Dixon Sand

Old Northern Road Quarry, Maroota

Annual Review
2021 – 2022

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Prepared by: Project Environmental Services Pty Ltd

Project Environmental Services

Document Control

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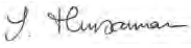
Signature of Authorised reporting officer	
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Appendix H – Annual Biodiversity & Rehabilitation Management Report

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Appendix J – Community Engagement and CCC Meeting Minutes

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Abbreviations

796/00/HE	Development Consent 796/00/HE for the Old Northern Road quarry,
Annual Review	This document (also formerly known as 'Annual Environmental Management Report')
DA250-09-01	Development Consent DA250-09-01 for the Old Northern Road quarry
DA165-7-2005	Development Consent DA165-7-2005 for the Haerses Road quarry
Dixon Sand	Dixon Sand Pty Ltd
DRG	Department of Planning, Industry and Environment – Resources Regulator (now MEG)
DPE	Department of Planning and Environment
DPE (Resources Regulator)	Department of Planning and Environment – Resources Regulator
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environment Planning and Assessment Act* 1979
EPL3916	Environment Protection Licence 3916 for the Old Northern Road quarry
HRBOA	Biodiversity Offset Area, located at Haerses Road Quarry (for Old Northern Road DA250-09-01)
IEA	Independent Environmental Audit
MEDM	Maximum Extraction Depth Map
MEG	Mining, Exploration and Geoscience, within the Department of Regional NSW
MTSGS	Maroota Tertiary Sands Groundwater Source
NVC	Native Vegetation Corridor, located at Old Northern Road Quarry
PIRMP	Pollution Incident Response Management Plan
PM10	Particulate matter <10µm
SCBGS	Sydney Central Basin Groundwater Source
TEOM	Tapered Element Oscillating Microbalance
TSP	Total suspended particulates
WAL	Water Access License

1. Statement of Compliance

Table 1: Statement of Compliance

All Conditions of the relevant approval(s) were complied with?		
Old Northern Road Quarry	DA250-09-01	No
	EPL3916	Yes
	WAL 24325	Yes
	WAL 24341	Yes
	WAL 43270	Yes

Table 2: Non-compliances

Relevant Approvals	Condition #	Condition description (summary)	Compliance Status	Section addressed in Annual Review
DA 250-09-01	Cond. 12 of Sch.5	Submission of Annual Review later than end of March 2022, however DPE approved an alternative date.	Non-compliant	Table 35, Section 11.1

Compliance Status Key

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

2. Introduction

2.1 Project Background

Dixon Sand Pty Ltd (Dixon Sand) operates two sand quarries on the Old Northern Road (Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255) and on Haerses Road (Lot 170 DP 664766, Lot 170 DP 664767, Lots A and B DP 407341, Lots 176 and 177 DP 752039 and Lot 216 DP 752039) in Maroota, New South Wales. The quarry sites are located approximately 40 kilometres north of Parramatta. The locations of the quarries are shown in Figure 1.

Extraction commenced on Lots 29 and 196, DP752025 at Old Northern Road quarry in the early 1980s, with Dixon Sand undertaking extraction from 1992 to December 1998. The continued approval for extraction on Lots 29 and 196 was granted by the Land and Environment Court NSW on 7 July 2000 with subsequent multiple Modification applications being lodged. Current extraction operations occur on Lot 196, 1 and 2, with materials being processed at the central processing plant, stockpiled and sold to the market on Lot 196.

Extraction commenced at the Haerses Road quarry in 2006 with current extraction operations in Stages 1 and 2, and Cells 1A, 1B and 2B. Sand is being transferred to the Old Northern Road quarry for processing, product blending and sales. Products are also permitted to be sold directly to the market from Haerses Road quarry.

Environmental Monitoring locations for Old Northern Road Quarry are shown in Figure 2.

2.2 Scope of this document

The objective of this Annual Review is to report on the overall environmental performance, management of the operations and compliance of Old Northern Road Quarry with the consent conditions issued by the Secretary of NSW Department of Planning and Environment (DPE). The reporting period is from 01 July 2021 to 30 June 2022, based on the date of the original quarry development consent 796/00/HE. Reporting for the rehabilitation assessment and ecological monitoring extends outside the specified period due to seasonal timing requirement for the surveys.

Development consent DA250-09-01 (Modification 5) is applicable to this Annual Review.

The following consent conditions outline the requirement of the Annual Review:

Schedule 5 of Condition 12 of DA250-09-01 (Modification 5) states:

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

- *(a) describe the development (including any progressive rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;*
- *(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar 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;*
    - *monitoring results of previous years; and*

- *relevant predictions in the documents listed in condition 2(a) of Schedule 2;*

(c) evaluate and report on:

- *the effectiveness of the air quality and noise management systems; and*
- *compliance with the performance measures, criteria and operating conditions in this consent.*

(d) identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance;

(e) identify any trends in the monitoring data over the life of the development;

(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies;

(g) escribe what measures will be implemented over the current calendar year to improve the 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 8 of Schedule 5) and any interested person upon request.

Dixon Sand requested approval from the DPE for the submission deadline of the Annual Review to be adjusted to reflect the financial year reporting. Approval was granted by the DPE on 9 February 2018 to submit the Annual Review by the end of September each year.

This Annual Review will report on the environmental performance in relation to the requirements of DA250-09-01 (Modification 5), Environment Protection License (EPL) # 3916 and Water Access Licenses (WALs) 24325, 24341 and 43270. The Annual Review has been prepared in accordance with *Post-approval requirements for State Significant mining developments – Annual Review Guideline* (DP&E, October 2015).

2.3 Old Northern Road Quarry Approvals

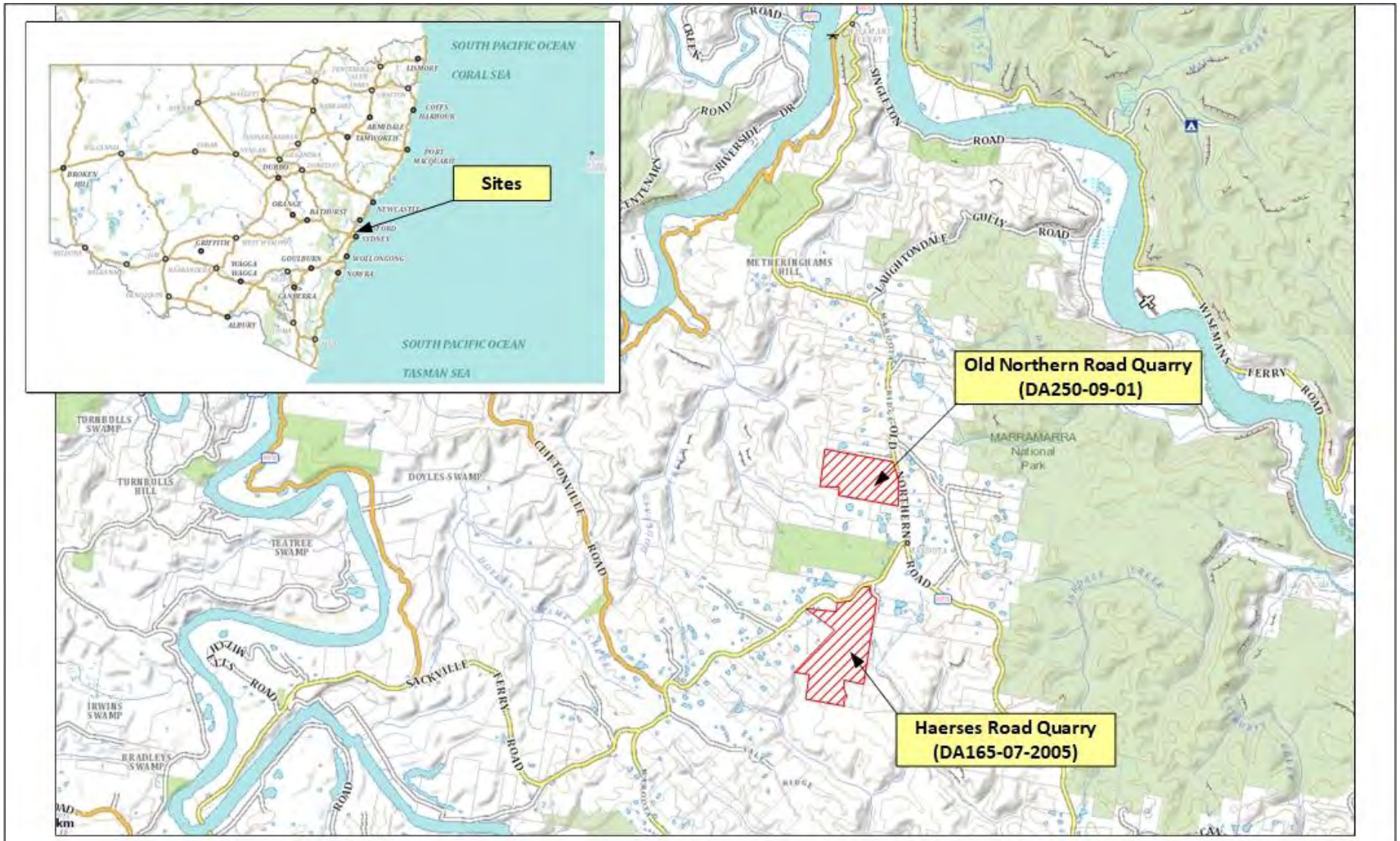
Development consents for the quarry on Lots 29 and 196 and extension into Lots 1 and 2 were issued by the Land and Environment Court on 7 July 2000 (796/00/HE) and 24 May 2004 (DA250-09-01), respectively. Consent No. 796/00/HE allowed for sand extraction, processing, and rehabilitation within Lots 29 and 196. This consent lapsed on the 22 of March 2010. Continued extraction on Lots 29 & 196 is permitted in DA250-09-01, which now forms a single integrated consent for all activities within Lots 1, 2, 29 and 196. Extraction of Lot 29 has completed with the area currently being utilised for sediment basins, haul road and undergoing rehabilitation.

Continued use of the central processing plant on Lot 196, transport of product from the site, water management, and rehabilitation operations are approved under DA250-09-01.

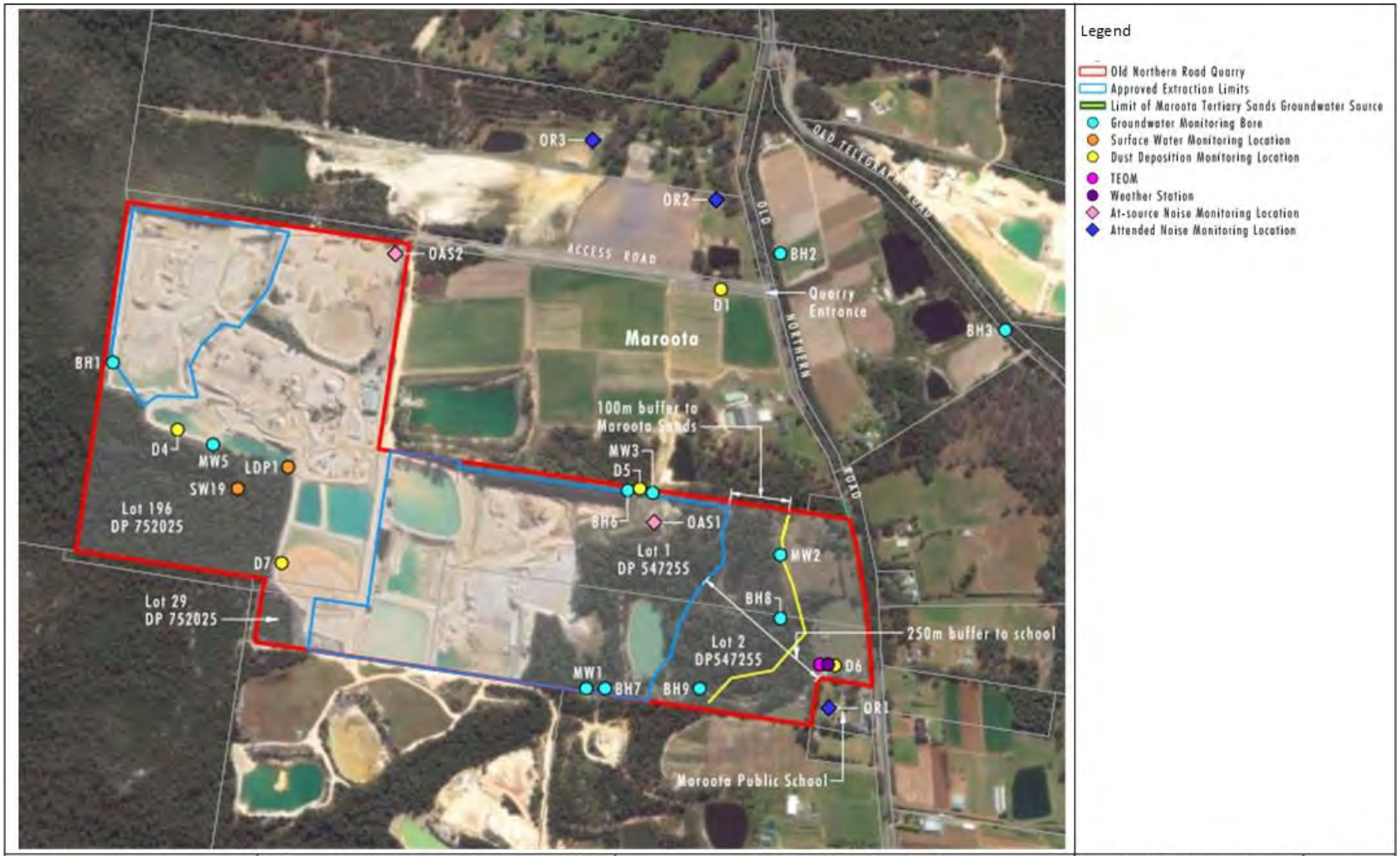
Five modifications to DA250-09-01 have been lodged and approved. Modification 5 is current and was approved on 14 November 2018. A summary of the development consents and modifications is provided in Table 3.

Table 3: Summary of Old Northern Road Quarry Development Consents and Modifications

Development Consents	Status	Date of Determination	Comments
Old Northern Road Quarry			
796/00/HE	Approved and superseded by DA250-09-01	7 July 2000	Approval for sand extraction, processing and rehabilitation of Lots 29 and 196, Old Northern Road.
DA250-09-01	Approved and superseded by Modification 1	2 January 2003	Continual of sand extraction on Lot 29 and 196, and the extension of extraction operations into Lots 1 and 2.
DA250-09-01 Modification 1	Approved and superseded by Modification 2	14 February 2006	Haerses Road sand to be transported and processed at the main Processing Plant on Lot 196 at the Old Northern Road
DA250-09-01 Modification 2	Approved and superseded by Modification 3	20 August 2008	Increased truck movements from 120 to 180 per day
DA250-09-01 Modification 3	Approved and superseded by Modification 4	30 August 2012	Amended DA250-09-01 to include extraction on Lots 29 and 196 Permit the extraction of Lot 196 to a level not within 2 metres of the wet weather high groundwater table Surrender of DA796/00/HE issued by the Land and Environment Court
DA250-09-01 Modification 4	Approved and superseded by Modification 5	6 July 2015	Application to include additional extraction areas on Lots 1 and 2 for extraction
DA250-09-01 Modification 5	Approved and current	17 November 2017	Application to extend the life of the quarry to 24 May 2042. Revision and update of the consent conditions in line with modern development consent format



Project Environmental Services	Map Source: Sixmap (2016) Scale 0 120 200 400 (kilometres)	Dixon Sand (Penrith) Pty Ltd Figure 1 Locality Plan of the Old Northern Road and Haerses Road Quarries	Plan No: J16-001-AR2017/18-1 Version: 1.0 Date: 01/08/2019 Drawn By: HC


Legend
Old Northern Road Quarry
Approved Extraction Limits
Limit of Maroota Tertiary Sands Groundwater Source
Groundwater Monitoring Bore
Surface Water Monitoring Location
Dust Deposition Monitoring Location
TEOM
Weather Station
At-source Noise Monitoring Location
Attended Noise Monitoring Location
OR3
OR2
OAS2
ACCESS ROAD
BH2
D1
Quarry Entrance
Maroota
BH3
BH1
100m buffer to Maroota Sands
MW3
D5
D4
MW5
LDP1
SW19
Lot 196 DP 752025
BH6
OAS1
Lot 1 DP 547255
MW2
D7
Lot 29 DP 752025
BH8
250m buffer to school
Lot 2 DP547255
D6
MW1
BH7
BH9
OR1
Maroota Public School
Project Environmental Services
Map Source: Extract from EMS (Umwelt, 2018)
Scale
0 120 200 400
(metres)
Dixon Sand (Penrith) Pty Ltd
Figure 2
Environmental Monitoring Locations,
Old Northern Road (DA250-09-01)
Plan No: J16-001-AR2017/18-2
Version Date Drawn By
1.0 01/08/2018 HC
N

3. Operations Summary

3.1 Production and Vehicle Movements

All bulk sand truck movements from the Haerses Road site since commencement of extraction in November 2006 have delivered raw product to the Old Northern Road site for processing. Direct sale of products from Haerses Road Quarry commenced in 2015 under a separate development consent DA165-7-2005.

A total of **449,885.32** tonnes of sand and sandstone products have been exported from the Old Northern Road quarry during the 2021 – 2022 reporting period. A total of **142,607.5** tonnes of materials have been extracted from Haerses Road and transferred to Old Northern Road for processing and blending.

An example of the morning truck movement record are contained in Appendix F.

Table 4 provides a summary of the annual production quantities, transfers and truck movements for Old Northern Road Quarry during the reporting period.

Table 4: Production Data, Transfers & Truck Movements at Old Northern Road Quarry.

Month	Total combined Production ONR from Lots 1, 2, 29 and 196 and HR (t)	Total Transfers from Haerses Rd to ONR (t)	Max Daily Truck Movements at ONR	Max No. Trucks 5:45 -7:00 am at ONR
Jul 2021	27,595.46	5,600	172	40
Aug 2021	32,330.77	630	156	38
Sep 2021	48,415.21	9,052.5	180	40
Oct 2021	45,348.90	11,040.5	180	40
Nov 2021	45,345.58	9,585	180	40
Dec 2021	37,497.52	11,537.5	178	40
Jan 2022	30,475.55	16,275.5	166	38
Feb 2022	33,467	13,307	178	40
Mar 2022	27,632.35	15,781.5	178	40
Apr 2022	34,169.11	21,454	180	32
May 2022	43,169.81	13,809	178	40
Jun 2022	44,438.06	14,535	180	38
Totals / Maximum	**449,885.32**	**142,607.5**	**180**	**40**
Annual Limit	**495,000**	**190,000**		
		Daily Max Criteria	**180**	**40**

3.2 Submission of Quarry Production Data to DRG

Condition 13 of Schedule 2 of DA 250-09-01 requires Dixon Sand to submit calendar year annual production data to the DRG (now MEG) using the standard form and include a copy of this data in the Annual Review.

The DRG (now MEG) Minerals Return forms require reporting of extractive materials for the financial year, and not for the calendar year as specified in the consent condition above.

The Minerals Return form for the financial year 2020 – 2021 was submitted to DRG (now MEG) on 25 October 2021. During the period of this Annual Review, Dixon Sand is awaiting the 2021 – 2022 Mineral Return form to be made available (anticipate this will occur around October 2022). The same production data contained in Table 4 will form the basis for calculations for MEG Minerals Return reporting. The forms will be completed and submitted to the DRG within the specified deadline.

4. Actions Required from Previous Annual Review

The proposed recommendations contained in the previous 2020-2021 Annual Review and Resources Regulator's Improvement Notice have been actioned by Dixon Sand and are summarised in Table 5.

Table 5: Summary of Recommendations and Actions

Recommendation from the 2020 – 2021 Annual Review	Actions
Vegetation Clearing and Extraction	
• Vegetation clearing will be undertaken in accordance with the Pre-clearing procedures.	• Actioned - vegetation clearing during this 2021 – 2022 reporting period was undertaken in accordance with the Pre-clearing procedures.
Rehabilitation and bush regeneration	
Old Northern Road Quarry Native Vegetation Corridor Rehabilitation Area	
• Propagation of threatened species from the original, translocated and planted specimens	• Actioned – continued threatened species propagation in commercial nurseries.
• Continue routine weed control and monitoring of regenerating native species	• Actioned – ongoing routine weed management and monitoring undertaken
Old Northern Road Quarry Lots 1 and 2	
• Continue management of Lantana camera and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2021)	• Actioned – ongoing management of Lantana camera and review of techniques
• Propagation from the original *Melaleuca deanei* specimens for future planting to achieve the required species offset numbers	• Actioned – propagated specimens currently in care at the Native Nursery for future planting. The targeted species offset numbers have been achieved.

Old Northern Road Quarry other areas	
• Continue routine weed control along the southern boundary of Cons Hill (Lot 196) and carry out direct seeding or supplementary planting where suitable	• Actioned – ongoing weed management. Supplementary planting not yet undertaken due to setback by unfavourable weather condition.
• Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.	• Actioned – ongoing rehabilitation work carried out. Supplementary planting not yet undertaken due to setback by unfavourable weather condition.
Haerses Road Biodiversity Offset Area (HRBOA)	
• Continue management of invasive grass and annual species along the North-western border of the HRBOA	• Actioned - continued weed management at the designated location

5. Environmental Performance

5.1 Air Quality

5.1.1 Dust Sources and Mitigation Measures

The objectives, criteria limits, procedures, response, reporting and responsibilities of air quality management are contained in the Air Quality Management Plan.

The following potential sources of dust generated from Old Northern Road Quarry and mitigation measures have been identified in Table 6.

Table 6: Potential sources of dust and mitigation measures.

Potential Dust Sources	Mitigation Measures
• topsoil stripping; • ripping with a bulldozer; • extraction with an excavator and truck; • crushers and screens at the processing plant; • wind erosion from stockpiles; • loading sand products into trucks; • vehicle movement and haulage on site; • product transportation along unsealed haul roads; and • occasional haul road grading.	• minimising the area of disturbance by only clearing areas immediately prior to extraction; • progressive rehabilitation; • maintaining dust suppression equipment to all processing plant; • maintaining a manual sprinkler system including fine sprays on the conveyors of the dry processing plant, overhead sprinklers and a conical jet stockpile sprinkler; • stabilising topsoil stockpiles by planting with a cover crop of non-invasive cereal or legumes; • using a water cart to suppress dust on unsealed roads, during dry conditions on days of operation; • limiting vehicle speed to 20 km/hr on internal unsealed access tracks; • ensuring all loads leaving the site are covered; and • regularly maintaining mobile and fixed equipment to minimise exhaust emissions.

5.1.2 Compliance Limits

Condition 8 of Schedule 3, DA250-09-01 requires Dixon Sand to operate a continuous air quality monitoring system to minimise the impacts at sensitive receivers such as the Maroota Public School. The following air quality criteria are to be complied with:

- dust deposition - 4g/m²/month (annual average) or 2g/m²/month increase;
- total suspended particulate matter (TSP) – 90µg/ m³ (annual mean); and
- particulate matter <10µm (PM10):
    - 50 µg/m³ (average for 24-hour period)
    - 30 µg/m³ (annual mean).

The NSW Environment Protection Authority (EPA) also requires the automatic alarm system of the Tapered Element Oscillating Microbalance (TEOM) continuous dust monitoring device to be set at a PM10 trigger value which triggers specific dust mitigation measure:

- 42 µg/m³ (average for rolling 24-hour period for wind directions between 270° and 315°) for the Old Northern Road quarry

Table 7 lists the relevant PM10 and Total suspended particulates (TSP) criteria as required by the Development Consent and Environment Protection Licence.

Table 7: PM10 and TSP Criteria.

Source	Condition	Criteria / Trigger Value	Comments
Old Northern Road			
DA250-09-01	Sch. 3, Cond. 7	30 µg/m^3	Annual PM_{10} average – long term impact assessment
		50 µg/m^3	24-hour PM_{10} average – short term impact assessment
EPL3916	O3.3	37 µg/m^3	Trigger value for PM_{10} automatic alarm
EPL3916	M2.4	42 µg/m^3 with prevailing wind direction from 270º - 315º	Criteria for enacting management plan strategies to notify the EPA, reduce dust emissions immediately and cease operations in Lots 1 and 2.
DA250-09-01	Sch. 3, Cond. 7	90 µg/m^3	Annual average criteria for TSP

5.1.3 Results

Climatic Data

Monthly climatic measurements were recorded by the weather station located adjacent to the Maroota Public School, in accordance with:

- Condition M4.1 of the EPL 3916,

These results are shown in Table 8.

Table 8: Monthly Total Rainfall and Averaged Temperatures.

Month	Jul 2021	Aug 2021	Sep 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022
Ave Temp (ºC)	11.5	13.2	15.2	16.8	17.2	19.9	21.8	20.4	19.4	17.4	14.3	11.3
Total Rainfall (mm)	19.2	64.0	20.8	43.0	175.8	108.8	107.2	273.8	520.2	114.4	76.0	3.8

Data presented in Table 8 shows that the highest monthly rainfall of 520.2 mm was recorded in March 2022 and the lowest monthly rainfall of 3.8 mm was recorded in June 2022. The total annual rainfall recorded during this reporting period is 1527 mm, representing a higher annual rainfall than the previous 5 reporting periods (1090.4 mm for 2020–2021, 313.2 mm for 2019-2020, 165.2 mm for 2018-2019, 372.8 mm in 2017-2018 and 924 mm in 2016-2017 reporting period).

From the recorded monthly temperature data, January 2022 experienced the highest average temperature at 21.8°C with June 2022 experiencing the lowest average temperature at 11.3°C.

Fluctuations in temperatures and rainfalls are generally influenced largely by the El-Nino and La-Nina climatic cycle.

Dust Deposition

Five dust deposition gauges are located on the Old Northern Road Quarry. Table 9 lists the locations of the dust gauges.

Table 9: Site location of dust deposition gauges

Dust Gauge I.D.	Location Reference	Quarry Site
D01A	Quarry Access Road, near the Old Northern Road	Old Northern Road
D04	Rehabilitation Area	Old Northern Road
D05	Bundwall, Lot 1	Old Northern Road
D06	Maroota Public School	Old Northern Road
D07	Mulloc Heap	Old Northern Road

Dust deposition results are collected and analysed monthly by a NATA accredited laboratory. Table 10 presents the monthly dust deposition results between July 2021 and June 2022. Table 11 contains the calculated annual averages for the dust deposition gauges. Note there are 13 sampling months during this reporting period.

The monthly laboratory results for dust deposition for this reporting period are presented in Appendix A.

Table 10: Dust Deposition Results: July 2021 – June 2022.

Dust Gauge Location	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jun-22
DA1A Front Gate	2.7*	2.7*	2.6*	2.1*	2.3	1.5	1.8	1.8	1.6	0.5	2.7*	5.5*	1.4
D4 Rehab	0.6*	0.5	0.5*	3.7*	1.2	0.4	0.8	0.5	1.2	1.3	0.7	0.5	0.5
D5 Bundwall	0.7*	1.0	1.0*	1.5*	1.1*	1.1*	2.1*	7.9*	0.8*	1.0*	0.6	0.9	0.4
D6 School	0.9*	1.1*	1.1*	1.0	1.0*	0.4	3.8*	1.2*	1.3	3.2*	0.9*	1.3	7.8*
D7 Mulloc Heap	0.3	0.2	0.4	0.7	6.6*	0.5	0.7	0.8	0.5	0.7	0.6	0.4	0.1

Note:

x.x*	Vegetation / algae present in dust gauge
x.x*	Insects / Spider web present in dust gauge
x.x*	Bird dropping present in dust gauge
x.x*	Ash present in dust gauge
x.x*	Sand present in dust gauge
x.x*	Dust present in dust gauge

Table 11: Calculated Annual Averages of Dust Deposition: June 2021 – June 2022.

Dust Gauge Location	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jun-22
DA1A Front Gate	2.7	2.7	2.7	2.5	2.5	2.3	2.2	2.2	2.1	2.0	2.0	2.3	2.2
D4 Rehab	0.6	0.6	0.5	1.3	1.3	1.2	1.1	1.0	1.0	1.1	1.0	1.0	1.0
D5 Bundwall	0.7	0.9	0.9	1.1	1.1	1.1	1.2	2.1	1.9	1.8	1.7	1.6	1.5
D6 School	0.9	1.0	1.0	1.0	1.0	0.9	1.3	1.3	1.3	1.5	1.4	1.4	1.9
D7 Mulloc Heap	0.3	0.3	0.3	0.4	1.6	1.5	1.3	1.3	1.2	1.1	1.1	1.0	1.0

Charts 1 to 4 illustrate the annual average dust deposition results for the reporting periods of 2018-2019, 2019-2020, 2020-2021 and 2021-2022 respectively.

TEOM PM_{10} and TSP

In accordance with Condition 8 of Schedule 3, DA250-09-01, the concentration of particulates with an aerodynamic diameter less than ten microns (PM_{10}) is monitored via the continuous dust monitor (TEOM) near Maroota Public School. The TEOM records data for the whole 360º angles, of which the 270º - 315º quadrat (westerly to north-westerly) indicate potential dust contributions from the Old Northern Road Quarry. Chart 8 illustrates the PM_{10} results for this reporting period, in comparison with relevant consent criteria. Charts 5 to 8 show the PM_{10} results for the reporting periods of 2018-2019, 2019-2020, 2020-2021 and 2021-2022 respectively.

One PM10 exceedance event occurred during this reporting period. The 24-hour average PM10 exceeded the EPL rolling 24-hour average PM10 of 42 ug/m3 criteria.

Reporting of TSP results commenced in December 2017 and are shown in Charts 9 to 12. No TSP exceedance occurred during this reporting period.

A copy of the full reports containing TEOM, TSP and weather station data provided by CBased Environmental Pty Ltd are contained in Appendix B.

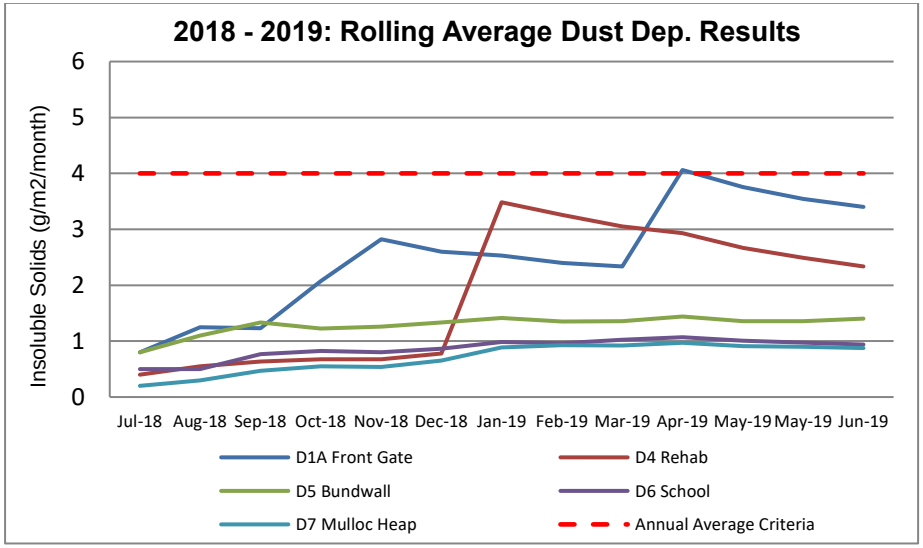


Chart 1: 2018 – 2019 Rolling Average of Dust Deposition Results

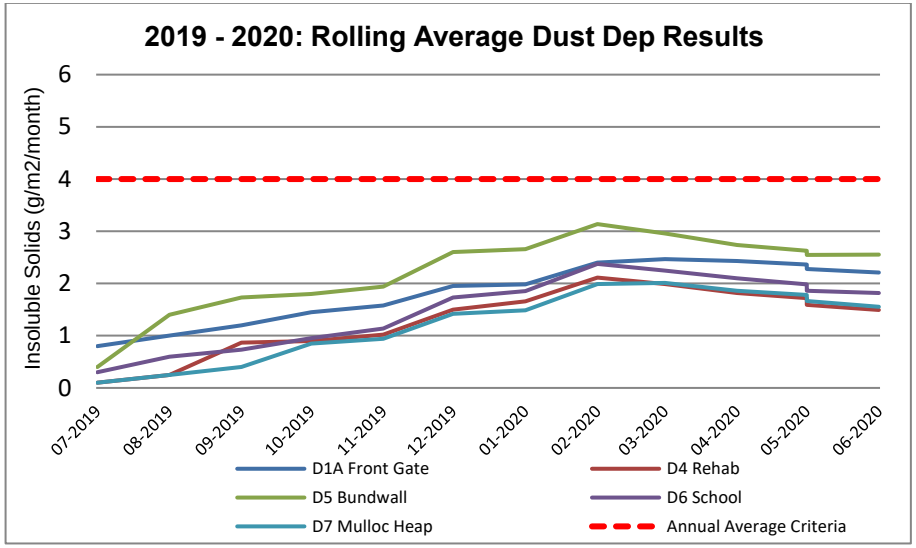


Chart 2: 2019 – 2020 Rolling Average of Dust Deposition Results

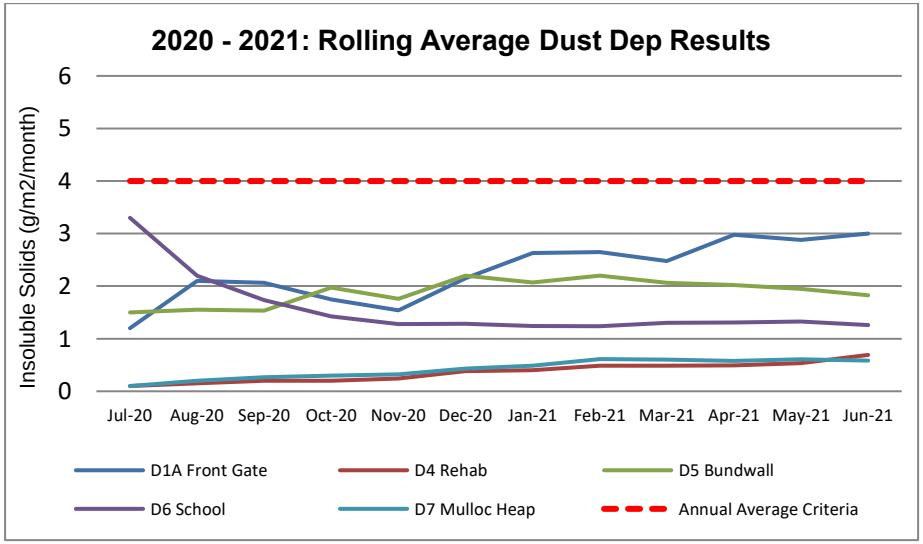


Chart 3: 2020 – 2021 Rolling Average of Dust Deposition Results

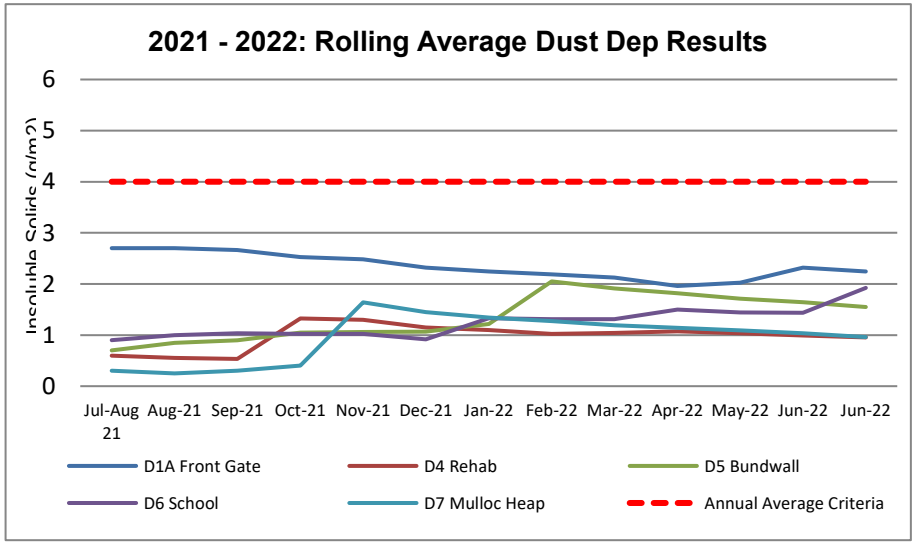


Chart 4: 2021 – 2022 Rolling Average of Dust Deposition Results

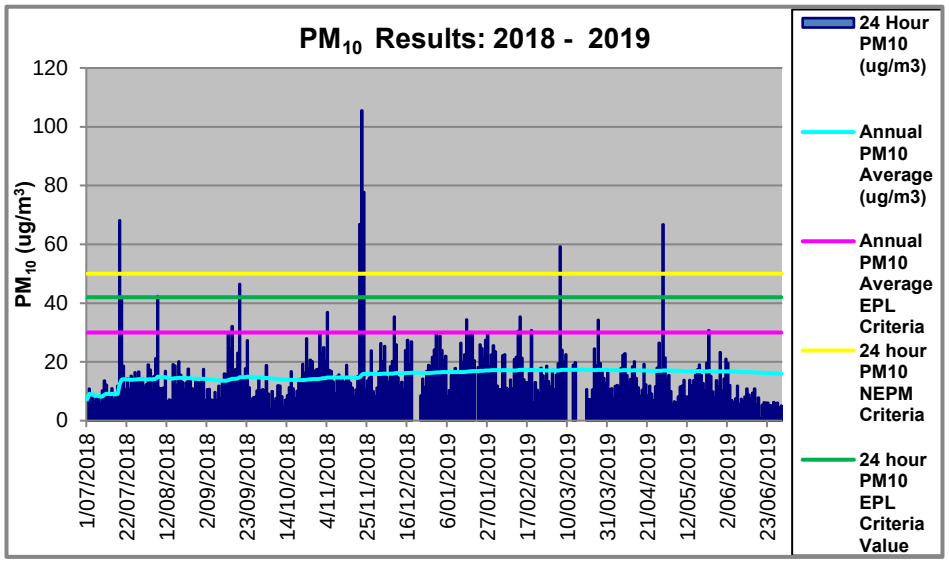


Chart 5: 2018-2019 PM10 Results and Criteria

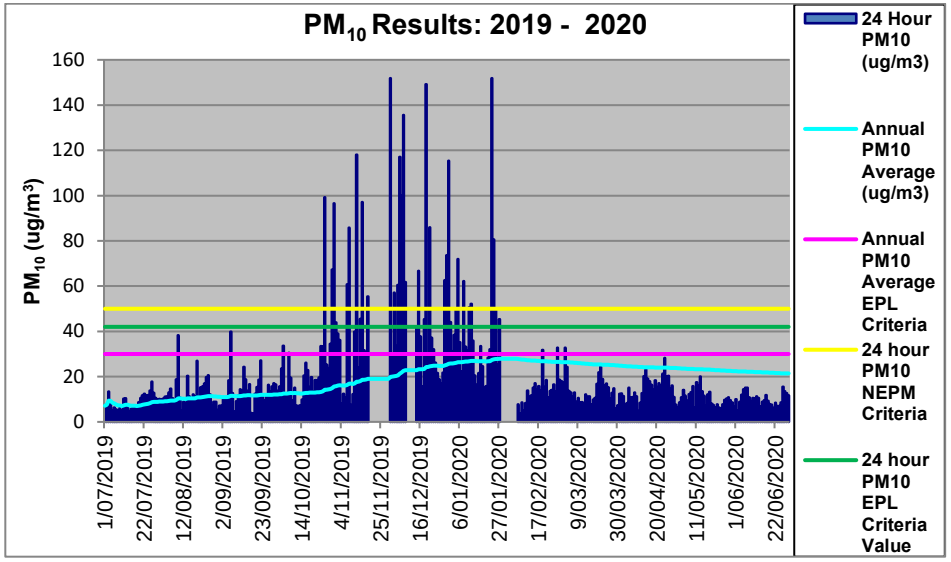


Chart 6: 2019-2020 PM10 Results and Criteria

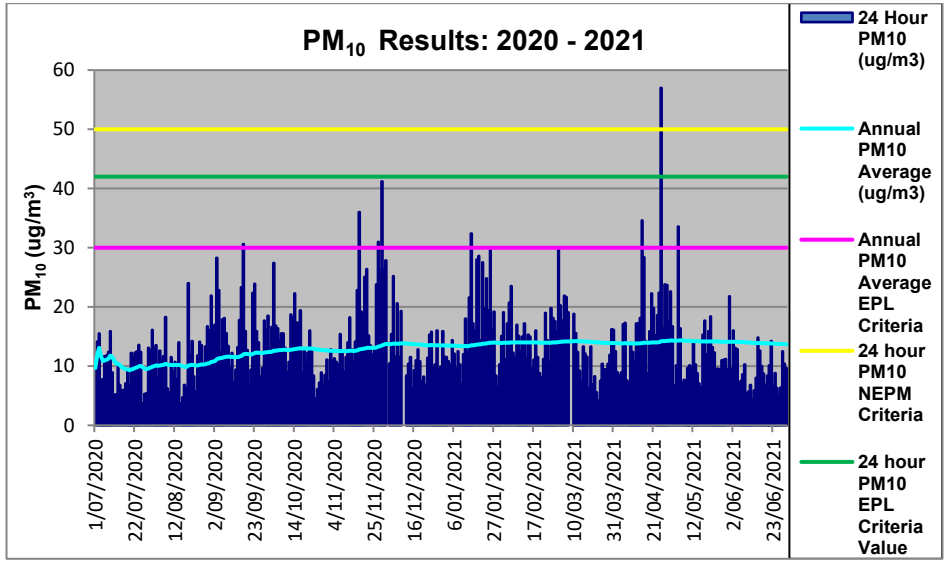


Chart 7: 2020-2021 PM10 Results and Criteria

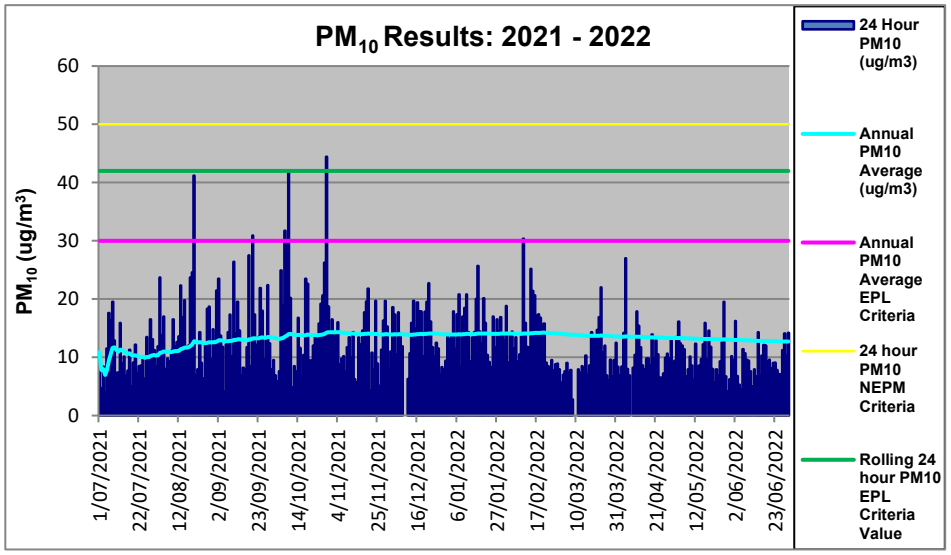


Chart 8: 2021-2022 PM10 Results and Criteria

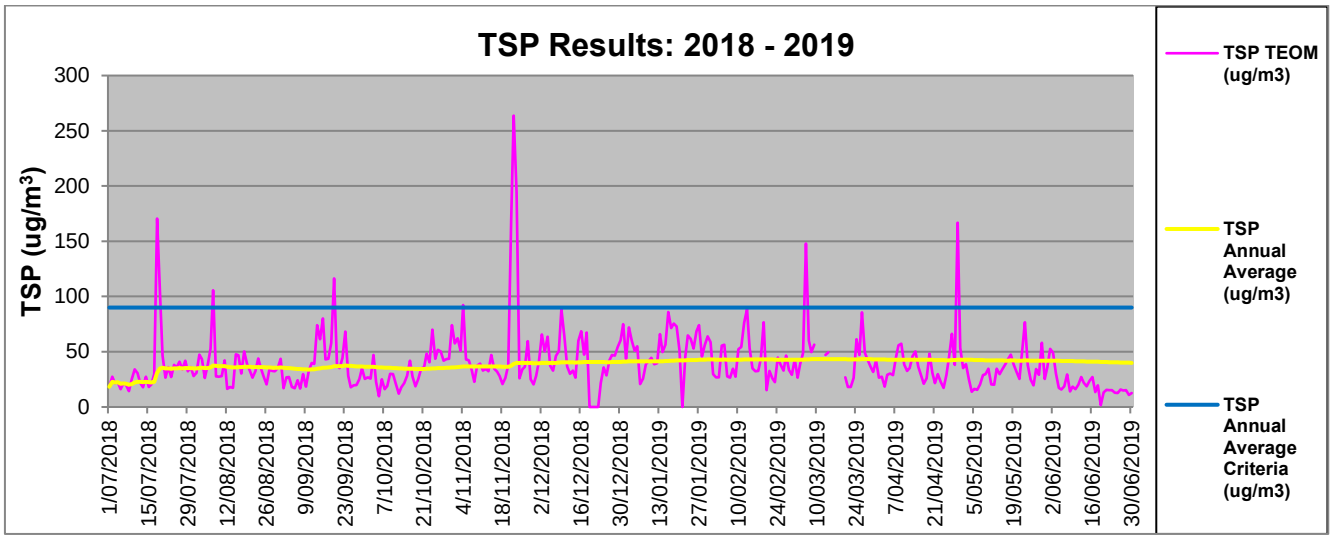


Chart 9: 2018-2019 TSP Results and Criteria

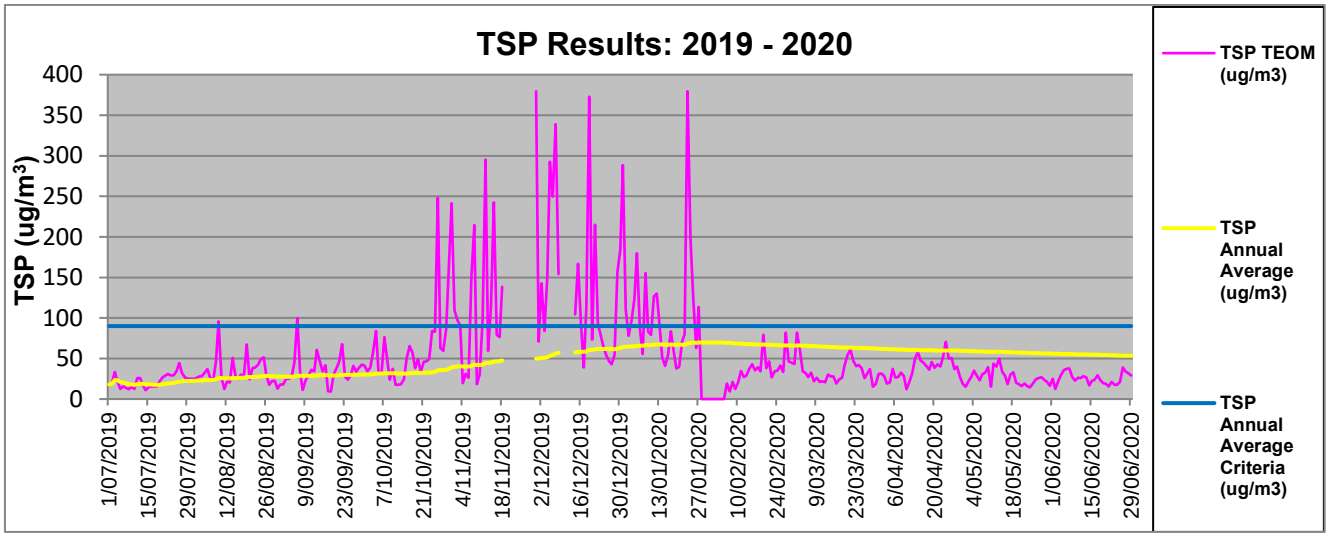


Chart 10: 2019-2020 TSP Results and Criteria

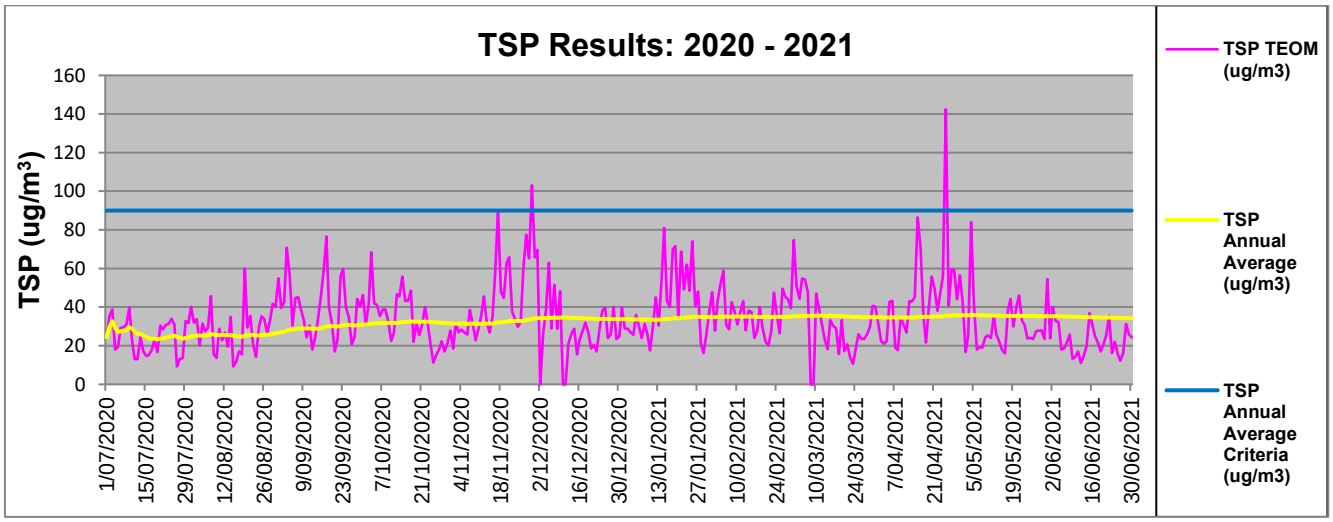


Chart 11: 2020-2021 TSP Results and Criteria

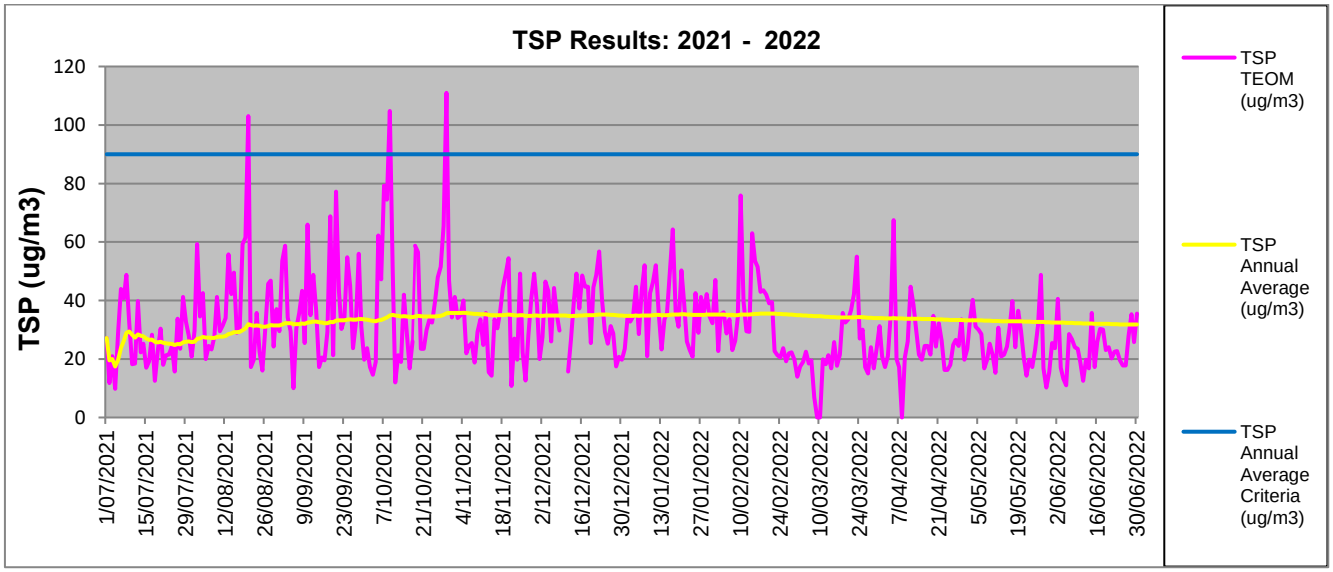


Chart 12: 2021-2022 TSP Results and Criteria

5.1.4 Analysis

Dust Deposition

Reporting Period 2021-2022

Five dust deposition gauges monitor potential dust impacts from the Old Northern Road quarry.

Monthly results and annual dust deposition averages for D01A (Front Gate), D04 (Bund), D05 (Mulloc Heap), D06 (School) and D07 (Bund) for the July 2021 to June 2022 period were in compliant. All annual averages were in compliant with the 4 g/m2/month criteria.

The EIS prepared for the extension of the quarry on Old Northern Road Lots 1 and 2 (ERM, 2001) predicted dust deposition at the nearest receptors to be between 2.2 and 2.9g/m²/month. The majority of the monthly dust deposition results at Old Northern Road quarry for the reporting period were within the EIS predicted range of dust levels, with the exception of the D06 (School) which returned slightly higher than predicted monthly results.

Historical Data

It can be seen from Charts 1 to 4 that the majority of the dust deposition results are compliant over the previous 4 years of monitoring.

D01 (front gate) was relocated in September 2016 (renamed D01(A)). During the 2018-2019, 2019-2020, 2020-2021 and 2021-2022 reporting periods, all monthly and annual average results were generally in compliant.

Annual averages for D04 (Rehab), D05 (Bundwall), D06 (School) and D07 (Mulloc Heap) have been consistently compliant over the last four reporting periods.

PM10

Reporting Period 2021-2022

The EIS predicted a 6th highest PM_{10} 24-hour average of 42 μg/m³ and a PM_{10} annual average of 7 μg/m³ (maximum values for 7 discrete receptors modelled). The air quality statement of evidence presented in the Land and Environment Court of NSW for Lots 1 and 2 (ERM, 2003) predicted that the highest 24-hour PM_{10} ground level concentration would be 37 μg/m³ at receptor 3. Consent DA250-09-01 and the Environment Protection Licence subsequently set a maximum rolling 24-hour average of 42 μg/m³ for the site.

The rolling annual average PM_{10} values (light blue line on Chart 8) remained below the EPA long term criteria of 30μg/m³ (pink line on Chart 8) for this reporting period.

The 24-hour average PM_{10} levels (dark blue columns on Chart 8) remained below the 24-hour EPL management level of 42 μg/m³ (green line on Chart 8) and the 24-hour NEPM short term criteria level of 50 μg/m³ (yellow line on Chart 8), except on one day during this reporting period. Table 12 lists the PM_{10} exceedance, relevant PM10 criteria and explanation.

Table 12: PM10 – EPL and NEPM Management Criteria Exceedance

Event No.	Exceedance Date	Exceeded PM10	Exceeded criteria (ug/m³)	Comment
1	Friday 29 Oct 2021	Rolling 24-hour average PM10 values reached 44.4 µg/m3	EPL 3916 Condition M2.4 Rolling 24-hour average PM10 criteria of 42 µg/m3	Quarry operations concluded for the day at the time the alarm was received (5:01pm on 29/10/21). Minimal work undertaken the following day (Richmond TEOM station shows wind not blowing from NW at ONR on Saturday during 6am-12pm. Dixon Sand's weather station did not record wind direction during the exceedance and reset itself after). RFS issued a fire danger warning and warm & windy conditions for the Friday. In addition, there was a small bushfire at South Maroota on Friday. During this event, the 50 µg/m3 NEPM 24-hour Average PM10 criteria was not exceeded and therefore, consent condition 7 of Schedule 3 of DA 250-09-01 has been complied with.

Historical Data

It can be seen from Charts 5 to 8 that all the annual average PM10 results recorded at the TEOM comply with the annual average PM10 criteria of 30μg/m³ over the previous four years of annual review reporting.

A number of 24-hour average PM10 exceedances were recorded over the last four reporting periods with causes attributed to activities not related to quarry operations. Exceedances during the 2018-2019 were attributed to a number of non-quarry related causes including scheduled hazard reduction burns, forecasted gusty winds, storm cells and dust storms passing through Sydney. Exceedances recorded during the 2019-2020 period was highly influenced by cumulative poor air quality associated with bushfires in the local, regional and inter-state areas. Exceedances during the 2020-2021 period were attributed to forecast windy conditions and a number of hazard reduction burns across the region.

The annual PM_{10} average for the 2021-2022 reporting period is 12.7 μg/m³, which is lower than the EPA criterion of 30μg/m³ but almost double of the predicted value of 7 μg/m³ in the EIS. In comparison, this annual average is lower than the recorded historical values of 21.3 μg/m³ (2019-2020), 16.0 μg/m³ (2018-2019) and 15.3 μg/m³ (2017-2018)

but is slightly higher than 12.4µg/m³ (2016-2017). The cause of the lower annual average for this reporting period is likely caused by the La Nina weather cycle which resulted in higher than average rainfall.

Total Suspended Particles

Reporting Period 2021-2022

The Total Suspended Particles (TSP) results are reported in Charts 9 to 12 inclusive. The annual average TSP for this reporting period is 31.8 µg/m³ which is lower than the annual average TSP criteria of 90 µg/m³ set out by the consent and EPL. The elevated TSP values were a reflection of high PM10 values.

Historical Data

Reporting of TSP commenced in December 2017. Historical annual average TSP values were 38.3 µg/m³ (2017-2018), 40.0 µg/m³ (2018-2019) and 53.4 µg/m³ (2019-2020) and 34.3 µg/m³ (2020-2021). The higher annual average TSP value recorded in 2019-2020 were attributed to cumulative effects of poor air quality associated with bushfires in the local, regional and inter-state areas.

5.1.5 Changes to Environmental Procedures

No changes to the environmental procedures are proposed or deemed necessary for air quality management.

In the event of significant amount of visible dust being observed at the premise, follow the steps outlined in the Air Quality Management Plan.

5.2 Noise Management

5.2.1 Noise Sources and Mitigation Measures

The objectives, criteria limits, procedures, response, reporting and responsibilities of noise management are contained in the Noise Management Plan.

The following potential sources of noise and mitigation measures at the Old Northern Road have been identified in Table 13.

Table 13: Potential sources of Noise and mitigation measures.

Potential Noise Sources	Mitigation Measures
• Extraction by bulldozers and excavators; • Moving of materials and stockpiling by dump trucks and excavators; • Truck haulage including bogie trucks, truck and dogs; • Wet/dry processing of sand; and • Ancillary activities including maintenance undertaken in the workshop • Construction/ maintenance of bund walls • Water transfers using pumps	• Construction of noise bunds in strategic locations as stipulated in the EIS/EAs and consent conditions; • Compliance with approved hours of operation; • Regular maintenance of road surfaces, vehicles and equipment to reduce noise emissions; and • Enforcement of speed limits for trucks and limited use of exhaust brakes in residential and school areas. • Enforcement of a 20km/h speed limit on quarry access road and haul roads. • Switch off plant when not in use and use of automatic idle shutdown.

The Noise Management Plan for Old Northern Road quarry requires attended noise monitoring to be undertaken bi-annually.

5.2.2 Compliance Limits

Noise Criteria

The Old Northern Road noise criteria are listed in Table 14. The approved hours of operation are contained in Table 15. Noise monitoring for the quarry is based on these criteria.

Table 14: Old Northern Road Noise Criteria.

<table>
<tr><th>Consent Condition</th><th>Conditions</th></tr>
<tr><td>DA250-09-01, Condition 3 of Schedule 3 and</td><td>The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land or at the Maroota Public School.

Table 2: Noise criteria dB(A)
<table>
<tr><th>Receiver</th><th>Averaging Period</th><th>Shoulder (6.00 am to 7.00 am)</th><th>Day (7.00 am to 6.00 pm)</th></tr>
<tr><td>Any residence on privately owned land</td><td>$L_{Aeq\ (15\ minute)}$</td><td>37</td><td>44</td></tr>
<tr><td>Any classroom at Maroota Public School</td><td>$L_{Aeq\ (1\ hour)}$</td><td>-</td><td>45</td></tr>
</table>
</td></tr>
</table>

	Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria. However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement. *Note: Should an agreement with a landowner be terminated for any reason, the Applicant must comply with the noise criteria in Table 2.*

Table 15: Old Northern Road Approved Hours of Operation.

<table>
<tr><th>Consent Condition</th><th>Condition</th></tr>
<tr><td>DA250-09-01, Condition 1 of Schedule 3</td><td>The Applicant must comply with the operating hours set out in Table 1.
Table 1: Operating hours
<table>
<tr><th>Activity</th><th>Permissible Hours</th></tr>
<tr><td rowspan="2">Quarrying operations (excluding truck arrival, loading and dispatch)</td><td>7.00 am to 6.00 pm Monday to Saturday</td></tr>
<tr><td>At no time on Sundays or public holidays</td></tr>
<tr><td rowspan="2">Truck arrival (unladen)</td><td>5.45 am to 6.00 pm Monday to Saturday</td></tr>
<tr><td>At no time on Sundays or public holidays</td></tr>
<tr><td rowspan="2">Truck loading
Truck dispatch
Truck arrival (laden)</td><td>6.00 am to 6.00 pm Monday to Saturday</td></tr>
<tr><td>At no time on Sundays or public holidays</td></tr>
<tr><td>Bund construction or rehabilitation works within 250 m of Maroota Public School</td><td>7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA</td></tr>
<tr><td>Maintenance</td><td>May be conducted at any time, provided that these activities are not audible at any privately-owned residence</td></tr>
</table></td></tr>
<tr><td>DA250-09-01, Condition 2 of Schedule 3</td><td>The following activities may be carried out outside the hours specified in condition 1 above:
(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.
In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.</td></tr>
</table>

5.2.3 Results

Attended noise monitoring was undertaken in December 2021 and June 2022. Attended noise monitoring was conducted at receivers (where permission to enter the property was granted) and at-source, in accordance with the requirements of the Noise Management Plan. In instances where extraneous noise such as road traffic and insects were found to be the dominant noise sources, noise levels were obtained at alternative locations closer to the quarry. Predicted noise levels are then extrapolated from the near-distance location to the sensitive receiver locations.

Quarry operations fell into five categories for main sources of noise during the monitoring period which were:

- sand processing and truck loading (main plant, front end loaders, trucks),
- extraction of sand (involving ripping by dozer and transporting via excavator loading a moxie)
- extraction of bulk sandstone by rock saw,

- stockpile management with screen, front end loader, excavator and moxie, and
- dewatering activities with dewatering pumps.

Results for predicted noise impacts for Old Northern Road quarry undertaken in December 2021 and June 2022 are contained in Tables 16 and 17 respectively.

The full noise monitoring reports for December 2021 and June 2022 are contained in Appendix D.

Table 16: Extrapolated noise levels for Old Northern Road Quarry, December 2021.

Receiver	Noise Criteria (dBA)		Extrapolated noise level (dBA)	Comment
	Shoulder	Day		
OR1	-	45	41	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	43	
OR3			44	
R2			42	
R3			41	
R4/R5			43	

*Note: A noise agreement between Dixon Sand and residents of receivers R1 and OR2 is in place and therefore the noise criteria do not apply.

Table 17: Predicted Noise Impacts for Old Northern Road Quarry, June 2022.

Receiver	Noise Criteria (dBA)		Extrapolated noise level (dBA)	Comment
	Shoulder	Day		
OR1	-	45	39	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	42	
OR3			42	
R2			41	
R3			39	
R4/R5			40	

*Note: A noise agreement between Dixon Sand and residents of receivers R1 and OR2 is in place and therefore the noise criteria do not apply.

5.2.4 Analysis

Old Northern Road - Attended Noise Monitoring – December 2021

Attended noise monitoring and modelling results indicate that the Quarry was compliant with the noise criteria for shoulder and daytime operations at all receivers under the meteorological conditions at the time.

Old Northern Road - Attended Noise Monitoring – June 2022

Attended noise monitoring and modelling results indicate that the Quarry was compliant with the noise criteria for shoulder and daytime operations at all receivers under the meteorological conditions at the time.

5.2.5 Noise Exceedance and Non-Compliance

No noise exceedance or non-compliance have been recorded during this monitoring period.

5.2.6 Discrepancies between Predicted and Actual Noise Impacts

Table 18 compares the predicted noise levels contained in the EIS (ERM, 2001) during non-adverse weather with quarry operations in Strip 2 and 3 on Lots 1 and 2. The extrapolated noise levels from December 2021 and June 2022 assessment at the receivers are also presented here for comparison.

Modelled noise impacts contained in the EIS (ERM, 2001) show that a maximum external level of LAeq 36 dB(A) has been calculated for the Maroota Public School (the school) and assuming that internal noise levels are 10 dB less than external noise levels (with windows opened), the predicted internal noise level is approximately 26 dB(A).

Extrapolated December 2021 and June 2022 noise monitoring results at the school (external) yield noise levels of 41dB(A) and 39 dB(A) respectively. Extrapolated noise monitoring results for residences on Old Northern Road yielded levels between 39 and 44 dB(A).

There are minor discrepancies between the predicted and actual noise impacts experienced at the school and residences with higher noise levels extrapolated during the attended noise monitoring. Despite of the higher extrapolated noise levels, all noise impacts comply with the daytime noise criteria. Dixon Sand is currently operating and extracting materials in Strip 3 which is east of Strip 2 which was the location used to model predicted impacts in the EIS (ERM, 2001). Therefore, current quarry operations are located closer to the school and receivers, which resulted in the recorded noise levels being higher than the predicted levels.

Table 18: Comparison of predicted and actual noise impacts, December 2021 and June 2022.

Receptor	EIS (ERM, 2001) Predicted Daytime Noise Levels LAeq (dB(A))	Daytime Noise Criteria LAeq (dB(A))	December 2021 Daytime Noise Levels	June 2022 Daytime Noise Levels	Compliance with Daytime Noise Criteria
R1	43	**44**	N/M	N/M	Yes
R2	40	**44**	42	42	Yes
R3	37	**44**	41	39	Yes
R4	35	**44**	43	40	Yes
R5	34	**44**	43	40	Yes
R6 (OR3)	N/A	**44**	44	42	Yes
School Building 1 (OR1)	36 (external) ~26 (internal)	**45**	41	39	Yes
School Building 2	35 (external) ~25 (internal)				

Note: N/A – R6 residential building constructed after the EIS (ERM, 2001)

N/M – R1 noise levels not measured due to existing Noise Agreement between Acurso and Dixon Sand.

5.2.7 Noise Trend

As quarry operations progress eastwards on Lots 1 and 2 towards Maroota Public School and other identified private residences, noise levels are expected to increase as a result of reduced proximity between machinery and noise receivers.

Charts 13 to 18 illustrate the long-term trend in noise monitoring levels for Maroota Public School and residences on Old Northern Road. Noise monitoring were undertaken during the period 2003 to 2007 however data has been omitted from this trending analysis due to the monitoring locations differing from the locations identified in the current Noise Management Plan.

It can be seen from Chart 13 that quarry noise level fluctuations occurred at Maroota Public School over the twelve-year period, with a general increasing trend with daytime noise level peaking in December 2019 at LAeq15 45 dB(A) and June 2021 at LAeq15 46 dB(A).

Chart 14 provides long-term data for receiver OR2 at 4624 Old Northern Road. Fluctuations in daytime and shoulder noise levels can be observed where reduced daytime noise levels were recorded between December 2011 to May 2014, possibly a consequence of reduced quarry activities on Lots 29 and 196. From December 2014 to date, a

general increasing daytime noise levels trend can be observed, with noise levels ranging from LAeq15min 34.1 to 45 dB(A).

Charts 16 and 17 display an increasing trend in quarry noise levels at receivers R2 and R3 from December 2018 to date, peaking at LAeq15 44 dB(A).

Chart 15 shows long term trend at receiver OR3 (R6) ranging between LAeq15 37 and 46 dB(A).

Chart 18 shows long term trend at receiver R4/5 with an increasing trend in noise levels from December 2018, peaking at LAeq15 45 dB(A) in June 2021.

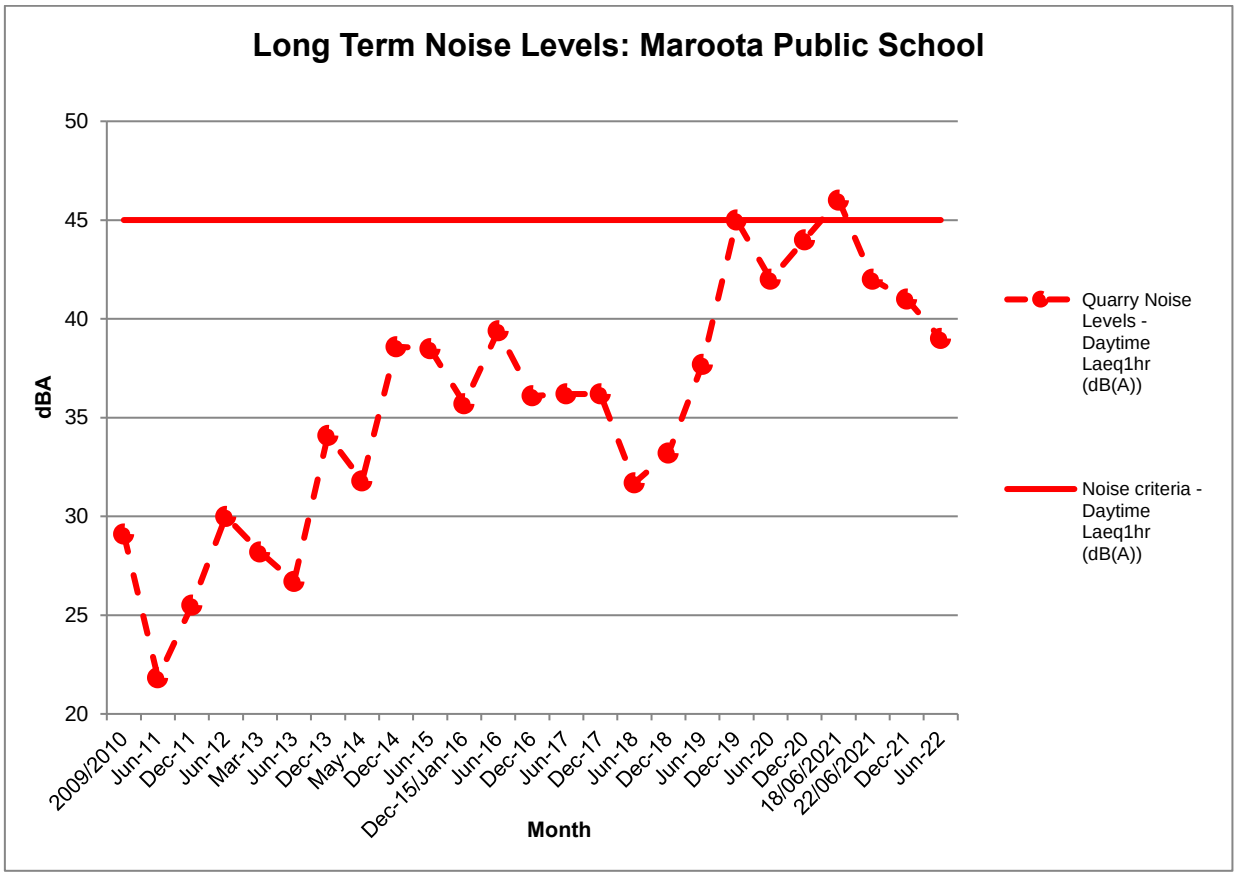


Chart 13: Long term noise trend – Maroota Public School

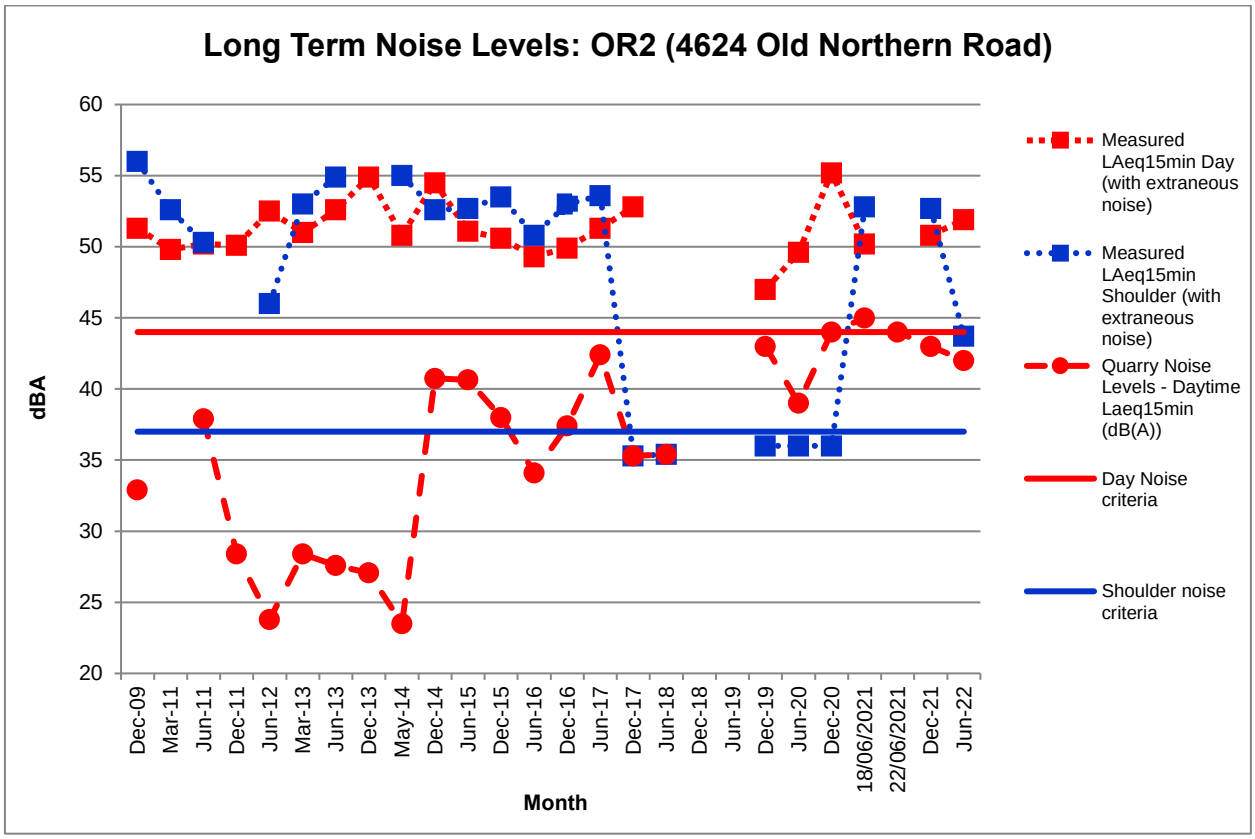


Chart 14: Long term noise trend – OR2 (No. 4624 Old Northern Road)

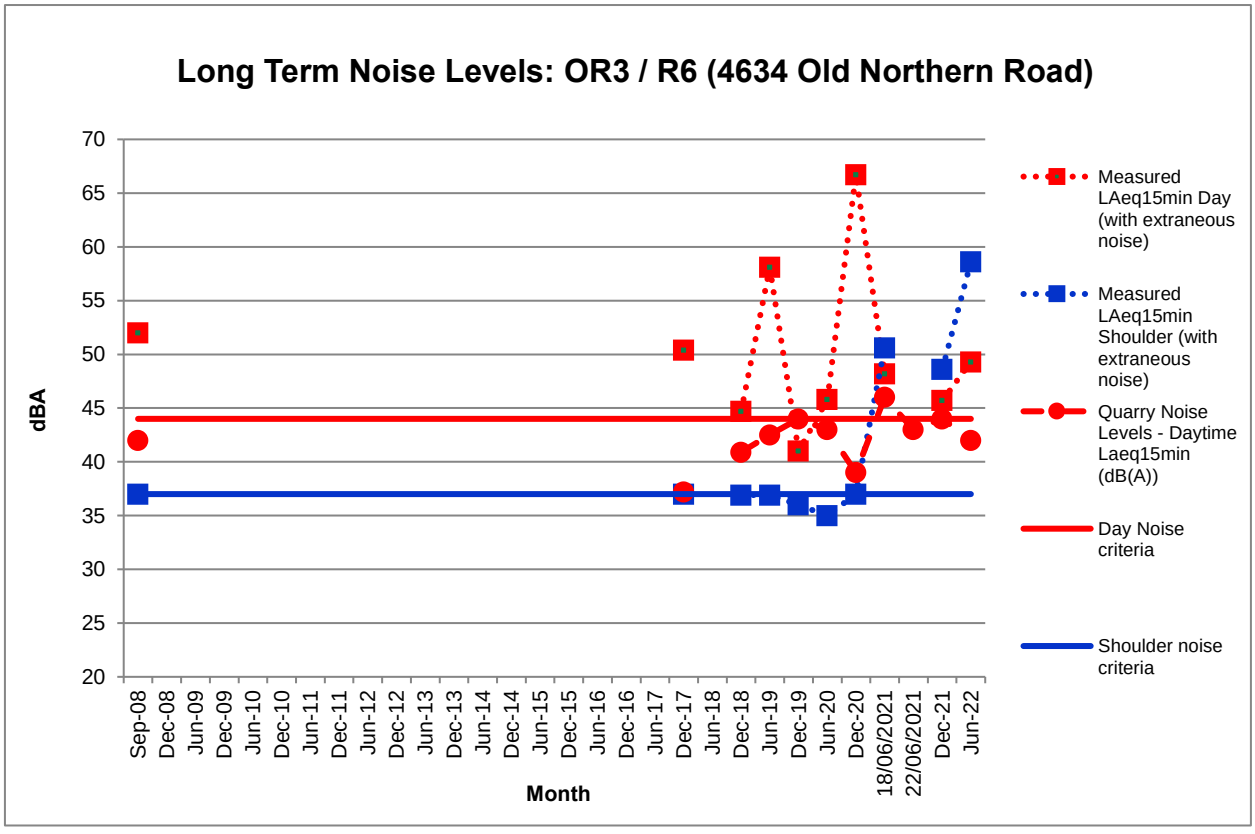


Chart 15: Long term noise trend – OR3/R6 (No. 4634 Old Northern Road)

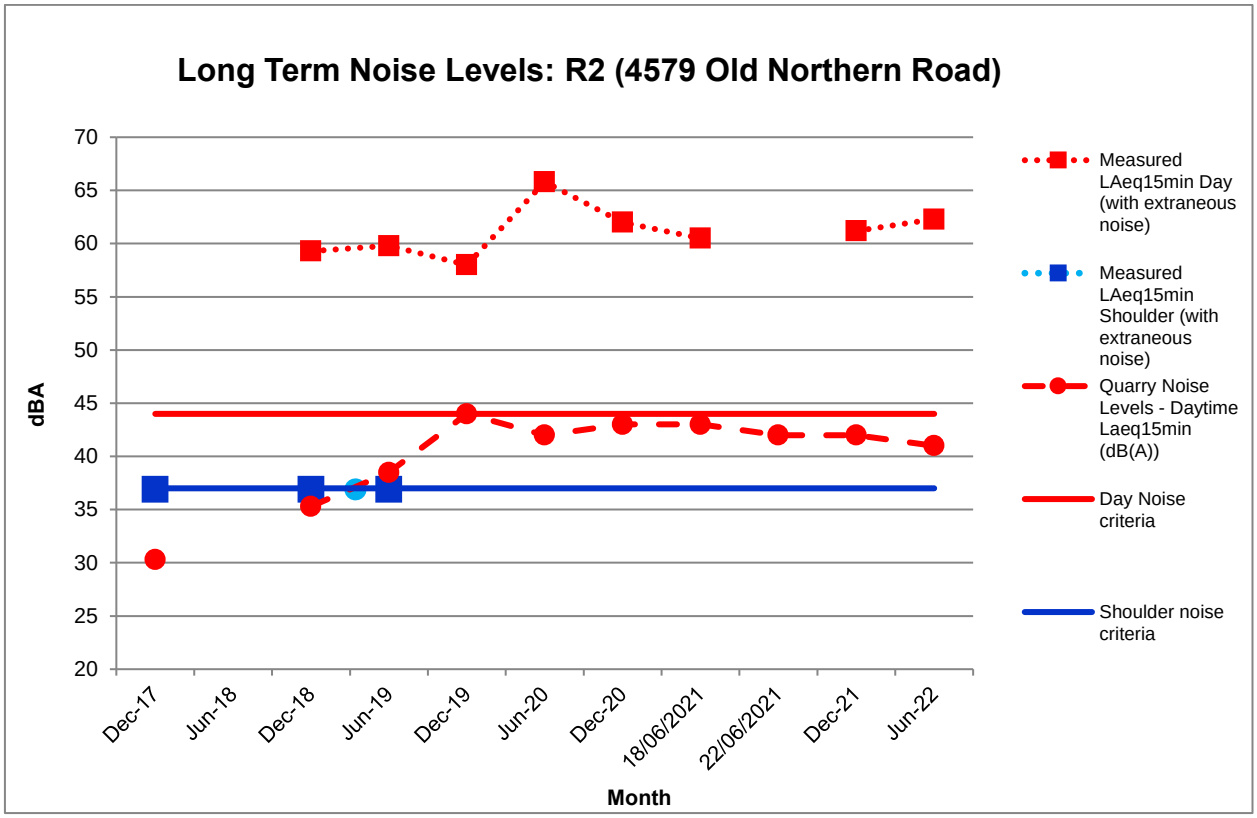


Chart 16: Long term noise trend – R2 (No. 4579 Old Northern Road)

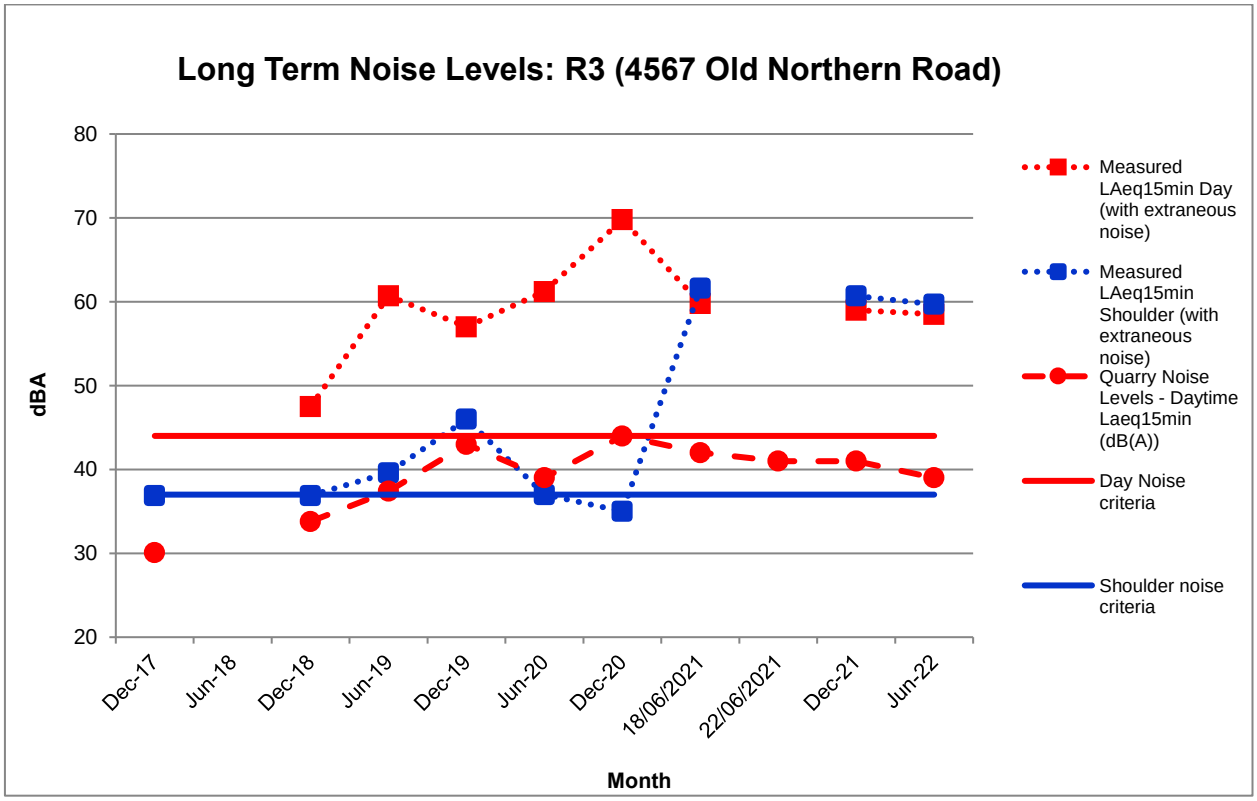


Chart 17: Long term noise trend – R3 (No. 4567 Old Northern Road)

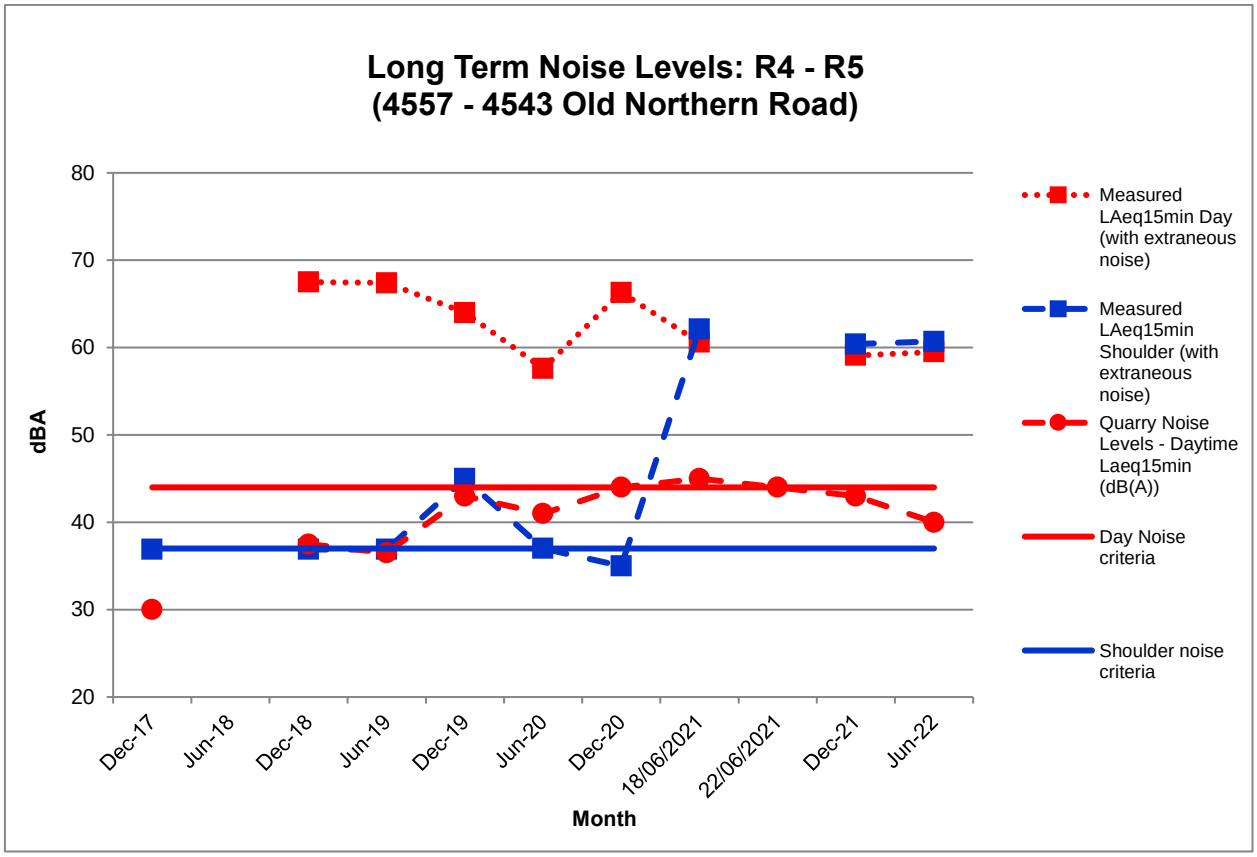


Chart 18: Long term noise trend – R4/R5 (No. 4634 Old Northern Road)

5.2.8 Changes to Environmental Procedures

There are no proposed changes to the noise procedures as a result of noise compliance during this reporting period.

Dixon Sand is required to construct a noise bund within the 250m buffer to the Maroota Public School prior to commencing extraction in Strip 4 on Lots 1 and 2. Any construction or maintenance of noise bund walls are to be carried out in accordance with the strategies outlined in the Old Northern Road Noise Management Plan. Should vegetation clearing be required for the bund construction, undertake vegetation clearing in accordance with the pre-clearing procedures.

Continue to undertake attended noise monitoring in accordance with the Noise Management Plan.

5.3 Traffic and Transport

5.3.1 Ongoing Management Measures

Vehicle Movements

Vehicle movement records have been sent to Council on a monthly basis and Section 94 Contribution payments made. There were no exceedances of permitted vehicle movements during the reporting period.

Monthly Inspections

Observations of road conditions and maintenance requirements are inclusive in the monthly site inspection checklists. An example of the monthly site inspection checklist is attached in Appendix E.

Community Liaison

Liaison between Dixon Sand and the representative of Maroota Public School is conducted on a regular basis during the Community Consultative Committee meetings which are held bi-annually. Details of the CCC meetings and community engagement and contributions are discussed further in Section 8.

5.3.2 Traffic Related Complaints

One traffic related complaint was received for Old Northern Road Quarry during the 2021-2022 reporting period. The details of the complaint, recommendations and outcome are summarised in Table 19 below. The complaint has been closed out.

Please note that Dixon Sand has no jurisdiction over haulage trucks outside the quarry premise as these are not contracted or owned by Dixon Sand. The enforcement of truck noise compliance rests with TfNSW and the EPA. Dixon Sand does not operate its own truck fleet and is restricted by its legal jurisdiction in prohibiting the use of the trucks' safety features. Dixon Sand however is committed to assisting in the education campaign through induction, traffic management policies and inter-pit agreement.

A copy of the complaints register containing the complaints received during the reporting period is attached in Appendix K.

Table 19: Traffic Complaints, recommended action(s) and outcome

Old Northern Road Quarry **Complaint No. 1**	
Date complaint received	30 November 2021 Complaint received by Weighbridge Operator via telephone call.
Issue	• The complainant was concerned about the driving nature of a truck who was crossing over double line markings on the road multiple times. • The complainant followed the truck to the quarry entrance and was able to record the truck identification.
Recommended Action(s)	• Notify Quarry Manager and/or Environmental Officer immediately • Request a copy of truck registration to check against Dixon Sand's customer haulage truck register and liaise with PF Formation and Hodgson Quarries in accordance with the Maroota Local Traffic Management Plan. • If the truck in question is confirmed to have picked up products from one of the three quarries, check if the truck has a previous offence(s) and notify the truck company as a formal warning.

	• Quarry Manager to execute appropriate disciplinary action. • If the truck in question has been verified to have picked up products from one of the three quarries, notify other truck drivers at the quarry of the nature of complaint/non-compliance and remediation action (privacy and identity of complainant and truck driver must be maintained).
Outcome	• The truck in question was identified. • Quarry Manager spoke to the truck driver who admitted responsibility. • The driver was reminded of the importance of adhering to the road rules, the quarry traffic management policy and the 3-strike out rule. • **Official Warning No. 1 was given to the driver**. • Quarry Manager contacted the Complainant and advised them of the abovementioned steps taken by the Quarry. • **The weighbridge operator(s) will commence the education campaign to remind haulage truck drivers of their responsibilities for road safety and to remind them of the requirements of the quarry Traffic Management Policy.**
Close out Date	30 November 2021

5.3.3 Compliance

Assessment of compliance against the relevant conditions is summarised in Table 20.

Table 20: Road and Traffic Compliance.

DA250-09-01 (Mod 5)	Condition	Compliance	Comments
Condition 5(b) of Schedule 2	continue to receive and process extractive material from Haerses Road Sand Quarry, and dispatch quarry products from the site, until 14 February 2046.	Yes	Material transported from Haerses Road to Old Northern Road during this reporting period.
Condition 7 of Schedule 2	Truck movements at the site (i.e. one-way trip, either arrival or dispatch), including truck movements between the site and the Haerses Road Sand Quarry, must not exceed: (a) 180 per day; and (b) 40 between 5.45 am and 7.00 am.	Yes	Maximum recorded daily truck movements were **180 in and out bound.** Maximum number of morning trucks was **40 in and out bound**
Condition 12 of Schedule 2	The Applicant must pay Council an annual financial contribution toward the maintenance of local roads used for haulage of quarry products. The contribution must be determined in accordance with The Hills Shire Council Contributions Plan No. 6 Extractive Industries, or any subsequent relevant contributions plan adopted by Council.	Yes	Refer to Appendix I for S.94 contribution
Condition 1 of Schedule 3	The Applicant must comply with the operating hours set out in Table 1.	Yes	Refer to truck records

DA250-09-01 (Mod 5)	Condition	Compliance	Comments

Table 1: Operating hours

Activity	Permissible Hours
Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday
	At no time on Sundays or public holidays
Truck arrival (unladen)	5.45 am to 6.00 pm Monday to Saturday
	At no time on Sundays or public holidays
Truck loading Truck dispatch Truck arrival (laden)	6.00 am to 6.00 pm Monday to Saturday
	At no time on Sundays or public holidays
Bund construction or rehabilitation works within 250 m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence

Condition 2 of Schedule 3	The following activities may be carried out outside the hours specified in condition 1 above: (a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and (b) emergency work to avoid the loss of lives, property or to prevent environmental harm.	Yes	Condition not triggered
Condition 21 of Schedule 3	The Applicant must keep accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months.	Yes	Refer to Summary Truck Record on Dixon Sand's website: http://www.dixonsand.com.au/environment
Condition 22 of Schedule 3	The Applicant must: (a) advise its drivers and its clients not to arrive at the site prior to 5:45 am on any day; (b) ensure that all laden trucks have their loads covered when arriving at or leaving the site; (c) ensure that all laden trucks are cleaned of material that may fall from vehicles, before leaving the site; and (d) use its best endeavours to ensure that appropriate signage is displayed on all trucks used to transport product from the development so they can be easily identified by road users.	Yes	Requirements outlined in the Traffic Management Plan

DA250-09-01 (Mod 5)	Condition	Compliance	Comments
Condition 2 of Schedule 3	The Applicant must prepare a Traffic Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with the RMS and Council; (b) be submitted to the Secretary for approval within 3 months of the approval of Modification 5, unless otherwise agreed by the Secretary; (c) describe the processes in place to control the arrival and dispatch of trucks; (d) include a Drivers' Code of Conduct that details the safe and quiet driving practices that must be used by drivers travelling to and from the site, particularly in the vicinity of the Maroota Public School; (e) describe the measures to be put in place to ensure compliance with the Drivers' Code of Conduct; (f) include specific measures to minimise the impact of heavy vehicles, including restrictions on routes and times (particularly in relation to peak hours, holiday periods and times immediately before and after school hours, i.e. 8.30 am – 9.00 am and 3.00 pm – 3.30 pm); and (g) propose measures to minimise the transmission of dust and tracking of material onto the surface of the public road from vehicles leaving the quarry. The Applicant must implement the approved Traffic Management Plan as approved by the Secretary.	Yes	Refer to the Traffic Management Plan

5.3.4 Analysis

The production and truck movement data outlined above is evidence that Dixon Sand has operated in compliance with the consent conditions during the 2020-2021 reporting period.

One traffic related complaint was received for Old Northern Road Quarry. The complaint was related to a haulage truck driving in a dangerous manner and crossing over double line markings on the road multiple times. The complaint related to actions which occurred outside the quarry premise. The complaint was investigated, resolved and closed out. In this instance, the haulage truck in question was associated with Dixon Sand and the driver was issued a formal first warning, as required by the Maroota Local Traffic Management Policy.

5.3.5 Findings and Effectiveness of Traffic Management

Current traffic management and mitigation measures are being implemented through Old Northern Road Quarry Traffic Management Plan (TMP). The mitigation measures listed in Table 5.1 in the TMP are categorised into three main categories: (1) truck movement measures, (2) site operational control measures and (3) transport related

consultation measures.

During the period of this Annual Review, the adopted mitigation measures have been effective in managing traffic on the quarry premise. Restrictions on number of truck movements to and from site during morning and daytime period have been complied with. All haulage truck operators have been inducted onto site and a record maintained.

During induction, the haulage truck operators were provided with a copy of the following documents:

- Site Traffic Management Plan - outlining specific requirements the responsibilities and requirements,
- Quarry Premise Map - showing traffic flow directions,
- Maroota Local Traffic Management Policy - outlining the inter-pit agreement between the three signatories of local quarries, and
- Site Induction Declaration – declaration to be made and signed by haulage truck operators confirming induction requirements.

The implemented mitigation measures and educational campaign increases awareness and emphasises the importance of traffic related compliance. This has proven to be effective as there is a decreasing trend in the number of traffic related complaints over the last three reporting years, as discussed in later Section 8.3.

5.3.6 Additional Management Controls

The Maroota Local Traffic Management Policy (MLTMP) was reviewed, updated and signed by the local quarry signatories on 17 January 2020. This MLTMP (2020) supersedes the original MLTMP.

Additional traffic management controls were proposed in the previous Annual Review period as a result of the review and revision of the TMP. A compliance procedure is an additional management control that has been added to the TMP and induction documents. The inclusion of a compliance procedure in the induction documents provides reiteration to haulage truck operators of the expected outcome should the requirements contained in the TMP are not complied with.

Dixon Sand continues to show its support towards the CCC's recommendation to extend the school zone time outside Maroota Public School in the afternoon from 16:00 to 16:30 due to safety concerns for students waiting for school bus pickup within that period. The matter has been raised by the CCC Chairperson with the member of the Hawkesbury Electorate and future correspondences will be dealt with in the CCC meetings. The outcome of this proposal is yet to be resolved.

5.3.7 Changes to Environmental Procedures

No changes to the environmental procedures are proposed or deemed necessary for road and traffic management.

5.4 Waste Management

5.4.1 Waste Generation, Disposal and Recycling

During the reporting period, waste oil and grease were removed from the quarry by a licensed contractor for processing and disposal. Scrap metals were transported by a licensed waste transporter and recycled at a licensed metal recycling facility.

Glass, paper, cardboard and plastic (general solid waste – non-putrescible) were recycled via Council's fortnightly scheduled bin collection service. Food waste and other general solid waste (putrescible) were disposed of and collected via Council's weekly scheduled bin collection. Other bulky waste associated with the workshop activities was disposed of in skip bins and transported offsite by a licensed waste transporter. Used printer ink cartridges were disposed of at the designated drop off bin at the local Post Office.

No building or putrescible wastes have been disposed of on the site.

The amount of waste transported off site from the Old Northern Road for disposal, recycled and processed during the monitoring period is contained in Tables 21. The waste tracking register is contained in Appendix L.

Table 21: Old Northern Road – Total waste generated on site, July 2021 to June 2022.

Waste Type	Disposal / Recycling / Processing	Amount of Waste Generated
General Solid Waste - Putrescible	The Hills Shire Council Waste Contractor weekly bin collection (3 x 240L Red bin)	Approx. 78 m^3
General Solid Waste - Recyclables	The Hills Shire Council Waste Contractor fortnightly bin collection (2 x 240L Yellow bin)	Approx. 26 m^3
Scrap Metals	Recycled by Westland Metals	22.3 tonnes
Non-putrescible waste from workshop	Skip Bins provided and picked up by Asquith Mini Skips	50m^3
Grease	Collected and transported by Grease Eater	3,960 litres
Waste Oil	Collected and transported by: • JJ's Waste & Recycling	2,000 litres
Sewage	Onsite sewage treatment through EnviroCycle	Estimated to be 0.225 Mega litres (average 15 employees per operating day)
Ink Cartridge	Drop off at Post Office	<0.5 m^3

5.4.2 Waste Importation

DA 250-09-01 does not permit any importation of waste onto the quarry premise.

5.4.3 Changes to Environmental Procedures

No changes to the waste management procedure are proposed for the next 2022-2023 reporting period.

Continued efforts to minimise waste generation and maximise recycling and reuse of materials are to be undertaken such as labelling of bins for waste segregation, waste reduction posters and toolbox talks to raise awareness.

6. Water Management

6.1 Monitoring and Compliance Limits

DA250-09-01 Modification 4 required Dixon Sand to install and monitor 2 additional monitoring bores. Installation and commencement of monitoring of these two additional bores occurred in September 2015.

6.1.1 Groundwater Levels and Criteria / Trigger Levels

Groundwater levels for the Old Northern Road Quarry have been measured on a monthly basis. The groundwater monitoring system comprised initially of five boreholes in 2003. Five additional boreholes were installed and monitored monthly since June 2011. Borehole MW4 has been decommissioned as the area is now under extraction. Boreholes BH8 and BH9 have been installed on Lot 2 to satisfy Condition 3.25 of Schedule 2, DA250-09-01 (Modification 4). Borehole BH2 was damaged in December 2019 due to vehicle strike and therefore monitoring has been suspended until the monitoring well is rectified.

Borehole locations are listed in Table 22.

Table 22: Boreholes for groundwater monitoring at the Old Northern Road quarry.

Monitoring Bore	Location Reference	Borehole Type	Aim of Monitoring
MW1	Quarry Lot 2, southern boundary	Old bore	Localised perched aquifer
MW2	Quarry Lot 1, west of existing house	Old bore	Localised perched aquifer
MW3	DS2, northern boundary of Quarry Lot 1	Old bore	Localised perched aquifer
MW4*	DS3, western boundary of Quarry Lot 2 –	Old bore	Localised perched aquifer
MW5	Quarry Lot 196, south of main dam	Old bore	Localised perched aquifer
BH1	Western boundary of Quarry Lot 196	New bore	Sydney Basin Central Groundwater Source
BH2	Located in Lot 1, DP204159	New bore	Sydney Basin Central Groundwater Source
BH3	Located in Lot 1, DP204159	New bore	Sydney Basin Central Groundwater Source
BH6	Northern boundary of Quarry on Lot 1	New bore	Sydney Basin Central Groundwater Source
BH7	Southern boundary of Quarry on Lot 2	New bore	Sydney Basin Central Groundwater Source
BH8	Within the 100m buffer to MTSGS on Lot 2	New bore	Localised perched aquifer
BH9	Within the 100m buffer to MTSGS on Lot 2	New bore	Deeper bore targeting the Sydney Basin Central Groundwater Source

Note: MW4 decommissioned due to its location being in the active extraction area.*

The baseline groundwater level statistics with the 20th and 80th percentile results are listed in Table 23.

Table 23: Baseline Groundwater Level Statistics and Trigger Values (2003 – 2020)

Monitoring Bore	Minimum	20th Percentile	50th Percentile	80th Percentile	Maximum
MW1	173.1	176.0	177.5	178.3	180.0
MW2	191.2	194.3	199.0	200.3	202.1
MW3	173.6	175.1	177.4	178.4	180.3
MW5	158.4	162.1	162.6	162.9	164.0
BH1	106.1	106.2	106.2	107.1	107.5
BH2	162.1	165.0	165.0	166.7	167.9
BH3	158.1	160.5	161.0	161.7	162.1
BH6	161.7	164.1	164.7	165.5	166.2
BH7	157.0	160.0	160.4	161.2	162.1
BH8	189.2	189.5	189.8	189.9	190.3
BH9	157.8	161.3	163.0	163.8	164.4

6.1.2 Groundwater Quality and Criteria / Trigger Levels

The Soil and Water Management Plan requires groundwater quality sampling to be undertaken on a 6-monthly basis. Groundwater quality sampling was undertaken in December 2020 and June 2021. Groundwater samples were obtained and sampled by a NATA qualified laboratory for analysis of electrical conductivity, total suspended solids and turbidity. pH measurements were taken in the field due to short sample holding time. Table 24 contains that baseline groundwater quality statistics and trigger values.

Table 24: Baseline Groundwater Quality Statistics and Trigger Values (2010 – 2020)

Monitoring Bore	pH			Electrical Conductivity (µS/c)		
	20th Percentile	50th Percentile	80th Percentile	20th Percentile	50th Percentile	80th Percentile
MW1	4.0	4.1	4.6	206	249	271
MW2	3.7	3.9	4.5	239	560	618
MW3	5.2	5.6	6.1	129	141	160
MW5	4.4	5.1	5.4	135	151	213
BH1	6.0	6.1	6.6	161	185	214
BH2	4.9	5.7	7.1	262	293	325
BH3	5.9	6.0	6.9	176	186	269

BH6	5.2	5.5	5.8	120	127	156
BH7	4.4	4.8	5.8	242	252	258
BH8	3.9	4.0	4.1	267	278	291
BH9	5.4	5.5	5.6	262	269	275

6.1.3 Surface Water Monitoring and Discharge Event

Condition M2.3 of EPL 3916 requires Dixon Sand to monitor (by sampling and obtaining results by analysis) the concentration of the pollutants utilising the specified methodology, units of measure and sampling frequency outlined in Table 25. Water discharged at the main storage dam weir must meet these criteria outlined in the EPL 3916. Water sampling at the EPA licensed discharge point is to be obtained and analysed against the criteria in Condition L2.4 of EPL 3916 prior to being discharged from the main water storage dam, as listed Table 26.

Table 25: EPL 3916 Surface water sampling requirement at LDP01.

Pollutant	Units of Measure	Frequency	Sampling Method
pH	pH	Daily during any discharge	Grab sample
Total Suspended Solids	Milligrams per litre	Daily during any discharge	Grab sample
Turbidity	Nephelometric turbidity units	Daily during any discharge	Grab sample

Table 26: EPL 3916 Surface water discharge criteria.

Pollutant	Units of Measure	100th Percentile concentration limit
pH	pH	4.5 – 6.5
Total Suspended Solids	milligrams per litre	50

6.2 Extraction Limits

Old Northern Road Extraction Limits

Extraction limits for the Old Northern Road quarry are defined by DA250-09-01 and listed in Table 27 below.

Table 27: Old Northern Road Quarry Extraction limits

DA250-09-01 Conditions	Extraction limit
Condition 17 of Schedule 2	Extraction below a depth of 15.24 m below original ground level is restricted to Lot 196 DP 752025 within the hatched area shown in the figure in Appendix 2 and to a depth not greater than 127.5 m AHD.
Condition 18 of Schedule 2	Extraction on Lot 29 DP 752025 is limited to a depth not greater than 15.24 m below original ground level.
Condition 19 of Schedule 2	Extraction on Lots 1 and 2 DP 547255, with the exception of the MTSGS buffer zone, is limited to a depth not greater than 170 m AHD in the east, gradually

	reducing to 153 m AHD in the west, and as shown conceptually in the figure in Appendix 4.
Condition 20 of Schedule 2	The Applicant must ensure that no extraction occurs with 2 m of the highest recorded wet weather groundwater level within the MTSGS buffer zone.
Condition 21 of Schedule 2	The Applicant must: (a) establish the highest recorded wet weather groundwater level within the MTSGS buffer zone based on all available (and at least 12 months) site specific groundwater monitoring data; (b) engage a suitably qualified and experienced expert to establish the maximum depths to which extraction can be undertaken within the MTSGS buffer zone to comply with condition 20 above; and (c) submit a Maximum Extraction Depth Map (contour map or similar) for the development, which demonstrates compliance with conditions 17 to 20 above (inclusive), to the Secretary for approval within 3 months of the approval of Modification 5.
Condition 22 of Schedule 2	The Applicant must comply with the extraction depths specified in the Maximum Extraction Depth Map to the satisfaction of the Secretary.

Notwithstanding Condition 17 of Schedule 2 of DA250-09-01, Licence 627635 was granted by Department of Planning, Industry and Environment (Crown Lands) and commenced on 4th June 2021 permitting Dixon Sand to undertake extraction of the area hatched on Lot 196 (Appendix 2 of DA 250-09-01) beyond the depth of 15.24 m below original ground level.

6.3 Results

6.3.1 Groundwater Levels

Chart 19 depicts the long term recorded groundwater levels, with monitoring commencing in June 2003. Charts 20 to 30 (inclusive) illustrate the groundwater levels for all monitoring bores for this reporting period.

6.3.2 Groundwater Quality

Chart 31 displays the long-term pH results for all monitoring bores from June 2010 to June 2022. Charts 32 to 42 (inclusive) show the pH results and trigger values for each bore for this reporting period.

Chart 43 presents the long-term electrical conductivity results for all monitoring bores from June 2010 to June 2022. Charts 44 to 54 (inclusive) show the electrical conductivity results and trigger values for each bore for this reporting period.

Note that there was insufficient water in Borehole BH8 during the sampling event and therefore no water quality could be tested.

6.3.3 Surface Water Monitoring

Charts 55 to 58 (inclusive) illustrate the pH, electrical conductivity, turbidity and total suspended solids of the water samples obtained from the surface monitoring location SW19.

6.3.4 Water Discharge Events

During the wet period in March 2022 which resulted in extensive flooding across the Hawkesbury and Windsor region, the EPA issued a broadcast email to all EPA licensed holders announcing that a grace period has been allocated for

the period of 3 – 14 March 2022 where there is no requirement to report any incidents. During this grace period, water in the water storage dam has overtopped the weir and not reported to the EPA, complying with the exemption.

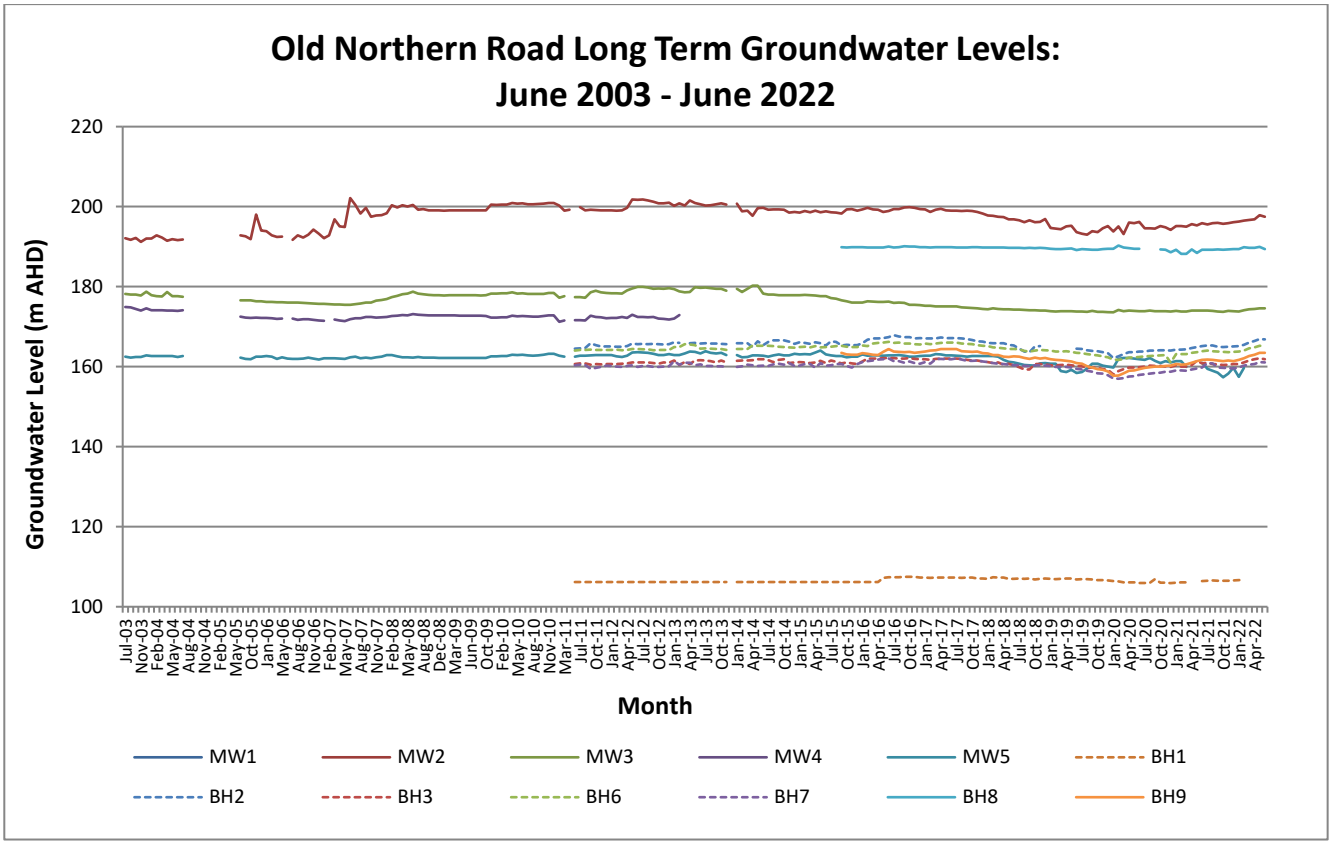


Chart 19: Long Term Groundwater Levels – all Boreholes.

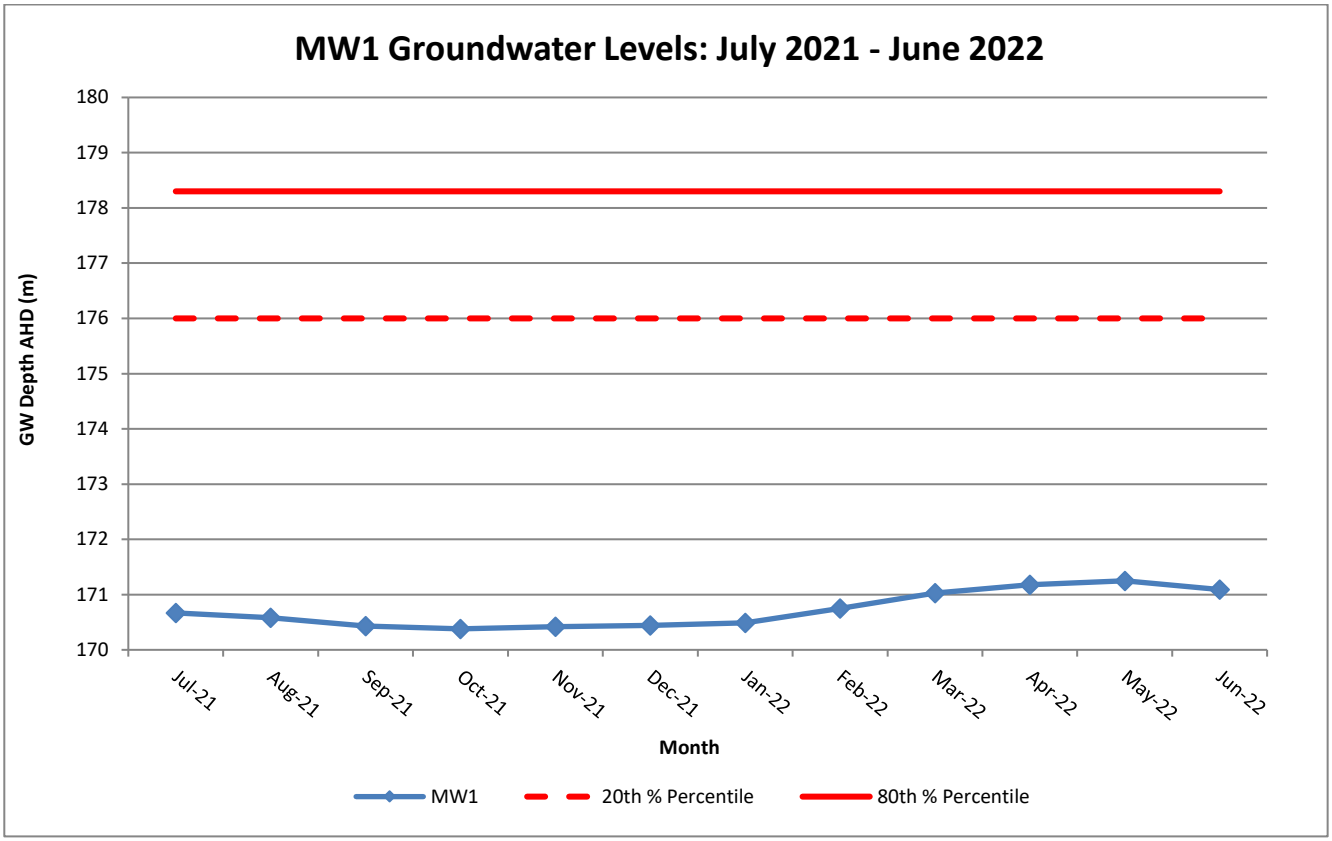


Chart 20: MW1 Groundwater Levels for July 2021 – June 2022.

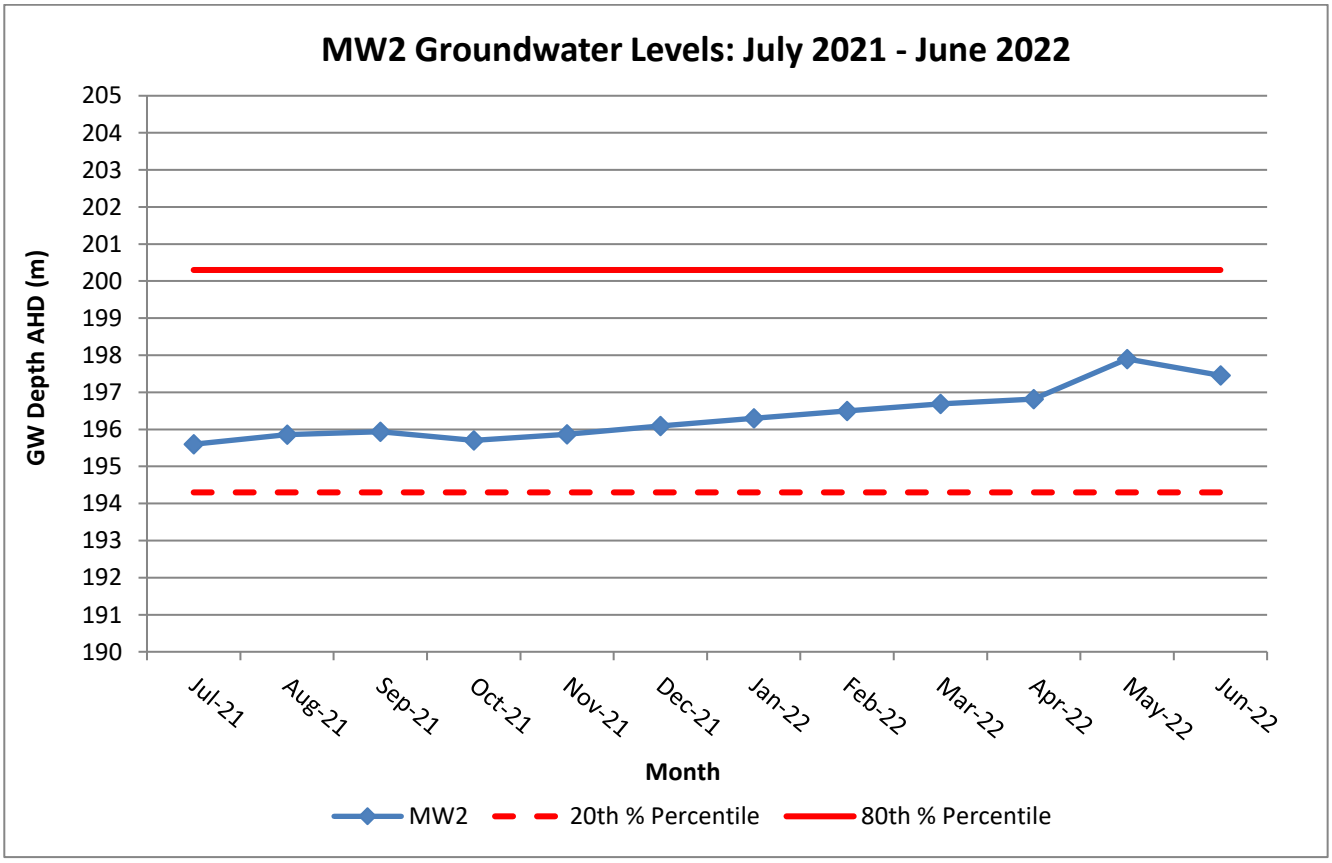


Chart 21: MW2 Groundwater Levels for July 2021 – June 2022.

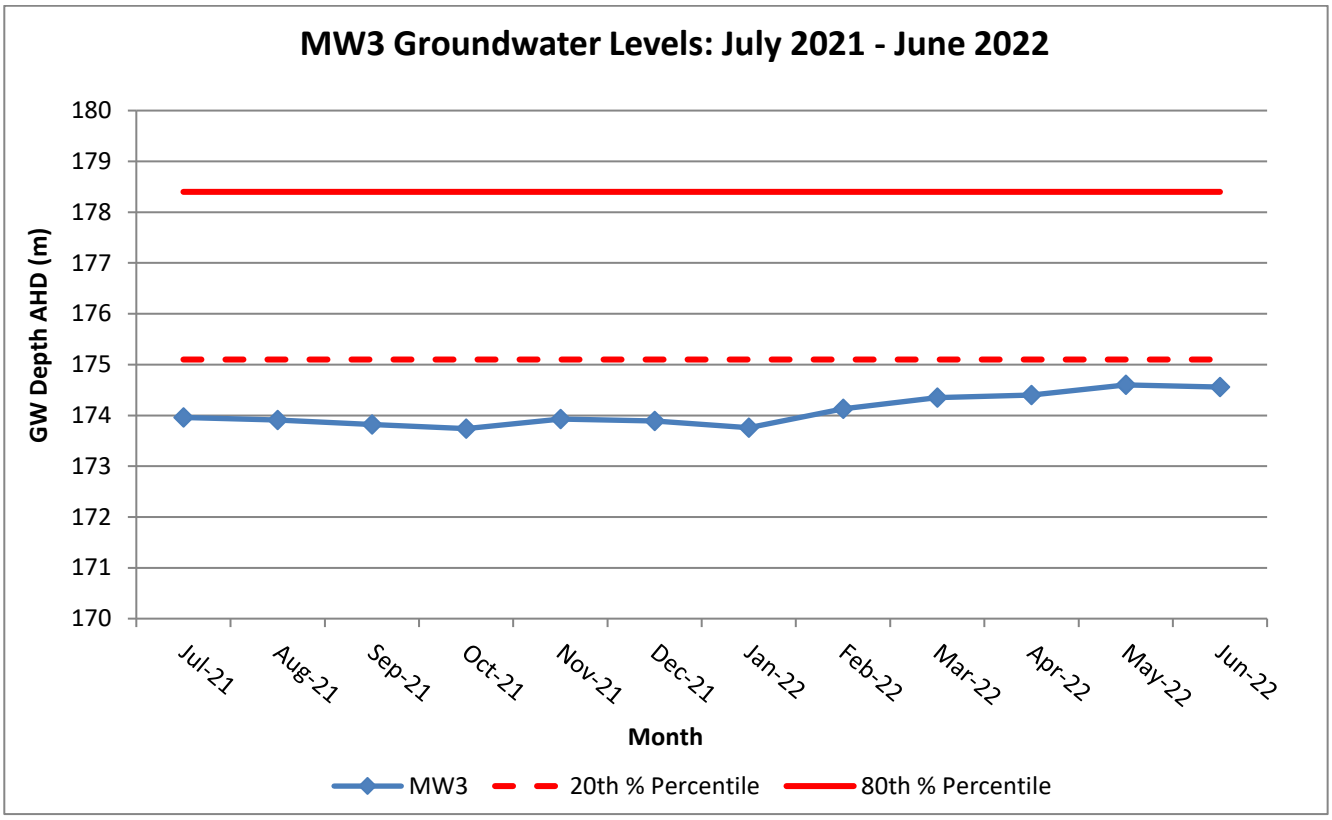


Chart 22: MW3 Groundwater Levels for July 2021 – June 2022.

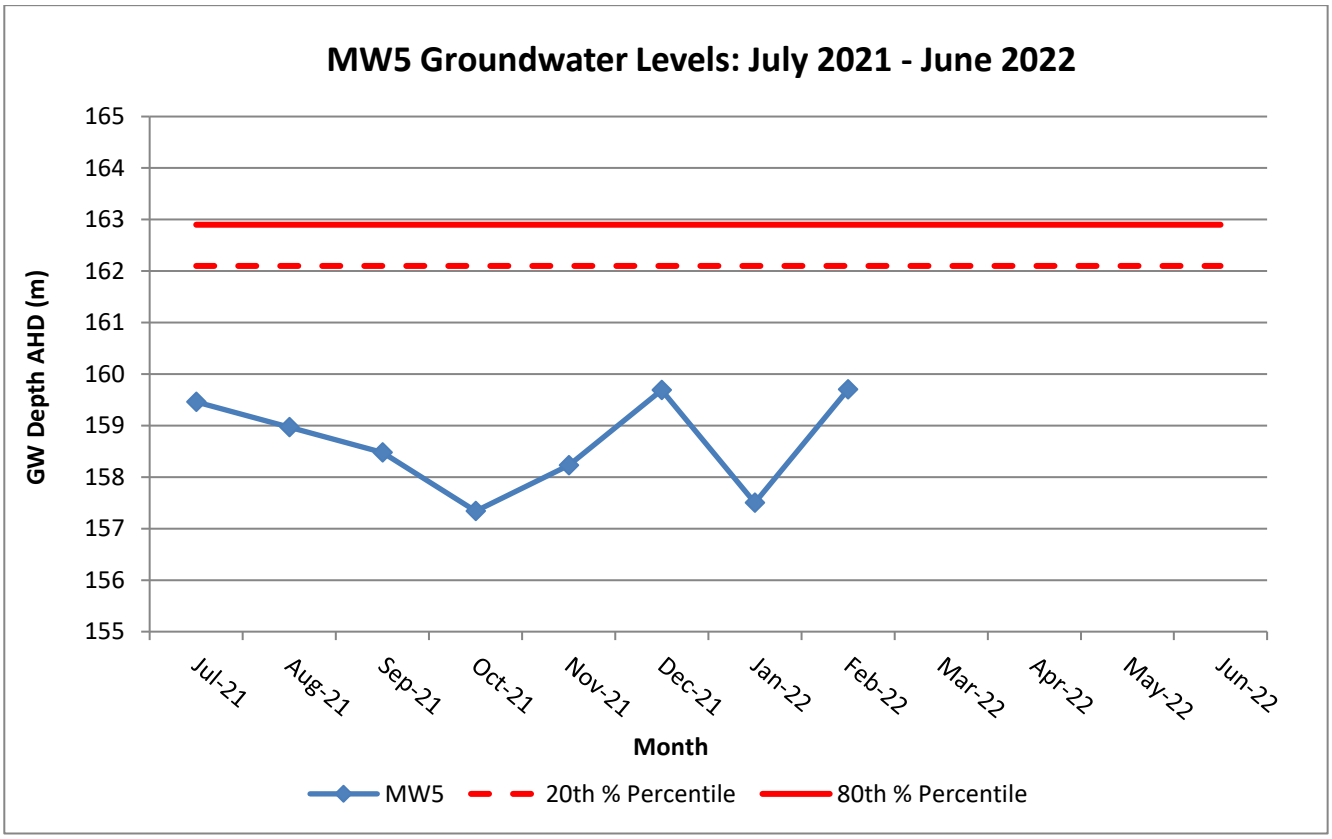


Chart 23: MW5 Groundwater Levels for July 2021 – June 2022.

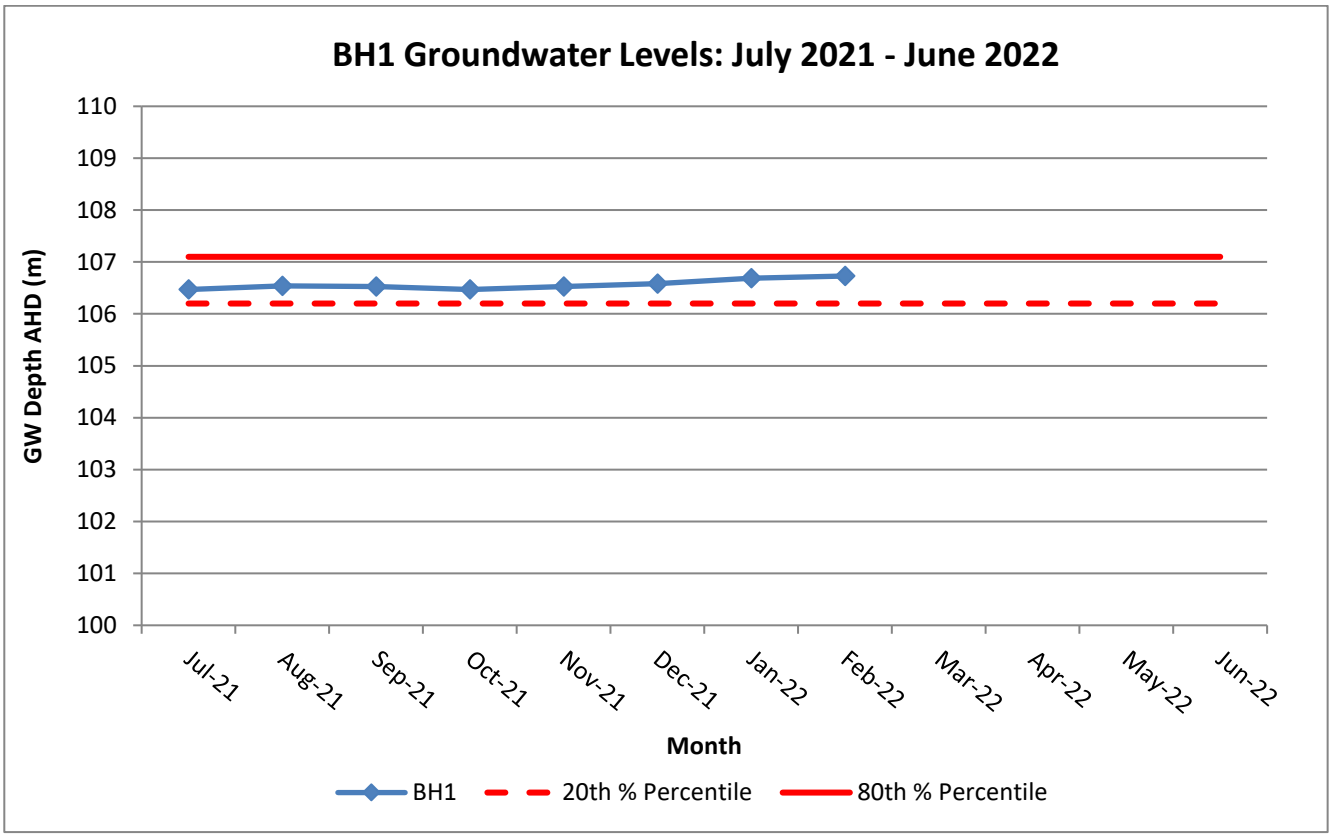


Chart 24: BH1 Groundwater Levels for July 2021 – June 2022.

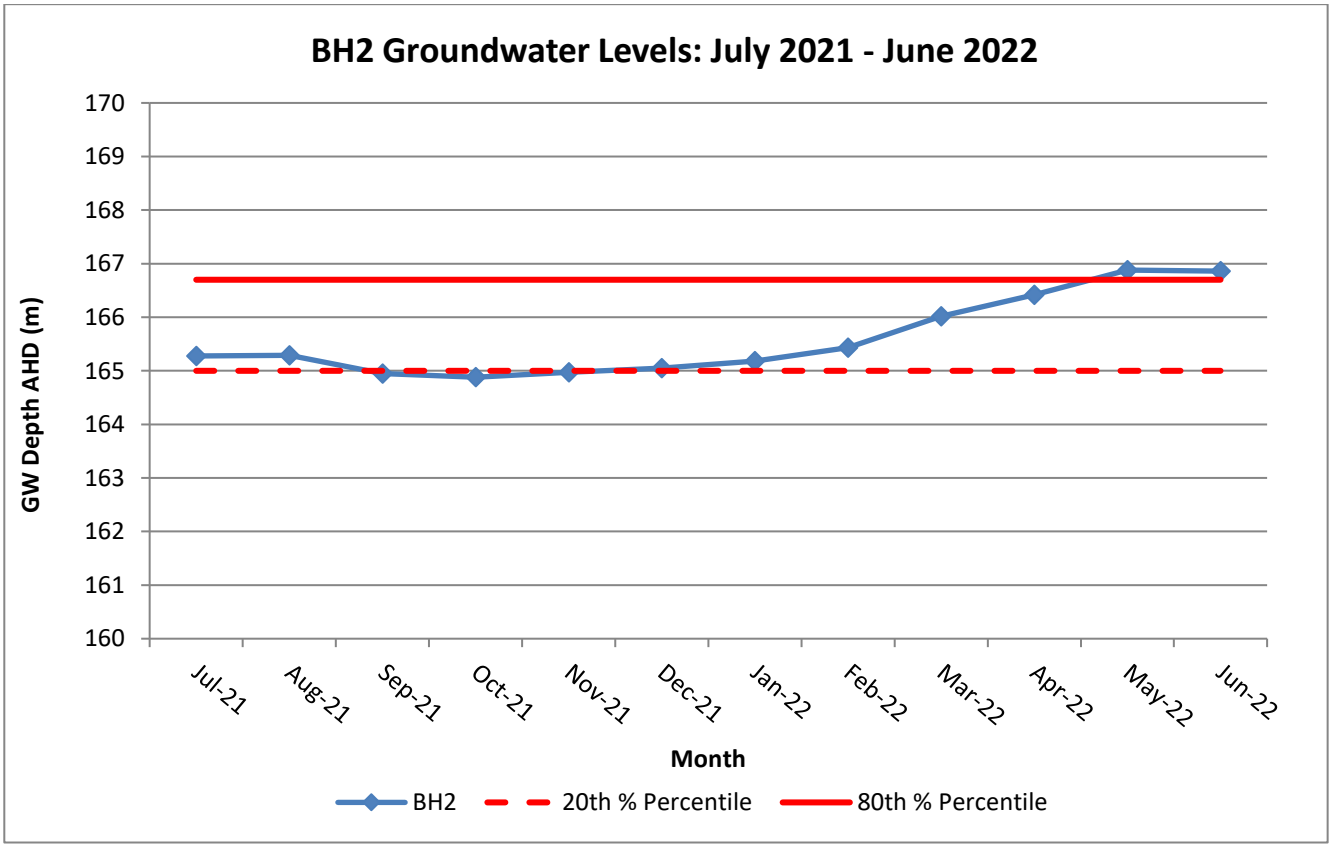


Chart 25: BH2 Groundwater Levels for July 2021 – June 2022.

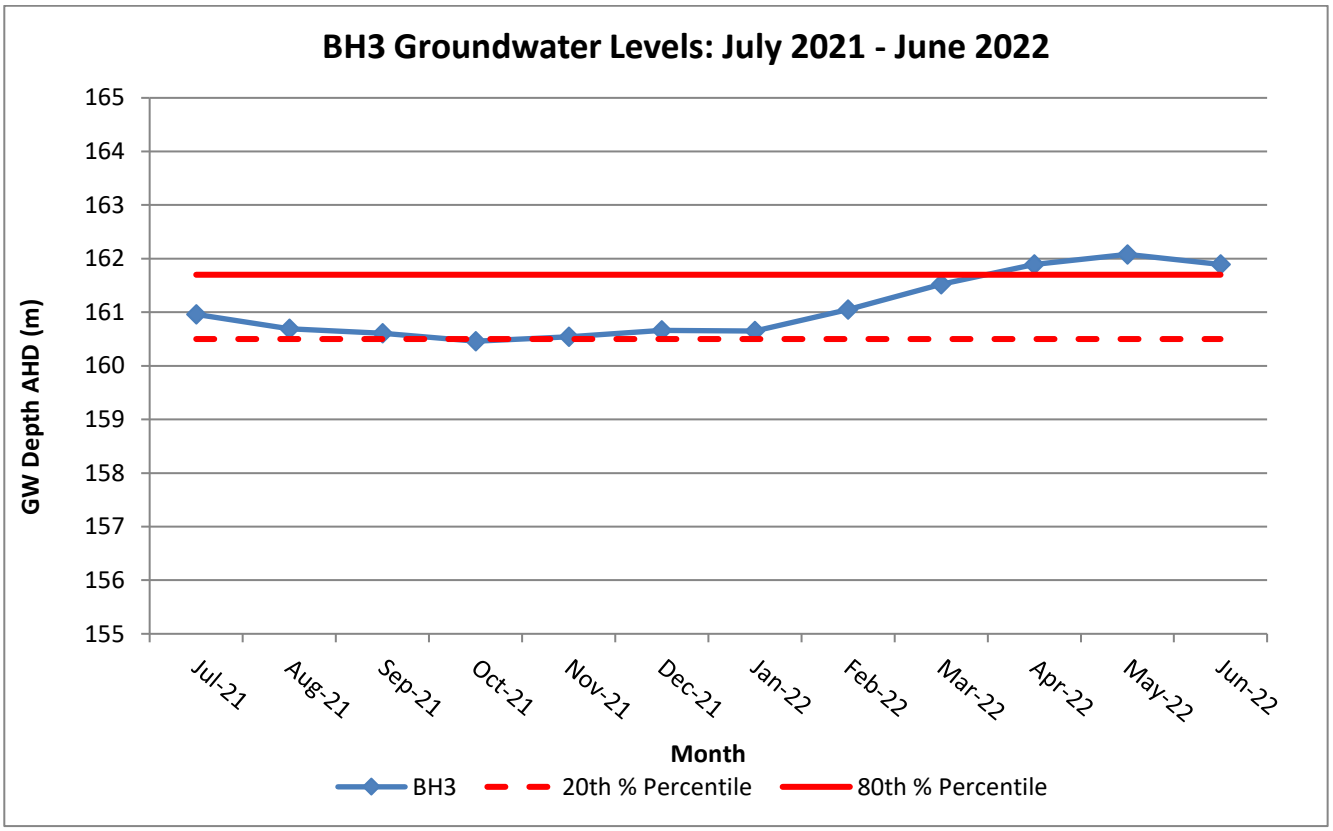


Chart 26: BH3 Groundwater Levels for July 2021 – June 2022.

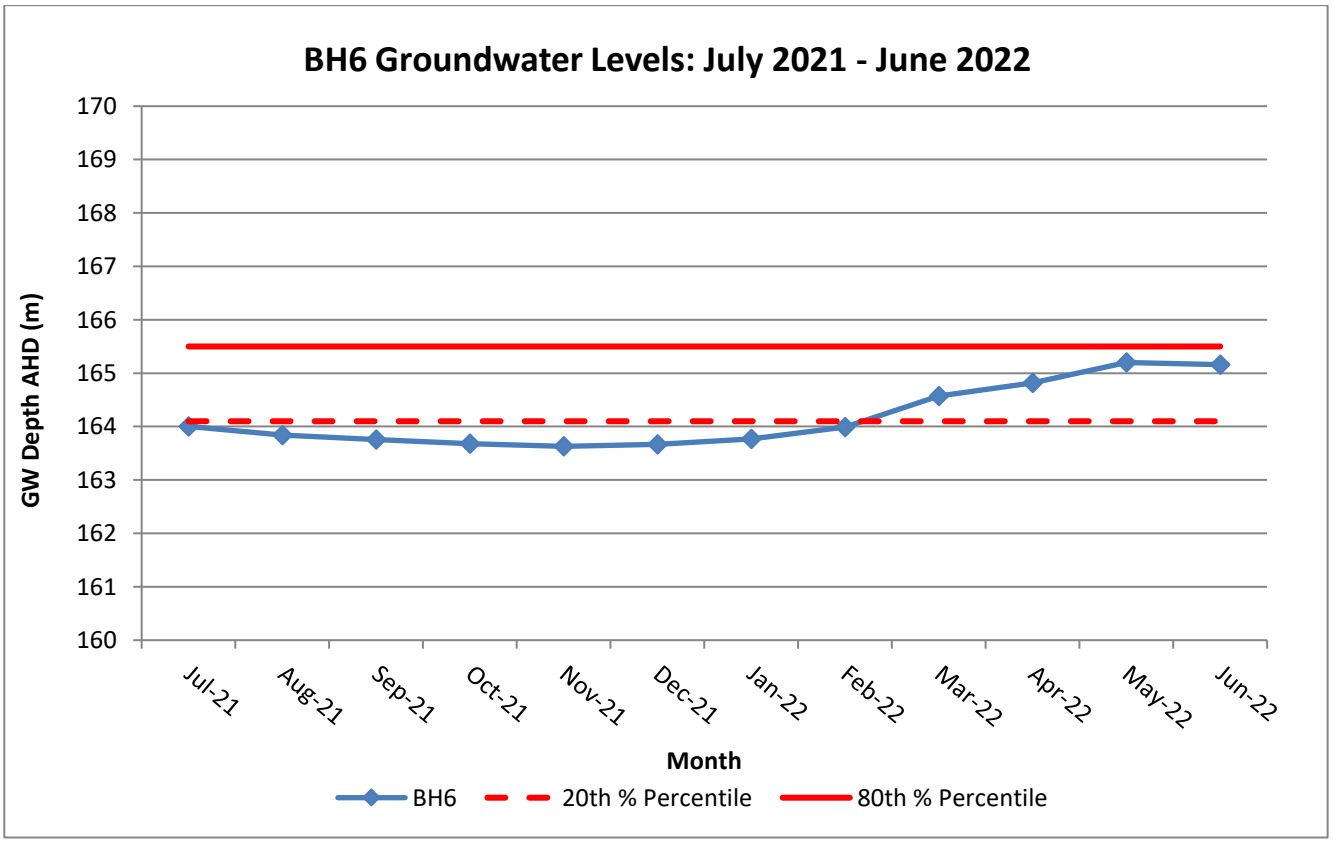


Chart 27: BH6 Groundwater Levels for July 2021 – June 2022.

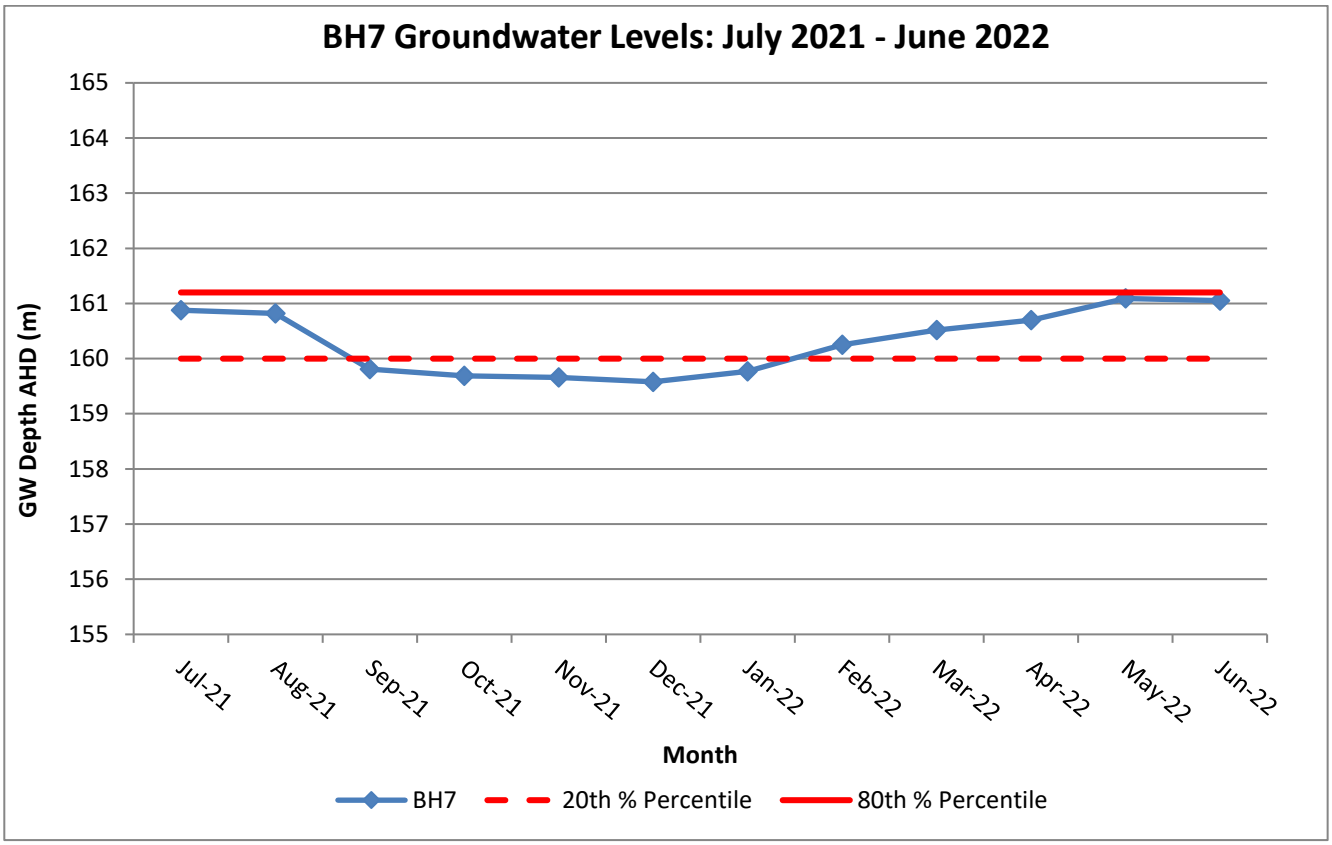


Chart 28: BH7 Groundwater Levels for July 2021 – June 2022.

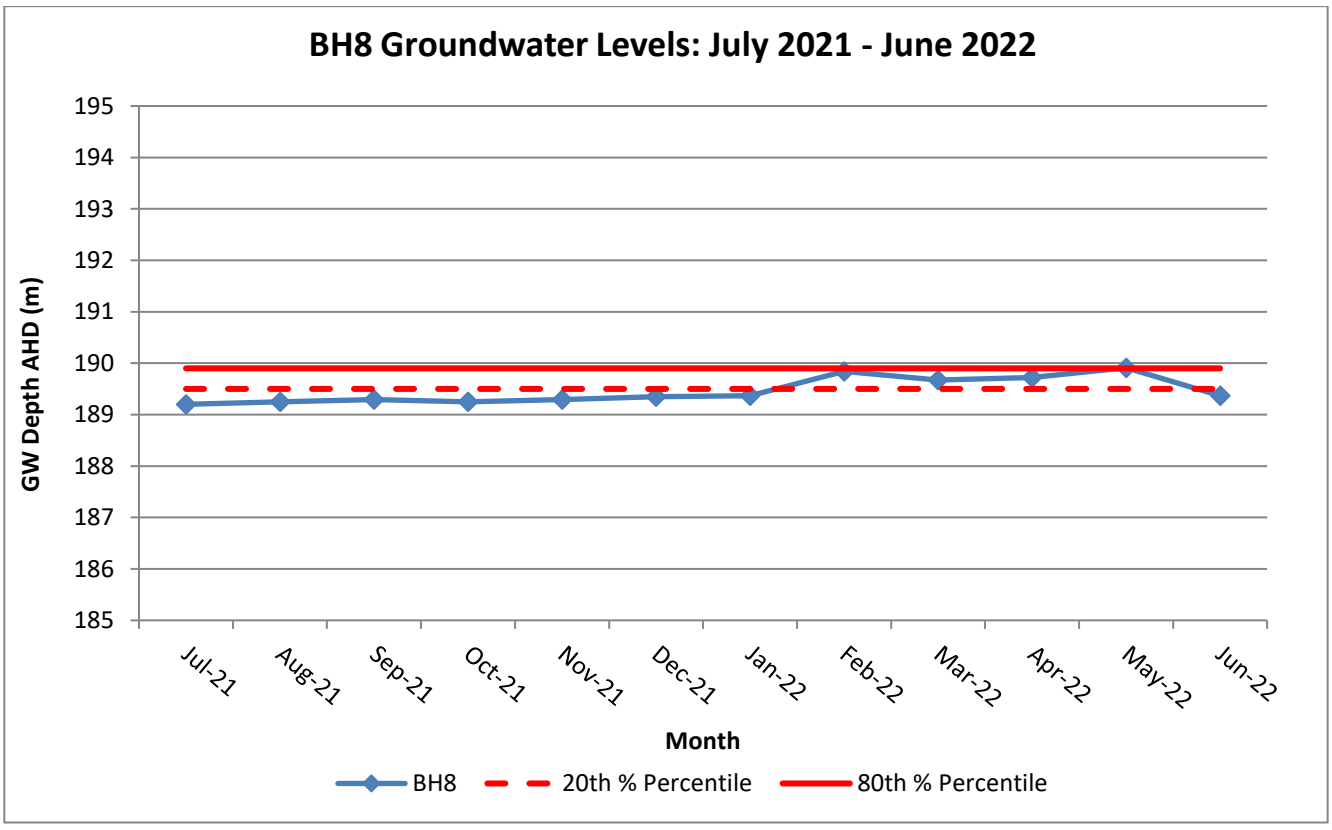


Chart 29: BH8 Groundwater Levels for July 2021 – June 2022.

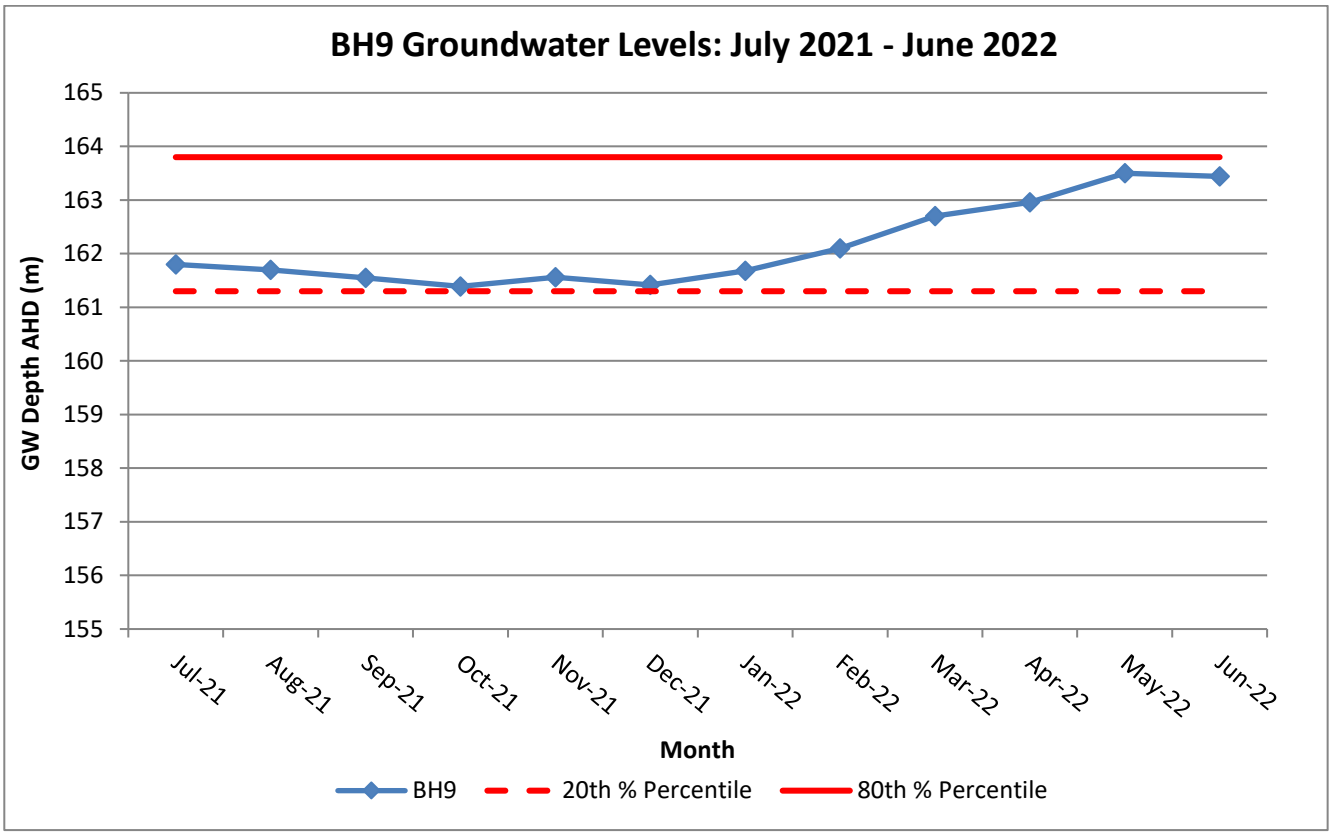


Chart 30: BH9 Groundwater Levels for July 2021 – June 2022.

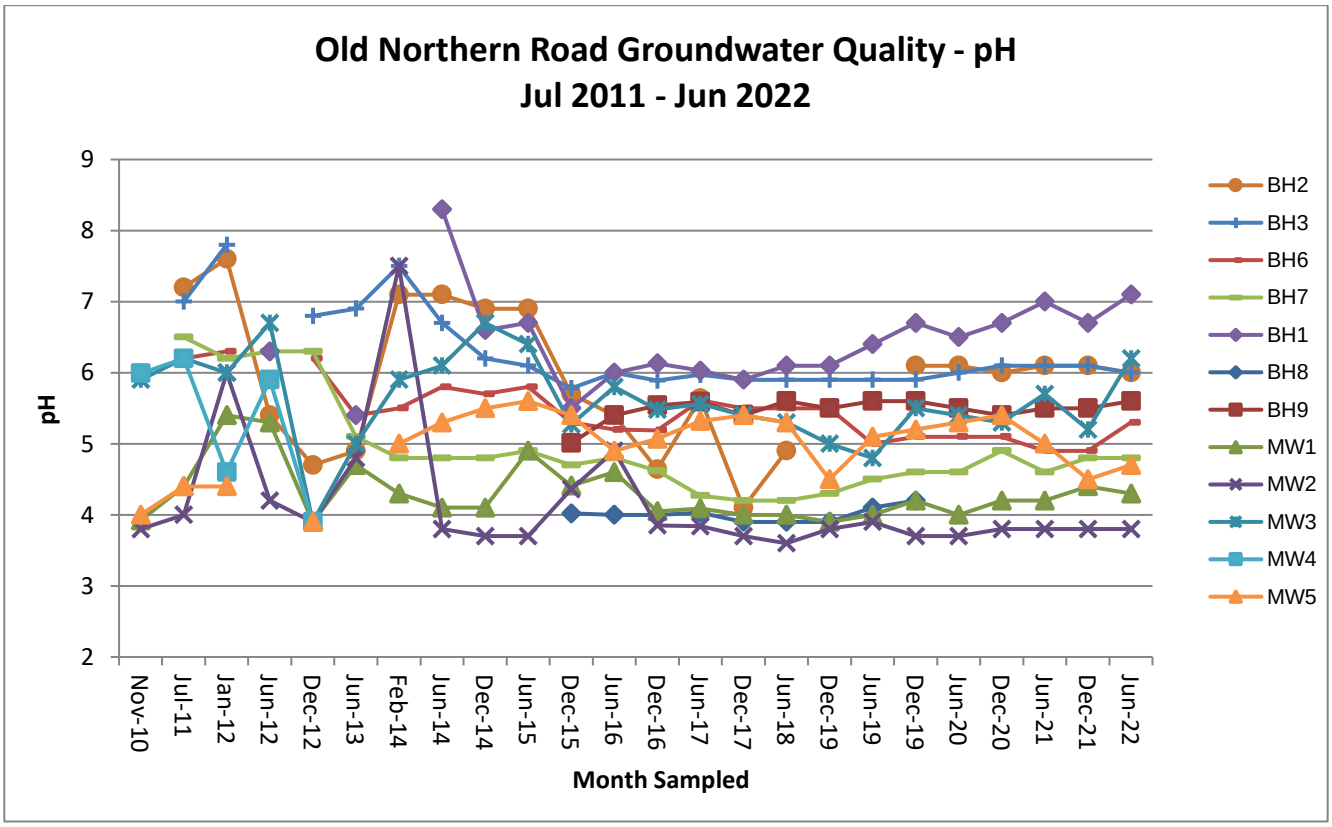


Chart 31: Long term pH results.

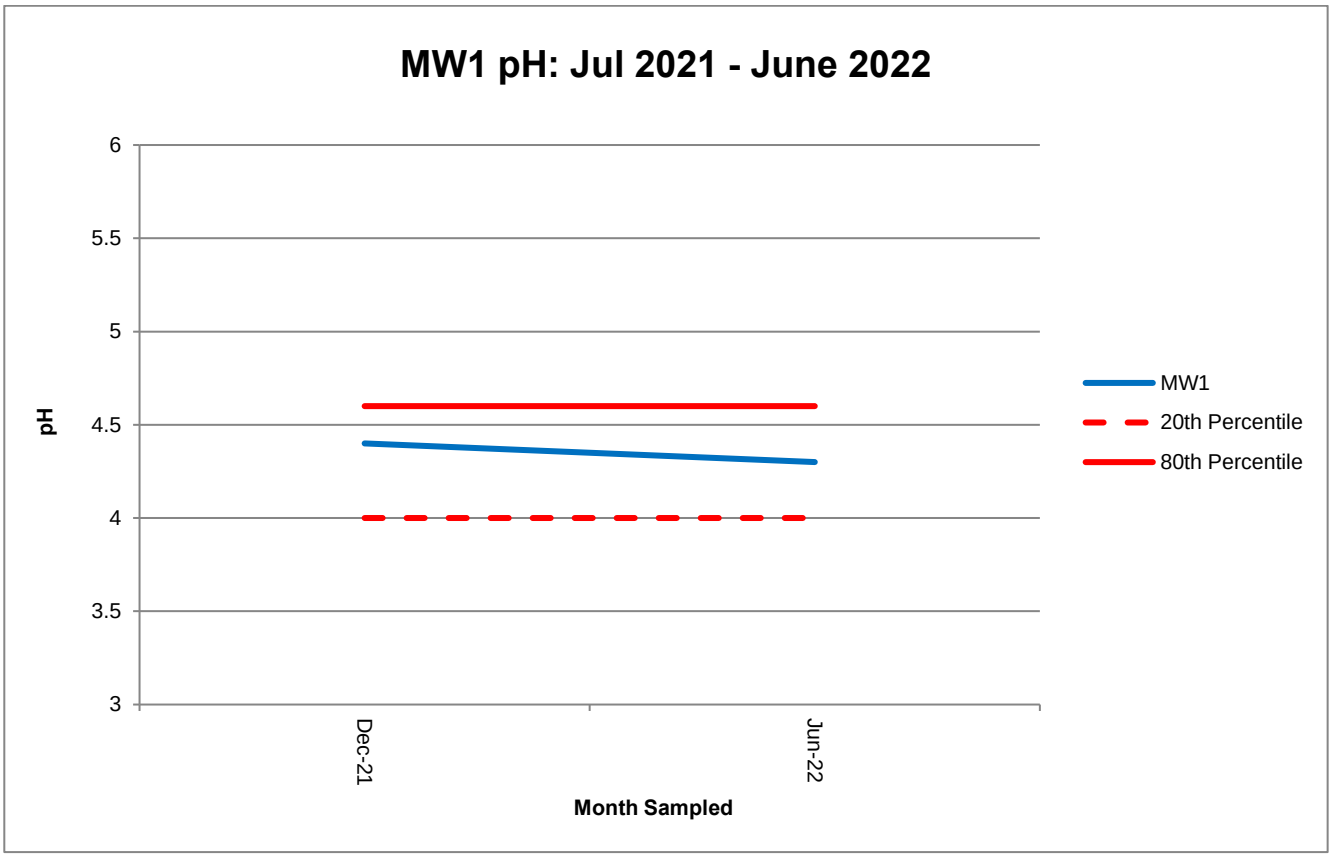


Chart 32: MW1 pH Results July 2021 – June 2022.

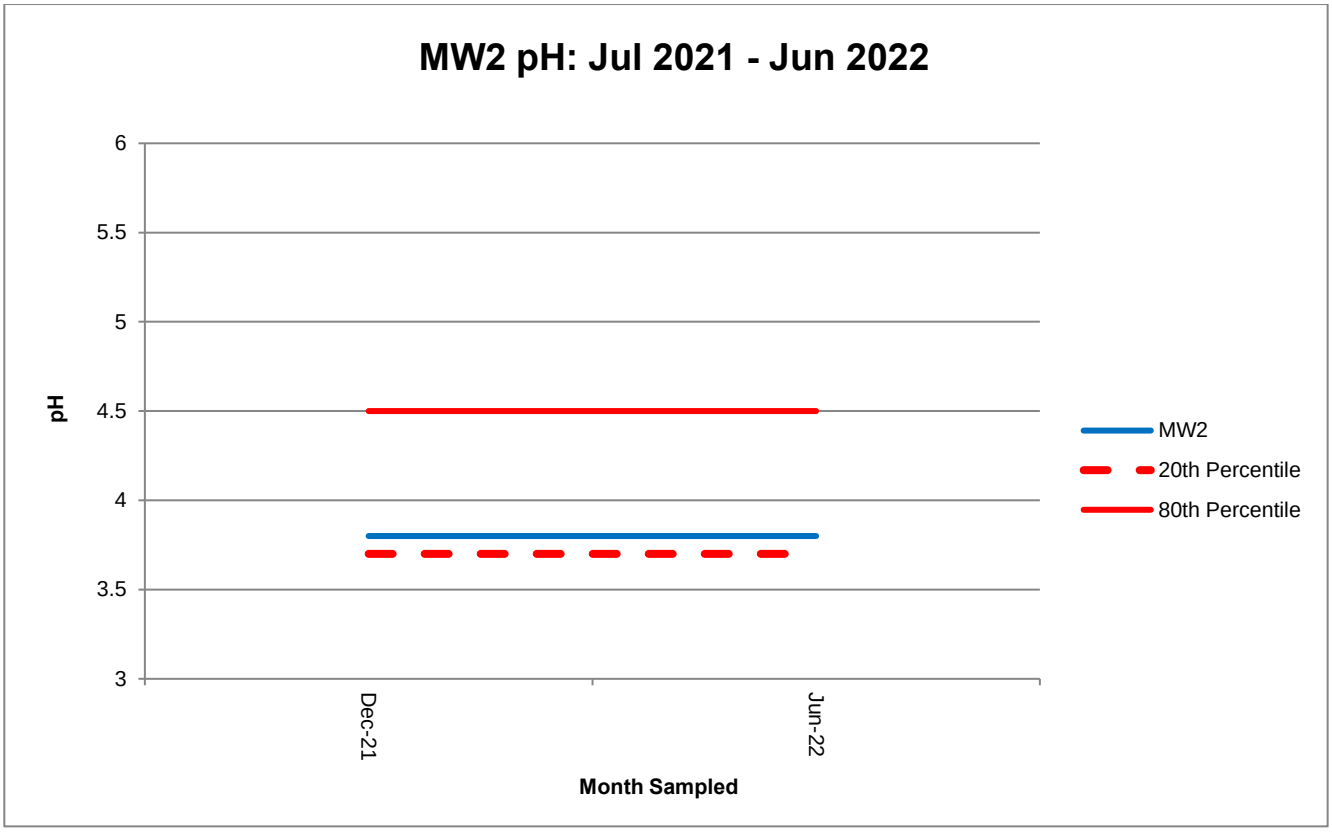


Chart 33: MW2 pH Results July 2021 – June 2022.

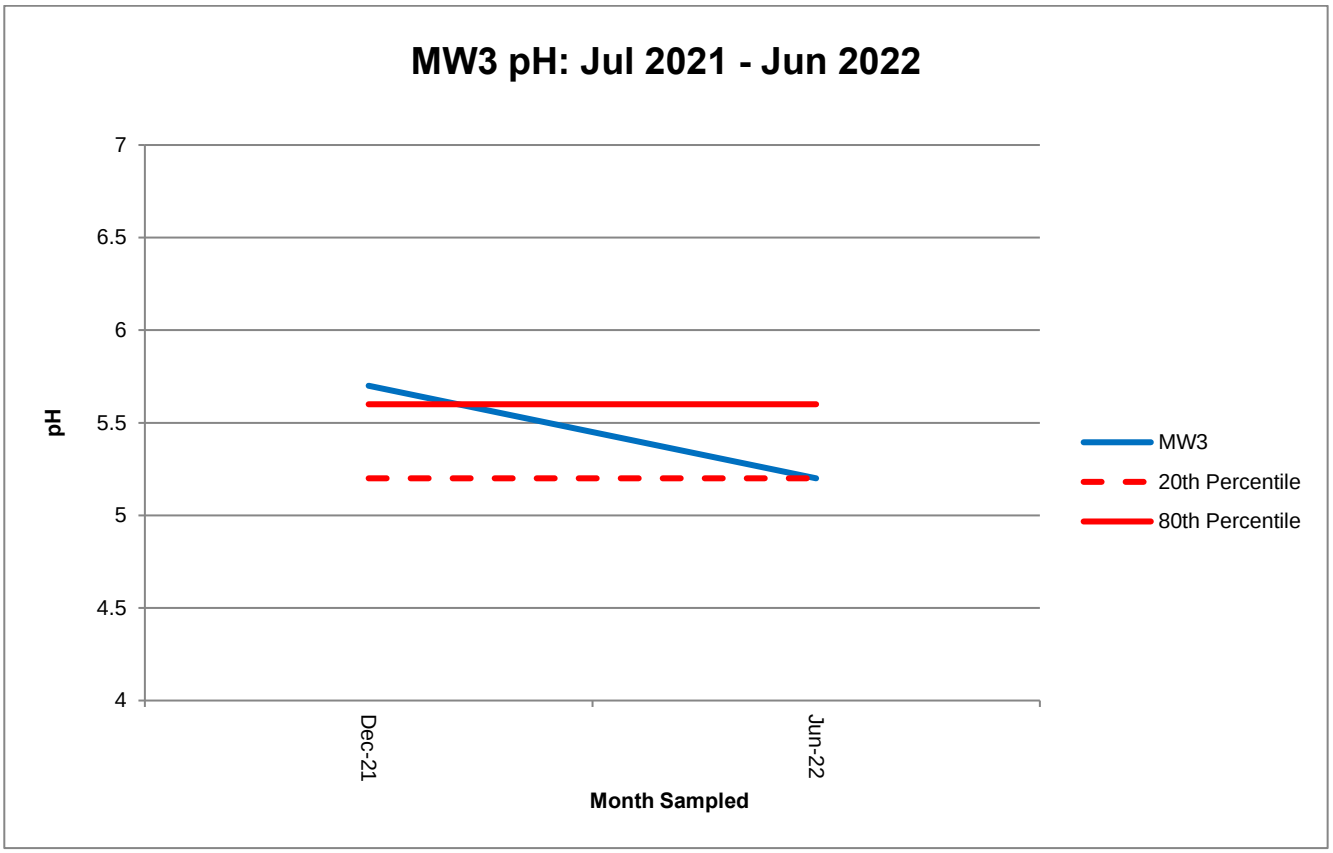


Chart 34: MW3 pH Results July 2021 – June 2022.

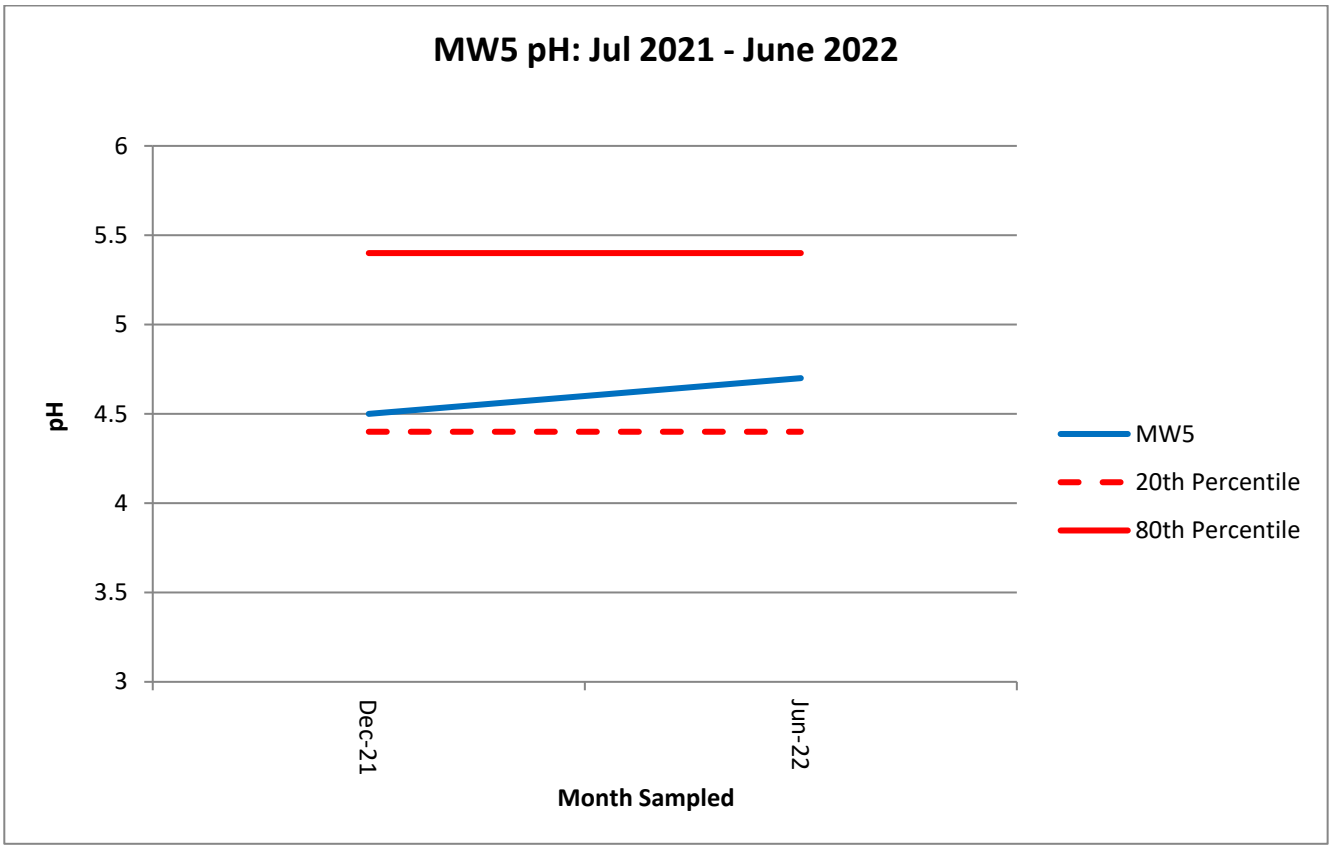


Chart 35: MW5 pH Results July 2021 – June 2022.

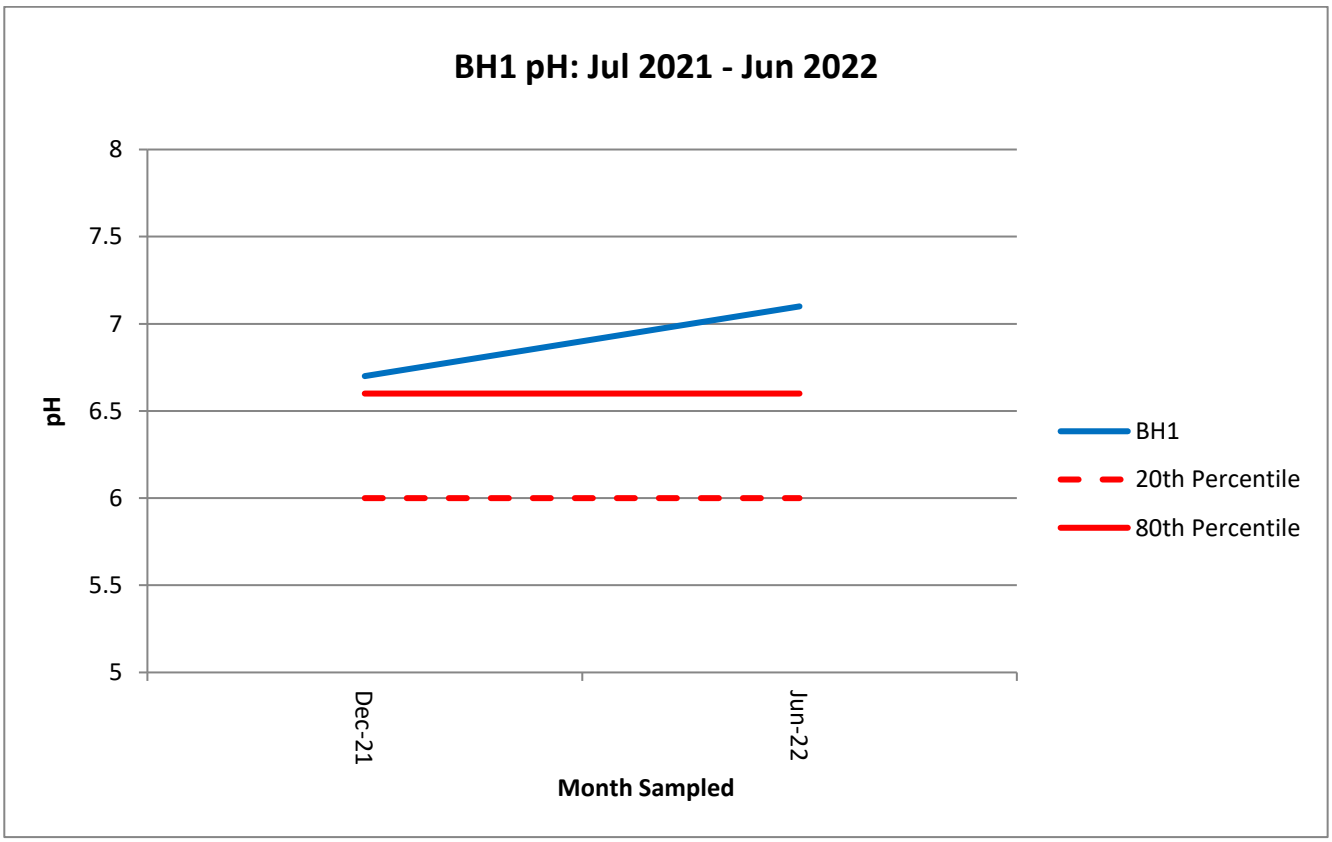


Chart 36: BH1 pH Results July 2021 – June 2022.

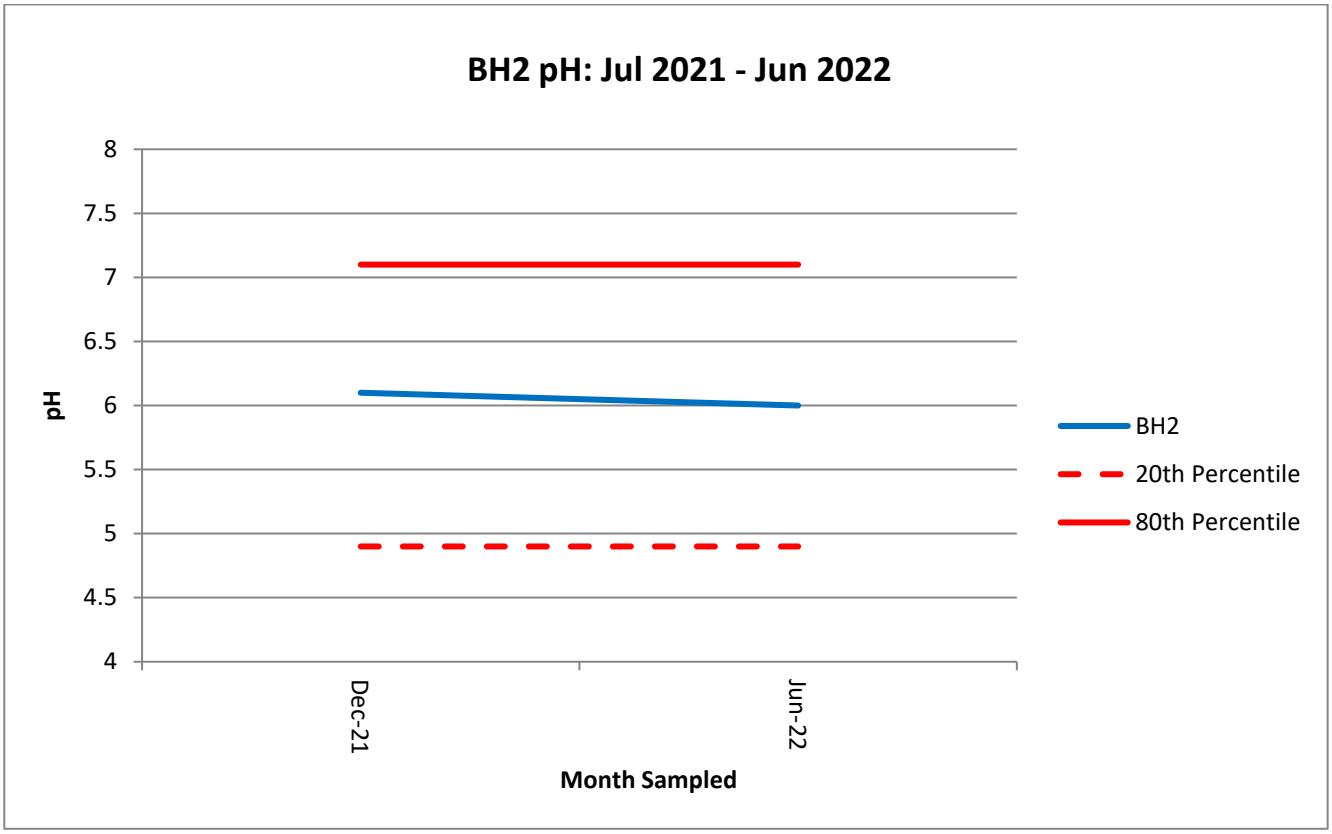


Chart 37: BH2 pH Results July 2021 – June 2022.

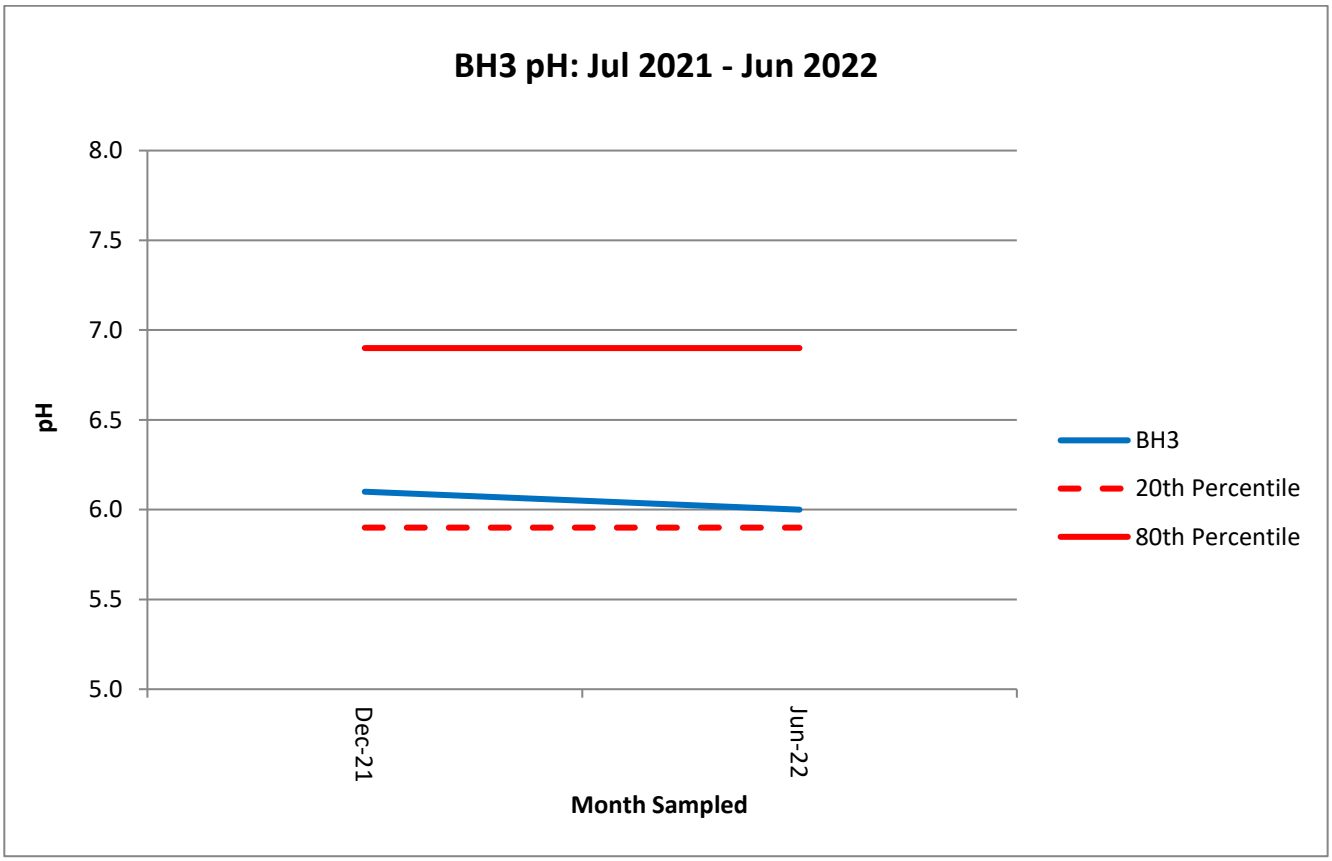


Chart 38: BH3 pH Results July 2021 – June 2022.

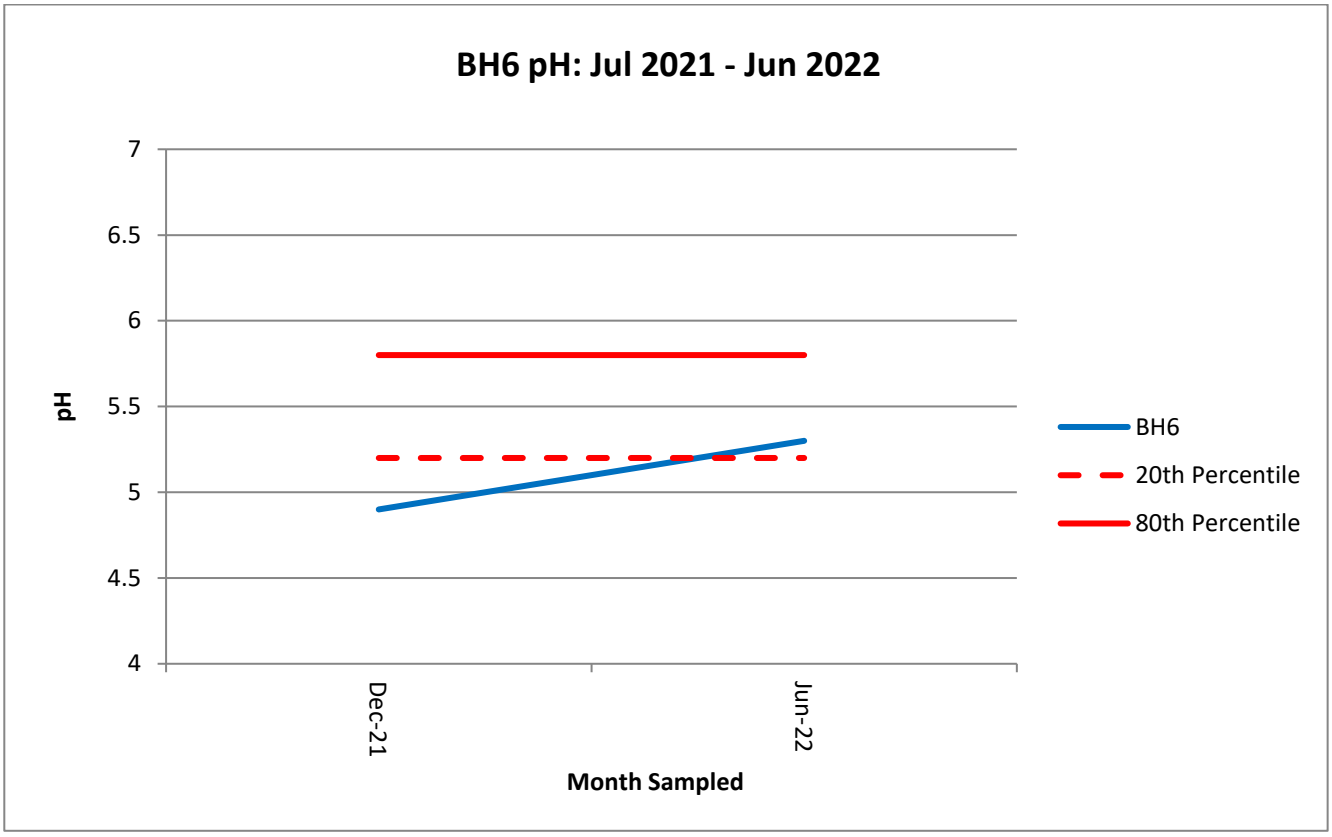


Chart 39: BH6 pH Results July 2021 – June 2022.

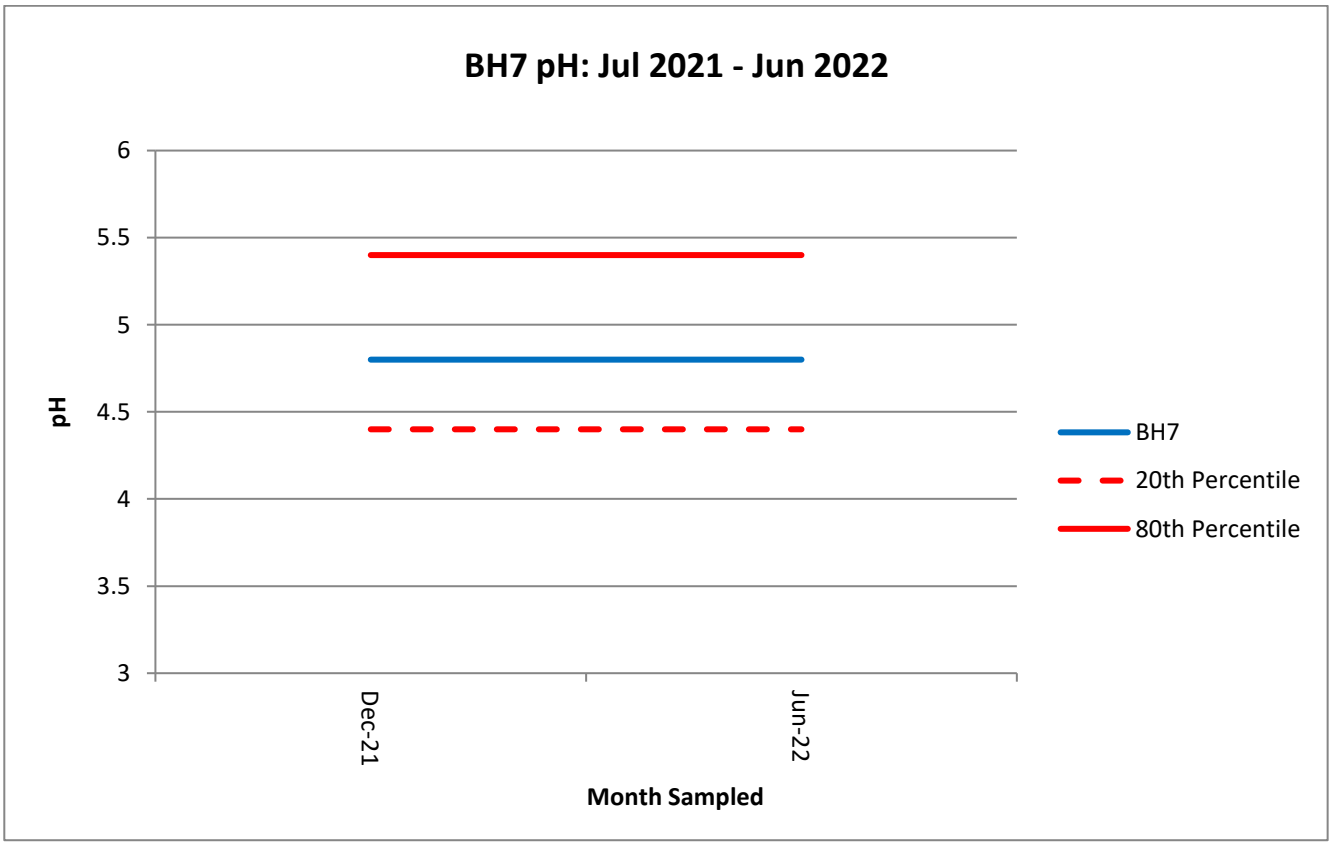


Chart 40: BH7 pH Results July 2021 – June 2022.

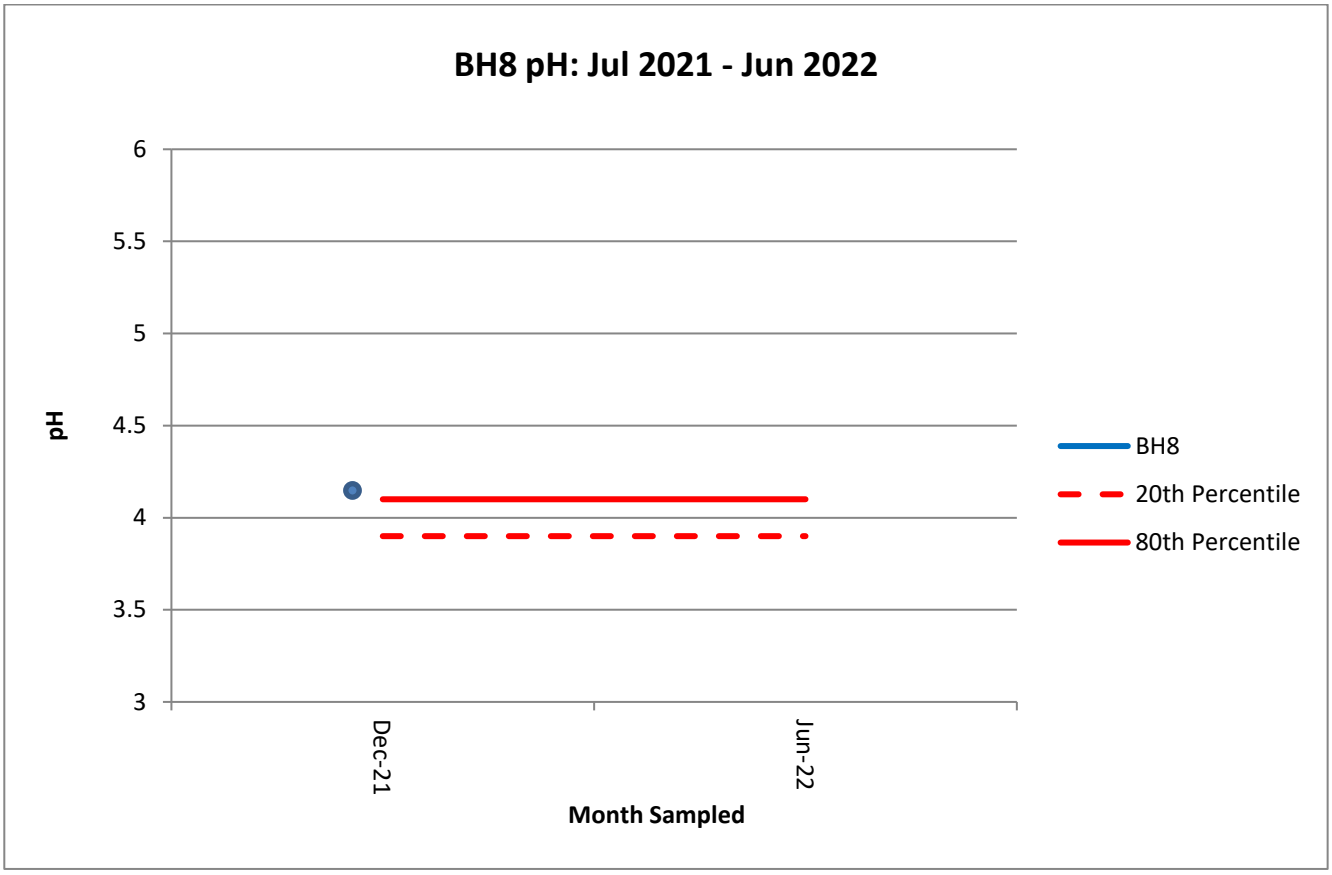


Chart 41: BH8 pH Results July 2021 – June 2022.

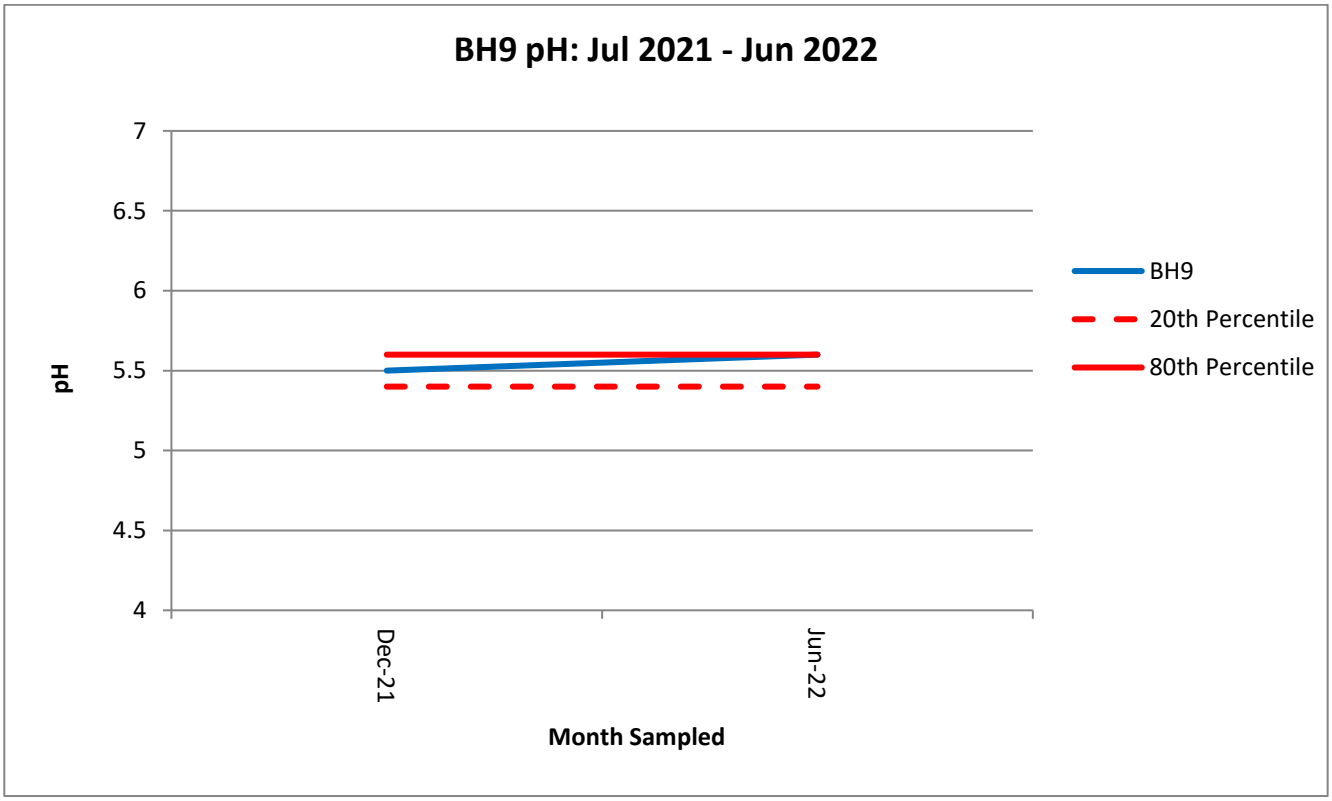


Chart 42: BH9 pH Results July 2021 – June 2022.

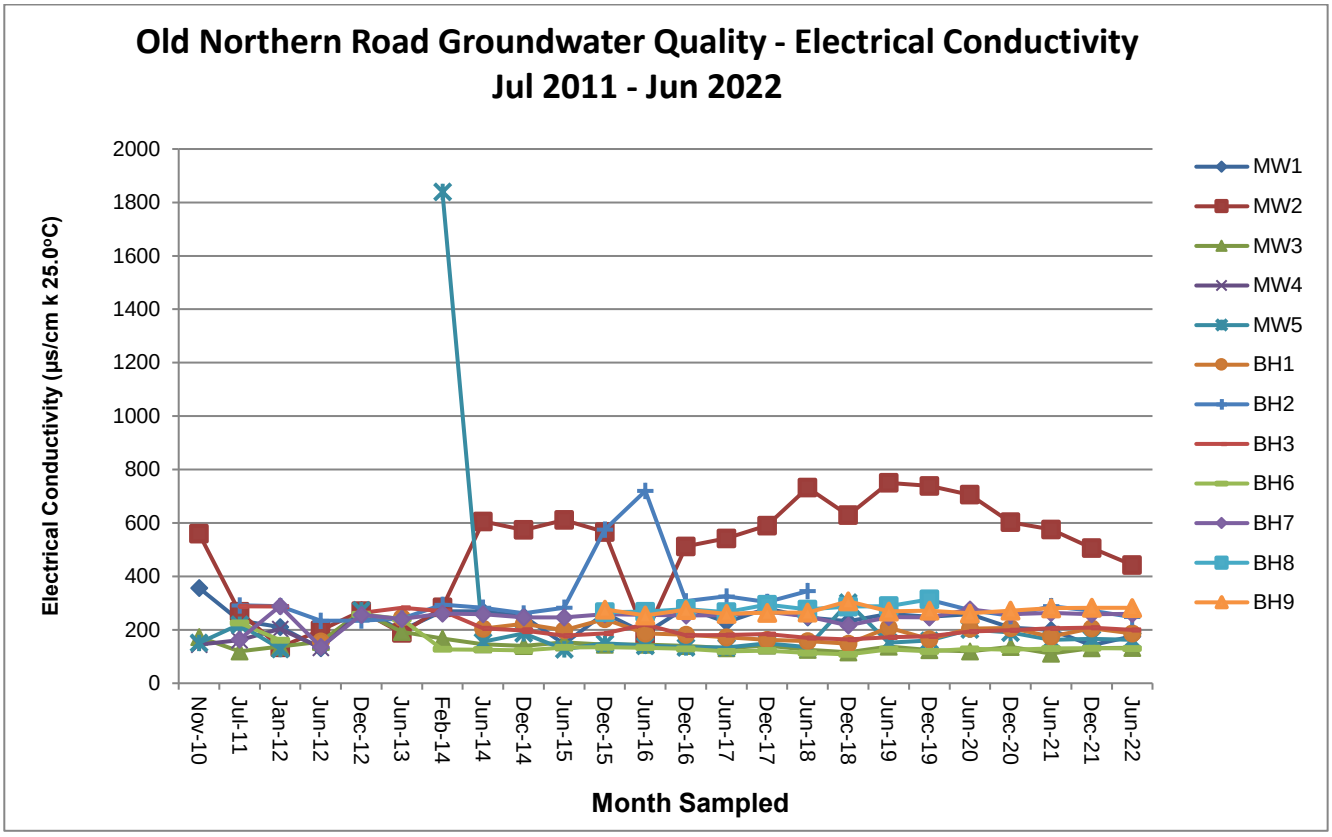


Chart 43: Long term Electrical Conductivity Results.

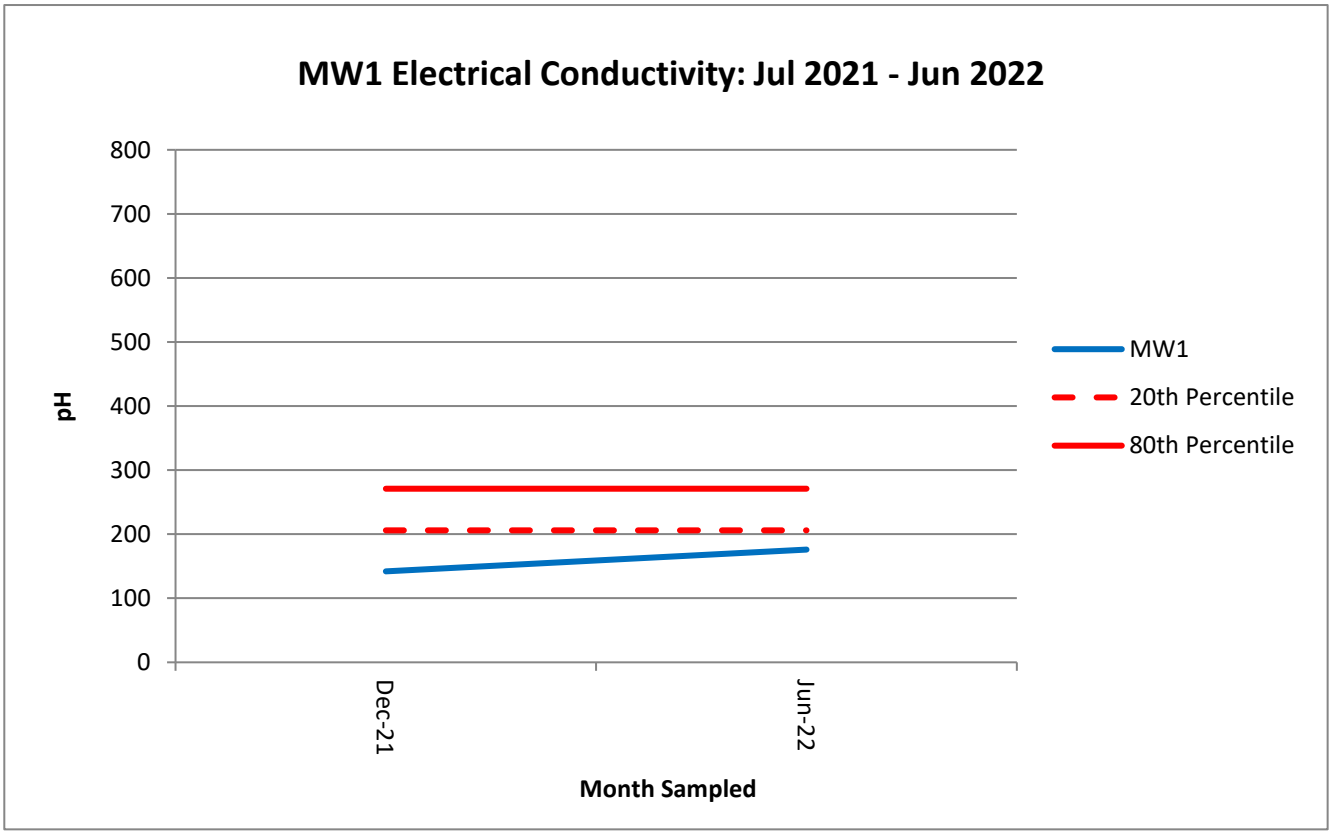


Chart 44: MW1 Electrical Conductivity Results July 2021 – June 2022.

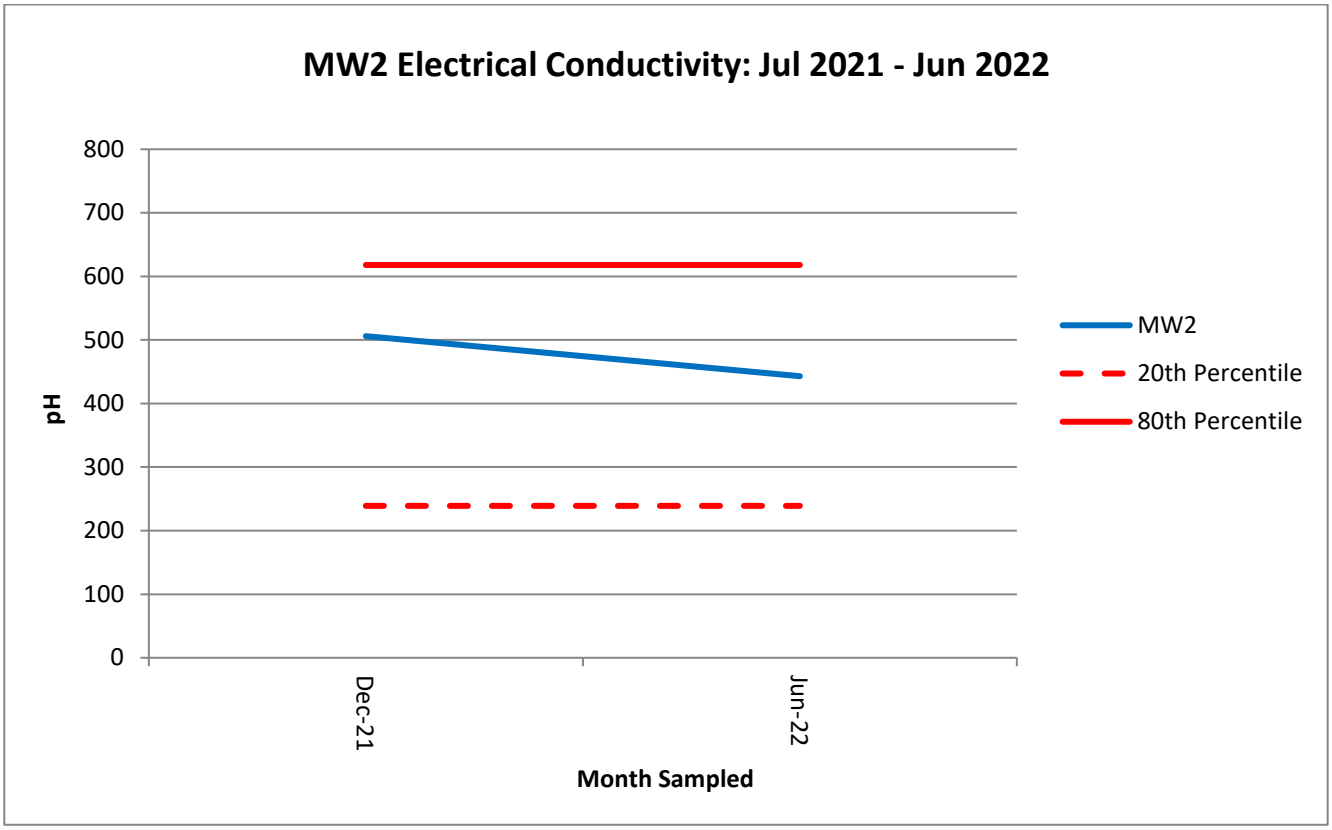


Chart 45: MW2 Electrical Conductivity Results July 2021 – June 2022.

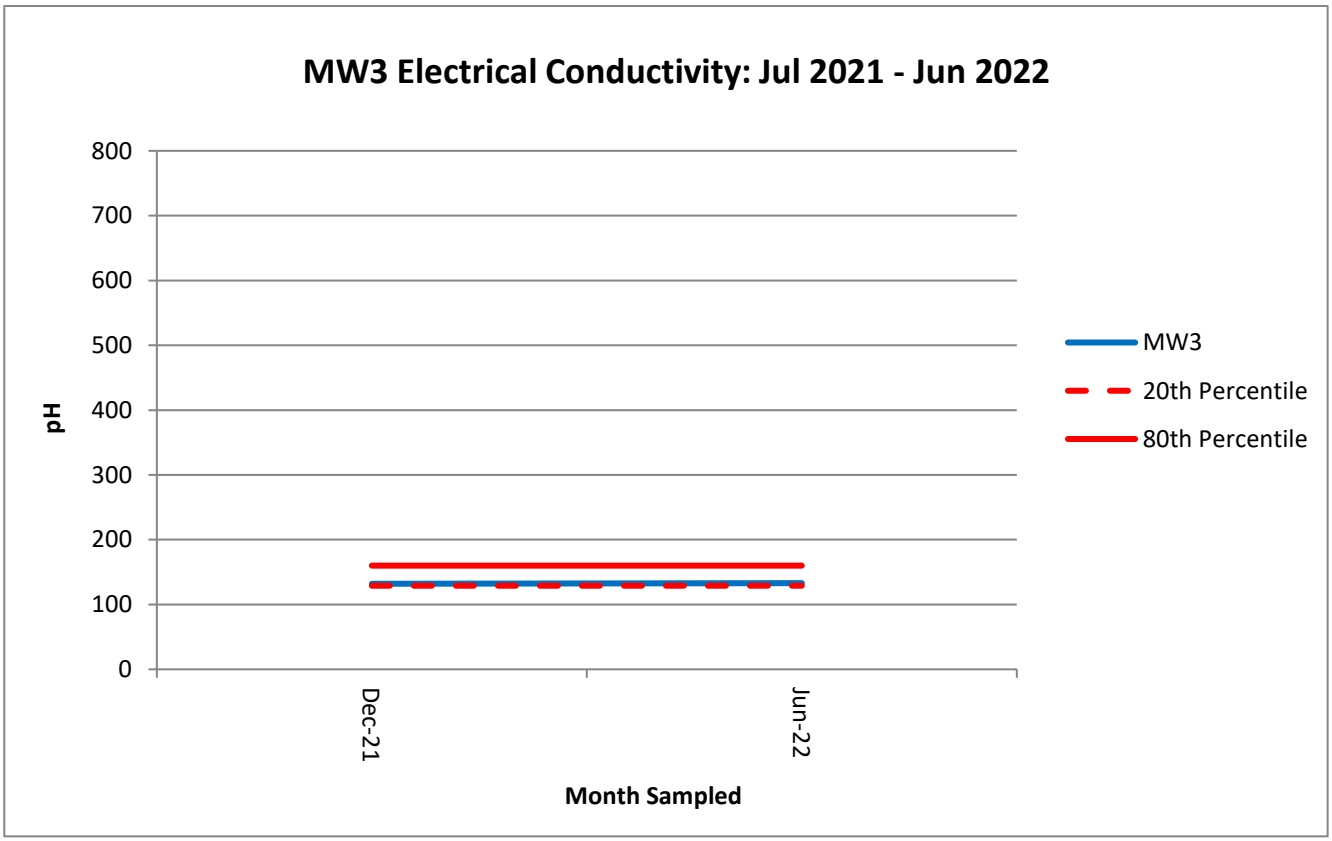


Chart 46: MW3 Electrical Conductivity Results July 2021 – June 2022.

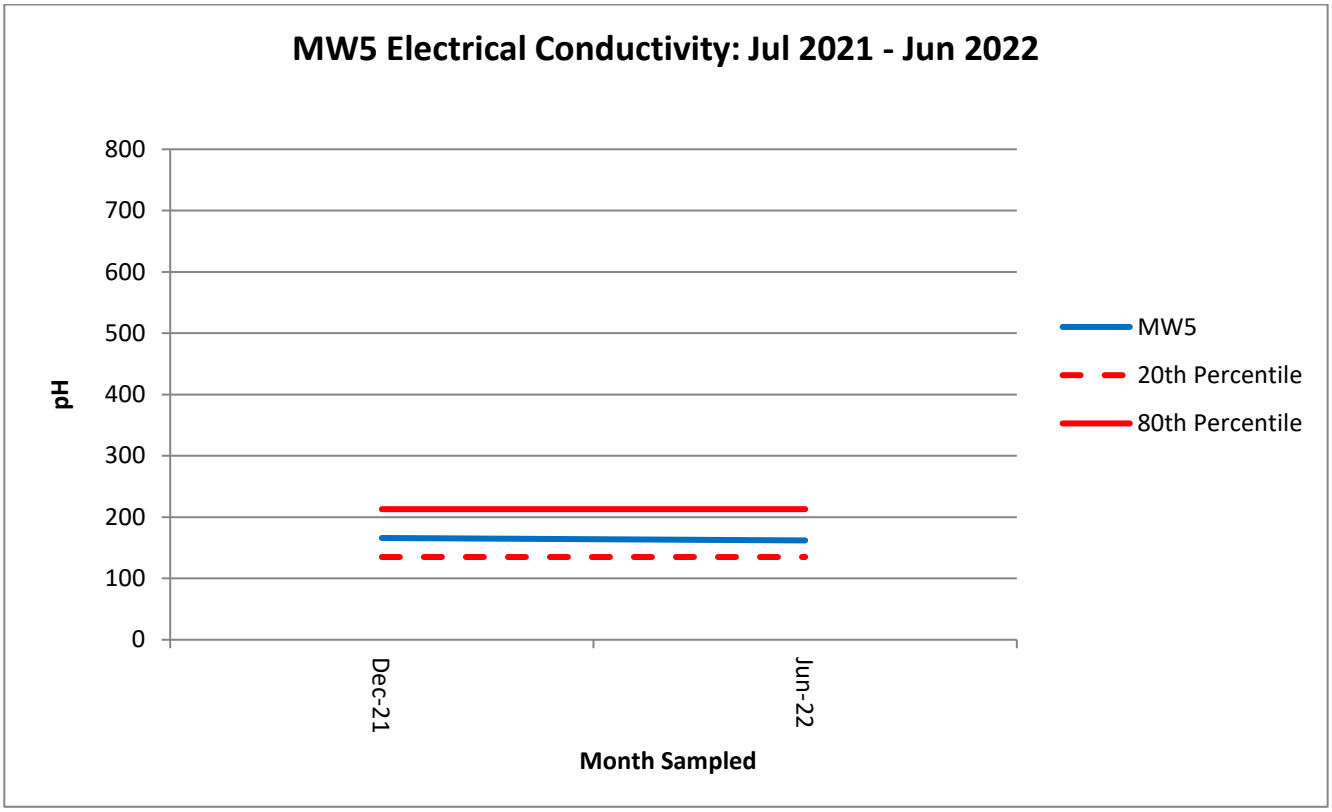


Chart 47: MW5 Electrical Conductivity Results July 2021 – June 2022.

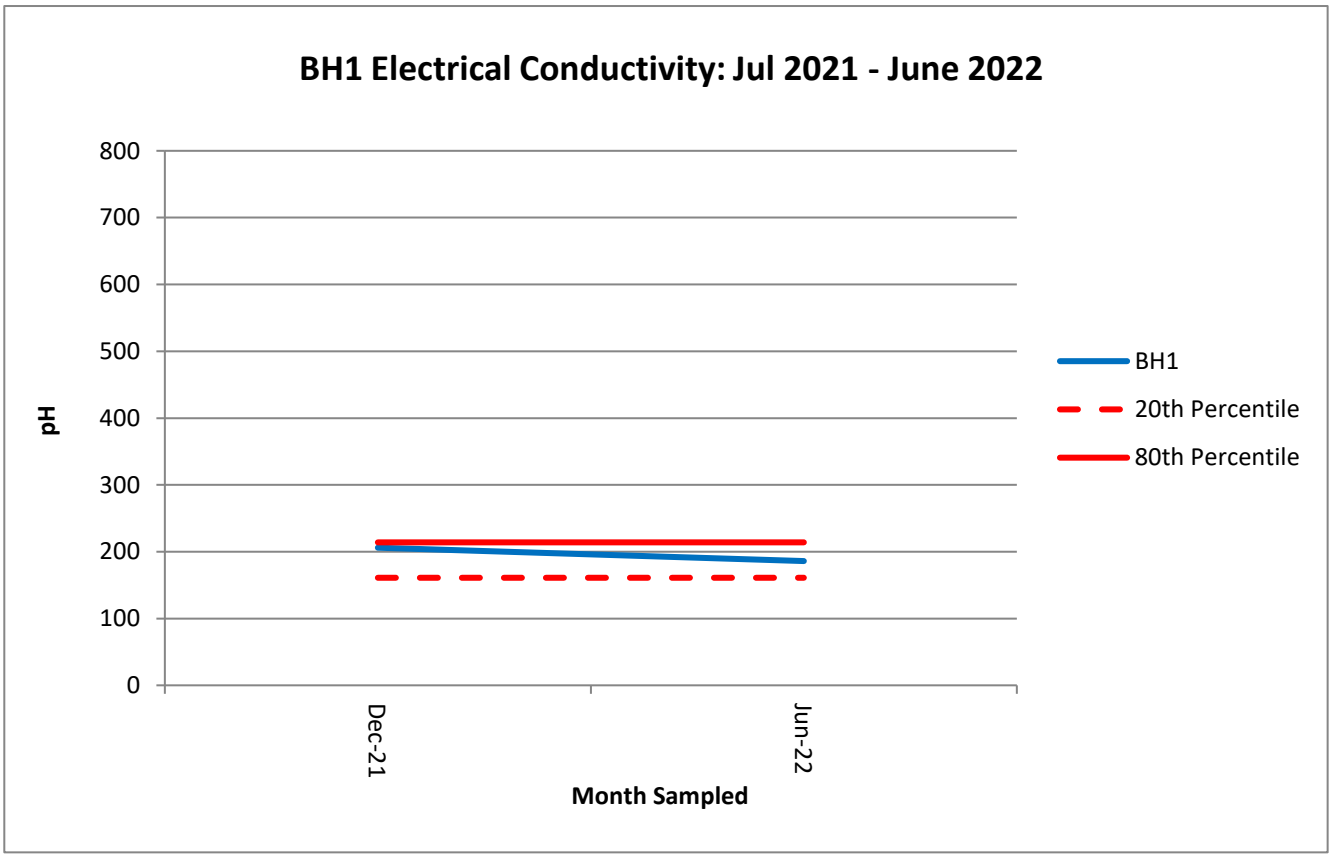


Chart 48: BH1 Electrical Conductivity Results July 2021 – June 2022.

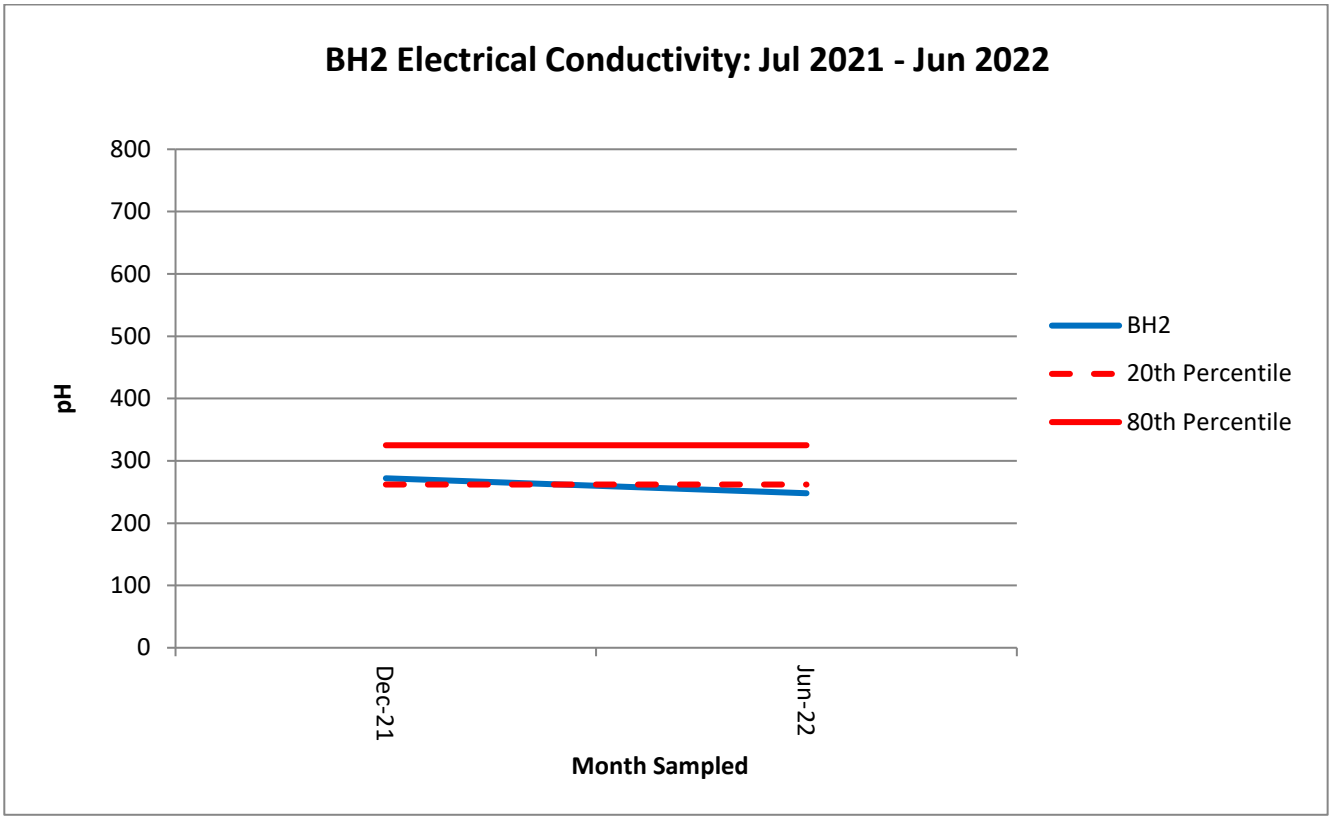


Chart 49: BH2 Electrical Conductivity Results July 2021 – June 2022.

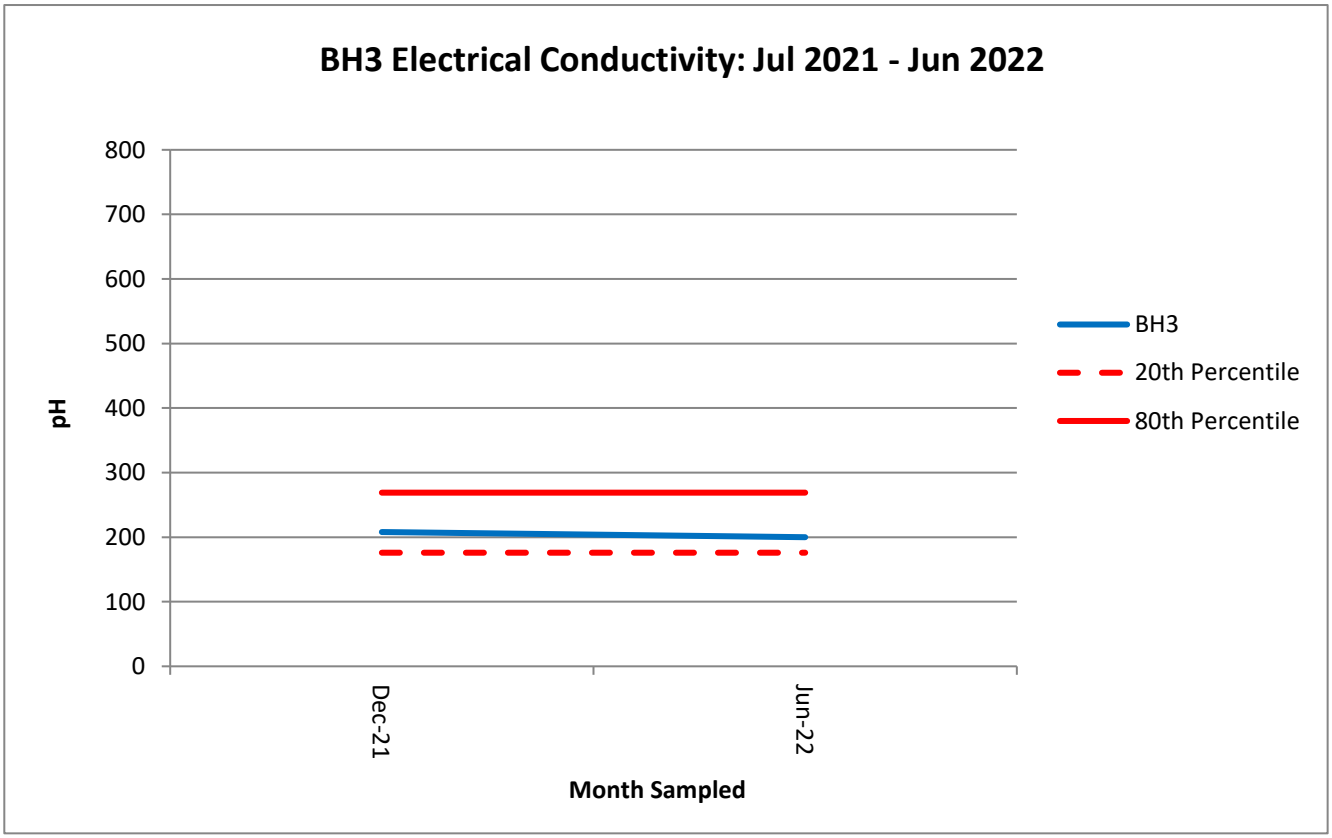


Chart 50: BH3 Electrical Conductivity Results July 2021 – June 2022.

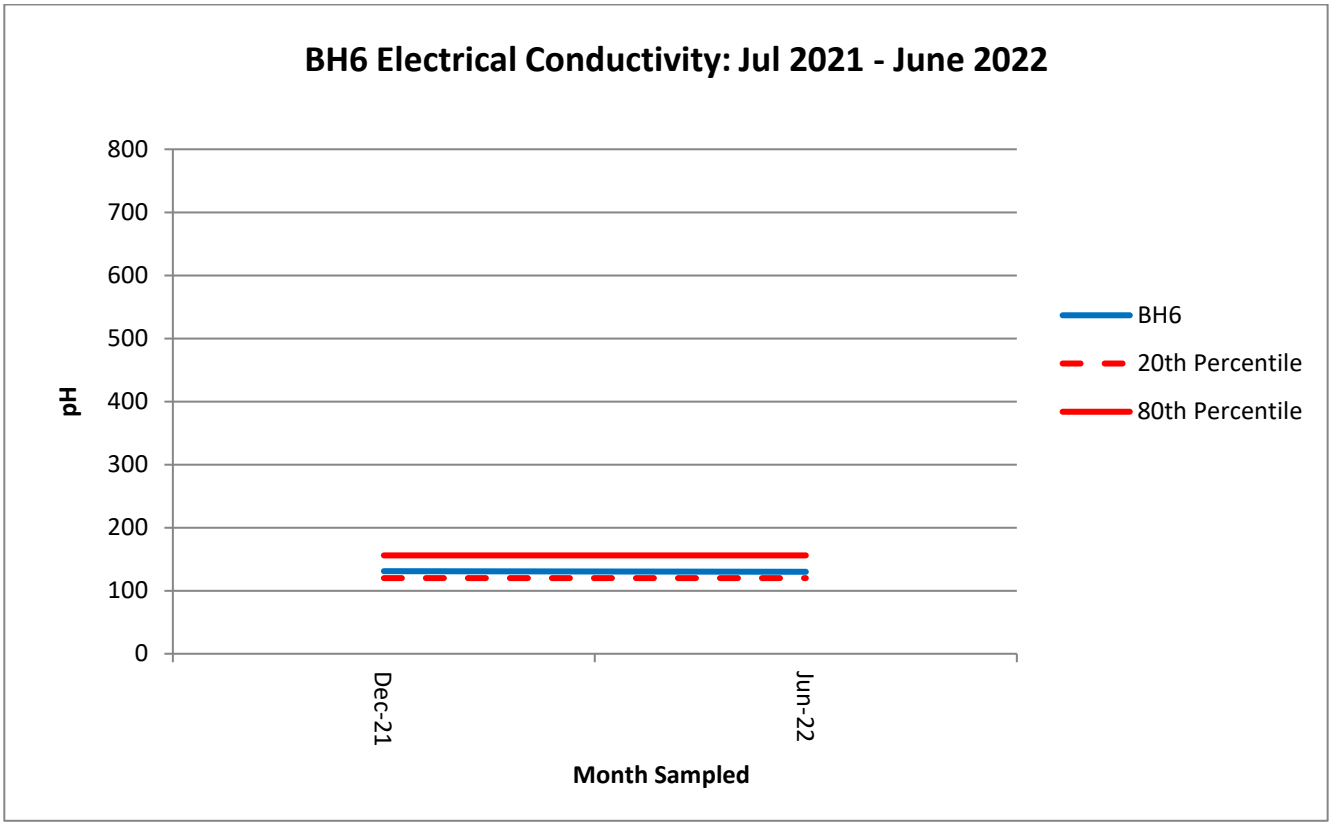


Chart 51: BH6 Electrical Conductivity Results July 2021 – June 2022.

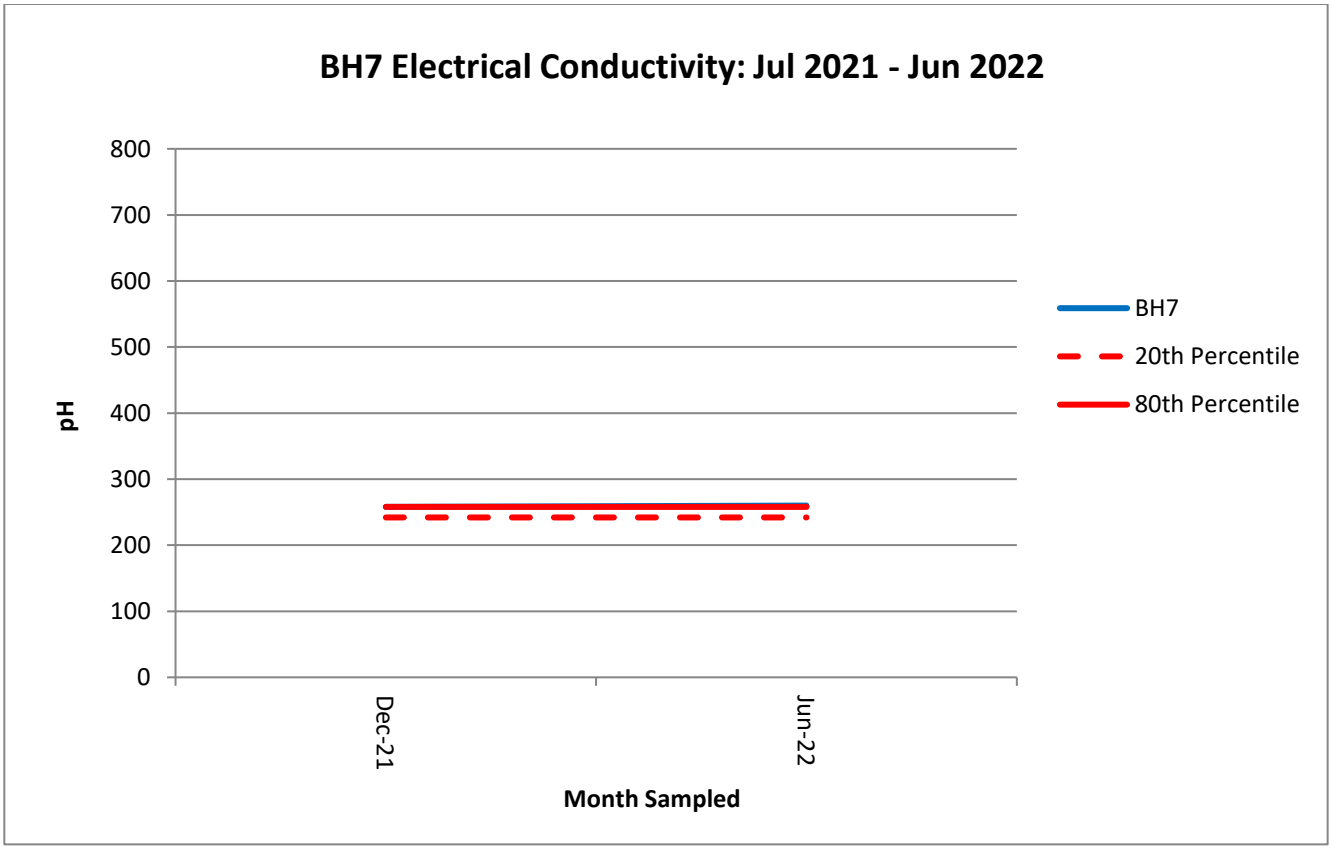


Chart 52: BH7 Electrical Conductivity Results July 2021 – June 2022.

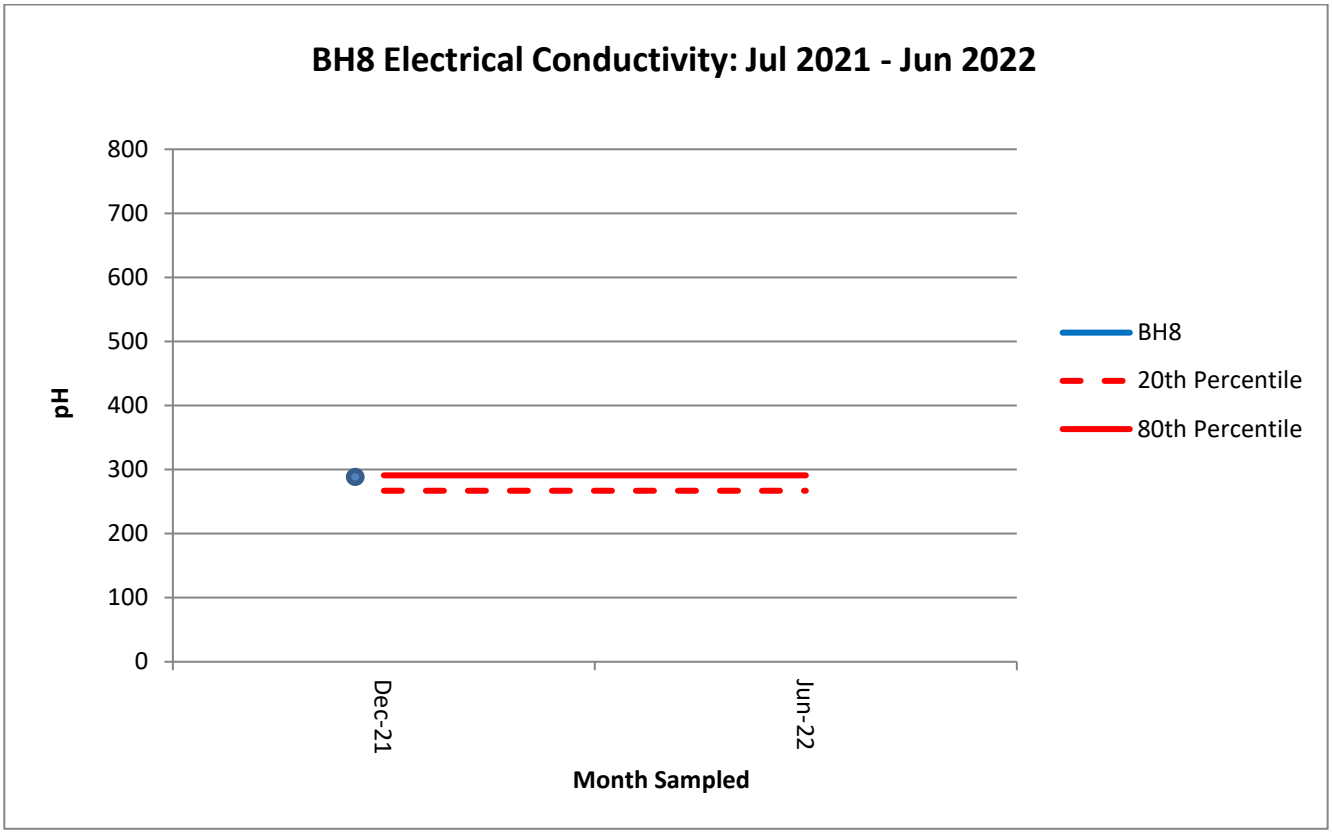


Chart 53: BH8 Electrical Conductivity Results July 2021 – June 2022.

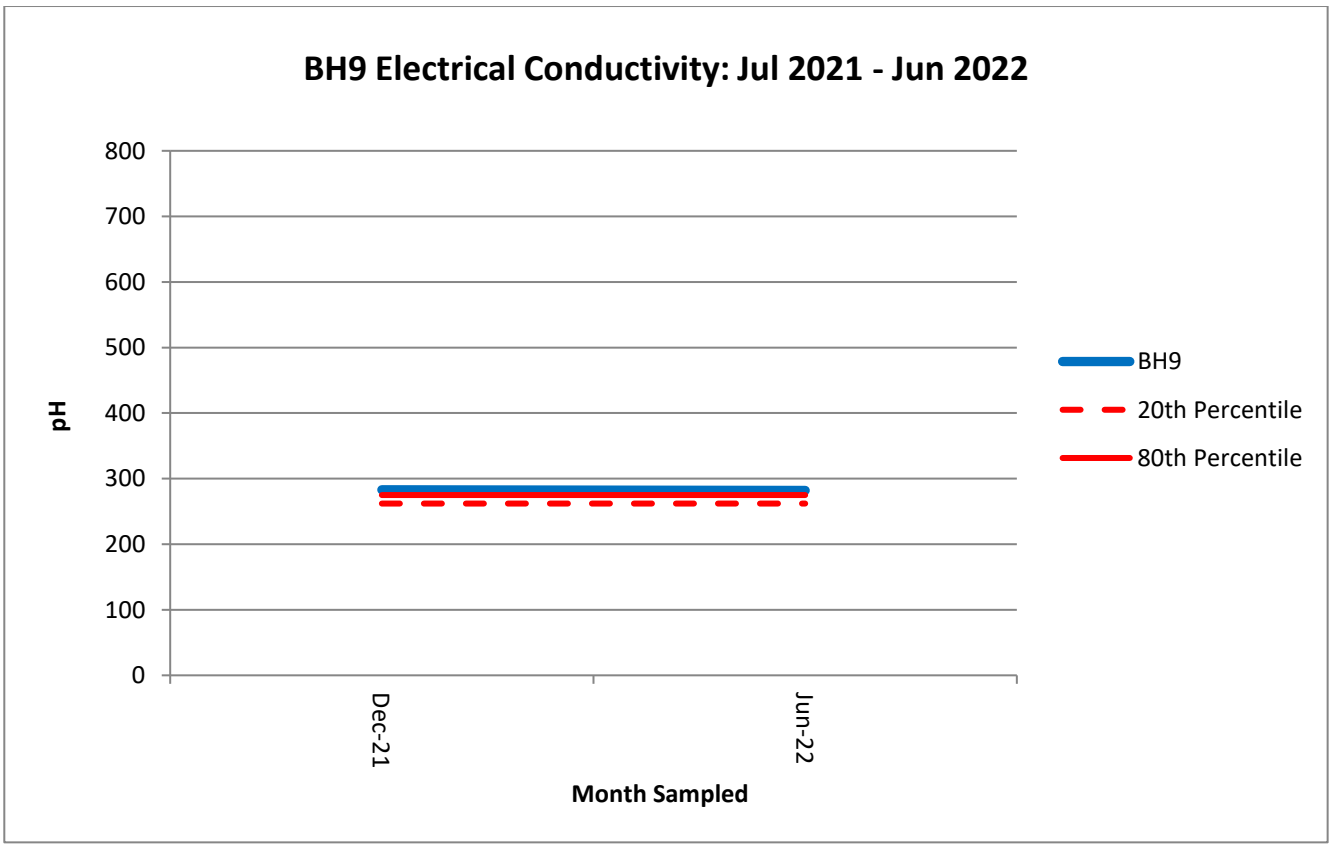


Chart 54: BH9 Electrical Conductivity Results July 2021 – June 2022.

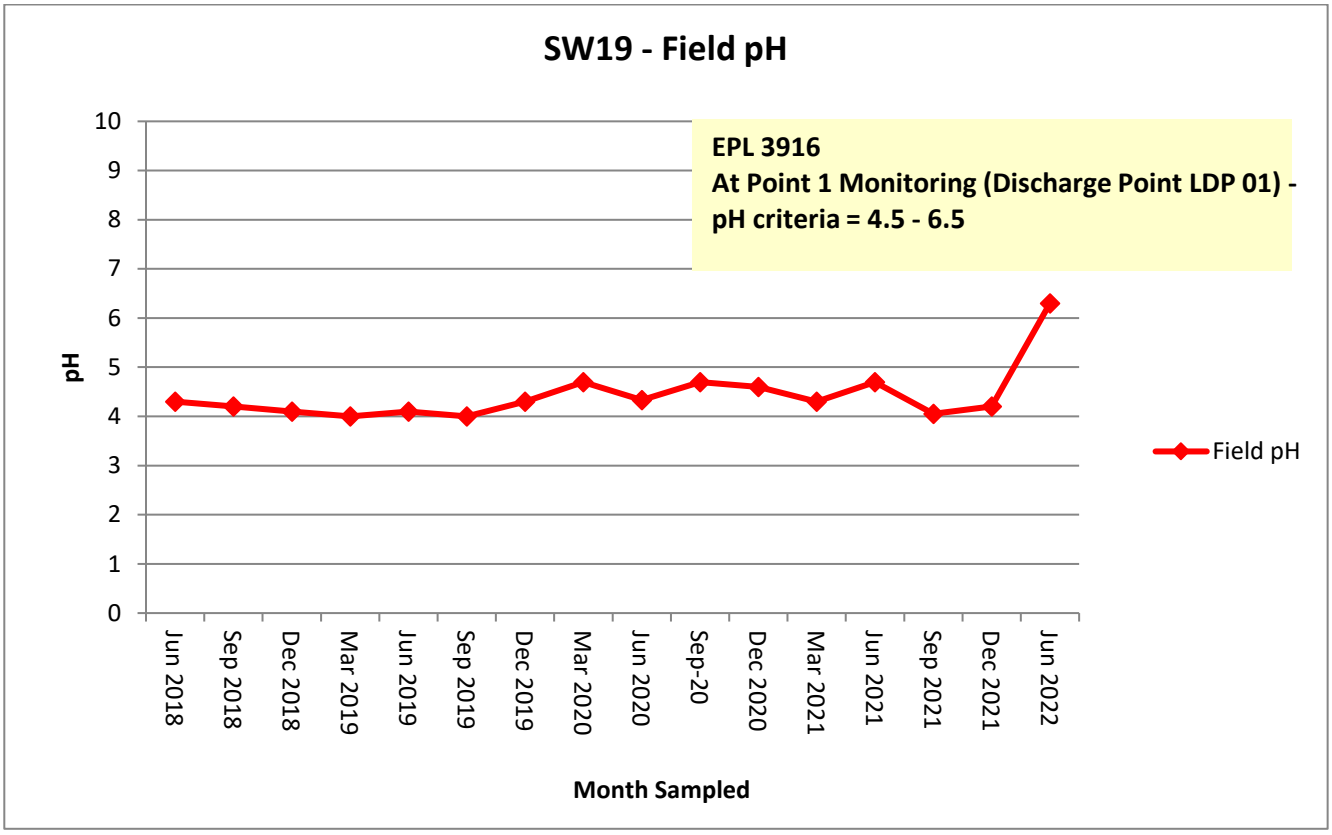


Chart 55: SW19 Field pH June 2018 – June 2022.

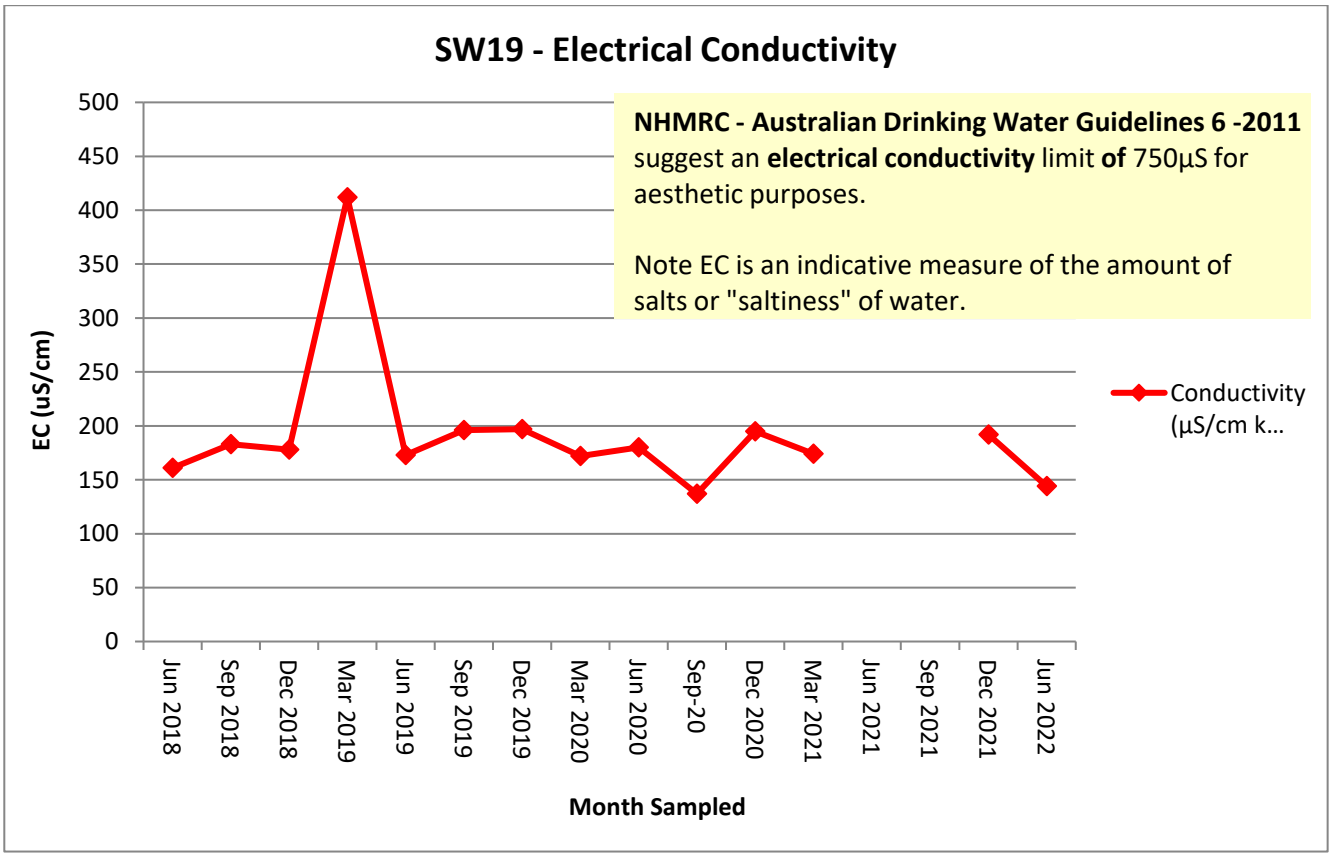


Chart 56: SW19 Electrical Conductivity June 2018 – June 2022.

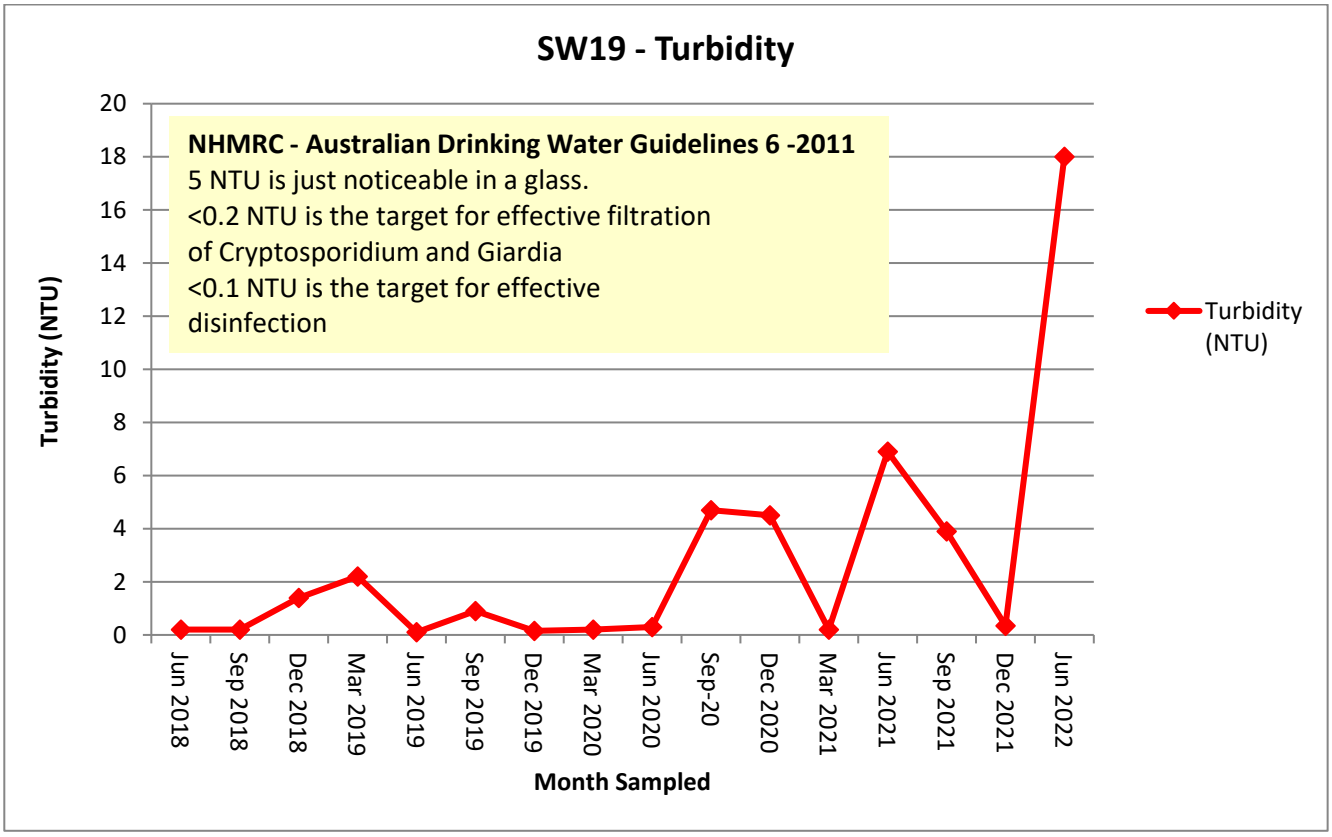


Chart 57: SW19 Turbidity June 2018 – June 2022.

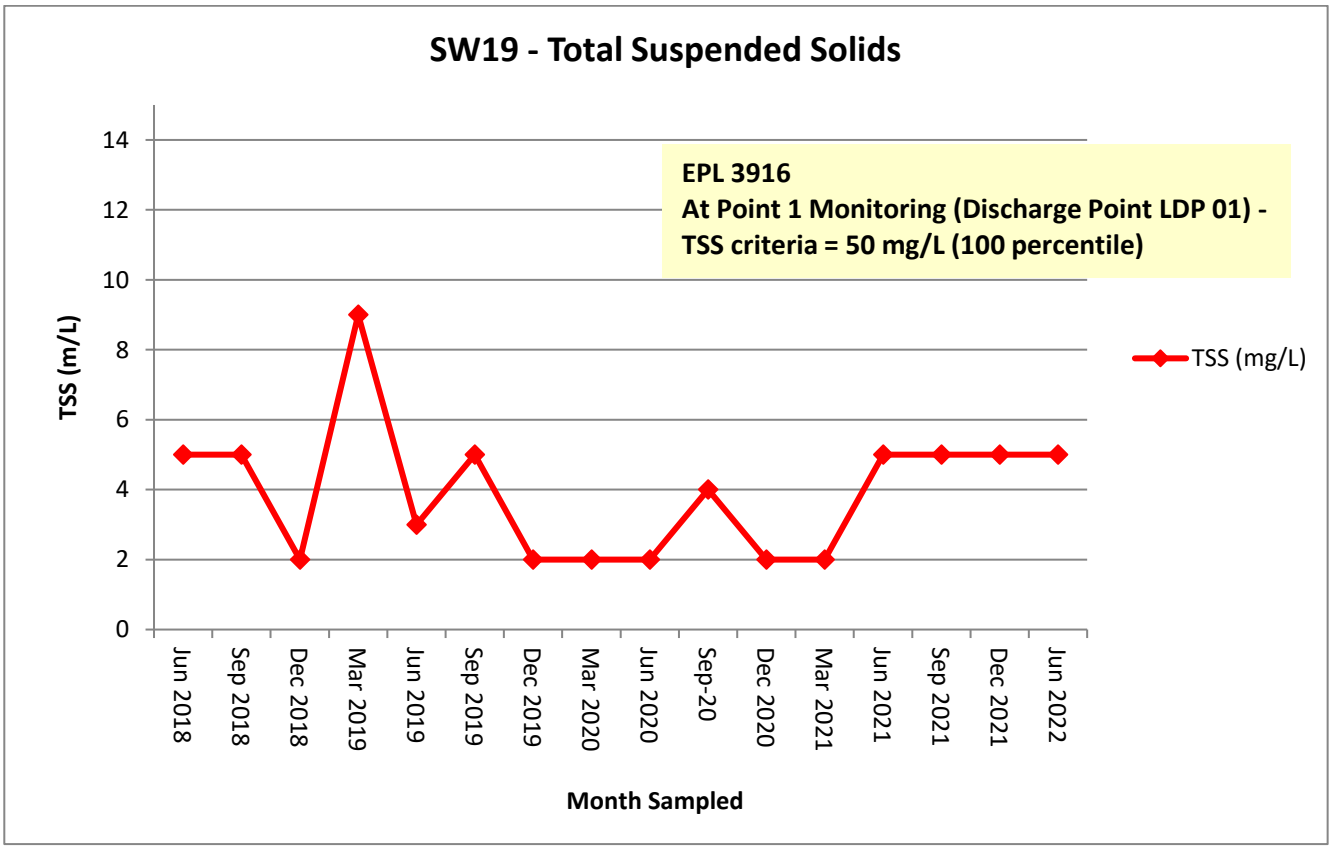


Chart 58: SW19 Total Suspended Solids June 2018 – June 2022.

Table 28: LDP01 laboratory results, relevant water criteria and compliance for discharge.

	pH			Total Suspended Solids (mg/L)			Turbidity (NTU)		
Sample Date	Laboratory Result	EPL Criteria	Criteria met	Laboratory Result	EPL Criteria	Criteria met	Laboratory Result	EPL Criteria	Criteria met
Discharged water occurred in March 2022 and not tested due to an exemption issued by the EPA during flood event									

6.4 Analyses

6.4.1 Groundwater Levels

Groundwater level results for bores which monitor localised perched groundwater aquifers (MW series and BH8) indicate relatively high fluctuations between water levels across the monitoring months. The majority of the measured groundwater levels in perched aquifer bores displaying a trend below the 20th percentile in the first half of the monitoring period which is the lower limit of the adopted trigger levels in the Soil and Water Management Plan. The second half of the monitoring period generally witnessed a rise in water levels across the bores. An investigation into the monitoring results indicate that these water level fluctuations are directly correlated to the amount of aquifer recharge of water through ground infiltration and percolation. Perched aquifers have been shown to be more responsive to surface water infiltration and percolation from rainfall events which have been evident since the commencement of the monitoring program. The 2021 – 2022 reporting period experienced wetter conditions than the previous years.

Water level results for boreholes which monitor the Sydney Basin Central Groundwater Source aquifer (BH1, BH2, BH3, BH6, BH7 and BH9) depict a strong trend across the monitoring months. The majority of the measured groundwater levels in SBCGS aquifer bores are recorded closer to the 80^{h} percentile values (upper limit of the adopted trigger levels in the Soil and Water Management Plan) during the monitoring period. The raise in groundwater is directly correlated with significant rainfall received.

6.4.2 Groundwater Quality

Greater fluctuations of pH values in groundwater were recorded during the 2010 to 2015 period. Relatively more stable pH values were recorded from 2015 to date, with the exception of BH2 which was struck by a vehicle late 2018. BH2 was rectified and groundwater quality monitoring recommenced in December 2019. Generally, pH values for MW1, MW2, MW3, MW5, BH2, BH3, BH6, BH7 and BH9 fall within the 20th and 80th percentile trigger values during the reporting period. pH values in BH1 were slightly higher than the 80th percentile value whilst pH values of BH6 were slightly lower than the 20th percentile value, a similar trend to the previous reporting period.

Electrical conductivity (EC) values in groundwater have been relatively stable from 2010 to the current reporting period, showing some fluctuations which were considered anomalies.

Electrical conductivity in MW2 showed greater fluctuations between 2010 and 2015 and started to stabilise from 2016 onwards. Elevated electrical conductivity value in MW5 was recorded in 2014 which then returned to stabilised values

thereafter. Electrical conductivity values in BH2 showed greater fluctuations in 2015 to 2016 which subsequently stabilised thereafter. During this monitoring period, electrical conductivity values for the majority of boreholes fall within the 20th and 80th percentile trigger values. Electrical conductivity values in MW1 and BH2 were recorded slightly below the 20th percentile values.

In both instances, the variations in pH and electrical conductivity values over the years were likely to be influenced by prolonged drought conditions and the wetter condition experienced during this monitoring period.

No water sample from BH8 was able to be obtained for analysis during the December 2021 and June 2022 sampling event, therefore water quality for this borehole could not be reported.

6.4.3 Assessment of Surface Water Quality and Discharge Event

SW19 represents the receiving water downstream of the discharge point (LDP01 which is Monitoring Point 1 of EPL 3916). Quarterly sampling and analysis of surface water quality at SW19 re-commenced in June 2018.

pH values of water sampled from SW19 were relatively consistent, fluctuating between 4.0 – 6.3 and fall within the EPL 3916 pH criteria for LDP01. pH generally fluctuated between 4.0 and 4.7, with the exception of pH 6.3 recorded in June 2022.

Electrical Conductivity (EC) values fluctuated between 137 and 195 µS/cm. An isolated high pH of 6.3 was recorded in June 2022. EC at SW19 were well below the *NHMRC - Australian Drinking Water Guidelines 6 - 2011* which suggests an electrical conductivity limit of 750µS for aesthetic purposes.

Turbidity values from SW19 varied between 0.2 and 6.9 NTU which according to the *NHMRC - Australian Drinking Water Guidelines 6 – 2* implies that water samples were mostly clear to some fine particles being visible. EC generally fluctuated between 0.2 and 6.9, with an isolated high reading of 18 NTU recorded in June 2022.

Total suspended solids (TSS) at SW19 varied between 2 – 9 mg/L which are significantly lower than the EPL 3916 TSS criteria of 50 mg/L. TSS generally fluctuated between 2 and 5 mg/L with a high reading of 9 mg/L recorded in March 2019.

The receiving surface water quality monitoring at SW19 was undertaken on a quarterly basis during this monitoring period in September 2021, December 2021 and June 2022. No samples were taken during in March 2022 due to significant rainfall and wet grounds resulting in unsafe access to the sampling location.

Table 29 presents the baseline surface water (SW19) quality and trigger values contained in the ***Soil and Water Management Plan (v5, November 2020)*** (SWMP). The trigger values adopted in the SWMP are as follow:

- pH: 20th and 80th percentile
- TSS: 80th percentile
- Turbidity: 80th percentile

Table 30 presents the surface water (SW19) quality results yielded during this monitoring period.

Table 29: Baseline Surface Water (SW19) Quality and Trigger Values (June 2018 to June 2020).

Parameter	Minimum	20th Percentile	50th Percentile	80th Percentile	Maximum
pH	4.0	4.1	4.2	4.3	4.7
TSS (mg/L)	2.0	2.0	3.0	5.0	9.0
Turbidity (NTU)	0.1	0.2	0.2	1.1	2.2

Table 30: Surface Water (SW19) Quality Results 2021 – 2022.

Parameter	Sep 2021	Dec 2021	Mar 2022	Jun 2022
pH	4.1	4.2	No sampling due to wet weather and unsafe access to sampling location	6.3
TSS (mg/L)	5	5		5
Turbidity (NTU)	3.9	0.35		18
SW19 quality results fall within the Trigger Values (SWMP, V5, Nov 2020)	No (Turbidity above 80th percentile)	Yes		No (Turbidity above 80th percentile)

The surface water (SW19) quality results contained in Table 30 indicate that with higher rainfall and flows within the creek some of the parameters fall outside the trigger value thresholds of Table 29.

No planned water discharge occurred at the licensed discharge point LDP01 (main water channel) during this reporting period. However, an unplanned discharge event occurred in March 2022 during the EPA exemption period due to significant wet weather leading to flooding across the Hawkesbury and Windsor regions.

6.4.4 Comparison of Surface Water Discharge Volume and Quality with Historical Data

The long-term discharge volumes and analysed water quality at the EPA licensed discharge point LDP01 are shown in Table 31. A total of 1.50 megalitres of water have been discharged during the discharge events since the 2003 – 2004 monitoring period to date. No 'planned' water discharge at the license discharge point LDP01 occurred during this reporting period however, an 'unplanned' discharge event occurred in March 2022 during the extremely wet weather period (during the exemption period issued by the EPA) and it was not possible to determine the amount of water overtopping the weir at LDP01.

Condition M2.3 of EPL lists the limits of water quality criteria to be met for water discharge which are:

- pH: 4.5 – 6.5
- Total suspended solids: 50 mg/L

Historically, laboratory results indicate that all water quality suites have met the EPL discharge criteria since the commencement of monitoring, except for one discharge event in the 2014 – 2015 monitoring period where the total suspended solids were slightly elevated and exceeded the EPL criteria.

Table 31: Long Term Discharged Water Volume at LDP01 (EPL licensed discharged point)

Annual Review Monitoring Period	Discharge Volume (Megalitre)	pH	Total Suspended Solid (mg/L)	Turbidity (NTU)	EPL Discharge Criteria Met
2003 – 2004	0.062 *1 0.034 *2	4.9 *1 5.0 *2	16 *1 31 *2	21 *1 33 *2	Yes *1 Yes *2
2004 – 2005	0.374 *1 0.156 *2	5.9 *1 6.3 *2	33 *1 22 *2	60 *1 6.3 *2	Yes *1 Yes *2
2005 – 2006	0	-	-	-	-
2006 – 2007	0	-	-	-	-
2007 – 2008	0	-	-	-	-
2008 – 2009	0	-	-	-	-
2009 – 2010	0	-	-	-	-
2010 – 2011	0	-	-	-	-
2011 – 2012	0	-	-	-	-
2012 – 2013	0	-	-	-	-
2013 – 2014	0	-	-	-	-
2014 – 2015	Not measured *1 Not measured *2	4.7 *1 5.5 *2	64 *1 32 *2	40 *1 80 *2	No *1 Yes *2
2015 – 2016	0	-	-	-	-
2016 – 2017	0	-	-	-	-
2017 – 2018	0	-	-	-	-
2018 – 2019	0	-	-	-	-
2019 – 2020	0.350 *1 0.520 *2 0.005 *3	5.79 *1 4.60 *2 no sample *3	18 *1 2 *2 no sample *3	24.1 *1 4.2 *2 no sample *3	Yes *1 Yes *2 No *3
2020 – 2021	0	-	-	-	-
2020 – 2022	Not measured *4	-	-	-	-
TOTAL Volume Discharged (Megalitre)	**1.500**				

Note: *1 *denotes to discharge event number 1 within the monitoring period*
*2 *denotes to discharge event number 2 within the monitoring period*
*3 *denotes to discharge event number 3 within the monitoring period*
*4 *denotes to discharge event number 3 within the monitoring period*

6.5 Maximum Extraction Depth Map

The Maximum Extraction Depth Map (MEDM) is based on the wet weather groundwater elevation and is determined by the quarry groundwater monitoring network.

An Independent Environmental Audit (IEA) was completed, and the report submitted in January 2020. Condition 23 of Schedule 2 of DA 250-09-01 states that a review and update of the MEDM for the Quarry is to be undertaken within 3 months of the completion of the IEA, to the satisfaction of the Secretary. A review of the MEDP was undertaken by Golder Associates in March 2020. The reviewed document was submitted to the DPIE on 3 April 2020 for review and approval. No changes have been proposed in the April 2020 version of the MEDM. No changes have been proposed between April 2020 and June 2021.

The next revision and update of the MEDM will be undertaken within 3 months of the next IEA which is scheduled to occur late 2022.

6.6 Water Access License Usage

The Annual Returns for Water Access Licenses (WALs) 24325, 24341 and 43270 for the 2021 – 2022 reporting period were submitted to WaterNSW in June and July 2022. The total water usage for each WAL is listed in Table 32 below.

Table 32: Water usage for Water Access Licences

Water Access License Number	Annual Water Usage (Megalitres)
WAL 24325	0
WAL 24341	0
WAL 43270	0

6.7 Chages to Environmental Procedures

Current groundwater management measures are considered adequate. No changes to environmental procedures are proposed.

Monitoring of the extraction limit will continue in order to ensure compliance. The Maximum Extraction Map for Old Northern Road quarry will require review following the next Independent Environmental Audit scheduled in late 2022.

Continue to monitor groundwater levels and quality, together with observations of any environmental or land use changes.

Any planned surface water discharge at LDP01 main water channel (Monitoring Point 1 of EPL 3916) will require grab samples prior to discharge for laboratory analysis to ensure pH, TSS and turbidity are within the specified EPL concentration limits. Dixon Sand staff to implement the Permit to Discharge procedure which outlines the steps required leading up to the allowable water discharge.

Quarterly sampling of surface water at SW19 to continue as normal.

7. Ecological Monitoring and Rehabilitation

7.1 Vegetation Clearing

One vegetation clearing event was carried out during this reporting period. The remaining uncleared area on Lot 2, Strip 2 which contained the original specimen of Melaleuca deanei was cleared on 31 May 2022.

All vegetation clearing was undertaken in accordance with the pre-clearing survey and multi-stage habitat tree clearing protocols implemented by the Quarry. Appropriate briefings were provided to the relevant staff prior to the commencement of vegetation clearing.

7.2 Bush Regeneration and Weed Management

Rehabilitation and weed management at Old Northern Road quarry were undertaken by a bush regeneration contractor Bush-It Pty Ltd with multiple visits each month throughout the reporting period.

Approximately 585.5 hours was spent on bush regeneration works at Old Northern Road Quarry, equating to approximately 85% of the time spent between Old Northern Road Quarry and Haerses Road Quarry scope of works.

Bush regeneration and weed management are carried at the following locations:

- Vegetated areas on Lots 1 and 2 excluding areas in the extraction pit and sediment ponds,
- Native Vegetation Corridor on 29,
- Southern border of extraction pit on Lot 196,
- Front embankment along the quarry entrance, and
- Biodiversity Offset Area located at Haerses Road (Lots 176 and 177 DP 752039).

Bush regeneration works involved mechanical and chemical methodologies.

Figures 3 and 4 show the locations where bush regeneration and weed management works have been undertaken at the Old Northern Road Quarry and Biodiversity Offset Area (located at Haerses Road) during this reporting period.

The Annual Bush Regeneration Report provided by the contractor for the 2021 – 2022 reporting period is attached as Appendix G.

Figure 3: Bush regeneration and weed management works area at Old Northern Road Quarry (source: BushIT 2022).

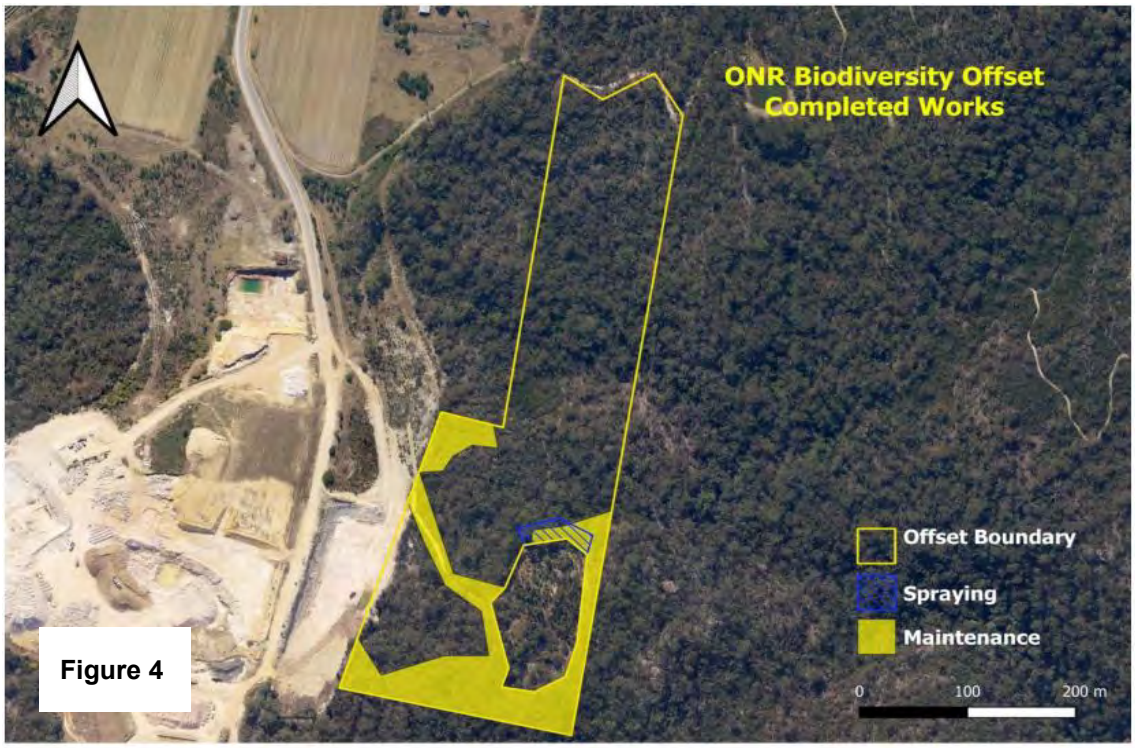


Figure 4: Bush regeneration and weed management works are at Haerses Road Biodiversity Offset Area (source: BushIT 2022).

7.3 Biodiversity and Rehabilitation

Dixon Sand engaged South East Environmental to undertake the annual biodiversity and rehabilitation monitoring and reporting for Old Northern Road Quarry. Progress assessments were made against the commitments in Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (BRMP). The Biodiversity and Rehabilitation Management Report (South East Environmental, 2022) aimed to:

- Identify native flora and fauna species, populations and ecological communities known to or likely to occur within the Native Vegetation Corridor (NVC) and Haerses Road Biodiversity Offset Area (HRBOA),
- describe the native vegetation and habitats within the NVC and HRBOA,
- describe the current condition of the threatened flora and its habitat found outside of the NVC at Old Northern Road,
- discuss the ongoing monitoring of threatened flora and fauna previously recorded at both ONR and HRBOA,
- determine the legislative and conservation significance of species, populations and ecological communities known or likely to occur within the NVC and HRBOA with reference to the Commonwealth *EPBC Act 1999* and the *NSW BC Act 2016*,
- recommend appropriate biodiversity and environmental management measures that should be implemented to reach criteria for monitoring success set by the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018), and
- provide an independent monitoring report for inclusion as part of the external reporting for the quarry Annual Review.

Field surveys were conducted over August and September 2022 throughout the established monitoring sites across the quarry. Specific survey methodologies were adopted including the 20m x 50m quadrats, 2m x 20m subplot, 1m x 1m line plots and random meandering. Fauna survey methods included general searches for indirect evidence of native fauna including scratches, scats, nests, hollows in use, camps, roosts, den sites etc. Opportunistic sightings of all fauna species were recorded throughout the survey period. Unbaled motion detection infra-red digital camera for 16 nights and Anabat recording device for 16 nights were also utilised for the fauna survey.

It was noted that the flora survey was conducted over a short timeframe during late winter to early spring and therefore some plant species may have been undetected and not identified due to their dormancy or lack of flower status. The study was limited by the timing and frequency of survey.

Sections 7.3.1 to 7.3.10 describe the findings at each nominated rehabilitation and monitoring area, assessment against completion criteria, together with discussion and recommendations. The full Biodiversity and Rehabilitation Management Report (South East Environmental, 2022) is contained in Appendix H.

7.3.1 Native Vegetation Corridor

The Native Vegetation Corridor (NVC) comprised of a minimum area of 6.83 hectares, extending from the south-western corner of Lot 29 and extending along the southern boundary of Lot 2 to the area located between the 250m buffer and the Maroota Public School.

Five out of nine vegetation monitoring sites are located within the NVC.

The location of the NVC and vegetation monitoring sites are shown in Figure 5.

Rehabilitation of native vegetation in the NVC commenced in late 2017 on the south-western boundary of Lot 29, comprising an area of approximately 0.8 hectares and utilising three rehabilitation methods. Parts of the current NVC are utilised as haul road, sediment ponds and active extraction area. The remaining area are existing areas containing native vegetation and disturbed areas which are remnants of orchard plantation, grazing land and farm dams.

Rehabilitation Area – Planted

The planted area in the NVC is approximately 0.4 hectares in size. One vegetation monitoring site, as specified by the BRMP, is located in this area. Native nursery tube stocks were planted in this location. Two of the species, *Melaleuca deanei* (vulnerable) and *Darwinia fascicularis* ssp*. oligantha* (endangered population) under the *Biodiversity Conservation Act* 2016, were propagated from onsite specimens, grown in commercial nurseries and replanted in the NVC.

A total of 47 native species have been planted in this area, including the abovementioned propagated threatened species. The ecological survey during this monitoring period identified an additional 51 native species which have emerged from seed bank storage from the sub-soil, including the endangered species *Acacia byoneana* and *Tetratheca glandulosa*. This is an increase of 10 species since last monitoring year which appears to have emerged from seed bank stored in the soil due to ideal growing conditions.

There were 22 live specimens of *Melaleuca deanei*, 12 *Darwinia fascicularis* ssp*. oligantha* and 9 *Tetratheca glandulosa* located this reporting period. Furthermore, a single *Pimelea curviflora var. curviflora* was located within this planted area. No *Acacia bynoeana* was identified during this period which is likely due to wet conditions causing unfavourable condition for the species to grow.

Figure 6 shows the *Tetratheca glandulosa* and Figure 7 shows the *Melaleuca deanei* planted within this rehabilitation area.

Rehabilitation Area – Translocated

This area involved direct translation of material from Lots 1 and 2 vegetation clearing. Recruitment from seed bank storage were observed to be ample. All age classes ranging from small seedlings to adult shrubs were observed from small seedlings to adult shrubs which were in flower during the survey. Shrubs and ground cover species were reasonably abundant throughout the area. The canopy stratum is yet to fully establish however, *Eucalyptus sp.*, *Corymbia sp*. and *Angophora hispada* recruits were observed.

Translocated *Darwinia fascicularis* ssp*. oligantha* is numerous, particularly on the western section of the area. One single translocated *Tetratheca glandulosa* were observed to be in a healthy state with flowers present during August suggesting that flowering will continue over the coming months. Another *Tetratheca glandulosa* specimen was located which has grown from seed bank within the soil.

Three *Melaleuca deanei* which were planted in 2017 are still present and observed to be in a healthy state. A further 26 *M. deanei* individuals have been planted within this area during the previous 2020 – 2021 reporting period. All plants appear to be doing well with some showing signs of active growth. Monitoring of these plants will continue over the coming months.

Figure 8 shows the *Darwinia fascicularis ssp oligantha* within this translocated rehabilitation area.

Rehabilitation Area – Soil Seed Bank

Ample natural recruitment of native species was observed in this area, including *Darwinia fascicularis* ssp*. oligantha* recruitment. Ground cover and shrub species are present throughout. The canopy stratum is beginning to emerge

with *Eucalyptus* sp. and *Coyrmbia* sp. observed. *Banksia ericifolia* is observed to be to the dominated recovering shrub layer with *Grevillea buxifolia* and *Acacia suaveolens* being widespread. Previously *Acacia suaveolens* had dominated this layer however the Banksia has outgrown most of the other species present. Groundcover species are present throughout the aera but due to the density of the shrub layer the groundcover is found to be sporadically distributed.

Altogether 23 *Darwinia fascicularis* ssp. *oligantha* have been identified and are scattered throughout the site, some observed to have new recruits. The planted *Melaleuca deanei* could not be located due to the density of the shrub layer however the specimen was observed on a separate occasion during the year. The density of the shrub regrowth is suspected to be impeding on the efforts to locate other individuals. All of the surviving threatened species which were located was observed to be in a healthy state.

Figure 9 shows the soil seed bank rehabilitation area, looking south.

Front Gate Rehabilitation

The area around the front gate of the quarry underwent initial rehabilitation in 2017 with supplementary planting of native species. However, hot dry conditions in 2017 and 2020 have resulted in a number of losses and slow growth of the surviving plants, despite regular watering and maintenance. Since the return of more regular rainfall, vegetation in the area has thrived with many shrubs flowering well and new recruitments observed. Gaps in vegetation occupancy are present but is expected to fill in with time via natural recruitment.

Figure 10 shows the status of the front gate rehabilitation.

Vegetation Monitoring within NVC

Out of the nine vegetation monitoring sites across the whole Old Northern Road Quarry site, five vegetation monitoring sites are located within the NVC including one site within the planted rehabilitation area previously discussed. From the remaining four sites, two sites could be safely accessed for monitoring. The two remaining sites are currently in active quarry extraction area.

The overall health of the vegetation and biodiversity within the NVC is moderate. Historic disturbance was observed in this area and likely to be due to livestock grazing and timber removal. Recent continued rainfall in the local area has assisted in the recovery of vegetation from previous drought conditions across all affected stratums with ground cover species showing good signs of recovery.

The remaining areas throughout the NVC are impacted by the presence of *Lantana camara*. An effort to remove and control has begun in earnest however due to the distribution and density, long term management is required to completely remove the species across the entire site.

During this reporting period, it was determined that the required number of cloned *Melaleuca deanei* specimens to offset vegetation clearing under DA 250-09-01 Modification 4 had been achieved and determined successful, meeting the 2:1 offset ratio. This enabled the parent plant to be removed from the original site on Lot 2 Strip 2. An attempt to translocation the parent plant was made via digging around the root ball and carrying the plant with the attached root ball using a loader bucket. However, the root system of the parent plant was found to be extensive and had coiled around large sandstone boulders and throughout the cracks of others. The parent plant was translocated and planted in the NVC with the root ball and immediate surrounding soil. The parent plant will be monitored over time for regrowth potential.

Vegetation Monitoring outside NVC

Four vegetation monitoring sites are located outside the NVC. Access to two of the monitoring sites are located in the current extraction areas and therefore cannot be accessed. Access to one other monitoring site was restricted by the presence of *Lantana camara*.

The first accessible survey site is located outside the NVC within the 250m buffer to the Maroota Public School with vegetation determined to be *Smooth barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney* Basin Bioregion. This area was subjected to historic disturbance, most likely from timber harvesting. Survey indicated there is abundance *Eucalyptus piperita* regenerating within the survey quadrat, all being around the same age which indicates that the area had been previously cleared. Diversity within the survey site was categorised as reasonable and biodiversity values moderate. This survey site will not be subjected to future vegetation clearing for the quarry and therefore presents a good opportunity to monitor the effects of sand extraction in nearby retained vegetation.

The additional survey site is also classified as *Smooth barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney*. This survey location is located just within the 250m buffer to the Maroota Public School and will not be subjected to future vegetation clearing. Vegetation within this survey plot appears to have had very little disturbance and contains no exotic weeds. This survey location will also provide good baseline data for future reference for rehabilitation.

Lantana camara have some impacts on the remaining area outside the NVC. The third survey quadrat could not be accessed due to this. Removal and control of the species have commenced within this section however more efforts are required as progress is slow and favourable conditions for weed growth have affected weed management progress.

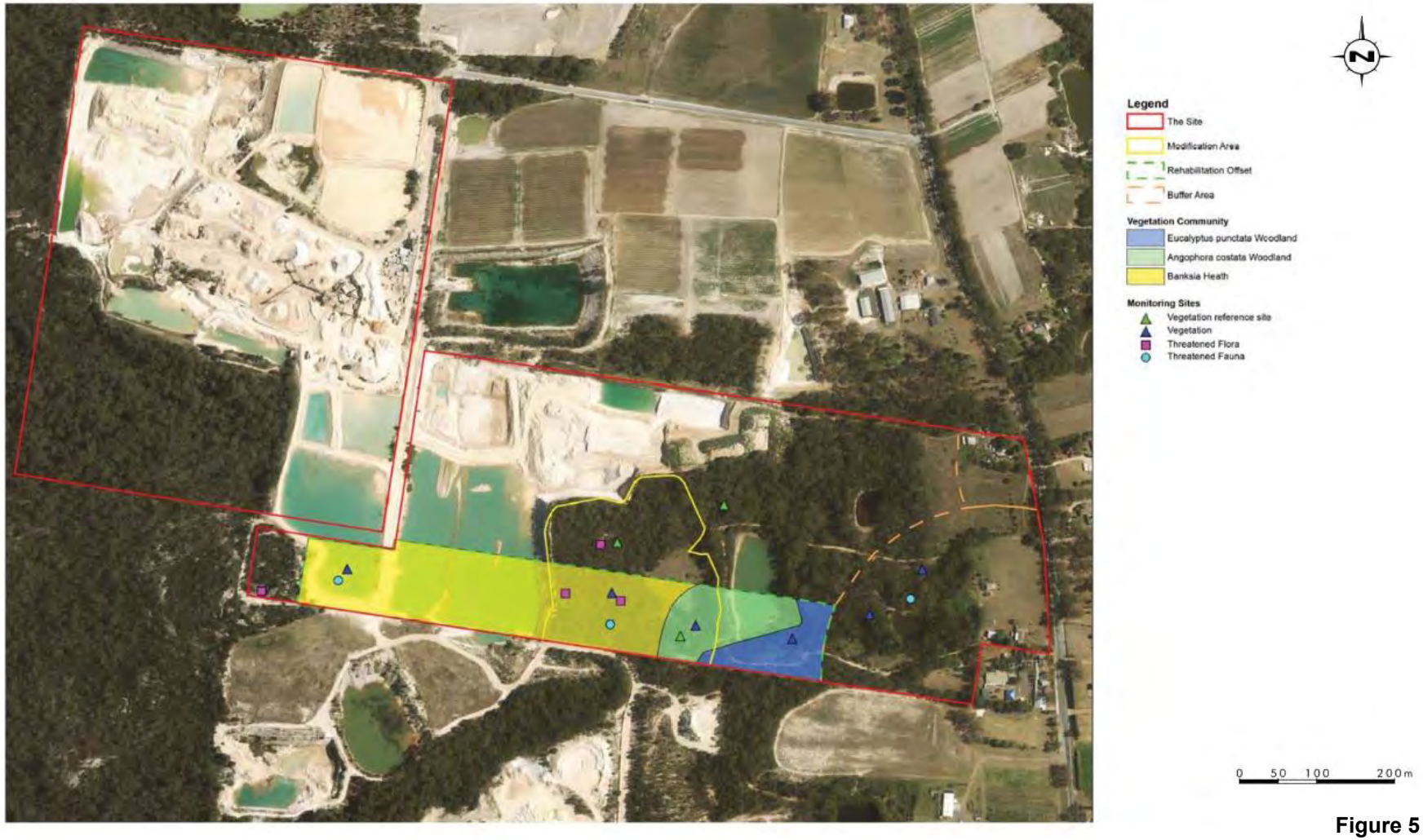


Figure 5

Location of Ecological Monitoring Sites
Old Northern Road Quarry

Image Source: Cumberland Ecology (2015)

File Name (A4): R06/4209_020.dgn
20180220 17.30

Figure 6: *Tetratheca glandulosa* within the planted rehabilitation area (Source: South East Environmental, 2022).

Figure 7: Planted *Melaleuca deanei* within the planted rehabilitation area (Source: South East Environmental, 2022).

Figure 8: the *Darwinia fascicularis ssp oligantha* within the translocated rehabilitation area (Source: South East Environmental, 2022).

Figure 9: soil seed bank rehabilitation area, looking south (Source: South East Environmental, 2022).

Figure 10: the status of the front gate rehabilitation (Source: South East Environmental, 2022).

umwelt

Figure 11

Location of Ecosystem Monitoring Sites Haerses Road Biodiversity Offset Area

Image Source: Cumberland Ecology (2015)

File Name (A4): R06/4209_021.dgn
20180220 17.10

7.3.2 Haerses Road Biodiversity Offset Area

The Haerses Road Biodiversity Offset Area (HRBOA) has a minimum area of 8.70 hectares and is located east of Stage 2 extraction at the Haerses Road quarry. Five vegetation monitoring sites are located within the HRBOA. The HRBOA and locations of the monitoring sites are depicted in Figure 11.

Overall, there has been an increase in foliage cover and structure cover in most stratums at the majority of the monitoring sites. Grass and groundcover species appear to have Extensive Long-nosed Bandicoot digs were noted in an area close to Quadrat 1. Bird presence and density has remained consistent from the last survey period, likely due to favourable weather conditions.

7.3.3 Threatened Flora Monitoring

Four threatened flora species are being monitored at the Old Northern Road quarry.

Kunzea rupestris* and *Darwinia fascicularis* ssp. *oligantha

The far western area of Lot 29 contains two rock platforms (eastern and western) occupied by *Kunzea rupestris* and *Darwinia fascicularis* ssp. *oligantha.* The Eastern rock platform contains four individual patches of *Kunzea rupestris* with the presence of *Darwinia fascicularis* ssp. *oligantha.* Much of the surrounding vegetation has suffered die back including Banksia ericifolia and Calytrix tetragona, likely attributed to the dry conditions during the 2017 – 2019. The Western rock platform contains five patches of *Kunzea rupestris* which was observed to be growing within a vegetation community with far more flora diversity than what is present on the eastern platform with shrubs growing in deeper soil profile in more protected conditions. The overall health of the *Kunzea rupestris* population is good following the continued rainfall in the local area. During the 2017 – 2019 drought some dieback and plant loss was observed however the remaining plants appear to be in good health and new recruitment is evident, particularly on the western rock platform. New growth on most plants was observed during this survey period with flower buds present on much of the population. Mosses and lichens were present on both rock platforms.

The *Darwinia fascicularis* ssp. *oligantha* was observed to be plentiful in these locations with plants in flower and new recruits evident throughout. This species is also very well represented throughout the rehabilitation areas in the NVC.

***Melaleuca deanei* (parent plant)**

The parent plant of *Melaleuca deanei* located in the Banksia heath plant community on Lot 2 strip 2 had been translocated to the NVC following the success of the 2:1 offset of propagation and planting.

Tetratheca glandulosa

Several *Tetratheca glandulosa* plants have been identified in Quadrat 2 during this period including an abundance of flowering *Pimelea curviflora var curviflora*.

7.3.4 Threatened Fauna Monitoring

Old Northern Road Quarry

Feed trees for Glossy Black Cockatoo are confirmed to be present in transect 2 of the NVC and within the 250m buffer to the Maroota Public School. Six individual birds were observed feeding in trees within the translocation rehabilitation area during the August 2022 survey.

Results from utilising an AnaBat Express sound recorder revealed the presence of three species:

- *Miniopterus australis* (Little Bent-winged Bat),
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), and
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat).

AnaBat results also indicated potential occurrence of the following bat species:

- *Chalinolobus dwyeri* (Large-eared Pied Bat),
- *Miniopterus orianae* (Large Bent-winged Bat),
- *Scoteanax rueppellii* (Greater Broad-nosed Bat), and
- *Myotis Macropus* (Southern Myotis).

Live trapping of bats was not conducted to reduce unnecessary stress on the fauna. Survey can be undertaken during the summer period to determine which species are likely to occur annually on site.

A pair of resident Wedge-tailed eagles were again observed flying over the site several times during this monitoring period. A single adult White Breasted Sea Eagle was also observed flying over the quarry during this reporting period.

Haerses Road Biodiversity Offset Area

There is a historic Bionet record of a Koala and Glossy Black Cockatoo sighting to the north of HRBOA towards Hitchcock Road.

A search for Koala scat under *Eucalyptus punctata* within all survey quadrats at the HRBOA were undertaken and no scats were present. However, Koala sightings in the local area, particularly in Glenorie, have increased since the Wollemi/Yengo mega bushfire over the spring-summer of 2019 – 2020.

Glossy Black Cockatoo feed trees were recorded in Quadrat 1 and just east of Quadrat 2. More feed trees will likely to be observed over time within the site as more survey is carried out.

Several Brown Treecreepers were observed foraging at various locations which indicate their permanent presence and residents within the site.

Survey utilising AnaBat Express sound recorder was undertaken for 16 nights which identified the presence of three species:

- *Chalinolobus dwyeri* (Large-eared Pied Bat),
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat), and
- *Miniopterus australis* (Little Bent-winged Bat).

AnaBat results also indicated potential occurrence of the following bat species:

- *Scoteanax rueppellii* (Greater Broad-nosed Bat),
- *Miniopterus orianae* (Large Bent-winged Bat),
- *Myotis Macropus* (Southern Myotis).

7.3.5 Exotic Flora

The weed distribution map has been reviewed and revised for the quarry during this reporting period. Weed species identified on this map will be the focus of weed management priority over the next reporting period. The map will continue to be reviewed and revised as required on an annual basis. Figure 12 shows the updated weed distribution map.

The following weed species were identified within the 250m buffer area, NVC and Lot 196 at the Old Northern Road Quarry:

- *Ageratina adenophora* (Crofton Weed),
- *Andropogon virginicus* (Whiskey Grass)
- *Bidens Pilosa* (Coblers Pegs),
- *Paspalum dilatatum* (Paspalum Grass),
- *Senecio madagascariensis* (Fireweed),
- *Lantana camara* (Lantana)*, and*
- *Bambusoideae sp.* (Bamboo)

Fireweed and Lantana are listed as Weeds of National Significance (WoNS) under the NSW *Biosecurity Act* 2015 and a weed management program is currently put in place for these species throughout the life of the rehabilitation plan.

Whiskey Grass (*Andropogan virginicus*) have been identified in the HRBOA.

Current progress of rehabilitation is in line with the ‘Mid stage 2016 – 2023’ staging of rehabilitation and rehabilitation strategy contained in Table 7.1 of the BRMP which includes:

- completion of rehabilitation on selected extracted areas on Lots 196 and 29,
- commencement of rehabilitation on strip 1,
- continual extraction on strips 2 and 3, and
- maintenance of previous revegetation, setbacks, buffer zones and bunds.

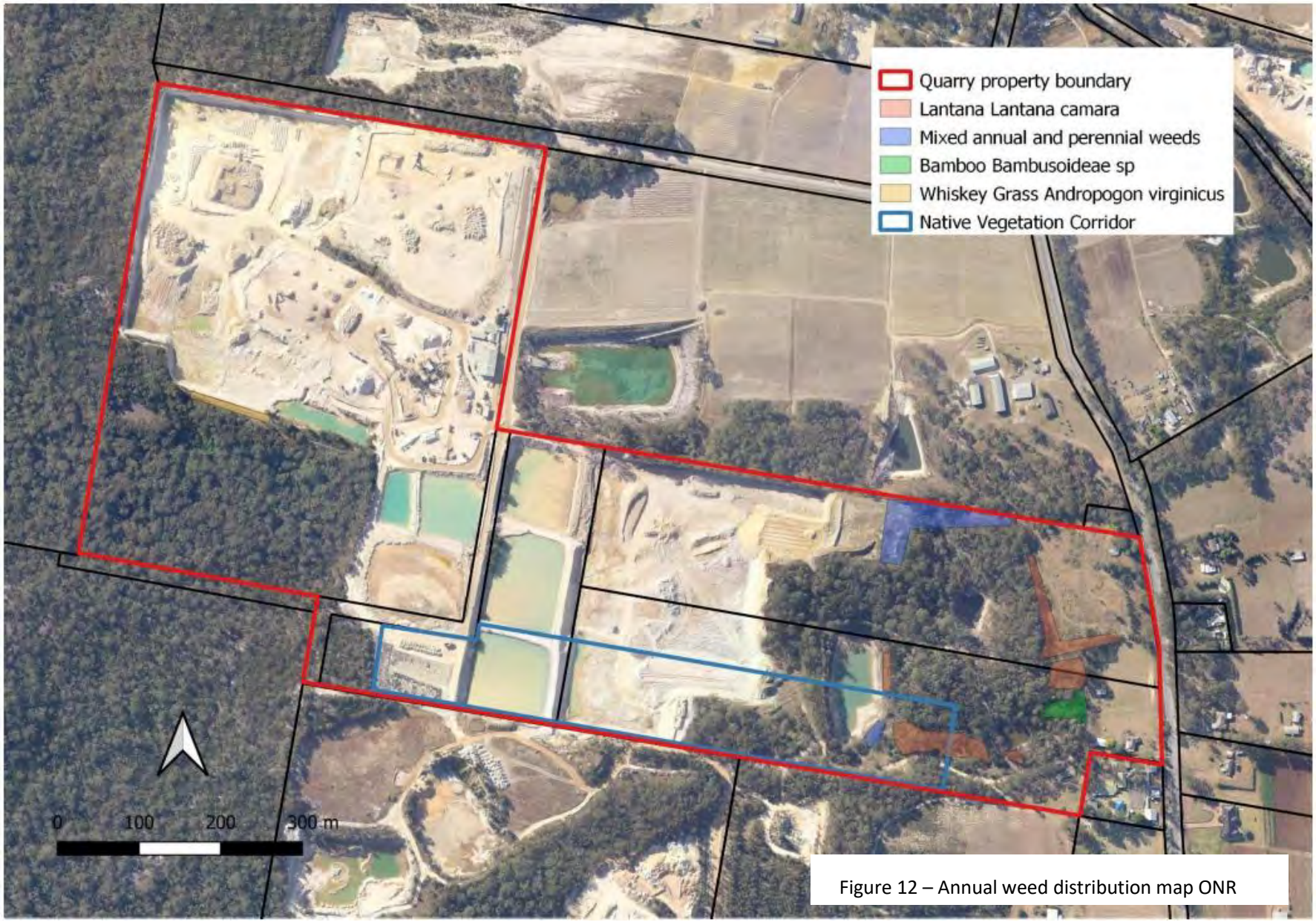


Figure 12 – Annual weed distribution map ONR

7.3.6 Pest Species Monitoring and Control

Feral pest species monitoring was undertaken by South East Environmental utilising infrared cameras, direct observation of prints and burrows, scat identification and digs. Sand plots were not able to be utilised during this reporting period due to wet conditions prohibiting machinery access.

The following feral pest species were identified to be present on the quarry premise:

- European Red Fox – identified through scats,
- Noisy Minor – identified through on-site observation,
- Dog – identified through infra-red camera, and
- European Rabbit – identified through scats.

European rabbit scats were observed in several locations within the NVC in low density. Carnivore scats observed on site were highly likely to be those of European Red Fox. No rabbits were observed to be feeding during the day, scats were not in high density and warrens were not observed. The population of rabbits is therefore, considered to be low to moderate, and likely to be kept under control by biological means such as predation from foxes, dogs, cats and birds of prays such as Wedge-tailed Eagle that are present nearby. Should the number of rabbits become problematic, it may be necessary to engage in a control program to reduce or eliminate the population. Noisy minors, although a native species, was observed within the NVC and the 250m buffer area. Noisy minors are considered a pest if present in high density and is a key threatening process to a number of threatened native species of small birds such as the Brown Tree Creeper which is present in the area. The population of the Noisy Minor was considered to be small, and the presence of other small native bird species was observed on site. The population of the Noisy Minor is to be monitored over time and management strategy to be implemented to prevent the species from becoming dominant which can lead to elimination and displacement of other native bird species.

Overall, occurrences of fauna pest species are not at a level considered to require active management and on-going monitoring will be undertaken to determine appropriate dynamic management strategy.

7.3.7 Progressive Rehabilitation

Progressive rehabilitation of the quarry during this reporting period included:

- capping and settlement of the silt pond located on Lot 196 directly north of the current Native Vegetation Corridor (NVC). Part of the silt pond will form the northern boundary of the NVC and the remainder will be revegetated to Class 4 Agriculture.
- Capping and settlement of the silt pond located on Lot 29 directly east of the current haul road separating Lots 29 and 196. Once optimal status is obtained, stockpiled windrows of material and topsoil will be applied to this area for rehabilitation of Banksia Heath Community, extending east from the current NVC on Lot 29.

The locations of the capped and settling silt ponds are shown in Figure 13 below.

No revegetation was carried out for rehabilitation during this reporting period due to extreme wet conditions restricting machinery access. Revegetation of the silt ponds may occur in the next reporting period if ground conditions are deemed suitable. Additional planting of propagated *Melaleuca deanei* was undertaken in the NVC.

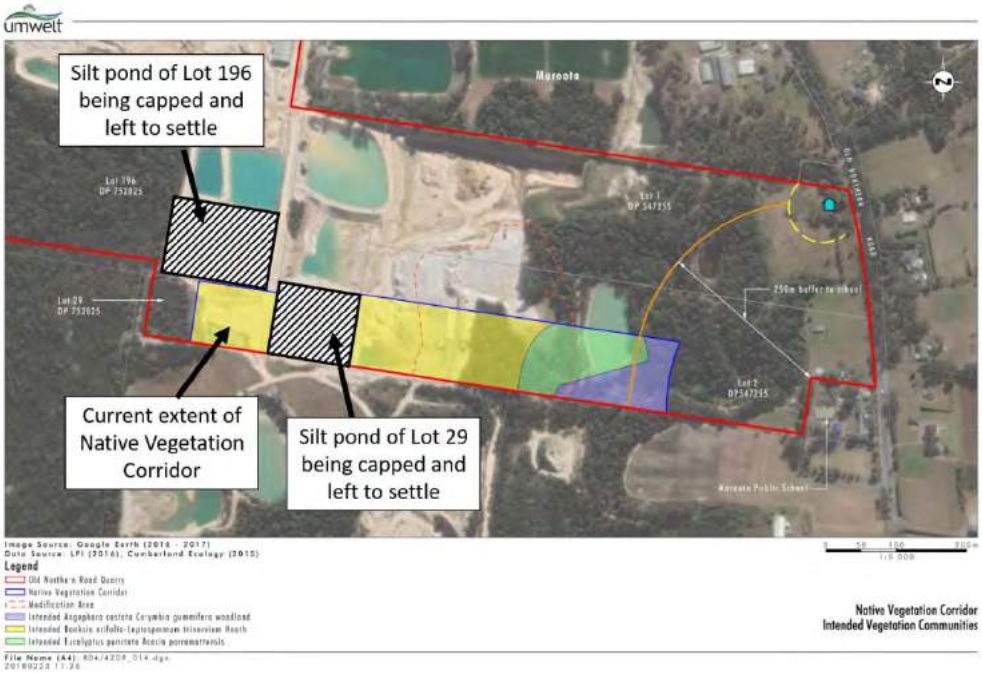


Figure 13: Locations of capped and settling silt ponds, in preparation for future rehabilitation/revegetation.

7.3.8 Progressive Achievement of Completion Criteria

Section 5.2 of the BRMP contains the preliminary rehabilitation performance and completion criteria. The status of targets being achieved against the preliminary rehabilitation performance and completion criteria are contained in Table 33.

Table 33: Assessment against criteria to monitor success of rehabilitation.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
Decommissioning	All surface infrastructure will be decommissioned and removed.	N/A	Noted – completion criteria not yet triggered
Soil	Rehabilitated slopes are stable	Yes	Complied with – managed through a combination of weekly and monthly inspections by Quarry Managers and Environmental Officer, or Delegates. Aspects managed through mitigation measures contained in the Soil and Water Management.
	No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use.		
	Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff.		
	Surface layer is free of any hazardous materials.		

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
Water	Runoff water quality from the site does not pose a threat to downstream water quality.	Yes	Complied with - aspect managed through downstream surface water monitoring, and other mitigation measures contained in the Soil and Water Management.
Native Vegetation	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	N/A	At this stage it is too early in the rehabilitation process to determine if the desired vegetation community is being established. Species planted in the NVC have been specifically chosen to recreate a Banksia Heath community.
	Second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e., evidence of fruiting of native species observed).	N/A	It is too early in the rehabilitation process for second generation tree seedlings. Fruiting of tree species is not expected for 5 years following the original planting (i.e., 2022).
	More than 75 per cent of trees are healthy and growing as indicated by long term monitoring.	Yes	More than 75% of the native vegetation within the active rehabilitation area is healthy and is growing as expected for long term survival. All shrub and ground cover species have reached maturity with flowering and seed production observed. Some species have begun self-propagation within rehabilitation sites. *Eucalyptus*, *Angophora* and *Corymbia* species have not yet reached maturity.
	More than 50 per cent of translocated or propagated threatened flora species survive as indicated by long term monitoring.	Yes	More than 50% of translocated and planted propagated threatened flora species has survived despite the extreme weather conditions of the past reporting periods to date, at least **45** propagated *Darwinia fascicularis subsp. Oligantha* and **52** propagated *Melaleuca deanei* have survived transplanting in the rehabilitation area. A complete count of translocated *Darwinia fascicularis subsp. Oligantha* was not undertaken at the time of relocation however it appears that any losses that may have occurred were minimal and new recruits are now visible throughout much of the area.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum.	Yes	There were no weed species identified within the Native vegetation area. There are no signs of feral animal activity.

Aspect	Preliminary Rehabilitation Performance and Completion Criteria	Target Achieved	Comments
Stream and Riparian Zone Restoration	Drainage line stable displaying no signs of erosion	N/A	Noted – aspect not yet triggered.
	Weed species densities no greater than surrounding vegetation		
	Access to riparian zone is restricted		
	Riparian zone established to a width of 20 metres		
	Riparian zone is considered self-sustaining and exhibits 60% or more of the control site scores for each riparian condition monitoring attribute		
Weed and Pests	Regular inspections indicate a decline weed diversity, density and abundance and a decline in signs of feral animal activity.	Yes	There are no weed species identified in the rehabilitation area. There are no signs of feral animal activity.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum.	Yes	There is no significant weed infestation within the rehabilitation area. Significant weed infestations are located within the NVC outside of the rehabilitation area. These areas are being actively addressed by weed management contractors.
	There is no evidence of significant damage resulting from feral animal activity	Yes	There is no evidence of significant damage caused from feral animal activity within the rehabilitation area.
Bushfire Hazard	Appropriate bushfire hazard controls have been implemented.	Yes	Complied with – bushfire hazards are managed through the Bushfire Management Plan (Parts 1 and 2). Annual meeting between Dixon Sand and the representative of Rural Fire Service are carried out before the start of the bushfire season to review and revise the status of hazards and mitigation measures. The annual meeting was carried out in August 2022 for this reporting period.
Ongoing Public Safety	Appropriate mechanisms are established to control access and manage public safety post-closure.	N/A	Noted – aspect not yet triggered

7.3.9 Stream Restoration

Riparian stream restoration has not commenced. The areas where the riparian stream was to be reinstated are either still being extracted or yet to be extracted.

7.3.10 Discussion and Recommendations

The annual biodiversity monitoring and rehabilitation management report undertaken by South East Environmental for this reporting period marks the fifth year of monitoring and reporting for the quarry. The continuation of above average rainfall over this reporting period of facilitated ideal growing conditions for the rehabilitation areas of the NVC. Vegetation within all stratums have shown an increase in size, maturity and density over the last twelve months. New juvenile recruits can be observed within the shrub and groundcover species, and an increase in diversity was recorded. Canopy species have shown to be growing well and should reach reproductive maturity within the next reporting period.

Other vegetation within the Old Northern Road quarry have shown to recovered well from previous drought conditions from the previous years due to above average rainfall during this reporting period, providing ideal growing conditions for groundcover species particularly forbs, grasses and ferns. Native vegetation within areas of no weedy growth have proven resilient with no new weed growth or establishment of weed following the return of regular rainfall events.

Vegetation changes within the HRBOA is observed to be minimal which provides a good demonstration of the hardiness of native vegetation stand with minimal historic disturbances.

The threatened *Kunzea rupestris* located west of the NVC have been affected by the prolonged drought conditions of 2017 to 2019. The *Kunzea rupestris* was adversely impacted by the drought, particularly from radiant heat reflection from the surrounding sandstone outcrop. New juvenile recruits have been recorded since the return of regular rainfall.

Other threatened species previously recorded on site were located and appear to be in a healthy state.

Management of Lantana within the NVC and 250m school buffer area at the Old Northern Road Quarry will be the priority for bush regeneration contractors to prohibit the spread of the weed into new areas which can form potential habitat for exotic fauna such as the European Red Fox and European Rabbit.

A silt pond directly east of the NVC rehabilitation area will be the designated area of new rehabilitation area, depending on the timing and readiness of the ground condition pending compaction and settlement of materials. Rehabilitation will also focus on the western embankment at the front entrance to the quarry site.

Planting of the remaining propagated *Melaleuca deanei* and other local species will be undertaken within the rehabilitation areas when condition is suitable. Continue with supplementary planting within the rehabilitation area and locations within the NVC and 250m buffer to the school where Lantana has been removed.

7.4 Change in Environmental Procedures

Old Northern Road NVC Rehabilitation Area

- Planting of the remaining propagated *Melaleuca deanei* and local species when condition is deemed suitable,
- Continue to propagate from the planted/translocated threatened species specimens for future planting to achieve the required species offset numbers (as required), and
- Continue with routine weed control and monitoring of regenerating native species.

Old Northern Road Lots 1 and 2

- Continued management of *Lantana camera* and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2022)

Old Northern Road other areas

- Continue with routine weed management along the southern boundary of Cons Hill (Lot 196) and carry out direct seeding or supplementary planting where suitable, and
- Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.

Haerses Road Biodiversity Offset Area

- Continue with management of invasive grass and annual species along the North-western border of the HRBOA, and

8. Community and Social Impacts

8.1 Compliance

Dixon Sand is required to adhere to the following community related consent conditions:

Table 34: Community related consent conditions

Development Consent	Consent Condition	Requirement	Compliance
DA250-09-01	Condition 8 of Schedule 5	The Applicant must establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. The CCC must be established by 10 October 2018 and operated in general accordance with the Department's Community Consultative Committee Guidelines, November 2016 (or later version). Notes: • The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. • In accordance with the guidelines, the Committee should comprise an independent chair and appropriate representation from the Applicant, Council and the local community. • The CCC established and operated prior to the approval of Modification 5 must continue to be operated in accordance with the procedures required by the consent prior to the approval of Modification 5 until such time as the CCC required by this condition is established.	The current CCC members were re-appointed by the DP&E on 1st March 2018 (note joint CCC for the Old Northern Road and Haerses Road quarries). Additional members have been endorsed by the Chair Person after this date.
DA250-09-01	Condition 1(e) of Schedule 5	describe the procedures to be implemented to: • keep the local community and relevant agencies informed about the operation and environmental performance of the development; • receive, record, handle and respond to complaints; • resolve any disputes that may arise during the course of the development; • respond to any non-compliance; • respond to emergencies; and	Refer to the Environmental Management Systems
DA165-7-2005	Condition 1(e) of Schedule 5		
DA250-09-01	Condition 1(f) of Schedule 5	include a Community Relations Plan, developed in consultation with	The Community Relations Plan is included as Appendix 11 of the

Development Consent	Consent Condition	Requirement	Compliance
		Council, the CCC, and the Maroota Public School, which includes: • identification of stakeholders potentially affected by the development; • detailed strategies to ensure open communication between the Applicant, the community and Maroota Public School; • detailed strategies to monitor and evaluate social impacts of the development on the local community and Maroota Public School; and • measures to improve community relations including: o quarry open days and education sessions to promote better understanding of quarry operations in the wider community; o participation in community activities; and o strategies involving in-kind exchanges of expertise and resources for activities such as bush regeneration, Landcare, Streamwatch, and other community-based environmental programs;	revised Environmental Management System
DA165-7-2005	Condition 8 of Schedule 5	The Applicant must establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. The CCC must be established by 30 June 2018 and operated in general accordance with the Department's Community Consultative Committee Guidelines, November 2016 (or later version). Notes: • The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. • In accordance with the guidelines, the Committee should comprise an independent chair and appropriate • representation from the Applicant, Council and the local community. • The CCC established and operated prior to the approval of Modification 1 must continue to be operated in accordance with the procedures required by the consent prior to the approval of Modification 1 until such time as	The current CCC members were re-appointed by the DP&E on 1st March 2018 (note joint CCC for the Old Northern Road and Haerses Road quarries). Additional members have been endorsed by the Chair Person after this date.

Development Consent	Consent Condition	Requirement	Compliance
		the CCC required by this condition is established. • The Applicant may, with the approval of the Secretary, combine the function of this CCC with the functions of other CCCs in the area.	

8.2 Complaints and Follow-up Actions

Three complaints were received for the Old Northern Road Quarry during the 2021-2022 reporting period. A summary of the complaints is contained in Table 36 below. All complaints have been closed out.

Table 35: Complaints received during the reporting period

Complaint No. 1	
Date complaint received	30 November 2021 Complaint received by Weighbridge Operator via telephone call.
Issue	• The complainant was concerned about the driving nature of a truck who was crossing over double line markings on the road multiple times. • The complainant followed the truck to the quarry entrance and was able to record the truck identification.
Recommended Action(s)	• Notify Quarry Manager and/or Environmental Officer immediately • Request a copy of truck registration to check against Dixon Sand's customer haulage truck register and liaise with PF Formation and Hodgson Quarries in accordance with the Maroota Local Traffic Management Plan. • If the truck in question is confirmed to have picked up products from one of the three quarries, check if the truck has a previous offence(s) and notify the truck company as a formal warning. • Quarry Manager to execute appropriate disciplinary action. • If the truck in question has been verified to have picked up products from one of the three quarries, notify other truck drivers at the quarry of the nature of complaint/non-compliance and remediation action (privacy and identity of complainant and truck driver must be maintained).
Outcome	• The truck in question was identified. • Quarry Manager spoke to the truck driver who admitted responsibility. • The driver was reminded of the importance of adhering to the road rules, the quarry traffic management policy and the 3-strike out rule. • **Official Warning No. 1 was given to the driver**. • Quarry Manager contacted the Complainant and advised them of the abovementioned steps taken by the Quarry. • **The weighbridge operator(s) will commence the education campaign to remind haulage truck drivers of their responsibilities for road safety and to remind them of the requirements of the quarry Traffic Management Policy.**
Close out Date	30 November 2021
Complaint No. 2	
Date complaint received	13 May 2022 Council notified David Dixon of Complaint
Issue	• Complaint received by Council. • Council informed Dixon Sand of the complaint during the CCC Meeting

	• Council advised the CCC that they had received a noise complaint for the Quarry. The complainant followed the truck to the quarry entrance and was able to record the truck identification.
Recommended Action(s)	Dixon Sand requested that Council contact the Complainant and provide more information i.e. date, time, location
Outcome	On 13/05/22 – During the CCC Meeting Hunny Churcher requested Council to provide more information in regards to the complaint. On 16/05/22 – Council provided the following additional information: • Ongoing noise - customer called to advise that Dixon Sand at Maroota are running diesel pumps constantly, continues all through the night. The noise is travelling and causing disruption to sleep. • Diesel pumps are constantly running all night pumping from water from the quarry is an ongoing issue that has been happening for 6 months. And that is happening all night On 17/05/2022: • Hunny provided a response to Council advising that the noise complaint has been investigated and discussed with Dixon Sand's management and can confirm that the operation at Old Northern Road Quarry does not operate pumps overnight or outside the operating hours. Under the water management protocols, sediment in silt ponds are left to flocculate and settle overnight and any transfer of water is undertaken during the day within the operating hours.
Close out Date	17 May 2022
Complaint No. 3	
Date complaint received	3 June 2022 Council notified David Dixon of Complaint
Issue	• Complaint received by the Hills Shire Council representative. • Council informed Dixon Sand of the complaint by telephone and email on 03/06/2022, advising that the complaint is in relation to sediment from the Quarry being tracked onto Old Northern Road.
Recommended Action(s)	• Dixon Sand to provide a response to Council as discussed.
Outcome	• On 07/06/2022 – Dixon Sand emailed Council and confirmed that the photo of the sediment laden section of the road provided to Council is not the location of the quarry access road but is located further uphill. Dixon Sand also provided evidence that the quarry is utilising both a broom sweep and a road wash watercart daily to mitigate sediment leaving the site. Dixon Sand pointed out that a number of private driveways and farms upslope of the quarry are also contributing to the sediment problem in these unusually wet conditions. • On 08/06/2022 – Council emailed and acknowledged the receipt of the correspondence above.
Close out Date	8 June 2022

A copy of the complaints register containing the details of the complaint received during the reporting period is contained in Appendix K.

8.3 Long Term Complaints Trend

Long term complaints monitoring data commencing since the 2003 – 2004 monitoring period is depicted in Chart 59 below. It must be noted that complaints were recorded for the Old Northern Road and Haerses Road quarries combined from the 2006 – 2007 to 2017 – 2018 monitoring periods, with complaints recorded separately for individual quarries from hereon.

A total of twenty-four complaints have been received by Dixon sand since the 2003 – 2004 monitoring period to date. The number complaints were between nil and up to three from the 2003 - 2004 to 2007 – 2008 monitoring periods, all of which were associated with haulage trucks driving in a dangerous manner or exceeding the speed limit.

During the 2008 – 2009 monitoring period, the number of complaints increased to six, with the majority associated with trucks driving in a dangerous manner or exceeding the school zone speed limit. One complaint was in regards to excessive noise generation where the source of noise was identified to be caused by a different operation.

From 2009 – 2010 to 2016 – 2017 monitoring periods, the number of complaints were minimal and fluctuated between nil and two. These complaints were associated with haulage trucks driving in a dangerous manner or exceeding the speed limit.

The 2016 – 2017 monitoring period recorded an increase in number of complaints to eight complaints which were associated with haulage trucks driving in a dangerous manner, excessive noise generation, operation outside of approved hours and excessive dust generation.

From this point, a downward trend in number of complaints was observed. The number of complaints received reduced to five haulage truck related complaints during the 2018 – 2019 monitoring period. The number of complaints further reduced to two truck related complaints (exceedance of speed limit) during this 2019 – 2020 monitoring period.

One haulage truck complaint (dangerous driving) was received during the 2019 - 2020 monitoring period.

Three complaints were received during this reporting period which were related to noise, sediment and haulage truck. The majority of the complaints were made by residents of Maroota, residents of neighbouring suburbs or local road users. One complaint was made by Dixon Sand Quarry Manager. Timing of events leading to complaints were mainly during quarry operation hours with the exception of complaints associated with operations outside of consented hours. The locations of haulage trucks driving in a dangerous manner, exceeding the speed limit or excessively using engine brakes were mainly on Old Northern Road and Wisemans Ferry Road in the local areas.

Dixon Sand implemented the steps to identify the validity of the complaints received and employed appropriate actions outlined in the complaints procedure and the Maroota Local Traffic Management Policy (inter-pit policy). Several complaints were identified to have been associated with other operations within or outside the local areas. All complaints have been closed out.

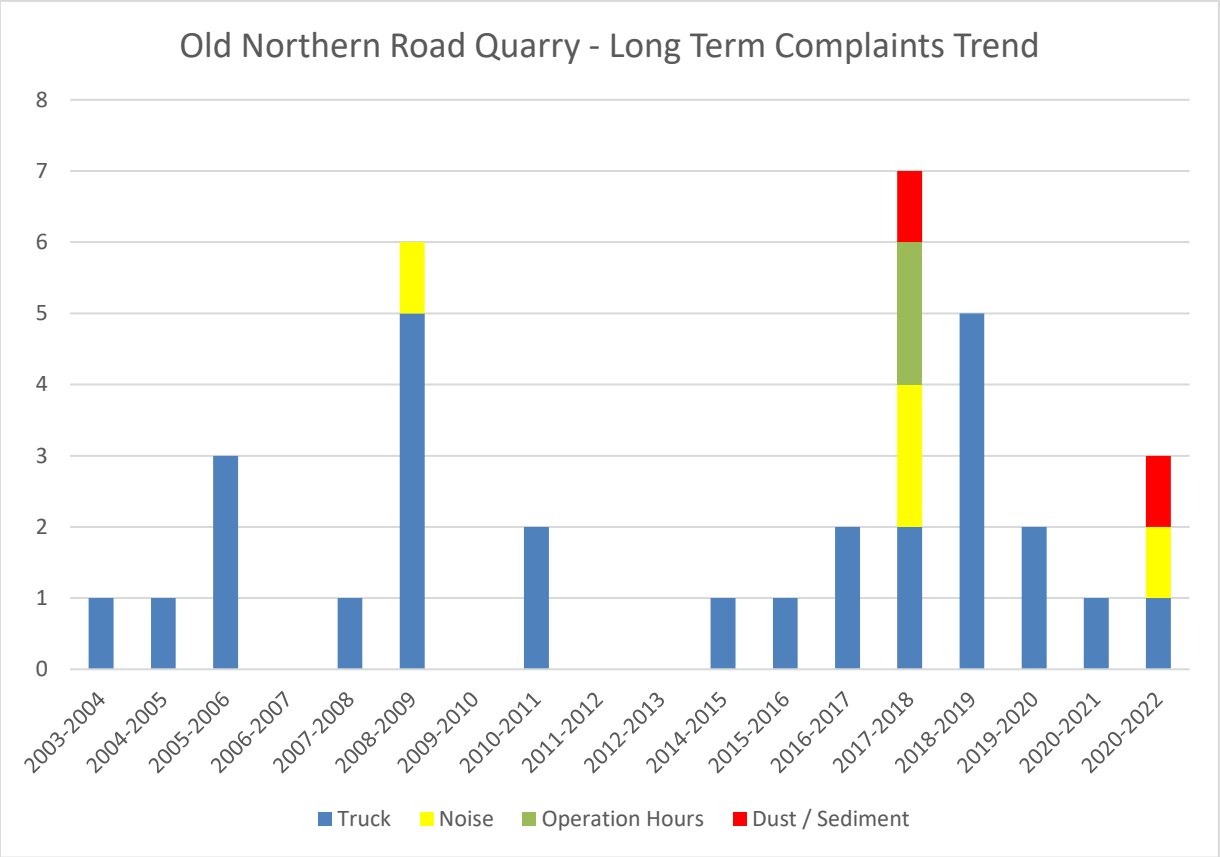


Chart 59: Long term complaints trend.

8.4 Community Consultative Committee, Meetings and Guidelines

Two CCC meetings were held in the 2021 - 2022 reporting period, in accordance with the consent conditions and CCC Guidelines (2016). The ordinary bi-annual CCC meetings were held on 10th November 2021 and 13th May 2022.

The minutes from the ordinary CCC meeting are provided in Appendix J.

8.5 Community and Stakeholder Liaison

In addition to contacting the Community Representatives of the CCC, the local community is provided with an opportunity to comment on Dixon Sand's environmental performance through direct contact with quarry staff or through the contact portal via the company's website.

Stakeholder Liaison and Correspondences

Dixon Sand staff made contact with local community members on a number of occasions. These include:

- Liaising with the neighbouring property owner to the Old Northern Road quarry regarding general maintenance,

- Notifying the Maroota Public School regarding noise monitoring undertaken in December 2021 and June 2022, and
- Bi-annual CCC meetings in November 2021 and May 2022

Local Initiatives

Dixon Sand regularly makes contributions to a number of community initiatives such as:

- monetary contribution to the Maroota Public School,
- monetary contribution to the Cattai Public School,
- monetary contribution to the Royal Flying Doctor Service, and
- publication of environmental monitoring data, and provision of all current consents and site management plans for public viewing on the Dixon Sand website.

Dixon Sand typically donates time and machine resources to the annual Maroota Muster however, the event did not take place during the 2021 – 2022 reporting period due to COVID-19 restrictions.

8.6 Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) can be defined as “using, conserving and enhancing the community’s resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased” (Commonwealth of Australia, 1992).

The four principles of ESD are listed in Schedule 2 of the *Environmental Planning and Assessment Regulation* 2000 as follows:

- the precautionary principle;
- inter-generational equity;
- conservation of biological diversity and ecological integrity; and
- Improved valuation, pricing and incentive mechanisms.

Dixon Sand’s Old Northern Road Quarry continue to manage all potential threats to the quality of the environment, determined with a reasonable degree of certainty through the use of scientific investigation and analysis of the individual and cumulative environmental impacts of the proposal.

Long-term environmental fluctuations have been, and will continue to be, monitored for the duration of extraction such as groundwater levels and quality, noise, air quality and threatened flora and fauna.

Threatened flora and fauna present on site is monitored annually to ensure they are not impacted by quarry activities. Similarly, noise and air quality monitoring will continue throughout the life of the developments. Mitigation measures are in place to minimise the potential adverse impacts likely to affect social and intergenerational equity. These measures relate to erosion and sediment control, surface and groundwater management, air quality control, and noise and waste management. Continual community relation strategies will ensure the community is well informed and has an effective means of voicing concerns and receiving feedback.

Dixon Sand aims to protect the biological diversity and ecological integrity of the sites through;

- progressive rehabilitation of the extracted areas using agricultural and native species;
- monitoring and maintenance of buffer areas to ecologically sensitive sites;

- establishment of native vegetation offset areas, biodiversity offset area and native rehabilitation areas to maximise native fauna habitats and enhance vegetation corridor for flora and fauna migration, and
- providing a final landform that integrates elements of the local area.

The value placed on environmental resources by Dixon Sand is represented as costs associated with the implementation of monitoring and mitigation measures throughout the life of the development consents.

8.7 Changes to Social Monitoring Procedures

No changes are proposed for the social management procedures.

9. Bushfire Management

9.1 Compliance

DA250-09-01 requires Dixon Sand to ensure that the Quarry is suitably equipped to respond to any fires on site. The Quarry is to assist the Rural Fire Service and emergency services to the extent practicable if there is a fire in the vicinity of the site.

A Bushfire Management Plan has been prepared for the Quarry.

An annual meeting between Dixon Sand and the representative of the Rural Fire Service was conducted in August 2021 on the quarry premise to:

- review the Bushfire Management Plans,
- review risk assessment and procedures in the event of a bushfire,
- discuss key dates for the 2021-2022 bushfire season and any specific season predictions,
- discuss any planned hazard reduction burns in the area including locations, size and dates,
- discuss any changes to quarry operations which may affect bushfire risks, and
- discuss the locations of static water supplies including waters storage ponds and standpipe

The outcome of the meeting was communicated to Dixon Staff in the form of a toolbox talk.

10. Competency, Training and Awareness

The quarry management team is responsible for ensuring all personnel, including contractors, are provided with appropriate environmental training and awareness to ensure they understand their environmental awareness, responsibilities and how to mitigate the impacts. Training is undertaken using the following avenues:

- Compulsory site environmental induction for employees and contractors,
- Truck driver induction training,
- Pollution Incident Response Management Plan (PIRMP) and mock scenario training,
- Two-stage pre-clearing procedures and fauna handling and rescue procedures training,
- Permit to discharge protocols,

- Environmental hazard identification workshop,
- Regular toolbox talks, and
- Bushfire Management and Emergency evacuation training.

11. Incidents and Non-Compliances

11.1 Environmental Incidents and Non-Compliances

Details of non-compliance are listed in Table 36 below. There were no environmental incidents during this period

Table 36: Non-compliances and Incidents

Event No.	Date of Incident / Non-compliance	Applicable Condition(s)	Details, Cause and Mitigation of Incident
1	Submission of 2021-2022 Annual Review	Condition 12 of Schedule 5 of DA 250-09-01	Dixon Sand is required to submit the Annual Review for the Quarry by the end of March each year. The submission of this Annual Review at the end of September is technically non-compliant with the deadline required by the consent condition. However, Dixon Sand requested approval from the DPE for the submission deadline of the Annual Review to be adjusted to reflect the financial year reporting. Approval was granted by the DPE on 9 February 2018 to submit the Annual Review by the end of September each year.

11.2 Section 191 Improvement Notice

Dixon Sand received a number of notices under the *Work Health and Safety Act* 2011 from NSW Resources Regulator as detailed in Table 37 below.

Table 37: Notices issued by Resources Regulator

Date Issued	Notice Reference	Identified Issues	Action
23 Nov 2021	NTCE0009343 – Section 23 Notice of Concerns	1. Risk assessment covering entanglement didn't cover all plant at the quarry. 2. Not all controls were listed in the Mechanical Engineering Control Plan	1. Entanglement risk assessment to be reviewed to address all potential entanglement scenarios and hazards. 2. ME Control plan to be updated following on from the above risk assessment.
20 May 2022	NTCE0010280 – Section 23 Notice of Concern	1. Training system doesn't have records to verify if contractors operating mobile plant are competent to do so.	1. Confirmed with onsite contractors their competencies to operate plant. 2. Competencies are requested of contractors during the procurement phase.
27 May 2022	NTCE0010313 – Section 191 Improvement Notice	1. PHMP for ground and strata failure not available including a risk assessment. 2. Prepare a current mine plan in accordance with clause	1. PHMP for ground and strata provided to regulator. 2. Water management plan provided to regulator

Date Issued	Notice Reference	Identified Issues	Action
		124 of the WHSMP Reg 2014	
30 May 2022	NTCE0010314 – Section 23 Notice of Concerns	1. Inspection arrangements not documented 2. No dedicated hazard reporting system 3. Documentation to support design, construction and maintenance of waste dumps & large stockpiles 4. Unsafe access areas were not signposted restricting entry.	Development of SOP's is ongoing for these items.
30 May 2022	NTCE0010330 – Section 191 Improvement Notice	1. Failure to notify the regulator of a high potential incident	1. Incident notified to regulator in portal 2. Wall has been repaired

12. Independent Environmental Audit

12.1 Independent Environmental Audit Requirements

Condition 14 of Schedule 5 of DA 250-09-01 requires:

> *Within 12 weeks of commencing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of these recommendations as required. The Applicant must implement these recommendations, to the satisfaction of the Secretary.*

The appointment of R.W. Corkery and Co Pty Ltd (RWC) to carry out the Independent Environmental Audit (IEA) for Old Northern Road Quarry was approved by the Department of Planning, Industry and Environment (DPIE) on 11th July 2019.

The IEA commenced on 22 October 2019 and the *Independent Environmental Audit: Old Northern Road Report* (RW Corkery & Co, January 2020, Document No. 1021/01) issued on 10th January 2020.

The *Response and Action Plan for the Independent Environmental Audit 2019, Old Northern Road Quarry* document was prepared to provide Dixon Sand's response and proposed actions addressing the IEA findings, recommendations for non-compliances and suggested improvements as identified in *the Independent Environmental Audit: Old Northern Road Report* (RW Corkery & Co, January 2020, Document No. 1021/01). This document has been prepared in accordance with the *Independent Audit – Post Approval Requirements June 2018* (Department of Planning and Environment, 2018).

The IEA report and Response and Action Plan report were submitted to the DPIE on 13th January 2020. The CCC members and other Agencies were provided a link to the reports published on Dixon Sand's website.

All proposed actions from the IEA 2019 have been implemented and closed out except for one item as is listed in Table 37 below. The matter of application to enact the Positive Public Covenant for the Haerses Road Biodiversity Offset Area is still on-going and terms of agreement still in negotiation between Dixon Sand and the DPE.

Dixon Sand recently sought endorsement from the DPE to engage RW Corkery & Co to undertake the 2022 IEA. The outcome of the 2022 IEA will be reported in the next 2022 – 2023 Annual Review.

Table 38: Outstanding Proposed Action, Implementation Timeframe and Status for the Recommendations arising from IEA Non-Compliances.

ID	IEA Comments and Recommended Action	Proposed Action and Implementation Timeframe by Dixon Sand
ONR R2/19	Ensure that the Positive Public Covenant or other agreed method for providing long-term security of the Haerses Road Biodiversity Offset Area is implemented. *DA 250-09-01 Schedule 3 Condition 25(c) requires that a long-term security is provided for the Haerses Road Biodiversity Offset Area. Whilst proposed terms for a Public Positive Covenant have now been submitted, confirmation of these terms is awaited from DPIE. It is important that the Company remains proactive in following up and implementing the required security.*	**Proposed Action:** Confirmation awaiting from DPIE regarding the conditional terms for the Positive Public Covenant. Once finalised, an application to enact the Positive Public Covenant for the Haerses Road Biodiversity Offset Area will be submitted. **Implementation Timeframe:** Application to enact the Positive Public Covenant for Haerses Road Biodiversity Offset Area will be processed once Dixon Sand receives confirmation from the DPIE regarding the condition terms. **Status:** Open - matter in liaison with the DPE

13. Proposed Actions to be completed in the next Reporting Period

13.1 Vegetation Clearing and Extraction

Vegetation clearing will be undertaken in accordance with the Pre-clearing procedures.

13.2 Rehabilitation and Bush Regeneration

Old Northern Road NVC Rehabilitation Area

- Planting of the remaining *Melaleuca deanei* and local species when condition is suitable,
- Continue with routine weed control and monitoring of regenerating native species.

Old Northern Road Lots 1 and 2

- Continue with management of *Lantana camera* and review techniques recommended in the Ecological Monitoring Report (South East Environmental, 2022)

Old Northern Road other areas

- Continue with routine weed management along the southern boundary of Cons Hill (Lot 196) and carry out direct seeding or supplementary planting where suitable, and
- Continue with rehabilitation works along the western embankment at the Quarry entrance gate. Carry out direct seeding or supplementary planting where suitable.

Haerses Road Biodiversity Offset Area

- Continue with management of invasive grass and annual species along the North-western border of the HRBOA

14. Conclusion

A number of recommendations and change in environmental procedures have been proposed throughout this Annual Review of 2021 – 2022 reporting period.

In general, Dixon Sand has maintained acceptable environmental performance outcomes throughout the reporting period. The company has committed to ongoing endeavours to minimise environmental impacts and potential exceedances related to quarry operations.

Appendix A – Dust Deposition Reports

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 11322

Date Issued: 13/08/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 9/08/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	01/06/2021 11:47	09/08/2021 10:54	11322/1	Dust	Extended sampling period for all gauges due to Covid 19 restrictions
D10 Hearses Rd	01/06/2021 11:24	09/08/2021 11:29	11322/2	Dust	
D06 School	01/06/2021 10:37	09/08/2021 10:47	11322/3	Dust	
D05 Bund	01/06/2021 10:49	09/08/2021 10:36	11322/4	Dust	
D04 Rehab	01/06/2021 11:13	09/08/2021 10:05	11322/5	Dust	
D07 Mullock	01/06/2021 11:23	09/08/2021 10:16	11322/6	Dust	
D01(A) Front Gate	01/06/2021 10:57	09/08/2021 09:55	11322/7	Dust	
D11 Goldstien	01/06/2021 16:28	09/08/2021 13:43	11322/8	Dust	
D12 Ram	01/06/2021 11:39	09/08/2021 11;21	11322/9	Dust	

The sample(s) have been tested as received and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 13/08/2021.

Test Report Number: 11322

Date Issued: 13/08/2021 Revision No: 00

Results

Ambient Air	Method	Units	11322/1 D08&9 Hitchcock Rd Olive Grove 9/08/2021	11322/2 D10 Hearses Rd 9/08/2021	11322/3 D06 School 9/08/2021	11322/4 D05 Bund 9/08/2021	11322/5 D04 Rehab 9/08/2021
Number of Days	AS 3580.10.1	days	**69**	**69**	**69**	**69**	**69**
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	0.4	0.9	0.7	0.6
Ash	AS 3580.10.1	g/m2/mth	0.3	0.2	0.3	0.6	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.2	0.6	0.1	0.2
Calculated Rain	AS 3580.10.1	mm	73	68	73	76	29

Ambient Air	Method	Units	11322/6 D07 Mullock 9/08/2021	11322/7 D01(A) Front Gate 9/08/2021	11322/8 D11 Goldstien 9/08/2021	11322/9 D12 Ram 9/08/2021
Number of Days	AS 3580.10.1	days	**69**	**69**	**69**	**69**
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	2.7	0.3	0.3
Ash	AS 3580.10.1	g/m2/mth	0.2	2.4	<0.1	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.3	0.3	0.2
Calculated Rain	AS 3580.10.1	mm	69	71	69	71

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Extended sampling period for all gauges due to Covid 19 restrictions prohibiting access.

Sampling Report Number: 11322

Date Issued: 13/08/2021 Revision No: 00

Sampling Conditions: Cloudy 12-19°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11322/1	D08&9 Hitchcock Rd Olive Grove		D.Walker	09/08/2021 10:54	AS3580.10.1	CuSO4
11322/2	D10 Hearses Rd		D.Walker	09/08/2021 11:29	AS3580.10.1	CuSO4
11322/3	D06 School		D.Walker	09/08/2021 10:47	AS3580.10.1	CuSO4
11322/4	D05 Bund		D.Walker	09/08/2021 10:36	AS3580.10.1	CuSO4
11322/5	D04 Rehab		D.Walker	09/08/2021 10:05	AS3580.10.1	CuSO4
11322/6	D07 Mullock		D.Walker	09/08/2021 10:16	AS3580.10.1	CuSO4
11322/7	D01(A) Front Gate		D.Walker	09/08/2021 09:55	AS3580.10.1	CuSO4
11322/8	D11 Goldstien		D.Walker	09/08/2021 13:43	AS3580.10.1	CuSO4
11322/9	D12 Ram		D.Walker	09/08/2021 11;21	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11322/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
11322/2	D10 Hearses Rd	312538	6294576	Pellet in funnel, minor algae.
11322/3	D06 School	313518	6296537	Minor vegetation and algae.
11322/4	D05 Bund	313160	6296838	Minor vegetation.
11322/5	D04 Rehab	312385	6296932	Minor vegetation.
11322/6	D07 Mullock	312579	6296676	
11322/7	D01(A) Front Gate	313290	6297176	Minor dust.
11322/8	D11 Goldstien	312034	6294213	Minor insects
11322/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 13/08/2021.
Where method is "unknown" sampling procedures are not endorsed

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NATA Accreditation 20375
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P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 11357

Date Issued: 31/08/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 24/08/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	09/08/2021 10:54	24/08/2021 10:15	11357/1	Dust	
D10 Hearses Rd	09/08/2021 10:54	24/08/2021 11:02	11357/2	Dust	
D06 School	09/08/2021 10:54	24/08/2021 09:17	11357/3	Dust	
D05 Bund	09/08/2021 10:54	24/08/2021 09:39	11357/4	Dust	
D04 Rehab	09/08/2021 10:54	24/08/2021 09:56	11357/5	Dust	
D07 Mullock	09/08/2021 10:54	24/08/2021 10:05	11357/6	Dust	
D01(A) Front Gate	09/08/2021 10:54	24/08/2021 09:48	11357/7	Dust	
D11 Goldstien	09/08/2021 10:54	24/08/2021 10:48	11357/8	Dust	
D12 Ram	09/08/2021 10:54	24/08/2021 10:32	11357/9	Dust	

The sample(s) have been tested as received and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 31/08/2021.

Test Report Number: 11357

Date Issued: 31/08/2021 Revision No: 00

Results

Ambient Air	Method	Units	11357/1 D08&9 Hitchcock Rd Olive Grove 24/08/2021	11357/2 D10 Hearses Rd 24/08/2021	11357/3 D06 School 24/08/2021	11357/4 D05 Bund 24/08/2021	11357/5 D04 Rehab 24/08/2021
Number of Days	AS 3580.10.1	days	**15**	**15**	**15**	**15**	**15**
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.1	**8.8**	1.1	1.0	0.5
Ash	AS 3580.10.1	g/m2/mth	0.9	2.7	0.9	0.9	0.5
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	6.1	0.2	0.1	<0.1
Calculated Rain	AS 3580.10.1	mm	38	42	36	39	36

Ambient Air	Method	Units	11357/6 D07 Mullock 24/08/2021	11357/7 D01(A) Front Gate 24/08/2021	11357/8 D11 Goldstien 24/08/2021	11357/9 D12 Ram 24/08/2021
Number of Days	AS 3580.10.1	days	**15**	**15**	**15**	**15**
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.2	2.7	1.5	0.8
Ash	AS 3580.10.1	g/m2/mth	0.3	2.4	0.9	0.5
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	0.3	0.6	0.3
Calculated Rain	AS 3580.10.1	mm	37	40	42	42

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Short sample period to normalise schedule after Covid lockdown.

Sampling Report Number: 11357

Date Issued: 31/08/2021 Revision No: 00

Sampling Conditions: Raining 8°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11357/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	24/08/2021 10:15	AS3580.10.1	CuSO4
11357/2	D10 Hearses Rd		T.Walker	24/08/2021 11:02	AS3580.10.1	CuSO4
11357/3	D06 School		T.Walker	24/08/2021 09:17	AS3580.10.1	CuSO4
11357/4	D05 Bund		T.Walker	24/08/2021 09:39	AS3580.10.1	CuSO4
11357/5	D04 Rehab		T.Walker	24/08/2021 09:56	AS3580.10.1	CuSO4
11357/6	D07 Mullock		T.Walker	24/08/2021 10:05	AS3580.10.1	CuSO4
11357/7	D01(A) Front Gate		T.Walker	24/08/2021 09:48	AS3580.10.1	CuSO4
11357/8	D11 Goldstien		T.Walker	24/08/2021 10:48	AS3580.10.1	CuSO4
11357/9	D12 Ram		T.Walker	24/08/2021 10:32	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11357/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
11357/2	D10 Hearses Rd	312538	6294576	Vegetation
11357/3	D06 School	313518	6296537	Minor vegetation
11357/4	D05 Bund	313160	6296838	
11357/5	D04 Rehab	312385	6296932	
11357/6	D07 Mullock	312579	6296676	
11357/7	D01(A) Front Gate	313290	6297176	Minor sand
11357/8	D11 Goldstien	312034	6294213	
11357/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 31/08/2021.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 11502

Date Issued: 29/09/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 21/09/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	24/08/2021 10:15	21/09/2021 11:12	11502/1	Dust	
D10 Hearses Rd	24/08/2021 11:02	21/09/2021 11:44	11502/2	Dust	
D06 School	24/08/2021 09:17	21/09/2021 10:08	11502/3	Dust	
D05 Bund	24/08/2021 09:39	21/09/2021 10:21	11502/4	Dust	
D04 Rehab	24/08/2021 09:56	21/09/2021 10:50	11502/5	Dust	
D07 Mullock	24/08/2021 10:05	21/09/2021 11:01	11502/6	Dust	
D01(A) Front Gate	24/08/2021 09:48	21/09/2021 10:34	11502/7	Dust	
D11 Goldstien	24/08/2021 10:48	21/09/2021 14:24	11502/8	Dust	
D12 Ram	24/08/2021 10:32	21/09/2021 11:33	11502/9	Dust	

The sample(s) have been tested as received and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 29/09/2021.

Test Report Number: 11502

Date Issued: 29/09/2021 Revision No: 00

Results

Ambient Air	Method	Units	11502/1 D08&9 Hitchcock Rd Olive Grove 21/09/2021	11502/2 D10 Hearses Rd 21/09/2021	11502/3 D06 School 21/09/2021	11502/4 D05 Bund 21/09/2021	11502/5 D04 Rehab 21/09/2021
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.8	**4.5**	1.1	1.0	0.5
Ash	AS 3580.10.1	g/m2/mth	0.4	0.7	0.5	0.9	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.4	3.8	0.6	0.1	0.2
Calculated Rain	AS 3580.10.1	mm	38	34	40	38	36

Ambient Air	Method	Units	11502/6 D07 Mullock 21/09/2021	11502/7 D01(A) Front Gate 21/09/2021	11502/8 D11 Goldstien 21/09/2021	11502/9 D12 Ram 21/09/2021
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	2.6	0.4	0.1
Ash	AS 3580.10.1	g/m2/mth	0.3	2.1	0.1	<0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.5	0.3	0.1
Calculated Rain	AS 3580.10.1	mm	36	40	34	36

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 11502

Date Issued: 29/09/2021 Revision No: 00

Sampling Conditions: Cloudy 12°-15°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11502/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	21/09/2021 11:12	AS3580.10.1	CuSO4
11502/2	D10 Hearses Rd		T & D.Walker	21/09/2021 11:44	AS3580.10.1	CuSO4
11502/3	D06 School		T & D.Walker	21/09/2021 10:08	AS3580.10.1	CuSO4
11502/4	D05 Bund		T & D.Walker	21/09/2021 10:21	AS3580.10.1	CuSO4
11502/5	D04 Rehab		T & D.Walker	21/09/2021 10:50	AS3580.10.1	CuSO4
11502/6	D07 Mullock		T & D.Walker	21/09/2021 11:01	AS3580.10.1	CuSO4
11502/7	D01(A) Front Gate		T & D.Walker	21/09/2021 10:34	AS3580.10.1	CuSO4
11502/8	D11 Goldstien		T & D.Walker	21/09/2021 14:24	AS3580.10.1	CuSO4
11502/9	D12 Ram		T & D.Walker	21/09/2021 11:33	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11502/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
11502/2	D10 Hearses Rd	312538	6294576	Insects, minor algae, slashing
11502/3	D06 School	313518	6296537	Minor vegetation, recent slashing
11502/4	D05 Bund	313160	6296838	Insects, minor vegetation, slashing, tilling
11502/5	D04 Rehab	312385	6296932	Minor vegetation
11502/6	D07 Mullock	312579	6296676	
11502/7	D01(A) Front Gate	313290	6297176	Minor sand and algae
11502/8	D11 Goldstien	312034	6294213	
11502/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 29/09/2021.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 11586

Date Issued: 27/10/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 19/10/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	21/09/2021 11:12	19/10/2021 11:01	11586/1	Dust	
D10 Hearses Rd	21/09/2021 11:44	19/10/2021 11:33	11586/2	Dust	
D06 School	21/09/2021 10:08	19/10/2021 10:09	11586/3	Dust	
D05 Bund	21/09/2021 10:21	19/10/2021 10:21	11586/4	Dust	
D04 Rehab	21/09/2021 10:50	19/10/2021 10:42	11586/5	Dust	
D07 Mullock	21/09/2021 11:01	19/10/2021 10:51	11586/6	Dust	
D01(A) Front Gate	21/09/2021 10:34	19/10/2021 10:29	11586/7	Dust	
D11 Goldstien	21/09/2021 14:24	19/10/2021 13:31	11586/8	Dust	
D12 Ram	21/09/2021 11:33	19/10/2021 11:23	11586/9	Dust	

The sample(s) have been tested as received and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 27/10/2021.

Test Report Number: 11586

Date Issued: 27/10/2021 Revision No: 00

Results

Ambient Air	Method	Units	11586/1 D08&9 Hitchcock Rd Olive Grove 19/10/2021	11586/2 D10 Hearses Rd 19/10/2021	11586/3 D06 School 19/10/2021	11586/4 D05 Bund 19/10/2021	11586/5 D04 Rehab 19/10/2021
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.8	**7.0**	1.0	1.5	3.7
Ash	AS 3580.10.1	g/m2/mth	0.5	2.4	0.6	1.0	1.9
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	4.6	0.4	0.5	1.8
Calculated Rain	AS 3580.10.1	mm	56	53	61	60	51

Ambient Air	Method	Units	11586/6 D07 Mullock 19/10/2021	11586/7 D01(A) Front Gate 19/10/2021	11586/8 D11 Goldstien 19/10/2021	11586/9 D12 Ram 19/10/2021
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	2.1	1.2	0.4
Ash	AS 3580.10.1	g/m2/mth	0.5	1.8	0.5	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.3	0.7	0.1
Calculated Rain	AS 3580.10.1	mm	52	63	54	52

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 11586

Date Issued: 27/10/2021 Revision No: 00

Sampling Conditions: 23°-27°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11586/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	19/10/2021 11:01	AS3580.10.1	CuSO4
11586/2	D10 Hearses Rd		T & D.Walker	19/10/2021 11:33	AS3580.10.1	CuSO4
11586/3	D06 School		T & D.Walker	19/10/2021 10:09	AS3580.10.1	CuSO4
11586/4	D05 Bund		T & D.Walker	19/10/2021 10:21	AS3580.10.1	CuSO4
11586/5	D04 Rehab		T & D.Walker	19/10/2021 10:42	AS3580.10.1	CuSO4
11586/6	D07 Mullock		T & D.Walker	19/10/2021 10:51	AS3580.10.1	CuSO4
11586/7	D01(A) Front Gate		T & D.Walker	19/10/2021 10:29	AS3580.10.1	CuSO4
11586/8	D11 Goldstien		T & D.Walker	19/10/2021 13:31	AS3580.10.1	CuSO4
11586/9	D12 Ram		T & D.Walker	19/10/2021 11:23	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11586/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor insects
11586/2	D10 Hearses Rd	312538	6294576	Vegetation, insects - slashing
11586/3	D06 School	313518	6296537	
11586/4	D05 Bund	313160	6296838	Minor insects
11586/5	D04 Rehab	312385	6296932	Insects, algae
11586/6	D07 Mullock	312579	6296676	
11586/7	D01(A) Front Gate	313290	6297176	Minor sand
11586/8	D11 Goldstien	312034	6294213	Minor insects
11586/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 27/10/2021.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 11703

Date Issued: 23/11/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 16/11/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	19/10/2021 11:01	16/11/2021 10:12	11703/1	Dust	
D10 Hearses Rd	19/10/2021 11:33	16/11/2021 10:46	11703/2	Dust	
D06 School	19/10/2021 10:09	16/11/2021 09:12	11703/3	Dust	
D05 Bund	19/10/2021 10:21	16/11/2021 09:24	11703/4	Dust	
D04 Rehab	19/10/2021 10:42	16/11/2021 09:46	11703/5	Dust	
D07 Mullock	19/10/2021 10:51	16/11/2021 09:58	11703/6	Dust	
D01(A) Front Gate	19/10/2021 10:29	16/11/2021 09:32	11703/7	Dust	
D11 Goldstien	19/10/2021 13:31	16/11/2021 12:26	11703/8	Dust	
D12 Ram	19/10/2021 11:23	16/11/2021 10:38	11703/9	Dust	

The sample(s) have been tested as received and the following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 23/11/2021.

Test Report Number: 11703

Date Issued: 23/11/2021 Revision No: 00

Results

Ambient Air	Method	Units	11703/1 D08&9 Hitchcock Rd Olive Grove 16/11/2021	11703/2 D10 Hearses Rd 16/11/2021	11703/3 D06 School 16/11/2021	11703/4 D05 Bund 16/11/2021	11703/5 D04 Rehab 16/11/2021
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.7	2.0	1.0	1.1	1.2
Ash	AS 3580.10.1	g/m2/mth	1.0	1.1	0.7	1.0	0.8
Combustible Matter	AS 3580.10.1	g/m2/mth	0.7	0.9	0.3	0.1	0.4
Calculated Rain	AS 3580.10.1	mm	103	102	102	115	116

Ambient Air	Method	Units	11703/6 D07 Mullock 16/11/2021	11703/7 D01(A) Front Gate 16/11/2021	11703/8 D11 Goldstien 16/11/2021	11703/9 D12 Ram 16/11/2021
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	**6.6**	2.3	1.9	0.2
Ash	AS 3580.10.1	g/m2/mth	5.9	2.0	1.2	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.7	0.3	0.7	<0.1
Calculated Rain	AS 3580.10.1	mm	115	109	110	112

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 11703

Date Issued: 23/11/2021 Revision No: 00

Sampling Conditions: Cloudy 18°-22°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11703/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	16/11/2021 10:12	AS3580.10.1	CuSO4
11703/2	D10 Hearses Rd		T & D.Walker	16/11/2021 10:46	AS3580.10.1	CuSO4
11703/3	D06 School		T & D.Walker	16/11/2021 09:12	AS3580.10.1	CuSO4
11703/4	D05 Bund		T & D.Walker	16/11/2021 09:24	AS3580.10.1	CuSO4
11703/5	D04 Rehab		T & D.Walker	16/11/2021 09:46	AS3580.10.1	CuSO4
11703/6	D07 Mullock		T & D.Walker	16/11/2021 09:58	AS3580.10.1	CuSO4
11703/7	D01(A) Front Gate		T & D.Walker	16/11/2021 09:32	AS3580.10.1	CuSO4
11703/8	D11 Goldstien		T & D.Walker	16/11/2021 12:26	AS3580.10.1	CuSO4
11703/9	D12 Ram		T & D.Walker	16/11/2021 10:38	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11703/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor insects
11703/2	D10 Hearses Rd	312538	6294576	Minor insects, algae
11703/3	D06 School	313518	6296537	Minor insects
11703/4	D05 Bund	313160	6296838	Minor insects, vegetationm
11703/5	D04 Rehab	312385	6296932	
11703/6	D07 Mullock	312579	6296676	Minor sand
11703/7	D01(A) Front Gate	313290	6297176	
11703/8	D11 Goldstien	312034	6294213	Insetcs, algae, bird droppings in funnel
11703/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 23/11/2021.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 11993

Date Issued: 22/12/2021 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 14/12/2021

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	16/11/2021 10:12	14/12/2021 11:06	11993/1	Dust	
D10 Hearses Rd	16/11/2021 10:46	14/12/2021 11:39	11993/2	Dust	
D06 School	16/11/2021 09:12	14/12/2021 10:59	11993/3	Dust	
D05 Bund	16/11/2021 09:24	14/12/2021 10:45	11993/4	Dust	
D04 Rehab	16/11/2021 09:46	14/12/2021 10:14	11993/5	Dust	
D07 Mullock	16/11/2021 09:58	14/12/2021 10:28	11993/6	Dust	
D01(A) Front Gate	16/11/2021 09:32	14/12/2021 09:58	11993/7	Dust	
D11 Goldstien	16/11/2021 12:26	14/12/2021 11:55	11993/8	Dust	
D12 Ram	16/11/2021 10:38	14/12/2021 11:24	11993/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 22/12/2021.

Test Report Number: 11993

Date Issued: 22/12/2021 Revision No: 00

Results

Deposited Matter	Method	Units	11993/1 D08&9 Hitchcock Rd Olive Grove 14/12/2021	11993/2 D10 Hearses Rd 14/12/2021	11993/3 D06 School 14/12/2021	11993/4 D05 Bund 14/12/2021	11993/5 D04 Rehab 14/12/2021
Date Tested	--	--	20/12/2021	20/12/2021	20/12/2021	20/12/2021	20/12/2021
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	0.2	0.4	1.1	0.4
Ash	AS 3580.10.1	g/m2/mth	0.4	0.1	0.2	0.6	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.1	0.2	0.5	0.1
Calculated Rain	AS 3580.10.1	mm	169	166	188	186	169

Deposited Matter	Method	Units	11993/6 D07 Mullock 14/12/2021	11993/7 D01(A) Front Gate 14/12/2021	11993/8 D11 Goldstien 14/12/2021	11993/9 D12 Ram 14/12/2021
Date Tested	--	--	20/12/2021	20/12/2021	20/12/2021	20/12/2021
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	1.5	0.3	0.1
Ash	AS 3580.10.1	g/m2/mth	0.4	1.5	0.2	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	<0.1	0.1	<0.1
Calculated Rain	AS 3580.10.1	mm	176	115	168	180

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 11993

Date Issued: 22/12/2021 Revision No: 00

Sampling Conditions: Cloudy 22-27°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11993/1	D08&9 Hitchcock Rd Olive Grove		T.Walker	14/12/2021 11:06	AS3580.10.1	CuSO4
11993/2	D10 Hearses Rd		T.Walker	14/12/2021 11:39	AS3580.10.1	CuSO4
11993/3	D06 School		T.Walker	14/12/2021 10:59	AS3580.10.1	CuSO4
11993/4	D05 Bund		T.Walker	14/12/2021 10:45	AS3580.10.1	CuSO4
11993/5	D04 Rehab		T.Walker	14/12/2021 10:14	AS3580.10.1	CuSO4
11993/6	D07 Mullock		T.Walker	14/12/2021 10:28	AS3580.10.1	CuSO4
11993/7	D01(A) Front Gate		T.Walker	14/12/2021 09:58	AS3580.10.1	CuSO4
11993/8	D11 Goldstien		T.Walker	14/12/2021 11:55	AS3580.10.1	CuSO4
11993/9	D12 Ram		T.Walker	14/12/2021 11:24	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
11993/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
11993/2	D10 Hearses Rd	312538	6294576	
11993/3	D06 School	313518	6296537	
11993/4	D05 Bund	313160	6296838	Insects, algae
11993/5	D04 Rehab	312385	6296932	
11993/6	D07 Mullock	312579	6296676	
11993/7	D01(A) Front Gate	313290	6297176	
11993/8	D11 Goldstien	312034	6294213	
11993/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 22/12/2021.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12091

Date Issued: 19/01/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 11/01/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	14/12/2021 11:06	11/01/2022 11:13	12091/1	Dust	
D10 Hearses Rd	14/12/2021 11:39	11/01/2022 11:55	12091/2	Dust	
D06 School	14/12/2021 10:59	11/01/2022 11:05	12091/3	Dust	
D05 Bund	14/12/2021 10:45	11/01/2022 10:50	12091/4	Dust	
D04 Rehab	14/12/2021 10:14	11/01/2022 10:21	12091/5	Dust	
D07 Mullock	14/12/2021 10:28	11/01/2022 10:35	12091/6	Dust	
D01(A) Front Gate	14/12/2021 09:58	11/01/2022 10:07	12091/7	Dust	
D11 Goldstien	14/12/2021 11:55	11/01/2022 14:10	12091/8	Dust	
D12 Ram	14/12/2021 11:24	11/01/2022 11:41	12091/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 19/01/2022.

Test Report Number: 12091

Date Issued: 19/01/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12091/1 D08&9 Hitchcock Rd Olive Grove 11/01/2022	12091/2 D10 Hearses Rd 11/01/2022	12091/3 D06 School 11/01/2022	12091/4 D05 Bund 11/01/2022	12091/5 D04 Rehab 11/01/2022
Date Tested	--	--	17/01/2022	17/01/2022	17/01/2022	17/01/2022	17/01/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.2	0.4	3.8	2.1	0.8
Ash	AS 3580.10.1	g/m2/mth	0.6	0.2	1.5	1.0	0.5
Combustible Matter	AS 3580.10.1	g/m2/mth	0.6	0.2	2.3	1.1	0.3
Calculated Rain	AS 3580.10.1	mm	104	107	99	94	90

Deposited Matter	Method	Units	12091/6 D07 Mullock 11/01/2022	12091/7 D01(A) Front Gate 11/01/2022	12091/8 D11 Goldstien 11/01/2022	12091/9 D12 Ram 11/01/2022
Date Tested	--	--	17/01/2022	17/01/2022	17/01/2022	17/01/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	1.8	2.2	0.5
Ash	AS 3580.10.1	g/m2/mth	0.5	1.4	0.6	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.4	1.6	0.3
Calculated Rain	AS 3580.10.1	mm	96	96	108	107

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12091

Date Issued: 19/01/2022 Revision No: 00

Sampling Conditions: Cloudy 24°-27°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12091/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	11/01/2022 11:13	AS3580.10.1	CuSO4
12091/2	D10 Hearses Rd		T & D.Walker	11/01/2022 11:55	AS3580.10.1	CuSO4
12091/3	D06 School		T & D.Walker	11/01/2022 11:05	AS3580.10.1	CuSO4
12091/4	D05 Bund		T & D.Walker	11/01/2022 10:50	AS3580.10.1	CuSO4
12091/5	D04 Rehab		T & D.Walker	11/01/2022 10:21	AS3580.10.1	CuSO4
12091/6	D07 Mullock		T & D.Walker	11/01/2022 10:35	AS3580.10.1	CuSO4
12091/7	D01(A) Front Gate		T & D.Walker	11/01/2022 10:07	AS3580.10.1	CuSO4
12091/8	D11 Goldstien		T & D.Walker	11/01/2022 14:10	AS3580.10.1	CuSO4
12091/9	D12 Ram		T & D.Walker	11/01/2022 11:41	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12091/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
12091/2	D10 Hearses Rd	312538	6294576	
12091/3	D06 School	313518	6296537	Insects
12091/4	D05 Bund	313160	6296838	Vegetation
12091/5	D04 Rehab	312385	6296932	
12091/6	D07 Mullock	312579	6296676	
12091/7	D01(A) Front Gate	313290	6297176	
12091/8	D11 Goldstien	312034	6294213	Minor vegetation
12091/9	D12 Ram	311750	6294159	Minor insects

Sampling procedures have been approved and report finalised on 19/01/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12230

Date Issued: 11/02/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 8/02/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	11/01/2022 11:13	08/02/2022 11:52	12230/1	Dust	
D10 Hearses Rd	11/01/2022 11:55	08/02/2022 12:08	12230/2	Dust	
D06 School	11/01/2022 11:05	08/02/2022 10:29	12230/3	Dust	
D05 Bund	11/01/2022 10:50	08/02/2022 10:47	12230/4	Dust	
D04 Rehab	11/01/2022 10:21	08/02/2022 11:09	12230/5	Dust	
D07 Mullock	11/01/2022 10:35	08/02/2022 11:21	12230/6	Dust	
D01(A) Front Gate	11/01/2022 10:07	08/02/2022 10:59	12230/7	Dust	
D11 Goldstien	11/01/2022 14:10	08/02/2022 14:16	12230/8	Dust	
D12 Ram	11/01/2022 11:41	08/02/2022 11:44	12230/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 11/02/2022.

Test Report Number: 12230

Date Issued: 11/02/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12230/1 D08&9 Hitchcock Rd Olive Grove 8/02/2022	12230/2 D10 Hearses Rd 8/02/2022	12230/3 D06 School 8/02/2022	12230/4 D05 Bund 8/02/2022	12230/5 D04 Rehab 8/02/2022
Date Tested	--	--	09/02/2022	09/02/2022	09/02/2022	09/02/2022	09/02/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	1.0	1.2	**7.9**	0.5
Ash	AS 3580.10.1	g/m2/mth	0.4	0.7	0.4	5.0	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.3	0.8	2.9	0.1
Calculated Rain	AS 3580.10.1	mm	126	129	139	135	124

Deposited Matter	Method	Units	12230/6 D07 Mullock 8/02/2022	12230/7 D01(A) Front Gate 8/02/2022	12230/8 D11 Goldstien 8/02/2022	12230/9 D12 Ram 8/02/2022
Date Tested	--	--	09/02/2022	09/02/2022	09/02/2022	09/02/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.8	1.8	2.2	0.5
Ash	AS 3580.10.1	g/m2/mth	0.5	1.5	1.0	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.3	1.2	0.3
Calculated Rain	AS 3580.10.1	mm	132	117	129	133

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12230

Date Issued: 11/02/2022 Revision No: 00

Sampling Conditions: Light showers, 23°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12230/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	08/02/2022 11:52	AS3580.10.1	CuSO4
12230/2	D10 Hearses Rd		T & D.Walker	08/02/2022 12:08	AS3580.10.1	CuSO4
12230/3	D06 School		T & D.Walker	08/02/2022 10:29	AS3580.10.1	CuSO4
12230/4	D05 Bund		T & D.Walker	08/02/2022 10:47	AS3580.10.1	CuSO4
12230/5	D04 Rehab		T & D.Walker	08/02/2022 11:09	AS3580.10.1	CuSO4
12230/6	D07 Mullock		T & D.Walker	08/02/2022 11:21	AS3580.10.1	CuSO4
12230/7	D01(A) Front Gate		T & D.Walker	08/02/2022 10:59	AS3580.10.1	CuSO4
12230/8	D11 Goldstien		T & D.Walker	08/02/2022 14:16	AS3580.10.1	CuSO4
12230/9	D12 Ram		T & D.Walker	08/02/2022 11:44	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12230/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Minor isnects
12230/2	D10 Hearses Rd	312538	6294576	Insects
12230/3	D06 School	313518	6296537	Insects
12230/4	D05 Bund	313160	6296838	Insects, vegetation, algae
12230/5	D04 Rehab	312385	6296932	
12230/6	D07 Mullock	312579	6296676	
12230/7	D01(A) Front Gate	313290	6297176	
12230/8	D11 Goldstien	312034	6294213	Minor vegetation
12230/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 11/02/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12408

Date Issued: 18/03/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 9/03/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	08/02/2022 11:52	09/03/2022 12:11	12408/1	Dust	
D10 Hearses Rd	08/02/2022 12:08	09/03/2022 14:55	12408/2	Dust	
D06 School	08/02/2022 10:29	09/03/2022 09:49	12408/3	Dust	
D05 Bund	08/02/2022 10:47	09/03/2022 10:58	12408/4	Dust	
D04 Rehab	08/02/2022 11:09	09/03/2022 11:30	12408/5	Dust	
D07 Mullock	08/02/2022 11:21	09/03/2022 11:42	12408/6	Dust	
D01(A) Front Gate	08/02/2022 10:59	09/03/2022 11:12	12408/7	Dust	
D11 Goldstien	08/02/2022 14:16	09/03/2022 14:25	12408/8	Dust	
D12 Ram	08/02/2022 11:44	09/03/2022 12:02	12408/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 18/03/2022.

Test Report Number: 12408

Date Issued: 18/03/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12408/1 D08&9 Hitchcock Rd Olive Grove 9/03/2022	12408/2 D10 Hearses Rd 9/03/2022	12408/3 D06 School 9/03/2022	12408/4 D05 Bund 9/03/2022	12408/5 D04 Rehab 9/03/2022
Date Tested	--	--	16/03/2022	16/03/2022	16/03/2022	16/03/2022	16/03/2022
Number of Days	AS 3580.10.1	days	29	29	29	29	29
Insoluble Solids	AS 3580.10.1	g/m2/mth	1.0	1.4	1.3	0.8	1.2
Ash	AS 3580.10.1	g/m2/mth	0.4	0.8	0.4	0.5	0.8
Combustible Matter	AS 3580.10.1	g/m2/mth	0.6	0.6	0.9	0.3	0.4
Calculated Rain	AS 3580.10.1	mm	288	288	287	288	288

Deposited Matter	Method	Units	12408/6 D07 Mullock 9/03/2022	12408/7 D01(A) Front Gate 9/03/2022	12408/8 D11 Goldstien 9/03/2022	12408/9 D12 Ram 9/03/2022
Date Tested	--	--	16/03/2022	16/03/2022	16/03/2022	16/03/2022
Number of Days	AS 3580.10.1	days	29	29	29	29
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	1.6	0.8	0.3
Ash	AS 3580.10.1	g/m2/mth	0.3	1.4	0.2	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	0.2	0.6	0.1
Calculated Rain	AS 3580.10.1	mm	288	115	287	287

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12408

Date Issued: 18/03/2022 Revision No: 00

Sampling Conditions: 100% cloudcover. Recent heavy rain, 24°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12408/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	09/03/2022 12:11	AS3580.10.1	CuSO4
12408/2	D10 Hearses Rd		T & D.Walker	09/03/2022 14:55	AS3580.10.1	CuSO4
12408/3	D06 School		T & D.Walker	09/03/2022 09:49	AS3580.10.1	CuSO4
12408/4	D05 Bund		T & D.Walker	09/03/2022 10:58	AS3580.10.1	CuSO4
12408/5	D04 Rehab		T & D.Walker	09/03/2022 11:30	AS3580.10.1	CuSO4
12408/6	D07 Mullock		T & D.Walker	09/03/2022 11:42	AS3580.10.1	CuSO4
12408/7	D01(A) Front Gate		T & D.Walker	09/03/2022 11:12	AS3580.10.1	CuSO4
12408/8	D11 Goldstien		T & D.Walker	09/03/2022 14:25	AS3580.10.1	CuSO4
12408/9	D12 Ram		T & D.Walker	09/03/2022 12:02	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12408/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Full
12408/2	D10 Hearses Rd	312538	6294576	Full. Funnel neck broken, funnel replaced
12408/3	D06 School	313518	6296537	Full, insects
12408/4	D05 Bund	313160	6296838	Full, minor vegetation
12408/5	D04 Rehab	312385	6296932	Full
12408/6	D07 Mullock	312579	6296676	Full
12408/7	D01(A) Front Gate	313290	6297176	Full
12408/8	D11 Goldstien	312034	6294213	Full, minor vegetation
12408/9	D12 Ram	311750	6294159	Full

Sampling procedures have been approved and report finalised on 18/03/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12573

Date Issued: 14/04/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 6/04/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	09/03/2022 12:11	06/04/2022 11:26	12573/1	Dust	
D10 Hearses Rd	09/03/2022 14:55	06/04/2022 11:58	12573/2	Dust	
D06 School	09/03/2022 09:49	06/04/2022 10:28	12573/3	Dust	
D05 Bund	09/03/2022 10:58	06/04/2022 10:44	12573/4	Dust	
D04 Rehab	09/03/2022 11:30	06/04/2022 11:08	12573/5	Dust	
D07 Mullock	09/03/2022 11:42	06/04/2022 11:16	12573/6	Dust	
D01(A) Front Gate	09/03/2022 11:12	06/04/2022 10:56	12573/7	Dust	
D11 Goldstien	09/03/2022 14:25	06/04/2022 14:05	12573/8	Dust	
D12 Ram	09/03/2022 12:02	06/04/2022 11:48	12573/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 14/04/2022.

Test Report Number: 12573

Date Issued: 14/04/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12573/1 D08&9 Hitchcock Rd Olive Grove 6/04/2022	12573/2 D10 Hearses Rd 6/04/2022	12573/3 D06 School 6/04/2022	12573/4 D05 Bund 6/04/2022	12573/5 D04 Rehab 6/04/2022
Date Tested	--	--	12/04/2022	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.3	0.9	3.2	1.0	1.3
Ash	AS 3580.10.1	g/m2/mth	0.2	0.4	0.8	0.5	1.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.5	2.4	0.5	0.1
Calculated Rain	AS 3580.10.1	mm	131	130	120	124	126

Deposited Matter	Method	Units	12573/6 D07 Mullock 6/04/2022	12573/7 D01(A) Front Gate 6/04/2022	12573/8 D11 Goldstien 6/04/2022	12573/9 D12 Ram 6/04/2022
Date Tested	--	--	12/04/2022	12/04/2022	12/04/2022	12/04/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.7	0.5	0.5	0.2
Ash	AS 3580.10.1	g/m2/mth	0.8	0.7	0.1	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	<0.1	0.4	<0.1
Calculated Rain	AS 3580.10.1	mm	123	116	159	169

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12573

Date Issued: 14/04/2022 Revision No: 00

Sampling Conditions: 100% Cloudcover, 18°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12573/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	06/04/2022 11:26	AS3580.10.1	CuSO4
12573/2	D10 Hearses Rd		T & D.Walker	06/04/2022 11:58	AS3580.10.1	CuSO4
12573/3	D06 School		T & D.Walker	06/04/2022 10:28	AS3580.10.1	CuSO4
12573/4	D05 Bund		T & D.Walker	06/04/2022 10:44	AS3580.10.1	CuSO4
12573/5	D04 Rehab		T & D.Walker	06/04/2022 11:08	AS3580.10.1	CuSO4
12573/6	D07 Mullock		T & D.Walker	06/04/2022 11:16	AS3580.10.1	CuSO4
12573/7	D01(A) Front Gate		T & D.Walker	06/04/2022 10:56	AS3580.10.1	CuSO4
12573/8	D11 Goldstien		T & D.Walker	06/04/2022 14:05	AS3580.10.1	CuSO4
12573/9	D12 Ram		T & D.Walker	06/04/2022 11:48	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12573/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	Insects
12573/2	D10 Hearses Rd	312538	6294576	
12573/3	D06 School	313518	6296537	Vegetation
12573/4	D05 Bund	313160	6296838	Insects
12573/5	D04 Rehab	312385	6296932	
12573/6	D07 Mullock	312579	6296676	
12573/7	D01(A) Front Gate	313290	6297176	Full (smaller bottle size)
12573/8	D11 Goldstien	312034	6294213	Minor algae
12573/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 14/04/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12767

Date Issued: 12/05/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 4/05/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	06/04/2022 11:26	04/05/2022 11:31	12767/1	Dust	
D10 Hearses Rd	06/04/2022 11:58	04/05/2022 11:49	12767/2	Dust	
D06 School	06/04/2022 10:28	04/05/2022 10:23	12767/3	Dust	
D05 Bund	06/04/2022 10:44	04/05/2022 10:39	12767/4	Dust	
D04 Rehab	06/04/2022 11:08	04/05/2022 11:07	12767/5	Dust	
D07 Mullock	06/04/2022 11:16	04/05/2022 11:02	12767/6	Dust	
D01(A) Front Gate	06/04/2022 10:56	04/05/2022 10:47	12767/7	Dust	
D11 Goldstien	06/04/2022 14:05	04/05/2022 14:50	12767/8	Dust	
D12 Ram	06/04/2022 11:48	04/05/2022 11:23	12767/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 12/05/2022.

Test Report Number: 12767

Date Issued: 12/05/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12767/1 D08&9 Hitchcock Rd Olive Grove 4/05/2022	12767/2 D10 Hearses Rd 4/05/2022	12767/3 D06 School 4/05/2022	12767/4 D05 Bund 4/05/2022	12767/5 D04 Rehab 4/05/2022
Date Tested	--	--	09/05/2022	09/05/2022	09/05/2022	09/05/2022	09/05/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.2	1.5	0.9	0.6	0.7
Ash	AS 3580.10.1	g/m2/mth	<0.1	0.5	0.3	0.2	0.3
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	1.0	0.6	0.4	0.4
Calculated Rain	AS 3580.10.1	mm	120	127	126	152	133

Deposited Matter	Method	Units	12767/6 D07 Mullock 4/05/2022	12767/7 D01(A) Front Gate 4/05/2022	12767/8 D11 Goldstien 4/05/2022	12767/9 D12 Ram 4/05/2022
Date Tested	--	--	09/05/2022	09/05/2022	09/05/2022	09/05/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.6	2.7	0.6	0.5
Ash	AS 3580.10.1	g/m2/mth	0.3	2.2	0.1	<0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	0.3	0.5	0.5	0.5
Calculated Rain	AS 3580.10.1	mm	135	115	126	131

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12767

Date Issued: 12/05/2022 Revision No: 00

Sampling Conditions: Fine 24°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12767/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	04/05/2022 11:31	AS3580.10.1	CuSO4
12767/2	D10 Hearses Rd		T & D.Walker	04/05/2022 11:49	AS3580.10.1	CuSO4
12767/3	D06 School		T & D.Walker	04/05/2022 10:23	AS3580.10.1	CuSO4
12767/4	D05 Bund		T & D.Walker	04/05/2022 10:39	AS3580.10.1	CuSO4
12767/5	D04 Rehab		T & D.Walker	04/05/2022 11:07	AS3580.10.1	CuSO4
12767/6	D07 Mullock		T & D.Walker	04/05/2022 11:02	AS3580.10.1	CuSO4
12767/7	D01(A) Front Gate		T & D.Walker	04/05/2022 10:47	AS3580.10.1	CuSO4
12767/8	D11 Goldstien		T & D.Walker	04/05/2022 14:50	AS3580.10.1	CuSO4
12767/9	D12 Ram		T & D.Walker	04/05/2022 11:23	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12767/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
12767/2	D10 Hearses Rd	312538	6294576	Minor vegetation
12767/3	D06 School	313518	6296537	Minor vegetation - Paddock slashed
12767/4	D05 Bund	313160	6296838	
12767/5	D04 Rehab	312385	6296932	
12767/6	D07 Mullock	312579	6296676	
12767/7	D01(A) Front Gate	313290	6297176	Full, minor sand
12767/8	D11 Goldstien	312034	6294213	
12767/9	D12 Ram	311750	6294159	Minor vegetation

Sampling procedures have been approved and report finalised on 12/05/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12860

Date Issued: 10/06/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 1/06/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	04/05/2022 11:31	01/06/2022 09:59	12860/1	Dust	
D10 Hearses Rd	04/05/2022 11:49	01/06/2022 10:31	12860/2	Dust	
D06 School	04/05/2022 10:23	01/06/2022 08:43	12860/3	Dust	
D05 Bund	04/05/2022 10:39	01/06/2022 08:58	12860/4	Dust	
D04 Rehab	04/05/2022 11:07	01/06/2022 09:29	12860/5	Dust	
D07 Mullock	04/05/2022 11:02	01/06/2022 09:41	12860/6	Dust	
D01(A) Front Gate	04/05/2022 10:47	01/06/2022 09:14	12860/7	Dust	
D11 Goldstien	04/05/2022 14:50	01/06/2022 10:54	12860/8	Dust	
D12 Ram	04/05/2022 11:23	01/06/2022 10:16	12860/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 10/06/2022.

Test Report Number: 12860

Date Issued: 10/06/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12860/1 D08&9 Hitchcock Rd Olive Grove 1/06/2022	12860/2 D10 Hearses Rd 1/06/2022	12860/3 D06 School 1/06/2022	12860/4 D05 Bund 1/06/2022	12860/5 D04 Rehab 1/06/2022
Date Tested	--	--	8/06/2022	8/06/2022	8/06/2022	8/06/2022	8/06/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.5	1.1	1.3	0.9	0.5
Ash	AS 3580.10.1	g/m2/mth	<0.1	0.4	0.5	0.7	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.5	0.7	0.8	0.2	0.1
Calculated Rain	AS 3580.10.1	mm	84	83	85	82	76

Deposited Matter	Method	Units	12860/6 D07 Mullock 1/06/2022	12860/7 D01(A) Front Gate 1/06/2022	12860/8 D11 Goldstien 1/06/2022	12860/9 D12 Ram 1/06/2022
Date Tested	--	--	8/06/2022	8/06/2022	8/06/2022	8/06/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	**5.5**	0.8	0.3
Ash	AS 3580.10.1	g/m2/mth	0.3	5.0	0.4	0.2
Combustible Matter	AS 3580.10.1	g/m2/mth	0.1	0.5	0.4	0.1
Calculated Rain	AS 3580.10.1	mm	77	80	83	80

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12860

Date Issued: 10/06/2022 Revision No: 00

Sampling Conditions: Windy 9°-13°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12860/1	D08&9 Hitchcock Rd Olive Grove		T & D.Walker	01/06/2022 09:59	AS3580.10.1	CuSO4
12860/2	D10 Hearses Rd		T & D.Walker	01/06/2022 10:31	AS3580.10.1	CuSO4
12860/3	D06 School		T & D.Walker	01/06/2022 08:43	AS3580.10.1	CuSO4
12860/4	D05 Bund		T & D.Walker	01/06/2022 08:58	AS3580.10.1	CuSO4
12860/5	D04 Rehab		T & D.Walker	01/06/2022 09:29	AS3580.10.1	CuSO4
12860/6	D07 Mullock		T & D.Walker	01/06/2022 09:41	AS3580.10.1	CuSO4
12860/7	D01(A) Front Gate		T & D.Walker	01/06/2022 09:14	AS3580.10.1	CuSO4
12860/8	D11 Goldstien		T & D.Walker	01/06/2022 10:54	AS3580.10.1	CuSO4
12860/9	D12 Ram		T & D.Walker	01/06/2022 10:16	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12860/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
12860/2	D10 Hearses Rd	312538	6294576	Minor insects
12860/3	D06 School	313518	6296537	
12860/4	D05 Bund	313160	6296838	
12860/5	D04 Rehab	312385	6296932	
12860/6	D07 Mullock	312579	6296676	
12860/7	D01(A) Front Gate	313290	6297176	Dust
12860/8	D11 Goldstien	312034	6294213	Minor vegetation
12860/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 10/06/2022.
Where method is "unknown" sampling procedures are not endorsed

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Report Number: 12999

Date Issued: 8/07/2022 Revision Number: 00

Site/Job: Dixon Maroota - Dusts

Client: Dixon Sand (No.1) Pty Ltd
Address PO Box 4019
PITT TOWN NSW 2756
Contact David Dixon

The following Dust Deposition sample(s) were received on 29/06/2022

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
D08&9 Hitchcock Rd Olive Grove	01/06/2022 09:59	29/06/2022 10:46	12999/1	Dust	
D10 Hearses Rd	01/06/2022 10:31	29/06/2022 11:16	12999/2	Dust	
D06 School	01/06/2022 08:43	29/06/2022 11:41	12999/3	Dust	
D05 Bund	01/06/2022 08:58	29/06/2022 11:54	12999/4	Dust	
D04 Rehab	01/06/2022 09:29	29/06/2022 12:20	12999/5	Dust	
D07 Mullock	01/06/2022 09:41	29/06/2022 12:31	12999/6	Dust	
D01(A) Front Gate	01/06/2022 09:14	29/06/2022 12:07	12999/7	Dust	
D11 Goldstien	01/06/2022 10:54	29/06/2022 11:05	12999/8	Dust	
D12 Ram	01/06/2022 10:16	29/06/2022 11:28	12999/9	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 8/07/2022.

Test Report Number: 12999

Date Issued: 8/07/2022 Revision No: 00

Results

Deposited Matter	Method	Units	12999/1 D08&9 Hitchcock Rd Olive Grove 29/06/2022	12999/2 D10 Hearses Rd 29/06/2022	12999/3 D06 School 29/06/2022	12999/4 D05 Bund 29/06/2022	12999/5 D04 Rehab 29/06/2022
Date Tested	--	--	5/07/2022	5/07/2022	5/07/2022	5/07/2022	5/07/2022
Number of Days	AS 3580.10.1	days	28	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.4	**7.8**	**7.8**	0.4	0.5
Ash	AS 3580.10.1	g/m2/mth	0.2	3.3	1.9	0.3	0.4
Combustible Matter	AS 3580.10.1	g/m2/mth	0.2	4.5	5.9	0.1	0.1
Calculated Rain	AS 3580.10.1	mm	6	6	5	5	5

Deposited Matter	Method	Units	12999/6 D07 Mullock 29/06/2022	12999/7 D01(A) Front Gate 29/06/2022	12999/8 D11 Goldstien 29/06/2022	12999/9 D12 Ram 29/06/2022
Date Tested	--	--	5/07/2022	5/07/2022	5/07/2022	5/07/2022
Number of Days	AS 3580.10.1	days	28	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	0.1	1.4	1.0	0.1
Ash	AS 3580.10.1	g/m2/mth	0.1	1.2	0.5	0.1
Combustible Matter	AS 3580.10.1	g/m2/mth	<0.1	0.2	0.5	<0.1
Calculated Rain	AS 3580.10.1	mm	5	5	6	6

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12999

Date Issued: 8/07/2022 Revision No: 00

Sampling Conditions: 13-16°C, fine

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12999/1	D08&9 Hitchcock Rd Olive Grove		D.Walker	29/06/2022 10:46	AS3580.10.1	CuSO4
12999/2	D10 Hearses Rd		D.Walker	29/06/2022 11:16	AS3580.10.1	CuSO4
12999/3	D06 School		D.Walker	29/06/2022 11:41	AS3580.10.1	CuSO4
12999/4	D05 Bund		D.Walker	29/06/2022 11:54	AS3580.10.1	CuSO4
12999/5	D04 Rehab		D.Walker	29/06/2022 12:20	AS3580.10.1	CuSO4
12999/6	D07 Mullock		D.Walker	29/06/2022 12:31	AS3580.10.1	CuSO4
12999/7	D01(A) Front Gate		D.Walker	29/06/2022 12:07	AS3580.10.1	CuSO4
12999/8	D11 Goldstien		D.Walker	29/06/2022 11:05	AS3580.10.1	CuSO4
12999/9	D12 Ram		D.Walker	29/06/2022 11:28	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
12999/1	D08&9 Hitchcock Rd Olive Grove	313058	6295137	
12999/2	D10 Hearses Rd	312538	6294576	Bird droppings, vegetation, algae
12999/3	D06 School	313518	6296537	Vegetation, algae, bird droppings in funnel
12999/4	D05 Bund	313160	6296838	
12999/5	D04 Rehab	312385	6296932	
12999/6	D07 Mullock	312579	6296676	
12999/7	D01(A) Front Gate	313290	6297176	
12999/8	D11 Goldstien	312034	6294213	Minor vegetation
12999/9	D12 Ram	311750	6294159	

Sampling procedures have been approved and report finalised on 8/07/2022.
Where method is "unknown" sampling procedures are not endorsed

Appendix B – PM10, TSP and Weather Station Reports

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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JULY 2021

Amendment 1

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 20 January 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for July 2021 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for July 2021.

Approximately 100% of TEOM data was recovered for July 2021.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 (2001) "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- 3580.1.1 (2007) "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly calibration was originally scheduled for June but was rescheduled and conducted on 20 July 2021, with the next calibration due to be completed in September 2021. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for July 2021 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/07/2021	10.9	10.9	27.3	27.3
2/07/2021	4.7	7.8	11.8	19.5
3/07/2021	8.4	8.0	21.0	20.0
4/07/2021	3.9	7.0	9.8	17.4
5/07/2021	11.5	7.9	28.8	19.7
6/07/2021	17.6	9.5	44.0	23.8
7/07/2021	16.3	10.5	40.8	26.2
8/07/2021	19.5	11.6	48.8	29.0
9/07/2021	12.9	11.7	32.3	29.4
10/07/2021	7.3	11.3	18.3	28.3
11/07/2021	7.4	10.9	18.5	27.4
12/07/2021	15.9	11.4	39.8	28.4
13/07/2021	8.9	11.2	22.3	27.9
14/07/2021	10.1	11.1	25.3	27.7
15/07/2021	6.8	10.8	17.0	27.0
16/07/2021	7.7	10.6	19.3	26.5
17/07/2021	11.3	10.7	28.3	26.6
18/07/2021	5.0	10.3	12.5	25.8
19/07/2021	9.1	10.3	22.8	25.7
20/07/2021	12.1	10.4	30.4	25.9
21/07/2021	7.2	10.2	18.0	25.5
22/07/2021	8.5	10.1	21.3	25.3
23/07/2021	8.6	10.1	21.5	25.2
24/07/2021	9.7	10.1	24.3	25.1
25/07/2021	6.3	9.9	15.8	24.8
26/07/2021	13.5	10.0	33.8	25.1
27/07/2021	9.4	10.0	23.5	25.1
28/07/2021	16.5	10.3	41.3	25.6
29/07/2021	13.1	10.3	32.8	25.9
30/07/2021	11.2	10.4	28.0	25.9
31/07/2021	8.3	10.3	20.8	25.8

*Calculated from PM10

**Calculated from PM10 Annual Average

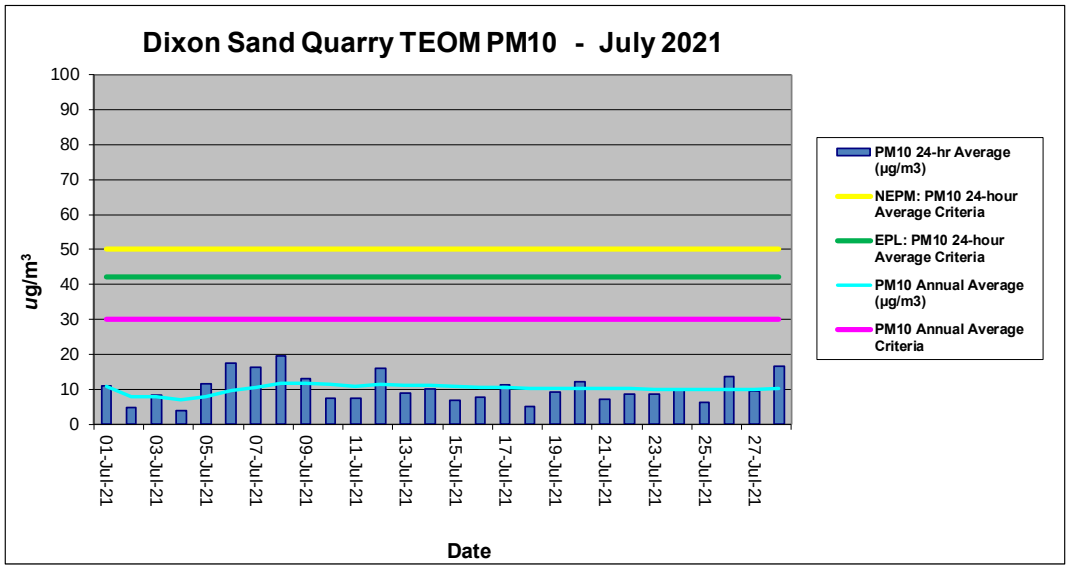


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

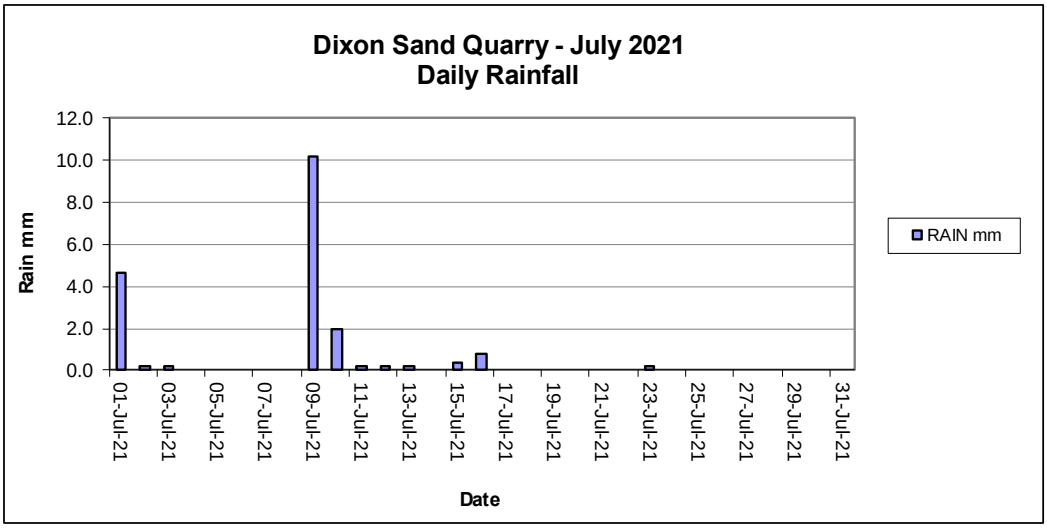
The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

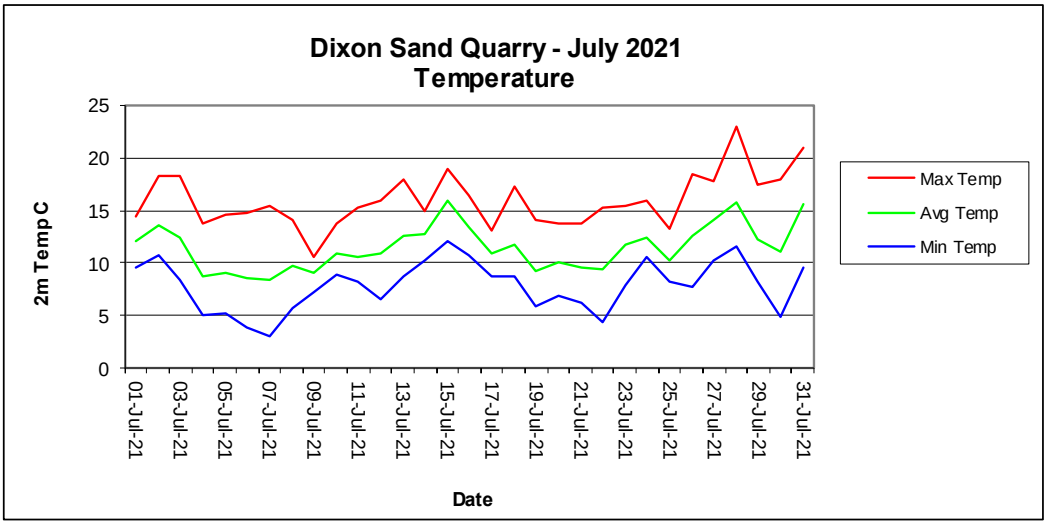
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for July 2021

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/07/2021	9.5	12.1	14.5	4.6	0.0	2.1	6.6	99.2	99.9	100.0	997.9	1002.4	1006.1
2/07/2021	10.7	13.5	18.3	0.2	0.1	4.0	15.9	58.5	86.8	100.0	995.8	997.2	998.3
3/07/2021	8.4	12.4	18.2	0.2	0.2	2.8	12.0	62.5	92.3	100.0	995.2	997.0	998.6
4/07/2021	5.1	8.7	13.8	0.0	0.1	2.9	17.2	45.0	74.9	99.7	998.4	1000.1	1002.6
5/07/2021	5.3	9.0	14.6	0.0	0.0	2.4	12.1	50.8	65.2	94.2	997.7	999.3	1000.6
6/07/2021	3.8	8.6	14.8	0.0	0.1	2.1	8.2	46.2	73.1	99.5	998.1	1000.1	1002.4
7/07/2021	3.1	8.5	15.4	0.0	0.0	2.0	7.0	57.0	85.1	100.0	1002.1	1003.3	1005.3
8/07/2021	5.7	9.7	14.1	0.0	0.0	1.8	7.9	67.7	92.6	100.0	997.9	1001.1	1003.6
9/07/2021	7.3	9.1	10.6	10.2	0.1	2.5	10.7	99.2	99.9	100.0	991.2	993.4	997.8
10/07/2021	8.9	10.8	13.7	2.0	0.6	7.1	19.6	71.2	91.8	100.0	991.8	997.5	1003.3
11/07/2021	8.3	10.5	15.3	0.2	0.1	4.1	13.7	68.3	96.4	100.0	1002.9	1004.3	1006.4
12/07/2021	6.6	10.9	15.9	0.2	0.0	3.1	12.4	60.6	91.0	100.0	998.5	1001.3	1003.7
13/07/2021	8.7	12.5	18.0	0.2	0.1	4.6	12.4	49.0	85.6	100.0	995.1	997.1	999.3
14/07/2021	10.2	12.7	15.0	0.0	0.2	5.3	14.4	52.8	71.3	100.0	987.4	991.6	995.5
15/07/2021	12.1	16.0	18.9	0.4	0.2	5.0	14.5	54.7	70.6	100.0	981.4	984.6	987.6
16/07/2021	10.8	13.4	16.4	0.8	0.2	7.3	27.5	40.3	65.8	100.0	974.4	977.5	981.4
17/07/2021	8.7	11.0	13.1	0.0	0.0	7.3	35.7	43.4	55.2	72.2	976.4	979.5	985.1
18/07/2021	8.7	11.8	17.2	0.0	0.1	3.5	11.8	41.0	80.6	100.0	984.9	991.6	996.9
19/07/2021	5.9	9.3	14.1	0.0	0.3	2.5	10.2	47.1	72.5	100.0	992.9	995.3	997.6
20/07/2021	6.9	10.1	13.7	0.0	0.0	4.8	20.2	47.1	67.8	100.0	985.9	988.9	992.9
21/07/2021	6.2	9.7	13.8	0.0	0.2	5.7	22.7	43.1	94.1	100.0	986.2	992.9	997.6
22/07/2021	4.3	9.4	15.3	0.0	0.1	3.4	13.7	35.5	64.8	100.0	991.9	995.4	998.4
23/07/2021	7.9	11.7	15.4	0.2	0.2	5.1	16.9	51.6	70.5	98.1	984.5	987.7	991.9
24/07/2021	10.5	12.4	16.0	0.0	0.2	6.7	34.3	68.3	88.3	99.4	981.2	982.6	984.5
25/07/2021	8.3	10.3	13.3	0.0	0.8	6.3	30.1	62.8	81.2	99.4	981.4	987.3	993.8
26/07/2021	7.7	12.6	18.5	0.0	0.7	5.6	16.0	44.9	76.0	99.4	992.5	995.1	997.6
27/07/2021	10.2	14.1	17.7	0.0	0.3	5.9	18.5	52.8	73.2	99.2	992.6	996.5	999.5
28/07/2021	11.5	15.8	23.0	0.0	0.4	8.1	28.0	37.0	68.5	99.2	983.0	987.7	992.9
29/07/2021	8.3	12.2	17.4	0.0	0.2	3.4	15.8	38.0	61.1	86.7	987.4	993.2	998.0
30/07/2021	4.8	11.1	17.9	0.0	0.1	4.5	13.3	26.9	55.3	99.4	996.3	998.1	1000.3
31/07/2021	9.5	15.5	20.9	0.0	0.2	7.2	19.9	35.1	62.6	100.0	988.4	992.2	996.4
Monthly	**3.1**	**11.5**	**23.0**	**19.2**	**0.0**	**4.5**	**35.7**	**26.9**	**77.9**	**100.0**	**974.4**	**993.9**	**1006.4**





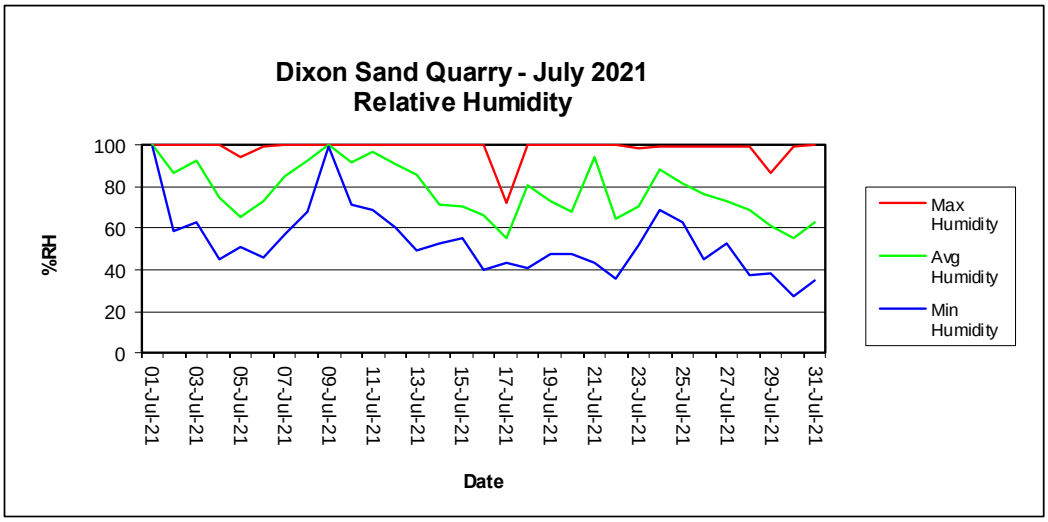


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

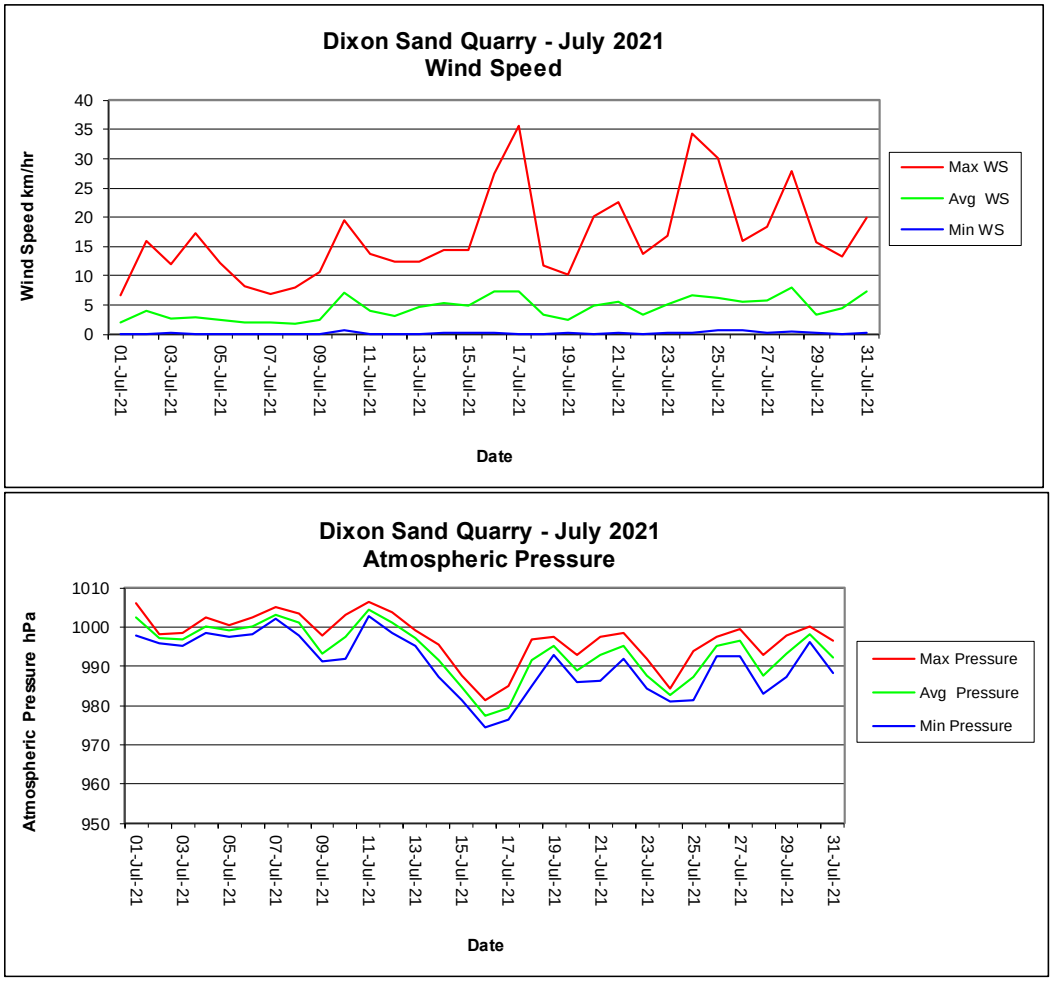
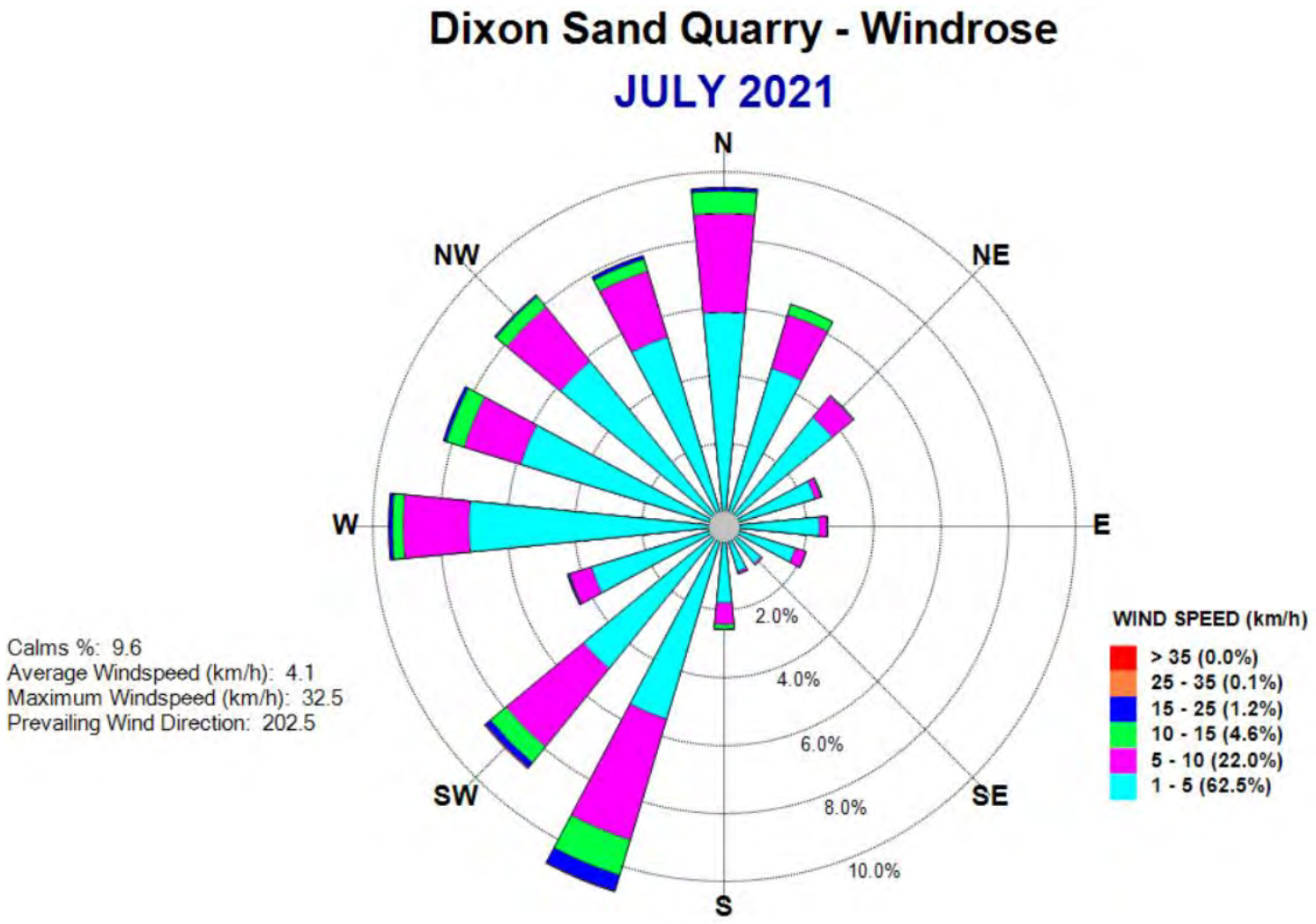


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
JULY 2021
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
10.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.1%)
15 - 25 (1.2%)
10 - 15 (4.6%)
5 - 10 (22.0%)
1 - 5 (62.5%)
Calms %: 9.6
Average Windspeed (km/h): 4.1
Maximum Windspeed (km/h): 32.5
Prevailing Wind Direction: 202.5

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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AUGUST 2021

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 30 September 2021

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

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Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

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Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/08/2021	11.9	10.4	29.8	25.9
2/08/2021	23.7	10.8	59.3	26.9
3/08/2021	13.8	10.9	34.5	27.1
4/08/2021	17.0	11.0	42.5	27.6
5/08/2021	8.0	10.9	20.0	27.4
6/08/2021	9.8	10.9	24.5	27.3
7/08/2021	9.3	10.9	23.3	27.2
8/08/2021	11.1	10.9	27.8	27.2
9/08/2021	16.5	11.0	41.3	27.5
10/08/2021	11.8	11.0	29.5	27.6
11/08/2021	12.6	11.1	31.5	27.7
12/08/2021	13.6	11.1	34.0	27.8
13/08/2021	22.3	11.4	55.8	28.5
14/08/2021	16.9	11.5	42.3	28.8
15/08/2021	19.8	11.7	49.5	29.2
16/08/2021	11.6	11.7	29.0	29.2
17/08/2021	12.0	11.7	30.0	29.2
18/08/2021	23.7	11.9	59.3	29.8
19/08/2021	24.6	12.2	61.5	30.5
20/08/2021	41.2	12.8	103.0	31.9
21/08/2021	6.9	12.6	17.2	31.6
22/08/2021	7.9	12.6	19.8	31.4
23/08/2021	14.3	12.6	35.8	31.5
24/08/2021	9.0	12.5	22.5	31.3
25/08/2021	6.4	12.4	16.0	31.0
26/08/2021	12.2	12.4	30.5	31.0
27/08/2021	18.3	12.5	45.8	31.3
28/08/2021	18.7	12.6	46.8	31.5
29/08/2021	9.7	12.6	24.3	31.4
30/08/2021	14.8	12.6	37.0	31.5
31/08/2021	11.8	12.6	29.5	31.5

*Calculated from PM10

**Calculated from PM10 Annual Average

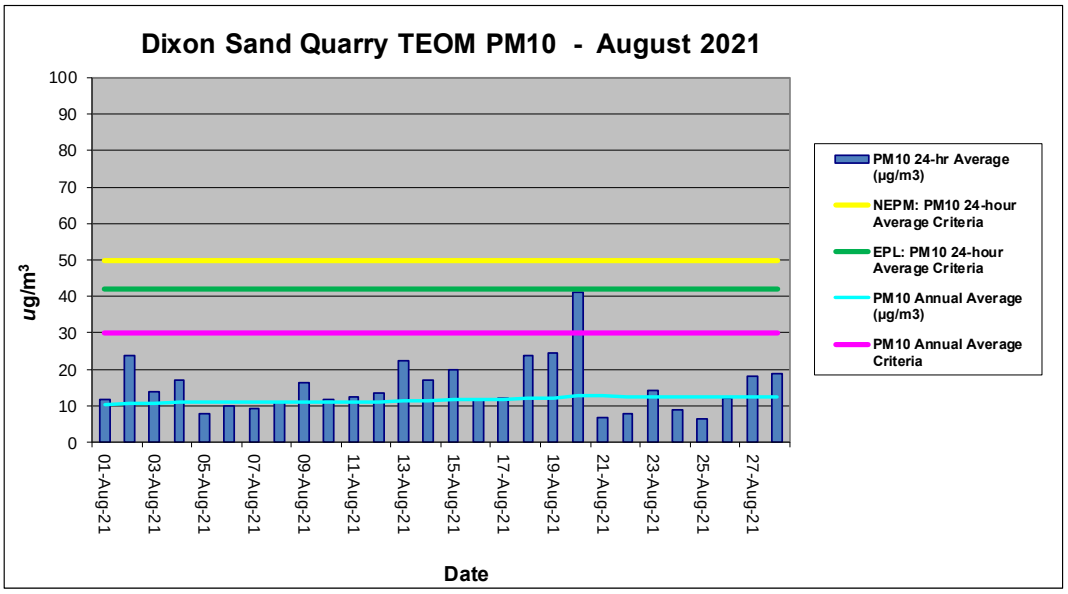

Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for August 2021

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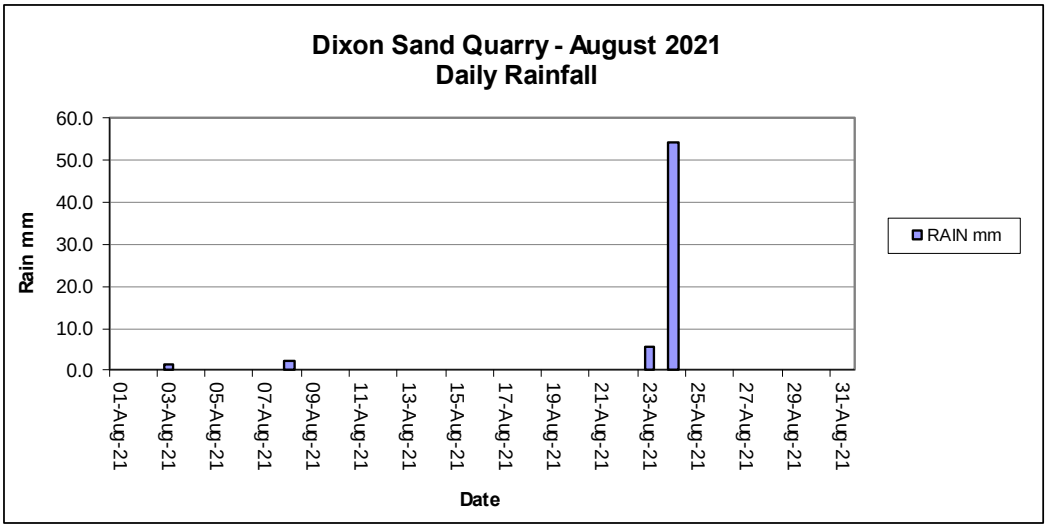
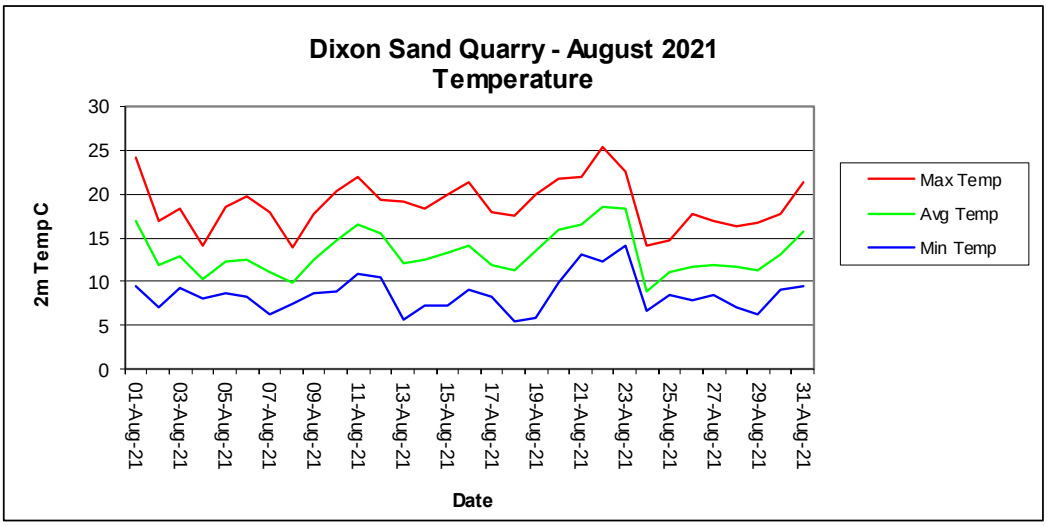
1/08/2021	9.4	16.8	24.2	0.0	0.1	6.2	29.3	39.3	63.9	100.0	985.5	989.1	995.8
2/08/2021	7.1	11.9	16.9	0.0	0.0	3.2	14.8	50.4	83.1	100.0	992.6	996.8	1000.1
3/08/2021	9.3	12.8	18.3	1.6	0.8	5.8	27.8	33.8	70.1	100.0	986.9	989.9	994.9
4/08/2021	8.1	10.4	14.1	0.0	0.3	5.7	26.2	42.9	83.7	100.0	990.6	992.7	995.8
5/08/2021	8.7	12.2	18.6	0.0	0.2	3.5	14.7	44.4	88.7	100.0	994.1	996.5	999.9
6/08/2021	8.3	12.6	19.7	0.0	0.1	2.4	9.0	41.6	79.1	100.0	999.1	1000.5	1002.5
7/08/2021	6.3	11.0	17.9	0.0	0.2	2.9	14.3	50.5	88.0	100.0	1000.7	1003.6	1007.4
8/08/2021	7.5	9.9	13.9	2.4	0.0	2.9	11.3	70.0	97.1	100.0	1007.4	1009.5	1011.1
9/08/2021	8.7	12.5	17.7	0.0	0.3	2.7	14.6	53.0	83.3	100.0	1005.2	1007.9	1010.3
10/08/2021	8.8	14.6	20.3	0.0	0.7	4.8	13.9	54.0	97.2	100.0	1003.0	1005.1	1007.6
11/08/2021	10.9	16.5	22.0	0.0	0.6	6.4	21.5	40.9	84.5	100.0	998.9	1002.0	1005.1
12/08/2021	10.4	15.4	19.4	0.0	0.0	3.9	16.8	30.1	99.2	100.0	998.2	1003.1	1006.5
13/08/2021	5.6	12.0	19.2	0.0	0.1	2.3	13.0	38.9	65.9	100.0	1003.0	1005.2	1006.9
14/08/2021	7.2	12.4	18.4	0.0	0.2	3.2	13.9	37.6	66.1	100.0	1004.4	1006.1	1008.3
15/08/2021	7.3	13.3	20.0	0.0	0.1	2.4	10.6	42.8	88.4	100.0	1000.1	1003.1	1006.0
16/08/2021	9.0	14.0	21.4	0.0	0.4	4.5	18.2	22.4	60.9	100.0	996.4	999.4	1002.2
17/08/2021	8.3	12.0	17.9	0.0	0.0	3.6	19.1	26.4	68.1	100.0	998.5	1000.4	1002.9
18/08/2021	5.5	11.2	17.5	0.0	0.1	3.1	10.2	42.3	80.2	100.0	1001.4	1003.1	1005.5
19/08/2021	5.9	13.6	19.9	0.0	0.2	3.8	13.9	37.7	69.6	99.4	999.5	1001.4	1003.5
20/08/2021	9.9	15.8	21.8	0.0	0.1	3.6	16.8	32.5	60.7	100.0	995.9	998.7	1000.9
21/08/2021	13.1	16.5	22.0	0.0	0.2	3.9	24.4	43.1	52.7	100.0	995.6	997.7	1000.2
22/08/2021	12.3	18.4	25.3	0.0	0.0	5.6	15.2	28.7	48.1	100.0	994.8	997.6	1000.6
23/08/2021	14.0	18.3	22.6	5.8	0.3	7.7	27.5	41.1	59.9	100.0	987.8	991.5	994.8
24/08/2021	6.6	8.8	14.1	54.2	0.7	6.9	31.6	60.2	96.3	100.0	983.8	985.9	988.4
25/08/2021	8.4	11.1	14.7	0.0	0.2	6.6	30.2	45.7	59.2	90.3	986.9	991.0	994.4
26/08/2021	7.8	11.8	17.7	0.0	0.1	3.1	16.3	41.1	70.7	100.0	994.3	996.1	997.7
27/08/2021	8.4	11.9	16.9	0.0	0.1	3.4	13.9	37.6	70.2	100.0	992.9	995.2	996.8
28/08/2021	7.0	11.7	16.3	0.0	0.2	3.0	12.3	46.6	64.8	100.0	994.1	995.6	996.6
29/08/2021	6.3	11.4	16.8	0.0	0.0	3.3	13.4	59.8	87.4	100.0	989.3	993.4	996.4
30/08/2021	9.0	13.1	17.7	0.0	0.2	3.0	11.6	45.8	85.7	100.0	993.8	996.8	1000.0
31/08/2021	9.4	15.6	21.3	0.0	0.0	3.9	14.3	31.6	93.9	100.0	999.1	1000.9	1003.3
Monthly	**5.5**	**13.2**	**25.3**	**64.0**	**0.0**	**4.1**	**31.6**	**22.4**	**76.3**	**100.0**	**983.8**	**998.6**	**1011.1**





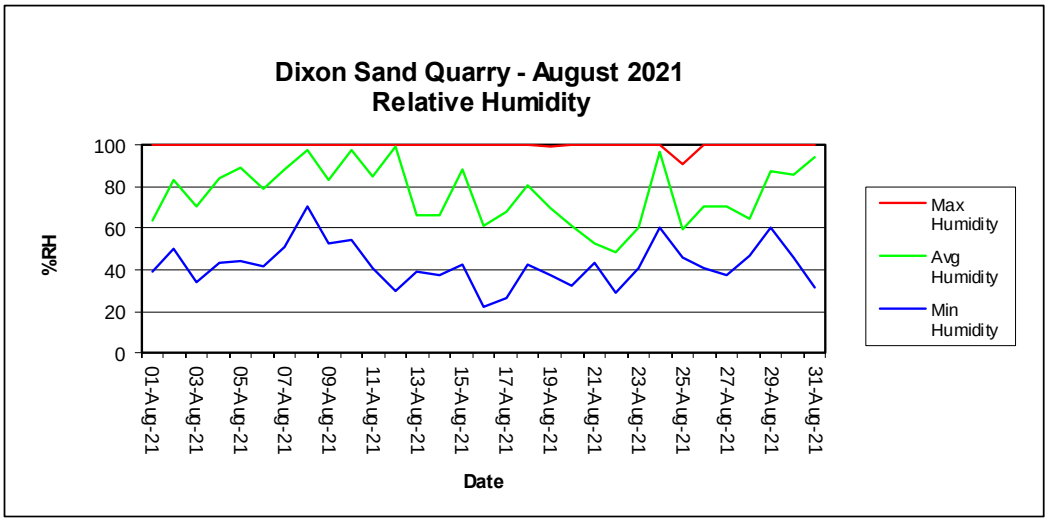


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

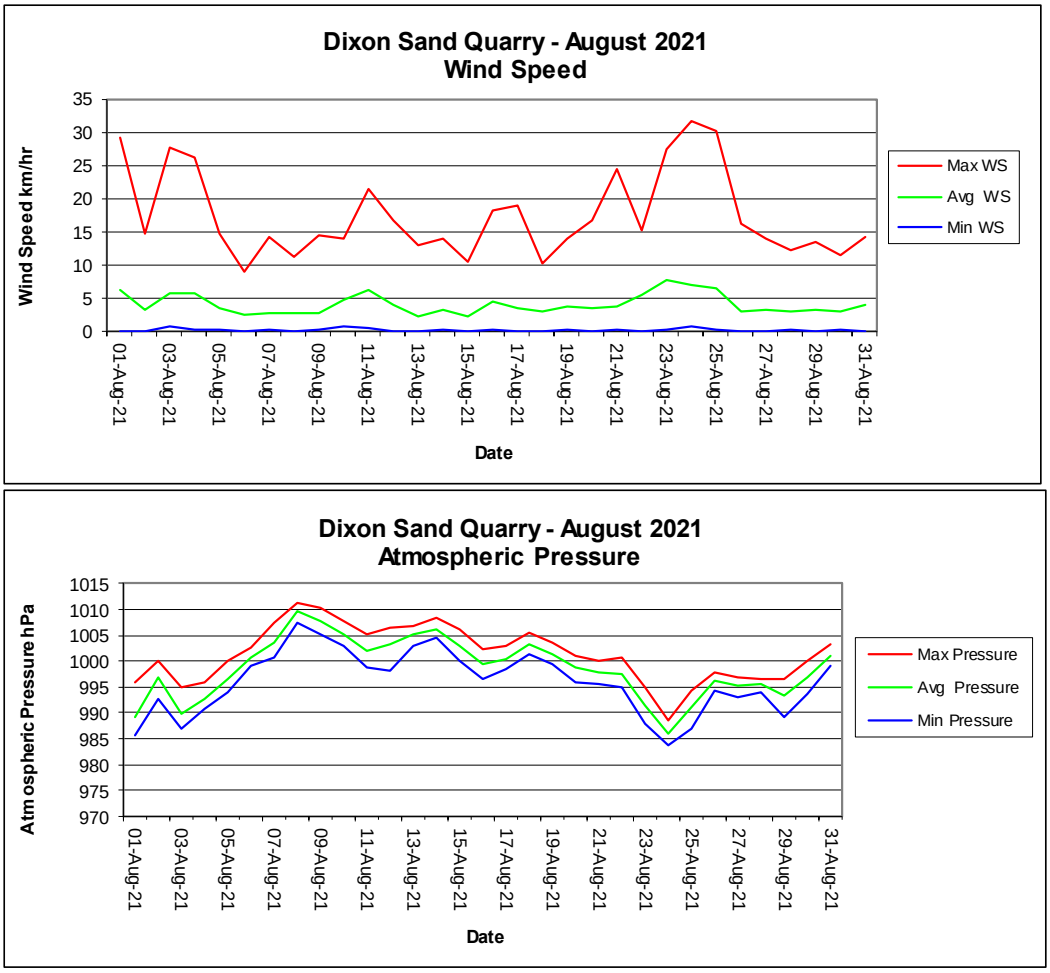
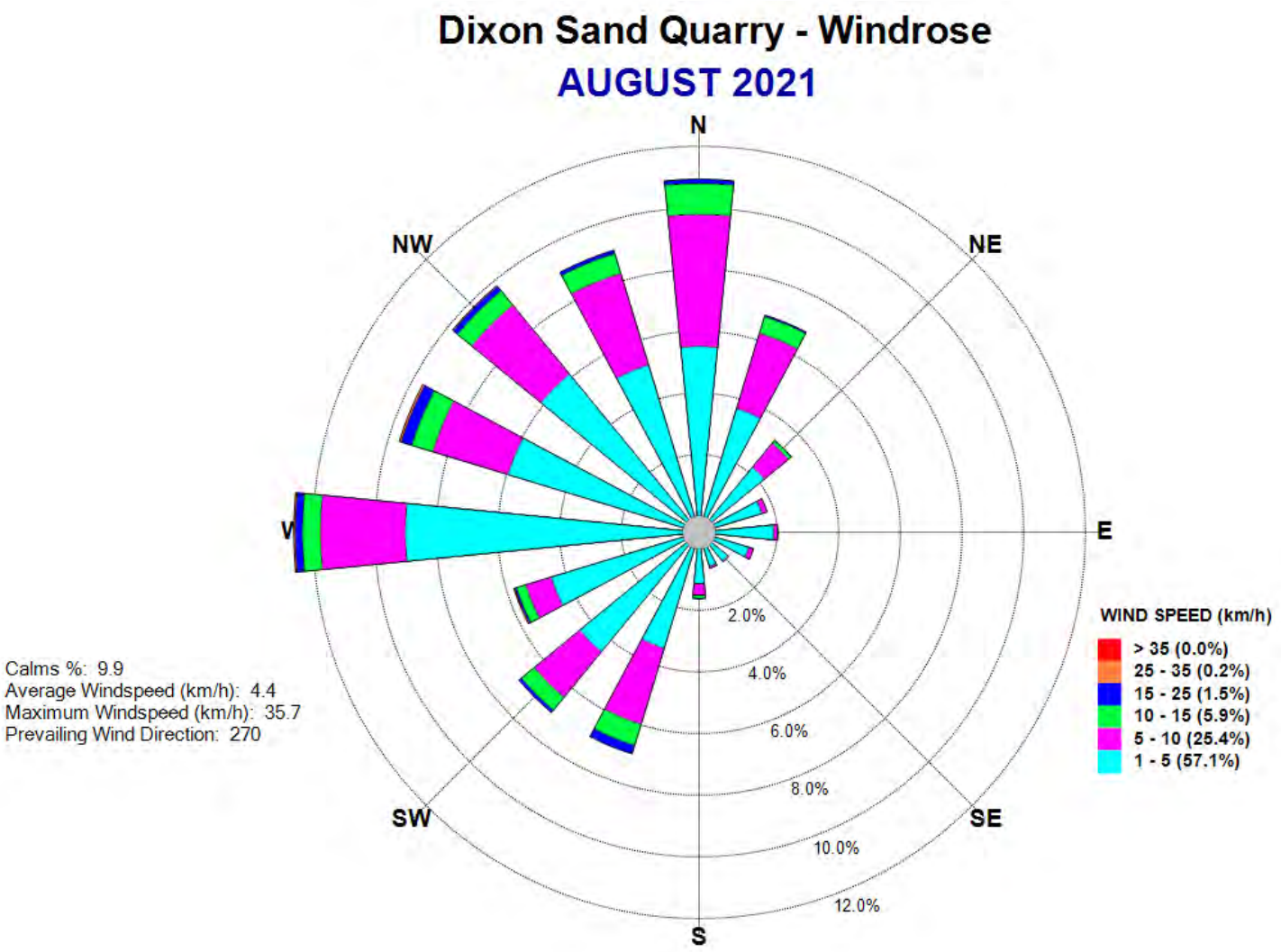


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
AUGUST 2021
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
10.0%
12.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.2%)
15 - 25 (1.5%)
10 - 15 (5.9%)
5 - 10 (25.4%)
1 - 5 (57.1%)
Calms %: 9.9
Average Windspeed (km/h): 4.4
Maximum Windspeed (km/h): 35.7
Prevailing Wind Direction: 270

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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SEPTEMBER 2021

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 25 October 2021

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for September 2021 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of meteorological data was recovered for September 2021.

Approximately 100% of TEOM data was recovered for September 2021.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m^3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted on 1 September 2021 with the next calibration due to be completed in December 2021. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for September 2021 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/09/2021	21.4	12.7	53.6	31.8
2/09/2021	23.5	12.9	58.8	32.3
3/09/2021	13.7	12.9	34.3	32.3
4/09/2021	11.8	12.9	29.5	32.2
5/09/2021	4.0	12.8	10.0	31.9
6/09/2021	12.2	12.8	30.5	31.9
7/09/2021	14.3	12.8	35.8	31.9
8/09/2021	17.3	12.8	43.3	32.1
9/09/2021	10.2	12.8	25.5	32.0
10/09/2021	26.4	13.0	66.0	32.5
11/09/2021	14.0	13.0	35.0	32.5
12/09/2021	19.5	13.1	48.8	32.7
13/09/2021	14.6	13.1	36.5	32.8
14/09/2021	6.9	13.0	17.3	32.6
15/09/2021	8.2	13.0	20.5	32.4
16/09/2021	7.8	12.9	19.5	32.3
17/09/2021	11.7	12.9	29.3	32.2
18/09/2021	27.5	13.1	68.8	32.7
19/09/2021	8.5	13.0	21.3	32.5
20/09/2021	30.9	13.2	77.3	33.1
21/09/2021	17.3	13.3	43.3	33.2
22/09/2021	12.1	13.3	30.3	33.2
23/09/2021	13.5	13.3	33.8	33.2
24/09/2021	21.9	13.4	54.8	33.4
25/09/2021	18.0	13.4	45.0	33.6
26/09/2021	9.5	13.4	23.8	33.5
27/09/2021	12.9	13.4	32.3	33.4
28/09/2021	22.4	13.5	56.0	33.7
29/09/2021	12.4	13.5	31.0	33.7
30/09/2021	7.9	13.4	19.8	33.5

*Calculated from PM10

**Calculated from PM10 Annual Average

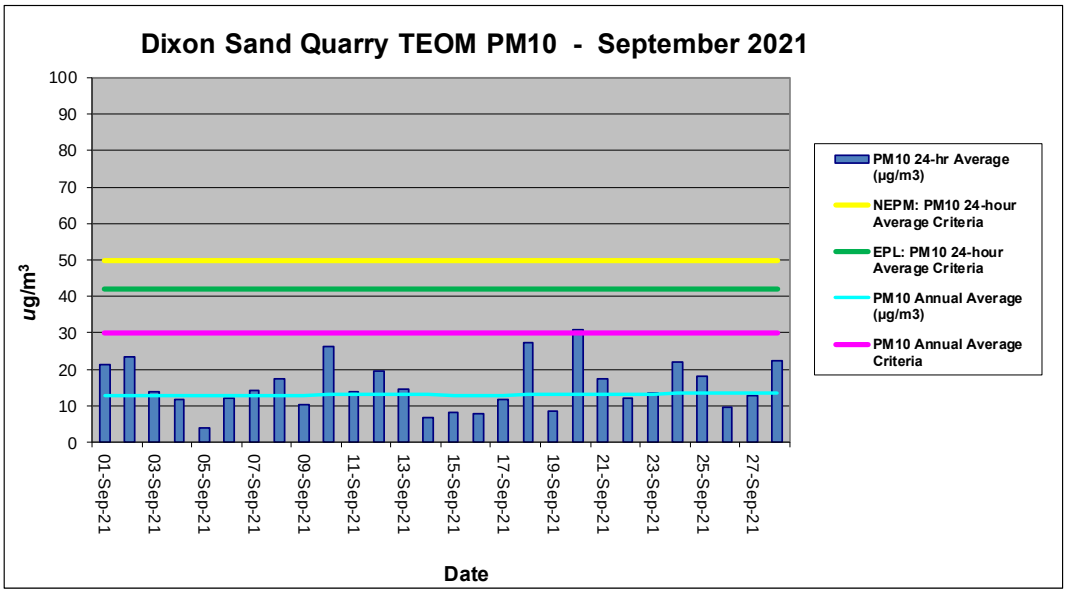


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

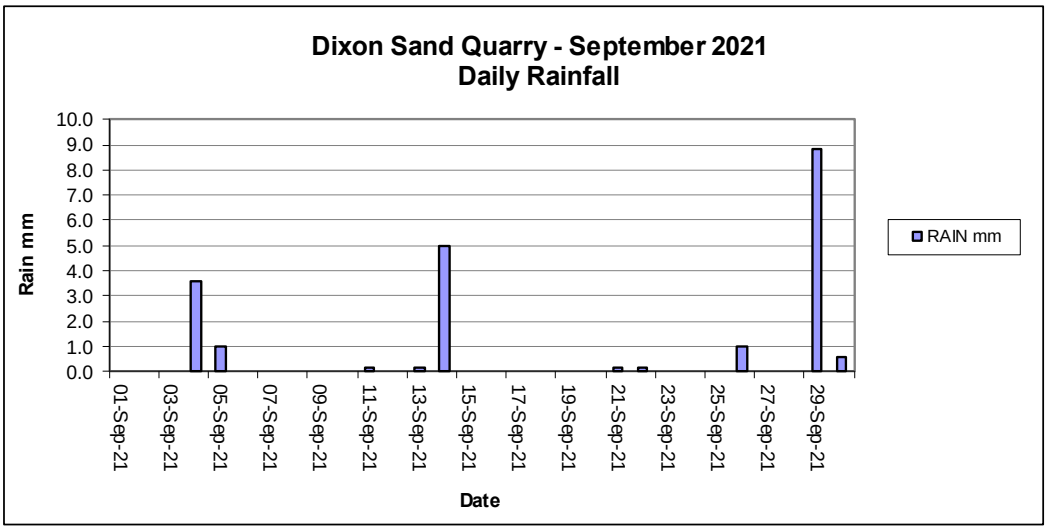
The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

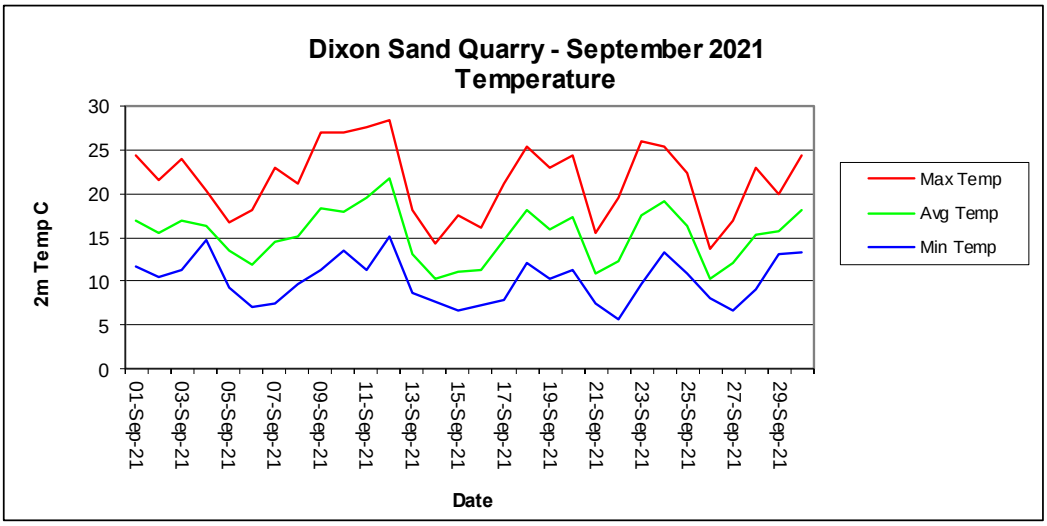
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for September 2021

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/09/2021	11.7	16.9	24.4	0.0	0.1	4.1	12.8	23.9	75.4	100.0	1003.0	1005.8	1008.8
2/09/2021	10.5	15.6	21.6	0.0	0.1	3.5	13.6	65.0	89.0	100.0	1004.5	1006.9	1009.5
3/09/2021	11.3	16.9	24.0	0.0	0.4	4.4	14.8	37.1	76.4	99.5	999.0	1002.2	1005.9
4/09/2021	14.6	16.4	20.3	3.6	0.5	7.3	20.5	53.4	78.0	100.0	994.3	997.2	999.4
5/09/2021	9.2	13.5	16.8	1.0	0.4	5.9	20.2	32.8	82.2	100.0	991.2	994.8	999.2
6/09/2021	7.0	11.9	18.2	0.0	0.0	4.0	22.3	25.5	54.0	100.0	999.2	1003.1	1007.2
7/09/2021	7.5	14.4	23.0	0.0	0.2	3.4	11.7	17.2	60.6	100.0	1002.7	1005.4	1008.9
8/09/2021	9.7	15.1	21.1	0.0	0.1	3.3	12.8	37.9	64.4	99.3	1005.4	1007.9	1010.7
9/09/2021	11.2	18.2	27.0	0.0	0.3	4.7	22.4	12.7	38.4	67.4	998.9	1003.3	1006.6
10/09/2021	13.4	18.0	26.9	0.0	0.2	5.4	23.9	16.8	55.5	100.0	998.8	1000.6	1002.1
11/09/2021	11.2	19.5	27.5	0.2	0.0	6.4	19.8	17.5	90.7	100.0	989.7	994.7	1000.4
12/09/2021	15.1	21.7	28.4	0.0	0.1	7.0	32.1	11.9	48.0	100.0	982.8	986.2	989.7
13/09/2021	8.7	13.0	18.2	0.2	0.6	5.4	14.2	34.4	77.0	100.0	989.0	993.9	999.1
14/09/2021	7.7	10.3	14.2	5.0	1.0	7.1	19.5	58.6	79.7	100.0	998.4	1001.1	1003.5
15/09/2021	6.7	11.1	17.6	0.0	0.1	4.8	18.0	43.8	74.8	96.7	1000.8	1002.4	1003.8
16/09/2021	7.3	11.3	16.2	0.0	0.0	4.9	26.5	52.6	80.8	99.5	1000.1	1002.0	1003.9
17/09/2021	7.9	14.7	21.2	0.0	0.1	4.6	18.0	35.0	70.1	100.0	996.7	999.5	1002.4
18/09/2021	12.1	18.1	25.3	0.0	0.3	6.9	34.2	35.6	53.9	67.5	991.0	995.1	1001.0
19/09/2021	10.2	15.9	22.9	0.0	0.1	4.1	15.7	22.3	41.2	58.3	996.7	999.8	1002.8
20/09/2021	11.2	17.3	24.4	0.0	0.5	7.9	35.3	13.9	35.0	55.5	988.2	992.7	998.1
21/09/2021	7.5	10.9	15.5	0.2	0.3	5.8	29.0	28.0	53.1	77.5	991.7	996.4	1002.7
22/09/2021	5.7	12.3	19.5	0.2	0.1	4.0	16.7	32.7	66.5	96.3	1000.2	1001.7	1003.5
23/09/2021	9.6	17.6	25.9	0.0	0.2	3.5	14.6	26.8	51.1	94.6	994.3	997.8	1001.4
24/09/2021	13.2	19.1	25.3	0.0	0.3	5.5	29.9	24.7	42.2	60.7	989.4	992.6	996.3
25/09/2021	10.8	16.2	22.3	0.0	0.3	4.8	19.1	18.9	52.3	96.3	990.1	995.2	1001.9
26/09/2021	8.0	10.3	13.6	1.0	0.3	4.2	15.8	65.1	91.6	100.0	1001.9	1004.6	1006.2
27/09/2021	6.6	12.1	16.9	0.0	0.1	3.4	14.3	49.6	77.9	99.7	1000.1	1002.9	1005.6
28/09/2021	9.0	15.2	23.0	0.0	0.1	4.1	15.8	40.5	75.9	99.3	996.0	998.8	1001.5
29/09/2021	13.0	15.7	19.9	8.8	0.4	4.1	12.3	60.7	88.6	100.0	992.9	995.3	997.8
30/09/2021	13.2	18.1	24.3	0.6	0.2	5.0	17.0	45.2	75.3	100.0	987.9	990.1	992.8
Monthly	**5.7**	**15.2**	**28.4**	**20.8**	**0.0**	**5.0**	**35.3**	**11.9**	**66.6**	**100.0**	**982.8**	**999.0**	**1010.7**





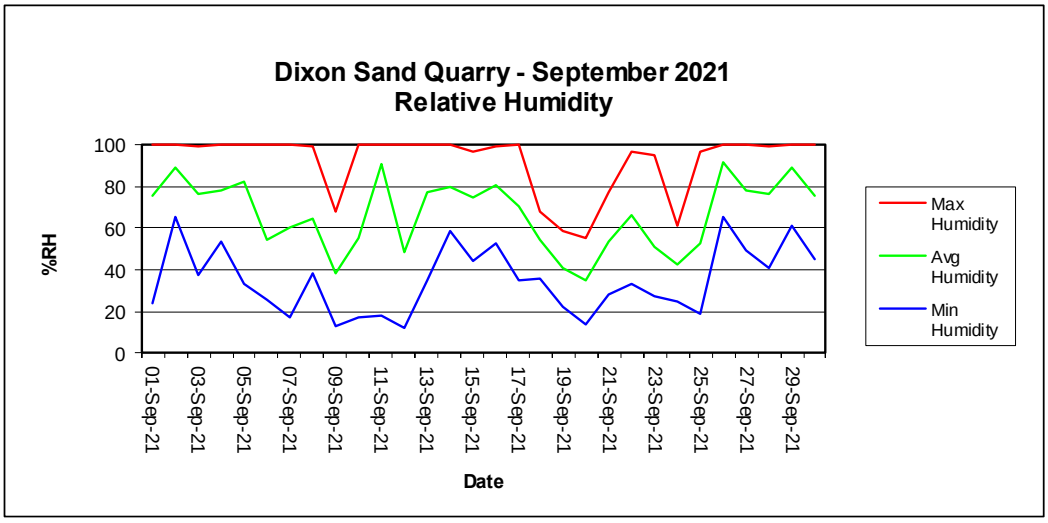


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

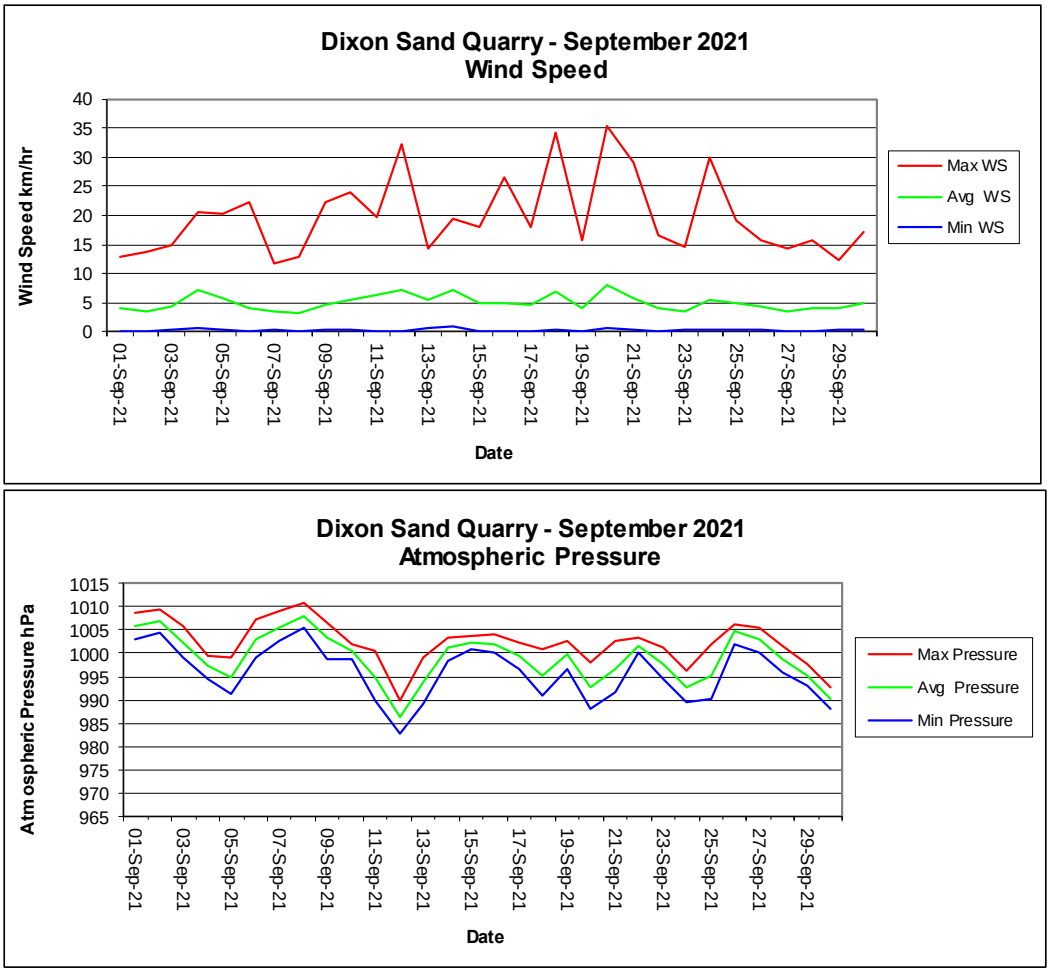
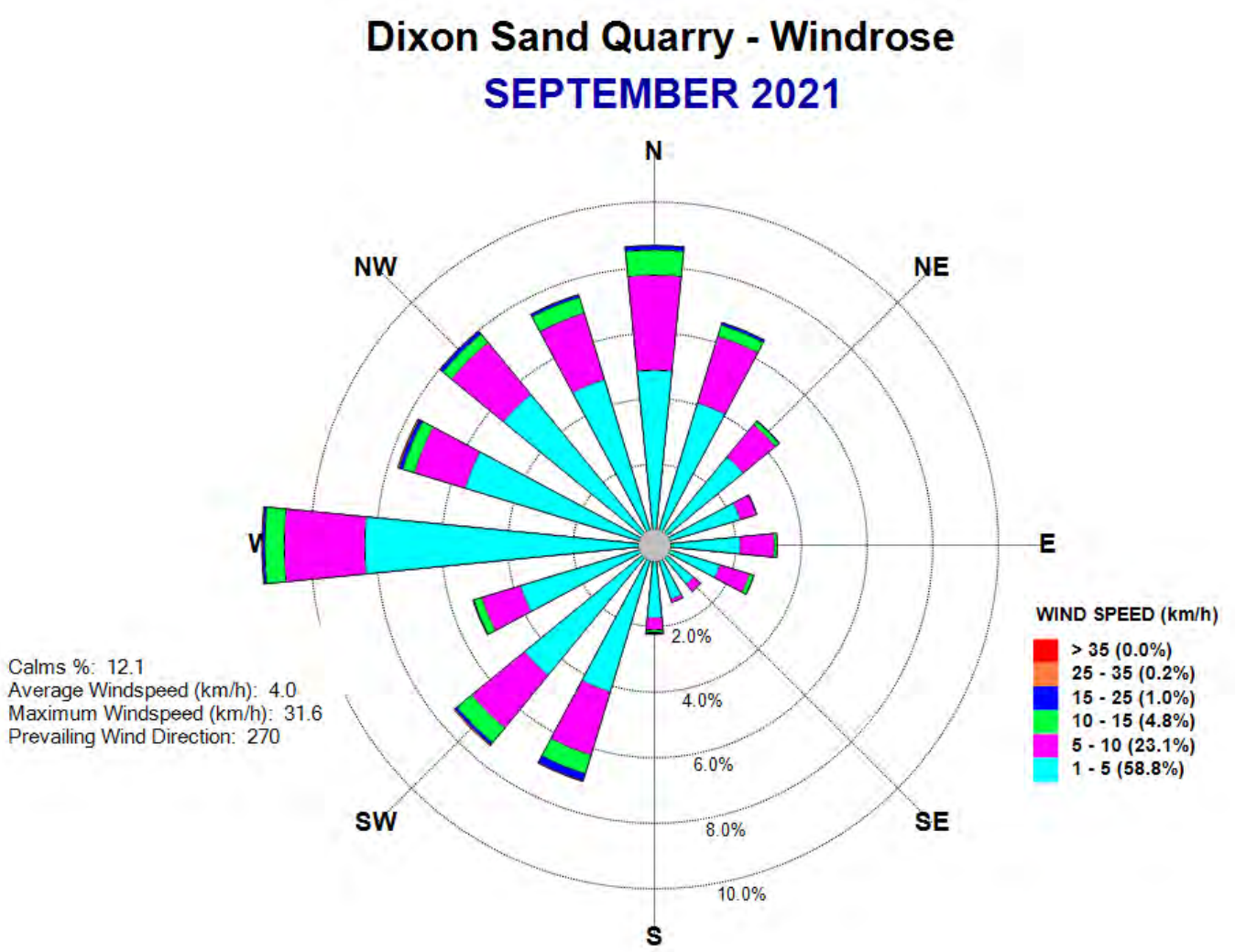


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
SEPTEMBER 2021
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
10.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.2%)
15 - 25 (1.0%)
10 - 15 (4.8%)
5 - 10 (23.1%)
1 - 5 (58.8%)
Calms %: 12.1
Average Windspeed (km/h): 4.0
Maximum Windspeed (km/h): 31.6
Prevailing Wind Direction: 270

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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OCTOBER 2021

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 29 November 2021

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The monitoring programme includes:

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- One continuous Meteorological Station.

This monthly report for October 2021 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3, with the exception of 1 occurrence on 29/10/2021 (44.4 ug/m^3)
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 98% of valid meteorological data was recorded for October 2021.

Approximately 100% of TEOM data was recovered for October 2021.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3.

All TEOM PM_{10} results were also below the Dixon Sand Quarry EPL limit of 42ug/m^3 with the exception of one occurrence (29/10/2021) highlighted yellow in **Table 2**. A small bushfire was reported at South Maroota and the Rural Fire Service (RFS) also issued a fire danger warning with warm/windy conditions for this day. The RFS was also conducting Hazard Reduction burning on 9-10 October 2021 which may explain the elevated PM_{10} levels recorded on 9 October 2021. These notifications are provided in **Appendix 1.**

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in September 2021 with the next calibration due to be completed in December 2021. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for October 2021 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/10/2021	9.5	13.4	23.8	33.4
2/10/2021	6.9	13.3	17.3	33.2
3/10/2021	5.9	13.2	14.7	33.0
4/10/2021	7.6	13.2	19.0	32.9
5/10/2021	24.9	13.3	62.3	33.2
6/10/2021	18.9	13.3	47.3	33.3
7/10/2021	31.7	13.5	79.3	33.8
8/10/2021	29.8	13.7	74.5	34.2
9/10/2021	41.9	14.0	104.8	34.9
10/10/2021	20.2	14.0	50.5	35.1
11/10/2021	4.8	13.9	12.0	34.8
12/10/2021	8.5	13.9	21.3	34.7
13/10/2021	7.6	13.8	19.0	34.6
14/10/2021	16.8	13.9	42.0	34.6
15/10/2021	11.6	13.8	29.0	34.6
16/10/2021	6.7	13.8	16.8	34.4
17/10/2021	10.4	13.7	26.0	34.3
18/10/2021	23.5	13.8	58.8	34.6
19/10/2021	22.6	13.9	56.5	34.8
20/10/2021	9.4	13.9	23.5	34.7
21/10/2021	9.4	13.8	23.5	34.6
22/10/2021	12.0	13.8	30.0	34.5
23/10/2021	13.4	13.8	33.5	34.5
24/10/2021	13.0	13.8	32.5	34.5
25/10/2021	15.8	13.8	39.5	34.5
26/10/2021	19.2	13.9	48.0	34.6
27/10/2021	20.6	13.9	51.5	34.8
28/10/2021	26.2	14.0	65.5	35.0
29/10/2021	**44.4**	14.3	111.0	35.7
30/10/2021	18.7	14.3	46.8	35.8
31/10/2021	13.7	14.3	34.3	35.7

*Calculated from PM10

**Calculated from PM10 Annual Average

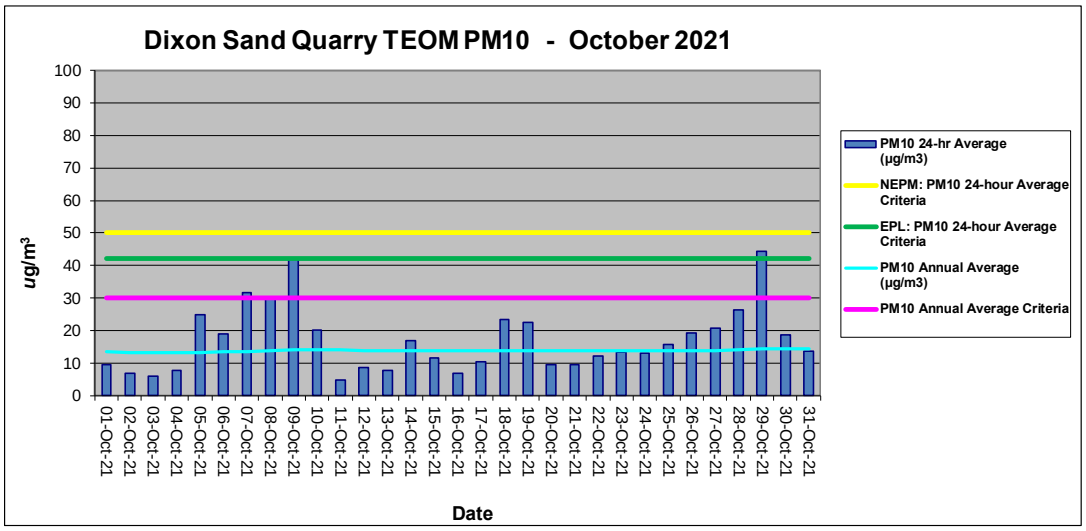


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for October 2021

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/10/2021	12.7	17.1	24.7	0.4	0.2	4.1	22.3	36.2	72.7	100.0	981.9	985.8	988.2
2/10/2021	12.6	16.6	21.7	0.0	0.3	3.5	13.7	44.6	74.6	99.6	981.4	983.3	984.9
3/10/2021	13.6	18.9	24.7	0.0	0.0	3.5	14.6	30.5	56.6	100.0	980.7	982.9	985.0
4/10/2021	16.5	20.5	26.0	0.0	0.2	5.1	28.4	15.8	42.7	62.0	978.6	980.8	986.4
5/10/2021	12.0	15.8	19.5	0.0	0.3	5.5	30.9	25.0	38.3	48.5	985.0	988.3	992.6
6/10/2021	9.9	16.1	24.8	0.0	0.1	3.9	21.8	14.7	41.1	63.1	989.9	992.8	996.0
7/10/2021	12.0	18.8	29.4	0.0	0.5	6.7	22.2	16.6	44.0	74.6	986.4	990.3	996.4
8/10/2021	13.1	16.1	21.0	0.0	0.1	4.6	25.9	50.5	69.6	97.7	995.0	996.9	998.5
9/10/2021	12.2	19.8	29.3	0.0	0.2	4.1	16.1	22.0	62.6	99.3	991.4	994.4	997.3
10/10/2021	14.5	20.3	31.3	3.0	0.2	4.4	17.9	35.0	66.6	100.0	984.4	988.8	992.0
11/10/2021	8.4	10.9	14.5	9.4	0.0	4.9	16.5	100.0	100.0	100.0	990.1	994.7	998.0
12/10/2021	10.1	11.7	14.0	5.6	0.0	2.6	15.0	94.4	99.6	100.0	995.3	996.9	998.3
13/10/2021	11.2	13.5	16.1	10.6	0.1	3.2	12.8	99.4	99.9	100.0	991.3	994.1	997.4
14/10/2021	12.6	17.3	24.6	12.2	0.2	3.6	15.4	63.5	99.6	100.0	981.8	986.3	991.5
15/10/2021	11.7	15.0	18.6	0.8	1.0	6.3	30.2	99.2	100.0	100.0	980.0	982.0	984.0
16/10/2021	11.1	15.3	20.3	0.2	0.2	6.0	26.1	100.0	100.0	100.0	982.1	984.7	990.5
17/10/2021	11.3	15.8	22.6	0.0	0.2	4.5	32.2	45.5	90.6	100.0	990.1	992.8	996.0
18/10/2021	10.3	17.5	25.7	0.0	0.2	3.3	14.9	26.1	73.7	100.0	991.6	994.7	996.9
19/10/2021	11.4	17.0	25.3	0.6	0.0	4.1	21.0	28.6	67.6	100.0	992.4	995.0	998.2
20/10/2021	9.6	14.6	21.6	0.2	0.2	3.8	25.4	41.4	78.1	100.0	995.1	996.7	998.1
21/10/2021	11.7	16.5	21.8	0.0	0.1	4.0	20.2	46.8	81.2	100.0	994.0	996.1	997.9
22/10/2021	12.0	17.3	24.1	0.0	0.0	3.8	22.0	71.6	97.5	100.0	993.4	995.9	997.6
23/10/2021	14.5	21.0	31.6	0.0	0.2	5.9	25.4	32.6	76.5	100.0	986.8	991.9	995.9
24/10/2021	13.0	17.5	24.0	0.0	0.1	5.9	28.8	30.2	74.8	100.0	990.9	993.8	997.2
25/10/2021	11.8	15.7	23.4	0.0	0.2	4.2	21.0	21.6	67.2	100.0	992.6	995.4	998.4
26/10/2021	9.8	15.3	22.6	0.0	0.0	4.0	30.1	33.7	73.6	99.5	995.6	998.3	1000.0
27/10/2021	13.1	19.0	28.1	0.0	0.0	4.0	20.2	27.6	73.9	99.2	992.2	996.3	999.8
28/10/2021	14.7	22.4	31.0	0.0	0.1	3.4	14.8	15.2	56.7	99.6	986.9	990.6	995.1
29/10/2021													
30/10/2021													
31/10/2021	8.5	14.6	20.3	0.0	0.1	3.4	20.2	39.5	63.5	93.8	1001.7	1003.6	1006.1
Monthly	**8.4**	**16.8**	**31.6**	**43.0**	**0.0**	**4.4**	**32.2**	**14.7**	**73.9**	**100.0**	**978.6**	**991.9**	**1006.1**

29/10/2021 - 30/10/2021 data was flat lining and met sensor needed to be power cycled, but unit eventually recovered

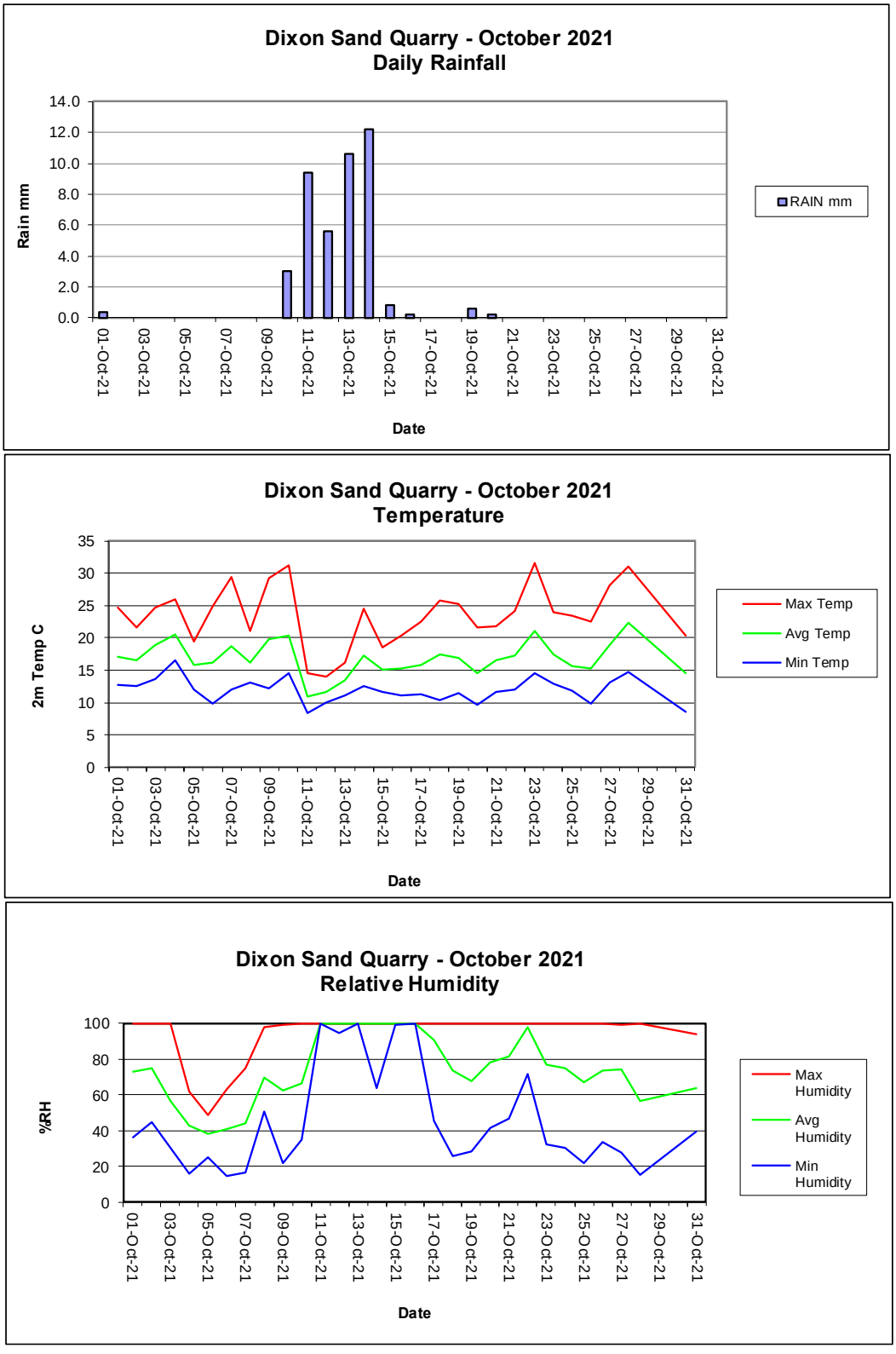


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

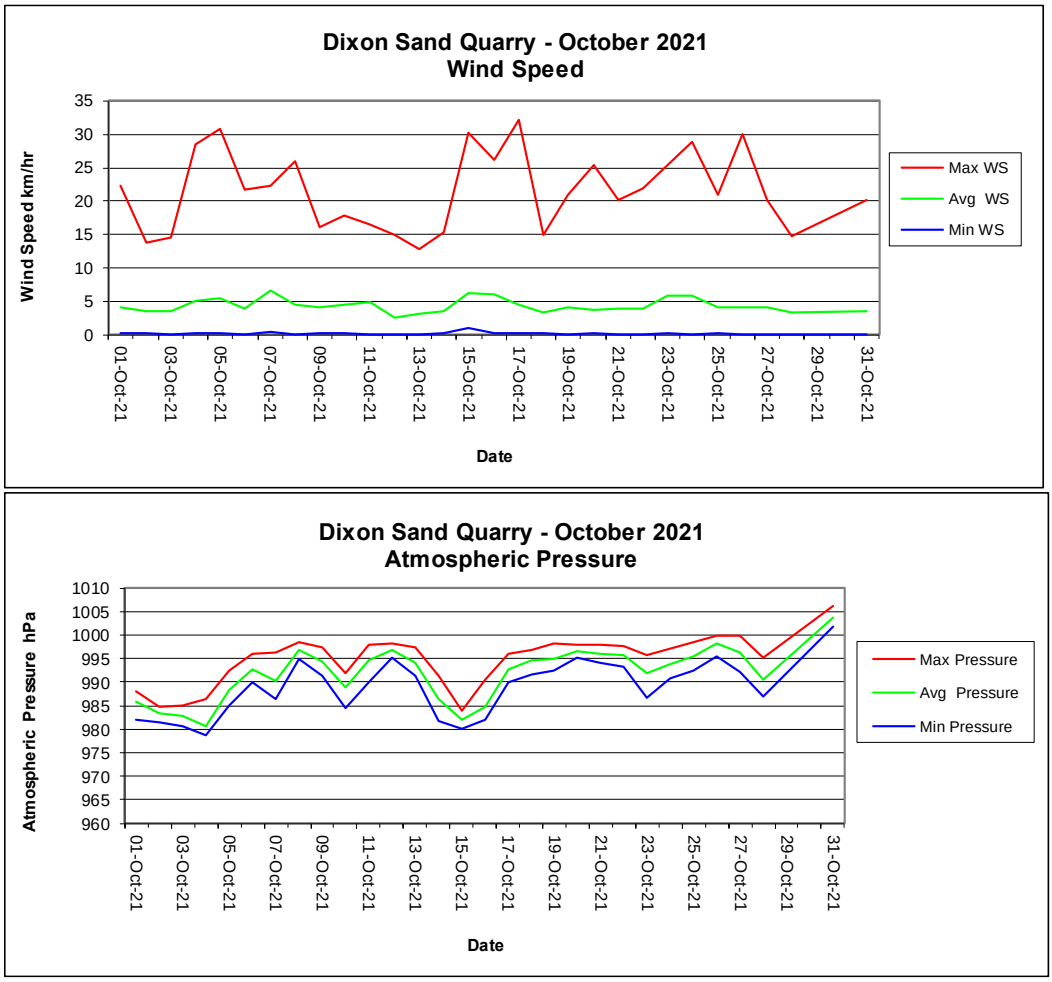
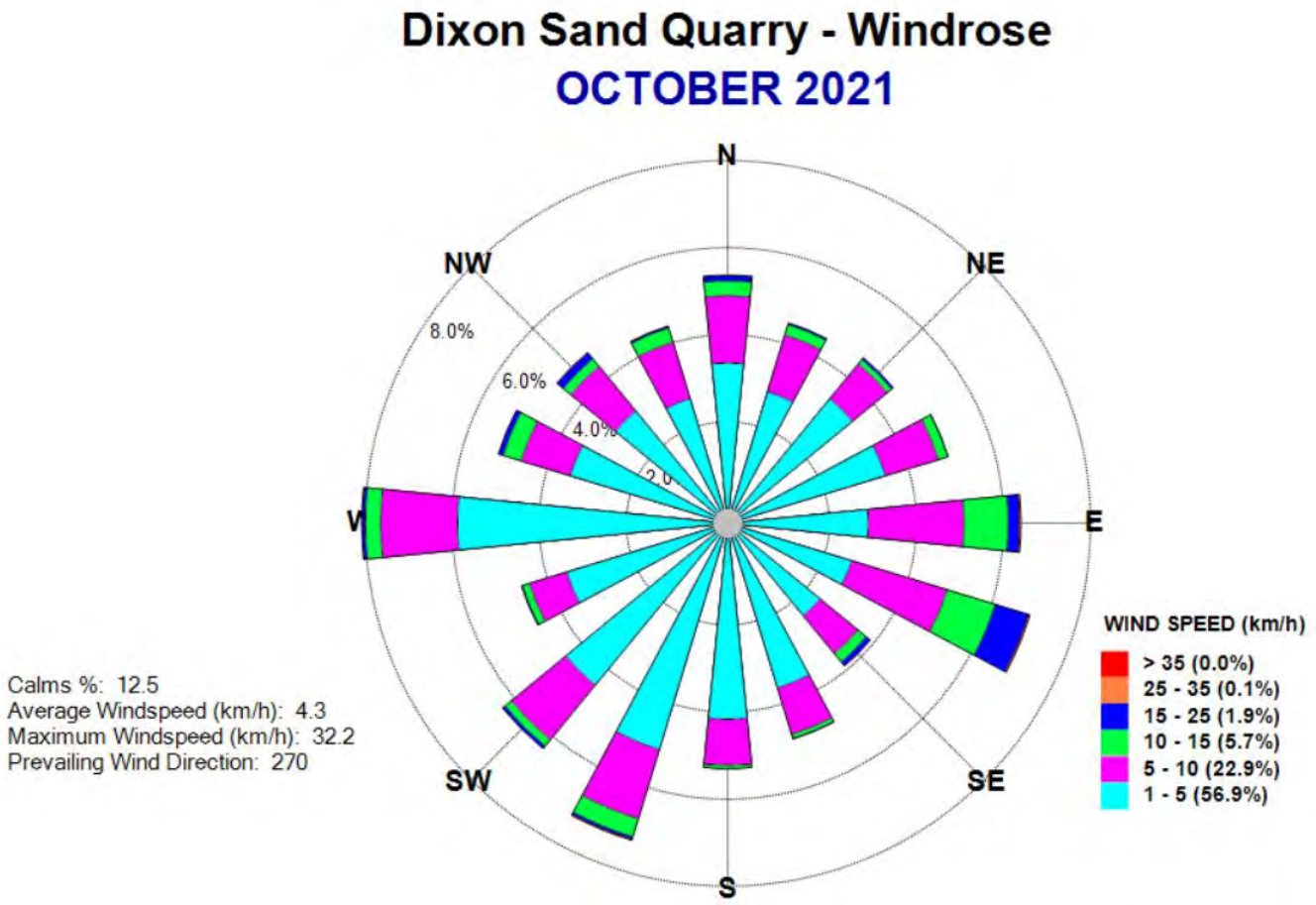


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
OCTOBER 2021
N
NE
E
SE
S
SW
W
NW
8.0%
6.0%
4.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.1%)
15 - 25 (1.9%)
10 - 15 (5.7%)
5 - 10 (22.9%)
1 - 5 (56.9%)
Calms %: 12.5
Average Windspeed (km/h): 4.3
Maximum Windspeed (km/h): 32.2
Prevailing Wind Direction: 270

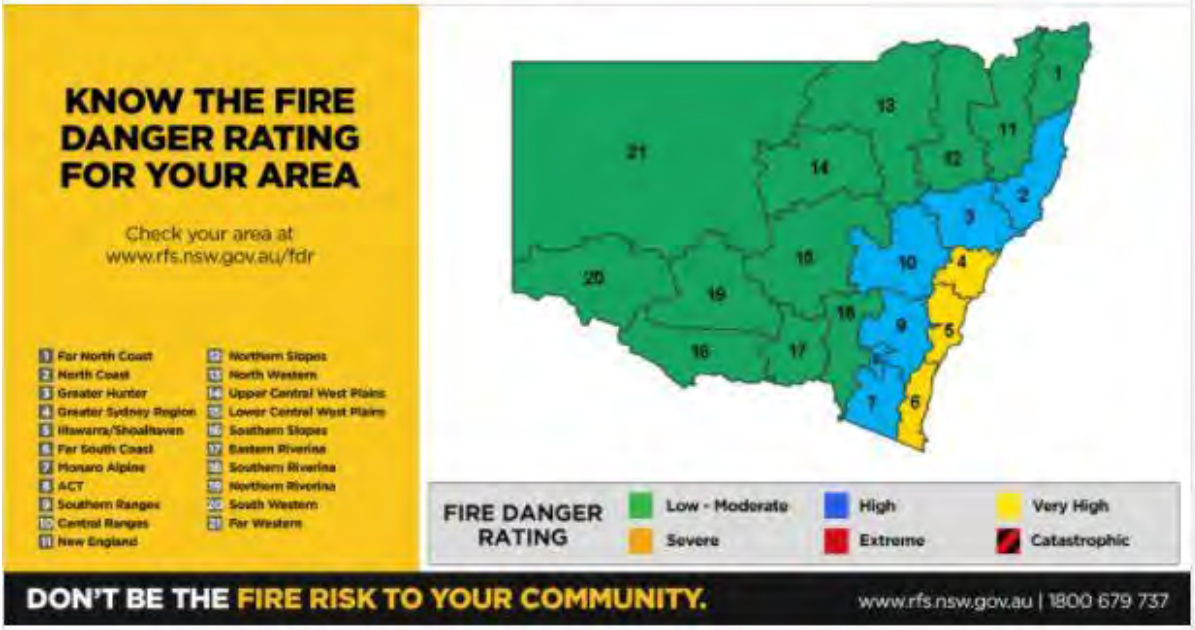
Appendix 1

Calibration Documents (when required)

NSW Rural Fire Service

Favourites · 28 October at 16:29 ·

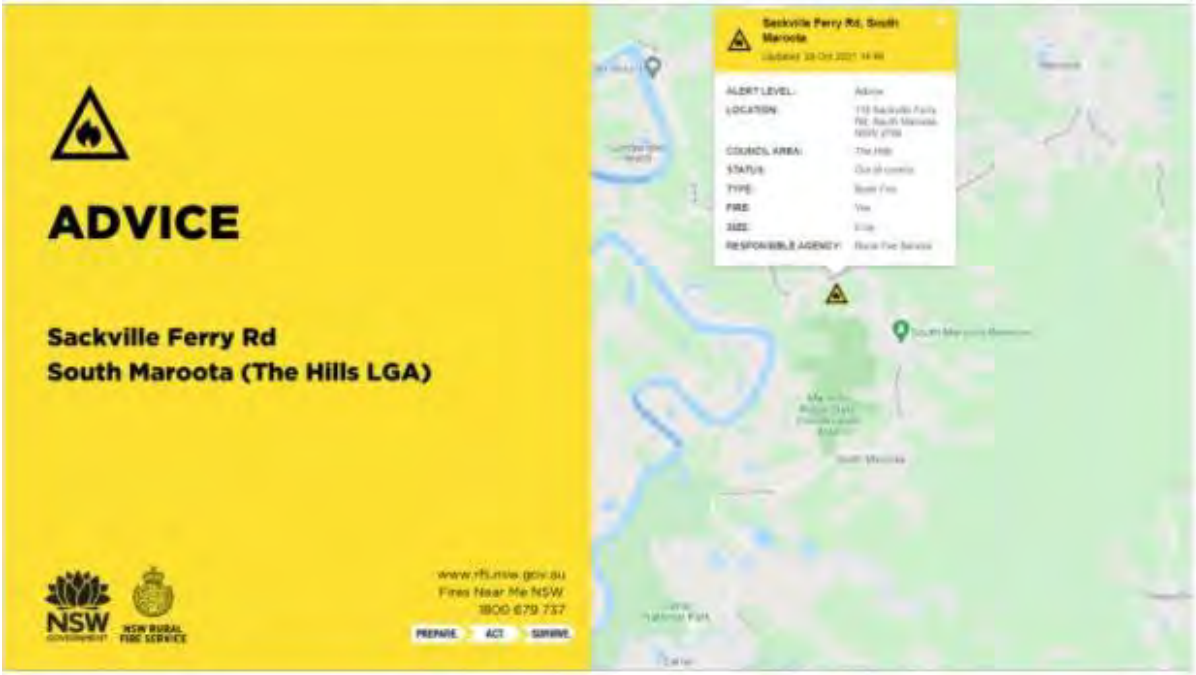
Warm and windy conditions forecast for tomorrow, 29 October, will result in elevated fire danger for parts of NSW. Fire permits will be suspended for areas with Very High Fire Danger ratings. If you have conducted a burn over previous days please check to ensure that it is extinguished and safe. Report unattended fires to Triple Zero (000).



NSW Rural Fire Service

Favourites · 29 October at 15:20 ·

ADVICE: Sackville Ferry Rd Fire, South Maroota. #NSWRFS firefighters are on scene at a bush fire burning near Sackville Ferry Rd at South Maroota. A water bombing helicopter has been sent to assist firefighters. Currently no homes are at threat.



Australian Government
Bureau of Meteorology

Marine Wind Warning Summary

IDN20400

Australian Government Bureau of Meteorology
New South Wales

Marine Wind Warning Summary for New South Wales

Issued at 4:05 pm EDT on Friday 29 October 2021
for the period until midnight EDT Saturday 30 October 2021.

Wind Warnings for Friday 29 October

Gale Warning for the following areas:
Batemans Coast and Eden Coast

Strong Wind Warning for the following areas:
Sydney Enclosed Waters, Byron Coast, Hunter Coast, Sydney Coast and Illawarra Coast

Wind Warnings for Saturday 30 October

Gale Warning for the following areas:
Batemans Coast and Eden Coast

Strong Wind Warning for the following areas:
Macquarie Coast, Hunter Coast, Sydney Coast and Illawarra Coast

The next marine wind warning summary will be issued by 4:10 am EDT Saturday.

Check the latest Coastal Waters Forecast or Local Waters Forecast for information on wind, wave and weather conditions for these coastal zones.

This page was created at **17:46 on Friday 29 October 2021 (AEDT)**

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NSW RURAL FIRE SERVICE

NOTICE OF SCHEDULED HAZARD REDUCTION BURN

We wish to advise you that the proposed Smiths Lane Hazard Reduction, which is in the vicinity of Cattai Ridge Road and Smith Lane Glenorie (see map overleaf) has been scheduled, subject to weather conditions, for this:

Saturday 09 October 2021.

This will consist of prescribed burning of vegetation to reduce the bush fire fuel and assist in reducing the intensity and adverse impact of bush fires in extreme weather conditions. The prescribed burn will be undertaken by the NSW Rural Fire Service.

Should weather conditions be unfavourable to complete the prescribed burn, ***this notice will remain valid for 4 weeks*** and will go ahead as soon as weather permits.

As the prescribed burn will generate smoke, hot embers and heat, it is important that you consider the following:

- **IMPORTANT**: If you have electronically operated or locked gates please leave them open on the day of the HR so that crews can access the area if and when needed;
- Keep doors and windows closed to prevent smoke entering homes;
- Keep outdoor furniture under cover to prevent ember burns;
- Retract pool covers to prevent ember damage;
- Remove washing from clothes lines;
- Ensure pets have a protected area;
- If you are driving a vehicle, slow down, keep windows up and turn headlights on; and
- If you have asthma or a lung condition, reduce outdoor activities. If smoke levels are high and if shortness of breath or coughing develops, take your reliever medicine or seek medical advice

Should any further information be required, please contact The Hills District Office on 02 9654 1244. You can also obtain additional information on prescribed burning and property preparedness by accessing the NSW Rural Fire Service website at www.rfs.nsw.gov.au.

Thank you for your cooperation,

District Officer

Postal address
The Hills District Rural Fire Service
PO Box 35
KENTHURST NSW 2156

Street address
The Hills District Rural Fire Service
1A Angus Road
KENTHURST NSW 2156

www.rfs.nsw.gov.au
T (02) 9654 1244
F (02) 9654 2268
E thehills.foc@rfs.nsw.gov.au

Keep doors and windows closed to prevent smoke entering homes
Keep outdoor furniture under cover to prevent ember burns
Retract pool covers to prevent ember damage
Remove washing from clotheslines
Ensure pets have a protected area
Vehicles must slow down, keep windows up, turn headlights on
Sightseers must keep away from burns for their own safety
If you have asthma or a lung condition, reduce outdoor activities if smoke levels are high and if shortness of breath or coughing develops, take your reliever medicine or seek medical advice

For health information relating to smoke from bush fires and hazard reduction burning, visit the NSW Health website (http://www.health.nsw.gov.au/environment/factsheets/Pages/bushfire-smoke.aspx) or the Asthma Foundation (http://www.asthmafoundation.org.au/Bushfires.aspx).

The following hazard reduction burns are planned by NSW land managers (such as National Parks and Wildlife Service, Forestry Corporation NSW, Crown Lands and Local Government Authorities) and fire agencies (NSW Rural Fire Service and Fire and Rescue NSW) over coming days, weather permitting.

Hazard Reduction Events

Due Date	11/10/2021 to 25/10/2021
LGA	Coffs Harbour
Location	ORARA WAY NANA GLEN
Tenure	Private
HR By	Private, NSW Rural Fire Service
Size	8.11 ha
Due Date	11/10/2021 to 18/10/2021
LGA	Tenterfield
Location	
Tenure	Local Govt
HR By	Tenterfield, NSW Rural Fire Service
Size	2.81 ha
Due Date	11/10/2021 to 04/11/2021
LGA	Mid-Coast
Location	TAMWORTH STREET
Tenure	Private
HR By	Private, NSW Rural Fire Service
Size	8.91 ha

Last update:
11/10/2021 at 8:30 AM

Use My Location

View all events in table view

Scheduled burns

Hazard Reduction

Hazard reduction is just one way of preparing for bush fires – it doesn't remove the threat of fire, and it doesn't remove the need for you and your family to be prepared.

There are different types of hazard reduction including controlled burning, mechanical clearing like slashing undergrowth, or even reducing the ground fuel by hand.

You can see a list of planned hazard reduction burns below. This list may change at short notice depending on the weather at the time.

If there is a hazard reduction burn planned for your area, take the following steps:

Due Date	11/10/2021 to 04/11/2021
LGA	Mid-Coast
Location	TAMWORTH STREET
Tenure	Private
HR By	Private, NSW Rural Fire Service
Size	0 ha

Due Date	10/10/2021 to 17/10/2021
LGA	Bellingen
Location	
Tenure	Private
HR By	Private, NSW Rural Fire Service
Size	2.9 ha

Due Date	09/10/2021 to 10/10/2021
LGA	Dubbo
Location	DUNEDOO ROAD DUBBO
Tenure	Other State Govt
HR By	Local Land Services, NSW Rural Fire Service
Size	75.3 ha

Due Date	09/10/2021 to 12/10/2021
LGA	Wollongong
Location	LAURINA CRESCENT
Tenure	National Park
HR By	NSW National Parks and Wildlife Service
Size	11.94 ha

Due Date	09/10/2021 to 10/10/2021
LGA	Wollongong
Location	BOURKE
Tenure	Other State Govt, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, WaterNSW, NSW Rural Fire Service
Size	2.95 ha

Due Date	09/10/2021 to 10/10/2021
LGA	Wollongong
Location	FLAT ROCK
Tenure	Private, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, Private, NSW Rural Fire Service
Size	12.11 ha
Due Date	09/10/2021 to 10/10/2021
LGA	Wollongong
Location	FLAT ROCK
Tenure	Private, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, Private, NSW Rural Fire Service
Size	0 ha

Due Date	09/10/2021 to 10/10/2021
LGA	The Hills
Location	SMITHS LANE AND CATTAI RIDGE RD GLENORIE NSW
Tenure	Private, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, Private, NSW Rural Fire Service
Size	142.15 ha

Due Date	09/10/2021 to 11/10/2021
LGA	Central Coast
Location	MORGANS RD
Tenure	Private, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, Private, NSW Rural Fire Service
Size	98.81 ha

Due Date	09/10/2021 to 10/10/2021
LGA	Mid-Coast
Location	BOOLAMBAYTE
Tenure	Private, National Park, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, Private, NSW National Parks and Wildlife Service
Size	57.27 ha

Due Date	09/10/2021 to 11/10/2021
LGA	Dubbo
Location	CWST-BURKS HR-LMZ-GOONOO NP
Tenure	National Park
HR By	NSW National Parks and Wildlife Service
Size	27.38 ha

Due Date	09/10/2021 to 11/10/2021
LGA	Dubbo
Location	CWST-BURKS HR-LMZ-GOONOO NP
Tenure	National Park
HR By	NSW National Parks and Wildlife Service
Size	667.9 ha

Due Date	09/10/2021 to 13/10/2021
LGA	Ryde
Location	MARS CREEK
Tenure	Private, National Park
HR By	Private, NSW National Parks and Wildlife Service
Size	20.58 ha

Due Date	08/10/2021 to 14/10/2021
LGA	Wingecarribee
Location	FITZROY FALLS OFFICE
Tenure	National Park
HR By	NSW National Parks and Wildlife Service
Size	0.91 ha

Due Date	08/10/2021 to 12/10/2021
LGA	Ku-ring-gai, Ryde
Location	BLAXLAND RD
Tenure	National Park
HR By	NSW National Parks and Wildlife Service
Size	13 ha

Due Date	07/10/2021 to 15/10/2021
LGA	Cootamundra-Gundagai
Location	ARTC MAIN SOUTHERN RAIL LINE, OLYMPIC WAY TO DIRNASEER RD, FRAMPTON
Tenure	Other State Govt, Crown Land
HR By	Department of Planning, Industry & Environment - Crown Lands, NSW Trains, NSW Rural Fire Service
Size	102.51 ha

Due Date	17/10/2021 to 18/10/2021
LGA	Clarence Valley
Location	SHERWOOD ROAD SHERWOOD
Tenure	Private
HR By	Private, NSW Rural Fire Service
Size	19.2 ha

Fire information (https://www.rfs.nsw.gov.au/fire-information)

Fires Near Me (https://www.rfs.nsw.gov.au/fire-information/fires-near-me)

Major Fire Updates (https://www.rfs.nsw.gov.au/fire-information/major-fire-updates)

Hazard Reductions (https://www.rfs.nsw.gov.au/fire-information/hazard-reductions)

Smoke from hazard reduction (https://www.rfs.nsw.gov.au/fire-information/hazard-reductions/smoke-from-hazard-reduction)

Managing smoke and its impact on the community (https://www.rfs.nsw.gov.au/fire-information/hazard-reductions/managing-smoke-and-its-impact-on-the-community)

Fire Danger Ratings and Total Fire Bans (https://www.rfs.nsw.gov.au/fire-information/fdr-and-tobans)

Bush Fire Danger Period and Fire Permits (https://www.rfs.nsw.gov.au/fire-information/BFDP)

Prevent bush fire arson (https://www.rfs.nsw.gov.au/fire-information/prevent-bush-fire-arson)

Report a cigarette butt tosser (https://www.rfs.nsw.gov.au/fire-information/cigarette-form)

Emergency information (https://www.rfs.nsw.gov.au/fire-information/emergency-information)

(HTTPS://WWW.RF
AND-
MEDIA/STAY-
UP-
TO-
(HTTPS://WWW.

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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NOVEMBER 2021

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 20 December 2021

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for November 2021 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for November 2021.

Approximately 100% of TEOM data was recovered for November 2021.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in September 2021 with the next calibration due to be completed in December 2021. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for November 2021 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/11/2021	16.5	14.3	41.3	35.8
2/11/2021	13.6	14.3	34.0	35.8
3/11/2021	14.0	14.3	35.0	35.8
4/11/2021	16.0	14.3	40.0	35.8
5/11/2021	8.8	14.3	22.0	35.7
6/11/2021	9.8	14.2	24.5	35.6
7/11/2021	10.2	14.2	25.5	35.5
8/11/2021	7.5	14.2	18.8	35.4
9/11/2021	11.7	14.1	29.3	35.4
10/11/2021	13.4	14.1	33.5	35.3
11/11/2021	9.9	14.1	24.8	35.3
12/11/2021	14.3	14.1	35.8	35.3
13/11/2021	6.2	14.0	15.5	35.1
14/11/2021	5.7	14.0	14.3	35.0
15/11/2021	13.4	14.0	33.5	35.0
16/11/2021	12.2	14.0	30.5	34.9
17/11/2021	14.6	14.0	36.5	34.9
18/11/2021	17.7	14.0	44.3	35.0
19/11/2021	19.6	14.0	49.0	35.1
20/11/2021	21.8	14.1	54.5	35.2
21/11/2021	4.3	14.0	10.8	35.1
22/11/2021	10.8	14.0	27.0	35.0
23/11/2021	7.9	14.0	19.8	34.9
24/11/2021	19.7	14.0	49.3	35.0
25/11/2021	8.9	14.0	22.3	34.9
26/11/2021	5.1	13.9	12.7	34.8
27/11/2021	11.3	13.9	28.3	34.7
28/11/2021	16.3	13.9	40.8	34.8
29/11/2021	19.7	13.9	49.3	34.9
30/11/2021	15.3	14.0	38.3	34.9

*Calculated from PM10

**Calculated from PM10 Annual Average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m^3 are highlighted in yellow

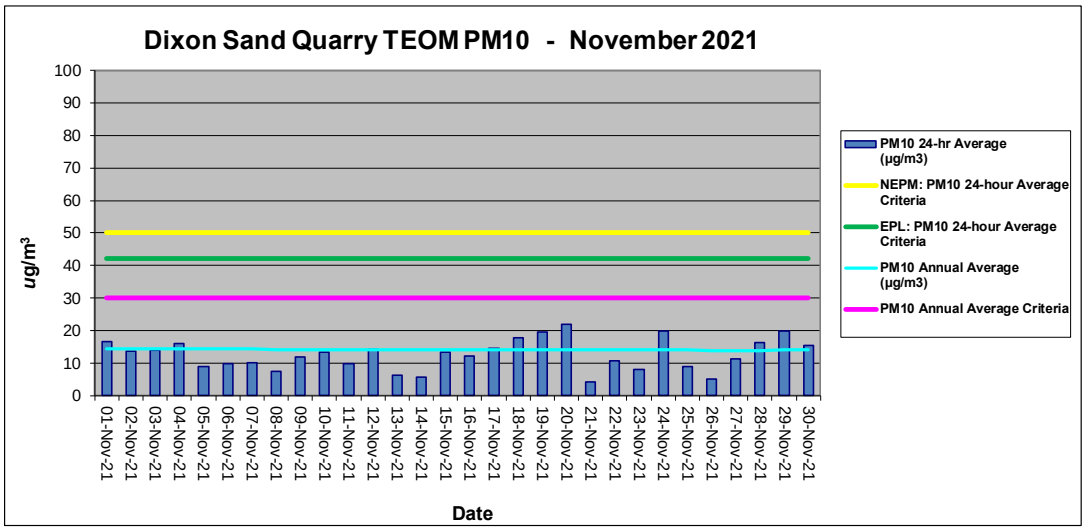


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for November 2021

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/11/2021	11.6	17.0	22.7	0.0	0.0	3.5	15.7	40.2	67.2	89.9	1002.4	1004.1	1005.8
2/11/2021	13.5	18.2	22.9	0.0	0.2	6.3	29.0	50.5	74.0	99.3	1003.3	1005.3	1007.0
3/11/2021	14.2	18.8	24.1	0.0	0.1	4.9	18.7	38.8	69.3	99.2	1000.4	1003.4	1006.5
4/11/2021	15.8	16.8	18.2	6.4	0.1	2.6	11.3	75.4	94.0	100.0	999.0	1000.4	1001.9
5/11/2021	15.8	17.3	20.9	16.2	0.0	3.5	17.2	68.4	93.7	100.0	997.2	999.0	1000.9
6/11/2021	13.9	18.9	26.2	0.8	0.1	4.0	22.1	42.6	85.4	100.0	988.8	992.8	998.0
7/11/2021	16.6	18.2	22.0	14.6	0.4	3.7	14.4	67.7	95.7	100.0	985.5	988.5	990.5
8/11/2021	16.2	18.8	24.9	12.0	0.0	3.5	18.2	52.1	90.6	100.0	986.3	988.2	991.4
9/11/2021	16.2	19.1	24.6	0.2	0.0	4.3	23.2	50.5	87.4	100.0	989.3	991.1	993.0
10/11/2021	15.9	17.5	19.0	18.8	0.0	2.5	15.0	99.3	99.9	100.0	984.6	987.9	991.4
11/11/2021	13.2	16.4	19.8	18.2	0.0	3.4	14.4	99.3	100.0	100.0	982.9	984.7	986.5
12/11/2021	10.7	16.9	26.3	5.2	0.5	6.0	37.2	41.4	84.6	100.0	972.7	977.8	983.8
13/11/2021	13.2	15.6	17.5	0.0	0.5	7.3	31.7	45.5	87.3	100.0	978.2	980.3	986.7
14/11/2021	10.7	14.7	21.0	0.2	0.1	4.8	21.7	32.4	73.4	100.0	983.5	986.4	988.4
15/11/2021	11.9	15.6	21.1	0.2	0.1	5.9	25.0	52.0	93.4	99.7	984.9	987.9	992.9
16/11/2021	11.0	14.7	20.7	0.0	0.0	4.0	19.4	55.7	89.6	100.0	992.0	995.8	1002.1
17/11/2021	10.6	15.3	20.0	0.0	0.0	4.0	22.4	51.8	77.1	100.0	999.9	1001.9	1003.9
18/11/2021	12.8	19.2	26.5	0.0	0.0	3.6	19.9	33.2	72.7	100.0	992.9	997.5	1001.9
19/11/2021	16.7	21.6	26.2	0.0	0.1	4.9	17.5	45.8	63.1	100.0	990.0	991.9	994.0
20/11/2021	15.3	17.7	21.8	0.8	0.1	3.3	22.0	96.6	99.6	100.0	989.1	991.2	994.8
21/11/2021	13.8	14.5	15.4	22.0	0.2	4.0	11.1	100.0	100.0	100.0	993.0	995.5	999.2
22/11/2021	13.5	15.4	18.9	2.2	0.1	4.2	12.3	73.9	99.3	100.0	998.5	1000.5	1002.3
23/11/2021	14.4	17.1	21.0	4.0	0.0	2.6	12.8	99.3	100.0	100.0	997.1	999.4	1001.5
24/11/2021	16.8	20.4	27.5	4.0	0.0	3.1	16.9	100.0	100.0	100.0	992.2	995.3	998.9
25/11/2021	18.9	21.1	24.6	3.4	0.1	3.1	11.6	99.4	100.0	100.0	985.9	989.5	993.8
26/11/2021	13.9	16.3	21.0	32.6	0.2	5.5	19.2	100.0	100.0	100.0	986.0	989.9	994.5
27/11/2021	12.8	13.8	15.7	14.0	0.6	5.7	17.7	100.0	100.0	100.0	994.1	997.8	1001.2
28/11/2021	12.5	14.6	18.4	0.0	0.3	4.2	12.6	73.1	97.2	100.0	999.8	1001.0	1002.5
29/11/2021	12.5	16.4	20.5	0.0	0.1	3.2	11.8	99.3	100.0	100.0	996.8	999.1	1001.1
30/11/2021	15.9	18.3	21.5	0.0	0.0	2.5	10.9	99.2	100.0	100.0	995.3	996.9	998.8
Monthly	**10.6**	**17.2**	**27.5**	**175.8**	**0.0**	**4.1**	**37.2**	**32.4**	**89.8**	**100.0**	**972.7**	**994.0**	**1007.0**

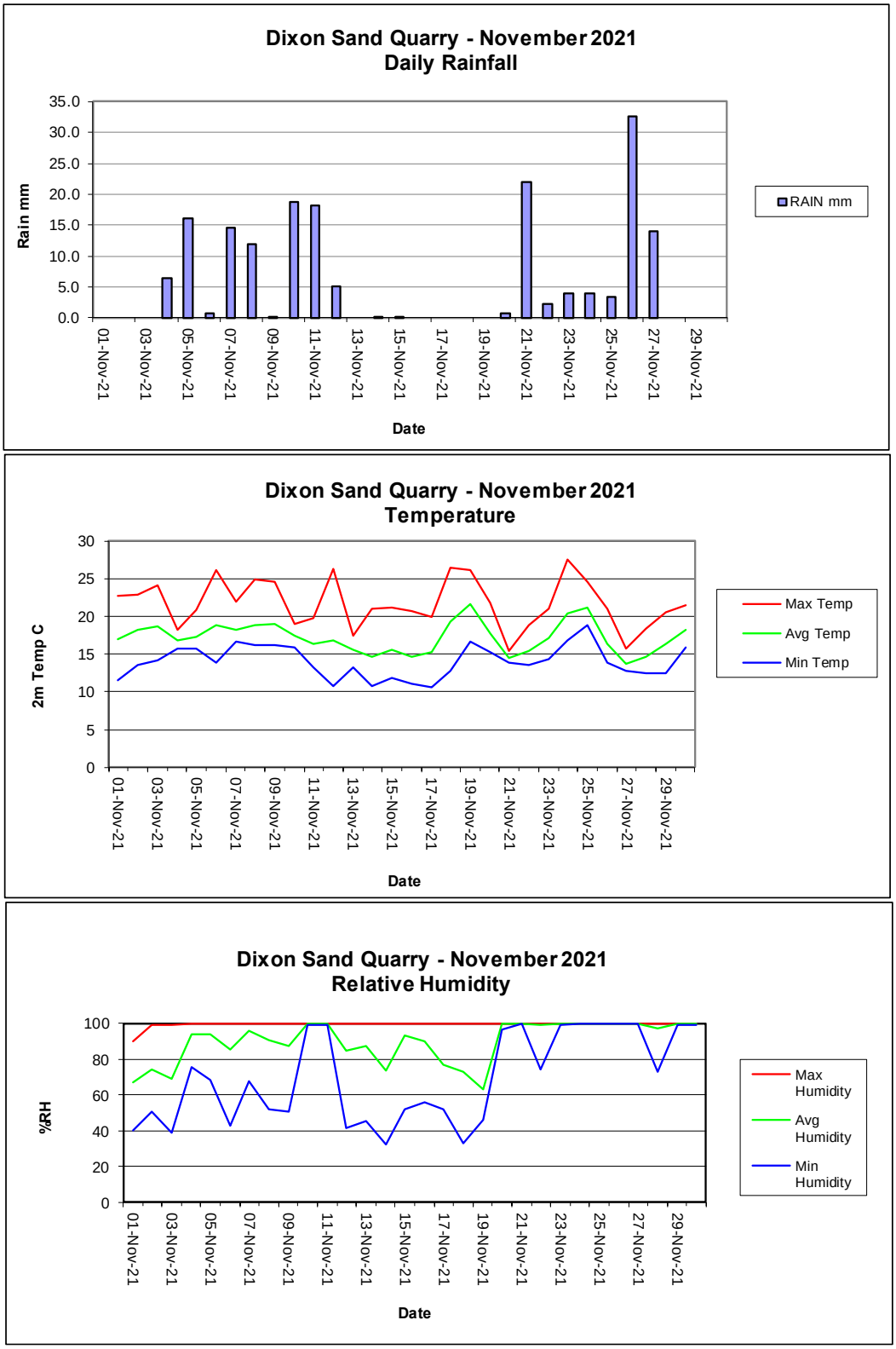


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

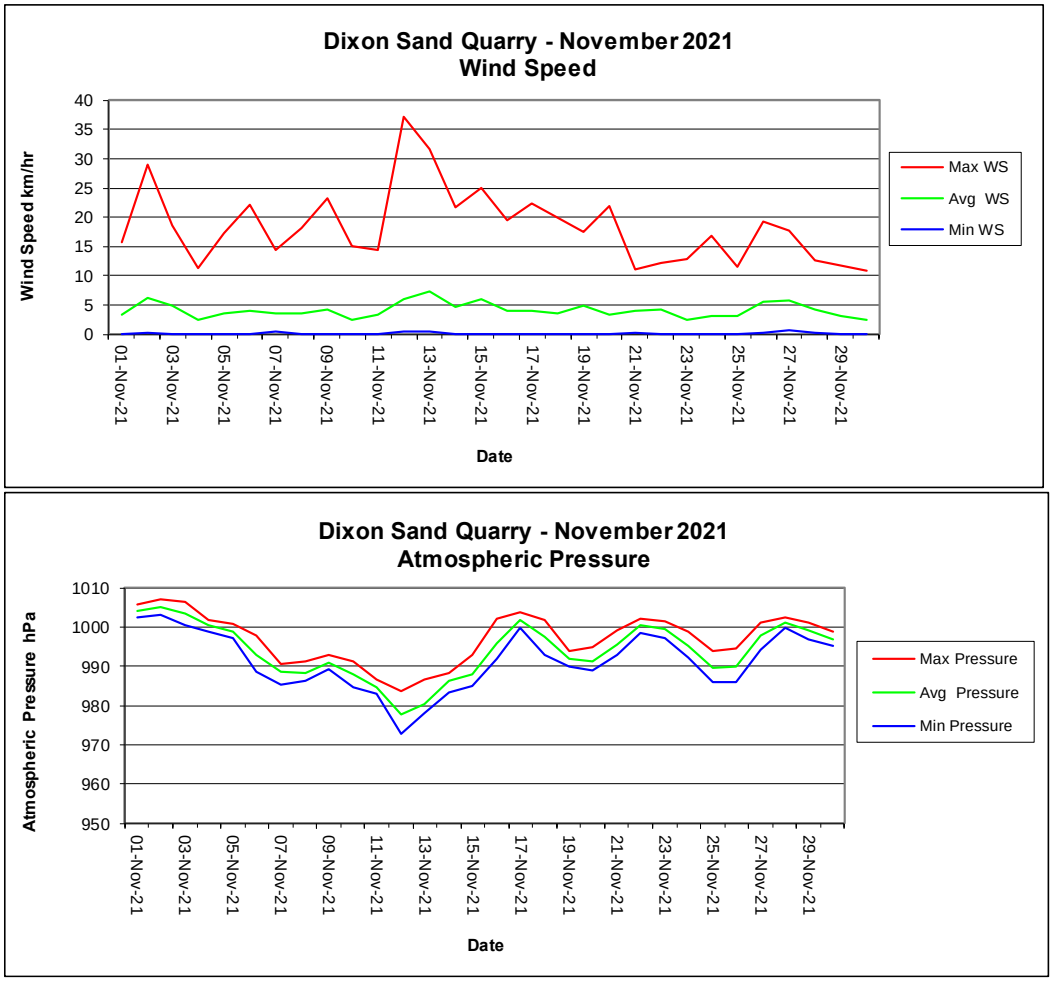
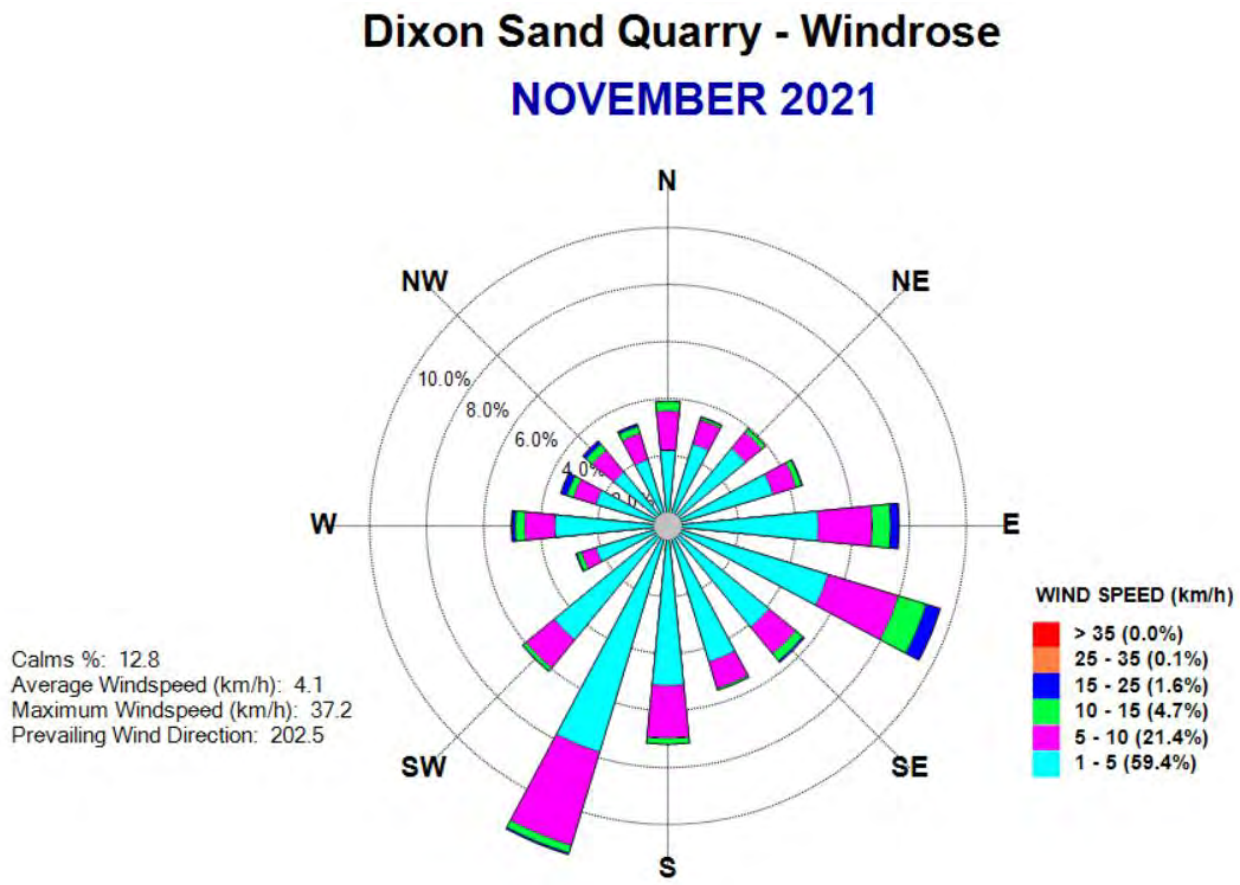


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
NOVEMBER 2021
N
NE
E
SE
S
SW
W
NW
10.0%
8.0%
6.0%
4.0%
Calms %: 12.8
Average Windspeed (km/h): 4.1
Maximum Windspeed (km/h): 37.2
Prevailing Wind Direction: 202.5
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.1%)
15 - 25 (1.6%)
10 - 15 (4.7%)
5 - 10 (21.4%)
1 - 5 (59.4%)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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DECEMBER 2021

Colin Davies BSc MEIA CEnvP
Environmental Scientist
Date: 20 January 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

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CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

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- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for December 2021 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for December 2021.

Approximately 100% of TEOM data was recovered for December 2021.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

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TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted on 9 December 2021 with the next calibration due to be completed in March 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for December 2021 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/12/2021	8.0	13.9	20.0	34.8
2/12/2021	11.0	13.9	27.5	34.7
3/12/2021	18.6	13.9	46.5	34.8
4/12/2021	17.3	13.9	43.3	34.9
5/12/2021	10.4	13.9	26.0	34.8
6/12/2021	17.7	13.9	44.3	34.9
7/12/2021	14.0	13.9	35.0	34.9
8/12/2021	11.9	13.9	29.8	34.8
9/12/2021	No Valid Data	13.9	No Valid Data	34.8
10/12/2021	No Valid Data	13.9	No Valid Data	34.8
11/12/2021	6.3	13.9	15.8	34.7
12/12/2021	10.7	13.9	26.8	34.7
13/12/2021	15.9	13.9	39.8	34.7
14/12/2021	19.7	13.9	49.3	34.8
15/12/2021	14.9	13.9	37.3	34.8
16/12/2021	19.4	14.0	48.5	34.9
17/12/2021	17.9	14.0	44.8	34.9
18/12/2021	17.9	14.0	44.8	35.0
19/12/2021	10.2	14.0	25.5	35.0
20/12/2021	17.8	14.0	44.5	35.0
21/12/2021	19.5	14.0	48.8	35.1
22/12/2021	22.7	14.1	56.8	35.2
23/12/2021	16.1	14.1	40.3	35.2
24/12/2021	11.7	14.1	29.3	35.2
25/12/2021	10.1	14.1	25.3	35.2
26/12/2021	12.5	14.1	31.3	35.1
27/12/2021	11.5	14.0	28.8	35.1
28/12/2021	7.0	14.0	17.5	35.0
29/12/2021	8.3	14.0	20.8	34.9
30/12/2021	7.9	13.9	19.8	34.8
31/12/2021	9.4	13.9	23.5	34.8

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – regularly scheduled calibration conducted 9-10 December 2021

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 are highlighted in yellow

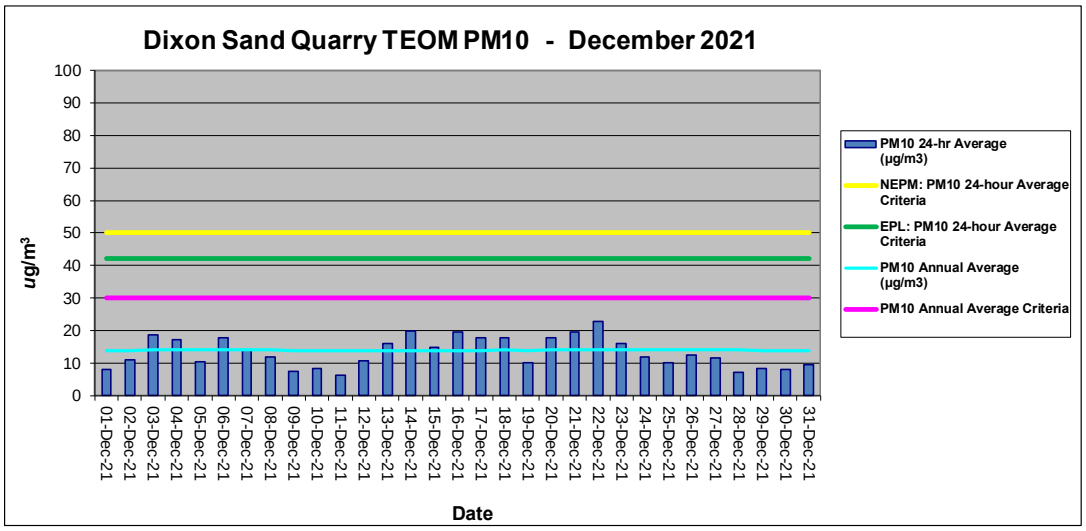


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for December 2021

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/12/2021	17.8	20.5	24.7	0.2	0.2	3.6	12.5	65.3	95.6	100.0	993.9	995.2	996.7
2/12/2021	17.1	21.1	27.3	0.0	0.1	3.6	19.9	74.0	97.8	100.0	994.0	995.9	997.6
3/12/2021	17.3	21.0	31.3	5.8	0.0	4.8	26.3	100.0	100.0	100.0	993.1	994.7	996.4
4/12/2021	15.2	17.7	21.0	1.8	0.1	3.2	11.3	79.6	98.2	100.0	992.5	994.4	999.1
5/12/2021	13.4	15.0	16.9	2.6	0.1	3.7	20.0	97.5	99.7	100.0	998.7	1000.7	1002.5
6/12/2021	12.6	16.8	20.0	0.2	0.0	2.3	10.9	99.3	99.5	99.9	995.2	998.1	1001.9
7/12/2021	15.5	19.0	28.9	12.2	0.1	3.5	16.9	41.9	92.7	100.0	988.8	991.6	995.4
8/12/2021	15.1	16.8	18.8	12.4	0.0	3.5	22.3	93.5	99.4	100.0	989.6	992.7	994.9
9/12/2021	14.8	17.6	24.2	42.4	0.0	3.8	23.0	93.2	99.9	100.0	986.1	989.0	993.5
10/12/2021	11.0	15.2	19.7	11.2	0.4	3.9	17.9	99.7	100.0	100.0	985.5	987.5	991.9
11/12/2021	14.0	16.2	19.5	0.2	1.0	5.6	19.8	99.6	100.0	100.0	991.5	994.5	998.0
12/12/2021	11.8	16.6	23.0	0.0	0.5	5.2	18.8	81.5	99.9	100.0	994.8	996.7	998.5
13/12/2021	13.0	18.1	26.0	0.0	0.0	4.0	23.9	60.9	99.5	100.0	992.1	994.8	997.1
14/12/2021	13.8	19.3	26.5	0.0	0.0	3.6	18.1	99.7	100.0	100.0	992.7	994.0	995.6
15/12/2021	15.0	22.7	32.6	0.0	0.4	4.5	21.0	30.1	92.4	100.0	987.9	991.7	994.2
16/12/2021	17.1	19.9	25.3	0.0	0.1	4.3	23.8	73.7	99.4	100.0	990.1	993.1	997.8
17/12/2021	16.1	19.8	25.1	0.0	0.2	4.3	18.9	60.8	92.0	100.0	993.2	996.2	998.4
18/12/2021	17.1	26.4	35.9	0.0	0.2	5.8	22.9	39.9	96.2	100.0	988.8	992.5	995.8
19/12/2021	19.6	24.8	32.9	2.8	0.5	6.7	34.0	38.1	92.0	100.0	986.9	990.2	995.2
20/12/2021	19.4	24.0	30.1	0.2	0.2	4.5	20.2	53.6	79.8	100.0	990.2	992.0	994.0
21/12/2021	20.1	24.9	35.1	0.0	0.0	4.1	19.1	44.5	94.6	100.0	987.9	990.8	993.1
22/12/2021	20.2	22.5	28.8	0.0	0.2	4.7	24.1	59.9	89.3	100.0	989.5	991.2	993.3
23/12/2021	17.9	21.3	26.4	0.6	0.0	2.6	10.7	55.2	93.3	100.0	989.0	991.7	993.2
24/12/2021	18.8	21.9	27.0	0.0	0.0	4.6	22.0	60.9	91.0	100.0	991.4	993.5	995.4
25/12/2021	19.0	23.9	31.4	0.0	0.0	3.9	21.3	35.5	82.2	100.0	991.0	993.3	995.2
26/12/2021	17.4	21.7	27.8	0.2	0.0	3.7	18.7	85.9	99.3	100.0	991.9	993.6	996.0
27/12/2021	14.9	17.0	21.3	3.4	0.4	4.7	17.1	60.7	89.0	100.0	995.4	997.0	999.1
28/12/2021	13.1	15.5	20.0	12.6	0.1	4.5	26.4	65.1	95.1	100.0	997.7	998.8	1000.2
29/12/2021	12.5	17.1	22.6	0.0	0.2	3.7	13.3	53.5	76.4	100.0	995.9	997.7	999.4
30/12/2021	13.9	19.9	26.3	0.0	0.0	3.1	14.9	46.2	73.0	99.3	993.8	996.2	998.1
31/12/2021	16.2	21.6	27.8	0.0	0.1	4.6	24.6	38.7	71.5	99.2	992.4	994.5	996.3
Monthly	**11.0**	**19.9**	**35.9**	**108.8**	**0.0**	**4.2**	**34.0**	**30.1**	**93.2**	**100.0**	**985.5**	**994.0**	**1002.5**

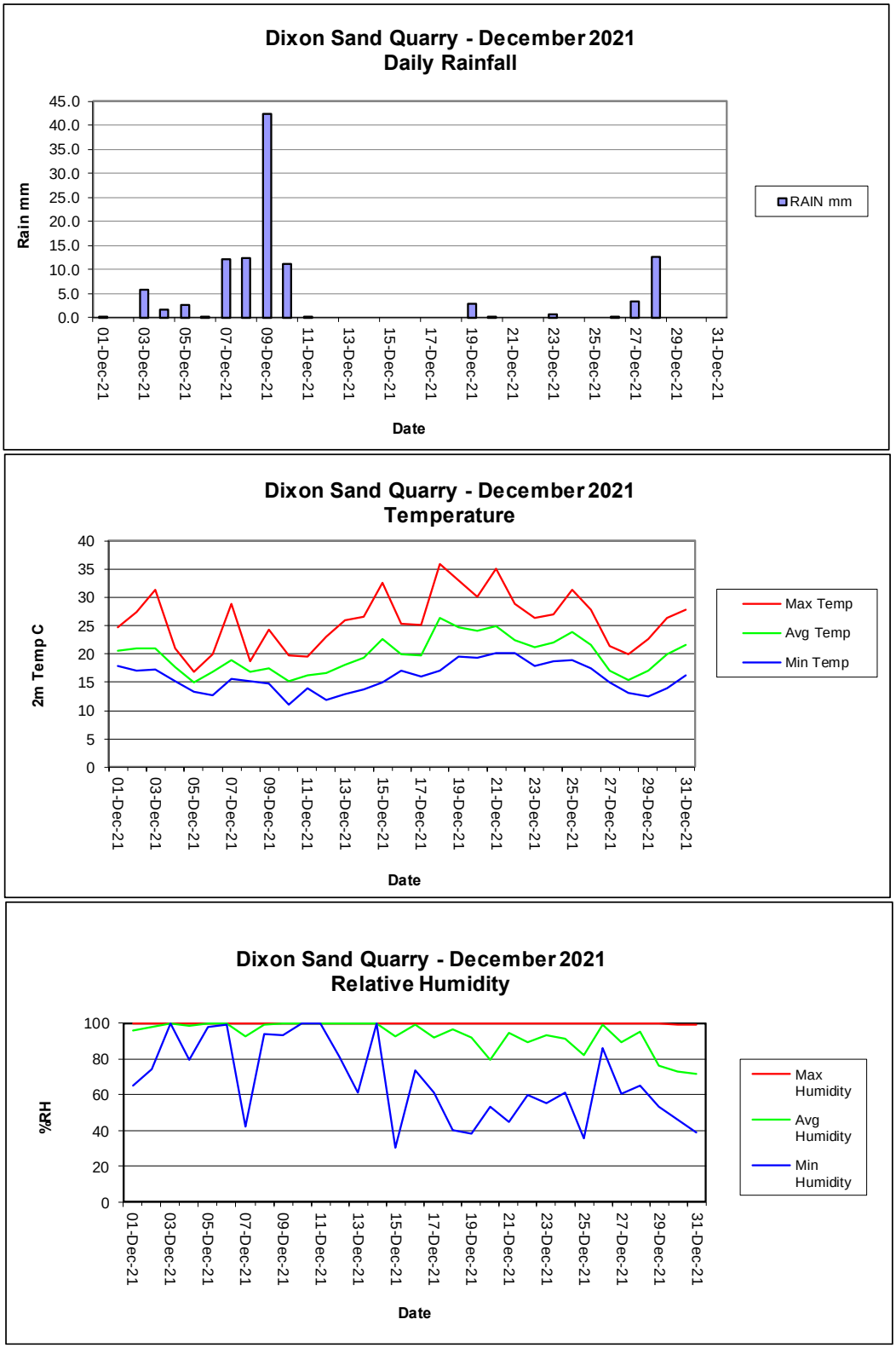


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

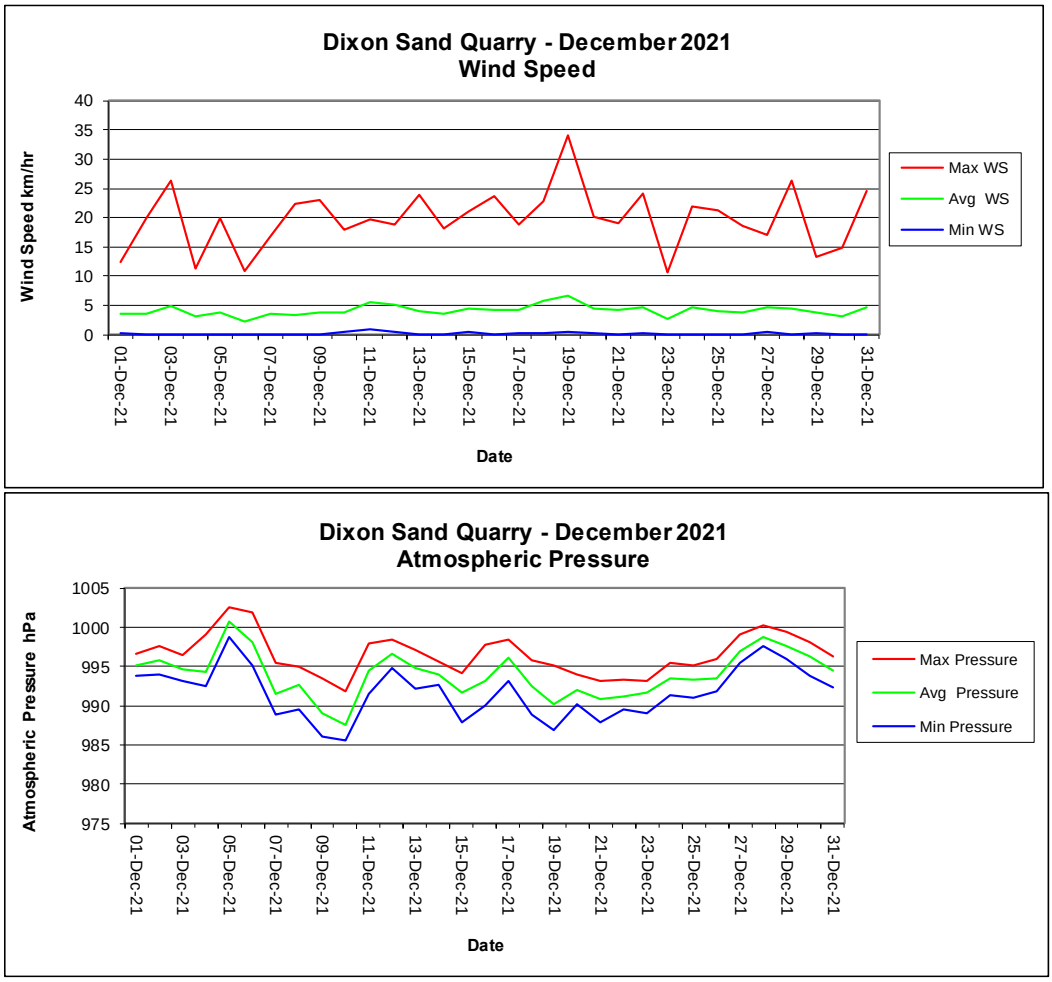
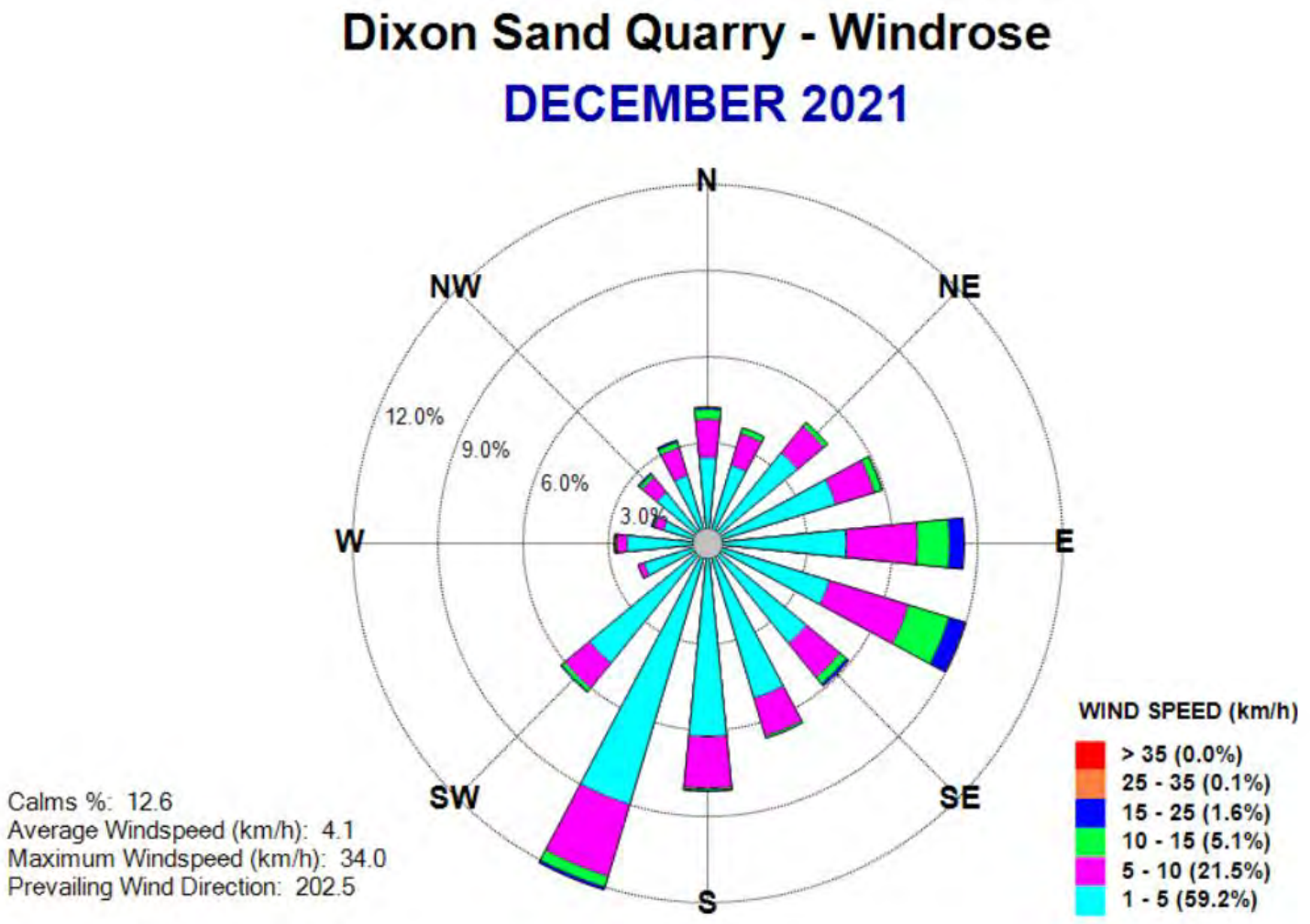


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
DECEMBER 2021
N
NE
E
SE
S
SW
W
NW
12.0%
9.0%
6.0%
3.0%
Calms %: 12.6
Average Windspeed (km/h): 4.1
Maximum Windspeed (km/h): 34.0
Prevailing Wind Direction: 202.5
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.1%)
15 - 25 (1.6%)
10 - 15 (5.1%)
5 - 10 (21.5%)
1 - 5 (59.2%)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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JANUARY 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 23 February 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for January 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results.

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 100% of valid meteorological data was recorded for January 2022.

Approximately 100% of TEOM data was recovered for January 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in December 2021 with the next calibration due to be completed in March 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for January 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/01/2022	13.9	13.9	34.8	34.8
2/01/2022	13.1	13.9	32.8	34.8
3/01/2022	13.8	13.9	34.5	34.8
4/01/2022	17.9	13.9	44.8	34.8
5/01/2022	11.4	13.9	28.5	34.8
6/01/2022	17.4	13.9	43.5	34.8
7/01/2022	20.8	14.0	52.0	34.9
8/01/2022	8.4	13.9	21.0	34.8
9/01/2022	17.0	14.0	42.5	34.9
10/01/2022	18.5	14.0	46.3	34.9
11/01/2022	20.8	14.0	52.0	35.0
12/01/2022	14.3	14.0	35.8	35.0
13/01/2022	9.3	14.0	23.3	35.0
14/01/2022	13.4	14.0	33.5	35.0
15/01/2022	14.3	14.0	35.8	35.0
16/01/2022	20.0	14.0	50.0	35.0
17/01/2022	25.7	14.1	64.3	35.2
18/01/2022	14.4	14.1	36.0	35.2
19/01/2022	12.4	14.1	31.0	35.2
20/01/2022	20.1	14.1	50.3	35.2
21/01/2022	15.9	14.1	39.8	35.3
22/01/2022	10.4	14.1	26.0	35.2
23/01/2022	9.2	14.1	23.0	35.2
24/01/2022	8.3	14.0	20.8	35.1
25/01/2022	17.0	14.1	42.5	35.1
26/01/2022	11.6	14.0	29.0	35.1
27/01/2022	16.5	14.1	41.3	35.1
28/01/2022	14.4	14.1	36.0	35.1
29/01/2022	16.9	14.1	42.3	35.2
30/01/2022	13.8	14.1	34.5	35.2
31/01/2022	12.9	14.1	32.3	35.2

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1 hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

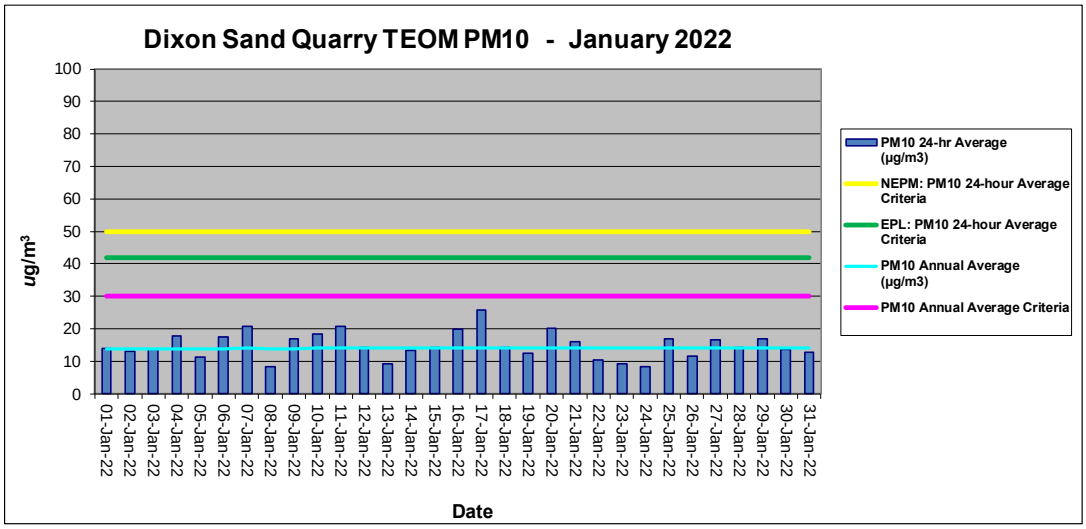

Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in February 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for January 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/01/2022	17.6	21.9	27.2	0.0	0.0	3.4	14.3	51.1	78.5	99.2	989.8	992.4	994.7
2/01/2022	17.9	23.6	30.2	0.0	0.1	4.5	15.4	46.5	73.9	99.4	987.1	989.5	991.5
3/01/2022	18.5	22.4	27.7	0.0	0.0	3.7	16.6	44.6	77.3	99.8	988.7	990.2	991.6
4/01/2022	17.8	21.8	27.1	0.0	0.2	4.1	21.6	52.1	81.8	100.0	989.8	991.0	992.5
5/01/2022	18.3	20.9	24.6	10.0	0.0	4.2	15.9	84.0	98.8	100.0	990.2	991.4	992.5
6/01/2022	20.7	22.3	25.4	7.8	0.1	5.8	22.4	78.7	93.9	100.0	991.1	992.8	994.5
7/01/2022	18.9	23.4	27.3	7.2	0.4	6.0	34.2	74.4	91.8	100.0	988.9	992.0	994.2
8/01/2022	18.6	22.7	31.3	34.6	0.5	5.0	25.4	52.5	85.8	100.0	988.1	990.3	994.4
9/01/2022	19.3	21.1	23.6	1.6	0.1	2.4	8.0	86.1	98.1	100.0	993.0	995.8	997.6
10/01/2022	20.8	23.2	28.2	0.4	0.0	3.9	21.0	72.9	93.1	100.0	996.4	998.0	999.5
11/01/2022	20.9	23.0	27.4	1.8	0.0	2.6	10.3	68.9	94.4	100.0	996.0	998.3	1000.2
12/01/2022	18.0	21.6	27.3	2.2	0.2	3.3	16.9	51.0	87.8	100.0	996.8	998.5	999.9
13/01/2022	17.8	21.0	26.0	0.4	0.1	3.0	11.8	61.1	91.5	100.0	994.3	997.0	999.5
14/01/2022	18.8	22.7	28.4	0.0	0.0	3.0	15.2	57.0	88.3	100.0	987.5	990.3	994.7
15/01/2022	19.3	24.0	31.5	14.6	0.0	3.5	16.2	45.2	82.0	100.0	982.2	985.4	987.5
16/01/2022	19.1	22.9	29.3	0.0	0.1	3.4	15.8	63.7	90.1	100.0	984.6	988.2	991.8
17/01/2022	20.3	24.3	31.5	0.0	0.1	3.1	12.4	45.9	87.9	100.0	988.5	990.5	992.0
18/01/2022	19.0	22.0	24.2	6.4	0.0	2.5	8.8	78.2	96.5	100.0	989.7	992.6	995.0
19/01/2022	16.3	18.0	20.7	11.8	0.5	4.7	17.3	85.9	98.8	100.0	994.3	999.1	1004.3
20/01/2022	16.1	19.0	23.3	0.2	0.5	3.6	12.0	50.0	76.0	99.7	1003.2	1006.2	1008.6
21/01/2022	15.2	18.6	23.1	3.4	0.1	3.1	21.6	51.5	88.7	100.0	1005.9	1007.1	1008.5
22/01/2022	16.1	19.3	24.3	0.2	0.3	3.7	20.7	49.3	85.6	100.0	1000.1	1002.6	1006.0
23/01/2022	15.7	19.3	24.8	2.0	0.1	2.4	11.8	66.0	92.8	100.0	994.4	997.0	1000.0
24/01/2022	17.4	20.1	25.5	2.6	0.0	3.2	16.6	59.5	91.4	100.0	990.7	993.2	995.5
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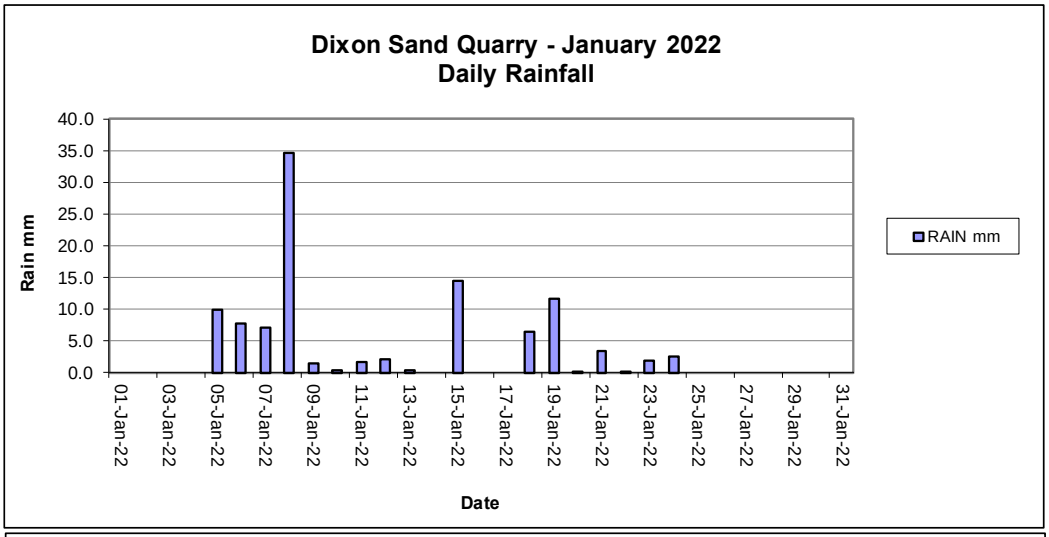
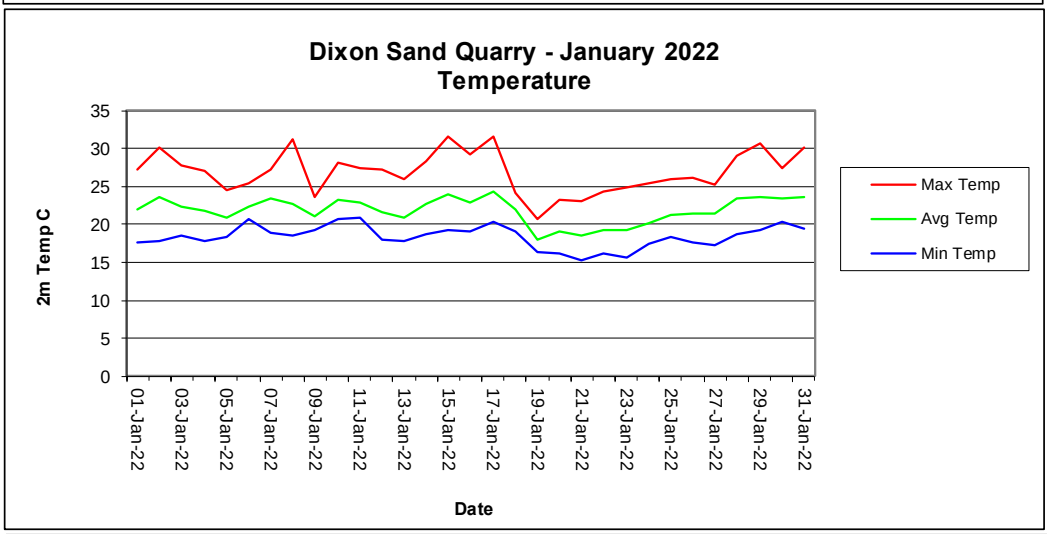
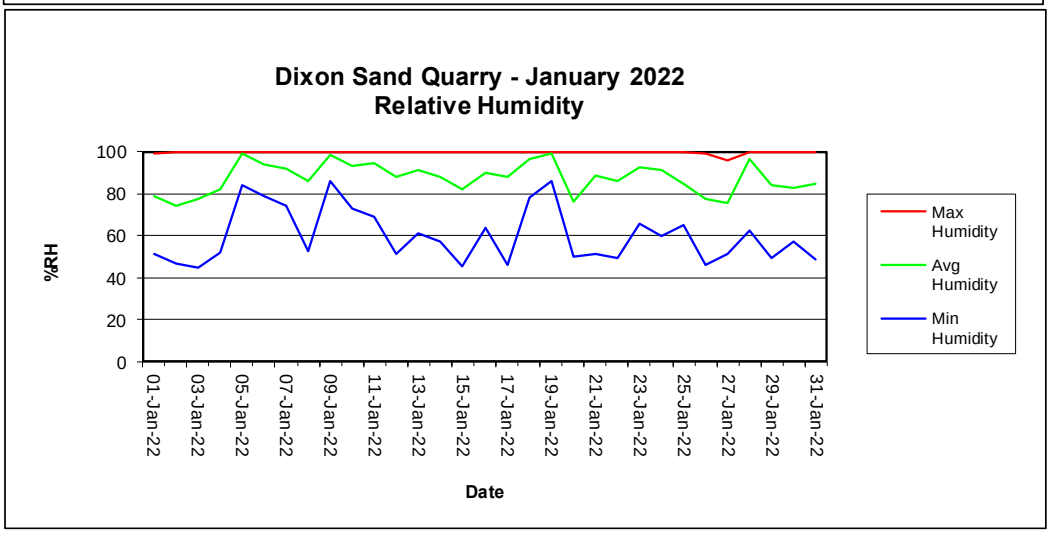
27/01/2022	17.2	21.4	25.3	0.0	0.0	3.7	18.4	51.2	75.8	95.5	993.6	995.1	996.8
28/01/2022	18.7	23.5	29.1	0.0	0.0	4.1	15.7	62.6	96.6	100.0	992.5	995.0	997.3
29/01/2022	19.2	23.7	30.7	0.0	0.2	5.3	16.5	49.2	83.8	99.8	992.4	994.7	996.3
30/01/2022	20.4	23.4	27.5	0.0	0.1	5.7	16.9	57.2	82.8	99.4	991.4	994.1	996.0
31/01/2022	19.4	23.6	30.2	0.0	0.0	3.6	22.4	48.4	84.4	99.6	985.0	989.0	993.2
Monthly	**15.2**	**21.8**	**31.5**	**107.2**	**0.0**	**3.8**	**34.2**	**44.6**	**87.4**	**100.0**	**982.2**	**994.3**	**1008.6**







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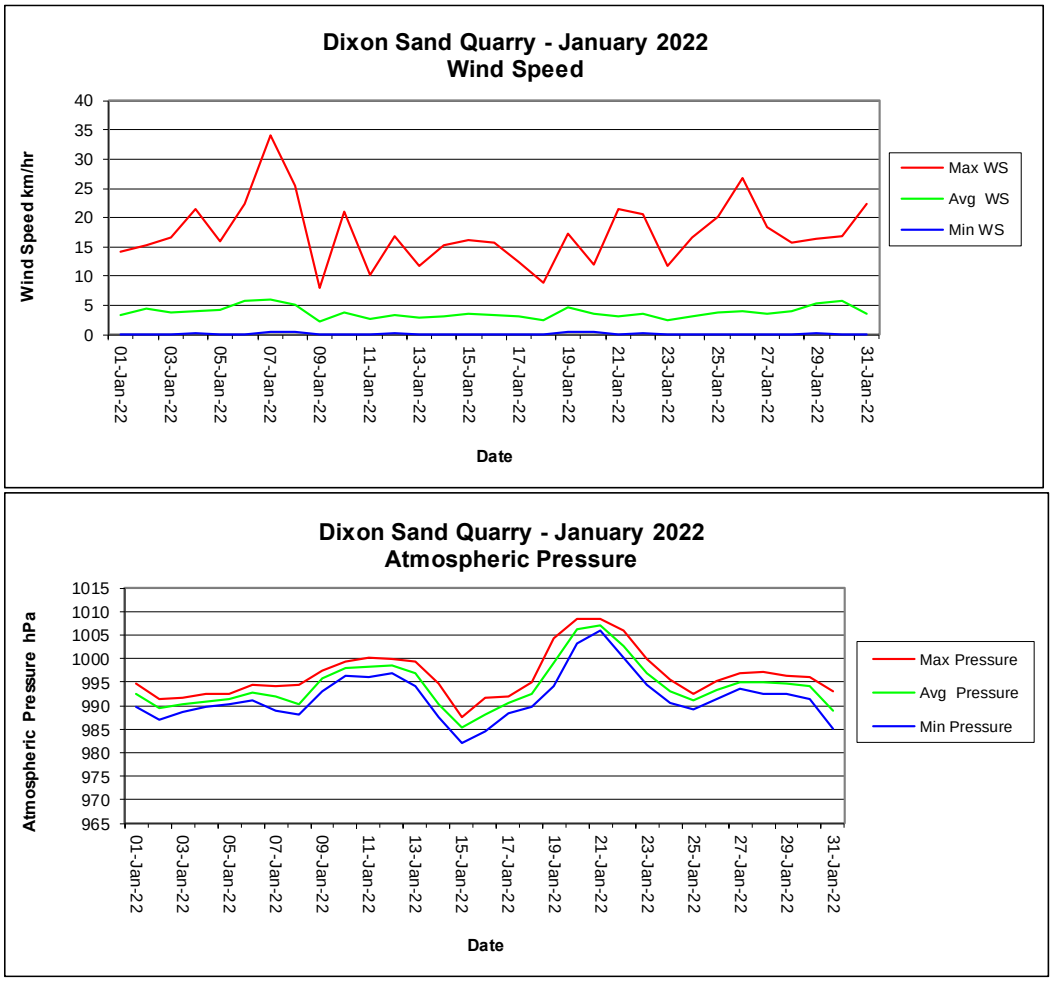

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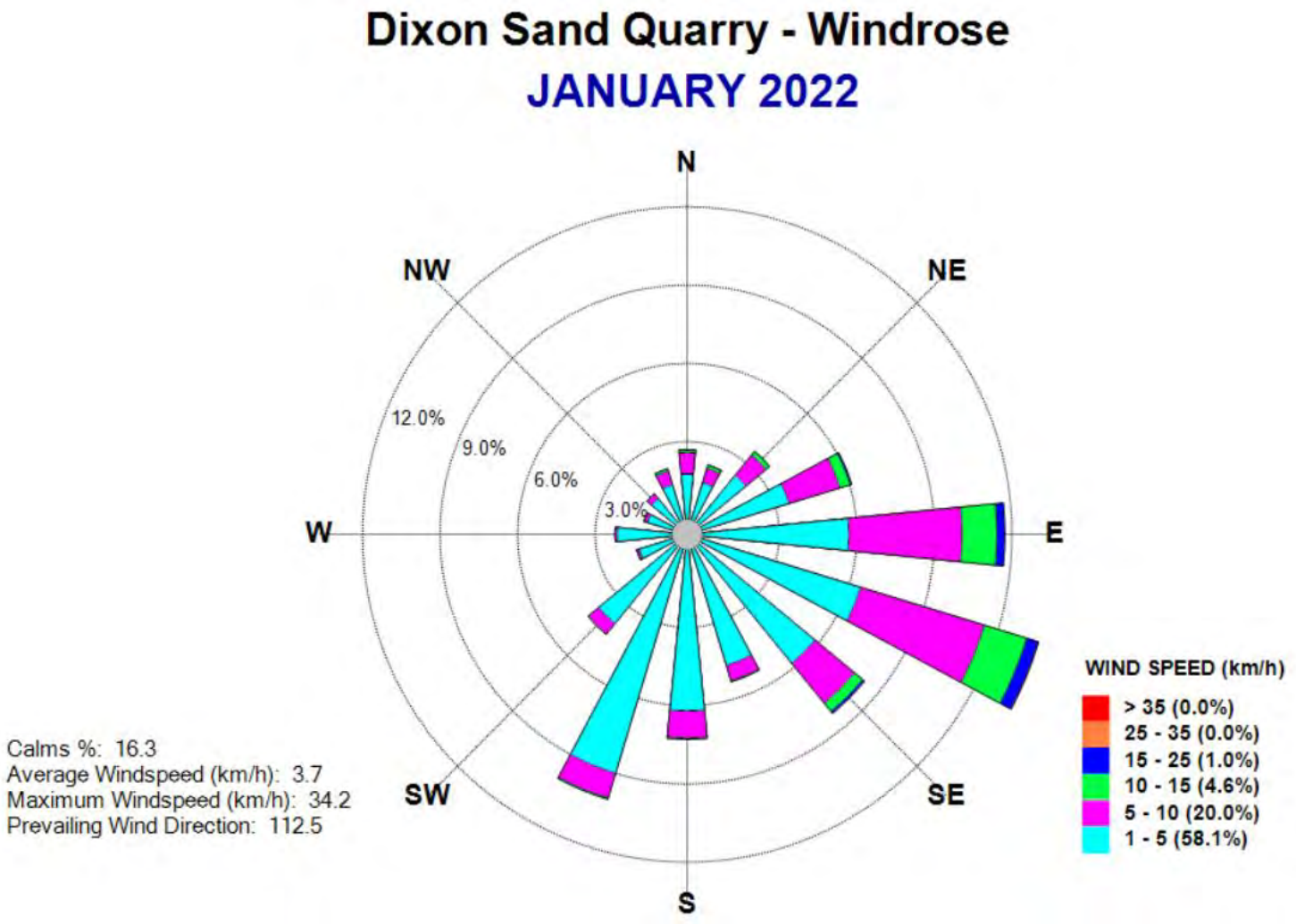
Dixon Sand Quarry - Windrose
JANUARY 2022
N
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W
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12.0%
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6.0%
3.0%
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WIND SPEED (km/h)
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25 - 35 (0.0%)
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CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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FEBRUARY 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 31 March 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

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24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in December 2021 with the next calibration due to be completed in March 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for February 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/02/2022	18.8	14.1	47.0	35.2
2/02/2022	9.1	14.1	22.8	35.1
3/02/2022	14.1	14.1	35.3	35.2
4/02/2022	14.4	14.1	36.0	35.2
5/02/2022	11.5	14.0	28.8	35.1
6/02/2022	13.4	14.0	33.5	35.1
7/02/2022	9.2	14.0	23.1	35.1
8/02/2022	10.5	14.0	26.3	35.0
9/02/2022	13.7	14.0	34.3	35.0
10/02/2022	30.4	14.1	75.9	35.2
11/02/2022	15.9	14.1	39.8	35.2
12/02/2022	11.8	14.1	29.5	35.2
13/02/2022	11.7	14.1	29.3	35.2
14/02/2022	25.2	14.1	63.0	35.3
15/02/2022	21.4	14.1	53.5	35.4
16/02/2022	20.6	14.2	51.5	35.4
17/02/2022	17.2	14.2	43.0	35.5
18/02/2022	17.4	14.2	43.5	35.5
19/02/2022	16.8	14.2	42.0	35.5
20/02/2022	15.6	14.2	39.0	35.6
21/02/2022	15.8	14.2	39.5	35.6
22/02/2022	9.1	14.2	22.8	35.5
23/02/2022	8.5	14.2	21.3	35.5
24/02/2022	8.2	14.2	20.5	35.4
25/02/2022	9.5	14.1	23.8	35.3
26/02/2022	7.7	14.1	19.3	35.3
27/02/2022	8.8	14.1	22.0	35.2
28/02/2022	8.9	14.1	22.3	35.2

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1 hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

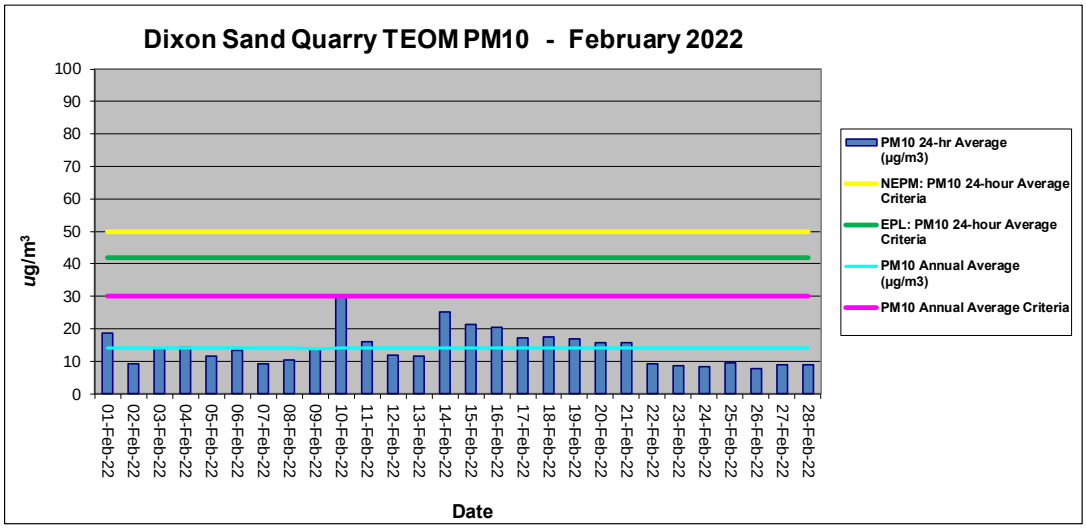


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted in March 2021 and is next due in March 2022. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for February 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/02/2022	20.4	25.0	33.8	37.8	0.3	3.0	10.5	34.5	82.3	100.0	979.1	982.7	986.5
2/02/2022	16.0	19.6	23.7	12.4	0.3	3.6	11.8	88.5	99.4	100.0	981.5	985.3	989.2
3/02/2022	14.9	18.1	23.4	0.2	0.4	4.5	19.9	54.2	82.7	100.0	986.7	988.2	991.5
4/02/2022	13.6	16.8	21.3	8.4	0.5	4.9	21.1	62.6	89.7	100.0	991.6	995.0	998.6
5/02/2022	14.3	17.5	23.3	3.2	0.1	4.0	21.9	79.3	99.5	100.0	997.2	998.7	1000.3
6/02/2022	14.9	17.9	23.7	6.6	0.4	3.3	19.1	56.3	95.6	100.0	999.8	1001.8	1003.3
7/02/2022	14.8	16.9	21.2	10.6	0.0	3.9	14.0	99.9	100.0	100.0	999.1	1001.0	1002.7
8/02/2022	14.1	17.6	23.5	1.6	0.1	3.9	15.1	89.9	99.4	100.0	992.2	995.6	999.2
9/02/2022	15.7	22.6	30.5	0.0	0.0	3.7	15.3	26.2	67.2	100.0	989.7	991.4	993.2
10/02/2022	18.6	24.4	32.7	8.4	0.2	3.6	44.2	27.0	61.3	100.0	990.5	992.1	996.0
11/02/2022	17.8	20.1	24.2	2.2	0.2	3.7	12.3	75.3	97.0	100.0	993.9	996.2	997.8
12/02/2022	16.4	18.2	22.7	5.4	0.1	3.8	19.8	63.6	97.1	100.0	995.9	998.2	1000.9
13/02/2022	16.2	19.1	23.8	0.4	0.0	3.7	14.3	56.9	84.7	100.0	1000.0	1001.6	1003.3
14/02/2022	15.4	21.0	26.7	0.0	0.1	3.7	16.0	50.8	82.2	100.0	1002.3	1003.7	1005.2
15/02/2022	17.6	21.6	27.9	0.0	0.2	4.3	20.0	44.9	82.1	99.7	1000.6	1002.7	1004.6
16/02/2022	16.1	21.3	26.9	0.0	0.0	3.9	11.9	46.3	81.4	100.0	993.7	997.8	1001.3
17/02/2022	17.4	23.2	34.2	1.8	0.3	4.4	15.8	32.5	94.1	100.0	986.2	990.1	994.1
18/02/2022	17.7	23.2	31.7	0.0	0.0	4.2	21.0	36.4	81.8	100.0	988.3	991.0	997.0
19/02/2022	17.1	19.4	21.4	0.8	0.0	3.0	10.6	74.2	91.8	100.0	997.0	998.7	1001.2
20/02/2022	16.6	22.2	29.2	0.0	0.0	3.8	19.0	50.8	81.7	100.0	986.3	991.2	997.1
21/02/2022	18.0	22.9	30.6	6.4	0.0	5.5	24.6	38.9	74.7	100.0	985.9	989.1	994.5
22/02/2022	18.4	19.5	22.1	87.8	0.0	2.5	10.3	99.3	100.0	100.0	993.4	996.5	998.8
23/02/2022	18.9	21.6	25.9	15.0	0.1	4.1	17.4	70.0	95.9	100.0	996.7	998.2	999.7
24/02/2022	19.6	21.9	25.9	19.4	0.2	3.9	13.3	81.9	98.6	100.0	995.4	997.0	998.6
25/02/2022	19.2	21.0	23.8	19.2	0.0	2.1	13.8	99.4	100.0	100.0	993.3	994.9	996.2
26/02/2022	17.1	19.1	20.9	12.8	0.1	2.8	17.1	100.0	100.0	100.0	994.0	995.1	996.3
27/02/2022	18.0	19.7	24.2	7.6	0.0	2.5	18.4	99.2	100.0	100.0	992.6	994.3	995.8
28/02/2022	18.0	20.0	24.4	5.8	0.0	3.1	17.0	95.3	99.9	100.0	992.5	993.8	995.0
Monthly	**13.6**	**20.4**	**34.2**	**273.8**	**0.0**	**3.7**	**44.2**	**26.2**	**90.0**	**100.0**	**979.1**	**995.1**	**1005.2**

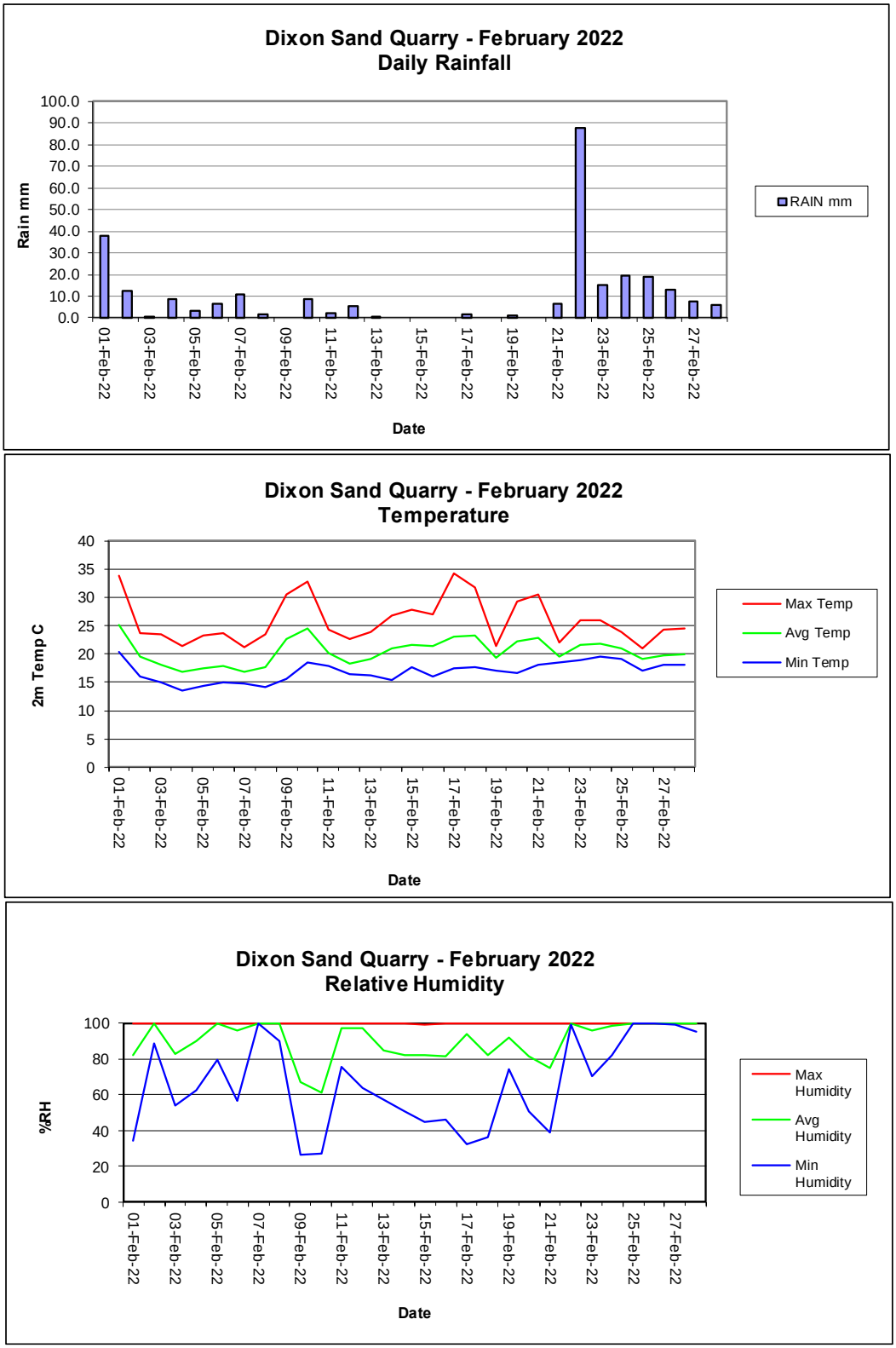


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

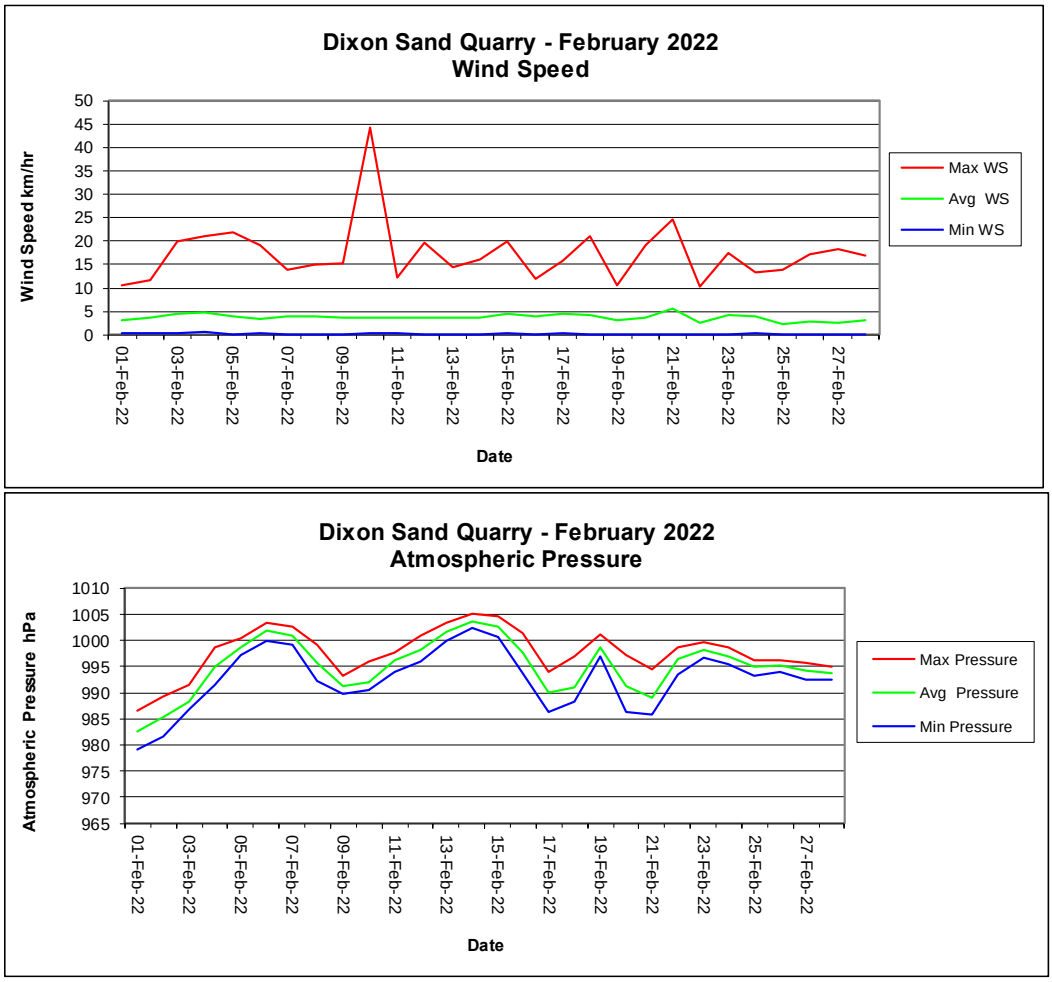
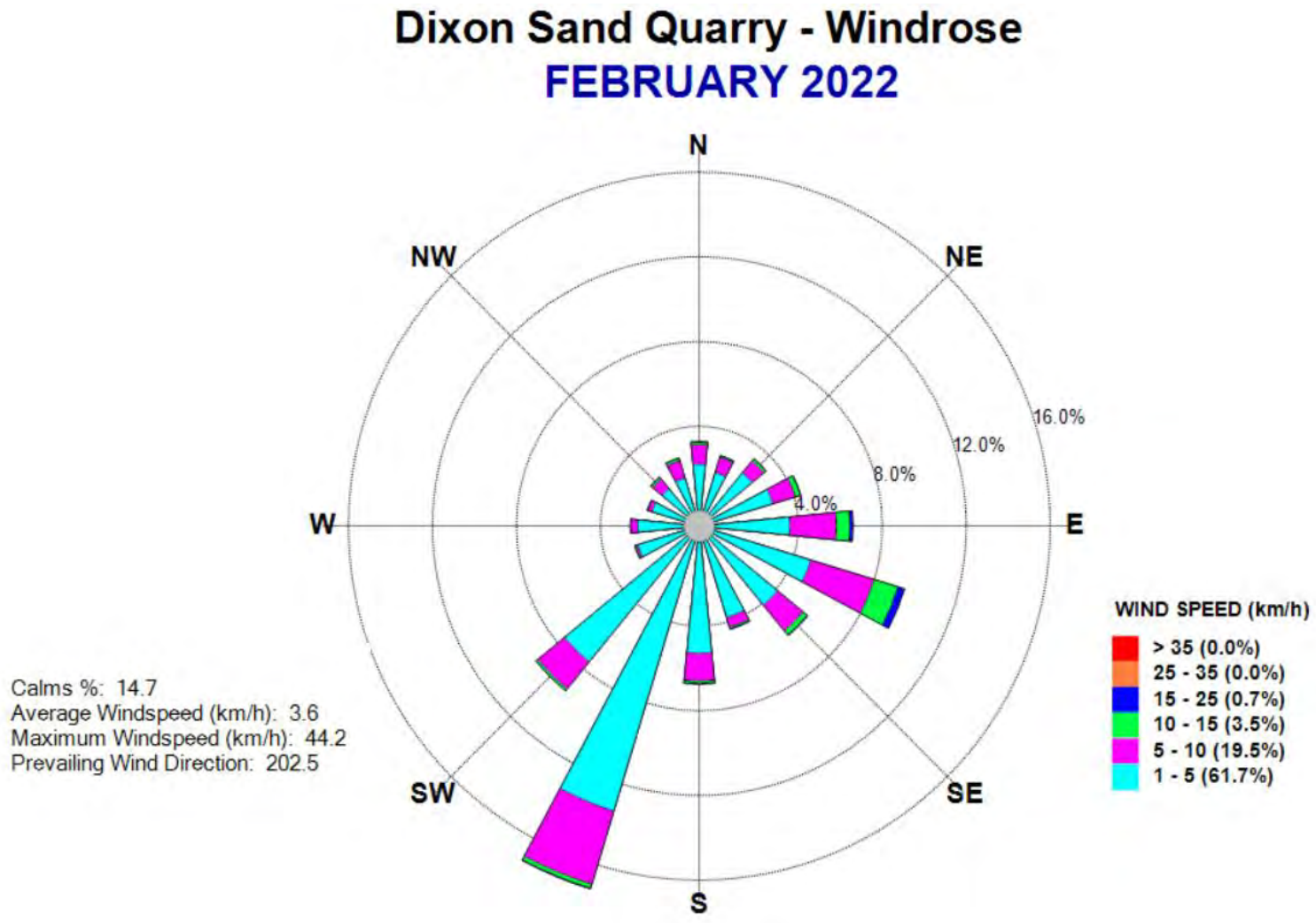


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
FEBRUARY 2022
N
NE
E
SE
S
SW
W
NW
4.0%
8.0%
12.0%
16.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (0.7%)
10 - 15 (3.5%)
5 - 10 (19.5%)
1 - 5 (61.7%)
Calms %: 14.7
Average Windspeed (km/h): 3.6
Maximum Windspeed (km/h): 44.2
Prevailing Wind Direction: 202.5

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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MARCH 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 27 March 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for March 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 72% of valid meteorological data was recorded for March 2022. Loss of valid data was due to a faulty humidity sensor and a power outage occurring 9-10 March 2022.

Approximately 100% of TEOM data was recovered for February 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted on 16 March 2022 with the next calibration due to be completed in June 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for March 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/03/2022	7.9	14.0	19.8	35.1
2/03/2022	5.6	14.0	14.0	35.0
3/03/2022	7.0	14.0	17.5	34.9
4/03/2022	7.6	14.0	19.0	34.9
5/03/2022	9.0	13.9	22.5	34.8
6/03/2022	7.4	13.9	18.5	34.8
7/03/2022	7.8	13.9	19.5	34.7
8/03/2022	2.7	13.8	6.9	34.6
9/03/2022	No Valid Data	13.8	No Valid Data	34.6
10/03/2022	No Valid Data	13.8	No Valid Data	34.6
11/03/2022	7.9	13.8	19.9	34.5
12/03/2022	7.3	13.8	18.3	34.5
13/03/2022	8.5	13.8	21.3	34.4
14/03/2022	6.7	13.7	16.8	34.3
15/03/2022	10.3	13.7	25.8	34.3
16/03/2022	7.1	13.7	17.6	34.2
17/03/2022	8.6	13.7	21.5	34.2
18/03/2022	14.3	13.7	35.8	34.2
19/03/2022	13.0	13.7	32.5	34.2
20/03/2022	13.4	13.7	33.5	34.2
21/03/2022	14.7	13.7	36.8	34.2
22/03/2022	16.9	13.7	42.3	34.2
23/03/2022	22.0	13.7	55.0	34.3
24/03/2022	10.8	13.7	27.0	34.3
25/03/2022	12.0	13.7	30.0	34.3
26/03/2022	6.9	13.7	17.3	34.2
27/03/2022	6.0	13.7	15.0	34.1
28/03/2022	9.6	13.6	24.0	34.1
29/03/2022	6.7	13.6	16.8	34.0
30/03/2022	9.5	13.6	23.8	34.0
31/03/2022	12.5	13.6	31.3	34.0

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1 hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

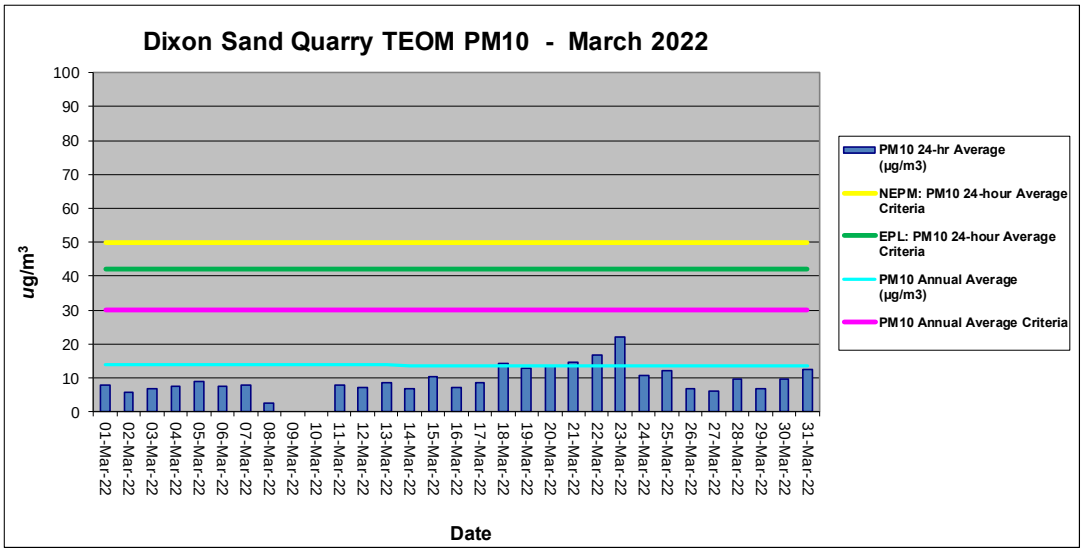


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

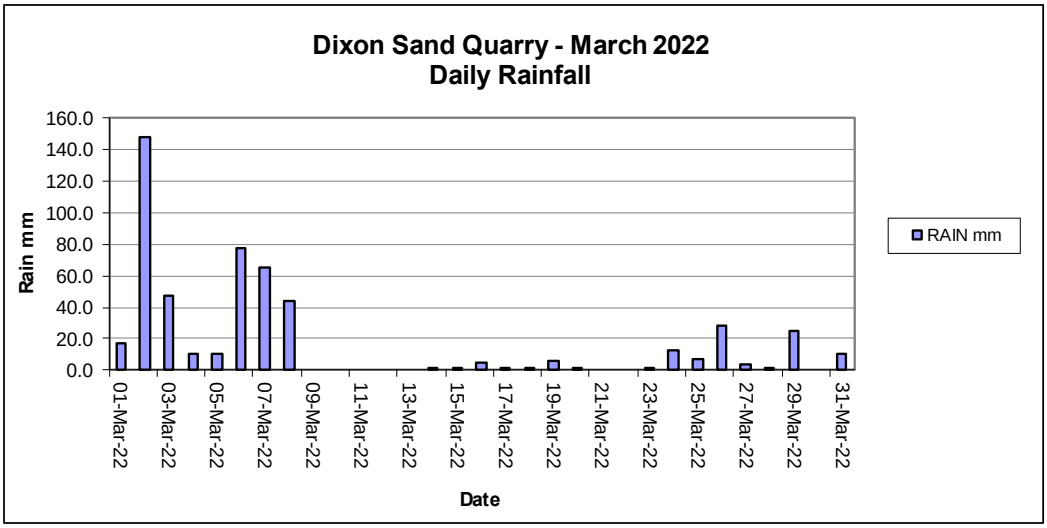
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

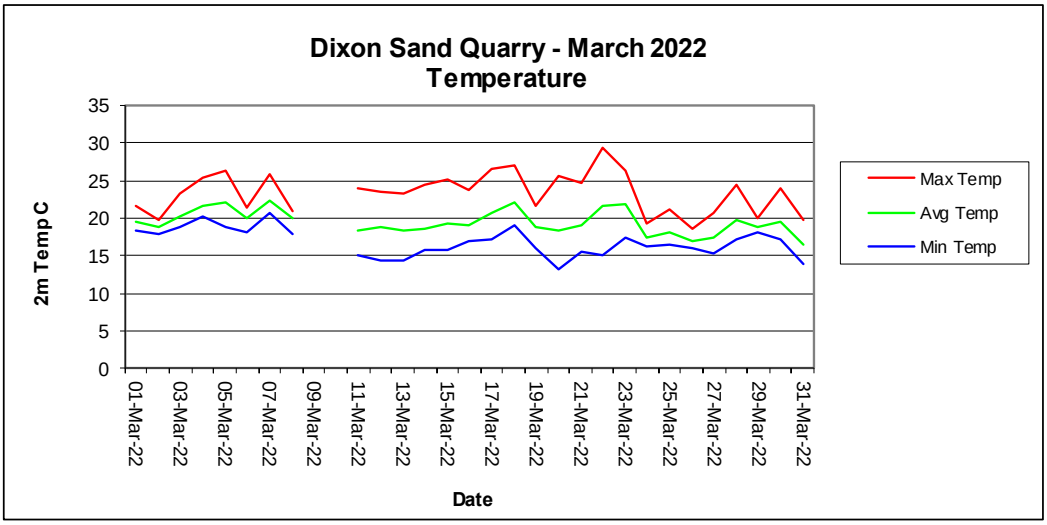
An annual physical screening and system check of the meteorological station was conducted on 16 March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for March 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/03/2022	18.4	19.5	21.5	16.8	0.3	5.1	23.7				990.5	991.9	993.6
2/03/2022	17.9	18.8	19.8	147.8	0.0	3.3	18.0				988.3	990.0	991.9
3/03/2022	18.9	20.2	23.2	46.8	0.1	3.9	16.4				988.4	989.6	991.7
4/03/2022	20.3	21.7	25.4	10.4	0.2	2.6	10.7				990.0	991.0	992.1
5/03/2022	18.7	22.1	26.2	10.4	0.1	3.2	20.9				983.6	987.2	990.6
6/03/2022	18.0	19.9	21.4	77.2	0.1	4.5	14.9				983.8	986.7	989.4
7/03/2022	20.6	22.4	25.9	65.4	0.2	4.2	13.7				986.9	987.9	989.3
8/03/2022	17.9	20.0	20.8	44.2	0.0	5.4	25.9				984.6	985.8	987.7
9/03/2022													
10/03/2022													
11/03/2022	15.1	18.3	23.9	0.0	0.1	4.2	22.5				998.2	999.5	1001.6
12/03/2022	14.3	18.8	23.4	0.0	0.0	3.0	19.2				1000.1	1002.1	1004.2
13/03/2022	14.3	18.4	23.2	0.0	0.0	2.8	17.9				1001.5	1003.0	1005.0
14/03/2022	15.8	18.5	24.4	0.4	0.0	2.1	12.8				1000.5	1001.7	1002.8
15/03/2022	15.7	19.2	25.2	0.2	0.0	3.3	17.4				1000.2	1001.5	1003.3
16/03/2022	16.8	19.1	23.8	4.4	0.0	3.4	18.0				997.8	999.8	1001.5
17/03/2022	17.1	20.6	26.5	0.2	0.1	2.6	14.9				994.7	997.3	999.7
18/03/2022	19.1	22.0	26.9	0.6	0.0	2.8	15.6				995.2	996.6	998.6
19/03/2022	15.9	18.7	21.7	6.2	0.1	2.8	12.8				996.7	998.9	1000.4
20/03/2022	13.2	18.3	25.5	0.2	0.0	2.8	14.0				995.1	997.1	999.8
21/03/2022	15.4	19.0	24.6	0.0	0.2	3.3	15.9				994.5	996.4	998.2
22/03/2022	15.1	21.6	29.3	0.0	0.0	3.6	14.3				987.7	991.6	995.4
23/03/2022	17.4	21.9	26.2	0.8	0.3	4.3	16.6				985.7	990.1	995.8
24/03/2022	16.3	17.3	19.2	13.2	0.0	2.3	9.9				994.6	996.0	997.8
25/03/2022	16.5	18.1	21.1	7.0	0.1	2.2	10.9				996.2	998.6	1001.4
26/03/2022	16.0	16.8	18.5	28.0	0.0	3.5	12.6				999.6	1000.8	1002.4
27/03/2022	15.3	17.3	20.6	4.2	0.2	2.5	9.8				995.5	998.1	1000.7
28/03/2022	17.1	19.8	24.5	0.8	0.1	2.3	11.0				991.3	993.3	995.5
29/03/2022	18.1	18.9	20.0	24.6	0.0	2.7	9.9				990.4	991.6	993.0
30/03/2022	17.2	19.5	23.9	0.0	0.4	4.9	13.4				988.7	990.3	991.7
31/03/2022	13.8	16.3	19.7	10.4	0.3	7.8	24.9				990.6	994.4	998.6
Monthly	**13.2**	**19.4**	**29.3**	**520.2**	**0.0**	**3.5**	**25.9**	**0.0**	**#DIV/0!**	**0.0**	**983.6**	**994.8**	**1005.0**

Power outage - unit offline and faulty humidity sensor





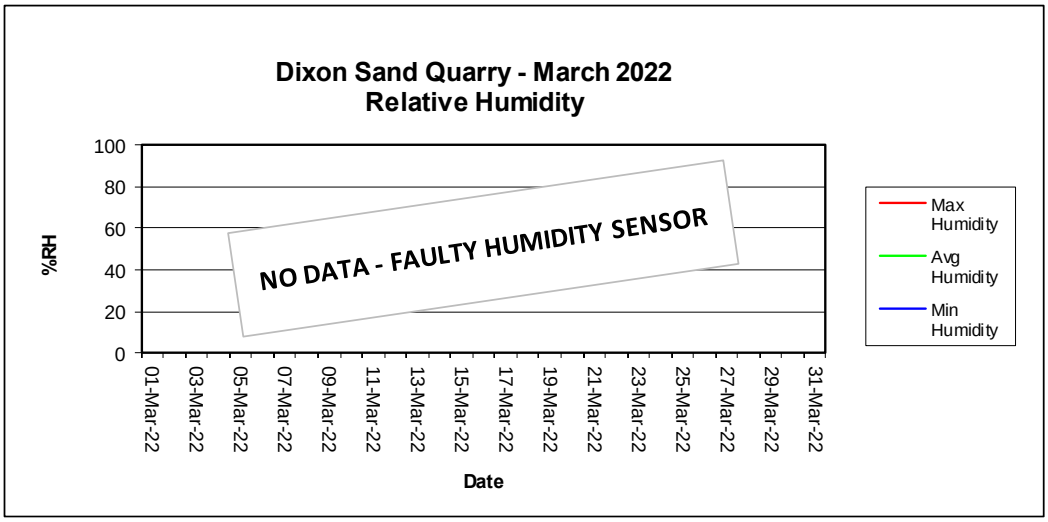


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

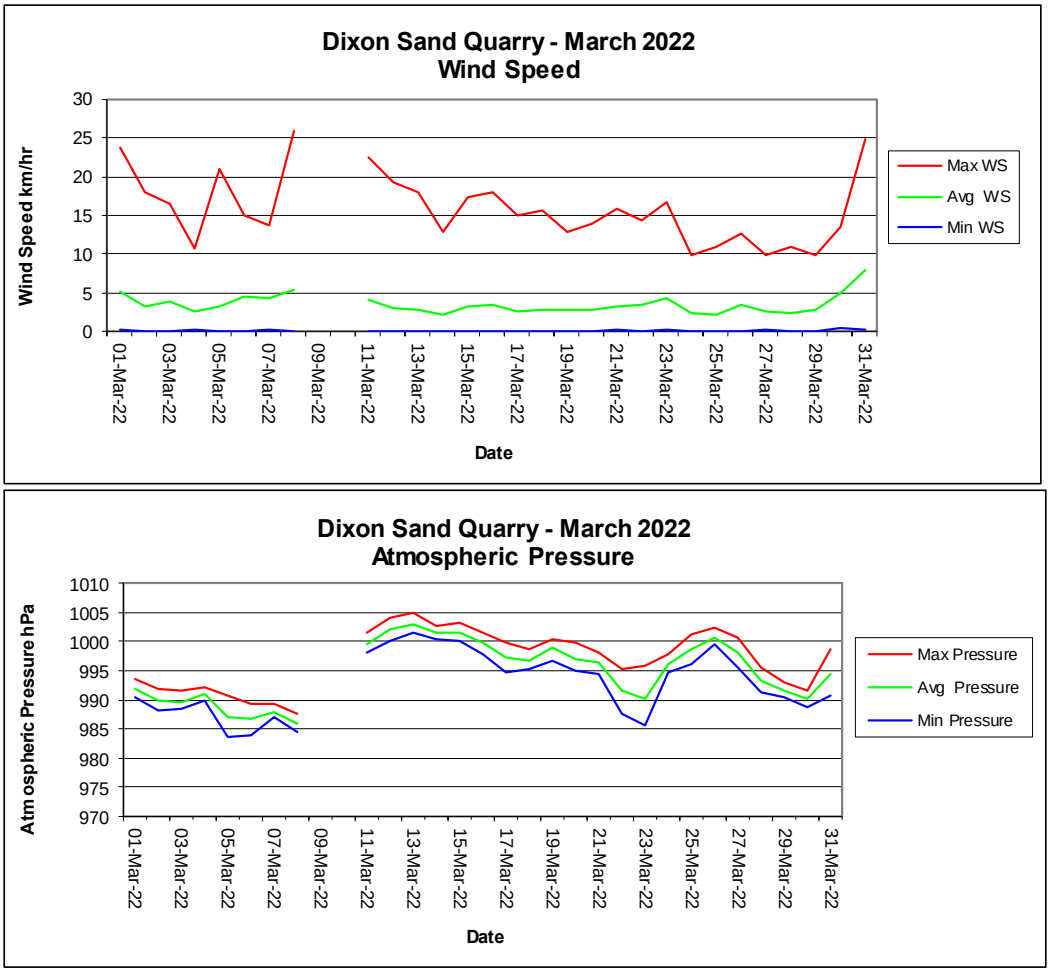
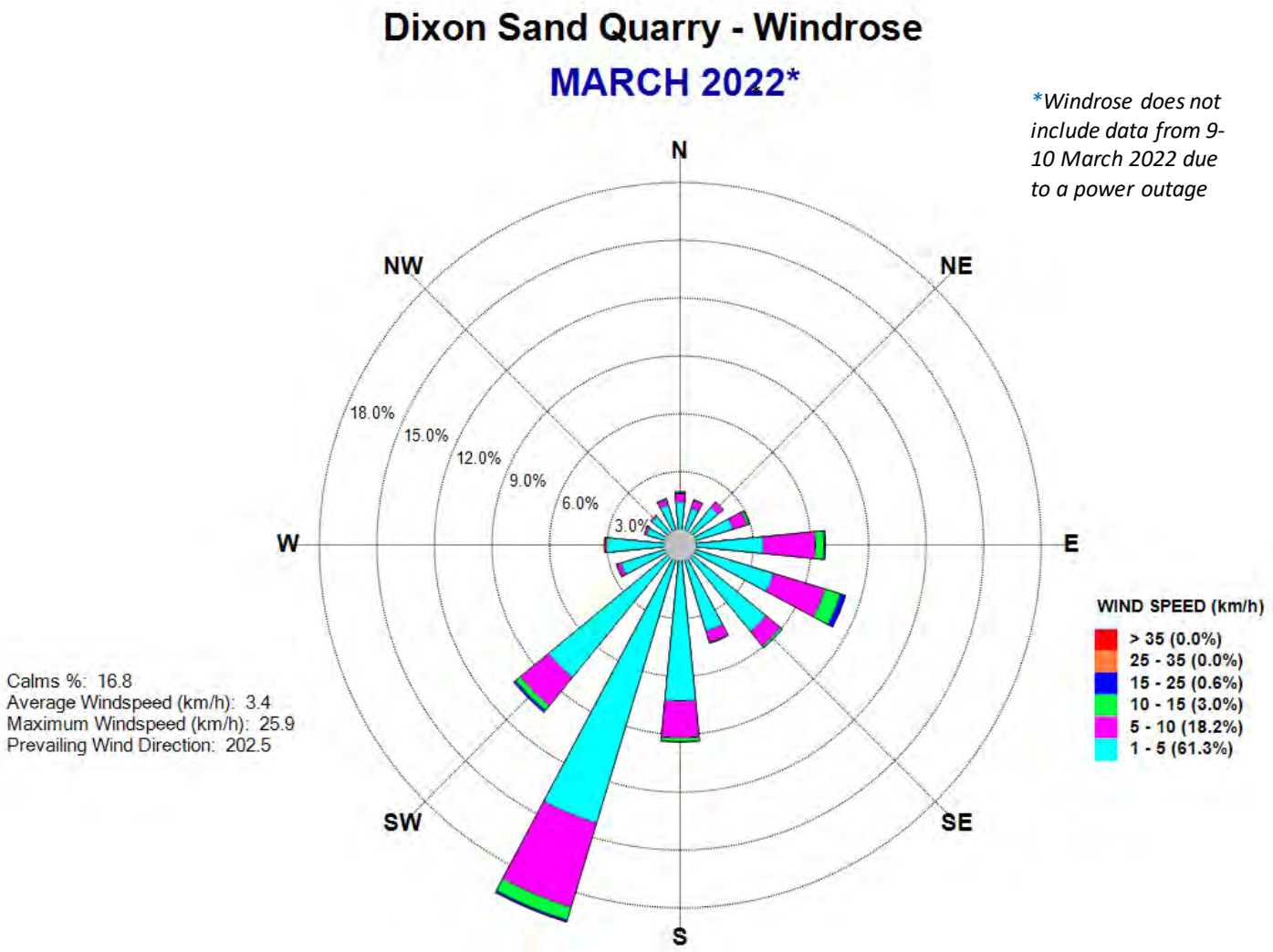


Figure 3: *Wind Speed and Atmospheric Pressure Charts*



*Windrose does not include data from 9-10 March 2022 due to a power outage

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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APRIL 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 31 May 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for April 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 75% of valid meteorological data was recorded for April 2022. Loss of valid data was due to a faulty humidity sensor.

Approximately 100% of TEOM data was recovered for April 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in March 2022 with the next calibration due to be completed in June 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for April 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/04/2022	8.4	13.6	20.9	33.9
2/04/2022	6.9	13.5	17.3	33.9
3/04/2022	8.4	13.5	21.0	33.8
4/04/2022	14.2	13.5	35.5	33.8
5/04/2022	27.0	13.6	67.5	34.0
6/04/2022	8.0	13.6	20.0	33.9
7/04/2022	6.9	13.5	17.3	33.8
8/04/2022	No Valid Data	13.5	No Valid Data	33.8
9/04/2022	8.2	13.5	20.5	33.8
10/04/2022	10.4	13.5	26.0	33.8
11/04/2022	17.9	13.5	44.8	33.8
12/04/2022	15.4	13.5	38.5	33.8
13/04/2022	11.7	13.5	29.3	33.8
14/04/2022	8.6	13.5	21.5	33.8
15/04/2022	7.9	13.5	19.8	33.7
16/04/2022	9.8	13.5	24.5	33.7
17/04/2022	9.8	13.5	24.5	33.6
18/04/2022	8.6	13.4	21.5	33.6
19/04/2022	13.9	13.4	34.8	33.6
20/04/2022	9.7	13.4	24.3	33.6
21/04/2022	12.9	13.4	32.3	33.6
22/04/2022	10.5	13.4	26.3	33.5
23/04/2022	6.5	13.4	16.3	33.5
24/04/2022	6.5	13.4	16.3	33.4
25/04/2022	7.2	13.4	18.0	33.4
26/04/2022	9.9	13.3	24.8	33.3
27/04/2022	10.6	13.3	26.5	33.3
28/04/2022	9.8	13.3	24.5	33.3
29/04/2022	13.4	13.3	33.5	33.3
30/04/2022	7.9	13.3	19.8	33.3

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1 hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

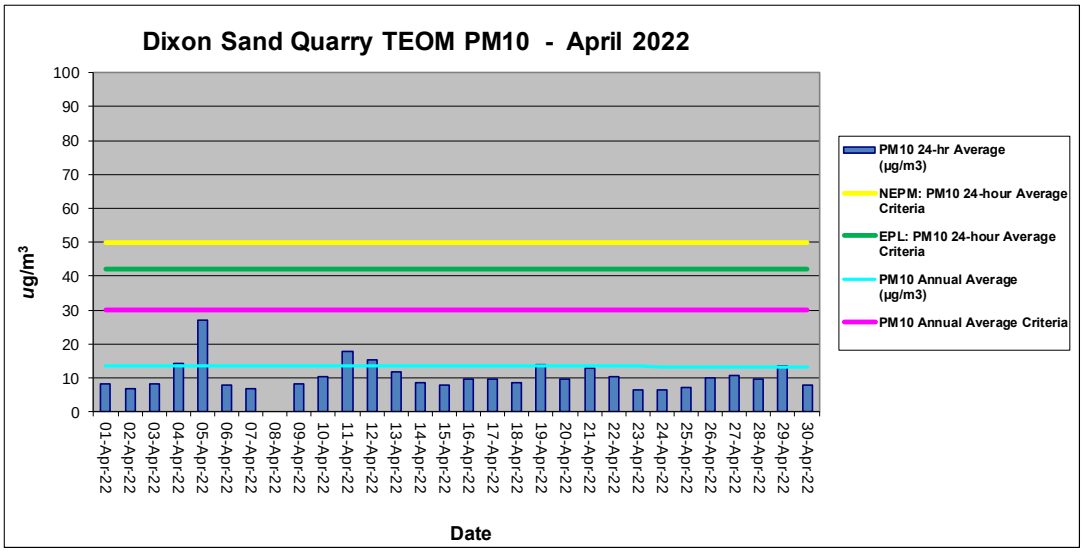


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

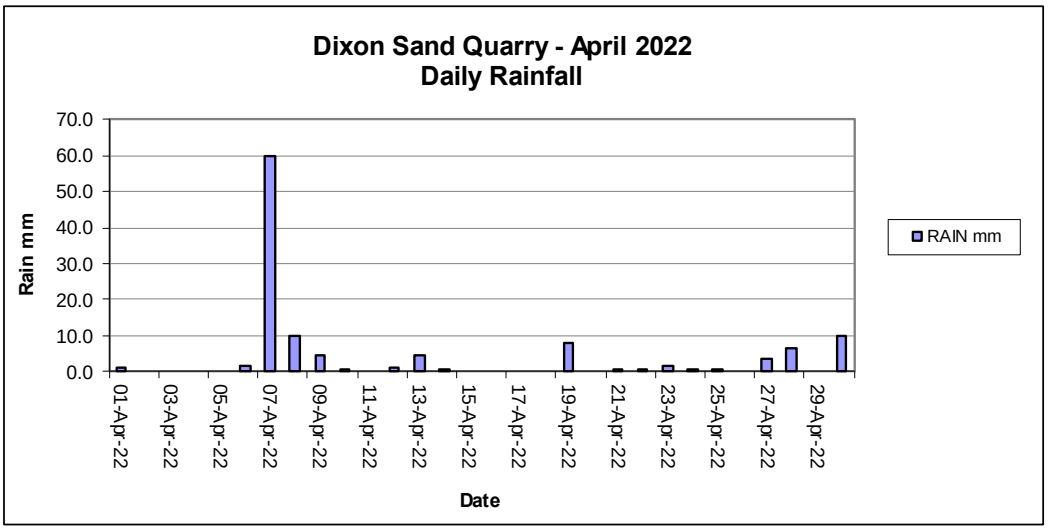
A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

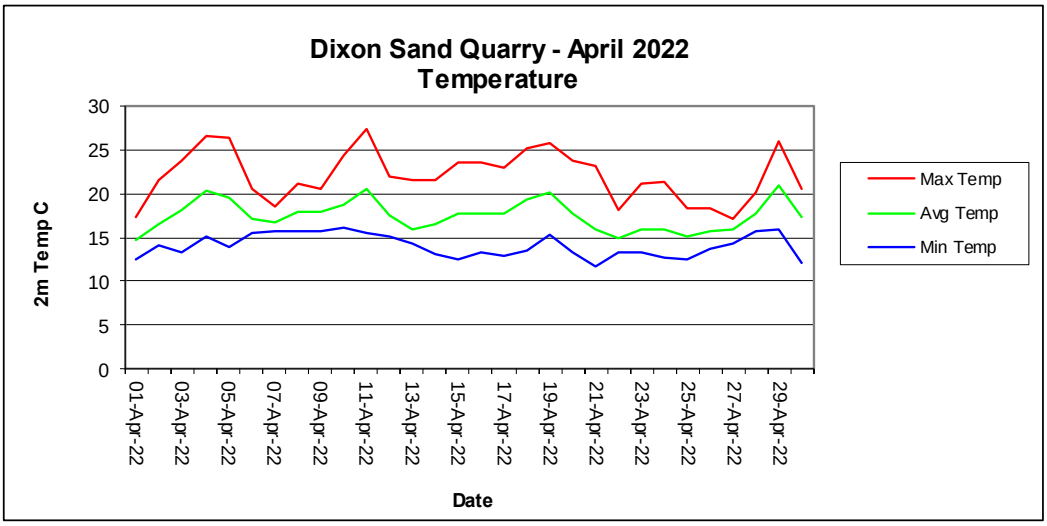
An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for April 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/04/2022	12.4	14.6	17.3	1.4	1.8	8.5	24.1				994.4	996.0	998.1
2/04/2022	14.0	16.4	21.5	0.0	0.1	4.4	18.0				991.9	993.3	994.9
3/04/2022	13.3	18.1	23.8	0.0	0.0	4.6	19.3				991.0	992.5	993.9
4/04/2022	15.2	20.4	26.5	0.0	0.1	3.4	20.4				991.4	993.3	995.0
5/04/2022	13.8	19.5	26.4	0.0	0.0	2.7	16.6				993.9	995.4	997.4
6/04/2022	15.6	17.1	20.6	1.6	0.1	3.5	15.3				995.8	997.5	999.1
7/04/2022	15.7	16.7	18.6	60.0	0.5	5.5	25.6				997.3	999.6	1001.9
8/04/2022	15.8	17.9	21.2	10.0	0.1	5.4	25.3				1000.4	1002.0	1003.5
9/04/2022	15.8	17.8	20.5	4.4	0.0	2.8	11.5				1001.4	1002.7	1004.7
10/04/2022	16.1	18.8	24.3	0.2	0.1	2.8	10.2				998.0	1000.2	1002.2
11/04/2022	15.6	20.5	27.3	0.0	0.1	2.9	13.1				995.5	997.7	999.9
12/04/2022	15.1	17.5	21.9	1.2	0.1	3.1	14.0				999.0	1000.4	1002.1
13/04/2022	14.2	15.9	21.5	4.4	0.3	4.6	22.5				999.9	1002.4	1005.1
14/04/2022	13.0	16.6	21.6	0.6	0.2	3.2	15.0				1003.4	1004.9	1006.5
15/04/2022	12.5	17.6	23.5	0.0	0.1	2.8	14.7				1000.4	1002.5	1005.2
16/04/2022	13.3	17.7	23.6	0.0	0.1	2.7	15.0				999.2	1000.6	1002.1
17/04/2022	12.9	17.7	23.0	0.0	0.0	2.8	16.6				997.5	999.5	1001.3
18/04/2022	13.4	19.3	25.2	0.0	0.5	3.5	12.7				996.0	997.7	999.2
19/04/2022	15.4	20.1	25.8	7.8	0.4	4.9	20.2				989.6	993.9	997.1
20/04/2022	13.3	17.7	23.8	0.0	0.0	3.0	11.7				989.5	995.0	999.4
21/04/2022	11.6	15.9	23.2	0.4	0.0	2.6	12.3				999.5	1003.0	1006.8
22/04/2022	13.2	14.9	18.2	0.4	0.1	3.3	9.7				1006.5	1008.9	1010.6
23/04/2022	13.3	15.9	21.2	1.6	0.1	3.0	14.5				1008.6	1010.0	1011.4
24/04/2022	12.6	15.9	21.4	0.2	0.0	2.6	14.1				1008.3	1010.1	1012.0
25/04/2022	12.5	15.1	18.4	0.4	0.1	1.6	8.0				1004.4	1007.0	1009.2
26/04/2022	13.7	15.6	18.3	0.0	0.0	1.7	8.7				999.8	1002.1	1004.4
27/04/2022	14.2	15.9	17.2	3.4	0.0	1.3	5.5				997.9	999.3	1001.2
28/04/2022	15.8	17.7	20.1	6.4	0.3	3.1	11.3				998.0	999.4	1001.0
29/04/2022	16.0	21.0	25.9	0.0	0.3	4.6	14.4				997.9	999.9	1002.2
30/04/2022	12.0	17.3	20.5	10.0	0.2	4.5	17.7				994.8	997.7	1001.6
Monthly	**11.6**	**17.4**	**27.3**	**114.4**	**0.0**	**3.5**	**25.6**	**0.0**	**#DIV/0!**	**0.0**	**989.5**	**1000.1**	**1012.0**

Faulty humidity sensor





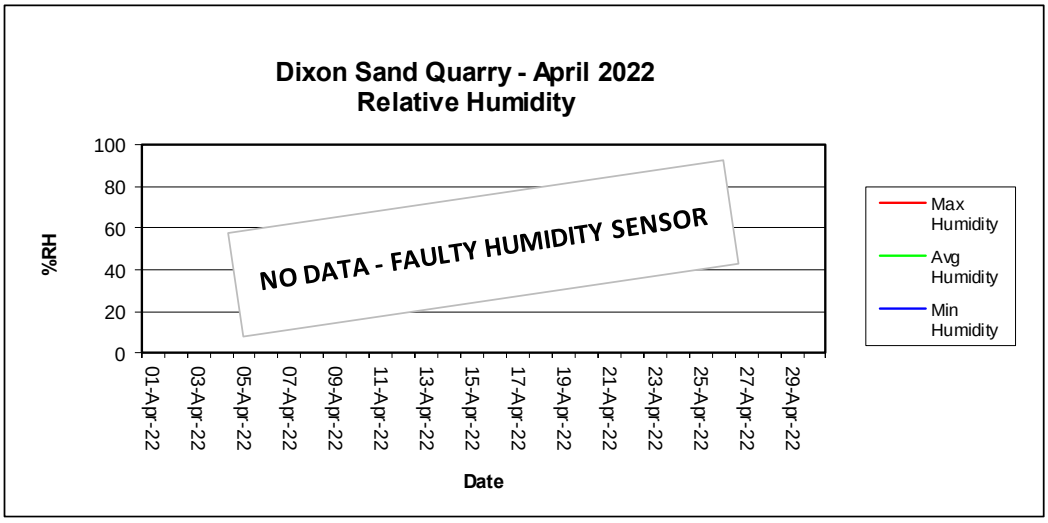


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

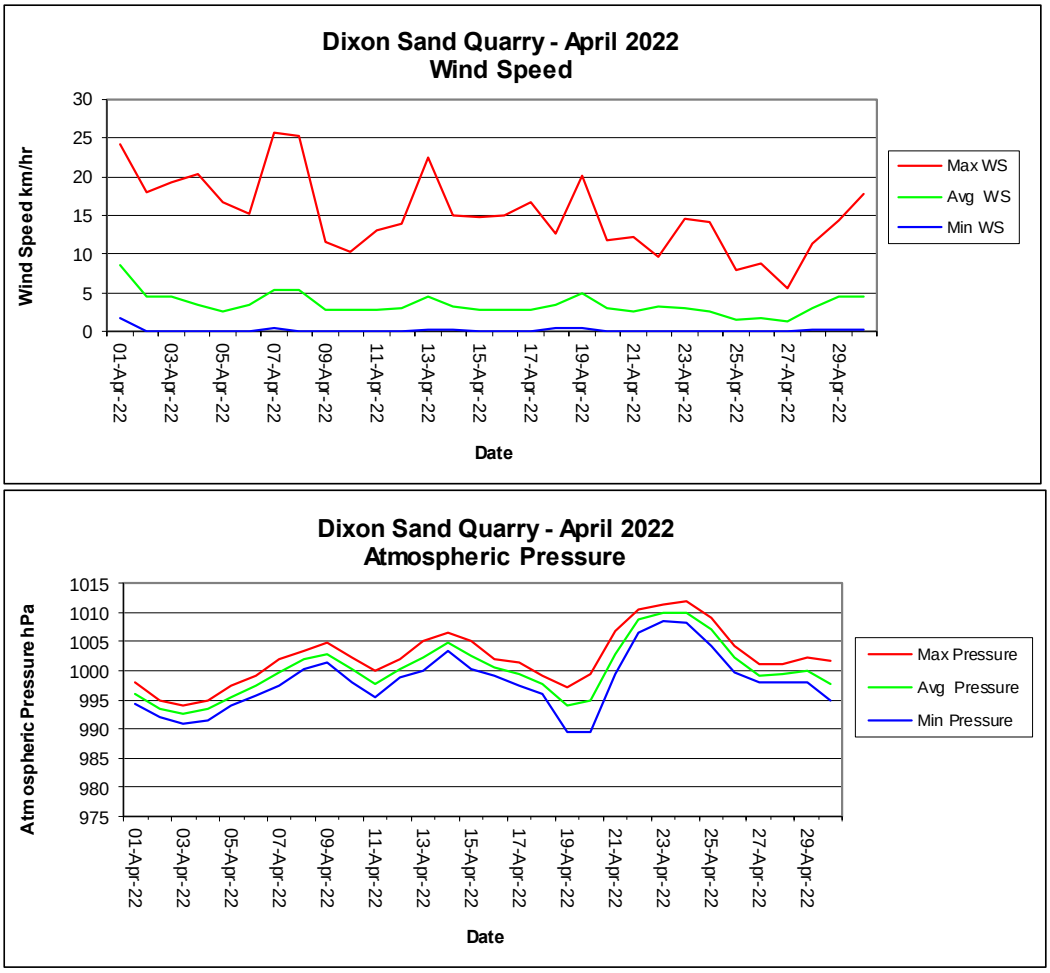
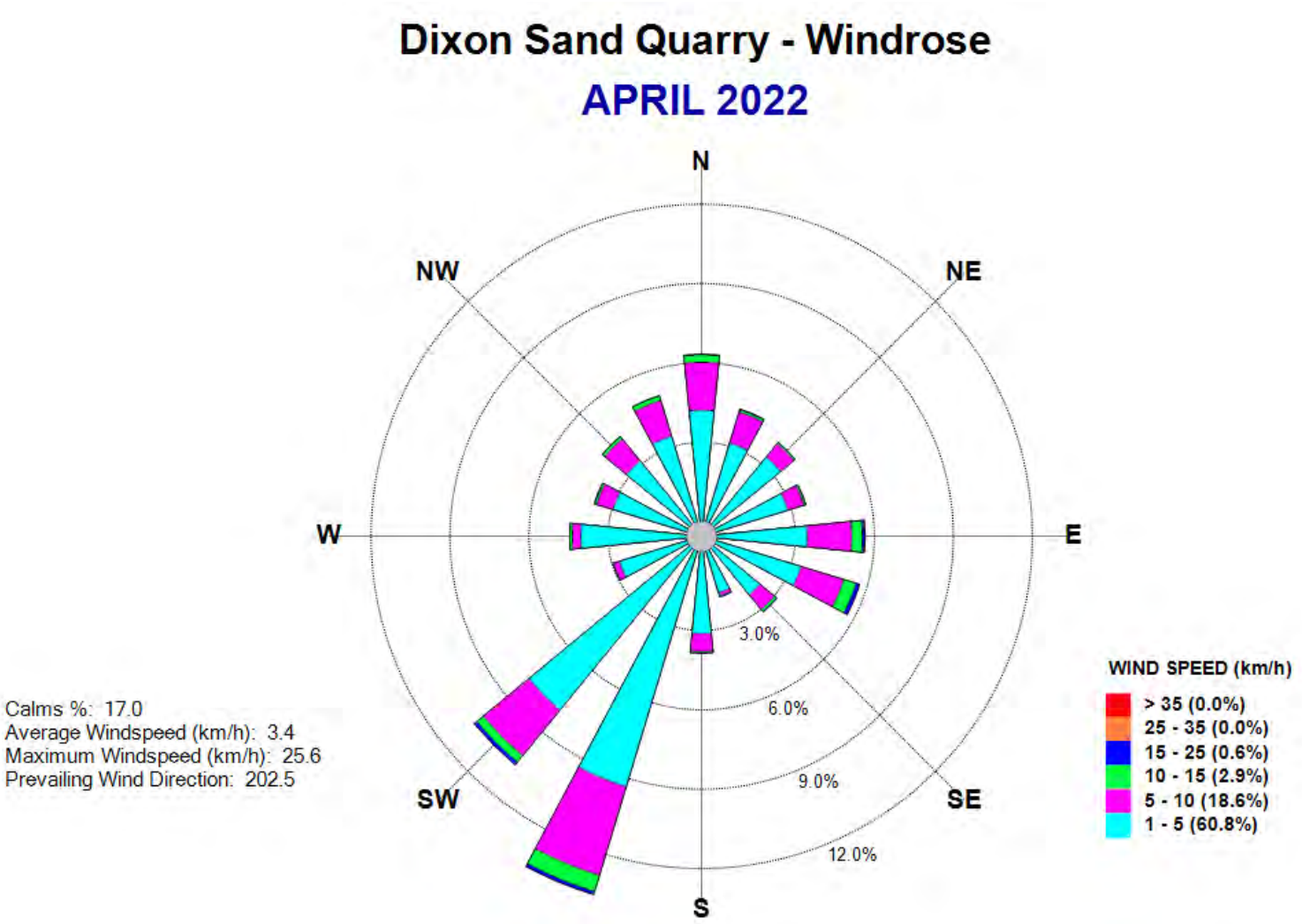


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
APRIL 2022
N
NE
E
SE
S
SW
W
NW
3.0%
6.0%
9.0%
12.0%
Calms %: 17.0
Average Windspeed (km/h): 3.4
Maximum Windspeed (km/h): 25.6
Prevailing Wind Direction: 202.5
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (0.6%)
10 - 15 (2.9%)
5 - 10 (18.6%)
1 - 5 (60.8%)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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MAY 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 30 June 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for May 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has not yet been collected.

Approximately 77% of valid meteorological data was recorded for May 2022. Loss of valid data was due to a faulty humidity sensor.

Approximately 100% of TEOM data was recovered for May 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
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TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has not yet been collected.

The quarterly TEOM calibration was conducted in March 2022 with the next calibration due to be completed in June 2022. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for May 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/05/2022	9.4	13.3	23.5	33.2
2/05/2022	13.5	13.3	33.8	33.2
3/05/2022	16.1	13.3	40.3	33.2
4/05/2022	12.4	13.3	31.0	33.2
5/05/2022	12.0	13.3	30.0	33.2
6/05/2022	11.4	13.3	28.5	33.2
7/05/2022	6.7	13.3	16.8	33.2
8/05/2022	7.9	13.2	19.8	33.1
9/05/2022	10.1	13.2	25.3	33.1
10/05/2022	8.6	13.2	21.5	33.0
11/05/2022	6.1	13.2	15.3	33.0
12/05/2022	12.3	13.2	30.8	33.0
13/05/2022	8.3	13.2	20.9	32.9
14/05/2022	8.6	13.2	21.5	32.9
15/05/2022	9.7	13.2	24.3	32.9
16/05/2022	12.2	13.1	30.5	32.9
17/05/2022	15.9	13.2	39.8	32.9
18/05/2022	9.6	13.1	24.0	32.9
19/05/2022	14.6	13.2	36.5	32.9
20/05/2022	11.8	13.1	29.5	32.9
21/05/2022	8.0	13.1	20.0	32.8
22/05/2022	5.7	13.1	14.3	32.8
23/05/2022	7.9	13.1	19.8	32.7
24/05/2022	6.9	13.1	17.3	32.7
25/05/2022	9.3	13.1	23.3	32.7
26/05/2022	12.6	13.1	31.5	32.6
27/05/2022	19.5	13.1	48.8	32.7
28/05/2022	6.7	13.1	16.8	32.7
29/05/2022	4.1	13.0	10.3	32.6
30/05/2022	6.2	13.0	15.5	32.5
31/05/2022	10.2	13.0	25.5	32.5

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

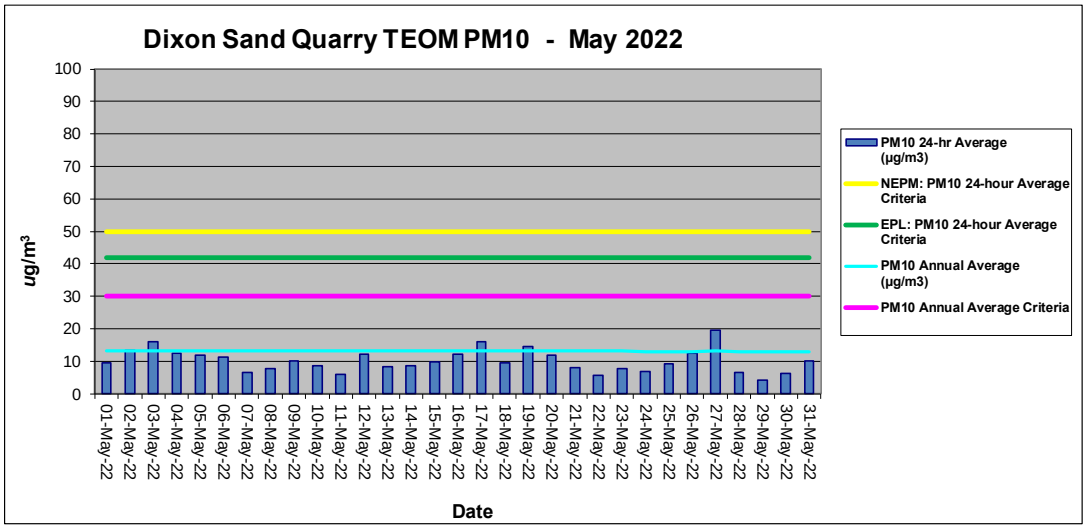


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for May 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/05/2022	9.6	14.8	21.4	0.2	0.0	1.9	6.8				1000.5	1002.0	1003.5
2/05/2022	12.2	16.0	21.0	0.0	0.0	2.1	9.2				1001.4	1002.5	1004.1
3/05/2022	12.9	16.9	22.0	0.2	0.0	2.4	10.8				997.8	1000.1	1002.2
4/05/2022	12.6	18.1	24.5	0.0	0.3	3.6	11.8				993.0	995.3	997.9
5/05/2022	13.2	17.3	21.5	1.8	0.3	2.7	10.0				991.7	993.1	995.5
6/05/2022	8.7	13.0	18.9	0.4	0.0	1.9	10.5				995.5	998.1	1000.3
7/05/2022	7.5	12.0	18.0	0.0	0.2	3.2	11.3				999.3	1000.9	1002.3
8/05/2022	7.9	13.1	18.7	0.0	0.0	2.5	9.4				1001.3	1003.3	1005.9
9/05/2022	8.4	12.4	14.2	9.0	0.2	2.8	10.6				1005.3	1007.1	1009.1
10/05/2022	12.7	14.6	17.4	8.0	0.0	2.3	7.7				1007.8	1008.9	1010.6
11/05/2022	13.2	14.6	16.0	7.4	0.0	1.8	8.0				1003.2	1006.6	1009.0
12/05/2022	14.6	16.8	19.4	8.6	0.0	2.4	11.8				997.2	999.6	1003.2
13/05/2022	16.4	17.5	19.3	3.0	0.0	2.4	6.7				994.7	996.9	999.0
14/05/2022	17.3	20.1	25.5	0.2	0.2	3.6	15.9				992.9	994.9	996.9
15/05/2022	17.2	19.9	24.6	0.0	0.0	2.4	11.0				991.0	993.1	994.8
16/05/2022	13.2	16.8	22.8	0.2	0.1	2.7	11.1				992.5	994.3	996.6
17/05/2022	10.7	15.0	20.6	0.0	0.1	2.3	14.9				996.4	998.0	999.9
18/05/2022	8.6	12.7	19.3	0.0	0.0	2.3	14.0				997.4	999.3	1002.1
19/05/2022	7.2	11.2	16.0	0.0	0.1	1.9	7.2				1001.9	1005.1	1008.9
20/05/2022	8.1	10.8	13.0	0.4	0.3	3.5	10.3				1008.3	1010.4	1012.4
21/05/2022	10.9	12.9	16.2	0.2	0.5	4.1	11.2				1008.6	1010.2	1011.8
22/05/2022	11.4	12.7	14.0	16.8	0.2	3.0	15.0				1006.0	1007.5	1009.0
23/05/2022	10.5	12.7	17.4	3.4	0.0	2.6	9.6				1006.6	1007.6	1008.8
24/05/2022	10.8	12.5	17.0	5.4	0.0	2.5	11.7				1005.4	1006.8	1008.4
25/05/2022	9.5	12.9	18.3	0.2	0.0	1.8	6.5				1001.0	1003.3	1005.9
26/05/2022	11.0	14.8	20.0	0.2	0.1	2.6	11.0				998.1	999.8	1001.4
27/05/2022	10.1	14.6	20.0	0.0	0.1	2.2	8.9				995.0	997.3	999.3
28/05/2022	11.5	14.4	19.4	6.2	0.1	2.3	8.7				989.0	991.4	995.1
29/05/2022	7.7	11.5	17.4	0.2	0.0	2.1	11.0				984.7	987.2	989.8
30/05/2022	7.4	10.4	16.0	3.8	0.6	6.1	25.0				969.4	977.2	984.8
31/05/2022	9.2	11.6	15.6	0.2	0.5	6.5	29.5				970.7	977.4	984.3
Monthly	**7.2**	**14.3**	**25.5**	**76.0**	**0.0**	**2.8**	**29.5**	**0.0**	**#DIV/0!**	**0.0**	**969.4**	**999.2**	**1012.4**

Faulty humidity sensor

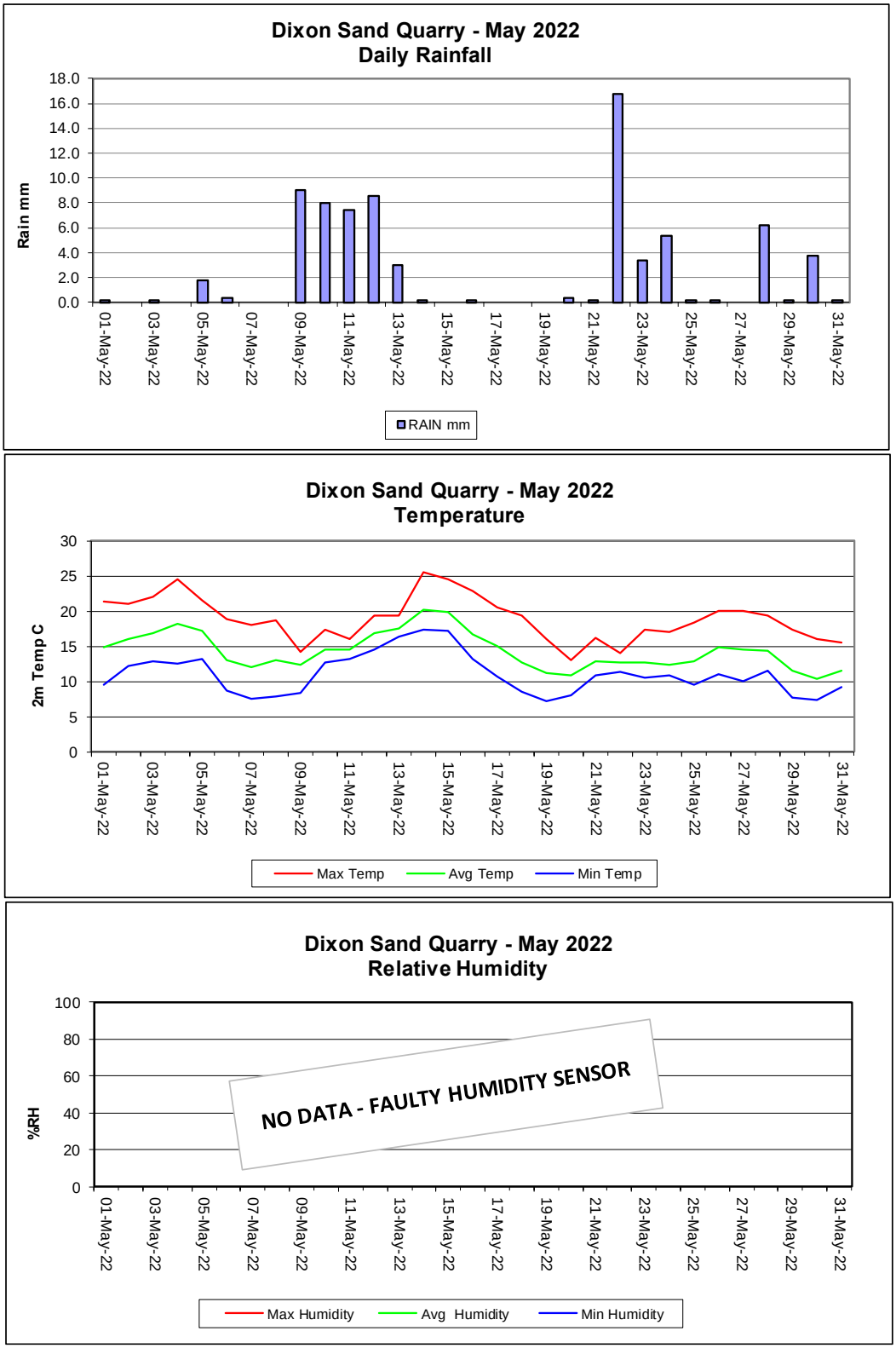
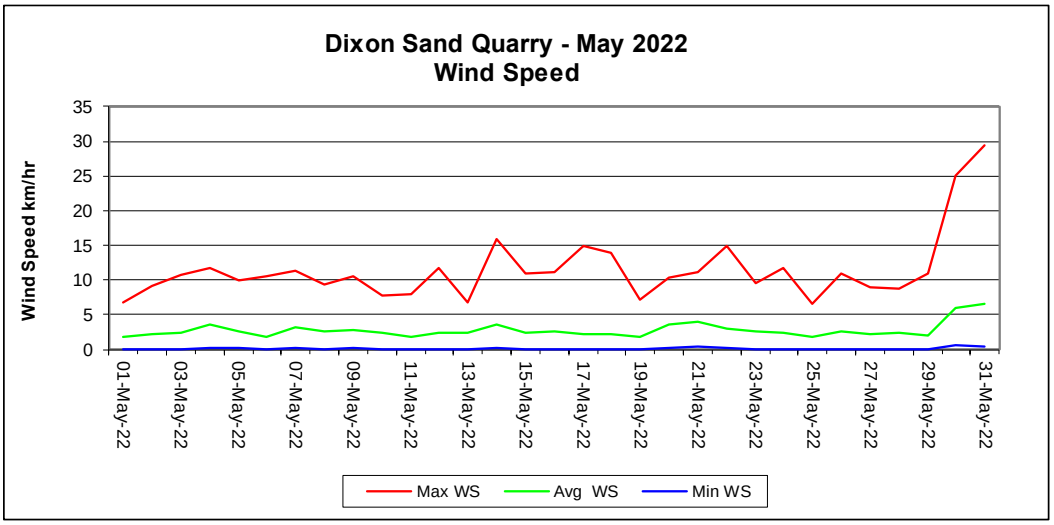


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*



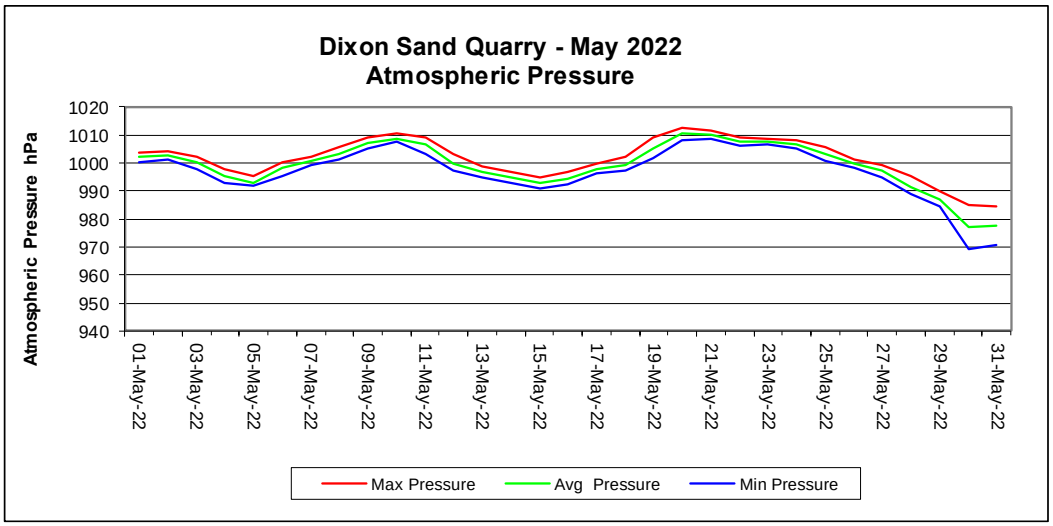
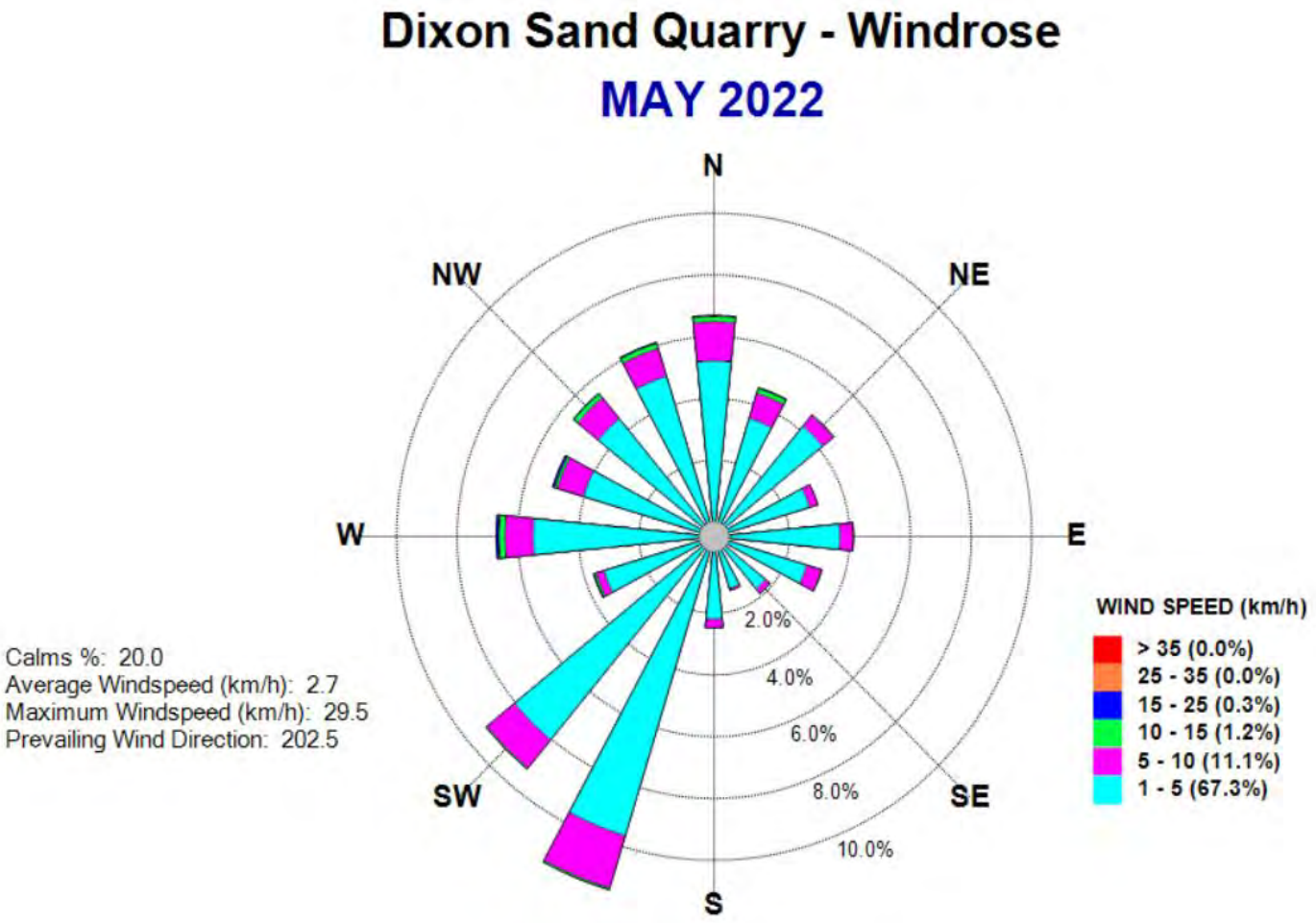


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
MAY 2022
N
NE
E
SE
S
SW
W
NW
2.0%
4.0%
6.0%
8.0%
10.0%
Calms %: 20.0
Average Windspeed (km/h): 2.7
Maximum Windspeed (km/h): 29.5
Prevailing Wind Direction: 202.5
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (0.3%)
10 - 15 (1.2%)
5 - 10 (11.1%)
1 - 5 (67.3%)

CBased Environmental Pty Limited
ABN 62 611 924 264

Dixon Sand Quarry

Environmental Monitoring
Air Quality

Tapered Element Oscillating Microbalance (TEOM) (PM_{10}) and Meteorological Data

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JUNE 2022

Colin Davies BSc MEIA CENVP
Environmental Scientist
Date: 20 July 2022

CBased Environmental Pty Ltd
Unit 3, 2 Enterprise Crescent SINGLETON NSW 2330
☎ (02) 65713334

1.0 Summary

CBased Environmental Pty Limited is contracted by Dixon Sand to conduct continuous Tapered Element Oscillating Microbalance (TEOM) for fine particulates (PM_{10}) and meteorological monitoring for the Dixon Sand Quarry. The information is required to assess air quality levels. The results for the TEOM and meteorological site are included in this report.

The monitoring programme includes:

- One continuous TEOM PM_{10} monitor; and
- One continuous Meteorological Station.

This monthly report for June 2022 was prepared by CBased Environmental and includes the following:

- TEOM (PM_{10}) monitoring results; and
- Meteorological results

In accordance with Schedule 3, Condition 7 of the Dixon Sand development Consent and the Dixon Sand EPL;

- 24-hour average results were below the NEPM 24-hour maximum criteria of 50ug/m^3;
- 24-hour average results were below the Dixon Sand Quarry EPL limit of 42ug/m^3;
- The annual average is below the Dixon Sand Quarry consent annual average criteria of 30ug/m^3; and
- The calculated TSP is below the Dixon Sand Quarry annual average criteria of 90ug/m^3.

Note: Based on the available data, statements in green indicate current conformance to Dixon Sand Quarry Air Quality Impact Assessment criteria, statements in red indicate possible non-conformance. Year to date annual average for PM_{10} is calculated from 1 July 2021 for TEOM's coinciding with the Dixon Sand project year. An annual amount of data has now been collected.

Approximately 77% of valid meteorological data was recorded for June 2022. Loss of valid data was due to a faulty humidity sensor.

Approximately 100% of TEOM data was recovered for June 2022.

2.0 Sampling Programme

The TEOM is sited and operated to the applicable Australian Standard and/or OEH (EPA) approved methods. The following Australian Standards were used:

- AS3580.9.8 - "*Methods for Sampling and Analysis of Ambient Air. Determination of Suspended Particulates—PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*"; and
- AS/NZS 3580.1.1 - "*Methods for Sampling and Analysis of Ambient Air Part 1.1 Guide to Siting Air Monitoring Equipment*".

TEOM PM_{10} results are 24-hour averages at midnight and are reported as $\mu g/m^3$ corrected to 0 degrees C and 101.3kPa.

All laboratory analysis was conducted by a National Association of Testing Authorities (NATA) accredited laboratory.

Air Quality monitoring site descriptions and locations are provided in **Table 1**.

Table 1: Dixon Sand Air Quality Monitoring Description and Locations

Monitor	Site Code	Location Description
TEOM PM_{10}	TEOM	Old North Road, Maroota NSW
Meteorological Station	MET	Old North Road, Maroota NSW

3.0 Results

3.1 TEOM PM_{10}

24-hour average TEOM PM_{10} results from the AQMS data collection software are provided in **Table 2** and a chart of the data is provided in **Figure 1**.

During the monitoring period, individual 24-hour TEOM PM_{10} results were below the National Environment Protection Measure (NEPM) short-term (24hr) impact criteria of 50ug/m^3 and the Dixon Sand Quarry EPL limit of 42ug/m3.

At present, the current TEOM PM_{10} annual average is below the Dixon Sand Quarry annual average PM_{10} criteria of 30ug/m^3. The current annual average for calculated Total Suspended Particulates (TSP) is below the annual average criterion of 90ug/m^3. The TSP is calculated by multiplying the PM_{10} by 2.5. Note: the annual average is calculated from 1 July 2021 and therefore an annual amount of data has now been collected.

The quarterly TEOM calibration was conducted in March 2022 with the next calibration due during this reporting period but has not yet been completed. The calibration certificate is provided in **Appendix 1** (when required).

Table 2: Average Daily 24-hr TEOM PM_{10} and TSP Results for June 2022 from AQMS and Annual Average PM_{10} calculated from the 1 July 2021.

Date	PM_{10} 24-hr Average ($\mu g/m^3$)	PM_{10} Annual Average ($\mu g/m^3$)	24-hr Average TSP* ($\mu g/m^3$)	Annual Average TSP** ($\mu g/m^3$)
1/06/2022	9.5	13.0	23.8	32.5
2/06/2022	16.2	13.0	40.5	32.5
3/06/2022	6.8	13.0	17.0	32.5
4/06/2022	5.3	13.0	13.3	32.4
5/06/2022	4.4	12.9	11.0	32.3
6/06/2022	11.4	12.9	28.5	32.3
7/06/2022	10.7	12.9	26.8	32.3
8/06/2022	9.6	12.9	24.0	32.3
9/06/2022	9.4	12.9	23.5	32.3
10/06/2022	7.6	12.9	19.0	32.2
11/06/2022	5.0	12.9	12.5	32.2
12/06/2022	7.9	12.9	19.8	32.1
13/06/2022	6.7	12.8	16.8	32.1
14/06/2022	14.3	12.8	35.8	32.1
15/06/2022	6.9	12.8	17.3	32.0
16/06/2022	10.3	12.8	25.8	32.0
17/06/2022	12.1	12.8	30.3	32.0
18/06/2022	12.0	12.8	30.0	32.0
19/06/2022	9.2	12.8	23.0	32.0
20/06/2022	9.6	12.8	24.0	32.0
21/06/2022	8.1	12.8	20.3	31.9
22/06/2022	9.0	12.8	22.5	31.9
23/06/2022	9.1	12.8	22.8	31.9
24/06/2022	7.8	12.7	19.5	31.9
25/06/2022	7.1	12.7	17.8	31.8
26/06/2022	7.1	12.7	17.8	31.8
27/06/2022	11.2	12.7	28.0	31.8
28/06/2022	14.1	12.7	35.3	31.8
29/06/2022	10.3	12.7	25.8	31.8
30/06/2022	14.2	12.7	35.5	31.8

*Calculated from PM10

**Calculated from PM10 Annual Average

"No Valid Data" – when displayed, indicates when no valid 1-hour data is available to calculate a 24hr average

Note: results above the Dixon Sand EPL criteria limit of 42 ug/m3 highlighted in yellow, when applicable

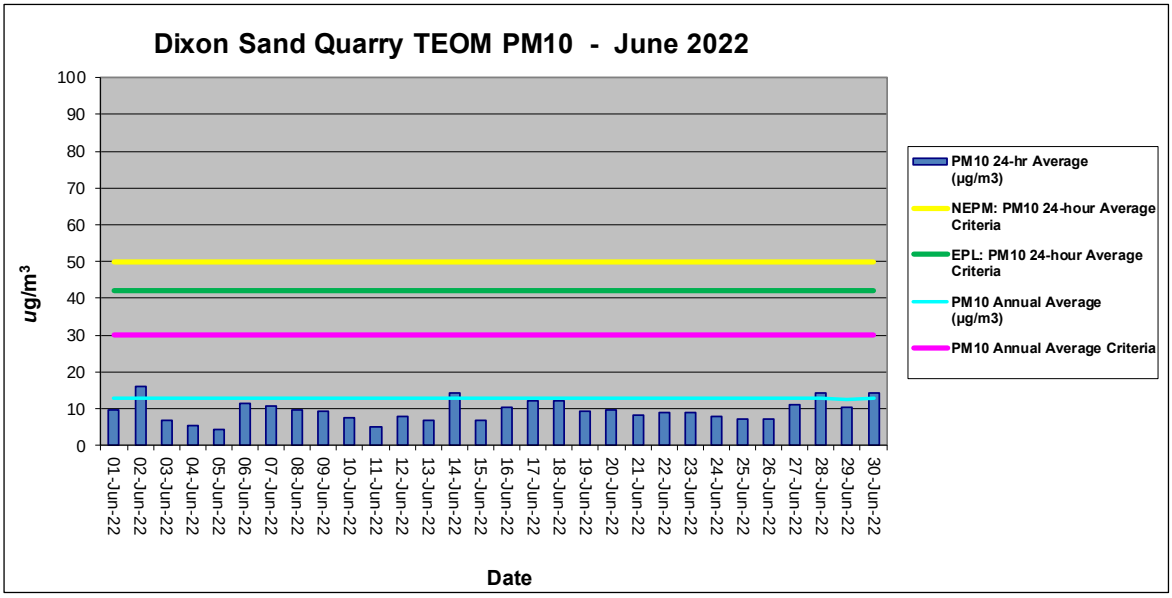


Figure 1: *TEOM PM_{10} 24 hr, Annual Average and Criteria*

3.2 Meteorological Data

The weather station logs data at 5-minute intervals and sends the data to a web database by NextG telemetry. The data is accessible from the web site http://console.teledata.com.au/index.html.

A summary of monthly results is presented in **Table 3**. Charts of meteorological parameters are presented in **Figures 2** and **3**. A windrose is provided in **Figure 4**. This provides the frequency distribution of wind speed and direction during the month to display dominant wind directions.

An annual physical screening and system check of the meteorological station was conducted March 2022 and is next due in March 2023. The screening and system check certificates are provided in **Appendix 1** (when required).

Table 3: Meteorological Data Summary for June 2022

Date	Min Temp	Avg Temp	Max Temp	RAIN mm	Min WS	Avg WS	Max WS	Min Humidity	Avg Humidity	Max Humidity	Min Pressure	Avg Pressure	Max Pressure
1/06/2022	6.4	9.4	13.1	0.0	0.0	4.6	22.4				984.5	989.0	996.5
2/06/2022	5.8	9.8	14.7	0.0	0.2	2.2	6.6				996.1	998.8	1001.0
3/06/2022	6.3	9.2	12.2	1.0	0.4	4.1	15.5				990.6	994.5	998.3
4/06/2022	7.3	11.0	16.5	0.4	0.3	4.0	18.1				989.7	991.9	994.0
5/06/2022	8.8	11.4	14.9	0.0	0.4	7.0	21.9				986.4	990.6	993.7
6/06/2022	8.0	11.4	15.2	0.2	0.5	6.5	22.2				982.8	987.4	991.9
7/06/2022	7.2	10.4	14.5	0.0	0.4	5.1	20.3				989.1	991.2	992.7
8/06/2022	6.0	8.9	14.3	0.0	0.3	3.6	15.5				992.5	994.5	996.7
9/06/2022	5.0	9.2	15.0	0.0	0.0	4.2	16.1				991.8	994.0	995.5
10/06/2022	7.3	10.7	16.3	0.0	0.2	3.4	15.6				992.4	994.3	995.8
11/06/2022	7.4	10.3	15.8	0.0	0.1	3.5	23.4				991.7	994.0	996.3
12/06/2022	7.1	10.9	15.8	0.0	0.3	3.8	14.1				990.4	993.2	997.4
13/06/2022	5.9	10.6	15.5	0.0	0.2	2.6	8.1				997.4	1000.5	1002.7
14/06/2022	4.6	10.1	15.8	0.0	0.0	2.8	14.3				1000.2	1002.0	1004.3
15/06/2022	8.9	12.9	18.0	0.0	0.5	5.1	14.7				996.8	998.7	1000.9
16/06/2022	10.5	13.8	19.5	0.0	0.2	4.2	13.6				994.7	997.0	998.2
17/06/2022	8.9	12.4	17.6	0.0	0.2	2.8	13.9				996.8	999.1	1002.1
18/06/2022	8.0	12.0	17.1	0.0	0.2	4.9	14.6				1001.9	1004.2	1006.2
19/06/2022	8.6	11.9	17.6	0.0	0.2	3.8	16.8				1004.6	1005.7	1007.6
20/06/2022	10.0	12.1	16.5	0.8	0.1	3.0	10.2				1001.5	1003.1	1005.1
21/06/2022	7.0	12.6	18.8	1.4	0.2	4.3	17.1				997.8	999.9	1001.7
22/06/2022	7.5	11.5	16.4	0.0	0.1	2.4	7.4				1000.6	1003.3	1005.1
23/06/2022	7.1	11.6	17.5	0.0	0.1	2.4	8.1				1000.4	1002.6	1004.6
24/06/2022	9.0	12.9	17.5	0.0	0.3	3.4	16.4				996.9	998.9	1000.4
25/06/2022	10.2	13.6	18.6	0.0	0.2	3.3	11.7				999.3	1001.2	1003.3
26/06/2022	9.8	13.6	18.8	0.0	0.1	3.0	14.3				1001.9	1003.4	1004.7
27/06/2022	7.0	10.3	14.3	0.0	0.0	3.9	17.2				1003.0	1006.1	1009.3
28/06/2022	5.8	9.3	13.4	0.0	0.0	4.0	13.0				1007.6	1009.0	1010.8
29/06/2022	8.2	11.6	15.8	0.0	0.4	3.6	15.0				1001.7	1004.5	1007.7
30/06/2022	10.6	12.4	15.6	0.0	0.2	2.6	8.6				1000.8	1002.9	1004.8
Monthly	**4.6**	**11.3**	**19.5**	**3.8**	**0.0**	**3.8**	**23.4**	**0.0**	**#DIV/0!**	**0.0**	**982.8**	**998.5**	**1010.8**

Faulty humidity sensor

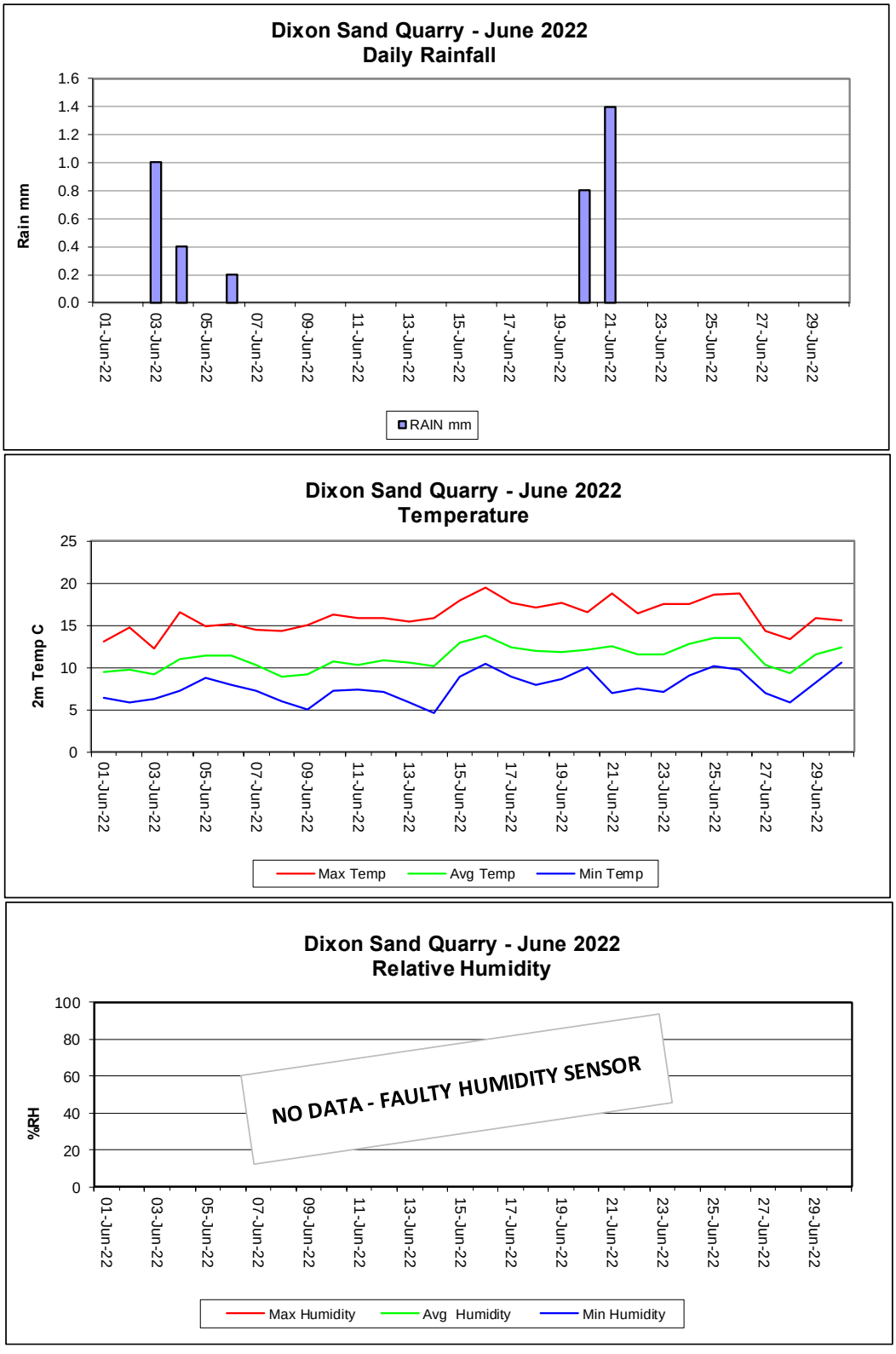


Figure 2: *Daily Rainfall, Temperature and Relative Humidity Charts*

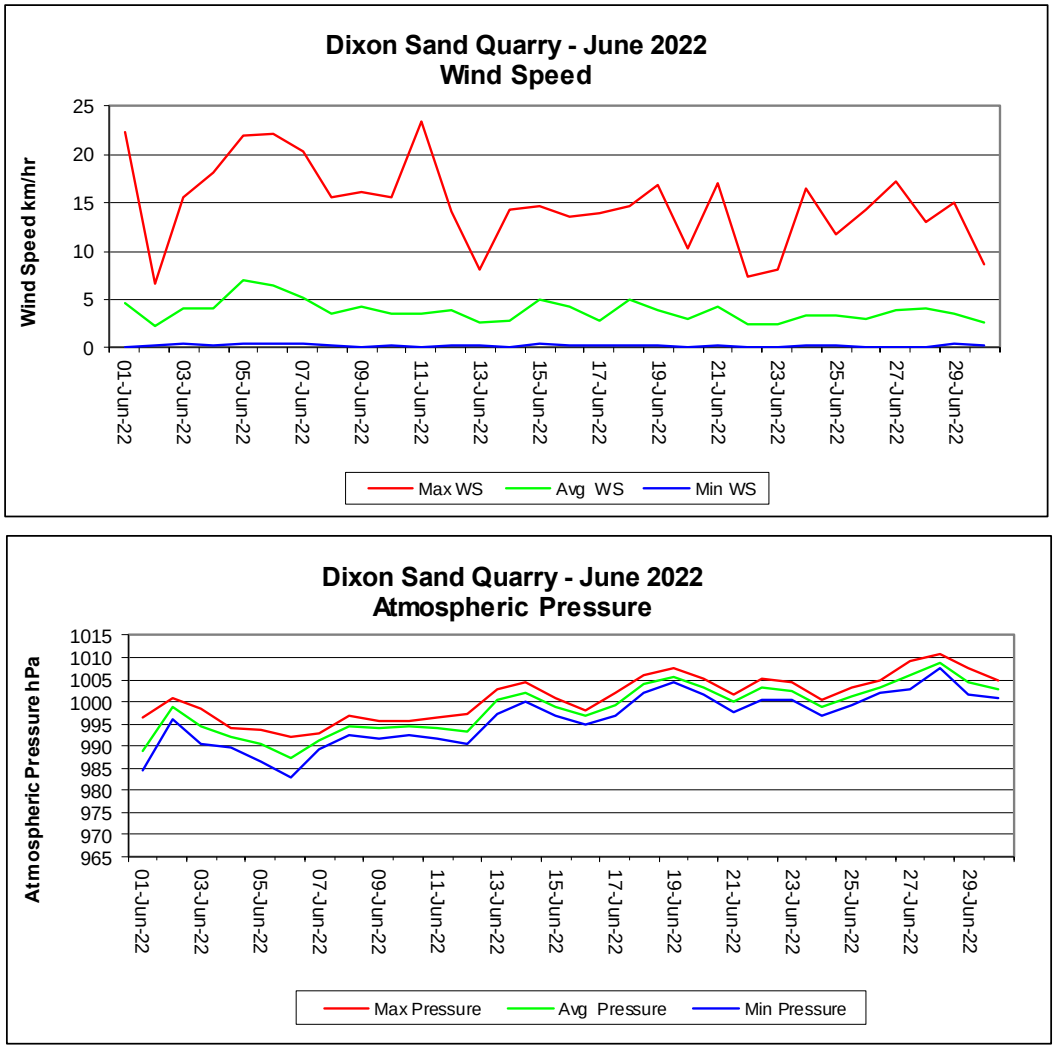
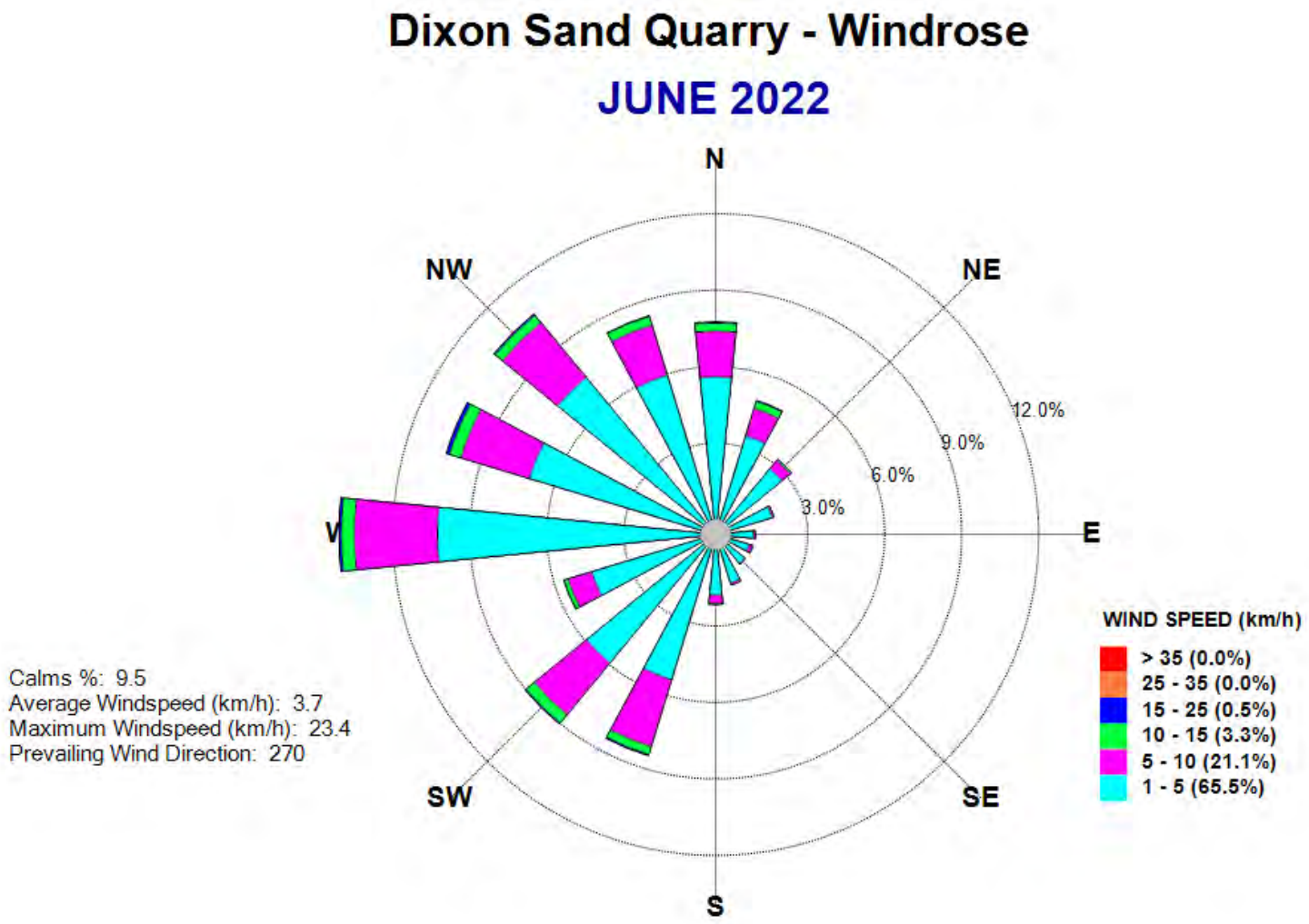


Figure 3: *Wind Speed and Atmospheric Pressure Charts*


Dixon Sand Quarry - Windrose
JUNE 2022
N
NE
E
SE
S
SW
W
NW
3.0%
6.0%
9.0%
12.0%
WIND SPEED (km/h)
> 35 (0.0%)
25 - 35 (0.0%)
15 - 25 (0.5%)
10 - 15 (3.3%)
5 - 10 (21.1%)
1 - 5 (65.5%)
Calms %: 9.5
Average Windspeed (km/h): 3.7
Maximum Windspeed (km/h): 23.4
Prevailing Wind Direction: 270

Appendix C – Groundwater and Surface Water Monitoring Results

Groundwater Quality

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 11902

Date Issued: 20/12/2021 Revision Number: 00

Site/Job: Old Northern Rd 6 Mnth Ground Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following groundwater sample(s) were received on 9/12/2021

Client Sample Reference	Date Sampled	Lab ID	Matrix	General Comments
BH1	9/12/2021	11902/1	Water	
BH2	9/12/2021	11902/2	Water	
BH3	9/12/2021	11902/3	Water	
BH6	9/12/2021	11902/4	Water	
BH7	9/12/2021	11902/5	Water	
BH8	9/12/2021	11902/6	Water	Insufficient water to sample
BH9	9/12/2021	11902/7	Water	
MW1	9/12/2021	11902/8	Water	
MW2	9/12/2021	11902/9	Water	
MW3	9/12/2021	11902/10	Water	
MW5	9/12/2021	11902/11	Water	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 20/12/2021.

Test Report Number: 11902

Date Issued: 20/12/2021 Revision No: 00

Results

Field Analysis	Method	Units	11902/1 BH1 9/12/2021	11902/2 BH2 9/12/2021	11902/3 BH3 9/12/2021	11902/4 BH6 9/12/2021	11902/5 BH7 9/12/2021
Depth to Water	AS5667.11	m(bTOC)	59.57	36.88	32.88	31.71	21.78
Temperature	Temp	°C	19.0	19.4	19.1	19.0	19.4
pH	APHA 4500-H B	pH Units	6.7	6.1	6.1	4.9	4.8
Electrical Conductivity	APHA 2510 B	µS/cm	206	272	208	131	258

Field Analysis	Method	Units	11902/6 BH8 9/12/2021	11902/7 BH9 9/12/2021	11902/8 MW1 9/12/2021	11902/9 MW2 9/12/2021	11902/10 MW3 9/12/2021
Depth to Water	AS5667.11	m(bTOC)	26.53	34.84	12.56	19.37	22.57
Temperature	Temp	°C	NT	19.1	18.7	17.8	19.5
pH	APHA 4500-H B	pH Units	NT	5.5	4.4	3.8	5.2
Electrical Conductivity	APHA 2510 B	µS/cm	NT	283	142	506	132

Field Analysis	Method	Units	11902/11 MW5 9/12/2021
Depth to Water	AS5667.11	m(bTOC)	9.05
Temperature	Temp	°C	19.7
pH	APHA 4500-H B	pH Units	4.5
Electrical Conductivity	APHA 2510 B	µS/cm	166

Total Dissolved Solids	Method	Units	11902/1 BH1 9/12/2021	11902/2 BH2 9/12/2021	11902/3 BH3 9/12/2021	11902/4 BH6 9/12/2021	11902/5 BH7 9/12/2021
Total Dissolved Solids	AS3550.4	mg/L	132	129	110	78	134

Total Dissolved Solids	Method	Units	11902/7 BH9 9/12/2021	11902/8 MW1 9/12/2021	11902/9 MW2 9/12/2021	11902/10 MW3 9/12/2021	11902/11 MW5 9/12/2021
Total Dissolved Solids	AS3550.4	mg/L	153	74	254	70	52

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 − Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 11902

Date Issued: 20/12/2021 Revision No: 00

Sampling Conditions: Cloudy, 19°- 23°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
11902/1	BH1		T & D.Walker	9/12/2021 11:20 AM	AS5667.11, Bail	AS5667.1
11902/2	BH2		T & D.Walker	9/12/2021 12:24 PM	AS5667.11, Pump	AS5667.1
11902/3	BH3		T & D.Walker	9/12/2021 12:47 PM	AS5667.11, Pump	AS5667.1
11902/4	BH6		T & D.Walker	9/12/2021 11:51 AM	AS5667.11, Pump	AS5667.1
11902/5	BH7		T & D.Walker	9/12/2021 2:39 PM	AS5667.11, Pump	AS5667.1
11902/6	BH8		T & D.Walker	9/12/2021 3:19 PM	AS5667.11, Bail	AS5667.1
11902/7	BH9		T & D.Walker	9/12/2021 2:18 PM	AS5667.11, Pump	AS5667.1
11902/8	MW1		T & D.Walker	9/12/2021 2:57 PM	AS5667.11, Pump	AS5667.1
11902/9	MW2		T & D.Walker	9/12/2021 3:35 PM	AS5667.11, Bail	AS5667.1
11902/10	MW3		T & D.Walker	9/12/2021 12:05 PM	AS5667.11, Pump	AS5667.1
11902/11	MW5		T & D.Walker	9/12/2021 10:48 AM	AS5667.11, Pump	AS5667.1

Lab ID	Client Sample Reference	Sampling Observations
11902/1	BH1	
11902/2	BH2	
11902/3	BH3	
11902/4	BH6	
11902/5	BH7	
11902/6	BH8	Insufficient water to sample & test (26.7m to bottom)
11902/7	BH9	
11902/8	MW1	
11902/9	MW2	
11902/10	MW3	
11902/11	MW5	

Sampling procedures have been approved and report finalised on 20/12/2021.
Where method is "unknown" sampling procedures are not endorsed

Well Parameters:

Client: Dixon Sand Pty Ltd

Site/Job: Old Northern Rd 6 Mnth Ground Water

Well ID	GPS-Easting	GPS-Northing	Survey Date	Surveyed AHD (m)	Depth to Screen (m)
BH1	312290	6297039			
BH2	313429	6297202			
BH3	313808	6297093			
BH6	313153	6296833			
BH7	313097	6296495			
BH8	313435	6296617			
BH9	313294	6296504			
MW1	313092	6296499			
MW2	313417	6296733			
MW3	313161	6296838			
MW5	312460	6296903			

Well ID	Date Well Measured	Case Height (monument) (m)	Depth to bottom m(bTOC)	Recharge Rate	Approximate Volume (L)
BH1	2/12/2019	0.68	>60	Slow	unkown
BH2	2/12/2019	0.57	>60	slow	unkown
BH3	2/12/2019	0.56	>60	Slow	Unkown
BH6	2/12/2019	0.52	>60	Slow	Unkown
BH7	2/12/2019	0.53	>60	Slow	Unknown
BH8	2/12/2019	0.73	27.53	Slow	2
BH9	2/12/2019	0.64	>60	Medium	Unkown
MW1	2/12/2019	0.28	15.53	Medium	12
MW2	2/12/2019	0.45	24.53	Slow	7.5
MW3	2/12/2019	0.88	34.57	Slow	2.5
MW5	2/12/2019	0.70	21.19	Slow	28

Note: NATA accreditation does not cover information provided in this section

*Where indicated AHD from ground level (m) estimated based on handheld GPS

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
P: (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

Report Number: 12976

Date Issued: 1/07/2022 Revision Number: 00

Site/Job: Old Northern Rd 6 Mnth Ground Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following groundwater sample(s) were received on 22/06/2022

Client Sample Reference	Date Sampled	Lab ID	Matrix	General Comments
BH1	23/06/2022	12976/1	Water	
BH2	23/06/2022	12976/2	Water	
BH3	23/06/2022	12976/3	Water	
BH6	23/06/2022	12976/4	Water	
BH7	23/06/2022	12976/5	Water	
BH8	23/06/2022	12976/6	Water	
BH9	23/06/2022	12976/7	Water	
MW1	23/06/2022	12976/8	Water	
MW2	23/06/2022	12976/9	Water	
MW3	23/06/2022	12976/10	Water	
MW5	23/06/2022	12976/11	Water	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 1/07/2022.

Test Report Number: 12976

Date Issued: 1/07/2022 Revision No: 00

Results

Field Analysis	Method	Units	12976/1 BH1 23/06/2022	12976/2 BH2 23/06/2022	12976/3 BH3 23/06/2022	12976/4 BH6 23/06/2022	12976/5 BH7 23/06/2022
Date Tested	--	--	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Depth to Water	AS5667.11	m(bTOC)	59.28	35.06	31.64	30.25	20.43
Temperature	Temp	°C	18.6	18.2	17.5	17.7	18.2
pH	APHA 4500-H B	pH Units	7.1	6.0	6.0	5.3	4.8
Electrical Conductivity	APHA 2510 B	µS/cm	186	248	200	130	260

Field Analysis	Method	Units	12976/6 BH8 23/06/2022	12976/7 BH9 23/06/2022	12976/8 MW1 23/06/2022	12976/9 MW2 23/06/2022	12976/10 MW3 23/06/2022
Date Tested	--	--	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Depth to Water	AS5667.11	m(bTOC)	26.57	32.93	11.86	18.57	21.89
Temperature	Temp	°C	[NT]	17.6	18.4	17.4	18.0
pH	APHA 4500-H B	pH Units	[NT]	5.6	4.3	3.8	6.2
Electrical Conductivity	APHA 2510 B	µS/cm	[NT]	282	176	443	133

Field Analysis	Method	Units	12976/11 MW5 23/06/2022
Date Tested	--	--	23/06/2022
Depth to Water	AS5667.11	m(bTOC)	5.58
Temperature	Temp	°C	19.2
pH	APHA 4500-H B	pH Units	4.7
Electrical Conductivity	APHA 2510 B	µS/cm	162

Total Dissolved Solids	Method	Units	12976/1 BH1 23/06/2022	12976/2 BH2 23/06/2022	12976/3 BH3 23/06/2022	12976/4 BH6 23/06/2022	12976/5 BH7 23/06/2022
Date Tested	--	--	30/06/2022	30/06/2022	30/06/2022	30/06/2022	30/06/2022
Total Dissolved Solids	AS3550.4	mg/L	164	151	129	100	167

Total Dissolved Solids	Method	Units	12976/6 BH8 23/06/2022	12976/7 BH9 23/06/2022	12976/8 MW1 23/06/2022	12976/9 MW2 23/06/2022	12976/10 MW3 23/06/2022
Date Tested	--	--	[NT]	30/06/2022	30/06/2022	30/06/2022	30/06/2022
Total Dissolved Solids	AS3550.4	mg/L	[NT]	160	108	260	96

Total Dissolved Solids	Method	Units	12976/11 MW5 23/06/2022
Date Tested	--	--	30/06/2022
Total Dissolved Solids	AS3550.4	mg/L	89

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 12976

Date Issued: 1/07/2022 Revision No: 00

Sampling Conditions: Fine, 12°- 18°C

Lab ID	Client Sample Reference	Licence/ Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
12976/1	BH1		T & D.Walker	23/06/2022 10:29 AM	AS5667.11, Bail	AS5667.1
12976/2	BH2		T & D.Walker	23/06/2022 12:17 PM	AS5667.11, Pump	AS5667.1
12976/3	BH3		T & D.Walker	23/06/2022 11:53 AM	AS5667.11, Pump	AS5667.1
12976/4	BH6		T & D.Walker	23/06/2022 11:37 AM	AS5667.11, Bail	AS5667.1
12976/5	BH7		T & D.Walker	23/06/2022 1:26 PM	AS5667.11, Pump	AS5667.1
12976/6	BH8		T & D.Walker	23/06/2022 2:03 PM	AS5667.11, Bail	AS5667.1
12976/7	BH9		T & D.Walker	23/06/2022 12:46 PM	AS5667.11, Pump	AS5667.1
12976/8	MW1		T & D.Walker	23/06/2022 1:40 PM	AS5667.11, Pump	AS5667.1
12976/9	MW2		T & D.Walker	23/06/2022 2:31 PM	AS5667.11, Bail	AS5667.1
12976/10	MW3		T & D.Walker	23/06/2022 11:23 AM	AS5667.11, Bail	AS5667.1
12976/11	MW5		T & D.Walker	23/06/2022 10:58 AM	AS5667.11, Bail	AS5667.1

Lab ID	Client Sample Reference	Sampling Observations
12976/1	BH1	
12976/2	BH2	
12976/3	BH3	
12976/4	BH6	
12976/5	BH7	
12976/6	BH8	Insufficient water to sample
12976/7	BH9	
12976/8	MW1	
12976/9	MW2	
12976/10	MW3	
12976/11	MW5	

Sampling procedures have been approved and report finalised on 1/07/2022.
Where method is "unknown" sampling procedures are not endorsed

Well Parameters:

Client: Dixon Sand Pty Ltd

Site/Job: Old Northern Rd 6 Mnth Ground Water

Well ID	GPS-Easting	GPS-Northing	Survey Date	Surveyed AHD (m)	Depth to Screen (m)
BH1	312290	6297039			
BH2	313429	6297202			
BH3	313808	6297093			
BH6	313153	6296833			
BH7	313097	6296495			
BH8	313435	6296617			
BH9	313294	6296504			
MW1	313092	6296499			
MW2	313417	6296733			
MW3	313161	6296838			
MW5	312460	6296903			

Well ID	Date Well Measured	Case Height (TOC) (m)	Depth to bottom m(bTOC)	Recharge Rate	Approximate Volume (L)
BH1	2/12/2019	0.68	>60	Slow	unkown
BH2	2/12/2019	0.57	>60	slow	unkown
BH3	2/12/2019	0.56	>60	Slow	Unkown
BH6	2/12/2019	0.52	>60	Slow	Unkown
BH7	2/12/2019	0.53	>60	Slow	Unknown
BH8	2/12/2019	0.73	27.53	Slow	2
BH9	2/12/2019	0.64	>60	Medium	Unkown
MW1	2/12/2019	0.28	15.53	Medium	12
MW2	2/12/2019	0.45	24.53	Slow	7.5
MW3	2/12/2019	0.88	34.57	Slow	2.5
MW5	2/12/2019	0.70	21.19	Slow	28

Note: NATA accreditation does not cover information provided in this section

*Where indicated AHD from ground level (m) estimated based on handheld GPS

Surface Water Quality

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
NATA Accreditation 20375
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
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Report Number: 11518

Date Issued: 22/09/2021 Revision Number: 00

Site/Job: Old Northern Rd - Surface Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following sample(s) were received on 22/09/2021 08:36

Client Sample Reference	Date Sampled	Sampled by	Lab ID	Matrix	Client Comments
SW19	21/09/2021 10:50 AM	M.Mass	11518/1	Water	Field pH 4.05

The sample(s) have been tested as received and the following reports are included:

- Test Report: Results apply to the sample(s) as submitted.
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 22/09/2021.

Test Report Number: 11518

Date Issued: 22/09/2021 Revision No: 00

Results

Physicals	Method	Units	11518/1 SW19 21/09/2021
Temperature	Temp	°C	16.3
pH	APHA 4500-H B	pH Units	4.7
Turbidity	APHA 2130 B	NTU	3.9
Total Suspended Solids	AS3550.4	mg/L	<5

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

VGT Laboratories Pty Ltd.
ABN 77 621 943 600
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Report Number: 11904

Date Issued: 10/12/2021 Revision Number: 00

Site/Job: Old Northern Rd - Surface Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following sample(s) were received on 10/12/2021 08:48

Client Sample Reference	Date Sampled	Sampled by	Lab ID	Matrix	Client Comments
SW19	9/12/2021	Client	11904/1	Water	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report: Results apply to the sample(s) as submitted.
- Chain of Custody (if available)

Approved by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 10/12/2021.

Test Report Number: 11904

Date Issued: 10/12/2021 Revision No: 00

Results

Physicals	Method	Units	11904/1 SW19 9/12/2021
Temperature	Temp	°C	19.7
pH	APHA 4500-H B	pH Units	4.2
Electrical Conductivity	APHA 2510 B	µS/cm	192
Turbidity	APHA 2130 B	NTU	0.35
Total Suspended Solids	AS3550.4	mg/L	<5

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Accredited for compliance with ISO/IEC 17025 – Testing.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

VGT Laboratories Pty Ltd.
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Report Number: 12977

Date Issued: 24/06/2022 Revision Number: 00

Site/Job: Old Northern Rd - Surface Water

Client: Dixon Sand Pty Ltd
Address PO Box 4019
Pitt Town NSW 2756
Contact David Dixon

The following sample(s) were received on 24/06/2022 08:35

Client Sample Reference	Date Sampled	Sampled by	Lab ID	Matrix	Client Comments
SW19	23/06/2022 11:15 AM		12977/1	Water	Sampled by Melissa Mass

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report: Results apply to the sample(s) as submitted.
- Chain of Custody (if available)

Authorised by: Anthony Crane
Laboratory Manager

Results have been approved and report finalised on 24/06/2022.

Test Report Number: 12977

Date Issued: 24/06/2022 Revision No: 00

Results

Physicals	Method	Units	12977/1 SW19 23/06/2022
Date Tested	--	--	24/06/2022
Temperature	Temp	°C	12.6
pH	APHA 4500-H B	pH Units	6.3
Electrical Conductivity	APHA 2510 B	µS/cm	144
Turbidity	APHA 2130 B	NTU	18

Solids	Method	Units	12977/1 SW19 23/06/2022
Date Tested	--	--	24/06/2022
Total Suspended Solids	AS3550.4	mg/L	5

Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Results in **bold** indicate an exceedance of the relevant guideline.
When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.
https://www.vgt.com.au/measurement-uncertainty

[NT]: Not tested

Location Analysed : Field and 4/30 Glenwood Dr Thornton NSW 2322.

Discharge Point – Water Quality

(No planned discharge during this reporting period)

Appendix D – Noise Compliance Reports

Dixon Sand Pty Ltd

Old Northern Road Quarry, Maroota

Noise monitoring report
December 2021

Doc no. 19020-NV-RP-6-0

Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

Title	Noise monitoring report
Document no.	19020-NV-RP-6-0
Revision	0
Date	20 December 2021
Author	John Hutchison
Reviewer	Scott Hughes
File path	C:\Users\john.HW\Documents\Client files\Projects (local)\19020 Dixon\19020-NV-RP-6-0 Dixon Sand Old Northern Road Noise Monitoring Dec 2021.docx

Hutchison Weller Pty Ltd
ABN 37 001 024 095
13/357 Military Road
Mosman NSW 2008

www.hutchisonweller.com

Revision history

0	20 December 2021	Report issued to client

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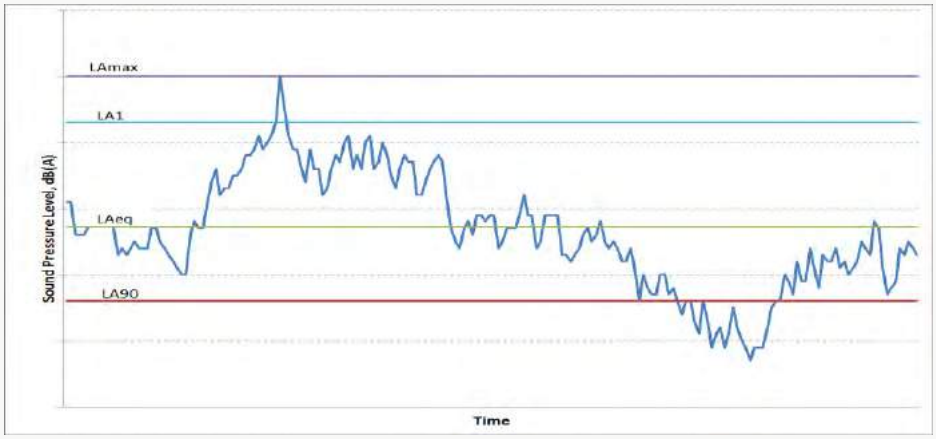
Definition of terms

Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
EPA	Environment Protection Authority
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise level statistics	L_{A90} – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period. 
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Receiver	The land use at which noise is heard
SLM	Sound Level Meter
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Sound Pressure Level (SPL)	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB).
Tonal noise	Noise with perceptible and definite pitch or tone

1. Introduction

Dixon Sand Pty Ltd operates the Old Northern Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Old Northern Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and direct sales involving loading of trucks for shipment.

The Quarry operates under Development Consent 250-09-01 and Environment Protection Licence (EPL) 3916, which set noise limits for its operation and require noise monitoring to be completed on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 14 December 2021.

Figure 1 Location of the Quarry

2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA250-09-01 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance.

1. The Applicant must comply with the operating hours set out in Table 1.

Table 1 Operating hours

Activity	Permissible hours
Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck arrival (unladen)	5.45 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck loading Truck dispatch Truck arrival (laden)	6.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Bund construction or rehabilitation works within 250 m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence

2. The following activities may be carried out outside the hours specified in condition 1 above:

(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and

(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.

In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land or at the Maroota Public School.

Table 2 Noise criteria dB(A)

Receiver	Averaging period	Shoulder (6.00 am to 7.00 am)	Day (7.00 am to 6.00 pm)
Any residence on privately owned land	LAeq (15 minute)	37	44
Any classroom at Maroota Public School	LAeq (1 hour)	-	45

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

3. Monitoring methodology

Operator-attended noise monitoring was undertaken on 14 December June 2021 by John Hutchison of Hutchison Weller, an independent acoustic specialist and Member of the Australian Acoustical Society. Monitoring locations included those described in the Quarry Noise Management Plan plus additional sensitive receivers, as illustrated in Figure 1 and summarised in Table 3.

Table 3 Monitoring locations

Receiver[1]	Address	Description
OR1	Maroota public school	Classroom closest to quarry operations
OR2	4624 Old Northern Road	Private residence
OR3	4634 Old Northern Road	Private residence
R2	4579 Old Northern Road	Private residence
R3	4567 Old Northern Road	Private residence
R4/5	4547 – 4543 Old Northern Road	Mid-point between private residence
OAS1	Lots 1 and 2 of the Quarry	At source monitoring, close to operations
OAS2	Lot 196 of the Quarry	At source monitoring, close to operations

Note 1: An agreement between Dixon Sand and receiver R1 is in place and, therefore, noise management levels defined by the development consent are not applicable.

Monitoring was conducted in accordance with procedures outlined in the Noise Policy for Industry and Section 6 of the Noise Management Plan.

At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation included a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2022.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LAmax statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish the meteorological conditions as being suitable for monitoring.

Where extraneous noise such as road traffic and fauna (insects/birds) were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlines in Noise Policy for Industry (NSW EPA 2017). This involved extrapolation from the near-distance location to the sensitive receiver location, as described in Section 4.3.

4. Monitoring results

4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 4.

In general, quarry operations were faintly audible from most locations, with traffic the dominant source of noise for residents on the Old Northern Road.

Quarry operations fell into four categories representing the main sources of noise. These were:

- Sand processing and truck loading (main plant, front end loaders, trucks)
- Extraction of sand (involving ripping by dozer and transport via excavator loading a moxie)
- Extraction of bulk sandstone by rock saw
- Dewatering activities with dewatering pumps

Depending on the receiver location, these sources played a varying role in contributing to the total noise level.

Measured results indicated quarry operations during the shoulder period (from 6.00am to 7.00am) were audible but complied with the noise criteria at all measurement locations.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken over 15-minute periods to establish representative sound power levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.3.

During the day (standard hours), measurement at the school and residential receivers established traffic was the dominant source of noise in the area and heavily influenced measured LAeq, 15-minute noise levels. However, quarry noise was audible over the background level.

Estimated contributions of quarry noise on the total noise level indicated compliance with the noise limit. However, due to ambient noise (traffic, birds, breeze in trees), extrapolation from at-source measurements has been undertaken to support this assertion (See Section 4.3.)

4.2 Modifying factors

No tonal, impulsive or low frequency noise characteristics were observed during the monitoring period. Therefore, application of modifying factors is not appropriate in this instance.

Table 4 Monitoring results

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Shoulder (6.00am to 7.00am)								
5.58am	OR3	37	48.6	40.2	59.0	<37	Occasional traffic on access road ~50 – 53 (some at 57-58 dBA) for short periods (approx. 8 trucks in 15 minutes) ONR traffic intermittent ~ 50 – 53 dBA, but audible for a long distance Processing area visibly operating and faintly audible when ambient level is 40 dBA Quarry generally inaudible	Clear sky and calm to light breeze (3 km/h) Temperature 14°C Neutral conditions (C-D class).
6.18am	OR2		52.7	41.8	68.3	<37	Heavy vehicles ~ 54 – 55 dBA approximately every 2 minutes ONR dominant ambient noise source with 58 – 60 dBA pass bys – engine braking Quarry barely audible at ambient levels of 37 dBA	
6.37am	R3		60.7	37.4	82.1	<37	Traffic on ONR is dominant noise source ~77-78 for HV passbys Processing plant just audible in break in traffic at ambient level of ~38 dBA but essentially inaudible for monitoring period	
6.55am	R4/5		60.4	38.2	77.9	<37	ONR dominant ~73 – 78 dBA for HV reduced frequency compared with earlier Processing plant just audible during break in traffic at ambient levels of 37 – 41 dBA	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Day period - (7.00am to 6.00pm)								
7:53am	OAS1	N/A	50.8	45.5	61.9	~50	Pit audible in this location – some intermittent ripping / bucket scraping at 46 dBA – no steady noise source Processing plant / moxies to stockpile dominant sources. Moxies on the mound ~ 56 dBA, processing plant ~44 dBA	Light breeze from S - SSW @ 4-5 km/h Temperature 18-19°C Clear sky unstable (A class)
9:38am	OAS2	N/A	60.0	52.4	64.0	63	Quarry noise is main source Dozer pushing up spoil at eastern end of pit – close to pit wall – 70 dBA Cliff is around 15-20 metres high around works Excavator loading moxies ~58 dBA	
10:13am	OR1	45	48.3	41.2	68.2	See Section 4.3	Quarry audible with dozer pushing up at 41 – 42 dBA Moxy audible at 50 dBA for short time ~ 5 – 10 secs Traffic on Old Northern Road fairly light ~53 – 58 intermittent School kids outside at 11am	Breeze from NNE - SSW@ 5km/h Temperature 23°C Unstable conditions (A class)
11:20am	R4/5	44	59.1	39.9	77.0	See Section 4.3	School kids in yard (voices) audible Traffic on ONR – 73 – 74 for truck passbys Birds / insects combined for 41 – 43 dBA Quarry noise intermittently audible ~39 – 41 dBA when breaks in traffic	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
11:40am	R3	44	59.0	39.5	59.0	See Section 4.3	Quarry faintly audible – 38 – 39 dBA during break in traffic Traffic noise remains dominant ~ 60 – 66 LV and 74 – 78 HV	Breeze from variable directions @ 5 - 6 km/h Temperature 25°C Unstable conditions (A class)
12:07pm	R2	44	61.2	38.3	83.8	See Section 4.3	Traffic dominant ~ 76 - 79 dBA Moxies heading to stockpile faintly audible at 39-40 dBA LAeq without traffic noise ~ 40 dBA includes faint hum of quarry, breeze in trees, birds/insects	
12:26pm	OR2	44	50.8	40.4	71.8	See Section 4.3	Old Northern Road traffic is dominant ~ 55-56 dBA Quarry intermittently audible pit noise ~38 dBA Haul road 55 – 56 dBA Moxy heading to stockpile ~47 dBA	
1:10pm	OR3	44	45.7	39.4	58.8	See Section 4.3	Quarry and pit faintly audible ~ 39 dBA Old Northern Road traffic 54 – 57 dBA Haul road traffic ~ 51 – 54 dBA	

4.3 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels. Therefore, measurements captured on-site without substantial influence from extraneous noise were used to calculate sound pressure levels at each receiver.

Calculations were based on ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation,* which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on measurements described in Table 4, extrapolated noise results for each monitoring location are presented in **Error! Not a valid bookmark self-reference.**. Results are shown for equipment operating in the pit, processing plant and stockpiling area.

Extrapolated results demonstrate the Quarry as measured demonstrates a contribution to the ambient noise environment that meets the noise limit for the day period in all locations.

Table 5 Extrapolated monitoring results

Receiver	Noise criteria		Extrapolated noise level, LAeq, 15 minute	Comment
	Shoulder	Day		
OR1	-	45	41	Predicted levels correlate well with measured levels and most locations shown to meet noise limits during the day period.
OR2	37	44	43	
OR3			44	
2			42	
3			41	
4/5			43	

4.4 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate the following.

1. Observed operations during the day period were compliant with the noise limit at each receiver under the meteorological conditions at the time.

2. Observed operations during the shoulder period were compliant with the noise criteria at all receivers under the meteorological conditions at the time.

hutchison weller

Dixon Sand Pty Ltd

Old Northern Road Quarry, Maroota

Noise monitoring report
June 2022

Doc no. 19020-NV-RP-9-0

Dixon Sand Pty Ltd
Old Northern Road Quarry, Maroota

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0	24 August 2022	Report issued to client

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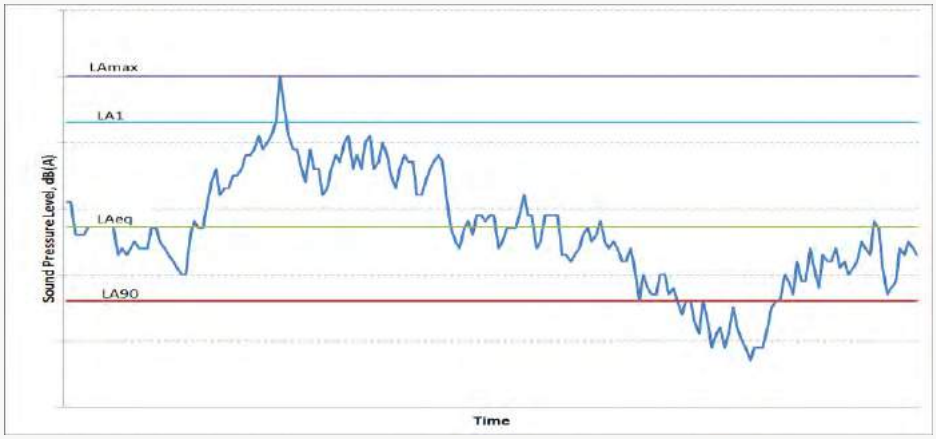
Definition of terms

Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
EPA	Environment Protection Authority
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise level statistics	L_{A90} – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise. L_{Aeq} – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period. L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period. L_{Amax} – The maximum A-weighted noise level associated with the measurement period. 
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Receiver	The land use at which noise is heard
SLM	Sound Level Meter
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Sound Pressure Level (SPL)	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise. A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically 20 µPa equivalent to 0 dB).
Tonal noise	Noise with perceptible and definite pitch or tone

1. Introduction

Dixon Sand Pty Ltd operates the Old Northern Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Old Northern Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and direct sales involving loading of trucks for shipment.

The Quarry operates under Development Consent 250-09-01 and Environment Protection Licence (EPL) 3916, which set noise limits for its operation and require noise monitoring to be completed on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 17 June 2022.

Figure 1 Location of the Quarry

2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA250-09-01 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance.

1. The Applicant must comply with the operating hours set out in Table 1.

Table 1 Operating hours

Activity	Permissible hours
Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck arrival (unladen)	5.45 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck loading Truck dispatch Truck arrival (laden)	6.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Bund construction or rehabilitation works within 250 m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence

2. The following activities may be carried out outside the hours specified in condition 1 above:

(a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and

(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.

In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land or at the Maroota Public School.

Table 2 Noise criteria dB(A)

Receiver	Averaging period	Shoulder (6.00 am to 7.00 am)	Day (7.00 am to 6.00 pm)
Any residence on privately owned land	LAeq (15 minute)	37	44
Any classroom at Maroota Public School	LAeq (1 hour)	-	45

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

3. Monitoring methodology

Operator-attended noise monitoring was undertaken by John Hutchison of Hutchison Weller, an independent acoustic specialist and Member of the Australian Acoustical Society. Monitoring locations included those described in the Quarry Noise Management Plan plus additional sensitive receivers, as illustrated in Figure 1 and summarised in Table 3.

Table 3 Monitoring locations

Receiver[1]	Address	Description
OR1	Maroota public school	Classroom closest to quarry operations
OR2	4624 Old Northern Road	Private residence
OR3	4634 Old Northern Road	Private residence
R2	4579 Old Northern Road	Private residence
R3	4567 Old Northern Road	Private residence
R4/5	4547 – 4543 Old Northern Road	Mid-point between private residence
OAS1	Lots 1 and 2 of the Quarry	At source monitoring, close to operations
OAS2	Lot 196 of the Quarry	At source monitoring, close to operations

Note 1: An agreement between Dixon Sand and receiver R1 is in place and, therefore, noise management levels defined by the development consent are not applicable.

Monitoring was conducted in accordance with procedures outlined in the Noise Policy for Industry and Section 6 of the Noise Management Plan.

At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation included a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2022.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LAmax statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish the meteorological conditions as being suitable for monitoring.

Where extraneous noise such as road traffic and fauna (insects/birds) were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlines in Noise Policy for Industry (NSW EPA 2017). This involved extrapolation from the near-distance location to the sensitive receiver location, as described in Section 4.3.

4. Monitoring results

4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 4.

In general, quarry operations were faintly audible from most locations, with traffic the dominant source of noise for residents on the Old Northern Road.

Quarry operations fell into four categories representing the main sources of noise. These were:

- Sand processing and truck loading (main plant, front end loaders, trucks)
- Extraction of sand (involving ripping by dozer and transport via excavator loading a moxie)
- Extraction of bulk sandstone by rock saw
- Stockpile management with screen, FEL, excavator and moxies

Depending on the receiver location, these sources played a varying role in contributing to the total noise level.

Measured results indicated quarry operations during the shoulder period (from 6.00am to 7.00am) were faintly audible during breaks in traffic noise and complied with the noise criteria at all measurement locations.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken over 15-minute periods to establish representative sound power levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.3.

During the day (standard hours), measurement at the school and residential receivers established traffic was the dominant source of noise in the area and heavily influenced measured LAeq, 15-minute noise levels. However, quarry noise was faintly audible over the background level.

Estimated contributions of quarry noise on the total noise level indicated compliance with the noise limit. However, due to ambient noise (traffic, birds, breeze in trees), extrapolation from at-source measurements has been undertaken to support this assertion (See Section 4.3.)

4.2 Modifying factors

No tonal, impulsive or low frequency noise characteristics were observed during the monitoring period. Therefore, application of modifying factors is not appropriate in this instance.

Table 4 Monitoring results

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Shoulder (6.00am to 7.00am)								
5.58am	OR3	37	58.6	38.5	90.7	<37	Occasional traffic on access road ~49 – 52 (some at 57-58 dBA) for short periods (approx. 9 trucks in 15 minutes) ONR traffic dominant ~ 53 – 56 dBA, and audible for a long distance. Dog at property occasional barks ~ Lamax 91 dBA Pump at property operates intermittently ~ 45 dBA Processing area visibly operating and faintly audible during gaps in traffic at 36 – 3 dBA – estimate 33-34 dBA	Clear sky and calm to light breeze (1-2 km/h) from WNW Temperature 9-10°C extremely unstable conditions (A-class).
6.17am	OR2		54.1	43.7	65.0	<37	Heavy vehicles on haul road ~ 57 – 64 dBA – higher speed increases noise approximately 10 trucks in 15 minutes ONR dominant ambient noise source with 60 - 64 dBA pass bys – engine braking Quarry not audible Processing area just audible when no traffic – once in 15 minutes – inaudible at 37 dBA ambient noise – estimate 31 – 32 dBA	
6.36am	R3		59.7	38.0	82.8	<37	Traffic on ONR is dominant noise source ~71-78 for HV passbys and 63-71 for LV Processing plant just audible in break in traffic at ambient level of ~35 dBA but essentially inaudible for monitoring period	
6.54am	R4/5		60.7	45.1	79.6	<37	ONR dominant ~70 – 73 dBA for HV reduced frequency compared with earlier Quarry / Processing inaudible	

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
Day period - (7.00am to 6.00pm)								
8:23am	OAS1	N/A	45.5	41.9	57.8	~45	Pit barely audible– some intermittent ripping / bucket scraping at 46 dBA – no steady noise source Processing plant / moxies to stockpile dominant sources. Moxies on the mound ~ 47 dBA, processing plant ~44 dBA Screen and excavator on stockpile ~ 42 dBA, 45 dBA with FEL operating	Clear sky and calm to light breeze (3-5 km/h) from WNW Temperature 10-11°C slightly to extremely unstable - conditions (A-C class).
9:26am	OAS2	N/A	57.3	49.8	68.2	57	Quarry noise is main source FELs loading stone ~ 55 dBA Excavator loading moxy ~ 56 dBA Second excavator working pile ~ 56 dBA Cliff is around 15-20 metres high around works	
10:31am	OR1	45	53.7	46.4	76.0	See Section 4.3	Quarry audible with engine of excavator just audible estimated 44-45 dBA Traffic intermittent ~55-60 dBA Cockatoos and Lorikeets intermittent ~ 60-62 PF's quarry dominant source for almost entire time ~ 49-54 dBA, Dixon quarry not audible over PF's. Dixon only audible when ambient noise quieter – no birds, traffic or PF's	Breeze from SW@ 4-5km/h Temperature 14-15°C Unstable conditions (A class)

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmax			
11:44am	OR3	44	49.3	45.7	62.8	See Section 4.3	Old Northern Road traffic 54 – 57 dBA - dominant Haul road traffic ~ 47 –54 dBA – speed greatly influences noise Screen on stockpile barely audible but tonal alarm prominent on excavator Pit not audible	Breeze from SW @ 5 - 6 km/h Temperature 16°C Unstable conditions (A-B class)
12:20pm	OR2	44	51.9	44.3	68.0	See Section 4.3	Old Northern Road traffic is dominant ~ up to 58 dBA Quarry intermittently audible pit noise ~42 dBA PF's quarry audible today Haul road 57 – 58 dBA Moxy heading to stockpile ~47 dBA	
12:44pm	R2	44	62.3	40.3	84.8	See Section 4.3	Traffic dominant ~ 76 - 85 dBA Without traffic noise at ~ 43-44 dBA quarry just audible, with faint engine noise Breeze in trees, birds/insects	
1:03pm	R3	44	58.5	40.7	77.9	See Section 4.3	Traffic noise remains dominant ~ 72 - 78 dBA Quarry faintly audible when traffic quiet– 41 – 42 dBA (PF's also contributes)	
1:20pm	R4/5	44	59.5	39.8	77.2	See Section 4.3	Traffic on ONR domaint– 72 – 77 for truck passbys, 62 – 65 for light vehicles Quarry noise intermittently just audible ~41 - 42 dBA when breaks in traffic, so <41 dBA	

4.3 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels. Therefore, measurements captured on-site without substantial influence from extraneous noise were used to calculate sound pressure levels at each receiver.

Calculations were based on ISO 9613-2:1996 *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation,* which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on measurements described in Table 4, extrapolated noise results for each monitoring location are presented in Table 5. Results are shown for equipment operating in the pit, processing plant and stockpiling area.

Extrapolated results demonstrate the Quarry as measured demonstrates a contribution to the ambient noise environment that meets the noise limit for the day period in all locations.

Table 5 Extrapolated monitoring results

Receiver	Noise criteria		Extrapolated noise level, LAeq, 15 minute	Comment
	Shoulder	Day		
OR1	-	45	39	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	42	
OR3			42	
2			41	
3			39	
4/5			40	

4.4 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate the following.

1. Observed operations during the day period were compliant with the noise limit at each receiver under the meteorological conditions at the time.

2. Observed operations during the shoulder period were compliant with the noise criteria at all receivers under the meteorological conditions at the time.

Appendix E – Monthly Site Inspection

OLD NORTHERN ROAD QUARRY
DIXON SAND, MAROOTA
MONTHLY SITE CONDITION CHECKLIST

This checklist is to be completed monthly by the Environmental Officer.
Completed checklists are to be retained and included in the Annual Review.

Date of inspection:	30/06/2022
Inspection by:	Melissa Mass
Measured monthly rainfall (mm)	31/05/2022 - 30/06/2022 Rainfall = 3.8 mm

	Yes (✓) No (X) NA	Comments	Actions	Actions Complete (Date/Sign)
SEDIMENT CONTROLS				
Site checked for potential erosion issues or transport of sediment batters, vehicle access points, excavations, haul roads, vegetation clearing etc.	✓	No erosion issues or transport of sediment noted this period		M.M.
Effectiveness and capacity of Erosion and Sediment controls checked (drains, basins, filters etc.)	✓	Drains, Basins etc all Clear		M.M.
Stockpiles located and maintained correctly	✓			
Tree clearance restricted to required area	✓	Vegetation clearance in Stage 2 Lot 2	Protocol and procedure followed.	M.M.
WATER QUALITY AND QUANTITY				
Water sample taken daily for quality testing prior to discharge of water. Water quality tested and EPL#3916 criteria for pH, TSS and turbidity complied prior to discharge.	N/A			
Weir: Daily volume of water discharged recorded.	N/A			
Monthly monitoring of surface water quality at SW19.	✓	undertaken June 23rd 2022.		M.M.
Monthly monitoring of groundwater quality at six bores on Lots 1&2 and two bores on Lots 196.	✓	undertaken June 23rd 2022 by VGT		M.M.
Monthly depth measurement of all groundwater bores and comparison with rainfall	✓	Depth measured 30/06/2022		M.M.
Monthly inspection of drainage & sediment controls including water storages, pumps, pipes and dams' walls	✓	All sites inspected 30/06/2022		M.M.
Any Fuel or oil spills reported and maintained	✓	No spills recorded this period		M.M.
Fuels/chemicals stored in bunded areas	✓	EPA approved Bunding		M.M.
AIR QUALITY				
Continuous static dust (collected for analysis monthly)	✓	Static dust gauge managed by VGT		M.M.
On site dust suppression	✓	Regular use of water cart when required		M.M.
Loads covered entering and leaving site	✓	In compliance with TMP		M.M.

No burning of vegetation	N/A			
Wind speed, direction and rainfall recorded	✓	TEOM and weather Station managed by COASED		M.M.
NOISE				
Operation only during hours of operation	✓	comply with DA, NMP and TMP		M.M.
No complaints received from school, residences or local community members.	✓	No complaints recorded this period		M.M.
6 monthly monitoring at Marcoola PS	✓	undertaken by Hutchison and weller		M.M.
Bulldozer not being used concurrently with any other plant on strips 4, 5 and 6 of Lots 1 and 2 DP547255 at depths between EGL and 6 metres below EGL	N/A			
Bulldozer being used for clearing, topsoil stripping and bund construction on Lots 1 and 2 DP547255 only during wind conditions	✓			
Between 0-6 metres depth below EGL, dozer-dump truck combination replaced by excavator-dump truck combination to strip overburden on Strips 2-6 inclusive	✓			
Quarrying at ground level on Lot 196 not occurring during southwest to northwest winds	✓	In accordance with EPL		M.M.
Construction and rehabilitation of eastern highwall of quarry within 250 metres of Marcoola Public School occurring in school holiday periods only	N/A			
FLORA & FAUNA/ REHABILITATION				
Sightings of threatened species reported	N/A			
No disturbance of buffer/conservation areas	✓			
Buffer/conservation area fencing/marking intact	✓			
Rehabilitation undertaken to schedule	✓	Monthly visit by Bush-It		M.M.
Success of rehabilitation of buffers, conservation areas & rehabilitation areas	✓			
Rehabilitation near school during holidays	✓			
Flora and fauna monitoring program undertaken to schedule	✓			
ARCHAEOLOGY				
Stop work if sites located – OEH notified	✓	None this period		M.M.
WASTE AND SITE CONDITION				
No rubbish visible or buried on site	✓			
Recyclables removed by licensed Contractors	✓	By council contractors and local contractors		M.M.
Putrescible waste covered and regularly removed	✓	By council contractors		M.M.

EXTRACTION PROGRAM				
Extraction depths from monthly checked control points in accordance with extraction program.	✓			
ROADS AND TRANSPORT				
Weekly inspection of Old Northern Rd/Crown Rd intersection and sand/clay removed as necessary.	✓			
Crown Road, Old Northern Road near site, intersection & haul roads in good state of repair.	✓			
Truck movements have not exceeded 180/day, or 40 between 6-7am.	✓	Refer to truck records		M.M.
Weighbridge/log book records forwarded to Council monthly	✓	Refer to truck records.		M.M.
REPORTING				
Complaints register maintained	✓	Updated monthly		M.M.
Environmental incidents reported to EPA and DPIE	✓	None this period		M.M
PIRMP / SPILL KIT				
Spill kits inspected and used items replaced	✓			
A copy of PIRMP flowchart available in each Spill Kit	✓			

Signed: M.M ..... (Environmental Officer or Delegate)

Appendix F – Truck Movement Data

Dixon Sand - Maroota Quarry Morning Trucks

JANUARY	2022	6.00am - 7.00am		Daily Truck (one way)
Date	**Time in**	**Docket No.**	**Tonnes**	
4/01/2022	6.11	307516	37.84	
4/01/2022	6.18	307517	37.04	
4/01/2022	6.25	307518	38.00	
4/01/2022	6.54	307519	37.62	4
5/01/2022	6.01	307543	31.14	
5/01/2022	6.05	307544	19.50	
5/01/2022	6.12	304545	53.96	
5/01/2022	6.19	307546	30.00	
5/01/2022	6.22	307547	19.90	
5/01/2022	6.25	307548	17.22	
5/01/2022	6.32	307549	38.14	
5/01/2022	6.35	307550	19.04	8
6/01/2022	6.00	307581	37.80	
6/01/2022	6.02	307582	19.66	
6/01/2022	6.06	307583	16.86	
6/01/2022	6.09	307584	38.78	
6/01/2022	6.18	307586	38.20	
6/01/2022	6.22	307587	38.14	
6/01/2022	6.30	307588	36.64	
6/01/2022	6.42	307589	38.04	
6/01/2022	6.50	307590	38.62	9
7/01/2022	6.00	307608	38.20	
7/01/2022	6.05	307609	37.50	
7/01/2022	6.08	307610	19.72	
7/01/2022	6.12	307611	19.04	
7/01/2022	6.20	307612	38.78	
7/01/2022	6.22	307613	8.50	
7/01/2022	6.25	307615	12.72	
7/01/2022	6.27	307616	12.86	
7/01/2022	6.35	307617	37.78	
7/01/2022	6.50	307618	37.98	10
8/01/2022	6.00	307640	38.14	
8/01/2022	6.07	307641	37.98	
8/01/2022	6.37	307642	19.94	
8/01/2022	6.45	307643	38.02	
10/01/2022	6.00	307650	19.92	
10/01/2022	6.02	307651	38.64	
10/01/2022	6.04	307652	36.14	
10/01/2022	6.06	307653	36.75	
10/01/2022	6.08	307654	32.24	
10/01/2022	6.12	307655	38.14	
10/01/2022	6.18	307656	31.54	
10/01/2022	6.20	307657	38.10	
10/01/2022	6.22	307658	37.86	
10/01/2022	6.25	307659	14.14	
10/01/2022	6.27	307660	12.92	
10/01/2022	6.37	307661	37.46	
10/01/2022	6.45	307662/307663	38.08	
10/01/2022	6.50	307664	32.54	
10/01/2022	6.54	307665	7.90	19
11/01/2022	6.00	307727	19.76	

Dixon Sand - Maroota Quarry Morning Trucks

11/01/2022	6.02	307728	37.80	
11/01/2022	6.04	307729	32.08	
11/01/2022	6.06	307730	39.26	
11/01/2022	6.08	307731	37.42	
11/01/2022	6.15	307732	36.70	
11/01/2022	6.17	307733	37.84	
11/01/2022	6.20	307734	32.14	
11/01/2022	6.21	307735	37.60	
11/01/2022	6.30	307736	14.56	
11/01/2022	6.32	307737	17.14	
11/01/2022	6.37	307738	20.08	
11/01/2022	6.48	307739/307740	37.60	13
12/01/2022	6.00	307791	19.88	
12/01/2022	6.02	307792	39.02	
12/01/2022	6.04	307793	31.96	
12/01/2022	6.05	307794	39.30	
12/01/2022	6.07	307795	36.74	
12/01/2022	6.11	307796	37.10	
12/01/2022	6.15	307797/307798	41.74	
12/01/2022	6.18	307799	11.58	
12/01/2022	6.20	307800	38.22	
12/01/2022	6.22	307801	18.44	
12/01/2022	6.24	307802	14.72	
12/01/2022	6.25	307803/307804	36.70	
12/01/2022	6.33	307806	38.26	
12/01/2022	6.35	307805	12.66	
12/01/2022	6.37	307807	37.78	
12/01/2022	6.46	307808	19.83	16
13/01/2022	6.00	307860	19.08	
13/01/2022	6.02	307861	32.04	
13/01/2022	6.04	307862	11.78	
13/01/2022	6.06	307863	39.36	
13/01/2022	6.07	307864	38.86	
13/01/2022	6.09	307865	12.34	
13/01/2022	6.12	307866	15.16	
13/01/2022	6.14	307867	37.02	
13/01/2022	6.16	307868	26.00	
13/01/2022	6.23	307869	19.08	
13/01/2022	6.51	307870	20.00	11
14/01/2022	6.00	307911	19.84	
14/01/2022	6.02	307912	31.94	
14/01/2022	6.04	307913	39.58	
14/01/2022	6.05	307914	32.22	
14/01/2022	6.08	307915	37.10	
14/01/2022	6.11	307916	19.00	
14/01/2022	6.12	307917	38.16	
14/01/2022	6.15	307918	20.30	
14/01/2022	6.18	307919	11.86	
14/01/2022	6.20	307920	12.32	
14/01/2022	6.22	307921	12.50	
14/01/2022	6.44	307922	54.70	12
15/01/2022	6.00	307957/307958	32.77	
15/01/2022	6.05	307959	38.30	
17/01/2022	6.00	307966	19.70	
17/01/2022	6.02	307967	32.64	

Dixon Sand - Maroota Quarry Morning Trucks

17/01/2022	6.05	307968	18.90	
17/01/2022	6.07	307969	38.16	
17/01/2022	6.09	307970	20.06	
17/01/2022	6.11	307971	38.64	
17/01/2022	6.14	307972	19.18	
17/01/2022	6.18	307973	31.88	
17/01/2022	6.25	307974	37.50	
17/01/2022	6.28	307975	17.20	
17/01/2022	6.36	307976	31.84	
17/01/2022	6.43	307977	39.06	14
18/01/2022	6.01	308026	19.96	
18/01/2022	6.03	308027	32.12	
18/01/2022	6.04	308028	19.76	
18/01/2022	6.06	308029	38.90	
18/01/2022	6.08	308030	38.90	
18/01/2022	6.10	308031	37.18	
18/01/2022	6.13	308032	37.26	
18/01/2022	6.16	308033	38.16	
18/01/2022	6.21	308034	18.80	
18/01/2022	6.23	308035	26.74	
18/01/2022	6.25	308036	19.30	
18/01/2022	6.27	308037	14.36	
18/01/2022	6.33	308038	32.54	
18/01/2022	6.35	308039	7.86	
18/01/2022	6.38	308040	37.88	
18/01/2022	6.45	308041	38.60	
18/01/2022	6.50	308042	38.38	
18/01/2022	6.52	308043	19.72	18
19/01/2022	6.00	308091	39.02	
19/01/2022	6.03	308092	38.62	
19/01/2022	6.05	308093	32.20	
19/01/2022	6.08	308094	19.12	
19/01/2022	6.11	308095	38.56	
19/01/2022	6.30	308096	38.02	
19/01/2022	6.36	308097	20.20	
20/01/2022	6.01	308126	32.38	
20/01/2022	6.14	308127	19.04	
20/01/2022	6.45	308128	12.98	10
21/01/2022	6.00	308161	20.22	
21/01/2022	6.02	308162	39.04	
21/01/2022	6.04	308164	38.24	
21/01/2022	6.10	308165	32.24	
21/01/2022	6.13	308166	38.62	
21/01/2022	6.17	308167	20.06	
21/01/2022	6.20	308168/308169	38.58	
21/01/2022	6.25	308170	37.94	
21/01/2022	6.28	308171	13.06	
21/01/2022	6.30	308172	37.60	
21/01/2022	6.47	308173	37.38	
21/01/2022	6.54	308175	38.22	
22/01/2022	6.27	308202	19.32	
22/01/2022	6.41	308203	46.32	14
24/01/2022	6.00	308213	39.00	
24/01/2022	6.02	308214	20.56	
24/01/2022	6.05	308215	32.12	

Dixon Sand - Maroota Quarry Morning Trucks

24/01/2022	6.06	308216	20.24	
24/01/2022	6.09	308217	13.08	
24/01/2022	6.12	308218	38.35	
24/01/2022	6.14	308219	19.02	
24/01/2022	6.16	308220	19.70	
24/01/2022	6.23	380221	38.94	
24/01/2022	6.33	308222	20.06	
24/01/2022	6.38	308223	19.22	
24/01/2022	6.41	308224	16.36	
24/01/2022	6.43	308225	14.32	13
25/01/2022	6.00	308262	19.86	
25/01/2022	6.02	308263	32.44	
25/01/2022	6.04	308264	39.23	
25/01/2022	6.06	308265	38	
25/01/2022	6.09	308266	20.18	
25/01/2022	6.11	308267	19.88	
25/01/2022	6.13	308268	28.72	
25/01/2022	6.15	308269	18.82	
25/01/2022	6.18	308270	37.7	
25/01/2022	6.21	308271	14.2	
25/01/2022	6.25	308272	4.96	
25/01/2022	6.31	308273	38.94	12
27/01/2022	6.00	20.32	308310	
27/01/2022	6.02	32.38	308311	
27/01/2022	6.03	19.06	308312	
27/01/2022	6.06	38.97	308313	
27/01/2022	6.08	19.96	308314	
27/01/2022	6.10	19.84	308315	
27/01/2022	6.12	19.1	308316	
27/01/2022	6.17	18.5	308317	
27/01/2022	6.19	38.82	308318	
27/01/2022	6.25	37.52	308319	
27/01/2022	6.27	19.02	308320	
27/01/2022	6.30	32.62	308321	
27/01/2022	6.32	19.24	308322	
27/01/2022	6.35	18.22	308323	
27/01/2022	6.55	32.78	308324	15
28/01/2022	6.00	20.22	308366	
28/01/2022	6.02	39.02	308367	
28/01/2022	6.04	19.86	308368	
28/01/2022	6.06	32.46	308369	
28/01/2022	6.09	39.21	308370	
28/01/2022	6.12	20.32	308371	
28/01/2022	6.15	36.86	308372	
28/01/2022	6.20	38.94	308373	
28/01/2022	6.24	32.3	308374	
28/01/2022	6.25	19.14	308375	
28/01/2022	6.27	37.82	308376	
28/01/2022	6.35	36.94	308377	12
29/01/2022	6.00	39.04	308424	
29/01/2022	6.05	39.01	308425	
29/01/2022	6.26	37.9	308426	
29/01/2022	6.34	19.06	308427	
29/01/2022	6.40	19.82	308428	
29/01/2022	6.50	37.72	308429	

Dixon Sand - Maroota Quarry Morning Trucks

29/01/2022	6.56	38.88	308430	7
31/01/2022	6.00	20.24	308447	
31/01/2022	6.02	16.7	308448	
31/01/2022	6.04	38.92	308449	
31/01/2022	6.05	31.94	308450	
31/01/2022	6.08	19.42	308451	
31/01/2022	6.12	19	308452	
31/01/2022	6.15	37.42	308453	
31/01/2022	6.17	19.58	308454	
31/01/2022	6.19	38.41	308455	
31/01/2022	6.23	31.94	308456	
31/01/2022	6.26	31.6	308457	
31/01/2022	6.30	14.4	308458	
31/01/2022	6.51	19.28	308459	
31/01/2022	6.59	32.9	308460	14
		Max morning truck (one - way)		**19**
		Max morning truck (in and out)		**38**

Appendix G – Bush Regeneration Report

Dixon Sand Pty Ltd

Old Northern Road Quarry

(Development Consent DA 250-09-01).

Annual Report

July 2021 – June 2022

Assisted bush regeneration and rehabilitation works

Authors: Jeff Gibbs & Zoe Ridgway

Date finalised: 25/07/2022

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INTRODUCTION

This report summarises the assisted bush regeneration work undertaken by Bush-it Pty Ltd for Dixon Sand Pty Ltd between July 2021 and June 2022 as part of the Old Northern Development Consent DA 250-09-01.
A total of 585.5 hours ($33,332.52 excluding GST) were worked throughout the financial year with an average team size of four per visit, not including the preparation of this report. The distribution of hours over the financial year are not uniform, as resources are focused on undertaking primary/planting works in the cooler months and targeting exotic grasses from seeding and spreading at the tail end of summer. Forecasted hours are shown below in Figure 1.

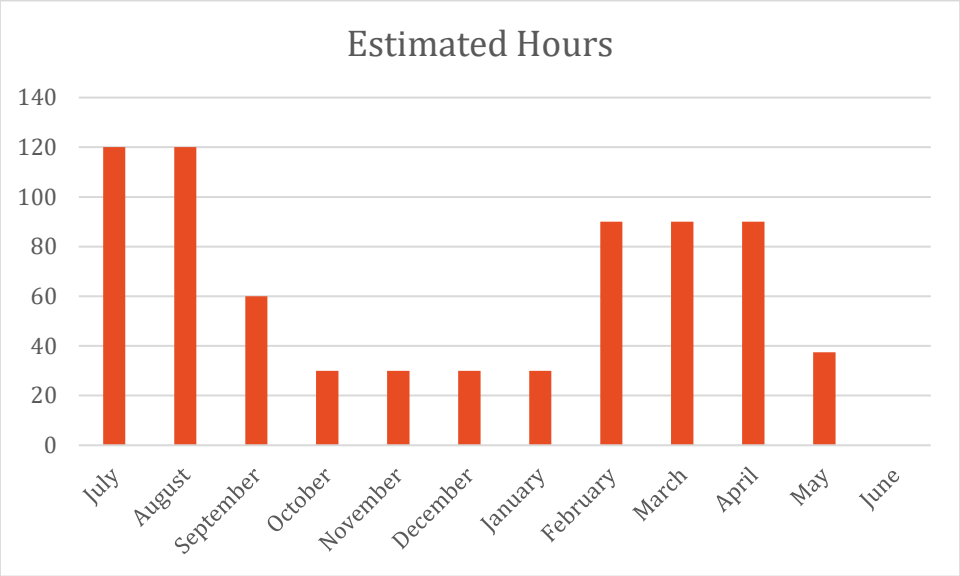

Figure 1. Forecast of resources over the financial year showing a bimodal distribution.
.

Dixon Sand Pty Ltd operate a mineral sand quarry on the Old Northern Road at Maroota, NSW. On their behalf Bush-it manages the native vegetation of roughly 8.4 hectares at the Old Northern Road (ONR) quarry as illustrated in Figure 2. The area managed by Bush-it at the ONR quarry is comprised of a mix of remnant native vegetation; rehabilitated quarry sand and abandoned agricultural land.

The vegetation at the ONR quarry site is managed according to the operating requirements of the quarry. As the quarry expands its area of extraction, existing native vegetation will be cleared, and the soil translocated to rehabilitate other areas. Figure 3 shows the restoration activities undertaken across the entire ONR site over the 2020-22 financial year.

This financial year saw record levels of rainfall with a total of 1633.5mm (Maroota weather station Old Telegraph Rd - 067014), some 709.9mm above the annual average of 923.6. The rainfall in March was the highest on record (since 1925), that is, 581.2mm. The bulk of the rainfall was over the warmer months and this was fortunate as the majority of the works were scheduled and worked in the cooler months, in particular September when we worked consecutive days and backed up visits. See Appendix for breakdown of monthly rainfall throughout the year.

In carrying out our work for Dixon Sand, Bush-it:

- Practices low impact weed management techniques such as manual removal in plant communities containing threatened species.

- Regularly identifies and maps the density and extent of weed infestations especially those covering an area of greater than 25 m^2

- Undertakes appropriate, targeted weed control activities to ensure minimum disturbance to natives and minimum off-target damage.

- Conducts site specific induction training for staff working at the quarry, including field identification of all threatened species.

- Routinely assesses the effectiveness of the control programs and in response makes necessary modifications.

- We undertake monthly inspections noting the presence of weeds in drainage lines, and along access tracks.

- And we follow industry standard protocols for bushland hygiene by ensuring all our tools, boots and equipment are clean before entering the work site.

OVERVIEW OF MANAGEMENT ZONES AND WORK AREAS

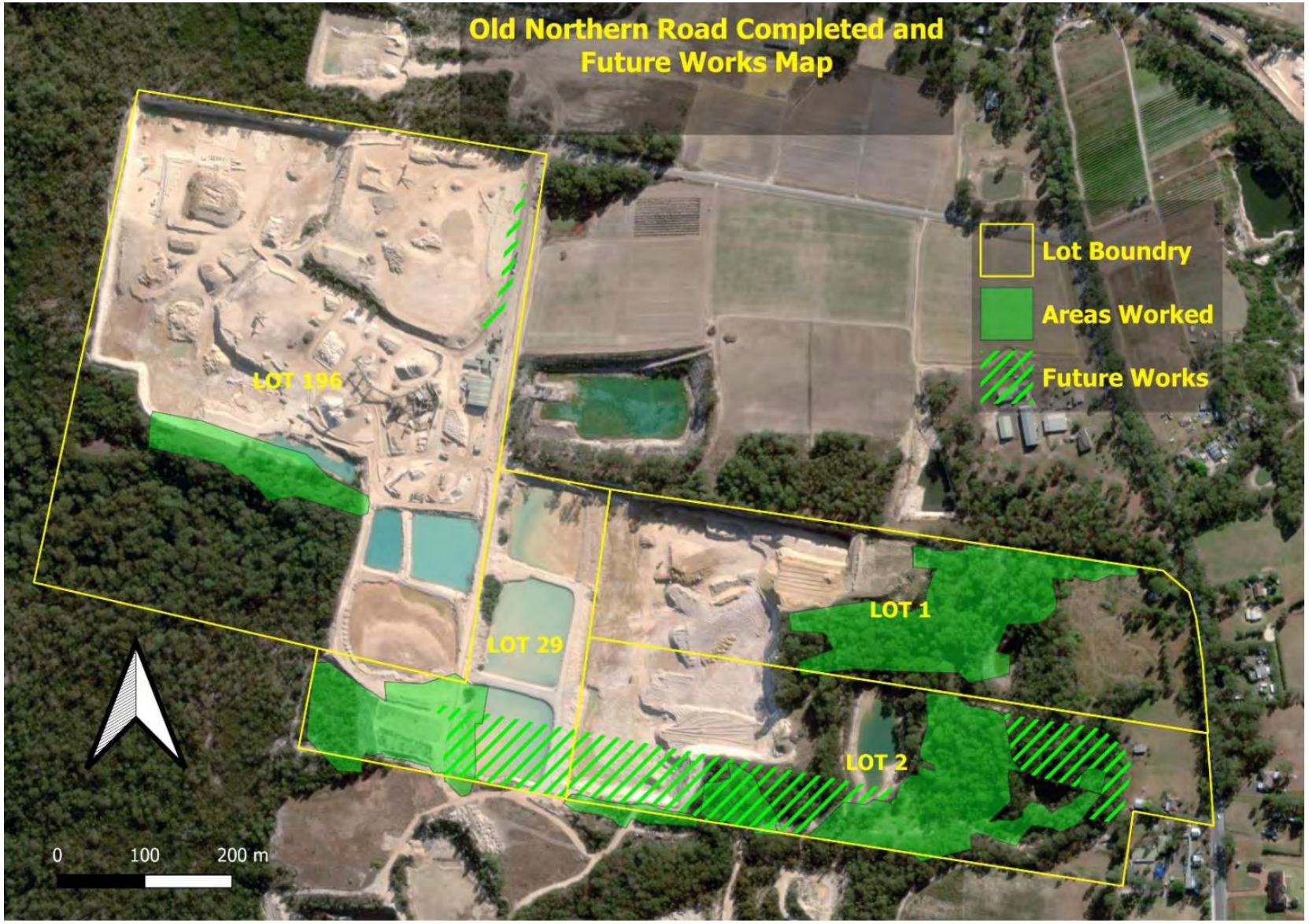

Figure 2a. – Aerial photo showing the areas worked in 2021-22 and areas that will be worked in the coming years.

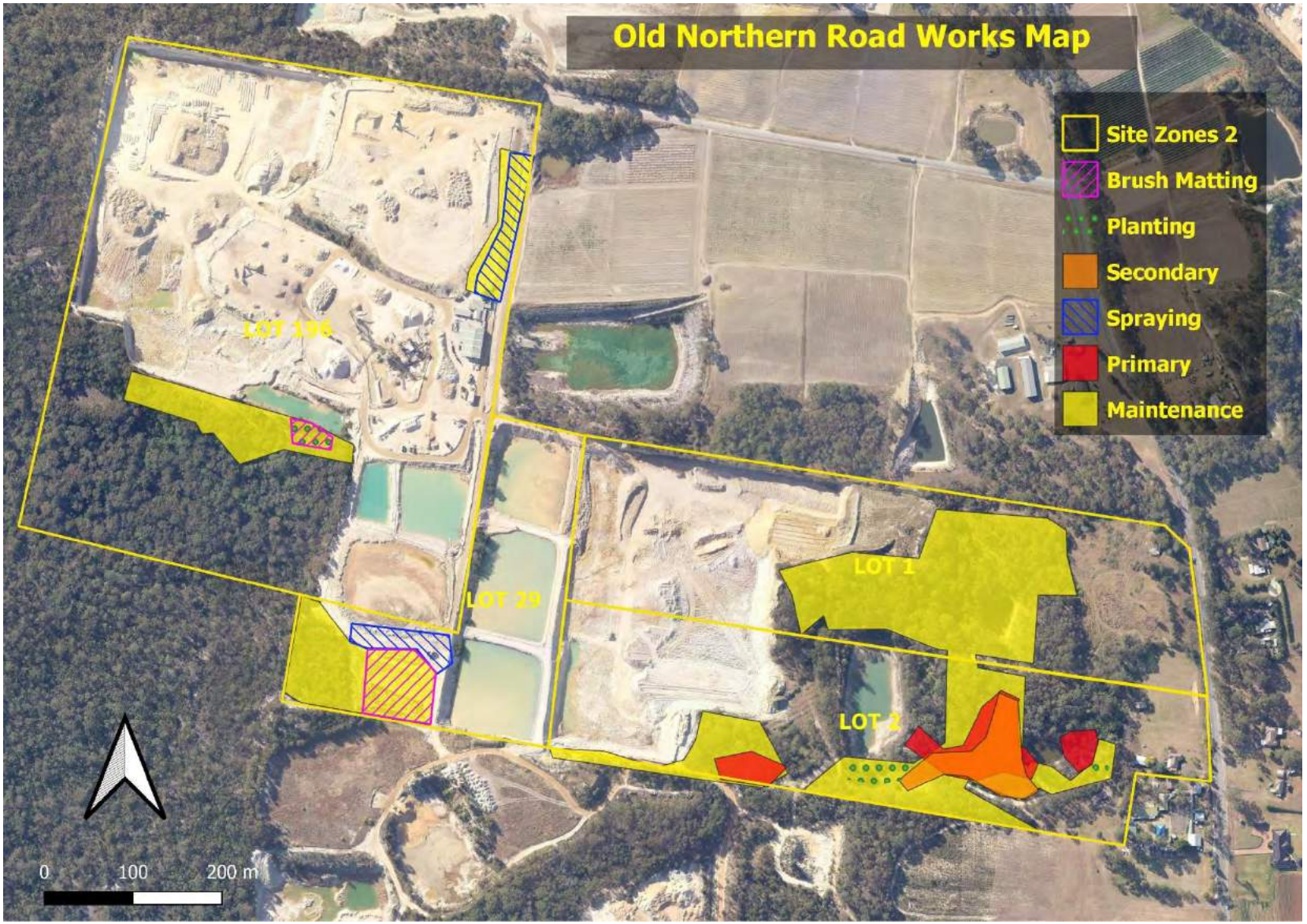

Figure 2b – Aerial photo highlighting the areas where different works activities were undertaken this year.

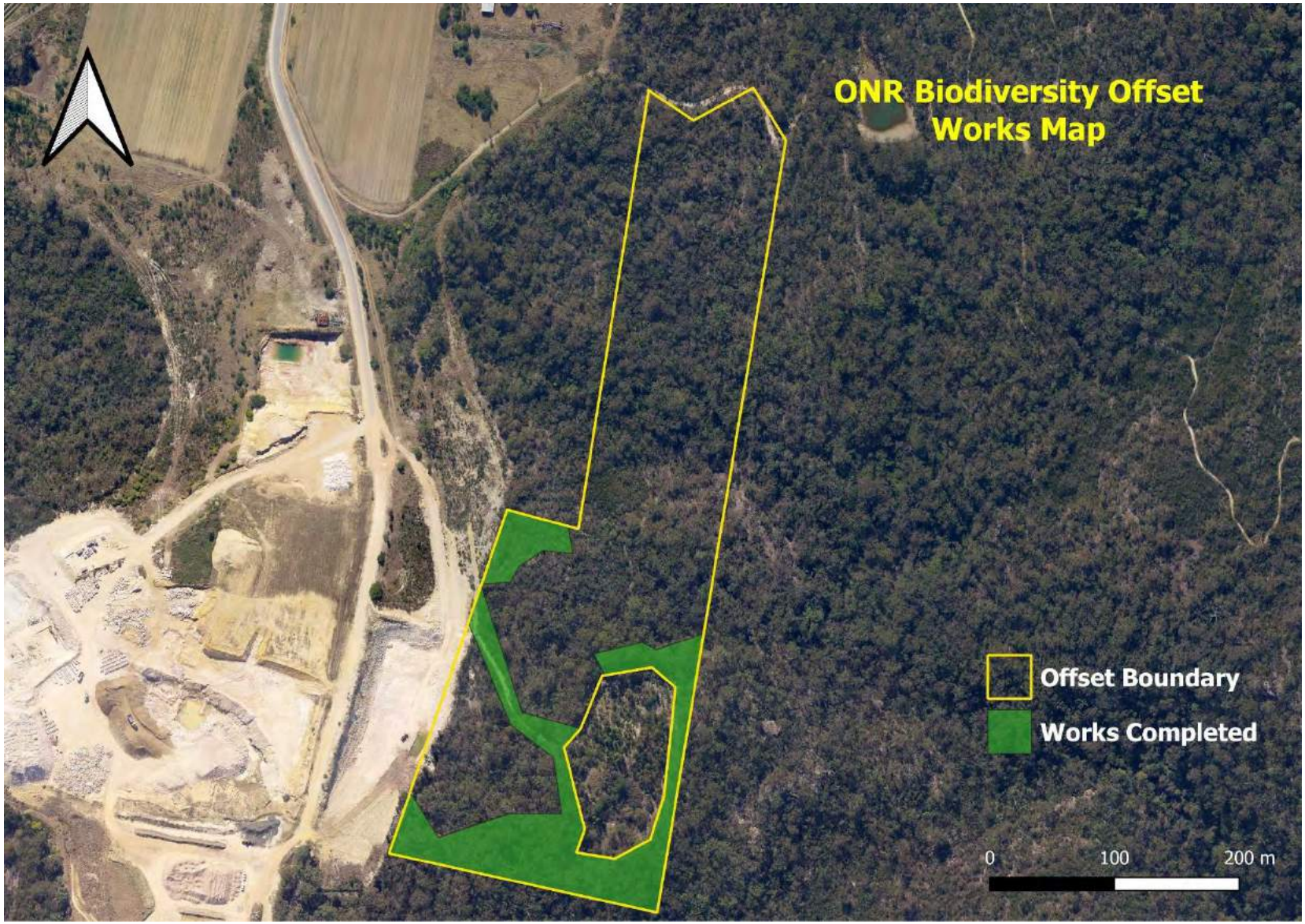

Figure 3a - ONR Biodiversity Offset Area

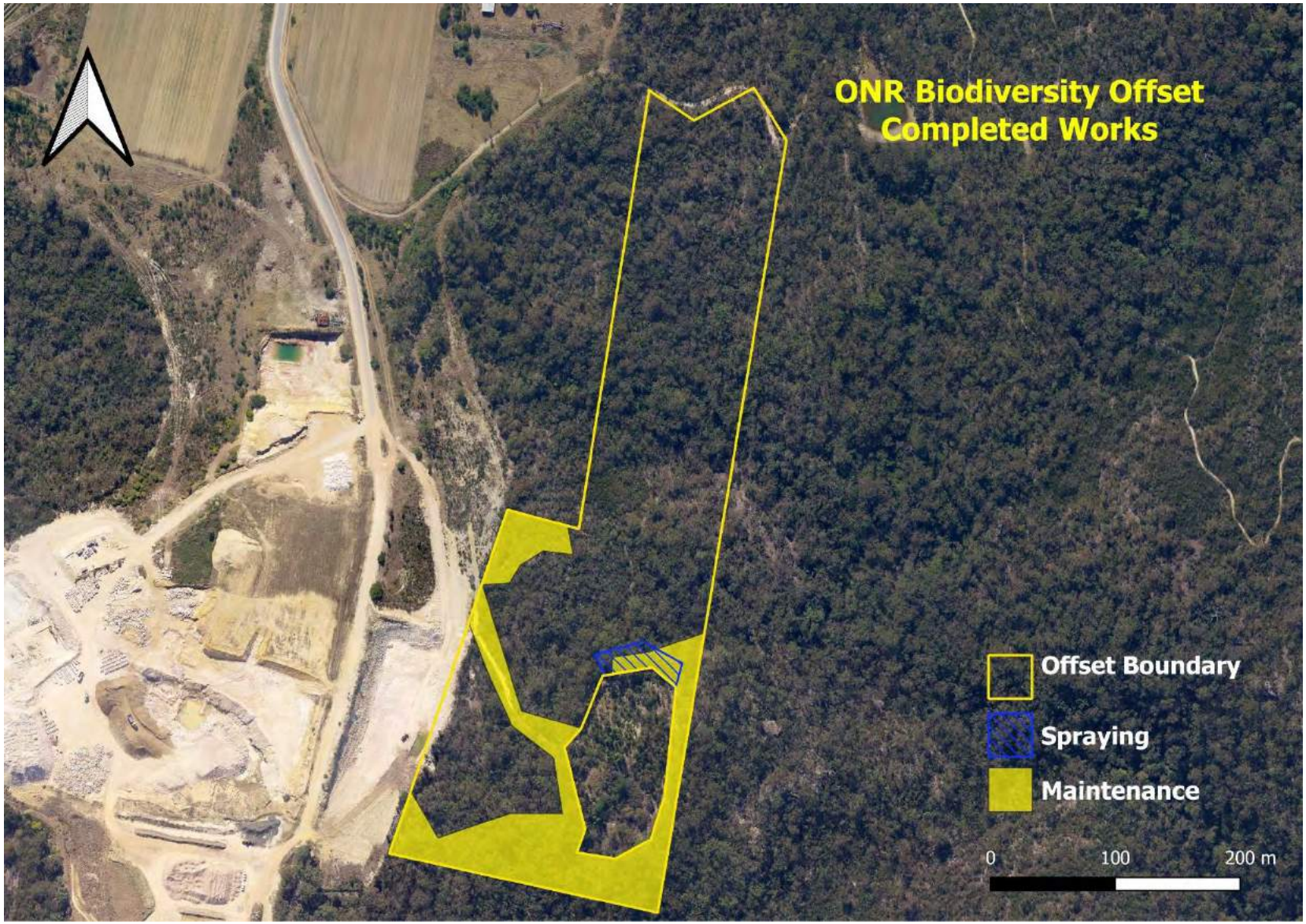

Figure 3b - ONR Biodiversity Offset Area at Haerses Rd - Completed Work 2021-2022

OLD NORTHERN ROAD QUARRY

EMBANKMENT AT FRONT GATE

SCOPE

The embankment at the front gate is an exposed area of the quarry located between the roadway and an area used to stockpile quarry products and machinery. The embankment is roughly 100m long and 20 m wide. A mix of native shrubs have been planted to stabilise the soil and improve the appearance of the mound.

RESOURCES – 15 HOURS

During the last twelve months we have routinely monitored the area from the road checking for obvious infestations of exotic grass and have and treated these with herbicide and/or manually removed them. Larger thickets may occasionally need to be brush cut and spot spray exotic grasses before they set seed.

RECOMMENDATIONS

Planting remnant canopy species and competitive native groundcovers such as *Hardenbergia sp.and Kennedia* sp would provide competition for exotic grasses and prevent them spreading throughout the quarry.

Direct seeding of a native grasses and shrubs gathered locally may also enhance the regeneration along this edge.

An ‘exhibit’ of *Melaleuca deanii* will be established at the Front Gate at a location yet to be decided.

LOT 1 AND 2

SCOPE

Lot 1 is a 1.4ha bush block located on the eastern side of the extraction site. It is an example of Shale-Sandstone Forest with a dry sclerophyll understorey. The canopy consists of red bloodwood (Corymbia gummifera) and smooth-barked apple (Angophora costata). There are also species here, such as the woody pear (Xylomellum pyraform) and the Graceful Bush Pea (*Pultenea gracilis)* that favour residual shale or laterite soils.

As Dixon Sands expands its quarry operations, Lot 1 will be cleared of vegetation and the topsoil translocated along the designated native vegetation corridor to form a connection between existing areas of bushland roughly 6.8ha in size. *Old Northern Road Quarry BRMP* (2020)

In the meantime, the vegetation on Lot 1 is conserved in its current natural state. The work undertaken by Bush-it ensures that the biodiversity of the vegetation remains intact and free from invasive species. Bush-it also works to preserve important habitat elements on the site by minimising soil disturbance or the relocation of deadwood or other plant material.

Lot 1 is exposed to seed from nearby soil mounds and *Ricinus communis* and *Phytolacca octandra* are routinely treated in this area. African Love grass and Paspalum are either brush cut or sprayed.

Recently, Lot 1 has been inundated with sand eroded from mining overburden, stockpiled along the Northern boundary. We estimate several tonnes of sediment have washed into Lot 1 and many of the canopy trees along the leading edge are exhibiting signs of stress consistent with a change in soil level. (See figure 8). It is also likely this disturbance will result in a flourish of annual and exotic grasses in Spring.

Lot 2 is a 3.4 ha block also located on the eastern side of the excavation area. The canopy here is composed of grey gums (*Eucalyptus punctata*) and peppermint gums (*Eucalyptus piperita*) intergrading with black she oak (*Allocasuarina littoralis*) and *Acacia parramattensis*

There are two water storage dams located in Lot 2 and a service trail connecting the quarry and the Old Northern Road runs along the southern side.

The core areas of Lot 2 are to be conserved in their current natural state. The abandoned farm and orchards that currently harbors *Lantana camara* and various exotic grass will be steadily revegetated. The indiscriminate clearing of vegetation by the neighbour on Lot 2 appears to have ceased so, Bush-it is now managing the degraded area and treating weeds.

Figure 4 – Regeneration of Native Shrubs and Grasses in NVC Lot 2

Figure 5 - Waterlogged Soils and the Loss of Mature Trees in Lot 2

RESOURCES – 351.5 HRS

The focus of our work in Lot 1 since July 2021, was to suppress the seed dispersal of exotic species from the soil mounds surrounding the site. We routinely treated *Eragrostis curvula, Paspalum urvillei* and *Andropogon virginicus* with herbicide before infestations could become established. These weeds will continue to flourish on the Northern boundary especially with recent quarry work creating a sediment “slug” that is laden with foreign seed.

On the soil mounds, we also regularly cut back *Ricinus communis* and *Phytolacca octandra* before it could set seed and left the cuttings to stabilise the soil. Much of the work we did early in the contract period has been buried by new created stockpiles Through the interior of Lot 1 we routinely surveyed for the emergence of bird dispersed brush weeds such as *Lantana camara* and *Ochna serulata.*

In Lot 2 we specifically targeted WONS, in particular *Asparagus asparagoides* and *Lantana camara,* as well as exotic grasses. *Eragrostis curvula,* and *Andropogon virginicus* were treated early in the growing season by selectively spot spraying them with herbicide (see detailed records in appendix). Around the perimeter of the site and we routinely brush cut the pathways that provide a vector for seed dispersal. In Lot 2, we also continued our work treating a thicket of Black bamboo (*Phyllostachys nigra*). We have had great success cutting the culms and filling the hollow root stock with dilute glyphosate.

In accordance with the *Old Northern Road Quarry BRMP (2020)* thickets of *Lantana camara* were manually removed in the cooler months of the year with minimal disturbance to resident small bird populations. We resumed our work removing *Lantana camara* in May this year and are looking to establish plantings in these areas in Spring.

Natural regeneration of soil laden seed continues to dominate the understorey in Lot 2. In areas cleared of *Lantana camara* (as shown in Figure.6.) remnant shrubs, ferns and grasses are beginning to colonise the bare soil and higher-than-average rainfall has assisted the growth of plantings established in September last year as shown in Figure 5.

RECOMMENDATIONS

Revegetation of Lot 2 with indigenous trees and shrubs should begin as soon as practicable. These will serve to shade out exotic grasses and provide much needed structure to a community that has recently lost mature standing trees to waterlogged soils as can be seen in Figure 7.

Translocation of soil-laden seed from Lot 1 with the aid of machinery may also assist the rehabilitation of Lot 2.

Areas of lantana should continue to be treated in Lot 2 only where there are positive signs of native regeneration as shown in Figure 4.

The Northern boundary of Lot 1 will need to be closely monitored for annuals following the inflows of sediment that have buried shrubs and groundcovers. A thick layer of eroded silt has also raised the soil level around mature canopy trees as can be seen in Figure 8 below.

LOT 196

SCOPE

The vegetation at Lot 196 resembles Coastal Enriched Sandstone Dry Forest intergrading with Sandstone Gully Forest containing *Angophora costata Corymbia gummifera*, *Eucalyptus piperita* with scattered *Eucalyptus haemastoma*. The understory is comprised *of Ceratapetalum gummiferum* and *Banksia serata*, and a grove of *Kunzea ambigua* has established itself on the old nursery site.

Plantings on the embankment have done little to prevent the emergence of exotic grass along this strip. Most of the maintenance hours spent here, are used to brush cut and spot spray exotic grasses before they set seed.

Figure 6 – Compacted area along the southern border of Lot 196 with September plantings in the background Photo taken in May 2022

RESOURCES – 86.5 HOURS

Since July 2021, Bush-it has hand weeded around natives and treated infestations of *Eragrostis curvula, Paspalum urvillei* and *Andropogon virginicus* with herbicide along the embankment adjoining Lot 196. This work has been timed to coincide with the emergence of these grasses between January and April. Brush matting with *Allocasaurina littoralis* and *Leptospermum polygalifolium* was also carried out in areas where exotic grasses haven't yet established d in Figure 10.

Acacia linifolia, Leptospermum polygalifolium, Oznothamus diosmofolius and Imperata cylindrica were planted in September last year. (Figure. 9)These colonising shrubs and grasses have established themselves well under the protection of existing canopy trees. The long-term goal is to revegetate the compact and exposed areas of the site.

RECOMMENDATIONS

Bush-it recommends that further plantings of remnant canopy species and competitive native grasses such as *Imperata* cylindrica be established along the strip adjoining Lot 196. Such a plantings provide competition for exotic grasses and prevent them spreading into the better areas.

Likewise, the select felling of branches along the front edge of Lot 196 and there use as brush matting will also suppress exotic grass.

Direct seeding of a native grasses and shrubs gathered locally may also enhance the regeneration along this edge, especially if the seed can be pre-treated.

NATIVE VEGETATION CORRIDOR (NVC)

SCOPE

The native heath in the rehabilitation area continues to flourish and the soil translocation in this area has been very successful. The locally threatened *Darwinia fascicularis subsp. oligantha* has established itself well and the *Melaleuca deanii* cuttings that were planted in 2017 have also put on new growth following above average rainfall this year.
.

RESOURCES – 76.5 HOURS

Bush-it has continued targeting whisky and pampas grass in the rehabilitation area. The proliferation of whisky and pampas on the neighbouring block owned by PF Formations P/L presents an ever-present source of wind-driven seed that blows in and establishes itself.
So, while the total eradication of pampas and whisky remains a long-term goal, we have successfully prevented any new infestations in the NVC.

Likewise, Bush-it has contained the spread of common couch, especially in the overburden piles to the North of the translocation site. We have also deseeded and sprayed the roadside grasses growing outside the fence and regular careful hand weeding throughout the translocation has prevented the spread of flat weeds.

Bush-it have taken measures to cull assertive native shrubs and trees, especially *Grevillea buxifolia*, *Allocasuarina littoralis and Banksia erificolia.* By decreasing the projected foliage coverage over threatened species, we are seeking to encourage vulnerable species to flourish.

Cut branches were mostly scattered in bare compacted access paths where signs of regeneration are minimal as shown in Figure 13 and where erosion was evident, and we are now seeing evidence of recruitment in these areas. (Figure 14)

With higher-than-average rainfall this year, the soil in areas of the NVC has become water-logged. *Darwinia fascicularis and Grevillea buxifolia* appear to have been most affected but, we will not be able accurately assess the extent of the dieback until rainfall conditions return to “normal”.(Figure 12)

Figure 7 – Emergent Canopy Species – NVC

.

Figure 8 - Dieback Attributed to Waterlogged-Soils . NVC

Figure 9 – Brush matting using vegetation that was culled to decrease foliage cover

Figure 10 – Germination of aerial seed from brush matted material.

RECOMMENDATIONS

Continue to monitor and manage competitive native shrubs and trees in the translocation, especially where they overshadow and/or encroach on the threatened species. Bush-it will selectively cull or cut back growth to encourage the most diverse assemblage of plants possible.

Establish a buffer planting on the southern boundary that catches wind-driven seed before it reaches the site. Bush-it has regularly picked invasive grasses out of the embankment and brush cut tussocks before they can ripen but, a dense row of *Imperata cylindrica* along this fence line would be ideal.

HAERSES ROAD BIODIVERSITY OFFSET AREA (HRBOA)

SCOPE

The vegetation communities represented at Haerses Road Biodiversity Offset Area (HRBOA) include Sydney Sandstone Ridgetop Woodland, Sydney Sandstone Gully Forest, and Sydney Sandstone Heath.

The dominant canopy species include *Corymbia gummifera* and *Eucalyptus racemosa*. While on the lower portions of the site, A*ngophora costata* and *Eucalyptus piperita* overshadow an understorey of *Syncarpia glomulifera* and *Ceratopetalum gummiferum*. The sandstone heath is prominent throughout the areas close to Haerses Road. The dominant species here include A*ngophora hispida, Banksia ericifolia and, Leptospermusm trinervium.*

The HRBOA is an example healthy of remnant native vegetation. It connected to an area of natural bushland and evidence suggests the trophic complexity and abundance of characteristic native species is high.

The threats to the HRBOA are well managed. On casual observation the soils on site are undisturbed and capable of supporting a diverse range of plants at various life stages. There is also evidence of colonisation of native plants around the perimeter of the HRBOA in areas that have been previously cleared of vegetation.

Given the protection it receives from the HR offset, the number of non-native invasive or undesirable species is low.

RESOURCES – 56 HOURS

In the last twelve months Bush-it has undertaken routine inspections of the HRBOA from the perimeter of the HR offset and along the drainage line that bisects the site.

These surveys have targeted known infestations of crofton weed and exotic grass and have been timed to coincide with flowering and seeding events.

By limiting the frequency and intensity of these visits, we have sought to limit the physical damage caused by trampling or inadvertent contaminating the HRBOA with invasive seed that might be carried on our clothing etc.

RECOMMENDATIONS

Continued work in the HRBOA would be assisted by identifying the successional stages of the floristic community and the habitat needs of resident fauna conducive to an ecological burn.

APPENDIX

WEED SPECIES CONTROLLED

Common name	**Scientific name**
Bridal Creeper	*Asparagus asparagoides*
Turkey Rhubarb	*Rumex sagittatus*
Moth vine	*Araujia sericifera*
Lantana	*Lantana camara*
Blackberry	*Rubus fruticosus agg.*
Ochna	*Ochna serrulata*
Wild Tobacco	*Solanum mauritianum*
Crofton weed	*Ageratina adenophora*
Bidens - Cobblers Peg	*Bidens pilosa*
Fleabane	*Conyza spp.*
Catsear, flatweed	*Hypochaeris radicata*
Fireweed	*Senecio madagascariensis*
Paddy's Lucerne	*Sida rhombifolia*
Blackberry Nightshade	*Solanum nigrum*
Sowthistle	*Sonchus oleraceus*
Purple Top	*Verbena bonariensis*
Panic Veldtgrass	*Ehrharta erecta*
Paspalum	*Paspalum dilatatum*
Couch common	*Cynodon dactylon*
Briza- Quaking Grass- Blowfly Grass	*Briza maxima*
Cudweed	*Gnaphalium spp.*
African Lovegrass	*Eragrostis curvula*
Buffalo Grass	*Stenotaphrum secundatum*
Flatweed	*Hypochaeris sp*
Paspalum (tussock)	*Paspalum quadrifarium*
Vetch	*Vicia spp*
Whisky grass	*Andropogon virginicus*
Summer grass	*Digitaria sanguinalis*
Periwinkle	*Vinca major*
Castor Oil	*Ricinus communis*
Stinking Roger	*Tagetes spp.*
Pigeon Grass	*Setaria spp.*
Pampas Grass	*Cortaderia selloana*
Ink weed	*Phytolacca octandra*

Common name	**Scientific name**
Chickweed	*Stellaria media*
Parramatta grass	*Sporobolus africanus*
Rhode's grass	*Chloris gayana*
Paspalum, large	*Paspalum urvillei*
Black-eyed Susan	*Thunbergia alata*
Spear thistle	*Cirsium vulgare*
Bamboo, rhizomatous	*Phyllostachys spp*

DISTRIBUTION OF HOURS ACROSS MANAGEMENT ZONES AND MONTHLY RAINFALL

Zone	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
ONR - Biodiversity Offset at Haerses Rd site	6	0	0	0	0	25	2.5	16.5	6	0	0	0	**56**
ONR - Embankment at front gate	0	9	0	0	0	0	6	0	0	0	0	0	**15**
ONR - Lot 196	13.5	0	36	0	0	0	14	9	6	0	8	0	**86.5**
ONR - Lots 1 & 2	27	16	138	24	30	20	20	18	0	0	28.5	30	**351.5**
ONR - Native Vegetation Corridor - Lot 29	6	0	30	6	0	7.5	10	9	0	0	8	0	**76.5**
TOTAL	**52.5**	**25**	**204**	**30**	**30**	**52.5**	**52.5**	**52.5**	**12**	**0**	**44.5**	**30**	**585.5**
Monthly Rainfall	***30.4***	***66.4***	***23***	***47.4***	***183.6***	***129.3***	***112***	***250.6***	***581.2****	***115.8***	***87.6***	***6.2***	***1052.3***
Median	*27.4*	*23.1*	*41.2*	*51.8*	*70.2*	*76.6*	*70.9*	*83.2*	*88.5*	*55.3*	*43.7*	*52*	***906***
Highest	*250.6*	*497.4*	*174*	*220.3*	*208.3*	*375*	*395.5*	*464.9*	*581.2*	*467.2*	*370.1*	*445.4*	***1773.6***

REGISTER OF HERBICIDE RECORDS*

Date	Operator name	Herbicide name	Wind description	Direction	Notes	Application method	Qty	Volume	Start time	End time
12/08/2021	Jeff Gibbs	Starane, Fluroxypyr-meptyl	1 - Light Air	W	Used to suppress flowering Crofton	Spray	15	5	9:01	10:01
23/09/2021	Tim Baker	Round-up, Glyphosate	1 - Light Air	SE	Targeted Couch	Spray	300	15	8:01	10:01
21/01/2022	Jeff Gibbs	Round-up, Glyphosate	3 - Gentle Breeze	E	Used with an admixture of 'Chemwet' to control exotic grass.	Spray	100	10	11:01	13:01
14/02/2022	Jeremy Houghton	Round-up, Glyphosate	2 - Light Breeze	NE	Used to control paspalum	Spray	75	5	9:01	10:01

Appendix H - Annual Biodiversity & Rehabilitation Management Report

ANNUAL BIODIVERSITY & REHABILITATION MANAGEMENT REPORT Old Northern Road 2022

Prepared for Dixon Sand Pty Ltd

September 2022 V.1

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Annual Biodiversity

&

Rehabilitation Management

Report

Old Northern Road

2022

Dixon Sand Pty Ltd

This assessment has been prepared by

Melissa Mass

September 2022 V.1

Date

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Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016*
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
HRBOA	Haerses Road Biodiversity Offset Area
HTW	High Threat Weed
KPI	Key Performance Indicators
KTP	Key Threatening Process
LEP	Local Environmental Plan
Mod 4	Modification 4
Mod 5	Modification 5
NSW OEH	New South Wales Office of Environment and Heritage
NVC	Native Vegetation Corridor
ONR	Old Northern Road
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
THSC	The Hills Shire Council
VIS	Vegetation Information System
WoNS	Weed of National Significance

1 INTRODUCTION

This report presents the findings of the annual monitoring of the biodiversity value and rehabilitation effort within the Dixon Sand operation at Old Northern Road Maroota and the biodiversity value of the offset vegetation at Haerses Road Maroota.

1.1 BACKGROUND

Dixon Sand Pty Ltd operates a sand extraction and processing operation across 58.4 hectares on Lot 29 DP752025, Lot 196 DP752025, Lot 1 DP547255 and Lot 2 DP547255 Old Northern Road Maroota. The quarry operates in compliance to Development Consent 250-09-01 issued by the Land and Environment Court in 2004.

Several modifications have been made to the Development Consent, the most recent being described as Modification 5. The previous modification, known as Mod 4, involved the clearing of native vegetation for continued sand extraction resulting in consent conditions requiring the management of biodiversity values and impacts. Thus a Biodiversity Offset Strategy for the Old Northern Road quarry site was established which includes a Native Vegetation Corridor (NVC) and the Haerses Road Biodiversity Offset Area (HRBOA).

1.2 OBJECTIVES

The objectives of this Annual Biodiversity and Rehabilitation Management Report is to describe the current condition of the NVC and the HRBOA and to advise Dixon Sand on the appropriate management measures required to be implemented in order to meet the expectations of the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018) prepared by Umwelt (Australia) Pty Ltd.

This report will:

- identify native flora and fauna species, populations and ecological communities known to or likely to occur within the NVC and HRBOA;
- describe the native vegetation and habitats within the NVC and HRBOA;
- describe the current condition of the threatened flora and its habitat found outside of the NVC at Old Northern Road;
- discuss the ongoing monitoring of threatened flora and fauna previously recorded at both ONR and HRBOA;
- determine the legislative and conservation significance of species, populations and ecological communities known or likely to occur within the NVC and HRBOA with reference to the Commonwealth *EPBC Act 1999* and the *NSW BC Act 2016*;
- recommend appropriate biodiversity and environmental management measures that should be implemented to reach criteria for monitoring success set by the Old Northern Road Quarry Biodiversity and Rehabilitation Management Plan (2018);
- provide an independent monitoring report for inclusion as part of the external reporting for the quarry Annual Review.

2 METHODOLOGY

2.1 SITE HISTORY

2.1.1 Old Northern Road Native Vegetation Corridor

The NVC on the Old Northern Road quarry site is 6.83 hectares, approximately 100m wide and 650m in length in an east-west direction. Approximately half the area of the NVC has been, or is currently, disturbed for sand extraction and areas dedicated as silt ponds. Approximately 0.8 hectares is currently under active rehabilitation as will be discussed further in this report.

The remaining vegetation within the NVC is disturbed and modified. Livestock grazing, timber removal and fruit orchards in the immediate and adjacent lands have contributed to the ongoing disturbance over many years within this area. As a result, exotic weed species are prolific and at times dominate the landscape. Farm dams have been dug which once provided irrigation to the fruit orchards and watered livestock. They now provide a water source for native and exotic species which occur in the immediate area.

Unsealed tracks are found throughout the NVC which currently provide easy access for vehicles or pedestrians.

2.1.2 Haerses Road Biodiversity Offset Area

The HRBOA is relatively undisturbed native vegetation which covers an area of 8.7 hectares. Four vegetation communities have been identified within the offset which includes habitat for threatened species known to occur in the area. Old vehicle tracks occur within the site although over time, with very little use, the tracks are now suitable for pedestrian access only.

2.1.3 Threatened flora habitat

An area to the west of the Old Northern Road NVC contains threatened flora habitat which has previously been identified and monitored. This area has had very little disturbance due to its location and unsuitability for grazing, farming or logging. A haul road had previously been constructed adjacent to the site however this road is no longer in use and most likely had very minimal impact upon the threatened flora habitat.

2.2 FIELD SURVEY

Botanical surveys of the study area were conducted over several days spread throughout August and September 2022. Fixed quadrat locations from previous annual surveys were revisited for annual flora comparison. Quadrat locations in the HRBOA were each marked with a permanent steel post and a yellow cap in the centre location along the western edge of the quadrat. The Old Northern Road NVC quadrats were marked with flagging tape given that some vegetation within the NVC is still subject to disturbance by sand extraction.

Each quadrat was 20m x 50m which included a subplot of 20m x 20m and 5 line plots of 1m x 1m. A random meander was conducted through most other areas of native vegetation within the study area, to search for threatened flora species, and to record information on habitat condition.

All flora species recorded are listed in Appendix A, B and C of this report.

Vegetation communities were identified and described with reference to the vegetation maps developed by THSC, the NSW Vegetation Information System (VIS), the descriptions in Tozer et al

(2010), and with reference to vegetation descriptions included by the Scientific Committee final determinations to list threatened communities under the *BC Act 2016 and* the *EPBC Act 1999.*

An assessment of fauna habitat was conducted within each survey quadrat to identify suitability for potential threatened fauna species known to occur in the local area.

The habitat assessment included the suitability of landscape features, hollow-bearing trees, stags, fallen timber and logs, rocky outcrops and boulders, flowering Eucalypts, specific feed trees for Glossy Black Cockatoo's, Swift Parrot, Koalas, Grey-headed Flying Fox, site connectivity, vegetation structure and vegetation types.

Searches were also undertaken for indirect evidence of native fauna, including scratches, scats, nests, hollows in use, camps, roosts, den sites etc. Opportunistic sightings of all fauna species were recorded throughout the survey period.

The following fauna survey methods were performed to target threatened species known to occur or likely to occur in the local area:

- General search with direct observation of any fauna species present within the study area, including diurnal and nocturnal call identifications;
- Early morning dedicated bird surveys;
- Unbaited motion detection infra-red digital camera left within the NVC and HRBOA for a total of 16 survey nights;
- Anabat recording device left within the NVC and HRBOA for a total of 16 survey nights.

A list of fauna species recorded across all sites is provided in appendix D and E.

Within each 50m x 20m quadrat the following information was recorded:

- centre of western edge GPS location
- aspect and slope of midline
- photograph of midline from western centre edge
- IBRA region
- vegetation class
- Plant Community Type (PCT)
- stem class including recruitment
- standing hollow count
- overall length of logs

The quadrats 20m x 20m recorded:

- every flora species identified
- abundance of each species recorded
- count of stratum richness
- percentage of High Threat Weed (HTW) cover

From within the five 1m x 1m plots the following information was recorded:

- litter cover
- native overstorey foliage cover
- native midstorey foliage cover
- native groundcover foliage cover
- cryptogam cover
- rock cover

- bare ground

Results collected from the 1m x 1m plots at each site is displayed as an average.

2.3 CRITERIA TO MONITOR SUCCESS OF REHABILITATION

The Key Performance Indicators (KPI) to measure success of the biodiversity and rehabilitation effort of the Old Northern Road NVC and the vegetation management within the HRBOA have been outlined by Umwelt (Australia) Pty Ltd 2018. The following tables depict the performance and completion criteria for both locations.

Table 1. Performance and completion criteria for Old Northern Road NVC (taken from Umwelt Pty Ltd 2018)

	Rehabilitation Performance and Completion Criteria
Native Vegetation	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities
	Second generation tree seedlings are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e. evidence of fruiting of native species observed)
	More than 75 percent of trees are healthy and growing as indicated by long term monitoring
	More than 50 percent of translocated or propagated threatened flora species survive as indicated by long term monitoring
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum
Weeds and Pests	Regular inspections indicate a decline in weed diversity, density and abundance and a decline in signs of feral animal activity
	There is no significant weed infestation such that weeds do not comprise a significant proportion of species in any stratum
	There is no evidence of significant damage resulting from feral animal activity

Table 2. Performance and measurable indicators for HRBOA (taken from Cumberland Ecology 2016)

	Performance and measurable indicators
Native Vegetation	Maintenance of current level of native species diversity and abundance
	Maintenance of current level of canopy regeneration
	Measurable increase in habitat features
	Measurable decrease in impacts from feral fauna activity
Weeds	Measurable decline in weed density and distribution
	Measurable decline in weed diversity
	Limited recruitment of new weed species
Feral Animals	Observable reduction in decline of native fauna populations due to either predation by feral species, habitat degradation caused by feral fauna or competition with feral fauna
	Limited recruitment of new feral species
General	Measurable increase in the condition of vegetation

Observable reduction in signs of erosion (if any)
Evidence of restrictions to site access
Observable decrease in bushfire risk

Furthermore, threatened flora species KPI for the translocated individuals and the flora species in-situ are to maintain or increase resident species population from the baseline levels which will be determined from this report.

Threatened fauna species previously identified at the Old Northern Road site and HRBOA are to be maintained or increase in population size based on a presence or absence survey each year following the baseline information within the Biodiversity Rehabilitation Management Plan (Umwelt Pty Ltd 2018).

2.4 SURVEY LIMITATIONS

The flora survey was conducted within a short timeframe during winter. Therefore some plant species may not have been identified due to the survey being performed when not in flower, or when dormant. It is noted that some flora species are seasonal, and may not have been visible at the time of the surveys. Recent rainfall has seen an increase in opportunistic species, such as annual weeds, while ongoing wet conditions have had negative impacts on some perennial species which prefer the dry harsh conditions of sandy soil structure. Overall there has been an increase in native abundance and diversity over time, particularly ground cover species such as forbs, grasses and ferns.

The survey limitations have been addressed through:

- consideration of flora and fauna species known to occur in the locality (including number of records from Bionet);
- consideration of habitat suitability present within the study areas and connectivity to other areas of habitat in the local landscape;
- consideration of current weather conditions;
- a conservative approach in assuming the presence of a species that could potentially be present in the study areas.

Where the study area contains potential habitat for threatened fauna species known to occur in the locality, and where survey areas support a likelihood of occurrence, it has been assumed on a conservative approach that such species may occur in the study area.

3 RESULTS

Results from the field surveys conducted over August and September 2022 have been separated into four distinct areas to enable quantification of condition for each specific location and its monitoring objectives.

3.1 OLD NORTHERN ROAD

The Old Northern Road NVC is currently in the mid stage of its rehabilitation strategy. Rehabilitation has begun within Lot 29 while extraction continues in Lot 1 and 2. Collection of propagation material from threatened flora species, *Melaleuca deanei* and *Darwinia fascicularis subsp oligantha*, has taken place with enough successful clone individuals been successfully raised to meet the approved quota. The *M. deanei* individuals were required to be established and actively growing in the ground before the removal of the parent plant could be undertaken. This was achieved in May 2022 with a total of 52 closed *M. deanei* successfully transplanted into the rehabilitation area showing signs of active growth. An attempt to translocate the parent plant into the active rehabilitation area was undertaken in June 2022.

Dedicated rehabilitation of native vegetation on Lot 29 begun in late 2017. An area of approximately 0.8 hectares was selected and prepared for three rehabilitation methods to use as a comparison for future reference. The larger area (approximately 0.4 hectares) has been planted out using local provenance stock and plants derived from material collected from threatened species onsite. In total 47 species have been planted within the rehabilitation area, including two threatened species. Artificial habitat structures such as rock, logs and plant debris have been placed around the rehabilitation site to provide habitat for small birds and reptiles.

Two adjacent areas, of approximately similar sizes, have undergone rehabilitation in conjunction with the planted rehabilitation. The area to the immediate south of the planted rehabilitation has undergone translocation of plant material, including root balls of several species together. This is a particularly successful conservation tool when used for threatened species which have little chance of survival in their current location. This approach has been used here to relocate *Darwinia fascicularis subsp*. *oligantha* along with flora species found within immediate and close proximity of each cluster of the threatened plants. Habitat features such as rocks, logs and plant debris have also been placed around the site to provide habitat for small birds, reptiles and to create microhabitats for dependant flora species.

The far western area of the NVC rehabilitation area has been spread with soil containing native seed bank and supplementary planting of threatened flora species. Habitat features have also been provided in this location.

Monitoring of vegetation condition has begun in other areas of the NVC, including areas which will be subjected to disturbance from sand extraction. The information gained from the pre-disturbance monitoring will provide Dixon Sand with quantitative data which can be used to rehabilitate the NVC back to, or close to, its pre-disturbance state.

Other areas of vegetation monitoring outside of the established rehabilitation corridor has also taken place to determine the effects of the sand extraction project on retained vegetation.

3.1.1 Rehabilitation area – Planted

The planted rehabilitation area is approximately 0.4 hectares in size and has been planted with 47 native species including 2 species listed on the *BC Act 2016* as being species of significance, *Melaleuca deanei* (vulnerable) and *Darwinia fascicularis subsp. Oligantha* (endangered population). In addition to the revegetation planting a number of species have emerged from seed bank storage from the sub-soil which was spread over the rehabilitation site before planting commenced. In total 51 native species which were not recorded as planted within the rehabilitation site were identified during the 2022 survey period including the vulnerable species *Tetratheca glandulosa*. This is an increase of 10 species since last year which appears to have appeared from seed bank stored in the soil until ideal growing conditions occurred. There was one weed species identified within the planted revegetation area, Whiskey Grass *Andropogon virginicus*.

There were 22 live specimens of *Melaleuca deanei,* 12 live specimens of *Darwinia fascicularis subsp. Oligantha* and 9 live specimens of *Tetratheca glandulosa* located within the planted rehabilitation area. Furthermore a single *Pimelea curviflora var. curviflora* was located within the planted rehabilitation area. There were no *Acacia bynoeana* identified during the survey period suggesting that the wet conditions may not have been favourable for the species to persist.

Image 1. View of planted rehabilitation area from north-west corner looking east 2021

Image 2. Comparison view of planted rehabilitation area from north-west corner looking east 2022

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Image 3. View of planted rehabilitation area from south-east corner looking west 2021

Image 4. Comparison view of planted rehabilitation area from south-east corner looking west 2022

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Image 5. Planted *Melaleuca deanei* within the planted rehabilitation area 2022

Image 6. Planted *Darwinia fascicularis subsp. Oligantha* flowering within the planted rehabilitation area 2022

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Image 7. *Tetratheca glandulosa* within the planted rehabilitation area 2022

3.1.2 Rehabilitation area – Translocated

The translocated rehabilitation area was not subjected to a flora survey as per the vegetation survey site locations suggested in the Biodiversity Rehabilitation Management Plan 2018. However a random meander through the area recording flora species was undertaken. Species identified and recorded can be found in Appendix B. Photo monitoring should, over time, be sufficient to determine the rehabilitation success of this area.

Overall coverage of vegetation from the translocation and continued recruitment from seed bank storage appears to be ample. Translocated *Darwinia fascicularis subsp. Oligantha* is numerous, particularly on the western side of the site. All age classes were observed from small seedlings to adult shrubs which were flowering well at the time of the survey period.

A single *Tetratheca glandulosa* which was translocated during the previous reporting period appears in a healthy state with flowers present during August suggesting flowering will continue to occur over the coming months. A further individual was located within the translocation area which has grown from seed bank within the soil.

Three *Melaleuca deanei* which were planted within this area in 2017 are still present and appear healthy. A further twenty six *M. deanei* have been planted within this area during 2020-2021. All plants appear to be doing well with most showing signs of active growth. These plants will continue to be closely monitored over the coming months.

There is currently no upper canopy within this area however *Eucalyptus sp*,, *Corymbia sp*. and *Angophora hispida* recruits were observed. Shrubs and ground cover plants are abundant throughout the area.

Image 8. Translocated *Tetratheca glandulosa* flowering within the translocation area 2022

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Image 9. Planted *Melaleuca deanei* within the translocation area 2022

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Image 10. *Darwinia fascicularis subsp. oligantha* within the translocation area

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3.1.3 Rehabilitation area – Soil seed bank

The soil seed bank rehabilitation area was not subjected to a flora survey as per the vegetation survey site locations suggested in the Biodiversity Rehabilitation Management Plan 2018. A random meander through the area recording flora species was undertaken and a count of living planted threatened species was recorded. Photo monitoring of the area will determine rehabilitation success.

Ample natural recruitment of native species is occurring across the site with recruitment of *Darwinia fascicularis subsp. Oligantha* evident. Canopy stratum is beginning to emerge with *Eucalyptus sp* and *Corymbia sp.* observed. *Banksia ericifolia* dominates the recovering shrub layer with *Grevillea buxifolia* and *Acacia suaveolens* also widespread. Previously *Acacia suaveolens* had dominated this area however the Banksia has outgrown most of the other species present. Ground cover species are present throughout although due to the density of the shrub layer the ground cover is sporadically distributed.

There were 23 *Darwinia fascicularis subsp. oligantha* identified scattered throughout the site, some of which are new recruits. The planted *Melaleuca deanei* could not be located due to the density of the shrub layer during the survey period although it was observed during the year on another occasion. The density of the shrub regrowth is suspected of hampering the efforts to locate other individuals. All the surviving threatened species which were located as present appear to be healthy.

3.1.4 Front gate rehabilitation

The front gate rehabilitation was initially planted in 2017. The hot dry conditions between 2017 and 2020 resulted in a number of losses and slow growth to the surviving plants despite regular watering and maintenance. Since the return to regular rainfall the front gate rehabilitation area has thrived with many shrubs flowering well and new recruitments evident. Gaps are still present however it is expected these will fill in with time via natural recruitment.

Image 11. View of translocated rehabilitation area from south-west looking east 2021

Image 12. Comparison view of translocated rehabilitation area from south-west looking east 2022

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Image 13. View of translocation rehabilitation area from north-west looking east 2021

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Image 14. Comparison view of translocation rehabilitation area from north-west looking east 2022

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Image 15. View of soil seed bank rehabilitation area from north looking south 2021

Image 16. Comparison view of soil seed bank rehabilitation area from north looking south 2022

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Image 17. View of soil seed bank rehabilitation area from south looking north 2021

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Image 18. Comparison view of soil seed bank rehabilitation area from south looking north 2022

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Image 19. Front gate rehabilitation area

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3.1.5 Vegetation monitoring within NVC

The Biodiversity Rehabilitation Management Plan 2018 indicates that nine vegetation monitoring sites should be established across the Old Northern Road site. Five of these sites occur within the NVC including one site within the planted rehabilitation area discussed in 3.1.1 of this report.

From the remaining four sites only two could be safely accessed for monitoring. The two remaining monitoring sites are currently disturbed for sand extraction.

The vegetation in the surveyed area is described in the Biodiversity Rehabilitation Management Plan 2018 as being *Eucalyptus punctata* woodland. The vegetation community in this location appears to be in a transition zone with influences from dry ridgetop woodland, heathland and gully forests emerging in one location. The species recorded within the survey site came to the determination that the VIS classification for this PCT best fit is *1328 - Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Bioregion.* Information collected during the survey period has been summarised in Table 3 while a full list of flora recorded can be found in Appendix A.

An additional survey plot, Plot 3, which was included in the previous year monitoring survey is located where active *Lantana Camara* management has been taking place allowing for further access. A vegetation plot of 20m x 20m was established however the larger plot of 50m x 20m could not be achieved due to *Lantana camara* thickets still remaining. It is expected over time the larger plot will be included in this monitoring as the Bush Regenerators remove the *Lantana camara* from within the site. Plot 3 vegetation is largely dominated by exotic weed species as a result of the disturbance caused by the *Lantana camara* and its removal. Recovering native vegetation is present with pioneer species, many of these being fast growing nitrogen fixing species, while planted native species have been introduced to the site in an effort to increase native diversity. With further weed control within the management areas the native species should recover in time with greater density and diversity expected.

The overall health of the vegetation and biodiversity within the NVC is moderate. There has been historic disturbance in the area most likely from livestock grazing and timber removal. Recent continued rainfall in the local area has assisted in the recovery of vegetation from the previous drought conditions across all affected stratums with ground cover species showing good signs of recovery.

The remaining areas throughout the NVC continue to be severely impacted from the presence of *Lantana camara*. An effort to remove and control the species has begun in earnest however due to the distribution and density it will require long term management to completely remove the species across the entire site.

During the reporting period it was determined that the required ratio of clone *Melaleuca deanei* had been successfully transplanted into the rehabilitation area allowing for the removal of the parent plant(s). An attempt was made to translocate the parent plant into the rehabilitation area via digging around the root ball and carrying the plant with the root ball attached in a loader bucket. The root system for the parent plant was extensive and had coiled around large sandstone boulders and through the cracks of others. Therefore during retrieval of the plant much of the root system was unfortunately damaged. The parent plant was placed within the rehabilitation area with the root ball and immediate surrounding soil which will be monitored over time for regrowth potential.

Image 20. Translocation of parent *Melaleuca deanei* in loader bucket

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Image 21. Translocation of parent *Melaleuca deanei* within rehabilitation area

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Table 3. Survey summary from NVC survey site location ONR quadrat 2.

1328 - Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0313182 Northing – 06296257 Midline - 89°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	15 – 20m	*Corymbia gummifera, Eucalyptus punctata, Eucalyptus haemastoma, Angophora bakeri, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Acacia linifolia, Grevillea buxifolia, Hakea sericea, Pimelea linifolia, Bossiaea obcordata, Jacksonia scoparia*		
Groundcover	0.1 – 0.5m	*Pratia purpurascens, Lomandra longifolia, Entolasia stricta, Themeda australis,*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	2
30-49cm	✓		2	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		6	60	
Shrubs		26	50	
Grasses etc		12	50	
Forbs		6	10	
Ferns		0	0	
Other		4	4	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	46 m			
Litter cover	45%			
Bare ground cover	0%			
Cryptogam cover	22%			
Rock cover	5%			
Overstorey foliage cover	45%			
Mid-storey foliage cover	40%			
Groundcover foliage cover	40%			

Table 4. Survey summary from NVC survey site location ONR quadrat 3

1328 - Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0313239 Northing – 06296521 Midline - 90°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	2 - 5m	*Acacia parramattensis, Allocasuarina littoralis, Glochidion ferdinandi*		
Shrubs	0.5 – 2m	*Acacia linifolia, Trema tomentosa var. aspera, Breynia oblongifolia, Ozothamnus diosmifolius*		
Groundcover	0.1 – 0.5m	*Lomandra longifolia, Imperata cylindrica, Einadia hastata*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				
20-29cm				
10-19cm		✓		
5-9cm		✓		
<5cm		✓		

Composition & Structure	**Composition Count**	**Structure cover %**
Trees	3	15
Shrubs	5	15
Grasses etc	3	5
Forbs	0	0
Ferns	0	0
Other	0	0
High Threat Weeds	7	40

Ecosystem Functions (includes exotic species)	
Length of habitat logs	0m
Litter cover	5%
Bare ground cover	0%
Cryptogam cover	0%
Rock cover	0%
Overstorey foliage cover	10%
Mid-storey foliage cover	20%
Groundcover foliage cover	90%

Image 22. Midline view of NVC survey quadrat 2 2022

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Image 23. Midline view of NVC survey quadrat 3 2022

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3.1.6 Vegetation monitoring outside NVC

There were four monitoring sites identified outside of the NVC which were proposed to be surveyed. Two of these locations were unable to be accessed due to sand extraction currently taking place. Another of the locations was not able to be accessed due to impenetrable thickets of *Lantana camara*. The remaining monitoring site and an additional monitoring site were selected for surveying to provide baseline data for ongoing assessment over the site.

The vegetation within Plot 1 was determined to be PCT *1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*. This survey location is outside of the NVC although within the 250m buffer area to Maroota Public School in the southeast corner of the site. This area has had historic disturbance most likely from timber harvesting. An abundance of *Eucalyptus piperita* are regenerating within this quadrat at around the same age class which suggests at some stage the area was once cleared. Despite this, the diversity within the survey site is reasonable and the biodiversity values are moderate. The area where this quadrat is located will not be subjected to clearing so will therefore provide an opportunity for monitoring the effects of sand extraction in nearby retained vegetation.

The additional survey site, Plot 4, was undertaken within an area of vegetation determined to also be PCT *1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*. This survey location is just within the 250m buffer to the Maroota Public School in the centre of the site and will not be subject to clearing for quarry activities. It is therefore likely to provide good baseline data for rehabilitation of the vegetation community for future reference. The vegetation within the survey plot appears to have very little disturbance and contains no exotic weed species.

The remaining vegetation within the 250m buffer area appeared to have some impacts from the spread and growth of Lantana camara therefore a third survey quadrat within the recommended survey area was not undertaken. Efforts have been made to reduce the impacts from the invasive species however the progress is slow and favourable weather conditions for growth have made control difficult.

Table 5. Survey summary for area outside NVC Survey site location ONR quadrat 1

1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0313250 Northing – 06296390 Midline - 230°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus piperita, Eucalyptus punctata, Angophora costata, Allocasuarina littoralis, Ceratopetalum gummiferum*		
Shrubs	0.5 – 2m	*Leptospermum polygalifolium, Kunzea ambugia, Banksia spinulosa, Acacia ulicifolia, Epacris pulchella*		
Groundcover	0.1 – 0.5m	*Lomandra filiformis, Xanthosia pilosa, Lomandra longifolia, Themeda australis, Entolasia stricta, Microleana stipoides*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓		1	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		6	80	
Shrubs		18	50	
Grasses etc		12	50	
Forbs		8	10	
Ferns		1	1	
Other		3	3	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	13.1m			
Litter cover	75%			
Bare ground cover	0%			
Cryptogam cover	30%			
Rock cover	5%			
Overstorey foliage cover	70%			
Mid-storey foliage cover	40%			
Groundcover foliage cover	40%			

Table 6. Survey summary for area outside NVC Survey site location ONR quadrat 4

1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0313263 Northing – 06296592 Midline - 90°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus piperita, Eucalyptus pilularis, Angophora costata, Allocasuarina littoralis, Ceratopetalum gummiferum, Corymbia gummifera*		
Shrubs	0.5 – 2m	*Banksia spinulosa, Persoonia linearis, Acacia ulicifolia, Bossieaea obcordata, Hakea sericea, Leucopogon parviflorus*		
Groundcover	0.1 – 0.5m	*Pteridium esculentum, Lomandra multiflora, Themeda australis, Entolasia stricta, Smilax glyciphylla*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		2	2
30-49cm	✓		3	
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		7	70	
Shrubs		23	60	
Grasses etc		10	20	
Forbs		9	5	
Ferns		3	5	
Other		5	5	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	32m			
Litter cover	40%			
Bare ground cover	0%			
Cryptogam cover	20%			
Rock cover	20%			
Overstorey foliage cover	60%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	20%			

Image 24. Midline view of ONR quadrat 1 2022

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Image 25. Midline view of ONR quadrat 4 2022

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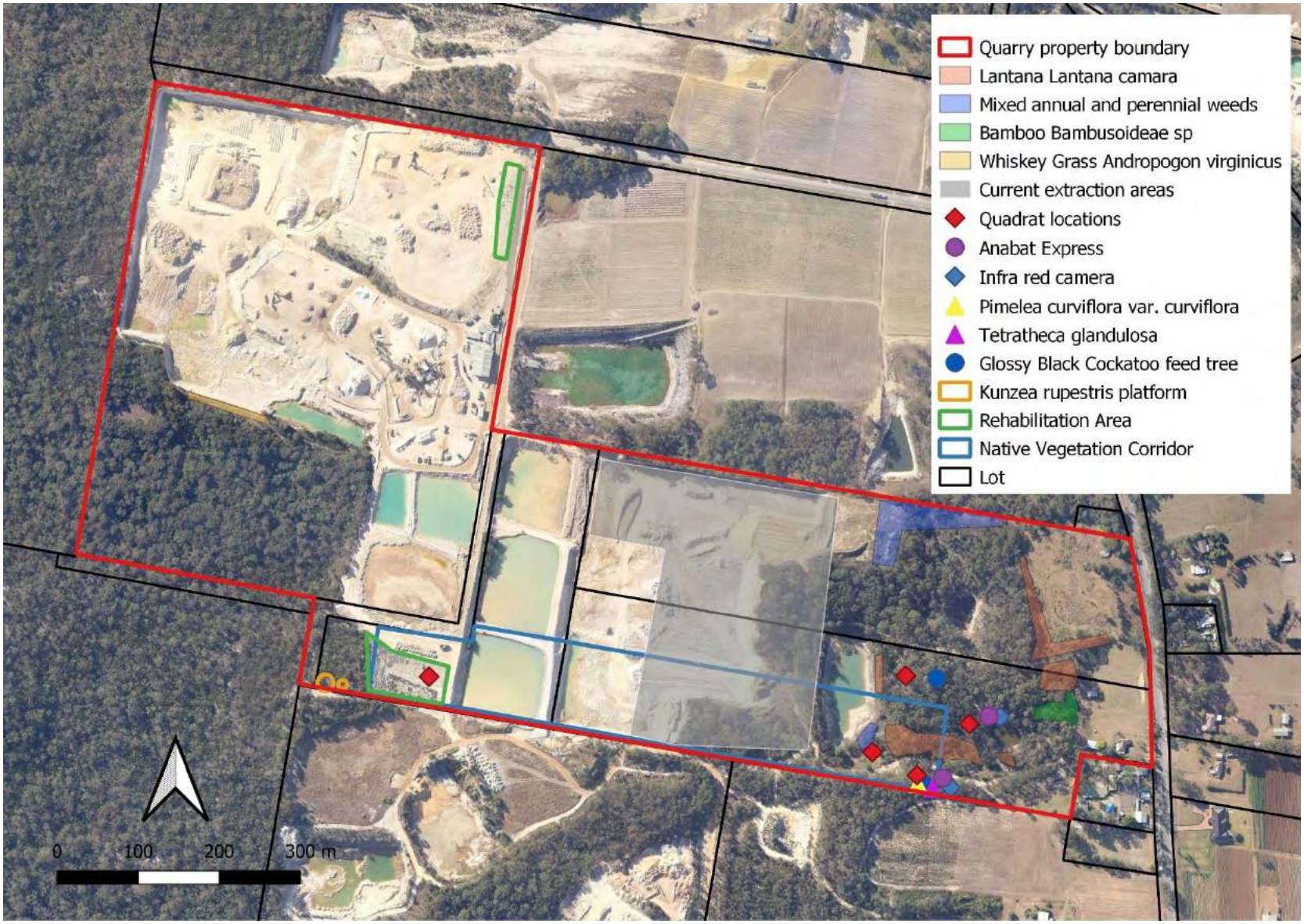

Image 26. ONR survey site locations 2022

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3.2 HAERSES ROAD BIODIVERSITY OFFSET AREA

The HRBOA has a total of five monitoring sites specifically to provide benchmark values for the vegetation communities found within the site. Baseline data collected and discussed within this report will enable a measurable value of success for management actions which may be implemented over the life of the offset.

It is expected over time there will be an increase in biodiversity, habitat features, ongoing evidence of natural recruitment and a decrease in exotic fauna and flora presence.

Each of the survey locations has been permanently marked with a steel post and yellow cap indicating the plot identification number.

Cumberland Ecology (2016) had previously identified four vegetation communities onsite as Sydney sandstone Ridgetop Woodland, Sydney Hinterland Transition Woodland, Sydney Sandstone Gully Forest and Sydney Sandstone Heath (Heath/Woodland Complex). Each survey location surveyed was given a best fit PCT based on the classification of the VIS which was determined by the native species most abundant throughout the quadrat. Therefore the following PCT's were identified:

- Plot 1 - *1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*
- Plot 2 – *1641 – Dwarf Apple – Scribbly Gum heathy low woodland on sandstone ranged of the Central Coast*
- Plot 3 - *1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*
- Plot 4 – *1627 – Smooth-barked Apple – Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast*
- Plot 5 – *1643 – Red Bloodwood – Smooth-barked Apple – Scribbly Gum – Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*

These PCT's are in line with the broader definition given in the Cumberland Ecology Biodiversity Management Plan 2016, although the location of the Sydney Hinterland Transition Forest was not surveyed.

Plot 2 had an abundance of the threatened flora species *Darwinia biflora* present. This shrub was noted to be very well represented throughout the entire area of the PCT 1641.

Overall there was an increase to foliage cover and structure cover in most stratums at most survey sites. Grass and ground cover species appear to have improved in density following recent continued rainfall. Extensive Long-nosed Bandicoot digs were again noted in an area close to Quadrat 1. Bird presence and density has remained consistent from last survey period, likely due to the favourable weather conditions.

The following tables (7 – 11) are a summary of the survey results at each of the plot locations across HRBOA.

Table 7. Survey summary for survey site location HRBOA quadrat 1

1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0312740 Northing – 06293489 Midline - 130°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Angophora costata, Corymbia gummifera, Allocasuarina littoralis, Ceratopetalum gummiferum, Banksia Serrata*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Persoonia pinifolia, Lambertia Formosa, Boronia floribunda, Grevillea speciosa, Acacia ulicifolia*		
Groundcover	0.1 – 0.5m	*Caustis flexosa, Pteridium esculentum, Lomandra brevis, Entolasia stricta, Smilax glyciphylla, Xanthorrhoea media*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	1
30-49cm	✓		1	
20-29cm	✓	✓		
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		5	50	
Shrubs		31	60	
Grasses etc		11	15	
Forbs		7	8	
Ferns		2	15	
Other		3	5	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	26.5m			
Litter cover	65%			
Bare ground cover	0%			
Cryptogam cover	2%			
Rock cover	30%			
Overstorey foliage cover	50%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	25%			

Image 27. Midline view of HRBOA quadrat 1 2022

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Table 8. Survey summary for survey site location HRBOA quadrat 2

1641 – Dwarf Apple – Scribbly Gum heathy low woodland on sandstone ranged of the Central Coast				
AGD Zone 56 Easting – 0312750 Northing – 06293649 Midline - 100°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	2 – 10m	*Angophora hispida, Eucalyptus haemastoma*		
Shrubs	0.5 – 2m	*Banksia ericifolia, Hakea sericea, Leptospermum trinervium, Dillwynia floribunda, Lambertia Formosa, Calytrix tetragona, Grevillea speciosa, Boronia ledifolia, Persoonia pinifolia*		
Groundcover	0.1 – 0.5m	*Caustis pentandra, Actinotus minor, Austrostipa pubescens, Mirbelia speciosa, Lepidosperma laterale, Cassytha glabella, Entolasia stricta, Lomandra obliqua*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		1	
30-49cm		✓		
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		2	20	
Shrubs		34	100	
Grasses etc		12	80	
Forbs		6	10	
Ferns		2	5	
Other		3	4	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	9.3m			
Litter cover	20%			
Bare ground cover	0%			
Cryptogam cover	10%			
Rock cover	5%			
Overstorey foliage cover	15%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	80%			

Image 28. Midline view of HRBOA quadrat 2 2022

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Image 29. Flowering *Darwinia biflora* located within HRBOA quadrat 2

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Table 9. Survey Summary of survey location HRBOA quadrat 3

1181 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion				
AGD Zone 56 Easting – 0312877 Northing – 06293628 Midline - 110°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Corymbia gummifera, Eucalyptus piperita, Eucalyptus punctata, Banksia serrata, Ceratopetalum gummiferum, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Persoonia levis, Persoonia pinifolia, Bossiaea lenticularis, Epacris pulchella*		
Groundcover	0.1 – 0.5m	*Dianella caerulea, Pteridium esculentum, Lindsaea microphylla, Lomandra filliformis, Entolasia stricta, Caustis flexosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm	✓		3	
30-49cm	✓		1	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**		**Structure cover %**
Trees		6		80
Shrubs		30		40
Grasses etc		14		20
Forbs		7		5
Ferns		3		10
Other		4		3
High Threat Weeds		0		0

Ecosystem Functions	
Length of habitat logs	10.1m
Litter cover	40%
Bare ground cover	0%
Cryptogam cover	15%
Rock cover	20%
Overstorey foliage cover	40%
Mid-storey foliage cover	20%
Groundcover foliage cover	10%

Figure 30. View of midline HRBOA quadrat 3 2022

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Table 10. Survey Summary of survey location HRBOA quadrat 4

1627 – Smooth-barked Apple – Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast				
AGD Zone 56 Easting – 0312847 Northing – 06293808 Midline - 100°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Corymbia gummifera, Eucalyptus resinifera, Angophora costata, Callicoma serratifolia, Ceratopetalum gummiferum, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Leptospermum trinervium, Telopea speciossima, Persoonia pinifolia, Bossiaea lenticularis, Lambertia formosa, Banksia spinulosa, Acacia linifolia*		
Groundcover	0.1 – 0.5m	*Pteridium esculentum, Gahnia sieberiana, Lomandra filliformis, Lomandra multiflora, Stylidium lineare, Entolasia stricta, Caustis flexosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+	2		2	1
50-79cm	✓		2	3
30-49cm	✓		2	
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**	**Structure cover %**	
Trees		7	80	
Shrubs		28	75	
Grasses etc		16	20	
Forbs		10	10	
Ferns		4	15	
Other		4	3	
High Threat Weeds		0	0	
Ecosystem Functions				
Length of habitat logs	47.8m			
Litter cover	30%			
Bare ground cover	10%			
Cryptogam cover	40%			
Rock cover	5%			
Overstorey foliage cover	40%			
Mid-storey foliage cover	50%			
Groundcover foliage cover	20%			

Image 31. View of midline HRBOA quadrat 4 2022

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Table 11. Survey Summary of survey location HRBOA quadrat 5

1643 – Red Bloodwood – Smooth-barked Apple – Scribbly Gum – Old Man Banksia heathy woodland on sandstone ranges of the Central Coast				
AGD Zone 56 Easting – 0312938 Northing – 06293983 Midline - 130°				
Vegetation Layer	**Height Range**	**Vegetation Layer**		
Trees	20 – 30m	*Eucalyptus punctata, Eucalyptus haemastoma, Angophora hispida, Banksia serrata, Allocasuarina littoralis*		
Shrubs	0.5 – 2m	*Lambertia formosa, Persoonia pinifolia, Bossiaea scolopendra, Woollsia pungens, Banksia ericifolia, Boronia floribunda, Epacris pulchella, Petrophile pulchella, Platysace linearifolia*		
Groundcover	0.1 – 0.5m	*Actinotus minor, Xanthosia pilosa, Lomandra multiflora, Austrostipa pubescens, Entolasia stricta, Xanthorrhoea resinosa*		
Stem Class			**Hollows**	
Dbh	**Eucalyptus**	**Non-Eucalypt**	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓		3	
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Composition & Structure		**Composition Count**		**Structure cover %**
Trees		5		20
Shrubs		33		65
Grasses etc		17		20
Forbs		11		10
Ferns		2		5
Other		3		2
High Threat Weeds		0		0

Ecosystem Functions	
Length of habitat logs	18.9m
Litter cover	25%
Bare ground cover	1%
Cryptogam cover	20%
Rock cover	30%
Overstorey foliage cover	20%
Mid-storey foliage cover	40%
Groundcover foliage cover	20%

Image 32. View of midline HRBOA quadrat 5 2022

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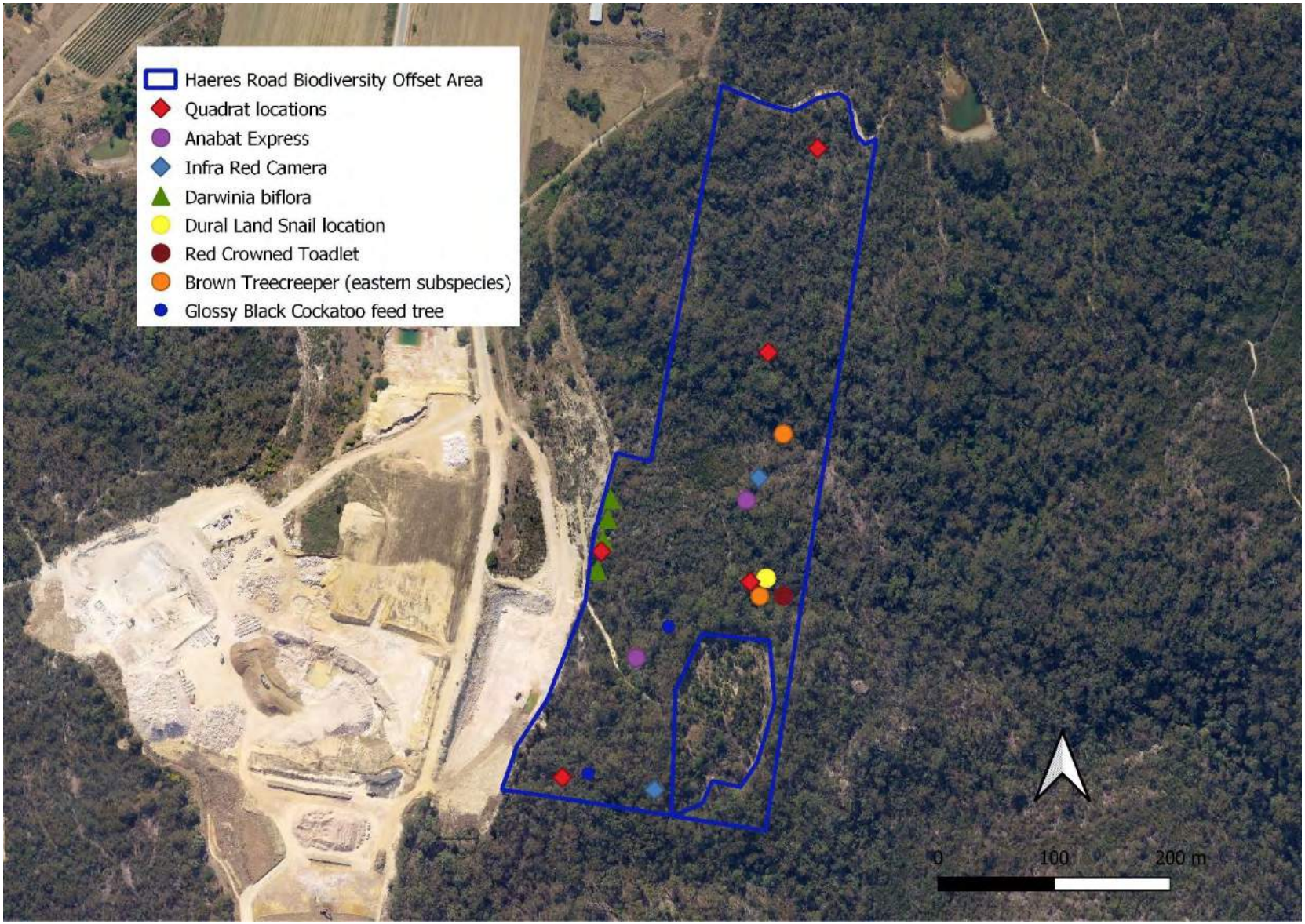

Image 33. HRBOA site location 2022 (note no change to the previous reporting period)

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3.3 Threatened Flora Monitoring

The threatened flora monitoring details the current condition of the four threatened flora species and their immediate habitat which has been previously recorded onsite. The far western area of Lot 29 contains a significant rock platform which supports *Kunzea rupestris* and *Darwinia fascicularis subsp oligantha*. Lot 2 contains *Pimelea curviflora var curviflora* and *Tetratheca glandulosa*.

The overall health of the *Kunzea rupestris* population is good following the continued rainfall in the local area. During the 2017-2019 drought some dieback and plant loss was observed however the remaining plants appear to be in good health and new recruitment is evident, particularly on the western rock platform where vacant soil is available. New growth on most plants was once again observed during the survey period with flower buds present on much of the population. Mosses and lichens were present in each patch on both platforms.

The eastern rock platform has been divided into four individual patches. Much of the surrounding vegetation has suffered die back including the *Banksia ericifolia* and *Calytrix tetragona*. This may be attributed to the dry conditions during the 2017-2019 drought followed by extreme wet conditions from 2020-2022.

Patch one had previously identified twenty six individual plants. During the July 2022 survey period twenty two individuals were counted. The dry conditions over 2017 and 2019, and in particular the extreme heat days which were experienced during the summer months throughout that time, is the expected cause for loss of plant density. The remaining patch is in relatively good health with flower buds present on mature growth. *Darwinia fascicularis subsp oligantha* is also present within this patch.

Patch two is much smaller with only three plants present. One plant has flower buds present. Within patch three the two persistent plants also have flower buds present. In patch four the five *Kunzea rupestris* appear to be in good health with two having flower buds present at the time of surveying.

The western rock platform has been divided into five individual patches which are much more widely distributed than the patches on the eastern rock platform. Within this section the *Kunzea rupestris* grows within a vegetation community with far more flora diversity than what is present on the eastern rock platform. Some of the shrubs are therefore much larger as soil depth and protection from external influences (such as wind and radiant heat) is more readily available.

Patch one has six plants present. *Calytrix tetragona* and *Darwinia fascicularis subsp oligantha* were also present within this patch. Patch two is a long patch which runs down the length of the rock platform. There appears to have been very little change to this patch from last year although some dieback of *Calytrix tetragona* and *Acacia hispidula* was noted. New recruits have appeared particularly on the edge of the soil profile. In total thirty three individual plants were identified within this patch. All plants in this location are low growing and all appear in good health with some flower bud present. Additional species identified within this patch included *Calytrix tetragona*, *Acacia hispidula*, *Grevillea buxifolia, Caustis flexuosa* and *Darwinia fascicularis subsp oligantha. Some outlying small patches were noted which appear to be newly created from soil run off during heavy rainfall periods. New recruits were noted to be growing in these patches although due to the very shallow soil profile they are not expected to survive should dry weather return.*

Patch three does not contain any *Kunzea rupestris* plants. The patch is considered for monitoring over time with the hope that new recruits will eventually appear. A single *Leucopogon parviflorus* is currently the only species within this patch.

Patch four currently has twenty seven *Kunzea rupestris* plants with several of those being juvenile recruits. Mature plants have flower buds present. Other flora species identified within the patch were *Calytrix tetragona*, *Grevillea buxifolia, Caustis flexuosa*, *Darwinia fascicularis subsp oligantha, Banksia ericifolia, Isopogon anethifolius, Bossiaea scolopendria* and *Petrophile pulchella.*

Patch five had twenty five *Kunzea rupestris* growing within a diverse mix of shrub species. Several of the counted individuals appear to be new recruits close to the old haul track. It was noted that some *Banksia ericifolia, Isopogon anethifolius* and *Calytrix tetragona* had died. Other species within this patch include *Acacia ulicifolia, Corymbia eximia, Dianella revolute, Grevillea buxifolia, Grevillea speciosa, Leucopogon parviflorus, Angophora hispidula, Caustis flexuosa*, *Persoonia levis*, *Isopogon anethifolius* and *Petrophile pulchella.*

Other threatened species located onsite were observed and inspected for current health and condition. As previously mentioned an attempt was made to translocate the original parent plant of the *Melaleuca deanei*. Prior to translocation the plant health was checked and it appeared to not have suffered any ill effects from previous multiple small branch removal during clone recruitment. No flowers were observed throughout the 2021-2022 period before translocation. In total there were 31 stems in 18 clumps covering an area of 25m². The highest peak of the shrub was approximately 2.5m tall. Once removed it appeared that the plant was one individual connected by a single root system, not multiple plants as once thought.

Darwinia fascicularis subsp oligantha was observed as being plentiful in the location of the *Kunzea rupestris* population and surrounding area. Plants were flowering well and new recruits were evident throughout the area. They were also very well represented throughout the rehabilitation areas. There were several *Tetratheca glandulosa* plants identified within Quadrat 2 during the 2022 flora survey period. In addition to this an abundance of flowering *Pimelea curviflora var curviflora* was also identified within the same quadrat site. The threatened species within this location will continue to be monitored each year they remain present onsite.

Image 34. *Kunzea rupestris* monitoring eastern rock platform photo location 1 2022

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Image 35. *Kunzea rupestris* monitoring eastern rock platform photo location 2 2022

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Image 36. 2022 eastern rock platform patch number 1-3, top 1 - bottom 3

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Image 37. *Kunzea rupestris* monitoring western rock platform photo location 1 2022

Image 38. *Kunzea rupestris* monitoring western rock platform photo location 2 2022

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Image 39. *Kunzea rupestris* monitoring western rock platform photo location 3 2022

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Image 40. 2021 western rock platform patch number 1-5, top left 1 top right 2 middle left 3 middle right 4 bottom 5

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Image 41. *Kunzea rupestris* flower buds on eastern rock platform July 2022

Image 42. *Darwinia fascicularis subsp. oligantha* in flower on western rock platform July 2022

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Image 43. *Tetratheca glandulosa* within Quadrat 2 2022

Image 44. *Pimelea curviflora var curviflora* within Quadrat 2 2022

3.4 Threatened Fauna Monitoring

Threatened fauna previously located within the Old Northern Road site included four species of microchiropteran bat and a Glossy Black Cockatoo.

A search was undertaken for Glossy Black Cockatoo feed trees throughout the site. Feed tree location was confirmed within transect 2 of the NVR and within the 250m buffer from Maroota Public School. Six individual birds were observed feeding in trees within the 250n buffer from Maroota Public School during August 2022.

An AnaBat Express sound recorder was left in place over 16 survey nights. The results were sent to Dr Anna McConville from Echo Ecology and Surveying for analysis. Three of the previously recorded threatened bat species were recorded within the survey area during this survey period, Little Bent-winged Bat *Miniopterus australis,* Eastern False Pipistrelle *Falsistrellus tasmaniensis* and Eastern Free-tailed Bat *Mormopterus norfolkensis*. In addition to this the Greater Broad-nosed Bat *Scoteanax rueppellii*, Large-eared Pied Bat *Chalinolobus dwyeri*, Large Bent-winged Bat *Miniopterus orianae oceanensis* and Southern Myotis *Myotis Macropus* potentially occurred within the site however the recorded calls could not be confidently identified. Live trapping was not conducted to reduce unnecessarily stress on fauna. Continued summer surveying for bat species will provide tangible conclusions for which species are expected to occur annually within the site.

No other threatened fauna were observed within or immediately surrounding the Old Northern Road site during the survey period. The resident pair of Wedged-tailed Eagles were observed flying over the site several times throughout the year. A single adult White Breasted Sea Eagle was also observed flying over the site during the reporting period.

The HRBOA previously had two threatened fauna species recorded on the property, although outside of the offset area. A historic Bionet record of a Koala and Glossy Black Cockatoo sighting to the north of the property towards Hitchcock Road was not investigated any further for the purpose of this report. Koala sightings in the area, particularly around Glenorie, have increased since the Wollemi/Yengo mega-bushfire over the spring/summer of 2019/2020. A search for Koala scat under *Eucalyptus punctata* within all survey quadrats at the HRBOA was undertaken. No scats were found.

Glossy Black Cockatoo feed trees were observed within quadrat 1. Several Brown Treecreepers were observed foraging again during the 2022 survey period within the site at various locations indicating these are permanent residents within the site. A survey for microchiropteran bat species using an AnaBat Express sound recorder was undertaken during January 2022. The Large-eared Pied Bat *Chalinolobus dwyeri*, Eastern Free-tailed Bat *Mormopterus norfolkensis*, and the Little Bent-winged Bat *Miniopterus australis* were identified by Dr Anna McConville over 16 nights. In addition to this the Greater Broad-nosed Bat *Scoteanax rueppellii*, Large Bent-winged Bat *Miniopterus orianae oceanensis* and Southern Myotis *Myotis Macropus* potentially occurred within the site however the recorded calls could not be confidently identified. The survey fauna results can be seen in Appendix D and E.

3.5 Exotic Species

Exotic flora species were identified within the NVC and 250m buffer area at the Old Northern Road site. Six species considered as High Threat Weeds (HTW) under the *Biosecurity Act 2015* occur on the property, Crofton Weed *Ageratina adenophora*, Whiskey Grass *Andropogon virginicus,* Cobblers Pegs *Bidens pilosa,* Paspalum Grass *Paspalum dilatatum,* Fireweed *Senecio madagascariensis* and the most widespread on the property Lantana *Lantana camara.* Two of those weed species, Fireweed and Lantana, are also listed as Weeds of National Significance (WoNS) as determined by the

Commonwealth Government. A weed management program is currently in place and will continue throughout the life of the rehabilitation plan. There was one HTW identified within the HRBOA, Whiskey Grass *Andropogon virginicus*, which occurs in the rehabilitation area located in the south east area of the site. It is likely seed has been spread to the walking trails of the site via the clothing and shoes of the bush regenerators undertaking weed management in the rehabilitation area. Annual sweeps of the property are recommended to ensure any outbreaks are managed and controlled before species become established.

A weed distribution map has been developed which will be updated yearly to allow for annual comparison. The weed management contractor should aim to reduce the size of these areas on an annual basis with the ultimate goal of eradication, particularly of WoNS and HTW. The weed distribution map has not changed from the previous reporting period. This is due to the wet conditions making it difficult for the weed management contractor to gain access to the site and the wet conditions providing ideal growing conditions for weed species.

Exotic fauna species were identified within the NVC at the Old Northern Road site. Infra-red cameras were left in place for 16 survey nights with a dog being recorded over several nights. Sand plots were not possible to undertake this reporting period due to the tracks being too wet for heavy machinery to gain access. Sand from the previous survey period had washed away from the heavy rainfalls during the year.

European Rabbit scats were observed in several locations within the NVC in low density. It could then be assumed that carnivore scats also observed onsite were most likely from the European Red Fox. As no Rabbits were observed feeding during the day, scats were not in high density and large warrens were not observed the population can be considered to be low and likely to be kept under control by biological means such as predation from foxes, dogs, cats and birds of prey such as the Wedge-tailed Eagle observed flying nearby. Should the number of rabbits become problematic then it may be necessary to engage in a control program to reduce or eliminate the population.

The Noisy Minor, *Manorina melanocephala*, was also observed within the NVC and 250m buffer area at the Old Northern Road Site. Although this bird is a native species to eastern Australia it is worth mentioning here as the species is considered a pest in high density and a Key Threatening Process to many threatened species of small bird including the Brown Treecreeper, which was identified at HRBOA. The population of Noisy Minor appeared to be small and a variety of small birds were observed on site during the survey period. The population should be monitored over time to ensure the species does not become dominant and eliminate other bird species from the vegetation.

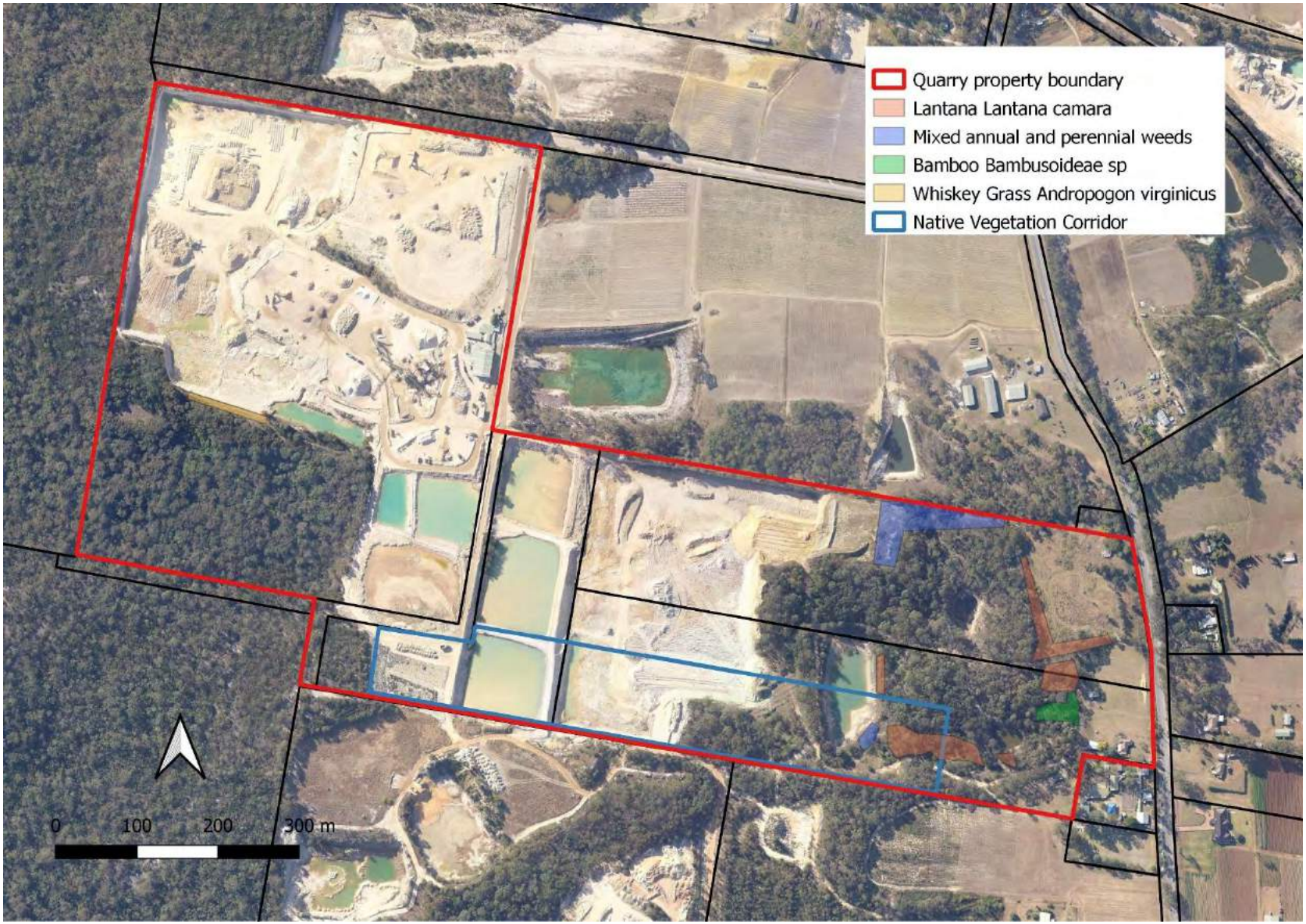

Figure 45. Annual weed distribution map ONR 2022

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3.6 Assessment Against Criteria

The results of the field survey were assessed against the criteria for successful rehabilitation (Table 12).

Table 12. Assessment against criteria to monitor success of rehabilitation

Category	Performance Criteria	Target Achieved	Comments
Native Vegetation	More than 75% of trees are healthy and growing as indicated by long term monitoring	YES	More than 75% of the native vegetation within the active rehabilitation area is healthy and is growing as expected for long term survival. All shrub and ground cover species have reached maturity with flowering and seed production observed. Some species have begun self-propagation within rehabilitation sites. *Eucalyptus, Angophora* and *Corymbia* species have not yet reached maturity.
	More than 50% of translocated or propagated threatened flora species survive as indicated by long term monitoring	YES	More than 50% of translocated and planted propagated threatened flora species has survived despite the extreme weather conditions of the past reporting periods. To date at least 45 propagated *Darwinia fascicularis subsp. Oligantha* and 52 propagated *Melaleuca deanei* have survived transplanting in the rehabilitation area. A complete count of translocated *Darwinia fascicularis subsp. Oligantha* was not undertaken at the time of relocation however it appears that any losses that may have occurred were minimal and new recruits are now visible throughout much of the area.
Vegetation Structure	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities	N/A	At this stage it is too early in the rehabilitation process to determine if the desired vegetation community is being established. Species planted have been specifically chosen to recreate a Banksia Heath community.
Ecosystem Function	Second generation tree seedlings are present or likely to be, based on monitoring comparable older rehabilitation sides (evidence of fruiting of native species observed)	N/A	It is too early in the rehabilitation process for second generation tree seedlings. Fruiting of tree species is not expected for 5 years following the original planting (i.e. 2022).
	Habitat values retained or beginning to develop and improve over time (leaf litter, fallen timber etc)	YES	Habitat values have been added to the rehabilitation site in the form of logs and vegetation debris. The site is not yet at the age where it will begin to form its own habitat value. This is expected

			to begin between 5-10 years following the original planting. That being said, leaf litter is beginning to form.
Weeds and Pests	Regular inspections indicate a decline weed diversity, density and abundance and a decline in signs of feral animal activity	YES	There were no weed species identified within the rehabilitation area. There are no signs of feral animal activity.
	There is no significant weed infestation such that weeds do not comprise a significant proportion of the species in the stratum	YES	There is no significant weed infestation within the rehabilitation area. Significant weed infestations are located within the NVC outside of the rehabilitation area. These areas are being actively addressed by weed management contractors.
	There is no evidence of significant damage resulting from feral animal activity	YES	There is no evidence of significant damage caused from feral animal activity within the rehabilitation area.

4 DISCUSSION AND RECOMMENDATIONS

This is the fifth Annual Biodiversity and Rehabilitation Management Report produced for Dixon Sand Modification 4. Rehabilitation work is in the early stages and will increase with both intensity and measurable criteria in the years that follow.

This report provides information which will allow for measurable and quantifiable data to be compared over time as the rehabilitation and monitoring continues.

The continuation of above average rainfall over this reporting period has provided ideal growing conditions for the rehabilitation areas of the NVC. Flora within all stratums have increased in size, maturity and density during the past twelve month period. New juvenile recruits are evident from shrub and ground cover species while an increase in species diversity was also recorded. Canopy species are growing well and are expected to reach reproductive maturity within the next reporting period.

The remaining vegetation areas within the ONR site have recovered well from the drought conditions of 2017-2019. The continuation of above average rainfall has provided ideal growing conditions for ground cover species, particularly forbs, grasses and ferns. The native vegetation areas with no weedy growth have demonstrated their resilience with no new weed growth or establishment evident following the return to regular rainfall events.

Vegetation within the HRBOA has once again had very little vegetation changes observed throughout the site demonstrating the hardiness of native vegetation stands with minimal historic disturbances. Shrub and forb species density and diversity has improved with the ideal growing conditions present over the past two year period.

Threatened species located within the NVC have persisted despite the drought conditions of 2017-2019. The *Kunzea rupestris* was adversely impacted by the drought, particularly from radiant heat reflection from the surrounding sandstone. Although the species is well suited to enduring dry seasons and limited water resources some losses did occur to individuals within the population. New juvenile recruitment is evident thanks to the continuation of regular rainfall. All other threatened species previously recorded onsite were located and appear healthy.

Weed species, particularly *Lantana camara*, within the NVC and 250m school buffer area of the Old Northern Road site should remain a priority management species for removal and control over the next twelve month period. Management of the species has commenced by the bush regeneration contractors however the continued above average rainfall has provided the species with ideal growing conditions. Without management this species is likely to spread over a larger area, in turn supporting habitat for exotic fauna species such as the European Rabbit and the European Red Fox. Suitable techniques for removal have been provided in appendix F.

Rehabilitation efforts have continued in earnest with native plant relocation, propagation and planting taking place throughout the reporting period. Continued supplementary planting within the rehabilitation area and locations within the NVC and 250m school buffer where Lantana is removed will continue over the next reporting period.

A silt pond is currently being rested immediately to the east of the rehabilitation areas. This silt pond will form the next new rehabilitation area which is expected to commence with rehabilitation over the next twelve month period. During the next twelve months native rehabilitation work will continue

along the western embankment at the front entrance to the quarry site, further clone *Melaleuca deanei* will be planted within the existing rehabilitation site and weed treatment and control will continue throughout the site.

5 LIMITATIONS AND ASSUMPTIONS

This study was limited by the timing and frequency of the survey. There may be flora and/or fauna species present at the site that were not recorded due to their seasonal, territorial or cryptic nature.

It can never be proven that threatened species have not, do not or will not use the site as habitat. The conclusions drawn in this report are a result of testing, observation and experience.

This report describes the habitat and vegetation of the site at the time of the field survey. Vegetation and habitat will change over time and therefore the findings of this report are only relevant for the current proposal and for the duration of the application.

6 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR AND FIELD ECOLOGIST

The Author and Field Ecologist, Melissa Mass, has formal qualifications including a Bachelor of Applied Science (B. App. Sc.), majoring in Ecology, and a Certificate 3 in Horticulture. Her current Scientific Licence number issued from the NSW OEH is SL101441 with expiry date 31st Oct 2023. Furthermore an Animal Research Authority issued by the NSW Animal Care and Ethics Committee is current to undertake general survey work in THSC local government area with expiry 23rd Mar 2023. Melissa is an accredited Biodiversity Assessor conforming to the requirements as imposed by OEH with Accreditation number being BAAS18053.

Melissa has been working as an Ecologist for 14 years. Her work has included targeted threatened species assessment and management, reviews of environmental factors, bush regeneration, environmental impact assessments, and environmental survey and monitoring.

Melissa has a strong focus on threatened species ecology and has actively contributed to the Long-nosed Potoroo National Recovery Plan.

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8 APPENDIX

APPENDIX A – FLORA SPECIES IDENTIFIED WITHIN THE ONR STUDY AREA

Status	Botanical Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4
	Acacia brownii	Heath Wattle				1
	Acacia linifolia	White Wattle		3	1	1
	Acacia myrtifolia	Red-stemmed Wattle		1		
	Acacia parramattensis	Parramatta Wattle	1	1	1	
	Acacia suaveolens	Sweet Wattle	1	1		
	Acacia ulicifolia	Prickly Moses	1			2
	Actinotus minor	Lesser Flannel Flower		1		1
HTW	*Ageratina adenophora*	Crofton Weed			3	
	Allocasuarina littoralis	Black She-oak	3	1	1	2
	Allocasuarina torulosa	Forest She-oak	1			
HTW	*Andropogon virginicus*	Whiskey Grass			3	
	Angophora bakeri	Narrow-leaved Apple		1		1
	Angophora costata	Smooth Barked Apple	1			1
WoNS HTW	*Asparagus asparagoides*	Bridal Creeper			1	
	Austrostipa pubescens	Spear Grass		1		1
	Banksia spinulosa	Hairpin Banksia	1			2
HTW	*Bidens pilosa*	Cobblers Pegs			1	
	Billardiera scandens	Hairy Apple Berry	1	1		1
	Bossiaea heterophylla	Variable Bossiaea	1			1
	Bossiaea obcordata	Spiny Bossiaea		2		2
	Breynia oblongifolia	Coffee Bush	1		1	
	Cassytha glabella	Slender Devils Twine	1	1		1
W	*Centaurium erythraea*	Common Centaury			1	
	Ceratopetalum gummiferum	NSW Christmas Bush	2			2
	Cheilanthes sieberi	Mulga Fern	1			1
W	*Cirsium vulgare*	Spear Thistle			1	
W	*Conyza bonariensis*	Flax-leaf Fleabane			1	
	Corymbia eximia	Yellow Bloodwood		1		
	Corymbia gummifera	Red Bloodwood		2		3
	Cyathochaeta diandra	Sheath Rush		1		1
W	*Cynodon dactylon*	Couch Grass			5	
	Dianella caerulea	Blue Flax Lily	1	1		1
	Dianella prunina	Native Flax Lily				1
	Dillwynia retorta	Heathy Parrot Pea		1		1
	Drosera peltata	Sundew				1
	Einadia hastata	Berry Saltbush	1		1	
	Entolasia marginata	Bordered Panic	2			
	Entolasia stricta	Wiry Panic	1	2		3
	Epacris pulchella	Wallum Heath	1	1		1
	Eragrostis brownii	Brown's Lovegrass	1	1		
HTW	*Erogrostis curvula*	African Lovegrass			1	

	Eucalyptus haemastoma	Scribbly Gum		1		
	Eucalyptus pilularis	Blackbutt				1
	Eucalyptus piperita	Sydney Peppermint	3			
	Eucalyptus punctata	Grey Gum	1	1		
	Exocarpos cupressiformis	Cherry Ballart				1
	Gnaphalium coarctatum	Cudweed			3	
	Gonocarpus teucrioides	Raspwort	1	1		1
	Goodenia bellidifolia	Daisy-leaved Goodenia	1			
	Grevillea buxifolia	Grey Spider Flower		2		1
	Grevillea mucronulata	Green Spider Flower	1			1
	Hakea sericea	Needlebush		2		2
	Hardenbergia violacea	False Sarsaparilla		1		1
	Hovea linearis	Common Hovea	1	1		1
	Imperata cylindrica	Blady Grass	1	1		
	Isopogon anemonifolius	Broad-leaved Drumsticks	1	1		1
	Jacksonia scoparia	Dogwood		2		1
	Juncus usitatus	Common Rush	1		1	
	Kunzea ambigua	Tickbush	3			
	Lambertia formosa	Mountain Devil	1	1		1
WoNS HTW	*Lantana camara*	Lantana			2	
	Leptospermum polygalifolium	Tantoon	1			
	Leucopogon parviflorus	Coastal Beard-heath		1		2
	Lindsaea microphylla	Lacy Wedge Fern				1
	Lomandra brevis	Tufted Mat-rush		1		1
	Lomandra filiformis	Wattle Mat-rush	1			1
	Lomandra gracilis	Lomandra gracilis				1
	Lomandra longifolia	Spiny-headed Mat-rush	1	1	1	1
	Lomandra multiflora	Many Flowered Mat-rush	1	1		1
	Lomandra obliqua	Fish Bones	1	1		1
	Lomatia silaifolia	Crinkle Bush		1		
	Microlaena stipoides	Weeping Grass	1	1	1	1
W	*Nephrolepis cordifolia*	Fishbone Fern			1	
	Ozothamnus diosmifolius	Rice Flower	1	1	2	
W	Paspalum	Paspalum			1	
	Persoonia levis	Broad Leaved Geebung		1		
	Persoonia linearis	Narrow Leaved Geebung		1		2
	Persoonia pinifolia	Pine-leaved Geebung	1	1		1
	Petrophile pulchella	Conesticks		1		
	Phyllanthus hirtellus	Thyme Spurge	1	1		1
W	*Phytolacca octandra*	Inkweed			1	
V	*Pimelea curviflora var. Curviflora*	Pimelea curviflora var. curviflora		1		
	Pimelea linifolia	Slender Rice Flower		2		1
W	*Plantago lanceolata*	Plantain			1	
	Platysace linearifolia	Carrot Tops	1	1		1

	Pomax umbellata	Pomax	1	1		1
	Pratia purpurascens	Whiteroot	1	1		1
	Pteridium esculentum	Bracken Fern				2
	Rytidosperma racemosum	Wallaby Grass		1		
	Scaevola ramosissima	Purple Fan-flower	1	1		1
WoNS HTW	*Senecio madagascariensis*	Fireweed			1	
	Smilax glyciphylla	Sweet Sarsaparilla	1			1
W	*Solanum mauritianum*	Wild Tobacco			1	
W	*Solanum nigrum*	Black Nightshade			1	
	Sporobolus elongatus	Slender Rats Tailed Grass			1	
	Stylidum lineare	Slender Trigger Grass	1			1
V	*Tetratheca glandulosa*	Glandular Pink Bells		1		
	Themeda australis	Kangaroo Grass	2	2		2
	Trema tomentosa var. aspera	Native Peach		1	1	
W	*Trifolium dubium*	Yellow Suckling Clover			2	
W	*Verbena bonariensis*	PurpleTop			1	
W	*Vicia sativa*	Common Vetch			2	
	Xanthorrhoea resinosa	Grass Tree		1		1
	Xanthosia pilosa	Woolly Xanthosia	2			1
	Xanthosia tridentata	Rock Xanthosia	2			
	Xylomelum pyriforme	Woody Pear				2

V – Vulnerable Species , **W** – Weed , **WoNS** – Weed of National Significance , **HTW** – High Threat Weed

Key
Braun-Blanquet scale.
1 <5% cover & 3 or less individuals
2 <5% cover & more than 3 individuals sparsely scattered
3 <5% cover common and consistent
4a <5% cover & very abundant many individuals
4b 5 – 25% cover
5 25 – 50% cover
6 50 – 75% cover
7 75% - 100% cover

APPENDIX B – FLORA SPECIES IDENTIFIED WITHIN ONR REHABILITATION AREA

Status	Botanical Name	Common Name	Rehab 1	Translocate	Soil seedbank
	Acacia linifolia	White Wattle	Seed bank	*	*
	Acacia myrtifolia	Red-stemmed Wattle	Seed bank	*	*
	Acacia parramattensis	Parramatta Wattle	Seed bank	*	*
	Acacia suaveolens	Sweet Wattle	Planted	*	*
	Acacia ulicifolia	Prickly Moses	Planted	*	*
	Actinotus minor	Lesser Flannel Flower	Seed bank	*	*
	Allocasuarina littoralis	Black She-oak	Planted	*	*
HTW	*Andropogon virginicus*	Whiskey Grass		*	
	Angophora bakeri	Narrow-leaf Apple	Seed bank	*	
	Angophora costata	Smooth Barked Apple	Planted		
	Angophora hispida	Dwarf Apple	Planted	*	*
	Anisopogon avenaceus	Oat Spear Grass	Seed bank	*	*
	Aristida vagans	Threeawn Speargrass	Planted	*	*
	Aristida warburgii	Fine-leafed Wire Grass		*	
	Asplenium trichomanes	Common Spleenwort		*	*
	Austrostipa pubescens	Spear Grass	Seed bank	*	*
	Banksia ericifolia	Heath-leaved Banksia	Planted	*	*
	Banksia serrata	Old Man Banksia	Planted	*	*
	Banksia spinulosa	Hairpin Banksia	Planted	*	
	Billardiera scandens	Hairy Apple Berry	Seed bank	*	*
	Boronia floribunda	Pale Pink Boronia	Seed bank	*	*
	Boronia ledifolia	Sydney Boronia	Seed bank	*	*
	Bossiaea heterophylla	Variable Bossiaea	Seed bank	*	*
	Bossiaea obcordata	Spiny Bossiaea	Planted	*	
	Calytrix tetragona	Common Fringe Myrtle	Planted	*	
	Cassytha glabella	Slender Devils Twine	Seed bank	*	*
	Caustis pentandra	Curly Wig	Seed bank	*	
	Cheilanthes seiberi	Mulga Fern	Seed bank	*	*
	Corymbia eximia	Yellow Bloodwood	Planted		
EnP	*Darwinia fascicularis subsp. oligantha*		Planted	Planted	Planted
	Dianella caerulea	Blue-flax Lily	Seed bank	*	
	Dianella prunina	Native Flax Lily	Planted	*	
	Dichelachne inaequiglumis	Short-hair Plume Grass		*	
	Dillwynia floribunda	Showy Parrot Pea	Seed bank		
	Dillwynia retorta	Parrot Pea	Seed bank	*	*
	Echinopogon caespitosus	Bushy Hedgehog Grass	Planted		
	Entolasia marginata	Bordered Panic	Planted		
	Entolasia stricta	Wiry Panic	Seed bank	*	*
	Epacris microphylla	Coral Heath		*	
	Epacris pulchella	Wallum Heath	Seed bank	*	*
	Eragrostis brownii	Brown's Lovegrass	Seed bank	*	*
	Eucalyptus haemastoma	Scribbly Gum	Planted	*	
	Eucalyptus punctata	Grey Gum	Seed bank		
	Eucalyptus tereticornis	Forest Redgum	Planted		
	Gahnia sieberiana	Red-fruit Saw-sedge		*	

	Gompholobium grandiflorum	Large Wedge Pea	Seed bank	*	*
	Gonocarpus teucrioides	Raspwort	Planted	*	*
	Goodenia hederacea	Forest Goodenia	Planted	*	*
	Grevillea buxifolia	Grey Spider Flower	Planted	*	*
	Grevillea mocronulata	Green Spider Flower			*
	Grevillea sericea	Pink Spider Flower	Planted		
	Grevillea speciosa	Red Spider Flower	Planted	*	*
	Hakea sericea	Needlebush	Planted	*	*
	Hardenbergia violacea	False Sarsparilla	Seed bank	*	*
	Hibbertia aspera	Rough Guinea Flower	Planted		
	Hibbertia diffusa	Wedge Guinea Flower	Planted		*
	Hovea linearis	Common Hovea	Seed bank	*	
	Imperata cylindrica	Blady Grass	Seedbank	*	*
	Isopogon anemonifolius	Broad-leaved Drumsticks	Planted	*	*
	Juncus usitatus	Common Rush		*	
	Kunzea ambigua	Tick Bush			*
	Kunzea capitata	Pink Kunzea	Planted		
	Laxmannia gracilis	Slender Wire Lily	Seed bank	*	*
	Lepidosperma neesii	Stiff Rapier-sedge	Seed bank	*	
	Leptospermum trinervium	Flaky-barked Tea-tree	Planted	*	*
	Leucopogon juniperinus	Prickly-beard Heath	Planted		
	Leucopogon microphyllus	Small-leaved White Beard		*	*
	Lomandra brevis	Tufted Mat-rush	Seed bank	*	
	Lomandra glauca	Pale Mat-rush	Seed bank	*	*
	Lomandra longifolia	Spiny-headed Mat-rush	Planted	*	*
	Lomandra multiflora	Many Flowered Mat-rush	Seed bank	*	*
	Lomandra obliqua	Fishbones	Seed bank	*	*
	Lomatia silaifolia	Crinkle Bush	Seed bank		
V	*Melaleuca deanei*	Deane's Paperbark	Planted	Planted	Planted
	Microlaena stipoides	Weeping Grass	Seed bank	*	
	Micromyrtus ciliata	Fringed Heath Myrtle		*	
	Mirbelia rubiifolia	Heath Mirbelia	Seed bank	*	*
	Mirbelia speciosa	Mirbelia	Seed bank		
	Patersonia sericea	Purple Flag Flower	Seed bank	*	*
	Persoonia pinifolia	Pine-leaved Geebung	Seed bank	*	*
	Petrophile pulchella	Conesticks		*	
	Petrophile sessilis	Prickly Conesticks	Planted		
	Phyllanthus hirtellus	Thyme Spurge	Planted	*	*
	Phyllota phylicoides	Heath Phyllota			
V	*Pimelea curviflora var. curviflora*		Seedbank	*	
	Pimelea linifolia	Slender Rice Flower	Seed bank	*	*
	Platysace linearifolia	Carrot Tops	Seed bank	*	*
	Pratia purpurascens	White Root	Seed bank	*	*
	Pteridium esculentum	Bracken Fern	Seed bank	*	
	Rytidosperma racemosum	Wallaby Grass	Seed bank	*	*

	Scaevola ramosissima	Purple Fan Flower	Seed bank	*	
	Schoenus ericetorum	Heath Bog Rush	Seed bank	*	*
	Stylidium graminifolium	Grass Trigger Plant	Seed bank	*	
V	*Tetratheca glandulosa*	Glandular Pink Bells	Seedbank	Translocated	
	Themeda australis	Kangaroo Grass	Seedbank	*	*
	Trema tomentose	Native Peach	Seed bank	*	*
	Veronica plebeia	Trailing Speedwell	Seed bank		
	Zieria laevigata	Smooth Zieria	Seed bank		

En – Endangered species
EnP – Endangered Population
V – Vulnerable species
HTW – High Threat Weed

APPENDIX C – FLORA SPECIES IDENTIFIED AT HRBOA

Status	Botanical Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
	Acacia hispidula	Little Harsh Acacia	1	1	1		
	Acacia linearifolia	Narrow-leaved Wattle				1	
	Acacia linifolia	White Wattle	1		1	2	
	Acacia suaveolens	Sweet Wattle	1	1	1	1	
	Acacia ulicifolia	Prickly Moses	2	1	1	1	1
	Actinotus helianthi	Flannel Flower	1		1		2
	Actinotus minor	Lesser Flannel Flower	1	3	1	1	3
	Allocasuarina distyla	Scrub She-oak		1			
	Allocasuarina littoralis	Black She-oak	2		1	1	2
	Angophora costata	Smooth Barked Apple	2			1	
	Angophora hispida	Dwarf Apple		2			1
	Aristida vagans	Threeawn Speargrass		1		1	1
	Aristida warburgii	Fine-leafed Wire Grass	1	1	1	1	
	Asplenium trichomanes	Common Spleenwort				1	
	Austrostipa pubescens	Spear Grass	1	2	1	1	2
	Banksia ericifolia	Heath-leaved Banksia	1	2	2	1	1
	Banksia oblongifolia	Fern-leaved Banksia		1			
	Banksia serrata	Old Man Banksia	2		2		2
	Banksia spinulosa	Hairpin Banksia		1		2	
	Billardiera scandens	Hairy Apple Berry	1	1	1	1	1
	Boronia floribunda	Pale Pink Boronia	2		1	1	1
	Boronia ledifolia	Sydney Boronia		2	1		2
	Bossiaea hetrophylla	Variable Bossiaea	1	2	1	1	2
	Bossiaea lenticularis	Bossiaea			3	2	
	Bossiaea scolopendra	Sword Bossiaea	1		1	1	
	Breynia oblongifolia	Coffee Bush	1				
	Callicoma serratifolia	Black Wattle				3	
	Calochlaena dubia	Soft Braken Fern			1	1	
	Calytrix tetragona	Common Fringe Myrtle		3			2
	Carex inversa	Knob Sedge					1
	Cassytha glabella	Slender Devils Twine	1	2	1	1	1
	Caustis flexuosa	Curly Wig	2		2	1	1
	Caustis pentandra	Thick Twist Rush		1			
	Ceratopetalum gummiferum	NSW Christmas Bush	1		2	2	
	Cheilanthes seiberi	Mulga Fern	1	2	1	1	1
	Corymbia eximia	Yellow Bloodwood					1
	Corymbia gummifera	Red Bloodwood	1		2	2	1
	Cyathochaeta diandra	Sheath Rush	1		1	1	1
	Cymbidium sp	Orchid				1	
V	*Darwinia biflora*			1			
	Dianella caerulea var. producta	Blue Flax Lily	1	1	1	1	1
	Dianella prunina	Native Flax Lily					1
	Dillwynia floribunda	Showy Parrot Pea		2			1
	Dillwynia retorta	Parrot Pea	1		1	1	1
	Dodonaea viscosa	Sticky Hop Bush			1		
	Dracophyllum secundum	Dracophyllum			1	1	

	Drosera auriculata	Sundew	1	1	1	1	1
	Elaeocarpus reticulatus	Blueberry Ash				1	
	Entolasia stricta	Wiry Panic	2	3	2	2	1
	Epacris microphylla	Coral Heath		2			
	Epacris pulchella	Wallum Heath	2	2	2	1	1
	Eragrostis brownii	Brown's Lovegrass	1	1	1		1
	Eucalyptus haemastoma	Scribbly Gum		1			1
	Eucalyptus pilularis	Blackbutt	1		1		
	Eucalyptus piperita	Sydney Peppermint			1		
	Eucalyptus punctata	Grey Gum			1		1
	Eucalyptus resinifera	Red Mahogony				1	
	Gahnia sieberiana	Red-fruit Saw-sedge				2	
	Glochidion ferdinandi	Cheese Tree				1	
	Gompholobium glabratum	Dainty Wedge Pea	1	1	1		1
	Gonocarpus teucrioides	Raspwort	1		1	1	1
	Grevillea buxifolia	Grey Spider Flower	1	1			1
	Grevillea mucronulata	Green Spider Flower	1			1	
	Grevillea speciosa	Red Spider-flower	2	1	1		1
	Hakea dactyloides	Broad-leaved Hakea	1	1	1	1	1
	Hakea propinqua	Large Fruit Hakea		1			
	Hakea sericea	Needlebush		1	1	2	
	Hibbertia aspera	Rough Guinea Flower			1		
	Hibbertia diffusa	Wedge Guinea Flower					1
	Hovea linearis	Common Hovea	1		1	1	1
	Imperata cylindrica	Blady Grass			1		1
	Isopogon anemonifolius	Broad-leaved Drumsticks	1			1	1
	Lambertia formosa	Mountain Devil	3	1	1	1	2
	Lepidosperma laterale	Variable Swordsedge		3		1	
	Leptospermum polygalifolium	Tantoon			1		
	Leptospermum trinervium	Flaky-barked Tea-tree	3	3	2	2	1
	Leucopogon juniperinus	Prickly-beard Heath					1
	Leucopogon microphyllus	Small Leaved White Beard		1			
	Leucopogon parviflorus	Coastal Beard-heath			1	1	
	Lindsaea microphylla	Lacy Wedge Fern	1	2	1	1	
	Lomandra brevis	Tufted Mat-rush	2	1	1	1	1
	Lomandra filiformis	Wattle Mat-rush			1	1	
	Lomandra glauca	Pale Mat-rush	1			1	1
	Lomandra gracilis	Small Lomandra		1			1
	Lomandra longifolia	Spiny-headed Mat-rush				1	1
	Lomandra multiflora	Many Flowered Mat-rush	1	2	1	2	2
	Lomandra obliqua	Fish Bones	1	2	1	1	1
	Lomatia silaifolia	Crinkle Bush	1	1	1	1	1
	Micrantheum ericoides			2			1
	Micromyrtus ciliata	Fringed Heath-myrtle		2			

	Mirbelia rubiifolia	Heath Mirbelia		2			2
	Patersonia sericea	Purple Flag Flower		1			
	Persoonia lanceolate	Lance Leaf Geebung	1	1			1
	Persoonia levis	Broad Leaved Geebung	1		2	1	1
	Persoonia pinifolia	Pine-leaved Geebung	2	2	3	1	2
	Petrophile pulchella	Conesticks	1	2			2
	Phyllanthus hirtellus	Thyme Spurge	1	2	1	1	1
	Phyllota phylicoides	Heath Phyllota		1			1
	Pimelea linifolia	Slender Rice Flower	1		1		1
	Platysace linearifolia	Carrot Tops	2	1	1	1	2
	Pomax umbellata	Pomax				1	1
	Pratia purpurascens	Whiteroot	1	1	1	1	1
	Pteridium esculentum	Bracken Fern	2	1	2	2	1
	Rytidosperma racemosum	Wallaby Grass		1	1	1	1
	Scaevola ramosissima	Purple Fan-flower	1			1	1
	Schoenus melanostachys	Black Bog Rush					1
	Smilax glyciphylla	Sweet Sarsaparilla	1		1		
	Stylidium graminifolium	Grass Trigger Plant			1	2	
	Telopea speciosissima	NSW Waratah				2	
	Tetratheca thymifolia	Black Eyed Susan				1	
	Themeda australis	Kangaroo Grass	1		1	1	1
	Woollsia pungens	Snow Heath					3
	Xanthorrhoea resinosa	Grass Tree		1	1	1	1
	Xanthosia pilosa	Woolly Xanthosia				1	1
	Xanthosia tridentata	Rock Xanthosia		2			1
	Xylomelum pyriforme	Woody Pear				1	

V – Vulnerable species

Key
Braun-Blanquet scale.

1 <5% cover & 3 or less individuals
2 <5% cover & more than 3 individuals sparsely scattered
3 <5% cover common and consistent
4a <5% cover & very abundant many individuals
4b 5 – 25% cover
5 25 – 50% cover
6 50 – 75% cover
7 75% - 100% cover

APPENDIX D – FAUNA SPECIES IDENTIFIED WITHIN ONR SURVEY AREA

	Scientific Name	Common name	Method of observation
BIRDS			
	Acanthorhynchus tenuirostis	Eastern Spinebill	On site observation
	Anthochaera chrysoptera	Little Wattlebird	On site observation
	Aquila audax	Wedge-tailed Eagle	Flying above
V	*Calyptorhynchus lathami*	Glossy Black Cockatoo	On site observation
	Colluricincla harmonica	Grey Shrike-thrush	On site observation
	Cracticus tibicen	Australian Magpie	On site observation
	Cracticus torquatus	Grey Butcherbird	On site observation
	Dacelo novaeguineae	Laughing Kookaburra	On site observation
	Eopsaltria australis	Eastern Yellow Robin	On site observation
	Falco cenchroides	Nankeen Kestral	Flying above
	Haliaeetus leucogaster	White-breasted Sea Eagle	Flying above
	Lichenostomus leucotis	White-eared Honeyeater	On site observation
	Malurus cyaneus	Superb Fairy Wren	On site observation
	Manorina melanocephala	Noisy Minor	On site observation
	Meliphaga lewinii	Lewin's Honeyeater	On site observation
	Neochmia temporalis	Red-browed Finch	On site observation
	Phylidonyris novaehollandiae	New Holland Honeyeater	On Site observation
	Platycerus elegans	Crimson Rosella	On site observation
	Rhipidura albiscapa	Grey Fantail	On site observation
	Rhipidura leucophrys	Willie Wagtail	On site observation
	Sericornis frontalis	White-browed scrubwren	On site observation
	Strepera graculina	Pied Currawong	On site observation
MAMMALS			
	Austronomus australis	White-striped Free-tailed Bat	AnaBat Express
P	*Canis lupus familiaris*	Dog	Scat and prints
	Chalinolobus gouldii	Gould's Wattled Bat	AnaBat Express
	Chalinolobus morio	Chocolate Wattled Bat	AnaBat Express
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	AnaBat Express
V	*Miniopterus australis*	Little Bent-winged Bat	AnaBat Express
V	*Mormopterus norfolkensis*	Eastern Free-tailed Bat	AnaBat Express
	Perameles nasuta	Long-nosed Bandicoot	Digs
P	*Oryctolagus cuniculus*	European Rabbit	Scat/digs
	Ozimops ridei	Ride's Free-tailed Bat	AnaBat Express
	Rhinolophus megaphyllus	Eastern Horseshoe Bat	AnaBat Express
	Trichosurus vulpecula	Brush-tailed Possum	Scat
	Vespadelus pumilus	Eastern Forest Bat	AnaBat Express
P	*Vulpes vulpes*	European Red Fox	Scat and prints
	Wallabia bicolor	Swamp Wallaby	On site observation/scat/ Sand pad
AMPHIBIANS			

	Crinia signifera	Common Eastern Froglet	Heard at farm dam
	Limnodynastes peronii	Striped Marsh Frog	On site observation
	Litoria peronei	Peron's Tree Frog	Heard in distance
REPTILES			
	Lampropholis guichenoti	Common Garden Skink	On site observation
	Tiliqua scincoides	Eastern Blue Tongue Lizard	On site observation

V – Vulnerable species
P – Pest species

APPENDIX E – FAUNA SPECIES IDENTIFIED WITHIN HRBOA SURVEY AREA

	Scientific Name	Common name	Method of observation
BIRDS			
	Acanthorhynchus tenuirostris	Eastern Spinebill	On site observation
	Alisterus scapularis	King Parrot	On site observation
	Anthochaera chrysoptera	Little Wattlebird	On site observation
V	*Calyptorhynchus lathami*	Glossy Black Cockatoo	On site observation
V	*Climacteris picumnus*	Brown Treecreeper	On site observation
	Colluricincla harmonica	Grey Shrike-thrush	On site observation
	Cracticus tibicen	Australian Magpie	On site observation
	Cracticus torquatus	Grey Butcherbird	On site observation
	Dacelo novaeguineae	Laughing Kookaburra	On site observation
	Eopsaltria australis	Eastern Yellow Robin	On site observation
	Falco cenchroides	Nankeen Kestrel	On site observation
	Lichenostomus chrysops	Yellow-faced Honeyeater	On site observation
	Lichenostomus leucotis	White-eared Honeyeater	On site observation
	Leucosarcia melanoleuca	Wonga Pigeon	On site observation
	Macropygia Phasianella	Brown Cuckoo-Dove	On site observation
	Malurus cyaneus	Superb Fairy Wren	On site observation
	Meliphaga lewinii	Lewin's Honeyeater	On site observation
	Neochmia temporalis	Red-browed Finch	On site observation
	Pardalotus punctatus	Spotted Pardalote	On site observation
	Phylidonyris novaehollandiae	New Holland Honeyeater	On site observation
	Platycercus elegans	Crimson Rosella	On site observation
	Platycercus eximius	Eastern Rosella	On site observation
	Ptilonorhynchus violaceus	Satin Bowerbird	On site observation
	Rhipidura albiscapa	Grey Fantail	On site observation
	Rhipidura leucophrys	Willie Wagtail	On site observation
	Rhipidura rufifrons	Rufus Fantail	On site observation
	Sericornis frontalis	White-browed Scrubwren	On site observation
	Strepera graculina	Pied Currawong	On site observation
MAMMALS			
	Austronomus australis	White-striped Free-tailed Bat	AnaBat Express
P	*Canis lupus familiaris*	Dog	Print
V	*Chalinolobus dwyeri*	Large-eared Pied Bat	AnaBat Express
	Chalinolobus gouldii	Gould's Wattled Bat	AnaBat Express
	Chalinolobus morio	Chocolate Wattled Bat	AnaBat Express
	Macropus giganteus	Eastern Grey Kangaroo	Print
V	*Miniopterus australis*	Little Bent-winged Bat	AnaBat Express
V	*Mormopterus norfolkensis*	Eastern Free-tailed Bat	AnaBat Express
	Perameles nasuta	Long-nosed Bandicoot	Digs/scats
	Rhinolophus megaphyllus	Eastern Horseshoe Bat	AnaBat Express
	Trichosurus vulpecula	Brush-tailed Possum	Scat
P	*Vulpes vulpes*	European Red Fox	Scat
	Wallabia bicolor	Swamp Wallaby	Scat/prints/Infrared camera
AMPHIBIANS			

	Crinia signifera	Common Eastern Froglet	Heard in distance
	Litoria peronei	Peron's Tree Frog	Heard in distance
REPTILES			
	Lampropholis guichenoti	Common Garden Skink	On site observation

V – Vulnerable species
P – Pest species

APPENDIX F – MELALUECA DEANEI IN REHABILITATION AREA

ID number	Easting	Northing	Condition	Height	Width
Planted Rehabilitation					
1	312588	6296396	Healthy	1.2m	0.8m
2	312592	6296403	Healthy	1.2m	0.7m
3	312589	6296408	Healthy	0.8m	0.3m
4	312580	6296412	Healthy	1m	0.4m
5	312563	6296403	Healthy	1m	0.4m
6	312560	6296413	Healthy	1m	0.5m
7	312556	6296404	Healthy	0.8m	0.3m
8	312584	6296410	Healthy	1m	0.5m
9	312558	6296418	Healthy	1.5m	0.7m
10	312502	6296414	Healthy	0.9m	0.4m
11	312556	6296422	Healthy	1.2m	0.5m
12	312567	6296416	Healthy	1.2m	0.4m
13	312574	6296396	Healthy	1.4m	0.5m
14	312221	6296241	Healthy	1m	0.3m
Translocated Rehabilitation					
1b	312539	6296391	Planted 2017 Healthy	1m	0.4m
2b	312587	6296378	Planted May 2021	<30cm	<20cm
3b	312582	6296376	Planted May 2021	<30cm	<20cm
4b	312581	6296382	Planted May 2021	<30cm	<20cm
5b	312576	6296379	Planted May 2021	<30cm	<20cm
6b	312575	6296376	Planted May 2021	<30cm	<20cm
7b	312573	6296377	Planted May 2021	<30cm	<20cm
8b	312571	6296385	Planted May 2021	<30cm	<20cm
9b	312564	6296387	Planted May 2021	<30cm	<20cm
10b	312564	6296385	Planted 2017 Healthy	1.2m	0.5m
11b	312562	6296380	Planted May 2021	<30cm	<20cm
12b	312565	6296378	Planted May 2021	<30cm	<20cm
13b	312561	6296383	Planted May 2021	<30cm	<20cm
14b	312549	6296390	Planted May 2021	<30cm	<20cm
15b	312555	6296381	Planted May 2021	<30cm	<20cm
16b	312549	6296385	Planted May 2021	<30cm	<20cm

17b	312545	6296379	Planted May 2021	<30cm	<20cm
18b	312535	6296387	Planted May 2021	<30cm	<20cm
19b	312541	6296392	Planted May 2021	<30cm	<20cm
20b	312547	6296393	Planted May 2021	<30cm	<20cm
21b	312525	6296400	Planted May 2021	<30cm	<20cm
22b	312531	6296408	Planted May 2021	<30cm	<20cm
23b	312537	6296405	Planted May 2021	<30cm	<20cm
24b	312540	6296406	Planted May 2021	<30cm	<20cm
25b	312543	6296406	Planted May 2021	<30cm	<20cm
26b	312586	6296367	Planted Oct 2021	<30cm	<20cm
27b	312580	6296386	Planted Oct 2021	<30cm	<20cm
28b	312527	6296405	Planted Oct 2021	<30cm	<20cm
29b	312529	6296414	Planted Oct 2021	<30cm	<20cm
30b	312536	6296422	Planted Oct 2021	<30cm	<20cm
31b	312553	6296421	Planted Oct 2021	<30cm	<20cm
32b	312562	6296418	Planted Oct 2021	<30cm	<20cm
33b	312574	6296415	Planted Oct 2021	<30cm	<20cm
34b	312574	6296438	Planted Oct 2021	<30cm	<20cm
35b	312567	6296406	Planted Oct 2021	<30cm	<20cm
Seedbank Rehabilitation					
17	312510	6296389	Healthy	2m	0.9m

South East Environmental

APPENDIX G – LANTANA CAMARA MANAGEMENT GUIDE

How to control lantana

Quick reference guide

Lantana – *Lantana camara*

Minimise spread and future impacts

Although lantana is widespread on the east coast of Australia, it is still absent from parts of its potential range. These areas should be protected by:

- preventing the importation of further varieties and species of lantana
- stopping more planting of lantana in gardens
- strategically controlling infestations which threaten uninfested areas.

A control program for dense infestations in pastures

The Queensland Department of Natural Resources and Mines has produced a pest series fact sheet on lantana (PP#34). They advise that herbicides are too expensive to treat large lantana infestations.

A combination of fire and mechanical control makes spot treatment of small patches with herbicides more cost-effective. The following suggested control program for dense infestations in pastures is based on the fact sheet:

1. Exclude stock to allow a fuel load to build up.
2. Bulldoze, stickrake or plough the infestation to add to the fuel load.
3. Burn the infestation after obtaining a permit. Summer burns are more effective than winter burns.
4. Sow an improved pasture. Seek advice of local council or state/territory government agencies for selection of non-weedy pasture species.
5. Continue stock exclusion until pasture has established and set seed.
6. Burn the infestation again after obtaining a permit.
7. Spot spray or grub out any regrowth or seedlings. Spraying is most effective between summer and autumn.
8. Follow-up burning, spraying and/or grubbing will be required for several years.

Lantana can escape from garden plantings into surrounding bushland.
Photo: Tim Schultz

Control options

Type of infestation	Physical	Mechanical	Chemical	Fire	Biological
Small (few plants, small area)	Hand grubbing only suitable for seedlings. Wear gloves for protection from thorns.	Not suitable.	Spot spray plants less than 2 m in height between summer and autumn with a registered herbicide.	Not suitable.	There are four useful biological control agents. They are already distributed throughout their potential range.
Medium (medium density, medium total area)		Bulldoze, plough, stick-rake or slash infestations. Soil disturbance will lead to mass seed germination, so follow up with further controls. Do not use mechanical control in areas susceptible to erosion. A permit may be required.	Spraying is uneconomical for medium or large infestations. Helicopter spraying is used when there is no access for mechanical control, eg very steep slopes.	Under permit, burn in summer with good fuel load of grass and/or mechanically cleared lantana. Also use as follow-up. Do not burn in rainforests.	
Large (many plants, many ha)					

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CRC Weed management

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South East Environmental

End

Of

Report

South East Environmental

Appendix I – S94 Contribution

DIXON SAND

SECTION 94 CONTRIBUTION

SAND & SANDSTONE SALES
AUGUST 2021

2	778.42
3	945.72
4	1,239.27
5	1,174.97
6	1,351.94
7	372.04
9	1,335.24
10	1,347.58
11	1,174.05
12	1,036.89
13	1,336.79
14	315.05
16	1,718.53
17	1,682.44
18	2,056.07
19	1,813.86
20	1,853.48
21	460.90
23	1,463.37
24	808.94
25	602.54
26	1,646.47
27	1,700.38
28	562.66
30	1,893.06
31	1,660.11

32,330.77 Tonnes @ $1.09
$35,240.54

Dixon Sand Pty Ltd ABN 80 002 278 686
Quarry: 4610 Old Northern Road, Maroota, NSW 2756. Ph. (02) 4566 8348
Postal Address: P.O. Box 4019, Pitt Town NSW 2756
Website: www.dixonsand.com.au

Dixon Sand Pty Ltd

PO Box 4019
PITT TOWN NSW 2756

The Hills Shire Council
P.O. Box 7064
BAULKHAM HILLS BC 2153

REMITTANCE ADVICE

Date: 15/09/2021

Payment Number:	eft
Payment Amount:	$35,240.54

Payment; The Hills Shire Council

In Payment For:

SUPPLIER INV.	PURCHASE NO.	INVOICE DATE	INVOICE AMOUNT	DISCOUNTS	PREVIOUS PAYMENTS	CURRENT PAYMENT
August 2021	00030539	31/08/2021	$35,240.54	$0.00	$0.00	$35,240.54

Appendix J – Community Engagement and CCC Meeting Minutes

DIXON SAND

MINUTES OF THE BI-ANNUAL COMMUNITY CONSULTATIVE COMMITTEE 10 NOVEMBER 2021 GLENORIE RSL CLUB - GLENORIE

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Kristine McKenzie (KM) *via video-conference*	The Hills Shire Council Representative
	Daniel Giffney (DG) *via video-conference*	The Hills Shire Council Representative
	Pat Schwartz (PS)	Community Representative
	Farley Roberts (FR)	Community Representative
	Lisa Aylward (LAy)	Maroota Public School Representative *[left at 2.34pm]*
	Timothy Baker (TB)	Bush Regeneration Contractor (Bush-It)
	Hunny Churcher (HC) *via video-conference*	Environmental Officer, Dixon Sand
	Mark Dixon (MD)	Dixon Sand
	Melissa Mass (MM)	Dixon Sand - Ecologist
APOLOGIES	David Dixon (DD)	General Manager, Dixon Sand
	Jemma Roberts (JR)	Community Representative (alternate)

WELCOME & INTRODUCTION	LA opened the meeting at 12.59pm following a light luncheon. All members were welcomed and LA advised that HC, KM & DG were participating via video-conferencing.	
DECLARATIONS OF INTEREST	LA declared that she is approved by the Department of Planning and Environment to chair the meeting and engaged by Dixon Sand.	**No changes to previous declarations by members.**
BUSINESS ARISING FROM PREVIOUS MEETING (12/5/21)		

Item	Issue	Responsibility
1	Follow-up response from Robyn Preston MP regarding the school zone (LA wrote to Robyn Preston MP ON 17/5/21 and advised that the subject area is actually located in The Hills Shire Council LGA & asked that she make representations to that Council. LA followed this matter up last week and her staffer said that she had forwarded the request through to The Hills Shire Council, but hadn't received a response as	LA

		yet. The staffer committed to chasing this up. Heldover.	
	2	Extending the length of the 60km zone at Cattai had been raised at a previous CCC and did not seem to have been addressed. Following the last meeting, LA looked up the previous discussions and included them as a postscript in the May minutes*.	LA

*QUOTE: PS further commented that the Eastbend committee had raised the issue of speed around the Cattai School, specifically where the speed goes from 80km to 40km during school times (from O'Brians Rd to Millers Rd or Threlkeld Dr – both sides of the school). Discussions on whether the speed should go from 80km to 60km to 40km or whether more signage should be erected, warning drivers of the upcoming school zone (40km). DD mentioned that it may be difficult to alter a main arterial road from 80km to 60km, stating it would require a robust argument with supporting technical data. Notwithstanding this, Dixon Sand is committed to safety and driver conduct.

Further discussion about this matter. Other community groups recommended to make representations to the state member and Council.

CORRESPONDENCE (as emailed with Meeting Notice on 29/10/21 with 4 additional items)	• 17/5/21 – Email to Robyn Preston MP informing that school zone area is located in The Hills Shire Council LGA. • 18/5/21 - Draft minutes sent to members for review • 26/5/21 - Email to members with the finalised minutes. • 29/9/21 – Email from HC advising that Dixon Sand has submitted the Annual Review 2020 – 2021 for Old Northern Road and Haerses Road Quarries to the DPIE. • 11/10/21 – Email to members advising that the CCC is planned to go ahead in person at Glenorie RSL as well as via video-conferencing. Details to be confirmed. • 29/10/21 – Email to CCC members with the Meeting Notice, Agenda and Correspondence Report for this meeting. • 29/10/21 – Email to Robyn Preston MP's office requesting an update on the school zone issue. • 29/10/21 – Email response from Roby Preston MP's office advising that a response from Council has not been received, however, the officer has chased up the matter. • 3/11/21 – Email to Council delegates with the Zoom meeting link. • 9/11/21 – Email to members with the reminder for this meeting.	
PROJECT REPORT, INCLUDING PRODUCTION/SALES	MD advised that he didn't have the production figures, however, production has been strong, especially with the sale of sandstone blocks.	**Questions asked and answered throughout the presentation.**

OLD NORTHERN ROAD QUARRY	KM enquired whether the shutdown to the Construction industry during COVID restrictions affected project with MD advising that most customers used the quarry as a buffer for material transport. KM asked if Dixon Sand had COVID procedures in place on site in relation to vaccinations. MD responded that Dixon Sand has a dedicated Safety Officer to ensure procedures are in place and compliance these requirements. HC advised that Dixon Sand had a campaign to have staff vaccinated and providing them time off during working hours to receive the vaccine.	**See - Slide No. 7**
HAERSES ROAD QUARRY	Development Consent Mod. 4 was approved on 29 June 2021. Changing the sequence of approved extraction within the Mod. 1 Friable Hawkesbury Sandstone resource. Approved Extraction Sequence: Cells 1A and 2A Proposed Extraction Sequence: Cells 1A and 1B Development Consent Mod. 3 was approved on 23 July 2021 • Increase in rate of extraction and production from 250,000 to 495,000 tpa • Increase in importation of up to 250,000 tpa of VENM and/or ENM • Increase in daily truck movements from 56 trucks per day to 180 trucks per day • Small extension to Stage 5 Tertiary Sand Extraction Area Development Consent Mod. 5 (preparation of Scoping Letter) for: • Relocation of the approved site office, maintenance shed and weighbridge to an area away from residents along Wiseman Ferry Rd and closer to the main processing plant on Lot 177. This will reduce noise and visual impacts of shed closer to main road. • Minor increase in internal floor dimensions (approximately 1,400m^2 including awning). • Lodgement of Scoping document seeking Modification under Section 4.55(1A) of the EP&A Act 1979.	**See Maps – Slide Nos. 8 & 10**
ENVIRONMENTAL MONITORING RESULTS	The presentation showed the: 1. Environmental Monitoring Locations 2. TEOM – PM10 data 3. Dust Deposition 4. Noise 5. Ground water and Surface Water 6. Incidents/Exceedances	**See Maps in Slides: 12, 13, 14 & 15.**

<table>
<tr>
<td>TEOM DATA</td>
<td>TEOM and Meteorological station records PM10 levels and weather data such as rain, temperature, wind etc.

Monitoring Criteria
o Long term: Annual PM10 average (light blue line) should not exceed the annual average criteria (pink line – 30µg/m3)
o Short term: 24hr PM10 average (blue bars) should not exceed the 24hr PM10 NEPM Criteria (yellow line – 50µg/m3)
o Short term: If the 24hr PM10 EPL Criteria Level (green line – 42µg/m3) is exceeded by the 24hr PM10 average (blue bars), and the prevailing wind is from the specific quadrant Dixon Sand is required to:
• Notify EPA
• Take immediate action to reduce PM10 levels
• Stop works if levels do not fall below 42µg/m3 within 1 hour
o TEOM station represent the EPL Points 1 and 3.</td>
<td>See Slides 17 for graph (July 2021 to October 2021)</td>
</tr>
<tr>
<td>ELEVATED PM10</td>
<td>There were elevated PM10 levels recorded where the 42µg/m3 EPL criteria were in exceedance:
• 8/10/21
• 10/10/21; and
• 29/10/21.
HC explained that the levels were due to agricultural and weather conditions and not from activities on site. All incidents were reported with the EPA not taking any regulatory action.</td>
<td>See Slide 18.</td>
</tr>
<tr>
<td>DEPOSITIONAL DUST DATA</td>
<td>Data and graphs explained for all sites for the monitoring period July 2021 to October 2021.

<table>
<tr><th>Location</th><th>Dust Gauge</th></tr>
<tr><td rowspan="4">Old Northern Road</td><td>D1A Access road</td></tr>
<tr><td>D4 Rehab area</td></tr>
<tr><td>D5 Bundwall</td></tr>
<tr><td>D7 Mullock Heap</td></tr>
<tr><td rowspan="4">Haerses Road</td><td>D8 Olive Grove</td></tr>
<tr><td>D10 Haerses Road (EPL Point 3)</td></tr>
<tr><td>D11 Receiver R6</td></tr>
<tr><td>D12 Receiver R8</td></tr>
</table>
</td>
<td>See Slides 21-27

Locations.</td>
</tr>
<tr>
<td>DUST DEPOSITION EXCEEDANCE</td>
<td>The annual average dust exceedance at monitor D10 in October 2021 was due to agricultural activities occurring in the adjacent paddocks (north and south) of the dust monitor. Previous elevated monthly results were due to (1) RFS utilising the area immediately adjacent to the dust gauge for staging of fire-fighting appliances for the local hazard reduction burn and (2) RFS utilising the same area for training purposes.</td>
<td>See Slides 28 – 31, which includes photographs.</td>
</tr>
</table>

NOISE MONITORING	The 6-monthly noise monitoring program and data was explained for ONR. Noise monitoring results demonstrated compliance with noise criteria apart from one reportable incident on 18/6/21: • Routine 6-monthly attended noise monitoring identified noise exceedances at a number of receivers: o DA 250-09-01, Condition 3 of Schedule 3 o EPL 3916, Conditions L4.1 and L4.2 • Noise criteria exceeded by 1 or 2 dBA • Cause of exceedance attributed to dozer ripping hard rock in the centre of the extraction pit on Lots 1 & 2. Cause of exceedance rectified immediately • DPIE and EPA notified of the incident Section 11.1.3 of the Industrial Noise Policy (2000) specifies a "development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or license condition". Therefore noise exceedances during this incident are NOT deemed a non-compliance. Noise Monitoring for HR; no non-compliances.	**See Slides 32-38** **See Slides 37 & 38.**
GROUND WATER MONITORING	GW Monitoring wells: – 11 x BHs at ONR – 9 x BHs at HR (original extraction in Tertiary Sand) – 13 x BHs at HR (new – 100 MTSGS Buffer zone for Mod 1 extraction cells GW levels: monthly + continuous data loggers GW quality sampling & lab analysis: – 6 monthly sampling and testing.	**Graphs explained - See Slides 40-54**
SURFACE WATER MONITORING	ONR • SW19 = Surface water monitoring at creek on Lot 196 • LDP1 = EPL 3916 Licenced Discharge Point at Weir of Main Water Channel HR • SW1 = Surface water monitoring at creek east of extraction Stage 2 East (inside the Biodiversity Offset Area) • SW2 = Surface water monitoring at creek west of extraction Cell 1A (Mod 1)	**Graphs explained - See Slides 55-59**

	Comment from PS, that she has observed that the western side of Little Cattai Creek is very low, which is unusual given the amount of rain that has been received. Whilst she is not drawing any conclusions from this observation, it is worth noting that there is only a small amount of water there. She will continue to monitor.	
BUSH REGENERATION WORKS	TB presented on the bush regeneration works: **Old nursery site & surrounds (ONR)** Bare areas brush matted with seeding shrubs earlier in the year. The area is heavily compacted and they have installed fast Bladey Grass into bare areas to assist recovery. Overall very little time is spent in this area. **NVC – non topsoil section** (ONR) Recruitment and recovery witnessed is much slower with minimal microbial and mycorrhizal fungi. However, minimal organic matter vastly reduces the ability of weeds to colonise. We have culled assertive species i.e. *Grevillea buxifolia* and *allelopathic* canopy species to promote more light reaching the ground layer. **NVC – filled section (ONR)** Good growth of more recent endangered species plantings and excellent natural recruitment from seed bank. Works have entailed mostly thinning *out Grevillea buxifolia* and *Banksia ericifolia*. **Lot 2 (ONR)** Mostly primary/secondary weed control of Lantana in this section. Planted out buffer zone and area near the dam which was previously disturbed with colonising shrubs. Also commenced controlling Bamboo. **Biodiversity Offset – (Haerses Rd**) Problematic species on disturbed edge next to access road predominantly. Relatively stable now with a dense buffer of competitive grasses and bracken fern. **Future works** Bush-it looks forward to taking on further work at the Biobank sites and the maintenance of remnant ecosystems adjacent to Dixon Sand.	**See photographs in Slides 60 - 67**
BIODIVERSITY AND REHABILITATION	MM provided a comprehensive presentation on the Biodiversity and Rehabilitation annual report, monitoring results and threatened species update. Photographs and maps were shown and explained. **Threatened Species Update** Biodiversity and Rehabilitation Annual Reports 2021	**See Slides 68 - 75**

	o The Biodiversity and Rehabilitation Annual Reports for 2021 was completed in September and submitted with the Annual Review on the 29th September, 2021. o The Annual Report identifies native flora and fauna within the Native Vegetation Corridor and the Haerses Road Biodiversity Offset Area, monitors the success of the rehabilitation area within the NVC and describes the current condition of threatened flora and their habitats within the Old Northern Road site and the HRBOA. o The rehabilitation areas are thriving and increasing in diversity and density. Ideal growing conditions with favourable temperatures and regular rainfall has improved the overall biodiversity of the NVC and HRBOA sites. Photographs were shown of the threatened species in the rehabilitation areas, ONR and HRBOA. Discussions about the cloning of the cloning of *Melaleuca deanei*. DG enquired about the plants viability and the long term life of the species. MM was unsure, but would check with the herbarium. **BCT Reporting** Annual Management Reports for year 2 were completed in February – Passive Management at Haerses Road and Porters Road continues.	
GENERAL BUSINESS	o PS recommended the ecologists and field officers working in the area keep an eye out for koalas. o LAy advised that she is now working at the school.	
MEETING SCHEDULE FOR 2022	*It was agreed the 2022 meeting schedule will continue as previous years:* - Wednesday 4th May 2022; and - Wednesday 9th November 2022. On site at **12.30pm** with a light lunch, followed by the CCC commencing at **1pm.**	

The meeting was closed at 2:59pm with the chair thanking all members for their attendance and MM for driving the video-conferencing and slide presentations. As this was the last CCC for 2021 – wishing everyone a safe and happy festive season.

ACTION ITEMS.

Item	Issue	Responsibility
1	Follow-up response from Robyn Preston MP regarding the school zone (held over)	LA

DIXON SAND

MINUTES OF THE BI-ANNUAL
COMMUNITY CONSULTATIVE COMMITTEE
13 MAY 2022
GLENORIE RSL CLUB - GLENORIE

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Kristine McKenzie (KM)	The Hills Shire Council Representative
	Pat Schwartz (PS)	Community Representative
	Lisa Aylward (LAy)	Maroota Public School Representative *[arrived at 1.04pm]*
	Hunny Churcher (HC) *via video-conference*	Environmental Officer, Dixon Sand
	Mark Dixon (MD)	Dixon Sand
	Melissa Mass (MM)	Dixon Sand - Ecologist
APOLOGIES	David Dixon (DD)	General Manager, Dixon Sand
	Farley Roberts (FR)	Community Representative
	Jemma Roberts (JR)	Community Representative (alternate)
	Timothy Baker (TB)	Bush Regeneration Contractor (Bush-It)
	Robert Buckham (RB)	The Hills Shire Council Representative
	Jeff Gibbs (JG)	Bush-It alternate

WELCOME & INTRODUCTION	LA opened the meeting at 1pm following a light luncheon. All members were welcomed and LA introduced HC who was participating via video-conferencing.	
DECLARATIONS OF INTEREST	LA declared that she is approved by the Department of Planning and Environment to chair the meeting and engaged by Dixon Sand.	**No changes to previous declarations by members.**
BUSINESS ARISING FROM PREVIOUS MEETING (12/5/21)	**Item** / **Issue** / **Responsibility** 1 / Follow-up response from Robyn Preston MP regarding the school zone (LA followed up Robyn Preston MP's office. Still no response; will send through any information received to CCC members). Heldover. / LA	
CORRESPONDENCE (as emailed with Meeting Notice on	• 18/11/21 - Draft minutes sent to members for review	

2/5/22 with 1 additional item)	• 27/11/21 - Email to members with the finalised minutes. • 25/3/22 – Email to members with proposed dates to reschedule May 2022 meeting. (Responses received). • 2/5/22 – Email to Roby Preston MP's office requesting an update on the school zone issue. (2 years, since initial enquiry made.) • 2/5/22 – Email to CCC members with the Meeting Notice, Agenda and Correspondence Report for this meeting. • 12/5/22 – Email to members with the reminder for this meeting.	
PROJECT REPORT, INCLUDING PRODUCTION/SALES **OLD NORTHERN ROAD EXPANSION PROPOSAL** **HAERSES ROAD QUARRY**	MD advised that the last six months have been very busy. There were record sales in April 2022. MD outlined that Dixon Sand is proposing to expand into Lot 1/DP204159 directly across from the existing intersection to allow for increased demand in spec and construction sands at the Old Northern Rd Quarry. The expansion of "spec" sand has assisted with its market in high performance sports grounds (including Brookvale Oval, Alliance Stadium, Sydney Football Stadium and various golf courses). Dixon Sand completed a preliminary environmental assessment for this site in 2015 and lodged an application with the Dept of Planning, however the SEARS have now lapsed and will be required to be resubmitted. Dixon Sand has been looking at access options for the site and plan to lodge a preliminary assessment shortly. KM asked if COVID has impacted on the site with MD responding, yes, a lot of staff have had it. KM asked if Dixon Sand were still able to operate during the ongoing wet weather. MD advised that the company and its customers have 'buffer' procedures in place there are a few days of supplies to meet customers' demands and some have their own stock yards. Development Consent Mod. 5: • DPE currently finalising Assessment report, Notice of Modification and the revised Consent Conditions: o Relocation of the approved site office, maintenance shed and weighbridge to an area adjacent to Lot 177. o Minor increase in internal floor dimensions (approx. 1,150 m2 plus awning) and Sandstone cutting in the proposed relocated workshop o Modification under Section 4.55(1A) of EP&A Act 1979	**Questions asked and answered throughout the presentation.** **See – Slides 6-11**

<table>
<tr><td>ENVIRONMENTAL MONITORING RESULTS</td><td>The presentation showed the:
1. Environmental Monitoring Locations
2. TEOM – PM10 data
3. Dust Deposition
4. Noise
5. Ground water and Surface Water
6. Inspections and Administrative Matters.</td><td>See Maps in Slides: 12-17</td></tr>
<tr><td>TEOM DATA</td><td>TEOM and Meteorological station records PM10 levels and weather data such as rain, temperature, wind etc.

Monitoring Criteria
o Long term: Annual PM10 average (light blue line) should not exceed the annual average criteria (pink line – 30µg/m3)
o Short term: 24hr PM10 average (blue bars) should not exceed the 24hr PM10 NEPM Criteria (yellow line – 50µg/m3)
o Short term: If the 24hr PM10 EPL Criteria Level (green line – 42µg/m3) is exceeded by the 24hr PM10 average (blue bars), and the prevailing wind is from the specific quadrant Dixon Sand is required to:
• Notify EPA
• Take immediate action to reduce PM10 levels
• Stop works if levels do not fall below 42µg/m3 within 1 hour
• TEOM station represent the EPL Points 1 and 3.</td><td>See Slides 18-19</td></tr>
<tr><td>DEPOSITIONAL DUST DATA</td><td>Data and graphs explained for all sites for the monitoring period July 2021 to May 2022.

<table><tr><th>Location</th><th>Dust Gauge</th></tr><tr><td rowspan="4">Old Northern Road</td><td>D1A Access road</td></tr><tr><td>D4 Rehab area</td></tr><tr><td>D5 Bundwall</td></tr><tr><td>D7 Mullock Heap</td></tr><tr><td rowspan="4">Haerses Road</td><td>D8 Olive Grove</td></tr><tr><td>D10 Haerses Road (EPL Point 3)</td></tr><tr><td>D11 Receiver R6</td></tr><tr><td>D12 Receiver R8</td></tr></table></td><td>See Slides 20-29</td></tr>
<tr><td>NOISE MONITORING</td><td>The 6-monthly noise monitoring program and data was explained for ONR. Noise monitoring results demonstrated compliance with noise criteria.

Noise Monitoring for HR; no non-compliances.</td><td>See Slides 30-35 For location of monitoring sites and summary of data.</td></tr>
<tr><td>GROUND WATER MONITORING</td><td>GW Monitoring wells:
– 11 x BHs at ONR
– 9 x BHs at HR (original extraction in Tertiary Sand)</td><td>Graphs explained - See Slides 36-50</td></tr>
</table>

	– 13 x BHs at HR (new – 100 MTSGS Buffer zone for Mod 1 extraction cells GW levels: monthly + continuous data loggers GW quality sampling & lab analysis: – 6 monthly sampling and testing.	
SURFACE WATER MONITORING	**ONR** • SW19 = Surface water monitoring at creek on Lot 196 • LDP1 = EPL 3916 Licenced Discharge Point at Weir of Main Water Channel **HR** • SW1 = Surface water monitoring at creek east of extraction Stage 2 East (inside the Biodiversity Offset Area) • SW2 = Surface water monitoring at creek west of extraction Cell 1A (Mod 1) • Basin 1 = Surface water monitoring at in-pit sump of the new extraction Cell 1A (Mod 1)	**Graphs explained - See Slides 51-55**
INSPECTION & ADMINISTRATIVE MATTERS	o DPE Site Compliance Inspection – both quarries o HR EPBC Consent Condition Variation o HR EPL 12513 Variation	**56**
BUSH REGENERATION WORKS	A summary of assisted bush regeneration work for the period November 2021 to May 2022. In the absence of a Bush-It representative, HC presented on the bush regeneration works: **Rehabilitation of Lot 196** **Challenges** o Machinery-compacted soils on North-facing aspect o Extensive infestations of exotic tussock grass **Achievements:** o Treatment of exotic grass to prevent seed-set and spread. o Revegetation with shrubs and grasses that commenced in October 2021 **Future Works** o Continued revegetation with locally endemic shrubs and grasses o Manual removal of couch grass and preparation of areas for translocation of soil and leaf litter gathered in remnant bush adjacent to the site. **Assisted Regeneration - Native Vegetation Corridor (NVC)** **Challenges** o Minimal microbial and mycorrhizal fungi o Infestation of exotic grasses	**See photographs in Slides 57-65**

	Achievements o Treatment of exotic grass has prevented seed-set and spread. o Propagation of brush-matted material **Future Work** o Continue to cull assertive shrub species to promote diversity o 25 Melaleuca deanii to be planted in spring. **Assisted Regeneration - Native Vegetation Corridor** The 6 months to May has seen: o Outstanding new growth of native species o Encouraging growth of Melaleuca deanii plantings o Excellent natural recruitment from the seed bank. **Rehabilitation of Lot 2** **Challenges** o Excess surface water flows and waterlogged soils o Extensive infestation of bamboo, lantana and exotic grass **Achievements** o Treatment of exotic grass to prevent seed-set and spread. o Removal of bamboo and 'fern garden' regeneration o Removal of lantana and recovery of native species **Future Work** o Continued revegetation of disturbed grassy areas o 200 native canopy trees to be planted using locally sourced seed **Assisted Regeneration - Haerses Road Biodiversity Offset** **Challenges** o Encroachment of invasive species along an extended edge and along drainage lines **Achievements** o Treatment of exotic grass to prevent seed- set and spread. o Manual treatment and minimal herbicide use has resulted in a dense buffer of native shrubs and canopy species. **Future Work** o Continued monitoring for incursions along the leading edge **Haerses Rd - Translocation** **Challenges** o Dominance of assertive native canopy species – Kunzea, Melaleuca and Acacia spp. o Infestation by invasive exotic grasses	

	Achievements o Treatment of exotic grass to prevent seed-set and spread. o Select thinning of assertive native canopy species has promoted understorey natives. **Future Work** o Continued treatment of grasses o Thinning of assertive native canopy	
BIODIVERSITY AND REHABILITATION	MM provided a comprehensive presentation on the Biodiversity and Rehabilitation annual report, monitoring results and threatened species update. Biodiversity and Rehabilitation Annual Report 2022 o The Biodiversity and Rehabilitation Annual Report identifies native flora and fauna within the Native Vegetation Corridor and the Haerses Road Biodiversity Offset Area, it monitors the success of the rehabilitation area within the NVC and describes the current condition of threatened flora and fauna and their habitats within the Old Northern Road site and the HRBOA. o The 2021 Biodiversity and Rehabilitation Annual Report was completed in September and submitted with the Annual Review on the 29th of September. o The results found the rehabilitation areas are thriving and increasing in diversity and density. Ideal growing conditions with favourable temperatures and regular rainfall has improved the overall biodiversity of the NVC and HRBOA sites. o Survey work has begun for the preparation of the 2022 report. Photographs were shown of: • Threatened species in rehab areas • Other threatened species at ONR • Threatened species at HRBOA • Explanation of Bird calls ONR Rehab area **BCT Reporting** Annual Passive Management Report for year 3 was completed in February - Passive Management at Haerses Road and Porters Road continues.	**See Slides 66 – 74** **Slide 75**
GENERAL BUSINESS	o PS raised the recent review of the DPE CCC guidelines, specifically the ability to conduct joint CCC meetings in an area to discuss cumulative impacts. PS mentioned that there is currently an SSD extractive application before DPE and the community are concerned about the cumulative impacts of another industry in the area contributing to traffic, dust, noise issues, etc.	

	o LA commented that whilst the provision in the guidelines does allow for joint meetings, they are often difficult to arrange as companies have concerns with "commercial in confidence" information and consent conditions/licencing requirements vary for each development. o MM advised that whilst there are a number of industries in the area, there is only one other CCC (PF Formation). o PS commented on the environmental sensitivity of the land for the proposed new development, especially in relation to koala habitat. o LA recommended that the issues mentioned by PS should be presented to DPE during the exhibition process. Reiterating that it is the responsibility of DPE to undertake cumulative impact and environmental assessments as part of the application process. o KM informed the CCC that Council had received a complaint that a diesel pump had been running through the night. HC sought more information, ie which site, what date, etc. o LAy advised that there have been a number of power blackouts in the area recently.	**Action: KM to obtain further information to assist in the investigation of this complaint.**
NEXT MEETING	Wednesday 9th November 2022. On site at **12.30pm** with a light lunch, followed by the CCC commencing at **1pm** and possible site inspection.	

The meeting was closed at 2:53pm with the chair thanking all members for their attendance and MM for driving the video-conferencing and slide presentations.

ACTION ITEMS.

Item	Issue	Responsibility
1	Follow-up response from Robyn Preston MP regarding the school zone (held over)	LA
2	KM to provide further information to HC on the diesel pump noise complaint	KM

Appendix K – Complaints Register

Dixon Sand Pty Ltd

Old Northern Road Quarry

Complaints Register - Summary

Period	Number of Complaints received	Complaint Register / Summary Published on Website
July 2021	0	4 August 2021
August 2021	0	22 September 2021
September 2021	0	25 October 2021
October 2021	0	11 November 2021
November 2021	1	6 December 2021
December 2021	0	11 January 2022
January 2022	0	21 February 2022
February 2022	0	14 March 2022
March 2022	0	26 April 2022
April 2022	0	17 May 2022
May 2022	1	6 June 2022
June 2022	1	15 July 2022
Total No. of Complaints	**3**	

Dixon Sand Pty Ltd - Complaints Register

Date Received	**03/06/2022**	**Time**	**10:22 am**	**Complaint Received By**	**David Dixon**
Contact Methodology	**Notification by Council**	**Complaint Nature**	**Sediment leaving site**		
Issue(s) raised					
) Complaint received by the Hills Shire Council representative.) Council informed Dixon Sand of the complaint by telephone and email on 03/06/2022, advising that the complaint is in relation to sediment from the Quarry being tracked onto Old Northern Road.					
Recommendation(s)					
) Dixon Sand to provide a response to Council as discussed.					
Outcome / Action(s) / Future Action(s)					
) On 07/06/2022 – Dixon Sand emailed Council and confirmed that the photo of the sediment laden section of the road provided to Council is not the location of the quarry access road but is located further uphill. Dixon Sand also provided evidence that the quarry is utilising both a broom sweep and a road wash watercart daily to mitigate sediment leaving the site. Dixon Sand pointed out that a number of private driveways and farms upslope of the quarry are also contributing to the sediment problem in these unusually wet conditions.) On 08/06/2022 – Council emailed and acknowledged the receipt of the correspondence above.					
Closed Out Date	08/06/2022	**Closed Out By**	David Dixon		

Dixon Sand Pty Ltd - Complaints Register

Date Received	13/05/2022	Time	During May 2022 CCC Meeting	Complaint Received By	Hunny Churcher
Contact Methodology	**Council Notified**	**Complaint Nature**	**Noise – Diesel Pump**		

Issue(s) raised

- Complaint received by Council.
- Council informed Dixon Sand of the complaint during the CCC Meeting
- Council advised the CCC that they had received a noise complaint for the Quarry.

Recommendation(s)

- Dixon Sand requested that Council contact the Complainant and provide more information i.e. date, time, location

Outcome / Action(s) / Future Action(s)

On 13/05/22 – During the CCC Meeting Hunny Churcher requested Council to provide more information in regards to the complaint.

On 16/05/22 – Council provided the following additional information:

- Ongoing noise - customer called to advise that Dixon Sand at Maroota are running diesel pumps constantly, continues all through the night. The noise is travelling and causing disruption to sleep.
- Diesel pumps are constantly running all night pumping from water from the quarry is an ongoing issue that has been happening for 6 months. And that is happening all night

On 17/05/2022:

- Hunny provided a response to Council advising that the noise complaint has been investigated and discussed with Dixon Sand's management and can confirm that the operation at Old Northern Road Quarry does not operate pumps overnight or outside the operating hours. Under the water management protocols, sediment in silt ponds are left to flocculate and settle overnight and any transfer of water is undertaken during the day within the operating hours.

Closed Out Date	17/05/2022	**Closed Out By**	Hunny Churcher

Date Received	30/11/2021	Time	9:24 am	Complaint Received By	John Attard (Weighbridge)
Contact Methodology	Telephone	Complaint Nature	Traffic – Haulage truck		

Issue(s) raised

- The complainant was concerned about the driving nature of a truck who was crossing over double line markings on the road multiple times.
- The complainant followed the truck to the quarry entrance and was able to record the truck identification.

Recommendation(s)

- Notify Quarry Manager and/or Environmental Officer immediately
- Request a copy of truck registration to check against Dixon Sand's customer haulage truck register and liaise with PF Formation and Hodgson Quarries in accordance with the Maroota Local Traffic Management Plan.
- If the truck in question is confirmed to have picked up products from one of the three quarries, check if the truck has a previous offence (s) and notify the truck company as a formal warning.
- Quarry Manager to execute appropriate disciplinary action.
- If the truck in question has been verified to have picked up products from one of the three quarries, notify other truck drivers at the quarry of the nature of complaint / non-compliance and remediation action (privacy and identity of complainant and truck driver must be maintained).

Outcome / Action(s) / Future Action(s)

- The truck in question was identified.
- Quarry Manager spoke to the truck driver who admitted responsibility.
- The driver was reminded of the importance of adhering to the road rules, the quarry traffic management policy and the 3-strike out rule.
- **Official Warning No. 1 was given to the driver.**
- Quarry Manager contacted the Complainant and advised them of the abovementioned steps taken by the Quarry.
- **The weighbridge operator(s) will commence the education campaign to remind haulage truck drivers of their responsibilities for road safety and to remind them of the requirements of the quarry Traffic Management Policy.**

Closed Out Date	30/11/2021	Closed Out By	David Dixon & Hunny Churcher

Appendix L – Waste Register

Old Northern Road
Waste Tracking Register 2021-2022

Date	Waste Type	Amount	Measurement	Contractor	Disposal / Recycle	Receipt No
6/07/2021	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	89589
6/07/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	89611
19/07/2021	Scrap Metal	12.12	tonne	Westland Metals	Recycle	WM-24820
19/07/2021	Scrap Metal	10.18	tonne	Westland Metals	Recycle	WM-24912
2/08/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	89949
30/08/2021	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	89879
30/08/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	89893
20/09/2021	Liquid Waste	1000	Litres	JJ's Waste & Recycling	Treatment	3409853
28/09/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	90276
11/10/2021	Liquid Waste	1000	Litres	JJ's Waste & Recycling	Treatment	3418666
25/10/2021	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	90580
25/10/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	90601
23/11/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	90900
20/12/2021	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	91113
20/12/2021	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	91113
12/01/2022	Non-Putrescible	6	cubic metre	Asquith Mini Skips	Disposal	9266
20/01/2022	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	91334
7/02/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9280
18/02/2022	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	91538
18/02/2022	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	91544
14/03/2022	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	91799
22/03/2022	Non-Putrescible	2	cubic metre	Asquith Mini Skips	Disposal	9297
11/04/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9314
12/04/2022	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	92082
12/04/2022	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	92383
11/05/2022	Non-Putrescible	6	cubic metre	Asquith Mini Skips	Disposal	9333
13/05/2022	Hydrocarbon waste	300	Litres	Greaseaters	Treatment	92363
7/06/2022	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	92600
7/06/2022	Hydrocarbon waste	45	Litres	Greaseaters	Treatment	92601
15/07/2022	Non-Putrescible	2	cubic metre	Asquith Mini Skips	Disposal	9110
12/08/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9124
3/09/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9138
30/09/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9152
26/10/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9169
18/11/2022	Non-Putrescible	4	cubic metre	Asquith Mini Skips	Disposal	9179
3/12/2022	Non-Putrescible	6	cubic metre	Asquith Mini Skips	Disposal	9192
01/07/21 - 30/06/22	General Solid Waste - recyclable	13	cubic metre	Council Waste Contractor	Recycle	Council Rate
01/07/21 - 30/06/22	Genral Solid Waste - putrescible	78	cubic metre	Council Waste Contractor	Disposal	Council Rate
01/07/21 - 30/06/22	Printer Ink Catridge	0.1	cubic metre	Post Office	Disposal	N/A

Total			
	Scrap Metal	22.3	tonnes
	Non-Putrescible	50	m3
	Hydrocarbon waste	3960	litres
	Council Putrescible	78	m3
	Council Recycle	13	m3
	Printer Ink Catridge	0.1	m3
	Liquid Waste	2000	litres

End of document