GERROA SAND RESOURCE

ANNUAL REVIEW

Period 01 July 2023 – 30 June 2024

Title Block

Name of operation	Gerroa Sand Resource
Name of operator	Cleary Bros (Bombo) Pty Ltd
Development consent #	05/0099
Name of holder of development consent	Cleary Bros (Bombo) Pty Ltd
Annual Review start date	1/7/2023
Annual Review end date	30/6/2024

I, Mark Hammond, certify that this audit report is a true and accurate record of the compliance status of the Gerroa Sand Resource for the period 1 July 2023 to 30 June 2024 and that I am authorised to make this statement on behalf of Cleary Bros (Bombo) Pty Ltd.

Note

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

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	Mark Hammond
Title of authorised reporting officer	Head of Sustainability
Signature of authorised reporting officer	
Date	27/8/2024

Contents

Abbreviations

CB	Cleary Bros (Bombo) Pty Ltd
DC	Development Consent (PA 05/0099) Modification 1
EPA	Environmental Protection Authority
DP	Deposited Plan
DPHI	Department of Planning, Housing and Infrastructure (formerly Department of Planning and Environment)
EPL	Environmental Protection Licence
LEC	Land & Environment Court
MW	Monitoring Well
QEMP	Quarry Environmental Management Plan

Internal Document Control

Version	Description	Prepared By	Reviewed By	Prepared Date
1	Initial Draft	C Conway	M Hammond	19/7/2024
2	Final	M Hammond	M Hammond	27/8/2027

1. Introduction

1.1. Statement of Compliance

Were all conditions of the relevant approvals complied with?	
Development consent #05/0099	No
Environmental Protection Licence #4146	Yes

One non-compliance with the requirements of the Aboriginal Cultural Heritage Management Plan was identified in the reporting period, which was reported to DPHI in line with the requirements of the Development Consent. Refer to Section 4.11 for more information regarding this non-compliance.

1.2. Background

Sand has been extracted from Cleary Bros (CB) sand quarry at Gerroa for approximately 60 years. The works have been authorised by a succession of development approvals.

On 10 June 2022 the Minister for Planning and Public Spaces approved Modification 1 (Development Consent) for the continuation of sand extraction from the Modification 1 area on the northwestern side of Blue Angle Creek. Modification 1 amends the original approval by the Land and Environment Court dated 2 September 2008 for the "Extension and Continuation of Gerroa Sand Quarry". Sand extraction by dredging on the property is licensed by the Environment Protection Authority (EPA) under EPL4146.

CB currently operates in accordance with the site's Quarry Environmental Management Plan (QEMP) in accordance with the requirements of the EPL and Development Consent (DC) The QEMP was most recently approved by the then Department of Planning and Environment (DPE, now DPHI) on 29 June 2023. The location of the property is shown in Figure 1.

1.3. Objectives of the Annual Review

Condition 4 of Schedule 5 of the Development Consent (DC) requires CB to submit an Annual Review. The condition requires the Annual Review to:

a) describe the activities associated with the project (including rehabilitation) that was carried out in the previous financial year, and the activities that are proposed to be carried out over the current financial year.
b) include a comprehensive review of the monitoring results and complaints records of the project over the previous financial year, which includes a comparison of these results against:
    - the relevant statutory requirements, limits or performance measures/criteria;
    - requirements of any plan or program required under this approval;
    - the monitoring results of previous years; and
    - the relevant predictions in the documents listed in condition 2(a) of Schedule 2;
c) identify any non-compliance or incident which occurred in the previous financial year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid recurrence;
d) evaluate and report on:
    - the effectiveness of the acid sulfate soils, noise amenity and water quality management and mitigation; and
    - compliance with the performance measures, criteria and operating conditions of this approval;
e) identify any trends in the monitoring data over the life of the project;
f) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
g) describe what measures will be implemented over the current financial year to improve the environmental performance of the project.

This Annual Review has been prepared to meet the requirements of Condition 4 of Schedule 5 of the Development Consent.

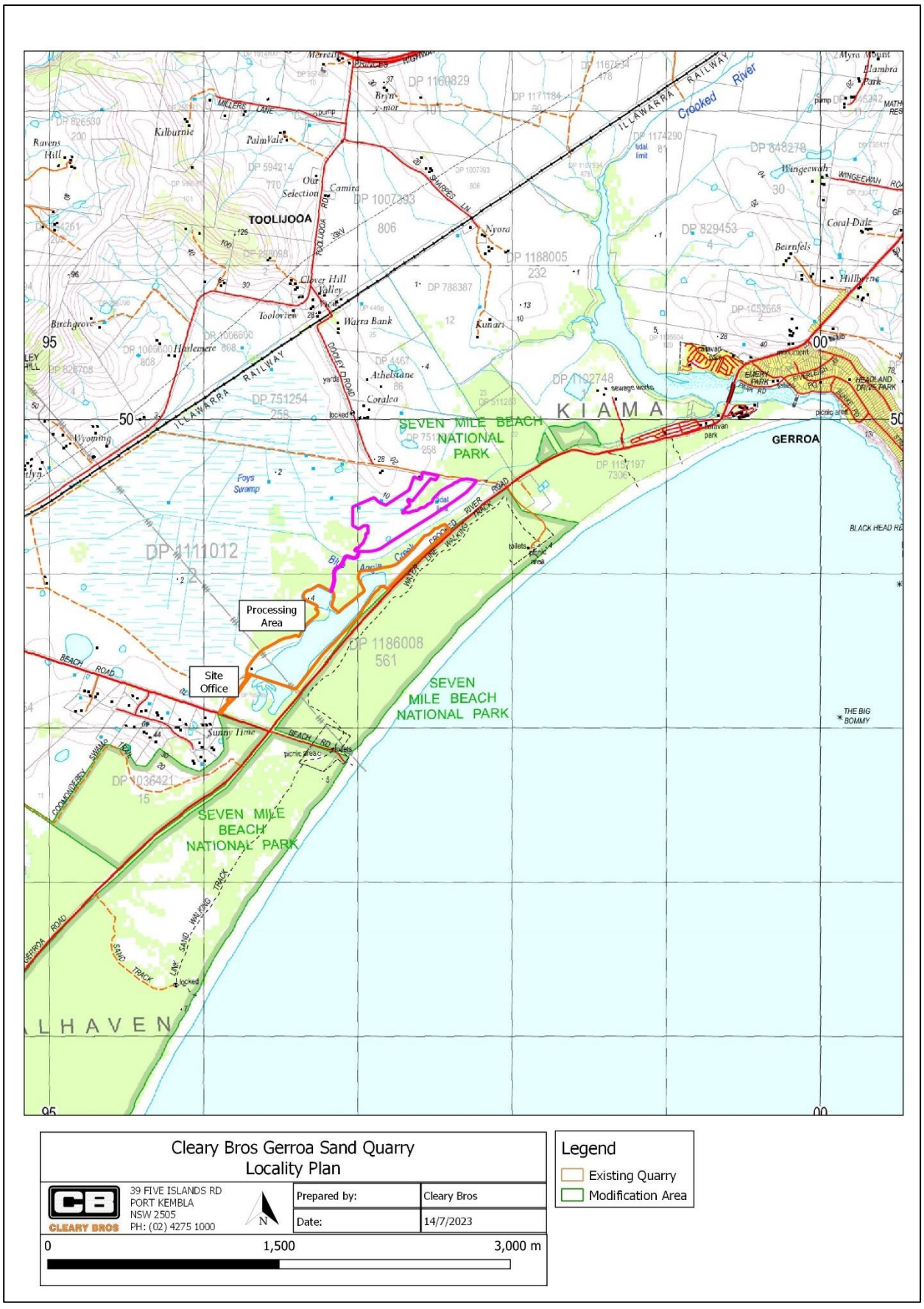


Figure 1 - Locality Plan

2. Site Description and Activities

2.1. Site Identification

The site comprises all of Lot A DP 185785 and part of Lot 2 DP 1111012. The property is owned by Bridon Pty Ltd, a member of the Cleary Bros group of companies.

The site straddles the boundary of the Kiama and Shoalhaven Local Government Areas. The operational area is contained within two portions of the site separated by Blue Angle Creek, with an area totalling approximately 42.5 hectares. The operational area fronts Crooked River Road and Berry Beach Road. The remainder of the property is used for agricultural activities.

The quarrying process involves dredging the sand mixed with water by suction based on a barge and piped back to the wet sorter located on the western edge of the existing dredge pond. In the wet sorter the gravel and larger materials such as shells are removed from the sand before the sand is sent to the cyclone which removes any remaining silt. From here the sand is deposited into a stockpile and the removed silt and excess water are returned to the existing dredge pond. When the sand stockpile is of sufficient size, it is re-stockpiled away from the wet sorter and cyclone systems to dry. The sand is then loaded on to road-going trucks for delivery to customers, primarily Cleary Bros concrete plants.

3. Key Licence Issues

3.1. Environmental Protection Licence Annual Reports

The Environment Protection Authority (EPA) has issued an Environmental Protection Licence (Licence No. 4146) for the dredging works on site, which was most recently updated on 6 October 2022.

The licence, issued under s55 of the Protection of the Environment Operations Act 1997, requires an annual return to be submitted to the EPA, for the reporting period of 1st February to 31st January.

The EPA Annual Returns for 2005 to 2024 reporting periods were reviewed to provide a background to this report. These Annual Returns are summarised in the following table.

Reporting Period	Pollution complaints	Concentration monitoring summary	Volume or mass monitoring summary	Compliance with licence conditions
1 Feb 2005 – 31 Jan 2006	Nil	None required	None required	All conditions complied with
1 Feb 2006 – 31 Jan 2007	Nil	None required	None required	All conditions complied with
1 Feb 2007 – 31 Jan 2008	Nil	None required	None required	All conditions complied with
1 Feb 2008 – 31 Jan 2009	Nil	None required	None required	All conditions complied with
1 Feb 2009 – 31 Jan 2010	Nil	None required	None required	All conditions complied with
1 Feb 2010 – 31 Jan 2011	Nil	None required	None required	All conditions complied with
1 Feb 2011 – 31 Jan 2012	Nil	None required	None required	All conditions complied with
1 Feb 2012 – 31 Jan 2013	Nil	None required	None required	All conditions complied with
1 Feb 2013 – 31 Jan 2014	Nil	None required	None required	All conditions complied with
1 Feb 2014 – 31 Jan 2015	Nil	None required	None required	All conditions complied with
1 Feb 2015 – 31 Jan 2016	Nil	None required	None required	All conditions complied with
1 Feb 2016 – 31 Jan 2017	Nil	None required	None required	All conditions complied with
1 Feb 2017 – 31 Jan 2018	Nil	None required	None required	All conditions complied with
1 Feb 2018 – 31 Jan 2019	Nil	None required	None required	All conditions complied with
1 Feb 2019 – 31 Jan 2020	Nil	None required	None required	All conditions complied with
1 Feb 2020 – 31 Jan 2021	Nil	None required	None required	All conditions complied with
1 Feb 2021 – 31 Jan 2022	Nil	None required	None required	All conditions complied with
1 Feb 2022 – 31 Jan 2023	Nil	None required	None required	All conditions complied with
1 Feb 2023 – 31 Jan 2024	Nil	None required	None required	All conditions complied with

3.2. Development Consent

The Development Consent (DC) was modified by the DPHI on 10 June 2022 and is the primary consent relevant to sand quarrying operations. As a requirement of the DC an Annual Review must be completed annually.

3.3. Standards and Performance Measures that apply

The Environmental Assessment dated February 2018 outlines the predicted impacts of the Project as modified. The Gerroa Sand Resource is also licenced by the Environmental Protection Authority under Environmental Protection License 4146. These documents contain the standards and performance measures for the Gerroa Sand Resource, which are identified separately in Section 4.

3.4. Works Carried Out in Reporting Period

The total sand transported from site during the 2023/2024 reporting year was 79,591 tonnes. In the current reporting period, sand was extracted from the northeastern part of the Modification 1 area ("CP" area). The previous year's return (2022/2023) to the Department of Regional NSW is included as Annexure A for 45,986 tonnes. The return for the 2023/2024 is due in November 2024 to the Department of Regional NSW and will be included in next year's Annual Review.

In the past 12 months, dredging has continued in the CP area of the site, following on from the previous period. In addition, the following works have been undertaken:

- Completion of initial plantings for tree screen along western boundary of site.
- Installation of the continuous water monitoring station in the new dredge pond.
- Continuation of construction of flood bunds on later sections of site.
- Commencement of archaeological salvage works within the West area of the site.
- Upgrade of the site weather station to 4G telemetry and replacement of electrical components within weather station.

3.5. Works to be Carried Out in the Next Period

The dredge will continue extracting sand from the CP area of the Modification 1 area slowly tracking towards the south. The area planned for extraction in 2024/2025 is shown in Figure 2.

Other works planned for the 2024/2025 period include:

- Completion of archaeological salvage works
- Installation of contour drains
- Maintenance of tree screen including replacement of lost plants.

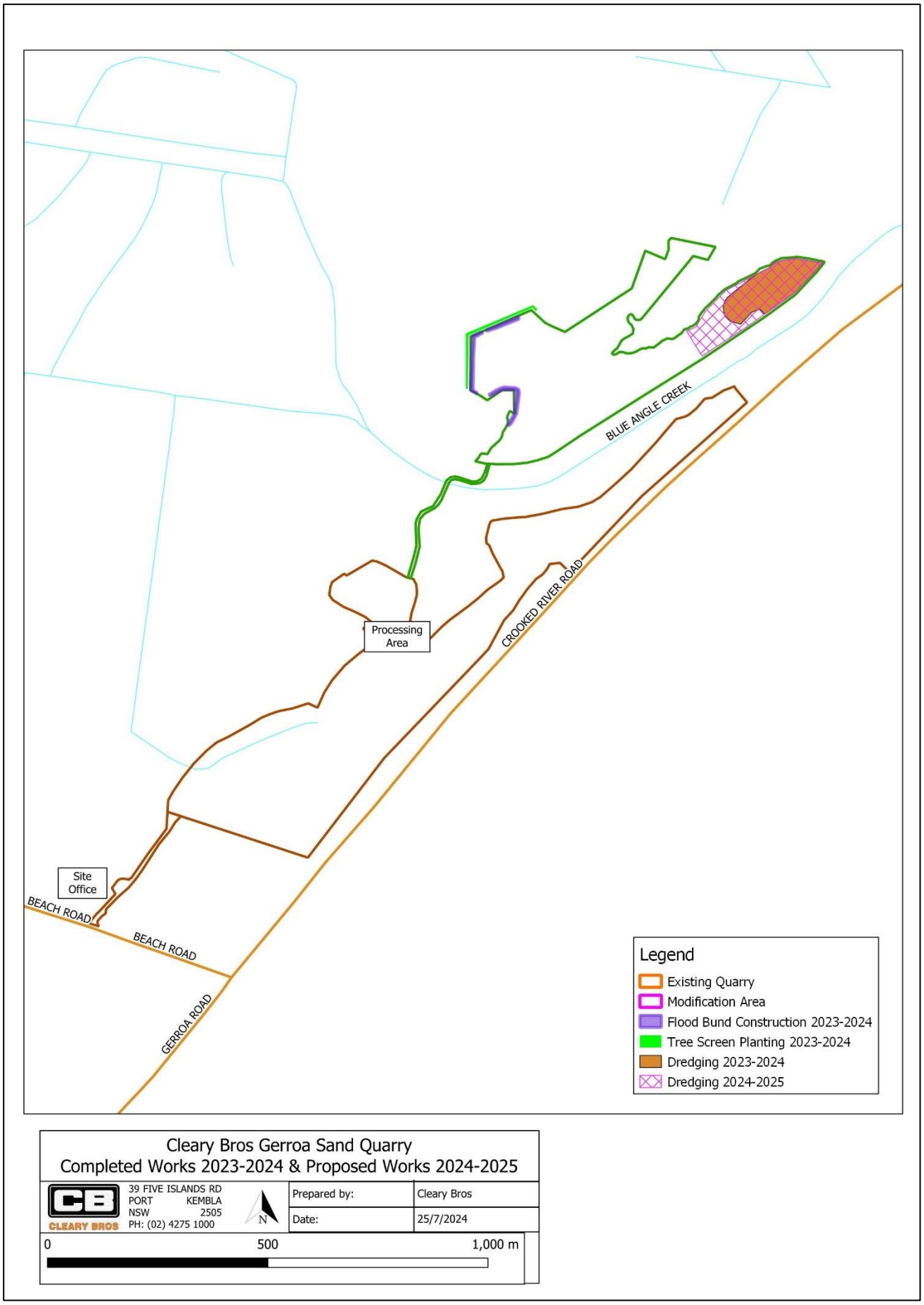


Figure 2 – Description of works

4. Review of Environmental Performance

4.1. Meteorological Monitoring

4.1.1. Licence Requirements

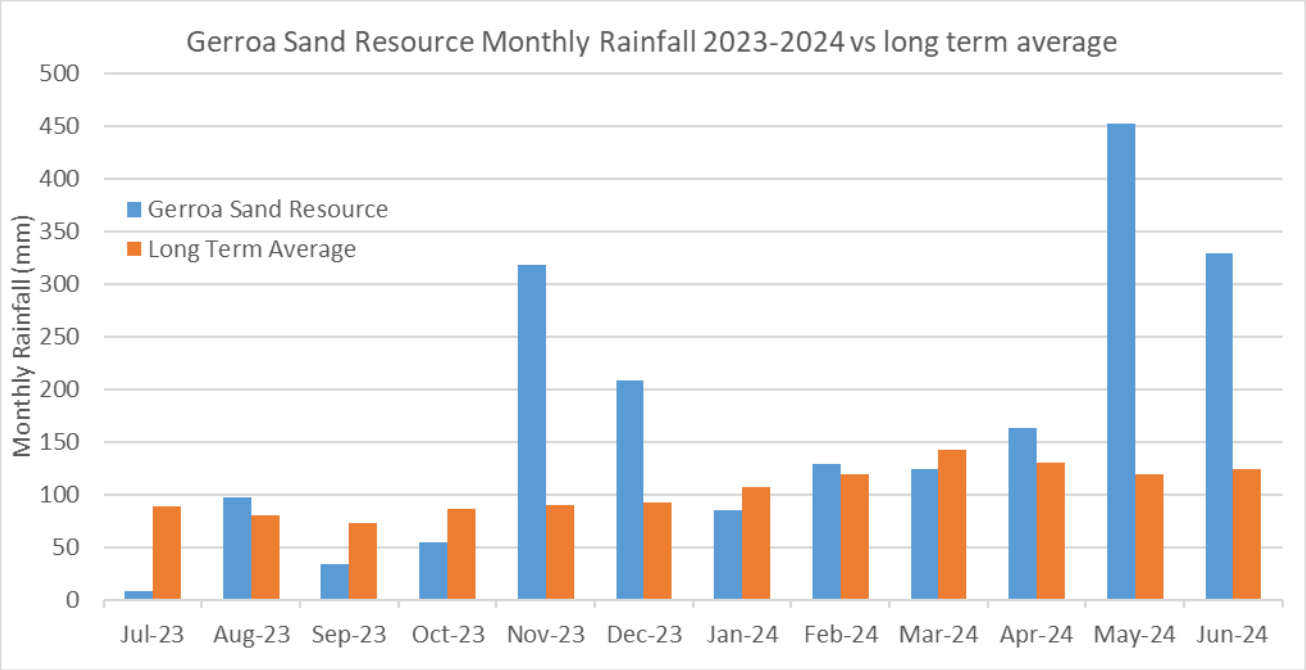
The DC requires Cleary Bros to maintain a meteorological station on site.

4.1.2. Compliance Assessment

A meteorological station is maintained onsite that provides information on rainfall, air temperature, solar radiation and wind speed and direction via mobile telemetry to an online portal. The current weather station was installed in September 2016. With the pending decommissioning of the Telstra 3G telecommunications network on which the weather station relies, the station was upgraded to the 4G network in early 2024. As part of the upgrade, all components within the cabinet (everything except the sensors and mast) were also replaced to ensure the ongoing reliability of the weather station. There were some transitional issues with the upgrade, with water ingress causing corrosion of some contacts and loss of data. These were identified and addressed as they came to light, with the water ingress issues fixed and the weather station operating as expected in July 2024. A manual rain gauge on the site was utilised when required to ensure completeness of rainfall data throughout the reporting period.

4.1.3. Meteorological Monitoring

Rainfall in the current reporting period has been above average, with 2006.3 mm recorded on the site compared with the long term average of 1254 mm (based on data sourced from the Kiama BOM station). It was, however, heavily skewed to the last two months of the reporting period, with 39% (781mm) falling in May and June 2024. Rainfall totals in the first four months of the reporting period were generally well below average, before above average rainfall in November (319mm) and December (209mm), and then approximately average rainfall from January to April 2024. These rainfall patterns are coming off a wetter past three years, which has meant an elevated water table for much of the surrounding floodplain throughout the year, particularly since December 2023.



4.2. Groundwater Management

4.2.1. Standards and Performance Measures

There are no specific criteria for groundwater quality in the sites EPL.

The current groundwater monitoring requirements from the DC are described in the QEMP. Section 8.6 of the current QEMP details the groundwater testing requirements and specifies that 9 boreholes on site require monthly water level readings and quarterly analyte testing. The tabulated results of groundwater monitoring are included in Annex B. The EA predicted that the project is not expected to result in variations in the range of groundwater levels outside that previously experienced in the monitoring bores on the site. Furthermore, the EA identified that existing low pH levels in groundwater bores to be relatively benign, signifying natural impacts from naturally occurring pyrites and organic acids, with sand extraction not predicted to lead to any deterioration of the groundwater quality.

The groundwater quality objectives which CB should "aim to meet" from the DC (and adopted in the QEMP) are as follows:

Analyte	Units	Objective
pH	pH	6.0 – 8.5
Electrical Conductivity	µS/cm	<1,500
Total Phosphorus	µg/L	<30
Total Nitrogen	µg/L	<350
Chlorophyll-A	µg/L	<5
Faecal Coliforms	Median No./100 mL	<1,000
Enterococci	Median No./100 mL	<230
Sodium	mg/L	<400
Potassium Ion	mg/L	<50
Magnesium Ion	mg/L	<50
Chloride Ion	mg/L	<300
Sulphate Ion	mg/L	<250
Bicarbonate Ion	mg/L	<750
Soluble Iron Ion	mg/L	<6
Ammonium Ion	µg/L*	<20

* amended from mg/L to µg/L as part of Modification 1

The QEMP target for groundwater dependant ecosystems is for no discernible deterioration of ecosystems or vegetation, attributable to measured changes in groundwater levels or quality as a result of quarrying operations.

Additional monitoring of groundwater bores to assess potential impacts from acid sulphate soils are detailed in Section 4.4.

4.2.2.Environmental Performance

CB has implemented the Groundwater Monitoring Program to meet the requirements of the DC. ALS Laboratory Group were engaged during the reporting period to conduct quarterly sampling and testing of the groundwater monitoring sites and monthly monitoring of groundwater level.

4.2.3.Groundwater Monitoring

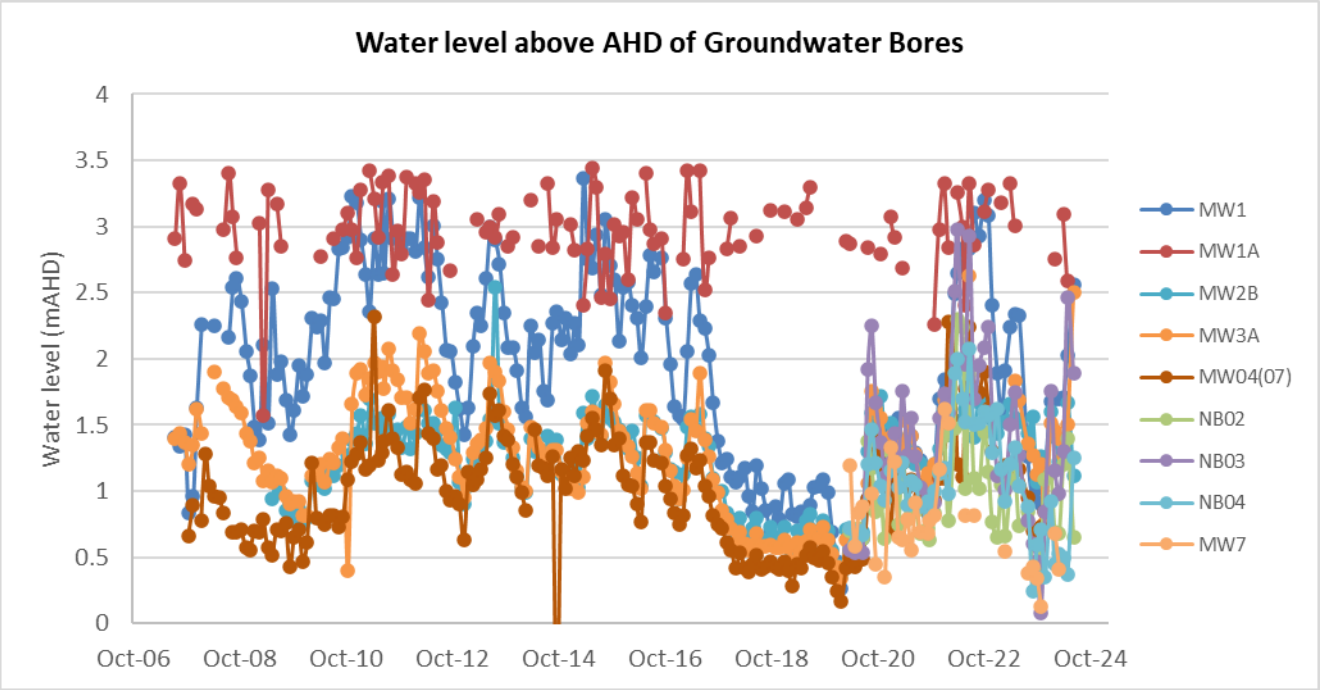
A summary of groundwater monitoring results for the period is displayed in this section, separated into the different analytes required to be monitored as per the DC. For each analyte, the range and average of the current period's monitoring are displayed, alongside the historical range and average, objectives as described in the DC, and any EA predictions. Where groundwater monitoring results trend outside of the historical range or DC objectives, these are identified in the summary with discussion into these results below. For each analyte, a historical graph is also included showing the variations in measurements for each groundwater bore throughout the historical monitoring period. Data captured from the new bores added to the monitoring program in the

current reporting period has not been graphed due to the small dataset. It should also be noted that monitoring bore MW07 represents a reference site located approximately 1km west of the Modification 1 area in Foys Swamp and is outside the influence of any sand extraction activities. During wetter months, some bores could not be safely accessed for monitoring (particularly MW07). Meanwhile, the shallow bore MW1A was recorded as dry for each of the quarterly monitoring rounds.

Depth (m)

The depths of the borehole are reported as metres above the Australian Height Datum

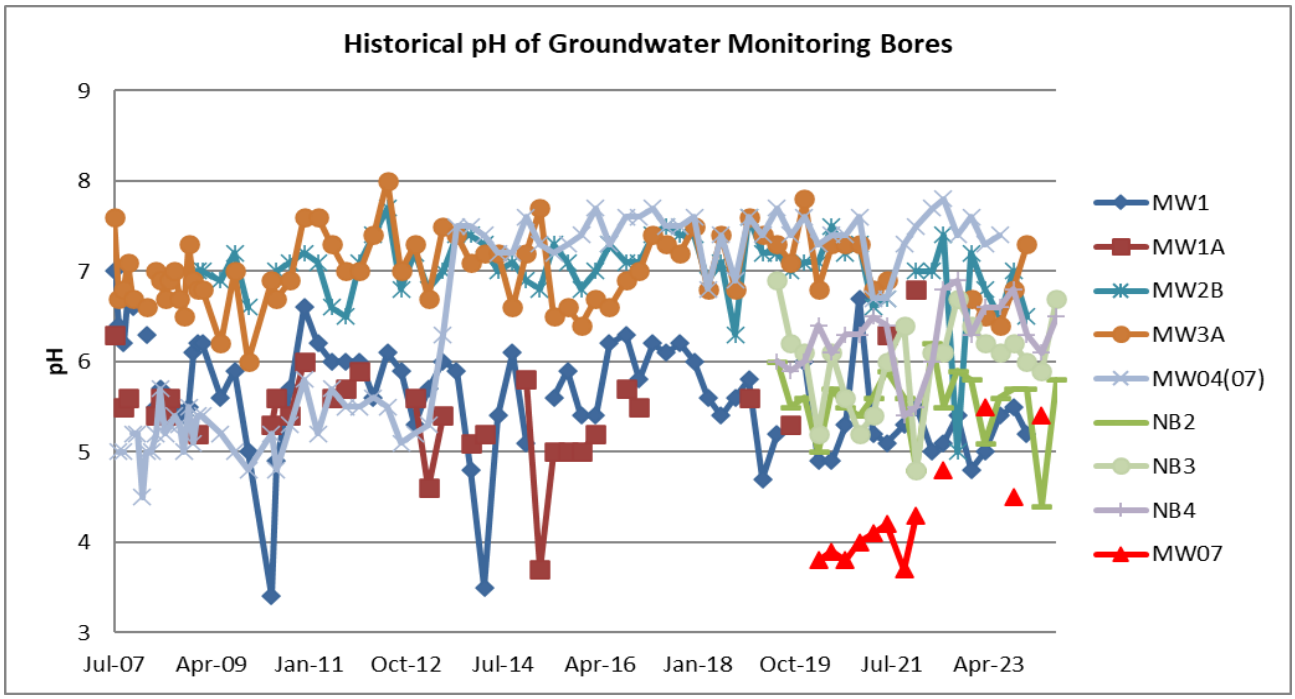
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	0.9	1.51	2.56	0.26	1.97	3.36	N/A	N/A
MW1A	2.59	2.81	3.09	1.57	2.98	3.44	N/A	N/A
MW2B	0.72	1.30	1.67	0.35	1.21	2.54	N/A	N/A
MW3A	0.76	1.40	2.5	0.34	1.26	2.63	N/A	N/A
MW04(07)	0.7	0.79	0.95	-0.69	1.00	2.32	N/A	N/A
NB2*	0.39	0.82	1.4	0.56	1.04	2.3	N/A	N/A
NB3*	0.08	1.12	2.46	0.54	1.51	2.98	N/A	N/A
NB4*	0.25	0.62	1.25	0.6	1.21	2.08	N/A	N/A
MW07*	0.13	0.40	0.68	0.35	0.87	1.62	N/A	N/A



Groundwater levels have varied consistently with significant rainfall events during the current reporting period. While some bores experienced greater fluctuations than others, all bores recorded a declining trend early in the reporting period, followed by an increasing trend since November 2023 due to the above average rainfall since this time. These changes reflect the significant natural variability of the local groundwater regime, suggesting weather patterns are the predominant driver of groundwater levels within each bore across the monitoring network. All measurements were within the historical ranges for the respective bores with the exception of the newer bores, which recorded levels below the historical ranges prior to the onset of the wetter period. This is expected given monitoring of these bores commenced in 2020, which has been a consistently wetter than average period.

pH (pH units)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	5.0	5.3	5.5	3.4	5.6	7.0	6.0 - 8.5	N/A
MW1A	Dry during quarterly sampling			3.7	5.4	3.7	6.0 - 8.5	N/A
MW2B	6.5	6.7	7.0	5.0	7.1	7.7	6.0 - 8.5	N/A
MW3A	6.4	6.8	7.3	6.0	7.0	8.0	6.0 - 8.5	N/A
MW04(07)	7.3	7.4	7.4	4.5	6.4	7.8	6.0 - 8.5	N/A
NB2	4.4	5.4	5.8	4.8	5.6	6.2	6.0 - 8.5	N/A
NB3	5.9	6.2	6.7	4.8	6.0	6.9	6.0 - 8.5	N/A
NB4	6.1	6.4	6.8	5.4	6.2	6.9	6.0 - 8.5	N/A
MW07	4.5	5.0	5.4	3.7	4.2	5.5	6.0 - 8.5	N/A



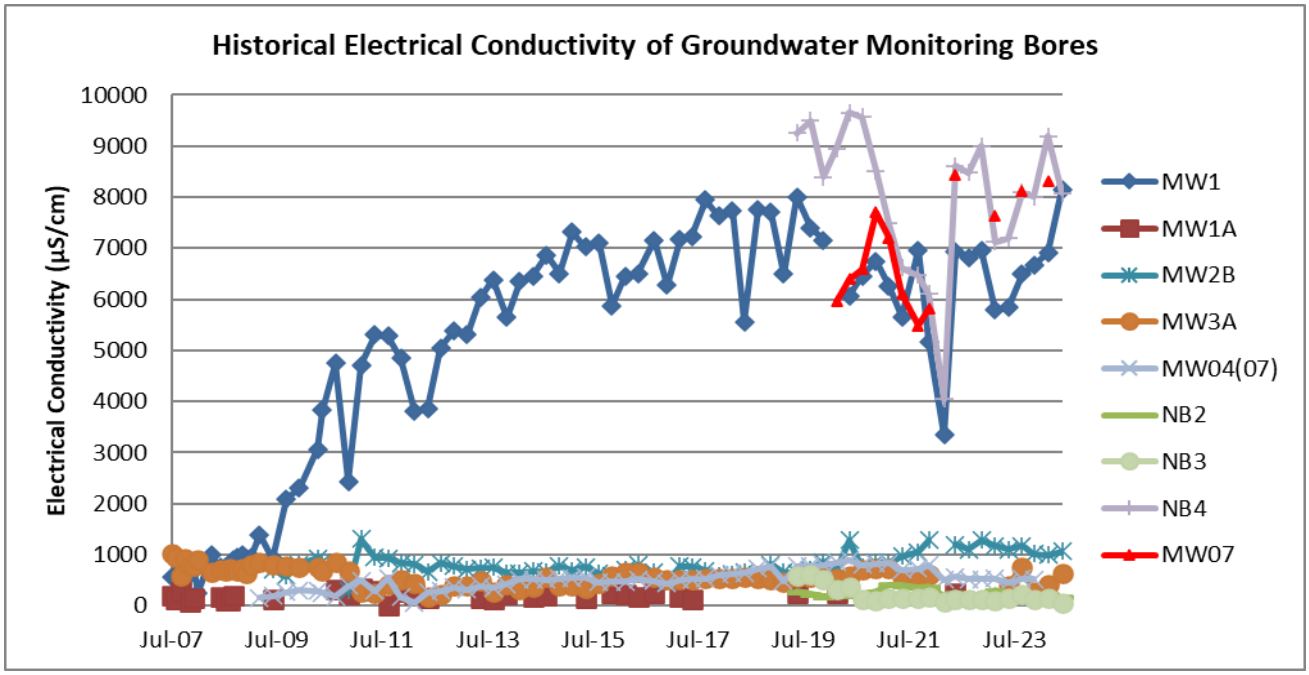
The pH values over the past 12 months have exhibited variability similar to that observed across the historical record. All groundwater bores recorded pH levels in line with historical averages, with the exception of a single result for bore NB02, which was lower than the historical average for this bore. As seen in the graph, this result was a once-off, with the pH returning to the historical range for this bore in the following sample.

The monitoring results suggest pH is close to neutral in the close vicinity of the dredge pond and in the lower reach of Blue Angle Creek (such as around NB4), with pH declining further from these moderating influences, including for bores MW1, MW7, and to a lesser extent NB2.

Electrical Conductivity (µS/cm)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	6,490	7,053	8,150	260	4,674	8,010	< 1,500	n/a
MW1A	No Data Available			90	200	350	< 1,500	n/a
MW2B	1,000	1,068	1,180	300	805	1,310	< 1,500	n/a

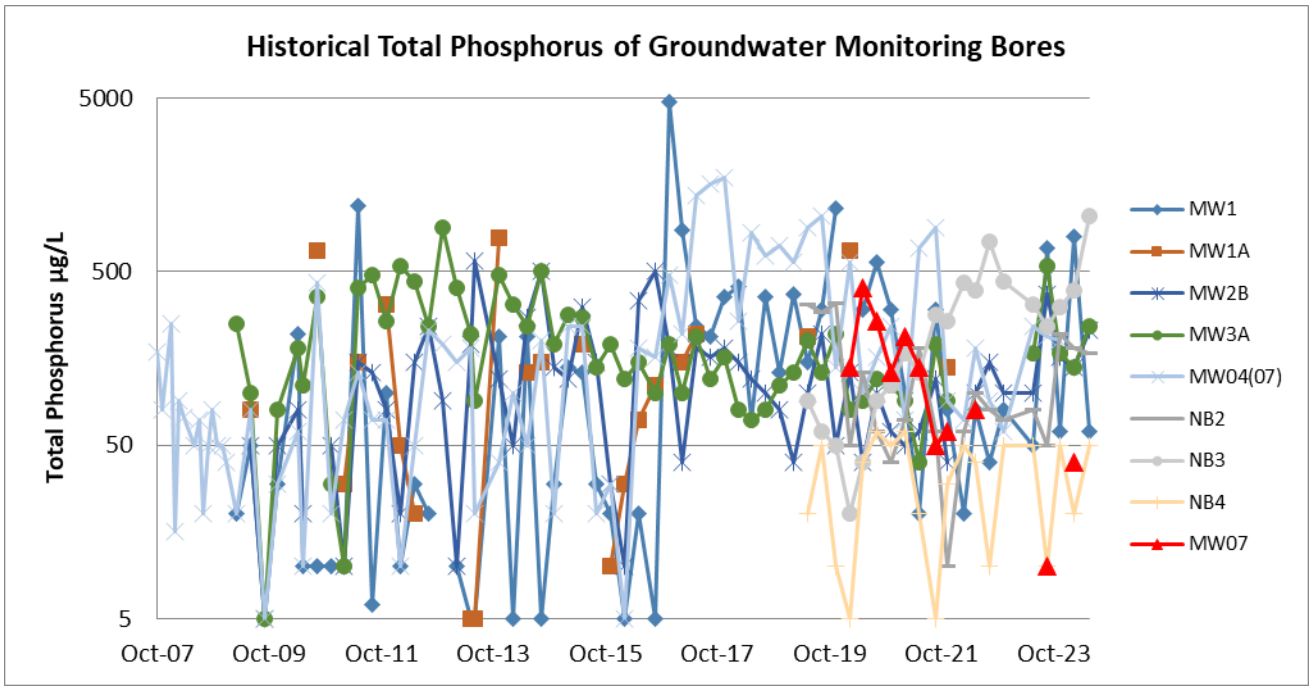
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW3A	274	527	767	176	589	1,030	< 1,500	n/a
MW04(07)	524	531	538	60	507	892	< 1,500	n/a
NB2	97	165	221	145	256	408	< 1,500	n/a
NB3	62	143	216	76	236	613	< 1,500	n/a
NB4	8,000	8,340	9,190	4,040	7,936	9,650	< 1,500	n/a
MW07	8,120	8,215	8,310	5,490	6,734	8,440	< 1,500	n/a



The results over the 12-month period show variability in the Electrical Conductivity (EC) of the groundwater in the boreholes which is consistent with the long term patten. Brackish groundwater in MW1 has been attributed to the Berry Siltstone aquifer to the southwest which continues to influence the groundwater quality in this bore. Meanwhile, brackish groundwater in bores NB4 and MW07 are influenced by tidal exchanges with the Crooked River estuary. With the exception of these three bores, the EC of all bores have remained with the objective levels, and are consistent with the historical ranges for the bores.

Total Phosphorus (µg/L)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	60	400	800	<10	253	4,780	< 30	n/a
MW1A	No Data Available			<10	190	780	< 30	n/a
MW2B	140	225	370	<10	131	580	< 30	n/a
MW3A	140	273	540	<10	205	900	< 30	n/a
MW04(07)	200	137	210	<10	255	1,750	< 30	n/a
NB2	50	155	220	10	121	330	< 30	n/a
NB3	240	498	1,050	20	226	740	< 30	n/a
NB4	10	33	50	<10	34	60	< 30	n/a
MW07	10	25	40	50	163	400	< 30	n/a

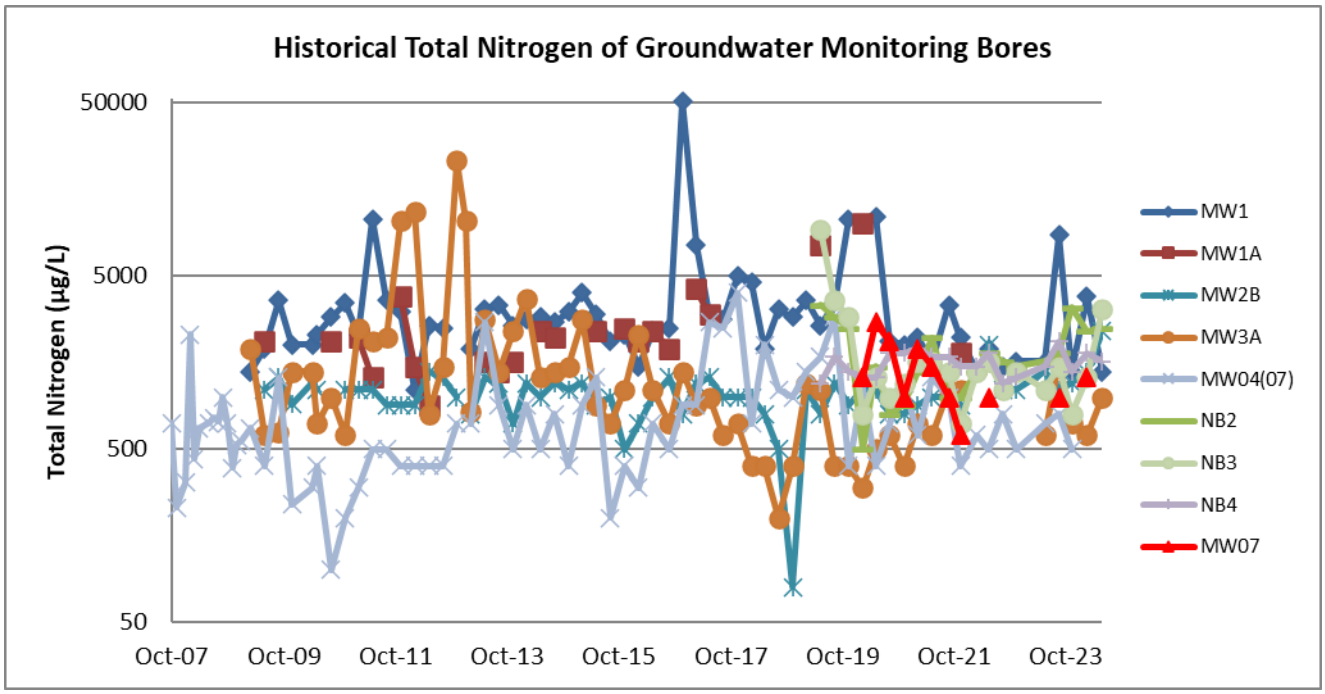


Concentrations of total phosphorus in the boreholes were generally above the groundwater quality objective, however they were all within the historical range for their respective bores with the exception of a single isolated result for bore NB3. During the reporting period, the concentration of total phosphorus in the existing dredge pond was generally less than that measured in all bores, suggesting the agricultural land uses surrounding the Gerroa Sand Resource have contributed to the levels of phosphorus in the groundwater monitoring network. Note a logarithmic scale has been applied to the graph above to improve interpretation.

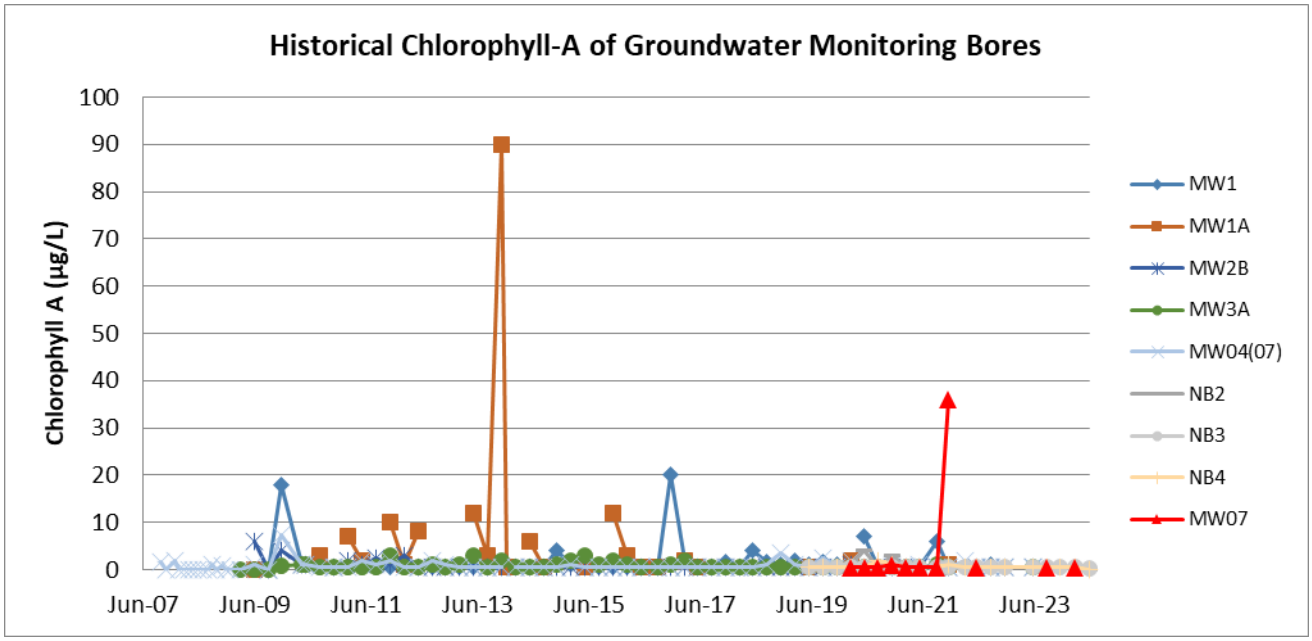
Total Nitrogen (µg/L)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1,400	3,800	8,600	1,100	4,016	51,100	< 350	n/a
MW1A	No Data Available			900	2,777	10,100	< 350	n/a
MW2B	1,100	1,525	2,400	80	1,024	2,000	< 350	n/a
MW3A	600	975	1,600	200	2,094	23,200	< 350	n/a
MW04(07)	500	650	800	100	860	4,000	< 350	n/a
NB2	1,800	2,500	3,300	500	1,625	3,400	< 350	n/a
NB3	800	1,700	3,200	700	1,994	9,200	< 350	n/a
NB4	1,400	1,725	2,100	1,200	1,538	1,900	< 350	n/a
MW07	1,000	1,150	1300	600	1,456	2,700	< 350	n/a

The concentrations of Total Nitrogen in all groundwater monitoring bores have consistently exceeded the objective level since monitoring of groundwater quality began. In the current reporting period, nitrogen concentrations were recorded within the historical range in all bores with the exception of MW2B and NB4, which were above the previous historical ranges for these bores. The recorded levels of total nitrogen in the groundwater monitoring network are likely related to the presence of agricultural activities in the area surrounding the Gerroa Sand Resource. This is supported by an analysis of water quality within the existing dredge pond, which shows that nitrogen concentrations in the pond are consistently lower than that recorded across the groundwater monitoring network. Note a logarithmic scale has been applied to the graph below to improve interpretation.



Chlorophyll A (µg/L)

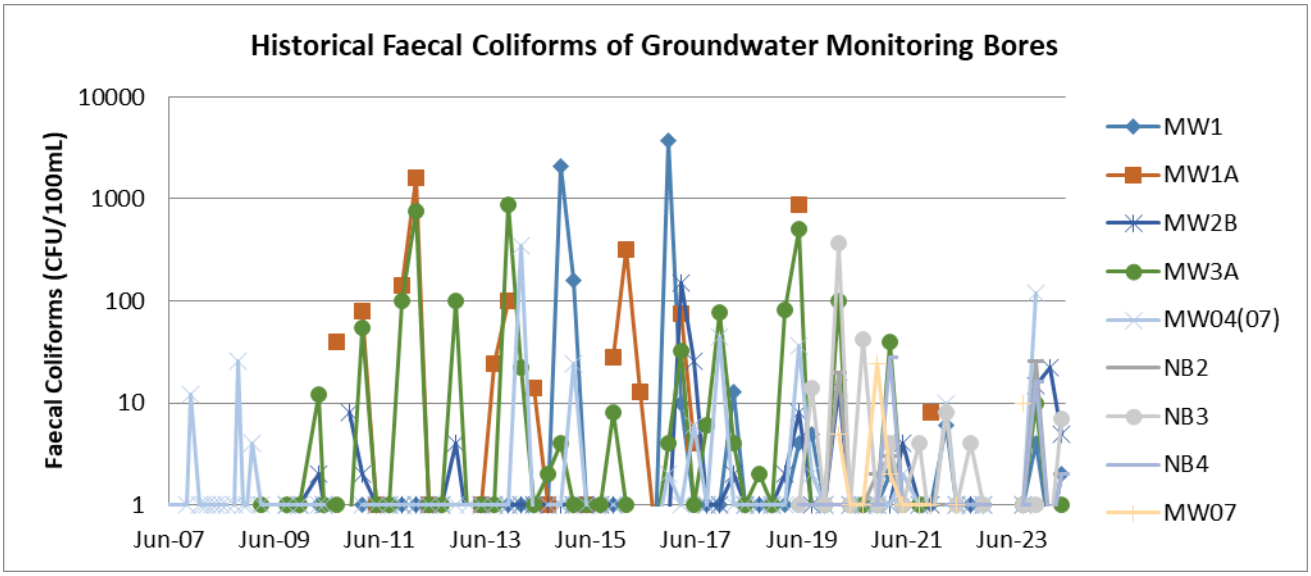


Chlorophyll-A can fluctuate greatly with plant materials being flushed into the system and any results away from the low levels generally observed can be attributed to tree and leaf matter after windy or rainy periods. The chlorophyll-A levels for the reporting period were within the objective level and historical ranges for the respective bores and were all below the limit of reporting. As such, the summary table has not been included in this report.

Faecal Coliforms (median number/100mL)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	<1	2	4	<1	110	3700	<1000	n/a
MW1A	No Data Available			<1	159	1600	<1000	n/a
MW2B	<2	11	22	<1	5	150	<1000	n/a

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW3A	<1	3	10	<1	53	890	<1000	n/a
MW04(07)	<2	61	120	<1	8	350	<1000	n/a
NB2	<1	7	26	<1	2	20	<1000	n/a
NB3	<1	2	7	<1	28	370	<1000	n/a
NB4	<1	5	16	<1	3	28	<1000	n/a
MW07	<1	5	10	<1	4	24	<1000	n/a

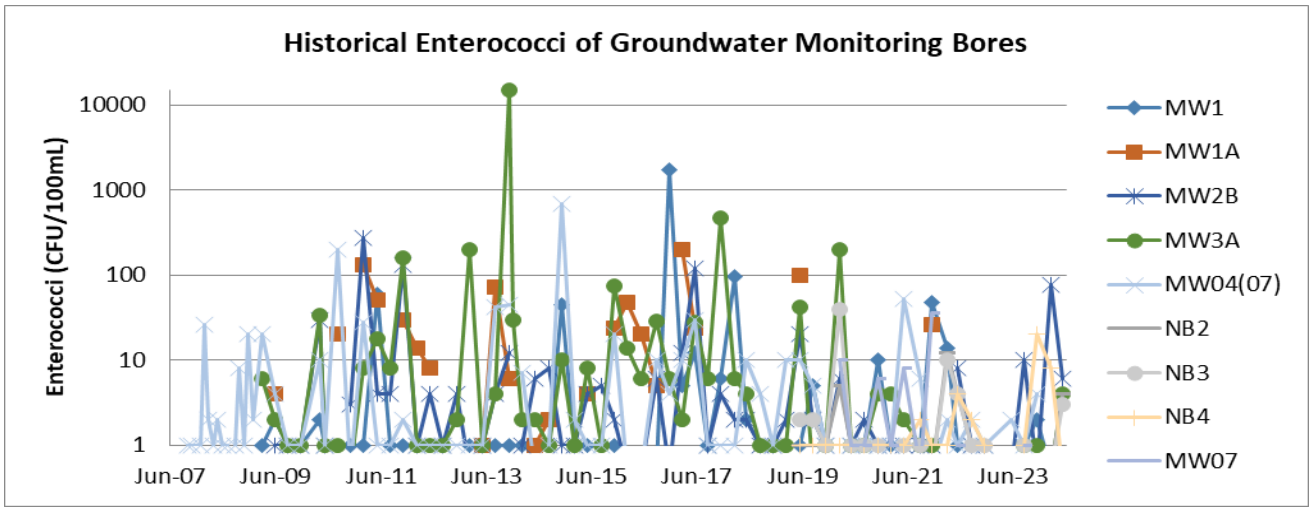


Faecal coliforms were within the objective levels during the reporting period, and also the historical ranges with the exception of one sample from NB2 which was slightly above the historical range, albeit still at low levels. Note a logarithmic scale has been applied to the graph above to improve interpretation.

Enterococci (median number/100mL)

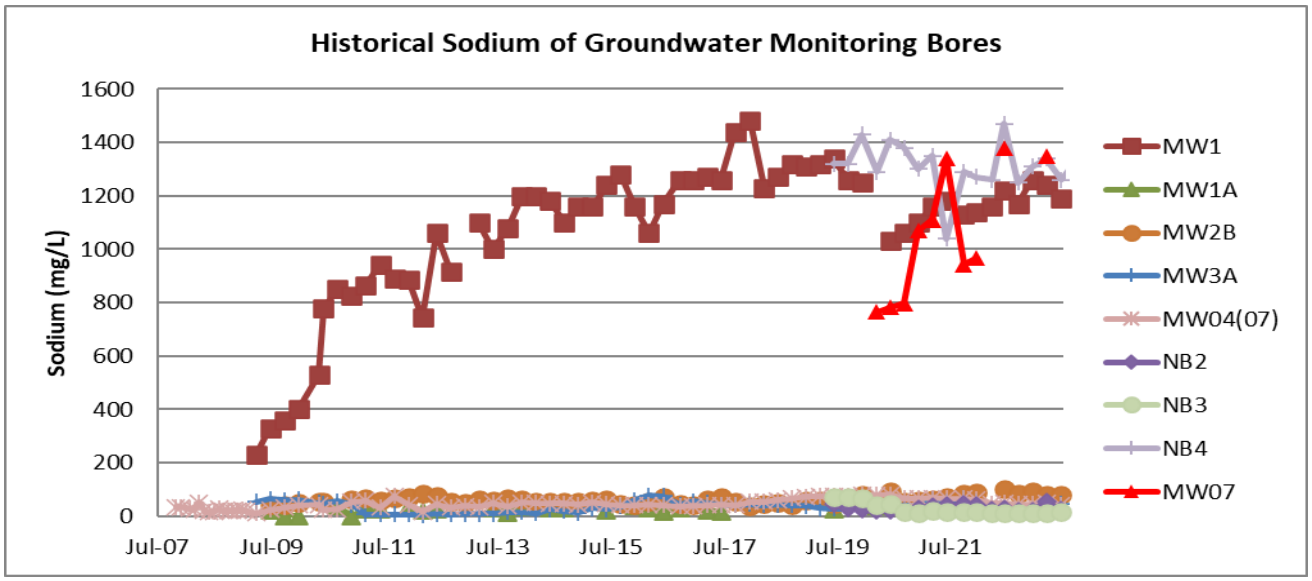
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	<1	<2	2	<1	37	1700	<230	n/a
MW1A	No Data Available			<2	38	200	<230	n/a
MW2B	<1	23	77	<1	13	270	<230	n/a
MW3A	<1	2	4	<1	304	15000	<230	n/a
MW04(07)	<2	3	4	<1	18	680	<230	n/a
NB2	<1	2	4	<1	2	12	<230	n/a
NB3	<1	<2	3	<1	4	39	<230	n/a
NB4	<1	7	20	<1	1	4	<230	n/a
MW07	<2	19001	38000	<1	7	36	<230	n/a

Enterococci concentrations were within the objective levels and the historical ranges during the reporting period, with the exception of a single result for NB4 which was above the historical range for this bore, and a single result for MW07, which was above the historical range and objective level. Note a logarithmic scale has been applied to the graph below to improve interpretation.



Sodium (mg/L)

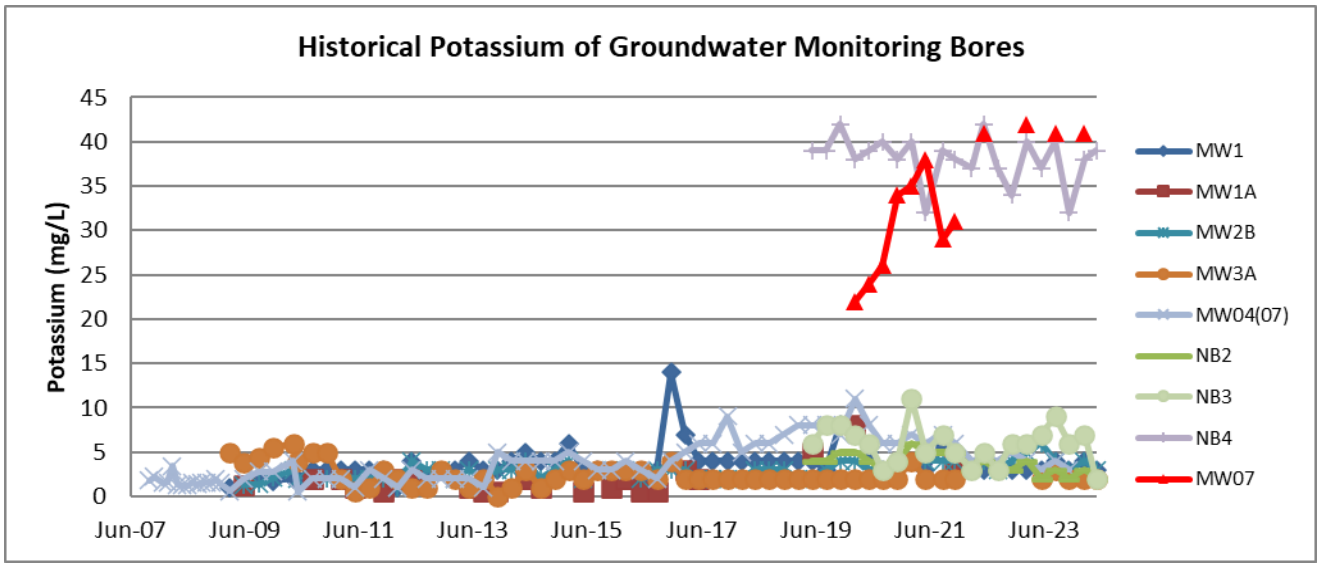
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1,030	1,123	1,180	230	1,072	1,480	< 400	n/a
MW1A	No Data Available			14	27	36	< 400	n/a
MW2B	80	85	90	38	62	101	< 400	n/a
MW3A	35	39	47	4	36	77	< 400	n/a
MW04(07)	41	44	46	11	45	81	< 400	n/a
NB2	10	20	31	21	31	53	< 400	n/a
NB3	10	13	17	10	27	72	< 400	n/a
NB4	1,140	1,248	1,330	1,040	1,311	1,470	< 400	n/a
MW07	1,230	1,250	1,270	765	1,050	1,380	< 400	n/a



With the exception of boreholes MW1, NB4 and MW07, sodium concentrations recorded in the monitoring network were within the DC objective, and consistently at low levels. Concentrations in the new bores NB4 and MW7 were recorded significantly above the DC objective, however, represent background levels for these sites due to the brackish influence from the Crooked River estuary. All sodium concentrations during the reporting period were generally consistent with the historical averages for the respective bores.

Potassium Ion (mg/L)

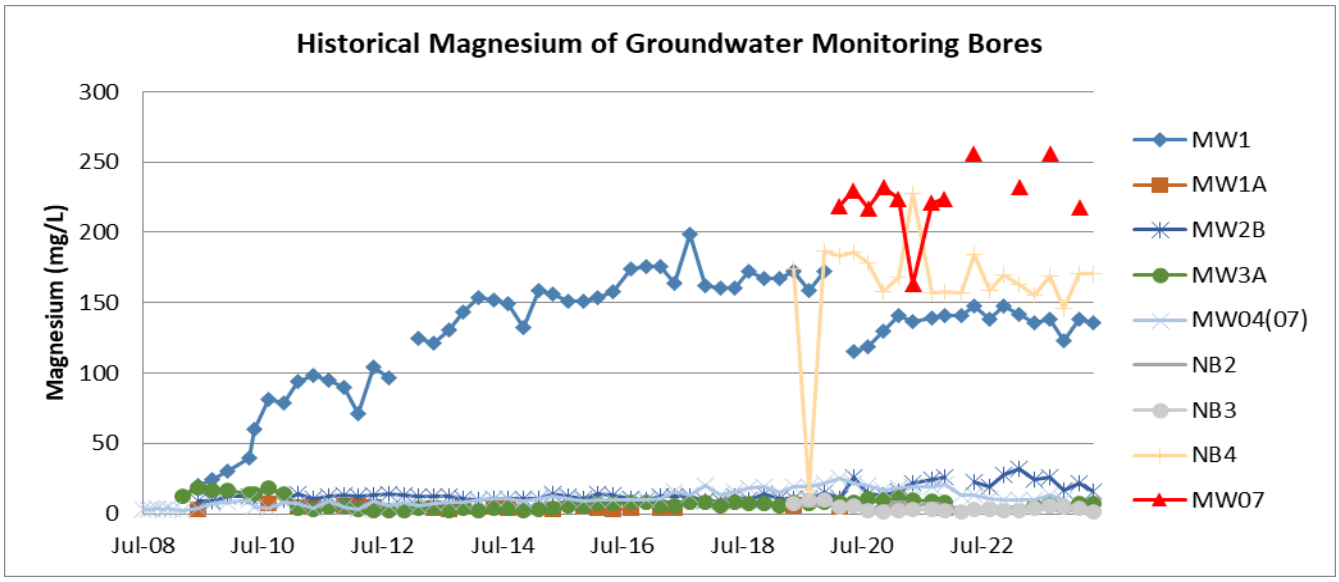
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	3	4	4	<1	4	14	< 50	n/a
MW1A	No Data Available			<1	2	8	< 50	n/a
MW2B	3	4	4	<1	3	6	< 50	n/a
MW3A	2	2	3	<1	3	6	< 50	n/a
MW04(07)	3	4	4	<1	4	11	< 50	n/a
NB2	2	3	3	2	4	6	< 50	n/a
NB3	2	6	9	3	6	11	< 50	n/a
NB4	32	37	40	32	38	42	< 50	n/a
MW07	41	41	41	22	32	42	< 50	n/a



Potassium ion concentrations in the original monitoring network have remained well below the DC objective level and were generally consistent with historical concentrations in the current reporting period. Concentrations in the newer monitoring bores NB4 and MW7 were recorded higher than the other sites however represent background levels for these sites due to the brackish influence from the Crooked River estuary.

Magnesium Ion (mg/L)

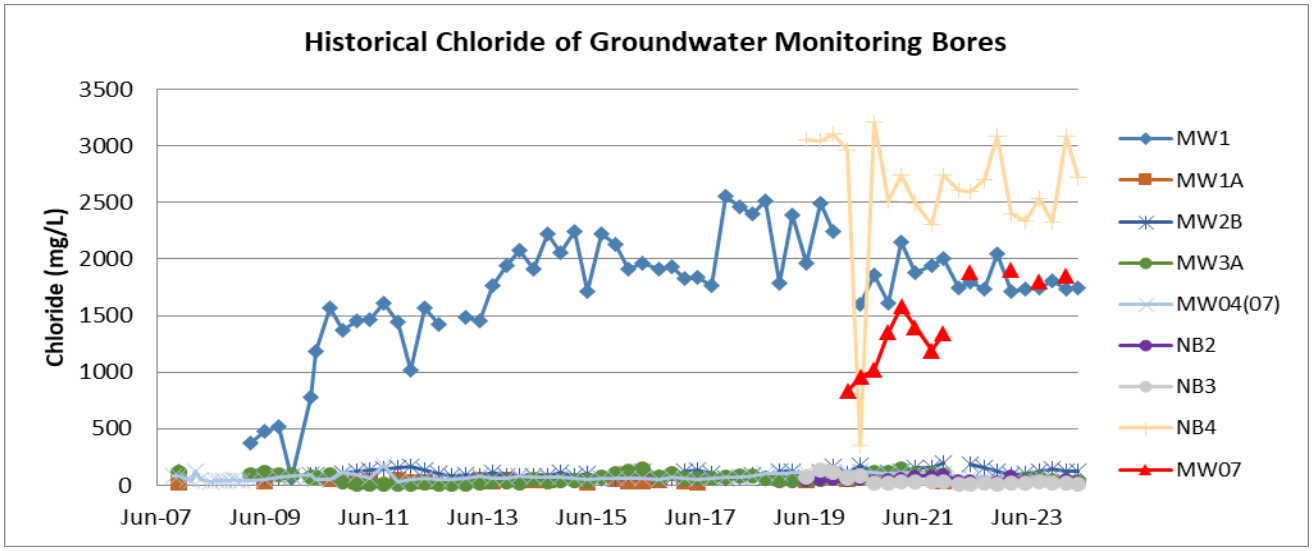
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	123	134	138	12	129	199	< 50	n/a
MW1A	No Data Available			3	5	7	< 50	n/a
MW2B	16	20	26	9	14	32	< 50	n/a
MW3A	5	7	7	2	7	18	< 50	n/a
MW04(07)	10	12	13	2.5	11	25	< 50	n/a
NB2	2	3	4	2	5	8	< 50	n/a
NB3	1	4	6	1	4	10	< 50	n/a
NB4	146	164	171	17	164	228	< 50	n/a
MW07	218	237	256	163	224	256	< 50	n/a



All magnesium ion concentrations were within the DC objective level with the exception of MW1, NB4, and MW07, which have followed similar trends as for conductivity and sodium. All samples were within the historical ranges for the respective sites.

Chloride Ion (mg/L)

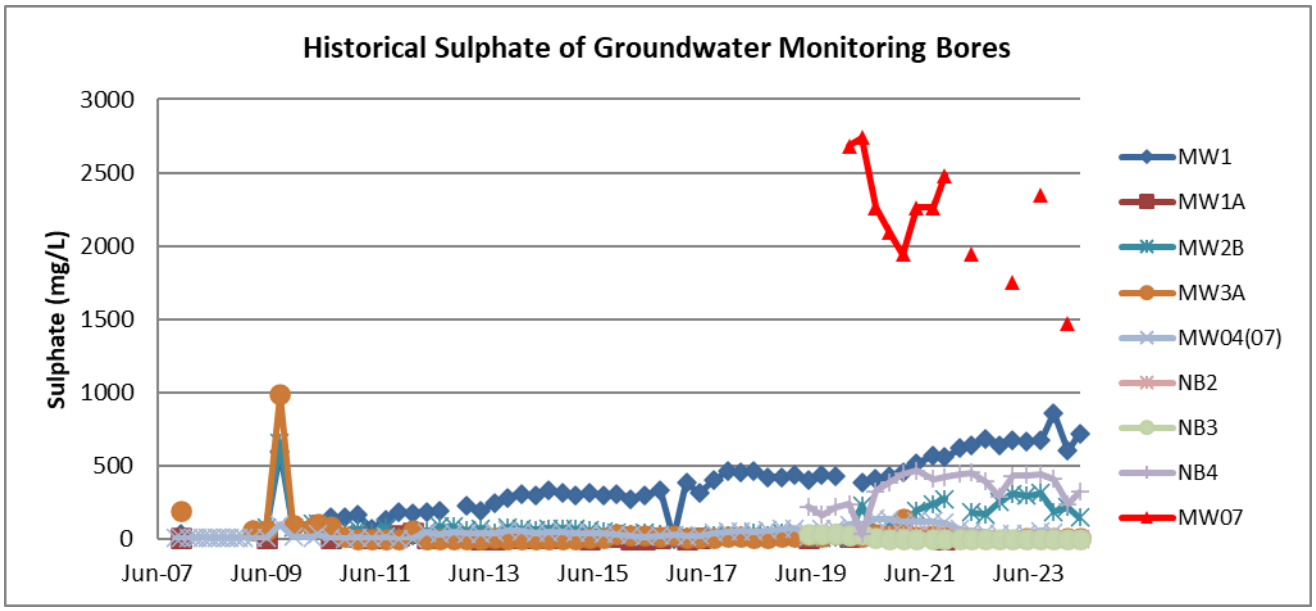
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1,730	1,755	1,810	60	1,708	2,550	< 300	n/a
MW1A	No data available			18	38	56	< 300	n/a
MW2B	125	131	144	57	110	198	< 300	n/a
MW3A	35	44	60	8	63	146	< 300	n/a
MW04(07)	64	71	78	33	74	172	< 300	n/a
NB2	21	35	51	26	51	90	< 300	n/a
NB3	10	22	29	12	43	135	< 300	n/a
NB4	2,330	2,665	3,080	351	2,602	3,210	< 300	n/a
MW07	1,800	1,825	1,850	832	1,345	1,900	< 300	n/a



All chloride ion concentrations were within the DC objective level with the exception of MW1, NB4, and MW07, which have followed similar trends as for conductivity and sodium. All samples were generally within the historical ranges for the respective sites. Site MW1 continues to be affected by brackish water from the Berry Siltstone, while bores NB4 and MW07 have been influenced by brackish water from the Crooked River estuary.

Sulphate Ion (mg/L)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	602	715	863	4	335	686	< 250	n/a
MW1A	No Data Available			<1	11	48	< 250	n/a
MW2B	148	217	316	8	93	660	< 250	n/a
MW3A	9	11	12	<1	46	990	< 250	n/a
MW04(07)	46	52	57	<1	40	138	< 250	n/a
NB2	5	5	5	<1	19	34	< 250	n/a
NB3	<1	1	4	<1	12	38	< 250	n/a
NB4	240	353	440	34	341	468	< 250	n/a
MW07	1,470	1,910	2,350	1,750	2,240	2,740	< 250	n/a

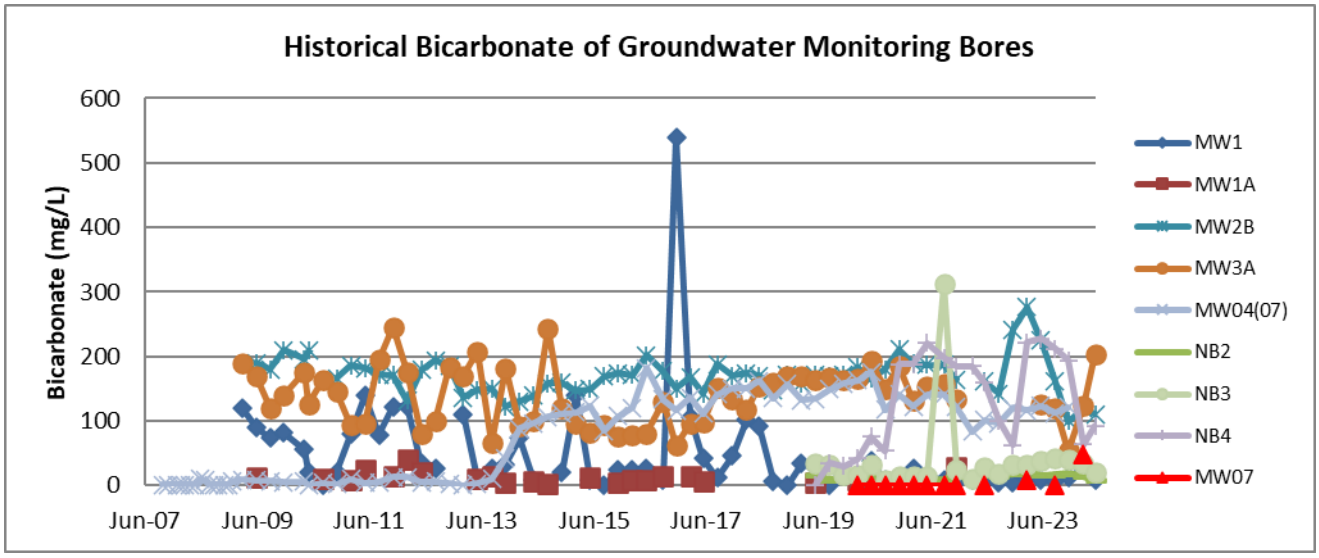


With the exception of MW1, all results were within the historical ranges for the respective bores, while MW1 was affected by one higher result in December 2023, which since returned to the typical range for this bore. Other bores have continued to show considerable variability in the current reporting period, which is likely related to rainfall infiltration to the groundwater table that has seen lower major ion concentrations in recent years. The concentration of sulphate in bores MW1, MW2B, NB4 and MW7 were outside of the DC objectives for one or more of the samples during the reporting period.

Bicarbonate Ion (mg/L)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	6	14	28	<1	49	540	< 750	n/a
MW1A	No Data Available			3	13	40	< 750	n/a

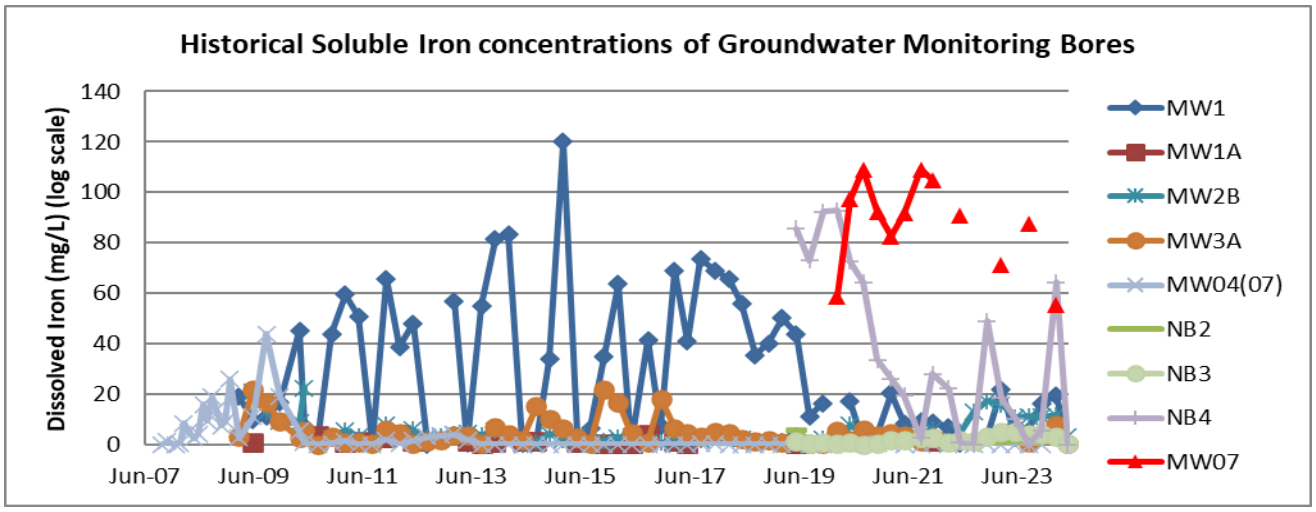
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW2B	99	122	161	122	174	276	< 750	n/a
MW3A	54	125	204	62	140	246	< 750	n/a
MW04(07)	112	117	121	<1	70	182	< 750	n/a
NB2	8	15	19	7	13	26	< 750	n/a
NB3	20	34	42	8	40	312	< 750	n/a
NB4	64	141	212	1	128	228	< 750	n/a
MW07	<1	24	48	<1	1	8	< 750	n/a



Bicarbonate concentrations remained below the objective level in all groundwater bores during the current reporting period. All bores have continued to show some inherent variability, with samples not exceeding the DC objectives. These are within expected and historical variabilities, and as such does not reflect a deterioration in groundwater quality.

Soluble Iron Ion (mg/L)

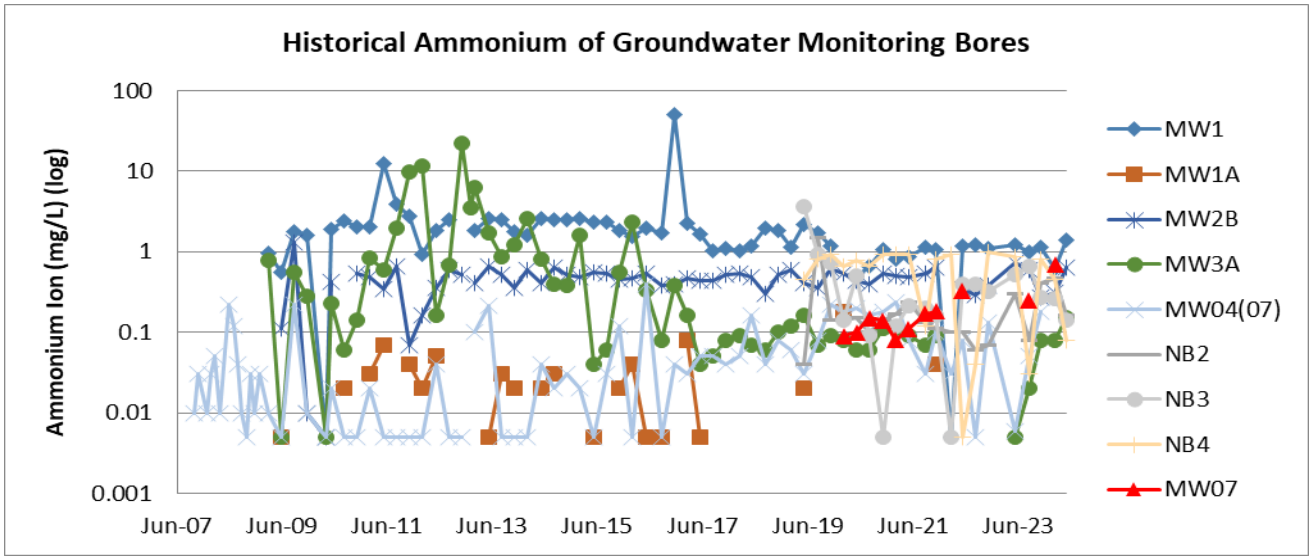
BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	0.07	10.5	19.5	0.16	30.1	120	< 6	0.07
MW1A	No Data Available			0.4	1.5	4.4	< 6	n/a
MW2B	3.25	9.3	11.7	0.1	4.9	22.5	< 6	n/a
MW3A	0.36	3.2	7.72	0.18	5.0	22	< 6	n/a
MW04(07)	0.07	0.1	0.11	<0.05	3.2	44	< 6	n/a
NB2	0.58	1.4	2.33	0.8	2.0	6.02	< 6	n/a
NB3	0.57	3.0	4.26	0.25	1.9	5.08	< 6	n/a
NB4	<0.05	17.5	64.4	<0.05	40.7	92.7	< 6	n/a
MW07	55.4	71.6	87.7	58.9	90.7	109	< 6	n/a



The dissolved iron concentrations were above the objective level for several bores at times during the current reporting period. This is a common phenomenon, with the graph above showing significant fluctuations throughout the historical period of monitoring for all bores. This historical trend has continued in the current reporting period. The concentrations of dissolved iron in all bores for the reporting period are within the historical range for the respective bores, with the exception of individual results for some bores lower than the historical range.

Ammonium Ion (mg/L)

BORE HOLE	2023/24 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	0.61	1.04	1.39	<0.01	2.69	49.50	< 0.02	n/a
MW1A	No Data Available			<0.01	0.03	0.18	< 0.02	n/a
MW2B	0.27	0.46	0.64	<0.01	0.46	1.30	< 0.02	n/a
MW3A	0.02	0.08	0.15	<0.01	1.39	22.30	< 0.02	n/a
MW04(07)	<0.01	0.09	0.18	<0.01	0.06	0.40	< 0.02	n/a
NB2	0.08	0.28	0.47	0.04	0.22	1.49	< 0.02	n/a
NB3	0.14	0.33	0.66	<0.01	0.52	3.67	< 0.02	n/a
NB4	0.03	0.35	0.82	<0.01	0.68	0.99	< 0.02	n/a
MW07	0.25	0.48	0.70	0.08	0.15	0.33	< 0.02	n/a



Ammonium ion concentrations were consistently above the objective level during the current reporting period, however within historical levels for all bores in the original monitoring network with the exception of one sample from MW07. This indicates that there is no deterioration in groundwater quality as a result of dredging operations. Note a logarithmic scale has been applied to the graph above to improve interpretation.

4.2.4. Groundwater Monitoring Results Interpretation

From the data gathered as part of the groundwater monitoring program for the Gerroa Sand Resource, groundwater quality has for the most part remained relatively stable during the current reporting period. Higher concentrations of major ions were observed in bores close to Blue Angle Creek, which is likely attributable to the effect of tidal influence from the Crooked River estuary, and reflecting the background variability of the environment.

Monitoring bore MW1 is connected to the Berry Siltstone aquifer, which forms the topographical high to the southwest of the project area. The Berry Siltstone aquifer is a slightly brackish groundwater system, with a relative deficiency of potassium, which is reflected in the monitoring results of MW1. Historical monitoring from this bore shows that higher salinity and major ion concentrations have been observed at various times since 1993. These records show that many of the water quality objectives in the Development Consent are not appropriate for this bore, given the inherent natural variability at the interface of the Berry Siltstone aquifer and alluvial aquifer. Nevertheless, the current monitoring program is well placed to both monitor any variations in groundwater quality over time, as well as monitoring the spatial distribution of any brackish influence in the vicinity of the dredging operation. Two of the newer monitoring bores (NB4 and MW7) also show brackish influences, however with commensurate elevated concentrations of potassium, which suggest influences from the tidal Crooked River estuary at these sites. It is possible that bore NB2 may also experience some saline influence due to its close proximity to Blue Angle Creek, however this has not been detected in the limited monitoring record for this bore to date.

One of the key observations made during previous annual reviews revolved around the shortcomings of the current groundwater quality objectives and their applicability to the natural groundwater regime of the site. The objectives are derived from previous surface water quality objectives for NSW, and are not directly relevant to groundwater. This is highlighted by the presence of iron sulphides in the local geology, which has contributed to a number of bores regularly and naturally recording pH levels below the objective range, and soluble iron concentrations above the objective level. Similarly, concentrations of nitrogen and phosphorus in the groundwater are regularly higher than the objective levels, despite no forms of these substances used or artificially generated on site as part of extraction activities. Nitrogen and phosphorus concentrations in the surface water of the dredge pond are typically far lower than that recorded in the groundwater monitoring network, supporting determinations that extraction activities are not contributing to the observed concentrations of these analytes in the groundwater. For these reasons, the objective levels of these analytes do not suitably reflect the natural groundwater regime, and comparison with historical results provides a far better method of detecting any changes to groundwater quality as a result of dredging and associated activities.

The current groundwater monitoring program is suitable for monitoring any spatial or temporal changes in the groundwater quality and quantity in the local environment. Current procedures allow for an accurate representation of any longer term trends in groundwater quality and availability.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to groundwater in the 2023-2024 reporting period.

4.3. Surface Water Management

4.3.1. Standards and Performance Measures

There are no specific requirements for surface water quality in the sites EPL other than with regard to discharges from the site, as detailed below:

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1		Discharge to waters	The end of the "Overflow Pipe" from the dredge pond as labelled on the map titled "Gerroa Sand Resource" dated 7/12/11 and held on EPA file 281283A8.

The overflow pipe indicated is licenced in case of extreme wet weather in which flood water would be allowed to drain to the adjacent Foy's Swamp. To date the dredge pond water has never required use of the overflow pipe.

The surface water monitoring requirements from the DC are realised by the sites QEMP. Section 8.5 of the QEMP details the surface water monitoring requirements and specifies that the dredge ponds and Blue Angle Creek require daily water level and pH measurements, as well as monthly monitoring for various analytes in both dredge ponds, Blue Angle Creek, and the processing returns line. The EA predicted that the project is not predicted to lead to any deterioration of the water quality of the dredge pond, or the surrounding area.

The surface water quality objectives for the dredge ponds which CB should "aim to meet" from the DC (and adopted in the QEMP) are as follows:

Analyte	Units	Objective
Turbidity	NTU	5 - 20
pH	pH	6.0 – 8.5
Salinity	µS/cm	<1,500
Dissolved Oxygen	mg/L	>6
Total Phosphorus	µg/L	<30
Total Nitrogen	µg/L	<350
Chlorophyll-A	µg/L	<5
Faecal Coliforms	Median No./100 mL	<1,000
Enterococci	Median No./100 mL	<230
Algae & BGA	No. Cells/mL	<15,000
Sodium	mg/L	<400
Potassium	mg/L	<50
Magnesium	mg/L	<50
Chloride	mg/L	<300
Sulphate	mg/L	<250
Bicarbonate	mg/L	<750
Soluble Iron	mg/L	<6
Ammonium	mg/L*	<0.02

* objective amended from 20 mg/L to 20 µg/L (0.02 mg/L) as part of Modification 1

4.3.2. Environmental Performance

CB has implemented the Surface Water Monitoring Program to meet the requirements of the DC. ALS Laboratory Group were engaged during the reporting period to conduct monthly and quarterly sampling and testing of the surface water monitoring sites. Automatic monitoring stations recording water level and pH were also operating in both dredge ponds and the downstream site on Blue Angle Creek. Additional management and monitoring of surface water resources to assess potential impact from acid sulphate soils are detailed in Section 4.4.

4.3.3.Surface Water Monitoring

A summary of surface water monitoring results for the period is tabulated in this section, with the range and average of each analyte displayed alongside the historical range and average, objectives as described in the DC, and any EA predictions. Units of reporting are listed in the table in Section 4.3.1. Graphs are also included to show trends in all analytes over the historical period of monitoring in the dredge pond. Where surface water monitoring results trend outside of the historical range or DC objectives, these are discussed after each graph.

Existing Dredge Pond

Existing Dredge Pond Analyte	2023/2024 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
Conductivity	382	481	582	376	660	1,040	< 1,500	N/A
pH	7.3	7.7	8.0	6.4	7.8	8.8	6 - 8.5	N/A
Total Algae	650	105,345	395,000	525	128,951	2,070,000	< 15,000	N/A
Cyanophyta	<5	5,579	18,300	<1	103,950	2,070,000	< 15,000	N/A
Total phosphorus	20	95	220	<10	44	790	< 30	N/A
Total nitrogen	500	1,100	2,100	40	635	6,900	< 350	N/A
Chlorophyll-a	<2	11	37	<1	7	49	< 5	N/A
Faecal coliforms	10	119	400	<2	101	2,100	< 1,000	N/A
Enterococci	<2	5	13	<2	39	690	< 230	N/A
Sodium	49	53	59	33	55	91	< 400	N/A
Potassium ion	4	5	6	1	5	8	< 50	N/A
Magnesium ion	11	13	15	9	14	22	< 50	N/A
Calcium ion	23	31	38	40	42	43	N/A	N/A
Chloride	61	74	91	16	84	140	< 300	N/A
Sulphate ion	62	68	75	25	106	1,300	< 250	N/A
Bicarbonate ion	50	66	82	1	99	313	< 750	N/A
Soluble iron ion	<0.05	<0.05	<0.05	<0.05	0.031	0.36	< 6	N/A
Ammonium ion	<0.01	<0.01	0.020	<0.01	0.031	0.360	< 0.02	N/A
Turbidity	55	123	184	1	12	98	1 - 20	N/A
DO (mg/L)	5.8	9.1	13.2	2.2	8.7	11.3	> 6	N/A
DO (%)	58	96	170	26	96	125	80-110	N/A

All the water quality analytes met the objective levels, with the exception of turbidity, dissolved oxygen, and the nutrient species. The nutrient species are likely elevated due to the historical and present agricultural land use of the surrounding area, with nitrogen and phosphorus elevated in the groundwater due to these land uses. Turbidity is elevated due to the increased fines generation associated with extraction from the new dredge pond, however with the flood bunds preventing any overflows, does not pose a risk to the surrounding surface water resources. Lower dissolved oxygen concentrations have been recorded for short periods of time, with the DO returning close to full saturation in following months.

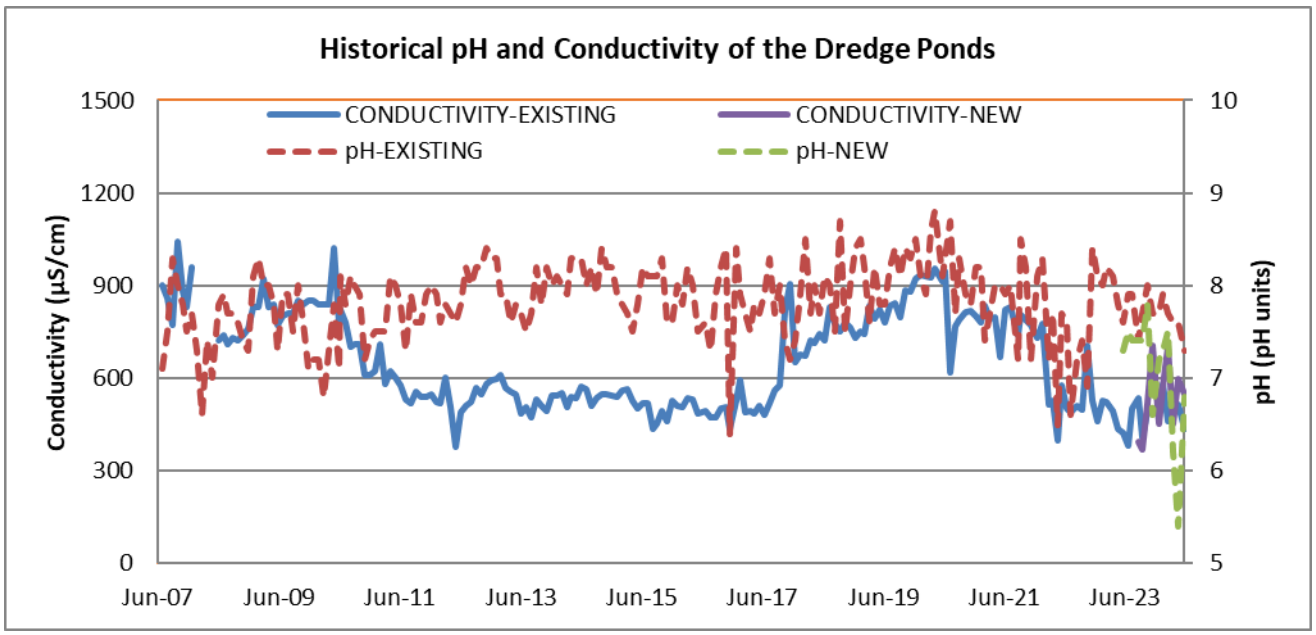
New Dredge Pond

New Dredge Pond Analyte	2023/2024 Reporting Period			DC Objectives	EA Predictions
	Min	Ave	Max		
Conductivity	367	568	715	<1,500	N/A
pH	5.4	7.0	7.8	6-8.5	N/A
Total Algae	750	8,908	24,300	<15,000	N/A
Cyanophyta	3	3,288	8,550	<15,000	N/A
Total phosphorus	<50	100	190	<30	N/A
Total nitrogen	600	1,025	1,500	<350	N/A
Chlorophyll-a	<1	<2	2	<5	N/A
Faecal coliforms	6	158	560	<1,000	N/A
Enterococci	1	15	48	<230	N/A
Sodium	47	72	103	<400	N/A
Potassium ion	4	6	7	<50	N/A
Magnesium ion	11	15	17	<50	N/A
Calcium ion	32	42	68	N/A	N/A
Chloride	67	117	164	<300	N/A
Sulphate ion	65	114	195	<250	N/A
Bicarbonate ion	28	50	71	<750	N/A
Soluble iron ion	<0.05	0.27	2.72	<6	N/A
Ammonium ion	0.02	0.04	0.07	<0.02	N/A
Turbidity	55	193	351	5-20	N/A
DO (mg/L)	4.3	8.3	11.5	>6	N/A
DO (%)	44	87	128	80-110%	N/A

Water quality of the new dredge pond was generally consistent with that of the old dredge pond, which is as expected due to the regular return of water from the old dredge pond to the new dredge pond to maintain stable water levels. Similarly to the old dredge pond, all the water quality analytes met the objective levels, with the exception of the nutrient species, turbidity, and DO. In addition, pH was recorded below the objective level in May 2024, which is further discussed in the section on acid sulphate soils, and which returned to the typical levels following lime treatment. The nutrient species are likely elevated due to the farming land use of the surrounding area, with nitrogen and phosphorus elevated in the groundwater due to these land uses. Turbidity is elevated due to the current small dredge pond and dredging activity close to the sampling point, however with the flood bunds preventing any overflows, does not pose a risk to the surrounding surface water resources.

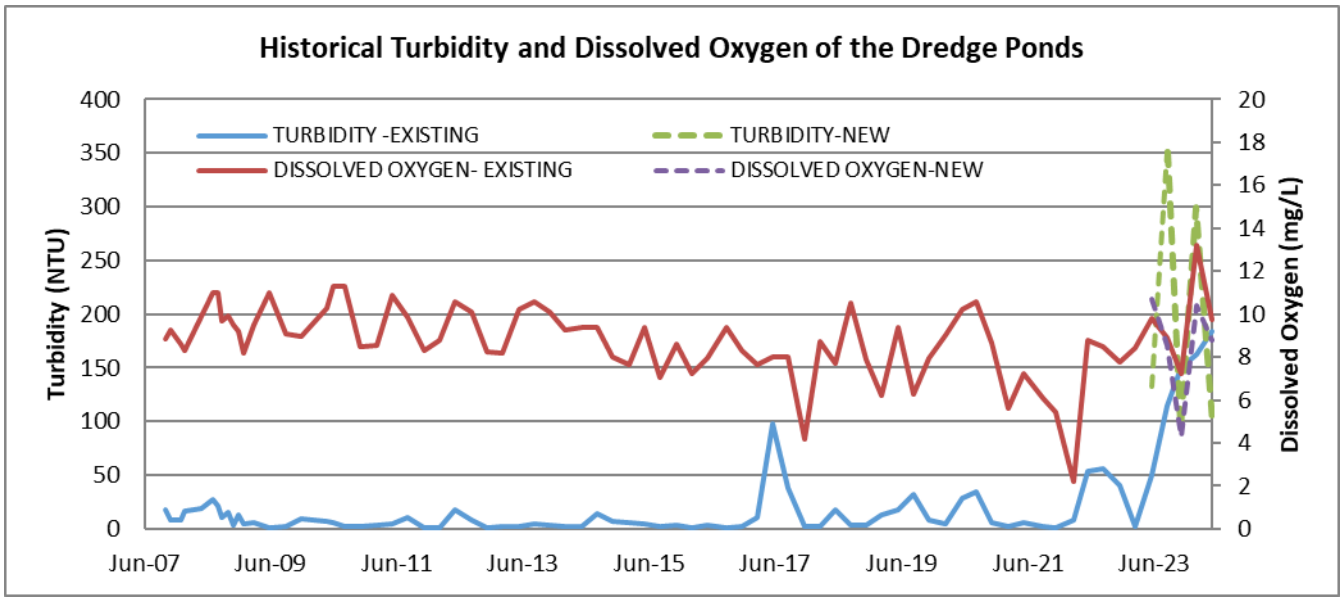
Graphs of the historical trends of each of the analytes for both dredge ponds are included below.

pH and Electrical Conductivity



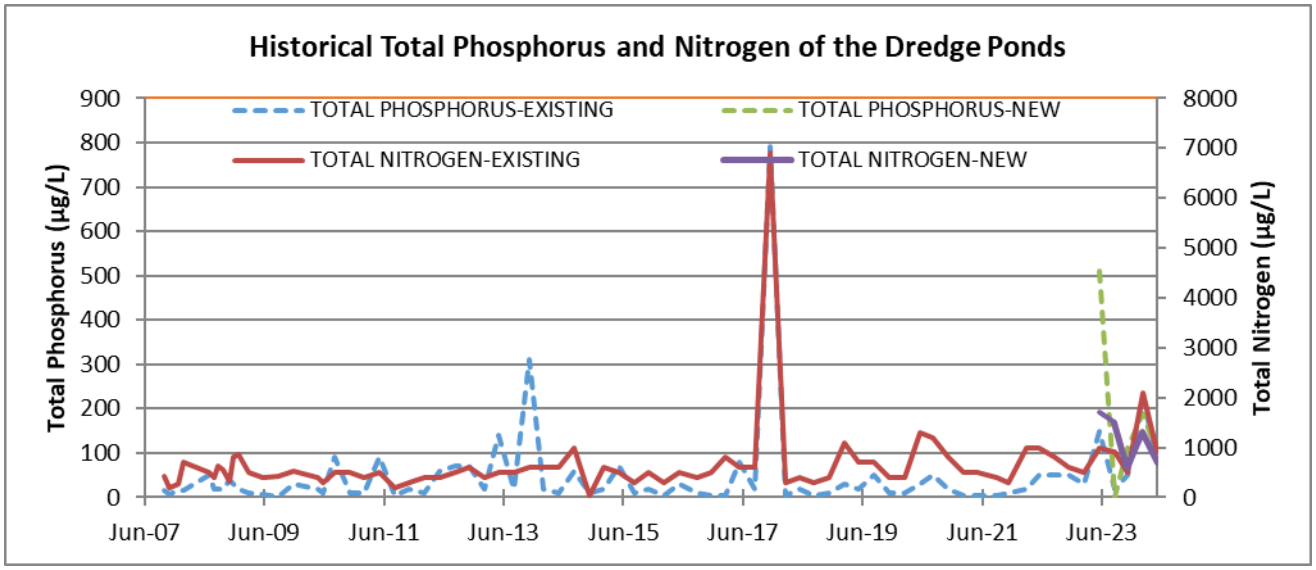
In the current reporting period, the pH of the existing dredge pond has shown variability consistent with the longer term patterns. The new dredge pond recorded a lowering in pH in May 2024, which returned to typical levels following lime treatment. EC has largely remained stable at the lower end of the historical range due to the continued above average rainfall. With the exception of the pH of the new dredge pond during May 2024, all pH and conductivity measurements were within the surface water quality objectives and the historical ranges during the reporting period.

Turbidity and Dissolved Oxygen



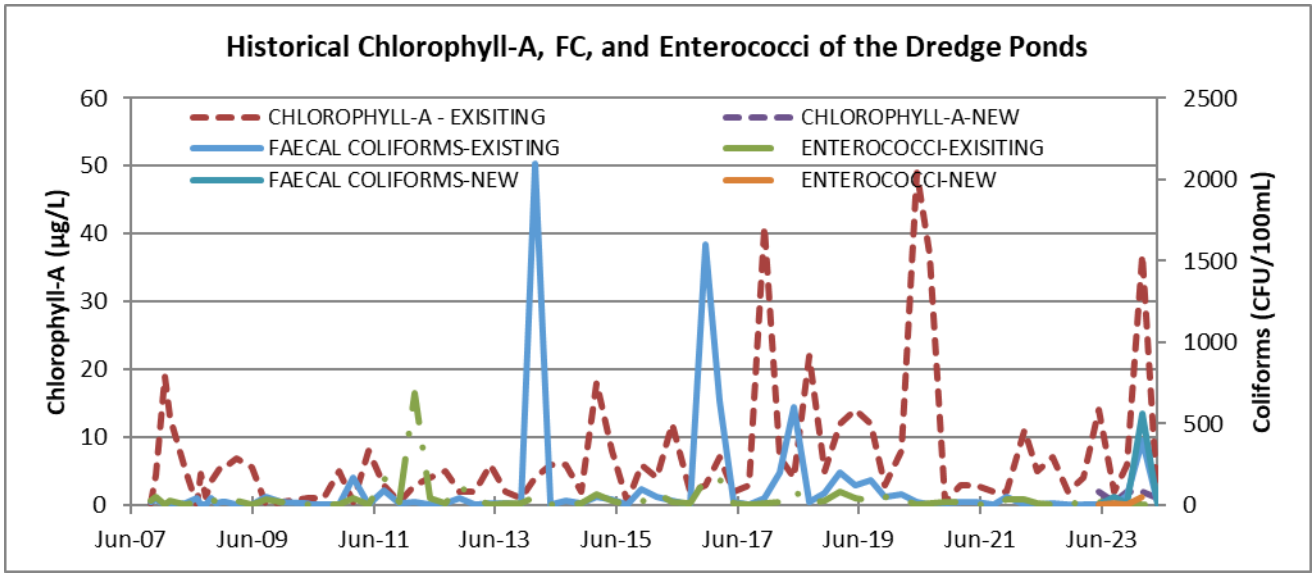
The turbidity of both dredge ponds has varied during the current reporting period due to extraction within the new dredge pond with a higher proportion of fines. The sampling point is close to the outflow of the existing dredge pond, and also the active area of the new dredge pond which has also influenced these measurements. Dissolved Oxygen also continued to record significant variations in concentrations during the reporting period due to the recirculation of water between the dredge ponds.

Total Phosphorus and Nitrogen



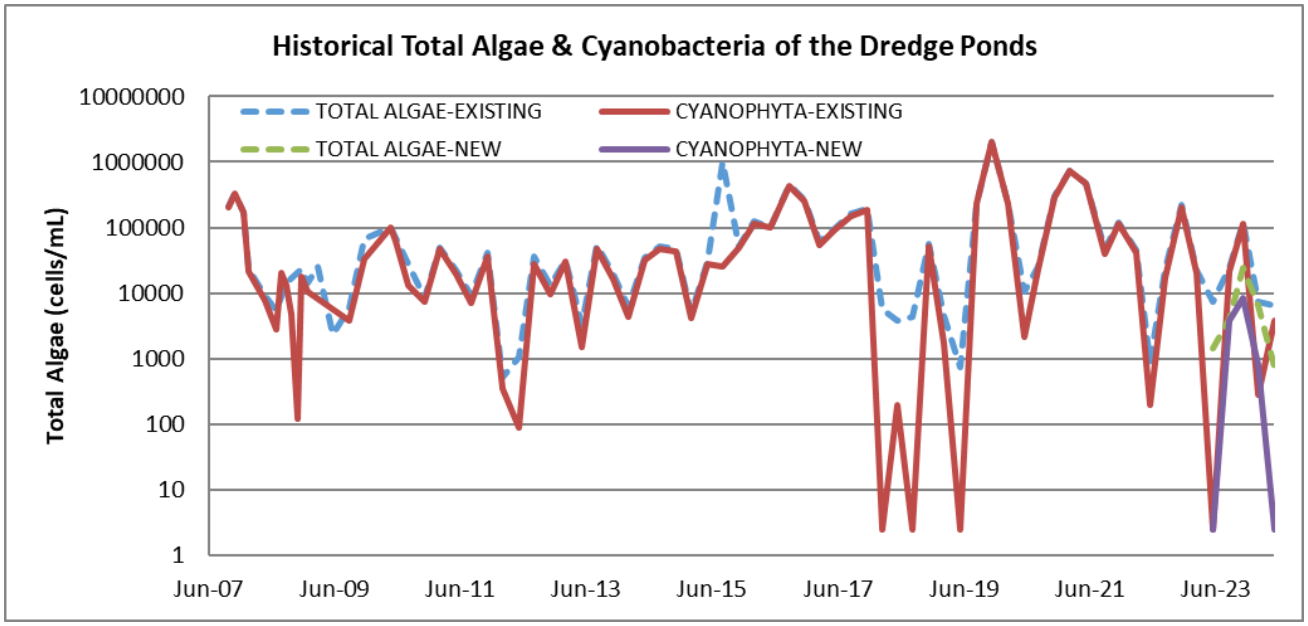
All nitrogen and phosphorus samples remained within the historical ranges for these analytes in the current reporting period, while concentrations of nitrogen and phosphorus were both above their respective objective levels at times during the reporting period. Nevertheless, concentrations of both nitrogen and phosphorus were consistent with longer term trends. This is reflective of the agricultural land use prevalent in the district, and unrelated to dredging operations.

Chlorophyll-A, Faecal Coliforms, and Enterococci



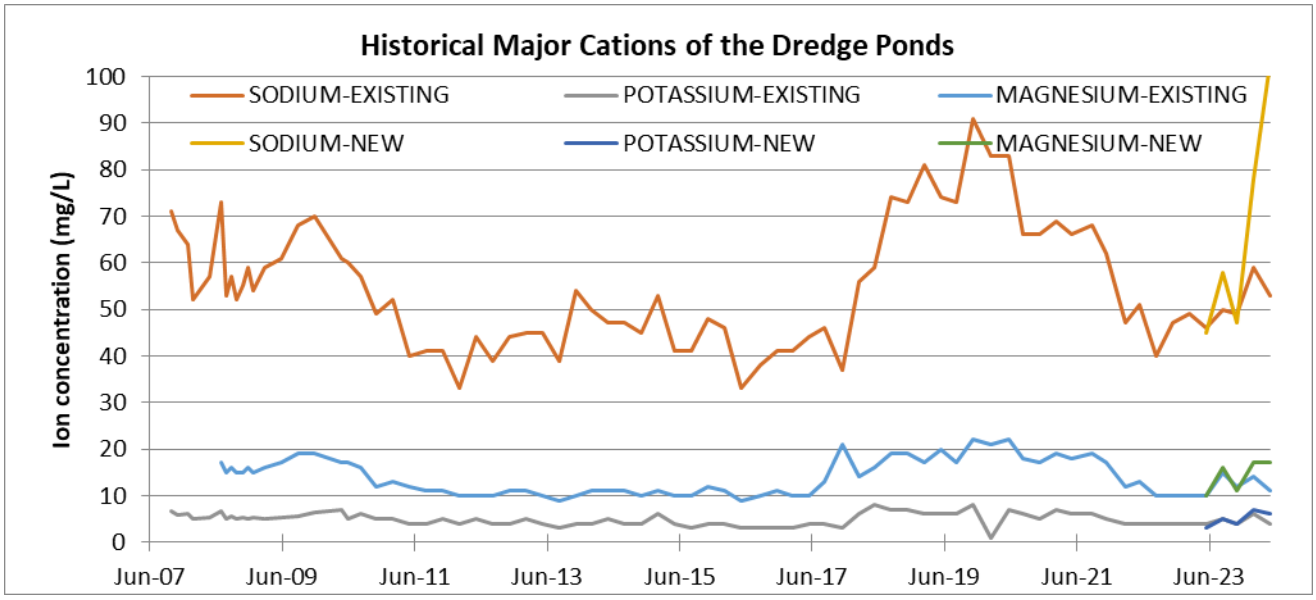
All chlorophyll-A, faecal coliform, and enterococci results were within the historical ranges for the respective analytes during the reporting period. Faecal coliforms and enterococci remained within the objective levels, while chlorophyll-A showed some variation, consistent with previous years, which can be attributed to the increased inflows to the dredge pond with the higher rainfall during the period.

Algae and Cyanobacteria



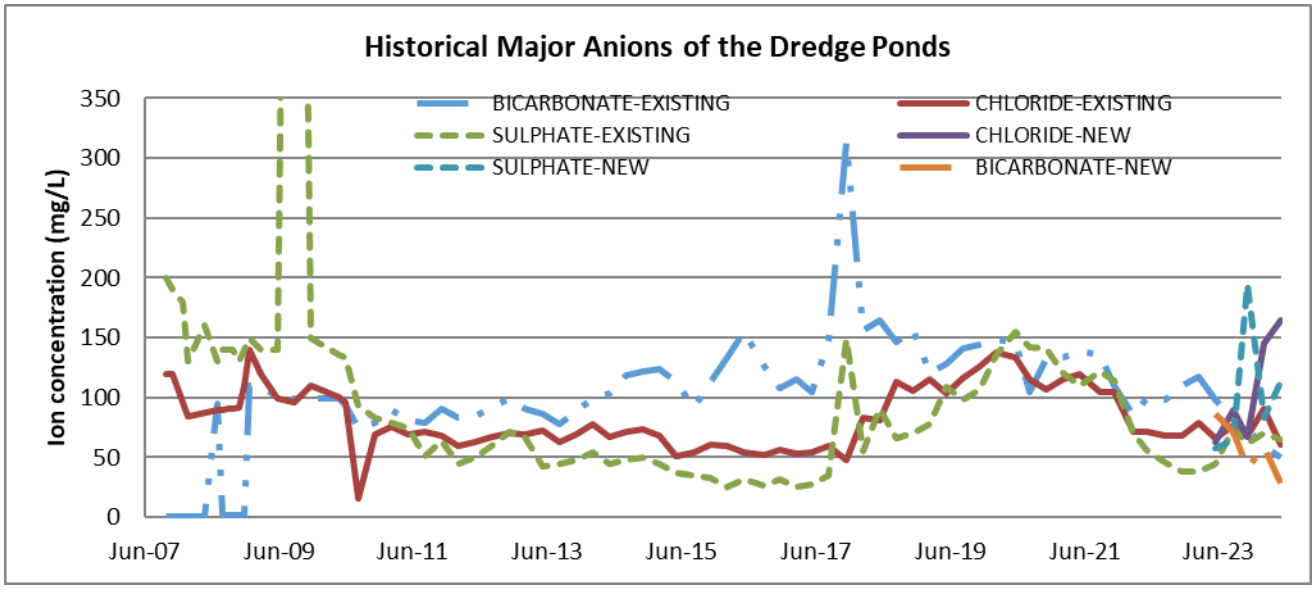
Total algae and cyanobacteria concentrations followed historical patterns, with seasonal fluctuations in concentrations of these microorganisms. Concentrations of both analytes were recorded above the objective levels during the year, which is consistent with historical results and does not reflect a decline in the water quality of the dredge ponds. Note a logarithmic scale has been applied to the graph above to improve interpretation.

Major Cations



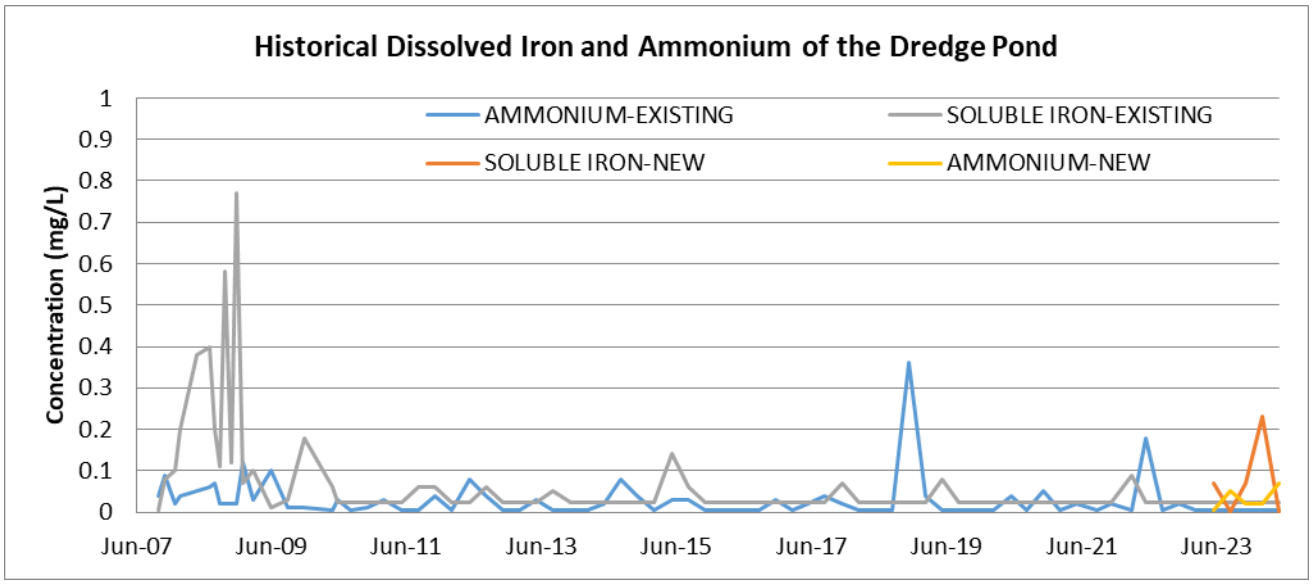
Sodium, magnesium, and potassium ion concentrations have generally stabilised at low concentrations in recent years following successive above average rainfall totals. The sodium concentration of the new dredge pond has shown a spike in the most recent sample, which appears to be related to low level brackish influence from the Crooked River estuary, and will be examined in future sample periods.

Major Anions



Concentrations of chloride, sulphate, and bicarbonate within the dredge ponds have remained well below the objective levels during the current reporting period and are consistent with historical levels. The concentration of chloride and sulphate ions have mirrored the increase in sodium in the latest sample period and will continue to be monitored closely.

Soluble Iron and Ammonium



Soluble iron and ammonium ion concentrations in the existing dredge pond have remained relatively stable and at low levels during the current reporting period, consistent with historical values, and within the objective levels. Concentrations of both analytes were consistently at or below the standard laboratory limit of reporting during the reporting period.

4.3.4.Surface Water Monitoring Results Interpretation

Surface water quality and water levels within the new dredge pond and the existing dredge pond continue to be driven by rainfall patterns. During the current reporting period this has included the continued high water levels in the existing dredge pond, coupled with the stabilisation of salinity and major ion concentrations at the lower end of their historical ranges. While the nutrient concentrations remained above the objective levels during the reporting period, there has been no unseasonal change observed in any biological parameters, including algae,

bacteria, or chlorophyll-a, all of which have remained relatively unchanged or simply followed their typical seasonal fluctuations.

While parameters were at times outside the water quality objectives for the site, all results were within the respective historical ranges for the existing dredge pond. The existing dredge pond continues to represent a surface water body of excellent water quality, with no observable impacts to water quality or levels as a result of dredging with the exception of the expected increase in turbidity.

The current surface water monitoring program is sufficient for monitoring any changes to the water quality of the dredge ponds. Current procedures allow for an accurate representation of any longer term trends in surface water quality and any potential impacts on surface and groundwater quality of the wider area.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to surface water in the 2023-2024 reporting period.

4.4. Acid Sulphate Soils Management

4.4.1. Standards and Performance Measures

There are no requirements for acid sulphate soils monitoring in the sites EPL.

The DC for the site requires an Acid Sulphate Management Plan to be prepared. This plan has been prepared and is included in the Water Management Plan (which forms part of the QEMP), and which requires a range of management and monitoring measures including:

- Lime treatment of stockpile base and dredge pond batters
- Lime treatment of excavated material and verification testing
- Direct piping of processing fines into deep sections of dredge pond
- Continuous monitoring of the pH of both dredge ponds and Blue Angle Creek.
- pH monitoring of stockpile leachate.
- Monitoring of groundwater and surface water for various parameters, which may influence, or be influenced by acid sulphate soils.

4.4.2. Environmental Performance

Cleary Bros has implemented the Acid Sulphate Soils Management Plan in the current reporting period to meet the requirements of the DC. Prior to commencing dredging in the modification area, a layer of lime was spread across the stockpile area and subsequently covered with processed sand. In addition, the processing fines outlet was upgraded at this time from the original surface runoff to a piped system that allowed for burial of fines in the dredge pond below the permanent water table. Continuous monitoring stations measuring water level and pH are installed in both dredge ponds and on Blue Angle Creek immediately above the floodgates. The monitoring station in the existing dredge pond includes two pH sensors to allow the measurement of pH near the surface as well as in the deeper water of the pond. These monitoring stations report data in real time to a central server and provide email alerts if pre-determined trigger levels are reached. No excavation or stockpiling of potential acid sulphate soils were undertaken during the reporting period, with all extraction via wet dredging only. The processed sand stockpile continued to be sampled monthly and tested for oxidisable sulphur.

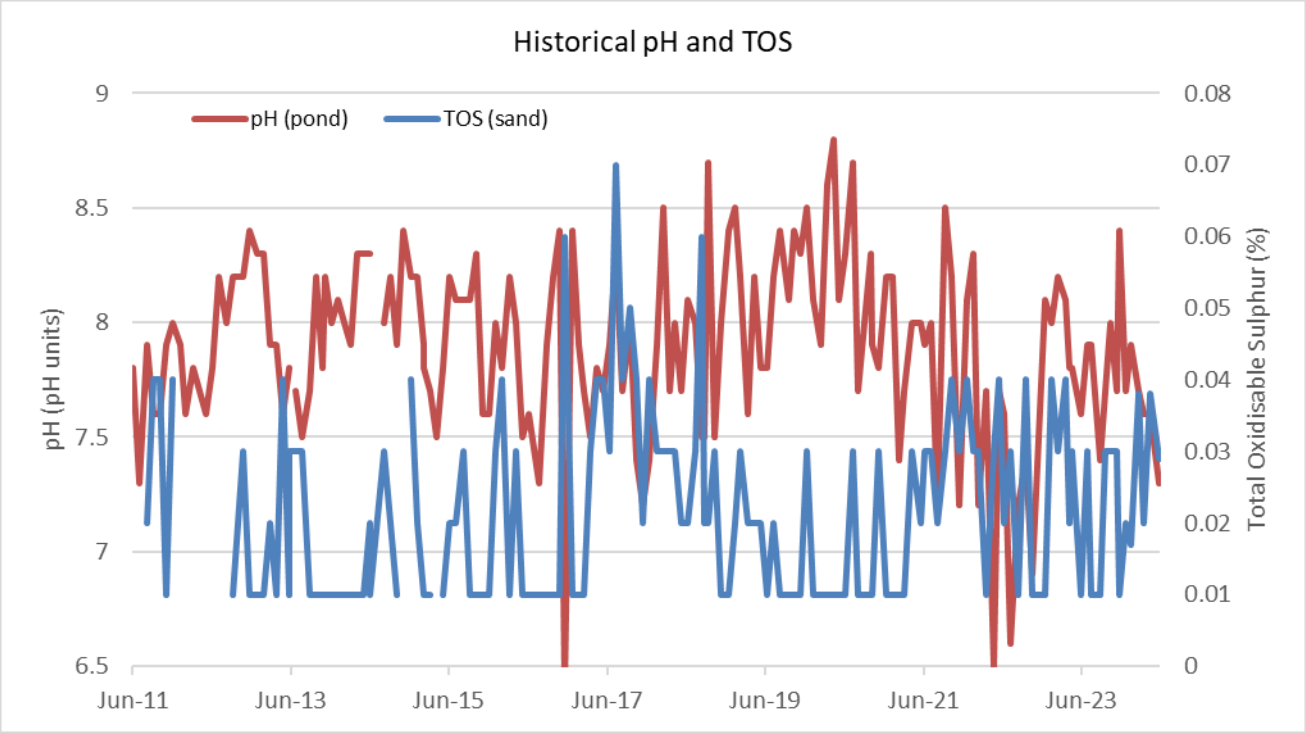
A reduction in pH was detected in the new dredge pond in April 2024, with the on-site stockpile of hydrated lime utilised to return the new dredge pond to the desired range, in line with the requirements of the ASSMP. Continued monitoring shows this has been effective with no further pH declines observed in the new dredge pond.

4.4.3.Acid Sulphate Soils Monitoring

Sand Stockpile and monthly water monitoring

Progressive pH testing of water in the existing dredge pond has not yet identified any results outside the desired range of 6.5 – 9 pH units in the current reporting period. During the year, the constituency of the sand has shown minor variability, as dredging continues through areas previously dredged and with the commencement of dredging in the modification area, however all testing of total oxidisable sulphur (TOS) returned low levels with a maximum of 0.04 recorded. A summary of the results of TOS of the extracted sand and pH of the dredge pond water is shown in the table below, with a graphical representation of historical trends also shown.

Parameter	2023/24 Reporting Period			Historical Results		
	Min	Average	Max	Min	Average	Max
pH (pH units)	7.3	7.7	8	6.4	7.9	8.8
TOS (%)	0.01	0.03	0.04	0.01	0.02	0.07
DC Criteria	N/A					
EA Predictions	N/A					

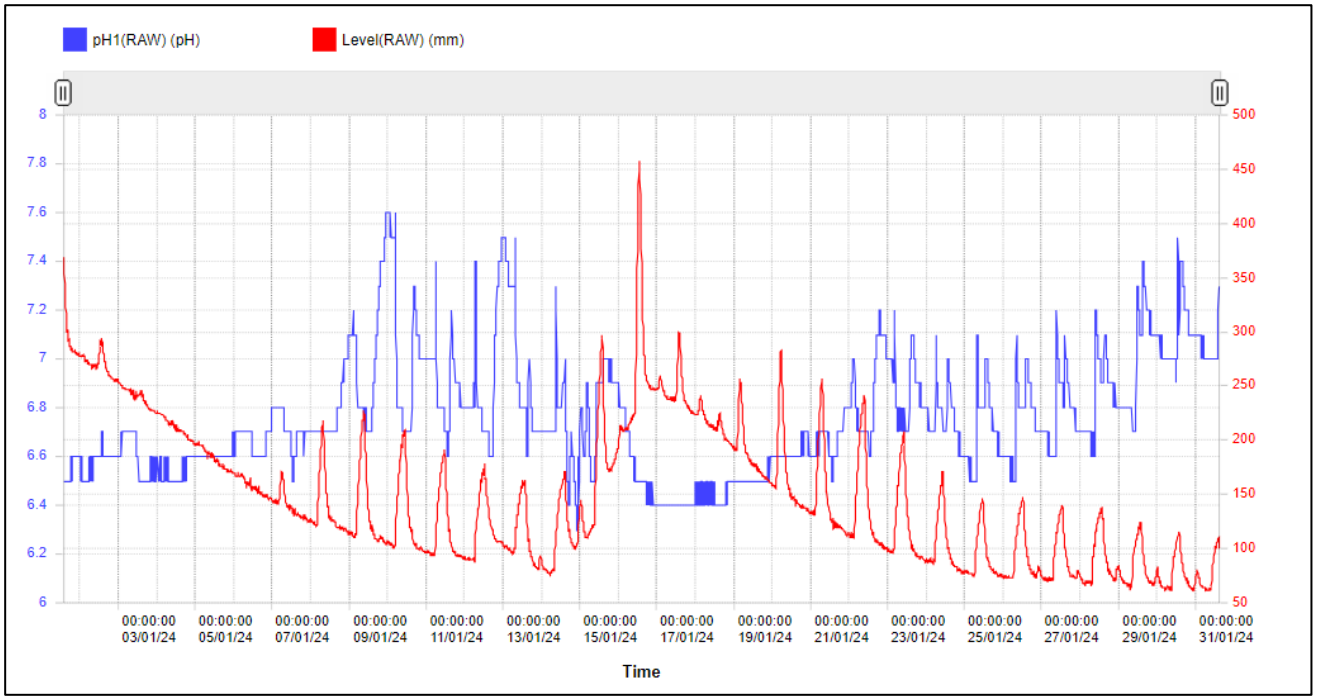


Continuous Monitoring

The continuous water quality monitoring stations were installed in the existing dredge pond and in Blue Angle Creek immediately above the floodgates prior to the current reporting period, and in the new dredge pond in August 2023. The site on Blue Angle Creek is immediately downstream of the new dredge pond, and monitors water flowing out from Foys Swamp, as well as tidal influences from the Crooked River estuary in between rain events. These stations have provided a mechanism to ensure the existing environmental controls are effective in minimising the risk of acid sulphate soils associated with dredging and processing activities.

During the reporting period, the continuous monitors assisted in identifying a reduction in pH in the new dredge pond in May 2024, as well as monitoring the response of the dredge pond to treatment with hydrated lime. Cleary Bros were also able to use the information provided in this trigger event to establish a targeted minimum water level in the new dredge pond to prevent oxidation of the soils around the pond, which has been used to guide internal water transfers.

A review of the water level and pH for the Blue Angle Creek monitoring site shows significant short term variations due to tidal influences, as shown in the graph below which plots water level (red) and pH (blue) for January 2024. The significant diurnal pH fluctuation amongst a broader monthly pattern of variation is evident in the Blue Angle Creek floodgates, which can be attributed to the tidal patterns within the Crooked River estuary. During periods of smaller tides, which can generally be attributed to periods around the half-moon, water level changes are reduced, with negligible daily variations in pH level. When tide variations are higher around the full and new moons, there is a considerable daily variation in water level and pH levels due to the competing influences of tidal water and runoff from upstream. During sustained periods of pH below 6.5, the pH of the water in Blue Angle Creek upstream of the modification dredge pond (at Site B) was measured, and in each instance found to be consistent with the pH recorded by the continuous monitor at Site C. As such, these lower pH values reflect the background environment in Blue Angle Creek and are unrelated to extractive activities.



Surface Water Monitoring

Cleary Bros has monitored the pH and EC of the existing dredge pond weekly for over 15 years. In February 2023, the surface water monitoring program was updated to include a broader range of analytes to identify the precursors of, and potential impacts of acid sulphate soils, as well as expanded to include the new dredge pond, two sites on Blue Angle Creek (upstream and downstream of the new dredge pond), as well as the processing plant return water. The below table presents a summary of the data collected under the revised acid sulphate soil surface water monitoring program.

Analyte	Interim trigger level	Existing Dredge Pond			New Dredge Pond			Processing Returns		
		Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
pH (pH units)	<6.5	7.3	7.7	8.0	5.4	7.0	7.8	7.1	7.5	8.1
EC (µS/cm)	N/A	382	481	582	367	568	715	400	597	734
Turbidity (NTU)	N/A	55	123	184	55	193	351	1.3	247	2,320
DO (mg/L)	<3.0	5.8	9.1	13.2	4.3	8.3	11.5	3.26	9.14	13.30
DO (% saturation)	<50	58	96	170	44	87	128	35	98	164
Alkalinity (mg/L)	N/A	50	75	127	3	55	103	47	79	160
Acidity (mg/L)	N/A	1	4	6	1	5	17	1	4	10

Analyte	Interim trigger level	Existing Dredge Pond			New Dredge Pond			Processing Returns		
		Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
Surplus Alkalinity (mg/L)	<0	49	72	123	-14	49	102	43	76	159
Dissolved Al (mg/L)	0.055	<0.01	0.02	0.08	<0.01	0.08	0.69	0.020	0.094	0.250
Dissolved As (mg/L)	0.024	<0.001	0.002	0.004	<0.001	0.003	0.007	<0.001	0.002	0.005
Dissolved Bo (mg/L)	0.370	<0.05	0.08	0.15	0.06	0.09	0.12	<0.05	0.085	0.260
Dissolved Ba (mg/L)	0.137	0.010	0.059	0.104	0.016	0.058	0.104	0.016	0.041	0.105
Dissolved Be (mg/L)	0.0013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cd (mg/L)	0.0008	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Co (mg/L)	0.0028	<0.001	<0.001	<0.001	<0.001	0.002	0.012	<0.001	<0.001	0.005
Dissolved Cr (mg/L)	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cu (mg/L)	0.006	<0.001	<0.001	0.002	<0.001	<0.001	0.0010	<0.001	<0.001	0.002
Dissolved Mn (mg/L)	1.900	<0.001	0.004	0.008	0.005	0.025	0.068	<0.001	0.014	0.065
Dissolved Ni (mg/L)	0.044	<0.001	<0.001	0.001	<0.001	<0.001	0.015	<0.001	0.002	0.009
Dissolved Pb (mg/L)	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Se (mg/L)	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Va (mg/L)	0.012	<0.01	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.020
Dissolved Zn (mg/L)	0.152	<0.005	0.024	0.054	<0.005	0.044	0.102	<0.005	0.020	0.083
Dissolved Fe (mg/L)	0.326^	<0.05	<0.05	<0.05	<0.05	0.27	2.72	<0.05	0.055	0.180
Dissolved Hg (mg/L)	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

^ For existing dredge pond only - triggers to be developed for other sites.

Analyte	Interim trigger level	Blue Angle Creek U/S			Blue Angle Creek D/S		
		Min	Ave	Max	Min	Ave	Max
pH (pH units)	<6.5	6.2	6.2	7.4	5.7	6.8	7.3
EC (µS/cm)	N/A	167	625	1140	169	8,480	14,800
Turbidity (NTU)	N/A	2.1	10.1	22.6	2.0	15.2	57.4
DO (mg/L)	<3.0	2.3	4.4	7.4	2.7	4.8	8.1
DO (% saturation)	<50	22	44	70	25	50	81
Alkalinity (mg/L)	N/A	14	74	155	15	101	187
Acidity (mg/L)	N/A	1	7	12	1	9	18
Surplus Alkalinity (mg/L)	<0	9	67	154	9	92	186
Dissolved Al (mg/L)	0.055	<0.01	0.06	0.15	<0.01	0.063	0.170
Dissolved As (mg/L)	0.024	<0.001	<0.001	0.001	<0.001	<0.001	0.002
Dissolved Bo (mg/L)	0.370	<0.05	0.125	0.220	<0.05	0.275	1.240
Dissolved Ba (mg/L)	0.137	0.004	0.046	0.114	0.004	0.036	0.110
Dissolved Be (mg/L)	0.0013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cd (mg/L)	0.0008	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Co (mg/L)	0.0028	<0.001	<0.001	0.003	<0.001	<0.001	0.003

Analyte	Interim trigger level	Blue Angle Creek U/S			Blue Angle Creek D/S		
		Min	Ave	Max	Min	Ave	Max
Dissolved Cr (mg/L)	0.013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cu (mg/L)	0.006	<0.001	<0.001	0.003	<0.001	<0.001	0.002
Dissolved Mn (mg/L)	1.900	0.019	0.232	0.523	0.016	0.126	0.386
Dissolved Ni (mg/L)	0.044	<0.001	<0.001	0.002	<0.001	<0.001	0.002
Dissolved Pb (mg/L)	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Se (mg/L)	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Va (mg/L)	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zn (mg/L)	0.152	<0.005	0.026	0.058	<0.005	0.019	0.060
Dissolved Fe (mg/L)	N/A	0.210	0.802	6.270	0.100	0.572	2.780
Dissolved Hg (mg/L)	N/A	<0.0001	0.000	<0.0001	<0.0001	<0.0001	<0.0001

The results show few exceedances of the ASS interim trigger values, which were subject to further review in line with the Water Management Plan. These exceedances included:

- In the existing dredge pond, dissolved aluminium and vanadium were recorded on occasion above the interim criteria, and consistent with previous monitoring reflecting the background environment for this site.
- In the new dredge pond, dissolved aluminium and vanadium were recorded on occasion above the interim criteria, consistent with the monitoring from the existing dredge pond. In addition, two samples of DO were marginally below the criteria during the first half of the reporting period. A low pH was also recorded (5.4) in May 2024, which also led to triggers for alkalinity and dissolved iron and cobalt. The new dredge pond was treated with lime in response, with the pH returning to typical levels on the following day, and with concentrations of the other analytes returning to below the trigger levels in the subsequent sample.
- The processing returns sample recorded isolated triggers of aluminium, cobalt, vanadium, and dissolved oxygen, consistent with concentrations in the dredge ponds.
- Both Blue Angle Creek monitoring sites (upstream and downstream) regularly recorded triggers for pH, dissolved aluminium, boron, cobalt, vanadium, and oxygen. Triggers were generally recorded in both monitoring sites, reflecting the natural background environment.

With the exception of the May 2024 sample for the new dredge pond, which was during a period of lowered pH, the remaining triggers reflect the background environment of the site.

The Acid Sulphate Soil Management Plan requires the refinement of the dissolved metals trigger values once 8 samples have been collected for each site. Sufficient samples have now been collected for all sites, and as such the Acid Sulphate Soil Management Plan will be updated in coming months to incorporate site specific trigger values.

Groundwater Monitoring

Cleary Bros has monitored the pH, EC, major ions, alkalinity, and dissolved iron of the various groundwater monitoring bores on a quarterly basis for between four and 16 years. In February 2023, the groundwater monitoring program was updated to include additional quarterly testing of dissolved metals and ions, and the total acidity in certain bores. The below table presents a summary of the data collected under the revised acid sulphate soil groundwater monitoring program in the current reporting period.

Analyte	Interim trigger level	MW1		MW1A		MW2B		MW3A		MW04(07)	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
pH (pH units)	N/A	5	5.5	dry	dry	6.5	7	6.4	7.3	7.3	7.4
EC (µS/cm)	N/A	6490	8150	dry	dry	1000	1180	274	767	524	538
Alkalinity (mg/L)	N/A	6	28	dry	dry	99	161	54	204	112	121
Acidity (mg/L)	N/A	15	105	dry	dry	15	32	3	20	4	5
Alkalinity balance (mg/L)	N/A	-77	-7			67	131	36	201	108	116
Dissolved Al (mg/L)	2,700	<0.01	0.03	dry	dry	0.03	0.22	0.03	0.33	<0.01	<0.01
Dissolved As (mg/L)	24	<0.001	0.001	dry	dry	<0.001	0.001	0.002	0.014	0.003	0.003
Dissolved Ba (mg/L)	137	0.038	0.09	dry	dry	0.014	0.038	0.005	0.096	0.012	0.074
Dissolved Cd (mg/L)	2.0	<0.0001	0.0002	dry	dry	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cr (mg/L)	30	<0.001	<0.001	dry	dry	0.002	0.011	0.001	0.005	<0.001	<0.001
Dissolved Co (mg/L)	2.8	0.013	0.014	dry	dry	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Dissolved Cu (mg/L)	13	<0.001	<0.001	dry	dry	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Dissolved Pb (mg/L)	48	<0.001	<0.001	dry	dry	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Mn (mg/L)	1,900	0.282	0.327	dry	dry	0.066	0.09	0.012	0.123	0.007	0.011
Dissolved Ni (mg/L)	105	0.011	0.013	dry	dry	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Dissolved Se (mg/L)	11	<0.01	<0.01	dry	dry	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Va (mg/L)	12	<0.01	<0.01	dry	dry	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Dissolved Zn (mg/L)	152	0.023	0.364	dry	dry	0.013	0.107	0.052	0.079	<0.005	0.041
Dissolved Bo (mg/L)	370	<0.05	0.12	dry	dry	0.07	0.1	<0.05	0.07	<0.05	<0.05
Dissolved Fe (mg/L)	varies	0.07	19.5	dry	dry	3.25	11.7	0.36	7.72	0.07	0.11
Dissolved Hg (mg/L)	N/A	<0.0001	<0.0001	dry	dry	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analyte	Interim trigger level	NB2		NB3		NB4		MW7	
		Min	Max	Min	Max	Min	Max	Min	Max
pH (pH units)	N/A	4.4	5.8	5.9	6.7	6.1	6.8	4.5	5.4
EC (µS/cm)	N/A	97	221	62	216	8000	9190	8120	8310
Alkalinity (mg/L)	N/A	8	19	20	42	64	212	48	48
Acidity (mg/L)	N/A	11	44	3	33	10	192	234	288
Alkalinity balance (mg/L)	N/A	-27	-3	1	20	-128	184	-186	-186
Dissolved Al (mg/L)	2,700	0.7	1.81	0.09	0.21	<0.01	<0.01	0.55	6.61
Dissolved As (mg/L)	24	0.002	0.01	<0.001	<0.001	<0.001	0.021	0.002	0.006
Dissolved Ba (mg/L)	137	0.011	0.187	0.019	0.11	0.035	0.106	0.018	0.024
Dissolved Cd (mg/L)	2.0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cr (mg/L)	30	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Dissolved Co (mg/L)	2.8	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.021	0.034
Dissolved Cu (mg/L)	13	<0.001	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001
Dissolved Pb (mg/L)	48	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Analyte	Interim trigger level	NB2		NB3		NB4		MW7	
		Min	Max	Min	Max	Min	Max	Min	Max
Dissolved Mn (mg/L)	1,900	0.004	0.026	0.073	0.486	0.224	0.478	0.801	1.1
Dissolved Ni (mg/L)	105	<0.001	0.002	<0.001	0.002	0.001	0.006	0.016	0.028
Dissolved Se (mg/L)	11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Dissolved Va (mg/L)	12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zn (mg/L)	152	0.009	0.06	<0.005	0.06	<0.005	0.067	0.079	0.242
Dissolved Bo (mg/L)	370	<0.05	0.09	<0.05	<0.05	0.21	0.79	0.59	0.68
Dissolved Fe (mg/L)	varies	0.58	2.33	0.57	4.26	<0.05	64.4	55.4	87.7
Dissolved Hg (mg/L)	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

The results show a varied groundwater environment, with low and high pH bores, high alkalinity and high acidity bores, considerable variations in salinity and major ion composition, and significant variability in dissolved metals, especially the major metal species including iron, manganese, and aluminium. Furthermore, there is no clear correlation between pH and any dissolved metal species (including aluminium). This reflects the complex groundwater environment, with various competing influences, including the saline inflows from the Berry Siltstone, the low pH and reducing contributions from the clay-rich Foys Swamp in the west, tidal influences from the Crooked River estuaries and fresh water contributions from local rainfall and the dune network.

During the current reporting period, the following triggers of the groundwater criteria were noted:

- MW1 regularly recorded higher concentrations of dissolved cobalt and zinc.
- MW2B regularly recorded higher concentrations of dissolved iron and vanadium.
- MW3A recorded a higher concentration of dissolved iron for one sample only.
- NB2 regularly recorded higher concentrations of dissolved barium.
- NB3 regularly recorded higher concentrations of dissolved iron.
- NB4 regularly recorded higher concentrations of dissolved boron.
- MW07 regularly recorded higher concentrations of dissolved boron and cobalt, and once off higher concentrations of aluminium and zinc.

These widely varied triggers reflect the varied nature of the groundwater environment across the monitoring network, and the diversity of the background environment of the site.

The Acid Sulphate Soil Management Plan requires the refinement of the dissolved metals trigger values once 8 samples have been collected for each site. This has not yet been achieved for each site, however sufficient data will be collected within the next 12 months to allow the refinement of trigger values.

4.4.4. Acid Sulphate Soils Monitoring Results Interpretation

The acid sulphate soil monitoring program was significantly expanded recently to allow for the early detection of changes in pH in the dredge ponds and Blue Angle Creek. The use of continuous monitoring stations has allowed the identification of pH changes due to local phenomenon including rainfall flows and tidal influences. With this ongoing collection of high-frequency data, Cleary Bros can better understand the background environment, allowing greater confidence in the identification of any trends that may emerge in following years as dredging continues in the Modification 1 area.

The monitoring now undertaken for the site shows that the interim triggers are not necessarily appropriate, especially for surface water where the background monitoring site on Blue Angle Creek has recorded a number of measurements above the interim triggers for multiple analytes. An update of the Acid Sulphate Soil

Management Plan can now be undertaken to derive site-specific trigger values for each analyte which will provide a useful trigger for response. Groundwater monitoring bores are expected to have a minimum of eight sample by early 2025, which will allow for the derivation of site-specific trigger values for these bores at that point.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to acid sulphate soils in the 2023-2024 reporting period.

4.5. Water Use

4.5.1. Standards and Performance Measures

Cleary Bros holds a Water Access Licence which permits the “take” of water from the environment for site operations. WAL43272 includes a share component of 56 units of the Metropolitan Coastal Sands Groundwater Source of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan. Cleary Bros also holds WAL43271, which comprises an additional 50 units of the Metropolitan Coastal Sands Groundwater Source in the event water take exceeds the permitted take under WAL43272. The Gerroa Sand Resource is required to adjust site operations where appropriate to ensure it has sufficient shares to meet its take of water. For the 2023-2024 reporting year, the 106 units allowed the Gerroa Sand Resource to take up to 106 ML from the coastal sands aquifer.

4.5.2. Environmental Performance

The two dredge ponds provide the means for the take of groundwater from the coastal sands aquifer and are listed as works in WAL43272.

Inflows to the dredge ponds include the following:

- Rainfall landing on the dredge pond surface.
- Runoff from the sand slurry back into the dredge pond.
- Water pumped in to the dredge pond as part of transfers between ponds.

Outflows from the dredge ponds include the following:

- Evaporation from the pond surface.
- Water pumped out for dust suppression, watering plants, or to transfer water between ponds.
- Water pumped out of the pond as part of the sand slurry.
- Water entrained in sand exported from the site.

In addition, the sand removed from the dredge pond that was below the water table creates a void which is rapidly infilled with water.

Where water inflows to the aquifer exceed the outflows from the aquifer, which is predicted to be the case in an average rainfall year, groundwater will flow from the dredge ponds into the surrounding aquifer, such that there will be no take of water from the aquifer. Where water outflows in any dredge pond exceed the inflows, which is predicted to be the case in a dry year, water from the aquifer will flow into one or both dredge ponds to balance the local groundwater table, leading to a take of water.

Cleary Bros monitor or record all inflows and outflows of water as follows:

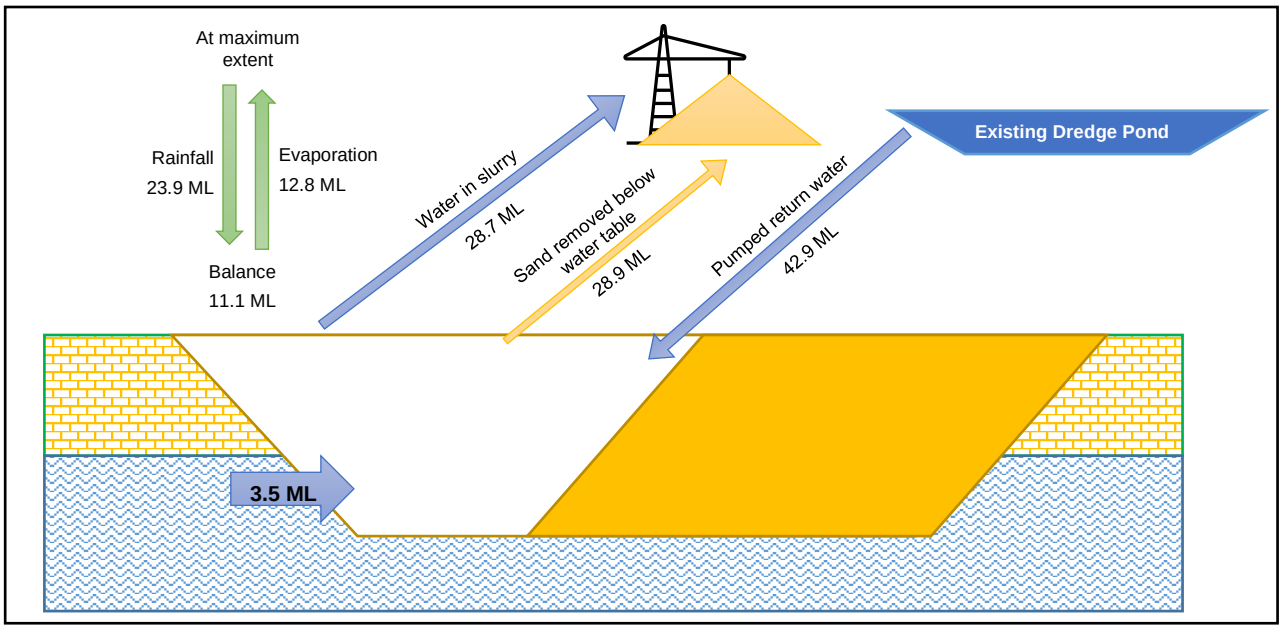
- Rainfall and evaporation (Morton evaporation over shallow lakes) sourced from SILO point data (-34.78 150.78) for the reporting period. SILO rainfall data is selected over rainfall data from the site weather station to ensure consistency when compared to the evaporation data.
- Volume of sand pumped based on cumulative density of sand slurry recorded daily.

- Water in exported sand based on site sales data and measured moisture of sand recorded monthly.
- Meters record all pumped water (dust suppression as well as internal transfers).
- Local water table estimated monthly from site observations and groundwater monitoring.
- Changes in dredge pond surface area estimated monthly with regular checks from mapping data.

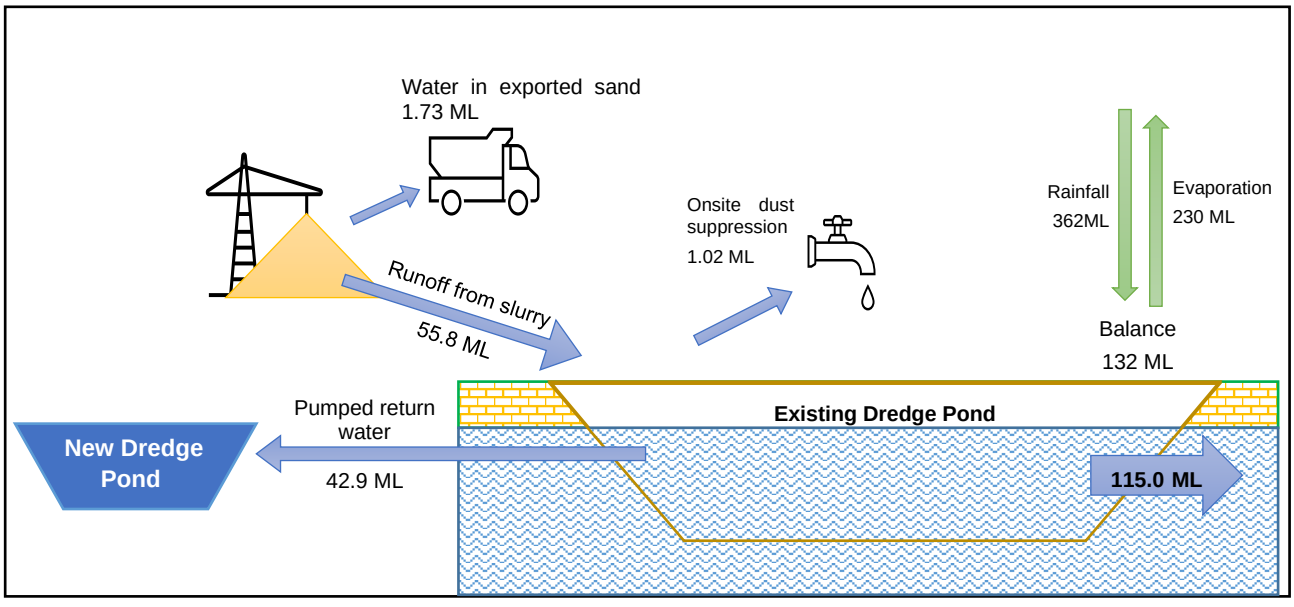
4.5.3.Water Take and Compliance Assessment

The following schematics show the water transfers during the 2023-2024 reporting period.

New Dredge Pond



Old Dredge Pond



During the 2023-2024 reporting period, a take of 3.5ML of water from the coastal sands aquifer, due to the extraction of sand and water from the new dredge pond. Due to the above average rainfall, no take was recorded from the existing dredge pond, with 115 ML flowing back into the aquifer from this dredge pond. Cleary Bros take of water during the reporting period is within the 106 ML permitted under the water licences.

4.6. Air Quality

4.6.1. Standards and Performance Measures

There are no specific requirements for air quality in the sites EPL.

The air quality monitoring requirements from the Development Consent are realised by the QEMP. Section 8.4 of the QEMP details the air quality testing requirements and specifies that 3 dust gauges are to be tested on site. The contribution from site operations to annual average dust deposition must not cause additional exceedances of the following criteria at any residence on privately owned land or on more than 25% of any privately owned land:-

- 2g/m^2/month, maximum increase in deposited dust level; and
- 4g/m^2/month, maximum annual average deposited dust level.

4.6.2. Environmental Performance

CB has implemented the Air Quality Monitoring Program to meet the requirements of the DC. ALS Laboratory Group were engaged during the reporting period to service the three depositional dust gauges on a monthly basis, in line with *AS/NZS 3580.10.1-2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulates – Deposited Matter – Gravimetric Method*. In addition, Cleary Bros has sealed the first 200 metres of the site entrance and utilised a water truck when required on the unsealed sections to minimise the generation of dust from unsealed roads.

4.6.3. Air Quality Monitoring

The following table provides Total Insoluble Solids concentrations (in g/m^2/month) recorded in the three dust depositional gauges at the Gerroa Sand Resource.

Dust Gauge	2023/24 Reporting Period			Historical Results		
Units: g/m^2/month	Min	Average	Max	Min	Average	Max
1A	0.1	1.3	3.4	0.1	2.1	20.1
2A	0.2	1.7	11.7	0.1	2	49.7
4A	0.1	0.5	1.5	0.1	0.3	0.5
DC Criteria / EA Predictions		< 4			< 4	

4.6.4. Air Quality Monitoring Results Interpretation

The results indicate that the activities associated with the Gerroa Sand Resource are having very little impact on local dust deposition, with levels consistent with the historical performance and well below the total annual average deposition criteria. Dredging operations at the site commenced in the 1960's, well before depositional dust monitoring commenced, and as such the incremental impact of the project cannot be accurately determined. Therefore, monitoring will continue to focus on measuring compliance with the total annual average deposition criteria.

The depositional dust monitoring results demonstrate that the measures to control dust generation associated with the Gerroa Sand Resource are effective in minimising any dust impacts from activities on site, and in maintaining a high standard of air quality in the local area. The air quality monitoring program currently in place is sufficient to monitor any potential impacts on air quality to surrounding receivers.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to air quality in the 2023-2024 reporting period.

4.7. Noise Monitoring

4.7.1. Standards and Performance Measures

There are no specific requirements for noise monitoring in the sites EPL.

The noise monitoring requirements from the Development Consent are realised by the QEMP. Section 8.3 of the QEMP details the noise testing requirements and specifies that noise testing is required annually in winter. Operator attended measurements are to be taken to quantify the maximum (LA_{max}) and the average ($LA_{eq\ 15min}$) intrusive noise from site activities over a 15 minute measuring period. Measurements are to be taken during the daytime while the site is in normal operation.

4.7.2. Environmental Performance

CB has constructed the visual and acoustic bund along the northern, eastern, and southern boundaries of the dredging operation. A preventative maintenance program is in place to ensure all equipment employed at the site is maintained in accordance with manufacturers' specifications, with no changes to equipment in operation at the site during the current reporting period. Dredging operations were restricted to the approved hours during the current reporting period.

4.7.3. Noise Monitoring

The annual winter noise monitoring was undertaken in June 2024 with normal dredging activities in operation throughout the period of noise monitoring.

Noise from quarry related activities was inaudible at each of the monitoring sites during the period of monitoring. The dominant noise source at most sites was attributable to wind blowing in adjacent trees and regular bird chatter. At sites R4 (Gerroa Picnic Area 1) and R5 (Gerroa Picnic Area 2) ocean waves were the dominant noise component, with wind noise in trees also contributing to the noise environment. Sites R1, R2, and R3 all experienced significant contributions from vehicles on adjacent roads (not related to quarry activities or road transport), which generally dictated the average noise levels for these sites. R3 (caravan park) was affected greatly by irregular non-Project related roadworks on Crooked River Road. Other minor noise contributions included bird noise and aircraft noise. The Gerroa Sand Quarry was inaudible at all receivers for the duration of monitoring. A summary of noise levels recorded at each site and the compliance status of the Gerroa Sand Quarry is included in the table below.

ID	Location	Measured Noise Levels				Criteria	Compliant
		Background L_{A90}	Average L_{Aeq}	Maximum L_{Amax}	Quarry contribution	$dBA_{eq\text{-}15\ min}$	Yes/No
R1	670 Beach Road	38.6	61.1	84.4	Inaudible	41	Yes
R2	11 Banggarai St	33.9	46.0	65.7	Inaudible	40	Yes
R3	Caravan Park	42.9	52.9	69.8	Inaudible	36	Yes
R4	Athelstane*	38.5	42.5	63.4	Inaudible	40	Yes
R5	Picnic Area 1	43.5	49.7	71.9	Inaudible	40	Yes
R6	Picnic Area 2	42.3	43.7	51.0	Inaudible	40	Yes

* monitored at Coralea, which is a project-related residence adjacent to Athelstane and closer to the site.

4.7.4. Noise Findings

Current strategies described above to minimise noise impacts on surrounding receivers have been effective during the current reporting year, which is supported by the noise monitoring program and continued absence of any noise related complaints related to the site.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to noise in the 2023-2024 reporting period.

4.8. Community

4.8.1. Licence Requirement

Licence condition M4 of the site's EPL provides that Cleary Bros must keep records of all complaints received for the site including any action taken regarding the complaint.

The Development Consent has no direct requirements for complaint handling however, the QEMP dedicates chapter 7 to Complaints Management, which describes the process for recording and responding to community complaints. Furthermore, Cleary Bros held two Community Consultative Committee meetings during the reporting period in August 2023 and February 2024, with the February 2024 meeting including a site visit. Minutes of these meetings have been provided to the DPHI and are available on Cleary Bros website.

4.8.2. Tabulated Results

No complaints were received in relation to the Gerroa Sand Resource in 2023/2024, which is in line with number of complaints received in previous years.

Year	Environmental Complaints
2005/2006	0
2006/2007	0
2007/2008	0
2008/2009	0
2009/2010	0*
2010/2011	0
2012/2013	0
2013/2014	0
2014/2015	0

Year	Environmental Complaints
2015/2016	0
2016/2017	0
2017/2018	0
2018/2019	0
2019/2020	0
2020/2021	0
2021/2022	0
2022/2023	0
2023/2024	0

*One complaint was reported to Cleary Bros from DoP as a letter dated 2 December 2009 relating to the extent of clearing. This was investigated and found not to be factual (refer Cleary Bros letter to DoP dated 15 December 2009).

4.8.3. Environmental Complaints Results Interpretation

The absence of any environmental complaints since 2005 reinforces the low environmental and amenity impact of the Gerroa Sand Resource and demonstrates that the site is functioning in harmony with the community.

4.9. Rehabilitation & Vegetation Management

4.9.1. Standards and Performance Measures

There are no specific requirements for rehabilitation or vegetation management in the sites EPL.

The DC and QEMP set out long and short term requirements and objectives regarding rehabilitation and vegetation management. These objectives are included in the Landscape and Rehabilitation Management Plan, which was most recently updated in December 2022, and includes priorities to be implemented over the following five years. For the purposes of this Annual Review, only those works identified for implementation during the current five year period will be reviewed. The current management priorities include weed control, maintenance of existing fencing, and pest animal control in all areas. Additional specific activities are required in some zones, including the replacement of any dead plants in Zones 2 and 3, some further infill planting in Zone 2 (2A2, 2A3,

2B2, 2C1) and Zone 5C1, and the stabilisation and re-creation of habitat along completed sections of the dredge pond foreshore. Furthermore, works required in the Modification 1 area include the planting of a tree screen along the northwestern boundary of the new dredge pond, which has now been completed and is in a maintenance stage. The QEMP requires that Cleary Bros inspect the planting and conservation works quarterly and that a qualified ecologist monitors the entire area annually. Quarterly inspections of the plantings and the conservation works are carried out by site personnel. An ecologist from Niche Environment and Heritage carried out the annual survey in June 2024 and it is attached as Annexure D.

4.9.2.Summary of Quarterly Inspections and Key Works

Quarterly inspections were carried out in September 2023, December 2023, March 2024 and June 2024.

Primary planting has been completed for all areas of revegetation. Approximately 320 plants consisting of 160 each of Casuarina glauca and Melaleuca stypheloides were planted for the tree screen during Spring 2023. This completed the planting works for the tree screen, with the screen now entering the maintenance stage to support seedling growth and replace any plants that do not survive.

No clearing of any trees or shrubs were undertaken during the current reporting period.

The batters of the existing dredge pond foreshore are stable on both the east and west sides with minimal erosion evident. The sections of the batter that were planted in earlier years have established very well with significant growth and cover now evident. Redundant tree guards were removed from established trees in some of the planting areas in the year, with further tree guards to be removed in the coming year as they are no longer required on established trees.

Weed control during the current reporting period has been hampered by the wet ground conditions, with many areas inaccessible particularly since November 2023. As such, weed control efforts have focussed on accessible areas generally alongside all weather access tracks on site. The main weed targeted during the current reporting period was lantana, with approximately 77 hours expended on weed control during the period. A further 140 hours of weed control focused on lantana removal was undertaken in July 2024 focusing on Zone 1.2. Additional weed control was undertaken to support plantings using either herbicide or mechanical removal (mowing) of exotic grasses.

4.9.3.Success of the Northern Corridor

The flora and fauna surveys over the first six years of this project, that is since the habitat establishment began in the Northern Corridor, found that the indigenous biota that inhabits and that traverses the corridor is equal to or greater than that recorded in the East-West Link. The successful establishment of the Northern Corridor has been described extensively in previous reports.

4.9.4.Findings and Recommendations from Annual Inspection

Most of the plantings were completed at each zone early in the monitoring program and are now in the maintenance phase. The most recent plantings have occurred in Zone 2B.1, 2D, 2C.2 and Zone 2C.1 to expand the vegetation buffer along Blue Angle Creek, creating suitable habitat for local fauna. The annual report stated the following general comments around the overall progress of the rehabilitation program and current priorities:

The 16th annual monitoring report for the Gerroa Sand Quarry is consistent with previous reports, which detail the success of plantings across the various zones on the Site. The quarterly reports completed by Cleary Bros staff have allowed for continuous management of priority weeds and maintenance of fenced areas. Overall, the revegetation works completed throughout the Site are in good condition with evidence of continued plant growth and natural regeneration occurring.

Due to the increased rainfall in recent months, some zones have been largely inaccessible and have subsequently become inundated with weed species. The previous two years reports noted that some plantings were impacted by the floodings and would need to be replaced, the most severely impacted being the eastern end of zone 2C.2. This zone was able to be accessed this year, and it was noted that the area was very overgrown and weedy. Additionally, subzone 2E has been inaccessible over previous years, and was once

again unable to be accessed. Management of these zone should be undertaken immediately as access becomes available again.

Subzones 1.4, 5 and 5C.1 were all too wet to access this year. They don't have as much of a history of inundation, having been accessed in last years inspection, so weed management in these areas should be easier.

To improve revegetation successes, such as those exhibited in the northern portions of the Gerroa Sand Quarry, mature weeds such as Wild Tobacco Bush (found in Zone 2A.1, 2A.2, 2B.2 and 2D) and Lantana stands (found in most zones) should be targeted to limit further seed dispersal given their higher fecundity. Weed removal should be undertaken using cut and paint methods for these woody weeds since it offers a higher kill rate and avoids indirect poisoning of adjacent native species.

Ongoing Lantana control throughout the Site should be undertaken in a mosaic pattern in areas up to 1000m2 at a time to allow for fauna to disperse through adjacent habitat whilst native revegetation occurs in the targeted extent.

Deer grazing and rubbing upon newly planted tube stock was observed in years past, however no evidence of deer rubbing was noted during this year's inspection. If predation intensifies again and rates of tube stock success decline, on-site deer control methods may need to be implemented.

Continued mowing and weed maintenance in younger planted areas such as 2C.1 and 2C.2 (once access is available) is required to ensure successful revegetation. Plantings need to be monitored and tree guards removed once saplings reach a healthy size to ensure their growth isn't restricted (as seen in subzone 2C.1).

Continued targeting of priority weed species across the southern and eastern extent of the Site in conjunction with ongoing maintenance of planting areas will continue to improve canopy connectivity across the Site. Whilst mature native species continue to flower and fruit, ongoing revegetation will continue to increase the proportion of native flora species until new plantings become self-sustaining in years to come.

4.9.5.Priorities for the following reporting period

The following are the priority activities for the 2024-2025 reporting period, subject to suitable weather and ground conditions:

- Infill planting to replace any plants lost in the tree screen and from flooding in Zone 2C.2.
- Control of annual weeds in Zone 2C.2 that have encroached following flooding.
- Lantana control, targeting the eastern side of the existing dredge pond, including the northern corridor to particularly prevent lantana establishing in Zone 2A.1.
- Continued removal of tree guards around plants no longer requiring protection, particularly Zone 2C.1.
- Inspection of zones 1.4, 2E, 5, and 5C.1 once conditions permit and identify any management measures required.

4.10. Traffic Management

4.10.1. Licence Requirements

The DC requires Cleary Bros to ensure that no truck associated with the project uses Gerroa Road, except where the destination lies along or adjacent to that road.

4.10.2. Compliance Assessment

Cleary Bros Site Induction and Work Instructions for the site indicates which roads are to be used when entering and exiting the site and further prohibits incidental use of Gerroa road. Staff are trained in these Work Instructions regularly.

4.11. General Environmental Management & Reporting

4.11.1. Licence Requirements

The EPL has various conditions regarding general environmental performance including reporting requirements for complaints, environmental harm and lodgement of an annual return.

The DC includes various environmental management and reporting procedural requirements that are implemented in the sites QEMP. The conditions that required attention beyond implementation of the QEMP are assessed below.

4.11.2. Performance Criteria and Compliance Assessment

Cleary Bros employs an authorised Environmental Officer to manage all compliance activities at the site, in association with the Quarry Manager.

One non-compliance with the requirements of the Aboriginal Cultural Heritage Management Plan (ACHMP) was identified in the reporting period, which was reported to DPHI in line with the requirements of the DC. This related to the excavation of surface material within the buffer area of locations designated for archaeological test pits prior to the completion of the archaeological investigations. The excavations did not impact any test pit sites, and the archaeological salvage program has continued without any adverse impacts. The non-compliance was inadvertent and caused by a misunderstanding of the requirements of the ACHMP, and in part due to contradictions within the ACHMP itself. Cleary Bros are currently reviewing the ACHMP to improve clarity and ease of implementation, which will be submitted to DPHI prior to implementation. With the exception of archaeological salvage works undertaken by archaeologists from Biosis and representatives from Jerrinja Local Aboriginal Land Council, no further ground disturbance in the vicinity of the test pits have been undertaken since the identification of the non-compliance, nor will they prior to approval of the updated ACHMP.

4.11.3. Review of Environmental Management Plans

Noise Management Plan

The Noise Management Plan was most recently revised and approved by DPHI on the 5 December 2022. This Noise Management Plan remains current and relevant to the site, and will continue to guide management practices on the site.

Air Quality Management Plan

The Air Quality Management Plan was most recently revised and approved by DPHI on the 5 December 2022. This Air Quality Management Plan remains current and relevant to the site, and will continue to guide management practices on the site.

Water Management Plan

The Water Management Plan (Rev 3), incorporating the Acid Sulphate Soils Management Plan (ASSMP), was most recently revised and approved by DPHI on the 10 March 2023. Since this time additional monitoring data has been recorded for the site which now allows for the derivation of surface water quality criteria to support the ASSMP. As such, a revision of the Water Management Plan and ASSMP is required so as to include site specific trigger levels for acid sulphate soils for all surface water monitoring sites.

Landscape and Rehabilitation Management Plan

The Landscape and Rehabilitation Management Plan was most recently revised and approved by DPHI on the 7 December 2022. This Landscape and Rehabilitation Management Plan remains current and relevant to the site, and will continue to guide management practices on the site.

Cultural Heritage Management Plans

The Cultural Heritage Management Plan for the original extraction area was approved by the Department of Planning on the 5 February 2009. This management plan remains current and appropriate for the management of cultural heritage in the vicinity of the existing extraction area.

The Aboriginal Cultural Heritage Management Plan for the Modification 1 area was approved by DPHI on the 12 December 2022. A non-compliance with this plan was identified and reported during the current reporting period, and a revised ACHMP is currently under consultation as part of the revision of the plan to improve clarity and assist implementation of the management plan.

Quarry Environmental Management Plan

The Quarry Environmental Management Plan (QEMP) was most recently revised and approved by DPHI on the 29 June 2023. This QEMP remains current and relevant to the site, however updates to other management plans as described above may lead to the need for a revision of the QEMP. In this event, the QEMP will be revised and submitted to the Planning Secretary for approval. Until such time however, the QEMP remains appropriate for guiding management practices on the site.

4.12. Independent Environmental Audit

4.12.1. Licence Requirements

The DC requires Cleary Bros to commission and carry out an Independent Environmental Audit within 12 months of the commencement of the Project and every three years thereafter.

4.12.2. Compliance Assessment

Cleary Bros commissioned ERM to carry out the fifth Independent Environmental Audit in November 2022. No “high” or “medium” non-compliances with the Site’s Environmental Protection Licence or Development Consent were identified in the audit. A copy of the audit was sent to the EPA, Kiama Council, Shoalhaven Council and the CCC members. A copy of the audit was also posted on Cleary Bros website.

The below table summarises the progress of the corrective actions undertaken to address the non-conformances identified in the 2022 Independent Environmental Audit. The next audit is scheduled for 2025.

Condition Number	Auditor Comment	Auditor Recommendation	Progress of Corrective Actions
Sch 2 Cond 1	There is an opportunity to improve housekeeping by cleaning up the areas affected by minor oil spill from dripping outlet. - Incidental diesel spill around the booster pump near the dredge pond, visible floating on a puddle. Spill volume appeared <1L. No sheen was visible on the nearby dredge pond. - Soil beneath the bund water drainage tap near the sand cleaning plant and stockpile had a faint hydrocarbon odour. Both spills appeared minor in nature and no evidence of environmental harm was observed.	Auditor recommended that a tool box talk for on-site staff is undertaken which discusses spill and hydrocarbon impacted water management. Workers are to be reminded that bund water may be impacted with fuels and should not be discharged is any sheen or odours are visible. Workers should be reminded that even minor spills of fuels should be cleaned up immediately and impacted soils should be disposed of by a suitably licenced waste contractor.	Completed All workers on site attended a toolbox on spill response and water management. Residual hydrocarbons were removed and disposed of at licenced waste facility.
Sch 3 Cond 16	CB submitted a draft planning agreement on 1 December 2008, which was agreed by the Department in	Nil	In progress - CB has met with DPHI during the reporting

Condition Number	Auditor Comment	Auditor Recommendation	Progress of Corrective Actions
Sch 3 Cond 16A	principle. A final agreement was never executed with the department, despite CB raising the issue in 2009 and 2013. Since Modification 1 of the Planning Agreement (10/06/2022), the Site has resubmitted a draft Planning Agreement. CB management advised that the Department has provided feedback in October 2022. The Site will now move forward with incorporating feedback provided, mostly in relation to bond recalculation. CB are working with their legal counsel to provide a response to the Department. The Site is engaged with ongoing discussions with the Department and therefore no agreement has been formally entered into. Therefore this requirement has not been formally met.		period to progress the agreement. The DPHI have advised that they no longer have a mechanism to establish a planning agreement with their Department, however suggest the permanent conservation of the site could be met through one of the avenues under the BC Act. CB are currently reviewing options available under the BC Act to meet the objectives of this requirement.

5. Conclusion

The Annual Review continued to note the departure of the surface and ground water quality of the site from the objective levels listed in the DC. However monitoring undertaken in the current reporting period demonstrates that the water quality is generally consistent with historical levels, with no deterioration in groundwater or surface water quality related to dredging operations with the exception of localised increases to turbidity, and a once-off decline in pH in May 2024 which was quickly addressed.

Site conditions during the current reporting period were characterised by a dry 2023 Winter and Spring followed by a wet remainder of the year, leading to another rainfall surplus on the back of four years of above average rainfall. The ongoing rainfall and saturated ground conditions has hampered maintenance of the conservation areas, with some minor damage due to flooding, and prevented access to many areas reducing weed management opportunities. Groundwater levels and quality are consistent with the long term averages. With the higher soil moisture conditions, dust deposition has remained at very low levels.

One non-compliance with the requirements of the Aboriginal Cultural Heritage Management Plan (ACHMP) was identified in the reporting period, which was reported to DPHI in line with the requirements of the DC. Cleary Bros have since worked constructively with Jerrinja LALC and archaeologists from Biosis to identify opportunities to gain additional information on the traditional use of the site as a result of this non-compliance.

Overall the site is performing well within the individual criteria and limits assigned to it in regard to environmental performance. There have been no community complaints in the reporting period, with the site continuing to have no unexpected impacts on the local environment.

Annexure A – Extractive Materials Return – 2022-23

Extractive Materials Return 2022-2023

NSW GOVERNMENT | Regional NSW

Form S1 – Period Ending 30 June 2023

Quote RIMS ID in all correspondence

Quarry Id: 4507 Rims ID: 400491

Operators Name: CLEARY BROS (BOMBO) PTY LTD
Address: PO BOX 210
PORT KEMBLA NSW
2505

Email: [redacted]
Quarry Name: GERROA SAND RESOURCE
Quarry Address: CNR BEACH RD & CROOKED RIVER RD

Inquiries please telephone:
(02) 4063 6713
Completed or Nil Returns
Email –
mineral.royalty@planning.nsw.gov.au
Postal Address (see below)

Please amend name, postal address and location of mine or quarry if incorrect or incomplete.

The return should be completed and forwarded to **Senior Advisory Officer, RESOURCE ECONOMICS, STRATEGY, PERFORMANCE & INDUSTRY DEVELOPMENT, DEPARTMENT OF REGIONAL NSW, PO BOX 344 HUNTER REGION MAIL CENTRE NSW 2310 on or before 31 October 2023**. If completion of the return is unavoidably delayed, an application for extension of time should be requested **before** the due date. If no work was done during the year, a **NIL** return must be forwarded.

The return should relate to the **above quarrying establishment** and should cover the operations of quarrying and treatment (such as crushing, screening, washing etc.) carried out at or near the quarry. A return is required even if the operations are solely of a developmental nature and whether the area being worked is held under a mining title or otherwise.

Director, Resources Policy

Please complete all the following information to assist in identifying the location of the Quarry

Typical Geology: Sand

Nearest Town to Quarry: Gerroa

Local Council Name: Kiama Municipal Council, Shoalhaven Regional Council

Deposited Plan and Lot Number/s of Quarry: Lot A DP185785, Lot 2 DP1111012

Email Address of Operator: [redacted]

Name of Owner or Licensee: Cleary Bros (Bombo) Pty Ltd

Postal Address of Licensee: PO Box 210, Port Kembla NSW 2505

Licence/Lease Number/s (if any)
From Mining, Exploration & Geoscience (NSW Mineral Resources): N/A

From Crown Lands or other NSW Department: N/A

If any output was obtained from land NOT held under licence from the above Departments, state the Name/s and Address/es of the Owners of the land: Bridon Pty Ltd, PO Box 210, Port Kembla NSW 2505

To the best of my knowledge, information entered in this return is correct and no blank spaces left where figures should have been inserted.

- **SIGNATURE of PROPRIETOR or MANAGER** [redacted] **DATE: 31/10/2023**
- **CONTACT PERSON for this return: Mark Hammond, Quality and Environment Manager**
- **NAME** (Block letters): MARK HAMMOND **Telephone** 02 4275 1000

Regional NSW | 1

Extractive Materials Return 2022-2023

NSW GOVERNMENT | Regional NSW

Form S1 – Period Ending 30 June 2023

Sales During 2022-2023

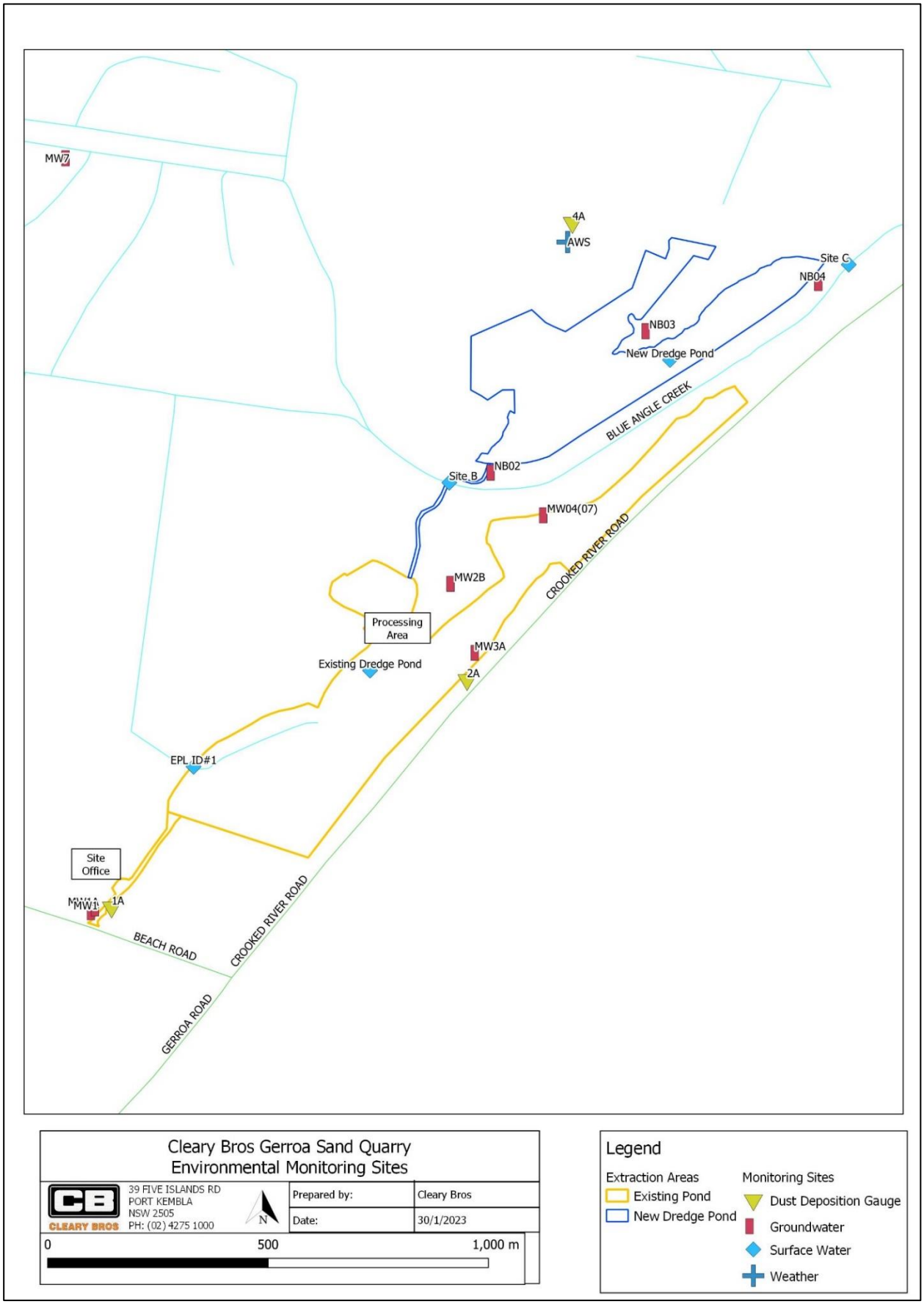
Production information may be published in aggregated form for statistical reporting. However, production data for individual operations is kept strictly confidential.

Product	Description	Quantity Tonnes
Virgin Materials		
Crushed Coarse Aggregates		
Over 75mm		-
Over 30mm to 75mm		-
5mm to 30mm		-
Under 5mm		-
Natural Sand		-
Manufactured Sand		-
Prepared Road Base & Sub Base		-
Other Unprocessed Materials		-
Recycled Materials		
Crushed Coarse Aggregates		
Over 75mm		-
Over 30mm to 75mm		-
5mm to 30mm		-
Under 5mm		-
Natural Sand		-
Manufactured Sand		-
Prepared Road Base & Sub Base		-
Other Unprocessed Materials		-
River Gravel		
Over 30mm		-
5mm to 30mm		-
Under 5mm		-
Construction Sand	Excluding Industrial	**45,986**
Industrial Sand		
Foundry, Moulding		-
Glass		-
Other (Specify)		-
Dimension Stone	Building, Ornamental, Monumental	
Quarried in Blocks		-
Quarried in Slabs		-
Decorative Aggregate	Including Terrazzo	-
Loam	Soil for Topdressing, Garden soil, Horticultural purposes)	-
TOTAL SITE PRODUCTION		**45,986**
Gross Value ($) of all Sales	[redacted]	
Type of Material	**Sand**	
Number of Full-Time Equivalent (FTE) Employees	**Employees: 3**	**Contractors:3**

Please Note: A return for clay-based products can be obtained by contacting the inquiry number.

Regional NSW | 2

Annexure B – Environmental Monitoring Locations



Annexure C – 2023/24 Environmental Monitoring Results

Groundwater Monitoring Results

	pH (pH units)				EC (µS/cm)				Total Phosphorus (µg/L)				Total Nitrogen (µg/L)			
	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24
MW 1	5	5.4	5.5	5.2	6490	6660	6910	8150	0.68	0.06	0.8	0.06	8.6	1.4	3.8	1.4
MW 1A	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
MW 2B	6.8	6.5	7	6.5	1180	1020	1000	1070	0.37	0.16	0.14	0.23	1.1	1.2	1.4	2.4
MW 3A	6.5	6.4	6.8	7.3	767	274	431	635	0.54	0.17	0.14	0.24	1.6	0.7	0.6	1
MW04(07)	7.3	7.4	*	*	538	524	*	*	0.21	0.2	*	*	0.8	0.5	*	*
NB02	5.7	5.7	4.4	5.8	172	97	221	170	0.05	0.22	0.18	0.17	1.8	3.3	2.4	2.5
NB03	6.2	6	5.9	6.7	216	138	156	62	0.24	0.31	0.39	1.05	1.5	0.8	1.3	3.2
NB04	6.8	6.3	6.1	6.5	8090	8000	9190	8080	<0.01	0.05	0.02	0.05	2.1	1.4	1.8	1.6
MW7	4.5	*	5.4	*	8120	*	8310	*	0.01	*	0.04	*	1	*	1.3	*
	Sodium (mg/L)				Potassium (mg/L)				Magnesium (mg/L)				Chloride (mg/L)			
	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24
MW 1	1170	1030	1180	1110	4	3	4	3	138	123	138	136	1740	1810	1730	1740
MW 1A	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
MW 2B	87	80	90	83	4	3	4	3	26	17	22	16	128	144	125	128
MW 3A	47	35	36	36	3	2	2	2	7	5	7	7	60	41	40	35
MW04(07)	46	41	*	*	4	3	*	*	13	10	*	*	78	64	*	*
NB02	23	10	31	16	3	2	3	2	4	2	4	2	38	21	51	31
NB03	17	12	13	10	9	6	7	2	6	5	4	1	29	24	23	10
NB04	1330	1140	1240	1280	40	32	38	39	169	146	171	171	2530	2330	3080	2720
MW7	1270	*	1230	*	41	*	41	*	256	*	218	*	1800	*	1850	*
	Sulphate (mg/L)				Bicarbonate (mg/L)				Soluble Iron (mg/L)				Chlorophyll-a			
	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24
MW 1	673	863	602	720	6	12	28	8	5.83	16.5	19.5	0.07	<1	<1	<1	<1
MW 1A	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
MW 2B	316	186	216	148	161	99	119	110	11.3	11.1	11.7	3.25	1	<1	<1	<3
MW 3A	12	12	9	12	120	54	123	204	0.82	4.07	7.72	0.36	<1	<1	<1	<3
MW04(07)	57	46	*	*	112	121	*	*	0.11	0.07	*	*	1	<1	*	*
NB02	<10	5	1	5	17	19	14	8	0.98	2.33	1.54	0.58	<1	<1	<1	<2
NB03	4	<1	6	<1	42	40	34	20	4.26	4.21	3.09	0.57	<1	<1	<1	<3
NB04	440	408	240	324	212	194	64	92	<0.05	5.5	64.4	<0.05	<1	<1	<1	<1
MW7	2350	*	1470	*	<1	*	48	*	87.7	*	55.4	*	<1	*	<1	*
	Faecal Coliforms (CFU/100mL)				Entercocci (CFU/100mL)				Ammonium (mg/L)							
	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24	Sep-23	Dec-23	Mar-24	Jun-24				
MW 1	<2	~4	<1	~2	<2	~2	<1	<1	1	1.14	0.61	1.39				
MW 1A	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry				
MW 2B	<2	15	22	~5	~10	<1	77	~6	0.6	0.27	0.31	0.64				
MW 3A	<2	10	<1	~1	<2	~1	<1	~4	0.02	0.08	0.08	0.15				
MW04(07)	<2	120	*	*	<2	~4	*	*	0.05	0.18	*	*				
NB02	<2	26	<1	~2	<2	<1	<1	~4	0.08	0.41	0.47	0.16				
NB03	<2	~1	<1	~7	<2	<1	<1	~3	0.66	0.27	0.26	0.14				
NB04	<2	16	<1	~2	<2	20	~8	<1	0.03	0.82	0.45	0.08				
MW7	<2	*	<1	*	<2	*	38000	*	0.25	*	0.7	*				
* inaccessible																

Groundwater Depth Results

(mAHD)	Jun-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
MW1	2.33	1.26	0.93	1.02	0.9	1.16	1.68	1.71	1.7	1.71	2.03	2.56
MW1A	dry	dry	dry	dry	dry	dry	dry	2.75	dry	3.09	2.59	dry
MW2B	1.52	1.44	1.56	1.07	1.26	0.72	1.6	1.41	1.22	1.22	1.67	1.12
MW3A	1.69	1.36	1.27	1.13	1.2	0.76	1.51	1.46	1.4	1.26	1.5	2.5
MW04(07)	1.17	0.95	0.7	0.7	0.73	0.85	*	*	*	2.45	2.69	*
NB02	0.74	0.85	0.4	0.39	0.58	1.09	1.14	0.69	0.68	1.2	1.4	0.65
NB03	1.27	0.78	0.6	0.47	0.08	0.85	1.76	1.16	0.98	1.3	2.46	1.89
NB04	1.04	0.88	0.25	0.59	0.71	0.35	0.92	0.45	0.53	0.5	0.37	1.25
MW7	*	0.38	0.43	0.34	0.13	*	*	0.68	0.41	*	*	*

* access flooded

Existing Dredge Pond Surface Water Monitoring Results

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
EC (µS/cm)	382	502	536	407	494	486	497	582	459	483	513	435
pH (pH units)	7.9	7.9	7.4	7.7	8	7.7	7.7	7.9	7.7	7.6	7.6	7.3
Total Algae (cells/mL)			6,330			19,400			395,000			650
Cyanophyta (cells/mL)			3,840			18,300			175			<5
Total Phosphorus (µg/L)			20			50			220			90
Total Nitrogen (µg/L)			900			500			2,100			900
Chlorophyll-a (µg/L)			2			6			37			<2
Faecal Coliforms (CFU/100mL)			~10			56			400			10
Enterococci (CFU/100mL)			<2			13			~3			~4
Sodium (mg/L)			50			49			59			53
Potassium (mg/L)			5			4			6			4
Magnesium (mg/L)			15			12			14			11
Calcium (mg/L)			38			28			33			23
Chloride (mg/L)			77			68			91			61
Sulphate (mg/L)			75			62			70			65
Bicarbonate (mg/L)			82			73			60			50
Soluble Iron (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonium (mg/L)			<0.01			<0.01			0.02			<0.01
Turbidity (NTU)	67.8	55.1	115	125	150	151	80	179	163	129	78.5	184
Dissolved Oxygen (mg/L)	11	10.3	8.88	8.28	5.75	7.25	8.06	7.72	13.2	12.6	6.15	9.76
Dissolved Oxygen (%)	101	97.9	96.7	86.9	58.1	72.7	92.1	96.7	170	125	62.1	91.3
Temperature (deg C)	11.9	14.5	21.7	17.7	23.9	27	23.1	26.9	29	21.2	19.4	12.1
Total Alkalinity (mg/L)	94	127	82	87	70	73	69	68	60	66	58	50
Total Acidity (mg/L)	6	4	3	5	6	2	5	1	5	1	5	1
Dissolved Aluminium (mg/L)	0.08	0.04	0.02	0.03	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.07	<0.01
Dissolved Arsenic (mg/L)	0.003	0.004	0.003	0.004	0.003	0.002	0.002	0.002	0.002	0.001	<0.001	0.001
Dissolved Boron (mg/L)	0.05	0.06	0.07	<0.05	0.06	0.11	0.09	0.15	0.11	0.13	<0.05	0.12
Dissolved Barium (mg/L)	0.046	0.044	0.01	0.075	0.08	0.102	0.08	0.104	0.034	0.064	0.014	0.053
Dissolved Beryllium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Dissolved Manganese (mg/L)	0.004	0.005	<0.001	0.002	<0.001	0.005	0.004	0.006	0.007	0.005	0.005	0.008
Dissolved Nickel (mg/L)	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Dissolved Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)	<0.01	0.01	0.02	0.02	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)	0.042	0.034	<0.005	0.044	0.009	0.054	0.031	0.021	<0.005	<0.005	<0.005	0.046
Dissolved Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Processing Returns Water Monitoring Results

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
pH (pH units)	7.8	8.1	7.5	7.5	8.1	7.2	7.3	7.5	7.2	7.1	7.2	7.2
EC (µS/cm)	400	573	728	447	633	529	647	632	599	585	654	734
Turbidity (NTU)	166	3.7	28.7	201	9.1	1.3	218	2320	2	1.7	4.6	5.9
Temperature (deg C)	13.9	14.3	19.1	18.5	23.3	27.8	24.5	31.4	27.3	20.8	18.3	13.1
Total Alkalinity (mg/L)	89	160	90	77	88	84	62	66	58	64	47	65
Total Acidity (mg/L)	10	1	2	3	2	2	5	5	5	1	4	2
Dissolved Aluminium (mg/L)	0.08	0.04	0.12	0.04	0.15	0.24	0.02	0.02	0.25	0.09	0.06	0.02
Dissolved Arsenic (mg/L)	0.005	0.001	0.001	0.005	<0.001	0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001
Dissolved Boron (mg/L)	0.07	<0.05	0.09	0.09	<0.05	0.08	0.14	0.26	0.08	0.07	0.07	<0.05
Dissolved Barium (mg/L)	0.06	0.016	0.028	0.105	0.017	0.017	0.104	0.078	0.02	0.017	0.019	0.016
Dissolved Beryllium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001
Dissolved Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Manganese (mg/L)	0.009	0.004	0.065	0.01	<0.001	0.004	0.033	0.014	0.014	0.002	0.014	0.004
Dissolved Nickel (mg/L)	0.001	0.001	0.009	<0.001	0.001	0.002	0.001	<0.001	<0.001	0.002	0.002	<0.001
Dissolved Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)	0.077	<0.005	<0.005	0.083	<0.005	<0.005	0.063	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Iron (mg/L)	<0.05	<0.05	0.15	<0.05	<0.05	0.1	<0.05	<0.05	0.18	<0.05	<0.05	<0.05
Dissolved Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Oxygen (mg/L)	10.6	11.6	9.73	8.61	5.21	3.26	7.99	7.26	13.2	13.3	9.65	9.21

New Dredge Pond Surface Water Monitoring Results

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
EC (µS/cm)	367	518	704	452	571	700	453	597	545	577	616	715
pH (pH units)	7.5	7.4	7.4	7.4	7.8	6.6	7.2	7.3	7.5	6.2	5.4	6.8
Total Algae (cells/mL)			4,000			24,300			6,580			750
Cyanophyta (cells/mL)			3,800			8,550			800			<5
Total Phosphorus (µg/L)			<0.05			110			190			100
Total Nitrogen (µg/L)			1500			600			1,300			700
Chlorophyll-a (µg/L)			<1			2			2			<2
Faecal Coliforms (CFU/100mL)			54			10			560			~6
Enterococci (CFU/100mL)			~10			~1			48			~2
Sodium (mg/L)			58			47			78			103
Potassium (mg/L)			5			4			7			6
Magnesium (mg/L)			16			11			17			17
Calcium (mg/L)			33			68			32			33
Chloride (mg/L)			90			67			145			164
Sulphate (mg/L)			65			195			83			113
Bicarbonate (mg/L)			71			41			58			28
Soluble Iron (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05	0.23	0.16	2.72	<0.05
Ammonium (mg/L)			50			20			20			0.07
Turbidity (NTU)	134	177	351	201	273	93.5	108	287	300	243	54.5	97.4
Dissolved Oxygen (mg/L)	11.4	9.73	8.55	8.09	4.6	4.27	7.76	7.74	10.4	11.5	7.26	8.79
Dissolved Oxygen (%)	100	90.3	88	86.1	47.2	43.9	85.9	94.5	128	121	73.5	81.3
Temperature (deg C)	10.3	13.4	19	19.7	22.9	30.3	21.5	27.6	26.7	19.5	18.4	11.6
Total Alkalinity (mg/L)	80	103	71	77	65	41	43	58	58	28	3	28
Total Acidity (mg/L)	10	1	5	3	4	5	4	2	5	4	17	2
Dissolved Aluminium (mg/L)	0.04	0.04	0.02	0.03	<0.01	0.04	0.01	<0.01	<0.01	0.03	0.69	0.02
Dissolved Arsenic (mg/L)	0.003	0.004	0.006	0.007	0.005	0.005	0.002	0.002	0.001	<0.001	0.002	<0.001
Dissolved Boron (mg/L)	0.06	0.07	0.09	0.08	0.09	0.08	0.08	0.12	0.1	0.11	0.1	0.12
Dissolved Barium (mg/L)	0.044	0.044	0.067	0.07	0.104	0.044	0.071	0.102	0.016	0.04	0.059	0.039
Dissolved Beryllium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	0.012	0.001
Dissolved Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Dissolved Manganese (mg/L)	0.019	0.012	0.005	0.008	0.006	0.034	0.009	0.024	0.029	0.043	0.068	0.048
Dissolved Nickel (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.001	0.001	0.005	0.015	0.002
Dissolved Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)	<0.01	<0.01	0.02	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)	0.048	0.038	0.062	0.054	0.029	0.041	0.036	0.04	<0.005	0.038	0.102	0.042
Dissolved Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Blue Angle Creek Upstream (Site B) Surface Water Monitoring Results

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
pH (pH units)	7.2	7.3	7.4	7.2	6.7	6.2	6.4	6.7	7.4	6.2	7	6.7
EC (µS/cm)	889	1,010	1,140	988	1120	185	401	554	724	170	167	297
Turbidity (NTU)	4.4	5.4	3.6	2.8	2.1	9.4	22.6	13.8	14.2	5.6	7.2	14
Temperature (deg C)	9.9	11.5	14.6	16.7	19.2	24.6	20.8	25.2	21.7	17.2	17.1	9.8
Total Alkalinity (mg/L)	89	155	127	153	133	41	45	62	91	14	15	16
Total Acidity (mg/L)	12	1	3	6	12	8	12	1	11	2	6	3
Dissolved Aluminium (mg/L)	0.04	0.06	0.05	0.02	<0.01	0.13	0.04	0.02	0.03	0.1	0.15	0.11
Dissolved Arsenic (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Boron (mg/L)	0.22	0.16	0.18	0.21	0.2	0.07	0.1	0.11	0.18	<0.05	<0.05	<0.05
Dissolved Barium (mg/L)	0.046	0.011	0.01	0.063	0.014	0.114	0.106	0.008	0.107	0.004	0.004	0.006
Dissolved Beryllium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)	0.001	0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.003
Dissolved Manganese (mg/L)	0.225	0.19	0.142	0.404	0.523	0.458	0.338	0.152	0.246	0.069	0.02	0.019
Dissolved Nickel (mg/L)	<0.001	0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)	0.058	0.006	0.008	0.029	<0.005	0.037	0.051	<0.005	0.053	<0.005	<0.005	0.011
Dissolved Iron (mg/L)	0.26	0.44	0.35	0.28	0.42	6.27	1.11	0.21	0.54	1.05	0.58	0.66
Dissolved Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Oxygen (mg/L)	4.48	2.47	3.7	4.52	3.25	4.25	3.37	3.15	2.27	6.65	6.83	7.44

Blue Angle Creek Downstream (Site C) Surface Water Monitoring Results

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
pH (pH units)	7	7.1	6.7	7	7.3	6.9	6.9	6.9	7.1	5.7	6.8	6.8
EC (µS/cm)	1120	2,280	8620	14,800	3,520	456	862	1900	6,640	304	169	274
Turbidity (NTU)	6.3	5.8	37.9	8.2	2	12.6	57.4	14.9	10.9	13.6	6.8	13.8
Temperature (deg C)	12.3	12.8	16.4	19.6	19.2	24.8	19.6	21.9	23.6	17.4	17.2	10.3
Total Alkalinity (mg/L)	138	187	136	148	123	37	95	95	122	15	15	30
Total Acidity (mg/L)	16	1	18	12	10	7	12	6	14	2	6	3
Dissolved Aluminium (mg/L)	0.08	0.08	0.11	0.02	<0.01	0.08	0.04	0.03	0.03	0.1	0.17	0.14
Dissolved Arsenic (mg/L)	<0.001	<0.001	0.002	0.002	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Dissolved Boron (mg/L)	0.14	0.18	0.65	1.24	0.21	0.08	0.11	0.18	0.49	<0.05	<0.05	<0.05
Dissolved Barium (mg/L)	0.053	0.008	0.009	0.035	0.014	0.085	0.11	0.009	0.02	0.005	0.004	0.069
Dissolved Beryllium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Chromium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.002
Dissolved Manganese (mg/L)	0.089	0.07	0.056	0.071	0.042	0.386	0.188	0.081	0.18	0.062	0.016	0.032
Dissolved Nickel (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.001	0.001	<0.001
Dissolved Lead (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01
Dissolved Selenium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)	0.047	<0.005	<0.005	0.009	<0.005	0.05	0.06	<0.005	<0.005	<0.005	0.006	0.06
Dissolved Iron (mg/L)	0.38	0.37	1.4	0.25	0.23	2.78	0.18	0.1	0.26	0.85	0.6	0.95
Dissolved Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Oxygen (mg/L)	4.16	2.74	4.94	4.58	5.6	6.32	3.53	3.74	4.9	8.05	6.92	6.35

Air Quality Monitoring Results – Depositional Dust Gauges

TIS (g/m2/month)	1A	2A	4A
Jul-23	1.0	11.7	0.1
Aug-23	1.1	1.0	0.1
Sep-23	3.4	1.0	0.2
Oct-23	1.5	1.0	0.2
Nov-23	1.7	1.8	0.3
Dec-23	1.6	0.9	0.4
Jan-24	1.2	0.2	1.4
Feb-24	1.3	0.4	0.3
Mar-24	1.1	0.5	0.5
Apr-24	0.9	1.3	1.5
May-24	0.9	0.5	0.5
Jun-24	0.1	0.4	0.5

Acid Sulphate Sand Monitoring

	TOS (%)
Jul-23	0.03
Aug-23	<0.02
Sep-23	<0.02
Oct-23	0.03
Nov-23	0.03
Dec-23	0.029
Jan-24	0.02
Feb-24	0.017
Mar-24	0.038
Apr-24	0.02
May-24	0.038
Jun-24	0.029

Annexure D - Annual Review of the Landscape and Rehabilitation Management Plan

2024 Annual Review of the Landscape and Rehabilitation Management Plan

Niche Environment and Heritage

1 July 2024

Niche

Gerroa Sand Quarry 2024 Annual Review

Vegetation Management Plan

Prepared for Cleary Bros (Bombo) Pty Ltd | 1/07/2024

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Document control

Project number	Client	Project manager	LGA
8712	Cleary Bros (Bombo) Pty Ltd	Lily Cains	Kiama

Version	Author	Review	Status	Comments	Date
D1	Lily Cains	Isabel Lyons	Draft		07 June 2024
Rev1	Lily Cains	Mark Hammond	Final		01 July 2024

Table of Contents

1 Vegetation Management Plan: Annual Monitoring Report

1.1 Introduction

Niche was commissioned by Cleary Bros (Bombo) Pty Limited (Cleary Bros) to complete the Gerroa Sand Quarry (the Project) annual rehabilitation monitoring, located at the corner of Beach Road and Crooked River Road, Gerroa (the Site). A map of Gerroa Sand Quarry Vegetation Management Areas is provided in Figure 1, and a map of the Compensatory Planting is provided in Figure 2.

The primary objective of this report is to update any necessary control measures required with regards to priority weed management within the designated zones across the Site and provide advice on any management actions that can be implemented to encourage the rehabilitation of the Site.

Primarily, this report aims to meet the Conditions of Approval granted by the NSW Land and Environment Court for the extension of the Gerroa Sand Quarry, operated by Cleary Bros (Bombo) Pty Limited (see Appendix 1). This report satisfies the condition requiring an annual report on the progress of the revegetation project.

This report is the 16th such annual report covering the Site at Gerroa prepared since 2009. This report is based on an inspection that was undertaken on the 4th of June 2024.

1.2 Background

Cleary Bros have undertaken annual monitoring of the Gerroa Sand Quarry since 2009. The sites mentioned in this report are those consistent with the document "Landscape and Rehabilitation Management Plan, Extension and Continuation of Gerroa Sand Quarry, Municipality of Kiama, City of Shoalhaven" Kevin Mills & Associates (KMA) (2008), which is the Court approved management plan for the Site.

This report is the annual inspection for the year 2023/2024; a similar report has been prepared annually by Niche since 2018. Prior to this, the report was prepared by Kevin Mills & Associates. The following has occurred at the Site in recent years (KMA 2018):

- The 'Northern Corridor' has been shown to be successful in terms of creating habitat and use by native animals, as compared to the 'East-West Link'.
- The quarry has moved northwards and the forest in the East-West Link has been removed, the quarry subsequently reaching its most northern limit.
- Quarterly inspections and reports have continued to be undertaken during 2019-24, providing regular updates of the progress of the revegetation/rehabilitation areas.
- Nearly all plantings within the designated revegetation areas have been completed and these areas are now in maintenance phase.
- Significant effort has been made to reduce the extent of *Lantana camara* (Lantana) on the Site through herbicide spraying.

Recent annual reports have detailed inspections of the revegetation areas with a focus of analysing the progress towards native dominant forest and making relevant recommendations to improve management outcomes if required. There have been no wildlife surveys since 2016 as this was deemed no longer necessary by KMA (2018).

Note that the background information, detailed description of survey methods and the extensive survey information from the first nine years of reporting are contained in the earlier reports KMA (2018); this information is not repeated here.

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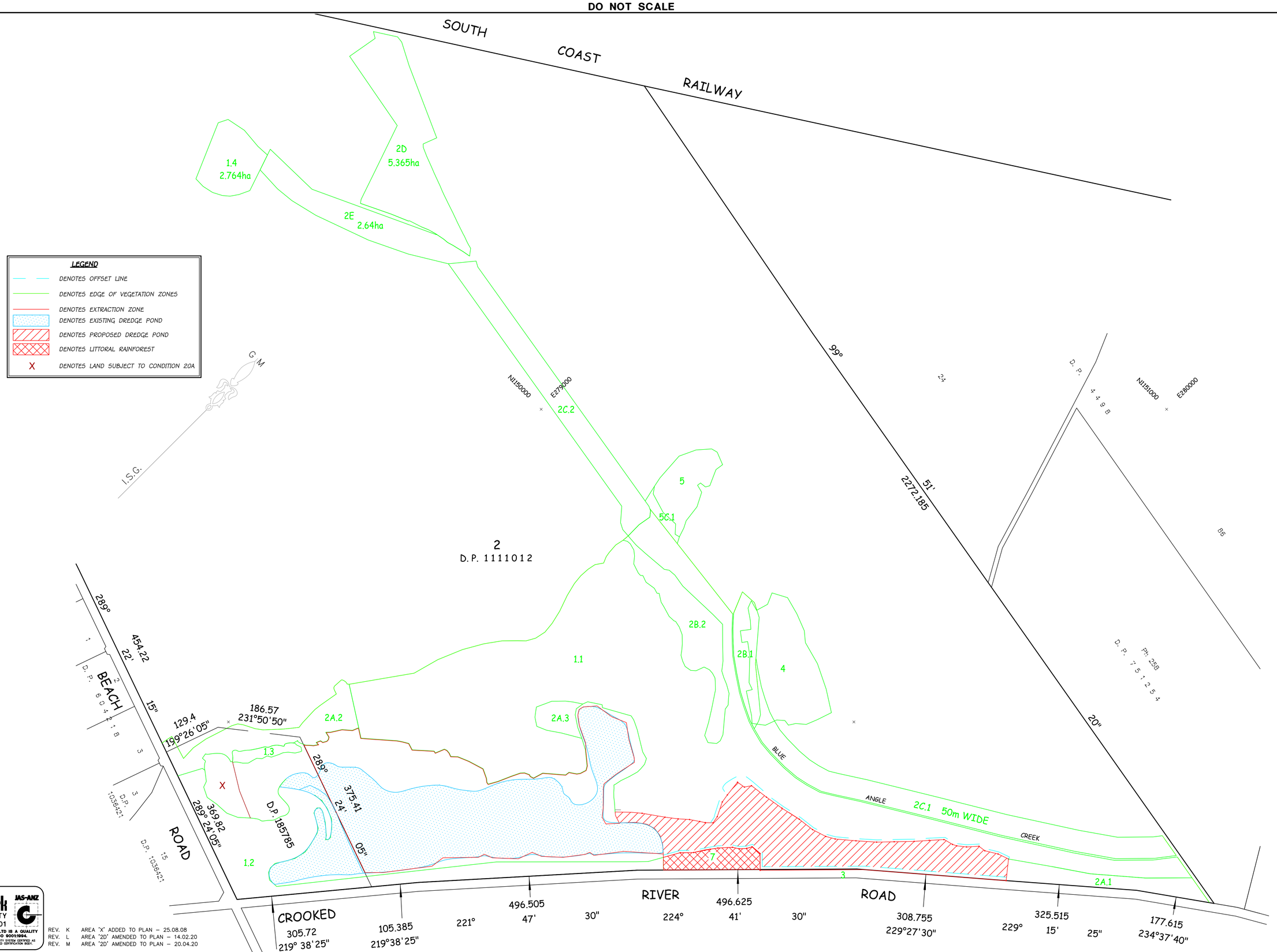

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REV. K AREA 'X' ADDED TO PLAN – 25.08.08
REV. L AREA '2D' AMENDED TO PLAN – 14.02.20
REV. M AREA '2D' AMENDED TO PLAN – 20.04.20

REVISIONS

No.	DESCRIPTION	DRN	APP	DATE
A	WESTERN ZONE AREAS ADDED	B.P		10-03-08
B	ADDITIONAL AREA 5.1 ADDED	J.T.		10-3-08
C	2C.1 & 2C.2 amended to 50m wide.	SP		21.05.08
D	Title amended, vegetation hatching removed from zones 1–4 & 5.	sp		22.05.08
E	Zone 7 added, title amended	sp		26.05.08

REVISIONS

No.	DESCRIPTION	DATE
F	AMENDMENT TO ZONE NUMBERING	27.05.08
G	Amendment to zone numbering, areas 1 and 5.	28.05.08
H	Amendment to southern area.	18.08.08
I	Amendment to southern area.	19.08.08
J	Amendment to southern area.	25.08.08

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A.C.N 008 664 417

SURVEYOR:
HEIGHT DATUM:
ORIGIN:
HORIZ. DATUM:
ROT'N ANG: 45°
SCALE: 1: 4000
DATE: 4-3-08
DRAWN: BEA
DESIGNED:
CHECKED: C.J.
APPROVED: C.J.
DWG STATUS.

VEGETATION MANAGEMENT AREAS AND SITE PLAN GERROA SAND MINE

JOB No. KF106198
DWG No. 106198/308
REV. M
SHEET 1 OF 1
A1

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REVISIONS		DESCRIPTION	DRN	APP	DATE
	A	AREAS 4 & 5 ADDDED	BEA		6-3-08
	B	ADDITIOAL AREA 5.1 ADDED	J.T.		10-3-08
	C	2C.1 & 2C.2 AMENDED TO 50M WIDE	SP		21.05.08
	D	TITLE AMENDED	SP		22.05.08
	E	ZONE 7 ADDED.	SP		26.05.08

REV F AMENDMENTS TO ZONE NUMBERING. 27.05.08
REV G AMENDMENTS TO ZONE NUMBERING. 29.05.08
REV H EAST-WEST LINK ZONE ADDED. 19.06.08
REV I HATCHING ADDED TO EAST-WEST LINK & NORTHERN CORRIDOR DEFINED. SOUTHERN AREA AMENDED. 18.08.08
REV J SOUTHERN AREA AMENDED - 19.08.08
REV K SOUTHERN AREA AMENDED - 25.08.08
REV K-1 SOUTHERN AREA AMENDED - 25.08.08
REV L AREA '2D' AMENDED - 14.02.20
REV M AREA '2D' AMENDED TO PLAN - 20.04.20

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SURVEYOR: C.J.	DATE: 5-3-08	PLAN SHOWING MANAGEMENT ZONES GERROA SAND MINE	JOB No. KF106198 / REV. M
HEIGHT DATUM: A.H.D.	DRAWN: BEA		DWG No. 6198/308
ORIGIN:	DESIGNED:		
HORIZ. DATUM:	CHECKED:		
ROT'N ANG: 11°	APPROVED:		
SCALE: 1:12500 POINT SCALE ONLY	DWG STATUS.	COMPENSATORY PLANTING	SHEET 1 OF 1 / A3

2 Assessment of Individual Zones

Most of the plantings were completed at each zone early in the monitoring program and are now in the maintenance phase. The most recent plantings have occurred in Zone 2B.1, 2D, 2C.2 and Zone 2C.1 (see Figure 1 and Figure 2) to expand the vegetation buffer along Blue Angle Creek, creating suitable habitat for local fauna. These areas are now similarly in the maintenance phase and will require further plantings to replace any lost in the past 3 years.

Weed maintenance has been carried out at each of the planting areas since the early stages of the project and are now considered to be under control. An updated description and condition of each of the zones (Figure 1) and the planting areas has been provided in Table 1.

Over the previous year, all zones were inspected by Cleary Bros staff and assessed during quarterly inspections. Due to the weather and the subsequent inundation over the previous months, access became difficult to some zones near Blue Angle Creek, including zones 5, 5C.1, 2C.2, 2D, 2E and 1.4. Maintenance work and inspections were therefore only conducted in these zones when access was safe and achievable. Of these sites, only 2C.2 and 2D were accessible for this year's inspection. The recommendations for the rehabilitation zones (Figure 1) detailed in Table 1 were made following the site inspection conducted by ecologist Lily Cains on the 4th of June 2024. A priority weeds list for the Site was also created and provides further detail on control methods (Appendix 2).

Table 1: Recommendations for the management zones

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 1: Forest Enhancement Zone Objectives (41.95 ha) - Improve the quality of the forest by removal of weeds. - Restrict access to grazing stock. - Monitor the health of the forest. - Strengthen tree cover south of previous dredge pond. Work in the past has included Lantana control and removal of selected weeds such as *Chrysanthemoides monilifera* (Bitou Bush). Weed management is ongoing and is guided by the Weed Management Plan for the Site (KMA 2008).			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 1.1	This is the main area of existing forest, extending from the southern to northern end of the property boundary.	The northern corridor of subzone 1.1 appears to be in good condition. Fireweed (*Senecio madagascariensis*), Cobbler's Pegs (*Bidens pilosa*) and Rhodes Grass (*Chloris gayana*) were all recorded, mainly close to the edge of the dredge pond. The larger portion of 1.1 appears to be mostly high condition vegetation (pictured). Some tall stands of Giant Reed (*Arundo donax*) were recorded along the roadside and in lower lying areas in the eastern section (Plate 1). Large stands of Lantana (*Lantana camara*) were also observed, however for the most part these were also confined to roadside sections.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 1.2	This subzone covers the forest around the eastern and southern sides of the old dredge pond.	Dense Lantana (*Lantana camara*) still persists throughout this zone (pictured), particularly within the northern linear section of subzone 1.2. Continue to manage via cut and paint methods. Scattered Crofton weed (*Ageratina adenophora*) was also noted. The southern portion of this zone near the office appears to be in reasonable condition, however multiple individuals of Cassia (*Senna pendula*) were observed (Plate 2), and Moth Vine (*Araujia sericifera*) was seen beginning to overtake native trees.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 1.3	Covers the old bund wall. This subzone is located behind the site office and towards the front gate.	This subzone appears to be in relatively good condition, with weeds mainly confined to roadside patches (pictured). Lantana (*Lantana camara*) and Moth Vine (*Araujia sericifera*) (Plate 3) are the priority weeds in this area. Control using cut and paint methods. Fireweed (*Senecio madagascariensis*), Rhodes Grass (*Chloris gayana*) and Cobblers Pegs (*Bidens pilosa*) were also recorded along the roadside.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 1.4	A fenced patch of Swamp Oak within grazing land, which now has a planted link to the east (planting zone 2E). Vegetation is well established and requires very little ongoing work.	This area was too wet to access. Last years report noted that this zone consisted of a high condition stand of Casuarina. Some dead Lantana (*Lantana camara*) was recorded along the edge of the fence. If there is any Lantana still present continue weed control efforts via cut and paint.	N/A
Zone 2: Broad scale planting zone Objectives (25.39 ha) - Develop habitat by planting forest communities in accordance with the Landscape and Rehabilitation Management Plan (KMA 2008) - Establish stronger habitat corridors to the north and south of the existing forest - Monitor plantings and complete maintenance, including the removal of unused plant guards. - Strengthen east-west and north-south links between the established forest and Seven Mile Beach National Park.			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2A.1	This is the main area that has been used to develop the forested link in the northeast corner of the Site. Extensive work was carried out in the early years to develop this area as habitat for native fauna.	This area appears to be in generally good condition. There are still some stands of Lantana (*Lantana camara*) throughout. A lot of Rhodes Grass (*Chloris gayana*) was recorded, mainly along the eastern perimeter near the entry gate (pictured). Scattered Tobacco Bush (*Solanum mauritianum*) was also recorded within this subzone.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2A.2	This area is important for the forest link to the south and into Seven Mile Beach National Park on the southern side of Beach Road. Planted trees are becoming well established in most places.	Large stands of Lantana (*Lantana camara*) recorded throughout subzone 2A.2 (pictured). Additional weeds such as Moth Vine (*Araujia sericifera*), Rhodes Grass (*Chloris gayana*), Cobblers Pegs (*Bidens pilosa*) and Fireweed (*Senecio madagascariensis*) were recorded along the roadside, however in low abundance. Tobacco Bush (*Solanum mauritianum*) was also recorded, with at least one very large individual observed (Plate 4).	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2A.3	This area was revegetated early in the re-planting program. The plantings that have survived in this area have become well established despite previous impacts from grazing native fauna.	Lantana (*Lantana camara*) was recorded growing intermittently throughout this zone, continue to control via cut and paint methods. Rhodes Grass (*Chloris gayana*), Spear thistle (*Cirsium vulgare*) and Cobblers Pegs (*Bidens pilosa*) were also recorded growing along the roadside.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2B.1	This subzone is a narrow area that was regenerated to link the creek-side forest to that within Zone 4. The subzone was spread with topsoil and timber debris, and plantings were undertaken. Considerable growth of the plantings has since been noted.	The vegetation within this subzone appears to be in good condition (pictured), however there is substantial Moth Vine (*Araujia sericifera*) and Giant Reed (*Arundo donax*) growth in places along the roadside. Both can be managed via cut and paint methods. Additionally, Cobblers Pegs (*Bidens pilosa*) and Spear thistle (*Cirsium vulgare*) were prominent along the edge of the road.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2B.2	This area is located in a low-lying swamp and is being colonised by Swamp Oak. Some planting was carried out on a higher part of the subzone in the south and west in previous years (KMA 2018). The natural regeneration occurring in this subzone is adequate.	This subzone appears to be high condition vegetation, largely made up of native ferns. There is some Lantana (*Lantana camara*) encroachment (pictured). This should be managed via cut and paint methods. Tobacco Plant (*Solanum mauritianum*) was also recorded sporadically along the roadside. At the western end of this subzone, Giant Reed (*Arundo donax*) and Pigeon Grass (*Setaria parviflora*) were also recorded. It was noted that some plantings were dead, however majority have matured nicely.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2C.1 (southern end)	Small revegetation patch that was completed recently to link the forest with Zone 4, located roadside adjacent to subzone 1.1.	Swamp Oak (*Casuarina glauca*) plantings are maturing well. Sleeves need to be removed so as not to restrict further growth (Plate 5). Additional plant of native tube stock is recommended to supplement plantings that haven't taken. The area is quite overgrown and weedy (pictured), with Fireweed (*Senecio madagascariensis*), Rhodes Grass (*Chloris gayana*) and Cobblers Pegs (*Bidens pilosa*) the dominant weeds. When supplementary planting is undertaken, weed management and maintenance mowing is encouraged to prevent tube stock from being overrun by weeds.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2C.1 (northern end)	This subzone is known as 'The Garden' and is a planted area adjacent to more established vegetation located in subzone 1.1.	'The Garden' appears to be in good condition, plantings are now well established, and the area is generally free from high threat weeds. Infill plantings are suggested to promote native tree and shrub growth and to lessen risk of weed reinvasion. Occurrence of weeds is concentrated around the bank of the dredge pond (pictured) and species include Flaxleaf Fleabane (*Conyza bonariensis*), Fireweed (*Senecio madagascariensis*) and Spear Thistle (*Cirsium vulgare*).	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2C.2	A long narrow area supporting some well-established plantings.	At western end, Swamp Oak (*Casuarina glauca*) plantings are very well established. Weeds are very sparse. A high cover of weeds was observed in the eastern end near 2B.2 (pictured) with species such as Pigeon Grass (*Setaria parviflora*), Fireweed (*Senecio madagascariensis*) and Purpletop Vervain (*Verbena bonariensis*) dominating the area.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2D	Modified some time ago to a triangular area between subzones 2E and 2D. This area was originally sprayed and partly spread with timber mulch prior to plantings. This area is prone to water inundation during wetter months, limiting some access to areas.	Access was limited due to recent rain. Large stands of Paddy's Lucerne (*Sida rhombifolia*) were recorded near the road at the western end of subzone 2D (pictured). Tobacco Bush (*Solanum mauritianum*) and Purpletop Vervain (*Verbena bonariensis*) were also recorded. Condition of the vegetation appears to improve significantly as you move further into the patch, away from the road. Old plantings are maturing nicely.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Subzone 2E	Plantings in this area have become well established and tree growth continues to be progressing well. This narrow strip of trees extends into subzone 1.4, an established area of trees.	Once again, this area was too wet to access. The previous report noted this area was in overall good condition. Continue to treat woody weeds such as Lantana (*Lantana camara*) that reappear.	N/A
Zone 3: Screen Planting Zone Objectives (0.42 ha) - Establish a screen of native vegetation along the eastern edge of pond extension - Maintain existing trees on south-eastern boundary, remove Lantana and replace with native plantings.			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 3	This zone includes the bund wall which reached its final height early in 2015. A screen of native vegetation was established along the eastern edge of the pond extension. The sand bund is currently stabilised by growth of plants, the majority of which are weeds.	Similarly to previous years, large stands of Lantana (*Lantana camara*) persist along the bund wall (pictured). Continue removal of the Lantana using cut and paint methods. Planting is required to encourage native growth and to stabilise the bund wall. Additional weeds recorded along the edge of the bund wall within zone 3 include Cobblers Pegs (*Bidens pilosa*), Rhodes Grass (*Chloris gayana*), Fireweed (*Senecio madagascariensis*) and White Passionflower (*Passiflora subpeltata*) (Plate 6).	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 4: Bangalay Sand Forest (3.32 ha) - Restrict access to grazing stock - Establish a forest link to nearby larger area through plantings - Monitor the health of the forest - Remove weeds when required.			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 4	This zone is remnant Bangalay Sand Forest vegetation. This area has an intact Bangalay and Blackbutt canopy and is of high habitat value. Lantana has been heavily targeted in this zone and continued maintenance has been completed.	The woodland appears to be in good condition (pictured). Fireweed (*Senecio madagascariensis*) is prevalent along the fence line, however there are minimal weeds within the woodland. A dense infestation of weeds, primarily Fireweed (*Senecio madagascariensis*) and Common thornapple (*Datura stramonium*), was recorded along the top of the dirt mound outside the fence line. Not part of this zone, however, monitor weeds for encroachment into zone 4.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 5: Swamp Oak Forest Objectives (1.82 ha) - Restrict access to grazing stock - Establish a forest link to nearby larger area through plantings - Monitor the health of the forest - Remove weeds when required.			
Zone 5	This zone includes remnant Swamp Oak Forest. Area is overall in good condition with a relatively open mid/understorey.	This area was too wet to access. Last year it was noted that the perimeter fence needed maintenance to stop stock from grazing on plantings. Control any Lantana (*Lantana camara*) via cut and paint methods.	N/A
Zone 5C.1	Occurs between the Swamp Oak Forest in zone 5 and the creek that has been planted. The area is dominated by Kikuyu Grass. The shrub Melaleuca ericifolia is continuing to expand from the creek-side.	This area was too wet to access. Last year it was suggested that further planting of native tube stocks (e.g. *Casuarina* spp.) would help establish connection to nearby subzone 5. If this hasn't been actioned, it should be done when the area is dry enough to access.	N/A
Zone 6: Dredge Pond Foreshore Objectives Dredge Pond Foreshore (includes 5 m setback from pond and batter slopes on both the existing and extension pond) - Stabilise the batters on the edges of the dredge pond - Undertake plantings within the 5 m set back area along the edge of the retained Littoral Rainforest (Zone 7) as soon as practical after dredging is completed in this area - Continue rehabilitation of previous dredge pond areas.			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 6	This zone occurs within the foreshore areas of the Dredge Pond. The foreshore has been previously shaped, had topsoil spread and planted as the dredge pond has expanded northwards. Overall, the pond bank is stable with little to no erosion evident. Natural regeneration and pre-existing native growth have helped to stabilise area.	This zone appears to be in relatively high condition. There is Giant Reed (*Arundo donax*) intermittently growing along the roadside (pictured), and some small Lantana (*Lantana camara*) stands, which can both be managed via cut and paint methods. Along the bank, avoid spraying to ensure native species retain dredge pond bank stability. Additional plantings may be beneficial to encourage native growth and to control herbaceous weeds such as Fireweed (*Senecio madagascariensis*) and invasive grasses from dominating.	

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 7: Littoral Rainforest Objectives (0.95 ha) - Control weeds, particularly Lantana - Monitor the health of the forest - Protect the western edges of the zone from quarrying - Ensure that the felling of trees does not impact the vegetation in this area.			

Zone	Location / description	Recommendations for ongoing works 2024/2025	Reference Images
Zone 7	This zone occurs along the eastern edge of the Site between zones 3 and 1.2. This zone has cultural significance, therefore only minor control of Lantana has been conducted over time.	This zone appears to be in a similar condition to subzone 1.2. Dense Lantana (*Lantana camara*) was observed throughout (pictured) and should continue to be monitored and removed via cut and paint methods.	

3 Discussion and recommendations

The 16th annual monitoring report for the Gerroa Sand Quarry is consistent with previous reports, which detail the success of plantings across the various zones on the Site. The quarterly reports completed by Cleary Bros staff have allowed for continuous management of priority weeds and maintenance of fenced areas. Overall, the revegetation works completed throughout the Site are in good condition with evidence of continued plant growth and natural regeneration occurring.

Due to the increased rainfall in recent months, some zones have been largely inaccessible and have subsequently become inundated with weed species. The previous two years reports noted that some plantings were impacted by the floodings and would need to be replaced, the most severely impacted being the eastern end of zone 2C.2. This zone was able to be accessed this year, and it was noted that the area was very overgrown and weedy. Additionally, subzone 2E has been inaccessible over previous years, and was once again unable to be accessed. Management of these zone should be undertaken immediately as access becomes available again.

Subzones 1.4, 5 and 5C.1 were all too wet to access this year. They don't have as much of a history of inundation, having been accessed in last years inspection, so weed management in these areas should be easier.

To improve revegetation successes, such as those exhibited in the northern portions of the Gerroa Sand Quarry, mature weeds such as Wild Tobacco Bush (found in Zone 2A.1, 2A.2, 2B.2 and 2D) and Lantana stands (found in most zones) should be targeted to limit further seed dispersal given their higher fecundity. Weed removal should be undertaken using cut and paint methods for these woody weeds since it offers a higher kill rate and avoids indirect poisoning of adjacent native species.

Ongoing Lantana control throughout the Site should be undertaken in a mosaic pattern in areas up to 1000m^2 at a time to allow for fauna to disperse through adjacent habitat whilst native revegetation occurs in the targeted extent.

Deer grazing and rubbing upon newly planted tube stock was observed in years past, however no evidence of deer rubbing was noted during this year's inspection. If predation intensifies again and rates of tube stock success decline, on-site deer control methods may need to be implemented.

Continued mowing and weed maintenance in younger planted areas such as 2C.1 and 2C.2 (once access is available) is required to ensure successful revegetation. Plantings need to be monitored and tree guards removed once saplings reach a healthy size to ensure their growth isn't restricted (as seen in subzone 2C.1, Plate 5).

Continued targeting of priority weed species across the southern and eastern extent of the Site in conjunction with ongoing maintenance of planting areas will continue to improve canopy connectivity across the Site. Additional information on maintenance actions for priority weeds is provided in Appendix 2. Whilst mature native species continue to flower and fruit, ongoing revegetation will continue to increase the proportion of native flora species until new plantings become self-sustaining in years to come.

References

— Kevin Mills & Associates Mills (2008). Landscape and Rehabilitation Management Plan, Extension and continuation of Gerroa Sand Quarry, Prepared for Municipality of Kiama, City of Shoalhaven, Cleary Bros (Bombo) Pty Limited. Cleary Bros (Bombo), Port Kembla, October.
— Kevin Mills & Associates (2018). Tenth Annual Report, Flora and Fauna Monitoring Surveys, Gerroa Sand Quarry, Municipality of Kiama. Report prepared for Cleary Bros. (Bombo) Pty Ltd, June.
— Department of Primary Industries (2023). NSW WeedWise, June.

Plates

Plate 1: Giant Reed (*Arundo donax*) growing along the roadside of Subzone 1.1

Plate 2: Cassia (*Senna pendula*) growing near office in Subzone 1.2

Plate 3: Moth Vine (*Araujia sericifera*) found within Subzone 1.3

Plate 4: Tall Tobacco plant (*Solanum mauritianum*) found within Subzone 2A.2

Plate 5: Swamp Oak (*Casuarina glauca*) planting with tree guard still in place, Subzone 2C.1 (southern end)

Plate 6: White Passionflower (*Passiflora subpeltata*) growing along the bund wall in Zone 3

Appendix 1: Selected Conditions of Approvals

Condition 17.

The Proponent shall:

(b) ensure that within 4 years of the date of this approval, the additional plantings in the Northern Corridor and Southern Rehabilitation Area are comprised of at least 60% of the plant species recorded for the representative plant communities in the quarry extension area, such as Bangalay Sand Forest and Littoral Rainforest;

Condition 20.

The proponent shall:

(a) commence Compensatory Planting and the vegetation screen along the Crooked River Road frontage north of the east-west link (as shown conceptually in Appendix 3) within 12 months of the date of this approval or when sufficient propagation material has been collected; and

(b) not sever the east-west link until it can be demonstrated to the satisfaction of the director-general that the established communities represented in the northern corridor comprise at least 60% of the native flora species as set out in Appendix 6 and the Northern Corridor is successful according to the criteria in Condition 25 to the satisfaction of the director-general."

Condition 23.

Successful establishment of the Northern Corridor shall be measured by the following criteria:

(a) presence of native flora species;

(b) a majority of the flora species recorded from the removed forest occur in the area; (e.g. 60% of flora species recorded in removed forest are present);

(c) species from all four layers have been planted and at least 50% of the projected cover has been achieved for each of the shrub and ground cover layers;

(d) self-sustaining native plant populations (e.g. regeneration of a second generation);

(e) no dominance by single flora species (e.g. Bracken);

(f) weeds are not significantly impacting on the native vegetation;

(g) weeds do not represent a majority of the flora species or a higher percentage cover than the native flora species; and

(h) impacts such as grazing are excluded from the area.

Condition 24.

Successful establishment of fauna habitat in the Northern Corridor would be measured by:

(a) presence of species;

(b) a majority of the resident species recorded from the removed forest occur in the area;

(c) fauna populations are resident in the area;

(d) pest animals are controlled and not impacting upon the fauna or its habitat; and

(e) impacts such as grazing are excluded from the area.

Condition 25.

Prior to the severance of the East-West Link the Proponent shall:

(a) determine the presence of species in both the East-West Link and Northern Corridor by conducting standard animal survey techniques at least twice in the first year (e.g. Elliot trapping for small mammals, pitfall trapping for reptiles, observational surveys for frogs and birds, and spotlighting transects for arboreal animals);

(b) determine whether a majority of animal species (particularly those determined to be likely to be impacted by fragmentation) utilising the corridor in the East-West Link are present in the conservation area and the Northern Corridor and the re-created link at the northern boundary.

Appendix 2: Priority weeds for the South East region

Note: this region includes the local council areas of Bega Valley, Eurobodalla, Goulburn, Mulwaree, Hilltops (eastern), Kiama, Queanbeyan-Palerang Regional, Shellharbour, Shoalhaven, Snowy Monaro Regional, Upper Lachlan, Wingecarribee, Wollongong and Yass Valley.

WARNING: ALWAYS READ THE LABEL

Users of agricultural or veterinary chemical products must always read the label and any permit, before using the product, and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from compliance with the directions on the label or the conditions of the permit by reason of any statement made or not made in this information. To view permits or product labels go to the Australian Pesticides and Veterinary Medicines Authority website www.apvma.gov.au

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
African Lovegrass	*Eragrostis curvula*	Regional Recommended Measure Land managers reduce impacts from the plant on priority assets.	Spot spray new growth if any arise with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water.
Asparagus fern	*Asparagus aethiopicus*	General Biosecurity Duty All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale.	Main methods of control include excluding plants from uninfested areas, physical removal of all plants parts, and herbicide application. Spot spraying is most successful when completed between flowering and berries forming. Spot spray using 360g/L Glyphosate based herbicide at a rate 1 part glyphosate to 50 parts water.

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
Bitou bush	*Chrysanthemoides monilifera* subsp. *rotundata*	**Biosecurity Zone** The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone.	Mature bitou bush plants can be slashed, whilst seedlings can be hand-pulled to remove the entire root system. Plants are liable to resprout after slashing alone, but applying herbicide to stems immediately after cutting should prevent regrowth. Use cut and paint methods or spot spray using 360g/L Glyphosate based herbicide at a diluted rate of 5 or 10ml/Litre of water.
Blackberry	*Rubus fruticosus* species aggregate	**Prohibition on dealings** Must not be imported into the State or sold, bartered, exchanged or offered for sale. *All species in the Rubus fruiticosus species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree.*	Not to be mulched with native species to reduce spread. A combination of slashing or hand removal and spot spraying with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water.
Cassia	*Senna pendula* var. *glabrata*	**General Biosecurity Duty** All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Spot spraying is recommended for seedlings and plants less than 2 m tall in dense infestations. Cut and paint methods should be used on taller or individual plants. Dried seed pods can be burnt in a hot fire. Contact your local council for further advice on how to dispose of seed pods. For spot spray and cut and paint methods use 360g/L Glyphosate at a diluted rate of 20 ml/Litre of water.

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
Common thornapple	*Datura stramonium*	General Biosecurity Duty All pest plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Common thornapple can be controlled by herbicides, mulching, slashing, hand-pulling or chipping. Preventing plants from seeding is the most effective way to control it. For chemical control of small infestations use Glyphosate 450 g/L in a handgun spray at a rate of 400 to 560 mL per 100 L of water.
Coral tree	*Erythrina crista-galli*	General Biosecurity Duty All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Seedlings can be removed by hand or be dug out. Cut stump method or stem injection is recommended for mature plants. This involves cutting the trunk or making an injection into the trunk and applying herbicide within 15 seconds. For chemical control use 360g/L Glyphosate at a rate of 1 part glyphosate and 1.5 parts water.
Crofton weed	*Ageratina adenophora*	General Biosecurity Duty All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Crofton weed can be controlled using a combination of methods, in conjunction with pasture and grazing management practices, aimed at creating an unfavourable environment for weed invasion. Small infestations can be manually removed. For larger infestations a combination of slashing and chemical application is used. When spraying Crofton weed use 360g/L Glyphosate based herbicide at a rate of 5 ml/Litre of water.
Fireweed	*Senecio madagascariensis*	Regional Recommended Measure **Exclusion zone:** whole of region except the core infestation area of Wollongong, Kiama, Shellharbour,	Herbicides are most effective in combination with healthy, competitive pastures. The best time to treat

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
		Eurobodalla, Shoalhaven, Bega Valley and Wingecaribee councils. **Whole region**: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. **Exclusion zone:** The plant should be eradicated from the land and the land kept free of the plant. **Core area:** Land managers reduce impacts from the plant on priority assets.	fireweed with herbicide is late autumn. This controls the peak numbers of seedlings and young plants. Spot spray with a 600g/kg Metsulfuron-methyl (Brush off), a broad leaf selective herbicide to avoid harming native grasses, at a diluted rate of 1g/10L of water.
Giant Reed	*Arundo donax*	**General Biosecurity Duty** All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Cut and paint using 360g/L Glyphosate at a diluted rate of 1 part glyphosate to 1.5 parts of water.
Lantana	*Lantana camara*	**Regional Recommended Measure** **Exclusion zone**: whole region excluding the core infestation area of Eurobodalla, Kiama, Shellharbour, Wollongong and the Shoalhaven local government area north of the Lantana Containment Line at 35'11"42 S **Whole region**: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.	Gradually control sections of large infestations, starting at the edges. Dry or frosty periods are good times to work on mature lantana plants, treat regrowth or seedlings before they are 1 m high and control young plants before they are a year old to prevent new fruit and seeds. **Chemical control:** Cut stems off at about 15 cm from the ground. Apply herbicide to the cut surface of the stump within 15

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
		Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant. Core area: Land managers reduce impacts from the plant on priority assets.	seconds. Treat every cut stem because lantana regrows vigorously from untreated stems or a variety of spot spray especially on new growth if any arise with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/Litre of water.
Maderia Vine	*Anredera cordifolia*	**General Biosecurity Duty** All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. **Prohibition on dealings** Must not be imported into the State or sold.	Successful control of Madeira vine requires all the tubers and bulbils to be removed or killed. Control activities are long-term, and require regular follow-up for many years. Single control activities generally cause disturbance that results in vigorous regrowth and can lead to worse infestation levels unless dedicated follow-up occurs.
Moth Vine	*Araujia sericifera*	**General Biosecurity Duty** All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Cut and paint using 360g/L Glyphosate at a diluted rate of 20 ml/Litre of water.
Tobacco Bush	*Solanum mauritianum*	**General Biosecurity Duty** All plants are regulated with a **general biosecurity duty** to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty	Cut and paint using 360g/L Glyphosate at a diluted rate of 20 ml/Litre of water.

Common name	Scientific name	Duty under *Biosecurity Act* 2015	Action
		to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	

Niche

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