Figure 9.2):

- Tertiary Detritals and South Jimblebar orebody areas (0.5% average annual rainfall)
- WH123, WHASH orebody areas and Weeli Wolli Formation (0.25% average annual rainfall)
- Jeerinah Formation and granites to south orebody aquifers (0.1 to 0.01% average annual rainfall)

Whilst the recharge rates are still very uncertain, at the rates adopted in the model they will have no effect on the predicted dewatering rates or drawdown migration and magnitude in the simulation time. The rates would have to be significantly higher (and most likely unrealistic) before influencing the results. They will however impact recovery times in post mine closure scenarios.



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Figure 9.2 Jimblebar Simulated recharge

Groundwater abstraction

Groundwater abstraction has occurred from 50 bores in the Jimblebar area between 1990 and 2020 (Figure 9.3). Injection has occurred into three bores (all of which were used for abstraction previously) between 2013 and 2020. In the model, the abstraction rate was reduced into yearly averages between 1994 and 2020 (Figure 9.3). For both abstraction and injection the Modflow Well Package was used.

Future dewatering was simulated using the Modflow Drain Package. Drain boundary conditions were placed in the deepest part of each mining area with elevations set to equal the appropriate target water level. When the mining in that area was completed, the drain was switched off. Optimisation of simulated dewatering (to smooth the peaks and troughs) was not undertaken.

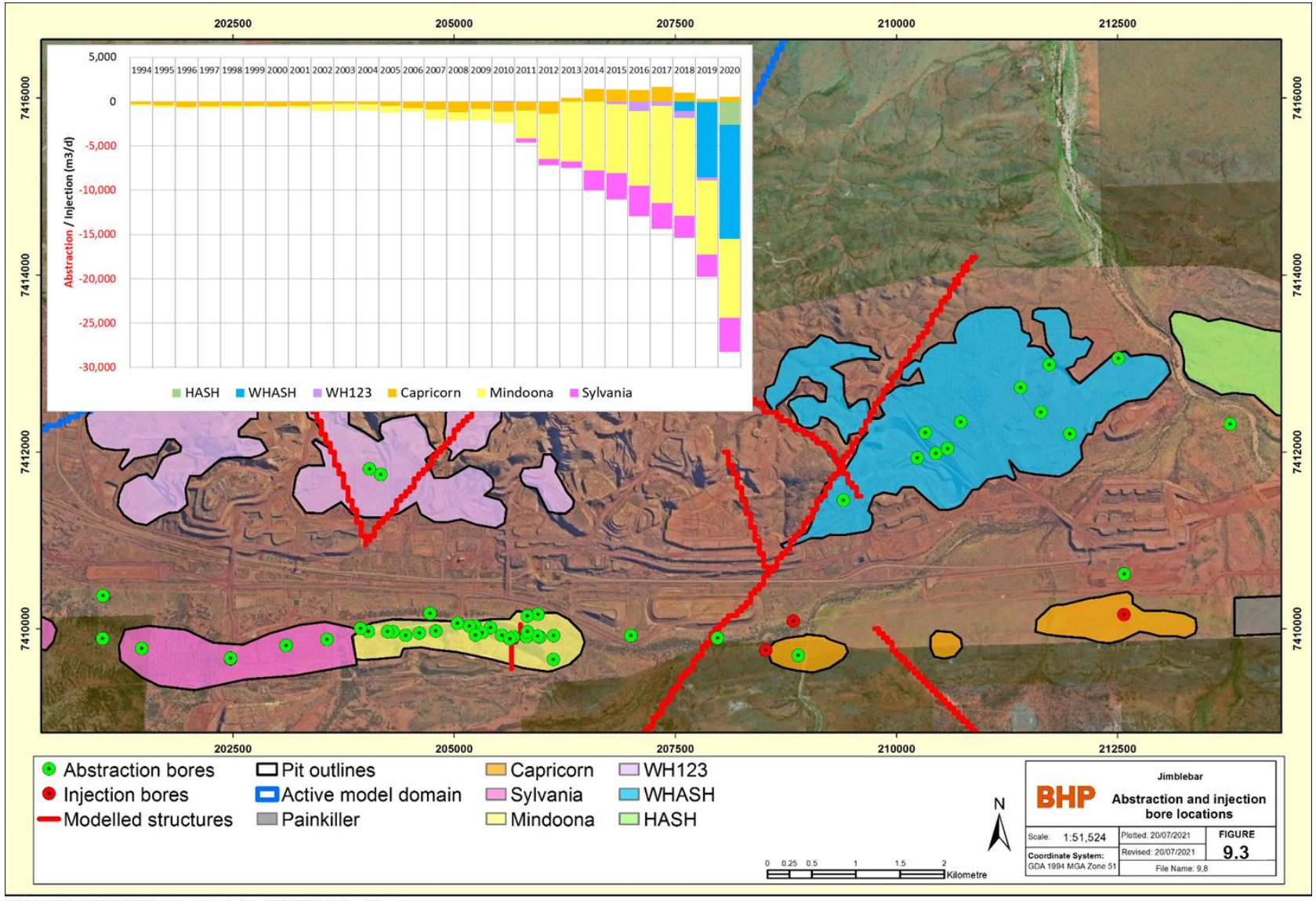


Figure 9.3 Jimblebar Abstraction and injection bore locations

9.3.6 Simulation time

A steady-state model was used to simulate the pre-development conditions at Jimblebar. This model has no time component.

The time-variant historical model commences on the 28th February 1994 and ends on the 31st December 2020. This period has been divided into 27 stress periods. The first period is 306 days long, the following are all 365 days in length. The initial conditions for this run are derived from the solution of the steady-state model.

The predictive model was run for a period of 24 years to match the mine life. Twenty four yearly stress periods were used to simulate the period between January 2021 and December 2044. Inflow and outflow boundary condition settings were unchanged from the historical model. The initial conditions were determined from the final conditions predicted in the time-variant historical model.

The closure model was run for steady state conditions only.

9.3.7 Hydraulic structures

Structures were included in the model as Horizontal Flow Barrier (HFB) boundary conditions where observation data provide clear evidence for their behaviour. The parameter settings were unchanged from the 2017 model.

9.4 History matching

9.4.1 Introduction

Steady-state and time-variant historical models were used to vary model settings and improve the match between the observed and simulated groundwater levels.

Initial model runs (i.e. with the changes described above but parameters unchanged) showed that some major adjustments were required:

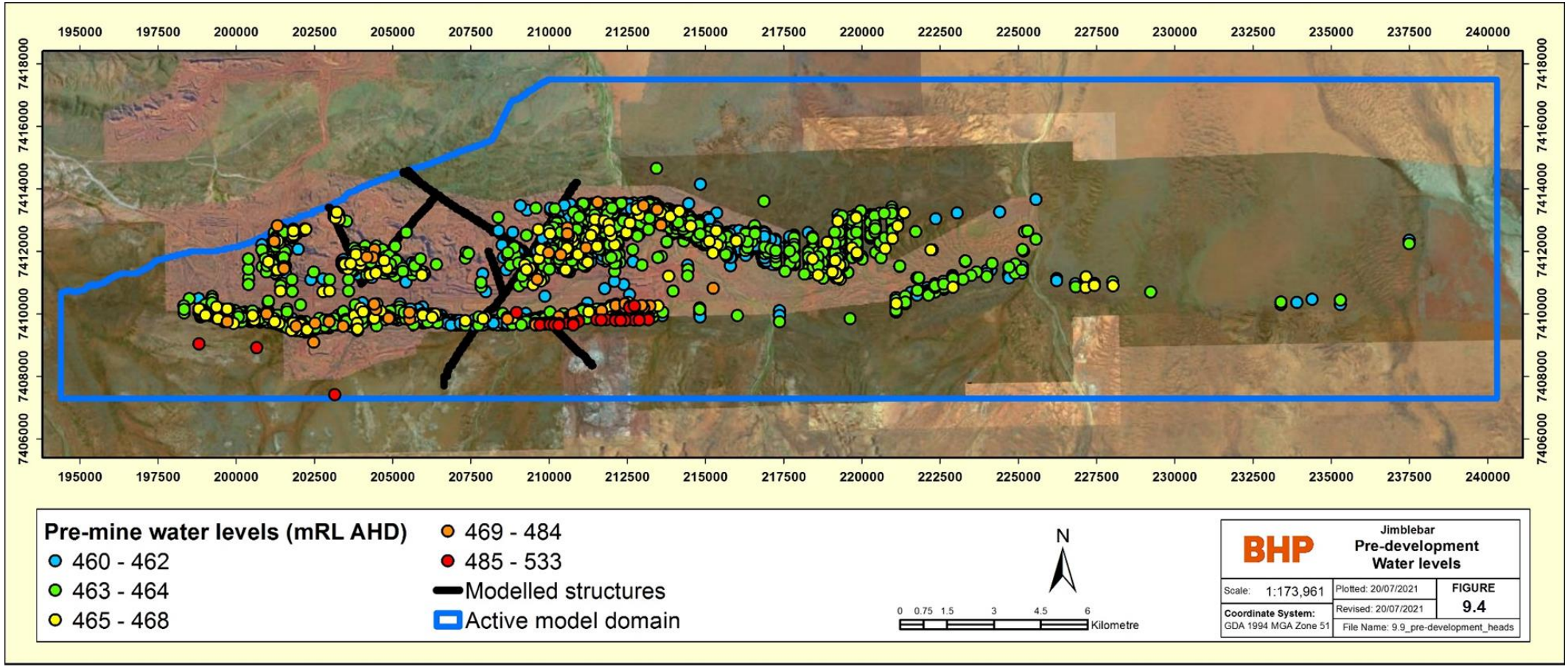
- Transmissivity needed to be increased in the eastern compartment. The predicted drawdown was constrained to within WHASH, with insufficient drawdown migrating out into the regional aquifer or the HASH and East Jimblebar orebody aquifers.
- The hydraulic connection between Capricorn and the regional aquifer was reduced. This was evidenced by lack of observed response to both water supply abstraction and injection, and then a larger response to WHASH dewatering.

The second of these required the addition of several zones of lower hydraulic conductivity between Capricorn and the regional aquifer. These were based on those used in the 2017 model.

As well as these major adjustments, adjustments were also made to hydraulic parameters throughout the model to try to improve the fit between observed and simulated heads.

9.4.2 Pre-development groundwater levels

The groundwater model was calibrated to pre-development groundwater levels (taken to represent steady state conditions). The dataset used for this purpose are the water levels taken during exploration drilling. Data was excluded if it was collected after dewatering had commenced; in the western compartment anything collected after 2007 and in the eastern compartment anything after 2018. The dataset does contain the influence of water supply abstraction and injection however which is coincident with most of the exploration drilling. Data was also excluded if it was higher than 470 mRL outside areas south of the Marra Mamba orebodies. The final dataset consisted of water levels measured at a total of 3,264 locations (Figure 9.4).

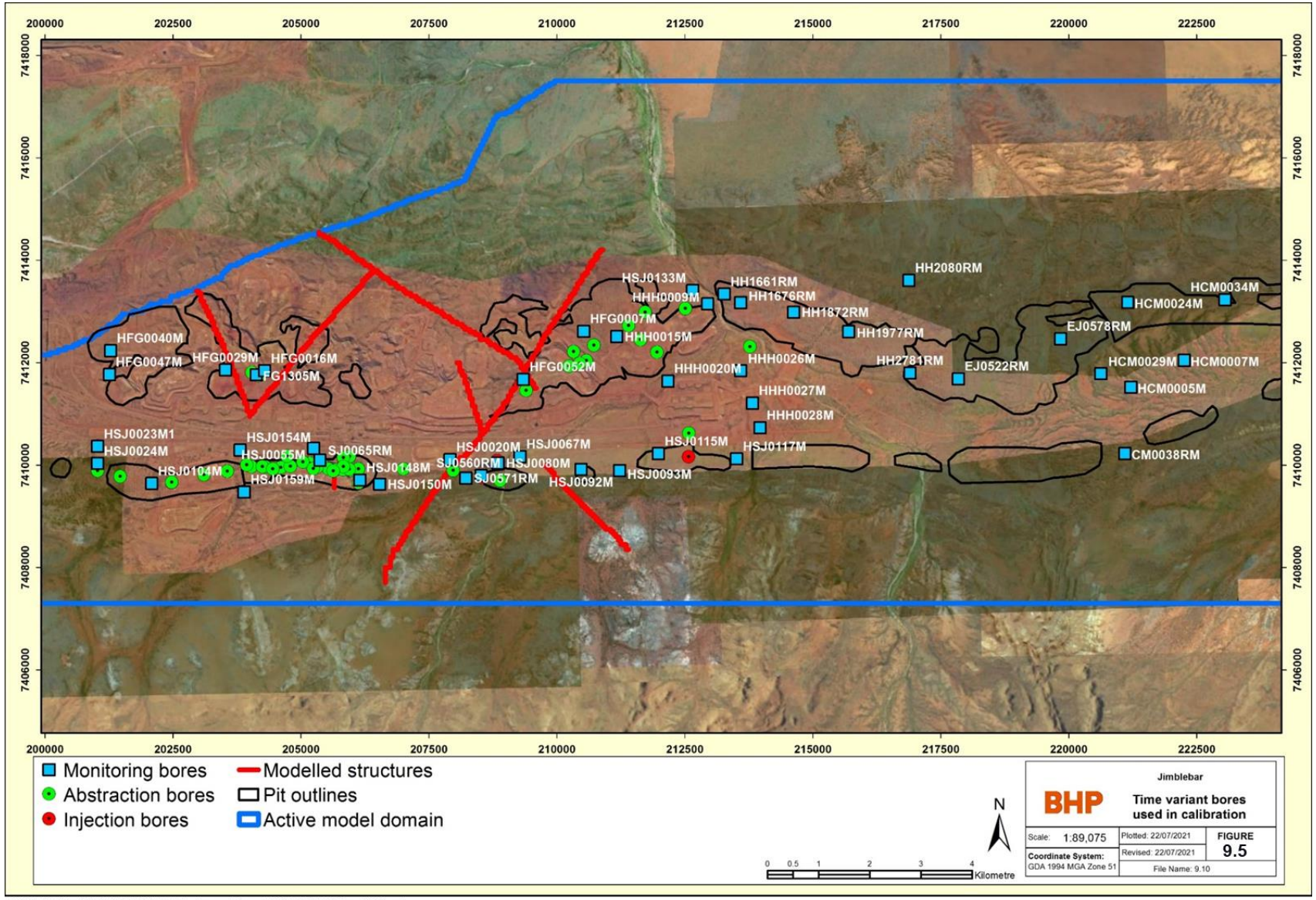


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Figure 9.4 Jimblebar Pre-development water levels

9.4.3 Time variant groundwater levels

Time-series observations were available from numerous bores in the Jimblebar area. Out of these, 47 monitoring bores were selected for use in the history matching based on their location and length of observations. Their locations are shown in Figure 9.5.



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Figure 9.5 Jimblebar Time variant bores using calibration

9.4.4 Base case hydraulic settings

The best history match was achieved with the hydraulic parameter settings shown in Table 9.2. The modelled hydrostratigraphy is shown in Figures 9.6 to 9.10. The representation of the high connectivity throughout the subregional systems was achieved by using high hydraulic conductivity values in the regional and orebody aquifers in most areas.

Table 9.2: Model Hydraulic Parameters

Material	Kh=Ky (m/d)		Sy (%)		Ss (m^{-1})	
	Max	Min	Max	Min	Max	Min
Granites and basalts to the south	0.00001		0.1		$5x10^{-7}$	
Jeerinah Formation	0.00001		0.1		$5x10^{-7}$	
Unmineralised Marra Mamba	0.01	0.00001	0.1		$5x10^{-7}$	
Submineralised Marra Mamba	5		1	0.1	$5x10^{-7}$	
Mineralised Marra Mamba	50	0.5*	20	10	$5x10^{-7}$	
West Angela Shale	0.5		1.0		$5x10^{-7}$	
Weathered Paraburdoo Dolomite	20		5		$5x10^{-7}$	
Fresh Paraburdoo Dolomite / Bee Gorge	10		5		$5x10^{-7}$	
Mt McRae Shale and Mt Sylvia Formation	1.0	0.5	0.1		$5x10^{-7}$	
Unmineralised Brockman Formation	0.001		10	0.1	$5x10^{-7}$	
Submineralised Brockman Formation	100	8	20	5	$5x10^{-7}$	
Mineralised Brockman Formation	100	8	20	5	$5x10^{-7}$	
Weeli Wolli Formation	0.01		0.1		$5x10^{-7}$	
Tertiary Detritals / Alluvium	50	0.001**	50	1	$5x10^{-7}$	

*In the western part of Capricorn there is a single zone of orebody, rather than mineralised and submineralised. **Clay

The locations of the simulated structures are shown in the Figures 9.6 to 9.10 (they are not vertically continuous through all layers) and their calibrated hydraulic parameters were:

- The wedge around WH2/3: Thickness 1 m, Hydraulic conductivity $1x10^{-4}$ m/d.
- The Central Fault and Comedy Fault: Thickness 1 m, Hydraulic conductivity $1x10^{-6}$ m/d.
- A HFB located in the far east of the 2017 model was removed from this model.

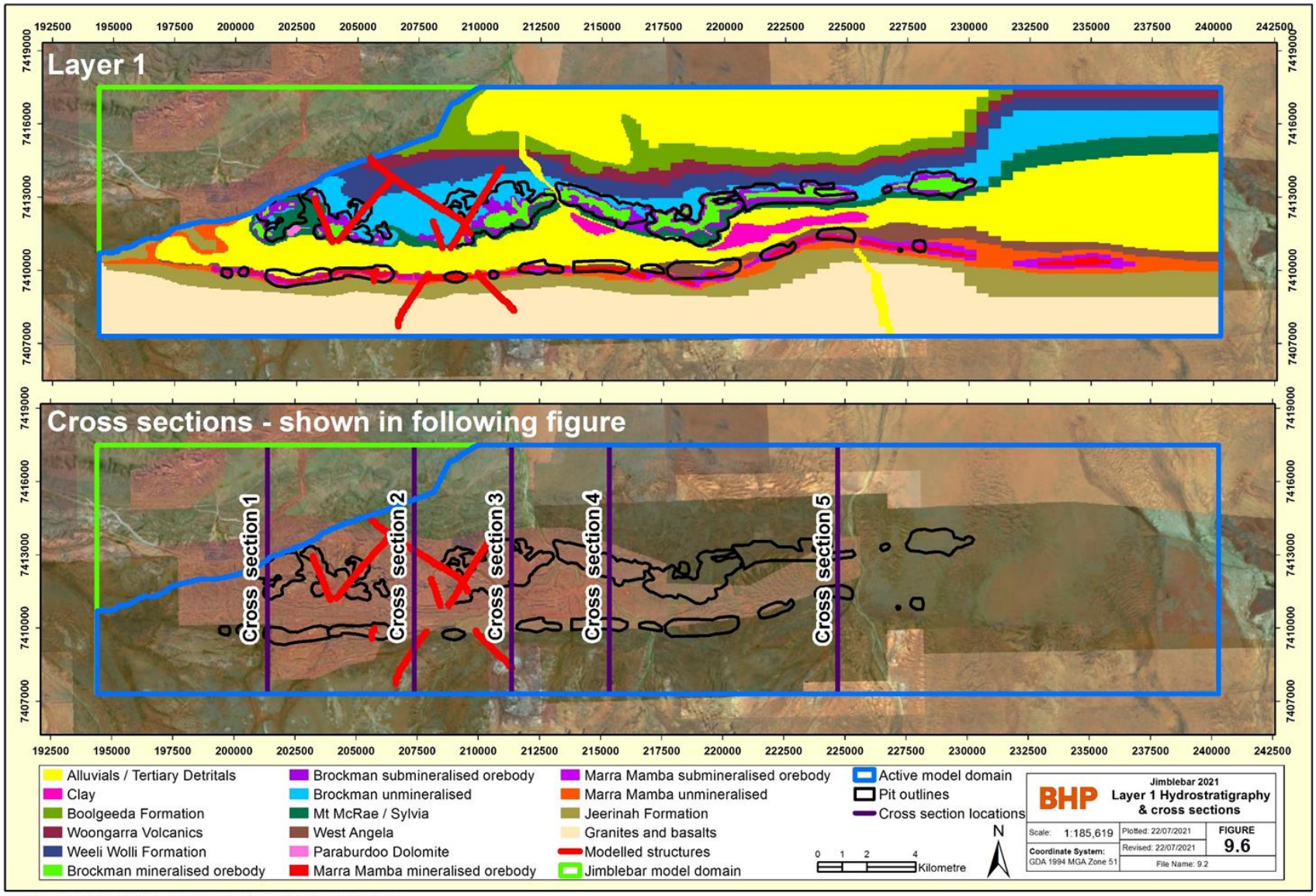


Figure 9.6 Jimblebar Lay 1 Hydrostratigraphy and cross sections

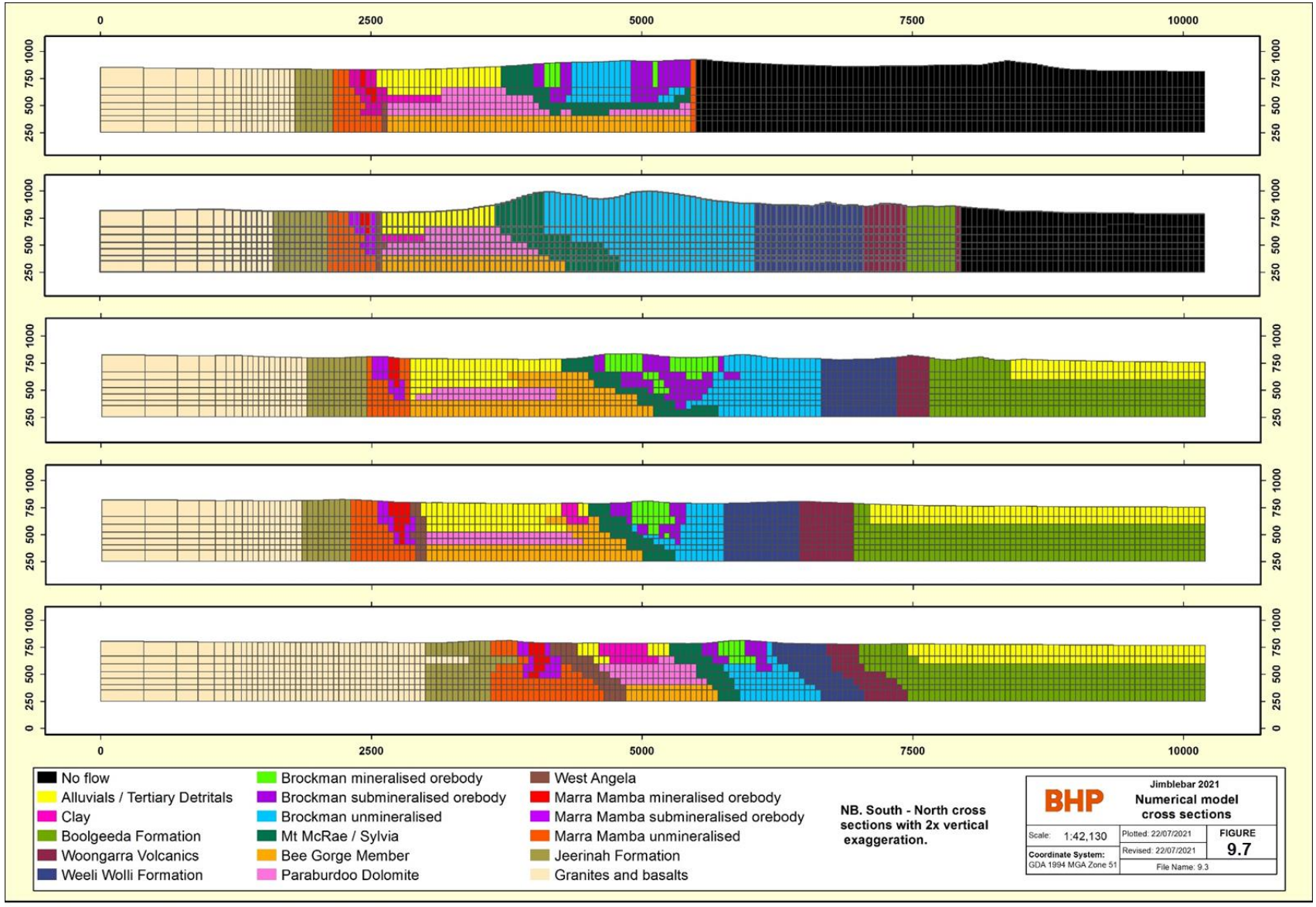


Figure 9.7 Jimblebar Numerical model cross sections

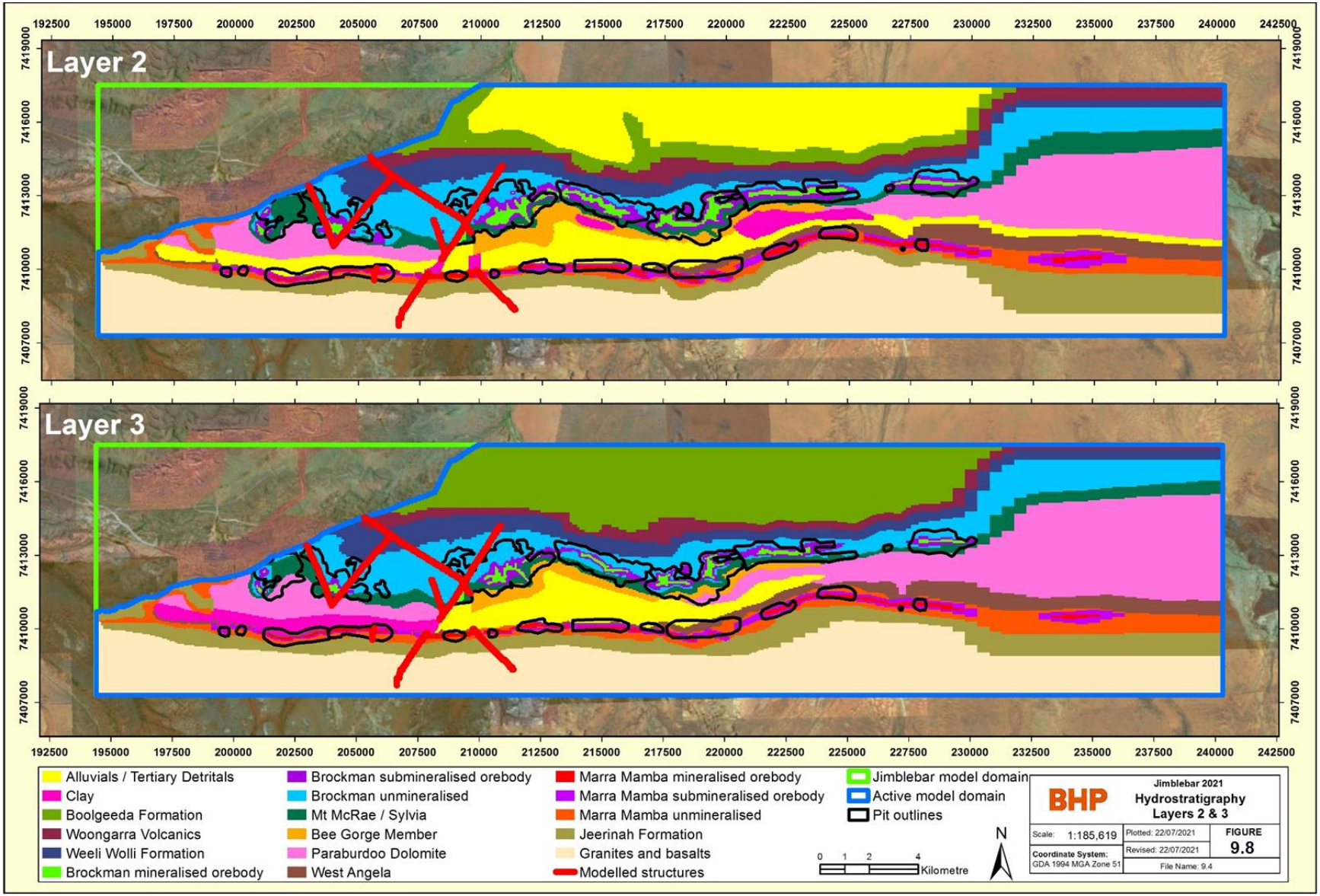


Figure 9.8 Jimblebar Hydrostratigraphy Layers 2 and 3

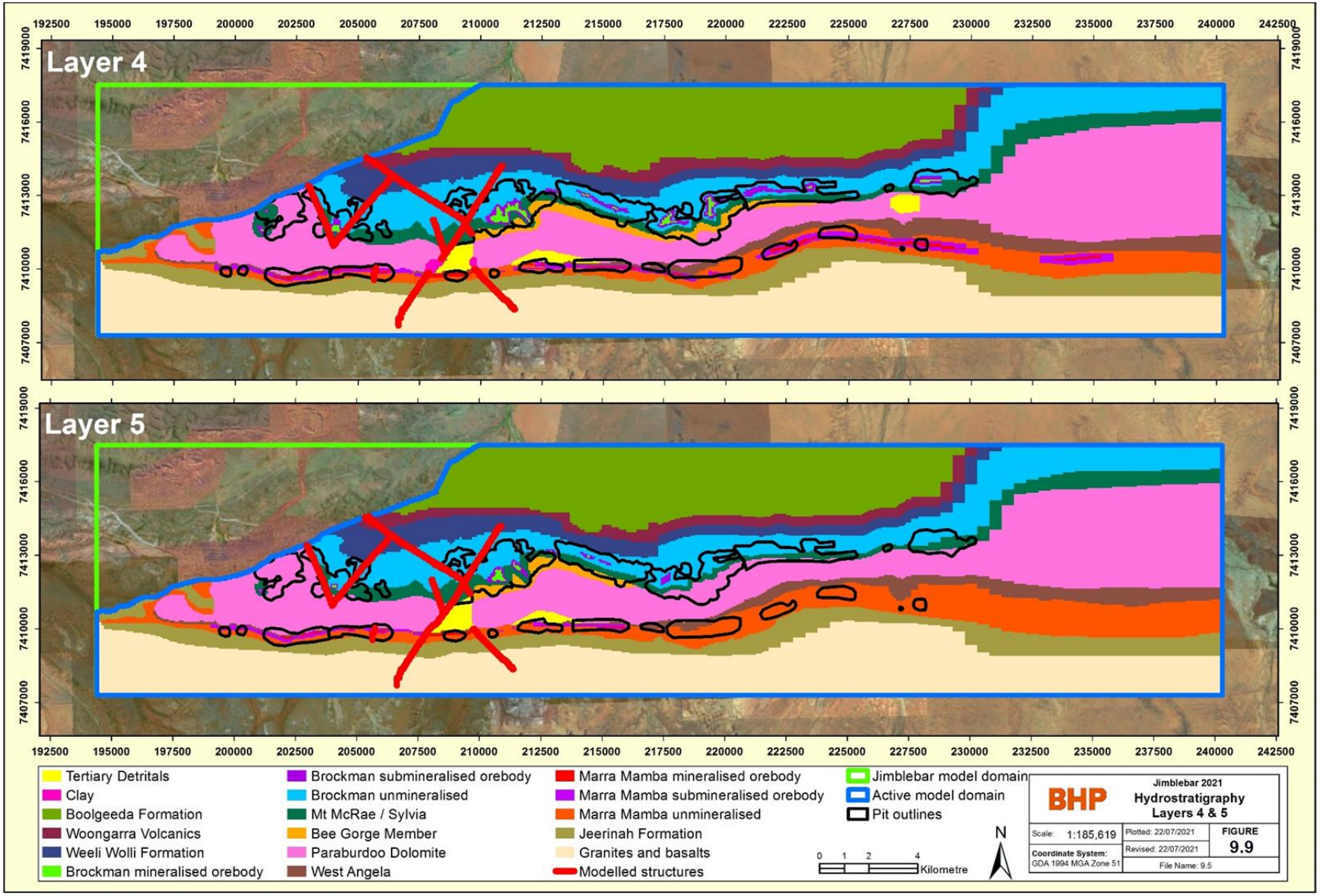


Figure 9.9 Jimblebar Hydrostratigraphy Layers 4 and 5

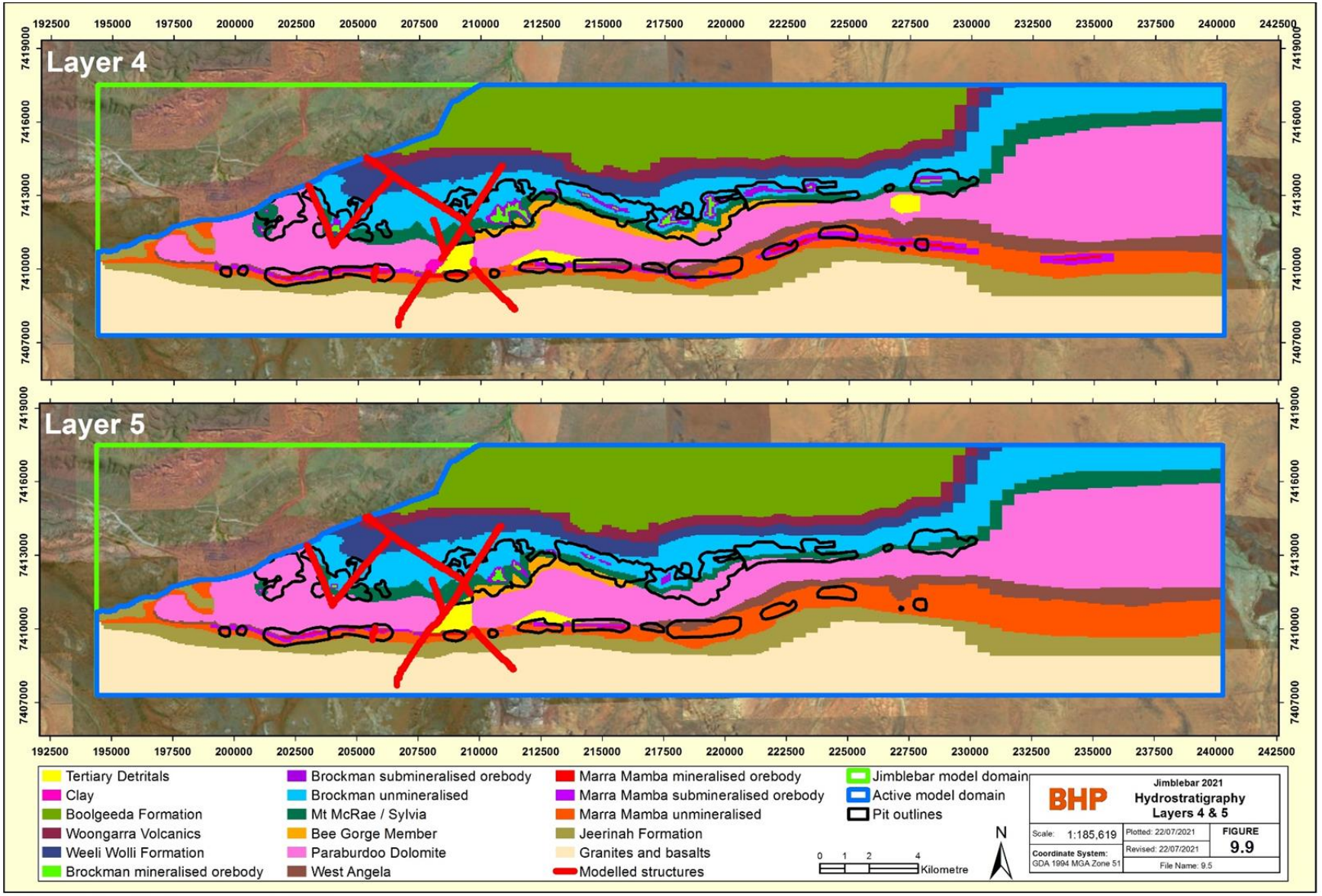


Figure 9.10 Jimblebar Hydrostratigraphy Layers 6 and 7

9.4.5 History match performance

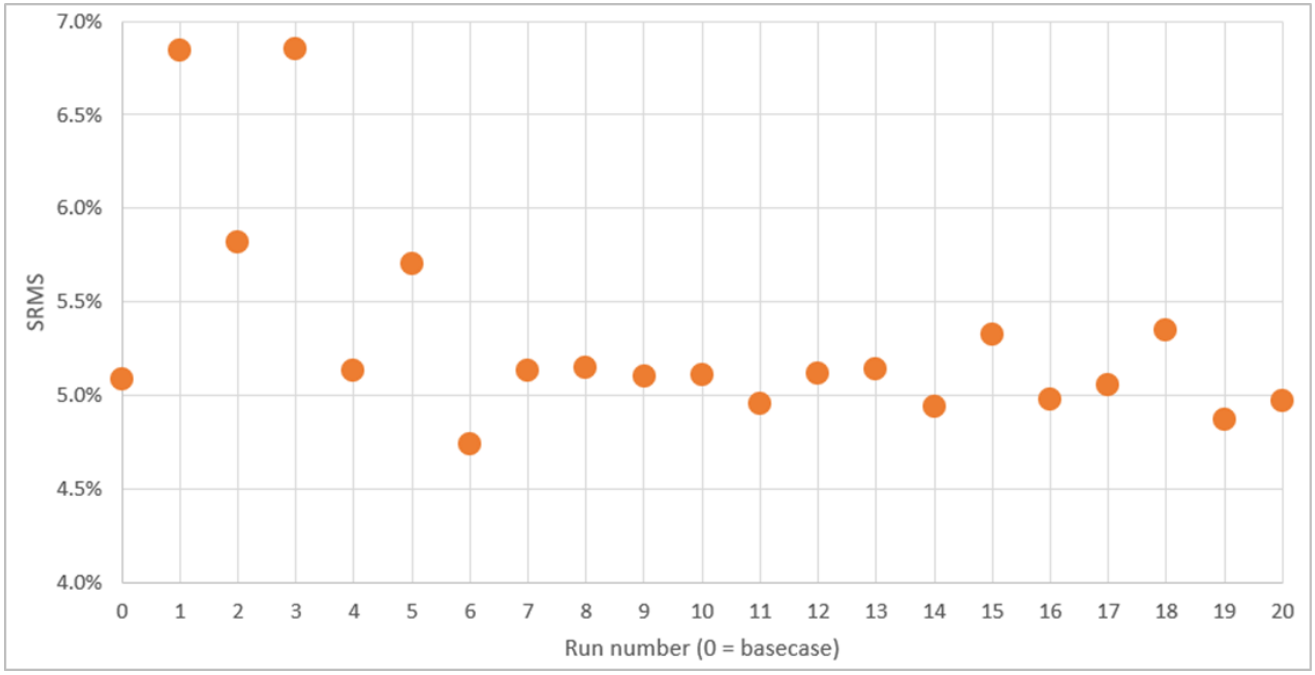
The steady state model produced a Scaled Root Mean Square (SRMS) of 3.7%. For the time variant model it was 5.1%. A scatter plot of observed and simulated time variant heads is shown in Figure 9.11. Other statistics of note are shown in Table 9.3. These statistics describe an acceptable match between observed and simulated groundwater levels in the updated model.

Table 9.3. Basecase history match statistics

Statistic	Result
Residual Mean (m)	1.1
Absolute Residual Mean (m)	1.8
Residual Std. Deviation (m)	2.2
Sum of Squares (m)	72856.6
Root Mean Square (RMS) Error (m)	2.5
Min. Residual (m)	-9.2
Max. Residual (m)	10.4
Number of Observations	12110
Range in Observations (m)	48.2
Scaled Residual Std. Deviation (%)	4.6
Scaled Absolute Residual Mean (%)	3.8
Scaled Root Mean Square (SRMS) Error (%)	5.1
Scaled Residual Mean (%)	2.3

The match between time variant observations and predictions is shown in Figures 9.12 to 9.15. These confirm that the model reproduces the main observed behaviours of the system, which are:

- The compartmentalisation across the Central Fault.
- The high degree of connectivity within the western aquifer compartment.
- The high degree of connectivity within the eastern aquifer compartment including through the Brockman orebody aquifers.
- The magnitude of observed drawdown in all areas.
- The relative isolation of the Capricorn and Wheelarra 3 orebody aquifers.



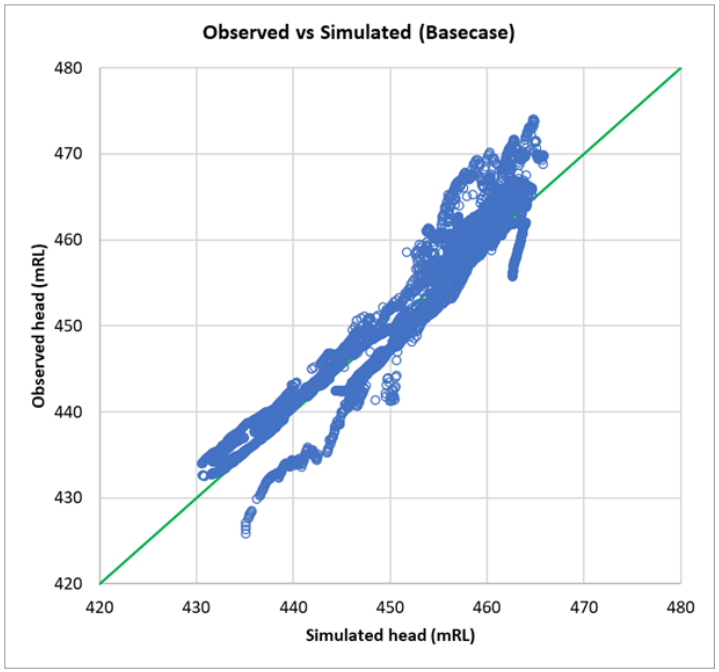


Figure 9.11 SRMS error and observed vs simulated scatterplot

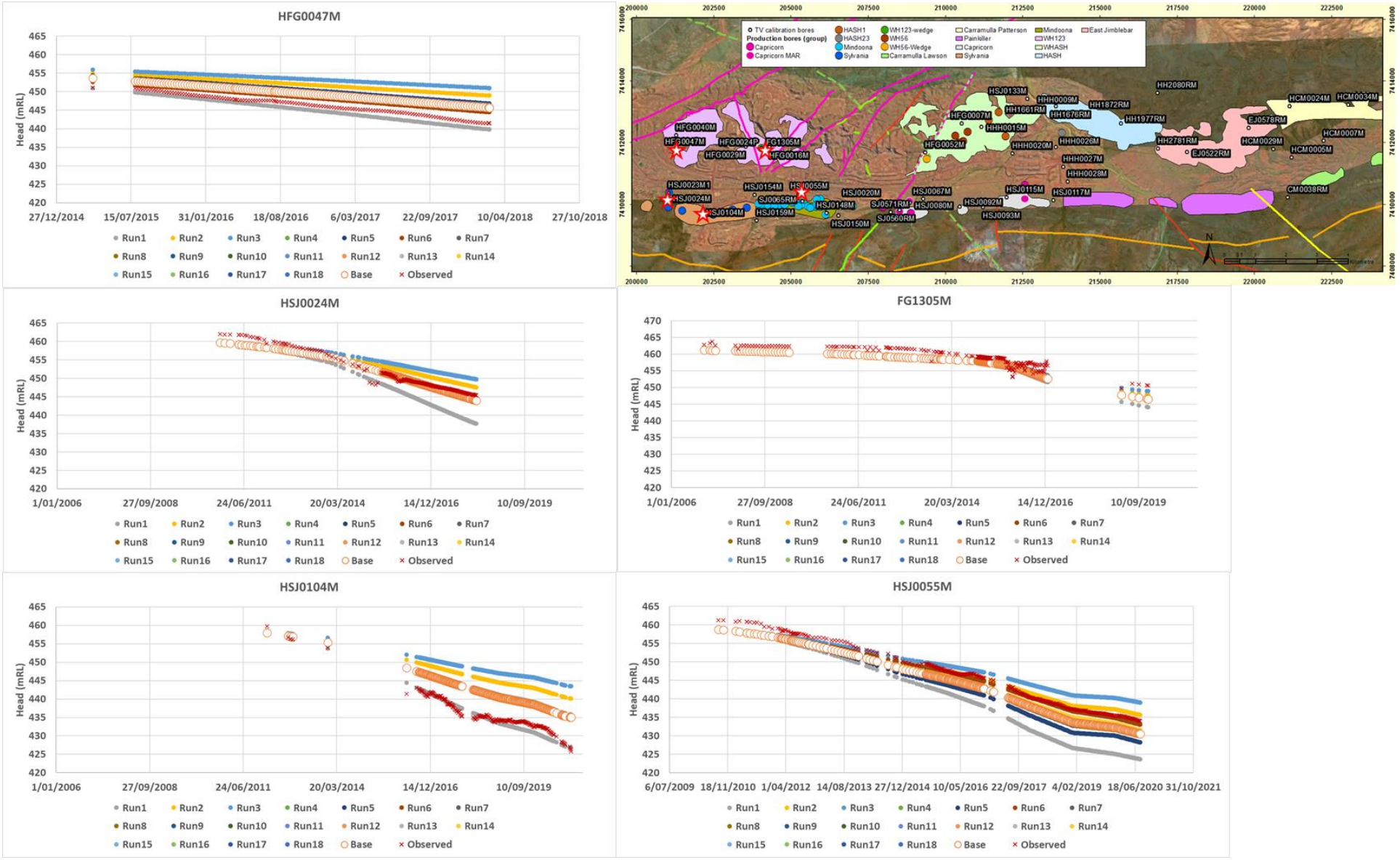


Figure 9.12 History match sensitivity – Western aquifer compartment

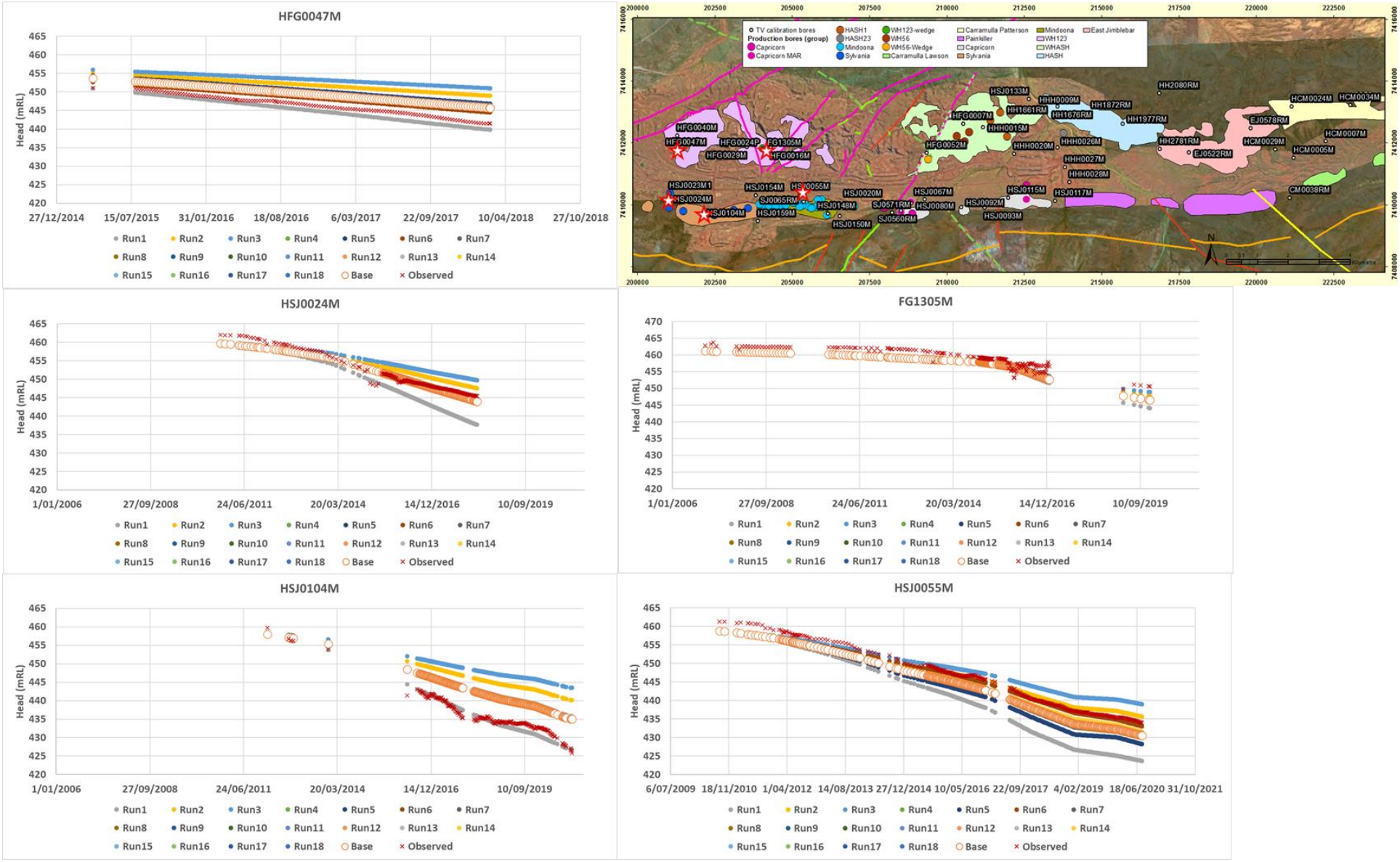
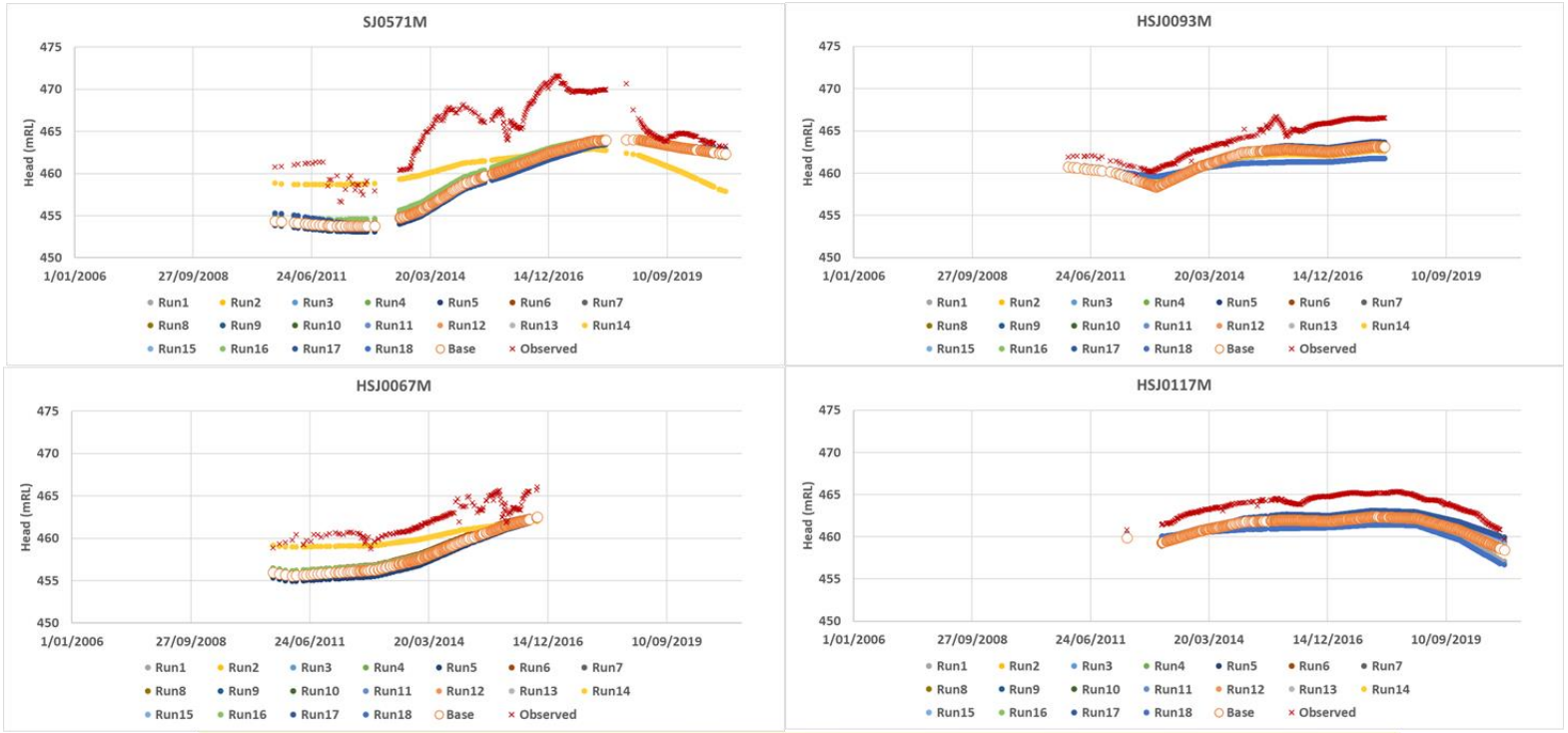


Figure 9.13 History match sensitivity – Eastern aquifer compartment (1)



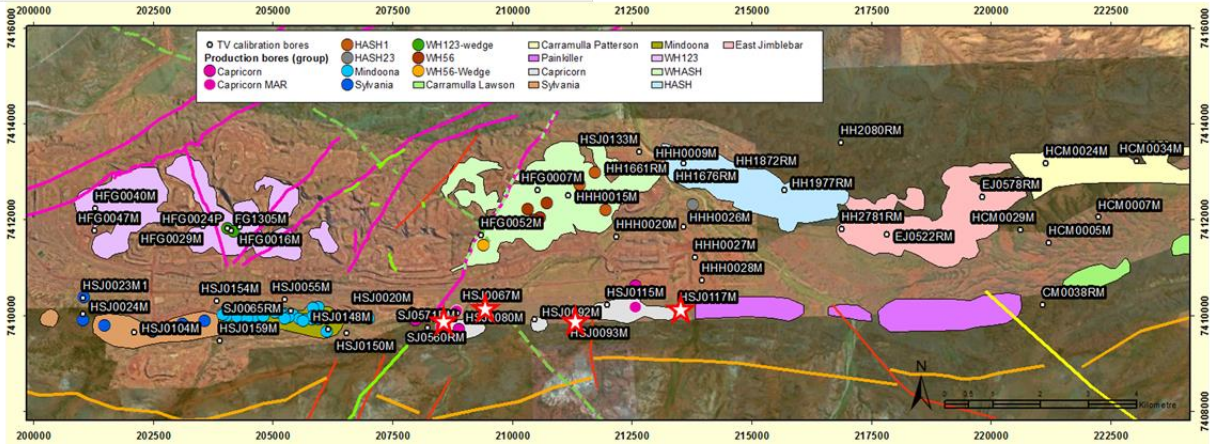
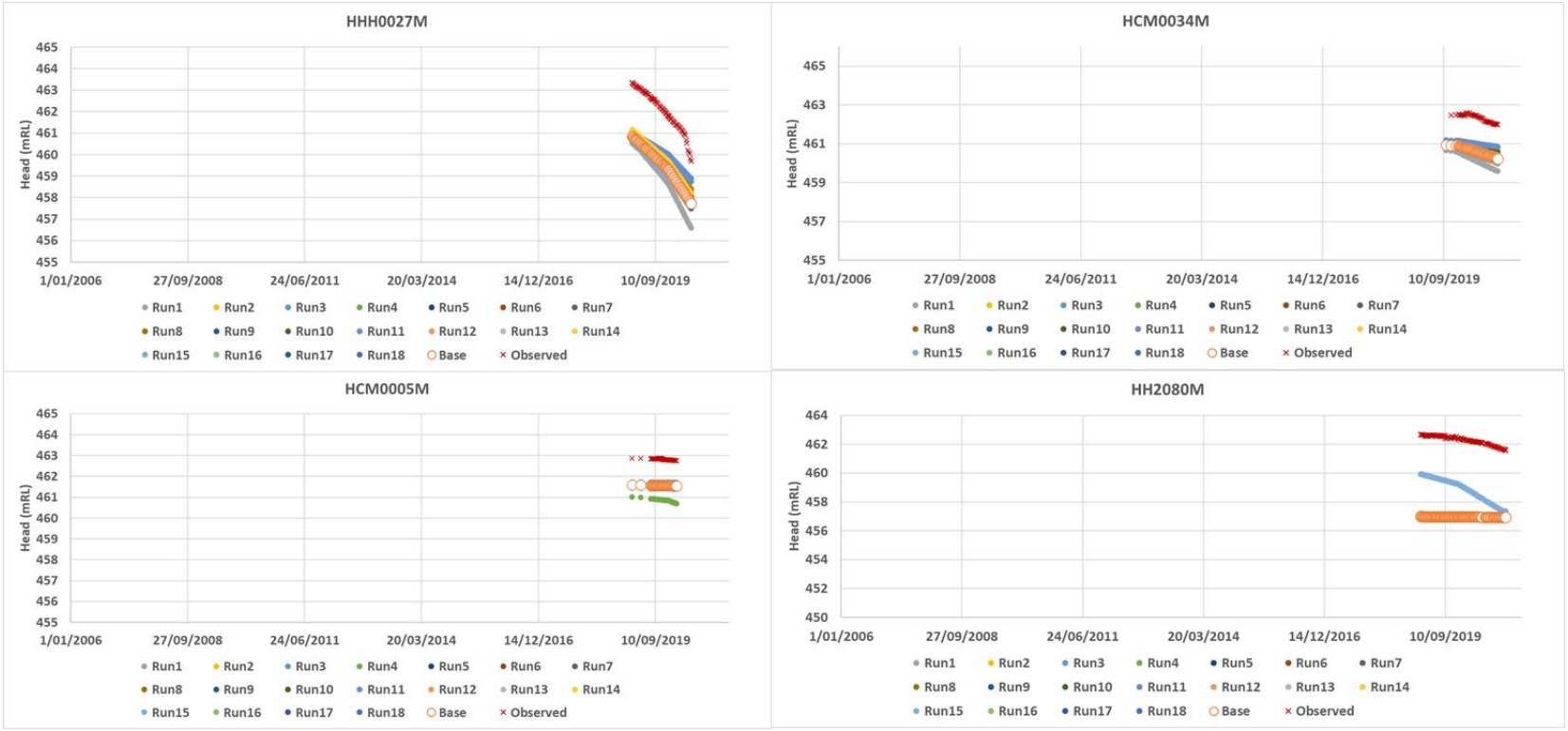


Figure 9.14 History match sensitivity – Eastern aquifer compartment (2)



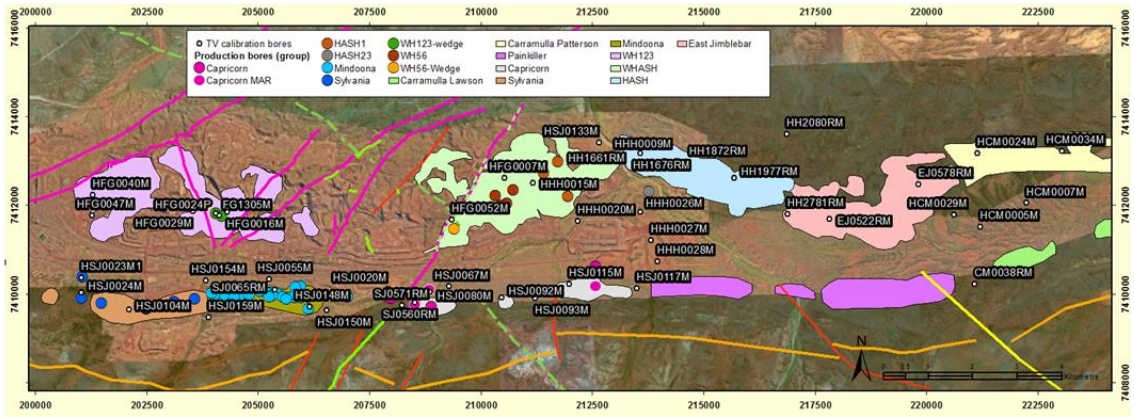


Figure 9.15 History match sensitivity – Eastern aquifer compartment (3)

9.4.6 Mass balance performance

The cumulative mass balance error and the water balance are shown in Figure 9.16. The error is below the guideline (Barnett et al, 2012) of 1% throughout the time variant and future predictive models.

Another test of model integrity is comparing abstraction rates from the model input files and model output files (i.e. what the model actually abstracted vs what it was asked to abstract). In this case, the comparison shows that the rates match (Figure 9.17).

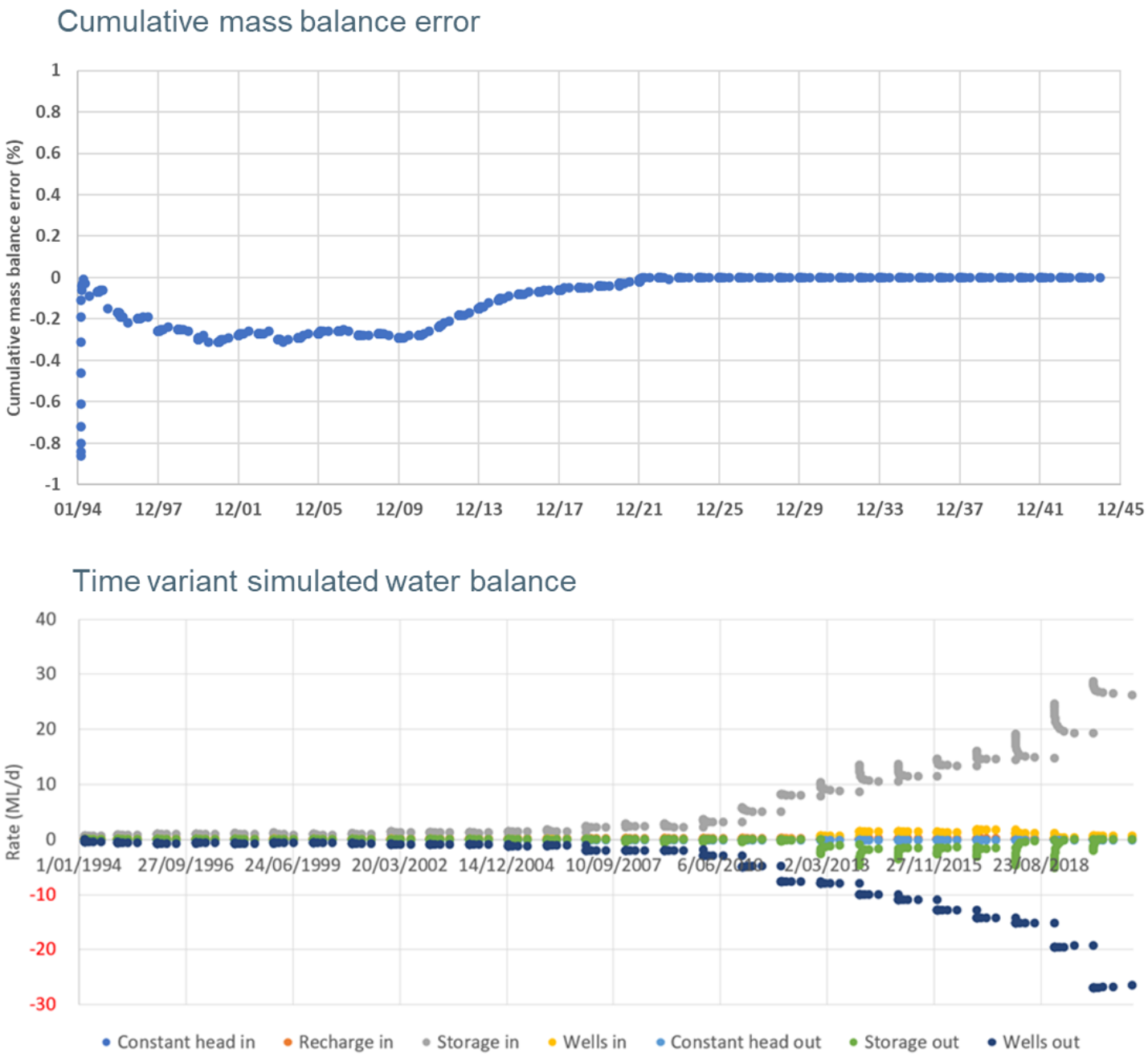


Figure 9.16 Mass balance performance – Base case model

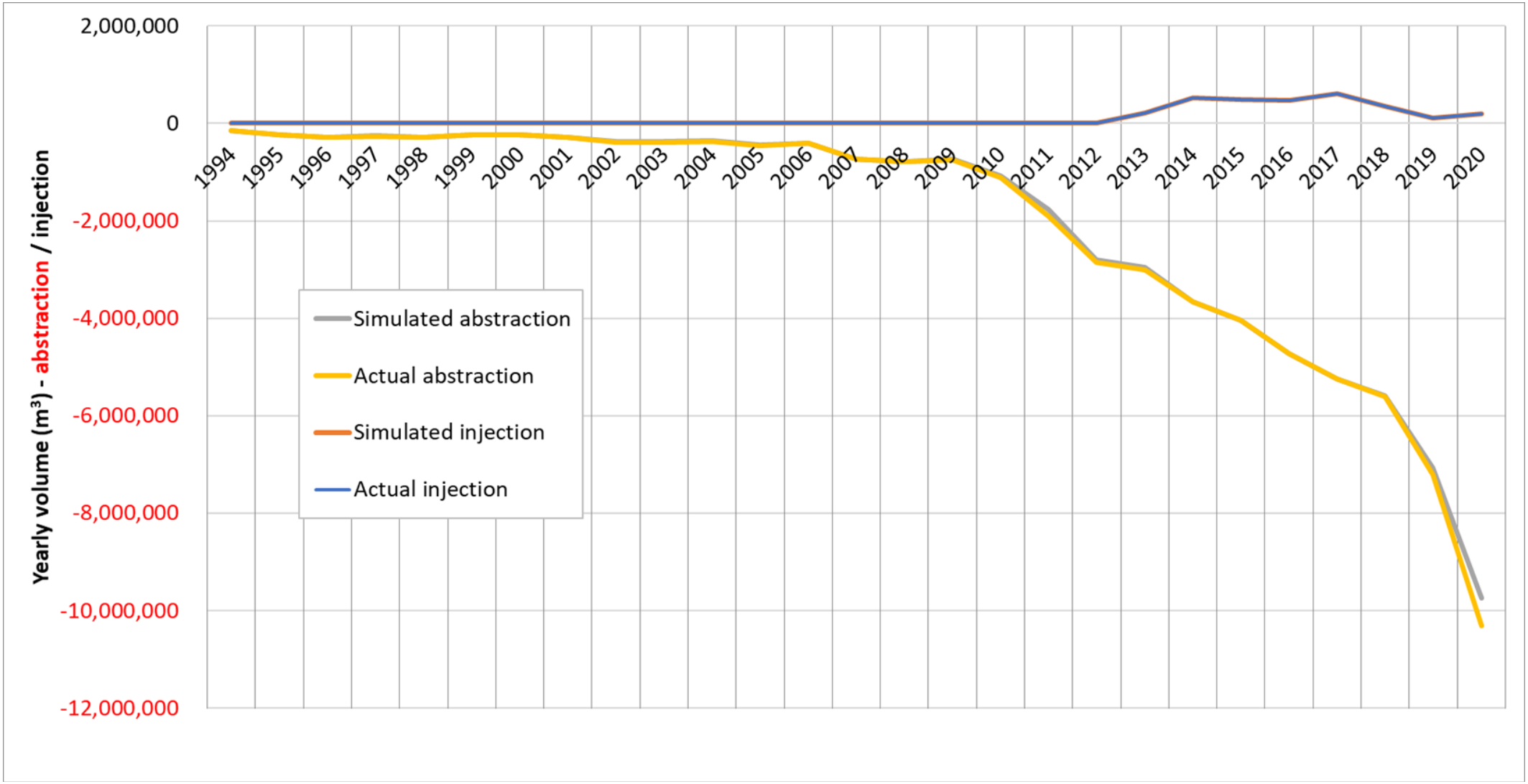


Figure 9.17 Comparison between MODFLOW well file and simulated abstraction

9.4.7 Confidence levels

The Jimblebar area is separated into two compartments by the Central Fault, both in terms of the hydrogeological system and conceptual confidence. As such, the definition of the confidence-level classification follows the same division.

Predictions within the Western Compartment are considered to be **Class 3** (Table 9.4). This area includes the prediction of dewatering from the Mindoona, Sylvania and WH123 mining areas.

Table 9.4 - Justification for Class 3 classification for predictive model in Western Compartment (after Barnett et al, 2012).

Data	Calibration	Prediction	Key Indicator	Example of specific use
Spatial and temporal distribution of groundwater head observations adequately define groundwater behaviour, especially in areas of greatest interest and where outcomes are to be reported	Scaled RMS error or other calibration statistics are acceptable	Length of predictive model is not excessive compared to length of calibration period	Stresses (in the western compartment) are not more than 2 times greater than those included in calibration	Suitable for predicting groundwater responses to arbitrary changes in applied stress or hydrological conditions anywhere within the model domain
Reliable metered groundwater extraction and injection data is available	Long-term trends are adequately replicated where these are important.	Temporal discretisation used in the predictive model is consistent with the transient calibration	Temporal discretisation in predictive model is the same as that used in calibration	Can be used to design mine-dewatering schemes.
	Transient calibration is current, i.e. uses recent data.	Level and type of stresses included in the predictive model are within the range of those used in the transient calibration	Mass balance closure error is less than 0.5% of total.	
	Observations of the key modelling outcomes dataset is used in calibration		Model parameters consistent with conceptualisation	

Predictions within the Eastern Compartment are considered to be **Class 2** (Table 9.5). This area includes the prediction of dewatering from the Capricorn, WHASH, HASH and East Jimblebar mining areas.

Table 9.5 - Justification for Class 2 classification for predictive model in Eastern Compartment (after Barnett et al, 2012).

Data	Calibration	Prediction	Key Indicator	Example of specific use
Groundwater head observations and bore logs are available but may not provide adequate coverage throughout the model domain.	It is hard to fit this area of the model into the categories offered in the Guidelines. The calibration data is robust in WHASH and Capricorn but becomes more limited to the east.	Level and type of stresses included in the predictive model are outside the range of those used in the transient calibration	Stresses are between 3 and 10 times the duration of transient calibration.	Providing estimates of dewatering requirements for mines and excavations and the associated impacts
			Not all model parameters consistent with conceptualisation	Prediction of impacts of proposed developments in medium value aquifers.

9.5 Model sensitivities

9.5.1 Sensitivity analysis

A sensitivity analysis was undertaken with the steady state and time variant historical models. This involved increasing and decreasing the values assigned to key hydraulic parameters, running the models, processing the results and assessing what effect this had on the predicted historical heads.

This process identifies those parameters to which history matching is sensitive and those to which it is not. In other words:

- parameters that are known with some confidence (if the history match is sensitive to them)
- parameters that are not known with confidence (if the history match is insensitive to them)

Therefore the process also identifies parameters that should be considered in the predictive uncertainty analysis; those parameters that have no or little effect on the history match (i.e. the insensitive or moderately insensitive ones).

Both higher and lower values of key hydraulic parameters were tested. Initially, single, or groups of similar parameters were varied, as shown in Table 9.6. These relate to the key aquifer parameters (regional and local aquifers) and some of the formations that control hydraulic connection between them.

Table 9.6. Parameter ranges tested in the sensitivity analysis

Run	Hydrostratigraphy	Parameter	Change
1	Paraburdoo dolomite / Tertiary Detritals	Sy	÷2
2			x1.5
3			x2
4		Eastern clay K	= 1 m/d
5		K	÷2
6			x2
7	Bee Gorge Member	K	÷10
8	McRae / Sylvia Formations	K	÷10
9			x10
10	Brockman Iron Formation (Mineralised / Submineralised)	K	÷5
11		Sy*	x2
12	Marra Mamba Iron Formation (Mineralised / Submineralised)	K	x2
13		Sy	x2 (max 20%)
14	Capricorn west low K zones	K	x5
15	Northern material (unmineralised Brockman, Weeli Wolli and Woongarra Formations)	K Sy	All 0.5 m/d 1.0%, 0.5% and 0.5% respectively
16	West Angela Member east	K	x4
17			÷50
18	Capricorn east low K zone	K	x10

* excluding WH123 wedge

The results of these runs are considered quantitatively, in terms of the statistical fit between observed and simulated groundwater levels and qualitatively, using the hydrographs of observed and simulated groundwater levels.

The Scaled Root Mean Square (SRMS) of all runs is shown in Figure 9.11. This suggests that other than Runs 1 and 3 (involving changes to the dolomite and Tertiary Detrital specific yield), all the runs produced an acceptable fit of roughly between 5% and 6% SRMS. Compared to the base case, some of the runs produced a lower SRMS error.

Hydrographs of observed and simulated groundwater levels are shown in Figures 9.12 to 9.15. These show that:

- The simulated heads at the monitoring bores are moderately sensitive to all the model parameters tested.

- Some of the changes have a different effect on simulated heads east and west of the Central Fault (i.e. in the eastern and western aquifer compartments).
- In most cases, these changes do not reduce the efficacy of the match between observed and simulated heads. The changes that did result in obvious reductions in the goodness of fit were:
    - Runs 2 and 3 – where the specific yield of the dolomite and Tertiary Detritals was increased. Run 2 only impacted the western compartment; whereas Run 3 impacted both sides.
    - Runs 5 and 6 – where the hydraulic conductivity of the dolomite and Tertiary Detritals was varied. Both changes negatively impacted the western compartment.
    - Run 11 – where Brockman Formation mineralised / submineralised specific yield was increased this had a negative impact on heads in the eastern compartment.
    - Run 14 – where the hydraulic conductivity in the western part of Capricorn (including the regional aquifer in that area) was increased.
    - Run 18 – where the hydraulic conductivity of the Tertiary Detrital immediately north of the eastern Capricorn orebody was increased.

This analysis suggests that the parameter values that produced these negative changes to the model output are not plausible and should not be considered in the predictive uncertainty.

An additional sensitivity model was developed that incorporated all the increases in parameter values (working on the assumption that higher values of specific yield and hydraulic conductivity would produce higher dewatering rates) that either produced a positive or neutral effect on the match between observed and simulated heads. As described above, some of the variations had different impacts in the western and eastern compartments. The parameters were only changed in one aquifer compartment, if the change produced a negative outcome in the other. The configuration of this run (Run 19) is shown in Table 9.7.

Table 9.7. Analysis of sensitivity runs and configuration of Run 19

Run	Hydrostratigraphy	Para meter	Change (Run 19 In **bold**)	Sensitivity result – WESTERN COMPARTMENT	Sensitivity result – EASTERN COMPARTMENT
1	Paraburdoo dolomite / Tertiary Detritals	Sy	÷2	Positive	Mixed – (ok in WHASH / HASH)
2			**x1.5 (east only)**	Negative (apart from wedge)	
3			x2	Negative (apart from wedge)	Negative
4		K	÷5		
5			÷2	Negative – a little	Positive - mostly
6			**x2 (east only)**	Negative – a little	
7	Bee Gorge Member	K	÷10		Positive - mostly
8	McRae / Sylvia Formations	K	÷10		Positive - mostly
9			**x10**		
10	Brockman Iron Formation (Mineralised / Submineralised)	K	÷5		Positive - mostly
11		Sy*	x2		Negative
12	Marra Mamba Iron Formation (Mineralised / Submineralised)	K	x2		
13		Sy	**x2 (max 20%)**		
14	Capricorn west low K zones	K	x5		Negative
15	Northern material (unmineralised Brockman, Weeli Wolli and Woongarra Formations)	K	All 0.5 m/d 1.0%, 0.5% and 0.5% respectively		
16	West Angela Member east (z25)	K	**x4**		

17			÷50		
18	Capricorn east low K zone	K	x10		Negative

* excluding WH123 wedge

As can be seen from the statistics (Figure 9.11) and hydrographs (Figures 9.18 to 9.21), Run 19 produces a viable history match, hardly diminished from the base-case model. In the WHASH area, the observed drawdown is under-predicted to some extent; however, given the early stage of data collection, size of the orebody and depth of mine below groundwater level, this result should not be discarded. Everywhere else, the model matches observed drawdown / draw-up to a high level of accuracy.

Another run was produced to try and mitigate the under-prediction of drawdown in WHASH by applying some of the lower parameter values from the sensitivity run that had positive or neutral control on the history match at WHASH. This run, Run 20, used a lower hydraulic conductivity in the Brockman mineralised and submineralised material, as per Run 10 and a lower specific storage (half the base case, which was not tested in the sensitivity analysis). The statistics and hydrographs are provided in Figures 9.11 and 9.18 to 9.21. Run 20 produces a match to the observed data in the WHASH area much closer to the base-case model.

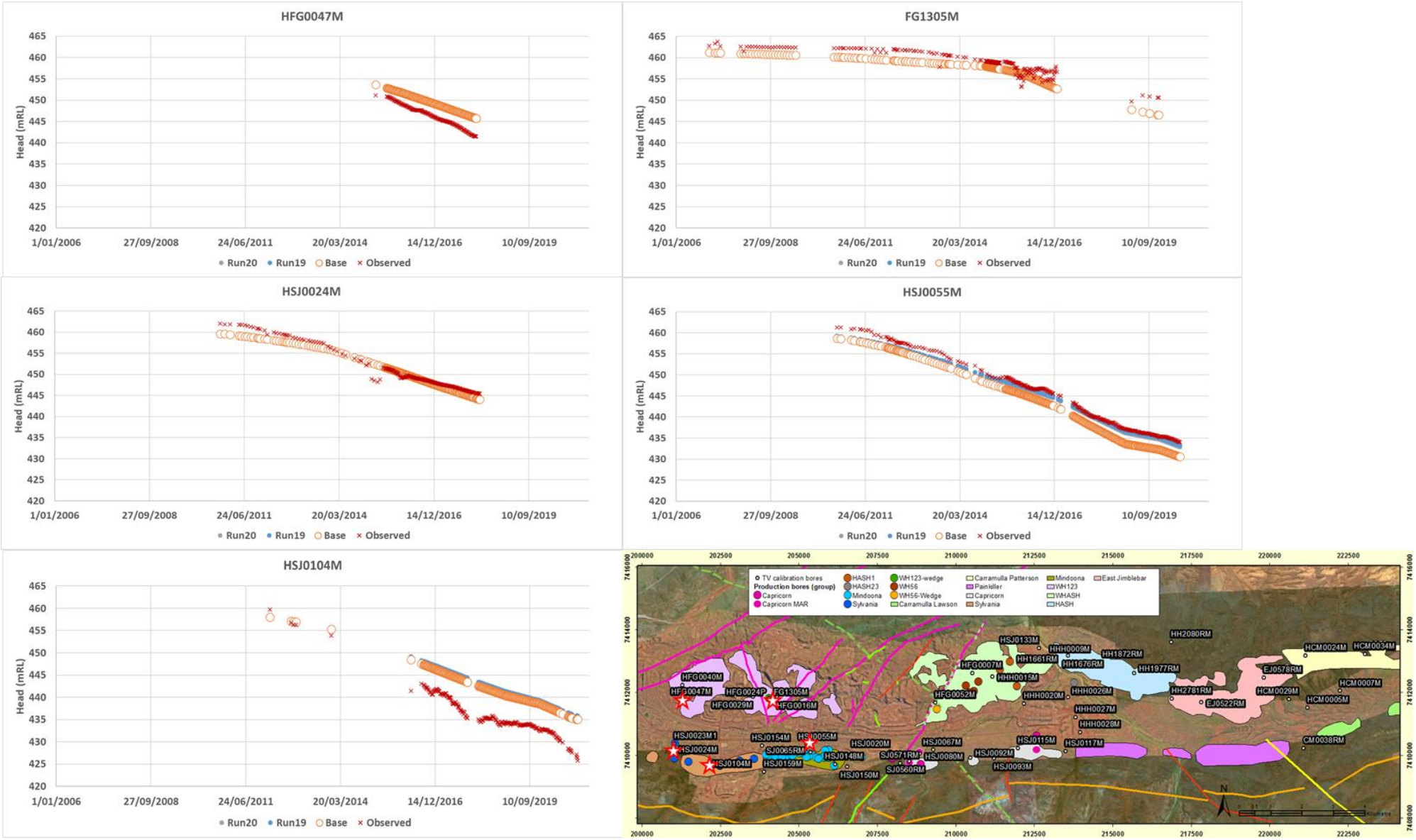


Figure 9.18 History match sensitivity Runs 19 and 20 – Western aquifer compartment

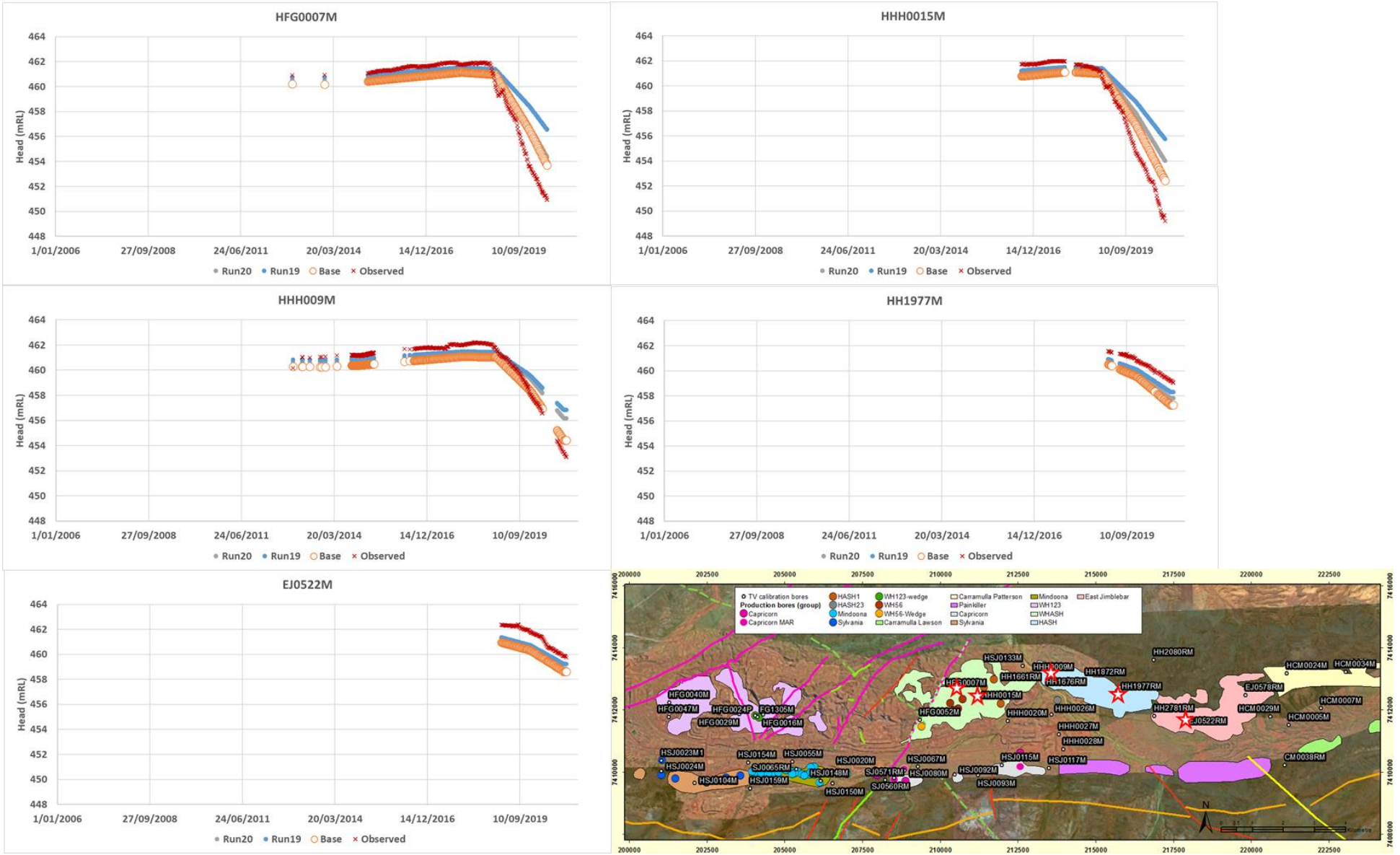
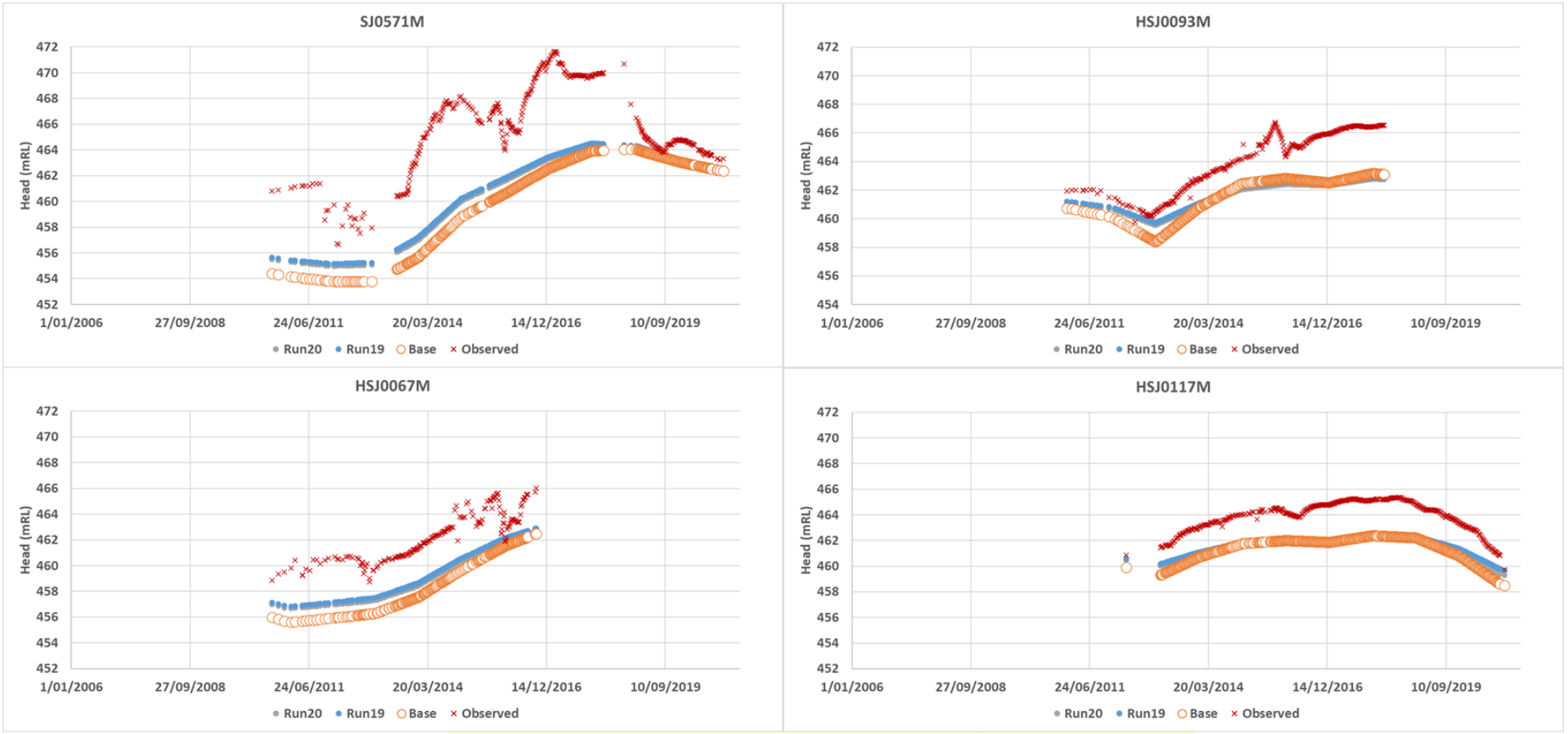


Figure 9.19 History match sensitivity Runs 19 and 20 – Eastern aquifer compartment (1)



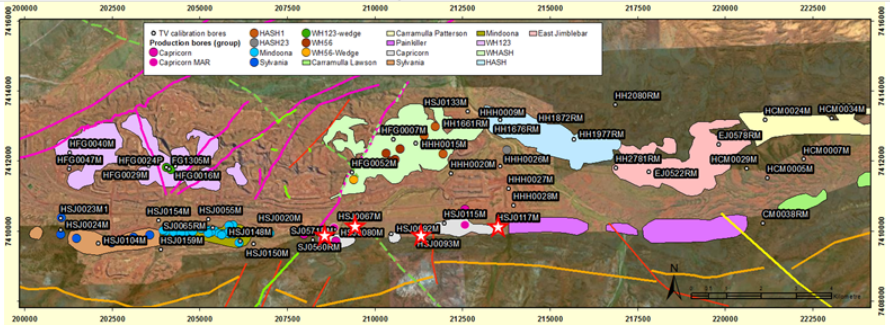
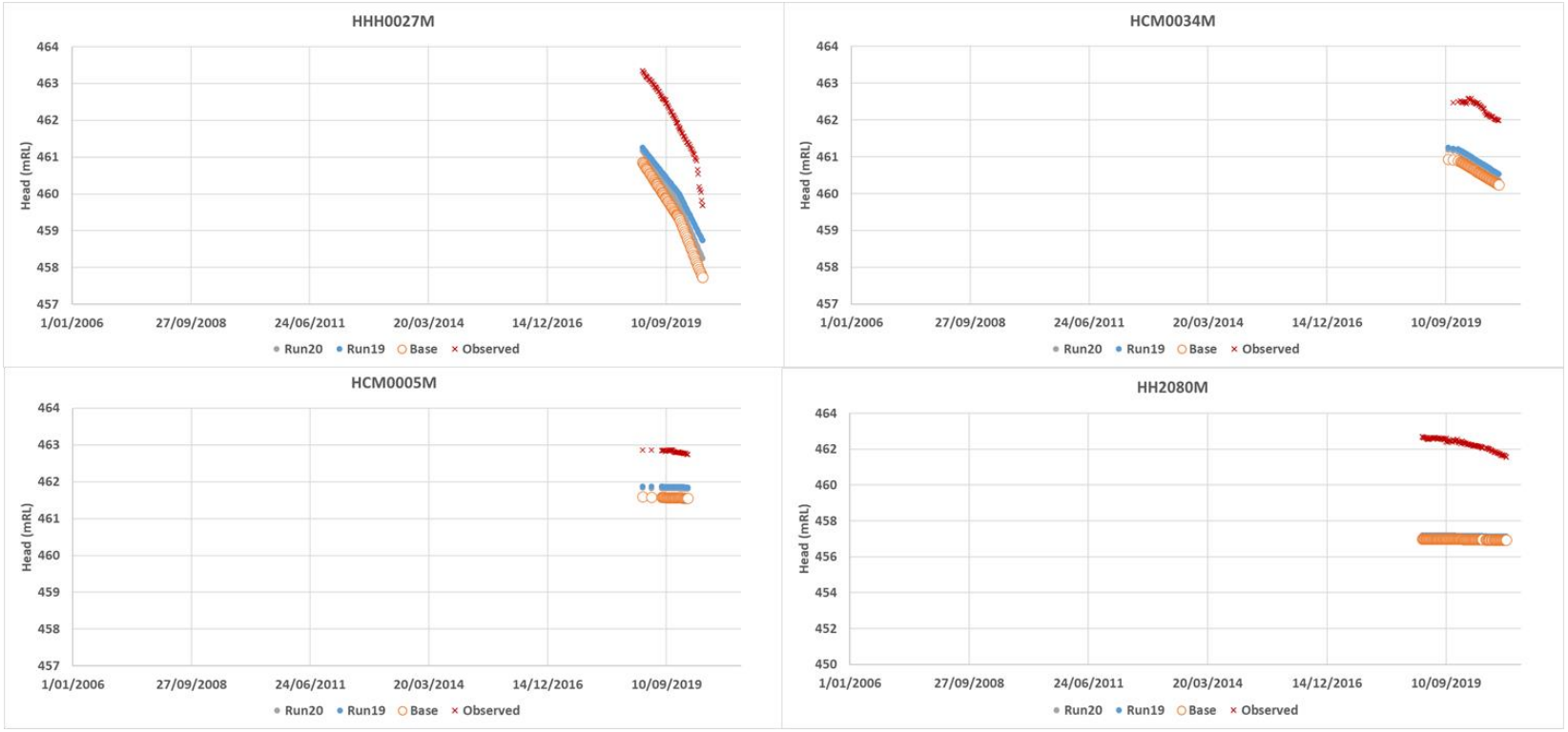


Figure 9.20 History match sensitivity Runs 19 and 20 – Eastern aquifer compartment (2)



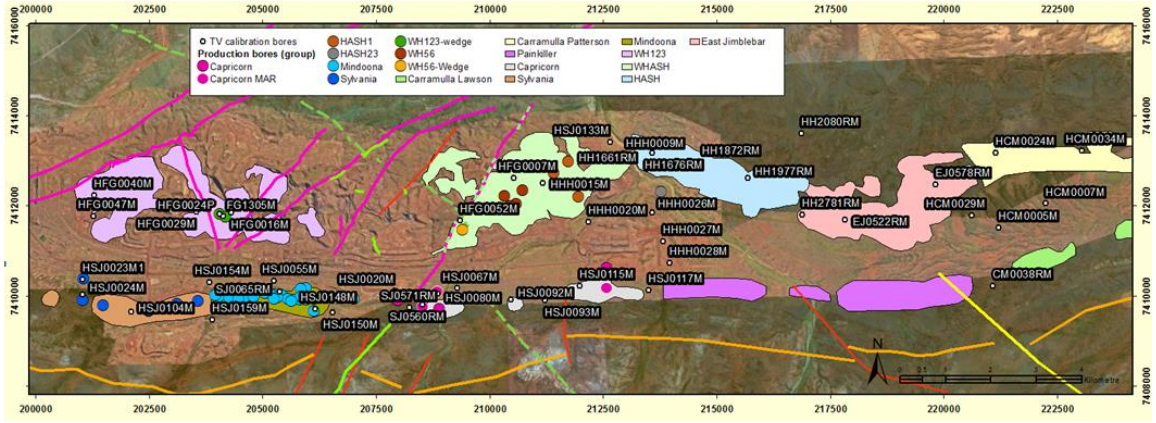


Figure 9.21 History match sensitivity Runs 19 and 20 – Eastern aquifer compartment (3)

9.5.2 Predictive confidence

Confidence in the ability of the model to predict the response to future dewatering varies throughout the model domain. In the compartment to the west of the Central Fault, which includes the WH123, Mindoona and Sylvania mining areas, there is a high level of confidence. To the west the main uncertainties are:

1. The geometry of the remaining saturated regional aquifer in this compartment. Water levels need to be reduced a further 90 to 100 m to realise the mine plans and the groundwater system may behave differently compared to the past as the water level falls further.
2. The nature of the areas to the north of WH123.
3. The vertical and horizontal geometries of the key aquitards and aquifers in the Tertiary Detritals.

In the area east of the Central Fault including the WHASH, HASH, Capricorn and East Jimblebar mining areas, there is moderate to low confidence. To the east the main uncertainties are:

1. Whilst dewatering has commenced in WHASH, the duration and drawdown so far is relatively limited. The monitoring data has improved the confidence significantly, but uncertainty remains as to the long-term response. Furthermore, the response rapidly reduces away from WHASH meaning that the peripheral areas (East Jimblebar for example) are still relatively untested.
2. The eastern compartment is much larger than the western compartment. The characteristics of the groundwater system as it extends to the east of East Jimblebar are not well understood and groundwater monitoring to the far east of the system is limited.

To the north of the Brockman orebodies predictive confidence is low. The area is vast, and the monitoring is limited to a few bores.

To the south of the Marra Mamba orebodies predictive confidence is moderate to high. The area is also vast but the monitoring bores provide consistent response to dewatering.

9.6 Predictions

9.6.1 Approach and uncertainty analysis

The modelled mine plan includes the seven mining areas - Sylvania, Mindoona, Capricorn, WH23, WHASH, HASH and East Jimblebar. The mine footprints are shown in Figure 9.22. MODFLOW drain boundary conditions (DRN) were used to simulate dewatering. Drain locations are shown in Figure 9.23 and the elevations assigned to them (i.e. target water level elevations) are shown in Figure 9.24.

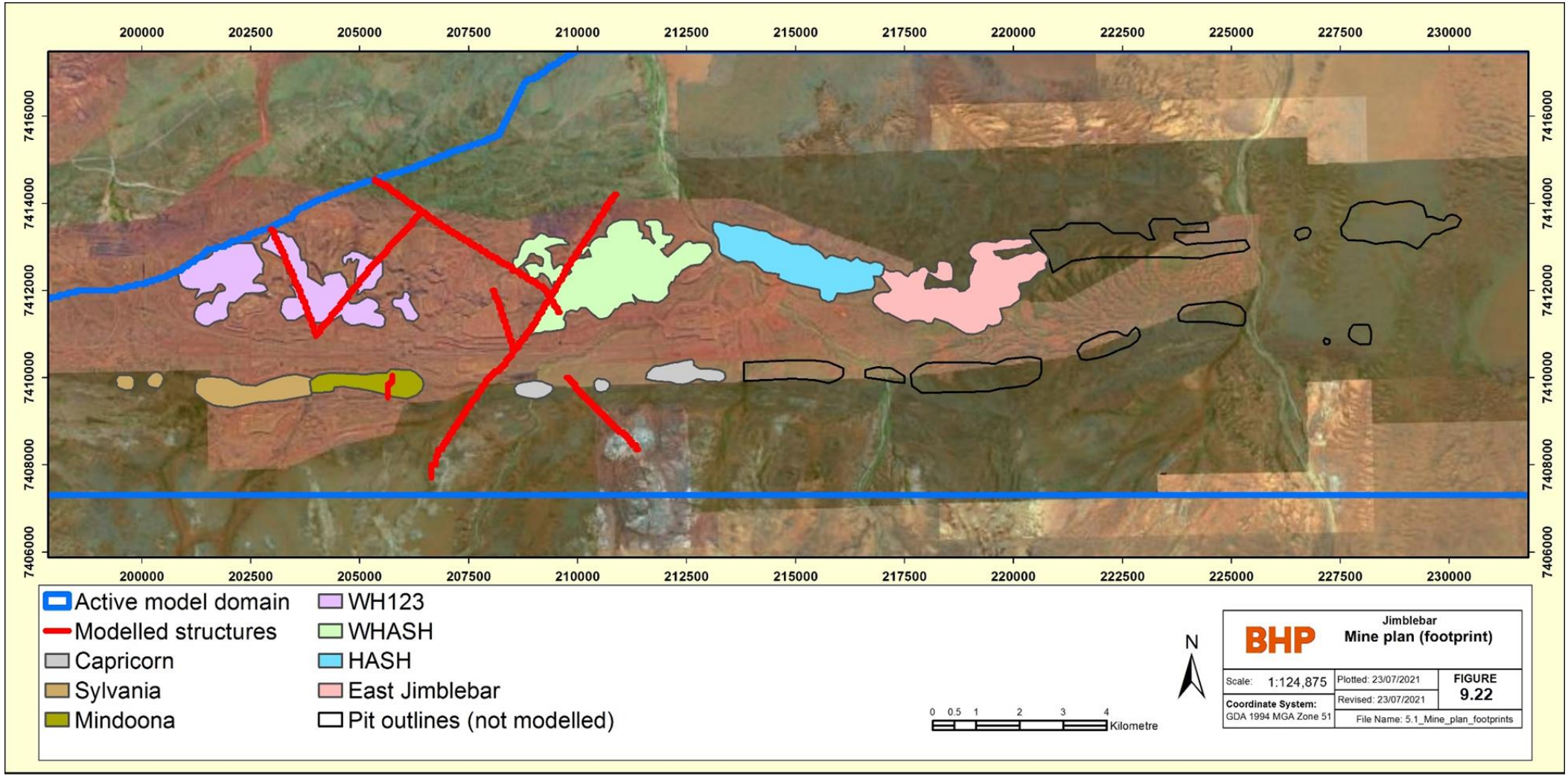
The base of the dewatering targets (which are generally 12 m below final mine depth) at each mining area are:

- Sylvania: 326 mRL
- Mindoona / Capricorn: 356 mRL
- WH23: 326 mRL
- WHASH: 316 mRL
- HASH: 327 mRL
- East Jimblebar: 348 mRL

As the main focus of the predictive modelling was to understand the potential high end (or “high-case”) dewatering rates and the subsequent regional impacts to groundwater levels, the dewatering scenario was tested with the base case (which can be considered a “mid-case” prediction) and Runs 19 and 20 only. The other 18 runs were not used as they would fall somewhere between Run 19 and the base case or lower in terms of dewatering rates. The base

case was included to show the magnitude of the range between these two prediction types (i.e. high-case and mid-case).

An additional run (Run 19B) was devised whereby the WHASH target water levels were delayed by a year so that the dewatering of this orebody was more aligned with the dewatering of the Sylvania orebody. This provides some insight into dewatering timing uncertainty, again, with a focus on the higher possible range



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Figure 9.22 Mine plan (footprint)

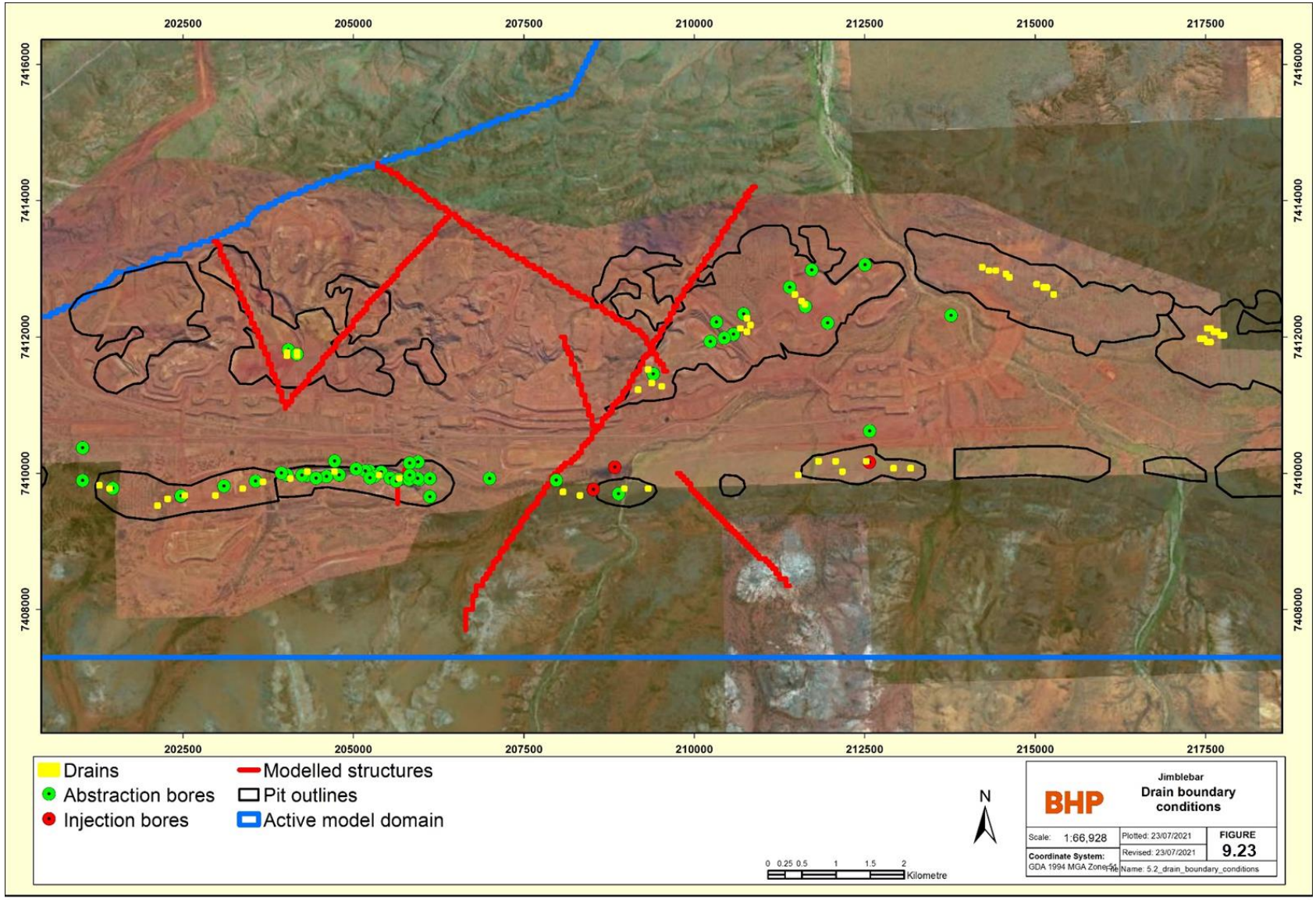


Figure 9.23 Jimblebar Drain boundary conditions

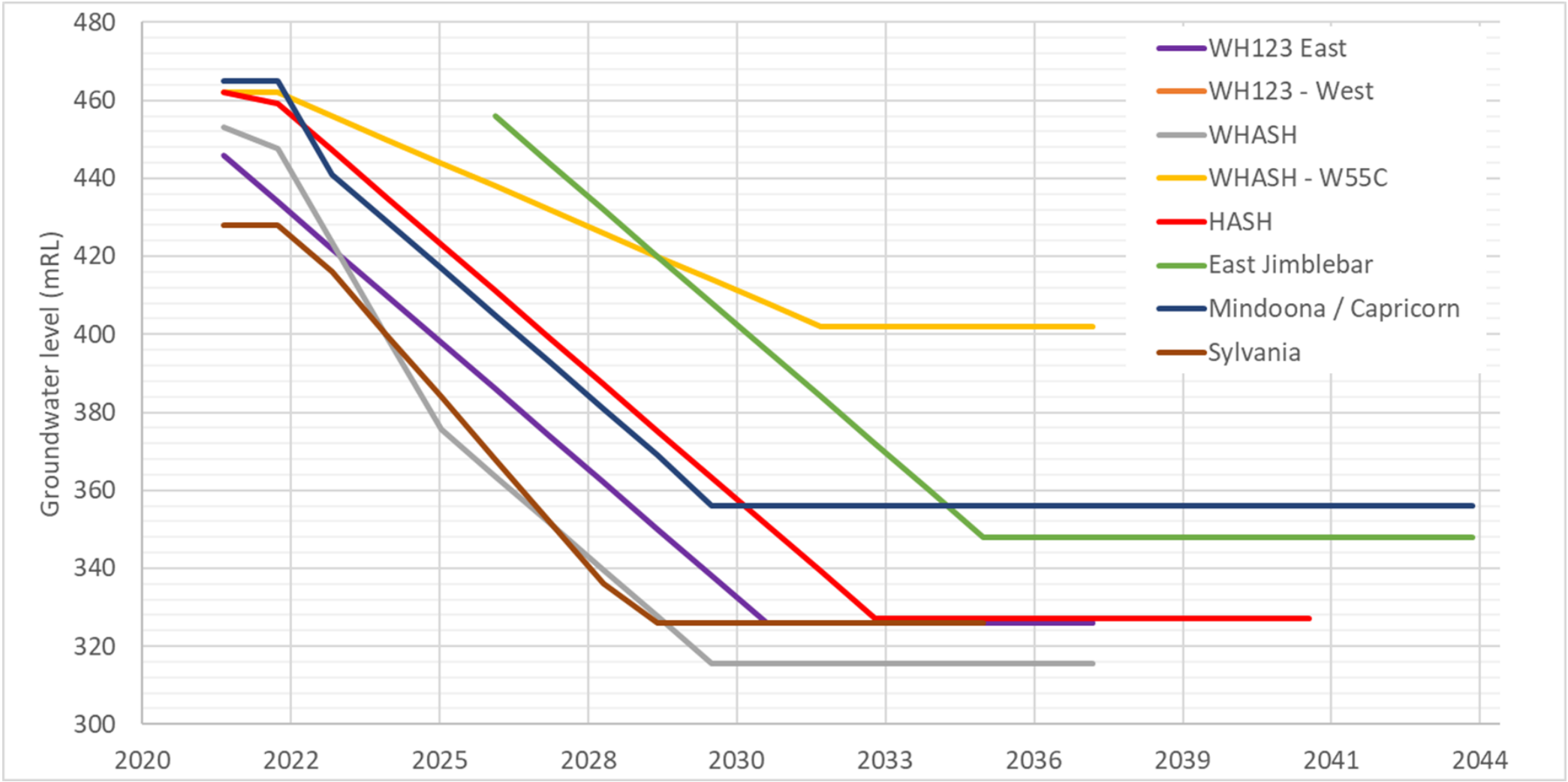


Figure 9.24 Target dewatering levels

9.6.2 Results

The predicted influence of mine dewatering on the groundwater system over the operational mine life is assessed using various methods:

- Yearly dewatering rate (Figure 9.25 and 9.26).
- Hydrographs at key bores (Figures 9.27 to 9.30)
- Regional drawdown contours in 2037, corresponding to the maximum depth of dewatering (Figure 9.31), and at the end of mining (Figure 9.32). These are calculated from the pre-development (steady state) conditions.

The results show that dewatering requirements:

- Have the potential to reach 140 ML/d by 2025 (compared to the mid-case of 90 ML/d)
- Are dominated by achieving the WHASH and Sylvania targets:
    - WHASH could reach a maximum of about 75 ML/d. However, in reality this would likely be divided more evenly between the WHASH and HASH (and even East Jimblebar) borefields.
    - Sylvania could reach a maximum of about 55 ML/d.

The results also show that drawdown at the end of mining is likely to spread to everywhere within both the eastern and western aquifer compartments. In more detail:

- The 1 m drawdown contour is predicted to extend:
    - Only marginally into the low-permeability Jeerinah Formation and volcanics to the south and slightly further into the Weeli Wolli Formation in the north.
    - Completely to the Wheelarra Fault and the flow barrier far in the east. Both of which are represented as no flow boundaries in the model.
- By the end of mining, drawdown is predicted to reach:
    - In the eastern compartment aquifers between 100 and 50 m around the active mining areas and between 50 and 25 m to the east of the mining areas.
    - Between 100 and 120 m in the western compartment.

Predicted drawdown (at the end of mining) in the model run with greater hydraulic connectivity to the north (Run 15) is shown in Figure 9.33 and the hydrographs are included in Figures 9.27 to 9.30. These show that predicted drawdown in this case has the potential to travel much further to the north but is generally similar in all other areas compared to the high dewatering case (Run 19B).

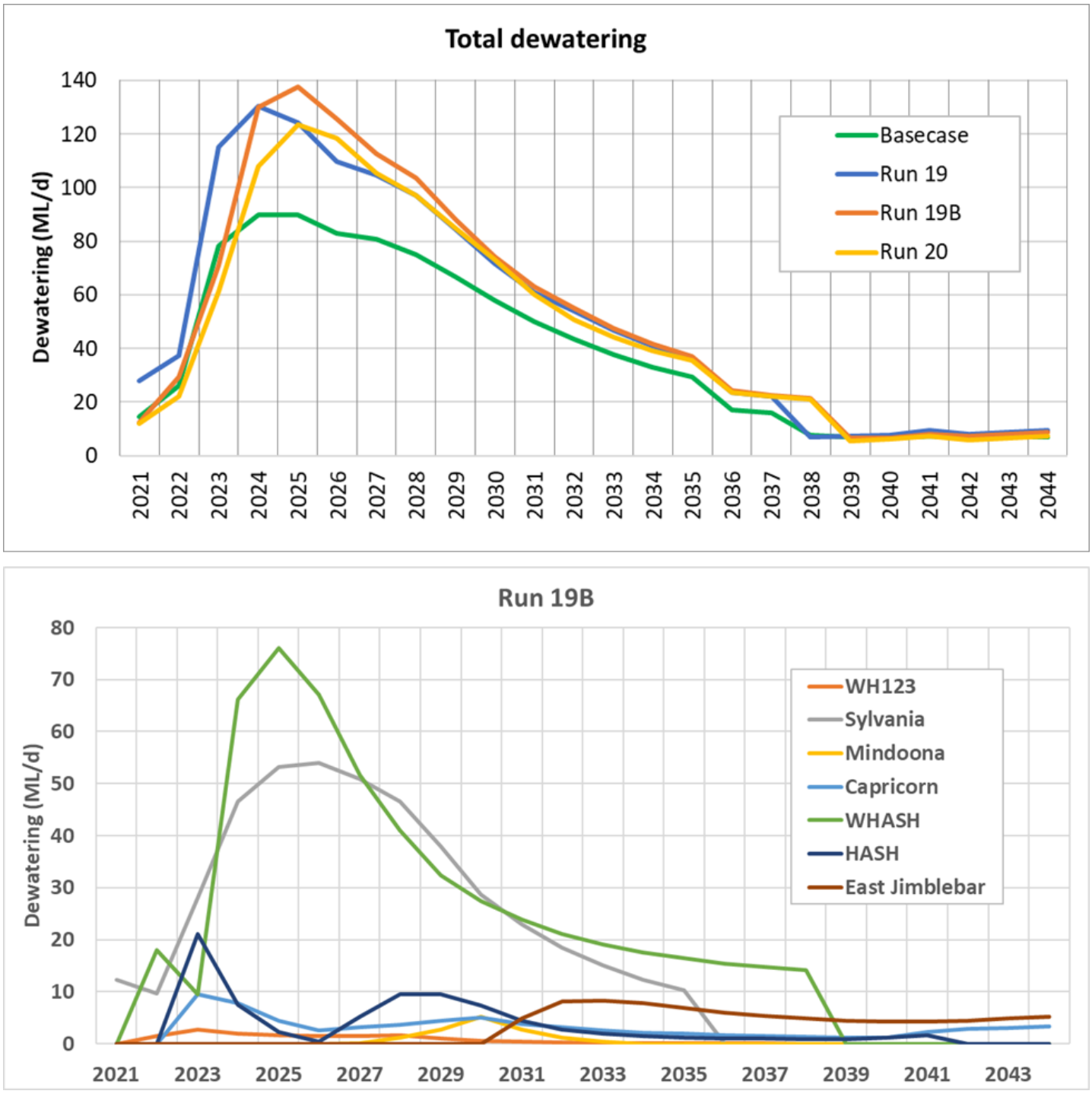
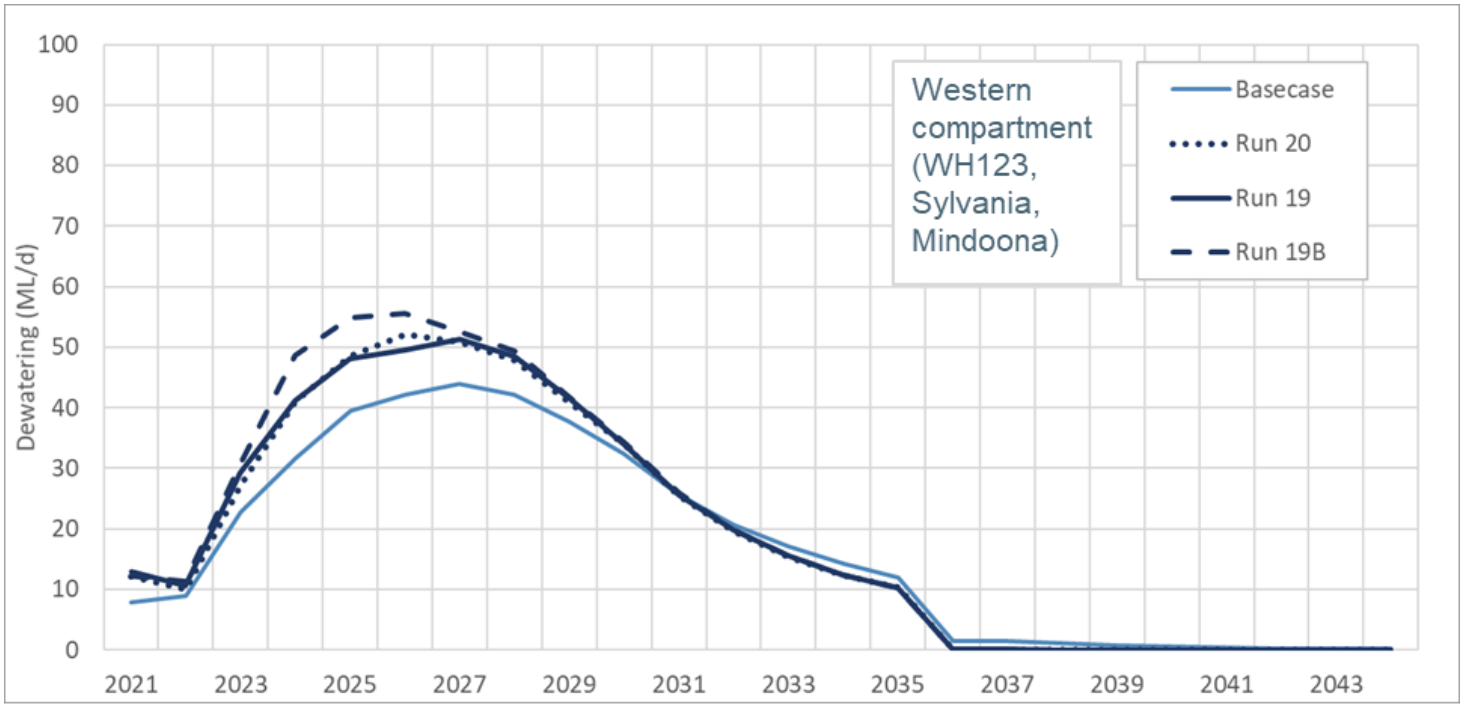


Figure 9.25 Simulated dewatering rates



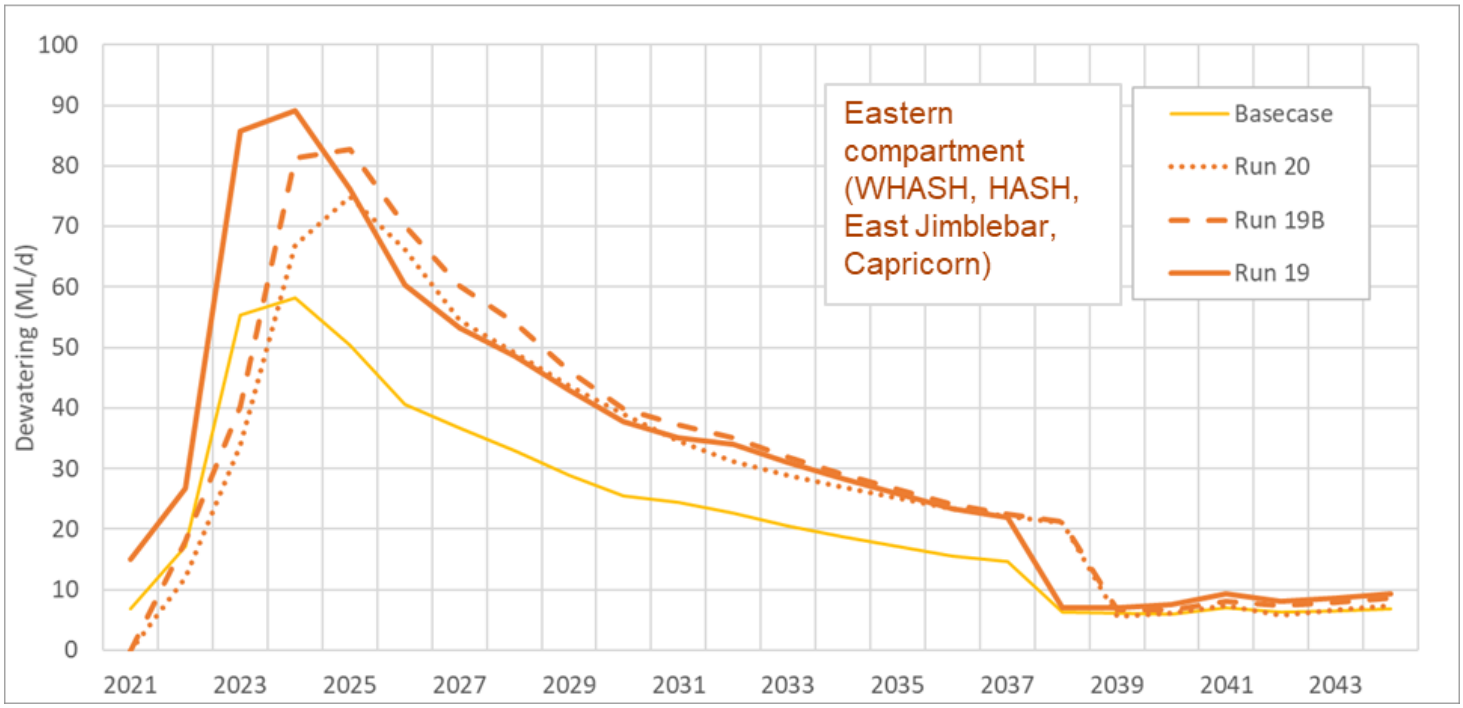


Figure 9.26 Predicted dewatering rates by compartment

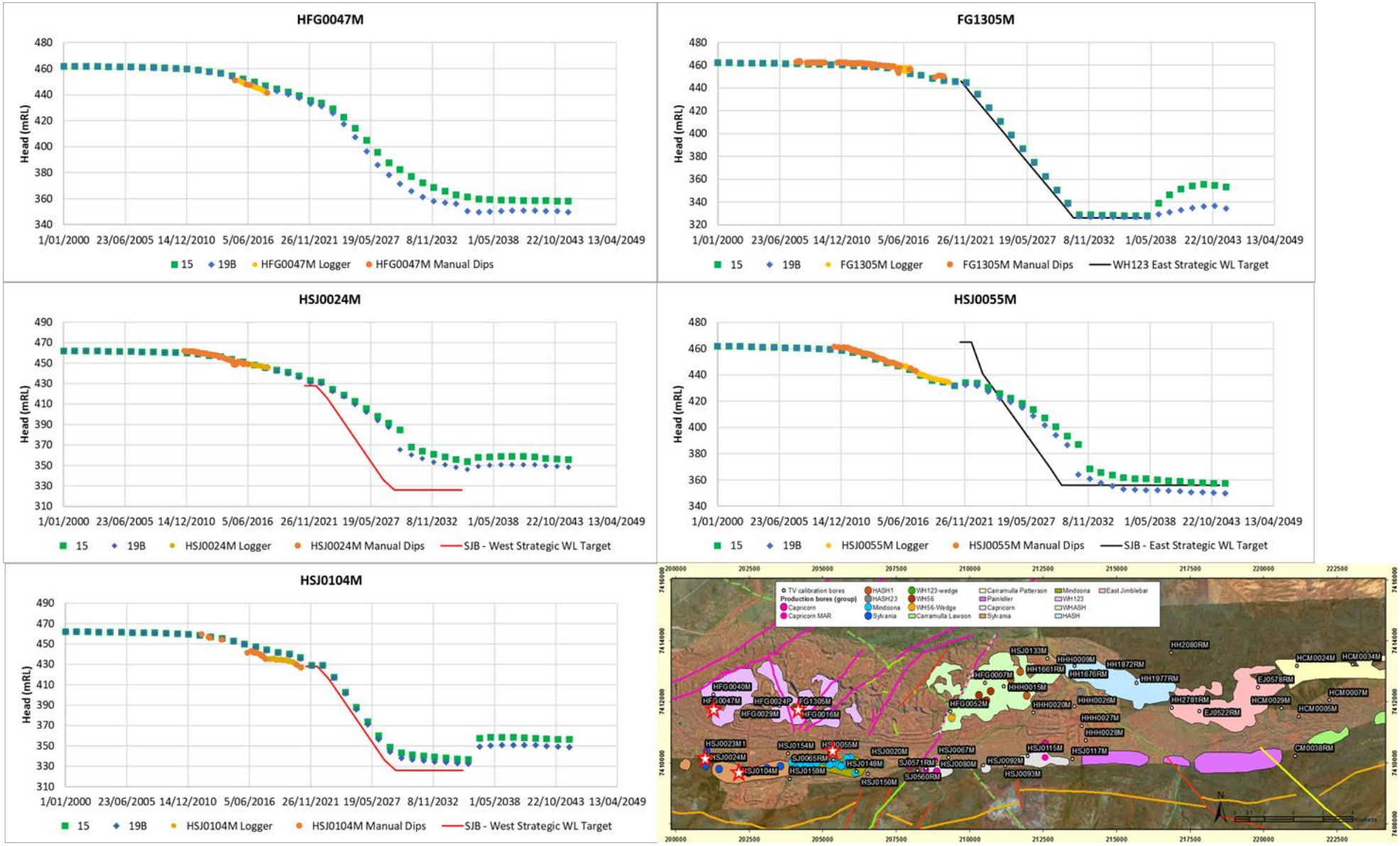


Figure 9.27 Predicted heads during dewatering (Run 19B and 15) – Western aquifer compartment

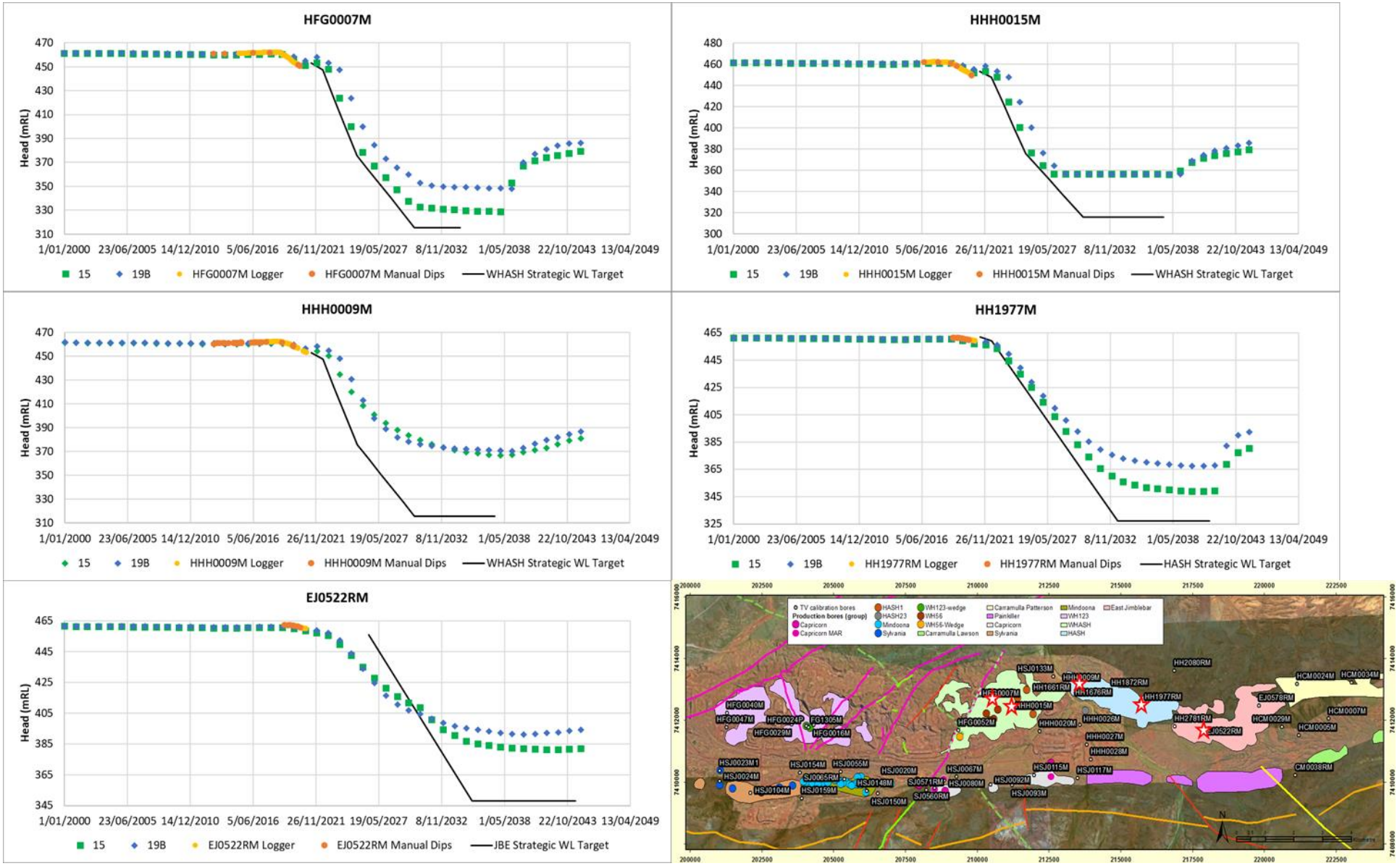
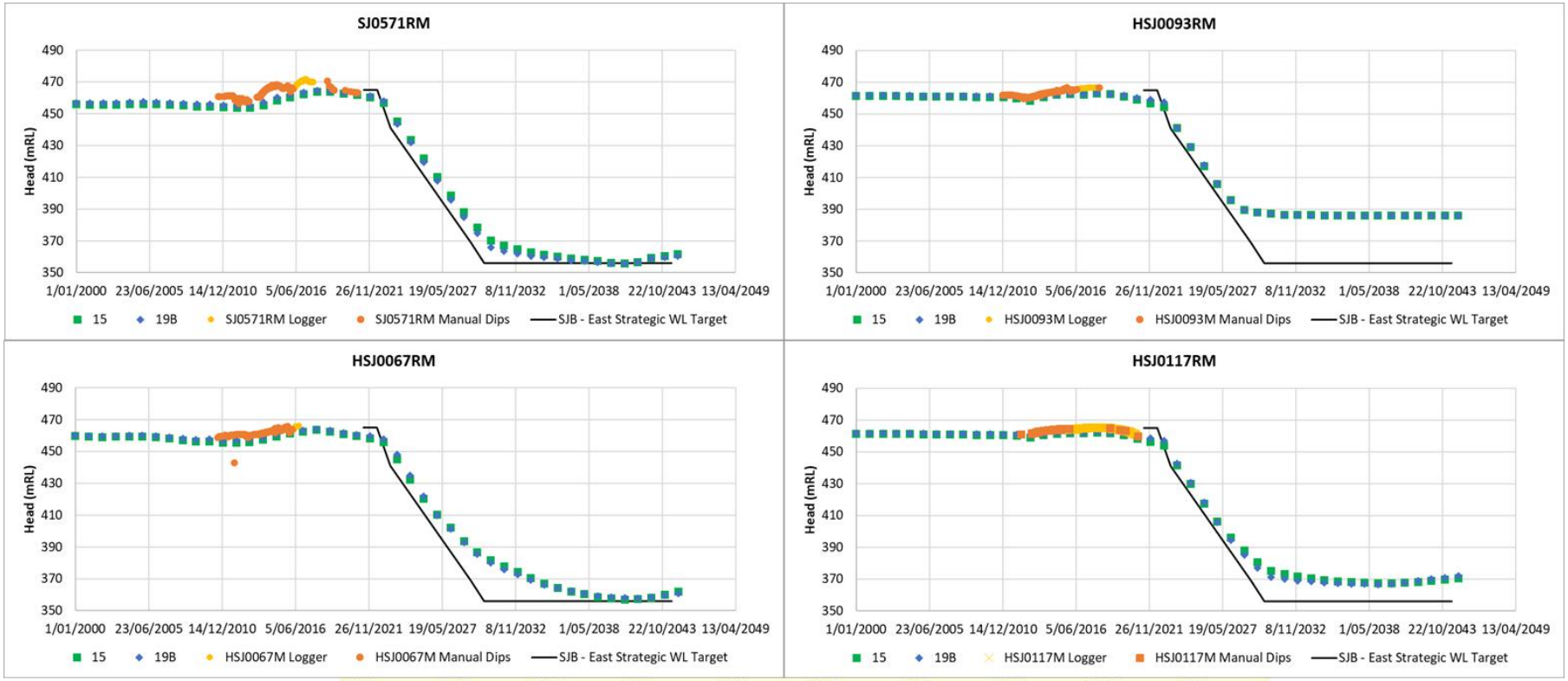


Figure 9.28 Predicted heads during dewatering (Run 19B and 15) – Eastern aquifer compartment (1)



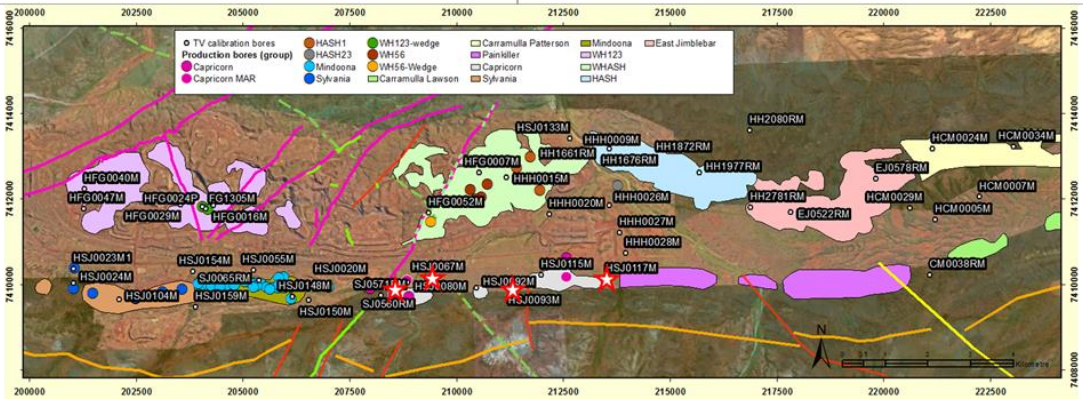
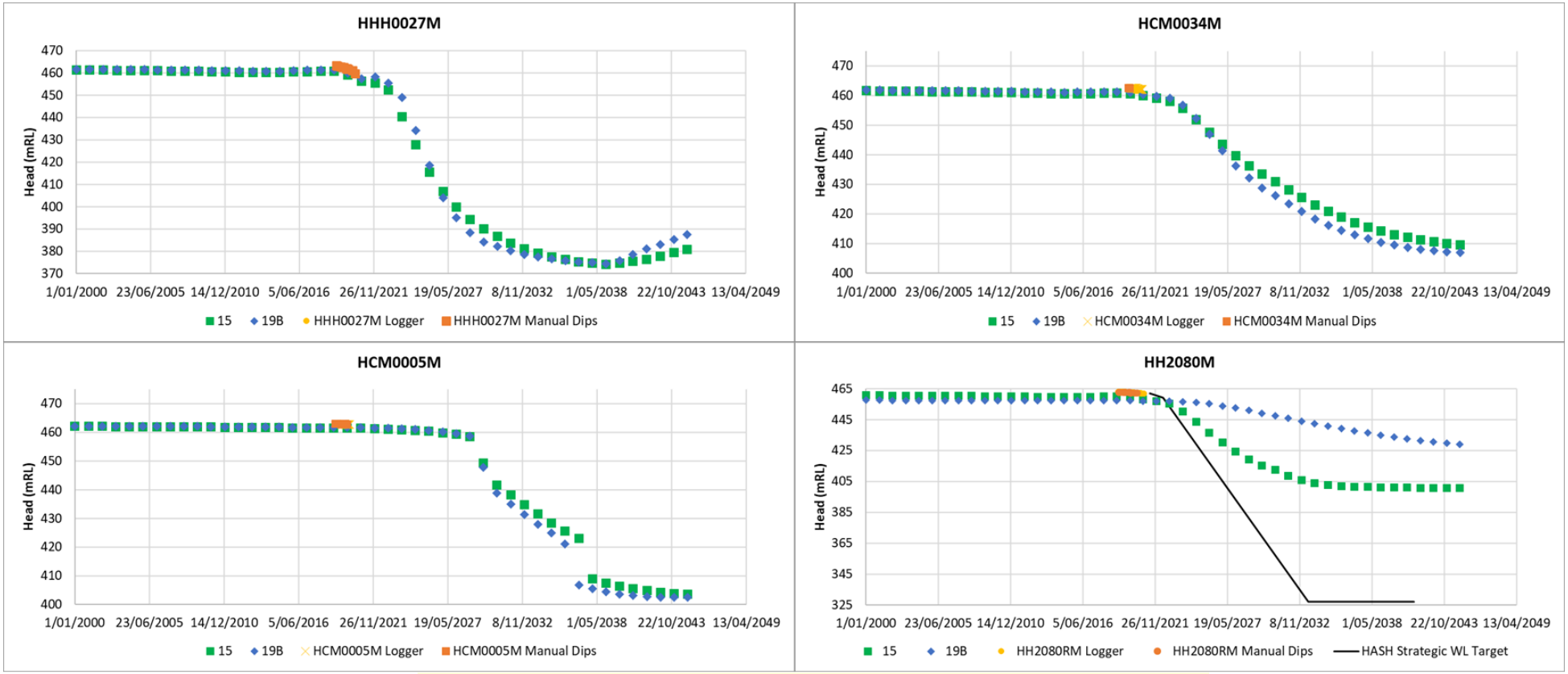


Figure 9.29 Predicted heads during dewatering (Run 19B and 15) – Eastern aquifer compartment (2)



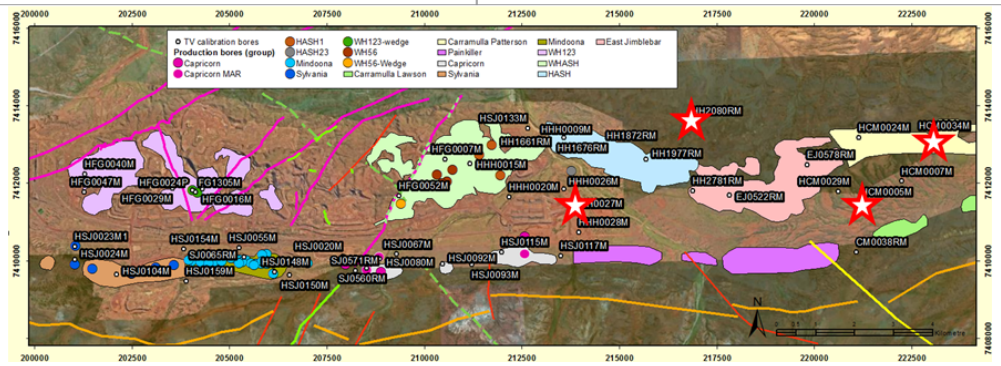
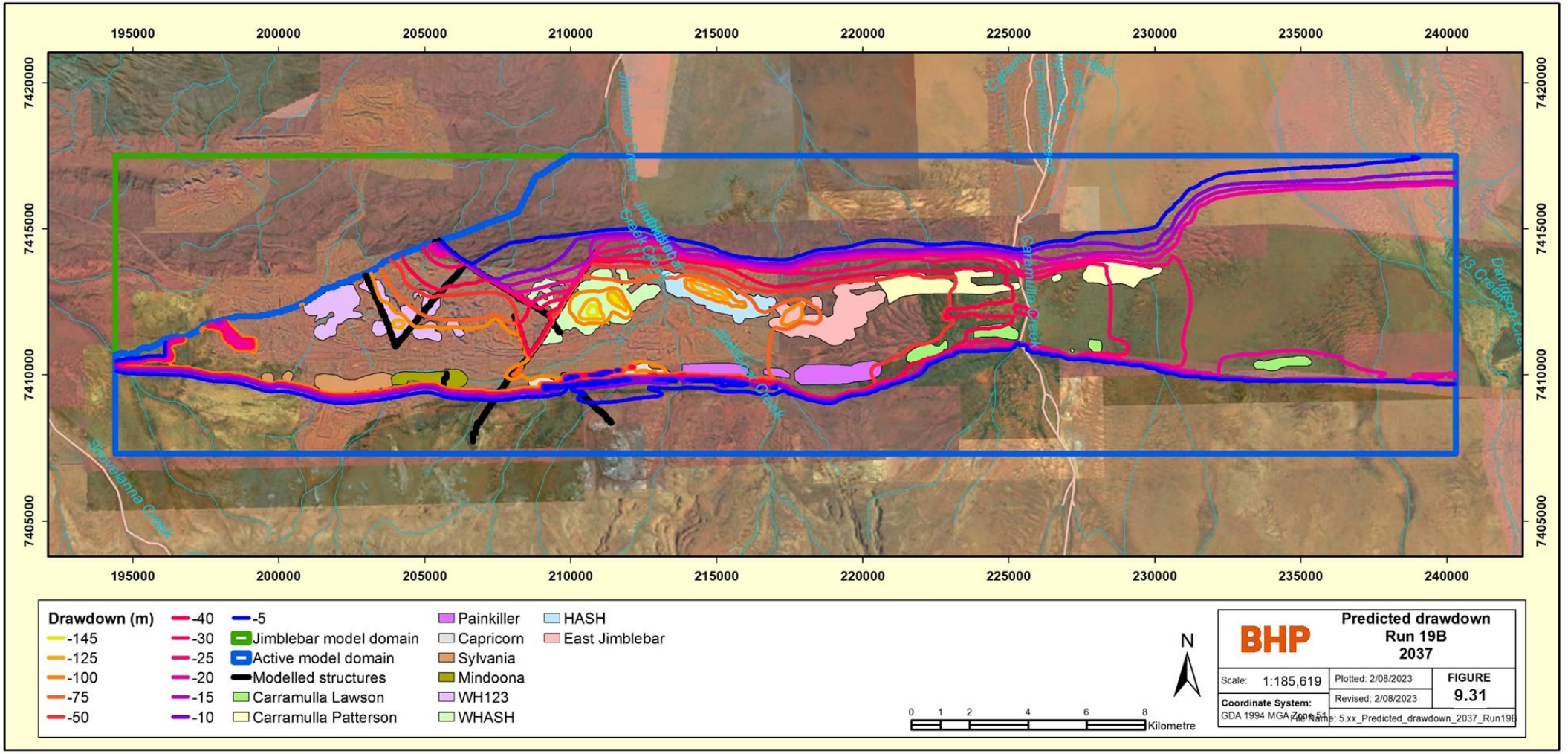
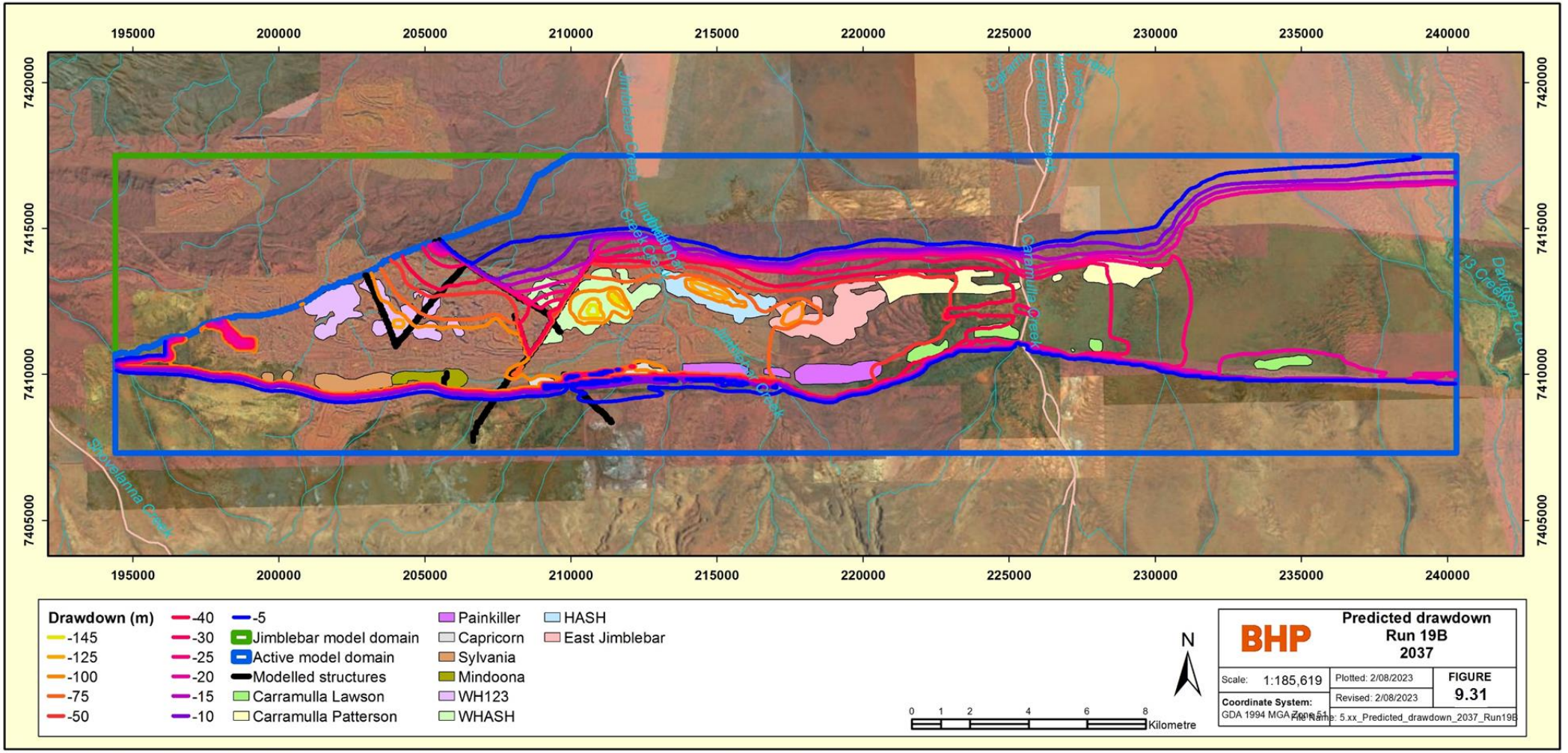


Figure 9.30 Predicted heads during dewatering (Run 19B and 15) – Eastern aquifer compartment (3)



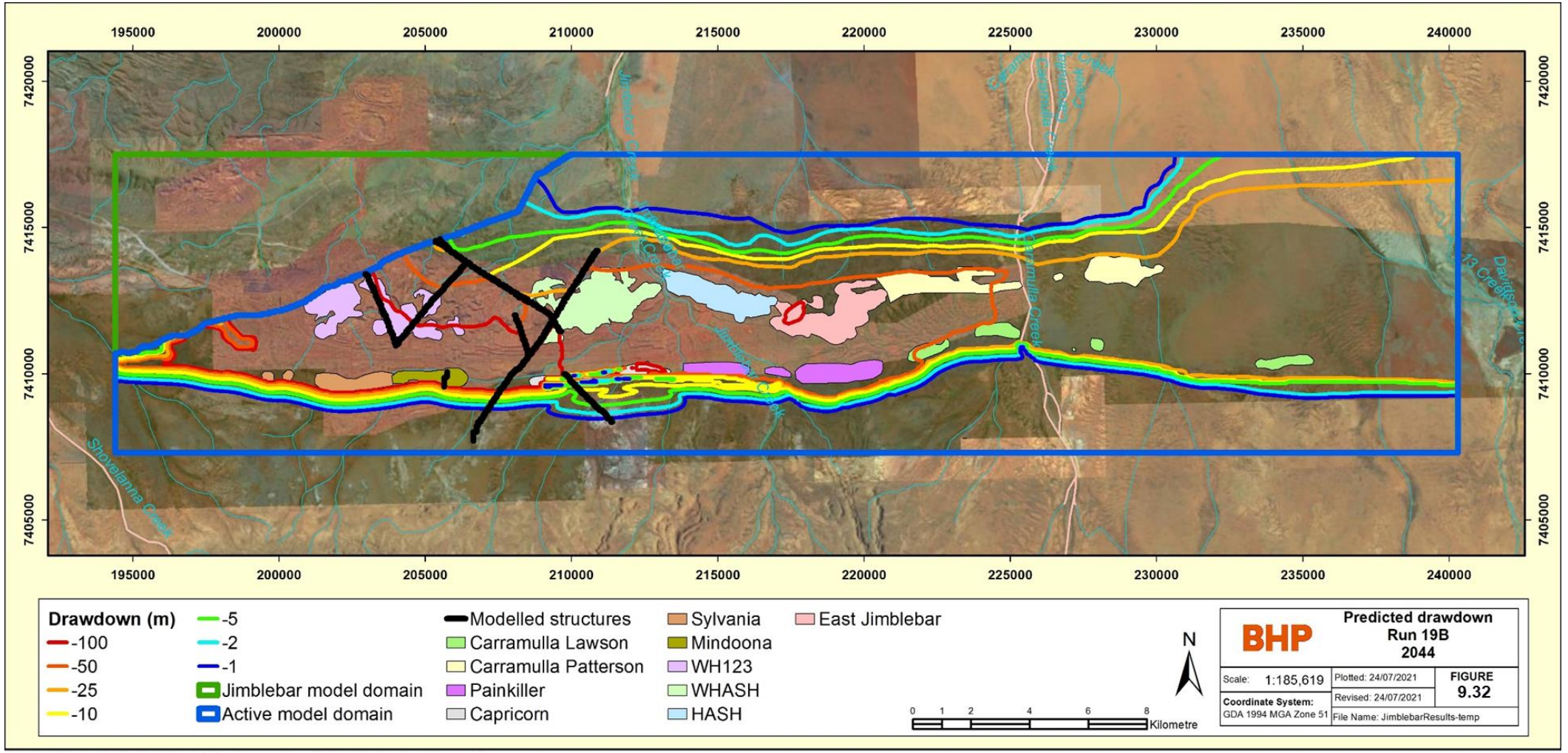
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Figure 9.31 Predicted drawdown Run 19B 2037



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Figure 9.32 Predicted drawdown Run 19B 2044



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Figure 9.32 Predicted drawdown Run 19B 2044

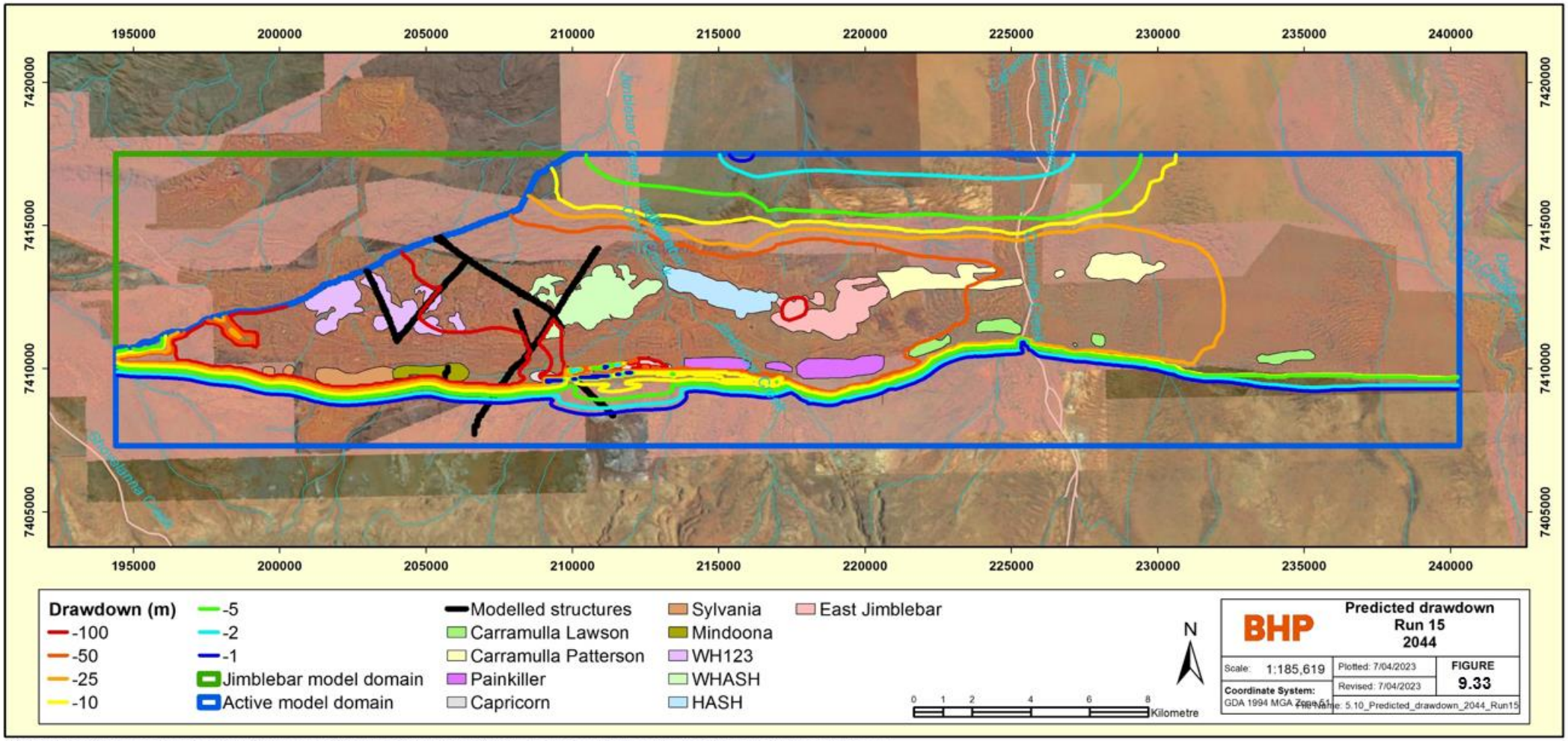


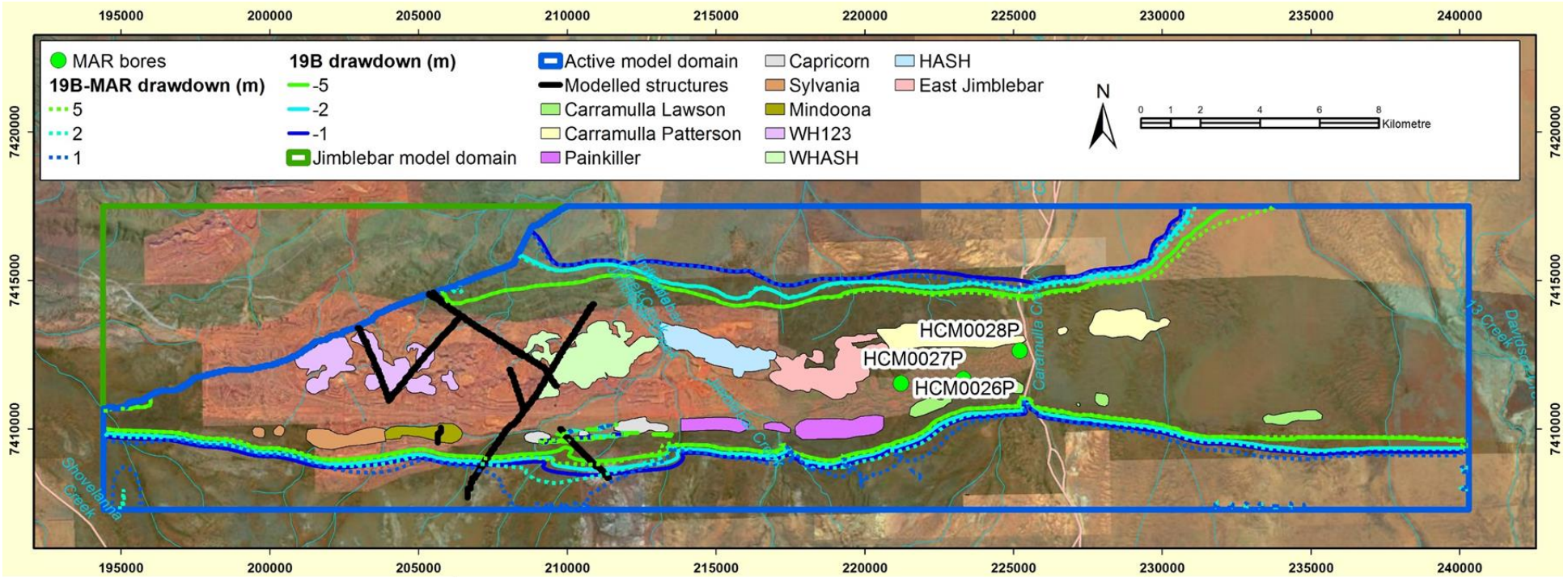
Figure 9.33 Predicted drawdown Run 15 2044

9.6.3 Influence of Caramulla Managed Aquifer Recharge

The model that produced the greatest dewatering rate (Run 19B) was used to assess the influence of the Caramulla Managed Aquifer Recharge (MAR) scheme on model predictions. The scheme is planned for a capacity of 15 ML/d and will be operational from April 2022 until the end of dewatering (in the model this equates to 23 years of injection, totalling (126,000 ML). The injection bores shown in Figure 9.34 were used, with each assigned a constant injection rate of 5 ML/d over this period.

The predicted dewatering rate with MAR and the drawdown contours in 2044 are shown in Figure 9.34. Hydrographs at key bores in the vicinity of the MAR borefield are shown in Figure 9.35. These show that Caramulla MAR:

- Increases the maximum dewatering rate to 145 ML/d.
- Increases total abstraction from 453,000 ML to 530,000 ML (an additional 77,000 ML/d, or 60% of the injected water).
- Reduces the drawdown in the regional aquifer by almost 20 m close to the MAR borefield (HCM0005M and HCM0034M) and 10 m as far west as Hullabaloo (HHH0027M).
- Doesn't change the extent of the drawdown footprint (i.e., the position of the 2 m drawdown contour is unchanged compared to the without MAR case).



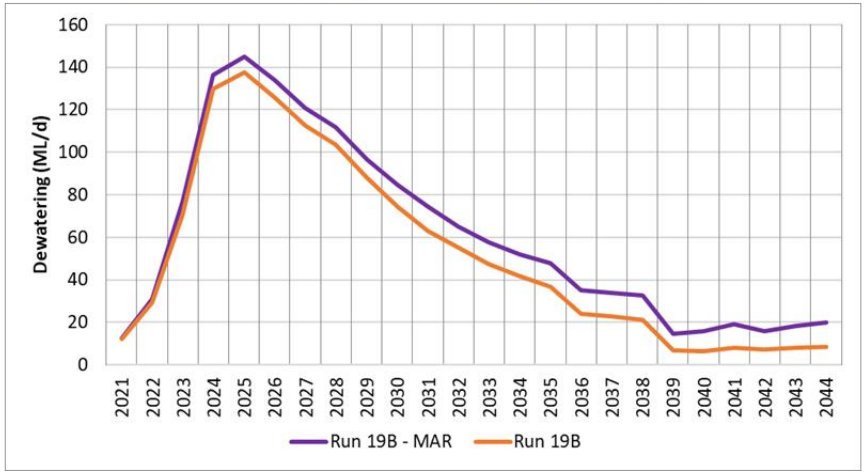
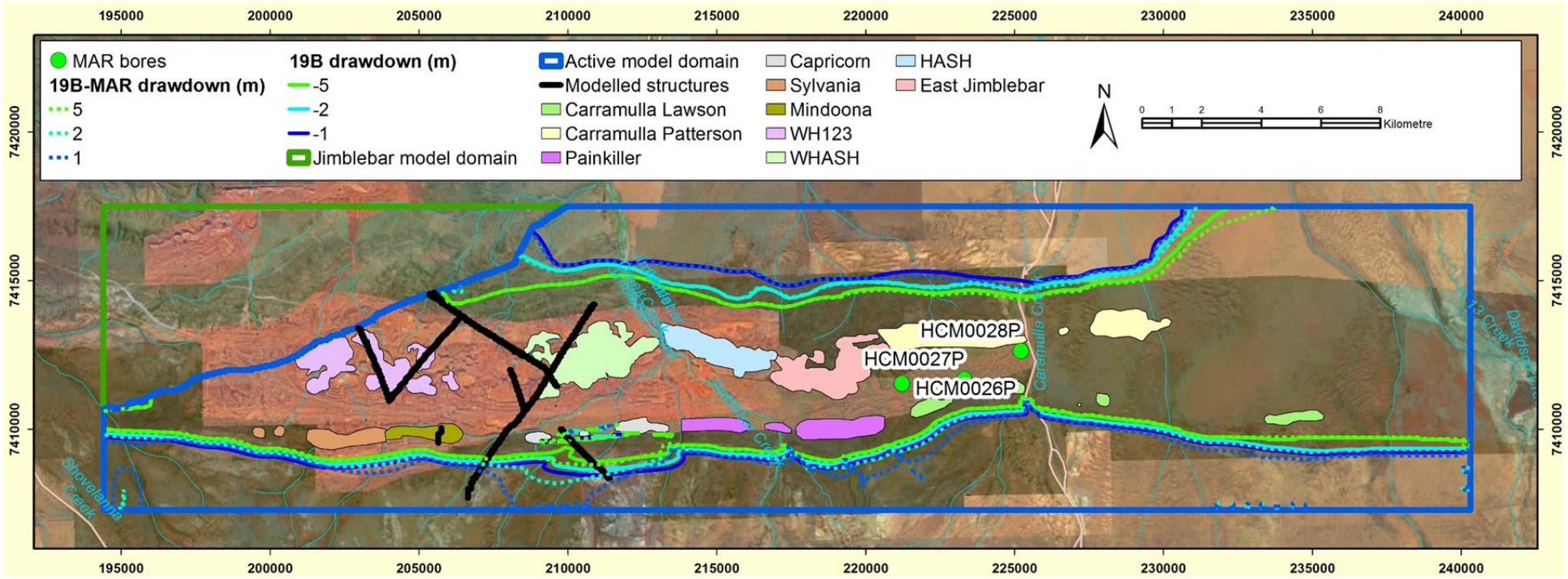


Figure 9.34 Effect of Caramulla MAR on dewatering rates and drawdown



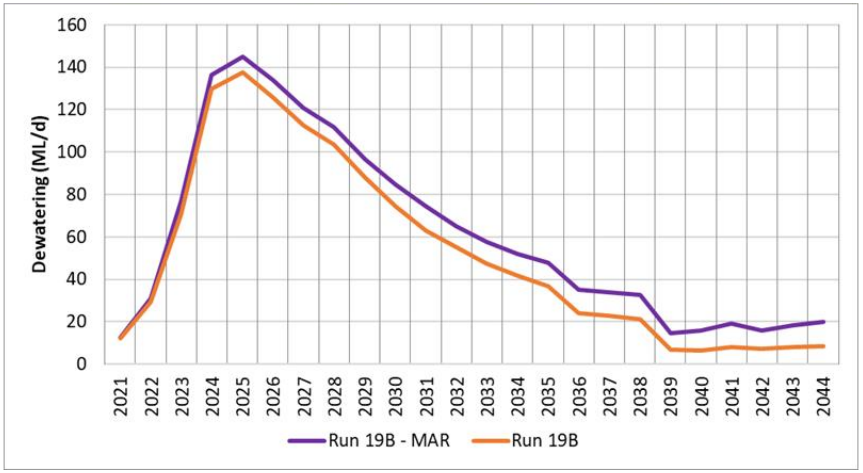


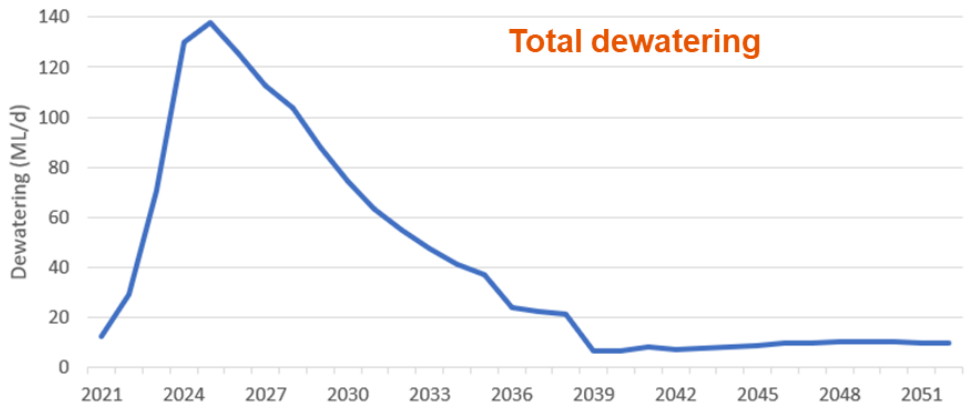
Figure 9.35 Predicted heads during dewatering (Run 19B and 19B-MAR) – Eastern aquifer compartment

9.6.4 Dewatering until 2052

The runs that predicted the highest dewatering and greatest drawdown (Runs 19B and 15 respectively) were used to assess the impact of continuing dewatering until 2052 (an additional 8 years from 2044). The models were extended in time and the Drain Boundary Conditions modified so that the two orebodies that were still being dewatered at the end of the original model run (East Jimblebar and Capricorn) continued until 2052. Groundwater levels were maintained at the final elevations used in 2044 (Figure 9.24).

The predicted dewatering rate is shown in Figure 9.36 and the drawdown contours in 2052 in Figure 9.37. These show that:

- Dewatering from 2044 to 2052 remains at about 10 ML/d (7 ML/d from East Jimblebar and 3 ML/d from Capricorn).
- Drawdown in 2052 for Run 19B is very similar to that predicted in 2044.
- The extent of drawdown in 2052 for Run 15 is similar to that predicted in 2044. The magnitude, particularly to the east however, has increased significantly over this period.



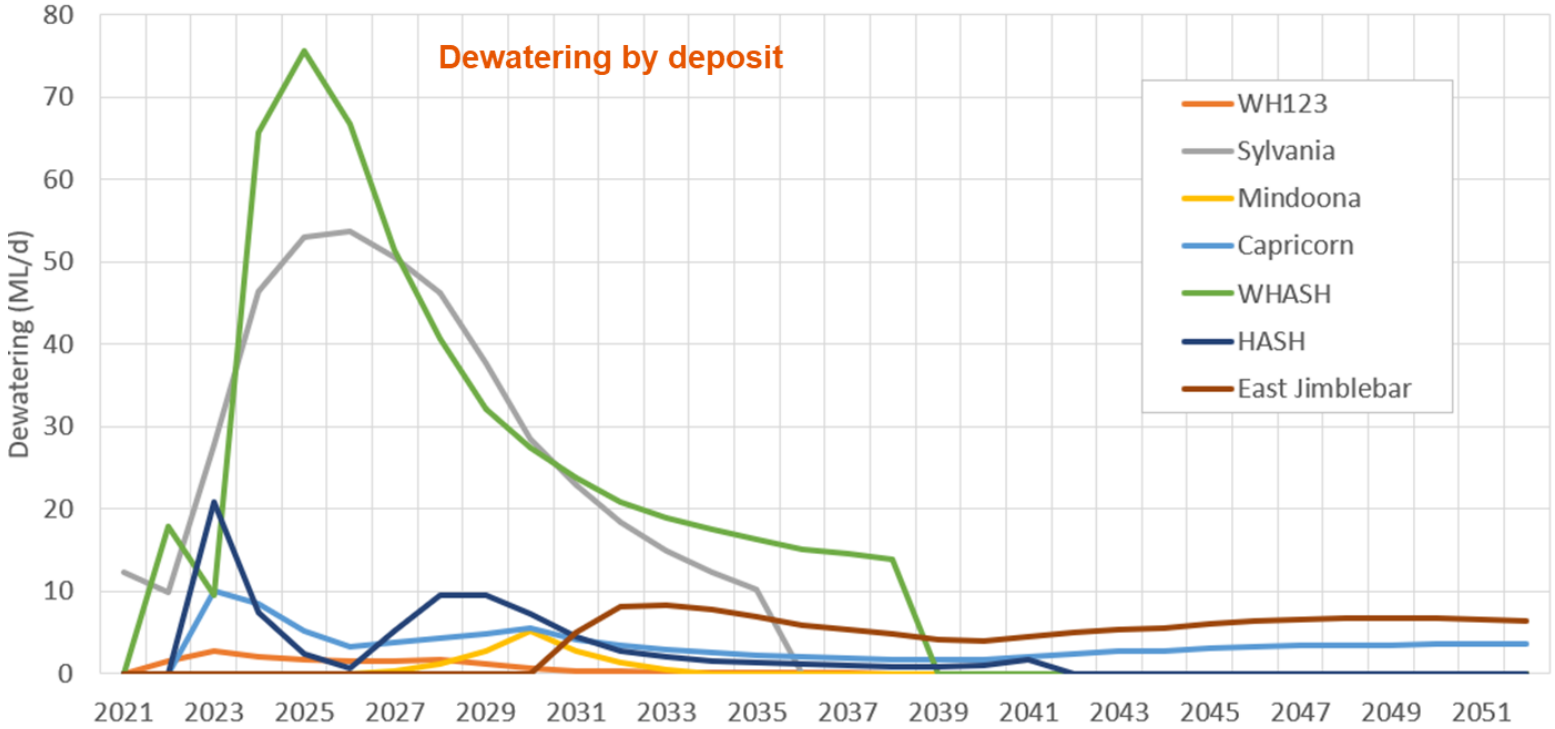


Figure 9.36 Predicted dewatering until 2052

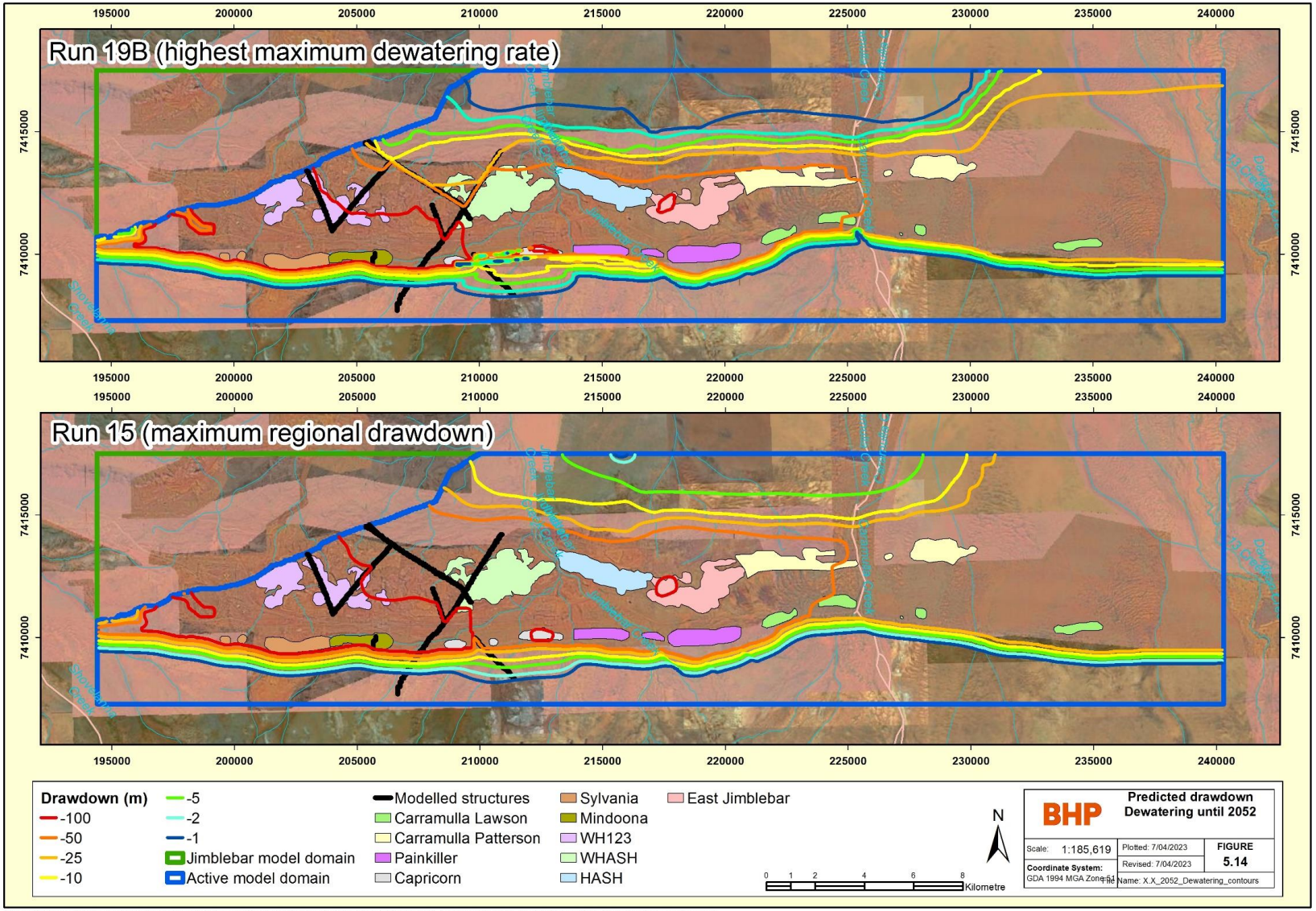


Figure 9.37 Predicted drawdown dewatering until 2052

9.7 Closure

Post mine closure, recovery of groundwater levels within the Jimblebar catchment will be driven by rainfall recharge only. No other inputs of water to the system are anticipated. Simple calculations, based on predicted volume abstracted over the life of mine, the area over which rainfall recharge can occur and the rate at which recharge occurs suggest that the time period for full recovery could be anything between 3,000 and 500 years. This assumes a range of rainfall recharge rates between 0.5% / 0.25% (South Jimblebar Valley and orebodies / everything else) and 2.0% / 1.0% of historical annual rainfall.

The calculations based on the 0.5% / 0.25% recharge rate are as follows:

Area of enhanced recharge (0.5%) = 56,425,000 m^2

Area of limited recharge (0.25%) = 112,850,000 m^2

Average rainfall (historical) = 0.31 m/yr

Recharge rate over area of enhanced recharge = 0.31 m/yr x 0.5% x 56,425,000 m^2 = 87,500 m^3/yr

Recharge rate over area of limited recharge = 0.31 m/yr x 0.25% x 112,850,000 m^2 = 87,500 m^3/yr

Total recharge to groundwater catchment = 87,500 m^3/yr + 87,500 m^3/yr = 175,000 m^3/yr

Total volume abstracted up to end 2020 (minus Capricorn MAR) = 52,000,000 m^3

Total volume abstracted from 2021 to end of mine life = 453,000,000 m^3

Total volume abstracted from groundwater catchment = 505,000,000 m^3

Total volume abstracted / total recharge to system = 505,000,000 m^3 / 175,000 m^3/yr = *2,900 years*

Operation of the Caramulla MAR scheme will reduce the recovery time, although, as there will be some recirculation into the dewatering bores, MAR will not have a significant impact on the order of magnitude of recovery time.

The steady state base case model was used to determine the potential influence of pit voids in recovery levels. Two scenarios were considered:

1. All pits left as open voids (i.e. no backfill)
2. Pits identified as having Potential Acid Forming (PAF) properties backfilled above pre-mine water table (WH56 / H1, WH123) and all other pits left as open voids.

The base case model was used for this analysis. Evaporation from the pit voids was simulated using drain cells set at the base elevation of each pit and with a low conductance value of 1 m^2/d. This represents a significant simplification of the processes that will occur once water levels start to recover (i.e., the interplay between groundwater inflow, evaporation rate, lake size (pit geometry) and recharge) but given the major uncertainties with all aspects of simulating the groundwater system post closure (i.e., associated with these inputs over the period of centuries) this is considered appropriate at this stage.

The predicted equilibrium recovery levels are shown in Figure 9.38 for both scenarios. This shows that:

- In the no backfill case, water levels recover to about 340 mRL in the western compartment and 360 mRL in the eastern compartment (compared to 462 mRL pre-development levels).
- In the PAF backfill case, water levels recover to about 340 mRL in the western compartment and 370 to 380 mRL in the eastern compartment (compared to 462 mRL pre-development levels).

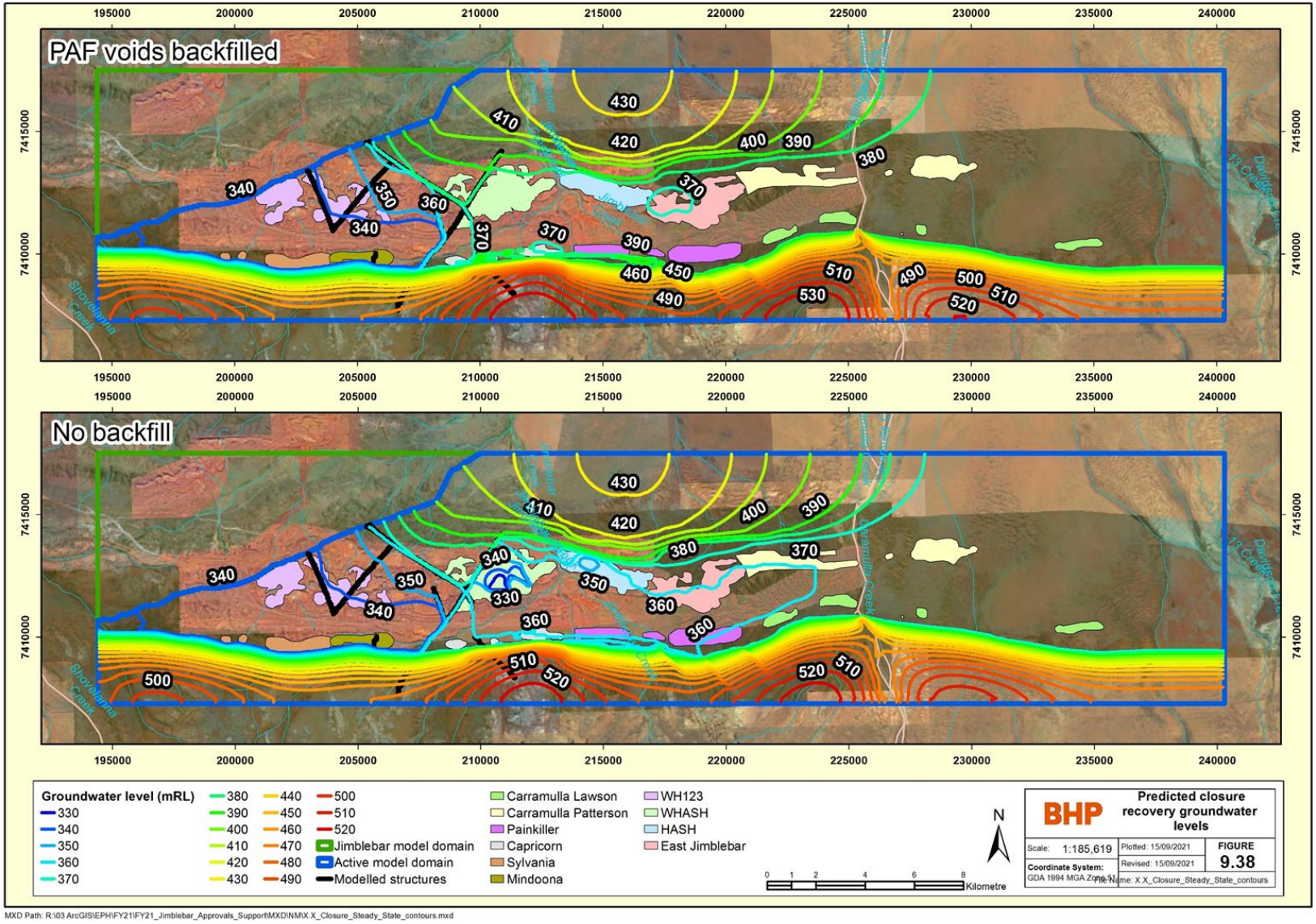


Figure 9.38 Predicted closure recovery groundwater levels

These runs show that there is little difference between the two scenarios:

- no difference in the western compartment because the water levels are controlled by evaporation from the Sylvania open void with its base at 338 mRL
- higher recovery levels in the eastern compartment because the deepest pits WHASH (324 mRL) and HASH (339 mRL) are backfilled in the PAF case and the remaining open voids Capricorn and East Jimblebar have void depth of 368 mRL and 360 mRL respectively.

The analysis therefore suggest that whether or not the PAF pits are backfilled, groundwater levels with any open voids will remain significantly lower than pre-development levels. This assumes a very low recharge environment however (0.5% and 0.25% of rainfall and no enhanced recharge into the open voids themselves) and can be considered very conservative.

9.8 Modelling conclusions

The Jimblebar numerical model has been modified and improved to enable predictions of groundwater abstraction and associated drawdown from the life of mine dewatering of the Mindoona, Sylvania, Capricorn, WH123, WHASH, HASH and East Jimblebar deposits.

Long-term dewatering and monitoring of the groundwater response has shown that the area is hydraulically “cut in two” by the Central Fault which is infilled by a dolerite dyke. The dyke trends roughly northeast – southwest and separates a western compartment from an eastern compartment. The eastern compartment is potentially three times larger than the western compartment and this is likely to have a significant impact on dewatering rates.

Predictive confidence is assessed to be high in the western compartment, where the majority of dewatering activity has historically been focussed.

Predictive capability in the eastern compartment is assessed to be moderate (western half) to low (eastern half). This compartment is much larger than the western compartment and has only recently been subjected to dewatering stresses.

The model suggests that dewatering of the:

- deposits in the western compartment should be achievable with a maximum rate of about 55 ML/d.
- deposits in the eastern compartment should be achievable with a maximum rate of about 90 ML/d.

Drawdown from these activities is predicted to be extensive within the Marra Mamba and Brockman Formation orebody aquifers, and the dolomite and Tertiary Detrital regional aquifers. This drawdown may exceed 100 m in the eastern compartment, and between 50 and 100 m in the vicinity of the mining areas in the western compartment. Monitoring data suggest that the local and regional aquifers are hydraulically well connected throughout most of the area (although not across the Central Fault).

Drawdown is not predicted to migrate west of the Wheelarra Fault or south into the granite bedrock. Drawdown is predicted to propagate to the east in the regional aquifers until it reaches the hydraulic barrier that is situated to the east of the Caramulla deposits. The future migration and magnitude of drawdown to the north is uncertain and hard to predict at this point.

Post closure the groundwater system is likely to take many centuries to recover. Predictions of what the groundwater levels will recover to when pits are left as open voids and evaporation is allowed to occur are very uncertain due to the combination of long time of recovery (and the uncertainty that this inherent in this) and the significant uncertainty in rainfall recharge.

10 Assessment of Potential Impacts

The identification and assessment of water related risks is in accordance with BHP's Our requirement for Risk Management outlined in BHP's *Water Management Standard* (BHP, 2023b). The standard includes catchment or basin scale risk and controls including environmental, community, third party and cumulative impacts (BHP, 2023b). BHP is committed to external engagement and collaboration to support social value initiatives, commercial arrangements, regulatory requirements, closure objectives and management of water related through but not limited to:

- External stakeholder engagement strategy
- If required contracts and agreements established for third-parties
- Water licences and approval conditions executed in accordance with regulatory and jurisdictional conditions and requirements

The groundwater model developed for Jimblebar has been used to estimate the extent of drawdown from dewatering at a maximum rate of 140 ML/d. The estimated drawdown at the end of mining (for several different uncertainty cases) are detailed below and provided in Figure 10.1.

10.1 Third party groundwater users

10.1.1 Pastoral bores

Jimblebar has an extensive groundwater monitoring network and will monitor any effect of drawdown if they occur. If Pastoral bores are effected mutual arrangements will be undertaken to ensure water supply is not affected and maintained.

10.1.2 Mining / Unknown Companies

There is some uncertainty on whether the dewatering activities will have an impact on water resource availability to where the Atlas Iron Ore bore is situated (Section 9.5.2). The bore could see a drawdown of 2 m occurring in their vicinity (Figure 10.1). Adequate monitoring will be put in place to mitigate any detrimental impact to the water resource at that location. There are no potential impacts considered for the Rio Tinto and the unknown bore located outside of the model domain.

10.1.3 Jigalong Aboriginal Reserve

Drawdown from Jimblebar dewatering is not predicted to migrate south across the granite bedrock and as such there is no potential impact on the Jigalong Aboriginal Reserve.

10.2 Local and Regional ecological assets

10.2.1 Innawally Pool

As discussed in section 4 Innawally Pool is a perched water feature and is not connected with the regional aquifer. BHP will continue to manage the discharge of surplus water to creeks through the continued implementation of the *Jimblebar Hub Water Management Plan*, to ensure that the surplus water discharge does not reach Innawally Pool under natural no flow conditions.

10.2.2 Ethel Gorge

Drawdown from Jimblebar dewatering is not predicted to migrate west across the Wheelarra Fault and as such there is no potential for drawdown reaching Ethel Gorge. Furthermore given the proposal will result in an increase to surplus water, the combined forecast surplus discharge from Jimblebar Hub will be less than the prescribed limit of the Part V licence of 32.625 GL/a. Groundwater levels and flow in the Ethel Gorge aquifer will be maintained to support the

stygofauna habitat of the Ethel Gorge TEC. Furthermore regional scale management through existing surplus water scheme of Ophthalmia Dam and prescribed mitigation actions detailed in the EPWRMP will be undertaken. Thus the level of impact will not be greater in magnitude than what is currently approved and there is no predicted change as a result of this proposal.

10.2.3 Newman Water Reserve

Drawdown from Jimblebar dewatering is not predicted to migrate west across the Wheelarra Fault and as such there is no potential impact on the Newman drinking water supply.

10.3 Other operations

Drawdown to the west toward the other BHP operations and borefields is attenuated by the Wheelarra Fault, which has been shown to form a regional hydraulic boundary. Consequently, these activities are not expected to be impacted by the dewatering drawdown footprint.

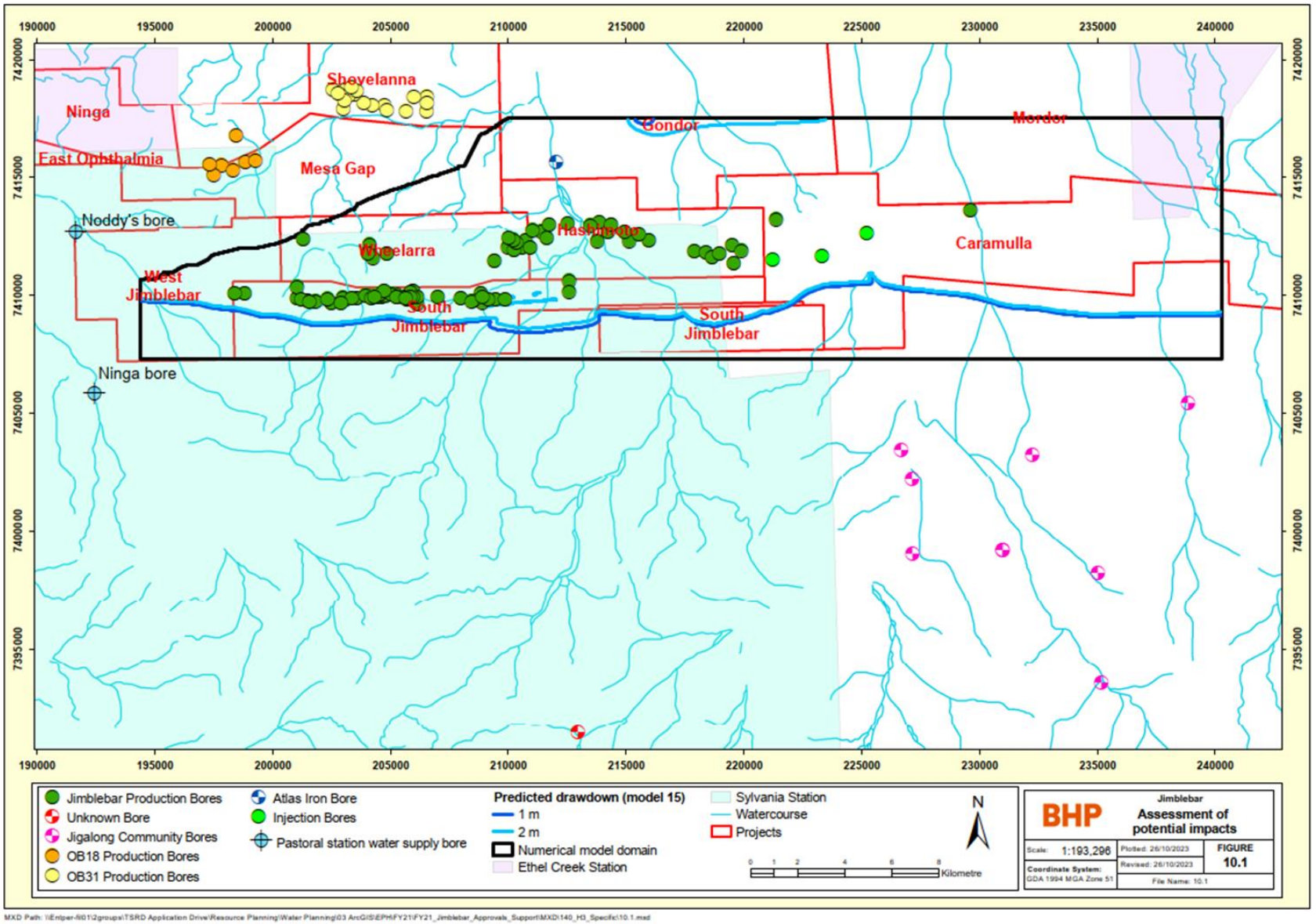


Figure 10.1 Assessment of potential impacts

11 Groundwater Monitoring

Monitoring of abstraction and water quality is undertaken in accordance with monitoring table (Table 3) outlined in the BHP GWL Operating Strategy for Jimblebar 4.0. Design of the monitoring program follows a source, pathway and receptor approach and currently focuses on the pathway from east to west across the Wheelarra Fault with the addition of regional bores.

As part of the Significant Amendment referral the GWOS will be updated to reflect current requirements of the source, pathway, receptor approach and where applicable will focus around areas of uncertainties identified by the model; assessment of aquifer performance and to determine any impact on other users/and or the environment.

Monitoring will also be in accordance with obligations set out in the Part V licence L5415/1988/9 and the updated Jimblebar Water Management Plan (JWMP) V0.1 (BHP, 2020).

12 Management Approach

BHP deems water as a finite resource and acknowledges how water plays an irreplaceable spiritual, cultural, ecological and economic role for different stakeholders in every landscape. BHP Water Management Standard sets the strategic direction for water management. Specifically for Jimblebar the Pilbara Water Resource Management Strategy (PWRMS) considers the hydrological changes resulting from BHP mining, the receiving receptors, potential impacts and the required risk-based adaptive management to mitigate potential impacts to acceptable levels.

The PWRMS is underpinned by regional water plans including the Eastern Pilbara Water Resource Management Plan (BHP, 2018b) and the JWMP. Each plan meets requirements of associated Ministerial Statements and outlines each key environmental value with outcome based provisions via trigger and threshold criteria.

Ethel Gorge TEC is managed through the EPWRMP (BHP, 2018), which is an adaptive, risk-based management approach designed to proactively counteract, mitigate and mange potential impacts (both predicted and actual) to an acceptable ecohydrological level. The EPWRMP has been reviewed and updated (Version 7.0) in concurrence with this report preparation to include potential impacts from surplus water discharge to Ophthalmia Dam/Ethel Gorge and Jimblebar Creek.

The JWMP includes outcomes based components including trigger and threshold criteria to manage the potential impacts of surplus mine dewatering form Jimblebar operations on regional aquifers and water features (Innawally Pool) and watercourses (Jimblebar Creek and Caramulla Creek) via groundwater injection and controlled discharge.

The Jimblebar AAR and GWOS will be the primary tools for assessing changes to local and regional groundwater levels and water quality.

13 Conclusions

A H3 level assessment has been undertaken to support the 5C application seeking an increase to GWL158795(11) for an annual water entitlement of 51,100,000kL/a (140 ML/d). The assessment consists of a conceptual hydrogeological model, which formed the basis for the development of the numerical groundwater model.

The model has been calibrated to current hydrogeological conditions using available water data concentrating on the response to dewatering at Jimblebar. Where the majority of dewatering activity has occurred this aligned with the predictive confidence of the model showing high confidence in the western compartment whereas less in the eastern

compartment given this area has only recently being subjected to stresses from dewatering. The calibrated model was used to predict dewatering rate over Jimblebar operations' mine life with the potential to reach 140 ML/d compared to the mid-case of 90 ML/d, with deposits in the western compartment achieving a maximum rate of approximately 55 ML/d and the eastern compartment a maximum rate of approximately 90 ML/d.

Monitoring data suggest that the local and regional aquifers are hydraulically well connected throughout most of the area (although not across the Central Fault). Drawdown is not predicted to migrate west of the Wheelarra Fault or south into the granite bedrock. Drawdown is predicted to propagate to the east in the regional aquifers until it reaches the hydraulic barrier that is situated to the east of the Caramulla deposits. The future migration and magnitude of drawdown to the north is uncertain and hard to predict at this point in time.

The level of impact is low with the majority of environmental values and third party users not being impacted by the proposal. Given the hydraulic connectivity there may be potential for water level reduction to the one Atlas Iron bore located to the north of the Jimblebar operations. A monitoring strategy (following a source, pathway and receptor approach) will be outlined in an updated GWOS which will be submitted to DWER following this application.

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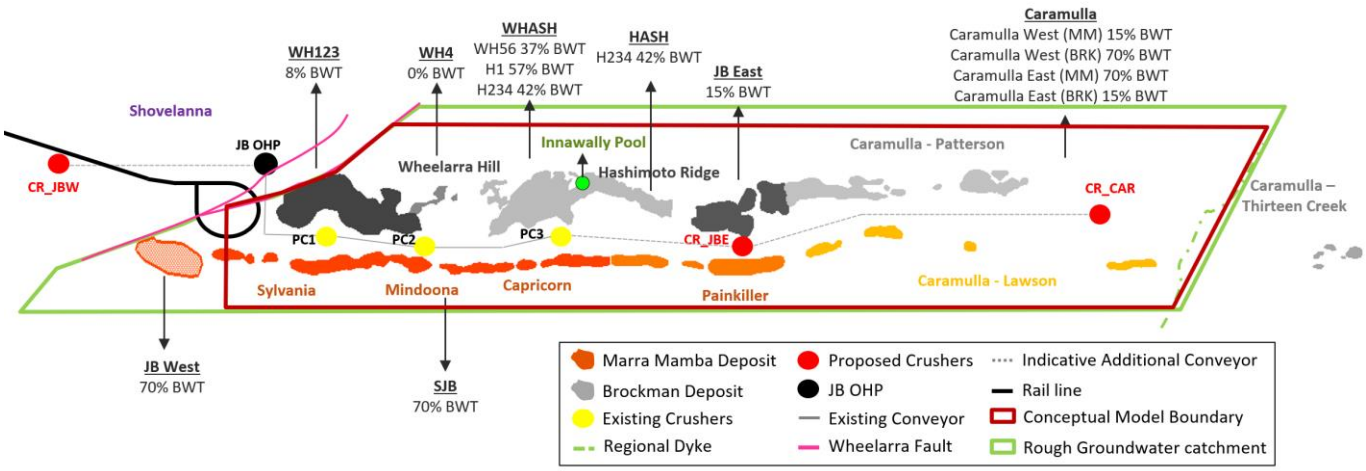
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15 Appendix A: Conceptual model

Jimblebar Conceptual Model

28 May 2021



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Objectives	3
Conceptual model boundary	4
Level of understanding	5
Conceptual model	6
Uncertainties	14
Knowledge and interpretation	16

Objectives

The objectives are to:

Provide a complete description of the Jimblebar conceptual groundwater model.

Provide evidence for all assertions and assumptions in the model. All data used should be stored in accessible format and locations.

Consider all aspects of the groundwater system that are pertinent to dewatering and impact assessment requirements.

Provide an assessment of uncertainty of all key elements of the conceptual model.

Provide a living document that can be updated easily.

Be concise.

Be developed and owned by BHP hydrogeologists to enhance in-house knowledge and ownership of the conceptualisation.

Conceptual model boundary

The broad Jimblebar-Wheelarra-Hashimoto-Caramulla mining area (referred to herein collectively as ‘Jimblebar’) has been conceptualised separately from the north-western Shovelanna mining area (which includes OB18 and OB31). This is due to the geographic and hydraulic isolation caused by the Wheelarra Fault (see Figure 1) that cuts between the two mining areas.

The extent of this conceptual model captures most of the potential mining areas at Jimblebar. The majority of the data is focused in the western part of the catchment.

The main Jimblebar groundwater catchment is defined within the following boundaries:

- West: The Wheelarra Fault
- East: The NE/SW trending Khyber Fault to the east of Caramulla
- North: Low permeability rocks (Weeli Wolli Formation)
- South: Low permeability rocks (granites etc.)

A note on nomenclature: references to South Jimblebar generally refer to the Mindoona, Sylvania and Capricorn deposits, WH123 refers to Wheelarra 123 deposits, WHASH refers to Wheelarra 56 and Hashimoto 1 deposits, and HASH refers to Hashimoto 234 deposits.

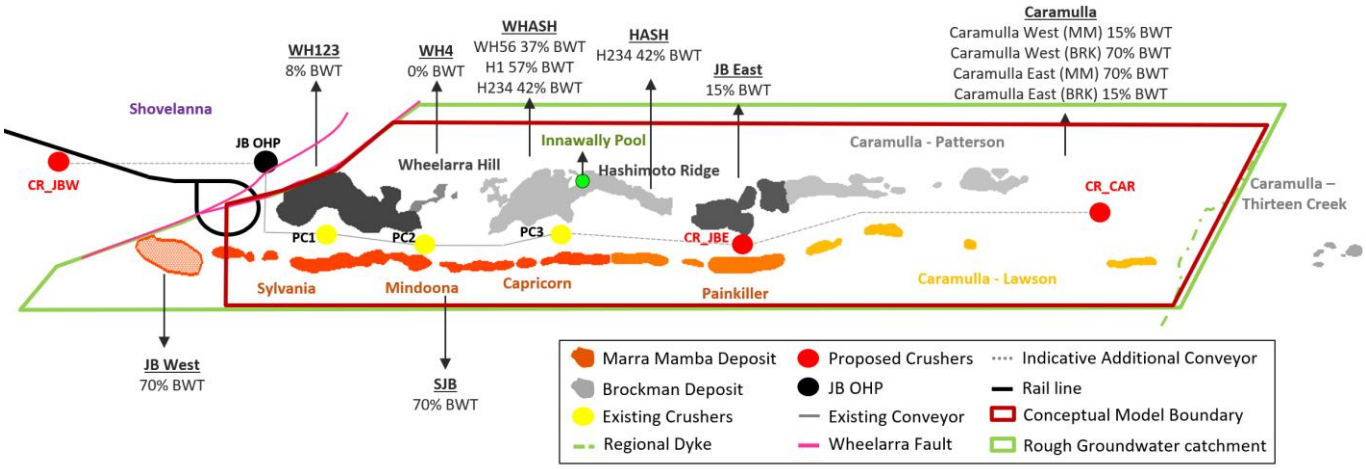


Figure 1. Conceptual Model Boundary and 2017 General Life of Asset Plan (BWT = ore below water table)

Level of understanding

There have been many small scale test pumping investigations in the Jimblebar area and a larger Hydrodynamic Trial was undertaken in South Jimblebar. In addition to this there have been many iterations of numerical modelling. By far the greatest insight however now comes from the observed response to South Jimblebar dewatering, which has been ongoing at significant rates since 2011, and WHASH dewatering which has been ongoing since November 2018.

The level of detail provided by the response to dewatering therefore completely eclipses all previous investigations and it is this data that has been used to define the groundwater flow components of the conceptual model. The level of understanding within the dewatering drawdown footprint can be considered very high. The one exception to this is the Caramulla MAR test pumping, which has provided valuable insights into that area.

Away from the dewatering drawdown, or where water levels are not being monitored (i.e. within the Painkiller deposit), the level of understanding reduces sharply. The spatial extent of hydrogeological certainty is summarised in Table 1.

Table 1: Conceptual model confidence

Area	Conceptual confidence
South Jimblebar (Mindoona)	High
South Jimblebar (Sylvania)	High/moderate
Wheelarra 123 (WH123)	High
Wheelarra 56 and Hashimoto 1 (WHASH)	High/moderate
South Jimblebar (Capricorn)	Moderate/low
Hashimoto 234 (HASH)	Moderate/low
Jimblebar East	Low
Jimblebar West	Low
Painkiller	Low
Caramulla	Low

Conceptual model

Introduction

The main conceptual model components are shown in Figure 2 and described below. The greatest detail is provided for the area encompassing Sylvania, Mindoona, Capricorn, WH123, WHASH and HASH deposits, as these are the areas represented by the vast majority of data. The mining areas are shown in Figure 3.

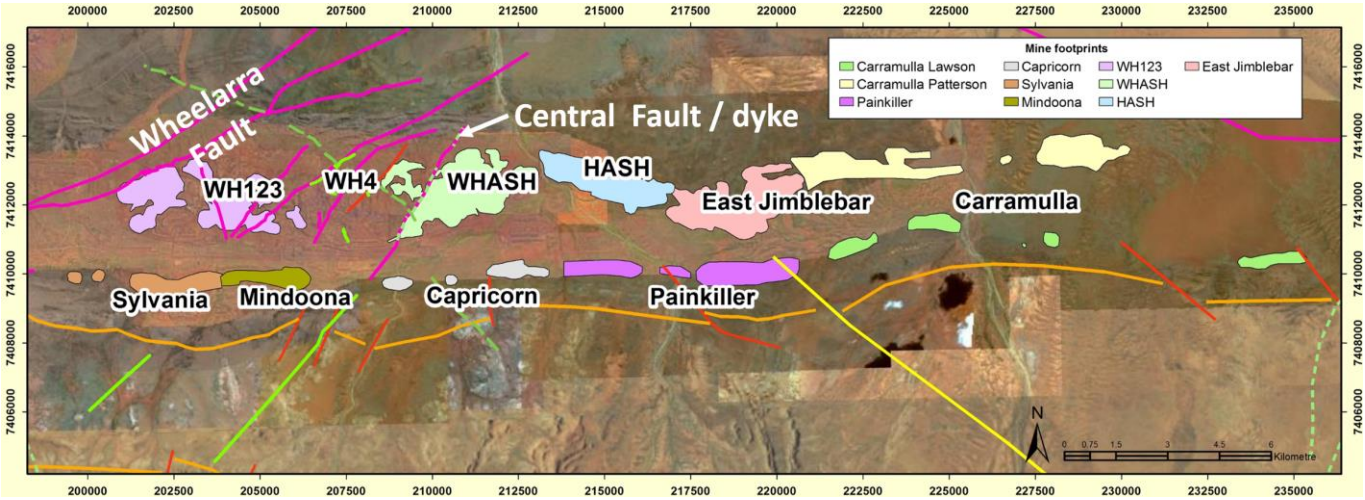


Figure 3. Mining areas

Hydrostratigraphy and relationships

The main aquifers in the area are:

- Orebody aquifers, which are made up of mineralised and submineralised material of the:
    - Marra Mamba Formation, which forms an almost continuous east/west striking aquifer in the south. As per the FY22 Life of Asset (LoA) mine plan, some of these orebodies reach depths of about 350 mRL (~110 m below water table (BWT)).
    - Brockman Iron Formation, which forms discontinuous east/west striking aquifers in the north. Whilst they are discontinuous, they can be very large, as in the case of the WHASH orebody. As per the FY22 LoA mine plan, the WH123 orebody reaches a maximum depth of about 354 mRL (~110 m BWT) and the WHASH orebody reaches as low as 324 mRL (~140 m BWT).
- Regional aquifers, which are located through the central valleys of the Jimblebar area and are made up of:
    - Weathered Paraburdoo (and Bee Gorge) Members of the Wittenoom Formation. The Paraburdoo dolomite in particular, can be karstic and highly permeable.
    - Sand and gravel occurrences in the Tertiary Detritals. The detritals are very thick in places, reaching up to 360 m thick immediately north of Mindoona pit and reaching as low as 200 mRL.

The orebody and regional bedrock aquifers are separated by the various shale members of the Wittenoom Formation, Brockman Iron Formation and Mt McRae / Mt Sylvia Formations. The Mt McRae and Mt Sylvia shales are present to the south of the Brockman orebodies and the West Angela Shale is found to the north of the Marra Mamba orebodies. In some areas the Tertiary Detrital aquifers are in direct contact with the orebody aquifers whereas in others they too are separated by the shale formations.

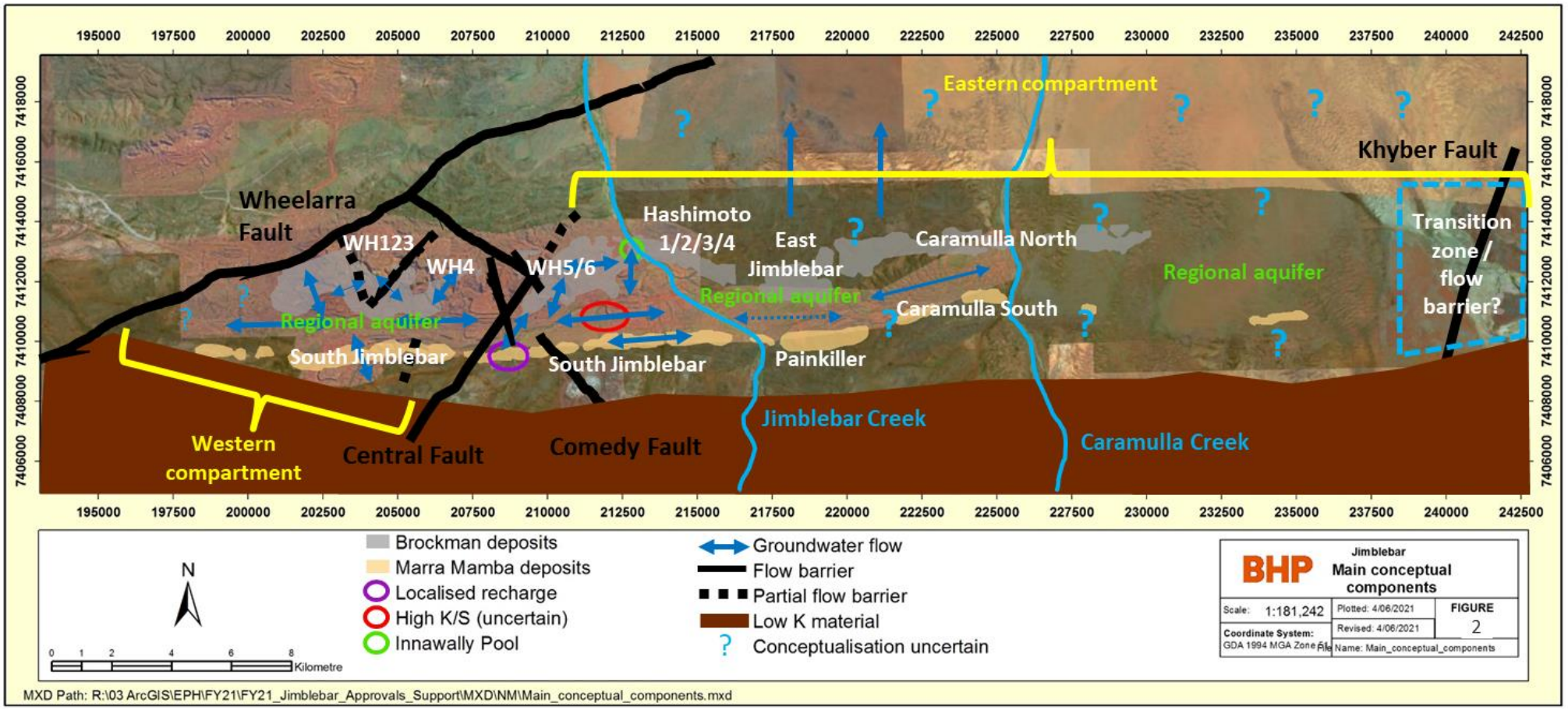


Figure 2. Conceptual model

Even with the presence of these conceptually lower permeability materials, at a regional scale, all the aquifers present a high degree of hydraulic connection. For example, dewatering of the southern Marra Mamba orebodies has been observed to significantly reduce groundwater levels in the northern Brockman orebodies.

However, as discussed further below, the Central Fault effectively divides the Jimblebar groundwater system in half and allows very little flow across it. Under dewatering conditions, these western and eastern compartments on either side of the Central Fault can be thought of as separate entities.

At a local scale some variability in hydraulic connection through the intervening non-orebody material is more likely to be encountered. However, dewatering of the South Jimblebar Stage 1 (Mindoona) pit has shown that water levels in virtually all lithologies local to the orebody in this location respond very well and uniformly to dewatering. These observations suggest that the mechanism for this, and the connection to the regional aquifers, is through the rock mass, rather than being structurally controlled.

The bedrock to the south of the Marra Mamba orebodies is made up of shales and dolerites of the Jeerinah Formation and granites of the Sylvania Inlier. Whilst the Jeerinah Formation may have a moderate permeability, particularly in the west of the area, the granites form a hydraulic barrier to the south of Jimblebar as evidenced by the very high groundwater levels and lack of an obvious response to dewatering.

The bedrock north of the Brockman orebodies consists of Yandicoogina Shale and Weeli Wolli Formation. These units are conceptually low permeability and form a hydraulic barrier to the north. The permeability of this material may be higher than the granites to the south however, as evidenced by the flatter groundwater heads in this material and the hypothesised throughflow out of the catchment to the north beneath WHASH.

The regional aquifer systems generally exhibit high transmissivity and storage. However, the system between Caramulla Patterson and Lawson deposits shows signs of being high transmissivity but also low storage.

Hydraulic parameter values characteristic of the various aquifer units are summarised in Table 2 (summarised from the 2021 regional scale numerical groundwater modelling). However, there is likely a significant degree of heterogeneity within hydrostratigraphic units across the Jimblebar area.

Table 2: Summary of key hydraulic parameters

Material	Hydraulic conductivity	Specific yield
Marra Mamba orebody aquifer	0.5 to 50 m/d	1 to 20%
Brockman orebody aquifer	5 to 100 m/d	5 to 20%
Regional aquifer (weathered dolomite)	20 m/d	5%
Regional aquifer (Tertiary Detritals)	0.001 to 50 m/d	5 to 15%

The Brockman orebody parameters are highest confidence around the WH123 and WHASH deposits and the Marra Mamba parameters are highest confidence around the Mindoona and Sylvania deposits.

Structures and flow barriers

Regional and local structures play a significant role in the Jimblebar groundwater system and generally behave as barriers to flow.

There is little or no flow across the Wheelarra Fault and this forms the western boundary to the Jimblebar groundwater catchment. The NE-SW trending structure(s) that passes through Caramulla in the far east of the catchment is shown by observed water levels to be significant (although as yet untested by drawdown) and is likely to act as the eastern boundary to the system.

Locally there are several structures that, as shown by the propagation of drawdown, provide either partial or complete barriers to groundwater flow. These include:

- The Central Fault which clearly separates all the aquifers into a western and eastern compartment. This may happen through a combination of dyke infill (dolerite) in the bedrock part of the fault and low permeability clay in the Tertiary Detritals immediately above it. This is important because the Tertiary

Detritals are saturated in this area and would otherwise enable unimpeded flow between the eastern and western sides of the fault (which does not happen).

- The Comedy Fault (infilled with dolerite), which seems to be significant in the Marra Mamba orebody of South Jimblebar.
- The Monster Fault and other, unnamed, faults around WH123 form a partial barrier to groundwater flow. This effect may also be due to, or as well as, lower hydraulic conductivity bedrock in this area.

There may be other structures that are hydraulically significant in the eastern part of the Jimblebar area (e.g. the Khyber Fault) but these are only likely to become apparent after several years of dewatering of the eastern orebodies.

Regional flows and heads

Pre-development groundwater levels were relatively flat in the Jimblebar area, particularly in the areas of the orebody and regional aquifers. This is relatively surprising given the presence of the behaviour of the Central Fault as a major flow barrier.

The general groundwater flow direction was probably from the orebody aquifers, where heads are slightly elevated (i.e. at WH123 they are about 463 mRL) into the valley aquifers (Tertiary Detritals and weathered Paraburdoo) where the water levels are around 462 mRL. Groundwater then flowed from the valley aquifers to the north and out of the catchment. The extent of outflow to the north is unknown due to limited pre-development head data, and it is hypothesised that groundwater may also flow in a northerly direction beneath the WHASH, HASH, East Jimblebar and Caramulla North orebodies where heads are marginally lower (range from 454 – 459 mRL).

There may be some inflow from the southern bedrock into the Marra Mamba orebodies where heads are significantly higher (530 mRL) but the rocks are most likely characterised by very low permeability and storage.

Recharge and discharge mechanisms

Rainfall recharge is likely to occur into this system, but the mechanism and rate is uncertain. In fact the evidence is contradictory, with very limited recharge suggested by:

- The lack of response in time variant groundwater levels to rainfall events (although this analysis is complicated by the dewatering response).
- The significant depth to groundwater.

However the potential for significant recharge is suggested by the:

- Discrepancy between average heads observed in exploration drill holes taken before the very wet 1999/2000 period, which are roughly 2 m lower than those taken after.
- Relatively fresh nature of groundwater as evidenced by the observed EC values.
- The very fresh groundwater encountered where Copper Creek crosses South Jimblebar (most likely a localised recharge area).
- Extreme fluctuation in orebody and dolomite EC following the start of mining in 2014. The permeable bedrock has been opened to direct rainfall recharge and this seems to be significant.

Recharge to the system via regional throughflow is estimated to be low, given the various low permeability barriers that bound the system to the west, south and east.

Due to the depth to water, discharge via evapotranspiration is not likely to contribute anything to the water balance. It is therefore likely that all discharge from the system prior to mining was via flow to the north in the central part of the Jimblebar catchment (i.e. WHASH, HASH, East Jimblebar and Caramulla).

A significant amount of groundwater discharge now occurs via abstraction for both mine dewatering and water supply (Figure 4). There has also been some recharge in the form of injection of surplus water to the three injection bores on the eastern side of the Central Fault.

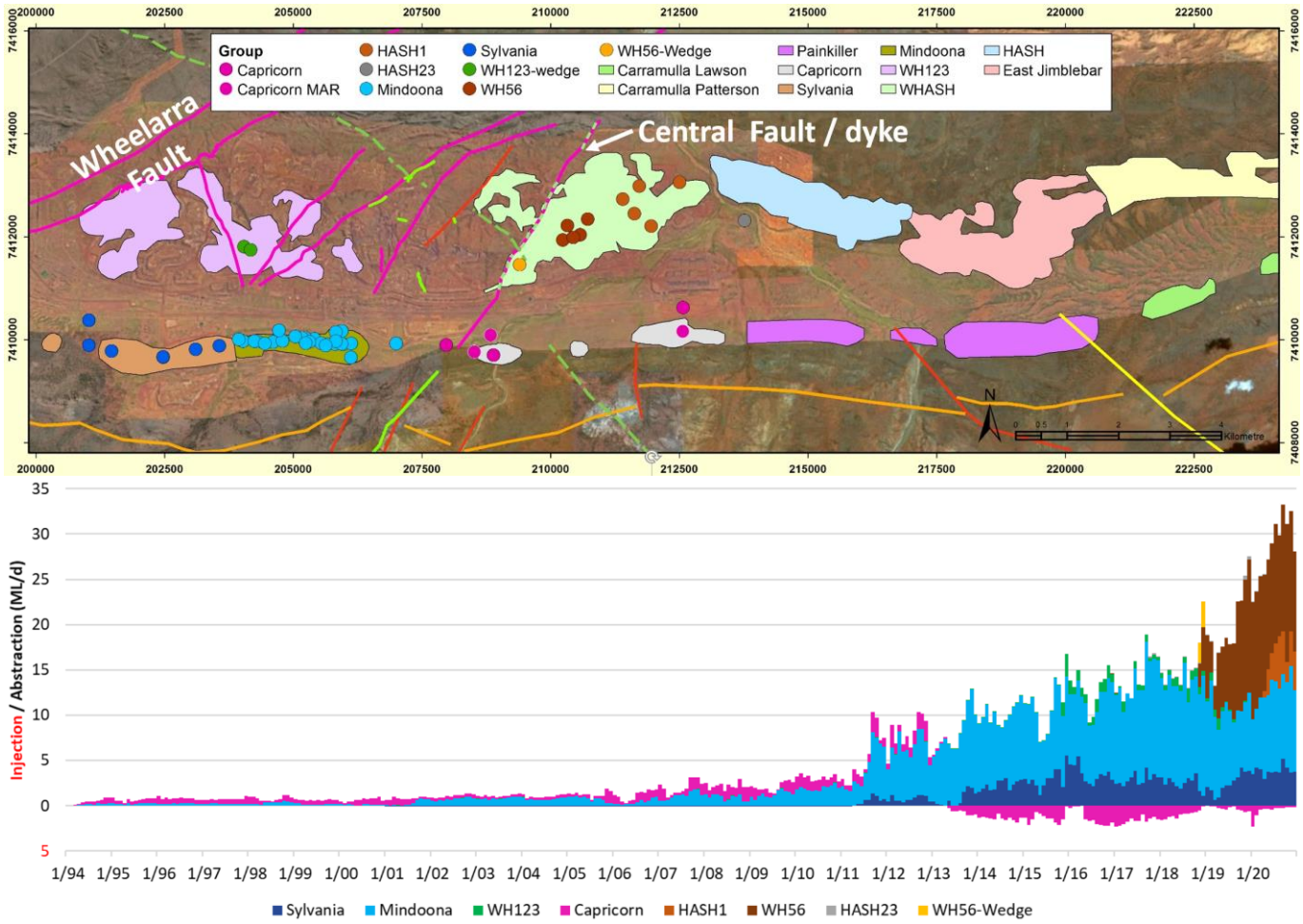


Figure 4. Historical abstraction and injection at Jimblebar

Change in groundwater levels

The change in groundwater levels since 1994, as described by the difference between pre-development and 2017 and 2021 head observations, is shown in Figures 5 and 6 respectively. The main conceptual elements are highlighted by this data:

- The barrier effect of the Wheelarra and Central Faults.
- The widespread and uniform drawdown throughout the western compartment.
- The widespread mounding (2017) suggesting good connection in the eastern compartment.
- The lack of discernible drawdown observed to the northwest and south
- The movement of drawdown from WHASH / HASH towards the east (2021)

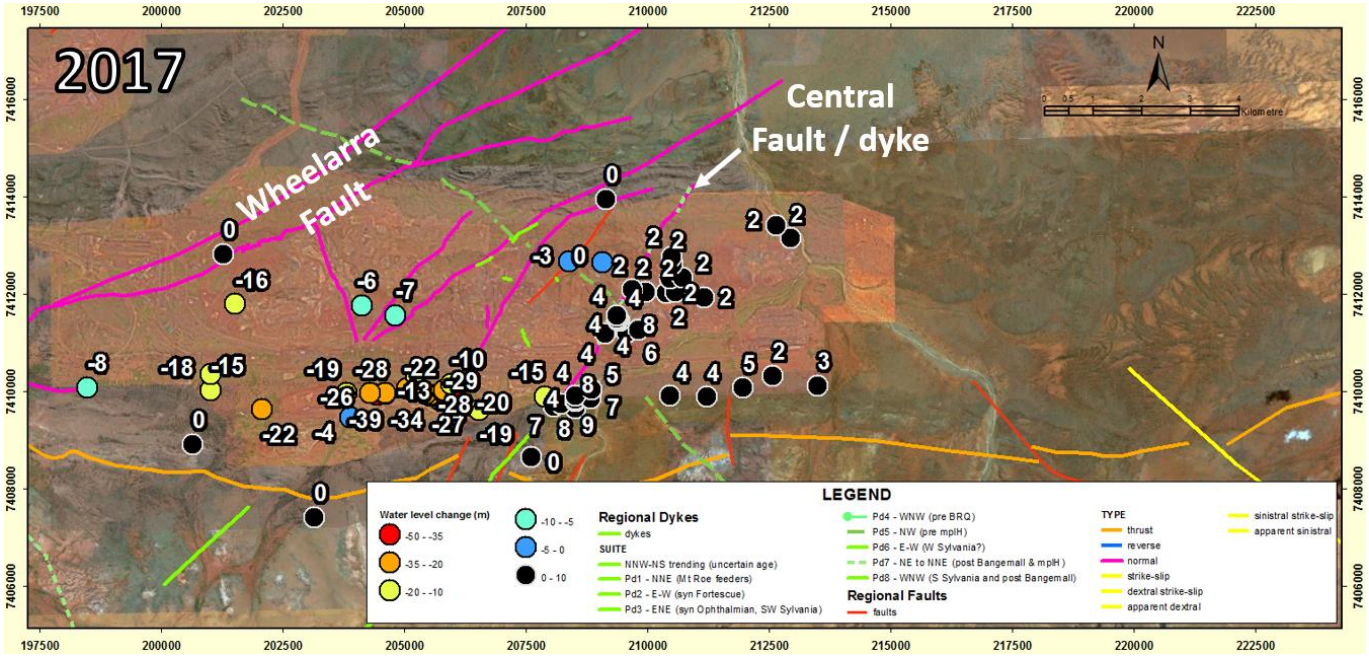


Figure 5. Observed change in Jimblebar groundwater levels from 1994 to 2017

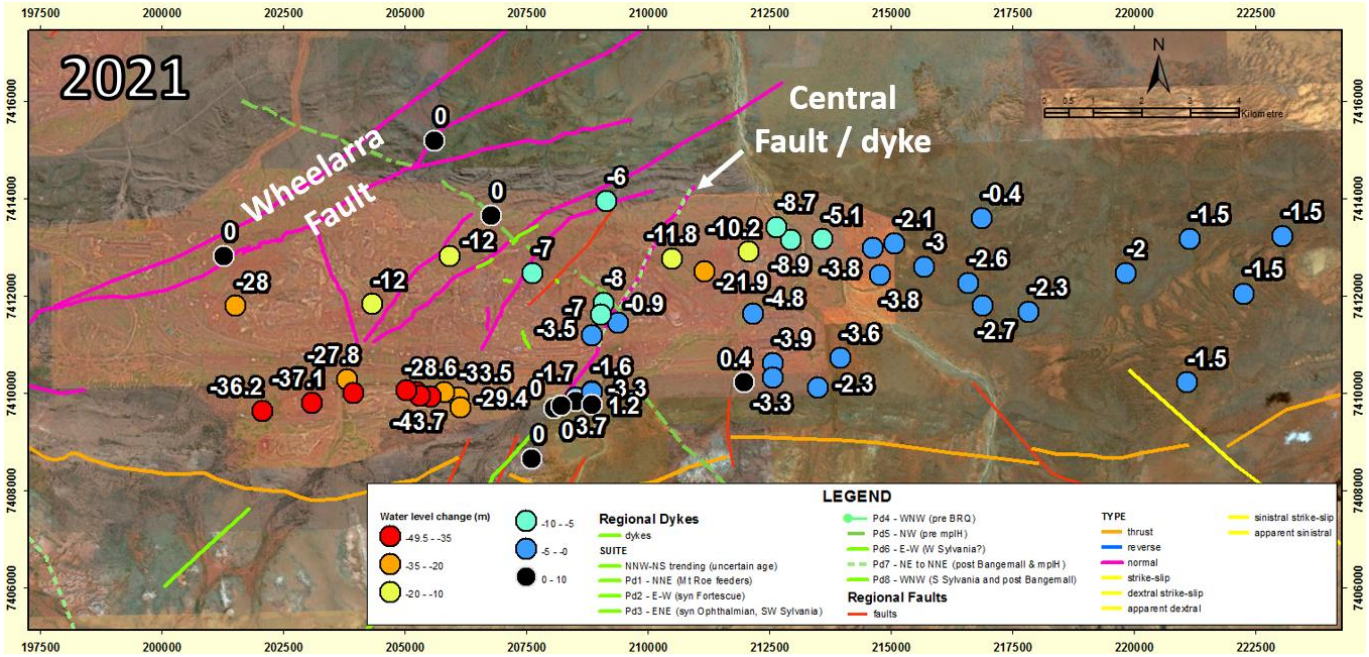


Figure 6. Observed change in Jimblebar groundwater levels by 2021

Groundwater / surface water interaction

The opportunity for direct interaction between the groundwater and surface water systems in the Jimblebar area is limited by the significant depth to groundwater over the entire area. Pre-development depth to groundwater was:

- WH123: ~100 m
- WH4: >110 m
- WHASH: > 80 m
- HASH: >70 m

- East Jimblebar: >90 m
- South Jimblebar (Sylvania, Mindoona): ~80 m
- Capricorn: ~70 m
- Painkiller: ~70 m
- Caramulla: ~65 m
- Valley alluvial fill (Tertiary Detritals):
    - South Jimblebar area: 100 m (west) to 50 m (east)
    - East Jimblebar / Caramulla area: 50 m

Receptors

There are no groundwater dependent receptors in the Jimblebar area. The main environmental receptors in the area are Innawally Pool and Jimblebar Creek, which, due to the significant depth to the water table, are not groundwater dependent. Station bores are present to the south of Jimblebar, but these are screened in perched alluvial systems unconnected to the Jimblebar groundwater system.

The project does have the potential to have an indirect impact on the Ethel Gorge stygofauna community through future surplus water discharge to Ophthalmia Dam.

Mine water management

Mine water supplies have been pumped from the Jimblebar Borefield since 1995. Early abstraction (HSJ0001P, 3P, 4P, 5P, 6P and 7P) occurred for dust suppression, ore handling and (after treatment at the RO plant) the workshop. The water balance was neutral and no excess water was pumped or discharged.

The current (as at FY21) groundwater abstraction license for the Jimblebar borefields is 60 ML/d. This allows abstracted water to be used for dust suppression, earthworks and construction, mineral ore processing, campsite purposes and reinjection. The current Part IV approvals allows discharge of up to 72 ML/d.

The current surplus schemes in operation include:

- South Jimblebar Copper Creek (commenced operation FY13)
- OB31 Emergency creek discharge (FY16 - used as required)
- Ophthalmia Dam (Jimblebar surplus to Dam commenced FY17)
- South Jimblebar (Capricorn) MAR Capricorn bores (injecting since FY12)
- Ninga Valley MAR (commenced operation late 2020)

The Caramulla MAR scheme Stage 1 is also set to commence in March 2022. Additional surplus options are currently being investigated further east of Jimblebar, including Caramulla MAR Stage 2, Caramulla Creek discharge and Thirteen Creek discharge.

BHP is now requesting a groundwater abstraction license increase (in progress) from 60 ML/d to 72 ML/d to align with the current Part IV approvals limit. This abstraction uplift is required to de-constrain dewatering of the WHASH and HASH deposits. Concurrently, BHP is also requesting a Part IV approvals uplift to enable discharge of up to 140 ML/day surplus dewatering at Jimblebar.

Mine plan risks / uncertainties

The conceptualisation in the western compartment can be considered high confidence, although some uncertainty remains:

- As the water level continues to decrease, the western compartment aquifers may become compartmentalised by basement highs, clay lenses etc.
- The significance of the localised pit rainfall recharge to the overall water balance is unknown.
- The hydrogeology of the Jimblebar West (Figure 1) Marra Mamba orebody is not well understood. Some mine plans show the pit to the west of the Wheelarra Fault but this is unlikely and illustrates the immature understanding of this orebody, which could be as much as 70% BWT.

Confidence in the conceptualisation of the eastern compartment ranges from low to high, depending on location (highest confidence in the western orebodies, lowest in the east). The following uncertainties remain:

- Variation in hydraulic behaviour with depth is not known.
- The range in estimated dewatering rates is very wide and the maximum is very high.
- Hydraulic boundaries may exist that are yet to express their control on the observed data.
- The connection between the orebody and regional aquifers is not known with certainty.

Acid and metalliferous drainage

Acid and Metalliferous Drainage (AMD) risk based assessments were undertaken in 2016 to inform the FY16 Jimblebar Mine Closure Plan (BHP, 2016). WH56 and H1 pits were identified as having moderate to high AMD risk. Key lithologies contributing to exposed Potentially Acid Forming (PAF) material at WH56/H1 include the Mt McRae and Mt Sylvia shale units. WH123, WH4, H234 and Mindoona pits were classified as having low AMD risk. There have been no changes to these risk levels in the FY21 revision of the Jimblebar Mine Closure Plan (BHP, 2021a).

An assessment has yet to be made of the potential AMD risk of the South Jimblebar Sylvania and Capricorn pits, East and West Jimblebar, Painkiller and Caramulla deposits.

Uncertainties

Main blind spots

As dewatering has been ongoing at significant rates for 10 years, the main uncertainties remaining in the area exist outside of the dewatering zone of influence or where monitoring infrastructure is not in place to observe dewatering drawdown.

The main uncertainties remaining in the Jimblebar area that are relevant to future dewatering requirements and drawdown predictions are:

- The size of the eastern aquifer compartment (i.e. how far to the east it extends, whether it is broken into smaller units by structures).
- The extent of hydraulic connection between the orebodies and regional aquifer in the eastern compartment.
- To the north of the Brockman Iron Formation the uncertainties are high. In places drawdown has been observed moving north, but monitoring is limited. There are no groundwater receptors in the immediate vicinity however and the connection to the north would have to be very high (not currently conceptualised) to have a major impact on dewatering rates.
- As water levels become lower in the western and eastern compartments the currently good hydraulic connection within each of them may become compromised if aquifers become disconnected and sub-compartments are created. This may be associated with basement highs and the presence of clays in the detritals at depth.
- The exact nature of the feature separating the western and eastern compartments (along the Central Fault) has not been confirmed. Most of the uncertainty is associated with the behaviour of the feature in the pre-development state, specifically:
    - How it was hidden in the water levels (which are flat)
    - How water could have passed through it to discharge to the north.

  The effect of this remaining uncertainty is probably low however because whatever the mechanism, the behaviour under dewatering stress is not in question.
- Numerical modelling suggested that there may be a very high K and / or high S material in the central valley directly south of WHASH in an area known as Hullabaloo. There is some evidence to suggest that the dolomite here is cavernous, but without additional data this remains a theory to be tested. If something like this does exist however, it implies high dewatering requirements for the WHASH deposits.
- The hydrostratigraphic understanding of entire detrital sequence is quite poor. It is defined based on limited data as it generally lies outside of the attention of resource drilling (and therefore the geological models). As the clay occurrences within this material have the potential to disrupt local hydraulic connection, a lack of knowledge as to their whereabouts and continuity may become more important as dewatering progresses.

Alternate models

The dewatering stress and abundance of observation data in the western compartment do not leave much room for alternate conceptualisations. There may be more connection to the west through the Wheelarra Fault directly adjacent to the Marra Mamba orebodies, but this is unlikely. There may be more connection through to the north, but this is also unlikely. The exact mechanism by which the Central Fault blocks flow between the east and west is also open to alternate explanations, but the result (i.e. no flow) is unchanged.

In the eastern compartment however, the following alternate conceptualisations are still possible:

- The boundaries are currently assumed to be relatively open to the east and north. A feasible alternate assumption could be that structures to the east exist much closer to Jimblebar and reduce the dewatering catchment size considerably.
- The detritals and/or dolomite in the area of Hullabaloo may present a significantly enhanced storage and or hydraulic conductivity compared to the material east and west.
- Connection between orebody and regional aquifers in this area is not well understood. In some locations the whole range of possibilities should be considered (i.e. from not well connected to very well connected).
- Current interpretations of limited geological drilling suggest reduced along-strike connection within the Caramulla north (Patterson) and south (Lawson) deposits (i.e. mineralised zones as separate pods of ore). However, an alternate conceptualisation may be that these deposits are well-connected along strike through the mineralised zones.

Knowledge and interpretation

Geology

Jimblebar is characterised by prominent E-W striking Brockman Iron Formation in the Wheelarra Hills to the north and low lying ridges of Marra Mamba Iron Formation to the south. In the valley between these ridges, the Tertiary Detritals form an extensive cover (Table 3). The main orebody scale knowledge comes from the various BHP geological models available as of June 2021. The coverage and drill hole density of these models, as well as geology are shown in Figure 7.

Table 3: Jimblebar stratigraphic log

Age	Location	Group	Formation	Member	Code
Young	Central	Tertiary Detritals	TD3		TD3
			TD2		TD2
			TD1		TD1
	North	Hamersley	Boolgeeda Iron		HO
			Woongarra Rhyolite		HW
			Weeli Wolli		HJ / WW
			Brockman Iron	Yandicoogina	Y
				Joffre	J1 – J6
				Whaleback Shale	W
				Dales Gorge	D1 – D4
			Mount McRae Shale		R
			Mount Sylvia		S
			Wittenoom	Bee Gorge	OC/OD
				Paraburdoo	OB
				West Angela	WA
			Marra Mamba Iron	Mount Newman	N1 – N3
				McLeod	MM
				Nammuldi	MU
		Fortescue	Jeerinah		JN
Old	South		Granatoid Complex		

Marra Mamba Iron Formation

South Jimblebar (Sylvania, Mindoona, Capricorn), West Jimblebar, Painkiller and parts of the Caramulla host the main Marra Mamba orebodies of the region. Mineralisation is primarily hosted within the Mt Newman Member (MN) and to lesser extent within the West Angela, McLeod and Nammuldi Members. Minor amounts of enrichment are noted within the Bee Gorge. Stratigraphy dips varyingly to the north (Figure 8).

To the south lies the Jeerinah Formation (shales and dolerites) and further south the Sylvania Inlier (largely granites and dolerites).

Brockman Iron Formation

The Wheelarra and Hashimoto Hills contain stratigraphic sequences of the Brockman Iron, Mt McRae Formation and Mt Sylvia Formations of the Hamersley Group which form alternating sequences of banded iron formation (BIF), shale and chert layers. The overall geometry of the Hashimoto area is of a gently northward dipping geological sequence (Figures 9 and 10). Common occurrences of lost drilling equipment due to vuggy and fractured ground as well as ‘groundwater issues’ noted during drilling suggests the occurrence of high yields and potentially a large dewatering effort.

Mineralisation is intersected in the Dales Gorge and Joffre Members of this Formation with high grade mineralisation noted dominantly within the J2, D4 and D2 units and variably within the D3, D1 and J1-6 units. In general, iron enrichment predominantly occurs within the Dales Gorge Member, with minor occurrences in the

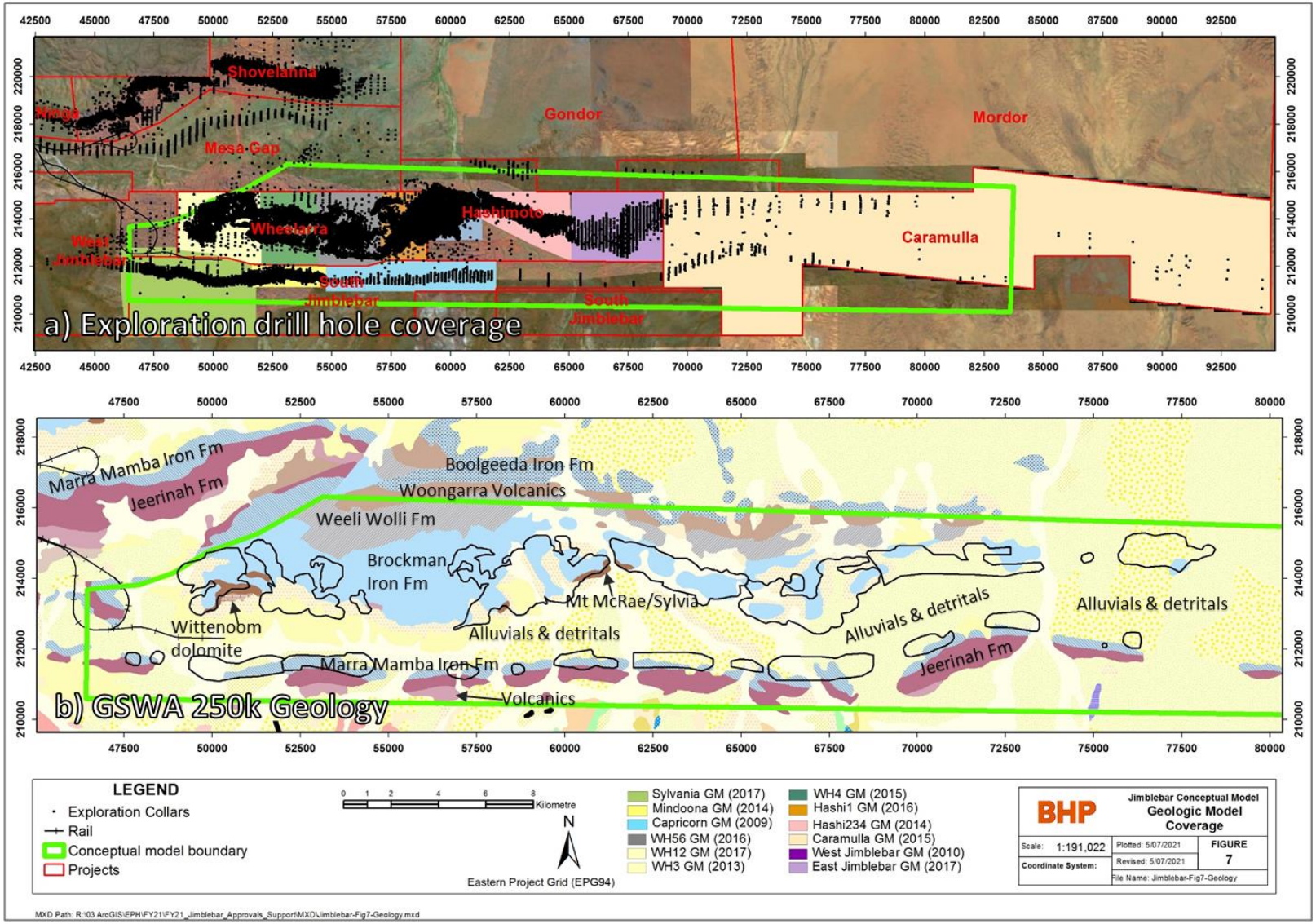


Figure 7. Drill hole coverage and geology

Joffre Member, matching observations of generally higher yields intersected within the Dales unit during hydrogeological drilling. The Whaleback Shale member separates the two orebody units (Dales and Joffre), characterised as predominantly shale and BIF bands.

The Mt Sylvia Formation consists of interbedded chert, shale and siltstone layers, the uppermost unit of which is the regionally extensive Bruno's Band. This band typically forms a resistant boundary to flow as observed through exposed seepage faces in the Eastern Ridge and Whaleback pits. The Mt McRae Shale consists of interbedded carbonaceous shale and chert and is typically the more impermeable of the two shales.

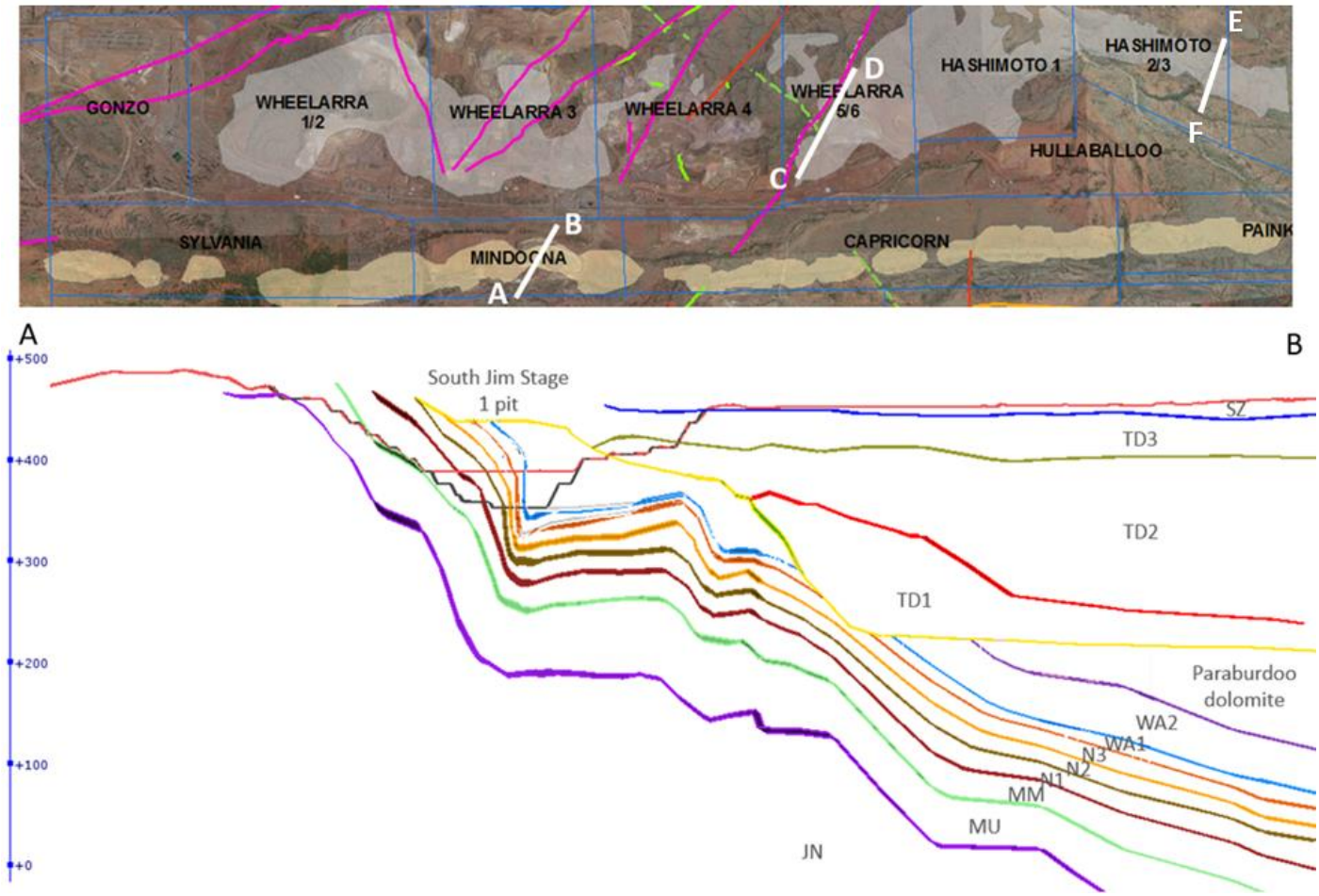


Figure 8. South Jimblebar (Marra Mamba) Cross Section

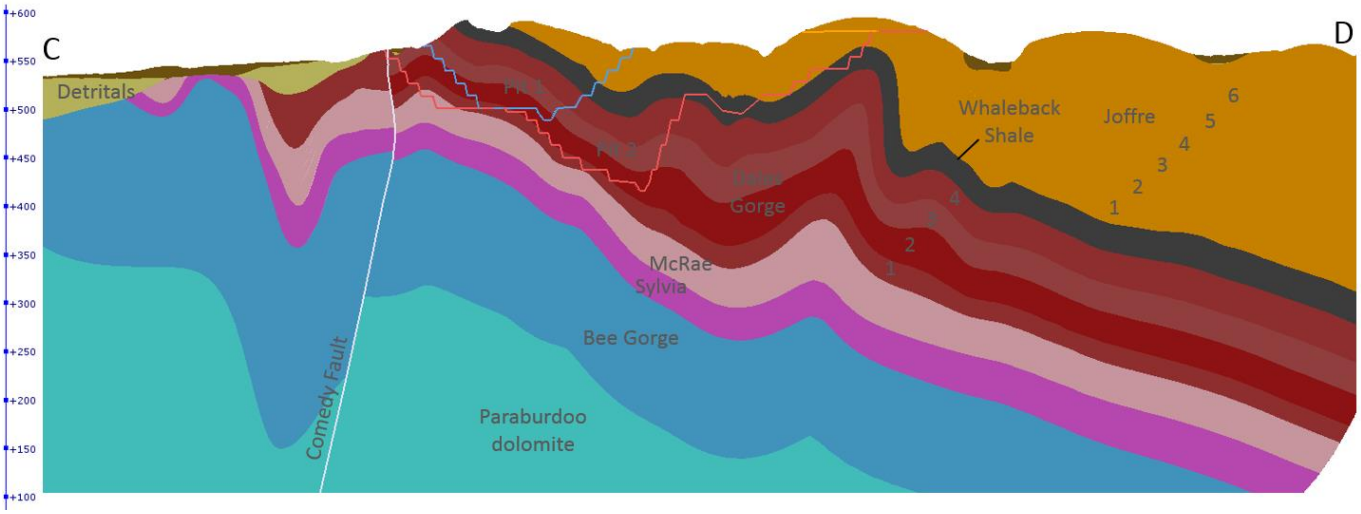


Figure 9. Wheelarra Hill (Brockman Iron) Cross Section

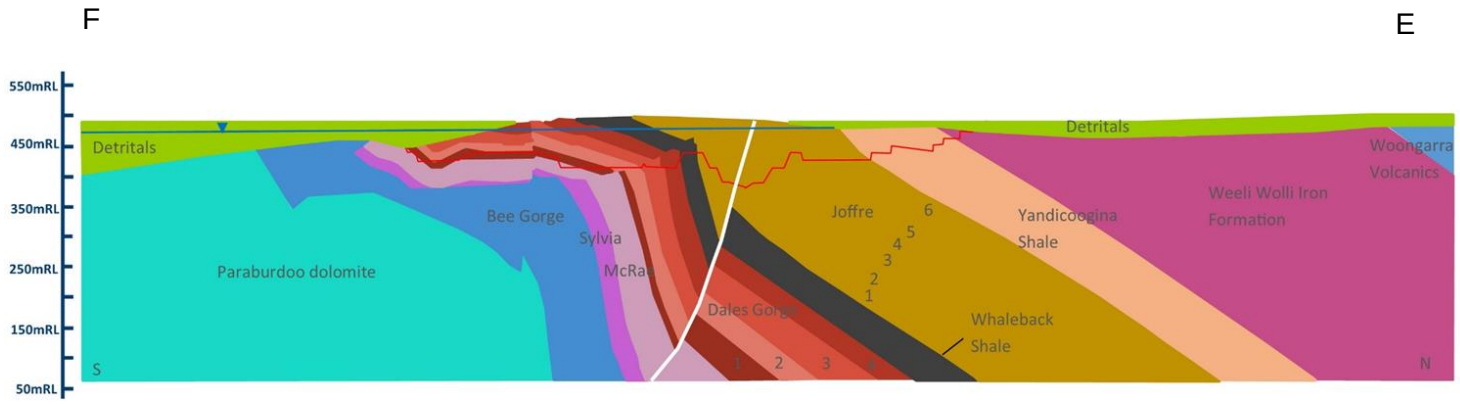


Figure 10. Hashimoto (Brockman Iron) Cross Section

Valley Fill (Tertiary Detritals) and underlying bedrock

Between the Marra Mamba and Brockman orebodies (i.e. between South Jimblebar and Wheelarra Hill) and following the same E-W striking trend, the Paraburdoo member of the Wittenoom Formation subcrops.

The Paraburdoo is overlain by Cainozoic and Quaternary deposits (Tertiary Detritals) up to 360 m thick. The deepest section is directly north of the Mindoona pit. The Tertiary Detritals are divided into TD1, TD2 and TD3. The older deeper sediments (TD1) are fluvial and comprise alluvial silts, sands and gravels. Intermediate to shallow depth sediments (TD2 and TD3) comprise lower energy clayey sequences and extensive calcrete horizons.

These are overlain and partly incised by recent alluvial deposits associated with the current surface drainage systems (I.e. Surface scree (SZ)).

The valley hosts floodplains of the present-day Caramulla, Copper and Jimblebar Creeks.

Structure

A complex area of faulting and folding exists along the Wheelarra-Hashimoto range and to a lesser extent along the Marra Mamba deposits (Figure 11). Monitoring has shown that the following faults may have a bearing on groundwater flow:

A. The NE-SW trending Wheelarra Fault is a major strike-slip fault which truncates the Shovelanna project area from Jimblebar with a stratigraphic offset up to 10 km. This has had the effect of bringing the granites and dolerites of the Sylvania Inlier to the north on the western side, which puts them adjacent to the Marra Mamba and Brockman orebodies on the eastern side.

B. Two faults (one of which is called “Monster”) offset at right angles in WH123 form a ‘V’ shape.

C. A NE-SW trending fault transgresses the eastern end of the Mindoona mining pit and extends northeast into Wheelarra 4.

D. In WH56 the NE-SW trending Central Fault and NW-SE Comedy Fault. Both are large sub-vertical normal faults and are at similar orientation to smaller scale faults across the Wheelarra project area. The central fault contains fine-grained weathered dolerite of generally 10 m width. The Comedy Fault shows only minor displacement of stratigraphy. The Central Dyke is thought to cut the Comedy Dyke.

E. The Khyber Fault and other NE-SW trending structure(s) that pass through Caramulla in the far east of the catchment.

The following structures have not been investigated in terms of their influence on flow, but may be significant:

F. The Nacho Fault, an inferred N-S trending vertical structure.

G. The Morton Bay Fault in Hashimoto 1 exhibits deformation, steepened folding and stratigraphic offset and has been filled with quartz and breccia fabrics.

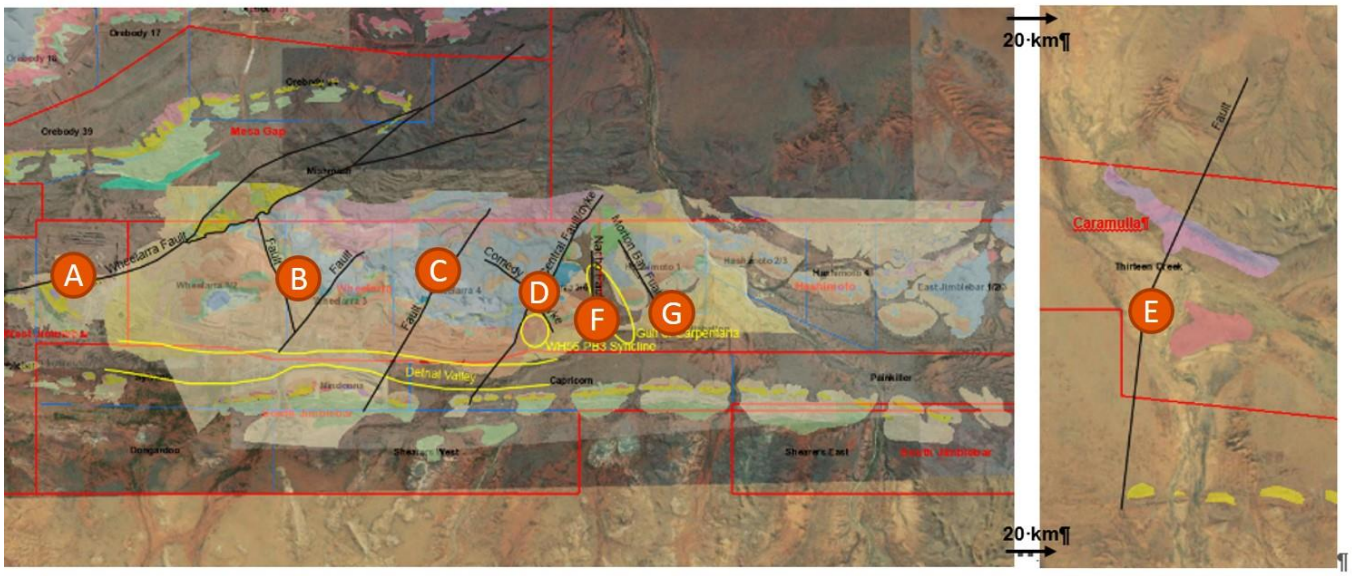


Figure 11. Structural geology

Undisturbed water levels

The observed heads from exploration drill holes are shown in Figure 12. There are thousands of data points within the orebodies but only limited data within the regional aquifers, north of the Wheelarra and Hashimoto deposits and further east towards Thirteen Creek. Data have been removed if they were collected before September 2015 west of the Wheelarra Fault, prior to 2007 in the Western compartment, and prior to 2018 in the Eastern compartment. These timings relate to the commencement of dewatering on either side of the Wheelarra and Central Faults.

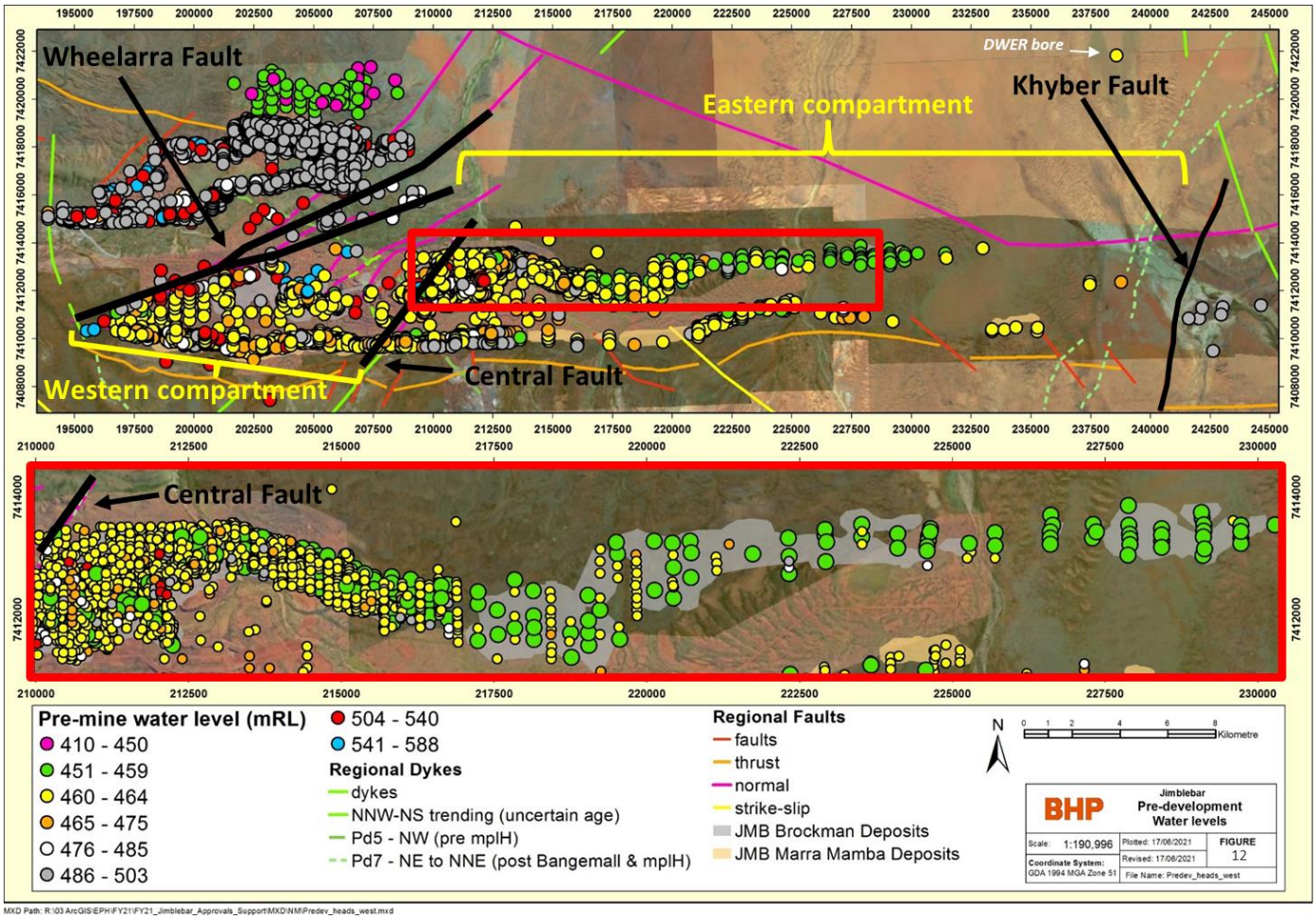


Figure 12. Pre-development water levels

The data in Figure 12 shows:

- Heads west of the Wheelarra Fault primarily range from 486 – 503 mRL, with lower heads in the north towards Shovelanna (450 – 459 mRL).
- Heads east of the Wheelarra Fault and within the conceptual model boundary are relatively uniform, ranging between 460 – 464 mRL, but primarily sitting around ~462 mRL.
- Heads in the north eastern Brockman orebodies (East Jimblebar, Caramulla North) are marginally lower than heads elsewhere and range between 454 – 459 mRL.
- Heads east of the Khyber Fault are 30 – 40 m higher than those directly west of the fault (i.e. the three eastern-most Caramulla drill holes).
- Heads north-east of WH3/4 are 20 – 30 m higher than water levels in the greater Jimblebar area.
- One DWER data point north of Thirteen Creek shows heads at 462.5 mRL in 1996.

While the uniform nature of the heads within the conceptual model boundary indicates that groundwater flow gradients were probably minimal within the greater Jimblebar region, there remain some uncertainties, particularly:

- The consistently lower heads in the north eastern Brockman orebodies. A portion of this data was collected prior to the very high rainfall event experienced in the Pilbara in 1999/2000. Groundwater level observations prior to 1999/2000 are on average 3 m lower than observations after. However, a portion of the data points in this area drilled after the rainfall event still show lower heads (454 – 459 mRL). This may indicate naturally lower heads in this region and flow gradients towards the north east (and potentially further north out of the catchment).

- The extent and direction of outflow from the catchment. Pre-development head data indicates that the general groundwater flow direction was probably from the orebodies aquifers where heads are slightly elevated and into the valley aquifers (Tertiary Detritals and weathered Paraburdoo). Groundwater then flowed from the valley aquifers to the north and out of the catchment. The extent of outflow to the north is unknown due to limited pre-development head data, and it is hypothesised that groundwater may also flow in a northerly/north easterly direction beneath the WHASH, HASH, East Jimblebar and Caramulla North orebodies where heads are marginally lower (range from 454 – 459 mRL). This potential for lower heads and outflow towards the north is also supported by trends west of the Wheelarra Fault where heads are lower in the north (Shovelanna) than the south (Mesa Gap/Ninga). However, with the exception of one DWER data point (462.5 mRL in 1996), there is no pre-development head data north of the Eastern compartment (i.e. Mordor and Gondor project areas), so this remains an area of uncertainty.

Time variant water levels

Introduction

The main anthropogenic stresses in the Jimblebar groundwater system have been (Figure 13):

- Water supply abstraction since 1994 (South Jimblebar).
- Dewatering abstraction:
    - South Jimblebar since 2011
    - Wheelarra 2/3 since 2015
    - WHASH since November 2018
- Surplus water injection east of South Jimblebar since 2013.

The monitoring of groundwater levels and their response to these stresses have provided a significant amount of data, which was used to develop the conceptual understanding of the Jimblebar groundwater system. All the manual dips (grouped into key response areas) are shown in Figure 14. The analysis has highlighted several key components that are outlined in Figure 15 and developed further in the text below.

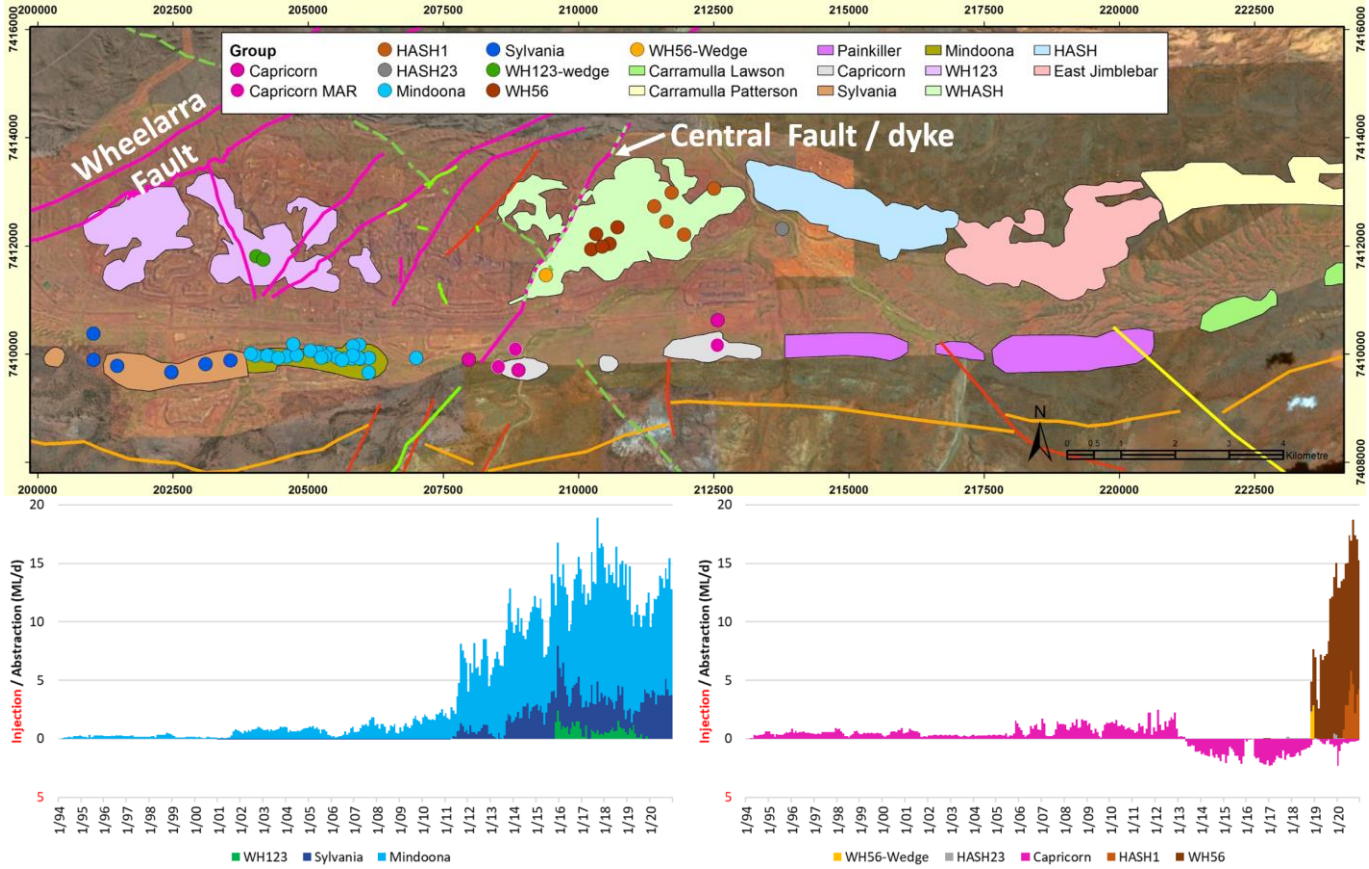


Figure 13. Geographical division of historical Jimblebar abstraction / injection

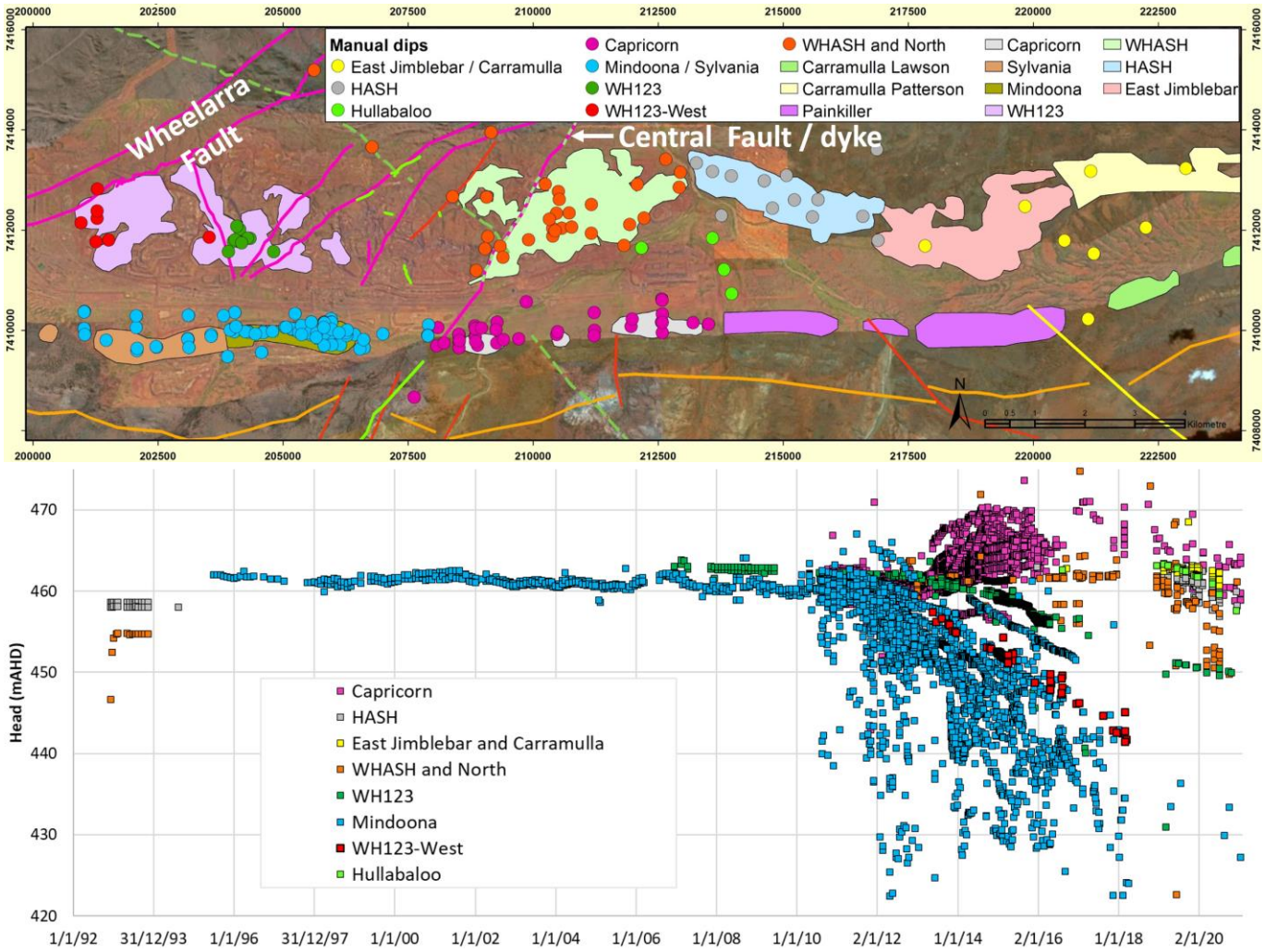


Figure 14. All manual dips from the Jimblebar area

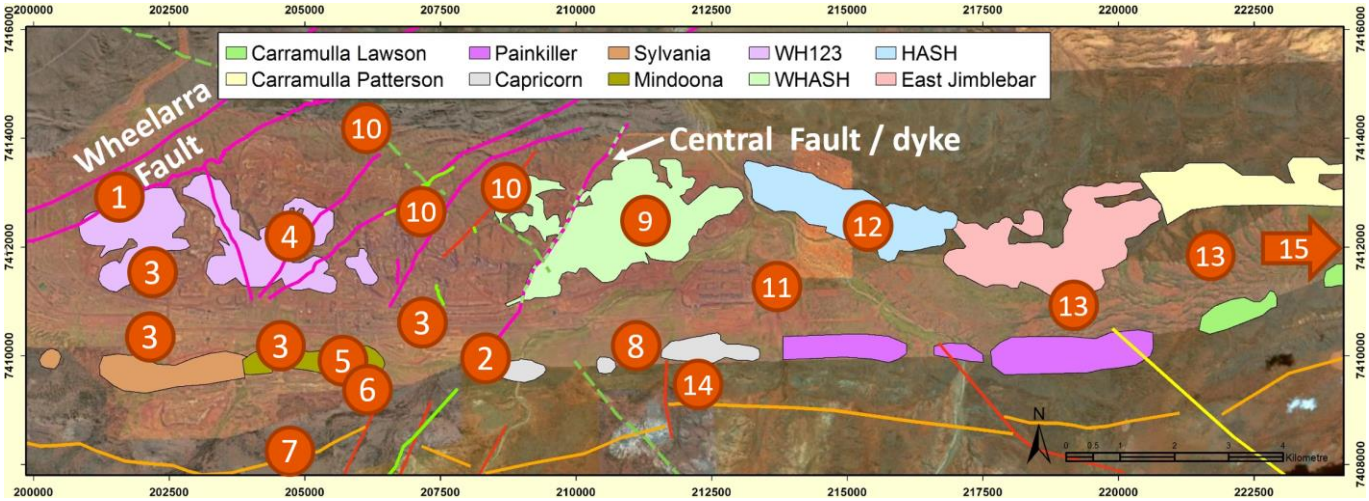


Figure 15. Water level interpretation key

Wheelarra Fault (1)

Evidence of the hydraulic character of the Wheelarra Fault system is provided by data from two monitoring bores located on either side of the structure (Figure 16). The data show that:

I. Groundwater levels north of the Fault are significantly higher than those to the south (i.e. 488 mRL at HFG0037M compared to the relatively uniform pre-development levels of 462 mRL to the south).

II. The drawdown response to dewatering is not obvious north of the Fault, i.e. there is no discernible drawdown at HFG0035M compared to over 10 m of drawdown observed just to the south in bores HFG0034V and HFG0040M.

The data therefore show that the Wheelarra Fault system behaves as a groundwater flow barrier. This is most likely through the juxtaposition of lower permeability material on the western side with the higher permeability material on the eastern side.

The Fault is mapped as being continuous to the north and south and as the movement along it has been estimated to be about 10 km it is likely that the conceptually lower permeability granites will provide a continuous barrier to flow along the southwestern boundary (i.e. directly west of South Jimblebar) of the groundwater catchment.

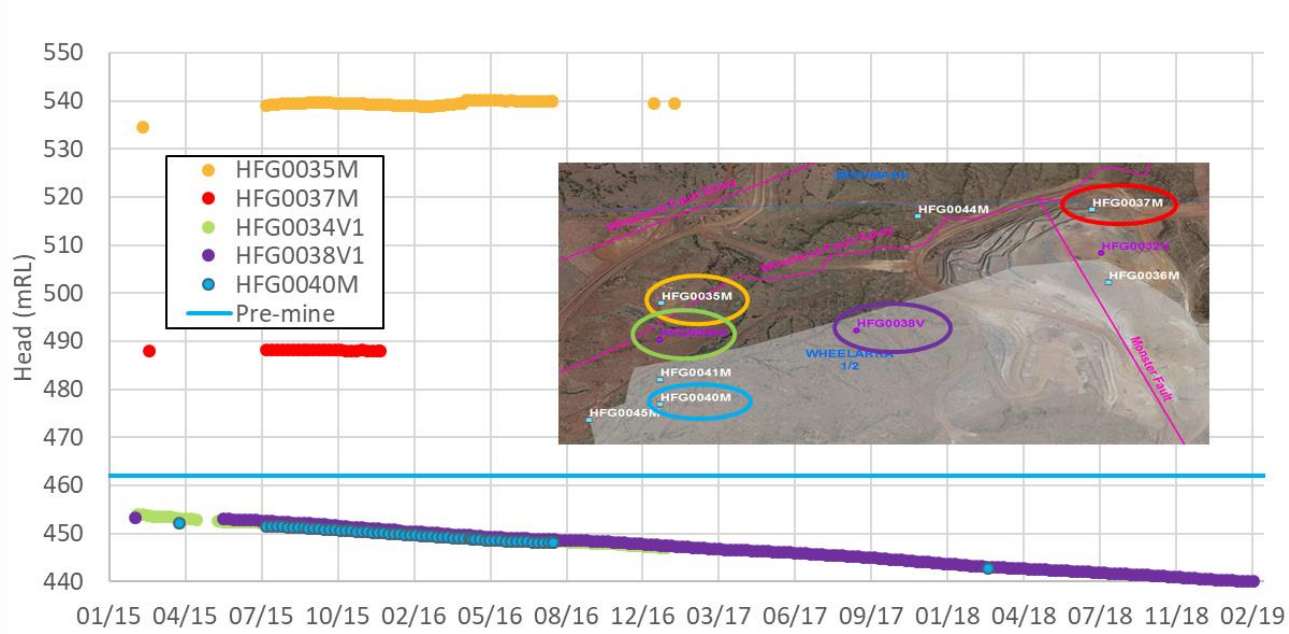


Figure 16. Wheelarra Fault heads

The Central Fault (2)

A major NE/SW trending dolerite dyke is mapped as running through the Jimblebar area, immediately to the west of WH5/6 and through the central-eastern part of South Jimblebar (Figure 17). The dyke is known as the Central Fault and assumed to be present within the bedrock only (i.e. not in the overlying alluvium). Whilst no hint of its hydrogeological significance is provided by the exploration drilling water levels, the time variant response to dewatering has shown that it plays a key role in the regional flow system.

The two bores HSJ0020M and HSJ0064M demonstrate this behaviour in their very different responses to dewatering (Figure 18). These are supplemented by other bores in similar positions since 2017. HSJ0020M, west of the dyke, records over 15 m drawdown up to 2017. This is in response to dewatering of the Mindoona pit west of the dyke (there has been very little abstraction to the east). HSJ0064M is located just 20 m to the east of HSJ0020M and apparently east of the dyke because it recorded almost no drawdown due to dewatering to the west and seems to respond only to abstraction / injection occurring to the east of the dyke. By 2017 this bore shows an increase in water levels of about 2 m compared to pre-development observations. Therefore in 2017 there was a 16 m head difference either side of the dyke with no evidence of any significant flow across it. Since then it seems likely that the head difference has continued to increase, although with the loss of HSJ0020M this cannot be confirmed there is no evidence to suggest that this situation has changed and the head difference is probably around 25 to 30 m as of 2021.

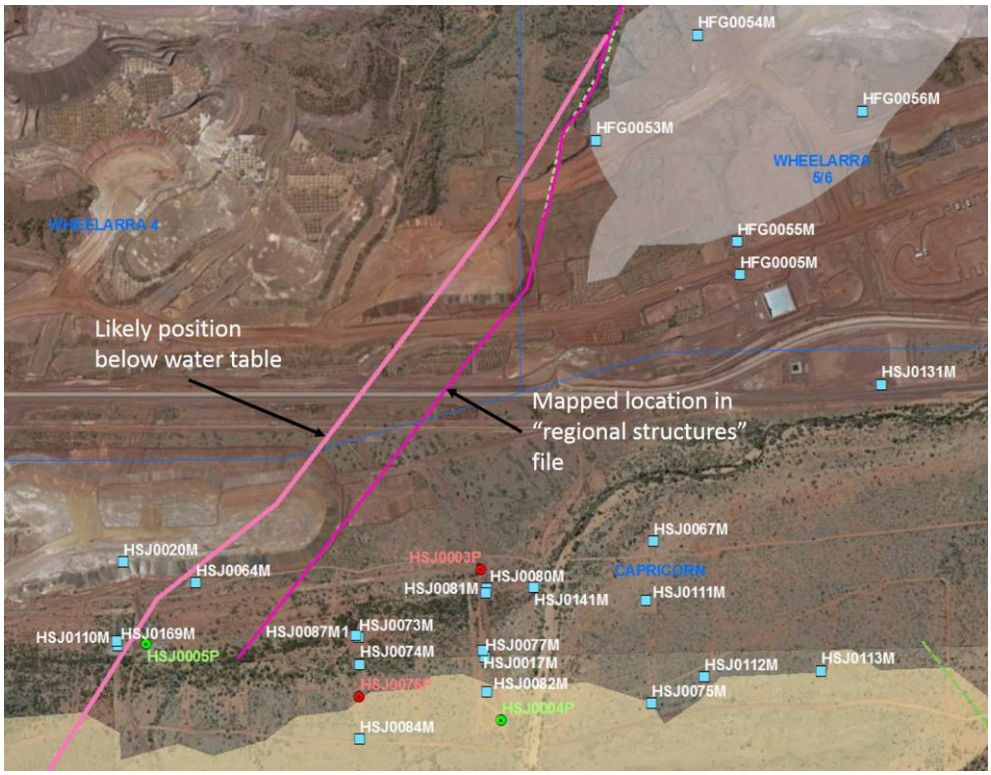


Figure 17. Central Fault position and monitoring locations (map)

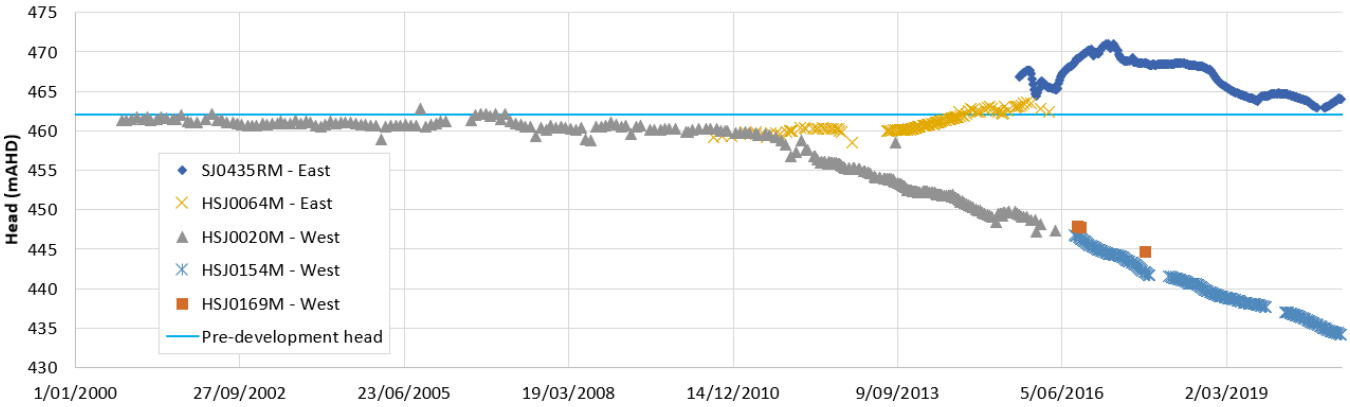


Figure 18. Central Fault monitoring data

Western compartment (3)

All monitoring bores within a polygon (shown in Figure 19) with sides made up of the Wheelarra Fault (west), the Central Fault (east), the granites (south) and the Weeli Wolli Formation (north), have recorded a significant and relatively uniform response to the dewatering of the Mindoona 1 pit. Several hydrographs supporting this are shown in Figures 20 and 21. Putting aside the hydrographs close to production bores and one associated with an alluvial clay (HSJ0050M) these show that within all hydrostratigraphic units monitored (alluvium and bedrock) and throughout the compartment, drawdown has reached between 25 and 30 m. The only major exception are bores in the area of WH3, which will be discussed below and are not shown in these figures.

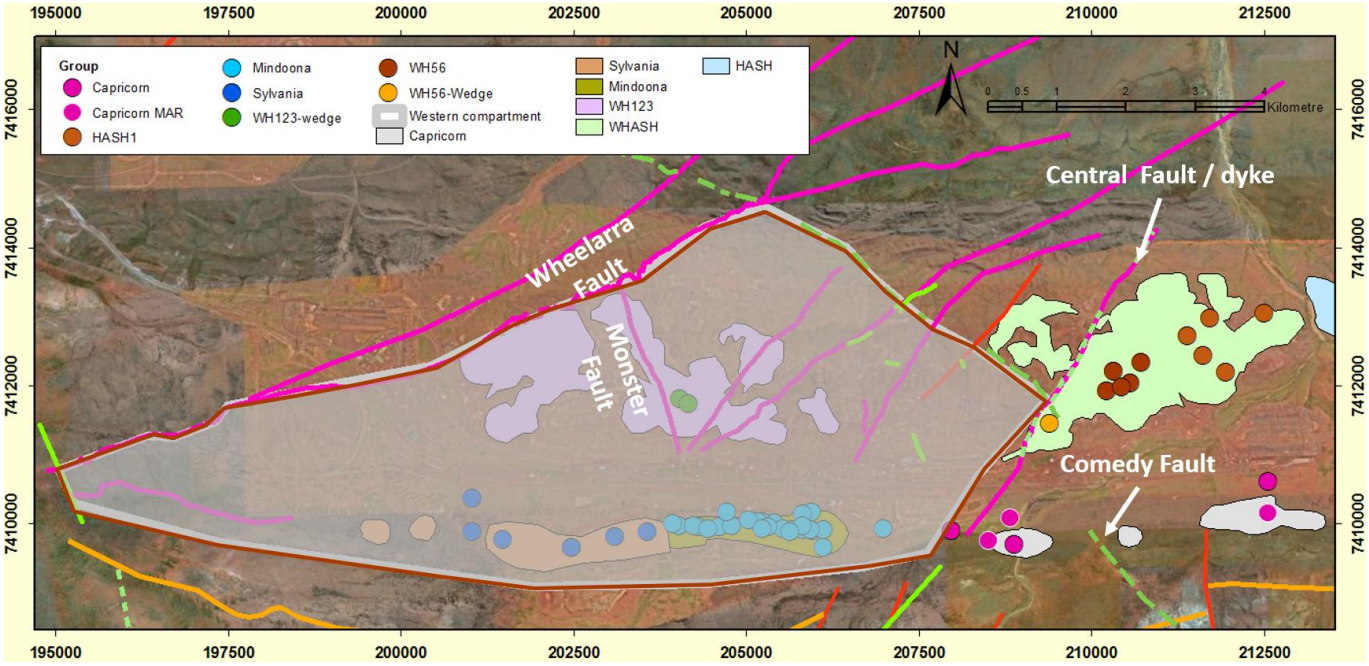
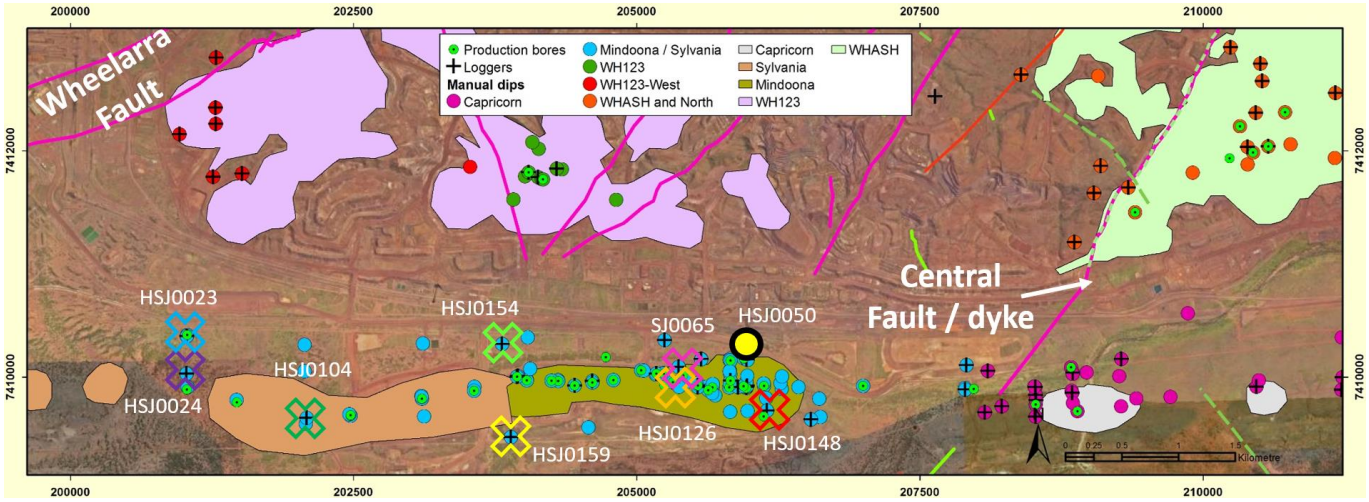


Figure 19. Western compartment



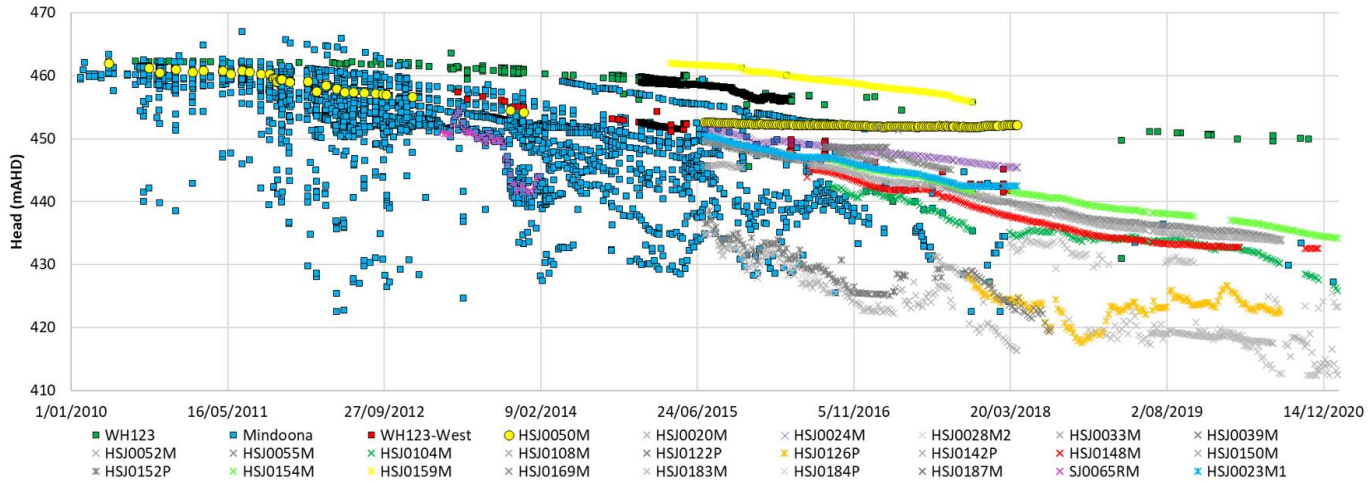


Figure 20. Western compartment – Mindoona / Sylvania / regional aquifer heads

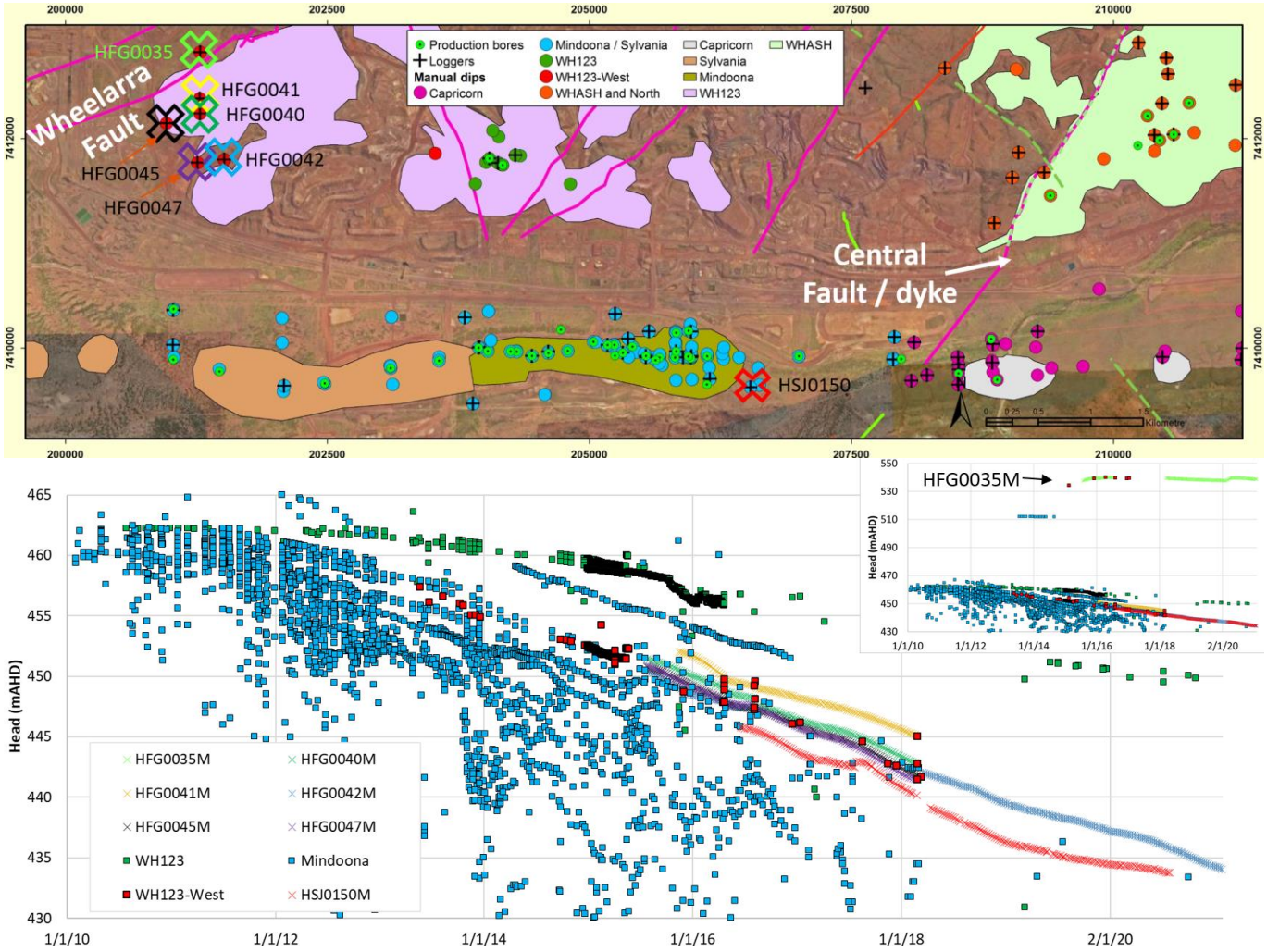


Figure 21. Western compartment – WH123 west heads

With the exception of HSJ0050M, these data show that the entire system within these stratigraphic and structural boundaries behaves in a very connected and uniform manner. The data do not confirm the mechanism, but they show that the non-aquifer (i.e. low permeability) materials usually associated with the bedrock and alluvial sequences, as well as any geological structures, do not impede flow within this compartment.

Bore HSJ0050M provides evidence that certain clays within the alluvium may be very low permeability. The bore, which is screened over two clay units (a lower carbonaceous and an upper non-carbonaceous clay), follows the general sub-regional drawdown response until it reaches about 452.5 mRL, where it levels off (Figure 20). The top of the carbonaceous clay in this borehole was logged at roughly the same elevation, and given that the screen continues below this point, this suggests that the carbonaceous clay is very low permeability and remains saturated even when the surrounding material becomes unsaturated. At this stage in the dewatering, the occurrence of this type of clay in the vicinity of the Mindoona pit has had no significant influence on the local or sub-regional dewatering effect. It may be this type of clay however, combined with the dolerite infill through the dolomite bedrock, that creates the effective barrier to flow along the Central fault.

WH3 subdued response (4)

Whilst drawdown of between 25 and 30 m is recorded almost universally within the area west of the Central Fault and east of the Wheelarra Fault, drawdown in the area of WH3 is subdued (Figure 22).

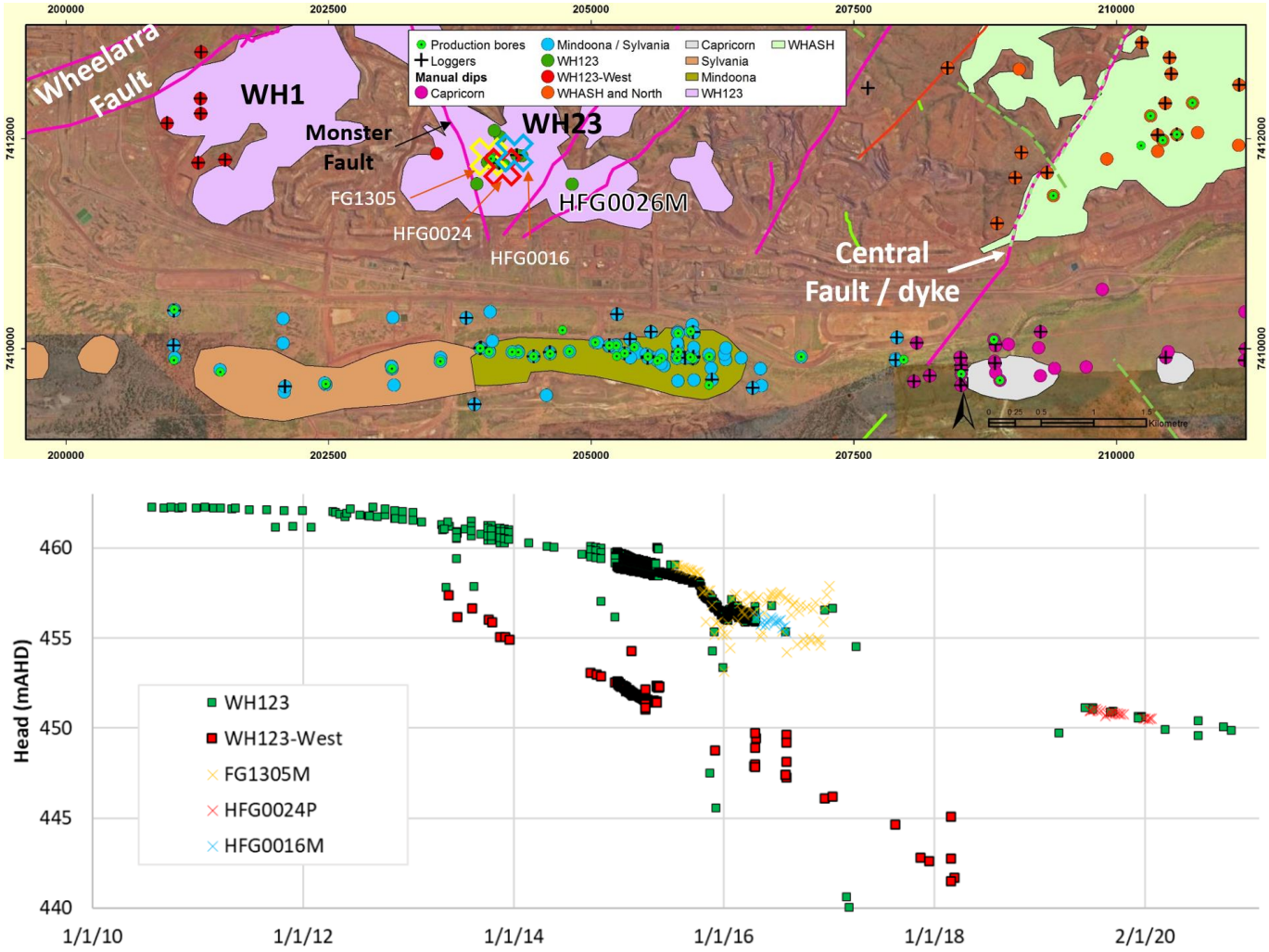


Figure 22. Wheelarra 2/3 subdued drawdown response

The bores here have experienced about 12 m of drawdown since dewatering commenced. Abstraction has occurred close to these bores since October 2015, but the drawdown prior to this can only be due to the dewatering of South Jimblebar and the difference here compared to the other locations is evidence for a hydrogeological disconnection of some significance. The options are:

- Three structures (faults) are mapped in this area and form a V shape around the bores, with the base of the “V” to the south. If they display reduced permeability compared to the surrounding material then they could reduce drawdown propagation into this area. HFG0026M (shown on the figure as WH123) also displays the subdued response, suggesting that it is the outer most structures that could be significant in this regard.
- The material around the bores or the orebody aquifer they are installed in (or both) may have an elevated storage and/or lower hydraulic conductivity.

South Jimblebar orebody response (5)

The orebody in the Mindoona mining area of South Jimblebar (the “Stage 1” pit) has been subjected to test pumping, a hydrodynamic trial (HDT) in 2010 and 10 years of dewatering. Numerous monitoring bores and vibrating wire piezometers (VWPs) have been installed to observe the system response to these stresses. However, as a result of active mining, there are very few bores remaining within the pit itself and none in the south wall.

Ignoring finer details of time variant abstraction from local production bores and degree of mineralisation, the Mindoona orebody groundwater response seems to show three main trends (Figure 23):

1. High drawdown – which appears to be well connected to production bores (even when not located right next to them), with significant and rapid drawdown and recovery. The drawdown by 2017 had reached 35 m (see HSJ0187M (very close to a production bore), SJ0782DV and SJ0123RV).

2. Moderate drawdown – which has been observed in the eastern half of the pit (see HSJ0188M and SJ0092RV), reaching about 17 m in 2017.

3. Low drawdown – observed in several bores (see HSJ0072M and HSJ0148M), reaching about 10 m in 2017. Whilst this is described as “low” drawdown, the rate and magnitude matches very well the drawdown trend in the regional aquifer, seen throughout the western compartment. This group is the slowest to respond to changes in abstraction.

Looking at the spatial distribution of these points (Figure 24) it is hard to discern a pattern and the structure does not appear to have a consistent effect. The distribution of high drawdown locations cuts through the north wall and cuts through low and moderate drawdown observations to the north and south.

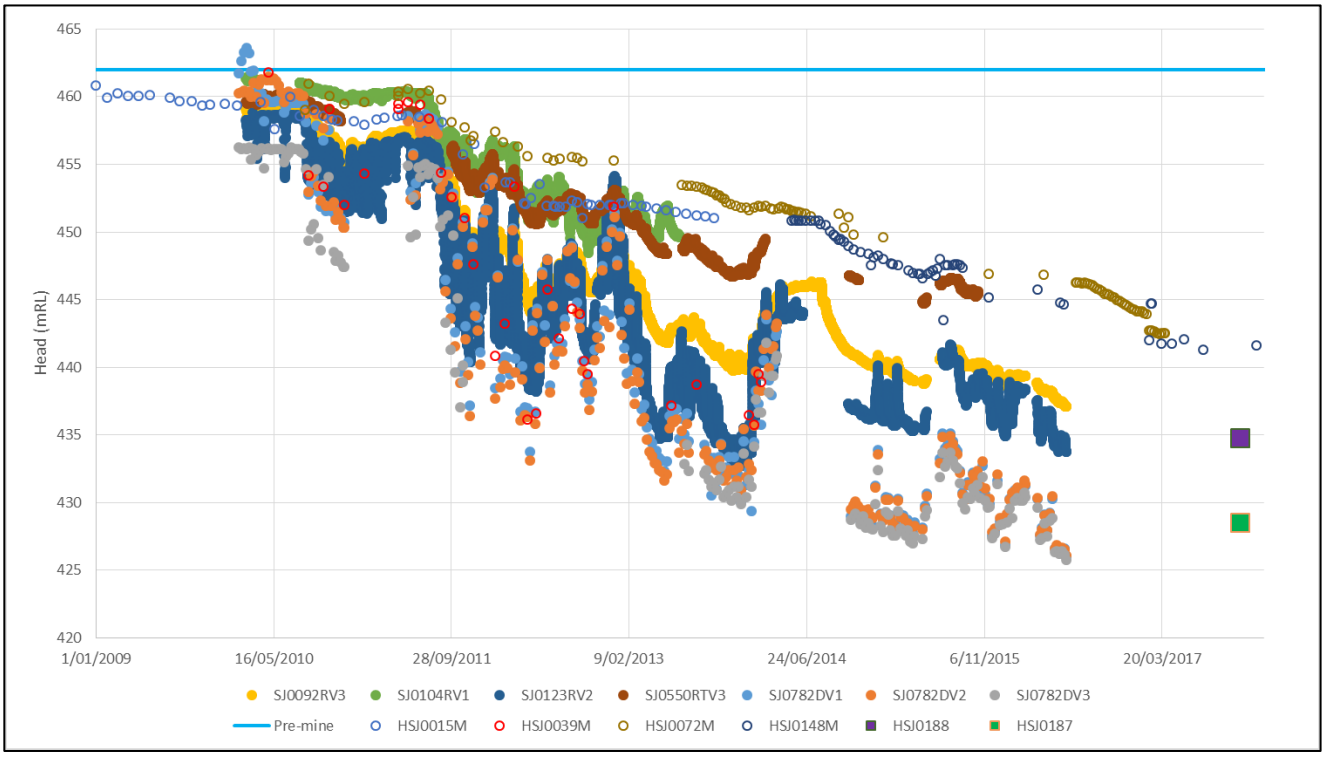


Figure 23. South Jimblebar orebody response

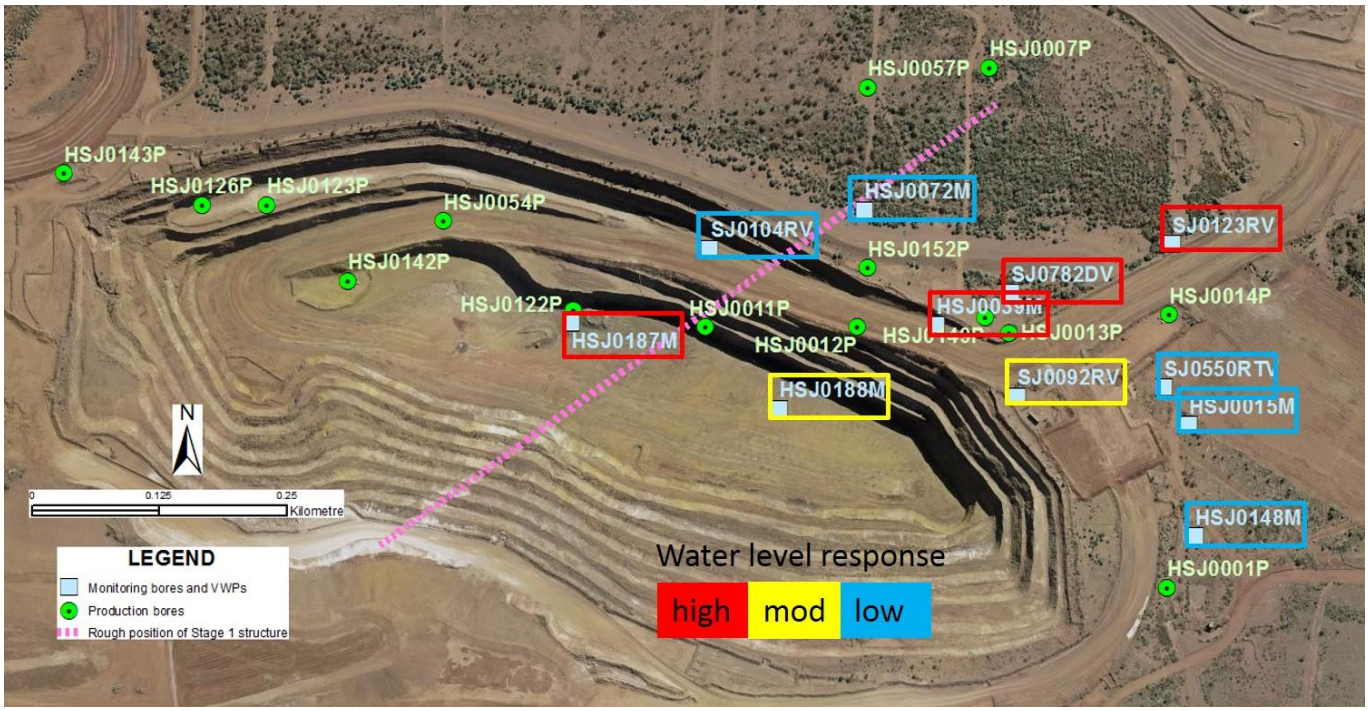


Figure 24. South Jimblebar orebody monitoring locations and response type

If dewatering stopped completely, it is unlikely that the orebody heads would increase to anything like the pre-development levels (462 mRL). Ignoring enhanced recharge into the pits, due to the closed nature of the western compartment, recovery heads would not exceed the drawdown observed in the wider compartment, which are currently (2021) at about 435 mRL.

South Jimblebar (Mindoona) South Wall (6)

Numerous water level observations are also available in the unmineralised Marra Mamba and Jeerinah Formation that make up the southern wall of the South Jimblebar pits. The pre-development observations suggest that the heads are marginally higher here than in the orebodies to the north. As shown in Figure 12, they range from 465 to 475 mRL.

Time variant observations are available at HSJ0146M and HSJ0159M, which are located within the Jeerinah Formation in an area where the pre-development heads were about 470 to 475 mRL. A conversion into drawdown for HSJ0058M (assuming a pre-development head of 470 mRL) shows a response that is very similar to that seen in the orebody (Figure 25).

These data suggest that the bedrock (Jeerinah) in this area may present a relatively high hydraulic conductivity (being as transmissive as the material to the north) and the elevated heads are a function of the transition from the uniform 462 to 463 mRL in the orebody to the elevated 530 mRL in the volcanics to the south.

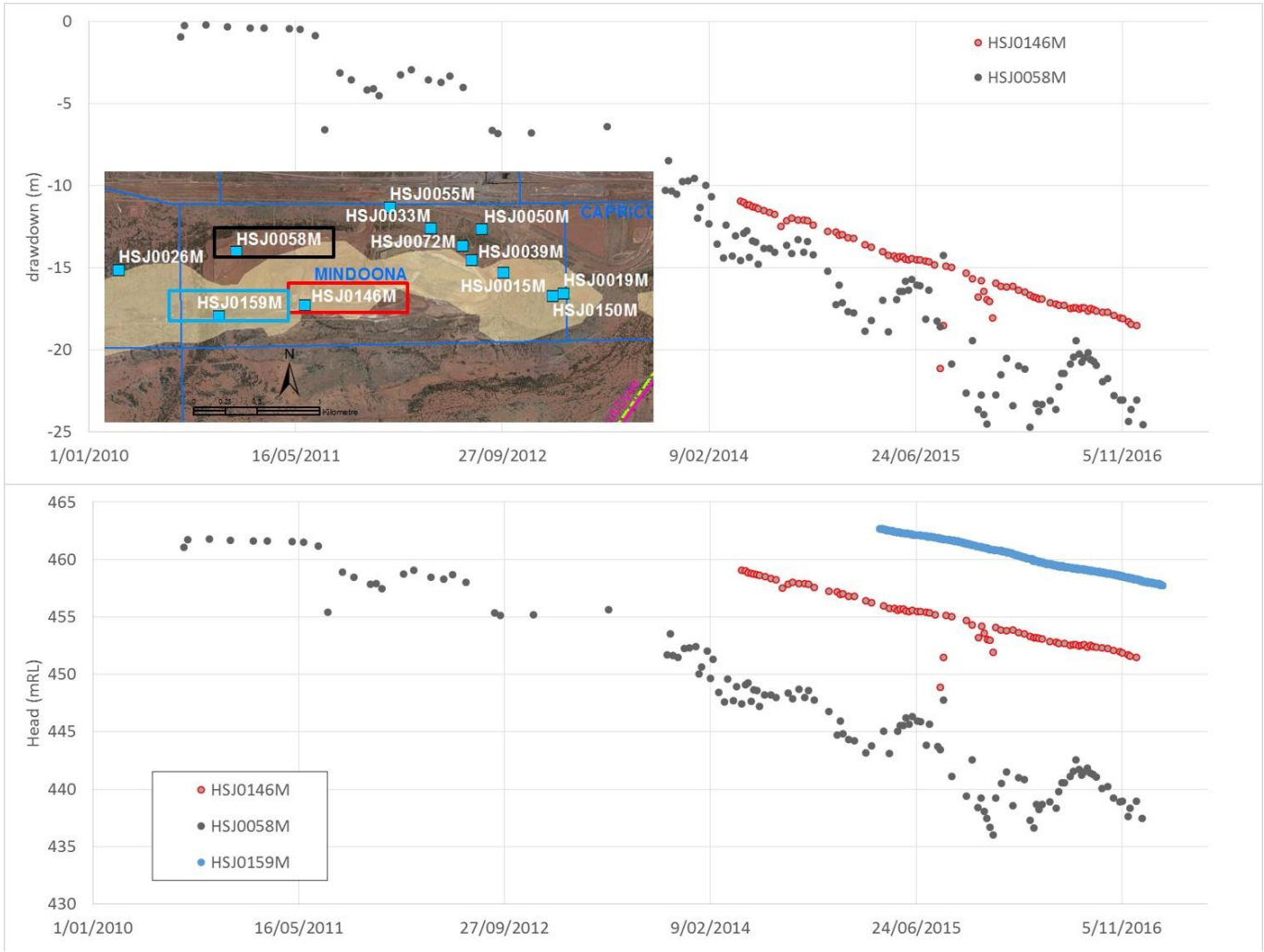


Figure 25. Time variant drawdown response – Jeerinah Formation (bores destroyed in 2017)

Response south of South Jimblebar (volcanic rocks) (7)

Three water level observations are available from the basement rocks (volcanics) found to the south of the South Jimblebar deposits. These are illustrated in Figure 26 and show that:

I. The groundwater levels here are elevated significantly (between 520 and 530 mRL) with respect to the levels within the aquifers to the north (pre-development of ~462 mRL).

II. The time variant record at HSJ0018M, whilst variable, does not appear to show a clear response to dewatering.

These data suggest that the material to the south of the Jeerinah Formation has a very low permeability and represents a barrier to groundwater flow south from Jimblebar.

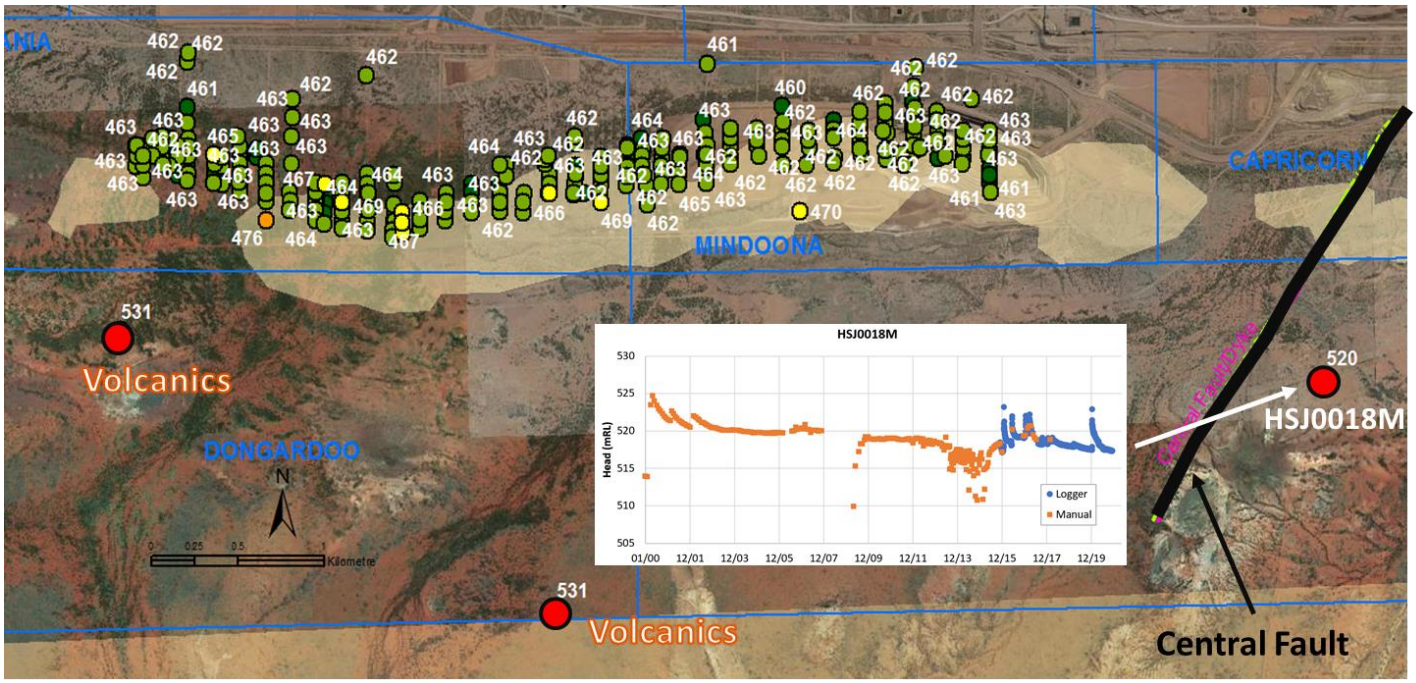


Figure 26. Regional spot heads (mRL) south of South Jimblebar

Capricorn (8)

The area of Capricorn has:

- Been subjected to a variety of different types and magnitudes of stress since 1994, including:
    - Abstraction for water supply from 1994 to 2013 at up to 2 ML/d
    - Injection from 2013 to the present (2021) at up to 2 ML/d
    - Dewatering from WHASH and HASH from the end of 2018, peaking at over 15 ML/d

These stresses along with the observed water levels are provided in Figure 27 (from 2010 onwards). This shows that:

- Heads in 2010 are quite varied (from 458 to 463 mRL) a result possibly of the unequal spatial distribution of water supply abstraction over this large area (almost 6 km from east to west). This is discussed more below.
- When injection commences the whole area responds, peaking at about 3 – 5 m (excluding injection bores) higher than pre-development levels (462 mRL). This response appears to be more significant to the response to abstraction at a similar rate, but this is most likely due to the fact that the relative change is more in this case (i.e. stopping abstraction (at 2 ML/d) and starting injection (at 2 ML/d) signifies a relative change of 4 ML/d).
- Since 2018 heads have been falling as injection has reduced and then dewatering of WHASH commenced. Heads in 2021 have roughly returned to pre-development levels.
- The heads seem to respond to the commencement of Hashimoto 1 (the eastern part of WHASH) dewatering too, with a clear change in gradient at that time.

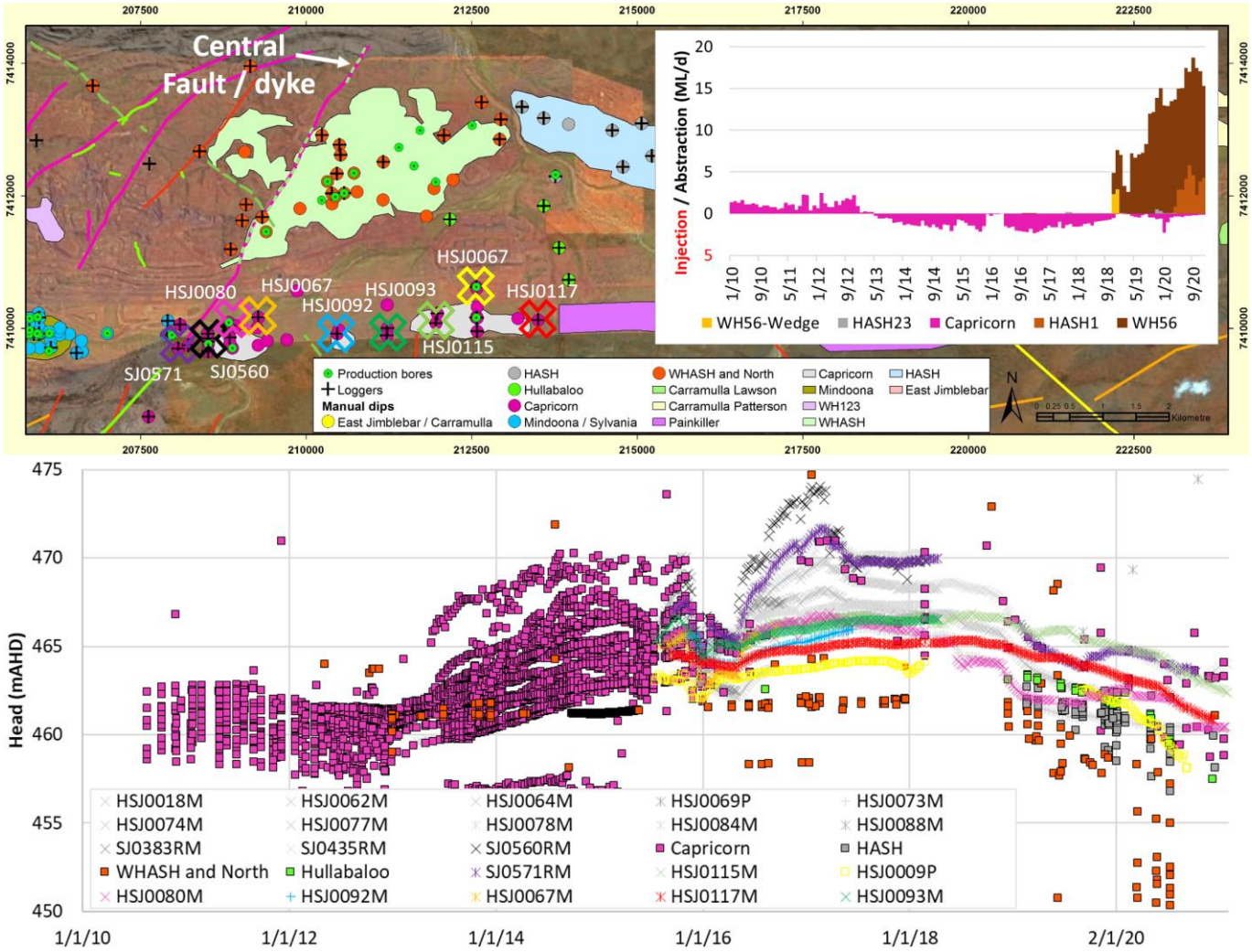


Figure 27. Heads and abstraction / injection in the Capricorn area

An analysis undertaken in 2017 investigated the potential connection between the orebody aquifers along strike and between the orebody aquifers and the regional dolomite to the north. This analysis, reproduced below, was undertaken prior to WHASH dewatering and provided some useful insights.

The main time variant monitoring boreholes (in which observations began in August 2010) and the production bores are shown in Figure 28 and the abstraction / injection data is shown in Figure 29. The data have been separated into two groups to assist the analysis (shown in Figure 30):

- South west
- South east

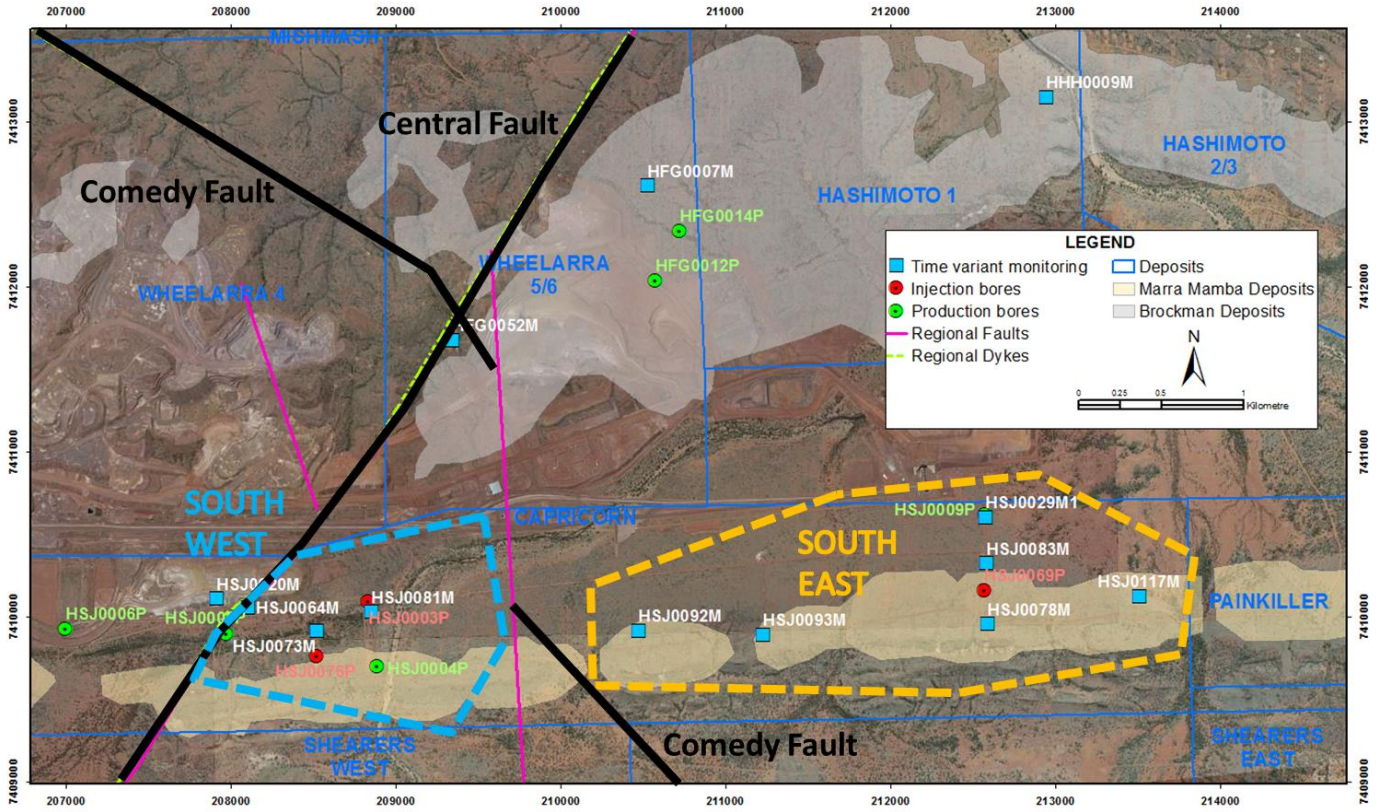


Figure 28. Capricorn monitoring and production bore locations (2017)

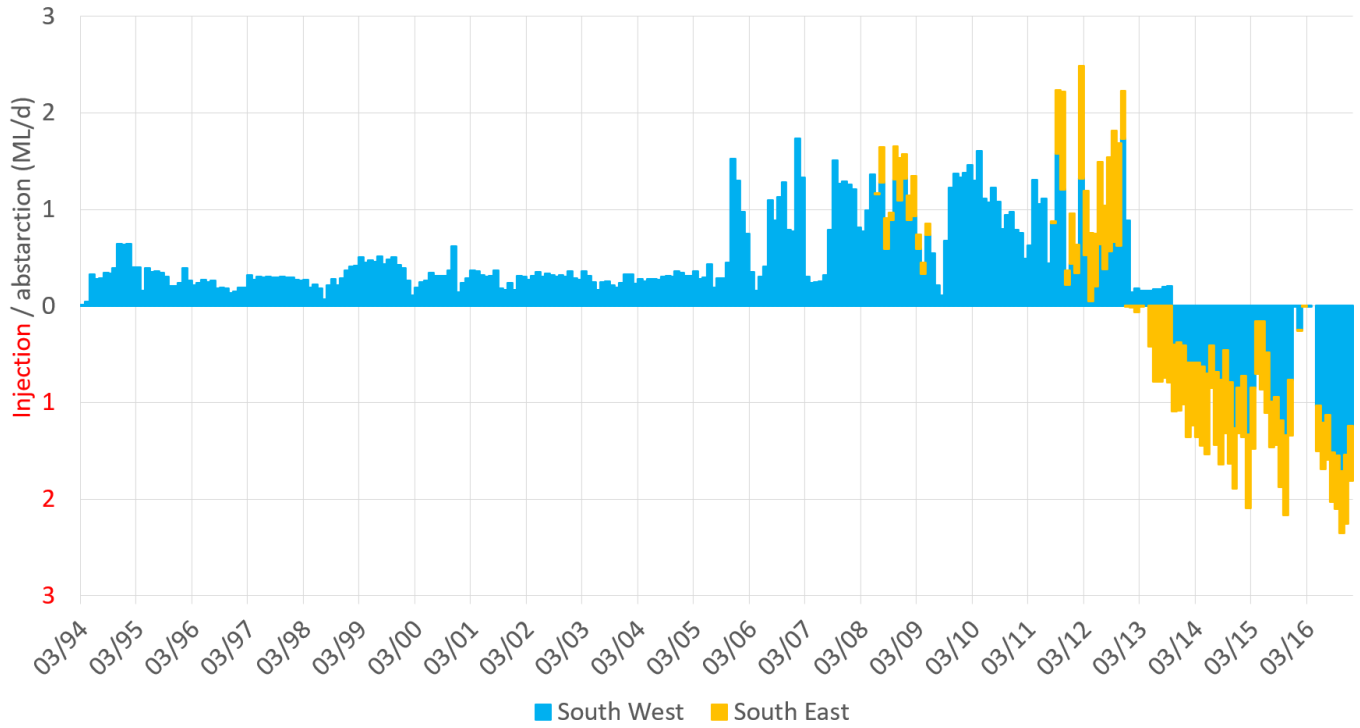


Figure 29. Eastern compartment abstraction and injection

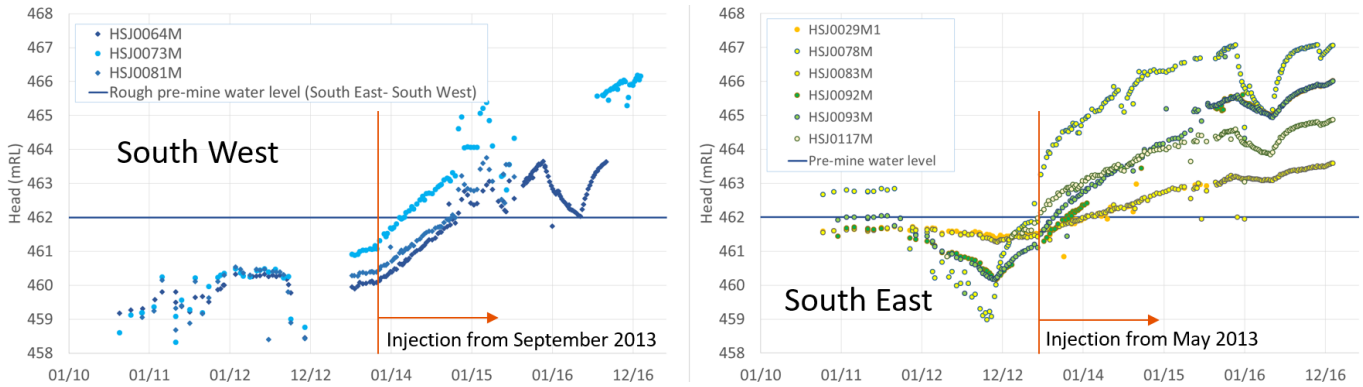


Figure 30. Eastern compartment water level response

Abstraction occurred in this area for water supply from 1994 until mid-2013, with most of the groundwater sourced from the South West area. The abstraction rate increased from 2006 to 2013. From mid-2013 abstraction ceased and was replaced by injection. The injection rates and volumes were split roughly 50:50 between the South East and South West areas. Up to the end February 2017 the total volumes were:

- South West – abstracted: 3.6 GL, injected: 1.0 GL, net: +2.6 GL
- South East – abstracted: 0.4 GL, injected: 0.8 GL, net: -0.4 GL

The water level responses over this time (Figure 30) suggest the following:

South West

Three bores provide a long time series record of water levels in this area:

- HSJ0064M – Tertiary/Dolomite
- HSJ0073M – Marra Mamba
- HSJ0081M – Tertiary/Dolomite

There are four production bores:

- HSJ0003P - Tertiary/Dolomite – Injection and Abstraction
- HSJ0004P – Marra Mamba - Abstraction
- HSJ0005P – Tertiary Detritals - Abstraction
- HSJ0076P – West Angela Member and Marra Mamba – Injection and Abstraction

During the monitoring period (from August 2010) the most active production bores are HSJ0003P and 76P. Between October 2013 and September 2014 injection was undertaken with 76P alone. From October 2010 both bores were used for injection. Abstraction from bores HSJ0004P and 5P was minimal.

The data show:

I. That at all bores the initial water levels (end 2010) are at about 459 mRL (~3 m below pre-development levels). This is due to water supply abstraction prior to this time.

II. The water levels recover a little in 2011 following a reduction in the abstraction from the South West as the South East production bore comes online. The three locations return similar observations though this period.

III. Data is missing during 2013, but it appears that water levels hold steady in HSJ0064M and 81M during 2012 and 2013. Sometime in 2013 however, the water level in HSJ0073M starts to diverge from the other two and ends the period about 1 m higher, most likely because HSJ00076P is pumped less during this period.

IV. All bores show a relatively uniform response to injection from the end of 2013 to October 2014 (even though only HSJ0076P is used). The 1 m difference between HSJ0064M / 81M and 73M is maintained and by the end of 2015 all see a fairly uniform 3 m increase in head.

V. From December 2015 to April 2016 there is almost no injection into any of the bores. The water level data is missing from all bores apart from HSJ0064M and this shows rapid recovery (i.e. heads falling about 1.5 m).

VI. Injection resumes in May 2016 and the groundwater level responds quickly. The last observations are in February 2017 but only for HSJ0073M. The head in this bore are 466 mRL, roughly 4 m higher than pre-development observations.

The analysis suggests that the orebody and dolomite in the South West area is well connected. It also confirms that this area is not hydraulically connected to the western compartment.

South East

Only one injection/abstraction bore is used in this area (HSJ0069P) and six monitoring bores provide a long time series record of water levels. A summary of the water level at each of these bores is provided in Table 4.

Table 4: South East area bore completion, location and 2017 head summary

Location	January 2017 water level
HSJ0078M – Marra Mamba (0.2 km to the south of the PB)	467.0 mRL
HSJ0092M and 93M – Marra Mamba (2.1 and 1.4 km to the west of the PB)	466.0 mRL
HSJ00117M – Marra Mamba (0.9 km to the east of the PB)	465.0 mRL
HSJ0083M (Tertiary Detritals) and 29M1 (Wittenoom) - (0.2 and 0.5 km to the north of the PB)	463.5 mRL

*PB = production bore HSJ0069P

The summary and hydrographs suggest that:

- There is a disconnection in the Marra Mamba Formation orebody between the South East and South West areas (i.e. the response at HSJ0092M is quite dissimilar to that seen to the west). The Comedy Fault is mapped across the Marra Mamba to the west of HSJ0092M and may provide the barrier to flow.
- The Marra Mamba orebody aquifer in the South East area is continuous along strike. The hydraulic continuity seems to be greater in the western direction (towards HSJ0092M and 93M) than the east (towards HSJ0117M).

The Tertiary Detritals and Wittenoom show a more subdued response than the orebody. This could be due to reduced connection across the unmineralised bedrock here or the Tertiary / Wittenoom may have a greater storage than the orebody.

Conclusion:

- The Capricorn orebody is hydraulically connected to regional aquifer system (and WHASH and HASH beyond that).
- There may be some hydraulic heterogeneity and possible disconnection through the Capricorn orebody aquifer.
- There is limited / no hydraulic connection across the Central Fault.

WHASH – East of the Central Fault (9)

Data from the WHASH area (east of the Central Fault) is shown in Figure 31. WHASH dewatering started in November 2018. The observations show that:

- The response at HFG0052M is very similar to the Capricorn response. This, combined with the geological and structural models, suggest that this area is not connected to the main WHASH area. The Comedy Fault trending NW/SE just to the north of this bore is the most likely mechanism for this isolation from the rest of WHASH.
- WHASH heads increase in response to injection in Capricorn.
- All WHASH heads respond to WHASH dewatering.
- By 2021 drawdown in the centre of the orebody was about 13 m (so roughly 12 m/yr at an average of 10 ML/d)
- By 2021 drawdown in the north east of WHASH (adjacent to the creek) was about 9 m (roughly 8 m/yr)

The data therefore indicate that the response within the WHASH orebody has been quite uniform to date.

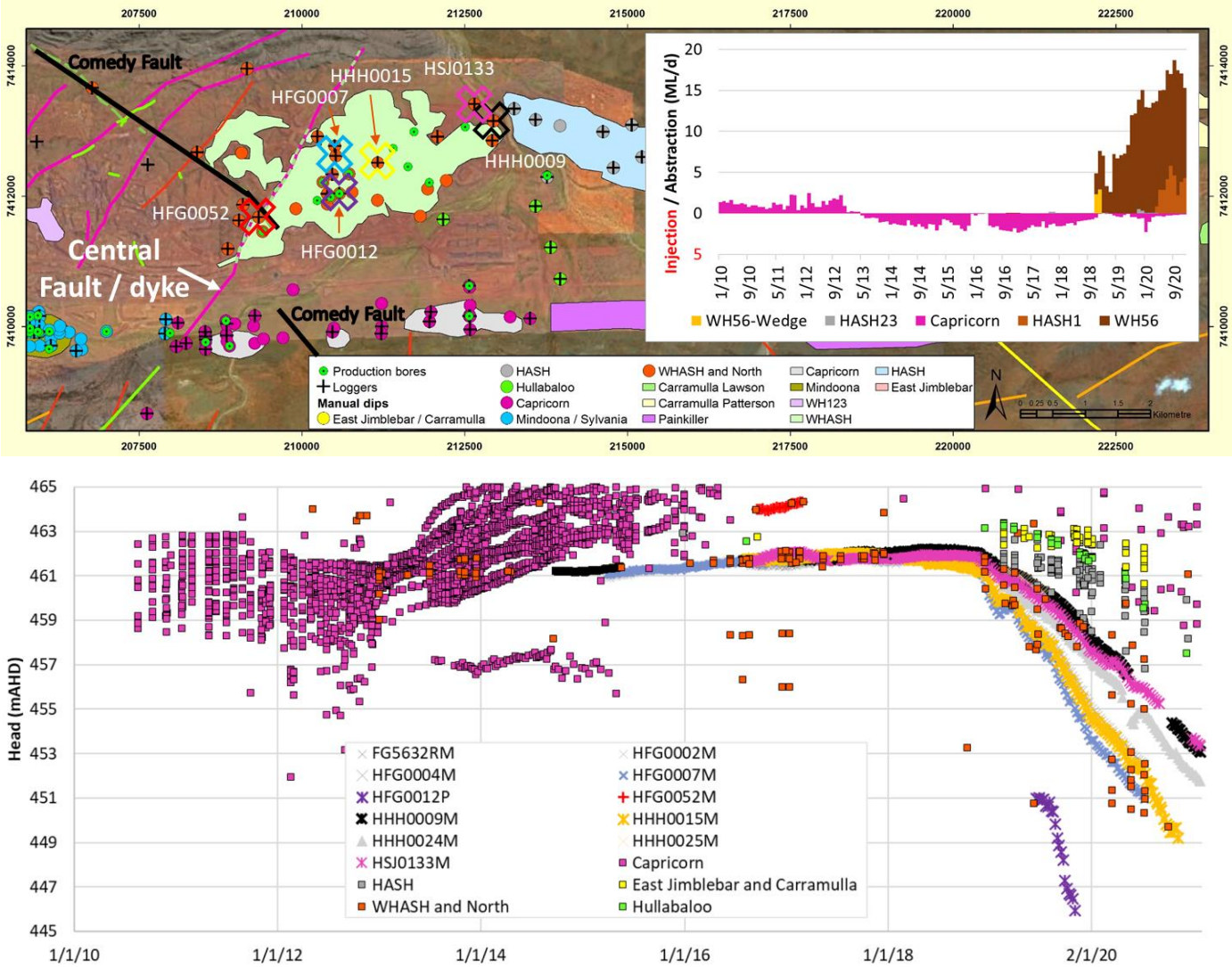


Figure 31. Heads in the WASH area (east of the central fault)

WHASH Central fault and north of WHASH / WH123 (10)

The pre-development data that are available are all to the north west, mostly on the Shovelanna side of the Wheelarra Fault (Figure 32). They show that heads fall from the west to east and reach a minimum of about 476 mRL. This is about 16 m higher than the observed heads just to the north of WH5/6. It can be assumed that these data confirm that the Wheelarra Fault continues to be a barrier to flow as it travels to the north east of Jimblebar.

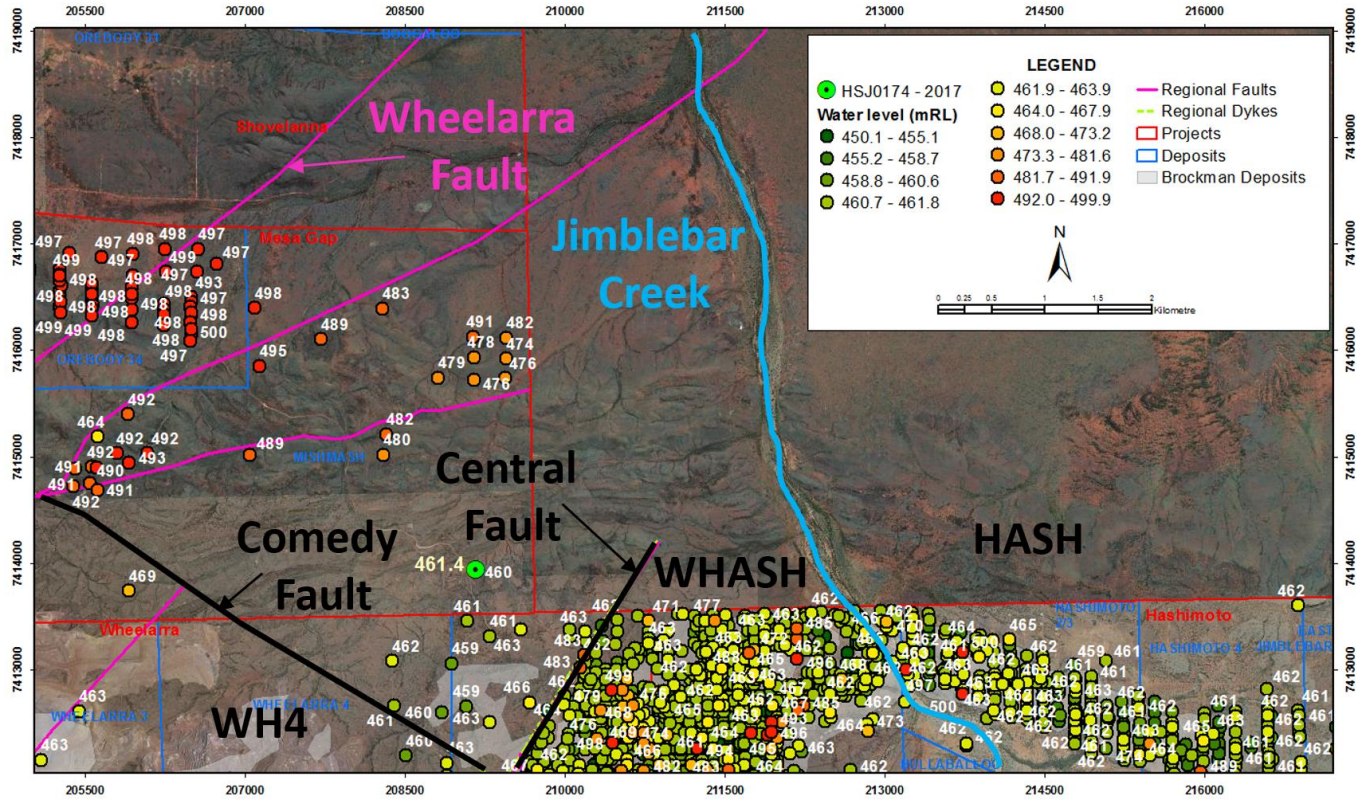


Figure 32. Heads to the north of Wheelarra and Hashimoto

The area of Brockman and Weeli Wolli immediately to the west and north west of the Central Fault as it passes through WHASH is a complex area of Jimblebar. Recent monitoring and dewatering stress at WHASH has helped this understanding, and the data is shown in Figures 33 and 34. These Figures include:

- Representative water levels in the regional system and in the WH2/3, both west of the Central Fault.
- Representative water levels in WHASH close to the Central Fault
- All monitoring west of the Central Fault in the Brockman material

Figure 33 shows just three bores, all in the north and outside of the main Brockman material, with the following data:

- FG4577 (unknown geology but within the Wheelarra Fault splay) and FG4620 (sills, clay):
    - High, stable (i.e. no sign of drawdown) heads in the far west and far northwest bores (which are in line with the pre-development heads in this area)
- HSJ0174M (Weeli Wolli Formation):
    - Heads prior to WHASH dewatering comparable (i.e. 462 mRL) to those east of the dyke in. In other words, no sign of this bore responding to the dewatering of South Jimblebar.
    - Drawdown response to WHASH dewatering (i.e. east of the Central Fault).

Figure 34 includes monitoring in the Brockman bores along strike of the WHASH and WH123 orebodies and shows:

- A more detailed picture of the response observed at HSJ0174 (described above).
- Apparently (although not irrefutable) similar response and water levels to HSJ0174 (although with less data for confidence) in three other bores west of the Central Fault (FG9778M, HFG0067M, FG4544M).

However, given the limited time series at these locations it cannot be concluded whether these are responding to South Jimblebar or WHASH dewatering, or both.

- HFG0066M and HFG0095M (although only a single point, i.e. no time variant data) responding to South Jimblebar dewatering as per the WH2/3 orebody.
- Two bores in the WHASH pit west of the Central Fault that seem to show a response (although again, not irrefutable) to South Jimblebar dewatering (FG4610M and FG4556M). Both bores are in the Joffre Member (probably orebody). As with some of the other bores, it is not possible to tell whether these are also responding to WHASH dewatering.

The data and analysis suggest that:

1. There is connection across the Central Fault in WHASH, into the northwest (HSJ0174M).
2. There may be some connection to the regional aquifer system west of the Central Fault into the western-most WHASH orebody via structures.
3. Just south of the western-most WHASH orebody there is connection to dewatering, but whether it is South Jimblebar or WHASH or both is not possible to say.
4. South and west of these there appears to be a good connection to the South Jimblebar dewatering (i.e. the regional aquifer system west of the Central Fault) and these bores respond as per the WH2/3 orebody.

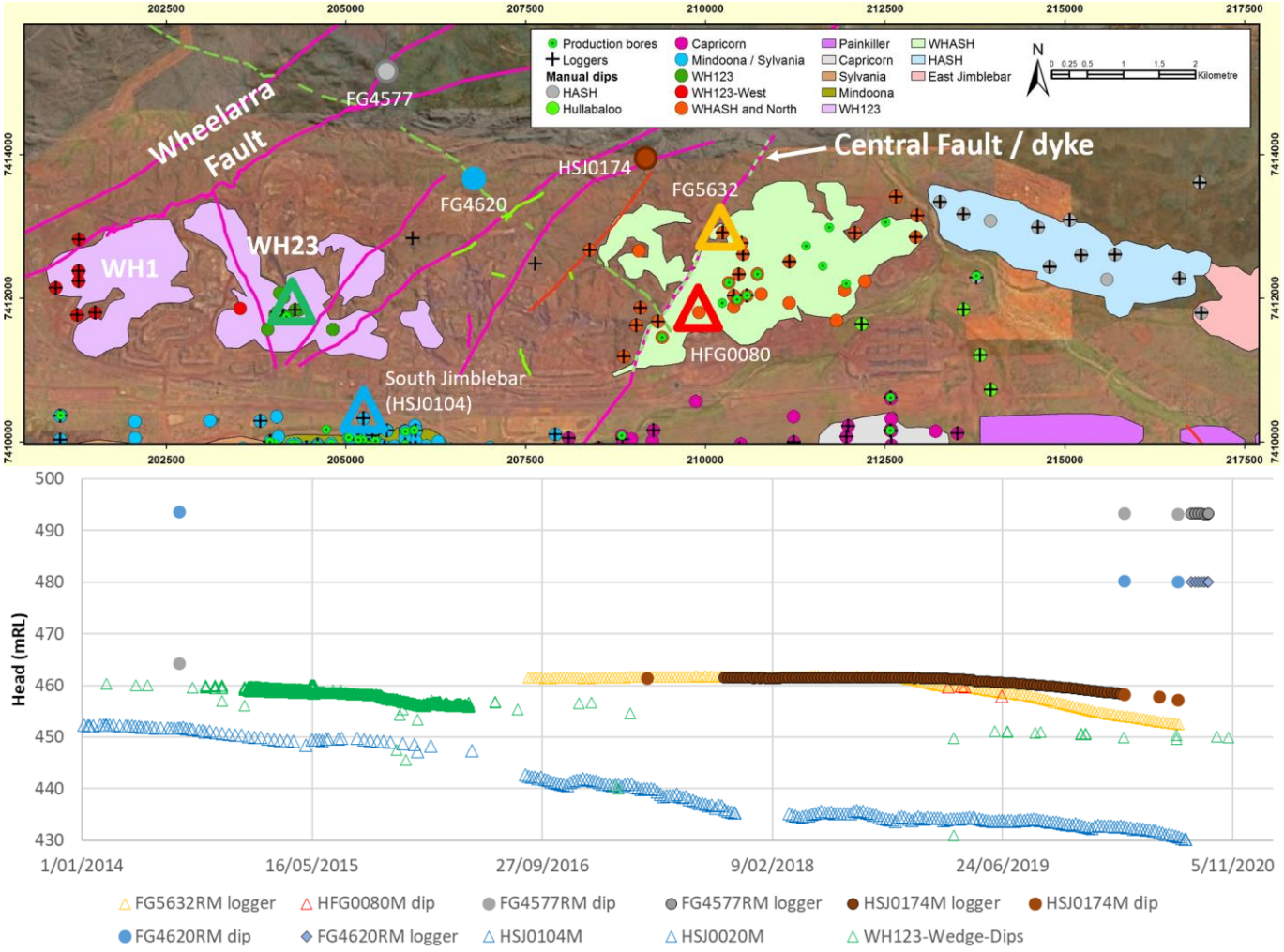


Figure 33. Heads in the WHASH area (west of the central fault) (Zoomed out)

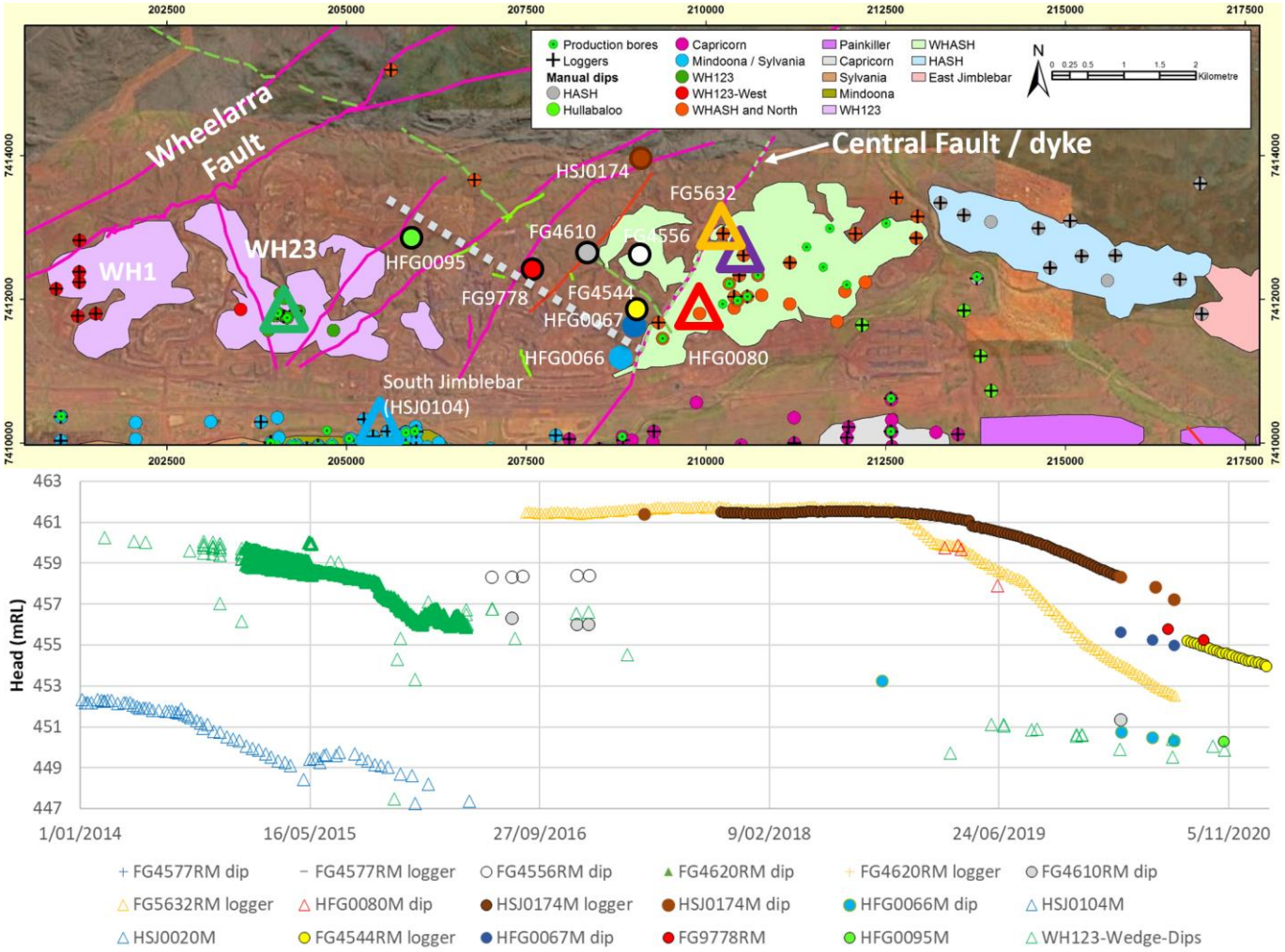


Figure 34. Heads in the WASH area (west of the central fault) (Zoomed in)

Hullaballoo (11)

Heads in the four Hullaballoo bores are shown in Figure 35. This shows that:

- There has been sustained drawdown since the end of 2018, which corresponds to WHASH dewatering,
- The bore closest to WHASH reports the greatest drawdown (HHH0020M screened in the Bee Gorge),
- The three bores to the south east of WHASH are very consistent and return almost identical heads and response (HHH0026M and 27M screened in dolomite, HHH0028M screened in TD2). The total drawdown in these bores was about 4.5 m by 2021.

The data show that the Hullabaloo area (i.e. the regional aquifer system south of WHASH) shows a clear response to WHASH dewatering and is therefore well connected to the WHASH orebody aquifer. The regional aquifer also shows signs of very high transmissivity and potentially high storage.

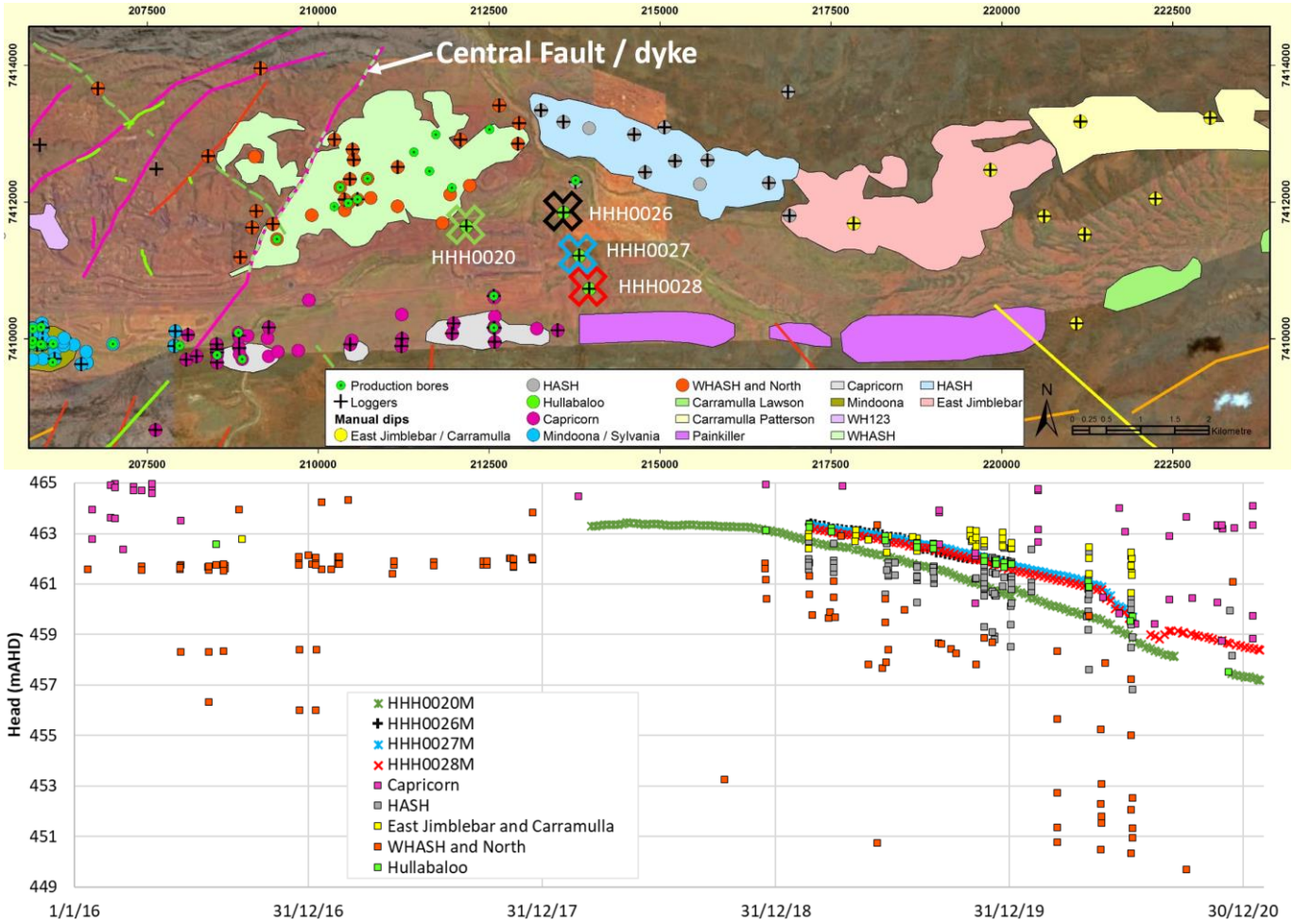


Figure 35. Heads in the Hullaballoo area

HASH (Hashimoto 234) (12)

Heads in HASH are shown in Figure 36. There has been no dewatering in this area yet. All bores show drawdown however:

- In the western most observation bore (HH1661RM) the response is very similar to WHASH on the other side of the Jimblebar Creek. This suggests that the orebody aquifer is continuous beneath the creek.
- From this point east though, the response changes rapidly:
    - Drawdown is initially slow to propagate, but when it does all the locations return a relatively consistent response for the first few months.
    - After this period, drawdown accelerates but at different rates in each bore. The greatest drawdown is seen in the west and the least drawdown in the east. However, there are some important subtleties:
        - There is a gradient in the western part (between HH1676RM and HH1661RM, which are very close to each other). The former returns 5 m drawdown by 2021, the if the latter's data is extrapolated, drawdown would be between 6 and 7 m.
        - There is virtually no gradient in the east, between HH1977RM and HH2781RM (about 2 km apart). Both experience between 2.5 and 3 m drawdown by 2021.
        - These observations hint at some lower transmissivity in the west and higher transmissivity in the east or discrete lower transmissivity zones within the orebody.

- Drawdown in east is greater than that in Hullaballoo. This suggests that it is occurring through the orebody (along strike), rather than via the regional aquifers and back into the orebody aquifer.
- Drawdown is also observed in the bore to the northeast of HASH (HH2080M, screened in the Woongarra Volcanics). At this location the initial heads are higher than the orebody, but drawdown reaches about 1.0 m by 2021.

The data therefore suggests that:

- The HASH and WHASH orebody aquifers are hydraulically connected.
- The full strike length of the HASH orebody is responding to WHASH dewatering.
- The HASH orebody aquifer may present some heterogeneity along strike.
- There may be some connection between the orebody and the volcanics to the north/northeast.

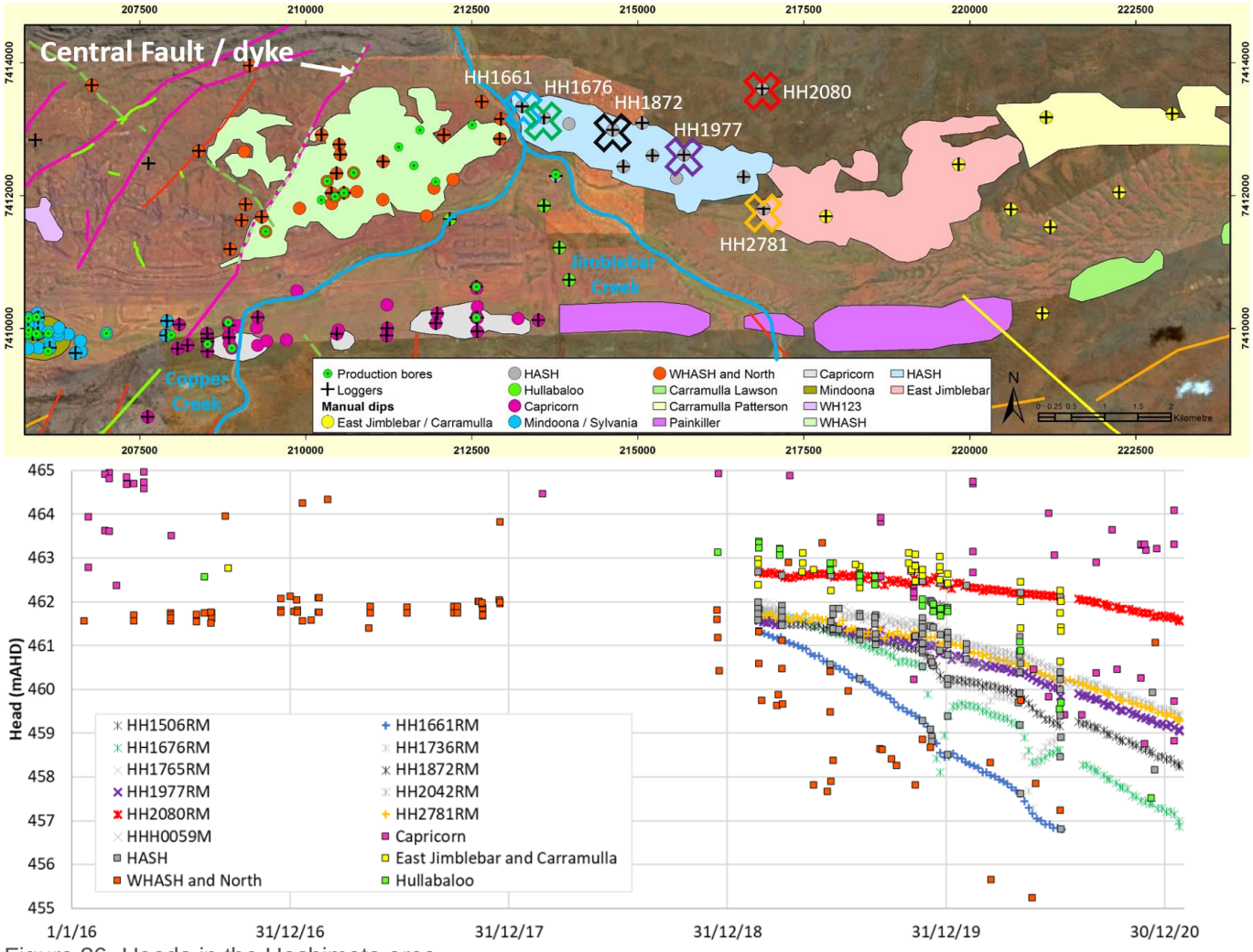


Figure 36. Heads in the Hashimoto area

East Jimblebar / Caramulla (13)

The data further east into East Jimblebar and Caramulla deposits and the regional aquifer system is shown in Figure 37. The only anthropogenic stress in this area has come from testing of production bores installed for the Caramulla MAR scheme which will be used to inject surplus water into the dolomite of the regional aquifer between the southern and northern Caramulla deposits (Lawson and Patterson respectively).

BHP

Of hydrogeological interest in this area is a very thick Tertiary sequence (TD3 and TD2) within the palaeovalley (to depths of up to 210 mbgl) that thins out towards the orebodies to the north and south and appears to deepen to the east. A clay-rich horizon is generally encountered within or at the base of the Tertiary sequence. This clay-rich horizon is inferred to hydraulically separate (at least locally) the underlying dolomite bedrock from the upper, largely unsaturated portions of the Tertiary sequence (TD3). The phreatic surface resides within this clay layer.

Monitoring here starts in February 2019, three months after WHASH dewatering commenced. The data show that:

- Heads start off a little higher here than to the west (up to 463 mRL, compared to 462 mRL).
- All bores in this area show a drawdown response to WHASH dewatering. In more detail:
    - East Jimblebar:
        - A gradient of about 1.5 m from west to east that is maintained during drawdown (suggesting reduced orebody transmissivity along strike)
        - Both western bores (HH2781RM and EJ0522RM) show about 2.5 m drawdown over the monitoring period. This is consistent with the HASH response just to the west.
        - Data at the eastern bore (EJ0578RM) is not available for the same duration as the western ones, but drawdown over the same period is estimated to be about 2 m.
    - Caramulla (Patterson). Assuming pre-dewatering heads about the same as the eastern part of East Jimblebar:
        - HCM0024M (western bore) shows a clear drawdown response reaching about 1.0 m by the last reading (January 2021).
        - HCM0034M (eastern bore) shows a clear drawdown response reaching about 0.5 m by the last reading (November 2020)
    - The regional system between the two Caramulla Patterson and Lawson deposits (HCM0005M, HCM0007M and HCM0029M) and the area between the Painkiller and Caramulla Lawson orebodies (CM0038M). These bores seem to follow the same trends, which are:
        - Flat or very gradual decline in heads until March 2020
        - Very strong and rapid response to MAR production bore test pumping
        - Partial recovery once test pumping ceases. The recovery seems to be to the same level as the head at the relevant time in the Caramulla Patterson orebody.
        - It is estimated that by 2021 end all of these bores would observe about 1 m drawdown.

Test pumping of three MAR production bores was carried out in 2020 (BHP, 2020). The bores were pumped for between 2 and 3 weeks at between 5.5 and 6.5 ML/d (Figure 38). The bores were pumped individually with a gap of about a month between each test. The findings pertinent to this study were that:

- All three tests provided evidence for a hydraulic boundary to about 10 km to the west of the MAR borefield.
- The aquifer exhibits high transmissivity and low storage.
- The data suggest an unconfined/semi-confined aquifer in this location.
- Drawdown preferentially extends in the east-west alignment along the axis of the palaeochannel.
- Post-pumping recovery is slow and incomplete (which may be due to the influence of WHASH dewatering).
- Within the margins of the dolomite palaeovalley, the overlying clay unit (generally >25 m thickness) is expected to constitute a confining / semi-confining layer.

Even with some remaining uncertainty in the data, the overall conclusion is that:

- The entire area is responding to WHASH dewatering at a relatively consistent rate (although slightly higher in the north west, closest to stress and in the orebody aquifer).
- The response is very consistent through the Caramulla Patterson (north) and Lawson (south) orebody aquifers and the regional aquifer system between them.
- The regional aquifer between the Caramulla orebodies and further to the west is probably high transmissivity and low storage.
- There is evidence to suggest that there is a hydraulic barrier to the west (through the regional aquifer system), just east of the Hullaballoo monitoring bores. The nature of the hydraulic barrier is unknown at present.
- Connection into the regional system in this area to WHASH dewatering may therefore be primarily through the orebody aquifers of East Jimblebar and Caramulla Patterson. This remains uncertain however.

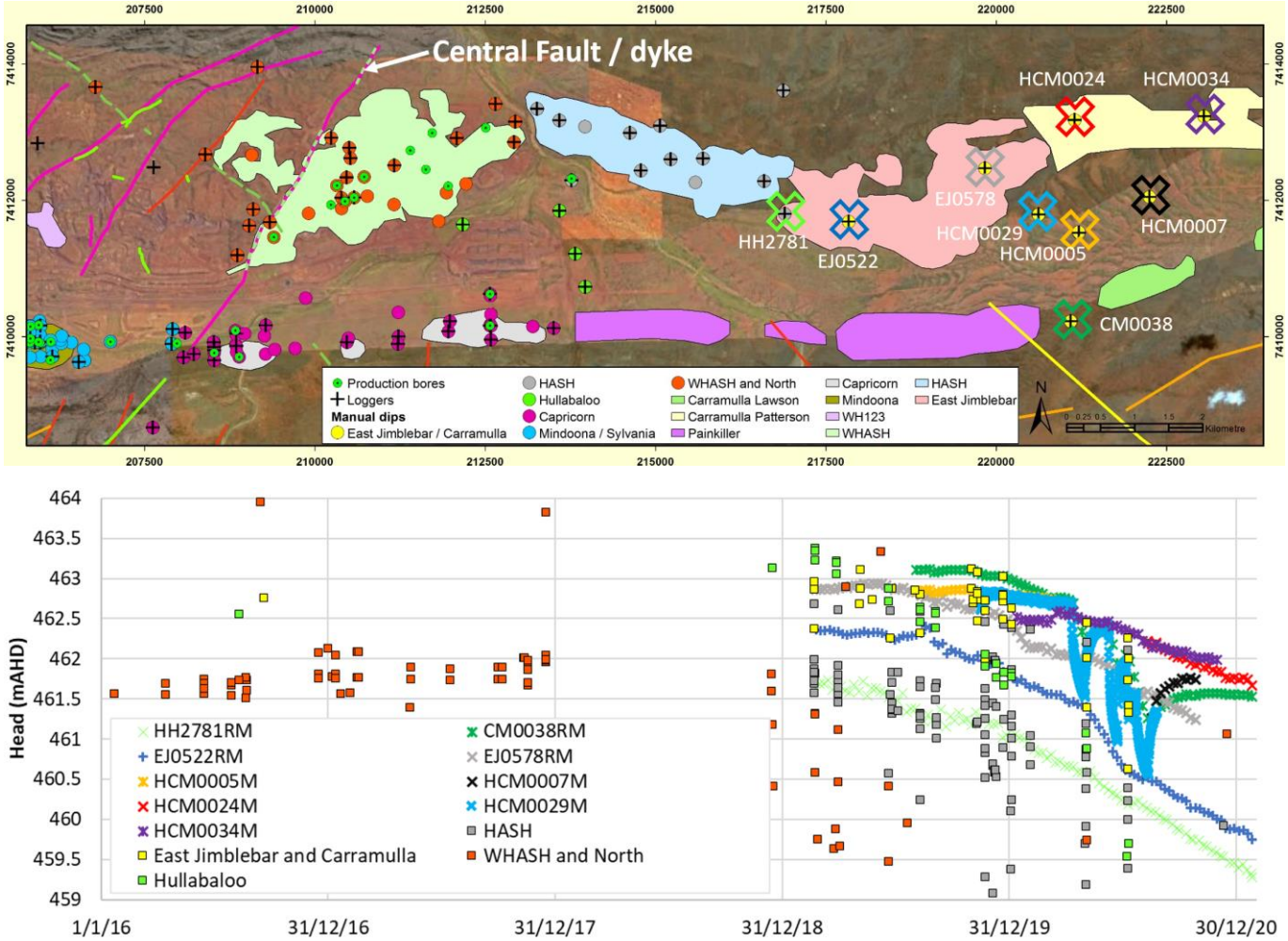


Figure 37. Heads in the East Jimblebar / Caramulla area

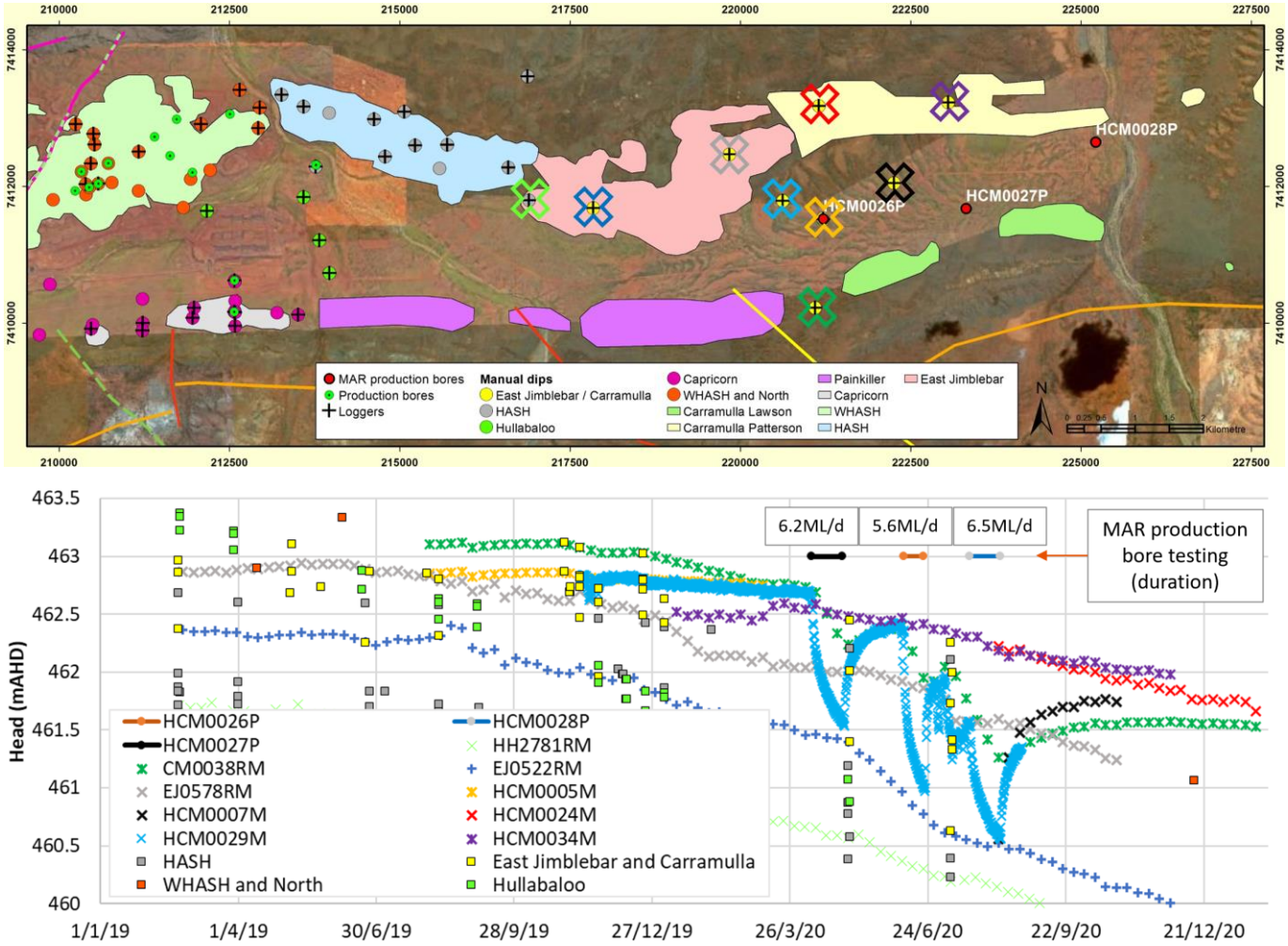


Figure 38. Heads in the East Jimblebar / Caramulla area – response to Caramulla MAR test pumping

Basement response south of Capricorn (East of Comedy Fault) (14)

The pre-development heads in the southern part of the South Jimblebar deposits east of the Comedy Fault (Figure 39) are consistently higher than the heads in the orebody and alluvium to the north. The heads increase from 462 mRL to 500 mRL within about 100 m. Furthermore, such a sharp contrast is not observed to the west of the Central Fault. These data suggest that the unmineralised Marra Mamba in this area has different hydraulic characteristics, i.e. is of a lower permeability than the same material further west.

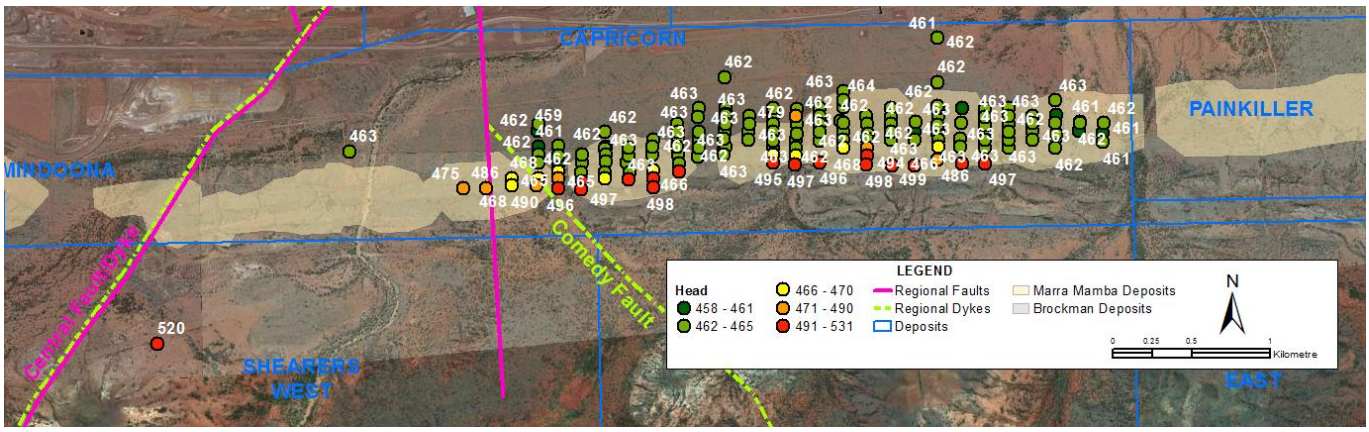


Figure 39. Regional spot heads (mRL) south of South Jimblebar and east of Comedy Fault

East of Caramulla (15)

To the far east of Caramulla the only water level data available are exploration drilling observations (Figure 40). The levels are relatively flat and consistent (i.e. they don't diverge more than a few metres from 462 mRL) as far as the regional fault in the eastern part of Caramulla. The observed heads increase by 40 m to the east of this structure which implies that it is a significant barrier to groundwater flow.

The response to dewatering in the Jimblebar area has however clearly shown that flat water tables do not preclude the possibility of other hydraulically significant structures cutting through the area and constraining drawdown propagation to the east.

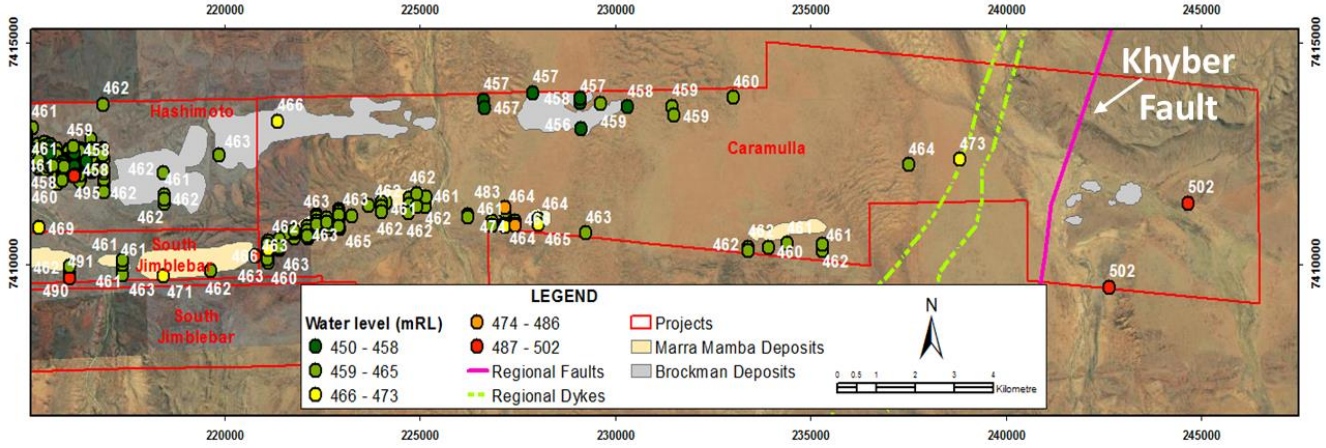


Figure 40. Regional spot heads east of Jimblebar (post 2001)

Vibrating Wire Piezometers

Over 70 vibrating wire piezometers (VWPs) have been installed in the Jimblebar area in 21 bores, most in South Jimblebar (Mindoona) and three in WH1/2. Of these, 65 have provided viable time variant water levels, with locations shown in Figure 41 and hydrographs in Figures 42 and 43. The driver for VWP installation is to support depressurisation predictions for geotechnical slope stability characterisation. Whilst detailed analysis of depressurisation of the pit slopes is not within the scope of this document, the data is presented here to see if it can add anything to the sub-regional scale conceptualisation.

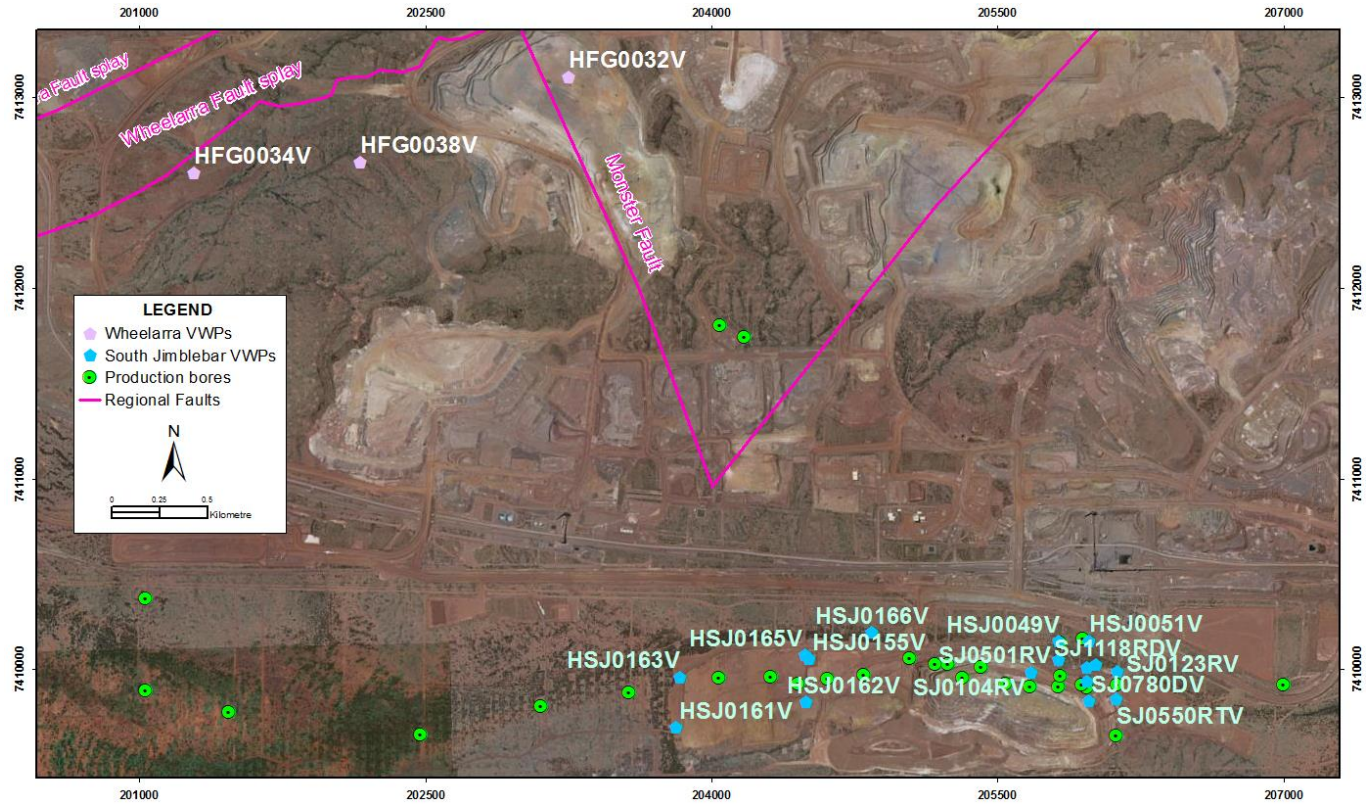


Figure 41. Vibrating wire piezometer locations

WH123:

All responding as expected, but some interesting observations (Figure 42).

HFG0032 is responding as if it is located within the WH3 fault block, with a subdued response to South Jimblebar dewatering. All lithologies respond uniformly with the McRae Shale showing a little less drawdown than the Dales Gorge.

In HFG0034, VWP2 looks erroneous. The Dales Gorge VWP returns the same drawdown magnitude as seen throughout the western compartment. The McRae Shale here shows much less drawdown however although still more than within the WH3 fault block, indicating lower permeability of this unit, at this location.

The Mt Sylvia and McRae Shale at HFG0038 respond to South Jimblebar dewatering as per the general western compartment, suggesting relatively high permeability. The Bee Gorge however shows a much reduced response (even less than within the WH3 fault block), indicating lower permeability.

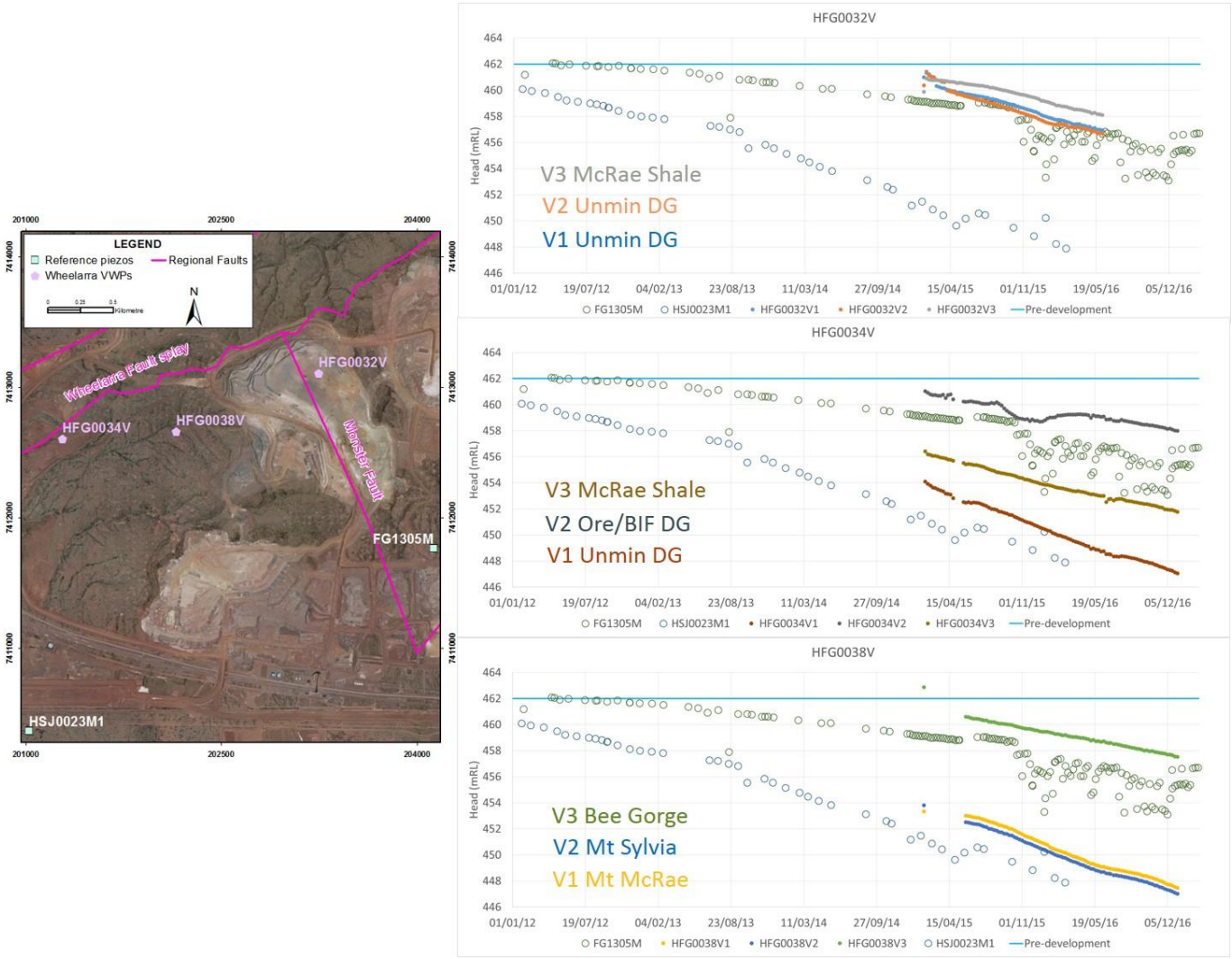


Figure 42. WH123 VWP hydrographs (by borehole)

South Jimblebar:

The 56 VWPs at South Jimblebar (Mindoona) show very similar trends even though they are installed in a variety of lithologies, including those previously considered as conceptual aquitards (Figure 43). Several VWPs have now become unsaturated (returning atmospheric pressure only) and are not included in the analysis. In the figures, HSJ0148M is also shown and can be used as a guide to the regional drawdown response. The comparison shows that:

- The majority of Tertiary Detrital responses show a greater drawdown than observed in HSJ0148M. The exception to this is HSJ0166V1 although the readings from all the VWPs in that hole look anomalous.
- The West Angela Shale and Newman Formation VWPs show many similarities with the data showing the full range of trends noted in the orebody response (i.e. high to low drawdown) as described in the *"South Jimblebar orebody response (5)"* Section above.
- VWPs installed in the Nammuldi and McLeod Members all respond to dewatering and show drawdown in excess of the sub-regional.
- The single observation on the Paraburdoo Member shows a rate of drawdown similar, but a little less, than that in HSJ0148M.

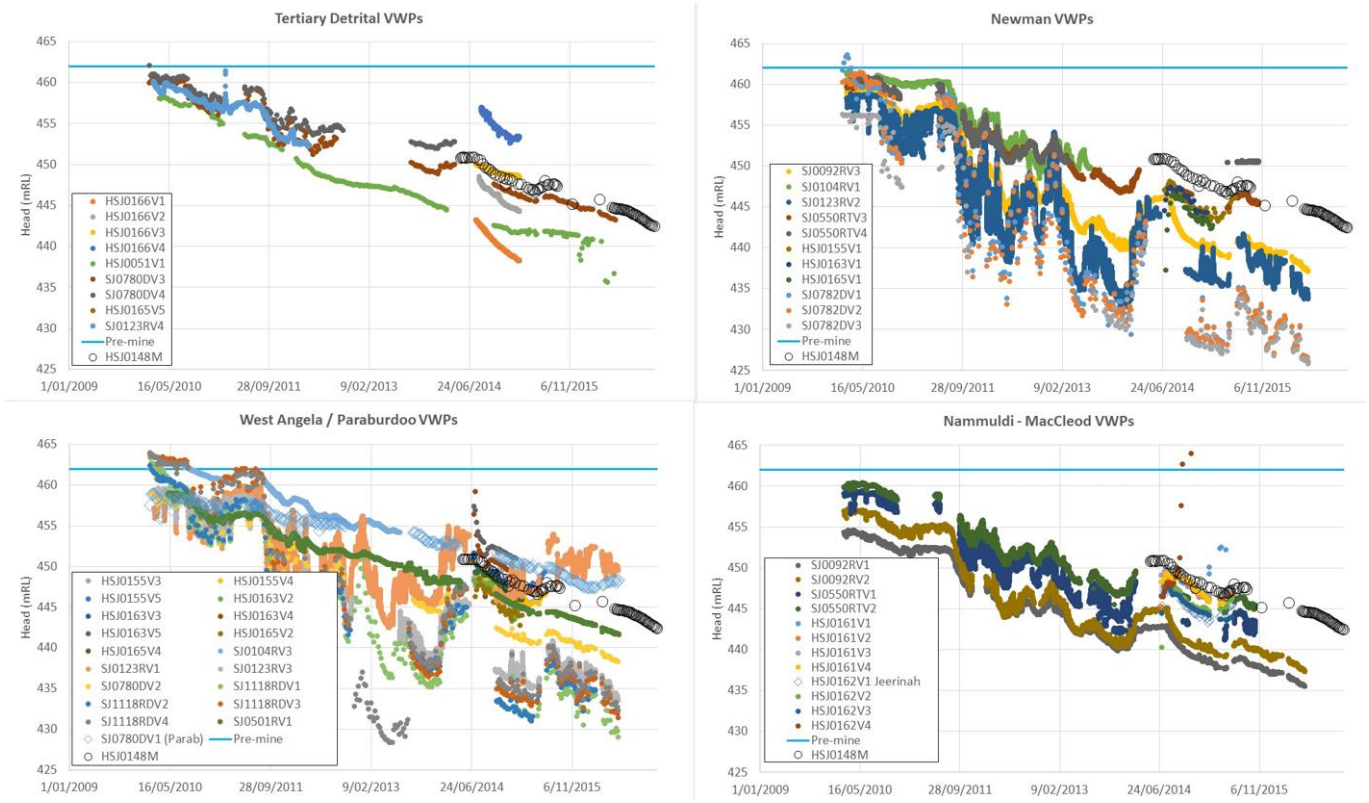


Figure 43. South Jimblebar VWP hydrographs (by lithology)

The VWPs seem to confirm that the mode of connection between the Marra Mamba orebody and regional aquifers is through the intervening rock mass material. At almost all of the 56 locations the response is greater than the sub-regional response and in many cases non-orebody material records as much drawdown as the orebody. Permeability in these units may be enhanced by mineralisation or may be characteristic of the unmineralised rock in this area.

Chemistry

pH and electrical conductivity (EC) observations in the Jimblebar area are shown in Figures 44 and 45 with data points coloured by lithology and location. A corresponding location map is shown in Figure 46. Where field EC and pH were not available (i.e. HASH, East Jimblebar and Caramulla), laboratory EC and pH were plotted. The main trends and observations in each region are summarised in Table 5.

A longer history of chemistry data collection is available for the South Jimblebar pits (Mindoona, Sylvania and Capricorn). EC and pH data, as well as location and conceptual maps for these regions are shown in Figures 47 – 50 and are referred to in Table 5.

The figures show:

- The following ranges of groundwater are present:
    - pH primarily between 7.0 - 8.0, with data existing within a wider range of 6.0 - 10.0
    - EC between 250 and 2,000 µS/cm (fresh to brackish)
- EC can be further broken into two main groups:

- 250 – 750 µS/cm: fresh groundwater located in the western region of the Capricorn orebody, in close proximity to Copper Creek. This may be an indication of enhanced rainfall recharge (via Copper Creek) at this location compared to elsewhere in Jimblebar.
- 1000+ µS/cm: brackish groundwater is found in all other locations within the Jimblebar groundwater system.

- There is a good history of monitoring dating back to 1995, particularly within the Mindoona and Capricorn water supply bores.
- There is no obvious correlation between lithology and chemistry (EC and pH).
- Most bores in the regional system (Tertiary Detritals and Dolomite) show EC and pH values not too dissimilar from the orebody aquifers.
- Once dewatering commences, the pH and EC dataset shows significant variability with time. It is difficult to determine whether this variability corresponds to dewatering stressors and/or reflects the natural variation in chemistry data from increased spatial monitoring.
- Post 2013, chemistry in the three Capricorn MAR bores is representative of the Mindoona/Sylvania groundwater. Monitoring in the western region of Capricorn (near Copper Creek) shows the influence of MAR - i.e. the fresh water near Copper Creek mixing with the higher EC water from Mindoona/Sylvania.
- Post 2014, EC values (and to a lesser extent pH) show significant variability. This does not appear to correspond to major changes in the dewatering regime but does seem to occur consistently throughout Jimblebar (i.e. WH123 and WHASH data is aligned with South Jimblebar chemistry). This suggests potential changes in groundwater chemistry in the system, but the mechanism behind it and the implications are currently unknown.

Table 5: Summary of Jimblebar chemistry main trends and observations

Region	Pre-dewatering	Post-dewatering
Mindoona	• Chemistry data is available dating back to 1995, mostly in the regional aquifer (Tertiary Detritals) and unknown lithology (suspected Marra Mamba). • Higher pH in early years (7.5 - 7.8) until 1998, after which relatively consistent between 7 - 7.5 with a few outliers ***(b).*** • EC mostly consistent, at around 1500 µS/cm ***(a).***	• In 2011, there is an increase in dewatering and chemistry monitoring within the orebody. • Post 2011, there is a wider spread of pH data from 6.4 - 7.8 ***(d)***. Appears to increase marginally from 2011 to 2016, with a peak at pH 8.4 ***(h)***. • Post 2016, pH scatter is greater (6.3 - 8.2) but with no other discernible trends i.e. unclear as to whether pH is decreasing beyond this point ***(i)***. • From 2011 - 2014, EC values are higher and have a wider spread (1650 – 1900 µS/cm) ***(c)***. • Post 2014, even wider spread of EC data mostly between 500 – 2000 µS/cm. Potentially decreasing pH from 2014 – 2017 ***(e)*** and increasing between 2017 – 2019 ***(f)***, although hard to discern properly.
Sylvania	No data	• In 2011, orebody abstraction and chemistry monitoring commences, mostly in the Marra Mamba orebody and West Angela. • pH range starts with a wide spread from 6.5 - 7.7 ***(d)***. The range of data then appears to shift, with pH increasing until 2016 (to 7.1 - 8.3) ***(h)***. • Post 2016, there is an even wider scatter of pH data (6.3 - 8.2). Potentially appears to be decreasing post 2016, although trends are unclear ***(i)***. • In 2011, the EC range starts between 1500 – 2000 µS/cm ***(c)***. • Post 2014, there is a wider scatter of EC data, ranging from 500 – 2000 µS/cm. Potentially decreasing between 2014 – 2017 ***(e)***, and increasing between 2017 – 2019 ***(f)***.
WH123	No data	• Chemistry monitoring commences in 2016, mostly in the Brockman orebody (Dales Gorge member).

		• pH ranges primarily between 7 – 8. Potentially appears to be decreasing, although trends are unclear. • EC ranges mostly between 500 – 1700 µS/cm, with no discernible trends with time. • There is limited chemistry monitoring post 2020.
Capricorn	• Chemistry data available dating back to 1995, mostly near Copper Creek and the Central Fault. Monitoring mostly in the regional aquifer or unknown lithology. • pH is relatively consistent between 6.6 - 8 with occasional fluctuations of mostly lower pH (down to 5.9, although may be erroneous data/outliers) ***(m)***. • EC separated into 2 main groups: lower EC ~300 – 400 µS/cm ***(j)***, and higher EC around ~1000 – 2000 µS/cm ***(k, l)***. • **Low EC groundwater located in close proximity to downstream Copper Creek. May receive significant fresh recharge following rainfall events**. • Higher EC groundwater just north of fresher region: initially between 1000 – 1500 µS/cm until 2009, after which range increases to 1200 – 1900 µS/cm. **There is potentially a groundwater divide between fresher and more saline region (i.e. between HSJ0080M and HSJ0003P).**	• In 2013, dewatering in Capricorn switched to MAR - receiving water from Mindoona/Sylvania abstraction. I.e. **chemistry in 3 x Capricorn MAR bores is representative of mixed Mindoona/Sylvania groundwater *(n)*.** • From 2013 pH range (6.7 – 7.8) appears to decrease ***(q)***. In 2018 pH mostly ranging from 6.4 - 7.3 ***(r)***. • Post 2013, additional monitoring near Copper Creek (in Marra Mamba) shows EC ranging between 250 – 750 µS/cm and remaining relatively consistent. However trend of increasing EC evident in one bore ***(p)***. **Potential for mixing of fresh and brackish groundwaters influenced by MAR**. • Monitoring further east in Marra Mamba orebody aquifer shows high EC values between 1300 – 2300 µS/cm. No clear trend as to whether salinity changes in response to injection/other stressors ***(o)***. • Monitoring frequency decreases over time.
WHASH & North	No data	• Chemistry monitoring commences in 2017, mostly in the Brockman orebody (Dales Gorge and Joffre members) with one monitoring bore in the Wittenoom Formation. Orebody abstraction commences in 2018. • pH primarily between 6.5 – 8.3. There are no discernible trends. • EC ranges from 500 – 1600 µS/cm. Potentially increasing, with higher values returned post 2020.
Hash	No data	• No field chemistry data available. Laboratory data used as proxy. • Chemistry monitoring commences 2019, mostly in the Brockman orebody (Dales Gorge and Joffre members). • pH ranging from 7.6 - 8.5. • EC ranging from 1100 – 1500 µS/cm. • Limited data - no discernible trends yet.
East Jimblebar & Caramulla	No data	• No field chemistry data available. Laboratory chemistry used as proxy. • Chemistry monitoring commences 2019 in a range of lithologies - orebody (Brockman, Marra Mamba), Regional Aquifer and West Angela. • pH ranging from 7.5 - 8.4, with one lower value at 6.5 which may be an outlier. • EC ranging from 910 – 1600 µS/cm. • Limited data - no discernible trends yet.

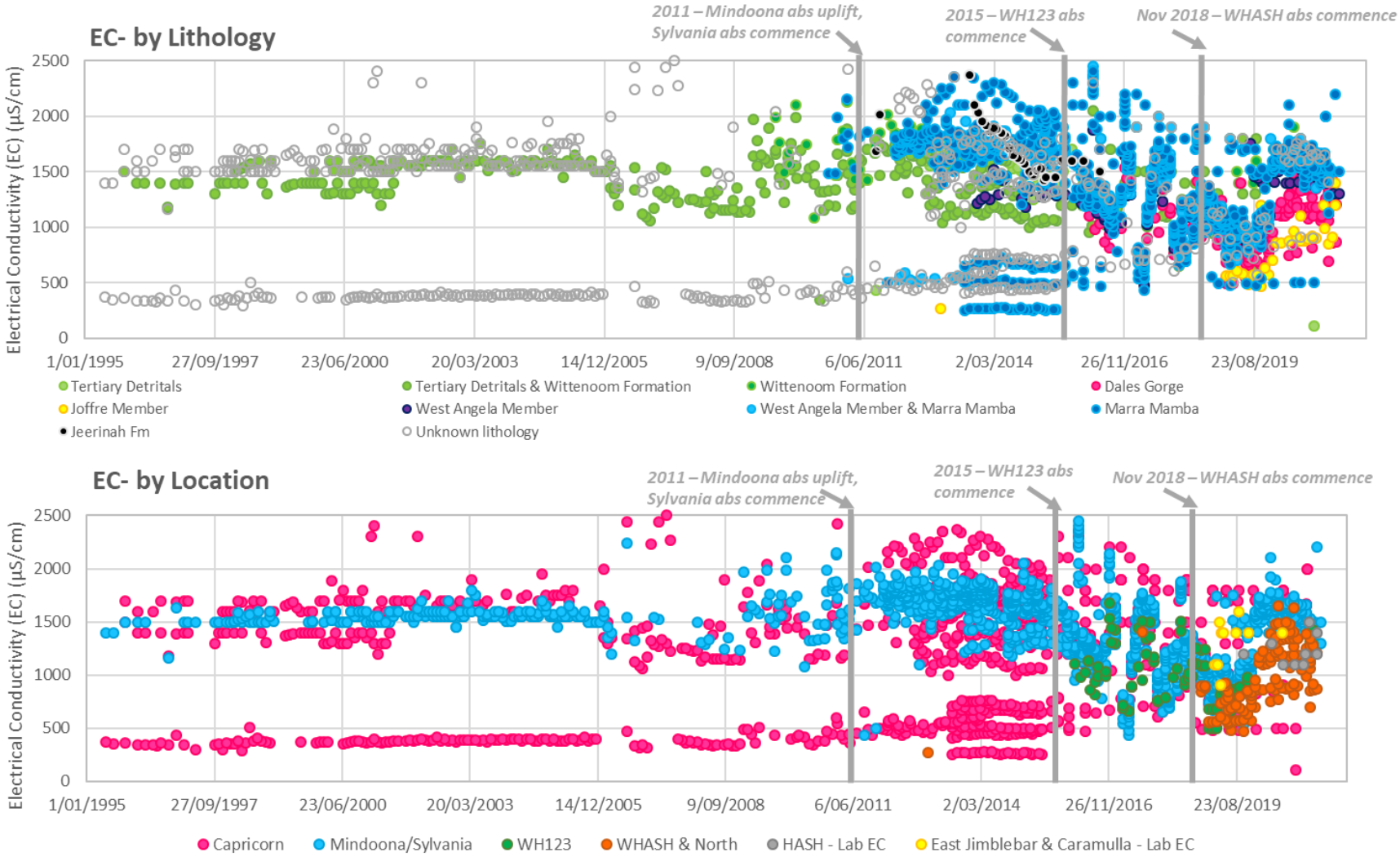


Figure 44. EC values plotted by lithology and location

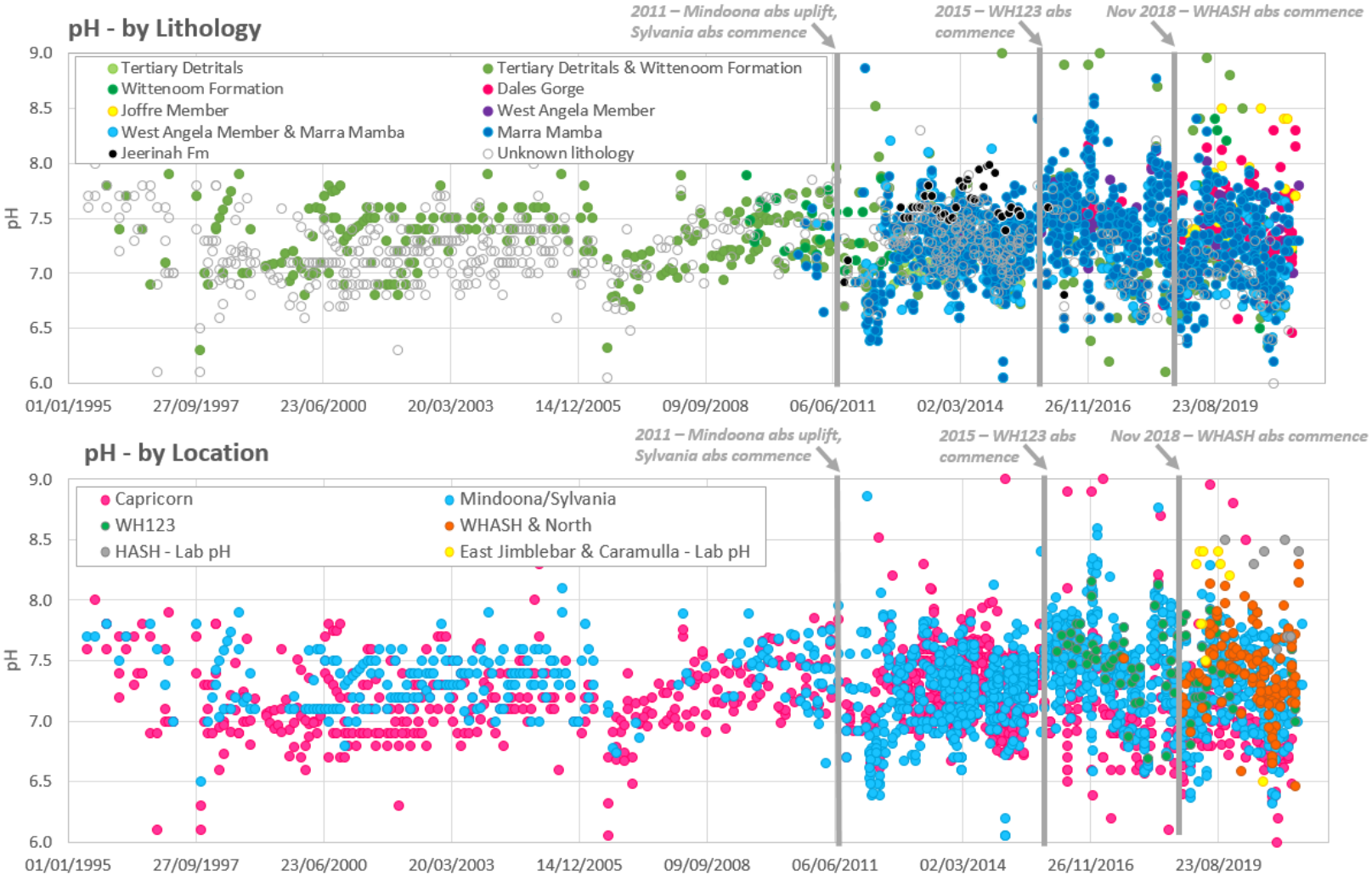


Figure 45. pH values plotted by lithology and location

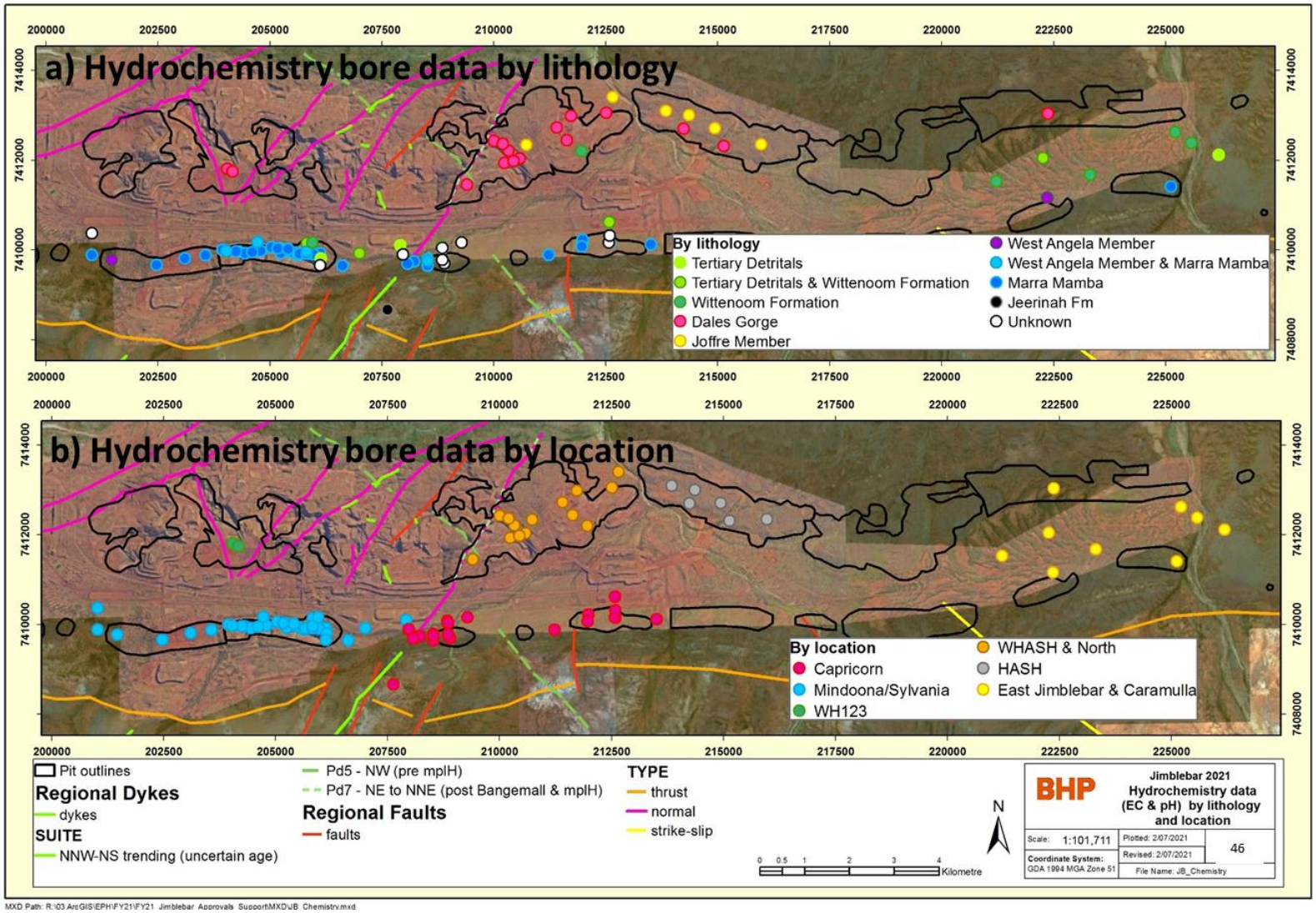
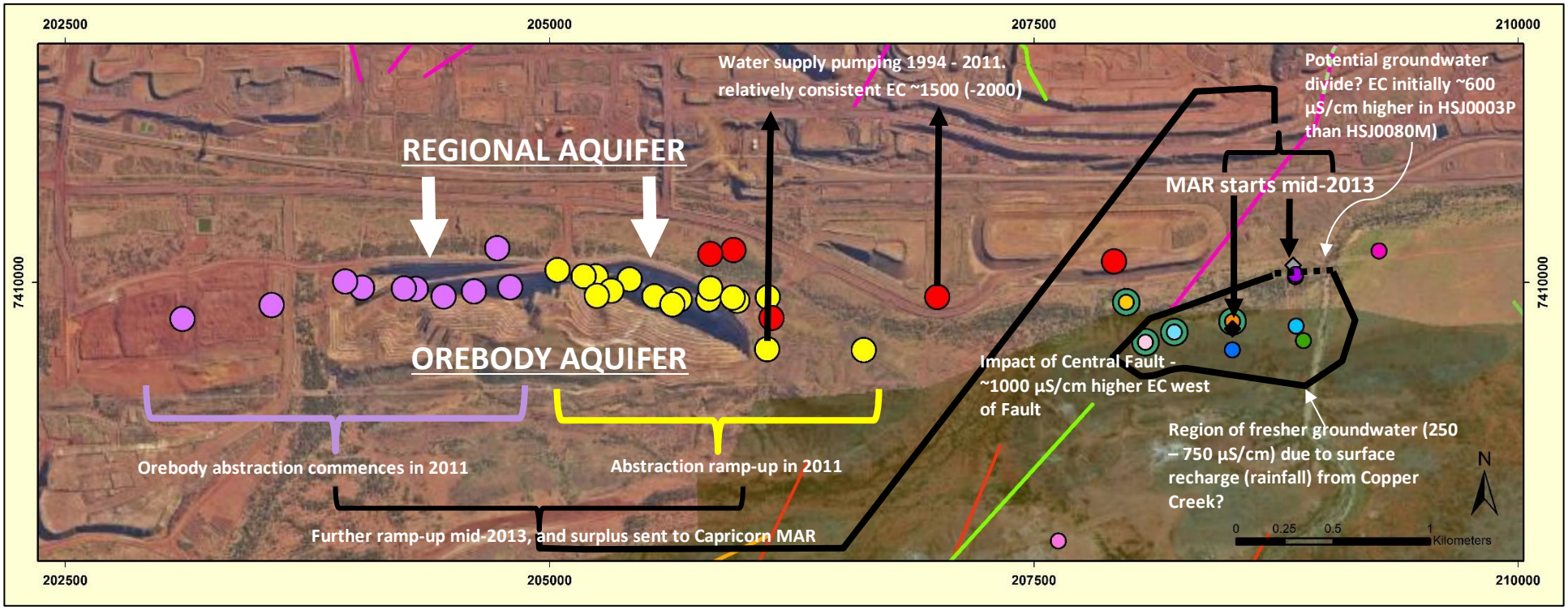


Figure 46. Spatial distribution of chemistry data – by lithology and location



Figure 47. EC and pH data in Mindoona/Sylvania and west Capricorn



Capricorn (West) Chemistry
- HSJ0003P - Injection bore (post 2013)
- HSJ0004P
- HSJ0005P
- HSJ0018M
- HSJ0067M
- HSJ0076P - Injection bore (post 2013)
- HSJ0080M
- HSJ0081M
- HSJ0082M
- HSJ0084M
- SJ0435RM
- SJ0560RM
- SJ0571RM

Sylvania/Mindoona Chemistry
- Capricorn monitoring
- Mindoona orebody monitoring
- Tertiary Detritals monitoring
- Sylvania orebody monitoring

Regional Dykes
- dykes

SUITE
- Pd5 - NW (pre mplH)
- Pd7 - NE to NNE (post Bangemall & mplH)

Regional Faults
- faults

TYPE
- thrust
- normal

Figure 48. Spatial distribution of chemistry data in South Jimblebar (west of Central Fault) and conceptualisation

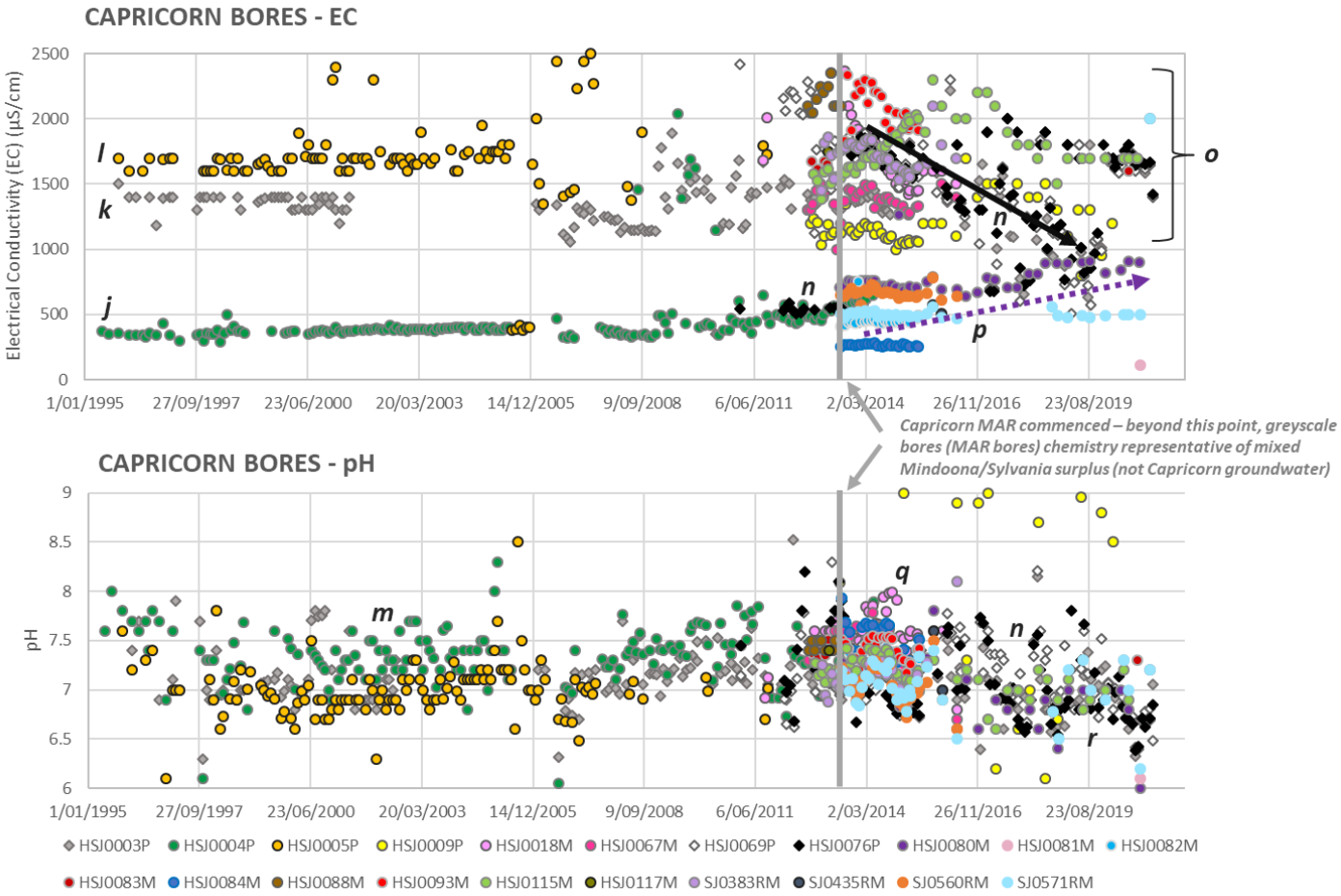
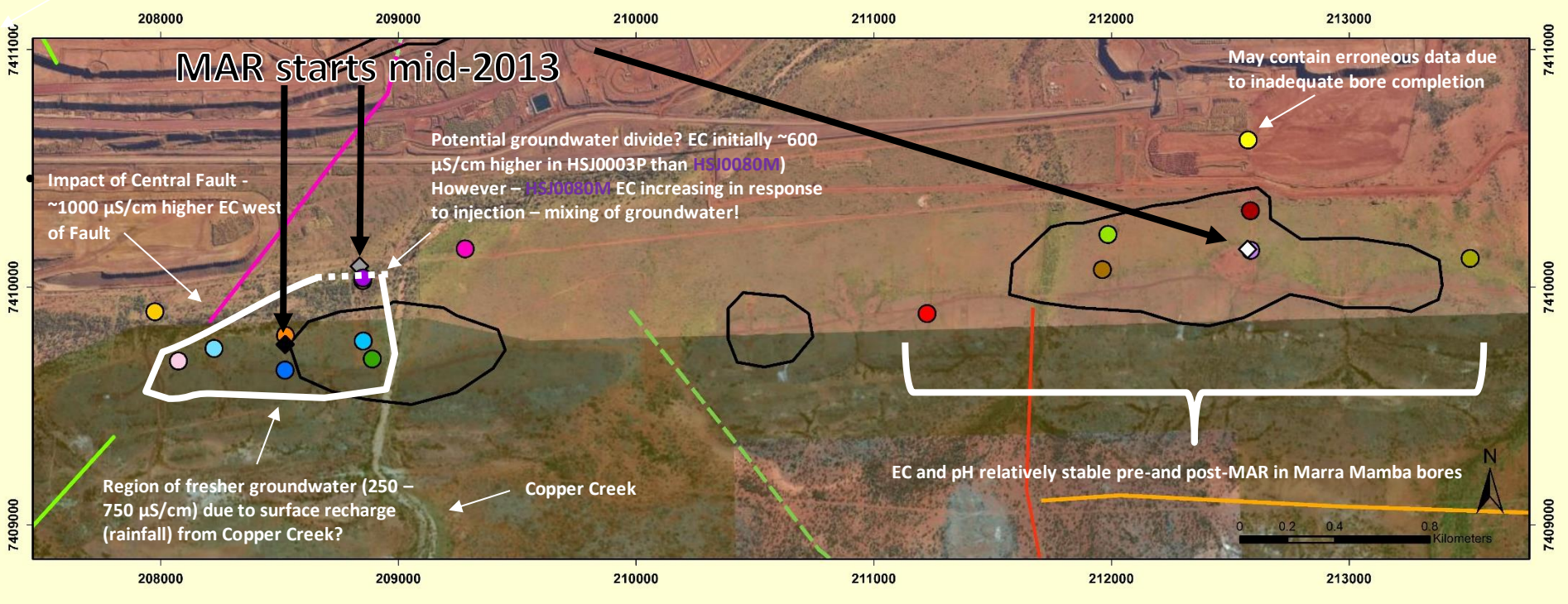


Figure 49. EC and pH data in Capricorn



Capricorn Chemistry Monitoring

- HSJ0003P - Injection bore (post 2013)
- HSJ0004P
- HSJ0005P
- HSJ0009P
- HSJ0018M
- HSJ0067M
- HSJ0069P - Injection bore (post 2013)
- HSJ0076P - Injection bore (post 2013)
- HSJ0080M
- HSJ0081M
- HSJ0082M
- HSJ0083M
- HSJ0084M
- HSJ0088M
- HSJ0093M
- HSJ0115M
- HSJ0117M
- SJ0383RM
- SJ0435RM
- SJ0560RM
- SJ0571RM

Pit outlines

Regional Dykes

dykes

SUITE

Pd5 - NW (pre mplH)

Pd7 - NE to NNE (post Bangemall & mplH)

Regional Faults

faults

TYPE

thrust

normal

Figure 50. Spatial distribution of chemistry data in Capricorn (east of Central Fault) and conceptualisation

The water type analysis below is taken straight from the FY17 AAR (FY21 update: there is no piper plot available in recent AARs). A check on the conclusions and an analysis of the change in chemistry through time would potentially provide more detail to the conceptual model.

The Piper diagram in Figure 51 shows the average of water types for each production borehole. The plot indicates that groundwater from the three major aquifers (Marra Mamba, Tertiary Detritals and Wittenoom dolomite) plot together toward the sodium-potassium type with sodium as the dominant cation. The samples are more variable in terms of anion dominance. HSJ0115M, screened in the dolomite, and a number of the South Jimblebar production bores, plot as bicarbonate type with HSJ0009P plotting as chloride type. The remaining samples plot between non dominant anion to slightly bicarbonate dominant

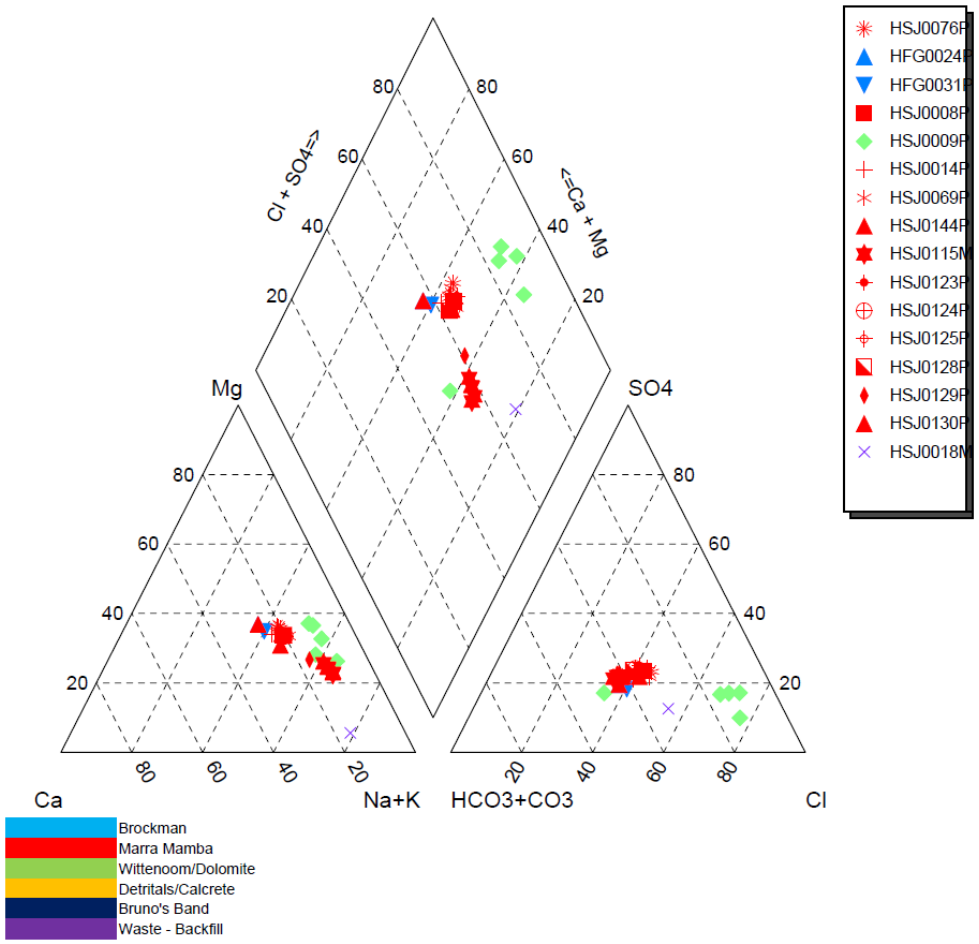


Figure 51. Piper plot of water types for Jimblebar production boreholes

Recharge

There is significant evidence that the Jimblebar groundwater system is bound to the west, east and south by very low permeability barriers. Rates of flow across these barriers are:

- Likely to be low, and
- Estimates will be very uncertain.

Conceptualising rainfall recharge into this system is also difficult and estimates of rates have not been found outside of numerical modelling. The latest numerical modelling (BHP, 2021) assumed the following rates:

- Tertiary Detritals and South Jimblebar orebody areas (0.5% average annual rainfall)
- WH123, WHASH orebody areas and Weeli Wolli Formation (0.25% average annual rainfall)

- Jeerinah Formation and granites to south orebody aquifers (0.1 to 0.01% average annual rainfall)

Rainfall averages 275 mm/yr. Data is available from the Newman Aero and Newman weather stations, which need to be amalgamated to cover observation gaps (Figure 52). The Newman site is now closed. An additional weather station (Jimblebar Weather Station) is located much closer to the study area on Wheelarra Hill (WH3) and has measurements from 2012 onwards. This site is owned and operated by BHP.

The evidence with which to build a conceptual understanding of rainfall recharge in the area is as follows:

1. The depth to the water table is significant being generally greater than 50 m.
2. Time variant water levels do not show strong responses to rainfall events. Interpretation is complicated however by the fact that all groundwater monitoring has taken place coincident with water supply abstraction and later dewatering, which makes the interpretation of finer detail responses more ambiguous.
3. Infiltration via the Tertiary sequence (and creek systems) in the low lying palaeovalley in the South Jimblebar area is also not interpreted to be significant as there are significant clay lenses that would constrain vertical flow.
4. No obvious response has been detected in the groundwater system following discharge to Copper Creek as part of the Hydrodynamic Trial (HDT).
5. Groundwater EC of between 1,000 and 2,000 µS/cm suggests that the water is not particularly old.
6. Analysis of exploration drill hole water levels (Figure 52) highlights significant differences between heads in bores drilled before 1999/2000 and bores drilled after (in the same areas – i.e. WHASH). Heads from before are around 2 m lower than heads after.

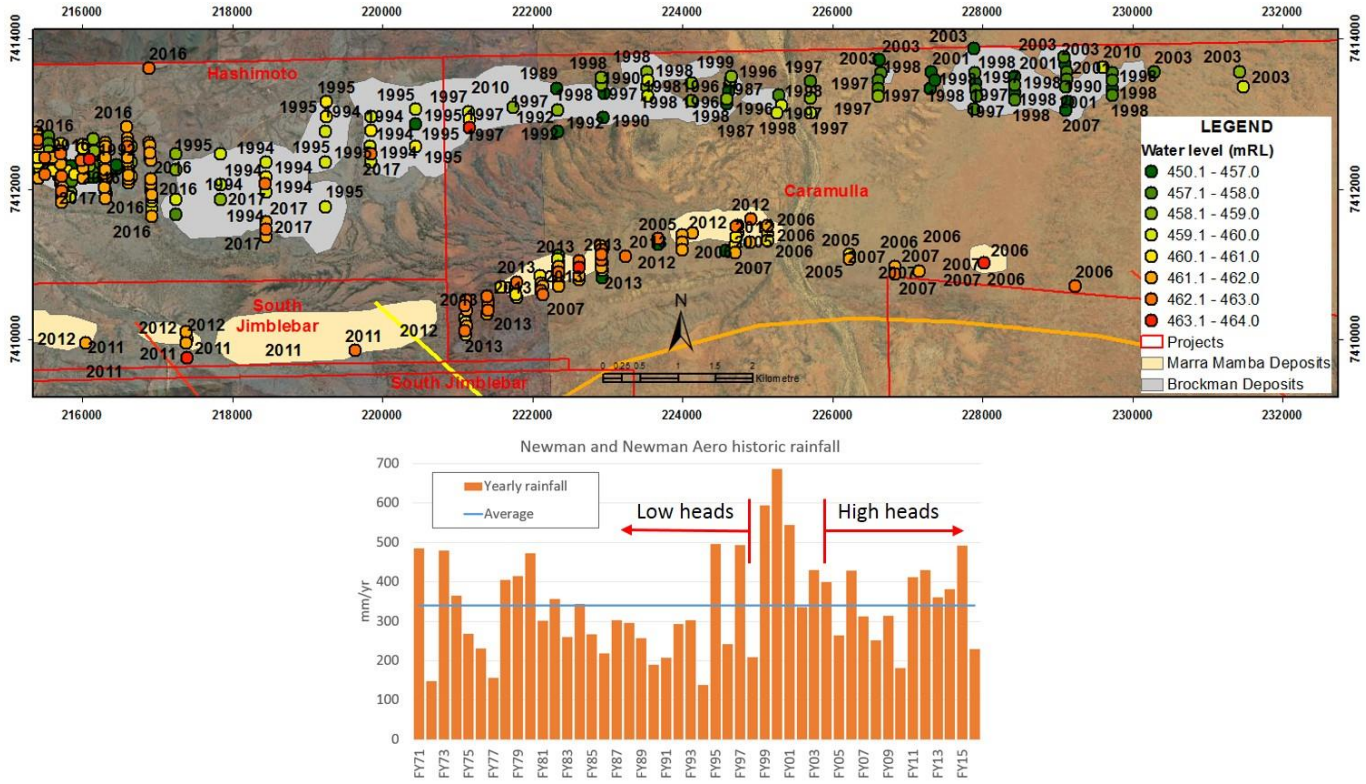


Figure 52. Evidence of rainfall recharge to groundwater in exploration drill holes

It is likely then that recharge to the system does occur. The data suggest that these may be quite infrequent events (although contributing a significant amount of water) that occur only with very high rainfall events.

Whatever the rate and mechanism, recharge will not affect the behaviour of the groundwater system under dewatering stress. The rate of dewatering will be orders of magnitude greater than that of rainfall recharge and

boundary inflow. Recharge will be an important factor in closure considerations however, where recovery times (usually measured in centuries) will be very sensitive to this input.

Groundwater / surface water interaction

Depth to groundwater prior to any water supply or dewatering is shown in Figure 53 and summarised below:

- WH123: ~100 m
- WH4: >110 m
- WHASH: > 80 m
- HASH: >70 m
- East Jimblebar: >90 m
- South Jimblebar (Sylvania, Mindoona): ~80 m
- Capricorn: ~70 m
- Painkiller: ~70 m
- Caramulla: ~65 m
- Valley alluvial fill (Tertiary Detritals):
    - South Jimblebar area: 100 m (west) to 50 m (east)
    - East Jimblebar / Caramulla area: 50 m

Groundwater at Jimblebar is therefore typically well below the root zone of vegetation and instead, infiltration of surface water contributes to soil moisture budgets which support the different vegetation environments.

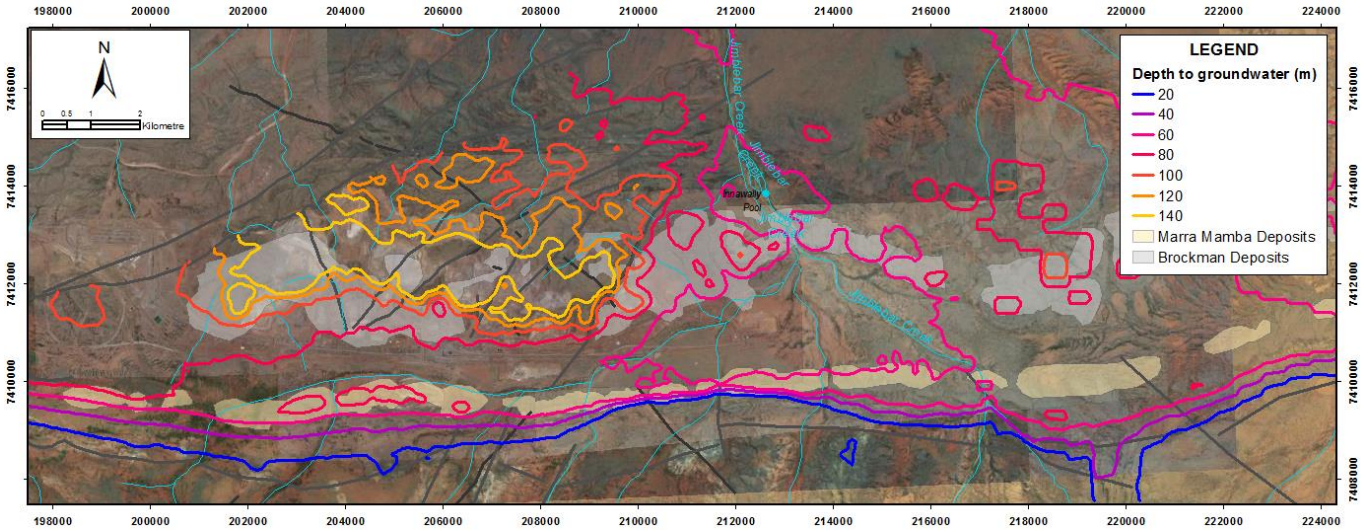


Figure 53. Depth to groundwater (pre-development)

Holes with the shallowest depth to groundwater (SJ0395, SJ0305, SJ03026 and SJ0522) occur in the central Capricorn deposit of South Jimblebar associated with a surface drainage floodway. Water levels here are about 25 m below ground surface.

Groundwater levels are 40-50 m below the base of Innawally pool. Monitoring bores have been installed adjacent to the Pool to assess seasonal water table (perched and permanent) fluctuations and to confirm hydraulic disconnection between the pool and deeper groundwater system. Two of these monitoring points have records that

date back to 2012 and display clear mounding (total 0.7 m) from the South Jimblebar reinjection borefield. The same monitoring records show no discernible response to the Jan 2014 (220 mm) and Jan/March 2017 (~150 mm) rainfall events (Figure 54).

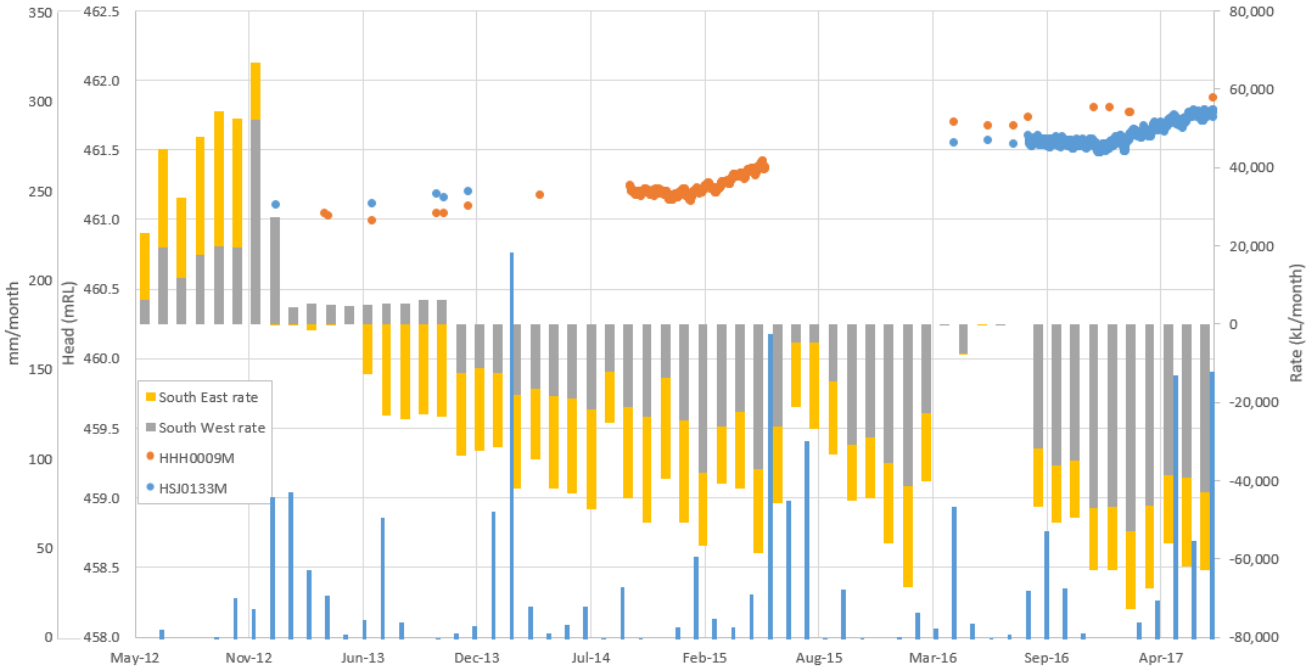


Figure 54. Groundwater level beneath Innawally Pool

Hydraulic parameters

There have been several iterations of hydraulic testing and numerical modelling of the Jimblebar area, mostly focussed on South Jimblebar but more recently on the Wheelarra 3, 5/6 and Hashimoto orebodies as well. The calibrated parameters from the most recent numerical modelling are provided in Table 6 and these are considered to be most representative of the current state of knowledge. The values become more uncertain away from the influence of the South Jimblebar abstraction and injection activities.

Table 6: Jimblebar hydraulic parameters (numerical model – 2017)

Material	Kh=Kz (m/d)		Sy (%)		Ss (m-1)	
	Max	Min	Max	Min	Max	Min
Granites and basalts to the south	0.00001		0.1		$5x10^{-7}$	
Jeerinah Formation	0.00001		0.1		$5x10^{-7}$	
Unmineralised Marra Mamba	0.01	0.00001	0.1		$5x10^{-7}$	
Submineralised Marra Mamba	20	1	10	1	$5x10^{-7}$	
Mineralised Marra Mamba	50	4	20	1	$5x10^{-7}$	
West Angela Shale	0.5		0.1		$5x10^{-7}$	
Weathered Paraburdoo Dolomite	20		5		$5x10^{-7}$	
Fresh Paraburdoo Dolomite / Bee Gorge	0.01	0.002	0.5		$5x10^{-7}$	
Mt McRae Shale and Mt Sylvia Formation	0.5		0.1		$5x10^{-7}$	
Unmineralised Brockman Formation	0.05		10	0.1	$5x10^{-7}$	
Submineralised Brockman Formation	0.8		10	1	$5x10^{-7}$	
Mineralised Brockman Formation	8		10	5	$5x10^{-7}$	
Weeli Wolli Formation	0.01		1		$5x10^{-7}$	
Tertiary Detritals	50	0.001	15	5	$1x10^{-3}$*	$5x10^{-7}$

*Extremely high value of Ss used provides for numerical solution and identifies area of uncertainty in conceptual and numerical models.

Environmental Receptors

Innawally Pool

The main environmental receptor in proximity to the Jimblebar area is Innawally Pool. Innawally Pool is semi-permanent surface water feature in Jimblebar Creek, between the Hashimoto 1 and Hashimoto 2/3 ranges. The pool formed in an erosional scour depressed in basement rocks where the confluence of the main two tributaries of Jimblebar Creek flow through a narrow gorge between the Hashimoto hills. The water in the pool is fresh, fed by direct rainfall and creek flow in the wet season and storage from shallow aquifers that bank the pool in the dry season. Further into the dry season when the creek bed alluvium has dried out, the pool becomes a stranded pond, perched within the scour depression. The pool is hydrochemically distinct from groundwater chemistry.

Ethel Gorge

The key environmental receptor in the Eastern Pilbara region is Ethel Gorge. However the Gorge is located 20 km downstream of Jimblebar, in a different catchment to most of the Jimblebar area and is hydraulically disconnected by the Wheelarra Fault.

Ethel Gorge is a shallow receiving environment along the Fortescue River at the confluence of Homestead, Shovelanna and Warrawandu Creeks. The Fortescue River then flows through a narrow gap in the Ophthalmia Range where flow is restricted and natural recharge of the shallow groundwater aquifer and extensive sub-surface development of calcrete occurs. The permanency of this shallow aquifer was enhanced by construction (in 1982) of the Ophthalmia Dam, which impounds water and forms a largely permanent surface water body ~5 km upstream of the Gorge. The presence of the Wheelarra Fault means Ethel Gorge is hydraulically disconnected from the Jimblebar deposit and drawdown is not predicted to extend west towards the Gorge. A detailed conceptualisation of Ethel Gorge is provided in BHPs Strategic Environmental Assessment (Ethel Gorge Receptor).

Jimblebar Creek

Jimblebar Creek is located within the Fortescue River Upper Catchment and is a major ephemeral tributary that merges into the Fortescue River approximately 50 km southeast of where the Fortescue River discharges into the Fortescue Marsh. Through the Hashimoto ridgeline, the Jimblebar Creek has cut a narrow gorge confined to approximately 40-60 m width. Flood discharges through the gorge have a higher local velocity and just downstream of the gorge a natural erosional scour has formed which hosts the present day Innawally Pool.

Copper Creek is a tributary to Jimblebar Creek which passes through the narrow valley on the southern side of Wheelarra Hill. Since 2012 minor amounts (average 2 ML/day) of surplus dewatering water has been discharged to Copper Creek approximately 6 km upstream from Innawally Pool. During trials this discharge travelled rapidly downstream along creek bed alluvium, suggesting very little infiltration. A lack of groundwater monitoring bores adjacent this creek stretch means surface water-groundwater connection can only be anecdotally inferred based on wetting front rates.

Most recent numerical modelling

Numerical groundwater modelling was most recently undertaken in FY21 to support the request for an increase to the 5C Licence to abstract and Part IV approvals. The numerical model boundary falls within the conceptual model boundary used in this report (Figure 55) but extends further to the east and north to incorporate groundwater throughflow and to allow prediction of drawdown migration into these areas in the future. The model is described in full in BHP (2021b).

The mine plan as simulated is shown in Figure 56 and the predicted dewatering rates are shown in Figure 57.

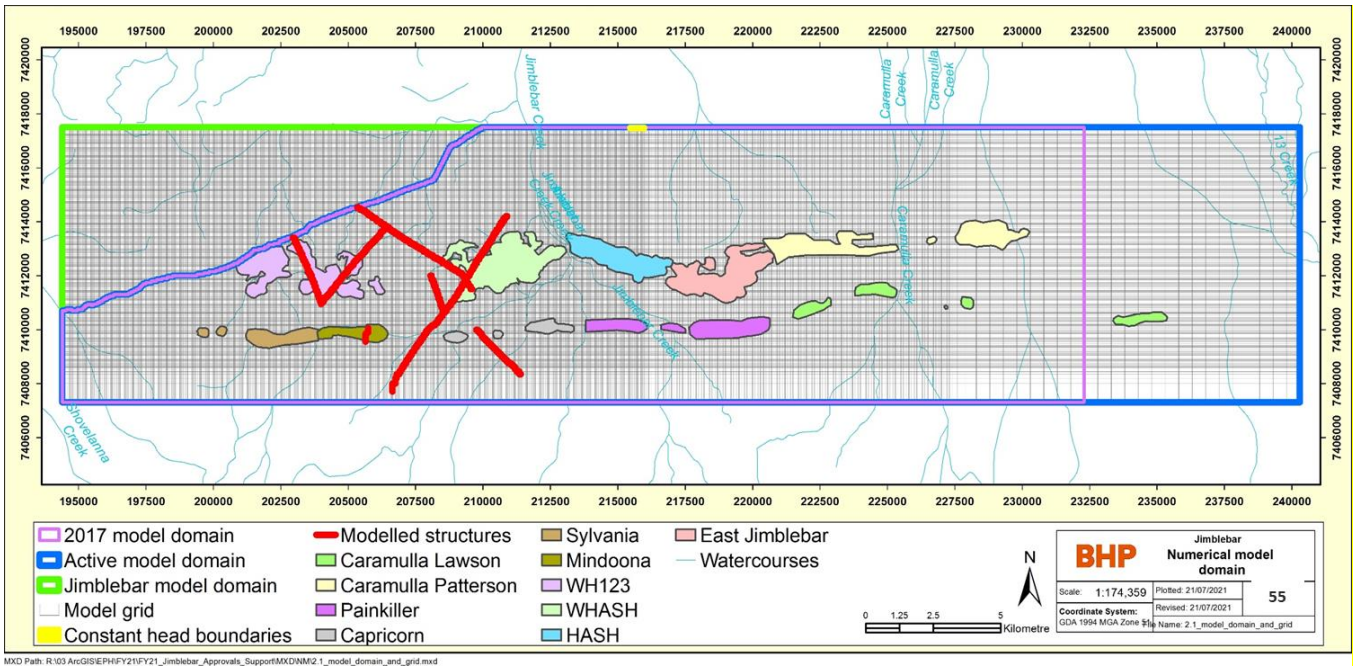


Figure 55. Latest numerical model boundary

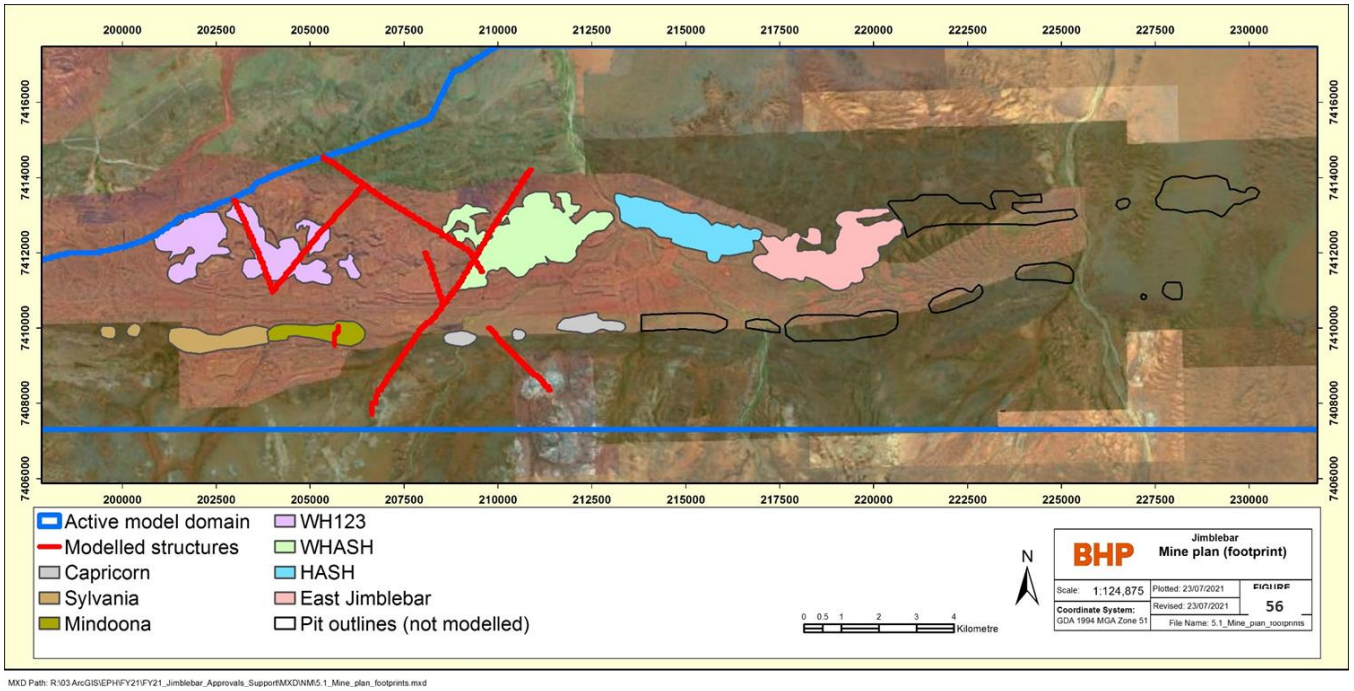


Figure 56. Mine plan used in 2021 numerical modelling

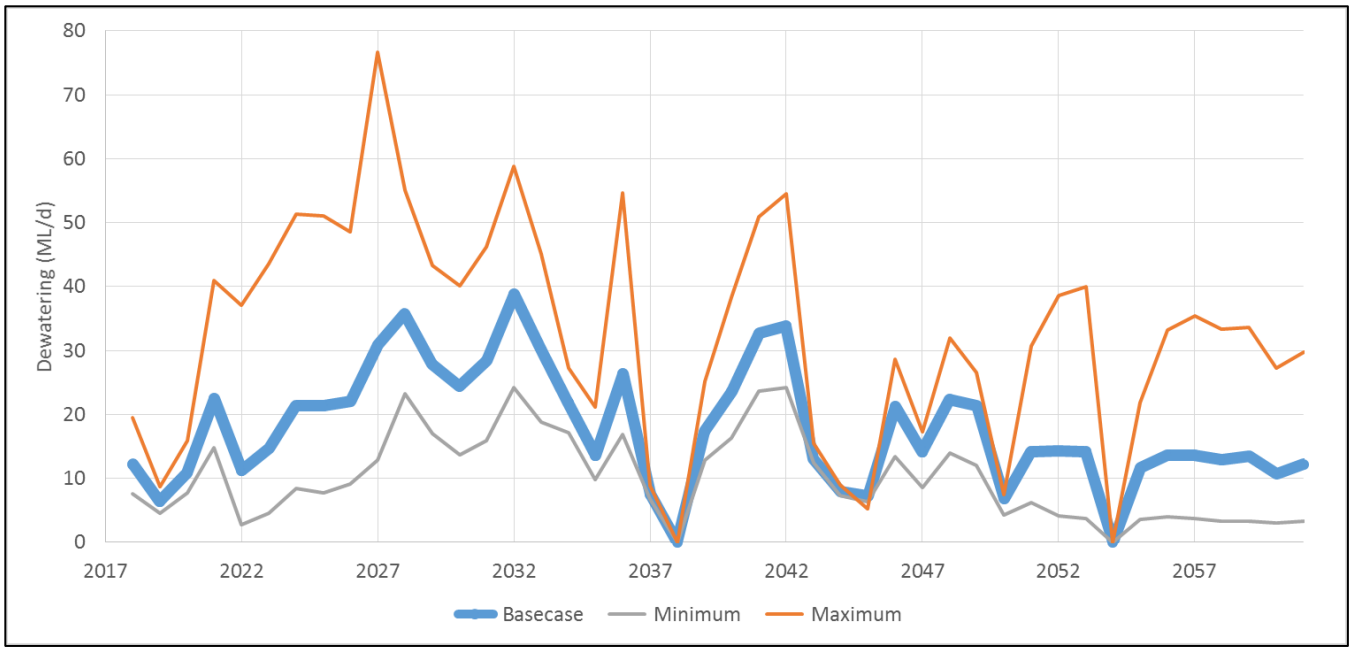


Figure 57. Dewatering rates predicted by 2021 numerical modelling

Acid and metalliferous drainage

Mining and dewatering activities have the potential to expose sulfide-bearing rocks to atmospheric oxygen. The process of sulfide oxidation can result in the generation of water drainage with low pH as well as elevated dissolved metals and salinity, referred to as acid and metalliferous drainage (AMD).

BHP has developed procedures for classifying material that can contribute to sources of AMD based on its Net Acid Production Potential (NAPP), which accounts for both acid generating and neutralising potentials. Using this approach AMD is classified into four classes based on NAPP values:

- AMD Class 0 (low NAPP <3 kg H2SO4/t, inert);
- AMD Class 1 (high NAPP >3 kg H2SO4/t, unweathered, formerly designated as Potential Acid Forming (PAF));
- AMD Class 2 (high NAPP >3 kg H2SO4/t, but from above the water table and assumed to be oxidised); and
- AMD Class 3 (high NAPP >3 kg H2SO4/t, detrital material).

A preliminary assessment of AMD Risk at Jimblebar (including the WH123, WH4, WH56/H1, H234 and Mindoona pits) was conducted by Earth Systems in late 2012 and built upon by SRK in 2016 (SRK, 2016) and BHP in 2016 (BHP, 2016) and 2021 (BHP, 2021a). In general, the proportions of AMD Class 1, 2 and 3 material to be mined for most pits are low, and thus OSAs, stockpiles and pit walls are considered to have low potential to generate acidity. The exception to this are the WH56 and H1 deposits. Figures 58 to 62 show planned exposures of AMD material on pit walls at South Jimblebar, Wheelarra and Hashimoto deposits.

WH56 and H1 pits have been identified as having moderate to high AMD risk based on assessments undertaken to inform the FY16 Jimblebar Closure Plan (with no change to this risk level in the FY21 revision of the Closure Plan). Key lithologies contributing to exposed PAF at WH56/H1 will include the Mt McRae and Mt Sylvia shale units. As these units become exposed, poor water quality management will need to be applied at the site and an active treatment facility is likely required. Consideration should be given to the fate of discharged surplus water from this site as alternate discharge locations (i.e. away from the Ethel Gorge threatened ecological stygofauna community) may need to be sought.

An assessment has yet to be made of the potential AMD risk of the South Jimblebar Sylvania and Capricorn pits, East and West Jimblebar, Painkiller and Caramulla deposits.

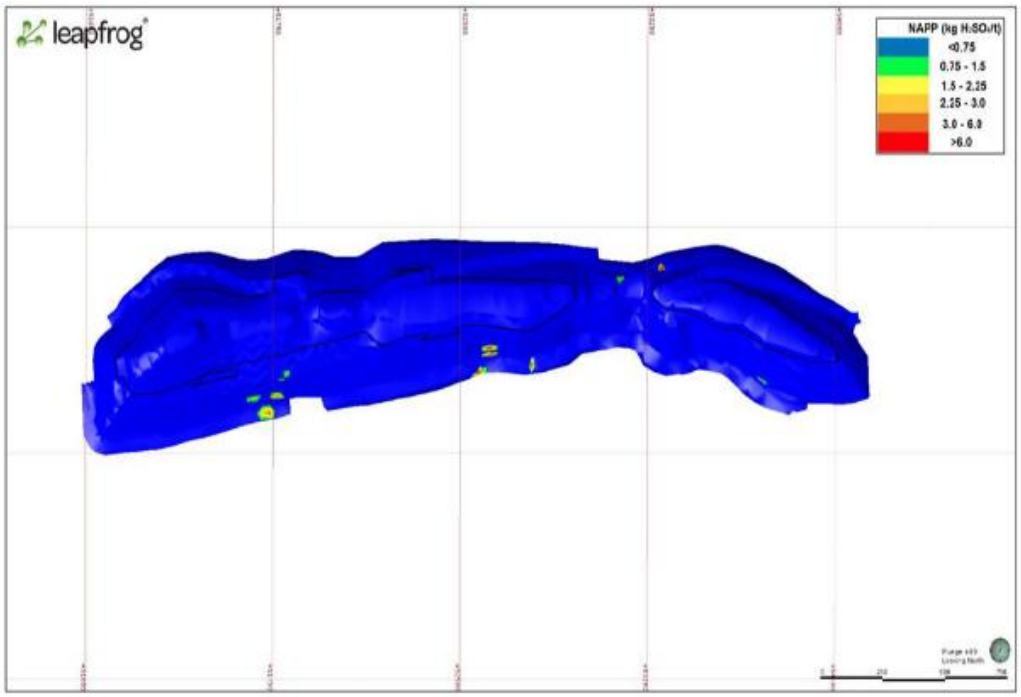


Figure 58. Mindoona pit wall Net Acid Production Potential.
High NAPP values shown in red. Note AMD Class 1, 2 and 3 materials classified as NAPP >3 kg H2SO4/t (i.e. red and brown).

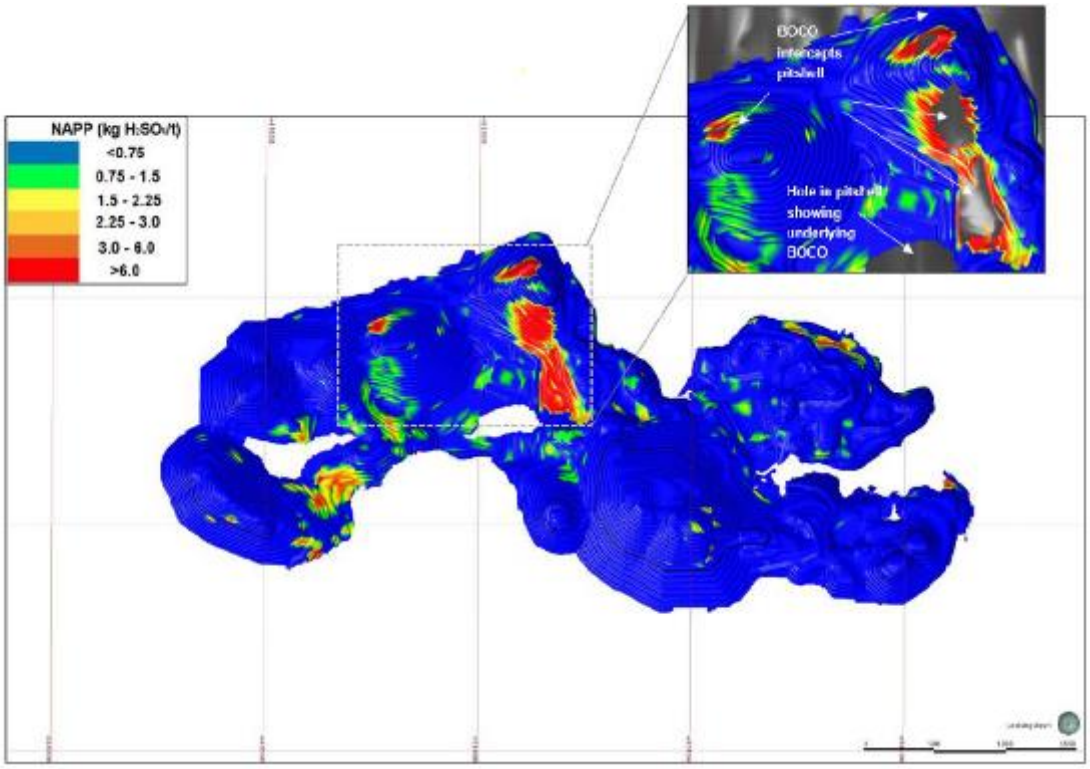


Figure 59. WH123 pit wall Net Acid Production Potential.
High NAPP values shown in red. Note AMD Class 1, 2 and 3 materials classified as NAPP >3 kg H2SO4/t (i.e. red and brown).

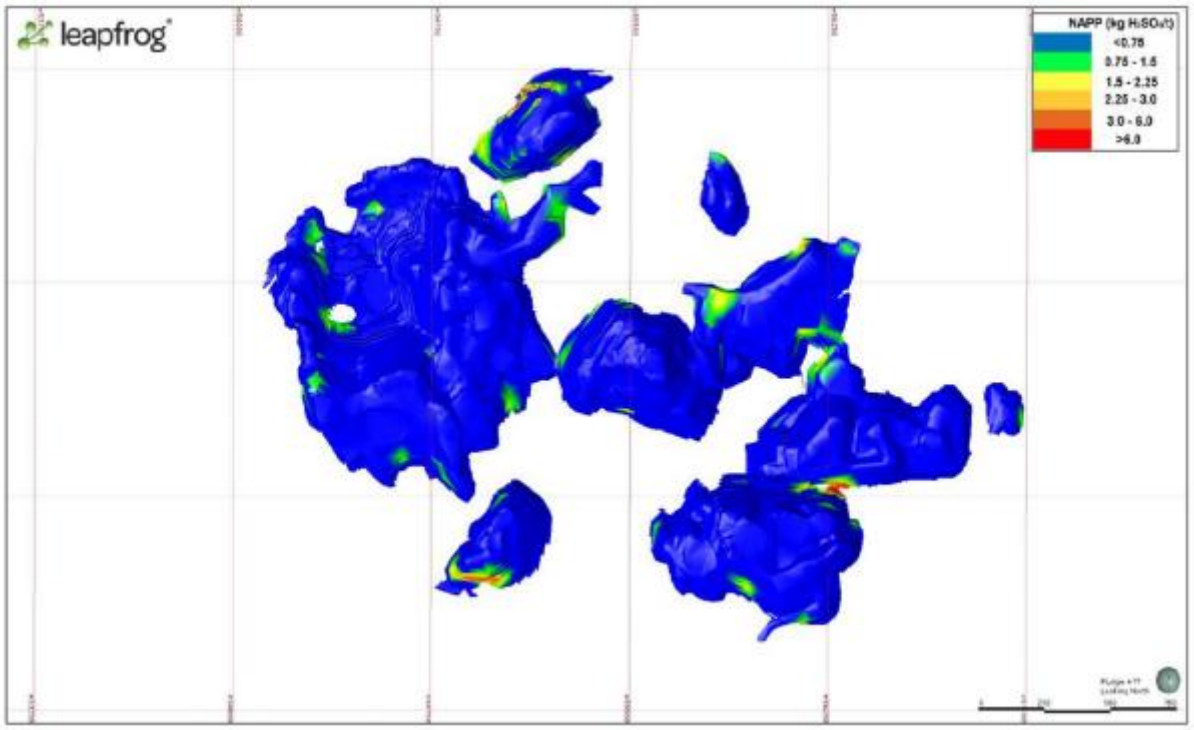


Figure 60. WH4 pit wall Net Acid Production Potential.

High NAPP values shown in red. Note AMD Class 1, 2 and 3 materials classified as NAPP >3 kg H2SO4/t (i.e. red and brown).

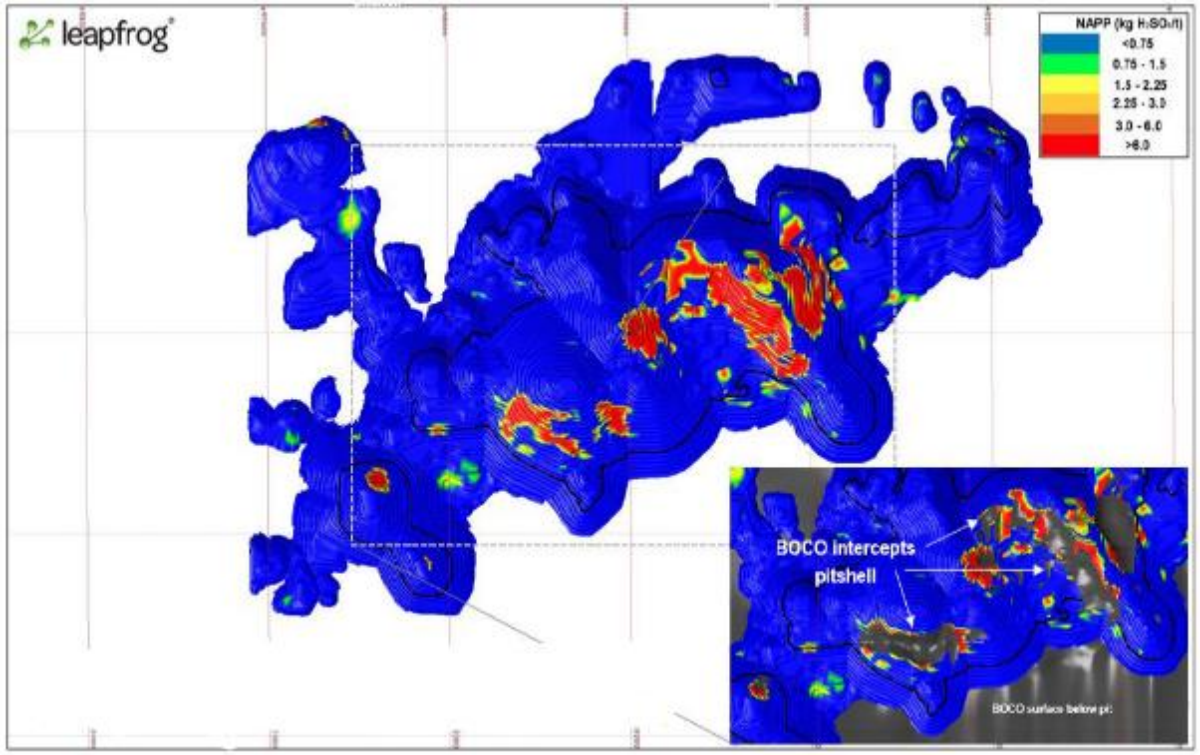


Figure 61. WH56/H1 pit wall Net Acid Production Potential.

High NAPP values shown in red. Note AMD Class 1, 2 and 3 materials classified as NAPP >3 kg H2SO4/t (i.e. red and brown).

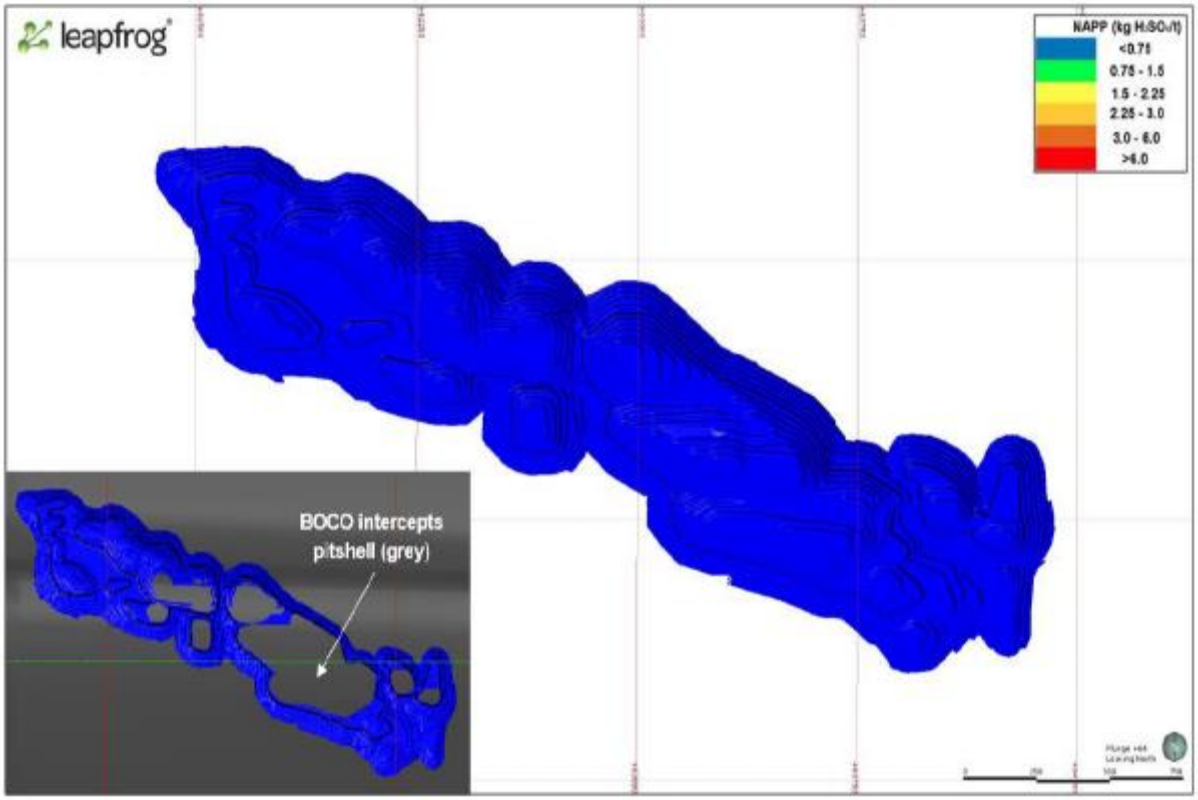


Figure 62. Hashi234 pit wall Net Acid Production Potential

High NAPP values shown in red. Note AMD Class 1, 2 and 3 materials classified as NAPP >3 kg H2SO4/t (i.e. red and brown).

References

BHP (2016). Jimblebar Mine Closure Plan Revision 1

SRK (2016). Preliminary Acid and Metalliferous Drainage Assessment

BHP (2017). Jimblebar Numerical Model 2017

BHP (2020). CPH 20201023 Caramulla MAR Test Pumping Report

BHP (2021a). Jimblebar Mine Closure Plan Revision 3 (March 2021)

BHP (2021b). Jimblebar Numerical Model 2021

16 Appendix B: Bore Logs

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0075	Hole Length:	84.00

Easting: 234639.60
Northing: 7414526.19
Surface RL: 506.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Nov 22 - 09 Nov 22
Comments: Stygofauna MB. FWS around 51-60mbgl.PVC Stickup & Hanging Plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 507.62 (Stickup 0.80m) (drilled) SWL: 43.78 MBTOC (09 Nov 22) Dev: N Final pH: -
TOC RL: 507.62 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Uniform, Sub-rounded					PERFORATED END CAP (0.00)
		GS3	Z	YJK			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: 5m Surface casing (collar) (0.00-5.00)
10												BLANK PVC: Size 50 - Class 18 (0.00-36.00)
20												OPEN HOLE (0.00-84.00)
30	MG	CY3	ZK	Y			CLAY, silty, trace gravel, (CLAY), Pink and Grey and brown, Transported, Stiff, Poorly graded, Sub-rounded					
40												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (36.00-80.00)
		VB2	ZSK	JC			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Grey and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50	HG											
		O	J	S			DOLOMITE, (O), Grey, Moderately Weathered, Medium Strong Rock					
60												
70												WELLCAP(70.00) ID: 3125
80												
90												
100						0 100 200		0-5000	0-14	0-50		

Program: FY23 Caramulla 13CK ENV Phase 1 RC & CR Planned Hole: HCM0075

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0076	Hole Length:	84.00

Easting: 235161.29
Northing: 7412968.37
Surface RL: 510.34
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Nov 22 - 09 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	NK3

Comments: Stygofauna MB. PVC Stickup & Hanging Plates. Intersected fresh dolomite at 68m to EOH.

TOC RL: 511.08 (Stickup 1.10m) (drilled) SWL: 39.25 MBTOC (09 Nov 22) Dev: N Final pH: -
TOC RL: 511.08 (Stickup 1.10m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YSJ			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10		GS3	ZY	SJ			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), buff and Brown and red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: surface casing (collar) (0.00-5.00)
20	MG											BLANK PVC: Size 50 - Class 18 (0.00-30.00)
30												OPEN HOLE (0.00-84.00)
40		CY3	Z	Y			CLAY, sandy, trace silt, (CLAY), Grey and Red, Transported, Stiff, Uniform, Rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (30.00-80.00)
50	HG											WELLCAP(50.00) ID: 3126
60	MG	VB2	ZG	YK			GRAVEL, silty, trace clay, (VUGHY BRECCIA), Brown and Light or White and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
70	HG	OB	D				DOLOMITE, (OB), Blue and Grey, Fresh, Strong Rock					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0077	Hole Length:	84.00

Easting: 236370.27
Northing: 7414146.24
Surface RL: 508.90
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 07 Nov 22 - 09 Nov 22
Comments: Stygofauna MB. FWS @ 49mbgl.PVC Stickup & Hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 509.61 (Stickup 0.84m) (drilled) SWL: 46.78 MBTOC (09 Nov 22) Dev: N Final pH: -
TOC RL: 509.61 (Stickup 0.84m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJS			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10		GS3	ZY	JK			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), buff and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
20	MG											BLANK PVC: Size 50 - Class 18 (0.00-42.00)
30												OPEN HOLE (0.00-84.00)
40												
50		CY3	ZK	Y			CLAY, silty, trace sand, (CLAY), Brown and buff and red, Transported, Stiff, Uniform, Rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (42.00-80.00)
60	HG	VB2	ZG	LY			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Brown and Yellow and buff, Transported, Non-Cohesive soils, Poorly graded, Rounded					
70		CY2	ZK	Y			CLAY, silty, trace sand, (CLAY), buff and Light or White, Transported, Stiff, Uniform, Rounded					WELLCAP(70.00) ID: 3127
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0078	Hole Length:	84.00

Easting: 237332.06
Northing: 7413063.14
Surface RL: 511.69
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Nov 22 - 09 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	NK3

Comments: Stygofauna MB. FWS around 47mbgl. PVC stickup & Hanging plates.

TOC RL: 512.46 (Stickup 0.89m) (drilled) SWL: 46.00 MBTOC (09 Nov 22) Dev: N Final pH: -
TOC RL: 512.46 (Stickup 0.89m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	JS			SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10		GS3	ZY	SJ			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Grey and Brown and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-42.00)
30		ST3	ZY	SJK			SILT, sandy, trace gravel, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					OPEN HOLE (0.00-84.00)
40		CY3	ZK	Y			CLAY, silty, trace sand, (CLAY), buff and Brown and red, Transported, Stiff, Uniform, Rounded					
50	MG	VB2	ZG	LJ			GRAVEL, silty, trace clay, (VUGHY BRECCIA), buff and Brown and light or white, Transported, Non-Cohesive soils, Poorly graded, Rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (42.00-80.00)
60												
70		CY2	ZK	Y			CLAY, silty, trace gravel, (CLAY), Light or White and buff, Transported, Stiff, Poorly graded, Sub-rounded					WELLCAP(70.00) ID: 3128
80												
90												
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0081	Hole Length:	82.00

Easting: 240789.25
Northing: 7409728.86
Surface RL: 520.85
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 10 Nov 22 - 12 Nov 22
Comments: Stygofauna MB. PVC stickup and hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 82.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 521.69 (Stickup 0.77m) (drilled) SWL: 16.61 MBTOC (12 Nov 22) Dev: N Final pH: -
TOC RL: 521.69 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZYJ	KQ			SAND, gravelly, (SCREE), Light or White and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-5.00) BLANK PVC: Size 50 - Class 18 (0.00-12.00) OPEN HOLE (0.00-82.00)
10		GS3	ZJK	Q			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Light or White and Yellow and red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 12, Slots 3mm (12.00-78.00)
20												
30	MG											
40		CY3	ZK				CLAY, gravelly, (CLAY), Light or White, Transported, Firm, Poorly graded, Sub-rounded					
50		CA2	Z3				SAND, gravelly, (CALCRETE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					WELLCAP(50.00) ID: 3129
60	HG	CY2	ZK				CLAY, (CLAY), Light or White and Yellow, Transported, Firm, Uniform, Sub-rounded					
70		VB2	ZKJ				GRAVEL, clayey, (VUGHY BRECCIA), Light or White and Yellow and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
80		OB	D				DOLOMITE, (OB), Blue and Pink, Moderately Weathered, Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0082	Hole Length:	90.00

Easting: 242268.28
Northing: 7411496.60
Surface RL: 520.24
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Nov 22 - 12 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	WLSRC40	RHF	146		WLS	KM4

Comments: Stygofauna MB, PVC stickup and hanging plates. Drilled to 90m, significant fallback due to broken material. Install to 42m.

TOC RL: 521.01 (Stickup 0.82m) (drilled) SWL: 16.14 MBTOC (13 Nov 22) Dev: N Final pH: -
TOC RL: 521.01 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	J3	JC	S			UNMINERALISED BIF, (J3), Light or White and Pink and yellow, Highly Weathered, Strong Rock					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
10												BLANK PVC: Size 50 - Class 18 (0.00-6.00)
20			JC				UNMINERALISED BIF, (J2), Dark or Black and Green and blue, Highly Weathered, Strong Rock					OPEN HOLE (0.00-42.00)
30		J2										SLOTTED PVC: Size 50 - Class 18, Slots 3mm (6.00-42.00)
40												
50	BG											FALLBACK (42.00-90.00)
60												WELLCAP(50.00) ID: 3130
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0086	Hole Length:	96.00

Easting: 242969.54
Northing: 7410238.39
Surface RL: 520.19
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Nov 22 - 12 Nov 22
Comments: Stygofauna MB, PVC stickup and hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 96.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 520.89 (Stickup 0.80m) (drilled) SWL: 15.56 MBTOC (13 Nov 22) Dev: N Final pH: -
TOC RL: 520.89 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		TD3	ZY	KQ			SILT, clayey, (SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: Perforated top cap (0.00)
			ZYJ	K			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Light or White and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
10												BLANK PVC: Size 50 - Class 18 (0.00-6.00)
												OPEN HOLE (0.00-96.00)
20			ZK	JQ			CLAY, trace gravel, (CLAY), Light or White and Pink, Transported, Soft, Gap graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (6.00-90.00)
30												
			ZJC	K			GRAVEL, clayey, (GRAVELLY SILTSTONE), Pink and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
40												
		O	CJ	S			CHERT, (O), Brown, Moderately Weathered, Very Strong Rock					
50												WELLCAP(50.00) ID: 3131
60												
70		WA2	S	J			UNMINERALISED BIF, (WA2), Light or White and Brown, Moderately Weathered, Medium Strong Rock					
80												
		WA1	SGJ				UNMINERALISED BIF, (WA1), Dark or Black, Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0087	Hole Length:	84.00

Easting:	243997.41
Northing:	7411732.32
Surface RL:	519.18
Grid Name:	MGA94_51
Incl / Azm:	-90-->0
Construct:	13 Nov 22 - 13 Nov 22
Comments:	Stygofauna MB, PVC stickup and hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	KM4

TOC RL:	520.09	(Stickup 0.87m)	(drilled)	SWL:	15.97 MBTOC	(14 Nov 22)	Dev:	N	Final pH:	-
TOC RL:	520.09	(Stickup 0.87m)	(current)	Is Live:	Y	(-)	Date:	-	Final EC:	-

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		TD3	ZY	JK			SILT, gravelly, trace clay, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
10												BLANK PVC: Size 50 - Class 18 (0.00-18.00)
20			ZYK	J			SILT, gravelly, trace clay, (GRAVELLY SILTSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					OPEN HOLE (0.00-84.00)
30												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (18.00-78.00)
40		TD2	ZK				CLAY, trace sand, (CLAY), Light or White and Yellow and pink, Transported, Firm, Gap graded, Sub-rounded				
50												
60												
70												
80			ZJK				GRAVEL, sandy, trace clay, (VUGHY BRECCIA), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded				
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0088	Hole Length:	88.00

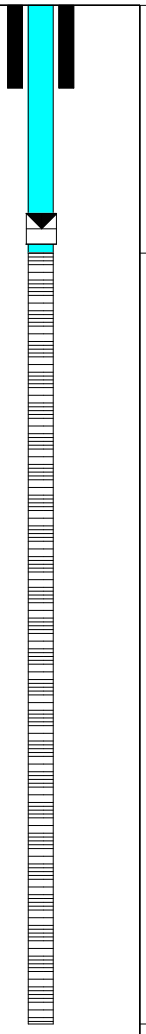
Easting: 244938.94
Northing: 7411429.01
Surface RL: 520.62
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Nov 22 - 14 Nov 22
Comments: Stygofauna MB, PVC stickup and hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 88.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 521.52 (Stickup 0.74m) (drilled) SWL: 16.24 MBTOC (14 Nov 22) Dev: N Final pH: -
TOC RL: 521.52 (Stickup 0.74m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description	Notes
0	SF	GS3	ZYJ			SILT, sandy, trace clay, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded	BLANK PVC: Size 150 - Class 18 (0.00-6.00)
10			ZYJ	K		GRAVEL, clayey, (GRAVELLY SILTSTONE), Light or White and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-rounded	BLANK PVC: Size 50 - Class 18 (0.00-18.00)
20							OPEN HOLE (0.00-88.00)
30	MG	CY2	ZK			CLAY, sandy, (CLAY), Light or White and Yellow, Transported, Stiff, Poorly graded, Sub-rounded	SLOTTED PVC: Size 50 - Class 18, Slots 3mm (18.00-74.00)
40		VB2	ZJK			GRAVEL, clayey, (VUGHY BRECCIA), Light or White and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular	
50							
60	SF	CY2	ZK			CLAY, (CLAY), Light or White and Red and yellow, Transported, Stiff, Poorly graded, Sub-rounded	
70							
80							
90							
100							

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50
Diagram Scaled to 400mm



BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0090	Hole Length:	96.00

Easting: 245097.24
Northing: 7409333.87
Surface RL: 523.52
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 16 Nov 22 - 17 Nov 22
Comments: FWS @ 16mbg. Stygofauna MB. PVC Stick up & Hanging Plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 96.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 524.39 (Stickup 0.84m) (drilled) SWL: 16.84 MBTOC (17 Nov 22) Dev: N Final pH: -
TOC RL: 524.39 (Stickup 0.84m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	J			SILT, gravelly, trace sand, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Collar (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-6.00) OPEN HOLE (0.00-96.00)
10		GS3	ZY	KJ			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), buff and Brown and red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (6.00-92.00)
20												
30												
40		CY2	ZK				CLAY, sandy, (CLAY), Brown, Transported, Firm, Poorly graded, Sub-rounded					
50												WELLCAP(50.00) ID: 3132
60		CA2	Z3				SILT, gravelly, trace sand, (CALCRETE), buff and Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
70	MG	OB	D				DOLERITE, (OB), Grey and buff, Moderately Weathered, Strong Rock					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0092	Hole Length:	84.00

Easting: 246107.46
Northing: 7411744.69
Surface RL: 538.00
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Nov 22 - 14 Nov 22
Comments: Stygofauna MB, PVC stickup and hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 84.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 538.78 (Stickup 0.85m) (drilled) SWL: 30.35 MBTOC (16 Nov 22) Dev: N Final pH: -
TOC RL: 538.78 (Stickup 0.85m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0 - 30	SF	GS3	ZYJ	K			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Red and Brown, Transported, Stiff, Poorly graded, Sub-rounded					BLANK PVC: Size 50 - Class 18 (0.00-6.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) OPEN HOLE (0.00-84.00) SLOTTED PVC: Size 50 - Class 18, Slots 3mm (6.00-80.00) WELLCAP(70.00) ID: 3133
30 - 84	SF	CY3	ZK	J			CLAY, gravelly, (CLAY), Light or White and Yellow and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					

0 10 20 30 40 50 60 70 80 90 100

0 100 200

0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0093	Hole Length:	90.00

Easting: 246341.21
Northing: 7410592.75
Surface RL: 525.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Nov 22 - 15 Nov 22
Comments: Stygofauna MB, PVC stickup and hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 526.28 (Stickup 0.79m) (drilled) SWL: 18.14 MBTOC (16 Nov 22) Dev: N Final pH: -
TOC RL: 526.28 (Stickup 0.79m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		VB2	ZJ	YGK			GRAVEL, clayey, trace sand, (VUGHY BRECCIA), Yellow and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					END CAP: Vented top cap (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-6.00) OPEN HOLE (0.00-90.00)
20		CA2	Z3J	K			GRAVEL, trace clay, (CALCRETE), Light or White and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (6.00-84.00)
		VB2	ZJC	Y			GRAVEL, trace clay, (VUGHY BRECCIA), Yellow and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
70		O	D				DOLOMITE, (O), Dark or Black, Slightly Weathered, Very Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0096	Hole Length:	44.00

Easting: 237334.28
Northing: 7413043.23
Surface RL: 511.72
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Dec 22 - 04 Dec 22
Comments: Troglofauna - Open hole. Dry.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	NK3
3.0 - 44.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 512.50 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 512.50 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YK			GRAVEL, silty, trace clay, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.6.35mm: 0.7m stickup (0.00-3.00)
10		ST3	ZY				SILT, sandy, trace gravel, (SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Rounded					OPEN HOLE (3.00-44.00)
20												
30												
40		GS3	Z	YJ			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0098	Hole Length:	13.00

Easting: 242245.09
Northing: 7411497.03
Surface RL: 520.53
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Dec 22 - 05 Dec 22
Comments: Troglofauna - Open Hole. Dry

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 2.0	WLDRIG4	CH	300		WELLDRILL	NK3
2.0 - 13.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 521.25 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 521.25 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	J3	CJ	S			UNMINERALISED BIF, (J3), Grey and Pink and green, Slightly Weathered, Strong Rock					BLANK STEEL: Size 12" - W.T.6.35mm (0.00-2.00) OPEN HOLE (0.00-13.00)
10												
20												
30												
40												
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0100	Hole Length:	14.00

Easting: 243999.52
Northing: 7411719.38
Surface RL: 519.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 Dec 22 - 06 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 1.0	WLDRIG4	CH	300		WELLDRILL	KM4
1.0 - 14.0	WLDRIG4	CH	150		WELLDRILL	KM4

Comments: Troglofauna monitoring hole. Open hole, no install. Dry hole. Concrete plinth & steel monument.

TOC RL: 519.85 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 519.85 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		SZ	Z	Y			GRAVEL, silty, (SCREE), Yellow and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK STEEL: 324mm (0.00-1.00) OPEN HOLE (0.00-14.00)
10		GS3	ZY	I			SILT, gravelly, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
20												
30												
40												
50												
60												
70												
80												
90												
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0102 **Hole Length:** 16.00

Easting: 246343.05
Northing: 7410579.22
Surface RL: 525.48
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 07 Dec 22 - 07 Dec 22
Comments: Troglofauna monitoring hole. Open hole. Dry. Concrete plinth & steel monument.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 1.0	WLDRIG4	CH	300		WELLDRILL	KM4
1.0 - 16.0	WLDRIG4	CH	150		WELLDRILL	KM4

TOC RL: 526.08 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 526.08 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		CA2	Z3	JY			GRAVEL, silty, (CALCRETE), Light or White and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK STEEL: 324mm (0.00-1.00) OPEN HOLE (0.00-16.00)
10		CY2	ZY	L3I			SILT, gravelly, (CLAY), Yellow and Brown, Transported, Firm, Poorly graded, Sub-rounded					
20												
30												
40												
50												
60												
70												
80												
90												
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0103	Hole Length:	102.00

Easting: 222699.96
Northing: 7411619.78
Surface RL: 518.01
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Oct 22 - 27 Oct 22
Comments: Stygofauna monitoring hole. Completed to 96m with PVC stickup and hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	NK3, KM4

TOC RL: 518.95 (Stickup 0.93m) (drilled) SWL: 54.93 MBTOC (28 Oct 22) Dev: N Final pH: -
TOC RL: 518.95 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			GRAVEL, silty, trace sand, (SCREE), Red, Transported, Non-Cohesive soils, Uniform, Sub-rounded					BLANK PVC: Size 150 - Class 18: 4m of surface casing used (0.00-4.00)
10		TD3	Y	JG			SILT, sandy, trace clay, (SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 50 - Class 18: PVC Stickup and Hanging Plates (0.00-54.00)
20			Y	KJ			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					OPEN HOLE (0.00-96.00)
30												
40												
50			K	YJ			CLAY, silty, trace sand, (CLAY), Red and Brown and light or white, Transported, Firm, Uniform, Rounded					Drillers unsure of FWS, Wallice drilllers not used to taking measurement and drilling wet. Estimated 50mbgl.
60		TD2	Z	J			GRAVEL, silty, (VUGHY BRECCIA), Light or White and Yellow and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (54.00-96.00)
70												
80												
90	HG		ZK	J			CLAY, gravelly, (CLAY), Light or White, Transported, Very Stiff, Poorly graded, Sub-rounded					
100	SF											FALLBACK (96.00-102.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA | Hole Name: HCM0103 | Hole Length: 102.00

Easting: 222699.96
Northing: 7411619.78
Surface RL: 518.01
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Oct 22 - 27 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	NK3, KM4

Comments: Stygofauna monitoring hole. Completed to 96m with PVC stickup and hanging plates.

TOC RL: 518.95 (Stickup 0.93m) (drilled) SWL: 54.93 MBTOC (28 Oct 22) Dev: N Final pH: -
TOC RL: 518.95 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	TD2	ZK	J			CLAY, gravelly, (CLAY), Light or White, Transported, Very Stiff, Poorly graded, Sub-rounded					FALLBACK (96.00-102.00)

110 120 130 140 150 160 170 180 190 200

0 100 200

0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0104	Hole Length:	90.00

Easting: 224428.09
Northing: 7411251.88
Surface RL: 519.41
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Nov 22 - 06 Nov 22
Comments: Stygofauna MB. Terminated at 90m, intersect Carbonaceous shales at 88-90m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 520.03 (Stickup 0.83m) (drilled) SWL: 56.82 MBTOC (06 Nov 22) Dev: N Final pH: -
TOC RL: 520.03 (Stickup 0.83m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	Z	YJ			SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Uniform, Sub-rounded					PERFORATED END CAP (0.00)
10		TD3	ZY	JS			SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Uniform, Sub-rounded					BLANK PVC: Size 150 - Class 18: 5m surface casing (collar) (0.00-5.00)
20		MM	G	SJ			UNMINERALISED BIF, (MM), Grey and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-42.00)
30												OPEN HOLE (0.00-90.00)
40												
50												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (42.00-90.00)
60		NM	SJ	L			SHALE, (NM), Grey and Red and brown, Moderately Weathered, Medium Strong Rock					
70												
80	HG											Estimate only
90		JN	B	SJ			UNMINERALISED BIF, (JN), Dark or Black, Highly Weathered, Weak Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0105	Hole Length:	102.00

Easting: 225993.44
Northing: 7411703.29
Surface RL: 516.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Oct 22 - 18 Oct 22
Comments: Terminated at 102m in SD2. Hanging plates, no end cap.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 516.91 (Stickup 0.93m) (drilled) SWL: 52.81 MBTOC (18 Oct 22) Dev: N Final pH: -
TOC RL: 516.91 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZCS	YGL			GRAVEL, sandy, trace silt, (SCREE), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 50 - Class 18: Hanging plates (0.00-42.00) OPEN HOLE (0.00-90.00)
10												
20	MG	TD3	ZKW	CG			GRAVEL, clayey, (SILTSTONE), Light or White and Red and yellow, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					
30												
40												
50												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (42.00-90.00) Drillers unsure, said they could really feel it at 78m, but likely hit it before this.
60												
70												
80	SF	TD2	Q	S			SAND, trace silt, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Uniform, Rounded					
90												FALLBACK (90.00-102.00)
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA | Hole Name: HCM0105 | Hole Length: 102.00

Easting: 225993.44
Northing: 7411703.29
Surface RL: 516.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Oct 22 - 18 Oct 22
Comments: Terminated at 102m in SD2. Hanging plates, no end cap.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 516.91 (Stickup 0.93m) (drilled) SWL: 52.81 MBTOC (18 Oct 22) Dev: N Final pH: -
TOC RL: 516.91 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	TD2	Q	S			SAND, trace silt, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Uniform, Rounded					FALLBACK (90.00-102.00)

110 120 130 140 150 160 170 180 190 200

0 100 200 | 0-5000 0-14 0-50

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BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0106	Hole Length:	102.00

Easting: 227180.46
Northing: 7411015.33
Surface RL: 516.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Oct 22 - 25 Oct 22
Comments: FWS around 50-54mbgl. Stick up and Hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 517.54 (Stickup 0.83m) (drilled) SWL: 52.95 MBTOC (25 Oct 22) Dev: N Final pH: -
TOC RL: 517.54 (Stickup 0.83m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			SILT, gravelly, trace sand, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
			ZYJ	K			GRAVEL, silty, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 50 - Class 18 (0.00-55.00)
10	MG	TD3										OPEN HOLE (0.00-102.00)
			Y	KJ			SILT, gravelly, trace clay, (SILTSTONE), Red, Transported, Non-Cohesive soils, Well graded, Sub-rounded					
20												
30	SF											
40	MG	TD2	KJ	Y			CLAY, silty, (CLAY), Light or White, Transported, Firm, Uniform, Sub-rounded					
50												fws approx. 50-54mbgl
												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (55.00-102.00)
60												
		MM	G	LS			MINERALISED BIF, (MM), Brown and Yellow and grey, Moderately Weathered, Medium Strong Rock					
70												
80												
	HG	MU	JG	S			UNMINERALISED BIF, (MU), Grey and Brown, Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA | Hole Name: HCM0106 | Hole Length: 102.00

Easting: 227180.46
Northing: 7411015.33
Surface RL: 516.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Oct 22 - 25 Oct 22
Comments: FWS around 50-54mbgl. Stick up and Hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 517.54 (Stickup 0.83m) (drilled) SWL: 52.95 MBTOC (25 Oct 22) Dev: N Final pH: -
TOC RL: 517.54 (Stickup 0.83m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	MU	JG	S			UNMINERALISED BIF, (MU), Grey and Brown, Moderately Weathered, Medium Strong Rock					OPEN HOLE (0.00-102.00)
110												
120												
130												
140												
150												fws approx. 50-54mbgl
160												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (55.00-102.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0107	Hole Length:	114.00

Easting: 227458.27
Northing: 7412196.55
Surface RL: 513.81
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Nov 22 - 05 Nov 22
Comments: Stygofauna MB. PVC Stickup and Hanging plates. FWS around 53-60mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 514.35 (Stickup 0.69m) (drilled) SWL: 50.52 MBTOC (05 Nov 22) Dev: N Final pH: -
TOC RL: 514.35 (Stickup 0.69m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			GRAVEL, silty, trace clay, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Uniform, Sub-rounded					PERFORATED END CAP (0.00)
10		CY3	ZK	YJ			CLAY, silty, trace sand, (CLAY), Red and Grey, Transported, Stiff, Well graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: 6m Surface casing (collar) (0.00-6.00)
		ST3	ZJ	YK			SILT, gravelly, trace sand, (SILTSTONE), buff and Red, Transported, Non-Cohesive soils, Uniform, Sub-rounded					BLANK PVC: Size 50 - Class 18 (0.00-84.00)
20			ZK	Y			CLAY, silty, trace gravel, (CLAY), Grey and Brown and yellow, Transported, Stiff, Poorly graded, Rounded					OPEN HOLE (0.00-114.00)
30												
40												
50	HG	CY2										FWS around 53-60mbgl.
60												
70												
80												Readings from bedrock
90		VB2	GZ	YKL			GRAVEL, silty, trace clay, (VUGHY BRECCIA), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					reading not recorded SLOTTED PVC: Size 50 - Class 18, Slots 3mm (84.00-114.00)
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0107	Hole Length:	114.00

Easting: 227458.27
Northing: 7412196.55
Surface RL: 513.81
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Nov 22 - 05 Nov 22
Comments: Stygofauna MB. PVC Stickup and Hanging plates. FWS around 53-60mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	WLSRC40	RHF	146		WLS	NK3

TOC RL: 514.35 (Stickup 0.69m) (drilled) SWL: 50.52 MBTOC (05 Nov 22) Dev: N Final pH: -
TOC RL: 514.35 (Stickup 0.69m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	VB2	GZ	YKL			GRAVEL, silty, trace clay, (VUGHY BRECCIA), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					OPEN HOLE (0.00-114.00)
110		MM	J	C			UNMINERALISED BIF, (MM), Brown and Grey, Moderately Weathered, Medium Strong Rock					
120												
130												
140												
150												FWS around 53-60mbgl.
160												
170												
180												Readings from bedrock
190												reading not recorded SLOTTED PVC: Size 50 - Class 18, Slots 3mm (84.00-114.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0108	Hole Length:	138.00

Easting: 229961.89
Northing: 7411137.43
Surface RL: 516.33
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Nov 22 - 03 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 138.0	WLSRC40	RHF	146		WLS	KM4

Comments: Stygofauna MB. Drilled to 138m, install to 100m - unable to push hollow rods past sand.

TOC RL: 517.06 (Stickup 0.70m) (drilled) SWL: 53.82 MBTOC (03 Nov 22) Dev: N Final pH: -
TOC RL: 517.06 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZYJ	I			GRAVEL, silty, (GRAVELLY SILTSTONE), Light or White and Red, Transported, Non-Cohesive soils, Poorly graded, Rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18: 5m surface casing (collar) (0.00-5.00) BLANK PVC: Size 50 - Class 18 (0.00-76.00) OPEN HOLE (0.00-100.00)
30		CY2	ZK	J			CLAY, gravelly, (CLAY), Light or White and Yellow and red, Transported, Firm, Poorly graded, Sub-rounded					fws around 50-60mbgl.
90		SD2	ZQK				SAND, clayey, trace gravel, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (76.00-100.00) FALLBACK (100.00-134.00)
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0108	Hole Length:	138.00

Easting: 229961.89
Northing: 7411137.43
Surface RL: 516.33
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Nov 22 - 03 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 138.0	WLSRC40	RHF	146		WLS	KM4

Comments: Stygofauna MB. Drilled to 138m, install to 100m - unable to push hollow rods past sand.

TOC RL: 517.06 (Stickup 0.70m) (drilled) SWL: 53.82 MBTOC (03 Nov 22) Dev: N Final pH: -
TOC RL: 517.06 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	SD2	ZQK				SAND, clayey, trace gravel, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					FALLBACK (100.00-134.00)
110												
120												
130												
140		CY2	ZK				CLAY, sandy, (CLAY), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded				
150												
160												
170												
180												
190												
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0109 **Hole Length:** 96.00

Easting: 231509.70
Northing: 7411378.94
Surface RL: 514.70
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Oct 22 - 31 Oct 22
Comments: Stygofauna MB. PVC stickup and hanging plates. FWS around 50mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 96.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 515.53 (Stickup 0.82m) (drilled) SWL: 32.19 MBTOC (31 Oct 22) Dev: N Final pH: -
TOC RL: 515.53 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZY	GJ			GRAVEL, silty, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					PERFORATED END CAP (0.00)
10	MG											BLANK PVC: Size 150 - Class 18: 6m of surface casing installed (0.00-6.00)
20	HG											BLANK PVC: Size 50 - Class 18 (0.00-48.00)
30												OPEN HOLE (0.00-90.00)
40	MG	CY3	ZK	J			CLAY, sandy, (CLAY), Light or White and Yellow, Transported, Very Soft, Poorly graded, Sub-rounded					
50												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (48.00-90.00)
60	HG											Drillers estimated appox. 50m
70												WELLCAP(70.00) ID: 3134
80												
90	MG	VB2	ZG	LK			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Dark or Black and Blue, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					FALLBACK (90.00-96.00)
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0110	Hole Length:	114.00

Easting: 232265.98
Northing: 7410506.53
Surface RL: 515.30
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Oct 22 - 29 Oct 22
Comments: Stygofauna MB. Drilled to 114m, installed to 110m per bore plan. S/Up & Hanging Plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 516.20 (Stickup 0.82m) (drilled) SWL: 52.74 MBTOC (30 Oct 22) Dev: N Final pH: -
TOC RL: 516.19 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	TD3	ZYI	KJ			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18: 6m of surface casing installed to stop potential erosion at collar. (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-50.00) OPEN HOLE (0.00-114.00)
40		WA1	GW	JS			MINERALISED BIF, (WA1), Brown, Highly Weathered, Weak Rock					
50		MN	GW	S			UNMINERALISED BIF, (MN), Brown, Highly Weathered, Weak Rock					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-78.00)
60	SF											
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0110 **Hole Length:** 114.00

Easting: 232265.98
Northing: 7410506.53
Surface RL: 515.30
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Oct 22 - 29 Oct 22
Comments: Stygofauna MB. Drilled to 114m, installed to 110m per bore plan. S/Up & Hanging Plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 516.20 (Stickup 0.82m) (drilled) SWL: 52.74 MBTOC (30 Oct 22) Dev: N Final pH: -
TOC RL: 516.19 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	MN	GW	S			UNMINERALISED BIF, (MN), Brown, Highly Weathered, Weak Rock					OPEN HOLE (0.00-114.00)
110	MG											
120												
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0111	Hole Length:	106.00

Easting: 233661.24
Northing: 7411263.46
Surface RL: 511.75
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 Oct 22 - 31 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 106.0	WLSRC40	RHF	146		WLS	KM4

Comments: Stygofauna MB. Drilled to 106m, installed to 102m. FWS @ 52m. PVC s/up and hanging plates.

TOC RL:	512.49	(Stickup 0.79m)	(drilled)	SWL:	49.56 MBTOC	(31 Oct 22)	Dev:	N	Final pH: -
TOC RL:	512.44	-	(current)	Is Live:	Y	(-)	Date:	-	Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZYI	J			GRAVEL, silty, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Rounded					PERFORATED END CAP (0.00)
10												BLANK PVC: Size 150 - Class 18: 6m surface casing. (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-48.00)
30		GS3	ZJ	KQ			GRAVEL, sandy, (GRAVELLY SILTSTONE), buff, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					OPEN HOLE (0.00-106.00)
40												
50	MG											SLOTTED PVC: Size 50 - Class 18, Slots 3mm (48.00-84.00)
60	SF											
70	MG	CA2	Z3				SILT, (CALCRETE), Light or White, Transported, Very Stiff, Gap graded, Sub-rounded					
80	SF											
90	MG	GS3	ZGK	W			GRAVEL, clayey, (GRAVELLY SILTSTONE), Dark or Black and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
100		CY2	ZK	J			CLAY, trace sand, (CLAY), Light or White and Yellow and brown, Transported, Soft, Poorly graded, Sub-rounded					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0111	Hole Length:	106.00

Easting: 233661.24
Northing: 7411263.46
Surface RL: 511.75
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 Oct 22 - 31 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 106.0	WLSRC40	RHF	146		WLS	KM4

Comments: Stygofauna MB. Drilled to 106m, installed to 102m. FWS @ 52m. PVC s/up and hanging plates.

TOC RL: 512.49 (Stickup 0.79m) (drilled) SWL: 49.56 MBTOC (31 Oct 22) Dev: N Final pH: -
TOC RL: 512.44 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	CY2	ZK	J			CLAY, trace sand, (CLAY), Light or White and Yellow and brown, Transported, Soft, Poorly graded, Sub-rounded					OPEN HOLE (0.00-106.00)

110 120 130 140 150 160 170 180 190 200

0 100 200 | 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0112 **Hole Length:** 90.00

Easting: 235570.02
Northing: 7410342.88
Surface RL: 515.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 31 Oct 22 - 02 Nov 22
Comments: Stygofauna monitoring hole. PVC stickup and hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	WLSRC40	RHF	146		WLS	KM4

TOC RL: 516.61 (Stickup 0.84m) (drilled) SWL: 53.31 MBTOC (02 Nov 22) Dev: N Final pH: -
TOC RL: 516.44 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZY	IJ			GRAVEL, silty, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18: 5m surface casing (collar) (0.00-5.00) BLANK PVC: Size 50 - Class 18 (0.00-52.00) OPEN HOLE (0.00-90.00)
20			ZYK	JQ			GRAVEL, silty, (GRAVELLY SILTSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
40			ZK	J			CLAY, trace sand, (CLAY), Light or White and Red, Transported, Firm, Gap graded, Sub-rounded					
50		TD2	ZJ	GKL			GRAVEL, sandy, trace clay, (VUGHY BRECCIA), Brown and Yellow, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					Between 50 t0 60mbgl. SLOTTED PVC: Size 50 - Class 18, Slots 3mm (52.00-88.00)
60												
70												
80												
90												
100												

0 100 200 0-5000 0-14 0-50

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BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0114	Hole Length:	50.00

Easting: 227180.05
Northing: 7410998.01
Surface RL: 516.66
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 01 Dec 22
Comments: Troglofauna - Open Hole . Dry. Concrete plinth & steel monument.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	NK3
3.0 - 50.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 517.39 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 517.39 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YK			GRAVEL, silty, trace sand, (SCREE), Red, Transported, Soft, Uniform, Rounded					BLANK STEEL: Size 12" - W.T.6.35mm (0.00-3.00)
10		ST3	ZY				SILT, sandy, trace gravel, (SILTSTONE), Red, Transported, Non-Cohesive soils, Well graded, Rounded					OPEN HOLE (0.00-50.00)
20		GS3	ZY	SJ			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Red and buff and pink, Transported, Non-Cohesive soils, Well graded, Sub-rounded					
30												
40		CA2	Z3				SILT, sandy, trace gravel, (CALCRETE), buff and Light or White, Transported, Non-Cohesive soils, Uniform, Rounded					
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0115	Hole Length:	20.00

Easting: 227454.30
Northing: 7412207.11
Surface RL: 513.69
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Dec 22 - 02 Dec 22
Comments: Troglofauna - Open Hole. FWS at 19 mbgl. Concrete plinth & steel monument. SWL @ 18.5mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	NK3
3.0 - 20.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 514.48 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 514.48 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	KY			SILT, clayey, trace gravel, (SCREE), Red and Brown, Transported, Soft, Uniform, Sub-rounded					BLANK STEEL: Size 12" - W.T.6.35mm (0.00-3.00)
10		ST3	ZY				SILT, clayey, trace gravel, (SILTSTONE), Brown and Red, Transported, Soft, Uniform, Rounded					OPEN HOLE (0.00-20.00)
20												
30												
40												
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0116	Hole Length:	30.00

Easting: 229957.93
Northing: 7411147.39
Surface RL: 516.35
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Dec 22 - 02 Dec 22
Comments: Troglofauna - open hole. Dry. Concrete plinth & steel monument.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	NK3
3.0 - 30.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 517.10 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 517.10 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			GRAVEL, silty, trace sand, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.6.35mm (0.00-3.00)
10		ST3	ZY	K			SILT, sandy, trace clay, (SILTSTONE), Brown and Red, Transported, Soft, Uniform, Rounded					OPEN HOLE (3.00-30.00)
20												
30												
40												
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0120	Hole Length:	50.00

Easting: 235563.12
Northing: 7410344.30
Surface RL: 515.72
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Dec 22 - 03 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	KM4
3.0 - 50.0	WLDRIG4	CH	150		WELLDRILL	KM4

Comments: Troglofauna monitoring hole. Open hole. Dry hole. Concrete plinth & steel monument.

TOC RL: 516.42 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 516.42 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		GS3	ZY	IJ			SILT, gravelly, (SILTSTONE), Red and Light or White, Transported, Soft, Poorly graded, Sub-rounded					BLANK STEEL: 324mm (0.00-3.00)
30		CY3	ZK				CLAY, trace silt, (CLAY), Light or White and Pink, Transported, Firm, Gap graded, Sub-rounded					OPEN HOLE (3.00-50.00)
40		ST3	ZY				SILT, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0121 **Hole Length:** 34.00

Easting: 233691.84
Northing: 7410362.21
Surface RL: 514.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Dec 22 - 03 Dec 22
Comments: Trogolofauna - Open Hole. Damp at 34 mbgl. Concrete plinth & steel monument.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 3.0	WLDRIG4	CH	300		WELLDRILL	NK3
3.0 - 34.0	WLDRIG4	CH	150		WELLDRILL	NK3

TOC RL: 515.52 - (drilled) SWL: Dev: N Final pH: -
TOC RL: 515.52 - (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	JK			GRAVEL, silty, trace sand, (SCREE), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.6.35mm (0.00-3.00)
10		ST3	ZY	K			SILT, clayey, trace gravel, (SILTSTONE), Red and Pink, Transported, Soft, Uniform, Rounded					OPEN HOLE (3.00-34.00)
30		VB2	ZG	JK			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Dark or Black and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA **Hole Name:** HCM0123 **Hole Length:** 200.00

Easting: 227553.92
Northing: 7411877.97
Surface RL: 514.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Jan 23 - 10 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	KM4

Comments: Targeting Wittenoom Dolomite for future SUR schemes. 3mm slots used at top of water table to allow for stygofauna sampling. Install to 198m.

TOC RL: 514.90 (Stickup 0.57m) (drilled) SWL: 49.71 MBTOC (10 Jan 23) Dev: N Final pH: -
TOC RL: 514.90 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	IK			GRAVEL, sandy, trace silt, (SCREE), buff and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) AB FOAM (0.00-1.00) BLANK PVC: Size 50 - Class 18 (0.00-48.00) BLANK PVC: Size 150 - Class 18 (1.00-12.00)
20		CY2	ZK				CLAY, trace sand, (CLAY), Light or White and Yellow, Transported, Soft, Gap graded, Sub-rounded					
50												SLOTTED PVC: Size 50 - Class 18, Slots 3mm (48.00-72.00)
70		VB2	Z	GYK			GRAVEL, clayey, trace sand, (VUGHY BRECCIA), Light or White and Grey, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (72.00-198.00)
90	MG	OB	D				DOLOMITE, (OB), Dark or Black and Blue and grey, Slightly Weathered, Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0123	Hole Length:	200.00

Easting: 227553.92
Northing: 7411877.97
Surface RL: 514.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Jan 23 - 10 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	KM4

Comments: Targeting Wittenoom Dolomite for future SUR schemes. 3mm slots used at top of water table to allow for stygofauna sampling. Install to 198m.

TOC RL: 514.90 (Stickup 0.57m) (drilled) SWL: 49.71 MBTOC (10 Jan 23) Dev: N Final pH: -
TOC RL: 514.90 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	OB	D				DOLOMITE, (OB), Dark or Black and Blue and grey, Slightly Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (72.00-198.00)
110												
120												
130												
140												
150	HG											
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		END CAP (198.00) FALLBACK (198.00-200.00)

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0124	Hole Length:	200.00

Easting: 229924.02
Northing: 7411444.74
Surface RL: 515.97
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Jan 23 - 13 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	NK3

Comments: Targeting Wittenoom Dolomite for future SUR schemes.3mm slots used at top of WT,for stygofauna sampling.

TOC RL: 516.98 (Stickup 1.13m) (drilled) SWL: 53.01 MBTOC (13 Jan 23) Dev: N Final pH: -
TOC RL: 516.98 (Stickup 1.13m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	ZY	SJ			SILT, gravelly, trace sand, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) AB FOAM (0.00-1.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-50.00)
10		SD2	Z	Y			SAND, silty, trace clay, (SANDSTONE), buff and Light or White, Transported, Non-Cohesive soils, Poorly graded, Rounded					
20												
30		CY2	Z	K			CLAY, gravelly, trace silt, (CLAY), Light or White and Yellow, Transported, Soft, Poorly graded, Sub-rounded					
40												
50		SD2	Z	K			CLAY, gravelly, trace sand, (SANDSTONE), buff and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-74.00)
60	MG											
70												
80	SF											
90	MG	CY2	Z	K			CLAY, gravelly, trace silt, (CLAY), Light or White and Brown, Transported, Firm, Gap graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (74.00-200.00)
							GRAVEL, clayey, (GRAVELLY SILTSTONE), Yellow and Blue, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
100		VB2	O	K								
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0124	Hole Length:	200.00

Easting: 229924.02
Northing: 7411444.74
Surface RL: 515.97
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Jan 23 - 13 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	NK3

Comments: Targeting Wittenoom Dolomite for future SUR schemes.3mm slots used at top of WT,for stygofauna sampling.

TOC RL: 516.98 (Stickup 1.13m) (drilled) SWL: 53.01 MBTOC (13 Jan 23) Dev: N Final pH: -
TOC RL: 516.98 (Stickup 1.13m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	VB2	O	K			GRAVEL, clayey, (GRAVELLY SILTSTONE), Yellow and Blue, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (74.00-200.00)
110			JC	S			UNMINERALISED BIF, (OB), Brown and Grey, Moderately Weathered, Medium Strong Rock					
120												
130		OB	D				DOLOMITE, (OB), Blue and Grey, Slightly Weathered, Strong Rock					
140	HG											
150												
160												
170												
180												
190												
200												END CAP (200.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0125	Hole Length:	200.00

Easting: 230995.07
Northing: 7411514.36
Surface RL: 515.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Jan 23 - 17 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	NK3

Comments: MB Targeting Wittenoom Dolomite for future SUR schemes. 3mm slots used at top of water table to allow for stygofauna sampling. Install to 192m.

TOC RL: 516.17 (Stickup 0.60m) (drilled) SWL: 52.24 MBTOC (22 Jan 23) Dev: N Final pH: -
TOC RL: 516.17 (Stickup 0.60m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			SILT, gravelly, trace clay, (SCREE), Red and Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) AB FOAM (0.00-1.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-42.00)
10		ST3	ZY	J			SILT, gravelly, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20		GS3	Z	JY			GRAVEL, sandy, trace clay, (GRAVELLY SILTSTONE), buff and Red and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
30												
40		VB2	ZK	Y			CLAY, silty, trace gravel, (CLAY), buff and Brown, Transported, Soft, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (42.00-66.00)
50												
60												
70												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (66.00-192.00)
80												
90												
100		SD2	K	Y			SAND, silty, trace gravel, (CLAY), Light or White and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0125	Hole Length:	200.00

Easting: 230995.07
Northing: 7411514.36
Surface RL: 515.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Jan 23 - 17 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	NK3

Comments: MB Targeting Wittenoom Dolomite for future SUR schemes. 3mm slots used at top of water table to allow for stygofauna sampling. Install to 192m.

TOC RL: 516.17 (Stickup 0.60m) (drilled) SWL: 52.24 MBTOC (22 Jan 23) Dev: N Final pH: -
TOC RL: 516.17 (Stickup 0.60m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	SD2	K	Y			SAND, silty, trace gravel, (CLAY), Light or White and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (66.00-192.00)
		CY3	Z	K			CLAY, gravelly, (CLAY), Brown and Light or White, Transported, Soft, Poorly graded, Sub-rounded					
110		OD	S	JC			UNMINERALISED BIF, (OD), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock					
120												
130												
140	MG	OB	D	C			DOLOMITE, (OB), Blue and Grey and buff, Slightly Weathered, Strong Rock					
150												
160												
170	HG											
180												
190			D				DOLOMITE, (OB), Blue and Grey, Slightly Weathered, Strong Rock					END CAP (192.00) FALLBACK (192.00-200.00)
200												

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0126	Hole Length:	200.00

Easting: 231492.15
Northing: 7412841.63
Surface RL: 512.60
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Jan 23 - 26 Jan 23
Comments: MB Targeting Wittenoom Dolomite for potential aquifer recharge injection

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	JP10

TOC RL: 513.56 (Stickup 0.70m) (drilled) SWL: 50.04 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 513.56 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	Z	YJ			SILT, gravelly, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Well graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-50.00)
40		CY3	ZK	Y			CLAY, silty, trace gravel, (CLAY), Red and buff, Transported, Soft, Poorly graded, Sub-rounded					
50	MG											SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-74.00)
70		VB2	ZG	KY			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Brown and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
74												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (74.00-200.00)
90		OD	S	CJ			SHALE, (OD), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock					
100												

0 100 200 0-5000 0-14 0-50

Program: East Caramulla SUR Phase 3 Planned Hole: CM_FY23_RC_MB04 Page: 45

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0126	Hole Length:	200.00

Easting: 231492.15
Northing: 7412841.63
Surface RL: 512.60
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Jan 23 - 26 Jan 23
Comments: MB Targeting Wittenoom Dolomite for potential aquifer recharge injection

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	JP10

TOC RL: 513.56 (Stickup 0.70m) (drilled) SWL: 50.04 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 513.56 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	MG / HG	OD	S	CJ		0 100 200	SHALE, (OD), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock	0-5000	0-14	0-50		SLOTTED PVC: Size 50 - Class 18, Slots 1mm (74.00-200.00)
		OB	4	D			DOLOMITE, (OB), Dark or Black and Grey and blue, Moderately Weathered, Medium Strong Rock					END CAP (200.00)

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0127	Hole Length:	200.00

Easting: 232103.39
Northing: 7411451.11
Surface RL: 514.13
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Feb 23 - 04 Feb 23
Comments: FWS at 58m. Targeting Wittenoom Dolomite

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 515.20 (Stickup 1.10m) (drilled) SWL: 51.70 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 515.20 (Stickup 1.10m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	Z	YJ			GRAVEL, silty, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 9 (B/C): Headworks = Monument cover and concrete Plinth (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-50.00)
25		CY3	ZG	KYC			CLAY, gravelly, trace silt, (CLAY), Yellow and Brown and light or white, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40		GS3	ZG	KL			GRAVEL, clayey, (GRAVELLY SILTSTONE), Brown and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-62.00)
60		CA2	Z3	K			SAND, (CALCRETE), Light or White and Yellow, Transported, Soft, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-200.00)
80		OD	S	D			SHALE, (OD), Yellow and Light or White and grey, Highly Weathered, Very Weak Rock					
90	MG	OB	4	D			DOLOMITE, (OB), Dark or Black and Grey and blue, Moderately Weathered, Medium Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0127	Hole Length:	200.00

Easting: 232103.39
Northing: 7411451.11
Surface RL: 514.13
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Feb 23 - 04 Feb 23
Comments: FWS at 58m. Targeting Wittenoom Dolomite

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 515.20 (Stickup 1.10m) (drilled) SWL: 51.70 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 515.20 (Stickup 1.10m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	OB	4	D			DOLOMITE, (OB), Dark or Black and Grey and blue, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-200.00)
110												
120												
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		END CAP (200.00)

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0128	Hole Length:	200.00

Easting: 233835.63
Northing: 7412843.38
Surface RL: 509.53
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Feb 23 - 13 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	JP10

Comments: Targeting the extent & occurrence of Witt. Dolomite, & managed Aquifer Recharge injection bores at later stage. FWS @ 33m

TOC RL: 510.07 (Stickup 0.26m) (drilled) SWL: 38.07 MBGL (14 Feb 23) Dev: N Final pH: -
TOC RL: 510.07 (Stickup 0.26m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZX	K			GRAVEL, silty, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10												BLANK PVC: 161mm (0.00-6.00)
20			ZX	JI			GRAVEL, sandy, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK PVC: Size 50 - Class 18 (0.00-50.00)
30												
40		TD2	ZK				CLAY, trace silt, (CLAY), Light or White and buff, Transported, Non-Cohesive soils, Uniform, Sub-rounded					
50			ZK	G			CLAY, sandy, trace silt, (CLAY), Grey and Dark or Black and red, Transported, Non-Cohesive soils, Uniform, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-62.00)
60	HG											
70	SF		ZKL	G			CLAY, sandy, (CLAY), Yellow and Brown and buff, Transported, Non-Cohesive soils, Uniform, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-200.00)
80	MG		ZG	LK			GRAVEL, sandy, (VUGHY BRECCIA), Yellow and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
90												
100	SF											
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0128	Hole Length:	200.00

Easting: 233835.63
Northing: 7412843.38
Surface RL: 509.53
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Feb 23 - 13 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	JP10

Comments: Targeting the extent & occurrence of Witt. Dolomite, & managed Aquifer Recharge injection bores at later stage. FWS @ 33m

TOC RL: 510.07 (Stickup 0.26m) (drilled) SWL: 38.07 MBGL (14 Feb 23) Dev: N Final pH: -
TOC RL: 510.07 (Stickup 0.26m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–120	SF	TD2	ZG	LK			GRAVEL, sandy, (VUGHY BRECCIA), Yellow and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-200.00)
120–200	HG	OB	D	C			DOLOMITE, (OB), Blue and Grey and buff, Moderately Weathered, Strong Rock					END CAP (200.00)

0 100 200 | 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0129	Hole Length:	202.00

Easting: 234206.60
Northing: 7411424.61
Surface RL: 511.50
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Feb 23 - 16 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	ML4

Comments: Targeting the extent & occurrence of Wittenoom Dolomite for MAR potential. FWS @ 49m. 1mm and 3mm slotted casing used to enable stygofauna monitoring. RC sampling interval was 2m.

TOC RL: 512.44 (Stickup 0.65m) (drilled) SWL: 47.80 MBGL (17 Feb 23) Dev: N Final pH: -
TOC RL: 512.44 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	Z	YJ			GRAVEL, silty, (SCREE), Red and Brown and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) AB FOAM (0.00-1.00) BLANK PVC: Size 50 - Class 18 (0.00-50.00)
10		ST3	ZJ	IH			SILT, sandy, trace gravel, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
		GS3	ZJ	H			GRAVEL, clayey, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
20												
30		VB2	Z	JCL			GRAVEL, clayey, trace sand, (VUGHY BRECCIA), Brown and Yellow and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40												
50	HG		Z	JGL			GRAVEL, sandy, trace clay, (VUGHY BRECCIA), Grey and Yellow and light or white, Transported, Non-Cohesive soils, Poorly graded, Angular					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (50.00-62.00)
60	MG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-201.00)
70												
80	SF											
90		OB	D	CQ			DOLOMITE, (OB), Blue and Grey, Slightly Weathered, Strong Rock					
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0129	Hole Length:	202.00

Easting: 234206.60
Northing: 7411424.61
Surface RL: 511.50
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Feb 23 - 16 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	ML4

Comments: Targeting the extent & occurrence of Wittenoom Dolomite for MAR potential. FWS @ 49m. 1mm and 3mm slotted casing used to enable stygofauna monitoring. RC sampling interval was 2m.

TOC RL: 512.44 (Stickup 0.65m) (drilled) SWL: 47.80 MBGL (17 Feb 23) Dev: N Final pH: -
TOC RL: 512.44 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	OB	D	CQ			DOLOMITE, (OB), Blue and Grey, Slightly Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-201.00)
110	MG											
120												
130												
140												
150	HG											
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA | Hole Name: HCM0129 | Hole Length: 202.00

Easting: 234206.60
Northing: 7411424.61
Surface RL: 511.50
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Feb 23 - 16 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	ML4

Comments: Targeting the extent & occurrence of Wittenoom Dolomite for MAR potential. FWS @ 49m. 1mm and 3mm slotted casing used to enable stygofauna monitoring. RC sampling interval was 2m.

TOC RL: 512.44 (Stickup 0.65m) (drilled) SWL: 47.80 MBGL (17 Feb 23) Dev: N Final pH: -
TOC RL: 512.44 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	OB	D	CQ			DOLOMITE, (OB), Blue and Grey, Slightly Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (62.00-201.00) END CAP (201.00) FALLBACK (201.00-202.00)
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0130	Hole Length:	202.00

Easting: 236018.30
Northing: 7411437.24
Surface RL: 514.38
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Feb 23 - 23 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	BF2

Comments: FWS@50m. Drill program to provide data on the extent and occurrence of Wittenoom Dolomite.

TOC RL: 515.29 (Stickup 0.70m) (drilled) SWL: 53.19 MBTOC (23 Feb 23) Dev: N Final pH: -
TOC RL: 515.29 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	Y			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-48.00)
10		TD3	ZY	JI			SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20												
30	MG											
40												
50	HG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (48.00-200.00)
60	MG											
70	HG											
80	MG	VB2	Z	JW			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Yellow and Brown, Transported, Soft, Poorly graded, Sub-rounded					
90	SF											
100	MG											

0 100 200 | 0-5000 0-14 0-50

Program: East Caramulla SUR Phase 3 Planned Hole: CM_FY23_RC_MB08

BHPIO - Hydrogeology Log

BHP

Project:	CARAMULLA	Hole Name:	HCM0130	Hole Length:	202.00

Easting: 236018.30
Northing: 7411437.24
Surface RL: 514.38
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Feb 23 - 23 Feb 23
Comments: FWS@50m. Drill program to provide data on the extent and occurrence of Wittenoom Dolomite.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 515.29 (Stickup 0.70m) (drilled) SWL: 53.19 MBTOC (23 Feb 23) Dev: N Final pH: -
TOC RL: 515.29 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	MG	VB2	Z	JW		0 100 200	GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Yellow and Brown, Transported, Soft, Poorly graded, Sub-rounded	0-5000	0-14	0-50		SLOTTED PVC: Size 50 - Class 18, Slots 1mm (48.00-200.00)
		OB	D	CQ			DOLOMITE, (OB), Blue and Grey, Moderately Weathered, Medium Strong Rock					END CAP (200.00) FALLBACK (200.00-202.00)

BHPIO - Hydrogeology Log

BHP

Project: CARAMULLA | Hole Name: HCM0130 | Hole Length: 202.00

Easting: 236018.30
Northing: 7411437.24
Surface RL: 514.38
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Feb 23 - 23 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 202.0	WLSRC40	RHF	140		WLS	BF2

Comments: FWS@50m. Drill program to provide data on the extent and occurrence of Wittenoom Dolomite.

TOC RL: 515.29 (Stickup 0.70m) (drilled) SWL: 53.19 MBTOC (23 Feb 23) Dev: N Final pH: -
TOC RL: 515.29 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	OB	D	CQ			DOLOMITE, (OB), Blue and Grey, Moderately Weathered, Medium Strong Rock					END CAP (200.00) FALLBACK (200.00-202.00)
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

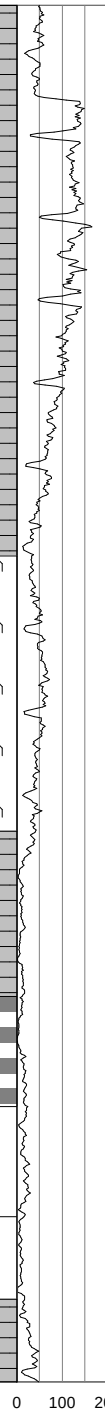
Project: HASHIMOTO **Hole Name:** HEJ0062 **Hole Length:** 182.00

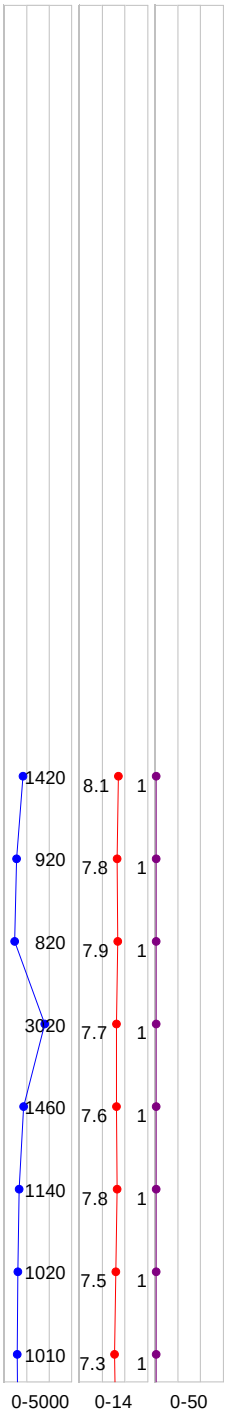
Easting: 220364.88
Northing: 7410865.24
Surface RL: 523.58
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Mar 23 - 17 Mar 23
Comments: FWS @ 62m. High yields available below 145m in Dolomite.

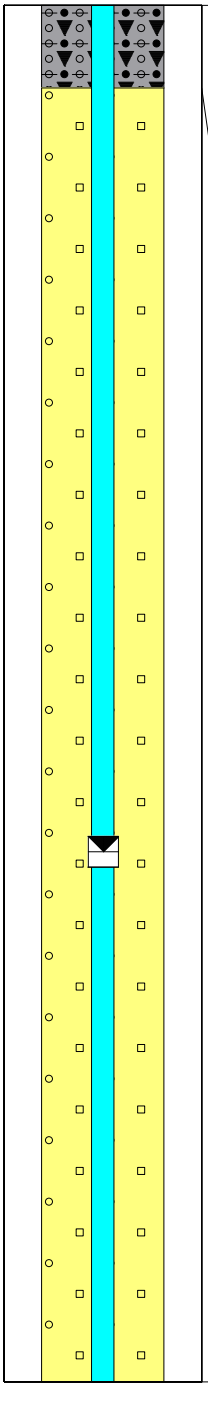
Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 146.0	EWMWW06	DR	250		EASTERNWELL	JP10
146.0 - 182.0	EWMWW06	DR	200		EASTERNWELL	KM4

TOC RL: 524.49 (Stickup 0.91m) (drilled) SWL: 61.51 MBTOC (21 Mar 23) Dev: N Final pH: -
TOC RL: 524.49 (Stickup 0.91m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZS	K			GRAVEL, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP: Concrete plinth and monument cover. (0.00) CEMENT (0.00-6.00) BLANK THREADED PVC: Size 50 - Class 25 (0.00-142.00)
40		CY2	ZK	S			CLAY, gravelly, (CLAY), Red and Brown and light or white, Transported, Soft, Gap graded, Rounded					GRAVEL MED (6.00-178.00)
60		VB2	ZS	LG			GRAVEL, (VUGHY BRECCIA), Yellow and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
70		CA2	Z3	S			GRAVEL, (CALCRETE), Light or White and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
80	SF	CY2	Z	KJ			CLAY, silty, (CLAY), Red and Light or White, Transported, Soft, Poorly graded, Rounded					
90		SD2	Z	O			SAND, silty, trace gravel, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
100		OC	S	J			SHALE, (OC), Brown and Red and grey, Highly Weathered, Very Weak Rock					







BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0062	Hole Length:	182.00

Easting: 220364.88
Northing: 7410865.24
Surface RL: 523.58
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Mar 23 - 17 Mar 23
Comments: FWS @ 62m. High yields available below 145m in Dolomite.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 146.0	EWMWW06	DR	250		EASTERNWELL	JP10
146.0 - 182.0	EWMWW06	DR	200		EASTERNWELL	KM4

TOC RL: 524.49 (Stickup 0.91m) (drilled) SWL: 61.51 MBTOC (21 Mar 23) Dev: N Final pH: -
TOC RL: 524.49 (Stickup 0.91m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–110	SF	OC	S	J			SHALE, (OC), Brown and Red and grey, Highly Weathered, Very Weak Rock	1020 / 1900	7.5 / 8.2	1 / 2		BLANK THREADED PVC: Size 50 - Class 25 (0.00-142.00) GRAVEL MED (6.00-178.00)
110–120	SF	OC	S	J			SHALE, (OC), Brown and Red and grey, Highly Weathered, Very Weak Rock	2120 / 1840	8.0 / 8.2	2 / 4		
120–130	SF	OC	S	J			UNMINERALISED BIF, (OC), Red and Brown, Highly Weathered, Weak Rock	1910 / 1460	8.0 / 8.0	4 / 4		
130–140	MG	OC	S	J			UNMINERALISED BIF, (OC), Red and Brown, Highly Weathered, Weak Rock	1460 / 1460	8.0 / 7.8	4 / 4		
140–150	MG	OB	4S				DOLOMITE, (OB), Dark or Black and Brown and grey, Moderately Weathered, Medium Strong Rock	1440 / 1480	8.0 / 8.7	10 / 15		SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (142.00-178.00)
150–160	MG	OB	4S				DOLOMITE, (OB), Dark or Black and Brown and grey, Moderately Weathered, Medium Strong Rock	1450 / 1390	8.1 / 8.2	15 / 15		
160–170	MG	OB	4S				DOLOMITE, (OB), Dark or Black and Brown and grey, Moderately Weathered, Medium Strong Rock	1450	8.0	20		
170–180	MG	OB	4S				DOLOMITE, (OB), Dark or Black and Brown and grey, Moderately Weathered, Medium Strong Rock					END CAP (178.00) FALLBACK (178.00-182.00)
180–200	MG	OB	4S				DOLOMITE, (OB), Dark or Black and Brown and grey, Moderately Weathered, Medium Strong Rock					

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0063	Hole Length:	144.00

Easting: 217218.28
Northing: 7411560.65
Surface RL: 534.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Jul 23 - 08 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 144.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed PVC to planned depth to allow future installation of VWPs sensors in McRae (R) & Sylvia (S) Fm.

TOC RL: 534.96 (Stickup 0.48m) (drilled) SWL: 78.52 MBTOC (09 Jul 23) Dev: N Final pH: -
TOC RL: 534.96 (Stickup 0.48m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	D3	W	JL			MINERALISED BIF, (D3), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP: PVC stickup with hanging plates. (0.00) BLANK PVC: 161mm (0.00-2.50) BLANK PVC: Size 50 - Class 18 (0.00-78.00)
10		D2	WJ	LS			MINERALISED BIF, (D2), Grey and Brown and red, Moderately Weathered, Medium Strong Rock					
20												
30												
40		D1	WL	SC			MINERALISED BIF, (D1), Brown and Yellow and grey, Moderately Weathered, Medium Strong Rock					
50		R	S	C			SHALE, (R), Pink and Grey and brown, Moderately Weathered, Medium Strong Rock					
60												
70												
80			S	JC			SHALE, (R), Brown and Grey and pink, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (78.00-144.00)
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0063	Hole Length:	144.00

Easting: 217218.28
Northing: 7411560.65
Surface RL: 534.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Jul 23 - 08 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 144.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed PVC to planned depth to allow future installation of VWPs sensors in McRae (R) & Sylvia (S) Fm.

TOC RL: 534.96 (Stickup 0.48m) (drilled) SWL: 78.52 MBTOC (09 Jul 23) Dev: N Final pH: -
TOC RL: 534.96 (Stickup 0.48m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	S	JC			SHALE, (R), Brown and Grey and pink, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (78.00-144.00)
110		S	BS				SHALE, (S), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock					
120												
130		OC	4S	J			SHALE, (OC), Brown and Grey and green, Moderately Weathered, Medium Strong Rock					
140												END CAP (144.00)
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

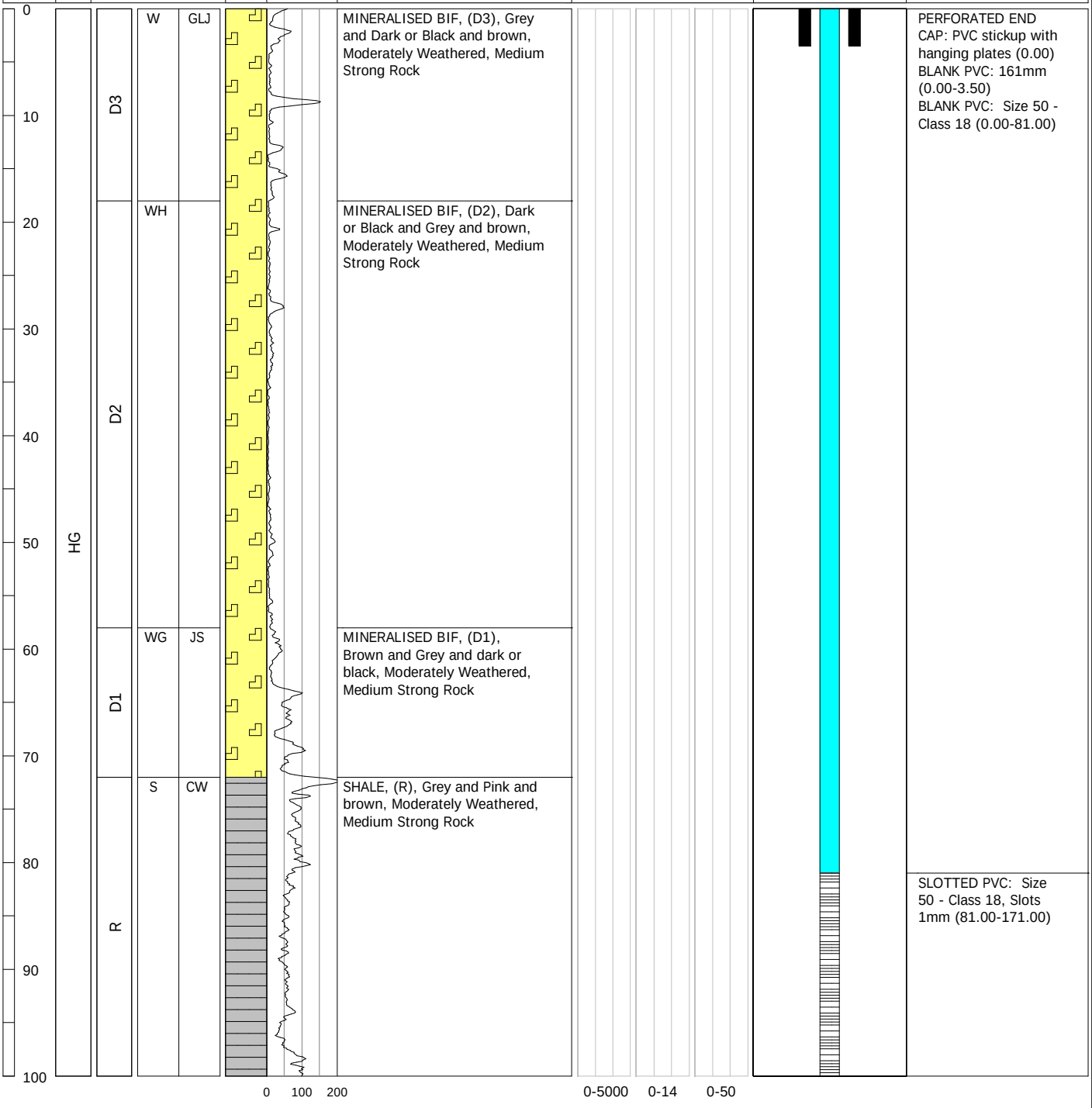
Project:	HASHIMOTO	Hole Name:	HEJ0064	Hole Length:	174.00

Easting: 217758.55
Northing: 7411564.58
Surface RL: 549.79
Grid Name: MGA94_51
Incl / Azm: -66-->77
Construct: 09 Jul 23 - 10 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed PVC to planned depth to allow future installation of VWPs sensors in McRae (R), Brunos Band & Sylvia (S) Fm.

TOC RL: 550.47 (Stickup 0.80m) (drilled) SWL: 100.38 MBTOC (11 Jul 23) Dev: N Final pH: -
TOC RL: 550.47 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HEJ0064 **Hole Length:** 174.00

Easting: 217758.55
Northing: 7411564.58
Surface RL: 549.79
Grid Name: MGA94_51
Incl / Azm: -66-->77
Construct: 09 Jul 23 - 10 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed PVC to planned depth to allow future installation of VWPs sensors in McRae (R), Brunos Band & Sylvia (S) Fm.

TOC RL: 550.47 (Stickup 0.80m) (drilled) SWL: 100.38 MBTOC (11 Jul 23) Dev: N Final pH: -
TOC RL: 550.47 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	R	S	CW			SHALE, (R), Grey and Pink and brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (81.00-171.00)
130	MG	S	JS	HC			UNMINERALISED BIF, (S), Grey and Dark or Black and pink, Moderately Weathered, Medium Strong Rock					END CAP (171.00) FALLBACK (171.00-174.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0065	Hole Length:	162.00

Easting: 218350.90
Northing: 7412112.32
Surface RL: 543.81
Grid Name: MGA94_51
Incl / Azm: -61-->177
Construct: 21 Jun 23 - 22 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	JP10

Comments: For future installation of pore pressure sensors in Whaleback Shale & Joffre/ Dales units. FWS @ 126mbgl.

TOC RL: 544.42 (Stickup 0.71m) (drilled) SWL: 96.58 MBTOC (23 Jun 23) Dev: N Final pH: -
TOC RL: 544.42 (Stickup 0.71m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	J4	JS	GL			UNMINERALISED BIF, (J4), Brown and Yellow and blue, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP: PVC stickup with hanging plates. (0.00) BLANK PVC: 161mm (0.00-3.00) BLANK PVC: Size 50 - Class 18 (0.00-84.00)
10		J3	JS	GL			UNMINERALISED BIF, (J3), Brown and Yellow and red, Moderately Weathered, Medium Strong Rock					
20	MG											
30	BG	J2	JCS	GLH			UNMINERALISED BIF, (J2), Brown and Yellow and red, Moderately Weathered, Medium Strong Rock					
40												
50			HLJ	SG			MINERALISED BIF, (J2), Grey and Brown and yellow, Moderately Weathered, Medium Strong Rock					
60												
70	MG	J1	JS	HG			UNMINERALISED BIF, (J1), Brown and Grey and pink, Moderately Weathered, Medium Strong Rock					
80												
90		W	SC	JG			SHALE, (W), Grey and Pink and red, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (84.00-162.00)
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0065	Hole Length:	162.00

Easting: 218350.90
Northing: 7412112.32
Surface RL: 543.81
Grid Name: MGA94_51
Incl / Azm: -61-->177
Construct: 21 Jun 23 - 22 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	JP10

Comments: For future installation of pore pressure sensors in Whaleback Shale & Joffre/ Dales units. FWS @ 126mbgl.

TOC RL: 544.42 (Stickup 0.71m) (drilled) SWL: 96.58 MBTOC (23 Jun 23) Dev: N Final pH: -
TOC RL: 544.42 (Stickup 0.71m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	W	SC	JG			SHALE, (W), Grey and Pink and red, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 3mm (84.00-162.00)
110												
120												
130		D4	WHJ	CS			MINERALISED BIF, (D4), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock					
140												
150												
160												END CAP (162.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0066	Hole Length:	153.00

Easting: 219518.59
Northing: 7411070.23
Surface RL: 523.76
Grid Name: MGA94_51
Incl / Azm: -66-->5
Construct: 04 Jul 23 - 05 Jul 23
Comments: Expected McRae & Mt Sylvia formaiton were not intersected. FWS @ 96mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 153.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 524.28 (Stickup 0.56m) (drilled) SWL: 70.54 MBTOC (06 Jul 23) Dev: N Final pH: -
TOC RL: 524.28 (Stickup 0.56m) (current) Is Live: Y (-) Date: 04 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZS	JH			GRAVEL, sandy, (SCREE), Brown and Pink and red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stick-up with hanging plates. (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-66.00)
10		GS3	ZS	HI			GRAVEL, clayey, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20												
30		VB2	ZG	L			GRAVEL, clayey, (VUGHY BRECCIA), Brown and Light or White and red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
40		OD	S	C			SHALE, (OD), Dark or Black and Grey and red, Moderately Weathered, Medium Strong Rock					
50	MG		S	C			SHALE, (OD), Pink and buff and red, Moderately Weathered, Weak Rock					
60												
70												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (66.00-150.00)
80												
90	HG	OC	C	SJ			CHERT, (OC), Grey and Blue and red, Moderately Weathered, Medium Strong Rock					
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0066	Hole Length:	153.00

Easting: 219518.59
Northing: 7411070.23
Surface RL: 523.76
Grid Name: MGA94_51
Incl / Azm: -66-->5
Construct: 04 Jul 23 - 05 Jul 23
Comments: Expected McRae & Mt Sylvia formaiton were not intersected. FWS @ 96mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 153.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 524.28 (Stickup 0.56m) (drilled) SWL: 70.54 MBTOC (06 Jul 23) Dev: N Final pH: -
TOC RL: 524.28 (Stickup 0.56m) (current) Is Live: Y (-) Date: 04 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	OC	C	SJ			CHERT, (OC), Grey and Blue and red, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (66.00-150.00)
110	MG		CS	J			CHERT, (OC), Grey and Blue, Moderately Weathered, Medium Strong Rock					
120												
130			S	P			SHALE, (OC), Dark or Black and Grey and blue, Moderately Weathered, Weak Rock					
140	HG											
150	MG											END CAP (150.00) FALLBACK (150.00-153.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0067	Hole Length:	141.00

Easting: 219873.84
Northing: 7411361.56
Surface RL: 523.58
Grid Name: MGA94_51
Incl / Azm: -66-->254
Construct: 03 Jul 23 - 03 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 141.0	WLSRC40	RHF	140		WLS	BF2

Comments: Expected McRae & Mt Sylvia formation were not intersected. FWS @ 114mbgl

TOC RL: 524.20 (Stickup 0.50m) (drilled) SWL: 71.87 MBTOC (04 Jul 23) Dev: N Final pH: -
TOC RL: 524.20 (Stickup 0.50m) (current) Is Live: Y (-) Date: 03 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	GY			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stickup with hanging plates. (0.00) BLANK PVC: 161mm (0.00-3.00) BLANK PVC: Size 50 - Class 18 (0.00-56.00)
10		ST3	ZS	G			SILT, gravelly, trace sand, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20												
30		GS3	ZG	C			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Red and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
40												
50	MG	OD	JC	S			UNMINERALISED BIF, (OD), Grey and Red and brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (56.00-140.00)
60												
70			CJ	S			CHERT, (OD), Red and Brown, Moderately Weathered, Medium Strong Rock					
80		OC	S	CJ			SHALE, (OC), buff and Yellow and grey, Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0067	Hole Length:	141.00

Easting: 219873.84
Northing: 7411361.56
Surface RL: 523.58
Grid Name: MGA94_51
Incl / Azm: -66-->254
Construct: 03 Jul 23 - 03 Jul 23
Comments: Expected McRae & Mt Sylvia formation were not intersected. FWS @ 114mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 141.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 524.20 (Stickup 0.50m) (drilled) SWL: 71.87 MBTOC (04 Jul 23) Dev: N Final pH: -
TOC RL: 524.20 (Stickup 0.50m) (current) Is Live: Y (-) Date: 03 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	OC	S	CJ			SHALE, (OC), buff and Yellow and grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (56.00-140.00)
110												
120			S				SHALE, (OC), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock					
130												
140												END CAP (140.00)
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0068	Hole Length:	162.00

Easting: 219207.79
Northing: 7412362.59
Surface RL: 535.02
Grid Name: MGA94_51
Incl / Azm: -61-->225
Construct: 06 Jul 23 - 07 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed depth down to 151m with 11m of fallback due to ground condition encountered during installation. FWS @ 120mbgl

TOC RL: 535.64 (Stickup 0.67m) (drilled) SWL: 87.34 MBTOC (09 Jul 23) Dev: N Final pH: -
TOC RL: 535.64 (Stickup 0.67m) (current) Is Live: Y (-) Date: 10 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZJ	X			GRAVEL, (GRAVELLY SILTSTONE), Brown and Red and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-3.00) BLANK PVC: Size 50 - Class 18 (0.00-85.00)
20		J3	GH	JS			MINERALISED BIF, (J3), Brown and Grey, Moderately Weathered, Medium Strong Rock					
40		J2	GH	LJ			MINERALISED BIF, (J2), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock					
50	MG	J1	JS	GL			UNMINERALISED BIF, (J1), Yellow and Brown and grey, Moderately Weathered, Medium Strong Rock					
70		W	S	C			SHALE, (W), Pink and Brown and yellow, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (85.00-151.00)
100					0 100 200			0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HEJ0068 **Hole Length:** 162.00

Easting: 219207.79
Northing: 7412362.59
Surface RL: 535.02
Grid Name: MGA94_51
Incl / Azm: -61-->225
Construct: 06 Jul 23 - 07 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installed depth down to 151m with 11m of fallback due to ground condition encountered during installation. FWS @ 120mbgl

TOC RL: 535.64 (Stickup 0.67m) (drilled) SWL: 87.34 MBTOC (09 Jul 23) Dev: N Final pH: -
TOC RL: 535.64 (Stickup 0.67m) (current) Is Live: Y (-) Date: 10 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	W	S	C			SHALE, (W), Pink and Brown and yellow, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (85.00-151.00)
110		D4	J	SW			UNMINERALISED BIF, (D4), Brown and Grey, Moderately Weathered, Medium Strong Rock					
120												
130												
140		D3	JS	C			UNMINERALISED BIF, (D3), Grey and Brown and yellow, Moderately Weathered, Medium Strong Rock					
150	HG											END CAP (151.00) FALLBACK (151.00-162.00)
160												
170												
180												
190												
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0069	Hole Length:	162.00

Easting: 220162.81
Northing: 7412332.08
Surface RL: 556.49
Grid Name: MGA94_51
Incl / Azm: -65-->257
Construct: 01 Jul 23 - 01 Jul 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

Comments: Future installation of VWPs in Mt McRae Shale and Mt Sylvia Fm. FWS @ 89mbgl

TOC RL: 557.27 (Stickup 0.76m) (drilled) SWL: 108.33 MBTOC (02 Jul 23) Dev: N Final pH: -
TOC RL: 557.27 (Stickup 0.76m) (current) Is Live: Y (-) Date: 01 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	D4	G	W			MINERALISED BIF, (D4), Grey and Brown, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP: PVC stickup with hanging plates. (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-89.00)
20		D3	G	S			MINERALISED BIF, (D3), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
40		D2	W	G			MINERALISED BIF, (D2), Grey and Brown, Moderately Weathered, Medium Strong Rock					
50		D1	G	WS			MINERALISED BIF, (D1), Grey and Brown, Moderately Weathered, Medium Strong Rock					
70	SF	R	S	GH			SHALE, (R), Yellow and Brown and red, Highly Weathered, Medium Strong Rock					
90	MG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (89.00-161.00)
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0069	Hole Length:	162.00

Easting: 220162.81
Northing: 7412332.08
Surface RL: 556.49
Grid Name: MGA94_51
Incl / Azm: -65-->257
Construct: 01 Jul 23 - 01 Jul 23
Comments: Future installation of VWPs in Mt McRae Shale and Mt Sylvia Fm. FWS @ 89mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 557.27 (Stickup 0.76m) (drilled) SWL: 108.33 MBTOC (02 Jul 23) Dev: N Final pH: -
TOC RL: 557.27 (Stickup 0.76m) (current) Is Live: Y (-) Date: 01 Jul 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	S	GH			SHALE, (R), Yellow and Brown and red, Highly Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (89.00-161.00)
140		S	S	GC			SHALE, (S), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock					END CAP (161.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0070	Hole Length:	174.00

Easting: 220353.83
Northing: 7412638.27
Surface RL: 537.29
Grid Name: MGA94_51
Incl / Azm: -85-->266
Construct: 29 Jun 23 - 29 Jun 23
Comments: Future installation of VWPs in Mt McRae Shale and Mt Sylvia Fm. FWS @ 82mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 537.97 (Stickup 0.67m) (drilled) SWL: 80.26 MBTOC (30 Jun 23) Dev: N Final pH: -
TOC RL: 537.97 (Stickup 0.67m) (current) Is Live: Y (-) Date: 30 Jun 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	HG	GS3	Z	YJ			GRAVEL, silty, trace sand, (SCREE), Brown, Transported, Soft, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stickup with hanging plates. (0.00)
10		J2	G	HC			UNMINERALISED BIF, (J2), Grey and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: 161mm (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-84.00)
30												
40												
50	MG	J1	G	S			UNMINERALISED BIF, (J1), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
60		W	S	W			SHALE, (W), Red and Pink, Highly Weathered, Medium Strong Rock					
70												
80												
90		D4	G	W			UNMINERALISED BIF, (D4), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (84.00-174.00)
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0070	Hole Length:	174.00

Easting: 220353.83
Northing: 7412638.27
Surface RL: 537.29
Grid Name: MGA94_51
Incl / Azm: -85-->266
Construct: 29 Jun 23 - 29 Jun 23
Comments: Future installation of VWPs in Mt McRae Shale and Mt Sylvia Fm. FWS @ 82mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 537.97 (Stickup 0.67m) (drilled) SWL: 80.26 MBTOC (30 Jun 23) Dev: N Final pH: -
TOC RL: 537.97 (Stickup 0.67m) (current) Is Live: Y (-) Date: 30 Jun 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D4	G	W			UNMINERALISED BIF, (D4), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (84.00-174.00)
110		D3	S	G			SHALE, (D3), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock					
120												
130		D2	W	G			UNMINERALISED BIF, (D2), Dark or Black and Red and grey, Moderately Weathered, Medium Strong Rock					
140												
150		D1	G	C			UNMINERALISED BIF, (D1), Brown and Yellow and buff, Moderately Weathered, Medium Strong Rock					
160												
170												END CAP (174.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0098	Hole Length:	78.00

Easting: 204015.45
Northing: 7411235.10
Surface RL: 546.88
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Jun 23 - 09 Jun 23
Comments: Installation of PVC into the detritals for the future installation of VWP sensors.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 78.0	WLSRC40	RHF	146		WLS	NS3

TOC RL: 547.44 (Stickup 0.49m) (drilled) SWL: 27.02 MBTOC (11 Jun 23) Dev: N Final pH: -
TOC RL: 547.44 (Stickup 0.49m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZJ	C			GRAVEL, clayey, trace silt, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10		CY3	ZK	J			CLAY, gravelly, trace silt, (CLAY), Red and Brown, Transported, Firm, Poorly graded, Sub-angular					BLANK PVC: Size 150 - Class 18: PVC stick up and hanging plates. (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-12.00)
30												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (12.00-78.00)
40												
50												
60		CY2	ZK	J			CLAY, gravelly, trace silt, (CLAY), Yellow and Brown, Transported, Firm, Poorly graded, Sub-angular					
70												
80												END CAP (78.00)
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0099	Hole Length:	240.00

Easting: 204180.85
Northing: 7412478.74
Surface RL: 635.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Apr 23 - 11 Apr 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 240.0	WLSRC40	RHF	140		WLS	BF2

Comments: Targeting water level variation in W3. FWS @ 190mbgl. End Cap @ 240mbgl.

TOC RL: 635.82 (Stickup 0.66m) (drilled) SWL: 197.05 MBTOC (11 Apr 23) Dev: N Final pH: -
TOC RL: 635.82 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	J3J5	JS	C			UNMINERALISED BIF, (J3J5), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-174.00)
40		J2	J	C			UNMINERALISED BIF, (J2), Red and Grey and brown, Moderately Weathered, Strong Rock					
100	HG	J1	JC	SG			UNMINERALISED BIF, (J1), Yellow and Grey and brown, Moderately Weathered, Medium Strong Rock					

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0099	Hole Length:	240.00

Easting: 204180.85
Northing: 7412478.74
Surface RL: 635.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Apr 23 - 11 Apr 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 240.0	WLSRC40	RHF	140		WLS	BF2

Comments: Targeting water level variation in W3. FWS @ 190mbgl. End Cap @ 240mbgl.

TOC RL: 635.82 (Stickup 0.66m) (drilled) SWL: 197.05 MBTOC (11 Apr 23) Dev: N Final pH: -
TOC RL: 635.82 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	J1	JC	SG			UNMINERALISED BIF, (J1), Yellow and Grey and brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-174.00)
110	MG	W	F	JC			SHALE, (W), Grey and Brown and red, Moderately Weathered, Medium Strong Rock					
120												
130												
140												
150	HG	D4	J	CH			MINERALISED BIF, (D4), Grey and Brown, Moderately Weathered, Strong Rock					
160												
170												
180		D3	J	CF			UNMINERALISED BIF, (D3), Red and Yellow and brown, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (174.00-240.00)
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0099	Hole Length:	240.00

Easting: 204180.85
Northing: 7412478.74
Surface RL: 635.11
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Apr 23 - 11 Apr 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 240.0	WLSRC40	RHF	140		WLS	BF2

Comments: Targeting water level variation in W3. FWS @ 190mbgl. End Cap @ 240mbgl.

TOC RL: 635.82 (Stickup 0.66m) (drilled) SWL: 197.05 MBTOC (11 Apr 23) Dev: N Final pH: -
TOC RL: 635.82 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D3	J	CF			UNMINERALISED BIF, (D3), Red and Yellow and brown, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (174.00-240.00)
210												
220												
230		D2	J	C			MINERALISED BIF, (D2), Dark or Black and Red and grey, Moderately Weathered, Strong Rock					
240												END CAP (240.00)
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0101	Hole Length:	220.00

Easting: 210306.28
Northing: 7412791.47
Surface RL: 535.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Dec 22 - 01 Jan 23
Comments: Ceased drilling due to water venting out nearby proxy hole in sump.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 48.0	DR3	DR	250		EASTERNWELL	KM4
48.0 - 220.0	DR3	CH	250		EASTERNWELL	KM4, JC3

TOC RL: 536.83 (Stickup 0.91m) (drilled) SWL: 109.92 MBTOC (10 Jan 23) Dev: N Final pH: -
TOC RL: 536.83 (Stickup 0.91m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	J6	GC	J			UNMINERALISED BIF, (J6), Brown, Highly Weathered, Strong Rock					PERFORATED END CAP: Vented end cap (0.00)
10		J3J5	JG				UNMINERALISED BIF, (J3J5), Brown, Highly Weathered, Strong Rock					CEMENT: 5m Surface Seal (0.00-5.00)
20	HG											BLANK THREADED PVC: Size 50 - Class 25 (0.00-118.00)
30		J3	G	WSJ			MINERALISED BIF, (J3), Yellow and Brown, Moderately Weathered, Medium Strong Rock					GRAVEL MED (5.00-220.00)
40												
50		J2	GW				MINERALISED BIF, (J2), Brown, Moderately Weathered, Medium Strong Rock					
60	MG											
70												
80												
90		J1	G	JS			MINERALISED BIF, (J1), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
100	MG	W	CGS				SHALE, (W), Red and Brown, Moderately Weathered, Weak Rock					

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0101	Hole Length:	220.00

Easting: 210306.28
Northing: 7412791.47
Surface RL: 535.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Dec 22 - 01 Jan 23
Comments: Ceased drilling due to water venting out nearby proxy hole in sump.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 48.0	DR3	DR	250		EASTERNWELL	KM4
48.0 - 220.0	DR3	CH	250		EASTERNWELL	KM4, JC3

TOC RL: 536.83 (Stickup 0.91m) (drilled) SWL: 109.92 MBTOC (10 Jan 23) Dev: N Final pH: -
TOC RL: 536.83 (Stickup 0.91m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	MG	W	CGS			0 100 200	SHALE, (W), Red and Brown, Moderately Weathered, Weak Rock	500 1250 1140 1070 1100 1180 1180 1240 1360 1330 1330 1330 1350 1340 1340	7.5 7.9 7.8 8.0 8.0 8.1 8.0 7.9 8.1 7.8 8.4 8.6 8.3 8.1 8.2	1 2 3 3 3 3 3 4 4 4 4 4 5 5 5		BLANK THREADED PVC: Size 50 - Class 25 (0.00-118.00) GRAVEL MED (5.00-220.00)
	HG	D4	JWC	S			UNMINERALISED BIF, (D4), Light or White and Green and brown, Moderately Weathered, Very Strong Rock					SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (118.00-220.00)
	MG	D3	JCW				UNMINERALISED BIF, (D3), Light or White and Green and brown, Moderately Weathered, Very Strong Rock					

0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0101 **Hole Length:** 220.00

Easting: 210306.28
Northing: 7412791.47
Surface RL: 535.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Dec 22 - 01 Jan 23
Comments: Ceased drilling due to water venting out nearby proxy hole in sump.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 48.0	DR3	DR	250		EASTERNWELL	KM4
48.0 - 220.0	DR3	CH	250		EASTERNWELL	KM4, JC3

TOC RL: 536.83 (Stickup 0.91m) (drilled) SWL: 109.92 MBTOC (10 Jan 23) Dev: N Final pH: -
TOC RL: 536.83 (Stickup 0.91m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	D3	JCW				UNMINERALISED BIF, (D3), Light or White and Green and brown, Moderately Weathered, Very Strong Rock	1340	8.2	5		GRAVEL MED (5.00-220.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (118.00-220.00)
210		D2	JCW				UNMINERALISED BIF, (D2), Light or White and Green and brown, Moderately Weathered, Very Strong Rock	1350	8.2	5		
220								1700	8.1	5		Hole terminated due to nearby proxy venting water in sump; Hole terminated due to nearby proxy venting water in sump; Hole terminated due to nearby proxy venting water in sump; Hole terminated due to nearby proxy venting water in sump
230								1430	8.4	6		END CAP (220.00)
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0102 **Hole Length:** 248.00

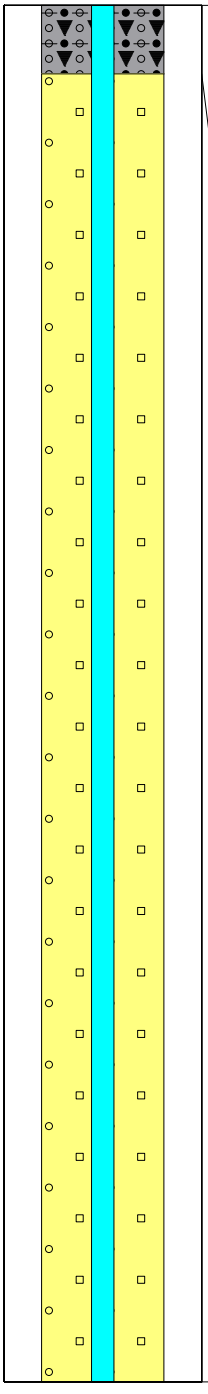
Easting: 204839.53
Northing: 7411733.16
Surface RL: 566.36
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 May 23 - 13 May 23
Comments: FWS at 146m. Pilot hole for possible PB location. Final yield of 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 56.0	DR3	DR	250		EASTERNWELL	KM4
56.0 - 248.0	DR3	CH	200		EASTERNWELL	NS3

TOC RL: 566.97 (Stickup 0.76m) (drilled) SWL: 130.25 MBTOC (15 May 23) Dev: N Final pH: -
TOC RL: 566.97 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Notes
0–10	MG	W	SGL	W		SHALE, (W), Light or White and Brown and yellow, Highly Weathered, Weak Rock				PERFORATED END CAP (0.00) CEMENT: Concrete plinth & monument cover. (0.00-5.00) BLANK THREADED PVC: Size 50 - Class 25 (0.00-122.00) GRAVEL MED (5.00-248.00)
10–40	HG	D4	GJ	WCS		MINERALISED BIF, (D4), Brown and Blue, Moderately Weathered, Strong Rock				
40–90	MG	D4	JC	S		UNMINERALISED BIF, (D4), Brown and Red, Moderately Weathered, Strong Rock				
90–100	MG	D3	JC	SLG		UNMINERALISED BIF, (D3), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock				

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50



BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0102	Hole Length:	248.00

Easting: 204839.53
Northing: 7411733.16
Surface RL: 566.36
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 May 23 - 13 May 23
Comments: FWS at 146m. Pilot hole for possible PB location. Final yield of 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 56.0	DR3	DR	250		EASTERNWELL	KM4
56.0 - 248.0	DR3	CH	200		EASTERNWELL	NS3

TOC RL: 566.97 (Stickup 0.76m) (drilled) SWL: 130.25 MBTOC (15 May 23) Dev: N Final pH: -
TOC RL: 566.97 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	MG / BG / MG / HG	D3 / D4 / D3	JC / JW / JC	SLG / CS / SGQ		0 100 200	UNMINERALISED BIF, (D3), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock UNMINERALISED BIF, (D4), Brown and Red, Moderately Weathered, Medium Strong Rock UNMINERALISED BIF, (D3), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	1200 1140 1300 1260 1270 1300 1290 1340 1370 1440 0-5000	9.1 9.3 9.3 9.2 9.8 9.9 10.0 9.9 9.7 10.0 0-14	2 2 2 2 2 3 4 3 3 4 0-50		BLANK THREADED PVC: Size 50 - Class 25 (0.00-122.00) GRAVEL MED (5.00-248.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (122.00-134.00) BLANK THREADED PVC: Size 50 - Class 25 (134.00-140.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (140.00-146.00) BLANK THREADED PVC: Size 50 - Class 25 (146.00-152.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (152.00-158.00) BLANK THREADED PVC: Size 50 - Class 25 (158.00-164.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (164.00-170.00) BLANK THREADED PVC: Size 50 - Class 25 (170.00-176.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (176.00-182.00) BLANK THREADED PVC: Size 50 - Class 25 (182.00-188.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (188.00-194.00) BLANK THREADED PVC: Size 50 - Class 25 (194.00-200.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (200.00-206.00)

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0102	Hole Length:	248.00

Easting: 204839.53
Northing: 7411733.16
Surface RL: 566.36
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 May 23 - 13 May 23
Comments: FWS at 146m. Pilot hole for possible PB location. Final yield of 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 56.0	DR3	DR	250		EASTERNWELL	KM4
56.0 - 248.0	DR3	CH	200		EASTERNWELL	NS3

TOC RL: 566.97 (Stickup 0.76m) (drilled) SWL: 130.25 MBTOC (15 May 23) Dev: N
TOC RL: 566.97 (Stickup 0.76m) (current) Is Live: Y (-) Date: -

Final pH: -
Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description
200	HG	D3	JC	SGQ			UNMINERALISED BIF, (D3), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock
210		D2	WJ	CQ			MINERALISED BIF, (D2), Brown and Blue and red, Moderately Weathered, Medium Strong Rock
220							
230							
240		D1	CJ	S			UNMINERALISED BIF, (D1), Brown and Red and green, Slightly Weathered, Strong Rock
250							
260							
270							
280							
290							
300							

0 100 200

EC us/cm	pH	Yield L/s
1440	10.0	4
1430	9.7	3
1420	10.3	4
1460	10.2	5
1400	10.1	6
1460	9.6	6
1480	9.6	7
1490	9.6	8

0-5000 0-14 0-50

Diagram Scaled to 400mm

Notes

25, Slots 1mm (122.00-134.00)
BLANK THREADED PVC: Size 50 - Class 25 (134.00-140.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (140.00-146.00)
BLANK THREADED PVC: Size 50 - Class 25 (146.00-152.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (152.00-158.00)
BLANK THREADED PVC: Size 50 - Class 25 (158.00-164.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (164.00-170.00)
BLANK THREADED PVC: Size 50 - Class 25 (170.00-176.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (176.00-182.00)
BLANK THREADED PVC: Size 50 - Class 25 (182.00-188.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (188.00-194.00)
BLANK THREADED PVC: Size 50 - Class 25 (194.00-200.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (200.00-206.00)
BLANK THREADED PVC: Size 50 - Class 25 (206.00-212.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (212.00-218.00)
BLANK THREADED PVC: Size 50 - Class 25 (218.00-224.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (224.00-230.00)
BLANK THREADED PVC: Size 50 - Class 25 (230.00-236.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (236.00-242.00)
BLANK THREADED PVC: Size 50 - Class 25 (242.00-248.00)

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0103 **Hole Length:** 240.00

Easting: 204440.55
Northing: 7411450.40
Surface RL: 547.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Mar 23 - 17 Mar 23
Comments: MB to test viability of a PB. FWS @ 108mbgl. Install to 124m. Fallback from 124-240m due to broken ground.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 152.0	DR3	DR	250		EASTERNWELL	JP10
152.0 - 240.0	DR3	CH	250		EASTERNWELL	JP10

TOC RL: 548.00 (Stickup 0.51m) (drilled) SWL: 108.98 MBTOC (20 Mar 23) Dev: N Final pH: -
TOC RL: 548.00 (Stickup 0.51m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZY	JS			GRAVEL, sandy, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					CEMENT (0.00-5.00)
10												BLANK PVC: Size 50 - Class 25 (0.00-72.00)
20			ZK	SJ			CLAY, sandy, (CLAY), Red and Brown, Transported, Soft, Poorly graded, Sub-rounded					GRAVEL MED (2.00-124.00)
30	MG											
40												
50		TD2	ZG	LK			GRAVEL, clayey, (VUGHY BRECCIA), Yellow and Brown and light or white, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
60												
70	SF											SLOTTED PVC: Size 50 - Class 25, Slots 1mm (72.00-84.00)
80												
90	MG											BLANK PVC: Size 50 - Class 25 (84.00-90.00)
100			Z	K			CLAY, silty, trace gravel, (CLAY), Red and Light or White and brown, Transported, Soft, Poorly graded, Sub-rounded					SLOTTED PVC: Size 50 - Class 25, Slots 1mm (90.00-102.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0103	Hole Length:	240.00

Easting: 204440.55
Northing: 7411450.40
Surface RL: 547.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Mar 23 - 17 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 152.0	DR3	DR	250		EASTERNWELL	JP10
152.0 - 240.0	DR3	CH	250		EASTERNWELL	JP10

Comments: MB to test viability of a PB. FWS @ 108mbgl. Install to 124m. Fallback from 124-240m due to broken ground.

TOC RL: 548.00 (Stickup 0.51m) (drilled) SWL: 108.98 MBTOC (20 Mar 23) Dev: N Final pH: -
TOC RL: 548.00 (Stickup 0.51m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	TD2	Z	K			CLAY, silty, trace gravel, (CLAY), Red and Light or White and brown, Transported, Soft, Poorly graded, Sub-rounded					GRAVEL MED (2.00-124.00)
110		D4	WH	S			MINERALISED BIF, (D4), Grey and Red, Moderately Weathered, Medium Strong Rock	3700	7.9	1		
		W	S	WJ			SHALE, (W), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	1500	8.5	1		
120								3700	9.5	1		
130								1500	8.5	1		
140								4800	9.5	1		
		D4	WH	G			MINERALISED BIF, (D4), Dark or Black and Grey and red, Moderately Weathered, Medium Strong Rock	1670	8.8	1		
150								1390	9.0	4		
								1520	8.0	8		
160								1660	8.3	10		
170								1630	9.3	10		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (72.00-84.00)
180								1620	9.1	10		BLANK PVC: Size 50 - Class 25 (84.00-90.00)
								1640	9.2	10		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (90.00-102.00)
190	HG	D3	JS	WG			UNMINERALISED BIF, (D3), Red and Brown and grey, Moderately Weathered, Medium Strong Rock	1690	9.0	8		BLANK PVC: Size 50 - Class 25 (102.00-108.00)
								1650	8.6	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (108.00-120.00)
200								1610	9.1	8		BLANK PVC: Size 50 - Class 25 (120.00-124.00)
									8.6	10		END CAP (124.00)
												FALLBACK (124.00-240.00)

0 100 200 | 0-5000 | 0-14 | 0-50

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BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0103	Hole Length:	240.00

Easting: 204440.55
Northing: 7411450.40
Surface RL: 547.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Mar 23 - 17 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 152.0	DR3	DR	250		EASTERNWELL	JP10
152.0 - 240.0	DR3	CH	250		EASTERNWELL	JP10

Comments: MB to test viability of a PB. FWS @ 108mbgl. Install to 124m. Fallback from 124-240m due to broken ground.

TOC RL: 548.00 (Stickup 0.51m) (drilled) SWL: 108.98 MBTOC (20 Mar 23) Dev: N Final pH: -
TOC RL: 548.00 (Stickup 0.51m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D3	JS	WG			UNMINERALISED BIF, (D3), Red and Brown and grey, Moderately Weathered, Medium Strong Rock	1610	8.6	10		FALLBACK (124.00-240.00)
210								1580	9.5	12		
220		D2	JS	C			UNMINERALISED BIF, (D2), Grey and Brown and red, Moderately Weathered, Medium Strong Rock	1540	8.6	11		
230								1600	9.7	15		
240								1680	9.2	15		
250								1510	9.2	15		
260												
270												
280												
290												
300												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0106	Hole Length:	242.00

Easting: 204412.42
Northing: 7412134.76
Surface RL: 540.14
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 May 23 - 01 Jun 23
Comments: FWS at 110m. Final yield 8 L/s. Monitoring bore siting possible production bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	250		EASTERNWELL	KM4
74.0 - 242.0	DR3	CH	200		EASTERNWELL	KM4, NS3

TOC RL: 540.56 (Stickup 0.40m) (drilled) SWL: 103.34 MBTOC (02 Jun 23) Dev: N Final pH: -
TOC RL: 540.56 (Stickup 0.40m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	J2	G	WJ			MINERALISED BIF, (J2), Yellow and Brown, Moderately Weathered, Strong Rock					PERFORATED END CAP (0.00)
10	MG											GROUT (0.00-2.00)
	HG											BLANK PVC: Size 50 - Class 25 (0.00-101.00)
20		J1	G	WJ			MINERALISED BIF, (J1), Brown, Moderately Weathered, Strong Rock					GRAVEL MED (2.00-221.00)
30	MG											
40		W	SJC	G			SHALE, (W), Brown and Red, Moderately Weathered, Weak Rock					
50												
60												
70												
80	HG											
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0106	Hole Length:	242.00

Easting: 204412.42
Northing: 7412134.76
Surface RL: 540.14
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 May 23 - 01 Jun 23
Comments: FWS at 110m. Final yield 8 L/s. Monitoring bore siting possible production bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	250		EASTERNWELL	KM4
74.0 - 242.0	DR3	CH	200		EASTERNWELL	KM4, NS3

TOC RL: 540.56 (Stickup 0.40m) (drilled) SWL: 103.34 MBTOC (02 Jun 23) Dev: N Final pH: -
TOC RL: 540.56 (Stickup 0.40m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–140	HG / BG	W	SJC	G			SHALE, (W), Brown and Red, Moderately Weathered, Weak Rock	250 / 220 / 780 / 800 / 850 / 850	8.1 / 8.4 / 8.5 / 9.1 / 8.8 / 9.4	1 / 1 / 2 / 2 / 3 / 3		BLANK PVC: Size 50 - Class 25 (0.00-101.00) GRAVEL MED (2.00-221.00)
140–150	BG	D4	W	SJC			MINERALISED BIF, (D4), Brown and Dark or Black, Moderately Weathered, Strong Rock	800 / 820 / 1150 / 1240	9.3 / 9.2 / 9.3 / 9.3	4 / 4 / 4 / 4		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (101.00-107.00)
150–170	MG / BG	D3	JC	S			UNMINERALISED BIF, (D3), Brown and Dark or Black, Moderately Weathered, Strong Rock	1200 / 1290 / 1290	9.8 / 9.8 / 9.1	5 / 5 / 5		BLANK PVC: Size 50 - Class 25 (107.00-113.00)
170–190	BG / HG	D2	JC	S			UNMINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1300 / 1260 / 1290	9.5 / 10.4 / 10.7	5 / 5 / 6		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (113.00-119.00)
												BLANK PVC: Size 50 - Class 25 (119.00-125.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (125.00-131.00)
												BLANK PVC: Size 50 - Class 25 (131.00-137.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (137.00-143.00)
												BLANK PVC: Size 50 - Class 25 (143.00-149.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (149.00-155.00)
												BLANK PVC: Size 50 - Class 25 (155.00-161.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (161.00-167.00)
												BLANK PVC: Size 50 - Class 25 (167.00-173.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (173.00-179.00)
												BLANK PVC: Size 50 - Class 25 (179.00-185.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (185.00-191.00)
												BLANK PVC: Size 50 - Class 25 (191.00-197.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (197.00-203.00)

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0106	Hole Length:	242.00

Easting: 204412.42
Northing: 7412134.76
Surface RL: 540.14
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 May 23 - 01 Jun 23
Comments: FWS at 110m. Final yield 8 L/s. Monitoring bore siting possible production bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	250		EASTERNWELL	KM4
74.0 - 242.0	DR3	CH	200		EASTERNWELL	KM4, NS3

TOC RL: 540.56 (Stickup 0.40m) (drilled) SWL: 103.34 MBTOC (02 Jun 23) Dev: N Final pH: -
TOC RL: 540.56 (Stickup 0.40m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D2	JC	S			UNMINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1290	10.7	6		GRAVEL MED (2.00-221.00)
210								1230	9.4	6		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (101.00-107.00)
220								1260	10.1	6		BLANK PVC: Size 50 - Class 25 (107.00-113.00)
230								1340	9.1	6		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (113.00-119.00)
240								1340	9.1	6		BLANK PVC: Size 50 - Class 25 (119.00-125.00)
250								1270	10.0	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (125.00-131.00)
260								1340	9.3	8		BLANK PVC: Size 50 - Class 25 (131.00-137.00)
270												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (137.00-143.00)
280												BLANK PVC: Size 50 - Class 25 (143.00-149.00)
290												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (149.00-155.00)
300												BLANK PVC: Size 50 - Class 25 (155.00-161.00)
						0 100 200		0-5000	0-14	0-50		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (161.00-167.00)
												BLANK PVC: Size 50 - Class 25 (167.00-173.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (173.00-179.00)
												BLANK PVC: Size 50 - Class 25 (179.00-185.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (185.00-191.00)
												BLANK PVC: Size 50 - Class 25 (191.00-197.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (197.00-203.00)
												BLANK PVC: Size 50 - Class 25 (203.00-209.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (209.00-215.00)
												BLANK PVC: Size 50 - Class 25 (215.00-221.00)
												END CAP (221.00)

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0107 **Hole Length:** 230.00

Easting: 204561.91
Northing: 7411398.81
Surface RL: 547.69
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Mar 23 - 24 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3, KM4
110.0 - 230.0	DR3	CH	200		EASTERNWELL	KM4

Comments: Monitoring point to test for suitable production bore location. Sticky clays caused bogging issues. Final yield 8L/s, FWS 116m.

TOC RL: 547.96 (Stickup 0.22m) (drilled) SWL: 109.05 MBTOC (26 Mar 23) Dev: N Final pH: -
TOC RL: 547.96 (Stickup 0.22m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZJK	CXI			GRAVEL, clayey, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10	MG											CEMENT (0.00-2.00)
20			ZK	J			CLAY, gravelly, (CLAY), Red and Yellow, Transported, Firm, Poorly graded, Sub-rounded					BLANK PVC: Size 50 - Class 25 (0.00-121.00)
30												GRAVEL MED (2.00-230.00)
40												
50	HG											
60		TD2	Z3	K			GRAVEL, clayey, (CALCRETE), Yellow and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
70			ZK	Q			CLAY, sandy, (CLAY), Brown and Red, Transported, Firm, Poorly graded, Sub-rounded					
80												
90	MG											
100		D4	W				MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0107 **Hole Length:** 230.00

Easting: 204561.91
Northing: 7411398.81
Surface RL: 547.69
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Mar 23 - 24 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3, KM4
110.0 - 230.0	DR3	CH	200		EASTERNWELL	KM4

Comments: Monitoring point to test for suitable production bore location. Sticky clays caused bogging issues. Final yield 8L/s, FWS 116m.

TOC RL: 547.96 (Stickup 0.22m) (drilled) SWL: 109.05 MBTOC (26 Mar 23) Dev: N Final pH: -
TOC RL: 547.96 (Stickup 0.22m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D4	W				MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock	1720	6.3	1		BLANK PVC: Size 50 - Class 25 (0.00-121.00) GRAVEL MED (2.00-230.00)
110		D3	GW				MINERALISED BIF, (D3), Dark or Black and Brown and blue, Moderately Weathered, Strong Rock	1870	6.3	1		
120								1850	9.6	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (121.00-229.00)
130								1610	9.5	4		
140		D2	GC				UNMINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1690	9.4	4		
150								1640	9.2	4		
160	BG							1830	8.7	4		
170								1700	8.6	4		
180								2400	8.4	4		
190	MG							1830	9.3	8		
200		D1	JCG	S			UNMINERALISED BIF, (D1), Brown, Moderately Weathered, Very Strong Rock	1600	9.3	8		
								1620	8.3	8		
								1610	9.0	8		
								1630	9.0	8		
								1640	8.9	8		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: WHEELARRA **Hole Name:** HFG0107 **Hole Length:** 230.00

Easting: 204561.91
Northing: 7411398.81
Surface RL: 547.69
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Mar 23 - 24 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3, KM4
110.0 - 230.0	DR3	CH	200		EASTERNWELL	KM4

Comments: Monitoring point to test for suitable production bore location. Sticky clays caused bogging issues. Final yield 8L/s, FWS 116m.

TOC RL: 547.96 (Stickup 0.22m) (drilled) SWL: 109.05 MBTOC (26 Mar 23) Dev: N Final pH: -
TOC RL: 547.96 (Stickup 0.22m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat 2	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	D1	JCG	S			UNMINERALISED BIF, (D1), Brown, Moderately Weathered, Very Strong Rock	1640	8.9	8		GRAVEL MED (2.00-230.00)
210								1580	9.2	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (121.00-229.00)
220								1640	9.0	8		
								1610	9.3	8		
		R	S	G			SHALE, (R), Red, Moderately Weathered, Weak Rock	1610	9.1	8		
230												END CAP (229.00)
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0109	Hole Length:	248.00

Easting: 205043.95
Northing: 7411957.77
Surface RL: 578.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 May 23 - 20 May 23
Comments: FWS at 134m. Monitoring bore for siting potential PB location. Final yield 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3
110.0 - 248.0	DR3	DR	200		EASTERNWELL	NS3

TOC RL: 579.61 (Stickup 0.80m) (drilled) SWL: 141.98 MBTOC (23 May 23) Dev: N Final pH: -
TOC RL: 579.61 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJ	CS			COBBLE, gravelly, trace clay, (SCREE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) CEMENT (0.00-12.00) BLANK PVC: Size 50 - Class 25 (0.00-118.00)
10	BG	J2	J	SC			UNMINERALISED BIF, (J2), Brown and Red and dark or black, Moderately Weathered, Medium Strong Rock					GRAVEL MED (12.00-244.00)
20	SF	J1	JS	CL			UNMINERALISED BIF, (J1), Brown and Yellow, Moderately Weathered, Medium Strong Rock					
30												
40												
50	BG											
60												
70	MG	W	SJ	C			SHALE, (W), Red and Yellow and brown, Moderately Weathered, Weak Rock					
80												
90												
100	BG											

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0109	Hole Length:	248.00

Easting: 205043.95
Northing: 7411957.77
Surface RL: 578.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 May 23 - 20 May 23
Comments: FWS at 134m. Monitoring bore for siting potential PB location. Final yield 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3
110.0 - 248.0	DR3	DR	200		EASTERNWELL	NS3

TOC RL: 579.61 (Stickup 0.80m) (drilled) SWL: 141.98 MBTOC (23 May 23) Dev: N Final pH: -
TOC RL: 579.61 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	BG	W	SJ	C			SHALE, (W), Red and Yellow and brown, Moderately Weathered, Weak Rock					BLANK PVC: Size 50 - Class 25 (0.00-118.00) GRAVEL MED (12.00-244.00)
110	MG	D4	JC	SG			UNMINERALISED BIF, (D4), Brown and Dark or Black, Moderately Weathered, Strong Rock					
120												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (118.00-124.00)
												BLANK PVC: Size 50 - Class 25 (124.00-130.00)
130	CV											SLOTTED PVC: Size 50 - Class 25, Slots 1mm (130.00-136.00)
	MG											BLANK PVC: Size 50 - Class 25 (136.00-142.00)
140	BG											SLOTTED PVC: Size 50 - Class 25, Slots 1mm (142.00-148.00)
150	MG							2240	9.9	1		BLANK PVC: Size 50 - Class 25 (148.00-154.00)
								1600	7.9	1		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (154.00-160.00)
160		D3	JS	CG			UNMINERALISED BIF, (D3), Brown and Dark or Black and red, Moderately Weathered, Strong Rock	1730	6.1	2		BLANK PVC: Size 50 - Class 25 (160.00-166.00)
										2		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (166.00-172.00)
170								1280	7.9	2		BLANK PVC: Size 50 - Class 25 (172.00-178.00)
								1240	7.3	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (178.00-184.00)
180								1360	8.1	4		BLANK PVC: Size 50 - Class 25 (184.00-190.00)
190	HG	D2	JC	S			UNMINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1160	8.9	6		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (190.00-196.00)
										6		BLANK PVC: Size 50 - Class 25 (196.00-202.00)
200								1320	10.7	7		

0 100 200 (Gamma CPS API) 0-5000 (EC us/cm) 0-14 (pH) 0-50 (Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0109	Hole Length:	248.00

Easting: 205043.95
Northing: 7411957.77
Surface RL: 578.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 May 23 - 20 May 23
Comments: FWS at 134m. Monitoring bore for siting potential PB location. Final yield 8 L/s.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 110.0	DR3	DR	250		EASTERNWELL	NS3
110.0 - 248.0	DR3	DR	200		EASTERNWELL	NS3

TOC RL: 579.61 (Stickup 0.80m) (drilled) SWL: 141.98 MBTOC (23 May 23) Dev: N Final pH: -
TOC RL: 579.61 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D2	JC	S			UNMINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1320	10.7	7		GRAVEL MED (12.00-244.00)
210								1370	10.0	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (118.00-124.00)
220								1110	9.4	8		BLANK PVC: Size 50 - Class 25 (124.00-130.00)
230								1440	10.1	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (130.00-136.00)
240		D1	C	JS			UNMINERALISED BIF, (D1), Green and Brown, Slightly Weathered, Strong Rock	1390	10.0	8		BLANK PVC: Size 50 - Class 25 (136.00-142.00)
250								1480	9.7	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (142.00-148.00)
260								1270	9.8	8		BLANK PVC: Size 50 - Class 25 (148.00-154.00)
270								1420	9.7	8		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (154.00-160.00)
280												BLANK PVC: Size 50 - Class 25 (160.00-166.00)
290												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (166.00-172.00)
300												BLANK PVC: Size 50 - Class 25 (172.00-178.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (178.00-184.00)
												BLANK PVC: Size 50 - Class 25 (184.00-190.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (190.00-196.00)
												BLANK PVC: Size 50 - Class 25 (196.00-202.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (202.00-208.00)
												BLANK PVC: Size 50 - Class 25 (208.00-214.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (214.00-220.00)
												BLANK PVC: Size 50 - Class 25 (220.00-226.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (226.00-232.00)
												BLANK PVC: Size 50 - Class 25 (232.00-238.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (238.00-244.00)
												END CAP (244.00)
												FALLBACK (244.00-248.00)

0 100 200 | 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0114	Hole Length:	180.00

Easting: 203706.90
Northing: 7411369.68
Surface RL: 549.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 31 May 23 - 31 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors McRae Shale & Sylvia.

TOC RL: 550.06 (Stickup 0.56m) (drilled) SWL: 113.52 MBTOC (01 Jun 23) Dev: N Final pH: -
TOC RL: 550.06 (Stickup 0.56m) (current) Is Live: Y (-) Date: 31 May 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZGY	HX			GRAVEL, sandy, trace silt, (SCREE), Red and Brown, Soil, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-90.00)
10		TD3	ZK	F			CLAY, sandy, trace gravel, (CLAY), Red, Transported, Soft, Poorly graded, Sub-rounded					
20												
30												
40												
50												
60												
70		D2	SG	C			UNMINERALISED BIF, (D2), Grey and Brown, Moderately Weathered, Medium Strong Rock					
80		D1	GH	F			UNMINERALISED BIF, (D1), Red, Highly Weathered, Medium Strong Rock					
90												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (90.00-180.00)
100		R	SG	H			SHALE, (R), Grey and Brown, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0114	Hole Length:	180.00

Easting: 203706.90
Northing: 7411369.68
Surface RL: 549.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 31 May 23 - 31 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors McRae Shale & Sylvia.

TOC RL: 550.06 (Stickup 0.56m) (drilled) SWL: 113.52 MBTOC (01 Jun 23) Dev: N Final pH: -
TOC RL: 550.06 (Stickup 0.56m) (current) Is Live: Y (-) Date: 31 May 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	SG	H			SHALE, (R), Grey and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (90.00-180.00)
130		S	GS	C			UNMINERALISED BIF, (S), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
180												END CAP (180.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0115	Hole Length:	200.00

Easting: 203727.36
Northing: 7412399.58
Surface RL: 576.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Jun 23 - 02 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors Mt Sylvia.

TOC RL: 577.09 (Stickup 0.48m) (drilled) SWL: 138.31 MBTOC (03 Jun 23) Dev: N Final pH: -
TOC RL: 577.09 (Stickup 0.48m) (current) Is Live: Y (-) Date: 02 Jun 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	D4	J	GC			UNMINERALISED BIF, (D4), Red and Brown, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-110.00)
10		D3	SG	JC			SHALE, (D3), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
40		D2	J	GS			UNMINERALISED BIF, (D2), Brown, Moderately Weathered, Medium Strong Rock					
60	MG	D1	JG	SC			UNMINERALISED BIF, (D1), Yellow and Brown, Highly Weathered, Medium Strong Rock					
90		R	S	F			SHALE, (R), Pink and Light or White and grey, Highly Weathered, Medium Strong Rock					
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0115	Hole Length:	200.00

Easting: 203727.36
Northing: 7412399.58
Surface RL: 576.45
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Jun 23 - 02 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors Mt Sylvia.

TOC RL: 577.09 (Stickup 0.48m) (drilled) SWL: 138.31 MBTOC (03 Jun 23) Dev: N Final pH: -
TOC RL: 577.09 (Stickup 0.48m) (current) Is Live: Y (-) Date: 02 Jun 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	S	F			SHALE, (R), Pink and Light or White and grey, Highly Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-110.00)
110			S	B			SHALE, (R), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (110.00-200.00)
120												
130												
140		S	J	HC			UNMINERALISED BIF, (S), Brown and Grey, Moderately Weathered, Medium Strong Rock					
150												
160												
170												
180												
190	HG											
200						0 100 200		0-5000	0-14	0-50		END CAP (200.00)

BHPIO - Hydrogeology Log

BHP

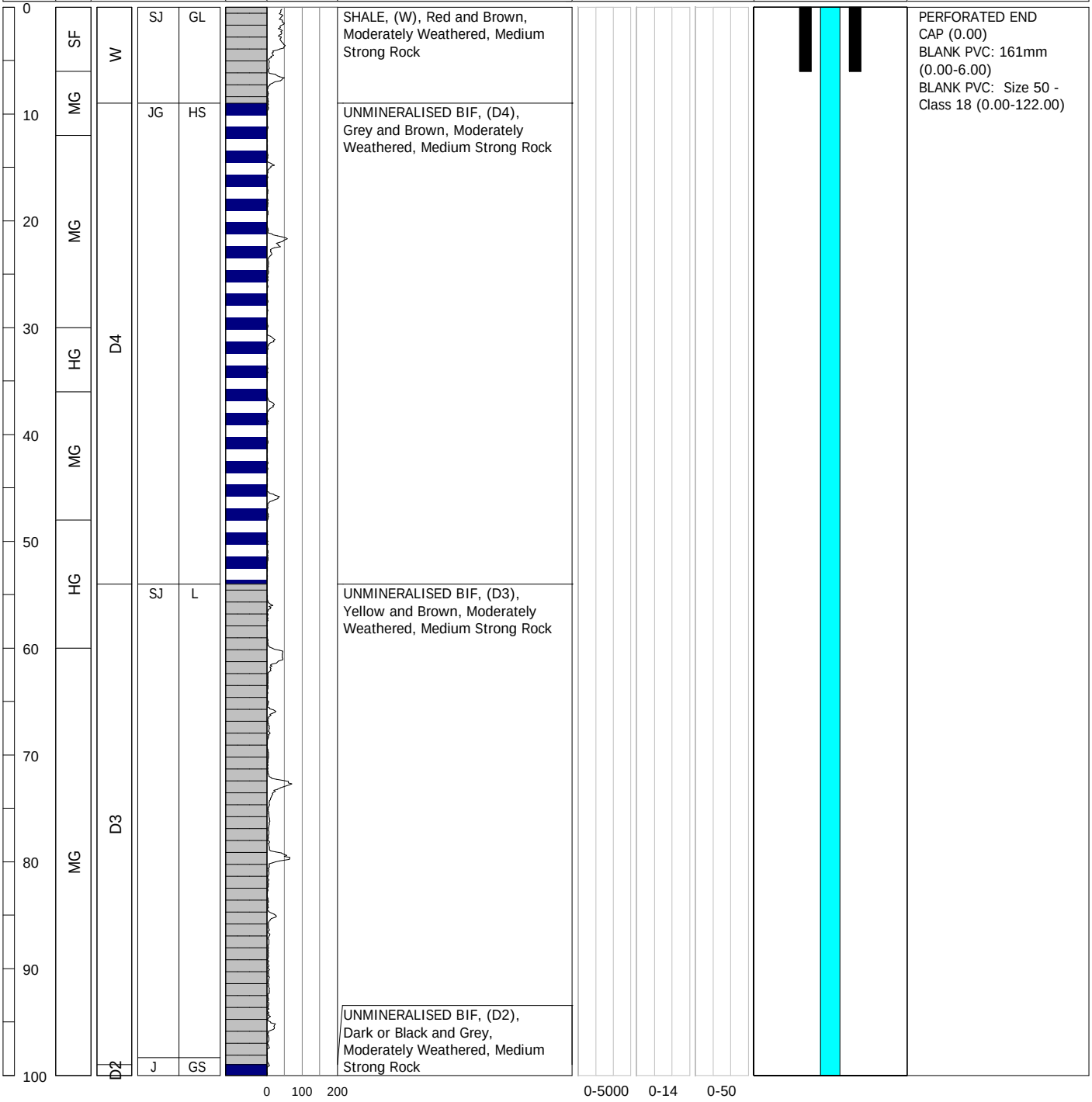
Project:	WHEELARRA	Hole Name:	HFG0116	Hole Length:	200.00

Easting: 203946.91
Northing: 7412299.54
Surface RL: 575.77
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Jun 23 - 05 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors into the Mt McRae.

TOC RL: 576.41 (Stickup 0.61m) (drilled) SWL: 138.75 MBTOC (06 Jun 23) Dev: N Final pH: -
TOC RL: 576.41 (Stickup 0.61m) (current) Is Live: Y (-) Date: 06 Jun 2023 Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0116	Hole Length:	200.00

Easting: 203946.91
Northing: 7412299.54
Surface RL: 575.77
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Jun 23 - 05 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	WLSRC40	RHF	146		WLS	BF2

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors into the Mt McRae.

TOC RL: 576.41 (Stickup 0.61m) (drilled) SWL: 138.75 MBTOC (06 Jun 23) Dev: N Final pH: -
TOC RL: 576.41 (Stickup 0.61m) (current) Is Live: Y (-) Date: 06 Jun 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D2	J	GS			UNMINERALISED BIF, (D2), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-122.00)
110	MG											
120	HG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (122.00-200.00)
130	MG	D1	JG	SC			UNMINERALISED BIF, (D1), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
140												
150												
160	MG	R	S	J			SHALE, (R), Yellow and Brown and grey, Moderately Weathered, Medium Strong Rock					
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		END CAP: PVC stickup with hanging plates (200.00)

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0098	Hole Length:	194.00

Easting: 211029.91
Northing: 7412754.75
Surface RL: 549.46
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Jan 23 - 15 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	DR3	DR	250		EASTERNWELL	KM4
102.0 - 194.0	DR3	CH	250		EASTERNWELL	KM4

Comments: FWS at 107m. Hole terminated at 194m instead of 200m due discharge management concerns regarding leaking sump.

TOC RL: 550.26 (Stickup 0.50m) (drilled) SWL: 128.00 MBTOC (15 Feb 23) Dev: N Final pH: -
TOC RL: 550.26 (Stickup 0.50m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	J2	G	WJ			MINERALISED BIF, (J2), Brown, Highly Weathered, Medium Strong Rock					PERFORATED END CAP (0.00)
10	HG											CEMENT (0.00-5.00)
20	BG											BLANK PVC: Size 50 - Class 25 (0.00-116.00)
30	MG											GRAVEL MED (5.00-194.00)
40	BG											
50												
60	HG	J1	GS	WJ			UNMINERALISED BIF, (J1), Brown, Moderately Weathered, Medium Strong Rock					
70												
80	MG	W	SC	J			SHALE, (W), Brown and Red, Moderately Weathered, Weak Rock					
90												
100		D4	GW				MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0098	Hole Length:	194.00

Easting: 211029.91
Northing: 7412754.75
Surface RL: 549.46
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Jan 23 - 15 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 102.0	DR3	DR	250		EASTERNWELL	KM4
102.0 - 194.0	DR3	CH	250		EASTERNWELL	KM4

Comments: FWS at 107m. Hole terminated at 194m instead of 200m due discharge management concerns regarding leaking sump.

TOC RL: 550.26 (Stickup 0.50m) (drilled) SWL: 128.00 MBTOC (15 Feb 23) Dev: N Final pH: -
TOC RL: 550.26 (Stickup 0.50m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D4	GW				MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock	2410	8.8	1		BLANK PVC: Size 50 - Class 25 (0.00-116.00) GRAVEL MED (5.00-194.00)
110								400	8.8	1		
120								660	9.0	0		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (116.00-194.00)
130	BG	D3	JG	CW			UNMINERALISED BIF, (D3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	540	8.7	1		
140								450	8.4	0		
150								310	8.7	1		
160								270	8.4	2		
170	MG	D2	JC	GW			UNMINERALISED BIF, (D2), Brown, Moderately Weathered, Medium Strong Rock	180	8.3	2		
180								80	8.3	3		
190	HG	D1	JC	GW			UNMINERALISED BIF, (D1), Brown, Slightly Weathered, Strong Rock	100	8.5	4		
200								120	8.5	4		
								110	8.6	4		
								270	8.7	4		
								280	8.3	4		
								270	8.3	4		END CAP (194.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0099	Hole Length:	224.00

Easting: 210934.61
Northing: 7412011.15
Surface RL: 522.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Feb 23 - 05 Mar 23
Comments: Test Dales Gorge mineralisation flow rates. FWS @ 122m. DR casing stuck & left from 6-122m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	250		EASTERNWELL	BF2
122.0 - 224.0	DR3	CH	250		EASTERNWELL	BF2

TOC RL: 522.91 (Stickup 0.64m) (drilled) SWL: 95.80 MBTOC (05 Mar 23) Dev: N Final pH: -
TOC RL: 522.91 (Stickup 0.64m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZJ	HG			GRAVEL, sandy, trace silt, (SCREE), Red and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10	SF	ST3	ZY	JG			SILT, gravelly, trace sand, (SILTSTONE), Red and Grey and brown, Transported, Soft, Poorly graded, Sub-angular					CEMENT (0.00-5.00)
		GS3	ZY	JG			SILT, gravelly, trace clay, (GRAVELLY SILTSTONE), Red and Brown, Transported, Soft, Poorly graded, Sub-angular					BLANK PVC: Size 50 - Class 25 (0.00-113.00)
30	MG	CY2	ZG	S			CLAY, gravelly, trace silt, (CLAY), Yellow and Brown, Transported, Very Soft, Poorly graded, Sub-angular					BLANK STEEL: Size 10" - W.T.9.27mm (0.00-122.00)
60	SF	VB2	ZK	WS			CLAY, gravelly, trace silt, (VUGHY BRECCIA), Yellow and Brown, Transported, Soft, Poorly graded, Sub-angular					GRAVEL MED (5.00-179.00)
80		W	S	JW			SHALE, (W), Red, Moderately Weathered, Weak Rock					
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0099	Hole Length:	224.00

Easting: 210934.61
Northing: 7412011.15
Surface RL: 522.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Feb 23 - 05 Mar 23
Comments: Test Dales Gorge mineralisation flow rates. FWS @ 122m. DR casing stuck & left from 6-122m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	250		EASTERNWELL	BF2
122.0 - 224.0	DR3	CH	250		EASTERNWELL	BF2

TOC RL: 522.91 (Stickup 0.64m) (drilled) SWL: 95.80 MBTOC (05 Mar 23) Dev: N Final pH: -
TOC RL: 522.91 (Stickup 0.64m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	SF	W	S	JW		0 100 200	SHALE, (W), Red, Moderately Weathered, Weak Rock	420 360 60 380 420 390 430 410 430 470 420 440 450 230 260	8.0 8.0 8.3 8.3 6.5 8.5 7.6 8.1 8.3 5.8 6.8 6.4 7.3 7.9 7.8	5 4 2 3 5 3 3 3 3 3 3 5 5 6 5		BLANK PVC: Size 50 - Class 25 (0.00-113.00) BLANK STEEL: Size 10" - W.T.9.27mm (0.00-122.00) GRAVEL MED (5.00-179.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (113.00-119.00) BLANK PVC: Size 50 - Class 25 (119.00-125.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (125.00-131.00) BLANK PVC: Size 50 - Class 25 (131.00-137.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (137.00-143.00) BLANK PVC: Size 50 - Class 25 (143.00-149.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (149.00-155.00) BLANK PVC: Size 50 - Class 25 (155.00-161.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (161.00-167.00) BLANK PVC: Size 50 - Class 25 (167.00-173.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (173.00-179.00) END CAP (179.00) FALLBACK (179.00-224.00)
160–170	MG	D4	J	WS			MINERALISED BIF, (D4), Brown, Moderately Weathered, Medium Strong Rock					
180–200	BG	D3	J	WS			MINERALISED BIF, (D3), Grey and Brown, Moderately Weathered, Medium Strong Rock					

0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0099 **Hole Length:** 224.00

Easting: 210934.61
Northing: 7412011.15
Surface RL: 522.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 12 Feb 23 - 05 Mar 23
Comments: Test Dales Gorge mineralisation flow rates. FWS @ 122m. DR casing stuck & left from 6-122m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	250		EASTERNWELL	BF2
122.0 - 224.0	DR3	CH	250		EASTERNWELL	BF2

TOC RL: 522.91 (Stickup 0.64m) (drilled) SWL: 95.80 MBTOC (05 Mar 23) Dev: N Final pH: -
TOC RL: 522.91 (Stickup 0.64m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	BG	D3	J	WS			MINERALISED BIF, (D3), Grey and Brown, Moderately Weathered, Medium Strong Rock	260	7.8	5		FALLBACK (179.00-224.00)
210								280	8.3	5		
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0100	Hole Length:	150.00

Easting: 211205.73
Northing: 7411881.59
Surface RL: 520.08
Grid Name: MGA94_51
Incl / Azm: -80-->91
Construct: 22 Mar 23 - 23 Mar 23
Comments: FWS @ 85m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	ML4

TOC RL: 520.85 (Stickup 0.71m) (drilled) SWL: 82.94 MBTOC (24 Mar 23) Dev: N Final pH: -
TOC RL: 520.85 (Stickup 0.71m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	GS3	Z	JGH			GRAVEL, clayey, (GRAVELLY SILTSTONE), Red and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-1.80) BLANK PVC: Size 50 - Class 18 (0.00-72.00)
10		D4	J	WC			UNMINERALISED BIF, (D4), Grey and Blue and red, Moderately Weathered, Medium Strong Rock					
20												
30		D3	LJ	SW			MINERALISED BIF, (D3), Yellow and Grey and brown, Moderately Weathered, Medium Strong Rock					
40												
50		D2	JC	SW			UNMINERALISED BIF, (D2), Grey and Brown, Moderately Weathered, Medium Strong Rock					
60		D1	JC	L			UNMINERALISED BIF, (D1), Green and Yellow and grey, Moderately Weathered, Medium Strong Rock					
70	SF	RU	S				UNMINERALISED BIF, (RU), Light or White and Red, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (72.00-150.00)
80		RC	C	J			UNMINERALISED BIF, (RC), Red and Brown and light or white, Highly Weathered, Weak Rock					
90												
100		RL	SC	J			UNMINERALISED BIF, (RL), Brown and Grey, Moderately Weathered, Medium Strong Rock					

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0100	Hole Length:	150.00

Easting: 211205.73
Northing: 7411881.59
Surface RL: 520.08
Grid Name: MGA94_51
Incl / Azm: -80-->91
Construct: 22 Mar 23 - 23 Mar 23
Comments: FWS @ 85m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	ML4

TOC RL: 520.85 (Stickup 0.71m) (drilled) SWL: 82.94 MBTOC (24 Mar 23) Dev: N Final pH: -
TOC RL: 520.85 (Stickup 0.71m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	RL	SC	J			UNMINERALISED BIF, (RL), Brown and Grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (72.00-150.00)
110		S	SC	NP			UNMINERALISED BIF, (S), Grey and Blue and light or white, Moderately Weathered, Medium Strong Rock					
120	MG											
130	UG											
140	SF											
150												END CAP (150.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0101	Hole Length:	162.00

Easting: 211217.88
Northing: 7412927.00
Surface RL: 534.35
Grid Name: MGA94_51
Incl / Azm: -80-->140
Construct: 12 Dec 22 - 12 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	LQ

Comments: No FWS. Installed with hanging plate. Sample pile photos not provided for database. All other photos in Imago.

TOC RL: 535.16 (Stickup 0.75m) (drilled) SWL: 105.10 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 535.16 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z				GRAVEL, silty, trace sand, (SCREE), Brown, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					PERFORATED END CAP (0.00)
10		TD3	ZYG	H			GRAVEL, sandy, trace silt, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: 140mm (0.00-9.00)
		J3	G	SL			UNMINERALISED BIF, (J3), Yellow and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-120.00)
20			G	WL			MINERALISED BIF, (J2), Red and Brown, Moderately Weathered, Medium Strong Rock					
30	MG											
40												
50	HG	J2										
60			GC	W			UNMINERALISED BIF, (J2), Red and Brown, Moderately Weathered, Medium Strong Rock					
70	MG											
80		J1	GC	S			UNMINERALISED BIF, (J1), Red and Brown, Moderately Weathered, Medium Strong Rock					
90												
100												
						0 100 200		0-5000	0-14	0-50		

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BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0101 **Hole Length:** 162.00

Easting: 211217.88
Northing: 7412927.00
Surface RL: 534.35
Grid Name: MGA94_51
Incl / Azm: -80-->140
Construct: 12 Dec 22 - 12 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	LQ

Comments: No FWS. Installed with hanging plate. Sample pile photos not provided for database. All other photos in Imago.

TOC RL: 535.16 (Stickup 0.75m) (drilled) SWL: 105.10 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 535.16 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	J1	GC	S			UNMINERALISED BIF, (J1), Red and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-120.00)
110		W	CS	GH			SHALE, (W), Red and Brown, Moderately Weathered, Weak Rock					
120												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (120.00-162.00)
130		D4	GC	W			UNMINERALISED BIF, (D4), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock					
140												
150												
160	MG											END CAP (162.00)
170												
180												
190												
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0103	Hole Length:	180.00

Easting: 212046.41
Northing: 7412842.59
Surface RL: 552.08
Grid Name: MGA94_51
Incl / Azm: -69-->189
Construct: 25 May 23 - 25 May 23
Comments: Installation for pore pressure sensors in D1, Mt McRae Shale and Mt Sylvia Fm.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 552.76 (Stickup 0.75m) (drilled) SWL: 117.47 MBTOC (26 May 23) Dev: N Final pH: -
TOC RL: 552.76 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	D4	J	WSG			UNMINERALISED BIF, (D4), Brown and Red and grey, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-108.00)
40		D3	JS	GL			UNMINERALISED BIF, (D3), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock					
70		D2	JC	WHS			UNMINERALISED BIF, (D2), Red and Brown and grey, Moderately Weathered, Medium Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0103	Hole Length:	180.00

Easting: 212046.41
Northing: 7412842.59
Surface RL: 552.08
Grid Name: MGA94_51
Incl / Azm: -69-->189
Construct: 25 May 23 - 25 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installation for pore pressure sensors in D1, Mt McRae Shale and Mt Sylvia Fm.

TOC RL: 552.76 (Stickup 0.75m) (drilled) SWL: 117.47 MBTOC (26 May 23) Dev: N Final pH: -
TOC RL: 552.76 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D2	JC	WHS			UNMINERALISED BIF, (D2), Red and Brown and grey, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-108.00)
110		D1	JCS	GL			UNMINERALISED BIF, (D1), Yellow and Brown and grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (108.00-180.00)
120												
130		RC	B	CQP			SHALE, (RC), Dark or Black and Grey and pink, Moderately Weathered, Weak Rock					
140												
150												
160												
170		S	JC	SH			UNMINERALISED BIF, (S), , Moderately Weathered, Medium Strong Rock					
180	HG											END CAP (180.00)
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0104	Hole Length:	174.00

Easting: 211033.85
Northing: 7412657.03
Surface RL: 542.64
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Mar 23 - 26 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: FWS @ 120m. MB on the western berm on H1 pit for additional pit monitoring, aiming to target Dales units, designed to terminate once intersected Mt McRae or target depth.

TOC RL: 543.42 (Stickup 0.72m) (drilled) SWL: 114.01 MBTOC (27 Mar 23) Dev: N Final pH: -
TOC RL: 543.42 (Stickup 0.72m) (current) Is Live: Y (-) Date: 26 Mar 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	J2	JC	GS			UNMINERALISED BIF, (J2), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18: PVC stickup with hanging plates (0.00-102.00)
20		J1	JCS	G			UNMINERALISED BIF, (J1), Pink and Yellow and brown, Moderately Weathered, Medium Strong Rock					
30			MG	WJ			MINERALISED BIF, (J1), Grey and Brown, Moderately Weathered, Strong Rock					
50	SF	W	JS	CG			UNMINERALISED BIF, (W), Red and Yellow and pink, Moderately Weathered, Medium Strong Rock					
90	MG	D4	JS	GWC			UNMINERALISED BIF, (D4), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0104	Hole Length:	174.00

Easting: 211033.85
Northing: 7412657.03
Surface RL: 542.64
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Mar 23 - 26 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: FWS @ 120m. MB on the western berm on H1 pit for additional pit monitoring, aiming to target Dales units, designed to terminate once intersected Mt McRae or target depth.

TOC RL: 543.42 (Stickup 0.72m) (drilled) SWL: 114.01 MBTOC (27 Mar 23) Dev: N Final pH: -
TOC RL: 543.42 (Stickup 0.72m) (current) Is Live: Y (-) Date: 26 Mar 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	D4	JS	GWC			UNMINERALISED BIF, (D4), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18: PVC stickup with hanging plates (0.00-102.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (102.00-174.00)
120		D3	JS	CG			UNMINERALISED BIF, (D3), Yellow and Brown and light or white, Moderately Weathered, Medium Strong Rock					Estimated FWS level due to no drilling return.
130												
140												
150	UG	D2	JC	GW			UNMINERALISED BIF, (D2), Dark or Black and Red and brown, Moderately Weathered, Medium Strong Rock					WELLCAP(150.00) ID: 3184
160												
170												END CAP (174.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0105	Hole Length:	186.00

Easting: 213397.98
Northing: 7412499.60
Surface RL: 509.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 May 23 - 23 May 23
Comments: MB to target Bee Gorge unit. FWS @ 102m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 186.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 509.98 (Stickup 0.57m) (drilled) SWL: 58.64 MBTOC (24 May 23) Dev: N Final pH: -
TOC RL: 509.98 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZS	C			GRAVEL, (SCREE), Dark or Black and Red and buff, Transported, Non-Cohesive soils, Poorly graded, Angular					PERFORATED END CAP: Stickup and Hanging Plates. (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-108.00)
10		S	S	JG			SHALE, (S), Grey and Red and brown, Moderately Weathered, Medium Strong Rock					
20												
30												
40		OC	S	CD			SHALE, (OC), Light or White and Grey and red, Moderately Weathered, Medium Strong Rock					
50												
60												
70												
80												
90												
100			C	S			CHERT, (OC), Dark or Black and Red and grey, Moderately Weathered, Medium Strong Rock					

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0105	Hole Length:	186.00

Easting: 213397.98
Northing: 7412499.60
Surface RL: 509.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 May 23 - 23 May 23
Comments: MB to target Bee Gorge unit. FWS @ 102m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 186.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 509.98 (Stickup 0.57m) (drilled) SWL: 58.64 MBTOC (24 May 23) Dev: N Final pH: -
TOC RL: 509.98 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	OC	C	S			CHERT, (OC), Dark or Black and Red and grey, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-108.00)
110			S				SHALE, (OC), Yellow and Brown and red, Highly Weathered, Extremely Weak Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (108.00-186.00)
120												
130												
140												
150			CS				CHERT, (OC), Dark or Black and Red and brown, Moderately Weathered, Medium Strong Rock					
160			SC				SHALE, (OC), Dark or Black and Grey and blue, Moderately Weathered, Medium Strong Rock					
170												
180												
190												END CAP (186.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0106	Hole Length:	150.00

Easting: 213378.20
Northing: 7413516.91
Surface RL: 514.49
Grid Name: MGA94_51
Incl / Azm: -71-->197
Construct: 03 Dec 22 - 05 Dec 22
Comments: FWS at 48mbgl. Inclined, Azimuth of 195, dip of -70.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 515.21 (Stickup 0.72m) (drilled) SWL: 70.83 MBTOC (05 Dec 22) Dev: N Final pH: -
TOC RL: 515.21 (Stickup 0.72m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	HJ	S	JC			SHALE, (HJ), Red and Brown and yellow, Highly Weathered, Extremely Weak Rock					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-78.00)
20	MG		J	GSC			UNMINERALISED BIF, (HJ), Red and Dark or Black and brown, Moderately Weathered, Medium Strong Rock					
40	SF	Y	S	GLC			UNMINERALISED BIF, (Y), Brown and Yellow and red, Moderately Weathered, Medium Strong Rock					
50			S	JC			SHALE, (Y), Pink and Red, Highly Weathered, Weak Rock					
80			SJ	C			UNMINERALISED BIF, (Y), Grey and Pink, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (78.00-150.00)
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0106	Hole Length:	150.00

Easting: 213378.20
Northing: 7413516.91
Surface RL: 514.49
Grid Name: MGA94_51
Incl / Azm: -71-->197
Construct: 03 Dec 22 - 05 Dec 22
Comments: FWS at 48mbgl. Inclined, Azimuth of 195, dip of -70.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 515.21 (Stickup 0.72m) (drilled) SWL: 70.83 MBTOC (05 Dec 22) Dev: N Final pH: -
TOC RL: 515.21 (Stickup 0.72m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	Y	SJ	C			UNMINERALISED BIF, (Y), Grey and Pink, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (78.00-150.00)
110												
120	MG											
130												
140		J6	HG	JS			MINERALISED BIF, (J6), Grey and Pink and red, Moderately Weathered, Medium Strong Rock					
150	SF											END CAP (150.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0107	Hole Length:	180.00

Easting: 213799.94
Northing: 7413533.34
Surface RL: 515.06
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Dec 22 - 08 Dec 22
Comments: FWS at 60mbgl. Installed with hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 515.85 (Stickup 0.77m) (drilled) SWL: 62.03 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 515.85 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZSC	J			SCREE, (SZ), Yellow and Brown, Highly Weathered, Weak Rock					PERFORATED END CAP (0.00)
		TD3	ZKS	JLY			GRAVEL, silty, (SILTSTONE), Brown and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: PVC stickup with hanging plates (0.00-6.00)
		HJ	FC	J			SHALE, (HJ), Red and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18: PVC stickup with hanging plates (0.00-108.00)
10			CS	J			CHERT, (Y), Yellow and Brown, Highly Weathered, Weak Rock					
20												
	MG		C	S			CHERT, (Y), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					
30												
	SF		SC	J			SHALE, (Y), Red and Brown and grey, Highly Weathered, Weak Rock					
40												
50	MG	Y	CS	J			CHERT, (Y), Light or White and Grey and green, Moderately Weathered, Weak Rock					
			C	SQ			CHERT, (Y), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					
60												
70	HG											
80			SC	J			SHALE, (Y), Grey and Blue and green, Slightly Weathered, Strong Rock					
90												
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0107 **Hole Length:** 180.00

Easting: 213799.94
Northing: 7413533.34
Surface RL: 515.06
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Dec 22 - 08 Dec 22
Comments: FWS at 60mbgl. Installed with hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 180.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 515.85 (Stickup 0.77m) (drilled) SWL: 62.03 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 515.85 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	Y	SC	J			SHALE, (Y), Grey and Blue and green, Slightly Weathered, Strong Rock					BLANK PVC: Size 50 - Class 18: PVC stickup with hanging plates (0.00-108.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (108.00-180.00)
120												
130												
140												
150			E	CS			DOLERITE, (Y), Blue and Grey, Fresh, Strong Rock					
160		J3J5	CJ	SH			CHERT, (J3J5), Grey and Red and blue, Moderately Weathered, Medium Strong Rock					
170			CJ	GS			CHERT, (J3J5), Yellow and Brown and blue, Moderately Weathered, Medium Strong Rock					
180												END CAP (180.00)
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0108	Hole Length:	186.00

Easting: 214578.12
Northing: 7413209.69
Surface RL: 521.29
Grid Name: MGA94_51
Incl / Azm: -70-->205
Construct: 17 Dec 22 - 18 Dec 22
Comments: FWS at 66mbgl. Installed with hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 186.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 521.92 (Stickup 0.65m) (drilled) SWL: 69.97 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 521.92 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZX	IY			GRAVEL, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: 161mm : (0.00-10.00) BLANK PVC: Size 50 - Class 18 (0.00-96.00)
10	MG	HJ	SC	GJQ			SHALE, (HJ), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock					
60		Y	SC	JG			SHALE, (Y), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
70			CS	HJ			CHERT, (Y), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					
80			E	SJ			DOLERITE, (Y), Grey and Blue and yellow, Moderately Weathered, Medium Strong Rock					
90			S	C			SHALE, (Y), Brown and Yellow, Moderately Weathered, Weak Rock					
100			D	SC			DOLERITE, (Y), Grey and Blue and yellow, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (96.00-186.00)

0 100 200 0-5000 0-14 0-50

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BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0108	Hole Length:	186.00

Easting: 214578.12
Northing: 7413209.69
Surface RL: 521.29
Grid Name: MGA94_51
Incl / Azm: -70-->205
Construct: 17 Dec 22 - 18 Dec 22
Comments: FWS at 66mbgl. Installed with hanging plates.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 186.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 521.92 (Stickup 0.65m) (drilled) SWL: 69.97 MBTOC (19 Dec 22) Dev: N Final pH: -
TOC RL: 521.92 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	Y	D	SC			DOLERITE, (Y), Grey and Blue and yellow, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (96.00-186.00)
110			CS	DG			CHERT, (Y), Yellow and Brown and blue, Moderately Weathered, Medium Strong Rock					
120												
130			SC	GH			SHALE, (Y), Brown and Yellow and red, Moderately Weathered, Strong Rock					
140												
150			C	SG			CHERT, (Y), Yellow and Brown and grey, Moderately Weathered, Strong Rock					
160		J6	HJ	CGS			MINERALISED BIF, (J6), Grey and Red and brown, Moderately Weathered, Very Strong Rock					
170												
180												
190												END CAP (186.00)
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0110 **Hole Length:** 162.00

Easting: 213014.52
Northing: 7413512.38
Surface RL: 518.58
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 Dec 22 - 06 Dec 22
Comments: FWS between 80 - 84mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 519.27 (Stickup 0.66m) (drilled) SWL: 73.10 MBTOC (06 Dec 22) Dev: N Final pH: -
TOC RL: 519.27 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	J6	J	GHC			UNMINERALISED BIF, (J6), Red and Brown, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP (0.00)
10	MG											BLANK PVC: Size 150 - Class 18: PVC stickup with hanging plates (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-82.00)
30												
40												
50	HG											
60												
70												
80												
90	MG	J3J5	J	SC			UNMINERALISED BIF, (J3J5), Grey and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-162.00)
100	HG					0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0110	Hole Length:	162.00

Easting: 213014.52
Northing: 7413512.38
Surface RL: 518.58
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 Dec 22 - 06 Dec 22
Comments: FWS between 80 - 84mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 519.27 (Stickup 0.66m) (drilled) SWL: 73.10 MBTOC (06 Dec 22) Dev: N Final pH: -
TOC RL: 519.27 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	J3J5	J	SC			UNMINERALISED BIF, (J3J5), Grey and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-162.00)
110												
120	MG											
130	SF											
140												
150	MG	J3	CJ	S			UNMINERALISED BIF, (J3), Grey and Pink and red, Moderately Weathered, Medium Strong Rock					WELLCAP(155.00) ID: 3161
160												END CAP (162.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0112	Hole Length:	120.00

Easting: 214901.53
Northing: 7413055.23
Surface RL: 518.75
Grid Name: MGA94_51
Incl / Azm: -59-->165
Construct: 27 May 23 - 28 May 23
Comments: Hole was cut short to 120m due to ground condition.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 519.20 (Stickup 0.87m) (drilled) SWL: 67.71 MBTOC (29 May 23) Dev: N Final pH: -
TOC RL: 519.20 (Stickup 0.87m) (current) Is Live: Y (-) Date: 29 May 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YS			GRAVEL, clayey, (SCREE), Yellow and Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-84.00)
10		HJ	S	J			SHALE, (HJ), Yellow and Brown and light or white, Highly Weathered, Weak Rock					
50		Y	S	CGL			SHALE, (Y), Brown and Yellow and grey, Moderately Weathered, Weak Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (84.00-120.00)
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0112	Hole Length:	120.00

Easting: 214901.53
Northing: 7413055.23
Surface RL: 518.75
Grid Name: MGA94_51
Incl / Azm: -59-->165
Construct: 27 May 23 - 28 May 23
Comments: Hole was cut short to 120m due to ground condition.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 519.20 (Stickup 0.87m) (drilled) SWL: 67.71 MBTOC (29 May 23) Dev: N Final pH: -
TOC RL: 519.20 (Stickup 0.87m) (current) Is Live: Y (-) Date: 29 May 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	Y	S	CGL			SHALE, (Y), Brown and Yellow and grey, Moderately Weathered, Weak Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (84.00-120.00)
110												
120	MG											END CAP (120.00)
130												
140												
150												
160												
170												
180												
190												
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0113	Hole Length:	174.00

Easting: 214660.38
Northing: 7412173.45
Surface RL: 511.74
Grid Name: MGA94_51
Incl / Azm: -60-->19
Construct: 26 May 23 - 26 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors NM Shale & Sylvia.

TOC RL: 512.38 (Stickup 0.87m) (drilled) SWL: 67.71 MBTOC (27 May 23) Dev: N Final pH: -
TOC RL: 512.38 (Stickup 0.87m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZS	QG			GRAVEL, (SCREE), Brown and Red and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP: PVC stickup with hanging plates (0.00) BLANK PVC: 161mm (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-96.00)
10	MG	OC	S4	CJ			SHALE, (OC), Red and Pink and grey, Moderately Weathered, Medium Strong Rock					
20												
30	SF											
40	MG											
50												
60												
70												
80												
90												
100												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (96.00-174.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0113 **Hole Length:** 174.00

Easting: 214660.38
Northing: 7412173.45
Surface RL: 511.74
Grid Name: MGA94_51
Incl / Azm: -60-->19
Construct: 26 May 23 - 26 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	JP10

Comments: Installation of PVC to planned hole depth to allow future installation of pore pressure sensors NM Shale & Sylvia.

TOC RL: 512.38 (Stickup 0.87m) (drilled) SWL: 67.71 MBTOC (27 May 23) Dev: N Final pH: -
TOC RL: 512.38 (Stickup 0.87m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	OC	S4	CJ			SHALE, (OC), Red and Pink and grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (96.00-174.00)
110												
120												
130		S	JC	S			UNMINERALISED BIF, (S), Grey and Brown and red, Moderately Weathered, Medium Strong Rock					
140												
150												
160												
170		RN	S	D			SHALE, (RN), Dark or Black and Grey and blue, Moderately Weathered, Medium Strong Rock					END CAP (174.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0114	Hole Length:	174.00

Easting: 215317.84
Northing: 7412856.28
Surface RL: 515.54
Grid Name: MGA94_51
Incl / Azm: -70-->160
Construct: 06 Jan 23 - 06 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	146		WLS	KM4

Comments: VWP drilled for install of pore pressure sensors. Azi 160, Dip -70. Drilled and installed to 174m.

TOC RL: 516.25 (Stickup 0.72m) (drilled) SWL: 64.35 MBTOC (07 Jan 23) Dev: N Final pH: -
TOC RL: 516.25 (Stickup 0.72m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	VB2	ZGI	YK			GRAVEL, clayey, trace sand, (BRECCIA), Brown, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-5.00)
10												BLANK PVC: Size 50 - Class 18 (0.00-98.00)
20	SF	CY2	ZK				CLAY, sandy, trace gravel, (CLAY), Light or White and Red and yellow, Transported, Stiff, Poorly graded, Sub-rounded					OPEN HOLE (0.00-174.00)
30												
40												
50	MG	VB2	ZLG	K			GRAVEL, clayey, (BRECCIA), Light or White and Red and yellow, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
60	SF	CY2	ZK	G			CLAY, gravelly, (CLAY), buff, Transported, Stiff, Gap graded, Sub-rounded					
70												
80	MG											
90	SF											
100						0 100 200		0-5000	0-14	0-50		SLOTTED PVC: Size 50 - Class 18, Slots 1mm (98.00-174.00)

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0114 **Hole Length:** 174.00

Easting: 215317.84
Northing: 7412856.28
Surface RL: 515.54
Grid Name: MGA94_51
Incl / Azm: -70-->160
Construct: 06 Jan 23 - 06 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	146		WLS	KM4

Comments: VWP drilled for install of pore pressure sensors. Azi 160, Dip -70. Drilled and installed to 174m.

TOC RL: 516.25 (Stickup 0.72m) (drilled) SWL: 64.35 MBTOC (07 Jan 23) Dev: N Final pH: -
TOC RL: 516.25 (Stickup 0.72m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	CY2	ZK	G			CLAY, gravelly, (CLAY), buff, Transported, Stiff, Gap graded, Sub-rounded					OPEN HOLE (0.00-174.00)
110	MG	WW	JCL	S			UNMINERALISED BIF, (WW), Light or White and Brown, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (98.00-174.00)
120												
130	SF	Y	S	D			SHALE, (Y), Red and Brown and yellow, Moderately Weathered, Very Weak Rock					
140												
150	MG											
160	SF											
170	MG	J6	GJF	LS			UNMINERALISED BIF, (J6), Brown, Moderately Weathered, Strong Rock					
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0115	Hole Length:	154.00

Easting: 215018.25
Northing: 7412130.63
Surface RL: 514.09
Grid Name: MGA94_51
Incl / Azm: -59-->328
Construct: 18 Nov 22 - 19 Nov 22
Comments: VWP. Azimuth of 325 Dip -60. FWS around 55mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 154.0	WLSRC40	RHF	140		WLS	NK3

TOC RL: 514.70 (Stickup 0.66m) (drilled) SWL: 69.59 MBTOC (19 Nov 22) Dev: N Final pH: -
TOC RL: 514.70 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	J			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10		GS3	ZY	JK			SILT, gravelly, trace clay, (SILTSTONE), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: Collar (surface casing) (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-82.00)
30												OPEN HOLE (0.00-154.00)
40												
50			JG	CS			UNMINERALISED BIF, (S), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock					
60	MG	S										
70												
80			SJ	C			UNMINERALISED BIF, (S), Brown and Grey and red, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-154.00)
90												
100			S	JC			SHALE, (S), buff and Brown and pink, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0115 **Hole Length:** 154.00

Easting: 215018.25
Northing: 7412130.63
Surface RL: 514.09
Grid Name: MGA94_51
Incl / Azm: -59-->328
Construct: 18 Nov 22 - 19 Nov 22
Comments: VWP. Azimuth of 325 Dip -60. FWS around 55mbgl

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 154.0	WLSRC40	RHF	140		WLS	NK3

TOC RL: 514.70 (Stickup 0.66m) (drilled) SWL: 69.59 MBTOC (19 Nov 22) Dev: N Final pH: -
TOC RL: 514.70 (Stickup 0.66m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	S	S	JC			SHALE, (S), buff and Brown and pink, Moderately Weathered, Medium Strong Rock					OPEN HOLE (0.00-154.00)
			C	SJ			CHERT, (S), Pink and buff and brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-154.00)
110												
	SF		S	CJ			SHALE, (S), buff and Brown, Highly Weathered, Weak Rock					
120												
	MG	OD	S	LJQ			SHALE, (OD), Red and Brown, Highly Weathered, Weak Rock					
130												
140												
150												END CAP (154.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0116	Hole Length:	174.00

Easting: 215562.66
Northing: 7412678.99
Surface RL: 515.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Nov 22 - 22 Nov 22
Comments: Monitoring bore. FWS around 59mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	NK3

TOC RL: 516.53 (Stickup 0.60m) (drilled) SWL: 60.89 MBTOC (22 Nov 22) Dev: N Final pH: -
TOC RL: 516.53 (Stickup 0.60m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	J			SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					END CAP (0.00)
10		GS3	ZY				GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Brown and Pink, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
20		ST3	ZY	K			SILT, gravelly, trace clay, (SILTSTONE), buff and Red and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: surface casing (collar) (0.00-6.00)
30		Y	S	J			SHALE, (Y), Red and Brown, Highly Weathered, Weak Rock					BLANK PVC: Size 50 - Class 18 (0.00-90.00)
40												OPEN HOLE (0.00-174.00)
50												
60			J	SC			UNMINERALISED BIF, (Y), Red and Brown, Moderately Weathered, Medium Strong Rock					
70												
80												
90												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (90.00-174.00)
100	MG											
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0116 **Hole Length:** 174.00

Easting: 215562.66
Northing: 7412678.99
Surface RL: 515.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Nov 22 - 22 Nov 22
Comments: Monitoring bore. FWS around 59mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC40	RHF	140		WLS	NK3

TOC RL: 516.53 (Stickup 0.60m) (drilled) SWL: 60.89 MBTOC (22 Nov 22) Dev: N Final pH: -
TOC RL: 516.53 (Stickup 0.60m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–130	MG	Y	J	SC		0 100 200	UNMINERALISED BIF, (Y), Red and Brown, Moderately Weathered, Medium Strong Rock	0-5000	0-14	0-50		OPEN HOLE (0.00-174.00) SLOTTED PVC: Size 50 - Class 18, Slots 1mm (90.00-174.00)
130–150	MG	J6	JS	L			UNMINERALISED BIF, (J6), Red and Brown, Moderately Weathered, Medium Strong Rock					
150–174	HG	J6	GJ	C			UNMINERALISED BIF, (J6), Grey and Blue, Moderately Weathered, Medium Strong Rock					
174–200												

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0117	Hole Length:	126.00

Easting: 215258.28
Northing: 7412145.14
Surface RL: 521.95
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 02 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 126.0	WLSRC40	RHF	140		WLS	BF2

Comments: Hole terminated at 126mbgl due to risk of black shales leaking out of sump. FWS at 76m.

TOC RL: 522.66 (Stickup 0.61m) (drilled) SWL: 69.17 MBTOC (05 Dec 22) Dev: N Final pH: -
TOC RL: 522.66 (Stickup 0.61m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	D3	G	JS			MINERALISED BIF, (D3), Red and Brown and grey, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 150 - Class 18 (0.00-6.00)
10												BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-82.00)
20		D2	H	J			MINERALISED BIF, (D2), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					OPEN HOLE (0.00-126.00)
30												
40												
50		D1	H	J			MINERALISED BIF, (D1), Red and Brown and yellow, Moderately Weathered, Medium Strong Rock					
60	SF	R	S	CJ			SHALE, (R), Yellow and Brown, Highly Weathered, Weak Rock					
70												Approximate FWS
80												
90	MG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-126.00)
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO | Hole Name: HHH0117 | Hole Length: 126.00

Easting: 215258.28
Northing: 7412145.14
Surface RL: 521.95
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 02 Dec 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 126.0	WLSRC40	RHF	140		WLS	BF2

Comments: Hole terminated at 126mbgl due to risk of black shales leaking out of sump. FWS at 76m.

TOC RL: 522.66 (Stickup 0.61m) (drilled) SWL: 69.17 MBTOC (05 Dec 22) Dev: N Final pH: -
TOC RL: 522.66 (Stickup 0.61m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	S	CJ			SHALE, (R), Yellow and Brown, Highly Weathered, Weak Rock					OPEN HOLE (0.00-126.00)
110		S	SJ	C			MINERALISED BIF, (S), Red and Brown, Moderately Weathered, Medium Strong Rock					
120		OD	SJ	C			MINERALISED BIF, (OD), Red and Brown, Moderately Weathered, Medium Strong Rock					
130												
140												
150												
160												
170												Approximate FWS
180												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (82.00-126.00)
190												
200						0 100 200		0-5000	0-14	0-50		

Program: FY23 HASH H2B1 POR Phase 1 RC | Planned Hole: HHH0117 | Page: 137

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0118	Hole Length:	162.00

Easting: 215879.30
Northing: 7412078.74
Surface RL: 537.75
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 26 Nov 22 - 27 Nov 22
Comments: VWP drilled to 162m to allow for fallback,installed to 156m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	KM4

TOC RL: 538.47 (Stickup 0.76m) (drilled) SWL: 82.79 MBTOC (28 Nov 22) Dev: N Final pH: -
TOC RL: 538.47 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZYI	J			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-6.00)
10		D	WG				MINERALISED BIF, (D), Dark or Black and Blue, Moderately Weathered, Strong Rock					BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-78.00)
20												OPEN HOLE (0.00-162.00)
30												
40												
50												
60												
70												
80		R	SJ				SHALE, (R), Light or White and Brown and red, Moderately Weathered, Very Weak Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (78.00-156.00)
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

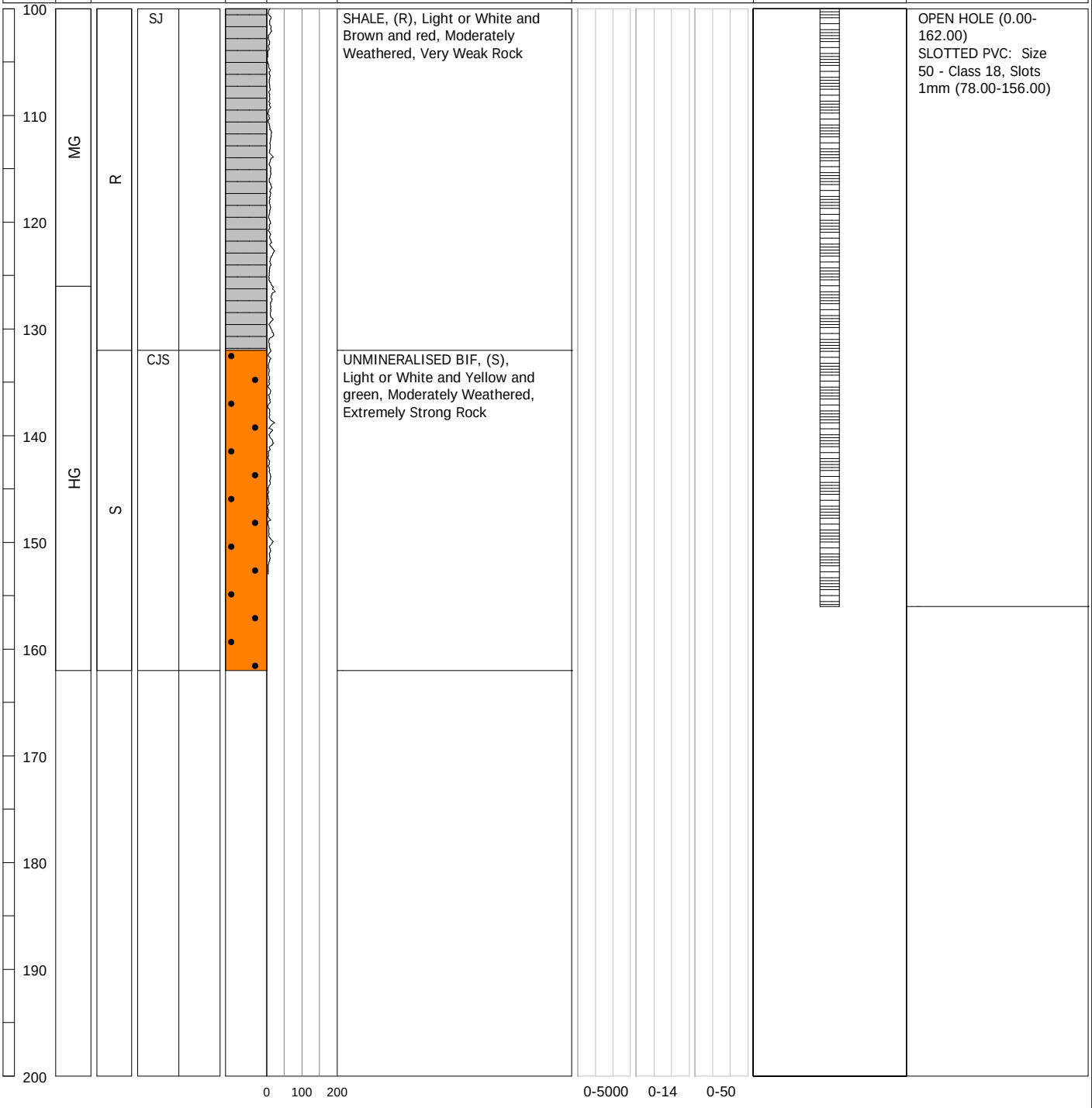
BHP

Project: HASHIMOTO **Hole Name:** HHH0118 **Hole Length:** 162.00

Easting: 215879.30
Northing: 7412078.74
Surface RL: 537.75
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 26 Nov 22 - 27 Nov 22
Comments: VWP drilled to 162m to allow for fallback,installed to 156m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	KM4

TOC RL: 538.47 (Stickup 0.76m) (drilled) SWL: 82.79 MBTOC (28 Nov 22) Dev: N Final pH: -
TOC RL: 538.47 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0119	Hole Length:	162.00

Easting: 216076.38
Northing: 7411994.54
Surface RL: 554.04
Grid Name: MGA94_51
Incl / Azm: -69-->302
Construct: 28 Nov 22 - 01 Dec 22
Comments: Inclined VWP. Drilled to 162m to allow for fallback. Installed to depth.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	KM4

TOC RL: 554.89 (Stickup 0.77m) (drilled) SWL: 104.83 MBTOC (01 Dec 22) Dev: N Final pH: -
TOC RL: 554.89 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	D	WG				MINERALISED BIF, (D), Dark or Black and Blue and brown, Moderately Weathered, Strong Rock					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-100.00) OPEN HOLE (0.00-162.00)
10												
20												Hydro was called and made aware
30												
40												
46		D1	JWC	S			UNMINERALISED BIF, (D1), Red and Light or White and blue, Moderately Weathered, Strong Rock					
50												
60												
67	HG											
70		R	S	JC			SHALE, (R), Light or White and Red and green, Moderately Weathered, Weak Rock					
80												
90												
94	MG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (100.00-159.00)
100												

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0119	Hole Length:	162.00

Easting: 216076.38
Northing: 7411994.54
Surface RL: 554.04
Grid Name: MGA94_51
Incl / Azm: -69-->302
Construct: 28 Nov 22 - 01 Dec 22
Comments: Inclined VWP. Drilled to 162m to allow for fallback. Installed to depth.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	KM4

TOC RL: 554.89 (Stickup 0.77m) (drilled) SWL: 104.83 MBTOC (01 Dec 22) Dev: N Final pH: -
TOC RL: 554.89 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	R	S	JC			SHALE, (R), Light or White and Red and green, Moderately Weathered, Weak Rock					OPEN HOLE (0.00-162.00)
110												
120												Hydro was called and made aware
130												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (100.00-159.00)
140		S	JC	S			UNMINERALISED BIF, (S), Red and Pink and light or white, Moderately Weathered, Strong Rock					
150												
160												FALLBACK (159.00-162.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0120	Hole Length:	204.00

Easting: 216818.24
Northing: 7412145.47
Surface RL: 521.28
Grid Name: MGA94_51
Incl / Azm: -89-->256
Construct: 23 Nov 22 - 24 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 204.0	WLSRC40	RHF	140		WLS	NK3

Comments: VWP with PVC stickup and hanging plates. Vertical hole. Drilled to 204m out of planned 200m, difficulties with install; installed to 197m.

TOC RL: 521.93 (Stickup 0.61m) (drilled) SWL: 65.68 MBTOC (26 Nov 22) Dev: N Final pH: -
TOC RL: 521.93 (Stickup 0.61m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZIY	J			SILT, gravelly, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18 (0.00-6.00)
10		TD3	ZY	J			GRAVEL, silty, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-110.00)
20		J2	J				UNMINERALISED BIF, (J2), buff and Grey and brown, Moderately Weathered, Medium Strong Rock					OPEN HOLE (0.00-197.00)
30												
40												
50		J1	J	S			UNMINERALISED BIF, (J1), Grey and Brown, Moderately Weathered, Medium Strong Rock					
60	HG											This was written on drillers sheet but could have been left from previous hole?
70												
80	MG	W	JG	S			SHALE, (W), Brown, Moderately Weathered, Weak Rock					
90												
100			S	J			SHALE, (W), Light or White and Red, Moderately Weathered, Weak Rock					

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0120 **Hole Length:** 204.00

Easting: 216818.24
Northing: 7412145.47
Surface RL: 521.28
Grid Name: MGA94_51
Incl / Azm: -89-->256
Construct: 23 Nov 22 - 24 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 204.0	WLSRC40	RHF	140		WLS	NK3

Comments: VWP with PVC stickup and hanging plates. Vertical hole. Drilled to 204m out of planned 200m, difficulties with install; installed to 197m.

TOC RL: 521.93 (Stickup 0.61m) (drilled) SWL: 65.68 MBTOC (26 Nov 22) Dev: N Final pH: -
TOC RL: 521.93 (Stickup 0.61m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–120	MG	W	S	J			SHALE, (W), Light or White and Red, Moderately Weathered, Weak Rock					BLANK PVC: Size 50 - Class 18: PVC stickup and hanging plates (0.00-110.00)
120–150	MG	D4	WG	J			MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock					OPEN HOLE (0.00-197.00)
150–180	HG	D3	J	CSG			UNMINERALISED BIF, (D3), Yellow and Brown, Moderately Weathered, Strong Rock					This was written on drillers sheet but could have been left from previous hole?
180–200	HG	D2	WG	J			MINERALISED BIF, (D2), Dark or Black and Blue, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (110.00-197.00)
						0 100 200		0-5000	0-14	0-50		FALLBACK (197.00-204.00)

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0120	Hole Length:	204.00

Easting: 216818.24
Northing: 7412145.47
Surface RL: 521.28
Grid Name: MGA94_51
Incl / Azm: -89-->256
Construct: 23 Nov 22 - 24 Nov 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 204.0	WLSRC40	RHF	140		WLS	NK3

Comments: VWP with PVC stickup and hanging plates. Vertical hole. Drilled to 204m out of planned 200m, difficulties with install; installed to 197m.

TOC RL: 521.93 (Stickup 0.61m) (drilled) SWL: 65.68 MBTOC (26 Nov 22) Dev: N Final pH: -
TOC RL: 521.93 (Stickup 0.61m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D2	WG	J			MINERALISED BIF, (D2), Dark or Black and Blue, Moderately Weathered, Strong Rock					FALLBACK (197.00-204.00)
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

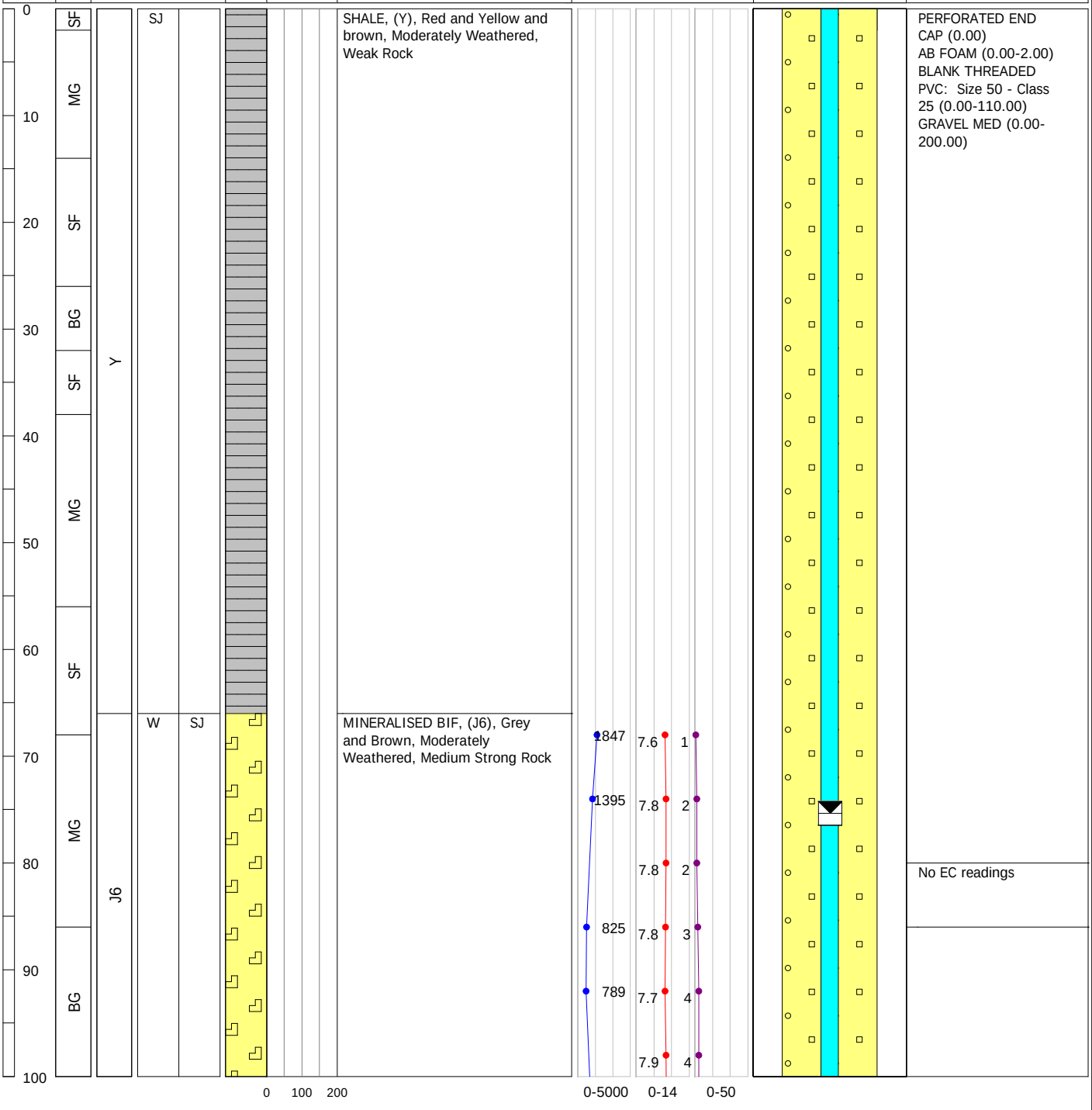
Project:	HASHIMOTO	Hole Name:	HHH0121	Hole Length:	200.00

Easting: 213341.50
Northing: 7413426.38
Surface RL: 519.99
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 22 Jun 23 - 23 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 134.0	DR3	DR	250		EASTERNWELL	KM4
134.0 - 200.0	DR3	CH	250		EASTERNWELL	ML4

Comments: FWS at 68m. Pilot hole for a potential monitoring bore. Hole has been moved and pad no longer suitable for both monitoring and production bores. Gamma run and failed.

TOC RL: 520.64 (Stickup 0.63m) (drilled) SWL: 75.35 MBTOC (25 Jun 23) Dev: N Final pH: -
TOC RL: 520.64 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

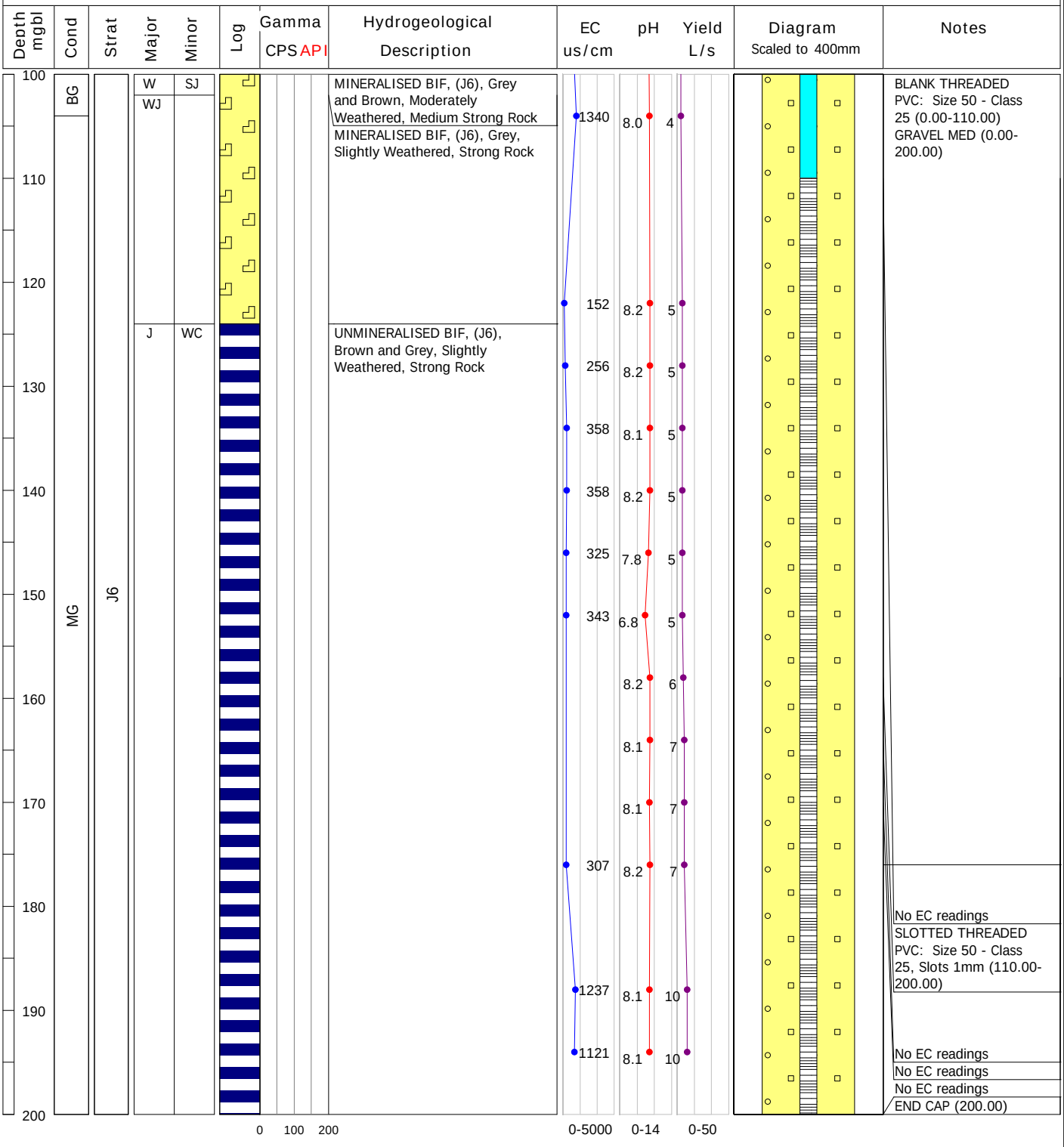
Project: HASHIMOTO **Hole Name:** HHH0121 **Hole Length:** 200.00

Easting: 213341.50
Northing: 7413426.38
Surface RL: 519.99
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 22 Jun 23 - 23 Jun 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 134.0	DR3	DR	250		EASTERNWELL	KM4
134.0 - 200.0	DR3	CH	250		EASTERNWELL	ML4

Comments: FWS at 68m. Pilot hole for a potential monitoring bore. Hole has been moved and pad no longer suitable for both monitoring and production bores. Gamma run and failed.

TOC RL: 520.64 (Stickup 0.63m) (drilled) SWL: 75.35 MBTOC (25 Jun 23) Dev: N Final pH: -
TOC RL: 520.64 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0124 **Hole Length:** 206.00

Easting: 215544.74
Northing: 7412271.63
Surface RL: 527.16
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Mar 23 - 13 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	EWMWW06	DR	250		EASTERNWELL	NK3
114.0 - 206.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to test viability for a production bore. FWS around 74mbgl. Drill extra rod to account any fallback.

TOC RL: 527.74 (Stickup 0.55m) (drilled) SWL: 74.81 MBTOC (13 Mar 23) Dev: N Final pH: -
TOC RL: 527.74 (Stickup 0.55m) (current) Is Live: Y (-) Date: 11 Mar 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	JYS			GRAVEL, silty, trace cobble, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10	MG	J1	GL	SW			MINERALISED BIF, (J1), Brown and Yellow and red, Moderately Weathered, Medium Strong Rock					CEMENT (0.00-2.00)
20	SF	W	S	HJ			SHALE, (W), Red, Highly Weathered, Weak Rock					BLANK PVC: Size 50 - Class 25 (0.00-103.00)
30												GRAVEL MED (2.00-206.00)
40												
50		D4	HW	S			MINERALISED BIF, (D4), Red and Grey, Moderately Weathered, Medium Strong Rock					
60												
70												
80	BG							1210	8.4	1		
80	SF							1180	8.2	1		
90		D3	WH	SJ			MINERALISED BIF, (D3), Red and Brown and grey, Moderately Weathered, Medium Strong Rock	1030	8.2	1		
								930	8.3	3		
100								1050	8.2	4		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

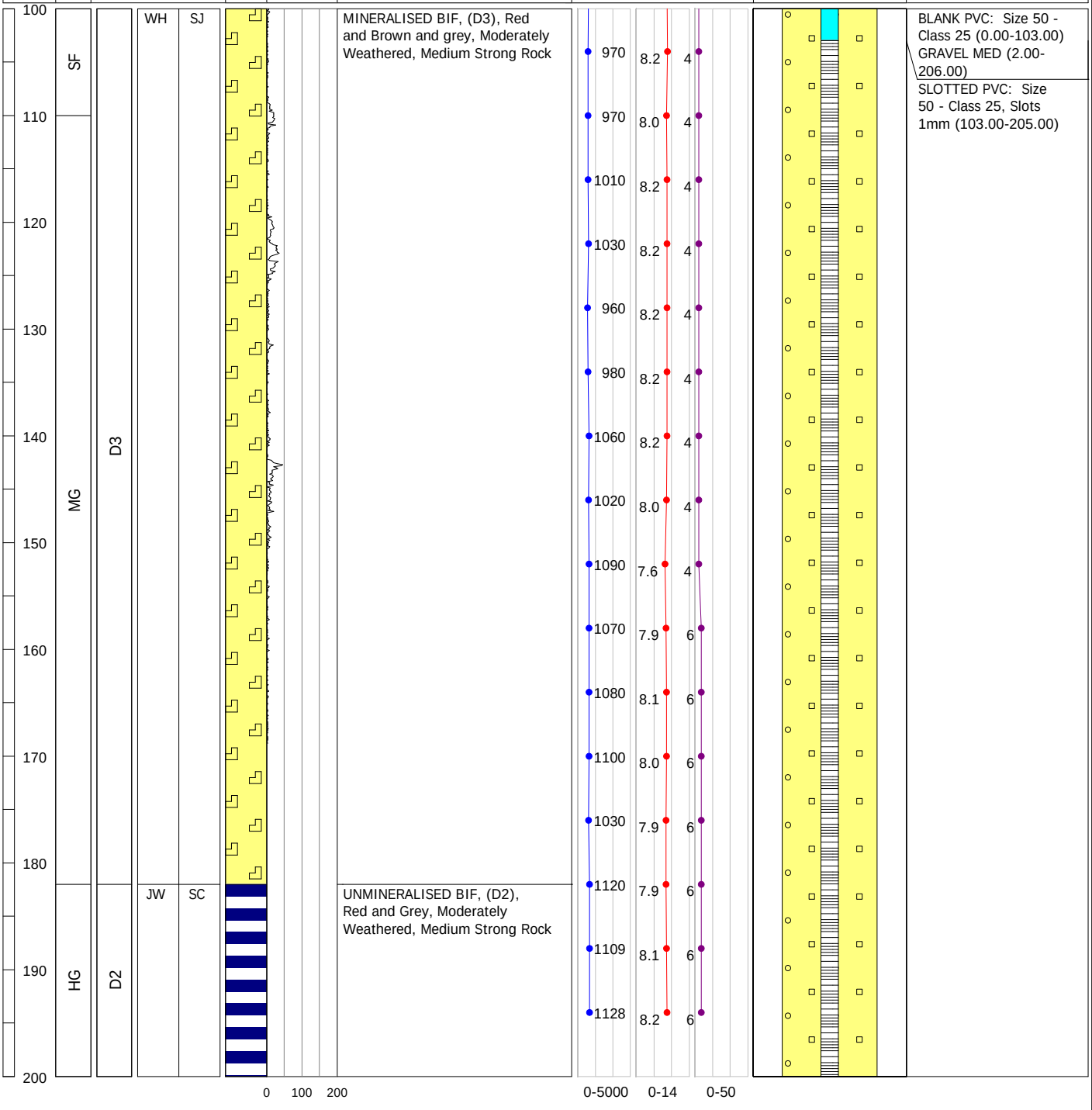
Project:	HASHIMOTO	Hole Name:	HHH0124	Hole Length:	206.00

Easting: 215544.74
Northing: 7412271.63
Surface RL: 527.16
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Mar 23 - 13 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	EWMWW06	DR	250		EASTERNWELL	NK3
114.0 - 206.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to test viability for a production bore. FWS around 74mbgl. Drill extra rod to account any fallback.

TOC RL: 527.74 (Stickup 0.55m) (drilled) SWL: 74.81 MBTOC (13 Mar 23) Dev: N Final pH: -
TOC RL: 527.74 (Stickup 0.55m) (current) Is Live: Y (-) Date: 11 Mar 2023 Final EC: -



BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0124 **Hole Length:** 206.00

Easting: 215544.74
Northing: 7412271.63
Surface RL: 527.16
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Mar 23 - 13 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 114.0	EWMWW06	DR	250		EASTERNWELL	NK3
114.0 - 206.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to test viability for a production bore. FWS around 74mbgl. Drill extra rod to account any fallback.

TOC RL: 527.74 (Stickup 0.55m) (drilled) SWL: 74.81 MBTOC (13 Mar 23) Dev: N Final pH: -
TOC RL: 527.74 (Stickup 0.55m) (current) Is Live: Y (-) Date: 11 Mar 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	HG	D2	JW	SC			UNMINERALISED BIF, (D2), Red and Grey, Moderately Weathered, Medium Strong Rock					GRAVEL MED (2.00-206.00)
210												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (103.00-205.00)
220												END CAP (205.00)
230												FALLBACK (205.00-206.00)
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0125 **Hole Length:** 216.00

Easting: 215547.02
Northing: 7412579.68
Surface RL: 515.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Mar 23 - 08 Mar 23
Comments: Monitoring bore to test location for potential production bore. FWS at 104mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 140.0	EWMWW06	DR	250		EASTERNWELL	ML4
140.0 - 216.0	EWMWW06	CH	200		EASTERNWELL	KM4

TOC RL: 516.22 (Stickup 0.44m) (drilled) SWL: 61.42 MBTOC (08 Mar 23) Dev: N Final pH: -
TOC RL: 515.79 (Stickup 0.05m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZYX	IK			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Red and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10												CEMENT (0.00-5.00)
20	BG											BLANK PVC: Size 50 - Class 25 (0.00-110.00)
30		J6	GH	L			MINERALISED BIF, (J6), Grey and Brown, Highly Weathered, Medium Strong Rock					GRAVEL MED (5.00-214.00)
40												
50												
60	BG											
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0125	Hole Length:	216.00

Easting: 215547.02
Northing: 7412579.68
Surface RL: 515.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Mar 23 - 08 Mar 23
Comments: Monitoring bore to test location for potential production bore. FWS at 104mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 140.0	EWMWW06	DR	250		EASTERNWELL	ML4
140.0 - 216.0	EWMWW06	CH	200		EASTERNWELL	KM4

TOC RL: 516.22 (Stickup 0.44m) (drilled) SWL: 61.42 MBTOC (08 Mar 23) Dev: N Final pH: -
TOC RL: 515.79 (Stickup 0.05m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Notes
100	BG	J6	GH	L		MINERALISED BIF, (J6), Grey and Brown, Highly Weathered, Medium Strong Rock	610	7.2	2	BLANK PVC: Size 50 - Class 25 (0.00-110.00) GRAVEL MED (5.00-214.00)
110	SF						950	8.0	2	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (110.00-116.00)
120							910	7.9	4	BLANK PVC: Size 50 - Class 25 (116.00-122.00)
			J	GC		UNMINERALISED BIF, (J6), Brown, Moderately Weathered, Strong Rock	1070	8.1	6	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (122.00-128.00)
130							1020	7.9	6	BLANK PVC: Size 50 - Class 25 (128.00-134.00)
	MG						1040	7.9	6	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (134.00-140.00)
140									0	BLANK PVC: Size 50 - Class 25 (140.00-146.00)
							970	8.1	2	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (146.00-152.00)
150							930	8.2	4	BLANK PVC: Size 50 - Class 25 (152.00-158.00)
							930	8.1	4	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (158.00-164.00)
160							990	8.2	4	BLANK PVC: Size 50 - Class 25 (164.00-170.00)
							960	8.6	4	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (170.00-176.00)
170							970	8.1	5	BLANK PVC: Size 50 - Class 25 (176.00-182.00)
	SF						960	8.3	4	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (182.00-188.00)
180										
		J5	J	SC		UNMINERALISED BIF, (J5), Blue and Grey and brown, Moderately Weathered, Strong Rock	960	8.2	5	BLANK PVC: Size 50 - Class 25 (188.00-194.00)
190							970	8.3	5	SLOTTED PVC: Size 50 - Class 25, Slots 1mm (194.00-200.00)
	MG						970	8.1	5	BLANK PVC: Size 50 - Class 25 (200.00-206.00)
200										

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50
Diagram: Scaled to 400mm

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0125	Hole Length:	216.00

Easting: 215547.02
Northing: 7412579.68
Surface RL: 515.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Mar 23 - 08 Mar 23
Comments: Monitoring bore to test location for potential production bore. FWS at 104mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 140.0	EWMWW06	DR	250		EASTERNWELL	ML4
140.0 - 216.0	EWMWW06	CH	200		EASTERNWELL	KM4

TOC RL: 516.22 (Stickup 0.44m) (drilled) SWL: 61.42 MBTOC (08 Mar 23) Dev: N Final pH: -
TOC RL: 515.79 (Stickup 0.05m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	J5	J	SC			UNMINERALISED BIF, (J5), Blue and Grey and brown, Moderately Weathered, Strong Rock	970	8.1	5		GRAVEL MED (5.00-214.00)
210		J4	J	C			UNMINERALISED BIF, (J4), Blue and Brown, Moderately Weathered, Strong Rock	910	8.8	5		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (110.00-116.00)
220												BLANK PVC: Size 50 - Class 25 (116.00-122.00)
230												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (122.00-128.00)
240												BLANK PVC: Size 50 - Class 25 (128.00-134.00)
250												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (134.00-140.00)
260												BLANK PVC: Size 50 - Class 25 (140.00-146.00)
270												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (146.00-152.00)
280												BLANK PVC: Size 50 - Class 25 (152.00-158.00)
290												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (158.00-164.00)
300												BLANK PVC: Size 50 - Class 25 (164.00-170.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (170.00-176.00)
												BLANK PVC: Size 50 - Class 25 (176.00-182.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (182.00-188.00)
												BLANK PVC: Size 50 - Class 25 (188.00-194.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (194.00-200.00)
												BLANK PVC: Size 50 - Class 25 (200.00-206.00)
												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (206.00-212.00)
												END CAP (216.00)
						0 100 200			0-5000	0-14 0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0228	Hole Length:	156.00

Easting: 208426.87
Northing: 7409724.35
Surface RL: 521.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Jul 22 - 25 Jul 22
Comments: Concrete plinth and monument cover for headworks

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 38.0	DR3	DR	150		EASTERNWELL	KM4
38.0 - 156.0	DR3	CH	250		EASTERNWELL	KM4

TOC RL: 522.36 (Stickup 0.95m) (drilled) SWL: 62.06 MBTOC (27 Jul 22) Dev: N Final pH: -
TOC RL: 522.36 (Stickup 0.95m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	UG	T	ZY	IJ			GRAVEL, (SCREE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10												CEMENT: Surface Seal (0.00-5.00)
20												BLANK PVC: Size 50 - Class 25 (0.00-66.00)
30		WA1	GJS	W			MINERALISED BIF, (WA1), Light or White, Moderately Weathered, Weak Rock					GRAVEL MED (5.00-156.00)
40												
50	MG	N3	GC	WJ			MINERALISED BIF, (N3), Brown, Moderately Weathered, Strong Rock					
60												
70												SLOTTED PVC: Size 50 - Class 25, Slots 1mm (66.00-150.00)
80		N2	G	WJ			MINERALISED BIF, (N2), Brown, Moderately Weathered, Strong Rock	1600	8.4	1		
90	MG		G	WJ			MINERALISED BIF, (N2), Brown, Moderately Weathered, Strong Rock	1180	8.2	1		
100		N1	GJ	W			MINERALISED BIF, (N1), Brown, Moderately Weathered, Strong Rock	1370	8.3	2		
								1070	8.3	3		
					0	100 200		0-5000	0-14	0-50		

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_HYD001 Page: 153

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0228	Hole Length:	156.00

Easting: 208426.87
Northing: 7409724.35
Surface RL: 521.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Jul 22 - 25 Jul 22
Comments: Concrete plinth and monument cover for headworks

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 38.0	DR3	DR	150		EASTERNWELL	KM4
38.0 - 156.0	DR3	CH	250		EASTERNWELL	KM4

TOC RL: 522.36 (Stickup 0.95m) (drilled) SWL: 62.06 MBTOC (27 Jul 22) Dev: N Final pH: -
TOC RL: 522.36 (Stickup 0.95m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat 2	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N1	GJ	W			MINERALISED BIF, (N1), Brown, Moderately Weathered, Strong Rock	1010	8.2	3		GRAVEL MED (5.00-156.00)
110								760	8.2	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (66.00-150.00)
120								850	8.6	3		
130		MM	CJ	GS			UNMINERALISED BIF, (MM), Brown and Yellow, Moderately Weathered, Very Strong Rock	920	8.4	3		
140								810	8.6	4		
150								820	8.6	5		END CAP (150.00)
160								560	8.8	6		
170								360	8.7	6		
180								860	8.7	6		
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0229 **Hole Length:** 206.00

Easting: 208895.31
Northing: 7409925.88
Surface RL: 520.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Aug 22 - 23 Aug 22
Comments: Abandoned.PVC dropped and seperated below 50m.S/up put to make hole visible.Dip to 50mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	DR3	DR	250		EASTERNWELL	NK3
182.0 - 206.0	DR3	CH	250		EASTERNWELL	NK3

TOC RL: 520.90 (Stickup 0.50m) (drilled) SWL: Dev: N Final pH: -
TOC RL: 520.90 (Stickup 0.50m) (current) Is Live: N (23 Aug 22) Date: 02 Aug 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description
0	SF	SZ	ZY	JS		SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular
10	MG	TD3	ZY	K		GRAVEL, silty, (GRAVELLY SILTSTONE), Red and buff and brown, Transported, Non-Cohesive soils, Uniform, Sub-angular
20	SF					
30	MG					
40						
50			Z3	Y		GRAVEL, silty, (CALCRETE), buff and Light or White, Transported, Non-Cohesive soils, Uniform, Sub-rounded
60			ZY	GH		GRAVEL, (VUGHY BRECCIA), buff and Red, Transported, Non-Cohesive soils, Uniform, Sub-rounded
70	SF	TD2	ZK			CLAY, silty, (CLAY), buff and Light or White, Transported, Non-Cohesive soils, Uniform, Rounded
80						
90						
100						

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

Diagram Scaled to 400mm

Notes:
- CEMENT (0.00-5.00)
- BLANK THREADED PVC: Size 50 - Class 25: Casing has separated at 50m and dropped 5.5m (possibly into a cavity). Ventia used one extra length of PVC at the top of the hole to allow it to be visible on the pad. (0.00-70.00)
- GRAVEL MED (5.00-196.00)
- SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (70.00-76.00)
- BLANK THREADED PVC: Size 50 - Class 25 (76.00-82.00)
- SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (82.00-88.00)
- BLANK THREADED PVC: Size 50 - Class 25 (88.00-94.00)
- SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (94.00-100.00)
- BLANK THREADED PVC: Size 50 - Class 25 (100.00-106.00)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0229 **Hole Length:** 206.00

Easting: 208895.31
Northing: 7409925.88
Surface RL: 520.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Aug 22 - 23 Aug 22
Comments: Abandoned.PVC dropped and seperated below 50m.S/up put to make hole visible.Dip to 50mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	DR3	DR	250		EASTERNWELL	NK3
182.0 - 206.0	DR3	CH	250		EASTERNWELL	NK3

GRAVEL MED (5.00-196.00)
SLOTTED THREADED PVC: Size 50 - Class 25 (76.00-82.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (82.00-88.00)
BLANK THREADED PVC: Size 50 - Class 25 (88.00-94.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (94.00-100.00)
BLANK THREADED PVC: Size 50 - Class 25 (100.00-106.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (106.00-112.00)
BLANK THREADED PVC: Size 50 - Class 25 (112.00-118.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (118.00-124.00)
BLANK THREADED PVC: Size 50 - Class 25 (124.00-130.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (130.00-136.00)
BLANK THREADED PVC: Size 50 - Class 25 (136.00-142.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (142.00-148.00)
BLANK THREADED PVC: Size 50 - Class 25 (148.00-154.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (154.00-160.00)
BLANK THREADED PVC: Size 50 - Class 25 (160.00-166.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (166.00-172.00)
BLANK THREADED PVC: Size 50 - Class 25 (172.00-178.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (178.00-184.00)
BLANK THREADED PVC: Size 50 - Class 25 (184.00-190.00)
SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (190.00-196.00)

TOC RL: 520.90 (Stickup 0.50m) (drilled) SWL: Dev: N
TOC RL: 520.90 (Stickup 0.50m) (current) Is Live: N (23 Aug 22) Date: 02 Aug 2022
Final pH:
Final EC:

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	TD2	ZK				CLAY, silty, (CLAY), buff and Light or White, Transported, Non-Cohesive soils, Uniform, Rounded	1690	8.6	1		
110			Z	6K			GRAVEL, clayey, (LIGNITE), buff and Brown and dark or black, Transported, Non-Cohesive soils, Uniform, Sub-rounded	5180	8.5	2		
120		WA2	S	JG			UNMINERALISED BIF, (WA2), Grey and Dark or Black and brown, Highly Weathered, Weak Rock	3500	8.2	2		
130								3750	7.8	2		
140								3420	7.9	2		
150	BG		HJ	SW			UNMINERALISED BIF, (WA2), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	2900	8.3	3		
160								2110	8.4	4		
170								2200	8.5	4		
180								2240	8.3	8		
190		WA1	J	WS			UNMINERALISED BIF, (WA1), Grey and Red, Moderately Weathered, Medium Strong Rock	1010	8.4	8		
200								980	8.4	5		
								930	8.4	6		
								900	8.4	5		
								1001	8.2	7		
								1005	8.3	7		
								1000	8.3	6		
								990	8.4	6		
					0 100 200			0-5000	0-14	0-50		

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_HYD002 Page: 156

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0229 **Hole Length:** 206.00

Easting: 208895.31
Northing: 7409925.88
Surface RL: 520.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Aug 22 - 23 Aug 22
Comments: Abandoned.PVC dropped and seperated below 50m.S/up put to make hole visible.Dip to 50mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	DR3	DR	250		EASTERNWELL	NK3
182.0 - 206.0	DR3	CH	250		EASTERNWELL	NK3

TOC RL: 520.90 (Stickup 0.50m) (drilled) SWL: Dev: N Final pH: -
TOC RL: 520.90 (Stickup 0.50m) (current) Is Live: N (23 Aug 22) Date: 02 Aug 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–110	SF	TD2	ZK				CLAY, silty, (CLAY), buff and Light or White, Transported, Non-Cohesive soils, Uniform, Rounded	1690	8.6	1		
110–120	SF	TD2	Z	6K			GRAVEL, clayey, (LIGNITE), buff and Brown and dark or black, Transported, Non-Cohesive soils, Uniform, Sub-rounded	5180	8.5	2		
120–130	SF	WA2	S	JG			UNMINERALISED BIF, (WA2), Grey and Dark or Black and brown, Highly Weathered, Weak Rock	3500	8.2	2		
130–140	SF	WA2	S	JG			UNMINERALISED BIF, (WA2), Grey and Dark or Black and brown, Highly Weathered, Weak Rock	3750	7.8	2		
140–150	SF	WA2	S	JG			UNMINERALISED BIF, (WA2), Grey and Dark or Black and brown, Highly Weathered, Weak Rock	3420	7.9	2		
150–160	BG	WA2	HJ	SW			UNMINERALISED BIF, (WA2), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	2900	8.3	3		
160–170	BG	WA2	HJ	SW			UNMINERALISED BIF, (WA2), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	2110	8.4	4		
170–180	BG	WA2	HJ	SW			UNMINERALISED BIF, (WA2), Brown and Red and yellow, Moderately Weathered, Medium Strong Rock	2200	8.5	4		
180–190	BG	WA1	J	WS			UNMINERALISED BIF, (WA1), Grey and Red, Moderately Weathered, Medium Strong Rock	2240	8.3	8		
190–200	BG	WA1	J	WS			UNMINERALISED BIF, (WA1), Grey and Red, Moderately Weathered, Medium Strong Rock	1010	8.4	8		
								980	8.4	5		
								930	8.4	6		
								900	8.4	5		
								1001	8.2	7		
								1005	8.3	7		
								1000	8.3	6		
								990	8.4	6		FALLBACK (196.00-206.00)

Log: 0 100 200
EC: 0-5000
pH: 0-14
Yield: 0-50

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_HYD002 Page: 157

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0229 Hole Length: 206.00

Easting: 208895.31
Northing: 7409925.88
Surface RL: 520.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Aug 22 - 23 Aug 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	DR3	DR	250		EASTERNWELL	NK3
182.0 - 206.0	DR3	CH	250		EASTERNWELL	NK3

Comments: Abandoned.PVC dropped and seperated below 50m.S/up put to make hole visible.Dip to 50mbgl.

TOC RL: 520.90 (Stickup 0.50m) (drilled) SWL: Dev: N Final pH: -
TOC RL: 520.90 (Stickup 0.50m) (current) Is Live: N (23 Aug 22) Date: 02 Aug 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	BG	WA1	J	WS			UNMINERALISED BIF, (WA1), Grey and Red, Moderately Weathered, Medium Strong Rock	990	8.4	6		FALLBACK (196.00-206.00)
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0230	Hole Length:	170.00

Easting: 208934.90
Northing: 7409853.35
Surface RL: 520.57
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 13 Oct 22 - 15 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	200		EASTERNWELL	KM4

Comments: Terminated at 170m,upper N3,not enoughrods on padto drill extra. Soft drilling conditions.

TOC RL: 521.42 (Stickup 0.77m) (drilled) SWL: 62.11 MBTOC (17 Oct 22) Dev: N Final pH: -
TOC RL: 521.42 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	QSJ			GRAVEL, silty, (SCREE), Light or White and Pink, Transported, Non-Cohesive soils, Poorly graded, Angular					PERFORATED END CAP (0.00) CEMENT (0.00-2.00) BLANK PVC: Size 50 - Class 25 (0.00-64.00) GRAVEL MED (0.00-170.00)
10												
20		ST3	Z	KG			SILT, clayey, (SILTSTONE), Light or White and Red, Transported, Soft, Gap graded, Sub-rounded					
30												
40												
50	MG	CY3	ZK				CLAY, sandy, (CLAY), Light or White and Yellow, Transported, Very Soft, Gap graded, Sub-rounded	9300	8.3	1		Salts used during drilling
60												
70	SF	WA2	S	GJ			UNMINERALISED BIF, (WA2), Dark or Black and Brown, Highly Weathered, Weak Rock	9150	8.2	1		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (64.00-160.00) Salts used during drilling
								3300	7.7	1		Salts used during drilling
80								1600	7.1	1		
90								1270	6.2	1		
								1650	7.2	1		Flow dropped off through this depth interval so no water quality measurements could be taken.
100										0		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

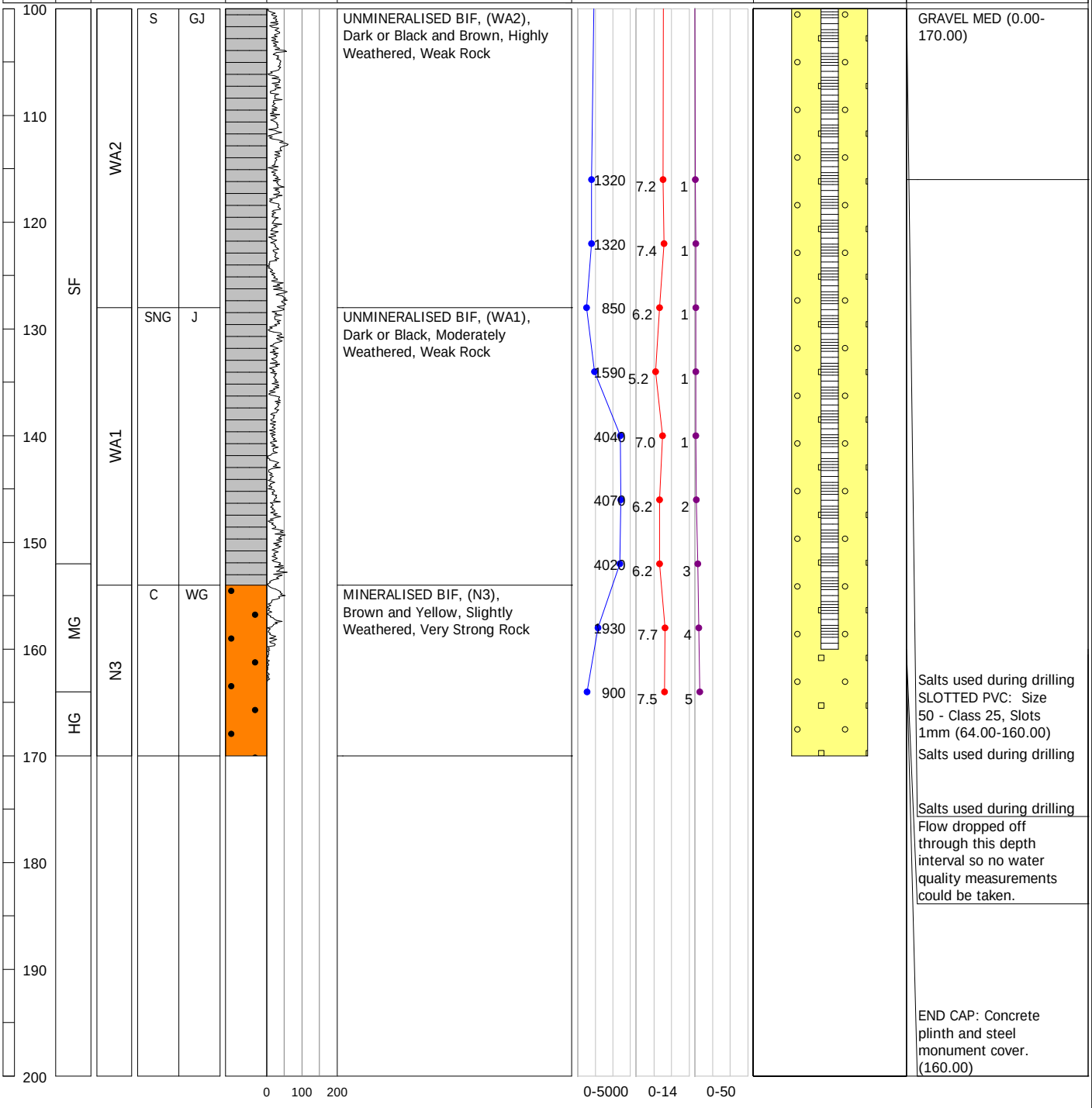
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0230	Hole Length:	170.00

Easting: 208934.90
Northing: 7409853.35
Surface RL: 520.57
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 13 Oct 22 - 15 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	200		EASTERNWELL	KM4

Comments: Terminated at 170m,upper N3,not enoughrods on padto drill extra. Soft drilling conditions.

TOC RL: 521.42 (Stickup 0.77m) (drilled) SWL: 62.11 MBTOC (17 Oct 22) Dev: N Final pH: -
TOC RL: 521.42 (Stickup 0.77m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0231	Hole Length:	182.00

Easting: 209313.21
Northing: 7409842.76
Surface RL: 521.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Oct 22 - 02 Nov 22
Comments: FWS ~ 50-56mbgl. MN unit appears to be missing,inferred fault contact at 124m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 124.0	DR3	DR	200		EASTERNWELL	NK3
124.0 - 182.0	DR3	CH	200		EASTERNWELL	NK3

TOC RL: 522.41 (Stickup 0.94m) (drilled) SWL: 62.72 MBTOC (02 Nov 22) Dev: N Final pH: -
TOC RL: 522.41 (Stickup 0.94m) (current) Is Live: Y (-) Date: 25 Oct 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	JSY			GRAVEL, silty, trace clay, (SCREE), Red and Brown and dark or black, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10		TD3	YK	J			SILT, clayey, trace gravel, (SILTSTONE), Red, Transported, Stiff, Poorly graded, Sub-rounded					CEMENT (0.00-5.00)
20												BLANK PVC: Size 50 - Class 25 (0.00-84.00)
30												GRAVEL MED (5.00-182.00)
40		TD2	G	KJ			GRAVEL, silty, (VUGHY BRECCIA), Yellow and Brown and grey, Transported, Non-Cohesive soils, Well graded, Sub-angular					
50								1007	8.3	1		
60								950	8.3	1		
70								960	8.3	1		
80		WA2	SG	JW			UNMINERALISED BIF, (WA2), Dark or Black and Brown, Highly Weathered, Weak Rock	960	8.2	1		
90	BG							1510	8.2	1		
100								600	8.0	1		
								1260	7.8	7		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (84.00-174.00)
								1170	8.0	6		
		WA1	S	CJ			UNMINERALISED BIF, (WA1), Dark or Black and Brown, Highly Weathered, Weak Rock	1760	7.9	6		
						0 100 200		0-5000	0-14	0-50		

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_HYD005 Page: 161

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0231	Hole Length:	182.00

Easting: 209313.21
Northing: 7409842.76
Surface RL: 521.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Oct 22 - 02 Nov 22
Comments: FWS ~ 50-56mbgl. MN unit appears to be missing,inferred fault contact at 124m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 124.0	DR3	DR	200		EASTERNWELL	NK3
124.0 - 182.0	DR3	CH	200		EASTERNWELL	NK3

TOC RL: 522.41 (Stickup 0.94m) (drilled) SWL: 62.72 MBTOC (02 Nov 22) Dev: N Final pH: -
TOC RL: 522.41 (Stickup 0.94m) (current) Is Live: Y (-) Date: 25 Oct 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	BG	WA1	S	CJ			UNMINERALISED BIF, (WA1), Dark or Black and Brown, Highly Weathered, Weak Rock	1740	7.8	7		GRAVEL MED (5.00-182.00)
110								1320	8.1	7		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (84.00-174.00)
120								1170	8.3	7		
	MG		GJ	LS			MINERALISED BIF, (MM), Brown and Red, Moderately Weathered, Medium Strong Rock	330	8.4	7		
130								500	8.6	7		
								320	8.5	7		
140	HG	MM	J	CS			UNMINERALISED BIF, (MM), Brown and Grey, Slightly Weathered, Strong Rock	310	8.6	7		
								320	8.6	7		
150	MG							350	8.6	7		
								370	8.6	7		
160								440	8.6	8		
170	HG							490	8.7	10		BLANK PVC: Size 50 - Class 25 (174.00-182.00)
180								480	8.6	10		END CAP (182.00)
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0232	Hole Length:	158.00

Easting: 209887.62
Northing: 7409863.33
Surface RL: 520.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Nov 22 - 07 Nov 22
Comments: FWS at 70m. Drilled 8m past target depth to help with install. installed to depth.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	200		EASTERNWELL	KM4
122.0 - 158.0	DR3	CH	200		EASTERNWELL	KM4

TOC RL: 521.83 (Stickup 0.89m) (drilled) SWL: 62.06 MBTOC (07 Nov 22) Dev: N Final pH: -
TOC RL: 521.83 (Stickup 0.89m) (current) Is Live: Y (-) Date: 07 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZYI	KJ			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Light or White and Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					PERFORATED END CAP (0.00)
10												CEMENT (0.00-5.00)
20	MG											BLANK PVC: Size 50 - Class 25 (0.00-84.00)
30	HG		G	SL			MINERALISED BIF, (OA), Brown and Yellow, Moderately Weathered, Medium Strong Rock					GRAVEL MED: (5.00-30.00)
40												GROUT: (30.00-45.00)
50	MG	OA										GRAVEL MED: (45.00-158.00)
60												
70								1100	8.3	1		
80		MN	GW	J			MINERALISED BIF, (MN), Dark or Black and Brown and yellow, Moderately Weathered, Strong Rock	1000	8.4	1		
90	HG							1100	8.8	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (84.00-158.00)
100								1220	8.3	4		
								1100	8.6	6		
								1170	8.5	6		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0232	Hole Length:	158.00

Easting: 209887.62
Northing: 7409863.33
Surface RL: 520.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 Nov 22 - 07 Nov 22
Comments: FWS at 70m. Drilled 8m past target depth to help with install. installed to depth.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	200		EASTERNWELL	KM4
122.0 - 158.0	DR3	CH	200		EASTERNWELL	KM4

TOC RL: 521.83 (Stickup 0.89m) (drilled) SWL: 62.06 MBTOC (07 Nov 22) Dev: N Final pH: -
TOC RL: 521.83 (Stickup 0.89m) (current) Is Live: Y (-) Date: 07 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	MN	GW	J			MINERALISED BIF, (MN), Dark or Black and Brown and yellow, Moderately Weathered, Strong Rock	1310	8.6	6		GRAVEL MED: (45.00-158.00)
110								1320	8.7	6		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (84.00-158.00)
120								1310	8.9	6		
130		MM	J	GW			UNMINERALISED BIF, (MM), Dark or Black and Yellow and blue, Moderately Weathered, Strong Rock	1280	8.4	6		
140								1280	8.7	6		
150								1300	8.6	8		
160								1300	8.7	8		END CAP (158.00)
170								1280	8.6	10		
180								1300	8.6	8		
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0233 **Hole Length:** 200.00

Easting: 209356.55
Northing: 7409902.75
Surface RL: 521.07
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Oct 22 - 23 Oct 22
Comments: Drilled past planned depth of 180m to intersect and test Mount Newman, orebody aquifer.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 116.0	DR3	DR	200		EASTERNWELL	KM4
116.0 - 200.0	DR3	CH	200		EASTERNWELL	KM4, NK3

TOC RL: 521.78 (Stickup 0.61m) (drilled) SWL: 63.08 MBTOC (23 Oct 22) Dev: N Final pH: -
TOC RL: 521.78 (Stickup 0.61m) (current) Is Live: Y (-) Date: 23 Oct 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description
0	SF	SZ	ZY	GWS		GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded
10		GS3	ZY	KWG		SILT, (GRAVELLY SILTSTONE), Light or White and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular
30		CY2	ZK	WJ		CLAY, (CLAY), Light or White and Red, Transported, Non-Cohesive soils, Uniform, Sub-rounded
80		LT2	ZNK	GJ		CLAY, (CLAY), Dark or Black, Transported, Non-Cohesive soils, Poorly graded, Sub-angular
90	MG	WA2	SG			UNMINERALISED BIF, (WA2), Red and Brown, Highly Weathered, Weak Rock
100						

Gamma CPS API: 0 100 200

EC us/cm	pH	Yield L/s
1630	7.8	1
1210	7.8	1
1400	7.8	1
520	7.0	1
1500	8.0	1
1400	7.0	1
1190	8.5	1
0-5000	0-14	0-50

Diagram Scaled to 400mm

Notes:
- PERFORATED END CAP (0.00)
- CEMENT (0.00-5.00)
- BLANK PVC: Size 50 - Class 25 (0.00-72.00)
- GRAVEL MED (5.00-200.00)
- SLOTTED PVC: Size 50 - Class 25, Slots 1mm (72.00-180.00)

BHPIO - Hydrogeology Log

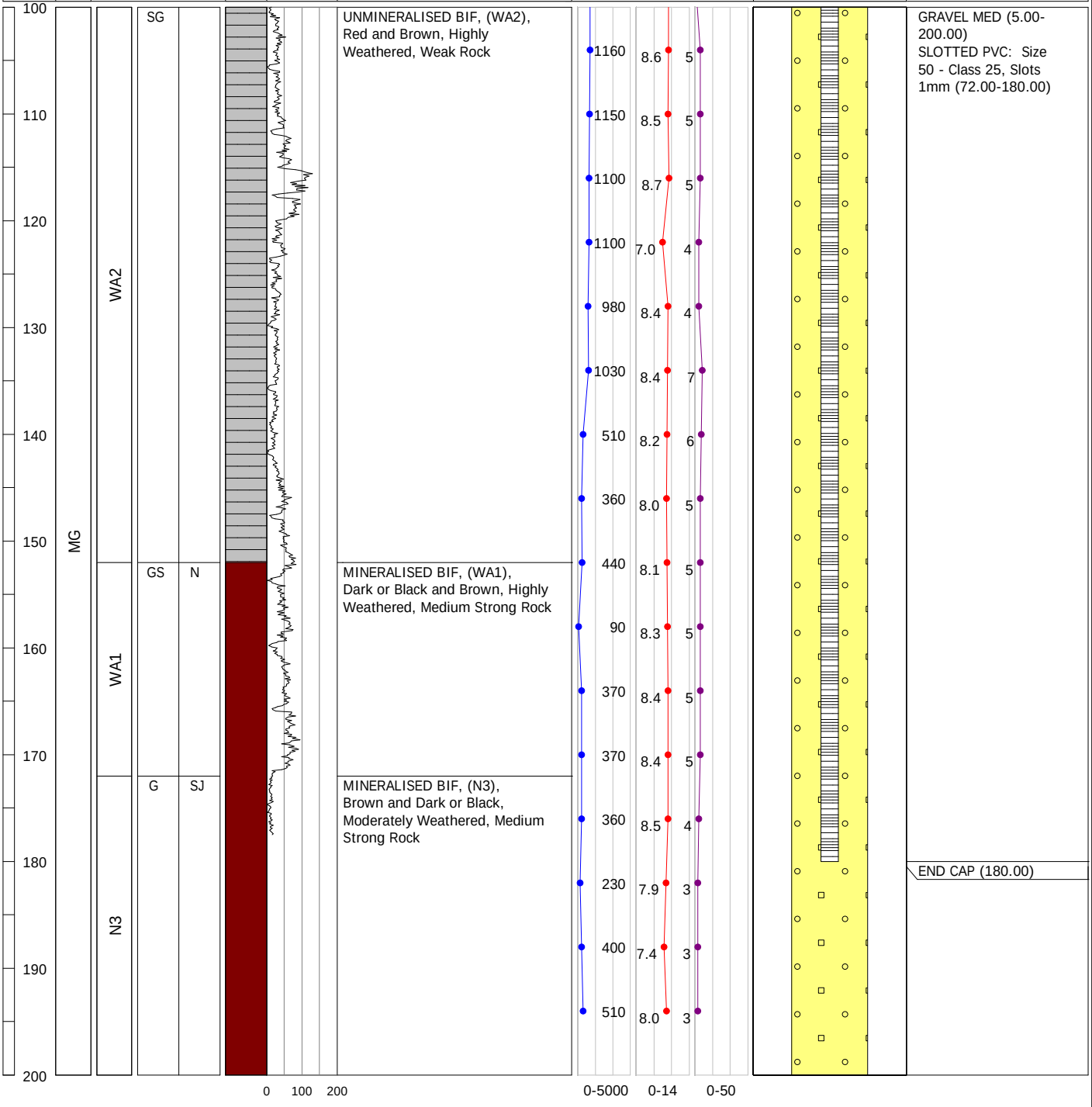
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0233	Hole Length:	200.00

Easting: 209356.55
Northing: 7409902.75
Surface RL: 521.07
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Oct 22 - 23 Oct 22
Comments: Drilled past planned depth of 180m to intersect and test Mount Newman, orebody aquifer.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 116.0	DR3	DR	200		EASTERNWELL	KM4
116.0 - 200.0	DR3	CH	200		EASTERNWELL	KM4, NK3

TOC RL: 521.78 (Stickup 0.61m) (drilled) SWL: 63.08 MBTOC (23 Oct 22) Dev: N Final pH: -
TOC RL: 521.78 (Stickup 0.61m) (current) Is Live: Y (-) Date: 23 Oct 2022 Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0234	Hole Length:	194.00

Easting: 209165.92
Northing: 7409854.72
Surface RL: 521.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 16 Oct 22 - 20 Oct 22
Comments: FWS at 48mbgl. Increase in manganiferous shales at 76-126mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 125.0	DR3	DR	250		EASTERNWELL	KM4
125.0 - 194.0	DR3	CH	200		EASTERNWELL	KM4

TOC RL: 521.90 (Stickup 0.47m) (drilled) SWL: 62.22 MBTOC (20 Oct 22) Dev: N Final pH: -
TOC RL: 521.90 (Stickup 0.47m) (current) Is Live: Y (-) Date: 16 Oct 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Hydrogeological Description
0 - 10	SF	SZ	ZY	SCJ	GRAVEL, sandy, trace silt, (SCREE), Light or White and Yellow, Transported, Non-Cohesive soils, Gap graded, Angular
10 - 30	SF	TD3	Z	SJ	SILT, sandy, (GRAVELLY SILTSTONE), Light or White and Red, Transported, Non-Cohesive soils, Gap graded, Rounded
30 - 50	SF	TD3	Z	SWJ	SAND, gravelly, trace silt, (GRAVELLY SILTSTONE), Yellow, Transported, Non-Cohesive soils, Poorly graded, Rounded
50 - 100	MG / SF	WA1	SW	NJ	UNMINERALISED BIF, (WA1), Brown, Moderately Weathered, Medium Strong Rock

Gamma CPS API: 0 100 200

EC us/cm	pH	Yield L/s
1590	7.1	1
		0
2140	7.8	1
590	5.5	2
780	5.8	1
970	5.8	2
550	7.5	1
720	7.0	1
1790	7.8	1
307	7.2	1

EC 0-5000 pH 0-14 Yield 0-50

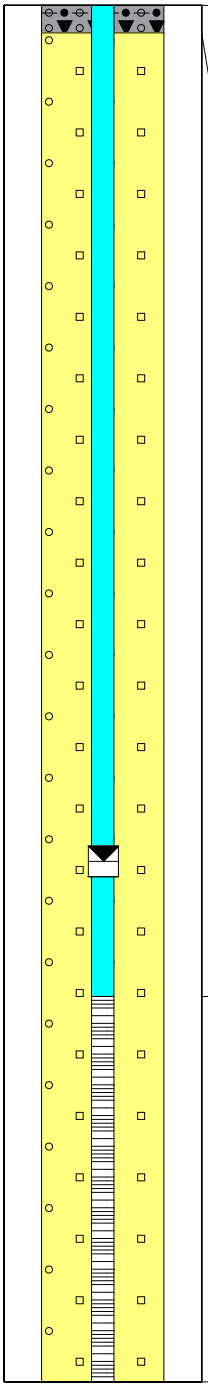


Diagram Scaled to 400mm

Notes:
- PERFORATED END CAP (0.00)
- CEMENT (0.00-2.00)
- BLANK PVC: Size 50 - Class 25 (0.00-72.00)
- GRAVEL MED (2.00-180.00)
- SLOTTED PVC: Size 50 - Class 25, Slots 1mm (72.00-180.00)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0234	Hole Length:	194.00

Easting: 209165.92
Northing: 7409854.72
Surface RL: 521.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 16 Oct 22 - 20 Oct 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 125.0	DR3	DR	250		EASTERNWELL	KM4
125.0 - 194.0	DR3	CH	200		EASTERNWELL	KM4

Comments: FWS at 48mbgl. Increase in manganiferous shales at 76-126mbgl.

TOC RL: 521.90 (Stickup 0.47m) (drilled) SWL: 62.22 MBTOC (20 Oct 22) Dev: N Final pH: -
TOC RL: 521.90 (Stickup 0.47m) (current) Is Live: Y (-) Date: 16 Oct 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–120	SF	WA1	SW	NJ			UNMINERALISED BIF, (WA1), Brown, Moderately Weathered, Medium Strong Rock	420	6.4	1		GRAVEL MED (2.00-180.00)
120–130	HG	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	510	7.8	2		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (72.00-180.00)
130–140	FR	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	410	7.6	2		
140–150	HG	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	530	8.3	2		
150–160	HG	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	540	8.3	5		
160–170	HG	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	460	8.3	5		
170–180	HG	N3	CW	S			UNMINERALISED BIF, (N3), Dark or Black and Brown and blue, Moderately Weathered, Medium Strong Rock	320	8.2	5		
180–190	HG	N2	CJ	S			UNMINERALISED BIF, (N2), Brown and Dark or Black, Slightly Weathered, Strong Rock	400	8.3	5		
190–200	HG	N2	CJ	S			UNMINERALISED BIF, (N2), Brown and Dark or Black, Slightly Weathered, Strong Rock	520	8.5	7		
								430	8.6	7		
								330	8.4	10		
								310	8.3	10		
								410	8.4	10		END CAP (180.00)
								140	7.2	10		

0 100 200 (Gamma CPS API) 0-5000 (EC us/cm) 0-14 (pH) 0-50 (Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0235 Hole Length: 170.00

Easting: 208751.95
Northing: 7409761.14
Surface RL: 521.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 26 Jul 22 - 29 Jul 22
Comments: Concrete plinth and monument cover .

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR3	DR	250		EASTERNWELL	KM4
32.0 - 170.0	DR3	CH	250		EASTERNWELL	KM4

TOC RL: 521.83 (Stickup 0.65m) (drilled) SWL: 61.69 MBTOC (29 Jul 22) Dev: N Final pH: -
TOC RL: 521.83 (Stickup 0.65m) (current) Is Live: Y (-) Date: 29 Jul 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJ	SY			GRAVEL, (SCREE), Red and Grey, Soil, Non-Cohesive soils, Poorly graded, Angular					PERFORATED END CAP (0.00) CEMENT (0.00-5.00) BLANK THREADED PVC: Size 50 - Class 25 (0.00-72.00)
10		TD2	ZY	KJ			GRAVEL, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					GRAVEL MED (5.00-170.00)
30		WA2	SW				UNMINERALISED BIF, (WA2), Red and Brown, Highly Weathered, Weak Rock					
40												
50	MG	WA1	SW	J			UNMINERALISED BIF, (WA1), Red and Brown, Moderately Weathered, Medium Strong Rock					
70												SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (72.00-150.00)
80		N3	W	GS			MINERALISED BIF, (N3), Red and Grey, Moderately Weathered, Medium Strong Rock					
100												

0 100 200

1640 1150 810

8.2 8.4 8.5

1 1 1

0-5000 0-14 0-50

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_HYD009 Page: 169

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0235	Hole Length:	170.00

Easting: 208751.95
Northing: 7409761.14
Surface RL: 521.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 26 Jul 22 - 29 Jul 22
Comments: Concrete plinth and monument cover .

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR3	DR	250		EASTERNWELL	KM4
32.0 - 170.0	DR3	CH	250		EASTERNWELL	KM4

TOC RL: 521.83 (Stickup 0.65m) (drilled) SWL: 61.69 MBTOC (29 Jul 22) Dev: N Final pH: -
TOC RL: 521.83 (Stickup 0.65m) (current) Is Live: Y (-) Date: 29 Jul 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N3	W	GS			MINERALISED BIF, (N3), Red and Grey, Moderately Weathered, Medium Strong Rock	810	8.2	1		GRAVEL MED (5.00-170.00)
110		N2	WG	J			MINERALISED BIF, (N2), Grey and Brown, Moderately Weathered, Medium Strong Rock	840	8.6	2		SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (72.00-150.00)
120								740	8.6	3		
130		N1	WG	JL			MINERALISED BIF, (N1), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock	720	8.4	3		
140		MM	J	WG			UNMINERALISED BIF, (MM), Dark or Black and Red, Moderately Weathered, Strong Rock	710	8.3	3		
150								700	8.3	5		END CAP (150.00)
160			J	CW			UNMINERALISED BIF, (MM), Dark or Black and Brown and red, Moderately Weathered, Strong Rock	740	8.9	5		
170								690	8.7	5		
180								700	8.8	5		
190								640	8.5	5		
200								730	8.6	6		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0236	Hole Length:	152.00

Easting: 210362.93
Northing: 7409887.82
Surface RL: 520.28
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 Nov 22 - 15 Nov 22
Comments: FWS at 62mbgl. Seal installed below detritals to test orebody aquifer.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	200		EASTERNWELL	NK3
122.0 - 152.0	DR3	CH	200		EASTERNWELL	NK3

TOC RL: 521.23 (Stickup 0.87m) (drilled) SWL: 62.45 MBTOC (15 Nov 22) Dev: N Final pH: -
TOC RL: 521.23 (Stickup 0.87m) (current) Is Live: Y (-) Date: 08 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	Z	YJ			SILT, gravelly, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10		TD3	Y	J			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					CEMENT (0.00-5.00)
20												BLANK PVC: Size 50 - Class 25 (0.00-86.00)
30	MG	N2	GW	FL			MINERALISED BIF, (N2), Red and buff and brown, Highly Weathered, Weak Rock					GRAVEL MED (5.00-24.00)
40												CEMENT: Cement/ bentonite mix (24.00-40.00)
50	SF							1550	8.1	2		GRAVEL MED (40.00-152.00)
60								860	7.6	1		
70								1230	8.3	1		
80								1400	8.4	1		
90	MG							830	7.8	1		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (86.00-152.00)
100	BG	N1	GH	F			MINERALISED BIF, (N1), Red and Brown, Moderately Weathered, Medium Strong Rock	1080	8.0	1		
								890	7.8	1		
								1180	8.1	1		
					0	100	200	0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0236	Hole Length:	152.00

Easting: 210362.93
Northing: 7409887.82
Surface RL: 520.28
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 Nov 22 - 15 Nov 22
Comments: FWS at 62mbgl. Seal installed below detritals to test orebody aquifer.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 122.0	DR3	DR	200		EASTERNWELL	NK3
122.0 - 152.0	DR3	CH	200		EASTERNWELL	NK3

TOC RL: 521.23 (Stickup 0.87m) (drilled) SWL: 62.45 MBTOC (15 Nov 22) Dev: N Final pH: -
TOC RL: 521.23 (Stickup 0.87m) (current) Is Live: Y (-) Date: 08 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–120	BG	N1	GH	F			MINERALISED BIF, (N1), Red and Brown, Moderately Weathered, Medium Strong Rock	1180 1190 1190	7.9 7.8 7.8	2 5 5		GRAVEL MED (40.00-152.00) SLOTTED PVC: Size 50 - Class 25, Slots 1mm (86.00-152.00)
120–150	HG	MM	JW	SC			UNMINERALISED BIF, (MM), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock	1220 1350 1520 1550 1490	8.0 8.1 8.1 8.1 8.2	5 6 6 6 5		
150–200												

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

Program: SJB SJG2 DEW Phase 1
Planned Hole: SJG2_FY22_HYD010

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0237	Hole Length:	152.00

Easting: 209615.12
Northing: 7409816.57
Surface RL: 520.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Oct 22 - 05 Nov 22
Comments: Terminated at 152m in MacLeod. FWS 64m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 152.0	DR3	DR	200		EASTERNWELL	KM4

TOC RL: 521.49 (Stickup 0.62m) (drilled) SWL: 61.66 MBTOC (05 Nov 22) Dev: N Final pH: -
TOC RL: 521.49 (Stickup 0.62m) (current) Is Live: Y (-) Date: 02 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZYW	SG			SILT, gravelly, (GRAVELLY SILTSTONE), Brown and Red, Transported, Firm, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) CEMENT (0.00-5.00) BLANK PVC: Size 50 - Class 25 (0.00-66.00) GRAVEL MED (5.00-152.00)
40		CY3	ZK	YG			CLAY, silty, trace gravel, (CLAY), Light or White and Yellow, Transported, Soft, Poorly graded, Sub-rounded					
50	HG	VB2	ZKJ				CLAY, gravelly, (VUGHY BRECCIA), Light or White and Yellow, Transported, Soft, Poorly graded, Sub-rounded					
60		N2	GL	WS			MINERALISED BIF, (N2), Brown and Yellow, Moderately Weathered, Medium Strong Rock	152 990 1350 1200 1330 1190 1170	8.5 8.8 8.8 8.5 8.8 8.9 8.9	2 2 5 5 6 6 5		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (66.00-152.00)
100	SF	N1	GW	J			MINERALISED BIF, (N1), Yellow and Brown, Moderately Weathered, Strong Rock					

0 100 200 (Gamma CPS API) 0-5000 (EC us/cm) 0-14 (pH) 0-50 (Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0237	Hole Length:	152.00

Easting: 209615.12
Northing: 7409816.57
Surface RL: 520.84
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Oct 22 - 05 Nov 22
Comments: Terminated at 152m in MacLeod. FWS 64m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 152.0	DR3	DR	200		EASTERNWELL	KM4

TOC RL: 521.49 (Stickup 0.62m) (drilled) SWL: 61.66 MBTOC (05 Nov 22) Dev: N Final pH: -
TOC RL: 521.49 (Stickup 0.62m) (current) Is Live: Y (-) Date: 02 Nov 2022 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	N1	GW	J			MINERALISED BIF, (N1), Yellow and Brown, Moderately Weathered, Strong Rock	1250	8.9	5		GRAVEL MED (5.00-152.00)
110								1240	8.9	5		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (66.00-152.00)
120	HG	MM	JC	G			UNMINERALISED BIF, (MM), Dark or Black, Slightly Weathered, Very Strong Rock	1240	8.8	5		
130								1220	8.9	5		
140								1240	8.8	5		
150								1250	8.7	5		END CAP (152.00)
160								1350	8.7	5		
170								1290	8.6	5		
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0243	Hole Length:	170.00

Easting: 210820.68
Northing: 7410030.94
Surface RL: 519.21
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Nov 22 - 15 Nov 22
Comments: MB. FWS @62m. Drilled to 170m(20m past planned depth)to capture MN contact.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	250		EASTERNWELL	ML4

TOC RL: 520.17 (Stickup 0.90m) (drilled) SWL: 62.92 MBTOC (15 Nov 22) Dev: N Final pH: -
TOC RL: 520.17 (Stickup 0.90m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJ				GRAVEL, (SCREE), Red, Transported, Non-Cohesive soils, Gap graded, Sub-angular					PERFORATED END CAP: Concrete plinth and steel monument cover. (0.00)
10			Z	3			GRAVEL, (GRAVELLY SILTSTONE), Red and Yellow, Transported, Non-Cohesive soils, Gap graded, Sub-angular					CEMENT (0.00-5.00)
20			Z				GRAVEL, silty, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Gap graded, Sub-angular					BLANK PVC: Size 50 - Class 25 (0.00-146.00)
30												GRAVEL MED (5.00-120.00)
40												
50		TD3	Z	K			CLAY, sandy, (CLAY), Light or White and Brown and grey, Transported, Stiff, Poorly graded, Sub-rounded	333 860 570 700 1070 710 690	7.9 5.5 6.5 4.7 7.3 6.2 5.2	1 1 1 1 1 1 1		
60												
70												
80												
90												
100		TD2	Z	K			CLAY, (CLAY), Dark or Black, Transported, Stiff, Poorly graded, Sub-angular	630	5.3	3		

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0243	Hole Length:	170.00

Easting: 210820.68
Northing: 7410030.94
Surface RL: 519.21
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Nov 22 - 15 Nov 22
Comments: MB. FWS @62m. Drilled to 170m(20m past planned depth)to capture MN contact.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	250		EASTERNWELL	ML4

TOC RL: 520.17 (Stickup 0.90m) (drilled) SWL: 62.92 MBTOC (15 Nov 22) Dev: N Final pH: -
TOC RL: 520.17 (Stickup 0.90m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	TD2	Z	K			CLAY, (CLAY), Dark or Black, Transported, Stiff, Poorly graded, Sub-angular	900	6.1	3		BLANK PVC: Size 50 - Class 25 (0.00-146.00) GRAVEL MED (5.00-120.00)
110								570	6.6	5		
								910	7.4	5		
120		WA1	JS				UNMINERALISED BIF, (WA1), Dark or Black and Grey, Highly Weathered, Very Weak Rock	810	5.2	3		GROUT (120.00-135.00)
								340	6.6	3		
130								820	6.6	5		
140	BG							730	5.4	3		GRAVEL MED (135.00-170.00)
								820	6.9	3		
150								770	6.3	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (146.00-170.00)
160		MN	J				MINERALISED BIF, (MN), Dark or Black, Extremely Weathered, Very Weak Rock	860	6.9	3		
170								1270	7.2	3		END CAP (170.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0246 **Hole Length:** 120.00

Easting: 214783.05
Northing: 7410181.33
Surface RL: 518.54
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Feb 23 - 01 Feb 23
Comments: MB Targeting Painkiller Deposit. FWS at 60m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 519.35 (Stickup 0.82m) (drilled) SWL: 63.43 MBGL (03 Feb 23) Dev: N Final pH: -
TOC RL: 519.35 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	ZK	JCI			SILT, gravelly, trace sand, (SILTSTONE), Red and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10												BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-60.00)
30		TD2	Z	JL			CLAY, gravelly, (VUGHY BRECCIA), Red and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40		MN	G	LJ			MINERALISED BIF, (MN), Yellow and Grey, Moderately Weathered, Medium Strong Rock					
50	MG											
60												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
70												
80												
90			JG	C			UNMINERALISED BIF, (MN), Yellow and Grey, Moderately Weathered, Medium Strong Rock					
100			LG	CJ			MINERALISED BIF, (MN), Yellow and Grey, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0246	Hole Length:	120.00

Easting: 214783.05
Northing: 7410181.33
Surface RL: 518.54
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Feb 23 - 01 Feb 23
Comments: MB Targeting Painkiller Deposit. FWS at 60m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 519.35 (Stickup 0.82m) (drilled) SWL: 63.43 MBGL (03 Feb 23) Dev: N Final pH: -
TOC RL: 519.35 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	MN	LG	CJ			MINERALISED BIF, (MN), Yellow and Grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
120												END CAP (120.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0247	Hole Length:	120.00

Easting: 215950.45
Northing: 7410097.29
Surface RL: 519.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 Jan 23 - 31 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	JP10

Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

TOC RL: 520.12 (Stickup 0.56m) (drilled) SWL: 64.52 MBGL (31 Jan 23) Dev: N Final pH: -
TOC RL: 520.12 (Stickup 0.56m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZX	JC			GRAVEL, clayey, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10			ZX	IJ			GRAVEL, clayey, (GRAVELLY SILTSTONE), Brown and Red and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-60.00)
30												
40												
50		TD2	ZKL	J			CLAY, gravelly, (CLAY), Yellow and Brown and red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
60	MG	N2	G	LJS			MINERALISED BIF, (N2), Brown and Yellow and grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
70												
80		N1	CJ	SG			UNMINERALISED BIF, (N1), Yellow and Brown and grey, Moderately Weathered, Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0247	Hole Length:	120.00

Easting: 215950.45
Northing: 7410097.29
Surface RL: 519.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 30 Jan 23 - 31 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	JP10

TOC RL: 520.12 (Stickup 0.56m) (drilled) SWL: 64.52 MBGL (31 Jan 23) Dev: N Final pH: -
TOC RL: 520.12 (Stickup 0.56m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N1	CJ	SG			UNMINERALISED BIF, (N1), Yellow and Brown and grey, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
120												END CAP (120.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0248	Hole Length:	120.00

Easting: 217342.82
Northing: 7410082.03
Surface RL: 520.48
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Jan 23 - 29 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	JP10

TOC RL: 521.30 (Stickup 0.75m) (drilled) SWL: 63.57 MBGL (30 Jan 23) Dev: N Final pH: -
TOC RL: 521.30 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0		TD3	ZX	JC			GRAVEL, silty, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10			ZX	ICJ			GRAVEL, silty, (GRAVELLY SILTSTONE), Red and Brown and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-60.00)
30												
40		OA	GH	L			MINERALISED BIF, (OA), Brown and Red and grey, Moderately Weathered, Medium Strong Rock					
50			S	JGC			SHALE, (OA), Yellow and Brown and grey, Moderately Weathered, Weak Rock					
60		N3	GL	HJ			MINERALISED BIF, (N3), Brown and Grey and yellow, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-119.00)
70												
80		N2	G	LJ			MINERALISED BIF, (N2), Yellow and Brown and grey, Moderately Weathered, Strong Rock					
90												
100		N1	JC	GL			UNMINERALISED BIF, (N1), Yellow and Brown and grey, Moderately Weathered, Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0248	Hole Length:	120.00

Easting: 217342.82
Northing: 7410082.03
Surface RL: 520.48
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Jan 23 - 29 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	JP10

TOC RL: 521.30 (Stickup 0.75m) (drilled) SWL: 63.57 MBGL (30 Jan 23) Dev: N Final pH: -
TOC RL: 521.30 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100		N1	JC	GL			UNMINERALISED BIF, (N1), Yellow and Brown and grey, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-119.00)
120												END CAP (119.00) FALLBACK (119.00-120.00)

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0249	Hole Length:	120.00

Easting: 218429.45
Northing: 7409712.81
Surface RL: 525.02
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Jan 23 - 27 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 525.71 (Stickup 0.63m) (drilled) SWL: 67.11 MBGL (28 Jan 23) Dev: N Final pH: -
TOC RL: 525.71 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	TD3	ZJ	XHI			GRAVEL, silty, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-60.00)
30			ZX	J			GRAVEL, (GRAVELLY SILTSTONE), Red and Brown and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40			ZK	YLH			CLAY, sandy, trace gravel, (CLAY), buff and Light or White and brown, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
60		TD2	ZG	LK			GRAVEL, silty, trace clay, (VUGHY BRECCIA), Brown and Yellow and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
70		OA	GH	LCJ			MINERALISED BIF, (OA), Brown and Red and grey, Moderately Weathered, Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0249	Hole Length:	120.00

Easting: 218429.45
Northing: 7409712.81
Surface RL: 525.02
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Jan 23 - 27 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	140		WLS	JP10

TOC RL: 525.71 (Stickup 0.63m) (drilled) SWL: 67.11 MBGL (28 Jan 23) Dev: N Final pH: -
TOC RL: 525.71 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	OA	GH	LCJ			MINERALISED BIF, (OA), Brown and Red and grey, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
110			J	SG			UNMINERALISED BIF, (OA), Brown and Dark or Black and grey, Moderately Weathered, Strong Rock					
120												END CAP (120.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0250	Hole Length:	120.00

Easting: 219647.26
Northing: 7409925.13
Surface RL: 530.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 22 Jan 23 - 22 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	BF2

TOC RL: 532.00 (Stickup 1.13m) (drilled) SWL: 72.71 MBGL (28 Jan 23) Dev: N Final pH: -
TOC RL: 532.00 (Stickup 1.13m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	Z	JT			SILT, sandy, trace gravel, (SILTSTONE), Red and Brown, Transported, Very Soft, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10												BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-60.00)
30												
40			Z	JS			GRAVEL, sandy, trace silt, (GRAVELLY SILTSTONE), Red and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50												
60		N3	J	GW			UNMINERALISED BIF, (N3), Grey and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
70	MG											
80		N2	J	HG			UNMINERALISED BIF, (N2), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0250	Hole Length:	120.00

Easting: 219647.26
Northing: 7409925.13
Surface RL: 530.91
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 22 Jan 23 - 22 Jan 23
Comments: MB Targeting Painkiller Deposit. Headworks = PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	BF2

TOC RL: 532.00 (Stickup 1.13m) (drilled) SWL: 72.71 MBGL (28 Jan 23) Dev: N Final pH: -
TOC RL: 532.00 (Stickup 1.13m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N2	J	HG			UNMINERALISED BIF, (N2), Yellow and Brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (60.00-120.00)
110			J	GL			MINERALISED BIF, (N2), Grey and Brown, Slightly Weathered, Strong Rock					
120												END CAP (120.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0251	Hole Length:	120.00

Easting: 220611.89
Northing: 7410174.26
Surface RL: 529.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Jan 23 - 21 Jan 23
Comments: MB Targeting Painkiller deposit . Headworks =PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 530.61 (Stickup 1.15m) (drilled) SWL: 65.72 MBTOC (22 Jan 23) Dev: N Final pH: -
TOC RL: 530.61 (Stickup 1.15m) (current) Is Live: Y (-) Date: 22 Jan 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	GS3	Z	LIK			GRAVEL, clayey, (SCREE), Brown and Red, Transported, Soft, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Headworks = PVC Stick up & Hanging plates (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-58.30)
10			Z	HKL			GRAVEL, clayey, (GRAVELLY SILTSTONE), Brown, Transported, Firm, Poorly graded, Sub-rounded					
20												
30		WA2	JS	L			UNMINERALISED BIF, (WA2), Red and Grey and yellow, Moderately Weathered, Medium Strong Rock					
40												
50		WA1	HG	JC			MINERALISED BIF, (WA1), Dark or Black and Yellow, Moderately Weathered, Medium Strong Rock					
60												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (58.30-118.30)
70												
80		N3	H	1LG			MINERALISED BIF, (N3), Brown and Grey, Moderately Weathered, Medium Strong Rock					
90	SF											
100	MG					0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0251	Hole Length:	120.00

Easting: 220611.89
Northing: 7410174.26
Surface RL: 529.44
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Jan 23 - 21 Jan 23
Comments: MB Targeting Painkiller deposit . Headworks =PVC Stick up & Hanging plates

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 120.0	WLSRC40	RHF	146		WLS	ML4

TOC RL: 530.61 (Stickup 1.15m) (drilled) SWL: 65.72 MBTOC (22 Jan 23) Dev: N Final pH: -
TOC RL: 530.61 (Stickup 1.15m) (current) Is Live: Y (-) Date: 22 Jan 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N3	H	1LG			MINERALISED BIF, (N3), Brown and Grey, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (58.30-118.30)
110		N2	HG	1			MINERALISED BIF, (N2), Yellow and Brown, Moderately Weathered, Medium Strong Rock					
120												END CAP (118.30) FALLBACK (118.30-120.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0252 Hole Length: 132.00

Easting: 208703.24
Northing: 7409725.19
Surface RL: 521.38
Grid Name: MGA94_51
Incl / Azm: -75-->180
Construct: 02 Feb 23 - 02 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 132.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS at 84m. Targeting MM & MU for pore pressure monitoring. VWP sensors to be installed.

TOC RL: 522.08 (Stickup 0.63m) (drilled) SWL: 65.30 MBTOC (04 Feb 23) Dev: N Final pH: -
TOC RL: 522.08 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	ST3	Z	J			SILT, gravelly, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10		GS3	Z	J			GRAVEL, sandy, (GRAVELLY SILTSTONE), Red and Brown and light or white, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: Headworks = PVC Stick up & Hanging Plates (0.00-6.00)
20	SF	MN	J	L			MINERALISED BIF, (MN), Grey and Yellow, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-102.00)
30												
40												
50	MG											
60		MM	J	C			MINERALISED BIF, (MM), Grey and Dark or Black and yellow, Moderately Weathered, Medium Strong Rock					
70												
80	HG											
90	SF	MU	CJ	L			MINERALISED BIF, (MU), Red and Grey, Slightly Weathered, Strong Rock					
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0252	Hole Length:	132.00

Easting: 208703.24
Northing: 7409725.19
Surface RL: 521.38
Grid Name: MGA94_51
Incl / Azm: -75-->180
Construct: 02 Feb 23 - 02 Feb 23
Comments: FWS at 84m. Targeting MM & MU for pore pressure monitoring. VWP sensors to be installed.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 132.0	WLSRC53	RHF	140		WLS	ML4

TOC RL: 522.08 (Stickup 0.63m) (drilled) SWL: 65.30 MBTOC (04 Feb 23) Dev: N Final pH: -
TOC RL: 522.08 (Stickup 0.63m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	MU	CJ	L			MINERALISED BIF, (MU), Red and Grey, Slightly Weathered, Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-102.00)
	MG											SLOTTED PVC: Size 50 - Class 18, Slots 1mm (102.00-132.00)
110	SF		CJ	B			UNMINERALISED BIF, (MU), Light or White and Grey, Slightly Weathered, Strong Rock					
120	MG											
130												END CAP (132.00)
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0253 **Hole Length:** 174.00

Easting: 208889.82
Northing: 7409891.88
Surface RL: 520.47
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Feb 23 - 04 Feb 23
Comments: FWS at 120m. Drillers had issues with MAGSUS readings

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC53	RHF	140		WLS	ML4

TOC RL: 521.32 (Stickup 0.70m) (drilled) SWL: 66.52 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 521.32 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZJ	CO			GRAVEL, clayey, (SILTSTONE), Red and Grey and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 25 (0.00-104.00)
40	BG	CA2	Z3	K			GRAVEL, clayey, (CALCRETE), Light or White and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
60	SF	CY2	K				CLAY, (CLAY), Light or White and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
90	SF	WA2	SJ				UNMINERALISED BIF, (WA2), Grey and Green, Highly Weathered, Weak Rock					

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0253	Hole Length:	174.00

Easting: 208889.82
Northing: 7409891.88
Surface RL: 520.47
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 04 Feb 23 - 04 Feb 23
Comments: FWS at 120m. Drillers had issues with MAGSUS readings

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 174.0	WLSRC53	RHF	140		WLS	ML4

TOC RL: 521.32 (Stickup 0.70m) (drilled) SWL: 66.52 MBTOC (05 Feb 23) Dev: N Final pH: -
TOC RL: 521.32 (Stickup 0.70m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	WA2	SJ				UNMINERALISED BIF, (WA2), Grey and Green, Highly Weathered, Weak Rock					BLANK PVC: Size 50 - Class 25 (0.00-104.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (104.00-174.00)
120												
130												
140	MG											
150	UG	WA1	SJ	L			UNMINERALISED BIF, (WA1), Grey and Green, Moderately Weathered, Medium Strong Rock					
160	HG											
170	SF											END CAP (174.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0254	Hole Length:	156.00

Easting: 209585.78
Northing: 7409904.39
Surface RL: 520.37
Grid Name: MGA94_51
Incl / Azm: -70-->173
Construct: 13 Feb 23 - 13 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	JP10

Comments: FWS @ 87m. Target West Angelas and Detritals BWT for pore pressure monitoring.

TOC RL: 521.20 (Stickup 0.89m) (drilled) SWL: 66.08 MBTOC (14 Feb 23) Dev: N Final pH: -
TOC RL: 521.20 (Stickup 0.89m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZX	YI			SILT, sandy, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Headworks:=PVC Stickup & Hanging Plates (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-114.00)
10			ZX	JYC			GRAVEL, silty, (GRAVELLY SILTSTONE), Red and Yellow and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20		CY2	ZK	CS			CLAY, gravelly, (CLAY), Yellow and Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
30		WA2	JS	G			UNMINERALISED BIF, (WA2), Light or White and buff and red, Moderately Weathered, Weak Rock					
40		WA1	J	GL			UNMINERALISED BIF, (WA1), Brown and Blue and yellow, Moderately Weathered, Medium Strong Rock					
50												
60		N3	J	GL			UNMINERALISED BIF, (N3), Blue and Grey, Moderately Weathered, Strong Rock					
70												
80	MG	N2	GW	LJ			MINERALISED BIF, (N2), Blue and Grey, Moderately Weathered, Strong Rock					
90												
100												

0 100 200 0-5000 0-14 0-50

Program: SJG2 POR Phase 1 Planned Hole: SJG2_FY23_HYD03 Page: 193

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0254	Hole Length:	156.00

Easting: 209585.78
Northing: 7409904.39
Surface RL: 520.37
Grid Name: MGA94_51
Incl / Azm: -70-->173
Construct: 13 Feb 23 - 13 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	JP10

Comments: FWS @ 87m. Target West Angelas and Detritals BWT for pore pressure monitoring.

TOC RL: 521.20 (Stickup 0.89m) (drilled) SWL: 66.08 MBTOC (14 Feb 23) Dev: N Final pH: -
TOC RL: 521.20 (Stickup 0.89m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	N2	GW	LJ			MINERALISED BIF, (N2), Blue and Grey, Moderately Weathered, Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-114.00)
110	HG	N2	GW	L			MINERALISED BIF, (N2), Blue and Grey, Moderately Weathered, Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (114.00-156.00)
120	MG	N1	WJS	GL			UNMINERALISED BIF, (N1), Yellow and Brown and red, Moderately Weathered, Strong Rock					END CAP (156.00)
130												
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0255	Hole Length:	150.00

Easting: 209624.67
Northing: 7409757.73
Surface RL: 521.88
Grid Name: MGA94_51
Incl / Azm: -75-->176
Construct: 14 Feb 23 - 14 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS @ 87m. Target Macleod & Nammuldi BWT for pore pressure monitoring.

TOC RL: 522.65 (Stickup 0.75m) (drilled) SWL: 64.55 MBGL (16 Feb 23) Dev: N Final pH: -
TOC RL: 522.65 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	Z	Y			SILT, gravelly, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10		TD3	ZX	JIC			GRAVEL, (GRAVELLY SILTSTONE), Grey and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK PVC: Size 150 - Class 18: Headworks= PVC Stickup & Hanging Plates (0.00-6.00)
20		VB2	ZX	GLJ			GRAVEL, (VUGHY BRECCIA), Grey and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK PVC: Size 50 - Class 18 (0.00-104.00)
30			ZL	JCG			GRAVEL, (VUGHY BRECCIA), Yellow and Grey, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40			JH	G			MINERALISED BIF, (MM), Blue and Grey and yellow, Moderately Weathered, Medium Strong Rock					
50												
60		MM	J	CL			MINERALISED BIF, (MM), Yellow and Grey, Moderately Weathered, Medium Strong Rock					
70												
80												
90	MG		C	JL			UNMINERALISED BIF, (MM), Light or White and Yellow and grey, Moderately Weathered, Medium Strong Rock					
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0255	Hole Length:	150.00

Easting: 209624.67
Northing: 7409757.73
Surface RL: 521.88
Grid Name: MGA94_51
Incl / Azm: -75-->176
Construct: 14 Feb 23 - 14 Feb 23
Comments: FWS @ 87m. Target Macleod & Nammuldi BWT for pore pressure monitoring.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC53	RHF	140		WLS	ML4

TOC RL: 522.65 (Stickup 0.75m) (drilled) SWL: 64.55 MBGL (16 Feb 23) Dev: N Final pH: -
TOC RL: 522.65 (Stickup 0.75m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	MM	C	JL			UNMINERALISED BIF, (MM), Light or White and Yellow and grey, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-104.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (104.00-150.00)
120			CS	J			UNMINERALISED BIF, (MM), Grey and Red and light or white, Highly Weathered, Very Weak Rock					
130		MU	CJ	S			UNMINERALISED BIF, (MU), Grey and Red, Moderately Weathered, Medium Strong Rock					
140	SF											
150												END CAP (150.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

Program: SJG2 POR Phase 1 Planned Hole: SJG2_FY23_HYD04 Page: 196

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0256	Hole Length:	150.00

Easting: 210520.27
Northing: 7409967.27
Surface RL: 519.48
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Feb 23 - 06 Feb 23
Comments: FWS at 63m. Target West Angelas and Detritals for pore pressure monitoring VWP.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC53	RHF	140		WLS	ML4

TOC RL: 520.23 (Stickup 0.57m) (drilled) SWL: 60.85 MBGL (07 Feb 23) Dev: N Final pH: -
TOC RL: 520.23 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	ZK	JY			CLAY, gravelly, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00)
10		GS3	ZK	JY			GRAVEL, clayey, trace silt, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 18: Headworks: =PVC Stickup & Hanging Plates (0.00-6.00)
20		CA2	Z3	JG			GRAVEL, clayey, trace silt, (CALCRETE), Light or White and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK PVC: Size 50 - Class 18 (0.00-97.00)
30	MG	VB2	ZK	JG			GRAVEL, clayey, (VUGHY BRECCIA), Grey and Red and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
40												
50												
60	UG	WA2	S	J			SHALE, (WA2), Light or White, Moderately Weathered, Medium Strong Rock					
70	SF											
80			JS	G			UNMINERALISED BIF, (WA2), Red and Grey and brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (97.00-145.00)
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0256	Hole Length:	150.00

Easting: 210520.27
Northing: 7409967.27
Surface RL: 519.48
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 05 Feb 23 - 06 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS at 63m. Target West Angelas and Detritals for pore pressure monitoring VWP.

TOC RL: 520.23 (Stickup 0.57m) (drilled) SWL: 60.85 MBGL (07 Feb 23) Dev: N Final pH: -
TOC RL: 520.23 (Stickup 0.57m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	WA2	JS	G			UNMINERALISED BIF, (WA2), Red and Grey and brown, Moderately Weathered, Medium Strong Rock					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (97.00-145.00)
130		WA1	JH	GL			UNMINERALISED BIF, (WA1), Grey and Yellow, Moderately Weathered, Medium Strong Rock					END CAP (145.00) FALLBACK (145.00-150.00)
150												
200						0 100 200		0-5000	0-14	0-50		

Program: SJG2 POR Phase 1 Planned Hole: SJG2_FY23_HYD05 Page: 198

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0257	Hole Length:	156.00

Easting: 210373.80
Northing: 7409823.59
Surface RL: 521.30
Grid Name: MGA94_51
Incl / Azm: -69-->177
Construct: 10 Feb 23 - 11 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	JP10

Comments: FWS @ 72m. Target Macleod (MM) & Nammuldi (MU) BWT for pore pressure monitoring.

TOC RL: 522.29 (Stickup 0.93m) (drilled) SWL: 67.02 MBGL (12 Feb 23) Dev: N Final pH: -
TOC RL: 522.29 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	TD3	ZX	IS			GRAVEL, silty, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: 161mm : Headworks:=PVC Stickup & Hanging Plates (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-102.00)
10												
20		WA2	JS	GL			MINERALISED BIF, (WA2), Red and Brown and grey, Moderately Weathered, Strong Rock					
30												
40												
50		WA1	GH	J			MINERALISED BIF, (WA1), Grey and Brown and blue, Moderately Weathered, Strong Rock					
60		MM	GH	J			MINERALISED BIF, (MM), Dark or Black and Red and brown, Moderately Weathered, Medium Strong Rock					
70												
80												
90												
100		MU	CJ	S			UNMINERALISED BIF, (MU), Grey and Brown and yellow, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

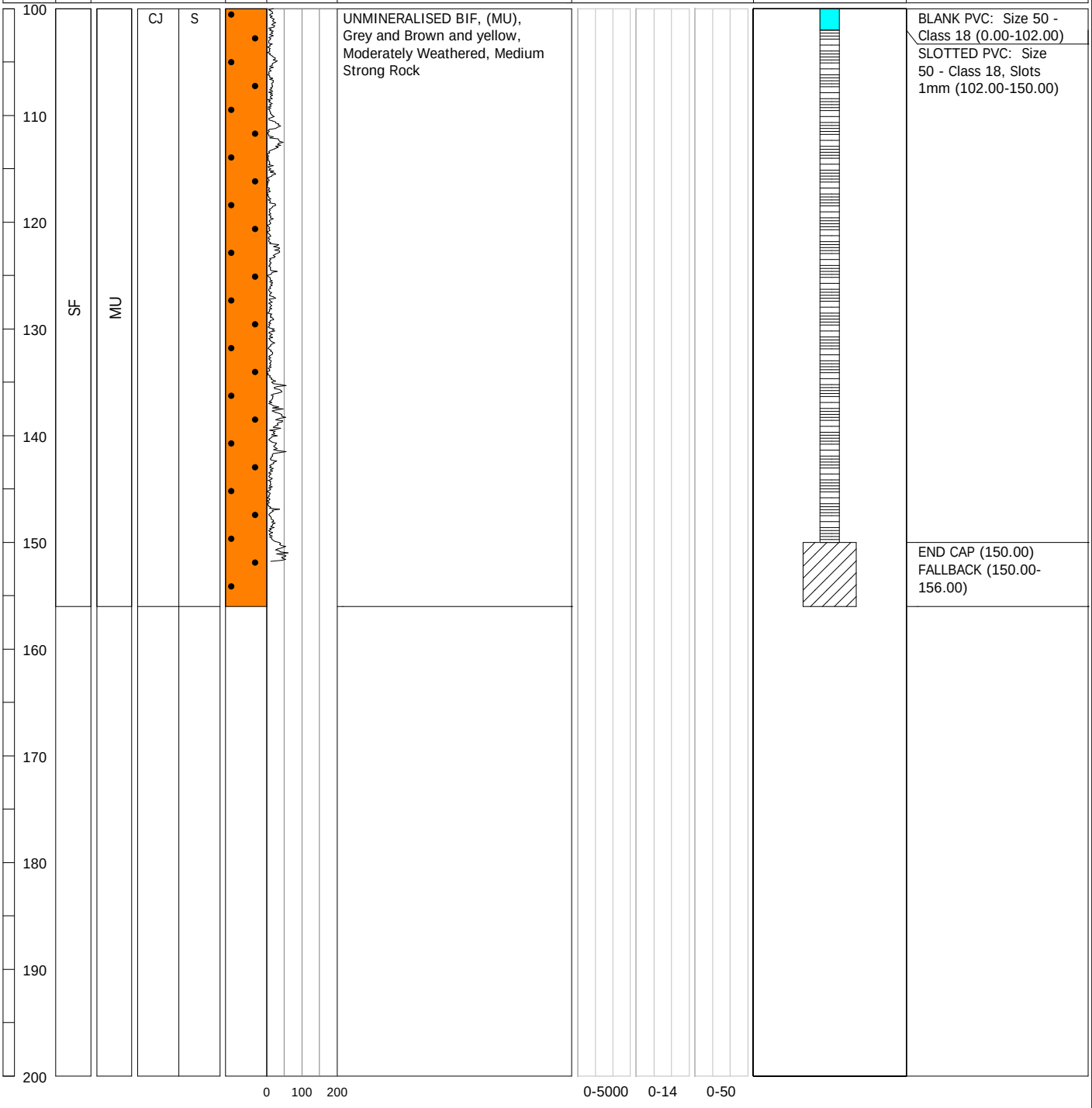
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0257	Hole Length:	156.00

Easting: 210373.80
Northing: 7409823.59
Surface RL: 521.30
Grid Name: MGA94_51
Incl / Azm: -69-->177
Construct: 10 Feb 23 - 11 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	JP10

Comments: FWS @ 72m. Target Macleod (MM) & Nammuldi (MU) BWT for pore pressure monitoring.

TOC RL: 522.29 (Stickup 0.93m) (drilled) SWL: 67.02 MBGL (12 Feb 23) Dev: N Final pH: -
TOC RL: 522.29 (Stickup 0.93m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0258	Hole Length:	156.00

Easting: 211844.85
Northing: 7410226.00
Surface RL: 516.62
Grid Name: MGA94_51
Incl / Azm: -80-->178
Construct: 16 Feb 23 - 17 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS @84m. Target West Angelas and Detritals for pore pressure monitoring VWP. Slotted casing 1mm @99-105m & 150-156m due to stock unavailability & to meet target criteria.

TOC RL: 517.33 (Stickup 0.65m) (drilled) SWL: 60.10 MBTOC (19 Feb 23) Dev: N Final pH: -
TOC RL: 517.33 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZY	CJ			SILT, gravelly, trace clay, (SCREE), Red and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-99.00)
10		VB2	ZJ	KCI			GRAVEL, clayey, (VUGHY BRECCIA), Red and Grey and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
40		TD2	ZK				CLAY, (CLAY), Light or White and Pink, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
80		SD2	ZQ	C			SAND, gravelly, trace clay, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (99.00-105.00)
90	MG											
100												

0 100 200 (Gamma CPS API)
0-5000 (EC us/cm) 0-14 (pH) 0-50 (Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0258	Hole Length:	156.00

Easting: 211844.85
Northing: 7410226.00
Surface RL: 516.62
Grid Name: MGA94_51
Incl / Azm: -80-->178
Construct: 16 Feb 23 - 17 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 156.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS @84m. Target West Angelas and Detritals for pore pressure monitoring VWP. Slotted casing 1mm @99-105m & 150-156m due to stock unavailability & to meet target criteria.

TOC RL: 517.33 (Stickup 0.65m) (drilled) SWL: 60.10 MBTOC (19 Feb 23) Dev: N Final pH: -
TOC RL: 517.33 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	SD2	ZQ	C			SAND, gravelly, trace clay, (SANDSTONE), Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (99.00-105.00)
110			CJG	LS			UNMINERALISED BIF, (OA), Grey and Yellow, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (105.00-150.00)
120												
130	SF	OA										
140												
150												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (150.00-156.00)
160												END CAP (156.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

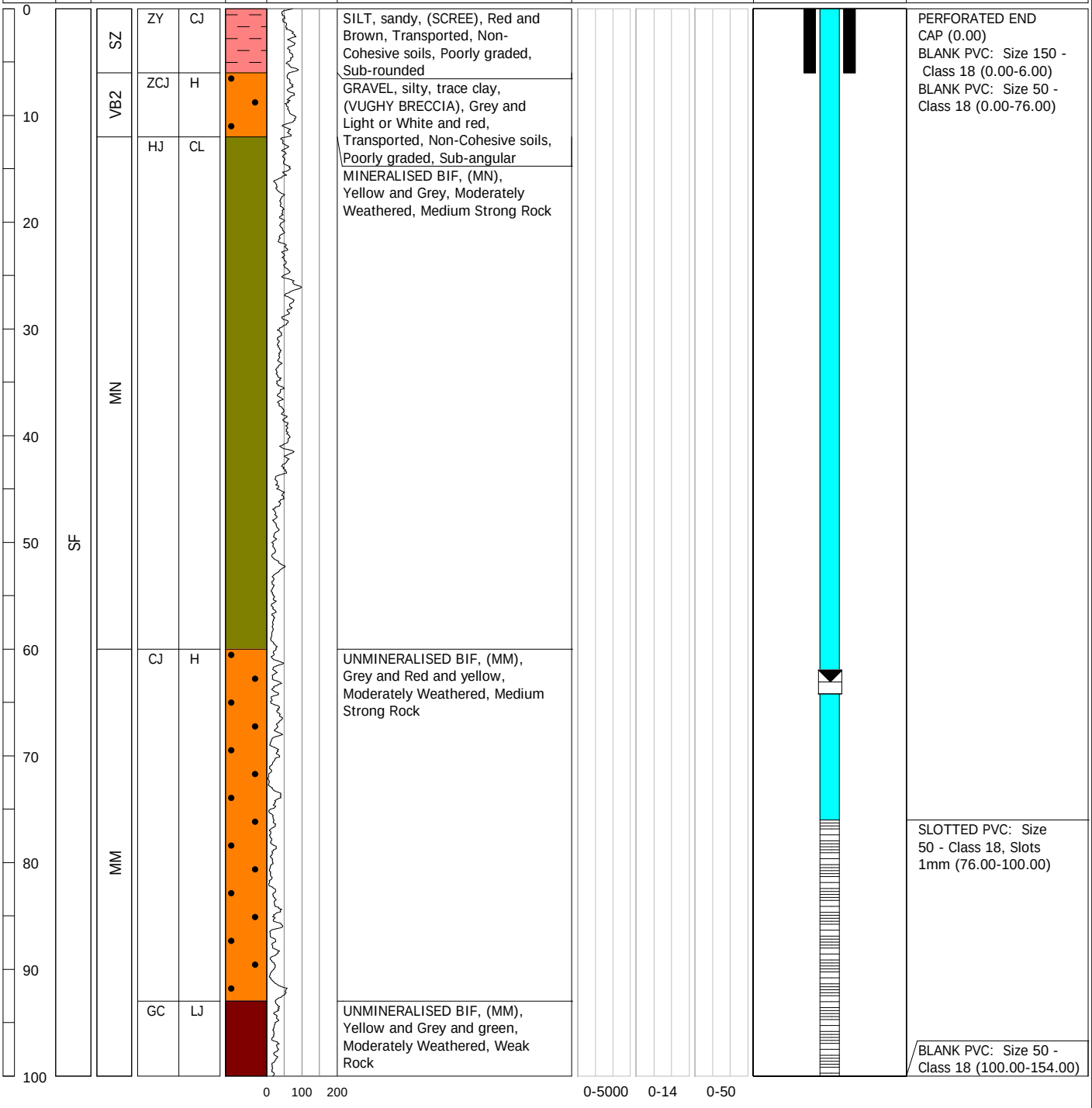
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0259	Hole Length:	168.00

Easting: 211962.77
Northing: 7410028.22
Surface RL: 518.25
Grid Name: MGA94_51
Incl / Azm: -75-->176
Construct: 19 Feb 23 - 19 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 168.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS @ 90m. Target Macleod (MM) & Nammuldi (MU) BWT for pore pressure monitoring. 2 intervals of slotted casing used due to stock unavailability & meet target criteria.

TOC RL: 518.93 (Stickup 0.65m) (drilled) SWL: 63.10 MBTOC (20 Feb 23) Dev: N Final pH: -
TOC RL: 518.93 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0259	Hole Length:	168.00

Easting: 211962.77
Northing: 7410028.22
Surface RL: 518.25
Grid Name: MGA94_51
Incl / Azm: -75-->176
Construct: 19 Feb 23 - 19 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 168.0	WLSRC53	RHF	140		WLS	ML4

Comments: FWS @ 90m. Target Macleod (MM) & Nammuldi (MU) BWT for pore pressure monitoring. 2 intervals of slotted casing used due to stock unavailability & meet target criteria.

TOC RL: 518.93 (Stickup 0.65m) (drilled) SWL: 63.10 MBTOC (20 Feb 23) Dev: N Final pH: -
TOC RL: 518.93 (Stickup 0.65m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	MM	GC	LJ			UNMINERALISED BIF, (MM), Yellow and Grey and green, Moderately Weathered, Weak Rock					BLANK PVC: Size 50 - Class 18 (100.00-154.00)
110												
120		MU	CJ	S			UNMINERALISED BIF, (MU), Grey and Blue and light or white, Moderately Weathered, Medium Strong Rock					
130												
140												
150												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (154.00-166.00)
160												
170												END CAP (166.00) FALLBACK (166.00-168.00)
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0260	Hole Length:	162.00

Easting: 212422.78
Northing: 7410283.74
Surface RL: 516.03
Grid Name: MGA94_51
Incl / Azm: -80-->180
Construct: 25 Feb 23 - 27 Feb 23
Comments: FWS @ 60m. Target West Angela and Detritals for pore pressure monitoring VWP.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 516.85 (Stickup 0.82m) (drilled) SWL: 61.61 MBTOC (27 Feb 23) Dev: N Final pH: -
TOC RL: 516.85 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	ST3	ZY	HS			SILT, sandy, trace gravel, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-58.00)
10		CY3	ZK	HS			CLAY, sandy, trace gravel, (CLAY), Red and Brown, Transported, Soft, Poorly graded, Sub-rounded					
20												
30												
40												
50		TD2	ZY	HS			SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Red and Brown, Transported, Very Soft, Poorly graded, Sub-rounded					
60		VB2	ZG	KL			GRAVEL, clayey, trace sand, (VUGHY BRECCIA), Yellow and Brown, Transported, Soft, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm: Drilers screened up to the water table (58.00-160.00)
70		CY2	ZK	G3			CLAY, silty, trace sand, (CLAY), Light or White and Grey and pink, Transported, Soft, Poorly graded, Sub-angular					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0260 **Hole Length:** 162.00

Easting: 212422.78
Northing: 7410283.74
Surface RL: 516.03
Grid Name: MGA94_51
Incl / Azm: -80-->180
Construct: 25 Feb 23 - 27 Feb 23
Comments: FWS @ 60m. Target West Angela and Detritals for pore pressure monitoring VWP.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC40	RHF	140		WLS	BF2

TOC RL: 516.85 (Stickup 0.82m) (drilled) SWL: 61.61 MBTOC (27 Feb 23) Dev: N Final pH: -
TOC RL: 516.85 (Stickup 0.82m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	CY2	ZK	G3			CLAY, silty, trace sand, (CLAY), Light or White and Grey and pink, Transported, Soft, Poorly graded, Sub-angular					SLOTTED PVC: Size 50 - Class 18, Slots 1mm: Drilers screened up to the water table (58.00-160.00)
110		WA2	JS	GN			SHALE, (WA2), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock					
120												
130	MG											
140												
150												
160		WA1	JG	S			UNMINERALISED BIF, (WA1), Light or White and Brown, Moderately Weathered, Medium Strong Rock					END CAP (160.00) FALLBACK (160.00-162.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0261	Hole Length:	150.00

Easting: 212438.21
Northing: 7410060.92
Surface RL: 520.06
Grid Name: MGA94_51
Incl / Azm: -70-->180
Construct: 01 Mar 23 - 01 Mar 23
Comments: FWS @ 72m. Target Macleod and Namuldi for pore pressure monitoring VWP.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	ML4

TOC RL: 520.98 (Stickup 0.80m) (drilled) SWL: 67.10 MBTOC (01 Mar 23) Dev: N Final pH: -
TOC RL: 520.98 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZY	HJ			SILT, sandy, trace gravel, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00) BLANK PVC: Size 150 - Class 18 (0.00-6.00) BLANK PVC: Size 50 - Class 18 (0.00-108.00)
10												
20	MG	MN	HJ	GL			MINERALISED BIF, (MN), Grey and Yellow and green, Moderately Weathered, Medium Strong Rock					
30												
40												
50												
60	SF	MM	LG	JS			MINERALISED BIF, (MM), Yellow and Grey, Slightly Weathered, Medium Strong Rock					
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0261 **Hole Length:** 150.00

Easting: 212438.21
Northing: 7410060.92
Surface RL: 520.06
Grid Name: MGA94_51
Incl / Azm: -70-->180
Construct: 01 Mar 23 - 01 Mar 23
Comments: FWS @ 72m. Target Macleod and Namuldi for pore pressure monitoring VWP.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 150.0	WLSRC40	RHF	140		WLS	ML4

TOC RL: 520.98 (Stickup 0.80m) (drilled) SWL: 67.10 MBTOC (01 Mar 23) Dev: N Final pH: -
TOC RL: 520.98 (Stickup 0.80m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	SF	MM	LG	JS			MINERALISED BIF, (MM), Yellow and Grey, Slightly Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-108.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (108.00-150.00)
120	MG	MU	CJ				UNMINERALISED BIF, (MU), Green and Grey and yellow, Moderately Weathered, Medium Strong Rock					
130	BG											
140	HG											
150												END CAP (150.00)
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

Program: SJG2 POR Phase 1 Planned Hole: SJG2_FY23_HYD10 Page: 208

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0262	Hole Length:	230.00

Easting: 198392.72
Northing: 7410112.25
Surface RL: 548.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Jan 23 - 10 Jan 23
Comments: Monitoring bore to investigate potable replacement bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	EWMWW06	DR	250		EASTERNWELL	JC3, KM4
200.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	KM4

TOC RL: 548.90 (Stickup 0.76m) (drilled) SWL: 107.84 MBTOC (03 Mar 23) Dev: N Final pH: -
TOC RL: 548.90 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJI	KY			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					PERFORATED END CAP (0.00)
10	MG											CEMENT (0.00-5.00)
												BLANK PVC: Size 50 - Class 25 (0.00-99.00)
20	SF	MM	GF	LS			UNMINERALISED BIF, (MM), Light or White and Yellow and grey, Highly Weathered, Medium Strong Rock					GRAVEL MED (5.00-230.00)
30	MG											
40	SF											
50		N1	GH	SL			MINERALISED BIF, (N1), Light or White and Grey and yellow, Moderately Weathered, Medium Strong Rock					
60	MG											
70	SF											
80	HG	N2	HG	LS1			MINERALISED BIF, (N2), Yellow and Grey, Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (99.00-230.00)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0262 **Hole Length:** 230.00

Easting: 198392.72
Northing: 7410112.25
Surface RL: 548.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Jan 23 - 10 Jan 23
Comments: Monitoring bore to investigate potable replacement bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	EWMWW06	DR	250		EASTERNWELL	JC3, KM4
200.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	KM4

TOC RL: 548.90 (Stickup 0.76m) (drilled) SWL: 107.84 MBTOC (03 Mar 23) Dev: N Final pH: -
TOC RL: 548.90 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Notes
100	HG	N2	HG	LS1		MINERALISED BIF, (N2), Yellow and Grey, Moderately Weathered, Medium Strong Rock				GRAVEL MED (5.00-230.00)
110										SLOTTED PVC: Size 50 - Class 25, Slots 1mm (99.00-230.00)
120	SF		GH	1LS		UNMINERALISED BIF, (N3), Yellow and Grey, Moderately Weathered, Strong Rock	1200	8.5	2	
130	MG						1100	8.2	3	
140							1800	8.9	4	
150	HG	N3					1800	8.7	3	
160							1800	8.4	3	
170	MG						2100	9.2	3	
180							2200	8.7	4	
190		WA1	SG	NL		SHALE, (WA1), Dark or Black and Brown, Moderately Weathered, Weak Rock	2050	8.4	4	
200		N3	GC			UNMINERALISED BIF, (N3), Yellow and Brown, Moderately Weathered, Strong Rock	2	8.3	4	
							2060	8.4	4	
							2	8.4	4	
							2040	8.4	3	
							2050	8.8	3	
							2030	8.4	3	

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50
Diagram: Scaled to 400mm

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0262	Hole Length:	230.00

Easting: 198392.72
Northing: 7410112.25
Surface RL: 548.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 08 Jan 23 - 10 Jan 23
Comments: Monitoring bore to investigate potable replacement bore location.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 200.0	EWMWW06	DR	250		EASTERNWELL	JC3, KM4
200.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	KM4

TOC RL: 548.90 (Stickup 0.76m) (drilled) SWL: 107.84 MBTOC (03 Mar 23) Dev: N Final pH: -
TOC RL: 548.90 (Stickup 0.76m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	N3	GC				UNMINERALISED BIF, (N3), Yellow and Brown, Moderately Weathered, Strong Rock	2030	8.4	3		GRAVEL MED (5.00-230.00)
210								2010	8.4	3		SLOTTED PVC: Size 50 - Class 25, Slots 1mm (99.00-230.00)
220	HG		GC	Q			UNMINERALISED BIF, (N3), Light or White and Yellow and brown, Moderately Weathered, Medium Strong Rock	1900	8.2	4		
230		JN	E				DOLERITE, (JN), Light or White and Blue, Slightly Weathered, Strong Rock	1950	8.2	4		END CAP (230.00)
240								1950	8.2	4		
250												
260												
270												
280												
290												
300												

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0263	Hole Length:	224.00

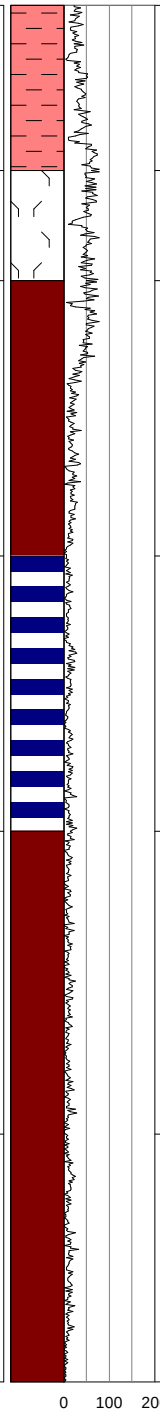
Easting: 198546.53
Northing: 7410101.57
Surface RL: 547.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jan 23 - 17 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	EWMWW06	DR	250		EASTERNWELL	NK3
182.0 - 224.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to site potable PB location. FWS @ 86m. Drilled to 224m and installed to 219m but due to broken ground unable to tag hole past 162m.

TOC RL: 547.43 (Stickup 0.49m) (drilled) SWL: 107.03 MBTOC (17 Feb 23) Dev: N Final pH: -
TOC RL: 547.43 (Stickup 0.49m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Hydrogeological Description
0	MG	ST3	ZY	J	SILT, gravelly, trace sand, (SILTSTONE), Red and Brown and buff, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded
10	SF	CY3	ZK	Y	CLAY, silty, trace sand, (CLAY), Red and buff, Transported, Soft, Poorly graded, Sub-rounded
20		VB2	ZG	L	GRAVEL, silty, trace clay, (VUGHY BRECCIA), Brown and buff and red, Transported, Non-Cohesive soils, Well graded, Sub-rounded
30					
40	BG	MU	J	SC	UNMINERALISED BIF, (MU), Brown and Dark or Black, Moderately Weathered, Medium Strong Rock
50					
60		MM	GW	L	MINERALISED BIF, (MM), Brown and Yellow, Highly Weathered, Weak Rock
70					
80	SF	N1	G	WS	MINERALISED BIF, (N1), Dark or Black and Grey and red, Moderately Weathered, Medium Strong Rock
90					
100					



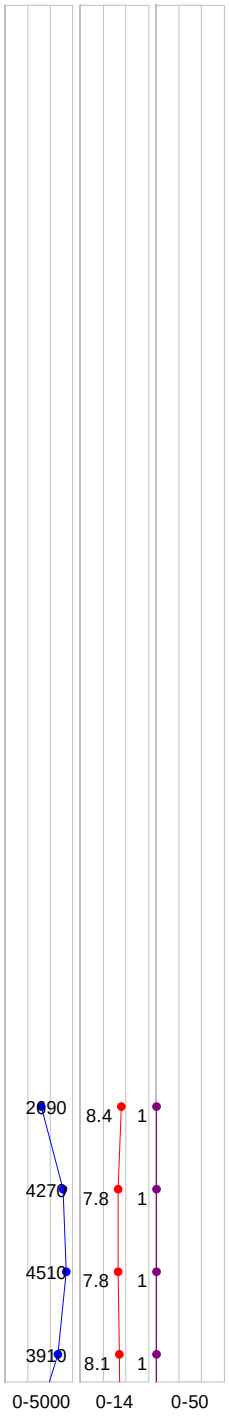
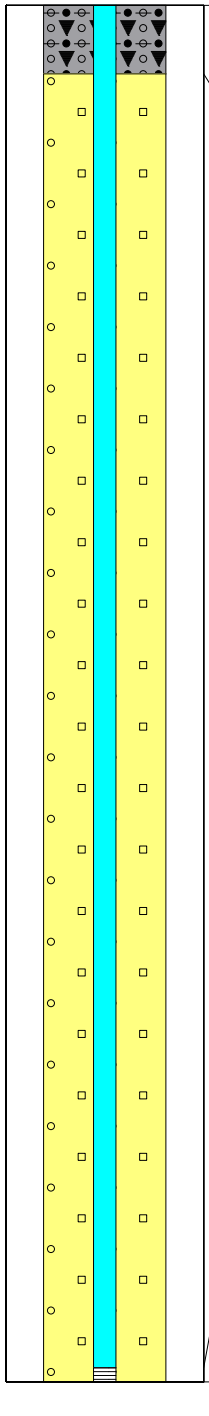


Diagram Scaled to 400mm



Notes:
- CEMENT (0.00-5.00)
- BLANK THREADED PVC: Size 50 - Class 25 (0.00-99.00)
- GRAVEL MED (5.00-219.00)
- SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (99.00-219.00)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0263	Hole Length:	224.00

Easting: 198546.53
Northing: 7410101.57
Surface RL: 547.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jan 23 - 17 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	EWMWW06	DR	250		EASTERNWELL	NK3
182.0 - 224.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to site potable PB location. FWS @ 86m. Drilled to 224m and installed to 219m but due to broken ground unable to tag hole past 162m.

TOC RL: 547.43 (Stickup 0.49m) (drilled) SWL: 107.03 MBTOC (17 Feb 23) Dev: N Final pH: -
TOC RL: 547.43 (Stickup 0.49m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–130	SF / MG	N1	G	WS			MINERALISED BIF, (N1), Dark or Black and Grey and red, Moderately Weathered, Medium Strong Rock	2004 / 1680 / 1470 / 1600 / 1840	8.1 / 8.2 / 7.5 / 8.3 / 8.2	1		GRAVEL MED (5.00-219.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (99.00-219.00)
130–150	MG	N2	W	GH			MINERALISED BIF, (N2), Dark or Black and Grey, Moderately Weathered, Medium Strong Rock					
150–190	BG / MG	N3	W	GH			MINERALISED BIF, (N3), Dark or Black and Grey and red, Moderately Weathered, Medium Strong Rock	2100 / 2110 / 2200 / 2130	8.3 / 8.2 / 8.2 / 8.2	2 / 3 / 3 / 4		
190–200	MG	JN	G	SJ			UNMINERALISED BIF, (JN), Brown and Dark or Black and grey, Moderately Weathered, Medium Strong Rock					

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0263 Hole Length: 224.00

Easting: 198546.53
Northing: 7410101.57
Surface RL: 547.43
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jan 23 - 17 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 182.0	EWMWW06	DR	250		EASTERNWELL	NK3
182.0 - 224.0	EWMWW06	CH	250		EASTERNWELL	NK3

Comments: MB to site potable PB location. FWS @ 86m. Drilled to 224m and installed to 219m but due to broken ground unable to tag hole past 162m.

TOC RL: 547.43 (Stickup 0.49m) (drilled) SWL: 107.03 MBTOC (17 Feb 23) Dev: N Final pH: -
TOC RL: 547.43 (Stickup 0.49m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	MG	JN	G	SJ			UNMINERALISED BIF, (JN), Brown and Dark or Black and grey, Moderately Weathered, Medium Strong Rock	2130	8.2	4		GRAVEL MED (5.00-219.00) SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (99.00-219.00)
210								2130	8.1	3		
220								2200	8.3	4		END CAP (219.00) FALLBACK (219.00-224.00)
230								2240	8.1	4		
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0264	Hole Length:	230.00

Easting: 198696.07
Northing: 7410122.54
Surface RL: 546.76
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 21 Jan 23 - 06 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 146.0	EWMWW06	DR	250		EASTERNWELL	NS3
146.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	NS3

Comments: EC values between 110-146m are anomalous. Difficult ground conditions, hole bridging below 180m, PVC installed to 178m.

TOC RL: 547.38 (Stickup 0.54m) (drilled) SWL: 106.72 MBTOC (06 Feb 23) Dev: N Final pH: -
TOC RL: 547.38 (Stickup 0.54m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	UG	SZ	ZJ	CK			GRAVEL, clayey, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) CEMENT (0.00-5.00) BLANK THREADED PVC: Size 50 - Class 25 (0.00-100.00)
10	SF	TD3	ZJ	KXI			GRAVEL, clayey, trace sand, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					GRAVEL MED (5.00-178.00)
20	UG											
30												
40												
50	SF	MM	CJ	S			UNMINERALISED BIF, (MM), Red and Light or White and yellow, Moderately Weathered, Medium Strong Rock					
60												
70												
80												
90	BG	MN	G	SL			MINERALISED BIF, (MN), Yellow and Dark or Black, Moderately Weathered, Medium Strong Rock					SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (100.00-178.00)
100	MG											

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0264	Hole Length:	230.00

Easting: 198696.07
Northing: 7410122.54
Surface RL: 546.76
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 21 Jan 23 - 06 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 146.0	EWMWW06	DR	250		EASTERNWELL	NS3
146.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	NS3

Comments: EC values between 110-146m are anomalous. Difficult ground conditions, hole bridging below 180m, PVC installed to 178m.

TOC RL: 547.38 (Stickup 0.54m) (drilled) SWL: 106.72 MBTOC (06 Feb 23) Dev: N Final pH: -
TOC RL: 547.38 (Stickup 0.54m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	MN	G	SL			MINERALISED BIF, (MN), Yellow and Dark or Black, Moderately Weathered, Medium Strong Rock	15290	7.8	1		GRAVEL MED (5.00-178.00)
			G	SC								SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (100.00-178.00)
110	BG						MINERALISED BIF, (MN), Dark or Black and Brown, Moderately Weathered, Strong Rock	10640	8.0	1		
								3500	8.3	1		
120								1730	8.1	1		
								14010	8.4	2		
130								7810	8.2	2		
								9900	8.2	2		
140								1760	8.5	2		
								1790	8.6	3		
150		WA1	G	SN			MINERALISED BIF, (WA1), Dark or Black and Brown and red, Moderately Weathered, Strong Rock	1980	8.5	3		
	MG							2080	8.4	3		
160								2030	8.2	3		
	HG	WA2	GS	CN			MINERALISED BIF, (WA2), Brown and Yellow and dark or black, Moderately Weathered, Strong Rock	2090	8.3	3		
170								2050	8.4	3		
	MG							2010	8.2	3		END CAP (178.00)
180												FALLBACK (178.00-230.00)
	FZ	WA1	GC	SQ			UNMINERALISED BIF, (WA1), Brown and Dark or Black, Moderately Weathered, Strong Rock	2000	8.2	3		
190												
								1860	8.3	3		
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0264	Hole Length:	230.00

Easting: 198696.07
Northing: 7410122.54
Surface RL: 546.76
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 21 Jan 23 - 06 Feb 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 146.0	EWMWW06	DR	250		EASTERNWELL	NS3
146.0 - 230.0	EWMWW06	CH	250		EASTERNWELL	NS3

Comments: EC values between 110-146m are anomalous. Difficult ground conditions, hole bridging below 180m, PVC installed to 178m.

TOC RL: 547.38 (Stickup 0.54m) (drilled) SWL: 106.72 MBTOC (06 Feb 23) Dev: N Final pH: -
TOC RL: 547.38 (Stickup 0.54m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	FZ	VA1	GC	SQ			UNMINERALISED BIF, (WA1), Brown and Dark or Black, Moderately Weathered, Strong Rock	860	8.3	3		FALLBACK (178.00-230.00)
210	BG	JN	CJ	E			UNMINERALISED BIF, (JN), Dark or Black and Brown, Moderately Weathered, Strong Rock	1020	8.0	3		
220	HG	WA1	CJ	S			UNMINERALISED BIF, (WA1), Dark or Black and Brown, Moderately Weathered, Strong Rock	990	8.2	3		
230								1020	8.0	3		
240								1040	8.1	3		
250												
260												
270												
280												
290												
300												

0 100 200 (Gamma CPS API)
0-5000 0-14 0-50 (EC us/cm, pH, Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0265	Hole Length:	226.00

Easting: 198811.13
Northing: 7410091.77
Surface RL: 546.52
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Dec 22 - 04 Jan 23
Comments: 8"steel surface casing grouted in from 0-108m to close off broken material above.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 6.0	WLDRIG4	CH	300		WELLDRILL	NK3
6.0 - 226.0	WLDRIG4	CH	200		WELLDRILL	NK3

TOC RL: 547.09 (Stickup 0.55m) (drilled) SWL: 106.61 MBTOC (04 Jan 23) Dev: N Final pH: -
TOC RL: 547.09 (Stickup 0.55m) (current) Is Live: Y (-) Date: 04 Jan 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	GS3	ZJ	KY			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Red and Pink, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					CEMENT (0.00-5.00) BLANK STEEL: Size 12" - W.T.6.35mm (0.00-6.00) BLANK STEEL: Size 8" - W.T.6.35mm (0.00-108.00) BLANK PVC: Size 50 - Class 18 (0.00-111.00) GRAVEL MED (0.00-226.00)
30		VB2	GZ	K			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Brown and Pink and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50		CY2	ZK	Y			CLAY, silty, trace gravel, (CLAY), buff and Red, Transported, Soft, Poorly graded, Sub-rounded					
60	MG	MM	GJ	LS			MINERALISED BIF, (MM), Brown and Yellow and grey, Highly Weathered, Weak Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0265	Hole Length:	226.00

Easting: 198811.13
Northing: 7410091.77
Surface RL: 546.52
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Dec 22 - 04 Jan 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 6.0	WLDRIG4	CH	300		WELLDRILL	NK3
6.0 - 226.0	WLDRIG4	CH	200		WELLDRILL	NK3

Comments: 8"steel surface casing grouted in from 0-108m to close off broken material above.

TOC RL: 547.09 (Stickup 0.55m) (drilled) SWL: 106.61 MBTOC (04 Jan 23) Dev: N Final pH: -
TOC RL: 547.09 (Stickup 0.55m) (current) Is Live: Y (-) Date: 04 Jan 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–110	MG	MM	GJ	LS			MINERALISED BIF, (MM), Brown and Yellow and grey, Highly Weathered, Weak Rock	1106	7.9	2		BLANK STEEL: Size 8" - W.T.6.35mm (0.00-108.00) BLANK PVC: Size 50 - Class 18 (0.00-111.00) GRAVEL MED (0.00-226.00)
110–120	MG	MN	G	SJ			UNMINERALISED BIF, (MN), buff and Brown, Moderately Weathered, Medium Strong Rock	230	8.3	2		
120–130	MG	MN	GW	J			MINERALISED BIF, (MN), Dark or Black and Grey and brown, Moderately Weathered, Medium Strong Rock	590	8.2	2		SLOTTED PVC: Size 50 - Class 18, Slots 1mm (111.00-226.00)
130–140	MG	MN						200	8.5	4		
140–150	MG	MN						170	8.5	4		
150–160	MG	MN						50	8.6	4		
160–170	MG	MN						140	8.7	6		
170–180	HG	MN						220	7.9	6		
180–190	HG	MN						30	6.8	10		
190–200	HG	MN						380	7.8	15		
								230	8.3	15		
								310	8.4	15		
								110	8.8	20		

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

Program: FY23 SJ POTABLE REPLACEMENT
Planned Hole: HSJ0265

BHPIO - Hydrogeology Log

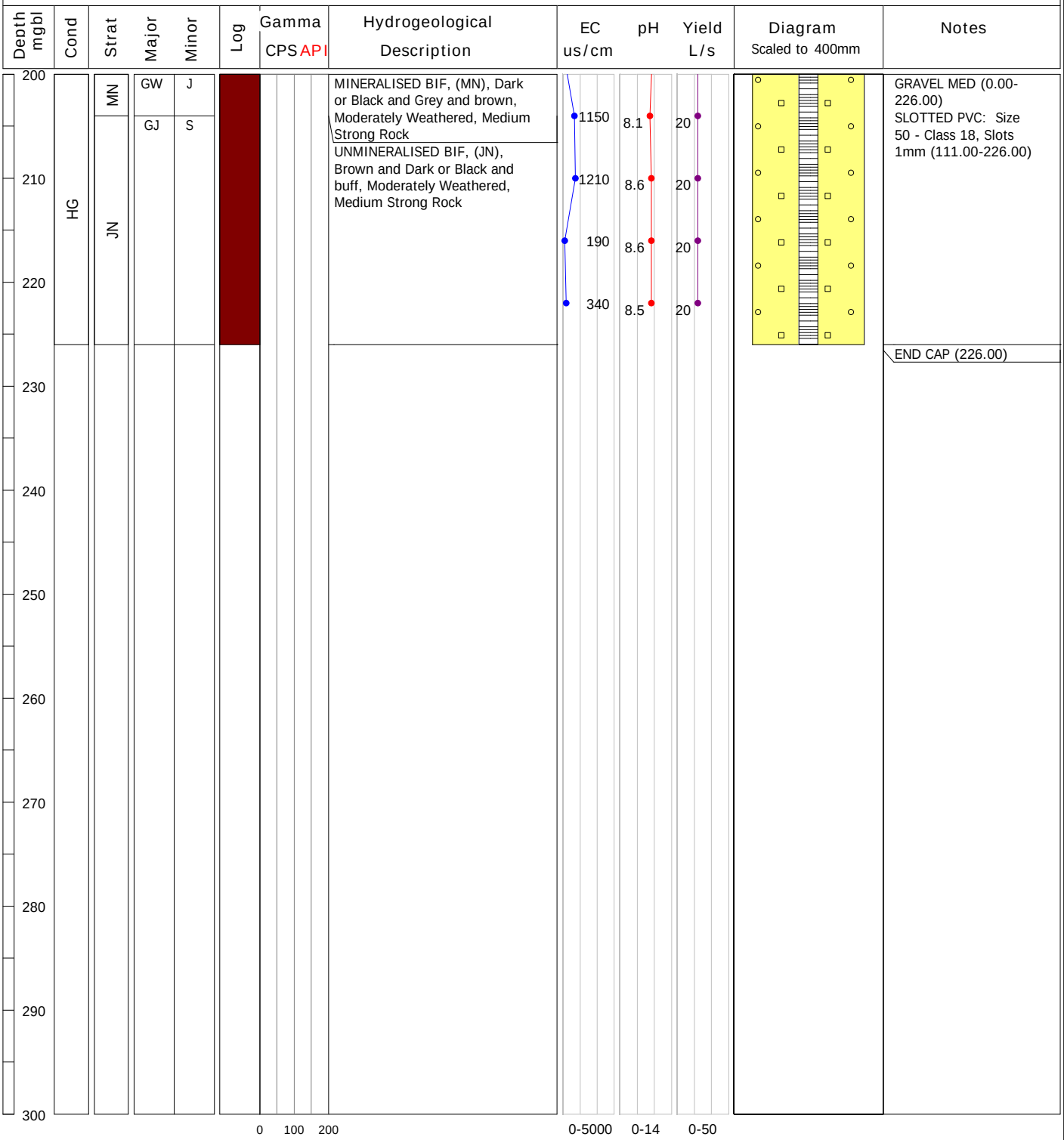
BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0265 Hole Length: 226.00

Easting: 198811.13
Northing: 7410091.77
Surface RL: 546.52
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Dec 22 - 04 Jan 23
Comments: 8"steel surface casing grouted in from 0-108m to close off broken material above.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 6.0	WLDRIG4	CH	300		WELLDRILL	NK3
6.0 - 226.0	WLDRIG4	CH	200		WELLDRILL	NK3

TOC RL: 547.09 (Stickup 0.55m) (drilled) SWL: 106.61 MBTOC (04 Jan 23) Dev: N Final pH: -
TOC RL: 547.09 (Stickup 0.55m) (current) Is Live: Y (-) Date: 04 Jan 2023 Final EC: -



Program: FY23 SJ POTABLE REPLACEMENT Planned Hole: HSJ0265 Page: 220

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0267 **Hole Length:** 210.00

Easting: 200496.99
Northing: 7410047.99
Surface RL: 540.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Jun 23 - 20 Jun 23
Comments: FWS at 128 mbgl. Final yield of 1 L/s. Unable to reach TD of 220m due to fallback. Final install 210m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 52.0	WLDRIG5	ROT	300		WELLDRILL	NS3
52.0 - 210.0	WLDRIG5	CH	200		WELLDRILL	BF2

TOC RL: 541.68 (Stickup 0.94m) (drilled) SWL: 115.99 MBTOC (23 Jun 23) Dev: N Final pH: -
TOC RL: 541.68 (Stickup 0.94m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	ZJ	C			GRAVEL, clayey, trace cobble, (SCREE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) BLANK THREADED STEEL: 324mm (0.00-52.00) BLANK THREADED PVC: Size 50 - Class 25 (0.00-126.00) GRAVEL MED (0.00-210.00)
10		CY3	ZK	J			CLAY, gravelly, trace silt, (CLAY), Red, Transported, Soft, Poorly graded, Sub-rounded					
20												
30												
40		GS3	ZJ	KC			GRAVEL, clayey, trace silt, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50		WA1	JS	C			UNMINERALISED BIF, (WA1), Brown and Red, Moderately Weathered, Medium Strong Rock					
60												
70		N3	G	WS			UNMINERALISED BIF, (N3), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJB SJD2 DEW PHASE 2 Planned Hole: SJ_D2_DEW_PHASE_2_MB02 Page: 221

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0267 **Hole Length:** 210.00

Easting: 200496.99
Northing: 7410047.99
Surface RL: 540.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Jun 23 - 20 Jun 23
Comments: FWS at 128 mbgl. Final yield of 1 L/s. Unable to reach TD of 220m due to fallback. Final install 210m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 52.0	WLDRIG5	ROT	300		WELLDRILL	NS3
52.0 - 210.0	WLDRIG5	CH	200		WELLDRILL	BF2

TOC RL: 541.68 (Stickup 0.94m) (drilled) SWL: 115.99 MBTOC (23 Jun 23) Dev: N Final pH: -
TOC RL: 541.68 (Stickup 0.94m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100–200	MG	N3	G	WS			UNMINERALISED BIF, (N3), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock	1402 1365 1395 1409 1409 1443 1415 1142 730 740 737	7.7 8.1 8.1 8.5 8.2 8.2 8.1 8.2 8.4 8.7 8.3 8.4 8.3	1		BLANK THREADED PVC: Size 50 - Class 25 (0.00-126.00) GRAVEL MED (0.00-210.00)
	BG	N2	G	JS			UNMINERALISED BIF, (N2), Brown, Moderately Weathered, Medium Strong Rock					SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (126.00-210.00)
		N1	G	HC			UNMINERALISED BIF, (N1), Grey and Brown, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJB SJD2 DEW PHASE 2 Planned Hole: SJ_D2_DEW_PHASE_2_MB02 Page: 222

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0267 **Hole Length:** 210.00

Easting: 200496.99
Northing: 7410047.99
Surface RL: 540.74
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 19 Jun 23 - 20 Jun 23
Comments: FWS at 128 mbgl. Final yield of 1 L/s. Unable to reach TD of 220m due to fallback. Final install 210m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 52.0	WLDRIG5	ROT	300		WELLDRILL	NS3
52.0 - 210.0	WLDRIG5	CH	200		WELLDRILL	BF2

TOC RL: 541.68 (Stickup 0.94m) (drilled) SWL: 115.99 MBTOC (23 Jun 23) Dev: N Final pH: -
TOC RL: 541.68 (Stickup 0.94m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
200	BG	N1	G	HC			UNMINERALISED BIF, (N1), Grey and Brown, Moderately Weathered, Medium Strong Rock					GRAVEL MED (0.00-210.00)
210												SLOTTED THREADED PVC: Size 50 - Class 25, Slots 1mm (126.00-210.00)
220												END CAP (210.00)
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0273	Hole Length:	252.00

Easting: 201673.20
Northing: 7409779.42
Surface RL: 536.77
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 May 23 - 28 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 129.0	WLDRIG5	ROT	300		WELLDRILL	NS3
129.0 - 252.0	WLDRIG5	CH	200		WELLDRILL	NS3

Comments: FWS at 138m. Max yield of 7 L/s. Drilled mud rotary to base of detritals to install surface casing, then CH to target depth.

TOC RL: 537.68 (Stickup 0.84m) (drilled) SWL: 82.30 MBTOC (30 May 23) Dev: N Final pH: -
TOC RL: 537.68 (Stickup 0.84m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJK	XI			GRAVEL, clayey, trace cobble, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP (0.00) CEMENT: PVC stickup headworks. (0.00-5.00) BLANK STEEL: 219mm (0.00-124.00) BLANK PVC: Size 50 - Class 18 (0.00-138.00)
10		TD2	ZJ	XI			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20	HG	CY2	ZK	JXI			CLAY, gravelly, trace sand, (CLAY), Red and Brown, Transported, Firm, Poorly graded, Sub-rounded					GRAVEL MED (5.00-129.00)
30												
40												
50												
60												
70												
80												
90		LT2	ZK6	J			CLAY, sandy, trace gravel, (CLAY), Dark or Black, Transported, Firm, Poorly graded, Sub-rounded					
100		CY2	ZK	J			CLAY, gravelly, trace sand, (CLAY), Light or White and Brown, Transported, Firm, Poorly graded, Sub-rounded					
						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJB SJD2 DEW PHASE 2 Planned Hole: SJ_D2_DEW_PHASE_2_MB08 Page: 224

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0273 **Hole Length:** 252.00

Easting: 201673.20
Northing: 7409779.42
Surface RL: 536.77
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 May 23 - 28 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 129.0	WLDRIG5	ROT	300		WELLDRILL	NS3
129.0 - 252.0	WLDRIG5	CH	200		WELLDRILL	NS3

Comments: FWS at 138m. Max yield of 7 L/s. Drilled mud rotary to base of detritals to install surface casing, then CH to target depth.

TOC RL: 537.68 (Stickup 0.84m) (drilled) SWL: 82.30 MBTOC (30 May 23) Dev: N Final pH: -
TOC RL: 537.68 (Stickup 0.84m) (current) Is Live: Y (-) Date: - Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	HG	CY2	ZK	J			CLAY, gravelly, trace sand, (CLAY), Light or White and Brown, Transported, Firm, Poorly graded, Sub-rounded					BLANK STEEL: 219mm (0.00-124.00) BLANK PVC: Size 50 - Class 18 (0.00-138.00) GRAVEL MED (5.00-129.00)
110	MG		SJ	C			UNMINERALISED BIF, (WA2), Brown and Dark or Black, Highly Weathered, Weak Rock					
120	CV											
	MG		S	JN			UNMINERALISED BIF, (WA2), Brown and Dark or Black, Moderately Weathered, Weak Rock					
130			JS	CH			UNMINERALISED BIF, (WA2), Brown and Red, Moderately Weathered, Medium Strong Rock	1703	8.8	5		GRAVEL MED (129.00-252.00)
140	BG							1522	8.4	5		SLOTTED PVC: Size 50 - Class 18, Slots 1mm (138.00-252.00)
								1383	8.1	5		
150	MG		JS	CN			UNMINERALISED BIF, (WA2), Brown and Dark or Black and red, Moderately Weathered, Medium Strong Rock	1419	8.0	5		
160		WA2						1360	8.3	5		
								1340	8.3	5		
170	BG							1317	7.9	5		
								1377	8.3	6		
180			CS	JNQ			UNMINERALISED BIF, (WA2), Brown and Dark or Black, Moderately Weathered, Medium Strong Rock	1320	8.3	6		
								1320	8.4	6		
190	MG							1306	8.2	6		
	BG	WA1	JS	CN			UNMINERALISED BIF, (WA1), Brown and Dark or Black and red, Highly Weathered, Medium Strong Rock	1353	8.5	6		
200												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

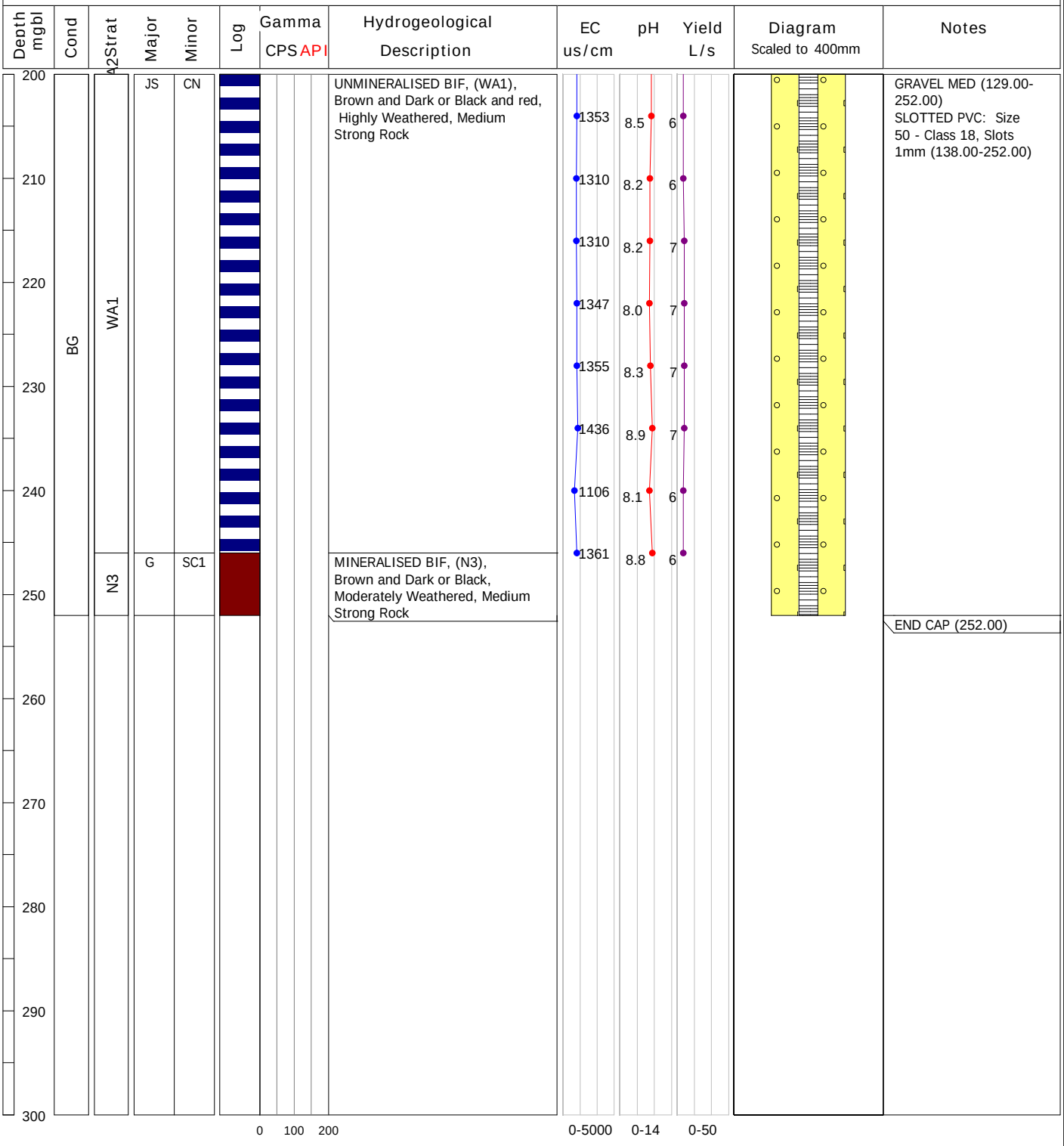
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0273	Hole Length:	252.00

Easting: 201673.20
Northing: 7409779.42
Surface RL: 536.77
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 May 23 - 28 May 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 129.0	WLDRIG5	ROT	300		WELLDRILL	NS3
129.0 - 252.0	WLDRIG5	CH	200		WELLDRILL	NS3

Comments: FWS at 138m. Max yield of 7 L/s. Drilled mud rotary to base of detritals to install surface casing, then CH to target depth.

TOC RL: 537.68 (Stickup 0.84m) (drilled) SWL: 82.30 MBTOC (30 May 23) Dev: N Final pH: -
TOC RL: 537.68 (Stickup 0.84m) (current) Is Live: Y (-) Date: - Final EC: -



Program: FY23 SJB SJD2 DEW PHASE 2 Planned Hole: SJ_D2_DEW_PHASE_2_MB08 Page: 226

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0275 **Hole Length:** 192.00

Easting: 199555.57
Northing: 7409975.01
Surface RL: 544.53
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Aug 23 - 21 Aug 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 12.0	WLDWW07	CH	300		WELLDRILL	JP10
12.0 - 192.0	WLDWW07	CH	200		WELLDRILL	JP10

Comments: Hole terminated @ 192m due to unstable ground & potential for hole to be compromised. FWS @ 126 mbgl. Drilled to N2 strat.

TOC RL: 545.50 (Stickup 0.93m) (drilled) SWL: 118.03 MBTOC (22 Aug 23) Dev: N Final pH: -
TOC RL: 545.50 (Stickup 0.93m) (current) Is Live: Y (-) Date: 23 Aug 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	N1	J	GLC			UNMINERALISED BIF, (N1), Brown and Yellow and red, Moderately Weathered, Medium Strong Rock					PERFORATED END CAP (0.00)
10												CEMENT (0.00-5.00)
20												BLANK STEEL: 219mm (0.00-12.00)
30	BG	N2	JG	SL			UNMINERALISED BIF, (N2), Yellow and Brown, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 25 (0.00-137.00)
40												GRAVEL MED (5.00-12.00)
50	SF											GRAVEL MED: 6T (12.00-191.00)
60	MG											
70	BG		J	GSL			UNMINERALISED BIF, (N2), Brown and Yellow and grey, Moderately Weathered, Medium Strong Rock					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJB SJD2 DEW PHASE 2 Planned Hole: SJ_D2_DEW_PHASE_2_MB10 Page: 227

BHPIO - Hydrogeology Log

BHP

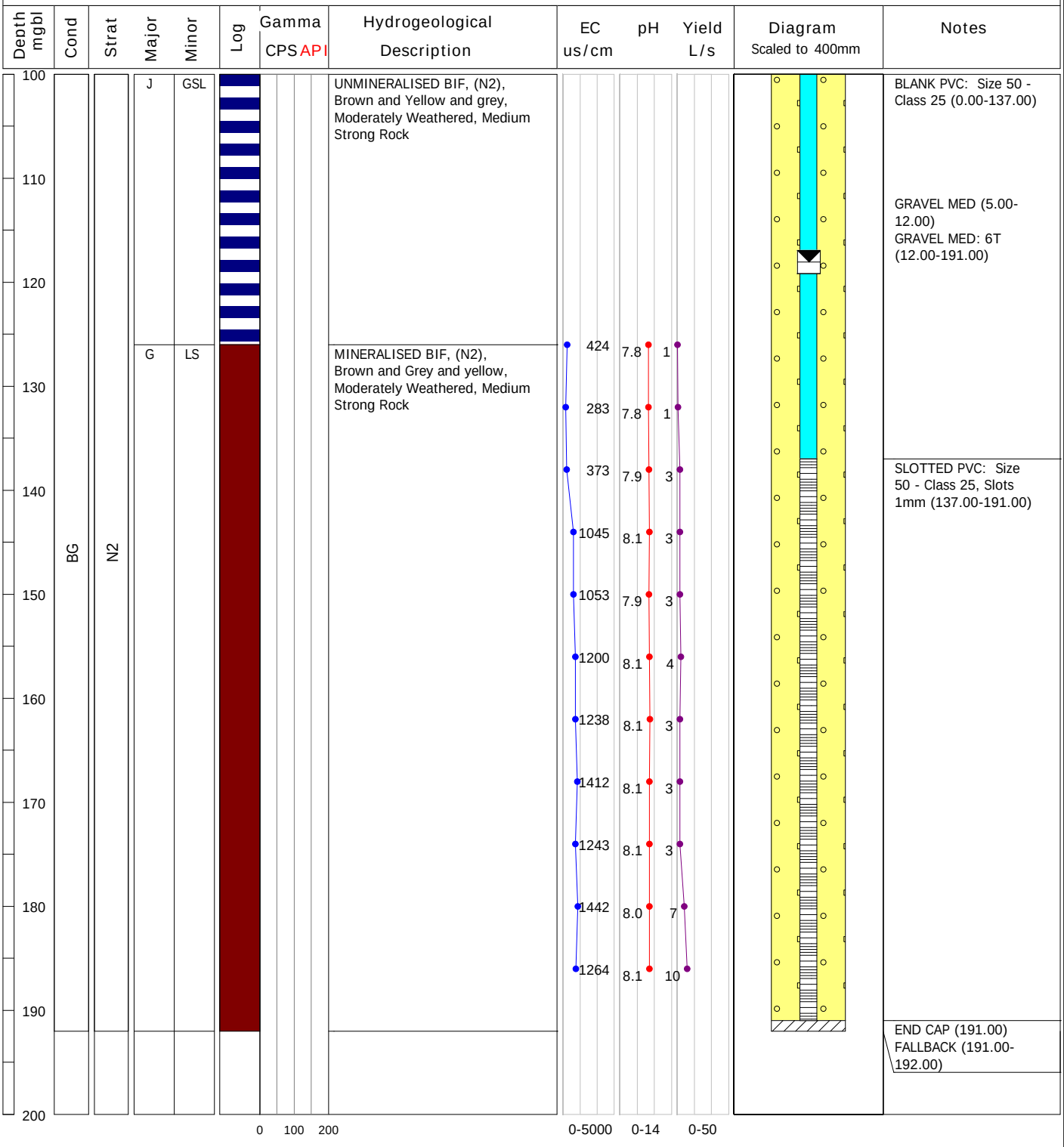
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0275	Hole Length:	192.00

Easting: 199555.57
Northing: 7409975.01
Surface RL: 544.53
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 20 Aug 23 - 21 Aug 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 12.0	WLDWW07	CH	300		WELLDRILL	JP10
12.0 - 192.0	WLDWW07	CH	200		WELLDRILL	JP10

Comments: Hole terminated @ 192m due to unstable ground & potential for hole to be compromised. FWS @ 126 mbgl. Drilled to N2 strat.

TOC RL: 545.50 (Stickup 0.93m) (drilled) SWL: 118.03 MBTOC (22 Aug 23) Dev: N Final pH: -
TOC RL: 545.50 (Stickup 0.93m) (current) Is Live: Y (-) Date: 23 Aug 2023 Final EC: -



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0283	Hole Length:	162.00

Easting: 203155.46
Northing: 7410106.28
Surface RL: 534.19
Grid Name: MGA94_51
Incl / Azm: -60-->199
Construct: 23 Sep 23 - 27 Sep 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC45	RHF	146		WLS	FH

Comments: FWS @ 84mbgl with VB2 from 102 - 160m. The expected LT2 was not intersected.

TOC RL: 534.73 (Stickup 0.62m) (drilled) SWL: 93.73 MBTOC (27 Sep 23) Dev: N Final pH: -
TOC RL: 534.73 (Stickup 0.62m) (current) Is Live: Y (-) Date: 26 Sep 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZHJ	C			GRAVEL, silty, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP: PVC stickup and hanging plates (0.00)
6		TD3	ZKH	Y			GRAVEL, clayey, (SILTSTONE), buff and Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK PVC: Size 50 - Class 18 (0.00-6.00)
10		CY3	Z				CLAY, (CLAY), Red and Light or White and brown, Transported, Stiff, Uniform, Rounded					BLANK PVC: Size 50 - Class 18 (0.00-88.00)
30	SF											
80	MG	CY2	Z				CLAY, trace gravel, (CLAY), Light or White and Yellow and red, Transported, Stiff, Uniform, Rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (88.00-160.00)
100												

0 100 200 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0283	Hole Length:	162.00

Easting: 203155.46
Northing: 7410106.28
Surface RL: 534.19
Grid Name: MGA94_51
Incl / Azm: -60-->199
Construct: 23 Sep 23 - 27 Sep 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 162.0	WLSRC45	RHF	146		WLS	FH

Comments: FWS @ 84mbgl with VB2 from 102 - 160m. The expected LT2 was not intersected.

TOC RL: 534.73 (Stickup 0.62m) (drilled) SWL: 93.73 MBTOC (27 Sep 23) Dev: N Final pH: -
TOC RL: 534.73 (Stickup 0.62m) (current) Is Live: Y (-) Date: 26 Sep 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	CY2	Z				CLAY, trace gravel, (CLAY), Light or White and Yellow and red, Transported, Stiff, Uniform, Rounded					SLOTTED PVC: Size 50 - Class 18, Slots 1mm (88.00-160.00)
110		TD2	ZG	KW			CLAY, gravelly, (VUGHY BRECCIA), Dark or Black, Transported, Stiff, Uniform, Rounded					
120												
130												
140												
150												
160												END CAP (160.00) FALLBACK (160.00-162.00)
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0287	Hole Length:	183.00

Easting: 206448.51
Northing: 7410012.73
Surface RL: 525.42
Grid Name: MGA94_51
Incl / Azm: -89-->85
Construct: 30 Sep 23 - 30 Sep 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 183.0	WLSRC45	RHF	146		WLS	FH

Comments: FWS not recorded as driller could not estimate a depth given the thick clay interval being drilled. Hole deviated from 100-150m?

TOC RL: 525.96 (Stickup 0.65m) (drilled) SWL: 98.19 MBTOC (01 Oct 23) Dev: N Final pH: -
TOC RL: 525.96 (Stickup 0.65m) (current) Is Live: Y (-) Date: 30 Sep 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	SF	SZ	ZJG	HQ			GRAVEL, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					PERFORATED END CAP: PVC stickup and hanging plates (0.00)
10		TD3	ZIK	GQ			GRAVEL, (GRAVELLY SILTSTONE), Red and Brown and light or white, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK PVC: Size 150 - Class 9 (B/C) (0.00-6.00)
20												BLANK PVC: Size 50 - Class 18 (0.00-102.00)
30												
40	SF											
50			Z3	K			GRAVEL, (CALCRETE), Red and Light or White, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
60												
70		TD2	ZG	LK			GRAVEL, (VUGHY BRECCIA), Brown and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
80	MG		ZK				CLAY, (CLAY), buff and Light or White and pink, Transported, Stiff, Uniform, Rounded					
90												
100		WA2	JC	N			UNMINERALISED BIF, (WA2), Yellow and Dark or Black, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0287	Hole Length:	183.00

Easting: 206448.51
Northing: 7410012.73
Surface RL: 525.42
Grid Name: MGA94_51
Incl / Azm: -89-->85
Construct: 30 Sep 23 - 30 Sep 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 183.0	WLSRC45	RHF	146		WLS	FH

Comments: FWS not recorded as driller could not estimate a depth given the thick clay interval being drilled. Hole deviated from 100-150m?

TOC RL: 525.96 (Stickup 0.65m) (drilled) SWL: 98.19 MBTOC (01 Oct 23) Dev: N Final pH: -
TOC RL: 525.96 (Stickup 0.65m) (current) Is Live: Y (-) Date: 30 Sep 2023 Final EC: -

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	WA2	JC	N			UNMINERALISED BIF, (WA2), Yellow and Dark or Black, Moderately Weathered, Medium Strong Rock					BLANK PVC: Size 50 - Class 18 (0.00-102.00)
110												SLOTTED PVC: Size 50 - Class 18, Slots 1mm (102.00-180.00)
120												
130												
140		WA1	G	JLS			MINERALISED BIF, (WA1), Red and Brown, Moderately Weathered, Medium Strong Rock					
150												
160												
170		N3	C	JL			CHERT, (N3), Brown and Yellow and blue, Slightly Weathered, Strong Rock					
180												END CAP (180.00) FALLBACK (180.00-183.00)
190												
200						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJF2 POR Phase 1 Planned Hole: HSJ0287 Page: 232

BHPIO - Hydrogeology Log

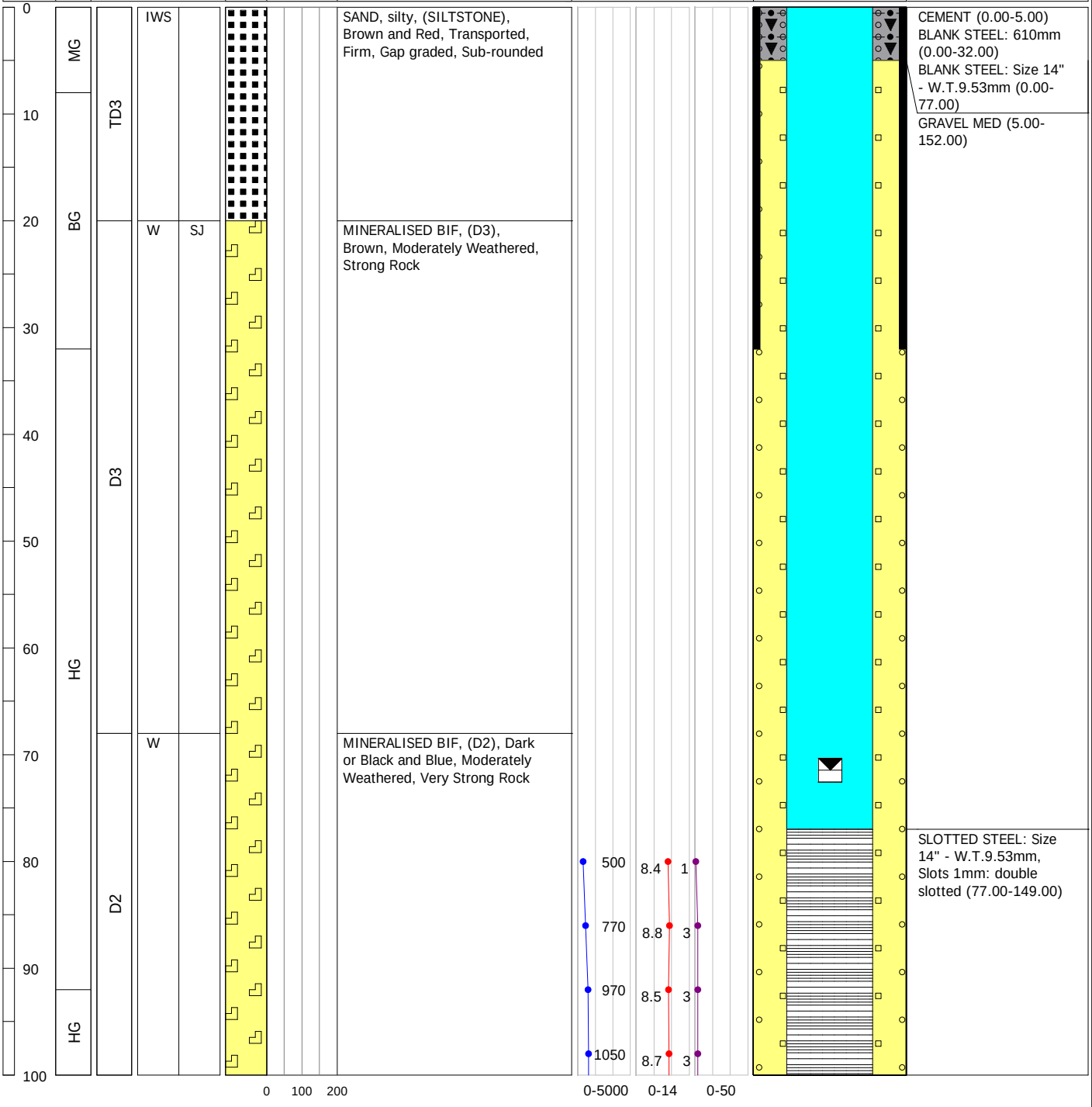
BHP

Project:	HASHIMOTO	Hole Name:	HEJ0057	Hole Length:	152.00

Easting: 218640.33
Northing: 7411616.97
Surface RL: 529.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Oct 22 - 12 Oct 22
License: CAW205880
Comments: Terminated @152m,risk of hitting Mt McRae Shales & DR casing getting tight. FWS at 80mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR3	DR	600		EASTERNWELL	KM4
32.0 - 152.0	DR3	DR	500		EASTERNWELL	KM4

TOC RL: 529.49 (Stickup 0.37m) (drilled) SWL: 71.46 MBTOC (12 Oct 22) Dev: Y: 10.3 hour(s) Final pH: 8.5
TOC RL: 529.49 (Stickup 0.37m) (current) Is Live: Y (-) Date: 10 Oct 2022 Final EC: 1005.00



BHPIO - Hydrogeology Log

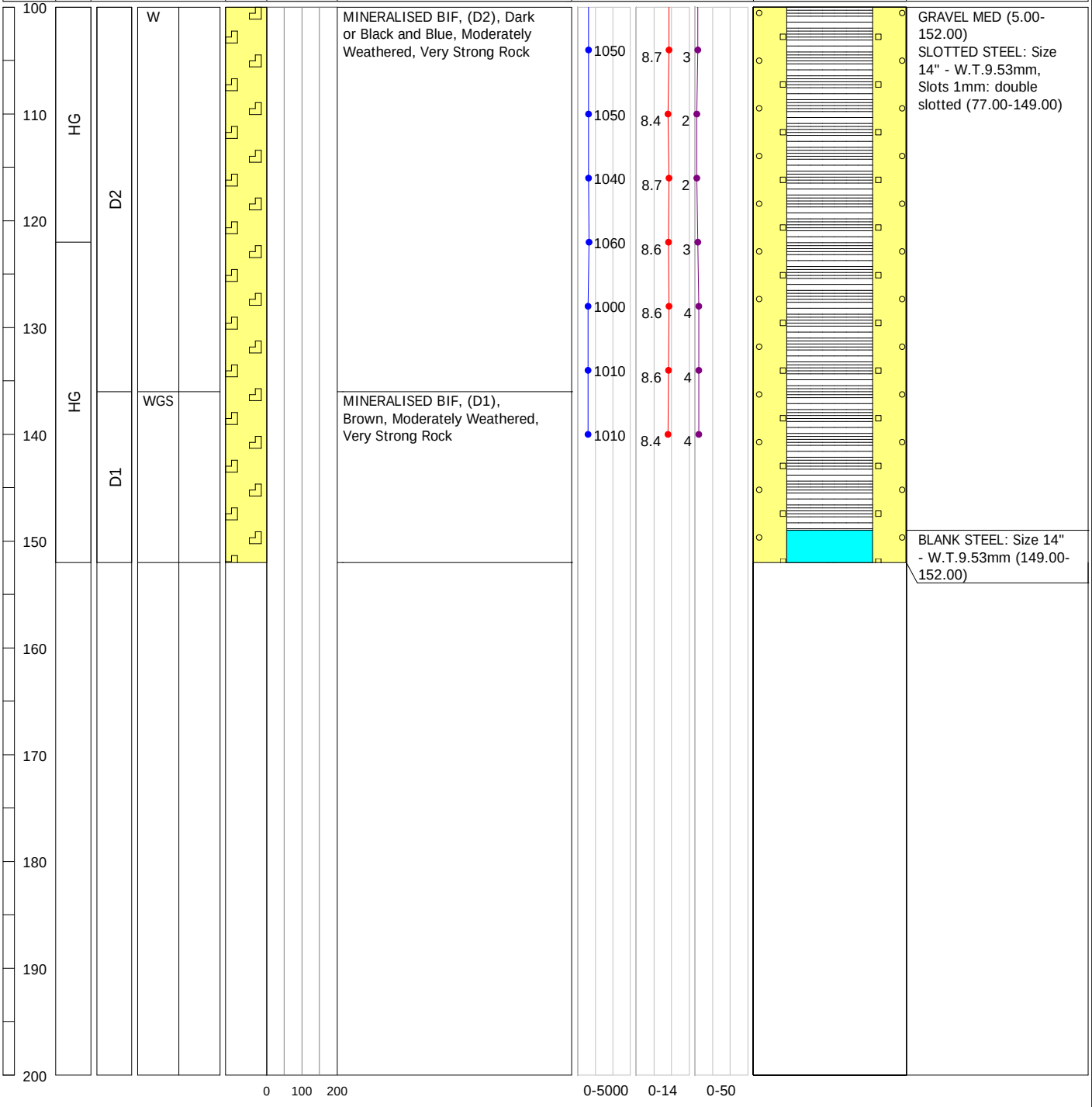
BHP

Project: HASHIMOTO **Hole Name:** HEJ0057 **Hole Length:** 152.00

Easting: 218640.33
Northing: 7411616.97
Surface RL: 529.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Oct 22 - 12 Oct 22
License: CAW205880
Comments: Terminated @152m,risk of hitting Mt McRae Shales & DR casing getting tight. FWS at 80mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR3	DR	600		EASTERNWELL	KM4
32.0 - 152.0	DR3	DR	500		EASTERNWELL	KM4

TOC RL: 529.49 (Stickup 0.37m) (drilled) SWL: 71.46 MBTOC (12 Oct 22) Dev: Y: 10.3 hour(s) Final pH: 8.5
TOC RL: 529.49 (Stickup 0.37m) (current) Is Live: Y (-) Date: 10 Oct 2022 Final EC: 1005.00



BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HEJ0058 **Hole Length:** 122.00

Easting: 218952.94
Northing: 7411763.46
Surface RL: 544.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Sep 22 - 01 Oct 22
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 37.0	DR5	DR	600		EASTERNWELL	KM4
37.0 - 85.0	DR5	DR	500		EASTERNWELL	KM4, NK3
85.0 - 122.0	DR5	DR	450		EASTERNWELL	NK3

Comments: Terminated at 122m in McRae shales, meeting termination criteria. FWS at 92 mbgl.

TOC RL: 544.68 (Stickup 0.30m) (drilled) SWL: 86.62 MBGL (01 Oct 22) Dev: Y: 15.8 hour(s) Final pH: 8.3
TOC RL: 544.68 (Stickup 0.30m) (current) Is Live: Y (-) Date: 27 Sep 2022 Final EC: 991.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	MG	J1	GW				MINERALISED BIF, (J1), Blue and Grey, Moderately Weathered, Strong Rock					CEMENT (0.00-5.00) BLANK STEEL: Size 24" - W.T.9.53mm: 24 inch surface casing left in ground (0.00-24.00) BLANK STEEL: Size 14" - W.T.9.53mm (0.00-89.00) GRAVEL MED (5.00-122.00)
20	MG	W	SG	J			UNMINERALISED BIF, (W), Light or White and Pink, Moderately Weathered, Weak Rock					BLANK STEEL: Size 20" - W.T.9.53mm: 20 inch casing left in ground 0-85m (24.00-85.00)
40	HG	D4	W	SG			MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Extremely Strong Rock					
50	MG											
60	MG											
70	MG	D3	W	CS			MINERALISED BIF, (D3), Brown and Yellow, Slightly Weathered, Extremely Strong Rock					
80	HG											
90	BG	D2	GH	CS			MINERALISED BIF, (D2), Brown and Grey and red, Moderately Weathered, Medium Strong Rock	1290 400	8.3 8.3	2 4		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (89.00-119.00)
100						0 100 200		0-5000	0-14	0-50		

Program: FY22 East Jimblebar DEW Phase 2 Planned Hole: HEJ0058 Page: 3

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HEJ0058 **Hole Length:** 122.00

Easting: 218952.94
Northing: 7411763.46
Surface RL: 544.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Sep 22 - 01 Oct 22
License: CAW205880

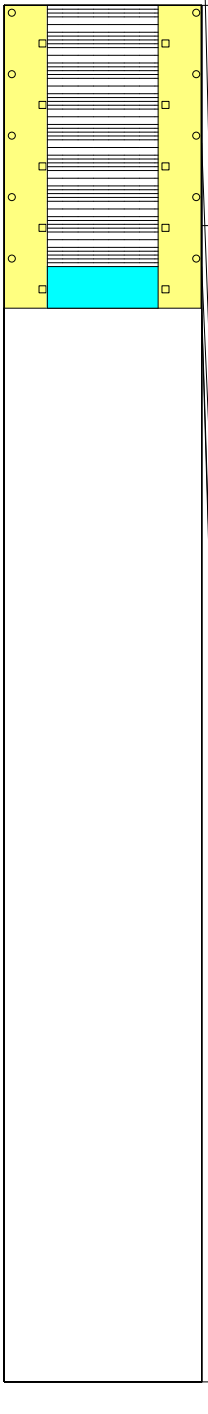
Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 37.0	DR5	DR	600		EASTERNWELL	KM4
37.0 - 85.0	DR5	DR	500		EASTERNWELL	KM4, NK3
85.0 - 122.0	DR5	DR	450		EASTERNWELL	NK3

Comments: Terminated at 122m in McRae shales, meeting termination criteria. FWS at 92 mbgl.

TOC RL: 544.68 (Stickup 0.30m) (drilled) SWL: 86.62 MBGL (01 Oct 22) Dev: Y: 15.8 hour(s) Final pH: 8.3
TOC RL: 544.68 (Stickup 0.30m) (current) Is Live: Y (-) Date: 27 Sep 2022 Final EC: 991.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s
100	BG	D2	GH	CS			MINERALISED BIF, (D2), Brown and Grey and red, Moderately Weathered, Medium Strong Rock	1014	8.2	4
110	MG	D1	CS	WG			UNMINERALISED BIF, (D1), Brown and Grey, Moderately Weathered, Medium Strong Rock	1022	8.3	3
120	SF	RU	S	JF			SHALE, (RU), Dark or Black and Pink, Highly Weathered, Weak Rock	1050	8.7	2
130										
140										
150										
160										
170										
180										
190										
200										
						0 100 200		0-5000	0-14	0-50

Diagram (Scaled to 600mm)



Notes

- GRAVEL MED (5.00-122.00)
- BLANK STEEL: Size 20" - W.T.9.53mm: 20 inch casing left in ground 0-85m (24.00-85.00)
- SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (89.00-119.00)
- 3-4L/s
- BLANK STEEL: Size 14" - W.T.9.53mm (119.00-122.00)
- END CAP (122.00)

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0059	Hole Length:	116.00

Easting: 219568.33
Northing: 7411369.48
Surface RL: 524.16
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Sep 22 - 28 Sep 22
License: CAW205880
Comments: Terminated at 116m in McRae shales, meeting termination criteria for hole. FWS at 72 mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 44.0	DR3	DR	600		EASTERNWELL	KM4, NK3
44.0 - 116.0	DR3	DR	500		EASTERNWELL	NK3

TOC RL: 524.36 (Stickup 0.21m) (drilled) SWL: 64.84 MBTOC (28 Sep 22) Dev: Y: 22.3 hour(s) Final pH: 8.3
TOC RL: 524.36 (Stickup 0.21m) (current) Is Live: Y (-) Date: 26 Sep 2022 Final EC: 786.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	ZY	JC			GRAVEL, sandy, trace silt, (SCREE), Light or White and Yellow, Transported, Non-Cohesive soils, Poorly graded, Angular					CEMENT (0.00-5.00)
			ZJS	GQ								BLANK STEEL: Size 24" - W.T.9.53mm (0.00-43.00)
10		TD3					SAND, clayey, trace gravel, (SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Gap graded, Sub-angular					BLANK STEEL: Size 14" - W.T.9.53mm (0.00-68.00)
20												GRAVEL MED (5.00-116.00)
30			IH	WK			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Uniform, Rounded					
40												
50		TD2	KL	GJ			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Yellow and Brown and grey, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
60												
70		D3	GS	LW			MINERALISED BIF, (D3), Grey and Brown and yellow, Highly Weathered, Weak Rock	510	8.2	1		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double slotted (68.00-110.00)
	SF	D2	W	HG			MINERALISED BIF, (D2), Blue and Grey, Moderately Weathered, Medium Strong Rock	370	8.2	1		
80								350	8.1	3		
								340	8.2	5		
90	BG							520	8.2	5		
							UNMINERALISED BIF, (D1), Red and Blue, Moderately Weathered, Medium Strong Rock	520	8.3	7		7-10L/s
100		D1	SW	J								
					0 100 200			0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0059	Hole Length:	116.00

Easting: 219568.33
Northing: 7411369.48
Surface RL: 524.16
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 23 Sep 22 - 28 Sep 22
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 44.0	DR3	DR	600		EASTERNWELL	KM4, NK3
44.0 - 116.0	DR3	DR	500		EASTERNWELL	NK3

Comments: Terminated at 116m in McRae shales, meeting termination criteria for hole. FWS at 72 mbgl.

TOC RL: 524.36 (Stickup 0.21m) (drilled) SWL: 64.84 MBTOC (28 Sep 22) Dev: Y: 22.3 hour(s) Final pH: 8.3
TOC RL: 524.36 (Stickup 0.21m) (current) Is Live: Y (-) Date: 26 Sep 2022 Final EC: 786.00

Depth mgbl	Cond	Strat 2	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	BG	D1	SW	J			UNMINERALISED BIF, (D1), Red and Blue, Moderately Weathered, Medium Strong Rock	570	8.3	10		GRAVEL MED (5.00-116.00)
110	SF	RU	SF	B			SHALE, (RU), Red and Brown and dark or black, Highly Weathered, Very Weak Rock					SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double slotted (68.00-110.00) 7-10L/s
120												BLANK STEEL: Size 14" - W.T.9.53mm (110.00-116.00)
130												END CAP (116.00)
140												
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0060	Hole Length:	152.00

Easting: 219500.90
Northing: 7412138.68
Surface RL: 525.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 13 Sep 22 - 18 Sep 22
License: CAW205880
Comments: Terminated at 152m.Difficulty due to broken heaving ground & Martite sands @ 128-152mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 66.0	DR3	DR	600		EASTERNWELL	KM4
66.0 - 152.0	DR3	DR	500		EASTERNWELL	NK3

TOC RL: 525.50 (Stickup 0.30m) (drilled) SWL: 67.15 MBGL (21 Sep 22) Dev: Y: 41.3 hour(s) Final pH: 8.0
TOC RL: 525.50 (Stickup 0.30m) (current) Is Live: Y (-) Date: 18 Sep 2022 Final EC: 1343.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	Z	JS			SILT, sandy, (SCREE), Light or White and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					CEMENT (0.00-5.00)
10		TD3	ZY	K			SILT, gravelly, trace clay, (SILTSTONE), Red, Transported, Non-Cohesive soils, Well graded, Sub-rounded					BLANK STEEL: Size 24" - W.T.6.35mm: Surface casing left in ground (0.00-66.00)
20												BLANK STEEL: Size 14" - W.T.9.53mm (0.00-87.50)
30			ZK	Y			CLAY, silty, (CLAY), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					GRAVEL MED (5.00-143.50)
40		TD2	ZG	YL			GRAVEL, clayey, trace silt, (VUGHY BRECCIA), Yellow and Brown and grey, Transported, Non-Cohesive soils, Well graded, Sub-angular					
50												
60												
70	MG		ZK	L			CLAY, silty, trace sand, (CLAY), Yellow and Light or White and brown, Transported, Non-Cohesive soils, Poorly graded, Rounded	5530	7.9	1		
80		J1	W	GSC			MINERALISED BIF, (J1), Grey and Brown and red, Highly Weathered, Weak Rock	7810	8.3	1		
90	UG							2670	8.1	2		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double slotted steel (87.50-105.50)
								2760	8.1	2		
100	MG							1210	8.7	4		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0060	Hole Length:	152.00

Easting: 219500.90
Northing: 7412138.68
Surface RL: 525.20
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 13 Sep 22 - 18 Sep 22
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 66.0	DR3	DR	600		EASTERNWELL	KM4
66.0 - 152.0	DR3	DR	500		EASTERNWELL	NK3

Comments: Terminated at 152m.Difficulty due to broken heaving ground & Martite sands @ 128-152mbgl.

TOC RL: 525.50 (Stickup 0.30m) (drilled) SWL: 67.15 MBGL (21 Sep 22) Dev: Y: 41.3 hour(s) Final pH: 8.0
TOC RL: 525.50 (Stickup 0.30m) (current) Is Live: Y (-) Date: 18 Sep 2022 Final EC: 1343.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	MG	J1	W	GSC			MINERALISED BIF, (J1), Grey and Brown and red, Highly Weathered, Weak Rock	1020	8.6	5		GRAVEL MED (5.00-143.50)
			SJ	WC								
110		W					UNMINERALISED BIF, (W), Red and Brown, Moderately Weathered, Medium Strong Rock	970	8.7	5		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double slotted steel (87.50-105.50)
								1850	8.1	5		BLANK STEEL: Size 14" - W.T.9.53mm (105.50-117.50)
120		D4	W	H			MINERALISED BIF, (D4), Grey and Dark or Black and red, Moderately Weathered, Medium Strong Rock	3200	8.4	5		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double slotted steel (117.50-141.50)
130	BG	D3	W	HS			MINERALISED BIF, (D3), Grey and Dark or Black and red, Moderately Weathered, Medium Strong Rock	1150	8.7	4		
								1010	8.6	5		
140								1110	8.1	5		BLANK STEEL: Size 14" - W.T.9.53mm (141.50-143.50)
								1090	8.4	5		FALLBACK (143.50-152.00)
150												
160												
170												
180												
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0061	Hole Length:	152.00

Easting: 219890.09
Northing: 7411904.30
Surface RL: 524.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Aug 22 - 06 Sep 22
License: CAW205880
Comments: PB took 50hrs to develop due to high sediment fines. 0.28 Steel cap stick up.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 20.0	DR3	DR	600		EASTERNWELL	KM4
20.0 - 152.0	DR3	DR	500		EASTERNWELL	JC3, KM4

TOC RL: 524.72 (Stickup 0.26m) (drilled) SWL: 67.35 MBTOC (06 Sep 22) Dev: Y: 48.2 hour(s) Final pH: 8.3
TOC RL: 524.72 (Stickup 0.26m) (current) Is Live: Y (-) Date: 04 Sep 2022 Final EC: 1267.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	BG	SZ	ZY	J			SILT, (SCREE), Brown and Red, Transported, Non-Cohesive soils, Well graded, Sub-angular					CEMENT: Surface Seal (0.00-5.00)
10		ST3	ZY	XJS			SILT, gravelly, trace clay, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Well graded, Sub-angular					BLANK STEEL: Size 24" - W.T.6.35mm: Surface casing left in ground (0.00-20.00)
20	SF											BLANK STEEL: Size 14" - W.T.9.53mm (0.00-75.00)
30												GRAVEL MED (5.00-152.00)
40		CY3	ZK	Y			CLAY, silty, (CLAY), Yellow and Brown, Transported, Non-Cohesive soils, Uniform, Sub-rounded					
50	BG	D4	G	W			MINERALISED BIF, (D4), Brown and Red, Moderately Weathered, Medium Strong Rock					
60												
70	MG	D3	W	G			MINERALISED BIF, (D3), Grey and Brown, Moderately Weathered, Medium Strong Rock	970	8.5	3		SLOTTED THREADED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double Slotted (75.00-146.00)
80								1500	8.9	4		
90								1800	8.9	5		
100								990	9.1	5		
								990	9.0	5		
								1000	8.8	5		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HEJ0061	Hole Length:	152.00

Easting: 219890.09
Northing: 7411904.30
Surface RL: 524.42
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 27 Aug 22 - 06 Sep 22
License: CAW205880
Comments: PB took 50hrs to develop due to high sediment fines. 0.28 Steel cap stick up.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 20.0	DR3	DR	600		EASTERNWELL	KM4
20.0 - 152.0	DR3	DR	500		EASTERNWELL	JC3, KM4

TOC RL: 524.72 (Stickup 0.26m) (drilled) SWL: 67.35 MBTOC (06 Sep 22) Dev: Y: 48.2 hour(s) Final pH: 8.3
TOC RL: 524.72 (Stickup 0.26m) (current) Is Live: Y (-) Date: 04 Sep 2022 Final EC: 1267.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100–110	MG	D3	W	G			MINERALISED BIF, (D3), Grey and Brown, Moderately Weathered, Medium Strong Rock	250	8.9	5		GRAVEL MED (5.00-152.00)
110–120		D2	G	WSC			MINERALISED BIF, (D2), Brown and Red, Moderately Weathered, Medium Strong Rock	980	8.7	5		SLOTTED THREADED STEEL: Size 14" - W.T.9.53mm, Slots 1mm: Double Slotted (75.00-146.00)
120–130								980	8.6	5		
130–140		D1	SG				UNMINERALISED BIF, (D1), buff and Red, Moderately Weathered, Weak Rock	980	8.5	5		
140–150								980	8.6	5		
150–160								600	8.1	5		Drilling fluid noted on drill conditions sheet
160–170								600	8.4	5		Drilling fluid
170–180								600	8.5	6		Drilling Fluid
180–190												BLANK STEEL: Size 14" - W.T.9.53mm: Sump (146.00-152.00)
190–200												

0 100 200 | 0-5000 0-14 0-50

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0111	Hole Length:	230.00

Easting: 204245.09
Northing: 7411593.73
Surface RL: 551.55
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Apr 23 - 20 Apr 23
License: CAW207661
Comments: FWS at 128 mbgl. Yield of 20 L/s encountered at 200 mbgl. Pilot hole HFG0092.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 86.0	DR5	DR	600		EASTERNWELL	KM4
86.0 - 176.0	DR5	DR	500		EASTERNWELL	NS3
176.0 - 230.0	DR5	CH	500		EASTERNWELL	NS3

TOC RL: 551.94 (Stickup 0.31m) (drilled) SWL: 113.47 MBTOC (22 Apr 23) Dev: Y: 20.3 hour(s) Final pH: 8.8
TOC RL: 551.94 (Stickup 0.31m) (current) Is Live: Y (-) Date: 20 Apr 2023 Final EC: 1590.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	MG	SZ	Z				GRAVEL, sandy, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					BLANK STEEL: 610mm (0.00-86.00) GRAVEL MED (0.00-86.00) BLANK THREADED STEEL: 356mm (0.00-115.50)
10		TD3	ZI	YK			SAND, silty, trace gravel, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
20												
30												
40												
50	SF											
60												
70												
80	MG											
90		J2	W	S			MINERALISED BIF, (J2), Brown and Red, Moderately Weathered, Strong Rock					GRAVEL MED (86.00-223.50)
100		J1	WS	C			MINERALISED BIF, (J1), Brown and Red, Moderately Weathered, Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0111	Hole Length:	230.00

Easting: 204245.09
Northing: 7411593.73
Surface RL: 551.55
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Apr 23 - 20 Apr 23
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 86.0	DR5	DR	600		EASTERNWELL	KM4
86.0 - 176.0	DR5	DR	500		EASTERNWELL	NS3
176.0 - 230.0	DR5	CH	500		EASTERNWELL	NS3

Comments: FWS at 128 mbgl. Yield of 20 L/s encountered at 200 mbgl. Pilot hole HFG0092.

TOC RL: 551.94 (Stickup 0.31m) (drilled) SWL: 113.47 MBTOC (22 Apr 23) Dev: Y: 20.3 hour(s) Final pH: 8.8
TOC RL: 551.94 (Stickup 0.31m) (current) Is Live: Y (-) Date: 20 Apr 2023 Final EC: 1590.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	MG	J1	WS	C			MINERALISED BIF, (J1), Brown and Red, Moderately Weathered, Strong Rock					BLANK THREADED STEEL: 356mm (0.00-115.50) GRAVEL MED (86.00-223.50)
110	SF	W	SW	F			SHALE, (W), Red and Brown, Moderately Weathered, Strong Rock					
120												
130										3		
140	BG	D4	H	SC			MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock		8.9	4		SLOTTED THREADED STEEL: 356mm , Slots 1mm (115.50-217.50)
150									9.0	5		
160								790	9.4	5		
170		D3	JC	S			UNMINERALISED BIF, (D3), Brown and Dark or Black, Moderately Weathered, Strong Rock	720	9.3	5		
180	HG							710	9.2	10		
190	SF	D2	W	SC			MINERALISED BIF, (D2), Dark or Black and Brown, Moderately Weathered, Strong Rock	720	8.9	10		
200	UG							750	9.0	10		
								760	9.3	10		
								780	9.0	15		
								790	8.8	15		
								350	9.7	15		
									9.7	20		
					0	100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

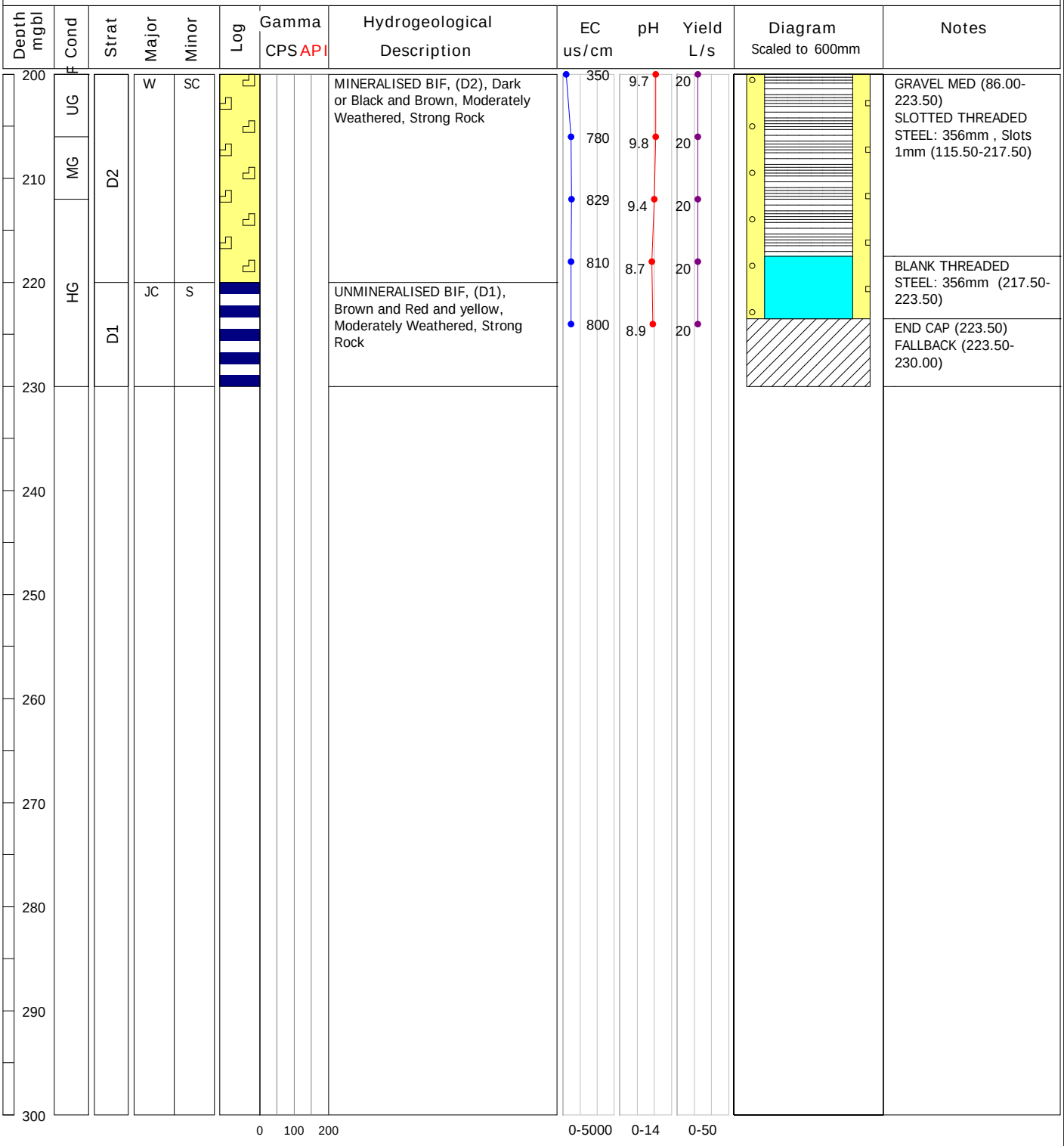
BHP

Project: WHEELARRA **Hole Name:** HFG0111 **Hole Length:** 230.00

Easting: 204245.09
Northing: 7411593.73
Surface RL: 551.55
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Apr 23 - 20 Apr 23
License: CAW207661
Comments: FWS at 128 mbgl. Yield of 20 L/s encountered at 200 mbgl. Pilot hole HFG0092.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 86.0	DR5	DR	600		EASTERNWELL	KM4
86.0 - 176.0	DR5	DR	500		EASTERNWELL	NS3
176.0 - 230.0	DR5	CH	500		EASTERNWELL	NS3

TOC RL: 551.94 (Stickup 0.31m) (drilled) SWL: 113.47 MBTOC (22 Apr 23) Dev: Y: 20.3 hour(s) Final pH: 8.8
TOC RL: 551.94 (Stickup 0.31m) (current) Is Live: Y (-) Date: 20 Apr 2023 Final EC: 1590.00



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BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0112	Hole Length:	248.00

Easting: 204837.83
Northing: 7411755.75
Surface RL: 566.40
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jun 23 - 18 Jun 23
License: CAW207661
Comments: FWS at 134m. Final yield 7L/s during drilling, 10L/s during airlift.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 9.0	DR3	DR	600		EASTERNWELL	KM4
9.0 - 85.0	DR3	DR	500		EASTERNWELL	KM4
85.0 - 248.0	DR3	CH	500		EASTERNWELL	NS3, KM4

TOC RL: 566.68 (Stickup 0.26m) (drilled) SWL: 129.39 MBTOC (19 Jun 23) Dev: Y: 14.5 hour(s) Final pH: 7.5
TOC RL: 566.68 (Stickup 0.26m) (current) Is Live: Y (-) Date: 18 Jun 2023 Final EC: 1471.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	MG	W	SGJ				SHALE, (W), Light or White and Red and brown, Moderately Weathered, Weak Rock					BLANK STEEL: Size 24" - W.T.9.53mm (0.00-9.00)
			WG				MINERALISED BIF, (D4), Dark or Black and Brown and blue, Moderately Weathered, Strong Rock					BLANK STEEL: Size 14" - W.T.9.53mm (0.00-151.00)
10	HG	D4										GRAVEL MED (0.00-247.00)
20												
30												
40												
50	BG											
60			JC	S			UNMINERALISED BIF, (D4), Dark or Black and Brown and red, Moderately Weathered, Strong Rock					
70												
80	HG											
90		D3	JC	S			UNMINERALISED BIF, (D3), Dark or Black and Brown and red, Moderately Weathered, Strong Rock					
100												
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0112	Hole Length:	248.00

Easting: 204837.83
Northing: 7411755.75
Surface RL: 566.40
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jun 23 - 18 Jun 23
License: CAW207661
Comments: FWS at 134m. Final yield 7L/s during drilling, 10L/s during airlift.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 9.0	DR3	DR	600		EASTERNWELL	KM4
9.0 - 85.0	DR3	DR	500		EASTERNWELL	KM4
85.0 - 248.0	DR3	CH	500		EASTERNWELL	NS3, KM4

TOC RL: 566.68 (Stickup 0.26m) (drilled) SWL: 129.39 MBTOC (19 Jun 23) Dev: Y: 14.5 hour(s) Final pH: 7.5
TOC RL: 566.68 (Stickup 0.26m) (current) Is Live: Y (-) Date: 18 Jun 2023 Final EC: 1471.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100–130	HG	D3	JC	S			UNMINERALISED BIF, (D3), Dark or Black and Brown and red, Moderately Weathered, Strong Rock	1009	7.4	2		BLANK STEEL: Size 14" - W.T.9.53mm (0.00-151.00) GRAVEL MED (0.00-247.00)
130–150	HG	D4	CJ	S			UNMINERALISED BIF, (D4), Dark or Black and Brown and yellow, Moderately Weathered, Strong Rock	666	8.1	2		
								1191	7.7	2		
								1243	7.9	2		
								790	7.8	2		
150–170	HG	D4						1030	7.5	3		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (151.00-241.00)
								821	7.8	4		
								808	7.9	4		
170–200	HG	D3	CJ	S			UNMINERALISED BIF, (D3), Dark or Black and Yellow and red, Moderately Weathered, Strong Rock	869	8.0	4		
								814	7.8	4		
								861	7.9	4		
								852	7.5	4		
								831	7.0	4		

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

BHPIO - Hydrogeology Log

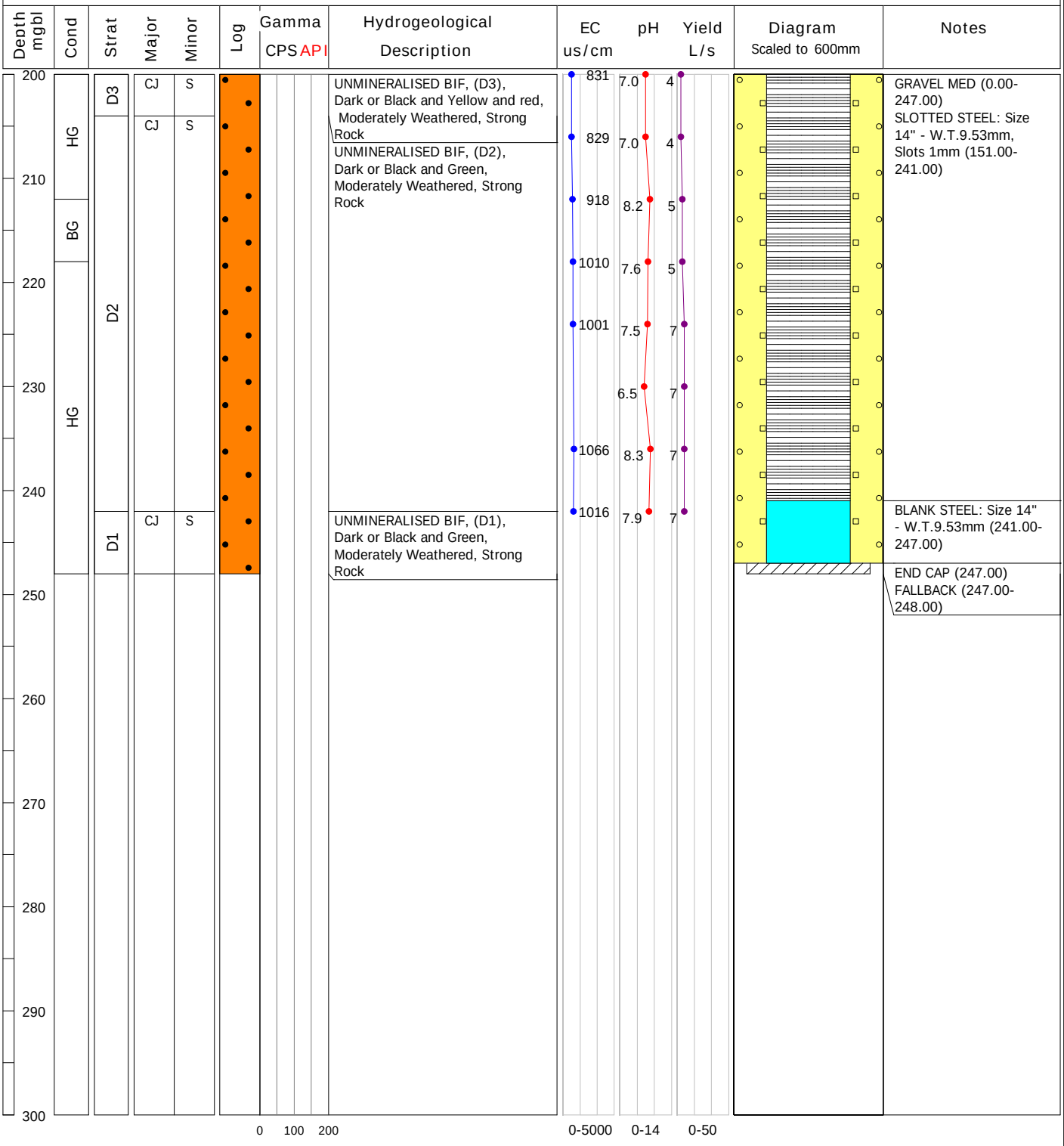
BHP

Project: WHEELARRA **Hole Name:** HFG0112 **Hole Length:** 248.00

Easting: 204837.83
Northing: 7411755.75
Surface RL: 566.40
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Jun 23 - 18 Jun 23
License: CAW207661
Comments: FWS at 134m. Final yield 7L/s during drilling, 10L/s during airlift.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 9.0	DR3	DR	600		EASTERNWELL	KM4
9.0 - 85.0	DR3	DR	500		EASTERNWELL	KM4
85.0 - 248.0	DR3	CH	500		EASTERNWELL	NS3, KM4

TOC RL: 566.68 (Stickup 0.26m) (drilled) SWL: 129.39 MBTOC (19 Jun 23) Dev: Y: 14.5 hour(s) Final pH: 7.5
TOC RL: 566.68 (Stickup 0.26m) (current) Is Live: Y (-) Date: 18 Jun 2023 Final EC: 1471.00



BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0117	Hole Length:	194.00

Easting: 204036.94
Northing: 7411762.68
Surface RL: 504.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 May 23 - 06 May 23
License: CAW207661
Comments: FWS at 80m. Final yield of 40 L/s. Carbonaceous shale & pyrite intersected at 162 -194m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 28.0	DR3	DR	600		EASTERNWELL	NS3
28.0 - 176.0	DR3	DR	500		EASTERNWELL	NS3
176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

TOC RL: 504.40 (Stickup 0.30m) (drilled) SWL: 67.10 MBTOC (08 May 23) Dev: Y: 16.8 hour(s) Final pH: 9.2
TOC RL: 504.40 (Stickup 0.30m) (current) Is Live: Y (-) Date: 06 May 2023 Final EC: 1320.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	BG	J2	G	S			MINERALISED BIF, (J2), Brown, Moderately Weathered, Strong Rock					BLANK STEEL: Size 24" - W.T.9.53mm (0.00-28.00)
10	MG											GRAVEL COARSE (0.00-83.50)
20		J1	G	S			MINERALISED BIF, (J1), Brown, Moderately Weathered, Strong Rock					BLANK STEEL: Size 14" - W.T.9.53mm (0.00-108.50)
30		W	SG	L			SHALE, (W), Brown and Red and yellow, Moderately Weathered, Strong Rock					
40												
50		D4	G	SL			MINERALISED BIF, (D4), Brown, Moderately Weathered, Strong Rock					
60												
70	BG											
80	UG	D3	G	S			MINERALISED BIF, (D3), Brown, Moderately Weathered, Strong Rock	800 1400 1330 1280	7.0 7.5 8.4 8.3	2 5 10 15		GRAVEL MED (83.50-194.00)
90	BG											
100						0 100 200		0-5000	0-14	0-50		

Program: WH123 East DEW Phase 2 Planned Hole: HYD_FY23_P04 Page: 17

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0117	Hole Length:	194.00	
Easting:	204036.94					
Northing:	7411762.68					
Surface RL:	504.10					
Grid Name:	MGA94_51					
Incl / Azm:	-90-->0					
Construct:	02 May 23 - 06 May 23			License:	CAW207661	

Comments: FWS at 80m. Final yield of 40 L/s. Carbonaceous shale & pyrite intersected at 162 -194m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 28.0	DR3	DR	600		EASTERNWELL	NS3
28.0 - 176.0	DR3	DR	500		EASTERNWELL	NS3
176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

TOC RL:	504.40	(Stickup 0.30m)	(drilled)	SWL:	67.10 MBTOC	(08 May 23)	Dev:	Y: 16.8 hour(s)	Final pH:	9.2
TOC RL:	504.40	(Stickup 0.30m)	(current)	Is Live:	Y	(-)	Date:	06 May 2023	Final EC:	1320.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s
100	BG	D3	G	S			MINERALISED BIF, (D3), Brown, Moderately Weathered, Strong Rock	1200	8.2	15
110								1400	8.1	15
120		D2	W	SC			MINERALISED BIF, (D2), Brown and Dark or Black, Moderately Weathered, Strong Rock	1480	8.1	15
								1610	8.0	20
130								1170	9.3	20
								1250	9.4	20
140			W	S			MINERALISED BIF, (D2), Dark or Black and Brown and yellow, Moderately Weathered, Strong Rock	1220	9.2	30
								1280	7.6	40
150		D1	JS	C			UNMINERALISED BIF, (D1), Yellow and Red and brown, Moderately Weathered, Strong Rock	1300	8.0	40
								1260	9.2	40
160		RU	B	SJ			SHALE, (RU), Dark or Black and Red, Moderately Weathered, Weak Rock	1290	10.1	40
170								1230	8.9	40
		RN	B	PJQ			SHALE, (RN), Dark or Black, Moderately Weathered, Weak Rock	1300	9.8	40
180								1320	9.1	40
		RC	BC	PQ			SHALE, (RC), Dark or Black, Moderately Weathered, Weak Rock	1400	9.0	40
190										
200										
						0 100 200		0-5000	0-14	0-50

Diagram Scaled to 600mm

Notes:
- BLANK STEEL: Size 14" - W.T.9.53mm (0.00-108.50)
- GRAVEL MED (83.50-194.00)
- SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (108.50-166.50)
- BLANK STEEL: Size 14" - W.T.9.53mm (166.50-172.50)
- END CAP (172.50)

BHPIO - Hydrogeology Log

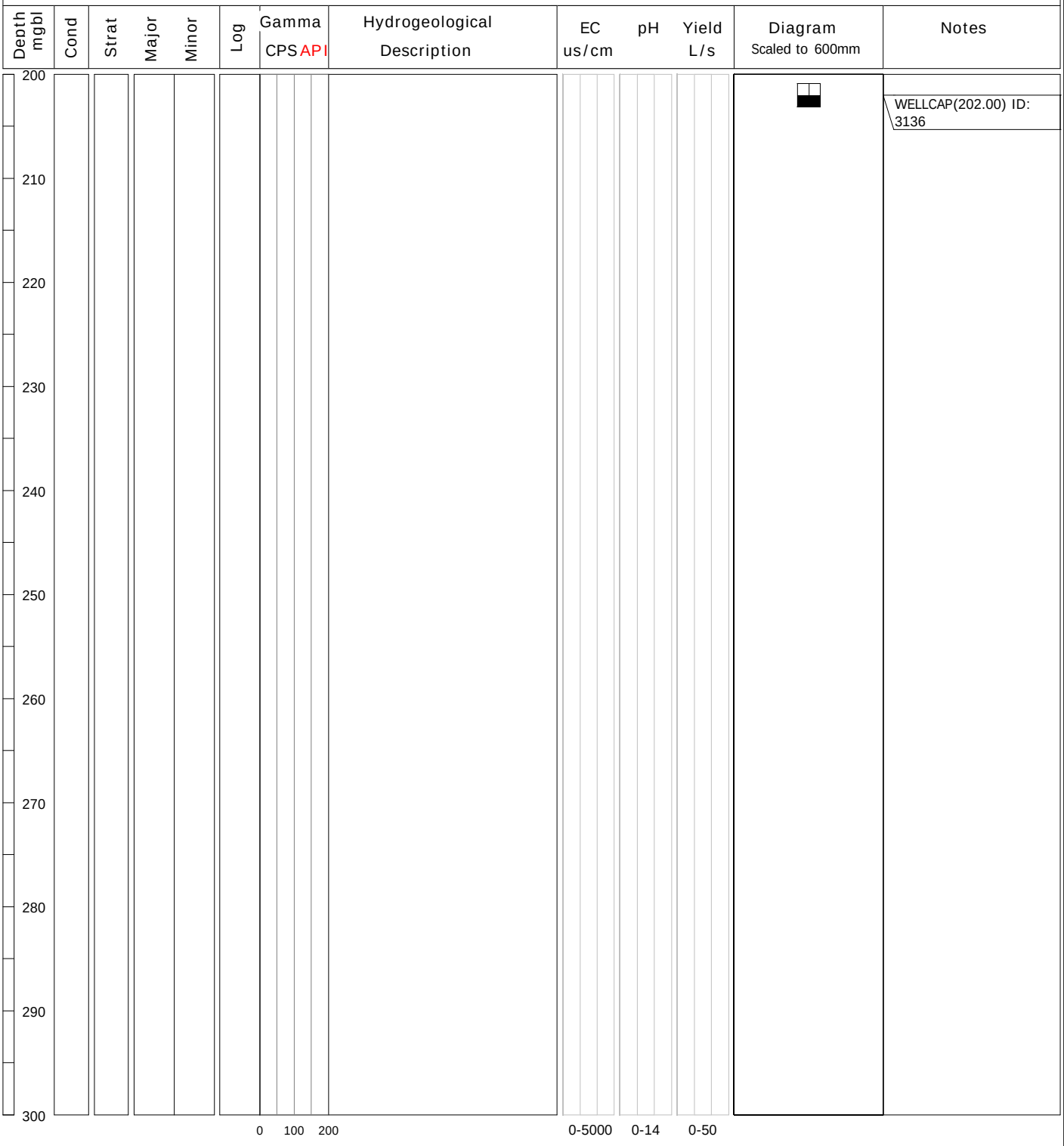
BHP

Project: WHEELARRA Hole Name: HFG0117 Hole Length: 194.00

Easting: 204036.94
Northing: 7411762.68
Surface RL: 504.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 May 23 - 06 May 23
License: CAW207661
Comments: FWS at 80m. Final yield of 40 L/s. Carbonaceous shale & pyrite intersected at 162 -194m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 28.0	DR3	DR	600		EASTERNWELL	NS3
28.0 - 176.0	DR3	DR	500		EASTERNWELL	NS3
176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

TOC RL: 504.40 (Stickup 0.30m) (drilled) SWL: 67.10 MBTOC (08 May 23) Dev: Y: 16.8 hour(s) Final pH: 9.2
TOC RL: 504.40 (Stickup 0.30m) (current) Is Live: Y (-) Date: 06 May 2023 Final EC: 1320.00



BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0097	Hole Length:	170.00

Easting: 213470.63
Northing: 7412977.80
Surface RL: 527.85
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Aug 22 - 21 Aug 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	450		EASTERNWELL	KM4, NK3

License: CAW205880

Comments: In-pit prodution bore to replace failed bore HHH0068. Broken ground from 146 - 170m with flows of 30-40L/s.

TOC RL:	528.33	(Stickup 0.43m)	(drilled)	SWL:	77.29 MBTOC	(23 Aug 22)	Dev:	Y: 18.0 hour(s)	Final pH:	8.3
TOC RL:	528.33	(Stickup 0.43m)	(current)	Is Live:	Y	(-)	Date:	21 Aug 2022	Final EC:	543.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	BG	J2	GW	C			MINERALISED BIF, (J2), Red and Brown, Moderately Weathered, Strong Rock					BLANK STEEL: Size 24" - W.T.9.53mm: Surface casing left in ground (0.00-8.00)
10	MG											BLANK STEEL: Size 14" - W.T.9.53mm (0.00-122.00)
20		J1	GWS	C			MINERALISED BIF, (J1), Brown, Moderately Weathered, Strong Rock					GRAVEL MED (0.00-170.00)
30	SF											
40		W	SG	C			UNMINERALISED BIF, (W), Pink and Red, Highly Weathered, Weak Rock					
50	HG	D4	W	G			MINERALISED BIF, (D4), Dark or Black and Blue, Moderately Weathered, Strong Rock					
60												
70												
80												
90												
100		D3	WS	GC			MINERALISED BIF, (D3), Brown and Blue, Moderately Weathered, Medium Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0097	Hole Length:	170.00

Easting: 213470.63
Northing: 7412977.80
Surface RL: 527.85
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 15 Aug 22 - 21 Aug 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 170.0	DR3	DR	450		EASTERNWELL	KM4, NK3

License: CAW205880

Comments: In-pit prodution bore to replace failed bore HHH0068. Broken ground from 146 - 170m with flows of 30-40L/s.

TOC RL: 528.33 (Stickup 0.43m) (drilled) SWL: 77.29 MBTOC (23 Aug 22) Dev: Y: 18.0 hour(s) Final pH: 8.3
TOC RL: 528.33 (Stickup 0.43m) (current) Is Live: Y (-) Date: 21 Aug 2022 Final EC: 543.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	HG	D3	WS	GC			MINERALISED BIF, (D3), Brown and Blue, Moderately Weathered, Medium Strong Rock	430	8.7	2		BLANK STEEL: Size 14" - W.T.9.53mm (0.00-122.00)
110								170	8.3	3		GRAVEL MED (0.00-170.00)
120	MG							340	8.3	4		
			W				MINERALISED BIF, (D2), Dark or Black and Blue, Moderately Weathered, Strong Rock	340	8.3	5		S/S SCREEN: Size 14" - W.T.9.53mm, Slots 1mm (122.00-164.00)
130		D2						360	8.5	6		
								340	8.6	6		
140								320	8.3	30		
			W	H			MINERALISED BIF, (D2), Dark or Black and Blue and grey, Moderately Weathered, Strong Rock	410	8.3	30		
150	BG							380	8.3	30		
160								410	8.5	30		
		D1	S	JL			UNMINERALISED BIF, (D1), Brown and Yellow, Highly Weathered, Very Weak Rock			30		BLANK STEEL: Size 14" - W.T.9.53mm (164.00-170.00)
170												DEVYES
180												DEVYES
190												
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0128	Hole Length:	224.00

Easting: 215542.02
Northing: 7412576.19
Surface RL: 515.79
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Mar 23 - 14 Apr 23
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 24.0	EWMWW06	DR	600		EASTERNWELL	NS3
24.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	NS3, KM4
146.0 - 224.0	EWMWW06	CH	500		EASTERNWELL	KM4

Comments: FWS at 74m. Nearby monitoring bore HHH0125 intersected from 114-128m. Chips below 182m washed away by rain.

TOC RL: 516.13 (Stickup 0.45m) (drilled) SWL: 61.42 MBTOC (17 Apr 23) Dev: Y: 29.8 hour(s) Final pH: 8.0
TOC RL: 516.13 (Stickup 0.45m) (current) Is Live: Y (-) Date: 08 Apr 2023 Final EC: 1183.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	MG	SZ	ZJ	C			GRAVEL, silty, trace clay, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					CEMENT (0.00-5.00)
10		GS3	ZI	JXC			GRAVEL, clayey, (SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: 610mm (0.00-24.00)
20	HG											BLANK THREADED STEEL: Size 14" - W.T.9.53mm (0.00-106.50)
30			GW	S			MINERALISED BIF, (J6), Brown, Moderately Weathered, Strong Rock					GRAVEL MED (5.00-24.00)
40		J6										GRAVEL MED (24.00-220.50)
50	MG											
60												
70								1440	8.8	2		
80								1300	8.7	3		
90	SF							1210	8.4	3		
100								1080	8.1	3		
								1060	7.9	4		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0128	Hole Length:	224.00

Easting: 215542.02
Northing: 7412576.19
Surface RL: 515.79
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Mar 23 - 14 Apr 23
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 24.0	EWMWW06	DR	600		EASTERNWELL	NS3
24.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	NS3, KM4
146.0 - 224.0	EWMWW06	CH	500		EASTERNWELL	KM4

Comments: FWS at 74m. Nearby monitoring bore HHH0125 intersected from 114-128m. Chips below 182m washed away by rain.

TOC RL: 516.13 (Stickup 0.45m) (drilled) SWL: 61.42 MBTOC (17 Apr 23) Dev: Y: 29.8 hour(s) Final pH: 8.0
TOC RL: 516.13 (Stickup 0.45m) (current) Is Live: Y (-) Date: 08 Apr 2023 Final EC: 1183.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	SF	J6	GW	S			MINERALISED BIF, (J6), Brown, Moderately Weathered, Strong Rock	1680	8.6	4		BLANK THREADED STEEL: Size 14" - W.T.9.53mm (0.00-106.50)
110								470	8.4	4		
120		FILL						1090	8.4	3		GRAVEL MED (5.00-24.00) GRAVEL MED (24.00-220.50)
130	HG	J5	CW	G			UNMINERALISED BIF, (J5), Dark or Black and Yellow and brown, Moderately Weathered, Strong Rock	1020	8.5	3		SLOTTED THREADED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (106.50-214.50)
140								1300	8.7	3		
150								1600	8.4	3		
160								1150	8.6	3		
170								1240	8.4	3		
180	MG		J	SC			UNMINERALISED BIF, (J5), Blue and Grey and brown, Moderately Weathered, Strong Rock	1170	8.3	3		
190								1080	8.5	4		
200								1120	8.3	4		
								1100	8.4	4		
								1050	8.2	4		
								1100	8.6	5		
								1200	8.7	5		
								1190	8.7	5		
								1060	8.8	5		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

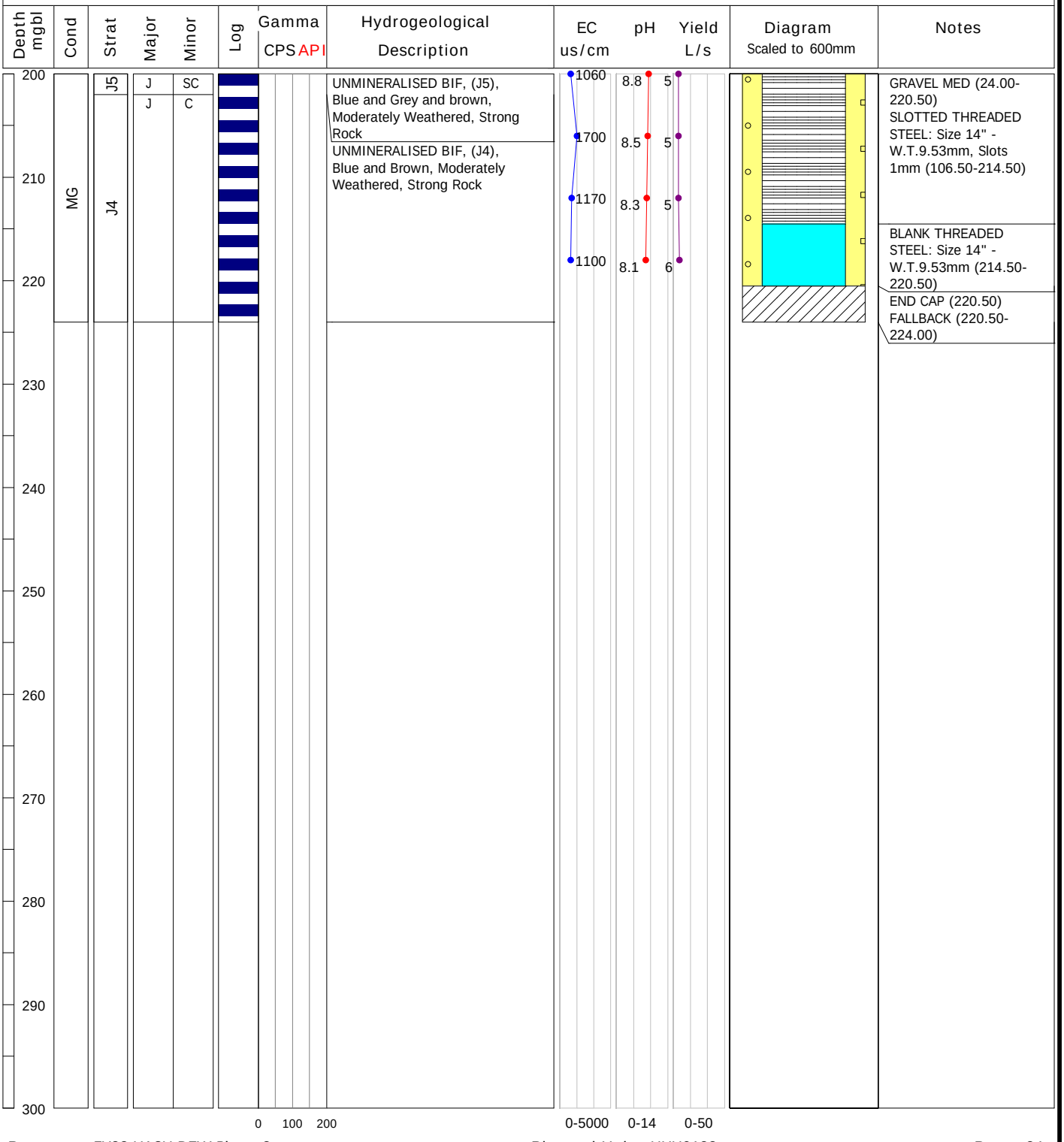
Project: HASHIMOTO **Hole Name:** HHH0128 **Hole Length:** 224.00

Easting: 215542.02
Northing: 7412576.19
Surface RL: 515.79
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 29 Mar 23 - 14 Apr 23
License: CAW205880

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 24.0	EWMWW06	DR	600		EASTERNWELL	NS3
24.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	NS3, KM4
146.0 - 224.0	EWMWW06	CH	500		EASTERNWELL	KM4

Comments: FWS at 74m. Nearby monitoring bore HHH0125 intersected from 114-128m. Chips below 182m washed away by rain.

TOC RL: 516.13 (Stickup 0.45m) (drilled) SWL: 61.42 MBTOC (17 Apr 23) Dev: Y: 29.8 hour(s) Final pH: 8.0
TOC RL: 516.13 (Stickup 0.45m) (current) Is Live: Y (-) Date: 08 Apr 2023 Final EC: 1183.00



BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0129	Hole Length:	206.00

Easting: 211026.41
Northing: 7412776.07
Surface RL: 549.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Feb 23 - 12 Feb 23
License: CAW207661
Comments: Pilote Hole HHH0098. FWS at 122m. Lockable steel cover for headworks

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 14.0	DR3	DR	600		EASTERNWELL	NK3
14.0 - 114.0	DR3	DR	500		EASTERNWELL	NK3
114.0 - 164.0	DR3	DR	450		EASTERNWELL	NK3
164.0 - 206.0	DR3	CH	450		EASTERNWELL	NK3

TOC RL: 549.71 (Stickup 0.29m) (drilled) SWL: 119.87 MBTOC (12 Feb 23) Dev: Y: 12.5 hour(s) Final pH: 8.2
TOC RL: 549.71 (Stickup 0.29m) (current) Is Live: Y (-) Date: 05 Feb 2023 Final EC: 850.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	J3	JS	G			UNMINERALISED BIF, (J3), Red and Brown, Moderately Weathered, Medium Strong Rock					BLANK STEEL: 610mm (0.00-14.00) BLANK THREADED STEEL: Size 14" - W.T.9.53mm (0.00-104.00) GRAVEL MED (0.00-198.00)
10	MG											
20	HG		WH	S			MINERALISED BIF, (J3), Grey and Red, Moderately Weathered, Medium Strong Rock					
30	MG	J2	HW	JS			UNMINERALISED BIF, (J2), Dark or Black and Red, Moderately Weathered, Medium Strong Rock					
40	HG											
50	MG											
60		J1	J	CS			UNMINERALISED BIF, (J1), Grey and Brown and red, Moderately Weathered, Medium Strong Rock					
70												
80		W	JC	S			UNMINERALISED BIF, (W), buff and Red and brown, Moderately Weathered, Medium Strong Rock					
90	HG											
100	SF					0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0129	Hole Length:	206.00

Easting: 211026.41
Northing: 7412776.07
Surface RL: 549.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Feb 23 - 12 Feb 23
License: CAW207661
Comments: Pilote Hole HHH0098. FWS at 122m. Lockable steel cover for headworks

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 14.0	DR3	DR	600		EASTERNWELL	NK3
14.0 - 114.0	DR3	DR	500		EASTERNWELL	NK3
114.0 - 164.0	DR3	DR	450		EASTERNWELL	NK3
164.0 - 206.0	DR3	CH	450		EASTERNWELL	NK3

TOC RL: 549.71 (Stickup 0.29m) (drilled) SWL: 119.87 MBTOC (12 Feb 23) Dev: Y: 12.5 hour(s) Final pH: 8.2
TOC RL: 549.71 (Stickup 0.29m) (current) Is Live: Y (-) Date: 05 Feb 2023 Final EC: 850.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	SF	W	JC	S			UNMINERALISED BIF, (W), buff and Red and brown, Moderately Weathered, Medium Strong Rock					BLANK THREADED STEEL: Size 14" - W.T.9.53mm (0.00-104.00)
			JC	G								GRAVEL MED (0.00-198.00)
110	HG	D4					MINERALISED BIF, (D4), Dark or Black and Grey and brown, Slightly Weathered, Strong Rock					
120									8.5	3		
130		D3	WJ	CS			UNMINERALISED BIF, (D3), Grey and buff and brown, Moderately Weathered, Medium Strong Rock		8.6	5		SLOTTED THREADED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (104.00-198.00)
									7.0	5		
140									8.6	5		
150									8.5	5		
									8.6	5		
	BG		JC	SW			UNMINERALISED BIF, (D2), buff and Brown and grey, Moderately Weathered, Medium Strong Rock		7.8	5		
160	MG	D2							8.7	5		
170	SF								8.4	5		
									8.5	5		
180	MG	D1	J	CS			UNMINERALISED BIF, (D1), buff and Brown and red, Moderately Weathered, Medium Strong Rock		8.5	6		
190									8.3	6		
200									9.0	6		END CAP (198.00) FALLBACK (198.00-200.00)
						0 100 200			0-5000	0-14	0-50	

Program: FY22 W5E1 DEW Phase 1 - H1 Planned Hole: W5E1_FY22_PB01 Page: 26

BHPIO - Hydrogeology Log

BHP

Project: HASHIMOTO **Hole Name:** HHH0129 **Hole Length:** 206.00

Easting: 211026.41
Northing: 7412776.07
Surface RL: 549.37
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Feb 23 - 12 Feb 23
License: CAW207661
Comments: Pilote Hole HHH0098. FWS at 122m. Lockable steel cover for headworks

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 14.0	DR3	DR	600		EASTERNWELL	NK3
14.0 - 114.0	DR3	DR	500		EASTERNWELL	NK3
114.0 - 164.0	DR3	DR	450		EASTERNWELL	NK3
164.0 - 206.0	DR3	CH	450		EASTERNWELL	NK3

TOC RL: 549.71 (Stickup 0.29m) (drilled) SWL: 119.87 MBTOC (12 Feb 23) Dev: Y: 12.5 hour(s) Final pH: 8.2
TOC RL: 549.71 (Stickup 0.29m) (current) Is Live: Y (-) Date: 05 Feb 2023 Final EC: 850.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	MG	D1	J	CS			UNMINERALISED BIF, (D1), buff and Brown and red, Moderately Weathered, Medium Strong Rock					
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0130	Hole Length:	206.00

Easting: 210927.52
Northing: 7412017.07
Surface RL: 522.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Feb 23 - 02 Mar 23
License: CAW207661
Comments: FWS at 104mbgl. Issues with heaving ground resulting in hole terminating at 206m. 20" DR casing stuck & left in hole to 107m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	KM4
50.0 - 122.0	DR3	CH	500		EASTERNWELL	MM9
122.0 - 206.0	DR3	DR	450		EASTERNWELL	MM9, NK3

TOC RL: 522.57 (Stickup 0.38m) (drilled) SWL: 95.40 MBTOC (05 Mar 23) Dev: Y: 46.3 hour(s) Final pH: 8.7
TOC RL: 522.57 (Stickup 0.38m) (current) Is Live: Y (-) Date: 02 Mar 2023 Final EC: 690.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	MG	FILL	G	W			GRAVEL, (SCREE), Brown, Transported, Non-Cohesive soils, Well graded, Angular					CEMENT (0.00-5.00)
10		GS3	ZIG	YK			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), Brown and Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					BLANK STEEL: Size 24" - W.T.9.53mm (0.00-50.00)
20												BLANK STEEL: 356mm (0.00-103.00)
30												BLANK STEEL: Size 20" - W.T.9.53mm (0.00-107.00)
40		CY2	ZK	Y			CLAY, silty, (CLAY), Red and Brown, Transported, Soft, Poorly graded, Sub-rounded					GRAVEL MED (5.00-206.00)
50	SF	VB2	ZC	Y			GRAVEL, silty, (VUGHY BRECCIA), Light or White, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
60			Z				CLAY, silty, (CLAY), Dark or Black and Brown and yellow, Transported, Stiff, Uniform, Sub-rounded					
70												
80			ZC				GRAVEL, silty, (VUGHY BRECCIA), Light or White, Transported, Non-Cohesive soils, Gap graded, Sub-angular					
90		W	S	JG			SHALE, (W), Dark or Black and Red and brown, Highly Weathered, Weak Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

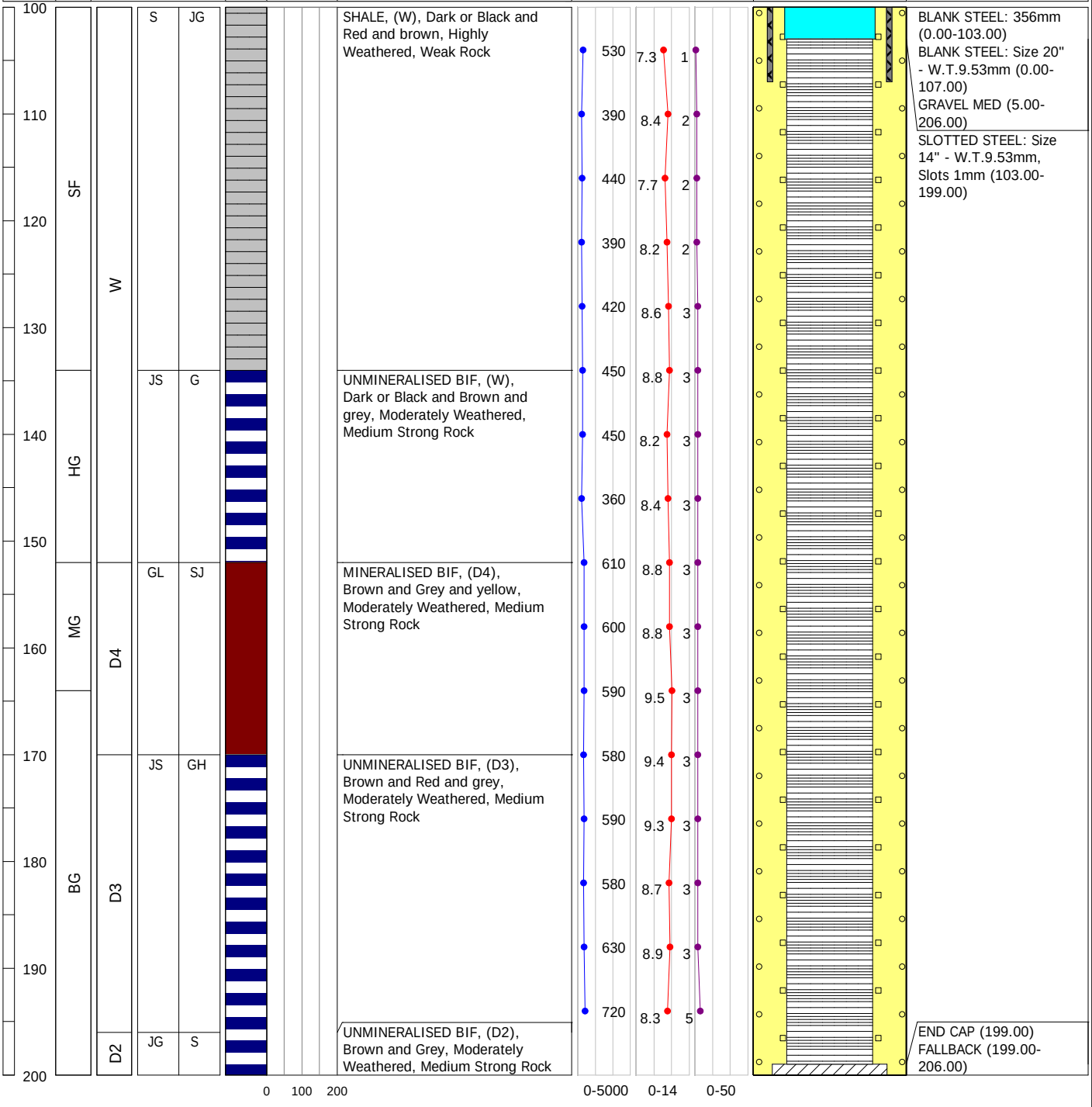
Project:	HASHIMOTO	Hole Name:	HHH0130	Hole Length:	206.00

Easting: 210927.52
Northing: 7412017.07
Surface RL: 522.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Feb 23 - 02 Mar 23
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	KM4
50.0 - 122.0	DR3	CH	500		EASTERNWELL	MM9
122.0 - 206.0	DR3	DR	450		EASTERNWELL	MM9, NK3

Comments: FWS at 104mbgl. Issues with heaving ground resulting in hole terminating at 206m. 20" DR casing stuck & left in hole to 107m.

TOC RL: 522.57 (Stickup 0.38m) (drilled) SWL: 95.40 MBTOC (05 Mar 23) Dev: Y: 46.3 hour(s) Final pH: 8.7
TOC RL: 522.57 (Stickup 0.38m) (current) Is Live: Y (-) Date: 02 Mar 2023 Final EC: 690.00



BHPIO - Hydrogeology Log

BHP

Project:	HASHIMOTO	Hole Name:	HHH0130	Hole Length:	206.00

Easting: 210927.52
Northing: 7412017.07
Surface RL: 522.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 24 Feb 23 - 02 Mar 23
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	KM4
50.0 - 122.0	DR3	CH	500		EASTERNWELL	MM9
122.0 - 206.0	DR3	DR	450		EASTERNWELL	MM9, NK3

Comments: FWS at 104mbgl. Issues with heaving ground resulting in hole terminating at 206m. 20" DR casing stuck & left in hole to 107m.

TOC RL: 522.57 (Stickup 0.38m) (drilled) SWL: 95.40 MBTOC (05 Mar 23) Dev: Y: 46.3 hour(s) Final pH: 8.7
TOC RL: 522.57 (Stickup 0.38m) (current) Is Live: Y (-) Date: 02 Mar 2023 Final EC: 690.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	BG	D2	JG	S			UNMINERALISED BIF, (D2), Brown and Grey, Moderately Weathered, Medium Strong Rock					GRAVEL MED (5.00-206.00)
210												SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (103.00-199.00)
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		END CAP (199.00) FALLBACK (199.00-206.00)

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HNPISJ0001	Hole Length:	224.00

Easting: 198797.02
Northing: 7410072.30
Surface RL: 546.62
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Feb 23 - 15 Feb 23
License: CAW207661
Comments: FWS@105mbgl.Sediment in casing @208.5-216m after install.Disseminated Pyrite @214-218m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 38.0	EWMWW06	DR	600		EASTERNWELL	BF2
38.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	BF2, KM4, BF2
146.0 - 188.0	EWMWW06	DR	450		EASTERNWELL	BF2
188.0 - 224.0	EWMWW06	CH	450		EASTERNWELL	BF2

TOC RL: 546.90 (Stickup 0.22m) (drilled) SWL: 106.99 MBTOC (17 Feb 23) Dev: Y: 22.8 hour(s) Final pH: 7.9
TOC RL: 546.90 (Stickup 0.22m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: 2054.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	Z	JY			SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					CEMENT (0.00-5.00)
			Z	J								BLANK STEEL: Size 24" - W.T.9.53mm (0.00-38.00)
10		GS3					SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.9.53mm (0.00-104.00)
20												GRAVEL MED (5.00-224.00)
30			Z	GJ			SILT, gravelly, trace sand, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Well graded, Sub-rounded					
40												
50	MG	VB2	Z	GF			CLAY, gravelly, trace sand, (VUGHY BRECCIA), Yellow and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
		CY2	Z	SG			CLAY, gravelly, trace sand, (CLAY), Grey and Brown and pink, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
60		MM	GL	JS			UNMINERALISED BIF, (MM), Brown and Yellow, Moderately Weathered, Medium Strong Rock					
70												
80												
90	SF											
100	MG											
						0 100 200		0-5000	0-14	0-50		

Program: FY23 SJ POTABLE REPLACEMENT Planned Hole: HNPISJ0001 Page: 31

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HNPISJ0001	Hole Length:	224.00

Easting: 198797.02
Northing: 7410072.30
Surface RL: 546.62
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Feb 23 - 15 Feb 23
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 38.0	EWMWW06	DR	600		EASTERNWELL	BF2
38.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	BF2, KM4, BF2
146.0 - 188.0	EWMWW06	DR	450		EASTERNWELL	BF2
188.0 - 224.0	EWMWW06	CH	450		EASTERNWELL	BF2

Comments: FWS@105mbgl.Sediment in casing @208.5-216m after install.Disseminated Pyrite @214-218m

TOC RL:	546.90	(Stickup 0.22m)	(drilled)	SWL:	106.99 MBTOC	(17 Feb 23)	Dev:	Y: 22.8 hour(s)	Final pH:	7.9
TOC RL:	546.90	(Stickup 0.22m)	(current)	Is Live:	Y	(-)	Date:	15 Feb 2023	Final EC:	2054.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description
100–110	MG	MM	GL	JS			UNMINERALISED BIF, (MM), Brown and Yellow, Moderately Weathered, Medium Strong Rock
110–120	MG	MN	G	CS			MINERALISED BIF, (MN), Yellow and Brown, Moderately Weathered, Medium Strong Rock
120–140	MG	MN	G	CS			MINERALISED BIF, (MN), Yellow and Brown, Moderately Weathered, Medium Strong Rock
140–150	SF	MN	H	WG			MINERALISED BIF, (MN), Dark or Black and Red, Moderately Weathered, Medium Strong Rock
150–160	MG	MN	JG	CS			UNMINERALISED BIF, (MN), Yellow and Brown, Moderately Weathered, Medium Strong Rock
160–170	HG	MN	JG	CS			UNMINERALISED BIF, (MN), Yellow and Brown, Moderately Weathered, Medium Strong Rock
170–180	MG	MN	JG	CS			UNMINERALISED BIF, (MN), Yellow and Brown, Moderately Weathered, Medium Strong Rock
180–190	MG	JN	H	GS			MINERALISED BIF, (JN), Red, Moderately Weathered, Medium Strong Rock
190–200	MG	JN	H	GS			MINERALISED BIF, (JN), Red, Moderately Weathered, Medium Strong Rock

Depth mgbl	EC us/cm	pH	Yield L/s
100	370	9.6	1
110	390	8.2	1
120	830	9.1	2
130	880	8.6	4
140	640	8.5	4
150	880	8.5	2
160	950	8.9	4
170	950	8.8	3
180	940	8.3	15
190	1000	8.3	15
200	1010	8.4	15
	950	8.5	15
	970	8.4	15
	1100	8.3	15
	1020	8.2	15
	980	8.2	15

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50

Diagram Scaled to 600mm

BLANK STEEL: Size 12" - W.T.9.53mm (0.00-104.00)
GRAVEL MED (5.00-224.00)
SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double density slotted steel (104.00-218.00)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HNPISJ0001 **Hole Length:** 224.00

Easting: 198797.02
Northing: 7410072.30
Surface RL: 546.62
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 09 Feb 23 - 15 Feb 23
License: CAW207661
Comments: FWS@105mbgl.Sediment in casing @208.5-216m after install.Disseminated Pyrite @214-218m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 38.0	EWMWW06	DR	600		EASTERNWELL	BF2
38.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	BF2, KM4, BF2
146.0 - 188.0	EWMWW06	DR	450		EASTERNWELL	BF2
188.0 - 224.0	EWMWW06	CH	450		EASTERNWELL	BF2

TOC RL: 546.90 (Stickup 0.22m) (drilled) SWL: 106.99 MBTOC (17 Feb 23) Dev: Y: 22.8 hour(s) Final pH: 7.9
TOC RL: 546.90 (Stickup 0.22m) (current) Is Live: Y (-) Date: 15 Feb 2023 Final EC: 2054.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	MG	JN	H	GS			MINERALISED BIF, (JN), Red, Moderately Weathered, Medium Strong Rock	980	8.2	15		GRAVEL MED (5.00-224.00)
210								970	8.3	15		SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double density slotted steel (104.00-218.00)
	HG		S	JC			UNMINERALISED BIF, (JN), Grey, Fresh, Strong Rock	900	8.6	15		
220								990	8.3	15		BLANK STEEL: Size 12" - W.T.9.53mm (218.00-224.00)
												END CAP (224.00)
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HNPISJ0002	Hole Length:	194.00

Easting: 198368.13
Northing: 7410091.50
Surface RL: 548.41
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Feb 23 - 01 Mar 23

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 194.0	EWMWW06	DR	300		EASTERNWELL	NK3

License: CAW207661

Comments: Pilot Hole HSJ0262. FWS @ 107m .Hole terminated at 194mbgl due to Carbonaceous Shales.

TOC RL: 548.87 (Stickup 0.44m) (drilled) SWL: 107.52 MBTOC (03 Mar 23) Dev: Y: 15.8 hour(s) Final pH: 8.0
TOC RL: 548.87 (Stickup 0.44m) (current) Is Live: Y (-) Date: 28 Feb 2023 Final EC: 2280.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
0	MG	SZ	Z	JY			GRAVEL, silty, trace clay, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					END CAP: Lockable steel cover (0.00)
10		MM	GJ	S			MINERALISED BIF, (MM), Brown and Grey, Moderately Weathered, Medium Strong Rock					CEMENT (0.00-5.00)
20												BLANK STEEL: Size 24" - W.T.9.53mm (0.00-20.00)
30												BLANK STEEL: Size 12" - W.T.9.53mm (0.00-104.00)
40												GRAVEL MED (5.00-194.00)
50												
60												
70												
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HNPISJ0002	Hole Length:	194.00

Easting: 198368.13
Northing: 7410091.50
Surface RL: 548.41
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 25 Feb 23 - 01 Mar 23
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 194.0	EWMWW06	DR	300		EASTERNWELL	NK3

Comments: Pilot Hole HSJ0262. FWS @ 107m .Hole terminated at 194mbgl due to Carbonaceous Shales.

TOC RL: 548.87 (Stickup 0.44m) (drilled) SWL: 107.52 MBTOC (03 Mar 23) Dev: Y: 15.8 hour(s) Final pH: 8.0
TOC RL: 548.87 (Stickup 0.44m) (current) Is Live: Y (-) Date: 28 Feb 2023 Final EC: 2280.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 400mm	Notes
100	MG	MM	GJ	S			MINERALISED BIF, (MM), Brown and Grey, Moderately Weathered, Medium Strong Rock	620	9.3	5		BLANK STEEL: Size 12" - W.T.9.53mm (0.00-104.00)
			GW	LJ								GRAVEL MED (5.00-194.00)
110		N1					MINERALISED BIF, (N1), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock	880	8.8	5		SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double density slotted steel (104.00-188.00)
120												
130	MG		JG	C			UNMINERALISED BIF, (N2), Brown and Grey, Moderately Weathered, Medium Strong Rock	830	8.8	5		
140		N2						440	8.3	5		
150								940	8.5	10		
	HG		JC	LG			UNMINERALISED BIF, (N3), Brown and Grey and yellow, Moderately Weathered, Medium Strong Rock	1030	8.6	20		
160								1020	8.5	20		
		N3						1050	8.6	20		
170								1030	8.0	20		
								2070	8.7	25		
180								2020	8.4	30		
	SF											
190		JN	S	BN			SHALE, (JN), Grey and Dark or Black, Highly Weathered, Weak Rock	330	8.4	30		BLANK STEEL: Size 12" - W.T.9.53mm (188.00-194.00)
												END CAP (194.00)
200												

0 100 200 | 0-5000 | 0-14 | 0-50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0220	Hole Length:	252.00

Easting: 201202.07
Northing: 7409852.84
Surface RL: 538.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Feb 22 - 05 Mar 22
Comments: TOC = 0.40m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	DR5	DR	500		EASTERNWELL	MF3
90.0 - 198.0	DR5	DR	450		EASTERNWELL	MF3, NK3
198.0 - 252.0	DR5	CH	400		EASTERNWELL	NK3

License: CAW204608

TOC RL: 538.63 (Stickup 0.40m) (drilled) SWL: Dev: Y: 18.8 hour(s) Final pH: 8.5
TOC RL: 538.63 (Stickup 0.40m) (current) Is Live: Y (-) Date: 05 Mar 2022 Final EC: 1451.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	TD3	ZSK	QY								AB FOAM (0.00-2.00) BLANK STEEL: Size 20" - W.T.12.7mm (0.00-90.00) BLANK STEEL: Size 12" - W.T.9.53mm (0.00-164.00) GRAVEL MED (2.00-248.00)
10												
20		TD2	ZK	I								
30												
40		TD1	Z	K								
50		MM	JH				MINERALISED BIF, (MM), , Highly Weathered, Medium Strong Rock					
60												
70	BG		JH				MINERALISED BIF, (MM), , Slightly Weathered, Strong Rock					
80		N1	JH				MINERALISED BIF, (N1), , Moderately Weathered, Medium Strong Rock					
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

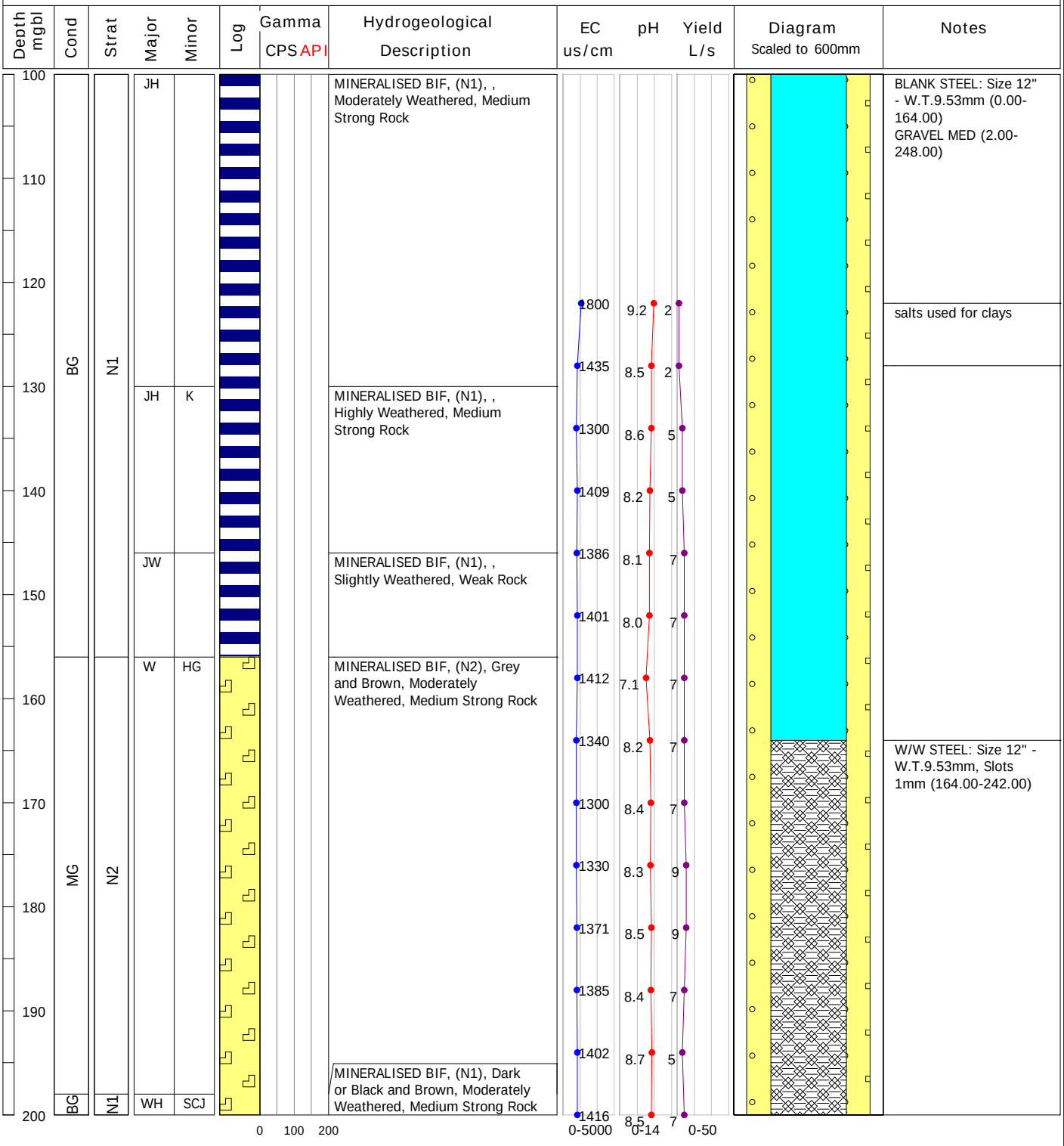
Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0220	Hole Length:	252.00

Easting: 201202.07
Northing: 7409852.84
Surface RL: 538.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Feb 22 - 05 Mar 22
Comments: TOC = 0.40m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	DR5	DR	500		EASTERNWELL	MF3
90.0 - 198.0	DR5	DR	450		EASTERNWELL	MF3, NK3
198.0 - 252.0	DR5	CH	400		EASTERNWELL	NK3

License: CAW204608

TOC RL: 538.63 (Stickup 0.40m) (drilled) SWL: Dev: Y: 18.8 hour(s) Final pH: 8.5
TOC RL: 538.63 (Stickup 0.40m) (current) Is Live: Y (-) Date: 05 Mar 2022 Final EC: 1451.00



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0220	Hole Length:	252.00

Easting: 201202.07
Northing: 7409852.84
Surface RL: 538.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 28 Feb 22 - 05 Mar 22
Comments: TOC = 0.40m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 90.0	DR5	DR	500		EASTERNWELL	MF3
90.0 - 198.0	DR5	DR	450		EASTERNWELL	MF3, NK3
198.0 - 252.0	DR5	CH	400		EASTERNWELL	NK3

License: CAW204608

TOC RL: 538.63 (Stickup 0.40m) (drilled) SWL: Dev: Y: 18.8 hour(s) Final pH: 8.5
TOC RL: 538.63 (Stickup 0.40m) (current) Is Live: Y (-) Date: 05 Mar 2022 Final EC: 1451.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	BG	N1	WH	SCJ			MINERALISED BIF, (N1), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock	1416	8.5	7		GRAVEL MED (2.00-248.00)
210								1457	8.6	7		
220			J	WQ			UNMINERALISED BIF, (N1), Brown and Dark or Black and grey, Moderately Weathered, Medium Strong Rock	1479	8.2	7		salts used for clays
230								1426	8.3	7		W/W STEEL: Size 12" - W.T.9.53mm, Slots 1mm (164.00-242.00)
240								1443	8.3	7		
250								1440	8.3	7		BLANK STEEL: Size 12" - W.T.9.53mm (242.00-248.00)
260								1479	8.2	7		END CAP (248.00)
270								1464	8.3	7		FALLBACK (248.00-252.00)
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0222	Hole Length:	242.00

Easting: 201808.12
Northing: 7409745.48
Surface RL: 536.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Feb 22 - 15 Feb 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	600		EASTERNWELL	NK3
80.0 - 140.0	DR3	DR	500		EASTERNWELL	MF3
140.0 - 206.0	DR5	DR	500		EASTERNWELL	NK3
206.0 - 242.0	DR5	DR	450		EASTERNWELL	NK3, MM9

License: CAW204608

Comments: Water not clear of fines. Development yield low- West Ang acting as constraint.

TOC RL:	536.59	(Stickup 0.30m)	(drilled)	SWL:	112.95 MBTOC	(18 Feb 22)	Dev:	Y: 81.3 hour(s)	Final pH: 8.2
TOC RL:	536.59	(Stickup 0.30m)	(current)	Is Live:	Y	(-)	Date:	15 Feb 2022	Final EC: 1144.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	Z	YQJ			GRAVEL, silty, trace sand, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Well graded, Sub-angular					AB FOAM (0.00-2.00) BLANK STEEL: Size 24" - W.T.9.53mm (0.00-80.00) BLANK STEEL: Size 12" - W.T.9.53mm (0.00-160.00) GRAVEL MED (0.00-232.00)
10		TD3	Z	XJK			GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Pink and Light or White, Transported, Firm, Poorly graded, Sub-angular					
20												
30												
40												
50												
60												
70		WA2	S	J			SHALE, (WA2), , Extremely Weathered, Extremely Weak Rock					
80												
90												
100			J	SK			UNMINERALISED BIF, (WA2), , Moderately Weathered, Strong Rock					
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

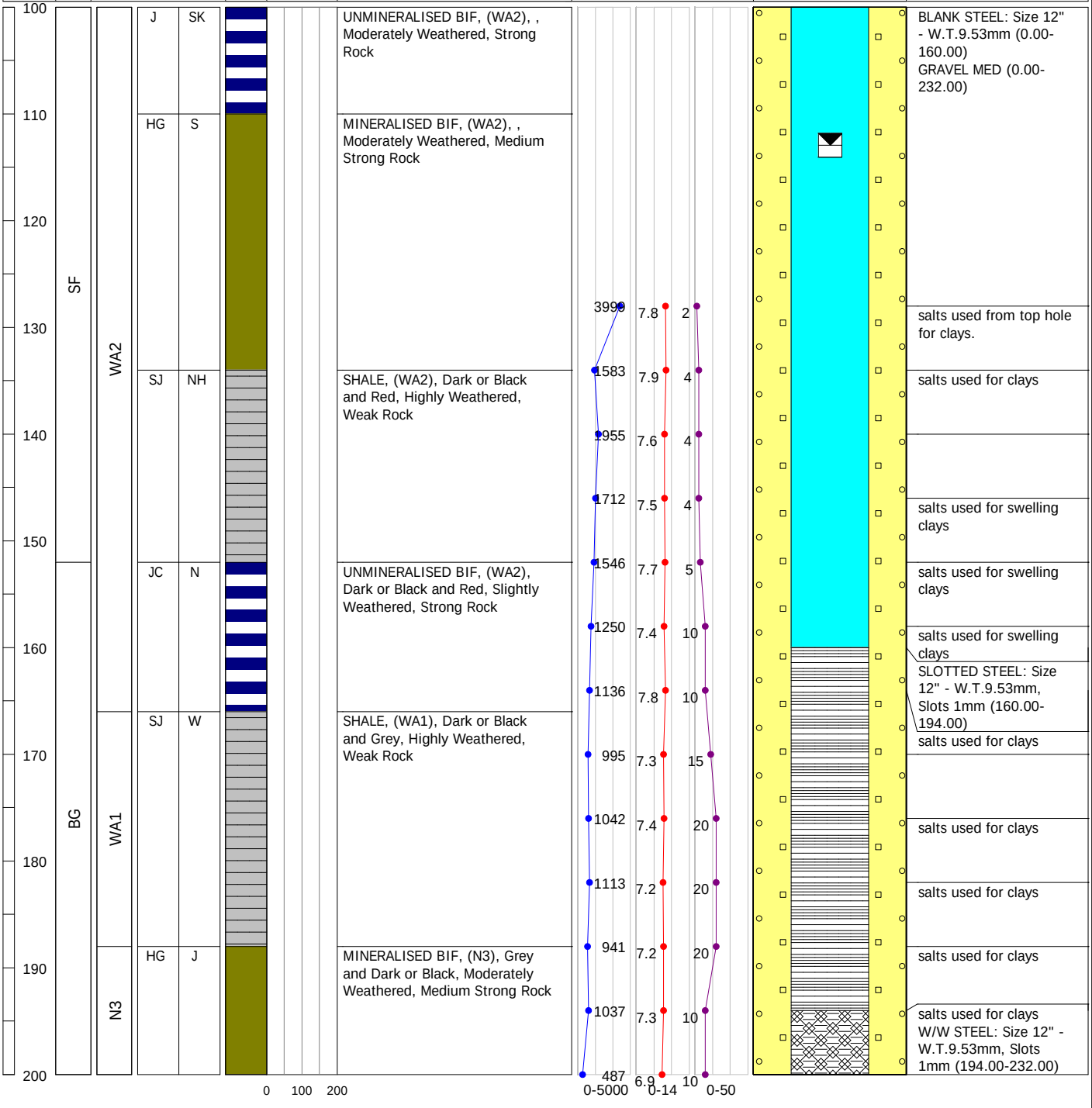
BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0222 **Hole Length:** 242.00

Easting: 201808.12
Northing: 7409745.48
Surface RL: 536.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Feb 22 - 15 Feb 22
License: CAW204608
Comments: Water not clear of fines. Development yield low- West Ang acting as constraint.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	600		EASTERNWELL	NK3
80.0 - 140.0	DR3	DR	500		EASTERNWELL	MF3
140.0 - 206.0	DR5	DR	500		EASTERNWELL	NK3
206.0 - 242.0	DR5	DR	450		EASTERNWELL	NK3, MM9

TOC RL: 536.59 (Stickup 0.30m) (drilled) SWL: 112.95 MBTOC (18 Feb 22) Dev: Y: 81.3 hour(s) Final pH: 8.2
TOC RL: 536.59 (Stickup 0.30m) (current) Is Live: Y (-) Date: 15 Feb 2022 Final EC: 1144.00



BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0222 Hole Length: 242.00

Easting: 201808.12
Northing: 7409745.48
Surface RL: 536.17
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Feb 22 - 15 Feb 22
Comments: Water not clear of fines. Development yield low- West Ang acting as constraint.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	600		EASTERNWELL	NK3
80.0 - 140.0	DR3	DR	500		EASTERNWELL	MF3
140.0 - 206.0	DR5	DR	500		EASTERNWELL	NK3
206.0 - 242.0	DR5	DR	450		EASTERNWELL	NK3, MM9

License: CAW204608

TOC RL: 536.59 (Stickup 0.30m) (drilled) SWL: 112.95 MBTOC (18 Feb 22) Dev: Y: 81.3 hour(s) Final pH: 8.2
TOC RL: 536.59 (Stickup 0.30m) (current) Is Live: Y (-) Date: 15 Feb 2022 Final EC: 1144.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	BG	N3	HG	J			MINERALISED BIF, (N3), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock	487	6.9	10		GRAVEL MED (0.00-232.00)
210								457	7.2	5		
										0		
220										0		
		N2	G	WJ			MINERALISED BIF, (N2), Brown and Grey, Moderately Weathered, Medium Strong Rock	315	7.8	2		salts used from top hole for clays.
230								902	7.9	2		salts used for clays
240								890	7.8	1		
												salts used for swelling clays
250												salts used for swelling clays
												salts used for swelling clays
260												SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm (160.00-194.00)
												salts used for clays
270												salts used for clays
												salts used for clays
												salts used for clays
280												salts used for clays W/W STEEL: Size 12" - W.T.9.53mm, Slots 1mm (194.00-232.00)
												just drilling foam - no Water
290												just drilling foam - no water
												just drilling foam - no water
												no sample
300												END CAP (232.00) FALLBACK (232.00-242.00)
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0223 Hole Length: 218.00

Easting: 201543.71
Northing: 7409718.94
Surface RL: 536.94
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Jan 22 - 10 Jan 22
License: CAW204608
Comments: Overdrilled 8m to account for potential fallback.Attempt install to depth. Dipped @ 214.5m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	NK3
50.0 - 92.0	DR3	DR	550		EASTERNWELL	NK3
92.0 - 176.0	DR3	DR	500		EASTERNWELL	JK3
176.0 - 218.0	DR3	DR	450		EASTERNWELL	JG6

TOC RL: 537.38 (Stickup 0.40m) (drilled) SWL: 112.02 MBTOC (13 Jan 22) Dev: Y: 29.8 hour(s) Final pH: 7.4
TOC RL: 537.38 (Stickup 0.40m) (current) Is Live: Y (-) Date: 10 Jan 2022 Final EC: 1300.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	Z	YX			GRAVEL, silty, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					CEMENT (0.00-2.00) BLANK STEEL: 610mm (0.00-50.00) BLANK STEEL: Size 12" - W.T.9.53mm (0.00-175.50) GRAVEL MED (2.00-214.50)
20		TD3	ZF	GX			SILT, gravelly, (SILTSTONE), Red, Transported, Non-Cohesive soils, Well graded, Sub-angular					
30		TD2	Z	XGQ			SAND, (GRAVELLY SILTSTONE), Red and Brown, Transported, Non-Cohesive soils, Uniform, Sub-rounded					
40		WA1	GW	SX			MINERALISED BIF, (WA1), Brown and Yellow, Moderately Weathered, Medium Strong Rock					
70		N3	HW	FS			MINERALISED BIF, (N3), Red and Grey, Moderately Weathered, Medium Strong Rock					
90			HG				MINERALISED BIF, (N3), Blue and Grey, Moderately Weathered, Medium Strong Rock					
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0223	Hole Length:	218.00

Easting: 201543.71
Northing: 7409718.94
Surface RL: 536.94
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Jan 22 - 10 Jan 22
License: CAW204608
Comments: Overdrilled 8m to account for potential fallback.Attempt install to depth. Dipped @ 214.5m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	NK3
50.0 - 92.0	DR3	DR	550		EASTERNWELL	NK3
92.0 - 176.0	DR3	DR	500		EASTERNWELL	JK3
176.0 - 218.0	DR3	DR	450		EASTERNWELL	JG6

TOC RL: 537.38 (Stickup 0.40m) (drilled) SWL: 112.02 MBTOC (13 Jan 22) Dev: Y: 29.8 hour(s) Final pH: 7.4
TOC RL: 537.38 (Stickup 0.40m) (current) Is Live: Y (-) Date: 10 Jan 2022 Final EC: 1300.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100–110	SF	N3	HG				MINERALISED BIF, (N3), Blue and Grey, Moderately Weathered, Medium Strong Rock					BLANK STEEL: Size 12" - W.T.9.53mm (0.00-175.50) GRAVEL MED (2.00-214.50)
110–120	SF	N2	GH	S			MINERALISED BIF, (N2), Brown and Blue and yellow, Moderately Weathered, Medium Strong Rock	746	8.2	2		
120–130	SF	N2	H	G			MINERALISED BIF, (N2), Blue and Grey, Moderately Weathered, Medium Strong Rock	749 / 848	7.8 / 7.6	1 / 6		
130–140	SF	N2	GW	L			MINERALISED BIF, (N2), Blue and Grey and brown, Moderately Weathered, Medium Strong Rock	774	7.8	10		
140–150	HG	N2	W	SG			MINERALISED BIF, (N2), Blue and Grey and red, Moderately Weathered, Medium Strong Rock	891 / 873	8.2 / 8.1	0 / 10		no readings recorded
150–160	BG	N1	J				MINERALISED BIF, (N1), Dark or Black and Brown and grey, Slightly Weathered, Medium Strong Rock	880 / 890 / 876 / 960	7.9 / 8.0 / 7.9 / 8.0	10 / 10 / 12 / 10		
160–170	BG	N1	J	1S			UNMINERALISED BIF, (MM), Brown and Grey, Slightly Weathered, Strong Rock	970 / 964 / 990	7.8 / 7.9 / 8.2	8 / 10 / 10		W/W STEEL: Size 12" - W.T.9.53mm, Slots 1mm (175.50-211.50)
170–180	BG	MM										
180–190	BG	MM										
190–200	HG	MM						950	7.8	10		
200	BG	MM										

0 100 200 (Gamma CPS API)
0-5000 (EC us/cm) 0-14 (pH) 0-50 (Yield L/s)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0223 **Hole Length:** 218.00

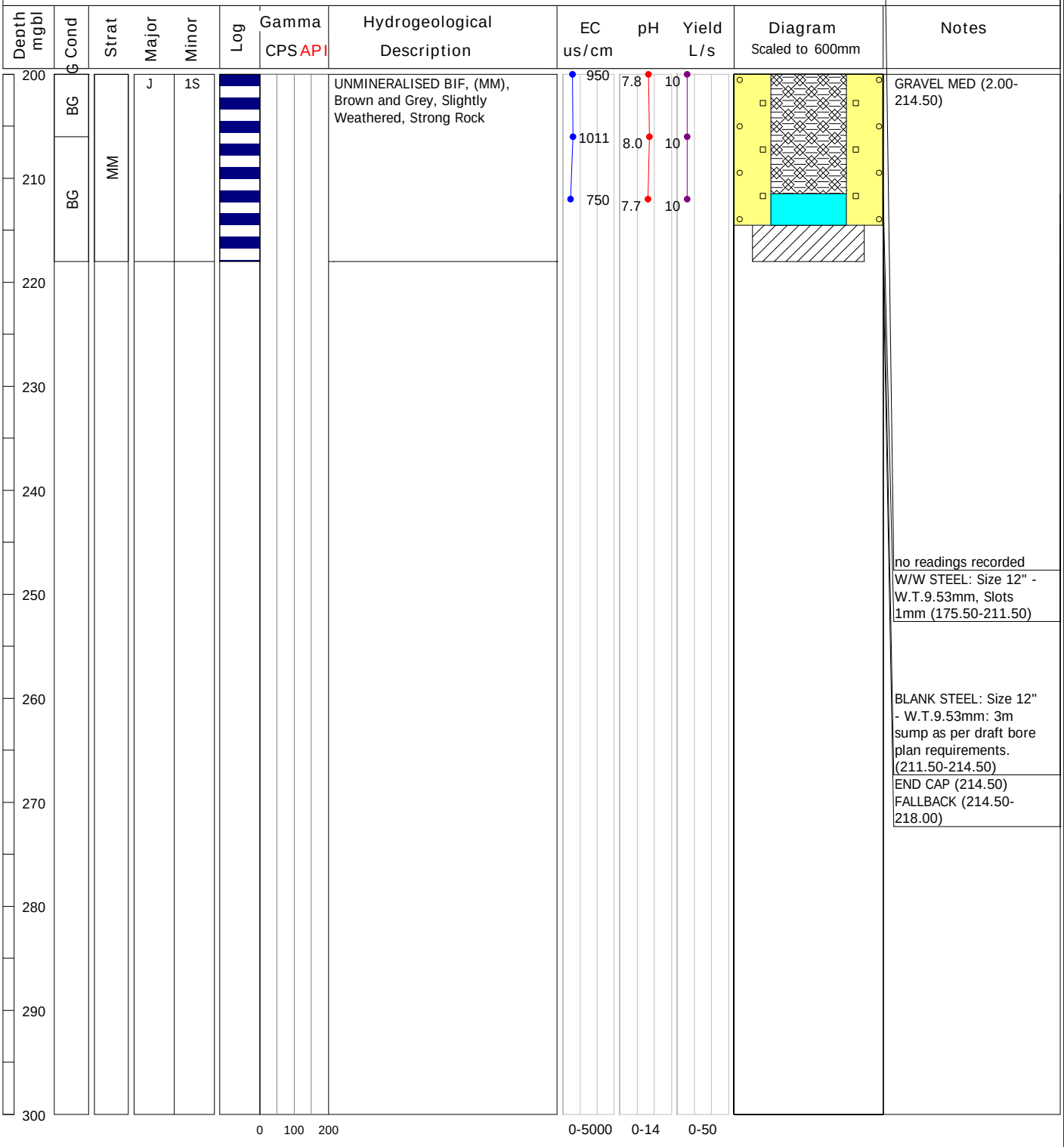
Easting: 201543.71
Northing: 7409718.94
Surface RL: 536.94
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 03 Jan 22 - 10 Jan 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 50.0	DR3	DR	600		EASTERNWELL	NK3
50.0 - 92.0	DR3	DR	550		EASTERNWELL	NK3
92.0 - 176.0	DR3	DR	500		EASTERNWELL	JK3
176.0 - 218.0	DR3	DR	450		EASTERNWELL	JG6

License: CAW204608

Comments: Overdrilled 8m to account for potential fallback.Attempt install to depth. Dipped @ 214.5m

TOC RL: 537.38 (Stickup 0.40m) (drilled) SWL: 112.02 MBTOC (13 Jan 22) Dev: Y: 29.8 hour(s) Final pH: 7.4
TOC RL: 537.38 (Stickup 0.40m) (current) Is Live: Y (-) Date: 10 Jan 2022 Final EC: 1300.00



Program: FY22 SJB SJD2 DEW Phase 1 DR Planned Hole: HSJ0223 Page: 44

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0224	Hole Length:	104.00

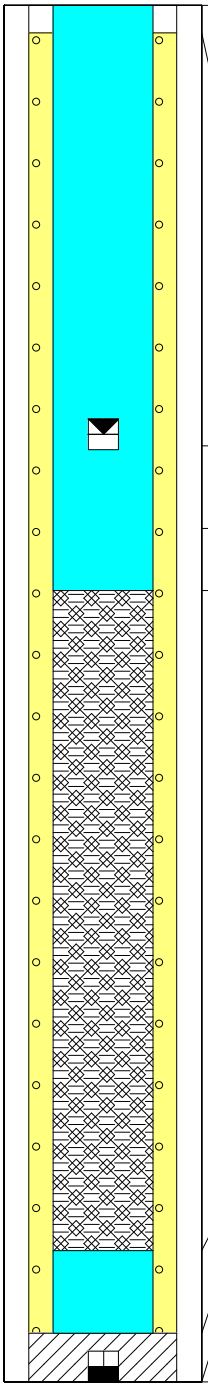
Easting: 204187.71
Northing: 7409886.76
Surface RL: 451.98
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 May 22 - 12 May 22
License: CAW204608
Comments: Install to 96.5mbgl - fallback. High sediment load, development longer than usual.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	450		EASTERNWELL	MM9, NK3
80.0 - 104.0	DR3	CH	450		EASTERNWELL	NK3

TOC RL:	452.36	(Stickup 0.20m)	(drilled)	SWL:	31.15 MBTOC	(14 May 22)	Dev:	Y: 47.0 hour(s)	Final pH:	8.6
TOC RL:	452.36	(Stickup 0.20m)	(current)	Is Live:	Y	(-)	Date:	12 May 2022	Final EC:	1680.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s
0	MG	MM	1J	S			UNMINERALISED BIF, (MM), Brown and Yellow, Slightly Weathered, Strong Rock	1750	8.4	5
10								1750	8.3	5
20	HG		S	JQC			UNMINERALISED BIF, (MM), Grey and Brown and yellow, Slightly Weathered, Strong Rock	1750	8.3	5
30								1750	8.3	5
40	MG	MU	Z3G	CN			UNMINERALISED BIF, (MU), Grey and Dark or Black and blue, Moderately Weathered, Medium Strong Rock	2200	8.6	6
50								2860	8.3	8
60								2000	8.8	8
70	HG		JC	W			UNMINERALISED BIF, (MU), Grey and Dark or Black, Moderately Weathered, Medium Strong Rock	1740	8.6	8
80								1730	8.6	8
90								1740	8.6	8
100			JC	S			UNMINERALISED BIF, (MU), Grey and Dark or Black and brown, Moderately Weathered, Medium Strong Rock	1750	8.6	8
								1760	8.6	8
					0 100 200			0-5000	0-14	0-50

Diagram Scaled to 600mm



Notes:
- AB FOAM (0.00-2.00)
- BLANK STEEL: Size 12" - W.T.9.53mm (0.00-42.50)
- GRAVEL MED (2.00-96.50)
- <5L/s
- <5L/s
- W/W STEEL: Size 12" - W.T.9.53mm, Slots 2mm (42.50-90.50)
- BLANK STEEL: Size 12" - W.T.9.53mm (90.50-96.50)
- FALLBACK (96.50-104.00)
- WELLCAP(100.00) ID: 2926

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0224	Hole Length:	104.00

Easting: 204187.71
Northing: 7409886.76
Surface RL: 451.98
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 06 May 22 - 12 May 22

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	450		EASTERNWELL	MM9, NK3
80.0 - 104.0	DR3	CH	450		EASTERNWELL	NK3

License: CAW204608

Comments: Install to 96.5mbgl - fallback. High sediment load, development longer than usual.

TOC RL: 452.36 (Stickup 0.20m) (drilled) SWL: 31.15 MBTOC (14 May 22) Dev: Y: 47.0 hour(s) Final pH: 8.6
TOC RL: 452.36 (Stickup 0.20m) (current) Is Live: Y (-) Date: 12 May 2022 Final EC: 1680.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	HG	MU	JC	S			UNMINERALISED BIF, (MU), Grey and Dark or Black and brown, Moderately Weathered, Medium Strong Rock					FALLBACK (96.50-104.00)

110 120 130 140 150 160 170 180 190 200

0 100 200 | 0-5000 0-14 0-50

Program: FY22 SJB SJC2 DEW Phase 3 DR Inpit Planned Hole: SJB_FY21_001

BHPIO - Hydrogeology Log

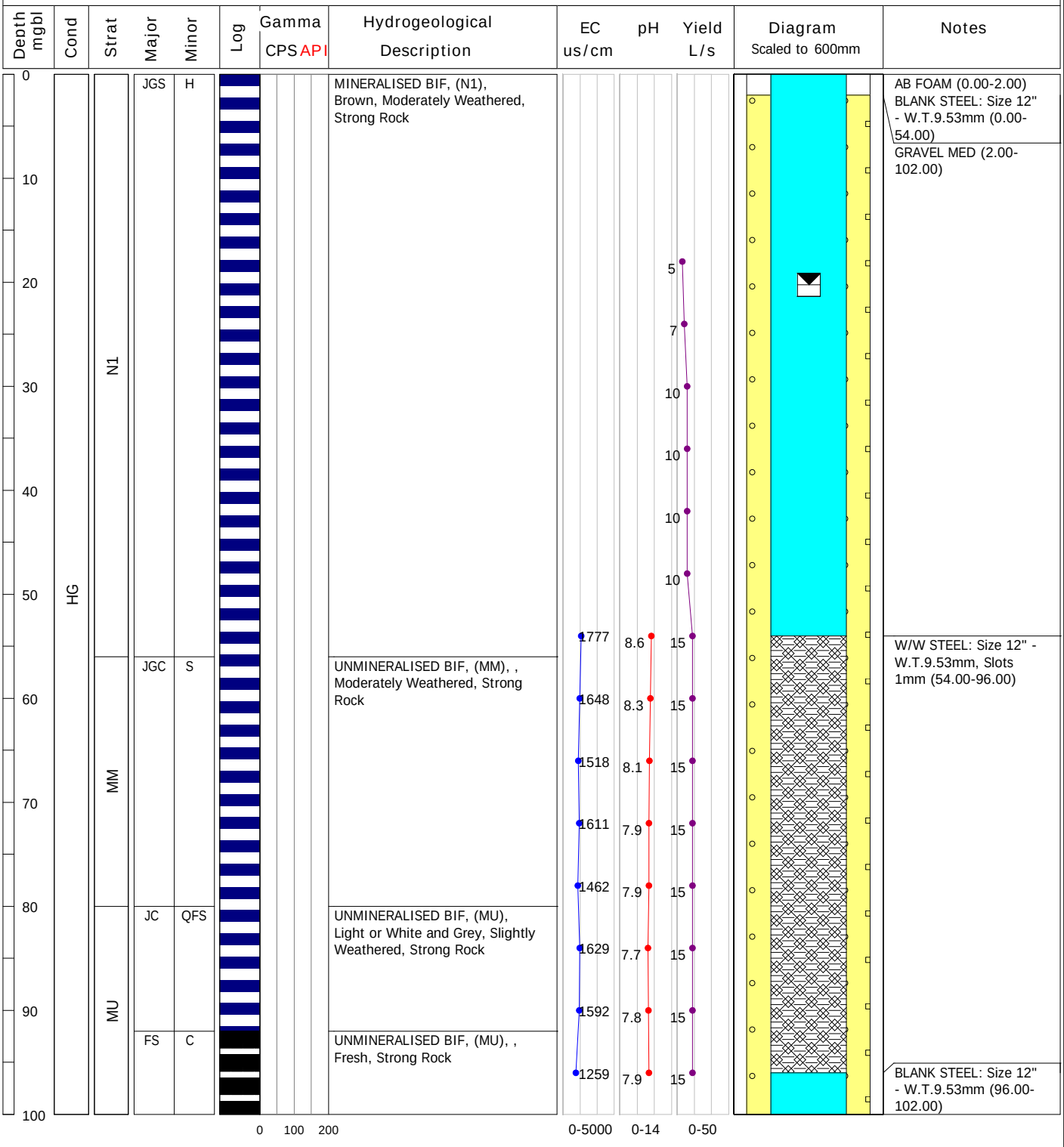
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0225	Hole Length:	104.00

Easting: 204315.51
Northing: 7409960.12
Surface RL: 441.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Apr 22 - 23 Apr 22
License: CAW204608
Comments: Over drill to 104m to end of rod also to account for any fallback.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 9.5	DR3	DR	500		EASTERNWELL	MF3
9.5 - 56.0	DR3	DR	450		EASTERNWELL	MF3
56.0 - 104.0	DR3	CH	400		EASTERNWELL	MF3

TOC RL: 441.77 (Stickup 0.60m) (drilled) SWL: 20.25 MBTOC (28 Apr 22) Dev: Y: 10.1 hour(s) Final pH: 7.9
TOC RL: 441.77 (Stickup 0.60m) (current) Is Live: Y (-) Date: 23 Apr 2022 Final EC: 1669.00



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0225	Hole Length:	104.00

Easting: 204315.51
Northing: 7409960.12
Surface RL: 441.12
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 17 Apr 22 - 23 Apr 22
License: CAW204608
Comments: Over drill to 104m to end of rod also to account for any fallback.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 9.5	DR3	DR	500		EASTERNWELL	MF3
9.5 - 56.0	DR3	DR	450		EASTERNWELL	MF3
56.0 - 104.0	DR3	CH	400		EASTERNWELL	MF3

TOC RL: 441.77 (Stickup 0.60m) (drilled) SWL: 20.25 MBTOC (28 Apr 22) Dev: Y: 10.1 hour(s) Final pH: 7.9
TOC RL: 441.77 (Stickup 0.60m) (current) Is Live: Y (-) Date: 23 Apr 2022 Final EC: 1669.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	HG	MU	FS	C			UNMINERALISED BIF, (MU), , Fresh, Strong Rock					GRAVEL MED (2.00-102.00)
110												
120												
130												
140												
150												
160												W/W STEEL: Size 12" - W.T.9.53mm, Slots 1mm (54.00-96.00)
170												BLANK STEEL: Size 12" - W.T.9.53mm (96.00-102.00)
180												END CAP (102.00)
190												FALLBACK (102.00-104.00)
200						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0238	Hole Length:	162.00

Easting: 209456.50
Northing: 7409817.68
Surface RL: 520.96
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Nov 22 - 19 Nov 22
License: CAW207661
Comments: FWS at approx. 69m. DR24" Casing left in ground from 0-32m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR5	DR	600		EASTERNWELL	KM4
32.0 - 122.0	DR5	DR	500		EASTERNWELL	KM4
122.0 - 162.0	DR5	CH	500		EASTERNWELL	KM4

TOC RL: 521.43 (Stickup 0.43m) (drilled) SWL: 62.21 MBTOC (24 Nov 22) Dev: Y: 8.0 hour(s) Final pH: 8.2
TOC RL: 521.43 (Stickup 0.43m) (current) Is Live: Y (-) Date: 19 Nov 2022 Final EC: 1640.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	Z	YQJ			SAND, silty, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					CEMENT (0.00-5.00)
	HG		ZY	JX								BLANK STEEL: Size 24" - W.T.9.53mm (0.00-32.00)
10							SAND, silty, trace gravel, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.9.53mm (0.00-65.50)
	MG	GS3										GRAVEL MED (5.00-161.50)
20												
30			G	LS			MINERALISED BIF, (WA1), Brown, Moderately Weathered, Medium Strong Rock					
40												
50	HG											
60		WA1										
70								59	7.5	1		SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double slotted steel (65.50-155.50)
	SF							38	6.6	1		
80								55	8.3	5		
	HG							52	8.1	1		
90		MN	GW	J			MINERALISED BIF, (MN), Dark or Black and blue and brown, Moderately Weathered, Strong Rock	470	8.2	1		
100								470	8.1	2		
						0 100 200		0-5000	0-14	0-50		

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_PB01 Page: 49

BHPIO - Hydrogeology Log

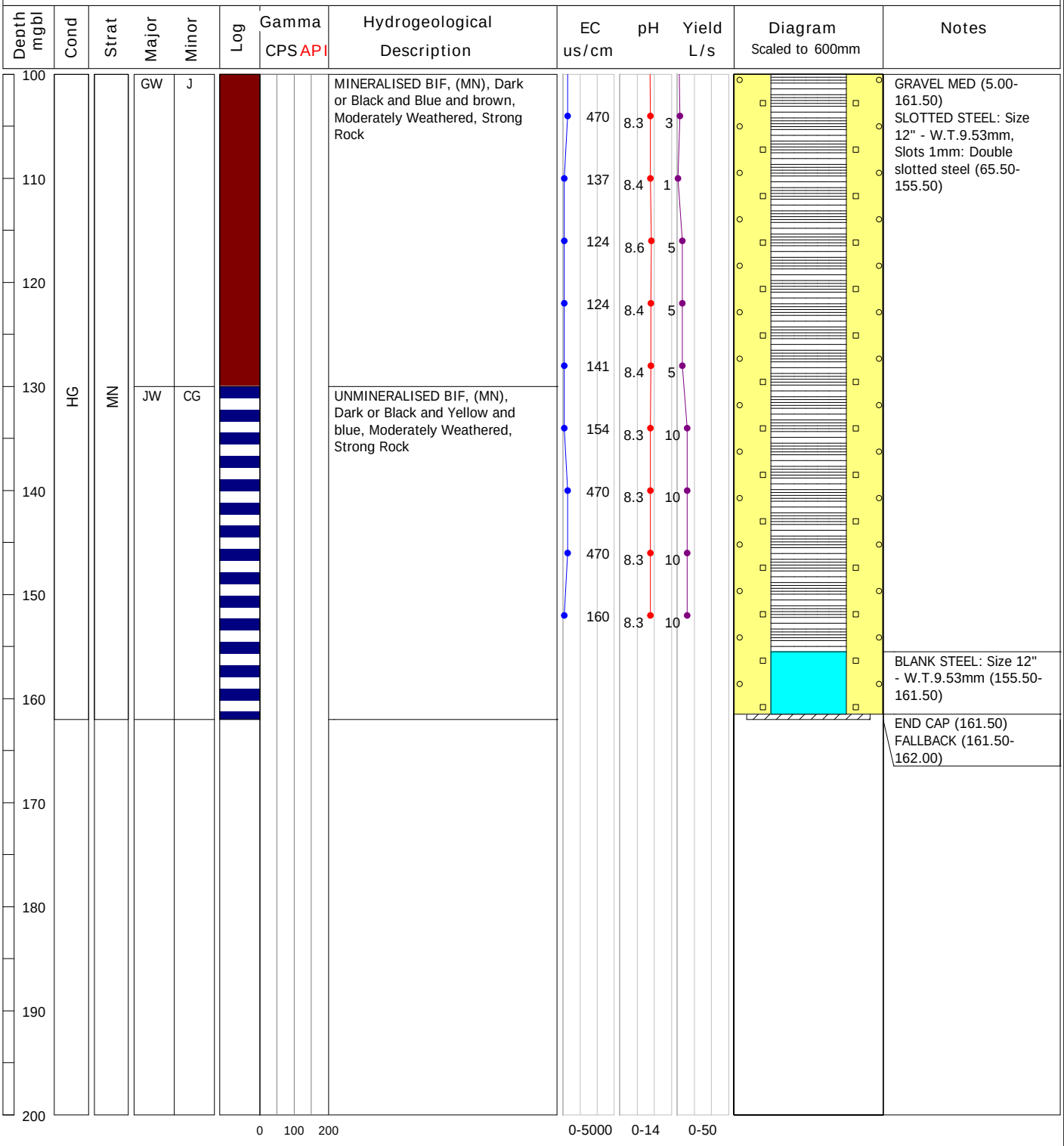
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0238	Hole Length:	162.00

Easting: 209456.50
Northing: 7409817.68
Surface RL: 520.96
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 14 Nov 22 - 19 Nov 22
License: CAW207661
Comments: FWS at approx. 69m. DR24" Casing left in ground from 0-32m

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	DR5	DR	600		EASTERNWELL	KM4
32.0 - 122.0	DR5	DR	500		EASTERNWELL	KM4
122.0 - 162.0	DR5	CH	500		EASTERNWELL	KM4

TOC RL: 521.43 (Stickup 0.43m) (drilled) SWL: 62.21 MBTOC (24 Nov 22) Dev: Y: 8.0 hour(s) Final pH: 8.2
TOC RL: 521.43 (Stickup 0.43m) (current) Is Live: Y (-) Date: 19 Nov 2022 Final EC: 1640.00



Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_PB01 Page: 50

BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0239	Hole Length:	200.00

Easting: 209143.87
Northing: 7409834.00
Surface RL: 521.25
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 16 Nov 22 - 21 Nov 22
License: CAW207661
Comments: Production bore. Drilled to 200m, installed to 199m. FWS at 60mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	600		EASTERNWELL	KM4
80.0 - 200.0	DR3	CH	500		EASTERNWELL	KM4

TOC RL: 521.76 (Stickup 0.45m) (drilled) SWL: 62.64 MBTOC (25 Nov 22) Dev: Y: 38.3 hour(s) Final pH: 8.1
TOC RL: 521.76 (Stickup 0.45m) (current) Is Live: Y (-) Date: 21 Nov 2022 Final EC: 639.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	ZYQ	J			SILT, gravelly, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Gap graded, Sub-angular					CEMENT (0.00-5.00)
10		GS3	ZY	JQ			GRAVEL, silty, (GRAVELLY SILTSTONE), Red, Transported, Non-Cohesive soils, Gap graded, Sub-rounded					BLANK STEEL: Size 12" - W.T.9.53mm (0.00-79.00)
20												BLANK STEEL: Size 24" - W.T.9.53mm (0.00-80.00)
30												GRAVEL MED (5.00-199.00)
40		CA2	ZJ3	YQ			SAND, gravelly, trace silt, (CALCRETE), Light or White and Yellow and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
50	BG	VB2	ZJQ	S			GRAVEL, (VUGHY BRECCIA), Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					
60												
70												
80												SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double Slotted Steel (79.00-199.00)
90	SF							2760 / 1330 / 1590	6.7 / 6.1 / 7.3	1 / 1 / 3		
100		WA2	SN				SHALE, (WA2), Dark or Black, Highly Weathered, Very Weak Rock					

0 100 200 | 0-5000 | 0-14 | 0-50

Program: SJB SJG2 DEW Phase 1 Planned Hole: SJG2_FY22_PB02 Page: 51

BHPIO - Hydrogeology Log

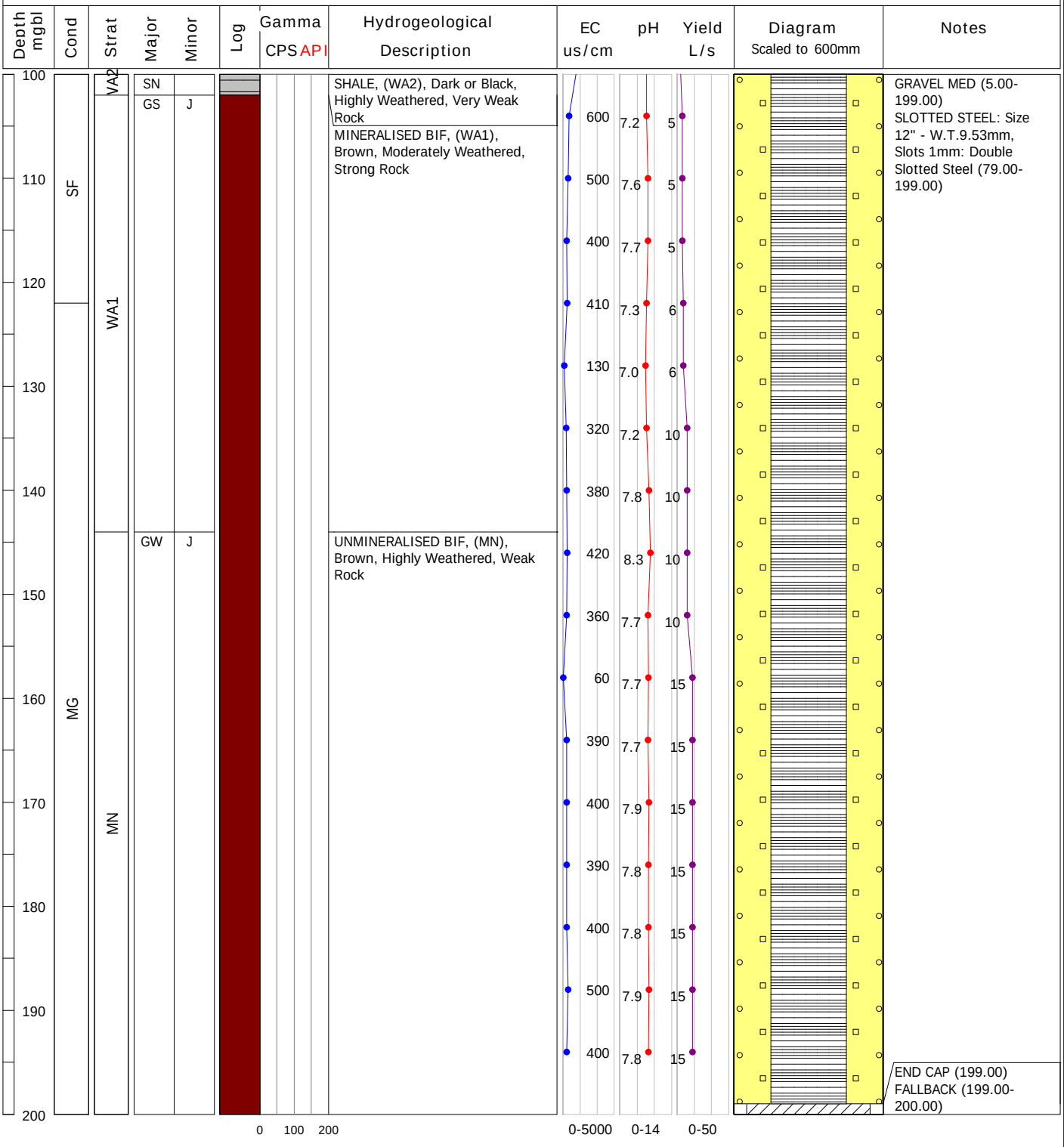
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0239	Hole Length:	200.00

Easting: 209143.87
Northing: 7409834.00
Surface RL: 521.25
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 16 Nov 22 - 21 Nov 22
License: CAW207661
Comments: Production bore. Drilled to 200m, installed to 199m. FWS at 60mbgl.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 80.0	DR3	DR	600		EASTERNWELL	KM4
80.0 - 200.0	DR3	CH	500		EASTERNWELL	KM4

TOC RL: 521.76 (Stickup 0.45m) (drilled) SWL: 62.64 MBTOC (25 Nov 22) Dev: Y: 38.3 hour(s) Final pH: 8.1
TOC RL: 521.76 (Stickup 0.45m) (current) Is Live: Y (-) Date: 21 Nov 2022 Final EC: 639.00



BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0240 **Hole Length:** 172.00

Easting: 208445.41
Northing: 7409743.62
Surface RL: 521.21
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Dec 22 - 15 Dec 22
License: CAW207661
Comments: FWS at 92mbgl. Pilot Hole HSJ0228M. Concrete Plinth and locakable steel cover

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	EWMWW06	DR	600		EASTERNWELL	ML4
32.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	ML4
146.0 - 172.0	EWMWW06	CH	500		EASTERNWELL	ML4

TOC RL: 521.57 (Stickup 0.25m) (drilled) SWL: 62.61 MBTOC (15 Dec 22) Dev: Y: 8.0 hour(s) Final pH: 7.8
TOC RL: 521.57 (Stickup 0.25m) (current) Is Live: Y (-) Date: 14 Dec 2022 Final EC: 1070.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	T	Z	IJC			GRAVEL, clayey, (SCREE), Red and Grey and yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					CEMENT (0.00-5.00) BLANK STEEL: 610mm (0.00-26.00) BLANK STEEL: Size 12" - W.T.9.53mm (0.00-84.00)
40	SF	WA1	JC	S			UNMINERALISED BIF, (WA1), Grey and Yellow, Moderately Weathered, Medium Strong Rock					GRAVEL MED (5.00-168.00)
50	MG	N3	JC	GH			MINERALISED BIF, (N3), Dark or Black and Yellow, Moderately Weathered, Medium Strong Rock					
90	UG							1770	8.6	3		SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double slotted steel (84.00-168.00)
								1750	8.5	3		
100	MG	N2	GJ				MINERALISED BIF, (N2), Dark or Black and Yellow, Highly Weathered, Medium Strong Rock	1730	8.2	4		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

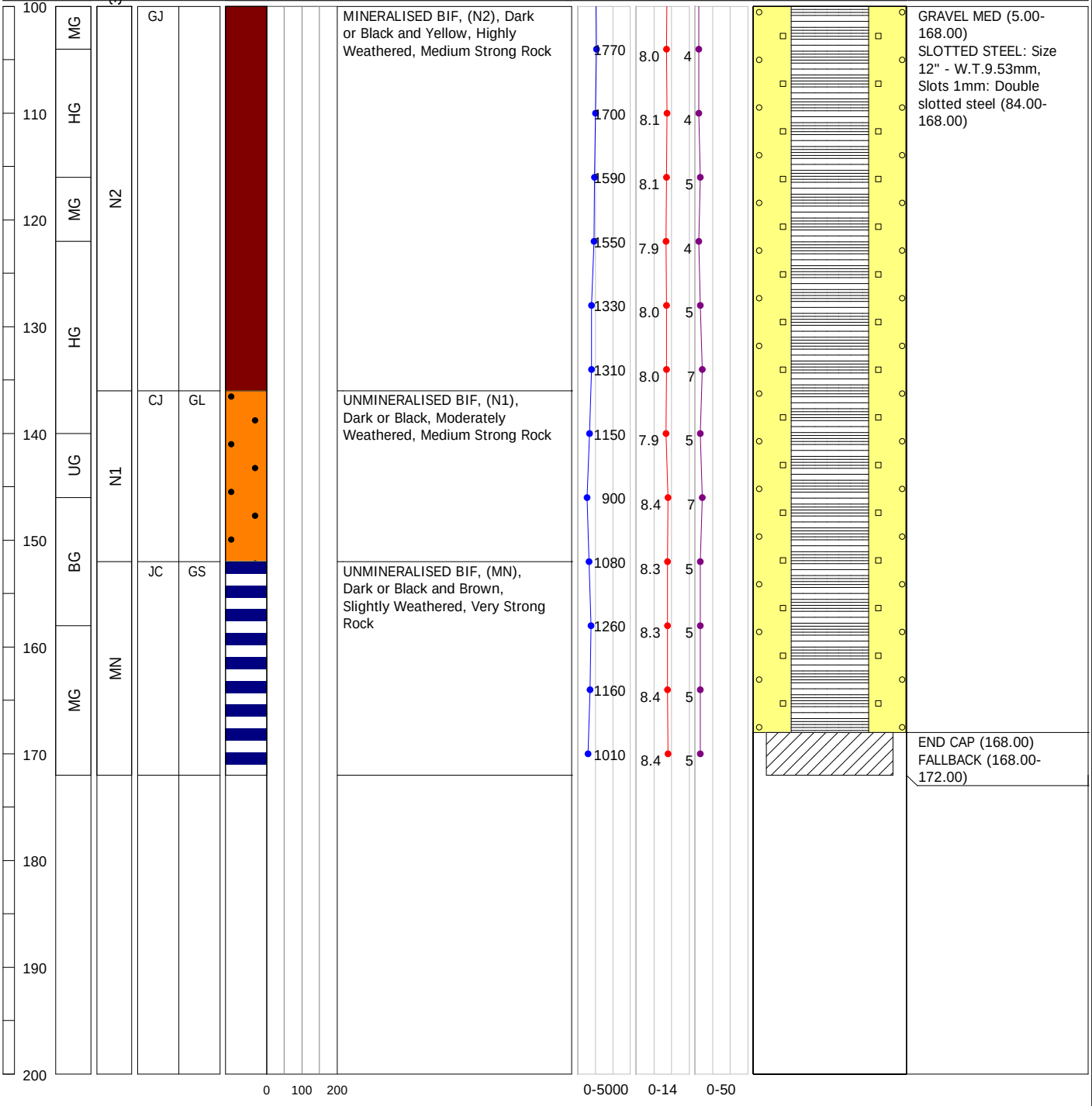
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0240	Hole Length:	172.00

Easting: 208445.41
Northing: 7409743.62
Surface RL: 521.21
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 11 Dec 22 - 15 Dec 22
License: CAW207661
Comments: FWS at 92mbgl. Pilot Hole HSJ0228M. Concrete Plinth and locakable steel cover

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 32.0	EWMWW06	DR	600		EASTERNWELL	ML4
32.0 - 146.0	EWMWW06	DR	500		EASTERNWELL	ML4
146.0 - 172.0	EWMWW06	CH	500		EASTERNWELL	ML4

TOC RL: 521.57 (Stickup 0.25m) (drilled) SWL: 62.61 MBTOC (15 Dec 22) Dev: Y: 8.0 hour(s) Final pH: 7.8
TOC RL: 521.57 (Stickup 0.25m) (current) Is Live: Y (-) Date: 14 Dec 2022 Final EC: 1070.00



BHPIO - Hydrogeology Log

BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0241	Hole Length:	206.00

Easting: 208894.47
Northing: 7409931.22
Surface RL: 520.09
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 06 Dec 22
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	600		EASTERNWELL	KM4
74.0 - 206.0	DR3	DR	500		EASTERNWELL	KM4

Comments: Difficult drilling, issues with broken heaving ground at 128-206m. Install to 180m due to fallback. FWS at 112mbgl.

TOC RL: 520.58 (Stickup 0.49m) (drilled) SWL: 64.72 MBTOC (12 Dec 22) Dev: Y: 36.0 hour(s) Final pH: 8.3
TOC RL: 520.58 (Stickup 0.49m) (current) Is Live: Y (-) Date: 09 Dec 2022 Final EC: 910.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	SF	SZ	ZY	J			SAND, silty, (SCREE), Red and Brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					CEMENT (0.00-5.00)
			ZJY	3Q			GRAVEL, silty, trace sand, (GRAVELLY SILTSTONE), buff and Red and brown, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded					BLANK STEEL: Size 24" - W.T.9.53mm (0.00-74.00)
10	MG	GS3										BLANK STEEL: Size 12" - W.T.9.53mm (0.00-120.00)
20												GRAVEL MED (5.00-180.00)
30												
40	HG	CA2	Z3C	J			SAND, (CALCRETE), Light or White and Yellow, Transported, Non-Cohesive soils, Poorly graded, Sub-angular					
50												
60												
70	SF	CY2	ZK	J			CLAY, (CLAY), Pink and Grey, Transported, Stiff, Poorly graded, Sub-angular					
80												
90												
100						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0241 **Hole Length:** 206.00

Easting: 208894.47
Northing: 7409931.22
Surface RL: 520.09
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 06 Dec 22
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	600		EASTERNWELL	KM4
74.0 - 206.0	DR3	DR	500		EASTERNWELL	KM4

Comments: Difficult drilling, issues with broken heaving ground at 128-206m. Install to 180m due to fallback. FWS at 112mbgl.

TOC RL: 520.58 (Stickup 0.49m) (drilled) SWL: 64.72 MBTOC (12 Dec 22) Dev: Y: 36.0 hour(s) Final pH: 8.3
TOC RL: 520.58 (Stickup 0.49m) (current) Is Live: Y (-) Date: 09 Dec 2022 Final EC: 910.00

Depth mgbl	Cond	Strat	Major	Minor	Hydrogeological Description
100–120	SF	CY2	ZK	J	CLAY, (CLAY), Pink and Grey, Transported, Stiff, Poorly graded, Sub-angular
110–120	SF	SD2	ZQ	JK	SAND, (SANDSTONE), Brown and Grey, Transported, Non-Cohesive soils, Uniform, Sub-rounded
120–140	BG	FILL			
140–160	SF	TD2	Z6	K	SILT, gravelly, trace clay, (LIGNITE), Dark or Black, Transported, Non-Cohesive soils, Poorly graded, Sub-angular
160–170	SF	WA2	WG	S	MINERALISED BIF, (WA2), Dark or Black and Brown, Moderately Weathered, Medium Strong Rock
170–180	SF	WA1	W	LS	MINERALISED BIF, (WA1), Brown and Yellow, Moderately Weathered, Medium Strong Rock
190–200	SF	N3	WS		MINERALISED BIF, (N3), Brown and Yellow, Highly Weathered, Weak Rock

Gamma CPS API: 0 100 200

EC us/cm: 0-5000 — pH: 0-14 — Yield L/s: 0-50

Depth	pH	Yield L/s
110	8.1	4
120	8.2	5
130	8.0	5
	5.3	5
	6 5.8	5
140	5.4	5
150	7.1	8
	7.1	8
160	6.9	8
	2 8.3	8
170	8.4	8
180	8.1	9
	7.6	9
190		3
200		2

Diagram Scaled to 600mm

Notes

- BLANK STEEL: Size 12" - W.T.9.53mm (0.00-120.00)
- GRAVEL MED (5.00-180.00)
- SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double slotted (120.00-180.00)
- END CAP (180.00)
- FALLBACK (180.00-206.00)

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR Hole Name: HSJ0241 Hole Length: 206.00

Easting: 208894.47
Northing: 7409931.22
Surface RL: 520.09
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 01 Dec 22 - 06 Dec 22
License: CAW207661

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 74.0	DR3	DR	600		EASTERNWELL	KM4
74.0 - 206.0	DR3	DR	500		EASTERNWELL	KM4

Comments: Difficult drilling, issues with broken heaving ground at 128-206m. Install to 180m due to fallback. FWS at 112mbgl.

TOC RL: 520.58 (Stickup 0.49m) (drilled) SWL: 64.72 MBTOC (12 Dec 22) Dev: Y: 36.0 hour(s) Final pH: 8.3
TOC RL: 520.58 (Stickup 0.49m) (current) Is Live: Y (-) Date: 09 Dec 2022 Final EC: 910.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
200	SF	N3	WS				MINERALISED BIF, (N3), Brown and Yellow, Highly Weathered, Weak Rock					FALLBACK (180.00-206.00)
210												
220												
230												
240												
250												
260												
270												
280												
290												
300						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project: SOUTH JIMBLEBAR **Hole Name:** HSJ0242 **Hole Length:** 159.50

Easting: 209868.84
Northing: 7409847.21
Surface RL: 520.95
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 21 Dec 22 - 25 Dec 22
License: CAW207661
Comments: Hole terminated @159.5m due to V/hard ground.Met Tech.Objective. Drill bit lost @159.5m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 34.0	EWMWW06	DR	600		EASTERNWELL	NK3
34.0 - 133.0	EWMWW06	DR	500		EASTERNWELL	NK3
133.0 - 159.5	EWMWW06	CH	450		EASTERNWELL	NK3

TOC RL: 521.18 (Stickup 0.26m) (drilled) SWL: 62.30 MBTOC (26 Dec 22) Dev: Y: 9.5 hour(s) Final pH: 8.0
TOC RL: 521.18 (Stickup 0.26m) (current) Is Live: Y (-) Date: 25 Dec 2022 Final EC: 1656.00

Depth mgbl	Cond	Strat	Major	Minor	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Notes
0	MG	SZ	ZY	J		SILT, sandy, trace gravel, (SCREE), Red, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded				CEMENT (0.00-5.00)
10		GS3	ZJ	YK		GRAVEL, silty, trace clay, (GRAVELLY SILTSTONE), Brown and Red and pink, Transported, Non-Cohesive soils, Poorly graded, Sub-rounded				BLANK STEEL: Size 24" - W.T.9.53mm (0.00-34.00)
20										BLANK STEEL: Size 12" - W.T.9.53mm (0.00-74.10)
30	HG	CY3	ZK	Y		CLAY, silty, trace sand, (CLAY), buff and Light or White, Transported, Soft, Well graded, Rounded				GRAVEL MED (5.00-158.10)
40	MG	WA2	SJ	C		UNMINERALISED BIF, (WA2), Dark or Black and buff and grey, Highly Weathered, Weak Rock				
50	HG									
60	MG									
70	SF	WA1	J	S		UNMINERALISED BIF, (WA1), buff and Brown and grey, Moderately Weathered, Medium Strong Rock				
80	MG	MN	G	WL		MINERALISED BIF, (MN), Brown and Grey and yellow, Highly Weathered, Medium Strong Rock	1520 / 1660 / 1750	8.4 / 8.3 / 8.6 / 8.5	1 / 1 / 2 / 2 / 5	SLOTTED STEEL: Size 12" - W.T.9.53mm, Slots 1mm: Double density slotted steel (74.10-158.10)
90	SF									
100	BG									
	MG									

Gamma CPS API: 0 100 200
EC us/cm: 0-5000
pH: 0-14
Yield L/s: 0-50
Diagram: Scaled to 600mm

BHPIO - Hydrogeology Log

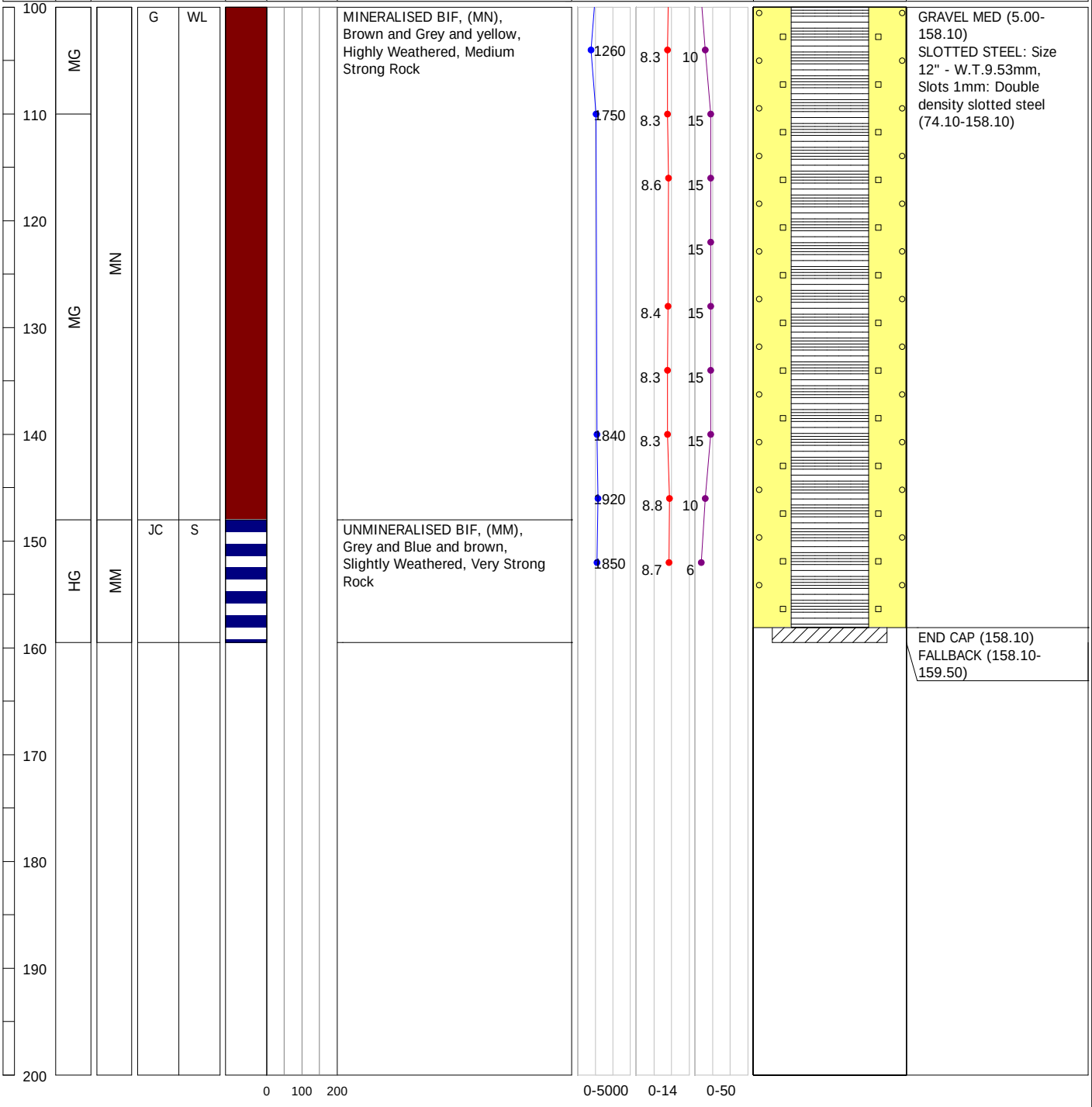
BHP

Project:	SOUTH JIMBLEBAR	Hole Name:	HSJ0242	Hole Length:	159.50

Easting: 209868.84
Northing: 7409847.21
Surface RL: 520.95
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 21 Dec 22 - 25 Dec 22
License: CAW207661
Comments: Hole terminated @159.5m due to V/hard ground.Met Tech.Objective. Drill bit lost @159.5m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 34.0	EWMWW06	DR	600		EASTERNWELL	NK3
34.0 - 133.0	EWMWW06	DR	500		EASTERNWELL	NK3
133.0 - 159.5	EWMWW06	CH	450		EASTERNWELL	NK3

TOC RL: 521.18 (Stickup 0.26m) (drilled) SWL: 62.30 MBTOC (26 Dec 22) Dev: Y: 9.5 hour(s) Final pH: 8.0
TOC RL: 521.18 (Stickup 0.26m) (current) Is Live: Y (-) Date: 25 Dec 2022 Final EC: 1656.00



17 Appendix C: Groundwater Chemistry

JIMBLEBAR BOREFIELDS

Contact: Annabelle Blom – General Manager Jimblebar

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Table 7.8: Laboratory Chemistry Results from Production Bores

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Figure 7.1: Regional map

Figure 7.2: Jimblebar Borefields South Jimblebar and Wheelarra Borefield map

Figure 7.3: Jimblebar Borefields Wheelarra, Hashimoto & South Jimblebar map

Figure 7.4: Jimblebar and Shovelanna Borefields Water Balance FY23

Figure 7.5: Monitoring summary: Hashimoto Hydrographs

Figure 7.6: Monitoring summary: Operations South Jimblebar Hydrographs

Figure 7.7: Monitoring summary: Regional West Hydrographs

Figure 7.8: Monitoring summary: Wheelarra Hill Hydrographs

Figure 7.9: Monitoring summary: Reinjection Hydrographs

Figure 7.10: Monitoring summary: Caramulla MAR Hydrographs

Figure 7.11: Monitoring summary: Hashimoto Production Boreholes

Figure 7.12: Monitoring summary: Operations South Jimblebar Production Boreholes

Figure 7.13: Monitoring summary: Regional West Production Boreholes

Figure 7.14: Monitoring summary: Wheelarra Hill Production Boreholes

Figure 7.15: Monitoring summary: South Jimblebar MAR Production Boreholes

Figure 7.16: Monitoring summary: Caramulla Discharge Production Boreholes

Figure 7.17: Monitoring summary: Caramulla MAR Production Boreholes

Figure 7.18: Piper Diagram

Appendices

Appendix 7.1: Licence

Appendix 7.2: Borehole details

Appendix 7.3: Borehole logs

7.1 Introduction

Outline of licensed operation

This Annual Aquifer Review (AAR) report is for the borefields of the Jimblebar Mining Operations. It covers the review period 1 July 2022 to 30 June 2023 (FY2022-2023). Groundwater abstraction at Jimblebar Operation is regulated through a 5C Licence to Take Water issued under the *Rights in Water and Irrigation Act 1914* (the Act). The Department of Water and Environmental Regulation (DWER) is responsible for administering the Act via the licence instruments outlined in Appendix 0.1. Licence commitments are outlined in the GWL Operating Strategy for Jimblebar (GWOS) (BHP 2018).

The Jimblebar Operation has the following licence and annual water entitlement:

- GWL158795 - 26,300,000 kL.

This water is authorised to be used for dust suppression, earthworks / construction, mineral ore processing, mine dewatering, exploratory drilling, geotechnical investigations, campsite purposes and injection.

Discharge of surplus water to creeks and MAR are undertaken at Jimblebar under the *Environmental Protection Act 1986* Part V Environmental Licence (L5415/1988/9). The licence permits discharge to Jimblebar Creek, Jimblebar West Branch, Caramulla Creek and injection to Caramulla MAR.

Jimblebar previously operated under *Environmental Protection Act 1986* Part IV Ministerial Statements 683, 809 and 857 (as amended by 1037). From 17 March 2020, these Statements have been replaced by Ministerial Statement 1126. These Statements contain conditions or commitments relating to groundwater receptors. As discussed in Section 1, compliance against *Environmental Protection Act 1986* requirements is addressed separately in Annual Environmental Reports.

Location of operation

The Jimblebar Mining Operations (Figure 7.1–Figure 7.3) are located approximately 40 km east of Newman at the eastern end of the Ophthalmia Range in the Pilbara region of Western Australia. The deposits are situated in a fractured-rock aquifer in the East Pilbara subarea of the DWER Pilbara Groundwater Allocation Plan (Department of Water, 2013).

FY23 events

The following activities took place at Jimblebar during the review period:

- Continued dewatering in Wheelarra Hill, South Jimblebar and Hashimoto
- No dewatering in South Jimblebar Stage 1 pit as mining is completed
- Test pumping of bores in South Jimblebar
- Additional bores commissioned in South Jimblebar
- Drilling, construction and testing of new monitoring and production bores in Hashimoto, Wheelarra
- New potable bores drilled and test pumped to replace existing potable bores in South Jimblebar.

7.2 Climate and rainfall

The Pilbara region of Western Australia is within ‘arid, desert, hot’ and ‘arid, steppe, hot’ climate zones, based on the Köppen-Geiger climate zonations (Charles et al. 2013). Rainfall and temperature exhibit high variability between seasons, with occasional intense rainfall and consistently high temperatures in summer (December through to February), an autumn (March to May) transition to dry and warm conditions throughout winter (June to August) and spring (September to November), with the southern Pilbara sometimes receiving rain in winter from southern sources. The Pilbara often records temperatures of ≥43°C in summer months. There is large rainfall variation between years as well as large spatial heterogeneity. Combined with consistently high potential evaporation, this results in significant hydrological variability.

Long term Bureau of Meteorology (BoM) climate records show average annual rainfall of 324 mm (Newman Aero rainfall station 007176 [1971–present]). Annual average evaporation is about 3,274 mm/year. Local weather station (WFG001) data (Table 7.1) show that the total rainfall during FY23 was 394.6 mm. The distribution and intensity of rainfall during FY23 was spread across seasons more so than in FY21 and FY22. September and March recorded significantly more rainfall than previous years. Groundwater monitoring graphs (Figure 7.5–Figure 7.10) include monthly rainfall for comparison.

Table 7.1: Monthly rainfall

Month	Rainfall[1] (mm)		
	FY21	FY22	FY23
July	2.2	0.0	0.0
August	3.0	0.0	2.0
September	0.0	0.0	60.0
October	5.8	0.4	0.4
November	10.2	12.0	0.0
December	119.0	0.2	14.2
January	138.2	31.2	62.4
February	192.6	81.4	39.4
March	12.4	41.4	158.0
April	36.8	2.2	49.6
May	2.2	67.4	0.0
June	8.0	1.0	8.6
TOTAL	**530.4**	**237.2**	**394.6**

1. Source: BHP's Jimblebar Mine weather station (WFG001).

7.3 Geology and hydrogeology

Geology

Jimblebar mining operation are located at the eastern end of the Ophthalmia Range within the Ophthalmia Fold Belt, which overlies Precambrian basement and abuts the granitic Sylvania Inlier. The basement stratigraphic sequence, from top to bottom, comprises the Brockman Iron Formation (found in the north of Jimblebar, including the Wheelarra and Hashimoto orebodies), the Mt McRae Shale, the Mt Sylvia Formation, the Wittenoom Formation, and the Marra Mamba Iron Formation (found in South Jimblebar orebodies). The rock units tend to be inclined to the north.

Cenozoic alluvial sediments overlie Precambrian units in the valley south of Wheelarra Hill, occupying an East-West oriented palaeovalley that is eroded into the Wittenoom Formation. The Cenozoic alluvial sediments are predominantly gravels, silts, clays, and detritals.

Key structures include a series of northeast-southwest striking faults. The Wheelarra Fault bounds the western side of the Jimblebar Operation. The Central Fault extends from the west side of Wheelarra 5 pit to the eastern side of South Jimblebar Stage 1 (Mindoona deposit).

Hydrogeology

The greater Jimblebar region's main aquifer types include:

- Regional aquifers associated with the dolomitic Paraburdoo Member of the Wittenoom Formation and overlying Cenozoic detrital sequence. These units are generally in hydraulic connection and form an integrated aquifer system.
- Orebody aquifer associated with iron ore mineralisation of the Brockman Iron Formation and the Marra Mamba Iron Formation.

Orebody aquifers in the Marra Mamba Iron Formation (South Jimblebar orebodies) and Brockman Iron Formation (Wheelarra and Hashimoto orebodies) are characterised by secondary permeability and porosity associated with zones of mineralisation. Aquifer storage and interconnectivity along strike is limited. The spatial extents (and associated aquifer storage) are variable and correlate with the size and interconnectivity of permeability zones.

The Jimblebar groundwater system is generally east-west oriented, bounded to the north by low-permeability Yandicoogina Shale and Weeli Wolli formations, and bounded to the south by shales and dolerites of the Jeerinah Formation and granites

of the Sylvania Inlier.

The regional-scale, northeast-southwest trending Wheelarra Fault forms the western boundary of the Jimblebar system, while the Khyber Fault forms the eastern boundary. These juxtapose high-permeability aquifers against lower-permeability units and act as barriers to groundwater flow. The Central Fault divides the aquifer system into east and west compartments, with very little groundwater flow across the fault. The Marra Mamba Iron Formation orebody aquifer at South Jimblebar comprises the west compartment and the Brockman orebody aquifer of the Wheelarra Hills deposits make up the east compartment. Mt McRae Shale and Mount Sylvia formations, as well as shale members within the Wittenoom and Brockman formations, act as aquitards/flow barriers that separate the regional and orebody aquifers.

The Marra Mamba Iron Formation orebody aquifer typically exhibits a (pre-mining) west to east, low-relief hydraulic gradient, and the degree of west to east interconnectivity is variable due to the influence of cross-cutting faults. Hydraulic gradients in the Brockman Iron Formation orebody aquifer are also mostly west to east.

The regional dolomite aquifer exhibits a similar west to east hydraulic gradient and appears to be laterally continuous. Structural features connect the dolomite aquifer with the Marra Mamba orebody aquifer to the south. The Cenozoic detritals aquifer appears to be variably connected to the underlying dolomite aquifer and Marra Mamba orebody aquifer.

Surface water drainages in the vicinity of the Jimblebar Borefields are generally in poor hydraulic connection with groundwater systems, due to groundwater levels ranging between 50 to 100 m below surface and recharge responses only observed after significant rainfall and runoff events.

Recharge to the aquifers is typically via infiltration where the host rocks are exposed, or via intermediary detrital systems associated with surface drainage. Leakage from the overlying Copper Creek into the Cenozoic detritals aquifer is likely to be low and variable, due to the deposition of a low-permeability clayey unit underlying most of the creek bed.

Groundwater chemistry data suggests pH values generally 7–8 pH units, with some data in the range of 6–10 pH units. Electrical conductivity data are generally in the range of 250–2,000 µS/cm (fresh to brackish). Fresh groundwater (250 – 750 µS/cm) is generally in the western region of the Capricorn orebody, in close proximity to Copper Creek. This may be an indication of enhanced rainfall recharge (via Copper Creek) at this location compared to elsewhere in Jimblebar. Brackish groundwater (>1000 µS/cm) is generally found in all other locations within the Jimblebar groundwater system.

7.4 Borefields description

During the FY23 review period, the Jimblebar Borefields included:

South Jimblebar:

- 8 operational production bores
- 3 operational injection bores
- 7 associated monitoring bores.

Wheelarra Hill and Regional West:

- 7 operational production bores
- 7 associated monitoring bores.

Hashimoto and Regional East:

- 6 operational production bores
- 6 associated monitoring bores.

Details of these bores are provided in Appendix 7.2 and bore logs for new production bores drilled during FY23 are provided in Appendix 7.3.

7.5 Groundwater abstraction and water use

The abstraction and injection volumes for each bore over the review period are shown in Table 7.4. The current annual water entitlement (allocation) for the Jimblebar Borefields is 26,300,000 kL.

- During FY23, the total groundwater abstracted was 15,026,649 kL.

There are multiple MAR schemes in operation with the objective of returning surplus water to local aquifers.

- During YF23, South Jimblebar MAR reinjected a total of 26,040 kL into HSJ0003P, HSJ0069P and HSJ0076P

- During FY23, 3,095,350 kL was reinjected at Caramulla MAR into bores HCM0026P, HCM0027P and HCM0028P.

The water balance diagrams illustrating the groundwater usage estimates for the review period are shown in Figure 7.4. Monthly abstraction for each production bore during FY23 is included in the monitoring summaries in Figure 7.5–Figure 7.10.

7.6 Monitoring results

The locations of monitoring and production bores are provided in Figure 7.2 and Figure 7.3. Monitoring results for water levels and water quality for the review period are discussed in this section. A summary of the findings is discussed in Section 7.8.

Groundwater levels

Groundwater level responses during the review period are summarised below by region. Hydrographs for the review period are shown in Figure 7.5–Figure 7.10.

Wheelarra Hill

- Decreasing at the 3 monitoring bores. HFG0006M 436.11 m RL to 428.76 mRL, HFG0068M 458.61 mRL to 455.46 m RL and HFG0092M 443.30 mRL to 438.03 mRL (Figure 7.8).

Regional West

- HFG0042M, HSJ0104M and HSJ0173M decreasing ((~1–2 m in drawdown) (Figure 7.7))
- HFG0035M increasing from 543.05 m RL to 547.26 mRL.

South Jimblebar

- Decreasing by ~1 m at HSJ0018M, HSJ0104M, HSJ0133M and HSJ0159M (Figure 7.6)
- Decreasing from 431.36 mRL to 419.80 mRL at HSJ0150M.

South Jimblebar MAR

- Decreasing production bore trend. Drawdown at HSJ0076P and HSJ0069P ~14 m. Monitoring bores more stable with levels dropping by ~0–2 m. Sump levels decreased by ~3–5 m (Figure 7.9).

Caramulla MAR

- Stable at all four monitoring bores. Levels at HCM0019M and HCM0047M ~461 mRL, HCM0043M (509 mRL) and HCM0044M (506 mRL)

Hashimoto

- Decreasing at all monitoring bores. HHH0024M from 443.34 mRL to 437.44 mRL (Figure 7.5).

Water quality

Field chemistry is shown in Table 7.6 and Table 7.7 respectively and results for field pH and EC for the review period are illustrated in Figure 7.11–Figure 7.17. Piper format major ion data (Figure 7.18) suggest generally coincident water types (dissolution/mixing) for mineralisation and carbonate aquifers (carbonate precipitation), with some outlier data. Laboratory chemistry results are shown in Table 7.8 with Site Specific Trigger Value (SSTV) exceedances highlighted red.

Groundwater quality from field measurements and laboratory analysis is summarised below.

Wheelarra Hill

- Circumneutral pH across all bores (6.9–7.8)
- Stable mainly brackish EC (917–1,276 µS/cm) at all bores except HFG0014P which had consistently fresh EC (<1,000 µS/cm) (Figure 7.14)
- SSTV exceedance of barium (0.019 mg/L) in April 2023 at HFG0064P. No other exceedances for reporting period.

Regional West

- Stable neutral pH (7.3–7.6)
- Stable brackish EC (1,500–1,600 µS/cm) (Figure 7.13)
- SSTV exceedances include barium (total and filtered) in December 2022 and June 2023. Boron concentrations also exceeded SSTV in June 2023 and nitrate as N concentrations exceeded the SSTV in December 2022.

South Jimblebar

- Stable circumneutral pH (6.6–7.7)
- Fresh to brackish EC (955–1,700 µS/cm) (Figure 7.12)
- SSTV exceedances include barium, boron and nitrate as N. Exceedances were observed for all 3 analytes at HSJ0207P and just a nitrate exceedance at HSJ0008P.

South Jimblebar MAR

- Stable circumneutral pH (6.5–7.3) (Figure 7.15)
- Stable brackish EC (1,212–1,800 µS/cm)
- Minor SSTV exceedances include barium, boron, nitrate as N and zinc at multiple bores (HSJ0003P, HSJ0069P, HSJ0076P and HSJ0003P).

Hashimoto

- Circumneutral pH across all bores (6.8–7.8) (Figure 7.11)
- Fresh to brackish EC (603–1,338 µS/cm)
- Minor SSTV exceedances for barium (including total) and nickel.

Caramulla Creek discharge

- Minor SSTV exceedances for barium (including total) and nickel (Figure 7.16)
- Neutral to slight alkaline pH (7.4–8.1)
- Stable brackish EC (1,400 µS/cm for all three recordings).

Caramulla MAR

- Neutral pH (6.9–7) in Aug 22 and Jan 23 (only recordings)
- Brackish EC (1,400 µS/cm and 1500 µS/cm) (Figure 7.17)
- Minor SSTV exceedances for aluminium (including total), barium (including total), manganese (including total in Jan 23).

7.7 Compliance

A summary of the Jimblebar Borefields' compliance with GWL requirements is provided in Table 7.2. Most of the compliance sample points that were missed were due to operational issues such as no access to sites, and bores not being operational at time of sampling. The compliance figures for Jimblebar include compliance for the Shovelanna operations.

Table 7.2: Summary of Jimblebar Borefields' compliance performance

Compliance category	Measure	Activity based compliance FY23
Allocation	GWL annual allocation	100%
Abstraction	Monthly measurements per production bores	100%
Water level monitoring	Monthly water level from identified monitoring bores	99%
Field chemistry	Monthly production bore pH and EC measurements	95%
Lab chemistry	Quarterly production bore measurements	79%
	Bi-annual	92%
Rainfall	Monthly measurements	100%

Table 7.3 shows the percentage of the GWL allocation used over the review period.

Table 7.3: Licence abstraction details

Licence No.	Allocation (kL)	Percent used (%)
	FY23	FY23
GWL158795(11)	26,300,000	57%

In addition to abstraction and injection conditions under GWL158795(11), there is recourse for Jimblebar operations to allow surface discharge into Copper Creek and Jimblebar Creek to manage short-term dewatering issues.

7.7 Assessment of impacts

Pit-proximal groundwater drawdown

General declining trends are observed in groundwater levels associated with dewatering, as may be expected from an actively dewatered mine. Major declines in groundwater levels are closely constrained to the orebody aquifers (Marra Mamba and Brockman) and tend to extend east and west Groundwater levels across the reporting period at Hashimoto, South Jimblebar and Wheelarra Hill continued to present a long-term decreasing trend in line with historical responses to abstraction at orebody aquifers (Marra Mamba and Brockman). In some areas, the drawdown effects of abstraction have been offset by injection.

Mesa-scale groundwater drawdown

The 'Regional West' grouping of groundwater monitoring data show a minor gradual decline in groundwater levels for the reporting period. Injection-proximal groundwater levels continue to respond (increase and decrease) in response to changes in injection volume throughout the reporting period, with an overall slight declining trend.

Groundwater levels in the Caramulla MAR borefield were generally stable, due to high transmissivities and dewatering-interference impacts.

Groundwater quality

For the reporting period pH and EC have remained relatively stable and circumneutral (pH) and generally brackish and stable (EC). Marginal exceedances SSTV exceedances (barium, boron, manganese, and zinc) were recorded.

Monitoring bore HNPISJ0129P (Regional West) showed SSTV nitrate exceedances of up to 13.0 mg/L (compared to guideline value of 0.7mg/L). HNPISJ0129P also had SSTV exceedances of barium (0.032 mg/L compared to trigger value of 0.01 mg/L).

7.8 Recommendations

Based on the data provided:

- Some chemical analytes have exceeded our internal guideline values during the reporting period. BHP will continue monitoring and analysis of these to understand the sources and any potential impacts.

7.9 References

BHP Billiton Iron Ore, 2018. GWL Operating Strategy for Jimblebar. Document ID 0019543 Version 4.0. BHP Billiton Iron Ore Pty Ltd, Perth, Western Australia.

Charles SP, Fu G, Silberstein RP, Mpelasoka F, McFarlane D, Hodgson G, Teng J, Gabrovsek C, Ali R, Barron O, Aryal SK, Dawes W, van Niel T, Chiew FHS (2013) Interim report on the hydroclimate of the Pilbara past, present and future. A report to the West Australian Government and industry partners from the CSIRO Pilbara Water Resource Assessment, CSIRO Water for a Healthy Country, Australia.

Department of Water, 2013. Pilbara Groundwater Allocation Plan, October 2013. Department of Water, Perth, Western Australia.

Jimblebar Borefields
Annual Reporting
Acknowledgement Slip

I have reviewed the site Annual Aquifer Review and accept the information provided is an accurate account of site compliance with Department of Water and Environmental Regulation (DWER) conditions for the period 1 July 2022 to 30 June 2023.

SIGNATURE: Blom, Annabelle Digitally signed by Blom, Annabelle DN: cn=Blom, Annabelle, o=BHP Billiton Group Operations Pty Ltd, ou=MULTI-ALLOWED Date: 2023.09.19 07:34:47 +08'00' DATE: _____

ANNABELLE BLOM

GENERAL MANAGER

JIMBLEBAR AND SHOVELANNA

Tables

Table 7.4: Abstraction

Sample Point ID	Hashimoto												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HHH0022P	4,590	6,195	6,754	2,324									**19,863**
HHH0039P	37,268	36,696	33,395	35,943	27,072	22,990	26,013	22,159	25,623	830			**267,989**
HHH0040P	133,873	87,818	19,284	35,486	153,928	160,630	170,921	156,299	171,105	160,492	170,756	161,127	**1,581,719**
HHH0042P	7,788				116,288	142,483	151,747	131,344	41,742				**591,392**
HHH0065P	13,659	8,158	523	227									**22,567**
HHH0066P									18,198	46,724	57,205	55,755	**177,882**
TOTAL	**197,178**	**138,867**	**59,956**	**73,980**	**297,288**	**326,103**	**348,681**	**309,802**	**256,668**	**208,046**	**227,961**	**216,882**	**2,661,412**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Sample Point ID	Operations South Jimblebar												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HSJ0008P				39,469	32,409	32,093	31,870	32,201	23,173				**191,215**
HSJ0063P	29,802	27,055	22,712	25,434	25,105	21,128	29,235	27,215	22,661		23,072	22,516	**275,935**
HSJ0125P	67,943							49,808	70,704	22,540	72,299	67,884	**351,178**
HSJ0180P	99,983	94,229	89,642	89,464	74,462	21,386	47,689	29					**516,884**
HSJ0182P	82,703	79,802	77,210	77,458	69,081	41,647	62,995	56,569	64,587	73,510	79,740	74,985	**840,287**
HSJ0184P	38,794	39,535	18,346									15,420	**112,095**
HSJ0207P	54,719	53,119	50,748	52,533	43,201	27,553	38,752	41,151	45,419	50,307	52,142	49,810	**559,454**
HSJ0219P										35,478	74,332	74,840	**184,650**
TOTAL	**373,944**	**293,740**	**258,658**	**284,358**	**244,258**	**143,807**	**210,541**	**206,973**	**226,544**	**181,835**	**301,585**	**305,455**	**3,031,698**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Sample Point ID	Wheelarra Hill												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HFG0012P	150,845	90,560	112,492	183,958	168,053	185,696	190,441	168,713	190,194	183,157	191,626	172,414	**1,988,149**
HFG0014P	53,594	59,783	70,868	70,751	56,362	38,592	68,804	55,662	65,197	59,573	60,115	51,932	**711,233**
HFG0064P	137,242	133,105	128,928	132,319	114,844	119,469	121,708	109,089	131,895	110,719	128,506	63,983	**1,431,807**
HFG0087P	178,475	173,307	168,703	171,126	161,488	161,540	151,981	142,983	144,623	96,418	157,912	11,463	**1,720,019**
HFG0088P	103,699	106,291	100,344	108,170	114,250	110,695	124,614	102,171	120,983	113,774	119,519	113,962	**1,338,472**
HFG0094P	160,907	158,996	153,474	159,975	128,685	156,204	158,260	139,241	158,614	154,151	159,868	152,744	**1,841,119**
TOTAL	**784,762**	**722,042**	**734,809**	**826,299**	**743,682**	**772,196**	**815,808**	**717,859**	**811,506**	**717,792**	**817,546**	**566,498**	**9,030,799**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Table 7.4: Abstraction (cont'd)

Sample Point ID	Regional West												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HNPISJ0129P	43,363	43,109	28,017	37,795	39,494	32,181	21,652	8,563	20,767	11,327	5,545	10,927	**302,740**
TOTAL	**43,363**	**43,109**	**28,017**	**37,795**	**39,494**	**32,181**	**21,652**	**8,563**	**20,767**	**11,327**	**5,545**	**10,927**	**302,740**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Sample Point ID	Caramulla Discharge												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
FJB0016	804,337	669,662	534,558	676,496	588,454	403,856	389,463	315,797	296,082	239,973	221,214	201,816	**5,341,708**
FJB0017	345,377	362,232	311,857	315,000	400,468							121	**1,735,055**
FJB0018	84,710	31,799	15,538	22,613	62,736							507	**217,903**
TOTAL	**1,234,424**	**1,063,693**	**861,953**	**1,014,109**	**1,051,658**	**403,856**	**389,463**	**315,797**	**296,082**	**239,973**	**221,214**	**202,444**	**7,294,666**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Table 7.4: Reinjection

Sample Point ID	Caramulla MAR												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HCM0026P	139,124	71,656	32,325	39,156	58,528	148,632	167,817	129,286	127,794	106,769	110,844	82,850	**1,214,781**
HCM0027P	35,191	25,172	16,083	23,697	24,195	23,727	25,029	18,638	17,927	14,960	16,650	11,898	**253,167**
HCM0028P	162,314	150,175	139,079	163,615	148,181	158,915	160,702	124,170	122,769	103,679	113,013	80,790	**1,627,402**
TOTAL	**336,629**	**247,003**	**187,487**	**226,468**	**230,904**	**331,274**	**353,548**	**272,094**	**268,490**	**225,408**	**240,507**	**175,538**	**3,095,350**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Sample Point ID	South Jimblebar MAR												
	FY23 (kL)												
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	TOTAL
HSJ0003P	18												**18**
HSJ0069P	4,373	4,610	4,778	6,002									**19,763**
HSJ0076P	1,371	1,237	1,273	1,192	741	445							**6,259**
TOTAL	**5,762**	**5,847**	**6,051**	**7,194**	**741**	**445**	**0**	**0**	**0**	**0**	**0**	**0**	**26,040**

Note: A blank cell indicates that no reading was taken. '0' indicates no abstraction.

Table 7.5: Field EC from Production Bores and Sumps

Sample Point ID	Hashimoto											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HHH0022P												
HHH0039P	648	659	652	664	678	698	646	603	659			
HHH0040P	1,229	1,295			1,293	1,333	1,196	1,092	1,113	1,224	1,080	961
HHH0042P					1,338	1,381	1,335	1,135				
HHH0065P												
HHH0066P										1,033	1,134	973

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Sample Point ID	Operations South Jimblebar											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0008P				1,499	1,435	1,700	1,546	1,219	1,358			
HSJ0063P	1,501	1,502	1,382	1,481			1,496	1,489	1,361		955	1,124
HSJ0125P	1,502							1,206	1,386		1,205	1,129
HSJ0180P	1,501	1,466	1,395	1,473	1,410	1,411		1,228	1,240	1,259		
HSJ0182P	1,540	1,547	1,432	1,533	1,450	1,399	1,569		1,357	1,566	1,224	1,122
HSJ0184P	1,570	1,500	1,408									
HSJ0207P	1,480	1,472	1,388	1,482	1,414	1,426	1,488	1,232	1,381	1,514	1,166	1,130
HSJ0219P											1,249	1,164

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Sample Point ID	Regional West											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HNPISJ0129P	1,600	1,500	1,600	1,500	1,500	1,500	1,600	1,500	1,500	1,600	1,500	1,500

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Table 7.5: Field EC from Production Bores and Sumps (cont'd)

Sample Point ID	Wheelarra Hill											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HFG0012P	1,181	1,198	1,096	1,190	1,200	1,263	1,274		1,152	1,212	1,156	988
HFG0014P	920	923	887	932	960	978	980	847	892	971	942	789
HFG0064P	1,176	1,188	1,107	1,200	1,181	1,242	1,258	1,034	1,141	1,188	1,155	
HFG0087P	1,207	1,223	1,102	1,220	1,211	1,276	1,269	1,049	1,152	1,125	1,144	
HFG0088P	1,144	1,192	1,103	1,180	1,195	1,201	1,218	1,025	1,116	1,139	1,116	917
HFG0094P	1,138	1,167	1,076	1,161	1,123	1,124	1,098	1,116	1,047	1,172	1,115	930

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Sample Point ID	South Jimblebar MAR											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0003P		1,429	1,260	1,457	1,439	1,212	1,700					
HSJ0069P	1,485	1,512	1,360	1,537	1,390	1,380	1,401	1,401				
HSJ0076P	1,497	1,512	1,292	1,570	1,800	1,279	1,800	1,307		1,700		

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Sample Point ID	Caramulla Discharge											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
FJB0016		1,400					1,400				1,400	

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Sample Point ID	Caramulla MAR											
	FY23 (µS/cm)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HCM0008M		1,500		1,400			1,400			1,300		
HCM0017M		1,500		1,500			1,400				1,500	

Note: A blank cell indicates that no reading was taken. EC values are in uS/cm

Table 7.5: Water Levels from Monitoring and Production Bores

Sample Point ID	Hashimoto											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HH1872RM	454.95											
HH1977RM	456.44	456.28	456.08	455.95	455.79	455.63	455.53	455.40	455.22	455.20	455.01	455.00
HHH0009M	447.34	446.73	446.43	446.17	445.97	445.42	444.56	443.98	443.46	443.21	442.90	442.73
HHH0024M	443.34	442.74	442.22	441.66	441.37	440.74	439.11	438.43	437.75	437.89	437.68	437.47
HHH0076M	456.53					455.72	455.56	455.44	455.25	455.15	455.09	454.89
HHH0078M			457.26	457.17	457.07	457.01	456.95	456.86	456.69	456.57	456.48	456.29

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Operations South Jimblebar											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0018M	518.71	518.64	518.60	518.60	518.55		518.50	518.44	518.60	518.48	518.38	518.32
HSJ0104M	421.81	421.87	422.13	421.63	422.28	422.56	422.28	422.37	422.08	421.84	421.37	421.00
HSJ0133M	445.73	445.30	445.14	444.85	444.57	443.48	442.83	442.25	441.86	441.62	441.27	
HSJ0148M				430.91								430.27
HSJ0150M	431.36	419.89	419.86	419.83	419.81	419.80						
HSJ0154M						429.45						
HSJ0159M	444.86	444.69	444.47	444.24	444.08	444.11	444.07	443.88	443.98	443.96	443.95	

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Regional West											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HFG0035M	543.05	543.29	543.97	544.86	545.01	545.24					547.64	547.26
HFG0042M	430.32	430.06	429.86	429.67	429.45	429.41	429.35	429.27	429.13	429.25	429.14	428.91
HSJ0104M	421.81	421.87	422.13	421.63	422.28	422.56	422.28	422.37	422.08	421.84	421.37	421.00
HSJ0173M	442.33	442.16	441.95	441.77	441.65	441.50	441.38					440.74

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Wheelarra Hill											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HFG0006M	436.11	435.77	435.73	435.11	433.55	432.53	431.25	430.25	429.96	429.73	429.03	428.76
HFG0068M				458.61	458.45	458.37	458.34	458.08			455.58	455.46
HFG0092M	443.30	442.68	442.04	441.44	441.11	440.46	439.91	439.40	438.93	438.45	438.03	

Note: A blank cell indicates that no reading was taken.

Table 7.5: Water Levels from Monitoring and Production Bores (cont'd)

Sample Point ID	Reinjection											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0003P	470.79	469.84	469.31	469.84	469.39	469.09	468.82	467.55	467.61	467.37	463.06	463.06
HSJ0069P	471.74	472.13	473.88	471.84	458.14	457.34	457.21	457.25	456.91	456.63	457.04	457.54
HSJ0073M	457.26		457.25	456.97	456.48	456.36	456.26	456.15	456.00	456.25	457.16	457.15
HSJ0076P	471.87	471.54	472.37	470.04	468.57	456.27	465.27	465.06	464.65	464.66	458.27	458.65
HSJ0081M	456.65	456.77	456.27	456.04	455.82	455.65	455.65	455.44	455.33	455.39	455.65	454.25
HSJ0083M	455.76	455.40	455.27	454.93	455.42	455.75	456.09	456.25	455.08	454.52	454.26	455.04
HSJ0115M								458.06	457.84	457.67	457.53	457.45
HSJ0117M	457.81	457.29	457.26	457.24	457.21	456.61	456.41	456.39	456.34	456.30	456.51	455.41
SJ0435RM	462.69	461.90	461.26	460.62			458.94	460.98	458.36	457.76	457.74	457.44
SJ0571RM	460.51	460.14	459.82	459.56	459.28	458.99	458.88	458.49	458.05	460.56	458.31	457.39

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Caramulla MAR											
	FY23 (mRL)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HCM0019M	461.05	461.25	461.30	461.34	461.41	461.44	461.53	461.35	461.34	461.30	461.42	461.36
HCM0043M	508.90	508.57	509.25	508.89	508.74	508.65	508.57	509.03	508.90	510.22	510.18	509.91
HCM0044M	505.72	505.74	505.64	505.60	505.56	505.54	505.50	505.43	505.38	507.25	506.84	506.54
HCM0045M												
HCM0046M												
HCM0047M	461.57	461.65	461.77	461.84	461.92	461.96	462.16	462.18	462.02	461.91	461.90	461.81
HCM0059M												

Note: A blank cell indicates that no reading was taken.

Table 7.6: Field pH from Production Bores and Sumps

Sample Point ID	Hashimoto											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HHH0022P												
HHH0039P	7.6	7.5	7.2	7.7	7.6	7.8	7.7	7.6	6.8			
HHH0040P	7.5	7.0			7.4	7.2	7.2	7.3	7.2	7.5	7.4	7.6
HHH0042P					7.6	7.8	7.6	7.8				
HHH0065P												
HHH0066P										7.6	7.4	7.2

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Operations South Jimblebar											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0008P				7.3	7.3	6.8	7.3	7.7	7.4			
HSJ0063P	7.2	7.5	7.3	7.5			7.4	7.5	7.4		7.3	7.0
HSJ0125P	6.8							7.7	7.4		7.7	7.5
HSJ0180P	7.5	7.6	7.5	7.6	7.6	7.3		7.1	7.2	7.0		
HSJ0182P	7.3	7.4	7.3	7.6	7.3	7.4	7.7		7.5	7.3	7.7	7.4
HSJ0184P	7.0	7.2	6.6									
HSJ0207P	7.0	7.0	6.8	7.3	7.2	6.9	7.1	7.4	7.3	7.0	6.8	7.0
HSJ0219P											7.4	6.9

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Regional West											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HNPISJ0129P	7.3	7.5	7.4	7.4	7.3	7.4	7.5	7.4	7.5	7.4	7.6	7.3

Note: A blank cell indicates that no reading was taken.

Table 7.6: Field pH from Production Bores and Sumps (cont'd)

Sample Point ID	Wheelarra Hill											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HFG0012P	7.7	7.7	7.3	7.7	7.4	7.6	7.4		7.4	7.5	7.6	7.2
HFG0014P	7.5	7.5	7.4	7.7	7.5	7.7	7.5	7.7	7.5	7.5	7.1	7.5
HFG0064P	7.6	7.6	7.6	7.7	7.5	7.7	7.6	7.7	7.2	7.4	7.8	
HFG0087P	7.5	7.1	7.4	7.5	7.5	7.4	7.4	7.7	7.2	7.7	7.7	
HFG0088P	6.9	6.9	6.9	7.3	6.9	7.3	7.0	7.3	7.1	7.2	7.1	6.9
HFG0094P	7.5	7.2	7.4	7.5	7.3	7.5	7.6	7.6	7.6	7.5	7.7	7.4

Note: A blank cell indicates that no reading was taken.

Sample Point ID	South Jimblebar MAR											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HSJ0003P		7.1	6.5	7.0	6.7	6.9	7.0					
HSJ0069P	6.9	6.8	6.7	7.0	7.0	6.7	7.2	7.3				
HSJ0076P	6.7	6.7	6.7	6.9	6.7	6.8	6.9	7.1		7.0		

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Caramulla Discharge											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
FJB0016		7.4					8.1				7.9	

Note: A blank cell indicates that no reading was taken.

Sample Point ID	Caramulla MAR											
	FY23 (pH)											
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
HCM0008M		6.9		7.1			7.0			6.5		
HCM0017M		6.9		6.9			6.9				6.7	

Note: A blank cell indicates that no reading was taken.

Table 7.8: Laboratory Chemistry Results from Production Bores

			Hashimoto			
			HHH0040P		HHH0042P	HHH0066P
Recording Type Name	Unit	Trigger Values	Dec - 22	Apr - 23	Dec - 22	Apr - 23
Aluminium	mg/L	0.055	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.013	<0.001	<0.001	<0.001	0.012
Barium	mg/L	0.01	0.028	0.023	0.024	0.015
Bicarbonate Alkalinity as HCO3	mg/L		390	340	360	370
Boron	mg/L	0.61	0.380	0.380	0.360	0.390
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L		59.0	58.0	56.0	56.0
Chloride	mg/L		230	200	210	210
Chromium	mg/L	0.01	0.004	0.002	0.002	<0.001
Copper	mg/L	0.01	<0.001	<0.001	<0.001	<0.001
Electrical Conductivity at 25°C	µS/cm	670-1880	1500	1400	1400	1500
Fluoride	mg/L		0.9	0.7	0.7	1.0
Iron Sol.	mg/L	0.1	<0.005	<0.005	<0.005	<0.005
Lead	mg/L	0.0034	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L		53.0	56.0	52.0	55.0
Manganese	mg/L	1.9	0.003	<0.001	<0.001	0.068
Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.01	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	<0.001	<0.001	<0.001	<0.001
Nitrate as N	mg/L	0.7	1.300		0.660	
pH	pH	6.0-8.5	8.1	8.0	8.0	8.1
Potassium	mg/L		8.2	9.5	8.7	8.7
Reactive Silica as SiO2	mg/L		20.00	16.00	17.00	15.00
Selenium	mg/L	0.011	0.001	0.001	<0.001	0.001
Silica	mg/L		18.00	16.00	15.00	15.00
Sodium	mg/L		160.0	140.0	140.0	160.0
Sulphate as SO4 2-	mg/L		150	140	140	160
Suspended Solids (SS)	mg/L		<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L		320	280	290	300
Total Dissolved Solids at 180°C	mg/L		880	800	810	850
Total Hardness as CaCO3	mg/L		370	380	350	370
Zinc	mg/L	0.024	<0.005	<0.005	0.017	0.012

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

			Operations South Jimblebar			
			HSJ0008P	HSJ0182P	HSJ0207P	
Recording Type Name	Unit	Trigger Values	Dec - 22	Apr - 23	Dec - 22	Apr - 23
Aluminium	mg/L	0.055	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.013	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.01	0.002	0.001	0.018	0.020
Bicarbonate Alkalinity as HCO3	mg/L		320	310	340	330
Boron	mg/L	0.61	0.600	0.610	0.600	0.640
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L		69.0	69.0	66.0	66.0
Chloride	mg/L		280	290	260	260
Chromium	mg/L	0.01	0.003	<0.001	<0.001	0.003
Copper	mg/L	0.01	<0.001	<0.001	<0.001	<0.001
Electrical Conductivity at 25°C	µS/cm	670-1880	1700	1800	1700	1700
Fluoride	mg/L		0.7	0.7	0.7	0.7
Iron Sol.	mg/L	0.1	<0.005	0.013	0.013	<0.005
Lead	mg/L	0.0034	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L		69.0	73.0	67.0	70.0
Manganese	mg/L	1.9	<0.001	0.002	0.120	0.003
Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.01	<0.001	0.001	0.001	0.001
Nickel	mg/L	0.011	0.001	0.001	0.002	<0.001
Nitrate as N	mg/L	0.7	1.600		1.800	
pH	pH	6.0-8.5	7.9	8.0	7.9	7.7
Potassium	mg/L		9.8	9.4	8.9	9.2
Reactive Silica as SiO2	mg/L		15.00	16.00	17.00	16.00
Selenium	mg/L	0.011	<0.001	<0.001	<0.001	0.001
Silica	mg/L		15.00	15.00	15.00	16.00
Sodium	mg/L		170.0	170.0	170.0	170.0
Sulphate as SO4 2-	mg/L		220	230	210	210
Suspended Solids (SS)	mg/L		<5	<5	11	<5
Total Alkalinity as CaCO3	mg/L		260	260	280	270
Total Dissolved Solids at 180°C	mg/L		1000	1100	990	1000
Total Hardness as CaCO3	mg/L		460	470	440	450
Zinc	mg/L	0.024	0.013	<0.005	<0.005	<0.005

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

			Regional West	
			HNPISJ0129P	
Recording Type Name	Unit	Trigger Values	Dec - 22	Jun - 23
Barium	mg/L	0.01	0.028	
Boron	mg/L	0.61	0.570	
Calcium	mg/L		48.0	48.0
Chloride	mg/L		220	220
Chromium	mg/L	0.01	0.007	0.006
Fluoride	mg/L		0.6	0.6
Iron Sol.	mg/L	0.1	<0.005	<0.005
Magnesium	mg/L		50.0	50.0
Nitrate as N	mg/L	0.7	13.000	10.000
Potassium	mg/L		9.3	9.5
Reactive Silica as SiO2	mg/L		18.00	18.00
Silica	mg/L		17.00	17.00
Sodium	mg/L		180.0	180.0
Sulphate as SO4 2-	mg/L		170	180
Suspended Solids (SS)	mg/L		<5	<5
Total Alkalinity as CaCO3	mg/L		240	240
Total Aluminium	mg/L	0.055	0.006	<0.005
Total Arsenic	mg/L	0.013	<0.001	<0.001
Total Barium	mg/L	0.01	0.032	0.031
Total Boron	mg/L	0.61	0.610	0.670
Total Cadmium	mg/L	0.0002	<0.0001	<0.0001
Total Copper	mg/L	0.01	<0.001	<0.001
Total Dissolved Solids at 180°C	mg/L		900	910
Total Hardness as CaCO3	mg/L		330	330
Total Lead	mg/L	0.0034	<0.001	<0.001
Total Manganese	mg/L	1.9	0.001	0.002
Total Mercury	mg/L	0.0006	<0.00005	<0.00005
Total Molybdenum	mg/L	0.01	0.002	0.002
Total Nickel	mg/L	0.011	<0.001	0.002
Total Selenium	mg/L	0.011	0.004	0.003
Total Zinc	mg/L	0.024	<0.005	<0.005
Zinc	mg/L	0.024	<0.005	

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

			Wheelarra Hill		
			HFG0064P	HFG0088P	
Recording Type Name	Unit	Trigger Values	Apr - 23	Dec - 22	Apr - 23
Aluminium	mg/L	0.055	<0.005	<0.005	<0.005
Arsenic	mg/L	0.013	<0.001	<0.001	<0.001
Barium	mg/L	0.01	0.019	0.009	0.008
Bicarbonate Alkalinity as HCO3	mg/L		320	300	310
Boron	mg/L	0.61	0.370	0.350	0.360
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001
Calcium	mg/L		56.0	58.0	57.0
Chloride	mg/L		200	200	200
Chromium	mg/L	0.01	0.002	<0.001	<0.001
Copper	mg/L	0.01	<0.001	<0.001	<0.001
Electrical Conductivity at 25°C	µS/cm	670-1880	1300	1300	1300
Fluoride	mg/L		0.6	0.5	0.5
Iron Sol.	mg/L	0.1	0.005	<0.005	0.005
Lead	mg/L	0.0034	<0.001	<0.001	<0.001
Magnesium	mg/L		52.0	56.0	56.0
Manganese	mg/L	1.9	<0.001	0.005	<0.001
Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.01	<0.001	<0.001	<0.001
Nickel	mg/L	0.011	<0.001	0.001	<0.001
Nitrate as N	mg/L	0.7		0.092	
pH	pH	6.0-8.5	8.0	7.6	7.6
Potassium	mg/L		9.4	11.0	11.0
Reactive Silica as SiO2	mg/L		16.00	16.00	15.00
Selenium	mg/L	0.011	<0.001	<0.001	<0.001
Silica	mg/L		15.00	15.00	14.00
Sodium	mg/L		130.0	120.0	120.0
Sulphate as SO4 2-	mg/L		140	120	140
Suspended Solids (SS)	mg/L		<5	<5	<5
Total Alkalinity as CaCO3	mg/L		260	240	250
Total Dissolved Solids at 180°C	mg/L		780	720	770
Total Hardness as CaCO3	mg/L		360	370	370
Zinc	mg/L	0.024	0.008	0.017	0.007

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

			South Jimblebar MAR								
			HSJ0003P				HSJ0069P	HSJ0076P			
Recording Type Name	Unit	Trigger Values	Aug - 22	Nov - 22	Jan - 23	Apr - 23	Aug - 22	Aug - 22	Nov - 22	Jan - 23	Apr - 23
Aluminium	mg/L	0.055	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	mg/L	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.01	0.022	0.014	0.009	0.007	0.020	0.022	0.021	0.010	0.009
Bicarbonate Alkalinity as HCO3	mg/L		290	280	310	340	290	290	270	330	320
Boron	mg/L	0.61	0.640	0.580	0.520	0.580	0.660	0.650	0.610	0.540	0.560
Cadmium	mg/L	0.0002	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/L		69.0	69.0	67.0	68.0	71.0	70.0	72.0	65.0	65.0
Chloride	mg/L		290	290	260	260	290	290	290	260	270
Chromium	mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003
Copper	mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Electrical Conductivity at 25°C	µS/cm	670-1880	1700	1700	1600	1700	1700	1700	1700	1700	1700
Fluoride	mg/L		0.9	0.8	0.7	0.7	0.9	0.9	0.8	0.6	0.7
Iron Sol.	mg/L	0.1	0.010	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006
Lead	mg/L	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L		72.0	72.0	67.0	75.0	74.0	73.0	75.0	65.0	71.0
Manganese	mg/L	1.9	0.100	0.250	0.004	0.004	0.013	0.085	0.095	0.001	0.002
Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.01	0.004	0.006	0.004	0.003	0.004	0.004	0.004	0.001	<0.001
Nickel	mg/L	0.011	0.003	0.007	<0.001	<0.001	0.001	0.002	0.003	<0.001	<0.001
Nitrate as N	mg/L	0.7	0.110	<0.005	0.022	0.860	0.110	0.110	0.032	1.100	1.600
pH	pH	6.0-8.5	7.4	7.5	7.8	7.7	7.4	7.3	7.5	7.7	7.5
Potassium	mg/L		10.0	10.0	11.0	9.4	10.0	10.0	10.0	9.7	8.9
Reactive Silica as SiO2	mg/L		17.00	15.00	14.00	14.00	16.00	17.00	17.00	15.00	15.00
Selenium	mg/L	0.011	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silica	mg/L		15.00	14.00	14.00	14.00	15.00	15.00	15.00	14.00	15.00
Sodium	mg/L		170.0	180.0	150.0	170.0	170.0	170.0	180.0	150.0	170.0
Sulphate as SO4 2-	mg/L		230	220	190	210	230	220	220	210	220
Suspended Solids (SS)	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO3	mg/L		240	230	250	280	240	240	220	270	260
Total Dissolved Solids at 180°C	mg/L		1000	1000	960	980	1000	1000	1000	970	1000
Total Hardness as CaCO3	mg/L		470	470	440	480	480	470	490	430	460
Zinc	mg/L	0.024	0.084	0.150	0.074	0.056	0.049	0.067	0.082	0.013	0.009

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

			Caramulla Discharge		
			FJB0016		
Recording Type Name	Unit	Trigger Values	Aug - 22	Jan - 23	May - 23
Bicarbonate Alkalinity as HCO3	mg/L		320	330	320
Calcium	mg/L		59.0	56.0	62.0
Chloride	mg/L		190	200	210
Chromium	mg/L	0.01	0.001	0.002	0.002
Fluoride	mg/L		0.6	0.3	0.6
Iron Sol.	mg/L	0.1	<0.005	<0.005	0.011
Magnesium	mg/L		56.0	53.0	63.0
Potassium	mg/L		10.0	9.7	10.0
Reactive Silica as SiO2	mg/L		16.00	16.00	15.00
Silica	mg/L				16.00
Sodium	mg/L		120.0	120.0	140.0
Sulphate as SO4 2-	mg/L		140	130	150
Suspended Solids (SS)	mg/L		<5	<5	
Total Alkalinity as CaCO3	mg/L		260	270	260
Total Aluminium	mg/L	0.055	0.005	0.006	0.012
Total Arsenic	mg/L	0.013	<0.001	<0.001	<0.001
Total Barium	mg/L	0.01	0.014	0.019	0.017
Total Boron	mg/L	0.61	0.380	0.410	0.450
Total Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001
Total Copper	mg/L	0.01	0.002	<0.001	<0.001
Total Hardness as CaCO3	mg/L		380	360	410
Total Lead	mg/L	0.0034	<0.001	<0.001	<0.001
Total Manganese	mg/L	1.9	0.003	0.005	0.019
Total Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005
Total Molybdenum	mg/L	0.01	<0.001	<0.001	<0.001
Total Nickel	mg/L	0.011	<0.001	<0.001	0.020
Total Selenium	mg/L	0.011	<0.001	0.001	<0.001
Total Zinc	mg/L	0.024	0.011	0.007	0.018

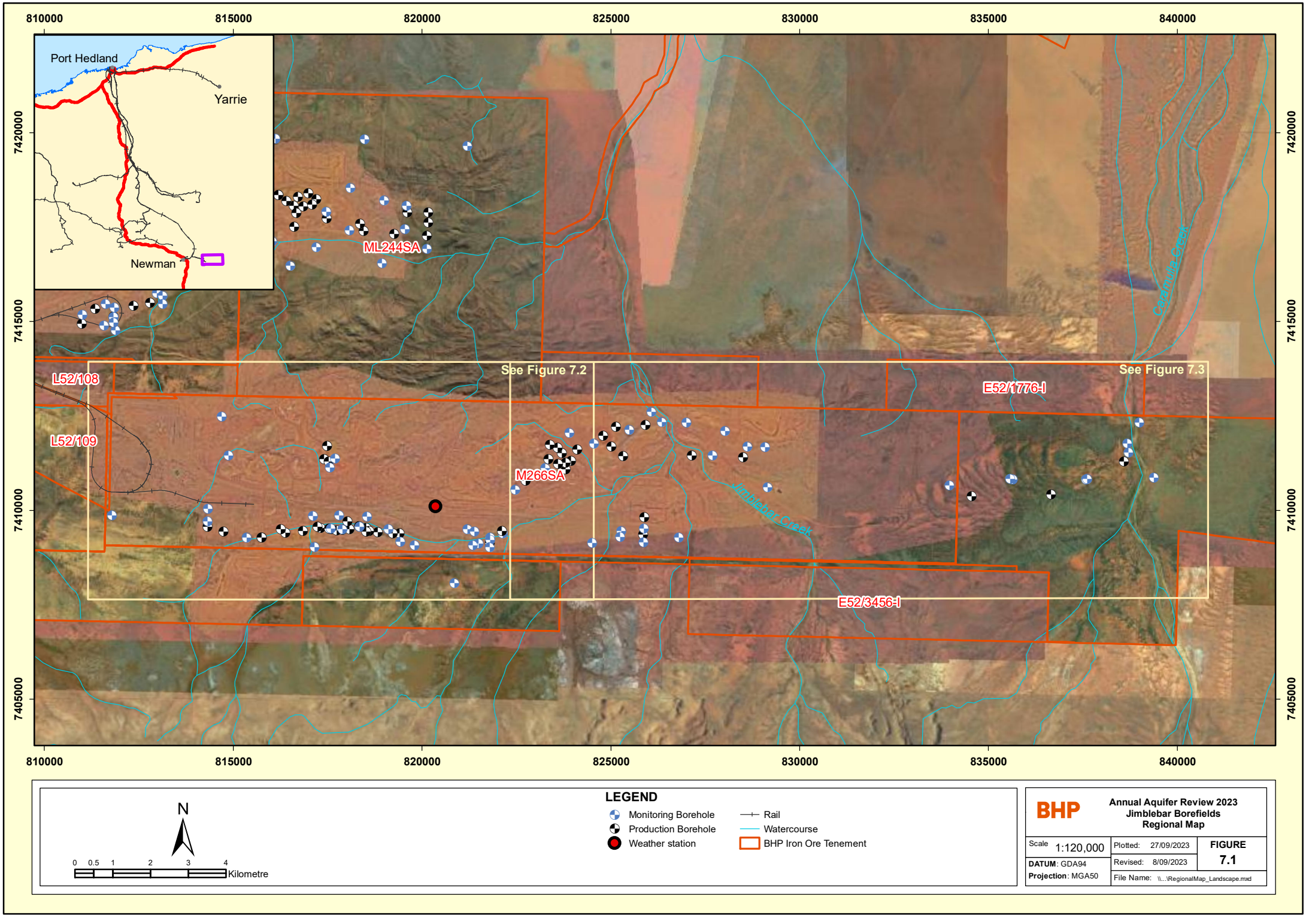
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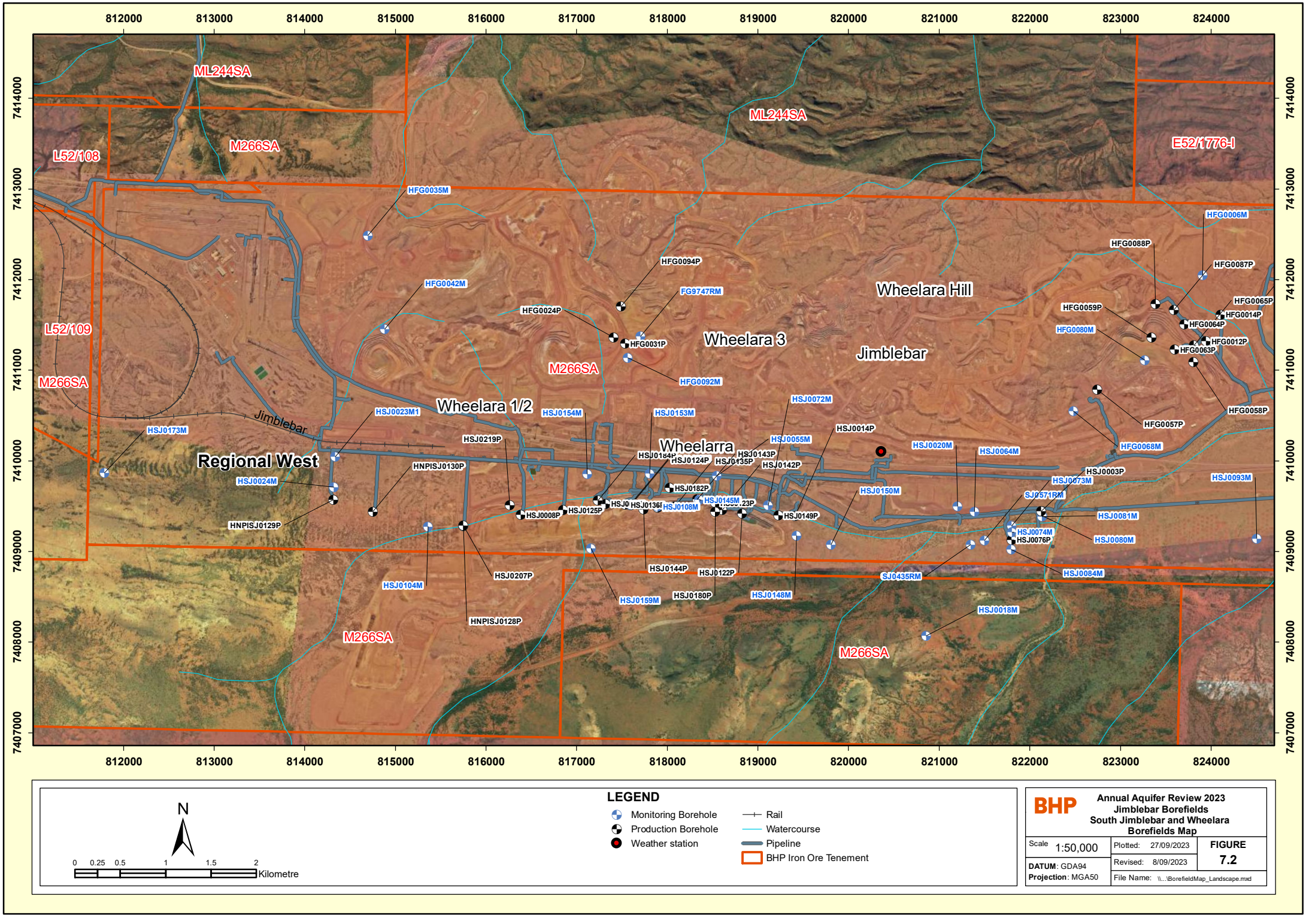
Table 7.8: Laboratory Chemistry Results from Production Bores (cont'd)

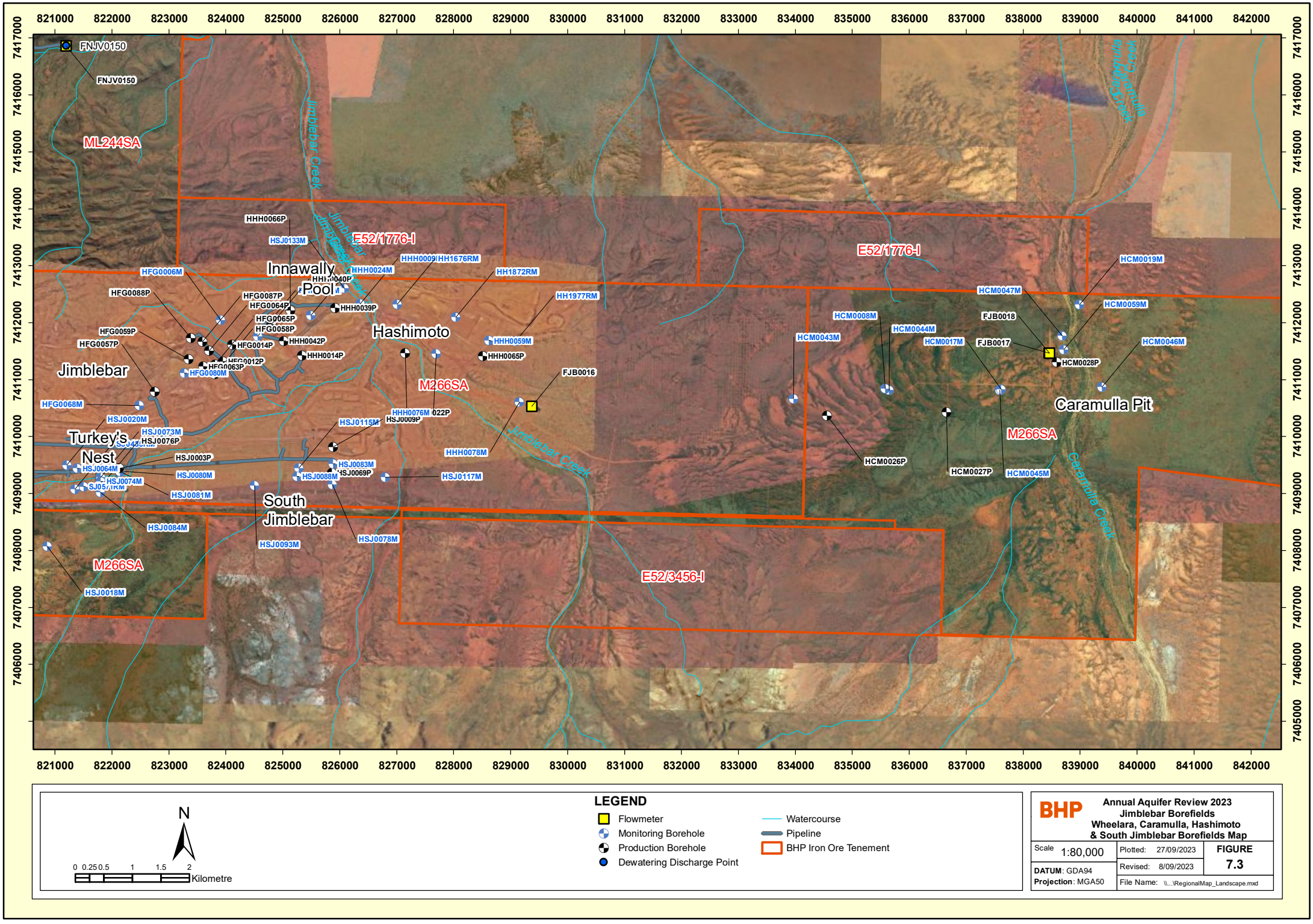
			Caramulla MAR							
			HCM0008M				HCM0017M			
Recording Type Name	Unit	Trigger Values	Aug - 22	Oct - 22	Jan - 23	Apr - 23	Aug - 22	Oct - 22	Jan - 23	May - 23
Bicarbonate Alkalinity as HCO3	mg/L		370	350	360	350	410	390	380	380
Calcium	mg/L		67.0	61.0	58.0	60.0	62.0	58.0	57.0	58.0
Chloride	mg/L		200	200	210	200	190	200	200	200
Chromium	mg/L	0.01	0.004	0.003	0.002	0.002	0.003	0.003	<0.001	0.002
Fluoride	mg/L		0.6	0.6	0.6	0.6	0.8	0.7	0.7	0.8
Iron Sol.	mg/L	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L		66.0	59.0	55.0	60.0	66.0	61.0	58.0	65.0
Potassium	mg/L		13.0	12.0	11.0	12.0	8.8	8.8	8.6	9.0
Reactive Silica as SiO2	mg/L		27.00	23.00	18.00	<0.1	21.00	23.00	21.00	20.00
Sodium	mg/L		140.0	130.0	120.0	130.0	150.0	140.0	130.0	150.0
Sulphate as SO4 2-	mg/L		130	150	130	150	140	150	140	140
Suspended Solids (SS)	mg/L		19	41	67	<5	<5	<5	<5	5
Total Alkalinity as CaCO3	mg/L		300	290	290	290	330	320	310	320
Total Aluminium	mg/L	0.055	1.100	1.200	0.350	0.150	0.063	0.057	0.006	0.046
Total Arsenic	mg/L	0.013	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Barium	mg/L	0.01	0.033	0.040	0.058	0.029	0.003	0.002	0.002	0.004
Total Boron	mg/L	0.61	0.330	0.350	0.390	0.400	0.360	0.370	0.380	0.420
Total Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Copper	mg/L	0.01	0.002	0.002	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Total Dissolved Solids at 180°C	mg/L		830	810	790	810	850	840	810	810
Total Hardness as CaCO3	mg/L		440	390	370	400	430	390	380	410
Total Lead	mg/L	0.0034	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Manganese	mg/L	1.9	1.600	1.500	2.600	0.540	0.081	0.078	0.097	0.067
Total Mercury	mg/L	0.0006	<0.00005	<0.00005	<0.00005	<0.00005	0.00009	<0.00005	<0.00005	<0.00005
Total Molybdenum	mg/L	0.01	0.002	0.003	0.002	0.002	0.002	0.002	0.001	0.002
Total Nickel	mg/L	0.011	0.003	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Total Selenium	mg/L	0.011	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Total Zinc	mg/L	0.024	0.011	0.008	<0.005	<0.005	<0.005	0.007	<0.005	<0.005

A blank cell indicates not analysed. Values in red indicate that it exceeded the site-specific trigger values. (Golder, 2015)

Figures


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Port Hedland
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Newman
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See Figure 7.2
See Figure 7.3
E52/1776-I
E52/3456-I
Jimblebar Creek
Caramulla Creek
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Kilometre
LEGEND
Monitoring Borehole
Production Borehole
Weather station
Rail
Watercourse
BHP Iron Ore Tenement
BHP
Annual Aquifer Review 2023
Jimblebar Borefields
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Plotted: 27/09/2023
Revised: 8/09/2023
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7.1


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Kilometre
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Monitoring Borehole
Production Borehole
Weather station
Rail
Watercourse
Pipeline
BHP Iron Ore Tenement
BHP
Annual Aquifer Review 2023
Jimblebar Borefields
South Jimblebar and Wheelara
Borefields Map
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Plotted: 27/09/2023
FIGURE
7.2
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Revised: 8/09/2023
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LEGEND

- Flowmeter
- Monitoring Borehole
- Production Borehole
- Dewatering Discharge Point
- Watercourse
- Pipeline
- BHP Iron Ore Tenement

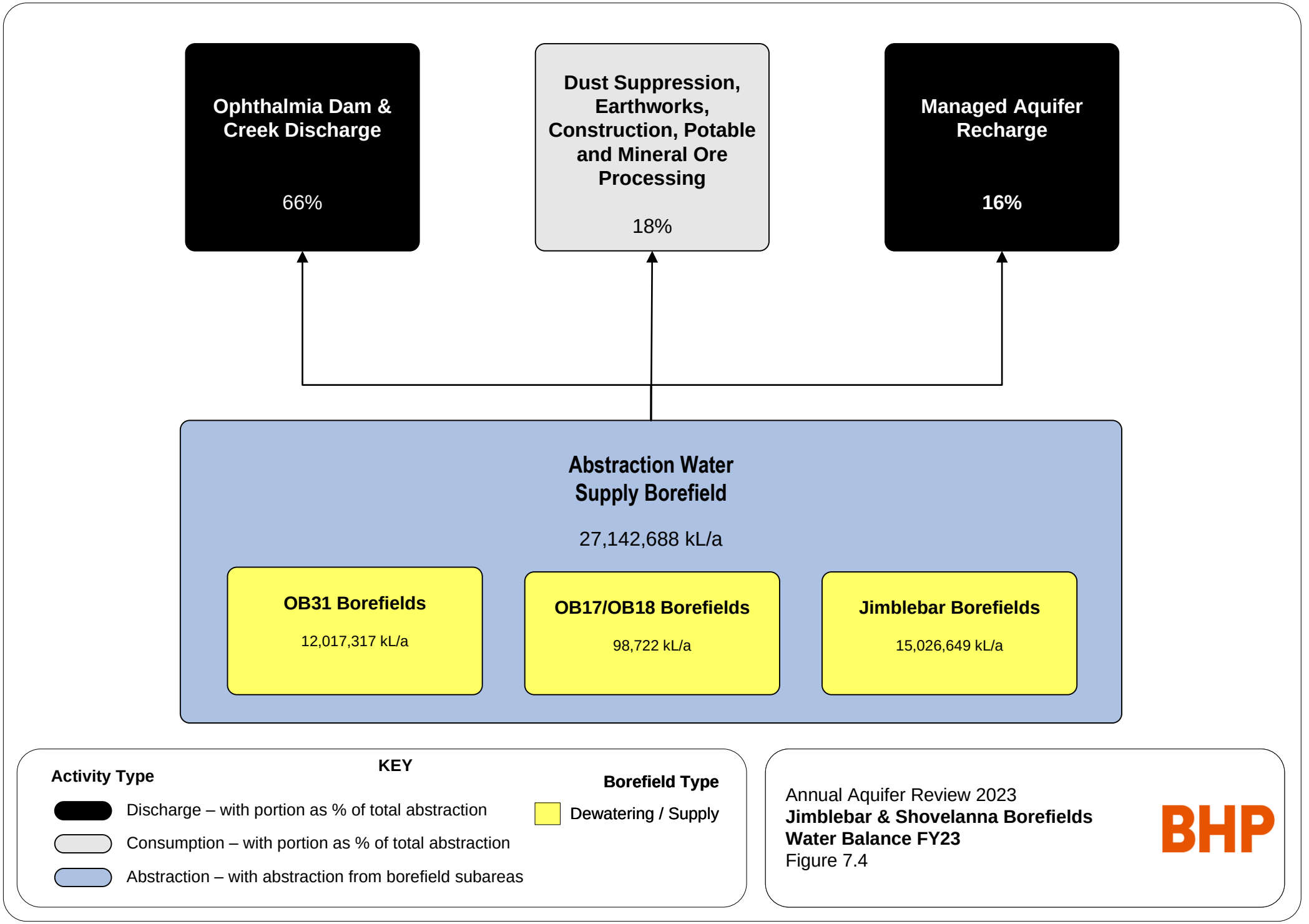
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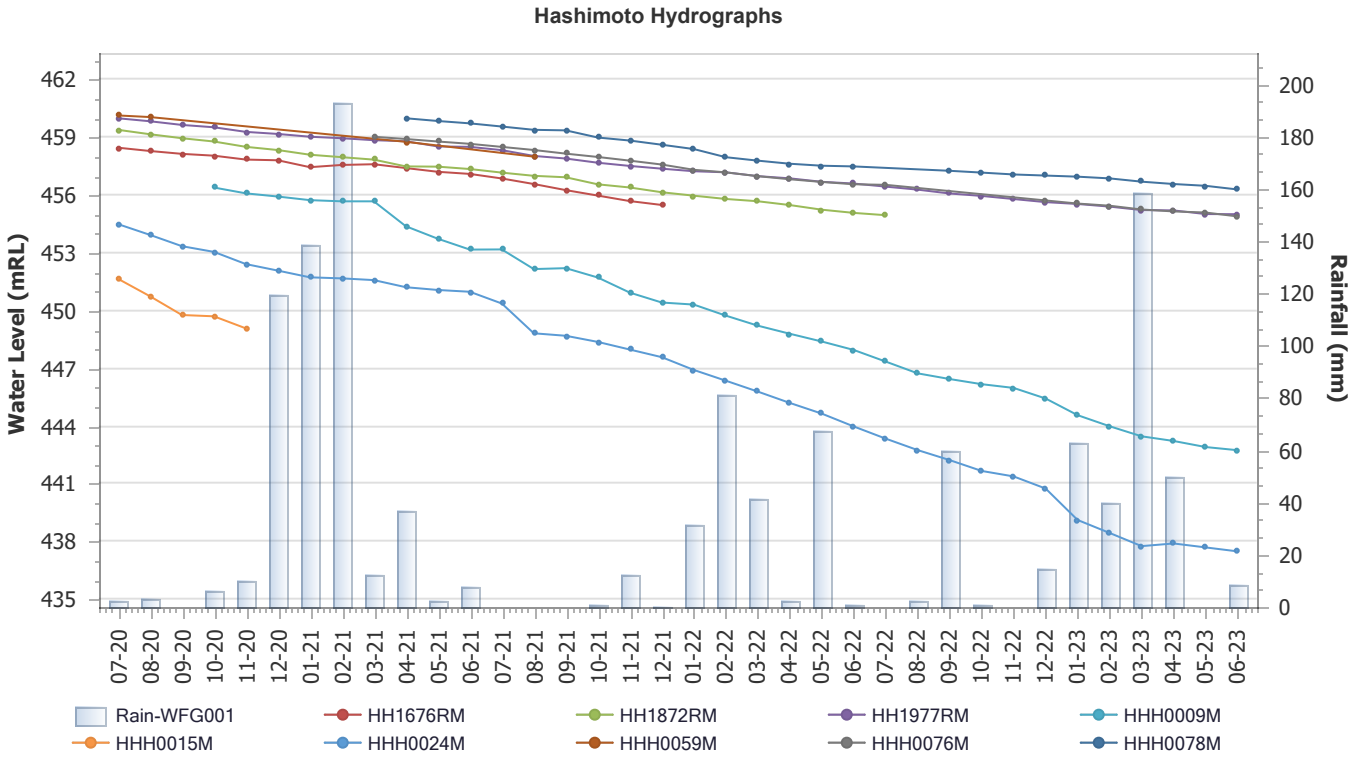
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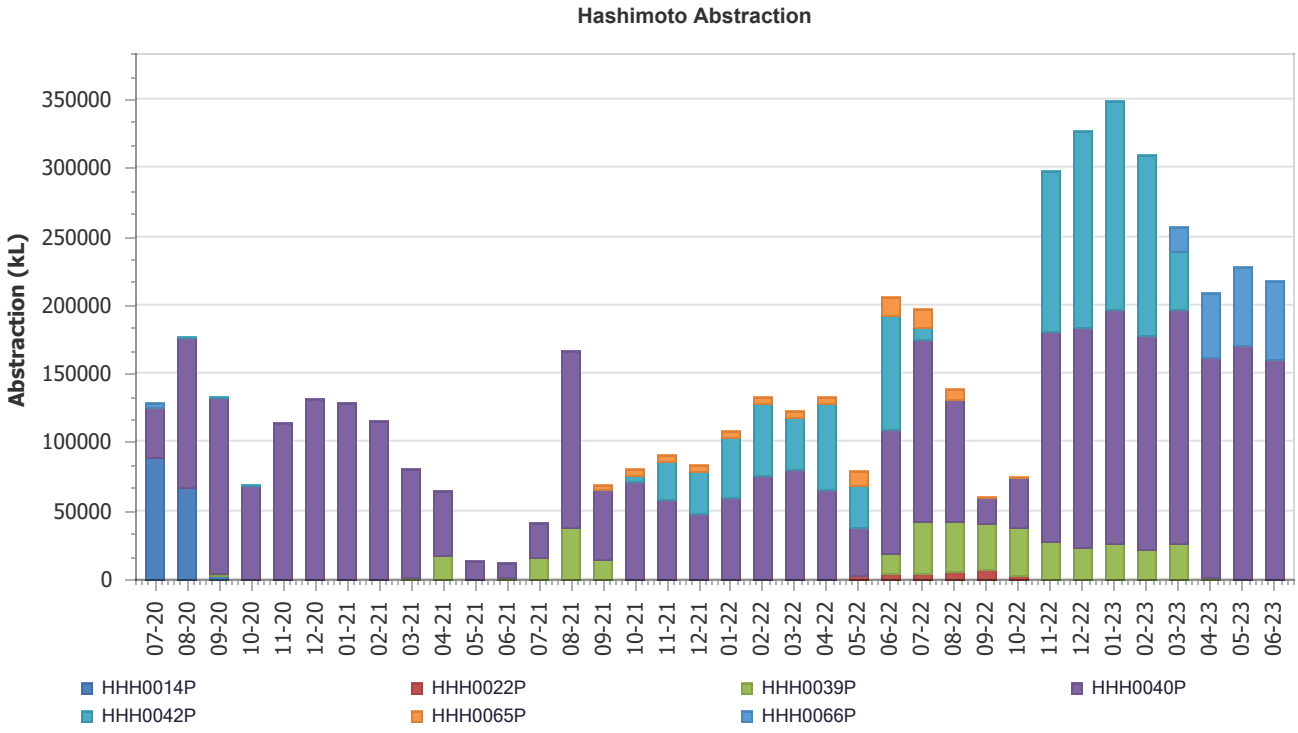
Annual Aquifer Review 2023
Jimblebar Borefields
Wheelara, Caramulla, Hashimoto
& South Jimblebar Borefields Map

Scale 1:80,000	Plotted: 27/09/2023	**FIGURE**
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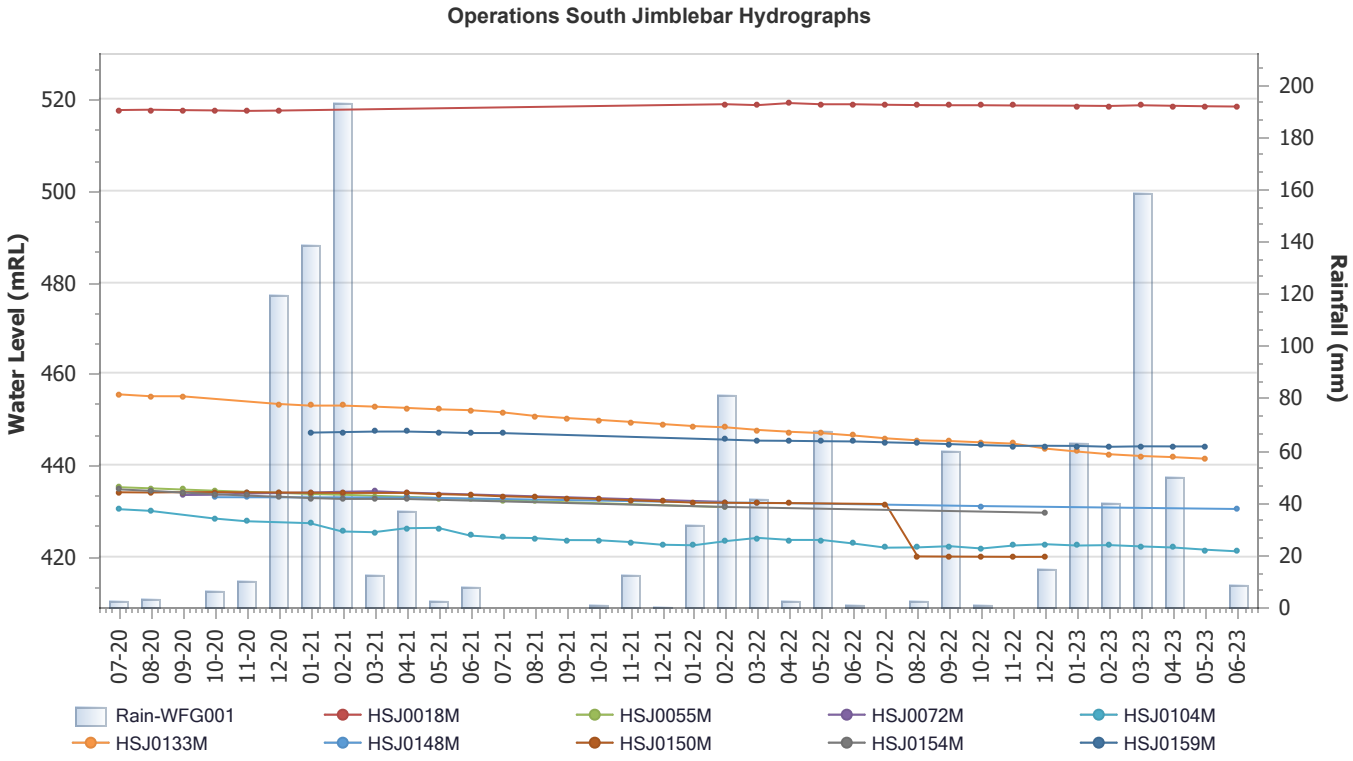
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Jimblebar & Shovelanna Borefields
Water Balance FY23
Figure 7.4

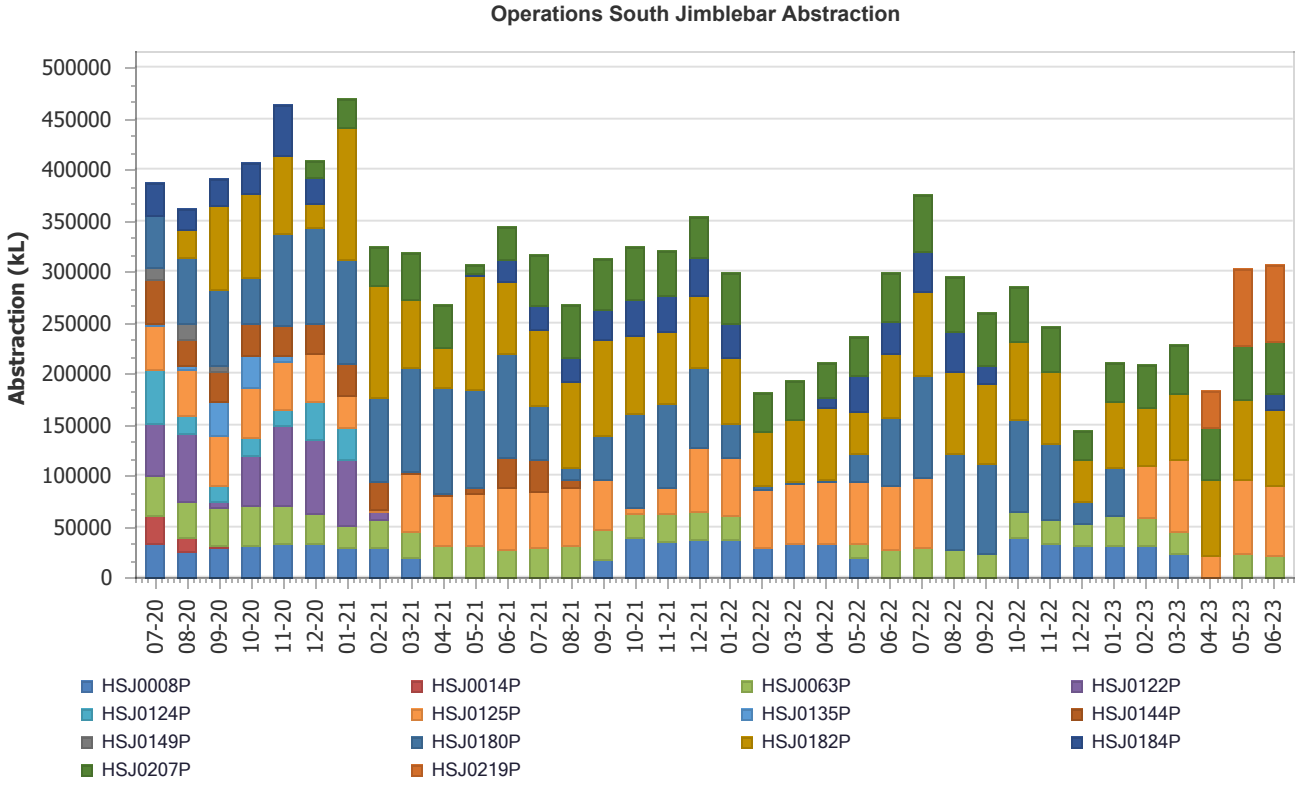




Monitoring summary: Hashimoto Hydrographs

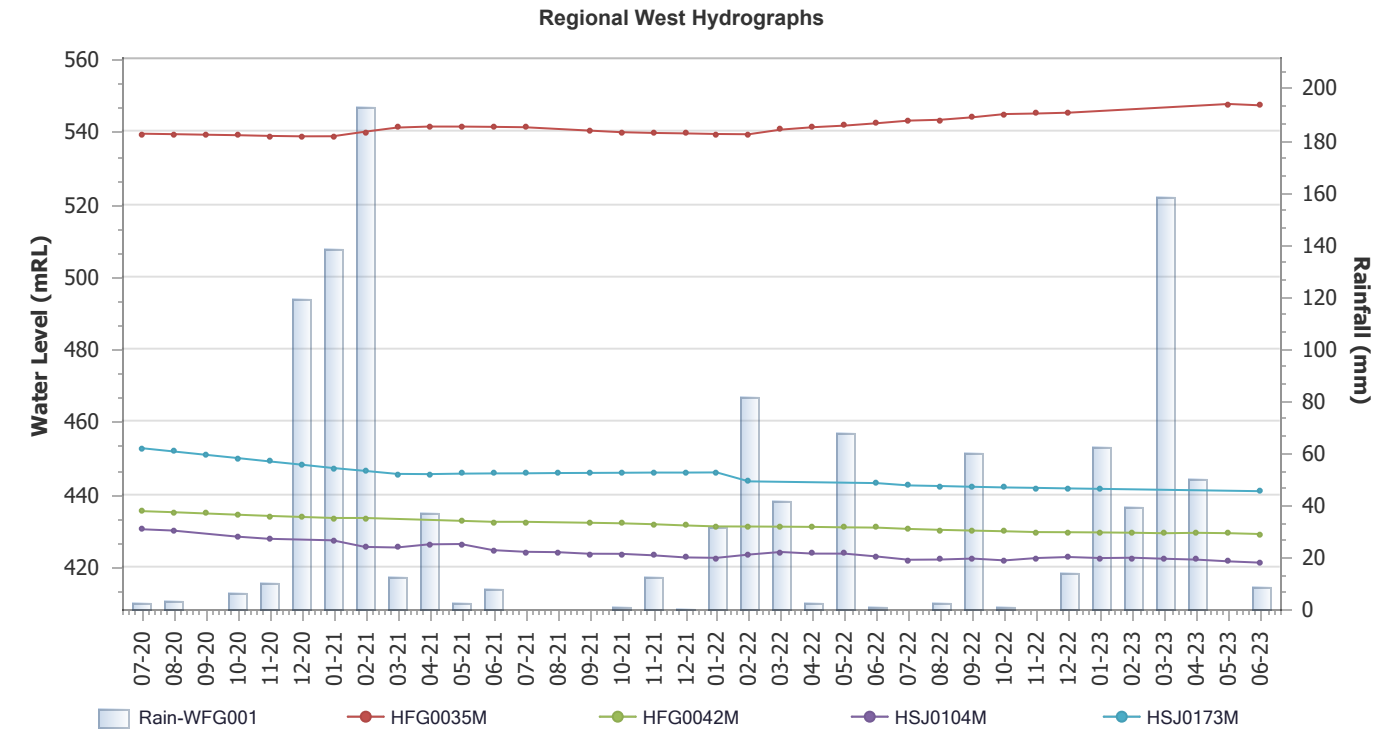
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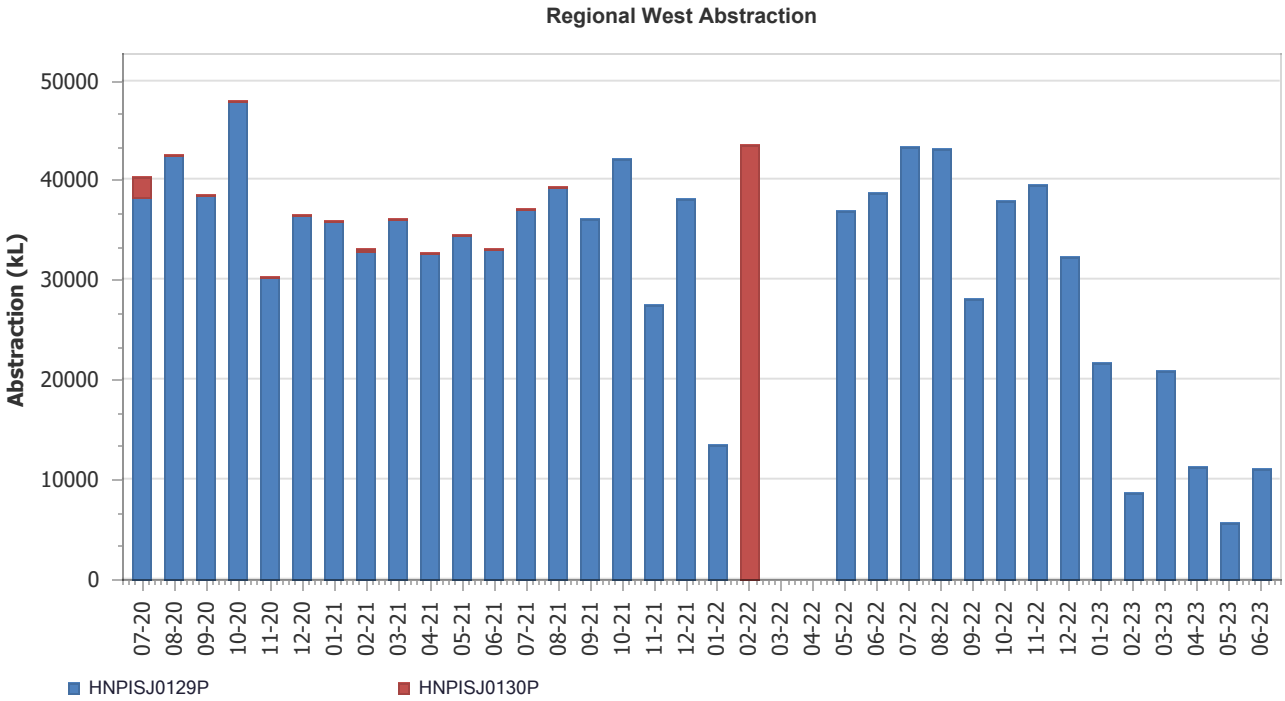




Monitoring summary: Operations South Jimblebar Hydrographs

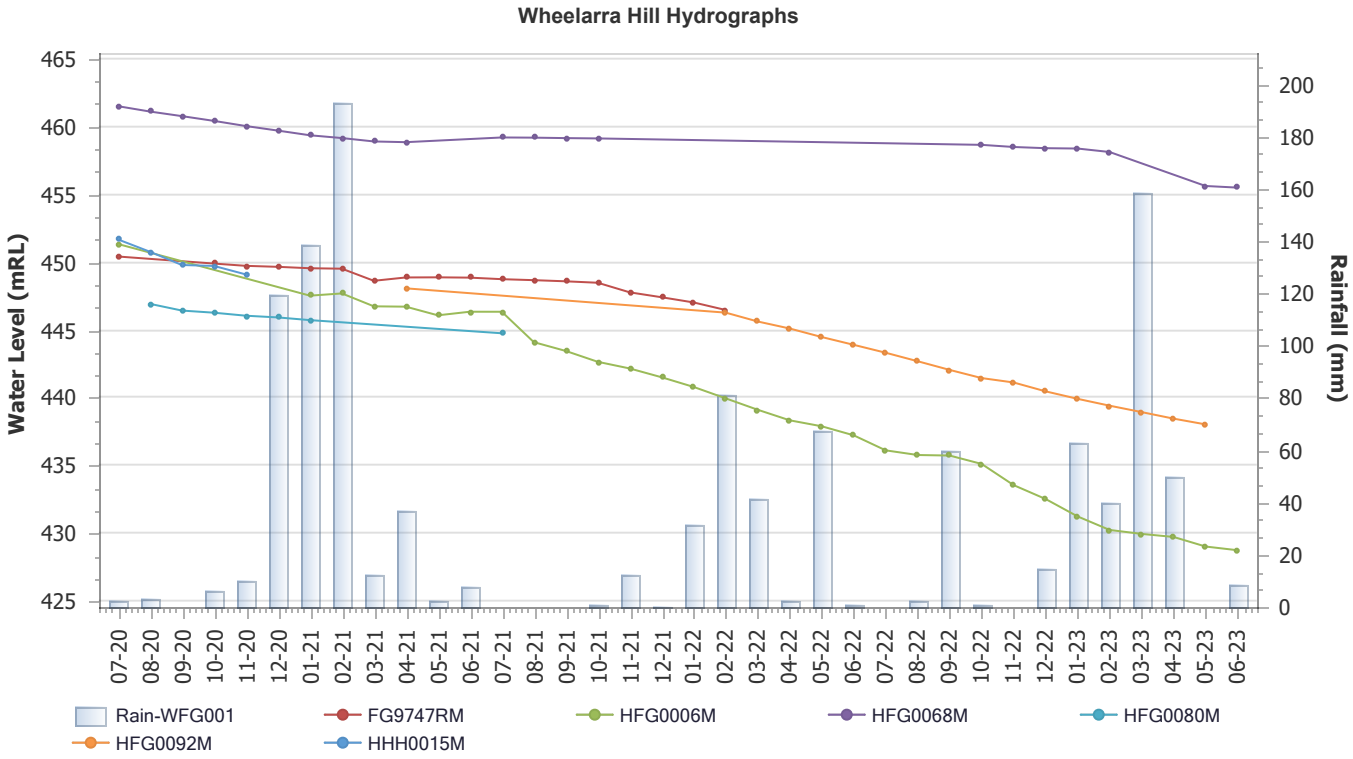
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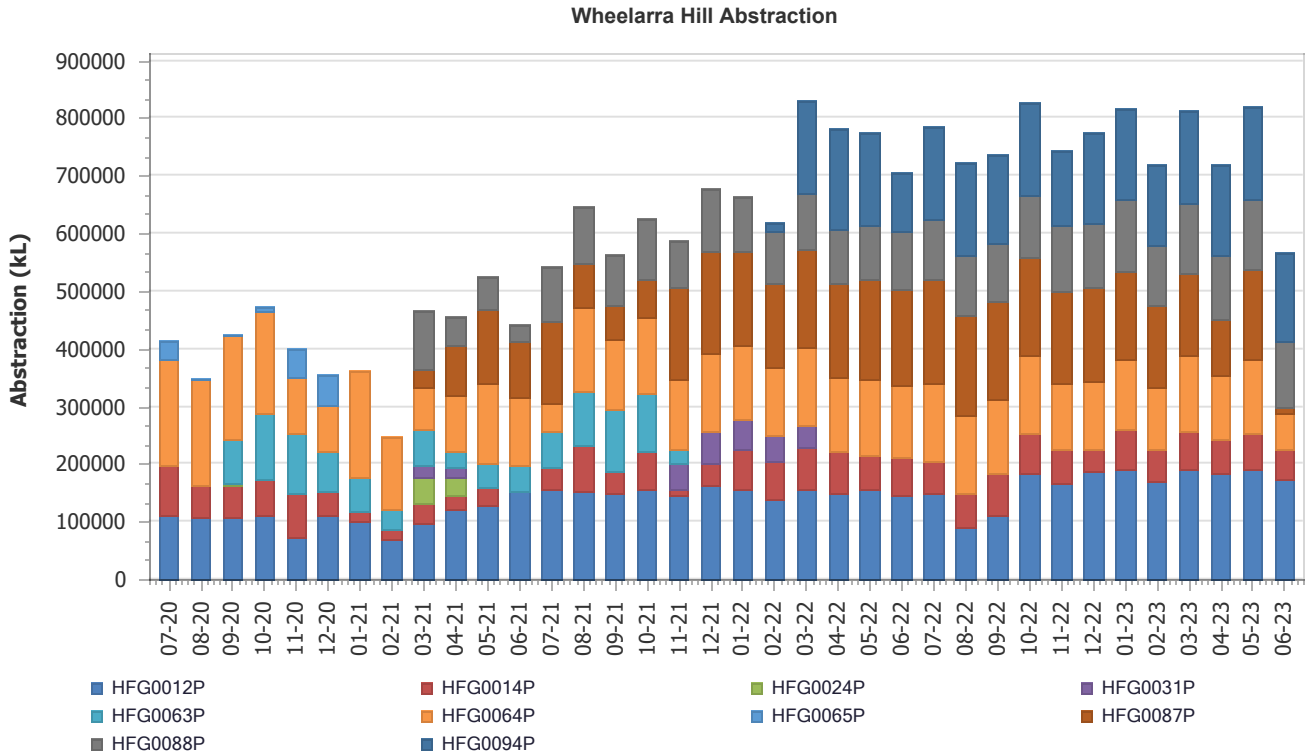




Monitoring summary: Regional West Hydrographs

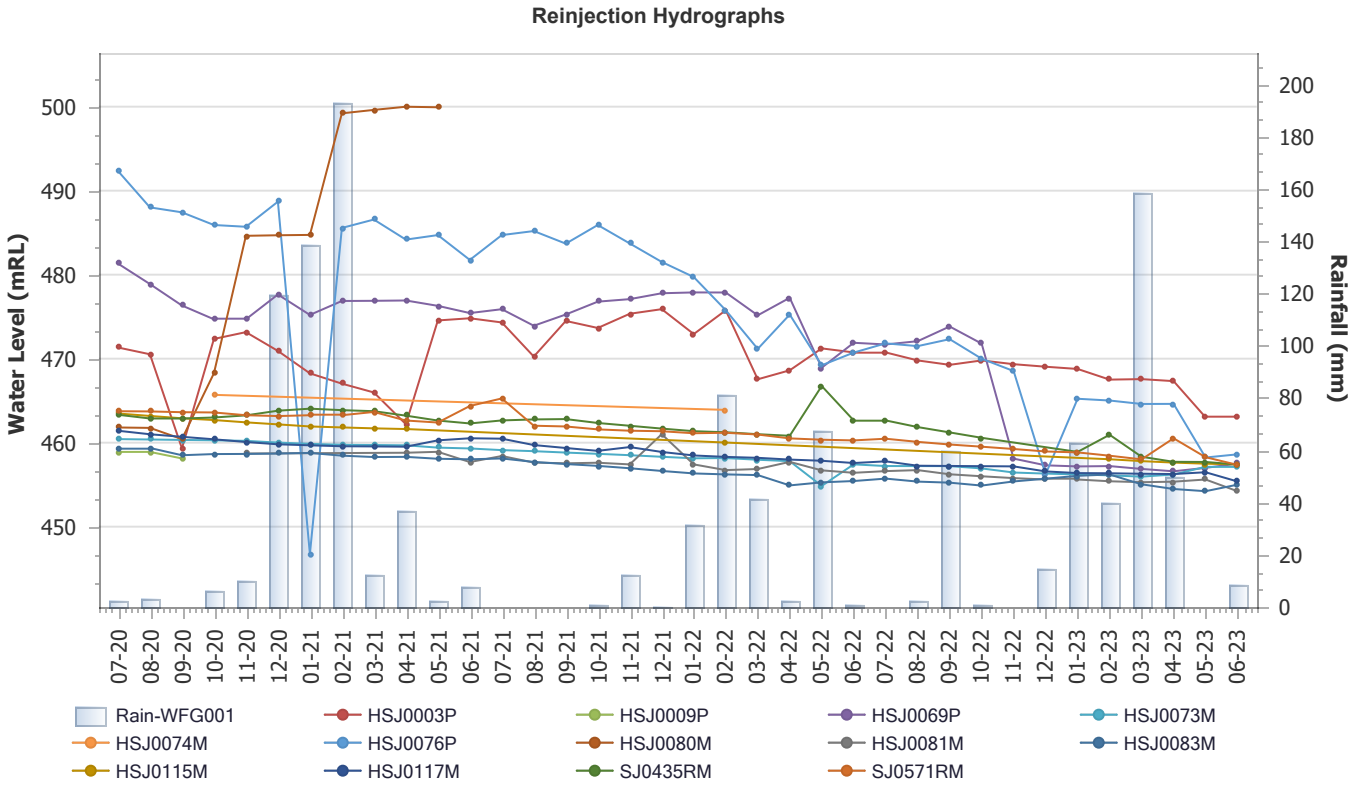
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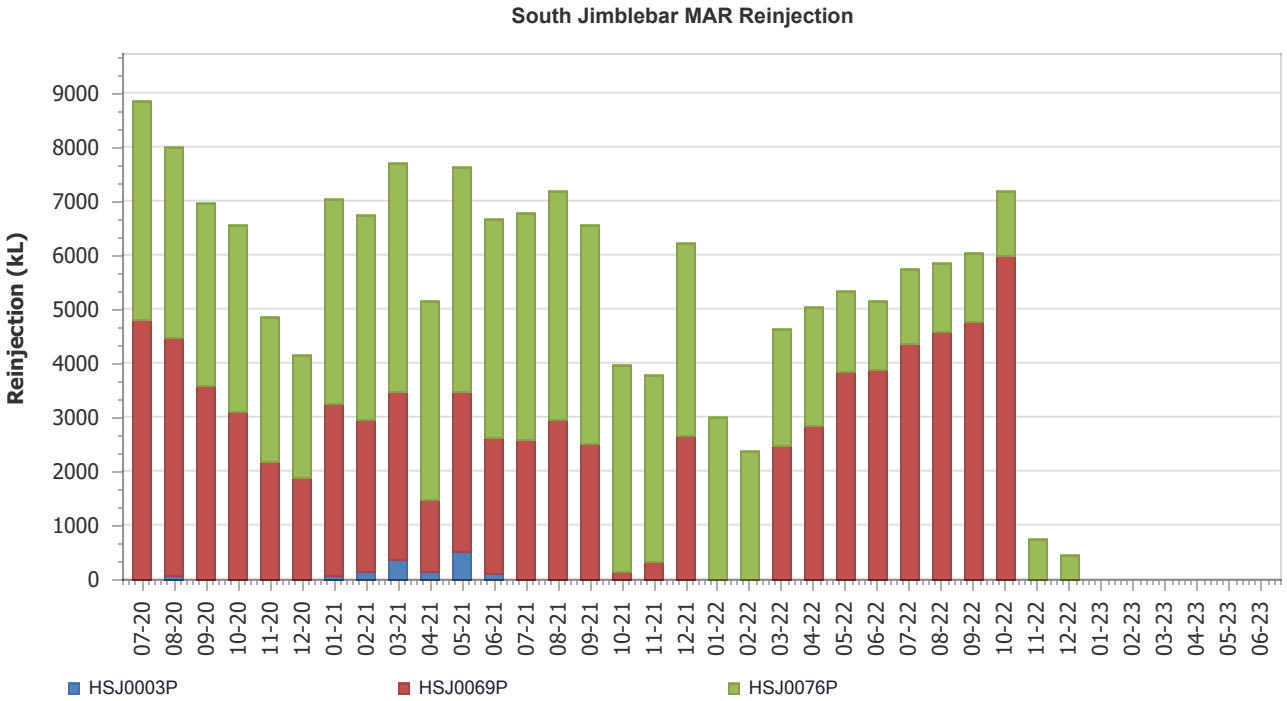




Monitoring summary: Wheelarra Hill Hydrographs

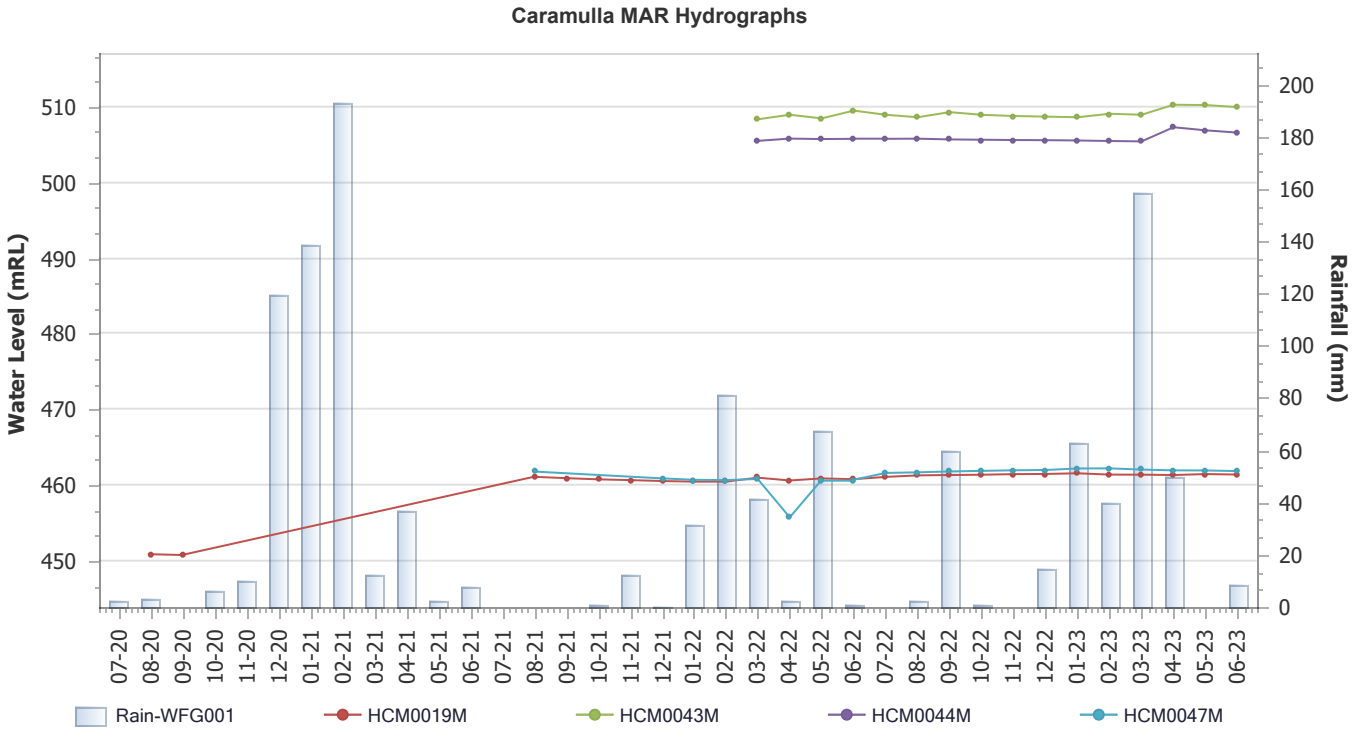
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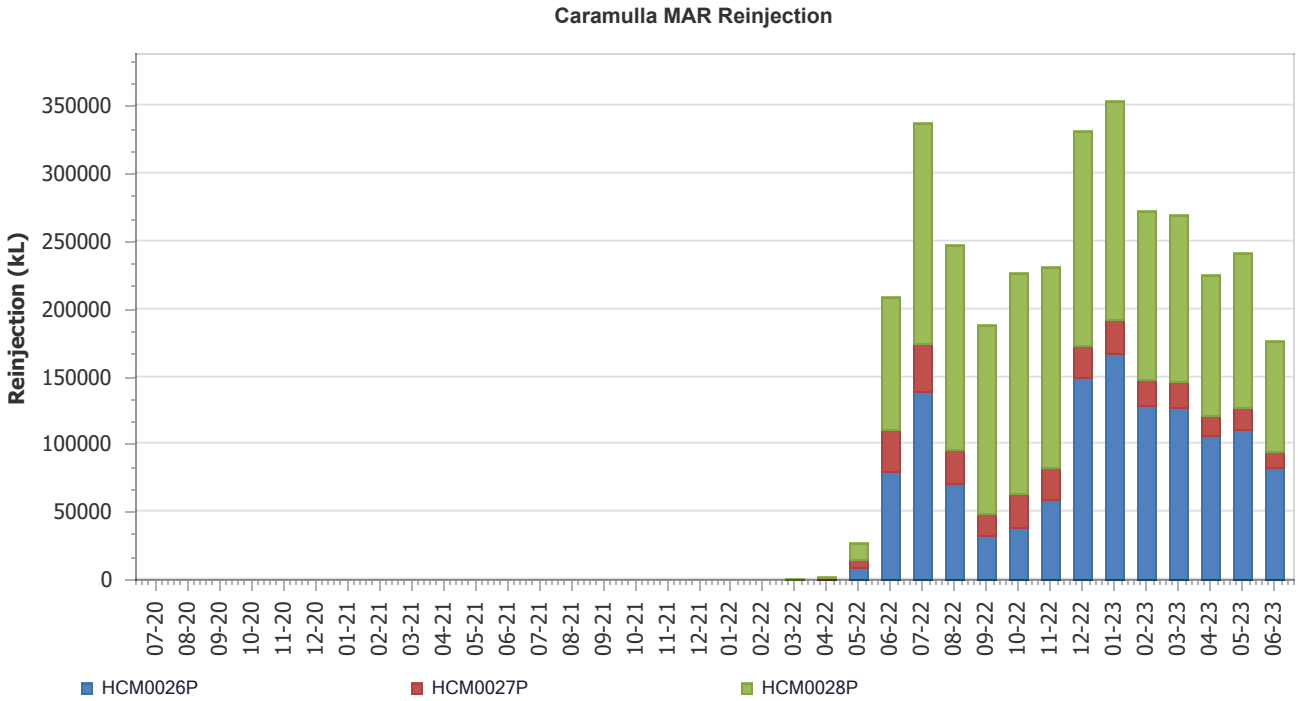




Monitoring summary: Reinjection Hydrographs

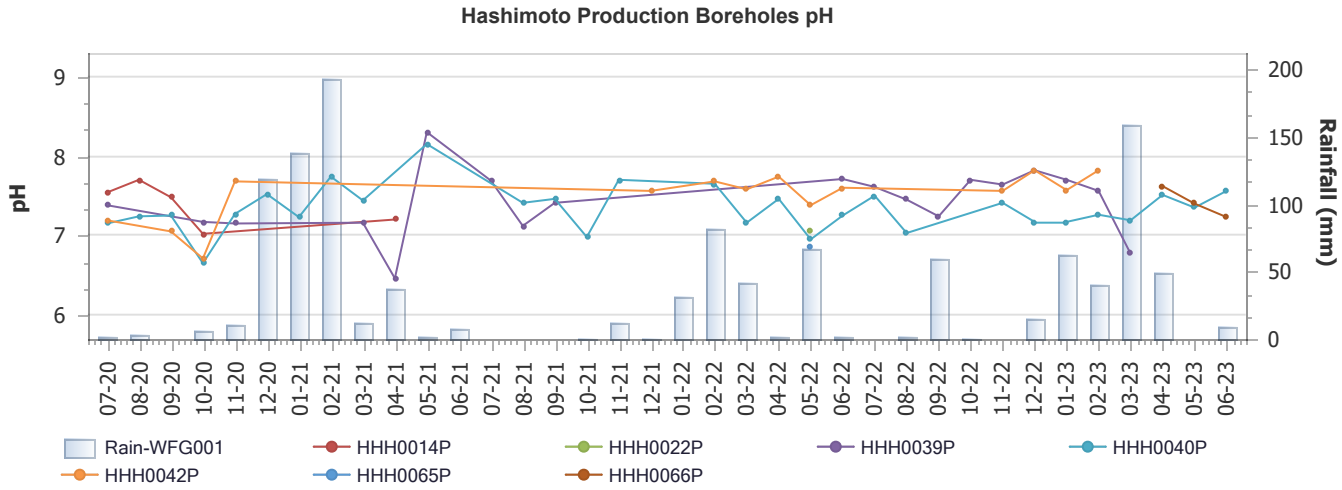
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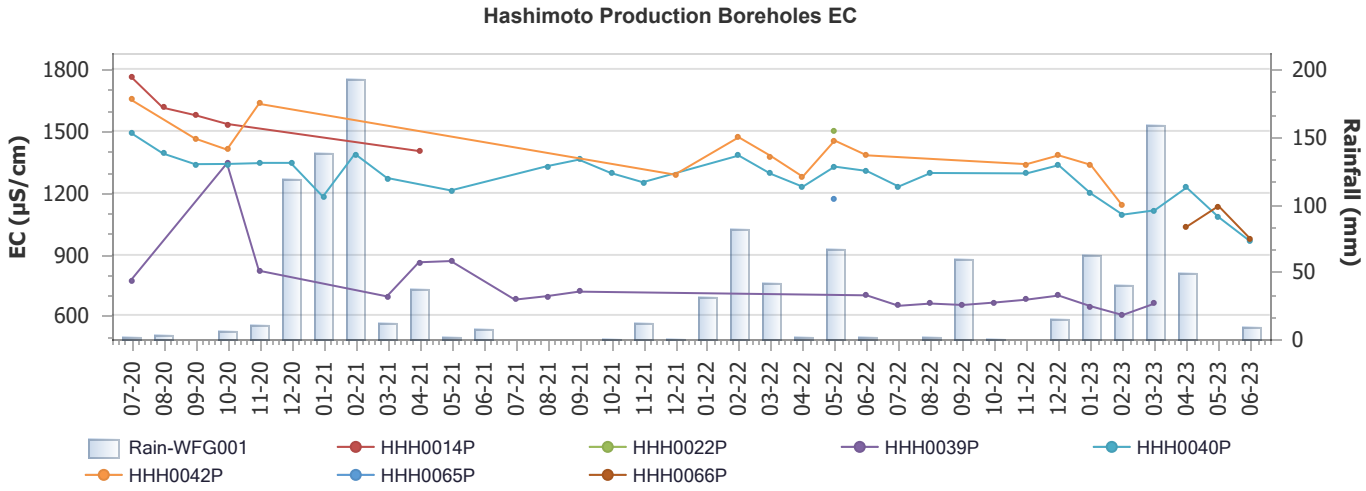


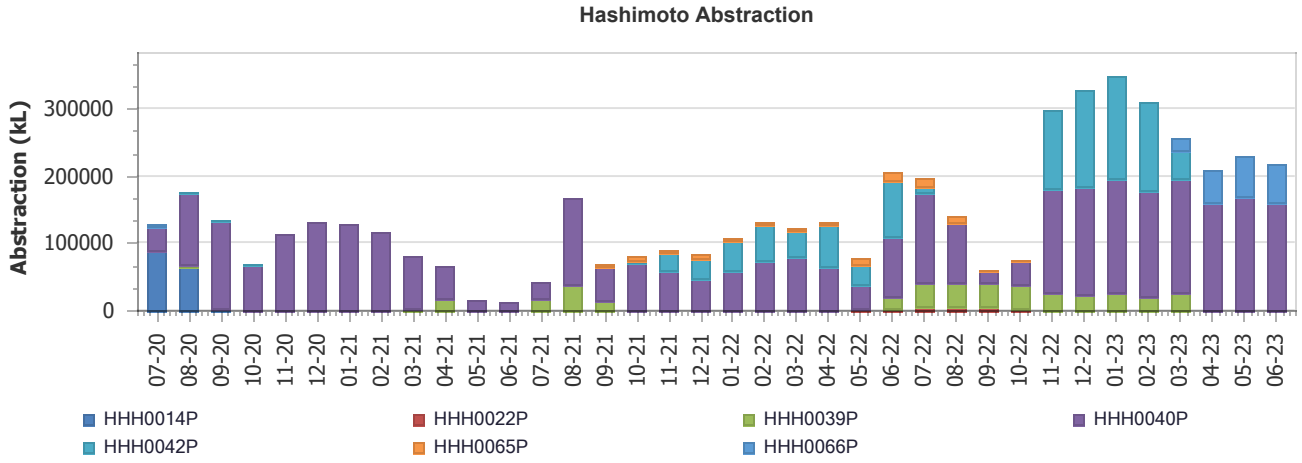


Monitoring summary: Caramulla MAR Hydrographs

Figure 7.10

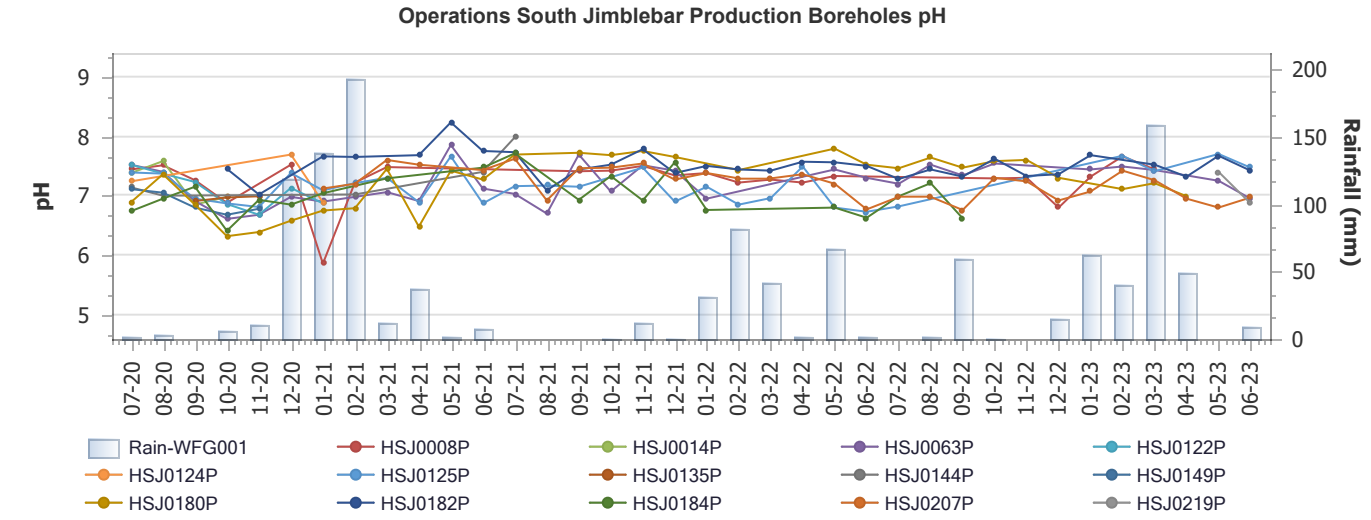


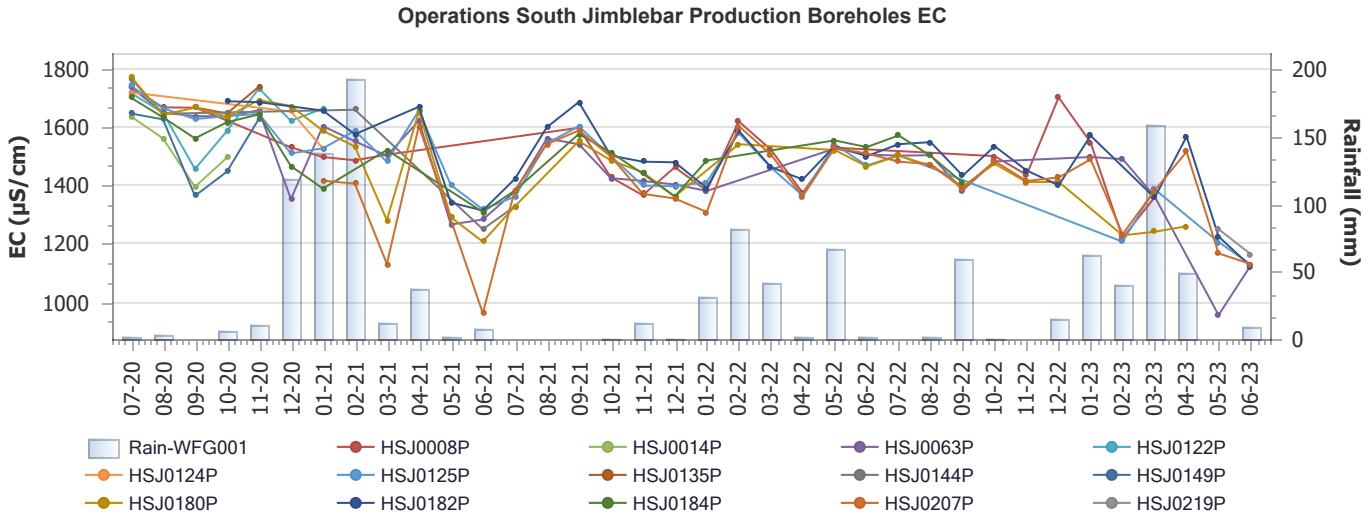


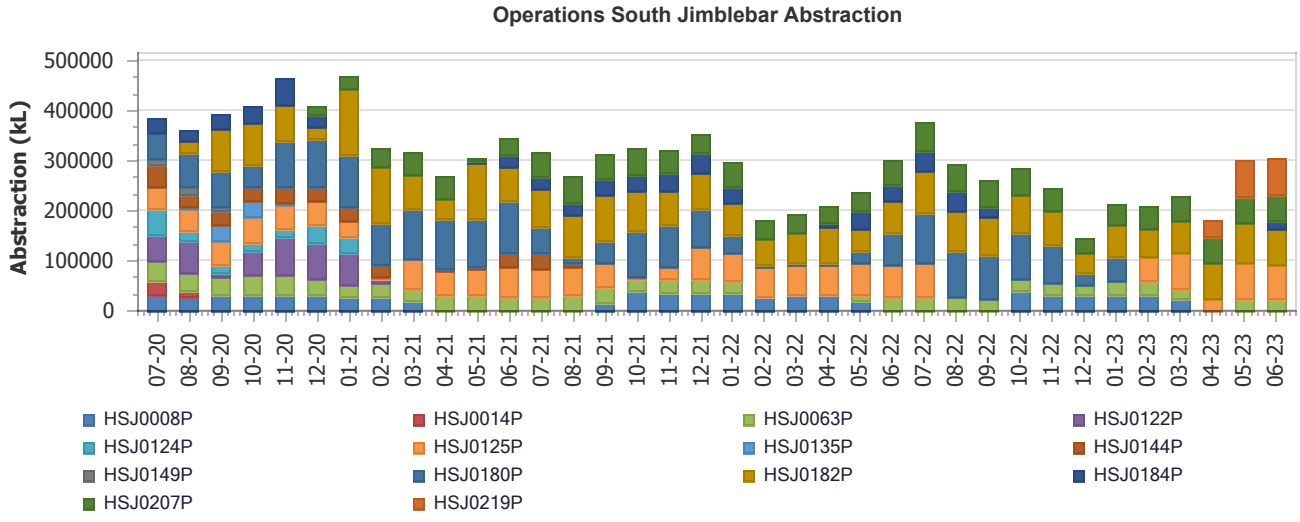


Monitoring summary: Hashimoto Production Boreholes

Figure 7.11

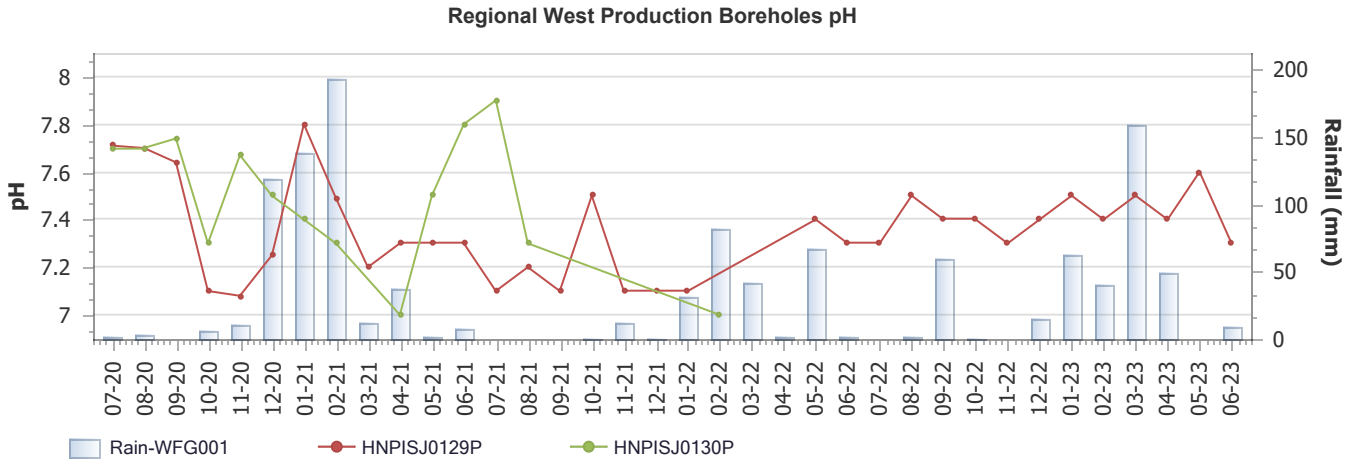


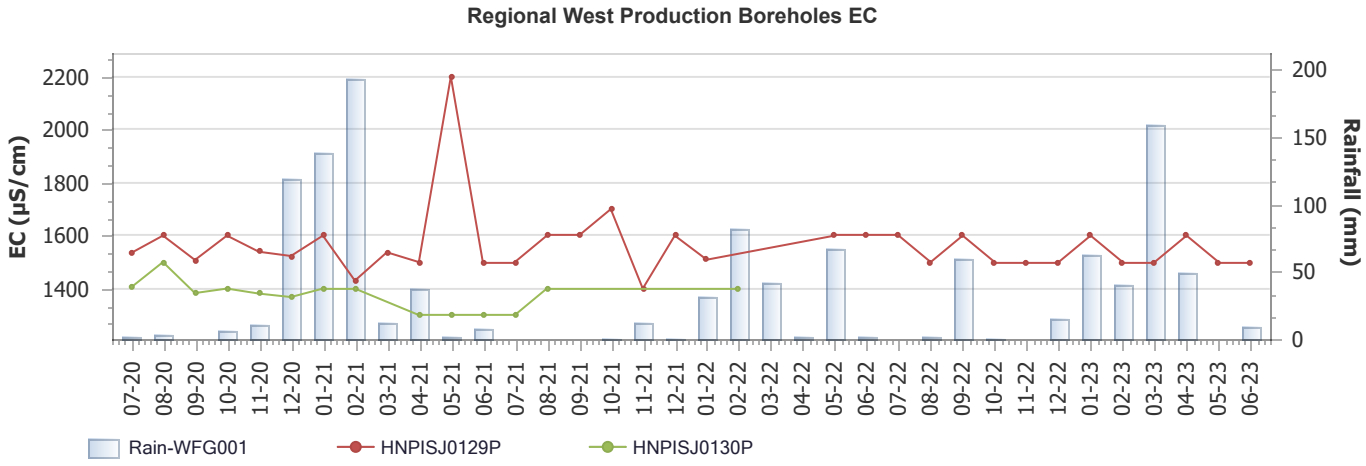


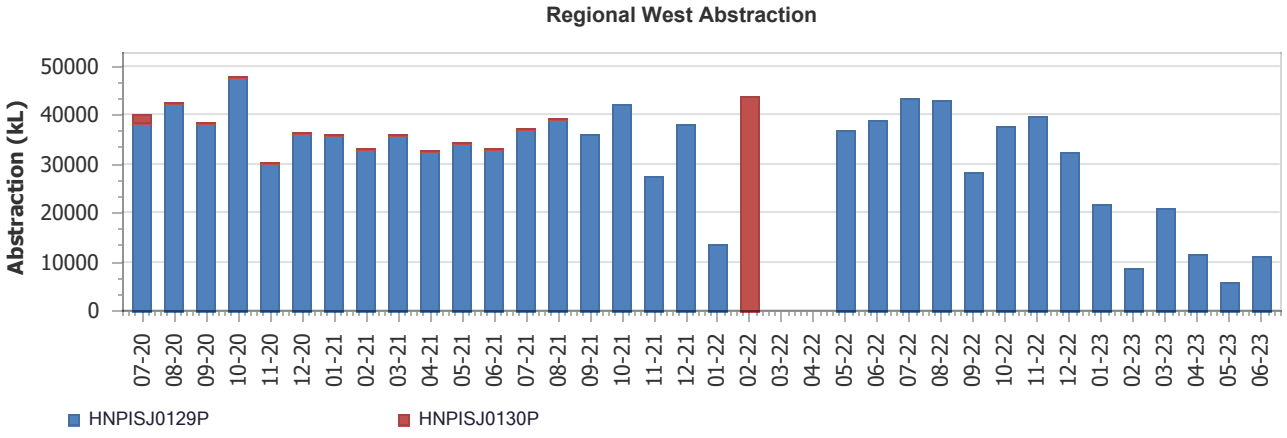


Monitoring summary: Operations South Jimblebar Production Boreholes

Figure 7.12

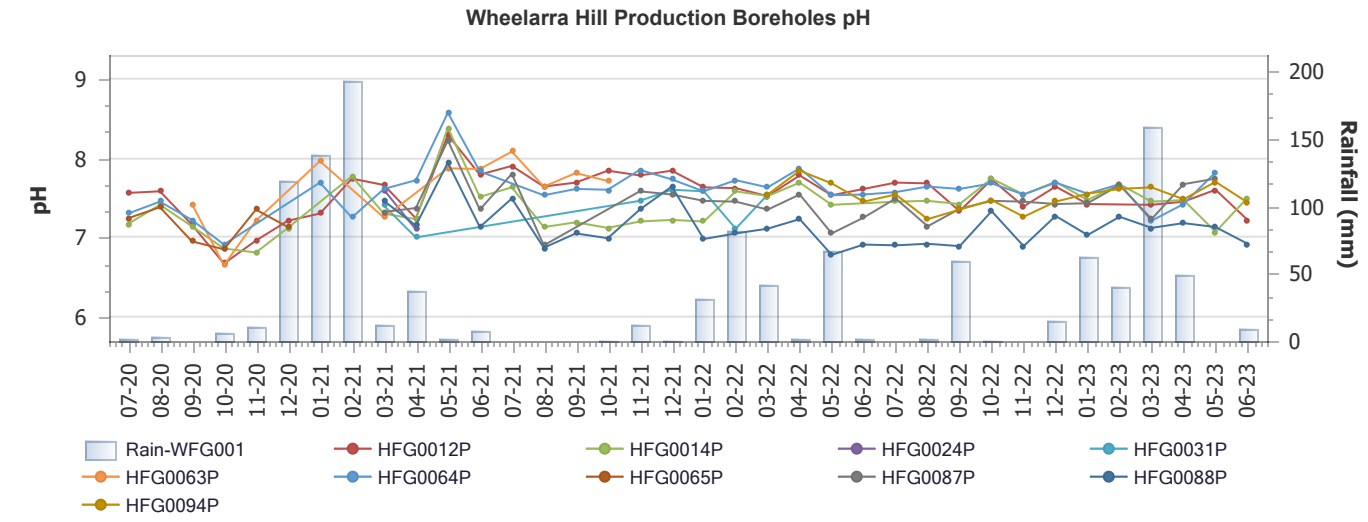


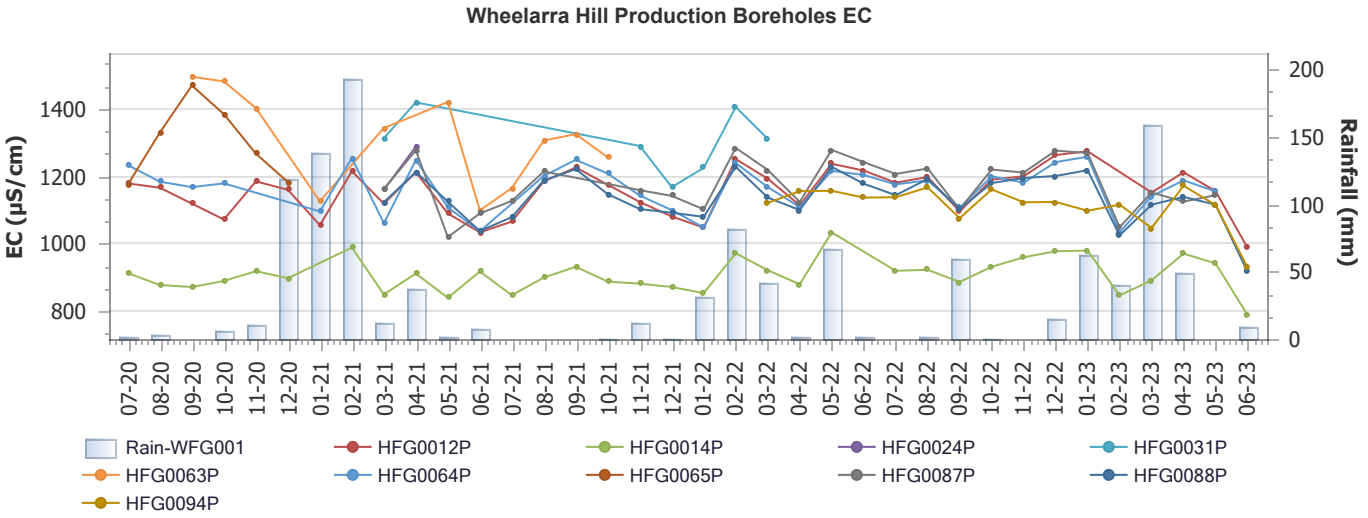


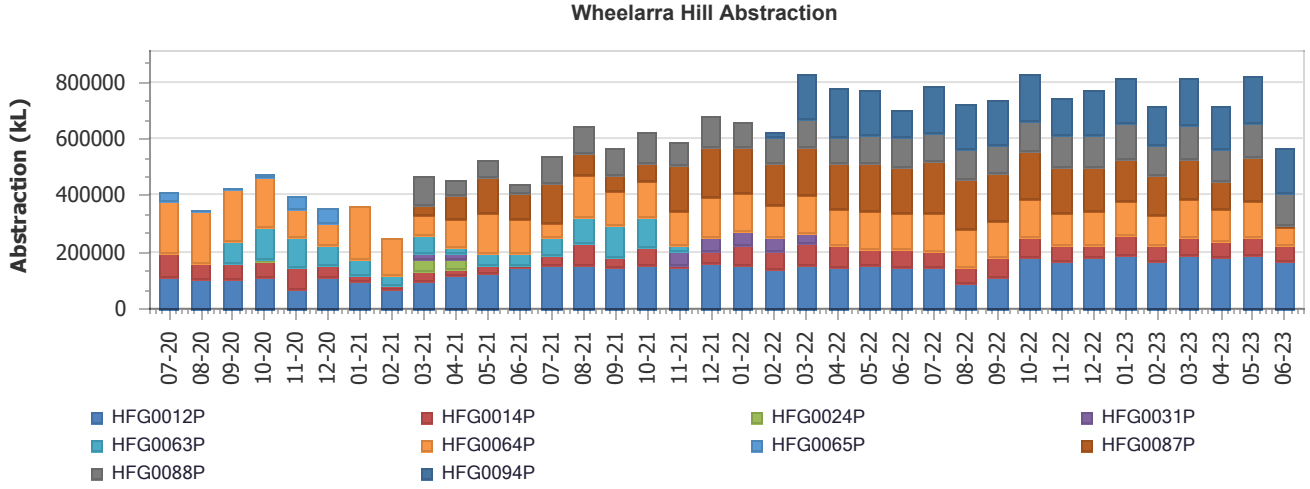


Monitoring summary: Regional West Production Boreholes

Figure 7.13

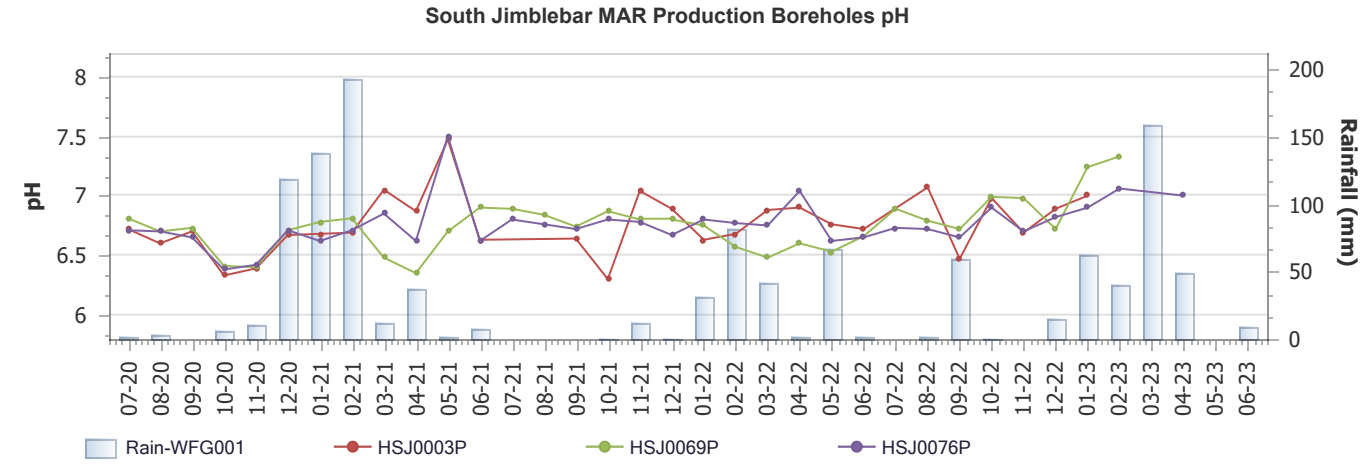


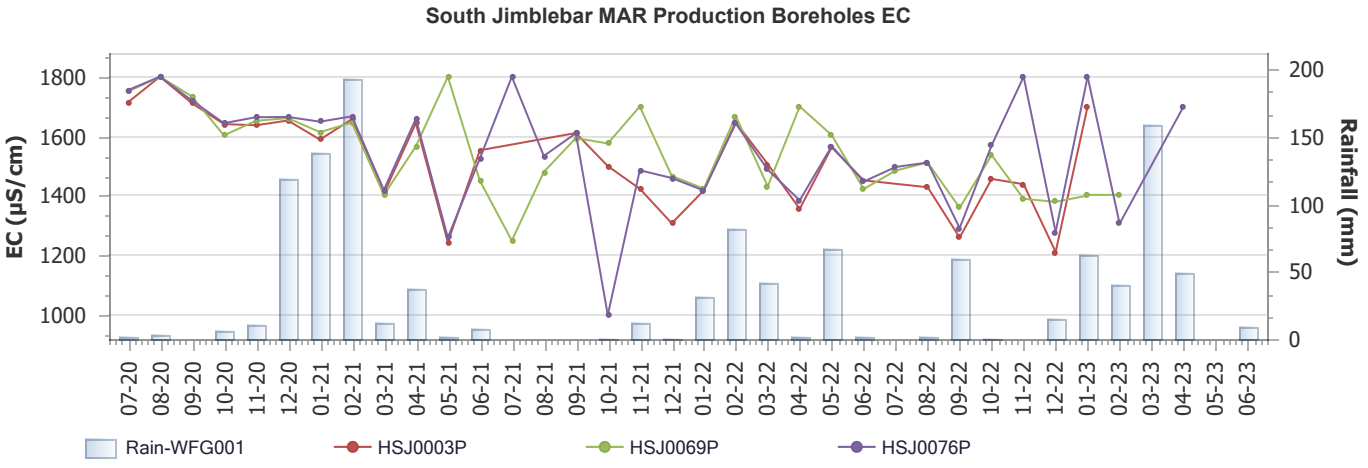


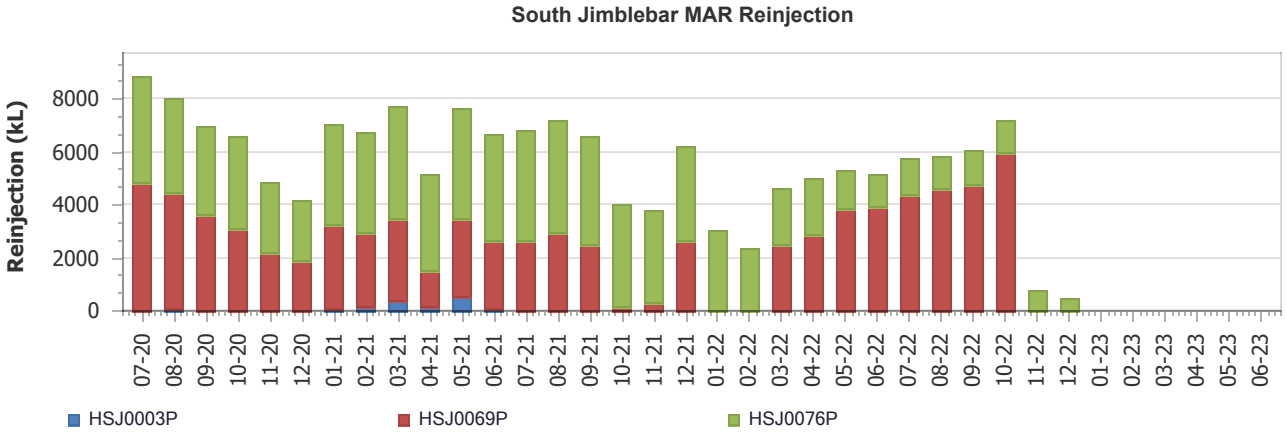


Monitoring summary: Wheelarra Hill Production Boreholes

Figure 7.14

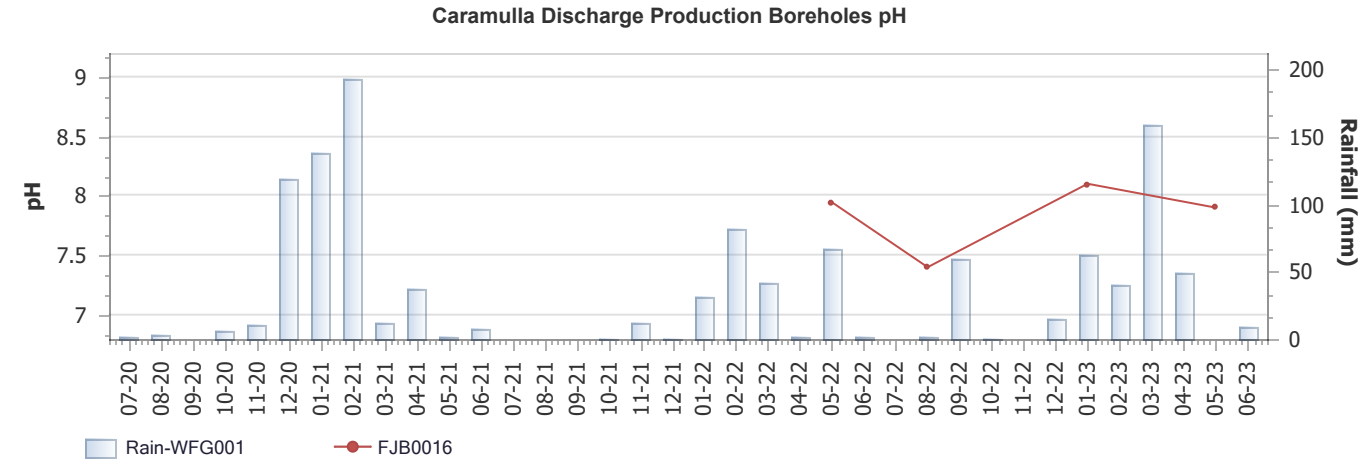


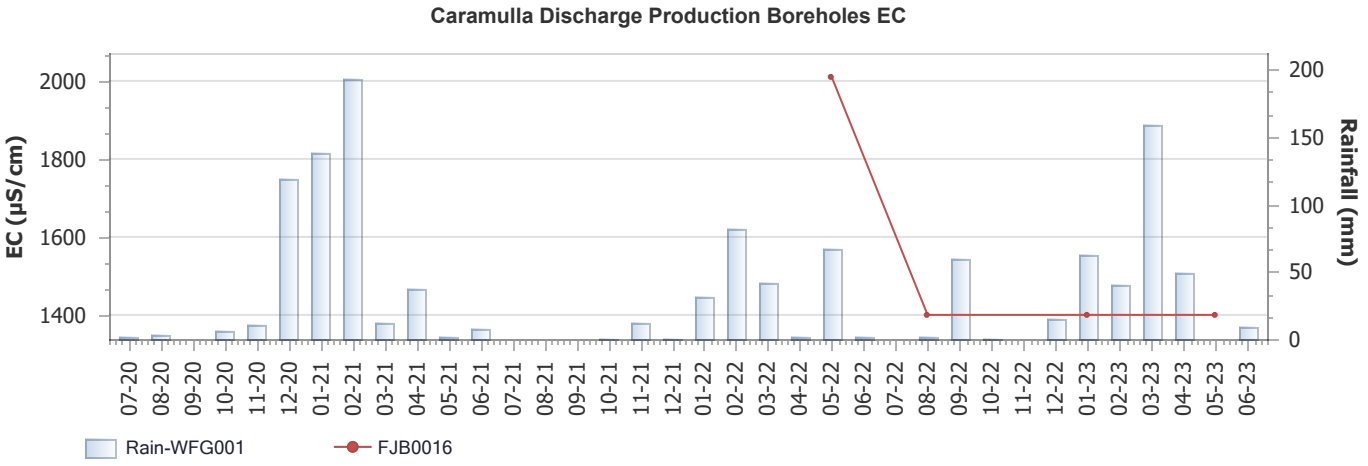


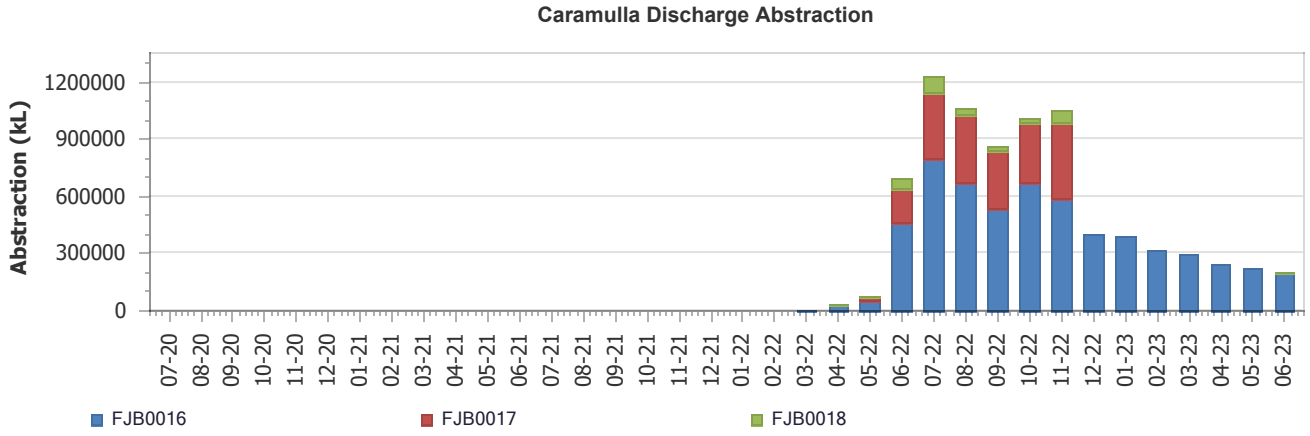


Monitoring summary: South Jimblebar MAR Production Boreholes

Figure 7.15

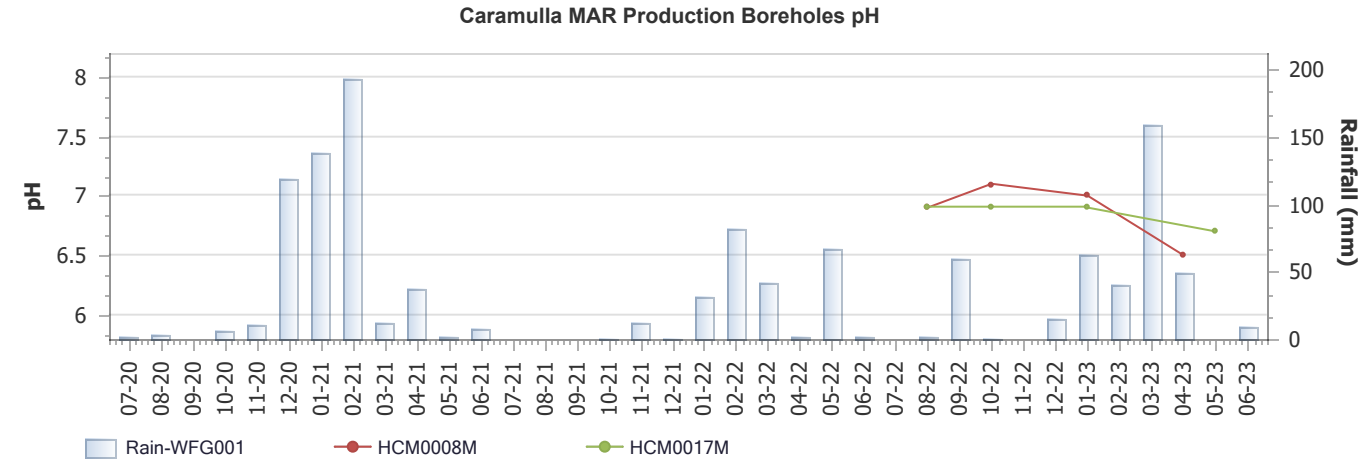


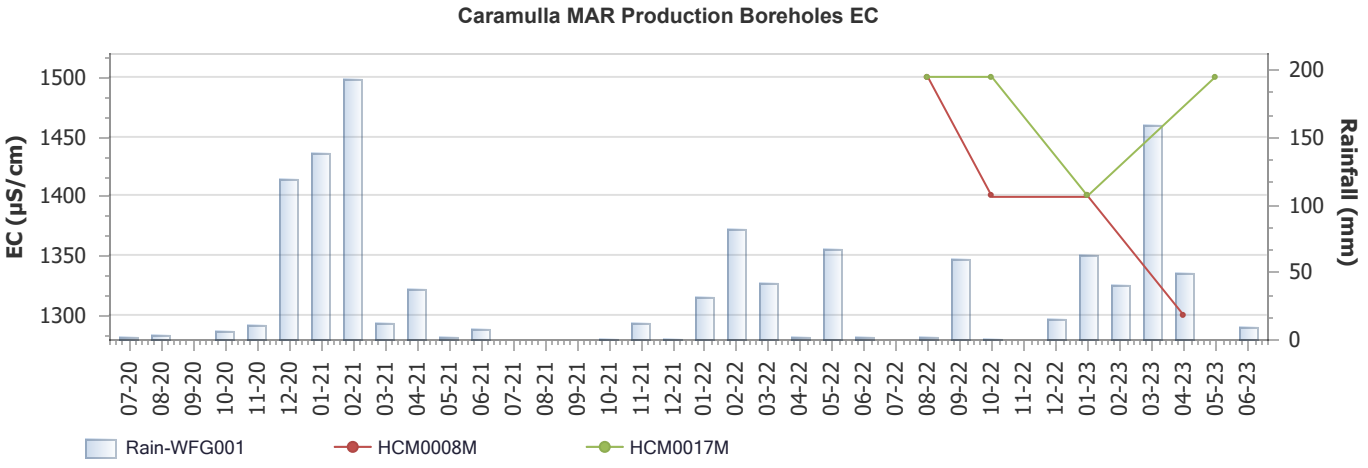


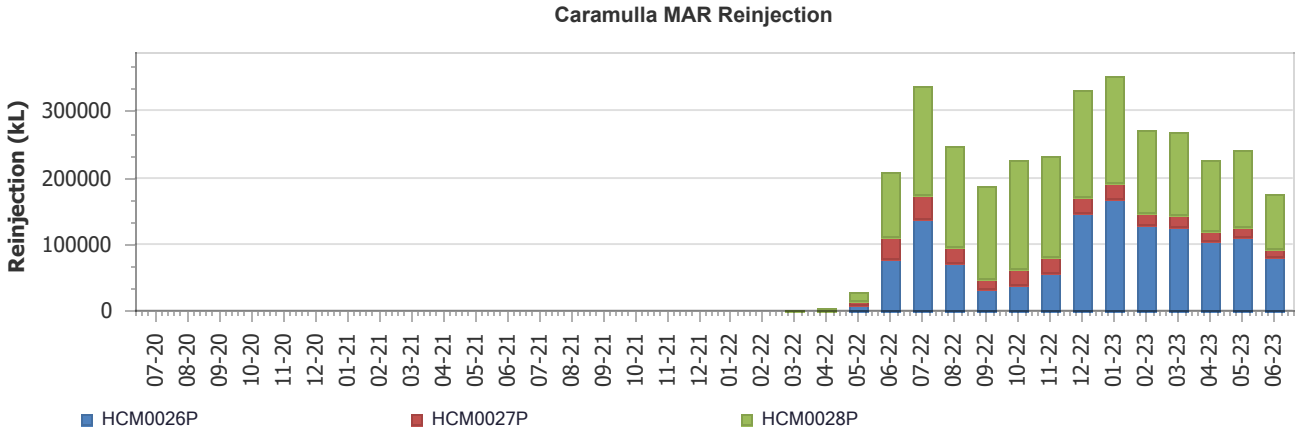


Monitoring summary: Caramulla Discharge Production Boreholes

Figure 7.16







Monitoring summary: Caramulla MAR Production Boreholes

Figure 7.17

Jimblebar

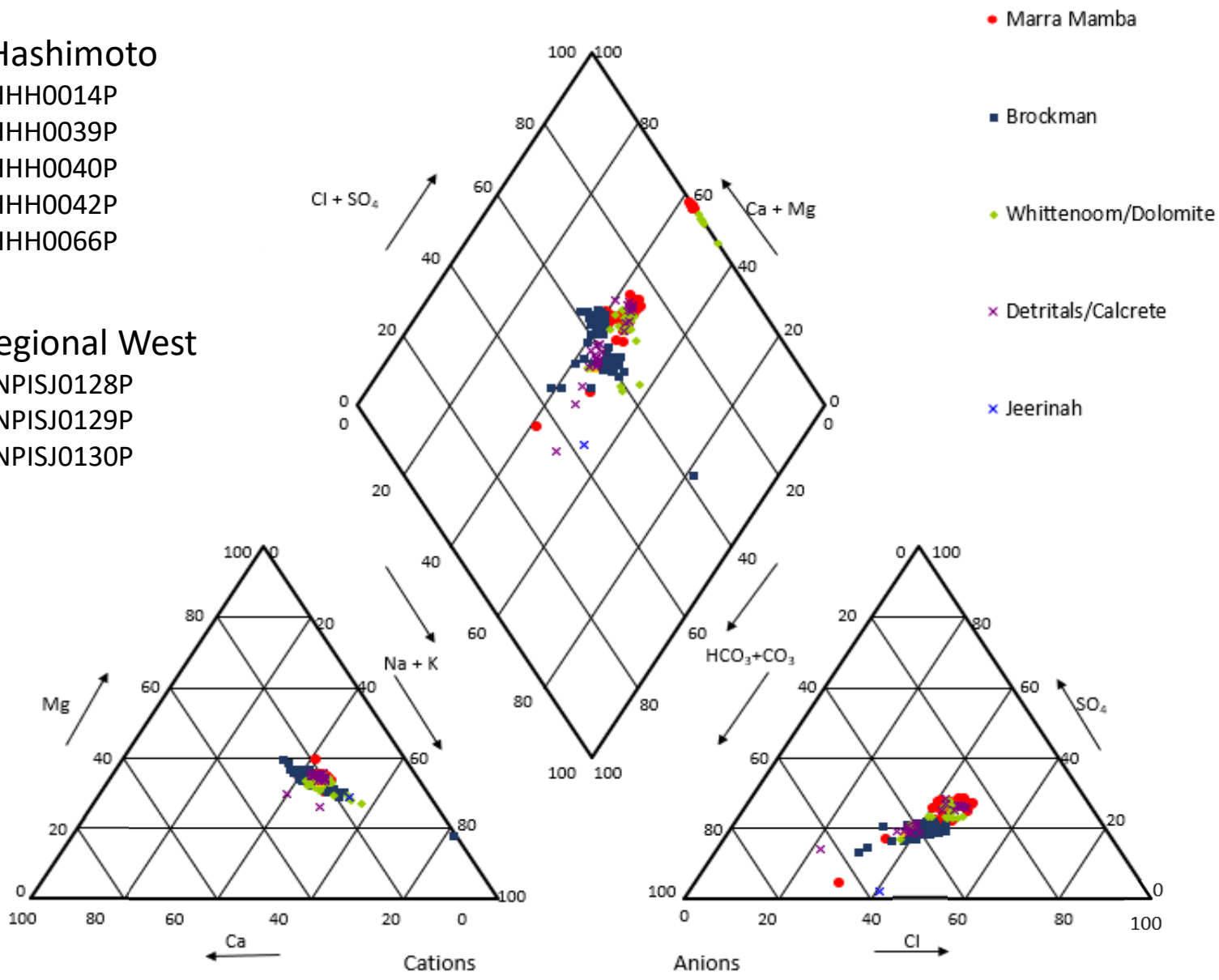
Caramulla MAR
HCM008M
HCM0017M
HCM0019M
HCM0043M
HCM0044M

Hashimoto
HHH0014P
HHH0039P
HHH0040P
HHH0042P
HHH0066P

Wheelarra Hill
HFG0012P HFG0063P
HFG0014P HFG0064P
HFG0024P HFG0088P
HFG0031P HFG0094P

Regional West
HNPISJ0128P
HNPISJ0129P
HNPISJ0130P

Operations South
HSJ0008P HSJ0125P
HSJ0014P HSJ0142P
HSJ0063P HSJ0143P
HSJ0122P HSJ0149P



Piper Diagram
Figure 7.18

BHP

Appendices

Appendix 7.1 Licences

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Instrument No. GWL158795(11)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	BHP Iron Ore Pty Ltd		
Description of Water Resource	Pilbara Hamersley - Fractured Rock	**Annual Water Entitlement**	26,300,000kL
Location of Water Source	M266SA		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Dewatering for mining purposes	GENERAL LEASE I126948 M266SA ML244SA
	Dust Suppression for mining purposes	GENERAL LEASE I126948 M266SA ML244SA
	Earthwork and construction purposes	GENERAL LEASE I126948 M266SA ML244SA
	Exploratory drilling operations	GENERAL LEASE I126948 M266SA ML244SA
	Geotechnical Investigation purposes	GENERAL LEASE I126948 M266SA ML244SA
	Mineral ore processing and other mining purposes	GENERAL LEASE I126948 M266SA ML244SA
	Mining camp purposes	GENERAL LEASE I126948 M266SA ML244SA
	Reinjection of groundwater	GENERAL LEASE I126948 M266SA

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000.

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

		ML244SA
	Well construction and Supply (pump) testing	GENERAL LEASE I126948 M266SA ML244SA
Duration of Licence	From 26 November 2021 to 25 June 2028	

This Licence is subject to the following terms, conditions and restrictions:

1. The annual water year for water taken under this licence is defined as 1 July to 30 June.

2. The licensee shall submit abstraction data within the annual report that is due 30 Sept each year.

3. Every 1 Years the licensee shall provide to the Department of Water and Environmental Regulation a Groundwater Monitoring Summary for the preceding water year. The first report is due 30/09/2023.

4. Every 3 Years the licensee shall provide to the Department of Water and Environmental Regulation a Groundwater Monitoring Review. The first report is due 30/09/2022. A Groundwater Monitoring Summary need not be submitted in a year in which a Groundwater Monitoring Review is due.

5. The licensee shall comply with the commitments of the operating strategy "BHP GWL Operating Strategy for Jimblebar Document Number: 0019543 Version: 4.0 dated 15/2/2018", as prepared by the licensee and approved by the Department of Water and Environmental Regulation on 19/06/2018 including any modifications to the commitments as approved during the term of the licence.

End of terms, conditions and restrictions

Appendix 7.2 Borehole details

Jimblebar Borefields production borehole details

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
Caramulla Discharge	FJB0016	216025.5	7411472.1	518.60					NA	
Caramulla Discharge Abstraction	FJB0016	216025.5	7411472.1	518.60					NA	
	FJB0017	225065.7	7412788.3	515.00					NA	
	FJB0018	225069.4	7412788.3	515.00					NA	
Caramulla MAR	HCM0026P	221214.8	7411530.7	521.25	14-Sep-19	188			Vuggy Breccia	Injection
	HCM0027P	223312.0	7411675.4	517.22	20-Aug-19	164			Wittenoom Formation	Injection
	HCM0028P	225207.2	7412627.1	514.65	22-Nov-19	170			Wittenoom Formation	Injection
Caramulla MAR WL	HCM0019M	225566.3	7413660.7	512.55	25-Mar-19	84			Brockman Iron Formation	Monitoring
	HCM0043M	220614.6	7411804.0	522.18	08-May-21	35			Clay in TD3	Monitoring
	HCM0044M	222285.7	7412022.7	518.18	24-Aug-21	35			Gravelly Siltstone	Monitoring
	HCM0045M	224225.7	7412103.0	515.53	22-Apr-21	35			Clay	Monitoring
	HCM0046M	226012.5	7412227.0	515.19	12-May-21	35			Sand	Monitoring
	HCM0047M	225279.4	7413102.8	512.27	11-May-21	84			Brockman Iron Formation	Monitoring
	HCM0059M	225316.5	7412856.8	513.65	10-May-21	35			Clay in TD3	Monitoring
Caramulla MAR WQ	HCM0008M	222216.5	7412042.7	518.18	25-Apr-19	116			Wittenoom Formation	Monitoring
	HCM0017M	224254.7	7412117.3	515.54	24-Jan-19	156			Wittenoom Formation	Monitoring
Hashimoto	HHH0014P	211959.2	7412202.1	522.27	19-Apr-13	207	60.90	460.92	Wittenoom Formation	Production
	HHH0022P	213771.9	7412313.0	512.06	03-Dec-15	167			Vuggy Breccia	Production
	HHH0039P	212509.4	7413056.7	492.50	14-Jun-19	122	55.45	459.79	Brockman Iron Formation	Production
	HHH0040P	211403.8	7412726.3	516.00	28-Aug-19	254			Brockman Iron Formation	Production
	HHH0042P	211632.2	7412446.5	504.30	07-Jun-19	230			Brockman Iron Formation	Production
	HHH0065P	215132.6	7412318.6	524.38	16-Mar-20	248			Mt. McRae Shale	Production
	HHH0066P	211726.0	7412983.3	504.00	07-Feb-20	152			Brockman Iron Formation	Production
Hashimoto WL	HH1676RM	213591.9	7413168.2	520.70	12-Nov-16	81			Brockman Iron Formation	Monitoring
	HH1872RM	214628.0	7412983.1	524.94	12-Nov-16	177			Brockman Iron Formation	Monitoring
	HH1977RM	215699.8	7412606.3	517.35	12-Nov-16	105			Brockman Iron Formation	Monitoring
	HHH0009M	212946.0	7413148.9	512.27	07-Feb-13	130			Brockman Iron Formation	Monitoring

Jimblebar Borefields production borehole details (cont'd)

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
	HHH0015M	211170.1	7412507.7	541.35	02-Apr-15	204	78.80	461.46	Brockman Iron Formation	Monitoring
	HHH0024M	212084.8	7412908.0	546.21	07-Sep-18	120	84.32	461.04	Brockman Iron Formation	Monitoring
	HHH0059M	215227.9	7412597.1	515.14	08-Nov-19	224			Brockman Iron Formation	Monitoring
	HHH0076M	214312.8	7412332.1	512.20	27-Nov-20	122	49.57	461.74	Wittenoom Formation	Monitoring
	HHH0078M	215808.9	7411540.8	517.72	07-Dec-20	152	56.63	460.19	Wittenoom Formation	Monitoring
Operations South Jimblebar	HSJ0008P	203104.6	7409809.7	512.00		206			Unknown stratigraphy	Production
	HSJ0014P	206126.2	7409922.3	526.89	22-Apr-10	232			Marra Mamba Iron Formation	Production
	HSJ0063P	204031.3	7409971.0	512.50	28-Jul-10	190			Wittenoom Formation	Production
	HSJ0122P	205541.1	7409926.9	452.70	06-Nov-17	212	78.33	452.25	Marra Mamba Iron Formation	Production
	HSJ0124P	204309.6	7409965.0	452.50		194	77.52	454.28	Marra Mamba Iron Formation	Production
	HSJ0125P	203565.8	7409881.2	512.00		202			Wittenoom Formation	Production
	HSJ0135P	204796.5	7409973.3	488.50	01-Nov-17	176			Wittenoom Formation	Production
	HSJ0144P	204453.3	7409926.0	440.50	13-Jan-14	166			Marra Mamba Iron Formation	Production
	HSJ0149P	205945.3	7409919.9	527.70	13-Jul-14	214			Tertiary Detritals 3	Production
	HSJ0180P	205244.2	7409929.6	453.15	29-Nov-17	104			Marra Mamba Iron Formation	Production
	HSJ0182P	204729.2	7410174.8	529.92	28-Mar-18	260	100.00	429.31	Tertiary Detritals 2	Production
	HSJ0184P	203944.5	7410002.8	524.50	23-Nov-17	233			Wittenoom Formation	Production
	HSJ0207P	202475.6	7409665.5	535.38	18-Oct-20	193	107.50	427.34	Marra Mamba Iron Formation	Production
	HSJ0219P	202974.3	7409909.0	512.00	16-Nov-21	278			Wittenoom Formation/West Angela	Production
Operations WL	HSJ0018M	207626.4	7408663.3	529.92	01-Jan-70	77			Unknown Stratigraphy	Monitoring
	HSJ0055M	205247.1	7410327.8	530.12	01-May-10	196			Wittenoom Formation	Monitoring
	HSJ0072M	205826.3	7410025.2	528.09	08-Aug-10	200			Wittenoom Formation	Monitoring
	HSJ0104M	202086.5	7409639.0	536.47	06-Mar-12	234	76.74	458.92	Wittenoom Formation	Monitoring
	HSJ0133M	212653.2	7413409.8	509.49	05-Aug-12	102	48.00	460.82	Brockman Iron Formation	Monitoring
	HSJ0148M	206151.3	7409704.8	529.04	27-Feb-14	142			Marra Mamba Iron Formation	Monitoring
	HSJ0150M	206538.8	7409625.6	531.45	01-Mar-14	150			Marra Mamba Iron Formation	Monitoring
	HSJ0154M	203814.1	7410291.3	533.80	19-Apr-14	214	79.44	453.23	Wittenoom Formation	Monitoring
	HSJ0159M	203891.8	7409471.6	536.51		148			Jeerinah Formation	Monitoring

Jimblebar Borefields production borehole details (cont'd)

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
Rainfall	WFG001	207046.0	7410672.0	0.00					NA	Weather station
Regional East WL	FG4610RM	208393.9	7412668.0	598.74	15-Jul-14	189	126.13	474.84	Brockman Iron Formation	Monitoring
	HH2080RM	216878.4	7413606.4	546.46	12-Nov-16	129			Stratigraphy to be confirmed	Monitoring
	HHH0028M	213972.4	7410728.3	516.82	25-Aug-18	170	53.08	463.07	Stratigraphy to be confirmed	Monitoring
	HHH0078M	215808.9	7411540.8	517.72	07-Dec-20	152	56.63	460.19	Stratigraphy to be confirmed	Monitoring
	HSJ0018M	207626.4	7408663.3	529.92	01-Jan-70	77			Unknown Stratigraphy	Monitoring
	HSJ0074M	208525.2	7409843.3	521.73	16-Aug-10	198			Unknown Stratigraphy	Monitoring
	HSJ0077M	208847.9	7409861.5	521.93	24-Aug-10	152			Unknown Stratigraphy	Monitoring
	HSJ0084M	208524.2	7409650.6	525.37	15-Sep-10	105			Unknown Stratigraphy	Monitoring
	HSJ0133M	212653.2	7413409.8	509.49	05-Aug-12	102	48.00	460.82	Brockman Iron Formation	Monitoring
	SJ0560RM	208525.7	7409796.9	522.32	17-Sep-10	201			Marra Mamba Iron Formation	Monitoring
	SJ0571RM	208225.2	7409742.1	523.27	22-Jul-10	189			Marra Mamba Iron Formation	Monitoring
Regional West	HNPISJ0128P	202475.8	7409660.3	535.21		195	77.70	457.06	Marra Mamba Iron Formation	Production
	HNPISJ0129P	201030.9	7409891.1			214			Unknown Stratigraphy	Production
	HNPISJ0130P	201470.1	7409777.5			184	79.50	458.00	Wittenoom Formation	Production
Regional West WL	HFG0035M	201289.3	7412818.8	574.42	07-Nov-14	204			Brockman Iron Formation	Monitoring
	HFG0042M	201516.9	7411796.5	580.48	22-Feb-15	216			Wittenoom Formation	Monitoring
	HSJ0104M	202086.5	7409639.0	536.47	06-Mar-12	234	76.74	458.92	Wittenoom Formation	Monitoring
	HSJ0173M	198494.0	7410082.7	548.83	11-Apr-17	135	93.86	453.99	Marra Mamba Iron Formation	Monitoring
Reinjection	HSJ0003P	208836.7	7410088.2	521.36	24-May-04	172			Tertiary Alluvium	Injection
	HSJ0009P	212576.0	7410619.9	516.23		136			Unknown Stratigraphy	Injection
	HSJ0069P	212572.5	7410160.1	517.94	17-Aug-10	210			West Angela	Injection
	HSJ0076P	208524.0	7409760.0	521.77	08-Sep-10	215			West Angela	Injection
Reinjection WL	HSJ0003P	208836.7	7410088.2	521.36	24-May-04	172			Unknown Stratigraphy	Production
	HSJ0009P	212576.0	7410619.9	516.23		136			Unknown Stratigraphy	Production
	HSJ0020M	207913.8	7410106.6	524.65	01-Jan-70	83			Unknown Stratigraphy	Monitoring
	HSJ0064M	208101.9	7410053.6	523.17	19-Jul-10	168			Unknown Stratigraphy	Monitoring
	HSJ0069P	212572.5	7410160.1	517.94	17-Aug-10	210			Unknown Stratigraphy	Production

Jimblebar Borefields production borehole details (cont'd)

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
	HSJ0073M	208521.0	7409913.3	522.26	14-Aug-10	230			Stratigraphy to be confirmed	Monitoring
	HSJ0074M	208525.2	7409843.3	521.73	16-Aug-10	198			Unknown Stratigraphy	Monitoring
	HSJ0076P	208524.0	7409760.0	521.77	08-Sep-10	215			Unknown Stratigraphy	Production
	HSJ0080M	208851.7	7410039.0	521.38	03-Sep-10	174			Unknown Stratigraphy	Monitoring
	HSJ0081M	208850.5	7410028.1	521.45	05-Sep-10	126			Stratigraphy to be confirmed	Monitoring
	HSJ0083M	212585.4	7410322.0	517.16	09-Sep-10	188			Unknown Stratigraphy	Monitoring
	HSJ0115M	211985.8	7410221.9	518.55		192	57.17	460.41	Marra Mamba Iron Formation	Monitoring
	HSJ0117M	213510.0	7410120.6	519.51		154	57.69	460.88	Marra Mamba Iron Formation	Monitoring
	SJ0435RM	208075.5	7409689.3	523.69	21-Jul-10	108			Marra Mamba Iron Formation	Monitoring
	SJ0571RM	208225.2	7409742.1	523.27	22-Jul-10	189			Marra Mamba Iron Formation	Monitoring
South Jimblebar	HNPISJ0128P	202475.8	7409660.3	535.21		195	77.70	457.06	Marra Mamba Iron Formation	Production
	HNPISJ0129P	201030.9	7409891.1			214			Unknown Stratigraphy	Production
	HNPISJ0130P	201470.1	7409777.5			184	79.50	458.00	Wittenoom Formation	Production
	HSJ0008P	203104.6	7409809.7	512.00		206			Unknown Stratigraphy	Production
	HSJ0014P	206126.2	7409922.3	526.89	22-Apr-10	232			Marra Mamba Iron Formation	Production
	HSJ0063P	204031.3	7409971.0	512.50	28-Jul-10	190			Marra Mamba Iron Formation	Production
	HSJ0122P	205541.1	7409926.9	452.70	06-Nov-17	212	78.33	452.25	Marra Mamba Iron Formation	Production
	HSJ0123P	205239.1	7410030.1	488.19	10-Oct-12	190	77.41	451.78	Marra Mamba Iron Formation	Production
	HSJ0124P	204309.6	7409965.0	452.50		194	77.52	454.28	Marra Mamba Iron Formation	Production
	HSJ0125P	203565.8	7409881.2	512.00		202			Marra Mamba Iron Formation	Production
	HSJ0135P	204796.5	7409973.3	488.50	01-Nov-17	176			Marra Mamba Iron Formation	Production
	HSJ0142P	205319.6	7409955.6	452.75	29-Nov-13	136			Marra Mamba Iron Formation	Production
	HSJ0143P	205040.7	7410061.4	531.11	08-Feb-14	172			Marra Mamba Iron Formation	Production
	HSJ0144P	204453.3	7409926.0	440.50	13-Jan-14	166			Marra Mamba Iron Formation	Production
	HSJ0149P	205945.3	7409919.9	527.70	13-Jul-14	214			Marra Mamba Iron Formation	Production
	HSJ0207P	202475.6	7409665.5	535.38	18-Oct-20	193	107.50	427.34	Unknown Stratigraphy	Production
South Jimblebar WL	HSJ0003P	208836.7	7410088.2	521.36	24-May-04	172			Quaternary, TD3-TD2-TD1	Production
	HSJ0009P	212576.0	7410619.9	516.23		136			Unknown Stratigraphy	Monitoring

Jimblebar Borefields production borehole details (cont'd)

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
	HSJ0018M	207626.4	7408663.3	529.92	01-Jan-70	77			Unknown Stratigraphy	Monitoring
	HSJ0020M	207913.8	7410106.6	524.65	01-Jan-70	83			Unknown Stratigraphy	Monitoring
	HSJ0023M1	201029.0	7410363.0	542.50		194			Unknown Stratigraphy	Monitoring
	HSJ0024M	201028.3	7410029.9	540.19		248			Unknown Stratigraphy	Monitoring
	HSJ0055M	205247.1	7410327.8	530.12	01-May-10	196			Wittenoom Formation	Monitoring
	HSJ0069P	212572.5	7410160.1	517.94	17-Aug-10	210			Unknown Stratigraphy	Production
	HSJ0072M	205826.3	7410025.2	528.09	08-Aug-10	200			Wittenoom Formation	Monitoring
	HSJ0074M	208525.2	7409843.3	521.73	16-Aug-10	198			Unknown Stratigraphy	Monitoring
	HSJ0076P	208524.0	7409760.0	521.77	08-Sep-10	215			Unknown Stratigraphy	Production
	HSJ0077M	208847.9	7409861.5	521.93	24-Aug-10	152			Unknown Stratigraphy	Monitoring
	HSJ0078M	212588.0	7409953.5	526.11	27-Aug-10	92			Unknown Stratigraphy	Monitoring
	HSJ0080M	208851.7	7410039.0	521.38	03-Sep-10	174			Unknown Stratigraphy	Monitoring
	HSJ0083M	212585.4	7410322.0	517.16	09-Sep-10	188			Unknown Stratigraphy	Monitoring
	HSJ0084M	208524.2	7409650.6	525.37	15-Sep-10	105			Unknown Stratigraphy	Monitoring
	HSJ0088M	211963.1	7410074.3	519.05	26-Oct-10	136			Unknown Stratigraphy	Monitoring
	HSJ0093M	211225.1	7409888.7	525.73	16-Dec-10	80			Unknown Stratigraphy	Monitoring
	HSJ0104M	202086.5	7409639.0	536.47	06-Mar-12	234	76.74	458.92	Marra Mamba Iron Formation	Monitoring
	HSJ0115M	211985.8	7410221.9	518.55		192	57.17	460.41	Marra Mamba Iron Formation	Monitoring
	HSJ0117M	213510.0	7410120.6	519.51		154	57.69	460.88	Marra Mamba Iron Formation	Monitoring
	HSJ0145M	205062.9	7410056.5	531.22		150			Marra Mamba Iron Formation	Monitoring
	HSJ0148M	206151.3	7409704.8	529.04	27-Feb-14	142			Marra Mamba Iron Formation	Monitoring
	HSJ0150M	206538.8	7409625.6	531.45	01-Mar-14	150			Marra Mamba Iron Formation	Monitoring
	HSJ0153M	204506.5	7410324.7	532.45	09-Apr-14	250	79.89	451.62	Wittenoom Formation	Monitoring
	HSJ0154M	203814.1	7410291.3	533.80	19-Apr-14	214	79.44	453.23	Wittenoom Formation	Monitoring
	HSJ0159M	203891.8	7409471.6	536.51		148			Jeerinah Formation	Monitoring
	SJ0435RM	208075.5	7409689.3	523.69	21-Jul-10	108			Marra Mamba Iron Formation	Monitoring
	SJ0560RM	208525.7	7409796.9	522.32	17-Sep-10	201			Marra Mamba Iron Formation	Monitoring
	SJ0571RM	208225.2	7409742.1	523.27	22-Jul-10	189			Marra Mamba Iron Formation	Monitoring

Jimblebar Borefields production borehole details (cont'd)

Area	Sample Point ID	Easting (MGA94)	Northing (MGA94)	TOC (m RL)	Construction Date	Depth (m bgl)	SWL (m bTOC)	SWL (m RL)	Screen Interval/Target Geology	Purpose
Wheelarra	HFG0012P	210578.2	7412037.2	525.74	23-Mar-13	250			Brockman Iron Formation	Production
	HFG0014P	210726.0	7412337.1	525.69	30-Apr-13	207	64.48	460.56	Brockman Iron Formation	Production
	HFG0024P	204046.8	7411807.2	504.00	02-Jun-13	203			Brockman Iron Formation	Production
	HFG0031P	204173.4	7411744.1	528.50	20-Jun-13	208	92.67	461.15	Brockman Iron Formation	Production
	HFG0057P	209400.4	7411454.8	540.50	20-Oct-16	200			Brockman Iron Formation	Production
	HFG0058P	210445.8	7411802.0	517.61	04-Feb-17	110			Brockman Iron Formation	Production
	HFG0059P	209977.0	7412052.4	456.00	05-Mar-17	176			Brockman Iron Formation	Production
Wheelarra Hill	HFG0012P	210578.2	7412037.2	525.74	23-Mar-13	250			Brockman Iron Formation	Production
	HFG0014P	210726.0	7412337.1	525.69	30-Apr-13	207	64.48	460.56	Brockman Iron Formation	Production
	HFG0024P	204046.8	7411807.2	504.00	02-Jun-13	203			Brockman Iron Formation	Production
	HFG0031P	204173.4	7411744.1	528.50	20-Jun-13	208	92.67	461.15	Brockman Iron Formation	Production
	HFG0063P	210236.9	7411931.7	456.00	12-Apr-19	140			Brockman Iron Formation	Production
	HFG0064P	210328.2	7412214.4	534.33	11-Jun-18	222	72.00	461.83	Brockman Iron Formation	Production
	HFG0065P	210444.3	7411982.8	504.44	13-Sep-18	242	42.55	461.42	Tertiary Detritals 2	Production
	HFG0087P	210207.3	7412369.9	540.53	07-Apr-20	200			Brockman Iron Formation	Production
	HFG0088P	210003.4	7412423.2	540.39	17-May-20	210			Brockman Iron Formation	Production
	HFG0094P	204109.7	7412153.0	552.22	22-Sep-20	210	101.57	450.03	Brockman Iron Formation	Production
Wheelarra Hill WL	FG9747RM	204341.2	7411833.7	558.65	27-May-20	174			Brockman Iron Formation/Whaleback Shale	Monitoring
	HFG0006M	210507.2	7412765.7	529.92	15-Nov-12	152			Brockman Iron Formation	Monitoring
	HFG0068M	209145.2	7411205.6	564.56	07-Nov-18	212	100.35	463.47	Wittenoom Formation	Monitoring
	HFG0080M	209911.5	7411803.5	480.50	22-Feb-19	63	20.75	459.24	Brockman Iron Formation	Monitoring
	HFG0092M	204209.4	7411590.8	551.55	24-Jun-20	224			Brockman Iron Formation	Monitoring
	HHH0015M	211170.1	7412507.7	541.35	02-Apr-15	204	78.80	461.46	Brockman Iron Formation	Monitoring

Appendix 7.3 Borehole logs

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0117	Hole Length:	194.00

Easting: 204036.94
Northing: 7411762.68
Surface RL: 504.10
Grid Name: MGA94_51
Incl / Azm: -90-->0
Construct: 02 May 23 - 06 May 23
License: CAW207661
Comments: FWS at 80m. Final yield of 40 L/s. Carbonaceous shale & pyrite intersected at 162 -194m.

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 28.0	DR3	DR	600		EASTERNWELL	NS3
28.0 - 176.0	DR3	DR	500		EASTERNWELL	NS3
176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

TOC RL: 504.40 (Stickup 0.30m) (drilled) SWL: 67.10 MBTOC (08 May 23) Dev: Y: 16.8 hour(s) Final pH: 9.2
TOC RL: 504.40 (Stickup 0.30m) (current) Is Live: Y (-) Date: 06 May 2023 Final EC: 1320.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
0	BG	J2	G	S			2-20mm subangular-subrounded chips. Chip size decreasing and angularity increasing with depth. 12-16m ultra fines.					BLANK STEEL: Size 24" - W.T.9.53mm (0.00-28.00)
10	MG											GRAVEL COARSE (0.00-83.50)
20		J1	G	S			2-6mm subangular-subrounded chips. 20-26m ultrafines caused DR casing to become stuck. Minor limonite throughout. 26-32m some rounded chips.					BLANK STEEL: Size 14" - W.T.9.53mm (0.00-108.50)
30		W	SG	L			2-8mm subangular-subrounded chips. Red and yellow shales throughout. Limonite throughout. 32-34m bedding evident. 34-36m white shale.					
40												
50		D4	G	SL			2-12mm subangular-subrounded chips. 60-70m limonitic. 58-66m broken ground with pitted & porous chips. Angularity decreasing with depth. FWS at 80m with yield of 2 L/s.					
60												
70	BG											
80	UG							800	7.0	2		GRAVEL MED (83.50-194.00)
90		D3	G	S			Mostly 2-5mm subangular chips, with larger subrounded chips up to 20mm 80-90m, 96-98m and 108-114m, inferred inflow zones. Pitted & porous chips throughout. 84-88m, 90-92m and 96-98m cream shale. Yield increasing to 5 L/ at 86m, 10 L/s at 92m and 15 L/ s at 96m through intermittent broken sections.	1400	7.5	5		
100	BG							1330	8.4	10		
								1280	8.3	15		
						0 100 200		0-5000	0-14	0-50		

BHPIO - Hydrogeology Log

BHP

Project:	WHEELARRA	Hole Name:	HFG0117	Hole Length:	194.00	
Easting:	204036.94					
Northing:	7411762.68					
Surface RL:	504.10					
Grid Name:	MGA94_51					
Incl / Azm:	-90-->0					
Construct:	02 May 23 - 06 May 23			License:	CAW207661	

Depth	Drill Rig	Type	Size	Fluid	Drilled By	Logged By
0.0 - 28.0	DR3	DR	600		EASTERNWELL	NS3
28.0 - 176.0	DR3	DR	500		EASTERNWELL	NS3
176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

Comments: FWS at 80m. Final yield of 40 L/s. Carbonaceous shale & pyrite intersected at 162 -194m.

TOC RL:	504.40	(Stickup 0.30m)	(drilled)	SWL:	67.10 MBTOC	(08 May 23)	Dev:	Y: 16.8 hour(s)	Final pH:	9.2
TOC RL:	504.40	(Stickup 0.30m)	(current)	Is Live:	Y	(-)	Date:	06 May 2023	Final EC:	1320.00

Depth mgbl	Cond	Strat	Major	Minor	Log	Gamma CPS API	Hydrogeological Description	EC us/cm	pH	Yield L/s	Diagram Scaled to 600mm	Notes
100	BG	D3	G	S			Mostly 2-5mm subangular chips, with larger subrounded chips up to 20mm 80-90m, 96-98m and 108-114m, inferred inflow zones. Pitted & porous chips throughout. 84-88m, 90-92m and 96-98m cream shale. Yield increasing to 5 L/ at 86m, 10 L/s at 92m and 15 L/ s at 96m through intermittent broken sections.	1200	8.2	15		BLANK STEEL: Size 14" - W.T.9.53mm (0.00-108.50) GRAVEL MED (83.50-194.00)
110								1400	8.1	15		SLOTTED STEEL: Size 14" - W.T.9.53mm, Slots 1mm (108.50-166.50)
120		D2	W	SC			2-10mm subangular-subrounded chips. 116-120m broken ground with subrounded chips up to 25mm. 122-138m limonite and minor yellow shale. Pitted and porous chips throughout. Yield increasing to 20 L/s at 122m.	1480	8.1	15		
130								1610	8.0	20		
140			W	S			3-30mm subangular-subrounded chips. Likely fault splay associated with the Bulldog Fault. 146-152m red and yellow shale. Breaking on bedding plane evident. Well rounded and some very pitted and porous chips throughout. Inferred inflow zone with yield increasing to 30 L/s at 140m and to 40 L/s at 146m and remaining consistent until EOH.	1170	9.3	20		
150								1250	9.4	20		
160		D1	JS	C			2-10mm subangular-subrounded chips. Red and yellow shale throughout. Angularity decreasing with depth. 160-162m minor carbonaceous shale at contact with McRae Shales.	1220	9.2	30		
170		RU	B	SJ			2-8mm subangular carbonaceous shale chips. Minor red and yellow shale throughout.	1280	7.6	40		BLANK STEEL: Size 14" - W.T.9.53mm (166.50-172.50)
180		RN	B	PJQ			2-10mm subangular carbonaceous shale chips, with minor disseminated pyrite throughout.	1300	8.0	40		END CAP (172.50)
190		RC	BC	PQ			2-10mm subangular carbonaceous shale and black chert chips, with minor disseminated pyrite and qtz throughout.	1260	9.2	40		
200								1290	10.1	40		
								1230	8.9	40		
								1300	9.8	40		
								1320	9.1	40		
								1400	9.0	40		
					0	100 200		0-5000		0-14	0-50	

BHPIO - Hydrogeology Log

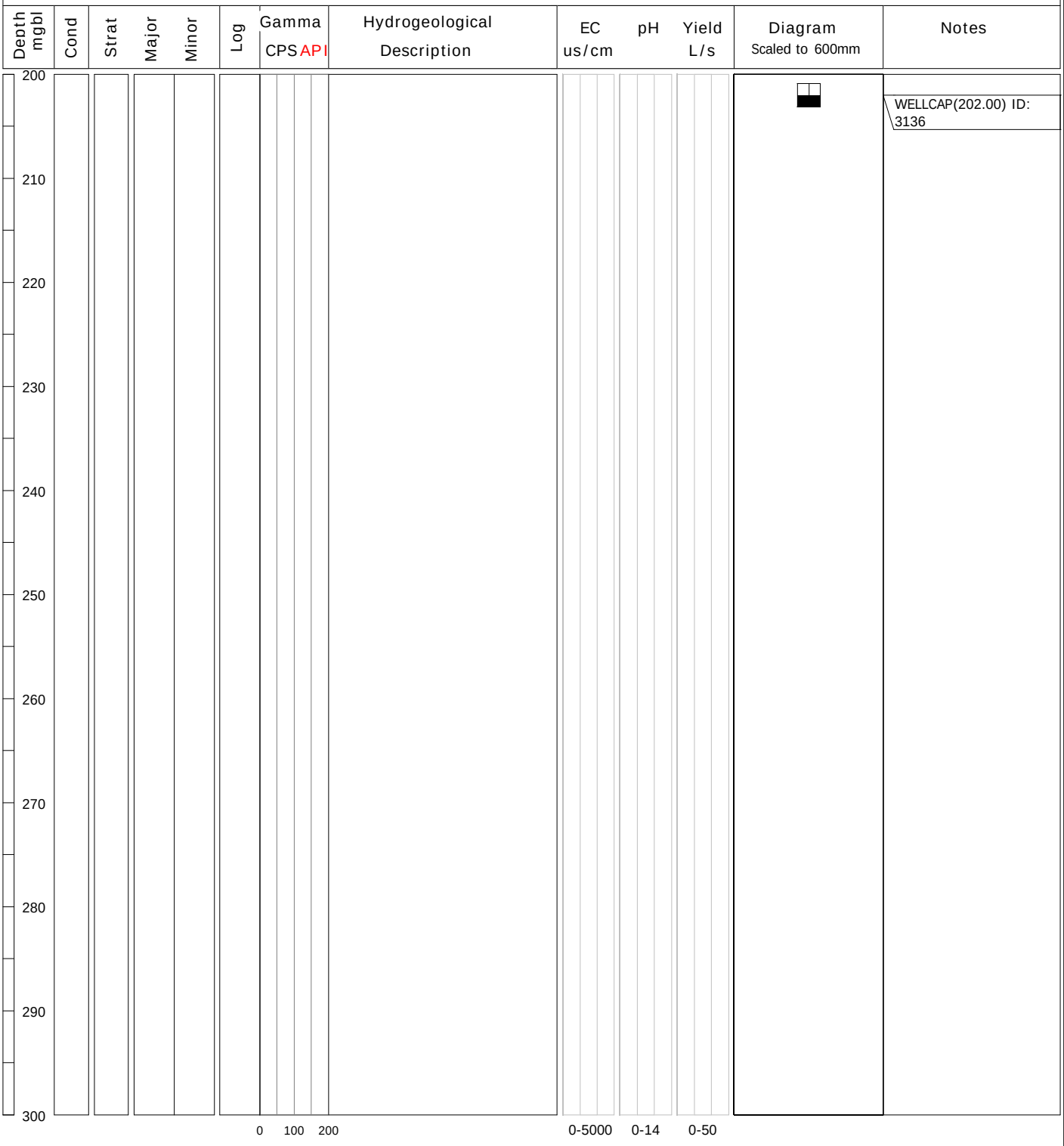
BHP

Project: WHEELARRA **Hole Name:** HFG0117 **Hole Length:** 194.00

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Northing: 7411762.68
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176.0 - 194.0	DR3	CH	500		EASTERNWELL	NS3

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