Annual Review 2018

Tarrawonga Coal Mine

Name of operation	Tarrawonga Coal Mine
Name of operator	Whitehaven Coal Mining Pty Ltd
Development consent/project approval number	PA 11_0047
Name of holder of development consent/project approval	Tarrawonga Coal Pty Ltd
Mining lease number	ML 1579, ML 1685, ML 1693, ML1749
Name of holder of mining lease	Tarrawonga Coal Pty Ltd
Water licence number	WAL 31084
Name of holder of water licence	Whitehaven Coal
MOP start date	4/12/2015
MOP end date	31/12/2020
Annual review start date [1]	1/01/2018
Annual review end date	31/12/2018

I, Jamie Frankcome, certify that this audit report is a true and accurate record of the compliance status of the Tarrawonga Coal Mine for the period 1st January 2018 until 31st December 2018, and that I am authorised to make this statement on behalf of Tarrawonga Coal Pty Ltd.

Note. a) The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	JAMIE FRANKCOMBE
Title of authorised reporting officer	DIRECTOR
Signature of authorised reporting officer	
Date	27/03/2019

[1] *NSW Annual Review Guideline was released in October 2015*

TABLE OF CONTENTS

TABLES

FIGURES

PHOTOS

APPENDICES

1 STATEMENT OF COMPLIANCE

The compliance status of the Tarrawonga Coal Mine (TCM) as at 31st December 2018 is summarised in Table 1 -Statement of Compliance. Table 2- Non-Compliances

notes non-compliances that occurred during the reporting period, and non-compliances from previous reporting periods that still require management action. References to the Environment Protection Licence (EPL) are limited to those that relate to the Project Approval conditions, specifically Schedule 3 Condition 22, 28(c), 33, 39(c)(ii) and Schedule 5 Condition 10 (c) and (e).

Table 1 -Statement of Compliance

Were all conditions of the relevant approval(s) complied with (Yes/No)?	
PA 11_0047	No
EPL 12365 (applicable conditions as above)	Yes
ML 1579	Yes
ML 1693	Yes
ML 1685	Yes
ML 1749	Yes
WAL 31084	Yes

Compliance status key for Table 2- Non-Compliances

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Table 2- Non-Compliances

Relevant Approval	Condition Number	Condition Description (summary)	Compliance status	Comment	Where Addressed in Annual Review
PA11_0047	Schedule 2 condition 2	Carry out project generally in accordance	Non-compliant	Refer following	Throughout AR
PA11_0047	Schedule 3 condition 21	Proponent shall prepare and implement a Blast Management Plan (BMP) for the project to the satisfaction of the Secretary.	Non-compliant	According to Section 4.2.1 of the BMP, TCM must notify ahead of the blast any interested party but failed to meet the condition on 18 January 2018. This resulted in an Official Warning Letter from the DP&E.	Section6.2

2 INTRODUCTION

The Annual Review (AR) produced for Tarrawonga Coal Mine (TCM), and it has been prepared in accordance with Condition 3 of Mining Lease (ML) 1579 and ML 1685 and Condition 4 of ML 1693 (Mining Act 1992), and Condition 4 (Schedule 5) of PA 11_0047, as modified.

TCM is located approximately 16km east of Boggabri (Refer Figure 1). TCM is owned by Tarrawonga Coal Pty Ltd (TCPL) and operated by Whitehaven Coal Mining Pty Ltd (WCMPL). Biodiversity offsets locations are shown in Figure 2- Regional Location of Biodiversity Offset and Figure 3- Regional Location of Biobank Site.

The current Mining Operations Plan for TCM was prepared under the new guidelines "ESG3: Mining Operations Plan (MOP) Guidelines". The AR follows the format required by the NSW Government Annual Review Guideline (October 2015). Though primarily covering the period from 1st January 2018 to 31st December 2018 (the reporting period), where relevant the Annual Review provides information on historical aspects of the operations, longer term trends in environmental monitoring results and provides relevant information on activities to be undertaken during the ensuing period, (i.e. from 1st January 2019 to 31st December 2019, or beyond).

2.1 Mine Contacts

The management personnel responsible for operational and environmental performance at the TCM and their relevant contact details are as follows:

- Mr Jacques du Toit, General Manager-Open Cut Operations:
  Contact: (02) 6741 9300.
- Mr John Hamson, Operations Manager:
  Contact: (02) 6741 5002.
- Mr Sebastien Moreno, Environmental Superintendent:
  Contact: (02) 6741 5009.

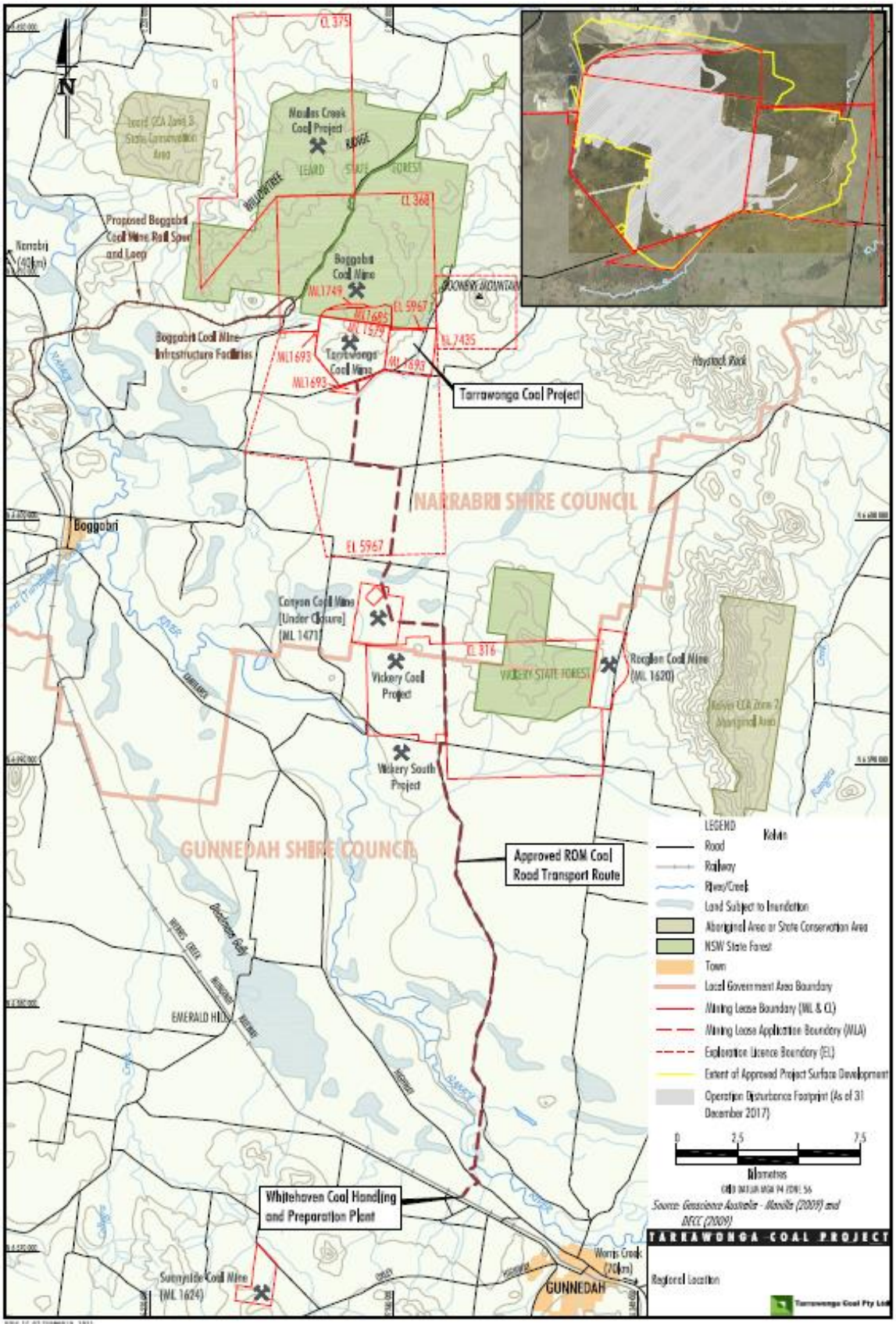


Figure 1- Locality Plan

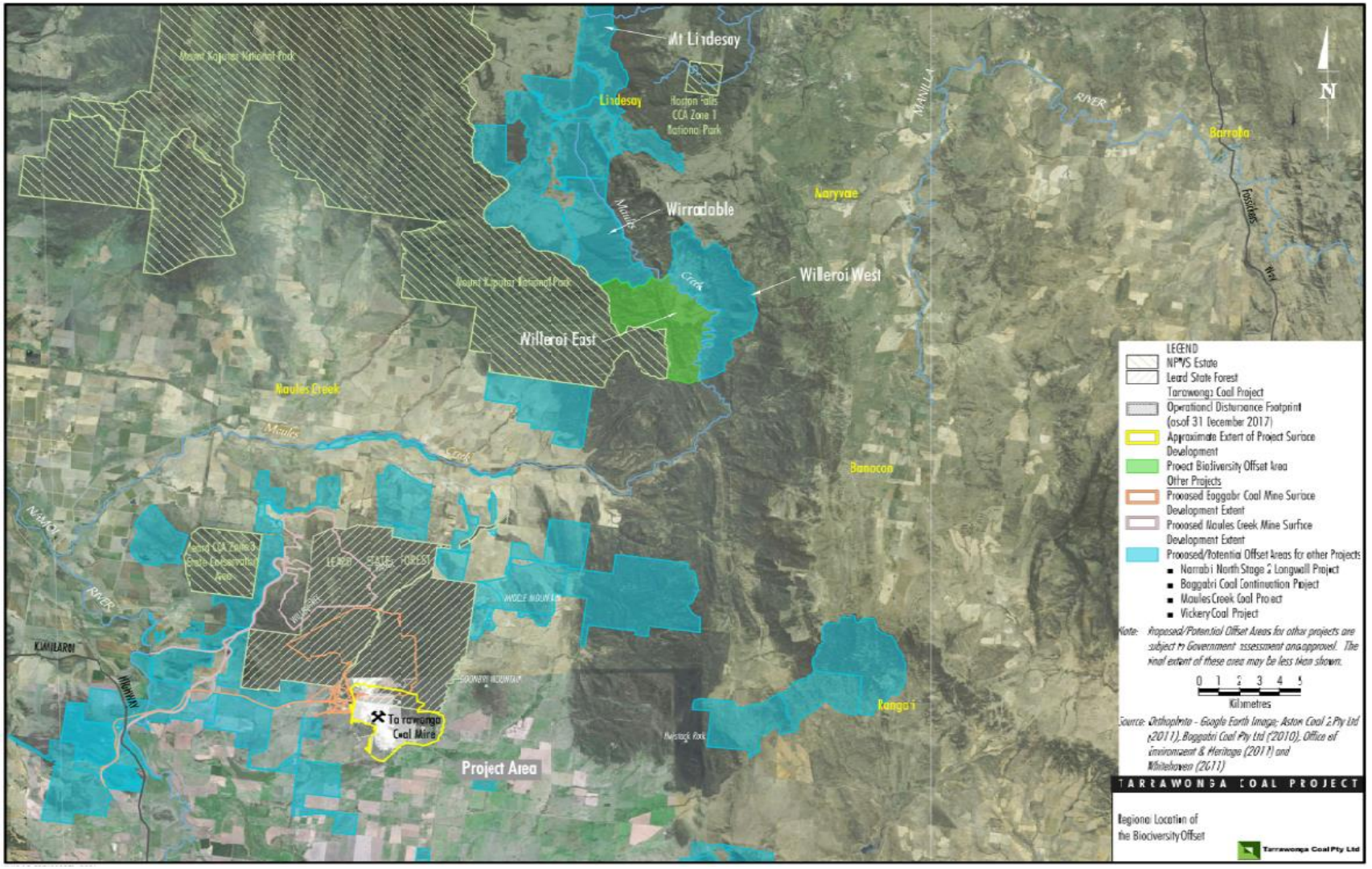


Figure 2- Regional Location of Biodiversity Offset

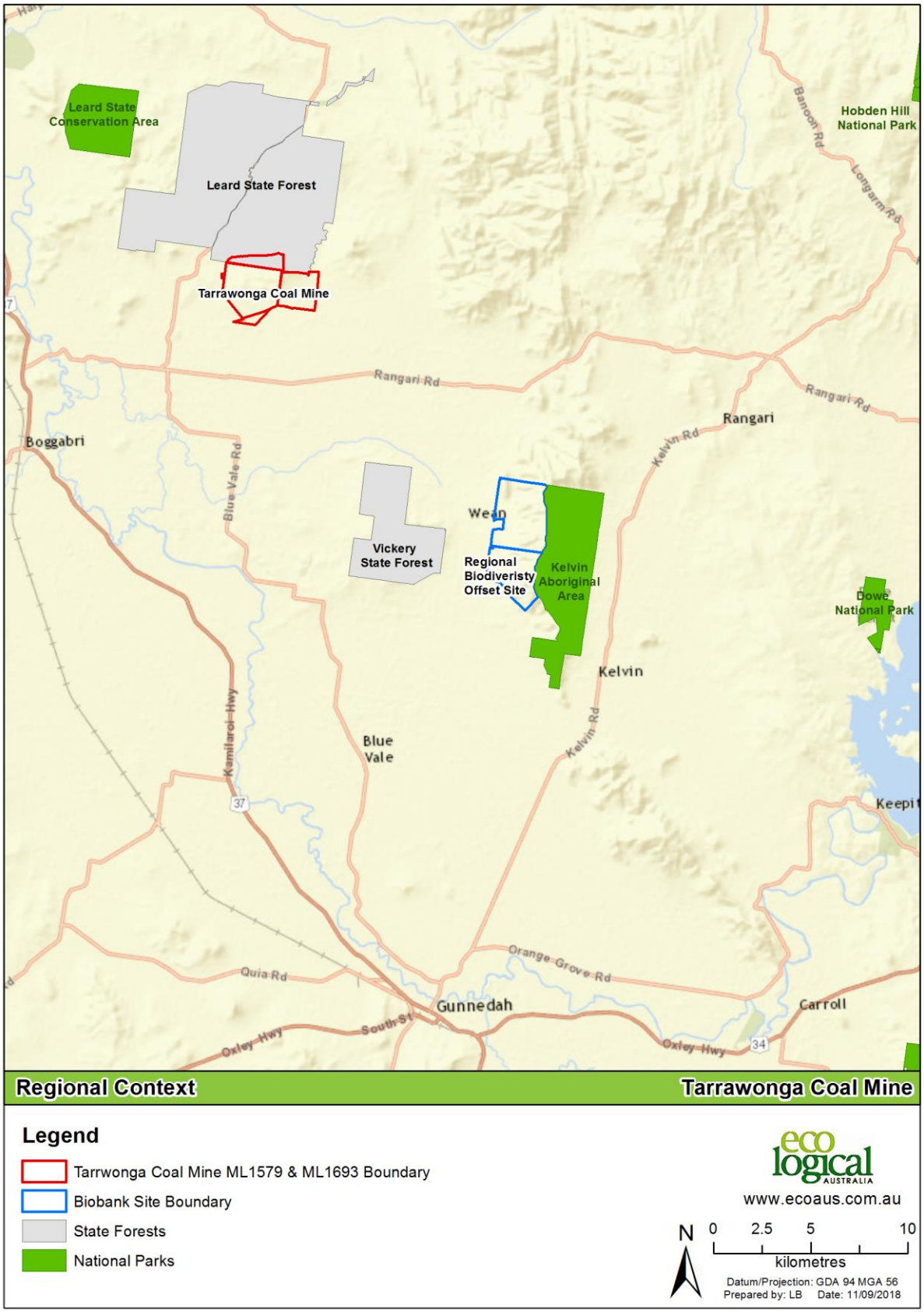


Figure 3- Regional Location of Biobank Site

3 APPROVALS

3.1 Tenements, Licences and Approvals

identifies the approvals in place for the TCM at the end of the reporting period, the issuing/responsible Authority, dates of issue, expiry date and relevant comments.

Table 3- Tenements, Licences and Approvals

Issuing / Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Division of Resources and Energy (DRE)	Exploration Licence (EL 5967)	10/01/2017	24/07/2021	Exploration Licence
Environment Protection Authority (EPA)	Environment Protection Licence (EPL) No. 12365	09/01/2006	N/A	EPL12365
Environment Protection Authority (EPA)	Variation- Environment Protection Licence (EPL) No. 12365	27/06/2017	N/A	Variation
NSW Department Primary Industry - Water	90BL253276 90BL253278 90BL253279 90BL253280 90BL254253 90BL254254 90BL254255 90BL254221 90BL254214 90BL255766 WAL31084 WAL29548	18/05/2006 18/05/2006 18/05/2006 18/05/2006 18/05/2006 18/05/2006 24/04/2007 05/04/2007 04/04/2007 19/08/2012 02/08/2013 26/07/2012	Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity	Monitoring bores 250 units 50 units
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	22/01/2013	31/12/2030	
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	2014	31/12/2030	MOD1 (continued coal haulage to Gunnedah CHPP)
Department of Planning &	Project Approval PA 11_0047	2016	31/12/2030	MOD2 (allow receipt of all types of coal

Issuing / Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Environment (DP&E)				reject)
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	February 2017	31/12/2030	MOD3 (Traffic Management Plan)
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	May 2017	31/12/2030	MOD4 (Sound Power Level modification)
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	August 2017	31/12/2030	MOD5 (Open Cut Augmentation)
Department of Planning & Environment (DP&E)	Project Approval PA 11_0047	October 2018	31/12/2030	MOD6 (Coal Haulage)
Department of the Environment	EPBC 2011/5923	11/03/2013	31/12/2053	Conditional Federal Project Approval for LOM Project
Division of Resources and Geoscience (DRG)	Mining Lease (ML) 1579	03/04/2006	02/04/2027	Expires 21 years from commencement
Division of Resources and Geoscience (DRG)	Mining Lease (ML) 1685	18/07/2013	14/11/2032	
Division of Resources and Geoscience (DRG)	Mining Lease (ML) 1693	14/10/2013	14/10/2034	Expires 21 years from commencement
Division of Resources and Geoscience (DRG)	Mining Lease (ML) 1749	17/11/2017	14/11/2032	
Division of Resources and Geoscience (DRG)	Mining Operations Plan (MOP) Amendment A	14/11/2016	31/12/2020	MOP Amendment A
Division of Resources and Geoscience (DRG)	Mining Operations Plan (MOP) Amendment B	30/06/2017	30/12/2020	MOP Amendment B approved 30/06/2017.
Division of Resources and Geoscience (DRG)	Mining Operations Plan (MOP) Amendment C	01/11/2015	30/11/2020	MOP Amendment C approved 16/03/2018

4 OPERATIONS SUMMARY

4.1 Mining Operations

Table 4- Production Summary presents the production summary at the end of the reporting period.

Table 4- Production Summary

Material	Approved Limit (Project Approval PA11_0047)	Previous Reporting Period 2017	This Reporting Period 2018 (actual)	Next Reporting Period 2019 (forecast)
Waste Rock/ Overburden (bcm)	***n/a***	15,051,089	17,086,835	23,388,129
ROM Coal/Ore (t)	***3,000,000***	1,872,836	2,044,658	2,752,399
Coarse and Fine Reject (t)	***700,000***	527,718	558,563	700,000
Saleable Product (t)	***n/a***	3,376,226	2,075,029	2,627,321
Gravel Production (m^3)	***90,000***	0	0	90,000

4.1.1 Other Operations

PA 11_0047 permits 24-hour operation of mining activities. TCPL has made some minor changes to operating times to accommodate changes in the working roster for improved production and economic stability.

Open cut mining activities, including processing of coal, generally occurred between the hours of 6:30 am and 5:00 pm (day shift) and 4:30 pm and 3:00 am (night shift) from Monday to Friday. Whilst processing of coal day shifts have been run almost every Saturday, mining activity day shifts have only occurred on occasion to meet production deadlines.

4.1.2 Coal Haulage

For the reporting period 2,309,673 tonnes of coal was hauled along the approved haulage route from TCM to the Whitehaven Gunnedah CHPP. During the same period 62,722 tonnes of coal was distributed from TCM to the domestic market. Combined haulage of ROM coal from TCM, Rocglen Coal Mine and Vickery Coal Mine during 2018 was 3,515,973 tonnes. There was no coal haulage

from Vickery Coal Mine during the reporting period. The total tonnage of coal rejects received by TCM during 2018 was 558,563 tonnes. Transport of coal from the site or receipt of coal reject from the Whitehaven CHPP by truck has only occurred during the approved hours of:

(a) 6 am to 9.15 pm Monday to Friday;

(b) 7 am to 5.15 pm Saturday; and

(c) at no time on Sundays or public holidays.

4.1.3 Exploration

Whitehaven Coal geology department undertook exploration drilling during the reporting period. Ten exploration boreholes were completed in April 2018 and these will be reported in the ML1579 Annual Report due in May 2019.

Exploration drilling will continue to be undertaken at the TCM to further assess the coal reserves within the tenements. The renewal of the licence (EL5967) took effect on 10 January 2017 and term will end on 24 July 2021.

4.2 Next Reporting Period

4.2.1 Mine Operations

The mine production rates are planned for 2,752,399 tonnes per annum of ROM coal and 23,388,129 bank cubic metres (bcm) of overburden during calendar year 2019.

Vegetation clearing activities in mining areas over the next reporting period will be conducted in accordance with the approved Biodiversity Management Plan (BMP) and the updated Mining Operations Plan Amendment C (2018). The clearing program will be undertaken during the annual twelve week clearing campaign from the 15th February to the 30th April, except under exceptional circumstances and with the approval of the Secretary of the DP&E.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Actions from the previous Annual Review are noted in Table 5- Actions required from the previous Annual Review.

Table 5- Actions required from the previous Annual Review

Action Required from Previous Annual Review	Requested By	Condition Number	Action Taken by the Operator	Where Discussed in Annual Review
Include the monthly coal and gravel records for 2017 to WHC website	DP&E	Sch. 3 Cond. 56	Uploaded to WHC website	Section 5
Include the Environmental Assessment for TCM's Sound Power level Environmental Assessment dated January 2017 and associated DP&E response dated June 2017 to WHC website.	DP&E	Sch.5 Cond.12	Uploaded to WHC website	Section 5
Include the TCM Open Cut Augmentation Modification Environmental Assessment dated June 2017 to WHC website.	DP&E	Sch.5 Cond.12	Uploaded to WHC website	Section 5
Include in the Complaints Register for the period January to August 2018 to WHC website	DP&E	Sch.5 Cond.12	Uploaded to WHC website	Section 5

6 ENVIRONMENTAL PERFORMANCE

The following sub-sections document the implementation and effectiveness of the various control strategies adopted at TCM, together with monitoring data for the reporting period. Life of mine monitoring data is included as Appendices in this AR, where relevant, to allow for discussion on longer-term trends.

6.1 Noise

6.1.1 Criteria

The Project Approval (PA 11_0047) and EPL 12365 detail the noise criteria for site operations and coal haulage.

Table 6- Noise Compliance

Noise Criteria dB(A)			
Location	*Day, Evening & Night LAeq (15 min)*	*Night LAeq (1 min)*	
All other privately-owned residences	35	45	
Road Traffic Noise Criteria dB(A) LAeq (1 hour)			
Location	*Day*	*Evening*	*Night*
Any residence on privately-owned land	60	60	55

A number of other specific conditions (i.e. acquisition, monitoring protocols and cumulative impacts) are listed in PA and EPL 12365.

6.1.2 Environmental Management Measures

In accordance with the Noise Management Plan, a number of operational measures continue to be implemented on site to maintain compliance with limits. These include but are not limited to:

- Real-time noise monitor and web based interface;
- Automated SMS alarms notifying site personnel of elevated noise levels approaching noise criteria;
- Modification of operations where required;

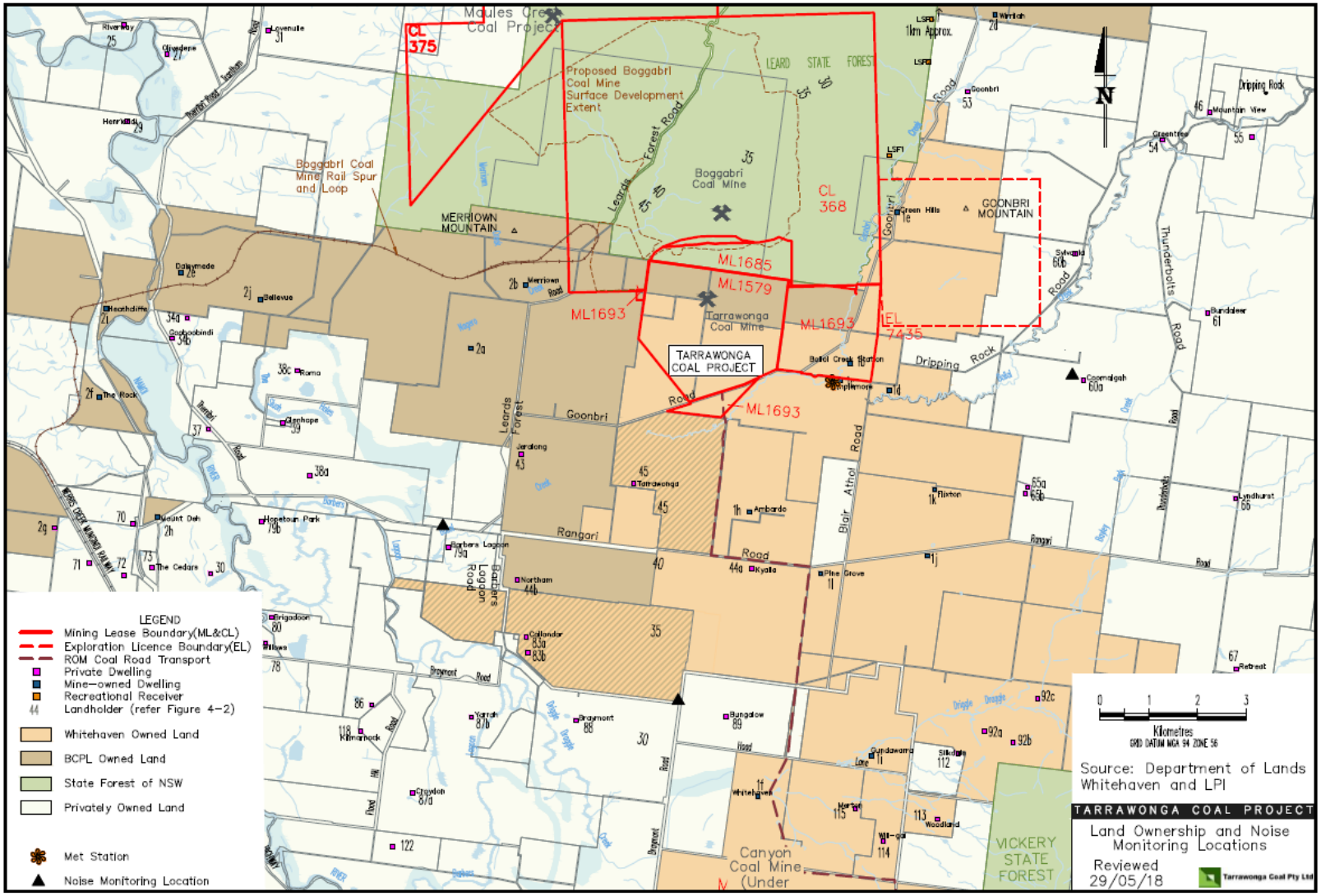


Figure 4- Noise monitoring locations

6.1.3 Key Environmental Performance

Attended Noise Monitoring

An independent consultant completed attended noise monitoring programs on a quarterly basis during the reporting period. The noise monitoring sites are identified on Figure 4 and include 3 sites: the "Bungalow" (TN4), "Barbers Lagoon" (TN3) and "Matong-Coomalgah" (TN2) properties. Attended noise monitoring showed compliance with the limits specified in the project approval on all occasions during the reporting period. No complaints were received in relation to noise during that period.

Attended noise monitoring to date indicates that results are generally consistent with previous reporting year's results.

Road Noise Monitoring

TCM had to ensure that the noise generated by road transport along public sections of the coal haulage route was in accordance with the Tarrawonga and Rocglen Road Noise Management Plan and with Schedule 3 condition 12 of PA 11_0047. A road noise survey was undertaken in July and December 2018. The monitoring occurred at the privately owned residences on the "Weroona" property and "Brooklyn" properties located off Blue Vale Road. Results showed compliance on all occasions, which is consistent with the predictions of the Whitehaven ROM Coal Haulage Modification Environmental Assessment for the southern section of the approval transport route.

Real Time Noise Monitoring

In accordance with the requirements of PA 11_0047 and EPL 12365, TCM continued to undertake real time noise monitoring and managed noise according to the Noise Management Plan during the reporting period.

Annual Sound Power level Testing

In November 2018, sound power level (SPL) testing of all the fixed and mobile plant was undertaken. According to MOD 4 (May 2017) of the PA 11_0047, there is no criteria applicable for SPL and levels identified in the EA are only used for comparison purposes. Each plant item was assessed for different types of activities (i.e. Dynamic and Stationary) and SPL results of the machines which were greater than indicative levels identified in the EA are shown in Table 7- Summary Sound Power Level Exceedances. All other mobile plant tested were within the indicative levels adopted for modelling purposes in the EA.

Table 7- Summary Sound Power Level Exceedances

Plant Items	Plant type	Name/ID	Dynamic SWL- Indicative Sound Power Level A-weighted (dB)	Modelled Level dB(A)	Variance (dB)
1	***Bulldozer***	***D10- 812***	119	116	+3
2	***Bulldozer***	***D10- 846***	120	116	+4
3	***Bulldozer***	***D10-856***	121	116	+5
4	***Bulldozer***	***D11- 822***	123	116	+7
5	***Bulldozer***	***D11- 842***	119	116	+3
6	***Bulldozer***	***D11-828***	121	116	+5
7	***Bulldozer***	***D11-843***	119	116	+3
8	***Grader***	***16M- 563***	110	108	+2
9	***Excavator***	***Hitachi-540***	116	115	+1
10	***Excavator***	***Terex-532***	116	115	+1
11	***Excavator***	***Terex-530***	118	115	+3

Acoustic model annual validation

An independent consultant was engaged to assess and validate the noise model prediction developed in 2011 against the monitoring result for 2018.

Measured levels higher than those of the predicted levels occurred during Quarter 1, Quarter 2 and Quarter 3. The greatest positive difference between predicted and measured $L_{Aeq(15minute)}$ levels where 7 dB(A) during the night-time period at TN2 under calm meteorological conditions.

Meteorologically applicable measured levels, during the evening and night-time periods, were generally 3 dB to 7 dB below the predicted meteorologically enhanced levels outlined in the EA.

Measured $L_{A1(1minute)}$ levels were generally consistent with predicted levels, with measured levels of up to 2 dB higher than predicted levels occurring at TN3. At TN2 the highest measured $L_{A1(1minute)}$ level was 1 dB below the predicted levels and the highest measured $L_{A1(1minute)}$ level at TN4 matching the predicted level. At all times during quarterly monitoring TCM was in compliance with the applicable noise criteria.

6.1.4 Proposed Improvements to Environmental Management

During the next reporting period, TCM will purchase new plantthat will be tested for sound power levels before use and fitted with noise suppressant technology.

A revised Noise Management Plan (NMP) was submitted in August 2018 and is being reviewed by the department. The revised NMP addresses the 2017 PA11_0047 Modification (MOD4) and the BTM Noise Management Strategy approvals.

6.2 Blasting

6.2.1 Criteria

Blasting criteria for the TCM are noted in PA 11_0047, and Condition L5 of EPL 12365.

- Blasting must only be carried out between 9.00 am and 5.00 pm, Monday to Saturday inclusive. Blasting is not allowed on Sundays, public holidays or at any other time without the written approval of the Director-General.
- A maximum of one (1) blast per day, unless an additional blast is required following a blast misfire and a maximum of 4 blasts per week averaged over a calendar year for the project:
- For non-project related residences, the overpressure level from blasting operations must not:
    - exceed 115dB (Lin Peak) for more than 5% of the total number of blasts over a period of 12 months; or
    - exceed 120dB (Lin Peak) at any time.
- For non-project related residences, ground vibration peak particle velocity from the blasting operations must not:
    - exceed 5mm/s for more than 5% of the total number of blasts over a period of 12 months; and
    - exceed 10mm/s at any time, at any residence on privately owned land.

6.2.2 Key Environmental Performance

During the reporting period, 73 blasts were initiated (all of which were monitored). There were no instances where two or more blasts were required to be fired on one day due to safety reasons. No exceedances of the blasting criteria have been recorded on privately owned land during the reporting period. There was only one instance where overpressure monitoring results exceeded 115 dB during the reporting period, occurring at the project-related “Tarrawonga” property, noting that

criteria only apply to non-project related properties. There were no instances where blast overpressure exceeded 120dB .

The maximum recorded ground vibration during the reporting period was 1.32mm/s recorded at "Tarrawonga" on 27 September 2018 which is below the consent criteria of 5mm/s. Results during the reporting period showed that performance improved in comparison to the previous reporting period with only one event slightly in excess of 115dB as noted above at the project related property "Tarrawonga" on 21st September 2018 recording 116dB. All blast monitoring results for the reporting period, including the time of initiation, have been included in Appendix 1.

Performance during the reporting period was consistent with the EA prediction for blasting.

The maximum fume rating for the reporting period was classified as a '3a' per the *Australian Explosives Industry And Safety Group Inc. – Code of Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting*. No instances were recorded of blast fume leaving the premises boundary.

6.2.3 Proposed Improvements to Environmental Management

A revised Blast Management Plan was submitted to DP&E in August 2018 for approval. No additional improvement are proposed for the next period.

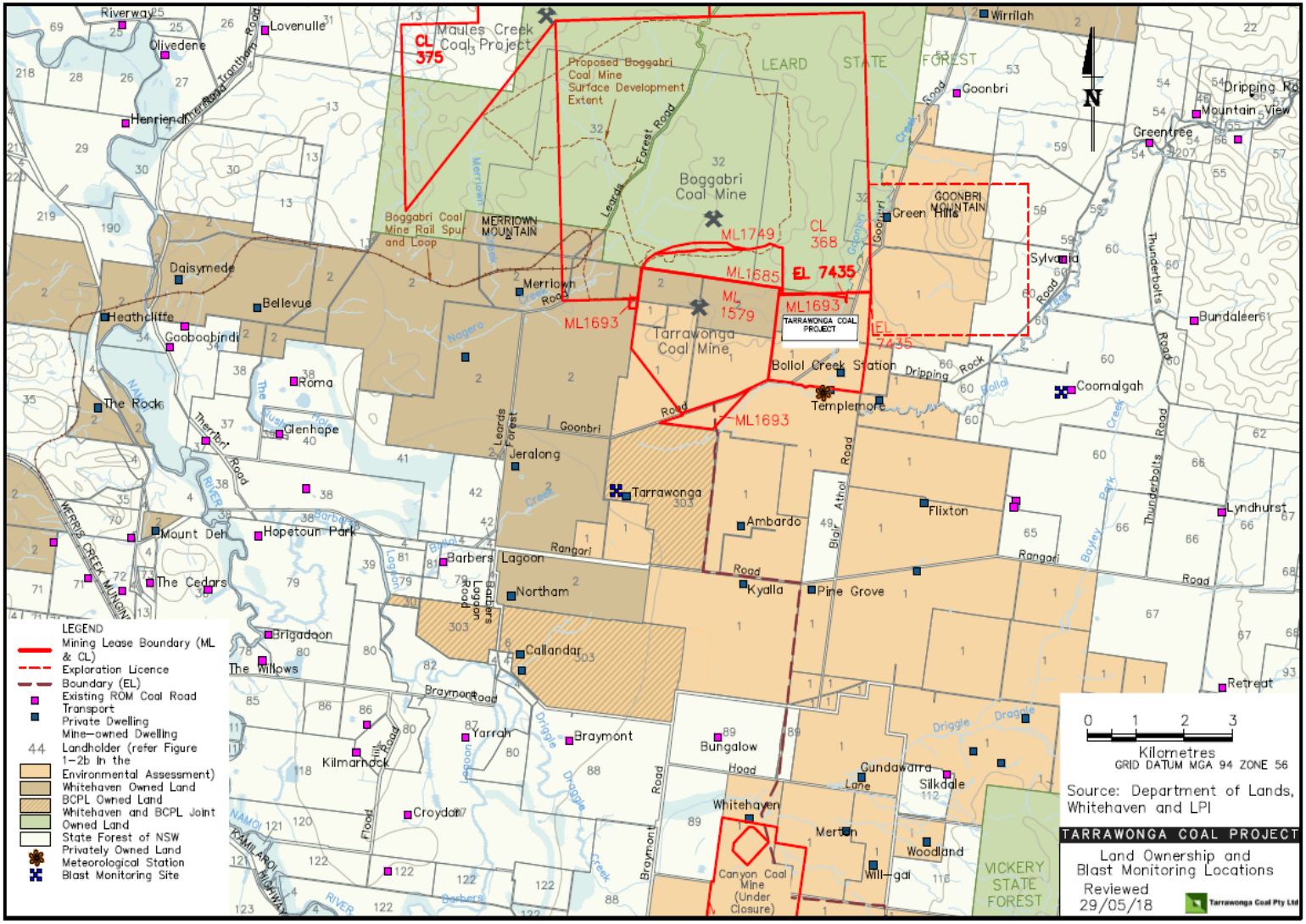


Figure 5- Blast monitoring locations

6.3 Air Quality

6.3.1 Criteria

The air quality criteria applicable to the TCM are specified in PA 11_0047 Schedule 3. Air quality criteria is summarised below:

- Acceptable mean annual increase in deposited dust – 2g/m^2/month.
- Mean annual dust deposition (all sources) – 4g/m^2/month.
- Mean annual Total Suspended Particles (TSP) (all sources) – 90 µg/m3.
- Mean annual Particle Matter under 10 microns (PM10) – 30 µg/m3.
- 24-hour average PM10 particulate level – 50 µg/m3.

6.3.2 Environmental Management Measures

TCM employs a range of air pollution control measures specified in the Air Quality and Greenhouse Gas Management Plan (AQGGMP), including:

- maintaining a real time SMS alarming system to key operational personnel;
- modification of work practices where required including changing dumping strategies;
- temporary cessation of operational equipment;
- Limiting ground cover removal in advance of mining consistent with operational requirements;
- Ground cover removal as part of the topsoil removal activities, rather than prior to topsoil removal;
- Where practicable, limiting soil stripping activities to periods when there is sufficient soil moisture to prevent significant dust lift-off and avoiding periods of high winds;
- Soil stripping using bulldozers, thereby eliminating the dust generated from elevated scrapers;
- Application of water to exposed surfaces, with emphasis on those areas subject to frequent vehicle/equipment movements which may cause dust generation and dispersal;
- Use of dust suppressant product on all roads;
- water injection on drilling rigs;
- Use of imported aggregates for blast hole stemming;
- Water application at the crusher and on the conveyor discharge point to the coal bin;

- Cessation of coal processing activities during periods of concurrent high winds and temperatures which cause coal dust dispersal, independent of water applications.
- ROM coal pad watering;
- Progressive shaping and rehabilitation of areas once they are no longer required for mining purposes;
- Speed limit restrictions on all vehicles and equipment on the mine site;
- Use of covers on all product coal trucks. All coal haulage vehicles (road trucks only), including those operated by sub-contractors, are fitted with roll-over tarpaulins.
- Stabilisation trial of the southern face of the southern emplacement.
- TCM continues to liaise with Boggabri Coal Mine (BCM) and Maules Creek Coal Mine (MCCM) during periods of elevated air quality events to manage cumulative impacts.

Figure 6 identifies the locations of the air quality monitoring locations including the deposited dust gauges (DDG), two Tapered Element Oscillating Micro balance units (TEOM) installed on project related properties (Flixton and Will-gai) and one High Volume Air Sampler (HVAS) on privately owned property (Coomalgah) operating and serviced during the reporting period.

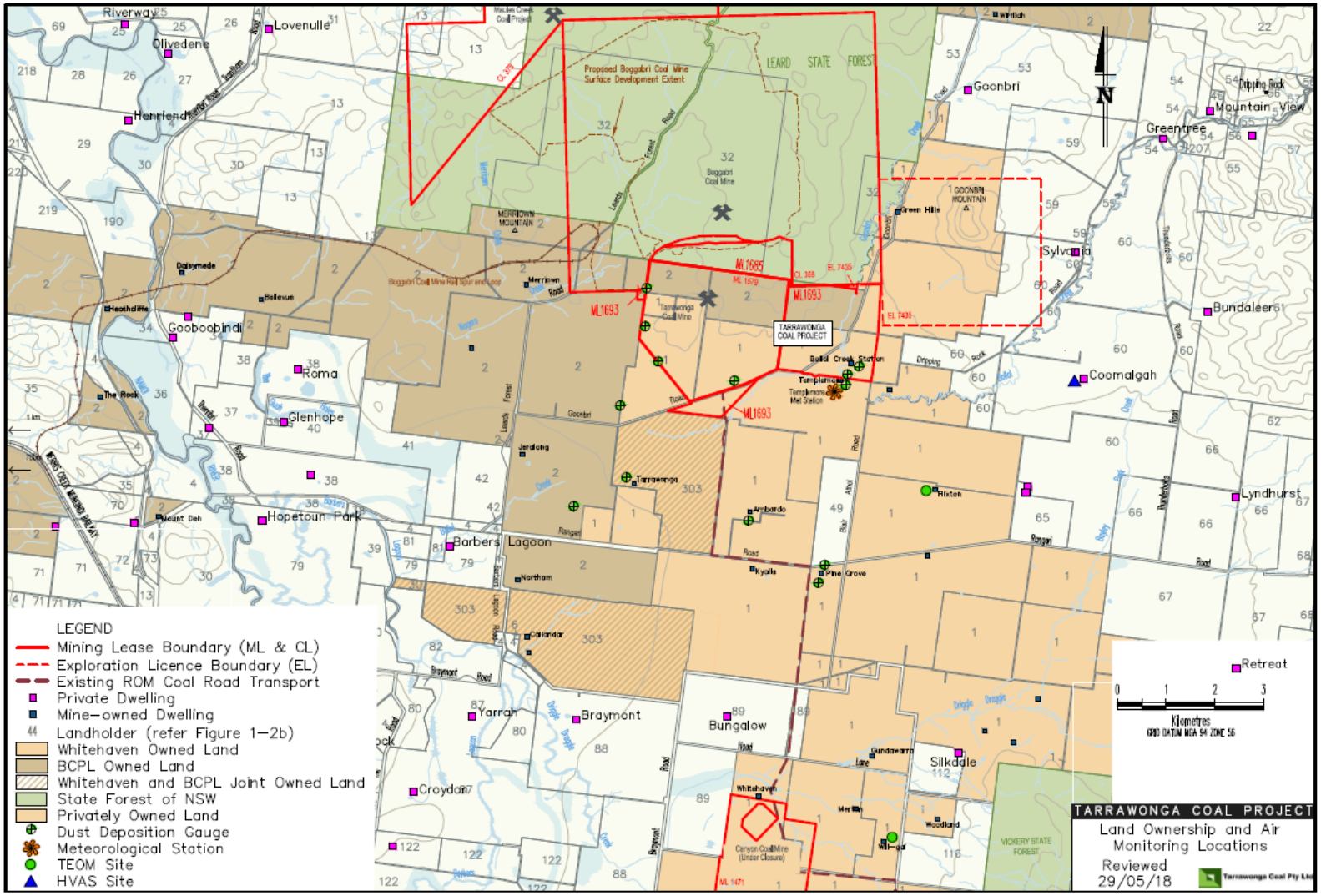


Figure 6- Air quality monitoring locations

A review of Table 8 shows that the annual average limit for deposited dust was exceeded at eight monitoring locations. These monitoring locations are all located on project related land and therefore monitoring criteria are not applicable at those locations. Though results from Templemore (EB-4) site were regularly elevated during the period with peak above the 18.9 g/m^2/month in December, they were overall lower than in 2017. Bollol Creek (EB-5) and Ambardo (EB-6) had the second highest levels of deposited dust recorded in December and June with 11.1 and 11.55 g/m^2/month respectively. Though the period was particularly dry, deposited dust levels measured were relatively conservative with 2017.

Table 8.1-Deposited Dust monitoring data summary 2018

MONTH	TEMPLEMORE (EB-4)[1]	BOLLOL CREEK STN (EB-5)[1]	AMBARDO (EB-6)[1]	TARRAWONGA (EB-7)[1]	THUIN (EB-8)[1]	PINE GROVE (EB-9)[1]	TARRAWONGA MINE (EB-10)[1]	TARRAWONGA MINE (EB-11)[1]	TARRAWONGA MINE (EB-14)[1]	TARRAWONGA MINE (EB-15)[1]	JERALONG NORTH (EB-16)[2]
Jan 2018	6.7	2.6	10.5	2.1	2.5	3.4	14.4	4.3	1.9	3.4	5.3
Feb 2018	1.9	2.5	2.6	1.3	13.3	6.2	3.6	3.2	2	3.1	2.2
Mar 2018	6.1	7.5	4.9	1.5	3.9	1.5	7.8	2.8	2.3	3.8	9.4
Apr 2018	1.2	3.4	1.2	0.9	3.4	2.4	4.8	4.5	1.9	4	3.3
May 2018	2.3	2.7	1	0.9	1.6	1.9	2	6.9	1.7	3.1	2.8
Jun 2018	1.2	2.4	0.9	0.8	2.1	2.4	3.4	3.1	2.1	4.7	0.8
Jul 2018	18.4	3.4	0.9	0.6	3.4	1.1	2.2	2	1.8	5	1.1
Aug 2018	5.19	4.01	11.55	1.77	3.63	2.11	3.85	5.08	3.58	4.35	1.94
Sep 2018	5.9	9.8	3.6	3.4	4.1	4.4	5.6	3.4	4.3	6.1	3.1
Oct 2018	5.9	4.3	11.1	1.7	3.8	4.7	10.8	3.5	3	5.4	2.7
Nov 2018	4.3	1.6	3.2	4.1	6.2	5.8	5.5	11.3	4.63	6.78	3.32
Dec 2018	18.9	11.1	11.1	2.8	4.2	4.6	5.7	3	C	8	4.3
2018 Period Average	**7.9**	**4.4**	**5.0**	1.8	**4.3**	3.3	**6.4**	**4.7**	2.7	**4.8**	**8.6**
2017 Period Average	**13.4**	**4.7**	2.1	1.5	2.6	1.8	**6.2**	3.4	2.7	**4.6**	**7.6**
May-Dec 2016 Period Average	**8.2**	**3.7**	0.7	0.6	**9.6**	1.2	**6.8**	**5.8**	1.5	**5.0**	0.9

[1] Project related land

[2] Owned by Boggabri Coal Mine.

C: Contaminated Sample (not included in annual average)

TCM has one High Volume Air Sampler (HVAS), which is located at the "Coomalgah" property. The PM10 levels recorded for the reporting period show 15 exceedances of the 24hr average criteria occurring at least once per month except for April, August and September.

Investigation of those exceedances showed they were not mine related but more likely caused by farming activity (i.e. harvest of wheat) and high wind speed (above 7.5m/s) combined with a prolonged period of very dry conditions recorded during the monitoring period. For these reasons, those exceedances have been excluded from the annual average calculation and are summarised in Table 8.2.

Table 8.2- HVAS PM_{10} 24 hours average exceedances

Date Sampled	24hr average level (µg/m³)	24hr average Limit (µg/m³)	Comments
19/01/18	67.7	50	Determined as not mine related - Extremely windy conditions noted by the monitoring contractor. Weather Station recorded winds above the 7.5m/s during that period from the South-Southeast. The result was excluded from annual average calculations
25/01/18	61.0	50	Determined as not mine related- Windy noted in the field sheet. Weather data showed that wind was mainly coming from South. That was exclude from annual average calculation.
18/02/18	51.4	50	Determined as not mine related. Windy noted in the field sheet. Weather station recorded winds above 9.5m/s during that monitoring period. The result was excluded from annual average calculations.
20/03/18	63.0	50	Determined as not mine related. Farming and grazing activities recorded in field sheet. The weather station recorded wind from Northeast and mine is located Northwest of the monitor. The result was excluded from annual average calculations.
7/5/18	54.4	50	Determined as not mine related. Windy noted in the field sheet. Weather station showed prevailing wind from Northeast and Southwest. The result was excluded from annual average calculations.
19/05/18	57.6	50	Determined as not mine related. Dry and dusty surrounding paddock noted in field sheet, Farming activity noted in field sheet on the 15/05. Prevailing wind recorded from South-Southeast and Northeast. Excluded from annual average calculations.
6/06/18	54.5	50	Determined as not mine Related. Very Windy with winds above 7.5 m/s recorded from South-Southwest and sheep grazing noted in the field. Excluded from annual average calculations.
30/06/18	119.0	50	Determined as not mine related. Grazing activity noted in the field sheet when filter was changed on 24/06 and dusty conditions observed with prevailing winds from East-Northeast. Excluded from annual average calculations.
6/7/18	121.0	50	Determined as not mine related. Winds recorded were predominantly from Northeast and Southwest and elevated wind recorded on the 6/07/18 (above 8m/s). Dry conditions noted on the field sheet. Excluded from annual average calculations.
18/07/18	139.0	50	Determined as not mine related. Wind recorded was from Northeast during the period and peak recorded above 6.5m/s. Dry conditions and windy noted on the field sheet. Excluded from annual average calculations.
24/07/18	248.0	50	Determined as not mine related. Elevated wind recorded above 10.5 m/s. Dry conditions and grazing activity noted by the contractor. The result was excluded from annual average calculations.
15/11/18	66.7	50	Determined as not mine related. Windy noted in the field sheet and above 7m/s on the day of sampling. Prevailing wind coming from South and West direction. Excluded from annual average calculations.
3/12/18	51.1	50	Determined as not mine related. Shed construction nearby noted in the field sheet. Wind recorded at the weather station on that day was predominantly coming from South and West of the monitor. Excluded from annual average calculations.
15/12/18	175.0	50	Determined as not mine related. Farming activity with movement of trucks near the monitor. Filter was very dusty (red dirt) noted on the field sheet. Wind recorded was above 7.5m/s. Excluded from annual average calculations.
27/12/18	111.0	50	Determined as not mine related. Grazing activity and wind noted on the field sheet. Most wind was coming from East of the monitor according to the weather station. Excluded from annual average calculations.

At Coomalgah, the PM10 annual average was 26.1 µg/m3, which is below the 30 µg/m3 criterion specified in Schedule 3 condition 25. Noting the exclusion of non-mine related results, TCM is compliant with the limits as shown in Figure 7.1 HVAS-PM10 24hr average monitoring data (2016-2018).

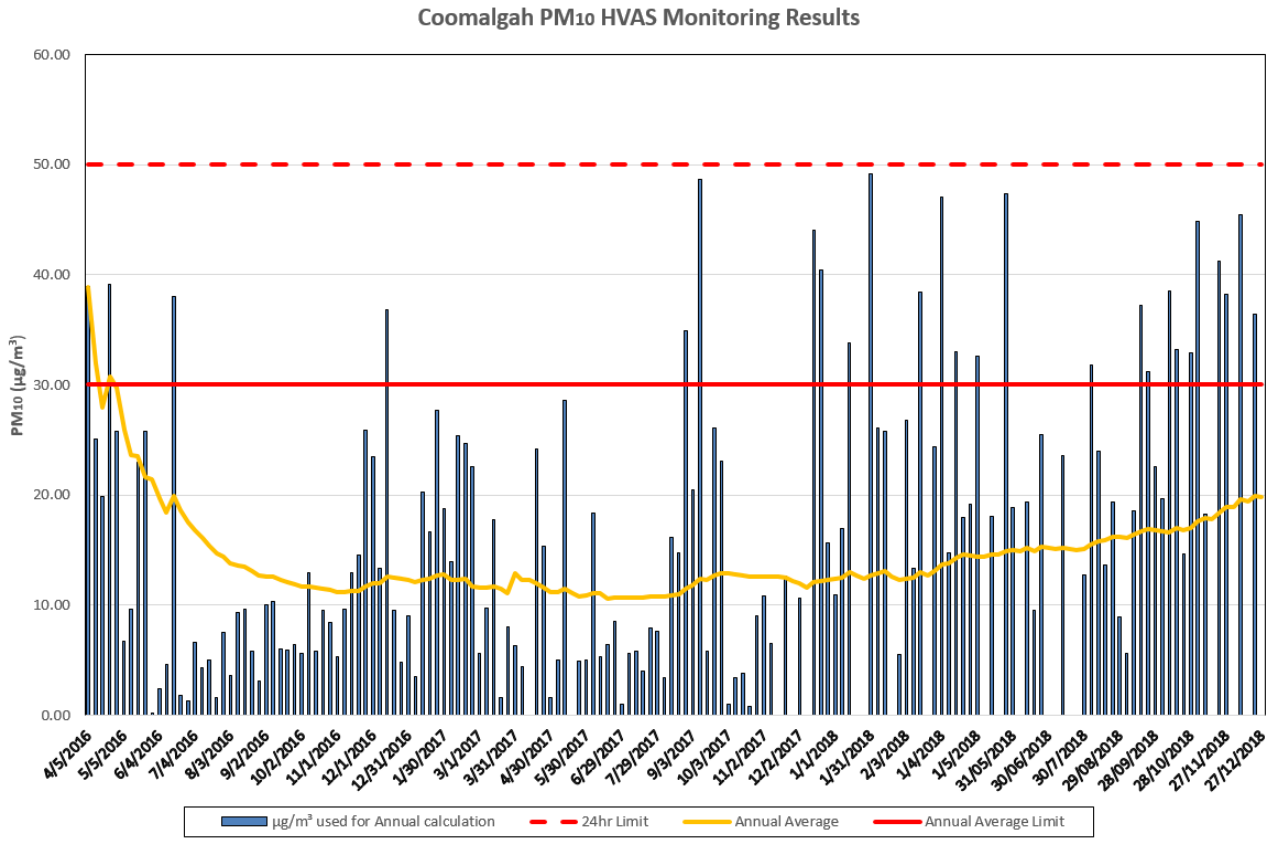


Figure 7.1 HVAS-PM10 24hr average monitoring data (2016-2018)

Total Suspended Particulate (TSP) is inferred from the measured PM10 data using monitoring conducted at the Coomalgah HVAS. Results indicated the TSP rolling annual average remained well below the applicable criteria of 90 µg/m and are illustrated in Figure 7.2.

The EA predicted no exceedance of the annual average TSP criterion. TSP results inferred from PM10 data were consistent with the EA for the reporting period.

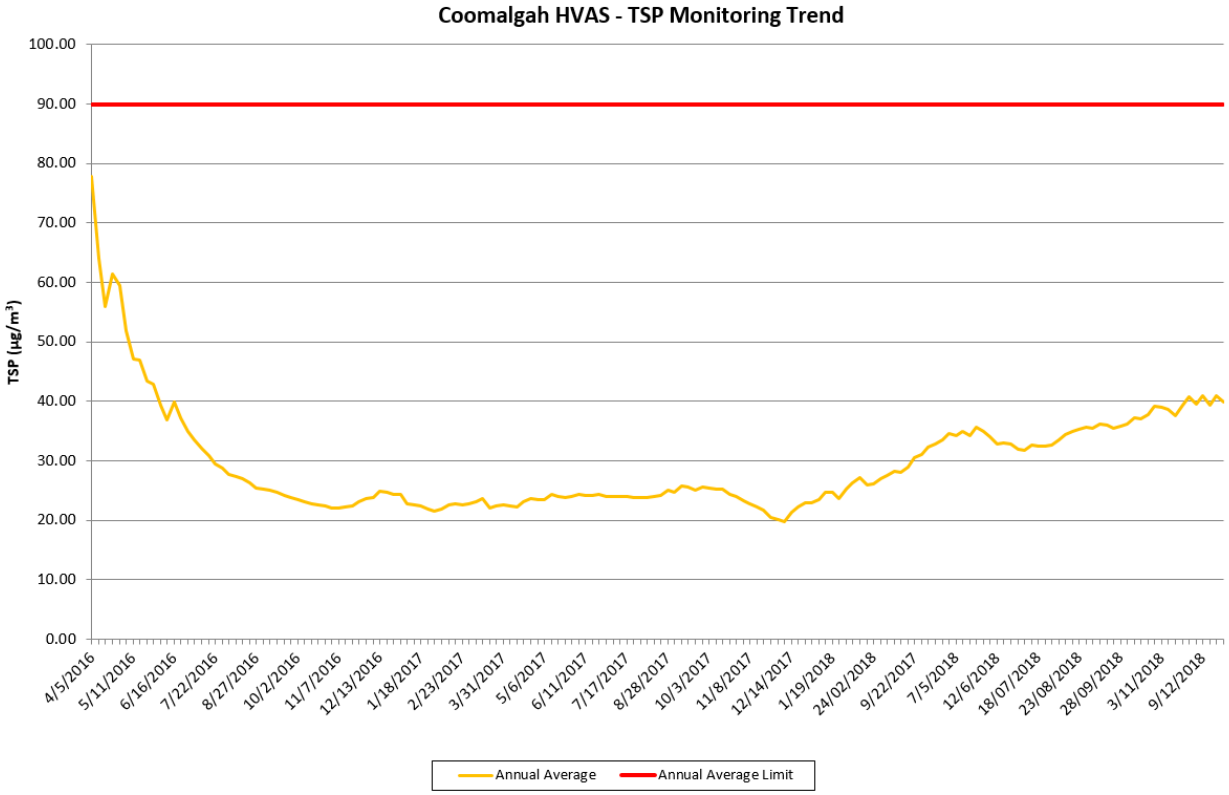


Figure 7.2 – Coomalgah HVAS- calculated TSP Monitoring Trend (2016- 2018)

Throughout the reporting period, the TEOM located on a mine owned property (Flixton) monitored continuously and real-time PM10 levels. The monitor is used as a management tool to facilitate the day to day mine operations therefore there is no criterion applicable at that location.

Results recorded at the $PM_{2.5}$ monitor on the "Will-gai" property remained consistent with those recorded during previous reporting periods. The Air Quality Greenhouse Gas Management Plan (AQGGMP) states that whilst no criteria applies TCM will compare results against target levels of 8 µg/m3 for annual average and 25 µg/m3 for 24hr maximum. During the reporting period an annual average of 3.07 µg/m3 was recorded, whilst the maximum 24hr result was 26.1 µg/m3 recorded on 15th December 2018 (dry day and winds above the 7m/s recorded). These results are within the target levels noted in the AQGGMP.

An air specialist assessed TCM performance against the Key Performance Indicators (KPI's) listed in Table 5.1 of *Tarrawonga Coal Mine – Particulate Matter Control Best Practice Pollution Reduction Program (PRP)*. The assessment of KPI-1 , KPI-2 and KPI-4 has shown that:

- KPI – 1 (PM_{10}/ROM (kilograms/tonne))

For 2018, calculated PM_{10} was 496,945 kg/year and ROM was 2,044,658 t/year giving a PM_{10}/ROM ratio of 0.24 (kg/t) which is consistent with the baseline ratio of 0.2 specified in the PRP.

- KPI – 2 (PM_{10} Emission Control (%)):

The level of control applied to operations has not changed since the PRP. As the level of dust control applied to activities at TCM have not changed from previous years the KPI-2 value would also be unchanged.

- KPI – 4 (Water Intensity for Hauling (L/VKT)):

Whilst total kilometres are not precisely measured there has been a significant increase in total water applied to haul roads since 2011 from 263ML to 656ML in 2017. However, since April 2018 a dust suppressant has been used on the haul road and as a result, the water used for dust mitigation has dropped to 495ML (approximately 40% water usage reduction since April 2018). Usage of dust suppressant can affect the utility of this KPI as it now stands.

6.3.3 Key Environmental Performance

TCM implemented and regularly used a predictive air dispersion modelling system and daily predictive forecasts to manage their operations.

6.3.4 Proposed Improvements to Environmental Management

The predictive air dispersion model system was fully implemented in accordance with the BTM Air Quality Management Strategy. TCM will assess if a calibration or update of the current air dispersion model will be necessary. In 2018, an air quality expert was engaged to review the Air monitoring network and the Air Quality Greenhouse Gas Management Plan. An updated version of the plan was submitted in August 2018 for approval. To improve the air-monitoring network, real-time monitors (Esamplers) have been installed close to the mine. They will be used as operational tools and will inform real-time level of air quality close to the mine, support internal investigation and enable data comparison with Coomalgah property (HVAS) and the Flixton property (TEOM) monitoring units.

6.4 Biodiversity

TCM revised Biodiversity Management Plan (BMP) draft was submitted to DPE for NSW approval on 28th February 2018. TCMs approved Biodiversity Offset Strategy includes the Willeroi West BOA for maintaining and improving 1,660ha of native woodland and forest adjacent to the south-eastern

boundary of Mount Kaputar National Park. VCPs approved Biodiversity Offset Strategy includes the Willeroi East (Offset Area 1) BOA for maintaining and improving 1,671ha of native woodland and forest adjacent to Willeroi West BOA and the south eastern boundary of Mount Kaputar National Park; as well as Offset Areas 2 to 5 covering 391.5ha located to the south and east of Boggabri.

Offset Security Management

During the reporting period, WHC undertook detailed cadastral survey definition and vegetation assessment as part of preparation of Conservation Agreements with the NSW Biodiversity Conservation Trust (BCT). WHC worked closely with the BCT during 2018 to progress Conservation Agreements towards in perpetuity securement of Willeroi BOA. WHC have consulted with DPE and DoEE as required during the reporting period to keep key regulators abreast of securement progress. Following registration of Conservation Agreements; WHC will prioritise negotiations of those BOAs that NPWS has previously shown interest in being transferred to National Park Estate.

Infrastructure Management

During the reporting period, 10km of redundant internal fences were deconstructed from the revegetation areas on the Willeroi BOA. Part of the former fencing material and redundant waste historically deposited onsite at the Willeroi BOA was removed and recycled at the Narrabri Waste Management Facility with the remainder temporarily stockpiled to be correctly disposed offsite during the next reporting period. The condition of the BOA fences, gates and signage were maintained to continue restricting unauthorised access and prevent inadvertent livestock grazing with no new fencing constructed. Hazardous material assessments were completed during the reporting period for redundant and derelict assets/infrastructure (i.e. sheds and cottages) associated with the former agricultural use as part of planning for their demolition and removal in the next reporting period.

6.4.1 Threatened Flora

Investigations undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd as part of the original Mine EIS identified no significant impact on threatened flora species, endangered ecological communities, endangered flora populations or critical habitat as a consequence of the development. Establishment of monitoring plots commenced in April 2007 and has continued as required. Over the life of the mine, a total of 28 quadrats are to be established across rehabilitation sites and control sites.

Eco Logical Australia Pty Ltd conducted vegetation monitoring during late August, September and November 2018 by. This monitoring comprised of:

- Multi-spectral imagery capture across the entire target area (including control areas) using 4-Band WorldView-2;
- Native vegetation survey; (refer to Figure 8- Flora Survey 2018)
- Fauna Survey (see Figure 9- Fauna Survey 2018)

Potential impacts noted in the EA included the clearing of Box-Gum Woodland EEC/CEEC and the groundwater dependent ecosystem - Bracteates Honey myrtle low riparian forest. These areas have not yet been cleared for mining purposes.

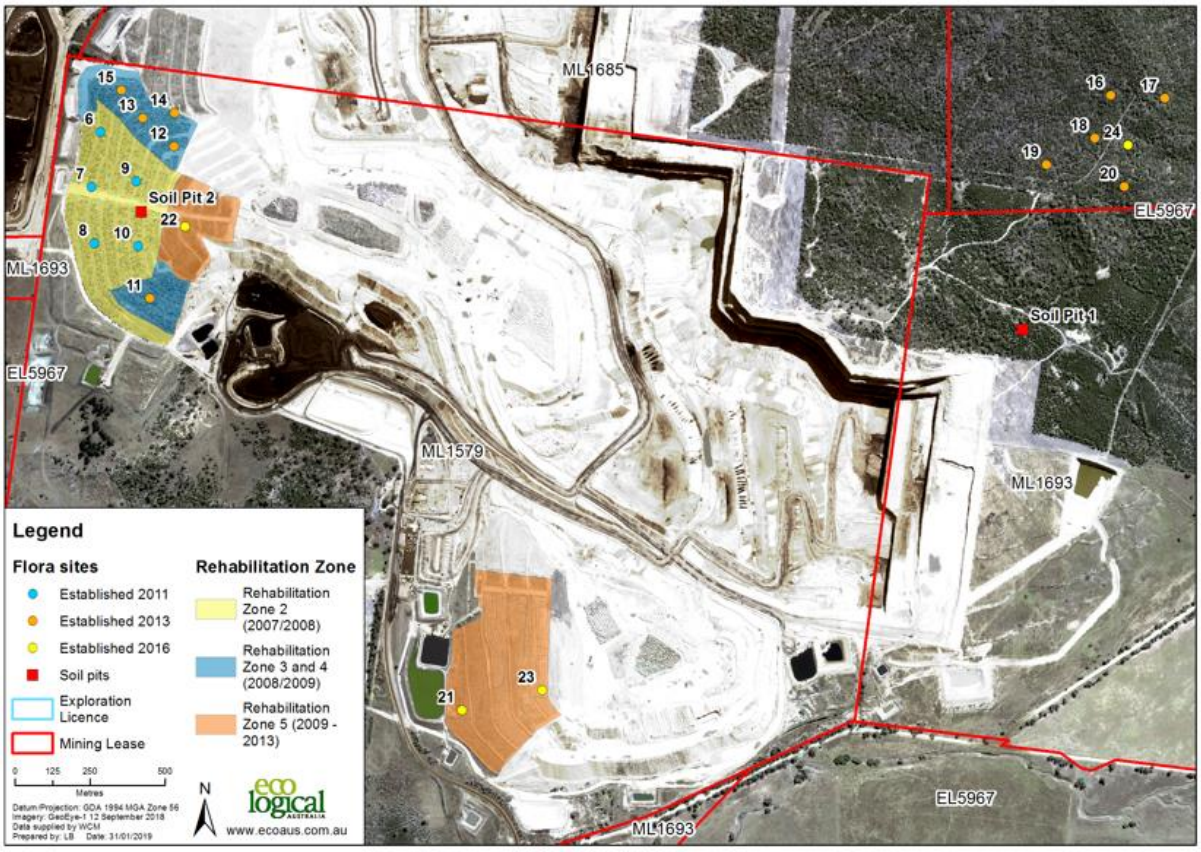


Figure 8- Flora Survey 2018

Remote Sensing Analysis

Remote sensing analysis identified areas of significant decrease in photosynthetically active biomass (PAB). Most significant decreases in PAB were associated with clearing due to mine development or reduced vegetation cover due to mine expansion. Notable thinning of vegetation is also evident; however, similar examples can be seen in the adjoining land to the northeast and is likely to be due

to water stress brought on by drier conditions. Small significant decreases were also apparent as a direct result of changes in ponding areas.

Significant increase in PAB can be seen in the southeast corner of the site and may be associated to agricultural practices such as the application of fertilisers and/or irrigation. Minor significant increases in PAB were identified across the site and can primarily be attributed to the reduction of water present in ponds and creek lines, such as where a dam dried up in early 2018.

Woodland Vegetation

Canopy and mid-storey:

Average percent True Projected Crown Cover (TPCC) increased slightly from 2014 to 2018 for mid-storey species in Rehabilitation Zone 2, as well as in the control. In Rehabilitation Zone 3 & 4, there has been a substantial increase in average mid-storey TPCC. This increase is not only attributed to the desired mid-storey species success, but also planted canopy species that have not yet reached a height to be classified in the canopy cover (>10 m tall). Since 2016, vegetation in Rehabilitation Zone 5 has developed a mid-storey cover.

The average number of canopy and mid-storey species declined in Rehabilitation Zone 2 and Rehabilitation Zone 5, while a slight increase was recorded at the control, and remained steady at Rehabilitation Zone 3 & 4. Where decreased canopy and mid-storey species richness was recorded in Control Lead State Forest (LFS), this may be a result of juvenile tree species, considered as a mid-storey component in previous years, reaching canopy height for 2018 monitoring. In the rehabilitation zones, decreased species richness is not due to canopy species achieving the height to classify in the canopy component, but likely due to senescence of *Acacia* and *Cassinia* species.

The mid-storey layer in the rehabilitation plots continue to comprise of mostly juvenile *Eucalyptus* species. Whilst Control (LSF) plots consist of these species as well, shrub and small tree species, such *Geijera parviflora* (Wilga) and *Acacia* species are more dominant. Whilst the plots consist of many of the same species, it can be seen in the analysis that the vegetation communities are only slightly similar between zones. This same conclusion presented in the previous monitoring report (ELA 2016) suggests that the mid-storey layer may lack diversity and structure once the juvenile trees mature into the canopy layer.

Canopy health as measured by the proportion of the potential canopy, has declined since 2017 when the majority of canopy health scores were 100%. In 2018, canopy health scores ranged from 2% to 98%, indicating canopy dieback has occurred in both the rehabilitation zones and Control (LSF) and may be attributed to the extended dry conditions. Epicormic growth was also observed on some

Eucalyptus species in Rehabilitation Zone 2 and Rehabilitation Zone 3 and 4, which can occur in response to canopy dieback.

Lycium ferocissimum (African Boxthorn) was recorded in low numbers in Rehabilitation Zones 3 & 4 and Rehabilitation Zone 5. African Boxthorn is listed as a State Priority (Asset Protection) weed under Appendix 1.1 of the *North West Regional Strategic Weed Management Plan 2017-2011* (North West LLS 2017). As required by WCM's general biosecurity duty under the *Biosecurity Act 2015,* African Boxthorn on site must not be allowed to spread to protect priority species.

Groundcover:

Since 2017, mean species richness and percent cover for exotic and native species has decreased in all monitoring zones, including the control. Native species richness is greater than exotic species richness in all zones, however exotic species cover remains greater, except in Control (LSF). Decreased groundcover species richness and cover is likely due to the extended dry environmental conditions, as this vegetation component fluctuates with seasonal conditions. However, rehabilitation zone surveys were undertaken in early spring, and a high cover of *Rapistrum rugosum* (Turnip Weed) rosettes were observed in some of the plots, and are likely to respond well to any summer rainfall and potentially outcompete desirable native species.

Comparison of groundcover composition between zones using Analysis of Variance (ANOVA) indicates that native species cover and bare ground cover are significantly different between monitoring zones, however native cover and bare ground cover at Rehabilitation Zone 5 are not significantly different to Control LSF, and the same applies to bare ground cover at Rehabilitation Zone 2. Exotic species cover and litter cover were significantly different between zones, however Tukey's Honestly Significant Difference (HSD) test could not reveal any significant differences between zone means. For all covers, Rehabilitation Zone 3 and 4 was significantly different to Control (LSF).

Temporal comparison of groundcover composition indicates that native species cover is significantly different in Rehabilitation Zone 3 and 4, as well as in Control (LSF) between years. In Rehabilitation Zone 3 and 4, native species cover has significantly decreased since 2011, but the decrease recorded at Control (LSF) is not significantly different between 2017 and 2018, or when monitoring began in 2011. Exotic species cover was significantly different between years at all rehabilitation zones. Whilst the decline in exotic species cover since 2017 was not significant between 2017 and 2018, 2018 exotic species cover is significantly different to 2011 in Rehabilitation Zone 2, and 2016 in Rehabilitation Zone 5. Litter cover was significantly different at all zones between years, including Control (LSF), however litter cover in 2018 was not significantly different to 2017. Bare ground cover was significantly different between years in Rehabilitation Zone 2. Bare ground cover in 2018 is only

significantly different to 2012, when the lowest mean bare ground cover (1.79%) was recorded. Changes in bare ground at in all other zones are not significant.

The groundcover species composition shows decreased similarity between zones from 2014 to 2018. Cluster analysis indicates that all zones are 20% similar, however the rehabilitation zones are more similar to each other than Control (LSF) (30%), except for in 2018. Generally, the plots in the older rehabilitation zones, Rehabilitation Zone 2 and Rehabilitation Zone 3 and 4 are more similar than those in the newer Rehabilitation Zone 5, ranging from 20 to 40% similarity. Within the rehabilitation zones, 2018 only showed 20% similarity to other years, but the direction for the 2018 data has not progressed towards the control zone. Within Control (LSF), 2018 has at least 40% similarity to other years, but 2018 has shifted slightly in the same direction as the 2018 rehabilitation zones, indicating climatic factors may be influencing groundcover.

The amount of Course Woody Debris (CWD [metres]) recorded has increased in all zones, however average length of CWD has increased in all zones except Control (LSF), which decreased. Conversely, the number of pieces of CWD had decreased in all zones except Control (LSF). High and dense groundcover made detection difficult in previous surveys and counts were previously underestimated. Variation in CWD averages could also be attributed to recorders including/excluding different components in the tally (i.e. all fallen timber or only timber greater than 50 cm in length and 10 cm in diameter). No CWD was not yet recorded in Rehabilitation Zone 5.

Soil pits

The soil pit in the rehabilitation zone (Rehabilitation Zone 2) shows a profile reconstruction with topsoil depth at 15 cm and depth to overburden at 30 cm. The control zone shows a similar profile reconstruction with topsoil depth at 10 cm and depth to compact clays at 30 cm. The rehabilitation zone exhibited good establishment of grass. The control zone also showed good establishment of grass and other plant roots including larger tree roots, which were present in all horizons. Soil fauna were not identified in any pits.

Seed Collection

Routine seed assessments completed for the Willeroi BOA were impacted by the severe drought conditions that were experienced during 2018. The routine seed assessments aim to identify on a seasonal basis the life cycle stage and development of native plants to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs. Because

of the drought conditions, additional seed collection opportunities within the Willeroi BOA were limited.

As part of the WHC group wide revegetation planning; the onsite collected seed was supplemented with commercially sourced local and regional provident seed by reputable seed collectors. A local revegetation provider was engaged to propagate the seed to produce Box Gum and non-EEC/CEEC Woodland overstorey species seedlings required for the FY18 (completed) and currently being grown for the FY19 revegetation programs for the Willeroi BOA.

Clearing

No threatened flora species were observed at the time of the pre-clearance survey conducted in March 2018. *Tylophora linearis*, listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and vulnerable under the BC Act, has previously been recorded within ML 1685. During sub-optimal growing conditions *T. linearis* may lay dormant or die back to root stock, effectively making the plant undetectable. Suitable habitat was identified in the northern and eastern disturbance areas, however no individuals were recorded at the time of survey.

Revegetation Management

The draft BMP revegetation strategy focuses on restoration and revegetation of cleared non-native grassland (former cultivation) and derived native grasslands and assisting natural regeneration in better quality woodland areas. Revegetation ground preparation was completed during the previous reporting period. During the reporting period, WHC coordinated an overstorey revegetation program in September 2018 across the Willeroi BOA with 86ha planted with 6,469 hiko seedlings of *Eucalyptus albens*, *Eucalyptus blakelyi*, *Eucalyptus melliodora, Angophora floribunda, Eucalyptus populanea, Eucalyptus macrocarpa, Eucalyptus pilligaensis, Eucalyptus melanophloia* and *Eucalyptus crebra*. Despite the prevailing drought conditions throughout 2018; routine tree watering and maintenance activities post planting have been successful to ensure that over an 80% survival had been achieved by the end of the reporting period which is commensurate with the target Box Gum Woodland vegetation structure of the Willeroi BOA. Previous ecological due diligence identified that there was 87ha of natural regeneration revegetation not requiring additional active revegetation at Willeroi BOA.

6.4.2 Threatened Fauna

At TCM, fauna and habitat monitoring surveys focused on thirteen sites within the woodland rehabilitation zones and two control sites within the Leard State Forest, as shown in Figure 9- Fauna Survey 2018. The terrestrial fauna survey target woodland birds and searches of available reptile habitat.

Woodland bird monitoring was undertaken during winter and spring 2018. Woodland birds were recorded while walking in a meandering path within each site, targeting areas of available habitat. All birds seen or heard were recorded in 5 minutes intervals and recording continued until no new species were recorded for three consecutive 5 minutes periods.

Opportunistic fauna sightings were also recorded in Table 9- Total individuals: birds survey spring-winter 2018.

Figure 9- Fauna Survey 2018

Birds:

Species richness for bird species was greater at the rehabilitation sites compared to the controls sites in 2018, indicating a diversion from pervious monitoring surveys. Feeding guild diversity is

similar between the control and rehabilitation sites, however Bark probers and omnivorous ground forages were not recorded at the rehabilitation sites in 2018.

The results show a clear difference between the rehabilitation and the control sites for both winter and spring. The control sites in the spring plot are clustered more closely together compared with the rehabilitation sites (indicating more similar communities in the control sites), though the winter plot clearly isolates 2017 and 2018 data for both control sites from other years. Cluster analysis indicates that the similarity between rehabilitation and control sites is variable with no clear separation between sites. In the spring bird's survey, the control sites are similar for all years, while the two rehabilitation sites are similar (40%), except in 2011 and 2018, which only have 20% and 30% similarity to the rest of the rehabilitation sites for other years. The decline in bird species richness recorded between the winter 2015 and winter 2016 monitoring periods has stabilised at the controls, however remains lower than winter 2014. In contrast, winter bird species richness has increased at both rehabilitation sites since 2014, and are the highest records since winter bird monitoring began in 2014. Since 2017, the number of species recorded during the winter survey has increased at Fauna Rehabilitation 1 and Fauna Rehabilitation 2 by nine and three species respectively. Changes in species richness were variable at the control sites. Sixteen species were recorded at Fauna Control 4, increasing by one species since 2017, and 14 species at Fauna Control 5 (LSF) which declined by three species. Since 2014, there has been a substantial decline in species richness at the control sites. This decline may be partially attributed to the eastwards encroachment of the main pit and the resultant disturbance from mining activities (noise, vibration and dust). Extended dry conditions may also partly explain the decline in bird species richness and abundance at the control sites, as birds migrate in search of food, due to the lack of flowering stands *Eucalyptus* species in winter.

Spring species richness has increased at the rehabilitation sites, indicating a recovery at Fauna Rehabilitation 2 since the 2017 surveys when only eight species were recorded. Species richness declined at Control Fauna 4 and Control Fauna 5 (LSF) since 2016 by 28 and 13 species respectively. Similarly, to the winter bird surveys, this may be partially attributed to pit encroachment and extended dry conditions.

Terrestrial fauna:

Trends for terrestrial fauna were similar to previous years, with *Macropus giganteus* (Eastern Grey Kangaroo) and *Macropus robustus* (Common Wallaroo) recorded in 2018 at both rehabilitation sites. However, these two species were not observed at either control site. *Wallabia bicolor* (Swamp Wallaby) was the only native mammal species recorded in the control area, observed at Fauna Control 4.

Three reptile species were recorded at the rehabilitation sites in spring 2018, showing an increase since the 2016 survey when no reptiles were found. One *Ctenotus robustus* (Eastern Striped Skink) (Rehabilitation 2) and one *Amphibolurus muricatus* (Jacky Dragon) and one *Pogona barbata* (Bearded Dragon) were recorded at Rehabilitation 1. In past surveys, dense and high groundcover during spring monitoring has limited reptile observations, however due to extended dry conditions, the ground layer was sparse allowing for better visibility. No frogs were recorded in the 2018 surveys.

The only exotic species observed in 2018 was *Lepus europaeus* (European Hare), recorded in the spring survey of Fauna Control 4. However, there were also signs of *Oryctolagus cuniculus* (Rabbit) activity at the rehabilitation sites, evident by scats.

Table 9- Total individuals: birds survey spring-winter 2018

Season	Total Individuals	Fauna Rehab 1	Fauna Rehab2	Fauna Cont 4	Fauna Cont 5
Spring	***2018***	***28***	***45***	***113***	***58***
	2017	74	30	69	71
	2016	57	46	108	83
Winter	***2018***	***40***	***45***	***39***	***39***
	2017	19	26	28	35
	2016	35	40	72	96

Clearing

A pre-clearance conducted by Eco Logical Australia (2018) identified a total of 145 habitat features (hollow bearing trees, large woody debris or nests) within the overall area to be cleared (approximately 30Ha).

Over the duration of the five days of clearance supervision 2018 no fauna species were injured and no active bird nests were disturbed. A total of 13 arboreal lizards (11 geckos and two skinks) and one frog were captured from habitat trees immediately after felling, and these were relocated to nearby suitable habitat outside the study area. Of the 11 geckos, seven were identified as *Gehyra* sp. and two were identified as Robust Velvet Geckos *Oedura robusta* . One skink was identified as a Tree skink *Egernia striolata* (see Photo 1- Tree Skink relocated during clearing 2018) and one was identified as a Snake-eyed Skink *Cryptoblepharus virgatus* . The single frog was identified as a Green Tree Frog Litoria caerulea .

On three occasions during clearing single microbats were seen exiting tree hollows when a tree was knocked on by the excavator prior to felling. In each of these cases the bats were uninjured, and

were observed until they flew safely into a nearby forested area. An additional three geckos, one skink and one *Antechinus* sp. were spotted hiding in inaccessible crevices within felled trees, and so these trees were left for 24 hours and then re-examined to confirm that the individuals had vacated overnight. One bee hive (European Honey Bee *Apis mellifera*) was located in a hollow of a felled tree within the Eastern Disturbance Area, and was left on the ground for additional days to allow bees to relocate.

Photo 1- Tree Skink relocated during clearing 2018

Habitat Management

During the reporting period, two rock debris habitat structures were constructed for habitat augmentation of the Willeroi BOA in accordance with the draft BMP.

On TCM Northern Dump rehabilitation area, several dead trees salvaged from previous years clearing were erected to create habitat for different bird species (Photo 2- Salvaged trees erected in the Northern rehabilitation area). Additional woody debris will be located on the ground on both northern and southern rehabilitated areas to generate extra shed and protection to other species.

Photo 2- Salvaged trees erected in the Northern rehabilitation area

Weeds

WHC coordinated routine weed monitoring/inspections undertaken across Willeroi BOA in February, May, September and November 2018. The priority weeds for control were noted as general broadleaf weeds (Biosecurity Act 2015 priority and general biosecurity duty species) as well as legacy noxious weeds inherited from previous owners management regimes such as Coolati Grass, St Johns Wort, Sweet Briar and Common Prickly Pear. The weed monitoring/inspections ensure that timely and prioritised weed control is undertaken on a seasonal basis with the spatial information directly given to spraying contractors to identify what, where, when and how to target appropriate resources across the Willeroi BOA for weed control.

During the reporting period, WHC implemented a comprehensive weed control program across the Willeroi BOA including 857.0ha treated between April and November 2018 targeting primarily Coolati Grass and St Johns Wort infestations as well as Sweet, Briar, Broadleaf and Pear species as required. Only appropriately qualified and experienced weed contractors (AQF3 accreditation or higher for use of herbicide) were engaged to undertake weed control works for WHC.

In 2018, a noxious weed monitoring program was conducted at TCM in a six monthly basis.

There had been a severe drought leading up to the time of the May survey which was evident throughout the survey area and likely had some impact on the species found during the survey. There was five noxious weed species identified during that survey and these were:

- African boxthorn (Lycium ferocissimum)
- Common pear (Opuntia stricta)
- Galvanised burr (Sclerolaena birchii)
- Green cestrum (Cestrum parqui)
- Noogoora burr (Xanthium occidentale)

During the November survey, there was twenty weed species identified and these were:

- African Boxthorn (Lycium ferocissimum)
- African Turnip - Western (Sisymbrium runcinatum)
- Amaranthus (Amaranthus spinosus L.)
- Bathurst Burr (Xanthium spinosum)
- Black Roly-poly (Sclerolaena muricata)
- Blue Heliotrepe (Heliotropium amplexicaule)
- Castor Oil plant (Ricinus communis)
- Common Pear (Opuntia stricta)
- Fleabane (Conyza species)
- Galvanised Burr (Sclerolaena birchii)
- Golden Dodder (Cuscuta campestris)
- Green Cestrum (Cestrum parqui)
- Mayne's Pest (Glandularia aristigera)
- Mother of Millions (Bryophyllum species)
- Noogoora Burr (Xanthium occidentale)
- Paterson's Curse (Echium plantagineum)
- Saffron Thistle (Carthamus lanatus)
- Sweet Briar (Rosa rubiginosa L.)
- Tree of Heaven (Ailanthus altissima)
- Wild Carrot (Dauca carota)

The infestation rates of the noxious weeds at Tarrawonga Coal Mine were generally at a low level throughout the surveys. Targeted weed management within the mine leases will be undertaken at opportune times following suitable weather and with consideration to the NIWAC Weed Management Guide for North West NSW (NSW DPI) with a focus on the following weeds:

- Spot spraying of African Boxthorn within the ML;
- Spot spraying of general weeds and grasses around the administration office and workshops;
- Spot spraying of Prickly Pear, Bathurst Burr and Noogoora Burr within the ML;
- Continue to manage and control Prickly Pear plants with Cactoblastis and Cochineal; and
- Spraying of grasses along rip lines and mounded areas to reduce competition with planted tubestock in rehabilitation areas.
- Spraying of weeds ahead of top soil stripping including common pear and Patterson's curse.

6.4.3 Feral Animal Control

WHC coordinated routine formal feral animal monitoring across the Willeroi BOA in February, May, September and November 2018. The adoption of a "monitor, measure and manage" approach to feral animal management will allow WHC to implement adaptive management in response to changes being measured through monitoring in feral animal abundance specific to the different geographical regions of the Willeroi BOA. Feral animal monitoring utilises the relevant

methodologies for specific feral animals generally in accordance with the NSW DPI *Monitoring Techniques for Vertebrate Pests* (2005) so that a range of methods can be used such as transects/spotlighting, sandpads, cameras traps where practicable and relevant to specific offset areas/properties. Monitoring demonstrated some feral animals species were in moderate abundance such as the European Red Fox, Feral Pig and Feral Goat. The feral animal monitoring ensures that timely and prioritised feral animal control is undertaken on a seasonal basis identifying what, where, when and how to target appropriate resources across the Willeroi BOA for feral animal management.

TCM coordinated the implementation of the Vertebrate Pest Management Plan using eight infra-red motion cameras installed at strategic locations around the site.

The survey for 2018 showed there were no sightings of feral goats and only one feral cat as such. Sightings for rabbits and hares have slightly decreased with 163 compare to 2017 (175). In case of increasing sighting, a baiting program was recommended to be used to control numbers, using 1080 or Pindone. Fox sightings has increased particularly during quarter 3 (south west of mine site adjacent the Goonbri road).

Feral pig sightings were medium but dramatically dropped from 360 to 159 at the end of the year. No trapping, shooting or baiting program was conducted in 2018 to control the feral pig population but TCM will continue to monitor and manage feral animals according to the BMP.

Table 10- Summary of Pest vertebrate sighting

	Feral Pig (descendant of various breeds of Sus scrofa)	Fox (Vulpes vulpes)	Feral Cat Felis catus)	Rabit/Hare (Oryctolagus cuniculus) / (Lepus capensis))	Wild Dog (canis familiaris)	Other
Quarter 1	13	8	0	9	0	0
Quarter 2	65	45	1	39	0	1*
Quarter 3	31	82	0	72	0	1**
Quarter 4	50	33	0	43	0	0
Total 2018	***159***	***168***	***1***	***163***	***0***	***2***
Total 2017	**360**	**75**	**0**	**175**	**0**	**0**

**Indistinguishable pest; **Echidna*

Soil & Erosion Management

During the reporting period, 78 tonnes of gypsum and 21 tonnes of lime were used to improve top soil characteristics. A water expert was engaged to design a new water management system for the new Domestic ROM pad location and design and recommendations for the construction of drop structures, drains and sediment basins for the northern dump for the Life of Mine (LOM). TCM will continue to seek technical advice from water experts to design and supply recommendations for the construction of the upgraded water system at the southern dump LOM.

Grazing Management

Willeroi BOA was destocked at the end of 2015 and during the reporting period, grazing was continued to be excluded from the Willeroi BOA.

Grazing activity continue to occur at several mine owned properties near the mine site including Tarrawonga, Templemore and Bollol Creek properties.

Monitoring Program

During the reporting period, the ecological monitoring program of the Willeroi BOA included winter bird surveys that were undertaken in July 2018; annual spring flora monitoring of 8 sites in October 2018 and fauna monitoring of 6 sites undertaken during November 2018. During the winter bird surveys, one threatened species was recorded (Turquoise Parrot). Despite the prevailing dry conditions for much of 2018, the native plant species richness did not change from the previous year with 8 sites meeting or exceeding the performance criteria (80% of native species richness benchmark for relevant biometric vegetation communities i.e. between 23 and 30 native species). Native overstorey cover increased from 0 sites last year to 1 out of the 8 sites meeting or exceeding the performance criteria (overstorey cover benchmark for relevant biometric vegetation communities i.e. between 6% and 40% cover). Native midstorey cover increased from 3 sites last year to 4 out of the 8 sites meeting or exceeding the performance criteria (midstorey cover benchmark for relevant biometric vegetation communities i.e. between 0% and 25% cover). Native ground cover grasses had no change from the previous year with 8 out of the 8 sites meeting or exceeding the performance criteria (grass groundcover benchmark for relevant biometric vegetation communities i.e. between 5 % and 40% cover). A total of 66 bird species were recorded during standardised bird surveys in 2018. Average species richness at the 4 woodland sites was 23 and ranged from 16 to 33. Average species richness at the 2 restoration sites was 12.5 and ranged from 10 to 15. These results are similar to 2017 where average species richness at woodland sites was 25 (ranged from 19 to 32), and average species richness at restoration sites was 9.5 (ranged from 7 to 12). Six microbat species were recorded from harp trapping in 2018. Average species richness at the

4 woodland sites was 3 but ranged from 2 to 6. The results are consistent with 2017 where seven microbat species were also recorded (site average 3, ranging from 1 to 5).

Independent Biodiversity Audit

There were no biodiversity audits during the reporting period.

6.4.4 Key Environmental Performance

Engagement with OEH and NPWS is ongoing regarding the potential to transfer of parts of the Willeroi BOA to National Parks Estates as per the letter from NPWS dated 16th August 2017 outlining the WHC BOAs that NPWS were interested in. WHC have requested extensions from DPE and DoEE for the timing of securing these offset areas until 31st December 2018 to allow negotiations on which BOAs to be transfer to Parks Estate to finalise with the residual BOAs to be secured via conservation agreements.

6.4.5 Proposed Improvements to Environmental Management

The TCM Biodiversity Management Plan (BMP) was revised and submitted in February 2018 to DPE for review and approval.

6.5 Aboriginal Heritage Management

6.5.1 Environmental Management Measures

During the reporting period, historical heritage assessments were completed for redundant and derelict assets/infrastructure (i.e. sheds and cottages) associated with the former agricultural use as part of planning for their demolition and removal in the next reporting period. There are 19 known Aboriginal cultural heritage sites within the Willeroi BOA with each site maintained with identification/demarcating fencing around the heritage site perimeter and signage to mitigate access and disturbance

A Cultural Heritage Assessment was completed in September 2011 as part of the Tarrawonga Coal Project EA . A total of 57 sites (21 open artefacts, 11 scarred trees and 21 isolated artefacts) were located during the surveys of the Project Area. An additional requirement of PA 11_0047 includes the development of an Aboriginal Cultural Heritage Strategy (ACHS) in conjunction with the Boggabri Coal Mine and Maules Creek Project. This Strategy was approved by DP&E in 2017.

To date, the measures in place to protect Aboriginal cultural heritage are considered satisfactory, with all measures identified in the EA, Project Approval and HMP in place. New procedures have

been implemented to manage a significantly larger number of registered Aboriginal parties identified through the Tarrawonga Coal Project EA (refer to HMP).

6.5.2 Key Environmental Performance

An independent consultant undertook a desktop registered aboriginal heritage sites survey in 2018. TCM also engaged an archaeologist to complete a survey and to compare field data with that report. During the field survey and according the current HMP, the registered archaeologist and RAPs salvaged all remaining artefacts located in the close proximity of the pit and in the areas that will be cleared in 2019.

6.5.3 Proposed Improvements to Environmental Management

Dr Whincop will prepare a report with the findings of the field survey. TCM will assess if an updated HMP will be required within the next reporting period.

6.6 Natural Heritage

There are no features of natural heritage within the Project Approval area and hence, no specific management procedures are required.

6.7 Spontaneous Combustion

6.7.1 Environmental Management Measures

TCM has a low percentage of inorganic sulphur content in coal, and hence a low potential for exothermic oxidation reactions. However, in the event of spontaneous combustion TCM personnel are trained to watch for indications of spontaneous combustion. Any incident would be followed by excavation to identify the source and extinguishment through water saturation.

Rehabilitation of the coal reject materials co-disposed amongst spoil is not anticipated to result in any detrimental changes to the quality of surface runoff and seepage. Therefore, the current water quality monitoring program remains suitable for assessing the quality of post-rehabilitation surface runoff and seepage from the final rehabilitated landform

In 2018, a geochemist was engaged to complete a geochemical assessment of the coal reject material (fines and coarse) and the key conclusions are:

- The coal reject materials have relatively low and variable sulfur content, and as a bulk material have a high factor of safety with respect to potential acid generation. Most materials are classified as Non Acid Forming (NAF).
- The concentrations of metals and metalloids in coal reject materials are low compared to typical levels in unmineralised soils.

- Surface runoff and seepage from coal reject materials is likely to be pH neutral to slightly alkaline with low levels of salinity.
- Static leach tests indicate that trace metals/metalloids and major ions will be sparingly soluble in runoff and seepage from coal reject materials. Dissolved concentrations of these parameters are predicted to remain within applied water quality guideline criteria and are not expected to present any significant environmental risks for on-site or downstream water quality. Dilution effects from rainfall and natural attenuation are also likely to occur in the field and further reduce the concentrations of soluble metals and metalloids in any runoff and seepage.
- Based on the predicted geochemical nature of the coal reject materials, no special management measures are required for the handling or storage of these materials, apart from those already planned in the current MOP.
- Surface runoff and seepage from coal reject materials co-disposed amongst spoil should continue to be monitored to ensure that key water quality parameters remain within appropriate criteria.

6.7.2 Key Environmental Performance

A number of minor instances occurred where small amounts of coal smouldered on the ROM pad. These instances were managed accordingly with no offsite impacts. No additional improvements are proposed within the next reporting period.

6.8 Bushfire Management

6.8.1 Environmental Management Measures

Bushfire management is undertaken in accordance with Condition 59 of Schedule 3 of PA 11_0047 with relevant aspects described within the Biodiversity Management Plan.

TCM maintains firebreaks around both its landholding, the mine area and the biodiversity offset area and maintains firefighting equipment as well as earthmoving equipment, a water truck etc. Any use of equipment for offsite bushfire control would be under the direction of the Rural Fire Service.

In accordance with the BMP, annual fuel load monitoring was undertaken in December 2018 as part of planning and assessment for an ecological burn of the Willeroi BOA revegetation areas in Autumn 2019. WHC also completed a 17ha ecological burn of the Willeroi BOA in April 2018. Other fire management implemented by WHC during the reporting period included the maintenance firebreak tracks (43.9km) to a zero fuel barrier standard. WHC maintains regular communications throughout

the reporting period with both the Liverpool Range and Namoi-Gwydir Zone RFS teams around planning of WHC BOA ecological burn programs as well as providing WHC emergency contacts. WHC maintains a specialist fire fighting contractor for an on call engagement during the fire season to respond in the event of a bushfire on WHC BOAs and non-mining lands.

6.8.2 Key Environmental Performance

No instances occurred where TCM was required to assist to the RFS or any other landholder or body. TCM will continue to communicate with the RFS and with the community via CCC meetings and their members. Access to water in case of bushfire are regularly topics of discussion during CCC meetings.

6.8.3 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.9 Meteorological Data

Meteorological monitoring is conducted onsite in accordance with Schedule 3 Condition 30 of the PA 11_0047. Table 11- Templemore weather station monitoring data 2018 summarises the monthly meteorological conditions at TCM for the 2018 reporting period.

The total annual rainfall for the reporting period was 447.6mm; this is below the annual rainfall recorded for 2017 (510.8mm) and the long term mean annual rainfall (585mm). The maximum monthly rainfall was recorded during October with 114.0 mm. Though 2018 was a very dry year, rainfall for February, October and November were above historical monthly averages.

A minimum temperature of -6.9°C was recorded in July and a maximum temperature of 41.5°C in January.

In 2018, prevailing winds were predominately from the North-Northeast (N-NE) from May to September but from South- Southeast (S-SE) for most of the rest of the year.

Table 11- Templemore weather station monitoring data 2018

Month	2m Temperature (°C)			10m Temperature (°C)			Average Wind Speed (m/s)	Prevailing Wind Direction	Monthly Rainfall (mm)
	Min	Mean	Max	Min	Mean	Max			
January	10.3	28.4	41.5	13.0	28.5	40.0	2.5	SE and SW	45.4
February	10.3	25.9	40.4	13.0	26.2	38.8	2.7	SE	62.2
March	8.6	24.1	38.9	11.3	24.7	37.8	2.3	SE	16.2
April	5.4	20.9	33.6	8.6	21.7	32.6	2.1	SE	30.0
May	-0.8	13.2	27	1.7	14.9	26.2	1.9	NE and SW	2.0
June	-3.2	10.4	23.0	0.4	11.7	22.3	2.0	NE and SE	7.0
July	-6.9	9.4	25.2	-3.3	11.3	24.7	1.8	NE and NW	11.2
August	-3.2	10.7	24.5	-0.1	12.1	23.9	2.1	N /NE and SW	44.2
September	-0.1	15.4	32.0	3.7	16.4	31.3	2.4	SW/ SE and NE	14.8
October	4.9	19.6	32.7	8.4	20.3	32.6	2.4	E and SE	114.0
November	6.1	22.45	40.7	7.7	22.9	39.6	2.8	W and SW	76.6
December	9.1	26.6	39.0	14.4	26.7	38.3	2.7	SW/ SE and NE	24.0
Total	-								**447.6**

6.10 Waste

6.10.1 Environmental Management

In August 2018, TCM engaged a contractor (Namoi Waste Corporation) that is responsible for the collection and management of the entire waste streams generated at the mine. This initiative will improve record keeping and data reliability.

During the reporting period, waste streams removed from site for disposal or recycling are summarised in Table 12- Waste management summary.

Table 12- Waste management summary

Waste Stream	Container size	Volume/Weight/ Quantity#	Unit of Measure
General Waste	$3m^3$	269,694	Kg
Tyres*	n/a	54	each
Batteries**	Pallet	57	each
Waste Oil	IBC	231,000	Lts
Oil Filters	$3m^3$	8,835	Kgs
Hydraulic Hoses	$3m^3$	885	Kg
Coolant	IBC	8,000	Lts
Scrap Metal**	$15m^3$	70,500	Kg
Cardboard	$10m^3$	9,825	Kg
Timber	$15m^3$	33,000	Kg
Sceptic Waste	Pumped out	55,500	Lts
Paper/Plastic/ Aluminium Can	240Lts	351	Kg

**Tyres were reused onsite for traffic management;*
***Battery Type N200, N150 & N70 donation to Westpack helicopter;*
****Major clean-up of the yard.*
#to be able to assess performance over the years, TCM has extrapolated values provided by the Waste contractor from August to December 2018.

6.10.2 Key Environmental Performance

During the reporting period no incidents relating to waste management occurred.

6.10.3 Proposed Improvements to Environmental Management

Tarrawonga continues to aim to reduce waste via a number of initiatives including recycling (oils, greases, scrap steel, and domestic recyclables) and increasing tyre life through education and training of machine operators.

6.11 Environmental Performance Summary

An environmental performance summary for TCM is presented in Table 13- Environmental Performance**:**

Table 13- Environmental Performance

Aspect	Approval Criteria or EIS/EA Prediction	Performance during the reporting period	Trend / Key Management Implications	Implemented / proposed management actions
Noise	Refer s6.1	Approval criteria met.	Nil	Nil
Blast	Refer s6.2	Approval criteria not met.	Nil	An interested party was not notified ahead of the blast on 18/01/2018. To minimise risk of reoccurrence TCM took several actions including: -Developed a Training package, - Developed a responsibility matrix - Blast Management Plan was reviewed and an updated version submitted to DPE in August 2018.
Air Quality	Refer s6.3	Approval criteria met.	Nil	Nil
Biodiversity	Refer s6.4	Approval criteria met.	Nil	Nil
Heritage	Refer s6.5	Approval criteria met.	Nil	Nil
Spontaneous Combustion	Refer s6.7	Approval criteria met.	Nil	Nil
Bushfire Management	Refer s6.8	Approval criteria met.	Nil	Nil
Waste Management	Refer s6.10	Approval Criteria Met	Nil	Nil

7 WATER MANAGEMENT

The mine lies within the catchment of the Namoi River. Locally, and within proximity of the project site, Goonbri Creek, Bollol Creek and Nagero Creek all provide flows to the Namoi River during runoff events. The design of sediment detention basins within the disturbed area of the mine aims to limit the opportunity of discharge of runoff from mine-disturbed area, i.e. after appropriate detention time to satisfy licensed discharge criteria.

Detailed Surface Water and Groundwater monitoring results are provided in Appendix 2 and Appendix 3 respectively.

7.1 Surface Water Management

All sediment basins, storage dams and associated banks and drains have been designed by an engineering consultant and constructed in accordance with the Managing Urban Stormwater: Soils and Construction Vol 2E Mines and Quarries (DECC, 2008) in conjunction with the references to Volume 1 (Landcom, 2004). Water within the Project Approval area is nominally classified either as "clean", "dirty", "contaminated" or "pit water" depending on the source of the flow and it's potential for physical or chemical contamination. The definition of these classifications follows:-

- "Clean Water" comprises water that has not come in contact with mine disturbance and does not have potential to contain hydrocarbons.
- "Dirty Water" comprises water that has come into contact with mine disturbance and does not have potential to contain hydrocarbons.
- "Pit Water" comprises water contained within the open cut sump or pumped to the void water dam for containment and use for dust suppression across the site.
- "Contaminated Water" comprises runoff water, which could potentially contain hydrocarbons.

There are six wet weather discharge points nominated in the current EPL 12365 (relevant to PA11_0047 Schedule 3 Condition 33, 39). These are SD9, SD16, SD17, SB14, SB23B and SB24A.

7.1.1 Surface Water Monitoring Results

TCM has a requirement to undertake surface water monitoring on a quarterly basis in addition to the monitoring of any wet weather discharge event. Historical data is available in Appendix 2. Surface water monitoring locations are shown on Figure 10- Surface water monitoring locations.

Whilst there are no criteria or concentration limits specified for the quarterly surface water samples, the results do provide an indication as to the quality of waters on-site. The assessment of sediment

load, salinity, pH, oil and grease and other monitoring parameters during these quarterly water monitoring events was consistent with previous reporting year and summarised in Table 14- Surface water Quarterly monitoring 2018. Due to weather conditions, most of the monitoring sites were dry in May and August.

Table 14- Surface water Quarterly monitoring 2018

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
22/02/2018	SD16	9.2	1400	216	34	<5	<0.001	0.018	0.015	<0.01
22/02/2018	SB14	8.9	823	60	11	<5	<0.001	0.01	0.007	<0.01
22/02/2018	SB16a	9.4	1330	280	36	<5	<0.001	0.012	0.028	<0.01
22/02/2018	Void	8.7	3600	15	1	<5	----	----	----	----
22/02/2018	GCU	7.0	170	166	25	<5	<0.001	0.004	<0.001	<0.01
22/05/2018	Void	8.9	3340	14	1	6	----	----	----	----
Other sites were dry										
21/08/2018	SB16A	9.3	5300	54	51	<5	0.002	0.022	0.192	<0.01
21/08/2018	Void	8.9	3590	<5	2	<5	----	----	----	----
Other sites were dry										
13/11/2018	SD16	8.5	407	634	4	<5	<0.001	0.014	0.001	0.01
13/11/2018	SD14	8.9	2020	26	10	5	<0.001	0.004	0.006	<0.01
13/11/2018	SD17	8.1	439	898	10	<5	<0.001	0.01	0.002	<0.01
13/11/2018	SB16A	8.4	1090	436	20	<5	<0.001	0.014	0.011	<0.01
13/11/2018	GCU	8.2	253	14	18	<5	<0.001	0.005	0.001	<0.01
13/11/2018	GCD	7.1	260	65	18	<5	<0.001	0.011	0.001	<0.01
13/11/2018	VOID	7.2	2880	18	5	<5	----	----	----	----

Levels of grease and oil were low and in most cases below the level of reporting of 5mg/l. Level of Total Suspended Solids (TSS) fluctuated between 8 and 898 mg/l during routine monitoring. During the discharge event that occurred in October 2018 from SD17, level of TSS measured was 3,970 mg/L. The elevated TSS value was due to heavy runoff occurring after a significant rainfall event of 89.9mm. Further details are available in section 7.1.2

Overall pH values showed that water sampled was more alkaline with a few values recorded above 9 units during the first and third quarter of the period.

Concentration level of antimony, arsenic, molybdenum and selenium were monitored throughout the period. Results remained consistently low and below thresholds outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000). Guidelines with no suggested trend of enrichment of these minerals in surface waters adjacent to the overburden emplacements.

Surface water monitoring results showed generally consistent trends with previous reporting periods.

In comparison with the EA, the following assessments has been made:

No intensive irrigation activities have been undertaken on site. Small volume of drinking water was used in the rehabilitation areas using an All-Terrain Vehicle.

Commitments made in the EA with regard to the surface water-monitoring program are addressed in the updated Water Management Plan, which was submitted, to DP&E for review in August 2018.

7.1.2 Discharges

There was only one wet weather (or controlled discharges) during the reporting period from licensed discharge point LDP1 (SD17) on 21 October 2018 and this discharge occurred after 89.9mm of rain.

During the discharge, concentration of Total Suspended Solid (TSS) measured exceeded the 50 mg/L limit with 3,970 mg/L. However, according to EPL12365 (L2.5) this condition does not apply in case of rainfall above 38.4mm over five consecutive days immediately prior to the discharge occurring. Discharge water did not go into Nagero Creek but was contained within Boggabri Coal Mine Lease. All the other parameters measured were within limits with:

- pH = 8.36,
- Electrical Conductivity= 244 µg/m^3 and
- Grease and Oil < 5 mg/L .

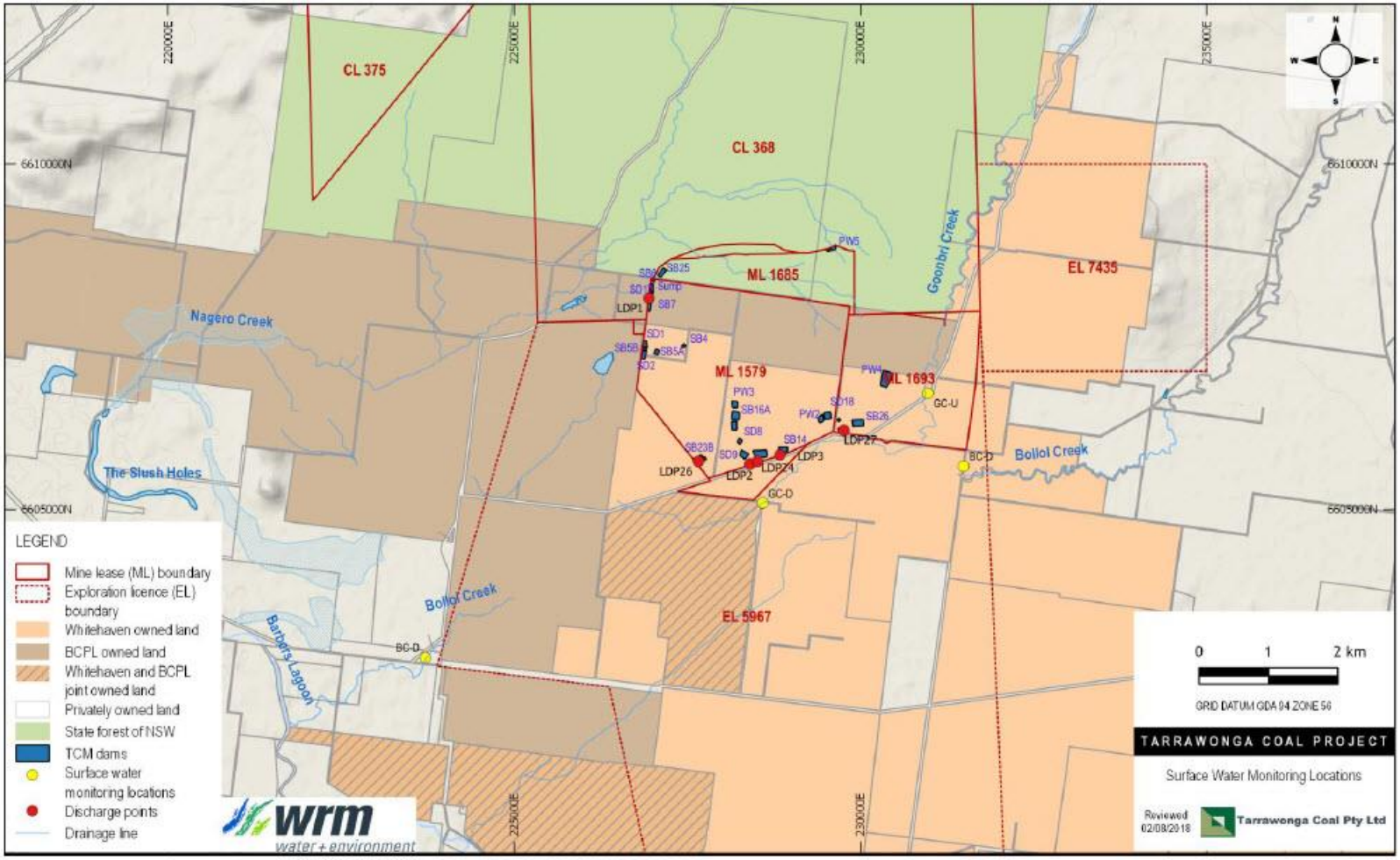


Figure 10- Surface water monitoring locations

7.2 Groundwater Management

7.2.1 Environmental Performance/Management

The mine's performance with respect to groundwater performance and management, the prevention of pollution, and the assessment of impacts on groundwater availability to other surrounding users, has been assessed through groundwater level and chemistry monitoring undertaken at a series of piezometers and bores within the Project Area and adjacent properties.

7.2.2 Groundwater Monitoring

The details of the groundwater monitoring program throughout the reporting period are listed in Table 15- Groundwater monitoring points and monitoring sites are shown on Figure 11. Historical groundwater quality data and standing water level plots are is available in Appendix 3.

Groundwater monitoring was undertaken by a contracted company, including water level measurement, sampling and analysis . Two data loggers monitored water levels at MW1 and MW2 to the South and two Vibrating Wire Piezometers (VWPs) sites (TA60 and TA65) were operating to the East of the mine. During the clearing campaign 2018, area around site TA60 was cleared and it will be stripped and prepared for blasting during 2019. With the assistance of a groundwater expert, TCM will assess the best location to install a replacement-monitoring bore to the East.

Groundwater levels

Graphs available in Appendix 3 show that groundwater levels at the majority of nominated monitoring bores maintained a steady trend. Whilst MW6 and MW3 level were rising, GW044997, MW7, Templemore A and B level were slightly decreasing likely due to dry conditions. As MW8 casing was damaged, no samples could be taken but since 2008 it has been regularly dipped.

The Vibrating Wire Piezometers (VWPs) installed at TA60 and TA65 indicated generally depressurisation increases with depth (at 110 and 153m intake) at TA65 and greatest depressurisation was observed for the shallowest and deepest intake 69 and 118m respectively at TA60.

Table 15- Groundwater monitoring points

Site ID (see Error! Not a valid result for table.**11)**	Registered Bore No. & Licence No	Property/ Location	Frequency		Purpose
			SWL[2], EC[3] and pH	Representative Metals and Ions	
MW1	GW967848 90BL253276	"Thuin"	Quarterly	Six monthly	To determine existing status and any impacts
MW2	GW967849 90BL253278	"Thuin"	Quarterly	Six monthly	
MW3*1	GW967860 90BL253841	"Nagero"	Quarterly	Six monthly	
MW4	GW967850 90BL253279	"Tarrawonga"	Quarterly	Six monthly	To determine existing status and any impacts
MW5	GW967851 90BL253280	"Thuin"	Quarterly	Six monthly	
MW6	GW967881 90BL254255	West of Boggabri Coal Infrastructure Area	Quarterly	Six monthly	
MW7	GW967883 90BL254254	"TCM"	Quarterly	Six monthly	
MW8	GW967882 90BL254253	"TCM"	Quarterly	Six monthly	
GW044997	GW044997 90BL102564	"Templemore"	Quarterly	Six monthly	
Templemore A	N/A	"Templemore"	Quarterly	Six monthly	
Templemore B	N/A	"Templemore"	Quarterly	Six monthly	To determine existing status and any impacts
GW031856	GW031856 90WA809087	"Ambardo"	Quarterly	Six monthly	
GW052266	GW052266 90BL116929	"Tarrawonga"	Quarterly	Six monthly	
TA60	90BL255930	"TCM"	Continuous	Nil	Vibrating Wire Piezometers
TA65	90BL255930	"TCM"	Continuous	Nil	

[1] Non-TCM owned bore [2] SWL – Standing Water Level [3] EC = Electrical Conductivity

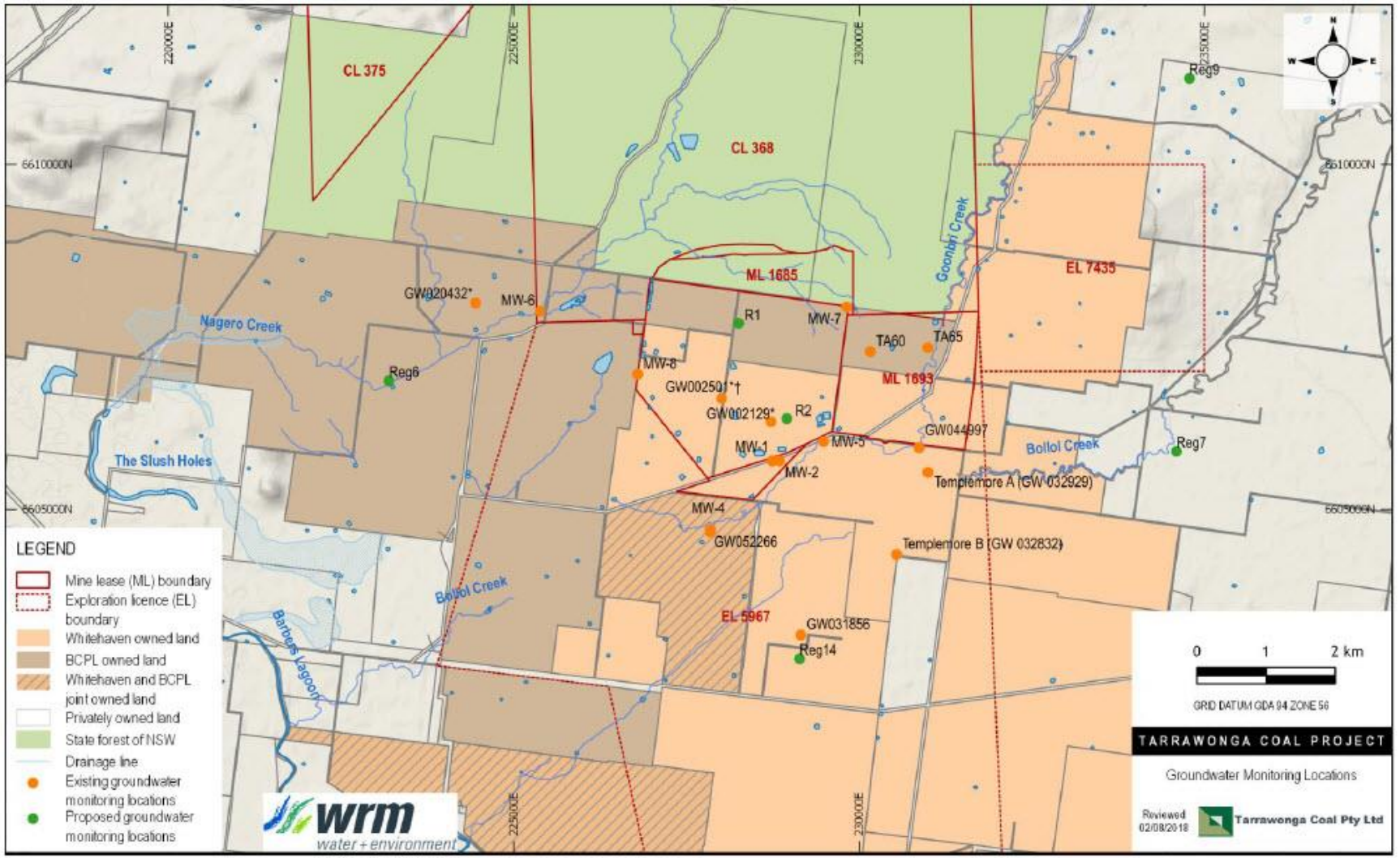


Figure 11- Groundwater monitoring locations

Groundwater quality

Analysis of samples taken during the reporting period showed that groundwater quality remained generally in line with historical data at all locations monitored. Water quality was compared to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) guidelines for stock watering (cattle). There were no recorded instances of groundwater quality exceeding the limits prescribed by those guidelines during the reporting period.

Water quality has also been compared against the National Environment Protection Council (NEPC) Agricultural and Livestock Guidelines. The following instances occurred where water quality did not meet the parameters identified in the guidelines:

- Since there is no Iron limits for livestock in the ANZECC, the agricultural irrigation guidelines for iron (0.2mg/L) was used for comparison. All the monitoring site were above the 0.2mg/l limit on at least one occasion during the reporting period with the exception of GW031856, MW6, MW4, Templemore A and B.
- Once again, MW1, MW5, MW6 and Templemore B were above the agricultural irrigation guideline for TDS (600mg/L) when sampled in March and/or September 2018. MW2, MW4 values were also above that limit but below the NEPC livestock guideline for TDS (2400mg/L). GW044997 had the only value above the 2,400mg/L NEPC limit but was below the limit of ANZECC guideline for stock drinking water (4,000mg/L) with 3,400mg/L.

7.2.3 Groundwater Management

Pit water inflow is a result of combination of rainfall and groundwater seepage:

- Direct rainfall runoff and infiltration through the emplaced overburden which flows down-dip to the open cut sump(s); and
- Inflows from the exposed coal seam.

To prevent any potential risk of contamination with chemical and hydrocarbon, TCM implemented control measures such as:

- Vehicle maintenance carried out in designated areas;
- Any spills being cleaned up; and
- Hydrocarbons products being stored within a bunded area, constructed in accordance with AS 1940-2004 and/or EPA requirements.

Groundwater from surrounding bores is monitored on a regular basis to detect and assess any changes in quality or level that may be attributable to the mine.

The Tarrawonga Coal Project EA identified that there would be a reduction in the potentiometric head in the aquifers of the porous rock systems to the east and the north. In the past, the Vibrating Wire Piezometer installed in TA60 and TA65 have demonstrated depressurisation as predicted as the mine moves toward the east. Due to pit progression, site TA60 will be decommissioned in 2019 and will have to be replaced.

The BTM Water strategy was submitted to the department during the reporting period. A cumulative BTM groundwater model was also updated during the reporting period.

During the reporting period, no complaints have been received in relation to impacts upon any other groundwater users. This is consistent with the predictions of the EA; that no significant impact would therefore affect beneficial use of groundwater of other groundwater users.

7.2.4 Water Take

In 2018, no water was extracted from the licenced groundwater bores. Instead, TCM used rainfall and runoff captured in the sediment dams and pit, together with transfer of surface water within the BTM mines, to provide operational water requirements. The water extracted from the pit was in accordance with WAL31084 that gives an entitlement of 250 units per annum. In accordance with respective operations approvals and principles of the BTM Water Management Strategy, water sharing opportunities are identified. TCM also received the transfer of water from the Namoi River in June 2018 via a temporary transfer in coordination with other sites in the BTM Complex.

Table 16- Water take

Water Licence Number	Water Sharing Plan Source and Management Zone (As applicable)	Entitlement	Passive take/ inflows	Active Pumping (ML)	SubTOTAL (ML)
WAL 31084	NSW Murray Darling Basin Porous Rock Groundwater Sources Gunnedah - Oxley Basin Mdb Groundwater Source Gunnedah - Oxley Basin Mdb (Other) Management Zone	250 units	N/A	180	180
WAL 13050	Namoi River- High security	200 units	N/A	200	200
TOTAL		**450**	**N/A**	**380**	**380**

7.3 Site Water Balance

According to the site water balance developed by a water consultant, the water management system for 2018 had the capacity to be operated and meet operational objectives in normal average weather condition;

- All pit water could be contained on-site and there were no wet weather discharge,
- Rainfall and runoff captured in the sediment and pit water dams provided for the majority of water demand in the dry, median and wet years;

However, in extended dry weather conditions, small quantities of externally sourced water could be required.

These predictions were consistent with the actual outcomes observed during this monitoring period with the exception of one wet weather discharge due to an elevated rainfall event (89.9mm) that was in accordance with the EPL12365.

Table 17 provides an overview of water stored and used on site during the reporting period.

Table 17- Water Stored and used during the reporting period

		Table 2-3 EA values (2012) (ML		
	Jan 2018-Dec 2018 (ML)	**Dry Year-25%-ile (17 years)**	**Average Year (17 years)**	**Wet Year - 75%ile (17 years)**
Total Runoff	328	325	402	480
Groundwater inflow	183	255	255	255
External Source	200	n/a	n/a	n/a
TOTAL INPUT	**711**	**580**	**657**	**735**
Evaporation	108	118	130	141
Moisture loss in coal	116	n/a	n/a	n/a
Crusher Dust suppression	35	8	8	8
Haul Road and ROM pad dust suppression	493	389	394	399
Offsite release/ discharge	7	0	0	0
TOTAL OUTPUT	**759**	**515**	**532**	**548**
Change in inventory	*-48*	*64*	*125*	*193*

**Note: For Jan-Dec 2018 period, values must be compared with caution as the EA value is based on 17 year annual average with changing catchment and land uses over time.*

8 REHABILITATION

8.1 Rehabilitation Performance during the Reporting Period

8.1.1 Status of Mining and Rehabilitation

Rehabilitation on the northern emplacement area has not reached final completion however is generally progressing. Integration with Boggabri Coal's waste emplacement has started with rehabilitation activities to follow as per the MOP.

The EA Total disturbance Area generally align with the MOP total disturbance Areas. However, the conceptual predicted rehabilitation areas in the EA are greater than the MOP rehabilitation areas due to the following points:

- The TCM EA mining and rehabilitation progression were based on an indicative mine schedule. The significantly reduced waste rock production over the period 2013-2017 has materially affected ability to advance TCMs emplacement area to final landform.
- The TCM EA rehabilitation progressions were based on the assumption that the ROM coal haulage, and the associated removal of existing TCM ROM infrastructure allowing the rehabilitation of the southern face of the northern area. Agreement with Boggabri Coal mine to receive TCM ROM coal haulage has not been reached to date: and as such the TCM ROM infrastructure has not been remove d preventing part of the northern waste emplacement
- The TCM EA rehabilitation progression were based on the assumption that the existing MIA area will be relocated to the southern extend of the project area, and Goonbri road realigned to allow rehabilitation of the southern face of the southern emplacement area and some ancillary areas. The existing MIA has not been relocated nor Goonbri Road realigned as assumed by the EA affecting the ability to rehabilitate the southern emplacement.

The status of mining and rehabilitation at the completion of the reporting period is summarised in Table 18 and Figure 12- Status of mining rehabilitation.

Table 18- Rehabilitation Status

Mine Area Type [1] [Ha]		2016	2017	2018
0	***Total Mine Footprint***	579.5	600.1	627.6
1	***Total Active Disturbance***	510.6	498.4	540.7
2	***Land Being Prepared for Rehabilitation***	9.9	8.9	12.9
3	***Land Under Active Rehabilitation***	59.0	67.2*	74.1
4	***Completed Rehabilitation***	0.0	0.0	0.0

[1] Refer Annual Review Guideline (p.11) for description of mine area types.
**Active rehabilitation area was incorrectly calculated and reported for 2017 with 83.3Ha.*

8.1.2 Post Rehabilitation Land Uses

Woodland areas will be established on slopes and upper terraces of the Northern and Southern Emplacement Areas. Tree species selection and planting densities adjacent to Boggabri and Leard State Forest are being determined with consideration of required integration with the Boggabri waste emplacement area and Leard State Forest. Rehabilitation on the southern emplacement is immature and requires ongoing maintenance. Rehabilitation on the northern emplacement is further advanced, requires significantly less maintenance and is nearing the point where it could be considered that open woodland land use has been achieved. Rehabilitation has commenced adjacent to Boggabri Coal and in the Leard State Forest (ML1685), which has been undertaken in accordance with the MOP and is currently immature.

No rehabilitation of agricultural lands has occurred during the reporting period.

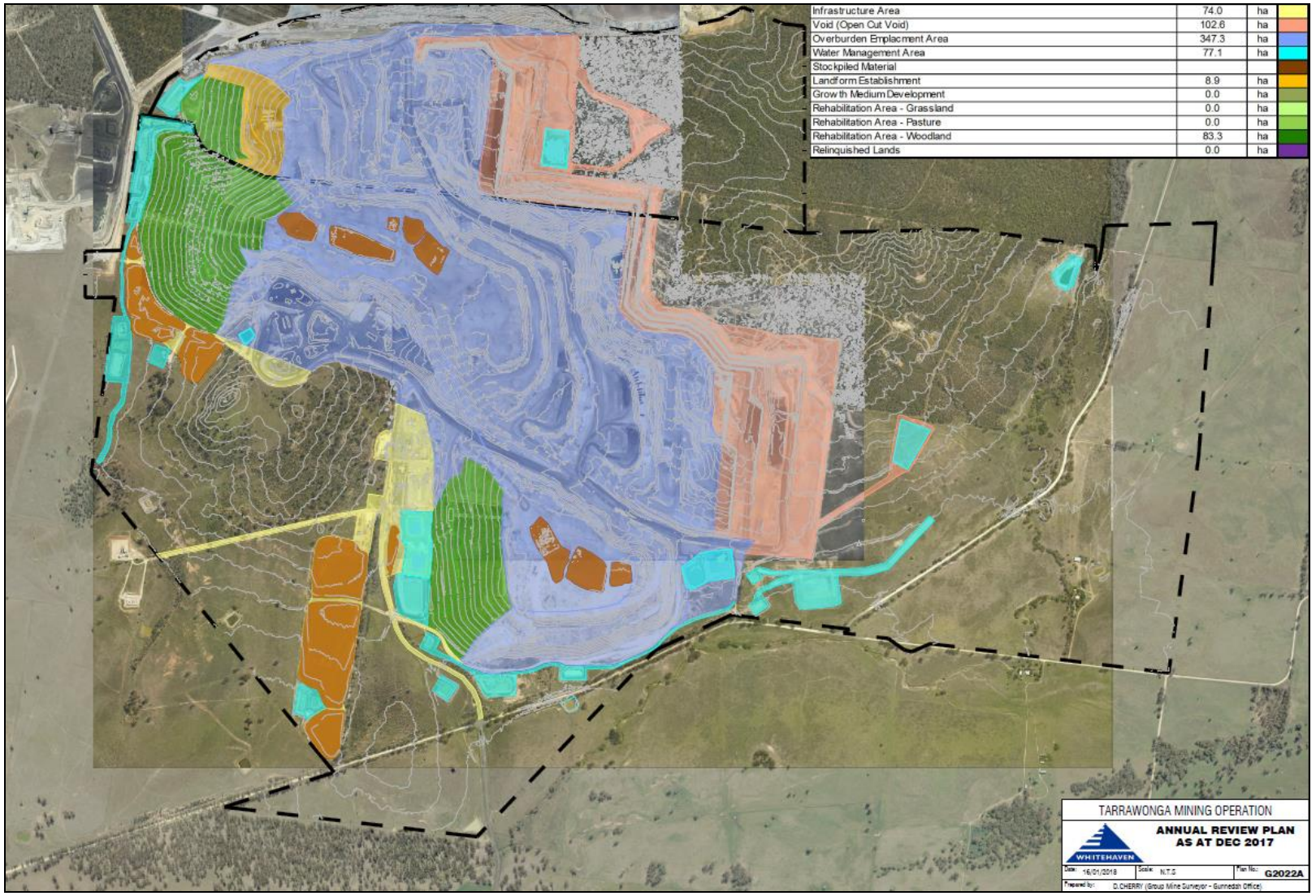


Figure 12- Status of mining rehabilitation

8.1.3 Rehabilitation Undertaken

TCM coordinated two revegetation programs in 2018 with the overstorey revegetation undertaken between April and July 2018. In total, 2,400 hiko seedlings of Eucalyptus albens, Eucalyptus blakelyi, Eucalyptus crebra, Eucalyptus melliodora, Eucalyptus pilligaensis, Eucalyptus populanea and Eucalyptus microcarpa were planted across 14Ha, with approximately 6Ha at the Southern dump rehabilitation area. Approximately 8 tonnes of mulch was applied around each of the hiko seedlings to improve moisture retention. In addition, TCM used an All Terrain Vehicle (ATV) to irrigate the young trees and to improve their chances of survival. That initiative had a positive impact with an estimated survival rate of a 70% on the Southern emplacement and nearly 90% on the Northern emplacement rehabilitation areas.

8.1.4 Rehabilitation Fauna and Flora Monitoring

Eco Logical Australia undertook the winter and spring monitoring programs in accordance with the MOP and the Biodiversity Management Plan. Part of this monitoring provided an annual snapshot of the habitats available in these areas and habitat utilisation by fauna. This was then compared to control sites to determine its success and progression in regards to habitat value for native and threatened species. Details on the results of the fauna/ flora monitoring campaign are available in section 6.4.16.4.1 and 6.4.2.

8.1.5 Weeds Management

More details on the Weed management program undertaken in 2018 are available in section 6.4.3

8.1.6 Renovation or Removal of Buildings

No renovation or removal of buildings occurred during the reporting period.

8.1.7 Other Rehabilitation Undertaken

No additional rehabilitation of explorations areas, infrastructure, shafts, dams, fence lines or bunds occurred during the reporting period.

8.1.8 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off has not been requested for any rehabilitated areas.

8.1.9 Variations in Activities against MOP/RMP

In March 2018, The Department approved the MOP Amendment C. This approval was limited to the rehabilitation objectives and completion criteria and the schedule of rehabilitation activities proposed for the MOP period. An amendment D to the MOP will be submitted in March 2019.

8.1.10 Trials, Research Projects and Initiatives

The direct seeding trial undertaken during 2015 has shown limited success; the site has been incorporated into the annual rehabilitation-monitoring program to effectively evaluate success over time.

There were no specific rehabilitation trials or research proposed for TCM in 2018. Rehabilitation monitoring and rehabilitation methodology records are however, shared among Whitehaven operations to inform decision-making regarding future rehabilitation campaigns. Specifically the nearby Maules Creek mine has a requirement to undertake a $1M research program into rehabilitation of Box Gum Grassy Woodland upon mine rehabilitation, the findings from which will be considered by TCM and integrated into future MOP amendments as appropriate.

In 2019, TCM will investigate opportunities for trials and assess different methodologies and techniques for rehabilitation of the Northern and Southern emplacement areas. Some of potential trials could include comparison of different type, depth and characteristics of top soils, and look at the impact of using ameliorants.

8.1.11 Key Issues to Achieving Successful Rehabilitation

The four key issues to achieving successful rehabilitation include:

- excessive erosion and sedimentation (e.g. gullying and sedimentation resulting in land stability and vegetation growth issues);
- weed and feral animal infestation;
- poor vegetation establishment and growth; and
- Landforms stability.

In cases where the performance is sub-optimal, additional management measures will be implemented (e.g. replanting, repairing landforms and water management features, application of much/fertilisers, feral animal and weed control etc. A Trigger Action Response Plan (TARP) for rehabilitation at the TCM has been included in the MOP, which outlines appropriate actions and varied responses that will be implemented as required.

8.2 Actions for Next Reporting Period

A MOD7 of PA11_0047 will be submitted in 2019 and key changes will include:

- Reduction in open cut extent and surface disturbance footprint
- ROM production increase to 3.5Mt
- Minor changes to size and location of post mining landforms

- Upper Namoi Alluvial Aquifer will not be mined and Goonbri Creek/Road will not be realigned.

After consultation with DRG and DPE; TCM will submit an amendment to the current MOP that will include current rehabilitation progression and futures opportunities where rehabilitation can be accelerated into a revised rehabilitation schedule.

In 2019, rehabilitation monitoring program will be undertaken in winter and spring and will be reported in the next Annual Review report.

9 COMMUNITY AND COMPLAINTS

In accordance with PA 11_0047, a Community Consultative Committee (CCC) meeting was held on a quarterly basis at TCM. The committee comprised representatives of Gunnedah Shire Council, Narrabri Shire Council, TCM and the community including landholders.

Community contributions continued to be managed in accordance with the Whitehaven Coal Donations and Sponsorship Policy. Approximately $65,000 were donated to several organisations for health, education and indigenous sport support Aboriginal girls academy education support, Westpac Rescue Helicopters, Boggabri Rotary Club and participation to several Charity day fundraiser and donations for those who suffered from the drought.

TCM maintained a designated community complaints line. In the event of a complaint, details pertaining to the complainant, complaint and action taken are recorded. Each complaint is investigated and documented with individual complaint records maintained. Any Complaints is reported and findings discussed with CCC members during the meeting. Those meetings give an opportunity to provide an update of the environmental and operations performance.

Only one complaint was recorded in 2018 and findings of the investigation showed that dust generated at the time of the complaint was not mine related. The number of complaints has significantly decreased since the previous reporting period and Table 19 provides a comparison of complaints received since 2012/13 annual reporting periods.

Table 19- Complaints summary

Category	2012/13	2013/14	2014/15	2015/16	2016	2017	2018
Air Quality	23	2	11	13	1	3	1
Traffic	8	3	0	0	1	0	0
Surface Water	1	0	0	0	1	0	0
Visual Amenity	1	0	0	0	0	0	0
Noise / Vibration	6	1	0	0	1	0	0
Blast	12	3	5	3	2	0	0
Other	4	2	2	0	0	0	0
TOTAL	**55**	**11**	**18**	**16**	**5**	**3**	**1**

* Tally of complaints does not necessarily equate to total complaints; some complaints received are for multiple categories.

10 INDEPENDENT AUDIT

An Independent Environmental Audit (IEA) was conducted in July 2017. The previous independent audit was undertaken in 2014. Outstanding items from the 2014 and 2017 Audits are detailed in Table 20 and Table 21 below.

Table 20- 2014 Independent Audit- Outstanding Actions Status in 2018

Management Area	Recommendations/ Proposed Action	Timing	Status
Biodiversity	The baseline surveys for threatened species in offset areas should be conducted in accordance with the department's Survey Guidelines for Australia's Threatened Birds and the Survey Guidelines for Australia's Threatened Bats. The annual monitoring reports should confirm compliance with the two stated methodologies	Ongoing	Baseline threatened species surveys will be undertaken in accordance with, and reported with reference to, the relevant methodologies. Awaiting approval of Stage 2 Biodiversity Management Plan.
Rehabilitation	Work be conducted to soften the visual impact of the unrehabilitated southern emplacement, reduce risk of impacts to Goonbri Creek and to lessen the levels of fugitive particulate emissions.	Ongoing	Assessment of unsuccessful aerial seeding trial undertaken in 18/5/2016. Review and reshape the area to achieve desired outcomes.
	No rehabilitation works were observed that did not comply with the rehabilitation management plan. However, revegetation is not of good quality, some trials have been conducted, further trials should be	Ongoing	TCM will investigate and compare several revegetation methodologies and conduct some trials.

	implemented to establish the most appropriate vegetation establishment methodologies.		
	Some topsoil at the site has been stored since the site inception. As soon as there is an opportunity to use this material it should be used. The longer topsoil is stored the less effective it is for vegetation establishment.	Ongoing	All the site Top Soil stockpiles have been tested in 2018. The results show the suitability of use and if ameliorant is required. Direct placement will be used as a preferred option to avoid stored topsoil for long period of time.
	Topsoil should be characterised prior to striping to ensure stripping depths are suitable and that similar soil qualities are stored together allowing the application of suitable soil ameliorants when the topsoil is spread.	Ongoing	Pre strip soil testing is conducted every year and results provide guidance in term of soil quality, depth and ameliorant requirement.
	Topsoils should be characterised prior to spreading to allow the application of suitable ameliorants (predominantly gypsum and lime).	As above	
	Dirty water management needs review in consideration of the water from around the coal loader not going into the dirty water system.	Ongoing	Updated Water Management Plan submitted in August 2018. Clean water not to enter dirty water circuit as much as practicable.
	To obtain groundwater samples that are representative of the water within the aquifer being sampled, groundwater wells should be purged (see Groundwater sampling guidelines, EPA Victoria 2000).	Ongoing	A contractor undertake Groundwater monitoring in accordance with the relevant Guidelines.

Table 21-2017 Independent Audit- Outstanding Action status in 2018

Item No	Findings/ Comment	Action/Timing
Minister's Conditions of Approval PA 11_0047		
3. 8	No agreements are held with landowners adjacent to haul route. No coal haulage at night. Noise monitoring reports reviewed demonstrated no exceedence of criteria. Three monitoring locations (2 properties) – 2 residences on Brooklyn and Weroona. Report states that for practical reasons it is not possible to undertake monitoring for 15 hours (entire day period). The approach here is to monitor noise over a representative one hour period and utilise the results of this to theoretically predict noise over the compliance period. TMCL should consider updating this condition to reflect the approach used to ensure 100% compliance	TCM to raise practicality of meeting condition with DP&E. Timing: Ongoing discussions
3.49	Predates this audit period. The previous IEA (SMEC 2014) stated against this condition: "Biodiversity Management Plan not approved, not able to calculate bond amount, not compliant with deadline stated" and adjudged as "Not Compliant Administrative". No evidence of a conservation bond exists which appears to have been required by May 2013 (or if not, then following the BMP preparation (ELA April 2015).	Agreement between DP&E and TCM in place. Bond to be calculated following approval of BMP. Timing: Action completed in 2018

Item No	Findings/ Comment	Action/Timing
3.64(h)	The Proponent shall prepare and implement a Rehabilitation Management Plan to the satisfaction of DRE. The auditor recommended more thorough implementation and recording of MOP requirements.	2018 MOP amendment C more clearly describe implementation, monitoring and auditing of rehabilitation. Timing: Action Completed in March 2018
	EPL 12365	
L4.4	Monitoring locations are stated in the NMP and in quarterly monitoring report. Site inspection demonstrated where noise monitoring is undertaken. The location of monitoring at Barbers Lagoon is on the property boundary however the residence is approximately 200m from the monitoring location. Hence this is considered a non-compliance (NC).	Submit a Modification to the EPL in draft to be submitted to EPA to amend condition. Timing: Submission of Variation to EPL planned in 2019. (TCM contest the weighting of NC; monitoring occurs at a location closer to the operation and due to distance from noise source the variability is immaterial. ANC considered appropriate).
M7.4	The auditor observed the noise monitoring locations in the field. Monitoring locations are stated in the NMP and in quarterly monitoring report. Site inspection demonstrated where noise monitoring is undertaken. The location of monitoring at Barbers Lagoon is on the property boundary however the residence is approximately 200m from the monitoring location. Hence this is considered a non-compliance. New EPL includes TB1	Modification to the EPL in draft to be submitted to EPA to amend condition. Current monitoring occurs at a location closer to noise source. Timing: Planned in 2019
	Mining Lease 1579	
4a	MOP (2015-2020) (SLR 2016) details rehabilitation planning (section 5), implementation (section 7) and MOP Plans 3(a-f) (annual timeslices) and 4 (post-mining landuse). Section 2.3.10 contains a table showing the material production schedule for six years. Plans are only for 5 years and material production schedule is only for 6 years, as such this is considered to be an ANC.	New MOP amendment C submitted and approved. Timing: Completed in March 2018
4e,4g	BMP (ELA April 2015) describes and demonstrates the flora and fauna on the site (especially shown in Figures 3.1, 3.2 and 3.3). Not contained in MOP.	New MOP amendment C submitted and approved. Timing: Completed in March 2018
	Mining Lease 1693	
5a	Auditor document review and interview with the Environmental Officer identified that no environmental incidents occurred on this mining lease. Other incidents have occurred and evidence of reporting has been observed. The incident report referenced was not submitted within 24 hours. Report all environmental incidents within 24 hours of the incident occurring.	Ensure any incidents are duly reported. Timing: Ongoing (TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered appropriate).
	Mining Lease 1685	
5a	No environmental incidents occurred on this mining lease. Incidents against other conditions have occurred as detailed in this report and evidence of reporting has been observed.	Ensure any incidents are duly notified. Timing: Ongoing

Item No	Findings/ Comment	Action/Timing
	However, the incident report referenced was not submitted within 24 hours. Report all environmental incidents within 24 hours of the incident occurring as this is the most stringent criteria at the site.	(TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered more appropriate).
5b	No environmental incidents occurred on this mining lease. Incidents against other conditions have occurred as detailed in this report and evidence of reporting has been observed. However, the incident report referenced was not submitted within 24 hours. Report all environmental incidents within 24 hours of the incident occurring as this is the most stringent criteria at the site.	Ensure after any incidents, report is submitted to department within 7 days. Timing: Ongoing TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered appropriate.

11 INCIDENTS AND NON-COMPLIANCES FOR THE REPORTING PERIOD

11.1 Reportable Incidents

No reportable incidents and exceedances recorded during the reporting period.

11.2 Non-compliances

Non-compliances with relevant approvals noted within Section 1 are outlined in Table 22:

Table 22- Non-compliance Action plan

Non - Compliance	Date / Location	Cause	Action Plan	Status/Estimated Completion Date
PA 11_0047, Schedule 2 condition 2	Reporting Period.	Per below	Per below	Per below
PA 11_0047, Schedule 3 condition 21	Feb 2018	Proponent shall prepare and implement a Blast Management Plan (BMP) for the project to the satisfaction of the Secretary. According to Section 4.2.1 of the BMP interested party must be notified ahead of the blast but on 18/01/18 one party was not notified.	To minimise risk of reoccurrence TCM took several actions including: -Developed a Training package, - Developed a responsibility Matrix - Blast Management Plan was reviewed and an updated version submitted to DPE in August 2018.	This resulted in an Official Warning Letter from the DP&E.

11.3 Regulatory Actions

- DP&E issued a Show Cause letter on 05 February 2018 related to a breach of sch.3 cond.21 of PA11_0047 regarding the implementation of a "Blast Management Plan for the Project to the satisfaction of the Secretary…." for an incident that occurred on 18th January 2018.
- DP&E issued a Show Cause letter on 26 February 2018 related to a breach of sch.3 cond.12 of PA11_0047 regarding the implementation of a "Noise management Plan for the project to the satisfaction of the Secretary…." for an incident that occurred in 2017.
- DP&E issued a Warning letter on 08 March 2018 related to a breach of sch.3 cond.21 of PA11_0047 regarding the implementation of a "Blast Management Plan for the Project to the satisfaction of the Secretary…." for an incident that occurred on 18th January 2018.
- DP&E issued an Official Caution letter on 23 March 2018 related to a breach of sch.3 cond.12 of PA11_0047 regarding the implementation of a "Noise management Plan for the project to the satisfaction of the Secretary…." for an incident that occurred in 2017.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following measures will be continued or implemented in the next reporting period:

Table 23- Summary of activities for 2019

	Activity Description	Timing
1	Review and update various Environmental Management Plans as required.	As required
2	Undertake rehabilitation and mining activities in accordance with the most recent MOP.	Ongoing throughout the year
3	Continue environmental monitoring and management.	Ongoing throughout the year
4	Continue implementation of approved Leard Forest Precinct Strategies.	Ongoing throughout the year
5	Continue community liaison and engagement with local stakeholders	Ongoing throughout the year

Appendix 1

BLAST MONITORING DATA

Tarrawonga Coal Pty Ltd ACN 100 742 185

Environmental Blast Monitoring

SHOT NO	DATE	MONITOR LOCATION	PEAK GROUND PRESSURE (mm/s)	PEAK OVERPRESSURE (dBL)	TIME	Fume Rating
782	03/01/18	Tarrawonga Station	0.5900	85.30		
782	03/01/18	Coomalgah	0.2100	95.90	11:59:00	
783	4/1/2018	Tarrawonga Station	0.0500	96.10		
783	1/04/2018	Coomalgah	0.0300	92.20	12:01:00	
784	10/1/2018	Tarrawonga Station	0.7600	107.00		
784	1/10/2018	Coomalgah	0.3700	99.60	12:00:00	
785	12/1/2018	Tarrawonga Station	0.3100	98.60		
785	1/12/2018	Coomalgah	0.2100	100.00	12:58:00	
786	16/1/18	Tarrawonga Station	0.0800	95.20		
786	16/1/18	Coomalgah	0.0800	96.20	11:39:00	
787	18/1/18	Tarrawonga Station	0.1400	103.30		
787	18/1/18	Coomalgah	0.14	90.1	0:00:00	
788	24/1/18	Tarrawonga Station	0.2100	88.50		
788	24/1/18	Coomalgah	0.2000	92.40	0:00:00	
789	30/1/19	Tarrawonga Station	0.1600	86.30		
789	30/1/19	Coomalgah	0.1500	97.40	0:00:00	
790	31/01/18	Tarrawonga Station	0.0000	69.10		
790	31/01/18	Coomalgah	0.0000	84.50	12:00:00	
791	5/2/2018	Tarrawonga Station	0.2600	92.40		
791	2/05/2018	Coomalgah	0.1000	92.20	16:47:00	
792	7/2/2018	Tarrawonga Station	0.1400	95.50		
792	2/07/2018	Coomalgah	0.1500	98.30	16:30:00	
793	9/2/2018	Tarrawonga Station	0.1200	101.10		
793	2/09/2018	Coomalgah	0.1000	94.60	13:00:00	
794	12/2/2018	Tarrawonga Station	0.2000	102.60		
794	2/12/2018	Coomalgah	0.2200	101.00	12:00:00	
795	16/2/18	Tarrawonga Station	0.0800	100.60		
795	16/2/18	Coomalgah	0.0400	98.50	12:00:00	
796	22/02/18	Tarrawonga Station	0.1900	104.70		2b
796	22/02/18	Coomalgah	0.1300	95.70	12:00:00	2b
797	27/2/18	Tarrawonga Station	0.2500	94.80		1a
797	27/2/18	Coomalgah	0.0900	93.10	0:00:00	1a
798	5/3/2018	Tarrawonga Station	0.2800	101.00		
798	3/05/2018	Coomalgah	0.4900	92.60	0:00:00	
799	9/3/2018	Tarrawonga Station	0.1100	96.60		
799	3/09/2018	Coomalgah	0.1500	96.50	0:00:00	
800	12/3/2018	Tarrawonga Station	0.4000	90.80		
800	3/12/2018	Coomalgah	0.4600	89.70	0:00:00	
801	23/3/18	Tarrawonga Station	0.4500	108.10		
801	23/3/18	Coomalgah	0.7200	102.80	0:00:00	
802	3/27/2018	Tarrawonga Station	0.1700	96.90		
802	27/03/2018	Coomalgah	0.0600	90.10	0:00:00	
803	28/3/18	Tarrawonga Station	0.1400	91.00		
803	28/3/18	Coomalgah	0.0000	77.90	0:00:00	
804	5/4/2018	Tarrawonga Station	0.1200	96.10		
804	4/05/2018	Coomalgah	0.0500	100.10	0:00:00	
805	17/04/18	Tarrawonga Station	0.6000	105.10		
805	17/04/18	Coomalgah	1.0800	93.40	0:00:00	
806	18/04/18	Tarrawonga Station	1.0400	90.80		1b
806	18/04/18	Coomalgah	0.3300	92.30	0:00:00	1b
807	24/4/18	Tarrawonga Station	0.1900	93.50		
807	24/4/18	Coomalgah	0.1200	103.30	0:00:00	
808	27/4/18	Tarrawonga Station	0.2600	100.30		
808	27/4/18	Coomalgah	0.1400	99.80	0:00:00	
809	5/2/2018	Tarrawonga Station	0.1200	103.20		
809	2/05/2018	Coomalgah	0.2600	92.70	0:00:00	
810	15/5/18	Tarrawonga Station	0.3300	97.50		1a
810	15/5/18	Coomalgah	0.5600	98.50	0:00:00	1a
811	17/5/18	Tarrawonga Station	0.1900	103.20		
811	17/5/18	Coomalgah	0.1200	97.40	0:00:00	
812	21/5/18	Tarrawonga Station	0.7700	93.60		
812	21/5/18	Coomalgah	0.2600	95.70	0:00:00	
813	25/5/18	Tarrawonga Station	0.1800	97.80		
813	25/5/18	Coomalgah	0.2100	99.30	0:00:00	
814	30/5/18	Tarrawonga Station	0.2200	102.50		
814	30/5/18	Coomalgah	0.1600	101.10	0:00:00	
815	1/6/2018	Tarrawonga Station	0.5100	87.10		
815	6/01/2018	Coomalgah	0.1800	96.70	0:00:00	
816	6/7/2018	Tarrawonga Station	0.1900	102.10		
816	7/06/2018	Coomalgah	0.3700	102.10	0:00:00	
817	14/6/18	Tarrawonga Station	0.2700	91.00		
817	14/6/18	Coomalgah	0.1800	101.80	0:00:00	
818	22/6/18	Tarrawonga Station	0.1300	97.10		
818	22/6/18	Coomalgah	0.0700	97.50	0:00:00	
819	26/6/18	Tarrawonga Station	0.3000	89.70		
819	26/6/18	Coomalgah	0.2100	104.20	0:00:00	
820	5/7/2018	Tarrawonga Station	0.7100	104.60		1a
820	7/05/2018	Coomalgah	0.2100	96.90	0:00:00	1a
821	10/7/2018	Tarrawonga Station	0.1900	97.40		
821	7/10/2018	Coomalgah	0.0900	94.10	0:00:00	
822	18/07/18	Tarrawonga Station	0.8200	107.80		1a
822	18/07/18	Coomalgah	1.1200	102.70	0:00:00	1a
823	24/07/18	Tarrawonga Station	0.1000	83.50		
823	24/07/18	Coomalgah	0.1000	92.60	0:00:00	
824	2/8/2018	Tarrawonga Station	0.7600	91.30		
824	8/02/2018	Coomalgah	1.0300	101.20	0:00:00	
825	8/8/2018	Tarrawonga Station	0.0500	97.60		
825	8/08/2018	Coomalgah	0.0200	102.80	11:58:33	
826	14/08/18	Tarrawonga Station	0.1600	98.10		1a
826	14/08/18	Coomalgah	0.1100	93.00	0:00:00	1a
827	15/8/18	Tarrawonga Station	0.3000	105.50		
827	15/8/18	Coomalgah	0.4700	104.20	0:00:00	
828	17/08/18	Tarrawonga Station	0.1300	72.80		2b

Tarrawonga Coal Pty Ltd ACN 100 742 185

Environmental Blast Monitoring

*

SHOT NO	DATE	MONITOR LOCATION	PEAK GROUND PRESSURE (mm/s)	PEAK OVERPRESSURE (dBL)	TIME	Fume Rating	
828	17/08/18	Coomalgah	0.1600	91.70	0:00:00	2b	
829	22/08/18	Tarrawonga Station	0.0700	94.30			
829	22/08/18	Coomalgah	0.0200	96.00	0:00:00		
830	24/8/18	Tarrawonga Station	0.1000	98.20			
830	24/8/18	Coomalgah	0.1600	80.20	0:00:00		
831	28/08/18	Tarrawonga Station	0.1900	96.90			
831	28/08/18	Coomalgah	0.1800	99.60	0:00:00		
832	4/9/2018	Tarrawonga Station	0.1200	93.60			
832	9/04/2018	Coomalgah	0.0600	85.30	0:00:00		
833	10/9/2018	Tarrawonga Station	0.2100	100.60		3a	
833	9/10/2018	Coomalgah	0.1800	99.20	0:00:00	3a	
834	14/9/18	Tarrawonga Station	0.1000	96.60			
834	14/9/18	Coomalgah	0.0700	93.30	0:00:00		
835	21/09/18	Tarrawonga Station	0.6300	116.00			Compliant with EPL, PA and MLs because occured in mine owned property
835	21/09/18	Coomalgah	1.0800	101.20	0:00:00		
836	27/09/18	Tarrawonga Station	1.3200	92.70		2b	
836	27/09/18	Coomalgah	0.6200	95.10	0:00:00	2b	
837	4/10/2018	Tarrawonga Station	0.0900	92.00			
837	10/04/2018	Coomalgah	0.0800	106.00	0:00:00		
838	5/10/2018	Tarrawonga Station	0.1000	80.20			
838	10/05/2018	Coomalgah	0.1400	84.50	0:00:00		
839	10/10/2018	Tarrawonga Station	0.1200	95.70			
839	10/10/2018	Coomalgah	0.0600	88.40	0:00:00		
840	12/10/2018	Tarrawonga Station	0.2200	104.80			
840	10/12/2018	Coomalgah	0.4000	106.20	0:00:00		
841	16/10/18	Tarrawonga Station	0.2200	94.40			
841	16/10/18	Coomalgah	0.0900	106.00	0:00:00		
842	18/10/18	Tarrawonga Station	0.0800	94.60			
842	18/10/18	Coomalgah	0.0400	89.50	0:00:00		
843	26/10/18	Tarrawonga Station	0.3600	104.50		1a	
843	26/10/18	Coomalgah	0.3400	99.00	0:00:00	1a	
844	30/10/19	Tarrawonga Station	0.1600	94.60		0	
844	30/10/19	Coomalgah	0.1200	90.10	0:00:00	0	
845	11/2/2018	Tarrawonga Station	0.1700	106.30			
845	2/11/2018	Coomalgah	0.0900	90.40	16:43:35		
846	11/6/2018	Tarrawonga Station	0.0800	89.50			
846	6/11/2018	Coomalgah	0.0500	100.40	15:07:00		
847	19/11/2018	Tarrawonga Station	0.3000	103.60		1b	
847	19/11/2018	Coomalgah	0.2500	95.90	9:56:00	1b	
848	26/11/18	Tarrawonga Station	0.1500	91.70		1a	
848	26/11/18	Coomalgah	0.1800	86.50	12:04:00	1a	
849	27/11/18	Tarrawonga Station	0.2400	103.60	11:03:00	1b	
849	27/11/18	Coomalgah	0.1500	95.80		1b	
850	12/03/2018	Tarrawonga Station	0.1800	96.80	13:12:00	1a	
850	12/03/2018	Coomalgah	0.1800	97.80		1a	
851	12/06/2018	Tarrawonga Station	0.3400	105.10	12:11:00	2a	
851	12/06/2018	Coomalgah	0.2100	98.80		2a	
852	12/11/2018	Tarrawonga Station	0.7200	102.60	13:14:00		
852	12/11/2018	Coomalgah	0.3600	99.10			
853	12/18/2018	Tarrawonga Station	0.0800	96.70	9:10:13	1c	
853	12/18/2018	Coomalgah	0.0700	91.80		1c	
854	12/31/2018	Tarrawonga Station	0.5200	103.40	12:38:33		
854	12/31/2018	Coomalgah	0.7400	97.80	12:38:33		

Appendix 2

SURFACE WATER MONITORING DATA

Quarterly Surface Water Monitoring Results

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
8 September 2006	SD5	6.5	930	144		<2				
8 September 2006	SD6	7.5	310	104		<2				
8 September 2006	SD8	8.9	190	25		<6				
8 September 2006	SD9	9	285	1940		<2				
11 January 2007	SD5	8.4	3750	20		<2				
11 January 2007	SD8	8.2	420	84						
11 January 2007	SD9	8.6	440	15		<2				
11 January 2007	MV1	7.7	3970	293		<2				
18 April 2007	SD1	8.6	605	86		<2				
18 April 2007	SD2	8.5	395	102		<2				
18 April 2007	SD8	8.6	270	36		<2				
18 April 2007	SD9	8.4	310	133		<2				
18 April 2007	SD20	9.1	520	80		<2				
18 April 2007	MV	7.8	4260	<2		<2				
25 July 2007	SD1	7.5	990	23		<2				
25 July 2007	SB5	8	1150	17		<2				
25 July 2007	MV1	7.6	3130	15		30				
25 July 2007	SD8	8.1	260	25		<2				
25 July 2007	SD9	7.7	290	22		<2				
25 July 2007	SD5	8.4	3370	8		<2				
31 October 2007	SD9	7.8	310	16		<2				
31 October 2007	SD8	8.8	780	32		<2				
31 October 2007	SB5	8.9	1200	60		<2				
31 October 2007	SB8*	9	2000	110		<2				
31 October 2007	SB7	8.4	560	27		<2				
31 October 2007	MV	8.1	2780	45		<2				
31 October 2007	SD5	8.3	2620	44		<2				
18 March 2008	SD9	6.9	245	27		<2				
18 March 2008	SD8	8.4	1340	19		<2				
18 March 2008	SD5									
18 March 2008	SD20	7.4	385	44		<2				
18 March 2008	Pit Water Dam	8.4	1620	14		<2				
18 March 2008	MV	7.8	3110	10		<2				
18 March 2008	SB5	7.8	870	54		<2				
18 March 2008	SB7	7.5	365	387		<2				
18 March 2008	SD17	7.4	460	58		<2				
22 August 2008	SD9	7.9	275	35		<2				
22 August 2008	SD8	8.9	1450	20		<2				
22 August 2008	SB16	8.8	1440	16		<2				
22 August 2008	SD5	8.7	1310	35		<2				
22 August 2008	SB4	8.7	1980	31		<2				
22 August 2008	SB5	8.5	955	13		<2				
22 August 2008	Pit Water Dam	8.7	2420	17		<2				
5 September 2008	BCD	7.2	75	150		<2				
5 September 2008	DAM1	7.4	185	4930		<2				
23 September 2008	BCU	6.8	95	92		<2				
23 September 2008	BCD	6.7	115	107		<2				
23 September 2008	SD8	8.9	995	24		<2				
23 September 2008	SD17	8.3	720	456		<2				
7 October 2008	SD17	8.2	735	75		<2				
7 October 2008	SD8	8.9	775	22		<2				
7 October 2008	SB14	8.5	255	43		<2				
15 December 2008	SD17	7.4	435	152		<2				
15 December 2008	SD9	7.3	245	24		3				
15 December 2008	SD8	8.2	635	22		<2				
15 December 2008	BCD	6.9	135	30		<2				
10 February 2009	MV	8.2	3370	13		<2				
10 February 2009	SD8	8.9	790	11		<2				
10 February 2009	SD9	8.5	330	16		<2				
10 February 2009	SB14	8	380	32		<2				

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
10 February 2009	SB5	8.8	1070	7		<2				
10 February 2009	SB16	9	1200	6		<2				
24 June 2009	SB7	8.21	401	90	6	<5				
24 June 2009	SB5	8.62	1180	12	8	<5				
24 June 2009	Pit water	8.87	2330	148	5	<5				
24 June 2009	SD9	8.33	335	5	8	<5				
24 June 2009	SD16	8.16	550	20	5	<5				
24 June 2009	SB14	7.71	351	29	9	<5				
27 August 2009	SB7	8.1	418	62	5	<10				
27 August 2009	SB5	8.64	1210	29	8	<10				
27 August 2009	Pit water	8.2	2580	264	6	<10				
27 August 2009	SD9	8.36	389	12	8	<10				
31 August 2009	SB14	8.73	342	56	10	<10				
31 August 2009	SD16	8.3	547	158	5	<10				
22 December 2009	NCD	7.8	137	164	16	19				
22 December 2009	BCU	7.32	150	220	25	-				
22 December 2009	BCD	7.04	146	32	43	-				
29 December 2009	BCD	6.88	75	47	15					
29 December 2009	NCD	6.73	143	32	10					
29 December 2009	NCU	6.79	95	34	18					
29 December 2009	SD14	8.12	1080	65	4					
29 December 2009	SB14	7.41	374	128	19					
29 December 2009	Goonbri Creek	7.02	60	38	12					

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
25 February 2010	SB7	8.14	197	194	3	5				
25 February 2010	SB5	8.06	681	77	4	<5				
25 February 2010	SD9	7.95	123	18	8	5				
25 February 2010	SD16	8.49	734	257	3	<5				
25 February 2010	SB14	8.03	232	40	6	<5				
25 February 2010	SD2	8.37	276	15	<5	<5				
24 May 2010	SB7	8.41	291	17	4	13				
24 May 2010	SB5	8.59	531	48	5	13				
24 May 2010	SD9	8.62	148	10	8	6				
24 May 2010	SD16	8.93	810	9	4	8				
24 May 2010	SB14	7.76	251	538	8	6				
6 July 2010	SB14	8.09	245	95	5	<5				
9 August 2010	SB16	8.39	1170	10	3	<5				
9 August 2010	Pit water	7.07	1940	37	2	<5				
9 August 2010	SD9	7.72	147	24	9	<5				
9 August 2010	SD16	8.29	793	40	5	<5				
9 August 2010	SB14	7.69	260	1300	6	<5				
2 November 2010	SB7 (pre floc)	8.33	332	38	4	<5				
4 November 2010	SB7 (post floc)	8.72	339	10	3	<5				
10 November 2010	SB16	9.19	1140	14	3	<5				
10 November 2010	SD9	7.94	168	16	11	<5				
10 November 2010	SD16	9.49	831	11	5	<5				
10 November 2010	SB14	7.72	323	56	5	<5				
9 March 2011	SD17	8.38	393	42	6	<5				
9 March 2011	SB16	7.17	968	20	6	<5				
9 March 2011	VOID	7.95	2540	78	6	<5				
9 March 2011	SD9	7.98	186	30	11	<5				
9 March 2011	SD16	8.71	762	27	5	<5				
9 March 2011	SB14	8.17	361	43	6	<5				
3 May 2011	SD16	8.58	1020	22	6	<5	<0.001	0.002	0.014	<0.01
3 May 2011	SB14	7.9	434	24	6	<5	<0.001	0.002	0.004	<0.01
3 May 2011	SD17	8.92	2040	20	6	<5	<0.001	0.004	0.014	<0.01
3 May 2011	SB16	8.58	1030	13	4	<5	0.003	0.2	0.029	<0.01
3 May 2011	VOID	Dry								
4 August 2011	SD16	8.64	975	32	8	<5	<0.001	0.002	0.011	<0.01
4 August 2011	SB14	8.33	414	24	6	<5	<0.001	0.001	0.003	<0.01
4 August 2011	SD17	8.53	925	10	8	<5	<0.001	0.002	0.006	<0.01
4 August 2011	SB16	8.52	891	24	4	<5	0.004	0.002	0.028	<0.01
4 August 2011	VOID	8.52	2890	49	5	<5		0.015		
9 November 2011	SD16	9.03	791	20	7	<5	<0.001	0.003	0.010	<0.01
9 November 2011	SB14	7.84	431	20	5	<5	<0.001	0.002	0.004	<0.01
9 November 2011	SD17	8.39	448	56	6	<5	<0.001	0.002	0.003	<0.01
9 November 2011	SB16	8.39	646	6	3	<5	0.003	0.002	0.026	<0.01
9 November 2011	VOID	8.08	1790	158	3	<5				
29 February 2012	SD16	7.96	365	34	2	<5	<0.001	0.001	0.009	<0.01
29 February 2012	SB14	8.15	443	174	5	<5	<0.001	0.002	0.003	<0.01
29 February 2012	SD17	8.23	434	18	7	<5	<0.001	0.003	0.004	<0.01
29 February 2012	SB16	8.17	433	23	1	<5	0.001	0.001	0.012	<0.01
29 February 2012	VOID	8.3	727	1620	2	<5		0.008		
9 March 2012	SB23 Pre-floc	7.84	148	70	4	<5				
10 March 2012	SB23 24hrs post floc	7.82	159	60	16	<5				
11 March 2012	SB23 48hrs post floc	7.75	158	61	16	<5				
2 March 2012	SD16 Pre-floc	8.17	351	16	2	<5				
2 March 2012	SB14 Pre-floc	8.13	452	50	5	<5				

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
2 May 2012	SD16	8.37	388	14	2	<5	<0.001	<0.001	0.008	<0.01
2 May 2012	SB14	9.08	1060	57	5	<5	<0.001	0.002	0.004	<0.01
2 May 2012	SD17	8.74	602	8	6	<5	<0.001	0.001	0.006	<0.01
2 May 2012	SB16	7.87	456	6	1	<5	0.001	0.001	0.013	<0.01
2 May 2012	VOID	8.26	2080	10	1	<5	0.002	0.009	0.048	<0.01
2 May 2012	GCR1	7.99	689	104	35	<5	<0.001	0.003	0.002	<0.01
11 May 2012	SB23		246	18	8	<5				
22 May 2012	SB24		373	42	11	<5				
22 May 2012	SB14		980	42	5	<5				
22 May 2012	SD16		400	35	2	<5				
22 May 2012	SD9		133	36	8	<5				
22 May 2012	SD17		618	20	6	<5				
28 May 2012	SD17	8.58	558	16	7	<5				
28 May 2012	SD9	7.97	136	37	8	<5				
28 May 2012	SB14	8.21	661	53	5	<5				
28 May 2012	SB24	8.21	351	42	11	<5				
18 June 2012	SB14	8.05	513	92	5	<5				
18 June 2012	SD16	8.13	445	25	4	<5				
18 June 2012	SD9	7.95	137	23	8	<5				
18 June 2012	SD17	8.54	533	14	6	<5				
18 June 2012	Canyon SD	8.13	304	87	9	<5				
11 July 2012	NCD	7.19	174	150	19	<5				
20 July 2012	SB23-After Floc	7.92	254	16	3	<5				
23 July 2012	SD16-Background info water	8.02	450	25	3	<5				
23 July 2012	SD14-After floc	7.94	590	35	3	<5				
14 August 2012	SD16	8.1	454	<5	3	<5	<0.001	0.001	0.008	<0.01
14 August 2012	SB14	8.11	646	<5	7	<5	<0.001	0.002	0.007	<0.01
14 August 2012	SD17	8.08	465	<5	5	<5	<0.001	0.001	0.004	<0.01
14 August 2012	SB16	7.96	561	<5	2	<5	0.003	0.002	0.02	<0.01
14 August 2012	VOID	8.39	2220	<5	2	<5				
14 August 2012	GCR1	7.82	190	16	19	<5	<0.001	0.002	<0.001	<0.01
14 August 2012	GCR2	7.72	182	12	17	<5	<0.001	0.002	<0.001	<0.01
14 November 2012	SD16	9.84	679	100	6	<5	<0.001	0.004	0.01	<0.01
14 November 2012	SB14	8.85	890	24	3	<5	<0.001	<0.001	0.006	<0.01
14 November 2012	SD17	8.7	700	14	4	<5	<0.001	<0.001	0.006	<0.01
14 November 2012	SB16	8.69	707	76	1	<5	0.004	0.002	0.026	<0.01

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
14 November 2012	VOID	8.62	2870	10	<1	<5				
1 February 2013	SD9 pre floc	7.44	262	43	7	<5				
1 February 2013	SD9 post floc	7.39	267	82	8	<5				
20 February 2013	SD9-Pre Discharge	7.89	275	18	8	<5				
6 March 2013	SD16	7.69	252	288	5	<5	<0.001	0.005	0.001	<0.01
6 March 2013	SB14	7.81	378	99	4	<5	<0.001	0.001	0.002	<0.01
6 March 2013	SD17	8	229	91	4	<5	<0.001	<0.001	0.002	<0.01
6 March 2013	SB16A	8.01	365	240	4	<5	0.002	0.004	0.013	<0.01
6 March 2013	VOID	8.23	1620	16	2	<5				
6 March 2013	GCR1	7.43	126	106	5	<5	<0.001	<0.001	<0.001	<0.01
6 March 2013	GCR2	7.42	173	48	16	<5	<0.001	0.002	<0.001	<0.01
30 May 2013	SD16	8.16	341	100	7	<5	<0.001	0.003	0.003	<0.01
30 May 2013	SB14	8.42	538	38	6	<5	<0.001	0.002	0.003	<0.01
30 May 2013	SD17	8.47	334	49	6	<5	<0.001	0.002	0.003	<0.01
30 May 2013	SB16A	8.25	530	108	10	<5	0.004	0.004	0.018	<0.01
30 May 2013	VOID	8.51	3120	45	4	<5				
7 August 2013	SD16	8.49	390	7	6	<5	<0.001	0.001	0.003	<0.01
7 August 2013	SB14	8.96	570	8	7	<5	<0.001	<0.001	0.002	<0.01
7 August 2013	SD17	8.59	371	9	4	<5	<0.001	<0.001	0.003	<0.01
7 August 2013	SB16A	8.05	585	20	7	<5	0.005	0.003	0.022	<0.01
7 August 2013	VOID	8.35	2660	29	6	<5				
7 August 2013	TAR-GCD	7.4	155	52	16	<5	<0.001	0.002	<0.001	<0.01
7 August 2013	TAR-GCU	7.42	208	14	20	<5	<0.001	0.003	<0.001	<0.01
5 November 2013	SD16	9.42	538	29	15	<5	<0.001	0.004	0.004	<0.01
5 November 2013	SB14	8.55	1070	172	17	<5	<0.001	0.002	0.005	<0.01
5 November 2013	SD17	8.87	573	21	9	<5	<0.001	0.002	0.005	<0.01
5 November 2013	SB16A	8.8	918	38	8	<5	0.008	0.005	0.04	<0.01
5 November 2013	VOID	8.25	2530	11	29	<5		0.01		
20 February 2014	TAR-SD16	8.35	432	65	6	<5	<0.001	0.006	0.003	<0.01
20 February 2014	TAR-SB14	8.09	393	1280	8	<5	<0.001	0.005	<0.001	0.01
20 February 2014	TAR-SD17	8.79	712	46	8	<5	<0.001	0.002	0.007	<0.01
20 February 2014	TAR-SB16A	8.61	713	330	8	<5	0.004	0.01	0.023	<0.01
20 February 2014	TAR-VOID	8.63	1350	22	1	<5	0.007	0.026	0.101	<0.01
20 February 2014	TAR-GCU	6.69	115	433	23	<5	<0.001	0.005	0.001	<0.01
6 May 2014	TAR-SD16	8.12	404	19	3	21	<0.001	0.004	0.003	<0.01
6 May 2014	TAR-SB14	8.92	1980	10	4	5	<0.001	0.002	0.008	<0.01
6 May 2014	TAR-SD17	8.26	351	25	3	<5	<0.001	0.002	0.0002	<0.01
6 May 2014	TAR-SB16A	8.2	483	134	1	<5	0.003	0.008	0.02	<0.01
6 May 2014	TAR-VOID	8.31	3280	213	<1	<5		0.006		
6 May 2014	TAR-GCU	7.89	318	<5	14	<5	<0.001	0.002	0.001	<0.01
6 May 2014	TAR-GCD	7.88	301	<5	17	<5	<0.001	0.001	<0.001	<0.01
6 August 2014	TAR-SD16	8.7	439	5	6	<5	<0.001	0.002	0.002	<0.01
6 August 2014	TAR-SB14	8.67	1450	22	7	<5	<0.001	0.001	0.004	<0.01
6 August 2014	TAR-SD17	8.44	397	48	7	<5	<0.001	0.002	0.003	<0.01
6 August 2014	TAR-SB16A	8.25	609	63	8	<5	0.005	0.004	0.024	<0.01
6 August 2014	TAR-VOID	8.5	3260	515	16	<5				
6 August 2014	TAR-GCU	8.31	392	42	14	<5	<0.001	0.002	<0.001	<0.01
11 November 2014	TAR-SD16	8.7	507	14	6	<5	<0.001	0.002	0.004	<0.01
11 November 2014	TAR-SB14	8.85	1480	50	14	<5	<0.001	0.003	0.012	<0.01
11 November 2014	TAR-SD17	8.7	539	34	7	<5	<0.001	<0.001	0.005	<0.01
11 November 2014	TAR-SB16A	8.51	740	18	5	<5	0.006	0.003	0.032	<0.01
11 November 2014	TAR-GCU	7.7	549	1230	57	<5	<0.001	0.022	0.006	<0.01
11 November 2014	TAR-GCD	7.64	751	62	50	<5	<0.001	0.011	0.004	<0.01
8 December 2014	TAR-VOID	8.04	3060	170	<1	<5				
18 February 2015	TAR-SD16	8.19	451	16	4	<5	<0.001	0.004	0.006	<0.01
18 February 2015	TAR-SB14	8	626	12	4	<5	<0.001	0.004	0.005	<0.01
18 February 2015	TAR-SD17	8.13	313	123	5	<5	<0.001	0.007	0.006	<0.01
18 February 2015	TAR-SB16A	8.29	574	71	2	<5	0.003	0.007	0.025	<0.01

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
18 February 2015	TAR-GCU	7.43	242	86	6	<5	<0.001	0.01	0.02	<0.01
18 February 2015	TAR-GCD	7.22	444	748	26	<5	<0.001	0.016	0.002	<0.01
18 February 2015	TAR-VOID	8.72	3170	10	<1	<5				
7 May 2015	TAR-SD16	8.27	409	16	6	<5	<0.001	0.003	<0.001	<0.01
7 May 2015	TAR-SB14	8.85	1300	17	8	<5	<0.001	0.002	0.002	<0.01
7 May 2015	TAR-SD17	8.3	539	44	5	<5	0.001	0.003	0.007	<0.01
7 May 2015	TAR-SB16A	8.19	571	44	2	<5	0.005	0.003	0.008	<0.01
7 May 2015	TAR-VOID	8.62	2910	5	5	<5				
7 May 2015	TAR-GCD	7.35	147	29	8	<5	<0.001	0.003	<0.001	<0.01
17 August 2015	TAR-SD16	8.43	426	19	4	8	<0.001	0.003	0.011	<0.01
17 August 2015	TAR-SB14	8.91	1070	7	5	<5	0.001	0.001	0.02	<0.01
17 August 2015	TAR-SD17	8.81	902	192	8	7	<0.001	0.002	0.043	<0.01
17 August 2015	TAR-SB16A	7.95	658	65	2	7	0.007	0.004	0.05	<0.01
17 August 2015	TAR-GCU	7.67	161	96	6	6	<0.001	0.004	0.001	<0.01
17 August 2015	TAR-GCD	7.59	202	35	7	<5	<0.001	0.007	<0.001	<0.01
27 August 2015	TAR-VOID	8.41	1020	49200	<20	6				
11/17/2015	TAR-SD16	8.9	440	10	6	<5	<0.001	0.004	0.004	<0.01
11/17/2015	TAR-SB14	8.21	455	100	9	<5	<0.001	0.003	0.005	<0.01
11/17/2015	TAR-SD17	7.98	361	191	10	<5	<0.001	0.004	0.004	<0.01

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
11/17/2015	TAR-SB16A	8.08	550	64	6	<5	0.001	0.002	0.048	<0.01
11/17/2015	TAR-VOID	8.36	1350	43	4	<5				
11/17/2015	TAR-GCU	7.47	157	33	15	<5	<0.001	0.006	<0.001	<0.01
2/11/2016	TAR-SD16	8.2	289	95	5	<5	<0.001	0.006	0.004	<0.01
2/11/2016	TAR-SB14	8.29	722	21	4	<5	<0.001	0.004	0.007	<0.01
2/11/2016	TAR-SD17	8.26	698	174	2	<5	0.002	0.007	0.014	<0.01
2/11/2016	TAR-SB16A	7.99	622	84	1	<5	0.002	0.003	0.035	<0.01
2/11/2016	TAR-VOID	8.28	882	53	<1	<5				
2/11/2016	TAR-GCD	7.45	159	129	10	<5	<0.001	0.01	0.002	<0.01
5/10/2016	TAR-VOID	8.33	3270	<5	2	<5		0.011		<0.01
5/10/2016	TAR-SD16	8.04	340	66	5	<5	<0.001	0.004	0.003	<0.01
5/10/2016	TAR-SB14	8.45	535	108	8	<5	<0.001	0.005	0.004	<0.01
5/10/2016	TAR-SD17	8.45	774	25	9	<5	<0.001	0.003	0.016	<0.01
5/10/2016	TAR-SB16A	8.42	847	21	4	<5	<0.001	0.002	0.03	<0.01
5/10/2016	TAR-GCD	7.25	170	119	14	<5	<0.001	0.005	<0.001	<0.01
8/10/2016	TAR-SD16	8.13	427	19	6	<5	<0.001	0.004	0.003	<0.01
8/10/2016	TAR-SD14	8.13	644	154	6	<5	<0.001	0.004	0.003	<0.01
8/10/2016	TAR-SD17	7.85	267	87	5	<5	<0.001	0.005	0.003	<0.01
8/10/2016	TAR-SB16A	8.13	474	45	3	<5	<0.001	0.002	0.017	<0.01
8/10/2016	TAR-GCU	7.29	136	18	16	<5	<0.001	0.003	<0.001	<0.01
8/10/2016	TAR-GCD	7.08	95	33	12	<5	<0.001	0.002	<0.001	<0.01
8/10/2016	TAR-VOID	8.55	3010	6	1	<5				
11/15/2016	TAR-SD16	8.72	712	7	5	<5	<0.001	0.005	0.004	<0.01
11/15/2016	TAR-SD17	8.77	557	37	10	<5	<0.001	0.003	0.01	<0.01
11/15/2016	TAR-SB16A	8.36	603	14	6	<5	<0.001	0.003	0.025	<0.01
11/15/2016	TAR-VOID	8.6	3000	26	2	<5				
11/15/2016	TAR-GCU	7.89	242	26	16	<5	<0.001	0.004	0.002	<0.01
11/15/2016	TAR-GCD	8.15	526	12	12	<5	<0.001	0.004	<0.001	<0.01
8/2/2017	SD14	7.9	459	28	12	<5	<0.001	0.008	0.002	<0.01
8/2/2017	SD17	8.1	528	202	22	<5	<0.001	0.009	0.006	<0.01
8/2/2017	SB16a	8.4	551	93	8	<5	<0.001	0.003	0.017	<0.01
8/2/2017	GCU	7.3	208	70	29	<5	<0.001	0.009	0.001	<0.01
8/2/2017	GCD	8.1	489	169	33	<5	<0.001	0.026	0.002	<0.01
8/2/2017	VOID	8.1	3360	8	2	<5	----	----	----	----
9/5/2017	SB14	8.9	757	67	5	5	<0.001	0.008	0.004	<0.01
9/5/2017	SD17	9.1	1300	170	12	12	<0.001	0.005	0.023	<0.01
9/5/2017	SB16a	8.4	957	41	1	1	<0.001	0.003	0.03	<0.01
9/5/2017	QCU	8.3	15	878	7	7	<0.001	0.006	<0.001	<0.01
9/5/2017	QCD	7.4	678	225	37	37	<0.001	0.006	0.003	<0.01
9/5/2017	VOID	8.6	3100	12	1	<5	----	0.006	----	----
9/8/2017	SD16	9.4	463	19	9	<5	<0.01	<0.01	<0.01	<0.01
9/8/2017	SD14	9.7	580	47	11	<5	<0.01	<0.01	<0.01	<0.01
9/8/2017	SD17	8.2	416	120	10	<5	<0.01	<0.01	<0.01	<0.01
9/8/2017	SB16a	8.1	703	62	6	<5	<0.01	<0.01	0.02	<0.01
9/8/2017	GCU	7.5	114	121	8	<5	<0.01	<0.01	<0.01	<0.01
9/8/2017	GCD	7.9	280	161	12	<5	<0.01	<0.01	<0.01	<0.01
5/9/2017	VOID	8.5	3050	21	1	<5	---	---	---	---
13/11/2017	SB14	8.1	440	130	11	<5	<0.001	0.007	0.002	<0.01
13/11/2017	SD17	9.1	958	122	29	<5	<0.001	0.006	0.017	<0.01
13/11/2017	SB16A	8.6	901	85	7	<5	<0.001	0.004	0.026	<0.01
13/11/2017	VOID	8.6	2970	19	2	<5	----	----	----	----
13/11/2017	GCU	6.5	175	22	14	<5	<0.001	0.007	0.001	<0.01
13/11/2017	GCD	6.7	234	125	14	<5	<0.001	0.005	0.001	<0.01
22/02/2018	SD16	9.2	1400	216	34	<5	<0.001	0.018	0.015	<0.01
22/02/2018	SB14	8.9	823	60	11	<5	<0.001	0.01	0.007	<0.01
22/02/2018	SB16a	9.4	1330	280	36	<5	<0.001	0.012	0.028	<0.01
22/02/2018	Void	8.7	3600	15	1	<5	----	----	----	----
22/02/2018	GCU	7.0	170	166	25	<5	<0.001	0.004	<0.001	<0.01

Date	Sample Location	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Grease & Oil (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
22/05/2018	Void	8.9	3340	14	1	6	----	----	----	----

Other sites were dry

21/08/2018	SB16A	9.3	5300	54	51	<5	0.002	0.022	0.192	<0.01
21/08/2018	Void	8.9	3590	<5	2	<5	----	----	----	----

Other sites were dry

13/11/2018	SD16	8.5	407	634	4	<5	<0.001	0.014	0.001	0.01
13/11/2018	SD14	8.9	2020	26	10	5	<0.001	0.004	0.006	<0.01
13/11/2018	SD17	8.1	439	898	10	<5	<0.001	0.01	0.002	<0.01
13/11/2018	SB16A	8.4	1090	436	20	<5	<0.001	0.014	0.011	<0.01
13/11/2018	GCU	8.2	253	14	18	<5	<0.001	0.005	0.001	<0.01
13/11/2018	GCD	7.1	260	65	18	<5	<0.001	0.011	0.001	<0.01
13/11/2018	VOID	7.2	2880	18	5	<5	----	----	----	----

Appendix 3

GROUNDWATER MONITORING DATA

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations					Major Anions							Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L										
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**						**1000**									**400**		**4000**			
NEPC Guideline - Agricultural Irrigation (mg/L)							**5**	**0.1**			**0.01**	**1**	**0.05**	**0.2**		**2**	**0.02**	**0.02**		**2**	**0.5**	**0.2**	**0.002**																			**600**			
NEPC Guideline - Livestock (mg/L)							**5**	**0.5**			**0.01**		**1**	**0.5**			**1**			**20**	**5**		**0.002**			**1000**						**1000**									**30**	**400**		**2400**			
THUIN																																														
MW1	2-Jun-06	7.77	8.50	7.48				0.006																6330	92	138	1710	43		2680	424				772											
MW1	11-Jan-07	8.49	9.22	7.12				0.001			<0.0001	<0.005		<0.006	<0.001		0.026			0.11			<0.0001		2410	26	33	554	18		346	145				684											
MW1	18-Apr-07	6.77	7.50																																											
MW1	9-Jul-07	7.23	7.96	7.30	2440	17.4		<0.001			<0.0001	<0.005		0.0005	<0.001		0.008			0.09			<0.0001		2500	21	29	504	25		385	143				614								3.1	<20	380
MW1	10-Jul-07	7.18	7.91																																											
MW1	18-Jul-07	7.18	7.91																																											
MW1	7-Aug-07	7.01	7.74																																											
MW1	22-Aug-07	6.93	7.66																																											
MW1	5-Sep-07	6.97	7.70																																											
MW1	24-Sep-07	6.93	7.66																																											
MW1	11-Oct-07	6.91	7.64																																											
MW1	26-Nov-07	6.89	7.62																																											
MW1	29-Jan-08	6.82	7.55																																											
MW1	4-Mar-08	6.87	7.60																																											
MW1	23-Apr-08	6.94	7.67	7.30	3100	21.3		<0.001			<0.00005	<0.01		0.002	0.0036		0.01			0.007			0.0002		3120	46	50	614	29		567	247				665									<0.025	0.027
MW1	21-Aug-08	7.00	7.73																																											
MW1	29-Oct-08	7.07	7.82	7.80	3430	21.6		0.001			0.00023	0.015		0.13	0.37		0.03			0.22			<0.0001		3500	44	51	670	32		680	210				690									<0.025	<0.100
MW1	29-Jan-09	7.08	7.73																																											
MW1	17-Jun-09		7.87	7.20	5470	19.8		0.001	<0.001	0.091	<0.0001	0.013	0.001	0.047	0.008	0.103	0.009		<0.01	0.019		0.71	<0.0001		3870	46	61	762	28	41.2	777	167	<1	<1	725	725	39.9	1.58	<0.01				2320			
MW1	11-Sep-09	7.23	7.90																																										
MW1	14-Dec-09	7.23	7.90	7.5	4670	17.5	<0.01	0.001				<0.005		0.014	0.001	0.131	0.038			0.048		<0.05	<0.0001	7.83	4510	70	95	875	28	50.1	882	234	<1	<1	780	780	45.3	4.99		<0.01	0.2	0.2				
MW1	25-Feb-10	7.17	7.84																																										
MW1	11-May-10	7.46	8.13	7.56	4330	22.6		0.001	<0.001	0.075	0.0001	0.002	0.002	0.011	0.005	0.204	0.009		<0.01	0.012		0.88	<0.0001		4090	43	60	779	26	41.7	795	229	<1	<1	694	694	41	0.75	0.16				1850			
MW1	30-Aug-10	7.47	8.14	7.47	3890	21.5																																							
MW1	9-Nov-10	7.45	8.12	7.06	3170	24.6																																								
MW1	10-Mar-11	7.38	8.05	7.1	3280	23.7	0.04	0.002				0.003		0.063	0.006	0.035	0.006			0.016		0.3	<0.0001	7.26	3650	44	62	771	29	41.6	839	210	<1	<1	658	658	41.2	0.49		<0.01	0.09	0.09				
MW1	6-Jun-11	7.20	7.87	7.2	3110	19.9																																							
MW1	6-Sep-11	7.19	7.86	7.09	3200	22.5	0.1	0.003	<0.001	0.057	0.0001	0.002	0.002	0.019	0.01	0.193	0.005		<0.01	0.014		0.99	<0.0001	7.72	3990	41	56	739	26	39.5	774	246	<1	<1	620	620	39.3	0.12	<0.01	<0.01	0.04	0.04	2080			
MW1	7-Dec-11	7.09	7.76	7.16	3150	20.1																																							
MW1	13-Mar-12	6.90	7.57	7.44	3140	21.9	0.12	<0.001	<0.001	0.067	<0.0001	0.003	<0.001	0.081	0.001	0.028	0.009		<0.01	0.027		0.23	<0.0001	7.78	3590	44	58	758	30	40.7	748	232	<1	<1	629	629	38.5	2.76	<0.01	<0.01	0.12	0.12	2040			
MW1	13-Jun-12	6.53	7.20	7.37	3730	20.3																																							
MW1	4-Sep-12	6.41	7.08	7.44	3340	20.8	0.03	<0.001	<0.001	0.069	<0.0001	0.005	<0.001	0.09	0.003	0.067	0.007		<0.01	0.067		0.2	<0.0001	7.8	3570	39	55	662	26	35.9	676	212	<1	<1	681	681	37.1	1.62	<0.01	<0.01	0.06	0.06	2090			
MW1	27-Nov-12	6.25	6.92	7.54	3140	20.8																																							
MW1	20-Mar-13	6.15	6.82	7.52	3180	21.9	0.05	0.002	<0.001	0.055	<0.0001	0.007	<0.001	0.1	0.008	0.031	0.016		<0.01	0.125		0.25	<0.0001	7.65	3400	35	48	700	25	36.8	575	182	<1	<1	690	690	33.8	4.2	0.08	<0.01	0.1	0.1	1830			
MW1	11-Jul-13	6.18	6.85	7.49	3110	20.1																																							
MW1	5-Sep-13	6.14	6.81	7.48	3040	21.4	0.15	<0.001	<0.001	0.058	<0.0001	0.003	<0.001	0.113	0.005	0.088	0.012	<0.01	<0.01	0.079	0.06	0.24	<0.0001	7.99	3330	31	44	677	27	35.3	586	205	<1	<1	672	672	34.2	1.52	0.02				1900			
MW1	22-Nov-13	5.95	6.62	7.6	3140	20.8																																							
MW1	20-Feb-14	6.08	6.75	7.5	3150	20.2	1.23	0.001	<0.001	0.062	0.0004	0.023	0.001	0.487	0.031	0.073	0.016	<0.01	<0.01	0.624	<0.05	2.49	<0.0001	7.65	3440	29	45	710	30	36.8	516	195	<1	<1	624	624	31.1	8.39	0.07				1800			
MW1	27-May-14	6.25	6.92	7.6	3140	20.7																																							
MW1	9-Sep-14	6.26	6.83	7.7	3220	20.2	0.13	0.002				0.01		0.058	0.006	0.077	0.009			0.098		0.53		7.97	3320	29	40	594	24	31.2	520	206	<1	<1	714	714	33.2	3.19		<0.01	0.17	0.17				
MW1	20-Nov-14	6.36	7.03	7.7	3190	21.6																																							
MW1	26-Feb-15	6.39	7.06	7.6	3170	27.7	0.08	0.001	<0.001	0.056	<0.0001	0.004	<0.001	0.045	0.003	0.078	0.009	<0.01	<0.01	0.118		0.3	<.00001	7.13	800	34	45	634	22	33.5	551	210	<1	<1	739	739	34.7	1.71	0.05	<0.01	0.15	0.15	1700			
MW1	26-May-15	6.47	7.14	7.5	3210	19.2																																							
MW1	27-Aug-15	6.51	7.18	7.6	3280	18.5	0.1	0.001	<0.001	0.066	<0.0001	<0.001	<0.001	0.026	<0.001	0.019	0.004	<0.01	<0.01	0.073	<0.05	0.18	<0.0001	8.03	3440	28	42	651	22	33.7	<1	225	<1	<	636	636	30.1	5.68	0.06	<0.01	0.11	0.11	1900			
MW1	4-Dec-16	6.59	7.26	7.7	3270	21																																							
MW1	24-Feb-16	6.59	7.26	7.6	3290	23.2	0.02	0.001	<0.001	0.061	<0.0001	<0.001	<0.001	0.032	0.001	0.016	0.006	<0.01	<0.01	0.049	<0.05	0.12	<0.0001	8.09	3400	40	48	715	24	37.7	582	233	<1	<1	686	686	35	3.66	0.1	<.01	0.15	0.15	1950			
MW1	23-May-16	6.65	7.32	7.7	3340	21.4																																							
MW1	1-Sep-16	6.67	7.34	7.6	3270	20.8	0.22	0.002				0.008		0.062	0.008	0.708	0.026					2.07	<0.0001	8	3350	36	45	545	20	34.1	572	210	<1	<1	674	674	34	0.1		<0.01	0.03	0.13				
MW1	29-Nov-16	6.68	7.35	7.6	3170	21.7																																							
MW1	23-Mar-17	6.66	7.33	7.7	3210		0.11	0.002	<0.001	0.069	<0.0001	0.003	0.001	0.086	0.011	0.323	0.016	<0.01	<0.01	0.135	<0.05	0.93	<0.0001	8.36	3380	34	45	634	23	33.6	578	188	<1	17	708	725	34.7	1.67	0.03	<0.01	0.15	0.15	2060			
MW1	21-Jun-17	6.74	7.41	7.8	3290	19.4																																							
MW1	13-Sep-17	6.80	7.47	7.8	3270		0.05	<0.001	<0.001	0.047	<0.0001	0.001	<0.001	0.025	0.002	0.065	0.009	<0.01	<0.01	0.028	<0.05	0.17	<0.0001	8.31	3370	31	46	656	22	34.4	550	214	<1	8	784	792	35.8	1.94	0.01	<0.01	0.07	0.07	1850			
MW1	13-Dec-17	6.73	7.4	7.7	3280																																								
MW1	22-Mar-18	6.81	7.48	7.9	3360	20.2	0.76	0.002	<0.001	0.068	<0.0001	0.012	0.002	0.071	0.038	0.286	0.018	<0.01	<0.01	0.2	<0.05	3.81	<0.0001	8.41	3360	33	44	581	24	31.2	646	212	<1	32	754	786	38.3	10.3	0.05	0.06	0.14	0.2	1950			
MW1	12-Jun-18	6.91	7.58	7.9	3350																																								
MW1	13-Sep-18	6.92	7.59	7.7	3300	21.9	0.73	0.002	<0.001	0.061	<0.0001	0.005	0.004	0.036	0.004	0.325	0.01	<0.01	<0.01	0.037	<0.05	1.38	<0.0001	8.09	3430	33	44	603	21	32	639	208	<1	<1	704	704	36.4	6.41	0.19	<0.01	0.01	0.01	1810			
MW1	5-Dec-18	7.03	7.7	7.8	3420	21.7																																							
THUIN																																													
MW2	2-Jun-06	3.63	4.40	7				<0.001																5440	132	106	1400	14		2230	475				432											
MW2	11-Jan-07	3.85	4.62	6.8				0.002			0.0001									0.09			<0.0001		511	1	<1	101	1		25.1	9				176											
MW2	18-Apr-07	2.83	3.60																																											
MW2	9-Jul-07	3.39	4.16	7.15	446	18.8		0.002			0.0002	<0.005		0.003	<0.001		0.002			0.233			<0.0001		496	<1	<1	99	1		27.2	11				175								7.89	<20	250
MW2	10-Jul-07	3.45	4.22																																											
MW2	18-Jul-07	3.52	4.29																																											
MW2	7-Aug-07	3.58	4.35																																											
MW2	22-Aug-07	3.55	4.32																																											
MW2	5-Sep-07	3.57	4.34																																											
MW2	24-Sep-07	3.57	4.34																																											
MW2	11-Oct-07	3.60	4.37																																											
MW2	26-Nov-07	3.91	4.68																																											
MW2	29-Jan-08	3.48	4.25																																											
MW2	4-Mar-08	3.46	4.23																																											
MW2	23-Apr-08	3.73	4.50	7.3	400	19.9		0.005			0.00018	0.11		0.13	0.14		0.15			0.37			0.0004		440	8.9	5.8	99	17		39	10				165									<0.025	<0.1
MW2	21-Aug-08	3.74	4.51																																											
MW2	29-Oct-08	3.59	4.37	6.9	600	19.2		0.008			0.00007	0.026		0.027	0.061		0.031			0.17			0.0002		620	6.8	7.1	120	6.8		93	27				180									<0.025	<0.100
MW2	29-Jan-09	3.73	4.51																																											
MW2	17-Jun-09	3.69	4.53	7.7	660	19.1		0.006	0.004	0.311	0.0002	0.025	0.052	0.047	0.052	1.54	0.041		0.08	0.172		32.6	0.0005		602	1	1	128	2	5.76	59	<10	<1	<1	195	195	5.57	1.62	0.1				1540			

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**										**400**		**4000**				
MW2	11-Sep-09	4.01	4.8																																										
MW2	14-Dec-09	3.72	4.51	7.7	691	18.3	<0.01	<0.001				<0.001		<0.001	<0.001	0.018	<0.001			<0.005		<0.05	<0.0001	7.5	640	2	1	134	2	6.07	55.3	12.8	<1	<1	202	202	5.86	1.73		<0.01	0.45	0.45					
MW2	25-Feb-10	1.72	2.51																																										
MW2	11-May-10	2.15	2.94	7.61	717	22.3		0.014	0.006	0.441	0.0002	0.071	0.058	0.073	0.071	1.06	0.094		0.13	0.3		88.3	0.0002		618	2	1	129	2	5.84	76.7	24.3	<1	<1	149	149	5.66	1.6	0.01				780				
MW2	30-Aug-10	2.10	2.89	7.4	590	20.5																																								
MW2	9-Nov-10	2.22	3.01	7.32	513	24.1																																									
MW2	10-Mar-11	2.96	3.75	7.31	566	24.2	0.28	0.001				0.001		0.018	0.002	0.018	0.006			0.045		0.3	0.0001	7.23	457	2	2	124	2	5.69	69	24	<1	<1	156	156	5.57	1.02		<0.01	0.07	0.07					
MW2	6-Jun-11	2.86	3.65	7.3	553	20.3																																								
MW2	6-Sep-11	2.95	3.74	6.9	585	19.8	1.93	<0.001	<0.001	0.016	<0.0001	0.002	<0.001	0.005	0.001	0.028	0.003		<0.01	0.021		1.76	<0.0001	7.33	692	3	3	144	2	6.71	92	32	<1	<1	169	169	6.64	0.5	<0.01	<0.01	0.02	0.02	340				
MW2	7-Dec-11	2.71	3.5	7.08	600	19.2																																								
MW2	13-Mar-12	2.38	3.17	7.06	912	22	0.3	<0.001	<0.001	0.012	<0.0001	0.002	<0.001	0.002	<0.001	0.058	0.004		<0.01	0.01		0.28	<0.0001	7.41	1060	12	10	224	4	11.3	164	50	<1	<1	232	232	10.3	4.44	0.03	<0.01	0.05	0.05	640				
MW2	13-Jun-12	3.13	3.92	7.02	1320	20																																								
MW2	4-Sep-12	3.11	3.9	7.07	1260	19.7	3.48	0.001	<0.001	0.034	<0.0001	0.002	0.002	0.009	0.003	0.145	0.004		<0.01	0.075		2.86	0.0002	7.47	1310	20	17	252	5	13.5	221	68	<1	<1	319	319	14	1.99	<0.01	<0.01	0.06	0.06	802				
MW2	27-Nov-12	3.42	4.21	7.29	905	19.1																																								
MW2	20-Mar-13	2.82	3.61	7.39	670	22.7	1.3	0.002	<0.001	0.022	<0.0001	<0.001	0.004	0.036	0.006	0.293	0.005		<0.01	0.078		0.88	0.0002	6.9	686	3	3	150	3	7	95	26	<1	<1	179	179	6.8	1.41	0.04	<0.01	0.05	0.05	376				
MW2	11-Jul-13	3.64	4.43	7.03	739	19.8																																								
MW2	5-Sep-13	3.45	4.24	6.78	680	19.8	6.39	0.001	0.039	0.1	<0.0001	0.005	0.002	0.037	0.006	0.134	0.006	<0.01	0.02	0.095	<0.001	5.54	0.0002	7.46	674	2	2	142	3	6.52	83	28	<1	<1	173	173	6.38	1.01	0.04				389				
MW2	22-Nov-13	3.68	4.47	6.9	694	19.4																																								
MW2	20-Feb-14	3.72	4.51	7.4	675	21.2	1.32	0.001	0.012	0.06	<0.0001	0.004	<0.001	0.055	0.006	0.058	0.004	<0.01	<0.01	0.08	<0.001	1.32	<0.0001	7.01	694	2	2	155	3	7.08	85	27	<1	<1	171	171	6.38	5.2	<0.01				395				
MW2	27-May-14	3.35	4.14	7.4	618	20.9																																								
MW2	9-Sep-14	3.48	4.29	7.6	845	21.4	14.8	0.004				0.01			0.01	0.22	0.012			0.086		11.8	<0.0001	7.27	615	<1	<1	131	2	5.75	57	19	<1	<1	219	219	6.38	5.25		<0.01	0.08	0.08					
MW2	20-Nov-14	3.63	4.42	7.4	615	20.4																																								
MW2	26-Feb-15	3.32	4.11	7.3	495	21.6	0.01	0.002	<0.001	0.007	<0.0001	<0.001	0.001	0.006	0.001	0.066	0.002	<0.01	<0.01	0.027	0.05	0.75	<0.0001	7.59	567	<1	<1	113	2	4.97	27	16	<1	<1	214	214	5.37	3.97	0.02	<0.01	0.02	0.02	306				
MW2	26-May-15	3.44	4.23	7.2	522	19.7																																								
MW2	27-Aug-15	3.46	4.25	7.1	540	18	0.87	0.002	<0.001	0.015	<0.0001	<0.001	<0.001	0.006	0.001	0.035	0.002	<0.01	0.01	0.028	<0.05	0.69	<0.0001	7.32	538	1	1	119	1	5.33	28	13	<1	<	188	188	4.82	5.04	0.04	<0.01	<0.01	0.02	298				
MW2	4-Dec-15	3.49	4.28	7.1	528	20.2																																								
MW2	24-Feb-16	3.62	4.41	7	562	21.4	0.48	0.002	<0.001	0.008	<0.0001	<0.001	<0.001	0.032	<0.001	0.038	0.002	<0.01	<0.01	0.016	<0.05	0.45	<0.0001	7.38	575	2	2	131	2	6.01	37	3.1	<1	<1	209	209	5.66	3	<0.01	<0.01	0.03	0.03	305				
MW2	23-May-16	3.74	4.53	6.9	597	21																																								
MW2	1-Sep-16	3.5	4.29	6.9	554	19.6	11.7	0.004				0.01		0.02	0.007	0.287	0.011			0.091		11.4	0.0001	7.04	557	<1	<1	130	2	5.7	36	19	<1	<1	207	207	5.55	1.35		<0.01	0.27	0.27					
MW2	29-Nov-16	3.54	4.33	7	524	21.2																																								
MW2	23-Mar-17	3.85	4.64	7	650		4.76	0.002	<0.001	0.032	<0.0001	0.004	0.004	0.019	0.004	0.235	0.005	<0.001	0.02	0.045	0.06	4.7	<0.0001	7.7	639	<1	1	138	2	6.14	48	18	<1	<1	232	232	6.36	1.82	0.02	<0.01	0.74	0.74	432				
MW2	21-Jun-17	3.85	4.64	7	591	18.9																																								
MW2	13-Sep-17	3.64	4.43	6.9	548		0.32	0.001	<0.001	0.006	<0.0001	<0.001	0.001	0.002	<0.001	0.077	0.001	<0.01	<0.01	0.01	0.07	0.21	<0.0001	7.54	533	2	1	130	2	5.89	31	16	<1	<1	226	226	5.72	1.42	0.02	<0.01	1.11	1.11	295				
MW2	13-Dec-17	3.68	4.47	7	545	20.2																																								
MW2	22-Mar-18	4.23	5.02	7.3	519	21.2	17.5	0.004	<0.001	0.073	<0.0001	0.013	0.011	0.013	0.01	0.8	0.012	<0.01	0.03	0.056	0.06	16.8	0.0004	7.4	498	3	2	102	1	4.78	34	15	<1	<1	204	204	5.35	5.64	0.04	0.01	0.97	0.98	348				
MW2	12-Jun-18	4.67	5.46	7.3	547																																								
MW2	13-Sep-18	4.79	5.58	6.8	600	21.2	18.3	0.003	0.001	0.077	<0.0001	0.015	0.009	0.013	0.009	0.492	0.013	<0.01	0.03	0.06	0.07	19.2	<0.0001	7.21	615	2	2	119	2	5.49	63	18	<1	<1	192	192	5.99	4.32	0.04	<0.01	0.89	0.89	612				
MW2	5-Dec-18	3.53	4.32	6.8	545	20.4																																								

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations					Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**				
NAGERO																																													
MW3	2-Jun-06	15.08		7.65		20		<0.001																1525	25	10	356	4		139	16				642											
MW3	15-Oct-06	15.71		7.85		23.1																		1534																				
MW3	11-Jan-07	15.89		7.66		24.9		<0.001				<0.001		0.006	<0.001		0.004							1600	19	7	381	4		127	4				696											
MW3	9-Jun-07	15.9		7.69		19.7		<0.001			<0.0001	<0.005		<0.001	<0.001		0.01			0.1				1028	15	5	389	3			3				673											
MW3	5-Oct-07	15.6		6.8		19.8																		1710																				
MW3	8-Jan-08	15.01		7.9		23.8																		1620																				
MW3	23-Apr-08	14.05		7.8		23.5																		1740																				
MW3	10-Jul-08	14.08		7.8		19																		1630																				
MW3	29-Oct-08	13.85		7.8		22.8																		1770																				
MW3	20-Jan-09	13.3		7.8		21.7																		1770																				
MW3	22-Apr-09	13.78		7.9		21.8																		1780																				
MW3	22-Jul-09	14.13		7.9		21.2																		1780																		890			
MW3	12-Nov-10	14.65		8		23.1																		1800																		890			
MW3	15-Feb-10	14.24		7.9	1440	21.5																		1440																		720			
MW3	16-Apr-10	13.21		8	1440	23.3																		1440																		720			
MW3	19-Jul-10	12.7		7.8	1700	20.3		0.002			<0.0001	<0.001		0.003	<0.001		0.003			0.013		0.27		7.93	1730	12	4	479	3	21.8	104	<1	<1	<1	871	871	20.3	3.56	0.17	<0.01	<0.01	<0.01	1020			
MW3	26-Oct-10	12.2		7.83	1730	21.7																																							
MW3	28-Jan-11	11.7		7.35	1750	26.1		0.001			<0.0001	<0.005		<0.001	<0.001		0.003			0.005		0.16		7.6	1740	10	4	436	3	19.8	108	<1	<1	<1	815	815	19.3	1.27	0.33	<0.01	<0.01	<0.01				
MW3	2-May-11	11.92		8.05	1760	22.2																																							
MW3	18-Jul-11	11.95		7.9	1760	20.8		<0.001			0.0001	0.003		<0.001	<0.001		0.004			0.017		<0.005		7.96	1840	11	4	3	454	20.7	104	<1	<1	<1	798	798	18.9	4.55	0.33	<0.01	0.02	0.02	1060			
MW3	24-Oct-11	12.1		8.08	1810	23.5																																							
MW3	18-Jan-12	11.25		6.86	1670	23.6		0.002			<0.0001	0.004		0.001	<0.001		0.007			0.02		0.49		7.63	1690	29	9	5	410	20.2	112	40	<1	<1	715	715	18.3	4.82	0.14	<0.01	<0.01	<0.01				
MW3	1-May-12	10.4		7.18	1840	22.5																																				910			
MW3	23-Jul-12	9.9		7.56	1700	20.6		<0.001			<0.0001	0.001		<0.001	<0.001		0.004			0.01		<0.05		8.05	1730	19	5	398	4	18.8	104	35	<1	<1	765	765	19	0.52	0.31	<0.01	0.02	0.02	1010			
MW3	23-Oct-12	9.84		7.66	1900	21.7																																					1020			
MW3	7-Mar-13	10.02		7.25	1650	21.9		0.001			<0.0001	0.008		0.001	<0.001		0.013			0.022		0.17		7.68	1830	18	5	470	4	21.9	103	31	<1	<1	815	815	19.8	4.79	0.17	<0.01	<0.01	<0.01	1190			
MW3	16-May-13	10.12		7.78	1730	20.7																																					0.86			
MW3	21-Aug-13	10.23		7.57		20.1		0.003			<0.0001	<0.001		<0.001	<0.001		0.002			0.008		<0.05		7.93	2020	12	4	504	4	23	284	52	<1	<1	592	592	20.9	4.58	0.23	<0.01	<0.01	<0.01				
MW3	14-Nov-13	10.39		8.13	1820	23.6																																					0.91			
MW3	3-Feb-14	10.3		8.41	1.87	23.3		0.001			<0.0001	<0.001		0.002	<0.001		0.002			0.013		<0.05		7.76	2140	17	5	464	4	21.5	319	60	<1	<1	477	477	19.8	4.23	0.12	<0.01	0.12	0.12		0.93		
MW3	17-Jul-14	10.00		7.98	2150																																								
MW3	29-Jan-15	10.47						0.001			<0.0001		<0.001	0.001	<0.001		0.002			0.026		<0.05		7.92	2050	17	5	436	3	20.3	369	74	<1	<	398	398	20.5	0.66	0.2	<0.01	0.02	0.02				
MW3	19-May-15	10.05		7.96	1790	21.9																																							
MW3	13-Aug-15	9.55				20.2		<0.001			<0.0001	<0.001		0.028	<0.001		0.003			0.584		<0.05		7.96	2060	15	5	403	3	18.8	285	78	<1	<1	451	451	18.7	0.2	0.32	<0.01	0.02	0.02				
MW3	30-Nov-15	9.28		7.22		23.2																																							
MW3	24-Feb-16	9.37		6.93		22.9		<0.001			<0.0001	<0.001		<0.001	<0.001		0.002			0.014		<0.05		7.94	2050	17	5	450	3	20.9	397	83	<1	<1	348	348	19.9	2.49	0.22	<0.01	<0.01	<0.01				
MW3	1-Mar-17	8.35		7.48	2060																																							
MW3	1-Jun-17	8.02		7.93	2060										<0.001																												
MW3	1-Sep-17	8.24		7.44	2070																																							
MW3	1-Nov-17	8.17		7.64	2030										<0.001																												
MW3	22-Mar-18	8.6		7.87	2050	23.3																																						
MW3	4-Jun-18	8.6		7.31	2050	21.5									<0.0005									6.79	2430																			
MW3	5-Jun-18	8.6		6.33	2040																																							
MW3	3-Sep-18	8.6		7.35	2050	22.5																																						
MW3	5-Dec-18	8.65		7.37	2020	24.1									<0.001									7.77	2130																			
TARRAWONGA																																													
MW4	2-Jun-06	8.8	9.5	7				0.006																3290	157	118	614	19		905	155				1010											
MW4	9-Sep-06	8.6	9.3																																										
MW4	11-Jan-07	8.67	9.37	7.06				0.004			0.0003	<0.005		0.011	0.029		0.014			0.1			<0.0001		3430	152	103	594	17		787	143				1050										
MW4	9-Jul-07	9.13	9.83	6.82	5410	18.9		0.001			0.0004	<0.005		0.008	0.011		0.011			0.13			<0.0001		5400	211	166	829	16		1480	235				989						0.6	<20	330	
MW4	18-Jul-07	9.18	9.88																																									
MW4	7-Aug-07	9.17	9.87																																									
MW4	22-Aug-07	9.17	9.87																																									
MW4	5-Sep-07	9.21	9.91																																									
MW4	24-Sep-07	9.03	9.73																																									
MW4	11-Oct-07	8.97	9.67																																									
MW4	26-Nov-07	9.06	9.76																																									
MW4	29-Jan-08	9.1	9.8																																									
MW4	4-Mar-08	9.17	9.87																																									
MW4	4-Apr-08	9.15	9.85																																									
MW4	23-Apr-08	9.18	9.88	7.1	5160	18		0.004			0.0015	0.042		0.29	0.44		0.16			0.62			0.001		4960	210	158	802	21		1240	317				995							<0.025	<0.1	
MW4	21-Aug-08	9.31	10.01																																									
MW4	29-Oct-08	9.28	9.98	7	5740	22.2		0.001			0.00009	0.008		0.008	0.18		0.016			0.2			<0.0001		5800	220	170	840	23		1400	280				980							<0.025	<0.100	
MW4	29-Jan-09	9.29	9.96																																									
MW4	17-Jun-09		10.05	6.8	5400	21.5		0.007	0.003	1.16	0.0004	0.023	0.015	0.207	0.106	1.82	0.055		0.04	0.278		24.9	0.0004		4920	189	147	755	16	54.8	1160	156	<1	<1	977	977	55.6	0.8	<0.01				2980			
MW4	28-Aug-09	9.48	10.1																																								
MW4	14-Dec-09	9.52	10.14	6.94	5060	25.6	<0.01	0.001				<0.005		0.001	<0.001	0.671	0.016			0.114		<0.05	<0.0001	7.35	5040	187	149	746	16	54.5	64.1	31.6	<1	<1	783	783	45.3	3.41		0.02	0.45	0.48				
MW4	25-Feb-10	9.68	10.3																																								
MW4	11-May-10	9.66	10.28	7.58	5660	21.8		0.012	0.006	1.84	0.0006	0.033	0.03	0.17	0.138	1.26	0.096		0.08	0.238		25.3	0.0002		5210	149	115	821	14	53	1180	200	<1	<1	942	942	56.2	3.01	0.02				3120			
MW4	30-Aug-10	9.69	10.31	7.33	4740	20																																							
MW4	9-Nov-10	9.61	10.23	6.9	3810	24.4																																							
MW4	10-Mar-11	9.31	9.93	7.18	3060	24.9	0.77	<0.001				0.005		0.084	0.15	0.188	0.014			0.801		1.08	<0.0001	7.37	3460	78	63	741	11	41.6	730	87	<1	<1	893	893	40.2	1.61		0.04	0.38	0.41				
MW4	6-Jun-11	9.42	10.04	7.25	3080	18.7																																							
MW4	6-Sep-11	9.46	10.08	7.12	3196	21	0.65	<0.001	<0.001	0.146	<0.0001	0.001	0.002	0.008	0.006	0.175	0.006		<0.01	0.418		0.7	<0.0001	7.77	3910	74	58	702	10	39.3	700	104	<1	<1	861	861	39.1	0.15	0.2	<0.01	0.43	0.43				
MW4	7-Dec-11	9.35	9.97	7.1	3180	20.5																																							
MW4	13-Mar-12	9.36	9.98	7.6	2580	22.1	0.16	<0.001	<0.001	0.159	<0.0001	<0.001	<0.001	0.01	<0.001	0.017	0.004		<0.01	0.27		0.3	<0.001	8.01	3690	90	64	759	13	43.1	700	103	<1	<1	898	898	39.8	3.92	<0.01	<0.01	0.85	0.85	2130			
MW4	13-Jun-12	9.22	9.84	7.52	3850	20.6																																							
MW4	4-Sep-12	9.11	9.73	7.72	3410	21.8	0.07	<0.001	<0.001	0.167	<0.0001	<0.001	<0.001	0.058	0.005	0.116	0.007		<0.01	0.513		0.44	<0.0001	7.98	3770	82	65	664	12	38.6	674	108	<1	<1	962	962	40.5	2.37	0.02	0.02	1.04	1.06	2170			

ANNUAL REVIEW
2018

TARRAWONGA COAL PTY LTD
Groundwater Monitoring Data

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**						**1000**															
MW4	27-Nov-12	8.94	9.56	7.74	3440	21.7																																							
MW4	20-Mar-13	8.92	9.54	7.53	3420	21.6	0.27	0.001	<0.001	0.156	<0.0001	0.011	<0.001	0.05	0.006	0.158	0.01		<0.01	0.338		0.4	<0.0001	7.65	3730	104	73	672	12	40.7	652	49	<1	<1	880	880	37	4.78	0.02	<0.01	1.68	1.68	2020			
MW4	11-Jul-13	8.87	9.49	7.76	3410	20.9																																						
MW4	5-Sep-13	8.83	9.45	7.63	3560	21.8	0.21	<0.001	0.182	<0.05	0.0002	0.001	0.005	0.144	0.018	0.282	0.008	<0.01	<0.01	0.453	<0.001	0.68	<0.0001	7.99	3950	110	81	704	15	43.2	745	110	<1	<1	908	908	41.4	2	0.09				2260			
MW4	22-Nov-13	8.61	9.23	7.6	3720	21.7																																						
MW4	24-Feb-14	8.74	9.36	7.6	3920	21.4	0.14	<0.001	0.166	<0.05	0.0003	0.005	<0.001	0.128	0.006	0.116	0.007	<0.01	<0.01	0.444	<0.001	1.22	<0.0001	7.98	3890	93	78	644	15	39.5	676	113	<1	<1	875	875	38.9	0.68	0.06				2010			
MW4	27-May-14	8.78	9.4	7.6	3840	21.3																																						
MW4	9-Sep-14	8.76	9.38	7.2	4090	20.5	0.13	<0.001				0.003		0.057	0.007	0.235	0.008			0.334		0.86	<0.0001	7.83	4170	108	79	597	11	38.1	679	118	<1	<1	1020	1020	42	4.83		0.2	0.54	0.74				
MW4	20-Nov-14	8.72	9.34	7.3	3970	21.8																																						
MW4	26-Feb-15	8.71	9.33	7.3	4030	21.6	0.13	<0.001	<0.001	0.159	<0.0001	0.002	0.002	0.033	0.02	0.373	0.007	<0.01	<0.01	0.244	<0.05	3.4	<0.0001	7.7	4430	131	107	687	14	45.6	786	132	<1	<1	1090	1090	46.7	1.23	0.18	0.01	0.97	0.98	2200			
MW4	26-May-15	8.93	9.55	7.3	4120	20.7																																						
MW4	27-Aug-15	8.85	9.47	7.2	4340	19.5	0.02	<0.001	<0.001	0.159	<0.0001	<0.001	<0.001	0.004	0.002	0.359	0.004	<0.01	<0.01	0.149	<0.05	1.21	<0.0001	7.72	4680	123	107	719	14	46.6	711	151	<1	<1	870	870	40.6	6.85	0.56	<0.01	0.6	0.6	2550			
MW4	4-Dec-15	8.85	9.47	7.3	4410	21.1																																						
MW4	24-Feb-16	8.86	9.48	7.4	4450	21.7	0.2	0.003	0.002	0.18	0.0004	0.003	0.003	0.02	0.014	0.46	0.006	<0.01	<0.01	0.209	<0.05	1.84	<0.0001	7.85	4650	156	119	767	17	51.4	899	152	<1	<1	988	988	48.3	3.1	2.22	<0.01	0.07	0.07	2610			
MW4	23-May-16	8.92	9.54	7.4	4480	21.4																																						
MW4	1-Sep-16																																												
MW4	29-Nov-16	8.91	9.53	7.3	4330	22.8																																						
MW4	3/23/2017	8.92	9.54	7.4	4370		0.54	<0.001	<0.001	0.184	0.0002	<0.001	0.002	0.036	0.011	0.356	0.008	<0.01	<0.01	1.57	<0.05	1.05	<0.0001	8.13	4610	145	113	710	16	47.8	882	101	<1	<1	982	982	46.6	1.3	0.1	0.05	1.36	1.41	2800			
MW4	6/21/2017	9	9.62	7.4	4370	19.7																																						
MW4	9/13/2017	8.9	9.52	7.3	4420		0.75	<0.001	<0.001	0.166	<0.0001	<0.001	0.001	0.015	0.009	0.316	0.005	<0.01	<0.01	0.686	<0.05	1.46	<0.0001	7.82	4570	141	116	730	15	48.7	848	147	<1	<1	1040	1040	47.8	0.99	0.03	0.08	1.15	1.23	2450			
MW4	13-Dec-17	8.95	9.57	7.2	4440	22.6																									990														
MW4	22-Mar-18	9.08	9.7	7.4	4610	21.3	0.3	<0.001	<0.001	0.172	<0.0001	0.002	<0.001	0.005	0.013	0.389	0.003	<0.01	<0.01	0.115	<0.05	0.65	<0.0001	7.4	4470	141	98	619	12	42.3	990	145	<1	<1	1020	1020	51.3	9.6	2.24	0.02	0.08	0.1	2560			
MW4	12-Jun-18	9.14	9.76	7.3	4430																																							
MW4	13-Sep-18	9.34	9.96	6.9	4370	22.1	0.05	0.001	<0.001	0.161	<0.0001	<0.001	0.001	0.004	0.002	0.307	0.004	<0.01	<0.01	0.077	<0.05	0.12	<0.0001	7.49	4560	155	102	611	10	43	959	142	<1	<1	919	919	48.4	5.92	0.33	<0.01	0.06	0.06	2310			
MW4	5-Dec-18	9.46	10.08	7	4610	21.9																																						

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µS/cm	Major Cations					Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**			
TEMPLEMORE																																												
MW5	2-Jun-06	2.78	3.4	6.9				0.006																1530	17	13	373	6		169	138				472										
MW5	9-Sep-06	2.98	3.6																																										
MW5	11-Jan-07	3.56	4.18	7.25				0.003			<0.0001	<0.001		<0.001	<0.001		0.013			0.09				4870	44	49	1070	13		1060	435				836										
MW5	18-Apr-07	2.98	3.6																																										
MW5	10-Jul-07	3.85	4.47	7.59	1360	19.7		0.002			<0.0001	<0.005		0.001	<0.001		0.009			0.111			<0.0001		1930	14	15	13	5		291	161				380								1.32	<20	3490
MW5	18-Jul-07	3.87	4.49																																										
MW5	7-Aug-07	3.92	4.54																																										
MW5	22-Aug-07	3.88	4.5																																										
MW5	5-Sep-07	3.84	4.46																																										
MW5	24-Sep-07	3.86	4.48																																										
MW5	11-Oct-07	3.91	4.53																																										
MW5	26-Nov-07	3.94	4.56																																										
MW5	29-Jan-08	3.06	3.68																																										
MW5	4-Mar-08	3.01	3.63																																										
MW5	4-Apr-08	3.07	3.69																																										
MW5	23-Apr-08	3.15	3.77	7.9	3550	19.9		0.012			0.00017	0.006		0.027	0.054		0.042			0.11			<0.0001		3260	29	33	696	13		553	332				630										
MW5	21-Aug-08	3.10	3.72																																										
MW5	29-Oct-08	2.97	3.59	7.3	3300	19.1		0.008			<0.00005	0.005		0.004	0.018		0.007			0.028			<0.0001		3400	21	24	640	11		560	290				680									<0.025	0.57
MW5	29-Jan-09	3.12	3.73																																										
MW5	17-Jun-09	3.33	4.18	7.7	2390	19.6		0.012	<0.001	0.054	<0.0001	0.002	0.003	0.02	0.019	0.586	0.006		<0.01	0.105		1.66	<0.0001		2120	13	15	485	8	23.2	315	120	<1	<1	486	486	21.1	4.6	0.07				1370			
MW5	14-Sep-09	3.52	4.32																																										
MW5	14-Dec-09	3.76	4.56	7.21	6900	28.4	0.04	0.016				<0.001		0.002	<0.001	1.4	0.022			0.078		0.19	<0.0001	7.44	7460	9	106	1870	28	91	1720	678	<1	<1	1110	1110	84.9	3.44		<0.01	<0.01	<0.01				
MW5	25-Feb-10	2.91	3.71																																										
MW5	11-May-10	3	3.8	7.73	6590	22		0.032	0.001	0.426	0.009	0.024	0.032	0.07	0.068	1.59	0.071		0.05	0.277		23	<0.0001		5920	38	70	1210	17	60.5	1260	491	<1	<1	838	838	62.4	1.53	0.1				3630			
MW5	30-Aug-10	2.6	3.4	7.85	1740	22.8																																							
MW5	9-Nov-10	2.48	3.28	7.35	2620	24.1																																							
MW5	10-Mar-11	2.51	3.31	7.39	1917	25.2	0.81	0.01				0.001		0.03	0.007	0.64	0.003			0.139		0.79	<0.0001	7.69	1980	11	13	474	8	22.4	396	150	<1	<1	416	416	22.6	0.49		<0.01	0.11	0.11				
MW5	6-Jun-11	2.47	3.27	7.45	1032	20.8																																							
MW5	6-Sep-11	2.7	3.5	7.39	1910	22.6	6.24	0.012	<0.001	0.051	<0.0001	0.004	0.001	0.006	0.004	0.081	0.005		<0.01	0.032		4.1	<0.0001	7.89	2310	10	11	501	7	23.4	385	177	<1	<1	427	427	23.1	0.6	0.11	<0.01	0.04	0.04	1360			
MW5	7-Dec-11	1.96	2.76	7.36	2275	20.5																																							
MW5	13-Mar-12	1.28	2.08	7.52	1110	25.1	1.91	0.006	<0.001	0.027	<0.0001	0.002	<0.001	0.005	<0.001	0.122	0.003		0.01	0.02		1.2	<0.0001	7.78	1250	8	7	292	5	13.8	262	45	<1	<1	269	269	13.7	0.33	<0.01	<0.01	0.43	0.43	736			
MW5	13-Jun-12	1.58	2.38	7.81	977	20.3																																							
MW5	4-Sep-12	1.46	2.26	7.63	1980	20.1	7.89	0.016	<0.001	0.056	<0.0001	0.004	<0.001	0.014	0.007	0.073	0.004		<0.01	0.086		5.13	<0.0001	7.92	2120	9	11	473	8	22.1	380	146	<1	<1	439	439	22.5	0.93	<0.01	<0.01	<0.01	<0.01	1400			
MW5	27-Nov-12	1.84	2.64	7.65	2650	22.5																																							
MW5	20-Mar-13	1.94	2.74	7.54	1430	24.7	0.53	0.011	<0.001	0.029	<0.0001	0.002	<0.001	0.054	0.008	0.33	0.004		<0.01	0.158		0.56	<0.0001	7.61	1520	7	8	321	6	15.1	236	46	<1	<1	323	323	14.1	3.57	0.08	<0.01	0.06	0.06	956			
MW5	11-Jul-13	2.26	3.06	7.62	846	21.5																																							
MW5	5-Sep-13	2.45	3.25	7.55	1640	21.8	4.62	0.011	0.038	0.12	<0.0001	0.003	<0.001	0.062	0.009	0.07	0.004	<0.01	<0.01	0.118	<0.001	3.25	<0.0001	8.07	1810	5	7	406	8	18.7	287	115	<1	<1	396	396	18.4	0.73	0.02				1040			
MW5	22-Nov-13	2.76	3.56	7.7	2430	21.1																																							
MW5	20-Feb-14	3.01	3.81	7.9	1790	22.7	2.6	0.014	0.039	<0.05	0.0004	0.01	0.002	0.166	0.024	0.232	0.007	<0.01	<0.01	0.46	<0.001	2.68	<0.0001	7.77	1850	7	8	394	6	18.3	282	111	<1	<1	377	377	17.8	1.34	<0.01				964			
MW5	27-May-14	2.77	3.57	7.7	925	22.5																																							
MW5	9-Sep-14	2.80	3.6	7.7	2130	20.5	12.7	0.014				0.009		0.059	0.016	0.379	0.019			0.141		8.81	<0.0001	7.99	2200	7	8	462	8	21.3	319	159	<1	<1	476	476	21.8	1.23		0.02	0.65	0.67				
MW5	20-Nov-14	3.00	3.8	7.8	3020	22.3																																							
MW5	26-Feb-15	3.18	3.97	7.8	1890	23.7	1.18	0.01	<0.001	0.026	<0.0001	<0.001	<0.001	0.005	<0.001	0.044	0.002	<0.01	<0.01	0.04	<0.05	0.74	<0.0001	8.15	2060	5	6	399	6	18.2	299	130	<1	<1	433	433	19.8	4.09	0.01	<0.01	0.14	0.14	1060			
MW5	26-May-15	3.29	4.08	7.8	2120	21.3																																							
MW5	27-Aug-15	3.19	3.98	7.7	2110	19.7	1.29	0.023	<0.001	0.051	<0.0001	<0.001	<0.001	0.002	<0.001	0.373	0.002	<0.01	<0.01	0.036	<0.05	1.67	<0.0001	8.08	2210	8	9	465	6	21.5	262	174	<1	<1	424	424	19.5	4.92	0.04	<0.01	0.02	0.02	1300			
MW5	4-Dec-15	3.29	4.08	7.7	3070	21.2																																							
MW5	24-Feb-16	3.36	4.15	7.7	2060	23.5	0.95	0.01	<0.001	0.036	<0.0001	<0.001	<0.001	0.013	0.002	0.209	0.003	<0.01	<0.01	0.071	<0.05	0.79	<0.0001	7.76	2230	12	13	519	7	24.4	361	184	<1	<1	471	471	23.4	2.04	0.09	<.01	0.24	0.24	1180			
MW5	23-May-16	3.41	4.2	7.7	1632	23.4																																							
MW5	1-Sep-16	2.29	3.08	7.7	1700	21	5.55	0.009				0.003		0.007	0.002	0.071	0.004			0.05		3.86	<0.0001	7.96	1750	6	7	378	5	17.4	256		<1	<1	382	382	17.5	0.25		<0.01	1.1	1.1				
MW5	29-Nov-16	2	2.79	7.6	3010	20.7																																							
MW5	23-Mar-17	2.36	3.15	7.7	1750		0.59	0.007	<0.001	0.042	<0.0001	<0.001	0.002	0.03	0.005	0.638	0.004	<0.01	<0.01	0.144	<0.05	0.5	<0.0001	8.24	1750	8	9	352	7	16.6	293	92	<1	<1	340	340	17	1.02	0.94	0.14	2.4	2.54	1100			
MW5	21-Jun-17	2.55	3.34	7.9	1288	20.7																																							
MW5	13-Sep-17	2.76	3.55	7.8	2610		1.13	0.014	<0.001	0.035	<0.0001	<0.001	<0.001	0.007	0.005	0.082	0.001	<0.01	<0.01	0.085	<0.05	0.74	<0.0001	8.19	2640	12	14	567	8	26.6	421	200	<1	<1	561	561	27.2	1.17	0.06	<0.01	0.06	0.06	1520			
MW5	13-Dec-17	2.79	3.58	7.7	2630	21.4																																							
MW5	22-Mar-18	3.13	3.92	7.9	2320	22	3.69	0.014	<0.001	0.041	<0.0001	0.002	<0.001	0.01	0.006	0.207	0.003	<0.01	0.01	0.047	<0.05	2.76	<0.0001	8.37	2260	10	11	425	6	20	395	156	<1	13	497	510	24.6	10.2	0.05	<0.01	0.14	0.14	1370			
MW5	12-Jun-18	3.31	4.1	7.9	1413																																								
MW5	13-Sep-18	3.56	4.35	7.8	1980	22	1.43	0.01	<0.001	0.03	<0.0001	<0.001	<0.001	0.005	0.002	0.035	<0.001	<0.01	<0.01	0.024	<0.05	1.09	<0.0001	8.07	2040	8	8	386	5	18	341	146	<1	<1	418	418	21	7.78	0.04	<0.01	0.03	0.03	1080			
MW5	5-Dec-18	3.41	4.2	7.7	2130	21.5																																							
NAGERO																																													
MW6	2-Jun-06	8.34	9	7.3				<0.001																2030	59	29	440	8		308	55				720										
MW6	9-Sep-06	8.84	9.5																																										
MW6	11-Jan-07	9.15	9.81	6.89				<0.001			<0.0001	<0.005		<0.001	<0.001		0.011			0.08			<0.0001		2030	62	30	426	7		252	51				724										
MW6	10-Jul-07	9.37	10.03	7.5	2060	18.1		0.0005			0.00005	0.0025		0.001	0.0005		0.004			0.01			0.00005		2000	58	27	411	8		283	47				666								5.99		
MW6	18-Jul-07	9.35	10.01																																									
MW6	7-Aug-07	9.32	9.98																																									
MW6	22-Aug-07	9.29	9.95																																									
MW6	5-Sep-07	9.31	9.97																																									
MW6	24-Sep-07	9.07	9.73																																									
MW6	11-Oct-07	9.16	9.82																																									
MW6	26-Nov-07	9.17	9.83																																									
MW6	29-Jan-08	9.06	9.72																																									
MW6	4-Mar-08	8.815	9.475																																									
MW6	22-Apr-08	8.62	9.28	7.1	2000	21.1		0.001			<0.00005	0.001		0.002	0.0031		0.006			0.005			<0.0001		2120	64	29	391	9.8		273	51				670									<0.025	<0.1
MW6	21-Aug-08	8.545	9.205																																									
MW6	29-Oct-08	8.48	9.15	7.1	2050	23.9		0.001			0.00005	0.003		0.003	0.077		0.004			0.034			<0.0001		2100	60	27	380	8.5		280	50				680									<0.025	0.18
MW6	29-Jan-09	8.33	9.1																																									
MW6	14-Sep-09	8.65	9.43																																									
MW6	14-Dec-09	8.86	9.64	7.13	2112	23.4	<0.01	<0.001				<0.005		<0.001	0.002	0.336	0.008			0.01		<0.05	<0.0001	7.3	2100	56	26	385	8	21.9	252	39.4	<1	<1	652	652	21	2.24		0.02	0.53	0.55				
MW6	25-Feb-10	8.84	9.62																																									

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations					Major Anions							Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**																
MW6	11-May-10	8.3	9.08	7.56	2360	21.5		<0.001	<0.001	0.193	<0.0001	0.002	0.002	0.002	0.006	0.278	0.003		<0.01	0.008		2.13	<0.0001		2030	56	26	380	7	21.6	261	42.2	<1	<1	645	645	21.1	1.14	<0.01				1160				
MW6	30-Aug-10	8	8.78	7.2	1927	23.8																																							
MW6	9-Nov-10	7.72	8.5	7.03	1835	24.3																																							
MW6	10-Mar-11	7.41	8.19	7.08	1783	24	0.15	<0.001				0.002		0.034	0.015	0.047	0.003			0.216		0.32	<0.0001	7.53	1790	55	27	406	9	22.9	293	42	<1	<1	627	627	21.7	2.61		0.03	0.97	1				
MW6	6-Jun-11	7.44	8.22	7.15	1670	19.6																																						
MW6	6-Sep-11	Piezo damaged																																										
MW6	7-Dec-11	Piezo damaged																																										
MW6	13-Mar-12	5.74	6.52	7.49	1840	23.4	0.15	<0.001	<0.001	0.125	<0.0001	0.002	<0.001	0.009	0.001	0.013	0.004		<0.01	0.071		0.12	<0.0001	7.68	1980	55	24	390	9	21.9	262	46	<1	<1	624	624	20.8	2.54	<0.01	<0.01	1.44	1.44	1150				
MW6	13-Jun-12	5.87	6.65	7.45	2040	21.3																																						
MW6	4-Sep-12	5.58	6.36	7.82	1840	22	0.09	<0.001	<0.001	0.143	<0.0001	<0.001	<0.001	0.012	0.003	0.013	0.003		<0.01	0.072		0.18	<0.0001	8.08	1990	53	25	381	8	21.5	276	39	<1	<1	681	681	22.2	1.69	<0.01	<0.01	1.13	1.13	1210				
MW6	27-Nov-12	5.55	6.33	7.6	1817	21.1																																						
MW6	20-Mar-13	5.75	6.53	7.46	343	22.8	0.49	0.001	<0.001	0.037	<0.0001	0.003	<0.001	0.081	0.009	0.095	0.006		0.02	0.402		0.56	<0.0001	7.43	351	12	3	49	8	3.18	16	28	<1	<1	106	106	3.15	0.44	0.23	0.1	0.6	0.7	252				
MW6	11-Jul-13	5.88	6.66	7.62	452	20.8																																						
MW6	5-Sep-13	5.96	6.74	7.21	465	21.3	0.86	<0.001	0.038	0.08	<0.0001	0.002	<0.001	0.075	0.006	0.058	0.005	<0.01	0.02	0.151	<0.001	0.93	<0.0001	7.8	496	18	3	75	10	4.66	25	60	<1	<1	132	132	4.59	0.74	0.09				327				
MW6	22-Nov-13	5.85	6.63	7.2	486	20.8																																						
MW6	24-Feb-14	5.84	6.62	7.8	215	22.1	0.48	<0.001	0.02	<0.05	<0.0001	0.008	0.001	0.045	0.004	0.094	0.005	<0.01	0.02	0.185	<0.001	0.5	<0.0001	7.51	212	8	1	29	8	1.95	5	26	<1	<1	66	66	2		0.35				182				
MW6	27-May-14	5.64	6.42	7.5	360	22.1																																						
MW6	9-Sep-14	5.54	6.32	7.6	845	21.4	1.63	0.002				0.005		0.006	0.016	0.154	0.012			0.13		1.55	<0.0001	7.61	854	24	7	140	8	8.07	83	46	<1	<1	274	274	8.77	4.22		<0.01	<0.01	<0.01				
MW6	20-Nov-14	5.55	6.33	7.5	712	21.6																																						
MW6	26-Feb-15	5.64	6.43	7.6	543	22.2	0.13	<0.01	<0.01	0.036	<0.0001	0.001	<0.001	0.012	0.002	0.059	0.007	<0.01	<0.01	0.238	<0.05	0.32	<0.0001	7.67	617	25	5	89	10	5.79	43	42	<1	<1	173	173	5.54	2.11	0.06	<0.01	0.62	0.62	353				
MW6	26-May-15	5.65	6.44	7.5	692	19.7																																						
MW6	27-Aug-15																																											
MW6	4-Dec-15	5.4	6.18	7.8	946	21.2																																						
MW6	24-Feb-16	5.38	6.16	7.6	1012	21.2	0.31	0.002	<0.001	0.083	<0.0001	0.004	<0.001	0.018	0.006	0.063	0.01	<0.01	<0.01	0.211	0.06	1.94	<0.0001	7.85	1080	41	12	203	10	12.1	125	46	<1	<1	327	327	11	4.73	0.09	<0.01	0.98	0.98	620				
MW6	23-May-16	5.36	6.14	7.6	1090	21.8																																						
MW6	6-Sep-16	5.15	5.93	7.6	1080	23.3	0.04	<0.001				<0.001		0.004	<0.001	0.016	0.007			0.079		0.49	<0.0001	7.77	1100	34	10	181	9	10.6	129		<1	<1	331	331	11	1.97		<0.01	0.42	0.42					
MW6	29-Nov-16	4.74	5.52	7.5	1416	21.2																																						
MW6	13-Mar-17	4.68	5.46	7.5	1600	22.8	0.04	<0.001	<0.001	0.103	0.0001	0.003	<0.001	0.026	0.002	0.008	0.007	<0.01	<0.01	0.156	0.07	0.21	<0.0001	8.25	1630	44	20	296	9	16.9	269	45	<1	<1	481	481	18.1	3.39	0.01	<0.01	1.1	1.1	980				
MW6	21-Jun-17	4.77	5.55	7.5	1660	21.8																																						
MW6	13-Sep-17	4.57	5.35	7.6	1660		0.05	<0.001	<0.001	0.09	<0.0001	0.007	<0.001	0.006	<0.001	0.006	0.008	<0.01	<0.01	0.121	0.08	0.14	<0.0001	8.15	1710	51	22	318	9	18.4	221	46	<1	<1	573	573	18.6	0.6	0.03	<0.01	1.7	1.7	1710				
MW6	13-Dec-17	4.55	5.33	7.6	1738	21.7																																						
MW6	22-Mar-18	4.76	5.54	7.8	1833	21	0.09	<0.001	<0.001	0.093	<0.0001	0.005	<0.001	0.004	<0.001	0.017	0.007	<0.01	<0.01	0.123	0.06	0.3	<0.0001	8.21	1800	54	21	304	8	17.8	285	44	<1	<1	617	617	21.3	8.77	0.04	0.01	1.69	1.7	1070				
MW6	12-Jun-18	4.75	5.53	7.7	1828																																							
MW6	13-Sep-18	4.84	5.62	8	2020	21.8	0.06	<0.001	<0.001	0.11	<0.0001	0.001	<0.001	0.002	<0.001	0.005	0.003	<0.01	<0.01	0.007	0.07	0.09	<0.0001	8.23	2090	38	26	344	6	19.2	347	48	<1	<1	566	566	22.1	7.14	0.04	<0.01	1.35	1.35	2090				
MW6	5-Dec-18	4.85	5.63	7.6	2200	21.3																																						

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**			
TARRAWONGA MINE																																													
MW7	2-Jun-06	73.47	74.3	7.2				0.002																	2250	45	43	536	12		202	34				1100										
MW7	9-Sep-06	79.67	80.5																																										
MW7	11-Jan-07	76.17	77	7.32				<0.001			<0.0001	<0.005		<0.001	<0.001		0.005			0.05			<0.0001		1960	23	36	459	8		189	22				935										
MW7	18-Apr-07	76.07	76.9																																										
MW7	10-Jul-07	77.06	77.89	7.24	2250	18.7		<0.001			<0.0001	<0.005		0.001	<0.001		0.018			0.106			<0.0001		2270	35	36	458	10		170	23				998								4.38	<20	410
MW7	18-Jul-07	77.1	77.93																																										
MW7	7-Aug-07	78.29	79.12																																										
MW7	22-Aug-07	78.45	79.28																																										
MW7	5-Sep-07	78.6	79.43																																										
MW7	24-Sep-07	78.56	79.39																																										
MW7	11-Oct-07	78.72	79.55																																										
MW7	26-Nov-07	79.34	80.17																																										
MW7	29-Jan-08	79.8	80.63																																										
MW7	4-Mar-08	80.27	81.10																																										
MW7	22-Apr-08	80.85	81.68	7.6	2440	21.9		<0.001			0.00014	0.004		0.033	0.25		0.017			0.12			<0.0001		2370	52	45	483	11		188	5				1050										
MW7	21-Aug-08	83.74	84.57																																										
MW7	29-Oct-08	85.99	86.81	7.4	2310	24.8		0.001			0.00006	0.005		0.014	0.088		0.009			0.099			<0.0001		2300	48	44	470	13		180	24				990									<0.025	0.3
MW7	28-Jan-09	86.99	87.8																																										
MW7	17-Jun-09	86.45	87.5	7.4	2440	20.7		<0.001	<0.001	0.2	<0.0001	0.001	<0.001	0.057	0.054	0.047	0.007		<0.01	0.13		0.43	<0.0001		2280	46	44	481	11	27.1	169	16	<1	<1	1050	1050	26.1	1.96	0.17				1430			
MW7	27-Aug-09	89.99	91.04																																										
MW7	23-Dec-09	89.53	90.58	7.55	2230	27.4	0.03	<0.001				<0.001		0.002	0.004	0.075	0.007			0.015		0.26	<0.0001	7.49	2240	5	46	556	9	28.5	182	17.1	<1	<1	1050	1050	26.5	3.58		<0.01	<0.01	<0.01			
MW7	25-Feb-10	89.64	90.69																																										
MW7	11-May-10	89.85	90.9	8.32	2950	23.9		<0.001	<0.001	0.227	<0.0001	<0.001	<0.001	0.009	0.046	0.11	0.017		<0.01	0.054		1.5	<0.0001		2330	42	41	478	9	26.5	182	15.9	<1	<1	1010	1010	25.6	1.72	0.45				1380			
MW7	30-Aug-10	90.48	91.53	7.52	2385	24.7																																							
MW7	10-Nov-10	90.38	91.43	7.47	2010	26																																							
MW7	14-Mar-11	90.95	92	7.24	2075	26.2	0.2	<0.001				<0.001	0.094		0.036	0.155	0.01			0.274		0.74	<0.0001	7.57	2220	41	41	493	11	27.1	225	23	<1	<1	951	951	25.8	2.43		<0.01	0.07	0.07			
MW7	21-Jun-11	91.31	92.36	7.55	2180	22.3																																							
MW7	8-Sep-11	92.49	93.54	7.35	2160	22.5	0.09	0.001	<0.001	0.18	<0.0001	<0.001	<0.001	0.006	0.028	0.059	0.007		<0.01	0.047		0.41	<0.0001	7.84	2550	10	36	545	10	27.4	255	29	<1	<1	936	936	26.5	1.66	0.55	<0.01	0.02	0.02	1510			
MW7	9-Dec-11	93.89	94.94	7.7	2200	26.8																																							
MW7	19-Mar-12	95.05	96.10	7.25	2460	24.9	0.31	<0.001	<0.001	0.186	<0.0001	0.002	<0.001	0.032	0.065	0.059	0.009		<0.01	0.085		0.61	<0.0001	7.82	2650	35	34	622	11	31.9	321	45	<1	<1	991	991	29.8	3.34	0.52	<0.01	0.03	0.03	1590			
MW7	14-Jun-12	97.70	98.75	7.6	2900	23.6																																							
MW7	6-Sep-12	98.95	100.00	7.33	2730	25.2	0.52	0.002	<0.001	0.205	<0.0001	0.002	<0.001	0.088	0.114	0.057	0.005		<0.01	0.19		2.84	<0.0001	7.93	2840	18	21	678	8	32.3	342	50	<1	<1	1140	1140	33.5	1.79	0.61	<0.01	0.05	0.05	1760			
MW7	28-Nov-12	101.99	103.04																																										
MW7	20-Mar-13	102.49	103.54																																										
MW7	11-Jul-13	103.65	104.7																																										
MW7	5-Sep-13	103.65	104.7																																										
MW7	22-Nov-13	103.43	104.48																																										
MW7	20-Feb-14	103.55	104.6																																										
MW7	27-May-14	103.96	105.01																																										
MW7	9-Sep-14	103.84	104.89																																										
MW7	20-Nov-14	104.01	105.06																																										
MW7	26-Feb-15	104.09	105.14																																										
MW7	26-May-15	104.67	105.46																																										
MW7	27-Aug-15	104.26	105.05																																										
MW7	4-Dec-15	104.35	105.14																																										
MW7	24-Feb-16	104.77	105.56																																										
MW7	23-May-16	105.13	105.92																																										
MW7	1-Sep-16	104.19	104.98																																										
MW7	29-Nov-16	104.41	105.2																																										
MW7	21-Jun-17	105.18	105.97																																										
MW7	13-Dec-17	104.79	105.58																																										
MW7	22-Mar-18	104.97	105.76																																										
MW7	12-Jun-18	106.21	107																																										
MW7	13-Sep-18	104.91	105.7																																										
MW7	5-Dec-18	105.01	105.8	grey mud on probe																																									
TARRAWONGA MINE																																														
MW8	2-Jun-06	13.06	13.8	6.7				<0.001																	2240	161	48	298	9		426	46				588										
MW8	9-Sep-06	13.16	13.9																																										
MW8	11-Jan-07	13.41	14.15	6.7				<0.001			<0.0001	<0.005		0.002	0.001		0.007			0.16			<0.0001		2260	180	53	319	7		411	80				587										
MW8	18-Apr-07	12.86	13.6																																										
MW8	9-Jul-07	13.62	14.36	6.8	2530	18.9		<0.001			<0.0001	<0.005		0.005	0.004		0.006			0.102			<0.0001		2610	196	55	308	8		483	80				616								7.77	<20	250
MW8	18-Jul-07	13.67	14.41																																										
MW8	7-Aug-07	13.66	14.4																																										
MW8	22-Aug-07	13.66	14.4																																										
MW8	5-Sep-07	13.72	14.46																																										
MW8	24-Sep-07	13.64	14.38																																										
MW8	11-Oct-07	13.63	14.37																																										
MW8	26-Nov-07	13.69	14.43																																										
MW8	29-Jan-08	13.54	14.28																																										
MW8	4-Mar-08	13.56	14.3																																										
MW8	22-Apr-08			Bore blocked no sample																																									
MW8	21-Aug-08	13.78	14.52																																										
MW8	29-Oct-08	13.85	14.59	Bore blocked no sample																																								
MW8	28-Jan-09	13.85	14.6																																										
MW8	17-Jun-09	14.02	14.77	Unable to sample - casing blocked																																								
MW8	27-Aug-09	14.02	14.77																																										
MW8	23-Dec-09	14.1	14.85	Unable to sample - casing blocked																																								
MW8	25-Feb-10	13.8	14.55																																										
MW8	11-May-10	13.72	14.47	Unable to sample - casing blocked																																								

Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**			
MW8	30-Aug-10	13.71	14.46	Unable to sample - casing blocked																																							
MW8	9-Nov-10	13.74	14.49	Unable to sample - casing blocked																																							
MW8	14-Mar-11	14.12	14.87	Unable to sample - casing blocked																																							
MW8	21-Jun-11	13.62	14.37	Unable to sample - casing blocked																																							
MW8	8-Sep-11	13.80	14.55	Unable to sample - casing blocked																																							
MW8	9-Dec-11	13.24	13.99	Unable to sample - casing blocked																																							
MW8	14-Mar-12	12.57	13.32	Unable to sample - casing blocked																																							
MW8	14-Jun-12	12.76	13.51	Blocked 3.2 down pipe																																							
MW8	6-Sep-12	12.63	13.38	Blocked 3.2 down pipe																																							
MW8	28-Nov-12	12.79	13.54	Blocked about 3m down pipe																																							
MW8	20-Mar-13	12.68	13.43	Blocked 3.2 down pipe																																							
MW8	11-Jul-13	12.95	13.7	Blocked 3.2 down pipe																																							
MW8	5-Sep-13	13.00	13.75	Blocked 3.2 down pipe																																							
MW8	22-Nov-13	13.01	13.76	Blocked 3.2 down pipe																																							
MW8	20-Feb-14	13.07	13.82	Blocked 3.2 down pipe																																							
MW8	27-May-14	13.00	13.75	Blocked 3.2 down pipe																																							
MW8	9-Sep-14	13.13	13.88	Blocked 3.2 down pipe																																							
MW8	20-Nov-15	13.22	13.97	Blocked 3.2 down pipe																																							
MW8	26-Feb-15	13.27	14.02	Blocked 3.2 down pipe																																							
MW8	26-May-15	13.43	14.22	Blocked 3.2 down pipe																																							
MW8	27-Aug-15	13.43	14.22	Blocked 3.2 down pipe																																							
MW8	4-Dec-15	13.46	14.25	Blocked 3.2 down pipe																																							
MW8	24-Feb-16	13.49	14.28	Blocked 3.2 down pipe																																							
MW8	23-May-16	13.54	14.33	Blocked 3.2 down pipe																																							
MW8	1-Sep-16	13.08	13.87	Blocked 3.2 down pipe																																							
MW8	29-Nov-16	12.62	13.41	Blocked 3.2 down pipe																																							
MW8	21-Jun-17	13.07	13.86	Blocked 3.2 down pipe																																							
MW8	13-Dec-17	13.12	13.91	Blocked 3.2 down pipe																																							
MW8	22-Mar-18	12.53	13.32	Blocked 3.2 down pipe																																							
MW8	12-Jun-18	13.33	14.12	Blocked 3.2 down pipe																																							
MW8	13-Sep-18	13.44	14.23	Blocked 3.2 down pipe																																							
MW8	5-Dec-18	13.29	14.08	Blocked 3.2 down pipe																																							

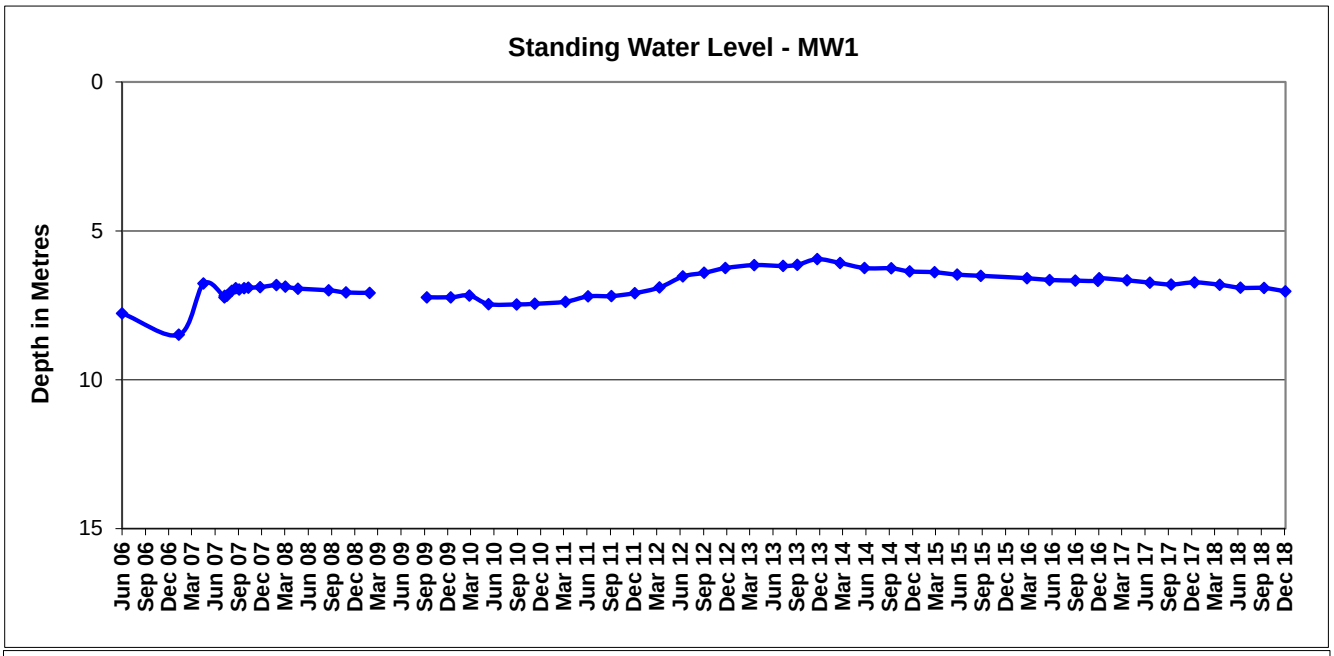
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**						**1000**															
TEMPLEMORE																																														
GW044997	2-Jun-06	6.19	6.4	6.9				0.001																3000	112	102	544	4		758	170				768											
GW044997	11-Jan-07	6.62	6.83	6.95				0.009			<0.0001	<0.005		0.001	<0.001		0.002			0.04			<0.0001		1570	45	36	298	1		200	55				495											
GW044997	10-Jul-07	6.7	6.91	7.06	785	17.1		0.009			0.0002	<0.005		0.001	<0.001		0.001			0.088			<0.0001		1590	46	41	270	1		211	84				441								9	<20	740
GW044997	18-Jul-07	6.73	6.94																																										
GW044997	7-Aug-07	6.79	7																																										
GW044997	22-Aug-07	6.76	6.97																																										
GW044997	5-Sep-07	6.83	7.04																																										
GW044997	24-Sep-07	6.62	6.83																																										
GW044997	11-Oct-07	6.73	6.94																																										
GW044997	26-Nov-07	7.05	7.26																																										
GW044997	29-Jan-08	6.44	6.65																																										
GW044997	4-Mar-08	6.23	6.44																																										
GW044997	4-Apr-08	6.295	6.505																																										
GW044997	22-Apr-08	6.31	6.52	7	3370	21.8		0.007			<0.00005	<0.001		0.005	0.0003		0.012			0.008			<0.0001		3150	135	125	461	1.7		656	276				585										<0.025	<0.1
GW044997	21-Aug-08	6.81	7.02																																										
GW044997	29-Oct-08	6.86	7.06	Bore blocked, no sample																																									
GW044997	29-Jan-09	7	7.2																																										
GW044997	17-Jun-09	7.52	7.77	7.1	3580	18.9		0.066	<0.001	0.523	0.0003	0.001	0.002	0.134	0.016	0.204	0.006		0.09	0.327		46.9	0.0001		3350	112	111	486	8	36	626	132	<1	<1	693	693	34.2	2.53	2.93				2020				
GW044997	28-Aug-09	7.85	8.05																																										
GW044997	23-Dec-09	7.97	8.17	6.95	3050	24.2	0.02	0.008				<0.001		0.005	<0.0010	0.021	0.004			0.065		0.07	<0.0001	6.87	3050	40	118	546	3	35.5	636	203	<1	<1	517	517	32.5	4.4		0.22	21	21.2				
GW044997	25-Feb-10	7.81	8.01																																										
GW044997	11-May-10	7.98	8.18	7.49	3720	22.7		0.018	<0.001	0.258	<0.0001	<0.001	<0.001	0.014	0.002	0.04	0.006		0.04	0.048		7.2	<0.0001		3480	114	119	434	2	34.4	640	192	<1	<1	593	593	33.9	0.66	2.03				1770				
GW044997	30-Aug-10	7.91	8.11	6.82	3720	22.2																																								
GW044997	9-Nov-10	7.8	8	6.8	3010	24.2																																								
GW044997	14-Mar-11	7.25	7.45	6.83	1670	25.9	0.04	0.002				<0.001		0.013	<0.001	0.004	<0.001			0.032		<0.05	<0.0001	7.15	1620	131	67	160	2	19.1	333	87	<1	<1	410	410	19.4	0.84		<0.01	1.8	1.8				
GW044997	6-Jun-11	8.02	8.22	7.3	1514	16.8																																								
GW044997	6-Sep-11	8.73	8.93	6.98	1525	16.7	0.05	0.002	<0.001	0.174	<0.0001	<0.001	<0.001	0.01	<0.001	0.007	<0.001		0.02	0.047		<0.05	<0.0001	7.64	1830	122	58	174	2	18.5	308	110	<1	<1	400	400	19	1.31	0.51	<0.01	1.43	1.43	1000			
GW044997	7-Dec-11	8.32	8.52	7.27	1545	20.6																																								
GW044997	13-Mar-12	5.1	5.3	No sample - pump not operational																																									
GW044997	14-Jun-12	5.18	5.38																																										
GW044997	6-Sep-12	4.8	5	7.95	1750	17.5	0.02	0.002	<0.001	0.128	<0.0001	<0.001	<0.001	0.011	<0.001	0.005	<0.001		0.01	0.027		0.07	<0.0001	7.69	1840	120	56	211	2	19.8	323	147	<1	<1	409	409	20.3	1.29	0.05	<0.01	5	5	1130			
GW044997	27-Nov-12	5.04	5.24	7.61	1665	24.6																																								
GW044997	21-Mar-13	5.78	5.98																																										
GW044997	11-Jul-13	6.37	6.57																																										
GW044997	5-Sep-13	6.65	6.85																																										
GW044997	22-Nov-13	6.87	7.07																																										
GW044997	20-Feb-14	6.93	7.13																																										
GW044997	27-May-14	8.05	8.25																																										
GW044997	9-Sep-14	7.99	8.19																																										
GW044997	20-Nov-14	8.56	8.76																																										
GW044997	26-Feb-15	8.61	8.81																																										
GW044997	26-May-15	8.74	8.94																																										
GW044997	27-Aug-15	10.67	10.87																																										
GW044997	4-Dec-15	10.43	10.63																																										
GW044997	24-Feb-16	10.72	10.92																																										
GW044997	23-May-16	10.99	11.19																																										
GW044997	1-Sep-16	11.18	11.38																																										
GW044997	29-Nov-16	9.17	9.37																																										
GW044997	21-Jun-17	9.68	9.88																																										
GW044997	13-Dec-17	9.67	9.87																																										
GW044997	22-Mar-18	13	13.2	7.1	5480	21	1.49	0.044	<0.001	0.258	<0.0001	0.002	0.002	0.137	0.026	0.219	0.001	<0.01	0.06	0.046	0.12	41.5	0.0001	7.83	5420	160	160	735	10	53.4	1180	396	<1	<1	947	947	60.4	6.21	0.08	0.02	5.13	5.15	3300			
GW044997	13-Sep-18	11.6	11.8	7	6120	20.8	0.08	0.005	<0.001	0.137	<0.0001	<0.001	<0.001	0.009	<0.001	0.028	0.002	<0.01	0.02	0.012	0.14	1.08	<0.0001	7.6	6400	179	183	897	3	63.1	1270	618	<1	<1	1010	1010	68.9	4.38	0.04	<0.01	24	24	3400			
GW044997	5-Dec-18	12.09	12.29	7.1	5710	20.7																																								
AMBARDO																																														
GW031856	2-Jun-06	15.76	16.4	7.3				<0.001			<0.0001	<0.001		0.036	0.001		0.001			0.126			<0.0001		1150	50	33	156	3		105	22				459										<20	<50
GW031856	11-Jan-07	19.1	19.74	7.27	910	23.1		<0.001			<0.0001	<0.005		0.005	<0.001		<0.001			<0.005			<0.0001		1080	47	30	164	3		75	18				457								3.37	<20	<50
GW031856	10-Jul-07	15.51	16.15	7.9	1080	13.5		<0.001			<0.0001	<0.005		0.008	0.0005		0.0005			2.29			0.00005		1180	48	34	162	3		94.8	20				440								3.11	10	25
GW031856	22-Apr-08			7.4	1090	19.8		0.001			<0.00005	<0.001		0.008	0.0004		0.003			0.048			<0.0001		1060	50	33	145	3.6		106	18				480										<0.025	<0.1
GW031856	29-Oct-08																																													
GW031856	10-Feb-09	17.85	18.49	7.3	1090	26.9		0.002			<0.00005	0.003		0.009	0.0006		0.002			0.26			<0.0001		1100	51	30	150	2.8		81	19				440										<0.025	<0.025
GW031856	17-Jun-09			7.4	1170	20.1		0.001	<0.001	0.156	<0.0001	<0.001	<0.001	0.004	<0.001	0.001	<0.001		<0.01	0.037		0.06	<0.0001		1110	51	33	149	3	11.8	92	15	<1	<1	453	453	12	0.52	<0.01				704				
GW031856	11-Sep-09	15.51	16.28																																										
GW031856	23-Dec-09	18.4		7.73	1029	29.3	0.01	0.001				<0.001		0.001	0.001	0.012	0.001			0.205		<0.05	<0.0001	7.45	1060	40	34	169	3	12.2	92.2	17.4	<1	<1	422	422	11.4	3.24		<0.01	0.14	0.14				
GW031856	25-Feb-10	16.31	16.91	7.61	1240	25.3	<0.01	0.001				<0.005		0.002	<0.001	0.001	<0.001			0.014		<0.05	<0.0001	7.54	1110	47	34	160	3	12.2	90.8	17.6	<1	<1	436	436	11.6	2.42		<0.01	0.19	0.19				
GW031856	11-May-10	16.58	17.18	8.2	1292	14.9		<0.001	<0.001	0.15	0.0002	<0.001	<0.001	0.116	0.006	<0.001	<0.001		<0.01	0.51		<0.05	<0.0001		1140	49	32	154	3	11.9	91.8	16.8	<1	<1	431	431	11.5	1.45	0.02				576				
GW031856	30-Aug-10	15.35	15.95	7.35	1106	18.2	<0.01	<0.001				<0.001		0.008	<0.001	0.009	<0.001			1.88		<0.05	<0.0001	7.33	1140	49	33	159	3	12.2	98	20	<1	<1	426	426	11.7	1.99		<0.01	0.24	0.24				
GW031856	10-Nov-10	15.52	16.12	7.08	990	27.8	<0.01	0.001				<0.005		0.014	<0.001	0.004	<0.001			1.26		<0.05	<0.0001	7.42	1160	22	33	163	3	11	103	18	<1	<1	440	440	12.1	4.84		<0.01	0.2	0.2				
GW031856	14-Mar-11	19.71	20.31	7.19	945	26.5	<0.01	<0.001				0.001		0.004	<0.001	<0.001	<0.001			0.015		<0.05	<0.0001	7.46	887	45	30	151	3	11.4	92	20	<1	<1	414	414	11.3	0.4		<0.01	0.2	0.2				
GW031856	7-Jun-11	16.08	16.68	7.35	929	19.2																																								
GW031856	9-Sep-11	15.49	16.09	7.33	970	17	<0.01	<0.001	<0.001	0.146	<0.0001	<0.001	<0.001	0.005	<0.001	<0.001	0.001		<0.01	1.25		<0.05	<0.0001	7.71	1120	52	35	161	3	12.6	109	22	<1	<1	412	412	11.8	3.22	<0.01	<0.01	0.16	0.16	620			
GW031856	7-Dec-11	15.65	16.25	7.64	940	20.9																																								
GW031856	19-Mar-12	15.1	15.7	7.27	1070	24.3	0.02	0.002	<0.001	0.161	<0.0001	0.002	<0.001	0.012	<0.001	0.002	<0.001		0.02	0.034		0.06	<0.0001	7.82	1110	53	34	155	3	12.3	106	23	<1	<1	421	421	11.9	1.55	<0.01	<0.01	0.27	0.27	666			
GW031856	14-Jun-12	16.04	16.64	7.57	1170	25.1																																								
GW031856	19-Sep-12	16.6	17.2	7.39	1060	21.2	0.01	0.001	<0.001	0.176	<0.0001	<0.001	<0.001	0.012	0.002	0.004	<0.001		0.01	0.027		0.29	<0.0001	7.84	1160	48	33	158	4	12.1	115	21	<1	<1	410	410	11.9	0.86	<0.01	<0.01	0.17	0.17	670			
GW031856	27-Nov-12	16	16.6	7.43	1048	25.4																																								
GW031856	21-Mar-13	15.7	16.3	7.42	1020	24.2	<0.01	0.001	<0.001	0.166	<0.0001	0.003	<0.001	0.027	0.006	0.005	<0.001		0.01	0.193		<0.05	<0.0001	7.78	1100	49	32	157	3	12	90	21	<1	<1	435	435	11.7	1.31	<0.01	<0.01	0.22	0.22	640			

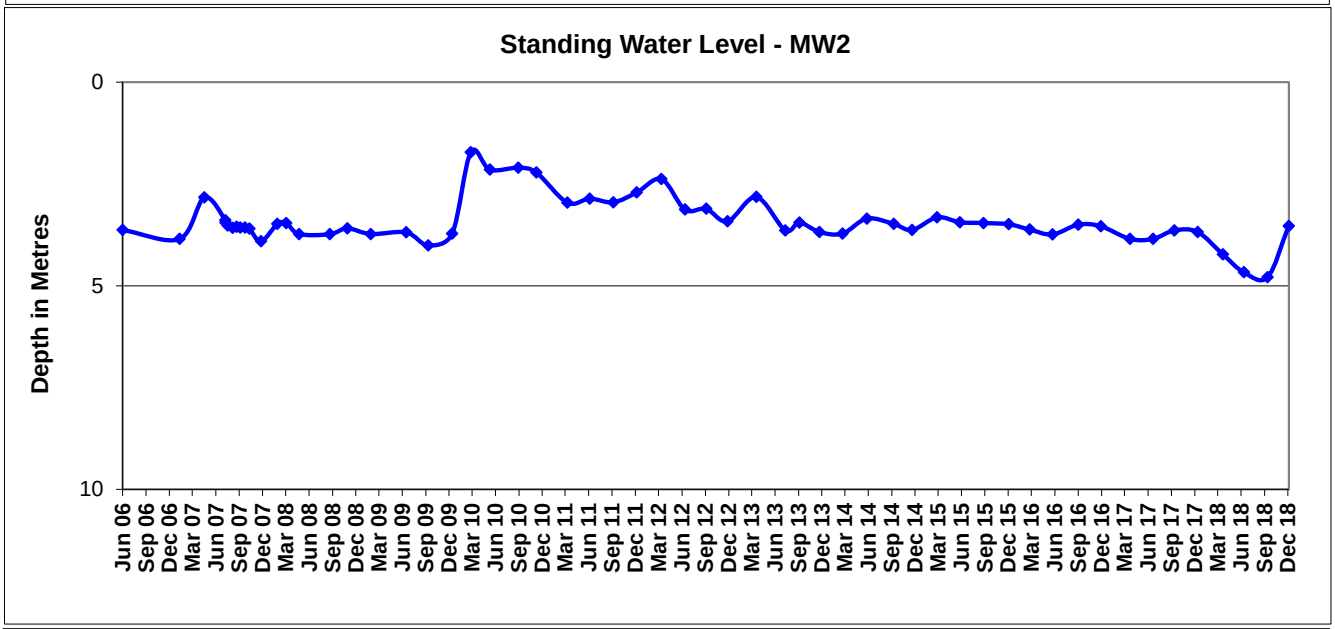
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**															
GW031856	11-Jul-13	17.47	18.07	7.54	1064	19.6																																							
GW031856	5-Sep-13	17.2	17.8	7.56	1070	19.2	<0.01	<0.001	0.141	<0.05	<0.0001	<0.001	<0.001	0.005	<0.001	0.002	<0.001	<0.01	<0.01	0.017	<0.001	0.06	<0.0001	7.92	1130	49	33	158	4	12.1	100	20	<1	<1	432	432	11.9	1.08	<0.01				660			
GW031856	22-Nov-13	15.88	16.48	7.6	1120	24.9																																							
GW031856	24-Feb-14	15.1	15.7	7.7	1120	24.5	<0.01	0.001	0.156	<0.05	<0.0001	<0.001	<0.001	0.007	<0.001	<0.001	<0.001	<0.01	0.01	0.138	<0.001	<0.05	<0.0001	7.84	1150	48	32	155	3	11.8	99	22	<1	<1	430	430	11.8	<0.01	0.02				684			
GW031856	27-May-14	15.20	15.8	7.5	1097	20.1																																							
GW031856	9-Sep-14	14.70	15.3	7.3	1120	18	<0.01	0.002				0.002		0.006		<0.001	<0.001			0.056		0.12	<0.0001	7.82	1140	46	30	142	3	11	101	23	<1	<1	388	388	11.1	0.31		<0.01	0.2	0.2				
GW031856	20-Nov-14	15.87	16.47	7.2	1120	24.5																																							
GW031856	26-Feb-15	15.6	16.2	7.5	1090	25.6	<0.01	0.001	<0.001	0.143	<0.0001	<0.001	<0.001	<0.001		<0.001	0.001	<0.01	0.01	0.197	<0.05	<0.05	<0.0001	7.94	1220	48	33	150	3	11.7	99	22	<1	<1	478	478	12.8	4.47	0.02	<0.01	0.21	0.21	570			
GW031856	26-May-15	15.07	15.67	NO [illegible]																																									
GW031856	27-Aug-15	15.1	15.7	6.9	1120	14.7	0.01	0.001	<0.001	0.126	<0.0001	<0.001	<0.001	0.022	0.003	0.002	0.001	<0.01	<0.01	0.348	<0.05	0.19	<0.0001	7.8	1120	49	35	157	2	12.2	66	23	<1	<1	406	406	10.4	7.71	0.04	<0.01	0.21	0.21	592			
GW031856	4-Dec-15	18.77	19.37	7	1118	22.1																																							
GW031856	24-Feb-16	17.83	18.43	7.1	1117	23.8	0.01	0.002	<0.001	0.154	<0.0001	<0.001	<0.001	0.007	<0.001	0.005	<0.001	<0.01	0.01	0.035	<0.05	0.09	<0.0001	7.89	1140	57	38	173	3	13.6	75	23	<1	<1	454	454	11.7	7.53	0.05	<0.01	0.21	0.21	656			
GW031856	23-May-16	16.53	17.13	7.2	1121	21																																							
GW031856	6-Sep-16	14	14.6	7.3	1140	16.7	<0.01	0.001				0.001		0.057	0.009	0.001	0.002			0.594		0.25	<0.0001	7.61	1120	53	33	142	2	11.6	96		<1	<1	424	424	11.6	0.06		<0.01	0.2	0.2				
GW031856	29-Nov-16	15.83	16.43																																										
GW031856	23-Mar-17	15.6	16.2	7.2	1130		<0.01	0.001	<0.001	0.158	<0.0001	<0.001	<0.001	0.03	0.002	0.002	<0.001	<0.01	0.01	0.068	<0.05	0.06	<0.0001	8.08	1110	50	34	149	3	11.8	102	18	<1	<1	460	460	12.4	2.44	0.02	<0.01	0.22	0.22	682			
GW031856	21-Jun-17	14.79	15.39	7.5	1152	14.7																																							
GW031856	13-Sep-17	17	17.6	7.4	1150		<0.01	0.001	<0.001	0.146	<0.0001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.01	<0.01	0.008	<0.05	<0.05	<0.0001	7.99	1130	56	35	159	3	12.7	82	22	<1	<1	497	497	12.7	0.13	0.03	<0.01	0.23	0.23	601			
GW031856	13-Dec-17	14.7	15.3	7.4	1133	25.6																																							
GW031856	22-Mar-18			7.5	1160	22	0.02	<0.001	<0.001	0.141	<0.0001	<0.001	<0.001	0.011	<0.001	0.004	0.001	<0.01	<0.01	0.197	<0.05	0.08	<0.0001	8.05	1140	52	31	134	2	11	106	24	<1	<1	490	490	13.3	9.27	0.06	<0.01	0.24	0.24	620			
GW031856	13-Sep-18	13.7	14.3	7.3	1130	16.1	0.01	0.002	<0.001	0.132	<0.0001	0.003	<0.001	0.054	0.018	0.002	<0.001	<0.01	<0.01	0.527	<0.05	0.82	<0.0001	7.76	1150	51	32	139	2	11.3	110	20	<1	<1	433	433	12.2	3.82	0.02	<0.01	0.2	0.2	598			
GW031856	5-Dec-18	13.87	14.47	7.1	1190	24.4																																							
GW031856																																													

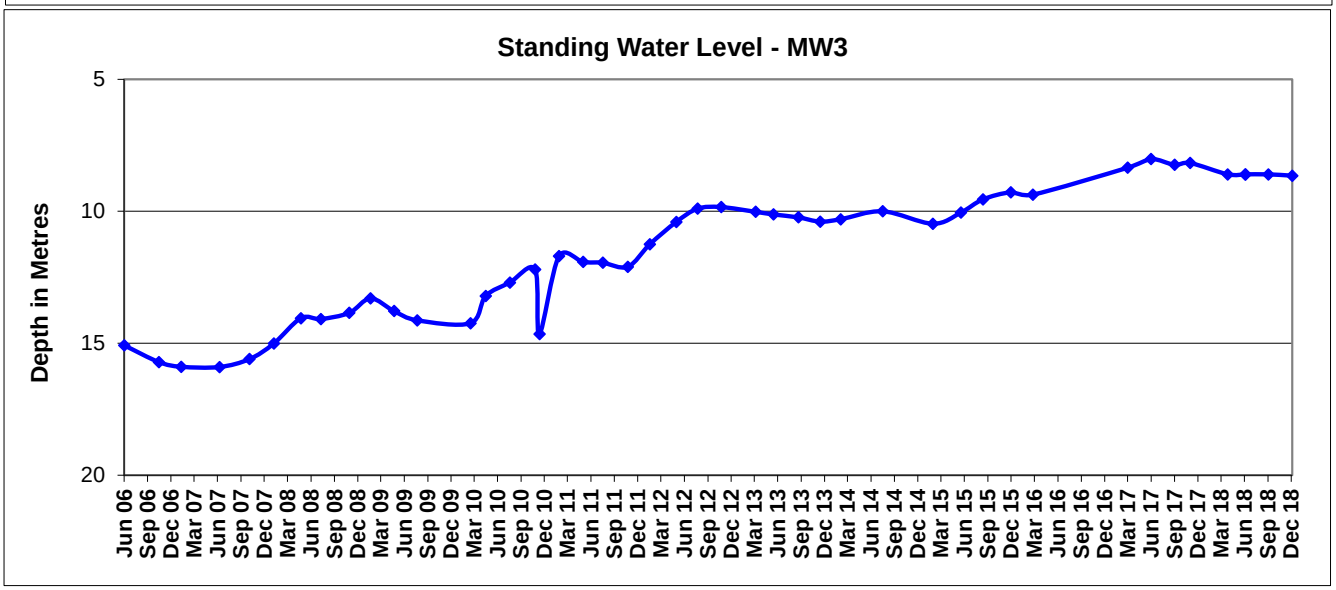
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations					Major Anions							Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L										
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**			
TARRAWONGA																																												
GW052266	2-Jun-06	7.67	8.1	7.9				<0.001																1360	17	13	301	5		134	65				488										
GW052266	11-Jan-07	8.94	9.37	7.58				<0.001			<0.0001	<0.005		<0.001	<0.001		<0.001			0.02			<0.0001		1950	45	29	389	8		362	126				457										
GW052266	10-Jul-07	7.92	8.35	8.01	1330	13.3		<0.001			<0.0001	<0.005		<0.001	<0.001		<0.001			0.01			<0.0001		1480	23	14	315	6		170	79				435								10.61	<20	250
GW052266	18-Jul-07	7.97	8.4																																										
GW052266	7-Aug-07	7.94	8.37																																										
GW052266	22-Aug-07	7.95	8.38																																										
GW052266	5-Sep-07	8.02	8.45																																										
GW052266	24-Sep-07	7.92	8.35																																										
GW052266	11-Oct-07	7.9	8.33																																										
GW052266	26-Nov-07	8	8.43																																										
GW052266	29-Jan-08	8.01	8.44																																										
GW052266	4-Mar-08	8.04	8.47																																										
GW052266	4-Apr-08	8	8.43																																										
GW052266	22-Apr-08	8.04	8.47	7.2	1230	20.6		<0.001			<0.00005	<0.001		<0.001	0.0002		0.006			<0.005			<0.0001		1250	94	48	110	4.5		131	19				465									<0.025	<0.1
GW052266	21-Aug-08	5.86	6.29																																										
GW052266	29-Oct-08			8.7	1600	28.4		<0.001			<0.00005	0.002		0.001	0.0003		<0.001			0.013			0.0006		1600	19	17	270	6.5		220	93				450									<0.025	<0.100
GW052266	28-Aug-09	9.7	10.13																																										
GW052266	14-Dec-09	11.3	11.35	7.4	922	23.3	<0.01	0.003				<0.001		0.003	<0.001	0.006	0.003			0.018		<0.05	<0.0001	7.51	838	55	16	84	<1	7.72	64.1	31.6	<1	<1	252	252	7.51	1.36		<0.01	6.09	6.09				
GW052266	25-Feb-10	10.44	10.49																																										
GW052266	11-May-10	10.43	10.48	8.23	954	18.6		0.002	<0.001	0.078	<0.0001	<0.001	<0.001	0.002	0.002	0.017	0.004		0.01	0.024		0.54	<0.0001		813	54	16	80	<1	7.52	68.3	34	<1	<1	241	241	7.46	0.42	0.05				446			
GW052266	16-Aug-10	9.71	10.21	7.4	860	18.7																																							
GW052266	9-Nov-10	10.53	10.58	6.98	817	24.1																																								
GW052266	10-Mar-11	10.51	11.01	7.04	786	23.5	0.15	0.004				<0.001		0.024	0.002	0.034	0.001			0.103		1.28	<0.0001	7	640	53	17	94	1	8.2	72	34	<1	<1	262	262	7.98	1.34		0.34	4.32	4.66				
GW052266	6-Jun-11	10.19	10.24	7.05	663	20.2																																							
GW052266	6-Sep-11	10.51	10.56	6.94	714	20.2	0.96	0.003	<0.001	0.106	<0.0001	0.002	<0.001	0.009	0.002	0.085	0.008		0.02	0.061		2.63	<0.0001	7.48	823	57	16	90	<1	8.08	71	38	<1	<1	260	260	7.99	0.53	0.14	<0.01	6.35	6.35	464			
GW052266	7-Dec-11	10.55	10.60	6.95	705	20.6																																							
GW052266	13-Mar-12	9.18	9.23	7.04	784	21.6	0.03	0.002	<0.001	0.086	<0.0001	<0.001	<0.001	0.113	0.003	0.005	0.012		0.02	0.15		0.1	<0.0001	7.54	821	57	17	99	<1	8.55	68	37	<1	<1	267	267	8.44	0.65	<0.01	<0.01	5.92	5.92	498			
GW052266	13-Jun-12	8.38	8.43	7.05	837	20.4																																							
GW052266	4-Sep-12	7.91	7.96	7.41	780	22.4	0.04	0.003	<0.001	0.078	<0.0001	<0.001	<0.001	0.018	0.002	0.03	<0.001		0.01	0.068		0.92	<0.0001	7.56	802	50	17	93	<1	7.94	76	32	<1	<1	260	260	8	0.42	0.07	0.01	5.53	5.54	562			
GW052266	27-Nov-12	8.00	8.05	7.28	750	22																																							
GW052266	20-Mar-13	9.24	9.29	7.18	740	21.4	0.02	0.004	<0.001	0.072	<0.0001	<0.001	<0.001	0.034	0.002	0.007	0.001		0.01	0.176		0.16	<0.0001	7.13	798	54	17	89	<1	7.97	80	28	<1	<1	244	244	7.71	1.58	0.02	<0.01	5.9	5.9	326			
GW052266	11-Jul-13	7.79	7.84	7.25	822	18.1																																							
GW052266	5-Sep-13	8.29	8.34	7.09	590	22.4	1.02	0.002	0.091	<0.05	<0.0001	0.004	0.002	0.324	0.006	0.036	0.009	<0.01	0.02	0.19	<0.001	1.72	<0.0001	7.62	782	48	16	95	<1	7.84	73	35	<1	<1	238	238	7.54	1.94	<0.01				493			
GW052266	22-Nov-13	7.84	7.89	7.2	670	21.8																																							
GW052266	24-Feb-14	7.74	7.79	7	727	21.2	0.2	0.002	0.072	<0.05	<0.0001	0.001	<0.001	0.112	0.007	0.03	0.003	<0.01	0.01	0.152	<0.001	0.86	<0.0001	7.48	737	42	14	83	<1	6.86	66	33	<1	<1	203	203	6.6	1.87	0.05				514			
GW052266	27-May-14	7.68	7.73	7.2	692	20.6																																							
GW052266	9-Sep-14	7.73	7.78	7.4	684	20.6	0.22	0.0001				<0.001		0.007	<0.001	0.318	0.003			0.048		3.63	<0.0001	7.83	693	34	12	82	<1	6.25	66	34	<1	<1	222	222	7.01	4.83		<0.01	1.75	1.75				
GW052266	20-Nov-14	7.77	7.82	7.2	748	21.5																																							
GW052266	26-Feb-15	7.51	7.56	7.2	752	21.6	0.44	0.006	<0.001	0.086	<0.0001	0.001	0.001	0.012	0.002	0.141	0.008	<0.01	0.03	0.214	<0.05	22.9	<0.0001	7.13	800	47	15	89	1	7.48	62	81	<1	<1	168	168	9.56	14.2	0.54	0.74	5.12	5.86	430			
GW052266	26-May-15	7.75	7.8	7.3	713	20.2																																							
GW052266	27-Aug-15	7.76	7.81	7.2	707	19.7	0.06	<0.001	<0.001	0.049	<0.0001	<0.001	<0.001	0.006	<0.001	0.273	0.002	<0.01	<0.01	0.093	<0.05	16	<0.0001	7.61	712	40	15	85	2	6.98	48	36	<1	<1	218	218	6.46	3.85	0.19	0.03	0.46	0.49	380			
GW052266	4-Dec-15	7.83	7.88	7.1	734	20.5																																							
GW052266	24-Feb-16	7.86	7.91	7	752	21.7	0.14	0.007	<0.001	0.084	<0.0001	<0.001	<0.001	0.008	<0.001	0.096	<0.001	<0.01	0.03	0.067	<0.05	30.6	<0.0001	7.5	508	52	15	90	<1	7.74	56	37	<1	<1	219	219	7.74	3.82	0.1	<0.01	6.21	6.21	508			
GW052266	23-May-16	7.91	7.96	7	746	20.6																																							
GW052266	6-Sep-16	7.94	7.99	7.1	712	21.5	0.12	0.001				<0.001		0.002	<0.001	0.03	<0.001			0.026		0.34	<0.0001	7.51	719	43	14	80	<1	6.78	66		<1	<1	224	224	7	1.65		<0.01	3.05	3.05				
GW052266	29-Nov-16	7.79	7.84	7.3	752	21.3																																							
GW052266	23-Mar-17	7.67	7.72	7.3	780	21.5	0.07	0.002	<0.001	0.071	<0.0001	<0.001	<0.001	0.013	<0.001	0.03	<0.001	<0.01	0.01	0.05	<0.05	0.39	<0.0001	7.81	780	47	17	90	<1	7.66	67	29	<1	<1	246	246	7.41	1.66	0.02	<0.01	5.97	5.97	490			
GW052266	21-Jun-17	7.81	7.86	7.3	776	19.9																																							
GW052266	13-Sep-17	7.81	7.86	6.9	793	21	0.61	0.001	<0.001	0.067	<0.0001	<0.001	<0.001	0.002	<0.001	0.176	0.001	<0.01	0.01	0.029	<0.05	2.56	<0.0001	7.72	779	58	18	93	<1	8.42	60	35	<1	<1	264	264	7.7	4.5	0.04	<0.01	6.17	6.17	404			
GW052266	13-Dec-17	7.88	7.93	7.1	815	22.3																																							
GW052266	22-Mar-18	8.09	8.14	7.3	806	21	0.15	0.002	<0.001	0.075	<0.0001	<0.001	<0.001	<0.001	<0.001	0.129	<0.001	<0.01	0.01	0.017	<0.05	1.86	<0.0001	7.76	813	52	15	84	<1	7.48	74	35	<1	<1	270	270	8.21	4.64	0.09	0.01	5.85	5.86	523			
GW052266	13-Sep-18	8.32	8.37	7	770	21.9	0.14	0.004	<0.001	0.067	<0.0001	<0.001	<0.001	0.002	<0.001	0.055	0.001	<0.01	0.01	0.019	<0.05	0.49	<0.0001	7.54	795	50	15	81	<1	7.25	65	34	<1	<1	233	233	7.2	0.39	0.03	<0.01	6.71	6.71	442			
GW052266	5-Dec-18	8.51	8.56	7	818	21.8																																							
GW052266																																													
TEMPLEMORE A																																													
Templemore A	18-Jul-07	8.61	9.07																																										
Templemore A	7-Aug-07	11.33	11.79																																										
Templemore A	22-Aug-07	12.08	12.54																																										
Templemore A	5-Sep-07	12.09	12.55																																										
Templemore A	24-Sep-07	12.22	12.68																																										
Templemore A	11-Oct-07	12.08	12.54																																										
Templemore A	26-Nov-07	12.09	12.55																																										
Templemore A	29-Jan-08	12.05	12.51																																										
Templemore A	4-Mar-08	12.07	12.53																																										
Templemore A	4-Apr-08	9.16	9.62																																										
Templemore A	21-Aug-08	8.68	9.14																																										
Templemore A	29-Jan-09	7.84	8.3																																										
Templemore A	17-Jun-09	8.65	9.39	7.7	1640	19.7		0.003	<0.001	0.132	<0.0001	<0.001	<0.001	0.021	0.002	0.247	0.002		<0.01	0.02			<0.0001	0.16	1500	165	42	106	1	16.3	228	56	<1	<1	426	426	16.1	0.7	0.01				1000			
Templemore A	28-Aug-09	8.92	9.4																																										
Templemore A	23-Dec-09	10.1	10.58	7.2	1473	24	<0.01	0.002				<0.001		0.007	<0.001	0.013	0.001			0.025		<0.05	<0.0001	7.54	1400	72	41	125	1	12.4	246	79	<1	<1	241	241	13.6	4.61		0.07	3.25	3.32				
Templemore A	25-Feb-10	9.16	9.64																																										
Templemore A	11-May-10	9.12	9.6	7.92	1083	21.2		0.004	<0.001	0.21	0.0001	<0.001	<0.001	0.011	<0.001	1.9	0.006		0.01	0.019		0.11	<0.0001		1600	152	38	105	3	15.4	241	68.3	<1	<1	376	376	15.7	1.13	3.1				906			
Templemore A	30-Aug-10	9.19	9.67	7.77	1590	22.1																																							
Templemore A	9-Nov-10	9.24	9.72	7.67	1485	23.7																																							
Templemore A	14-Mar-11	9.44	9.92	7.35	1486	24.8	0.02	0.003				<0.001		0.011	<0.001	3.31	0.005			0.079		0.76	<0.0001	7.56	1420	175	41	120	4	17.4	297	49	<1	<1	402	402	17.4	0.03		<0.01	0.09	0.09				
Templemore A	6-Jun-11	9.36	9.84	7.45	1392	20.2																																							
Templemore A	6-Sep-11	9.5	9.98	7.61	1395	21.8	0.08	0.004	<0.001	0.266	<0.0001	<0.001	<0.001	0.004	<0.001	1.81	0.004		<0.01	0.033		0.1	<0.0001	8.04	1670	169	41	120	3	17.1	285	62	<1	<1	405	405	17.4	0.9	1.37	0.12	0.46	0.58	790			

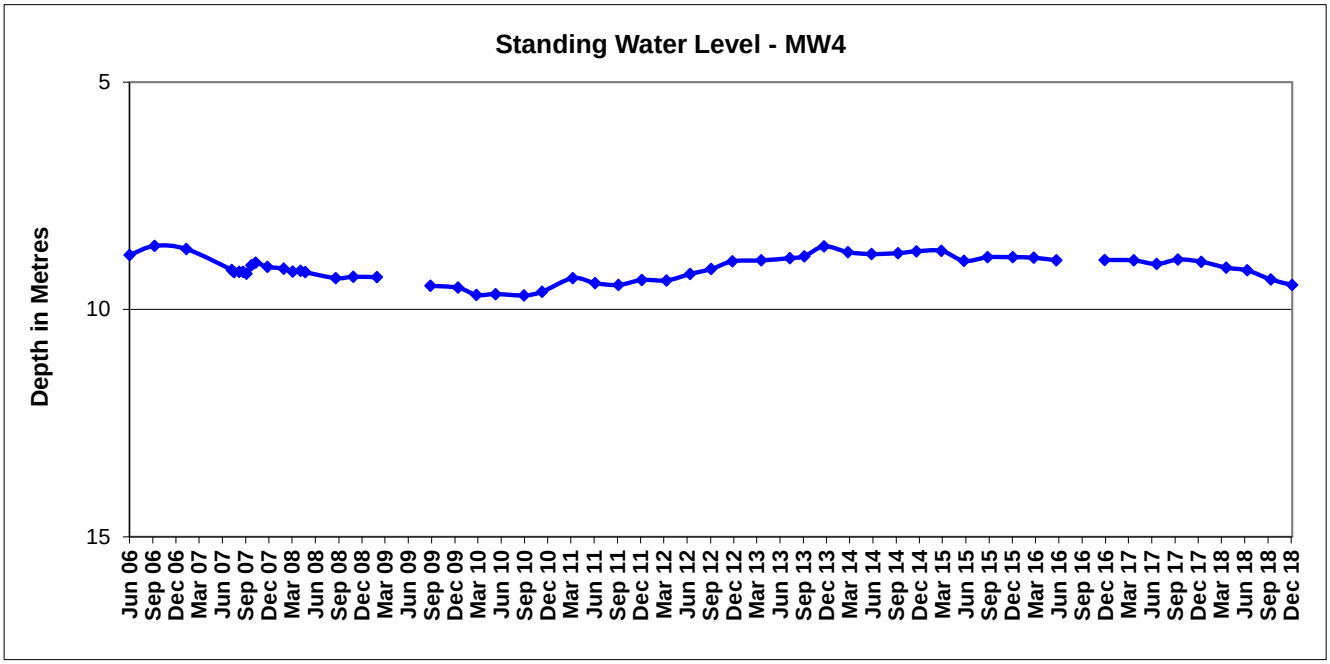
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**															
Templemore A	9-Dec-11		No access to well - paddock flooded																																										
Templemore A	13-Mar-12	2.7	3.18	7.62	960	22.9	0.1	0.003	<0.001	0.093	<0.0001	<0.001	<0.001	<0.001	<0.001	0.006	<0.001		<0.01	0.023		0.11	<0.0001	7.79	988	92	25	74	8	10.1	103	59	<1	<1	222	222	9.98	0.6	0.04	0.01	19.7	19.7	578			
Templemore A	13-Jun-12	3.28	3.76	7.31	826	20.2																																							
Templemore A	6-Sep-12	3.59	4.07	7.32	816	20.1	0.05	0.002	<0.001	0.071	<0.0001	<0.001	<0.001	0.017	<0.001	0.008	<0.001		<0.01	0.026		0.09	<0.0001	7.67	820	80	22	54	4	8.25	103	66	<1	<1	203	203	8.34	0.48	<0.01	<0.01	2.79	2.79	500			
Templemore A	27-Nov-12	3.85	4.33	7.42	812	21.1																																						
Templemore A	21-Mar-13	4.31	4.79	7.67	943	21.8	1.68	0.003	<0.001	0.114	0.0001	0.001	0.001	0.142	0.01	0.501	0.005		<0.01	0.279		2.56	<0.0001	7.75	1020	97	24	60	9	9.66	116	74	<1	<1	242	242	9.65	0.06	2.75	3.32	0.18	3.5	614			
Templemore A	11-Jul-13	5.34	5.82	7.68	1162	19.2																																						
Templemore A	5-Sep-13	4.29	4.77	7.57	1150	20.4	0.07	0.003	0.119	<0.05	<0.0001	<0.001	<0.001	0.068	0.003	0.688	0.003	<0.01	<0.01	0.103	<0.001	0.12	<0.0001	7.96	1240	119	30	93	5	12.6	175	96	<1	<1	284	284	12.6	0.1	0.07				765			
Templemore A	22-Nov-13	7.5	7.98	7.7	1189	19.8																																						
Templemore A	20-Feb-14	4.41	4.89	7.7	1110	20.7	0.23	0.004	0.1	<0.05	<0.0001	0.001	<0.001	0.105	0.012	0.432	0.005	<0.01	<0.01	0.204	<0.001	0.75	<0.0001	7.71	1150	104	27	80	6	11	150	84	<1	<1	272	272	11.4	1.63	4.83				669			
Templemore A	27-May-14	4.57	5.05	7.6	1281	20																																						
Templemore A	9-Sep-14	4.31	4.79	7.8	1150	19.3	0.02	0.004				<0.001		0.012	<0.001	0.011	<0.001			0.031		0.86	<0.0001	7.98	1190	105	26	78	2	10.8	164	98	<1	<1	272	272	12	5.3		<0.01	2.6	2.6				
Templemore A	20-Nov-14	4.78	5.26	7.9	1117	21.2																																						
Templemore A	26-Feb-15	5.27	5.75	7.9	1100	23.7	0.2	0.003	<0.001	0.079	<0.0001	<0.001	<0.001	0.015	<0.001	0.1	0.002	<0.01	<0.01	0.064	<0.05	0.22	<0.0001	7.69	1210	109	27	84	4	11.4	157	105	<1	<1	242	242	12.9	13.7	0.73	0.14	0.3	0.44	674			
Templemore A	26-May-15	5.59	6.07	7.9	1125	19.4																																						
Templemore A	27-Aug-15	5.64	6.12	7.9	1180	18.4	0.04	0.002	<0.001	0.077	<0.0001	<0.001	<0.001	0.019	<0.001	0.014	<0.001	<0.01	<0.01	0.034	<0.05	0.05	<0.0001	8.03	1190	113	27	87	3	11.7	134	82	<1	<1	264	264	10.8	4.28	0.04	<0.01	0.93	0.93	755			
Templemore A	4-Dec-15	5.77	6.25	7.8	1192	22.7																																						
Templemore A	24-Feb-16	6.08	6.56	7.8	1234	22.5	0.03	0.004	<0.001	0.105	<0.0001	<0.001	<0.001	0.012	0.001	0.415	0.001	<0.01	<0.01	0.037	<0.05	0.11	<0.0001	8.09	1300	147	30	102	4	14.3	176	88	<1	<1	340	340	13.6	2.71	0.5	0.44	<0.01	0.27	668			
Templemore A	23-May-16	6.31	6.79	7.9	1302	20.7																																						
Templemore A	6-Sep-16	6.43	6.91	7.9	1280	23.8	0.04	0.003				<0.001		0.023	0.002	0.404	0.001			0.26		0.26	<0.0001	7.89	1300	134	26	89	4	12.8	183		<1	<1	338	338	13.5	2.64		<.01	2.14	2.14				
Templemore A	29-Nov-16	3.27	3.75	7.5	810	20.5																																						
Templemore A	23-Mar-17	4.31	4.79	7.4	824	22.1	0.31	0.002	<0.001	0.07	<0.0001	<0.001	<0.001	0.026	0.001	0.086	0.001	<0.01	<0.01	0.097	<0.05	0.35	<0.0001	7.99	816	65	20	65	4	7.82	112	53	<1	<1	189	189	8.04	1.39	0.56	0.1	3.14	3.24	530			
Templemore A	21-Jun-17	4.89	5.37	7.6	943	18.7																																						
Templemore A	13-Sep-17	5.11	5.59	7.5	1050	20.3	0.1	0.003	<0.001	0.076	0.0002	<0.001	<0.001	0.02	<0.001	0.018	<0.001	<0.01	<0.01	0.07	<0.05	0.1	<0.0001	8.08	1030	110	24	75	4	10.8	143	76	<1	<1	259	259	10.8	0.18	0.05	<0.01	1.79	1.79	575			
Templemore A	13-Dec-17	5.22	5.7	7.7	1091	21																																						
Templemore A	22-Mar-18	5.87	6.35	8	1180	21.2	0.06	0.005	<0.001	0.096	<0.0001	<0.001	<0.001	0.02	0.002	0.46	<0.001	<0.01	<0.01	0.027	<0.05	1.93	<0.0001	8.23	1150	111	23	77	4	10.9	182	97	<1	<1	307	307	13.3	9.94	0.7	0.2	0.16	0.36	784			
Templemore A	13-Sep-18	6.39	6.87	7.7	1250	20.2	0.03	0.003	<0.001	0.087	<0.0001	<0.001	<0.001	0.025	0.001	0.078	<0.001	<0.01	<0.01	0.024	<0.05	0.17	<0.0001	7.9	1280	114	26	86	2	11.6	201	84	<1	<1	287	287	13.2	6.19	0.05	<0.01	1.54	1.54	762			
Templemore A	5-Dec-18	6.66	7.14	7.7	1278	21.2																																						
Templemore A																																												

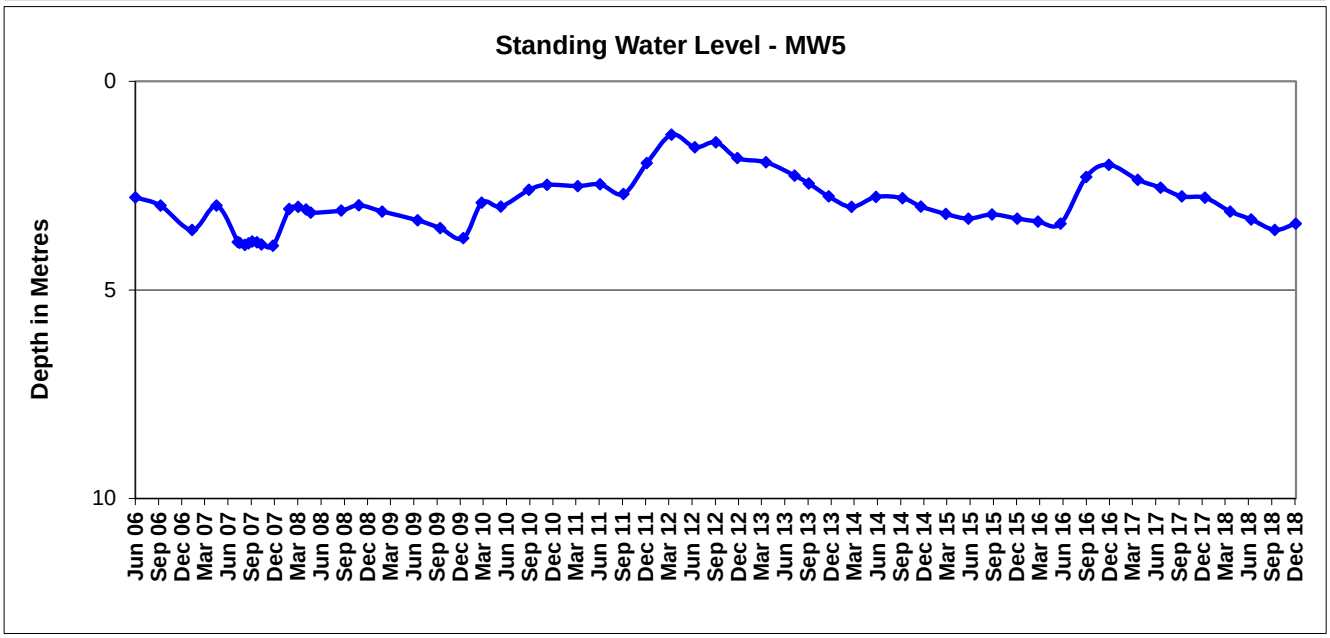
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N - mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L				Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L											
ANZECC Guideline - stock drinking water							**5**	**0.5**			**0.01**	**1**	**1**	**1**	**0.1**		**1**	**0.02**		**20**			**0.002**			**1000**					**1000**									**400**		**4000**				
TEMPLEMORE B																																													
Templemore B	18-Jul-07	9.89	9.89																																											
Templemore B	7-Aug-07	8.14	8.14																																											
Templemore B	22-Aug-07	8.31	8.31																																											
Templemore B	5-Sep-07	8.17	8.17																																											
Templemore B	24-Sep-07	8.05	8.05																																											
Templemore B	11-Oct-07	8.09	8.09																																											
Templemore B	26-Nov-07	7.9	7.9																																											
Templemore B	29-Jan-08	8.13	8.13																																											
Templemore B	4-Mar-08	8.44	8.44																																											
Templemore B	4-Apr-08	8.42	8.42																																											
Templemore B	21-Aug-08	10.55	10.55																																											
Templemore B	29-Jan-09	15.5	15.5																																											
Templemore B	17-Jun-09	9.49	9.63	7.3	1810	19.5		0.002	<0.001	0.145	<0.0001	<0.001	<0.001	0.055	<0.001	0.008	<0.001		0.01	0.052		<0.05	<0.0001		1700	118	52	175	2	17.9	240	106	<1	<1	419	419	17.4	1.46	<0.01				1080			
Templemore B	28-Aug-09	12.69	12.83																																											
Templemore B	23-Dec-09	15.84	15.98	6.75	1491	24.4	<0.01	0.003				<0.001		0.022	<0.001	0.003	0.002			0.068		<0.05	<0.0001	7.44	1420	31	31	221	2	13.8	196	134	<1	<1	291	291	14.1	1.29		<0.01	0.74	0.74				
Templemore B	25-Feb-10	9.36	9.5																																											
Templemore B	11-May-10	10.52	10.66	8.01	1722	22.2		0.002	<0.001	0.059	<0.0001	<0.001	<0.001	0.007	<0.001	0.024	<0.001		0.01	0.02		0.11	<0.0001		1540	85	30	194	2	15.1	204	129	<1	<1	328	328	15	0.48	0.02				854			
Templemore B	30-Aug-10	17.65	17.79	7.23	1532	23.8																																							
Templemore B	9-Nov-10	9.94	10.08	7.19	1405	24.8																																							
Templemore B	14-Mar-11	17.11	17.25	7.21	1460	24.7	0.28	0.002				<0.001		0.055	0.003	0.034	0.002			0.185		0.43	<0.0001	7.28	1400	97	37	200	2	16.6	264	136	<1	<1	339	339	17	1.3		<0.01	2.85	2.85				
Templemore B	6-Jun-11	10.42	10.56	7.3	1370	21.5																																							
Templemore B	8-Sep-11	13.56	13.7	7.12	1387	20.8	0.03	0.003	<0.001	0.076	<0.0001	<0.001	<0.001	0.015	<0.001	0.005	<0.001		0.01	0.019		<0.05	<0.0001	7.54	1630	62	38	202	2	15.1	254	137	<1	<1	325	325	16.5	4.62	0.03	<0.01	0.73	0.73	982			
Templemore B	7-Dec-11	10.53	10.67	7.21	1360	21																																							
Templemore B	13-Mar-12	9.58	9.72	7.28	1680	23	0.07	0.002	<0.001	0.09	<0.0001	<0.001	<0.001	0.013	<0.001	0.004	<0.001		0.02	0.036		0.1	<0.0001	7.7	1790	116	42	228	2	19.2	307	142	<1	<1	338	338	18.4	2.24	0.11	<0.01	3.37	3.37	1040			
Templemore B	13-Jun-12	10.51	10.65	7.34	1704	20.8																																							
Templemore B	4-Sep-12	8.28	8.42	7.3	1770	21.4	0.05	0.002	<0.001	0.099	<0.0001	<0.001	<0.001	0.01	<0.001	0.005	<0.001		0.01	0.072		0.1	<0.0001	7.63	1920	110	46	248	2	20.1	326	181	<1	<1	364	364	20.2	0.31	<0.01	<0.01	7.25	7.25	1200			
Templemore B	27-Nov-12	7.65	7.79	7.37	1611	21.8																																							
Templemore B	20-Mar-13	12.36	12.5	7.29	1570	22.4	0.04	0.004	<0.001	0.069	<0.0001	<0.001	<0.001	0.019	0.001	0.012	<0.001		0.01	0.064		0.09	<0.0001	7.51	1700	94	36	235	2	17.9	255	137	<1	<1	335	335	16.7	3.41	0.03	<0.01	4.44	4.44	886			
Templemore B	11-Jul-13	6.08	6.22	7.22	1523	21.7																																							
Templemore B	5-Sep-13	6.1	6.24	7.24	1470	22.3	0.28	0.003	0.076	0.06	<0.0001	<0.001	<0.001	0.046	0.002	0.035	<0.001	<0.01	0.02	0.148	<0.001	0.3	<0.0001	7.79	1620	78	32	230	2	16.6	242	158	<1	<1	304	304	16.2	1.18	0.03				988			
Templemore B	22-Nov-13	7.89	8.03	7.4	1483	20.7																																							
Templemore B	20-Feb-14	8.31	8.45	7.5	1400	21.6	0.1	0.004	0.061	0.06	<0.0001	<0.001	<0.001	0.045	0.005	0.022	0.002	<0.01	0.02	0.129	<0.001	0.38	<0.0001	7.47	1470	69	29	204	1	14.7	199	142	<1	<1	293	293	14.4	1.03	0.02				829			
Templemore B	27-May-14	10.51	10.65	7.4	1566	19.7																																							
Templemore B	9-Sep-14	6.38	6.52	7.4	1390	21.5	0.05	0.004				<0.001		0.007	<0.001	0.004	<0.001			0.028		0.07	0.0001	7.7	1480	63	25	192	1	13.6	195	141	<1	<1	325	325	14.9	4.76		<0.01	2.3	2.3				
Templemore B	20-Nov-14	6.96	7.1	7.4	1523	22.3																																							
Templemore B	26-Feb-15	7.58	7.72	7.4	1450	23.6	0.15	0.003	<0.001	0.064	<0.0001	<0.001	<0.001	0.01	<0.001	0.013	0.002	<0.01	0.01	0.078	<0.05	0.2	<0.0001	7.89	1580	70	30	205	2	14.9	211	144	<1	<1	328	328	15.5	1.9	0.09	<0.01	2.38	2.38	955			
Templemore B	26-May-15	8.37	8.51	7.4	1453	20.6																																							
Templemore B	27-Aug-15	8.03	8.17	7.3	1480	19.2	0.03	0.003	<0.001	0.061	<0.0001	<0.001	<0.001	0.006	0.003	0.005	<0.001	<0.01	0.02	0.046	<0.05	0.07	<0.0001	7.73	1520	74	31	202	1	15	179	158	<1	<1	286	286	14	3.43	0.04	<0.01	2.07	2.07	826			
Templemore B	4-Dec-15	10.98	11.12	7.3	1572	22.8																																							
Templemore B	24-Feb-16	10.77	10.91	7.2	1465	23.4	0.31	0.004	<0.001	0.069	<0.0001	<0.001	<0.001	0.007	<0.001	0.005	<0.001	<0.01	0.01	0.046	<0.05	1.7	<0.0001	7.77	1510	82	32	219	1	16.3	214	158	<1	<1	307	307	15.5	2.56	0.05	<0.01	0.21	0.21	874			
Templemore B	23-May-16	7.18	7.32	7.2	1481	21.8																																							
Templemore B	6-Sep-16	13.46	13.6	7.2	1510	23.5	0.25	0.004				<0.001		0.024	0.003	0.021	<0.001			0.153		1.12	<0.0001	7.58	1560	90	30	196	2	15.5	240		<1	<1	325	325	16.1	1.84		<0.01	2.14	2.14				
Templemore B	29-Nov-16	9.27	9.41	7.2	1345	21.3																																							
Templemore B	23-Mar-17	6.91	7.05	7.3	1500	23	0.04	0.003	<0.001	0.069	<0.0001	<0.001	<0.001	0.014	<0.001	0.012	<0.001	<0.01	0.02	0.035	<0.05	0.08	<0.0001	8.02	15200	71	31	197	1	14.7	235	129	<1	<1	322	322	15.7	3.48	0.02	<0.01	2.42	2.42	1040			
Templemore B	21-Jun-17	6.46	6.6	7.4	1613	19.7																																							
Templemore B	13-Sep-17	6.68	6.82	7.6	1600	21.13	<0.01	0.003	<0.001	0.07	<0.0001	0.001	<0.001	0.011	<0.001	0.009	0.004	<0.01	0.01	0.044	<0.05	0.23	<0.0001	8.3	1620	89	37	213	2	16.8	245	149	<1	<1	360	360	17.2	1.19	0.04	<0.01	2.31	2.31	916			
Templemore B	13-Dec-17	6.61	6.75	7.4	1425	22.4																																							
Templemore B	22-Mar-18	8.9	9.04	7.3	1380	21.1	0.15	0.003	<0.001	0.058	<0.0001	<0.001	<0.001	0.003	<0.001	0.024	<0.001	<0.01	0.01	0.016	<0.05	0.58	<0.0001	7.95	1380	66	26	168	1	12.8	215	144	<1	<1	324	324	15.5	9.79	0.08	0.02	1.62	1.64	899			
Templemore B	13-Sep-18	7.22	7.36	7.1	1440	22	0.07	0.003	<0.001	0.058	<0.0001	<0.001	<0.001	0.001	<0.001	0.004	<0.001	<0.01	0.02	0.033	<0.05	0.09	<0.0001	7.59	1480	74	27	180	2	13.8	233	135	<1	<1	305	305	15.5	5.74	0.05	<0.01	1.89	1.89	777			
Templemore B	5-Dec-18	10.22	10.36	7.1	1520	21.7																																							
Templemore B																																													

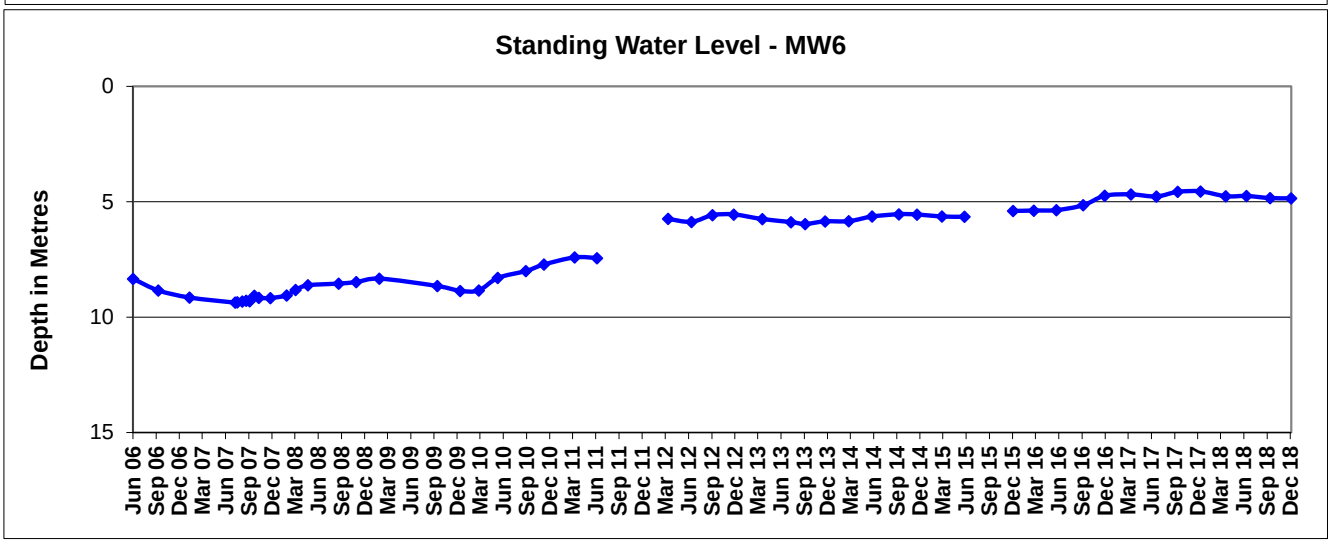

Standing Water Level - MW1
Depth in Metres
0
5
10
15
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

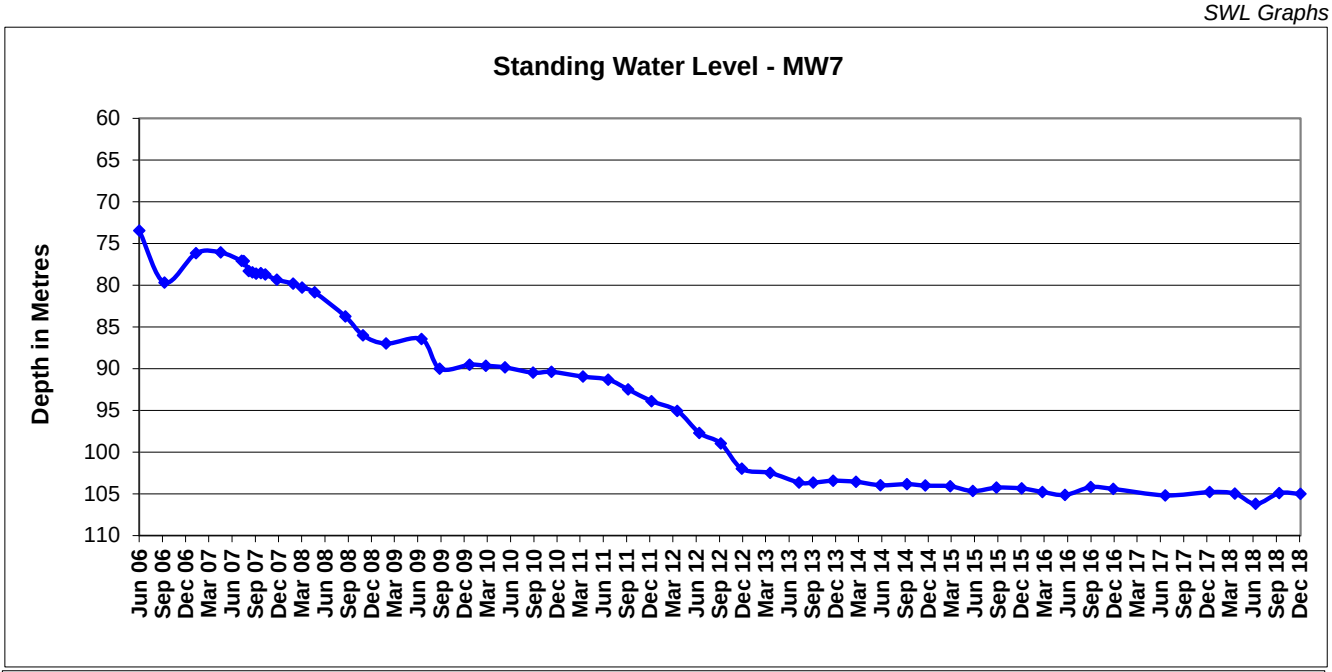

Standing Water Level - MW2
Depth in Metres
0
5
10
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

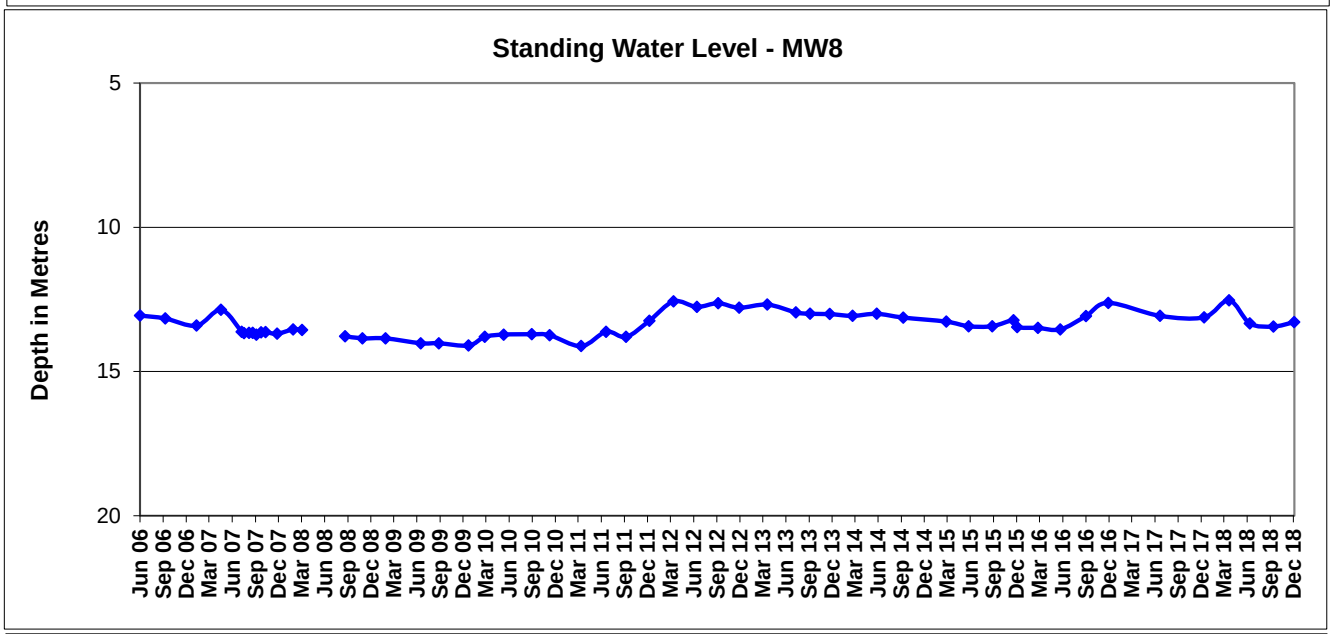

Standing Water Level - MW3
Depth in Metres
5
10
15
20
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

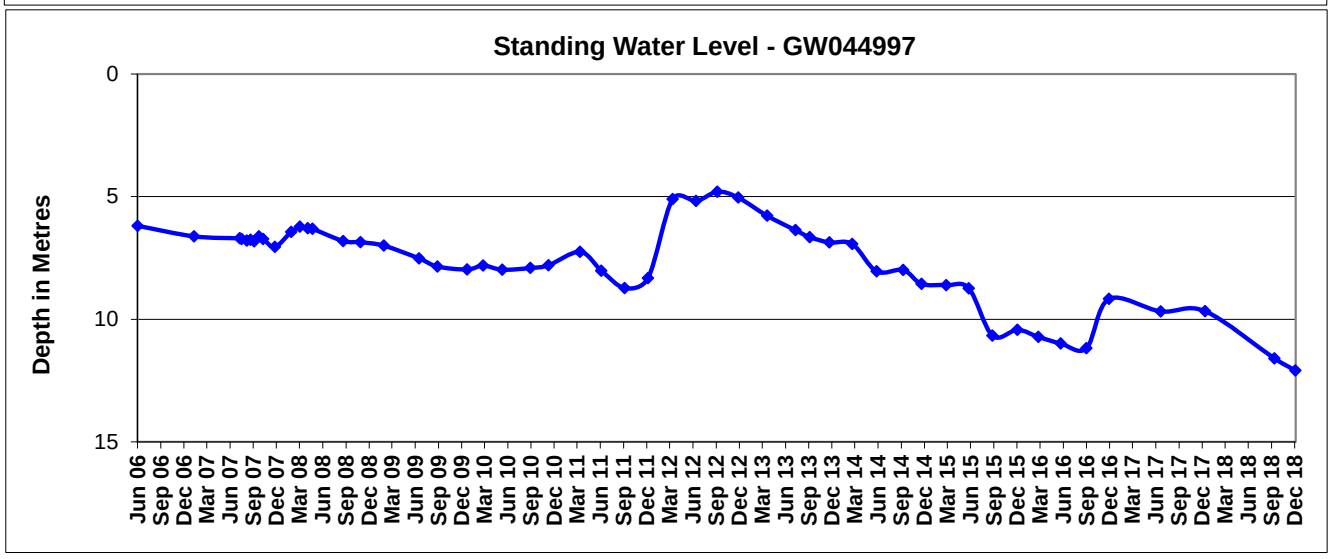

Standing Water Level - MW4
Depth in Metres
5
10
15
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

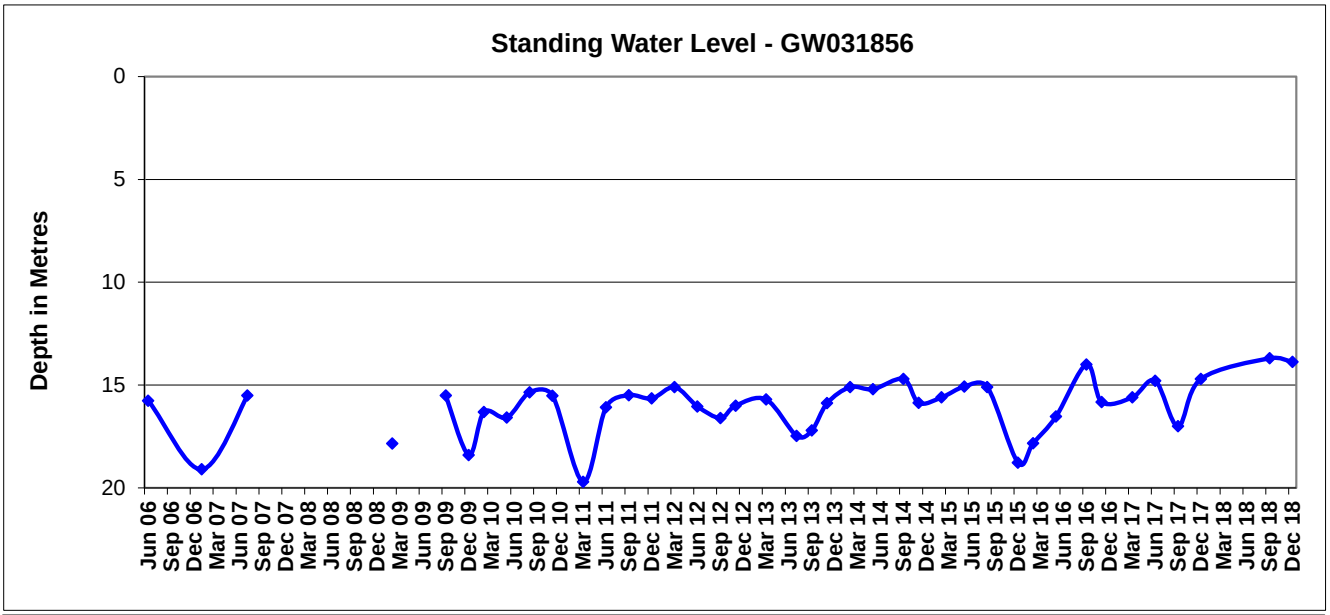

Standing Water Level - MW5
Depth in Metres
0
5
10
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

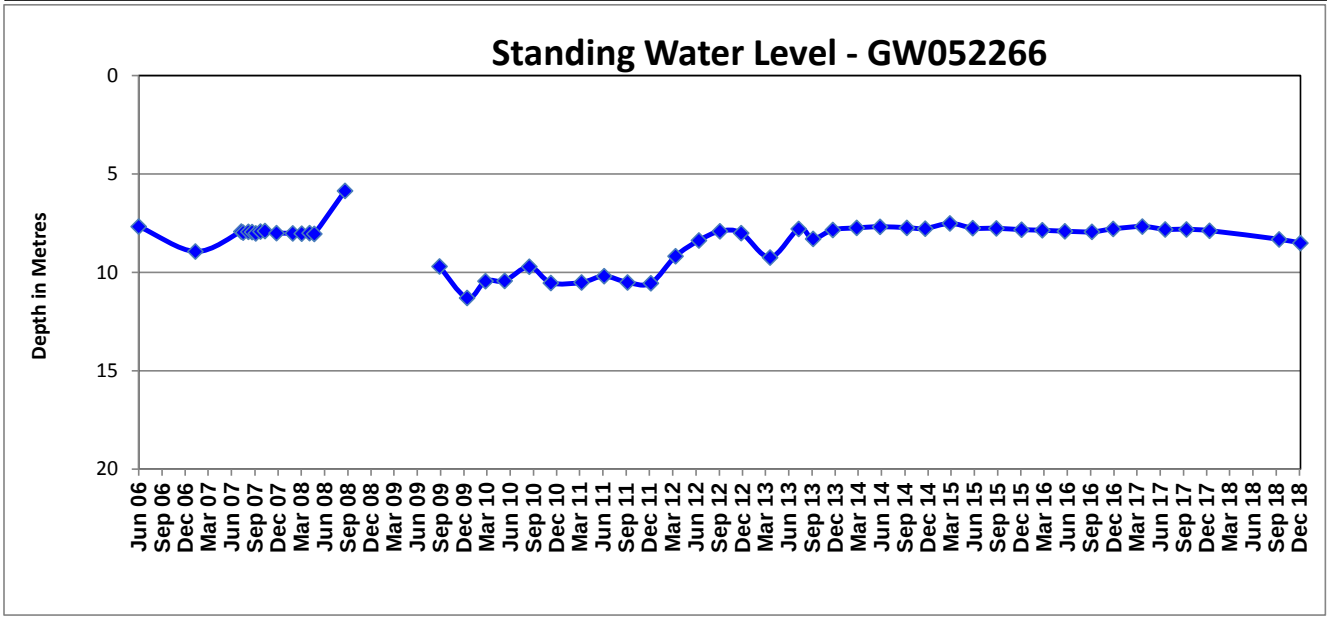

Standing Water Level - MW6
Depth in Metres
0
5
10
15
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

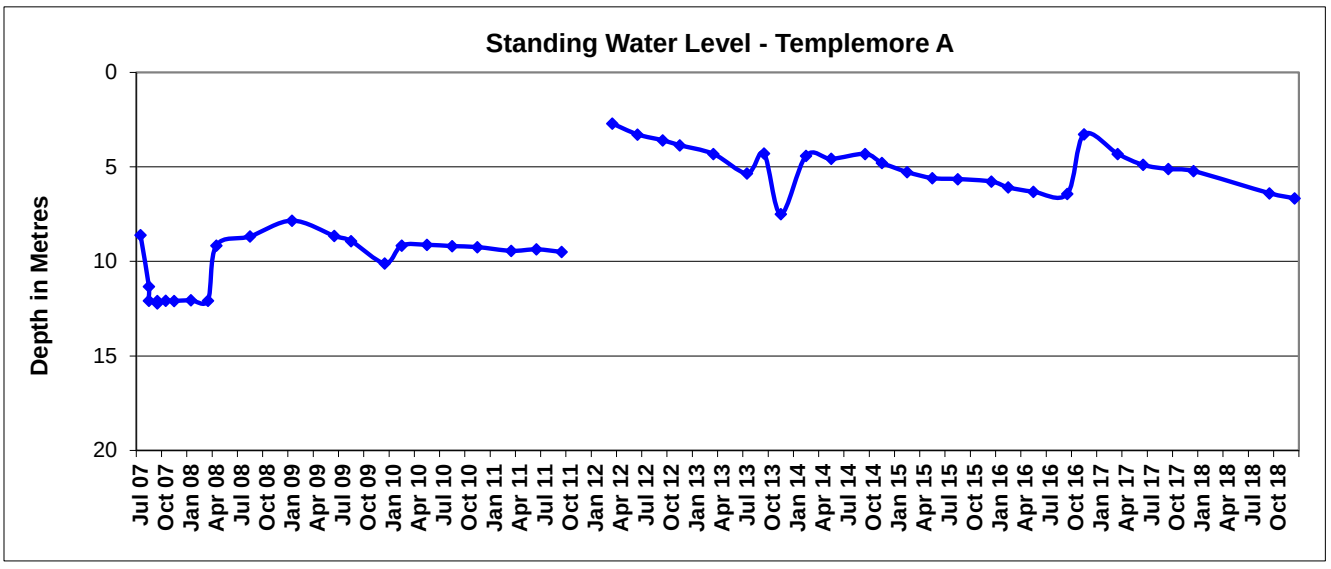

Standing Water Level - MW7
Depth in Metres
60
65
70
75
80
85
90
95
100
105
110
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18

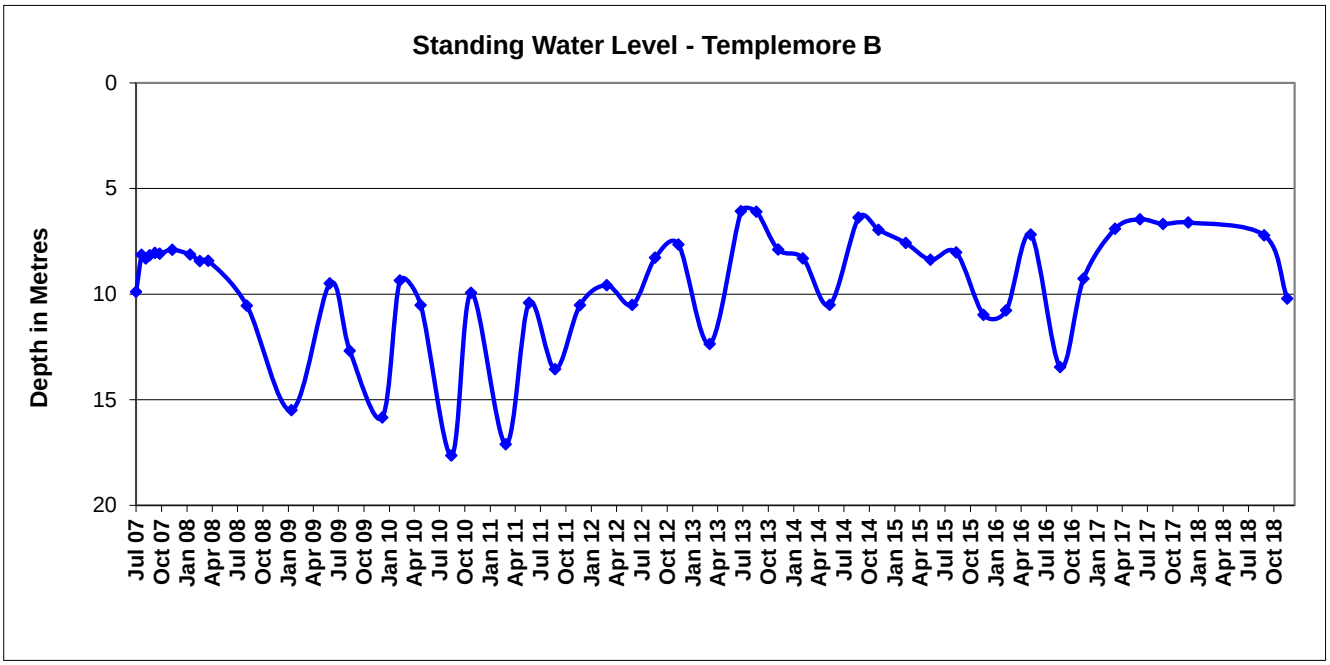

Standing Water Level - MW8
Depth in Metres
5
10
15
20
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18


Standing Water Level - GW044997
Depth in Metres
0
5
10
15
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18


Standing Water Level - GW031856
Depth in Metres
0
5
10
15
20
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18


Standing Water Level - GW052266
Depth in Metres
0
5
10
15
20
Jun 06
Sep 06
Dec 06
Mar 07
Jun 07
Sep 07
Dec 07
Mar 08
Jun 08
Sep 08
Dec 08
Mar 09
Jun 09
Sep 09
Dec 09
Mar 10
Jun 10
Sep 10
Dec 10
Mar 11
Jun 11
Sep 11
Dec 11
Mar 12
Jun 12
Sep 12
Dec 12
Mar 13
Jun 13
Sep 13
Dec 13
Mar 14
Jun 14
Sep 14
Dec 14
Mar 15
Jun 15
Sep 15
Dec 15
Mar 16
Jun 16
Sep 16
Dec 16
Mar 17
Jun 17
Sep 17
Dec 17
Mar 18
Jun 18
Sep 18
Dec 18


Standing Water Level - Templemore A
Depth in Metres
0
5
10
15
20
Jul 07
Oct 07
Jan 08
Apr 08
Jul 08
Oct 08
Jan 09
Apr 09
Jul 09
Oct 09
Jan 10
Apr 10
Jul 10
Oct 10
Jan 11
Apr 11
Jul 11
Oct 11
Jan 12
Apr 12
Jul 12
Oct 12
Jan 13
Apr 13
Jul 13
Oct 13
Jan 14
Apr 14
Jul 14
Oct 14
Jan 15
Apr 15
Jul 15
Oct 15
Jan 16
Apr 16
Jul 16
Oct 16
Jan 17
Apr 17
Jul 17
Oct 17
Jan 18
Apr 18
Jul 18
Oct 18


Standing Water Level - Templemore B
Depth in Metres
0
5
10
15
20
Jul 07
Oct 07
Jan 08
Apr 08
Jul 08
Oct 08
Jan 09
Apr 09
Jul 09
Oct 09
Jan 10
Apr 10
Jul 10
Oct 10
Jan 11
Apr 11
Jul 11
Oct 11
Jan 12
Apr 12
Jul 12
Oct 12
Jan 13
Apr 13
Jul 13
Oct 13
Jan 14
Apr 14
Jul 14
Oct 14
Jan 15
Apr 15
Jul 15
Oct 15
Jan 16
Apr 16
Jul 16
Oct 16
Jan 17
Apr 17
Jul 17
Oct 17
Jan 18
Apr 18
Jul 18
Oct 18