

GERROA SAND RESOURCE

ANNUAL REVIEW

Period 01 July 2022 – 30 June 2023



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	1/7/2022
Annual Review end date	30/6/2023
<p>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 2022 to 30 June 2023 and that I am authorised to make this statement on behalf of Cleary Bros (Bombo) Pty Ltd.</p> <p>Note</p> <p>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.</p> <p>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).</p>	
Name of authorised reporting officer	Mark Hammond
Title of authorised reporting officer	Quality and Environment Manager
Signature of authorised reporting officer	
Date	21/8/2023

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- Annexure A Department of Regional NSW Return 2021/2022
- Annexure B Environmental Monitoring Locations
- Annexure C Environmental Monitoring Results
- Annexure D 15th Annual Report – Flora and Fauna Monitoring Survey

Abbreviations

CB	Cleary Bros (Bombo) Pty Ltd
DC	Development Consent (PA 05/0099)
EPA	Environmental Protection Authority
DP	Deposited Plan
DPE	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	M Hammond		25/7/2023
2	Final for distribution	M Hammond	T Kalajzich	21/8/2023

1. Introduction

1.1. Statement of Compliance

Were all conditions of the relevant approvals complied with?	
Development consent #05/0099	Yes
Environmental Protection Licence #4146	Yes

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 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 Department of Planning and Environment (DPE) 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.

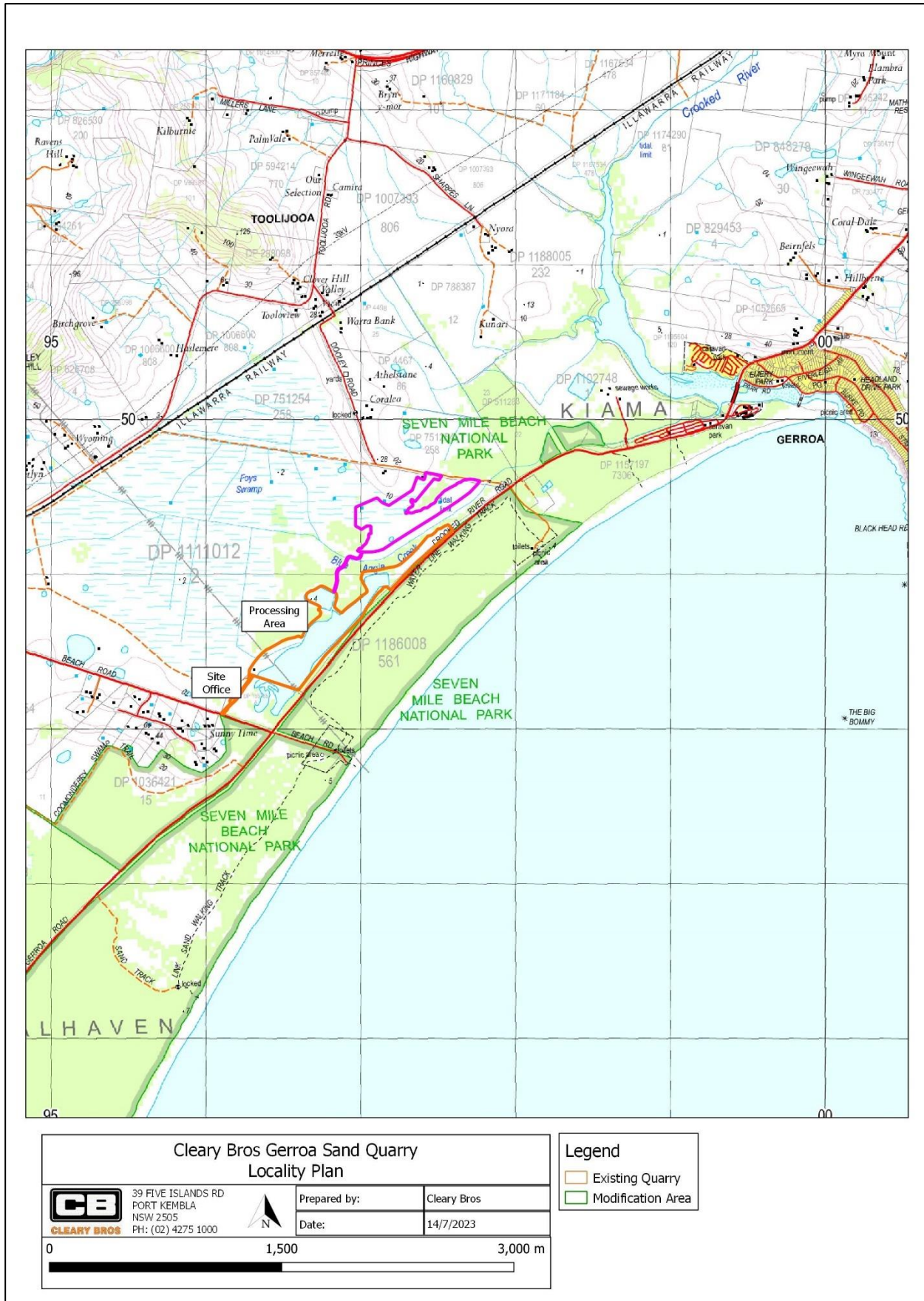


Figure 1 - Locality Plan

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 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 2022 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 ¹	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 One other complaint was reported to CB 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 CB letter to DoP dated 15 December 2009).

3.2. Development Consent

The Development Consent (DC) was modified by the DPE 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 2022/2023 reporting year was 45,986 tonnes. In the current reporting period, sand was extracted from previously dredged parts, as well as commencing extraction from the Modification 1 area. The previous year's return (2021/2022) to the Department of Regional NSW is included as Annexure A for 31,291 tonnes. The return for the 2022/2023 is due in November 2022 to the Department of Regional NSW and will be included in next year's Annual Review.

In the past 12 months, the QEMP and supporting plans have been revised and approved by the DPE for the Modification 1 area, and the following works have been undertaken:

- Fencing around Conservation Area C (cultural heritage management area).
- Installation of sediment and erosion controls around the Modification 1 area (Figure 3).
- Construction of flood bunds around the "CP" area (Figure 3).
- Installation of pipeline infrastructure to the Modification 1 area, including return water pump and pipeline.
- Installation of new continuous water monitoring stations in the existing dredge pond and on Blue Angle Creek (Figure 2).
- Excavation of the initial dredge sump in the Modification 1 area in late March 2023.
- Treatment and verification testing of acid sulphate soils from the initial excavation.
- Lime treatment of stockpile area base.
- Installation of deepwater outlet on processing returns line.
- Planting of seedlings for vegetation screen in accessible areas above the floodplain
- Floating of dredge in initial excavation of Modification 1 area.
- Commencement of dredging from the Modification 1 area in April 2023.

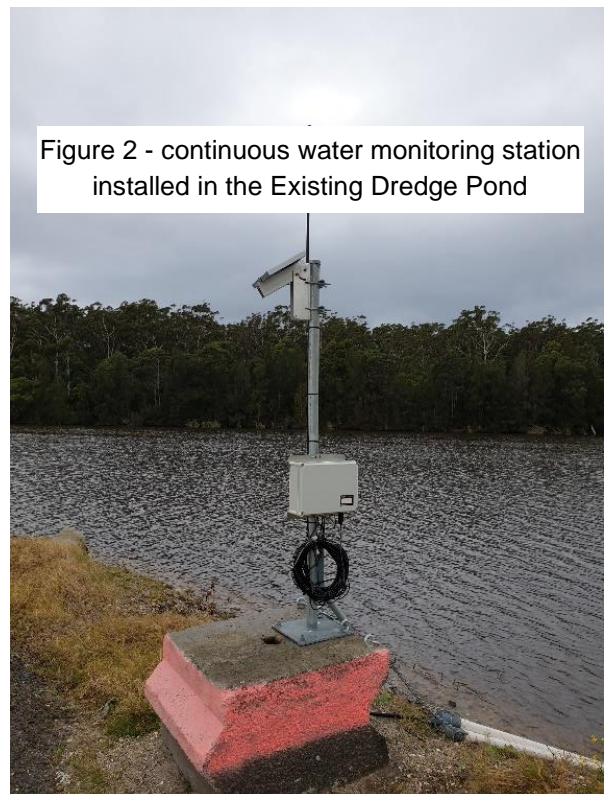




Figure 3 – Flood bund and sediment fence installed alongside perimeter of new dredge pond near zone 2C1

3.5. Works to be Carried Out in the Next Period

The dredge will continue extracting sand from the northern part of the CP area of the Modification 1 area, and then slowly track towards the south. The area planned for extraction in 2023/2024 is shown in Figure 4.

Other works planned for the 2023/2024 period include:

- Plant remaining seedlings for the tree screen (when floodplain accessible).
- Installation of continuous water monitoring station in the new dredge pond once batter has been stabilised.

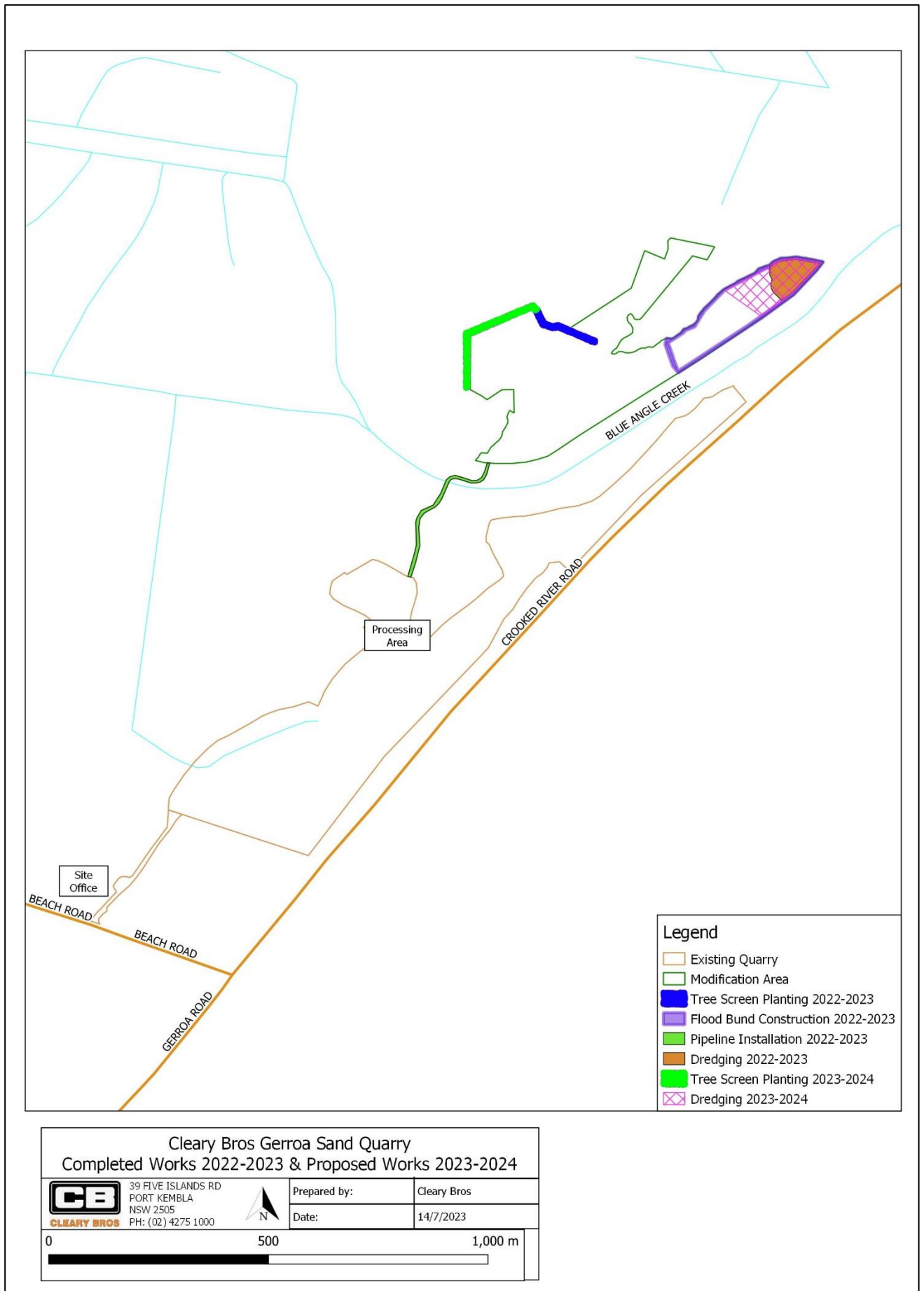


Figure 4 – Description of works

4. Review of Environmental Performance

4.1. Meteorological Monitoring

4.1.1. Licence Requirements

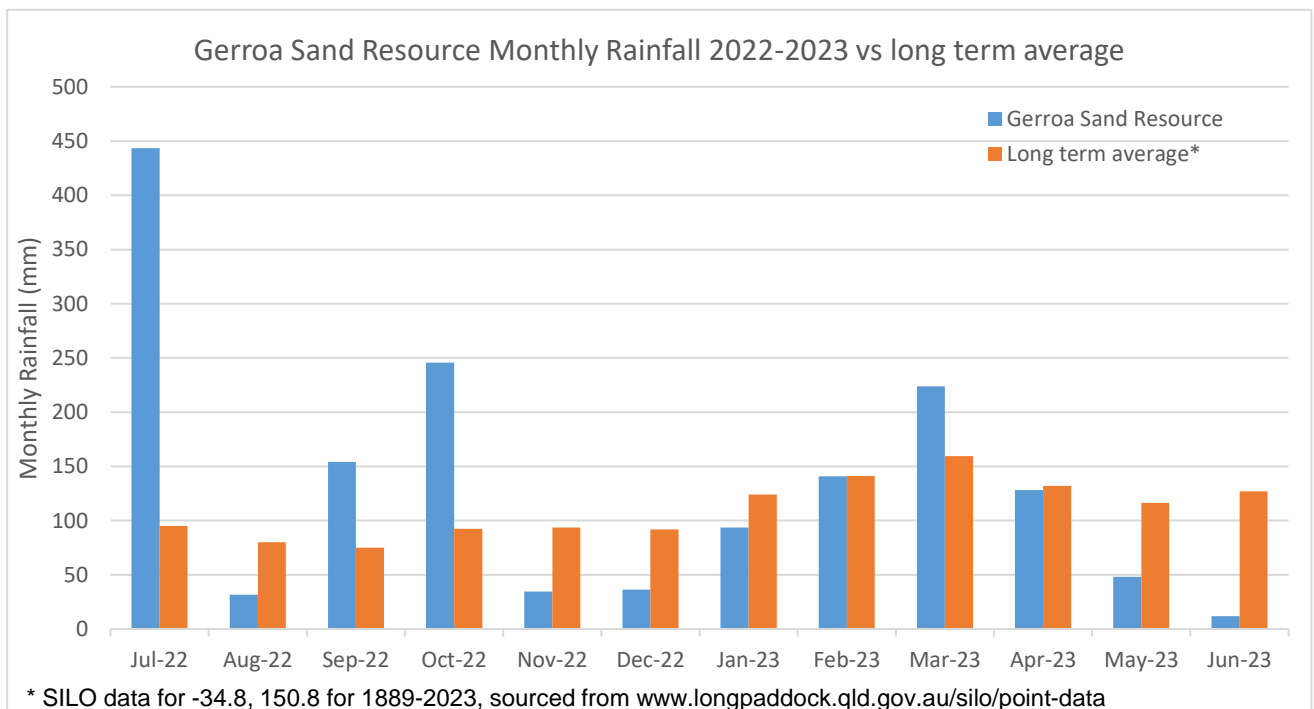
The DC requires Cleary Bros to maintain a meteorological station on site.

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. The meteorological station has operated throughout the reporting period, with minimal disruptions due to power supply issues in early 2023. These disruptions were quickly identified in each instance and the station repaired with minimal loss of data.

4.1.3. Meteorological Monitoring

Rainfall in the current reporting period has been above average, with 1,592 mm recorded compared with the long term average of 1,328mm (based on data sourced from SILO dataset for -34.8, 150.8 for the period 1889-2023, sourced from www.longpaddock.qld.gov.au/silo/point-data). It was, however, heavily skewed to the first third of the reporting period, with 55% (875mm) falling between July 2022 and October 2022, including a peak of 444mm recorded in July 2022. Rainfall totals have been below average for most other months, albeit the period of January to April 2023 recorded approximately average falls during this typically wetter period of the year. Rainfall tapered off towards the end of the reporting period, coinciding with the end of the La Nina and emergence of the El Nino climate cycle. The rainfall patterns coming off a wetter past three years has meant an elevated water table for much of the surrounding floodplain throughout the year.



4.2. Groundwater Management

4.2.1. Standards and Performance Measures

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

The QEMP including Water Management Plan was updated during the reporting period to reflect the modification area. As part of this update, 8 bores were discontinued while 4 others were added to the

monitoring program, and as such, this section includes the results from those bores which have since been discontinued, but which were sampled in first half of the reporting period. The current groundwater monitoring requirements from the DC are realised by 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.

4.2.3. Groundwater Monitoring

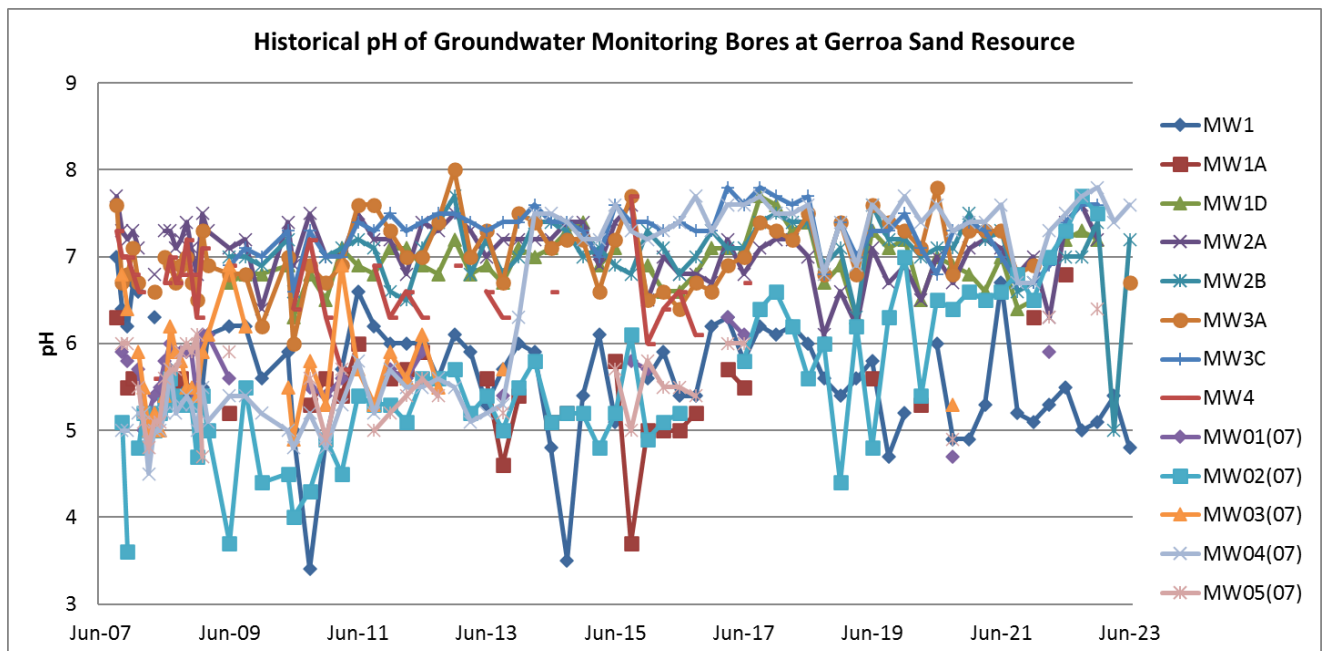
A summary of groundwater monitoring results for the period is displayed in this section, separated into the different analytes required to be monitored as per the DC. For each analyte, the range and average of the current period’s monitoring are displayed, alongside the historical range and average, 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 MW7 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.

pH (pH units)

BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	4.8	5.1	5.4	3.4	5.6	7.0	6.0 - 8.5	N/A
MW1A	Insufficient water for sample			3.7	5.4	6.8	6.0 - 8.5	N/A
MW1D#	7.2	7.3	7.3	6.3	6.9	7.7	6.0 - 8.5	N/A
MW2A#	7.2	7.4	7.6	6.1	7.1	7.7	6.0 - 8.5	N/A
MW2B	5.0	6.7	7.4	6.3	7.1	7.7	6.0 - 8.5	N/A
MW3A	6.7	6.7	6.7	6.0	7.0	8.0	6.0 - 8.5	N/A
MW3C#	7.6	7.6	7.6	6.6	7.3	7.8	6.0 - 8.5	N/A
MW4#	Insufficient water for sample			5.6	6.6	7.7	6.0 - 8.5	N/A
MW01(07)#	Insufficient water for sample			4.7	5.7	6.3	6.0 - 8.5	N/A
MW02(07)#	7.5	7.6	7.7	3.6	5.5	7.3	6.0 - 8.5	N/A
MW03(07)#	Insufficient water for sample			4.9	5.7	6.9	6.0 - 8.5	N/A
MW04(07)	7.4	7.6	7.8	4.5	6.3	7.7	6.0 - 8.5	N/A
MW05(07)#	6.4	6.4	6.4	4.7	5.5	6.3	6.0 - 8.5	N/A
NB2*	5.1	5.6	5.9	4.8	5.6	6.2	6.0 - 8.5	N/A
NB3*	6.1	6.4	6.7	4.8	5.9	6.9	6.0 - 8.5	N/A
NB4*	6.3	6.6	6.9	5.4	6.1	6.8	6.0 - 8.5	N/A
MW7*	5.5	5.5	5.5	3.7	4.1	4.8	N/A	N/A

sampling discontinued from bore in January 2023 *bore installed and monitored since June 2019



The pH values over the past 12 months have exhibited variability similar to that observed across the historical record. Most groundwater bores recorded pH levels in line with historical averages, with some bores recording slightly higher results, within the DC objectives, related to freshwater inflows associated with the higher rainfall experienced in the last three years. Monitoring bore MW2B recorded a single result below the historical range in March 2023, but as shown in the graph this was a once-off, with the pH returning to the average historical result in the following sample.

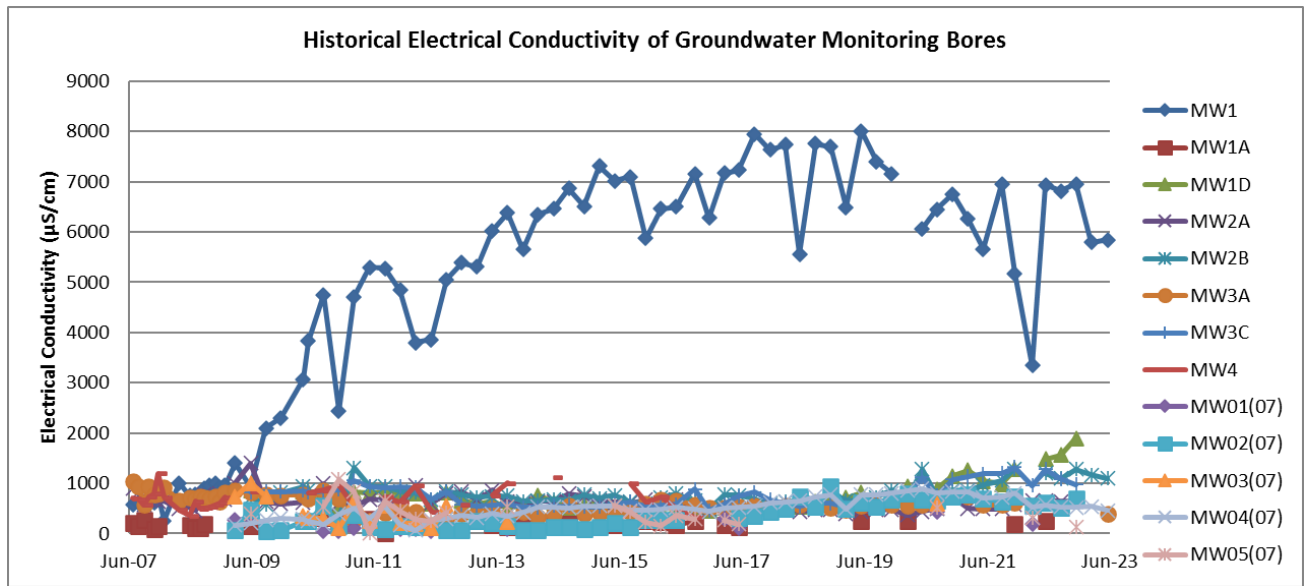
The monitoring results suggest pH is close to neutral in the close vicinity of the dredge pond and in the lower reach of Blue Angle Creek (such as around NB4), with pH declining further from these moderating influences, including for bores MW1, MW7, and to a lesser extent NB2.

Electrical Conductivity ($\mu\text{S}/\text{cm}$)

BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	5790	6353	6960	260	4576	8010	< 1,500	N/A
MW1A	Insufficient water for sample			90	200	350	< 1,500	N/A
MW1D	1560	1730	1900	457	719	1480	< 1,500	N/A
MW2A	636	646	655	366	633	1400	< 1,500	N/A
MW2B	1100	1163	1280	300	777	1310	< 1,500	N/A
MW3A	395	395	395	176	592	1030	< 1,500	N/A
MW3C	977	1034	1090	453	760	1320	< 1,500	N/A
MW4	Insufficient water for sample			327	688	1200	< 1,500	N/A
MW01(07)	Insufficient water for sample			40	166	441	< 1,500	N/A
MW02(07)	510	608	705	50	359	948	< 1,500	N/A
MW03(07)	Insufficient water for sample			100	430	1000	< 1,500	N/A
MW04(07)	462	512	535	60	507	892	< 1,500	N/A
MW05(07)	138	138	138	158	434	1080	< 1,500	N/A
NB2	145	197	309	189	275	408	< 1,500	N/A
NB3	107	129	156	76	269	613	< 1,500	N/A
NB4	7120	7948	9000	4040	7933	9650	< 1,500	N/A
MW7	7630	7630	7630	5490	6634	8440	N/A	N/A

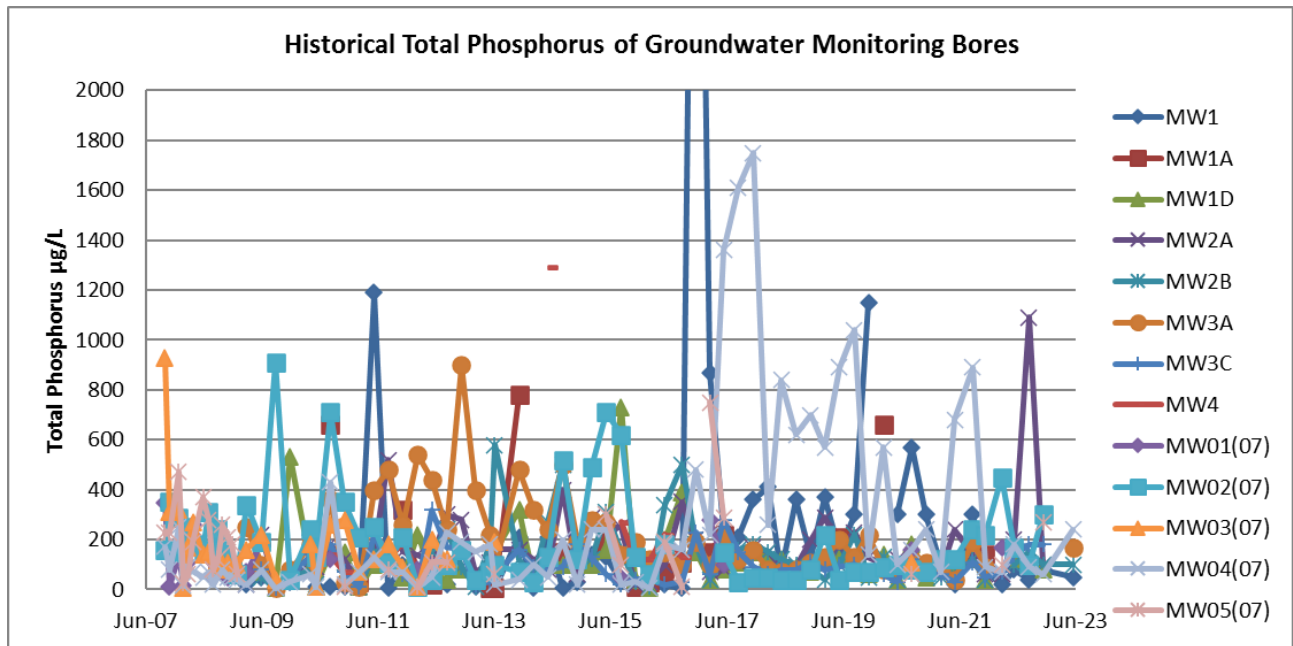
The results over the 12 month period show considerable variability in the Electrical Conductivity (EC) of the groundwater in the boreholes due to a third year of very wet conditions. Two bores recorded EC levels below their historical ranges (MW05(07) and NB2) while one bore recorded EC levels above the historical range (MW1D). With the exception of MW1 and MW1D, all results were within the objective levels. The brackish groundwater in MW1 has been attributed to the Berry Siltstone aquifer to the southwest, while it is likely the higher EC recorded in MW1D is due to some tidal influence from Blue Angle Creek.

The monitoring bores have continued to show significant variability in EC concentrations across the monitoring network, and with the exception of MW1, the southernmost and eastern bores generally showing slightly lower EC than those bores to the northwest, albeit amongst a pattern of ongoing variability. This variability has likely been enhanced at various times throughout the current reporting period with the increased rainfall infiltration to the aquifer.



Total Phosphorus (µg/L)

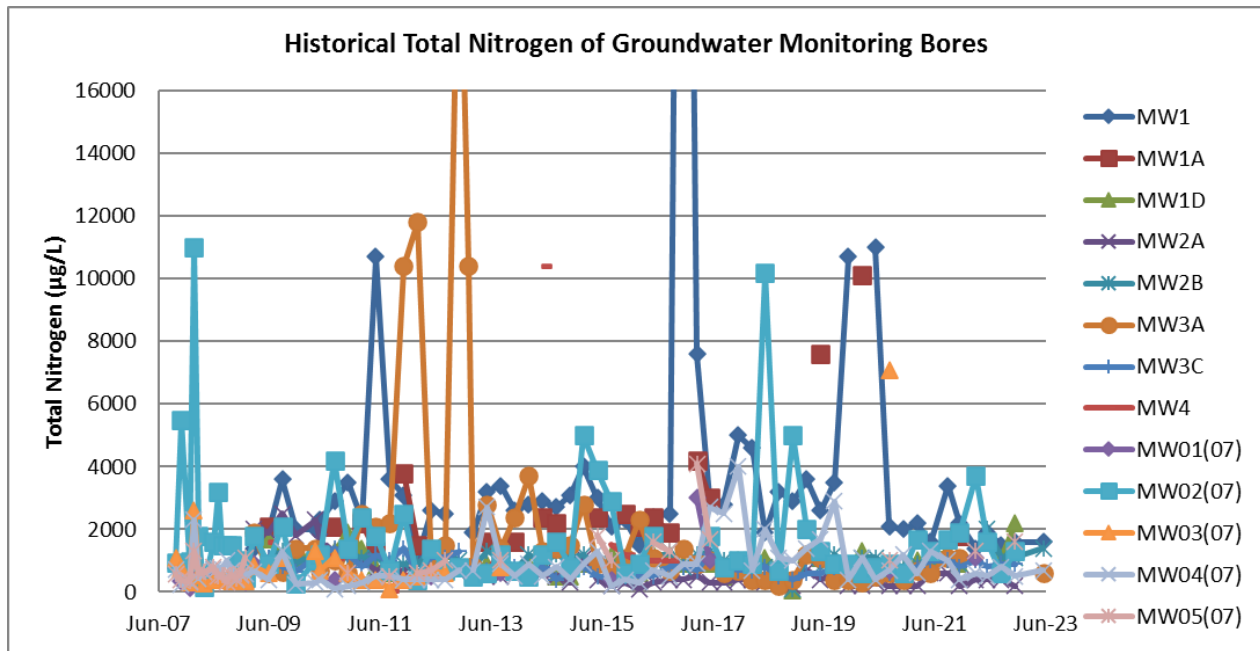
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	40	57	80	<10	264	4780	< 30	N/A
MW1A	Insufficient water for sample			<10	190	780	< 30	N/A
MW1D	80	90	100	<10	125	730	< 30	N/A
MW2A	100	595	1090	10	149	520	< 30	N/A
MW2B	100	117	150	<10	132	580	< 30	N/A
MW3A	170	170	170	<10	205	900	< 30	N/A
MW3C	180	180	180	<10	93	320	< 30	N/A
MW4	Insufficient water for sample			70	215	1290	< 30	N/A
MW01(07)	Insufficient water for sample			12	121	346	< 30	N/A
MW02(07)	100	200	300	10	191	910	< 30	N/A
MW03(07)	Insufficient water for sample			8	170	929	< 30	N/A
MW04(07)	60	130	240	<10	261	1750	< 30	N/A
MW05(07)	270	270	270	10	177	750	< 30	N/A
NB2	70	77	80	40	131	330	< 30	N/A
NB3	320	500	740	20	163	430	< 30	N/A
NB4	10	10	10	<10	34	60	< 30	N/A
MW7	Wet - Unable to access			130	163	400	N/A	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 MW2A, and two results for NB3 recorded prior to any works in the Modification 1 area. 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 may have contributed to the measurements of total phosphorus in all bores.

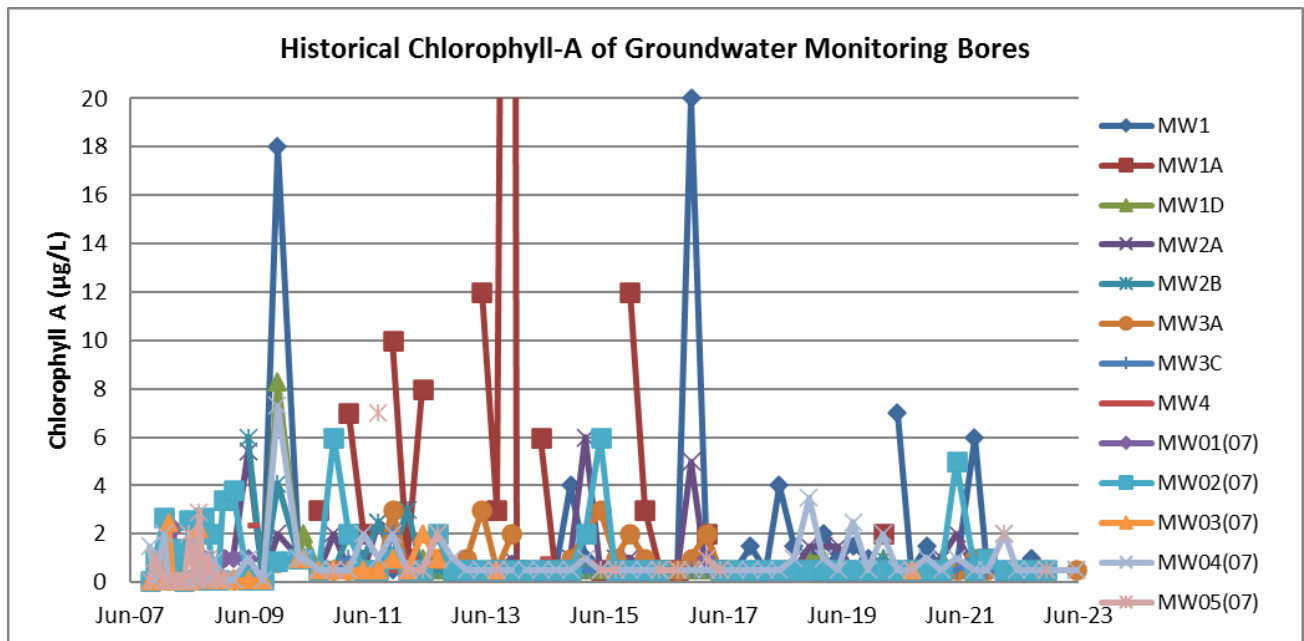
Total Nitrogen (µg/L)

BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1500	1567	1600	1100	4158	51100	< 30	N/A
MW1A	Insufficient water for sample			900	2777	10100	< 30	N/A
MW1D	1100	1650	2200	70	932	1900	< 30	N/A
MW2A	200	300	400	100	670	2500	< 30	N/A
MW2B	1100	1200	1400	80	1014	2000	< 30	N/A
MW3A	600	600	600	200	2122	23200	< 30	N/A
MW3C	900	900	900	400	805	1400	< 30	N/A
MW4	Insufficient water for sample			60	1579	10400	< 30	N/A
MW01(07)	Insufficient water for sample			130	643	3000	< 30	N/A
MW02(07)	600	950	1300	180	1830	11000	< 30	N/A
MW03(07)	Insufficient water for sample			100	868	7100	< 30	N/A
MW04(07)	500	667	800	100	869	4000	< 30	N/A
MW05(07)	1600	1600	1600	330	973	4100	< 30	N/A
NB2	1500	1567	1600	500	1638	3400	< 30	N/A
NB3	1100	1200	1400	700	2177	9200	< 30	N/A
NB4	1200	1333	1500	1200	1585	1900	< 30	N/A
MW7	Wet - Unable to access			600	1456	2700	N/A	N/A



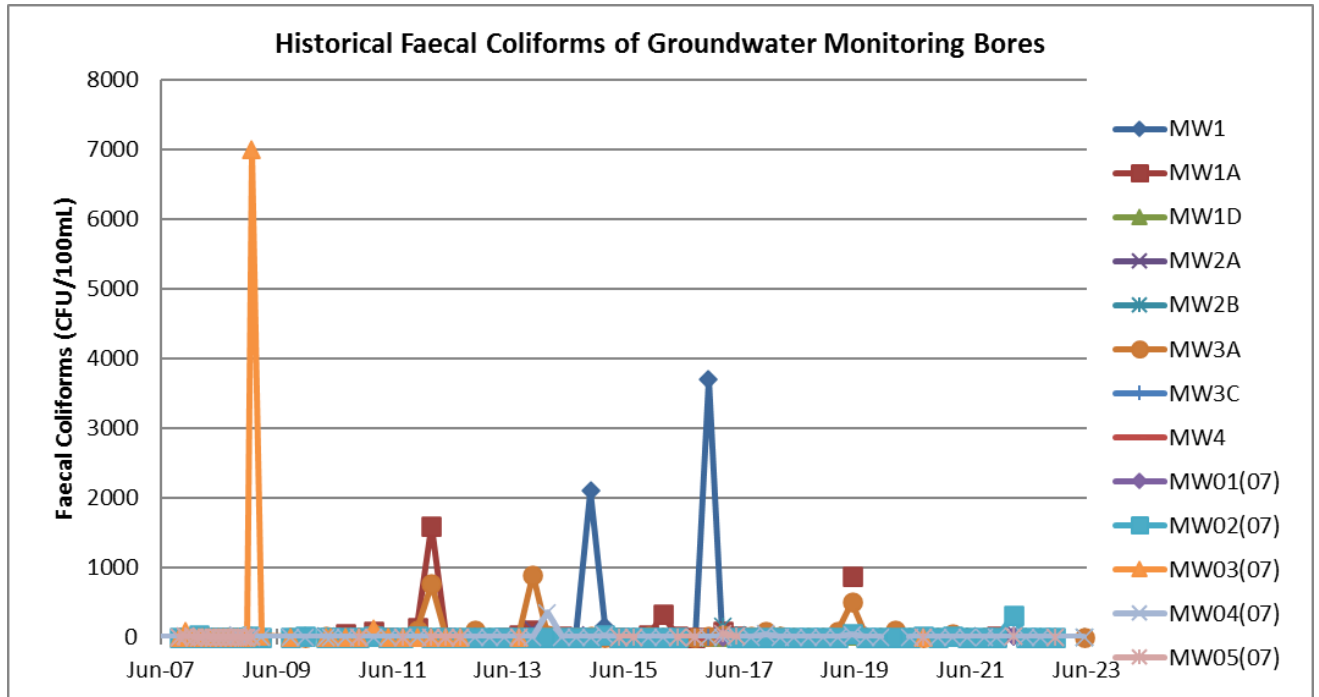
The concentrations of Total Nitrogen in all groundwater monitoring bores have consistently exceeded the objective level since monitoring of groundwater quality began. In the current reporting period, nitrogen concentrations were recorded within the historical range in all bores with the exception of the single result for bore MW1D, which was above the previous historical range. The presence of Total Nitrogen at those concentrations recorded in the bores are likely to be 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 broader groundwater monitoring network.

Chlorophyll A (µg/L)



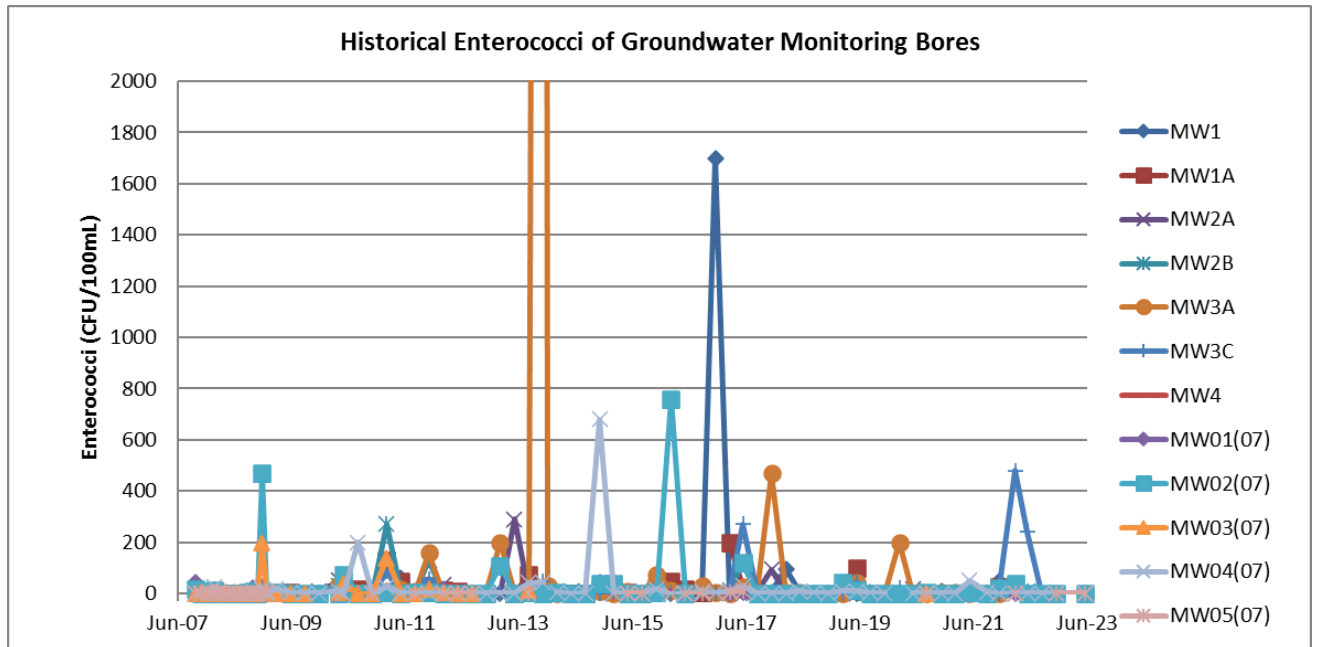
Chlorophyll-A can fluctuate greatly with plant materials being flushed into the system and any results away from the low levels generally observed can be attributed to tree and leaf matter after windy or rainy periods. The chlorophyll-A levels for the reporting period were within the objective level and historical ranges for the respective bores and were all below the limit of reporting with the exception of one low result for MW1 in September 2023. As such, the summary table has not been included in this report.

Faecal Coliforms (median number/100mL)



Faecal coliforms were within the objective levels and historical ranges during the reporting period, and were all below the limit of reporting with the exception of a single low result for NB3 in September 2023. As such, the summary table has not been included in this report.

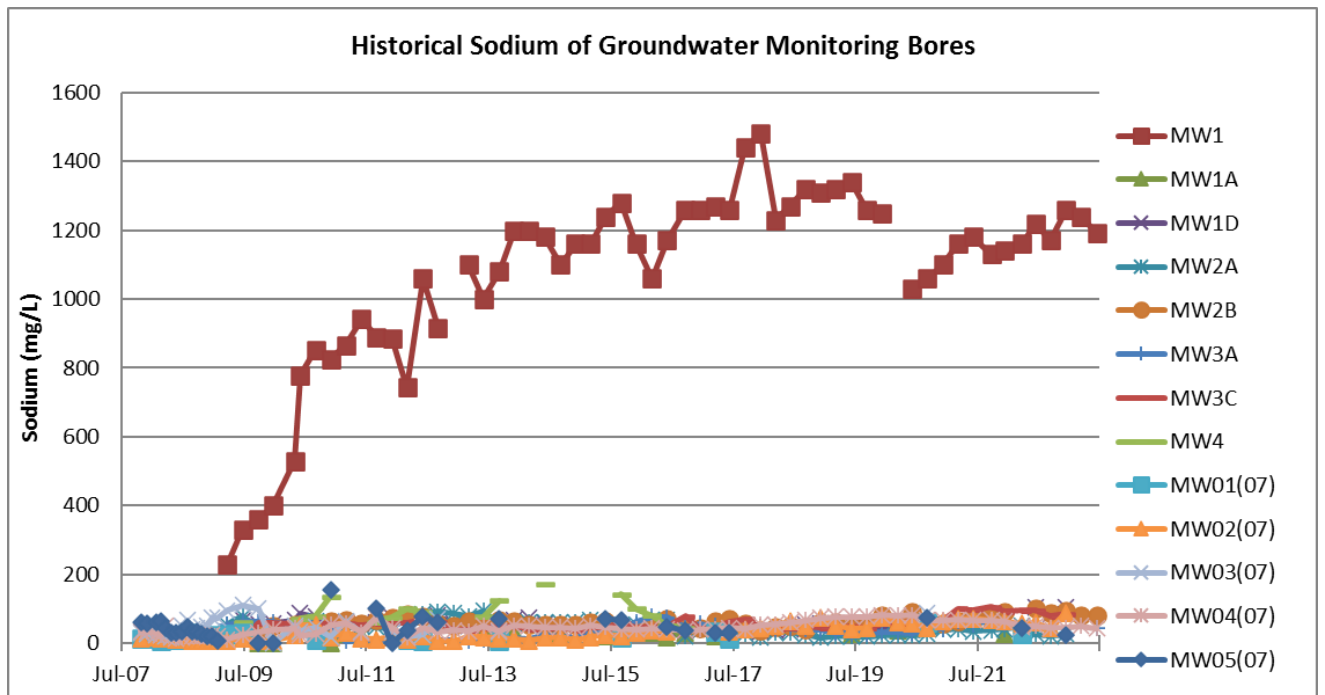
Enterococci (median number/100mL)



Enterococci concentrations were within the objective levels and the historical ranges during the reporting period, and were all either below or at the limit of reporting during the reporting period. As such, the summary table has not been included in this report.

Sodium (mg/L)

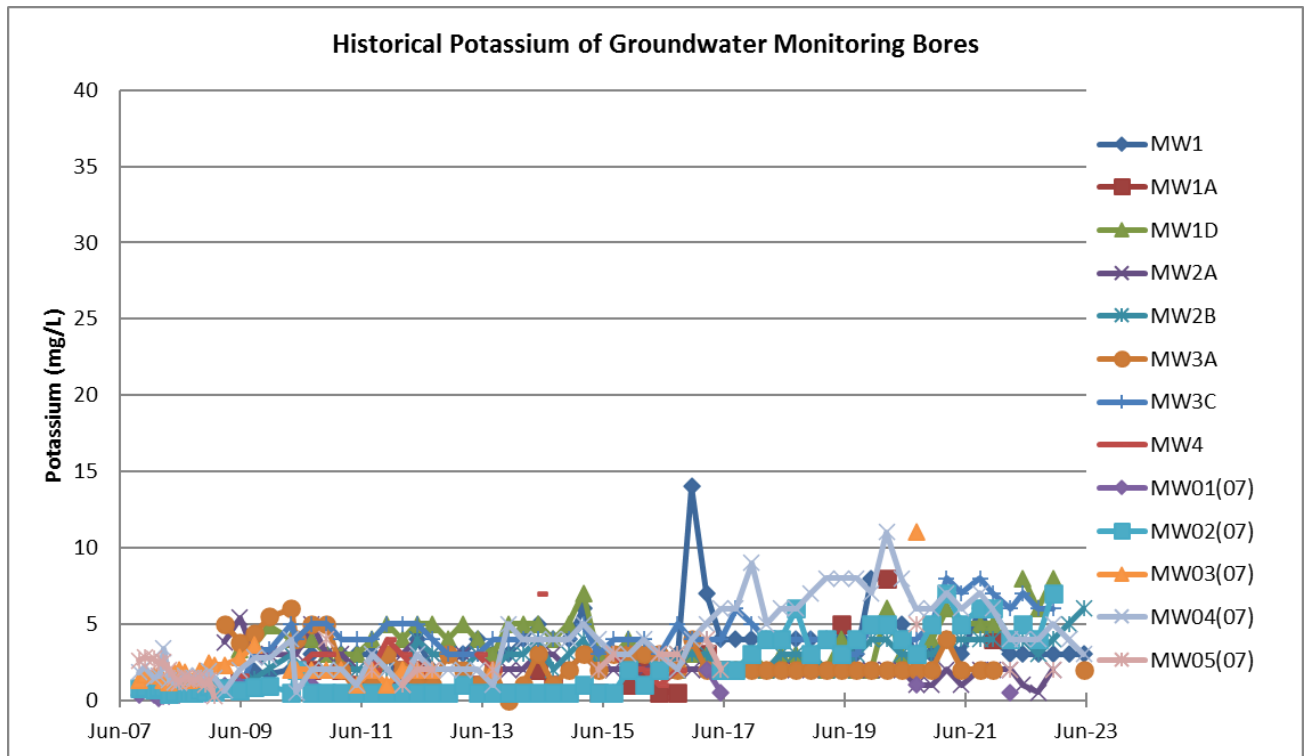
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1170	1215	1260	230	1061	1480	< 400	N/A
MW1A	Insufficient water for sample			14	27	36	< 400	N/A
MW1D	85	96	106	33	56	106	< 400	N/A
MW2A	22	25	27	16	46	94	< 400	N/A
MW2B	80	86	93	38	60	101	< 400	N/A
MW3A	45	45	45	4	36	77	< 400	N/A
MW3C	79	82	85	11	57	106	< 400	N/A
MW4	Insufficient water for sample			45	92	173	< 400	N/A
MW01(07)	Insufficient water for sample			6.2	19	61	< 400	N/A
MW02(07)	43	66	88	5.4	30	75	< 400	N/A
MW03(07)	Insufficient water for sample			17	50	110	< 400	N/A
MW04(07)	43	46	50	11	45	81	< 400	N/A
MW05(07)	24	24	24	5.5	51	154	< 400	N/A
NB2	21	30	53	21	32	45	< 400	N/A
NB3	10	12	15	10	32	72	< 400	N/A
NB4	1250	1290	1340	1040	1318	1470	< 400	N/A
MW7	1350	1350	1350	765	1017	1380	N/A	N/A



With the exception of borehole MW1, all sodium concentrations recorded in the original monitoring network were within the DC objective, and consistently at a low level. Concentrations in the new bores NB4 and MW7 were recorded significantly above the DC objective, however represent background levels for these sites. MW02(07) recorded sodium concentrations slightly above its historical range for a single sample.

Potassium Ion (mg/L)

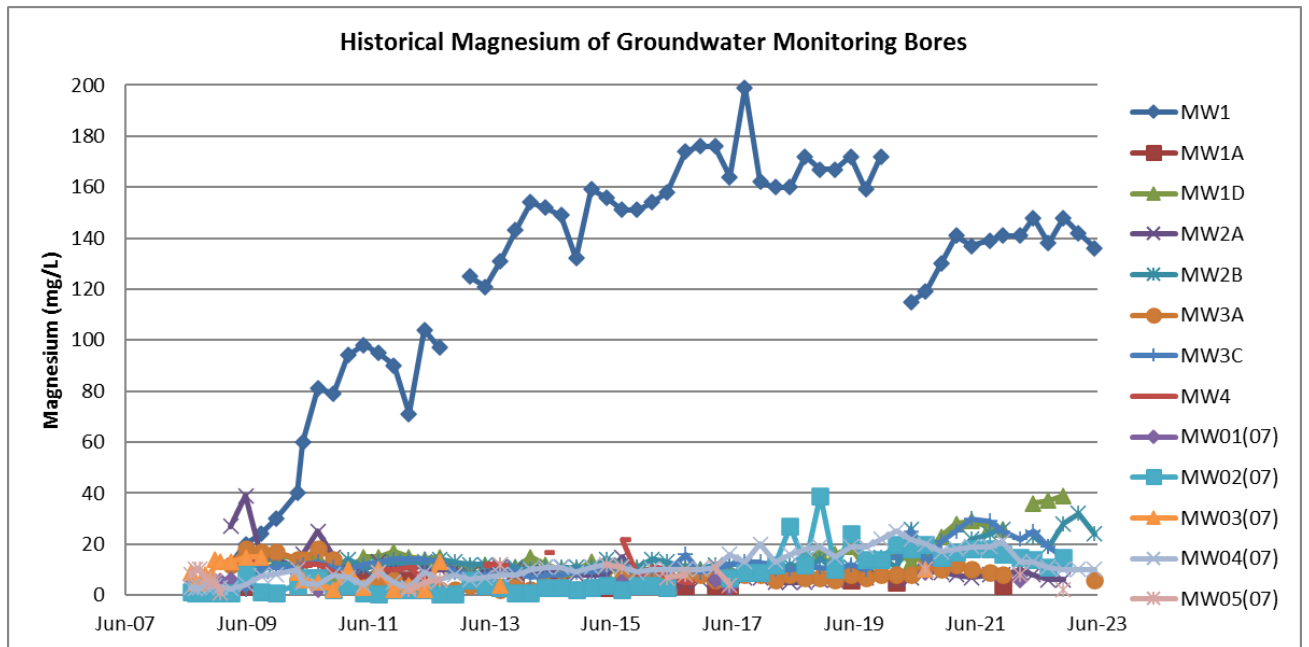
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	3	3	3	<1	4	14	< 50	N/A
MW1A	Insufficient water for sample			<1	2	8	< 50	N/A
MW1D	6	7	8	2	4	8	< 50	N/A
MW2A	<1	1	2	1	2	5.4	< 50	N/A
MW2B	3	5	6	1	3	4	< 50	N/A
MW3A	2	2	2	<1	3	6	< 50	N/A
MW3C	6	6	6	<1	4	8	< 50	N/A
MW4	Insufficient water for sample			1	3	7	< 50	N/A
MW01(07)	Insufficient water for sample			<1	1	2	< 50	N/A
MW02(07)	4	6	7	<1	2	7	< 50	N/A
MW03(07)	Insufficient water for sample			1	2	11	< 50	N/A
MW04(07)	3	4	5	<1	4	11	< 50	N/A
MW05(07)	2	2	2	<1	2	5	< 50	N/A
NB2	2	3	4	3	4	6	< 50	N/A
NB3	3	6	7	3	6	11	< 50	N/A
NB4	34	37	40	32	39	42	< 50	N/A
MW7	42	42	42	22	31	41	N/A	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. The monitoring results indicate no deterioration in groundwater quality related to potassium ion concentrations in the current reporting year.

Magnesium Ion (mg/L)

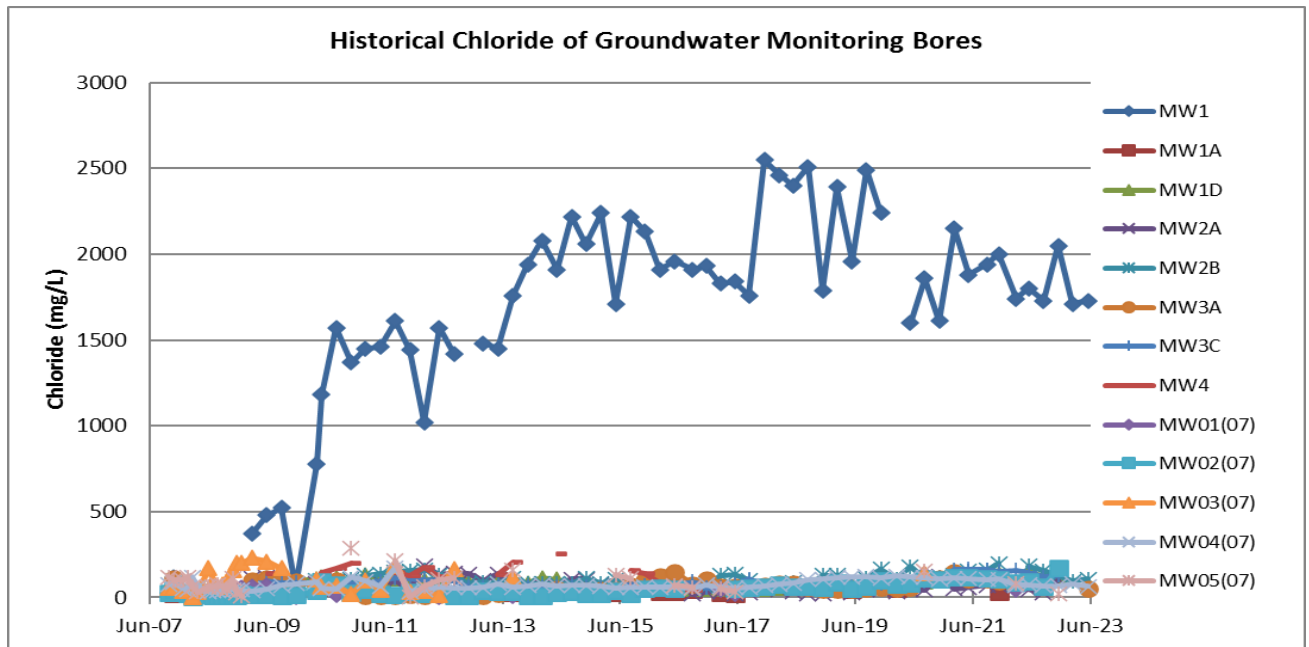
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	136	141	148	12	127	199	< 50	N/A
MW1A	Insufficient water for sample			3	5	7	< 50	N/A
MW1D	37	38	39	8	14	36	< 50	N/A
MW2A	6	6	6	5	10	39	< 50	N/A
MW2B	19	26	32	9	13	26	< 50	N/A
MW3A	6	6	6	2	7	18	< 50	N/A
MW3C	15	17	19	2.1	13	30	< 50	N/A
MW4	Insufficient water for sample			5	11	22	< 50	N/A
MW01(07)	Insufficient water for sample			2	5	9	< 50	N/A
MW02(07)	11	13	15	0.5	8	39	< 50	N/A
MW03(07)	Insufficient water for sample			2	8	15	< 50	N/A
MW04(07)	10	10	11	2.5	11	25	< 50	N/A
MW05(07)	2	2	2	0.79	8	12	< 50	N/A
NB2	2	3	5	4	5	8	< 50	N/A
NB3	2	3	4	1	4	10	< 50	N/A
NB4	155	162	170	17	164	228	< 50	N/A
MW7	232	232	232	163	221	256	N/A	N/A



All magnesium ion concentrations in the original monitoring network were within the DC objective level with the exception of MW1, which has followed similar trends as for conductivity and sodium. All samples were within the historical ranges for the respective sites with the exception of samples from MW1D and MW2B which were above their historical range at times. Trends in magnesium concentration appear to be most closely linked with proximity to Blue Angle Creek, with those bores closest to Blue Angle Creek continuing to show increases in magnesium concentration while those furthest away showing reductions in response to the improved rainfall observed in the period. Bores NB4 and MW7 have recorded magnesium concentrations well above the objective level, which represents the baseline environment for these sites.

Chloride Ion (mg/L)

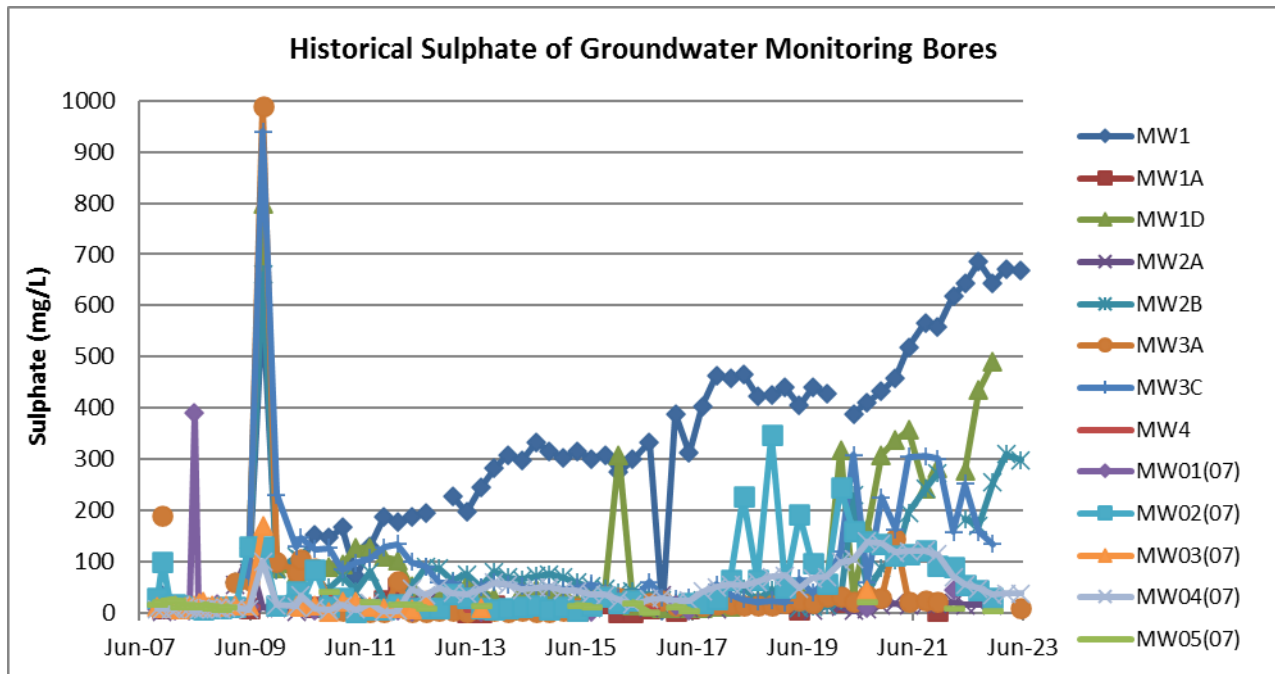
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1710	1805	2050	60	1701	2550	< 300	N/A
MW1A	Insufficient water for sample			18	38	56	< 300	N/A
MW1D	119	126	132	48	87	148	< 300	N/A
MW2A	29	67	105	18	71	181	< 300	N/A
MW2B	95	122	155	57	109	198	< 300	N/A
MW3A	52	52	52	8	63	146	< 300	N/A
MW3C	120	125	129	55	86	164	< 300	N/A
MW4	Insufficient water for sample			47	141	256	< 300	N/A
MW01(07)	Insufficient water for sample			0.5	35	134	< 300	N/A
MW02(07)	66	118	170	0.5	44	116	< 300	N/A
MW03(07)	Insufficient water for sample			0.5	100	230	< 300	N/A
MW04(07)	65	70	79	33	74	172	< 300	N/A
MW05(07)	23	23	23	11	94	286	< 300	N/A
NB2	26	45	83	31	53	90	< 300	N/A
NB3	12	18	22	13	50	135	< 300	N/A
NB4	2340	2630	3080	351	2593	3210	< 300	N/A
MW7	1900	1900	1900	832	1283	1880	N/A	N/A



As for sodium, the concentration of chloride in all groundwater bores of the original monitoring network were within the DC objective with the exception of MW1. Chloride concentrations in MW1 have been variable within the reporting period, consistent with results from recent years. All samples from other bores were measured within the respective historical ranges during the current reporting period, with the exception of a single sample from MW02(07). Chloride concentrations in bores NB4 and MW7 are both well above the objective level, reflecting the baseline environment for these sites.

Sulphate Ion (mg/L)

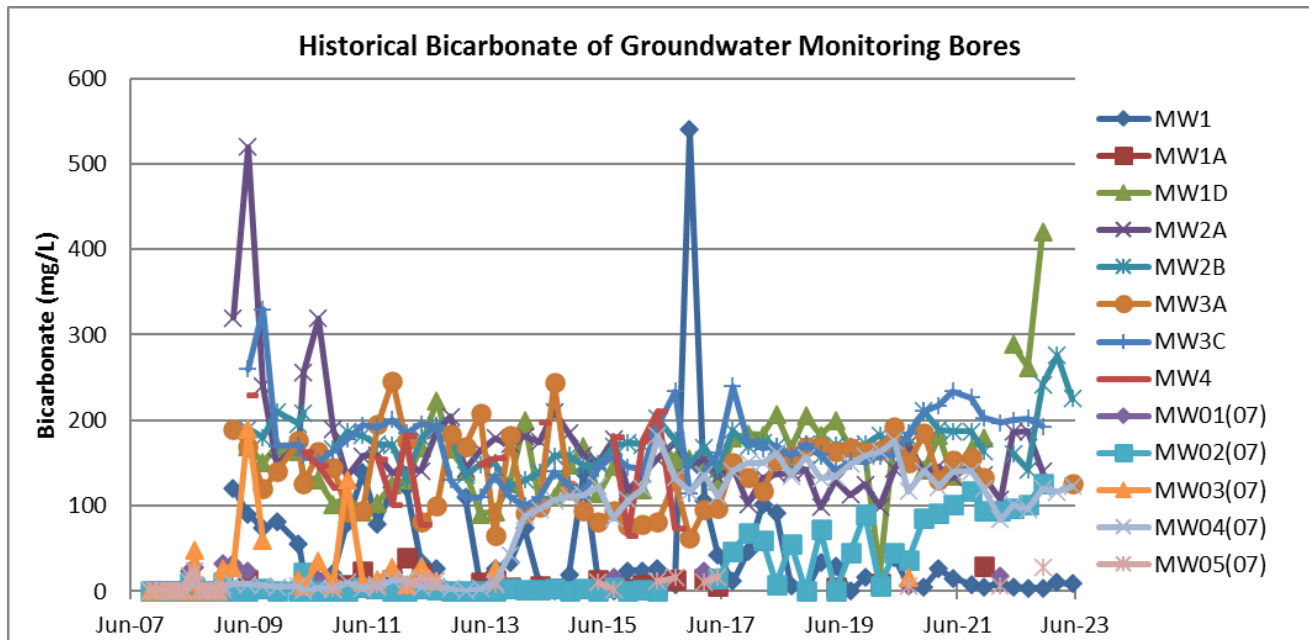
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	644	668	686	4	310	643	< 250	N/A
MW1A	Insufficient water for sample			<1	11	48	< 250	N/A
MW1D	434	462	490	5	103	800	< 250	N/A
MW2A	14	15	16	1	16	110	< 250	N/A
MW2B	170	258	309	8	80	660	< 250	N/A
MW3A	9	9	9	<1	47	990	< 250	N/A
MW3C	133	146	158	19	112	940	< 250	N/A
MW4	Insufficient water for sample			2	15	36	< 250	N/A
MW01(07)	Insufficient water for sample			1	24	390	< 250	N/A
MW02(07)	29	37	45	<1	52	347	< 250	N/A
MW03(07)	Insufficient water for sample			2	19	170	< 250	N/A
MW04(07)	34	39	47	<1	41	138	< 250	N/A
MW05(07)	<10	<10	<10	1	15	42	< 250	N/A
NB2	<1	<10	<10	7	23	34	< 250	N/A
NB3	<1	<10	<10	<1	15	38	< 250	N/A
NB4	292	389	436	34	326	468	< 250	N/A
MW7	1750	1750	1750	1940	2294	2740	N/A	N/A



The concentration of sulphate in all groundwater bores were within the DC objective with the exception of results from MW1, MW1D, MW2B, NB4 and MW7. However with the exception of MW1, all results were within the historical ranges for the respective bores, while MW1 has continued to follow the trend of other major ions. 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.

Bicarbonate Ion (mg/L)

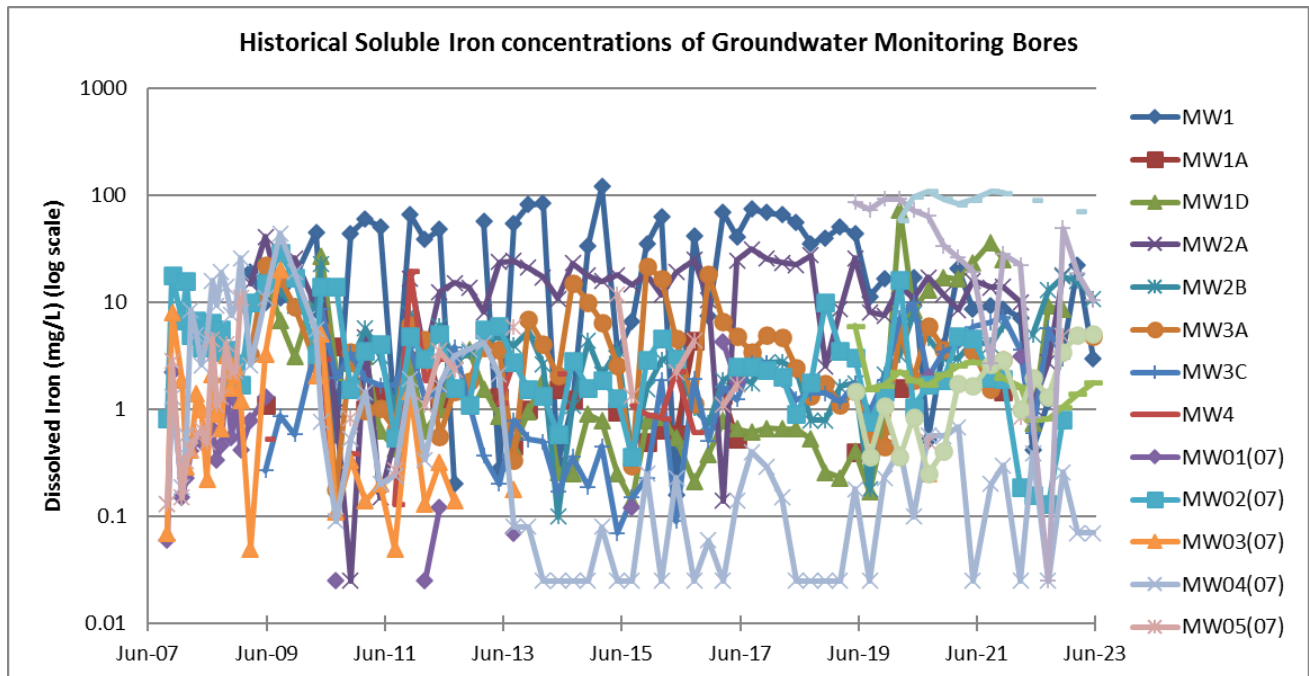
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	4	7	10	<1	52	540	< 750	N/A
MW1A	Insufficient water for sample			3	13	40	< 750	N/A
MW1D	262	342	421	21	152	289	< 750	N/A
MW2A	140	164	187	98	167	520	< 750	N/A
MW2B	142	221	276	122	170	211	< 750	N/A
MW3A	126	126	126	62	140	246	< 750	N/A
MW3C	193	198	202	100	171	330	< 750	N/A
MW4	Insufficient water for sample			66	150	230	< 750	N/A
MW01(07)	Insufficient water for sample			1	11	32	< 750	N/A
MW02(07)	102	114	126	<1	21	117	< 750	N/A
MW03(07)	Insufficient water for sample			1	24	190	< 750	N/A
MW04(07)	96	114	123	<1	68	182	< 750	N/A
MW05(07)	28	28	28	1	7	24	< 750	N/A
NB2	15	19	26	7	11	16	< 750	N/A
NB3	18	31	39	8	43	312	< 750	N/A
NB4	63	153	228	1	120	221	< 750	N/A
MW7	8	8	8	<1	<1	<1	N/A	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 in bores MW1D, MW2B, MW02(07), and MW05(07) above the historical ranges. These are within expected and historical variabilities, and as such does not reflect a deterioration in groundwater quality.

Soluble Iron Ion (mg/L)

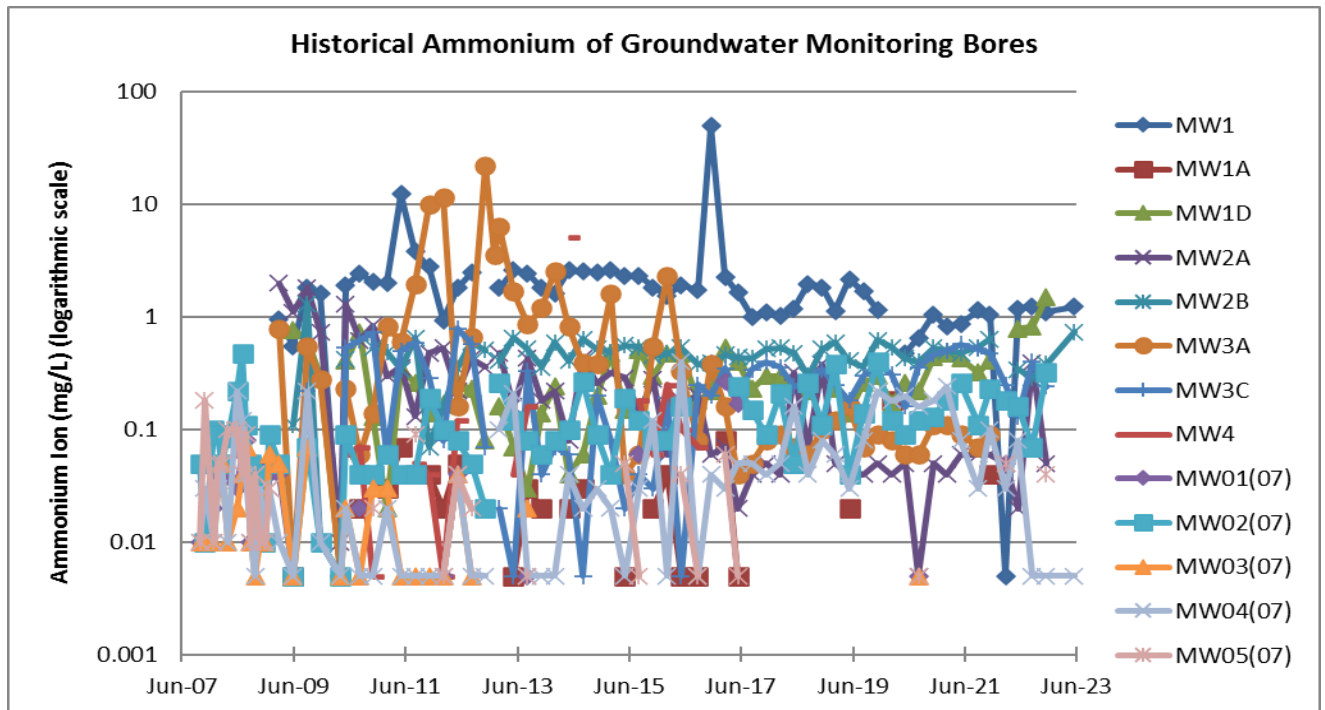
BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1.19	7.4	22	0.16	31.9	120	< 6	N/A
MW1A	Insufficient water for sample			0.4	1.5	4.4	< 6	N/A
MW1D	8.55	8.9	9.25	0.14	6.2	73.5	< 6	N/A
MW2A	2.77	10.4	18	<0.05	14.6	41	< 6	N/A
MW2B	10.8	14.2	17.3	0.1	4.2	22.5	< 6	N/A
MW3A	4.82	4.8	4.82	0.18	5.0	22	< 6	N/A
MW3C	2.96	4.3	5.7	0.07	2.2	9.99	< 6	N/A
MW4	Insufficient water for sample			0.1	2.5	19.5	< 6	N/A
MW01(07)	Insufficient water for sample			<0.05	0.9	4.23	< 6	N/A
MW02(07)	0.13	0.5	0.81	0.16	4.9	29	< 6	N/A
MW03(07)	Insufficient water for sample			0.05	2.0	20	< 6	N/A
MW04(07)	<0.05	0.1	0.26	<0.05	3.4	44	< 6	N/A
MW05(07)	4.79	4.8	4.79	0.13	2.5	11.7	< 6	N/A
NB2	0.82	1.3	1.78	0.8	2.3	6.02	< 6	N/A
NB3	1.32	3.7	5.08	0.25	1.3	2.91	< 6	N/A
NB4	<0.05	19.5	49	0.84	47.2	92.7	< 6	N/A
MW7	71.1	71.1	71.1	58.9	92.9	109	N/A	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 in the original monitoring network for the reporting period are within the historical range for the respective bores, which indicates no deterioration in groundwater quality as evident by soluble iron concentration across the monitoring network.

Ammonium Ion (mg/L)

BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1.1	1.19	1.23	<0.01	2.78	49.50	< 0.02	N/A
MW1A	Insufficient water for sample			<0.01	0.03	0.18	< 0.02	N/A
MW1D	0.82	1.16	1.50	<0.01	0.29	0.79	< 0.02	N/A
MW2A	0.05	0.22	0.39	<0.01	0.31	2.00	< 0.02	N/A
MW2B	0.29	0.47	0.74	<0.01	0.46	1.30	< 0.02	N/A
MW3A	Insufficient water for sample			<0.01	1.42	22.30	< 0.02	N/A
MW3C	0.24	0.32	0.40	<0.01	0.26	0.79	< 0.02	N/A
MW4	Insufficient water for sample			<0.01	0.39	5.07	< 0.02	N/A
MW01(07)	Insufficient water for sample			<0.01	0.05	0.27	< 0.02	N/A
MW02(07)	0.07	0.20	0.32	<0.01	0.12	0.48	< 0.02	N/A
MW03(07)	Insufficient water for sample			<0.01	0.02	0.07	< 0.02	N/A
MW04(07)	<0.01	0.01	0.01	<0.01	0.06	0.40	< 0.02	N/A
MW05(07)	0.04	0.04	0.04	<0.01	0.04	0.18	< 0.02	N/A
NB2	0.06	0.14	0.30	0.04	0.23	1.49	< 0.02	N/A
NB3	0.32	0.41	0.51	<0.01	0.55	3.67	< 0.02	N/A
NB4	0.04	0.63	0.99	<0.01	0.69	0.94	< 0.02	N/A
MW7	Wet - Unable to access			0.08	0.15	0.33	N/A	N/A

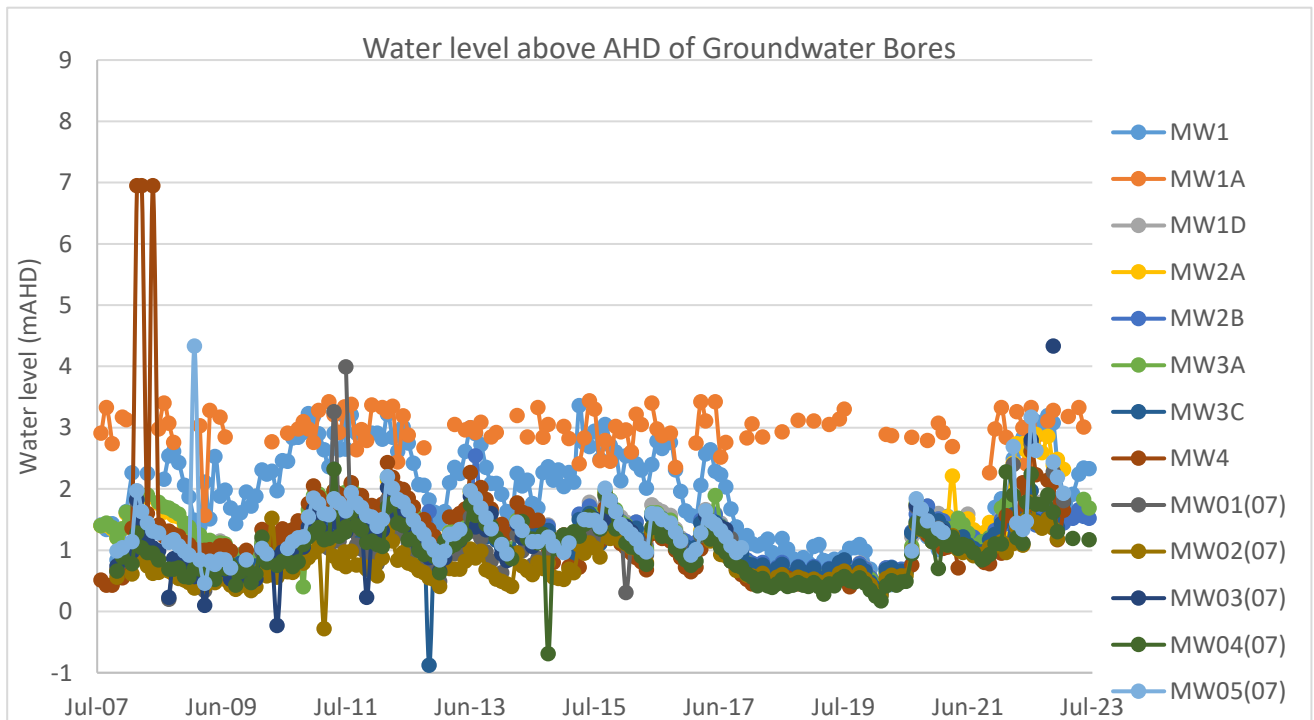


Ammonium ion concentrations were consistently above the objective level during the current reporting period, however within historical levels for all bores in the original monitoring network with the exception of results from MW1D. This indicates that there is no deterioration in groundwater quality as a result of dredging operations.

Depth (m)

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

BORE HOLE	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
MW1	1.6	2.49	3.2	0.26	1.93	3.36	N/A	N/A
MW1A	2.86	3.16	3.33	1.57	2.97	3.44	N/A	N/A
MW1D	1.52	2.25	2.95	0.35	1.24	1.83	N/A	N/A
MW2A	2.32	3.09	3.94	0.34	1.26	2.74	N/A	N/A
MW2B	1.41	1.55	1.67	0.35	1.19	2.54	N/A	N/A
MW3A	1.69	2.05	2.63	0.34	1.25	2.19	N/A	N/A
MW3C	1.38	2.06	2.88	-0.88	1.08	1.6	N/A	N/A
MW4	1.17	3.97	6.95	0.4	1.35	6.95	N/A	N/A
MW01(07)	1.81	4.35	5.9	0.2	1.10	3.99	N/A	N/A
MW02(07)	1.18	1.44	1.78	-0.28	0.77	1.52	N/A	N/A
MW03(07)	2.8	3.57	4.33	-0.23	1.14	2.02	N/A	N/A
MW04(07)	1.17	1.62	2.24	-0.69	0.97	2.32	N/A	N/A
MW05(07)	1.93	4.24	6.44	0.46	1.37	4.33	N/A	N/A
NB2	0.65	1.06	1.88	0.56	1.03	2.3	N/A	N/A
NB3	1.01	1.74	2.93	0.54	1.42	2.98	N/A	N/A
NB4	0.92	1.40	2.08	0.6	1.12	2	N/A	N/A
MW7	0.55	0.69	0.82	0.35	0.88	1.62	N/A	N/A



Groundwater levels have varied consistent with significant rainfall events during the current reporting period, increasing significantly since October - November 2021 due to the significantly above-average rainfall received during this time. While some bores have experienced greater fluctuations than others, all bores have recorded an increasing trend. These increases have come off a very low base in 2020 following an extended drought

period, and reflects the significant natural variability of the local groundwater regime, suggesting climate is the predominant driver of groundwater levels within each bore across the monitoring network. All measurements were within the historical ranges for the respective bores, except for recent measurements for MW2A, which are above the historical range, consistent with many of the other bores which currently show groundwater levels near their historical maximums.

4.1.4 Groundwater Monitoring Results Interpretation

From the data gathered above 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. Some increases were observed in major ion concentrations in bores close to Blue Angle Creek, which is likely attributable to the effect of tidal influence from the Crooked River estuary combining with recent flushing of salts due to rainfall. This reflects 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 water reservoir, 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. Furthermore, two of the new monitoring bores (NB4 and MW7) show brackish influences, however also show 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. 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 2022-2023 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 pond 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 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	µg/L*	<20

* amended from mg/L to µg/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 sampling and testing of the water in the existing dredge pond for pH and Electrical Conductivity, as well as quarterly testing of the existing dredge pond water for the larger suite of water quality parameters listed in the table above. This program was expanded from February 2023 to include monitoring from two sites in Blue Angle Creek, as well as from the

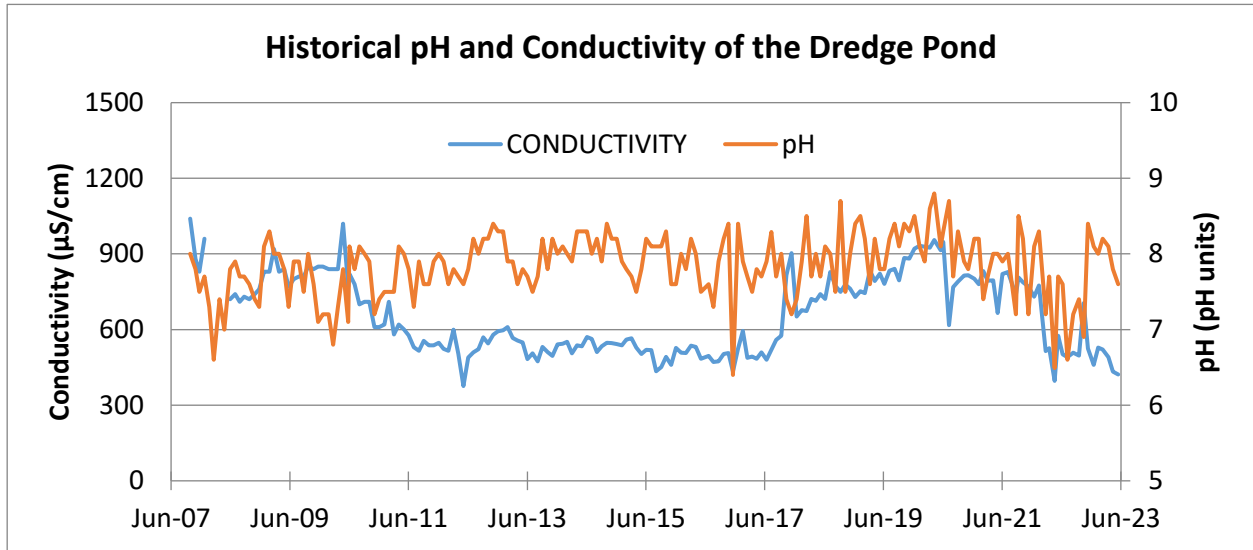
new dredge pond and processing plant return water once these sites were able to be sampled in June 2023. The analytes monitored also expanded at this time to include monthly sampling of these sites for Dissolved Oxygen, Turbidity, Temperature, Alkalinity, Acidity, and Dissolved Metals. Additional management 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.

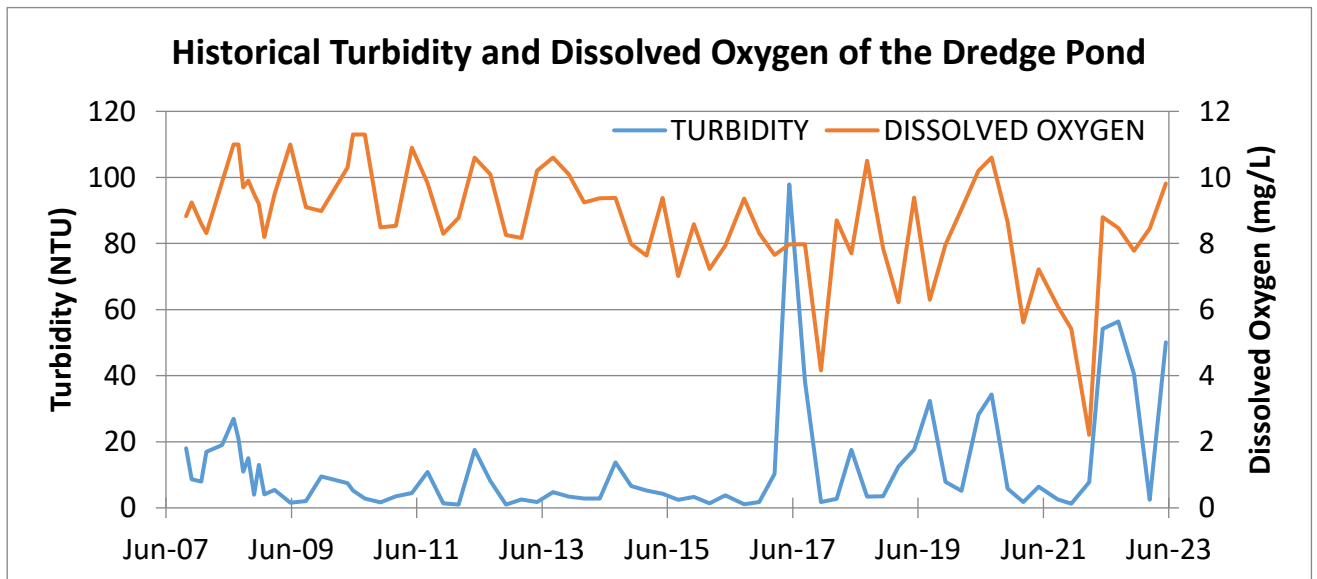
Existing Dredge Pond Analyte	2022/23 Reporting Period			Historical Results			DC Objectives	EA Predictions
	Min	Ave	Max	Min	Ave	Max		
Conductivity	422	507	705	376	670	1,040	< 1,500	N/A
pH	6.6	7.7	8.4	6.4	7.8	8.8	6 - 8.5	N/A
Total Algae	7,410	39,458	119,000	525	134,544	2,070,000	< 15,000	N/A
Cyanophyta	3	34,494	116,000	0	107,976	2,070,000	< 15,000	N/A
Total phosphorus	30	70	150	<5	43	790	< 30	N/A
Total nitrogen	500	725	1,000	40	630	6,900	< 350	N/A
Chlorophyll-a	2	7	14	<0.1	7	49	< 5	N/A
Faecal coliforms	2	6	14	1	107	2100	< 1000	N/A
Enterococci	2	11	20	1	41	690	< 230	N/A
Sodium	40	46	49	33	55	91	< 400	N/A
Potassium ion	4	4	4	1	5	8	< 50	N/A
Magnesium ion	10	10	10	9	14	22	< 50	N/A
Chloride	66	70	79	16	85	140	< 300	N/A
Sulphate ion	38	42	46	25	110	1,300	< 250	N/A
Bicarbonate ion	98	106	117	1	98	313	< 750	N/A
Soluble iron ion	<0.05	<0.05	<0.05	<0.01	0.08	0.77	< 6	N/A
Ammonium ion	<0.01	<0.01	0.02	<0.01	0.03	0.36	< 0.02	N/A
Turbidity	2	37	56	1	11	98	1 - 20	N/A
DO (mg/L)	7.78	8.63	9.82	2.21	8.70	11.30	> 6	N/A
DO (%)	85.6	94.2	99.4	25.8	95.6	125.0	80-110	N/A

pH and Electrical Conductivity



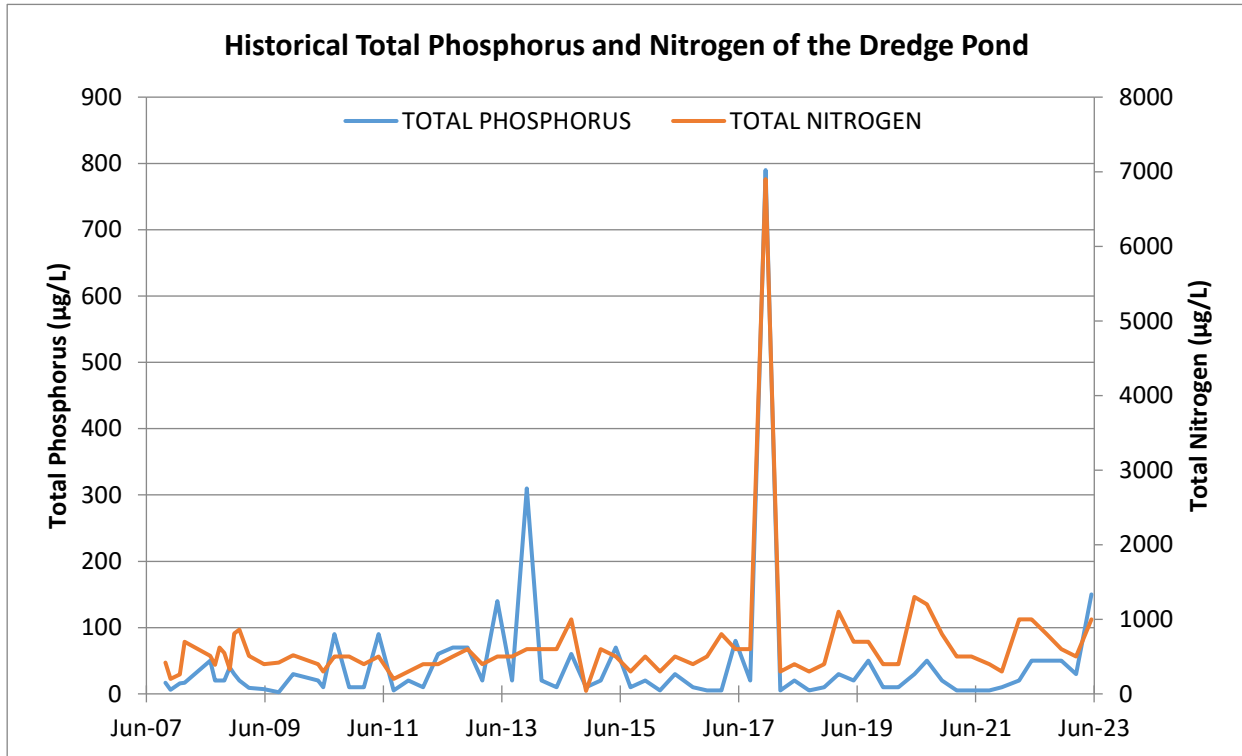
In the current reporting period, the dredge pond pH has returned to the historical average following a minor decline early in the reporting report. Meanwhile, EC has continued the steady decline from previous years in response to the consecutive years of above average rainfall, and is now at concentrations typical of the years prior to the 2017-2020 drought event. All pH and conductivity measurements were within the surface water quality objectives and the historical ranges during the reporting period.

Turbidity and Dissolved Oxygen



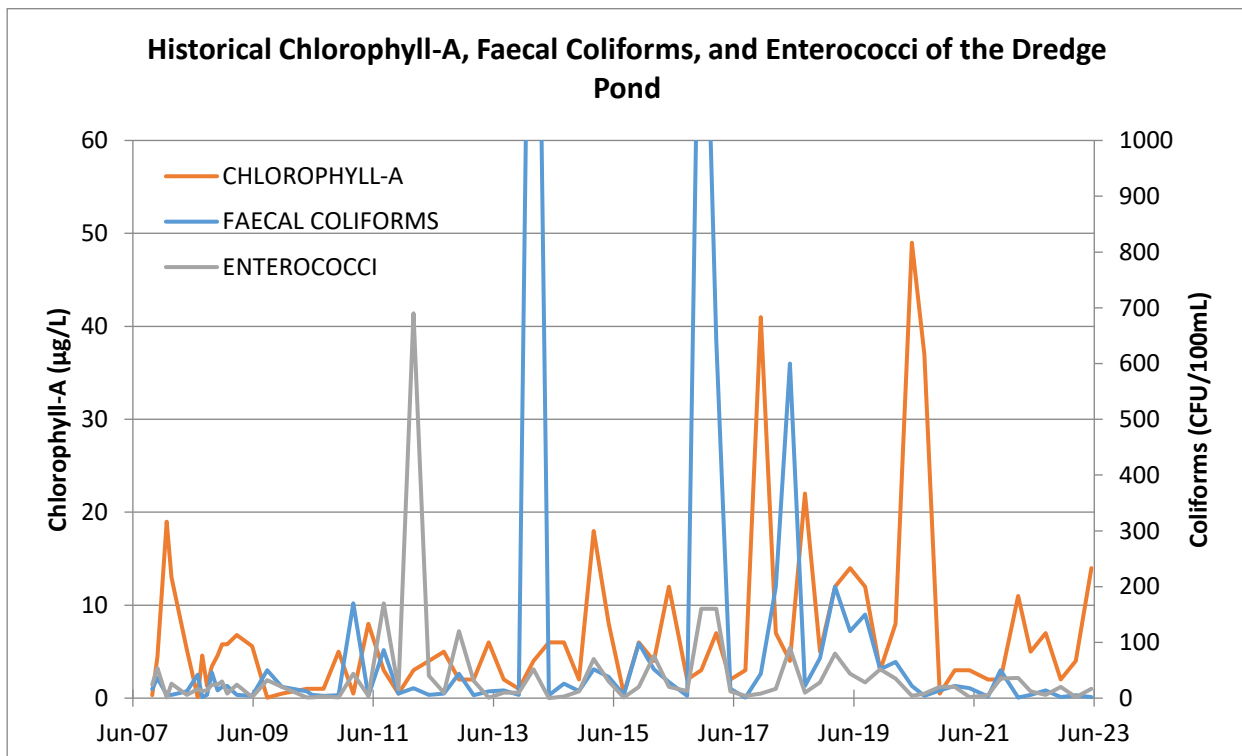
Turbidity has seen some fluctuations in the current reporting period, with dredging close to the sampling point which has skewed measurements, and as such was at times outside of the objective level. Dissolved Oxygen measurements were within the historical range and objective levels throughout the reporting period.

Total Phosphorus and Nitrogen



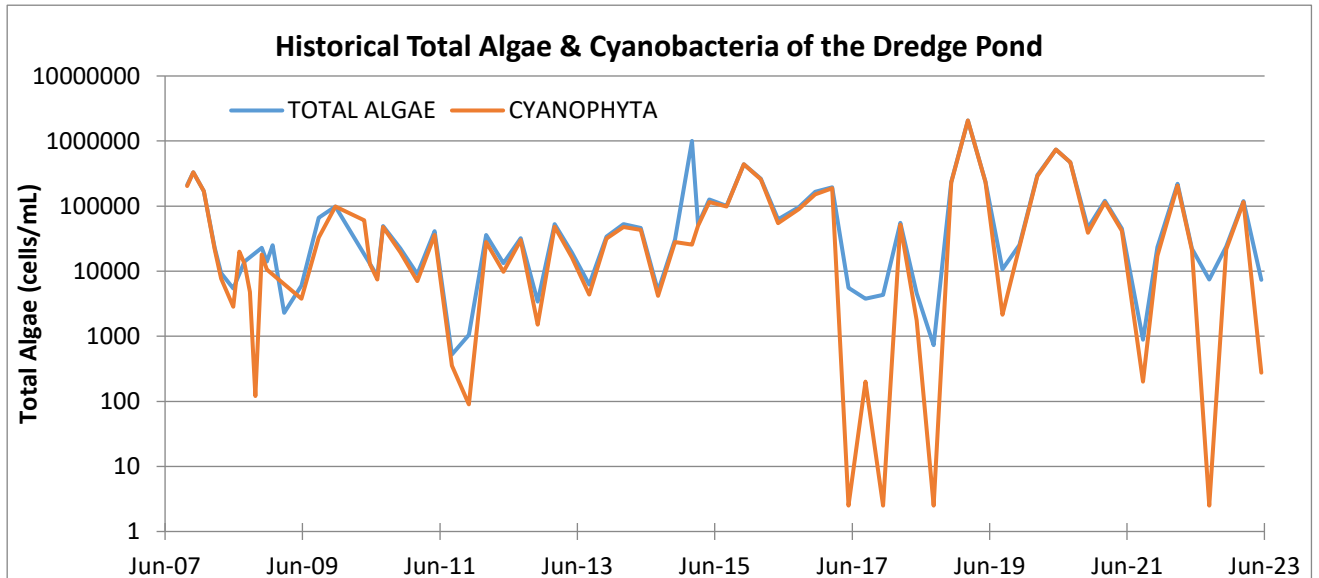
All nitrogen and phosphorus samples remained within the historical ranges for these analytes in the current reporting period, while concentrations of nitrogen and phosphorus were both above their respective objective levels at times during the reporting period. Nevertheless, concentrations of both nitrogen 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



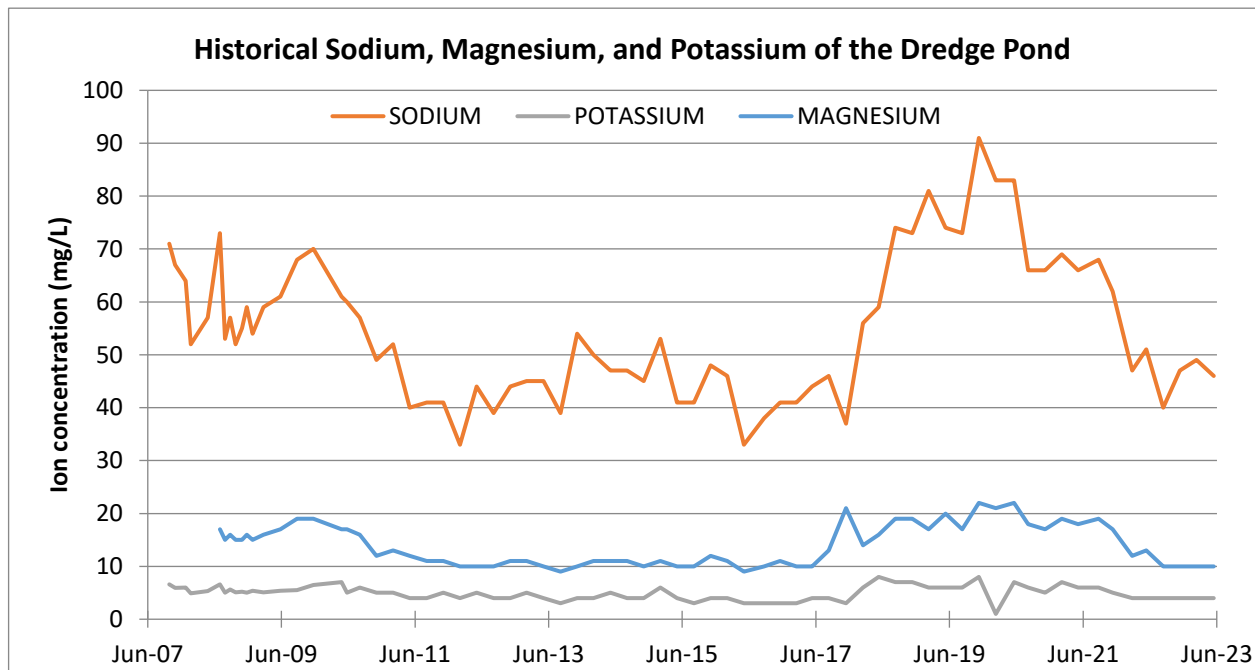
All chlorophyll-A, faecal coliform, and enterococci results were within the historical ranges for the respective analytes during the reporting period. Faecal coliforms and enterococci remained within the objective levels, while chlorophyll-A showed some variation, consistent with previous years, which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

Algae and Cyanobacteria



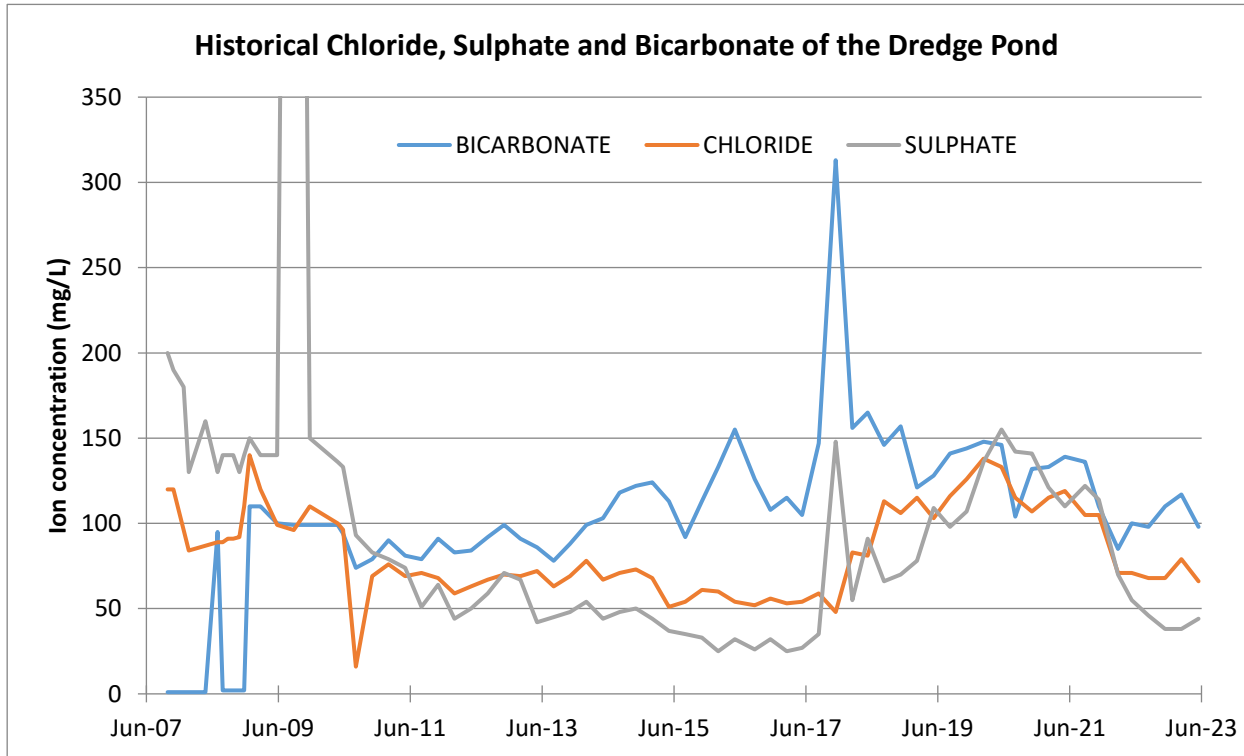
Total algae and cyanobacteria concentrations followed historical patterns, with seasonal fluctuations in concentrations of these microorganisms. Concentrations of both analytes were recorded above the objective levels during the year, which is consistent with historical results and does not reflect a decline in the water quality of the dredge pond.

Major Cations



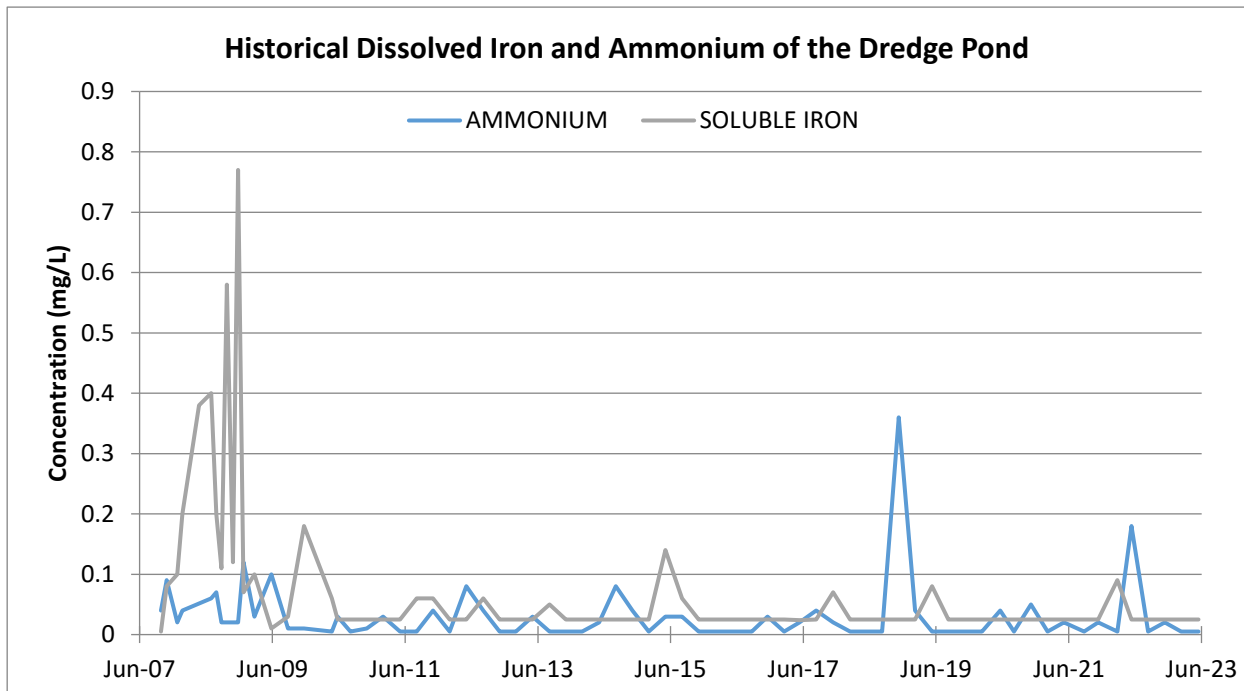
Sodium, magnesium, and potassium ion concentrations have followed the recent trends in electrical conductivity, showing an overall decline in recent years, although some stabilisation is evident in the current reporting period. All analytes remained within the objective levels and the historical ranges for the site during the reporting period.

Major Anions



Concentrations of chloride, sulphate, and bicarbonate have remained well below the objective levels during the current reporting period and are consistent with historical levels. They have stabilised at recent lows in the current reporting period consistent with the patterns shown for major cations and electrical conductivity.

Soluble Iron and Ammonium



Soluble iron and ammonium ion concentrations 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 below the standard laboratory limit of reporting for the majority of the reporting period.

New Dredge Pond

The new dredge pond in the Modification 1 area was sampled once during the reporting period, with the results presented below.

New Dredge Pond	June 2023	DC Objectives	EA Predictions
Conductivity	394	< 1,500	N/A
pH	7.3	6 - 8.5	N/A
Total Algae	1440	< 15,000	N/A
Cyanophyta	<5	< 15,000	N/A
Total phosphorus	510	< 30	N/A
Total nitrogen	1700	< 350	N/A
Chlorophyll-a	2	< 5	N/A
Faecal coliforms	<2	< 1000	N/A
Enterococci	<2	< 230	N/A
Sodium	45	< 400	N/A
Potassium ion	3	< 50	N/A
Magnesium ion	10	< 50	N/A
Chloride	63	< 300	N/A
Sulphate ion	57	< 250	N/A
Bicarbonate ion	86	< 750	N/A
Soluble iron ion	0.07	< 6	N/A
Ammonium ion	<0.01	< 0.02	N/A
Turbidity	133	1 - 20	N/A
DO (mg/L)	10.7	> 6	N/A
DO (%)	104	80-110	N/A

All the water quality analytes met the objective levels, with the exception of the nutrient species and turbidity. The nutrient species are likely elevated due to the recent farming land use of the area, with nitrogen and phosphorus elevated in the surrounding groundwater due to these past 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.

4.3.4. Surface Water Monitoring Results Interpretation

Surface water quality and water levels within 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 dredge pond, coupled with an ongoing reduction in salinity and major ion concentration, which has stabilised somewhat in recent months. 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. Furthermore, pH has largely returned to its neutral long-term average in the current reporting period, as the system equilibrates again following successive wet years.

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 dredging recently commenced in the new dredge pond, continuous monitoring of pH, as well as regular monitoring of other analytes, will be effective in identifying any unexpected changes in water quality.

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 2022-2023 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 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 were installed in the existing dredge pond 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. A third monitoring station has been procured and will be installed in the new dredge pond once the northern bank has been completed.

Material excavated for the new dredge pond was ploughed with lime at a rate of 34kg/t of excavated material, with testing undertaken on the treated material to confirm effective neutralization. The processed sand stockpile continued to be sampled monthly and tested for oxidisable sulphur.

The water monitoring program was updated in February 2023 to include additional monitoring points and analytes as required under the approved QEMP.

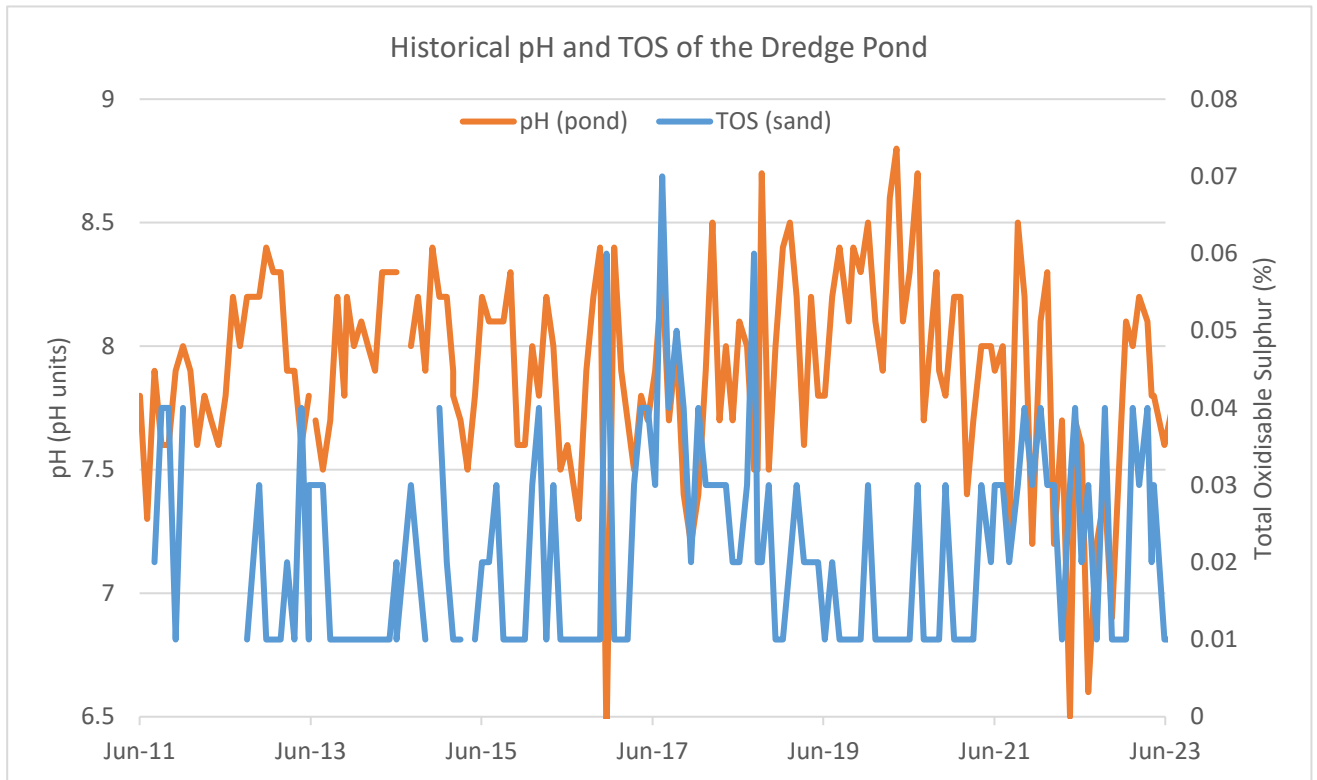
4.4.3. Acid Sulphate Soils Monitoring

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	2022/23 Reporting Period			Historical Results		
	Min	Average	Max	Min	Average	Max
pH (pH units)	6.6	7.7	8.4	6.4	7.9	8.8
TOS (%)	<0.02	0.02	0.04	<0.02	0.02	0.07
DC Criteria	N/A					
EA Predictions	N/A					



Monitoring of excavated and treated acid sulphate soils

Three composite samples of treated excavated material were analysed for the *chromium reducible sulphur acid sulphate soil* suite. In each case, the acid neutralising capacity exceeded the chromium reducible sulphur acidity, confirming that treatment of the acid sulphate soils had been effective. The acid base accounting for each composite sample identified no net acidity.

Continuous Monitoring

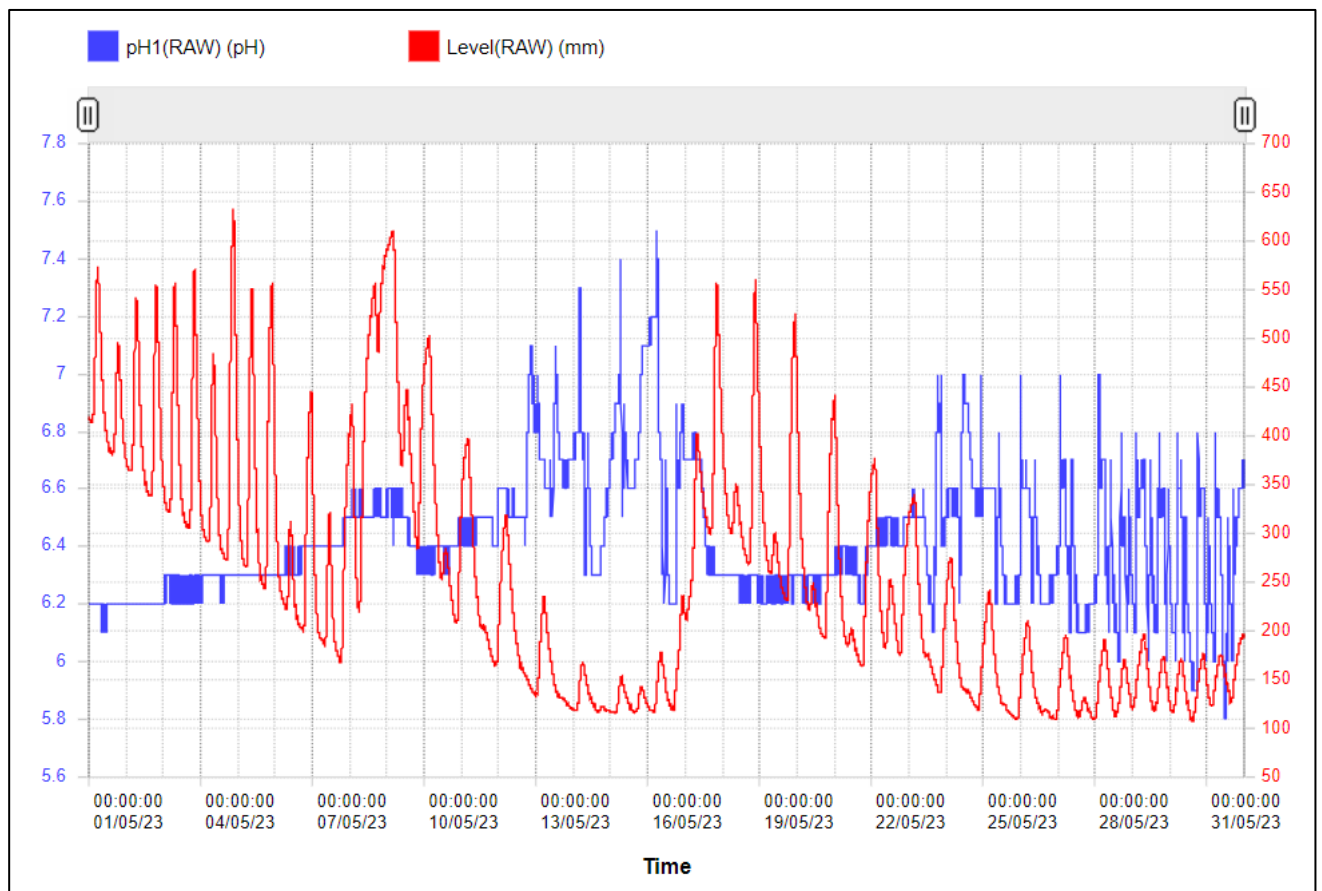
The continuous water quality monitoring stations were installed in the existing dredge pond and in Blue Angle Creek immediately above the floodgates on the 15 March 2023. The site on Blue Angle Creek is immediately downstream of the new dredge pond, and monitors water flowing out from Foy's Swamp, as well as tidal influences from the Crooked River estuary in between rain events.

A monthly summary of pH data from each of the continuous monitoring stations is as follows.

Month	Existing Dredge Pond Shallow probe			Existing Dredge Pond Deep probe			Blue Angle Creek		
	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
March	8.0	8.2	8.7	7.8	8.2	8.4	6.3	6.8	7.8

Month	Existing Dredge Pond Shallow probe			Existing Dredge Pond Deep probe			Blue Angle Creek		
	Min	Ave	Max	Min	Ave	Max	Min	Ave	Max
April	7.8	8.1	8.8	7.4	8.0	8.5	6.2	6.7	7.7
May	7.5	7.7	7.9	7.7	7.9	8.1	5.8	6.4	7.5
June	7.5	7.6	8.8	7.3	8.4	8.9	5.4	6.5	7.7
DC Criteria	N/A								
EA Predictions	N/A								

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 May 2023. 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 higher daily variations in pH observed. When tide variations are higher around the full and new moons, there is a considerable daily variation in water level, which appears to stabilise pH levels due to the contributions from tidal waters. 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 surface water monitoring program.

Analyte	Interim trigger level	Existing Dredge Pond		New Dredge Pond*		Blue Angle Creek U/S		Blue Angle Creek D/S		Processing Returns*	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
pH (pH units)	<6.5	6.6	8.4	7.3	7.3	6.2	7.0	6.3	7.3	7.4	7.4
EC ($\mu\text{S}/\text{cm}$)	N/A	422	705	394	394	99	954	111	16,700	449	449
Turbidity (NTU)	N/A	2.4	56	133	133	4.6	19.5	5.5	24.1	222	222
Temperature ($^{\circ}\text{C}$)	N/A	15.8	23.4	13.4	13.4	11.3	19.1	13.4	19.0	17.6	17.6
DO (mg/L)	<3.0	7.78	9.82	10.7	10.7	3.0	6.9	3.3	5.4	9.81	9.81
DO (% saturation)	<50	85.6	99.4	104	104	33.2	64.8	31.7	56	104	104
Alkalinity	alk < acidity	107	117	86	86	18	121	43	154	92	92
Acidity		1	3	4	4	6	9	6	13	4	4
Dissolved Al ($\mu\text{g}/\text{L}$)	55	30	130	110	110	20	60	30	70	70	70
Dissolved As ($\mu\text{g}/\text{L}$)	24	3	4	6	6	<1	<1	1	2	9	9
Dissolved Bo ($\mu\text{g}/\text{L}$)	370	50	80	<50	<50	70	180	70	580	60	60
Dissolved Ba ($\mu\text{g}/\text{L}$)	137	10	86	74	74	15	89	11	78	80	80
Dissolved Be ($\mu\text{g}/\text{L}$)	1.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Cd ($\mu\text{g}/\text{L}$)	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Co ($\mu\text{g}/\text{L}$)	2.8	<1	<1	<1	<1	<1	1	1	1	<1	<1
Dissolved Cr ($\mu\text{g}/\text{L}$)	13	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Cu ($\mu\text{g}/\text{L}$)	6	<1	<1	<1	<1	<1	1	<1	<1	2	2
Dissolved Mn ($\mu\text{g}/\text{L}$)	1,900	<1	4	27	27	88	375	86	208	25	25
Dissolved Ni ($\mu\text{g}/\text{L}$)	44	<1	<1	1	1	1	2	2	2	1	1
Dissolved Pb ($\mu\text{g}/\text{L}$)	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Se ($\mu\text{g}/\text{L}$)	11	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dissolved Va ($\mu\text{g}/\text{L}$)	12	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dissolved Zn ($\mu\text{g}/\text{L}$)	152	26	37	76	76	26	53	14	53	73	73
Dissolved Fe ($\mu\text{g}/\text{L}$)	326 [^]	<50	<50	70	70	180	460	210	530	<50	<50
Dissolved Hg ($\mu\text{g}/\text{L}$)	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

* Sampling commenced June 2023. [^] For existing dredge pond only - triggers to be developed for other sites.

The results show few exceedances of the ASS interim trigger values, which were subject to further review in line with the Water Management Plan. Of these, dissolved aluminium was regularly above the interim trigger value for all monitoring sites, including for samples collected prior to the commencement of activities in the Modification 1 area, and for upstream of the new dredge pond in Blue Angle Creek. This suggests dissolved aluminium concentrations are naturally elevated in the local surface water resources of the area. Similarly, dissolved oxygen concentrations in both upstream and downstream monitoring sites on Blue Angle Creek were regularly below the interim trigger values, including prior to the commencement of activities in the Modification 1 area. Once again this suggests that the low dissolved oxygen concentrations are a natural feature of Blue Angle Creek. In contrast, the dredge ponds typically exhibit dissolved oxygen saturation close to 100%. All other results are within the interim trigger levels, or were outside for a single result only.

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.

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 two and 15 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 groundwater monitoring program.

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	4.8	5.4	dry	dry	5	7.2	6.7	6.7	7.4	7.6
EC ($\mu\text{S}/\text{cm}$)	N/A	5790	5840	dry	dry	1100	1170	395	395	462	535
Alkalinity	N/A	9	10	dry	dry	225	276	126	126	116	123
Acidity	N/A	23	116	dry	dry	16	30	12	12	3	6
Sulphate (mg/L)	N/A	668	672	dry	dry	298	309	9	9	37	37
Chloride (mg/L)	N/A	1710	1730	dry	dry	95	107	52	52	65	79
Calcium (mg/L)	N/A	34	37	dry	dry	144	160	37	37	44	44
Magnesium (mg/L)	N/A	136	142	dry	dry	24	32	6	6	10	10
Sodium (mg/L)	N/A	1190	1240	dry	dry	80	82	45	45	43	50
Potassium (mg/L)	N/A	3	3	dry	dry	5	6	2	2	3	4
Dissolved Al ($\mu\text{g}/\text{L}$)	2,700	<10	20	dry	dry	<10	20	220	220	<10	<10
Dissolved As ($\mu\text{g}/\text{L}$)	24	<1	<1	dry	dry	<1	<1	13	13	4	6
Dissolved Ba ($\mu\text{g}/\text{L}$)	137	60	62	dry	dry	35	36	94	94	85	95
Dissolved Cd ($\mu\text{g}/\text{L}$)	2.0	0.1	0.2	dry	dry	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Cr ($\mu\text{g}/\text{L}$)	30	<1	<1	dry	dry	1	2	3	3	<1	<1
Dissolved Co ($\mu\text{g}/\text{L}$)	2.8	16	16	dry	dry	<1	<1	<0.1	<0.1	<1	<1
Dissolved Cu ($\mu\text{g}/\text{L}$)	13	<1	3	dry	dry	<1	<1	<1	<1	<1	<1
Dissolved Pb ($\mu\text{g}/\text{L}$)	48	<1	1	dry	dry	<1	<1	<1	<1	<1	<1
Dissolved Mn ($\mu\text{g}/\text{L}$)	1,900	293	303	dry	dry	68	79	78	78	2	7
Dissolved Ni ($\mu\text{g}/\text{L}$)	105	15	19	dry	dry	<1	<1	<1	<1	<1	<1
Dissolved Se ($\mu\text{g}/\text{L}$)	11	<10	<10	dry	dry	<10	<10	<10	<10	<10	<10
Dissolved Va ($\mu\text{g}/\text{L}$)	12	<10	<10	dry	dry	<10	<10	<10	<10	<10	<10
Dissolved Zn ($\mu\text{g}/\text{L}$)	152	106	114	dry	dry	54	57	57	57	40	42
Dissolved Bo ($\mu\text{g}/\text{L}$)	370	<50	<50	dry	dry	<50	70	<50	<50	<50	<50
Dissolved Fe ($\mu\text{g}/\text{L}$)	varies	2940	22000	dry	dry	10800	15900	4820	4820	70	70
Dissolved Hg ($\mu\text{g}/\text{L}$)	N/A	<0.1	<0.1	dry	dry	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Analyte	Interim trigger level	NB2		NB3		NB4		MW7	
		Min	Max	Min	Max	Min	Max	Min	Max
pH (pH units)	N/A	5.1	5.6	6.1	6.2	6.6	6.6	5.5	5.5
EC ($\mu\text{S}/\text{cm}$)	N/A	161	309	107	156	7120	7190	7630	7630
Alkalinity	N/A	16	26	33	39	222	228	8	8
Acidity	N/A	31	50	23	26	28	58	257	257
Sulphate (mg/L)	N/A	<1	3	<1	<10	434	436	1750	1750
Chloride (mg/L)	N/A	37	83	17	22	2340	2400	1900	1900
Calcium (mg/L)	N/A	7	7	6	6	136	142	201	201
Magnesium (mg/L)	N/A	3	5	2	4	155	163	232	232
Sodium (mg/L)	N/A	24	53	12	15	1260	1340	1350	1350
Potassium (mg/L)	N/A	2	4	6	7	37	40	42	42
Dissolved Al ($\mu\text{g}/\text{L}$)	2,700	1460	2080	110	220	<10	<10	180	180
Dissolved As ($\mu\text{g}/\text{L}$)	24	12	15	<1	<1	<1	2	7	7
Dissolved Ba ($\mu\text{g}/\text{L}$)	137	129	156	117	137	39	68	56	56
Dissolved Cd ($\mu\text{g}/\text{L}$)	2.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2	2
Dissolved Cr ($\mu\text{g}/\text{L}$)	30	2	3	<1	<1	<1	<1	<1	<1
Dissolved Co ($\mu\text{g}/\text{L}$)	2.8	<1	<1	1	2	<1	<1	24	24
Dissolved Cu ($\mu\text{g}/\text{L}$)	13	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Pb ($\mu\text{g}/\text{L}$)	48	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Mn ($\mu\text{g}/\text{L}$)	1,900	5	7	464	506	202	220	789	789
Dissolved Ni ($\mu\text{g}/\text{L}$)	105	<1	<1	<1	1	<1	<1	17	17
Dissolved Se ($\mu\text{g}/\text{L}$)	11	<10	<10	<10	<10	<10	<10	<10	<10
Dissolved Va ($\mu\text{g}/\text{L}$)	12	<10	10	<10	<10	<10	<10	<10	<10
Dissolved Zn ($\mu\text{g}/\text{L}$)	152	38	94	20	41	<5	56	779	779
Dissolved Bo ($\mu\text{g}/\text{L}$)	370	<50	70	<50	<50	730	850	880	880
Dissolved Fe ($\mu\text{g}/\text{L}$)	varies	1390	1780	4960	5080	10400	18600	71100	71100
Dissolved Hg ($\mu\text{g}/\text{L}$)	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

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), suggesting the low pH in some bores isn't always sufficient to mobilise aluminium from the soils. 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.

Unlike for surface water, dissolved aluminium remained below the interim trigger levels in all bores throughout the reporting period. However other dissolved aluminium species were at times above the interim trigger levels for certain bores. MW7, which represents the background monitoring bore 1km west of the new dredge pond, recorded the most individual triggers, at times exceeding the interim trigger level for dissolved cobalt, zinc and boron. These triggers represent the background groundwater environment, unrelated to dredging activities. Furthermore, triggers for dissolved barium in NB2, dissolved cobalt in MW1, dissolved boron in NB4, and

dissolved iron in MW2B, and NB3, were all recorded prior to the commencement of excavation works in the Modification 1 area, suggesting these measured concentrations represent the background for these bores.

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 24 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 during the reporting period, and includes a much higher level of control, allowing for the early detection of changes in pH in the dredge ponds and Blue Angle Creek. Furthermore, 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.

Dissolved metals concentrations in both surface water and groundwater resources have very limited datasets at present (with the exception of dissolved metals), so the continued refinement of the trigger values in future years will allow Cleary Bros to identify any changes from the background. It is expected that a minimum eight samples will have been collected for each surface water monitoring site by early 2024, allowing the derivation of site specific trigger values at that point. Groundwater monitoring bores are expected to have a minimum of eight sample by early 2025, allowing the derivation of site specific trigger values at that point. Until these times, Cleary Bros will continue to examine each result in line with recent results and the process described in the ASSMP for the implementation of any contingency measures.

There were no non-compliances with conditions of the Development Consent or Environmental Protection Licence 4146 related to acid sulphate soils in the 2022-2023 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 2022-2023 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 exceed the outflows, 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.

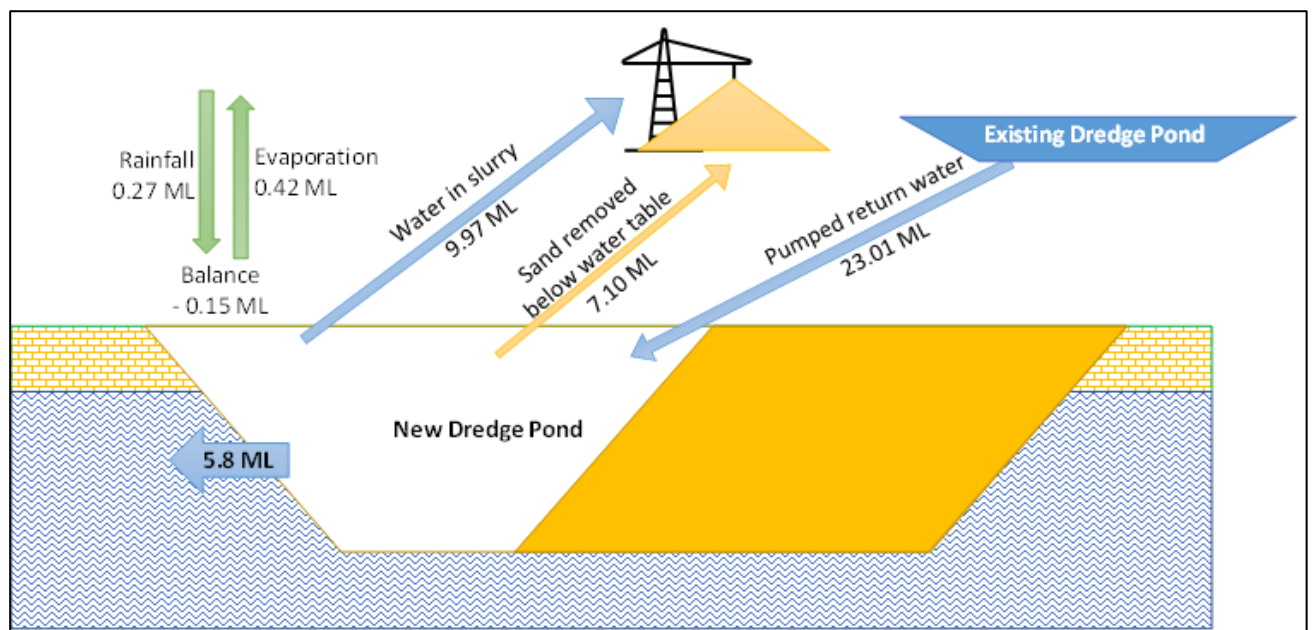
Cleary Bros monitor or record all inflows and outflows of water as follows:

- 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.

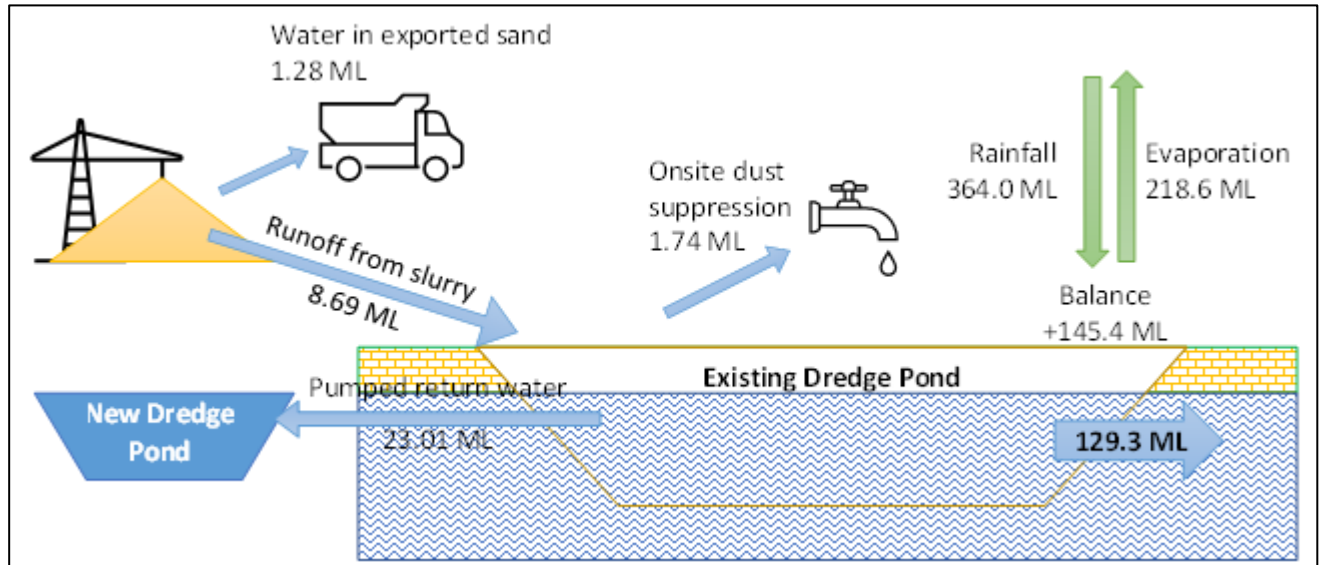
4.5.3. Water Take and Compliance Assessment

The following schematics show the water transfers during the 2022-2023 reporting period.

New Dredge Pond



Old Dredge Pond



During the 2022-2023 reporting period, the above average rainfall resulted in no take of water from the coastal sands aquifer, with outflows from both the old dredge pond (129.3 ML) and new dredge pond (5.8 ML) into the aquifer. Cleary Bros take of water during the reporting period is within that permitted under the water licences, given there was no take of water from the coastal sands aquifer.

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/m²/month, maximum increase in deposited dust level; and
- 4g/m²/month, maximum annual average deposited dust level.

The Air Quality Monitoring Program was updated during the reporting period following approval of the modification, with dust gauge 3A discontinued and a new dust gauge (4A) installed adjacent to the site weather station.

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/m²/month) recorded in the three dust depositional gauges at the Gerroa Sand Resource.

Dust Gauge Units: g/m ² /month	2022/23 Reporting Period			Historical Results		
	Min	Average	Max	Min	Average#	Max
1A	0.5	1.6	5.1	0.1	2.2	20.1
2A	0.2	1.2	3.3	0.1	2.0	49.7
3A	0.3	0.7	1.2	0.1	1.4	220.0
4A	0.1	0.3	0.5	New monitor installed Feb 2023		
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 Mine 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 2022-2023 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 within 3 months of commencement of operations on the extension site, and annually in winter thereafter. 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 are 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 initial attended noise monitoring was undertaken on 15 March 2023, which was within 3 months of commencement of operations in the Modification 1 area. At the time of the monitoring, earthmoving equipment was engaged constructing the flood bunds for the new dredge pond, with sand also being loaded onto road trucks in the processing area. Dredging had not yet commenced at this time.

Noise from quarry related activities was not detected at any of the monitoring sites at any time. Dominant noise sources were ocean waves for the sites close to Seven Mile Beach, local road, insect, and bird noise for the rural residential sites to the south of the quarry, and insect and bird noise for the rural site to the north of

the quarry. Other noise contributions at most sites included local road traffic and aircraft, including helicopters, low-level light planes, and higher altitude jet planes. 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-15 min}	Yes/No
R1	670 Beach Road	44.2	64.5	84.1	Not audible	41	Yes
R2	11 Banggarai St	36.8	46.8	66.6	Not audible	40	Yes
R3	Caravan Park	46.0	53.8	77.0	Not audible	36	Yes
R4	Athelstane*	37.4	44.5	70.7	Not audible	40	Yes
R5	Picnic Area 1	43.0	48.6	65.9	Not audible	40	Yes
R6	Picnic Area 2	43.6	46.5	66.1	Not audible	40	Yes

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

The annual winter noise monitoring was also undertaken during the reporting period, in June 2023. Construction activities were largely complete at this time, with normal dredging activities in operation throughout the period of noise monitoring. In addition, a grader was in use maintaining roads in the Modification 1 area, and sand was being loaded onto road trucks in the processing area.

Noise from quarry related activities was not detected at any of the monitoring sites at any time with the exception of site R4 (Athelstane). At this site, the grader was occasionally audible as a contributing noise source, however was never the dominant noise source. The dominant noise source at most sites was attributable to wind blowing in adjacent trees. At sites R3 (Caravan Park) and R5 (Gerroa Picnic Area) 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 determined the average noise levels for these sites. Other minor noise contributions included bird noise and light aircraft noise. 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-15 min}	Yes/No
R1	670 Beach Road	36.7	63.8	84.0	Not audible	41	Yes
R2	11 Banggarai St	38.6	48.2	73.7	Not audible	40	Yes
R3	Caravan Park	43.5	52.1	69.8	Not audible	36	Yes
R4	Athelstane*	40.6	45.9	63.3	Grader faintly audible (<36 dB(A))	40	Yes
R5	Picnic Area 1	44.9	48.0	63.3	Not audible	40	Yes
R6	Picnic Area 2	43.2	45.6	58.0	Not audible	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 2022-2023 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 three Community Consultative Committee meetings during the reporting period in July and December 2022 and June 2023, with the December 2022 meeting including a site visit. Minutes of these meetings have been sent to the DPE and are also available on the Cleary Bros website.

4.8.2. Tabulated Results

No complaints were received in relation to the Gerroa Sand Resource in 2022/2023, 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

*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 updated 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. 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 fifteenth annual survey in June 2023 and it is attached as Annexure C.

4.9.2. Summary of Quarterly Inspections and Key Works

Quarterly inspections were carried out for September 2022, December 2022, March 2023 and June 2023.

Primary planting has been completed for all areas of revegetation. Approximately 50 plants featuring a mix of *Casuarina glauca* and *Melaleuca stypheloides* were planted for the tree screen during the reporting period. This comprised the only section of the tree screen above the floodplain, with the remaining floodplain areas inaccessible for the majority of the period due to the wet ground conditions. The completion of the tree screen is proposed as soon as ground conditions permit access to this area. In addition, approximately 20 advanced *Ficus macrophylla* seedlings, kindly donated by one of the community representatives from the CCC, were planted in various revegetation zones across the site towards the end of the reporting period. These individuals will assist in boosting biological diversity and habitat across the site.

Otherwise there has been limited opportunity to undertake significant infill planting during the current reporting period due to the continued wet ground conditions across the majority of the revegetation areas. Plants have been held in the site greenhouse, with many having to be re-potted during the period due to their continued growth. The current plant stock in the greenhouse awaiting planting are summarised in the table below.

Species	Greenhouse
<i>Angophora floribunda</i>	95
<i>Casuarina glauca</i>	960
<i>Eucalyptus botryooides</i>	60
<i>Eucalyptus pillularis</i>	32
<i>Eucalyptus robusta</i>	89
<i>Lomandra longifolia</i>	19
<i>Melaleuca stypheloides</i>	254
<i>Pittosporum revolutum</i>	50

No clearing of any trees or shrubs were undertaken during the current reporting period. Grubbing of the cleared pasture in the northeastern section of the new dredge pond was undertaken, as well as mulching of the area of the new vegetation screen prior to planting.

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. 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 56 hours expended on weed control during the period. 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

The fifteenth annual report included an inspection of each zone where practicable (zones 2C2 and 2E were inaccessible due to wet ground conditions), principally focusing on any areas for improvement where vegetation management efforts should be directed in the following year. The report stated the following general comments around the overall progress of the rehabilitation program and current priorities:

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 recorded in late 2022, some zones were largely inaccessible until recently and had subsequently become inundated with weed species. The previous years report noted that some plantings were impacted by the floodings and would need to be replaced, the most severely impacted being zone 2C.2. This subzone, as well as 2E, were still too wet to access this year, so management of this zone should be undertaken immediately as access becomes available again.

To achieve 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 1.1, 1.3 and 2A.3) 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 Zone 2C.2 and 2B.1 last year, however no evidence of deer rubbing was noted during this year's inspection. If predation intensifies and rates of tube stock success decline, on-site deer control methods may need to be implemented.

Continued mowing and weed maintenance in newly planted areas (such as 2C.1) 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 2D).

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.

Management activities to be undertaken in the 2023-24 period will be in accordance with the recommendations in the fifteenth annual report. This will include a focus on plantings in those areas affected by flooding, and infill in other areas of site with the excess plant stock currently in the site greenhouse. Weed control focusing on localised removal of Tobacco Bush, fireweed and other isolated weed species will also be prioritised alongside the broader control of lantana.

4.10. General Environmental Management & Reporting

4.10.1. 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 into the QEMP are assessed below.

4.10.2. 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.

4.11. Traffic Management

4.11.1. 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.

4.11.2. 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.

4.12. 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	<p>There is an opportunity to improve housekeeping by cleaning up the areas affected by minor oil spill from dripping outlet.</p> <ul style="list-style-type: none"> - 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 	<p>Auditor recommended that a toolbox talk for on-site staff is undertaken which discusses spill and hydrocarbon impacted water management.</p> <p>Workers are to be reminded that bund water may be impacted with fuels and should not be discharged if any sheen or odours are visible.</p> <p>Workers should be reminded that even minor spills of fuels should</p>	<p>Completed</p> <p>All workers on site attended a toolbox on spill response and water management.</p> <p>Residual hydrocarbons were removed and disposed of at licenced waste</p>

Condition Number	Auditor Comment	Auditor Recommendation	Progress of Corrective Actions
	<p>cleaning plant and stockpile had a faint hydrocarbon odour.</p> <p>Both spills appeared minor in nature and no evidence of environmental harm was observed.</p>	<p>be cleaned up immediately and impacted soils should be disposed of by a suitably licenced waste contractor.</p>	<p>facility.</p>
<p>Sch 3 Cond 16 Sch 3 Cond 16A</p>	<p>CB submitted a draft planning agreement on 1 December 2008, which was agreed by the Department in principle. A final agreement was never executed with the department, despite CB raising the issue in 2009 and 2013.</p> <p>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.</p> <p>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.</p>	<p>Nil</p>	<p>In progress - CB has provided a response to the Department and are waiting on their response to finalise the agreement. CB followed up with the Department again in June 2023 and are still awaiting a response.</p>

5. Conclusion

The primary issue identified in this Annual Review is the continuing departure of surface and ground water quality 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. Furthermore, the updated Water Management Plan has significantly expanded the surface and groundwater monitoring program, and allowed a better understanding of the background environment, allowing for the early detection of any unexpected changes that may emerge as dredging continues in the new dredge pond.

Site conditions during the current reporting period were characterised by the continued rainfall surplus on the back of three years of above average rainfall. This has largely returned the aquatic environment to conditions typical of the pre-drought years prior to 2017. 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 have generally returned to traditional levels across the monitoring network, while groundwater quality has been relatively unchanged. With the higher soil moisture conditions, dust deposition has remained at very low levels.

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

Annexure A

Return to Department of Regional NSW 2021/2022

Extractive Materials Return

2021-2022

Form S1 – Period Ending 30 June 2022



Regional NSW

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)
<p><i>Please amend name, postal address and location of mine or quarry if incorrect or incomplete.</i></p>	

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 2022**. 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:** 19/6/2023
- **CONTACT PERSON** for this return: [REDACTED]
- **NAME** (Block letters): [REDACTED] **Telephone** [REDACTED]

Extractive Materials Return

2021-2022



Regional
NSW

Form S1 – Period Ending 30 June 2022

Sales During 2021-2022

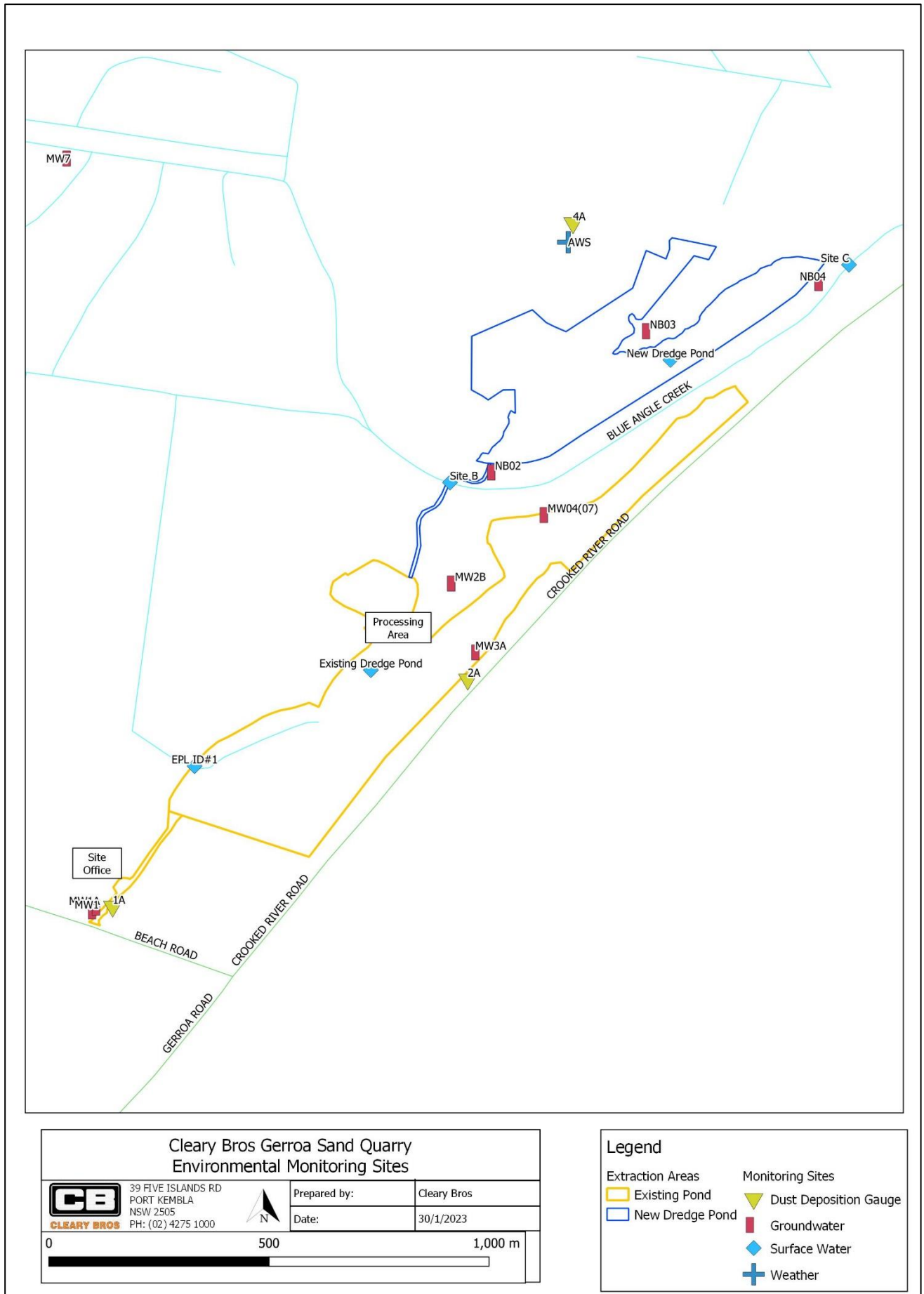
Production information may be published in aggregated form for statistical reporting. However, production data for individual operations is kept strictly confidential.

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	31,291
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		31,291
Gross Value (\$) of all Sales	██████████	
Type of Material	Sand	
Number of Full-Time Equivalent (FTE) Employees	Employees: 2	Contractors:3

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

Annexure B

Environmental Monitoring Locations



Annexure C

2022/23 Environmental Monitoring Results

Groundwater Monitoring Results

	pH (pH units)				EC (µS/cm)				Total Phosphorus (µg/L)			Total Nitrogen (µg/L)		
	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Jun-23	Sep-22	Dec-22	Jun-23
MW1	5	5.1	5.4	4.8	6820	6960	5790	5840	40	80	50	1500	1600	1600
MW1A	insufficient sample	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	dry
MW1D	7.3	7.2	discontinued		1560	1900	discontinued		100	80	discontinued	1100	2200	discontinued
MW2A	7.6	7.2	discontinued		636	655	discontinued		1090	100	discontinued	400	200	discontinued
MW2B	7	7.4	5	7.2	1100	1280	1170	1100	150	100	100	1100	1100	1400
MW3A	access flooded	access flooded	access flooded	6.7	access flooded	access flooded	access flooded	395	access flooded	access flooded	170	access flooded	access flooded	600
MW3C	7.6	7.6	discontinued		1090	977	discontinued		180	180	discontinued	900	900	discontinued
MW4	bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued	bore damaged	bore damaged	discontinued
MW01(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued	dry	dry	discontinued
MW02(07)	7.7	7.5	discontinued		510	705	discontinued		100	300	discontinued	600	1300	discontinued
MW03(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued	dry	dry	discontinued
MW04(07)	7.7	7.8	7.4	7.6	528	522	535	462	90	60	240	800	500	700
MW05(07)	dry	6.4	discontinued		dry	138	discontinued		dry	270	discontinued	dry	1600	discontinued
NB2	5.9	5.8	5.1	5.6	173	145	309	161	80	70	80	1600	1500	1600
NB3	6.7	6.4	6.2	6.1	134	118	107	156	740	440	320	1100	1400	1100
NB4	6.9	6.3	6.6	6.6	8480	9000	7120	7190	<20	50	50	1200	1300	1500
MW7	access flooded	access flooded	5.5	access flooded	access flooded	access flooded	7630	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded

	Sodium (mg/L)				Potassium (mg/L)				Magnesium (mg/L)				Chloride (mg/L)			
	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23
MW1	1170	1260	1240	1190	3	3	3	3	138	148	142	136	1730	2050	1710	1730
MW1A	insufficient sample	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	insufficient sample	dry
MW1D	85	106	discontinued		6	8	discontinued		37	39	discontinued		119	132	discontinued	
MW2A	22	27	discontinued		<1	2	discontinued		6	6	discontinued		29	105	discontinued	
MW2B	87	93	82	80	3	4	5	6	19	28	32	24	155	129	95	107
MW3A	access flooded	access flooded	access flooded	45	access flooded	access flooded	access flooded	2	access flooded	access flooded	access flooded	6	access flooded	access flooded	access flooded	52
MW3C	79	85	discontinued		6	6	discontinued		19	15	discontinued		120	129	discontinued	
MW4	bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued	
MW01(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued	
MW02(07)	43	88	discontinued		4	7	discontinued		11	15	discontinued		66	170	discontinued	
MW03(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued	
MW04(07)	45	45	50	43	4	5	4	3	11	10	10	10	68	69	79	65
MW05(07)	dry	24	discontinued		dry	2	discontinued		dry	2	discontinued		dry	23	discontinued	
NB2	21	22	53	24	3	3	4	2	2	2	5	3	34	26	83	37
NB3	10	10	12	15	3	6	6	7	3	2	2	4	21	12	17	22
NB4	1250	1310	1340	1260	37	34	40	37	159	170	163	155	2700	3080	2400	2340
MW7	access flooded	access flooded	1350	access flooded	access flooded	access flooded	42	access flooded	access flooded	access flooded	232	access flooded	access flooded	access flooded	1900	access flooded

	Sulphate (mg/L)				Bicarbonate (mg/L)				Soluble Iron (mg/L)				
	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23	Sep-22	Dec-22	Mar-23	Jun-23	
MW1	686	644	672	668	4	4	10	9	1.19	3.48	22	2.94	
MW1A	insufficient	insufficient	insufficient	dry	insufficient	insufficient	insufficient	dry	insufficient	insufficient	insufficient	dry	
MW1D	434	490	discontinued		262	421	discontinued		9.25	8.55	discontinued		
MW2A	16	14	discontinued		187	140	discontinued		2.77	18	discontinued		
MW2B	170	254	309	298	142	242	276	225	12.9	17.3	15.9	10.8	
MW3A	access flooded	access flooded	access flooded	9	access flooded	access flooded	access flooded	126	access flooded	access flooded	access flooded	4.82	
MW3C	158	133	discontinued		202	193	discontinued		5.7	2.96	discontinued		
MW4	bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued		bore damaged	bore damaged	discontinued		
MW01(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued		
MW02(07)	45	29	discontinued		102	126	discontinued		0.13	0.81	discontinued		
MW03(07)	dry	dry	discontinued		dry	dry	discontinued		dry	dry	discontinued		
MW04(07)	47	34	37	37	96	120	116	123	<0.05	0.26	0.07	0.07	
MW05(07)	dry	<10	discontinued		dry	28	discontinued		dry	4.79	discontinued		
NB2	<10	<10	<1	3	15	18	26	16	0.82	1.05	1.39	1.78	
NB3	<1	<10	<10	<1	18	32	33	39	1.32	3.45	4.96	5.08	
NB4	394	292	434	436	100	63	222	228	<0.05	49	18.6	10.4	
MW7	access flooded	access flooded	1750	access flooded	access flooded	access flooded	8	access flooded	access flooded	access flooded	access flooded	71.1	access flooded

	Chlorophyll-a (µg/L)			Faecal Coliforms (CFU/100mL)			Enterococci (CFU/100mL)			Ammonium (mg/L)		
	Sep-22	Dec-22	Jun-23	Sep-22	Dec-22	Jun-23	Sep-22	Dec-22	Jun-23	Sep-22	Dec-22	Jun-23
MW1	1	<1	<1	<2	<2	<1	<2	<2	<1	1.23	1.1	1.23
MW1A	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	dry	insufficient sample	insufficient sample	dry
MW1D	<1	<1	discontinued	<2	<2	discontinued	<2	<2	discontinued	0.82	1.5	discontinued
MW2A	<1	<1	discontinued	<2	<2	discontinued	<2	<2	discontinued	0.39	0.05	discontinued
MW2B	<1	<1	<1	<2	<2	<1	<2	<2	<1	0.29	0.38	0.74
MW3A	access flooded	access flooded	<1	access flooded	access flooded	<1	access flooded	access flooded	<1	access flooded	access flooded	0.002
MW3C	<1	<1	discontinued	<2	<2	discontinued	~2	<2	discontinued	0.4	0.24	discontinued
MW4	bore damaged	bore damaged	discontinued	bore damaged	bore damaged	discontinued	bore damaged	bore damaged	discontinued	bore damaged	bore damaged	discontinued
MW01(07)	dry	dry	discontinued	dry	dry	discontinued	dry	dry	discontinued	dry	dry	discontinued
MW02(07)	<1	<1	discontinued	<2	<2	discontinued	<2	<2	discontinued	0.07	0.32	discontinued
MW03(07)	dry	dry	discontinued	dry	dry	discontinued	dry	dry	discontinued	dry	dry	discontinued
MW04(07)	<1	<1	<1	<2	<2	<1	~2	<2	~2	<0.01	0.13	0.006
MW05(07)	dry	<1	discontinued	dry	<2	discontinued	dry	<2	discontinued	dry	0.04	discontinued
NB2	<1	<1	<1	<2	<2	<1	<2	<2	<1	0.06	0.07	0.3
NB3	<1	<1	<1	~4	<2	<1	<2	<2	<1	0.39	0.32	0.51
NB4	<1	<1	<1	<2	<2	<1	~2	<2	<1	0.04	0.99	0.87
MW7	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded	access flooded

Groundwater and Surface Water Level Monitoring Results

(mAHD)	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
MW1	1.08	0.81	0.98	0.71	0.83	1.5	2.02	2.31	2	1.67	1.57	1.58
MW1A	0.58	1.05	dry	0.8	0.63	dry	dry	0.73	dry	0.58	0.9	dry
MW1D	*	1.43	1.16	1.11	*	1.26	1.32	discontinued				
MW2A	1.21	1.05	1.35	1.08	1.55	1.46	1.62	discontinued				
MW2B	*	1.71	1.45	1.45	*	1.58	1.68	*	1.6	1.46	1.57	1.6
MW3A	0.58	*	*	*	*	*	*	*	*	*	1.38	1.52
MW3C	0.91	1.4	1.46	1.35	1.33	1.5	1.1	discontinued				
MW4	4.34	4.72	bore damaged	4.81	4.85	5.78	5.3	discontinued				
MW01(07)	3.16	dry	dry	dry	3.62	dry	4.09	discontinued				
MW02(07)	0.78	1.11	1.2	1.05	1.2	1.38	bore damaged	discontinued				
MW03(07)	3.88	dry	dry	dry	2.35	dry	dry	discontinued				
MW04(07)	2.16	2.65	2.65	2.5	2.78	3.1	*	*	3.21	*	*	3.23
MW05(07)	3.27	3.81	dry	dry	4	4.25	4.51	discontinued				
NB2	1.22	2	2.08	1.65	1.95	2.33	2.45	2.05	2.44	2.02	1.88	2.36
NB3	5.17	6.4	6.15	6.01	5.86	6.5	6.98	essible - fld	7.09	6.6	6.35	6.83
NB4	0.12	0.7	0.69	0.6	0.63	0.91	0.58	1.03	1.28	1	0.87	1.16
MW7	*	1.21	*	*	*	*	*	*	1.48	*	*	*
Existing Dredge Pond	not visible	2.4	2.3	2.5	2.3	2.2	2.1	2.2	1.9	2.2	2	2
Channel (depth)	over gauge	0.5	0.6	0.9	0.4	0.4	0.3	0.6		0.6	0.4	0.4
* access flooded												

Existing Dredge Pond Surface Water Monitoring Results

	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
EC (µS/cm)	502	490	508	497	705	525	460	528	521	491	433	422
pH (pH units)	7.6	6.6	7.2	7.4	6.9	8.4	8.1	8	8.2	8.1	7.8	7.6
Total Algae (cells/mL)			7420			24000			119000			7410
Cyanophyta (cells/mL)			<5			21700			116000			275
Total Phosphorus (µg/L)			50			50			30			150
Total Nitrogen (µg/L)			800			600			500			1000
Chlorophyll-a (µg/L)			7			2			4			14
Faecal Coliforms (CFU/100mL)			~14			~2			~5			~2
Enterococci (CFU/100mL)			~6			20			~2			17
Sodium (mg/L)			40			47			49			46
Potassium (mg/L)			4			4			4			4
Magnesium (mg/L)			10			10			10			10
Calcium (mg/L)									43			40
Chloride (mg/L)			68			68			79			66
Sulphate (mg/L)			46			38			38			44
Bicarbonate (mg/L)			98			110			117			98
Soluble Iron (mg/L)			<0.05			<0.05		<0.05	<0.05	<0.05	<0.05	<0.05
Ammonium (mg/L)			<0.01			0.02			<0.01			<0.01
Turbidity (NTU)			56.4			40.4		5.9	2.4	8.6	19.6	50.1
Dissolved Oxygen (mg/L)			8.47			7.78		8.16	8.45	9.57	9.41	9.82
Dissolved Oxygen (%)			85.6			93.5		95.3	99.4	104	93.6	98.4
Temperature (deg C)								22.5	23.4	19.6	15.8	14.7
Total Alkalinity (mg/L)								116	117	111	107	98
Total Acidity (mg/L)								2	3	<1	1	3
Dissolved Aluminium (mg/L)								0.03	0.08	0.13	0.09	0.05
Dissolved Arsenic (mg/L)								0.003	0.004	0.003	0.003	0.004
Dissolved Boron (mg/L)								0.05	<0.05	0.08	0.06	<0.05
Dissolved Barium (mg/L)								0.078	0.012	0.01	0.086	0.07
Dissolved Beryllium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Chromium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Manganese (mg/L)								<0.001	<0.001	0.001	0.003	0.004
Dissolved Nickel (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Lead (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)								0.026	<0.005	<0.005	0.037	0.039
Dissolved Mercury (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Blue Angle Creek Surface Water Monitoring Results

Site B (Blue Angle Creek Upstream)	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
pH (pH units)	6.5	6.5	6.5	7	6.9	6.8	6.6	6.6	7	6.6	6.2	6.8
EC (µS/cm)	99	674	679	203	705	892	728	589	954	687	392	759
Turbidity (NTU)								17.5	14.4	19.5	4.6	10.8
Temperature (deg C)								19.1	18.8	16.5	13	11.3
Total Alkalinity (mg/L)								59	121	50	18	64
Total Acidity (mg/L)								7	9	8	6	9
Dissolved Aluminium (mg/L)								0.05	0.02	0.03	0.06	0.05
Dissolved Arsenic (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Boron (mg/L)								0.08	0.15	0.14	0.07	0.18
Dissolved Barium (mg/L)								0.089	0.072	0.015	0.06	0.056
Dissolved Beryllium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)								<0.001	<0.001	<0.001	0.001	0.001
Dissolved Chromium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)								<0.001	<0.001	<0.001	0.001	<0.001
Dissolved Manganese (mg/L)								0.216	0.309	0.375	0.088	0.168
Dissolved Nickel (mg/L)								0.001	0.001	<0.001	0.002	0.001
Dissolved Lead (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)								0.051	0.05	<0.005	0.026	0.053
Dissolved Iron (mg/L)								0.18	0.46	0.38	0.22	0.22
Dissolved Mercury (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Oxygen (mg/L)								3.04	3.55	4.96	6.9	4.22
Dissolved Oxygen (%)								33.2	38.1	50.7	64.8	39

Site C (Blue Angle Creek Downstream)	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
pH (pH units)	6.3	6.3	7	6.6	7.3	7.2	6.9	6.8	7.1	6.9	6.5	7
EC (µS/cm)	111	732	908	197	761	16700	910	945	8110	1490	451	1000
Turbidity (NTU)								14.6	6.6	24.1	5.5	16.2
Temperature (deg C)								18.6	19	16.7	13.9	13.4
Total Alkalinity (mg/L)								71	154	111	43	123
Total Acidity (mg/L)								9	13	8	6	9
Dissolved Aluminium (mg/L)								0.05	0.03	0.05	0.07	0.07
Dissolved Arsenic (mg/L)								<0.001	0.002	<0.001	<0.001	0.001
Dissolved Boron (mg/L)								0.11	0.58	0.15	0.07	0.16
Dissolved Barium (mg/L)								0.078	0.016	0.011	0.05	0.066
Dissolved Beryllium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Cadmium (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Cobalt (mg/L)								<0.001	<0.001	<0.001	<0.001	0.001
Dissolved Chromium (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Copper (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Manganese (mg/L)								0.195	0.163	0.13	0.086	0.208
Dissolved Nickel (mg/L)								<0.001	<0.001	<0.001	0.002	<0.001
Dissolved Lead (mg/L)								<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Selenium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Vanadium (mg/L)								<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved Zinc (mg/L)								0.045	<0.005	<0.005	0.014	0.053
Dissolved Iron (mg/L)								0.21	0.35	0.53	0.24	0.42
Dissolved Mercury (mg/L)								<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dissolved Oxygen (mg/L)								5.19	4.14	3.83	5.44	3.26
Dissolved Oxygen (%)								56	45.8	39.6	51.9	31.7

New Dredge Pond Surface Water Monitoring Results

New Dredge Pond	Jun-23
EC (µS/cm)	394
pH (pH units)	7.3
Total Algae (cells/mL)	1440
Cyanophyta (cells/mL)	<5
Total Phosphorus (µg/L)	510
Total Nitrogen (µg/L)	1700
Chlorophyll-a (µg/L)	2
Faecal Coliforms (CFU/100mL)	<2
Enterococci (CFU/100mL)	<2
Sodium (mg/L)	45
Potassium (mg/L)	3
Magnesium (mg/L)	10
Calcium (mg/L)	38
Chloride (mg/L)	63
Sulphate (mg/L)	57
Bicarbonate (mg/L)	86
Soluble Iron (mg/L)	0.07
Ammonium (mg/L)	<0.01
Turbidity (NTU)	133
Dissolved Oxygen (mg/L)	10.7
Dissolved Oxygen (%)	104
Temperature (deg C)	13.4
Total Alkalinity (mg/L)	86
Total Acidity (mg/L)	4
Dissolved Aluminium (mg/L)	0.11
Dissolved Arsenic (mg/L)	0.006
Dissolved Boron (mg/L)	<0.05
Dissolved Barium (mg/L)	0.074
Dissolved Beryllium (mg/L)	<0.001
Dissolved Cadmium (mg/L)	<0.0001
Dissolved Cobalt (mg/L)	<0.001
Dissolved Chromium (mg/L)	<0.001
Dissolved Copper (mg/L)	<0.001
Dissolved Manganese (mg/L)	0.027
Dissolved Nickel (mg/L)	0.001
Dissolved Lead (mg/L)	<0.001
Dissolved Selenium (mg/L)	<0.01
Dissolved Vanadium (mg/L)	<0.01
Dissolved Zinc (mg/L)	0.076
Dissolved Mercury (mg/L)	<0.0001

Processing Return Water	Jun-23
pH (pH units)	7.4
EC (µS/cm)	449
Turbidity (NTU)	222
Temperature (deg C)	17.6
Total Alkalinity (mg/L)	92
Total Acidity (mg/L)	4
Dissolved Aluminium (mg/L)	0.07
Dissolved Arsenic (mg/L)	0.009
Dissolved Boron (mg/L)	0.06
Dissolved Barium (mg/L)	0.08
Dissolved Beryllium (mg/L)	<0.001
Dissolved Cadmium (mg/L)	<0.0001
Dissolved Cobalt (mg/L)	<0.001
Dissolved Chromium (mg/L)	<0.001
Dissolved Copper (mg/L)	0.002
Dissolved Manganese (mg/L)	0.025
Dissolved Nickel (mg/L)	0.001
Dissolved Lead (mg/L)	<0.001
Dissolved Selenium (mg/L)	<0.01
Dissolved Vanadium (mg/L)	<0.01
Dissolved Zinc (mg/L)	0.073
Dissolved Iron (mg/L)	<0.05
Dissolved Mercury (mg/L)	<0.0001
Dissolved Oxygen (mg/L)	9.81
Dissolved Oxygen (%)	104

Air Quality Monitoring Results – Depositional Dust Gauges

TIS (g/m2/month)	1A	2A	3A	4A
Jul-22	0.8	1.3	0.5	
Aug-22	1.8	1.2	0.3	
Sep-22	1.2	1.2	0.4	
Oct-22	5.1	0.7	0.4	
Nov-22	2.1	1.3	0.9	
Dec-22	2.0	3.3	1.2	
Jan-23	2.2	0.2	0.9	
Feb-23	1.3	0.3		0.2
Mar-23	0.5	0.3		0.3
Apr-23	0.7	1.7		0.5
May-23	0.5	0.9		0.1
Jun-23	1.0	1.4		0.3

Acid Sulphate Sand Monitoring

	TOS (%)
Jul-22	0.02
Aug-22	0.03
Sep-22	<0.02
Oct-22	0.04
Nov-22	<0.02
Dec-22	<0.02
Jan-23	<0.02
Feb-23	0.04
Mar-23	0.03
Apr-23	0.04
May-23	0.02
May-23	0.03
Jun-23	<0.02

Annexure D

Fifteenth Annual Review

Landscape and Rehabilitation Management Plan

Niche Environment and Heritage

7 July 2023

Gerroa Sand Quarry 2023 Annual Review Vegetation Management Plan

Prepared for Cleary Bros (Bombo)

Prepared by Niche Environment and Heritage | 7 July 2023



Document control

Project number	Client	Project manager	LGA
8167	Cleary Bros (Bombo) Pty Limited	Lily Cains	Kiama

Version	Author	Review	Status	Date
D1	Lily Cains	Isabel Lyons	Draft	03 July 2023
R0	Lily Cains	-	Final	07 July 2023

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1. Vegetation Management Plan: Annual Monitoring Report

1.1 Introduction

Niche Environment and Heritage Pty Ltd (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 15th such annual report covering the Site at Gerroa prepared since 2009. This report is based on an inspection that was undertaken on the 21st of June 2023.

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 2022/2023; a similar report has been prepared annually since the beginning of the quarry expansion 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 2019-21, 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.

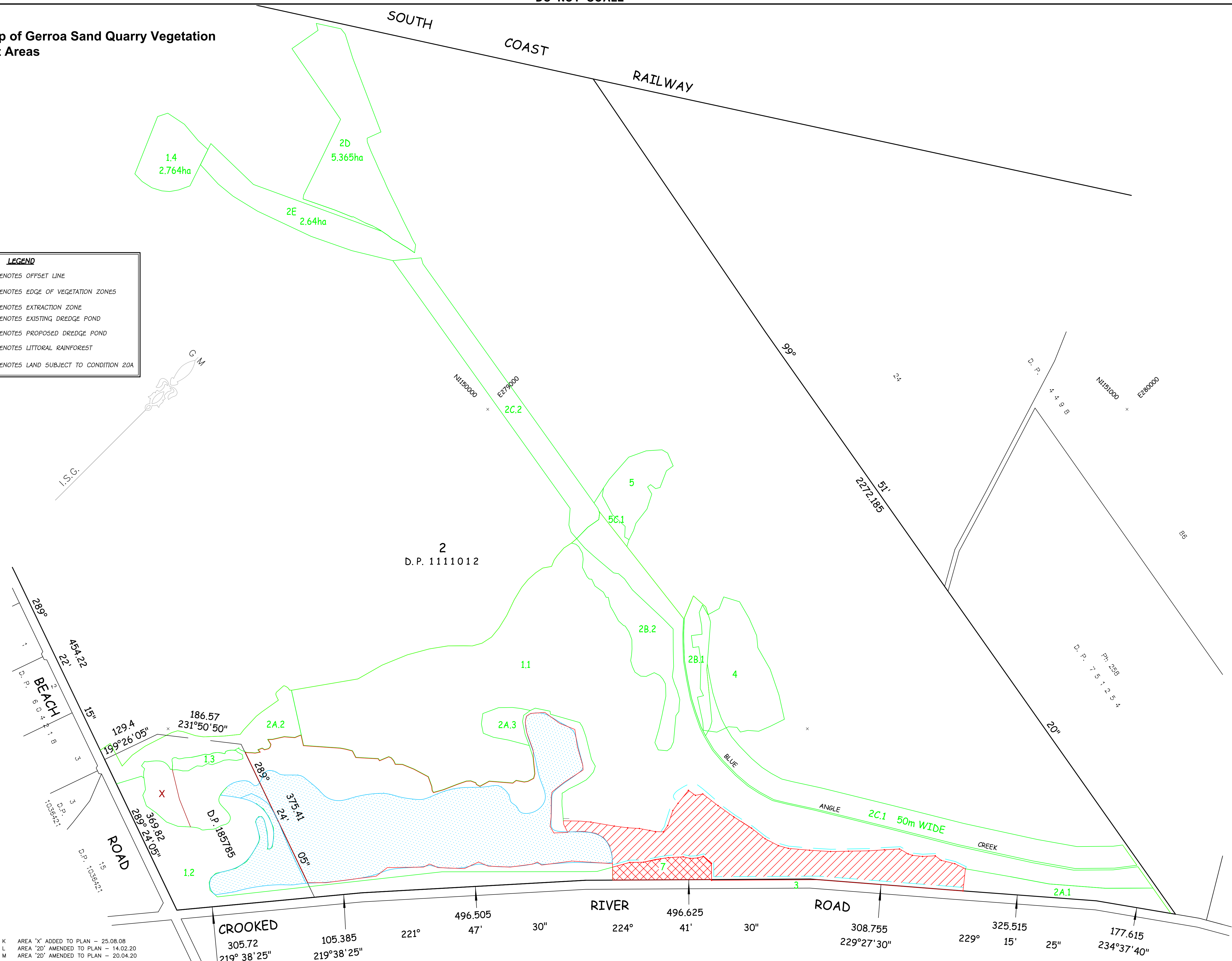
Recent annual reports have detailed inspections of the revegetation areas with a focus of analysing the progress towards native dominant forest and making relevant recommendations to improve management outcomes if required. There have been no wildlife surveys since 2016 as this was deemed no longer necessary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

Figure 1: Map of Gerroa Sand Quarry Vegetation Management Areas

LEGEND

- DENOTES OFFSET LINE
- DENOTES EDGE OF VEGETATION ZONES
- DENOTES EXTRACTION ZONE
- DENOTES EXISTING DREDGE POND
- DENOTES PROPOSED DREDGE POND
- DENOTES LITTORAL RAINFOREST
- X DENOTES LAND SUBJECT TO CONDITION 20A



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

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

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

VEGETATION MANAGEMENT AREAS AND SITE PLAN GERROA SAND MINE

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

Figure 2: Map of Gerroa Sand Quarry Compensatory Planting



 EAST WEST LINK
 NORTHERN CORRIDOR

 **benchmark**
 IN QUALITY
 AS/NZS ISO 9001


SATELLITE IMAGERY ONLY
 SCALE & AREA HAVE BEEN DEDUCED
 FROM IMAGERY INTERPRETATION &
 ARE APPROXIMATE ONLY

Image © 2008 DigitalGlobe
 © 2008 MapData Sciences PtyLtd, PSMA

© 2007 Google

REVISIONS	DESCRIPTION	DRN	APP	DATE
A	AREAS 4 & 5 ADDED	BEA		6-3-08
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	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 L-1 SOUTHERN AREA AMENDED - 25.08.08
 REV L AREA '20' AMENDED - 14.02.20
 REV M AREA '20' AMENDED TO PLAN - 20.04.20

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SURVEYOR: C.J.	DATE: 5-3-08
HEIGHT DATUM: A.H.D.	DRAWN: BeA
ORIGIN:	DESIGNED:
HORIZ. DATUM:	CHECKED:
ROTN ANG: 11°	APPROVED:
SCALE: 1:12500 POINT SCALE ONLY	DWG STATUS:

**PLAN SHOWING MANAGEMENT ZONES
 GERROA SAND MINE**
COMPENSATORY PLANTING

JOB No.	REV.
KF106198	M
DWG No.	
6198/308	
SHEET 1 OF 1	A3

2. Assessment of Individual Zones

Most of the plantings were completed at each zone early on 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 2 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 subsequential floodings last year, 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. All sites except 2C.2 and 2E (due to wet conditions) 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 21st of June 2023. A weeds list for the Site was also created and provides further detail on control methods (Appendix 2: Priority weeds for the South East region, *Biosecurity Act 2015*).

Table 1: Recommendations for the management zones

Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 1: Forest Enhancement Zone Objectives (41.95 ha)</p> <ul style="list-style-type: none"> • 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. <p>Work in the past has included Lantana control and removal of selected weeds such as <i>Chrysanthemoides monilifera</i> (Bitou Bush). Weed management is ongoing and is guided by the Weed Management Plan for the Site (KMA 2008)</p>			

Subzone 1.1

This is the main area of existing forest, extending from the southern to northern end of the property boundary.

Fireweed (*Senecio madagascariensis*) and Spear Thistle (*Cirsium vulgare*) prominent along roadside (pictured). Lantana (*Lantana camara*) weed in the south western portion. Giant Reed (*Arundo donax*) in the roadside veg and lower lying areas in north eastern section (Plate 1). Tobacco Bush (*Solanum mauritianum*) also present throughout subzone. Flaxleaf fleabane (*Conyza bonariensis*) (Plate 5) and Cobbler's pegs (*Bidens pilosa*) prominent along roadside



Subzone 1.2

This subzone covers the forest around the eastern and southern sides of the old dredge pond. This area was revegetated early in the rehabilitation program and is now well established.

Efforts of previous Lantana management are evident however large stands still persist, particularly in the eastern portion (pictured). Continue cut and paint control methods of woody weeds, specifically Lantana (*Lantana camara*). Control of herbaceous weeds such as Crofton weed (*Ageratina adenophora*) and Bidens (*Bidens pilosa*) that are encroaching from the roadside is required. Continue to promote native tree and shrub cover via planting of native species to lessen risk of weed reinvasion.



Subzone 1.3

Covers the old bund wall that was revegetated earlier in the rehabilitation program. This subzone is located behind the site office and towards the front gate.

Lantana thickets should be the priority weed in this area using cut and paint methods (pictured), however, Crofton weed (*Ageratina adenophora*) and Tobacco Bush (*Solanum mauritianum*) (Plate 4) should also be controlled to reduce spreading. Cobbler's pegs (*Bidens Pilosa*) and Flaxleaf fleabane (*Conyza bonariensis*) prominent along roadside.



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.

Good condition *Allocasuarina* stand, some dead lantana along edges. If any Lantana (*Lantana camara*) still present continue weed control efforts via cut and paint.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 2: Broad scale planting zone Objectives (25.39 ha)</p> <ul style="list-style-type: none"> • 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. 			

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 has been carried out over the past twelve years to develop this area as habitat for native fauna.

This area is in generally good condition, however there are some stands of Lantana (*Lantana camara*), particularly to the south along the edge of the dredge pond (pictured). African Love Grass (*Eragrostis curvula*) found growing along eastern perimeter near the entry gate.



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. Previously most of the planted Swamp Oak (*Casuarina glauca*) in the northern area died. A total of 24 replacement trees were subsequently planted in the following year to replace the trees that died (KMA 2018).

Large stand of Lantana (*Lantana camara*) found (pictured). Ongoing Lantana management required via cut and paint method. Spear thistle (*Cirsium vulgare*), Cobble's pegs (*Bidens Pilosa*) and Flaxleaf fleabane (*Conyza bonariensis*) prominent along roadside. Tobacco Bush (*Solanum mauritianum*) also recorded.



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.

Removal of Crofton weed (*Ageratina Adenophora*) from roadside veg should be the priority (pictured). Minimal Lantana (*Lantana camara*) was also noted within this zone, continue to control via cut and paint methods.



**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.

This subzone requires continued monitoring and management of herbaceous weed growth, such as Fireweed (*Senecio madagascariensis*) (pictured). The plantings are well established, however maintenance mowing around tree guards and removal of grass from within the guards is required (Plate 6). Continue to promote native tree and shrub cover via planting of more native species to lessen risk of weed reinvasion.



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.

The understorey in this subzone is largely made up of native ferns, with some pasture grass. Some large lantana stands were recorded (pictured), and a few small stands of Tobacco Bush. These should be managed via cut and paint methods.



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.

Area free from high threat weeds. However, Spear thistle (*Cirsium vulgare*), Cobbler's pegs (*Bidens Pilosa*) and Flaxleaf fleabane (*Conyza bonariensis*) were all recorded along the roadside. These can be managed with herbicides and persistent mowing to reduce spread to surrounding forest.



**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' is in good condition, plantings have become 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.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
Subzone 2C.2	A long narrow area supporting some well-established plantings.	This area was too wet to access however appeared to be in similar condition to subzone 1.4. The previous report noted some plantings were impacted by last years flooding events. Further planting is required to replace plants that were impacted and to promote growth of surrounding native plants. Management of weeds and pasture grasses should be completed once area is dry enough to access.	N/A

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.

This area is regenerating nicely. There are some common weeds along the perimeter such as Flaxleaf fleabane (*Conyza bonariensis*). Plantings need tree guards removed (pictured) and mowing needs to be done to upkeep the area.



Zone	Location/description	Recommendations for ongoing works 2023/24	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.	This area was too wet to access however appeared to be in similar condition to subzone 1.4. The previous report noted this area was in overall good condition. Continue to treat woody weeds such as Lantana (<i>Lantana camara</i>) that reappear.	N/A
Zone 3: Screen Planting Zone Objectives (0.42 ha) <ul style="list-style-type: none"> 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 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.

Continue removal of Lantana using spraying and cut and paint methods, as large stand persist along bund wall (pictured). Planting is required to encourage native growth to stabilise bund wall.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 4: Bangalay Sand Forest (3.32 ha)</p> <ul style="list-style-type: none"> • 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 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.

Canopy in excellent condition, however this zone still contains large patches of Lantana (*Lantana camara*) that require management. Some herbaceous weeds such as Fireweed (*Senecio madagascariensis*) and Flaxleaf fleabane (*Conyza bonariensis*) growing along perimeter fence (Plate 2). These should be managed to ensure they don't spread to the woodland.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 5: Swamp Oak Forest Objectives (1.82 ha)</p> <ul style="list-style-type: none"> • 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.

Continue to maintain perimeter fencing to stop stock from grazing on plantings. Undertake weed control to remove scattered Tobacco Bush (*Solanum mauritianum*) (pictured) and Lantana (*Lantana camara*) throughout subzone.



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 is in good condition with minimal weeds. Further planting of native tube stocks (e.g. *Casuarina* spp.) will help establish connection to nearby subzone 5.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 6: Dredge Pond Foreshore Objectives</p> <p>Dredge Pond Foreshore (includes 5 m setback from pond and batter slopes on both the existing and extension pond)</p> <ul style="list-style-type: none"> • 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 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.

Monitor and control of priority weeds such as Lantana (*Lantana camara*) (pictured) and Tobacco Bush (*Solanum mauritanum*) using cut and paint method as necessary. Avoid spraying in this area 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*), annual weeds and invasive grasses (Plate 3) from dominating.



Zone	Location/description	Recommendations for ongoing works 2023/24	Reference Images
<p>Zone 7: Littoral Rainforest Objectives (0.95 ha)</p> <ul style="list-style-type: none"> • 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 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.

SW end of zone is well maintained with minimal Lantana present. Presence of Lantana increases in the NE section of the zone (pictured). Monitor and control Lantana and Tobacco Bush as necessary using the mosaic methods of weed removal (i.e. working in patches).



3. Discussion and recommendations

The 15th 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 recorded in late 2022, some zones were largely inaccessible until recently and had subsequently become inundated with weed species. The previous years report noted that some plantings were impacted by the floodings and would need to be replaced, the most severely impacted being zone 2C.2. This subzone, as well as 2E, were still too wet to access this year, so management of this zone should be undertaken immediately as access becomes available again.

To achieve 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 1.1, 1.3 and 2A.3) 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 Zone 2C.2 and 2B.1 last year, however no evidence of deer rubbing was noted during this year's inspection. If predation intensifies and rates of tube stock success decline, on-site deer control methods may need to be implemented.

Continued mowing and weed maintenance in newly planted areas (such as 2C.1) 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 2D).

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.

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*) found growing along the northern perimeter of subzone 1.1.



Plate 2: Fireweed (*Senecio madagascariensis*) growing along perimeter fence of subzone 4.



Plate 3: Weeds such as Flaxleaf fleabane (*Conyza bonariensis*) along the edge of subzone 6.



Plate 4: Tobacco Bush (*Solanum mauritianum*) in subzone 1.3.



Plate 5: Flaxleaf fleabane (*Conyza bonariensis*) growing along roadside of subzone 1.1.



Plate 6: Pigeon grass (*Setaria parviflora*) growing through tree guard and strangling planting in subzone 2C.1.

Appendix 1: Selected Conditions of Approval

“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, Biosecurity Act 2015

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	<i>Eragrostis curvula</i>	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	<i>Asparagus aethiopicus</i>	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.
Bitou bush	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	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	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.

Common name	Scientific name	Duty under <i>Biosecurity Act 2015</i>	Action
		notified of any new infestations of this weed within the Biosecurity Zone.	
Blackberry	<i>Rubus fruticosus</i> species aggregate	Prohibition on dealings Must not be imported into the State or sold, bartered, exchanged or offered for sale. <i>All species in the Rubus fruticosus species aggregate have this requirement, except for the varieties Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree.</i>	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	<i>Senna pendula</i> var. <i>glabrata</i>	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.
Coral tree	<i>Erythrina crista-galli</i>	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	<i>Ageratina adenophora</i>	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.

Common name	Scientific name	Duty under <i>Biosecurity Act 2015</i>	Action
Fireweed	<i>Senecio madagascariensis</i>	<p>Regional Recommended Measure</p> <p>Exclusion zone: whole of region except the core infestation area of Wollongong, Kiama, Shellharbour, Eurobodalla, Shoalhaven, Bega Valley and Wingecaribee councils.</p> <p>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.</p> <p>Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant.</p> <p>Core area: Land managers reduce impacts from the plant on priority assets.</p>	<p>Herbicides are most effective in combination with healthy, competitive pastures. The best time to treat fireweed with herbicide is late autumn. This controls the peak numbers of seedlings and young plants.</p> <p>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.</p>
Giant Reed	<i>Arundo donax</i>	<p>General Biosecurity Duty</p> <p>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.</p>	<p>Cut and paint using 360g/L Glyphosate at a diluted rate of 1 part glyphosate to 1.5 parts of water.</p>
Lantana	<i>Lantana camara</i>	<p>Regional Recommended Measure</p> <p>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</p> <p>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.</p> <p>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.</p>	<p>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.</p> <p>Chemical control:</p> <p>Cut stems off at about 15 cm from the ground. Apply herbicide to the cut surface of the stump within 15 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.</p>

Common name	Scientific name	Duty under <i>Biosecurity Act 2015</i>	Action
Maderia Vine	<i>Anredera cordifolia</i>	<p>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.</p> <p>Prohibition on dealings Must not be imported into the State or sold.</p>	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	<i>Araujia sericifera</i>	<p>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.</p>	Cut and paint using 360g/L Glyphosate at a diluted rate of 20 ml/Litre of water.
Tobacco Bush	<i>Solanum mauritianum</i>	<p>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.</p>	Cut and paint using 360g/L Glyphosate at a diluted rate of 20 ml/Litre of water.