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2018 Annual Environmental Management Report



Tharbogang Waste Management Centre

Annual Environmental Management Report 2018

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Glossary and Acronyms

Acronym	Description
AEMR	Annual Environmental Management Report
AQMP	Air Quality Monitoring Plan
ARI	Average Recurrence Interval
AUR	Auxiliary Right Turn
BOA	Biodiversity Offset Area
C&D	Construction and Demolition Waste
C&I	Commercial and Industry Waste
DoP	NSW Department of Planning
DPE	NSW Department of Planning and Environment
EA	Environmental Assessment (Balance 2009)
EPA	Environmental Protection Agency
EPL	Environmental Protection Licence (version 9-Dec-2015)
GHG	Greenhouse Gas
ha	hectare(s)
km	kilometre
LEMP	Landfill and Environmental Management Plan
LGA	Local Government Area
masl	Metres above sea level
OP	Operation Plan
MSW	Municipal Waste
NSW	New South Wales
PA	Project Approval
PIRMP	Pollution Incident Response Management Plan (Griffith City Council 2008)
POEO Act	NSW <i>Protection of the Environment Operations Act 1997</i>
SSTV	Site Specific Trigger Values
SWLMP	A Soil, Water and Leachate Management Plan
TWMC	Tharbogang Waste Management Centre

1. Introduction

This Annual Environmental Management Report (AEMR) has been prepared as a condition of Project Approval (PA) relating to the proposed extension of the Tharbogang Waste Management Centre (TWMC) (Lots 201 and 202 // DP 756035), Hillside Drive, Griffith, NSW, 2680. Tharbogang Waste Management Centre is owned and operated by Griffith City Council and is located approximately 10 km north-east of Griffith, NSW (**Figure 1.1**). A summary of the site details is included below in **Table 1.1**.

Table 1.1: Site summary

Name of mine	Tharbogang Waste Management Centre		
Titles and mining Leases	Lots 201 and 202 // DP 756035		
Operation Plan commencement date	31/12/1997	Operation Plan completion date	TBA
AEMR commencement date	1 January 2017	AEMR end date	31 December 2017
Name of land owner and operator	Griffith City Council		
Site contact	John Roser – Waste Operations Manager		

This AEMR provides a summary of activity, environmental performance, compliance and community relations between the period of 1 January 2018 to 31 December 2018. The AEMR includes the following:

- Description of the works completed in 2018,
- Review, summary and analysis of environmental monitoring results that were carried out in 2018,
- Analysis of trends,
- Identification of non-compliance and assessment of measures undertaken to ensure compliance, and
- Summary of complaints received during the assessed period,

Ministerial approval was received for the expansion, as well as the landfilling and quarrying operations in July 2010.

The initial PA has undergone two modifications. Modification 1 allowed for the use of Lots 181 and 182, Deposited Plan (DP) 756035 to the immediate east of the site and was approved on 9 May 2012 (Risk Property Australia 2018). As part of Modification 1 the offset value for the TWMC was also re-negotiated.

Modification 2 included an increased extraction volume from the existing quarry; changes to the extraction sequence for quarry pits 101 and 103; and the location of a new Green Waste Stockpile site on a capped part of former asbestos disposal site, in the north-east corner of Lot 202 DP 756035. This modification was approved on 22 July 2014 (Risk Property Australia

2018). A new filling sequence for the new landfill development was also approved as part of this modification.

The PA requires an updated Environmental Protection Licence (EPL) from the Environmental Protection Agency (EPA).

Under the PA, Under the PA, there is approval to operate in the new approved sites until 31 December 2035. Within a calendar year the site must not extract more than 315,000 tonnes per year of gravel materials, or, receive more than 35,000 tonnes of general solid waste.

The existing landfill and quarry are within a natural depression in the centre of the site. The current site footprint is approximately 120 Most of the site is vegetated with a sparse cover of native trees and grasses, with weeds and regrowth dominating areas which have been previously cleared. Previously, a speedway (Blue-dot speedway) was in the south eastern section of the site but was closed in 2010.

There are five permanent residences located within 1.5 km of the western boundary of the site. The surrounding areas are primarily rural/agricultural comprising pastoral grasslands and orchards.

1.1 Regulatory framework

Project Approval for the expansion of the site was granted by the Minister for Planning (MP_06_0334) on 8 July 2010. The expansion includes landfilling of the existing quarry, two additional quarry pits (pit 103 and pit 101), two additional leachate ponds, a waste transfer station, a stormwater detention pond and minor works (**Figure 1.2**). The use of Lots 181 and 182 (DP 756035) as a Biodiversity Offset Area was approved on 9 May 2018.

This AEMR has been prepared to meet with Schedule 5, Condition 4 of the Project Approval (PA):

'Within 12 months of the date of this approval, and annually thereafter, the Proponent shall submit and AEMR to the Director-general and relevant agencies. This report must:

- a) *Identify the standards and performance measures that apply to the project;*
- b) *Describe the works carried out in the last 12 months and the works that will be carried out in the next 12 months;*
- c) *Include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;*
- d) *Include a summary of the monitoring results for the project during the past year;*
- e) *Include an analysis of these monitoring results against the relevant:*
 - a. *Impact assessment criteria/limits;*
 - b. *Monitoring results from previous years; and*
 - c. *Predictions in the EA;*
- f) *Identify any trends in the monitoring results over the life of the projects;*
- g) *Identify any non-compliance during the previous year; and*
- h) *Describe what actions were, or are being, taken to ensure compliance.'*

1.1.1 Project Approval

The compliance requirements that are associated with the PA are summarised in **Table 1.2**. The table provides references to the relevant section of this AEMR which contains an assessment of the relevant criteria, monitoring results and a compliance assessment.

Table 1.2: Project Approval conditions summary (Application No: 06_0334)

Compliance Condition	Project Approval Compliance Requirement (06_0334)	Section of AEMR
Schedule 2: Administrative Conditions		
7	Quarrying and landfilling may be undertaken until 31 December 2035.	4.1
8	No more than 315,000 tonnes per year of gravel materials shall be extracted, and no more than 35,000 tonnes per year of general solid waste be received.	4.1 and 4.2
12	All plant equipment shall be maintained and operated in a proper and efficient condition / manner.	4.1
Schedule 3: Specific Environmental Conditions		
1	Only waste authorised by the EPL shall be received by the site.	4.2
2	All waste outputs should be disposed of at a suitably licenced facility.	4.2
3	All waste generated during construction must be classified and disposed of according to DECCW's <i>Waste Classification Guidelines, Part 1: Classifying waste</i> .	4.2
4	Suitable procedures are in place to ensure that the site does not accept prohibited waste, incoming waste loads are screened, appropriate documentation of all waste sludges and waste s that are controlled under a tracking system and adequate training to recognise and handle hazardous or unapproved waste.	4.2
6	A waste monitoring program must be prepared to the satisfaction of the DG and implemented prior to commencement of operations.	4.2
7	Prescribes landfill criteria including revegetation and systematic filling and management of landfill cells.	4.3
8	The site surrounding the landfill must be kept secure and locked when unattended.	4.1 and 4.18
9	Existing litter shall be removed, mesh fencing 1.8 m high shall be installed around the site and the site will be inspected daily with a minimum of a weekly litter removal.	4.1 and 4.14
10	Pests, vermin and noxious weeds (now priority weeds under the <i>Biosecurity Act 2015</i>) on site are managed and inspected regularly.	4.4
11	Composting is undertaken in accordance with <i>Australian Standard AS 4454-2003</i> .	4.13
12	A feasibility report outlining options to capture and use greenhouse gas in the generation of electricity is to be prepared within 5 years of PA.	4.13

Compliance Condition	Project Approval Compliance Requirement (06_0334)	Section of AEMR
13	The existing Landfill Environmental Management Plan is updated within 6 months of the PA.	4.3
14	When discharging, the Proponent will comply with section 120 of the <i>Protection of the Environment Operations Act 1997</i> (POEO Act) unless expressly provided for by an EPL.	4.5
15	Stormwater will be controlled and diverted through appropriate erosion and sediment control/pollution measures.	4.5
16	On site sewerage shall be managed and comply with the <i>Environment and Health Protection Guidelines – On-site Sewage Management for Single Households (1998)</i> .	4.5
17	Water that has come in contact with waste must not be discharged from the site.	4.5
18	Prescribes leachate management criteria.	0
19	All above ground tanks and vats are to be stored and handled in accordance with the relevant criteria.	4.17
20 to 26	A Soil, Water and Leachate Management Plan must be prepared and implemented which must include a site water balance, erosion and sediment control plan, stormwater management scheme, surface water monitoring program, ground water and leachate monitoring program and surface water, groundwater and leachate response plan. SWLMP to be provided to DG for approval within 6 months of PA.	4.5, 4.6 and 4.7
27	A meteorological station must be established and maintained in the vicinity of the development in accordance with the <i>Approved Methods for Sampling Air Pollutants in NSW</i> guideline	4.8
28	Prescribes maximum noise limits.	4.9
29	Prescribes quarrying and landfilling operating hours.	4.1
30 and 31	Prescribes blasting criteria, airblast overpressure limits and ground vibration thresholds.	4.10
32 and 33	Prescribes blasting hours and frequency	4.10
34	Requires that blasting is not undertaken within 200 m of privately-owned land unless suitable arrangements have been made	4.10
35 and 36	Requires that all landholders within 500 m are advised of proposed blasting activities and prior to 30 November 2010 these owners are entitled to a property inspection. In the event that a written request of a property inspection, the inspection shall be undertaken by a suitably qualified person.	4.10
37	Prescribes the investigation process following landholder claims of property damage as a result of blasting.	4.10

Compliance Condition	Project Approval Compliance Requirement (06_0334)	Section of AEMR
38	A Blast Management Plan must be prepared and implemented prior to 30 November 2010.	4.10
39	Prescribes continuous improvement criteria of blasting and noise impacts.	4.9 and 4.10
40	A Noise and Vibration Monitoring Plan must be prepared and implemented. This will include annual attended noise monitoring, traffic noise monitoring, details of how noise performance is monitored and a noise monitoring protocol.	4.9 and 4.16
41	Tables 5, 6 and 7 prescribe Air Quality criteria not to be exceeded.	4.11 and 4.12
42	Requires that odour complies with section 129 of the <i>POEO Act</i> unless expressly provided in the EPL.	4.12
43	An Air Quality Monitoring Plan must be prepared and implemented. The plan will include details of how air quality performance will be monitored and a protocol for evaluating compliance.	4.11 and 4.12
44	Requires continuous improvement of dust mitigation measures.	4.11
45	Table 8 prescribes Biodiversity Offset Requirements	4.4
46 and 47	Requires a revision of the Biodiversity Offset Strategy and that the strategy be implemented prior to any clearing on site.	4.4
48	A Landscape and Biodiversity Management Plan must be prepared and implemented. This must be prepared by a qualified person, be submitted to the Director-General and include a Rehabilitation and Biodiversity Offset Strategy Management Plan and a Long Term Management Strategy.	4.4 and 4.14
49 and 50	Prescribes Landscape and Biodiversity Management Plan criteria and Long-Term Management Strategy criteria	4.14
51 and 52	Prescribes criteria for the rehabilitation bond.	4.14
53	A Cultural Heritage Management Plan must be prepared and implemented and prescribes criteria for the plan. This plan must be prepared in consultation with DECCW and local Aboriginal communities, draw on relevant recommendations for management and include description of measures that would be implemented.	4.15
54	A Traffic Management Plan must be prepared and implemented and prescribes criteria for the plan. This plan must be prepared in consultation with RTA, outline measures to manage traffic issues, review standard of access roads, outline dust mitigation measures and outline rubbish management from vehicles.	4.16

Compliance Condition	Project Approval Compliance Requirement (06_0334)	Section of AEMR
55	Requires that the Auxiliary Right Turn (AUR) at the intersection of Access Road and the Kidman Way be upgraded within 12 months of operations commencing on site.	4.16
57	All loaded vehicles must be covered when travelling to and from the site and that loaded vehicles are cleaned of material when leaving the site.	4.16
58	A logbook of the extraction quantities and traffic movements must be kept on site and available for inspection.	4.16
59	Storage, handling and transport of fuels and dangerous goods is to be conducted in accordance with the relevant Australian standards.	4.17
60 (b)	Prescribes fire management criteria.	4.18
61	Prescribes criteria for recording of annual production data and the inclusion of this data in the AMER.	4.1
Schedule 4: Additional Procedures		
1	Requires that the Director General and affected landowners and tenants are notified if the monitoring in Schedule 3 identifies the impacts generated are greater than the relevant criteria. Quarterly monitoring results shall be provided to each of these parties until results indication that the project is complying with the relevant criteria.	4.18
2-5	Prescribes the criteria for an independent review.	NA
Schedule 5: Environmental Management, Reporting and Auditing		
1	<p>An Environmental Management Strategy must be prepared and implemented. This strategy must provide strategic framework, identify statutory approvals that apply to the project, describe the role of key personnel involved in the management, describe the procedures to:</p> <ul style="list-style-type: none"> • Keep local community and relevant agencies informed about the operation and environmental performance, • Receive, hand, respond to and record complaints • Resolve any disputes that may arise during the course of the project, • Respond to any non-compliance, and • Respond to emergencies <p>Additionally, copies of the strategies, plans and programs must be included in the strategy and a clear plan depicting all monitoring being carried out within the project area.</p>	Not addressed
2	Within 24 hours of an exceedance of the limits/performance criteria in this PA or the occurrence of an incident that causes or may cause material harm to the environment the Department of Planning and other relevant agencies of the exceedance/incident must be notified.	4.18

Compliance Condition	Project Approval Compliance Requirement (06_0334)	Section of AEMR
3	A written report must be provided to the Department of Planning and other relevant agencies of an exceedance/incident within 6 days of the incident. The report must describe the date, time and nature of exceedance/incident, identify the cause, describe what action has been taken and proposed measures.	4.18
4	Prescribes criteria for the AEMR.	This report
5-7	Prescribes criteria for the independent environmental audit.	NA
8	Within one month of approval of strategies/plans/programs or the completion of audits or AEMR, copies of the relevant documents must be provided to the relevant agencies and that copies are made publicly available on its website and at the site.	4.1
9	During the project the proponent must make a summary of monitoring results required under this approval publicly available on its website and update these results on a regular basis	4.1
10	A community education program must be prepared and implemented. This program should focus on promoting resource recovery activities, community benefits of composting food and garden waste and the importance of food waste recovery.	3.3

1.1.2 NSW EPA Environmental Protection Licence

All operations are regulated under the *Environmental Protection Licence No. 5875 (EPL) (2015)*, which has been summarised in **Table 1.2**. The EPL has been issued for all extractive scheduled activities. The most recent licence variation occurred on 9 December 2015.

Table 1.3: Environmental Protection Licence (EPL no. 5875) compliance conditions.

Compliance Condition	EPL Compliance Requirement (No. 5875)	Section of AEMR
Condition P1.1 and 1.2	Groundwater Quality Monitoring (EPA points 1, 3-7) Surface Water Quality Monitoring (EPA point 8) Leachate Runoff (EPA point 9)	4.5, 4.6 and 4.7
Condition L1.1	Requirement to comply with section 120 of the POEO Act – prohibition of the pollution of waters.	4.5
L2.1	Lists the type of waste permitted to be received at the TWMC	4.2
L2.2	The total tonnage of waste disposal must not exceed 100,000 tonnes per year.	4.2
L2.3 and L2.4	Prescribes criteria for the disposal and storage of tyres.	4.2
L3.1 and L3.2	Prescribes noise limits.	4.9
L4	Prescribes blasting criteria.	4.10

Compliance Condition	EPL Compliance Requirement (No. 5875)	Section of AEMR
L5	Prescribes hours of operation.	4.1
O1, O2 and O3	Activities must be undertaken in competent manner (O1), plant and equipment must be maintained and operated in a proper and efficient manner (O2) and activities must be undertaken in a manner which minimises dust emission (O3).	4.1 and 4.11
O4	Outlines the emergency response procedures for fires.	4.18
O5.1	Sedimentation basin and leachate holding pond must be maintained to ensure their design capacity is available for stormwater and leachate.	4.5 and 4.7
O5.2	Perimeter of areas where waste has been landfilled must be contoured to prevent stormwater running onto these surfaces from all storm events less than or equal to a 1 in 10 year, 24 hour duration storm event.	4.5
O5.3 -O5.7	Outlines the measures to be implemented to prevent unauthorised entry.	4.1
O5.8	Requires that the litter management program specified in the LEMP be implemented.	4.14
O5.9	Requires that pests, vermin and weeds be controlled.	4.4
O5.10	Outlines staff training requirements	4.1
O6.1 – O6.5	Outlines leachate management and disposal requirements	4.7
O6.6, O6.7 and O6.8	Outlines waste screening and compaction requirements.	4.2
O6.9	Waste disposal must follow the filling plan.	4.3
O6.10 and O6.11	Prescribes requirements for completion of landfill cells.	4.3
O6.12	Requirements for closure plan.	4.14
O6.13	Prescribes criteria for burning of waste.	4.2
O6.14 and O6.15	Prescribes criteria for covering of waste.	4.3
O6.16 and O6.17	Biosolids and green waste must be stored on an impermeable pad with a bunded area capable of capturing all leachate in accordance with the EPL performance conditions.	4.2
M1	Includes criteria for the recording of monitoring data.	4.1
M2	Prescribes requirements to monitor the concentration of pollutants to be discharged.	4.5

Compliance Condition	EPL Compliance Requirement (No. 5875)	Section of AEMR
M3	Monitoring of concentration of a pollutant discharged must be undertaken in accordance with the Approved Methods Publication unless alternative methods has been approved.	4.5 and 4.6
M4 and M5	Prescribes pollution complaint criteria and telephone complaint criteria.	3
M6.1	Remaining disposal capacity of landfill must be monitored.	4.3
R1	Outlines the annual returns document requirements.	4.18
R2	EPA must be notified of incidents of environmental harm.	4.18
R3	A written report must be produced if requested regarding and event (caused, causing or is likely to cause material harm to the environment).	-
R4.1 – R4.2	Criteria for recording fires	4.18
R4.3	The annual report for TWMC must be prepared and submitted within 6 weeks after the end of licence year.	-

All assessments are in relation to the PA, EPL and Environmental Assessment (EA) guidelines. The landfills environmental goals are listed in *Environmental Guidelines: Solid Waste Landfills* (EPA 2016) and have been reviewed for landfill operations.

1.1.3 Environmental Assessment mitigation and management commitments

The PA indicates that *the statement of commitments contained in Section 9 of the EA (Balance 2009) have been updated and amended to reflect the revised project description and to take into account submissions received during the EA. Appendix 2 of the PA supersedes and replaces Section 9 of the EA.* The revised commitments are included in **Appendix A**.

The PA states that the predictions in the EA (Balance 2009) need to be compared against the monitoring results.

1.1.4 Actions required from previous AEMR

The 2018 AEMR is the second report with the following actions identified in the 2017 AMER for action:

Conditions requiring the development and implementation of a community education program and an indication of landholder consultation were not assessed in the 2017 AMER due to insufficient information provided during the reporting period. Further clarification is needed to determine if these requirements have been met.

A compliance assessment found that the TWMC had a moderate level of compliance with the PA and EPL conditions and EA revised statement of commitments in the 2017 AMER. Several compliances were unable to be adequately assessed due to insufficient information and 21 non-compliances were identified across each of the fields. Notably, there was a large amount of information still required to assess compliance for incident management and response.

There was an absence of the following information and / or monitoring data (this list is not exhaustive and the compliance table in each relevant section of the 2017 AMER should be referred to):

- Noise monitoring data
- Odour monitoring data
- Annual production data using the standard form (this needs to be in this AEMR)
- No information regarding a community education and consultation with landholders
- No information available regarding inductions, refresher training and some logbooks
- No copies of licences from other facilities provided for the AEMR.
- The scarred tree exclusion zones have not been implemented
- Traffic volumes and vehicle types have not been provided and no logbooks of traffic movement provided
- No evidence that the storage, handling and transport of fuels and dangerous goods is conducted in accordance with AS 1940 and 1596.
- No indication of what dangerous goods are present on site has been provided for this reporting period

Non-compliance was not recorded for any of the following categories although several had conditions for which insufficient information was available to adequately assess compliance and / or conditions that were not yet triggered:

- Landfilling
- Groundwater
- Leachate
- Meteorological
- Noise and vibration
- Dust
- Odour
- Rehabilitation and Land Management
- Dangerous Goods

It was recommended that the compliance tables in Section 4 of the 2017 AEMR are used as a 'checklist' for future compliance and ensuring conditions are met as additional criteria are triggered (blue).

Areas of non-compliance (red) were flagged to be addressed promptly and areas where insufficient information was available (white) be reviewed by Council. Where data is available it was recommended that it should be reviewed to identify areas of non-compliance or provide the relevant information to enable the assessment of compliance to be revised.

1.1.5 Management plans and monitoring programs / reports

Several management plans have been prepared for the site. These have been prepared in accordance with the conditions of consent and the PA:

- Pollution Incident Response Management Plan (PIRMP)
- Waste Monitoring Program
- Waste Screening & Tracking Program
- Landfill & Environmental Management Plan
- Soil, Water & Leachate Management Plan
- Noise & Vibration Monitoring Program
- Noise Monitoring Report
- Air Quality Monitoring Program
- Transport Management Plan
- Cultural Heritage Management Plan
- Landscape & Biodiversity Plan
- Independent Environmental Audit
- Blast Management Plan
- Annual Tharbogang Offset Monitoring 2016, 2017 and 2018

1.1.6 Compliance assessment

Each relevant section is reviewed to determine compliance with the regulatory framework. The categories presented in **Table 1.4** have been allocated to the compliance assessment.

Table 1.4: Compliance assessment criteria.

Compliance	Colour	Description
Yes	Green	Meets the criteria specified.
Partly	Orange	Some aspects do not meet the relevant criteria and further improvement is needed.
No	Red	Does not meet the criteria specified.
Undetermined	White	Unable to determine with current data.
Not triggered	Blue	Condition not triggered yet as works in this area have not began



Figure 1.1: Site location.

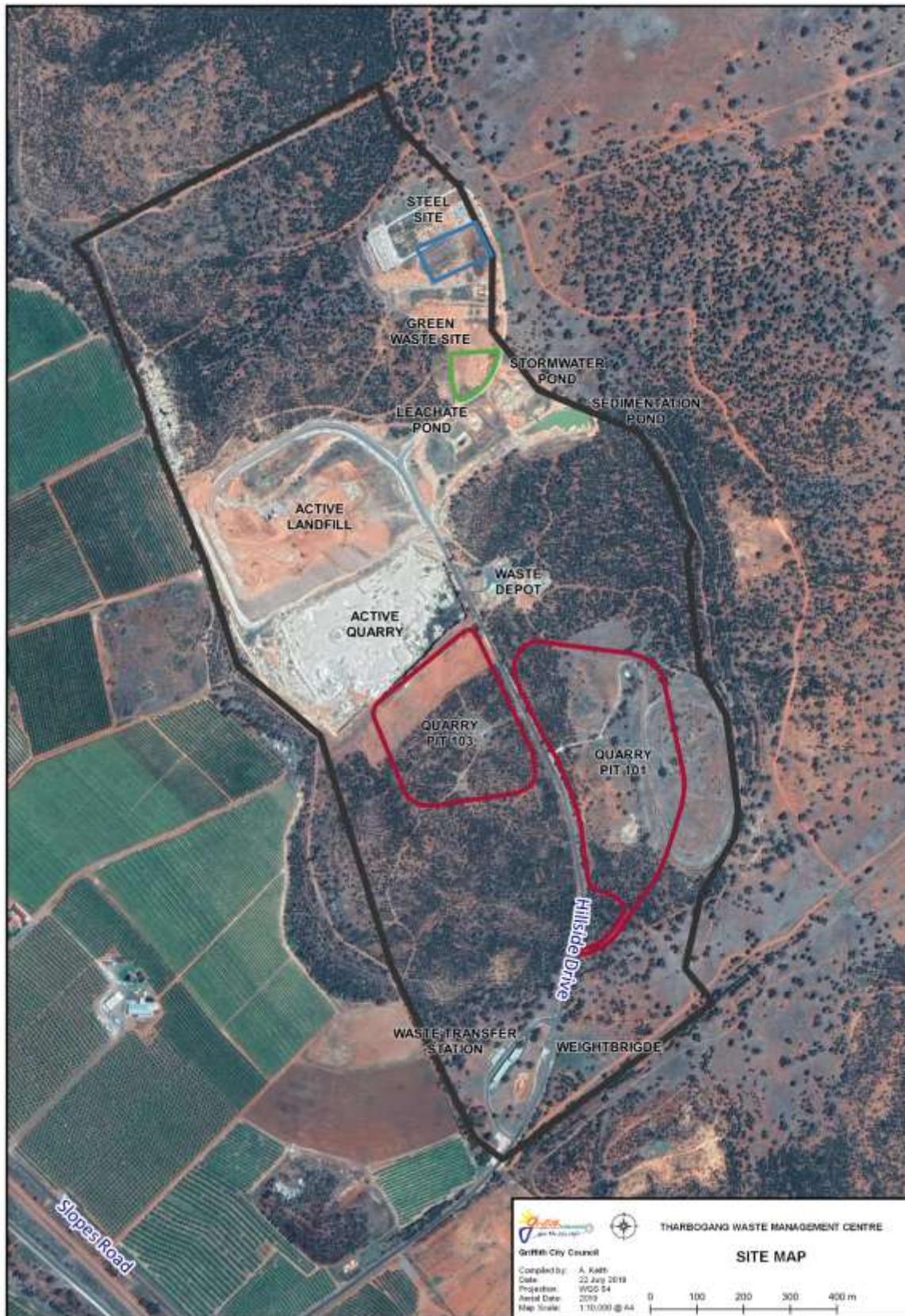


Figure 1.2: Project layout

2. Landfill and quarry operations

The following section summarises the work completed, data collected during the reporting period and any work planned for the next monitoring period.

2.1 Production data

Waste to landfill was 29,129 tonnes in 2018, 31,537 tonnes in 2017 and 25,505 tonnes in 2016. Recycled waste is also reported in this manner, which was 797 tonnes in 2018, 303 tonnes in 2017 and 398 tonnes in 2016. **Table 2.1** below includes a breakdown of the waste received at TWMC over the past four years.

Table 2.1: Waste received at TWMC

Activity	2015	2016	2017	2018
Waste leaving landfill (steel, tyres, green waste, oil, mattress) - recycling	430.0	398.3	303.3	797.1
Gravel	16,665.6	50,361.9	45,942.9	8,360.6
MSW	8,599.2	8,763.8	8,477.6	8,348.7
C&D	5,642.02	5,284.8	11,446.0	8,124.8
Green waste	1,134.8	1,016.8	2,621.4	1,344.6
C&I	11,606.07	11,456.4	11,614.2	12,655.9
Clean fill	0	0	631,330.8	29,393.08
Total waste in landfill	25,847.3	25,505.1	31,537.8	29,129.4

Quarry extraction figures for the past four years are included below in **Table 2.2**.

Table 2.2: Quarry extraction figures

Year	Extraction figures
2015	16,665.6
2016	50,361.9
2017	45,942.9
2018	8,360.6

2.2 Work completed this reporting year

The following activities have been completed at TWMC during 2018:

- Weed control spraying was undertaken at the landfill site only during 2018
- Formalisation of major landfill drainage works (installation of rock pitching) was completed in January 2018 (**Figure 2.1**).
- The sealing of land fill access road (Spiral Road) was also completed during this reporting period (17 April 2018) (**Figure 2.2**).



Figure 2.1: Formalisation of the culvert with rock pitching



Figure 2.2: Sealed Spiral Road

2.3 Works scheduled

The following works schedule is an estimate only (Property Risk Australia 2018):

- Construction of the new green waste stockpile site: 2019 - 2020 (financial year);
- Construction of the new leachate ponds: 2020 - 2021 (financial year);
- Landfilling within the existing quarry: 2030 (calendar year);
- Quarrying within Pit 101: 2030 (calendar year)
- Quarrying within Pit 103: More than 20 years.
- Sealing of 500 m of access road which was previously gravel.
- Construction of new Landfill Cell 19/20 (financial year)

2.4 Hours of operation

The licenced hours of operation for the TWMC are in the PA and EPL. The EPA was contacted to verify the discrepancy between the operation and blasting hours listed in the PA and EPL and it was advised that the EPL conditions would apply.

Currently the landfill operates from 8:00am to 5:00pm 7 days per week. Licenced quarry operations are presented in **Table 2.3**.

Table 2.3: Licenced hours of operation as per the EPL

Activity	Day	Licenced operating hours
Landfilling operations and quarrying operations	Monday – Friday	6:00am to 5:30pm
	Saturday, Sunday and Public Holidays	8:00am to 6.30pm
Blasting (once monthly)	Monday – Saturday	9:00am to 5:00pm
	Sundays or Public Holidays	Not permitted.

2.5 Environmental performance

Several monitoring programs and management plans have been prepared for the TWMC, see **Section 1.1.5**.

The EPL requires that the results from any monitoring conducted by this licence, or, a load calculation protocol, be recorded and retained. To minimise environmental harm, a Pollution Incident Management Plan (PIRMP) (Griffith City Council 2018a) has been prepared for the site. This plan defines what a pollution incident is, the likelihood of occurrence and pre-emptive actions to be taken. Pollution incidents are categorised as either Air, Water, Noise or Land pollution incidents. Previous risk assessments of the likelihood of each pollution incident occurring has been assessed, they concluded that all pollution incident categories have a low likelihood of occurring and are actively regulated by the EPL.

2.5.1 Waste

Waste is managed in accordance with the TWMC Waste Monitoring Program and Waste Screening & Tracking Program.

Waste brought to the landfill site is weighed and checked at the weighbridge by staff. The staff member allocates the waste into a category and directions are provided to the appropriate area to unload the waste. Data regarding the vehicle registration, customer details and destination of the waste (i.e. landfill, recycling, quarry, service vehicles) is entered into a database.

The TWMC does not receive any trackable wastes nor any waste sludges as they are not permitted under their EPL, except for asbestos. Asbestos is received but is only trackable when conveyed across state borders which is unlikely to be brought to TWMC (CPE 2011b).

For vehicles taking recovered or processed materials away from the TWMC, the procedure is similar to that used for vehicles entering except when the vehicle is heavier upon exiting. The difference in entry and exit weight is the weight of materials leaving the site. The material type is documented so a record of material movements can be kept. For quarry materials, an invoice is also generated (CPE 2011b).

All weighbridge data is stored in an electronic database. A record of the training provided for all staff and the competencies achieved are kept on their personal file (CPE 2011a).

Results and review of the waste environmental performance is addressed in **Section 4.2**.

2.5.2 Landfill and Environmental Management Plan (LEMP)

A Landfill and Environmental Management Plan (LEMP) (Griffith City Council 1999) has been developed for TWMC to provide an operational design model to document work practices. This plan sets out work practices and priorities towards achieving environmental goals, compliance with statutory obligations, public safety, waste minimisation, conserving of land resources, provision of a quality service in a cost effective manner, monitoring of operations and impacts upon the environment and progressive site rehabilitation and post closure development. The landfill is intended for the reception and disposal of wastes classified as 'Class 1 Inert Waste' and 'Class 1 Solid Waste'. This plan was prepared in 1997 and revised in 1999.

Results and review of the landfills environmental performance is addressed in **Section 4.3**.

2.5.3 Soil, water and leachate management

A Soil, Water and Leachate Management Plan (SWLMP) (CPE Associates 2011a) has been prepared to inform the management of surface water, groundwater, leachate, erosion and sedimentation at TWMC. Data is collected at monitoring points upstream of the site, the sediment basin and for the site. Boreholes, leachate dams and Tharbogang swamp are monitored biannually to identify potential impacts from TWMC activities.

Groundwater monitoring aims to provide long-term data from which accurate interpretation of groundwater levels and water quality can be determined. Activities that may be causing adverse impacts are identified and modified. Groundwater monitoring was undertaken at eight locations specified in the EPL. Borehole 2 is dry and no longer requires monitoring. The parameters required to be collected are shown in **Table 2.4**. Monitoring must be completed in accordance with the approved Methods Publication unless otherwise approved by the EPA.

Table 2.4: Bore Hole Pollutants required for analysis by the Environmental Protection Licence (EPL 2015)

Location	Pollutant	Units of Measure	Frequency
1, 3, 4, 5, 6 & 7	Alkalinity, Ammonia, Calcium, Chloride, Chlorinated volatile compounds, conductivity, Fluoride, Iron, Magnesium, manganese, Nitrate, Potassium, Sodium, Sulphate, Total Phenolics, Total organic carbon, pH	All mgL ⁻¹ except conductivity (µSCm ⁻¹) and pH (pH).	Biannually
8	Alkalinity (as calcium carbonate), Calcium, Chloride, Chlorinated volatile compounds, Conductivity, Fluoride, Iron, Magnesium, Manganese, Nitrate, Potassium, Sodium, Sulphate, Total Phenolics, Total Organic carbon, Total suspended solids, pH	All mgL ⁻¹ except conductivity (µSCm ⁻¹) and pH (pH).	Biannually
9	Alkalinity (as calcium carbonate), Ammonia, Calcium, Chloride, Chlorinated volatile compounds, Fluoride, Iron, Magnesium, Manganese, Nitrate, Potassium, Sodium,	All mgL ⁻¹ except pH (pH).	Biannually

Location	Pollutant	Units of Measure	Frequency
	Sulphate, Total Phenolics, Total Organic carbon, Total suspended solids, pH		

All stormwater at TWMC is contained on site. Surface water impacts include contaminated runoff and an increase in erosion in disturbed areas. There are six sources of water which need to be considered; potable water, surface drainage water, ground water, potentially contaminated stormwater, underdrain water and landfill leachate. Separate storage ponds are required for leachate and quarry/landfill runoff; these are stored in ponds as specified in the EPA guidelines for aqueous liquid treatment ponds. Landfill leachate is isolated from all other sources of runoff and contained to allow the water to evaporate. A leachate pond with a 500 KL capacity has been constructed at TWMC. Under the current landfill expansion, this pond will be expanded to a 620 KL capacity. It will be pumped back to landfill rehabilitation areas where it will be used to irrigate rehabilitated vegetation areas or to the active landfill to promote the bioreactor process. The rehabilitation areas have been designed to ensure that there is no runoff from these areas. This system will promote bioremediation of any pollutants contained in the leachate.

TWMC runoff is captured in sedimentation ponds. The storages have been designed to fully contain runoff from an ARI 1:100 year, 72 hour storm. There are three ponds on site. A sediment pond with a current capacity of 0.8 ML and two stormwater detention ponds, with a capacity of 7.0 ML and 7.8 ML. These are proposed to undergo further expansion.

Results and review of the surface water, groundwater and leachate environmental performance is addressed in **Sections 4.5, 4.6 and 0.**

2.5.4 Meteorological monitoring

Meteorological monitoring is collected by the meteorological station at Griffith Water Reclamation Plant. Use of this station was approved by DOP & EPA in September 2011 as it complied with the requirements of the PA being in the vicinity of the TWMC. The station monitors rainfall, wind speed and wind direction in accordance with the *Approved Methods for Sampling of Air Pollutants in New South Wales guidelines*.

Results and review of the meteorological environmental performance is addressed in **Section 4.8.**

2.5.5 Biodiversity

The biodiversity offset requirements for the PA are addressed in the Landscape and Biodiversity Management Plan (Ecological 2011).

Annual offset monitoring has been completed by Ecoplanning for the 2017 and 2018 monitoring period. Monitoring of the offset site complied with the Conservation Agreement.

Quarterly inspections are conducted in accordance with the Conservation Agreement and inform ongoing site management of the biodiversity offset area. Annual biodiversity monitoring and quarterly inspections are combined in an annual report.

Results and review of the biodiversity environmental performance is addressed in **Section 0.**

2.5.6 Noise and vibration

Noise and vibration impacts and exceedances relate to blasting activities and operation of the quarry plant (Balance 2009). Noise criteria is provided by the NSW Government which includes the *Industrial Noise Policy 2000* (INP), the ANZECC guidelines (2000) and the *Environmental Criteria for Road Traffic Noise for on-road traffic noise* (EPA 1999). A Noise Impact Statement was completed by Noise and Sound Services (2008). A Noise and Vibration Monitoring Plan (NVMP) was prepared by GHD in 2013 and five noise monitoring locations identified. Monitoring of vibration and airblast overpressure is to be undertaken for the first three blasts undertaken on site and annual blast monitoring. Attended vibration monitoring is not required but will be undertaken subject to any vibration related complaints.

Noise monitoring of Tharbogang Quarry Operations 18-393 was undertaken in 2018 using six sensitive receivers in close proximity to quarry operations. Monitoring was conducted at three separate times during operating hours on 11 December 2018. Both the quarry and landfill were in operation during monitoring (NGH Environmental 2019).

The results and a review of the noise monitoring program conducted during the reporting period are presented in **Section 4.9**.

2.5.7 Blasting

All blasting operations are monitored through both overpressure and ground vibrations at the closest residents to the quarry. Monitoring of these metrics is required for every blast in accordance with EPL requirements. Operations regarding blasting are outlined in the *Blasting Management Plan*, required under Section 37 (Schedule 3) of the Project Approval. A copy of the following information, relating to blasting is kept in Griffith City Council's Document Management System:

- Explosive inventory worksheet,
- Blast Pre Check,
- Toolbox Talk
- Dangerous Good Shipping Documents,
- Blast Monitor results,
- Photo of Monitor,
- Notice of Blast,
- Orica Delivery Docket,
- Blast Pattern.

The frequency of blasting is to be approximately once per month. In accordance with the EPL, blasting can be undertaken between 9:00 and 17:00 Monday to Saturday and is not permitted on Sunday or Public Holidays.

One blast event occurred on the 15 November 2018 within the existing quarry site by Milbrae Quarries. Blasting operations within pits 101 and 103 have not commenced.

The results and review of blast monitoring conducted during the reporting period are presented in **Section 4.10**.

2.5.8 Air Quality – Dust and Odour

Quarrying and landfilling may generate dust and odour. Dust baseline surveys were carried out in June 2007 (Coffey Geotechnics 2007) to determine background dust levels and comprised

four sampling events over approximately one month at one site. Air quality monitoring locations are shown in **Figure 4.22**. Air quality monitoring was undertaken monthly from September 2018

Dust

Based on the sampling carried out at TWMC and surrounding area in 2007, all recorded dust levels were below the EPA goal (4 g/m²/month) (Balance 2009: p103-104, Table 7.9 & Figure 5.4).

A dust suppression system has been installed at the quarry and has been operational since early 2013. Additional dust abatement is undertaken by a Council water cart. Water tanks have been installed on site, which are in strategic locations to minimise travel time by water carts and other water dependent vehicles. To further minimise dust, operations cease when weather conditions are not favourable. This includes periods of high winds and low visibility.

New air quality monitoring locations have been established and monitoring commenced at the locations shown in **Figure 4.22** in 2018.

Dust gauges measure the level of particulate matter in the ambient air. The NSW EPA Air quality guidelines are 4g/m²/month. Weather conditions during monitoring periods are also recorded. Sampling is to be undertaken in accordance with *AS3580.10.1 – Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gavitmetric method* (2003). Analysis of samples is typically completed by ALS, a NATA accredited laboratory as per *Australian Standard AS3580.10.1*.

Odour

An odour impact assessment was completed by Griffith City Council in 2007 (GCC 2007). This report found that the proposed expansion should have no adverse odour impacts from the expansion of the landfill.

Air Quality monitoring results are available in **Section 4.11** and **4.12**.

2.5.9 Rehabilitation and Landscape Management

Rehabilitation and landscape management primarily refers to the rehabilitation of a landfill site once it has reached capacity and the landscaping required as part of the rehabilitation process. Currently, no rehabilitation of landfill areas is being undertaken. Once completed the rehabilitation areas will be designed to ensure that there is no runoff from these areas. Other landscape management in the form of weed removal has been undertaken in this reporting period (information supplied by Griffith City Council). This is covered in more detail within the biodiversity management section of this report.

2.5.10 Heritage

A survey for Aboriginal Heritage Cultural Material was undertaken on 25-26 July 2007 by Griffith Local Aboriginal Land Council (LALC) (Balance 2009: Appendix F). Further assessment was undertaken in May 2013, for the preparation and implementation of the *Cultural Heritage Management Plan* (Black Mountain Projects 2013). No known items of Aboriginal Heritage have previously been identified within the current or proposed development area onsite. However, two scarred trees occur outside the proposed expansion area. In the event of any Aboriginal artefacts becoming uncovered, all work must cease, and the Griffith LALC and National Parks and Wildlife Service must be contacted.

2.5.11 Traffic and Transport

No traffic monitoring data has been provided for this reporting period. Noise criteria for traffic movement is provided by the EPA (1999) and a Traffic Impact Assessment undertaken by GHD in 2007. This assessment concluded that the existing road network is adequate to meet the current and future needs of the site. On site, access ways are always to be kept clear and unrestricted. Further, only authorised personnel are permitted to enter and move around the centre site. Overall, it was determined that there are likely to be no impacts to the road network or road users anticipated from the project expansion.

2.5.12 Incident management and response

Emergency responses are undertaken in accordance with the Council's 'procedure for incident management'. Incidents and accidents, including near misses which involve equipment, vehicles or materials are required to be reported to the supervisor immediately. A formal investigation and reporting of all incidents and accidents must be carried out as soon as possible.

The Pollution Incident Response Management Plan (PIRMP) (Griffith City Council 2012) prepared for TWMC provides guidelines that meet the requirement of the POEO Act and the procedures to be followed in the event of a pollution incident.

Fire management is an important consideration for the landfill site. Fire breaks surrounding infrastructure are maintained by landfill operation staff. In the event of a fire breaking out within a landfill cell, the burning waste is separated and a water cart brought in to extinguish the fire. If required, the Rural Fire Service can be called to assist. Over the reporting period, one landfill fire occurred in February 2018.

An assessment of the relevant criteria, the monitoring results and a compliance assessment are presented in **Section 4.18**.

3. Community relations

This section of the AEMR summaries community relations during the reporting year and, where applicable, provides comparison to previous years. There are five adjoining landholders around the quarry. The adjoining land to the east, north and north-west is owned by Council. Community relations are addressed in the PA, EPL and the EA.

The PA specifies several conditions regarding community relations for the site. Notification must be made to affected landholders and tenants if any impacts are generated which are greater than the relevant criteria (Condition 1, Schedule 4). During this period, quarterly results shall be provided to the landholders and tenants until compliance is reached. Further, a community education program must be prepared and implemented (Condition 10, schedule 4).

The EPL prescribes criteria for recording of pollution complaints (Condition M4) as well as for the operation of a telephone complaints line (M5). Under the EPL, a legible record of all complaints made in relation to pollution arising from any activity which is covered by the EPL.

Complaint records must be kept for a minimum of 4 years and provided upon request to any EPA officer. Additionally, a telephone complaints line must be operated during operating hours for the purpose of receiving any complaints from members of the public regarding activities conducted at the premises, by vehicles or from the mobile plant. The number must be made available to the public.

The EA recommended that ongoing and inclusive consultation with nearby landholders (A) is maintained, and that all community concerns are responded to and recorded on a complaints register (B).

3.1 Complaints received this reporting year

No complaints were received during 2018 annual reporting period. The Customer Service Call Centre is used as a telephone complaints line and all complaints are recorded on Council's Complaint Management System.

3.2 Comparison to previous year

No complaints were received during the 2017 nor 2018 annual reporting period.

3.3 Community involvement

The Utilities Committee was removed as a Council Committee back in 2017 and there has been no further community involvement undertaken in this reporting period.

As part of the RAMJO (this is a network of member councils in the Riverina area. Funding is provided by the EPA to provide a number of initiatives these include.

A "Love Food hate waste" stall where TWMC select major events in the region and an educator runs workshops based on reducing waste. There was 6 such events where this stall was set up during the reporting period.

TWMC also fund an EnviroMentors program which is run by Keep Australia Beautiful, and they go into the schools region and talk about preselected topics. During the reporting period 20 schools were visited.

At the time of reporting, no Community Consultative Committee had been formed. No further community involvement was undertaken during this annual report period.

This is no indication of publication of any community consultation documents other than information within the EA. Further, no monitoring results have been provided and there is no evidence of a community education program having been implemented.

3.4 Review

A compliance assessment has been undertaken to determine how the relevant criteria has been implemented at TWMC (**Table 3.1**). Further information is required to adequately assess the compliance in some cases.

Table 3.1: Community relations compliance assessment.

Condition	Review
Project Approval	
Criteria 1, Schedule 4	No notification was required as no impacts occurred which were greater than the specified criteria.
Criteria 10, Schedule 5	Whilst community education programs were undertaken during the reporting period, it is unclear as to whether these were education programs approved by the Director-General and considered to meet the requirements of this Condition.
EPL	
M4	No complaints were received within the reporting period. A 'Received Request Statistics' (i.e. complaints log) has been kept from July 2010 to March 2018.
M5	No telephone complaints were received during the reporting period.
EA	
A	Consultation with nearby landholders was undertaken prior to blasting.
B	No complaints have been received for the reporting period.

4. Environmental Monitoring and Management

This section summarises and reviews the environmental monitoring data obtained over the monitoring period (1 January 2018 to 31 December 2018). Any trends in the monitoring results occurring over the life of the project are identified. These results are analysed against relevant impact assessment criteria, previous years results and predictions in the EA. Green in each compliance assessment table in the sections below indicates compliance, orange partial compliance, red non-compliance, blue condition not triggered at this stage and white insufficient data to confirm compliance.

An independent environmental audit of the TWMC was undertaken by Property Risk Australia in March 2018.

4.1 Operations

Operations refers to the general day to day work completed at the site that are not specific to any other category.

4.1.1 Monitoring and management criteria

The following conditions are specified in the relevant legislation which relate to the general operation of Tharbogang Waste Management Centre.

Under the project approval:

- Current operations may be undertaken until the 31 December 2035 (Condition 7, Schedule 2).
- In a calendar year, no more than 315,000 tonnes of material shall be extracted from the quarry site (Condition 8, Schedule 2).
- All equipment owned and operated by the site must be maintained and operated correctly (Condition 12, Schedule 2).
- The area surrounding the landfill site is to be kept secure and locked when unattended (Condition 8, Schedule 3).
- The quarry and landfill must only operate within the specific hours listed by the project approval and EPL (Condition 29, Schedule 3).
- Annual production data must be recorded using the standard form for that purpose and included in this AEMR (Criteria 61, Schedule 3).
- All strategies/plans/programs, completed audits, AEMRs and other relevant documents must be provided to the relevant agencies and copies made publicly available on the website and physical copies at the site (Condition 8, Schedule 5).
- A summary of monitoring results must be made publicly available on the website which must be regularly updated (Condition 9, Schedule 5).

Criteria regarding the operation of the site is also specified within the EPL:

- Hours of operation (L5),
- All activities must be undertaken in a competent manner (O1),
- All equipment must be maintained in a proper and efficient condition and manner (O2)
- Measures must be implemented to prevent unauthorised entry (O5.3-5.7),

- Staff training requirements (O5.10), and
- The criteria for the record keeping of monitoring data (M1).

EA:

- Visual inspections of engineering works on a daily basis (A),
- Install operational backflow device on potable water (B),
- Identify, map and colour code all pipelines (C),
- Conduct site inductions and periodic refresher training for all employees, contractors and transport contractors (D),
- Operator to maintain a logbook of extraction quantities (E).

4.1.2 Results

Quarry extraction quantities have been provided for the past four years and are shown in **Table 2.2**.

All equipment owned and operated by the site is inspected daily by operational staff. Maintenance is also carried out by landfill staff when appropriate to do so.

The landfill site currently operates from 8.00am - 5.00pm (7 days/week).

Monitoring of the boreholes on site has been published on the councils website <https://www.griffith.nsw.gov.au/cp_themes/default/page.asp?p=DOC-KCB-52-46-17> and are available to staff via the website.

The EPA Statement of Compliance – Licence Details (Licence 5875) covering the reporting period from 11 September 2017 to 10 September 2018 outlines the annual compliance for TWMC.

4.1.3 Review

The compliance of the site with regards to operations is presented in **Table 4.1**, below.

Table 4.1: Operations compliance assessment.

Condition	Review
Project Approval	
Condition 7, schedule 2	Current operations are within the 2035 requirements.
Criteria 12, Schedule 2	Equipment is inspected daily and maintenance carried out by staff.
Condition 8, Schedule 3	Site operates within specified hours.
Condition 61, Schedule 3	Production data is included in Section 2.1 of this report.
Condition 8, Schedule 5	The following plans are provided on the council website: <ul style="list-style-type: none"> • Waste Monitoring Program • Waste Screening & Tracking Program • Landfill & Environmental Management Plan • Soil, Water & Leachate Management Plan • Noise & Vibration Monitoring Program

Condition	Review
	<ul style="list-style-type: none"> • Air Quality Monitoring Program • Transport Management Plan • Cultural Heritage Management Plan • Landscape & Biodiversity Plan • Independent Environmental Audit • Annual Tharbogang Offset Monitoring - 2016 • Annual Tharbogang Offset Monitoring - 2017 • Blast Management Plan • Pollution Incident Response Management Plan • Tharbogang Waste Management Centre Pest and Animal Control Plan. <p>Additionally, the EPA annual return, EPA Annual Report (2019) and EPA analysis is provided. The Independent Environmental Audit (Property Risk Australia 2018) is also on the website.</p> <p>Absent Plans:</p> <ul style="list-style-type: none"> • Conservation Agreement - A Conservation Agreement between the Minister administering the NPW Act and Griffith City Council for the TWMC Conservation Agreement was executed on 12 July 2017 and registered on 17 November 2017, for Lots 181 and 182 in DP 756 035. This was provided for the AMER but is not available on Council's website. • Any additional audits (if completed).
Condition 9, Schedule 5	<p>The 'Tharbogang Borehole Test Results' have been published on the council website.</p> <p>It is unclear if results from other monitoring are required for this condition.</p>
EPL	
L5	Site operates within specified hours.
O1	Insufficient data available to assess if all activities are conducted in a competent manner
O2	The EPA audit states that some plant and equipment was not maintained in a proper and efficient condition and was not operated in a proper and efficient manner.
O5.3	All practicable steps to control entry into the site have been taken.
O5.4	<p>A stockproof fence has been installed and is maintained.</p> <p>The EPA audit (2019) states that the stock fence was not being maintained in a proper and efficient condition.</p> <p>The licensee has not installed and maintained a high wire mesh of less than 1.8 metres around the active tipping face.</p>

Condition	Review
	There was fencing to the west of the current landfill that was greater than 1.5m mesh fencing but this was a boundary fence.
O5.6	Lockable gates have been installed at all access points.
O5.7	Gates are locked when landfill is unattended.
O5.10	A record of the training provided for all staff and the competencies achieved are kept on their personal file (CPE 2011a). However, the independent audit noted that staff were not adequately trained to administer the requirements of the licence.
M1	Monitoring data has been recorded following the correct protocol set out in this condition.
M3	No indication whether monitoring has been undertaken in accordance with the approved methods.
EA	
A	Council were not able to provide documentation of daily visual inspections of erosion and sediment controls for the independent audit.
B	At the time of independent audit, the, Waste Operations Manager could not advise whether an operational backflow device was installed on the potable water supply pipeline.
C	Water, sewer and electrical lines are easily identifiable onsite, and Council has mapped the location of these within their GIS mapping.
D	No information available regarding inductions and refresher training.
E	Logbooks were filled out by the operator before and after operation of plant equipment. Logbook sheets are forwarded to workshop for scheduled maintenance. Logbooks are held in landfill site office.
Not Triggered	
Criteria 8, Schedule 2	No information regarding extraction quantities has been provided as this condition has not yet been triggered. The PA only applies to pits 101 and 103 in which quarrying has not commenced.
O5.5	Landfilling activities within the existing quarry have not commenced and therefore, this requirement has not yet been triggered.

4.2 Waste

4.2.1 Monitoring and management criteria

Waste criteria is provided by the PA, EPL and EA. Under the PA, all waste outputs generated by the site should be disposed of at a suitably licenced facility (Condition 2, Schedule 3). The waste generated during the construction process must be classified and disposed of accordingly (Condition 3, Schedule 3). No more than 35,000 tonnes of general soil waste must be received over a calendar year (Condition 8, Schedule 2). Further, suitable procedures should be in place to ensure that the site does not accept prohibited waste. Staff should keep

appropriate documentation of waste and receive adequate training to recognise and handle hazardous or unapproved waste (Condition 4, Schedule 3).

Only waste authorised under the EPL shall be received by the site (L2.1), which must not exceed 100,000 tonnes per year (L2.2). The EPL also includes specific criteria for the disposal of tyres (L2.3 and L2.4), that a litter management program is implemented (O5.8) and criteria for the screening, disposal, burning and covering of waste (O6.6, O6.7, O6.8, O6.9, O6.13 – O6.15).

Waste minimisation has been assessed by the EA, which provided the following mitigation and management commitments:

- Construct a waste transfer station (A),
- Re-direct recyclables for processing (B),
- Record the waste stream and amount received, recovered, recycled and disposed of in landfill (C), and
- Implement procedures for refusing prohibited wastes (D),
- Construct defined asbestos disposal zone (E),
- Street sweeper waste to be stockpiled with green waste (F),
- Monitor and manage waste prior to disposal into landfill cell and implement other measures outlined in Table 7.13 of the EA (G), and
- Operator to maintain a logbook of waste deliveries (H).

4.2.2 Results

The waste transfer station was officially opened August 2016. Two waste management programs have been developed for the site. These plans dictate how waste should be monitored with the *Waste Monitoring Program* (CPE Associates 2011b) and how the screening of waste should be undertaken with the *Waste Screening Procedures* (CPE Associates 2011c).

Waste data has been provided for calendar years. The results for the past four years are presented in **Table 4.2**. Current waste compaction is estimated to be at 630 kgm⁻³ and is compacted using the 26 tonne Tana Compactor (EPA 2018).

Table 4.2: Waste monitoring results

Year - EPA reporting period	Waste to landfill (Tonnes)	Waste Recycled (Tonnes)
2018	29,129	797
2017	31,538	303
2016	25,505	398
2015	25,847	430

4.2.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.3**. Construction of the waste transfer station was completed in August 2016. However, the remaining waste criteria specified within the PA, EPL and EA was unable to be assessed as no records have been provided.

Table 4.3: Waste compliance assessment.

Condition	Review
Project Approval	
Condition 2, Schedule 3	<p>No copies of licences from other facilities provided for the AEMR.</p> <p>The full weighbridge data provided shows a total of 797 tonnes of recyclable material was removed off site over the year 2018.</p> <p>The full weighbridge data provided shows that annual total waste to landfill was 29,129 tonnes for 2018.</p>
Condition 3, Schedule 3	The waste generated during the construction process is classified and disposed of accordingly. This is included in the amounts shown in the 'Full Weighbridge Data Calendar Year' spreadsheet provided by Council.
Condition 4, Schedule 3	No information regarding prohibited waste, documentation of waste or training of staff is provided. However, two large signs are installed at the weighbridge one of which outlines what can be dumped at the TWMC and the Waste Screening Procedures document outlines measures to screen waste loads within the weighbridge and WTS.
Condition 8, Schedule 2	It is clear from the full weighbridge data provided, that the current waste inputs are less than the 35,000 tonne threshold imposed on the landfill.
EPL	
L2.1	Only waste permitted under this section of the licence is accepted on site and there are signs regarding this at the weighbridge
L2.2	The full weighbridge data provided shows that the annual total waste to landfill was 29,129 tonnes for 2018.
L2.3 and 2.4	Prior to 2018, recycling of tyres was an <i>ad hoc</i> management. However, all tyres disposed of on site are being recycled from 2018.
O6.6 and O6.13 – O6.15	<p>The EPA annual return report states that burning of green waste has not occurred for some time and is used for mulch.</p> <p>Green waste is eventually shredded and stockpiled north of the asbestos landfill area. The EPA audit (2019) states that the stockpile is greater than 20 m diameter and therefore, is non-compliant with the allowed 10 m diameter (condition O6.13).</p> <p>The EPA audit (2019) states that neither the green waste nor the biosolids are stored on an impermeable bunded area.</p> <p>Council progressively covers waste maintaining a minimum area exposed to 1,000 to 2,000m². The EPA audit (2019) states that the licensee was not applying cover material over all exposed landfilled waste prior to ceasing operations at the end of each day.</p> <p>The EPA annual return states that waste loads are checked at the weighbridge and the waste category determined by the weighbridge operator.</p>

Condition	Review
6.7	Current waste compaction is estimated to be at 630 kgm ⁻³ and is compacted using the 26 tonne Tana Compactor. This is less than the 650 kgm ⁻³ rate required.
6.8	Achieved compaction rate of landfill waste (excluding cover material) is included in the annual report for the waste premises submitted to the EPA.
6.9	A filling plan has been designed and has been submitted to the local EPA office. See the LEMP by Barton (1997).
O6.16 – O6.17	<p>The majority of Biosolids are disposed of into landfill. When they cannot be disposed of into landfill a designated pad has been constructed for this purpose.</p> <p>Biosolids, if not disposed directly to landfill, is stockpiled in an area specifically isolated to allow the material to dry. These pits are eventually covered when the pit is both dry and full to capacity.</p> <p>The EPA audit (2019) states that neither the green waste nor the biosolids are stored on an impermeable bunded area. The green waste and biosolids waste pads must be impermeable to that required and have a thickness of not less than 600mm.</p>
EA	
A	Waste transfer station has been completed.
B	The waste monitoring results provided indicates that waste is being redirected for recycling. Backflow prevention devices are installed on potable water supply lines and it is a Council policy to do so.
C	The waste stream and amount received, recovered, recycled and disposed of in landfill is recorded on a spreadsheet for each year and includes data from 2009 – 2019.
D	Procedures for refusing prohibited waste include a waste transfer station and inspections of waste entering the site.
E	Asbestos is currently accepted on site, however, loads have to comply with restrictions, set out in Appendix A and B . Asbestos is buried on site separately from other waste north of the leachate and sedimentation ponds.
F	Due to the street sweeper waste been wet, it is disposed of down the side of the landfill or on a cell wall.
G	<p>Procedures for refusing prohibited waste include a waste transfer station and inspections of waste entering the site.</p> <p>Two large signs are installed at the weighbridge on of which outlines what can be dumped at the TWMC and the Waste Screening Procedures document outlines measures to screen waste loads within the weighbridge and WTS.</p>
H	All logbooks are taken to the workshops to enable data to be entered into specific software.

Condition	Review
Not Triggered	
O6.16 – O6.17	The green waste pad has not yet been constructed.

4.3 Landfilling

4.3.1 Monitoring and management criteria

Landfilling criteria is specified within the relevant legislation.

Within the PA (Condition 7, Schedule 3), the site manager is required to:

- Minimise the exposed and active tip face at the landfill,
- Progressively revegetate all completed areas of the landfill and stabilise and exposed areas that are not required for operational purposes for a period greater than 90 days,
- Minimise the tracking of mud and water from the site on public roads,
- Fill the landfill cells in a systematic manner,
- Maximise landfill compaction rates,
- Cover the active area with at least 0.15 m of soil (or a suitable alternative material, as approved by DECCW) at the end of daily waste disposal and compaction activities,
- Progressively cap the landfill cells with the approved capping layer, which shall comprise (from top to bottom):
 - 0.15 m of topsoil,
 - A 0.85°m thick layer of uncompacted soil,
 - A sealing layer, comprising compacted clay at least 0.5 m thick and have permeability less than $k = 10^{-8} \text{ ms}^{-1}$, and
 - A seal bearing layer, comprising 0.3 m thick layer of compact, and
- Revegetate the covered landfill cells following the capping of each cell once they reach their final design height
- Establish and maintain a landfill incident response register and assessment of potential risks.

The PA also requires that the existing *Landfill Environmental Management Plan* be updated (Condition 13, schedule 3). It also specifies that all composting should be undertaken in accordance with *AS 4454-2003* (Condition 11, schedule 3).

Additionally, the EPL requires that the disposal of waste is managed in accordance with the progressive filling plan are outlined in the LEMP (1997) (O6.9), that completed landfill cells follow the prescribed requirements (O6.10 and O6.11) and the criteria for the covering of waste (O6.14 and O6.15). The EPL also requires that the remaining disposal capacity of the landfill be monitored (M6).

The revised EA's mitigation and management commitments relating to landfilling are as follows:

- Cap and rehabilitate the landfill on completion (A),

- Construct appropriately engineered landfill cells lined within impermeable liner and a drainage layer (B),
- Establish and maintain a landfill incident response register and assessment of potential risks (C), and
- Install leachate collection system for landfill cells (to protect Groundwater Dependent Ecosystems) (D)

4.3.2 Results

The information provided in **Table 4.4** outlines the landfill progress to date. A number of management actions ongoing or partially complete at this stage.

4.3.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.4**. The *Landfill Environmental Management Plan* was most recently updated in March 1999. Under the PA, an additional update to this plan is required, which has not been completed. No information regarding composting of waste is provided, nor is there information regarding landfill design.

No indication of the remaining disposal capacity of the landfill has been provided for this reporting period. The EPA audit states that the licensee must cover all exposed waste at end of day with VENM or other EPA approved alternative, to depth required (refer “Environmental Guidelines Solid Waste Landfills” NSW EPA 2016). This includes landfill and animal pits. Green waste is not an appropriate cover material. Further, the licensee must also ensure that asbestos disposed of on site is immediately and properly covered with VENM (EPA 2019).

Table 4.4: Landfilling compliance assessment.

Condition	Review
Project Approval	
Condition 7, Schedule 3	<ul style="list-style-type: none"> • There is only one active cell at a time. Given the landfill it not at its completion height, only the outer sides can be rehabilitated at this stage and this is done through capping and spreading of mulched Green Waste. • A closure / rehabilitation plan has been prepared and is being reviewed by DoP and the EPA. Once the Closure/Rehabilitation Plan has been approved it will cover the works required for re-vegetation of the site. • 80% of the access road into the active cells is sealed. Further sealing will occur next financial year (20/21). • No mud leaves the site. • Cells are filled in a systematic manner - once a cell is filled, the next cell is used. It is always covered. • Waste is not covered at the end of the day. Management is looking for other compliant methods to cover waste at the end of the day. • There is a register for all incident reports. This is championed by the WH&S team.
Condition 11, Schedule 3	Composting does not occur on the site. All green waste is mulched and stockpiled north of the asbestos landfill area for cover use.

Condition	Review
Condition 13, Schedule 3	The <i>Landfill Environmental Management Plan</i> was most recently updated in March 1999.
EPL	
O6.9, O6.10 and 6.11	A filling plan has been designed and has been submitted to the local EPA office. See the LEMP by Barton (1997).
O6.14 and O6.15	The EPA audit (2019) states that the licensee was not applying cover material over all exposed landfilled waste prior to ceasing operations at the end of each day.
M6	No information regarding remaining disposal capacity is provided. The EPA annual return states that surveys are carried out regularly on the current landfill which provides information of the remaining air space of the landfill.
EA	
B	No information regarding landfill cells engineering design other than that they will be constructed to engineering details and surface water and leachate managed as per the PA conditions.
D	A leachate collection system and holding ponds have been developed for the existing Landfill. The leachate ponds have been 'roughed out' and they will be formalised and engineered when the new Landfill development occurs. Leachate currently remains diverted solely to existing leachate ponds. All leachate is kept on site and evaporated. The collection of leachate running off the landfill cell and leaching out of the cell front collects in the leachate overflow pond to the east of the landfill before being pumped to the leachate pond further to the east. Due to the high evaporation rate and drought conditions there is little to no leachate collected at this time and leachate that does enter the leachate pond is left to evaporate.
Not Triggered	
A	Not triggered: Landfill cells are not completed and do not require rehabilitation.
C	Not triggered. Council must prepare this prior to undertaking landfilling activities within the existing quarry.

4.4 Biodiversity

4.4.1 Monitoring and management criteria

Biodiversity criteria is provided by the PA, EPL and EA.

Under the PA:

- Pests, vermin and noxious weeds found on site must be managed and regular inspection undertaken for their presence (Condition 10, Schedule 3).
- The offset requirements specified in **Table 4.5** must be implemented (Condition 45, Schedule 3).
- The Proponent shall revise the Biodiversity Offset Strategy outlined in the response to submissions (dated Feb 2010) within 3 months of the date of approval, in consultation with DECCW, aiming to (Condition 46, Schedule 3):
 - Ensure that adequate resources are dedicated towards the implementation of the strategy,
 - Provide appropriate long-term security for the offset areas to the satisfaction of the Director-General.
- The offset strategy must be implemented prior to any vegetation clearance on site (Condition 47, Schedule 3).

Table 4.5: Biodiversity Offset Requirements (Condition 8, schedule 3).

Vegetation Community	Ratio	Area cleared (ha)	Offset Area (ha)
Bimble Box-Pine	1:12.5	12.2	152.5
Dwyer's Red Gum-Currawong	1:10	3	30
Total		15.2	182.5

The EPL addresses the requirement to control pests, vermin and weeds (O5.9).

The current and predicted impacts to flora and fauna have been assessed as a part of the EA. Mitigation and management commitments are as follows:

- Develop and implement Griffith Biodiversity Management Strategy (A),
- All retained areas of native vegetation on Lot 201 and 202 (that is areas not subject to the proposed and envisaged future clearing for quarry operations) will be protected in perpetuity as part of the offset package and rezoned to Environment and Conservation or Environmental Management (B),
- Revegetate and enhance (where possible) to create a contiguous corridor with Lot 201 on the western boundary (C)
- Maintain and enhance a 40m riparian zone on either side of the ephemeral drainage line (D),
- Collect, store and/or propagate seeds for rehabilitation purposes (to be stipulated in the detailed rehabilitation plan (E),
- Relocation of hollow trees and woody debris to corridors and areas not designated for clearing (F),
- Clearing of hollow-bearing trees will be undertaken outside of the main bird breeding periods and trees will be inspected for resident fauna by a suitably

qualified ecologist. Appropriate action will be taken prior to removal should the presence of fauna be confirmed (G),

- Undertake detailed flora and fauna assessments of proposed offsets (H),
- Refine the offset package described in Appendix C of the PA to the satisfaction of the DoP and implement it prior to the commencement of the new quarrying activities in order to compensate for the native vegetation to be cleared (I),
- Enhance onsite vegetation in areas not designated for clearing through direct seeding, thinning, grazing exclusion, weed and fire management (J),
- Develop and implement a weed and pest management strategy (K),
- Develop and implement a weed and pest management strategy for the control and eradication of weed species and incorporate into the rehabilitation plan, and QOEMP and LOEMP (L),
- Monitor success of revegetation and enhancement works onsite and in offset areas (M),
- Prepare a detailed rehabilitation plan for the quarry and landfill components to achieve the rehabilitation outcomes identified in the EA (N),
- Performance monitoring and completion criteria will be designed to demonstrate that the rehabilitation outcomes identified in the EA and rehabilitation plan are met (O)
- Progressively clear vegetation for each quarry pit (P),
- Assess the significance of various ephemeral swamps and water bodies as part of the Griffith Biodiversity Strategy (Q).

4.4.2 Results

A summary of the key observations and completed management actions from the annual monitoring report (2017) is presented below. A conservation area has been developed for the site (Eco Logical Australia 2011) and monitoring is regularly undertaken. For further information refer to the Annual Monitoring Report (Ecoplanning 2018).

The following survey techniques were employed:

- Photo points; eight monitoring photo points have been established. Assessment of the presence of weeds, erosion and the vegetation condition is completed and compared to previous years.
- BioBanking monitoring sites; floristic data are collected at six sites in accordance with the Biobanking assessment Methodology (2014) and compared with baseline (2015) and benchmark data.
- Fauna monitoring: Surveys for microchiropteran bats is completed using Anabat equipment.
- Walk through assessment: Traversed on foot to record opportunistic sightings, weed species, evidence of pests, regeneration and threatened species.

The following management actions have been undertaken within the Conservation Area during the reporting period (**Table 4.6**):

- Monitoring of photo points and biobanking monitoring plots. No significant deviations from the baseline monitoring occurred during the monitoring period.
- Weed management occurred on 25-26 June and 16 and 31 July 2018. *Lycium ferocissimum* (African Boxthorn), *Marrubium vulgare* (Horehound) and *Opuntia* sp. (Prickly Pear) were sprayed with herbicide during the monitoring period. However, this did not appear to have been undertaken at Photo Point 9, 12, 13 and 14.

- Pest management indicated that there was no evidence of Rabbits (*Oryctolagus cuniculus*), Feral Cats (*Felis catus*) or Feral Goats. However, the European Red Fox (*Vulpes vulpes*) was observed. Pest control measures had not commenced during this reporting period.
- Vehicle access was maintained through re-grading of the perimeter trail in November 2017 which also serves as a fire trail.
- The northern boundary fence was completed in March 2018.
- Quarterly inspections and stock management data collected. Inspections undertaken in February, June / July, September and December 2018.
- No grazing occurred in 2018 (year 3)

Table 4.6: Completed management actions for year 3 (2018) of the required monitoring period (Ecoplanning 2018).

Management Action	Timing	Status
Monitoring Biobanking monitoring plots and photo points	Year 3	Complete – results of monitoring are provided
Recommend weed management thresholds and commence weed management actions in the Conservation Area in Year 1	Years 1 - 3	Weed management occurred during 2017 targeting <i>Lycium ferocissimum</i> (African Boxthorn) and <i>Opuntia</i> sp.
Pest animal control (local co-ordination with LLS and OEH)	Years 1 - 10	No pest animal control actions were undertaken.
	Years 1 – 3 Initial Rabbit Control	No pest animal control actions were undertaken. No Rabbits, evidence of Rabbits, were observed during the survey.
	Years 1-10 Fox Control	No pest animal control actions were undertaken. Foxes were observed in the offset site.
	Years 1 – 10 Feral Goat Control	No pest animal control actions were undertaken. No Feral Goats, or evidence of Feral Goats were observed during monitoring.
	Years 1 – 10 Feral Cat Control	No pest animal control actions were undertaken. No Feral Cats, or evidence of Feral Cats, were observed during the survey.
Fire management hazard reduction burn	Years 1 – 10	No fire management actions were undertaken.
Maintain vehicle access to Conservation Area for fire management, weed and fencing management.	Year 2-10 Maintain tracks and fire breaks	Fire trails were re-graded in the offset site on 25/11/2017. A track was created along the new fence along the northern boundary.

Management Action	Timing	Status
Fencing, gates and signage	Year 1	The boundary of the offset area has been fenced and signage erected. Western fence line completed in December 2017. The northern boundary fence completed in March 2018.
	Year 2-10 – maintain fences and gates	Fences and gates re inspected quarterly.
Quarterly inspections and stock management data	Years 1 - 10	Inspections were conducted in February, June/July, September and December 2018. No grazing occurred in year 3.
Annual Reports for Monitoring Program	Years 1 -10	Monitoring was conducted in September 2018.

Note: Biobanking monitoring data can be found in the Biodiversity Monitoring Report, Ecoplanning (2018)

4.4.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.7**.

Table 4.7: Biodiversity compliance assessment.

Condition	Review
Project Approval	
Condition 10, Schedule 3	The EPA audit (2019 states that licensee was not adequately controlling weeds, pests and vermin at the premises. The program from observations has not been successful to date given the proliferation of prickly pear and African boxthorn (EPA 2019).
Condition 45, Schedule 3	Offsetting requirements have been implemented.
Condition 46, Schedule 3	The TWMC Landscape and Biodiversity Management Plan – Rehabilitation and Biodiversity Offset Strategy Plan (ELA 2013) incorporates the BOS and addresses this condition.
Condition 47, Schedule 3	Table 4.6 outlines the tasks relevant to this condition that have been completed to date as per the 2016, 2017 and 2018 Annual Offset Monitoring reports.
EPL	
O5.9	Pests are currently managed. No feral animal management was undertaken during the reporting period although weed treatment was conducted.

Condition	Review
EA	
A	The Biodiversity Management Strategy is included in the TWMC Landscape and Biodiversity Management Plan – Rehabilitation and Biodiversity Offset Strategy Plan (ELA 2013).
B	An in perpetuity Conservation Agreement was placed over the land in 2015.
C	No information regarding revegetation and enhancement to create a contiguous corridor with Lot 201.
D	No information regarding a 40m riparian zone on either side of the ephemeral drainage line
E	No information regarding seeds for rehabilitation has been provided.
F	No information regarding relocation of hollow trees and woody debris
G	No information regarding the removal of hollow-bearing trees outside the main bird breeding period has been provided.
H	Detailed flora and fauna assessments have been undertaken.
I	Offset areas have been acquired and a Conservation Agreement reached in 2015. However, PA states that prior to the commencement of each quarry pit the offset package is to be refined to the satisfaction of the DoP and implemented prior to the commencement of the new quarrying activities.
J	No information regarding vegetation enhancement in areas not designated for clearing.
K	The TWMC Landscape and Biodiversity Management Plan – Rehabilitation and Biodiversity Offset Strategy Plan (ELA 2013) incorporates the weed and pest management strategies and addresses this condition.
L	The LOEMP is still under review. The required works (action plan) section of the LMBP will be included in the LOEMP.
M	No information regarding revegetation success. However, the LBMP states that throughout the majority of the BOA, no broadscale revegetation work is required due to its high resilience although some supplementary plantings may be required. Direct seeding and tubestock revegetation was proposed within Management Zone 1 (MZ 1) should natural regeneration of the overstorey be absent after five years (ELA 2013). The management works are currently in year 3 and therefore, assessment of the requirement for revegetation in MZ 1 cannot be made at this stage.
N	A rehabilitation plan has been developed - TWMC Landscape and Biodiversity Management Plan – Rehabilitation and Biodiversity Offset Strategy Plan (ELA 2013).

Condition	Review
O	Outlined in the TWMC Landscape and Biodiversity Management Plan – Rehabilitation and Biodiversity Offset Strategy Plan (ELA 2013).
Q	The draft Griffith Biodiversity Management Strategy must be finalised and include an assessment of the significance of various ephemeral swamps and waterbodies in the Griffith region. The Strategy was last updated in December 2011. It has been advised from the Environment Health and Sustainability Coordinator that until an Environmental Officer is appointed on staff at TWMC, this document will remain in it's current form. Even with an EO, this project is not likely to be pencilled in as a priority for review.
Not Triggered	
P	Clearing for the quarry pits has not commenced.

Additionally, the following recommendations were made for the offset site by the ecologist as part of the annual monitoring report 2018.

- Several new observations of *Xanthium spinosum* (Bathurst Burr) were made during the monitoring period that were likely to have grown over the 2017/18 summer. Monitoring and primary treatment is advised over the 2018/19 summer. The most efficient and effective method of control should be discussed with the weed management contractor.
- Fox control is recommended for the offset site in accordance with the Conservation Agreement.
- Conduct secondary treatment for *Lycium ferocissimum*, *Opuntia* sp. and *Marrubium vulgare* as required. Consider digging out small *Opuntia* sp. rather than spraying.
- Maintain quarterly inspections. In particular, monitoring weed growth along the new northern perimeter track.

Additional information is required to adequately address if the biodiversity compliance criteria meets the requirements of the relevant legislation.

4.5 Surface Water

4.5.1 Monitoring and management criteria

Surface water criteria is provided by the PA, EPL and EA. The PA specifies the following conditions:

- Discharging water must comply with Section 120 of the POEO Act, unless provided for by an EPL (Condition 14, Schedule 3).
- Stormwater must be controlled and diverted through appropriate erosion and sediment control/pollution measures (Condition 15, Schedule 3).
- Sewerage on site shall be managed and comply with the *Environment and Health Protection Guidelines – On site sewerage management for Single Households (1998)* (Condition 16, Schedule 3).

- All water that has come in contact with waste must not be discharged from the site (Condition 17, Schedule 3).
- A Soil, Water and Leachate Management Plan must be prepared and implemented, which must include a site water balance, erosion and sediment control plan, stormwater management scheme, surface water monitoring program and surface water response plan (Condition 20-26, Schedule 3).

Surface water criteria addressed under the EPL comprises a surface water quality monitoring point (EPA point 8; Points 1, 3-7- groundwater) (M2) and the requirement to comply with the POEO Act, prohibiting the pollution of waters (L1.1). The EPL states that monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved in writing by the EPA before any tests are conducted (M3).

Surface runoff is also addressed by the EPL. The sedimentation basin and leachate holding ponds must be maintained to ensure their design capacity is available for stormwater and leachate (O5.1). Additionally, the perimeter of the areas where waste has been landfilled must be contoured to prevent stormwater running onto these surfaces from all storm events less than or equal to a 1 in 10 year 24 hour duration storm event (O5.2).

Finally, the following mitigation and management commitments were made in the EA and revised for the PA. The EA (Balance 2009) has previously assessed the surface water impacts. They identified an increase in potentially contaminated runoff from additional landfill as well as increased erosion and sediment laden runoff from disturbed areas. This is due to additional landfill and additional quarry pits and associated infrastructure. Operations have not commenced within pits 101 and 103 and the EA recommends further improvement to the Soil, Water and Leachate Management Plan:

- Preparation of a surface water management plan to the satisfaction of NSW Office of Water. This should include measures to ensure that contaminated runoff will not leave the site (A),
- Construct diversion drains and bunds around perimeter of the quarry pits (B),
- Install pumps to divert surface water to settlement and stormwater detention ponds (C),
- Install sediment traps at discharge points (D),
- Incorporate energy dissipation and erosion protection measures in surface water diversions (E), and
- Install table drains, culvert pipes and silt traps on all new roads (F),
- Undertake all engineering works to minimise erosion and soil contamination; (G),
- Ensure all water storages are engineered for peak weather events (1 in 100 year 72 hour rainfall event) (H),
- The stormwater detention pond will be lined with a flexible membrane and the water quality monitored on a quarterly basis; (I)
- Install operational backflow device on potable water supply pipeline (J),
- Identify, map and colour code all pipelines on site (K),
- Construct surface water diversions around the landfill (L),
- Construct / install stormwater and sedimentation controls (M),
- Install closed leachate collection system and surface water controls around landfill (N),
- Install sedimentation dam and drainage channels to direct water from quarries (O),

- Periodically check and empty sediment trap at settlement dam (P), and
- Visual inspection of engineering works on a daily basis (Q).

4.5.2 Results

A formal site water quality monitoring plan is required. This plan forms an important part of the greater environmental monitoring plan for the site. Griffith City Council has prepared a management plan for surface water: *Tharbogang Waste Management Centre: Soil, Water & Leachate Management Plan (v2.0)*.

The following is to be monitored twice yearly at Tharbogang:

- Leachate Pond
- Sedimentation Pond
- Boreholes 1-7
- Tharbogang Swamp

Surface monitoring was undertaken in March and August 2018 within the Stormwater and Sediment Pond Dam 2 (EPA point 8) (results supplied by Griffith City Council). However, no monitoring was undertaken for Tharbogang Swamp. The pollutants monitored for, and the results of the monitoring, are presented within the groundwater monitoring in **Section 4.6.2**. Monitoring of the stormwater and sedimentation ponds is undertaken in accordance with the specific assessment criteria.

Peak weather events (1 in 100 year or 72 hour rainfall events) require water quality monitoring of stormwater detention ponds and other water storage areas. No events have occurred over this monitoring period.

4.5.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.8**.

Table 4.8: Surface Water compliance assessment.

Condition	Review)
Project Approval	
Condition 14, Schedule 3	No water is discharged from site. The EPA annual return states that all stormwater that falls on the active landfill and quarry sites is contained on site and leachate is contained on site.
Condition 15, Schedule 3	Two stormwater control dams are on site. These are proposed to be expanded in the near future. All stormwater that falls on site is contained. Rainwater and process water is pumped from the quarry collection sumps to the stormwater collection dam.
Condition 16, Schedule 3	All sewerage is contained in two septic tanks and is emptied when required.
Condition 17, Schedule 3	No water is discharged from site.
Condition 20-26, Schedule 3	A Soil, Water and Leachate Management Plan has been developed.

Condition	Review)
EPL	
M2.1 and M2.2	Monitoring of all attributes listed in Section M2.2 of the EPL was undertaken at the relevant sites (see Groundwater section). Monitoring of EPA point 8 occurred in March and August 2018. However, no monitoring data for Tharbogang Swamp has been provided.
O5.1 and O5.2	All water that falls on site is contained within sedimentation basins and the landfill perimeters have been contoured.
L1.1	No water is discharged from site.
EA	
A	A Soil, Water and Leachate Management Plan has been developed.
B	New diversion drains and bunds were in the process of being constructed at the time of commencement for this AEMR.
C	Pump information is not provided.
D	Construction of a sedimentation basin has been completed although Council advised that there are no sediment traps installed.
E	Reinstatement of drainage swale works commenced 27/3/18 and were completed 3/5/18.
F	Table drains, culvert pipes and silt traps were in the process of being constructed at the time of commencement for this AEMR.
G	There is no information regarding engineering works.
H	Current water storages are constructed for a 1:100 ARI flood.
I	The stormwater pond is not lined with a flexible membrane and water quality monitoring is only undertaken twice a year.
K	Two stormwater control dams are on site. These are proposed to be expanded in the near future. All stormwater that falls on site is contained. Construction of a sedimentation basin has been completed although Council advised that there are no sediment traps installed.
M	All surface water is contained on site, any water in contact with the landfill site is treated as leachate.
P	Insufficient information to determine if sediment traps are present and emptied at the settlement dam.
Q	Council were unable to provide documentation of daily visual inspections of erosion and sediment controls for the independent audit.
Not Triggered	
J	Landfilling activities within the existing quarry have not commenced. All surface water is contained on site, any water in contact with the landfill site is treated as leachate.

Condition	Review)
L	Not triggered: Landfilling activities within the existing quarry have not commenced. All surface water is contained on site, any water in contact with the landfill site is treated as leachate.
N	Not triggered: Landfilling activities within the existing quarry have not commenced. All surface water is contained on site, any water in contact with the landfill site is treated as leachate.
O	Not triggered: Landfilling activities within the existing quarry have not commenced. All surface water is contained on site, any water in contact with the landfill site is treated as leachate.

4.6 Groundwater

4.6.1 Monitoring and management criteria

Monitoring of groundwater includes seven bore holes, two leachate dams and one swamp monitoring point. Bore holes range in depth between 7 and 22 m.

As with surface water, the PA recommends that a Soil, Water and Leachate Management Plan must be prepared and implemented, which must include a site water balance, erosion and sediment control plan, stormwater management scheme, surface water monitoring program and surface water response plan (Condition 20-26, Schedule 3).

The EPL specifies that ground water monitoring must be undertaken at seven boreholes on site (P1.1) which must comply with section 120 of the *POEO Act* (L1.1) and that specific pollutants are monitored for (M1). The EPL states that monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved in writing by the EPA before any tests are conducted (M3).

The EPL (M2) also states that for each monitoring/discharge point or utilisation area specified in the EPL (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1 of the EPL table. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns.

Finally, the EA has assessed the current and future groundwater impacts. The following mitigation and management commitments have been made:

- Install two new groundwater monitoring bores west of the site (A),
- Licence new groundwater monitoring bores (B)
- Establish and implement groundwater monitoring program in accordance with DECCW requirements (C), and
- Conduct ongoing groundwater monitoring post closure and action non-compliances (D).

4.6.2 Results

Griffith City Council has prepared a management plan for Groundwater: *Tharbogang Waste Management Centre: Soil, Water & Leachate Management Plan (v2.0)* (CPE Associates 2011a).

Groundwater bore holes are located throughout the site (**Figure 4.1**). Borehole depths are recorded two times in a calendar year. The results from the 2018-2019 reporting period are shown in **Table 4.9**. The pollutants which are required to be monitored during the reporting period are identified in **Table 4.10** and a summary of the results presented in **Table 4.11**. The trends for each pollutant over time are shown in **Figure 4.2** to **Figure 4.16**.

Borehole 2 was found to be inaccessible in 2015 and has not been sampled since 2006. The replacement of this borehole was deemed unnecessary (EPA 2015). Therefore, borehole 2 shows nil results for all attributes.

Over the reporting period Borehole 3 (chloride, alkalinity, sulphate, conductivity, dissolve magnesium, potassium, sodium) showed some significant spikes as did sedimentation pond dam 2 (fluoride, dissolved iron), leachate dam 1 (total organic carbon) and borehole 7 (total oxidised nitrogen).

Over the period commencing August 2017 and August 2018 there was a major spike in the leachate water levels for conductivity, alkalinity, chloride, sulphate, potassium, sodium and total organic carbon all peaking in March 2018. The PEA audit (2019) states that there was no investigation (through further sampling and analysis) or explanation given and outlines that the spike may have occurred for any number of reasons, such as rainfall washing out the analytes from the landfill cell or drought concentrating the leachate. The EPA Annual Return 2017-2018 does not states that there were no specific events that these spikes could be attributed to.

Table 4.9: Bore hole depths during the monitoring period

Monitoring Point	Depth (m)	
	Mar-18	Aug-18
Bore Hole 1	14.0	14.0
Bore Hole 2	0.0	0.0
Bore Hole 3	12.0	14.4
Bore Hole 4	7.0	8.30
Bore Hole 5	19.0	20.0
Bore Hole 6	17.0	12.0
Bore Hole 7	20.0	20.8



Figure 4.1: Groundwater Bore Hole Monitoring Sites and Leachate Control

Table 4.10: Pollutant monitoring required by the EPL and completed during the reporting period.

Pollutant	Bore Hole Number					
	1-7		8		9	
	Frequency	Completed	Frequency	Completed	Frequency	Completed
Alkalinity (as calcium carbonate)	2 times	Y	2 times	Y	2 times	Y
Ammonia	2 times	Y	2 times	Y	2 times	Y
Calcium	2 times	Y	2 times	Y	2 times	Y
Chloride	2 times	Y	2 times	Y	2 times	Y
Chlorinated volatile compounds	2 times	Y	2 times	Y	2 times	Y
Conductivity	2 times	Y	2 times	Y	Not required	Y
Fluoride	2 times	Y	2 times	Y	2 times	Y
Iron	2 times	Y	2 times	Y	2 times	Y
Magnesium	2 times	Y	2 times	Y	2 times	Y
Manganese	2 times	Y	2 times	Y	2 times	Y
Nitrate	2 times	Y	2 times	Y	2 times	Y
Potassium	2 times	Y	2 times	Y	2 times	Y
Sodium	2 times	Y	2 times	Y	2 times	Y
Sulphate	2 times	Y	2 times	Y	2 times	Y
Total Phenolics	2 times	Y	2 times	Y	2 times	Y
Total organic carbon	2 times	Y	2 times	Y	2 times	Y
Total Suspended solids	Not required	Y	2 times	Y	2 times	Y
pH	2 times	Y	2 times	Y	2 times	Y

N: Not required

Table 4.11: Summary of groundwater results during the monitoring period.

Monitoring Point	Date	Alkalinity (mg/L)	Ammonia (as N) (mg/L) N	Dissolved Calcium (mg/L)	Chloride (mg/L)	Volatile Organics (ug/L)	Sp. Conductance (uS/cm)	Fluoride (mg/L)	Dissolved Iron (mg/L)	Dissolved Magnesium (mg/L)	Dissolved Manganese (mg/L)	Total Oxidised Nitrogen (as N) (mg/L)	Dissolved Potassium (mg/L)	Dissolved Sodium (mg/L)	Sulphate (mg/L) SO4	Total Phenol (mg/L)	Total Org Carbon-filt (mg/L)	Suspended Solid (mg/L)	pH
Bore Hole 1	Mar-18	633.00	0.03	32.00	1680.00	<50	7290.00	0.9	0.87	0.020	158.00	23.40	77.00	1140.00	398.00	<1.0	23.00	0.00	7.24
	Aug-18	661.00	0.07	31.00	1760.00	<50	7150.00	1.10	0.39	0.018	176.00	25.50	98.00	1330.00	396.00	<1.0	17.00	8.00	7.26
Bore Hole 2	Mar-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Aug-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bore Hole 3	Mar-18	331.00	0.36	8.00	384.00	<50	1860.00	0.80	0.42	0.056	16.00	0.87	10.00	317.00	26.00	<1.0	<1.00	<5.00	7.17
	Aug-18	478.00	38.20	6.00	415.00	<50	2040.00	0.90	1.32	0.068	15.00	0.01	14.00	308.00	8.00	<1.0	27.00	66.00	7.01
Bore Hole 4	Mar-18	1300.00	0.33	103.00	3820.00	<50	13000.00	0.70	0.57	0.094	204.00	0.37	130.00	2280.00	469.00	<1.0	17.00	18.00	7.40
	Aug-18	1330.00	0.48	104.00	3720.00	<50	12600.00	0.80	0.54	0.065	234.00	0.64	187.00	2970.00	434.00	<1.0	19.00	27.00	7.42
Bore Hole 5	Mar-18	894.00	16.40	117.00	1180.00	<50	5610.00	0.70	1.74	1.110	141.00	1.49	48.00	681.00	107.00	<1.0	9.00	22.00	7.35
	Aug-18	951.00	6.69	96.00	1340.00	<50	5600.00	0.90	1.52	0.468	164.00	0.02	64.00	899.00	100.00	<1.0	15.00	21.00	7.22

Monitoring Point	Date	Alkalinity (mg/L)	Ammonia (as N) (mg/L) N	Dissolved Calcium (mg/L)	Chloride (mg/L)	Volatile Organics (ug/L)	Sp. Conductance (uS/cm)	Fluoride (mg/L)	Dissolved Iron (mg/L)	Dissolved Magnesium (mg/L)	Dissolved Manganese (mg/L)	Total Oxidised Nitrogen (as N) (mg/L)	Dissolved Potassium (mg/L)	Dissolved Sodium (mg/L)	Sulphate (mg/L) SO4	Total Phenol (mg/L)	Total Org Carbon-filt (mg/L)	Suspended Solid (mg/L)	pH
Bore Hole 6	Mar-18	924.00	0.03	58.00	1530.00	<50	6950.00	1.00	0.58	0.019	130.00	0.97	64.00	1170.00	242.00	<1.0	7.00	34.00	7.85
	Aug-18	934.00	0.07	44.00	1680.00	<50	7080.00	1.20	0.09	0.004	112.00	0.92	71.00	1200.00	238.00	<1.0	<1.00	11.00	7.86
Bore Hole 7	Mar-18	1100.00	23.00	281.00	1360.00	<50	9930.00	0.70	1.12	0.228	473.00	791.00	168.00	1080.00	425.00	<1.0	<1.00	22.00	7.34
	Aug-18	1100.00	28.60	275.00	1310.00	<50	9740.00	0.70	0.52	0.217	456.00	576.00	176.00	1030.00	438.00	<1.0	<1.00	73.00	7.57
Leachate dam 1 Pt 9	Mar-18	1260.00	34.50	32.00	8160.00	<50	18800.00	<0.10	1.86	0.117	543.00	0.05	1240.00	4770.00	1500.00	0.00	6250.00	1050.00	8.74
	Aug-18	3810.00	4.52	23.00	1480.00	<50	4970.00	0.20	1.57	0.191	408.00	<0.10	2790.00	9090.00	1800.00	0.00	644.00	900.00	8.78
Sed Pond dam 2 Pt 8	Mar-18	293.00	0.07	14.00	251.00	<50	1290.00	1.00	1.23	0.159	26.00	0.17	41.00	186.00	26.00	<1.0	50.00	108.00	9.03
	Aug-18	369.00	0.18	22.00	365.00	<50	1770.00	1.30	1.93	0.250	37.00	<0.10	47.00	243.00	66.00	<1.0	69.00	380.00	8.85
Tharbogang Swamp	Mar-18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aug-18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

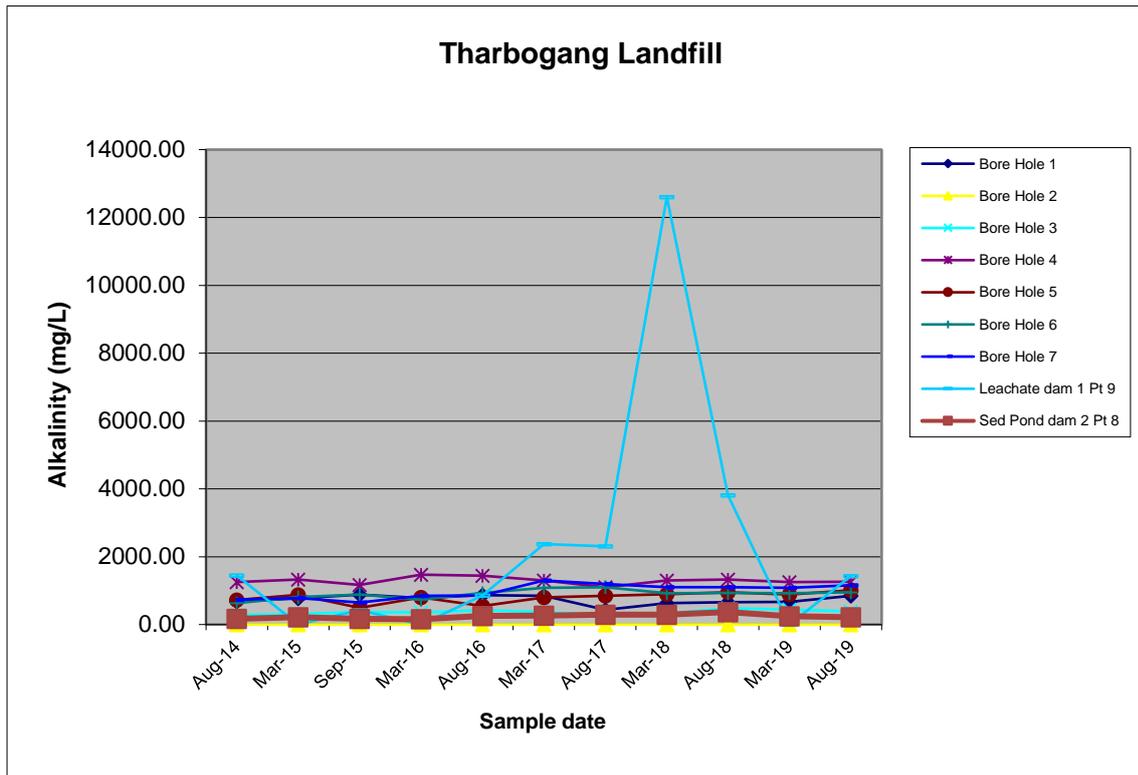


Figure 4.2: Alkalinity trends

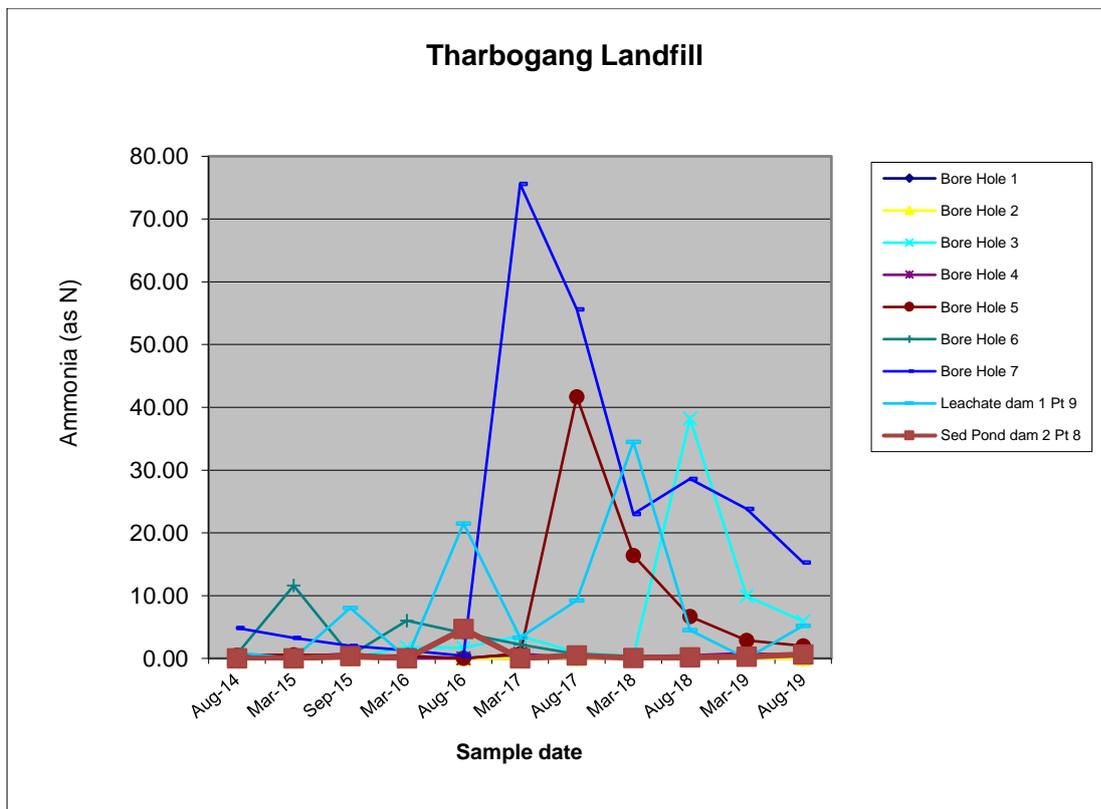


Figure 4.3: Ammonia trends

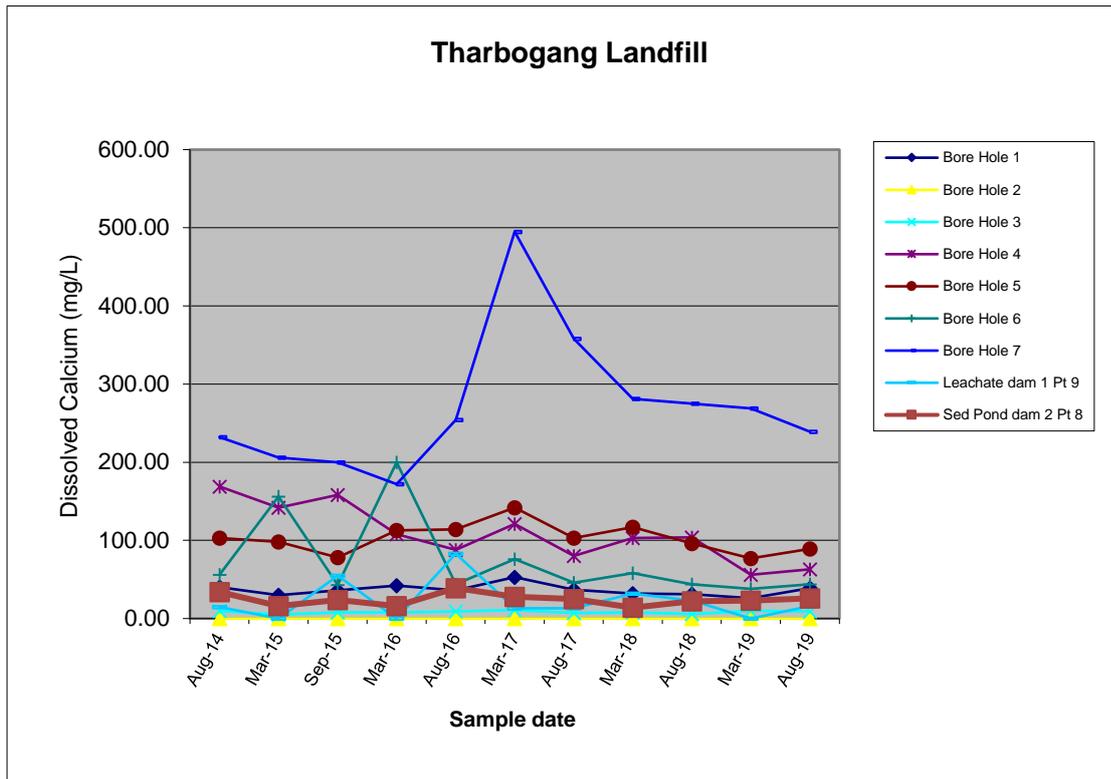


Figure 4.4: Calcium trends

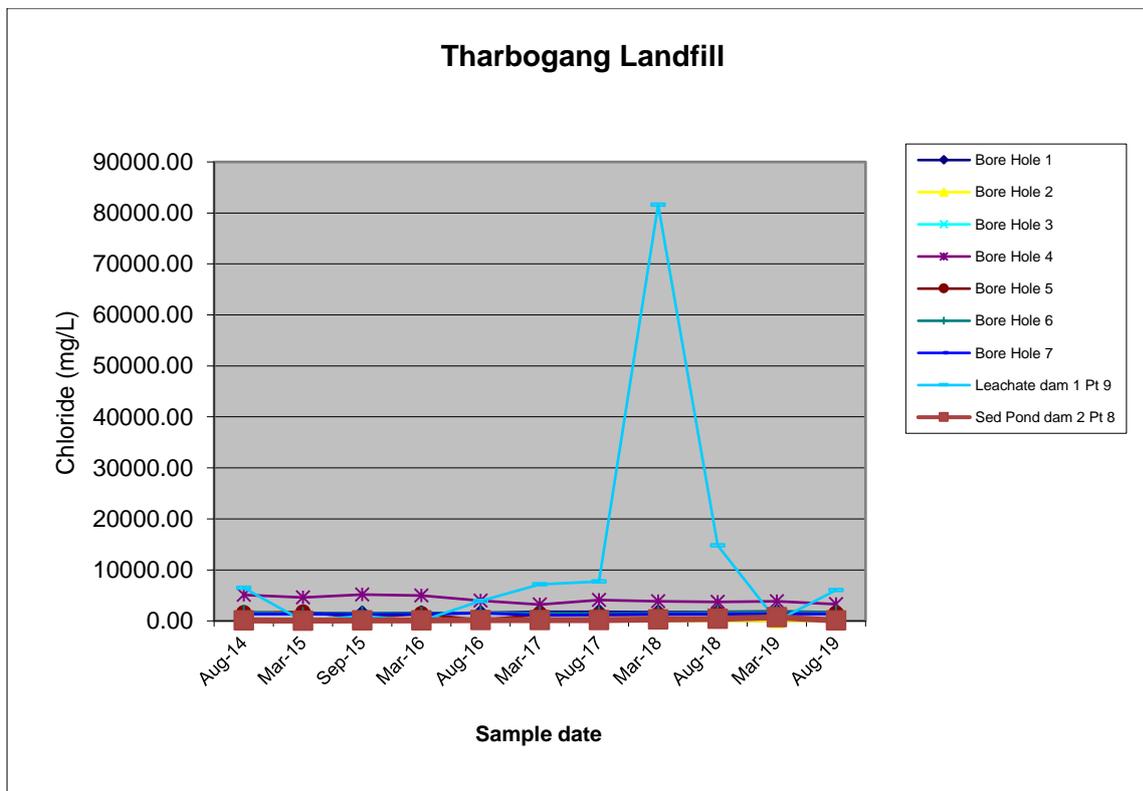


Figure 4.5: Chloride trends

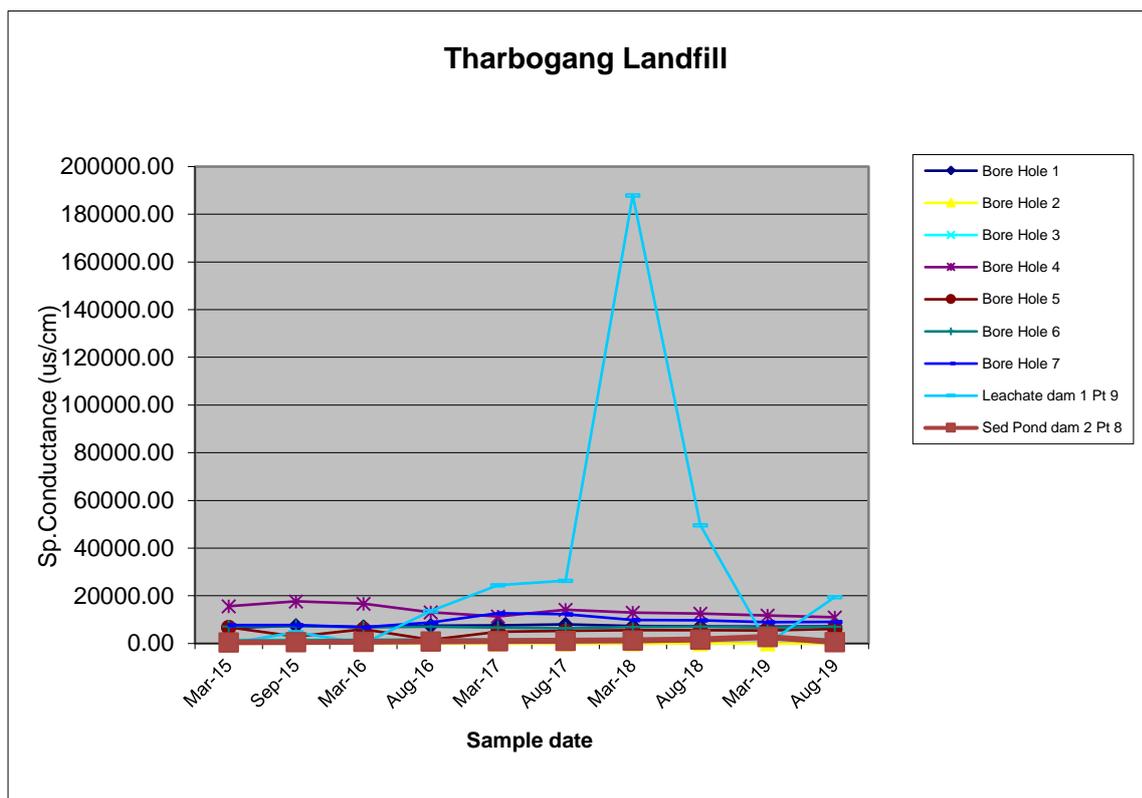


Figure 4.6: Conductivity trends

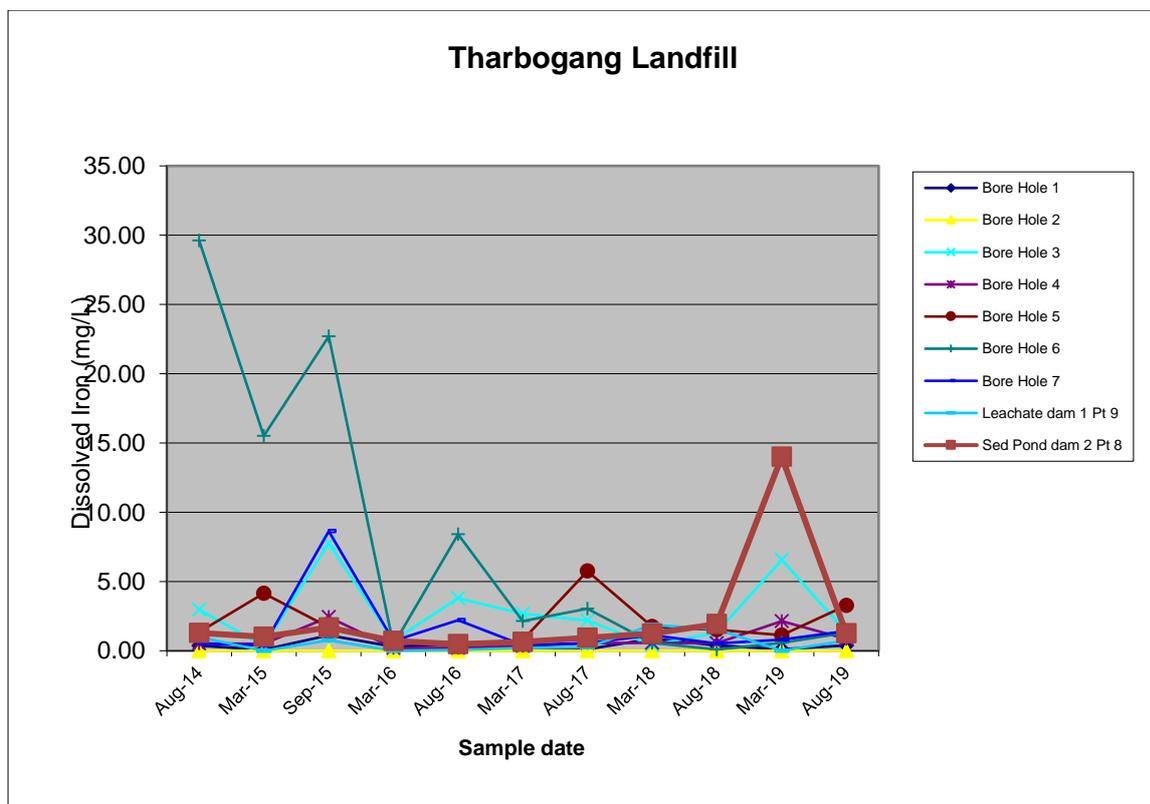


Figure 4.7: Iron trends

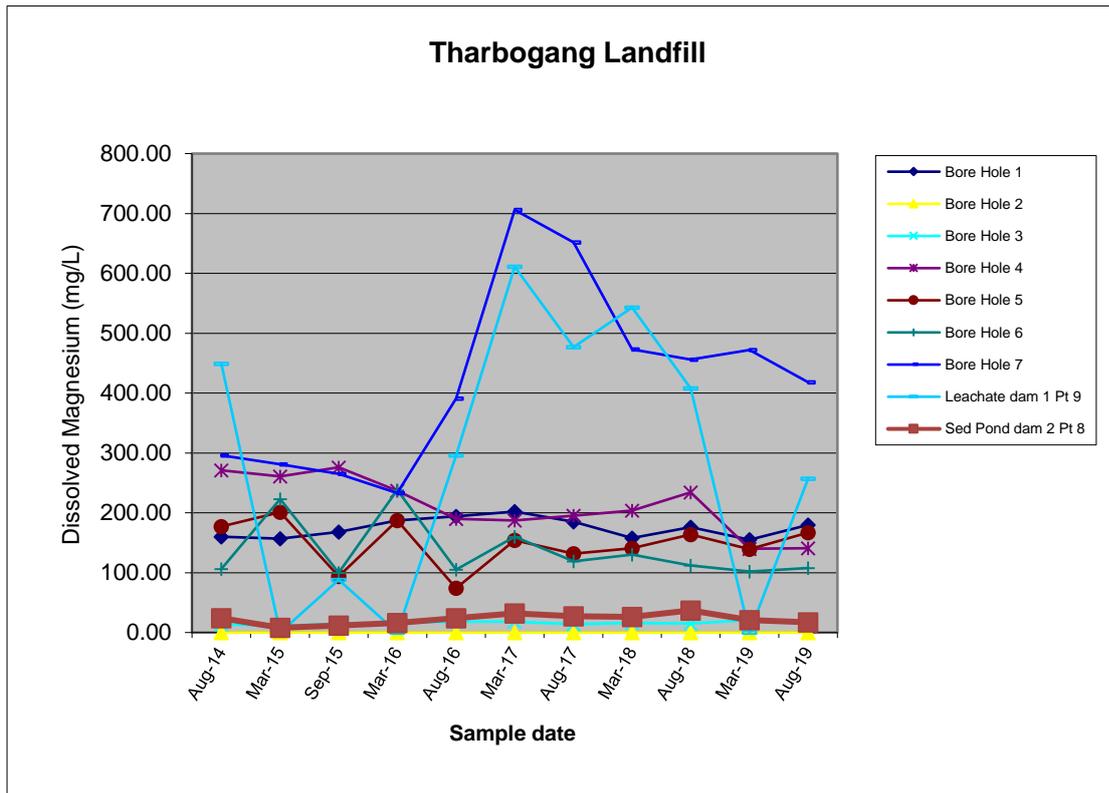


Figure 4.8: Magnesium trends

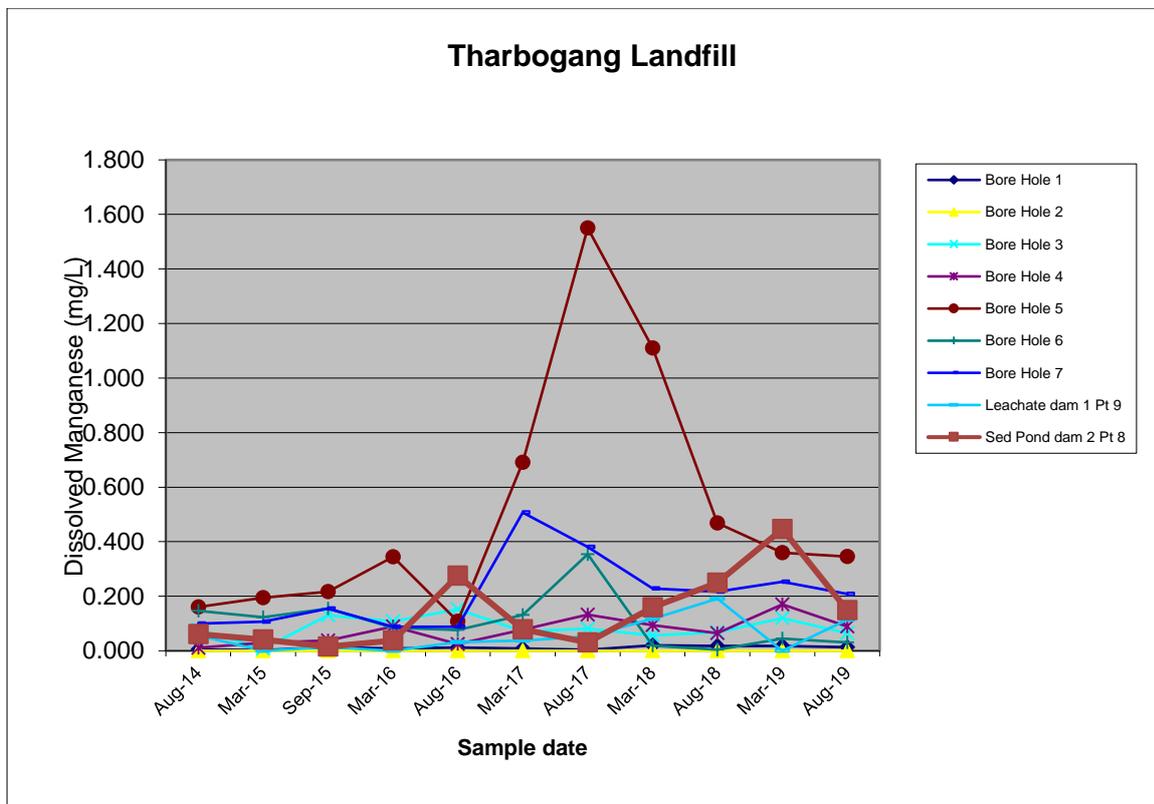


Figure 4.9: Manganese trends

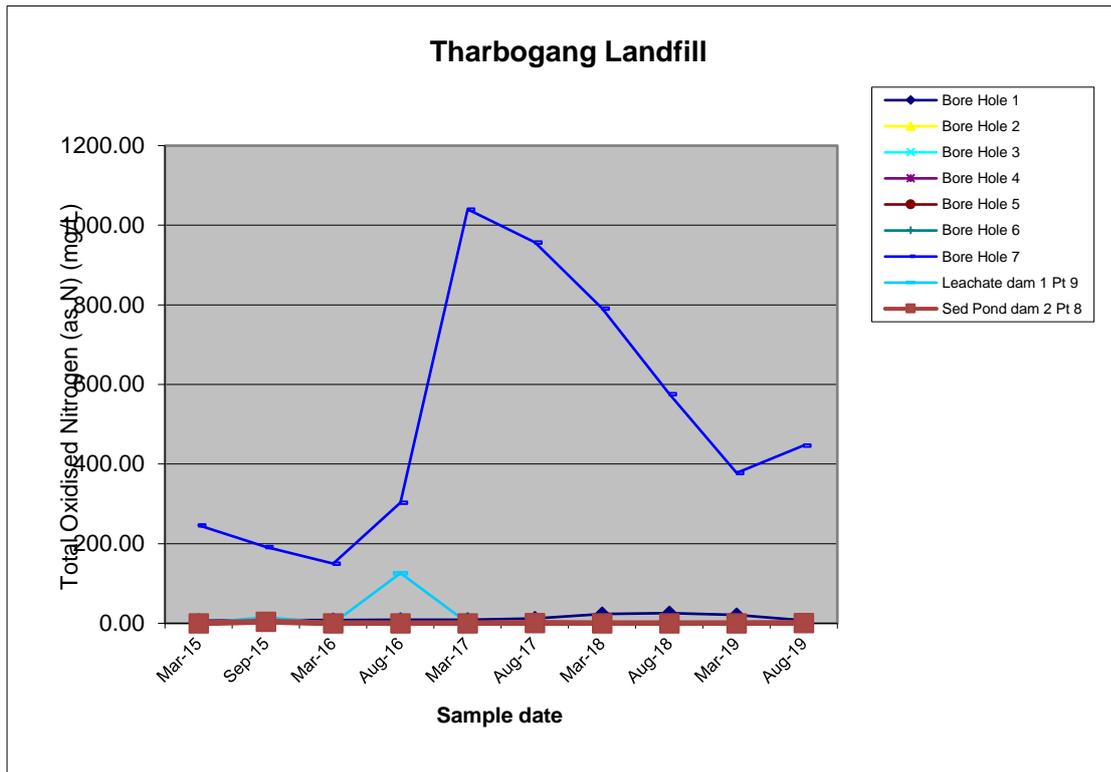


Figure 4.10: Total oxidised Nitrogen (as N mg/L)

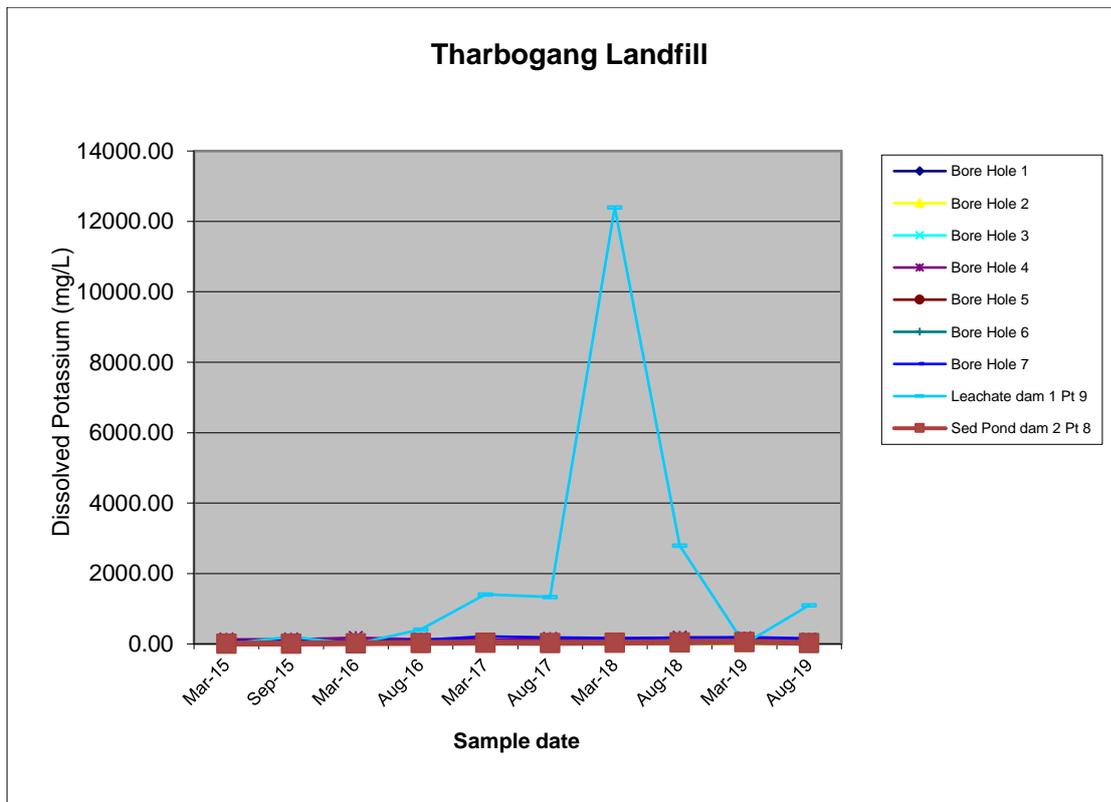


Figure 4.11: Potassium trends

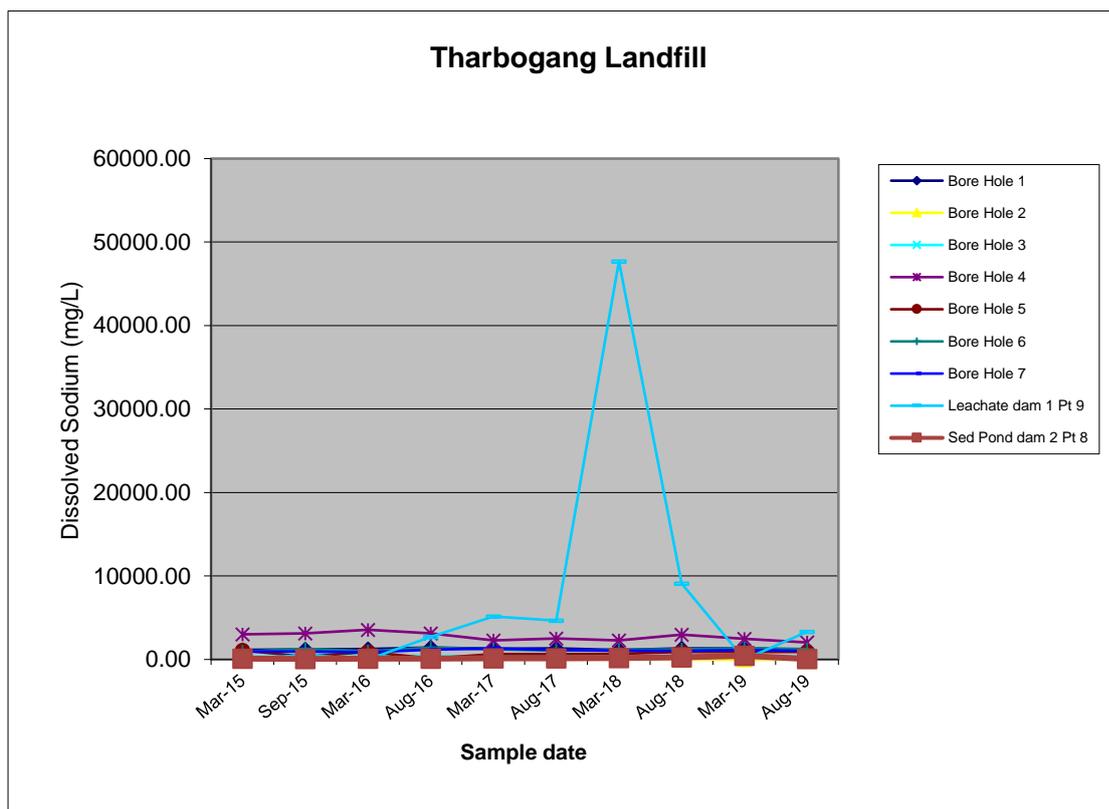


Figure 4.12: Sodium trends

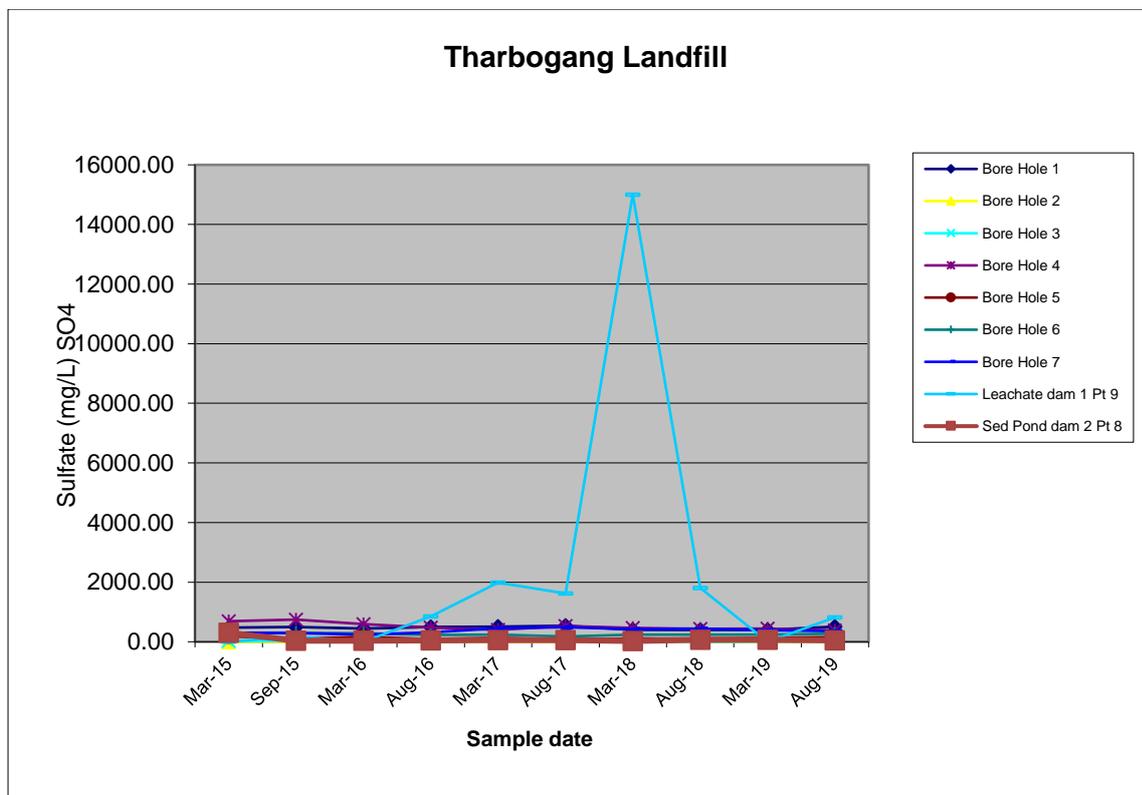


Figure 4.13: Sulphate trends

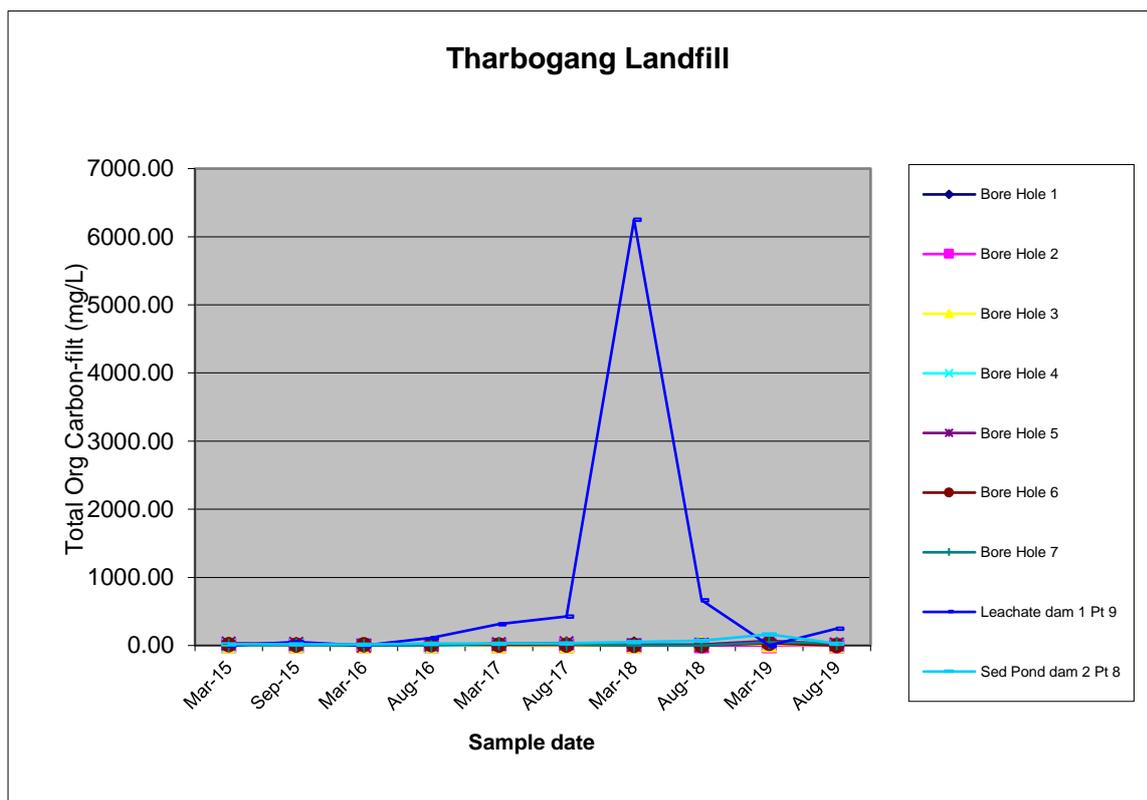


Figure 4.14: Total organic carbon (TOC) trends

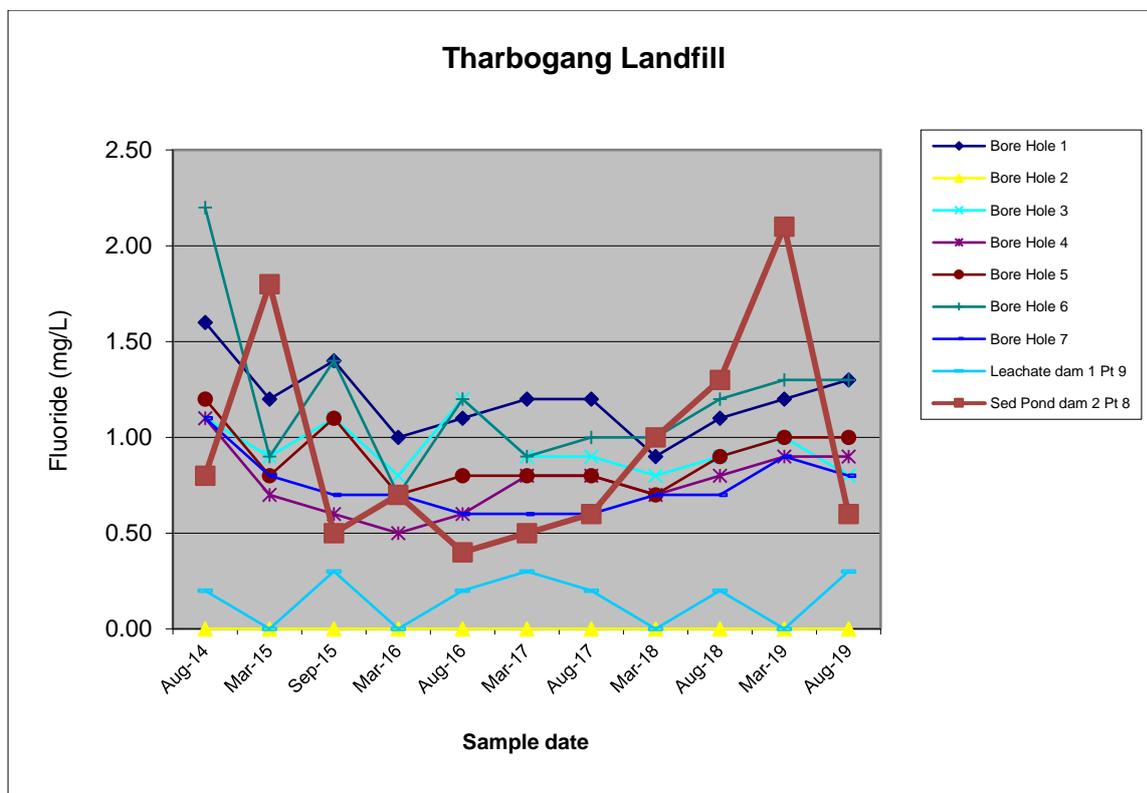


Figure 4.15: Fluoride (mg/L)

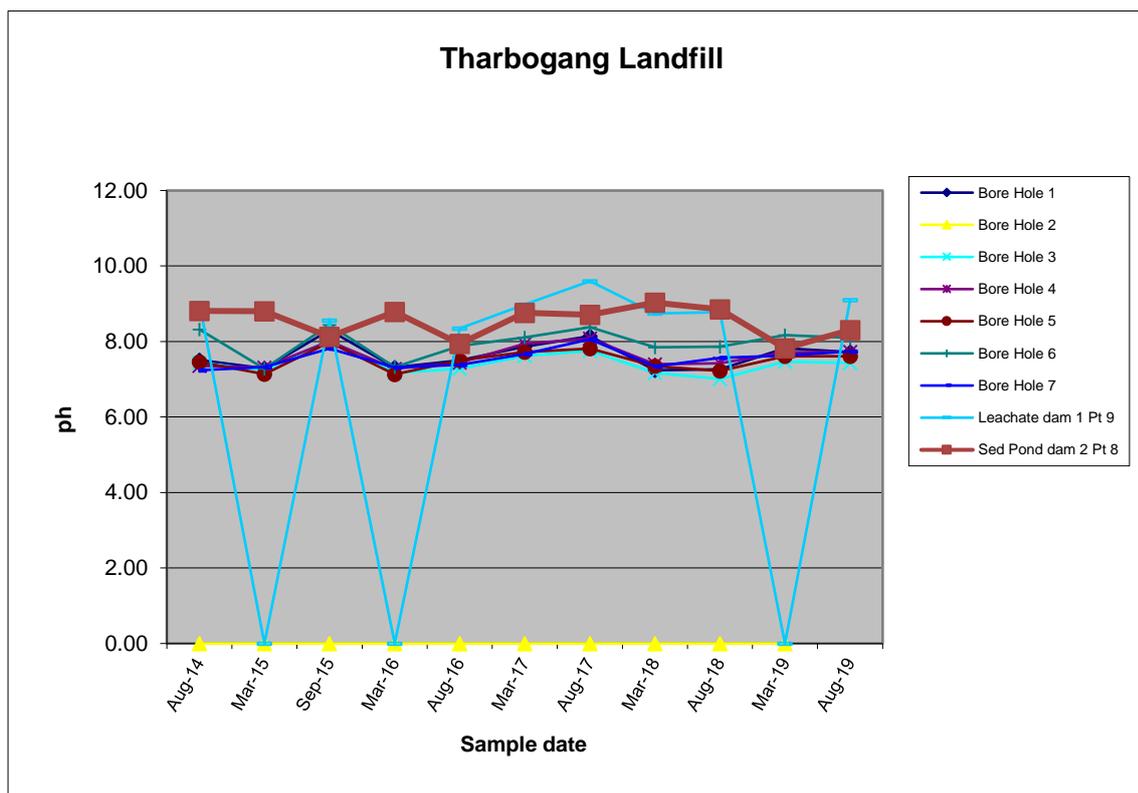


Figure 4.16: pH trends

4.6.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.12**.

Table 4.12: Groundwater compliance assessment

Condition	Review
Project Approval	
Condition 20-26, Schedule 3	A Soil, Water and Leachate Management Plan has been developed.
EPL	
P1.1	Monitoring of EPA points 1, 3-7 and dams 8 and 9 was completed in March and August 2018.
L1.1	No pollution of waters under the POEO Act has occurred.
M1	Monitoring results have been recorded and retained correctly. All records are legible and the date, time, location and person collecting have been recorded. The EPA audit (2019) states that the recoding of time of sampling for each sample is required on chain of custody or other record.
M2	All required pollutants have been monitored.
M3	No indication of if monitoring followed the Approved Methods Publication.

Condition	Review
	The EPA (2019) is concerned that the method of analyses used by the contract laboratory is not compliant with the approved methods.
EA	
A	No new boreholes have been installed in the past 10 years. However, a hydrogeological investigation carried out by Geolyse (2015) concluded that <i>installation of additional piezometers and/or implementing a more rigorous groundwater monitoring program to (a) replace non-viable monitoring location BH2, and/or (b) demarcate the extent of nondelineated impacts (known or potential), is not considered necessary.</i>
B	Unclear but possibly covered under EPL (9 Dec 2015)
C	A Groundwater Monitoring Program has been included in the Soil, Water and Leachate Management Plan.
Not Triggered	
D	Not applicable at this stage.

The site appears to be largely compliant regarding all aspects relevant to the licence conditions above. Assessment of the monitoring data shows that borehole 2 was dry over the entire assessment period.

A hydrological investigation was carried out by Geolyse in 2015 which, amongst other things, undertook a comparison of analyte concentrations from bore holes upgradient of the landfill footprint with corresponding concentrations at downgradient bore holes and assessing for increasing or decreasing trends in contaminant concentrations

No additional boreholes have been installed. However, the hydrological investigation carried out by Geolyse (2015) concluded that *installation of additional piezometers and/or implementing a more rigorous groundwater monitoring program to (a) replace non-viable monitoring location BH2, and/or (b) demarcate the extent of nondelineated impacts (known or potential), is not considered necessary.*

It further concluded, that based on the groundwater flow direction at the site's downgradient boundary tending towards the north, it is considered unlikely that groundwater impacts from Tharbogang WMC would be adversely affecting the groundwater quality of Tharbogang Swamp.

Geolyse (2015) recommends *the current biannual groundwater monitoring programme be continued at the site to continue to assess for adverse impacts to groundwater quality. Inclusion of TPH/TRH in the groundwater monitoring parameters as a discrete event may allow for better characterisation of such impacts, however long-term TPH/TRH monitoring is not considered to be necessary (unless significantly elevated concentrations are identified).*

Given that the Groundwater monitoring program does not provide exceedances, this report is unable to comment whether the results obtained over this reporting period meet required

criteria. However, the Geolyse (2015) report concluded that *the existing groundwater monitoring programme and network at the site satisfactorily characterises groundwater impacts at the site that may be attributable to landfilling activities.*

It is recommended that the management plan needs to develop Site Specific Trigger Values (SSTVs) which will enable a more realistic indication of landfill impacts on local groundwater conditions.

4.7 Leachate

4.7.1 Monitoring and management criteria

Leachate criteria is provided by the PA, EPL and EA. The PA provides criteria for the collection and management of leachate (Condition 18, Schedule 3). The proponent shall:

- a) Install a leachate barrier system on any surface to be use for the direct impoundment of leachate;
- b) Ensure that this leachate barrier system:
 - a. has a re-compacted clay or modified soil layer that is at least 600 mm thick and has in in situ coefficient of permeability of less than 1×10^{-9} m/s, or some other suitable liner approved by DECCW; and
 - b. drain to the leachate dams as a minimum gradient of 0.5%.
- c) Collect all leachate in the leachate dams to prevent it from escaping from the site to surface water, ground water or subsoil.
- d) Treat all water from waste storage or handling areas, including any organic waste storage area, or that has been in contaminated by leachate, as leachate;
- e) Ensure that the leachate storage dams:
 - a. Are capable of accepting leachate generated in a 1 in 100 year, 72 hour duration storm event without overflowing;
 - b. Have a re-compacted clay or modified soil layer that is at least 900 mm thick and in situ coefficient of permeability of less than 1×10^{-9} m/s, or, some other suitable liner approved by DECCW;
- f) Are constructed to the satisfaction of the DG.

Additionally, as with surface and groundwater, the PA recommends that a Soil, Water and Leachate Management Plan must be prepared and implemented, which must include a site water balance, erosion and sediment control plan, stormwater management scheme, surface water monitoring program and surface water response plan (Condition 20-26, Schedule 3).

The EPL provides several performance criteria for leachate management.

- A leachate collection system must be installed on each surface within the premises to be used for the disposal of waste (O6.1),
- The leachate collection system must be capable of capturing all leachate generated from the waste disposed of at the premises (O6.2),
- Surface waters must be diverted away from any area where waste is being or has been landfilled (O6.3),
- A leachate barrier system must be installed on each surface within the premises to be used for the storage of leachate (O6.4),
- There must be no discharge of leachate to waters (O6.5), and

- Requirement to monitor concentration of pollutants discharged (M2.1), following the Water/Land Monitoring Requirements (M2.2).

The EA statement of commitments require the following:

- Construct a leachate collection system with appropriate holding pond and/or tanks to divert leachate back to landfill (A),
- Install high level alarm to the leachate pond interlocked with the drainage system to prevent overflowing (B),
- Install monitoring and alarm system to detect possible failures in the leachate collection system (C), and
- Establish assessment procedures to determine extent of leachate system failure (D).

Griffith City Council has prepared a management plan for Leachate: *Tharbogang Waste Management Centre: Soil, Water & Leachate Management Plan (v2.0)*.

4.7.2 Results

Leachate monitoring has been completed for monitoring point 9 under the EPL. Monitoring results are presented with groundwater data in **Section 4.5.2**. All leachate is contained on site and is left untreated on site to evaporate.

Details of the installation of the retrofit leachate collection in January 2002 has been provided (SMEC 2002). Griffith City Council has also provided the *Leachate Well Pump Investigation* document as supporting evidence of the completion of the leachate collection (GCC 2019).

Griffith City Council has prepared a management plan for Leachate: *Tharbogang Waste Management Centre: Soil, Water & Leachate Management Plan (v2.0)*.

4.7.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.13**.

Table 4.13: Leachate compliance assessment

Condition	Review
Project Approval	
Condition 18, Schedule 3 (a)	The Soil, Water and Leachate Management Plan assumes that the landfill profile has these characteristics.
Condition 18, Schedule 3 (b)	Installation of the retrofit leachate collection has been completed (SMEC 2002).
Condition 18, Schedule 3 (c)	All leachate generated by the site is contained within the leachate ponds. However, the EPA audit (2019) noted that the leachate pump and discharge point into the leachate dam was not function or obstructed.
Condition 18, Schedule 3 (d)	No information.
Condition 18, Schedule 3 (e)	Leachate storage dams are designed to cater for a 1 in 100 year, 72 hour storm event.

Condition	Review
	The EPA is concerned that the rill and gully erosion observed on the walls of the leachate dam and the growth of vegetation is likely to compromise the present permeability of the leachate dam's base and banks increasing the likelihood of the leachate pond being breached and unable to contain a design storm event (EPA 2019).
Condition 20-26, Schedule 3	A Soil, Water and Leachate Management Plan has been developed.
EPL	
O6.5	All leachate is contained on site. No leachate is discharged. Leachate generated is contained and natural evaporation takes place.
O6.1	Leachate storage dams have been installed.
O6.2	Storage dams are designed to cater for a 1 in 100 year, 72 hour storm event.
O6.3	No surface water which falls on site leaves the site.
O6.4	Installation of the retrofit leachate collection has been completed (SMC 2002 and GCC 2019).
O6.5	All leachate is contained on site. No leachate is discharged. Leachate generated is contained and natural evaporation takes place.
M2.1 and M2.2	Monitoring of EPA point 9 was completed in March and August 2018.
EA – Not Triggered	
A	Relates to the new landfill development which has not commenced.
B	Relates to the new landfill development which has not commenced.
C	Relates to the new landfill development which has not commenced.
D	Relates to the new landfill development which has not commenced.

4.8 Meteorological Monitoring

4.8.1 Monitoring and management criteria.

The PA requires that the meteorological station be established and maintained in the vicinity of the development (Condition 27, Schedule 3). The station should monitor rainfall, wind speed and wind direction in accordance with the *Approved Methods for Sampling of Air Pollutants in New South Wales guidelines*. Meteorological monitoring is not addressed in the EPL or EA.

4.8.2 Results

Meteorological monitoring data has been collected from the Griffith Water Reclamation Plant (AMG 6206405.9, 408734.488) for reporting purposes to meet the EPL requirements (**Figure 4.17**). Thirteen monitoring parameters are downloaded from the weather station and averages calculated for each parameter. The following have been included in **Table 4.14**):

- Wind Speed AVG

- AVE Wind Speed Max
- Radiant Heat Max
- Radiant Heat Min
- Radiant Heat AVG
- Daily Air Temperature Min
- Air Temperature Max
- Air Temperature AVG
- Rainfall Data provided from BOM Griffith (75041)

Data is logged at two minute and ten minute intervals. Modelling utilises the ten minute interval. Due to the rain sensor not working the statistical information for rain fall was taken from the Bureau of Meteorology. Results are shown in **Table 4.14**.

Between the sampling dates March 2018 and August 2018, there was a total of 76mm of rainfall (EPA 2017-2018 Annual Return).

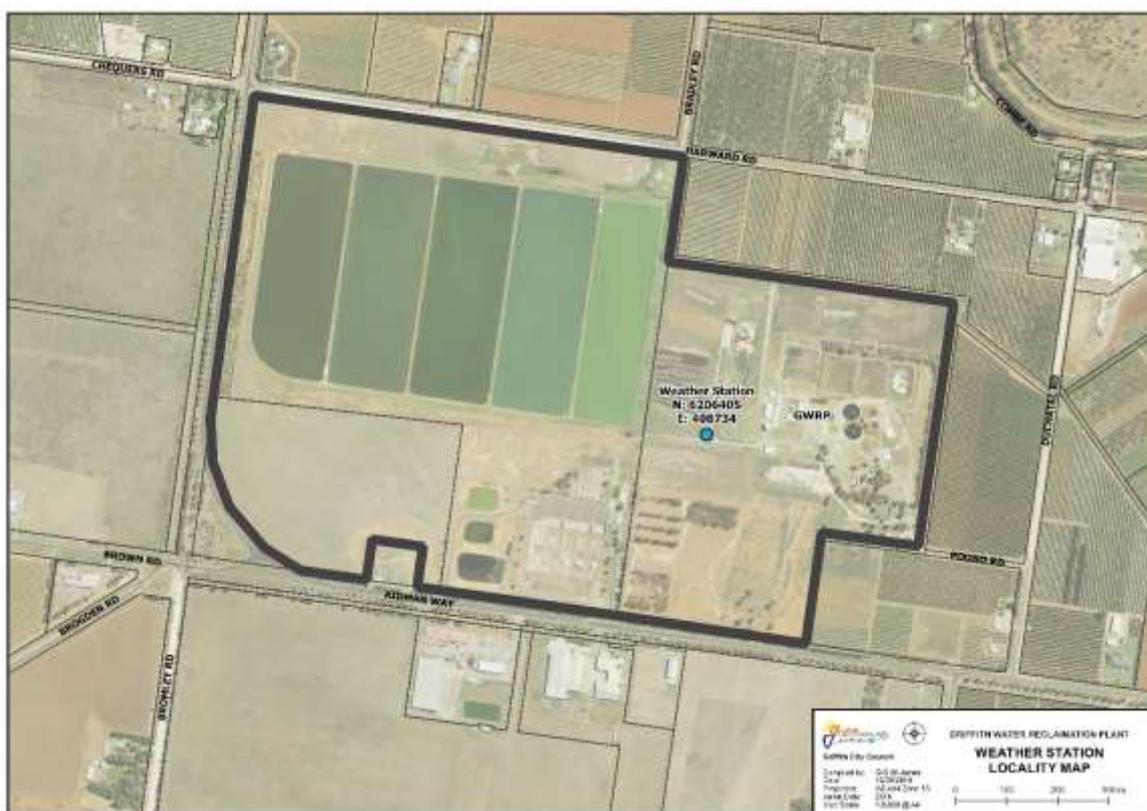


Figure 4.17: GRWP Weather Station Site Map

Table 4.14: Griffith Water Reclamation Plant weather station data 2018

Parameter	AVG of Wind Speed AVG	AVG Wind Speed Max	Radiant Heat Max	Radiant Heat AVG	AVG Daily Air Temperature Min	AVG Air Temperature Max	Air Temperature AVG	AVG Rainfall Data provided from BOM Griffith (75041)
Month	km/h	km/h	(%)	(%)	deg c	deg c	deg c	mm
January	8.8	23.6	78.4	46.3	17.8	35.0	26.5	17.6
February	8.6	22.6	75.2	44.3	16.0	33.2	24.5	2.2
March	8.2	20.2	78.2	47.7	12.6	30.6	21.6	2.6
April	6.8	19.6	80.8	51.5	9.9	28.8	19.0	0.4
May	7.6	20.6	89.8	69.5	5.2	19.7	12.0	19.0
June	6.8	18.2	92.8	77.4	3.8	15.2	8.9	33.0
July	8.0	21.0	89.5	68.1	1.9	16.3	8.8	8.2
August	10.0	24.8	86.6	59.5	3.0	17.3	10.1	6.4
September	8.4	23.8	81.7	52.5	4.1	21.2	12.8	8.0

Parameter	AVG of Wind Speed AVG	AVG Wind Speed Max	Radiant Heat Max	Radiant Heat AVG	AVG Daily Air Temperature Min	AVG Air Temperature Max	Air Temperature AVG	AVG Rainfall Data provided from BOM Griffith (75041)
Month	km/h	km/h	(%)	(%)	deg c	deg c	deg c	mm
October	10.0	24.7	81.4	52.5	10.4	26.2	18.5	48.8
November	9.6	26.0	82.0	51.6	12.8	27.6	20.3	52.8
December	9.4	24.6	70.3	41.9	17.3	33.5	25.8	21.8

4.8.1 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.15**.

Table 4.15: Meteorological monitoring compliance assessment.

Condition	Review
Project Approval	
Condition 27, Schedule 3	Use of the meteorological station as Griffith Water Reclamation Plant was approved by DOP & EPA in September 2011 and data included in this report.

4.9 Noise and vibration

4.9.1 Monitoring and management criteria.

Noise and Vibration criteria is provided by the PA, EPL and EA. The PA requires:

- Maximum noise limits must not exceed the noise impact assessment criteria in **Table 4.16** (Condition 28, Schedule 3),
- Continuous improvement of noise impacts and mitigation measures must be undertaken (Condition 39, Schedule 3),
- A Noise and Vibration Plan must be developed and implemented. An annual attended noise monitoring, traffic monitoring, details of how the noise monitoring is to be conducted and a noise monitoring protocol must be included in the Noise and Vibration Plan (Condition 40, Schedule 3).

Table 4.16: PA operational noise impact assessment criteria dB(A).

Location and Locality	Day $L_{Aeq}(15 \text{ min})$	Evening $L_{Aeq}(15 \text{ min})$	Night $L_{Aeq}(15 \text{ min})$
All Surrounding Sensitive Receivers	35	35	35

Noise restrictions under the EPL (L3.1 and 3.2) are presented in **Table 4.17**.

Table 4.17: Noise limits dictated under the ELP.

Day	Time	Limit (L_{A10} (15 minute))
Monday - Friday	7am – 6pm	55dB
Saturday	7am – 1pm	
Monday – Friday	6pm – 10pm	45dB
All other times	All other times	40dB

The revised EA mitigation table identified the following mitigation and management commitments for relating to noise and vibration:

- Implement procedures or investigating complaints (A),
- Ensure noise and vibration from quarry operation does not exceed project specific intrusive, amenity, vibration and sound pressure level goals. Noise from the plant should be below 35dB (B),
- Where quarry plant noise is found to exceed the intrusive goal of 35dB ($L_{Aeq,15 \text{ mins}}$) at affected residences, the plant will be moved or modified to ensure the noise impact from the plant is below 35dB ($L_{Aeq,15 \text{ mins}}$) (C),
- Review potential for traffic noise levels once extraction rates exceed 350,000 tpa and scale up (Prior to 2033) (D), and
- Restrict operating hours to 8:30am – 5pm (E).

4.9.2 Results

Noise monitoring was conducted at six sensitive receivers at three separate times during operating hours on 11 December 2018. Both the quarry and landfill were in operation during

the monitoring. The monitored noise levels exceed the noise impact assessment criteria at each location for every monitoring period (NGH Environmental 2019). However, the report concluded that *the impact of quarry and landfill noise emission was shown to be relatively minor when attenuated for distance and that the site observations at the sensitive receivers reinforce the notion that the facility noise impact is a minor contributor to ambient noise levels. While the recorded noise levels at each of the sensitive receivers ($L_{Aeq(15 min)}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq(15 min)}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations* (NGH Environmental 2019).

Activities within quarry pits 101 and 103 have not commenced at the time of reporting. No noise complaints have been received.

Table 4.18: Noise monitoring summary results (taken from NGH Environmental 2019)

Assessment Criteria	Monitored noise levels dB(A) $L_{Aeq(15min)}$			Distance from facility to receiver (m)
	Morning	Midday	Afternoon	
	35	35	35	-
Sensitive receiver 1	36.4	51.6	52.0	1020
Sensitive receiver 2	55.2	54.4	43.4	1300
Sensitive receiver 3	49.9	46.0	46.1	1000
Sensitive receiver 4	42.3	47.8	40.3	650
Sensitive receiver 5	-	40.6	43.6	690
Sensitive receiver 6	65.0	53.8	67.3	1250
Quarry face	-	44.3	-	60

4.9.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.19**.

The noise report concluded that *the impact of quarry and landfill noise emission was shown to be relatively minor when attenuated for distance and that the site observations at the sensitive receivers reinforce the notion that the facility noise impact is a minor contributor to ambient noise levels. While the recorded noise levels at each of the sensitive receivers ($L_{Aeq(15 min)}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq(15 min)}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations* (NGH Environmental 2019).

Table 4.19: Noise and vibration compliance criteria.

Condition	Review
Project Approval	
Condition 28, Schedule 3	<p>The NGH report noted that <i>while the recorded noise levels at each of the sensitive receivers ($L_{Aeq (15 min)}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq (15 min)}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations (NGH Environmental 2019).</i></p> <p>The EPA audit (2019) states that the licensee is to keep copy of chain of custody of all samples taken for auditable records.</p>
Condition 39, Schedule 3	No evidence of continuous improvement is provided. However, the impact of quarry and landfill noise emission was shown to be relatively minor when attenuated for distance (NGH Environmental). The site observations at the sensitive receivers reinforce the notion that the facility noise impact is a minor contributor to ambient noise levels.
Condition 40, Schedule 3	Noise and Vibration Plan has been developed.
EPL	
L3.1 and L3.2	<p>Noise at sensitive receiver 6 exceed the required levels of 55dB(A) both in the morning and afternoon.</p> <p>The NGH report noted that <i>while the recorded noise levels at each of the sensitive receivers ($L_{Aeq (15 min)}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq (15 min)}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations (NGH Environmental 2019).</i></p>
EA	
A	No complaints have been received.
B	<p>Noise exceeded the required 35dB(A) for all receivers during the 2018 monitoring (NGH Environmental 2019).</p> <p>The NGH report noted that <i>while the recorded noise levels at each of the sensitive receivers ($L_{Aeq (15 min)}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq (15 min)}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations (NGH Environmental 2019).</i></p> <p>No noise monitoring data has been provided as the quarry operations for Pits 101 and 103 have not commenced.</p>
D	Operating hours are that which is recommended (8:30 – 17:30).
Not Triggered	
C	Not triggered

4.10 Blasting

4.10.1 Monitoring and management criteria

Blasting criteria is provided by the PA and EPL. The PA Compliance Requirements state that the following criteria must be upheld in accordance with the Schedule 3 - Specific Environmental Conditions. Airblast overpressure limits and the ground vibration thresholds must not be exceeded. The following criteria is provided by the PA:

- Blasting must not occur within 200m of privately-owned lands unless suitable arrangements have been arranged (Condition 34, Schedule 3).
- Property inspections are required in which landholders are entitled to a property inspection when the property lies within 500m of the blasting area. The landholders within 500m of the blasting area must be notified of the proposed blasting activities (Condition 35, Schedule 3).
- If a landholder has requested an inspection of their property, a suitably qualified person must undertake the inspection. The process involved in the investigation must be recorded. (Condition 36, Schedule 3).

The preparation and implementation of a Blast Management Plan is required. Continual improvement criteria must be recorded for blasting.

The EPL specifies the overpressure level (L4.1; **Table 4.20**) and ground vibration (L4.2; **Table 4.21**) criteria be met when undertaking blasting. Monitoring equipment should have a cut-off frequency of 2Hz or less. If the equipment has a higher cut-off frequency, then a correction of 5dB should be added. However, no equipment with cut-off frequency exceeding 10Hz should be used to measure Airblast overpressure.

Table 4.20: Airblast overpressure limits specified in the EPL.

Receiver	Airblast overpressure level (dB (Lin Peak))	Allowable exceedance
All Surrounding Sensitive Receivers	115	Must not exceed 5% of the total number of blasts in a 12-month period.
	120	0% - must not exceed at any time.

Table 4.21: Ground vibration criteria from the EPL.

Receiver	Peak particle velocity (mm/s)	Allowable exceedance
All Surrounding Sensitive Receivers	5	Must not exceed 5% of the total number of blasts in a 12-month period
	10	0% - must not exceed at any time.

The EPL (L4.3) also requires that blasting must only be carried out between 9.00 hours and 17.00 hours, Monday to Saturday. Blasting must not take place on Sundays or Public Holidays without prior EPA approval.

The EA revised conditions specify the following mitigation and management measures regarding blasting:

- Blasting airblast overpressure (in dB Linear Peak) and ground vibration peak particulate velocity (in millimetres per second) will be measured for the first three blasts at the nearest affected residence. If these are well within the limited and there are no complaints, then monitoring will be undertaken once per year. The results will be reported to DECCW (A),
- Blasting will only occur between 9:00am-3pm, Monday to Friday excluding public holidays (B), and
- Notify residents within 2 km of intention to blast at least 7 days in advance (C).

4.10.2 Results

One blasting event occurred during the reporting period, the results of this blast are presented in **Table 4.22** (Results supplied by Griffith City Council). Analysis of trends of overpressure and ground vibration are presented in **Figure 4.18** and **Figure 4.19**.

Table 4.22: Blasting monitoring results from the monitoring period.

Blast Date and Time	Ground Vibration (mm/s)	Over Pressure (dB – Linear)	Compliant
15/11/2018 – 3.51 PM	1.77	108	Yes

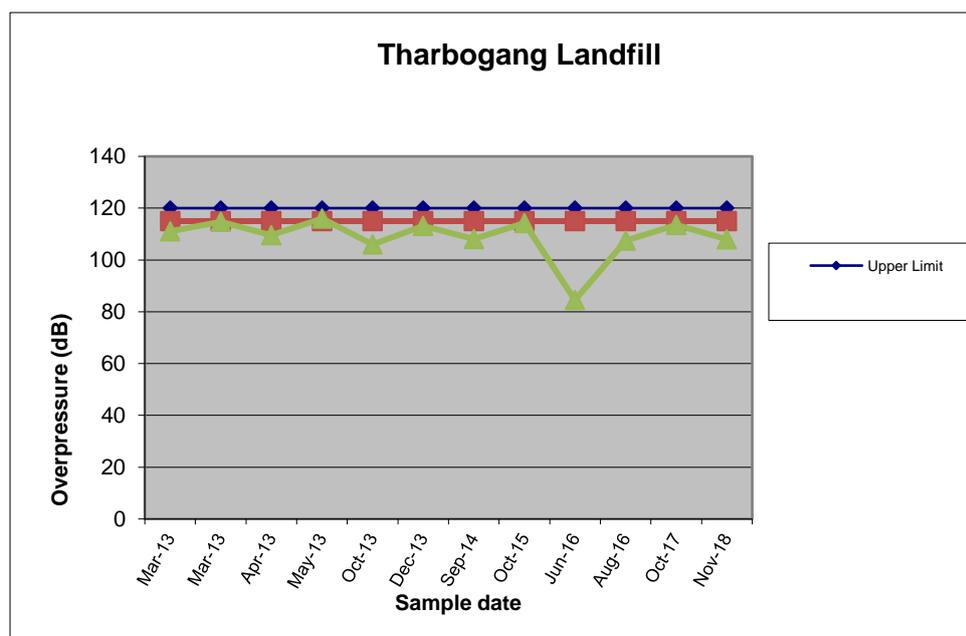


Figure 4.18: Blasting overpressure results

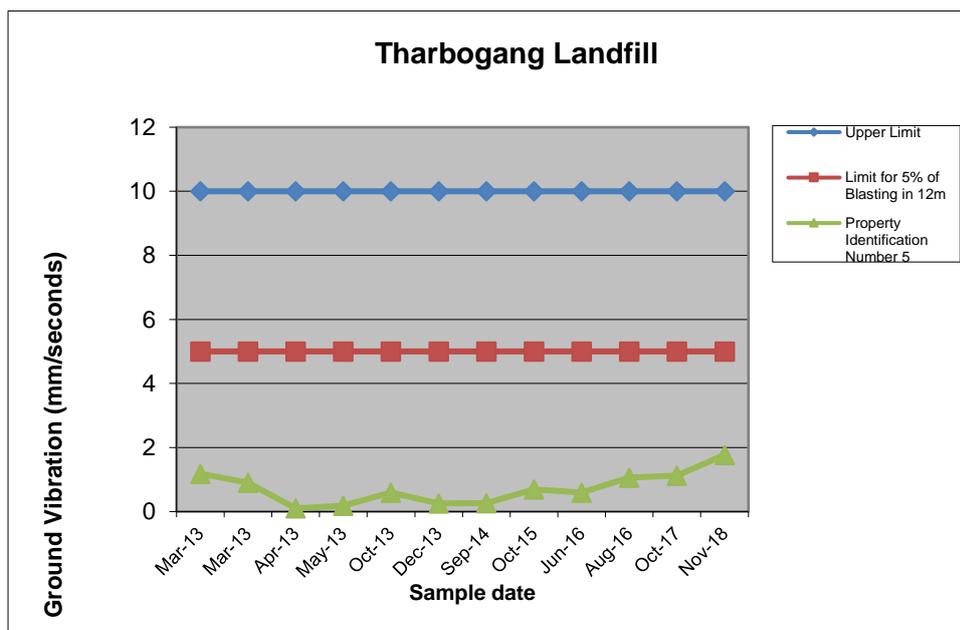


Figure 4.19: Blasting Ground Vibration results

4.10.3 Review

The blasting event occurred at 3.51 PM, within the specified hours of operation. The results of the blast monitoring are within the ground vibration and overpressure limits specified within the EPL. An assessment of the monitoring results against the regulatory framework is presented in **Table 4.23**.

Table 4.23: Blasting compliance assessment

2019Condition	Review
Project Approval	
Condition 30, Schedule 3	The one blast within the reporting period was within the specified airblast overpressure criteria.
Condition 31, Schedule 3	The one blast within the reporting period was within the specified ground vibration levels.
Condition 32, Schedule 3	The blast occurred at 3.51 pm, which is within the hours specified in the EPL. The EPA was contacted to verify the discrepancy, regarding operation and blasting hours, between the PA and EPL and it was advised that the EPL conditions would apply.
Condition 33, Schedule 3	Only one blast occurred throughout the calendar year (15/11/18).
Condition 34, Schedule 3	The blast was not within 200m of any privately owned land.
Condition 35, Schedule 3	Not relevant, past 30 November 2010.
Condition 36, Schedule 3	No written requests were made within the reporting period.
Condition 37, Schedule 3	No property damage occurred to any landowner within 500m of blasting.
Condition 38, Schedule 3	A <i>Blast Management Plan</i> has been prepared by Griffith City Council.
Condition 39, Schedule 3	No indication of continuous improvement within the reporting year.

2019Condition	Review
EPL	
L4.1	The one blast within the reporting period was within the specified airblast overpressure criteria.
L4.2	The one blast within the reporting period was within the specified ground vibration levels.
L4.3	The blast occurred at 3.51 pm, within the specified hours of operation.
EA	
A	The one blast within the reporting period was within the specified airblast overpressure criteria. Measurement of two more blasts, when they occur, is required. The one blast within the reporting period was within the specified ground vibration levels. Measurement of two more blasts, when they occur, is required.
B	The blast occurred at 3.51 pm, which is within the ours specified in the EPL.
C	Residents within 2 km were notified (evidence provided by GCC)

4.11 Air Quality – Dust

A copy of the Air Monitoring Plan (AMP) has not been provided for the AEMR.

4.11.1 Monitoring and management criteria

Air Quality criteria is provided by the PA, EPL and EA. Under the PA (Condition 43, Schedule 3), an Air Quality Monitoring Plan is required to be prepared and implemented. This plan must include details of how air quality performance will be monitored and protocols for compliance evaluation.

Dust monitoring was carried out by Coffey Geotechnics at four sampling points in June 2007 as part of the EA to determine background dust levels. Although the data on background dust levels has not been provided, data for monitoring from September 2018 – September 2019 has been provided with the results shown in **Table 4.26**.

The PA also prescribes air quality criteria which must not be exceeded (Condition 41, Schedule 3), this is listed in **Table 4.24** for particulate matter and **Table 4.25** or dust.

Table 4.24: Impact assessment criteria for particulate matter under the project approval.

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m ³
Particulate matter <10 µm (PM ₁₀)	Annual	30 µg/m ³
Particulate matter <10 µm (PM ₁₀)	24 hour	µg/m ³

Table 4.25: Long term impact assessment criterion for deposited dust under the project approval

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

The EPL condition O3 specifies that all operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.

The approved methods for the modelling and assessment of air pollutants in NSW has been developed by the EPA (EPA 2016). This document provides the methodology and impact assessment criteria for common pollutants.

Air quality impacts have been assessed by the EA. The following mitigation and monitoring commitments have been made:

- Implement procedures for investigating complaints (A),
- Water cart for dust suppression on unsealed roads (B),
- Water down uncovered stockpiles (C),
- Use water sprayers whenever the crusher is operating (D),
- When 10 minute average wind speed exceeds 30km/hr from the NE quadrant (between 0° and 90°), operation of the quarry will cease or as specified in the Dust Management Plan (E),
- When 10 minute average wind speed exceeds 35km/hr from any direction, operation of the quarry will cease or as specified in the Dust Management Plan (F),
- Preparation and implementation of a Dust Management Plan incorporating dust monitoring (G), and
- Wet down stockpiles as per the dust management plan (H).

4.11.2 Results

Dust and air quality monitoring data for this reporting period is provided below in **Figure 4.20**, **Figure 4.21** and **Table 4.26**. An Air Monitoring Plan has been developed for the site (GHD 2013a) and outlines the air quality criteria. Some non-compliance with the air quality thresholds occurred during the monitoring period and a summary of the results is outlined below:

- Overall averages for total dust deposited and TSP matter complied with all thresholds
- At all dust monitoring sites there was at least one month where the maximum increase in deposited dust levels exceeded the 2 g/m²/month threshold. These are indicated in blue in **Table 4.26**.
- At DM02 and DM03 particulate matter exceeded the 24 hour 50 µg/m³ threshold over more than one month. Particulate matter exceeded the 24 hour 50 µg/m³ threshold in November only at DM01 and DM04 These are indicated in orange in **Table 4.26**.
- All sites exceeded the particulate matter per 24 hour threshold of 50 µg/m³ was exceeded at all sites in November 2018.

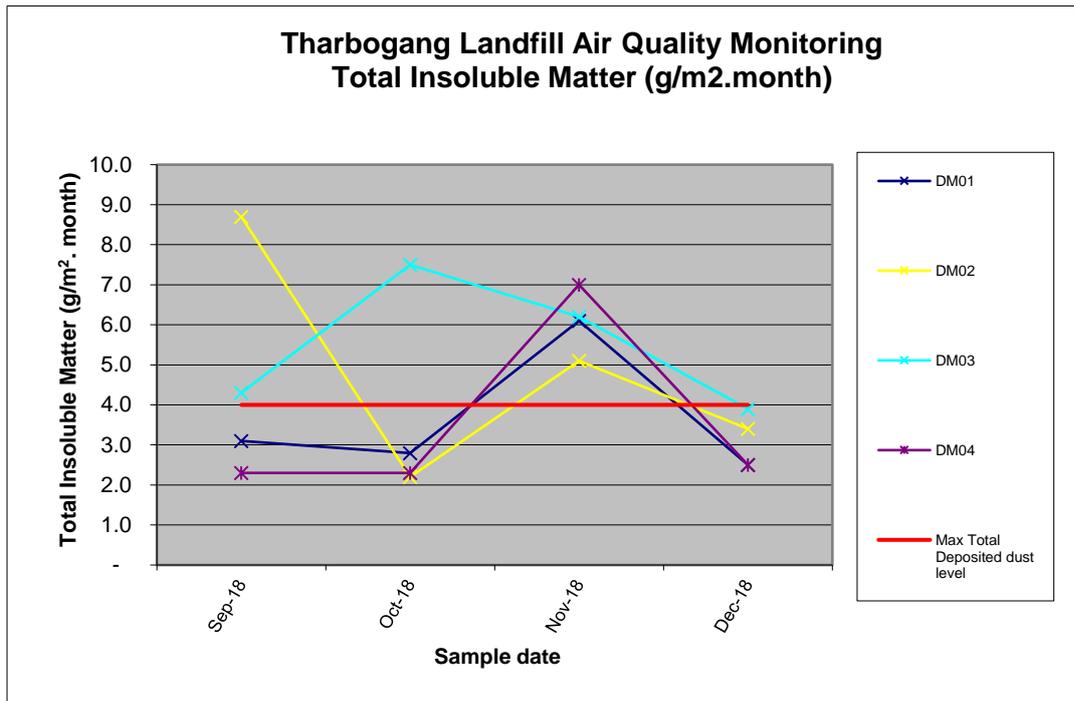


Figure 4.20: Total insoluble matter (g/m².month) (deposited dust level)

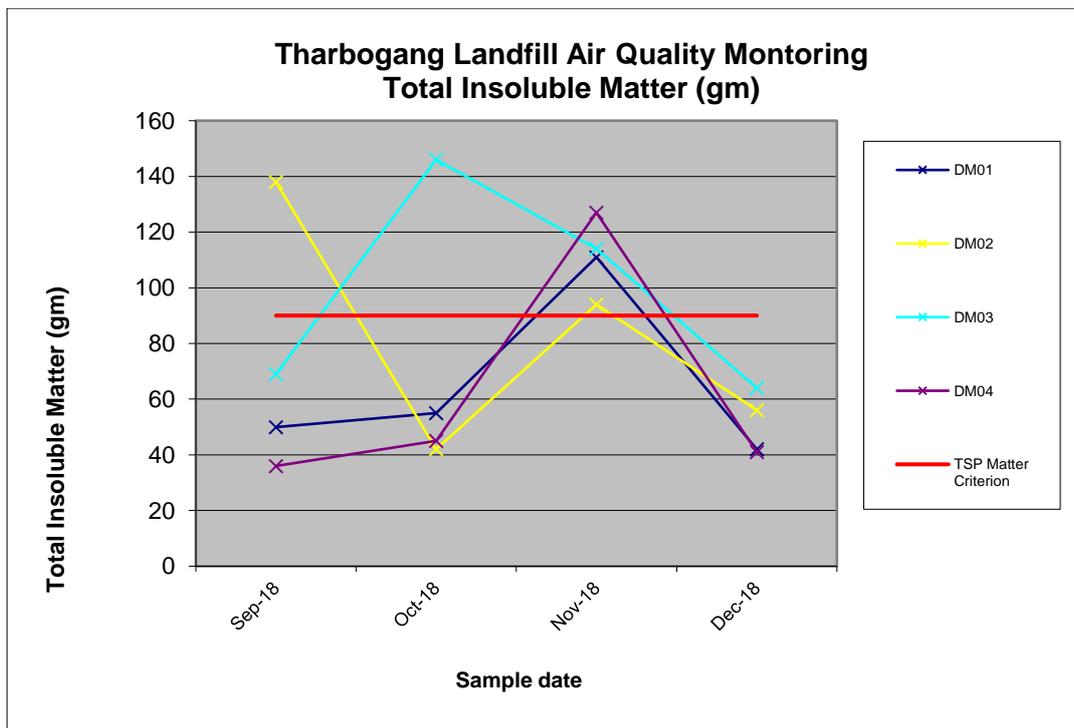


Figure 4.21: Total insoluble matter (gm) (TSP Matter)

<u>Total Insoluble Matter (g/m 2.month)</u>	Sept 2018 - Sept 2019							
	Sep-18	Oct-18	Nov-18	Dec-18	COUNT of samples for period	MIN of samples for period	MAX of samples for period	AVERAGE
DM01	3.1	2.8	6.1	2.5	4	2.500	6.100	3.6
DM02	8.70	2.2	5.10	3.40	4	2.200	8.700	4.9
DM03	4.3	7.5	6.2	3.9	4	3.900	7.500	5.5
DM04	2.3	2.3	7.0	2.5	4	2.300	7.000	3.5
Max Total Deposited dust level	4.0	4.0	4.0	4.0				
<u>Total Insoluble Matter (gm)</u>								
	Sep-18	Oct-18	Nov-18	Dec-18				
DM01	50	55	111	42.0	4	42.000	111.000	64.50
DM02	138.00	42	94.00	56.00	4	42.000	138.000	82.50
DM03	69.00	146	114.00	64.00	4	64.000	146.000	98.25
DM04	36	45	127	41	4	36.000	127.000	62.25
TSP Matter Criterion	90.0	90.0	90.0	90.0				

Orange and blue indicate thresholds exceeded.

Table 4.26: Dust and air quality monitoring results

4.11.3 Review

There is currently no evidence of any implementation of reasonable and feasible dust mitigation measures at the site. Additionally, no investigation of dust reduction measures has been provided. No Air Quality Monitoring Plan has been provided for this AEMR. An assessment of the monitoring results against the regulatory framework is presented in **Table 4.27**.

Once there is a data set of 12 months air quality testing results, an assessment report will be prepared and submitted to DPOI and EPA. The assessment of this report will determine if air quality monitoring will continue.

Table 4.27: Dust compliance assessment.

Condition	Review
Project Approval	
Condition 43, schedule 3	An Air Monitoring Plan has been developed for TWMC (GHD 2013a).
Condition 41, schedule 3	Air quality monitoring commenced in September 2018
EPL	
O3	Dust mitigation activities are considered in the Air Monitoring Plan (GHD 2013a).
EA	
A	Procedures for investigating complaints are considered in Section 3 . No complaints have been received during the reporting period.
B	Water carts are in use and operations cease when weather conditions cause low visibility.
C	A sprinkler system is in use.
D	A sprinkler system is in use.
E	Average wind speed management measures and monitoring protocol are included in the Air Monitoring Plan (GHD 2013a) and meet the EA criteria.
F	Average wind speed management measures and monitoring protocol are included in the Air Monitoring Plan (GHD 2013a) and meet the EA criteria.
G	Air Monitoring Plan has been prepared by GHD (2013a).
H	A sprinkler system and water carts are in use.

4.12 Odour (Air Quality)

4.12.1 Monitoring and management criteria

Odour criteria is provided by the PA. The PA (condition 42, Schedule 3) requires that odour complies with section 129 of the *POEO Act* unless expressly provided in the EPL. Under this

Act, no emission of any offensive odour must come from the premises where the licence applies. However, odour emissions are permitted provided they are in accordance with the conditions of the licence or that the only persons affected are workers on site. This is designed to minimise the nuisance effect to acceptable levels.

The EA has recommended that the site conduct odour modelling in the event of a complaint / incident (A).

4.12.2 Results

No odour monitoring data was provided for the reporting period. An Odour Impact Assessment Study was completed in 2007 by The Odour Unit Pty Ltd. This assessment conducted odour modelling.

4.12.3 Review

No further assessment was completed as no odour monitoring was completed. The legislative criteria addressed by the PA is assessed in **Table 4.28**.

Table 4.28: Odour (air quality) compliance assessment.

Condition	Review
Project Approval	
Condition 42, Schedule 3	No odour monitoring data has been provided. However, no complaints have been made regarding odour in the reporting period.
EA	
A	Odour Modelling has been completed in an Odour Impact Assessment Study.

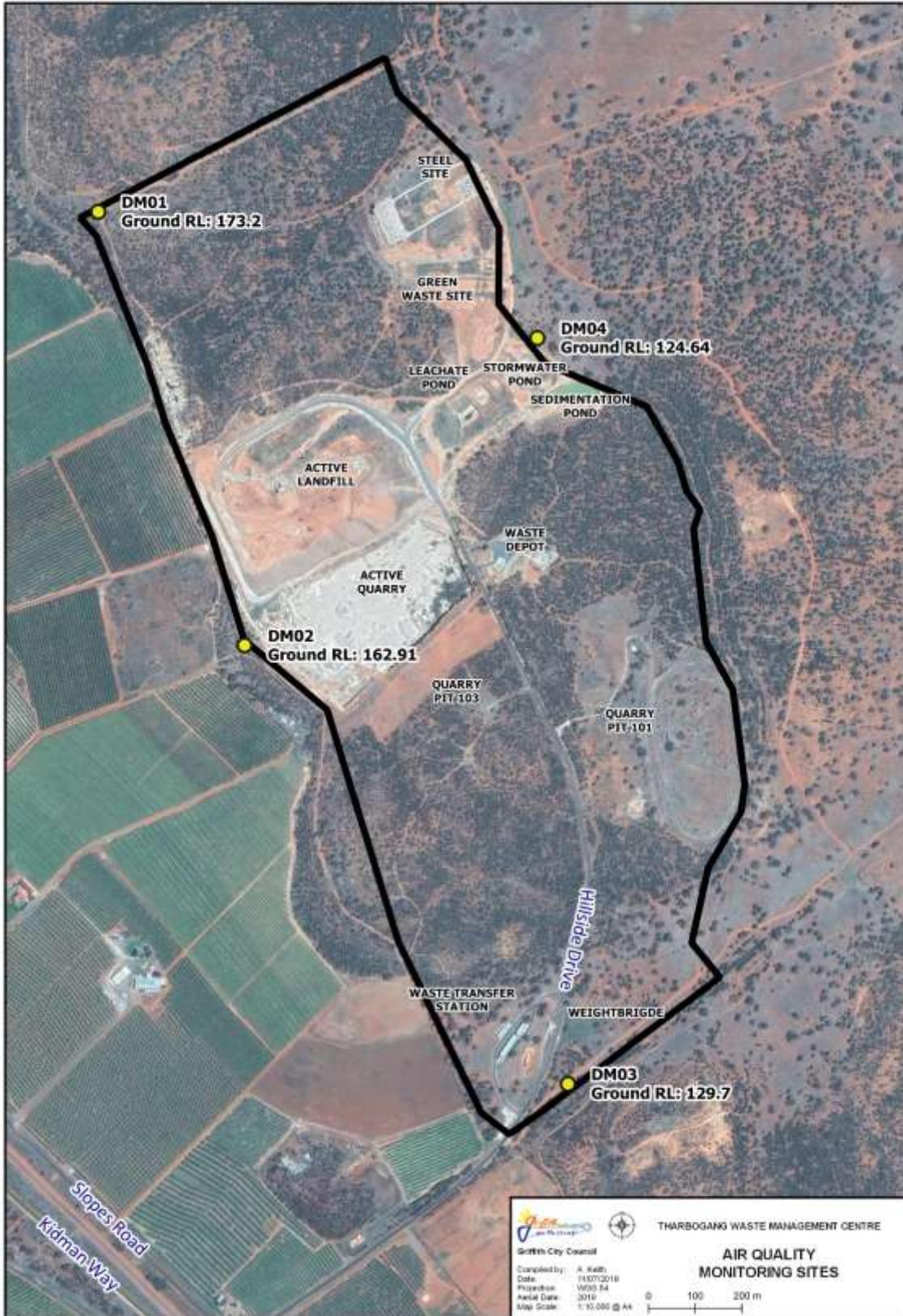


Figure 4.22: Air Quality Monitoring Locations (monitoring to begin in 2018)

4.13 Greenhouse Gas Emissions

4.13.1 Monitoring and management criteria

Greenhouse Gas (GHG) Emissions are emitted from the landfill site. The relevant criteria are provided by the PA and EA. Landfill sites are a source of GHG as waste decomposes. Under the PA (Condition 11, Schedule 3), all composting undertaken at the site must be in accordance with *AS 4454-2003: Composts, Soil Conditioners and Mulches, Appendix N, best practice guidelines for Composting Systems*. Utilisation of other composting practices must be approved by the DECCW. Additionally, the PA requires that a feasibility report is required to be prepared for within 5 years of the Planning Approval (Condition 12, Schedule 3). This report must outline options to capture and use GHG in the generation of electricity. Feasible options must be considered in this report.

Present and future GHG emissions have been assessed in the EA, the following mitigation and management commitments have been made:

- Capture and flare landfill gases and continuously monitor emissions (A),
- Once data is available, a greenhouse gas target will be set and incorporated into the landfill operational environmental management plan (B),
- Construct and operate waste transfer station to reduce waste to landfill (C), and
- Cover active tip face daily with green waste to improve bioreaction process (D).

4.13.2 Results

No greenhouse gas emission monitoring occurred during the reporting period. No feasibility report for the capture and use of greenhouse gas has been prepared.

4.13.3 Review

No monitoring data has been provided. Consequently, it is not possible to assess the levels of GHG emissions, or, if composting undertaken met *AS 4454-2003*. An assessment of the monitoring results against the regulatory framework is presented in **Table 4.29**. No target has been set and incorporated into the landfill Operational Environmental Management Plan.

Table 4.29: Greenhouse Gas Emissions compliance assessment.

Condition	Review
Project Approval	
Condition 11, Schedule 3	No evidence of if composting undertaken on site meets <i>AS 4454-2003</i>
Condition 12, Schedule 3	No feasibility report has been provided.
EA	
B	No GHG monitoring has been undertaken or a target set.
C	Waste transfer station has been constructed.
Not Triggered	
A	Not triggered at this stage.
D	Not triggered – landfilling within the existing quarry has not commenced.

Condition	Review
	No information regarding daily tip face cover is provided for current landfill.

4.14 Rehabilitation and Landscape Management

4.14.1 Monitoring and management criteria

Rehabilitation and Landscape management criteria is provided by the PA and EA. The PA has specific requirements for the visual amenity and litter control within 6 months of the date of project approval (Condition 9, Schedule 3):

- Remove existing litter that has accumulated across the site,
- Implement suitable measures to prevent the unnecessary proliferation of litter both on and off site, including the installation and maintenance of a mesh fence not less than 1.8 high around the proposed landfill area, and
- Inspect daily and clear the site (and surrounding area if necessary) of litter on at least a weekly basis.

The PA also requires that a Landscape and Biodiversity Management Plan be prepared and implemented. This plan must be prepared by a suitably qualified person, include a Rehabilitation and Biodiversity Offset Strategy Management Plan and a Long Term Management Strategy (Condition 48, Schedule 3). The Landscape and Biodiversity Management Plan must address the following criteria (Condition 49, schedule 3):

- The rehabilitation objectives for the sites and offset areas;
- A description of the measures that would be implemented to;
 - rehabilitate and stabilise the site,
 - minimise the removal of mature trees,
 - implement the Biodiversity Offset Strategy and
 - manage the remnant vegetation and habitat on the site and in offset areas.
- Detailed performance and completion criteria for the rehabilitation and stabilisation of the site,
- A detailed description of how the performance of the rehabilitation of the quarry areas would be monitored over time to achieve the stated objectives,
- A detailed description of what measures would be implemented to rehabilitate and manage the landscape of the site including
 - the procedures to be implemented for: progressively rehabilitating and stabilising areas disturbed by quarrying,
 - implementing revegetation and regeneration within the disturbance areas, protecting areas outside the disturbance areas,
 - including the biodiversity Offset Strategy areas. Vegetation clearing protocols,
 - including a protocol for clearing any trees containing hollows and the relocation of hollows from felled trees,
 - managing impacts on fauna, in particular threatened species,
 - controlling weeds and pests,
 - controlling access,

- bushfire management and
- reducing the visual impacts of the projects.
- A description of the potential risks to successful rehabilitation and a description of the contingency measures that would be implemented to mitigate these risks, and
- Details of who is responsible for monitoring, reviewing and implementing the plan.

The EPL states that the licensee must submit to the EPA within three months prior to the last load of waste being landfilled a closure plan in accordance Section 76 of the POEO Act (O6.12).

The PA specifies criteria for the Long Term Management Strategy (Condition 50, Schedule 3), which must:

- Define the objectives and criteria for quarry closure and post-extraction management,
- Be prepared in consultation with DECCW, NOW and DII,
- Describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the projects, and
- Describe how the performance of these measures would be monitored over time.

The need for a rehabilitation bond prior to commencing quarrying operations is specified in condition 51, Schedule 3. This requires that the sum of the bond be \$1/m² for the area to be disturbed. Additionally, within 3 months of each Independent Environmental Audit (IEA), the proponent shall review and if necessary, revise the sum of the rehabilitation bond to the satisfaction of the DG (Condition 52, Schedule 3). This review must consider, inflation, changes to the total area of disturbance and performance of the rehabilitation and revegetation to date.

The visual amenity of the site has been assessed in the EA. The following mitigation and management commitments have been made:

- Erect 2.5 m perimeter fence to prevent windblown rubbish leaving the site (A),
- Ensure rubbish pickup along the fence line and more generally is undertaken regularly (B),
- The landfill will be rehabilitated and revegetated to replicate areas of open grassy woodland (C),
- Construct batters with fissures (offset at each bench) and benches to minimise extent of the cut face. These will mimic natural scarps and reduce the formation of unnatural straight lines (D),
- The benches and floor of the quarries will be revegetated with suitable native species (E),
- Ensure strategic landscaping is incorporated into new residential developments within line of site and in close proximity to the development (F),
- Contaminated soils will be removed and placed in the active putrescible landfill cell (G),
- Soils testing will be conducted down gradient of the landfill, leachate collection system, leachate pond, quarry pits and settlement pond to ensure soil quality remains intact (H),
- Enhance vegetation in edge areas (landfill, roads, quarry edges etc) (I),
- Cover edges with mulch as a temporary measure (J),

- Progressively rehabilitate quarry voids to minimise area of disturbance potential for loss/gain of water accession to groundwater (K),
- Progressively rehabilitate each quarry pit (L), and
- Cap and rehabilitate the landfill on completion (M).

4.14.2 Results

No information regarding rehabilitation and landscape management has been provided for this reporting period. However, a Landscape and Biodiversity Plan has been developed and implemented (Eco Logical Australia 2011). **Table 4.6** (Biodiversity section) outlines the management actions completed for year 2.

4.14.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.30**.

Table 4.30: Rehabilitation and Landscape management compliance assessment.

Condition	Review
Project Approval	
Condition 9, Schedule 3	Litter has been removed, no information regarding a 1.8 m high fence is provided, no indication of daily inspections or weekly litter removal.
Condition 48, Schedule 3	A Landscape and Biodiversity Management Plan has been developed by Eco Logical Australia (2013). This plan covers management implementation for each year up to year 10 and then a more generalised set of management measures for year 10 onwards per year.
Condition 49, Schedule 3	The Landscape and Biodiversity Management Plan meets the specified criteria.
Condition 50, Schedule 3	The LBMP outlines the Long Term Management Strategy.
Condition 51, Schedule 3	No information regarding a rehabilitation bond has been provided.
Condition 52, Schedule 3	Not relevant. The first IEA was completed after this reporting period.
EPL	
See 'not triggered' section	
EA	
B	No observation of rubbish along fence-lines during the independent audit.
D	No information regarding batters with fissures and benches.
G	No information regarding contaminated soil disposal.
H	No information regarding soils testing.
I	No information regarding edge vegetation.
J	No information regarding mulching.
K	No information regarding quarry void rehabilitation.

Not Triggered	
O6.12	Not required until 3 months prior to last load of waste being landfilled
A	Not triggered - landfilling activities within the existing quarry have not commenced.
C	Not triggered.
E	Not triggered.
F	Not triggered – no new residential developments.
L	Not triggered – No quarry pits require rehabilitation.
M	Not triggered – No landfill sites require capping and rehabilitation.

4.15 Heritage

4.15.1 Monitoring and management criteria

Heritage criteria is provided by the PA and EA. The project approval (Condition 53, Schedule 3) requires that a Cultural Heritage Management Plan be prepared and implemented. The plan must be prepared in consultation with the DECCW and local Aboriginal communities, it must draw on relevant recommendations for management and include descriptions of measures to be implemented.

Heritage impacts of the site and proposed expansion have been investigated in the EA, the following mitigation and management recommendations have been made:

- Implement procedures to investigate and protect culturally significant material if discovered during construction and operation (A),
- Protect and preserve the two surveyor scarred trees and a 20 m exclusion zone maintained around each tree (B), and
- Bluedot Speedway signs will be carefully removed and handed over to the car racing club, reused or displayed at Griffith Pioneer Park Museum. (C)

4.15.2 Results

No information regarding heritage management has been provided for this reporting period other than the Heritage Management Plan (Black Mountain Projects 2013).

There is no evidence of Aboriginal Heritage Cultural Material within the study area. The scarred trees are listed under the Cultural Heritage Management Plan (CHMP) and included in schedule 5 of the Griffith Local Environmental Plan 2014. There is a requirement that 20 exclusion zones be installed around the trees. Council offered the two hand painted Bluedot Speedway signs to Pioneer Park Museum who declined the offer. Therefore, an Expression of Interest was put out and Council has given the signs to an ex member of the Speed Way club who is to restore them and add them to his collection.

4.15.3 Review

The exclusion zones have not been implemented.

A *Cultural Heritage Management Plan* has been provided and meets the criteria specified within the Project Approval. An assessment of the monitoring results against the regulatory framework is presented in **Table 4.31**.

Table 4.31: Heritage compliance assessment.

Condition	Review
Project Approval	
Condition 53, Schedule 3	A Cultural Heritage Management Plan has been developed.
EA	
A	The Cultural Heritage Management Plan recommended exclusion zones
B	Council is currently taking steps to include the two 'scar trees' in the LEP Heritage Plan and large 'do not touch' bands have been put around both scar trees to protect them from contractors who may not know the significance of the trees.
C	Council has given the signs to an ex member of the Speed Way club who is to restore them and add them to his collection.

4.16 Traffic and Transport

4.16.1 Monitoring and management criteria

Traffic and transport criteria are provided by the PA and EA. The PA requires the following:

- A *Transport Management Plan* is prepared and implemented (Condition 54, Schedule 3).
- The upgrade of the Auxiliary Right Turn (AUR) at the intersection of Access Road and Kidman Way within 12 months of operations commencing (Condition 55, Schedule 3),
- Loaded vehicles are covered when travelling to and from the site, and that loaded vehicles are cleaned of materials when leaving the site (Condition 57, Schedule 3),
- A logbook of the traffic movements is kept on site and made available for inspection (Condition 58, Schedule 3).

Traffic volumes and predicted impacts were assessed in the EA. The following mitigation and management procedures were recommended:

- Implement procedures for investigating complaints (A),
- Undertake regular road inspections and any works required will be undertaken in accordance with road and rail design standard applicable at the time (B),
- Compile a Transport Management Plan (C),
- Upgrade auxiliary right turn at the intersection with Kidman Way and ensure that there is no cost to the RMS associated with the development (D), and
- The operator to maintain a logbook of traffic movements (E).

4.16.2 Results

Information on traffic volumes and vehicle types has been provided. Full weighbridge data per calendar year is recorded and include dates, time, truck registration number, product type and individual Gross, Tare and Net weigh for each truck. No evidence of abnormal traffic and/or transport occurred during this reporting period. A *Transport Management Plan* has been produced for the site under condition 54 (Section 3) of the Project Approval (Griffith City Council n.d.).

Upgrades to the intersection of Access Road and Kidman Way occurred in 2012/2013.

4.16.3 Review

The production and implementation of a Transport Management Plan meets the criteria specified for the Project Approval Condition 54. The Auxiliary Right Turn (AUR) has previously been upgraded as per the Project Approval. However, traffic volumes and vehicle types are to be reviewed every five years and no indication of any review has been provided. Additionally, it is not clear if traffic movements have been logged and a record kept on site. An assessment of the monitoring results against the regulatory framework is presented in **Table 4.32**.

Table 4.32: Traffic and transport compliance assessment.

Condition	Review
Project Approval	
Condition 54, Schedule 3	A Transport Management Plan has been developed.
Condition 55, schedule 3	The AUR turn has been upgraded.
Condition 57, schedule 3	No information regarding covering of loads has been provided.
Condition 58, Schedule 3	A logbook of traffic movements, including all weighbridge data per calendar year, has been provided.
EA	
A	Complaints procedures are addressed in Section 3 .
B	No indication of traffic and road inspections has been provided.
C	A Transport Management Plan has been developed.
D	The AUR turn has been upgraded.
E	A logbook of traffic movements, including all weighbridge data per calendar year, has been provided.

4.17 Dangerous goods and hazardous materials management

4.17.1 Monitoring and management criteria

Dangerous good and hazardous materials management criteria is provided by the PA and EA. The management of dangerous goods under PA Condition 19 (Schedule 3) requires that all above ground tanks and vats are stored and handled in accordance with all relevant Australian standards and have a minimum bund volume of 110% of the volume of the largest single stored volume and the DECCW's *Storing and Handling of Liquids: Environmental Protection – Participant Manual*. Additionally, Condition 59 (Schedule 3) requires that the storage, handling and transport of fuels and dangerous goods be conducted in accordance with *Australian Standards AS 1940 and AS1596*, and the *Dangerous Goods Code*.

EA:

- Construct bunded area of diesel containers (A),
- Store chemical and explosives offsite (B), and
- Install bunding and spill kits in the vicinity of any chemicals or fuels stored or used onsite (C).

4.17.2 Results

A Pollution and Incident Response Management Plan has been development for the site (Griffith City Council 2018a). Dangerous goods and hazardous materials on site are managed via diesel bunds, spill kits and bunding around the storage of chemicals and fuels. Spill kits are located inside the landfill workshop (**Figure 4.23**) and at the waste transfer station (**Figure 4.24**). Diesel fuel is stored in an open location in a self bunded 4000lt storage tank on a concrete bund (**Figure 4.25**). Bunds are also utilised for battery storage and chemical storage (**Figure 4.26** and **Figure 4.27**) on site. Chemicals used on site are stored in coloured and clearly signed cabinets within the landfill workshop (**Figure 4.28**). Additionally, there is a MDS folder kept on site, which contains the technical details (safe handling procedures, spill clean-up and disposal) of all the chemicals which are held on site (**Figure 4.29**).



Figure 4.23: General purpose spill kit located in the landfill workshop.



Figure 4.24: Universal spill kit located within the waste transfer station.



Figure 4.25: Concrete diesel fuel bund in an open area.



Figure 4.26: Bund for battery storage in the landfill workshop.



Figure 4.27: Bunded storage shed on site.



Figure 4.28: Chemical storage with signage within the landfill workshop.

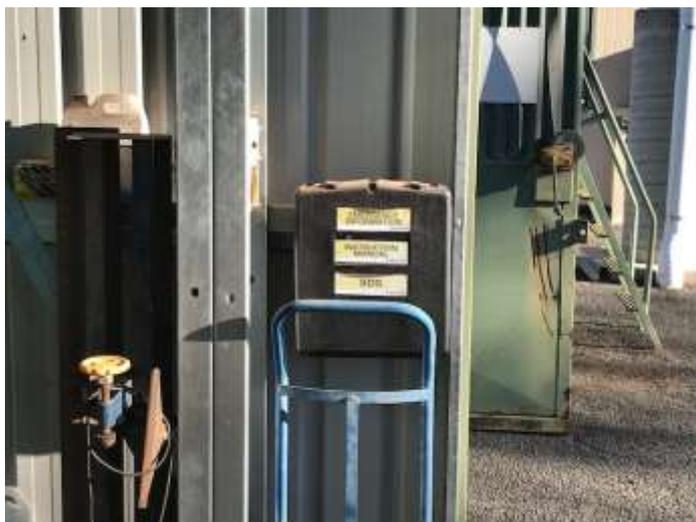


Figure 4.29: MDS folder located on site.

4.17.3 Review

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.33**.

The EPA audit (2019) noted that the licensee must ensure that the diesel fuel tank is maintained in a proper and efficient condition including: sign posted appropriately as dangerous goods and otherwise protected from being compromised by vehicular activity.

Table 4.33: Dangerous goods and hazardous materials compliance assessment.

Condition	Review
Project Approval	
Condition 19, Schedule 3	No information provided about the storage of above ground tanks and vats.
Condition 59, Schedule 3	No evidence that the storage, handling and transport of fuels and dangerous goods is conducted in accordance with AS 1940 and 1596.
EA	
A	The storage and handling of chemicals and fuels, including requirements for bunding and provision of spill kits is met in relation to chemical storage within the WTS and site compound/workshop area.
B	Bunding and spill kits have been installed in the vicinity of any chemical or fuels stored or used onsite.
C	The assessment of chemical management for the existing landfill and quarry was not within the scope of the audit. No information on if there is storage of chemicals and explosives offsite.

4.18 Incident management and response

4.18.1 Monitoring and management criteria

Dangerous good and hazardous materials management criteria is provided by the PA, EPL and EA. Under the PA the following conditions are provided:

- The project shall be kept secure to ensure public safety (Condition 8, Schedule 3),
- Fire management (Condition 60 (b), Schedule 3):
 - Implement suitable measures to minimise the risk of fire on site, including in the landfill area,
 - Extinguish any fires on site promptly,
 - Maintain adequate fire-fighting capacity on site, in consultation with the rural fire service (RFS), including a tanker or water cart, and
 - Assist the RFS and emergency services if safe to do so, if there is a fire on site.

The EPL requires that a formal investigation and reporting of incidents and management response is required for all incidents. The licensee must:

- Have in place and implement fire prevention measures to minimise risk of fire at the premises (O4.1),

- Extinguish fires at the premises as soon as possible (O4.2),
- Implement fire prevention measures at the premises in accordance with the *LEMP Tharbogang Recycling and Waste Disposal Facility* prepared by RE Barton and dated December 1997 (O4.3),
- Annual returns document meets the requirements outlined in R1,
- Notify the EPA of incidents of environmental harm (R2),
- Provide a written report on request by and EPA officer (R3), and
- Record details of the fire (R4) including:
 - Time and date the fire started,
 - Which the fire was authorised by the licensee, and if not, the circumstances which ignited the fire,
 - The time and date that the burn was extinguished,
 - The location of the fire,
 - Prevailing weather conditions at the time of the fire.
 - Observations made in regard to smoke direction and dispersion,
 - Amount of waste that was combusted in the fire,
 - Action taken to extinguish the fire, and
 - Action taken to prevent reoccurrence.

Notification of fires must be completed in accordance with condition R2.

The revised EA mitigation and management commitments are as follows:

- Erect fencing above quarry walls (A),
- Develop and implement fire management procedures in consultation with Griffith Fire Control centre, and submit with emergency services (B),
- Develop emergency response and contingency procedures as part of the operational plans (C),
- Public education and additional inspection for prohibited wastes and burning materials (D),
- Reduce tip face and cover daily to reduce risk of ignition from lightning strikes (E),
- Spread green waste in thin layers to minimise risk of self-combustion (F),
- Create vertical and horizontal layers in inert cell with clay to isolate volume of waste prone to a fire event (G),
- Limit access to quarry faces and exposed edges (H),
- Conduct safe work methods statements for potentially hazardous tasks (I),
- Ensure appropriate supervision for personnel for all tasks (J),
- Conduct site induction and periodic refresher training for all employees, contractors and transport contractors (K), and
- Containment spill kit will be kept on site at all times (L).

4.18.2 Results

A fire occurred at the existing landfill in February 2018. Council's incident report form was completed. On the form it was identified that the fire was not considered a 'notifiable event.' as prescribed in Section 35 of the *Work Health and Safety (WHS) Act 2011 (NSW)*.

Fire breaks and/or fire trails have been established in the woodland to the north and north west of the premises as well as to the south of the sedimentation pond and existing quarry (EPA 2019).

The EPA audit (2019) noted on 27 September 2017 Nearmap records a potential fire or spill event at or around the containment pond (most northerly pond on the premises), resulting in what looks like an oily substance entering the pond area including contained waters. Note the “spill” was not evident on Nearmap in previous years. There had been a fire in the green waste area a couple of weeks before but this incident appears unrelated. A search of incident logs and notifications for evidence of the event was unsuccessful.

The contamination of a site from a hazardous materials spill of that magnitude (potentially a 200L drum) that could potentially show up in the groundwater should have been reported and PIRMP activated.

4.18.3 Review

The current provided information is insufficient to determine the adequacy of the existing procedures and if they were implemented, or, if licencing conditions were met. The EPA audit (2019) identified an potential non-compliance with regards to reporting pollution incidents to the EPA.

No indication of the security of the site has been made available. No information regarding correct handling of any chemicals, if present, has been provided.

An assessment of the monitoring results against the regulatory framework is presented in **Table 4.34**. The EPA (2019) audit states that once emergency services are notified of an incident including fire, and the licensee’s response is initiated, the EPA must be notified of any fire on the premise.

Table 4.34: Incident management and response compliance assessment.

Condition	Review
Project Approval	
Condition 8, schedule 3	An Air Monitoring Plan has been developed for TWMC (GHD 2013).
Condition 60 (b), schedule 3	There is no evidence of dust monitoring within the site.
EPL	
O4.1	It is unclear whether all of the prevention measures outlined in the LEMP (1997) have been implemented although all practicable steps to prevent entry to the site have been undertaken. Independent audit notes that fire trails were regraded in November 2017. The EPA Audit (2019) states that emergency response prevention methods were not undertaken.
O4.2	Consultation with the RFS has not been undertaken to decide the necessary fire-fighting equipment available on site.
O4.3	The landfill has a 10,000L water cart that has a hydraulic pump / spray unit and a 10,000L water tank.
R1	It is not possible to assess whether the 2018-2019 Annual returns report addresses all of the criteria listed in R1

Condition	Review
R2	The Annual return report states that there were no incidents of environmental harm during the reporting period. However, the EPA audit noted an unreported spill event at the northern containment pond (EPA 2019).
R3	No evidence of written reports submitted to the EPA and would not have been required if there were no environmental harm incidents.
R4	Council incident report form WHS_FO_036 was completed for the fire, although this does not contain all of the information requested under condition R4
EA	
B	No fire management procedures have been provided.
C	No indication of public education or additional inspections for prohibited wastes and burning material.
D	The 'Procedures in the Event of a Fire at the Landfill (WM-PR-016)' were approved 8 February 2017. They do not specifically cover a fire at the WTS.
E	No information regarding the frequency of tip face replacement to prevent lightning strikes.
F	No information regarding the spreading of green waste in layer to minimise self combustion. When cover is applied it consists of Virgin Excavated Natural Material (VENM) or in some cases top soil containing some green waste. The EPA audit (2019) states that the licensee was not applying cover material over all exposed landfilled waste prior to ceasing operations at the end of each day.
G	No information regarding landfill design to isolate volume of waste prone to fire.
H	Public access is restricted to designated areas.
I	No work safe method statements for hazardous tasks has been provided.
J	No information regarding appropriate supervision for tasks.
K	No information regarding site inductions and periodic refresher training.
Not Triggered	
A	No evidence of fencing as not triggered yet.

4.19 Monitoring and recording conditions

The EPL conditions (M1.1 to M1.3) state the following:

The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition (M1.1).

- All records required to be kept by this licence must be:
 - in a legible form, or in a form that can readily be reduced to a legible form;
 - kept for at least 4 years after the monitoring or event to which they relate took place; and
 - produced in a legible form to any authorised officer of the EPA who asks to see them. (M1.2)

The following records must be kept in respect of any samples required to be collected for the purposes of this licence (M1.3):

- the date(s) on which the sample was taken;
- the time(s) at which the sample was collected;
- the point at which the sample was taken; and
- the name of the person who collected the sample.

4.19.1 Results

The EPA audit (2019) noted that the licensee could not provide a copy of the chain of custody for all samples taken for auditable records nor was the time of sampling recorded for all samples on the chain of custody or other records. This has resulted in some non-compliance.

4.19.1 Review

Whilst records of monitoring and conditions were available, they were not available for some areas and / or incomplete resulting in non-compliance.

Table 4.35: Monitoring and recording conditions compliance assessment

Condition	Review
EPL	
M.1.1	Not all monitoring results were set out as required by the condition (EPA 2019).
M1.2	Not all monitoring results could be provided upon request from the EPA officer (EPA 2019).
M1.3	Time of sampling was not recorded for some monitoring (EPA 2019).

5. Conclusion and recommendations

The Griffith City Council owned and operated Tharbogang Waste Management Centre operates under Project Approval 06_0334, which includes a specific requirement for an AEMR to be prepared annually. This is the second of these AEMRs and aims to assess the environmental performance of the site over the 2018 calendar year. Assessments are made with reference to the conditions within the PA, the EPL and the revised EA commitments. During the reporting period, a review of all existing quarry and landfill environmental management plans for the control and monitoring was undertaken. These documents provide the objectives and framework for the compliance and continual improvement objectives. They aim to ensure that the environment and neighbouring community are not adversely impacted by Tharbogang Waste Management Centre activities.

Community engagement

No complaints were received over the reporting period. However, conditions requiring the development and implementation of a community education program and an indication of landholder consultation were not assessed due to insufficient information provided during the reporting period. Further clarification is needed to determine if these requirements have been met.

Compliance

A compliance assessment found that the TWMC had a moderate level of compliance with the PA and EPL conditions and EA revised statement of commitments. An EPA audit (2019) noted several non-compliances which have been incorporated into this AEMR. Several compliances were unable to be adequately assessed due to insufficient information and 29 non-compliances were identified across each of the fields. Notably, there is large amount of information is still required to assess compliance for incident management and response.

Non-compliance was not recorded for any of the following categories although some had conditions for which insufficient information was available to adequately assess compliance and / or conditions that were not yet triggered:

- Meteorological
- Blasting
- Odour
- Rehabilitation and Land Management
- Heritage

There is an absence of the following information and / or monitoring data (this list is not exhaustive and the compliance table in each section should be referred to):

- Odour monitoring data
- Annual production data using the standard form (this need to be in this AEMR)
- No information regarding a community education and consultation with landholders
- No information available regarding inductions, refresher training and some logbooks
- No copies of licences from other facilities provided for the AEMR.
- The scarred tree exclusion zones have not been implemented

- Traffic volumes and vehicle types have not been provided and no logbooks of traffic movement provided
- No evidence that the storage, handling and transport of fuels and dangerous goods is conducted in accordance with AS 1940 and 1596.
- No indication of what dangerous goods are present on site has been provided for this reporting period

Non-compliance was recorded for the following categories:

- Operations
- Waste
- Landfilling
- Biodiversity
- Surface water
- Groundwater
- Leachate
- Noise and vibration
- Air quality (Dust)
- Greenhouse gas emissions
- Traffic and transport
- Dangerous good and hazardous materials
- Incident management and response
- Monitoring and recording conditions

The NGH report noted that while the recorded noise levels at each of the sensitive receivers ($L_{Aeq(15\text{ min})}$) exceeded the assessment criteria of 35 dB(A) $L_{Aeq(15\text{ min})}$, it was likely that this was due to a range of noise sources at the sensitive receiver sites. As such it is likely that noise from the quarry was not consistently the main contributor to noise at any of the sensitive receiver locations (NGH Environmental 2019).

Recommendations

It is recommended that the compliance tables in Section 4 of this AEMR are used as a 'checklist' for future compliance and ensuring conditions are met as additional criteria are triggered (blue).

Areas of non-compliance (red) should be addressed promptly in general and areas where insufficient information was available (white) should be reviewed by Council. Where data is available this should be reviewed to identify areas of non-compliance or provide the relevant information to enable the assessment of compliance to be revised.

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Appendix A – Mitigation and management commitments in the PA

Table E1: Mitigation and management commitments

MITIGATION AND MANAGEMENT MEASURE	RESPONSIBILITY	IMPLEMENTATION SCHEDULE	PERFORMANCE INDICATOR, STANDARD OR GUIDELINE	DOCUMENT REFERENCE
FLORA AND FAUNA				
<ul style="list-style-type: none"> Develop and implement Griffith Biodiversity Management Strategy 	Council	Project commencement	Strategy review of biodiversity outcomes	EA Section 7.2.2 'Onsite measures'
<ul style="list-style-type: none"> All retained areas of native vegetation on Lot 201 and Lot 202 (that is areas not subject to the proposed and envisaged future clearing for quarrying operations) will be protected in perpetuity as part of the offset package and rezoned to Environmental Conservation or Environmental Management Revegetate and enhance (where possible) to create a contiguous corridor with Lot 201 on the western boundary Maintain and enhance a 40m riparian zone on either side of the ephemeral drainage line 	Contractors	Prior to commencement of each quarry pit	Species survival counts Structural and floristic diversity Buffer dimensions	EA Section 7.2.2 'Onsite measures'
<ul style="list-style-type: none"> Collect, store and/or propagate seeds for rehabilitation purposes (to be stipulated in the detailed rehabilitation plan) 	Council	Prior to commencement of each quarry pit	Species diversity in seed collection	EA Sections 6.3.6 and 6.4.4 'Rehabilitation and final landform'
<ul style="list-style-type: none"> Relocate hollow trees and woody debris to corridors and areas not designated for clearing 	Council	Prior to commencement of each quarry pit		EA Section 7.2.2 'Onsite Measures'
<ul style="list-style-type: none"> Clearing of hollow-bearing trees will be undertaken outside of the main bird breeding periods and trees will be inspected for resident fauna by a suitably qualified ecologist. Appropriate action will be taken prior to removal should the presence of native fauna be confirmed 	Qualified NSW Parks Officer or equivalent	Prior to commencement of each quarry pit	Property Vegetation Plan (Native Vegetation Act 2003)	EA Section 7.2.2 'Onsite measures'
<ul style="list-style-type: none"> Undertake detailed flora and fauna assessments of proposed offsets 	Council	Prior to the commencement of each quarry pit	Consultant Brief 2007 'Objectives and Assessment Tasks', and in consultation with DECC	EA Section 10.2
<ul style="list-style-type: none"> Refine the offset package described in Appendix C to the satisfaction of the Department of Planning and implement it prior to the commencement of the new quarrying activities in order to compensate 	Council	Prior to the commencement of each quarry pit	Approval from the Department of Planning and verified number of hectares protected and reported as offsets	EA Section 7.2.2 'Offsets' EA Section 10.4

for the native vegetation to be cleared				
<ul style="list-style-type: none"> Enhance onsite vegetation in areas not designated for clearing through direct seeding, thinning, grazing exclusion, weed and fire management Develop and implement a weed and pest management strategy for the control and eradication of weed species and incorporate into the rehabilitation plan, and QOEMP and LOEMP Monitor success of revegetation and enhancement works onsite and in offset areas 	Council	Ongoing		EA Section 7.2.2 EA Section 10.5
<ul style="list-style-type: none"> Prepare a detailed rehabilitation plan for the quarry and landfill components to achieve the rehabilitation outcomes identified in the EA. The rehabilitation plan will describe short, medium and long-term measures what will be implemented to rehabilitate the site, manage the remnant vegetation and habitat on the site and landscaping of the site to mitigate any visual impacts of the project. Performance monitoring and completion criteria will be designed to demonstrate that the rehabilitation outcomes identified in the EA and rehabilitation plan are met. 	Council	Project commencement and ongoing	DECCW approval	EA Section 6.3.6 and 6.4.4
<ul style="list-style-type: none"> Progressively clear vegetation for each quarry pit Progressively rehabilitate each quarry pit 	Council/Contractors	Ongoing	Number of hectares successfully rehabilitated Species survival counts	EA Section 6.3.6
<ul style="list-style-type: none"> Cap and rehabilitate the landfill on completion 	Council/Contractors	Landfill closure	Species survival counts	EA Section 6.4.4
GROUNDWATER				
<ul style="list-style-type: none"> Install 2 new licensed groundwater monitoring bores west of the site 	Landfill Operations Manager	Project commencement	<i>Minimum Construction Requirements for Water Bores in Australia 2003</i>	EA Section 7.3.2 & figure 7.3
<ul style="list-style-type: none"> Licence new groundwater monitoring bores 	Landfill Operations Manager	Prior to installation of new bores	<i>Water Act 1912 (NSW)</i>	EA Section 7.3.2
<ul style="list-style-type: none"> Establish and implement groundwater monitoring program in accordance with DECCW requirements 	Quarry and Landfill Operations Managers	Project commencement	<i>EPA Environmental Guidelines: Solid Waste Landfill 1996</i> <i>Guidelines for Water Quality Monitoring and Reporting ANZECC 2000</i> <i>Approved Methods for the Sampling and Analysis of Water Pollutants in NSW 2004</i>	EA Section 7.3.2
<ul style="list-style-type: none"> Construct appropriately engineered landfill cells lined with an impermeable liner (i.e. with a permeability less than 10^{-9}ms^{-1}) and a 	Council, project designers and	Construction	<i>EPA Guidelines for Aqueous Liquid Treatment Ponds</i>	EA Section 6.4.3 Monitoring and

<p>drainage layer</p> <ul style="list-style-type: none"> Construct a leachate collection system with appropriate holding pond and/or tanks to divert leachate back to landfill Construct surface water diversions around landfill Install high level alarm to the leachate pond interlocked with the drainage system to prevent overflowing Install monitoring and alarm system to detect possible failures in the leachate collection system and liner 	contractor		<p><i>EPA Leachate Barrier System Guidelines</i> <i>EPA Leachate Collection System Guidelines</i> <i>EPA Environmental Guidelines: Solid Waste Landfills 1996</i></p>	<p>maintenance & Section 7.3.2</p>
<ul style="list-style-type: none"> Establish assessment procedures to determine extent of leachate system failure Establish and maintain a landfill incident response register and assessment of potential risks 	Landfill Operations Manager	Ongoing		EA Section 7.3.2
<ul style="list-style-type: none"> Visual inspections of engineering works on a daily basis 	Site Manager	Ongoing		EA Section 9.5
<ul style="list-style-type: none"> Install operational backflow device on potable water supply pipeline Identify, map and colour code all pipelines on site 	Landfill Operations Management	Project Commencement	<i>National and State plumbing regulations</i>	EA Section 6.5
<ul style="list-style-type: none"> Contour, cap and revegetate to top profile of the landfill form to maximum 5% gradient 	Landfill Operations Manager	Closure	<i>EPA Environmental Guidelines: Solid Waste Landfills 1996</i>	EA Section 6.4.4
<ul style="list-style-type: none"> Conduct ongoing groundwater monitoring post closure and action non-compliances 	Council	Closure	<i>EPA Environmental Guidelines: Solid Waste Landfills 1996</i>	EA Section 7.3.2
GROUNDWATER DEPENDANT ECOSYSTEMS				
<ul style="list-style-type: none"> Progressively rehabilitate quarry voids to limit area of disturbance potential for loss / gain of water accession to groundwater 	Quarry contractor	Completion of extraction in each pit		EA Section 6.3.6
<ul style="list-style-type: none"> Install leachate collection system for landfill cells. 	Council, project designers and contractor	Construction		EA Section 7.3.2
<ul style="list-style-type: none"> Construct / install stormwater and sedimentation controls 	Council, project designers and contractor	Construction		EA Sections 7.5.2
<ul style="list-style-type: none"> Assess the significance of the various ephemeral swamps and water bodies as part of the Griffith Biodiversity Strategy 	Council	Ongoing		EA Section 5.11

SURFACE WATER

<ul style="list-style-type: none"> Council will prepare a surface water management plan to the satisfaction of the NSW Office of Water. This should include measures to ensure that contaminated runoff will not leave the site. 	Council	Prior to project commencement	<i>Approval of plan by NSW Office of Water</i>	EA Sections 7.4.2 and 7.5.2
<ul style="list-style-type: none"> Construct diversion drains and bunds around perimeter of quarry pits Install pumps to divert surface water to settlement and stormwater detention ponds Install sediment trap at discharge point Incorporate energy dissipation and erosion protection measures in surface water diversions 	Council, project designers and contractor	Construction	<i>Managing Urban Stormwater: Soils and Construction (Landcom, 2004)</i>	EA Section 7.5.2
<ul style="list-style-type: none"> Install table drains, culvert pipes and silt traps on all access new roads, i.e. to pit 101 Undertake all engineering works to minimise erosion and soil contamination 	Council, project designers and contractor	Construction	<i>RTA Roadside Handbook - environmental guidelines for road construction and maintenance workers 1995</i> <i>RTA Road Design Guidelines (draft Chapter 7 – drainage)</i>	EA Section 6.2.2
<ul style="list-style-type: none"> Ensure all water storages are engineered for peak weather events (1 in 100 year 72 hour rainfall event) The stormwater detention pond will be lined with a flexible membrane and the water quality monitored on a quarterly basis 	Council, project designers and contractor	Construction and ongoing	<i>ANCOLD Guidelines on Design Floods for Dams 1994</i> <i>ANCOLD Guidelines Environmental Management for Dams 2001</i>	EA Section 6.5 Appendix J, Section 7.2
<ul style="list-style-type: none"> Install bunding and spill kits in the vicinity of any chemicals or fuels stored or used onsite 	Quarry and Landfill Operations Managers	Ongoing	<i>AS 1940 The storage and handling of flammable and combustible liquids 2004</i> <i>Dangerous Goods Regulations 2005</i>	EA Section 6.3.4
<ul style="list-style-type: none"> Install operational backflow device on potable water supply pipeline Identify, map and colour code all pipelines on site 	Landfill Operations Manager	Project Commencement	<i>National and State plumbing regulations</i>	EA Section 6.5
<ul style="list-style-type: none"> Visual inspection of engineering works 	Site Manager	Ongoing		EA Section 9.5

SOILS

<ul style="list-style-type: none"> Containment spill kit will be kept on site at all times Contaminated soils will be removed and placed in the active putrescible landfill cell Soils testing will be conducted down gradient of the landfill, leachate collection system, leachate pond, quarry pits and settlement pond to ensure soil quality remains intact 	Site Manager	Commencement of works and ongoing	Number of spills and remediation action	EA Sections 6.3.4 and 7.6.2
<ul style="list-style-type: none"> Construct out-off drains and diversions with erosion control measures 	Council, project designers and	Construction	<i>Managing Urban Stormwater: Soils and</i>	EA Section 7.6.2

	contractor		<i>Construction (Landcom, 2004)</i>	
<ul style="list-style-type: none"> Periodically check and empty sediment trap at settlement dam 	Contractor	Ongoing		EA Section 7.6.2
<ul style="list-style-type: none"> Wet down stockpiles as per the Dust Management Plan 	Contractor	Ongoing		EA Section 7.6.2
<ul style="list-style-type: none"> Enhance vegetation in edge areas (landfill, roads, quarry edges etc) Cover edges with mulch as a temporary measure 	Council	Ongoing	Species survival counts Evidence of erosion	EA Section 7.2.2 'Onsite measures'
<ul style="list-style-type: none"> Progressively revegetate quarry stages 	Contractor	On completion of each quarry stage	Number of hectares successfully rehabilitated Species survival counts	EA Section 6.3.6
SALINITY				
<ul style="list-style-type: none"> Install closed leachate collection system and surface water controls around landfill Install sedimentation dam and drainage channels to direct water from quarries 	Council, project designers and contractor	Construction	<i>Managing Urban Stormwater: Soils and Construction (Landcom, 2004)</i>	EA Section 7.7.2
AIR QUALITY				
<ul style="list-style-type: none"> Implement procedures for investigating complaints 	Council	Ongoing	Number of complaints registered and finalised	EA Section 7.17
<ul style="list-style-type: none"> Water cart for dust suppression on unsealed roads Water down uncovered stockpiles 	Contractor	Ongoing	Compliance with Dust Management Plan	EA Section 7.8.2
<ul style="list-style-type: none"> Conduct odour modelling in the event of a complaint / incident 	Council	Ongoing	<i>Approved Methods for the Sampling and analysis of Air Pollutants NSW 2007</i>	EA Section 7.8.2
<ul style="list-style-type: none"> Water sprayers will be used on the crusher whenever it is operating 	Council	Ongoing	Compliance with Dust Management Plan	
<ul style="list-style-type: none"> When the 10 minute average wind speed measured at the quarry exceeds 30km/hr from the north-east quadrant (between 0 degrees and 90 degrees) operation of the quarry will cease or as specified in Dust Management Plan 	Council	Ongoing	Compliance with Dust Management Plan	
<ul style="list-style-type: none"> When the average wind speed measured at the quarry in any direction exceeds 35km/hr (10 minute average), then all construction and operation of the quarry will cease or as specified in Dust Management Plan. 	Council	Ongoing	Compliance with Dust Management Plan	
<ul style="list-style-type: none"> A Dust Management Plan incorporating dust monitoring to be developed and submitted to DECCW. 	Council	Prior to Project Commencement	Approval from DECCW	

GREENHOUSE GAS EMISSIONS

<ul style="list-style-type: none"> Capture and flare landfill gases and monitor emissions Once data is available, a greenhouse gas target will be set and incorporated into the landfill operational environmental management plan 	Landfill Operations Manager	Ongoing	<i>POEO (Clean Air) Regulations 2002 - schedule 2</i> <i>EPA Environmental Guidelines: Solid Waste Landfills 1996</i>	EA Section 7.9.2
<ul style="list-style-type: none"> Construct and operate waste transfer station to reduce waste to landfill 	Council	Within 2 years of project commencement	<i>Handbook for the Design and Operation of Rural and Regional Transfer Stations 2006</i>	EA Figure 6.11
<ul style="list-style-type: none"> Cover active tip face daily with green waste to improve bioreaction process 	Council	Ongoing	<i>Environmental Guidelines: Solid Waste Landfills</i>	EA Section 7.9.2

NOISE AND VIBRATION

<ul style="list-style-type: none"> Implement procedures for investigating complaints 	Council	Ongoing	Number of complaints registered and finalised	EA Section 7.17
<ul style="list-style-type: none"> Where quarry plant noise is found to exceed the intrusive goal of 35dB (L_{Aeq, 15 min}) at affected residences, the plant will be moved or modified to ensure the noise impact from plant is below 35dB (L_{Aeq, 15 min}). 	Contractor	Ongoing	Number of exceedences	EA Section 7.7.2
<ul style="list-style-type: none"> Blasting airblast overpressure (in dB Linear Peak) and ground vibration peak particle velocity (in millimetres per second) will be measured for the first three blasts at the nearest affected residence. If these are well within the limits and there are no complaints, then monitoring will be undertaken once a year. The results will be reported to DECCW. Blasting will only occur between 9.00am -3pm, Monday to Friday excluding public holidays. 	Contractor	Ongoing	Number of exceedences	
<ul style="list-style-type: none"> Restrict operating hours of the quarry to 8.30am - 5pm 	Contractor	Ongoing		EA Section 6.4.3
<ul style="list-style-type: none"> Notify residents within 2,000m of intention to blast at least 7 days in advance 	Council / Contractor	Ongoing		EA Section 7.8.2

HAZARDS

<ul style="list-style-type: none"> Erect fencing above quarry walls 	Contractor	Prior to commencement of quarry works	<i>DPI Safety Bulletin: working near quarry benches 2008</i>	EA Section 7.10.2
<ul style="list-style-type: none"> Implement procedures for refusing prohibited wastes Construct defined asbestos disposal zone 	Landfill Operational Manager	Construction	<i>Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 2004</i>	EA Table 7.13
<ul style="list-style-type: none"> Construct bunded area for diesel containers 	Quarry Operational	Construction	<i>AS 1940 The storage and handling of</i>	EA Section 6.3.4

	Manager		<i>flammable and combustible liquids 2004 Dangerous Goods Regulations 2005</i>	
<ul style="list-style-type: none"> Develop and implement fire management procedures in consultation with the Griffith Fire Control Centre, and submit to emergency services Develop emergency response and contingency procedures as part of the operational plans 	Landfill Operational Manager	Construction		EA Table 7.13
<ul style="list-style-type: none"> Store chemicals and explosives offsite 	Landfill Operational Manager	Ongoing	<i>Explosives Act 2003 and Regulations 2005</i>	EA Table 7.13
<ul style="list-style-type: none"> Public education and additional inspection for prohibited wastes and burning materials 	Landfill Operational Manager		<i>Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 2004</i>	EA Table 7.13
<ul style="list-style-type: none"> Reduce tip face and cover daily to reduce risk of ignition from lightening strikes Spread green waste in thin layers to minimise risk of self-combustion Street sweeper waste to be stockpiled with green waste Manage and monitor waste prior to disposal in the landfill cell and implement other measures outlined in Table 7.13 of the EA Create vertical and horizontal layers in inert cell with clay to isolate volume of waste prone to a fire event 	Landfill operational manager	Ongoing		EA Table 7.13
<ul style="list-style-type: none"> Limit access to quarry face and exposed edges Conduct safe work methods statements for potentially hazardous tasks Ensure appropriate supervision for personnel for all tasks Conduct site inductions and periodic refresher training for all employees, contractors and transport contractors 	All personnel	Ongoing	<i>DPI Safety Bulletin: working near quarry benches 2008</i>	EA Section 7.10.2 & Table 7.13

WASTE MINIMISATION

<ul style="list-style-type: none"> Construct waste transfer station 	Project design and contractor	Construction	<i>Handbook for the Design and Operation of Rural and Regional Transfer Stations 2006</i>	EA Figure 6.4.3 'Infrastructure and equipment'
<ul style="list-style-type: none"> Re-direct recyclables for processing 	Landfill Operations Manager	Within 2 years of project commencement	<i>NSW Waste avoidance and Resource Recovery Strategy 2007</i>	EA Section 8.3
<ul style="list-style-type: none"> Record the waste stream and amount received, recovered and recycled, and disposed of in landfill 	Landfill Operations Manager	Ongoing	<i>NSW Waste avoidance and Resource Recovery Strategy 2007</i>	EA Section 8.3

			DECC Online Tracking Service Pack DECC Online Waste Reporting Service Pack and User Guide	
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TRAFFIC

<ul style="list-style-type: none"> Implement procedures for investigating complaints 	Council	Prior to commencement of works	Number of complaints registered and finalised	EA Section 7.17
<ul style="list-style-type: none"> Undertake regular traffic and road inspections and any works required will be undertaken in accordance with road and rail design standard applicable at the time 	Council	Every 5 years	In consultation with RTA and the rail authorities, and standards current to the time	EA Section 7.11.2
<ul style="list-style-type: none"> Compile Transport Management Plan 	Council	Prior to commencement of works	Approval of plan by RTA.	
<ul style="list-style-type: none"> Upgrade auxiliary right turn treatment at the intersection with Kidman Way and ensure that there is no cost to the RTS associated with the development 	Council	In accordance with the RTA approved Transport Management Plan	Approval of plan by RTA.	
<ul style="list-style-type: none"> The operator to maintain a log book of extraction quantities, waste deliveries and traffic movements. 	Council	Ongoing		

HERITAGE

<ul style="list-style-type: none"> Implement procedures to investigate and protect culturally significant material if discovered during construction and operation 	Site Manager	Prior to commencement of works	<i>Guidelines for Aboriginal Heritage Impact Assessment in the Exploration & Mining Industries</i>	EA Section 7.12.2 and Appendix D of this Response to Submissions
<ul style="list-style-type: none"> The two surveyor scarred trees will be preserved and protected and a 20 m radius development exclusion zone will be maintained around each tree 	Council	Prior to commencement of works		Appendix D of this Response to Submissions
<ul style="list-style-type: none"> The two Bluedot Speedway signs will be carefully removed and handed over to the car racing club for safe-keeping, reuse or displayed at Griffith Pioneer Park Museum. 	Council	Prior to commencement of works		Appendix D of this Response to Submissions

VISUAL AMENITY

<ul style="list-style-type: none"> Erect 2.5m perimeter fence to prevent windblown rubbish leaving the site Ensure rubbish pickup along the fence line and more generally is undertaken regularly 	Site Manager	Prior to commencement of works and ongoing	Number of complaints regarding rubbish	EA Section 7.13.2
<ul style="list-style-type: none"> The landfill will be rehabilitated and revegetated to replicate areas of open grassy woodland. 	Council	Ongoing		EA Section 6.4.4
<ul style="list-style-type: none"> Construct batters with fissures (offset at each bench) and benches to minimise extend of the cut face. These will mimic the natural scarps and reduce the formation of unnatural straight lines. The benches and floor of the quarries will be revegetated with suitable native species 	Quarry Operations Manager and Contractor	Ongoing	<i>NSW Minerals Council Rehabilitation by Design Practice Notes</i> <i>DITR Mine Rehabilitation</i> <i>Landform Design for Rehabilitation 1998</i>	EA Sections 6.3.4 and 7.13.2
<ul style="list-style-type: none"> Ensure strategic landscaping is incorporated into new residential developments within line of sight and in close proximity to the development 	Planning division Council	Ongoing	<i>Griffith Land and Environment Plan</i>	EA Section 7.13.2

SOCIOECONOMIC

<ul style="list-style-type: none"> Maintain ongoing and inclusive consultation with nearby landholders Respond to all community concerns and the complaints register 	Council	All project stages	Number of complaints registered and finalised	EA Sections 7.14 and 7.17
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Appendix B - Asbestos Disposal at Tharbogang Waste Management Centre



Asbestos Disposal at Tharbogang Waste Management Centre

Griffith City Council will still be accepting Asbestos at Tharbogang Waste Management Centre; however loads will now have to comply with the following restrictions;

- Asbestos Disposal Days will only be on a Monday and Wednesday between the times of 9am and 12pm
- Customers must book on (02) 69636491 and provide Council employees with the following description;
 - Approximate size of load.
 - Type of asbestos Friable (i.e.: insulation, asbestos fibre) or Non Friable(i.e. roof or fence corrugated sheeting, eave or fibro wall sheeting)
 - Contact name and phone number
 - Registration of the vehicle and trailer that the load will be delivered in to Tharbogang Waste Management Centre main gate for assessment and acceptance.
 - Asbestos Removalist Name and Licence Number
 - Location of site when asbestos has been removed
 - Has load been registered on EPA Waste Locate?
- Loads must be double wrapped in "black builders" type plastic and sealed with "silver duct tape" and loaded onto a pallet.
- Wrapping and taping must be robust enough to allow council employees to handle the asbestos pallet, without the contents breaking through thus exposing the asbestos material contents.
- Council employees will unload the pallet that contains the Asbestos on top of it. During this processes the general public are to remain in their vehicles for their own safety.
- Each loaded pallet must not exceed a height of 10msq and a weight of 100kg.
- Contractors with Large Amounts of asbestos will have to pre arrange the disposal by contacting (02) 69636491. It is important to note that the contractor at their own cost will cover the load at the time of disposal

IMPORTANT NOTICE TO THE PUBLIC

- If a load is deliver to Tharbogang Waste Management Centre and is not declared as asbestos by the customer, then the load will not be accepted until it is wrapped correctly as required above.
- If asbestos is dumped at the Tharbogang internal active tipping site and the offending customer is identified, then a fine will be imposed. The load charge will then be recalculated and the offending customer will be asked to remove the asbestos and wrap it correctly as required above. If the offending customer refuses to remove the asbestos, then a professional asbestos removalist contractor will be engaged and their fee will be passed onto the offending customer.

If you are not sure if it is Asbestos, then always assume it is Asbestos!

Council employees and the public's safety is Councils priority and adherence to the above procedures and processes will assist this.