

To: F Kuranchie
From: I Epari
Company: M Mining
SLR Consulting Australia Pty Ltd
cc:
Date: 1 August 2023
Project No. 620.V14721.00001
RE: Millennium Mine
Groundwater Drawdown information for the EA

Introduction

The Millennium Coal Mine is located approximately 20 kilometres (km) south-east of the township of Moranbah, within the Isaac Regional Council Local Government Area (LGA) in Queensland.

The Millennium Mine consists of two mining areas with six contiguous mining leases (ML): the Mavis Downs area (ML 70457, ML 70483 and ML 70485); and the Millennium area (ML 70313, ML 70401, ML 70344), together form a single operational project, the Millennium Mine. Millennium Mine operates under Environmental Authority (EA) EPML00819213.

SLR (2021)¹ noted that the screened aquifer information in EA Table D1 is inconsistent with the bore logs or the site geological model. The information was re-visited after a DES meeting on 29 June 2023. The review of EA Table D1 is part of the scope of this technical memorandum.

The most recent update of the EA (30 March 2023) included Condition D6.0, which states:

"The environmental authority holder must provide predicted maximum incremental drawdown values for bores MB2, MB8B, MB9B, MB10B and CS_MB2 to populate Trigger level thresholds in Table D3 – Groundwater level thresholds by 31 May 2023. These values must be sourced from the numerical model used to develop predicted drawdowns for Mavis underground impacts as presented in the Millennium Groundwater Impact Assessment (2021)."

This memo provides the relevant groundwater level trigger thresholds for EA Table D3.

Groundwater Monitoring Network (EA Table D1)

Table 1 lists the current aquifer attribution as listed in the EA, the information found on the bore logs (Appendix A), and the information from the geological model used as the basis for the layering of the numerical model in SLR (2021). For each bore, it was then assessed in which formation the bore is most likely screened, incorporating multiple data sources, including the publicly available surface and solid geology maps (Appendix B).

Figure 1 shows a cross-section of the site. This cross-section was based on the site geological model, deemed the most accurate source of information for the coal resource. The cross-section intersects MB9A/B, visually showing the most likely screened formations at this nested location.

The final screened formation is listed in the last column of Table 1. For the Rangal Coal Measures (RCM) and Fort Cooper Coal Measures (FCCM), it was distinguished if the bore is screened in a coal seam (Coal) or over/inter/underburden (Sandstone).

EA Table D1 lists the coordinates for the designated monitoring network. It was noted that these coordinates needed to be corrected. Site personnel visited each monitoring bore and took hand-held GPS coordinates at each bore. The corrected Latitude and Longitude readings are listed in Table 2.

¹ SLR (2021) *Millennium Mine Supporting documentation to the Environmental Authority (EPML00819213) amendment application Mavis Underground operations - Groundwater Impact Assessment. State considerations* SLR Ref: 620.30404.00000-R01, Version No: -v3.0, October 2021

Table 1 Screened aquifer assessment based on bore logs, geological site model and geology maps

Monitoring bore	Bore Depth (mbgl)	Aquifer (current EA)	Screened interval (Bore logs) Appendix A	Model layer (numerical model based on site geological model)	Assessment	Proposed aquifer for amended EA
MB2	90	Permian Rangal	Permian Rangal (Sandstone and Coal)	Rangal Coal Measures (RCM)	Consistent across multiple data sources.	RCM (Coal)
MB8A	30	Fort Cooper (New Chum Creek Alluvium)	Sandstone	Rewan	The Surface geology map (Appendix B) shows a Rewan outcrop at the location, and the bore is assessed as being more likely screened in the Rewan than in the Fort Cooper CM.	Rewan Group
MB8B	80	Fort Cooper	Sandstone	RCM overburden	The numerical model (based on the site geological model) assigned this bore to the RCM. Based on this information, this bore is more likely in the RCM than in the Fort Cooper CM.	RCM (Sandstone)
MB9A	30	Fort Cooper (New Chum Creek Alluvium)	Moranbah Coal Seam	FCCM (Coal Seam), refer to Figure 1	Based on the site geological model, the cross-section shows that MB9A intersects the FCCM (Coal Seam).	FCCM (Coal)
MB9B	80	Fort Cooper	Moranbah Coal Measures Sandstone	FCCM (Sandstone underburden), refer to Figure 1	The cross-section based on the site geological model shows that MB9A intersects the FCCM (Sandstone underburden).	FCCM (Sandstone)
MB10A	35	Fort Cooper (New Chum Creek Alluvium)	Fort Cooper (Sandstone)	FCCM (Coal Seam)	The numerical model shows MB10A in the FCCM coal seam. The bore log has no coal in the screened interval, so FCCM (Sandstone) is proposed as the screened formation.	FCCM (Sandstone)
MB10B	80	Fort Cooper	Fort Cooper (Sandstone)	FCCM (Underburden)	The numerical model shows MB10A in the FCCM underburden, consistent with the logs.	FCCM (Sandstone)
CS_MB2	170	Rangal Coal Measures – Leichhardt Seam	Rangal Coal Measures – Leichhardt Seam	Leichhardt Seam	Bore logs and geological site model/ numerical model are consistent.	RCM (Coal)



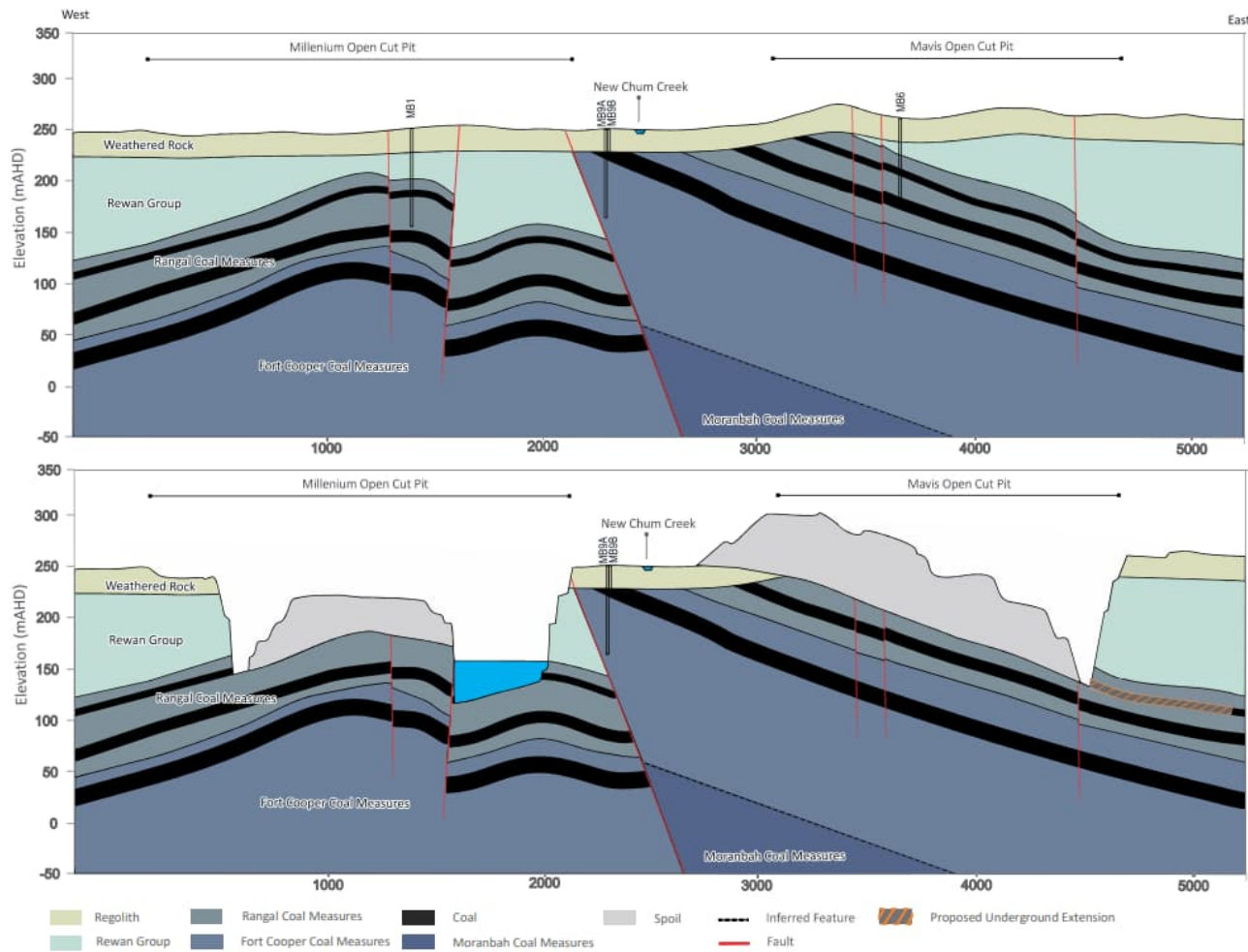


Figure 1 Conceptual cross-section around the Millenium and Mavis sites showing bore MB9A/B.



Bore MB8A has been found dry since installation. It is recommended to retain this bore in the monitoring network but remove it as a compliance bore, given that there are no results at this bore.

Table 2 Final proposed EA Table D1.

Monitoring bore	Latitude	Longitude	Ground elevation (mAHD)	Depth (mbgl)	Screens (mbgl)	Aquifer	Monitoring Frequency	Monitoring Parameters
MB2	22°1'50" S	148°14'18" E	262.4	90	72- 90	RCM (Coal)	Quarterly	SWL
MB8A	22°0'28" S	148°14'3" E	259.1	30	22-28	Rewan Group	Quarterly	SWL and Quality
MB8B (Monitoring, not compliance)	22°0'28" S	148°14'3" E	259.1	80	62-74	RCM (Sandstone)	Quarterly	SWL and Quality
MB9A	22°0'34" S	148°14'43" E	251.8	30	22-30	FCCM (Coal)	Quarterly	SWL and Quality
MB9B	22°0'34" S	148°14'43" E	251.8	80	60-74	FCCM (Sandstone)	Quarterly	SWL and Quality
MB10A	22°1'33" S	148°16'0" E	233.9	35	27-35	FCCM (Sandstone)	Quarterly	SWL and Quality
MB10B	22°1'33" S	148°16'0" E	233.9	80	64-76	FCCM (Sandstone)	Quarterly	SWL and Quality
CS_MB2	22°1'10" S	148°17'16" E	236.4	170	161-164	RCM (Coal)	Quarterly	SWL

Notes: green shade denotes amended values

Groundwater Level Trigger Thresholds (EA Table D3)

Approach

The methodology adopted to develop the proposed EA groundwater level trigger thresholds was based on numerical groundwater modelling predictions for the Mavis underground operations reported in SLR (2021). The outputs of the numerical groundwater model were reviewed with respect to predicted groundwater levels at the five monitoring bores (MBO2, MBO8B, MBO9B, MB10B and CS_MB2) for the EA over the life of Millennium. By comparison of groundwater level predictions at the commencement of Mavis underground mining and at the end of mining, incremental groundwater drawdown values were calculated. The maximum groundwater level drawdown predicted at each of the five EA monitoring bores was then extracted from those calculations, providing groundwater level trigger thresholds at each bore that are not expected to be exceeded after accounting for natural groundwater level variability. Natural groundwater variability was accounted for by reviewing the groundwater levels over the last five years. Exceedance of these groundwater drawdown values would therefore indicate the potential for groundwater impacts beyond those modelled, and thus this approach is considered appropriate for the EA.

Further, it was noted that the shallow bores of the Fort Cooper Coal Measures (FCCM) had a level trigger threshold of 1 m in the EA Table D3, as pre-populated by DES. It is considered that drawdown values of less than 2 m are not appropriate for the groundwater level trigger thresholds for the EA since natural groundwater level variability of up to approximately 2 m is expected over the life of the project. This is driven by climate variability, as presented in the water level plots in Appendix A. Thus, drawdown level trigger thresholds of less than 2 m will likely result in erroneous EA trigger breaches due to natural non-mining related effects. Furthermore, the 2 m drawdown limit is also the lowest of the *Water Act 2000* bore trigger thresholds used within Chapter 3 of the Water Act to define the potential for impacts to third-party groundwater extraction bores. Therefore, considering both natural groundwater level variability and bore trigger thresholds defined in the Water Act, it is proposed that a lower limit for the level trigger threshold of 2 m be adopted for the EA.



Model Drawdown Predictions

The numerical groundwater model drawdown predictions at the five EA monitoring bores over the life of the Mavis underground mine are provided in Table 3. The method used for the drawdown was to calculate the difference between the water levels in January 2023 and the end of mining in December 2027. This is considered the incremental drawdown for this assessment.

The water levels over the entire measurement period for each bore are shown in Appendix C. To account for climatic variability, the water level for the last five years has been reviewed at each bore. The difference between the maximum and minimum recorded water levels is listed as the “Variability over the last five years (m)” in Table 3. If the variability was not likely to be mining affected, the proposed drawdown trigger (Table 3) was then calculated by adding the predicted drawdown and half of the natural variability (i.e. accounting for the additional drawdown that may be caused by climate variability). For the two bores where a mining drawdown impact was likely (MB2 and MB8B), the predicted drawdown values were applied with no further changes (no additional variability predicted).

Bore MB9B shows a groundwater level recovery since observations started, including over the last five years, with the rate of increase slowing down over the last three years, and tending towards a plateau around 221 mAHD. A mining impact is likely, however, it relates to water level recovery rather than water level drawdown. Given this potential mining impact, no additional natural variability was added to the model predictions to obtain the drawdown trigger. The proposed reference water level was the last observation in October 2022 (Figure 2). It is still deemed useful to have a drawdown trigger for MB9B (measured from the reference level) to have an early warning for a reversal of the recovery curve. Water quality changes associated with the water level increase are covered under the EA water quality triggers.

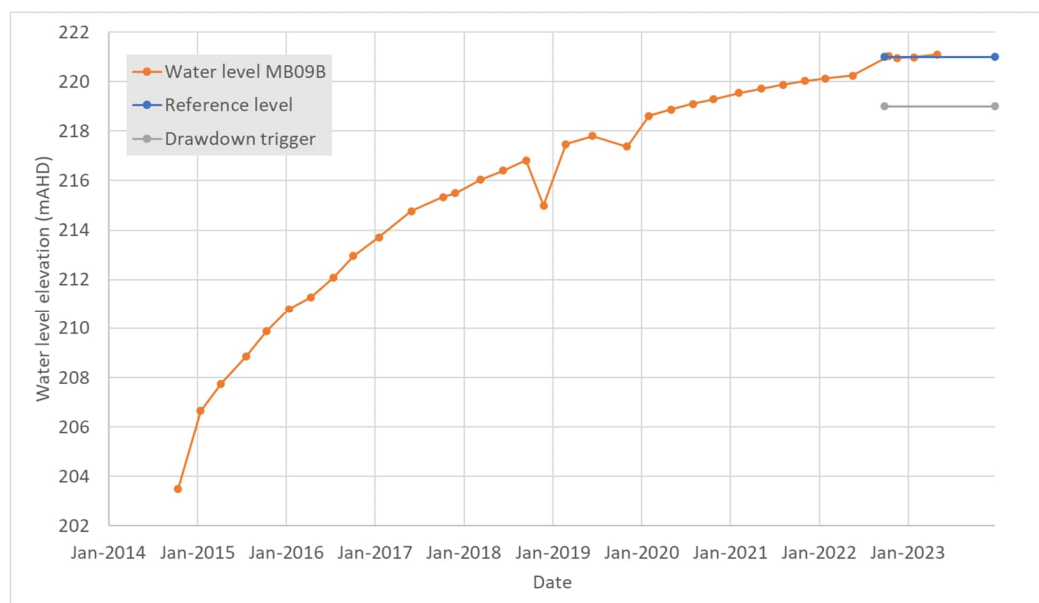


Figure 2 Groundwater level at MB9B with reference and trigger level



Table 3 Model predicted groundwater drawdowns between January 2023 and December 2027.

Bore	Aquifer	Predicted Drawdown (m) from SLR (2021) model	Variability over the last five years (m)	Mining impact likely in the last five years?	Proposed EA drawdown trigger threshold (m)
MB2	RCM (Coal)	4.3	5.0	Likely	4.3
MB8B	RCM (Sandstone)	1.4	2.5	Likely	2.0*
MB9B	FCCM (Sandstone)	1.2	6.0	Likely (recovery)	2.0*
MB10B	FCCM (Sandstone)	-0.2	3.0	No	2.0*
CS_MB2	RCM (Coal)	48.3	6.0	No	51.3

*The minimum drawdown level of 2 m was adopted, as the calculated value was below this minimum.

EA Table D3 correction

During this scope of work, it was noted that the reference water level for CS_MB2 in Table D3 of the EA needs to be corrected. Bore CS_MB2 has a ground elevation of 236.4 mAHD². This value was incorrectly listed as the reference water level in the EA. Instead, the correct reference water level is the ground elevation (236.4 mAHD) minus the reference depth to water (84.63m), which is 151.8 mAHD. Since the first version of this report, new water level data for CS_MB2 has been made available (Appendix C). The longer time series shows that the reference level of 151.8 mAHD is conservative (recently, lower water levels have been observed before Mavis underground had started). However, it is recommended to keep the reference level at 151.8 mAHD.

Final proposed Table D3

Table 4 presents the final proposed EA Table D3, which includes the corrected reference water level for CS_MB2 and the proposed triggers for the bores that previously had no drawdown value assigned to them. The trigger limit for MB8A was removed because this bore has historically been found dry.

Table 4 Final proposed EA Table D3.

Monitoring bore	Aquifer	Level trigger threshold (m) (drawdown from reference water level)	Reference water level (mbgl)	Reference water level* (mAHD)
MB2	RCM (Coal)	4.3	86.6	175.7
MB8B	RCM (Sandstone)	2.0	64.4	194.7
MB9A	FCCM (Coal)	2.0	25.1	226.7
MB9B	FCCM (Sandstone)	2.0	30.9	221.0
MB10A	FCCM (Sandstone)	2.0	19.7	214.3
MB10B	FCCM (Sandstone)	2.0	19.9	214.0
CS_MB2	RCM (Coal)	51.3	84.6	151.8

*Reference water level based on the last observation in October 2022.

² SLR (2022) Millennium Mine Groundwater Network Review and Trigger Assessment, SLR Ref: 620.30802.00000-R02
Version No: -v3.0, February 2023

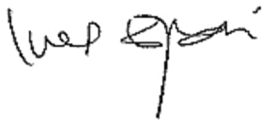


Closure

This memo addressed the requirement of condition D6.0 of the EA and provided corrected values for any identified incorrect bore details (coordinates and aquifer attributions).

Regards,

SLR Consulting Australia Pty Ltd



I Epari
Principal Consultant

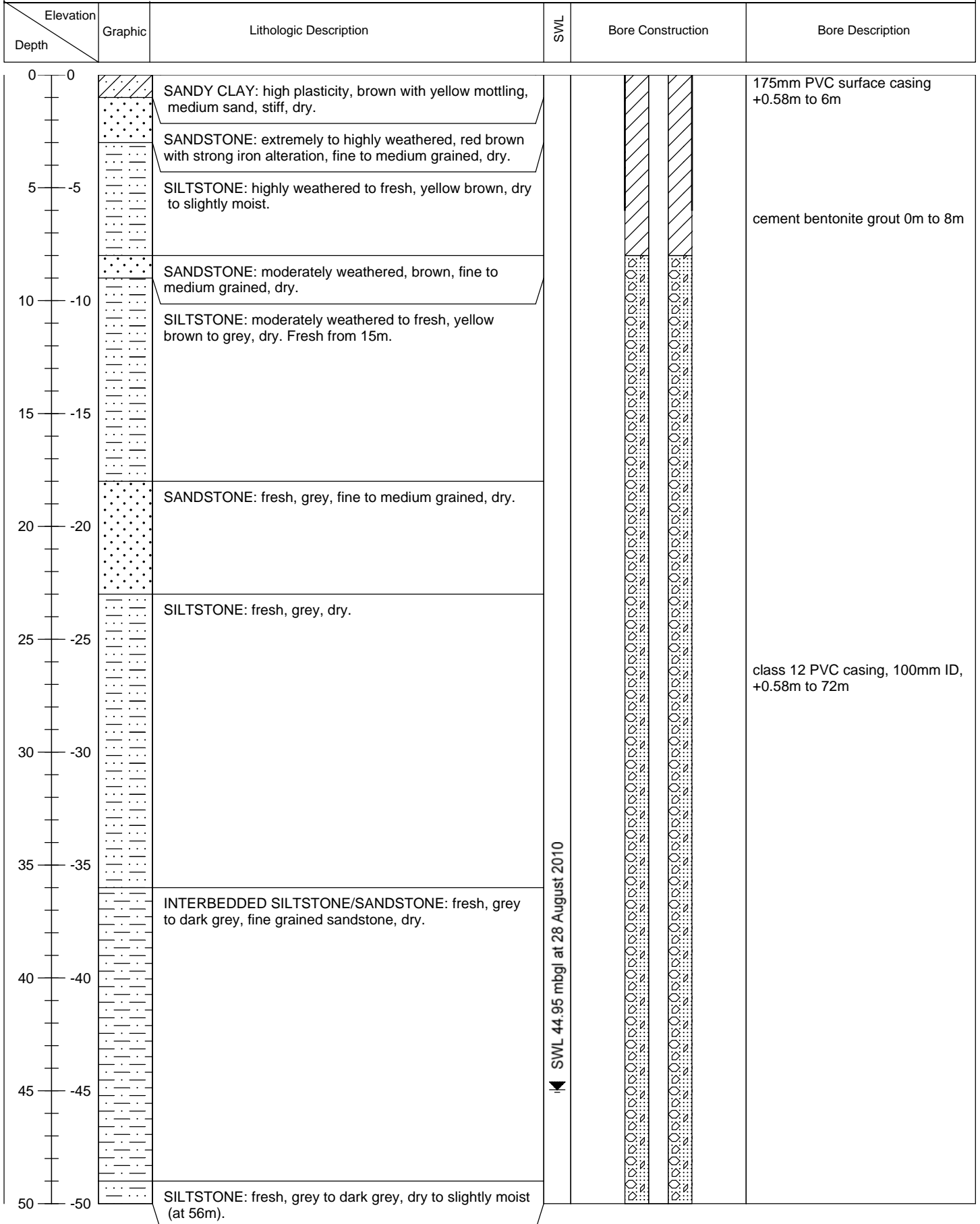


Appendix A – Bore logs





PROJECT NO. G1506	DRILLER: Damien Mulcahy	DATUM: AGD 84 Z55
PROJECT NAME: Millennium Coal Mine	DRILLING METHOD: Rotary Percussion	GROUND LEVEL: - mAHD
DATE: 2 August 2010	DRILL RIG: THD	TOP OF CASING LEVEL: +0.58 m
CONTRACTOR: Big Hole Drilling Pty Ltd	COORDINATES: 627690 mE / 7563100 mN	LOGGED BY: DI





PROJECT NO. G1506	DRILLER: Damien Mulcahy	DATUM: AGD 84 Z55
PROJECT NAME: Millennium Coal Mine	DRILLING METHOD: Rotary Percussion	GROUND LEVEL: - mAHD
DATE: 2 August 2010	DRILL RIG: THD	TOP OF CASING LEVEL: +0.58 m
CONTRACTOR: Big Hole Drilling Pty Ltd	COORDINATES: 627690 mE / 7653100 mN	LOGGED BY: DI

Elevation Depth	Graphic	Lithologic Description	SWL	Bore Construction	Bore Description
50 -50		SILTSTONE: fresh, grey to dark grey, dry to slightly moist (at 56m).			backfill 8m to 68m
55 -55					
60 -60		INTERBEDDED SILTSTONE/SANDSTONE: fresh, grey to dark grey, fine to medium grained sandstone, fractured(?), moist.			
65 -65		SANDSTONE: fresh, grey, fine to medium grained, moist to slightly wet.			
70 -70		INTERBEDDED SILTSTONE/SANDSTONE: fresh, grey to dark grey, fine grained sandstone, slightly wet.			1/2" bentonite pellet seal 68m to 69m
75 -75		SANDSTONE: fresh, dark grey, fine grained, slightly wet.			class 12 PVC screen, 100mm ID, hand slotted, 72m to 90m
80 -80		INTERBEDDED SILTSTONE/SANDSTONE: fresh, dark grey, fine grained sandstone, slightly wet.			
85 -85		INTERBEDDED SANDSTONE/COAL/SILTSTONE: fresh, dark grey to black, fine grained sandstone, wet. Visual estimate ~0.5L/sec.			gravel pack 3-6mm 69m to 90m
90 -90					drilled depth 90m
95 -95					
100 -100					

Report Date: 16/09/2021 16:35

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162245	Sub-Artesian Facility	Existing	09/12/2013	Mackay	3980 - ISAAC REGIONAL
Details			Location		
Description			Latitude	22-00-34	Basin 1304
Parish	4308 - STALBRIDGE		Longitude	148-13-59	Sub-area
Original Name	MB 8A		GIS Latitude	-22.00952409	Lot 2
			GIS Longitude	148.2330537	Plan GV165
			Easting	627275	
Driller Name	BAKER, STEVEN JOHN		Northing	7565606	Map Scale
Drill Company	HODGE DRILLING		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy		Map No
Bore Line			GPS Accuracy		Map Name
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	06/01/2014	Data Owner	DNR		
Roles	Mine Monitoring				

Casing 7 records for RN 162245

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	09/12/2013	1	0.00	22.00	Polyvinyl Chloride			115
A	09/12/2013	2	22.00	30.00	Screen			115
A	09/12/2013	3	20.00	30.00	Gravel Pack	3.000	GR - Gravel Size	150
X	09/12/2013	4	17.00	20.00	Bentonite Seal			150

Report Date: 16/09/2021 16:35

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	09/12/2013	5	6.00	17.00	Cuttings or other fill between casing and hole wall			150
X	09/12/2013	6	5.00	6.00	Grout			150
X	09/12/2013	7	0.00	5.00	Grout			157

Strata Logs 8 records for RN 162245

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SOIL
2	1.00	3.00	CLAY, RED
3	3.00	5.00	CLAY
4	5.00	6.00	CLAY, SANDY
5	6.00	12.00	CLAY
6	12.00	13.00	CLAY, HARD
7	13.00	15.00	CLAY
8	15.00	30.00	SANDSTONE

Stratigraphies 0 records for RN 162245

Aquifers 0 records for RN 162245

Pump Tests Part 1 0 records for RN 162245

Pump Tests Part 2 0 records for RN 162245

Bore Conditions 0 records for RN 162245

Elevations 0 records for RN 162245

Water Analysis Part 1 0 records for RN 162245

From Year:

Water Analysis Part 2	0 records for RN 162245
Water Levels	0 records for RN 162245
Wire Line Logs	0 records for RN 162245
Field Measurements	0 records for RN 162245
Special Water Analysis	0 records for RN 162245

From Year:

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Report Date: 16/09/2021 16:35

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162244	Sub-Artesian Facility	Existing	09/12/2013	Mackay	3980 - ISAAC REGIONAL
Details			Location		
Description			Latitude	22-00-34	Basin 1304
Parish	4308 - STALBRIDGE		Longitude	148-13-59	Sub-area
Original Name	MB 8B		GIS Latitude	-22.00952846	Lot 2
			GIS Longitude	148.2329962	Plan GV165
			Easting	627270	
Driller Name	BAKER, STEVEN JOHN		Northing	7565605	Map Scale
Drill Company	HODGE DRILLING		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy		Map No
Bore Line			GPS Accuracy		Map Name
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date		Data Owner	DNR		
Roles	Mine Monitoring				

Casing 8 records for RN 162244

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	09/12/2013	1	0.00	62.00	Polyvinyl Chloride			115
A	09/12/2013	2	62.00	80.00	Screen			
A	09/12/2013	3	60.00	80.00	Gravel Pack	3.000	GR - Gravel Size	150
X	09/12/2013	4	57.00	60.00	Bentonite Seal			150

Report Date: 16/09/2021 16:35

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	09/12/2013	5	6.00	57.00	Cuttings or other fill between casing and hole wall			150
X	09/12/2013	6	5.00	6.00	Grout			150
X	09/12/2013	7	0.50	5.00	Grout			150
X	09/12/2013	8	0.00	0.50	Grout			200

Strata Logs 8 records for RN 162244

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SOIL
2	1.00	3.00	CLAY, RED
3	3.00	5.00	CLAY
4	5.00	6.00	CLAY, SANDY
5	6.00	12.00	CLAY
6	12.00	13.00	CLAY, VERY HARD
7	13.00	15.00	CLAY
8	15.00	80.00	SANDSTONE

Stratigraphies 0 records for RN 162244

Aquifers 0 records for RN 162244

Pump Tests Part 1 0 records for RN 162244

Pump Tests Part 2 0 records for RN 162244

Bore Conditions 0 records for RN 162244

Elevations 0 records for RN 162244

From Year:

Water Analysis Part 1	0 records for RN 162244
Water Analysis Part 2	0 records for RN 162244
Water Levels	0 records for RN 162244
Wire Line Logs	0 records for RN 162244
Field Measurements	0 records for RN 162244
Special Water Analysis	0 records for RN 162244

From Year:

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Report Date: 16/09/2021 16:33

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162246	Sub-Artesian Facility	Existing	09/12/2013	Mackay	3980 - ISAAC REGIONAL

Details			Location			
Description			Latitude	22-00-40	Basin	1304
Parish	4308 - STALBRIDGE		Longitude	148-14-39	Sub-area	
Original Name	MB 9A		GIS Latitude	-22.01112592	Lot	2
			GIS Longitude	148.2442927	Plan	GV165
			Easting	628434		
Driller Name	BAKER, STEVEN JOHN		Northing	7565419	Map Scale	
Drill Company	HODGE DRILLING		Zone	55	Map Series	
Const Method	ROTARY AIR		Accuracy		Map No	
Bore Line			GPS Accuracy		Map Name	
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section	
R/O File No		Equipment				
H/O File No		RN of Bore Replaced				
Log Received Date	06/01/2014	Data Owner				DNR
Roles	Mine Monitoring					

Casing 6 records for RN 162246

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	09/12/2013	1	0.00	22.00	Polyvinyl Chloride			115
A	09/12/2013	2	22.00	30.00	Screen			115
A	09/12/2013	3	20.00	30.00	Gravel Pack	3.000	GR - Gravel Size	150
X	09/12/2013	4	17.00	20.00	Bentonite Seal			150

Report Date: 16/09/2021 16:33

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	09/12/2013	5	6.00	17.00	Cuttings or other fill between casing and hole wall			150
X	09/12/2013	6	0.00	6.00	Grout			165

Strata Logs 7 records for RN 162246

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SOIL
2	1.00	3.00	CLAY
3	3.00	4.00	CLAY, SANDY
4	4.00	5.00	ROCK
5	5.00	8.00	CLAY, SANDY
6	8.00	12.00	CLAY
7	12.00	30.00	COAL SEAM

Stratigraphies 0 records for RN 162246

Aquifers 1 records for RN 162246

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	12.00	30.00	COAL - Coal						N	PS	MORANBAH COAL MEASURES

Pump Tests Part 1 0 records for RN 162246

Pump Tests Part 2 0 records for RN 162246

Bore Conditions 0 records for RN 162246

Elevations 0 records for RN 162246

From Year:

Water Analysis Part 1	0 records for RN 162246
Water Analysis Part 2	0 records for RN 162246
Water Levels	0 records for RN 162246
Wire Line Logs	0 records for RN 162246
Field Measurements	0 records for RN 162246
Special Water Analysis	0 records for RN 162246

From Year:

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Report Date: 16/09/2021 16:34

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162247	Sub-Artesian Facility	Existing	09/12/2013	Mackay	3980 - ISAAC REGIONAL
Details			Location		
Description			Latitude	22-00-40	Basin 1304
Parish	4308 - STALBRIDGE		Longitude	148-14-39	Sub-area
Original Name	MB 9B		GIS Latitude	-22.01108319	Lot 2
			GIS Longitude	148.2442497	Plan GV165
			Easting	628430	
Driller Name	BAKER, STEVEN JOHN		Northing	7565424	Map Scale
Drill Company	HODGE DRILLING		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy		Map No
Bore Line			GPS Accuracy		Map Name
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	06/01/2014	Data Owner	DNR		
Roles	Mine Monitoring				

Casing 6 records for RN 162247

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	09/12/2013	1	0.00	80.00	Polyvinyl Chloride	8.000	WT - Wall Thickness	115
A	09/12/2013	2	60.00	74.00	Screen	0.800	AP - Aperture Size	115
A	09/12/2013	3	58.00	80.00	Gravel Pack	0.300	GR - Gravel Size	
X	09/12/2013	4	55.00	58.00	Bentonite Seal			150

Report Date: 16/09/2021 16:34

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	09/12/2013	5	6.00	55.00	Cuttings or other fill between casing and hole wall			150
X	09/12/2013	6	0.00	6.00	Grout			165

Strata Logs 11 records for RN 162247

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SOIL
2	1.00	3.00	CLAY
3	3.00	4.00	CLAY, SANDY
4	4.00	5.00	ROCK
5	5.00	8.00	CLAY, SANDY
6	8.00	12.00	CLAY
7	12.00	32.00	COAL SEAM, MORANBAH
8	32.00	36.50	MUDSTONE
9	36.50	54.00	COAL SEAM, MORANBAH
10	54.00	72.00	SANDSTONE
11	72.00	80.00	MUDSTONE

Stratigraphies 0 records for RN 162247

Aquifers 0 records for RN 162247

Pump Tests Part 1 0 records for RN 162247

Pump Tests Part 2 0 records for RN 162247

Bore Conditions 0 records for RN 162247

From Year:

Elevations	0 records for RN 162247
Water Analysis Part 1	0 records for RN 162247
Water Analysis Part 2	0 records for RN 162247
Water Levels	0 records for RN 162247
Wire Line Logs	0 records for RN 162247
Field Measurements	0 records for RN 162247
Special Water Analysis	0 records for RN 162247

From Year:

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Report Date: 16/09/2021 16:27

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162249	Sub-Artesian Facility	Existing	10/12/2013	Mackay	3980 - ISAAC REGIONAL
Details			Location		
Description			Latitude	22-01-39	Basin 1304
Parish	2420 - ILSINGTON		Longitude	148-15-57	Sub-area
Original Name	MB 10A		GIS Latitude	-22.0274232	Lot 4
			GIS Longitude	148.2657576	Plan SP190266
			Easting	630635	
Driller Name	BAKER, STEVEN JOHN		Northing	7563596	Map Scale
Drill Company	HODGE DRILLING		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy		Map No
Bore Line			GPS Accuracy		Map Name
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	06/01/2014	Data Owner	DNR		
Roles	Mine Monitoring				

Casing 6 records for RN 162249

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	10/12/2013	2	27.00	35.00	Perforated or Slotted Casing			
A	10/12/2013	3	25.50	35.00	Gravel Pack	0.300	GR - Gravel Size	150
X	10/12/2013	1	0.00	35.00	Polyvinyl Chloride	0.800	WT - Wall Thickness	115
X	10/12/2013	4	23.00	25.50	Bentonite Seal			150

Report Date: 16/09/2021 16:27

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	10/12/2013	5	6.00	23.00	Cuttings or other fill between casing and hole wall			150
X	10/12/2013	6	0.00	6.00	Grout			165

Strata Logs 12 records for RN 162249

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.50	SOIL
2	0.50	3.00	CLAY
3	3.00	8.00	CLAY, SANDY
4	8.00	8.50	CLAY, DRY
5	8.50	9.00	COAL, WEATHERED
6	9.00	14.00	CLAY
7	14.00	17.00	MUDSTONE
8	17.00	20.00	SANDSTONE
9	20.00	20.20	COAL
10	20.20	21.00	MUDSTONE
11	21.00	26.00	SANDSTONE
12	26.00	35.00	SANDSTONE, COARSE

Stratigraphies 0 records for RN 162249

Aquifers 1 records for RN 162249

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	20.00		COAL - Coal SDST - Sandstone	10/12/2013	-19.80	N	"BRACKIS H"	14.00	Y	PS	

Pump Tests Part 1 1 records for RN 162249

Report Date: 16/09/2021 16:27

Bore Report

From Year:

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	10/12/2013	1	162249	20.00			PUM		AIR	26.00				

Pump Tests Part 2

1 records for RN 162249

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	10/12/2013	1	60	-19.80				14.00						26.00		

Bore Conditions

0 records for RN 162249

Elevations

0 records for RN 162249

Water Analysis Part 1

0 records for RN 162249

Water Analysis Part 2

0 records for RN 162249

Water Levels

0 records for RN 162249

Wire Line Logs

0 records for RN 162249

Field Measurements

0 records for RN 162249

Special Water Analysis

0 records for RN 162249

Report Date: 16/09/2021 16:27

Bore Report

From Year:

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Report Date: 16/09/2021 16:28

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
162248	Sub-Artesian Facility	Existing	10/12/2013	Mackay	3980 - ISAAC REGIONAL
Details			Location		
Description			Latitude	22-01-39	Basin 1304
Parish	2420 - ILSINGTON		Longitude	148-15-57	Sub-area
Original Name	MB10B		GIS Latitude	-22.02746627	Lot 4
			GIS Longitude	148.2657368	Plan SP190266
			Easting	630633	
Driller Name	BAKER, STEVEN JOHN		Northing	7563592	Map Scale
Drill Company	HODGE DRILLING		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy		Map No
Bore Line			GPS Accuracy		Map Name
D/O File No	LON/515/000 (1733)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	06/01/2014	Data Owner	DNR		
Roles	Mine Monitoring				

Casing 6 records for RN 162248

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	10/12/2013	1	0.00	80.00	Polyvinyl Chloride	0.800	WT - Wall Thickness	115
A	10/12/2013	2	64.00	76.00	Perforated or Slotted Casing	0.800	AP - Aperture Size	
A	10/12/2013	3	62.00	80.00	Gravel Pack	0.300	GR - Gravel Size	150
X	10/12/2013	4	59.00	62.00	Bentonite Seal			150

Report Date: 16/09/2021 16:28

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	10/12/2013	5	6.00	59.00	Cuttings or other fill between casing and hole wall			150
X	10/12/2013	6	0.00	6.00	Grout			165

Strata Logs 13 records for RN 162248

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.50	SOIL
2	0.50	3.00	CLAY
3	3.00	8.00	CLAY, SANDY
4	8.00	8.50	CLAY, DRY
5	8.50	9.00	COAL, WEATHERED
6	9.00	14.00	CLAY
7	14.00	17.00	MUDSTONE
8	17.00	20.00	SANDSTONE
9	20.00	20.20	COAL
10	20.20	21.00	MUDSTONE
11	21.00	26.00	SANDSTONE
12	26.00	78.00	SANDSTONE, COARSE
13	78.00	80.00	MUDSTONE

Stratigraphies 0 records for RN 162248

Aquifers 2 records for RN 162248

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	20.00	20.20	COAL - Coal	10/12/2013	-18.50	N	"BRACKIS H"	12.00	N	PS	

Report Date: 16/09/2021 16:28

Groundwater Information

GWDB8250

Bore Report

From Year:

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
2	66.00	78.00	SDST - Sandstone			N	"BRACKIS H"	0.10	N	PS	

Pump Tests Part 1

1 records for RN 162248

Pipe	Date	Rec	RN of Pumped Bore	Top (m)	Bottom (m)	Dist (m)	Meth	Test Types	Pump Type	Suction Set (m)	Q Prior to Test (l/s)	Dur of Q PR (mins)	Pres on Arriv (m)	Q on Arriv (l/s)
A	10/12/2013	1	162248	26.00	78.00		PUM		AIR	65.00				

Pump Tests Part 2

1 records for RN 162248

Pipe	Date	Rec	Test Dur (mins)	SWL(m)	Recov Time (mins)	Resid DD (m)	Max DD or P RED (m)	Q at Max DD (l/s)	Time to Max DD (mins)	Max Q (l/s)	Calc Stat HD (m)	Design Yield (l/s)	Design BP (m)	Suct. Set (m)	Tmsy (m2/Day)	Stor
A	10/12/2013	1	60					0.10						65.00		

Bore Conditions

0 records for RN 162248

Elevations

0 records for RN 162248

Water Analysis Part 1

0 records for RN 162248

Water Analysis Part 2

0 records for RN 162248

Water Levels

0 records for RN 162248

Wire Line Logs

0 records for RN 162248

Field Measurements

0 records for RN 162248

Special Water Analysis

0 records for RN 162248

Report Date: 16/09/2021 16:28

Groundwater Information

GWDB8250

Bore Report

From Year:

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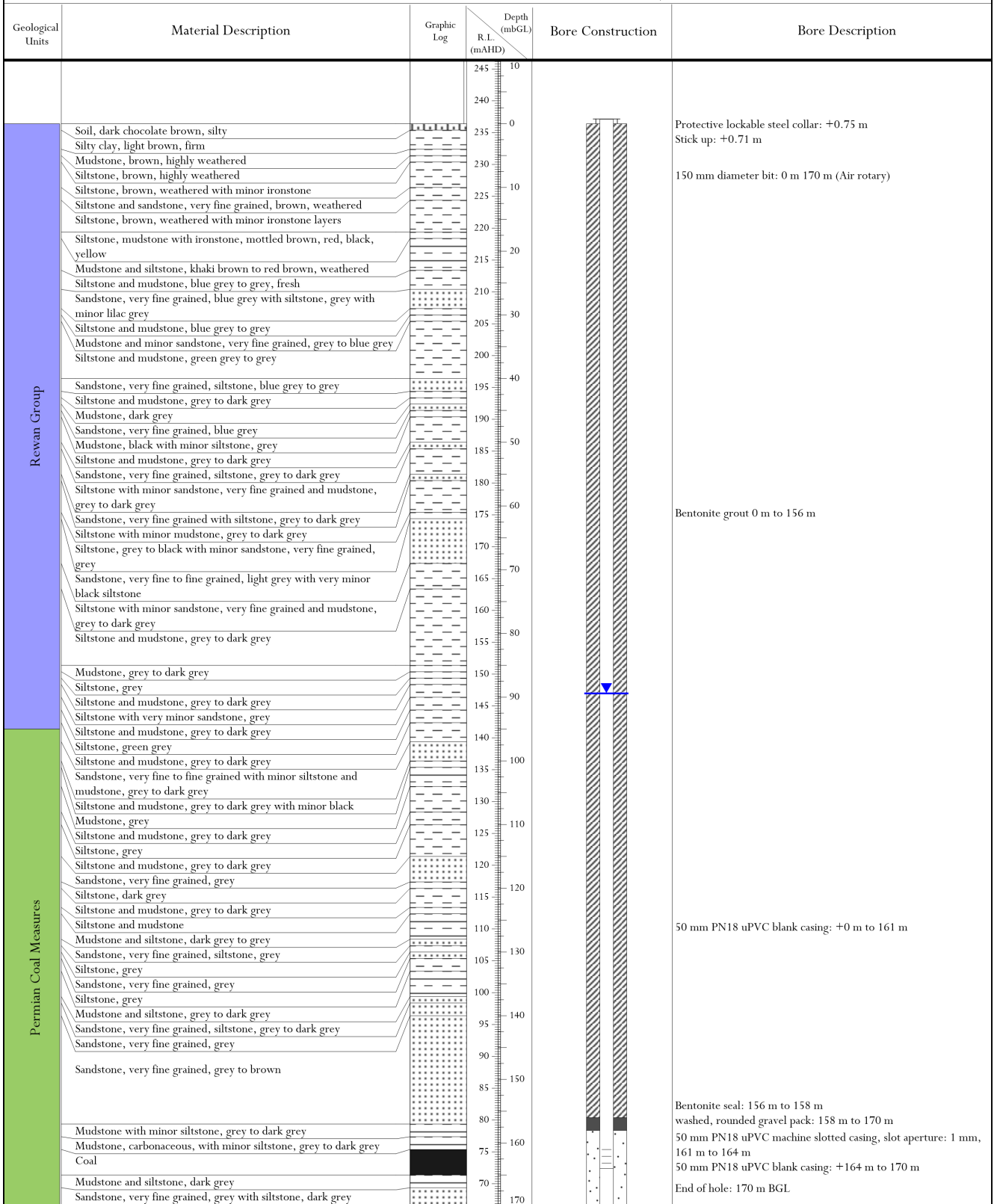


Project No.: 4043

Project Name: Gundyer

MONITORING BORE

MB2



Date Drilled: 2.5.2020

Drilling Company: DEPCO Drilling

Easting: 632811

RL: 236.4

Driller: David Grisinger

Drilling Method: Rotary open hole

Northing: 7564270

TD: 170.0

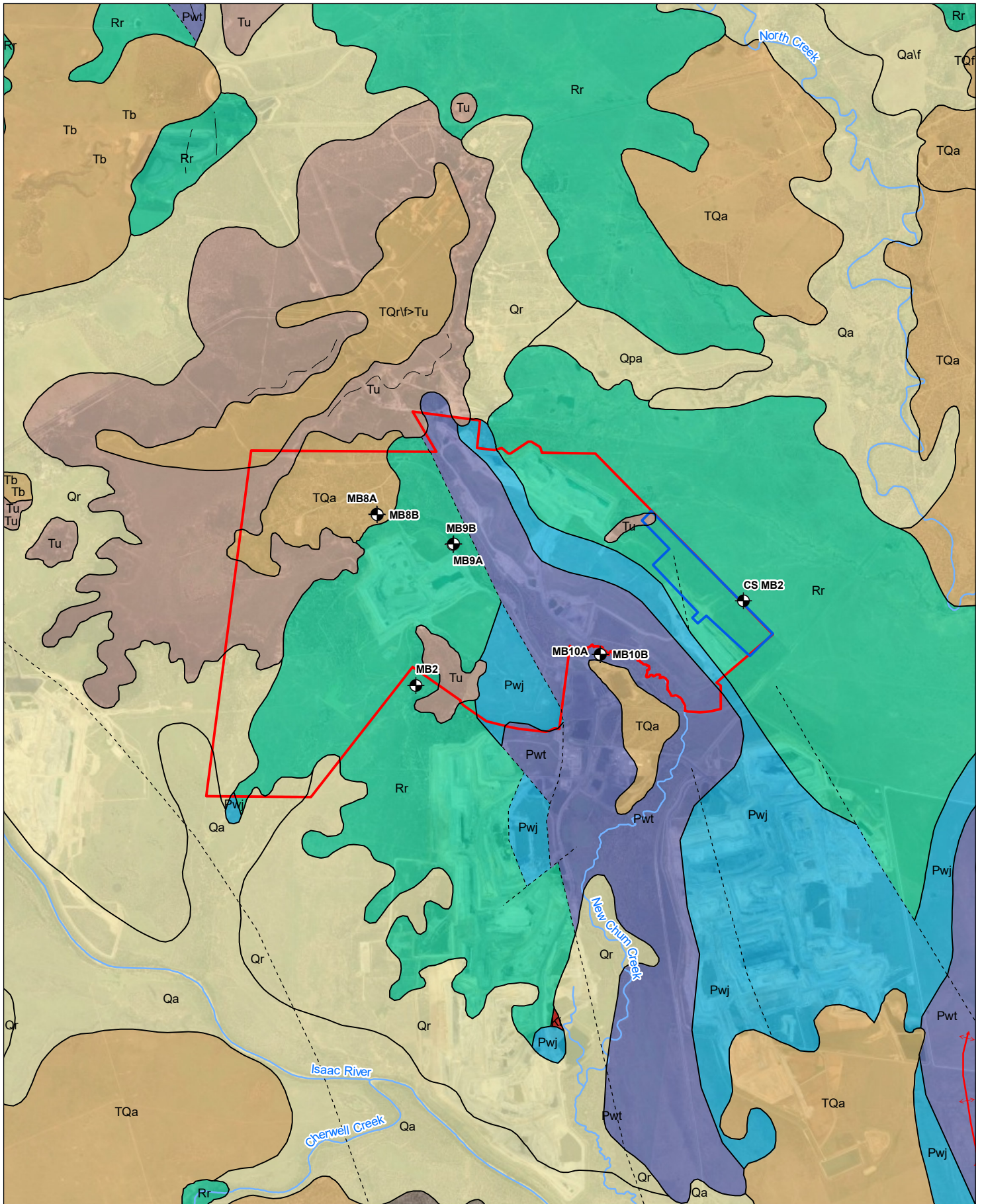
Drill Rig: UDR650

Logged By: DFB


Datum: AGD84 Zone55









Appendix B – Geology Maps












H:\Projects-SLR\620-BNE\620-BNE_PROMO\A00_14721_PROMO_Millennium_GMMMP\GIS\LR62014721_F0B_1_Surface_Geology_with_Bore_Network.mxd

 0 1 2 km
 Coordinate System: GDA2020 MGA Zone 55
 Scale: 1:80,000 at A4
 Project Number: 620.14721
 Date: 13-Jul-2023
 Drawn by: AS

-  Millennium Mine Groundwater Monitoring Bore
-  Watercourses
-  Mavis Underground
-  Millennium Mine
-  Anticline accurate showing double plunge away from culmination
-  Fault
-  Geological boundary
-  Trend line

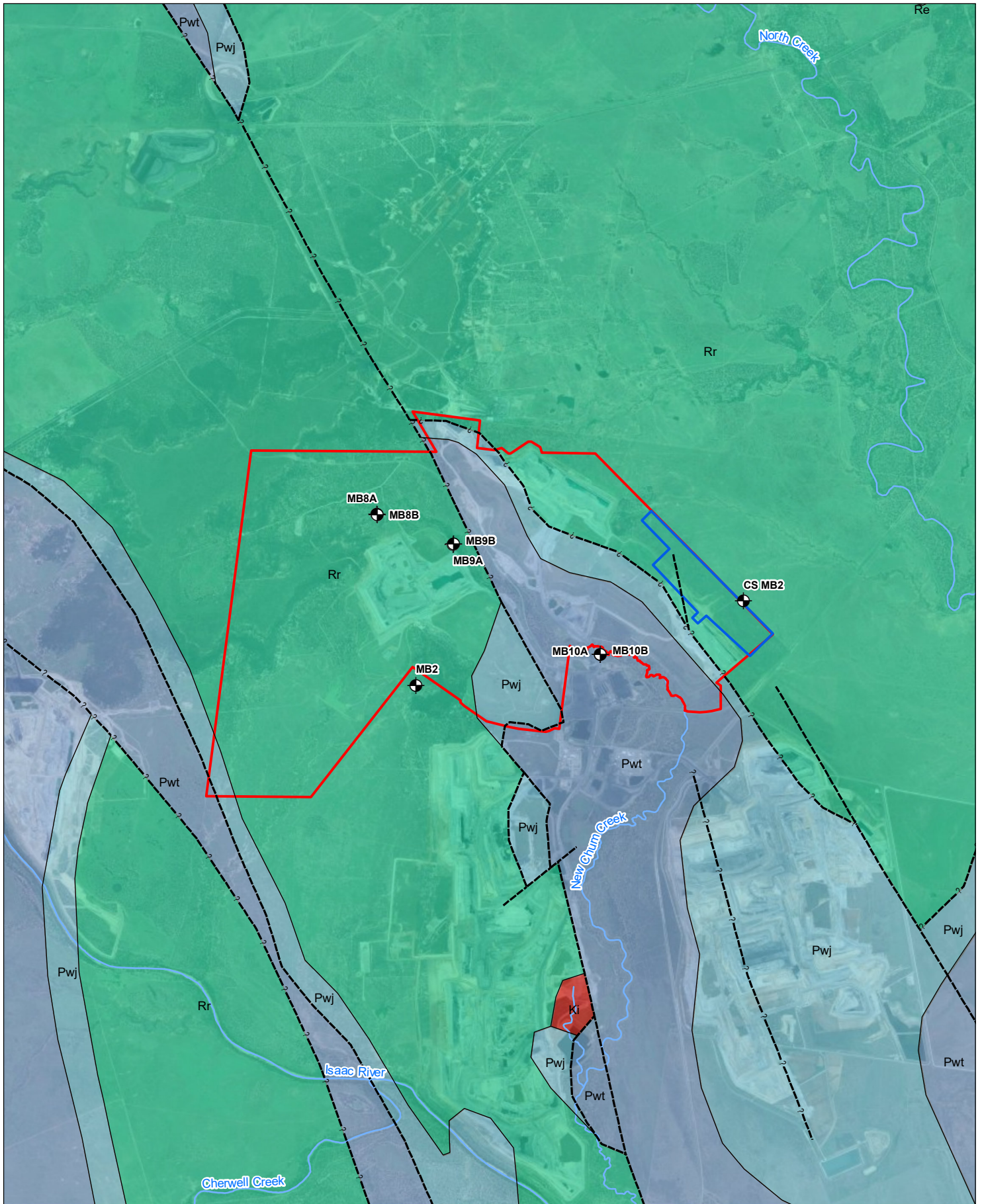
- Surface Geology**
-  Tertiary Sandstone (TQ)
 -  Alluvium (Qa)
 -  Suttor Formation (Tu)
 -  Fort Cooper Coal Measures (Pwt)
 -  Rewan Group (Rr)
 -  Rangal Coal Measures (Pwj)
 -  Ki-CQ

**MILLENNIUM MINE
 GROUNDWATER MONITORING
 AND MANAGEMENT
 PROGRAM**


**SURFACE GEOLOGY WITH
 MONITORING BORE NETWORK**















FIGURE B-1



H:\Projects-SLR\620-BNE\620-BNE_PROMO\A00_14721_PROMO_Millennium_GMMMP\GIS\LR62014721_F0B_2_Solid_Geology_with_Bore_Network.mxd

 0 1 2 km
 Coordinate System: GDA2020 MGA Zone 55
 Scale: 1:80,000 at A4
 Project Number: 620.14721
 Date: 13-Jul-2023
 Drawn by: AS

-  Millennium Mine Groundwater Monitoring Bore
-  Watercourses
-  Mavis Underground
-  Millennium Mine
- Structure Geology**
-  Fault Approximate
-  Fault Inferred
-  Geological Boundary

- Solid Geology**
-  Ki-CQ (Ki)
-  Clematis Group (Re)
-  Rewan Group (Rr)
-  Fair Hill Formation, Fort Cooper Coal Measures (Pwt)
-  Rangal Coal Measures, Bandanna Formation, Baralaba Coal Measures (Pwj)

**MILLENNIUM MINE
 GROUNDWATER MONITORING
 AND MANAGEMENT
 PROGRAM**

**SOLID GEOLOGY WITH
 MONITORING BORE NETWORK**



FIGURE B-2

Appendix C – Water level observations

