

# Gunlake Quarry Project



**Annual Review**  
**1 July 2019 to 30 June 2020**



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## ANNUAL REVIEW INFORMATION

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Name of Operation	Gunlake Quarry
Name of Operator	Gunlake Quarries Pty Ltd
Development Consent No.	2017/108663
Name of holder of Development Consents	Gunlake Quarries Pty Ltd
Annual Review start date	01 Jul 2019
Annual Review end date	30 Jun 2020

# 1. Introduction

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Gunlake Quarry (the Quarry) is a hard rock quarry operated by Gunlake Quarries Pty Ltd (Gunlake) and is located approximately 7 km northwest of Marulan, off the Brayton Road as shown on Figure 1. Gunlake is an independent quarry producer and provides aggregates and manufactured sand for its own operations in Sydney as well as other markets. The defined hard rock resource contains material suitable for use in a full range of quarry products including concrete and sealing aggregates, rail ballast, manufactured sand and road base. The quarry has an expected life of over 100 years and approval under the development consent has been obtained for a 25 year period.

This Annual Review has been prepared in accordance with Schedule 5 Condition 10 of Development Consent 2017/108663 for Gunlake Quarry and covers the operations and environmental monitoring undertaken at Gunlake Quarry for the period 1 July 2019 to 30 June 2020. This Annual Review also outlines the proposed operations for the next reporting period including additional measures that will be implemented to improve the environmental performance of the project. Monitoring locations are shown in Figure 2.

## 2. ANNUAL REVIEW REQUIREMENTS

By the end of September each year, or other timing as may be agreed by the Secretary, Gunlake must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the secretary. This review must:

- a) describe the development (including any rehabilitation) that was carried out in the previous financial year, and the development that is proposed to be carried out over the current financial year;
- b) include a comprehensive review of the monitoring results and complaints records of the development over the previous financial year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performances measures/criteria; • requirements of any plan program required under this consent;
  - monitoring results of previous years; and
  - relevant predictions in the documents listed in condition 2(a) of Schedule 2;
- c) identify any non-compliance over the past financial year, and describe what actions were (or are being) taken to ensure compliance;
- d) identify any trends in the monitoring data over the life of the development
- e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- f) describe what measures will be implemented over the current financial year to improve the environmental performance of the development.

The Applicant must ensure that copies of the Annual Review are submitted to Council and the EPA and are available to the Community Consultative Committee and any interested person upon request in accordance with condition 7, Schedule 5 of the development consent.

### 2.1 Key Personnel

Details of the management personnel at Gunlake Quarry are provided in Table 2.1 below. Additional specialist advice is provided as required by a range of environmental consultants.

**Table 2.1 –Quarry Contacts**

Role	Name	Contact
Quarry Manager	Vince Matthews	02 4841 1344
Project Manager	David Kelly	02 4841 1344
Director	Ed O'Neil	02 4841 1344

## 3. APPROVALS

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### 3.1 Project Approval

Gunlake Quarry held Project Approval 07\_0074 which was surrendered on 6<sup>th</sup> August 2018.

### 3.2 Gunlake Extension Project SSD Development Consent 2017/108663

In June 2015 Gunlake submitted the Preliminary Environmental Assessment and request for the Secretary's Environmental Assessment Requirements for the proposed Gunlake Quarry Extension Project. The Secretary's requirements were issued on 13<sup>th</sup> October 2015. An Environmental Impact Statement (EIS) prepared to support the Development Application and in April 2016 Gunlake submitted the EIS for the Gunlake Quarry Extension Project to the DP&E. This project was subject to assessment under Division 4.1 of Part 4 of the EP & A Act and represents a State Significant development.

The EIS was on exhibition from 4<sup>th</sup> April to 20<sup>th</sup> May 2016. A Response to Submission Report was prepared and submitted in September 2016 which responded to submissions received in relation to the EIS and matters raised during ongoing consultation with government agencies and the community, including issues raised at the public meeting convened by DPE on 30<sup>th</sup> June 2016.

Development Consent for the Gunlake Extension Project was refused by the NSW Planning Assessment Commission in April 2017, with the determination based primarily on community impacts associated with product transportation. This determination was referred to the Land and Environment Court, and approval of the Gunlake Extension Project was granted on 30<sup>th</sup> as an outcome of the S34 agreement filed on June 2017 (Appendix A).

#### 3.2.1 Development Consent Modification

A modification to Development Consent 2017/108663 was lodged with the NSW Land and Environment Court in March 2019. This modification seeks to amend Schedule 3 Condition 32 of the consent that relates to historical biodiversity areas to reduce the required area from 78.82ha to 39.6ha. It does not change the quarry layout or activities. A Statement of Environmental Effects for the proposed modification was prepared for the Department of Planning and Environment (DPE) and placed on public exhibition from 25 April 2019 to 9 May 2019. On 14 May 2019, the DPE requested the preparation of a report detailing responses to the issues raised in the submissions. A response to submissions (RTS) report was prepared in June 2019. It is anticipated that a determination will be handed down in the coming reporting period. There were no further modifications during the reporting period.

### 3.3 EPA Environment Protection Licence

The quarry holds Environment Protection Licence 13012 administered by the Environment Protection Authority covering all scheduled activities undertaken at the Quarry (Appendix B). The licence anniversary date for EPL 13012 is 13<sup>th</sup> July each year. The licence was varied on 12<sup>th</sup> July 2018 to reflect the requirements of the development consent 2017/108663. The variations covered noise assessment locations and limits, hours of operation, and the requirement for an additional PM<sub>10</sub> monitor. There were no changes to the EPL during the reporting period.

### **3.4 Federal Approval EPBC**

Prior to its approval, the Gunlake Extension Project was referred to the Federal Department of the Environment and Energy and it was determined that the project comprised a controlled action with impact to threatened species and communities listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlled action was subsequently approved under the EPBC Act on 17<sup>th</sup> November 2017 (EPBC 2015/7557).

### **3.5 Water Access Licence**

Water access licence WAL42340 was issued to Gunlake on 26<sup>th</sup> April 2019 which allows for 37ML annual extraction from the Goulburn Fractured Rock Groundwater Source in the Greater Metropolitan Region Groundwater Source Water Sharing Plan.

## 4. OPERATIONS SUMMARY

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The following sections provide a summary of the works undertaken at Gunlake Quarry during the period 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2020.

### 4.1 Quarry Operations

#### 4.1.1 Land Preparation

Within the reporting period, land preparation in the approved Gunlake Extension Project pit and overburden areas continued. The majority of the vegetation cleared for this purpose during the reporting period was pasture, which was stripped and retained in the topsoil and stockpiled adjacent to the western overburden emplacement area for future use. Following soil stripping activities, overburden was removed progressively from the quarry pit area prior to blasting and subsequent resource extraction. Overburden emplacement continued in the western emplacement area.

#### 4.1.2 Drilling and Blasting

Drilling and blasting is undertaken by specialist contractor. A total of 31 blasts occurred during the reporting period. All blasts were fully monitored, and neighbours notified of the blasts as outlined in the Noise and Blast Monitoring Program. Results of the blast monitoring are provided in Section 6.7.

Regular drilling and blasting will continue during the next 12 months as required to prepare quarry rock for removal to the crushing and processing plant. The information collected during blasting already undertaken will continue to be used to assist with the design of the regular blasting activities. The frequency of blasting may increase during the coming reporting period as the Extension Project Development Consent allows for blasting twice per week.

#### 4.1.3 Crushing and Processing

Crushing and processing continued during the reporting period within the processing areas to the north of the quarry pit. A heavy vehicle haul road connects the quarry pit and the processing area, allowing quarried rock to be transported by dump trucks from the extraction area to the primary and secondary crushers and screens. Product is conveyed to the tertiary and quaternary crushers and screens for further crushing, screening and shaping. The processing plant features atomised water dust suppression systems at all of the discharge points, as well as the tipping point into the apron feeder and at the primary crusher input.

A front end loader is used to load various products into road registered trucks for transport to various market destinations. The processing equipment and saleable products stockpiles area acoustically and visually screened by the overburden emplacement bund wall and also by the nature of the existing topography.

Quarrying and processing activities will continue during the coming reporting period. Quarry production in the next reporting period is anticipated to increase from the previous reporting period.

#### 4.1.4 Maintenance and Rehabilitation

Maintenance on plant and equipment is scheduled and carried out on a regular basis. Rehabilitation is undertaken on a progressive basis. During the reporting period the first two benches were completed at the northern end of the western overburden emplacement and rehabilitation commenced with the planting of tubestock. Other rehabilitation activities were associated with infill planting and maintenance to drainage structures on the northern side of the noise bund emplacement area. Weed spraying of tussock and blackberry was undertaken in the biodiversity offset areas.

#### 4.1.5 Hours of Operation

**Table 4.1 Hours of Operation**

<b>Activity</b>	<b>Permissible Hours</b>
Construction	7am to 6pm Monday to Friday  8am to 1pm Saturday  At no time on Sunday or Public Holidays
Blasting	9am to 5pm Monday to Friday  At no time on Saturday, Sunday or Public Holidays
Quarrying Operations (excluding overburden removal/ emplacement and drilling)	24 hours a day but not between 6pm Saturday and 2am Monday  At no time on Sunday or Public Holidays
Overburden removal/ emplacement and drilling	7am to 6pm Monday to Saturday  At no time on Sunday or Public Holidays
Loading and Dispatching	24 hours a day but not between 6pm Saturday and 2am Monday  At no time on Sunday or Public Holidays
Transportation on the primary transport route	24 hours a day but not between 6pm Saturday and 2am Monday  At no time on Sunday or Public Holidays
Transportation on the secondary transport route	6am to 7pm Monday to Saturday  At no time on Sunday or Public Holidays
Maintenance	At any time provided that the activity is not audible at any privately-owned residence

## 4.2 Traffic and Transportation

Gunlake Quarry operates under a Traffic Management Plan (TMP) which was updated and approved by the Department of Planning and Environment following approval of the Gunlake Extension Project. The TMP was reviewed and updated during the reporting period as

required following the first Independent Environmental Audit under development consent 2017/108663.

In accordance with the TMP, all drivers (both quarry staff and contractors) are made aware of and trained in the requirements of the TMP and the Driver Code of Conduct. This is done as part of the online induction required to be undertaken prior to entry to the site.

Saleable products are transported by truck from the quarry direct to the Sydney market and to other markets north and south of Marulan. South bound trucks use the Brayton Road to access the purpose built and grade separate Hume Highway interchange at Marulan, and trucks returning from the south continue north along the highway past the Marulan interchange and turn left onto Red Hills Road intersection to use Ambrose Road to Brayton Road. Trucks heading north use Ambrose road exiting onto the Hume Highway at the Red Hills Road intersection. Trucks returning from the north cannot make a right hand turn from the Highway at Red Hills Road. They travel further south to the South Marulan Interchange on the Highway and use the grade-separated roundabout intersection to U turn and access the northbound lane in the Hume Highway and return to make a left hand turn into Red Hills Road, and then use Red Hills Road, the Bypass Road and Brayton Road back to the Quarry. Trucks returning from the southern customers travel north along the Hume Highway and utilise Red Hills Road, the Bypass Road and Brayton Road.

#### **4.2.1 Product Transport**

The majority of the product from the quarry is transported north towards Sydney. Daily truck movements are limited to an average of 370, including an average of 25 movements on the secondary transport route and a daily maximum of 440 including a maximum of 38 outbound laden truck movements on the secondary transport route. Truck movements for the reporting period are published on the Gunlake website.

Gunlake has upgraded the Primary Transport Route in accordance with the Austroads design standards, including the addition of the quarry acceleration lane, constructing a new acceleration lane at the junction of Red Hills Road and the Hume Highway to NSW RMS standards, and the incorporation of a wide centre line as shown on Plate 1. This work was completed in the 2018/2019 reporting period.



**Plate 1 a) Intersection of Red Hills Road and Hume Highway b) Wide centre line on Brayton Road**

#### **4.2.2 Council Contributions**

Gunlake paid Goulburn Mulwaree Council a S94 contribution of \$219,904.33 during the reporting period. This S94 contribution is for maintenance of the Council roads on the Primary and Secondary transport routes.

### **4.3 Employment**

The workforce at Gunlake Quarries has continued to grow through the reporting period in accordance with the requirements of quarry development.

### **4.4 Next Reporting Period**

During the coming reporting period quarrying will continue in the current approved extraction area with further bench development in the south-east and pit expansion and bench development in the southwest of the approved extraction area. General quarrying operations will continue with:

- pre-stripping of topsoil;
- overburden removal and emplacement;
- drill and blast activities;
- resource extraction and hauling;
- crushing, screening and stockpiling operations; and
- maintenance and rehabilitation activities.

## **5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW**

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This Annual Review represents the second Annual Review as required under development consent 2017/108663 and was provided to DPIE, Goulburn Mulwarree Council and EPA on 30<sup>th</sup> September 2019. The DPIE responded to the Annual Review in their letter dated 11<sup>th</sup> November 2019. The matters raised were administrative in nature and were addressed by Gunlake. No further actions were required.

## 6. ENVIRONMENTAL PERFORMANCE

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### 6.1 Environmental Management

Gunlake operates under a series of environmental management plans and monitoring programs to minimise and manage the identified potential environmental impacts associated with the project. These plans include:

- Noise and Blast Management Plan;
- Air Quality Management Plan;
- Soil and Water Management Plan;
- Rehabilitation and Biodiversity Offset Management Plan;
- Aboriginal Heritage Management Plan; and
- Traffic Management Plan.

This section addresses the EIS predictions, performance criteria, operational measures, commitments and management activities that have been defined as relevant for the Gunlake Quarry Extension Project.

The above-mentioned management plans were updated in accordance with the Gunlake Extension Project SSD Development Consent and reviewed during the reporting period following the first Independent Environmental Audit under development consent 2017/108663.

For the NBMP and AQMP, the changes primarily related to inclusion of updated monitoring results following operations under the development consent. The SWMP included amendments to the site water balance following prolonged dry periods and water use and storage requirements. Changes to the AHMP related to the completion of salvage works undertaken in 2018 and changes to the TMP reflected the completion of the upgrades required on Brayton Road and the Red Hills Road/Hume Highway intersection. The RBOMP was not updated as this is awaiting determination of Mod1 of the Development Consent.

### 6.2 Environmental Constraints

Large parts of NSW have experienced extreme drought conditions which began in early 2017 and persisted until mid 2020. The reporting period saw the peak of the drought from October 2019 to early February 2020. This timeframe was characterised by regionally hot dusty and windy conditions and a catastrophic bushfire season due to areas of extremely dry vegetation. The poor air quality and dusty conditions were exacerbated by land degradation, soil erosion and the driest 36 month period on record in Australia. Rain in February restored process water storage for the site.

These extreme conditions resulted in regional and site elevated dust levels as detailed in Section 6.4 and limited rehabilitation success and opportunities as described in Section 6.5.3

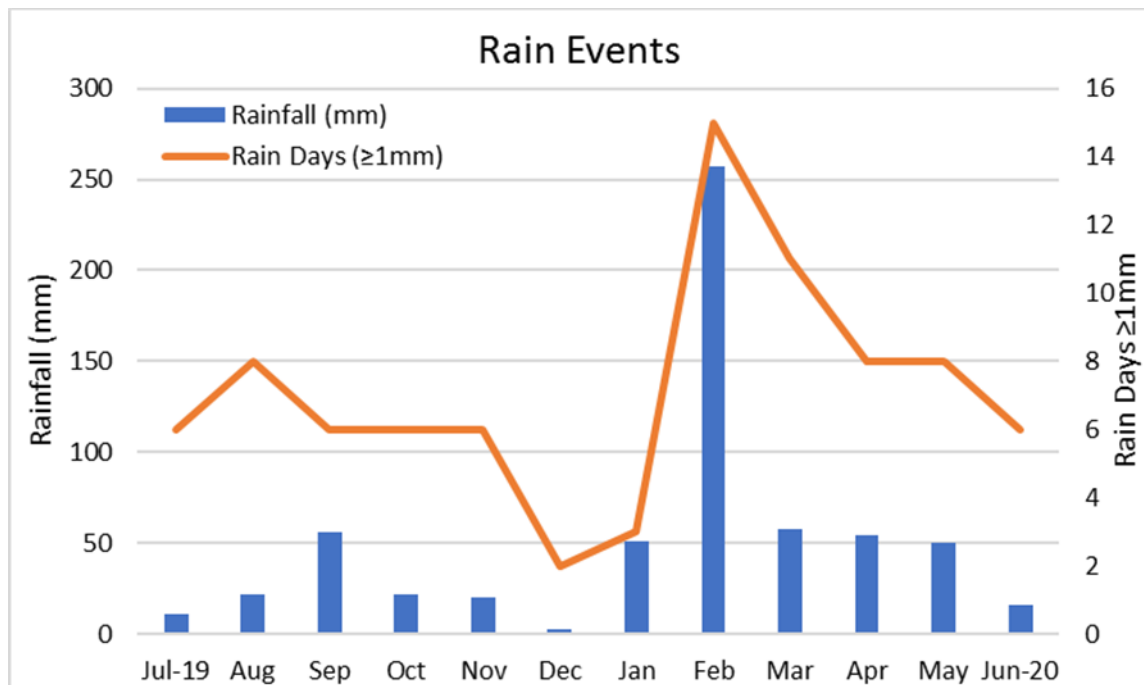
## 6.3 Meteorological Monitoring

Gunlake Quarry operates a weather station at site in accordance with condition 18 of Schedule 3 of the Development Consent. The station provides data for day to day operations and environmental management.

### 6.3.1 Rainfall

**Table 6.1– Total Monthly Rainfall (mm) (2019/20)**

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Tot
10.8	22.4	56.2	22.2	20.0	2.6	50.8	257.2	58.2	54.6	50.4	16.4	621.8
Number of Rain Days (≥1mm)												
6	8	6	6	6	2	3	15	11	8	8	6	85



**Graph 6.1 – Monthly Rainfall and Number of Rain Days**

The drought conditions eased slightly during the latter half of the reporting period, following heavy rain in February with a total of 257.2mm and 15 days of rain above 1mm/day for the month (Graph 6.1). The average monthly rainfall was 51.8mm which was reflective of the months September 2019 and January, March, April and May 2020. Meanwhile, December 2019 had the lowest rainfall, with only 2.6mm over the duration of the month.

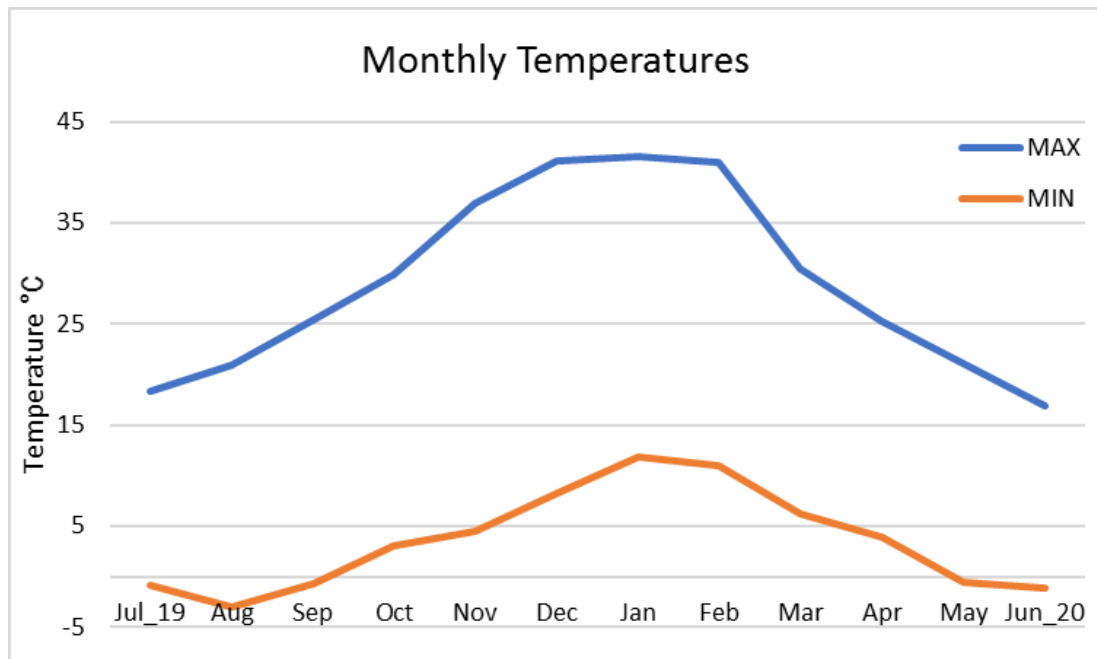
### 6.3.2 Temperature

The area is characterised by mild to hot summers and cool to cold winters. Generally, December, January and February are the warmest months with mean daily maximum temperatures approximately 41°C (Graph 6.2). August was the coldest month with minimum daily temperatures reaching -3.0°C. Table 6.2 shows temperature for the past reporting

period. On average, the 2018/2019 year had lower minimum mean monthly temperatures and higher maximum monthly temperatures than the current reporting period by approximately 2°C.

**Table 6.2 - Minimum and Maximum Monthly Temperatures (°C) (2019/20)**

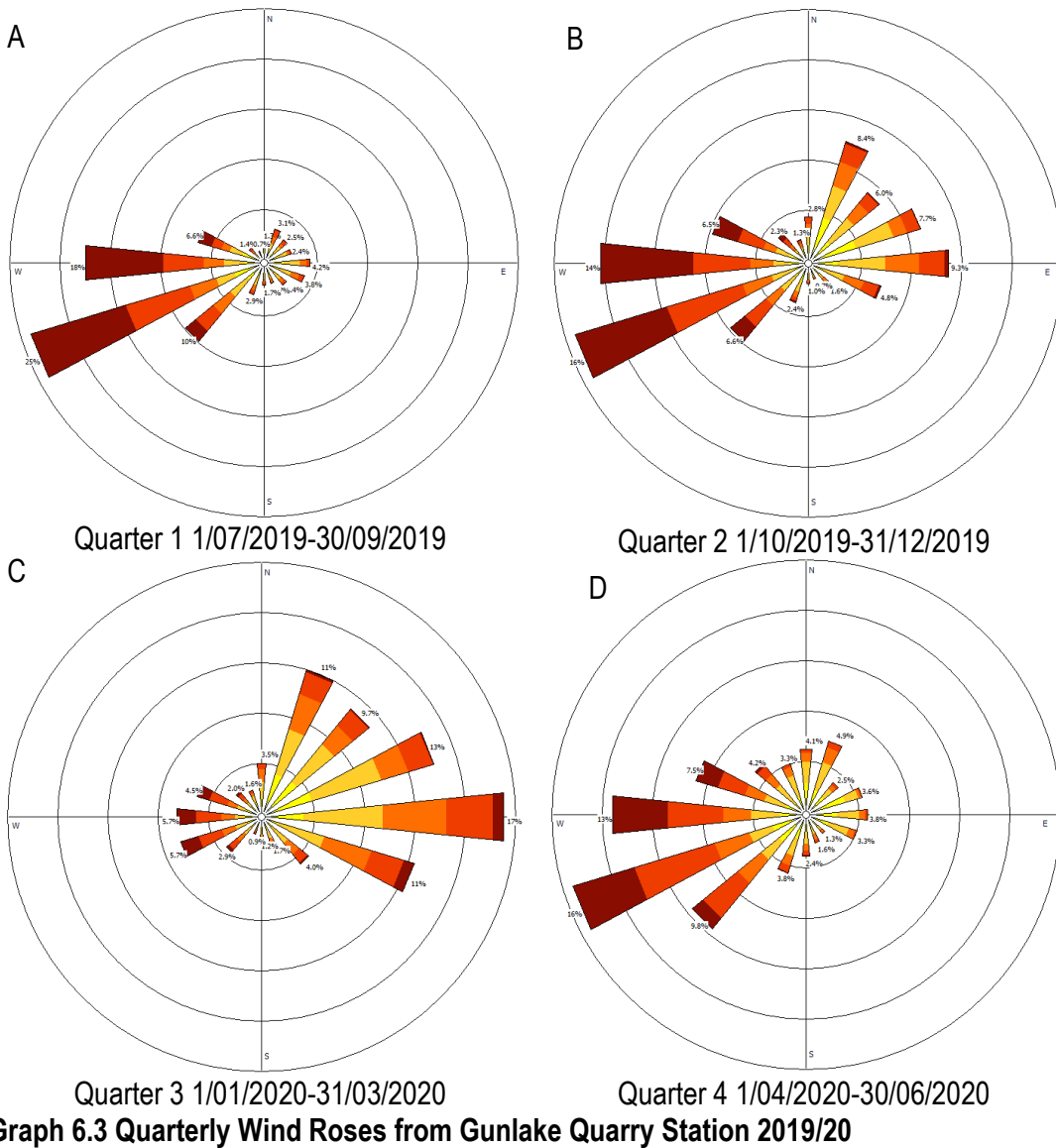
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Min	-0.8	-3	-0.7	3	4.5	8.3	11.9	11	6.2	3.9	-0.6	-1.1
Max	18.4	20.9	25.4	29.9	36.9	41.1	41.5	41	30.4	25.3	21.1	16.9



**Graph 6.2 – Monthly Minimum and Maximum Temperatures**

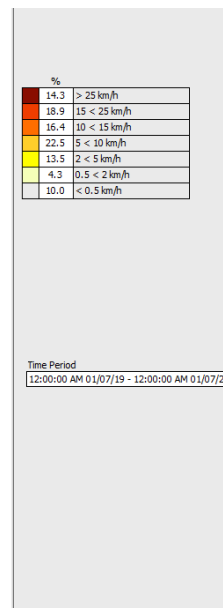
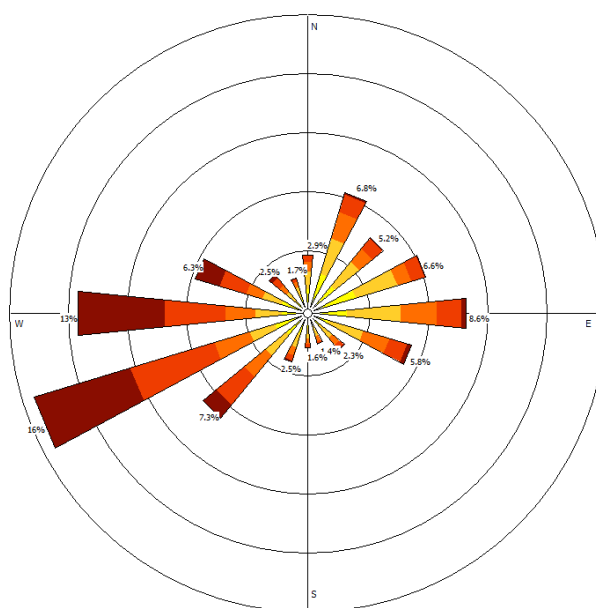
### 6.3.3 Wind

Quarterly wind roses and an annual average wind rose showing wind speed and direction data recorded by the Gunlake weather station are shown in Graph 6.3 (A-D) and Graph 6.4 respectively. The annual recorded wind pattern consists of strong, high speed west-southwest to westerly winds throughout the entire reporting period, however lower speed air flow is predominant from the east-northeast during spring and summer months (Graph 6.3 B, C). The long term average recorded wind speed is 3.5 m/s, and calm conditions remain similar to the previous year with a frequency of (wind speeds less than 0.5 m/s) 10% of the time (Graph 6.4).



**Graph 6.3 Quarterly Wind Roses from Gunlake Quarry Station 2019/20**

WS Km/h: 10.0%



**Graph 6.4 Annual Average Wind Rose Gunlake Quarry Station 2019/20**

## 6.4 Air Quality

Gunlake Quarry operates under an approved Air Quality Management Plan (AQMP), which documents the control measures and management initiatives to control dust generation from the site.

The main objectives of the AQMP are to provide a program detailing the assessment criteria, monitoring locations and procedures, reporting protocol and compliance checking procedures for air quality management at the Quarry.

There are three broad dust sources which may be measured as part of the monitoring program, which are:

- Background sources such as from traffic on unsealed local roads and agricultural activities,
- Dust generated from land disturbance such as topsoil stripping and overburden emplacement; and
- Dust generated from material processing and handling, such as crushing, screening and conveying product.

### 6.4.1 Dust Control Measures

A summary of the dust mitigation strategy is provided in Table 6.3. In addition to the below controls, during adverse meteorological conditions when wind speed exceeds 8m/s the Quarry Manager may limit or stop specific activities being undertaken in the Quarry in order to reduce dust emissions. During the reporting period the haul roads were upgraded with further compaction and an additional water cart was based at the quarry providing additional dust control and bushfire fighting capacity.

**Table 6.3 - Air Quality and Dust Management Measures**

Activity	Control
Stripping, transport, and emplacement/stockpiling of topsoil	Minimise clearing ahead of extraction activities Avoid stripping in high wind conditions Revegetation of completed surfaces
Removal, transport and placement of overburden	Water cart used on haul roads
Drilling activities	Dust apron on drill rig
Blasting activities	Blast design to minimise fine particles
Face loading	Water cart used on hardstand areas and extraction benches
Hauling raw product on internal haul roads	Water truck Speed limit
Conveyors and transfer points	Water sprays
Crushing, screening	Water sprays
Product stockpiles	Located in nominated areas with topographic shielding
Product loading and dispatch	Use of minimal heights when loading Water cart used on hardstand areas Road registered trucks equipped with automatic tarps Use of bypass road avoids residential areas of Marulan

Activity	Control
Internal haul roads	Water truck
General on-site activities	Water truck Alarm on weather station when wind speeds exceed 8 m/s

#### 6.4.2 Air Quality Monitoring Program

The Gunlake AQMP contains assessment criteria, reporting protocol and compliance checking procedures and monitoring program to enhance the management of any potential air quality impacts associated with the Project. In addition to the assessment criteria, Gunlake have made specific commitments and the Development Consent contains a number of conditions aimed at minimising air quality impacts

The air quality monitoring program comprises the following:

- Three dust deposition gauges located to the northeast, south and northwest of the quarry operations as shown on Figure 2;
- Two high volume air samplers located at R1 to the east of the quarry and R4 located to the northwest of the quarry; and
- Automatic weather station located adjacent to the site offices.

The air quality monitoring activities are summarised in Table 6.4 below.

**Table 6.4 –Air Quality Monitoring Program**

Monitoring Site	Parameter	Timing
DDG1	Deposited Dust	Monthly (30 days +/- 2 days)
DDG2	Deposited Dust	Monthly (30 days +/- 2 days)
DDG3	Deposited Dust	Monthly (30 days +/- 2 days)
R1 (HVAS)	Particulate Matter (PM <sub>10</sub> )	One day in six cycle
R4 (HVAS)	Particulate Matter (PM <sub>10</sub> )	One day in six cycle
Weather Station	Meteorological Parameters	Continuous

#### 6.4.3 Background Dust Concentrations

As part of the Environmental Assessment process for Modification 2, the available monitoring data was used to determine background air quality concentrations at the nearest residential receptors. These are shown in Table 6.5 below and are considered low in comparison to typical agricultural environments.

**Table 6.5 – Background Air Quality Concentrations**

Parameter	Concentration
24-hour average PM <sub>10</sub>	Varies daily
Annual Average PM <sub>2.5</sub>	7 ug/m <sup>3</sup>
Annual average PM <sub>10</sub>	13 ug/m <sup>3</sup>
Annual average TSP	33 ug/m <sup>3</sup>
Combined Annual Average Dust Deposition	1.8 g/m <sup>2</sup> /month

#### 6.4.4 Air Quality Assessment Criteria and Predictions

Table 6.6 defines the short term and long term impact assessment criteria for particulate matter and Table 6.7 defines the long term impact assessment criteria for deposited dust.

**Table 6.6 Short Term and Long Term Particulate Matter Impact Assessment Criteria**

Pollutant	Averaging Period	<sup>d</sup> Criterion
Total Suspended Particulate matter (TSP)	Annual	<sup>a</sup> 90 ug/m <sup>3</sup>
Particulate Matter < 10um (PM <sub>10</sub> )	Annual	<sup>a</sup> 30 ug/m <sup>3</sup>
	24 Hour	<sup>a</sup> 50 ug/m <sup>3</sup>

**Table 6.7 Long term Assessment Criteria for Deposited Dust**

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
<sup>c</sup> Deposited dust	Annual	<sup>b</sup> 2g/m <sup>2</sup> /month	<sup>a</sup> 4g/m <sup>2</sup> /month

Notes to Tables 6.6 and 6.7:

- Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources);
- Incremental impact (i.e. incremental increase in concentrations due to the project on its own);
- Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003:Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and
- Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.

The data presented in Table 6.8 below shows the predicted Gunlake Quarry- only incremental concentrations and deposition rates at each of the receptor locations. The following EIS predictions are under an existing operations scenario. All concentrations and deposition rates are well below the relevant impact assessment criteria, as presented in Tables 6.6 and 6.7 above.

**Table 6.8 Predicted Quarry-only Incremental Concentrations and Deposition Rates for Existing Operations**

Receptor ID	Annual TSP (µg/m <sup>3</sup> )	Max 24h PM <sub>10</sub> (µg/m <sup>3</sup> )	Annual PM <sub>10</sub> (µg/m <sup>3</sup> )	Max 24h PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Annual PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Annual RCS	Annual Dust Deposition (g/m <sup>2</sup> /month)
Criteria	90	50	30	25	8	3	2
1*	2.4	9.7	0.9	1.5	0.2	0.013	0.4
2	1.0	6.7	0.4	1.1	0.1	0.005	0.2
3*	0.5	3.3	0.2	0.7	<0.1	0.003	0.1
4*	0.2	1.4	0.1	0.3	<0.1	0.001	<0.1
5	0.9	4.9	0.3	0.8	0.1	0.004	0.1
6	0.5	1.4	0.1	0.2	<0.1	0.002	0.1
7	0.3	1.2	0.1	0.2	<0.1	0.001	<0.1
8	0.7	1.3	0.1	0.2	<0.1	0.002	0.1
9	0.3	0.7	0.1	0.1	<0.1	0.001	<0.1
10	0.2	0.6	0.1	0.1	<0.1	0.001	<0.1
11	0.1	0.5	<0.1	0.1	<0.1	0.001	<0.1
12	0.1	0.5	<0.1	0.1	<0.1	0.001	<0.1

\*Gunlake Quarries owned residence

#### 6.4.5 Dust Deposition Monitoring Results

Table 6.9 includes the dust fallout data for the reporting period which is shown graphically in Graph 6.5 with the annual rolling average shown in Graph 6.6. Dust deposition levels are monitored by Gunlake at three locations in the vicinity of the quarry. Dust Deposition Gauge 1 (DDG1) is located to the northeast of the quarry, DDG2 to the south and DDG3 to the northeast. Monitoring has been undertaken on a monthly basis continually since 2007 and the locations of the monitoring sites are shown on Figure 2.

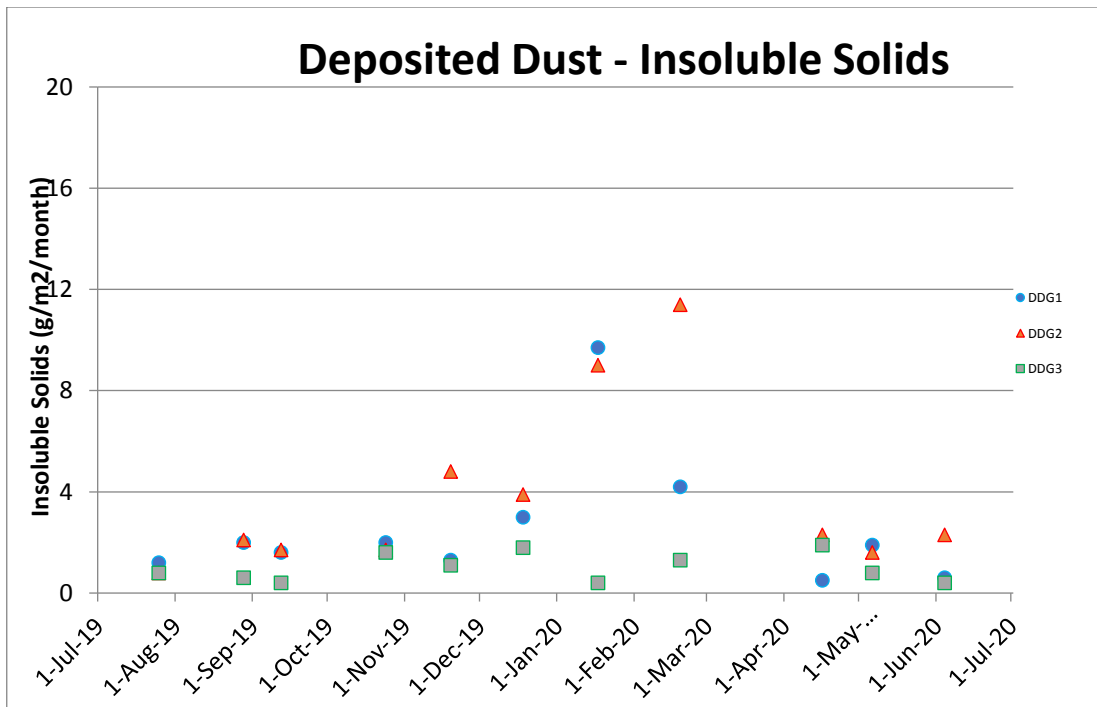
The Gunlake property is predominantly grassland with patches of well vegetated areas with tall trees. Sources of particulate matter in the area would include quarrying activities, traffic on unsealed roads, local building and construction activities, and agricultural activities.

**Table 6.9 Dust Monitoring Results – Insoluble Solids (g/m<sup>2</sup>/month)**

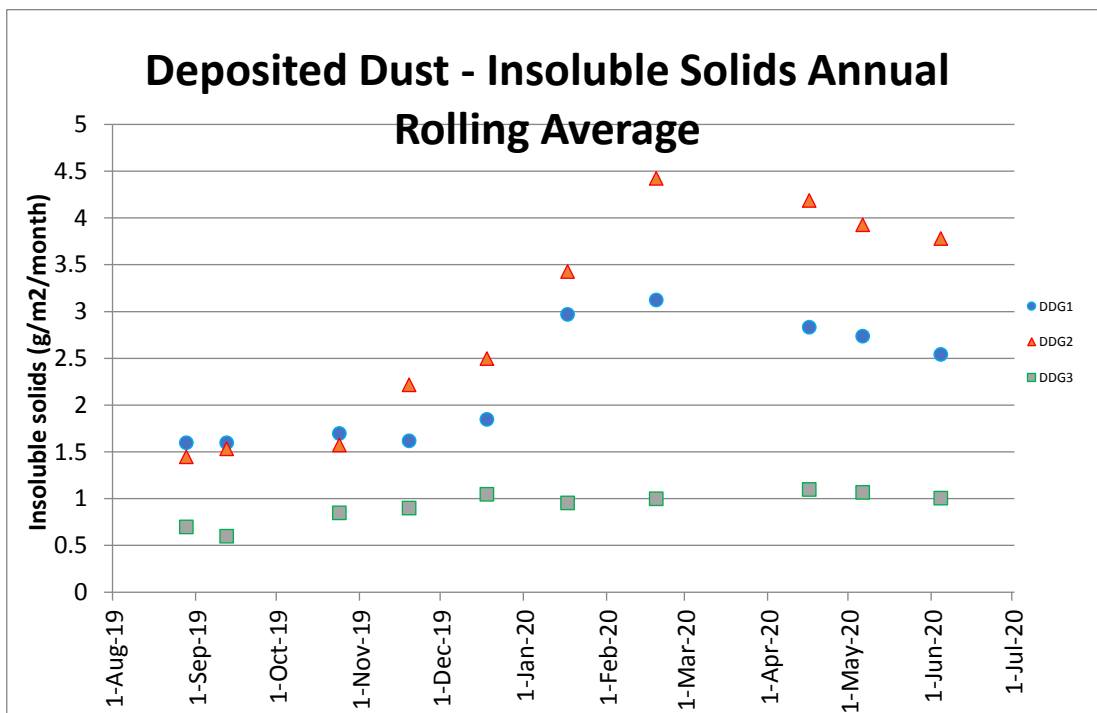
Date Sampled	DDG1	DDG2	DDG3
25-Jul-19	1.2	0.8	0.8
28-Aug-19	2.0	2.1	0.6
12-Sep-19	1.6	1.7	0.4
24-Oct-19	2	1.7	1.6
19-Nov-19	1.3	4.8	1.1
18-Dec-19	3	3.9	1.8
17-Jan-20	9.7	9	0.4
19-Feb-20	4.2	11.4	1.3
16-Apr-20	0.5	2.3	1.9
6-May-20	1.9	1.6	0.8
4-Jun-20	0.6	2.3	0.4

**Table 6.10 Insoluble Solids (g/m<sup>2</sup>/month) Summary**

	Dust Gauge No 1	Dust Gauge No 2	Dust Gauge No 3
Individual Gauge Background Average	1.8	0.9	2.4
Overall Background Average	1.8		
Individual Gauge Average July 18 – June 19	1.6	3.3	2.1
Overall Average for Period July 18 – June 19	2.3		
Individual Gauge Average July 19 – June 20	2.4	3.5	1.2
Overall Average for Period July 19 – June 20	2.3		



Graph 6.5 - Dust Deposition



Graph 6.6 - Dust Deposition – Annual Rolling Average

The annual average dust deposition at DDG1 for the reporting period was 2.4 g/m<sup>2</sup>/month, which is higher than the background levels and slightly higher than the previous reporting period. It is still, however, below the assessment criteria detailed in the AQMP and Table 6.7.

The annual average of DDG2 (3.5 g/m<sup>2</sup>/month) was higher than the background levels for that site and higher than the previous reporting period. It is still, however also below the assessment criteria detailed in the AQMP. DDG2 is located in proximity to the Gunlake Extension Project extraction area and the increased dust deposition is likely due to localised dust generated from topsoil stripping, blasting and overburden removal activities during the reporting period.

The annual average of DDG3 for the reporting period was lower than the background average (1.2 g/m<sup>2</sup>/month) and was also lower than the previous reporting period as can be seen in Table 6.10. DDG3 had the lowest annual average dust deposition for the reporting period.

Table 6.11 below shows annual summaries of the dust deposition monitoring program covering background conditions, construction, first production and normal operations.

**Table 6.11 Gunlake Quarry Dust Deposition Summary Calendar Year**

Year	DDG1	DDG2	DDG3	Average	Comment
2007	0.7	1.3	2.4	1.5	No quarry activities
2008	1.4	2.7	2.4	2.1	No quarry activities
2009	0.9	1.4	2.5	1.6	Construction and initial extraction
2010	1.0	0.9	1.2	1.0	First production
2011	1.5	1.3	3.2	2.0	Normal operations
2012	1.7	1.4	2.3	1.8	Normal operations
2013	2.0	1.1	2.8	2.1	Normal operations
2014	2.1	0.9	2.4	1.8	Normal operations
2015	2.9	1.6	2.5	2.3	Normal operations
2016	1.2	1.2	1.5	1.3	Normal operations
2017	1.3	1.9	4.0	2.4	Normal operations
2018	1.5	3.3	3.2	2.4	Normal operations
2019	1.6	3.3	2.1	2.9	Normal operations
Average	1.5	1.7	2.5	1.9	Normal operations

Based on the above results, there are no statistically significant changes in dust deposition rates in the direction of the nearest residential receptors since the quarry commenced operations. DDG3 located to the west of the quarry, has had fluctuating dust deposition levels and is influenced by normal agricultural activities. DDG1, located to the northeast of the quarry operations, in opposing the direction of the prevailing winds, captures dust emanating from the quarry. This gauge show constant readings from before the quarry started and throughout the operations to date and therefore verify that the dust mitigation strategy has been effective in meeting the assessment goals contained in AQMP, that is the quarry has not increased ambient dust levels by more than 2 g/m<sup>2</sup>/month at nearby residential receptors.

#### 6.4.6 High Volume Air Sampling PM10 Monitoring

Gunlake Quarry is required to monitor the very small fraction of total suspended particulate matter, namely the 10-micron fraction (PM<sub>10</sub>). This test measures the levels of the very fine dust suspended in the air which is a measure of potential health effects (irritation of the respiratory tract) as the small particles can penetrate the airways and the lungs.

PM<sub>10</sub> monitoring commenced in December 2014 at site R1-HVAS which is located to the northeast of the quarry. PM<sub>10</sub> monitoring was expanded with the addition of a second PM<sub>10</sub> monitor at R4 in mid July 2018, with monitoring at both stations undertaken on a one-in-six-day cycle in line with the Gunlake Extension Project Development Consent and the EPL. Results for the 2019/2020 reporting period are contained in Table 6.12 and shown graphically in Graph 6.7 and 6.8 for R1 and R4 respectively.

**Table 6.12 PM<sub>10</sub> Monitoring Results**

Sampling Date	R1 PM <sub>10</sub> (µg/m <sup>3</sup> )	R4 PM <sub>10</sub> (µg/m <sup>3</sup> )
2/07/2019	50.1	5.2
8/07/2019	20.2	2.7
14/07/2019	4.7	2.2
20/07/2019	1.9	1.9
26/07/2019	18.3	6.0
1/08/2019	N/A*	5.6
7/08/2019	45.5	10.6
13/08/2019	31.5	4.6
19/08/2019	22.0	22.0
25/08/2019	17.2	26.4
31/08/2019	4.3	4.4
6/09/2019	24.8	17.8
12/09/2019	58.2	16.1
18/09/2019	7.1	8.4
24/09/2019	14.2	5.0
30/09/2019	10.8	11.3
6/10/2019	22.4	26.4
12/10/2019	3.0	3.8
18/10/2019	N/A*	N/A*
24/10/2019	38	21.6
30/10/2019	40.7	33.8
5/11/2019	7.2	6.8
11/11/2019	11.0	6.0
17/11/2019	14.6	14.6
23/11/2019	29.6	51.3 <sup>#1</sup>
29/11/2019	42.2	35.9
05/12/2019	52.2 <sup>#2</sup>	37.6
11/12/2019	27.4	N/A <sup>#</sup>
17/12/2019	33.5	39.1
23/12/2019	N/A <sup>#3</sup>	N/A <sup>#3</sup>
29/12/2019	N/A <sup>#3</sup>	N/A <sup>#3</sup>

Sampling Date	R1 PM <sub>10</sub> (µg/m <sup>3</sup> )	R4 PM <sub>10</sub> (µg/m <sup>3</sup> )
04/01/2020	N/A#3	N/A#3
10/01/2020	N/A#3	N/A#3
16/01/2020	38.8	36.6
22/01/2020	20.4	19.8
28/01/2020	44.4	23.4
3/02/2020	61	40.8
9/02/2020	7.4	6.2
15/02/2020	11.4	13.8
21/02/2020	13.6	12.0
27/02/2020	19.3	18.5
4/03/2020	2.2	2.5
10/03/2020	2.6	6.6
16/03/2020	<1.0	7.1
22/03/2020	10.8	11.9
28/03/2020	7.4	6.7
3/04/2020	3.4	2.8
9/04/2020	3.9	3
15/04/2020	27.4	8.2
21/04/2020	14.3	13.5
27/04/2020	5.9	8.1
3/05/2020	1.7	<0.1
9/05/2020	8.7	9.5
15/05/2020	10.5	7.4
21/05/2020	3.8	3.1
27/05/2020	4.7	2.7
2/06/2020	18.8	0.1
8/06/2020	3.1	3.2
14/06/2020	6.3	2.5
20/06/2020	4.4	5.8
26/06/2020	14.8	1.1

\*Filter paper damaged.

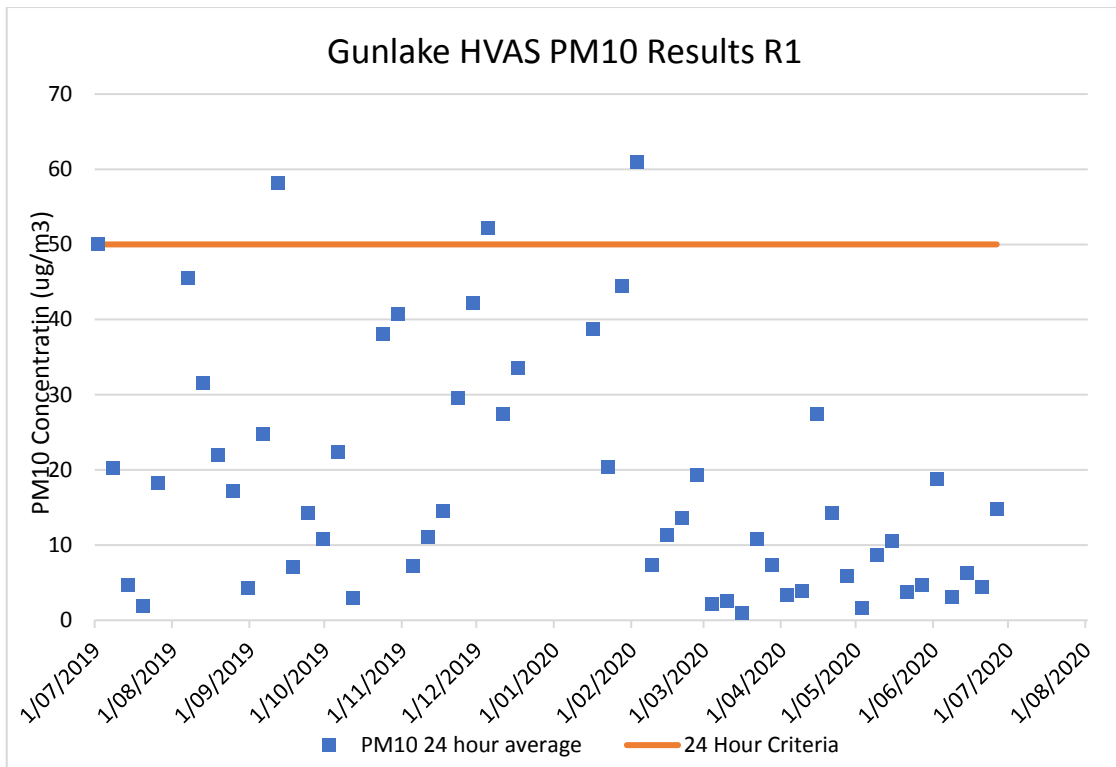
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#1 High reading at background monitoring site R4 not attributable to quarry – prevailing westerly winds on day of sampling and quarry located to the SE of R4. Corresponding levels at R1 on day of sampling 29.6 µg/m<sup>3</sup>.

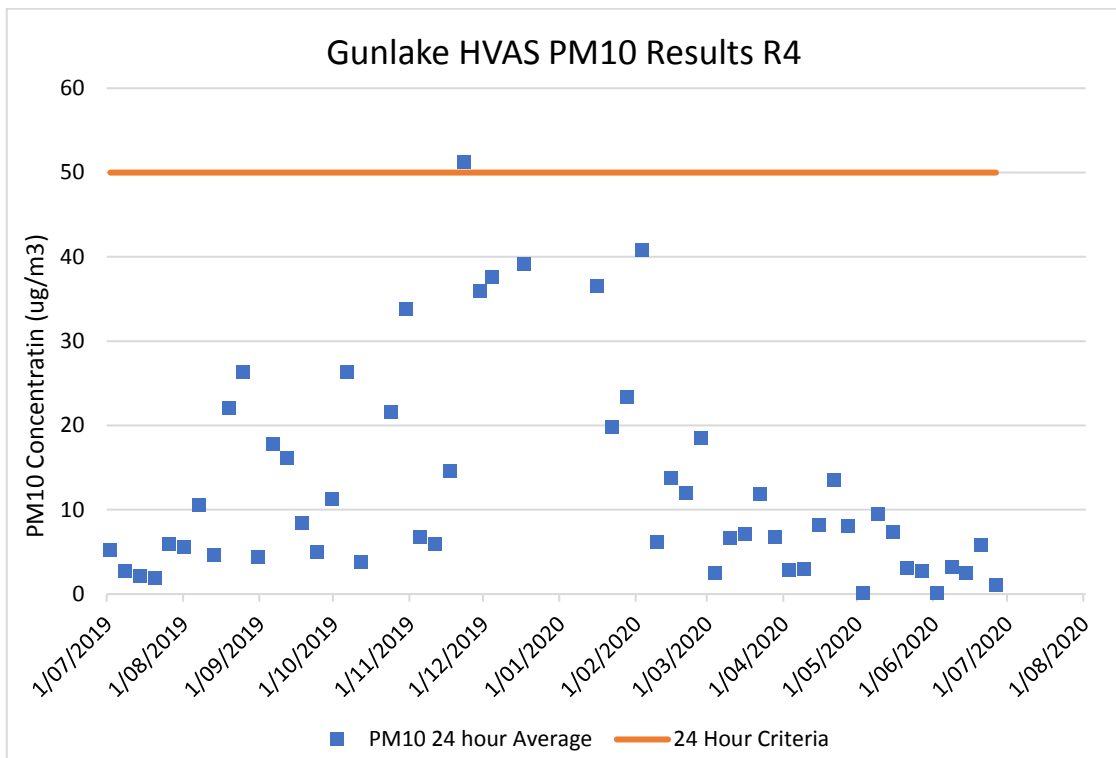
#2 High wind on day of sampling dust generation due to exposed agricultural land resulting from drought conditions

#3 Extraordinary event – regional bushfires with heavy smoke on day of sampling

Graphs 6.7 and 6.8 show the PM<sub>10</sub> data for both HVAAS sites recorded for the 2018/2019 reporting period. The extraordinary events such as widespread dust storms and bushfires as listed above have been excluded from these graphs and Table 6.13 below.



**Graph 6.7 – R1 HVAS PM<sub>10</sub> Results**



**Graph 6.8 – R4 HVAS PM<sub>10</sub> Results**

The monitoring results at R1, show an annual average PM<sub>10</sub> concentration of 18.63 ug/m<sup>3</sup>, with a maximum 24 hour average of 61 ug/m<sup>3</sup> and a minimum 24 hour average of 1 ug/m<sup>3</sup>. At R4, the annual average PM<sub>10</sub> concentration was 12.80 ug/m<sup>3</sup>, with a maximum 24 hour average of 51.3 ug/m<sup>3</sup> and a minimum 24 hour average of <0.1 ug/m<sup>3</sup>.

**Table 6.13 PM<sub>10</sub> Monitoring Summary**

	Maximum 24 hour average ug/m <sup>3</sup>	Annual average ug/m <sup>3</sup>
Background	Varies Daily	13
2014/2015	24.9	13.19
2015/2016	40.4	15.33
2016/2017	44.7	18.8
2017/2018	48.0	18.6
2018/2019 R1	47.4	17.62
2018/2019 R4	49.5	13.61
2019/2020 R1	61.0	18.63
2019/2020 R4	51.3	12.80
Assessment Criteria	50	30

It can be seen in Table 6.13 that the 24 hour average PM<sub>10</sub> concentration at R1 was higher than the previous reporting period and exceeded the 24 hour criteria detailed in Table 6.6. the annual average PM<sub>10</sub> concentration was however below the annual average criteria. Similarly, R4 had a higher maximum 24 hour PM<sub>10</sub> concentration that exceeded the 24 hour criteria whilst the annual average was lower than the previous reporting period and below the criteria. The exceedances of the 24 hour criteria were investigated and reported to the DPIE and EPA and were determined to be caused by dust generation from drought affected bare agricultural land and high winds and regionally elevated dust levels rather than from the quarry operations.

These PM<sub>10</sub> -HVAS are located on Gunlake-owned properties and the results are used to indicate compliance at the nearest non-company owned residences. Dust assessment contained in the EA predicted that the closest non-company owned residences will not experience dust levels attributed to the project greater than the project emissions criteria as outlined in the AQMP.

### 6.4.7 TSP Monitoring

Condition 14 of Schedule 3 of the Development Consent requires evaluation of a Total Suspended Particulate (TSP) annual criterion (90 µg/m<sup>3</sup>, annual average). The typical percentage of PM<sub>10</sub> in a semi-rural environment (i.e. one where the airshed is not dominated by particulate from motor vehicles) lies in the range of 40-50%. Given this, compliance with the annual PM<sub>10</sub> criterion (30 µg/m<sup>3</sup>) should therefore be seen to satisfying the annual TSP criterion. Monitoring of PM<sub>10</sub> therefore is used as a surrogate for evaluating compliance with the TSP criterion (i.e. if the annual PM<sub>10</sub> criterion is satisfied, it is assumed that the TSP criterion will also be achieved). In addition, the annual average TSP has been estimated from the monitoring results to be approximately 33 µg/m<sup>3</sup> which is well below the annual average criteria of 90 µg/m<sup>3</sup> for TSP. These results are in line with the predictions in the EA.

## 6.5 Biodiversity

### 6.5.1 Flora and Fauna

The property in which the Gunlake quarry is located was previously extensively cleared and used for sheep and cattle grazing. The property consists of highly disturbed native vegetation,

of which most is predominantly native grassland in cleared areas and the remainder consisting of clusters of remnant native trees and shrubs and some isolated native trees.

One threatened ecological community has been identified in the vicinity of the quarry that is listed both under the NSW Biodiversity Conservation Act (as EEC *White Box Yellow Box Blakely's Red Gum Woodland*) and the Commonwealth EPBC Act (as CEEC *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland*).

During surveys undertaken as part of the original EIS for the Gunlake Extension Project, six threatened fauna species listed under the Biodiversity Conservation Act were recorded within the extension area being the Speckled Warbler, Diamond Firetail (*Stagonopleura guttata*), Square-tailed Kite (*Lophoictinia isura*), Eastern Bentwing Bat, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) and Little Bentwing Bat (*Miniopterus australis*). Fauna and flora are managed as per Gunlake's Rehabilitation and Biodiversity Offset Management Plan.

### 6.5.2 Fauna Management

Effective management of vegetation communities at Gunlake enhances the habitat for native fauna species including known rare endangered species such as the Speckled Warbler. Specific management initiatives include:

- Minimising clearing at any one time as the quarry progresses;
- Undertaking pre-clearing surveys which include marking of hollow bearing trees which will not be felled if there is a risk to fauna or active nests;
- A total of two nest boxes per hollow tree removed will be established;
- Should any threatened fauna be discovered or injured a suitably qualified carer such as WIRES will be contacted and works in that area will cease until the ecologist has given the all clear to proceed;

The above measures are designed to minimise the impact on existing fauna on site as well as enhancing the habitat value of the property both during and after quarry extraction.

### 6.5.3 Biodiversity and Rehabilitation

The aims of the Management Strategy for biodiversity, rehabilitation and agriculture, currently comprise:

- protection, maintenance and enhancement of 32.66 ha of "Box Gum Woodland" in Biodiversity Areas 1 and 2 through assisted regeneration;
- regeneration and/or replanting of 46.16 ha of cleared land in Biodiversity Areas 1 and 2 with native vegetation representative of Box Gum Woodland;
- retiring 571 ecosystem credits for PCT 1330 in the Gunlake Quarry Extension Project offset areas;
- retiring 845 ecosystem credits for PCT 734 in the Gunlake Quarry Extension Project offsets;
- protection of the biodiversity offsets into perpetuity; and
- no net loss of stream length and aquatic habitat in the offset areas.

The Biodiversity Areas are currently subject to a modification as detailed in Section 3.2.1. These areas will remain protected under a conservation agreement and managed in accordance with the Biodiversity, Rehabilitation and Offset Management Plan. The Gunlake Extension Project Offset Areas that house the credits will be protected by the BioBanking Agreement. The management initiatives of these areas will be implemented as per the updated Rehabilitation and Biodiversity Offset Management Plan and will be updated with the resolution of the modification.



**Plate 3 Biodiversity Conservation Area Rehabilitation Monitoring Site**



**Plate 4 Biodiversity Conservation Area Existing Vegetation**



**Plate 5 Gunlake Extension Project Offset Area**

#### **6.5.4 Weeds and feral Animals**

Two noxious weeds listed under the Goulburn-Mulwaree LGA occur on the Gunlake property:

- Serrated Tussock – *Nasella trichomotoma*
- Blackberry – *Rubus fruticosus*

Gunlake implements a weed control strategy for the site. During the reporting period spraying of blackberry and serrated tussock continued in the biodiversity offset areas and riparian zones. The weed control program at Gunlake will continue during the coming reporting period.

### **6.6 Operational Noise**

The Noise Monitoring Program (NMP) and Blast Monitoring Program (BMP) are contained in the Noise and Blast Management Plan (NBMP) for Gunlake Quarry, and detail the monitoring locations, methods of monitoring noise and vibration and the correct compliance checking procedures for the subsequent reporting in accordance with the Department of Planning and Environment (DPE) and the EPA requirements.

Table 6.14 lists the Gunlake Quarry Project operational noise assessment criteria as prescribed in Condition 6, Schedule 3 of the Development Consent. These criteria have to be met at any residence or on more than 25% of any privately owned land.

**Table 6.14 Operational Noise Assessment Criteria**

Noise Assessment Location	Day	Evening	Night	
	L <sub>Aeq</sub> (15 minute)	L <sub>Aeq</sub> (15 minute)	L <sub>Aeq</sub> (15 minute)	L <sub>A1</sub> (1 minute)
R7	38	38	38	45
R8	37	37	37	45
All other privately-owned residences	35	35	35	45

Noise modelling for the EIS identified receiver locations R7 and R8 as being relevant for the project. The predicted noise emission levels from Gunlake Quarry at R7 and R8 are provided in Table 6.15. Noise emission levels are predicted to be within the Development Consent limits and project specific noise limits (PSNLs) at both receiver locations from year 1 to year 30. Noise levels at R2 are predicted to be up to 10dB above the PSNLs which is considered to be a significant impact and entitles this location to voluntary acquisition upon request and therefore is not subject to the assessment criteria. Gunlake has purchased receivers R1, R3 and R4.

**Table 6.15 Predicted Noise Levels LAeq (15 min) dB**

Assessment Location	Day	Evening/Night	Night	Night
	Calm	Calm	Prevailing Winds*	Inversion#
Existing Quarry Operations (Pre – Extension Project)				
R7	33	31	34	34
R8	32	30	33	33
Quarry Operations (Gunlake Extension Project Years 1-30)				
R7	34	35	37	38
R8	33	34	37	37

\* Max level based on wind speeds of 23m/s and wind directions from 360° to 112.5° from north based on data from the Gunlake weather station

# F class temperature inversion

To verify compliance with operational noise assessment criteria, noise measurements have been carried out at all source points and at the property boundary in the direction of the noise receptors. Attended noise monitoring is undertaken at N1 and N2 at the property boundary between the quarry and R7/R8.

Noise monitoring of the plant and equipment was undertaken as part of the environmental assessment for the Gunlake Extension Project to verify the sound power level of various plant and equipment. The results are provided in Table 6.16.

**Table 6.16 Noise Monitoring Plant and Equipment**

Plant and Equipment	Sound Power Level (L <sub>w</sub> ) (dB)
Primary Crusher	112
Secondary Crusher	115
Primary Screens	112
Tertiary Crusher and Impact Crusher	115
Secondary Screens	109
Front End Loader	112
Excavator	104
Dozer	112
Water Cart	102

Attended noise measurements were undertaken quarterly during the reporting period at N1 to the east of the quarry processing area. This location measures noise generated from the quarry travelling in the direction of sensitive receivers R7 and R8. Attended noise monitoring was also undertaken at N2 located at the south-east boundary corner from April 2020. The results are summarised in Table 6.17 and show compliance with the assessment criteria (Table 6.14) and are in line with the EIS predictions.

**Table 6.17 - Gunlake Quarry Noise Monitoring Results 2019/20**

Location	Date	Start Time	Total Noise dB(A) $L_{eq}$	Criterion dB(A) $L_{eq}$	Estimated Noise Contribution at Receiver	Identified Noise Sources ( $L_{eq}$ (15 min))
N1	25/9/2019	1010	41.91	R7 38 R8 37	<30 dB(A) <30 dB(A)	Reverse beep (44); Dump truck driving (45); Hammer (48); Birds (41); Truck (42); Crusher alarm (49); Plane (54)
N1	10/12/2019	0830	61.97	R7 38 R8 37	<30 dB(A) <30 dB(A)	Rock fall into hopper (65); Dump truck on haul road (69); Wind (66); Water cart in operation(63); Crusher (63); Excavator (65); Reverse beep (64)
N1	15/4/2020	0920	65.82	R7 38 R8 37	<30 dB(A) <30 dB(A)	Dump truck on haul road (72); Dumping rocks (71); Crusher (65); Rock hammer (71); Reverse beep (70); Rock fall into hopper (73); Conveyor belt and rocks dropping onto stockpiles (background continuous)
N2	15/4/2020	1005	49.90	R7 38 R8 37	<30 dB(A) <30 dB(A)	Rock hammer (58); Dump truck on haul road (54); Drill entering rock (58); Reverse beep (50); Sound meter disturbance (57); Birds (48); 2x Drills (background continuous- 45)
N1	09/6/2020	0917	59.93	R7 38 R8 37	<30 dB(A) <30 dB(A)	Dump truck on haul road (68) Drill (58) Reverse Beep (66) Crusher (60) Birds (58) Loading truck at face (58) Rock fall into hopper (67)

Location	Date	Start Time	Total Noise dB(A) $L_{eq}$	Criterion dB(A) $L_{eq}$	Estimated Noise Contribution at Receiver	Identified Noise Sources ( $L_{eq}$ (15 min))
N2	09/06/2020	1000	46.08	R7 38 R8 37	<30 dB(A) <30 dB(A)	Crow (58) Dump truck on haul road (52) Loader reversing quack (47) Dump truck reversing (47) Loading rocks into truck (62) Loader horn beep (47) Drill (44)

## 6.7 Vibration and Air blasting

Table 6.18 shows the airblast overpressure criteria and ground vibration impact assessment criteria for residences on privately owned land in relation to the Gunlake Quarry Project as prescribed by Condition 10, Schedule 3 of the Development Consent.

**Table 6.18 Airblast Overpressure and Ground Vibration Impact Assessment Criteria**

Airblast Overpressure Level (dB (Lin Peak))	Allowable Exceedances
115	5% total number of blasts over 12 month period.
120	0%
Ground Vibration Level (mm/s)	Allowable Exceedances
5	5% total number of blasts over 12 month period.
10	0%

A blast overpressure and ground vibration assessment was undertaken at various distances from the blast locations at the Quarry. The results shown in Table 6.19 convey that a large range of MICs can be adopted, based on the distance from the blast. Blasting may occur at 700m from the nearest assessment location, and the ANZECC limits will be satisfied with a respective MIC of 290kg.

**Table 6.19 Blast Overpressure and Ground Vibration EIS Assessment Results for Hard Rock Extraction**

Distance from Blast (m)	Highest Allowable MIC (kg)	Overpressure Criteria (dB (Lin Peak))	Ground Vibration Criteria PPV (mm/s)	Highest Allowable MIC (kg) to satisfy criteria
700	290	$\leq 115$	$\leq 5$	290
900	600	$\leq 115$	$\leq 5$	600
1,100	1,150	$\leq 115$	$\leq 5$	1,150
1,300	1,900	$\leq 115$	$\leq 5$	1,900

A portable blast emissions monitor that measures airblast overpressure and vibration is positioned at R2 on Brayton Road during each blast event. Monitoring will continue at this location in the coming reporting period.

Table 6.20 details the Airblast Overpressure and the Ground Vibration level monitoring results for all the blasts undertaken at Gunlake during the reporting period. All blasting was undertaken within the approved time between 9:00am to 5:00pm Monday to Friday.

**Table 6.20 Blast Monitoring Summary for the Reporting Period**

Date	Time	Location	Airblast Overpressure (dB (Lin Peak))	Ground Vibration Level (mm/s)
18/07/2019	14.02	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
26/07/2019	11.07	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
2/08/2019	11.09	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
13/08/2019	12.05	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
19/08/2019	14.08	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
20/08/2019	2.08	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
30/08/2019	3.08	Lot 529 Brayton Rd	112.6	1.264
6/09/2019	11.06	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
13/09/2019	11.59	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
20/09/2019	13.04	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
4/10/2019	13.26	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
18/10/2019	11:58	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
25/10/2019	11:58	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
1/11/2019	10:32	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
11/11/2019	12:03	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
18/11/2019	10:32	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
22/11/2019	12:39	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
6/12/2019	12:41	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
17/1/2020	11:25	Lot 529 Brayton Rd	109.9	0.933
31/1/2020	10:41	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
25/2/2020	12:56	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
6/3/2020	13:47	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
13/3/2020	13:41	Lot 529 Brayton Rd	107.5	0.568
20/4/2020	12:07	Lot 529 Brayton Rd	114.8	1.442
8/5/2020	13:18	Lot 529 Brayton Rd	114.8	0.950
22/5/2020	11:03	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
29/5/2020	14:01	Lot 529 Brayton Rd	114.4	1.164
9/6/2020	14:07	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
12/6/2020	13:30	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
26/6/2020	10:57	Lot 529 Brayton Rd	Nil Trigger	Nil Trigger
3/7/2020	10:57	Lot 529 Brayton Rd	113.3.	0.852

During the reporting period a total of 31 blasts were conducted. The maximum air blast overpressure results for the reporting period were 114.8 dB (Lin Peak) recorded at Lot 529 Brayton Road on 20<sup>th</sup> April 2020 and 8<sup>th</sup> May 2020. These results were lower higher than the maximum for the previous reporting period being 116.3 dB (Lin Peak). Results for all 31 blasts were below the criteria of 115 dB (Lin Peak) outlined in Table 6.18.

The ground vibration results show compliance with impact assessment criteria with the maximum recorded on 20<sup>th</sup> April 2020 being 1.44 mm/s. This was lower than the previous reporting period's maximum of 1.80 mm/s however both maximums are well below the impact assessment criteria of 5mm/s as detailed in Table 6.18 and the Noise and Blast Management Plan which was reviewed during the reporting period.

The results confirm the EIS predictions that the project will comply with relevant vibration and air blast criteria at all sensitive receivers through ongoing management of blast design.

## 6.8 Aboriginal Heritage

Gunlake's Aboriginal Heritage Management Plan was updated in April 2018 as required by the Development Consent and reviewed in March 2020 following the Independent Environmental Audit. The Plan outlines a six step mitigation process for the accidental discovery of cultural heritage items, and a five step mitigation process for the accidental discovery of skeletal material. No skeletal material were discovered during the reporting period, nor the previous reporting period.

Extensive surveys of the areas subject of the Gunlake Extension Project were undertaken as part of the Aboriginal Cultural Heritage Assessment (ACHA) for the EIS. An Aboriginal site collection report was conducted by EMM Consulting Pty Limited and assisted by representatives from Registered Aboriginal Parties on 25/07/2018. The site survey involved the collection of Aboriginal stone artefact sites which would otherwise be impacted during quarrying operations for the extension project. A total of 867 artefacts were salvaged during the survey.

## 6.9 Bushfire

Under the *Rural Fires Act 1997*, there are a number of obligations that must be met by Gunlake with respect to managing their land. In summary, these include:

- Occupiers of land are to extinguish fires or notify firefighting authorities immediately; and
- It is the duty of the owner or occupier of land to take practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of bush fires on or from that land.

These issues are relevant, given the location of the quarry having native forested areas to the south and will include additional reforested areas on site. The following measures are employed at the site to ensure that these obligations under the Rural Fires Act are met:

- The main water storages on site are available for fighting purposes if required. This includes the main farm dam and PWD adjacent to the workshop.
- Maintaining the agricultural component of the property to avoid significant quantities of long dry grass. Management activities include active grazing or slashing as required.
- Firebreaks are maintained around key infrastructure areas including the office and main access road to the site.

Fire fighting equipment is available on site at the office, workshop, and mobile equipment.

During catastrophic bushfire events in the Marulan area in December 2019 and January 2020, water from site was made available to the RFS from the onsite dams and via a dedicated water cart. Quarry staff were briefed daily on the weather and fire conditions and emergency evacuation procedures discussed during these high fire danger events. A number of Gunlake staff are members of the local RFS.

## 6.10 Hydrocarbon Contamination

Plant and equipment are serviced regularly to maintain good working order and lubricants and oils for servicing of plant are stored in the workshop and banded. Spill kits are kept on site. The site fuel tank is self banded.

## 6.11 Waste Management

Gunlake operates a comprehensive management system for the appropriate handling and disposal of waste materials. The principle wastes generated by the site are categorised as non-production and production wastes.

### 6.11.1 Non-Production Wastes

#### 6.11.1.1 *General Domestic-Type Wastes and Routine Maintenance Consumables*

All general wastes originating from the office and workshop area, together with routine maintenance wastes from the servicing of equipment are disposed of in 205L drums and 240L mobile garbage bins located adjacent to the various buildings on site. These bins are collected weekly or as required into skips adjacent to the workshop, which is then collected by a licensed waste contractor.

Recyclables such as paper, cardboard, drink containers, ferrous and non-ferrous metals, are contained separately and collected by a licensed waste contractor for recycling.

#### 6.11.1.2 *Oils and Greases*

Routine maintenance of quarrying and earthmoving equipment is undertaken in the maintenance workshop. Waste oils are collected and pumped to bulk storage tanks by oil excavation pumps. Waste oils and grease are stored in a banded area at the maintenance workshop and collected by an EPA licensed waste oil recycling contractor for recycling.

#### 6.11.1.3 *Sewerage*

All domestic waste water is collected and treated in a purpose-built approved wastewater management system. This system is serviced annually by an external contractor.

### 6.11.2 Production Wastes

#### 6.11.2.1 *Overburden*

When quarrying first commenced, overburden was used to progressively construct the noise bund wall to the north of the processing area. Overburden from the current extraction area is being placed on the new extension project western emplacement area.

## 7. WATER MANAGEMENT

The attributes of the Quarry form the basis of ongoing management principles governing the need to protect water systems, both surface and groundwater, during quarrying activities as well as managing the remaining land for agricultural and biodiversity uses.

The operation lies within the Chapman's Creek Catchment. Chapman's Creek is an ephemeral creek which flows through the property roughly from south to north. The water management system has been designed to protect Chapman's Creek.

### 7.1 Erosion and Sediment Management

Gunlake Quarry operates in accordance with the Gunlake Water Management Plan which contains an Erosion and Sediment Control Plan. Specifically, the Plan includes:

- Implementation of the requirements set out in the publication "Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition, 2004 (Landcom, 2004)", referred to as the '*Blue Book*' and Volume 2E Mines and Quarries (DECC, 2008);
- Detailing practices that have potential to cause erosion and generate sediment and what control measures will be adopted to minimise the impact of these practices; and
- Detailing the location function and capacity of erosion and sediment control structures and how they will be maintained.

The design of the quarry has included the construction of rock-lined drains and check dams, sediment traps and water quality control ponds to contain dirty water. These structures were constructed as part of the initial quarry development and are maintained as necessary in order ensure adequate storage to capture runoff from storm events, to maintain a nil discharge site, and to minimise erosion and sedimentation. The Independent Environmental Audit identified areas of erosion within the stormwater control system below the noise bund emplacement area that required maintenance. This was carried out in March 2020.



**Plate 6 Maintenance of Bund Wall / Overburden Emplacement Area Drainage System**

The audit also identified the need to desilt the water quality control ponds, particularly the Process Water Dam (PWD). Access to the dam to extract the silt is limited and options to do so are being investigated and implemented. In the interim to prevent further siltation of the PWD, maintenance work was undertaken on the drainage adjacent to the workshop and weigh bridge, and a silt pond installed at the end of the drain directing dirty water into the PWD. This pond is easily accessible and will be cleaned out on a regular basis.

## 7.2 Surface Water Management

### 7.2.1 Pollution Control Strategies

Gunlake Quarry operates under an approved Soil and Water Management Plan. This Plan was updated following the approval of the Gunlake Extension Project and reviewed in March 2020 to incorporate very low rainfall scenarios in the site water balance given the prolonged drought conditions.

Stormwater is collected in a series of pollution control structures which is then recycled within the process water circuit. Collected water is utilised for the:

- Crushing plant;
- Dust suppression on roads and hardstand areas;
- Pasture irrigation (when required to dispose of excess site water);
- Truck washing; and
- Non-potable domestic water.

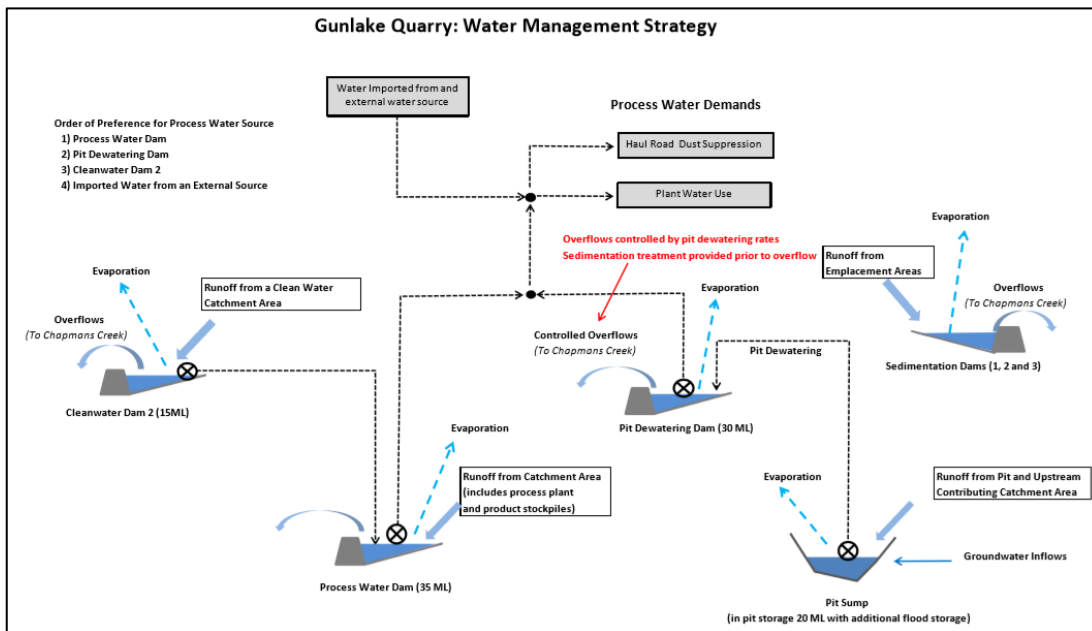


Plate 7 – Surface Water Management Plan



**Plate 8 Process Water Dam**

### **7.2.2 EIS Assessment and Predictions**

No specific assessment criteria were provided in the EIS in relation to surface water. The EIS however, made the following Surface water management objectives;

- Separation of clean and quarry water circuits using clean water diversion drains up gradient from disturbance areas. This will minimise water treatment required on site.
- Providing sedimentation basins of an appropriate size for all catchment areas based on '*Managing Urban Stormwater: Soils and Construction, Volume 2E– Mines and Quarries*' (DECC, 2008).
- Suitable management of excess water in the pit by pumping to a pit dewatering dam that will hold water for process water usage.
- The volume and frequency of site discharge will be minimised by capturing water from disturbed areas in water management dams to be used as process water.
- Site discharge locations have been established and characterised for each stage of the quarry plan.
- Model the quarry's operational water demands to estimate process water needs and supply reliability, including dam storage volumes.
- Use of an ongoing monitoring and review program to enable improvement of the Surface Water Management Plan as the operation expands.

### **7.2.3 Monitoring and Reporting**

Gunlake Quarry undertakes quarterly monitoring of surface water quality within Chapman's Creek at two sites within the project boundary to determine a basis for potential impact assessment as the quarry progresses. The data shows that the upper reaches of Chapmans

Creek are predominantly dry and only flow following heavy rain events, while the lower section towards Brayton Road at the Gunlake property boundary consists largely of unconnected stagnant pools which respond more quickly to rainfall events and tend to dry rapidly in periods of dry weather.

The sites include two sampling locations on Chapmans Creek downstream of the operation known as RW1 and RW2. RW1 is located at the Quarry entrance adjacent to Brayton Road, whilst RW2, which is often dry, is sampled approximately 1km upstream of RW1 within the property. The upstream site previously recorded as Site I is no longer monitored as sufficient background data on Chapmans Creek exists for the purposes of impact assessment.

The water quality has been monitored and significant parameters outlined in the TARPs including pH, EC and TDS have been compared to historical background levels taken at Site I in order to identify any harmful changes to the creeks' water quality. Chapman's Creek flows into Joaramin Creek approximately 1.4 km downstream from the Gunlake project boundary, and Joaramin Creek eventually flows into the Wollondilly River.

Tables 7.1 to 7.4 provide summaries of the surface water monitoring for the 2019/2020 reporting period. Monitoring is undertaken on a quarterly basis and sample results from the Process Water Dam (PWD) and the Drop Cut are also included.

**Table 7.1 Monitoring Results for RW1**

Analyte	Units	Sample Date			
		26/09/2019	10/12/2020	10/03/2020	9/06/2020
pH	pH units	7.31	7.94	8.03	8.03
Electrical Conductivity	uS/cm	1170	2160	1520	2990
Total Suspended Solids (TSS)	mg/L	<5	18	6	<5
Total Dissolved Solids (TDS)	mg/L	760	1400	988	1940
Total Phosphorus as P (TP)	mg/L	0.01	0.01	0.01	<0.01
Total Nitrogen as N (TN)	mg/L	7	1	4.2	0.6
Dissolved Oxygen (DO)	mg/L	9.6	8.7	8.6	11.5
Turbidity	NTU	1.1	14.1	4.3	1.3
Chloride	mg/L	304	638	405	801
Calcium	mg/L	39	56	40	80
Magnesium	mg/L	41	88	59	128
Sodium	mg/L	101	226	192	300
Potassium	mg/L	5	9	5	5
Total Arsenic	mg/L	<0.001	0.002	<0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	0.001	<0.001
Total Copper	mg/L	<0.001	0.002	<0.001	<0.001
Total Manganese	mg/L	0.004	0.13	0.029	0.026
Total Nickel	mg/L	<0.001	0.001	0.001	<0.001
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	<0.05	0.07	0.17	<0.05
Oil and Grease	Visual	None visible	None visible	None visible	None visible

**Table 7.2 Monitoring Results for RW2**

Analyte	Units	Sample Date			
		26/09/2019	10/12/2020	10/03/2020	9/06/2020
pH	pH units	7.91	DRY	7.76	7.88
Electrical Conductivity	uS/cm	1010		1200	2620
Total Suspended Solids (TSS)	mg/L	20		7	6
Total Dissolved Solids (TDS)	mg/L	656		780	1700
Total Phosphorus as P (TP)	mg/L	0.03		0.04	<0.01
Total Nitrogen as N (TN)	mg/L	15		2.2	0.3
Dissolved Oxygen (DO)	mg/L	9.9		8.5	11.1
Turbidity	NTU	9		11.3	0.9
Chloride	mg/L	208		289	698
Calcium	mg/L	27		28	67
Magnesium	mg/L	37		42	113

Analyte	Units	Sample Date			
		26/09/2019	10/12/2020	10/03/2020	9/06/2020
Sodium	mg/L	133		148	266
Potassium	mg/L	6		4	5
Total Arsenic	mg/L	<0.001		<0.001	<0.001
Total Cobalt	mg/L	0.002		0.002	<0.001
Total Copper	mg/L	0.001		<0.001	<0.001
Total Manganese	mg/L	0.024		0.075	0.032
Total Nickel	mg/L	<0.001		0.001	<0.001
Total Zinc	mg/L	<0.005		0.006	<0.005
Total Iron	mg/L	0.24		0.34	0.06
Oil and Grease	Visual	None visible		None visible	None visible

Due to dry weather conditions at the time of sampling and the nature of the location of Site RW2 being further upstream in Chapmans Creek, no samples were obtained for this site during December 2019.

**Table 7.3 Monitoring Results for PWD**

Analyte	Units	Sample Date			
		26/09/2019	10/12/2020	10/03/2020	9/06/2020
pH	pH units	7.83	8.18	7.67	8.09
Electrical Conductivity	uS/cm	2220	1360	659	752
Total Suspended Solids (TSS)	mg/L	11	10	46	19
Total Dissolved Solids (TDS)	mg/L	1440	884	428	489
Total Phosphorus as P (TP)	mg/L	0.04	<0.01	0.02	0.01
Total Nitrogen as N (TN)	mg/L	0.7	2.1	13	11.4
Dissolved Oxygen (DO)	mg/L	8.7	9.5	8	11.4
Turbidity	NTU	3.1	6	78.6	26.2
Chloride	mg/L	683	368	61	74
Calcium	mg/L	49	39	11	17
Magnesium	mg/L	85	55	14	19
Sodium	mg/L	215	144	97	107
Potassium	mg/L	5	7	5	6
Total Arsenic	mg/L	<0.001	0.001	0.002	<0.001
Total Cobalt	mg/L	<0.001	<0.001	0.002	0.002
Total Copper	mg/L	0.002	0.002	0.005	<0.001
Total Manganese	mg/L	0.051	0.025	0.07	0.022
Total Nickel	mg/L	0.002	<0.001	0.002	<0.001
Total Zinc	mg/L	<0.005	0.013	0.012	<0.005
Total Iron	mg/L	0.08	<0.05	2.44	0.76
Oil and Grease	Visual	None visible	None visible	None visible	None visible

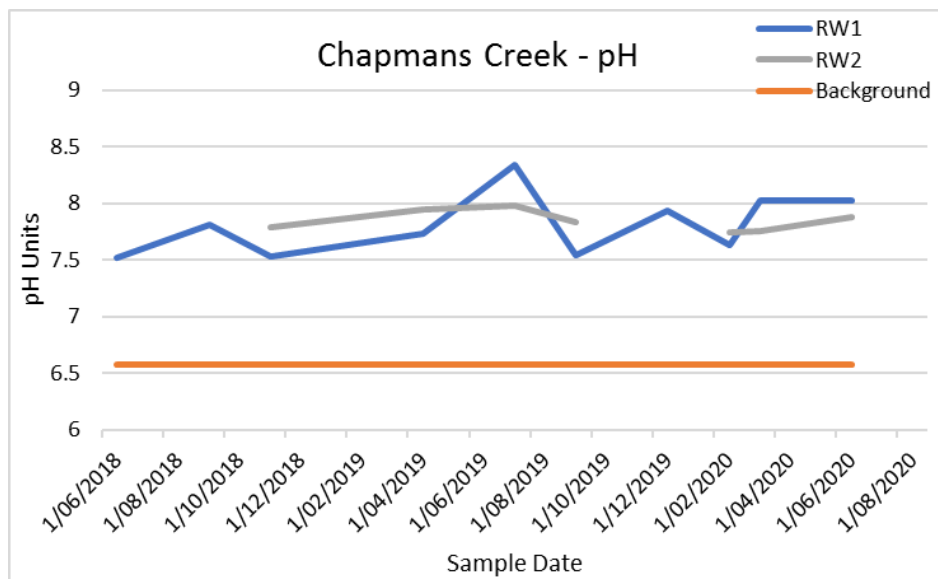
**Table 7.4 Monitoring Results for Drop Cut**

Analyte	Units	Sample Date			
		27/09/2018	29/11/2018	02/4/2019	02/7/2019
pH	pH units	No Sample	8.09	7.94	8.56
Electrical Conductivity	uS/cm		1260	882	933
Total Suspended Solids (TSS)	mg/L		14	16	5
Total Dissolved Solids (TDS)	mg/L		819	573	606
Total Phosphorus as P (TP)	mg/L		0.01	0.04	<0.01
Total Nitrogen as N (TN)	mg/L		11.1	5.4	5.8
Dissolved Oxygen (DO)	mg/L		9.4	8.8	11.6
Turbidity	NTU		24.3	7.3	0.9
Chloride	mg/L		349	162	216
Calcium	mg/L		42	29	34
Magnesium	mg/L		47	27	34
Sodium	mg/L		128	75	90
Potassium	mg/L		6	5	5
Total Aluminium	mg/L		1.12	----	----
Total Arsenic	mg/L		<0.001	<0.001	<0.001
Total Cobalt	mg/L		<0.001	<0.001	<0.001
Total Copper	mg/L		0.003	<0.001	<0.001
Total Manganese	mg/L		0.032	0.01	0.006
Total Nickel	mg/L		0.001	<0.001	<0.001
Total Zinc	mg/L		<0.005	<0.005	<0.005
Total Iron	mg/L		0.88	0.18	0.12
Oil and Grease	Visual		None visible	None visible	None visible

Graphs 7.1 - 7.5 present the water quality parameters in Chapmans Creek over the last two reporting periods. There are no site specific trigger values for the surface water monitoring sites, however the following water quality parameters and values are used as the basis for impact assessment as detailed in the SWMP:

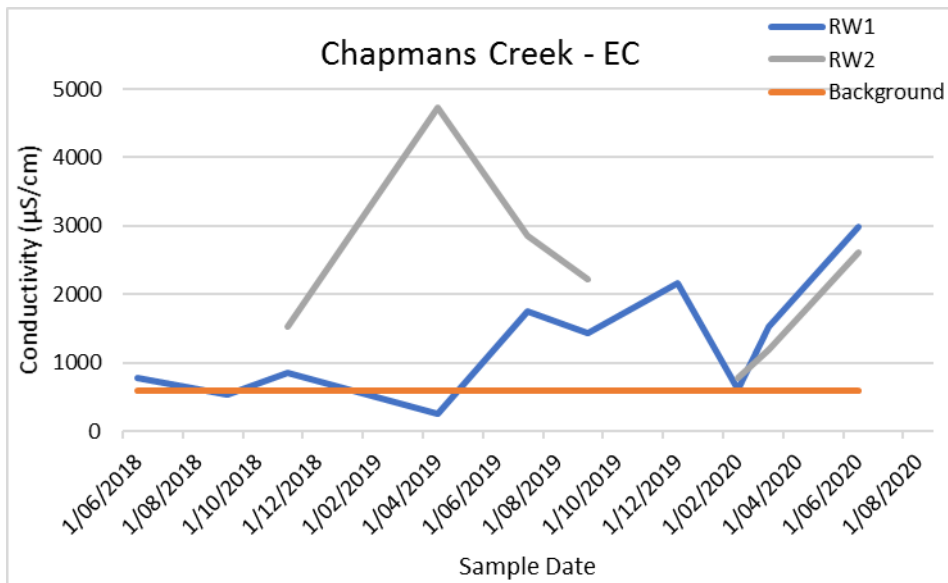
- ☐ pH 6.5 – 8.5
- ☐ Electrical conductivity <2,000  $\mu\text{S}/\text{cm}$
- ☐ Total suspended solids <50mg/L

The monitoring results for the past two periods however show results below the assessment criteria for pH and suspended solids with fluctuating conductivity on a number of occasions exceeding the criteria for both sites in Chapmans Creek. Given the ephemeral nature of the creek it is difficult to determine trends in the water quality and therefore the cause of changes in water quality. The fluctuation in conductivity is likely due to the variation from stagnant water through to high flow events and movement of salts through the system.



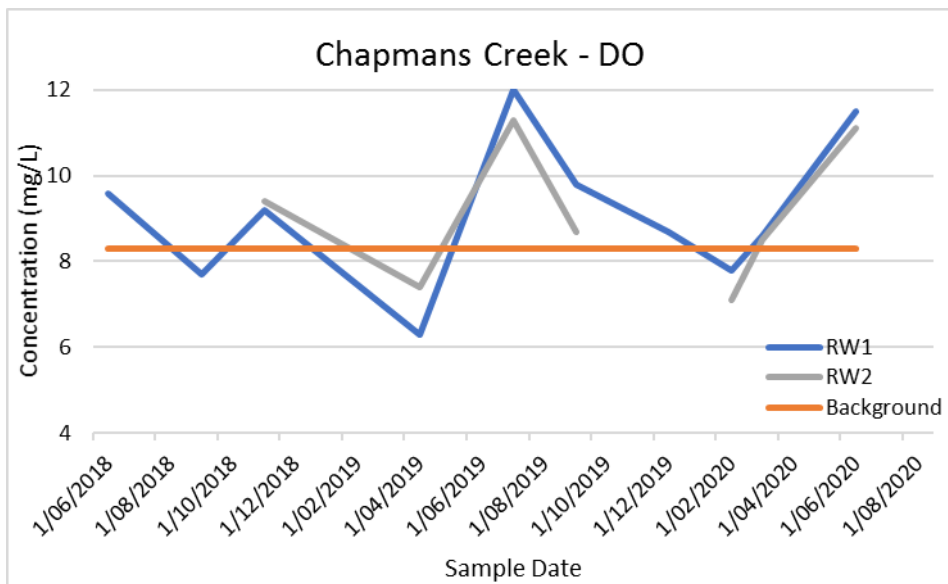
**Graph 7.1 – Chapmans Creek pH**

The data shows that water quality in Chapmans Creek is largely influenced by groundwater baseflow. Salt levels at RW1 and RW2 respectively average at 1290  $\mu\text{S}/\text{cm}$  and 2278  $\mu\text{S}/\text{cm}$  (Graph 7.2) with a pH slightly above neutral (Graph 7.1). During high flow, the salt content would likely decrease.

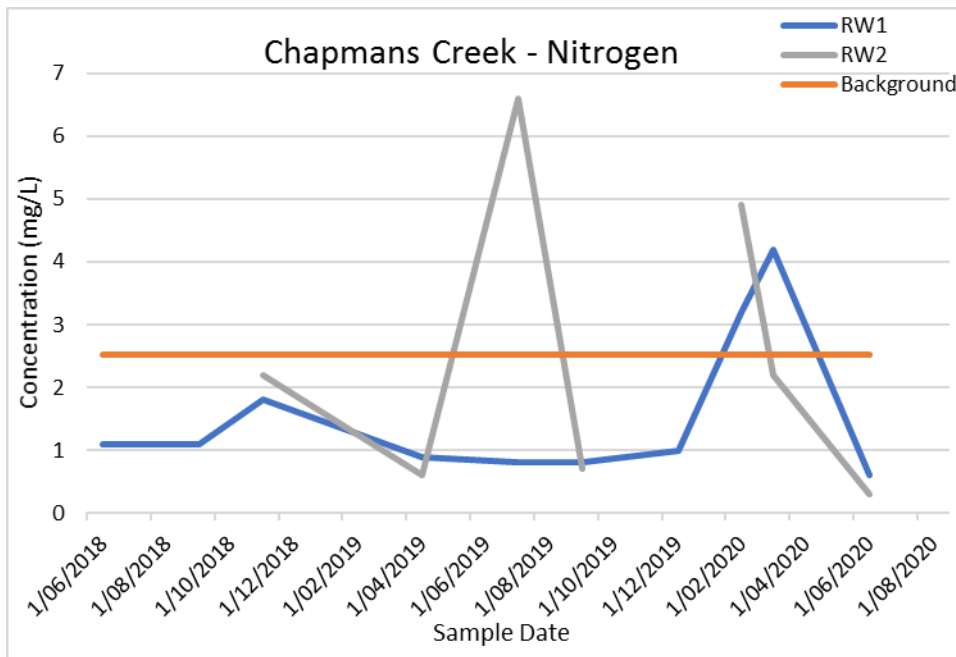


**Graph 7.2 - Chapmans Creek Electrical Conductivity**

Dissolved oxygen levels presented in Graph 7.3 remain in a range for healthy aquatic biodiversity in line with background levels from the upstream Site I.

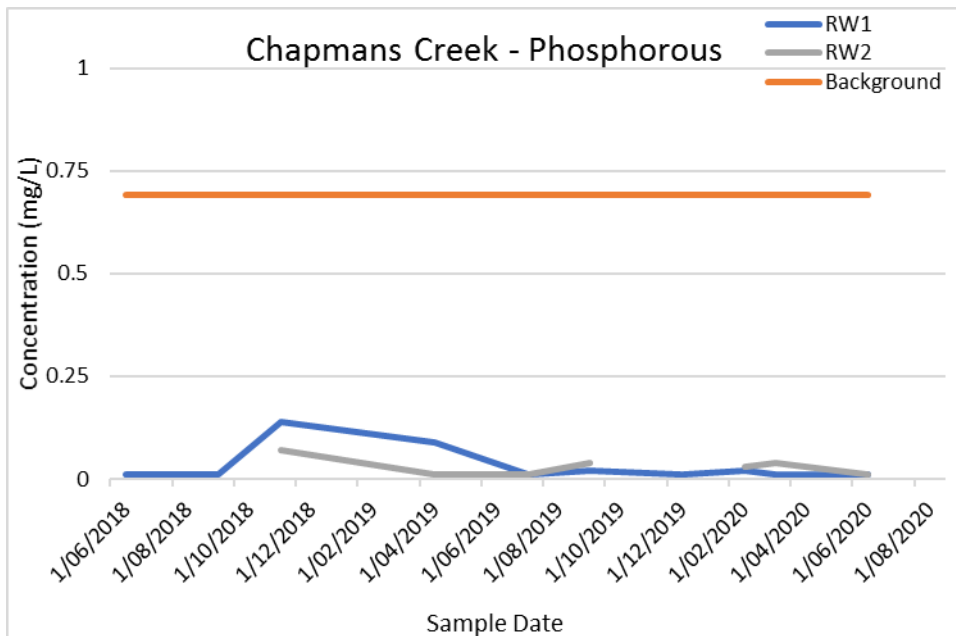


**Graph 7.3 – Chapmans Creek Dissolved Oxygen**



**Graph 7.4 – Chapmans Creek Total Nitrogen**

Levels of total Nitrogen show fluctuation which is likely due to fertilisation of the agricultural properties upstream and downstream of the quarry (Graph 7.4). Total Phosphorous levels shown in Graph 7.5 are consistently below 0.2mg/L and are well below the background average of 0.7mg/L at Site I.



**Graph 7.5 – Chapmans Creek Total Phosphorous**

### 7.2.4 Stream Health Monitoring

As with most ephemeral streams, the intermittent flow events in Chapmans Creek give rise to infrequent but often high sediment movement. Ephemeral streams tend to remain apparently stable for long periods until major storm events when high flows cause channel scour and

mass movement of sediment downstream. Although these are natural events, the loss of riparian vegetation through past agricultural activities can result in higher than normal instability of channels and banks. Four monitoring points have been identified along the creek and are monitored quarterly to observe changes over time. The results of this monitoring are included in Appendix C.

During the reporting period, no evidence of any further erosion was recorded at the four monitoring points. Erosion is minimal at point 1, as banks are shallow and are well vegetated. Even with the heavier rainfall in February 2020, no changes to erosion were visible at the second monitoring point. Highly disturbed riparian vegetation is visible at site 3. The roots of large trees growing on the embankment are exposed due to erosion, although no changes were observed in 2019/2020. The gully erosion at monitoring site 4 has not extended during this period, however continued monitoring is required following heavy rainfall.

There has been no change to the four monitoring points over the reporting period, and the creek is deemed to currently be in a stable state. Quarterly monitoring will continue over the coming reporting period with additional monitoring following heavy rainfall.

### **7.2.5 Future Improvements**

Surface water quality remains within a healthy range and will continue to be monitored on a quarterly basis in the 2020/2021 reporting period.

## **7.3 Groundwater Management**

### **7.3.1 Groundwater Monitoring**

Baseline data on static water level, water quality and rock permeability was obtained from a broad network of monitoring bores distributed around the current and future quarry area. Ongoing monitoring will continue with two groundwater monitoring bores GM6 and GM13 located in proximity to the pit. The direction of the groundwater flow is generally to the northwest following the surface topography. Bores GM24 and GM36 were last sampled in September 2018 prior to being removed as the pit area was expanded.

The Groundwater Monitoring component of the Gunlake Groundwater Management Plan provides a set of trigger levels for investigating any potential adverse groundwater impacts. The initial triggers relate to physical and chemical descriptors of water quality which may be influenced by quarrying activities. These triggers will be updated as the range of natural background variability is refined through ongoing monitoring. The current triggers relating to groundwater quality are:

- A 'significant' decrease in pH (pH less than 6); and
- A gradually increasing trend in EC and TDS values in GM6 and GM13.

Table 7.5 presents average analytical results for the background groundwater as sampled from a series of 9 groundwater monitoring bores determined from samples collected in June 2007 prior to the commencement of quarrying activities.

**Table 7.5 Summary of Background Bore Water Quality**

Analyte	Range	Average
pH (pH units)	6.8-7.3	6.9
EC (uS/cm)	720-7210	3232
Sodium (mg/L)	110-575	293
Calcium (mg/L)	17-530	224
Potassium (mg/L)	2.5-18	9.7
Magnesium (mg/L)	17-435	177
Ammonia (mg/L)	<0.1-1.4	0.7
Chloride (mg/L)	110-2620	1093
Sulphate (mg/L)	3-44	17
Bicarbonate (mg/L)	210-760	490
Carbonate (mg/L)	<1	<1
Nitrate (mg/L)	<0.1-7.1	2.02
Nitrite (mg/L)	<0.1-0.33	0.14
Phosphate (mg/L)	<0.01-0.04	0.02
Total Phosphorous (mg/L)	0.33-4.0	1.16
Copper (mg/L)	0.001-0.003	0.002
Lead (mg/L)	<0.001	<0.001
Zinc (mg/L)	0.002-0.010	0.005
Cadmium (mg/L)	<0.0002	<0.0002
Chromium (mg/L)	<0.01	<0.01
Nickel (mg/L)	<0.01	<0.01
Total Iron (mg/L)	14-82	42
Dissolved Iron (mg/L)	<0.01-0.69	0.09
Arsenic (mg/L)	<0.01	<0.01
Mercury (mg/L)	<0.0001	<0.0001

Tables 7.6 to 7.7 show the monitoring data during the reporting period for bores GM6 and GM13.

**Table 7.6 Groundwater Quality Monitoring Results and Summary GM 6**

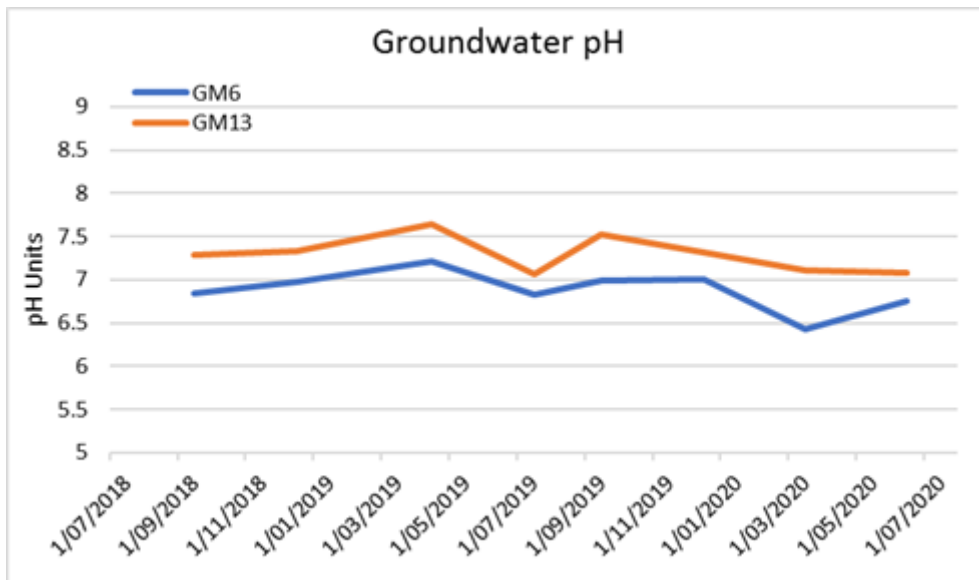
Parameter	Unit of Measure	Sample Date: 26/9/19	Sample Date: 10/12/19	Sample Date: 10/3/20	Sample Date: 9/6/20	Reporting Period Average
pH	pH units	6.99	7.01	6.43	6.75	6.795
Electrical Conductivity	uS/cm	281	294	289	280	286
Total Dissolved Solids	mg/L	183		188	182	184.3
Hardness	mg/L	71	80	55	62	67
Chloride	mg/L	30	35	32	34	32.75
Sulfate	mg/L	<1	<1	6	6	6
Bicarbonate alkalinity	mg/L	88	93	42	67	72.5
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1
Hydroxide alkalinity	mg/L	<1	<1	<1	<1	<1
Total alkalinity	mg/L	88	93	42	67	72.5
Calcium	mg/L	12	14	9	10	11.25
Iron (dissolved)	mg/L	0.58	2.0	0.1	0.07	0.7
Magnesium	mg/L	10	11	8	9	9.5
Potassium	mg/L	4	4	5	29	10.5
Sodium	mg/L	25	28	28	5	21.5
Iron (total)	mg/L	2.65	5.28	3.72	1.64	3.3
Arsenic	mg/L	0.001	0.002	0.001	<0.001	0.001
Cadmium	mg/L	<0.0001	<0.0001	0.0003	0.0001	0.0002
Chromium	mg/L	0.003	0.003	0.007	0.003	0.004
Copper	mg/L	0.005	0.004	0.023	0.006	0.01
Lead	mg/L	0.004	0.005	0.023	0.011	0.01

Parameter	Unit of Measure	Sample Date: 26/9/19	Sample Date: 10/12/19	Sample Date: 10/3/20	Sample Date: 9/6/20	Reporting Period Average
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.014	0.014	0.011	0.012	0.01
Zinc	mg/L	0.012	0.012	0.047	0.017	0.02
Ammonia as N	mg/L	0.45	0.38	0.11	<0.01	0.3
Nitrite as N	mg/L	<0.01	0.15	<0.01	0.03	0.06
Nitrate as N	mg/L	0.11	0.15	7.27	2.07	2.4
Total Phosphorus as P	mg/L	0.04	0.04	0.09	0.1	0.07
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

**Table 7.7 Groundwater Quality Monitoring Results and Summary GM 13**

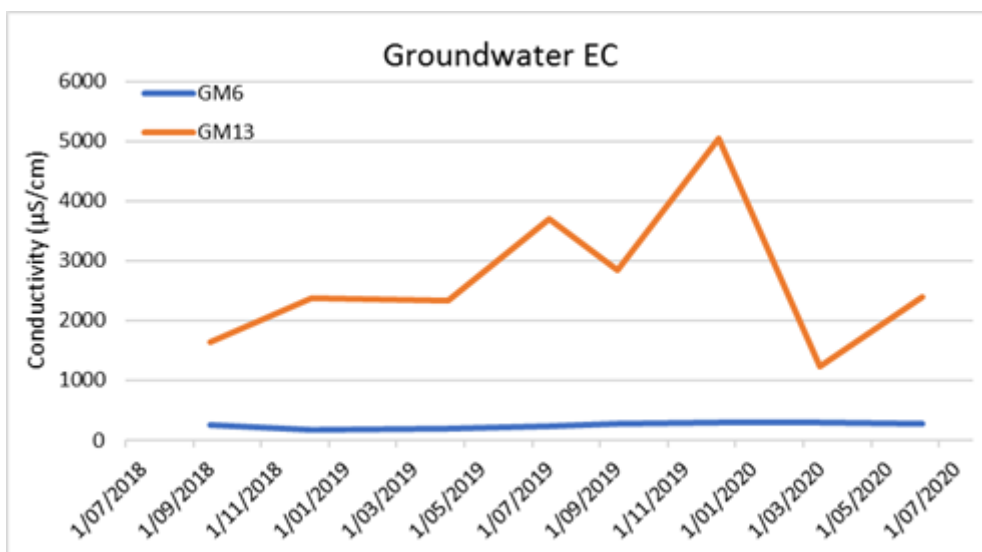
Parameter	Unit of Measure	Sample Date: 26/9/19	Sample Date: 10/12/19	Sample Date: 10/3/20	Sample Date: 9/6/20	Reporting Period Average
pH	pH units	7.52	7.32	7.11	7.08	7.23
Electrical Conductivity	µS/cm	2840	5040	1230	2400	2877.5
Total Dissolved Solids	mg/L	1850	3280	800	1560	1872.5
Hardness	mg/L	994	1770	371	763	974.5
Chloride	mg/L	844	1440	280	636	800
Sulfate	mg/L	10	15	7	8	10
Bicarbonate alkalinity	mg/L	283	409	174	194	265
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1
Hydroxide alkalinity	mg/L	<1	<1	<1	<1	<1
Total alkalinity	mg/L	283	409	174	194	265
Calcium	mg/L	177	308	63	134	170.5
Iron (dissolved)	mg/L	0.33	0.32	<0.05	<0.05	0.2
Magnesium	mg/L	134	244	52	104	133.5
Potassium	mg/L	12	17	7	152	47
Sodium	mg/L	208	338	102	9	164.25
Iron (total)	mg/L	0.47	0.71	0.64	0.23	0.5
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	0.0002	0.0003	0.0002
Chromium	mg/L	0.003	0.003	0.002	0.001	0.002
Copper	mg/L	0.013	0.015	0.009	0.006	0.01
Lead	mg/L	<0.001	<0.001	0.001	<0.001	0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Nickel	mg/L	0.018	0.013	0.004	0.005	0.01
Zinc	mg/L	0.033	0.052	0.014	0.015	0.03
Ammonia as N	mg/L	0.17	0.22	0.1	0.98	0.4
Nitrite as N	mg/L	<0.01	<0.01	0.5	0.03	0.1
Nitrate as N	mg/L	0.14	0.15	14.2	15.2	7.4
Total Phosphorus as P	mg/L	0.01	0.01	0.01	<0.01	0.01
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

The monitoring to date shows that the groundwater varies from slightly basic to slightly acidic, having a narrow range of 1pH unit from 6.43 to 7.52 across the sites for the reporting period (Graph 7.6). The lowest pH recorded during the reporting period was 6.43 for GM6 which is slightly lower than the trigger level of 6.5. Subsequent monitoring showed a normal pH range and no further investigation under the trigger action response plan was required. It should be noted that the quarry does not undertake any processes, store or use any materials that would cause a low pH to occur in the groundwater.



**Graph 7.6 – Monitoring Bore Ground Water - pH**

The bores show typical groundwater characteristics with conductivity ranging from 280 uS/cm to 294 uS/cm in bore GM6 and 1,230 uS/cm to 5,040 uS/cm for GM13 (Graph 7.7) The concentration of GM6 has remained relatively consistent, although GM13 shows a gradual increase during the prolonged drought conditions, followed by a decline following high levels of rainfall. The concentration in December 2019 exceeds the ANZECC Livestock Drinking Water Guideline which has been adopted as the assessment criteria for groundwater quality. This result however, is not a concern as the levels decline substantially in subsequent monitoring in 2020 following the relief from the drought. The Trigger Action Response Plan as detailed in the Soil and Water Management Plan requires ongoing monitoring if an exceedance of the criteria occurs to establish any trends or correlations to quarrying activities to determine if the quarry is causing the increase in EC.



**Graph 7.7 – Monitoring Bore Ground Water - Electrical Conductivity**

The salt content consists largely of chloride, magnesium and sodium ions. The background levels shown in Table 7.5 show conductivity levels in excess of 7,000 uS/cm but having the same characteristics being dominated by chloride, sodium, magnesium and low levels of sulphates and metals with the exception of iron. Variability in concentration of parameters

between sites indicate local changes in geology, particularly for conductivity and iron. There has been no significant change in metal concentrations in either bore during the reporting period and remain low.

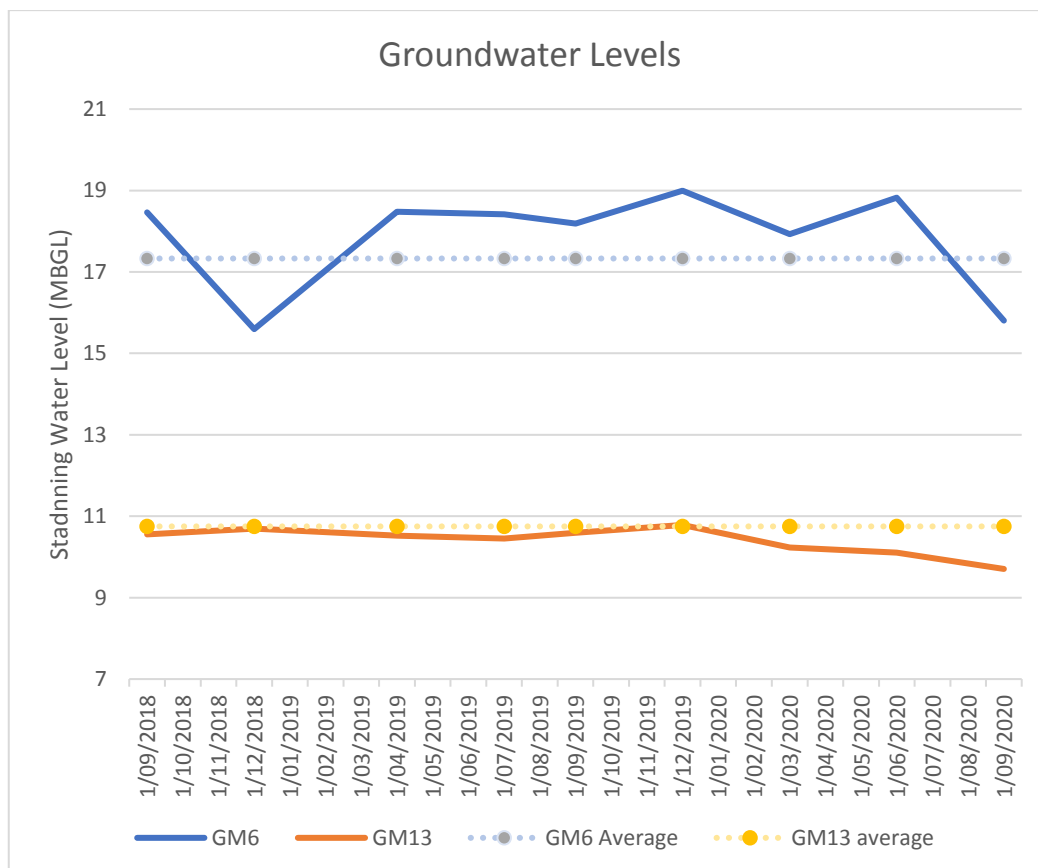
There are indications of some low levels of nutrients such as nitrate and phosphorus which could have come from agricultural practices in the area.

### 7.3.2 Groundwater Levels

The EIS has made assumptions of predicted groundwater levels using a series of transient models used to simulate the staged expansion of the extension project. The incorporation of the expanded pit shows levels of stress on the groundwater system. At the end of each development stage, the EIS has predicted the following impacts to the groundwater table:

- Stage 1: During the first five years excavation will only occur above the groundwater table, and no impacts on groundwater are predicted.
- Stage 2: Years 5 – 10 will see an interception of the groundwater table, resulting in a predicted 2m drawdown contour extending 300m from the edge of the pit.
- Stage 3: From year 10 – 20, the 2m drawdown contour will extend up to 1km from the pit footprint edge.
- Stage 4: During years 20 – 30, it is predicted that the drawdown will extend up to 1.5km.

The groundwater levels recorded during the reporting period are presented in Graph 7.8 below.



Graph 7.8 - GW6 and GW13 Depth

Bore GW06 remained very stable during the reporting period, with a range from 15.53m to 19.0m below ground level, while GM13 followed a similar but less pronounced trend for the reporting period with an average standing water level of 10.75m and a range of 0.68m (Graph 7.8).

The depth range of these bores can be attributed to recharge of local aquifers following rainfall as can be seen in the slight reduction of depth in February and August 2020. The results indicate that the quarry development is not impacting the standing water level in the bores. The decrease in water level was attributable to the drought conditions but did not fall by more than 20% in either bore and therefore did not trigger further investigations as would have been required by the Trigger Action Response plan. These results are also in line with the EIS predictions. Bore monitoring will continue in the coming reporting period and expansion of the monitoring network with additional bore/s on the western side of the quarry will be examined.

### **7.3.3 Water Take**

Gunlake quarry holds water access licence WAL42340 which allows for 37ML groundwater take per annum. No groundwater was extracted or used during the reporting period. The EIS predicts that groundwater will not be intercepted in the pit until year 5 of quarry operations.

### **7.3.4 Future Improvements**

There are no apparent significant variations or developing trends in groundwater quality as a result of the quarrying activity undertaken to date. The monitoring program will continue on a quarterly basis in the 2020/2021 period.

## 8. REHABILITATION

### 8.1 Rehabilitation Performance and Objectives

The Applicant must rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the rehabilitation strategy in the EIS and must comply with the objectives in Table 8.1.

**Table 8.1 Rehabilitation Objectives**

Feature	Objective
Site (as a whole)	<ul style="list-style-type: none"> <li>• Safe, stable and non-polluting</li> <li>• Final landform integrated with surrounding natural landforms as far as is reasonable and feasible</li> <li>• Final landform has minimal visual impact when viewed from surrounding land</li> </ul>
Surface Infrastructure	<ul style="list-style-type: none"> <li>• Decommissioned and removed, unless otherwise agreed by the Secretary</li> </ul>
Land identified as the Biodiversity Area	<ul style="list-style-type: none"> <li>• Conserved and enhanced with native, endemic vegetation consistent with the objectives</li> </ul>
Riparian Corridors along Chapman Creek and its tributaries	<ul style="list-style-type: none"> <li>• Stabilised and vegetated</li> </ul>
Quarry benches	<ul style="list-style-type: none"> <li>• Landscaped and vegetated using native tree and understorey species</li> </ul>
Final Void	<ul style="list-style-type: none"> <li>• Minimise the size, depth and slope of the batters of the final void</li> <li>• Minimise the drainage catchment of the final void</li> </ul>

**Table 8.2 Rehabilitation Performance**

Area of Rehabilitation	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	During the reporting period the quarry was expanded further to the south and west as approved in the Gunlake Extension Project. Existing rehabilitation on the bund wall was maintained. Approximately 600 trees were planted on overburden benches, along with seeding and stormwater erosion works.
Agreed post- rehabilitation land use	The final land use will comprise the final void, rehabilitated emplacement area, conservations areas and agricultural areas within the Gunlake property.
Key rehabilitation performance indicators	<p>The following performance criteria apply:</p> <ul style="list-style-type: none"> <li>• Key indicator species present in equivalent density to target vegetation community.</li> <li>• Indicator species successfully seed in two consecutive years.</li> </ul>

Area of Rehabilitation	Site Comment
Any other Rehabilitation Taken including: <ul style="list-style-type: none"> <li>• Exploration activities;</li> <li>• Infrastructure;</li> <li>• Dams; and</li> <li>• The installation or maintenance of fences, bunds and any other works</li> </ul>	There was no other rehabilitation undertaken during the reporting period. Fencing of the Biodiversity area was completed.  Ongoing repair of erosion controls within stormwater management system.
Any rehabilitation areas which have received formal sign off from DRG	N/A
Variations to activities undertaken to those proposed (including why there were variations and whether DRG was notified)	No
Outcomes of trials, research projects and other initiatives	No trials were undertaken during the reporting period
Key issues that may affect successful rehabilitation	There are a number of issues that affect rehabilitation success and these include low volume of topsoil, extreme drought condition, feral animals, and seedling quality.

## 8.2 Progressive Rehabilitation Strategy

Gunlake has adopted a progressive approach to the rehabilitation of disturbed areas to ensure that where practicable areas where quarrying or overburden placement is completed are progressively shaped and vegetated to provide a stable landform. The rehabilitation of the site has been designed to integrate the re-establishment of agricultural land with the conservation of native vegetation and the creation of a riparian habitat corridor.

The outer extent of the overburden emplacement bund to the north east of the processing area has been shaped and revegetation work undertaken on the completed batters progressively (Plate 9). Maintenance of the rehabilitated area was undertaken during the reporting period, with infill planting of tubestock, weed control and maintenance of water control structures.

As previously discussed, the drought significantly restricted the rehabilitation activities at the site during the past two reporting periods. Water levels in the drop cut and process water dam were at historic low levels and water was required to be maintained for dust suppression, processing and firefighting, therefore leaving no water for irrigation. Following some rain in February 2020, the first three completed batters at the northern end of the western overburden emplacement area were planted with 600 tubestock to commence rehabilitation of this area (Plate 10).



**Plate 9 Rehabilitation of Bund Wall / Overburden Emplacement Area**



**Plate 10 Rehabilitation of Western Overburden Emplacement Area**

### **8.3 Key Environmental Issues and Management Measures**

Due to active quarry development and emplacement of overburden rehabilitation areas are essentially limited to the noise bund wall and first three batters of the northern end of the western emplacement area. Replacement of unsuccessful tubestock, weed and erosion control comprise the main management measures for the rehabilitation area at present.

## 8.4 Actions for the Next Reporting Period

**Table 8.3 Actions for the Next Reporting Period**

Action	Site Comment
Describe the steps to be undertaken to progress agreement during next reporting period, where final rehabilitation outcomes have not yet been agreed between stakeholders	There will be further rehabilitation of the bund wall and western overburden emplacement following final shaping in the next Annual Review period.
Outline proposed rehabilitation trials, research projects and other initiatives to be undertaken during next reporting period.	Monitoring of the conservation and offset areas will be undertaken during the next Annual Review period.
Summary of rehabilitation activities proposed for next report period.	There will be further rehabilitation of the bund wall and western overburden emplacement following final shaping as well as further maintenance and weed spraying in the next Annual Review period.

## 9. COMMUNITY RELATIONS

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### 9.1 Community Consultation

Gunlake management is required keep the local community and relevant agencies informed about the construction, operation and environmental performance of the project. A Community Consultative Committee (CCC) has been formed. Information is provided CCC along with other members of the community on request. The CCC is independently chaired and currently meets approximately three to four times per year. Minutes are available on the website.

Three CCC meetings were held during the reporting period, on the 11<sup>th</sup> October 2019, 14<sup>th</sup> February 2020 and 17<sup>th</sup> July 2020. These meetings discussed the Primary Transport Route Update, current employment, road use, provided a community update, and discussed the Biodiversity Modification DA.

Gunlake is committed to supporting the local community and welcome input from the Committee on other local Community events or projects that may benefit from Gunlake's support. Community events that Gunlake were involved in during 2019/2020 are listed below:

- Financially supporting the installation of new playground equipment at Marulan Public School in August 2020;
- Gunlake has previously been the major sponsor of the Marulan Australia Day celebrations which were cancelled in 2020 due to Covid-19. Alternatively, the sponsorship funds were donated to the Marulan Rural Fire Brigade;
- Continued involvement in the Goulburn District Education Foundation's (GDEF) scholarship program, in which 30 grants were awarded during the reporting period;
- Following the Morton bushfire, Gunlake loaned a ute to Bundanoon Wombat Care for providing food and water to wildlife and maintaining feed stations in response to the bushfire crisis;
- Gunlake was a co-sponsor of the Clockmakers weekend and time piece display in Marulan in October 2019;
- Major sponsor of the 2019 Marulan Kite Festival's Art and Photographic Exhibition
- Continued membership of Goulburn Mulwaree Council's Marulan Village Plan Working Party;
- Jointly funded the new BBQ cover in Tony Onions Park;
- Unfortunately, the annual Tallong Apple day in which Gunlake has been an ongoing sponsor was cancelled in May 2020 due to Covid-19.

Community liaison and support will continue in the coming reporting period.

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## 9.2 Blast Liaison

In accordance with Schedule 3, Condition 13 of the Development Consent, Gunlake undertakes a notification process as detailed in the Noise and Blast Management Plan:

## 9.3 Community Complaints

A complaints register is provided on Gunlake's website. One complaint was received during the reporting period on the 30/08/2019. The complainant reported that his house shook from blast vibration and that the blast was not monitored. The blast contractor was contacted by the quarry manager and it was confirmed that the blast was monitored as required and that the blast criteria were not exceeded. The complainant was then contacted and advised of the findings. The complaint was closed on the 5/09/2019.

## 10. INDEPENDENT AUDIT

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Condition 11 of Schedule 5 of the Development Consent for the project requires an independent environmental audit to be undertaken within a year of commencing development under the consent and every three years thereafter. The first independent environmental audit covered the date of commencement of SSD 2017/108663, that is, 7th August 2018 to 30th September 2019. The audit report is available on the Gunlake Quarries website.

### 10.1 Audit Methodology

The independent audit included detailed inspections of the quarry operation, review of existing management plans and interviews with key management personnel. As part of the audit, advice from the following agencies and organisations was obtained:

- Chair and other members of the Community Consultative Committee
- Department of Planning, Infrastructure and Environment.
- Roads and Maritime Services.
- WaterNSW.
- Goulburn Mulwaree Shire Council.
- Environment Protection Authority.
- Office of Environment and Heritage.

All environmental reports and monitoring data were reviewed and the effectiveness of the environmental management procedures operating at the quarry was assessed. The audit also determined that status of implementation of environmental controls and commitments made in the EIS and SSD approval process.

### 10.2 Areas of improvement

The audit found that overall, the site is well managed. Areas of concern often relate to external factors outside of the control of Gunlake. Areas of improvement have been outlined below:

- Rehabilitation work undertaken over recent years is surviving, although showing signs of stress. Ground cover is sparse which can create dust and potential for erosion, however revegetating these areas was not possible during the time leading up to the audit due to prolonged drought conditions and minimal soil moisture.
- The weed growth on site was noted by the audit and has been addressed. This appears to be caused by the spread of weeds from neighbouring agricultural land.
- Fuel and oil storage and handling systems can be improved by additional bunding and control of delivery drip points. The current systems are not a non-compliance issue and are currently adequately managed there is a risk of future contamination if not upgraded.

## 10.3 Audit Recommendations and Actions

The following table details the status of implementation of recommendations from the independent audit.

**Table 10.1- Summary of Recommendations**

Recommendations from Audit	Actions
Update the Rehabilitation and Biodiversity Offset Management Plan following determination of the SSD MOD1 application and approval from OEH of the BioBanking Agreement.	Plan will be updated within three months of determination of SSD MOD 1 which is scheduled for hearing at the NSW L&E Court in February 2021.
Repair areas of erosion within the stormwater control system below the original emplacement area.	Works complete.
Spray areas of tussock and blackberry	Action works commenced with on-site weed spray vehicle and trained staff
Investigate the performance of the sewage treatment system and investigate causes of elevated nitrogen downstream of the site.	Sewerage treatment system serviced in December 2019, nitrogen levels in creek have improved during storm events.
Review and update the Water Management Plan with respect to very low rainfall scenarios and determine if there are opportunities to store and conserve additional water on site.	Completed March 2020
Review the existing groundwater monitoring program with a view to increasing the number of monitoring bores, particularly on the western side of the quarry footprint in order to more accurately determine draw down as the quarry develops.	Completed March 2020
When rainfall improves determining the presence of seeps and springs on nearby privately-owned land in accordance with Condition 22 iv) point 6.	All accessible seeps have been investigated, access to adjacent properties will now be required.
When soil moisture improves, revegetated bare and eroded sections within the rehabilitation areas.	Monitoring rainfall and regrowth which is extensive at present. Reseeding of certain areas ongoing.
Ensure all stormwater ponds are desilted following storm events to maintain capacity.	Ongoing.
Determine any additional external sources of dust which affect the readings of DDG3.	Completed, nothing other than drought and surrounding agricultural practices found.

Recommendations from Audit	Actions
Undertake water quality monitoring when water flowing in both of the surface water monitoring sites.	Completed and ongoing following recent rain.
Determine species diversity in the Biodiversity Offset Area to enable comparison with undisturbed vegetation communities. Plan for the potential for additional sowing or planting of tube stock to supplement ground cover and shrubs which are currently missing.	All work will be performed in accordance with the Biobank and Conservation Agreements, in accordance with the Rehabilitation and Biodiversity Offset Management Plan.
Ensure regular driver training is conducted in accordance with the Driver Code of Conduct and Transport Management Plan.	All drivers have now completed a Driver reinduction to site (February 2020), which includes the Driver Code of Conduct.
Update Environmental Management Strategy.	Completed March 2020.



## 11. INCIDENTS AND NON-COMPLIANCES

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No incidents occurred at Gunlake Quarry during the reporting period, and as such the Pollution Incident Response Management Plan was not activated. Non-compliances relating to dust monitoring are described in Section 6.3.6.

Non-compliances identified in the Independent Environmental Audit were of an administrative nature and did not pose a risk to the environment, increase environmental impacts or otherwise detract from the intent of the conditions and were addressed in Gunlake's response to DPIE.

## 12. ACTIVITIES PROPOSED FOR NEXT AEMR PERIOD

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The following activities are planned to be undertaken in the coming reporting period:

- Further development of quarry benches in the Gunlake Extension Project Area;
- Rehabilitation of completed benches on western emplacement area and noise bund wall;
- Ongoing program for desilting of sediment ponds and stormwater erosion control system;
- Continue environmental monitoring in accordance with management plans, EPL and consent requirements;
- Continue to update the website with monitoring data;
- Management of conservation areas as per conservation agreement;
- Spraying of tussock and blackberry;
- Determination of development consent modification reduction in biodiversity areas; and
- Ongoing driver training in accordance with the Driver Code of Conduct and Transport Management Plan.



## APPENDIX A – Development Consent

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## APPENDIX B - EPA LICENCE

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## **Appendix C – Chapmans Creek Monitoring Report**

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