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Dunmore Hard Rock Quarry Annual Review

1 July 2020 – 30 June 2021

Document Control Sheet

Document Control				
Ref	Prepared by	Approved by	Date	Distribution
v1.0	EMM Consulting Pty Ltd	Boral Resources	1/09/2021	Initial draft for internal distribution for review
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Dunmore Hard Rock Quarry Annual Review Title Block

Name of operation	Boral Dunmore Hard Rock Quarry
Name of operator	Boral Resources (NSW) Pty Ltd
Development consent	DA-470-11-2003
Name of holder of development consent	Boral Resources (NSW) Pty Ltd
Water licence number	WAL#25152 Ref# 10AL103610
Name of holder of water licence	Boral Resources (NSW) Pty Ltd
Name of holder of EPL	Boral Resources (NSW) Pty Ltd
Annual Review start date	1 July 2020
Annual Review end date	30 June 2021

I, , certify that this audit is a true and accurate record of the compliance statues of the Dunmore Hard Rock Quarry for the period of the 2021 Financial Year and that I am authorised to make this statement on behalf of Boral Resources (NSW) Pty Ltd.

Note

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

Name of authorised reporting officer	
Title of authorised reporting officer	
Signature	
Date	

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List of Abbreviations

ACHMP	Aboriginal and Cultural Heritage Management Plan
ANZECC	Australian and New Zealand Environment Conservation Council
AQMP	Air Quality Management Plan
AR	Annual review
AS	Australian Standard
BFMP	Bushfire Management Plan
BMP	Blast Management Plan
BOS	Biodiversity Offset Strategy
CCC	Community Consultative Committee
DA 470-11-2003	The development application for the Dunmore Hard Rock Quarry operated by Boral Resources (NSW) Pty Ltd
DO	Dissolved Oxygen
DPIE	Department of Planning, Industry and Environment
DRG	NSW Division of Resources and Geoscience
EPA	Environmental Protection Authority
EPA&A Act	Environmental Planning and Assessment Act 1979
EPL 77	Environmental Protection Licence 77 for the Dunmore Hard Rock Quarry operated by Boral Resource (NSW) Pty Ltd
FFMP	Flora and Fauna Management Plan
FY21	Financial Year 2021 (1 July 2020 – 30 June 2021)
HVAS	High Volume Air Sampler
IEA	Independent Environmental Audit
LOR	Limit of Reporting
ML	Megalitres
MSDS	Material Safety Data Sheet
NATA	National Association of Testing Authorities
NMP	Noise Management Plan
NRAR	Natural Resource Access Regulator
NTU	Nephelometric Turbidity Units
OEH	Office of Environment and Heritage
PIRMP	Pollution Incident Response Management Plan

PM10	Particulate Matter (10 microns in diameter)
PM2.5	Particulate Matter (2.5 microns in diameter)
POEO Act	*Protection of the Environment Operations Act 1997*
RIC	Rail Infrastructure Corporation
S5.C9	Used to refer to a particular condition in DA-470-11-2003 (in this case Schedule 5, Condition 9).
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
WMP	Water Management Plan
WQO	Water Quality Objectives
$\mu g/m^3$	Micrograms per cubic metre

1. Purpose and Scope

In addition to determining compliance of the operation, DA 470-11-2003 Schedule 5 Condition 9 (S5.C9) requires that the AR reports on specific components of the operation.

S5.C9 and all other relevant conditions required to be addressed as part of the AR are outlined in Table 1 with reference to the section of this report where each has been addressed. The timeframe for the annual review is the 2021 Financial Year which is 1 July 2020–30 June 2021.

Table 1 Annual Review Consent Requirements

Condition	Condition Requirements	Location within this report
S4.C29	In each Annual Review, the Applicant must:	
	(a) recalculate the site water balance for the development; and	Section 5.5.4
	(b) provide information on evaporative losses, dust suppression, dam storage levels and implications of obtaining any water supplies from off-site; and	Section 5.5.4
	(c) evaluate water take against licensing requirements	Section 5.5.4
S4.C50	The Applicant must include a progress report on the implementation of the Flora and Fauna Management Plan in the Annual Review.	Section 5.7, Appendix F
S4.C57	The Applicant must include a progress report on the implementation of the Rehabilitation Management Plan in the Annual Review.	Section 5.7, Appendix F
S4.C71	The Applicant must describe what measures have been implemented to minimise the amount of waste generated by the development in the Annual Review	Section 5.9
S4.C77	The Applicant must:	
	a. provide annual production data to the DRG using the standard form for that purpose; and	Section 3
	b. include a copy of this data in the Annual Review.	Section 3

Condition	Condition Requirements	Location within this report
S5.C9	By the end of September each year, or other timing as may be agreed by the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. The review must: a) Describe the development (including 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 performance measures/criteria; • Requirements of any plan or program required under this consent; • Monitor results of previous years; and • Relevant predictions in the document listed in condition 2 of schedule 3; c) Identify any non-compliance over the last 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 are available to the Community Consultative Committee (see condition 6 of Schedule 5) and any interested person upon request.	Section 5.7, Appendix F Section 5, Section 6.1 Section 1.1 Section 5 Section 5 Section 5

1.1. Statement of Compliance

The statement of compliance for the FY21 reporting period (1 July 2020 – 30 June 2021) is contain in Table 2 below.

Table 2 Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
DA-470-11-2003	No

The non-compliances identified in the reporting period are detailed in Table 3. Each non-compliance has been risk assessed as per the DPIE Annual Review Guidelines Compliance Status key outlined in Table 3.

Table 3 Non-Compliances Risk Assessment

Condition #	Condition Description	Compliance Status	Comments	Section addressed
DA 470-11-2003 S4.C32	By 18 May 2008, or as otherwise agreed to by the Secretary, the Applicant must: (a) modify the existing dam at the site to create increased capacity offline from Rocklow Creek; (b) construct dams within the site of sufficient capacity to ensure that the water quality criteria in condition 29 can be met for all rainfall events up to and including the 5-day duration 95th percentile rainfall event; (c) ensure the discharge and overflow points of the dams do not cause erosion at the point of discharge/overflow; (d) rehabilitate and stabilise the banks of the dams; and	Non-compliant Administrative	The NRAR has returned comments on the Water Management Plan (WMP) submitted to DPIE Water in October 2020. These comments will be addressed in an updated Water Management Plan to be submitted to NRAR for review and approval. This plan will be updated in the suite of management plan updates in response to the post approval requirements for MOD 12 approved in August 2021. The WMP currently details the dam upgrade works designed to meet this condition. Section 5 of the WMP details the proposed changes and Appendix G describes the preliminary engineering designs The Lower Dam upgrades cannot	

Condition #	Condition Description	Compliance Status	Comments	Section addressed
	(e) ensure the integrity of the dams would not be compromised by flooding; to the satisfaction of the EPA and the Secretary.		proceed without the approval of the WMP under S4.C35A.	

Risk Assessment of Non-Compliances

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

Copies of the AR will be submitted to the DPIE and made available to the public at on the Dunmore Quarry website.

https://www.boral.com.au/locations/boral-dunmore-operations

1.2. Contacts Relevant to Dunmore Quarry Operations

Key contacts associated with the management of the Quarry operations, environment, safety and stakeholder relationships are provided in Table 4.

Table 4 Contacts Relevant to Dunmore Quarry Operations

Contact	Position	Contact Details
Brodie Bolton	Dunmore Quarry Manager	Tel: (02) 4237 2000 Email: brodie.bolton@boral.com.au
Angus Shedden	Metropolitan Operations Manager NSW/ACT	(02) 4237 8414 Email: angus.shedden@boral.com.au
Ben Williams	Environmental Coordinator Dunmore	Tel: (02) 4237 8414 Email: ben.williams@boral.com.au
Kate Woodbridge	Stakeholder Relations Manager	Tel: (02) 4237 8414 Email: kate.woodbridge@boral.com.au

2. Dunmore Quarry Operations

The Dunmore Hard Rock Quarry, owned and operated by Boral Resources (NSW) Pty Ltd, is located at Tabbita Road Dunmore, approximately 12 kilometres north-west of Kiama in the Shellharbour Local Government Area. The Quarry produces hard rock from Bumbo Latite Member, a fine-grained intermediate volcanic rock similar to basalt, which is crushed to produce coarse aggregates, road construction materials and fines.

Development Consent (DA 470-11-2003), issued 19 November 2004 by the Minister for Infrastructure and Planning, allows Boral to produce up to 2.5 million tonnes of quarry product a calendar year (Mtpa), and transport it offsite by road and rail to local and regional markets.

Dunmore Hard Rock Quarry (the site) covers approximately 248 hectares and is surrounded by private property, predominantly agricultural grazing land and tracts of remnant native vegetation, to the south, north and west (The Boral owned and operated Dunmore Lakes Sand Project adjoins the site to the east).

The extraction method involves drilling and blasting to produce broken rock, that is transported to the primary crusher feed bin. The primary-crushed rock is further reduced in size in a series of crushers, before being conveyed to the tertiary screen house where the crushed rock is sized according to product specifications. The sized products are then stockpiled within the various stockpile areas on site, until they are transported to local and regional markets.

During the reporting period extraction has occurred in the area known as the Croome West Pit. Approval of the most recent modification, MOD 11, was granted in March 2019. The site layout is shown below in Figure 1.

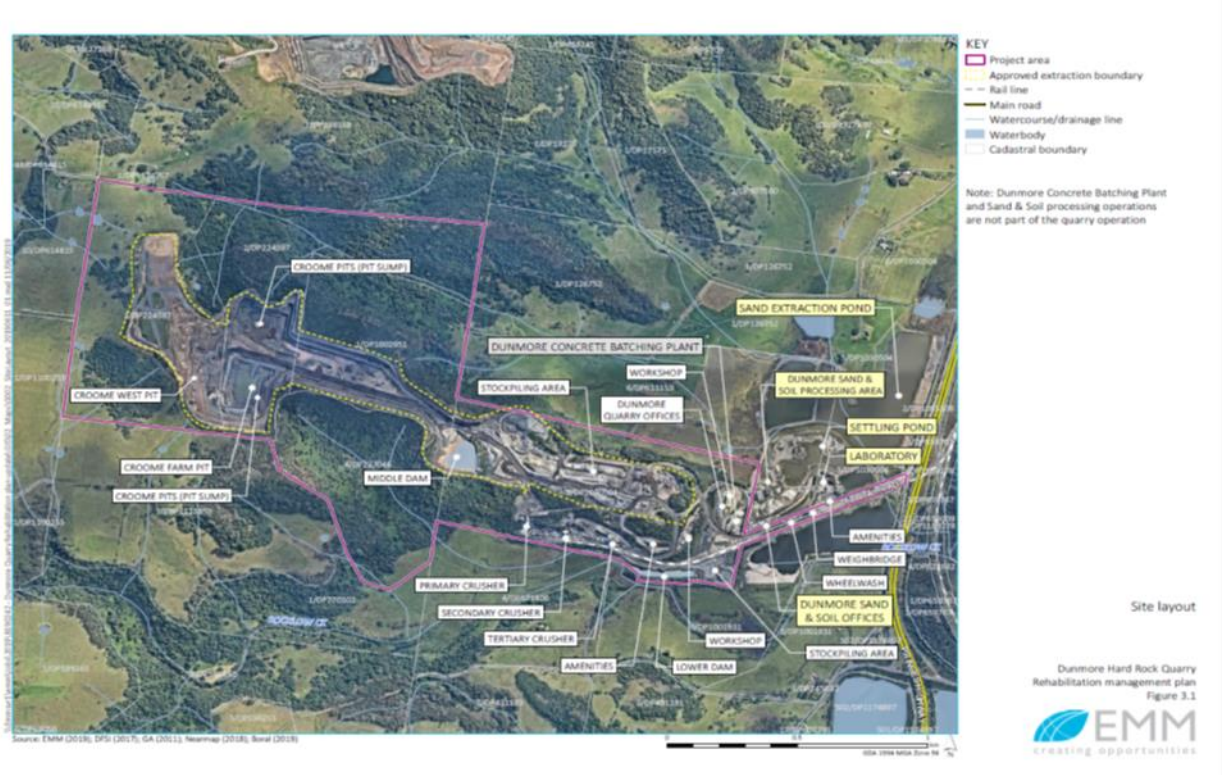

Figure 1 Dunmore Site Layout

2.1. Operations the last 12 months

The last 12 months at Dunmore have been largely disturbed by the effects of Covid-19 and as such, production was down to suit the market demand. The aggregate supply to Greater Sydney has slowed and planned production and operations was scaled back. The effect on production has caused a drop in blasting activities and a reduction in load and haul requirements.

There has been a slight increase in external customers and slight increase in road base sales. Production was out of the West Croome production pit and removal and placement of inter burden continued in this time.

2.2. Operations the next 12 months

Boral has acquired the Rail Infrastructure Corporation (RIC) slot from Sydney Trains and will start production out of the RIC slot. Raw rock feed will be balanced between extraction from the Croome West and the RIC slot. It is predicted that the sales market will be reactive upon the ongoing COVID pandemic in Sydney and production will be able to adjust based on the demand in the future.

Blending Plant trials will continue, and plans are ongoing to expand sales of prepared road base.

Production will be tied to demand which is forecast to be 1.2 to 1.6 Mt for the next reporting period however these estimates are expected to fluctuate depending on the COVID pandemic and government mandates for the construction industry.

Overarching safety management systems and management plans will be continuously reviewed. DA 470-11-2003 MOD 12 is expected to be approved in August 2021 to increase hourly transport dispatch limits under the conditions of consent.

2.3. Licences and Approvals

Dunmore Quarry operates under a number of regulatory approvals and licences which are summarised in Table 5 below.

Table 5 Relevant Licences and Approvals

Approval	Detail	Regulatory Authority
DA 470-11-2003 Modification 11	Quarry operating conditions as granted by DPIE. The current consent has been updated to remove the restriction of road transport within this reporting period. The current modification (MOD 11) was granted in March 2019.	NSW Department of Industry, Planning and Environment
EPL 77	The EPL is issued for the scheduled activity of: Crushing, Grinding, Separation and Extractive activities for tonnages up to 2 million tonnes per annum as defined by the EPA anniversary date 01 July.	NSW Environmental Protection Authority
Water Access Licence WAL#25152	Extraction of water from the Lower Dam. This allows for 227 ML per annum to be extracted from Rocklow Creek. Since 2008	NSW Office of Water

WSW# 10AL103610	the Lower Dam has been taken offline from Rocklow Creek as part of MOD 2	

A copy of DA 470-11-2003 and EPL 77 is available on request or can be accessed through the Boral Dunmore website:

https://www.boral.com.au/locations/boral-dunmore-operations

3. Production, Sales and Transport

Production was forecast to be below FY20 numbers for the FY21 reporting period to the Sydney market with a slight increase in local infrastructure works in the Illawarra.

Disruptions due to the COVID-19 pandemic also affected demand and as a result production was adjusted to reflect uncertainties in demand. Table 6 and Table 7 detail the production data in both a monthly breakdown and the format submitted to DRG as required by S4.C77.

Table 6 Production data

Month	Production (t)	Sales (t)	
		Road	Transfers
Jul-2020	85,402	85,773	7,483
Aug-2020	100,791	88,116	3,099
Sep-2020	118,087	86,688	4,896
Oct-2020	119,439	67,306	3,946
Nov-2020	200,305	87,394	4,691
Dec-2020	62,433	80,850	6,734
Jan-2021	45,540	67,263	7,725
Feb-2021	115,628	91,197	16,602
Mar-2021	108,634	89,187	16,785
Apr-2021	117,087	85,566	10,193
May-2021	85,036	83,768	5,618
Jun-2021	131,053	109,304	10,224
FY 21 Total	1,289,435	1,022,412	97,996
		1,120,408	

Table 7 Sales data for FY21 period

Total Sales/Disposals			
Product	**Type of Material**	**Quantity (Tonnes)**	**$ Value of Sale***
Virgin Materials			
Crushed Coarse Aggregates			
Over 75mm	Latite	40,253	*
Over 30mm to 75mm	Latite	118,706	*
5mm to 30mm	Latite	614,169	*
Under 5mm	Latite	136,724**	*
Natural sand		0	*
Manufactured Sand	Latite	51,482	*
Construction Sand		0	*
Prepared Road Base & Sub Base	Latite	185,698	*
Other Unprocessed Materials	Latite	559	*
Total		1,147,591	*

Note: This data is an approximation of FY21 production data and is subject to change.

*This information is commercially sensitive and has been omitted.

** This product is not part of the total sales

3.1. Transport Dispatch Data

Transport numbers are extracted from the transport monitoring system, which uses a docket tracking system to calculate the dispatch number, which is then automatically migrated over to the transport dispatch monitoring sheet.

No exceedances occurred with respect to the limit of 400 laden trucks from the site per day during the reporting period. The highest number of trucks leaving site on any given day was 242.

4. Actions Required from Previous Annual Review

Table 8 details the actions required from the FY21 Annual review and where each item is discussed.

Table 8 FY21 Annual review actions

Reference	Description of Action	Actions Completed	Section Addressed
DQ1/20	Finalise revised Water Management Plan (WMP).	Comments were provided to Boral from DPIE in October and recommendations will be incorporated into the updated plan to be submitted post approval of MOD 12.	Section 5.5
DQ2/20	Follow up approval of works required under S4, C38 from DPIE.	A letter was sent requesting approval of works (470-11-2003-PA-14). DPIE have approved the works as complete in accordance with S4.C37 on 9 April 2021.	N/A
DQ3/20	Determine whether 'regional' monitoring that has been completed is satisfactory and the regional monitoring program can therefore be suspended.	Groundwater monitoring will be continued as part of data collection of the aquifer.	Section 5.6.3
DQ4/20	Update of WMP to include measures to prevent mud tracking onto public roads from the site.	It was determined that a more appropriate location for the updated WMP includes an Erosion and Sediment Control Plan located in Section 6 of the water management plan. The effectiveness of the controls described in the plan are monitored via the site environmental checklist (monthly checklist and EPP)	Section 5.5
DQ5/20	Confirm tyre numbers stored on site are less than 500, and if there is a requirement for more than 500 tyres, consult with EPA regarding a licence.	Boral confirms that less than 500 tyres are stored on the premises as waste. The tyre register was completed in 2021 and tyres stored as waste will be progressively recycled by a licenced contractor in September 2021.	Section 5.9.1
DQ6/20	Finalise revised Bushfire Management Plan and ensure it covers safe storage of tyres in accordance with "Tyre	An updated Bushfire Management Plan will be provided as part of the suite of management plans updated post MOD 12 approval.	Section 5.9.1

Reference	Description of Action	Actions Completed	Section Addressed
	stewardship Australia Best Practice Guidelines for Tyre Storage and Emergency Preparedness (March 2019)" guidelines and "Fire & Rescue NSW Fire Safety Guideline – Guideline for bulk storage of rubber tyres" (December 2014).	As discussed above, excess waste tyres are being progressively removed by a licenced subcontractor. The bushfire management plan will be updated after excess tyres are removed and included in the updated management plans as part of MOD 12 post approval documentation.	
DQ7/20	Ensure all management plans are prepared and reviewed in accordance with the requirements of the conditions of consent It is suggested a review record/register is maintained.	A record was created and attached to the Environmental Permit Planner used by site management.	N/A
DQ8/20	A Traffic Management System should be developed to monitor and control truck dispatch movements in accordance with limitations	The Transport Management Plan (TMP) will be updated as part of the MOD 12 post approval documentation.	Section 3.1, Section 6.2
DQ9/20	If the hourly truck dispatch limitations are not practical for operations, consultation with DPIE should occur to understand if modification of this condition is appropriate.	A modification of consent (MOD 12) has been granted in August 2021. The TMP will be updated as part of MOD 12 post approval documentation.	Section 6.2
DQ10/20	Prioritise maintenance checks of bag houses in crushing and screening plans to ensure they are maintained in a proper and efficient condition.	A plant inspection checklist is undertaken daily by staff to ensure that plant components are working correctly, and any corrective actions are completed.	N/A
DQ11/20	Confirm survey plan has been submitted to the Secretary.	Boundary plans were sent 30 December 2017 to DPIE as part of MOD 9 approval	N/A
DQ12/20	Implement updated Water Management Plan when approved to reconfigure storage on site and prevent uncontrolled discharge events.	The updated Water Management Plan details the particular dam upgrade works designed to meet this condition. The WMP will be submitted post approval of MOD 12.	Section 5.5

Reference	Description of Action	Actions Completed	Section Addressed
DQ13/20	Ensure all future Annual Reviews address the reporting requirements in Schedule 4, Condition 29.	Completed in this Annual Review	Section 5.5.4
DQ14/20	Ensure Dam Upgrade Plan is updated or incorporated into the updated approved Water Management Plan.	The dam upgrade plan is included in Appendix G of the updated WMP.	Section 5.5.5
DQ15/20	Ensure the approved updated Water Management Plan includes the Lower Dam Transition Plan.	The dam transition plan is included in the Options Assessment (Section 5.3) of the updated WMP.	Section 5.5.5
DQ16/20	Bunded fuel drum storage area to be used correctly with all oil drums to be positioned within the bunded area.	Bunded area was cleared of unnecessary containers. An audit from the resource regulator was conducted in the last reporting period. The audit confirmed that the storage is in accordance with AS 1940.	Section 5.11
DQ17/20	Ensure all fuel, oil and chemical storage areas occurs in appropriately bunded areas.	As above.	Section 5.11
DQ18/20	Condition number references were noted as being incorrect throughout document. Condition numbering to be updated in next review.	Condition references will be amended in the next review of the Flora and Fauna Management Plan document as per the recommendation. This will be completed with the suite of updates for management plans that will be conducted as part of the post MOD 12 approval requirements.	Section 5.7
DQ19/20	Vegetation Clearing Protocol (VCP) to be updated to address collecting seed from site and conserving and reusing topsoil.	As above.	Section 5.7
DQ20/20	Rehabilitation Conservation Bond not lodged within the required timeframe. Boral to ensure timing requirements are met for obligations under this consent.	Rehabilitation Conservation Bond to be recalculated and lodged in accordance with the obligations under the consent. This will be recalculated as part of the updated Rehabilitation Management Plan to be submitted with the	Section 5.7

Reference	Description of Action	Actions Completed	Section Addressed
		suite of updates post MOD 12 approval.	
DQ21/20	It is recommended that sweeping increase to three times per week, the WMP is updated to address this matter, and consideration of further mitigation measures is undertaken.	Sweeping was increased to three days a week with Kiama Council in February 2021.	N/A
DQ22/20	The document control tables within the all the plans, strategies and programs required under this consent do not reflect the reviews that have occurred. Ensure all documents are reviewed in accordance with this condition of consent. Update the relevant management plans to contain information on timing of review.	Subsequent management plans to include a more accurate description of the document control process, including space to denote when management plans were reviewed. This will be undertaken as part of the MOD 12 post approval updates of management plans.	N/A
AQMP 1	Alerting system for Real Time Dust Monitors.	A new system is being devised with the subcontractor to provide the alerting system as the old system was discontinued.	Section 5.2.6
FFMP1	Continue monitoring Croome West Bund.	Photos of Croome West are provided in Section 5.7.	Section 5.7
FFMP2	Repair fence lines to reduce instances of cattle intrusion in rehab areas, specifically the RVCA.	Contractor engaged to repair fences in early September. COVID related impacts and flooding have limited access required to complete works in the FY21 reporting period	Section 5.7.3
FFMP3	Continue works in active rehabilitation zones as per FFMP	Contractor (Goodbush) engaged to continue works to meet completion criteria thresholds	Section 5.7.1 and Section 5.7.2

5. Environmental Performance

Dunmore Quarry has comprehensive management and monitoring programs which collect information and data for the assessment of environmental impacts, regulatory compliance and performance against continual improvement objectives. Specific Management Plans define the framework for measuring environmental performance and compliance with statutory requirements for each relevant aspect of environmental performance

5.1. Meteorological Monitoring

An onsite weather station is located at Dunmore, which collects a range on meteorological parameters. This system was upgraded as part of the transition to real time air quality monitoring. The location of the weather station is shown in Appendix A.

There is no prescribed impact assessment criteria and meteorological monitoring is used to provide background information for management of the site. A detailed summary of the FY21 and historical rainfall data can be found in Appendix A.

5.1.1. Meteorological Monitoring Long Term Analysis and Trends

The FY21 period was wetter than average with 1,556 mm falling over the reporting period. There were five notable rain events during the reporting period, all of which exceeded the design capacity of the lower dam (90.7 mm over 5 days):

- 26–28 July 2020: 214 mm.
- 7–10 August 2020: 179 mm.
- 2–5 January 2021: 127 mm.
- 19–23 March 2021: 215 mm.
- 5–7 May 2021: 186 mm.

Typically winds during the reporting period originated from the west and west-south-west for the majority of the year. In Summer, prevailing winds were also from the north-east. These results are mostly consistent with historic trends and generally had a greater concentration of winds from the west and north-east.

5.1.2. Meteorological Monitoring Summaries and Opportunity for Improvement

The weather station is capable of providing real time data via download which is an upgrade from the previous station. The next reporting period will focus on continuing the processes established during the current reporting period.

5.2. Air Quality Monitoring

Two methods of monitoring air quality are used at Dunmore Quarry. Deposited dust gauges are used to measure deposited dust every 30 days (+/- 2 days). A High Volume Air Sampler (HVAS) is used to measure the fine particulate matter under 10 microns (PM_{10}) every 6 days.

A real time monitoring system has been installed which is used to guide day to day management and response to air quality monitoring. This system is currently in a transitional phase. Under the currently approved AQMP, the real-time monitoring network is proposed to eventually replace the deposited dust and HVAS monitoring once the transitional phase is complete. During the transition phase, the existing HVAS monitor would continue to be operated and be used to validate real-time monitoring network and assess the compliance of the project. It is anticipated that the transitional phase will be finished next financial year (FY22).

The location of air quality monitoring equipment is shown below in Figure 2.

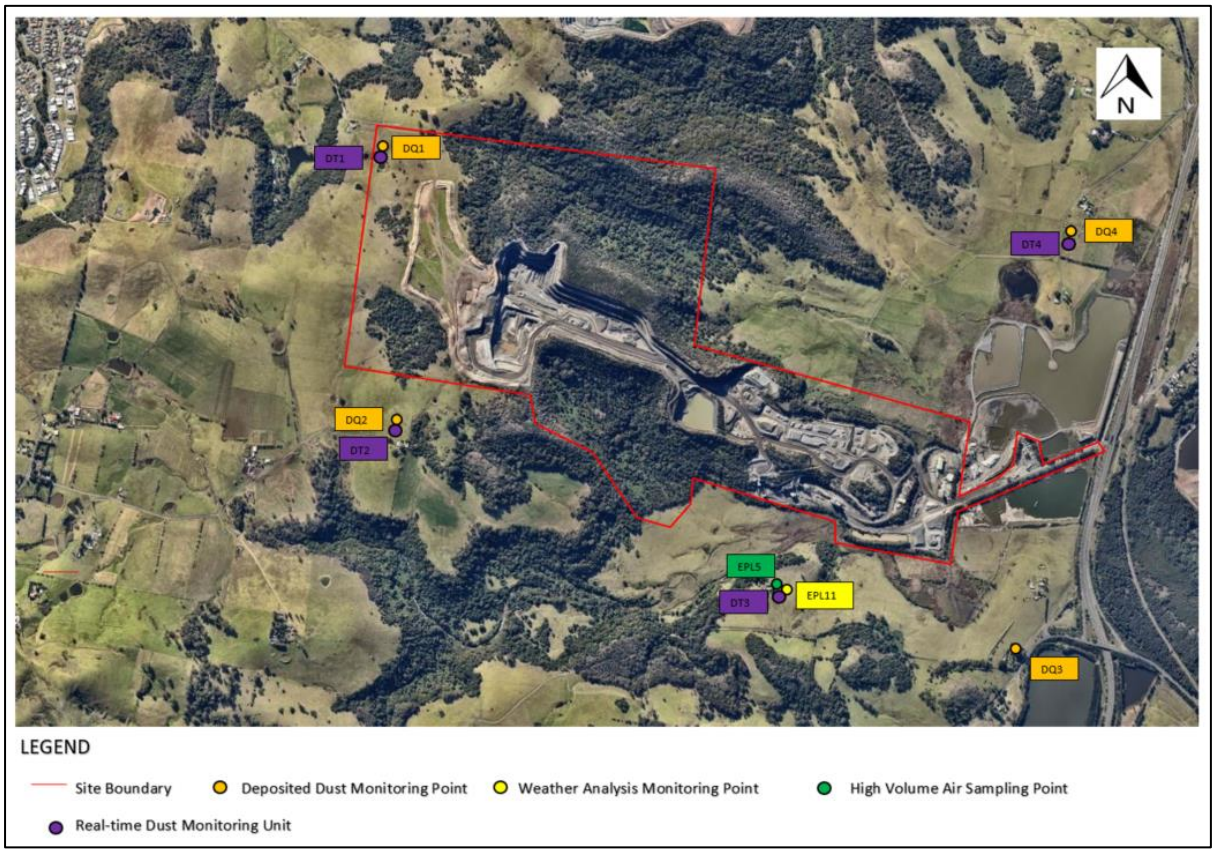

Figure 2 Air Quality Monitoring Locations

5.2.1. Deposited Dust Monitoring Assessment Criteria

The relevant deposited dust impact assessment criteria apply to a residence on privately owned land. Monitoring points 1, 2 and 4 are not located in direct vicinity of residences. It is important to note that the assessment criteria refer to an annual averaging period (i.e. a monthly average over the last 12 months). Impact assessment criteria is shown in Table 9 below.

Table 9 Deposited Dust Impact Assessment Criteria

Pollutant	Averaging Period	Criterion	
Deposited dust[c]	Annual	2g/m2/month[b]	4g/m^2/month[a,d]

[a] Cumulative impacts (ie increases in concentration due to development plus all other sources)

[b] Incremental impact (ie increases in concentration alone, with zero allowable exceedances of criteria over the life of the development.

[c] Deposited dust is defined as insoluble solids

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity as agreed by the Secretary.

5.2.2. Deposited Dust Monitoring FY21 Performance Review

All monitoring points were below the required assessment criteria of rolling annual average of 4g/m^2/month for dust measured as insoluble solids during the reporting period.

All sites also were below 4g/m^2/month for ash fraction which excludes the organic (combustible) component of the sample such as vegetation, bird droppings and insects. These organic contaminants within the sample are typically representative of the surrounding wetlands and farmland which the monitors are located within.

A summary of results for each monitoring location is shown in Table 10 below. A monthly breakdown of each site and summary graphs is located in Figures 3 to 6.

Table 10 Deposited Dust Monitoring Summary

	Site 1 grams/m^2/month		Site 2 grams/m^2/month		Site 3 grams/m^2/month		Site 4 grams/m^2/month	
	Insoluble Solids	Ash	Insoluble Solids	Ash	Insoluble Solids	Ash	Insoluble Solids	Ash
FY21 Average	1.88	1.16	1.70	1.08	1.94	1.12	1.89	1.12
Criterion	4	-	4	-	4	-	4	-

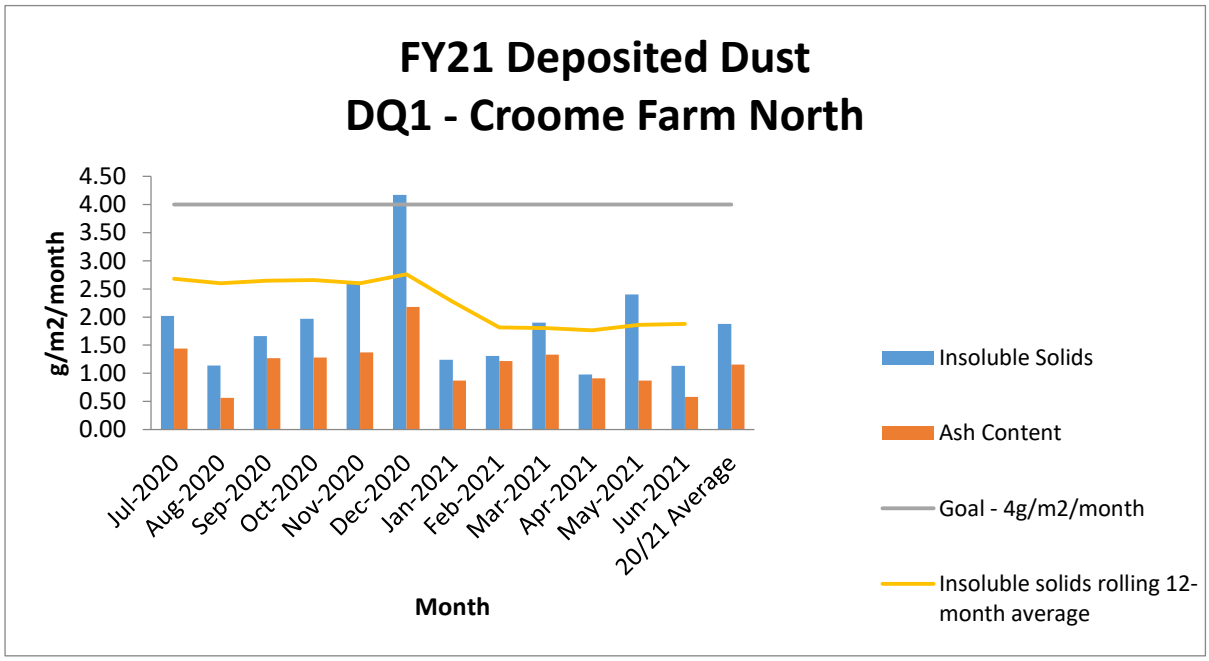

Figure 3 DQ1 Deposited Dust Results

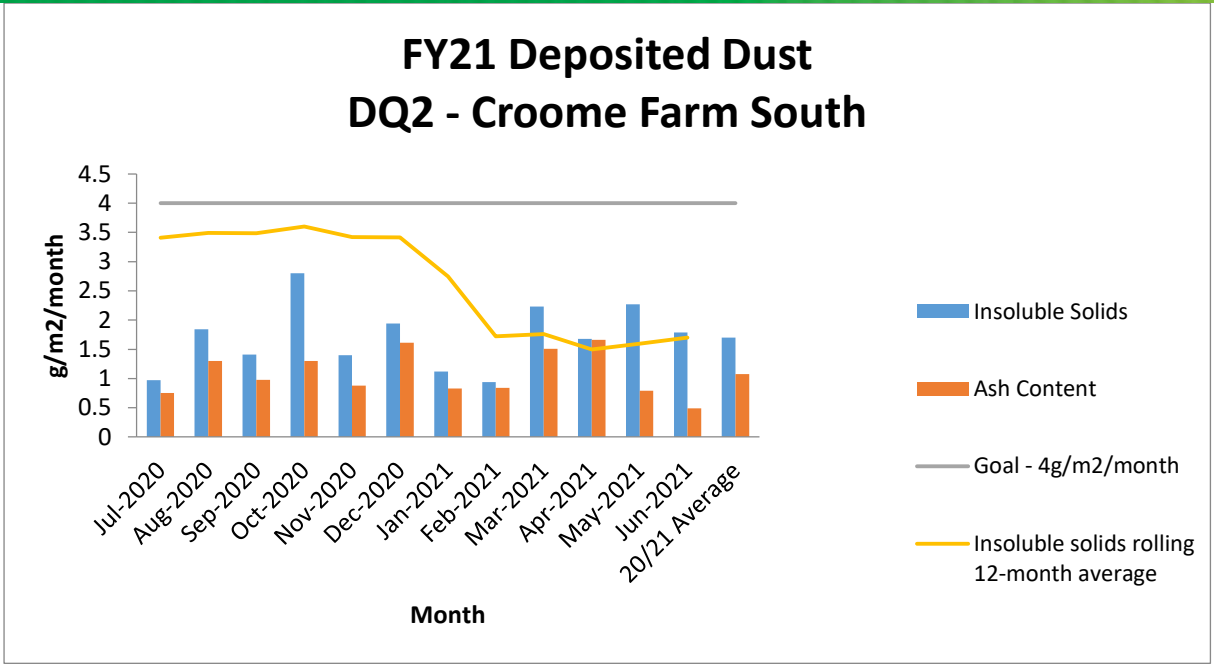

Figure 4 DQ2 Deposited Dust Results

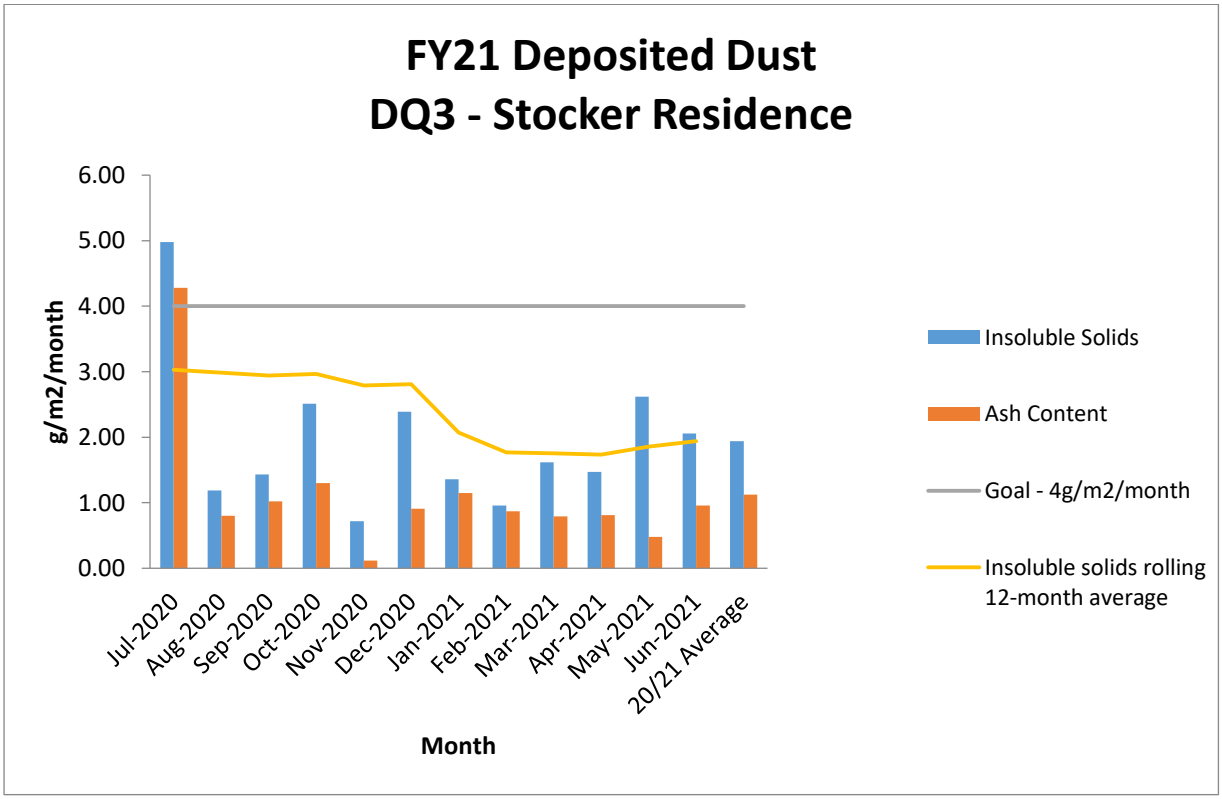

Figure 5 DQ3 Deposited Dust Results

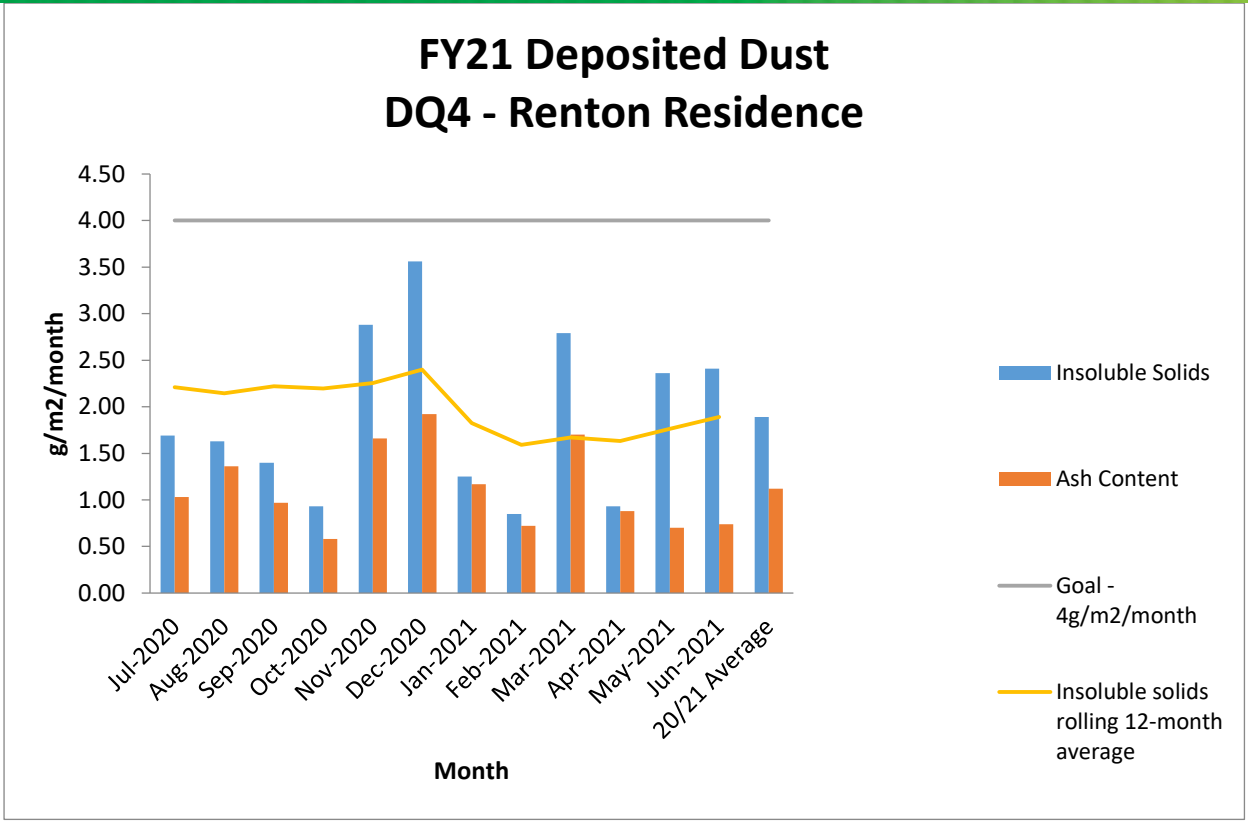

Figure 6 DQ4 Deposited Dust Results

5.2.3. Particulate Monitoring Assessment Criteria

The impact assessment criteria for Particulate Monitoring is provided below in Table 11.

Table 11 Particulate Monitoring Impact Assessment Criteria

Pollutant	Averaging Period	Criterion
PM_{10}	Annual	[a,d] 25 µg/m³
PM_{10}	24 hour	[b]50 µg/m³
TSP	Annual	[a,d] 90 µg/m³
$PM_{2.5}$*	Annual	[a,d] 8 µg/m³

[a] Cumulative impacts (i.e increases in concentration due to development plus all other sources)

[b] Incremental impact (i.e increases in concentration alone, with zero allowable exceedances of criteria over the life of the development.

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity as agreed by the Secretary.

5.2.4. Particulate Monitoring FY21 Performance Review

The PM_{10} readings from FY21 can be seen below in Figure 7.

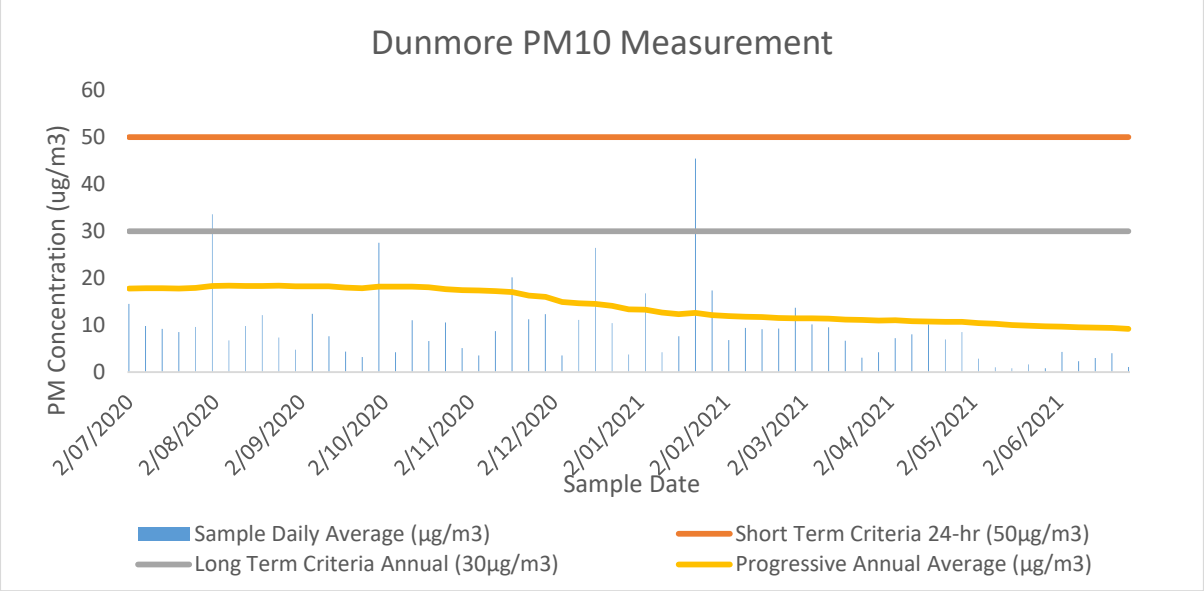

Figure 7 PM_{10} Measurements – FY21

The annual average PM_{10} measurement for the reporting period was below the impact assessment criteria of 30 µg/m³ for PM_{10} and 90 µg/m³ for TSP. The PM_{10} measurements were also similar to the Albion Park South air quality monitoring station's annual averages.

There were no readings recorded as occurring above the long-term criteria for PM_{10} of 50µg/m³ during the reporting period.

TSP concentrations are not measured in the vicinity of the quarry, however annual average TSP concentrations can be derived based on typical ratios of PM_{10}: TSP. Rural areas (such as DQ), typically experience a PM_{10}:TSP ratio of 0.4. This ratio has been applied to the annual average PM_{10} concentrations to derive a representative TSP background concentration in µg/m³. This methodology is in-line with the method used by Ramboll in the MOD 9 Environmental Assessment for the Dunmore Quarry.

Table 12 Summary of Particulate Monitoring Data

Pollutant	Dunmore Quarry FY21 Average (µg/m³)	Albion Park FY21 Average(µg/m³)	Dunmore Quarry Long Term Average (µg/m³)
Measured PM10	9.21	17.1	13.02
Derived TSP	23.03	42.75	32.33
Real time monitor TSP	15.83	-	-
Real time monitor PM10	13.83	-	-
Real time monitor PM2.5	3.74	-	-

5.2.5. Air Quality Monitoring Long Term Analysis and Assessment

The DQ site has been collecting deposited dust data since 2002. A graph of long-term trends can be found in Figure 8 below and shows that deposited dust has typically decreased over time.

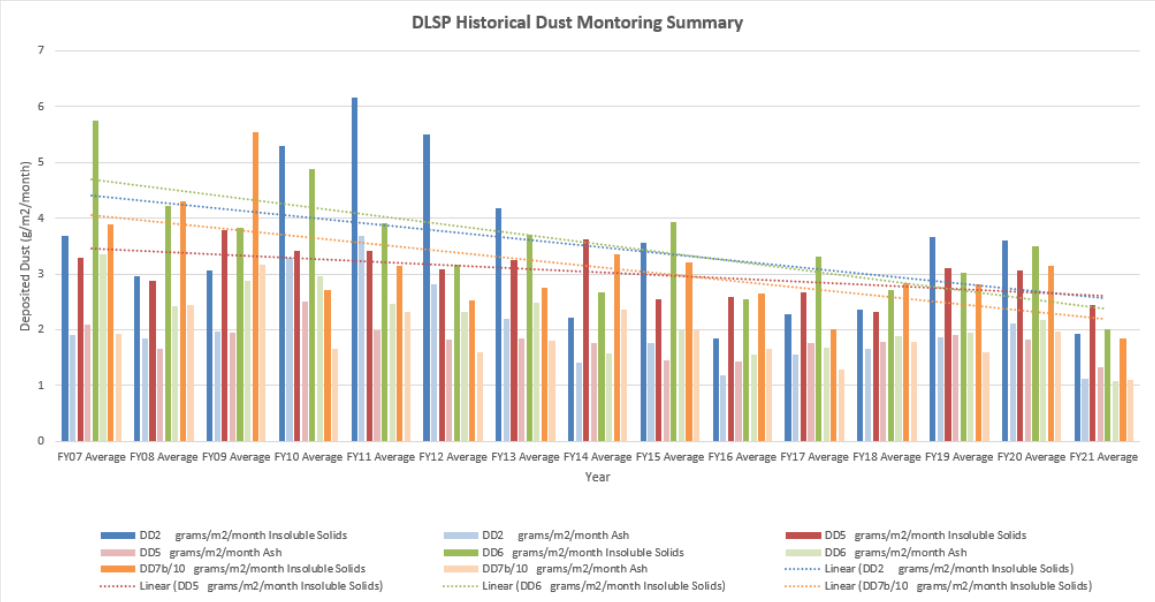

Figure 8 Historical Dust Monitoring Data

A general trend that has been observed is that measured deposited dust is typically higher in dry summer months than winter months, which is to be expected. This trend is also confirmed with the PM_{10} measurements and is generally reflective of regional conditions as a whole.

Figure 9 shows a 90 day average in black, which illustrates a seasonal fluctuation of measured PM_{10} values. A trend can be observed that PM_{10} values are typically higher during summer dry periods and are lower during the winter periods.

This fluctuation is mirrored in the Office of Environment and Heritage's (OEH) Albion Park PM_{10} measurements available on the OEH website (https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility)

These trends indicate the measured PM_{10} and deposited dust values are typically influenced by ambient local conditions rather than development operations at DLSP.

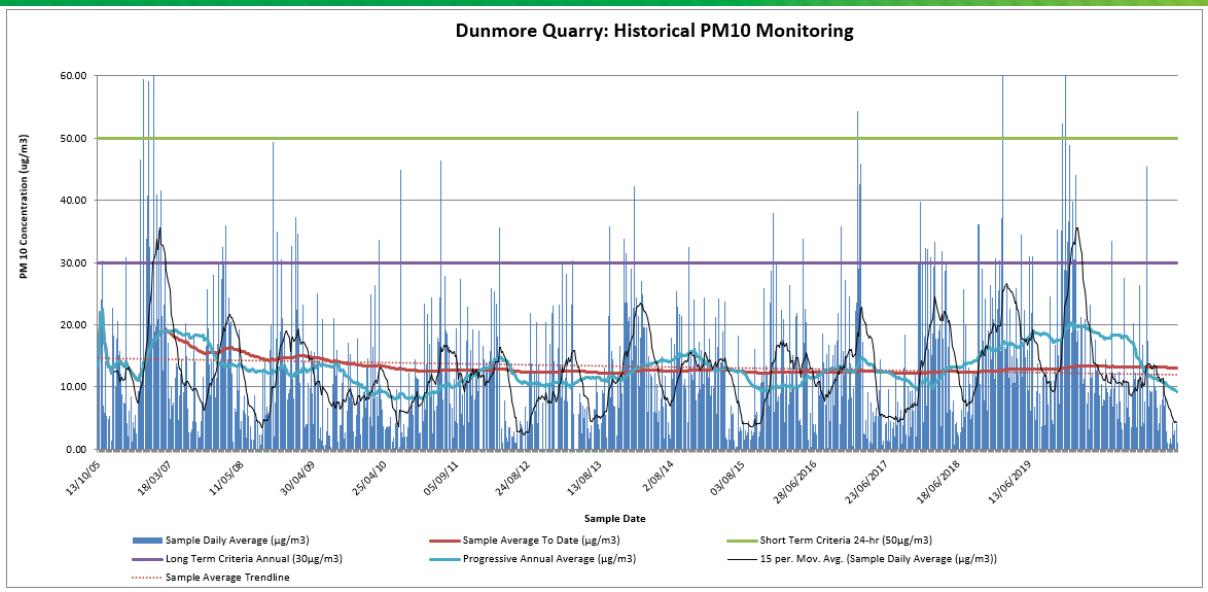

Figure 9 Historical PM_{10} Monitoring Data

5.2.6. Air Quality Monitoring Summary and Opportunities for Improvement

The site is still in the transitional period with TARP and alerting systems being finalised. There were delays in the last financial years sourcing components and parts for the real-time monitors due to COVID-19 related embargos affecting supply of hardware from overseas. The alerting system has been redesigned to a web based format to allow greater access to data for operational staff. The next reporting period will focus on fine tuning alerting systems along with continuing the operation of the real time monitoring units.

5.3. Blast Monitoring

S4C16 and S4.C17 outline the blast monitoring parameters which are assessed at the nearest receiver, the Benny Residence. Monitoring at the Benny residence indicated compliance with all relevant blast parameters during the reporting period. Monitoring Points are shown in Figure 10.

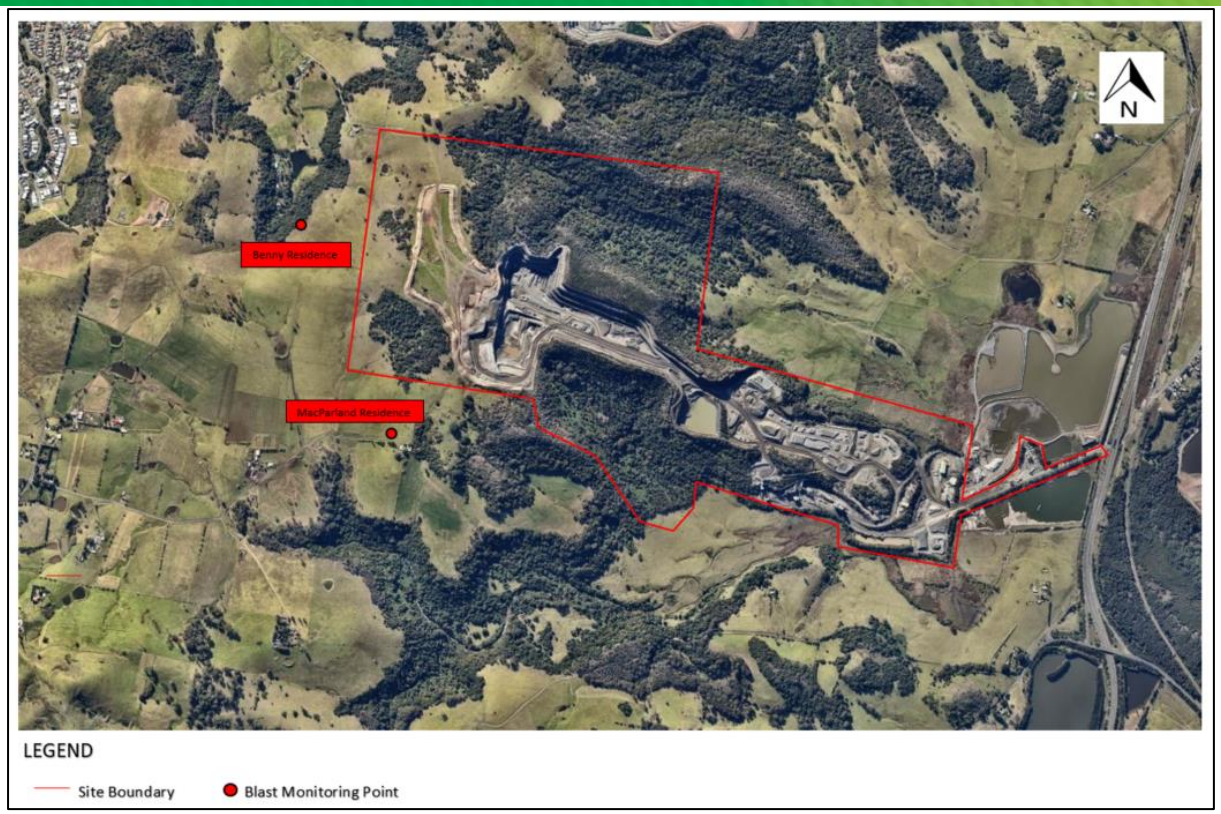

Figure 10 Blast Monitoring Locations

5.3.1. Blast Monitoring Impact Assessment Criteria

S4C16 and S4.C17 outline the blast monitoring parameters which are assessed at the nearest receiver at the Benny Residence. These parameters are reproduced below in Table 13.

Table 13 Blast Monitoring Parameters

Airblast Overpressure	Allowable exceedances
120 ((dB(Lin Peak))	0 (absolute limit)
115 ((dB(Lin Peak))	5% of the total number of blasts over a period of 12 months
Ground Vibration	Allowable exceedances
10mm/s	0 (absolute limit)
5mm/s	5% of the total number of blasts over a period of 12 months

37 blasts were undertaken during the FY21 reporting period. Therefore no more than one (1) blast is allowable over the 95th percentile limits of 115 (dB(Lin Peak)) and 5 mm/s for airblast overpressure and ground vibration respectively at the Benny Residence, which is used for compliance reporting as per the approved Blast Management Plan.

In addition, the approved Blast Management Plan outlines monitoring which will be undertaken to preserve the heritage value of the old flour mill at the MacParlands residence. The following blast parameters were adopted.

Table 14 Blast Monitoring Parameters – MacParlands Residence

Airblast Overpressure	Allowable exceedances
130 ((dB(Lin Peak))	5% of the total number of blasts over a period of 12 months
Ground Vibration	Allowable exceedances
30mm/s	5% of the total number of blasts over a period of 12 months

A dilapidation report was commissioned, detailing the condition of the MacParland Residence. Specifically, the condition of the structures of heritage value such as the flour mill, butter mill, hay shed and the primary residence. Baseline monitoring was conducted in FY20. Monitoring during the FY21 period indicated no change to any of the observed structures on the property, bar the hay shed. When measured in FY20, the awning of the hay shed showed significant deterioration and was leaning to the north. The FY21 inspection observed that the north awning has now collapsed. It was determined that the damage was unrelated to blasting as no cracking was observed.

5.3.2. Blast Monitoring FY21 Performance Review

Figure 11 and Figure 12 details a visual representation of the blast monitoring in FY21.

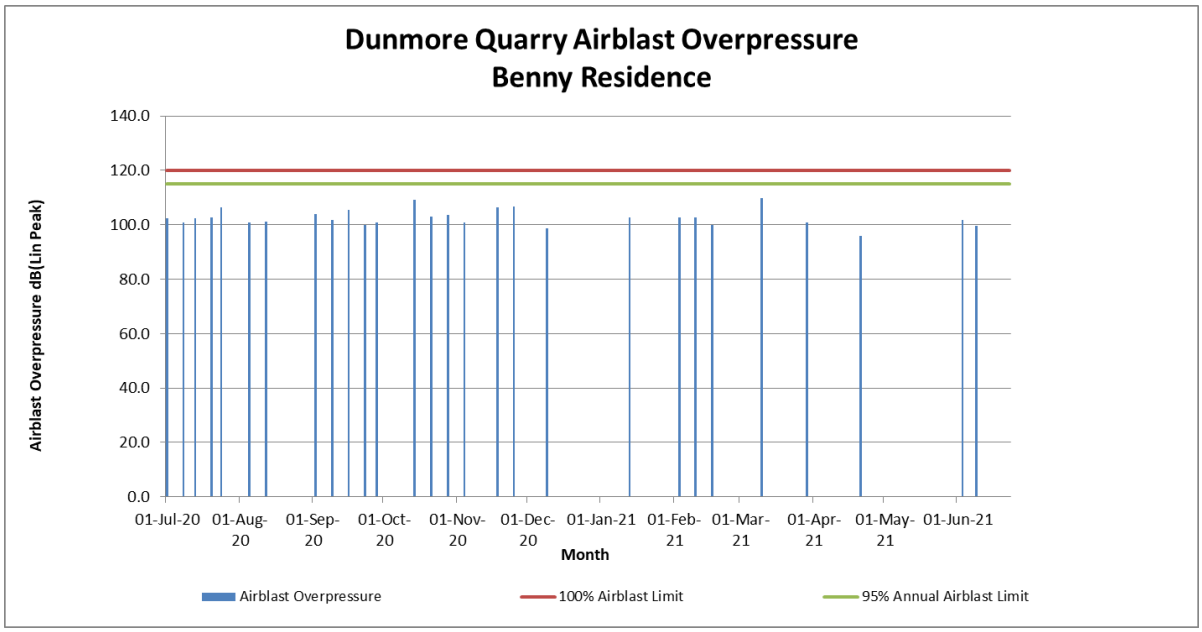

Figure 11 FY21 Overpressure Data

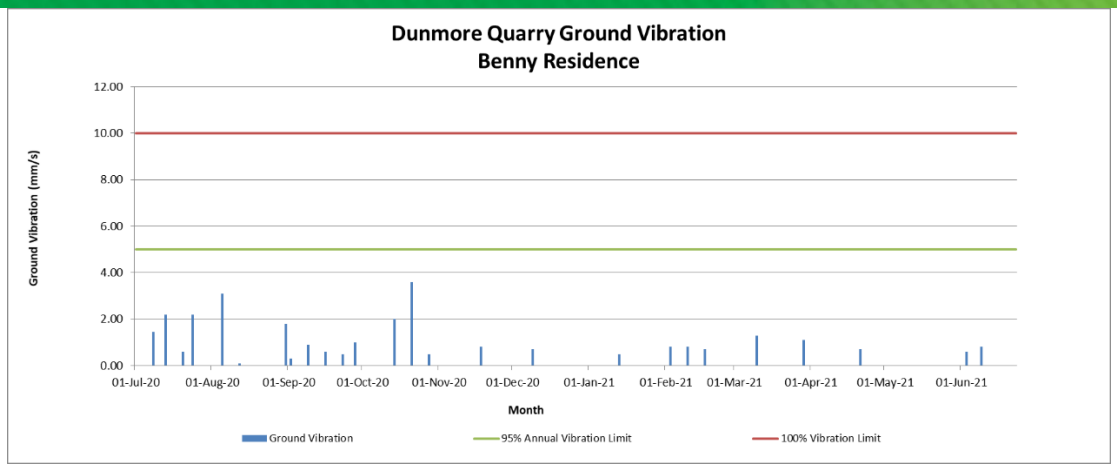

Figure 12 FY21 Ground Vibration Data

There were no blasts above the prescribed limits during the FY21 reporting period.

5.3.3. Blast Monitoring Long Term Analysis and Trends

A visual representation of historical blast monitoring data can be seen below in Figures 13 and 14.

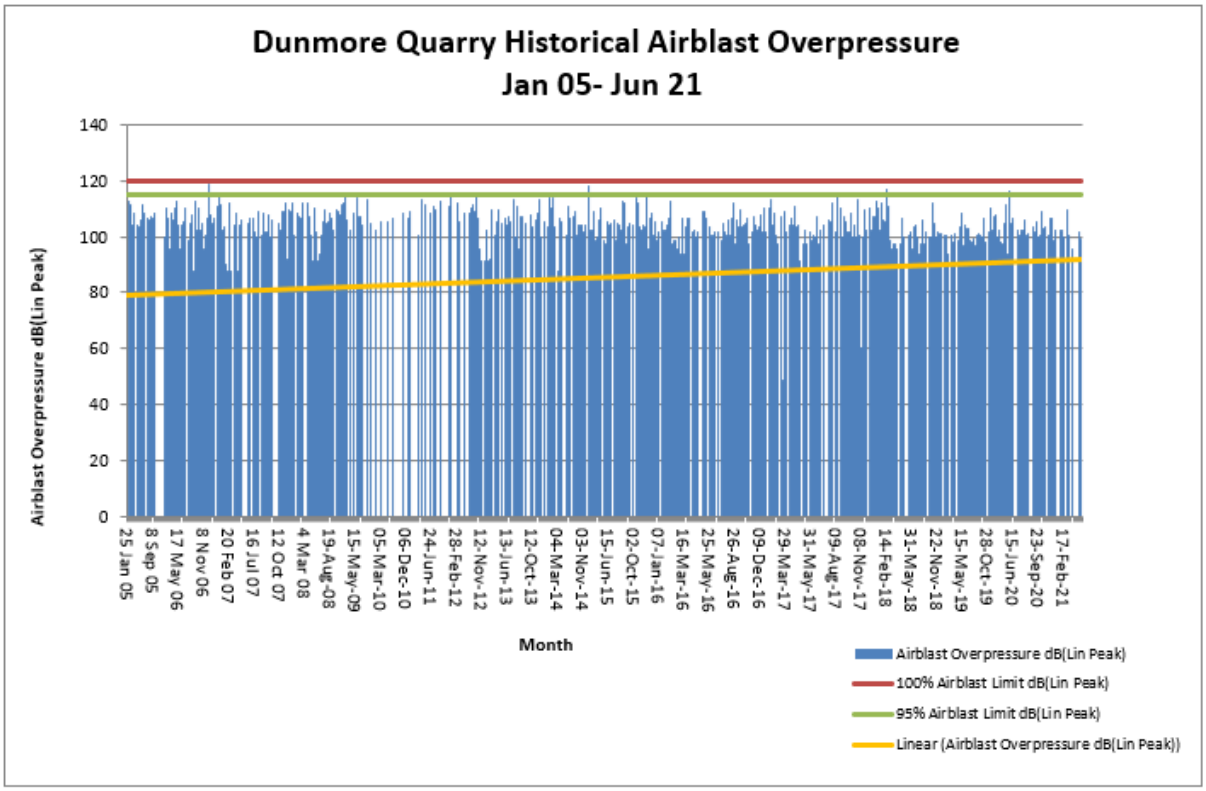

Figure 13 Historical Overpressure Data

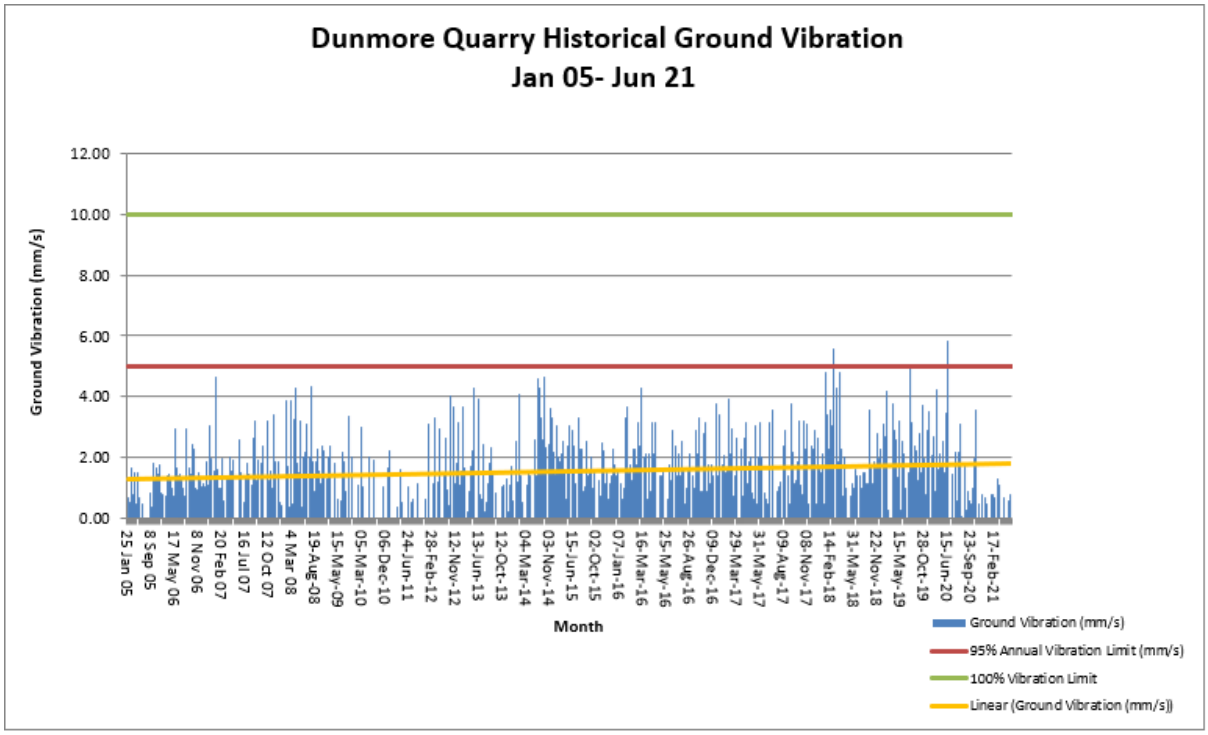

Figure 14 Historical Ground Vibration Data

There has been a steady increase in the measured data at the Benny residence as operations continue westward in the direction of the monitoring point.

5.3.4. Blast Monitoring Summary and Opportunities for Improvement

The blast monitoring equipment was placed on permanent fixings in the FY21 reporting period. The intention of this action was to limit instances where soil properties affected the ground vibration reading on the monitor. Since this has been completed, no elevated readings were recorded for FY21 blasts. There has been a higher instance of blast readings being lower than the sensitivity of the blast measuring equipment, i.e. no trigger conditions.

5.4. Noise Monitoring

Annual Noise Monitoring is undertaken annually in winter to determine quarry contribution to noise at private residences. The current reporting period was the third instance where the new monitoring points were assessed post MOD 9 approval. Monitoring results demonstrated compliance with prescribed assessment criteria during all monitored time periods.

5.4.1. Noise Monitoring Impact Assessment Criteria

S4.C4 outlines the relevant noise assessment criteria to be adopted for the annual monitoring, shown in Table 15 below. The location of these monitoring points are represented by NM-1 to NM-5 as displayed in Figure 15.

Noise monitoring is completed in July each year which typically represents the worst-case meteorological conditions for noise propagation.

Table 15 Noise Monitoring Impact Assessment Criteria

Receiver Location	Noise Limits dB (A)					
	LA_{eq} (15 minute)				LA_{eq} (1 minute)	
	Day (7am - 6pm)	Evening (6pm - 10pm)	Night (10pm - 7am)	Morning Shoulder (6am - 7am)	Night (10pm - 7am)	Morning Shoulder (6am - 7am)
Location K Stocker Residence	49	44	38	47	48	55
Location O Dunmore Lakes	49	44	38	47	48	55
Location J Creagan Residence	Negotiated Agreement in Place					
Location AA	38	38	38	38	45	45
Locations AB and T	36	36	36	36		
Location D, F, G and Z	40	40	40	40		
Location S	37	37	37	37		
Other privately owned residence	35	35	35	35		

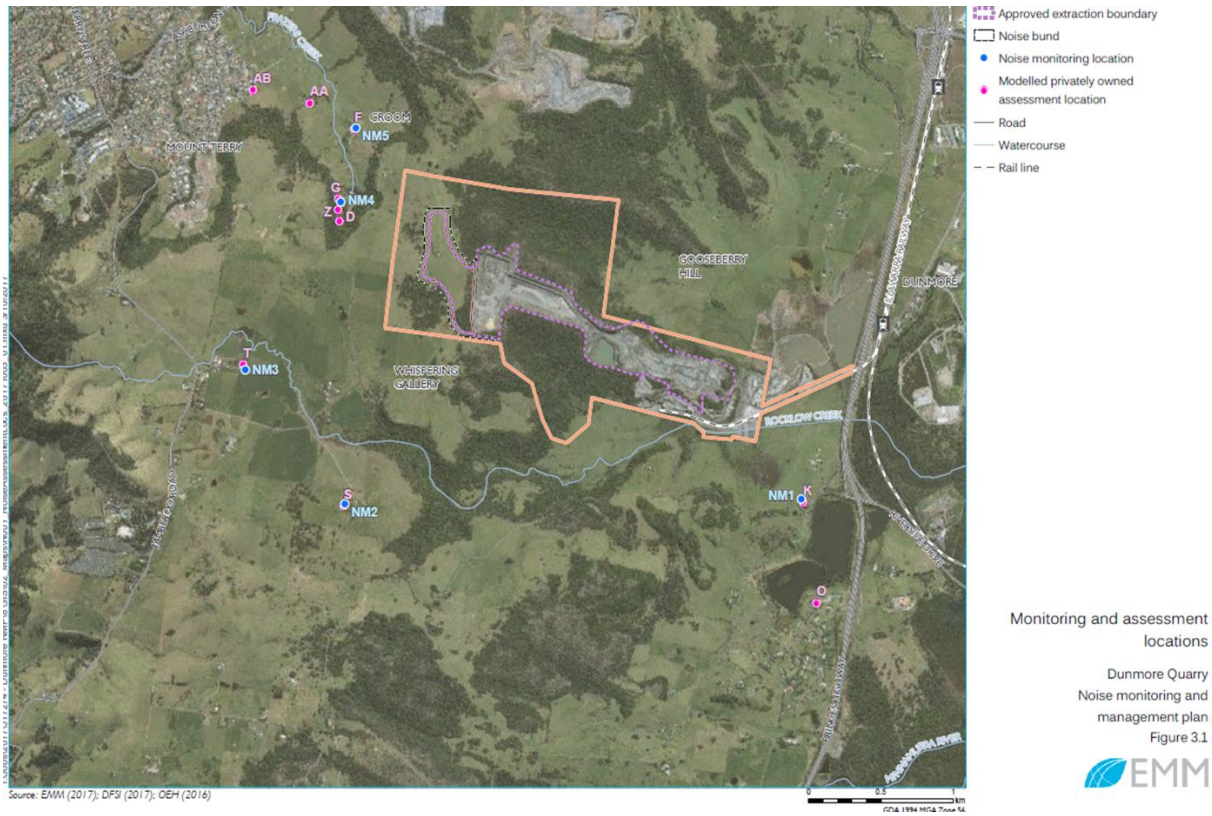

Figure 15 Noise Monitoring Locations

5.4.2. Noise Monitoring FY21 Performance Review

A summary of the attended noise monitoring results against the modelled MOD 9 quarry operations is shown below in Table 16. Noise monitoring is conducted at the end of each calendar year, consistent with previous review periods.

Table 16 Attended noise monitoring results

Post Modification 9 Noise Monitoring Results NM1 (representative of resident K and O)				
	Day	Evening	Morning Shoulder	
Noise	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(1min)}$
Limit	49	44	47	55
Predicted	35	35	35	
2018	40	40	40	50
2019	45	41	47	55
2020	49	44	47	55
Post Modification 9 Noise Monitoring Results NM2 (representative of resident S)				
	Day	Evening	Morning Shoulder	
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(1min)}$
Limit	37	37	37	45
Predicted	35	35	35	
2018	30	30	30	32
2019	33	30	32	40
2020	36	35	37	45
Post Modification 9 Noise Monitoring Results NM3 (representative of resident T)				
	Day	Evening	Morning Shoulder	
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(1min)}$
Limit	36	36	36	45
Predicted	35	35	35	
2018	35	35	35	40
2019	32	30	31	40
2020	35	35	35	45

Post Modification 9 Noise Monitoring Results NM4 (representative of resident G,D,Z)				
	Day	Evening	Morning Shoulder	
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(1min)}$
Limit	40	40	40	45
Predicted	35	35	35	
2018	30	30	30	30
2019	33	30	31	40
2020	35	35	35	45
Post Modification 9 Noise Monitoring Results NM5 (representative of resident F, AA,AB)				
	Day	Evening	Morning Shoulder	
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(1min)}$
Limit	40	40	40	45
Predicted	35	35	35	
2018	30	30	30	30
2019	35	30	34	40
2020	40	35	40	45

During the reporting period monitoring points were denoted as compliant during all time windows. Prior to MOD 9, location K and O (now monitored under NM-1) had been monitored separately. The land Location A was acquired by Boral in 2016 and as such is no longer monitored.

5.4.3. Noise Monitoring Long Term Analysis and Trends

There has only been three years of monitoring under the current monitoring program post MOD 9 operations and over time trends will become more apparent. NM-1 has been monitored for a number of years as part of the previously approved monitoring program. The trends of NM-1 over the last 13 years can be seen below in Figure 16. A summary of the noise monitoring results post MOD 9 can be seen in Figures 17 to 21.

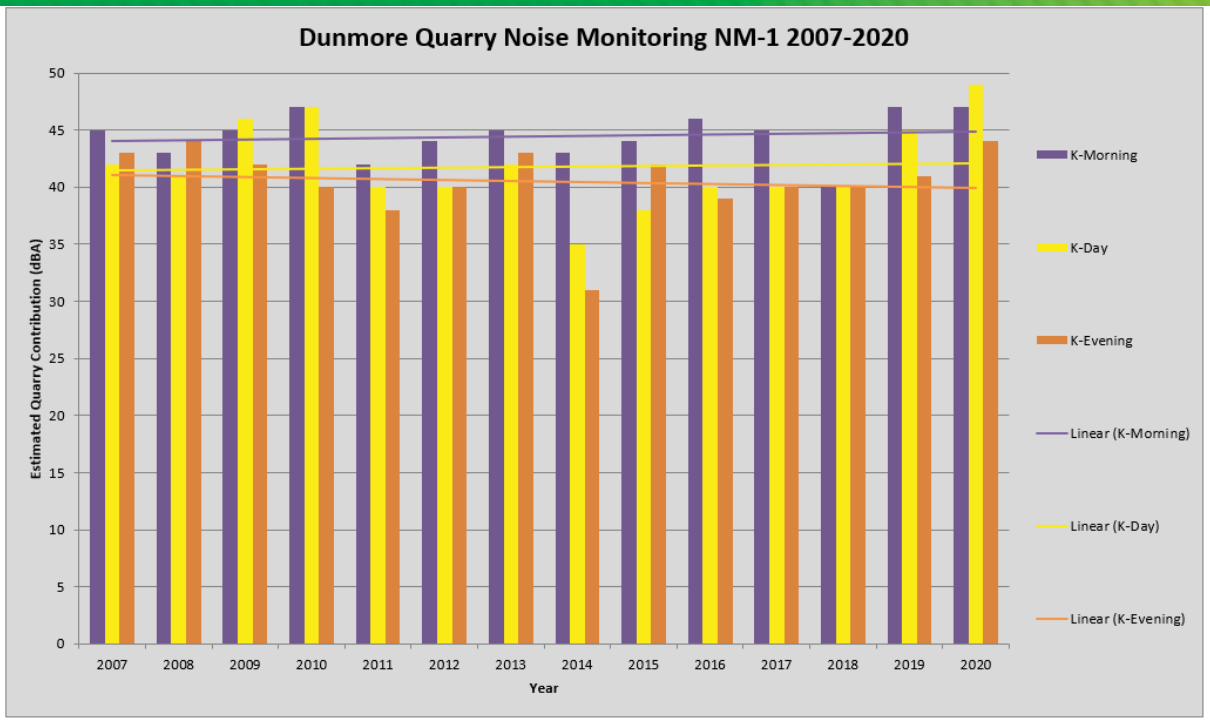

Figure 16 Long term noise monitoring at NM-1 results since 2007

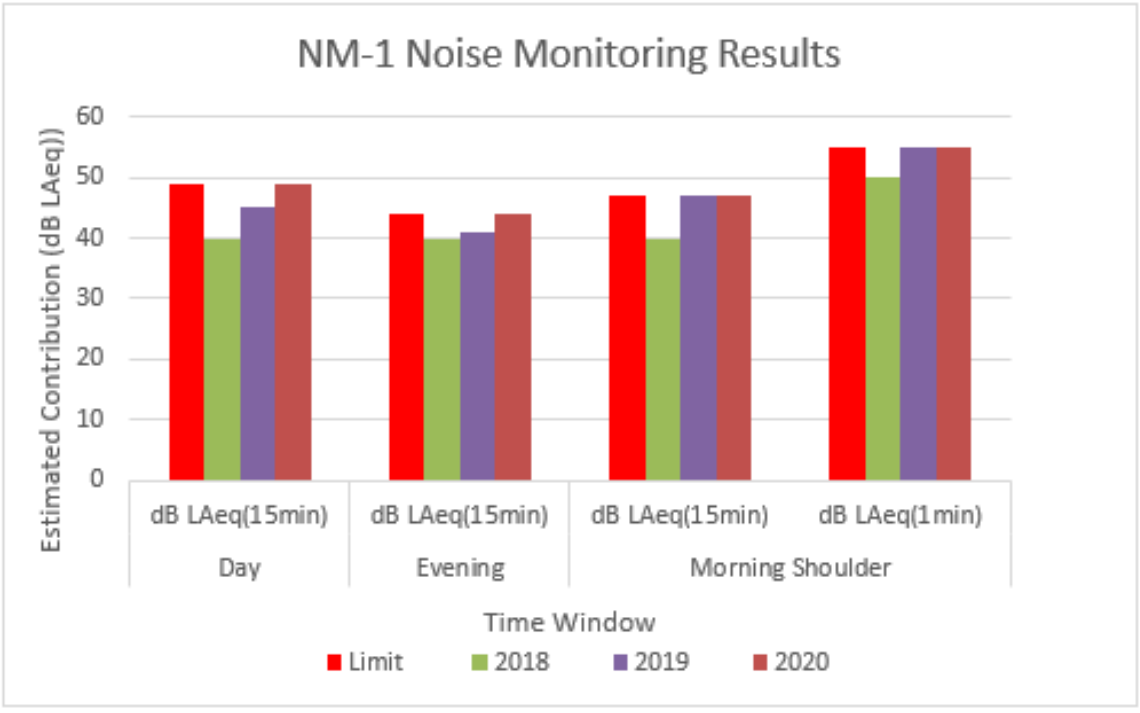

Figure 17 NM-1 Noise monitoring results since MOD-9

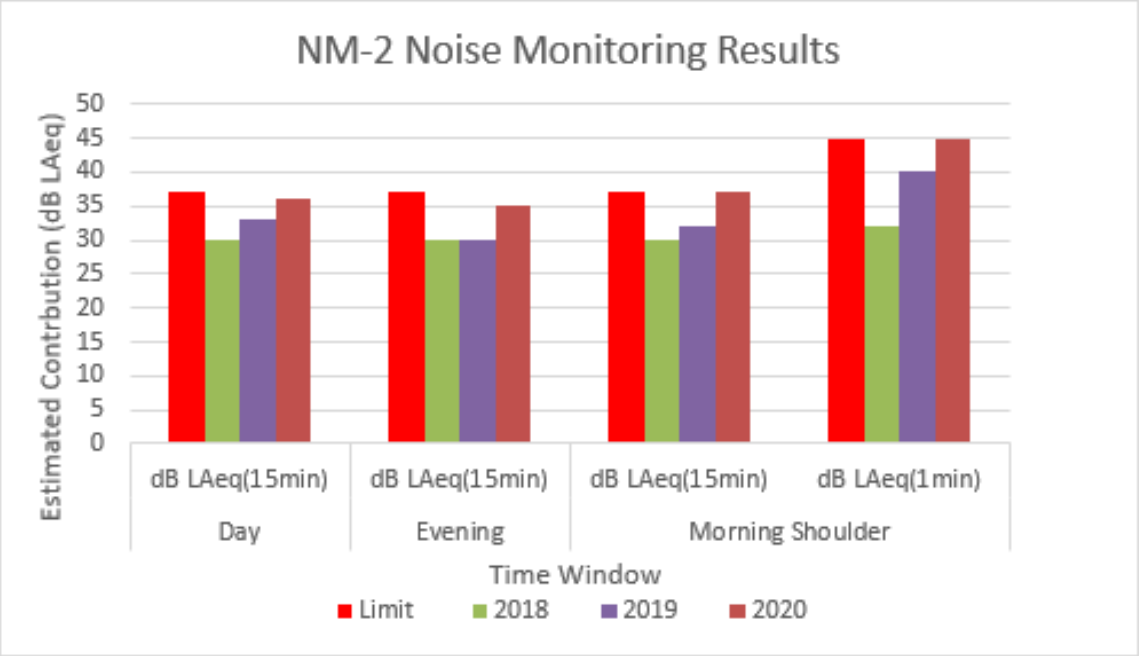

Figure 18 NM-2 Noise monitoring results since MOD-9

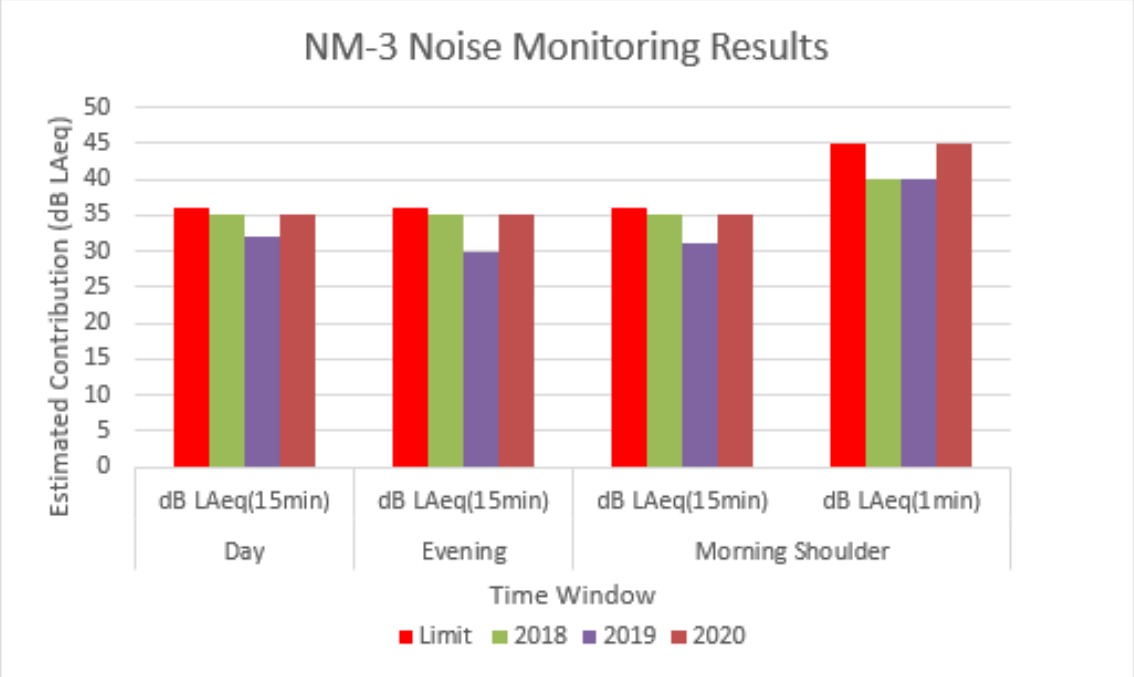

Figure 19 NM-3 Noise monitoring results since MOD-9

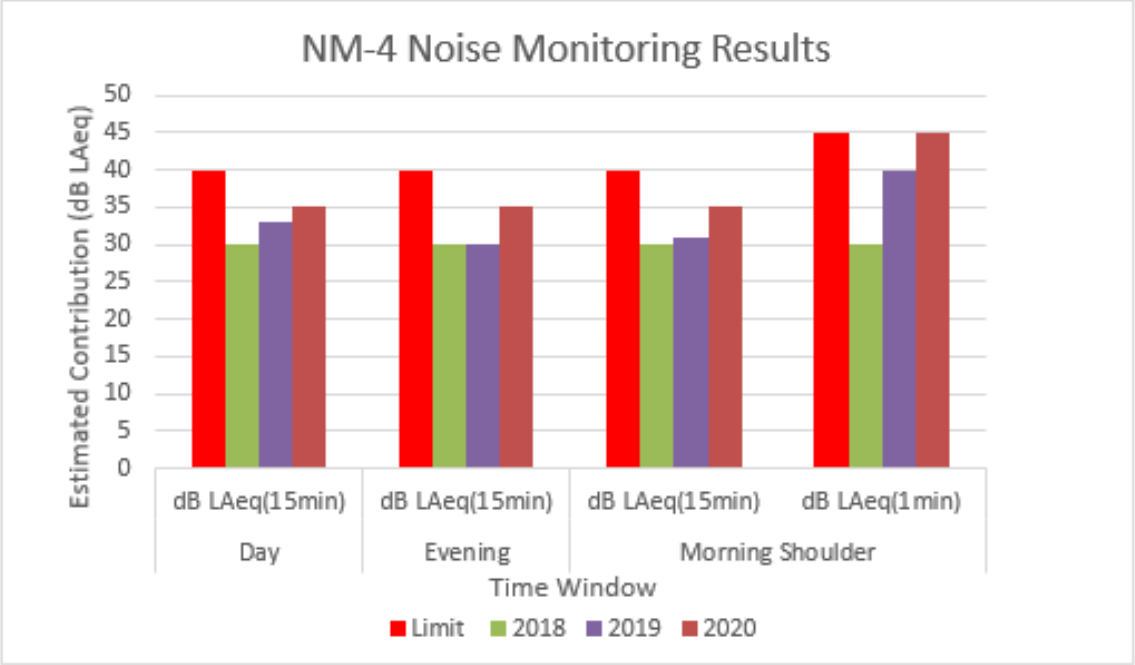

Figure 20 NM-4 Noise monitoring results since MOD-9

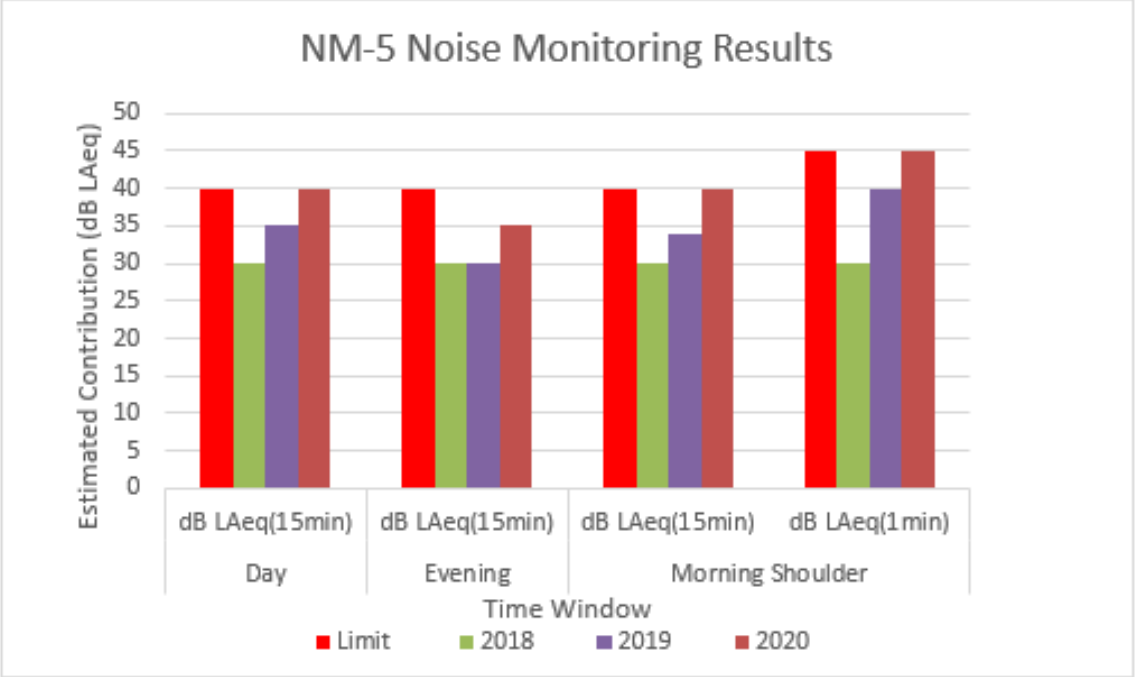

Figure 21 NM-5 Noise monitoring results since MOD-9

Typically noise measurements have decreased or remained stable over time at NM-1. Noise monitoring results at NM-1 to NM-5 were higher than the previous year but within compliance limits.

5.4.4. Noise Monitoring Summary and Opportunities for Improvement

As previously discussed, all monitoring points were measured below relevant limits. Noise monitoring will continue as per previous years. It is expected that as operations move down the pit face that measured noise will decrease for the western monitoring points due to the buffering effect. Access to real time weather data will continue to assist and inform site operations.

5.5. Surface Water Monitoring

An updated Water Management Plan was submitted to the department in the FY21 reporting period. The NRAR has provided comments to the management plan in October 2020. These comments will be addressed in an updated Water Management Plan to be submitted to NRAR for comment. This plan will be updated in the suite of management plan updates in response to the post approval requirements for MOD 12 approved in August 2021.

During the FY21 reporting period, the monitoring and operations follow procedures outlined in the Arcadis Dunmore Quarry Water Management Plan (2016).

During normal operations, the Lower Dam is kept offline to Rocklow Creek however in the case of high rainfall there is potential for floodwaters to back up around the narrow bend of the creek and inundate the Lower Dam, causing it to fill and create a mixing zone with waters from the Lower Dam, compromising its storage capacity. Upgrades to the water management plan detail a range of improvements to prevent such a phenomenon. Note that the water management plan has not yet been finalised (awaiting regulatory approval), Thus, no upgrades are able to be made until the WMP has been formally approved.

Figure 22 outlines the monitoring points for the most recently approved WMP.

Figure 22 Surface water monitoring points

5.5.1. Surface Water Quality Impact Assessment

S4.C28 defers discharge limits to the limits imposed by EPL 77 which states that the site will comply with discharge limits from condition L2.4 and Section 120 of the *POEO Act*. EPL 77 describes discharge limits at the licenced discharge point for controlled discharge at the site via the bio-filtration swale at monitoring location EPL6. Total Suspended Solids must not exceed 50mg/L at this point.

A second discharge point is nominated in EPL 77 for uncontrolled discharge at the spillway at the Lower Dam at monitoring location EPL7. No TSS limits apply for EPL7 as it is a spillway, which only typically discharges if the dam design capacity (designed to hold 90.7mm in 5 days) is exceeded.

Monthly monitoring is undertaken at the Lower Dam at GS-1, GS-2 and GS-3 at Rocklow Creek to determine ambient conditions upstream, in the immediate vicinity of the Lower Dam spillway and downstream respectively.

Monitoring is also undertaken daily during any discharge event via either the licenced discharge mechanism at EPL6, or via uncontrolled discharge via the Lower Dam spillway at EPL7. Upstream and downstream monitoring points at Rocklow Creek at GS3 are also sampled to determine if any impacts to water quality have occurred.

5.5.2. Surface Water Quality FY21 Performance Review

Monthly ambient water quality monitoring of the Lower Dam at GS-4/EPL#8 is shown below in Table 17. For comparison, monitoring points upstream (GS-1) and downstream (GS-2) of the Lower Dam are also shown to indicate the typical water quality along Rocklow Creek. Please note there are no discharge limits applicable to the ambient water quality of the dam as it is offline to Rocklow Creek during normal operations.

Monthly monitoring results at Rocklow Creek indicate the following:

- Ambient conditions upstream of the Lower Dam at GS-1 are generally lower values when compared to the WQOs and discharge limits. Despite this, the area is associated with water bodies that are impacted by active cattle grazing. Cattle tend to stir up water during grazing and are often observed within Rocklow Creek during monthly sampling events, especially during drought conditions.
- Ambient conditions in the vicinity of the mixing zone at GS-2 are typically within discharge limits. Occasional elevations can occur during high intensity flood events. Water levels can be low or dry during extended dry spells/drought.
- Ambient conditions at GS-3 downstream of Rocklow Creek are generally within the discharge parameters with the exception of TSS. This location is sometimes dry and affected by saline tidal inflow as well as being impacted by cattle grazing. During dry periods, water level tends to be quite low. Cattle tend to stir up water during grazing and are often observed within Rocklow Creek during monthly sampling events.

Table 17 Water quality monitoring results at GS-1, GS-4/EPL#8, and GS-2 over the reporting period.

	GS-1 Upstream of Rocklow				EPL#8 Lower Dam			
Month	pH	Turbidity (NTU)	EC (µS/cm)	TSS(mg/L)	pH	Turbidity (NTU)	EC (µS/cm)	TSS(mg/L)
Jul-20	6.9	1.3	483	3	8	65	881	24
Aug-20	8.3	301	415	0.1	7.9	26	687	20
Sep-20	6.9	1.9	358	4	8	40	685	19
Oct-20	7.5	3.4	392	12	8.1	19	729	20
Nov-20	6.7	1.6	412	7	8.2	28	704	24
Dec-20	6.9	7.8	425	13	8.2	65	668	38
Jan-21	6.9	2.8	400	0.1	8.4	40	623	38
Feb-21	7.4	2	387	5	7.8	60	597	47
Mar-21	7	8.7	332	10	8.1	220	550	148
Apr-21	6.7	2.9	335	11	8.1	55	632	36
May-21	6.8	3.5	333	7.6	8	70	596	48
Jun-21	7.4	1.7	386	2	7.9	60	578	27
FY21 Av	7.1	28.2	388.2	6.2	8.1	62.3	660.8	40.8

	GS-2 Downstream of Rocklow Mixing Zone				GS-3 Downstream of Rocklow at Property Boundary			
Month	pH	Turbidity (NTU)	EC (µS/cm)	TSS(mg/L)	pH	Turbidity (NTU)	EC (µS/cm)	TSS(mg/L)
Jul-20	7.4	7.3	810	8	7.1	624	6	5.9
Aug-20	7.4	6.9	396	4	8	515	10	3.4
Sep-20	7.3	130	657	128	7.6	559	18	7.8
Oct-20	7.5	11	603	18	\	\	\	\
Nov-20	\	\	\	\	7.3	523	20	7.3
Dec-20	7	12	640	20	\	\	\	\
Jan-21	6.8	45	496	85	7	571	76	34
Feb-21	7	75	527	148	7.2	481	27	8.6
Mar-21	7.6	120	581	90	7.1	462	5	13
Apr-21	7.1	7.4	503	32	7.1	468	16	12
May-21	7.6	19	604	30	7.2	422	30	20
Jun-21	7.7	65	940	48	7.1	453	12	13
FY21 Av	7.3	45.3	614.3	55.5	7.3	507.8	22.0	12.5

There were four major rain events in the reporting period which led to discharge from the Lower Dam via the spillway at EPL7. These events include:

- 214mm between 26 and 28 July 2020
- 179mm between 7 and 10 August 2020
- 215mm between 19 and 23 March 2021
- 186mm between 5 and 7 May 2021

These events were outside the dam design capacity, which are designed to hold a 95th percentile 5-day rainfall event (90.7mm). During instances where sampling points were inaccessible due to site flooding, sampling was delayed due to safety and access concerns and the EPA were notified and satisfied with the arrangements.

The results of wet weather discharge monitoring over the reporting period is summarised in Table 18.

Table 18 Wet Weather Discharge Monitoring

Sample	Date	pH	Turbidity (NTU)	Conductivity (µS/cm)	TSS (mg/L)
GS-1	29/07/2020	7	13	229	3
EPL#7	29/07/2020	7.1	39	258	10
GS-2	29/07/2020	7.4	45	292	14
GS-3	29/07/2020	6.7	11	222	6
GS-1	11/08/2020	7.41	9.5	228	<5
EPL#7	11/08/2020	7.44	20	251	8
GS-2	11/08/2020	7.44	33.8	304	15
GS-3	11/08/2020	7.50	11.8	230	5
GS-1	12/08/2020	7.64	7.4	233	<5
EPL#7	12/08/2020	7.49	18.1	280	18.1
GS-2	12/08/2020	7.62	24	302	24
GS-3	12/08/2020	7.42	9.4	236	<5
GS-1	13/08/2020	7.27	6.4	258	6
EPL#7	13/08/2020	7.23	13.7	300	8
GS-2	13/08/2020	7.32	16.9	317	12
GS-3	13/08/2020	7.40	9	276	9
GS-1	14/08/2020	7.18	7.4	305	7
EPL#7	14/08/2020	7.92	41.1	493	15
GS-2	14/08/2020	7.33	15.3	381	6
GS-3	14/08/2020	7.08	6.5	322	<5

Sample	Date	pH	Turbidity (NTU)	Conductivity (µS/cm)	TSS (mg/L)
GS-1	15/08/2020	6.9	5.8	307	6
EPL#7	15/08/2020	7	20.1	371	12
GS-2	15/08/2020	7.1	10.3	403	6
GS-3	15/08/2020	6.9	5.4	319	9
GS-1	24/03/2021	7	8.3	212	10
EPL#7	24/03/2021	7.4	200	316	125
GS-2	24/03/2021	7.1	130	334	88
GS-3	24/03/2021	6.8	12	184	3
GS-1	25/03/2021	7	8.3	239	4
EPL#7	25/03/2021	7.6	170	420	120
GS-2	25/03/2021	7.7	95	476	74
GS-3	25/03/2021	7.0	2.7	403	5
GS-1	06/05/2021	6.9	15	378	11
EPL#7	06/05/2021	7.9	280	484	192
GS-2	06/05/2021	7.9	95	507	58
GS-3	06/05/2021	7.1	20	422	22
GS-1	08/05/2021	6.9	13	208	5
EPL#7	08/05/2021	8	160	374	179
GS-2	08/05/2021	7.8	400	397	300
GS-3	08/05/2021	6.7	15	191	10

Note: Those numbers highlighted in red represent an exceedance of the relevant criteria.

Recorded pH was within the discharge limits of 6.5-8.5 at EPL#7 for all samples collected during the high rainfall event.

Recorded TSS was above 50mg/L during sampling collected in March and May 2021 at EPL#7 as indicated in Table 18. As noted above all five flood events were well above the dam holding capacity of 90.7mm causing discharge via the designed spillway. The spillway is designed with gabion rock and riparian zone reeds in the immediate vicinity. Downstream water levels at GS-3 were similar to upstream levels during all spillway discharge events. **No breach of consent condition occurred as the rainfall event was outside of the design capacity of the dam as denoted by S4.C30.**

5.5.3. Surface Water Long Term Analysis and Trends

The Lower Dam (GS-4/EPL#8) ambient water quality for FY21 was below average for TSS and turbidity and relatively consistent for pH. Conductivity was slightly higher for FY21 than the overall average. The increase in conductivity is likely due to the dry conditions experienced throughout the year where evaporation was typically greater than rainfall. These trends are visible in Figures 23 to Figure 26 below.

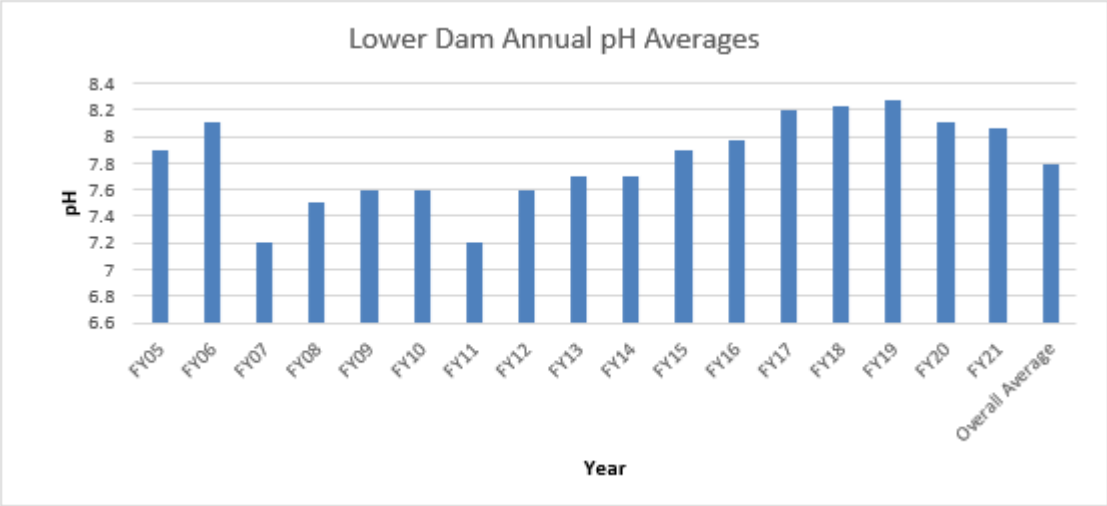

Figure 23 Lower Dam Annual pH Averages

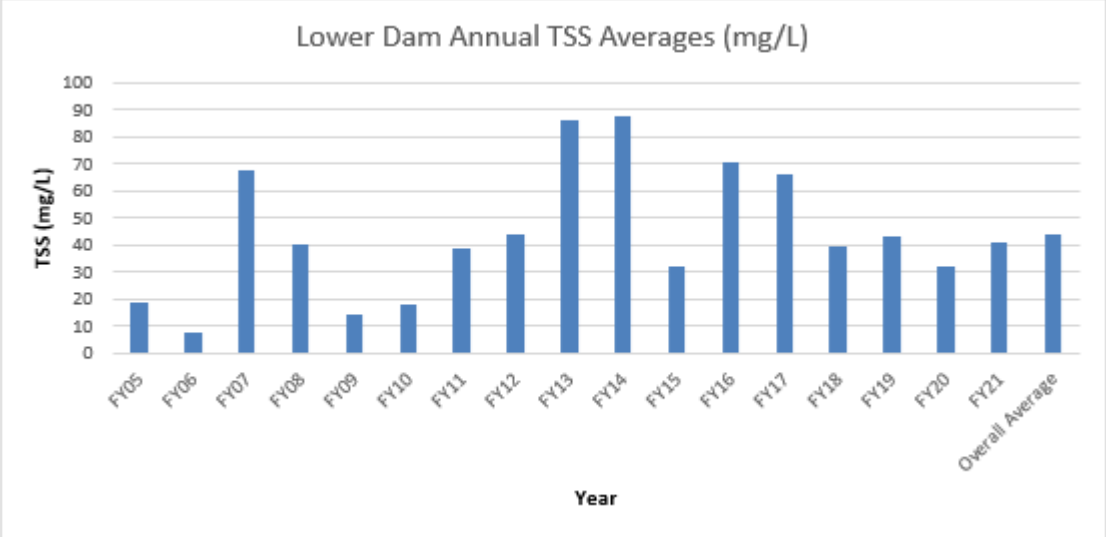

Figure 24 Lower Dam Annual TSS Averages

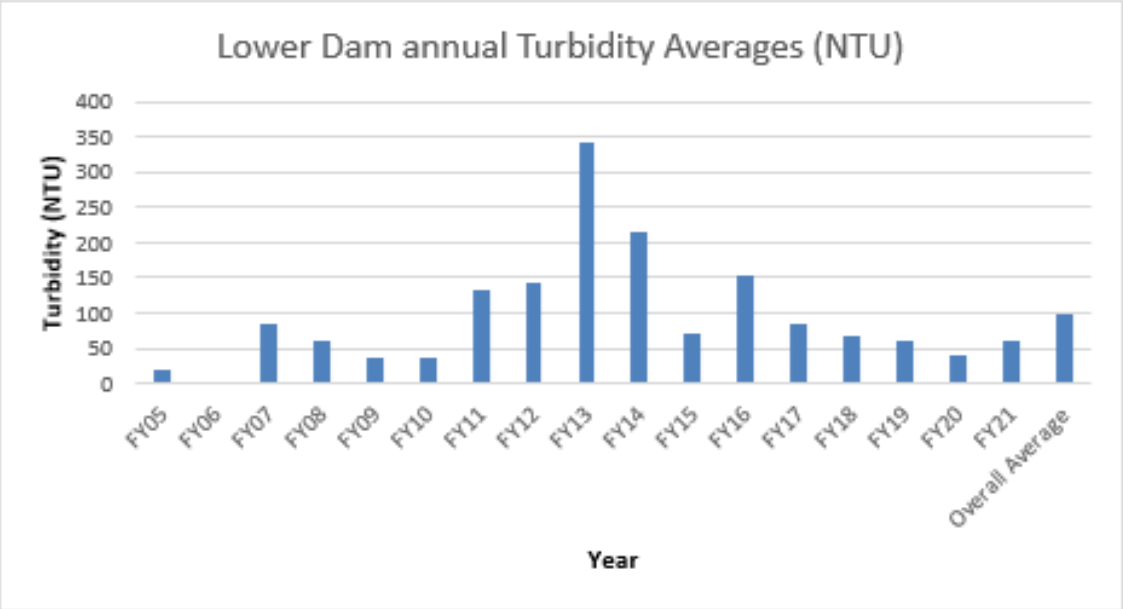

Figure 25 Lower Dam Annual Turbidity Averages

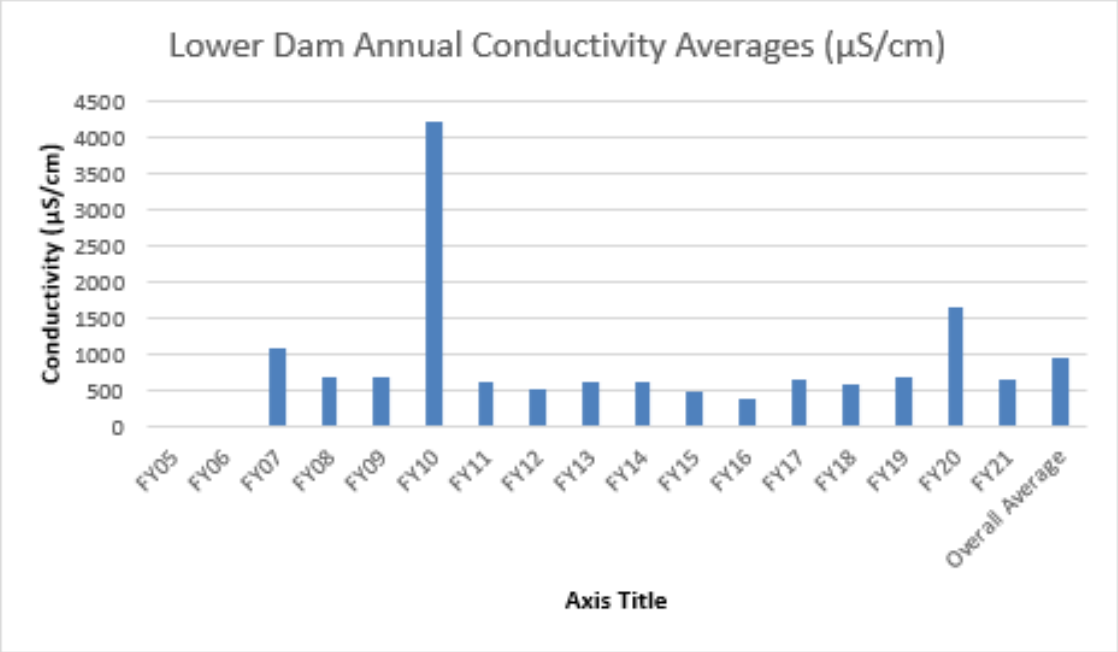

Figure 26 Lower Dam Annual Conductivity Averages

5.5.4. Water Balance and Consumption

The majority of surface water runoff from the quarry is captured in the sites' water management dams. Captured surface water runoff is either used as process water within the quarry operations (e.g. for dust suppression), lost to evaporation or seepage, or discharged to receiving waters.

The quarry is licenced to take surface water from Rocklow Creek. This allocation, under WAL#25152, is 227ML/year and is extracted via a 100mm centrifugal pump. **No water take was initiated from Rocklow Creek during the reporting period**. NRAR has delayed rollout of new metering framework for non-urban water take for coastal regions until 1 December 2023 for pumps below 500 mm.

All process water was sourced by either the Lower Dam, Middle Dam or Croome Sumps, which are offline from Rocklow Creek as per water management upgrades undertaken in 2008 under MOD 4. The Location of water storage infrastructure is shown below in Figure 27.

Figure 27 Water Storage Locations

The updated WMP outlines a range of water balance scenarios based on different climate conditions. The wet year scenarios (90th percentile 1,658mm rainfall) best reflects rainfall for the FY21 period (annual rainfall was 1,556mm) as shown in Figure 28. As a result, the process water use was modelled to be 176ML for the reporting period with a change of storage of +137ML over the year within the three dam storages.

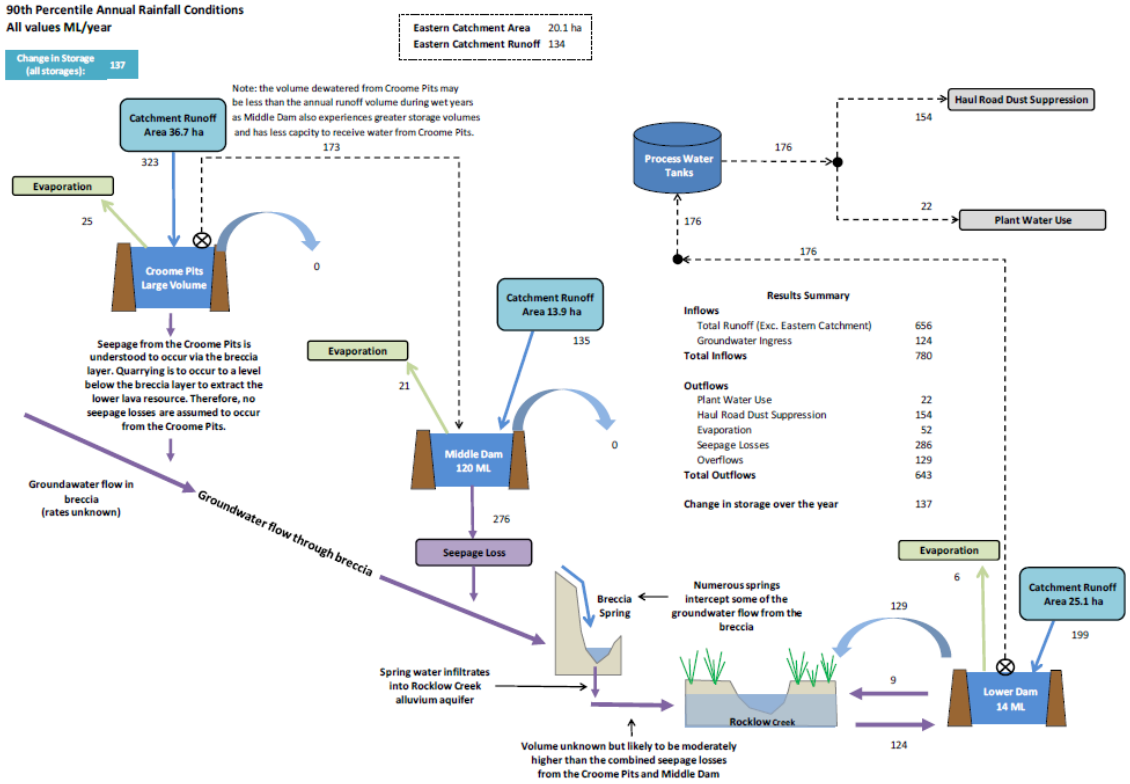

Figure 4.8 Existing water management system: typical wet year results

Figure 28 Existing water management system: typical wet year water balance

5.5.5. Surface Water Quality Summary and Opportunities for Improvement

A new water management system was devised as part of the MOD 9 Surface Water Assessment where a number of improvements were proposed. It is a requirement of S4C35A that the Lower Dam is not altered until approval of the Lower Dam Transition Plan is obtained. The improvements to the water management system outlined in the updated WMP will reduce the instances where Rocklow Creek inundates the Lower Dam causing it to fill up. A summary of these improvements is reproduced in Table 19 below and will be addressed in the updated WMP.

Table 19 Proposed Water Management System Improvements

Proposed Modification	Outcome
Relocate spillway to south-east side of the dam where Rocklow Creek levels are expected to be lower during large runoff events. Relocate primary sedimentation chamber to western end of dam. Raise embankment at existing spillway location from 2.8 to 4.0 m AHD.	• Significantly reduce the frequency of uncontrolled inflows from Rocklow Creek inundating the Lower Dam. • Improve water treatment function of Lower Dam during Rocklow Creek flood events. • Inflows will occur at the opposite end of the dam to outflows, resulting in longer residence time and improved sediment treatment function. • Provide vehicle access to primary sedimentation chamber to allow for sediment removal as required.

Extend the dam footprint to the east by approximately 1,600m2 and excavate to 2.0 m AHD.	• Provide an additional 1.1 ML of storage above 2.0 m AHD. • Establish a macrophyte zone near the dam outlet.
The relocated spillway will have an invert level of 3.1 m AHD1, which will be 300 mm higher than the existing level (2.8 m AHD).	• Reduce the frequency of Rocklow Creek floodwaters inundating the Lower Dam. • Provide an additional 2.0 ML of storage above 2.0 m AHD.
Establish macrophyte zone within extended dam footprint area.	• Provide beneficial water quality treatment during significant rainfall (discharge) events.

5.6. Ground Water Monitoring

An annual groundwater monitoring report has been prepared by EMM Consulting Pty Ltd, in accordance with condition 44C. This report is included in full within Appendix E. The monitoring program uses the established down gradient bores at Dunmore Sand and Soil (DG-31, DG-59 and BH-F) and three established up gradient bores at Dunmore Quarry (GW-1, GW-2 and GW-3). Location of Groundwater monitoring bores are shown below in Figure 29.

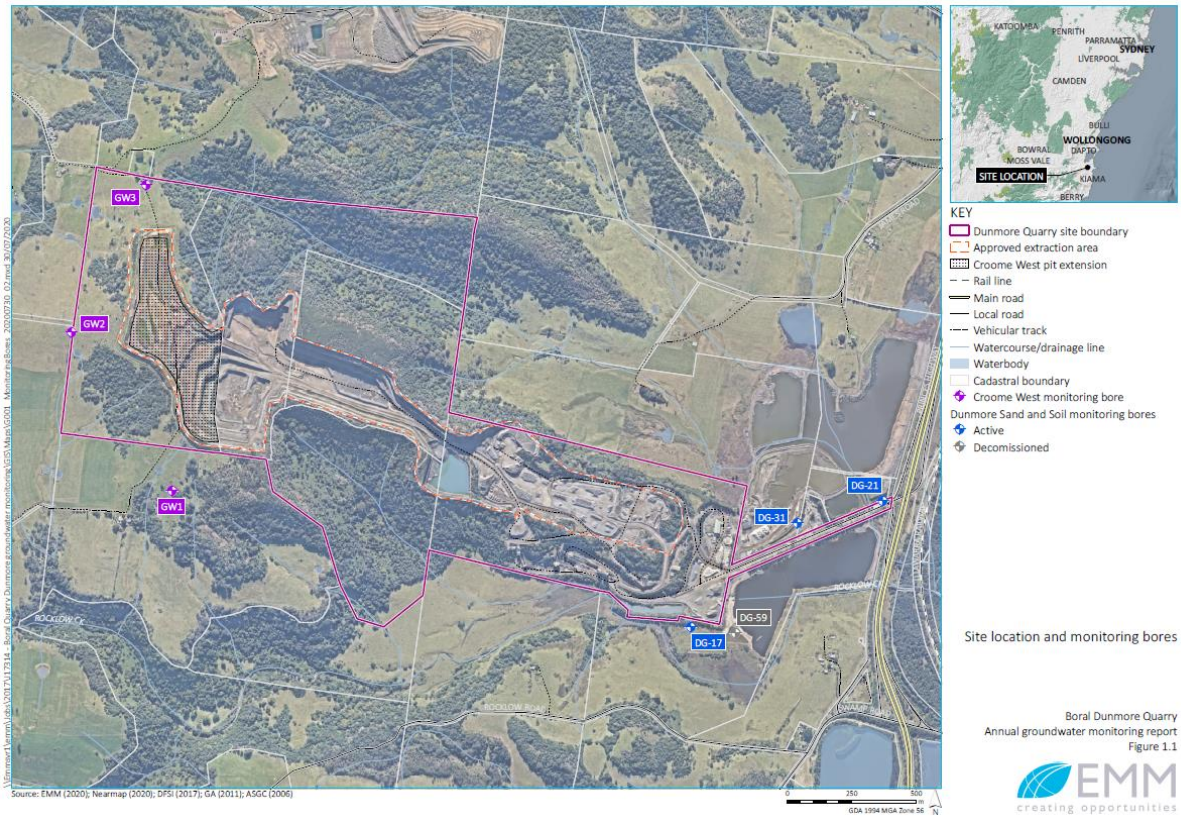

Figure 29 Groundwater Monitoring Bores

The monitoring bores are located up hydraulic gradient from current quarrying activities and are therefore considered representative of baseline conditions (both water levels and quality). Groundwater monitoring for the up-gradient bores includes six-hourly groundwater level measurements and six monthly groundwater sampling events

5.6.1. Groundwater Monitoring Impact Assessment Criteria

Groundwater impacts relating to quality and water levels downgradient are assessed in relation to the up-gradient (baseline) conditions located in bores GW-1, GW-2 and GW-3 and

against the site conceptual model which was formulated as part of the MOD 9 Croome West Expansion.

5.6.2. Groundwater Monitoring FY21 Performance Review

Groundwater levels are recorded every six-hours allowing water level trends to be identified in the alluvium and the Bumbo Latite. Continued six monthly sampling of water quality at the Croome West sites and quarterly sampling at the DSS sites has also established useful trends.

The main findings for the FY21 monitoring year regarding water levels are:

- Groundwater levels in the alluvium (DG-17, DG-31 and DG-21) are comparable to previous monitoring events and are generally less than 3 metres below ground level (mbgl). The shallow alluvium shows a direct and immediate response to rainfall at DG-17 and DG-31. The groundwater level at DG-21 does not respond to rainfall recharge.
- There is an increasing trend in groundwater levels at DG-31 and DG-17 from February 2020 onwards, which reflects the above average rainfall conditions observed for the period and likely increases in aquifer storage.
- The groundwater level at GW1 has historically shown a direct response to rainfall recharge during periods of above average rainfall. Comparatively, GW2 and GW3 show little to no response to rainfall.
- Groundwater quality data collected during the FY21 monitoring year was generally consistent with previous years. The exception was for June 2021 concerning total phosphorus result at GW1, which had increased, but was still within historical observations. Groundwater at this location is marginal to brackish, with a neutral to slightly alkaline pH.
- The dissolved metal results were comparable to previous sampling results. Iron was typically higher in the alluvial groundwater and manganese was typically higher at the Latite monitoring bores GW1 and GW2.
- Nitrate results at GW3 continue to be an order of magnitude higher than the other Latite and alluvial bores, which could be related to the Breccia layer. Total phosphorus results continue to be an order of magnitude higher at DG-17 compared to the other alluvial and Latite bores.

The results for the FY21 monitoring year are consistent with the conceptual model for the project. There does not appear to be any impact on groundwater levels or quality in the Bumbo Latite or Kiama Sandstone associated with the Croome West pit extension activities.

5.6.3. Groundwater Monitoring Summary and Opportunities for Improvement

As per S4.C43: *on the provision of two years of monitoring data that shows negligible impact on the regional groundwater network the Secretary may agree to suspend monitoring of regional groundwater levels and/or quality.* The two-year groundwater monitoring period has shown negligible impact to the monitored groundwater system.

However, in the interest of collecting additional groundwater site data and continuing groundwater monitoring whilst Boral are still continuing extraction in the Croome West pit, it is proposed to continue with the current monitoring regime at the quarry.

5.7. Flora and Fauna Management and Rehabilitation

Most areas of the site are currently operational and as such rehabilitation is not able to commence on the majority of areas within the quarry until the completion of extraction activities. When practical, progressive rehabilitation of the site will be undertaken in conjunction with on-going quarrying works. Hydroseeding of the Croome West Bund is now well established with trees as shown below in Figure 30.

Figure 30 Hydroseeding cover and trees over Croome West Bund

Rehabilitation activities undertaken to date have been in accordance with the updated Flora and Fauna Management by EMM (2019) and Rehabilitation Management Plan prepared by Arcadis (2016).

There are three (3) designated conservation areas for Dunmore Quarry as shown in Figure 31 below. These areas are referred to as the Compensatory Habitat Area (CHA), Remnant Vegetation Conservation Area (RCVA), and Offset Area (OA). Works in the last reporting period focussed on the CHA and OA and are summarised in the Annual Monitoring report located in Appendix E.

In the last 12 months, rehabilitation within the quarry itself has continued on the Croome West amenity bund. Hydro-seeding took place in the northern section of the bund in 2018 and 2019 with more infill seeding to occur during the next reporting period.

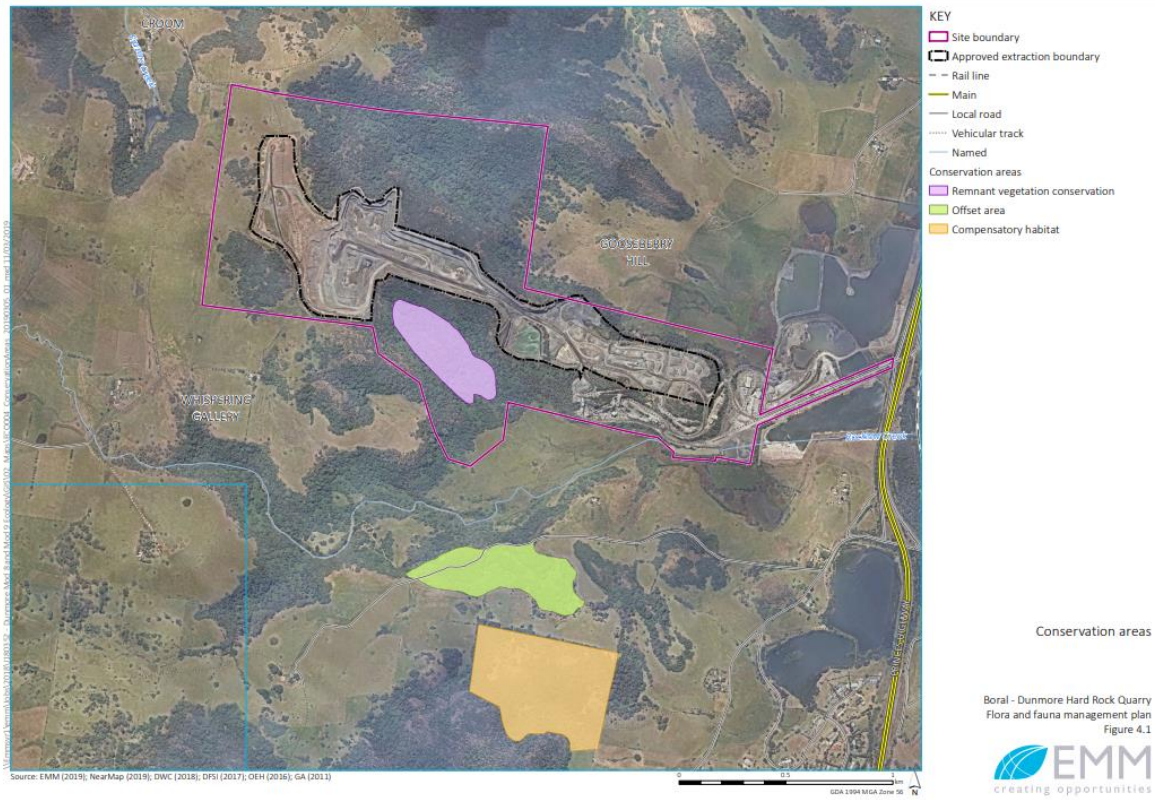

Figure 31 Conservation Areas

5.7.1. Flora and Fauna Impact and Rehabilitation Assessment Criteria

Completion criteria were designed in the updates to the FFMP, which was approved June 2019.

The following completion criteria are outlined for the Compensatory Habitat Area (CHA):

- establishment of a dominant native canopy cover across the Compensatory Habitat Area, as per below:
  - midstory canopy cover of 50% for areas of Melaleuca Armillaris Tall Shrubland; and
  - overstory canopy cover of 15% for areas of Illawarra Lowlands Grassy Woodland;
- removal of woody weeds across the Compensatory Habitat Area; and
- reduction in exotic groundcover to less than 30% over five consecutive monitoring periods.

Once these completion criteria have been met, no further management of this area is required under this FFMP and Conditions 46(a) and 49 are deemed to have been satisfied.

The following completion criteria are outlined for the Remnant Vegetation Conservation Area (RCVA):

- maintenance of high-quality intact remnants, with no significant change in cover of native species;
- establishment of a dominant native canopy cover of 15% in the lower (south-eastern) portion of the Remnant Vegetation Conservation Area; and

- Establishment of a predominantly native (>50%) groundcover, with maintenance of this native groundcover over five consecutive monitoring periods.

Once these completion criteria have been met, no further management of this area is required under this FFMP, and Conditions 46(b) and 50 are deemed to have been satisfied.

There are no completion criteria set for the Offset Area (OA) as the area is managed via an in-perpetuity arrangement via a Conservation Agreement. A Conservation Agreement between the Minister administering the *National Parks and Wildlife Act (1974)* and Boral Resources for Dunmore Quarry was signed by NSW Minister for the Environment on February 2011. The NSW Minister for the Environment confirmed signing the Dunmore Quarry Conservation Agreement and acknowledged that the Conservation Agreement satisfied condition 46A of DA 470-11-2003, for the long term security of the Offset Area.

5.7.2. Flora and Fauna and Rehabilitation FY21 Performance Review

A summary of the bushland regeneration works undertaken within the three active bushland restoration zones is outlined in Bushland Restoration Project Final Report contained in Appendix F.

5.7.2.1. Zone 1 Remnant Vegetation Conservation Area

Works within the RVCA zone consisted of primary weed control activities targeting woody weeds throughout the established approximately 15 year old revegetation. Large amounts of Wild Tobacco and Lantana were dominating the revegetation areas on the southern side of the creek, while encroachment of Kikuyu was impacting the plantings on the northern side of the creek. A total of 25,000m² of primary weed control was carried out within this zone.

Infill planting was scheduled for this zone, but the fencing has fallen into disrepair. Cattle have accessed this site on a number of occasions. The hardwood stakes installed to monitor the photo points were removed and lost. A fencing contractor has been engaged to repair the fences to this area.

Table 20 RVCA1 vegetation condition summary

Photo Point	**RVCA1**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Melaleuca armillaris* *Acacia maidenii*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Solanum mauritianum**	20% native cover 80% weed cover	0% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Ulex europaes**	0% native cover 100% weed cover	0% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Lantana camara** *Bidens pilosa** *Pellaea falcata*	60% native cover 30% weed cover	70% native cover 30% weed cover

Zone 1 Photographs

RVCA1 Photo point prior to primary weed control November 2019 (photo point marker was removed)

Similar area after primary weed control, September 2020

Figure 32 Photomontage of vegetation condition at RVCA1

Table 21 RVCA2 vegetation condition summary

Photo Point	RVCA2		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Melaleuca armillaris* *Acacia maidenii*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Solanum mauritianum**	20% native cover 80% weed cover	0% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Ulex europaes**	0% native cover 100% weed cover	0% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Lantana camara** *Bidens pilosa** *Pellaea falcata*	60% native cover 30% weed cover	70% native cover 30% weed cover

RVCA2 Photo point prior to primary weed control November 2019 (photo point marker was removed)

Similar area after primary weed control, September 2021

Figure 33 Photomontage of vegetation condition at RVCA2

5.7.2.2. Zone 2 Offset Area

The contract period bush regeneration works for the OA focused on secondary and primary weed control within the woodland remnants and the rainforest ecotone at the eastern extent of this zone. Rainfall has been adequate this year compared to last year and regeneration of weeds and natives has become more widespread. Mass regeneration of rainforest pioneer species has been a positive sign and several additional local native plants have appeared within this area over this past 12 months.

Extensive primary weed control was carried out at the eastern extent of this zone during this contract period. Additional populations of the threatened plant species White Wax Flower (*Cynanchum elegans*) were located within the ecotone between the rainforest and woodland remnants. Mass regeneration of Illawarra Zieria (*Zieria granulata*) has been observed within some areas and *Homalanthus stillingiifolius* has emerged within the site having not been previously recorded.

Table 22 Zone 2a vegetation condition summary

Zone 2a: Melaleuca armillaris Tall Shrubland

Photo Point	**A1, A3**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Melaleuca armillaris* *Eucalyptus tereticornis*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Zieria granulata* *Dodonea viscosa* *Olea europaea* subsp. *cuspidate**	80% native cover 20% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Indigofera australis* *Leucopogon juniperinus*	30% native cover 70% weed cover	100% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Lantana camara** *Bidens pilosa** *Tagetes minuta**	40% native cover 60% weed cover	95% native cover 5% weed cover

indicates exotic plant species

Zone 2 Photographs

A1 Photo point prior to commencement of works in 2017

A1 Photo point after primary weed control and maintenance, September 2021

A3 Photo point prior to commencement of works in 2017

A3 Photo point after primary weed control and maintenance, September 2021

Figure 34 Photomontage of vegetation condition at Zone 2a

Table 23 Zone 2c vegetation condition summary

Zone 2c: Illawarra Grassy Woodland

Photo Point	**A2**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Melaleuca armillaris* *Eucalyptus tereticornis*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Notolea venosa* *Dodonea viscose* *Acaica maidenii* *Olea europaea* subsp. *cuspidata**	80% native cover 20% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Indigofera australis*	30% native cover 70% weed cover	100% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Lantana camara** *Bidens pilosa** *Tagetes minuta**	40% native cover 60% weed cover	80% native cover 20% weed cover

[k] indicates exotic plant species

A2 Photo point prior to commencement of works in 2017

A2 Photo point after primary weed control and maintenance, September 2021

Figure 35 Photomontage of vegetation condition at Zone 2c

5.7.2.3. Zone 3 Compensatory Habitat Area

The CHA zone is located south of Rocklow Road and consists of a large bushland remnant on a hilltop with a small ephemeral creek line within a gully to the south of the hill. The total site area of this zone covers approximately 23.1 hectares. The majority of this zone is perched on the rocky hillside and supports the *Melalecua armillaris* tall shrubland vegetation community. The gully drops at the southern end of the zone, which is well defined by the presence of rainforest species and some very impressive land large Moreton Bay Fig (*Ficus macrophylla*) trees.

Extensive revegetation has been carried out within this zone within the southern gully and on the eastern and western edges of the zone. Hundreds of thousands of trees have been planted within this zone and are now reaching maturity. Many open areas that have been cleared of vegetation also exist within this zone with the majority of these clearings occurring on the rocky hill tops.

Works within this zone have focused on treating woody weeds within the establishing revegetation along the western boundary if the zone.

Table 24 Zone 3a vegetation condition summary

Photo Point	**3A**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of revegatation *Melaleuca armillaris* *Eucalyptus saligna* *Acacia maidenii*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Hakea salicifolia* *Dodonea viscosa* *Glochidion ferdinandi*	100% native cover 0% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Solanum mauritianum**	100% native cover 0% weed cover	0% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Sida rhombifolia** *Bidens pilosa** *Sigesbeckia orientalis*	40% native cover 60% weed cover	80% native cover 20% weed cover

3A Photo point prior to commencement of works

The same view after primary and secondary weed control works, September 2021

Figure 36 Photomontage of vegetation condition at Zone 3a

Table 25 Zone 3b vegetation condition summary

Photo Point	**3B**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of revegatation *Melaleuca armillaris* *Eucalyptus saligna* *Acacia maidenii*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Hakea salicifolia* *Dodonea viscosa* *Glochidion ferdinandi*	100% native cover 0% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Solanum mauritianum**	100% native cover 0% weed cover	0% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Sida rhombifolia** *Bidens pilosa** *Sigesbeckia orientalis*	40% native cover 60% weed cover	80% native cover 20% weed cover

3B Photo point prior to commencement of works

The same view after primary and secondary weed control works, September 2021

Figure 37 Photomontage of vegetation condition at Zone 3b

Table 26 Zone 3d vegetation condition summary

Photo Point	**3D**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Ficus macrophylla*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Elaeodendron australe* *Clerodendrum tomentosum* *Maclura cochinensis*	100% native cover 20% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Cestrum nocturnum* *Pittosporum multiflorum*	30% native cover 70% weed cover	100% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Oplismenis imbecillis* *Bidens pilosa** *Solanum pseudocapsicuum**	40% native cover 60% weed cover	70% native cover 30% weed cover

3D Photo point prior to commencement of works August 2020

3D Photo after primary weed control September 2021

Figure 38 Photomontage of vegetation condition at Zone 3d

Table 27 Zone 3c vegetation condition summary

Photo Point	**3C**		
Commencement of works date	September 2020		
Completion of works date	August 2021		
Vegetation Condition		**Percentage Cover prior to works**	**Percentage Cover post works**
Upper Stratum (emergent canopy)	The upper stratum surrounding this photo point is dominated by a tall canopy of *Melaleuca armillaris* *Acacia maidenii*	100% native cover	100% native cover
Mid Stratum (sub canopy)	The mid stratum surrounding this photo point is dominated by *Clerodendrum tomentosum* *Maclura cochinensis* *Ehretia accuminata* *Solanum mauritianum**	80% native cover 20% weed cover	100% native cover 0% weed cover
Shrub layer	The shrub layer surrounding this photo point is dominated by *Lantana camara** *Zieria granulata* *Croton verrauxii*	70% native cover 30% weed cover	100% native cover 0% weed cover
Ground Layer	The ground layer surrounding this photo point is dominated by native and weed grasses as well as a range of annual weeds and woody weed seedlings such as *Lantana camara** *Bidens pilosa** *Pellaea falcata*	60% native cover 30% weed cover	80% native cover 20% weed cover

3C Photo Point before primary weed control August 2020

Figure 39 Photomontage of vegetation condition at Zone 3c

5.7.3. Flora and Fauna and Rehabilitation Summary and Opportunities for Improvement

Works will continue in line with the completion criteria thresholds during the next reporting period. Repairs to the fence line of the RCVA is also scheduled for the next reporting period to reduce instances of cattle intrusion.

5.8. Heritage Conservation

Kelleher Nightingale Consulting Pty Ltd was engaged by Boral to undertake a detailed Aboriginal archaeological assessment and prepare an Aboriginal Cultural Heritage Assessment Report (CHAR) to inform the Modification 9 EA.

An Aboriginal Cultural Heritage Management Plan was subsequently prepared for the project, detailing the required Aboriginal heritage management and mitigation measures. The plan was prepared in consultation with OEH and Registered Aboriginal Parties in accordance with condition 64 of the Modification 9 consent (approved September 2017) and is available on the Boral Dunmore website.

Archaeological salvage excavation and mitigation for the impact of the Croome Farm Pit expansion project on Aboriginal heritage has been completed for Croome West AFT 1 (AHIMS 52-5-0851) and Croome West AFT 2 (AHIMS 52-5-0850). Archaeological excavation and mitigation was not required for Croome West AFT 3 (AHIMS 52-5-0849).

The archaeological salvage program was completed in October 2017 (outside the current reporting period). In accordance with the MOD 9 conditions of approval, requirements of the AHMP and approved salvage methodology are outlined in the CHAR.

Boral is committed to effective consultation with the local Aboriginal community regarding Boral's activities and Aboriginal cultural heritage values. Registered Aboriginal Parties have been consulted and provided with an opportunity to participate in the assessment and management of Aboriginal heritage values. Consultation with Registered Aboriginal Parties has followed OEH consultation requirements, as applicable (Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010a)). Registered Aboriginal stakeholders participated in the salvage excavations.

The salvage operations of the study areas have mitigated identified Aboriginal heritage constraints prior to any pre-construction or construction activities, which may harm Aboriginal objects at these site locations. A total of 1,188 artefacts were recovered during the salvage excavation program undertaken in October 2017 (outside of this reporting period), with 76 m^2 excavated across the two sites.

A draft report has been completed in September 2018 by Kelleher Nightingale and was finalised in the FY20 period. Management actions are summarised below:

In accordance with the AHMP, salvaged Aboriginal objects will be managed at a temporary storage location for analysis and reporting purposes and lodged for long term management with the Australian Museum. Deposition of the significant archaeological assemblage at the Australian Museum ensures ongoing access and appreciation of the artefact assemblage for current and future generations.

The short-term management of excavated Aboriginal objects is as follows:

- Any Aboriginal objects that are removed from the land by actions authorised by the project approval, must be moved as soon as practicable to the temporary storage

location (see below) for analysis, reporting and preparation for the long term management of the Aboriginal objects.

- The temporary storage location is Kelleher Nightingale Consulting Pty Ltd, Level 10, 25 Bligh Street, Sydney NSW 2000.
- Any Aboriginal objects stored at the temporary storage location must not be further harmed, except in accordance with the conditions of the approval.

The long-term management of excavated Aboriginal objects is as follows:

- Once all analysis has been completed, recovered objects are to be lodged with the Australian Museum in accordance with the Australian Museum Archaeological Collection Deposition Policy. Analysis is ongoing.

5.9. Waste Minimisation

Boral is committed to continuing non-production waste management minimisation in accordance with the waste hierarchy and minimising the amount of waste sent to landfill. To achieve this, all liquid and solid wastes are classified and sorted so they can be appropriately re-used or recycled. Waste is managed by appropriately licenced sub-contractors and entered into a waste tracking register.

To deter illegal dumping, Shellharbour Council installed cameras around the surrounds of Dunmore Quarry and Dunmore Sand and Soil. Council indicated that two prosecutions have resulted from investigations aided by the installation of the cameras.

Boral is committed to ensuring its extraction and processing activities produces minimal waste rock material. Approximately 30% of the hard rock processed at Dunmore Quarry becomes material of less than 4mm in diameter, which are known as quarry fines. In the past, quarry fines were considered a product waste and stockpiled due to having no steady market, however the material is now used in manufactured sand (as opposed to natural sand) production.

During the reporting period 97,996 tonnes of quarry fines were utilised for manufactured sand production, backfilling and progressive rehabilitation.

Recycling has increased within FY21 as shown in the Waste Tracking Register in Section 5.9.1.

5.9.1. Waste Tracking Register

A detailed breakdown of the waste collected on-site during the reporting period is shown below in Table 28. Yearly trends are shown in Table 29.

Table 28 Waste Tracking Data

Month	General Waste (t)	Cardboard (t)	Commingle (t)	Timber (t)	Scrap Metal (t)	Oil & Oily Water (L)	Effluent (L)	Filter (t)*	Rags (t)**
Jul-20	4.53	0.08	0.055	0	11.92	2,900	17,000	0	0
Aug-20	0.717	0.25	0	1.96	0	2,700	19,000	0	0
Sep-20	3.14	0	0	0	0	3,100	11,000	0	0
Oct-20	1.33	0.18	0	0	0	3,400	13,000	1.64	0.41
Nov-20	6.9	0.59	0	1.88	10.42	3,600	10,180	1.64	0.41

Dec-20	1.1	0.19	0	1.66	0	4,100	15,000	1.64	0.41
Jan-21	1.33	0.15	0	0	0	4,600	15,000	0	0
Feb-21	1.22	0.23	0.07	1.18	0	3,200	15,000	0	0
Mar-21	5.25	0.2	0.02	0	10.48	3,700	15,000	0	0
Apr-21	3.38	0.11	0.06	2.74	4.42	3,100	15,000	1.64	0.41
May-21	1.09	0.15	0.03	0	360.86	3,800	15,000	1.64	0.41
Jun-21	7.25	0.19	0.02	0.82	159.36	3,700	10,028	1.64	0.41
Total	**37.237**	**2.32**	**0.255**	**10.24**	**557.46**	**41900**	**170208**	**9.84**	**2.46**

* Based on an average weight of 0.004 tonne per filter bin

** Based on an average weight of 0.04 tonne per rag bin

Table 29 Historical Waste Data

Waste Classification		FY17	FY18	FY19	FY20	FY21
Solid Waste	General Waste (t)	45.123	38.032	41.814	34.398	37.237
	Cardboard Tonnes (t)	2.152	1.531	0.93	3.355	2.32
	Timber Tonnes (t)	8.14	13	13.24	10.24	10.24
	Comingle Recycling (t)	ND	ND	0.63	3.825	0.255
	Used Oil Filters/ Rags (t)	ND	2.4	0.936	1.072	2.46
	Scrap Metal (t)	ND	ND	110	79.64	557.46
Liquid Waste	Oil/Oily Water Litres (L)	25,400	43,250	46,900	68,883	41,900
	Effluent Litres (L)	60,000	61,000	140,000	190,000	170,208
	Other Litres (L)	400	0	0	0	0

It can be seen that a significant increase in the percentage of waste recycled via cardboard or comingle recycling has occurred in the FY21 reporting period. This is mostly due to the improvements in visibility and access to recycling bins, as well as part of the improvements to the waste minimisation strategies made during the reporting period.

An audit of stored tyres was completed as part of the independent audit actions as shown below in Table 30.

Table 30 Stored tyres audit outcome

Storage Locations	*2016*	*2019*	*2021*	*Purpose*	*Colour code*
Old Workshop Southern End	50	77	121	990H and Haul Truck Tyres	Red- Waste Storage
Old Workshop Northern end	55	14		Bitz tyre storage	Red- Waste Storage
Graveyard	6	89		Mixed Waste Storage	Red- Waste Storage
New Workshop		16	50	Bund Retaining Wall	Blue- Retaining Wall
Go Line	26	21	21	Parking Bay Dividers	Orange - Road Dividers/Stockpile markers

Rail Loading Area	10	8	9	Area Markers, Road Dividers	Orange - Road Dividers/Stockpile markers
Pipe Rd Blues Blvd	2	2	2	Road Divider	Orange - Road Dividers/Stockpile markers
Croome Intersection		1	1	Road Divider	Orange - Road Dividers/Stockpile markers
Level 3 Sales	16	17	13	Stockpile Markers	Orange - Road Dividers/Stockpile markers
Bottom of Pipe Rd	2	16	0	Marker	
Dust Extractors		1	0	Utility to pick up bins	
CR01 and CR02 Access	Not Specified	Not Specified	Not Specified	Mixed Tyres - Retaining Wall	Blue Retaining Wall
CR01 Retaining Wall		15	15	Mixed Tyres - Retaining Wall	Blue Retaining Wall
CR02 Retaining Wall		185	185	Mixed Tyres - Retaining Wall	Blue Retaining Wall
Transport Area		2	2	Road Divider	Orange – Road Dividers/Stockpile markers
Level 2 Sales			3	Mixed Tyres	

A contractor has been engaged to collect and recycle excess stored tyres which are not being utilised for retaining walls. This is expected to be completed in September 2021 and the tyre register will be updated post works.

5.9.2. Waste Minimisation Opportunities for Improvement

Further work will continue with subcontractors to optimise the record keeping for waste collection data. Work will continue to consolidate the recycling improvements undertaken in FY21. A centralised waste management contract has been established with Cleanaway, which will assist in the tracking and reporting of waste.

5.10. Incident and Emergency Response

The following management actions were undertaken in regard to incident and emergency response.

- The Pollution Incident Response Management Plan was reviewed and updated in December 2020. The current version is available online at https://www.boral.com.au/our-commitment/environmental-reporting.
- Vehicle pedestrian safety upgrades were completed during the reporting period. Car park and traffic areas were refurbished to remove pedestrian and vehicle interactions wherever possible.

5.11. Dangerous and Hazardous Goods Storage

Storage of dangerous goods and hazardous material have continued as per established operations. All dangerous goods and chemicals are handled and transported in accordance with the AS1940 and AS25956 and the Dangerous Goods Code and S4.C72. The resource regulator undertook a further audit in April. The audit was in April and hazardous material storage was observed to be as per AS1940. MSDS sheets and Chem Alert databases were updated in May as part of recommendations in the audit.

6. Community

The Dunmore Quarry Community Consultative Committee (CCC) continues to serve as a valuable dialogue between Boral and the local community with valuable input and feedback being provided by the community regarding quarry operations and plans. The CCC is run as per S5.C6 and the Departments Community Consultative Committee Guidelines for State Significant Developments (2016).

Members include:

- An independent chairperson.
- At least 2 representatives from Boral (typically the environmental co-ordinator and quarry manager).
- A member from Shellharbour City Council.
- Three local community representatives.

Members are informed of the environmental performance of the site, provided with an update on operations, and given a chance to tour the site and ask questions they may have regarding the operation. CCC members have also been diligent in disseminating the information from the meetings to other interested community members in the local area. The minutes of each meeting is published in the Boral website.

https://www.boral.com.au/locations/boral-dunmore-operations

The CCC met twice during the FY21 reporting period (August 2020 and February 2021).

6.1. Environmental Complaints Management

There were no environmental complaints received during the reporting period.

A graph showing the community complaints over time can be seen in Figure 40.

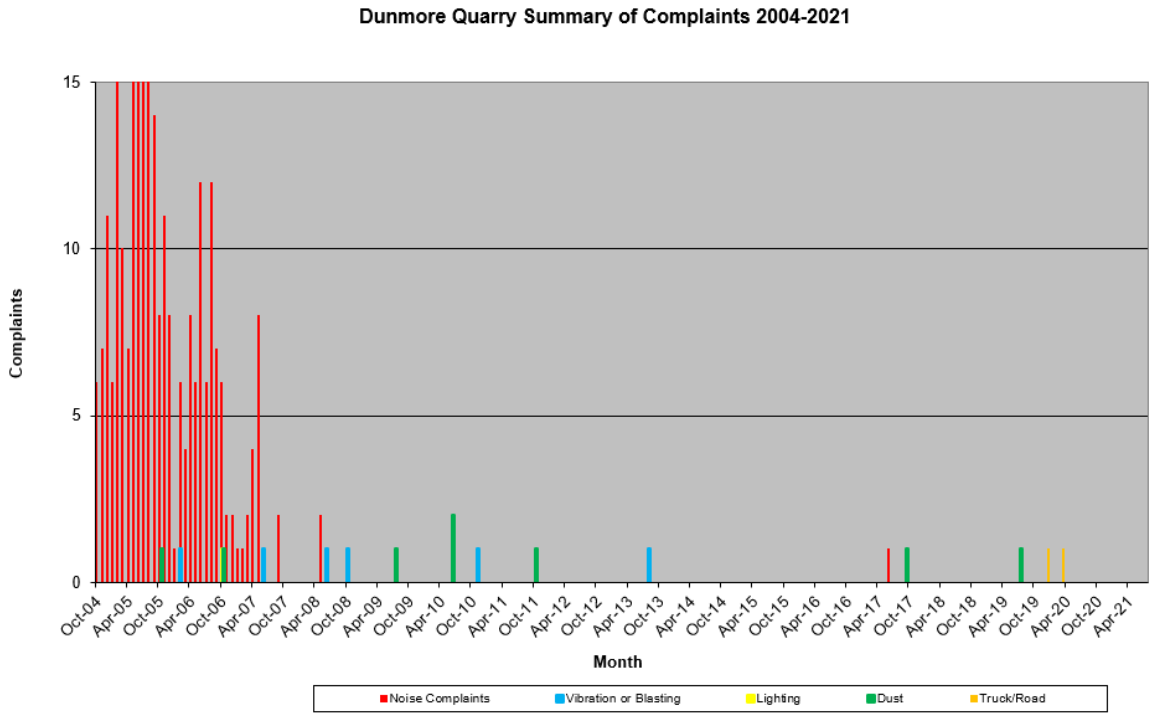

Figure 40 Historical Community Complaints

6.2. Summary of Regulatory Notifications

One (1) regulatory notification was received during the FY21 reporting period. A formal warning letter was issued on 27 October 2020 by NSW DPIE relating to the exceedance of transport dispatch limits which was reported in the independent audit and in the previous Annual Review. The letter was issued based on Boral's failure to comply with Schedule 3, Condition 7A of the Consent by exceeding the hourly truck limits, on a number of occasions in December 2019 and March and April 2020.

In reaching this decision, the Department considered the particulars of the breach and the following matters:

- Boral was cooperative during the investigation;
- The exceedances resulted in no known impacts on the environment or community; and
- No known community complaints were received in relation to the exceedances.

A warning letter is an informal action taken where a breach has been established and the Department has determined that no formal enforcement action is warranted in the circumstances.

No further exceedances have occurred in the reporting period. Boral has since applied for a modification of consent (MOD 12) to modify these transport limits as recommended in the independent audit. The MOD 12 modification of consent was granted August 2021.

7. Activities to be completed by the Next Reporting Period

The next reporting period (FY22) will contain a strong focus on addressing recommendations within the IEA, maintaining regulatory compliance and optimising management actions established in the FY21 reporting period.

Table 31 Activities to be Completed by the Next Reporting Period (FY22)

Reference	Description of Action
AR 1	Update Water Management Plan as part of MOD 12 post approval documentation
AR 2	Update Air Quality Management Plan as part of MOD 12 post approval documentation to denote that DSS is included in the monitoring program
AR 3	Update Rehabilitation Management Plan as part of MOD 12 post approval documentation
AR 4	Recalculate and lodge the rehabilitation bond post RMP approval
AR 5	Organise independent audit of Flora Fauna Management Plan. Incorporate comments from the independent environmental audit into the updates.
AR 6	Update Water Management Plan as part of MOD 12 post approval documentation
AR 7	Update Transport Management Plan as part of MOD 12 post approval documentation
AR 8	Update Bushfire Management Plan as part of MOD 12 post approval documentation and removal of excess stored tyres.
AR 9	Complete re-fencing of rehabilitation areas to limit intrusion of cattle.

8. Conclusion

Dunmore Quarry has continued to focus on ensuring the environment and neighbouring community are not adversely impacted by quarry operations. Throughout this reporting period extraction and processing of quarry materials has remained consistent with previous years.

The FY21 period had a strong focus on maintaining regulatory compliance and optimising management actions established in the FY20 reporting period.

The next reporting period will continue to focus on completing actions from the independent audit and updating applicable management processes and plans post approval of modification 12 of the consent.

9. Appendix A Meteorological Monitoring Locations Data and Graphs

The location of the onsite weather station is shown Figure 41 below.

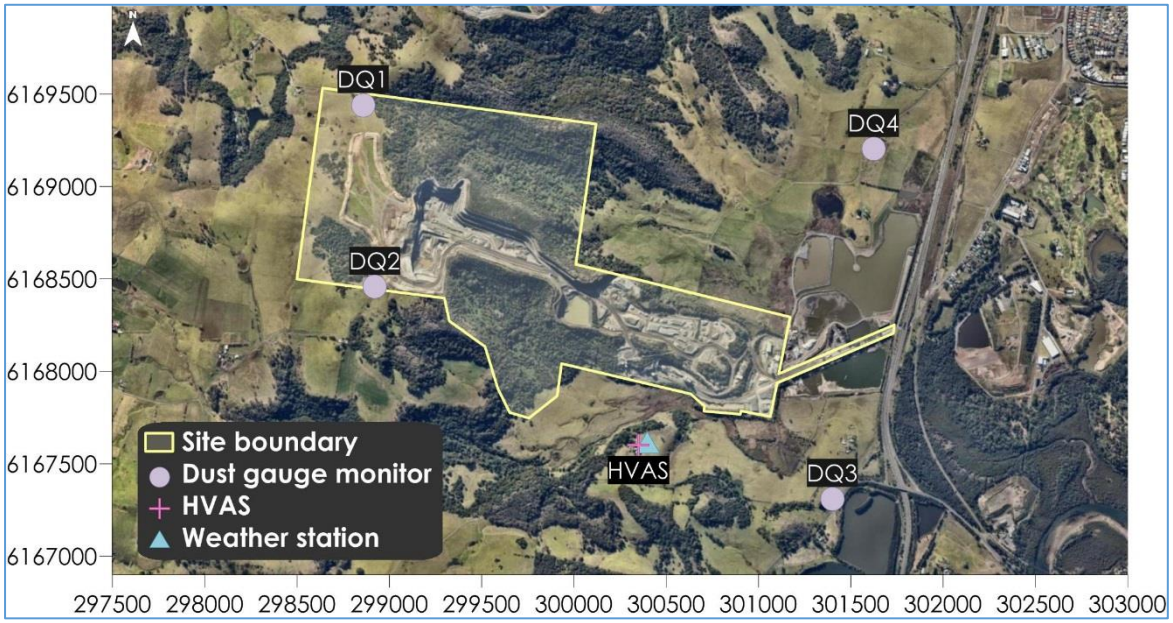

Figure 41 Meteorological Monitoring Locations

A monthly review of weather data is undertaken by the environmental co-ordinator. Important meteorological conditions assessed are rainfall, wind speed direction and atmospheric stability.

Rainfall data has been collected since FY2003. A summary of the rainfall measured from the Dunmore Quarry weather station is shown below in Table 32. Values shown in red relate to periods where rainfall was above the regional average.

Table 32 Rainfall Data Summary

Rainfall (mm)			
Month	**FY21**	**Site Average**	**Regional Average**
July	264.2	63.3	49
August	187.1	64.5	53.5
September	11.3	47.7	42.7
October	114.4	72.5	64.5
November	83	89.9	83.1
December	83.8	84.3	67
January	189.3	79.6	72.9
February	88.4	144.7	140.5
March	278.5	140.9	122.3

Rainfall (mm)			
Month	**FY21**	**Site Average**	**Regional Average**
April	5.9	84.3	73.8
May	206.1	72.2	55.8
June	44	114.7	93.7
Total	1556	1043.5	925.6

Table 33 Historical Rainfall Data

	Rainfall (mm)																				
Month	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	Site Average	Regional Average
July	20	23.5	54.2	41	96	30.5	63.5	35.5	78	194	39	61.7	5	48	97.5	25	6	20.5	264.2	63.3	49
August	13.5	38.5	23	3	42.5	58.5	39	0.5	72	85.5	4.5	17	252	327	76	39	31	39	187.1	71.0	53.5
September	14	7.5	40.6	33	101	39	56	19.5	145.5	58.5	11.5	85.5	48.7	82	51	1	41.5	59.5	11.3	47.7	42.7
October	6.5	49	245.4	48	0	17	79	125.5	126	124.5	83.5	6.5	102.5	36.5	32	14.5	128	38.5	114.4	72.5	64.5
November	17	149.5	126.8	144.5	39.5	161.5	46.5	65	198	163.5	25	173	24	48	33	85	92	25.5	83	89.5	83.1
December	70	40.5	136.2	36.5	54	120	112.5	80.5	147.5	63	32	70.5	233.5	116.5	58	53	90.5	2.5	83.8	84.3	67
January	68	30.5	128.8	90	0	65.5	9.5	79	59.5	50.5	183	43.5	192.5	155.5	32.5	36	143.5	65	189.3	85.4	72.9
February	112	70	180.4	87.1	186.5	351.5	107.5	197.5	48	257.5	142.5	59	112.5	29.5	283	128.5	35.5	272.5	88.4	144.7	140.5
March	121	84	118	43.5	67.5	36.5	39	74	362.5	196	23.5	326	57	145	441	41.5	156.5	65.5	278.5	140.9	122.3
April	91.5	200	24.4	8	145	90.5	106	63	37.4	87.5	136	64.5	305	37.5	40.5	26.1	48.5	85	5.9	84.3	73.8
May	427.5	43.5	85.6	65.5	23	8	20	80.5	58.3	9.5	81	13	53.5	35.5	51.5	44	13.5	52	206.1	72.2	55.8
June	74.5	42	84.4	124	318.5	85.5	67	52	92	89	239	34	76	429	57	133.5	103	35	44	114.7	93.7
Total	1035.5	778.5	1247.8	724.1	1073.5	1064	745.5	872.5	1424.7	1379	1000.5	954.2	1462.2	1490	1253	627.1	889.5	760.5	1556	1070.4	925.6

Monthly wind roses and seasonal wind roses are shown in Figure 42 to Figure 53. Please note calm is defined as winds averaging less than 0.3m/s over the averaging period.

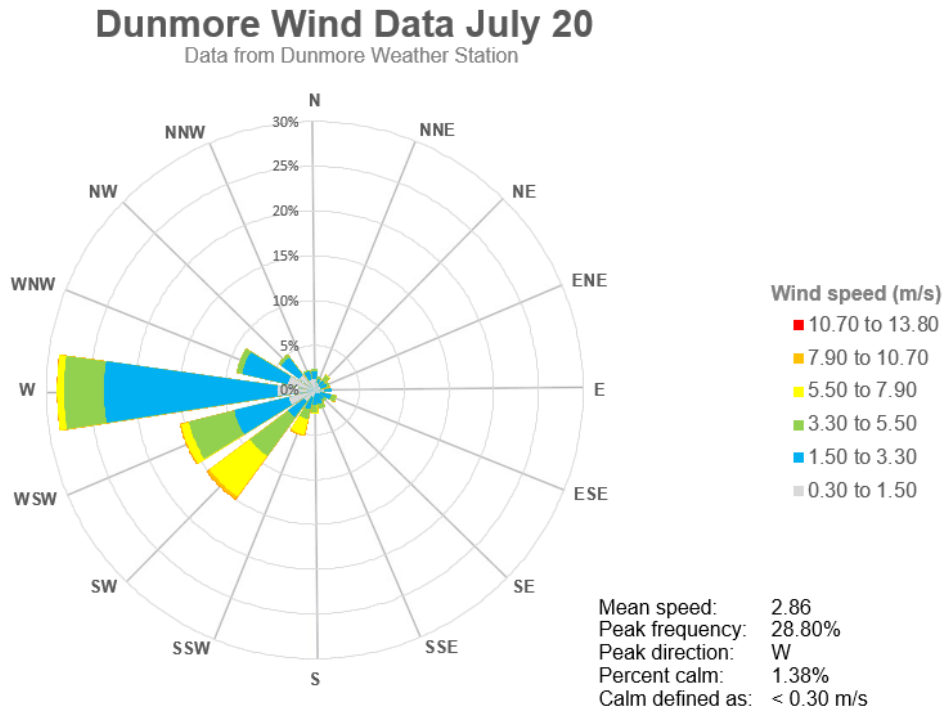

Figure 42 July 2020 Wind Rose

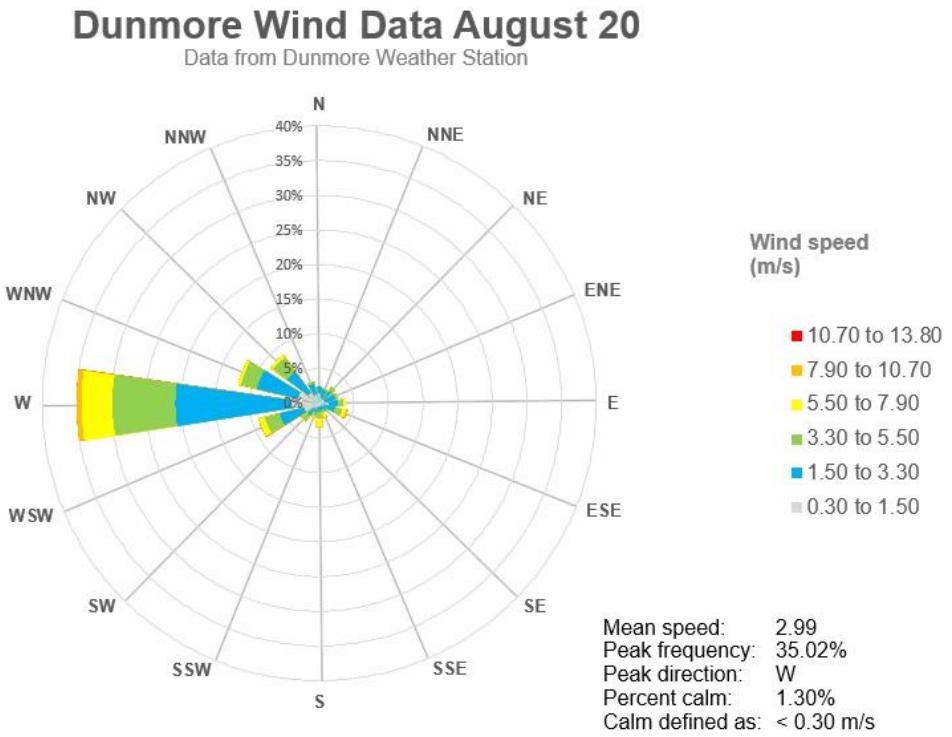

Figure 43 August 2020 Wind Rose

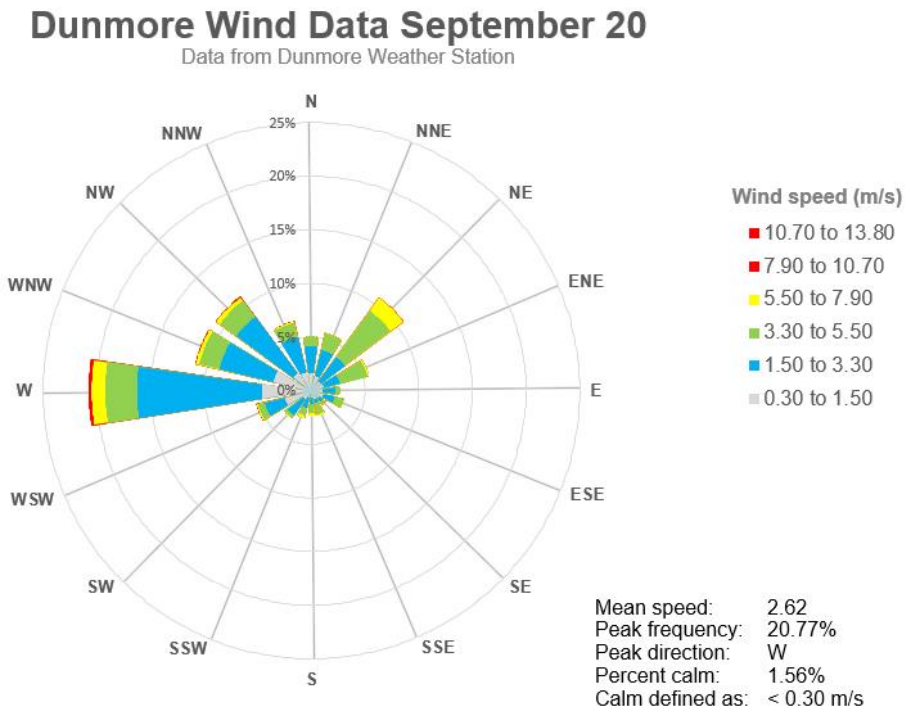

Figure 44 September 2020 Wind Rose

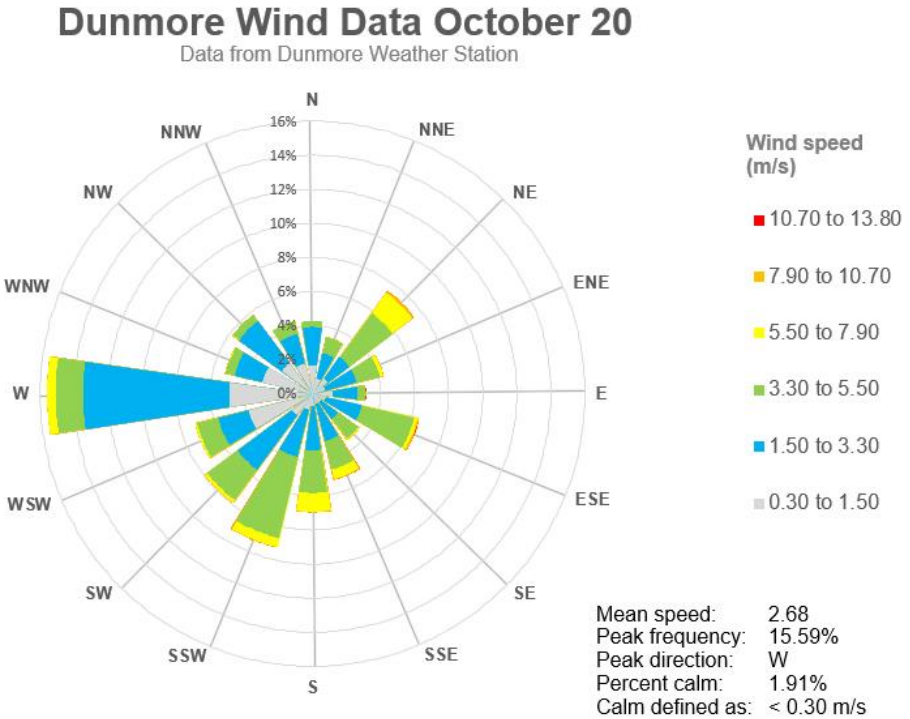

Figure 45 October 2020 Wind Rose

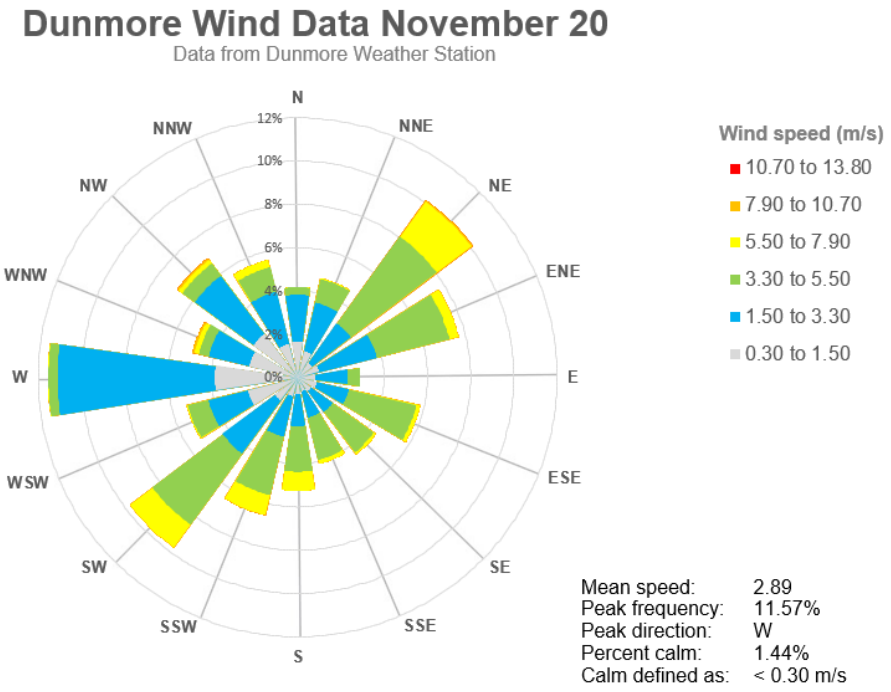

Figure 46 November 2020 Wind Rose

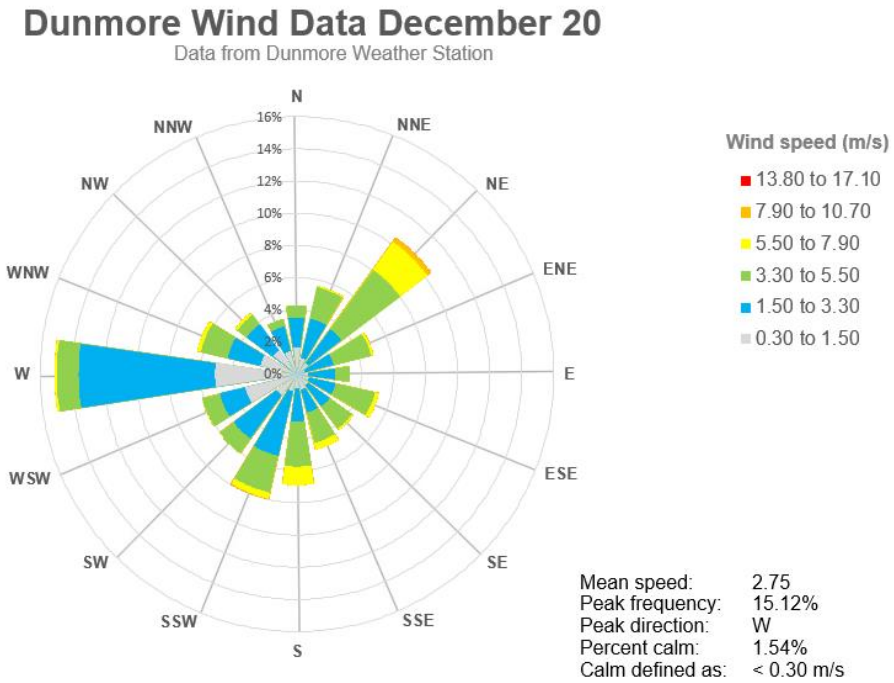

Figure 47 December 2020 Wind Rose

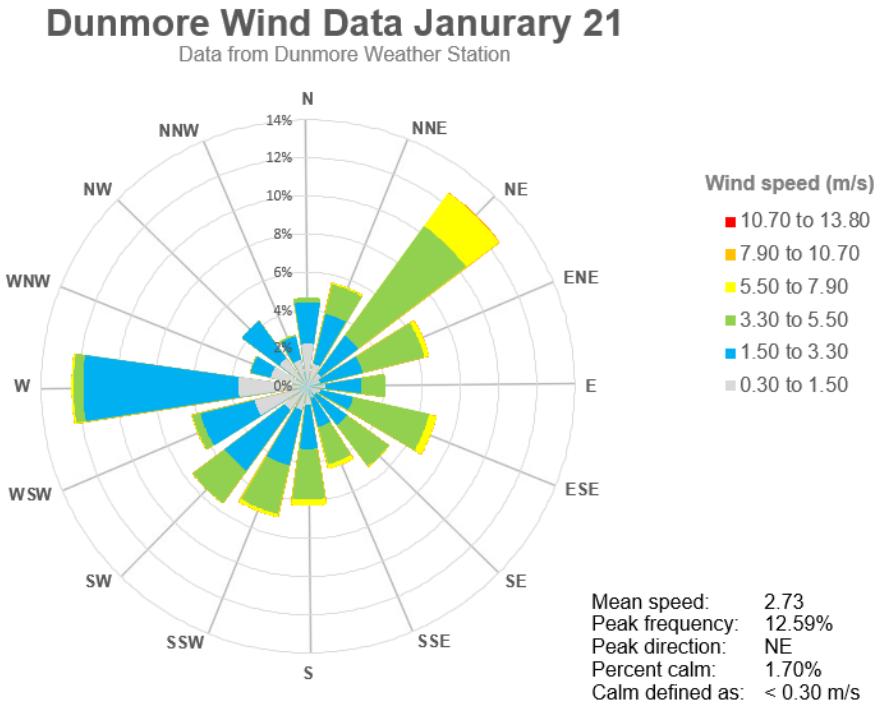

Figure 48 January 2021 Wind Rose

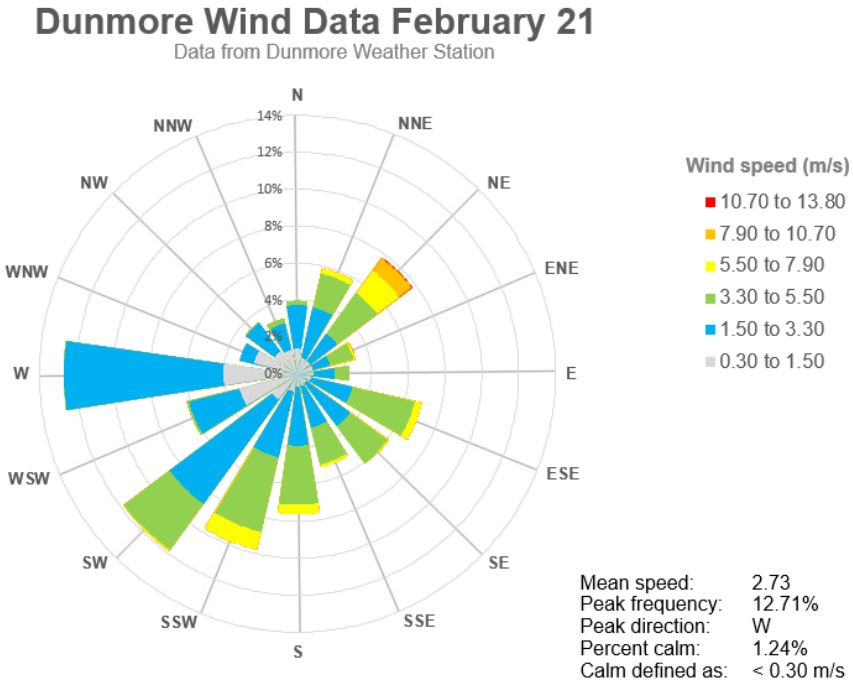

Figure 49 February 2021 Wind Rose

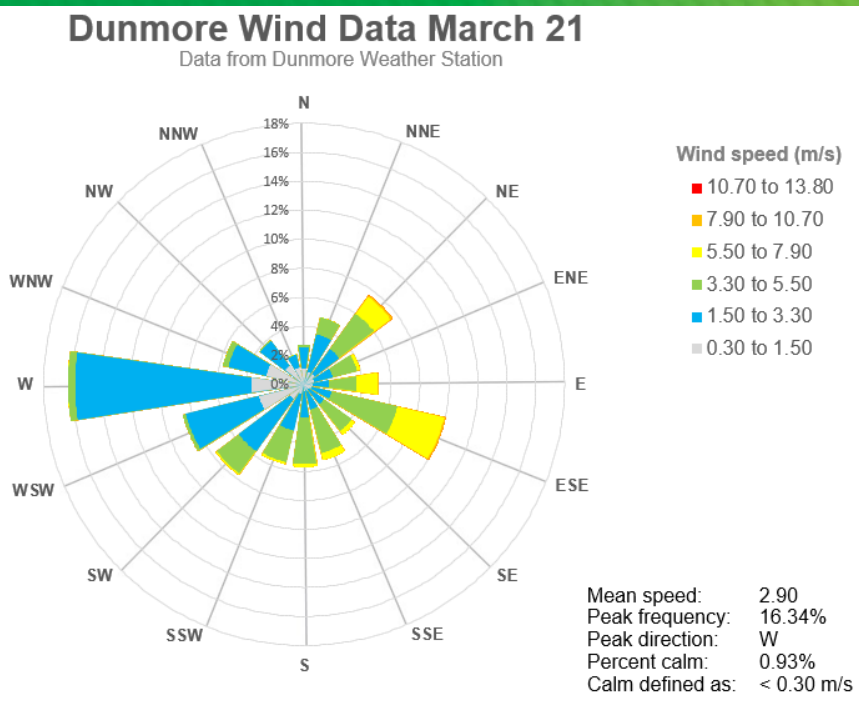

Figure 50 March 2021 Wind Rose

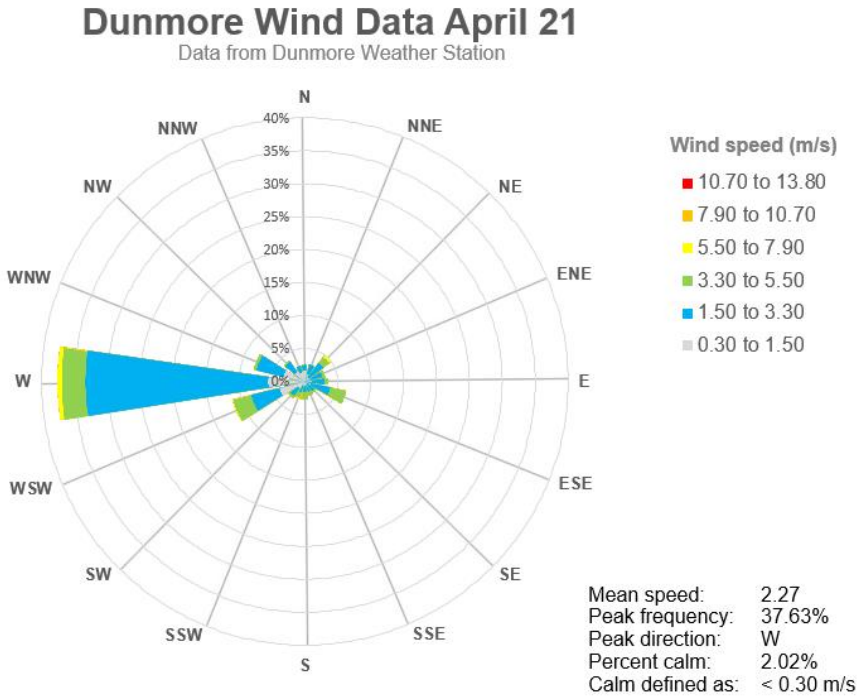

Figure 51 April 2021 Wind Rose

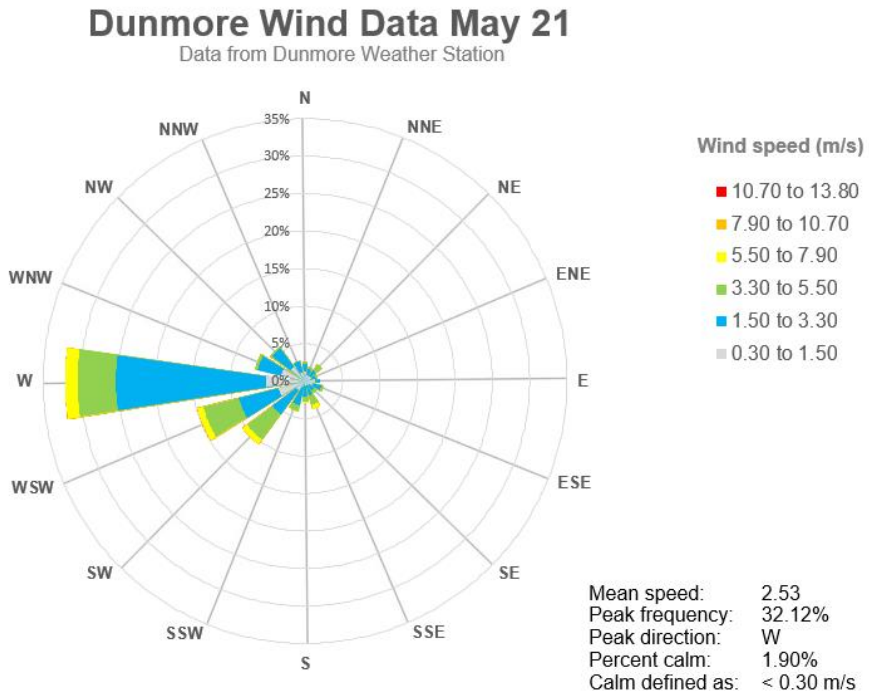

Figure 52 May 2021 Wind Rose

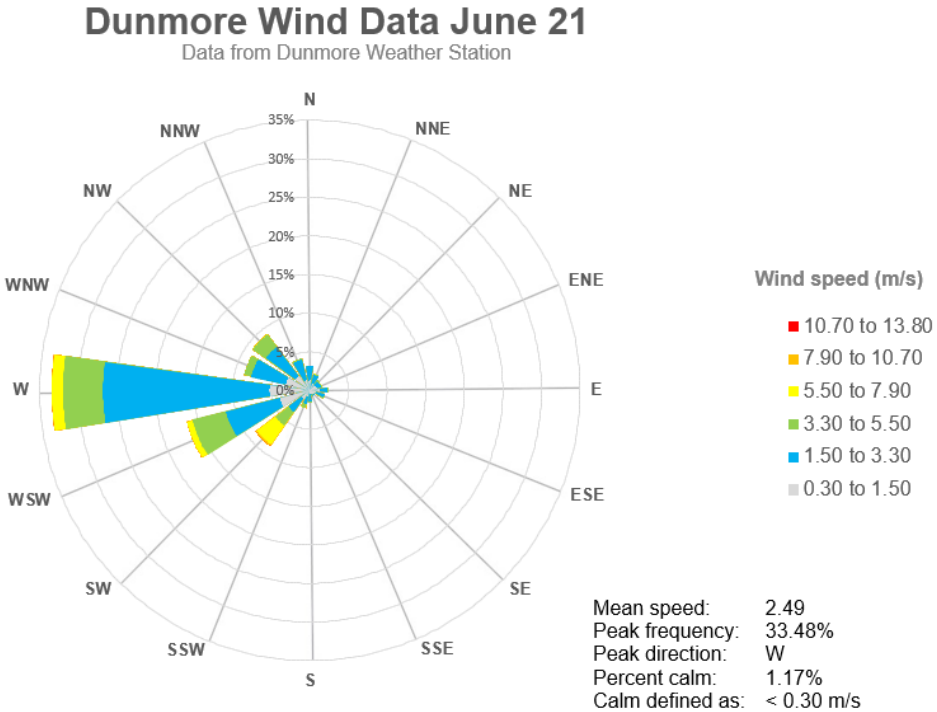

Figure 53 June 2021 Wind Rose

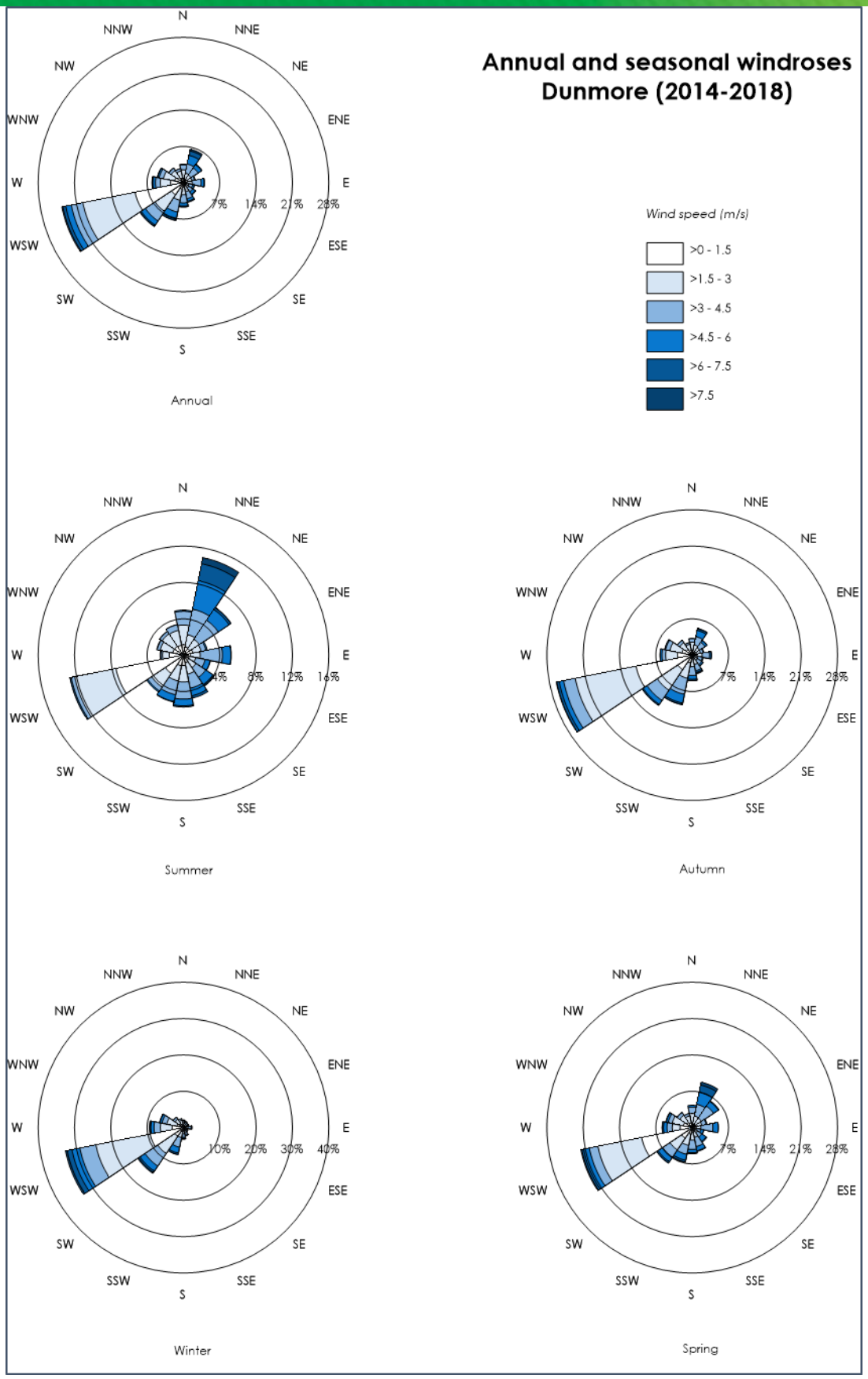

Figure 54 Dunmore Seasonal Wind Rose Data

10. Appendix B Air Quality Monitoring Additional Data and Graphs

Monthly breakdown of deposited dust monitoring is shown in Table 34. Dominant wind directions and production data are also shown within this table.

Table 34 Historical Deposited Dust Results

Month	Site 1 grams/m²/month		Site 2 grams/m²/month		Site 3 grams/m²/month		Site 4 grams/m²/month		Dominant Wind Direction	Direction of Strongest Winds	Production Tonnes
	Insoluble Solids	Ash	Insoluble Solids	Ash	Insoluble Solids	Ash	Insoluble Solids	Ash			(t)
05/06 Average	5.85	2.66	4.48	1.67	4.85	2.22	3.9	1.92			
06/07 Average	5.4	2.13	2.48	1.53	2.79	1.89	4.31	2.44			
07/08 Average	3.26	1.67	2.37	1.3	3.89	2.9	5.55	3.17			
08/09 Average	6.6	2.63	3.01	2.1	3.12	2.17	2.71	1.66			
09/10 Average	4.65	3.03	4.41	2.6	5.02	3.49	3.15	2.33			
10/11 Average	3.35	1.43	5.86	3.92	3.43	2.09	2.53	1.6			
11/12 Average	3.74	1.92	3.28	1.7	5.03	3.44	2.75	1.81			
12/13 Average	3.73	1.65	2.61	1.65	5.87	3.6	3.36	2.36			
13/14 Average	9.56	4.94	3.63	1.79	4.61	3.28	3.2	2			
14/15 Average	5.63	2.72	2.38	1.44	7.36	4.42	3.1	1.98			
15/16 Adjusted	3.46	1.66	3.12	1.77	7.2	4.45	3.01	1.84			
16/17 Average	2.2	1.42	3.36	1.96	2.28	1.56	2.01	1.3			
17/18 Average	2.93	2	4.2	3.14	2.36	1.65	2.84	1.79			
18/19 Average	3.05	1.84	2.95	1.92	3.66	2.01	2.81	1.59			
19/20 Average	2.61	1.76	3.45	2.43	2.66	1.94	2.1	1.51			
Jul-2020	2.02	1.44	0.97	0.75	4.98	4.28	1.69	1.03	W (28%)	SW	85,402
Aug-2020	1.14	0.56	1.84	1.3	1.19	0.80	1.63	1.36	W (35%)	W	100,791
Sep-2020	1.66	1.27	1.41	0.98	1.43	1.02	1.40	0.97	W (21%)	W	118,087
Oct-2020	1.97	1.28	2.8	1.3	2.51	1.30	0.93	0.58	W (16%)	ESE	119,439
Nov-2020	2.60	1.37	1.4	0.88	0.72	0.12	2.88	1.66	W (12%)	NE	200,305
Dec-2020	4.17	2.18	1.94	1.61	2.39	0.91	3.56	1.92	W (15%)	NE	62,433
Jan-2021	1.24	0.87	1.12	0.83	1.36	1.15	1.25	1.17	NE (13%)	NE	45,540
Feb-2021	1.31	1.22	0.94	0.84	0.96	0.87	0.85	0.72	W (13%)	NE	115,628
Mar-2021	1.90	1.33	2.23	1.51	1.62	0.79	2.79	1.7	W (16%)	ESE	108,634
Apr-2021	0.98	0.91	1.68	1.66	1.47	0.81	0.93	0.88	W (38%)	W	117,087
May-2021	2.40	0.87	2.27	0.79	2.62	0.48	2.36	0.70	W (32%)	W	85,036
Jun-2021	1.13	0.58	1.79	0.49	2.06	0.96	2.41	0.74	W (33%)	W	131,053
20/21 Average	1.88	1.16	1.70	1.08	1.94	1.12	1.89	1.12			

A graph of the historical deposited dust values compared to production is shown in green for each deposited dust site in Figures 55 to 58.

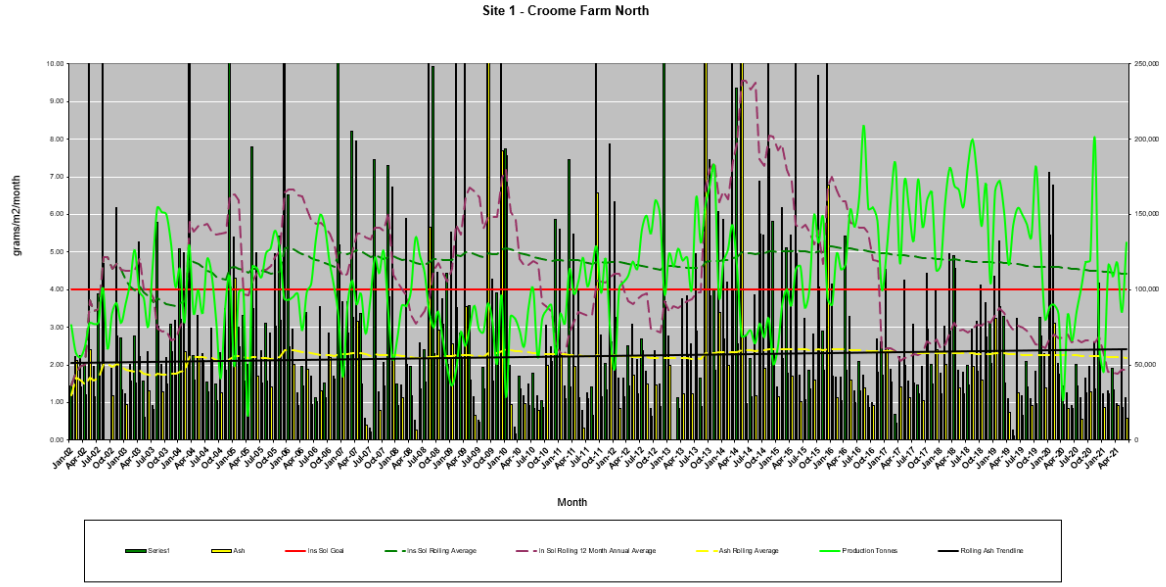

Figure 55 Historical Deposited Dust Values – DQ1

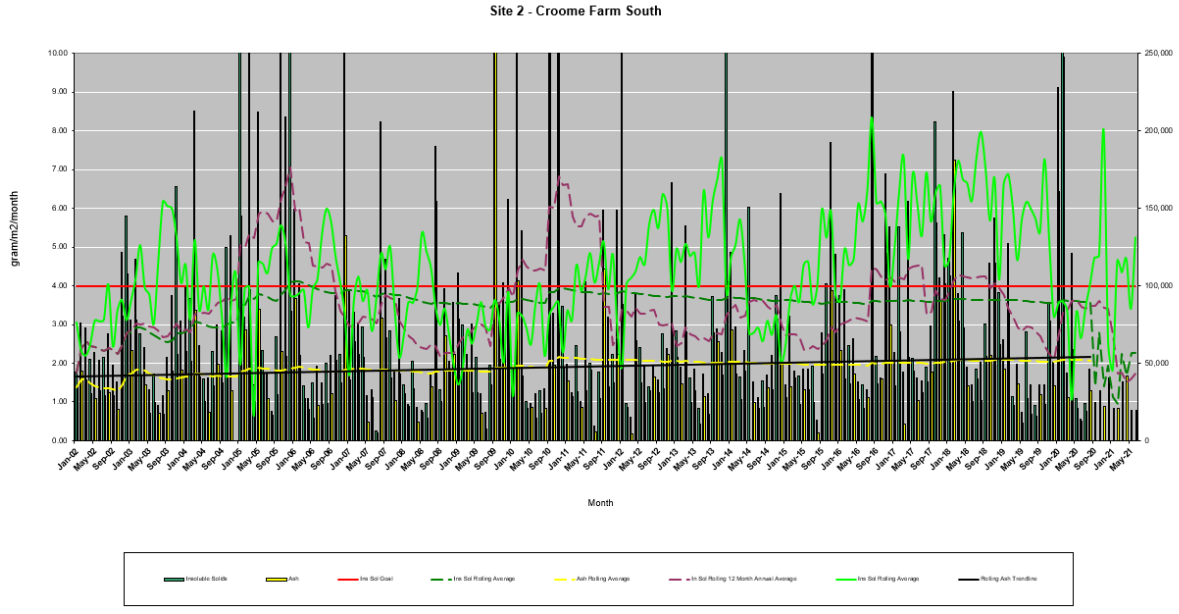

Figure 56 Historical Deposited Dust Values – DQ2

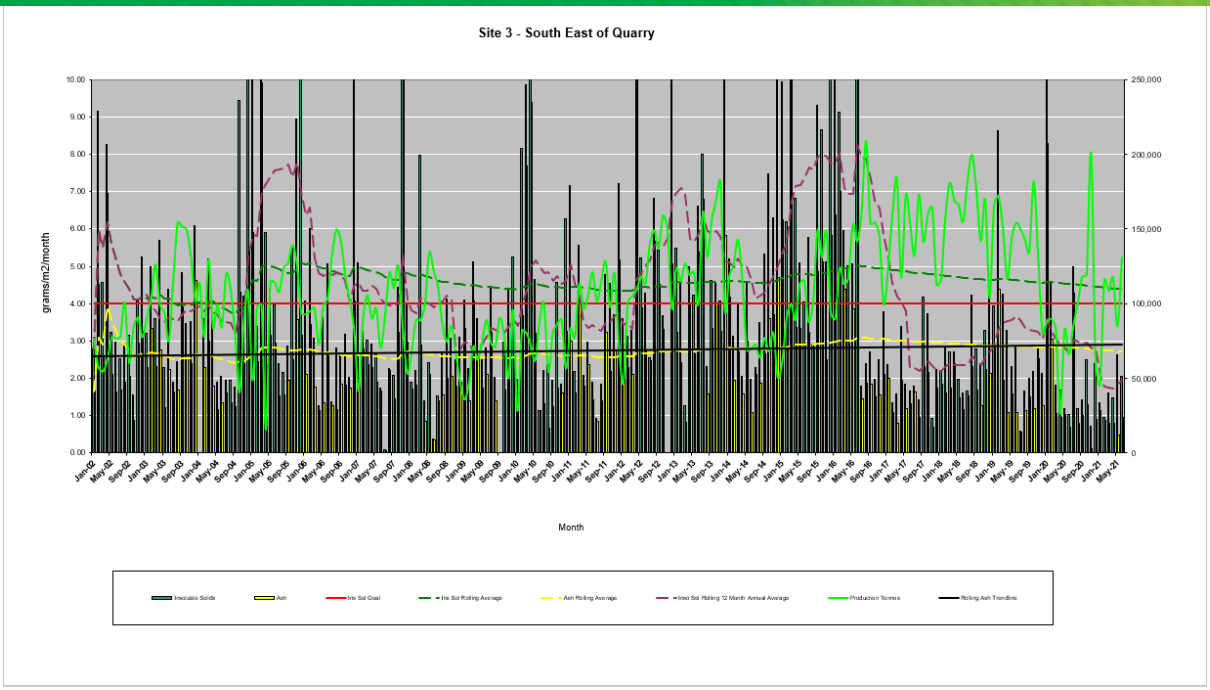

Figure 57 Historical Deposited Dust Values – DQ3

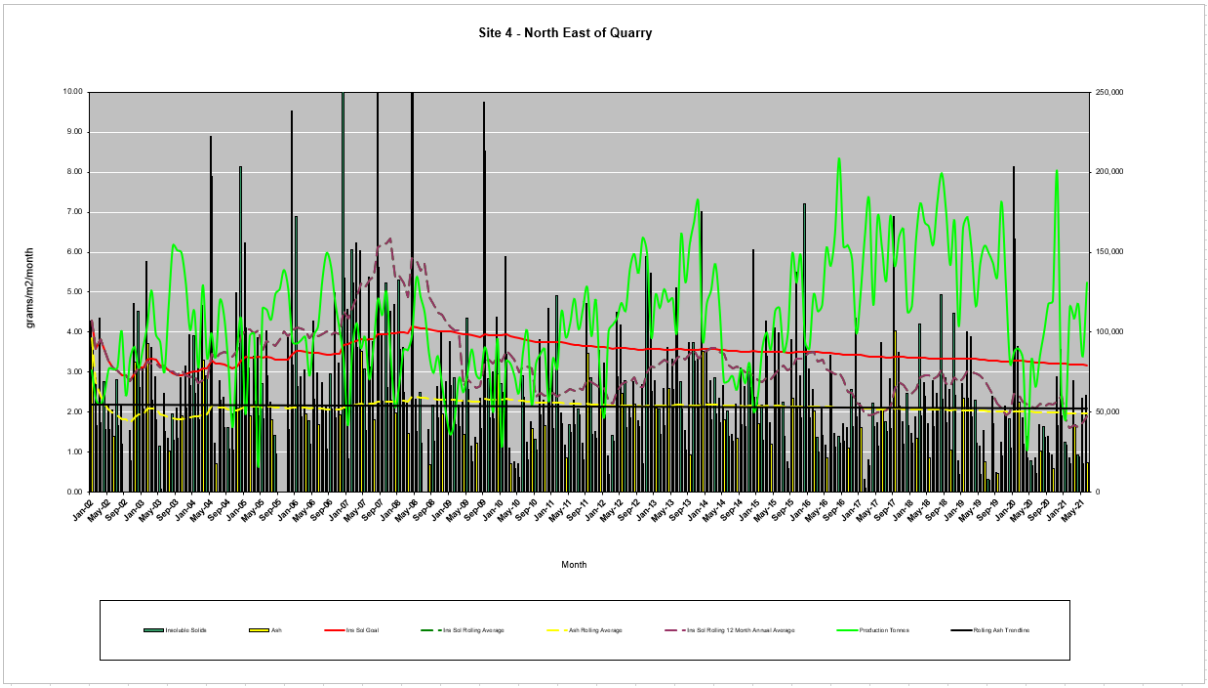

Figure 58 Historical Deposited Dust Values – DQ4

Table 35 Particulate Monitoring

Date	Sample Daily Average (µg/m$^{3)}$	Short Term Criteria 24-hr (50µg/m$^{3)}$	Long Term Criteria Annual (30µg/m$^{3)}$	Progressive Annual Average (µg/m3)
2/07/2020	14.5	50	30	17.77
8/07/2020	9.86	50	30	17.86
14/07/2020	9.21	50	30	17.85
20/07/2020	8.5	50	30	17.77
26/07/2020	9.63	50	30	17.93
1/08/2020	33.57	50	30	18.34
7/08/2020	6.77	50	30	18.39
13/08/2020	9.8	50	30	18.36
19/08/2020	12.12	50	30	18.35
25/08/2020	7.37	50	30	18.41
31/08/2020	4.81	50	30	18.27
6/09/2020	12.42	50	30	18.29
12/09/2020	7.66	50	30	18.30
18/09/2020	4.4	50	30	17.96
24/09/2020	3.21	50	30	17.83
30/09/2020	27.51	50	30	18.21
6/10/2020	4.21	50	30	18.22
12/10/2020	11.05	50	30	18.22
18/10/2020	6.65	50	30	18.05
24/10/2020	10.58	50	30	17.64
30/10/2020	5.11	50	30	17.47
5/11/2020	3.57	50	30	17.41
11/11/2020	8.73	50	30	17.26
17/11/2020	20.2	50	30	17.01
23/11/2020	11.23	50	30	16.33
29/11/2020	12.34	50	30	16.05
5/12/2020	3.57	50	30	14.94
11/12/2020	11.11	50	30	14.65
17/12/2020	26.44	50	30	14.53
23/12/2020	10.46	50	30	14.10
29/12/2020	3.74	50	30	13.35
4/01/2021	16.76	50	30	13.31
10/01/2021	4.22	50	30	12.72
16/01/2021	7.66	50	30	12.34
22/01/2021	45.44	50	30	12.59
28/01/2021	17.41	50	30	12.14
3/02/2021	6.83	50	30	11.97
9/02/2021	9.45	50	30	11.81
15/02/2021	9.15	50	30	11.74
21/02/2021	9.27	50	30	11.54
27/02/2021	13.73	50	30	11.44
5/03/2021	10.16	50	30	11.43
11/03/2021	9.57	50	30	11.40
17/03/2021	6.71	50	30	11.17
23/03/2021	3.09	50	30	11.09
29/03/2021	4.22	50	30	11.01
4/04/2021	7.25	50	30	11.08

Date	Sample Daily Average (µg/m$^{3)}$	Short Term Criteria 24-hr (50µg/m$^{3)}$	Long Term Criteria Annual (30µg/m$^{3)}$	Progressive Annual Average (µg/m3)
10/04/2021	8.08	50	30	10.83
16/04/2021	10.16	50	30	10.81
22/04/2021	6.95	50	30	10.72
28/04/2021	8.5	50	30	10.71
4/05/2021	2.91	50	30	10.47
10/05/2021	1.07	50	30	10.28
16/05/2021	0.83	50	30	10.06
22/05/2021	1.66	50	30	9.89
28/05/2021	0.83	50	30	9.76
3/06/2021	4.28	50	30	9.66
9/06/2021	2.32	50	30	9.58
15/06/2021	3.03	50	30	9.50
21/06/2021	4.04	50	30	9.43
27/06/2021	1.13	50	30	9.21

11. Appendix C MAC Noise Monitoring Annual Compliance Report

12. Appendix D Blast Monitoring Tables

Table 36 Benny Residence FY21 Compliance Blast Monitoring Results

Date	Time	Airblast Overpressure	Ground Vibration	EIS Predicted Ground Vibration (100 MIC)	EIS Predicted Ground Vibration (30 MIC)
		dB(Lin Peak)	*(mm/s)*	*(mm/s)*	*(mm/s)*
01-Jul-20	13:11	102.3	No Trigger	4.2	3.5
08-Jul-20	13:08	101.0	1.45	4.2	3.5
13-Jul-20	13:12	102.3	2.20	4.2	3.5
20-Jul-20	15:03	102.8	0.60	4.2	3.5
24-Jul-20	12:24	106.4	2.20	4.2	3.5
05-Aug-20	14:43	100.8	3.10	4.2	3.5
12-Aug-20	13:12	101.2	0.10	4.2	3.5
26-Aug-20	14:28	No Trigger	No Trigger	4.2	3.5
31-Aug-20	12:12	No Trigger	1.80	4.2	3.5
02-Sep-20	12:09	103.8	0.30	4.2	3.5
09-Sep-20	14:26	101.9	0.90	4.2	3.5
16-Sep-20	12:15	105.5	0.60	4.2	3.5
23-Sep-20	12:33	100.0	0.50	4.2	3.5
28-Sep-20	14:32	101.0	1.00	4.2	3.5
14-Oct-20	12:10	109.3	2.00	4.2	3.5
21-Oct-20	14:59	103.0	3.60	4.2	3.5
28-Oct-20	14:40	103.5	0.50	4.2	3.5
04-Nov-20	12:23	101.0	No Trigger	4.2	3.5
18-Nov-20	14:48	106.5	0.80	4.2	3.5
25-Nov-20	12:45	106.7	No Trigger	4.2	3.5
09-Dec-20	14:32	98.8	0.70	4.2	3.5
13-Jan-21	12:59	102.8	0.50	4.2	3.5
20-Jan-21	12:48	No Trigger	No Trigger	4.2	3.5
29-Jan-21	12:59	No Trigger	No Trigger	4.2	3.5
03-Feb-21	15:09	102.8	0.80	4.2	3.5
10-Feb-21	13:50	102.8	0.80	4.2	3.5
17-Feb-21	13:10	100.0	0.70	4.2	3.5
24-Feb-21	09:52	No Trigger	No Trigger	4.2	3.5
10-Mar-21	14:29	109.9	1.30	4.2	3.5
29-Mar-21	15:07	101.0	1.10	4.2	3.5
14-Apr-21	13:49	No Trigger	No Trigger	4.2	3.5
21-Apr-21	12:46	95.9	0.70	4.2	3.5
10-May-21	13:49	No Trigger	No Trigger	4.2	3.5
19-May-21	12:43	No Trigger	No Trigger	4.2	3.5
03-Jun-21	15:05	101.9	0.60	4.2	3.5
09-Jun-21	15:01	99.5	0.80	4.2	3.5
23-Jun-21	12:53	No trigger	No trigger	4.2	3.5

Table 37 MacParland Residence FY21 Heritage Value Blast Monitoring Results

Date	Time	Airblast Overpressure	95% Annual Airblast Limit	Ground Vibration	95% Annual Vibration Limit
		dB(Lin Peak)	*dB(Lin Peak)*	*(mm/s)*	*(mm/s)*
01-Jul-20	13:11	No trigger	130	No Trigger	30
08-Jul-20	13:08	104.6	130	2.30	30
13-Jul-20	13:12	113.9	130	4.90	30
20-Jul-20	15:03	106.2	130	7.60	30
24-Jul-20	12:24	108.2	130	1.30	30
05-Aug-20	14:43	110.0	130	6.20	30
12-Aug-20	13:12	101.0	130	3.40	30
26-Aug-20	14:28	107.1	130	2.60	30
31-Aug-20	12:12	106.3	130	4.30	30
02-Sep-20	12:09	112.7	130	4.80	30
09-Sep-20	14:26	106.3	130	4.80	30
16-Sep-20	12:15	105.9	130	4.00	30
23-Sep-20	12:33	112.2	130	3.90	30
28-Sep-20	14:32	100.8	130	2.60	30
14-Oct-20	12:10	120.5	130	3.40	30
21-Oct-20	14:59	111.2	130	5.60	30
28-Oct-20	14:40	96.4	130	2.20	30
04-Nov-20	12:23	109.0	130	4.90	30
18-Nov-20	14:48	124.5	130	8.40	30
25-Nov-20	12:45	110.2	130	2.80	30
09-Dec-20	14:32	106.8	130	5.10	30
13-Jan-20	12:59	114.5	130	2.30	30
20-Jan-20	12:48	106.8	130	3.20	30
29-Jan-20	12:59	104.0	130	1.20	30
03-Feb-21	3:09	107.4	130	4.80	30
10-Feb-21	1:50	105.6	130	3.00	30
17-Feb-21	1:10	116.2	130	17.00	30
24-Feb-21	9:52	111.0	130	1.00	30
10-Mar-21	14:29	115.3	130	8.80	30
29-Mar-21	15:07	106.5	130	7.60	30
14-Apr-21	13:49	109.0	130	6.00	30
21-Apr-21	12:46	111.5	130	2.60	30
10-May-21	13:49	107.6	130	2.50	30
19-May-21	12:43	108.5	130	8.20	30
03-Jun-21	15:05	No Trigger	130	No Trigger	30
09-Jun-21	15:01	109.0	130	7.40	30
23-Jun-21	12:53	104.5	130	1.00	30

13. Appendix E EMM Ground Water Monitoring Annual Report

14. Appendix F Goodbush Bushland Restoration Annual Report