HYDROILEX PTY LTD ABN 57 003 372 834

HYDROILEX **GEOLOGICAL CONSULTANTS**

Groundwater Geosciences

[redacted]

8.

HUME COAL PROJECT SSD 7172 IPC HEARING – MOSSVALE 27TH FEBRUARY 2019

INTRODUCTION

John Lee is my name, I am a hydrogeologist with extensive experience in a number of geoscientific fields. I represent and support the landholders and particularly the *Water Access License* (WAL) holders in the region potentially affected by the mining proposal. I have worked in the region for over 25 years on several hundred private projects and have been closely involved in developing a clear understanding of the geological and hydrogeological controls of groundwater over a wide area.

The battle here is that of existing privately-owned water resource rights vs corporate efforts to obtain the rights to mine and extract the coal at the expense of groundwater users.

An important irrigation bore located at 'Rosedale', Sutton Forest is cited in this brief presentation as an example of significant impacts in consequence of the mining proposal.

SLIDE 1 shows the location of the bore. A centre pivot can be observed adjacent to the freeway. In the RTS groundwater model, the expected drawdown in the bore is 29.1m. The bore will be intersected by mining, and the proposal is to either replace it, deepen it or modify it.

SLIDE 2 shows the flow of water during testing operations in 2005 at 42 L/s flow. We can make a few valid comments about the principal occurrences and controls of groundwater in the region.

SLIDE 3. The Rosedale bore has been used to illustrate the local stratigraphy, and shows the Wianamatta Group, Hawkesbury Sandstone, Illawarra Coal Measures and Shoalhaven Group sequences in relation to groundwater occurrence.

The bore provides an excellent example of a bore that was targeted within an interpreted fracture zone, with groundwater associated with both primary and secondary porosity. The bore was tested at a maximum pump rate of 42 L/s, associated with a 24-hour drawdown of only 8.68m below the SWL of 12.8m. The ultimate capacity of the bore is in the range of 50-100 L/s.

The following is noted in relation to the bore, where similar geology is recognised throughout the region:

HYDROILEX

1: Highest yielding aquifers are mainly in the basal part of the Hawkesbury Sandstone which about 50m thick in the area. Coarse sandstone deposits relate to the primary depositional source drainage corridor into the basin from a southerly provenance.

2: Enhanced-yielding aquifers are associated with secondary fracturing, jointing and faulting.

3: Some of the highest-yielding aquifers in the Southern Highlands are in the proposed mine area. The Rosedale bore has a certified allocation of 400 ML per year, being the highest-allocated bore in the region. Other bores such as those at Comfort Hill have sustainable yields of >> 20 L/s. These examples illustrate that extremely high yields that are associated with open fractures and coarse porous sandstones.

4: It is logical to recognise that the proposed mine is in a geological environment where there is significant fracture porosity. In the more regional environment, there is major faulting along the Mittagong Ranges, and the proposed mine precinct is within a region of intrusive diatremes and Tertiary to Jurassic volcanism.

5: The proposal is to mine the coal which lies immediately beneath the aquifer sequence. This not the usual geological situation in the Illawarra and Southern Sydney coalfields where the Hawkesbury Sandstone is separated from the coal by a thick impervious shale sequence, the Narrabeen Group. So, we have a major important aquifer resting near or immediately on a coal seam at relatively shallow depth, where vertical/sub-vertical fractures are existent. I believe this is the worst scenario for water ingress, aquifer depletion, and mine safety.

6. Most bores are equipped so that the aquifer is not dewatered, reducing cascading water and maintaining the integrity of the aquifer. Groundwater management practice and *WaterNSW* bore certification does not permit 'mining the aquifer'. In contrast. *Hume* propose to dewater the aquifer.

SLIDE 4 shows the Rosedale bore in relation to the mine workings, impacted bores, drawdown classes, and bores marked by 'X' to be replaced.

SLIDE 5 shows the in the first table the numbers of bores impacted, properties involved, and the enormous time involved in recovery.

The middle table indicated the scheduling of the impact bore replacement.

The lower table provides quantified test data, and the very poor number of formal pump tests on which the mining proposal groundwater model has been based.

HYDROILEX

SLIDE 6 is an example of a bore overview document provided to landholders. In the document, the main issues have been related to the 'initial standing water level'. By convention, the SWL is that at a static condition. Hume Coal have invented an artificial SWL, which in the case of Rosedale bore, the difference is 38.4m. The level has been apparently calculated from the groundwater model and apparently includes a 'drought factor', and it would seem that they have been *fudged* to match a certain computed drawdown level during mining.

SLIDE 7 shows the relative variance between the computed and realistic SWL's. The data manipulation has been adopted in all bores affected. Of note is that the Rosedale bore is still operating as designed. The Comfort Hill bore has an apparent reduction in water level by only approximately 2m since 2005, at a time of 'drought'. This relationship is believed to exist throughout the region.

SLIDE 8 shows a hydrograph of the Rosedale bore, showing the likely drawdown curve, as predicted in the model. By creating an artificial 'initial standing water level', the impacts are reduced, and in the case of the example, the 2m AIP trigger is not initiated until the water level is reduced to ~53m. This is nonsensical!

SLIDE 9 shows the proposed 'fix' for the Rosedale bore.

- Initially the bore was proposed to be deepened, but there is no significant water in the Shoalhaven Group.
- It is not feasible to relocate, as the yield nmay be reduced.
- It is now proposed that the lower part of the sandstone aquifer be sealed-off, but if the DDL of 80m is achieved, then there would only be ~10m sandstone aquifer head.

SLIDE 10 provides a summary of facts wrt the proposed 'Make Good Strategies', where many generalisations and data misrepresentations are made:

- Initial SWL's are erroneous, artificially lowered to reduce apparent impacts
- Initiation of AIP trigger levels are consequently false
- Dewatering of WAL holder aquifer license 'conditions of approval' of drawdown limits are not respected, where aquifer dewatering rules are breached
- Assumptions in 'make good provisions' are invalid:

    - Pumps are usually installed at the level of the main aquifer, or shallower (not at 75% of total bore depth), but designed to provide maximum drawdown, sufficient pump submergence, and effective cooling, with minimal cascading water;
    - If only 20% of the hydraulic head is remained after lowering of the water table, then aquifer loss and reduced 'available drawdown' will vary the viability depending on the discharge rate;

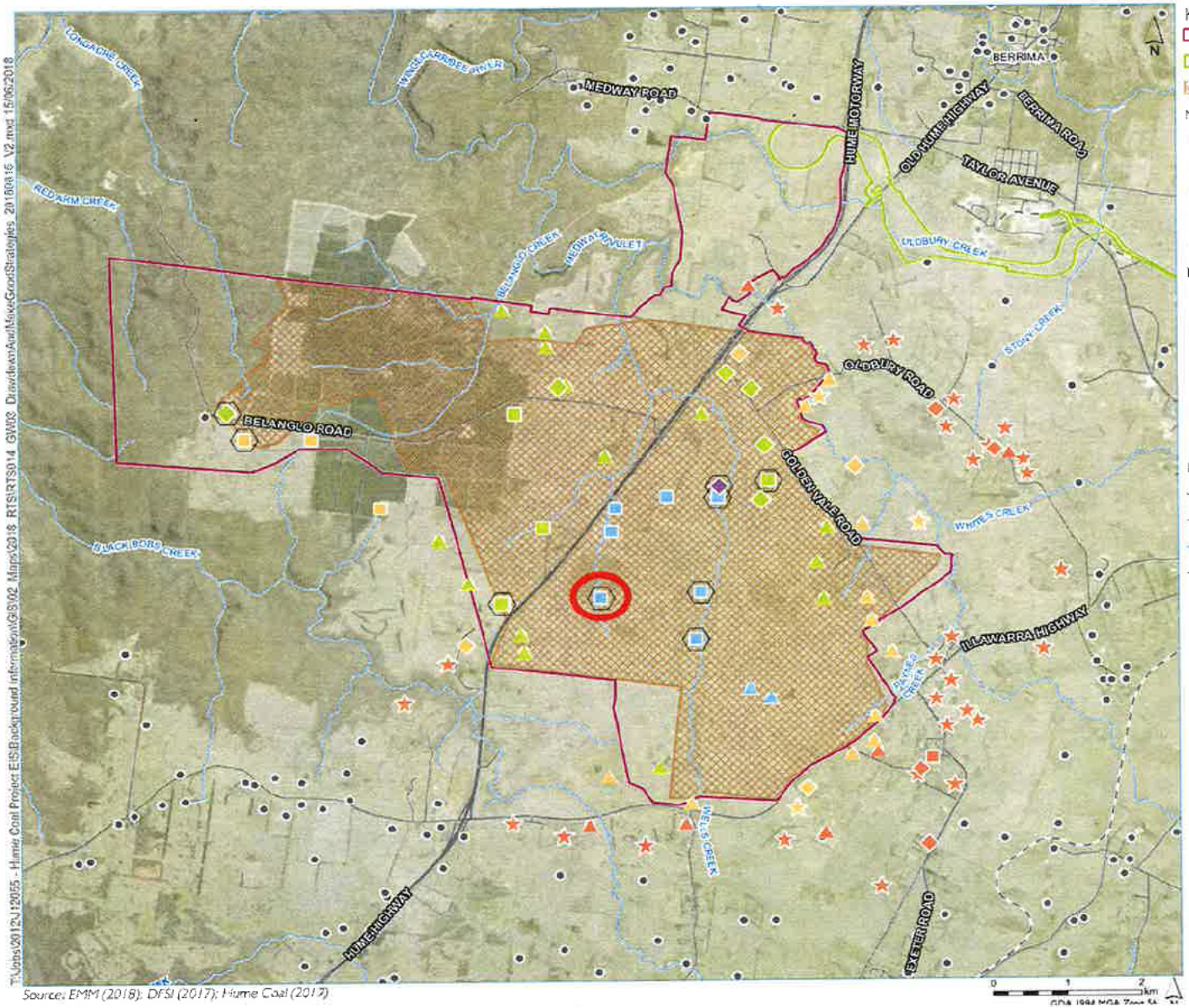
  - Deepening a bore will unlikely increase the yield, unless the bore is initially shallow;
  - Bore deepening into the Shoalhaven Group is not feasible;
  - Relocating a bore does not necessarily replicate the same yields;
- All bores to be modified or replaced need WaterNSW approvals, which may also affect setbacks;
- Aquifer depletion, cementation, and cascading water induces bore plugging, cementation, iron precipitation and leakage of inferior water;
- Cost of deepening, disruptions to supplies, changes in pump ratings, power supply, infrastructure and associated management of 94 sites is a horrendous intrusion burden on the users;

[redacted]

John Lee

Geoscientist

26th February 2019



Source: EMM (2018); DFSI (2017); Hume Coal (2017)

T:\Jobs\2012\12055 - Hume Coal Project EIS\Background information\GIS\02 Maps\2018 RTS\RTS014 GW08 Drawdown\Arc\MakeGoodStrategies 20180816 V2.mxd 15/06/2018

EIS FIG 5.2

Project drawdown and proposed make good provisions

Hume Coal Project and Berrima Rail Project
Response to submissions
Figure 5.2

HUMECOAL

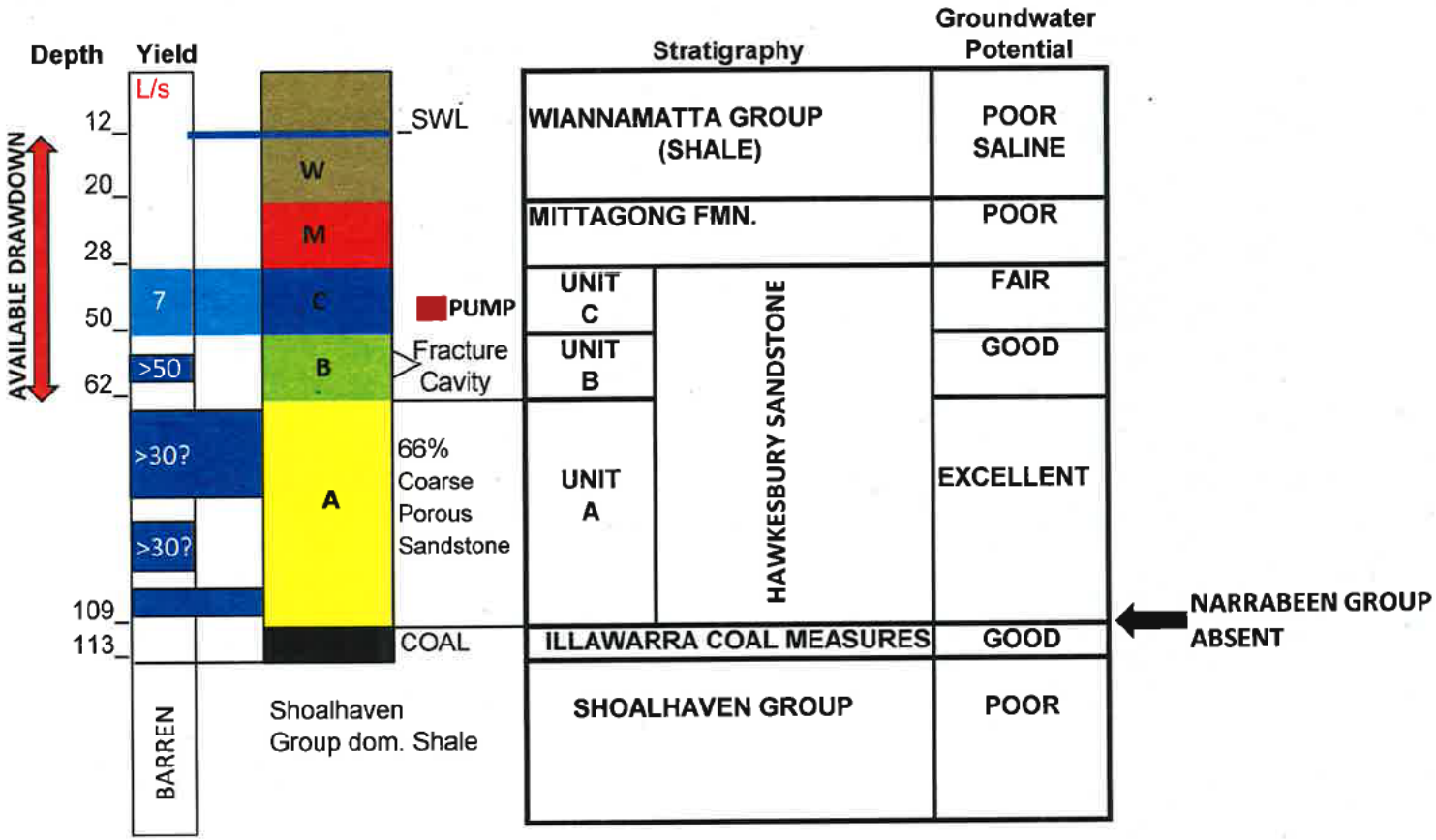
EMM

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**Bore GW107535 - 'Rosedale', Sutton Forest** **Drawdowns in Landholder Bores in Relation to Mine Footprint**	**SLIDE 1**

N

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE** **Testing at 42 L/s max pump flow May 2005**	**SLIDE 2**

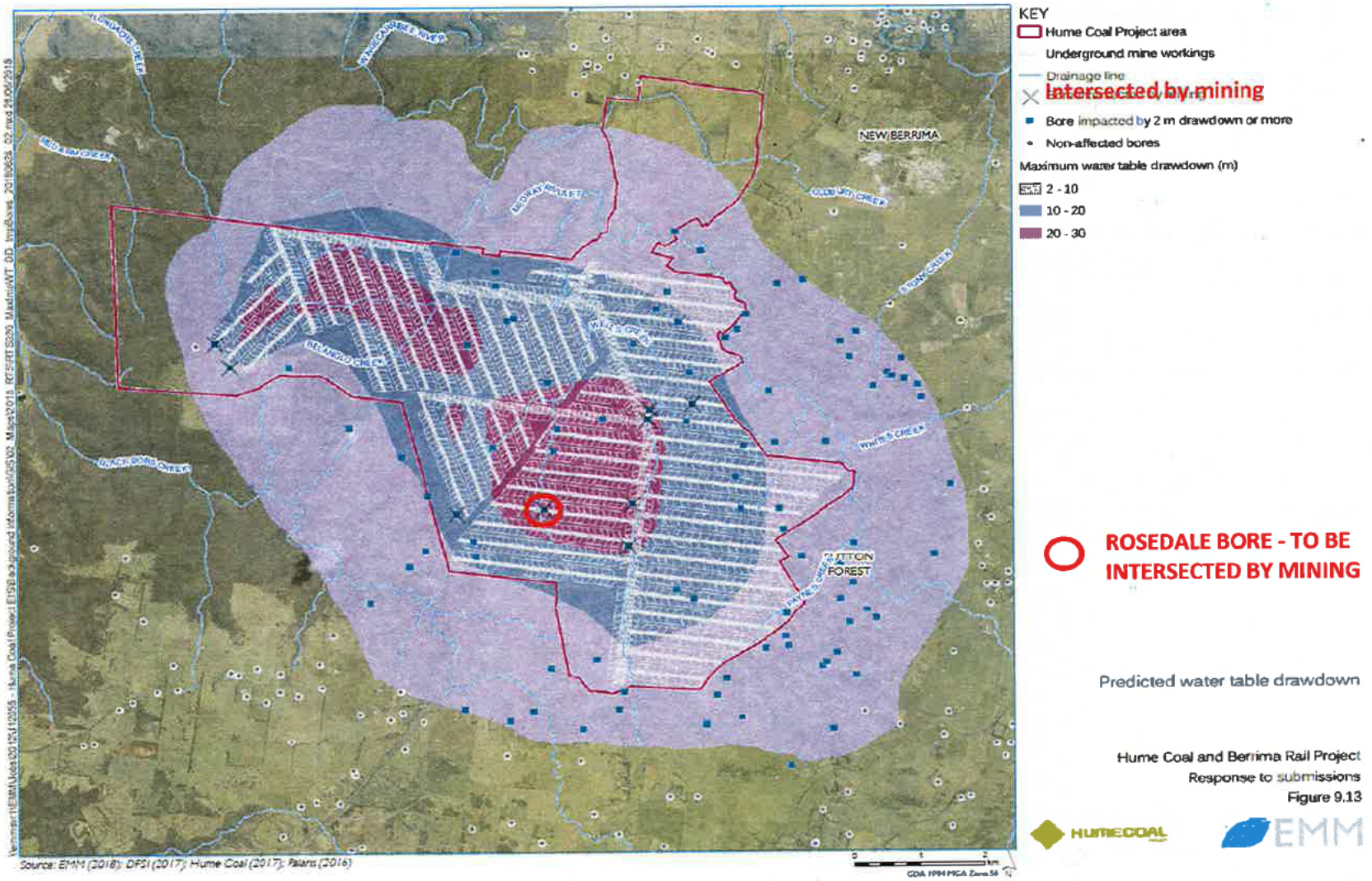
HYDROGEOLOGY & AQUIFER DISTRIBUTION IN ROSEDALE BORE



TESTED @ 42 L/s - max pump flow
DRAWDOWN 8.68m
LICENSE 400 ML/annum
POT'L YIELD ~100 L/s

Note: Not to scale

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	ROSEDALE BORE HYDROGEOLOGY & TESTING & STRATIGRAPHY	SLIDE 3



ROSEDALE BORE - TO BE INTERSECTED BY MINING

Predicted water table drawdown

Hume Coal and Berrima Rail Project
Response to submissions
Figure 9.13

HUMECOAL EMM

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE** **Rosedale in relation to mine**	**SLIDE 4**

Table 5.1 Landholder bores – summary of drawdown statistics

	Revised assessment	EIS
Number of bores impacted	94[1]	93[1]
Maximum drawdown range	2–47 m	2-80 m
Median maximum drawdown	6 m	12 m
Number of landholders (properties) with impacted bores	72	71
Average time for a bore to recover by 75% since impact begins	20 years	23 years
Time until all impacted bores recover, after mining starts	76 years	72 years

Notes: *1. Not including bores located on properties owned by Hume Coal.*

Table 5.2 Make good bores within individual stages

Stage	1	2	3	4	5	6	Total
Time when bore first impacted by 2 drawdown	**0-5 yrs**	**5-10 yrs**	**10-15 yrs**	**15-20 yrs**	**20-25 yrs**	**+25 years**	
Make good provision							
1. increased pumping costs	-	3	7	9	5	7	31
2. deepen pump	6	9	13	3	2	-	33
3a. replace a stock / domestic bore	5	4	2	2	1	1	15
3b. replace an irrigation bore	5	8	1	1	-	-	15
	16	**24**	**23**	**15**	**8**	**8**	**94**

Table 9.2 Mining project comparison of on-site hydraulic testing

Project	Stage	Date	Airlift tests	Slug tests	Packer Testing	Laboratory Core permeability	Pumping tests
Watermark Coal Project	EIS (approved)	2015	31 recovery tests	82 bores	60 tests (12 bores)	59 samples (8 bores)	8 tests
Stratford Extension project	EIS (approved)	2015	-	5 bores	-	31 samples (5 bores)	1 test (6 days)
Hume	EIS (RTS)	2017	-	42 bores	28 tests (3 bores)	39 samples (16 bores)	2 test locations (one 24hr, one 72hr)

HUME COAL INFORMATION PROVIDED TO LANDHOLDER

Groundwater Bore Overview – 2018

June 2018

JUNE 2018 - RTS MODEL

MAY 2017
COFFEY MODEL

Bore	GW107535
Owner	
Property Address	'Rosedale' Illawarra Highway, SUTTON FOREST NSW 2577
Easting / Northing	249655 / 6172612
Licenced Purpose	Irrigation
Proposed mitigation	Replacement Bore (Irrigation)

Bore Details

Initial Standing Water Level (m)	51.17 Actually 12.77m published by *WaterNSW*	52
Screens From (m)	13.0 40.0	
Screens To (m)	114.0 58.0	
Total Depth (m)	114.0 Open hole 58-114	

Bore Impacts

Project drawdown - max (m)	29.1 ** Is that 29.1 below 51.17 or 12.77m ??	58.6
Project time to max drawdown (years)	17.5	20
Project time to 2m drawdown (years)	7.5	13.5
Project time to 2m recovery (years)	54.5 ** To what SWL?	52.9
Number of years drawdown > 2m (years)	47.0	39.4

N

Table A.1 Make good assessment table

Make good option	Bore	Above mine or within 14 m?	Total depth (m)	Initial standing water level (m bgl)	Licensed purpose	Project only drawdown - max (m)	Project only time to max drawdown (yrs)	Project time to 2 m drawdown (yrs)	time to recovery (dd<2m) (yr)	Duration of time drawdown exceeds 2 m (yr)	STAGE 1 impact observed <5 years?
3a. Replace stock/domestic bore	GW032319		38.1	30.72	Domestic, Stock	10.9	8.5	2.5	44.5	42.0	1
	GW105744		67	52.35	Domestic, Stock	3.6	29.0	16.5	65.5	49.0	4
	GW104421	yes	42	27.01	Domestic, Stock	11.2	9.5	4.0	47.5	43.5	1
	GW057943		25.9	60.87	Domestic, Stock	5.9	23.5	14.5	73.6	59.0	3
	GW104745	yes	130	32.30	Domestic, Stock	46.8	8.5	2.5	51.5	49.0	1
	GW064613	yes	43	35.71	Domestic	17.2	18.5	1.0	46.5	45.5	1
	GW104486	yes	43	35.67	Domestic, Stock	15.5	18.5	7.0	59.5	52.5	2
	GW048345		38.1	29.42	Domestic, Stock	13.1	18.5	6.0	53.5	47.5	2
	GW060067		76	65.50	Domestic, Stock	2.6	39.5	25.5	67.5	42.0	6
	GW052538	yes	88	63.51	Domestic, Stock	13.1	6.5	6.0	43.5	37.5	2
	GW114544		36			2.6	26.5	17.5	40.5	23.0	4
	GW035590		33.5			6.6	20.5	12.5	56.5	44.0	3
	GW060199		37			8.2	20.0	8.5	57.5	49.0	2
	GW107240	yes	42			8.5	9.0	4.0	41.5	37.5	1
	GW034742		76.2			2.3	28.0	21.0	41.5	20.5	5
3b. Replace Irrigation bore	GW102588	yes	88	72.14 56	Domestic, Irrigation, Stock	5.4	7.5	6.0	31.5	25.5	2
	GW026805		82.9	60.65 ND	Domestic, Irrigation, Stock	6.8	22.0	6.5	57.5	51.0	2
	GW023322	yes	44.8	34.30 7.6	Domestic, Irrigation, Stock	19.7	18.5	2.5	55.5	53.0	1
	GW026136	yes	52.7	51.86 ND	Irrigation, stock	21.4	18.0	7.5	52.5	45.0	2
	GW110236	yes	108	36.00 17	Irrigation, stock	24.8	18.0	4.0	52.5	48.5	1
	GW047157	yes	67.1	48.09 ND	Domestic, Irrigation, Stock	19.2	3.5	1.5	55.5	54.0	1
	GW108195	yes	126	44.90 28	Irrigation	21.1	18.5	10.5	69.5	59.0	3
	GW108194	yes	121.5	43.79 24	Irrigation	23.6	18.5	9.0	65.5	56.5	2
	GW072672	yes	122	36.20 24	Domestic, Irrigation, Stock	12.8 DDL	18.5	6.5	59.5	53.0	2
	GW107535	yes	114	51.17 12.77	Irrigation	29.1 80.27	17.5	7.5	54.5	47.0	2
	GW106710	yes	115	68.09 35	Domestic, Irrigation, Stock	14.3	18.0	8.0	56.5	48.5	2
	GW102309		67	51.10 45	Irrigation	3.9	28.0	16.0	67.5	51.5	4
	GW106489	yes	55	31.99 5	Irrigation	29.9	18.0	1.5	65.5	64.0	1
	GW106491	yes	60	40.20 5	Irrigation	26.2	18.0	2.0	57.5	55.5	1
	GW021817		92.9	68.50 54.8	Domestic, Irrigation, Stock	6.6	11.0	6.0	58.5	52.5	2

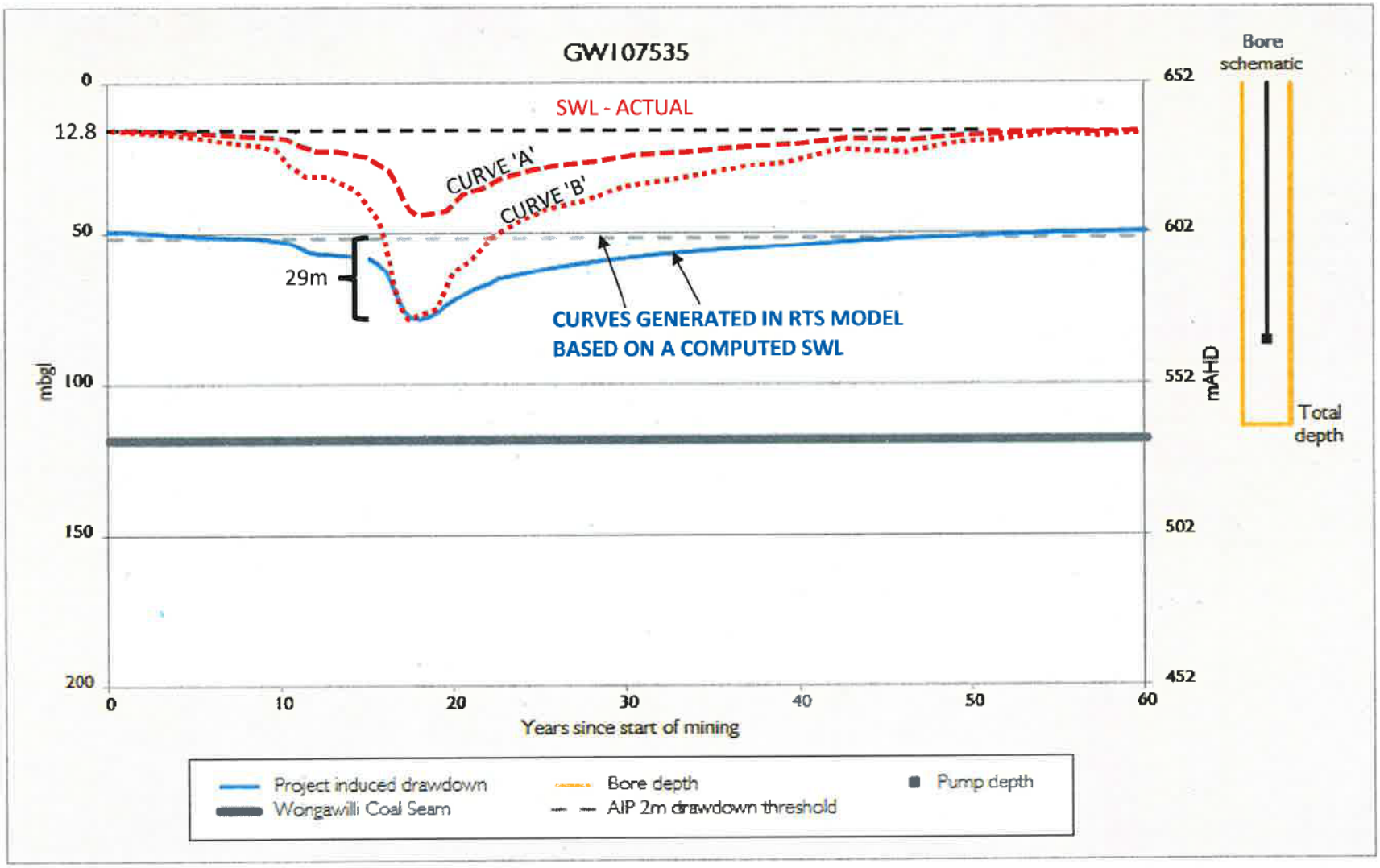
ARTIFICIAL SWL'S GENERATED BY HUME COAL VS RECORDED SWL

*Notes: * information on the existence of bore received after uncertainty analysis completed. Impacts from nearby similar bores have been used to include these in the make good assessment. (GW102950 – proxy bore GW057683; GW103325 – proxy bore GW047443*

ND = No Data recorded in *WaterNSW* database

Rosedale Bore

Comfort Hill Bore



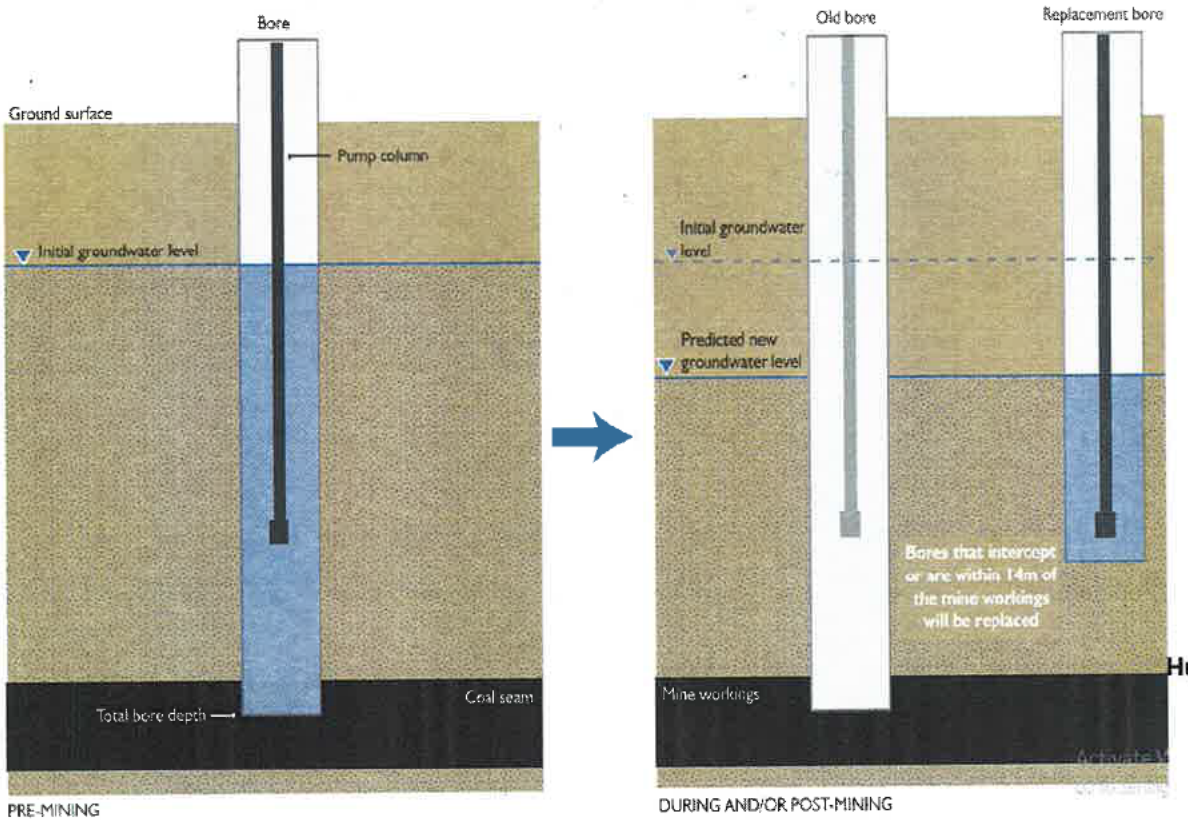
EMM HUMECOAL PROJECT

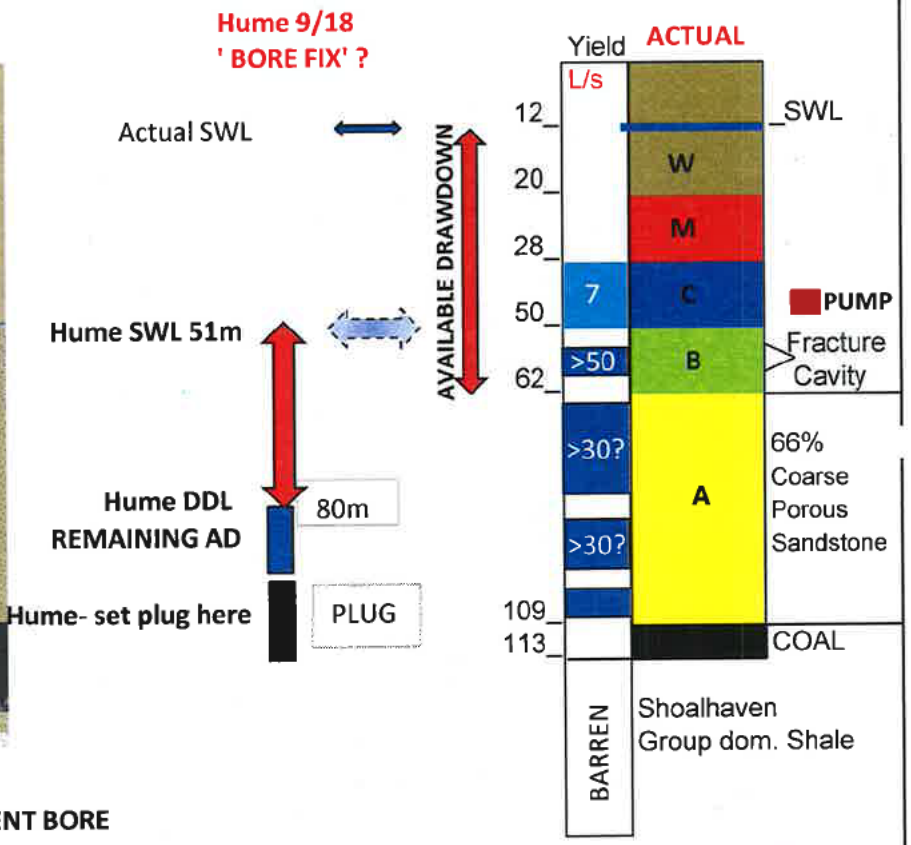
Drawdown in Landholder Bores
Make Good Strategy
Hume Coal Project

N

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	ROSEDALE BORE Hume Coal Hydrograph - Rosedale Bore	SLIDE 8

ROSEDALE BORE - PROPOSED OPTIONS - RTS MODEL 2018



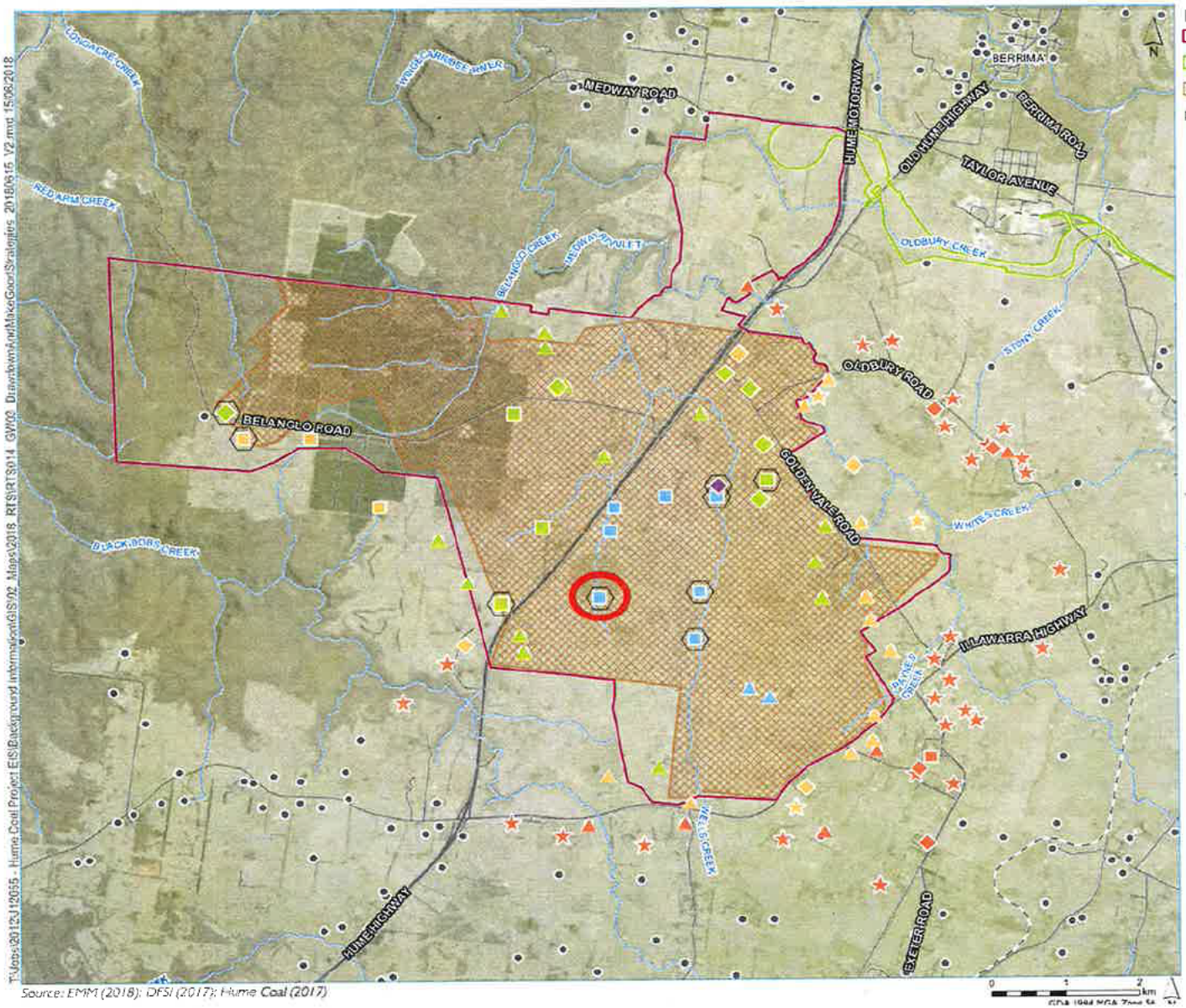


HUME COAL GENERIC 'MAKE GOOD' CONSTRUCTION DIAGRAM FOR REPLACEMENT BORE

The following is proposed by Hume:
1. **Reduce the depth of the bore by setting a plug at the base**
2. **Draw the water down to below the deepest level below 80m**
3. **This allows only about 10m of water column**

TESTED @ 42 L/s - max pump flow
DRAWDOWN 8.68m
LICENSE 400 ML/annum
POT'L YIELD ~100 L/s

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: -	**ROSEDALE BORE -' Make Good Strategy'**	**SLIDE 9**
	Jan-19		
	Drawn: RJL	**HUME COAL PROPOSED BORE REMEDIATION VS ACTUAL DATA**	
	Approved: RJL		



KEY

- Hume Coal Project area
- Berrima Rail Project area
- Underground mining area

Maximum drawdown (m)

- 2 - 5
- 5 - 10
- 10 - 20
- 20 - 40
- 40+

Make good provision

- 1. increased pumping costs only
- 2. deepen pump
- 3a. replacement bore (stock / domestic)
- 3b. replacement bore (irrigation)
- Bore to be intersected by mining
- Non-affected bores

Existing features

- Main road
- Local road
- Drainage line
- Rail line

'ROSEDALE' BORE

EIS FIG 5.2

Project drawdown and proposed make good provisions

Hume Coal Project and Berrima Rail Project
Response to submissions
Figure 5.2

HUMECOAL EMM

Source: EMM (2018); DFSI (2017); Hume Coal (2017)

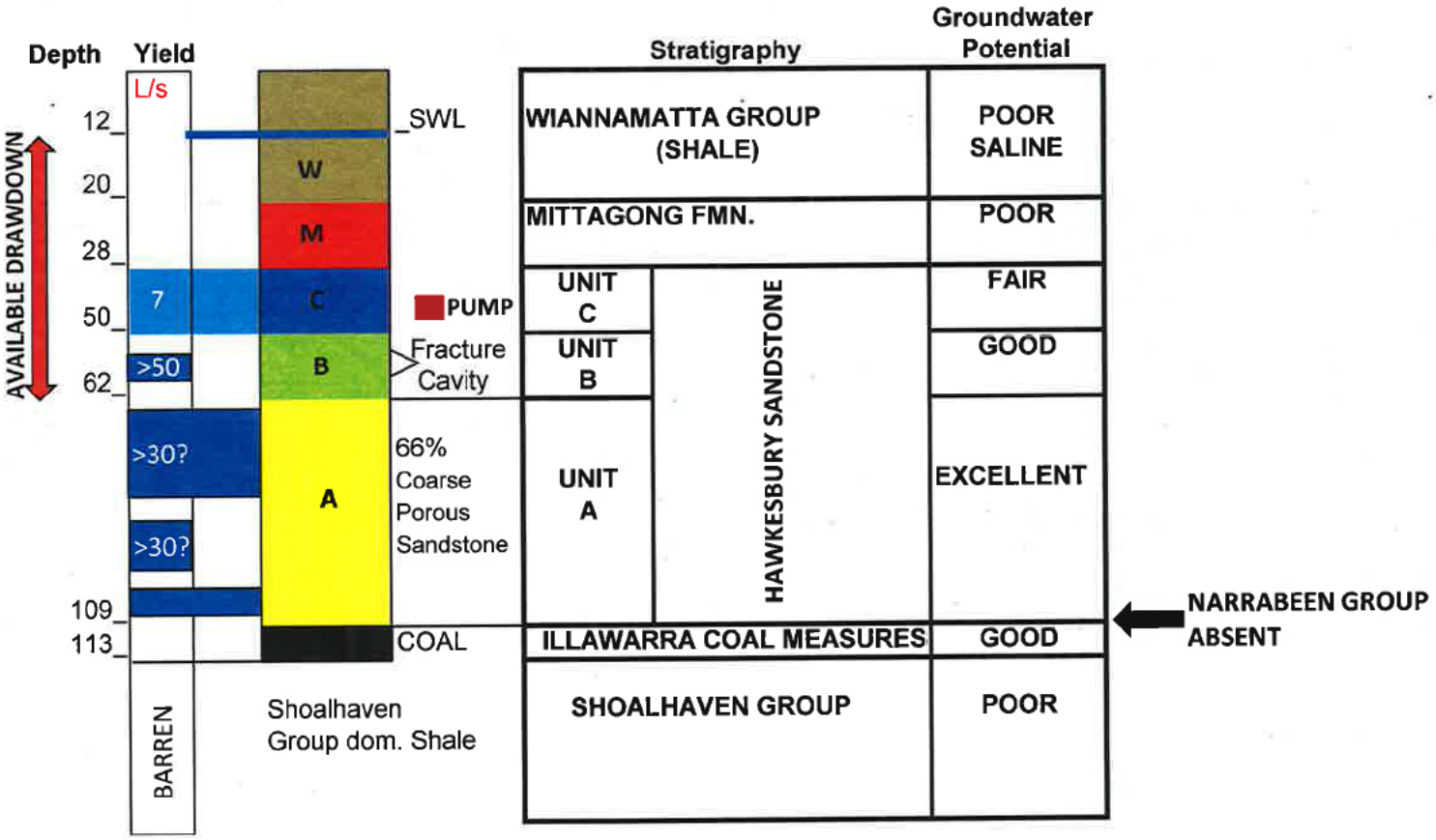
T:\Jobs\2012\12055 - Hume Coal Project EIS\Background Information\GIS\02_Maps\2018_RTS\RTS014_GW02_Drawdown\Art\MakeGood\Strategies_2018/0615_V2.mxd 15/06/2018

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**Bore GW107535 - 'Rosedale', Sutton Forest** **Drawdowns in Landholder Bores in Relation to Mine Footprint**	**SLIDE 1**

N

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE** **Testing at 42 L/s max pump flow May 2005**	**SLIDE 2**

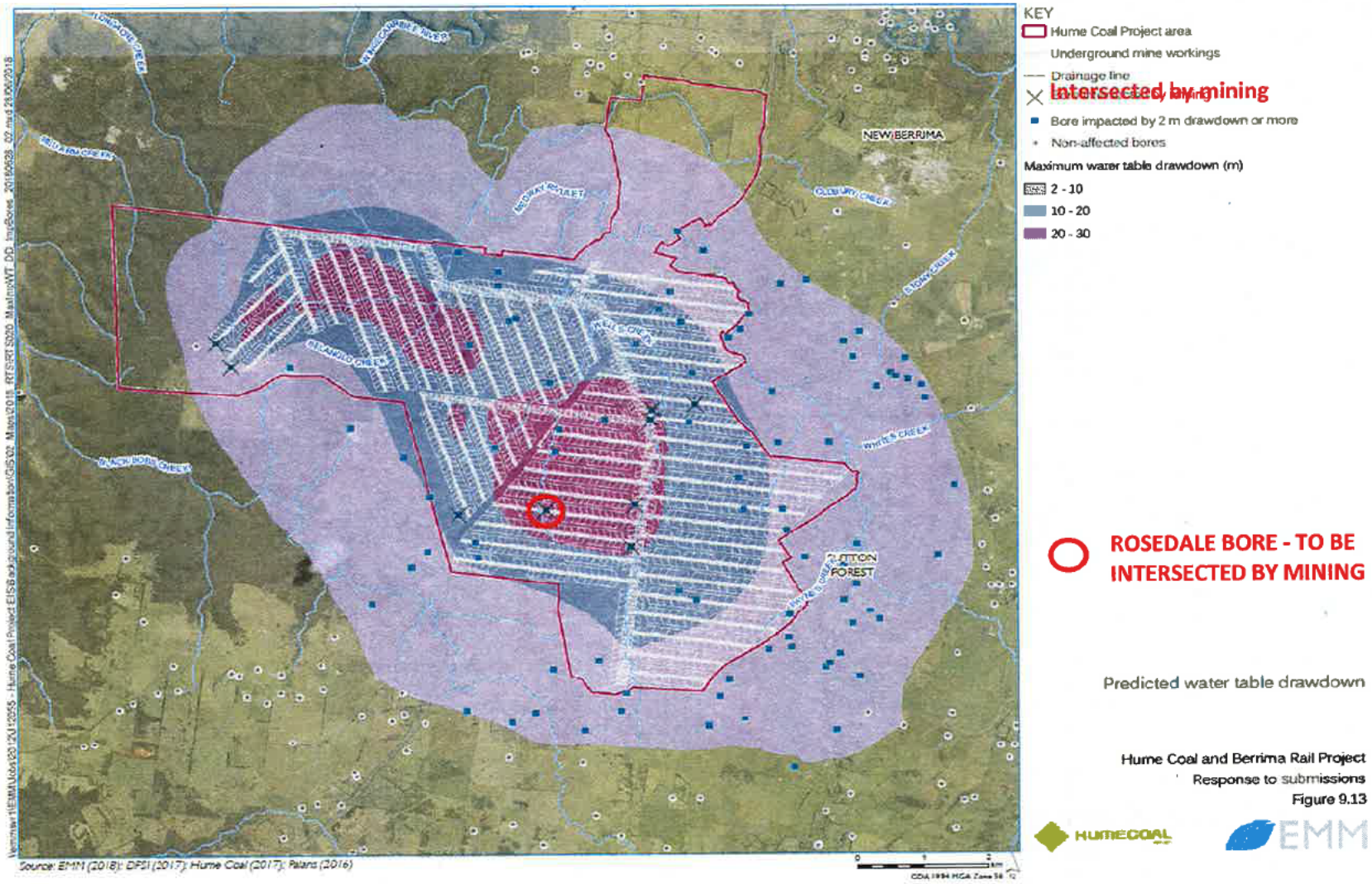
HYDROGEOLOGY & AQUIFER DISTRIBUTION IN ROSEDALE BORE



TESTED @ 42 L/s - max pump flow
DRAWDOWN 8.68m
LICENSE 400 ML/annum
POT'L YIELD ~100 L/s

Note: Not to scale

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	ROSEDALE BORE HYDROGEOLOGY & TESTING & STRATIGRAPHY	SLIDE 3



Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE** **Rosedale in relation to mine**	**SLIDE 4**

Table 5.1 Landholder bores – summary of drawdown statistics

	Revised assessment	EIS
Number of bores impacted	94[1]	93[1]
Maximum drawdown range	2–47 m	2-80 m
Median maximum drawdown	6 m	12 m
Number of landholders (properties) with impacted bores	72	71
Average time for a bore to recover by 75% since impact begins	20 years	23 years
Time until all impacted bores recover, after mining starts	76 years	72 years

Notes: 1. Not including bores located on properties owned by Hume Coal.

Table 5.2 Make good bores within individual stages

Stage	1	2	3	4	5	6	Total
Time when bore first impacted by 2 drawdown	**0-5 yrs**	**5-10 yrs**	**10-15 yrs**	**15-20 yrs**	**20-25 yrs**	**+25 years**	
Make good provision							
1. increased pumping costs	-	3	7	9	5	7	31
2. deepen pump	6	9	13	3	2	-	33
3a. replace a stock / domestic bore	5	4	2	2	1	1	15
3b. replace an irrigation bore	5	8	1	1	-	-	15
	16	**24**	**23**	**15**	**8**	**8**	**94**

Table 9.2 Mining project comparison of on-site hydraulic testing

Project	Stage	Date	Airlift tests	Slug tests	Packer Testing	Laboratory Core permeability	Pumping tests
Watermark Coal Project	EIS (approved)	2015	31 recovery tests	82 bores	60 tests (12 bores)	59 samples (8 bores)	8 tests
Stratford Extension project	EIS (approved)	2015	-	5 bores	-	31 samples (5 bores)	1 test (6 days)
Hume	EIS (RTS)	2017	-	42 bores	28 tests (3 bores)	39 samples (16 bores)	2 test locations (one 24hr, one 72hr)

HUME COAL INFORMATION PROVIDED TO LANDHOLDER

Groundwater Bore Overview – 2018

June 2018

JUNE 2018 - RTS MODEL

MAY 2017
COFFEY MODEL

Bore	GW107535
Owner	
Property Address	'Rosedale' Illawarra Highway, SUTTON FOREST NSW 2577
Easting / Northing	249655 / 6172612
Licenced Purpose	Irrigation
Proposed mitigation	Replacement Bore (Irrigation)

Bore Details

Initial Standing Water Level (m)	51.17 Actually 12.77m published by *WaterNSW*	52
Screens From (m)	13.0 40.0	
Screens To (m)	114.0 58.0	
Total Depth (m)	114.0 Open hole 58-114	

Bore Impacts

Project drawdown - max (m)	29.1 ** Is that 29.1 below 51.17 or 12.77m ??	58.6
Project time to max drawdown (years)	17.5	20
Project time to 2m drawdown (years)	7.5	13.5
Project time to 2m recovery (years)	54.5 ** To what SWL?	52.9
Number of years drawdown > 2m (years)	47.0	39.4

N

Table A.1 Make good assessment table

Make good option	Bore	Above mine or within 14 m?	Total depth (m)	Initial standing water level (m bgl)	Licensed purpose	Project only drawdown - max (m)	Project only time to max drawdown (yrs)	Project time to 2 m drawdown (yrs)	time to recovery (dd<2m) (yr)	Duration of time drawdown exceeds 2 m (yr)	STAGE 1 impact observed <5 years?
3a. Replace stock/domestic bore	GW032319		38.1	30.72	Domestic, Stock	10.9	8.5	2.5	44.5	42.0	1
	GW105744		67	52.35	Domestic, Stock	3.6	29.0	16.5	65.5	49.0	4
	GW104421	yes	42	27.01	Domestic, Stock	11.2	9.5	4.0	47.5	43.5	1
	GW057943		25.9	60.87	Domestic, Stock	5.9	23.5	14.5	73.6	59.0	3
	GW104745	yes	130	32.30	Domestic, Stock	46.8	8.5	2.5	51.5	49.0	1
	GW064613	yes	43	35.71	Domestic	17.2	18.5	1.0	46.5	45.5	1
	GW104486	yes	43	35.67	Domestic, Stock	15.5	18.5	7.0	59.5	52.5	2
	GW048345		38.1	29.42	Domestic, Stock	13.1	18.5	6.0	53.5	47.5	2
	GW060067		76	65.50	Domestic, Stock	2.6	39.5	25.5	67.5	42.0	6
	GW052538	yes	88	63.51	Domestic, Stock	13.1	6.5	6.0	43.5	37.5	2
	GW114544		36			2.6	26.5	17.5	40.5	23.0	4
	GW035590		33.5			6.6	20.5	12.5	56.5	44.0	3
	GW060199		37			8.2	20.0	8.5	57.5	49.0	2
	GW107240	yes	42			8.5	9.0	4.0	41.5	37.5	1
	GW034742		76.2			2.3	28.0	21.0	41.5	20.5	5
3b. Replace Irrigation bore	GW102588	yes	88	72.14 56	Domestic, Irrigation, Stock	5.4	7.5	6.0	31.5	25.5	2
	GW026805		82.9	60.65 ND	Domestic, Irrigation, Stock	6.8	22.0	6.5	57.5	51.0	2
	GW023322	yes	44.8	34.30 7.6	Domestic, Irrigation, Stock	19.7	18.5	2.5	55.5	53.0	1
	GW026136	yes	52.7	51.86 ND	Irrigation, stock	21.4	18.0	7.5	52.5	45.0	2
	GW110236	yes	108	36.00 17	Irrigation, stock	24.8	18.0	4.0	52.5	48.5	1
	GW047157	yes	67.1	48.09 ND	Domestic, Irrigation, Stock	19.2	3.5	1.5	55.5	54.0	1
	GW108195	yes	126	44.90 28	Irrigation	21.1	18.5	10.5	69.5	59.0	3
	GW108194	yes	121.5	43.79 24	Irrigation	23.6	18.5	9.0	65.5	56.5	2
	GW072672	yes	122	36.20 24	Domestic, Irrigation, Stock	12.8 DDL	18.5	6.5	59.5	53.0	2
	GW107535	yes	114	51.17 12.77	Irrigation	29.1 80.27	17.5	7.5	54.5	47.0	2
	GW106710	yes	115	68.09 35	Domestic, Irrigation, Stock	14.3	18.0	8.0	56.5	48.5	2
	GW102309		67	51.10 45	Irrigation	3.9	28.0	16.0	67.5	51.5	4
	GW106489	yes	55	31.99 5	Irrigation	29.9	18.0	1.5	65.5	64.0	1
	GW106491	yes	60	40.20 5	Irrigation	26.2	18.0	2.0	57.5	55.5	1
	GW021817		92.9	68.50 54.8	Domestic, Irrigation, Stock	6.6	11.0	6.0	58.5	52.5	2

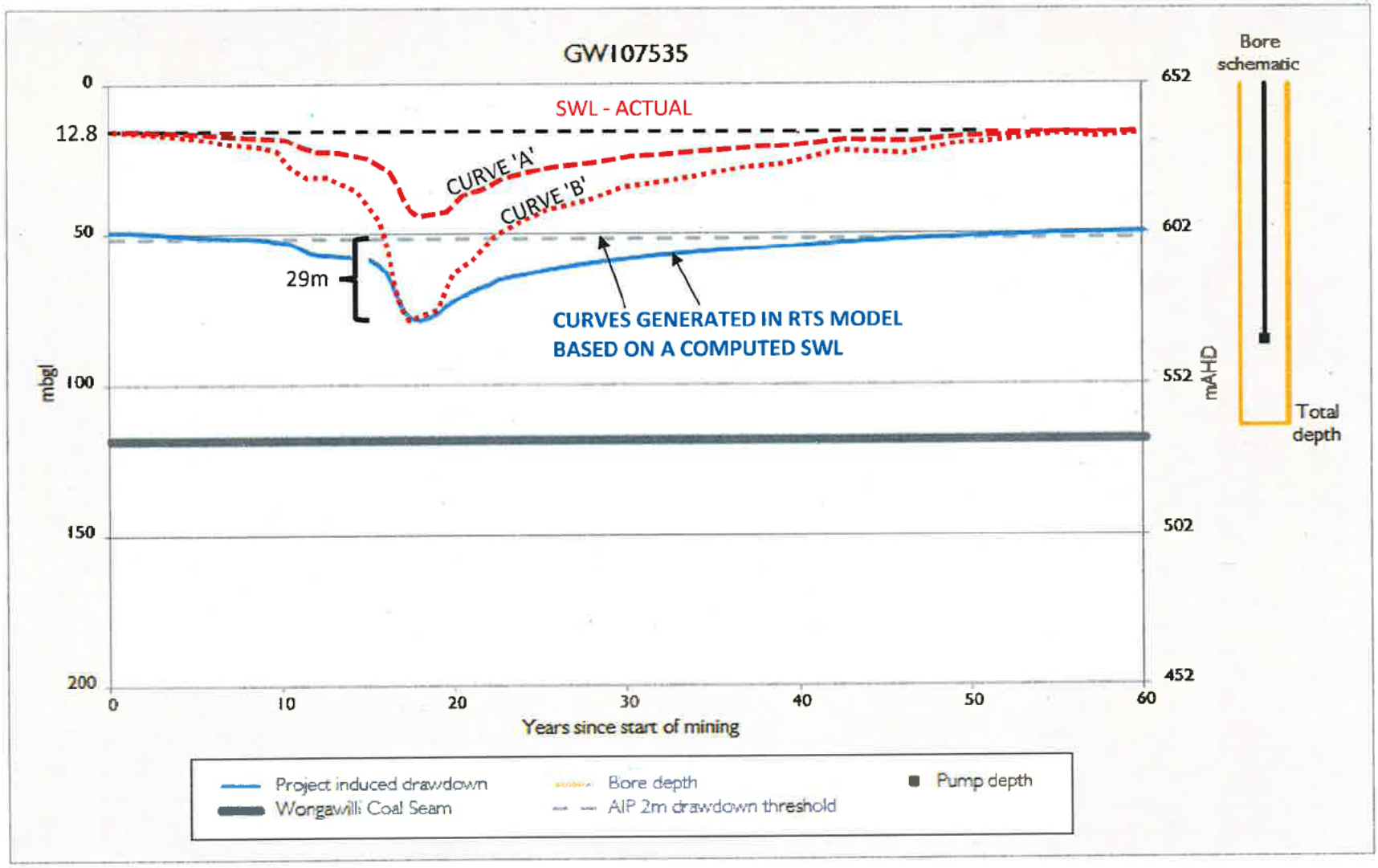
ARTIFICIAL SWL'S GENERATED BY HUME COAL VS RECORDED SWL

*Notes: * information on the existence of bore received after uncertainty analysis completed. Impacts from nearby similar bores have been used to include these in the make good assessment. (GW102950 – proxy bore GW057683; GW103326 – proxy bore GW047443*

ND = No Data recorded in *WaterNSW* database

Rosedale Bore

Comfort Hill Bore



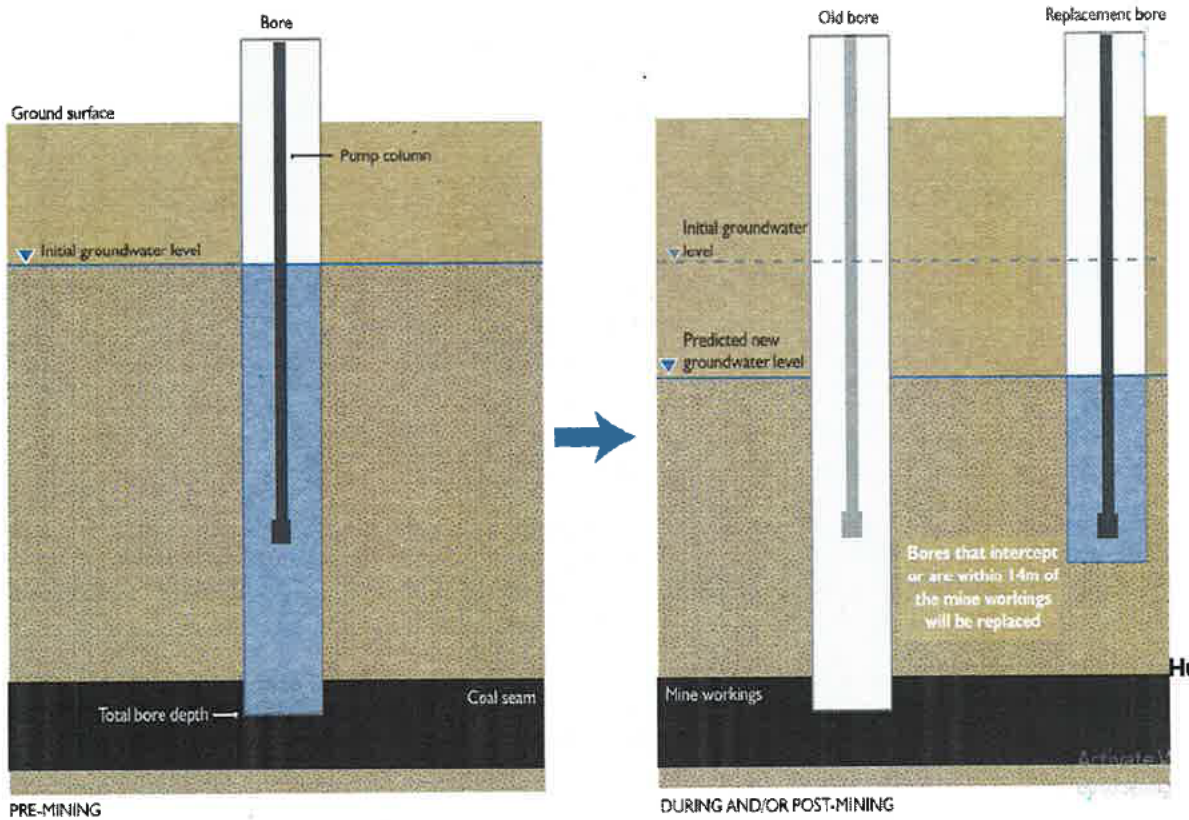
EMM HUMECOAL PROJECT

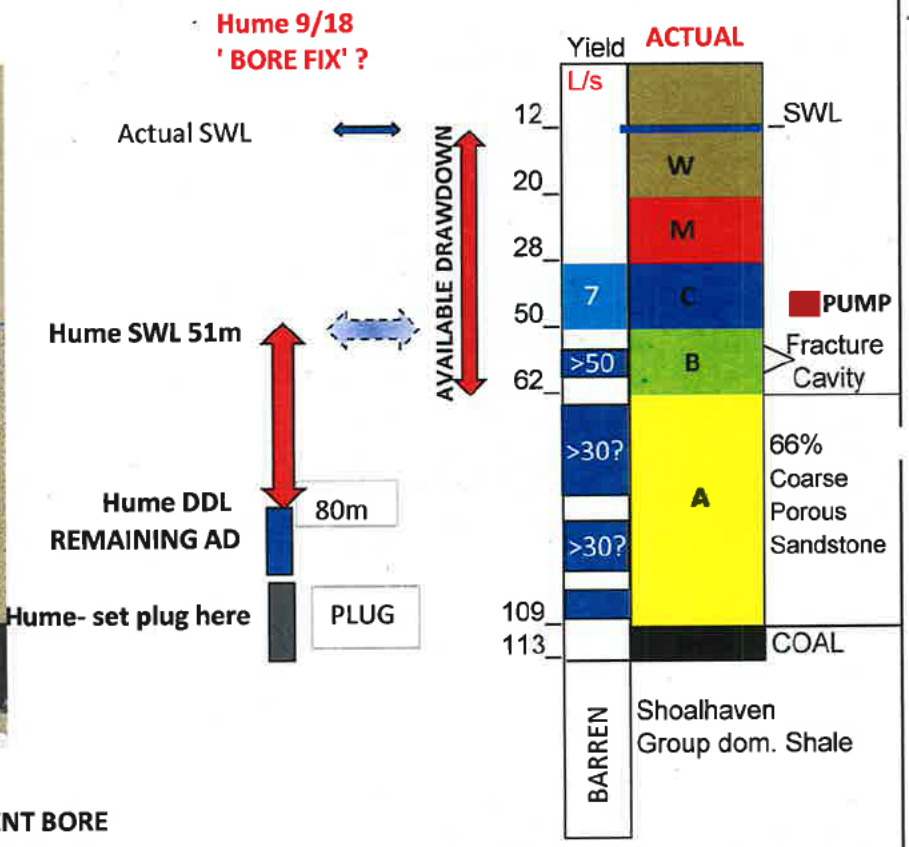
Drawdown in Landholder Bores
Make Good Strategy
Hume Coal Project

N

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE** **Hume Coal Hydrograph - Rosedale Bore**	**SLIDE 8**

ROSEDALE BORE - PROPOSED OPTIONS - RTS MODEL 2018





HUME COAL GENERIC 'MAKE GOOD' CONSTRUCTION DIAGRAM FOR REPLACEMENT BORE

The following is proposed by Hume:
1. **Reduce the depth of the bore by setting a plug at the base**
2. **Draw the water down to below the deepest level below 80m**
3. **This allows only about 10m of water column**

TESTED @ 42 L/s - max pump flow
DRAWDOWN 8.68m
LICENSE 400 ML/annum
POT'L YIELD ~100 L/s

Hydroilex Pty Ltd www.hydroilex.com.au	UTM: - Jan-19 Drawn: RJL Approved: RJL	**ROSEDALE BORE -' Make Good Strategy'** **HUME COAL PROPOSED BORE REMEDIATION VS ACTUAL DATA**	**SLIDE 9**

SUMMARY OF MAIN ISSUES

- Initial SWL's are erroneous, artificially lowered to reduce apparent impacts
- Initiation of AIP trigger levels are consequently false
- Dewatering of WAL holder aquifer license 'conditions of approval' of drawdown limits are not respected, where aquifer dewatering rules are breached
- Assumptions in 'make good provisions' are invalid:

  - Pumps are usually installed at the level of the main aquifer, or shallower (not at 75% of total bore depth), but designed to provide maximum drawdown, sufficient pump submergence, and effective cooling, with minimal cascading water;
  - If only 20% of the hydraulic head is remained after lowering of the water table, then aquifer loss and reduced 'available drawdown' will vary the viability, depending on the discharge rate;
  - Deepening a bore will unlikely increase the yield, unless the bore is initially shallow;
  - Bore deepening into the Shoalhaven Group is not feasible;
  - Relocating a bore does not necessarily replicate the same yields;
- All bores to be modified or replaced need *WaterNSW* approvals, which may also affect setbacks;
- Aquifer depletion, cementation, and cascading water induces bore plugging, cementation, iron precipitation and leakage of inferior water;
- Cost of deepening, disruptions to supplies, changes in pump ratings, power supply, infrastructure and associated management of 94 sites is a horrendous burden & intrusion on the users;