Annual Review 2019

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	31/11/2020
Annual review start date [1]	1/01/2019
Annual review end date	31/12/2019

I, Jacques du Toit, 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 2019 until 31st December 2019, 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	JACQUES DU TOIT
Title of authorised reporting officer	GM OPEN CUT OPS
Signature of authorised reporting officer	
Date	26.03.2020.

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

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1 STATEMENT OF COMPLIANCE

The compliance status of the Tarrawonga Coal Mine (TCM) as at 31st December 2019 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)	No
ML 1579	No
ML 1693	No
ML 1685	No
ML 1749	No
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 3 condition 24	Proponent shall provide an annual and 24hour PM_{10} 'Total Impact'. Total impact criteria includes background levels plus any incremental contribution from the Project to obtain a final measure.	Administrative Non-compliance	TCM received a Warning Letter regarding failure 'to adequately calculate long term air quality impact by excluding fifteen (15) PM10 HVAS results from the 2018 Annual Review because they were determined not to be mine related.	Section 11
ML_1579; ML_1685; ML_1693; ML_1749.	Condition 2(1); 3(a); 3(a); 3(a).	Proponent shall maintain a current Mining Operations Plan until site is fully rehabilitated and signed off by a Resources Regulator	Administrative Non-compliance	TCM operated in accordance with the approved MOP Amendment C however this MOP was required to be updated to report on progress against rehabilitation undertakings by 1 April 2019. Even though MOP Amendment D was submitted on 15 March 2019, DRG approved it on 12th April. The Resource regulator issued a Caution letter for having continued operation without an approved Mining Operations Plan (MOP) from the 2nd to the 11th of April 2019.	Section 11
PA11_0047	Schedule 3 condition 3.	Proponent must not exceed limits specified in *Table 2: Noise Criteria dB(A)* , and*;* Noise generated at the premises must not exceed the noise limits in the table below.	Low Non-Compliance	On 7th of June 2019, during the quarterly attended Noise monitoring, noise limit (35 dBA) was exceeded at the monitoring site TN2 (Coomalgah) recording a maximum measurement of 42dB (including 2dB Noise Modifying Factor applied as per the Noise Policy for Industry), in one occasion during the daytime. TCM engaged a separate noise specialist to take supplementary operational noise monitoring. The results showed that throughout the entire period there were no recorded noise non-compliance.	Section 6.1

Relevant Approval	Condition Number	Condition Description (summary)	Compliance status	Comment	Where Addressed in Annual Review
PA11_0047	Schedule 3 condition 24.	The Proponent must ensure that all reasonable and feasible avoidance and mitigation measures are implemented so that particular matter emissions generated by the project do not cause exceedances of the criteria in Table 6, Table 7 and Table 8 at any residence on privately owned land or on more than 25 percent of any privately-owned land.	Low Non-Compliance	TCM's HVAS at property 'Coomalgah' measured twenty two (22) exceedances of the 24 hour average limit over 12 months. Investigations showed that all those elevated PM10 levels were not mine related. DPIE acknowledged that there were 18 out of 22 exceedances recorded on days that regional air quality alerts were issued by Office of Environment Heritage (OEH) or days of 'extraordinary event' therefore advised criterion could be excluded from the annual averaging calculation. However they advised that these events and dates will be confirmed in the Air Quality Monitoring Network Spring 2019 and Summer 2019-2020 Namoi North West Slopes Region reports.	Section 6.3

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 2019 to 31st December 2019 (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 9301.
- Mr John Hamson, Operations Manager:
  Contact: (02) 6741 5002.
- Mr Sebastien Moreno, Environmental Superintendent:
  Contact: (02) 6741 5009.

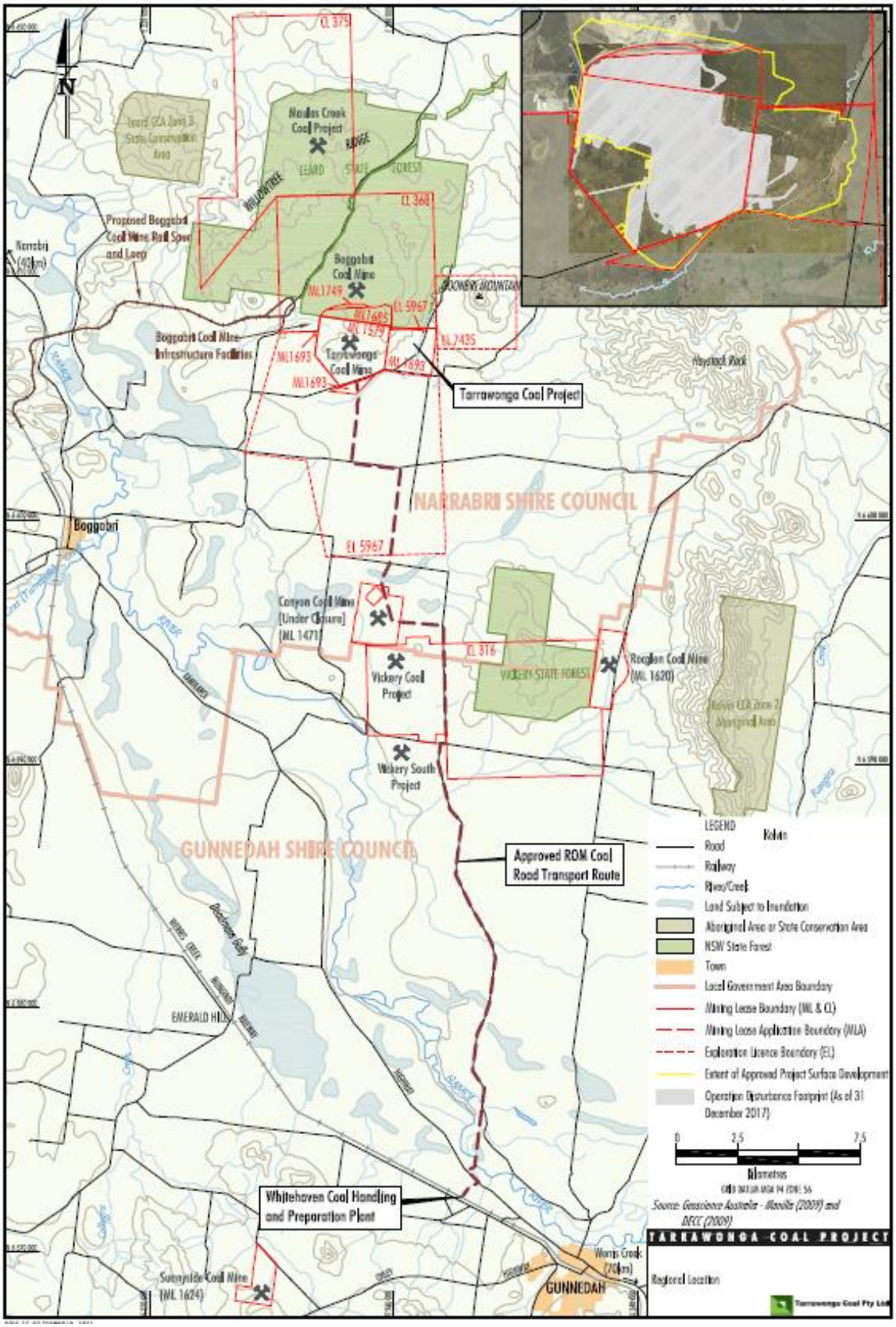


Figure 1- Locality Plan

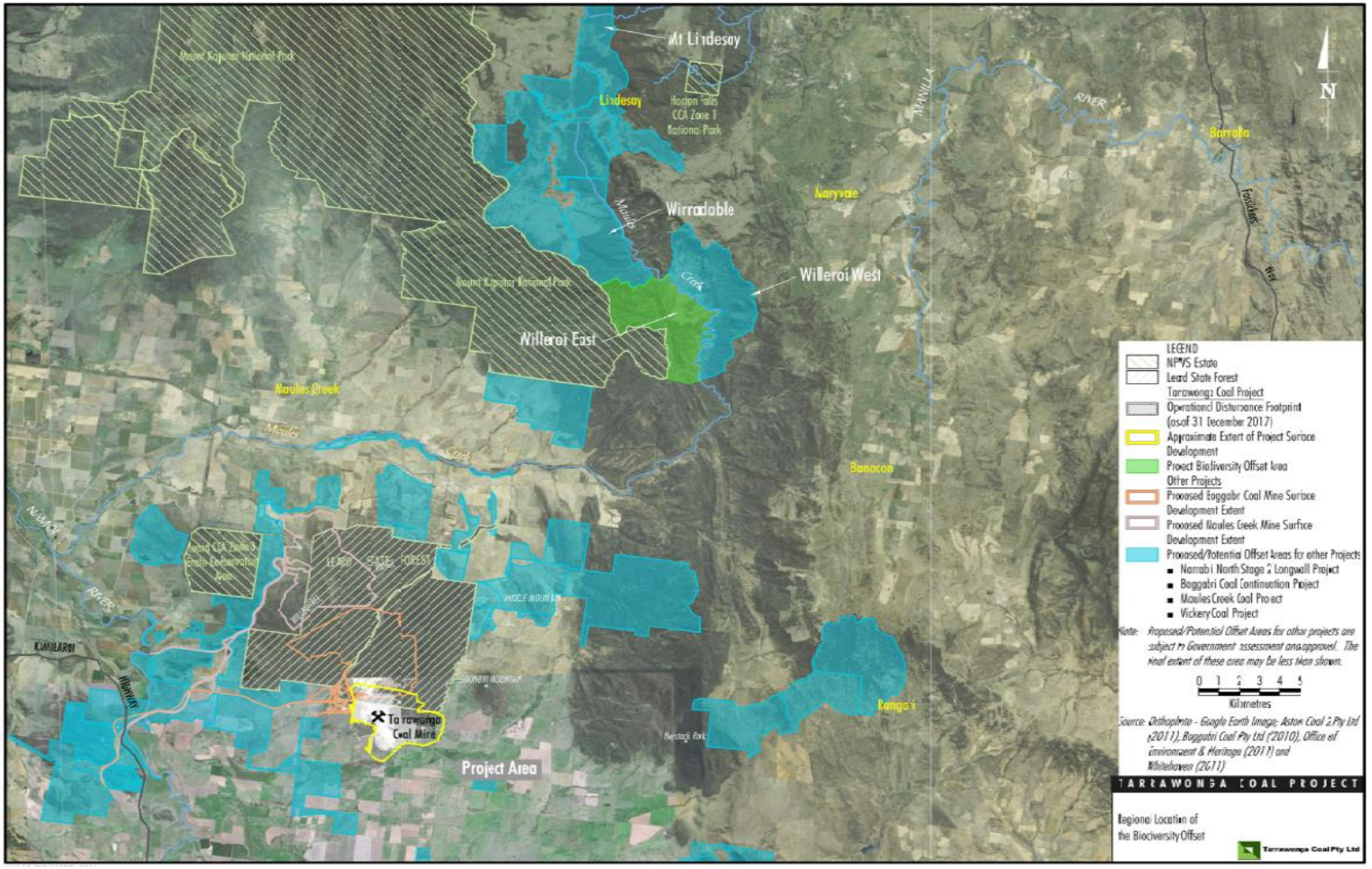


Figure 2- Regional Location of Biodiversity Offset

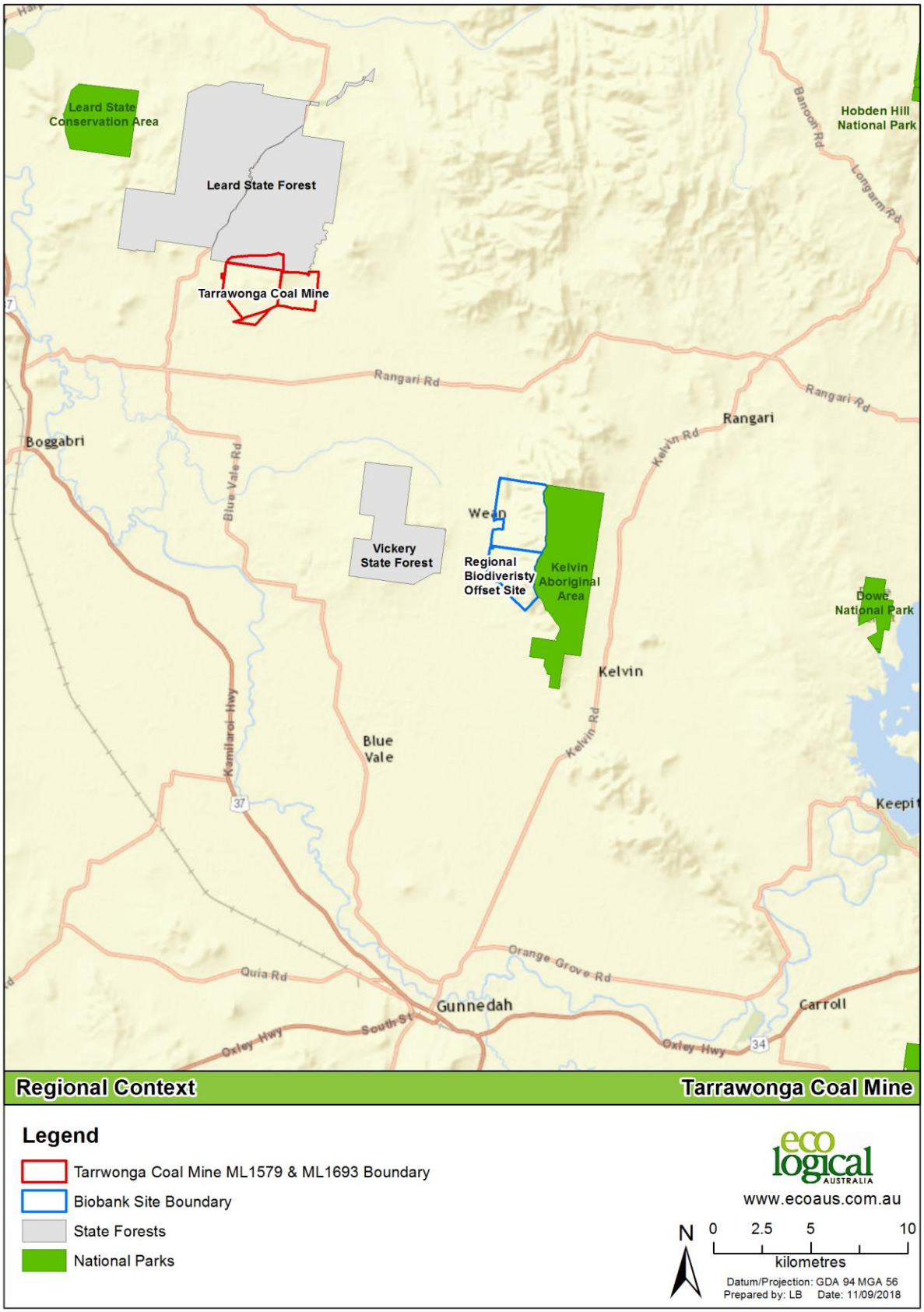


Figure 3- Regional Location of Biobank Site

3 APPROVALS

3.1 Tenements, Licences and Approvals

Table 3 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 Infrastructure & Environment (DPIE)	Project Approval PA 11_0047	22/01/2013	31/12/2030	
Department of Planning Infrastructure & Environment (DPIE)	Project Approval PA 11_0047	2014	31/12/2030	MOD1 (continued coal haulage to Gunnedah CHPP)
Department of Planning Infrastructure & Environment (DPIE)	Project Approval PA 11_0047	2016	31/12/2030	MOD2 (allow receipt of all types of coal reject)
Department of Planning	Project Approval	February	31/12/2030	MOD3 (Traffic

Issuing / Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Infrastructure & Environment (DPIE)	PA 11_0047	2017		Management Plan)
Department of Planning Infrastructure & Environment (DPIE)	Project Approval PA 11_0047	May 2017	31/12/2030	MOD4 (Sound Power Level modification)
Department of Planning Infrastructure & Environment (DPIE)	Project Approval PA 11_0047	August 2017	31/12/2030	MOD5 (Open Cut Augmentation)
Department of Planning Infrastructure & Environment (DPIE))	Project Approval PA 11_0047	October 2018	31/12/2030	MOD6 (Coal Haulage)
Department of the Environment and Energy (DoEE)	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
Division of Resources and Geoscience (DRG)	Mining Operations Plan (MOP) Amendment D	1/11/2015	30/11/2020	MOP Amendment D approved 12/04/2019

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 2018	This Reporting Period 2019 (actual)	Next Reporting Period 2020 (forecast)
Waste Rock/ Overburden (bcm)	***n/a***	23,388,129	21,814,461	29,015,237
ROM Coal/Ore (t)	***3,000,000***	2,752,399	2,258,954	2,912,045
Coarse and Fine Reject (t)	***700,000***	700,000	291,683	700,000
Saleable Product (t)	***n/a***	2,627,321	2,187,249	2,676,364
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 **2,240,824** tonnes of coal was hauled along the approved haulage route from TCM to the Whitehaven Gunnedah CHPP. During the same period **105,907** 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 2019 was **2,893,136** tonnes. There was no coal haulage

from Vickery Coal Mine during the reporting period. The total tonnage of coal rejects received by TCM during 2019 was **291,683** 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. Seven exploration boreholes were completed in April 2019 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 **2,912,045** tonnes per annum of ROM coal and **29,015,237** bank cubic metres (bcm) of overburden during calendar year 2020.

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 E (2020). 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 DPIE.

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
Waste Management : Include a comparison to previous four years performance for each waste stream.	DPIE	Sch. 2 Cond.4	Comparison table included showing waste data from 2016 to 2019	Section 10
WHC website: Environmental Assessments: Whitehaven Temporary Road Haulage Modification Environmental Assessment, dated September 2018 (MOD6)	DPIE	Sch.5 Cond.12	Uploaded to WHC website by 31 May 2019	Nil
WHC website: Statutory approvals: PA 11_0047 MOD6 consolidated approval	DPIE	Sch.5 Cond.12	Uploaded to WHC website by 31 May 2019	Nil

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 describe 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 the 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;

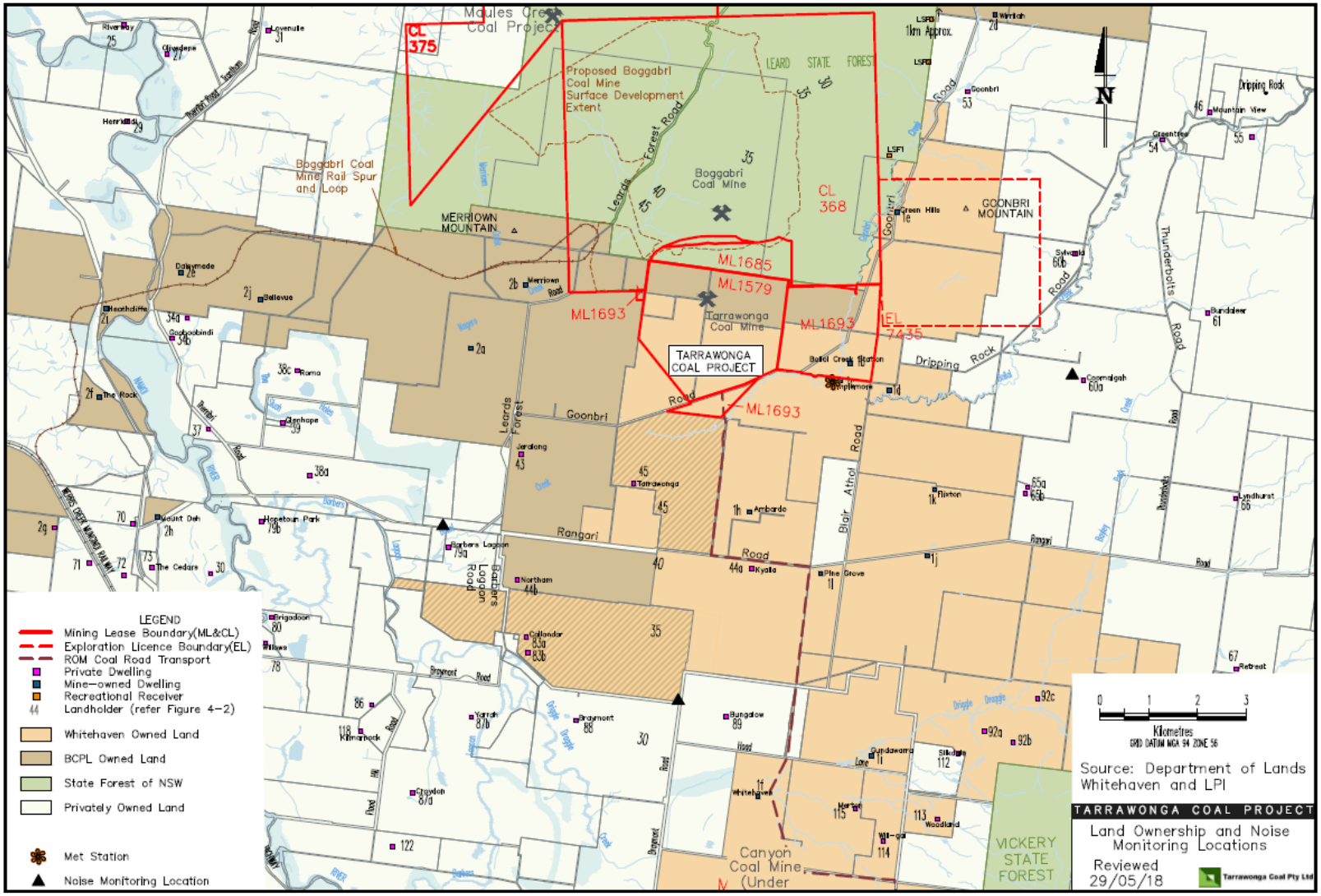


Figure 4- Noise monitoring locations (No changes since 29/05/2018)

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: "Bungalow" (TN4), "Barbers Lagoon" (TN3) and "Matong-Coomalgah" (TN2) properties. Attended noise monitoring showed compliance with the criteria specified in the project approval on all occasions during Quarter 1, 3 and 4. However on 7th June, during the daytime period (Quarter 2 attended noise monitoring), one measurement was recorded above the 35dBA limit by 7dBA (including 2dB modifying factor applied as per the Noise policy for Industry) at the monitoring site "TN2". TCM reported the exceedance to agencies and completed an internal review to investigate the incident. TCM also engaged a separate noise specialist to peer review the Quarterly report and to take supplementary operational noise monitoring at (TN2) which is located approximately 3km to the east of the mine. Coomalgah is the nearest residences to the east of the mine and is approximately 6km from the mine.

The investigation showed that noise levels measured at (TN2) can only be used as a guide for impacts at the more distant 'Coomalgah' receiver to the east of the mine and it is conservative to assume levels experienced at 'Coomalgah' would be at least 6 dB below those measured at (TN2). Results of the supplementary operational noise monitoring showed that throughout the entire period there were no recorded non-compliance.

No complaints were received in relation to noise during the entire reporting period.

Attended noise monitoring to date indicates that results are generally consistent with previous reporting year's results for all other measurements taken.

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 June and December of 2019. 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 2019, 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 which were greater than indicative levels identified in the EA were compared with 2018 measured levels and 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)- 2019	Dynamic SWL- Indicative Sound Power Level A-weighted (dB)- 2018	Modelled Level dB(A)	Variance 2019-2018 (dB)
1	***Bulldozer***	***D10- 812***	118	119	116	-1
2	***Bulldozer***	***D11- 816***	119	115	116	+4
3	***Bulldozer***	***D11- 822***	123	123	116	0
4	***Bulldozer***	***D11-828***	122	121	116	+1
5	***Bulldozer***	***D10- 836***	120	116	116	+4
6	***Bulldozer***	***D11- 842***	122	119	116	+3
7	***Bulldozer***	***D11-843***	120	119	116	+1
8	***Bulldozer***	***D10- 846***	123	120	116	+3
9	***Bulldozer***	***D10-856***	122	121	116	+1
10	***Bulldozer***	***D11- 861***	120	n/a	116	n/a
11	***Bulldozer***	***D11- 864***	120	n/a	116	n/a
12	***Grader***	***16H- 561***	109	108	108	+1

13	***Excavator***	***Terex-532***	117	116	115	+1
14	***Excavator***	***Terex-531***	119	n/a	115	n/a
15	***Crusher***	***Power-screen***	114	119	113	-5
16	***Water Cart***	***Cat-807***	115	n/a	111	n/a
17	***Water Cart***	***Cat-824***	116	116	111	0
18	***Drill***	***Terex-5271***	121	n/a	117	n/a
19	***Drill***	***Cat-5251***	119	113	117	+6

Overall, the indications are that the plant noise levels are not greatly different to the levels in 2018, and this is consistent with the findings of the attended noise monitoring that shows the mine operation complies with its noise limits at off-site receptor locations.

Acoustic model annual validation

An independent consultant was engaged to assess and validate the noise model prediction developed in 2011 against the monitoring results for 2019.

The results show that winds towards some locations occur more often in some periods (i.e. day or night time) than others, according to the location. Inversion conditions (stability classes E, F and G) do not appear to cause more elevated results.

The attended monitoring has only been able to obtain limited numerical data on the mine noise contribution at most of the nearest privately owned receptor locations. This arises largely as the private receptors closer to the mine have been acquired since the time of the EIS, hence the existing sensitive receivers are now a significant distance away from the mine, where there is little mine noise.

The results indicate that it is rare for even a trained technician in the field, assisted by a specialised noise analyser to be able to measure any mine noise contribution at the more distant locations (i.e. Bungalow and Barber's Lagoon). It is noted that for Coomalgah, the monitoring is conducted much closer to the mine than the receptor (hence it is possible to measure the mine noise more often), and these measurements are then extrapolated back to the commensurate mine noise levels at the receptor location; a key reason that makes it possible to obtain more data for this location relative to the other sites.

The assessment indicates that the measured mine noise levels comply with criteria and generally align well with the predicted levels.

6.1.4 Proposed Improvements to Environmental Management

During the reporting period, TCM put new plant to work that were tested for sound power levels before use and fitted with noise suppressant technology as required.

A revised Noise Management Plan (NMP) was submitted to the Department in October 2019. A new NMP addressing recent comments will be submitted in 2020.

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, 78 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. One exceedance of the 115 dB overpressure criterion was recorded on privately-owned property “Coomalgah” during the reporting period which is equivalent to 1 in 78 (~1.2%) of exceedance over a 12 month period . There were three instances where overpressure monitoring results exceeded 115 dB at the project-related “Tarrawonga” property, which is equivalent to 3 in 78 (~3.8%) of exceedance noting that criteria only apply to privately owned properties.

The maximum recorded ground vibration during the reporting period was 1.82mm/s recorded at "Coomalgah" on 15 July 2019 which is below the consent criterion of 5mm/s. The elevated overpressure recorded at "Coomalgah" on 6th December 2019 was 117.5dB. Three overpressure exceedances recorded at the project related property "Tarrawonga" on the 5th of October, 18th and 20th of December 2019, were 116.6dB, 115.3dB and 117.1dB respectively. As noted above, overpressure exceedance criteria does not apply at the project related premises 'Tarrawonga'. 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 '3c' 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 DPIE in October 2019 for approval. TCM received additional comments in early 2020 and will address the new comments in a new plan version. No additional improvements to the MP are proposed for the next period.

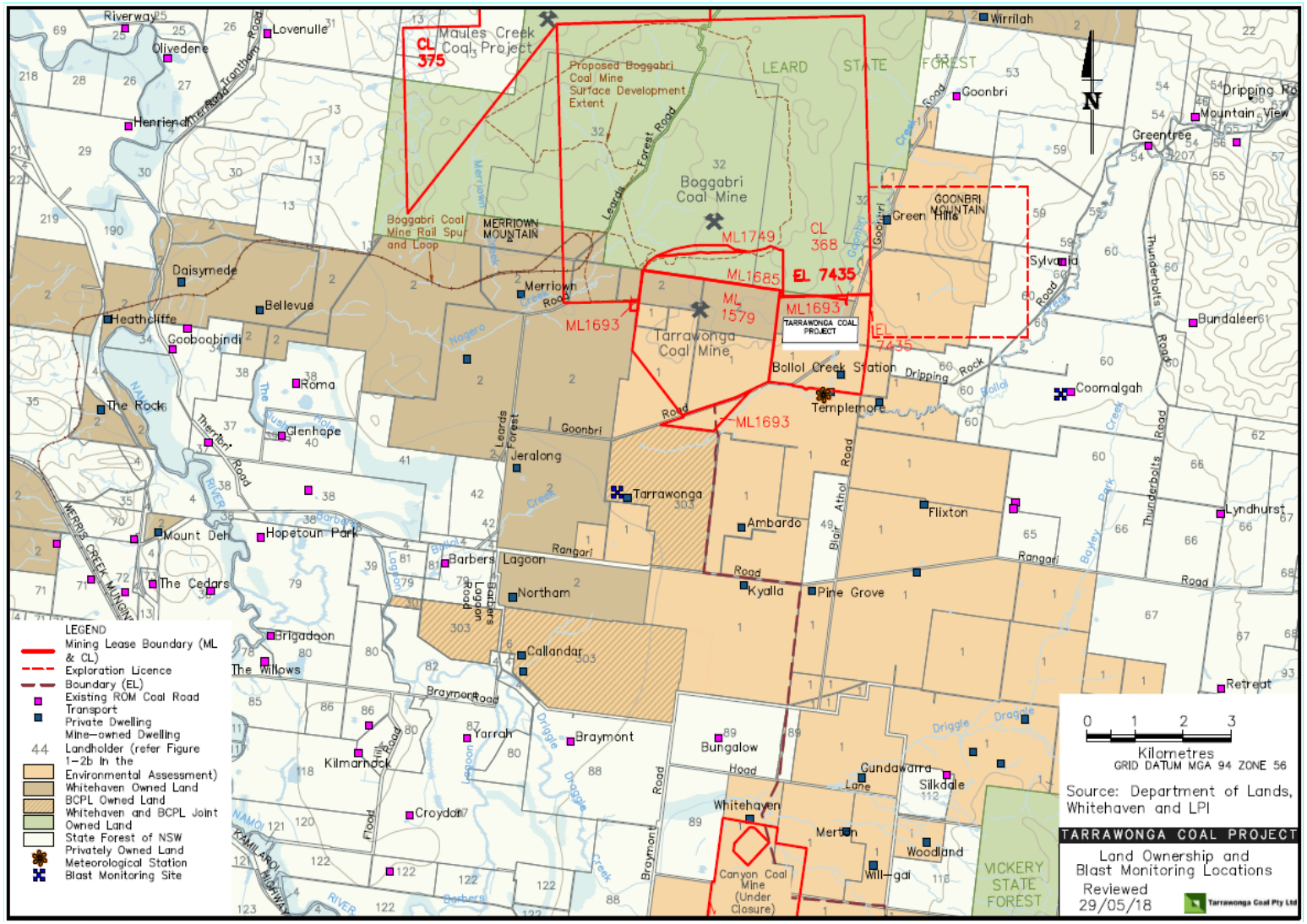


Figure 5- Blast Monitoring locations (No changes since 29/05/2018)

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 Wil-gai) and one High Volume Air Sampler (HVAS) on privately owned property (Coomalgah) operating and serviced during the reporting period.

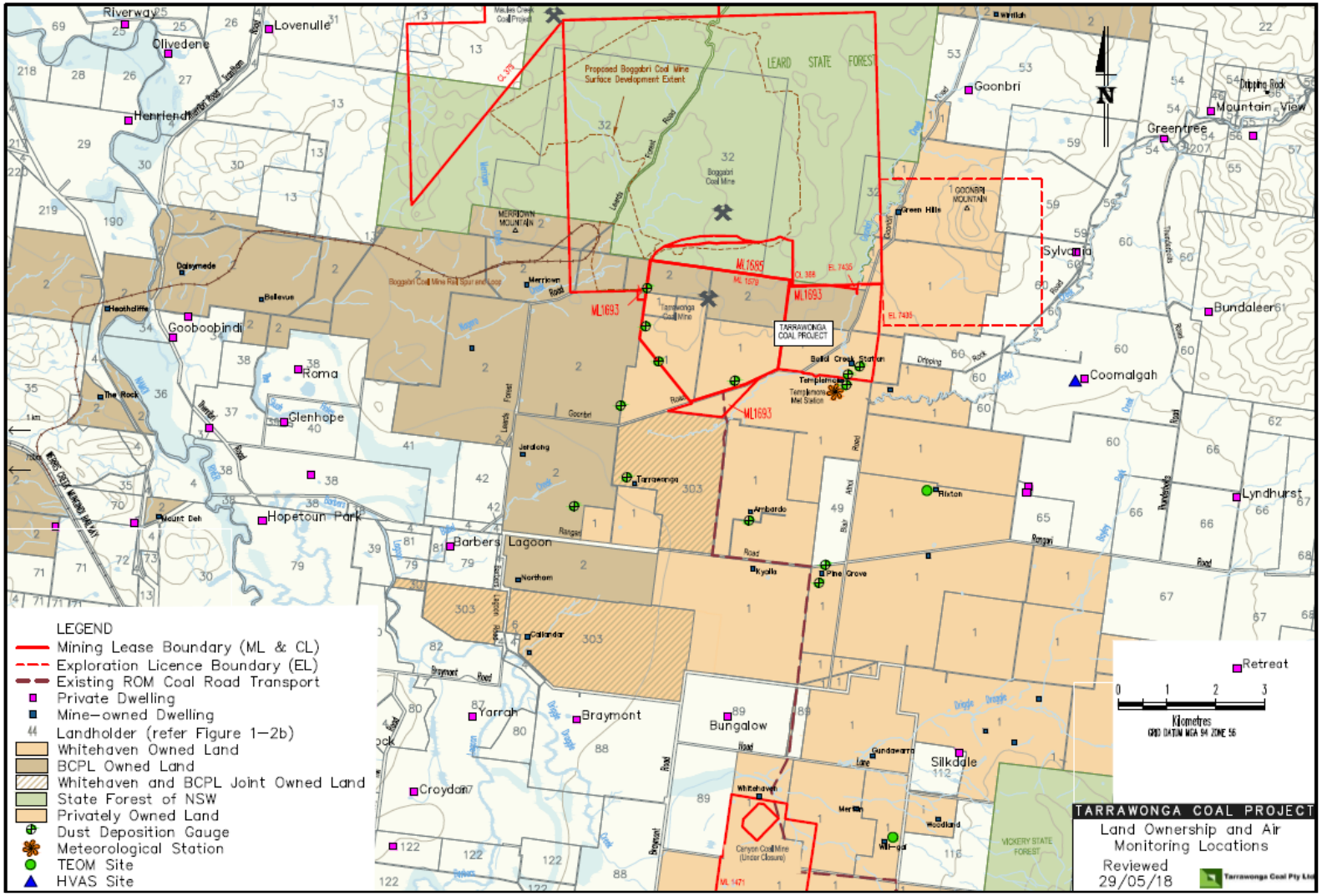


Figure 6- Air quality monitoring locations (No changes since 29/05/2018)

6.3.3 Key Environmental Performance

Table 8.1 shows that the annual average limit for deposited dust was exceeded at five monitoring locations. These monitoring locations are all located on project related land or on the mining lease therefore monitoring criteria are not applicable at those locations. Though results from Ambardo (EB-6) site were regularly elevated during the period with a peak at 11.9 g/m^2/month in February, period averages were overall lower than in 2018. Thuin (EB-8) and Tarrawonga Mine (EB-10) had the second highest peak levels of deposited dust both recorded in January with 9.5 and 9.2g/m^2/month respectively. Though the reporting period was particularly dry, deposited dust levels measured were lower than almost all 2018 Dust Deposited Gauges (DDG) averages.

Table 8.1-Deposited Dust monitoring data summary 2019

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 2019	7.8	2.4	5.6	5.7	9.5	7.8	9.2	6.2	3.3	4.0	7.6
Feb 2019	4.6	5.5	11.9	4.3	5.2	2.8	5.5	5.0	6.8	3.5	5.7
Mar 2019	2.1	4.8	4.0	2.2	4.1	2.9	8.6	2.4	1.9	2.2	2.6
Apr 2019	2.7	4.5	4.1	1.6	2.8	1.8	4.7	2.6	2.7	3.9	6.2
May 2019	2.2	4.7	3.0	1.4	2.7	1.4	4.6	3.4	2.5	5.1	1.3
Jun 2019	7.0	5.1	1.8	1.6	2.5	1.4	1.8	5.6	3	8.8	2.3
Jul 2019	4.8	4.0	1.6	0.9	2.9	1.1	4.7	2.7	2.6	4.4	1.6
Aug 2019	2.0	2.8	1.7	1.5	2.0	1.5	1.4	3.3	2.2	4.9	1.2
Sep 2019	1.4	2.8	1.3	0.7	5.0	1.4	1.5	3.1	2.8	3.8	1.1
Oct 2019	4.0	4.2	1.7	2.6	5.0	3.8	2.6	4.1	2.8	4.5	3.4
Nov 2019	6.8	4.3	0.3	1.8	3.3	1.6	4.3	2.5	2.1	2.7	2.5
Dec 2019	4.5	5.6	4.8	4.9	9.0	1.7	7.9	5.3	4.4	7.0	5.1
2019 Period Average	4.2	4.2	3.5	2.4	4.5	2.4	4.7	3.9	3.1	4.6	3.4
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
May-Dec 2017 Period Average	7.8	3.4	1.6	1.7	2.3	2.1	4.9	3.6	2.4	4.7	10.0

[1] Project related land; [2] Owned by Boggabri Coal Mine;

TCM has one High Volume Air Sampler (HVAS), which is located at the privately-owned property "Coomalgah". All the results recorded at the HAS are summarised in Appendix 2.

From all the PM10 levels recorded for the reporting period, twenty two (22) results were above the 24hr average criterion. There were fifteen (15) elevated PM10 results received between September and December 2019 only. TCM notified the Department and provided information showing that those results were not mine activity related but were more likely due to prolonged period of drought combined with poor ground cover and farming activity at proximity of the monitor (i.e. harvest of wheat and grazing), and adverse weather condition such as dust storms, smoke and haze caused by catastrophic bushfires in the North-West Slopes region.

Over the reporting period, daily report received from the Office of Environment and Heritage (OEH) showed that Regional Air Quality Index (RAQI) was regularly above the 24hr average criterion (50µg/m^3).

TCM notified the Department who advised that all the PM10 measurements recorded on dates affected by 'an extraordinary event' should not be included in the annual average calculation.

Excluding those PM10 levels, the PM10 annual average at Coomalgah was 28.7 µg/m3, which is below the 30 µg/m3 criterion specified in Schedule 3 condition 24.

PM10 measurements have been summarised in Table 8.2, and Figure 8.2 shows the trend from 2017 to December 2019, excluding the values measured during days of "adverse weather".

Table 8.2- HVAS PM10 24 hour average elevated results

Date Sampled	24hr average level (µg/m³)	24hr average Limit (µg/m³)	RAQI (North-West Slopes) (µg/m³)	Comments
8/01/2019*	53.8	50	57	Determined as not mine related. Wind and Grazing activity noted in the field sheet by the contractor during the filter change on the 02/01/19. Elevated wind recorded on 7/01/2019 with winds above the 8m/s.
14/01/2019*	88.8	50	61	Determined as not mine related. Most wind was coming from South West on that day. Winds recorded at 7m/s the day before. Farming activity and wind noted in the field sheet on the day of inspection.
13/02/2019*	154	50	328	Determined as not mine related. Dust storm on the sampling day. Extremely windy noted on the field sheet by the contractor.
19/02/2019*	102	50	84	Determined as not mine related. Regional elevated dust level. Windy and grazing activity noted on the field sheet.
9/03/2019	101	50	52	Determined as not mine related. Winds recorded coming from West most of the day. Windy recorded in the field sheet by contractor.

26/04/2019*	59.7	50	52	Determined as not mine related. Grazing activity noted on the field sheet by contractor. Most wind was coming from North East of the monitor according to the weather station.
2/05/2019	72.5	50	45	Determined as not mine related. Windy and grazing activity noted in the field sheet by the contractor. Weather station recorded winds coming from N-NE and S-SW.
12/08/2019	50.8	50	75	Determined as not mine related. Dusty surrounds noted in the field sheet by the contractor. Weather station recorded winds coming from N-NE.
11/09/2019*	58.0	50	48	Determined as not mine related. Dusty conditions noted in the field sheet by the contractor. Weather station recorded winds coming from SE.
17/09/2019*	103	50	84	Determined as not mine related. Severe wind and dust noted in the field sheet by the contractor. Weather station recorded winds above 11m/s coming from E and S.
29/09/2019	55.7	50	49	Determined as not mine related as there was no mining activity. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from W-SW.
5/10/2019*	93.9	50	73	Determined as not mine related. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from NE-S.
11/10/2019*	69	50	59	Determined as not mine related. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from East.
17/10/2019*	78.6	50	213	Determined as not mine related. Dust storm noted in the field sheet by the contractor. Weather station recorded winds coming from W and SW with 49% winds above 6m/s.
23/10/2019*	132	50	174	Determined as not mine related. Contaminated paper filter and smoke haze noted in the field sheet by the contractor. Weather station recorded winds coming from North.
29/10/2019*	110	50	200	Determined as not mine related. Smoke haze in sky and farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from E and SW.
22/11/2019*	176	50	243	Determined as not mine related. Grazing Activities reported on field sheet.
28/11/2019*	114	50	215	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a W direction.
4/12/2019*	115	50	63	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds coming from a W direction.
10/12/2019*	155	50	372	Determined as not mine related. wind – dry and dusty recorded on field sheet.
16/12/2019*	641	50	171	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a S direction with an average 4.1m/s and gusts above 8m/s
22/12/2019*	813	50	393	Determined as not mine related as there was no mining activity. Grazing Activities, smoke haze and slight wind' reported on field sheet. Weather Station recorded winds from a S, SE direction >6m/s.
28/12/2019*	141	50	98	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a SSE direction.

N=North; S=South; E=East; W=West

**After consultation with DPI&E, results were deemed to be adverse weather conditions and were allowed to be excluded from the annual average.*

Note: Regional Air Quality Index (RAQI) was retrieved from the OEH websites' database, and values (24 hour rolling average 12am-11:59pm) may differ from those received via the OEH daily report emailed (rolling average at 1.00-200pm).

TCM engaged an air specialist to review all the PM10 data recorded for the reporting period at the HVAS. It was estimated that TCM's air quality contribution at this site was approximately 4.5µg/m^3 (6.1%) over 12 months. (Refer to Appendix 2)

Table 8.3: TCM's annual average PM10 level contribution 2019 extract from (TAS, 2020)

	HVAS at Coomalgah
TCM estimated contribution to the PM10 Levels (µg/m^3)	4.5*
Annual average PM10 level (µg/m^3)- including all PM10 measurements	73.2*
Percentage of contribution to the annual average PM10 level	6.1 %*

**Those vales are likely to be overestinate of prevailing dust levels and TCM's contribution due to localised sources near the monitor*

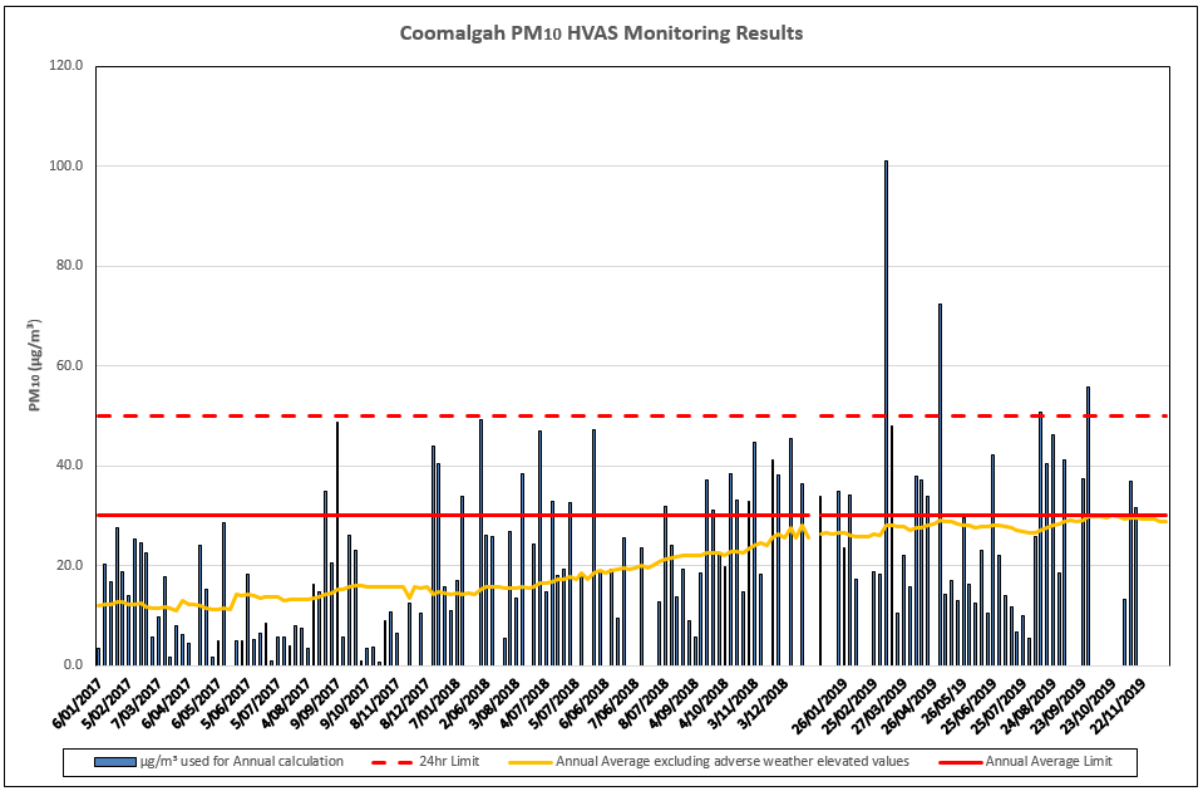


Figure 7- HVAS-PM10 24hr average monitoring data (2017-2019)

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 below the applicable criteria of 90 µg/m for the reporting period. These are illustrated in Figure 8.3.

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.

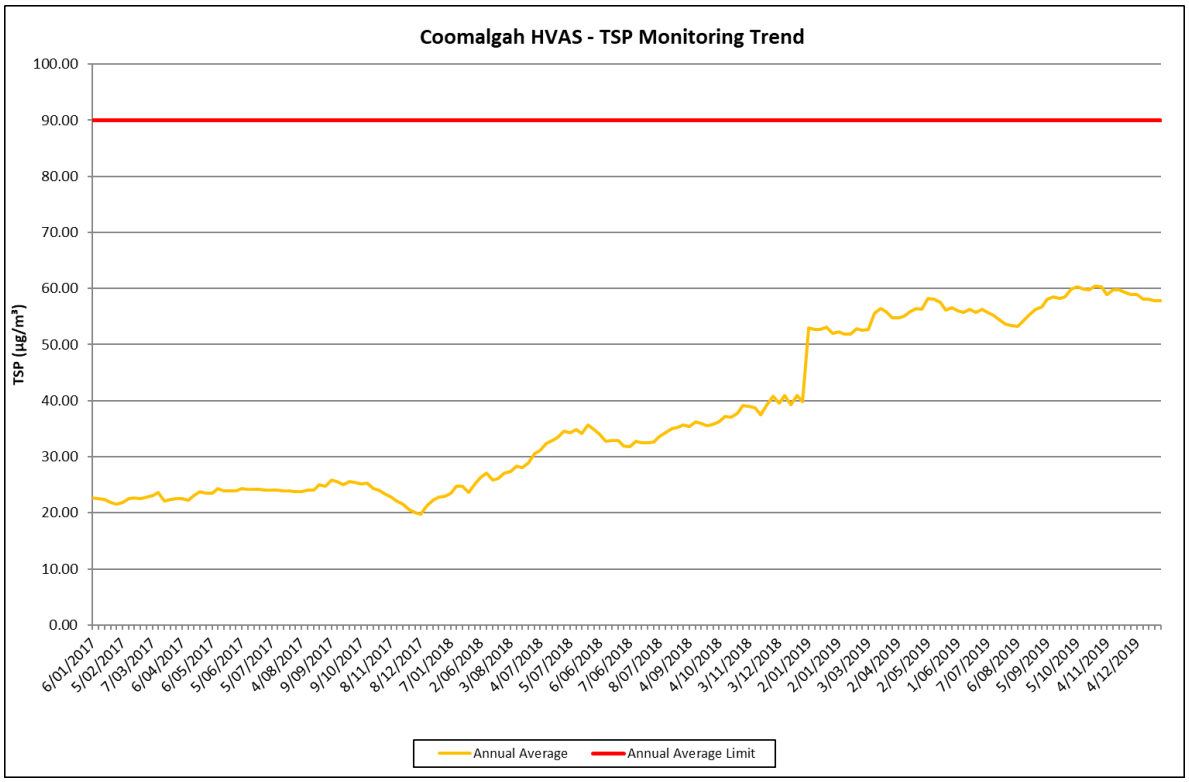


Figure 8-Coomalgah HVAS- calculated TSP Monitoring Trend (2017- 2019)

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 PM2.5 monitor on the project related property 'Wil-gai' remained generally consistent with those recorded during previous reporting periods for most of the year. The Air Quality Greenhouse Gas Management Plan (AQGGMP) states that whilst no criteria applies TCM will compare results against target levels of 8µg/m^3 for annual average and 25µg/m^3 for 24hr average. Including all the PM2.5 24hr average values measured during the reporting period, the annual average calculated is 9.8µg/m^3. This is primarily the result of adverse weather conditions and extraordinary events such as bushfires and dust storms throughout the year. The maximum 24hr result was 119.3µg/m^3 recorded on 22nd November 2019 (OEH website recorded a RAQI of 243µg/m^3 due to smoke haze and drought). If we follow advised given by the Department and do not include the values measured on days of 'extraordinary event' in the average calculation (i.e.: not including the 18 days removed from the PM10 annual average calculation) then the PM2.5 annual average drops to 8.8µg/m^3 and it is assumed that this could even drop further if all the values recorded on day of 'extraordinary event' are not included.

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 2019, calculated PM_{10} was 542,960kg/year and ROM was 2,233,183t/year giving a PM_{10}/ROM ratio of 0.2 (kg/t) which is consistent with the baseline ratio of 0.2 specified in the PRP.

- KPI – 2 (PM10 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.

Table 8.4: KPI – 2 Summary of PM10 control factor (TAS, 2020)

Mining Activity	Current Control Factor	Control Factor with additional best practicable controls.	K2y
Hauling on unsealed roads	75	80	94%
Unloading Coal to hopper	30	79	38%
Wind Erosion and Maintenance - Stockpiles	25	62.5	40%

- 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 dropped to 495ML in 2018 and to 398ML in 2019 (approximately 50% water usage reduction since April 2018). Usage of dust suppressant can affect the utility of this KPI as it now stands.

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. An updated version of the Air Quality and Greenhouse Gas Management plan was submitted in October 2019 for approval and a new version of the plan that addresses the

last Department's comments will be submitted in 2020. Real-time monitors (E-Samplers) installed in 2018 close to the mine will continue to be used as operational tools.

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 contemporised vegetation mapping and prepared a Conservation Agreement submitted to the NSW Biodiversity Conservation Trust (BCT). WHC are waiting for feedback from the BCT to organise site inspections ahead of finalising the Conservation Agreement which will provide in perpetuity securement of the Willeroi BOA. WHC have also consulted with DPIE and DoEE as required during the reporting period to keep key regulators abreast of securement progress; including requesting a 12 month extension to the EPBC Approval 2011/5923 Condition 10 current securement timeline of 31st March 2020. 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, , no new fencing was required but derelict assets/infrastructure like the former homestead and a cottage on Willeroi BOA were demolished and removed from site disposed at a licenced waste management facility including appropriate treatment of previous hazardous materials onsite. The condition of the perimeter BOA fences, gates and signage were maintained to continue restricting unauthorised access and prevent inadvertent livestock grazing.

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 2019. 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 9- Flora Survey 201)
- Fauna Survey (see Figure 10- Fauna Survey 201)

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.

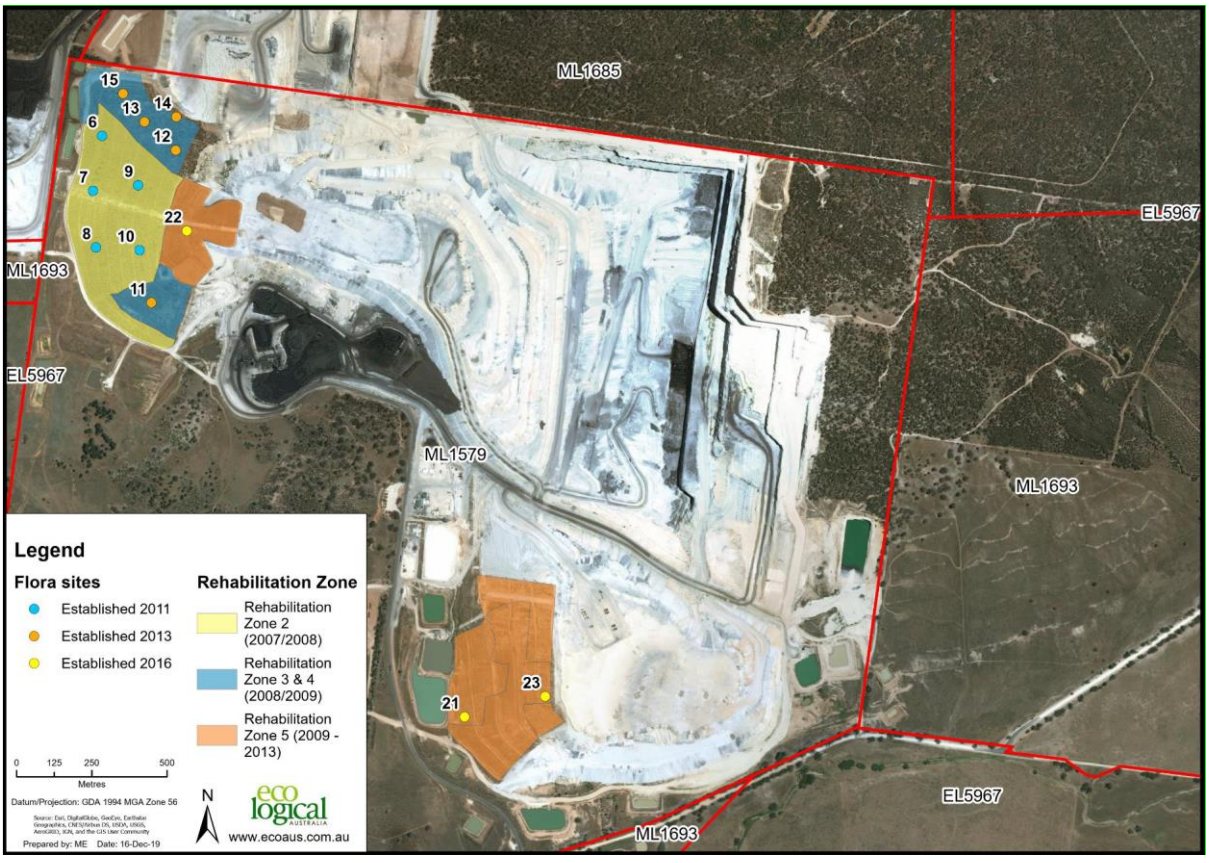


Figure 9- Flora Survey 2019

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, with dams drying up from the beginning of 2018.

Woodland Vegetation

Canopy and mid-storey:

Woodland vegetation monitoring was undertaken at 11 plots during 2019, including five control plots. New woodland control plots (controls at Kenna) were chosen during 2019 due to the original control plots (Control LSF) that were established in 2015 being scheduled to be cleared within 2020. Further investigation found that rehabilitation sites at Tarrawonga were more closely rehabilitated to a 'Box Gum Woodland' vegetation community, than the 'Narrow-leaved Ironbark woodland' within Control LSF. As such, 2019's analysis included a comparison between the rehabilitated sites at Tarrawonga and the most suitable Kenna control sites (S1, S5, S5 Rep, S6 and S6 Rep). A comparison of Control LSF and the Kenna controls were also incorporated to test the similarity and spatial relationship between the two control sites which may indicate Kenna's suitability as a control site replacement to the control (LSF).

Mean True Projected Foliage Cover (TPFC) for the mid-storey species decreased notably across all rehabilitation zones from 2018 to 2019, however this was found to be insignificant. Comparison to the control (LSF) zone was not undertaken due to control site relocations. Rehabilitation zone mid-storey TPFC compared to mid-storey TPFC at Kenna was only marginally less and did not exhibit a significant difference, indicating that changes in TPFC were similar between both sites. Mean TPFC for the mid-storey between the control (LSF) 2018 data, compared to Kenna show that Kenna has less mid-story cover, although is mostly similar when compared to all previous years at the control (LSF). Analysis supports this similarity, showing no significant difference in mid-storey cover between Kenna and 2018 results for the control (LSF).

Compositional Cluster and species analysis for over-storey and mid-storey species indicates a strong relationship between all rehabilitation zones, with a high level of temporal stability indicating no significant trend, namely those that may suggest an increase in similarity to the control zones. All rehabilitation plots are within 40% similarity levels to each other, with rehabilitation zone 2 and rehabilitation zone 3 and 4 showing up to 50% similarity. The control zones are also highly similar in terms of species composition being ~45% similar, again with the control (LSF) showing high temporal

stability. The similarity and spatial relationship between the two control sites may indicate Kenna's suitability (in terms of over-storey and mid-storey composition) as a control site replacement to the control (LSF), supported by non-significant statistical results as aforementioned. Conversely, the rehabilitation zones, when compared to both control zones show a distinct dissimilarity at below 20% similarity levels. With no evident spatial trend, this dissimilarity indicates a vastly different species composition between the rehabilitation zones and control zones. It is worth noting that only one yearly dataset has been assessed for the new Kenna control sites, and that further yearly comparisons will create a more robust analysis.

The average number of canopy and mid-storey species increased slightly in all rehabilitation zones, except rehabilitation zone 3 and 4, which showed a minor decrease in mean species richness. Mean species richness is also higher at Kenna compared to 2018 data for the control (LSF). Variations in mean species richness in the rehabilitation zones is likely attributed to the senescence of *Acacia* and *Cassinia* species

The mid-storey layer in the rehabilitation plots continue to comprise of mostly juvenile *Eucalyptus* species. Whilst the Kenna Control plots consist of these species as well, shrub and small tree species, such *Geijera parviflora* (Wilga) and *Callitris glaucophylla* (White Cypress Pine) are more dominant. These differences in species composition and communities are exhibited in the Cluster and nMDS analysis. Whilst the plots consist of many of the same species, it can be seen in the analysis that the rehabilitation 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 TPFC for the rehabilitation zones has not been assessed due to the lack of any recorded canopy at these locations. Mean TPFC for the canopy between 2018 results for the control (LSF) as compared to 2019 results Kenna shows increased canopy cover at Kenna, although as 2019 data for the control (LSF) was not recorded this may not be representative. Comparing 2019 data for Kenna to the control (LSF) over time indicates that mean TPFC is variable, though is generally similar to previous records from the control (LSF). This is supported by the lack of any significant difference in canopy cover between Kenna 2019 and the control (LSF) 2018 datasets.

Lycium ferocissimum (African Boxthorn) was recorded in rehabilitation plots 10, 11 and 13, whilst *Opuntia* spp. (Prickly Pear) were recorded in plots 7 and 8 during 2019. Both are 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,* these weeds must not be allowed to spread.

Groundcover:

Since 2017, mean species richness and percent cover for both native and exotic species has decreased in all rehabilitation zones but Rehabilitation Zone 5, which noted an increase during 2019 when compared to 2018. Kenna controls recorded the highest native species richness during 2019, with this being significantly higher than the Rehabilitated zones. There was no significant difference detected between exotic species richness at Kenna controls and Rehabilitation zones during 2019.

Comparison of groundcover composition between zones using Analysis of Variance (ANOVA) indicates that native species, exotic species, litter and bare ground cover are significantly different between the Kenna Control and rehabilitation zones, with the Kenna Control containing significantly higher native species cover, litter cover and significantly lower exotic species cover and bare ground cover.

Temporal comparison of groundcover composition indicates that native species percentage cover has increased within all rehabilitation zones since the 2018 monitoring period, although this was insignificant. Rehabilitation Zone 2 significantly decreased in exotic species cover when compared to 2018. Significant increases in both litter and bare ground cover were also detected during 2019 within Rehabilitation Zone 2. Rehabilitation Zones 3 and 4, and Rehabilitation Zone 5 significantly increased in both litter and bare ground percentage cover when compared to the 2018 survey results. This is likely a result of the prevailing dry period experienced prior to the 2019 survey period throughout the region.

Groundcover composition indicates a distinct separation from all previous year's data, supported by similarity levels of below 20% as compared to any other dataset. This variation is consistent throughout all rehabilitation zones, which are ~55% similar to each other. This trend is consistent with similar results from 2018, where a separation of all rehabilitation zones can similarly be seen and was suggested to be the results of climatic factors. This is indicated by the spatial distribution of the rehabilitation zones, which whilst showing change, are not moving in the direction of the control zones. It is expected that climatic factors, namely the drought period, are a contributing factor to this compositional separation and that further monitoring into better climatic periods will highlight developing trends. The Kenna control zone, whilst separate to the control (LSF) zone is spatially distributed to be most similar to the control (LSF) zone, which is indicative of compositionally similar groundcover. Kenna data from 2019 may be represented as separate as it is only a single year dataset and could be skewed against the control (LSF) which is a more robust dataset. Despite the separation, similarity levels are indicated at ~30%, and it is expected that further monitoring will allow a more complete analysis of trends and similarity levels.

Soil pits

As nominated in the RMP (ELA 2011), soil profile and condition assessments are recommended every three years. Two soil pits were established in 2011, one in the rehabilitation zone, and one in each control zone. Soil pits are described using standard field measures with particular notice of horizon boundaries and ecological functionality (e.g. root establishment, evidence of soil fauna). As per the RMP (ELA 2011), soil pits are analysed every three years. As soil pits were analysed in 2018, this parameter is due next in 2021.

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 2019. 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 over-storey species seedlings required for the 2019 revegetation program that was completed for the Willeroi BOA.

Clearing

No threatened flora species were observed at the time of the pre-clearance survey conducted in February 2019. The pre-clearance surveys were conducted by Eco Logical Australia (2019) and they identified a total of 359 habitat features (hollow bearing trees, large woody debris or nests) within the overall area to be cleared (approximately 19.4Ha). A qualified ecologist was present during clearing activities in accordance with the Biodiversity Management Plan (BMP).

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 May 2019. During the reporting period, WHC coordinated an over-storey revegetation program in September 2019 across the Willeroi BOA with over 60ha planted with 3,398 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 2019; 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.

At TCM, approximately 4,000 trees were planted in 2019. Further details related to rehabilitation are discussed in **section 8.**

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 10- Fauna Survey 2019. The terrestrial fauna survey target woodland birds and searches for available reptile habitat.

Woodland bird monitoring was undertaken during winter and spring 2019. 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 20199.

Figure 10- Fauna Survey 2019

Birds:

Species richness for bird species was greatest during 2019 at Fauna Control 5 (23), and lowest at Fauna Rehab 1 (15). Whilst both Fauna Rehab 2 and Fauna Control 4 had a total species richness of 17. Both rehabilitation sites decreased in species richness when compared to the 2018 survey period, whilst both control sites recorded an increase during 2019. Feeding guilds were again dissimilar between rehabilitation and control zones during 2019.

There is indicated variablility during the current monitoring period, with 2019 results for all zones exhibiting distinct differences from previous years' data. The control zones show the largest dissimilarity between years since monitoring began, at ~35% similarity level, also showing a decrease in similarity between zones at less than 35%, down from 45% in the 2018 period. Data for the rehabilitation zones indicate a trend towards the control zones prior to 2019 and a distinct separation from the 2018 survey period. Fauna Rehab 1 exhibits over 60% similarity to Fauna Control 4, however is only 35% similar to Fauna Control 5 and previous year's results, whereas Fauna Rehab 2 shows ~45% similarity to previous years' rehabilitation zones and remains at 35% similarity the controls (though still displaying a spatial trend toward the controls (likely due to similar species composition between the rehabilitation zones). Although significant changes are observed in the 2019 analysis, varied trends and similarity levels highlight high compositional variability between the

zones during the 2019 monitoring period and does not indicate a discernible trend. Further monitoring into the future will assist in highlighting and indicating the reliability of the compositional data observed during the 2019 period, showing if these trends continue.

Three threatened bird species were recorded during the 2019 survey period. A Dusky Woodswallow (*Artamus cyanopterus*) and a Speckled Warbler (*Chthonicola sagittata*) both listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) were recorded within Fauna Control 4, whilst a Turquoise Parrot (*Neophema pulchella*), which is also listed as vulnerable under the BC Act 2016 was recorded at Fauna Rehab 1. This is the first instance that a Turquoise Parrot has been observed inhabiting a rehabilitated zone.

Table 9- Total individuals: birds survey spring-winter 2019

Season	Total Individuals	Fauna Rehab 1	Fauna Rehab2	Fauna Cont 4	Fauna Cont 5
Spring	2019	20	24	39	34
	2018	28	45	113	58
	2017	74	30	69	71
	2016	57	46	108	83
Winter	2019	24	26	20	20
	2018	40	45	39	39
	2017	19	26	28	35
	2016	35	40	72	96

Terrestrial fauna:

Trends for terrestrial fauna were similar to previous years, with *Macropus giganteus* (Eastern Grey Kangaroo) and *Macropus robustus* (Common Wallaroo) recorded in 2019 at both rehabilitation sites. However, these two species were not observed at either control site. No Fauna species were observed at any of the control sites.

One reptile species, *Neophema pulchella* (Bearded Dragon) was recorded at the rehabilitation sites in spring 2019. No other terrestrial fauna species were noted within the 2019 survey period. This is likely attributed to the prevailing dry periods that have been experienced prior to the survey period.

There were no exotic species observed at any sites in the 2019 surveys.

Clearing

No threatened fauna species were observed during the time of pre-clearing survey. However, the proposed disturbance area may have potentially supported threatened fauna species that are likely to use similar habitat or have been observed within the Tarrawonga Mine lease during previous surveys. The threatened fauna species that may potentially occur include Glossy Black-Cockatoo (Calyptorhynchus lathami), Brown Treecreeper (eastern subspecies) (Climacteris picumnus victoriae), Little Lorikeet (Glossopsitta pusilla), Turquoise Parrot (Neophema pulchella), Grey-crowned Babbler (Pomatostomus temporalis temporalis), Speckled Warbler (Pyrrholaemus sagittatus) and Varied Sittella (Daphoenositta chrysoptera) (all listed under the NSW Biodiversity Conservation Act 2016), however, no individuals were observed during the survey.

Over the duration of the clearance supervision 2019, one fauna species was injured (Chocolate Wattled bat) and taken to Gunnedah Veterinary Hospital, but no active bird nests were disturbed. A total of 55 arboreal lizards (42 geckos and 13 skinks) were captured from habitat trees immediately after felling, and these were relocated to nearby suitable habitat outside the study area. Of the 42 geckos, thirty-eight were identified as *Gehyra* sp. and three were identified as Southern Spiny-tailed gecko (*Strophurus intermedius*) and two Rhobust Velvet Geckos (*Nebulifera robusta*). All thirteen skinks were identified as Tree skinks, *Egernia striolata.* An Eastern Brown snake (*Pseudonaja textilis*) and Lace Monitor (*Varanus varius*) were seen fleeing after disturbance.

One Yellow-bellied Sheath-tailed bat (*Saccolaimus flaviventris*), fifteen Southern Free-tailed Bat (*Ozimops planiceps)* and three Chocolate Wattled Bats *(Chalinolobus morio)* were relocated within nearby fauna release areas as well as one Laughing Kookabura (*Dacelo novaeguinaea*). Eight Chocolate Wattled Bats *(Chalinolobus morio)* were observed taking flight into nearby forest.

Photo 1- *Strophurus intermedius* (Southern Spiny-tailed Gecko) captured on the ground near a felled *Eucalyptus crebra*. Successfully released. (EcoLogical 2019)

Habitat Management

During the reporting period, no specific habitat management works were undertaken within the Willeroi BOA.

On TCM Northern and Southern emplacement rehabilitation areas, 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 2019). 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 in 2019

Weeds

WHC coordinated routine formal weed monitoring/inspections undertaken across Willeroi BOA in in February, May, August and November 2019. 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 weed control program across the Willeroi BOA including 50ha treated in January 2019 targeting Coolati Grass; general revegetation preventative maintenance spraying of 64ha and general fire break track maintenance spraying of up to 43ha. 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 2019, a noxious weed monitoring program was conducted at TCM bi-annually. There had been a severe drought leading up to the time of both surveys. The survey in May found that there was seventeen noxious weed species identified during the survey period and these were:

- African Boxthorn (Lycium ferocissimum)
- Amaranthus (Amaranthus spinosus L.)
- Black Roly-poly (Sclerolaena muricata)
- Common Pear (Opuntia stricta)
- Galvanised Burr (Sclerolaena birchii)
- Horehound (Marrubium vulgare)
- Marshmallow (Malva parviflora L.)
- Mayne's Pest (Glandularia aristigera)
- Mother of Millions (Bryophyllum species)
- Narrow-leaf Privet (Ligustrum sinense)
- Noogoora Burr (Xanthium occidentale)
- Paterson's Curse (Echium plantagineum)
- Saffron Thistle (Carthamus lanatus)
- Sweet Briar (Rosa rubiginosa L.)
- Variegated Thistle (Silybum marianum)
- Wild Radish (Raphanus raphanistrum)
- Wild Turnip (Brassica tournefortii)

During the November survey, there were sixteen weed species identified and these were much the same as the precious report (Excluding *M. vulgare, M. parviflora L., R. rubiginosa L., R. raphanistrum* and *B. tournefortii*) but also include:

- Bathurst Burr (Xanthium spinosum)
- Blue Heliotrope (Heliotropium amplexicaule)
- Soft Roly-polu (Salsola australis R.Br.)
- Wild Carrot (Daucus carota L.)

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 was 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 with Glyphosate;
- Spot spraying of general weeds and grasses in the vicinity of the weather station (M2 – Templemore) with Glyphosate;
- Spot spraying of Prickly Pear within the ML using Picloram;
- Spot spraying of general weeds and grasses in the vicinity of the Magazine and Reload area using Glyphosates;

6.4.3 Feral Animal Control

WHC coordinated routine formal feral animal monitoring across Willeroi BOA in February, May, August and November 2019. 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* so that a range of methods can be used such as transects/spotlighting and cameras traps where practicable and relevant to specific offset areas/properties. Monitoring demonstrated that certain animals like Eastern Grey Kangaroos and Feral Pigs can be high, Foxes can be medium in abundance seasonally with all other feral animal species recorded as scarce to low abundance levels across 2019. 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.

During the reporting period, WHC implemented a comprehensive feral animal control program across the Willeroi BOA with routine 1080 baiting and pig trapping programs undertaken in March (15 Foxes and 7 Wild Dogs removed from 66 baits presented and 23 Feral Pigs trapped), June (13 Foxes and 7 Wild Dogs removed from 66 baits presented and 5 Feral Pigs trapped), September (5 Fox removed from 96 baits presented and 4 Feral Pigs trapped) and December 2019 (5 Foxes and 1 Wild Dog removed from 96 baits presented and 2 Feral Pigs trapped). Night time open range shooting programs were implemented in conjunction with the other routine programs resulting in an additional 2 Foxes, 2 Hares, a Rabbit and 2 Cats were controlled in 2019. The Feral Goat harvesting

during the reporting period resulted in 124 being captured with the Feral Goats then on sold to an abattoir. Only appropriately qualified and experienced feral animal contractors (appropriate feral animal management qualifications, NSW fire arm licence and pesticide accreditation where relevant) were engaged to undertake feral animal control works for WHC.

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

It is believed that due to extended period of drought overall vertebrate pest sighting onsite had significantly dropped.

The survey for 2019 showed there were no sightings of feral goats and two feral cats. Sightings for rabbits and hares have slightly decreased to 140 when compared to 2018 (163). In case of increased sightings, a baiting program was recommended to be used to control numbers, using 1080 or Pindone. Fox sightings has increased particularly during quarter 2 (south west of mine site adjacent the Goonbri road) but has decreased this reporting period in comparison to 2018. A program was carried out in December 2019 to reduce the number of kangaroos. A fox and 2 hares were also killed during this program.

Feral pig sightings continued to decrease from 360 to 159 (2017-2018) down to 54 for this reporting period. No trapping, shooting or baiting program was conducted within the Mining Lease in 2019 to control the feral pig population but TCM will continue to monitor and manage feral animals according to the BMP.

Table 10- Summary of Vertebrate Pest sighting

	Feral Pig (descendant of various breeds of Sus scrofa)	Fox (Vulpes vulpes)	Feral Cat Felis catus)	Rabbit/Hare (Oryctolagus cuniculus) / (Lepus capensis))	Wild Dog (canis familiaris)	Other
Quarter 1	12	18	0	18	0	0
Quarter 2	22	23	0	50	0	1*
Quarter 3	15	10	2	44	0	0
Quarter 4	5	22	0	28	0	1[#]
Total 2019	***54***	***73***	***2***	***140***	***0***	***2***
Total 2018	***159***	***168***	***1***	***163***	***0***	***2****
Total 2017	**360**	**75**	**0**	**175**	**0**	**0**

Cow ;* [#] Two Deer sighted;* 1 Unidentified species & 1 Echidna*

Soil & Erosion Management

During the reporting period, 93 tonnes of gypsum was used to improve top soil characteristics. During 2019, TCM conducted erosion management including the construction of a rock structure in the Northern Rehabilitation area. One dam was increased in capacity to hold approximately 40ML in the northern emplacement area. Several dams were desilted to maximise water capacity onsite.

During the reporting period, no specific treatment or soil erosion mitigation works were undertaken at Willeroi BOA.

Grazing Management

During the reporting period, the Willeroi BOA was not stocked and subsequently grazing was excluded.

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

Monitoring Program

Despite the prevailing dry conditions for much of 2019, the native plant species richness did not change from the previous year with all sites meeting or exceeding the performance criteria (80% of native species richness benchmark for relevant biometric vegetation communities i.e. 23 native species). Native over-storey cover did not change from the previous year with 1 site out of 8 meeting or exceeding the performance criteria (over-storey cover benchmark for relevant biometric vegetation communities i.e. between 6% and 25% cover). Native mid-storey cover increased from 4 sites last year to all 8 sites meeting or exceeding the performance criteria (mid-storey cover benchmark for relevant biometric vegetation communities i.e. between 0% and 5% cover). Native ground cover grasses decreased from 8 sites last year to 2 sites out of the 8 sites meeting or exceeding the performance criteria (grass groundcover benchmark for relevant biometric vegetation communities i.e. between 30 % and 40% cover). During the reporting period, the ecological monitoring program of the Willeroi BOA included winter bird surveys that were undertaken in June and July 2019, and fauna monitoring of 6 sites undertaken during November 2019. During the winter bird surveys, six threatened species were recorded (Brown Treecreeper, Diamond Firetail, Hooded Robin, Little Lorikeet, Swift Parrot and Turquoise Parrot). A total of 58 bird species were recorded during standardised bird surveys in 2019. Average species richness at the 4 woodland sites was 19 and ranged from 12 to 23. Average species richness at the 2 restoration sites was 10.5 and ranged from 8 to 13. These results are similar to 2018, although average species richness is slightly lower at woodland sites (in 2018 it was 23 ranging from 16 to 33) and restoration sites (in 2018 it was 12.5 ranging from 10 to 15). A total of 4 micro bat species were recorded from harp trapping in 2019. Average species richness at the 4 woodland sites was 3.25 but ranged from 2 to 4. The results are

slightly lower than 2018 where a total of 6 micro bat species were recorded (site average 3, ranging from 2 to 6).

Independent Biodiversity Audit (EPBC)

The Commonwealth Department of Agriculture, Water and Environment (formerly Department of Environment and Energy) directed TCM to undertake an Independent Compliance Audit including biodiversity offsets in October 2019 and to be completed in the next reporting period by February 2020.

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 DPIE 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 DPIE for review and approval.A revised version of the BMP will be submitted in the next reporting period.

6.5 Aboriginal Heritage Management

6.5.1 Environmental Management Measures

During the reporting period, heritage site and fencing inspections were completed of the 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 DPIE 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

In accordance with the current HMP, a registered archaeologist and RAPs salvaged all remaining artefacts located in the close proximity of the pit and in the areas that were cleared in 2019.

6.5.3 Proposed Improvements to Environmental Management

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 2019, a geochemist was engaged to complete a geochemical assessment of the coal reject material (fines and coarse) and the key conclusions are similar to previous reporting years:

- The coal reject materials have relatively low and variable sulfur content and excess ANC, and as a bulk material have a high factor of safety with respect to potential acid generation.
- 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 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.
- 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.
- The coal reject materials at Tarrawonga have a low propensity to spontaneously combust and should be managed in line with the relevant parts of the NSW technical guideline related to this issue (Industry and Investment NSW, 2011).

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

In accordance with the draft BMP, annual fuel load monitoring was undertaken in December 2019 as part of planning and assessment of bushfire and ecological burn strategy for the Willeroi BOA in 2020. During the reporting period, no fire occurred on Willeroi BOA but the average overall fuel load measured was 11.9 t/ha (moderate) and grassland fuel load was 1.3 t/ha (low). Other fire management implemented by WHC during the reporting period included the maintenance fire break tracks (28km) 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 firefighting 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 2019 summarises the monthly meteorological conditions at TCM for the 2019 reporting period.

The total annual rainfall for the reporting period was 277mm; this is below the annual rainfall recorded for 2018 (447.6mm) and the long term mean annual rainfall (585mm). The maximum monthly rainfall was recorded during May with 70.6 mm. 2019 was a very dry year, and no months reached their normal rainfall averages.

A minimum temperature of 1.6°C was recorded in July and a maximum temperature of 38.6°C in January.

In 2019, prevailing winds were predominately between the South-South Easterly (S-SE) and South-South Westerly (S-SW) direction for the whole of the year, apart from November which recorded a West – South Westerly (W-SW) prevailing direction.

Table 11- Templemore weather station monitoring data 2019

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	23.2	31	38.6	24.5	30.9	37.4	1.2	SW 227.5	20.6
February	19	27.1	34.7	20.3	27.2	33.7	2.4	SSE 153.6	10.2
March	17.4	24.9	32.2	18.7	25.1	31.3	1.84	S 184.7	95
April	11.7	19.7	27	13.9	20.6	26.7	1.72	SSE164.9	0
May	6.2	13.2	21.0	9.0	14.7	20.5	1.0	SSW 203.2	70.6
June	2.2	10.2	18.1	5.2	11.6	17.7	1.2	SSE 166.8	5.8
July	1.6	9.9	17.9	5.0	11.5	17.7	1.2	SSW 203.1	23.2
August	2.4	10.5	18.0	5.9	12.6	18.3	1.3	SE 142.4	1.2
September	4.7	15.7	25.5	8.8	17.3	24.6	1.8	SSW 219.6	3.2
October	10.2	20.6	29.3	12.9	21.5	28.2	1.6	SSW 199.6	9.6
November	14.4	23.7	32.0	16.7	24.1	30.8	2.0	WSW 245.5	35.8
December	18.7	28.2	36.0	21.0	28.6	34.9	1.7	S 170.3	1.8
Total	-								**277mm**

6.10 Waste

6.10.1 Environmental Management

During 2019, 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 has improved record keeping and data reliability.

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

Table 12- Waste management summary

Waste Stream	Container size	2019	2018#	2017	2016	Unit of Measure
General Waste	3m^3	**306,530**	269,694	600 (2m^3 bin)	360 (loads)	Kg
Tyres*	n/a	**61**	54	73	n/a	each
Batteries **	Pallet	**21**	57	72	n/a	each
Waste Oil	IBC	**273,800**	231,000	242,000	148,000	L
Oil Filters	3m^3	**28,165**	8,835	6,160	n/a	Kg
Hydraulic Hoses	3m^3	**1,685**	885	n/a	n/a	Kg
Coolant	IBC	**0**	8,000	13,700	n/a	L
Scrap Metal* **	15m^3	**68,000**	70,500	29,260	4,200	Kg
Cardboard	10m^3	**11,535**	9,825	57 (IBC)	n/a	Kg
Timber	15m^3	**33,480**	33,000	n/a	n/a	Kg
Sceptic Waste	Pumped out	**90,300**	55,500	n/a	n/a	L
Paper/Plastic/ Aluminium Can	240Lts	**320**	351	37	n/a	Kg

**Tyres were reused onsite for traffic management; **Battery Type N200, N150 & N70 donation to Westpack helicopter;*
****Major clean-up of the yard; n/a not applicable or data not available*
#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 aims 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 not met.	Nil	Quarterly Noise monitoring exceedance on 7th of June 2019 recorded a maximum measurement of 42dB (including 2dB Noise Modifying Factor applied as per the Noise Policy for Industry), during the daytime measuring period at location TN2. Actions included: - Engage a Noise consultant to Peer review the Quarterly report - Conduct a supplementary monitoring at TN2 and results were within the PA and EPL limits. - Continue to operate in accordance with the Noise Management Plan and implement noise controls as required.
Blast	Refer s6.2	Approval criteria met.	Nil	Nil
Air Quality	Refer s6.3	Approval criteria not met.	Nil	TCM's notified DPIE regarding all the PM10 24 hour average exceeding the 50µg/m^3 limit at the Coomalgah property. DPIE advised TCM not to include in the annual average calculation PM10 measured on days of "extraordinary events'. As a result, only four (4) elevated PM10 measurements were included in the annual average calculation of the Annual Review 2019. TCM also engaged an air specialist to review all the PM10 data recorded throughout the reporting period and the results outlined estimated TCM's contribution to air quality at

Aspect	Approval Criteria or EIS/EA Prediction	Performance during the reporting period	Trend / Key Management Implications	Implemented / proposed management actions
				Coomalgah was approximately 6.1% of the total dust measured equal to 4.5µg/m^3.
Biodiversity	Refer s6.4	Approval criteria met.	Nil	Nil
Heritage	Refer s6.5;s6.6	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, SB14, SD16, SD17, 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 9.

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 20199. Due to weather conditions, most of the monitoring sites were dry.

Table 14- Surface water Quarterly monitoring 2019

Date	Time	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)	Comments
22/02/2019		SB14	8.8	2410	536	24	<5	<0.001	0.016	0.007	<0.01	
22/02/2019		SB16A	10	6840	47	126	<5	0.002	0.058	0.238	<0.01	
22/02/2019		Void	8.6	3720	19	3	<5	----	----	----	----	
Other sites were not flowing- no sample taken												
9/05/2019		SD16	7.6	169	83	5	<5	<0.001	0.01	<0.001	0.01	
9/05/2019		SD14	8.4	971	20	5	<5	<0.001	0.002	0.003	<0.01	
9/05/2019		SD17	7.4	435	141	10	<5	0.001	0.003	0.004	<0.01	
9/05/2019		SD16A	8.2	509	276	11	<5	<0.001	0.006	0.005	<0.01	
9/05/2019		GCU	6.8	90	16	10	<5	<0.001	0.002	<0.001	<0.01	
9/05/2019		GCD	6.7	101	39	8	<5	<0.001	0.002	<0.001	<0.01	
23/05/2019		Void	8	3070	<5	<1	<5	----	0.046	----	----	
13/08/2019		SD16	7.8	297	434	4	<5	<0.001	0.012	0.001	0.01	
13/08/2019		SD17	7.9	393	181	6	<5	<0.001	0.002	0.002	<0.01	
13/08/2019		VOID	8.6	3000	15	<1	<5	----	----	----	----	
Other sites were not flowing- no sample taken												
11/08/2019		VOID	8.6	3700	13	4	<5	----	----	----	----	
Other sites were not flowing- no sample taken												

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 <5 and 536 mg/L during routine monitoring. There were no discharge events during the reporting period.

Overall pH values showed that water sampled was between neutral and alkaline with a single value recorded at 10 units during the first 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.

No intensive irrigation activities have been undertaken on site. This reporting year, small quantities of potable water was used in the rehabilitation areas using an All-Terrain Vehicle.

Commitments with regard to the surface water-monitoring program are addressed in the updated Draft Water Management Plan which was submitted to DPIE for review in October 2019.

7.1.2 Discharges

There were no wet weather (or controlled) water discharges during the reporting period from any licensed discharge points.

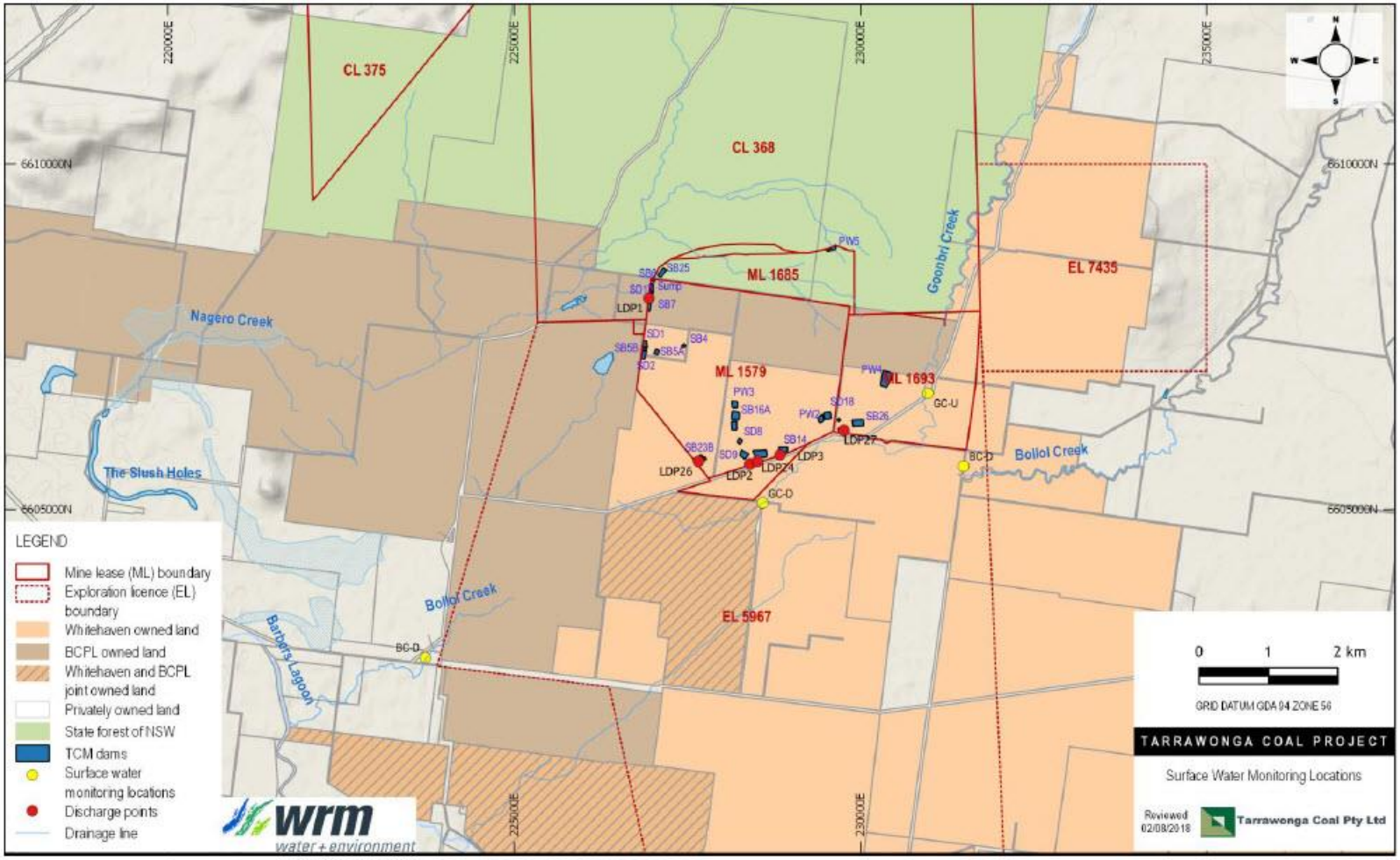


Figure 9-Surface water monitoring locations (No changes since 2/08/2018)

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 sites are shown on Figure 10. During the next reporting period, MW3 will be superseded for the next reporting period, as EPL 12365 Variation was approved on the 16/01/2020. Historical groundwater quality data and standing water level plots are available in Appendix 4.

Groundwater monitoring was undertaken by a contracted company, accountable for water level measurement, collection of samples and laboratory analysis. Two data loggers monitored water levels at MW1 and MW2 to the South and one Vibrating Wire Piezometers (VWPs) sites (TA65) was operating to the East of the mine.

During the reporting period TA60 was decommissioned as a result of mining operations. With the assistance of a groundwater consultant, TCM will assess the best location to install a replacement-monitoring bore to the East.

Groundwater levels

Graphs available in Appendix 4 show that groundwater levels at the majority of nominated monitoring bores maintained a steady trend. Whilst MW6 and MW3 levels were rising, GW044997, MW7, Templemore A and B levels were slightly decreasing likely due to dry conditions. Sampling could not be taken at MW8 because casing was damaged, however water level has regularly been checked at that site.

The Vibrating Wire Piezometers (VWPs) installed at TA65 indicated general depressurisation increases with depth (at 110m, 136m and 153m intake). Excluding the 56m intake (which is likely to be faulty), depressurisation of all intakes continued throughout 2019, ranging from 0.04m in the 30m intake to a maximum of 4.81m in the 136m intake, reflecting changes consistent with the presence of an open cut mining operation in proximity to TA65.

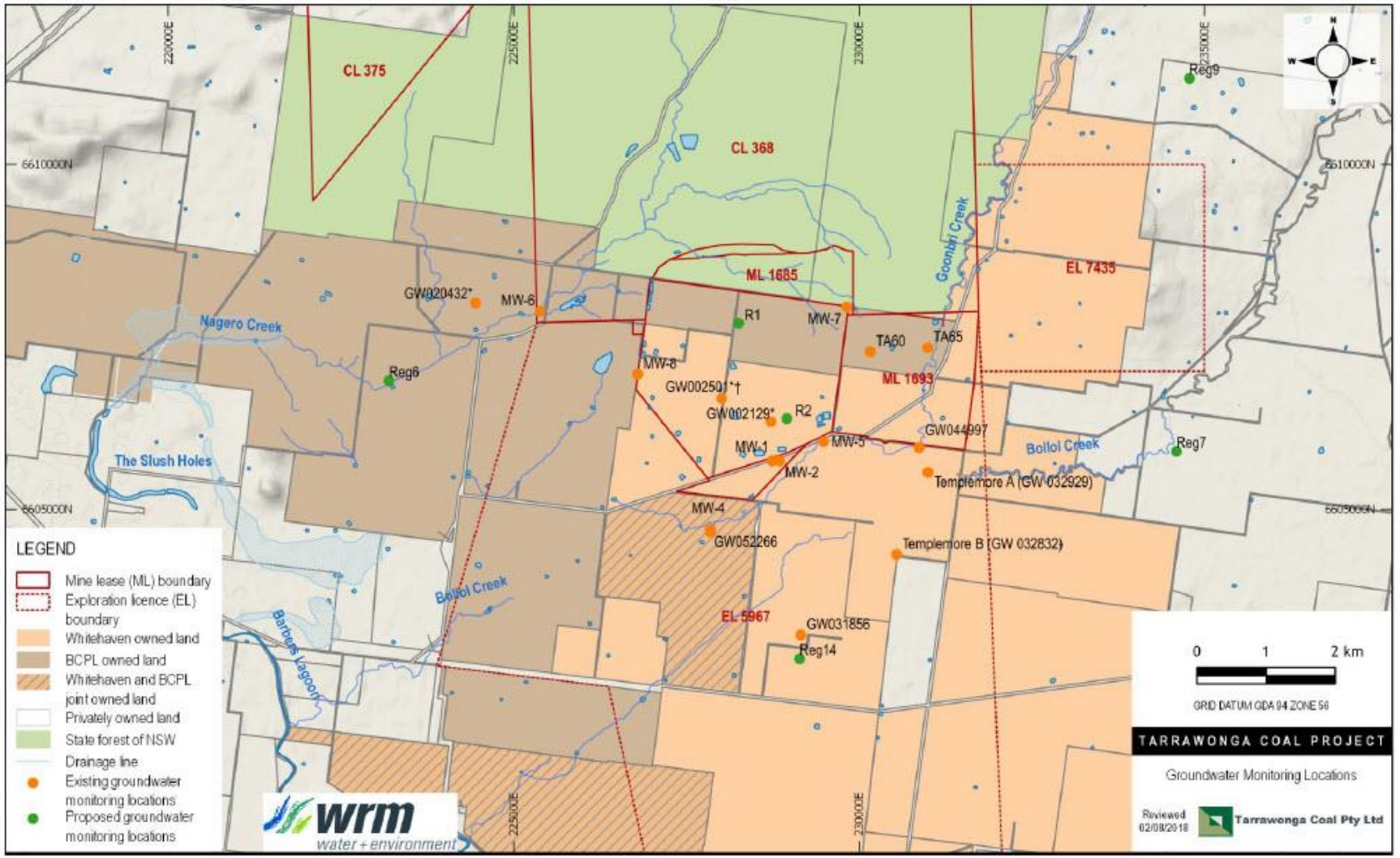


Figure 10- Groundwater monitoring locations (No changes since 2/08/2018)

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.
- MW1, MW4, MW5, Templemore A, Templemore B, GW031856 and GW044997 were above the agricultural irrigation guideline for TDS (600mg/L) when sampled throughout 2019. MW4 and GW044997 were the only points with measured values above the 2,400mg/L NEPC livestock guideline limit but both were below the limit of ANZECC guideline for stock drinking water (4,000mg/L) with 3,800mg/L as the highest value.

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 was 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 has being updated during the reporting period and is expected to be finalised in the next 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 2019, no water was extracted from the licenced groundwater bores. Instead, TCM used rainfall and runoff captured in the sediment dams and pit, and water transfer (43ML) via trucks from another Whitehaven Coal site, 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.

Table 15- Water take

Water Licence Number	Water Sharing Plan Source and Management Zone (As applicable)	Entitlement[#]	Passive take/ inflows	Active Pumping (ML)	TOTAL (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	58	58
TOTAL		**250**	**N/A**	**58***	**58***

 # this entitlement is per 'water year' i.e. from July'18 to June'19.
**Note: Total water pumped for FY2018 includes (Runoff and Groundwater inflows) and was approximately 117ML*

7.3 Site Water Balance

According to the site water balance developed by a water consultant, the water management system for 2019 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.

Table 16 provides an overview of water stored and used on site during the reporting period.

Table 16- Water Stored and used during the reporting period

			Table 2-3 EA values (2012) (ML)		
	Jan 2019 – Dec 2019 (ML)	**Jan 2018- Dec 2018 (ML)**	**Dry Year- 25%-ile (17 years)**	**Average Year (17 years)**	**Wet Year - 75%ile (17 years)**
Total Runoff	316	328	325	402	480
Groundwater inflow	58	183	255	255	255
External Source	43	200	n/a	n/a	n/a
TOTAL INPUT	**530**	**711**	**580**	**657**	**735**
Evaporation	100	108	118	130	141
Moisture loss in coal	113	116	n/a	n/a	n/a
Crusher Dust suppression	35	35	8	8	8
Haul Road and ROM pad dust suppression	406	493	389	394	399
Offsite release/ discharge	0	7	0	0	0
TOTAL OUTPUT	**656**	**759**	**515**	**532**	**548**
Change in inventory	-126	*-48*	*64*	*125*	*193*

Note: For Jan-Dec (annual) 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 removed 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 17 and Figure 11.

Table 17- Rehabilitation Status

Mine Area Type [1] [Ha]		2016	2017	2018	2019
0	***Total Mine Footprint***	579.5	600.1	627.6	**687.5**
1	***Total Active Disturbance***	510.6	498.4	540.7	**579.4**
2	***Land Being Prepared for Rehabilitation***	9.9	8.9	12.9	**29.6**
3	***Land Under Active Rehabilitation***	59.0	67.2*	74.1	**78.5**
4	***Completed Rehabilitation***	0.0	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.

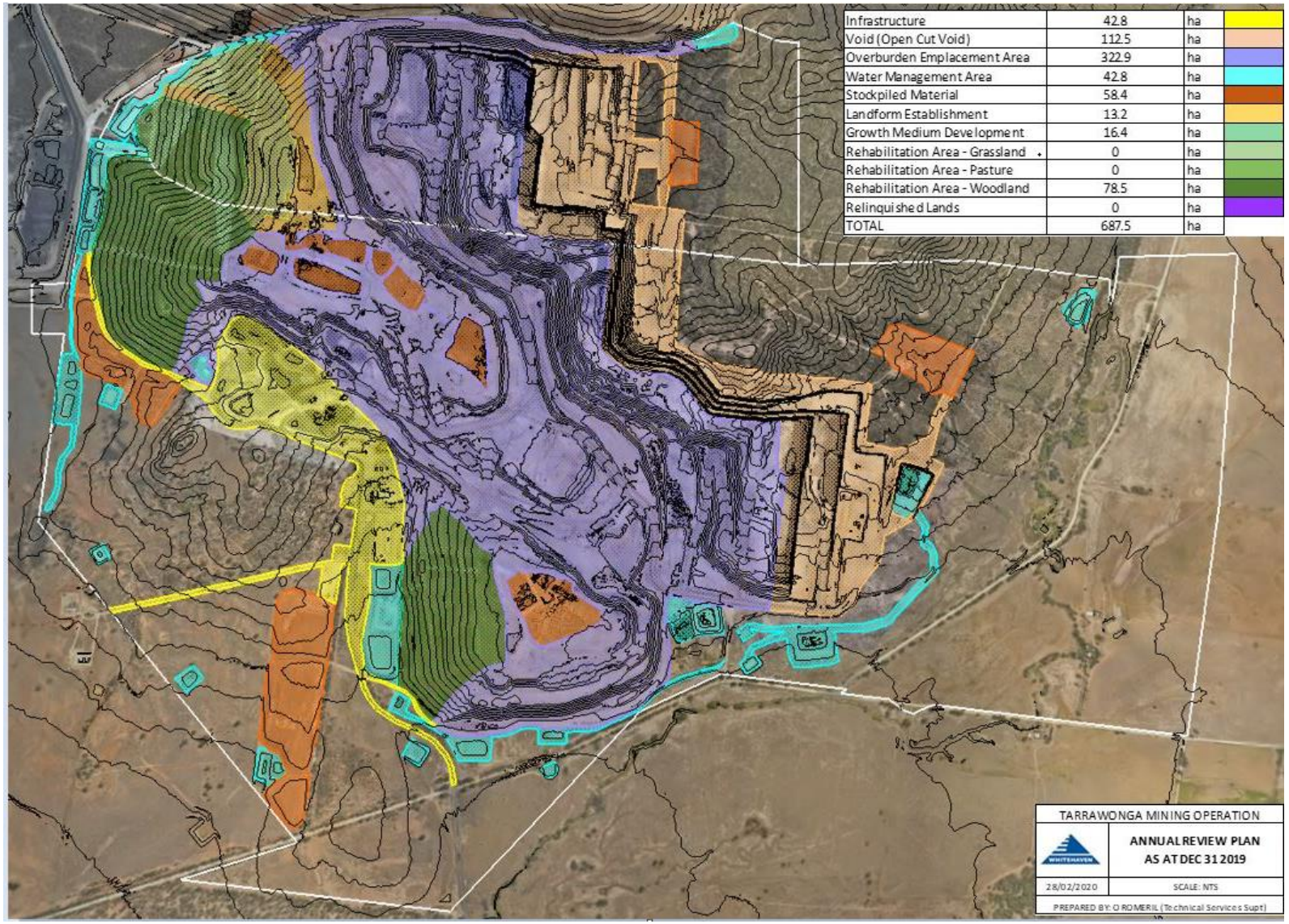


Figure 11- Status of mining rehabilitation as at December 2019

TCM coordinated one revegetation program in 2019 with over-storey revegetation undertaken between July and August 2019 including approximately 4,000 hiko seedlings of Eucalyptus albens, Eucalyptus blakelyi, Eucalyptus crebra, Eucalyptus melliodora, Eucalyptus pilligaensis, Eucalyptus populanea and Eucalyptus macrocarpa. They were planted across nearly 30Ha including approximately 8Ha at the Southern dump rehabilitation area, approximately 20Ha of maintenance area throughout both waste emplacement areas and around 2Ha along Goonbri Road. Approximately 13Ha of the Northern Dump was reshaped to final RL and covered with top soil. Top soil throughout all rehabilitation areas were generally mixed with mulch from previous tree clearing campaign to increase water retention within the soil itself. 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 approximately 80% on the Southern emplacement and nearly 90% on the Northern emplacement rehabilitation areas.

8.1.3 Rehabilitation Fauna and Flora Monitoring

An ecologist 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 utilised 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.

8.1.4 Weeds Management

More details on the Weed management program undertaken in 2019 is available in section 6.3.2

8.1.5 Renovation or Removal of Buildings

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

8.1.6 Other Rehabilitation Undertaken

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

8.1.7 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off has not been requested for any rehabilitated areas during the reporting period.

8.1.8 Variations in Activities against MOP/RMP

In April 2019 MOP C expired and TCM operated without a valid MOP for several days until MOP D was finally approved on April 12.

In August 2019, TCM notified the Division of Resources and Geoscience (DRG) of a variation in the sequence of clearing undertaken at TCM during the operational year period.

As a result TCM submitted a MOP Amendment E that included current rehabilitation progression and future opportunities where rehabilitation can be accelerated into a revised rehabilitation schedule. This MOP E was approved in early January 2020 and will be implemented throughout the next reporting period.

8.1.9 Trials, Research Projects and Initiatives

In 2019, TCM performed three trials, assessing different methodologies and techniques for rehabilitation on Southern emplacement area. These trials assessed the outcome of three different planting methodologies including wholly tube stock seedlings, only seed, and a mixture of both. These trials are showing success in all areas, and as growth continues, the outcomes will be assessed and incorporated into future rehabilitation programs.

Rehabilitation monitoring and rehabilitation methodology records are shared among Whitehaven operations to inform decision-making regarding future rehabilitation campaigns. Specifically the nearby Maules Creek coal 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 the next reporting period TCM will conduct new trials and will assess success.

8.1.10 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 for the LOM will be submitted in 2020 and key changes include:
  - ROM coal production rate increase from 3.0 to 3.5 million tonnes per annum (Mtpa);
  - increase in ROM coal transported along the Northern Section of the Approved ROM Coal Transport Route from 3.0 to 3.5 Mtpa;
  - reduction of the open cut extent to avoid mining:
    - the Upper Namoi alluvium; and
    - Goonbri Creek.
  - revision of the post-mining landform and land use;
  - relocation of the ROM coal stockpile and associated infrastructure;
  - construction of a new site access road and intersection to allow haulage of ROM coal along a section of Goonbri Road; and
  - Construction and use of a water transfer pipeline between the Tarrawonga Coal Mine and the proposed Vickery Extension Project (which is the subject of a separate Development Application for State Significant Development [SSD] 74801).
- In 2020, rehabilitation monitoring programs will be undertaken in winter and spring and will be reported in the next Annual Review.
- TCM will submit a new MOP before December 2020.

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 $70,000 was donated to several organisations including Indigenous Art & Literacy Program, Rotary Club's Drought Relief for Farmers, Upgraded Air Conditioners in the Boggabri Aged Care Facility and Gunnedah Education Scholarships.

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.

No complaints were recorded in 2019. The number of complaints has significantly decreased in recent years. This is the result of continuous collaboration and constant engagement with community members. Table 18 provides a comparison of complaints received since 2012/13 annual reporting periods.

Table 18- Complaints summary

Category	2012/13	2013/14	2014/15	2015/16	2016	2017	2018	2019
Air Quality	23	2	11	13	1	3	1	0
Traffic	8	3	0	0	1	0	0	0
Surface Water	1	0	0	0	1	0	0	0
Visual Amenity	1	0	0	0	0	0	0	0
Noise / Vibration	6	1	0	0	1	0	0	0
Blast	12	3	5	3	2	0	0	0
Other	4	2	2	0	0	0	0	0
TOTAL	**55**	**11**	**18**	**16**	**5**	**3**	**1**	**0**

* 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 19 and Table 20 below.

Table 19- 2014 Independent Audit- Outstanding Actions Status in 2019

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	Noted. 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	Ongoing	Noted. Assessment of unsuccessful aerial seeding trial undertaken in 18/5/2016.

	Goonbri Creek and to lessen the levels of fugitive particulate emissions.		Review and reshape the area to achieve desired rehabilitation outcomes in accordance with MOP E.
	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 implemented to establish the most appropriate vegetation establishment methodologies.	Ongoing	TCM will investigate and compare several revegetation methodologies and conduct some trials. Trials were conducted in 2019. More trials will be conducted in the next reporting period.
	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.	Complete	Noted. All the site Top Soil stockpiles have been tested in 2019. The results show the suitability of use and if ameliorant is required. Where possible, 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.	Complete	Noted. Pre strip soil testing is conducted every year and results provide guidance in term of soil quality, depth and amelioration requirements.
	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	An updated draft Water Management Plan (WMP) was submitted in 2019. Clean water not to enter dirty water circuit as much as practicable. A new draft of the WMP addressing recent DPIE comments will be submitted in 2020.
	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).	Complete	Noted. A contractor undertake Groundwater monitoring in accordance with the relevant Guidelines.

Table 20-2017 Independent Audit- Outstanding Action status in 2019

Condition No	Findings/ Comment	Timing	Action/ Status
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.	Ongoing discussions	TCM to raise practicality of meeting condition with DPIE.

Condition No	Findings/ Comment	Timing	Action/ Status
	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		
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).	Action completed in 2018	Agreement between DPIE and TCM in place. Bond to be calculated following approval of BMP.
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.	Complete	MOP amendment C and D clearly described implementation, monitoring and auditing of rehabilitation. The Rehabilitation Management Plan (RMP) is addressed within the MOP to address any relevant PA condition.
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).	Quarterly noise monitoring currently occurs as specified in the EPL.	TCM contest the weighting of NC; monitoring used to occur at a location closer to the operation and due to distance from noise source the variability is immaterial. ANC is considered more 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	Same as above	Same as above

Condition No	Findings/ Comment	Timing	Action/ Status
	monitoring location. Hence this is considered a non-compliance.		
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.	Ongoing	TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered appropriate).Ensure any incidents are duly reported.
Mining Lease 1685			
5a	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.	Ongoing	TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered more appropriate). Ensure any incidents are duly notified.
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	Ongoing	TCM contest NC weighting; noting evidence of reporting to respective agencies. ANC considered appropriate. Ensure after any incidents, report is submitted to department within 7 days.

11 INCIDENTS AND NON-COMPLIANCES FOR THE REPORTING PERIOD

11.1 Reportable Incidents

Reportable exceedances regarding Noise and Dust are discussed in 6.11 and 6.3.

11.2 Non-compliances

Non-compliances with relevant approvals noted within Section 1 are outlined in Table 21:

Table 21- Non-compliance Action plan

Non - Compliance	Date / Location	Cause	Action Plan	Status/Estimated Completion Date
PA11_0047, sch.3 cond. 24	Reporting Period.	Did not provide an accurate annual and 24hour PM10 'Total Impact'. Total impact criteria includes background levels plus any incremental contribution from the Excluded exceedances from annual average in 2018 Annual Review.	TCM will report and include all the elevated PM10 values measured as advised by DPIE.	DPIE issued a Warning Letter on 16 October 2019.
ML_1579 cond.2 (1); ML_1685 cond.3(a); ML_1693 cond.3(a); ML_1749 cond.3(a).	April 2019	Did not maintain a current Mining Operations Plan 'until site is fully rehabilitated and signed off by a Resources Regulator.' Between the 4th and 11th of April 2019	MOP C was approved to 30 November 2020 however a MOP amendment was required to incorporate an update on progress against rehabilitation by 1 April 2019. MOP amendment D was submitted on 15th March 2019 but not approved until 12 April 2019.	DRG initially issued a penalty Notice which was then withdrawn and replaced with a Caution Letter on 06 November 2019
PA11_0047 sch.3 cond.3	June 2019 (Quarter 2), at TN2	During the Quarterly attended Noise monitoring, noise limit was exceeded at the monitoring site TN2 (Matong/Coomalgah) recording a maximum measurement of 42dB (including 2dB Noise Modifying Factor applied as per the Noise Policy for Industry), in one occasion during the daytime	TCM notified agencies and engaged a separate noise expert to peer-review the report and undertake a new measurement at that location (TN2). Results of the supplementary operational noise monitoring showed that throughout the entire period there were no recorded noise non-compliance.	Following Quarterly Attended Noise monitoring conducted at TN2 showed that TCM has been compliant with the noise criteria specified in the PA and EPL.
PA11_0047 sch.3 cond. 24	Reporting Period.	During the reporting period, 22 elevated 24hr average PM10 levels were recorded above the air criteria (50 µg/m^3) at the HVAS installed at the privately owned property Coomalgah.	DPIE advised not to include in the annual average calculation elevated PM_{10} values recorded on the days of "extraordinary events". As a result, only four elevated PM_{10} levels were included in the annual average calculation in the annual review 2019.	Applied in this annual review report 2019

11.3 Regulatory Actions

- DPIE issued a Warning letter on 16 October 2019 related to a breach of sch.3 cond.24 of PA11_0047 regarding failure 'to adequately calculate long term air quality impact by excluding fifteen PM10 HVAS results' from the 2018 Annual Review.
- DPIE issued an Official Caution letter on 06 November 2019 related to a breach of Con.2(1) of ML1579, Con.3(a) of ML1685, Con.3(a) of ML1693 and Cond.3(a) of ML1749, regarding the undertaking of mining operations 'without an approved Mining Operations Plan' between the 1st and 11th of April 2019.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

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

Table 22- Summary of activities for 2020

	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
6	3 yearly Independent Environmental Audit (IEA)	mid- 2020

Appendix 1

BLAST MONITORING DATA

Environmental Blast Monitoring

SHOT NO	LOCATION I.D	DATE	MONITOR LOCATION	PEAK GROUND PRESSURE (mm/s)	PEAK OVERPRESSURE (dBL)	TIME	FUME RATING
855	TC42_1821_JE	7/01/2019	Tarrawonga Station	0.12	95.50	3:38pm	0
			Coomalgah	0.17	88.20		
856	TN21_0001_JE	1/4/2019	Tarrawonga Station	0.07	110.90	12:59pm	0
			Coomalgah	0.04	84.80		
857	TN25_0509_BW310	1/11/2019	Tarrawonga Station	0.17	93.40	12:05pm	0
			Coomalgah	0.12	92.90		
858	TC41_2224_NG	1/16/2019	Tarrawonga Station	0.18	103.20	12:02pm	1a
			Coomalgah	0.12	96.90		
859	TNN16_0809_MNU	23/01/2019	Tarrawonga Station	0.01	95.50	12:59pm	0
			Coomalgah	0.02	99.60		
860	TN21_0003_MU & TC43_1821_JE_PS	29/01/1919	Tarrawonga Station	0.23	90.70	12:05pm	0
			Coomalgah	0.14	86.40		
861	TN20_0810_JE	1/02/2019	Tarrawonga Station	0.22	102.70	12:06pm	0
			Coomalgah	0.20	112.70		
862	TC41_1718_MN	11/02/2019	Tarrawonga Station	0.87	109.50	11:28am	0
			Coomalgah	1.67	99.30		
863	TC43_1821_JE	14/02/2019	Tarrawonga Station	0.28	109.50	12:00pm	0
			Coomalgah	0.39	106.10		
864	TC41_2022_NG	20/02/2019	Tarrawonga Station	0.15	92.80	11:39am	0
			Coomalgah	0.14	98.60		
865	TN16_0809_NG_TSB	27/02/2019	Tarrawonga Station	0.09	100.30	12:08pm	0
			Coomalgah	0.04	91.90		
866	TC_1318_MN	1/03/2019	Tarrawonga Station	1.12	113.30	12:21pm	0
			Coomalgah	1.79	95.20		
867	TN21_0103_VY_190308	8/03/2019	Tarrawonga Station	0.11	98.80	9:18am	0
			Coomalgah	0.07	92.40		
868	TN20_0809_MNU	15/03/2019	Tarrawonga Station	0.15	109.90	11:59am	0
			Coomalgah	0.14	102.70		
869	TC45_1114_BW300	21/03/2019	Tarrawonga Station	0.18	92.80	1:34pm	0
			Coomalgah	0.18	93.70		
870	TC42_1924_MN_PS	22/03/2019	Tarrawonga Station	0.28	89.50	12:12pm	0
			Coomalgah	0.25	92.30		
871	TN21_0003_NG	27/03/2019	Tarrawonga Station	0.11	103.60	12:02pm	0
			Coomalgah	0.08	104.20		
872	TC43_1924_MN_PS & TC43_1617_JE_PS	4/04/2019	Tarrawonga Station	0.20	87.00	11:59am	0
			Coomalgah	0.31	90.20		
873	TC41_1319_NG_&TN18_09_NG_PS	10/04/2019	Tarrawonga Station	0.19	92.30	12:17pm	1a
			Coomalgah	0.18	94.50		
874	TN18_0809_NG	15/04/2019	Tarrawonga Station	0.15	90.50	12:17pm	1a
			Coomalgah	0.06	93.60		
875	TC41_NG_2	18/04/2019	Tarrawonga Station	0.13	94.50	12:07pm	0
			Coomalgah	0.15	101.30		
876	TN18_0809_NG	1/05/2019	Tarrawonga Station	0.25	95.60	1:54pm	2a
			Coomalgah	0.10	91.50		
877	TC43_1618_JE	6/05/2019	Tarrawonga Station	0.20	100.10	1:07pm	2b
			Coomalgah	0.26	93.20		
878	TC43_1215_JE_PS & TC43_12_JE_EW_PS	7/05/2019	Tarrawonga Station	0.29	94.20	12:09pm	1b
			Coomalgah	0.19	97.70		
879	TN18_0809_NG_TSB	15/05/2019	Tarrawonga Station	0.14	93.10	2:10pm	3c
			Coomalgah	0.12	88.40		
880	TC42_2324_MN	16/05/2019	Tarrawonga Station	0.27	98.60	12:20pm	1c
			Coomalgah	0.23	98.10		
881	TC43_1415_JE	20/05/2019	Tarrawonga Station	0.17	101.30	12:24pm	0
			Coomalgah	0.23	94.20		
882	TN20_0910_BC	23/05/2019	Tarrawonga Station	0.15	97.50	1:07pm	1a
			Coomalgah	0.06	93.70		
883	TC43_1213_JE	30/05/2019	Tarrawonga Station	0.52	96.40	12:10pm	1b
			Coomalgah	0.34	98.90		
884	TC42_1922_MN	5/06/2019	Tarrawonga Station	0.77	108.50	9:12am	1a
			Coomalgah	1.32	94.10		
885	TN26_05_BW300	12/06/2019	Tarrawonga Station	0.08	91.90	12:02pm	0
			Coomalgah	0.04	91.50		

Environmental Blast Monitoring

SHOT NO	LOCATION I.D	DATE	MONITOR LOCATION	PEAK GROUND PRESSURE (mm/s)	PEAK OVERPRESSURE (dBL)	TIME	FUME RATING
886	TN22_0910_BC	13/06/2019	Tarrawonga Station	0.03	94.40	12:23pm	0
			Coomalgah	0.01	92.50		
887	TC46_2224_BW265	14/06/2019	Tarrawonga Station	0.14	101.50	11:38am	0
			Coomalgah	0.14	96.50		
888	TC42_1718_NG_PS	18/06/2019	Tarrawonga Station	0.46	96.2	12:28pm	0
			Coomalgah	0.46	87.8		
889	TC46_2224_BW265	20/06/2019	Tarrawonga Station	0.11	108.00	9:18am	0
			Coomalgah	0.19	113.20		
890	TC42_1718_MN	21/06/2019	Tarrawonga Station	0.61	106.00	4:43pm	0
			Coomalgah	1.20	98.30		
891	TC42_2125_NG & TC46_1621_BW275	28/06/2019	Tarrawonga Station	0.23	103.20	12:05pm	1b
			Coomalgah	0.17	100.70		
892	TC46_1621_BW275 & TC42_1316_NG_PS	4/07/2019	Tarrawonga Station	0.30	110.80	12:09pm	0
			Coomalgah	0.36	97.80		
893	TN21_0406_MN_PS	7/12/2019	Tarrawonga Station	0.73	95.70	12:04pm	1a
			Coomalgah	0.31	94.80		
894	TC42_1316_MN	15/07/2019	Tarrawonga Station	0.69	107.70	12:09pm	0
			Coomalgah	1.82	103.60		
895	TN21_0406_JE	18/07/2019	Tarrawonga Station	0.68	104.50	12:06pm	1a
			Coomalgah	0.45	92.90		
896	TN21_0909_MN_EW & TN21_0709_MN_PS	23/07/2019	Tarrawonga Station	0.41	93.20	12:02pm	0
			Coomalgah	0.20	101.10		
897	TN21_0709_JE	26/07/2019	Tarrawonga Station	0.56	104.30	12:13pm	0
			Coomalgah	0.24	96.90		
898	TC46_1315_RL285	31/07/2019	Tarrawonga Station	0.11	101.60	12:16pm	2b
			Coomalgah	0.14	96.10		
899	TC42_1922_NG	2/08/2019	Tarrawonga Station	0.22	100.40	12:21pm	0
			Coomalgah	0.26	95.80		
900	TN23_0510_BC_TSB & TN1_0406_MN &TN28_0809_BW300	8/08/2019	Tarrawonga Station	0.06	114.80	12:09pm	0
			Coomalgah	0.11	110.00		
901	TN21_0406_MN	12/08/2019	Tarrawonga Station	0.06	98.00	12:41pm	0
			Coomalgah	0.03	88.80		
902	TC45_1819_JE	15/08/2019	Tarrawonga Station	0.16	103.20	9:42am	3b
			Coomalgah	0.13	105.60		
903	TC45_1819_JE & TC45_1214_BW285	23/08/2019	Tarrawonga Station	0.12	105.70	9:25am	2b
			Coomalgah	0.11	94.70		
904	TC42_1317_NG	29/08/2019	Tarrawonga Station	0.26	103.80	4:03pm	2c
			Coomalgah	0.30	92.60		
905	TN27_0104_BW300	3/09/2019	Tarrawonga Station	0.19	93.50	12:20pm	2c
			Coomalgah	0.19	97.30		
906	TC43_2225_NG_PS	10/09/2019	Tarrawonga Station	0.25	94.10	1:19pm	0
			Coomalgah	0.14	102.70		
907	TN21_0406_VY & TN21_0910_NG_PS	11/09/2019	Tarrawonga Station	0.45	104.70	12:25pm	1a
			Coomalgah	0.13	89.20		
908	TN21_0709_VY	13/09/2019	Tarrawonga Station	0.24	98.60	12:00pm	0
			Coomalgah	0.20	86.70		
909	TC43_225_MN	18/09/2019	Tarrawonga Station	0.35	100.90	12:58pm	0
			Coomalgah	0.38	100.60		
910	TN27_0507_BW310	20/09/2019	Tarrawonga Station	0.13	92.20	12:01pm	0
			Coomalgah	0.06	96.10		
911	TN27_0810_BW310	25/09/2019	Tarrawonga Station	0.28	92.10	12:14pm	1a
			Coomalgah	0.21	100.60		
912	TC44_1217_JE_PS_&_TC44_12_JE_PS_EW &_TC43_18_NG_PS	30/09/2019	Tarrawonga Station	0.34	93.60	12:12pm	0
			Coomalgah	0.21	98.10		
913	TC44_1217_JE	5/10/2019	Tarrawonga Station	0.18	116.60	9:12am	0
			Coomalgah	0.23	100.40		
914	TC43_1921_MN	10/10/2019	Tarrawonga Station	0.64	109.30	12:11pm	0
			Coomalgah	1.32	102.20		
915	TC45_1217_JE_PS	14/10/2019	Tarrawonga Station	0.32	87.00	4:41pm	0
			Coomalgah	0.20	88.90		
916	TN22_0001_JE_&_TN21_0409_NG &_TN22_003_MN_PS	28/10/2019	Tarrawonga Station	0.54	104.00	12:08pm	0
			Coomalgah	0.29	98.00		

Environmental Blast Monitoring

SHOT NO	LOCATION I.D	DATE	MONITOR LOCATION	PEAK GROUND PRESSURE (mm/s)	PEAK OVERPRESSURE (dBL)	TIME	FUME RATING
917	TN27_02_MN_PS_1	31/10/2019	Tarrawonga Station	0.49	95.80	12:08pm	0
			Coomalgah	0.16	85.70		
918	TN2227_01_JE	5/11/2019	Tarrawonga Station	0.90	105.40	10:13am	0
			Coomalgah	0.41	110.80		
919	TN22_0003_MN_PS_&TN27_02_MN_PS_3	11/11/2019	Tarrawonga Station	0.82	89.20	12:18pm	0
			Coomalgah	0.28	95.10		
920	TC43_2224_NG	13/11/2019	Tarrawonga Station	0.16	97.60	10:05am	0
			Coomalgah	0.18	97.50		
921	TC48_1620_BW285_&TC45_1217_JE_PS	14/11/2019	Tarrawonga Station	0.17	95.30	1:38pm	0
			Coomalgah	0.28	96.20		
922	TC43_1318_NG_PS_& _TC48_1620_BW285_2	20/11/2019	Tarrawonga Station	0.28	94.70	4:37pm	0
			Coomalgah	0.38	100.60		
923	TN2227_01_&TN27_0001_MN_PS	21/11/2019	Tarrawonga Station	0.57	107.30	12:13pm	0
			Coomalgah	0.36	110.60		
924	TN27_JE_HARD_DIG	27/11/2019	Tarrawonga Station	0.03	91.10	10:55am	0
			Coomalgah	0.01	87.70		
925	TC43_1318_MN	29/11/2019	Tarrawonga Station	0.87	113.70	1:08pm	0
			Coomalgah	1.36	106.90		
926	TN22_0104_JE	5/12/2019	Tarrawonga Station	0.58	105.40	1:08pm	0
			Coomalgah	0.26	97.80		
927	TN2227_02_JE_TRIM	6/12/2019	Tarrawonga Station	0.39	105.90	1:25pm	0
			Coomalgah	0.28	117.50		
928	TC45_1217_JE	12/12/2019	Tarrawonga Station	0.14	101.60	9:03am	0
			Coomalgah	0.24	94.60		
929	TN22_0510_MN_PS + TN22_10_MN_PS	13/12/2019	Tarrawonga Station	0.41	92.60	1:05pm	0
			Coomalgah	0.30	90.90		
930	TC43_1316_MN_TRIM	18/12/2019	Tarrawonga Station	0.23	115.30	4:22pm	0
			Coomalgah	0.47	102.00		
931	TC30_0409_BW322_1	20/12/2019	Tarrawonga Station	0.32	117.1	4:09pm	0
			Coomalgah	0.22	103		
932	TN22_0710_BW292 WEDGE	12/23/2019	Tarrawonga Station	0.16	104.2	12:46pm	0
			Coomalgah	0.05	94.5		
933	TC30_0103_BC	12/31/2019	Tarrawonga Station	0.29	97.1	4:06pm	0
			Coomalgah	0.13	101.4		

Appendix 2

HVAS MONITORING DATA

COOMALGAH PM_{10} HIGH VOLUME AIR SAMPLER

Site
COOMALGAH

Date	Measured PM10 Value (µg/m³)	PM10 24hr Limit (µg/m³)	Regional Air Quality Index (RAQI) (µg/m³)	Estimated Contribution PM10 (µg/m³)*	Comments
2/01/2019	34	50	73	17.3	Nil
8/01/2019	53.8	50	57	3.4	Determined as not mine related. Wind and Grazing activity noted in the field sheet by the contractor during the filter change on the 02/01/19. Elevated wind recorded on 7/01/2019 with winds above the 8m/s.
14/01/2019	88.8	50	61	7.4	Determined as not mine related. Most wind was coming from South West on that day. Winds recorded at 7m/s the day before. Farming activity and wind noted in the field sheet on the day of inspection.
20/01/2019	34.8	50	74	0	Nil
26/01/2019	23.7	50	70	5.3	Nil
1/02/2019	34.1	50	46	0	Nil
7/02/2019	17.2	50	39	2.9	Nil
13/02/2019	154	50	328	0	Determined as not mine related. Dust storm on the sampling day. Extremely windy noted on the field sheet by the contractor.
19/02/2019	102	50	84	48.6	Determined as not mine related. Regional elevated dust level. Windy and grazing activity noted on the field sheet.
25/02/2019	18.8	50	37	0	Nil
3/03/2019	18.2	50	33	0	Nil
9/03/2019	101	50	52	26.3	Determined as not mine related. Winds recorded coming from West most of the day. Windy recorded in the field sheet by contractor.
15/03/2019	47.9	50	64	0	Nil
21/03/2019	10.6	50	49	0	Nil
27/03/2019	22	50	52	0	Nil
2/04/2019	15.7	50	35	0	Nil
8/04/2019	37.9	50	54	21	Nil
14/04/2019	37.1	50	54	0	Nil
20/04/2019	34	50	33	0	Nil
26/04/2019	59.7	50	52	27.2	Determined as not mine related. Grazing activity noted on the field sheet by contractor. Most wind was coming from North East of the monitor according to the weather station.
2/05/2019	72.5	50	45	0	Determined as not mine related. Windy and grazing activity noted in the field sheet by the contractor. Weather station recorded winds coming from N-NE and S-SW.
8/05/2019	14.4	50	44	2.7	Nil
14/05/2019	17.1	50	38	0	Nil
20/05/2019	13.1	50	39	0	Nil
26/05/2019	29.5	50	59	4.4	Nil
1/06/2019	16.3	50	37	0	Nil
7/06/2019	12.4	50	36	0	Nil
13/06/2019	23.2	50	48	8.7	Nil
19/06/2019	10.6	50	98	0	Nil
25/06/2019	42.2	50	43	0	Nil
1/07/2019	22	50	63	0	Nil
7/07/2019	14	50	40	0	Nil
13/07/2019	11.8	50	40	3.1	Nil
19/07/2019	6.7	50	88	0	Nil
25/07/2019	10	50	75	0	Nil
31/07/2019	5.5	50	44	0	Nil
6/08/2019	25.9	50	91	4.3	Nil
12/08/2019	50.8	50	75	0	Determined as not mine related. Dusty surrounds noted in the field sheet by the contractor. Weather station recorded winds coming from N-NE.
18/08/2019	40.5	50	45	0	Nil
24/08/2019	46.1	50	67	0	Nil
30/08/2019	18.6	50	43	0	Nil
5/09/2019	41.3	50	65	4.2	Nil
11/09/2019	58.0	50	48	0	Determined as not mine related. Dusty conditions noted in the field sheet by the contractor. Weather station recorded winds coming from SE.
17/09/2019	103	50	84	0	Determined as not mine related. Severe wind and dust noted in the field sheet by the contractor. Weather station recorded winds above 11m/s coming from E and S.
23/09/2019	37.3	50	49	0	Nil
29/09/2019	55.7	50	49	4.8	Determined as not mine related as there was no mining activity. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from W-SW.
5/10/2019	93.9	50	73	0	Determined as not mine related. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from NE-S.
11/10/2019	69	50	59	0	Determined as not mine related. Farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from East.
17/10/2019	78.6	50	213	0	Determined as not mine related. Dust storm noted in the field sheet by the contractor. Weather station recorded winds coming from W and SW with 49% winds above 6m/s.
23/10/2019	132	50	174	7	Determined as not mine related. Contaminated paper filter and smoke haze noted in the field sheet by the contractor. Weather station recorded winds coming from North.
29/10/2019	110	50	200	0	Determined as not mine related. Smoke haze in sky and farming activity noted in the field sheet by the contractor. Weather station recorded winds coming from E and SW.
4/11/2019	13.3	50	61	7.2	Nil
10/11/2019	36.8	50	51	7.3	Nil
16/11/2019	31.7	50	103	5.6	Nil
22/11/2019	176	50	243	33.3	Determined as not mine related. Grazing Activities reported on field sheet.
28/11/2019	114	50	215	0	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a W direction.
4/12/2019	115.0	50	63	0	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds coming from a W direction.
10/12/2019	155.0	50	372	20.2	Determined as not mine related. wind – dry and dusty recorded on field sheet.
16/12/2019	641.0	50	171	0	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a S direction with an average 4.1m/s and gusts above 8m/s
22/12/2019	813.0	50	393	0	Determined as not mine related as there was no mining activity. Grazing Activities, smoke haze and slight wind' reported on field sheet. Weather Station recorded winds from a S, SE direction >6m/s.
28/12/2019	141.0	50	98	0	Determined as not mine related. Grazing Activities reported on field sheet. Weather Station recorded winds from a SSE direction.

* Based on Assessment Report prepared by Torodoski Air Sciences.

Appendix 3

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)	Comments
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					
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					

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)	Comments
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						
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			

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)	Comments
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					
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	
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	

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)	Comments
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	
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	
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	

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)	Comments
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	
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	----	----	----	----	
22/02/2019	SB14	8.8	2410	536	24	<5	<0.001	0.016	0.007	<0.01	
22/02/2019	SB16A	10	6840	47	126	<5	0.002	0.058	0.238	<0.01	
22/02/2019	Void	8.6	3720	19	3	<5	----	----	----	----	
Other sites were not flowing- no sample taken											
9/5/2019	SD16	7.6	169	83	5	<5	<0.001	0.01	<0.001	0.01	
9/5/2019	SD14	8.4	971	20	5	<5	<0.001	0.002	0.003	<0.01	
9/5/2019	SD17	7.4	435	141	10	<5	0.001	0.003	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)	Comments
9/5/2019	SD16A	8.2	509	276	11	<5	<0.001	0.006	0.005	<0.01	
9/5/2019	GCU	6.8	90	16	10	<5	<0.001	0.002	<0.001	<0.01	
9/5/2019	GCD	6.7	101	39	8	<5	<0.001	0.002	<0.001	<0.01	
23/05/2019	Void	8	3070	<5	<1	<5	----	0.046	----	----	
13/08/2019	SD16	7.8	297	434	4	<5	<0.001	0.012	0.001	0.01	
13/08/2019	SD17	7.9	393	181	6	<5	<0.001	0.002	0.002	<0.01	
13/08/2019	VOID	8.6	3000	15	<1	<5	----	----	----	----	
Other sites were dry- no sample taken											
8/11/2019	VOID	8.6	3700	13	4	<5	----	----	----	----	
Other sites were dry- no sample taken - See photos											

Appendix 4

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	TRH C6- C10	TRH C10-C40
				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**					
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																																								
MW1	14-Mar-19	7.11	7.78	8.1	3430	20.8	0.11	0.001	<0.001	0.054	<0.0001	0.005	<0.001	0.017	0.005	0.064	0.014	<0.01	<0.01	0.04	<0.05	0.62	<0.0001	8.22	3640	31	45	693	27	36.1	561	211	<1	<1	755	755	35.3	1.09	<0.01	0.03	0.11	0.14	2190		<20	<50	<20	<100
MW1	19-Jun-19	7.22	7.89	8	3320	20.3																																								
MW1	11-Sep-19	7.32	7.99	8	3440	21.7	0.06	<0.001	<0.001	0.046	<0.0001	0.002	0.001	0.012	0.003	0.199	0.008	<0.01	<0.01	0.037	<0.05	0.33	<0.0001	8.21	3430	40	51	701	24	37.3	36.3	224	<1	<1	672	672	36.3	1.34		<0.01	0.04	0.04	2010		<20	<50	<20	<100
MW1	5-Dec-19	7.35	8.02	8	3510	21.3																																								
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					
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																																								

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	TRH C6- C10	TRH C10-C40
				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**					
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**					
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																																									
MW2	14-Mar-19	3.55	4.34	7.1	560	21	4	0.002	<0.001	0.02	<0.0001	0.004	0.002	0.004	0.002	0.168	0.003	<0.01	0.01	0.014	0.07	3.68	<0.0001	7.38	532	<1	<1	122	2	5.36	40	20	<1	<1	186	186	5.26	0.91	0.01	<0.01	3.08	3.08	532				<20	<100
MW2	19-Jun-19	3.41	4.2	7	461	20.4																																									
MW2	11-Sep-19	4.01	4.8	6.9	530	21	11.9	0.003	<0.001	0.049	<0.0001	0.01	0.006	0.007	0.006	0.341	0.009	<0.01	0.02	0.028	0.07	9.97	<0.0001	7.35	530	2	1	113	2	5.15	44	22	<1	<1	166	166	5.02	1.3		<0.01	2.32	2.32	379					
MW2	5-Dec-19	4.65	5.44	7.1	560	21.2																																									
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																																									
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																																									
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	28-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																						
MW3	22-Mar-19	9.1		7.87	2050	36.2																																									
MW3	19-Jun-19	9.35		7.76	2129	23.5		<0.001			<0.0001	<0.0001		<0.001	<0.001	0.105	0.005			<0.005		<0.05		8.28	2120	16	5	436	3		367	82	<1	<1	384	384			0.19	<0.01	0.01	0.01						
MW3	25-Nov-19	9.98		7.85	2097	26.6		<0.001			<0.0001	<0.0001		<0.001	<0.001	0.069	0.006			<0.005		<0.05		7.87	2090	15	5	431	3		447	80	<1	<1	419	419			0.22	<0.01	<0.01	<0.01						
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					
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					

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	TRH C6- C10	TRH C10-C40
				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**					
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**					
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	23/03/2017	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	21/06/2017	9	9.62	7.4	4370	19.7																																								
MW4	13/09/2017	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																																								
MW4	22-Mar-18	9.08	9.7	7.4	4610	21.3									0.013									7.4	4470																						
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																																								
MW4	14-Mar-19	9.58	10.2	7.2	4480	21.9	0.14	<0.001	<0.001	0.181	<0.0001	0.001	<0.001	0.005	0.008	0.394	0.003	<0.01	<0.01	0.079	<0.05	0.65	<0.0001	7.67	4840	145	112	702	16	47.4	818	145	<1	<1	1010	1010	46.3	1.2	2	0.05	0.21	0.26	2460				<20	360
MW4	19-Jun-19	9.41	10.03	7.3	3860	20.5																																								
MW4	11-Sep-19	9.62	10.24	7.4	3460	20.8	0.12	<0.001	<0.001	0.075	<0.0001	0.001	<0.001	0.002	0.002	0.141	0.002	<0.01	<0.01	0.023	<0.05	0.4	<0.0001	7.95	3460	78	52	685	8	38.2	682	112	<1	<1	715	715	35.8	3.13		<0.01	0.08	0.08	1930					
MW4	5-Dec-19	10.14	10.76	7.3	3530	21.8																																								
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	3.12		7.9	2320																																								
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																																								
MW5	14-Mar-19	3.41	4.2	7.9	1240	24.1	1.65	0.01	<0.001	0.023	<0.0001	<0.001	<0.001	0.004	0.001	0.044	0.002	<0.01	0.01	0.028	<0.05	1.4	<0.0001	8.11	1220	3	3	286	4	12.9	162	69	<1	<1	313	313	12.3	2.69	0.02	<0.01	0.17	0.17	764				<20	<100
MW5	19-Jun-19	2.91	3.7	7.6	1292	22.5																																								
MW5	11-Sep-19	2.9	3.69	7.8	2100	20.4	2.47	0.009	<0.001	0.032	<0.0001	0.002	<0.001	0.004	0.002	0.044	0.002	<0.01	0.01	0.031	<0.05	1.63	<0.0001	8.12	2120	10	10	450	7	21.2	370	164	<1	<1	393	393	21.7	1.47		<0.01	0.09	0.09	1170		<20	<50	<20	<100
MW5	5-Dec-19	3.25	4.04	7.8	2080	21.4																																								
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																																										

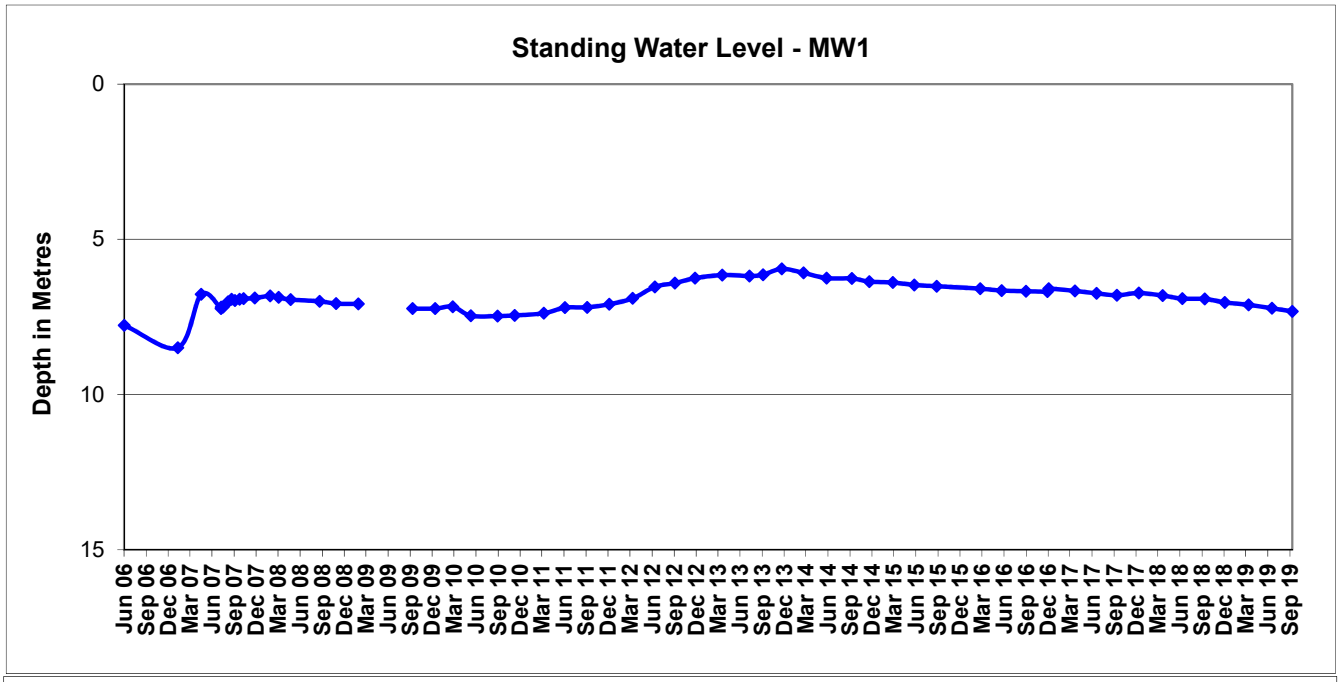
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N -mg/L	Nitrate as N - mg/L	Nitrite + Nitrate as N mg/L	Total Dissolved Solids	Dissolved oxygen	TPH C6-C9	TPH C10-C36	TRH C6- C10	TRH C10-C40
				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**					
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**					
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																																											
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																																								
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																																							
MW6	14-Mar-19					Casing broken																																							
MW6	19-Jun-19					Casing broken																																							
MW6	11-Sep-19					Casing broken																																							
MW6	5-Dec-19					Casing broken																																							
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																																									
MW7	14-Mar-19			Dry																																										
MW7	19-Jun-19			Dry																																										

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	TRH C6- C10	TRH C10-C40
				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**					
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**					
MW7	11-Sep-19			Dry																																										
MW7	6-Dec-19			Dry																																										
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																																									
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																																									
MW8	14-Mar-19	13.62	14.41	Blocked 3.2 down pipe																																									
MW8	19-Jun-19	13.69	14.48	Blocked 3.2 down pipe																																									
MW8	11-Sep-19	13.77	14.56	Blocked 3.2 down pipe																																									
MW8	6-Dec-19	13.76	14.55	Blocked 3.2 down pipe																																									
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																																										

				Field Parameters			Total Metals																			Major Cations					Major Anions																	
Sample Location	Date	Depth to Ground - mbgl	Depth to Stand - mbtoc	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	Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm	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	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	TRH C6- C10	TRH C10-C40
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**					
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	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																																										
GW044997	14-Mar-19	12.5	12.7	7.3	5710	21.1	0.05	0.005	<0.001	0.144	<0.0001	0.004	<0.001	0.008	<0.001	0.024	0.002	<0.01	0.02	0.021	0.13	0.35	<0.0001	7.75	6350	166	172	956	4	64.1	994	555	<1	<1	1050	1050	60.6	2.85	0.06	<0.01	17	17	3810				<20	<100
GW044997	19-Jun-19	12.32	12.52	7.1	3470	20.1																																										
GW044997	11-Sep-19	12.66	12.86	7.3	5260	19.9	0.08	0.006	<0.001	0.125	<0.0001	0.001	<0.001	0.007	<0.001	0.043	0.002	<0.01	0.02	0.017	0.12	3.25	<0.0001	7.77	5490	181	166	933	4	63.4	1080	479	<1	<1	892	892	58.3	4.21		<0.01	13.2	13.2	3430		<20	<50	<20	<100
GW044997	5-Dec-19	12.76	12.96	7.3	5290	20.6																																										
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					
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	essure at tap.																																												
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	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	14-Mar-19	24.4	25	7.2	1100	22.2	0.01	0.001	<0.001	0.147	<0.0001	0.001	<0.001	0.031	0.002	0.002	<0.001	<0.01	0.01	0.022	<0.05	<0.05	<0.0001	7.86	1050	42	29	155	3	11.3	68	19	<1	<1	451	451	11.3	0.1	0.01	<0.01	0.22	0.22	736				<20	<100
GW031856	19-Jun-19	23.16	23.76	7.3	1120	18.6																																										
GW031856	11-Sep-19	23.03	23.63	7.4	1160	16.9	<0.01	0.001	<0.001	0.166	<0.0001	0.002	<0.001	0.013	<0.001	0.002	0.001	<0.01	<0.01	0.2	<0.05	<0.05	<0.0001	7.92	1160	63	38	156	3	13.1	104	21	<1	<1	429	429	11.9	4.75		<0.01	0.26	0.26	636		<20	<50	<20	<100
GW031856	6-Dec-19	14.98	15.58	7.4	1180	25.9																																										
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																																										

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	TRH C6- C10	TRH C10-C40
				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**					
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**					
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	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	14-Mar-19	8.6	8.65	7.1	855	21.6	0.18	0.003	<0.001	0.094	<0.0001	<0.001	<0.001	0.002	<0.001	0.284	0.002	<0.01	0.02	0.047	<0.05	2.92	<0.0001	7.46	824	53	17	95	<1	8.18	64	31	<1	<1	285	285	8.14	0.19	0.03	<0.01	6.68	6.68	581				<20	<100
GW052266	19-Jun-19	8.66	8.71	7	780	19.8																																									
GW052267	11-Sep-19	8.7	8.75	6.9	810	21	0.39	0.002	<0.001	0.075	<0.0001	0.002	<0.001	<0.001	<0.001	0.168	<0.001	<0.01	0.01	0.016	<0.05	1.69	<0.0001	7.6	814	61	17	89	<1	8.31	62	33	<1	<1	227	227	7.47	5.38		<0.01	6.85	6.85	478		<20	<50	<20	<100
GW052268	5-Dec-19	8.7	8.75	7.1	840	21.8																																									
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					
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	210																																									
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	14-Mar-19	7.11	7.59	7.8	1230	21.3	0.02	0.003	<0.001	0.096	<0.0001	<0.001	<0.001	0.006	<0.001	0.018	<0.001	<0.01	0.01	0.025	<0.05	0.11	<0.0001	7.77	1200	112	30	83	2	11.7	177	82	<1	<1	276	276	12.2	2.07	0.12	0.08	3.49	3.57	850				<20	<100
Templemore A	19-Jun-19	7.31	7.79	7.5	1240	19.5																																									
Templemore A	11-Sep-19	7.53	8.01	7.6	1290	19.6	0.02	0.002	<0.001	0.092	<0.0001	<0.001	<0.001	0.006	<0.001	0.006	<0.001	<0.01	<0.01	0.158	<0.05	0.05	<0.0001	8.06	1310	142	34	94	2	14	206	107	<1	<1	271	271	13.4	2.08		<0.01	2.19	2.19	778		<20	<50	<20	<100
Templemore A	5-Dec-19	7.77	8.25	7.7	1360	20.7																																									
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																																									

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	TRH C6- C10	TRH C10-C40
				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**					
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**					
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	21.1	<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	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	14-Mar-19	7.71	7.85	7.3	1390	22.9	0.03	0.003	<0.001	0.063	<0.0001	<0.001	<0.001	0.001	<0.001	0.003	<0.001	<0.01	0.02	0.025	0.05	0.11	<0.0001	7.58	1410	66	66	66	66	14.4	194	138	<1	<1	319	319	14.7	0.96	0.01	<0.01	1.3	1.3	874				<20	<100
Templemore B	19-Jun-19	7.67	7.81	7.2	1580	20.5																																									
Templemore B	11-Sep-19	9.01	9.15	7.4	1780	21.3	<0.01	0.002	<0.001	0.134	0.0003	0.001	<0.001	0.02	0.003	0.006	0.06	<0.01	0.02	0.394	<0.05	1.04	<0.0001	7.84	1820	143	65	174	2	20.1	322	121	<1	<1	376	376	19.1	2.52		<0.01	1.55	1.55	1010		<20	<50	<20	<100
Templemore B	5-Dec-19	8.21	8.35	7.4	1820	22.1																																									


Standing Water Level - MW1
Depth in Metres
0
5
10
15
Jun 06
Sep 06
Dec 06
Mar 07
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Sep 08
Dec 08
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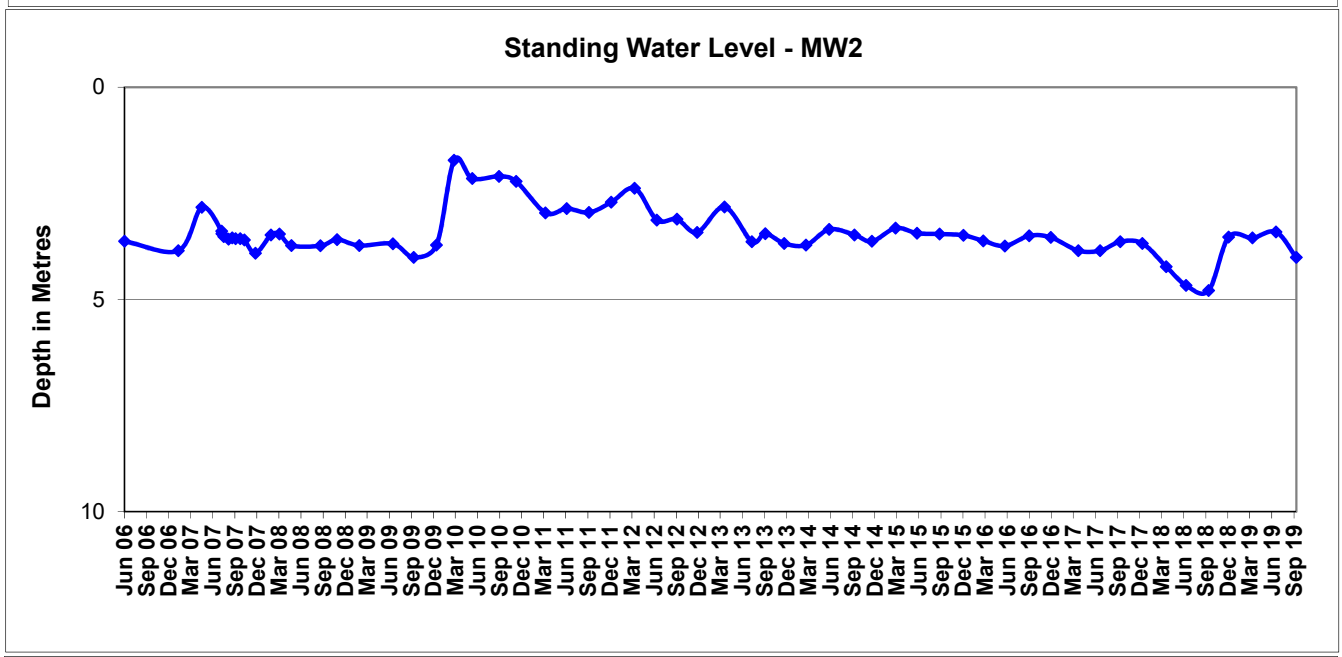
Sep 19


Standing Water Level - MW2
Depth in Metres
0
5
10
Jun 06
Sep 06
Dec 06
Mar 07
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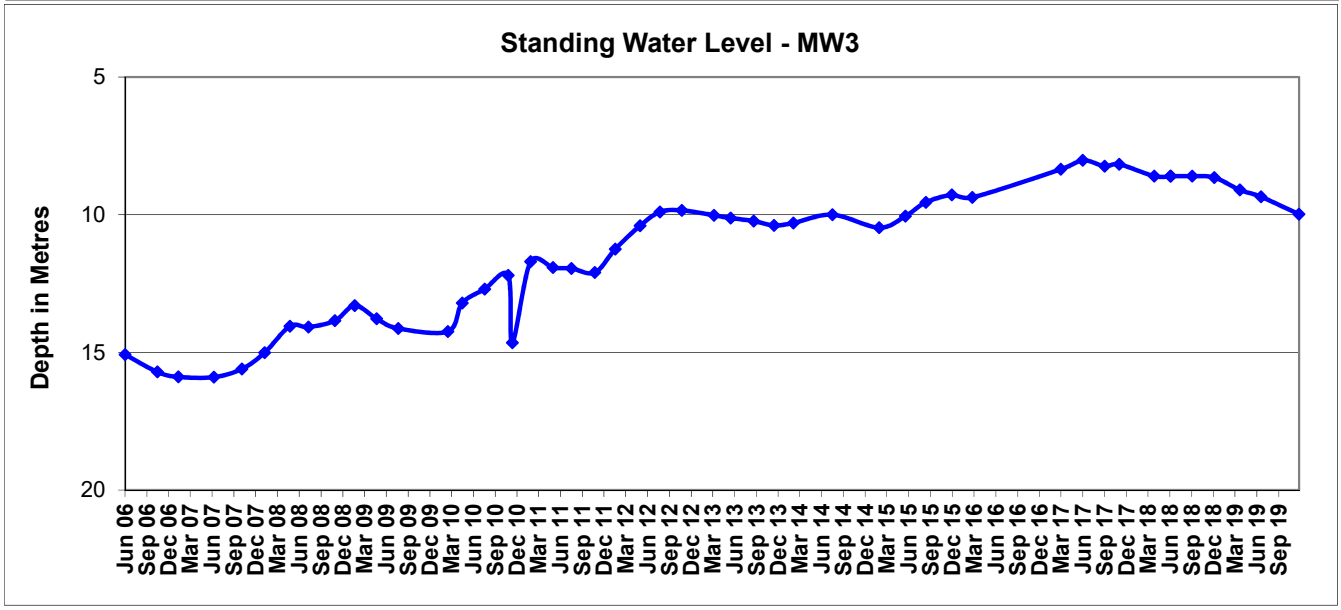
Jun 19
Sep 19


Standing Water Level - MW3
Depth in Metres
5
10
15
20
Jun 06
Sep 06
Dec 06
Mar 07
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Dec 08
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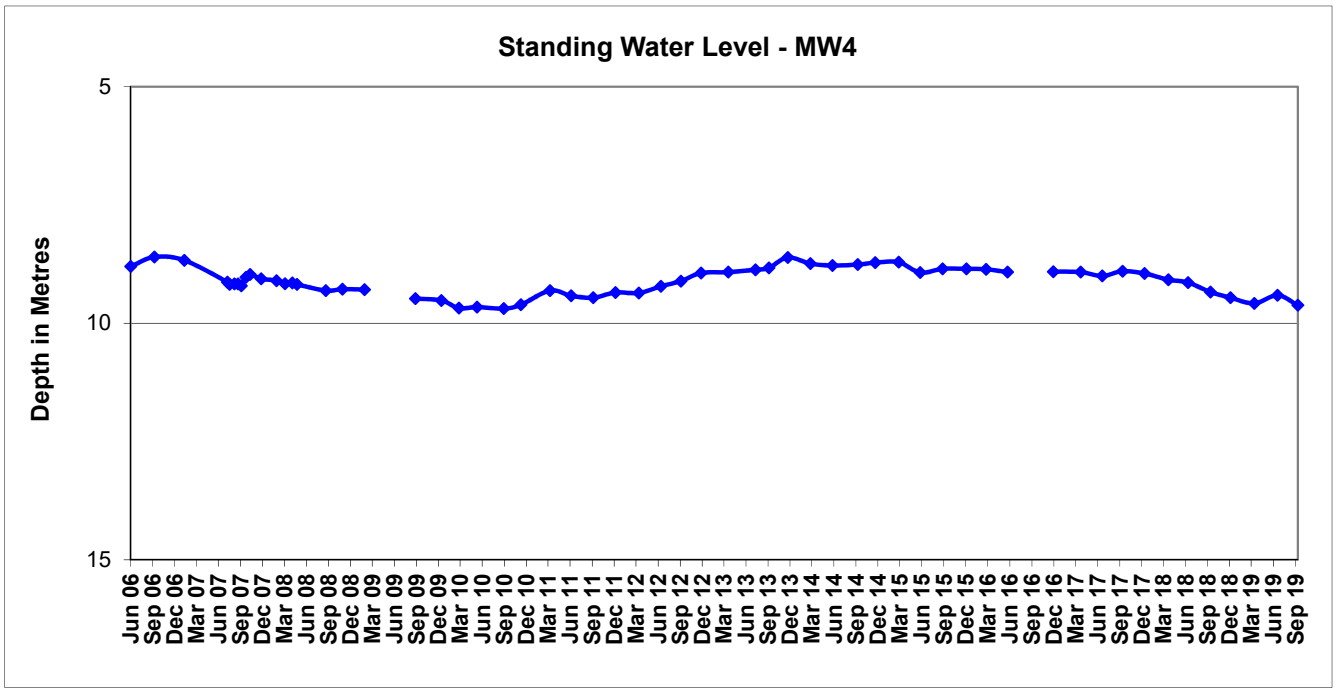
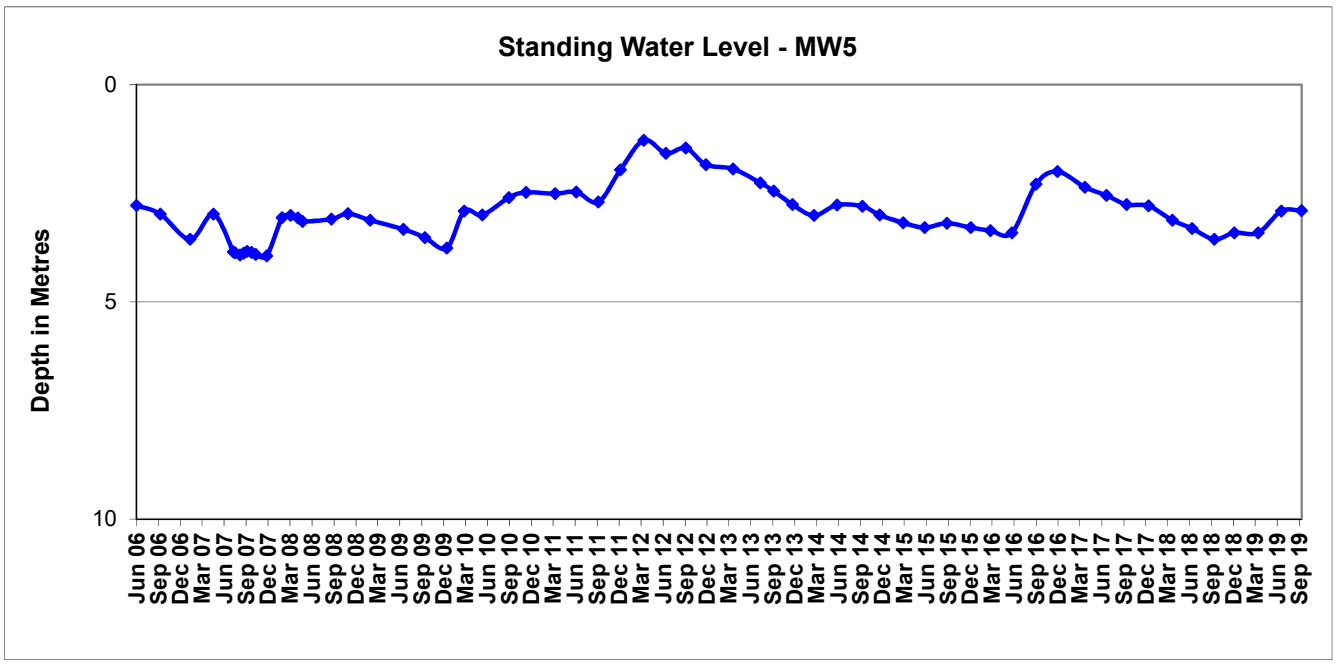
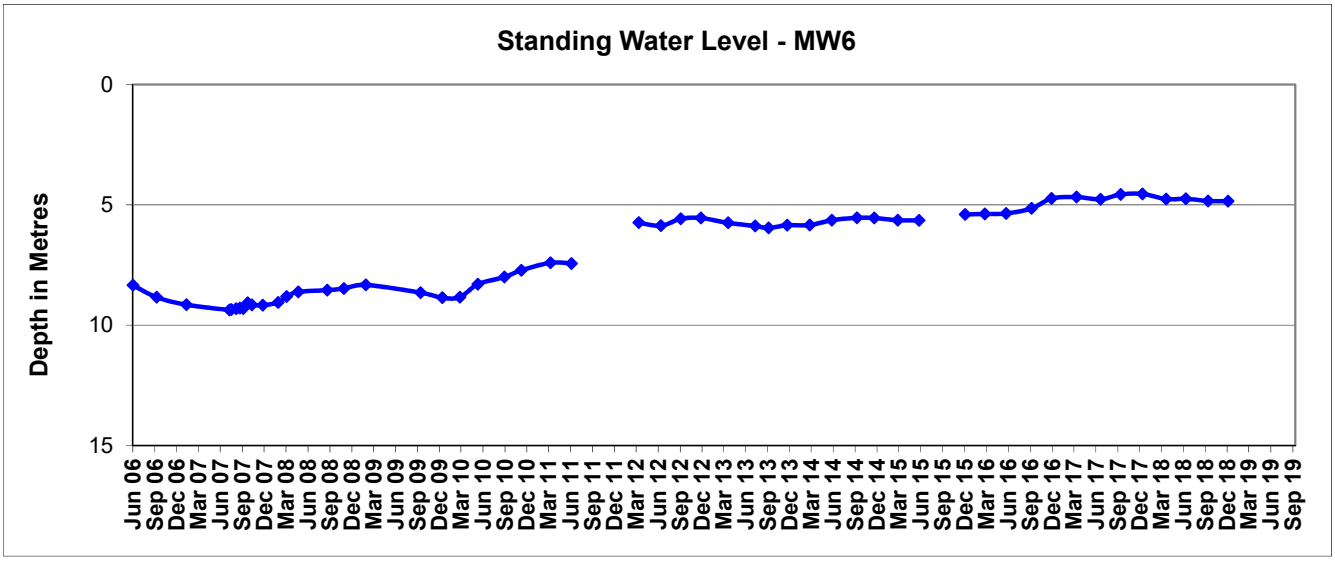
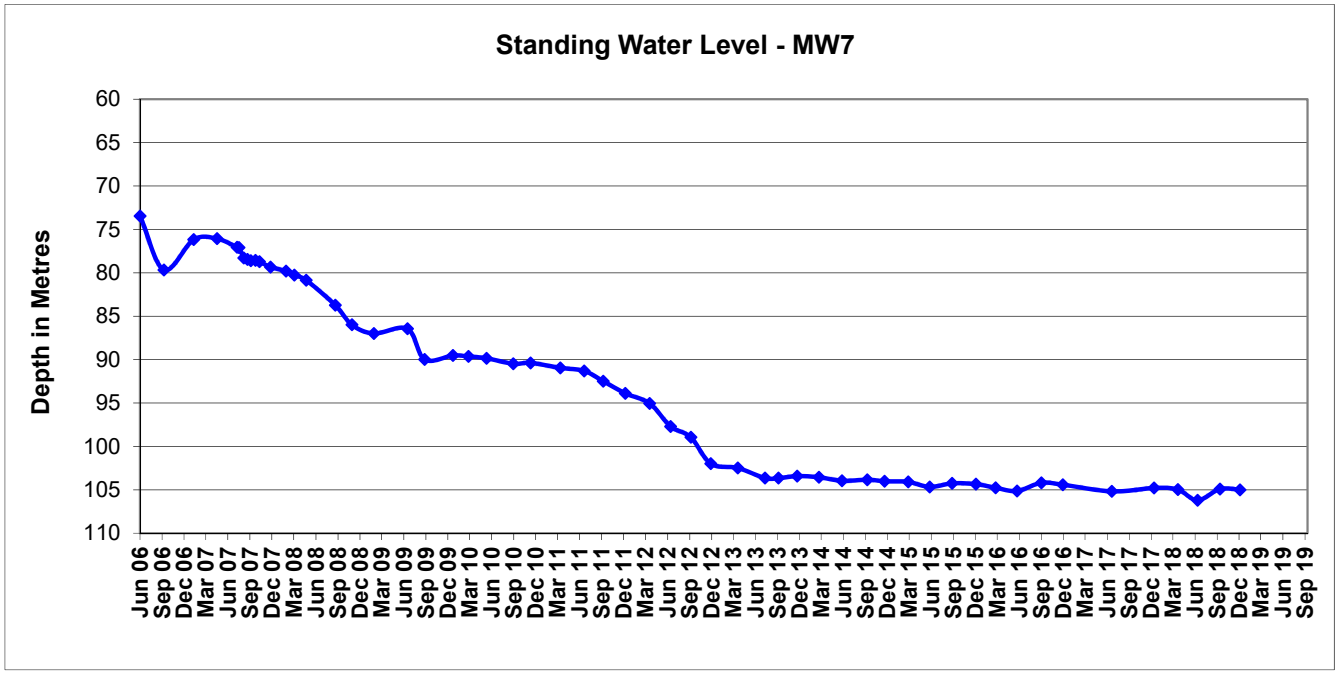
Jun 19
Sep 19







Not monitored anymore- casing destroyed


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
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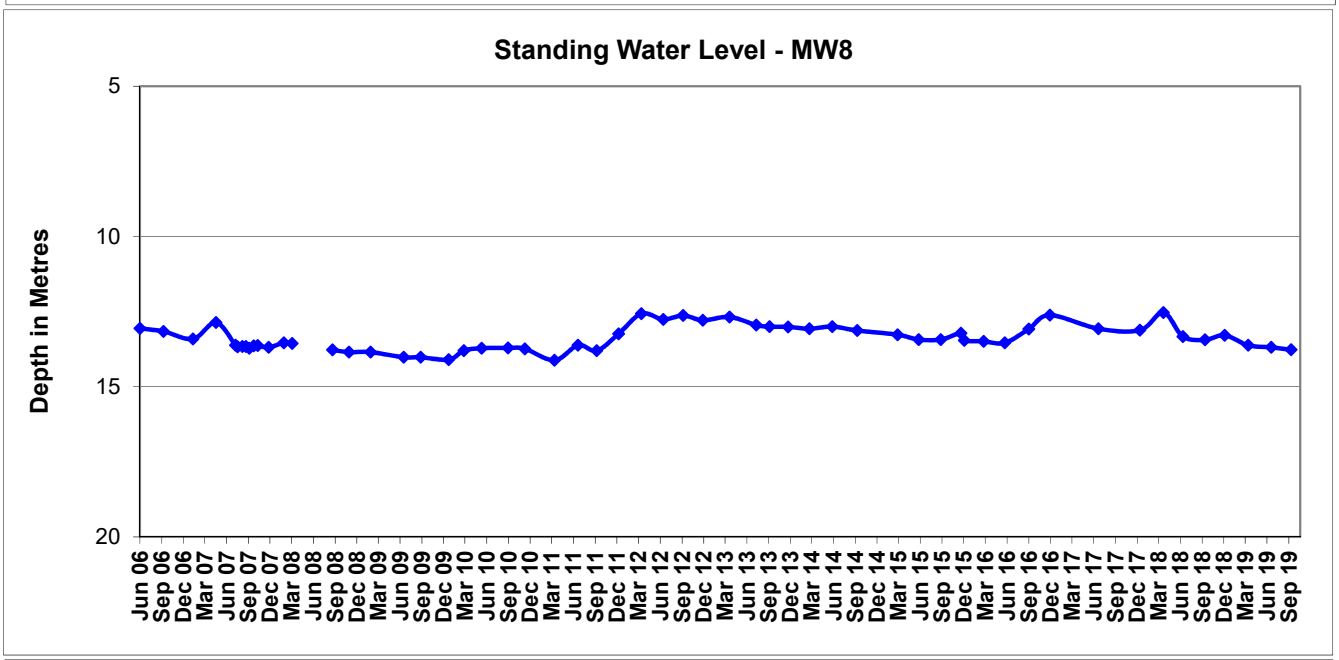
Standing Water Level - MW8
Depth in Metres
5
10
15
20
Jun 06
Sep 06
Dec 06
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Jun 08
Sep 08
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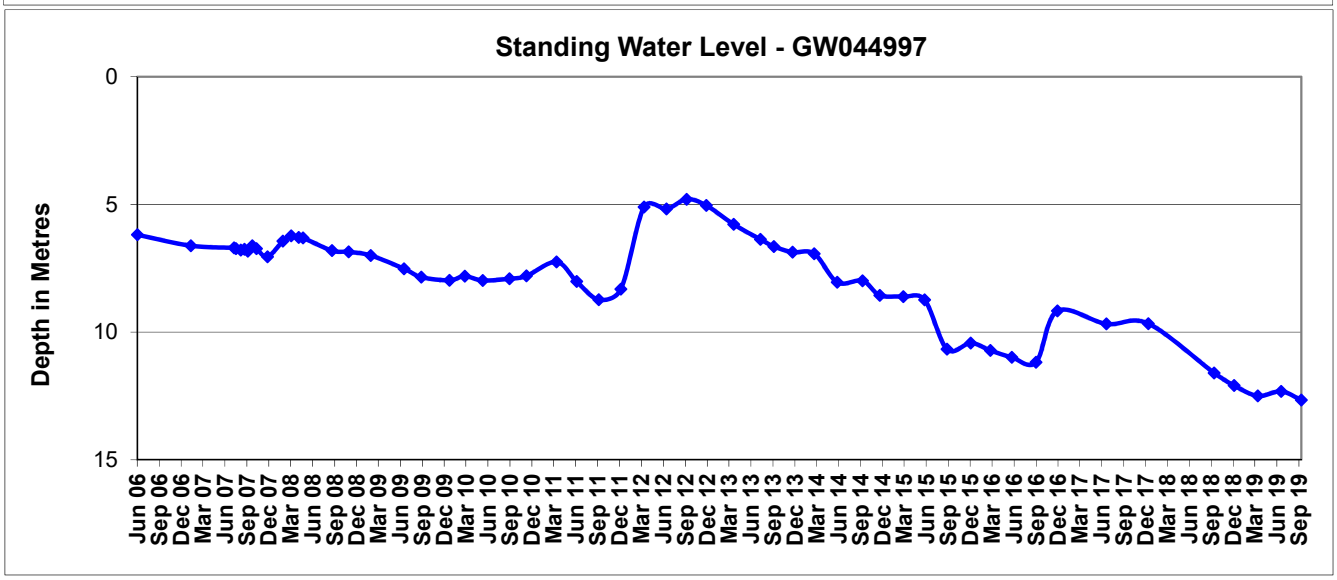
Standing Water Level - GW044997
Depth in Metres
0
5
10
15
Jun 06
Sep 06
Dec 06
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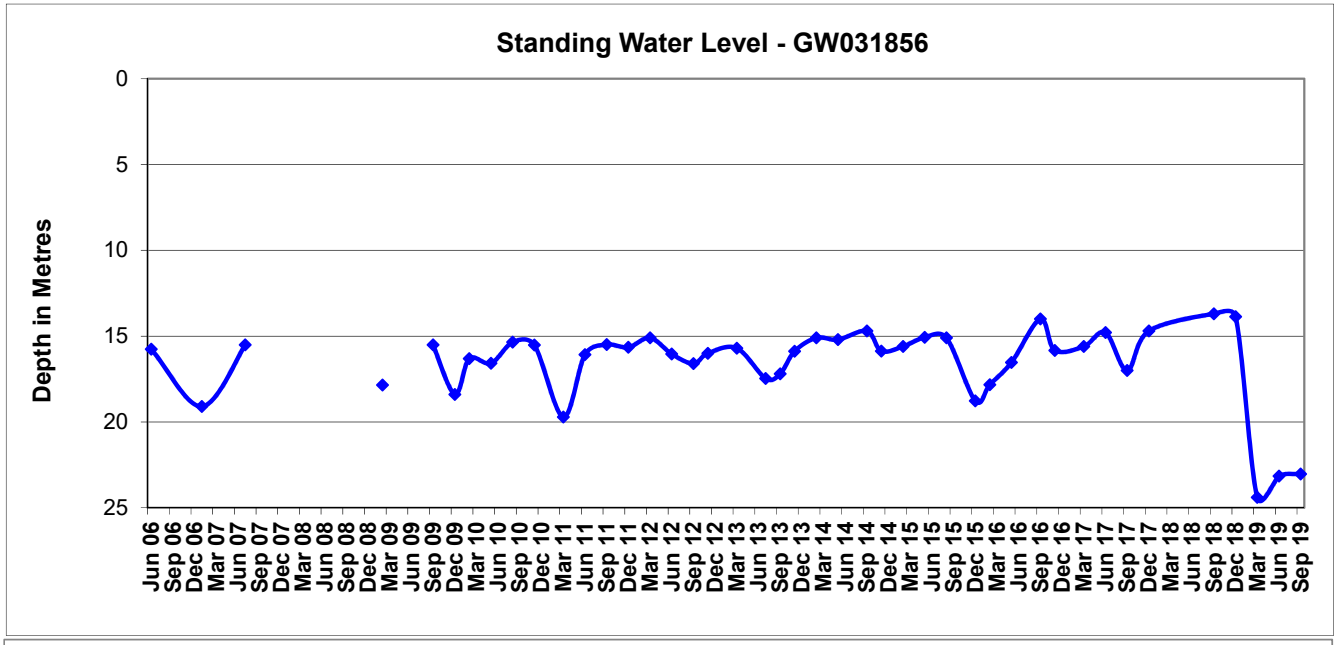
Standing Water Level - GW031856
Depth in Metres
0
5
10
15
20
25
Jun 06
Sep 06
Dec 06
Mar 07
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Mar 08
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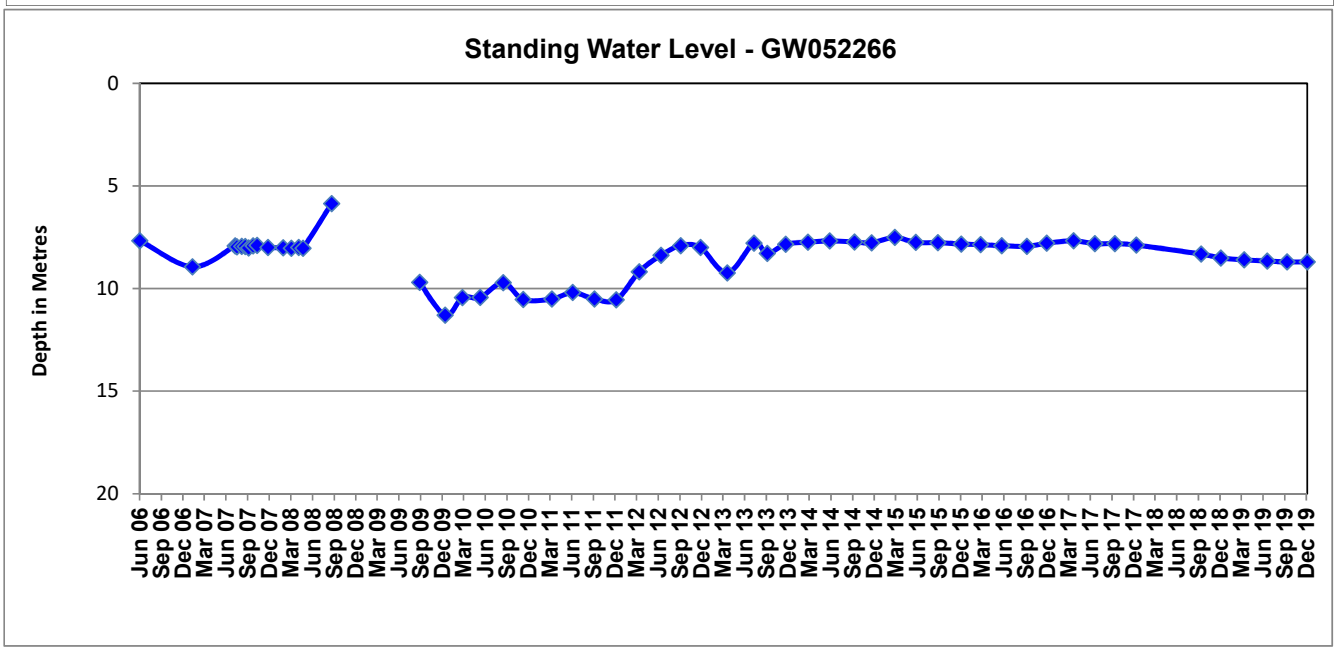
Standing Water Level - GW052266
Depth in Metres
0
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Jun 06
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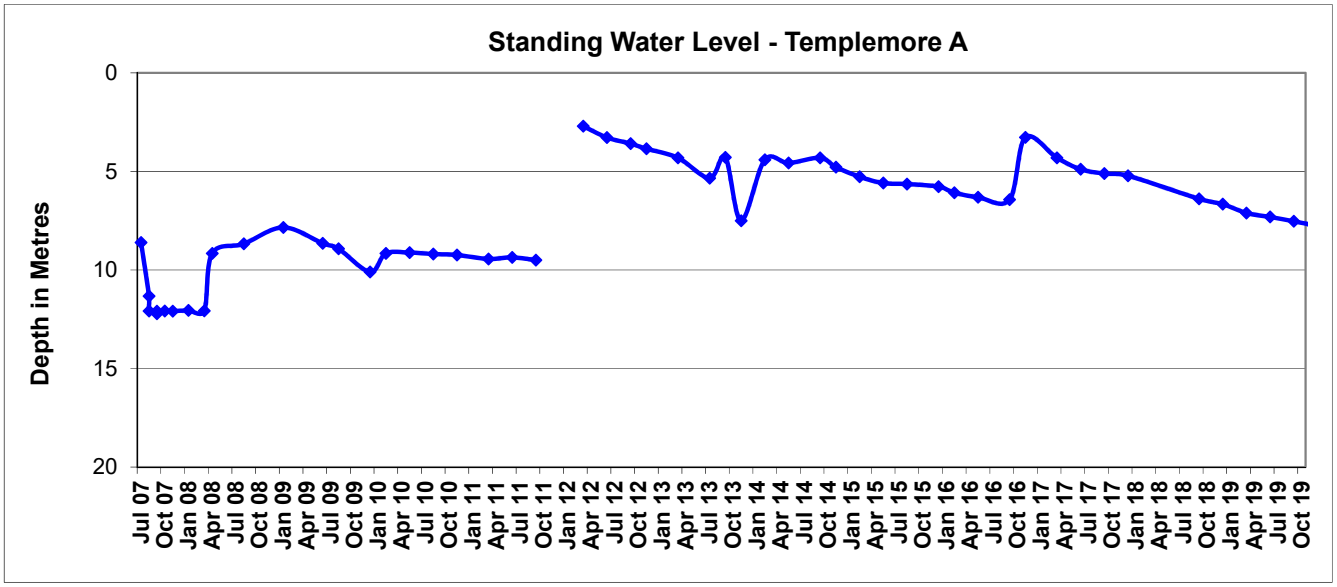
Dec 19


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
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Apr 10
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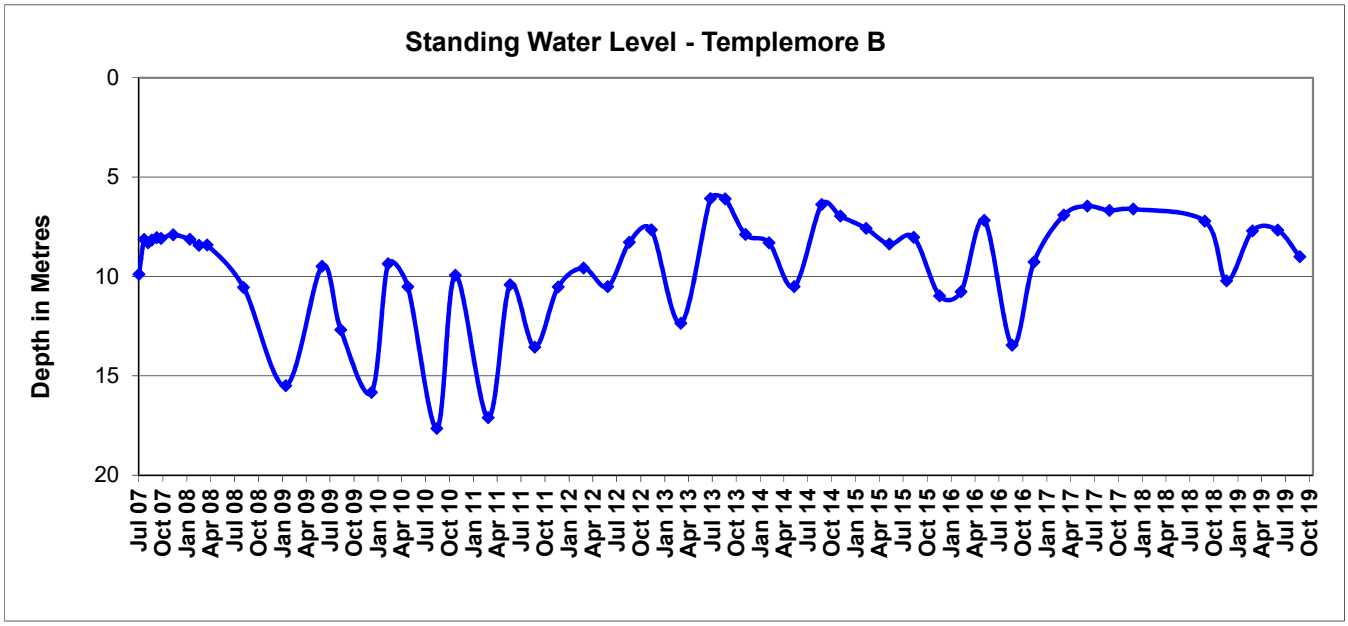
Standing Water Level - Templemore B
Depth in Metres
0
5
10
15
20
Jul 07
Oct 07
Jan 08
Apr 08
Jul 08
Oct 08
Jan 09
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Jul 09
Oct 09
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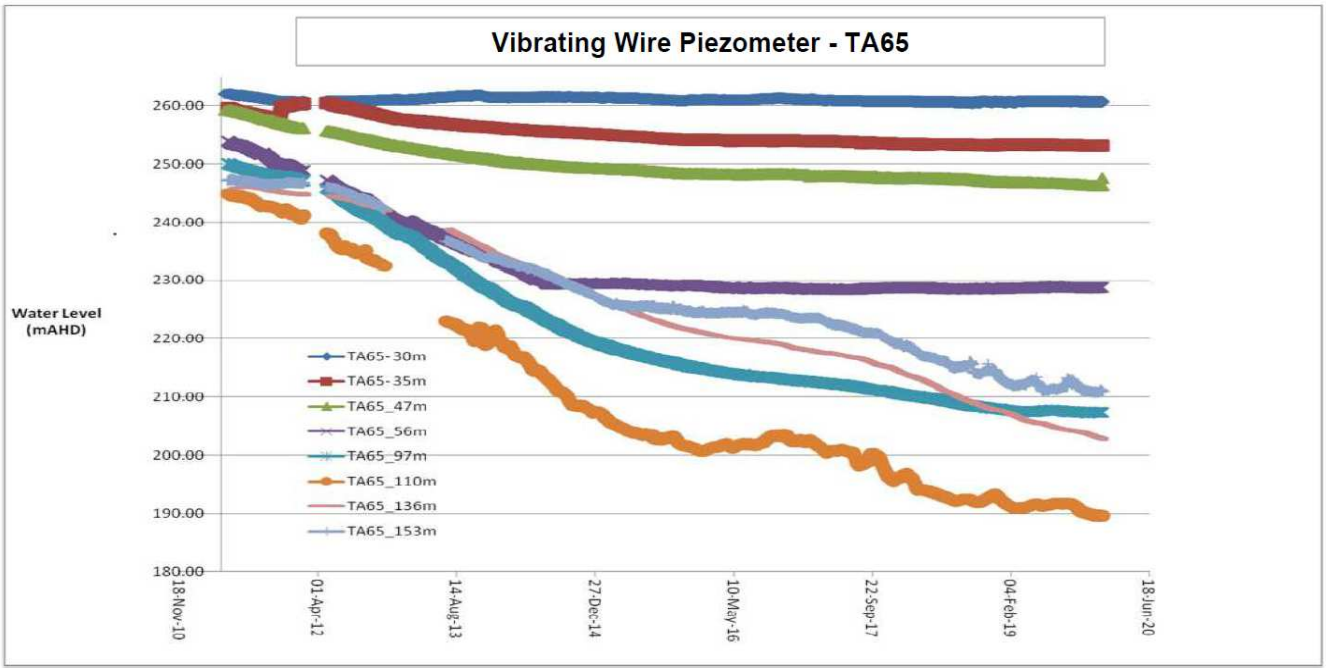
Vibrating Wire Piezometer - TA65
Water Level (mAHD)
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
TA65-30m
TA65-35m
TA65_47m
TA65_56m
TA65_97m
TA65_110m
TA65_136m
TA65_153m
18-Nov-10
01-Apr-12
14-Aug-13
27-Dec-14
10-May-16
22-Sep-17
04-Feb-19
18-Jun-20