

ANNUAL REVIEW
1 April 2022 – 31 March 2023

Northern Dune Extension

TABLE OF CONTENTS

1	STATEMENT OF COMPLIANCE	6
2	INTRODUCTION	7
2.1	Name and Contact Details	10
2.2	Background Information and Mining History	11
3	APPROVALS	15
4	OPERATIONS SUMMARY	16
4.1	Exploration	16
4.2	Land Preparation.....	16
4.3	Construction Activities.....	16
4.4	Quarry Operations.....	16
4.5	Next Reporting Period.....	16
5	ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW	17
5.1	Actions from 2021/22 Annual Review	17
5.2	Management Plan Updates	17
6	ENVIRONMENTAL PERFORMANCE	18
6.1	Summary of Environmental Performance	18
6.2	Noise	21
6.2.1	Key Environmental Performance	21
6.3	Air Quality.....	21
6.3.1	Approved Criteria	21
6.3.2	Management Measures	22
6.3.3	Key Environmental Performance	23
6.3.3.1	Depositional Dust	23
6.3.4	Proposed Improvements	28
6.4	Traffic Management	28
6.4.1	Approved Criteria	28
6.4.2	Key Environmental Performance	28
6.5	Biodiversity	29
6.5.1	Nest Box Installation and Monitoring Program.....	29
6.5.2	Amphibian Monitoring	30
6.5.3	Koala Monitoring	31
6.5.4	Habitat Restoration.....	33
6.5.4.1	Vegetation Condition Survey.....	33
6.5.4.2	Weed Control Works	34
6.6	Heritage.....	35
6.6.1	Approved Criteria	35

6.6.2	Cultural Heritage Management Plan	35
6.6.3	Key Environmental Performance	35
6.6.4	Proposed Improvements	35
6.7	Waste Minimisation	36
6.7.1	Management Measures	36
6.7.2	Key Environmental Performance	36
6.7.3	Proposed Improvements	36
7	WATER MANAGEMENT	37
7.1	Groundwater Management Measures	37
7.1.1	Groundwater Levels	40
7.1.1.1	Groundwater Level Results Discussion and Trend Summary	43
7.1.2	Groundwater Quality	44
7.1.2.1	Groundwater Quality Results Discussion and Trend Summary	47
8	REHABILITATION AND LANDSCAPE MANAGEMENT	48
8.1	Rehabilitation Management	48
8.2	Rehabilitation Monitoring.....	48
8.3	Weeds	55
8.4	Plantings.....	55
8.5	Performance Indicators	55
8.6	Rehabilitation Actions.....	59
9	COMMUNITY	60
9.1	Community Engagement Activities	60
9.2	Complaints	60
10	INDEPENDENT AUDIT	61
11	INCIDENTS AND NON-COMPLIANCE	62
12	ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD.....	63
13	APPENDICES	65

TABLES

Table 1:	Statement of Commitments.....	6
Table 2:	Annual Review Requirement.....	9
Table 3:	Summary of operations	12
Table 4:	Approvals for Northern Dune Extension.....	15
Table 5:	EPL Fee-Based Activity at Northern Dune Extension.....	15
Table 6:	Summary of Conditions	18
Table 7:	Long term criteria for particulate matter	21
Table 8:	Short term criterion for particulate matter	21
Table 9:	Long term criteria for deposited dust	21
Table 10:	Insoluble Matter (g/m ²) Monitoring results for the D3 / TB4 Monitoring Station (April 2022 – April 2023).....	25

Table 11:	Insoluble Matter (g/m ²) Monitoring results for the D5 / TB3 Monitoring Station (April 2022 – March 2023).....	26
Table 12:	Amphibian presence during targeted nocturnal monitoring	31
Table 13:	Koala activity levels from the Spot Assessment Technique.	32
Table 14:	Current Groundwater Quality Monitoring Locations.....	39
Table 15:	EPL 11633 Groundwater Monitoring Requirements	40
Table 16:	Groundwater Levels at Northern Dune Extension Monitoring Locations	42
Table 17:	Comparison of Groundwater quality results against trigger values for the 2012/23 reporting period.....	45
Table 18:	Block preparation and survey details for the North Dunes Extension Rehabilitation Blocks	49
Table 19:	Performance Indicators for Tanilba Northern Dune Extension rehabilitation.....	586
Table 20:	Proposed works – 2023/24	63

FIGURES

Figure 1:	Northern Dune Extension Operations (Including Offset Areas)	8
Figure 2:	Northern Dune Extension Site Plan	13
Figure 3:	Northern Dune Extension Land Ownership and Extraction Area.....	14
Figure 4:	Dust Sampling Locations	22
Figure 5:	Insoluble Matter (g/m ²) Monitoring results for the D5 / TB3 Monitoring Station and D3 / TB4 Monitoring Station.....	27
Figure 6:	Location of the Tanilba Northern Dune Projects and Associated Current Monitoring Locations	38
Figure 7:	2022/23 Monthly Rainfall at Williamstown RAAF.....	41
Figure 8:	ACI-13 Iron Results Trend History	46
Figure 9:	Locations of Blocks Q1 to Q6.....	50

APPENDICES

Appendix 1 – Project Approval

Appendix 2 – Monthly Inspections

Appendix 3 – Annual Rehabilitation Monitoring Report

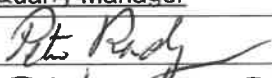
Appendix 4 – Biodiversity Offset Monitoring Report

Appendix 5 – Rehabilitation Monitoring Report

Appendix 6 – Groundwater Level Trend Hydrographs

Appendix 7 – Groundwater Quality Trend Hydrographs (Quality vs. Trigger Values)

SITE DETAILS

<u>Name of operation</u>	Northern Dune Extension
<u>Name of operator</u>	Holcim (Australia) Pty Ltd
<u>Development consent / project approval #</u>	MP 09 0091
<u>Name of holder of development consent / project approval</u>	Holcim (Australia) Pty Ltd
<u>Annual Review start date</u>	April 1, 2022
<u>Annual Review end date</u>	March 31, 2023
<p><u>I, Peter Radziewicz, certify that this audit report is a true and accurate record of the compliance status of Northern Dune Extension for the period of April 1, 2022 - March 31, 2023 and that I am authorised to make this statement on behalf of Holcim (Australia) Pty Ltd.</u></p>	
<p><i>Note.</i></p> <p>a) <i>The Annual Review is an 'environmental audit' for the purposes of Division 9.4) of the Environmental Planning and Assessment Act 1979. Division 9.42 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.</i></p> <p>b) <i>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).</i></p>	
<u>Name of authorised reporting officer</u>	Peter Radziewicz
<u>Title of authorised reporting officer</u>	Quarry Manager
<u>Signature of authorised reporting officer</u>	
<u>Date</u>	30/06/2023

1 STATEMENT OF COMPLIANCE

See **Table 1** for statement of commitments for the 2022/23 reporting period for Northern Dune Extension Quarry.

Table 1: Statement of Commitments

Were all conditions of the relevant approval(s) complied with?	
MP 09_0091	Yes
Hunter Water (Special Areas) Regulations 2010 – Approval under Clause 10(1)	Yes
EPL No. 11633	Yes

No incidents or non-compliances were recorded during this AR period.

2 INTRODUCTION

Holcim (Australia) Pty Ltd (Holcim) operates Northern Dune Extension (NDE), a sand quarry located in Tanilba Bay, within the Port Stephens Local Government Area. The site operates under Project Approval (MP-09-0091) approved by the New South Wales (NSW) Department of Planning and Environment (DPE) on 8 March 2013.

This Annual Review (AR) has been prepared for the Tanilba Northern Dune Extension Project to report on mining activities undertaken during the past 12-month reporting period from 1st April 2022 to 31st of March 2023. This report addresses the site's present compliance obligations and status, activities undertaken at the site during the reporting period and proposed activities for the following 12-month period.

This AR encompasses the annual reporting requirements required by Project Approval MP 09_0091 issued by the Department of Planning and Environment on 8 March 2013 for the Tanilba Northern Dune Extension Project (attached as Appendix 1).

This AR will be distributed to DPE, Hunter Water Corporation (HWC) and Port Stephens Council (PSC) and will also be made publicly available on Holcim's website.

The site also operates in accordance with Environment Protection License (EPL) No. 11633 issued by the Environmental Protection Authority (EPA). A location figure and aerial view of the site are outlined in Figure 1 below.

Project Application MP 09_0091 was approved under Section 75J of the *Environmental Planning and Assessment Act 1979* for Sibelco Australia to conduct mining activities on Lots 11, 12 and 13 on DP601306, Lot 408 on DP1041934, and Lots 1 and 2 on DP408240. Project Approval MP 09_0091 has been attached as Appendix 1.

The Annual Review required by approval MP 09_0091 is detailed in Schedule 5, Condition 3 of the approval whereby it is stated:

“Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:

- (a) describe the works (including rehabilitation) that were carried out in the previous year, and the works that are proposed to be carried out over current year;*
- (b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against:
 - the relevant statutory requirements, limits or performance measures/criteria;*
 - the monitoring results of previous years; and*
 - the relevant predictions in the EA;**
- (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;*
- (d) identify any trends in the monitoring data over the life of the project;*
- (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and*
- (f) describe what measures will be implemented over the next year to improve the environmental performance of the project.”*

Mining commenced within Lots 11 – 13 of the Extension area in 2016 and ceased on 18 December 2018. As such, **no clearing or extraction occurred during the reporting period.**

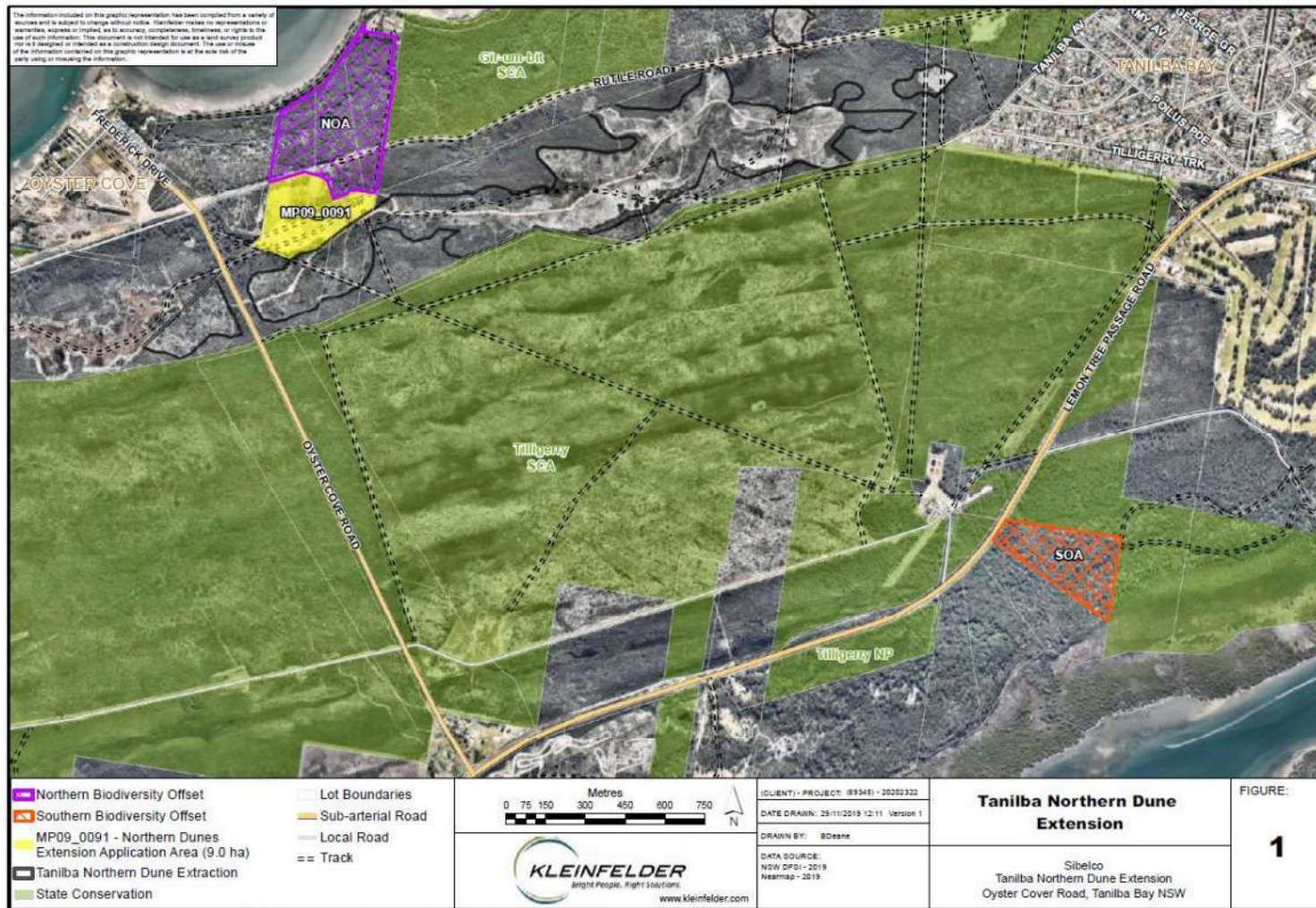


Figure 1: Northern Dune Extension Operations (Including Offset Areas)

In accordance with Schedule 5, Condition 4 of the modified Development Consent the site is required to undertake an Annual Review of the site. This Annual Review has been prepared in accordance with Schedule 5, Condition 4 (Annual Performance Monitoring) of the Development Consent and in accordance with the *Annual Review Guideline: post approvals requirements for state significant mining developments* (October 2015). The Annual Review requirements and the section where they have been addressed in this document have been provided in **Table 2**.

Table 2: Annual Review Requirement

Condition	Section in Annual Review
<p>3. Annual Review</p> <p>Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:</p> <p>(a) describe the works (including rehabilitation) that were carried out in the previous year, and the works that are proposed to be carried out over the current year;</p>	Section 4 and 6
<p>(b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against:</p> <ul style="list-style-type: none"> - the relevant statutory requirements, limits or performance measures/criteria; - the monitoring results of previous years; and - the relevant predictions in the EA; 	Section 6 and 7
<p>(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;</p>	Section 1 and 11
<p>(d) identify any trends in the monitoring data over the life of the project;</p>	Section 6 and 7
<p>(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and</p>	Section 6
<p>(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.</p>	Section 12

2.1 Name and Contact Details

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2.2 Background Information and Mining History

The Tanilba Northern Dune is an elevated sand dune system located on the Tilligerry Peninsula adjacent to the township of Oyster Cove in the Port Stephens Shire, New South Wales.

White silica sand has been extracted from the Tanilba Northern Dune by several companies at different locations since 1991 - the approved extraction area in relation to the regional context can be seen in Figure 1.

Prior to 2003, the western parts of the Tanilba Northern Dune were mined by ACI Operations Ltd. Sibelco commenced operations in 2004. Sand extraction works at the Tanilba Northern Dune were comprised of four approval areas separated jurisdictionally by Crown Lands, Hunter Water (x2) and Department of Planning and Environment approvals.

In 2013 approval was granted by the Minister for Planning and Infrastructure to extend the approval area for quarrying activities by 9 ha in an area to the north of the existing extraction operations. The extension project was a Major Project considered under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is known as the Tanilba Northern Dune Extension Project (now declared a State Significant Development under an Order dated 22 November 2018). Holcim took ownership of the Project on 1 April 2020.

The project area comprises land owned by the Crown, the Hunter Water Corporation and Holcim (the site) and consists of the following:

- Lots 11, 12 ,13 DP601306 (Holcim);
- Lot 408 DP1041934 (Crown Land); and
- Lots 1, 2 DP408240 (Hunter Water Corporation).

The above areas are depicted in Figure 3.

In terms of the mining process, clearance was undertaken progressively across the site to minimise the area exposed at any one time. Topsoil was then stripped before sand was extracted for processing at the nearby Salt Ash processing plant. Sand was extracted in a rolling south to north sequence where possible, with previously mined areas no longer subject to extraction undergoing rehabilitation at the same time. Pre-clearance surveys for flora, fauna and the presence of culturally significant sites were undertaken prior to any clearing of vegetation.

Mined areas are required to be rehabilitated in accordance with an approved Landscape Management Plan (LMP) and areas cleared of vegetation are required to be offset by implementation of a Biodiversity Offset Strategy including management and improvement of vegetation retained in the north of the approval area. Once rehabilitation is complete, the rehabilitated areas will be returned to their respective owners. Extraction ceased in December 2018, with the project moving to a rehabilitation only phase.

A summary of operating parameters at the Tanilba Northern Dunes Extension during the reporting period (reportable per the January 2006 Annual Environmental Management Report guidelines) is provided below.

Table 3: Summary of operations

Parameter	Site detail
Operating hours	Daylight hours from 7:00am to 6:00pm (light permitting) Monday to Friday.
Infrastructure	No permanent infrastructure has been constructed on-site at the Northern Dune Extension as per approvals.
Construction activities	No construction took place at Northern Dune Extension during the reporting period.
Equipment management	No chemicals or mobile plant are stored overnight at Northern Dune Extension.
Waste management	No bins or other waste management facilities are kept on site - any waste produced is removed at the end of each working day.
Lighting	Northern Dune Extension does not operate outside of daylight hours and therefore does not have a lighting system installed.
Exploration	No exploration took place at the Northern Dune Extension during the reporting period.
Blasting	Blasting does not occur at the Northern Dune Extension Project site.
Land clearing	No land clearing occurred during the reporting period.
Extraction	Extraction ceased at the site on December 18, 2019. No extraction occurred during the reporting period.

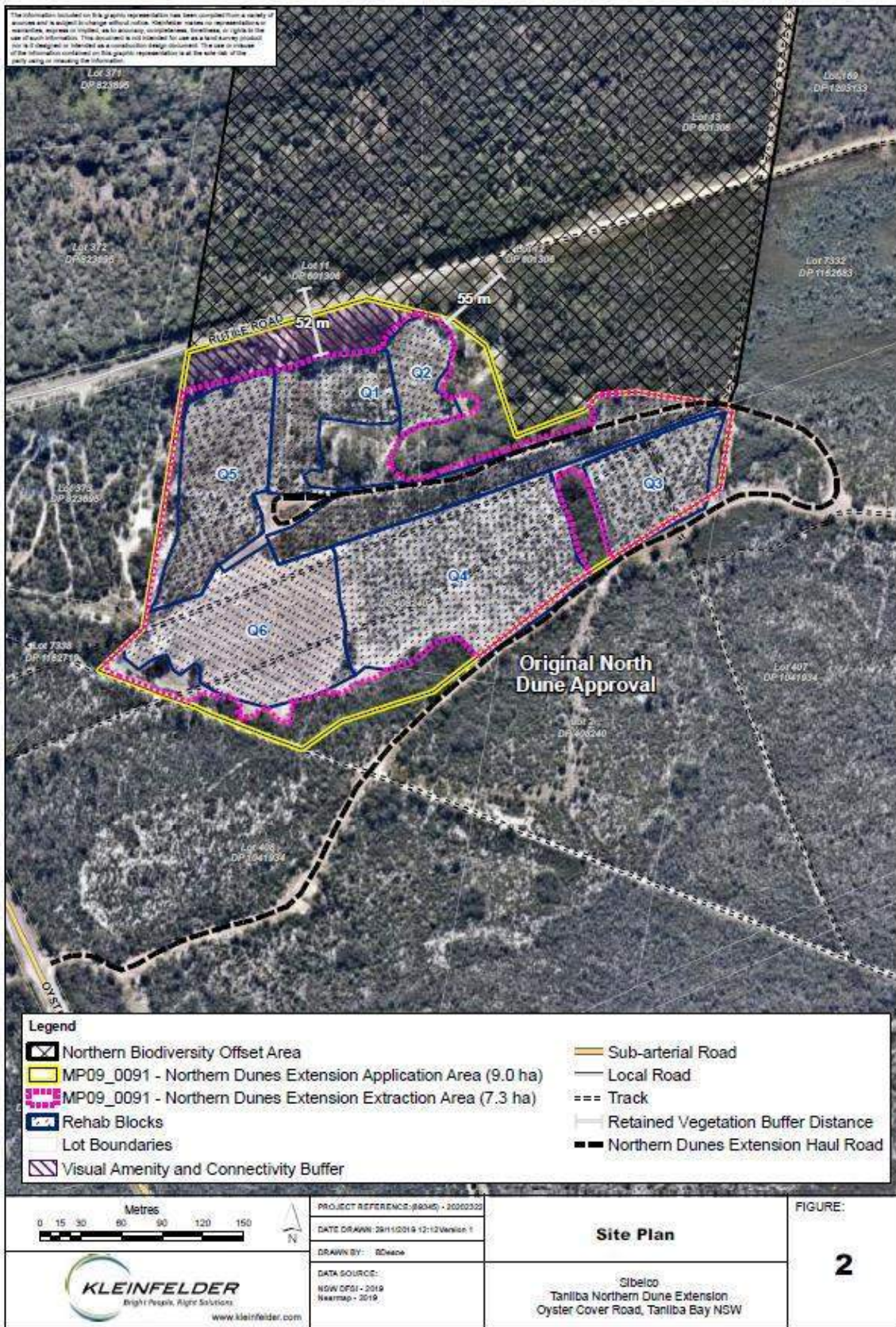


Figure 2: Northern Dune Extension Site Plan

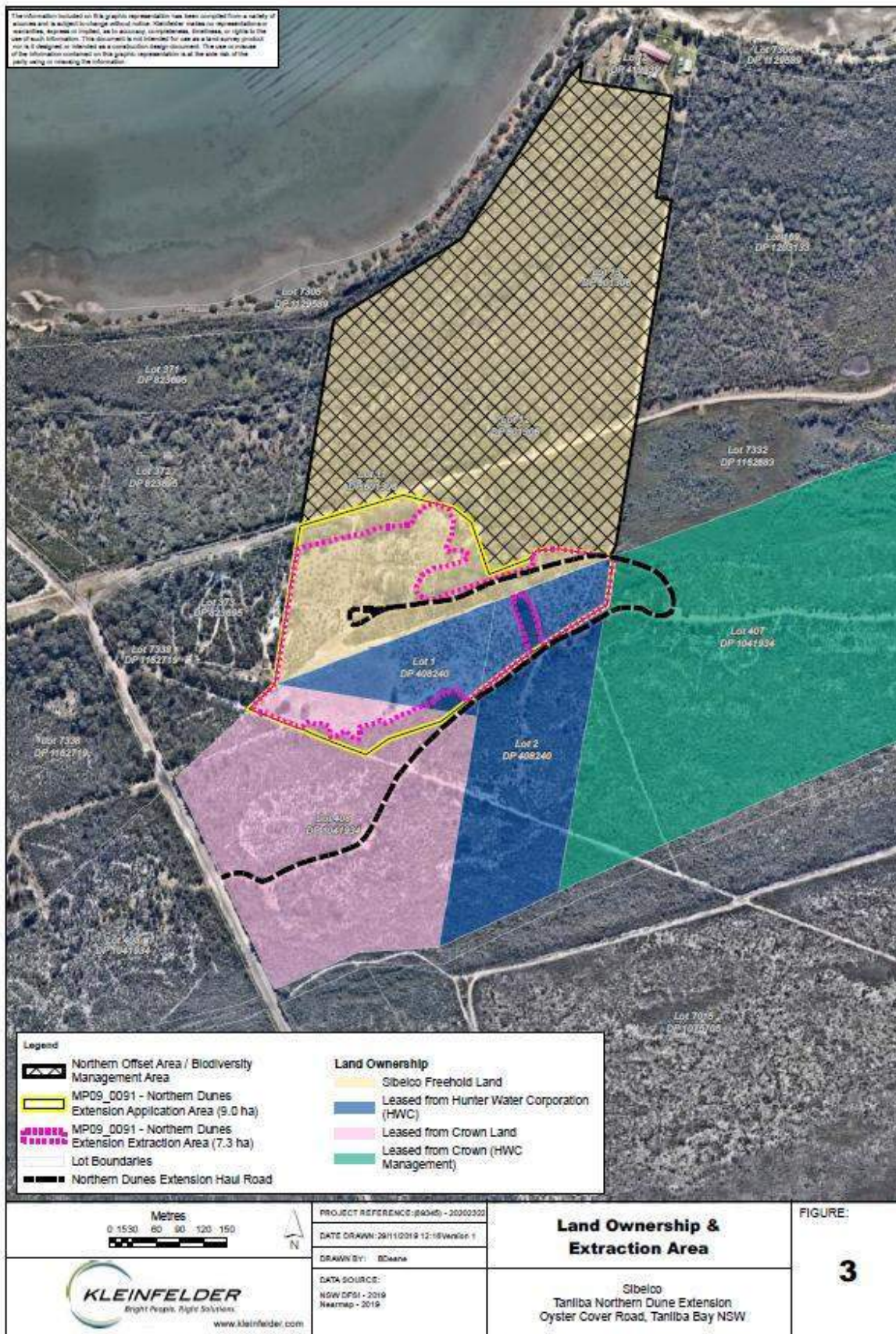


Figure 3: Northern Dune Extension Land Ownership and Extraction Area

3 APPROVALS

The site operates under the following approvals listed in **Table 4**, with the areas of land ownership displayed in **Figure 3**.

Table 4: Approvals for Northern Dune Extension

Approval	Regulatory Authority
MP 09_0091	NSW Department of Planning and Environment
EPL 11633	NSW Environmental Protection Authority
Hunter Water (Special Areas) Regulations 2010 – Approval under Clause 10(1)	Hunter Water Corporation

Holcim holds EPL 11633 which covers its activities at Northern Dune Extension. **Table 5** outlines the EPL licensing limits.

Table 5: EPL Fee-Based Activity at Northern Dune Extension

Scheduled Activity	Fee Based Activity	Scale
Extractive activities	Land-based extractive activity	>100,000 – 500,000 T extracted, processed, or stored

Schedule 2, Condition 6 outlines that the proponent shall not transport more than 150, 000 tonnes of extractive materials from the site in any calendar year.

4 OPERATIONS SUMMARY

4.1 Exploration

No exploration activities were completed during the Annual Review period.

4.2 Land Preparation

No clearing took place during the Annual Review period. All areas of the site were undergoing rehabilitation and predominantly covered by vegetation.

4.3 Construction Activities

There was no construction undertaken during the Annual Review period.

4.4 Quarry Operations

No extraction occurred during the reporting period. Only rehabilitation activities were performed and are discussed in Section 8. No extractive material was transported from site.

4.5 Next Reporting Period

Extraction at the Northern Dune Extension site has ceased. Only rehabilitation activities are proposed during the next reporting period. These are discussed further in Section 8.6. Groundwater monitoring will also be performed as per the Groundwater Management Plan (GMP).

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

5.1 Actions from 2021/22 Annual Review

A site visit invitation was extended alongside submission of a previous AR (2019/20) but was not attended due to the onset of the COVID-19 pandemic and associated restrictions in place. DPE did, however, attend site for an inspection on 25 March 2021. At the time of writing this AR no formal feedback has been received. During the subject reporting period (2022/23), no site visit occurred with HWC, and no formal feedback was subsequently provided. Compliance officers from DPE attended the project site twice during the subject reporting period to inspect the progress of rehabilitation. The inspections took place on 27 June 2022 and 28 September 2022.

5.2 Management Plan Updates

Schedule 5 Clause 4 of the project approval requires that management plans are reviewed and, if necessary, revised within 3 months of the submission of an Annual Review. In the previous reporting period, all management plans for the Northern Dune Extension were reviewed and where necessary revised following the submission of the 2020/21 AR. Revisions were made to reflect the requirements of the current operation now that it has transitioned into a rehabilitation phase. Following revision, they were submitted to DPE for review to meet the satisfaction of the Director-General.

The outcome was that a number of updates were approved, most notably to the Groundwater Management Plan (GMP) to remove monitoring locations that had expired as per the original GMP, and to provide for monitoring and reporting frequencies commensurate with the lack of extraction and the shift to the rehabilitation phase of the operation (see Section 7).

No further revisions to any of the management plans were deemed necessary following the submission of the previous 2021/22 AR.

6 ENVIRONMENTAL PERFORMANCE

6.1 Summary of Environmental Performance

A summary of the conditions of the approval MP 09_0091 and sections within this AR where each condition is addressed is provided in **Table 6** below.

Table 6: Summary of Conditions

MP 09_0091 Reference	Summary of Condition	Report Reference	Compliance
ADMINISTRATIVE CONDITIONS			
S2, CI6	<i>The Proponent shall not transport more than 150,000 tonnes of extractive materials from the site in any calendar year</i>	4.4	Y
S2, CI7	<i>The Proponent shall ensure that no more than three hectares of the site would be exposed (ie cleared but not re-vegetated) at any one time</i>	4.2	Y
ENVIRONMENTAL PERFORMANCE CONDITIONS			
Identification of Boundaries			
S3, CI1	<i>Prior to the commencement of quarrying operations, the Proponent shall: (a) Engage a registered surveyor to mark out the boundaries of the approved limits of extraction; and (b) Ensure that these boundaries are clearly marked at all times in a permanent manner that allows operating staff and inspecting officers to clearly identify those limits</i>	4.4	Y
Noise			
S3, CI2	<i>The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land</i>	4.4	Y
S3, C3	<i>The Proponent shall only conduct quarrying operations on the site ... during stipulated hours</i>	4.4	Y
Noise Monitoring Program			
S3, CI5	<i>The proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the DG. This program must (amongst other items): Include quarterly noise monitoring during at least the first two years of operations</i>	6.2	Y
Air quality			
S3, CI6	<i>The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land</i>	6.3.2	Y
S3, CI7	<i>The Proponent shall regularly assess air quality monitoring data</i>	6.3.2	Y
S3, CI8	<i>The Proponent shall prepare and implement a Dust Monitoring Program</i>	6.3.2	Y
Soil and Water – Management and monitoring			
S3, CI10	<i>The Proponent shall not extract sand or other extractive materials or carry out any work in the extraction area below a level of 0.7 m above the predicted maximum groundwater elevation (see condition 14 of schedule 3), other than the construction of any bores approved by NOW</i>	4.4	Y
S3, CI11	<i>The Proponent shall ensure that the final landform of the extraction area must be at least 1 metre above the predicted maximum groundwater elevation</i>	4.2	Y
S3, C13	<i>Erosion and sediment control plan</i>	5.2	Y
S3, CI14	<i>The Ground Water Monitoring Program shall include (a) Detailed baseline data on groundwater levels and quality (b) Groundwater impact assessment criteria (c) A program to monitor groundwater levels and quality</i>	7.1	Y Y Y Y

MP 09_0091 Reference	Summary of Condition	Report Reference	Compliance
	<p>(d) A protocol for the investigation, notification and mitigation of any notified exceedance of the impact assessment criteria;</p> <p>(e) The outcome of groundwater modelling to establish the predicted maximum groundwater elevation for the site</p> <p>(f) a program to monitor any impacts on GDE</p> <p>(g) a contingency plan to manage any acid sulfate soils and potentially acid sulfate soils encountered during quarrying operations</p>		<p>Y</p> <p>N/A</p> <p>Y</p>
MP 09_0091 Reference	Summary of Condition	Report Reference	Compliance
Biodiversity			
S3, CI15	<p>The Biodiversity Management Plan must</p> <p>(c) Address project site and offset areas</p> <p>(d) provide for retention of hollow bearing trees</p> <p>(e) on-going monitoring (at least 6 years) of at least 2 nest boxes for each hollow tree removed during clearing</p> <p>(f) a program to undertake targeted survey for Uperoleia sp</p> <p>(g) implement a program for any areas within offset areas requiring rehabilitation and/or revegetation</p> <p>(i) include monitoring procedures and performance indicators with reference to Uperoleia sp., Koala and Wallum Froglet</p>	6.5	Y
S3, CI16	<p>By 31 December 2013, or otherwise agreed by the Director-General, the Proponent shall:</p> <p>(a) enter into a Biobanking agreement in respect of the proposed offset areas (see Appendix 4) with the Minister for the Environment, in accordance with Part 7A of the Threatened Species Conservation Act 1995, to implement the Biodiversity Offset Strategy; or</p> <p>(b) enter into an agreement with OEH to transfer the offset areas into the national parks estate, to the satisfaction of the Director-General</p>	N/A	Y
Rehabilitation and landscaping			
S3, CI18	The Proponent shall prepare and implement a Landscape Management Plan to the satisfaction of the DG. This shall include a Rehabilitation Management Plan and a Long Term Management Strategy.	8	Y
Aboriginal Cultural Heritage			
S3, CI22	The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the DG	6.6.2	Y
Visual amenity			
S3, CI27	The Proponent shall minimize the visual impacts of the project to the satisfaction of the DG	8	Y
Waste Management			
S3, CI28-31	The Proponent shall comply with conditions of waste management as outlined in the approval]	6.7.1	Y
Dangerous Goods			
S3, CI32	The Proponent shall ensure that chemicals and/or petroleum products are not stored on site	6.7.1	Y
Production Data			
S3, CI34	<p>The Proponent shall</p> <p>(a) provide annual quarry production data to DRE using the standard form for that purpose and</p> <p>(b) include a copy of this data in the Annual Review</p>	4.4	Y
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING			
Annual Review			
S5, CI3	Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General.	This Report and 5.2	Y
Reporting			
S5, CI 5	The Proponent shall notify the DG ... of any incident associated with the project	11	Y
Auditing			

MP 09_0091 Reference	Summary of Condition	Report Reference	Compliance
S5, CI 7	<i>Within 1 month of completion of quarrying operations ... the Proponent shall commission an Independent Environmental Audit to ... assess the environmental performance of the project and whether it is complying with the relevant requirements in this approval and any relevant EPL.</i>	10	Y
Access to Information			
S5, CI 9	<p><i>From 1 July 2013, the Proponent shall make the following information publicly available on its website:</i></p> <ul style="list-style-type: none"> • <i>A copy of all approved strategies, plans and programs</i> • <i>A summary of all monitoring results of the project</i> • <i>A complaints register that is updated on a quarterly basis</i> • <i>Copies of any Annual Review</i> • <i>Copies of any Independent Environmental Audit and the Proponents response to the recommendation in any audit</i> 	9.1	Y

6.2 Noise

6.2.1 Key Environmental Performance

The approved Noise Management Plan states that as quarrying operations have been performed for greater than 2 years and the project is currently in the rehabilitation and closure phase, noise monitoring will only be conducted upon the receipt of a verified noise complaint from a local resident. No noise complaints were received during the reporting period.

6.3 Air Quality

6.3.1 Approved Criteria

Air Quality monitoring is required to be undertaken in accordance with the following development consent conditions:

“The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land.”

Table 7: Long term criteria for particulate matter

Pollutant	Averaging Period	^d Criterion
Total suspended particulate (TSP) matter	Annual	^a 90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 30 µg/m ³

Table 8: Short term criterion for particulate matter

Pollutant	Averaging Period	^d Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	^a 50 µg/m ³

Table 9: Long term criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
^c Deposited dust	Annual	^b 2 g/m ² /month	^a 4 g/m ² /month

Notes to Tables above:

- ^a Total impact (i.e. incremental increase in concentrations due to the projects plus background concentrations due to all other sources);
- ^b Incremental impact (i.e. incremental increase in concentrations due to the projects on their own);
- ^c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient A-r - Determination of Particulate Matt-r - Deposited Matt-r - Gravimetric Method.
- ^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with DECCW.

6.3.2 Management Measures

Air quality monitoring for the site is undertaken consistent with the Dust Management Plan, available as Appendix J of the Northern Dune Environmental Management Plan.

Depositional dust monitoring is undertaken at four locations, known as D3 / TB4, D4 / TB2, D5 / TB3 and D6 / TB1 (see **Figure 4**). Monitoring locations D3 / TB4 and D5 / TB3 are located adjacent to the closest sensitive receiver to extraction activities undertaken by Holcim within the Northern Dunes Extension area and represent compliance monitoring sites.

Monitoring locations D4 / TB2 and D6 / TB1 are located immediately adjacent to extraction activities where deposited dust is most likely to be related to Holcim's activities. These sites enable evaluation of compliance stations D3 / TB4 and D5 / TB3 with data from comparison stations D4 / TB2 and D6 / TB1 to infer whether the high dust levels are likely related to the Northern Dune Extension activities or may have been associated with external land use activities.

Depositional dust was monitored monthly over the AR reporting period and analysis conducted by ALS Laboratory Services (NATA accredited) for insoluble solids in accordance with AS 3580.10-1 - 2003.

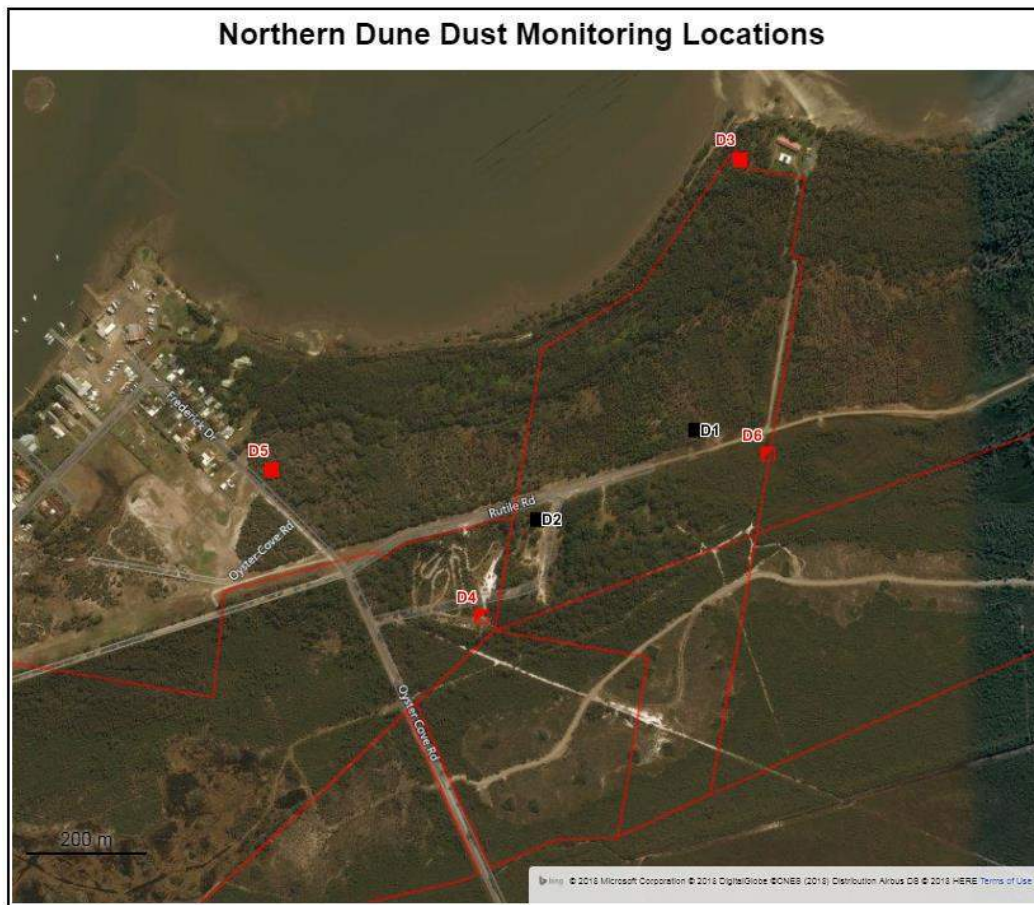


Figure 4: Dust Sampling Locations

6.3.3 Key Environmental Performance

6.3.3.1 Depositional Dust

Monitoring results for the 2022/23 reporting period are presented in Table 10 and Table 11. Results at compliance locations D3 / TB4 and D5 / TB3 have been compared against criteria in Schedule 3, Condition 6, Table 4, shown above. The criteria allow for an annual average of up to 4 g/m²/month for insoluble solids (or Total Insoluble Matter (TIM) as reported by ALS), as a total (inclusive of the site and background dust). The criteria of 2 g/m²/month relates to an incremental impact from the Project alone and is also assessed as a rolling annual average.

TIM is an indicator of the mineral constituent of dust as indicative of soil or rock particles and is the parameter of interest when measuring levels of deposited dust as per *Notes to Tables 2 to 4, Note C* referenced above. Highlighted results within the table indicate where dust trigger limits were exceeded during the reporting period.

The annual rolling average shown for D3 / TB4 and D5 / TB3 in Table 10 and Table 11 was calculated using data obtained over a rolling 12 month period in accordance with *Appendix J Dust Monitoring Program* of the approved Environmental Management Plan (EMP). The annual rolling average was then compared to the long term maximum total deposited dust level trigger level of 4 g/ m²/month under Schedule 3, Clause 6 for analysis of ongoing compliance of Northern Dune Extension operations in relation to depositional dust levels.

As seen in Table 10 and Figure 5, there was one single instance where measured deposited dust exceeded 4 g/m²/month at monitoring station D3 / TB4

- 17 August 2022 (5.5 g/m²).

Review of depositional dust results at comparison sites D4 / TB2 and D6 / TB1 in the same time period found the following:

- In August 2022, comparison site D4 / TB2 had an insoluble matter level of 1.1 g/m², while D6 / TB1 had an insoluble matter level of 0.3 g/m².

The results at the comparison sites suggest the following:

- D4 / TB2 has most likely been tampered with. There is evidence for this through the presence of a significant amount of dirt in the bottle as opposed to finer particle dust as would be expected if it were due to Holcim activities. D4 / TB2 is located in an area that is accessible by the public, including motorbike usage with visible tracks noted around the sample station, and has been susceptible to suspected tampering in the past (as reported in previous Annual Reports).
- D6 / TB1 has recorded a level of only ~10% of the allowable criteria suggesting that Holcim activities have not resulted in any significant air quality impacts.

Further evidence to support this is that given no extraction was occurring during the entire time of the reporting period when results were obtained, the source is highly unlikely to be related to activities on the Northern Dune Extension site. The only activities performed during the reporting period were rehabilitation activities (as discussed in Section 8.2) which generally do not have the potential to generate dust beyond the criteria.

Given that no extractive activity occurred through the reporting period it is possible that background dust levels are responsible for exceedances of the criteria. Any dust exceedances are attributed to external activities, i.e. not related to quarrying operations due to:

1. Extraction and ground disturbing activities have not occurred during the reporting period.
2. Rehabilitation monitoring shows greater ground cover in comparison to previous years (see Section 8).
3. No dust complaints have been received from nearby residents.

The annual rolling average for both D3 / TB 4 and D5 / TB3 are below the trigger threshold under Schedule 3, Clause 6 of the conditions of approval for all months within the monitoring period.

Table 10: Insoluble Matter (g/m²) Monitoring results for the D3 / TB4 Monitoring Station (April 2022 – March 2023).

Sample Period		Dust Monitor		Purpose (Comparison / Compliance)	D3 - Insol. Matter (g/m ²)	Comment	D3 - Annual Rolling Average (g/m ²)	Criteria (g/m ²)
Month	Year	TB	D					
April	2022	TB4	D3	Compliance	0.4		1.7	4.0
May	2022	TB4	D3	Compliance	3.5		1.8	4.0
June	2022	TB4	D3	Compliance	2.4		1.9	4.0
July	2022	TB4	D3	Compliance	1.2		1.9	4.0
August	2022	TB4	D3	Compliance	5.5	'D3 August 2022 5.5 dirt & sand in the bottle, it seems that the sample station may have been tampered with.'	2.3	4.0
September	2022	TB4	D3	Compliance	-	Sample missing – 'D3 Monitoring station damaged and dust bottle & funnel broken. No test results able to be taken'.	2.5	4.0
October	2022	TB4	D3	Compliance	3.5		2.6	4.0
November	2022	TB4	D3	Compliance	2.6		2.7	4.0
December	2022	TB4	D3	Compliance	1.6		2.6	4.0
January	2023	TB4	D3	Compliance	0.2		2.5	4.0
February	2023	TB4	D3	Compliance	1.3		2.4	4.0
March	2023	TB4	D3	Compliance	0.8		2.2	4.0

Table 11: Insoluble Matter (g/m²) Monitoring results for the D5 / TB3 Monitoring Station (April 2022 – March 2023).

Sample Period		Dust Monitor		Purpose (Comparison / Compliance)	D5 - Insol. Matter (g/m ²)	Comment	D5 - Annual Rolling Average (g/m ²)	Criteria (g/m ²)
Month	Year	TB	D					
April	2022	TB 3	D5	Compliance	1.2		1.4	4.0
May	2022	TB 3	D5	Compliance	0.6		1.4	4.0
June	2022	TB 3	D5	Compliance	0.8		1.2	4.0
July	2022	TB 3	D5	Compliance	2.2		1.2	4.0
August	2022	TB 3	D5	Compliance	0.5		1.2	4.0
September	2022	TB 3	D5	Compliance	0.6		1.2	4.0
October	2022	TB 3	D5	Compliance	1.7		1.3	4.0
November	2022	TB 3	D5	Compliance	1		1.3	4.0
December	2022	TB 3	D5	Compliance	0.5		1.3	4.0
January	2023	TB 3	D5	Compliance	1.3		1.3	4.0
February	2023	TB 3	D5	Compliance	1.7		1.2	4.0
March	2023	TB 3	D5	Compliance	1		1.0	4.0

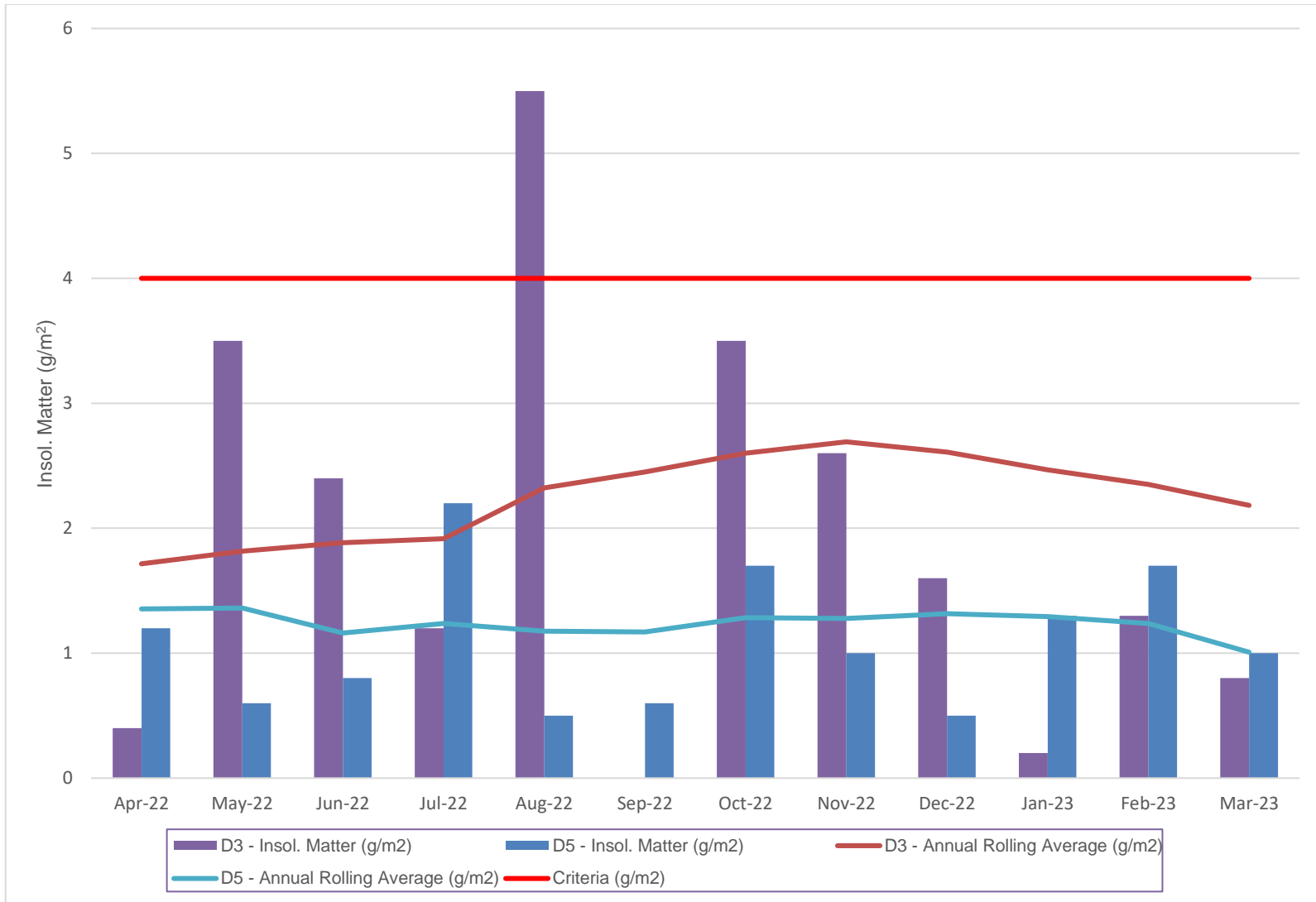


Figure 5: Insoluble Matter (g/m²) Monitoring results for the D5 / TB3 Monitoring Station and D3 / TB4 Monitoring Station

6.3.4 Proposed Improvements

The Northern Dune Extension Dust Management Plan will be reviewed following submission of this AR and updated if necessary. Given that extractive operations are no longer occurring and the potential for air quality impacts from dust due to operations are therefore removed, the value of an ongoing dust monitoring program is limited. The results from this reporting period (and previous) suggest that external sources contribute more dust to the monitoring network than the NDE site which further limits the value.

6.4 Traffic Management

6.4.1 Approved Criteria

The site is required to operate traffic and manage transport through compliance with the requirements of the conditions listed below:

TRAFFIC

Haulage Route

23. All extractive materials dispatched from the site must be delivered to Sibelco's Salt Ash Sand Processing Plant by the most direct route available.

Road Signage

24. Prior to commencing quarrying operations, the Proponent shall:
- (a) install "Trucks Crossing" and "Trucks Entering" warning signs on Nelson Bay Road on both the western and eastern approaches to the intersection of Lemon Tree Passage Road; and
 - (b) pay the full cost of this installation, to the satisfaction of RMS.

On-Site Traffic Management

25. The Proponent shall ensure that:
- (a) all vehicles do not exceed a speed of 25 kph on the site;
 - (b) all loaded vehicles entering or leaving the site have their loads covered; and
 - (c) all loaded vehicles leaving the site are cleaned of sand and other materials that may fall on the road, before leaving the site.

Traffic Management Plan

26. The Proponent shall prepare and implement a Traffic Management Plan for the project, to the satisfaction of the Director-General. This plan must:
- (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
 - (b) include a drivers' code of conduct to minimise the impacts of project-related trucks on local residents and road users; and
 - (c) describe the measures that would be put in place to ensure compliance with the drivers' code of conduct.

6.4.2 Key Environmental Performance

No extractive materials were dispatched from the site during the reporting period resulting in zero truck movements related to the Northern Dune Extension. An approved Traffic Management Plan is in place, available as Appendix H of the Northern Dune EMP. No traffic related non-compliances were recorded during the reporting period.

6.5 Biodiversity

Schedule 3, Condition 15 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091) required the preparation of a Biodiversity Management Plan (BMP). While the BMP requires similar management actions as the LMP, for operational and administrative simplicity, these plans apply to the site as follows:

- Management measures for the extraction area are addressed in the LMP (See Section 8).
- Management of the approved Biodiversity Offset Areas are addressed in the BMP.

Biodiversity offset areas for the project have been established in the north-east of the approved extraction area (Northern Biodiversity Offset Area, NBOA) and to the south-east of the extraction area off Lemon Tree Passage Road (Southern Biodiversity Offset Area, SBOA).

The BMP requires the following actions to be undertaken within the offset areas:

- Annual inspection and monitoring to be conducted by a suitably qualified person/s;
- Implementation of a nest box installation and monitoring program within the northern offset area to replace hollow bearing trees removed from the extraction area;
- Utilisation of potential habitat features from the disturbance area (e.g. large organic debris and habitat hollows) either within the rehabilitation or NBOA;
- Targeted fauna monitoring across all offset areas to monitor for Wallum Froglet (*Crinia tinnula*), Koala (*Phascolarctos cinereus*) and Mahoney's Toadlet (*Uperoleia mahonyi*);
- Establishment of a habitat restoration and rehabilitation program across all offset areas (including the visual amenity buffer along the northern boundary of the extraction area) consisting of:
 - Annual inspections to identify areas requiring weed and pest control;
 - A weed and pest management program;
 - Enhancement of the availability of habitat for the Koala through the use of *Eucalyptus robusta* (Swamp Mahogany) within the offset area;
 - Rehabilitation of the regenerating Grassland-Heath to the surrounding Swamp Mahogany – Paperbark Swamp Forest through seeding and planting of appropriate species;
- Establishment of a vegetation monitoring program (VMP) to ensure vegetation and fauna habitat qualities within the offset areas are being maintained and identify any issues requiring management.

6.5.1 Nest Box Installation and Monitoring Program

The approved BMP requires the establishment and on-going monitoring (at least 6 years) of at least two nest boxes for each tree hollow removed during clearing.

A nest box installation program was implemented on 21st December 2015 to offset the loss of 26 hollows across the whole of the approved extraction area. These were replaced at a 2:1 ratio resulting in the installation of 52 nest boxes in the NBOA within Coastal Sands Apple Blackbutt Forest and the northern section of the Swamp Mahogany – Paperbark Forest. Nest boxes were positioned in areas of vegetation that contained suitable food resources but lacked denning sites for arboreal fauna. As such, the central part of the offset area was the most appropriate site for installation. The installation of the nest boxes was supervised by suitably trained ecologists to ensure appropriate site selection.

Environmental contractor Wedgetail Project Consulting was engaged by Holcim to conduct annual monitoring of the nest boxes during the reporting period on 16 September 2022, and prepared a report on the monitoring program (refer Appendix 4). This reporting period consisted of the sixth and final survey.

In 2022, the percentage of all nest boxes exhibiting any sign of use was 56% (29). Fifteen percent (8)

of the total number of nest boxes were determined to be unavailable for use resulting from the boxes being missing from its location on the site.

Unlike previous years, no boxes were deemed to be unavailable due to insects such as wasps, bees or ants.

In 2022, four boxes (8%) were observed to have animals present (A). There were three boxes showing recent evidence of use with four boxes within the “moderately fresh” category, and the total number of boxes showing old evidence was 17 boxes (33%).

A total of eight boxes (15%) were noted to being missing, believed stolen. This brought the total number of nest boxes available for fauna use to 44, one more than the 2021 survey as no boxes were deemed unusable due to insects.

Two of the Possum boxes showed evidence of use with one being occupied by a Common Brushtail Possum (*Trichosurus vulpecula*), Glider boxes had a utilisation rate of 79% (27 out of 34 boxes) with two of the boxes being utilised by Sugar Gliders (*Petaurus breviceps*) with another box occupied by a Sydney Diamond Python (*Morelia spilota spilota*).

Fauna uptake of the nest boxes was successful in the first year of installation with several species of mammals and reptiles recorded occupying boxes, and evidence of usage across many more boxes. Since that initial survey, no fauna was recorded in the boxes in 2019 and 2020. The recent surveys in 2021 and 2022 have seen an increase in usage and fauna present within two and four of the nest boxes respectively. The surveys conducted in 2019 and 2020 where no occupation was recorded resulted in the surveys being conducted earlier in the year i.e., winter and spring on the hypothesis that the boxes were not being occupied in the heat of the summer months. This has been vindicated with occupation of boxes being recorded.

The presence of non-target species such as the python suggests that the boxes are and have been utilised by a range of fauna. It should be noted that for two of the box types – possum and bat – little evidence of usage will be apparent, unless an animal is actually recorded in the box as neither of the target fauna generally leave nesting materials behind, as with gliders.

6.5.2 Amphibian Monitoring

Targeted monitoring for the Wallum Froglet (*Crinia tinnula*) and Mahony’s Toadlet (*Uperoleia mahonyi*) was conducted as part of the requirements outlined in section 5.1.4 of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2014). The monitoring was conducted on 15 November 2022, and 2 and 3 February 2023 by two WPC ecologists over three nights, following periods of rainfall. A prior diurnal assessment of the offset areas was conducted to determine habitat suitability. Surveys consisted of a meandering search in the Northern Biodiversity Offsets Area (NBOA).

Nocturnal surveys for amphibian species employed visual and audible detection techniques with the aid of spotlights. Wallum Froglet was recorded within the NBOA on two of the three survey nights at multiple locations, while Mahony’s Toadlet was not identified within the NBOA during this year’s monitoring event. An adjacent waterbody to the east was visited to confirm the presence of the Mahony’s Toadlet and Wallum Froglet and only Wallum Froglet were found to be calling.

Opportunistic sightings of non-target amphibian species were also recorded. Additional opportunistic sightings of non-amphibian species within the NBOA included the Brushtail Possum (*Trichosurus vulpecula*) and Sugar Glider (*Petaurus breviceps*). Results from the surveys show that one of the targeted species are utilising the NBOA for breeding and foraging habitat when the conditions are suitable. With no permanent water bodies on the NBOA, this is restricted to periods of higher rainfall. Nearby more permanent water bodies are presumed to be the core habitat for these species. Ongoing surveys after suitable rain events will determine if the species continue to utilise the NBOA.

Table 12: Amphibian presence during targeted nocturnal monitoring

Species detected	Observation type	15/11/2022	02/02/2023	03/02/2023
<i>Crinia signifera</i>	Heard	-	+	+
<i>Crinia tinnula</i>	Heard	-	+	+
<i>Limnodynastes peronii</i>	Heard/Observed	+	+	+
<i>Litoria fallax</i>	Heard/Observed	-	+	-
<i>Litoria latopalmata</i>	Heard	+	+	-
<i>Litoria freycineti</i>	Observed	-	-	+
<i>Litoria nasuta</i>	Observed	-	-	+
<i>Platyplectrum ornatum</i>	Observed	+	+	-
<i>Uperoleia mahonyi</i>	-	-	-	-

6.5.3 Koala Monitoring

Koala monitoring was undertaken using the Spot Assessment Technique (SAT) within the NBOA as described by Phillips and Callaghan (2011). The SAT test involves a radial survey of koala “activity” within the immediate area of a tree that is known or deemed to be utilised by koalas. The search beneath each tree is conducted for two person minutes or until a single pellet is found, whichever occurs first. A tree is defined as a live woody stem of any species (except for cycads, palms, tree ferns and grass trees) which has a diameter at breast height (dbh) greater than 10cm. Two WPC ecologists conducted 15 SAT surveys on the 18 March 2023.

The SAT surveys conducted in 2023 did not find any Koala activity in the NBOA. Within the NBOA, the greater activities have been found to be within the Swamp Mahogany – Paperbark Swamp Forest to the north of the offset area where there are mature trees for feeding, although evidence of use was found throughout the extent of the NBOA in previous years’ monitoring. The NBOA has good habitat suitability for the koala to the north of the area, although parts of this area were hard to traverse due to of thick belt of lantana (*Lantana camara*) dominating the understory which has the potential to hinder Koala movement through the site, although this survey, vegetation was not present in area that have been previously inundated, making movement relatively easy. This survey, in conjunction with the Amphibian surveys, utilised thermal imaging binoculars to scan the vegetation for koalas over two nights. No koalas were observed over these nights. The remaining southern areas of the NBOA are still regenerating but have shown promising signs of koala use in previous years monitoring which will continue to improve as the trees mature.

The assessed low activity levels within the NBOA suggest that koalas are not permanently resident within the site but use it to transition between other areas of higher populations. Despite the apparent suitability of the NBOA as habitat, a number of possible factors can be suggested as to why the site is not used at higher levels or even permanently. As alluded to above, there is a dense lantana understory that effectively separates the site in two. There has been historic and ongoing disturbance due to recent fires, and human activity including motorcycle riding, dog walking and rubbish dumping, although these activities within the NBOA have decreased as the vegetation has increased in density and made access to the site more difficult.

Location	No Activity				Low Activity				Medium Activity				High Activity			
	2019	2020	2021	2022/23	2019	2020	2021	2022/23	2019	2020	2021	2022/23	2019	2020	2021	2022/23
1	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-
2	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-
3	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-
4	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
6	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-
8	-	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-
9	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
15	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-

Table Symbology – “+” indicates Koala scat present. “-“ no scat present

Table 13 Koala activity levels from the Spot Assessment Technique

6.5.4 Habitat Restoration

6.5.4.1 Vegetation Condition Survey

An annual inspection of the NBOA is to be conducted as per Section 5.1.3B of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2019). This survey was conducted on 17 November 2022. As per the BMP, photo monitoring points were established, weed infestations were noted, locations of rubbish dumping were noted, survey the regeneration and health of the *Eucalyptus robusta* along one transect, east to west across the BOA noting the size in classes of trees 1m either side of the transect, noting the extent and requirement of any revegetation works in the BOA.

South of Rutile Rd, a small section of the NBOA abuts the extraction zone. Most of this area was affected by the 2018 fires but has recovered with increased rainfall in late 2020 and early 2021. The condition improves moving east from Coastal Sand Apple Blackbutt Forest that fringes the extraction zone and Block Q2 which is quite weed infested until good condition Swamp Mahogany – Paperbark Forest is encountered. This area has some scattered Fishpole Bamboo (*Phyllostachys aurea*), and Bugle Lily (*Watsonia meriana*). The 50m buffer zone of vegetation along Rutile Rd is quite weedy with exotic grasses, Lantana (*Lantana camara*) and some minor Blackberry (*Rubus fruticosus* spp. agg.), Glory Lilly (*Gloriosa superba*), *Watsonia meriana* and *Pinus elliotii* (Slash Pine) as well as others.

Regeneration of the *E. robusta* within this “regenerating” area was assessed by measuring the health and size of *E. robusta* trees within 1m of a transect running East to West across the NBOA. The individual trees were divided into five height classes (<1m, 1-2m, 2-10m, 10-15m and >15m or mature trees) for determination of age. Trees <1m in height were classified as seedlings/saplings, trees 1-2m in height were classified as saplings, trees 2-10m were classified as immature trees, trees 10-15m were classified as intermediate, while trees estimated to be over 15m in height were classified as mature.

This year, a total of 78 trees were assessed along the transect that is approximately 400m long. The 2021 survey assessed 114 trees, the difference attributed to GPS drift rather than any dieback or death of trees. The assessment found that there were two saplings <1m, only six were estimated to be between 1-2m, in height, with 39 trees estimated to be between 2-10m, 31 trees between 10-15m tall and no trees assessed as mature. This indicates that this southern of the NBOA is advanced re-growth, with no trees deemed to be old growth.

The majority of the *E. robusta* – 66 trees - were located in the eastern section of regenerating Swamp Mahogany – Paperbark Swamp Forest. Two areas at the western end of the NBOA are classified as regenerating grassland where the density of trees and shrubs is greatly reduced. Since the initial survey in 2013, natural regeneration has occurred, with many shrubs and some midstorey species self-seeding. The northern most section of the NBOA has been classified as mature Swamp Mahogany – Paperbark Swamp Forest. This area contains mature *E. robusta* and *Melaleuca quinquenervia* trees with an understorey of Tall Saw-sedge (*Gahnia clarkei*) and other swamp flora.

Weed mapping was conducted as part of the monitoring of the BOA. The key weed species recorded on site that have the potential to restrict revegetation or native fauna use are the Slash Pine, Lantana and Bugle Lily. The Slash Pine is concentrated along Rutile Rd in the regenerating Swamp Mahogany – Paperbark Swamp Forest, but seedlings and saplings have spread throughout this entire section of the BOA. The density has been mapped from medium to heavy in these areas and there are many scattered immature and mature trees in other areas. The Slash Pine is rapidly spreading through the BOA and does pose a threat to the viability of the area as an offset. The Bugle Lily is concentrated in the central portion of the regenerating Swamp Mahogany – Paperbark Swamp Forest with a large central dense infestation that becomes less dense towards the edges. Lantana has colonised this section of the BOA with infestation levels varying from scattered individuals to very heavy (<75% cover), with a belt of dense Lantana acting to separate this section from the southern regenerating section of the BOA. Evidence of previous control works conducted by contractors is visible.

Where weed species have not become established the condition of the native vegetation is quite good. Native vegetation is generally in good health with no visible dieback observed amongst the canopy species on site. The regenerating grassland is slowly self-seeding with some native species such as Coastal Wattle (*Acacia longifolia*) and Coast Teatree but would benefit from a modest planting program of tubestock installation of *E. robusta*, Red Bloodwood (*Corymbia gummifera*) and Smooth-barked

Apple (*Angophora costata*). Sibelco Australia (the previous owners) had commenced a modest weed control program, and Holcim (Australia) have continued this program. Further ongoing and more intense weed control efforts will be required to improve the condition of the BOA.

6.5.4.2 Weed Control Works

WPC was engaged by Holcim (Australia) to conduct weed control works in the BOA during the 2022 reporting period. These works consisted of a team of two Land Management Technicians working on site for two rounds of two days each. Works were performed on the 21 November and 12 December 2022, where Environmental Technicians from WPC carried out weed control activities within the NBOA.

On 8 and 9 March 2023, staff returned to site to continue the treatment of weeds previously identified during annual monitoring. The target weeds were Lantana (*Lantana camara*), Slash Pine (*Pinus elliottii*) and Watsonia (*Watsonia meriana*).

The following recommendations are made –

- The weed control effort is increased to allow for a greater area to be worked. Given the level of infestation it is suggested that effort be increased – i.e., 12 person days per year.
- The Slash Pine saplings that have been cut and dropped in the past control efforts should be removed – most can be removed by hand to Rutile Rd and chipped there. This will facilitate native species regeneration.
- The larger Slash Pine trees require a specialist arborist to safely be removed.

6.6 Heritage

6.6.1 Approved Criteria

“The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Director-General. This plan must:

- (a) be prepared in consultation with all relevant local Aboriginal communities;*
- (b) be submitted to the Director-General for approval prior to commencing quarrying operations;*
and
- (c) include:*
 - measures for the protection and management of site 38-4-0318 within Lot 13 DP601306;*
 - a program to complete prospective pre-clearance surveys of the extraction area in consultation with Aboriginal stakeholders;*
 - measures for ongoing consultation with local Aboriginal communities and the involvement of these communities in pre-clearance surveys and the ongoing management of any Aboriginal cultural heritage values identified within the site;*
 - an Aboriginal cultural education program for the induction of personnel and contractors involved in quarrying operations; and*
 - a description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project.”*

6.6.2 Cultural Heritage Management Plan

An Aboriginal Cultural Heritage Management Plan (CHMP) has been prepared in consultation with the three Registered Aboriginal Parties (RAPs) within the local area:

- Worimi Local Aboriginal Land Council;
- Mur-Roo-Ma Incorporated, and;
- Nur-Run-Gee Pty Ltd

The CHMP contains plans of actions for pre-clearance surveys and unexpected finds such as new Aboriginal objects or skeletal remains during extraction as well as an ongoing plan to manage Aboriginal Cultural Heritage. With respect to actions under the CHMP during the reporting period:

- No clearing or extraction occurred as the project is in the rehabilitation phase;
- Site 38-4-0318 is located in the northern part of Lot 13 outside the extraction area. There was no disturbance of this area during the reporting period.

6.6.3 Key Environmental Performance

No clearing or extraction occurred during the reporting period. There were no issues relating to Aboriginal and Cultural Heritage in the reporting period.

6.6.4 Proposed Improvements

The CHMP will be reviewed and if necessary updated in the next reporting period.

6.7 Waste Minimisation

6.7.1 Management Measures

The following management measures are in place at Northern Dune Extension:

- No burning of waste;
- Any noxious plant species will be removed from the site, bagged and disposed of at a licensed landfill;
- Any waste will be removed daily and recycled or disposed of directly at a licensed landfill; and
- The site will be maintained and kept free of rubbish and cleaned up at the end of each working day.

6.7.2 Key Environmental Performance

No bins or other waste management facilities are kept on site - any waste produced is removed at the end of each working day.

6.7.3 Proposed Improvements

There are no proposed improvements to waste management during the Annual Review period.

7 WATER MANAGEMENT

This section addresses compliance with the approved GMP required by Schedule 3, Clause 14 of Project Approval MP 09_0091, and EPL 11633. It is noted that the GMP was revised in October 2021 and the updated version was approved within the previous reporting period, amending the monitoring requirements in the Tanilba Northern Dunes locations. This is discussed further below in Section 7.1.

No environmental incidents or implementations of the Emergency Response Plan (ERP) in relation to groundwater occurred.

As described in the approved GMP there are no Groundwater Dependent Ecosystems (GDE) identified within the Northern Dune Extension area, therefore no impacts are able to be assessed. A study by SKM in 2012 for the NOW on NSW Coastal GDE's did not identify a GDE at the Northern Dune Extension area site, and a site is not listed in the National Atlas of GDE's.

7.1 Groundwater Management Measures

Groundwater Management issues are managed by the regulatory approved Groundwater Management Plan 2021 (GMP). The GMP has been developed to ensure compliance with the conditions of consent and licensing requirements stipulated by the relevant regulatory authorities, during development and operation at the Northern Dune sites. The GMP provides a formal framework for ongoing monitoring of groundwater to manage the potential impact of sand extraction on groundwater level and quality. The GMP stipulates that:

- No excavation is to be carried out to a depth greater than 0.7m above the maximum predicted elevation of the water table;
- The land surface is to be restored, following mining, to a level at least 1m above the maximum predicted elevation of the water table;
- If concentrations of any analyte are found to exceed the provisional trigger levels given in the GMP, that monitoring point will be re-sampled within fourteen days, with investigatory monitoring implemented should re-sampling also be in exceedance of the trigger values; and
- The relevant Regulatory Authorities will be contacted if any recorded water level exceeds the benchmark maximum predicted groundwater levels.

The GMP states that the GMP will be reviewed at the completion of sand extraction in a zone and/or prior to commencement of operations in each new zone (the Northern Dune Extension is effectively a single zone). If this review indicates a need to change programs or procedures, then a submission outlining the proposed changes and the need for them will be made to DPE and HWC. Extraction ceased in 2018 and no extraction occurred during the reporting period.

A revised GMP was submitted and approved in October 2021 due to the cessation of extraction and progression of the project into a rehabilitation activity. The revised GMP includes monitoring at a reduced number of bores. It was also revised to lower the frequency of groundwater quality monitoring and reporting for bores that:

- Were not representative for the measurement of potential groundwater impacts from rehabilitation activities on the project area; and
- Were not part of the EPL monitoring network.

This resulted in the groundwater quality monitoring locations and frequencies listed in Table 14 remaining. The locations of these bores are shown in Figure 6.

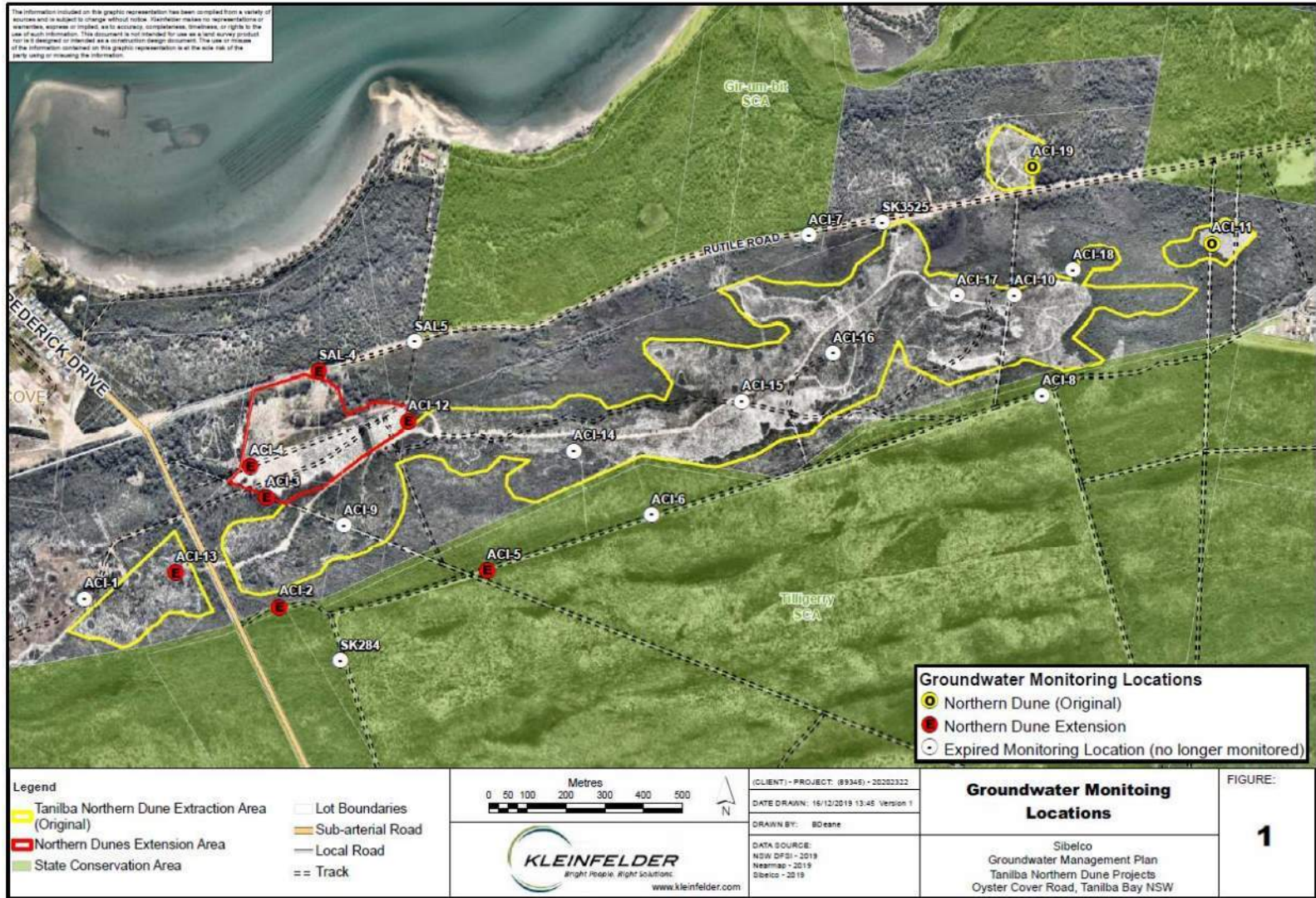


Figure 6: Location of the Tanilba Northern Dune Projects and Associated Current Monitoring Locations

Table 14 Current Groundwater Quality Monitoring Locations

Project	Agency / Approval Jurisdiction	Monitoring Location Name	Easting	Northing	End of Mining Activity	Groundwater quality Monitoring Frequency	Groundwater Level Monitoring Frequency
Northern Dune Extension	DPE / HWC / EPA	ACI-2	402538	6376802	Ceased Jan 2006 (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPE / HWC / EPA	ACI-5	403076	6376897	Outside of extraction zone (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPE / HWC / EPA	ACI-13	402270	6376891	Ceased Jun 2005 (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPE / HWC / EPA	SAL-4	402641	6377413	Outside of extraction zone (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPE / HWC	ACI-3	402505	6377085	July 2018	Annually	Monthly
	DPE / HWC	ACI-4	402463	6377166	July 2018	Annually	Monthly
	DPE / HWC	ACI-12	402872	6377282	July 2018	Annually	Monthly

Groundwater quality is tested for the parameters required by EPL 11633, as presented in Table 15.

Table 15: EPL 11633 Groundwater Monitoring Requirements

POINT 2,5,13,14

Pollutant	Units of measure	Frequency	Sampling Method
Arsenic	milligrams per litre	Every 6 months	Grab sample
Conductivity	microsiemens per centimetre	Every 6 months	Grab sample
Iron	milligrams per litre	Every 6 months	Grab sample
Manganese	milligrams per litre	Every 6 months	Grab sample
pH	pH	Every 6 months	Grab sample
Standing Water Level	metres	Monthly	In situ
Total petroleum hydrocarbons	milligrams per litre	Every 6 months	Grab sample

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
2	Groundwater quality monitoring		Groundwater monitoring bore ACI-2 located to the South of Extraction Zone 1 near DLWC in "Northern Dune Water Bore Locations" figure accompanying additional information supplied to EPA on 6 May 2002.
5	Groundwater quality monitoring		Groundwater monitoring bore ACI-5 located at the South of Extraction Zone 2 & outside lease boundary in "Northern Dune Water Bore Locations" in additional information supplied to EPA on 6 May 2002.
13	Groundwater quality monitoring		Groundwater monitoring bore ACI-13 located within Extraction Zone 1 in "Northern Dune Water Bore Locations" figure in additional information supplied to EPA on 6 May 2002.
14	Groundwater quality monitoring		Groundwater monitoring bore SAL4 as identified on Figure 6.2 of report titled 'Tanilba Northern Dune Sand Extraction Extension - Environmental Assessment' dated August 2012.

7.1.1 Groundwater Levels

Wider groundwater monitoring was initiated at Northern Dune in 2002, prior to the commencement of sand extraction in 2003. Baseline groundwater level and quality monitoring is undertaken within a planned zone prior to commencing sand extraction. Baseline groundwater level monitoring is used to create a Predicted Maximum Groundwater Elevation (PMGE) which is then used for determining depth of extraction and final landform.

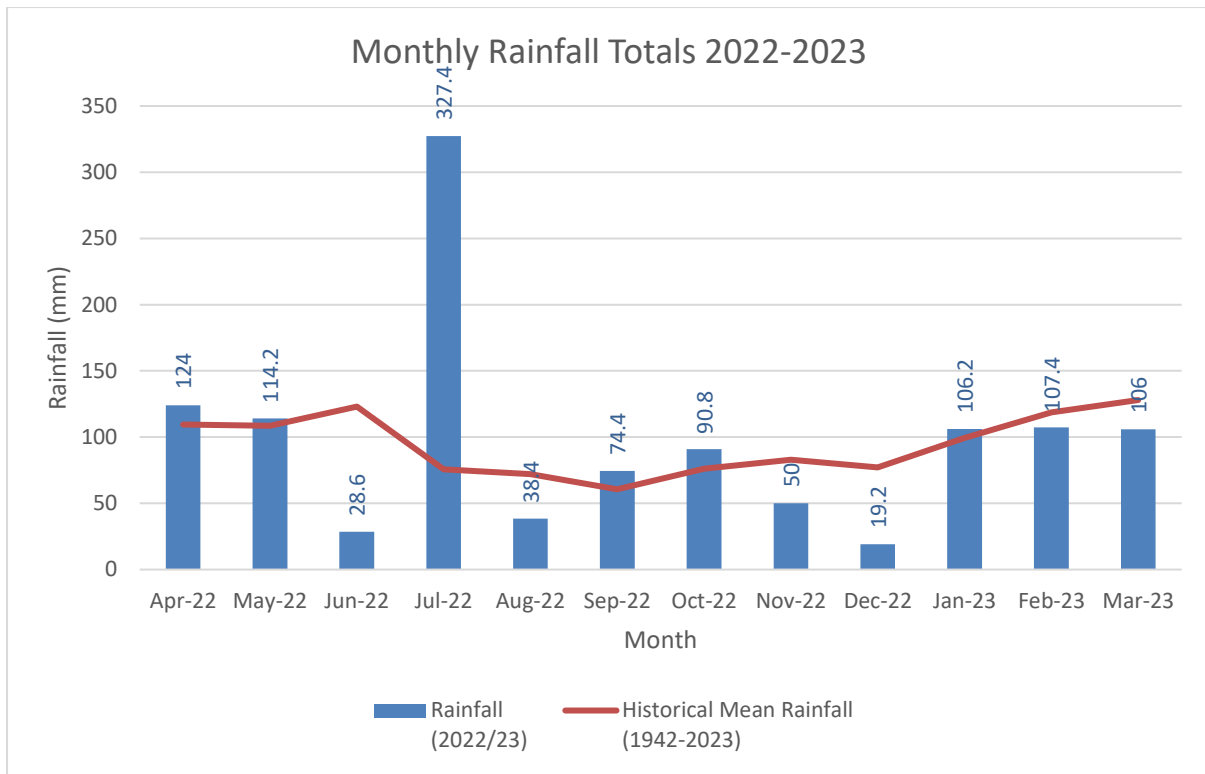


Figure 7: 2022/23 Monthly Rainfall at Williamtown RAAF

Historically, groundwater level data is collected monthly across the entire wider monitoring network with reporting against the piezometers used to analyse Predicted Maximum Groundwater Extent (PMGE) surfaces for the extraction zones.

For the Northern Dune Extension area, the required monitoring locations were reduced in March 2020 to those that are considered most relevant to groundwater level observation as detailed in Table 14. This was done via regulatory approval of a revised GMP as discussed above.

Other locations within the wider monitoring network are considered to be more applicable to the wider Northern Dune area, and of less significance to the specific Northern Dune Extension area (this report). The results for all locations are provided in tabulated form for this reporting period in

Table 16, with those relevant to the Northern Dune Extension area shaded grey.

The hydrographs in Appendix 6 demonstrate the groundwater trends throughout the life of the project, and Table 8 presents the monthly results for the current reporting period which demonstrate that all locations were monitored monthly (or weekly) during the current reporting period as per the requirements.

Annual rain monitoring data recorded at Williamtown throughout the reporting period has been included in Figure 7 for reference. During the reporting period, the highest recorded rainfall was in July 2022 with 327.4 mm being recorded. This was a very significant rain event that resulted in more than three times the monthly average rainfall. During this event, the majority of this rain fell heavily and consistently for consecutive days. There were further significant rainfall events in April 2022 (124 mm) and May 2022 (114.2 mm), and also above average rainfall in September 2022 (74.4mm), October 2022 (90.8mm) and January 2023 (106.2mm). December 2022 saw the lowest rainfall, with 19.2 mm falling throughout the month. The rainfall received is likely to influence the groundwater levels which respond to rainfall.

When rainfall levels exceeded more than 100 mm in a seven-day period, bores are monitored weekly for a total of four weeks. This occurred two times during the reporting period in April 2022 and July 2022, and subsequent weekly monitoring was performed, the results of which are presented in

Table 16. It should be noted that weekly monitoring carried over from the previous reporting period was performed in April 2022.

Groundwater level monitoring results (

Table 16) demonstrate that there has been one exceedance of the Predicted Maximum Groundwater Extent (PMGE) during the reporting period except for during the exceptional rain events described. Rainfall such as this was experienced in the previous reporting period and is attributed to the La Nina weather phenomenon that has been experienced throughout the summers of 2021 and 2022/23 resulting in significantly increased rainfall events as demonstrated in Figure 7 which resulted in exceedances of the PMGE at ACI-3, ACI-4 and ACI-13.

Table 16: Groundwater Levels at Northern Dune Extension Monitoring Locations

Date	ACI-2	ACI-3	ACI-4	ACI-5	ACI-12	ACI-13	SAL4
6/04/2022 100mm Rain	8.42	9.30	9.44	8.13	8.88	9.07	8.34
13/04/2022 100mm Rain	8.40	9.45	9.60	8.13	8.83	9.13	8.46
20/04/2022 100mm Rain	8.36	9.29	9.41	8.13	8.74	8.98	8.36
16/05/2022	8.37	9.06	9.12	8.13	8.44	8.79	8.22
16/06/2022	8.22	9.01	9.05	7.93	8.47	8.75	8.19
07/07/2022 100mm Rain	8.44	9.74	10.47	8.13	9.19	9.65	8.59
13/07/2022 100mm Rain	8.44	9.71	9.78	8.13	8.71	9.39	8.49
20/07/2022 100mm Rain	8.42	9.68	9.75	8.13	9.02	9.26	8.42
28/07/2022 100mm Rain	8.41	9.51	8.13	8.13	8.81	9.10	8.38
04/08/2022 100mm Rain	8.42	9.41	9.49	8.13	8.81	9.10	8.38
17/08/2022	8.38	9.38	9.45	8.13	8.70	9.00	8.32
16/09/2022	8.37	9.16	9.20	8.09	9.28	8.84	8.60
17/10/2022	8.30	9.05	9.70	8.02	8.52	8.82	8.23
17/11/2022	8.14	8.82	8.85	7.82	8.32	8.61	8.06
16/12/2022	7.83	8.63	8.56	7.52	8.15	8.37	7.91
16/01/2023	7.53	8.13	8.20	7.24	7.80	7.94	7.78

14/02/2023	7.30	8.02	8.10	7.11	7.73	7.78	7.55
16/03/2023	7.12	7.81	7.85	6.88	7.65	7.61	7.43
PMGE	8.44	9.47	9.31	8.16	9.28	9.20	8.65

In accordance with the GMP, the results of groundwater level monitoring are analysed to determine whether they are anomalous and whether further sampling is required. If further sampling confirms anomalous results, then notification to the regulators is required.

The groundwater elevations above the PMGE at ACI-3, ACI-4 and ACI-13 correspond to the extraordinary rainfall events and as such are not considered to be anomalous. Other than the exceedances related to the extraordinary events, during the reporting period there was one groundwater level elevation recorded to be above the PMGE at ACI-4 on 17 October 2022. However, this corresponded to above average rainfall for that month, which then decreased as rainfall levels decreased. As such it is not considered to be an anomalous result. There were not any other anomalous results at any of the monitoring points, as demonstrated by

Table 16.

7.1.1.1 Groundwater Level Results Discussion and Trend Summary

During previous reporting periods, it was noted that the trend observed in groundwater levels is that they fluctuate naturally in response to rainfall. During this reporting period

Table 16 demonstrates the same trend is observed; groundwater levels rise as there is increased monthly rainfall and fall during periods of reduced rainfall. This trend is highlighted by the elevated levels following the significant rain events described, and also when above average rainfall is apparent. The annual trends over previous reporting periods show that following rain significant rain events, groundwater levels return to the expected fluctuating trend over time, and this is demonstrated following the events.

As the groundwater in the area is rain fed, and this reporting period has seen an overall increased trend in the rainfall received annually, groundwater levels have shown a slight trend of increasing across the monitoring network when compared to previous years.

No significant change to the trends demonstrated in groundwater levels over the life of the project have been observed within this reporting period.

7.1.2 Groundwater Quality

In addition to the requirements of EPL11633, Trigger Values were established for a number of initial monitoring bores. Baseline groundwater quality samples were collected prior to extraction to create trigger values for comparison against sample concentrations during extraction operations and post-extraction operations to assist in detecting any changes in groundwater quality at the site.

The trigger values are then tested against predetermined increments. Groundwater quality testing is undertaken as per Table 14 and reported to the relevant regulators.

Groundwater quality is sampled and tested by an external third party with results sent to Holcim.

The groundwater quality monitoring results presented in Table 17 show that all results were within normal limits with the exception of:

- It is noted that the location ACI-13 reported a dissolved iron concentration (1.58mg/L) slightly above the adopted trigger value (1.547mg/L) set for this specific location during this monitoring event (Q1, 16/03/2023) noting Iron exceeded adopted criteria (2.62mg/L) during the same monitoring event (Q1) in 2022. The total Iron concentration however did not breach the trigger value set for this location. This is a seasonal trend of background iron mobilised from the coffee rock horizon via rising groundwater levels.

Previous reports submitted to DPE and HWC stated that Iron results are elevated and exceed the assigned trigger values in the September/October monitoring events at ACI-2 since September 2017, and that results have been below trigger values during the March/April monitoring events. Unfortunately, no sample was collected in the September event at ACI-2 as it was inaccessible due to the significant rainfall event (see 'Groundwater Levels' above). The March 2022 result reversed the trend of being below the trigger value in the March event and this is likely due to the extraordinary rainfall conditions experienced throughout the summer period under a second consecutive La Nina weather system.

Previous reports have also revealed how Manganese results are also elevated and have exceeded the assigned triggers in the September/October monitoring events at ACI-2 since September 2017. Results have been below trigger values during the March/April monitoring events until the previous reporting period. The March 2022 results exhibit a similar trend to the previous reporting period, which again is likely due to the extraordinary rainfall conditions experienced throughout the summer period under a second consecutive La Nina weather system, with March 2022 in particular being a significantly above average month for rainfall. For the current reporting period this trend has subsided with Manganese results, both total and dissolved, being below the trigger levels.

ACI-13 also returned an exceedance of the trigger value for dissolved iron in March 2022. As per the trend demonstrated by ACI-2, ACI-13 fluctuated above and below the trigger value between the winter and summer monitoring events, with exceedances traditionally returned in winter under increased rainfall and below trigger results returned in summer under drier conditions. However, once again this previous exceedance in March 2022 was likely due to the extraordinary rainfall conditions experienced throughout the summer period under a second consecutive La Nina weather system, with March 2022 in particular being a significantly above average month for rainfall. As noted previously, this would have resulted in mobilization of iron from the coffee rock horizon. This trend has continued into the current reporting period for ACI-13, and as noted above, however, with a significantly lower concentration just above the trigger level.

Table 17: Comparison of Groundwater quality results against trigger values for the 2022/23 reporting period.

	Date	Bore	pH	EC µS/cm	Iron mg/L		Arsenic mg/L		Manganese mg/L		TPH mg/L			
					Dissolved	Total	Dissolved	Total	Dissolved	Total	C6- C9	C10- C14	C15- C28	C29- C40
Trigger Value		ACI-2	N/A	N/A	3.058	3.623	0.001	0.01	0.015	0.014	0.02 (LOR)	0.05 (LOR)	1 (LOR)	1 (LOR)
Results	14/09/2022		4.44	102	2.15	2.34	x	x	0.01	0.01	<LOR	<LOR	<LOR	<LOR
Results	16/03/2023		4.48	94	1.77	2.05	<0.001	0.001	0.01	0.01	<LOR	<LOR	<LOR	<LOR
Trigger Value		ACI-5	N/A	N/A	2.048	3.286	0.001	0.015	0.014	0.036	0.02	0.05	1	1
Results	14/09/2022		4.70	133	0.39	0.42	<0.001	<0.001	x	x	<LOR	<LOR	<LOR	<LOR
Results	16/03/2023		4.56	130	0.39	0.5	<0.001	<0.001	<0.001	<0.001	<LOR	<LOR	<LOR	<LOR
Trigger Value		ACI-13	N/A	N/A	1.547	6.428	0.001	0.012	0.061	0.056	0.02	0.05	1	1
Results	14/09/2022		5.05	52	1.47	2.16	<0.001	<0.001	0.01	0.01	<LOR	<LOR	<LOR	<LOR
Results	16/03/2023		5.13	53	1.58	1.8	<0.001	<0.001	0.056	0.055	<LOR	<LOR	<LOR	<LOR
Trigger Value		SAL-4	4.44 - 6.6	213	3.21	3.64	0.001	0.002	0.093	0.116	0.02	0.05	1	1
Results	14/09/2022		5.21	116	0.58	0.74	<0.001	<0.001	0.02	0.02	<LOR	<LOR	<LOR	<LOR
Results	16/03/2023		4.90	138	0.82	0.96	<0.001	<0.001	0.034	0.034	<LOR	<LOR	<LOR	<LOR

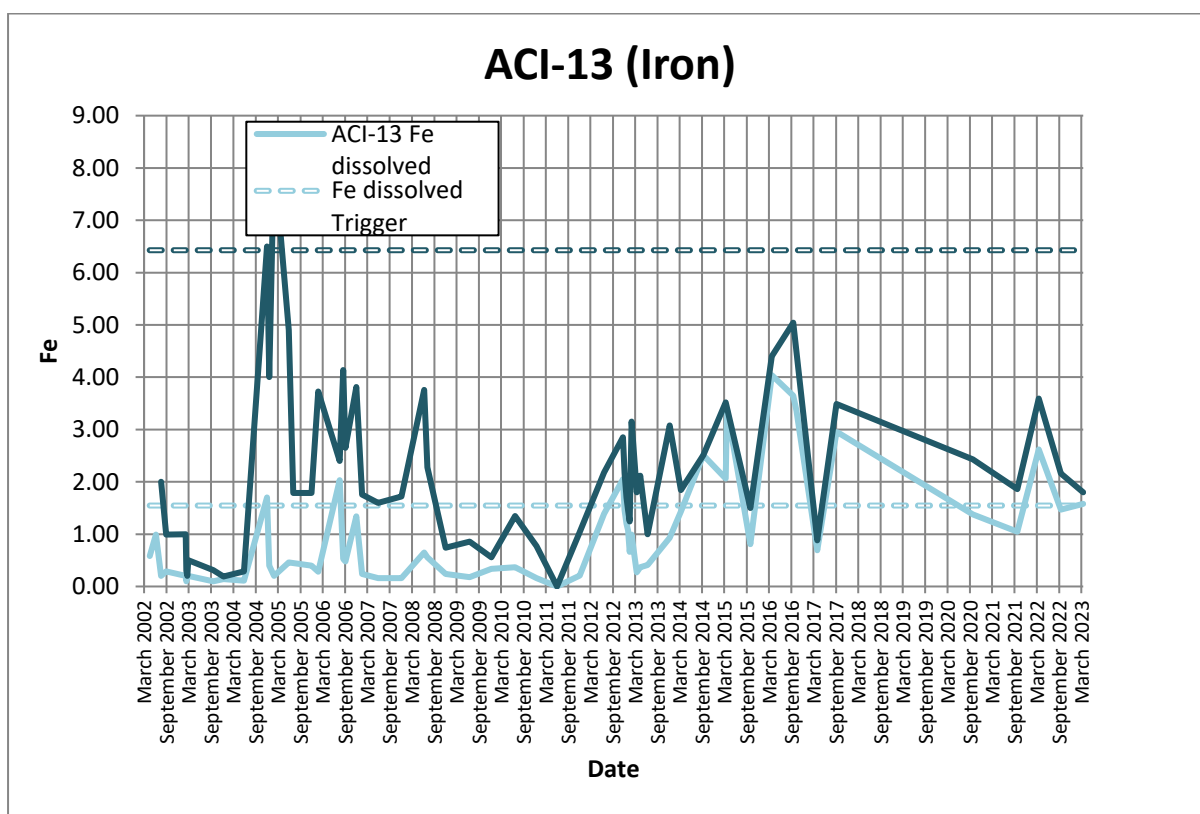


Figure 8: ACI-13 Iron Results Trend History

Groundwater quality at Northern Dune is driven by the nature of rainfall and properties of the unsaturated zone. Rainfall entering the soil zone undergoes significant changes in chemical composition and pH by processes such as root respiration and decomposition of organic matter via chemical reactions such as sorption and redox. The chemical constituency of infiltrating water in turn modifies groundwater chemistry by processes such as leaching, dilution but not concentration (which is protected against by licence conditions limiting depth to groundwater) as well as dissolution/precipitation. The effect of multiple processes on groundwater quality parameters and therefore setting Trigger Values is that water quality data is often multiple-modal (non-normal distribution) and so simple statistical analysis using mean and standard deviation may not adequately represent processes leading to water quality change. Water quality is dependent upon the nature of rainfall (ie. timing, intensity, duration...etc.) which determines whether infiltration provides a diluting effect and/or a leaching effect on ions and/or metals. Water quality can improve or deteriorate with rainfall and therefore timing of a small, limited sample set strongly influences the calculated trigger value.

The ACI-2 and ACI-13 monitoring locations have exhibited similar seasonal exceedances for Iron in previous reporting periods as detailed in reports previously provided. ACI-2 and ACI-13 have historically been used to monitor potential impacts from the Northern Dune project area, not the Northern Dune extension area. These exceedances are not related to the extension area and, consequently, have not been reported to the DPE under Project Approval MP09_0091.

It is noted that extraction activities within proximity to ACI-2 ceased in 2006, and ACI-13 in 2005 and therefore the elevated iron and manganese levels observed are unlikely to be the result of extraction activities within the NDE area.

7.1.2.1 Groundwater Quality Results Discussion and Trend Summary

Observations of groundwater quality trends over time show concentrations have fluctuated throughout the life of the project. This trend has been demonstrated by the results provided in previous annual reports provided as per the approval requirements, along with previously required bi-annual groundwater monitoring reports. This observation was also made based upon analysis of data collected during operations across the wider Tanilba Northern Dune site and presented in the trend predictions of the Environmental Assessment (EA) for the Northern Dune Extension Area.

The fluctuating trend previously identified has been continued in the current reporting period as demonstrated by the data presented in the hydrographs (Quality vs. trigger values) which demonstrate this trend over the life of the project in Appendix 8, and in the tabulated results for the current reporting period provided in Table 17.

The EA for the Northern Dunes Extension project discussed possible causes and influences of the trends observed in metal concentrations (based upon observations of the wider Northern Dune area) and predicted that:

- Peak total iron concentration seems to be attributed to the re-establishment of topsoil and regeneration which occurs after mining has ceased.
- The fluctuation of the water table (in response to rainfall) may cause enhanced mobilisation of iron from the coffee rock horizon, giving rise to potentially increased concentrations of iron.
- Localised variability of metal concentrations has been seen throughout monitoring of the wider northern dune area and appears to be impacted from well construction through localised coffee rock deposits.

Groundwater quality trends have continued as expected during the reporting period. In line with earlier predictions of the EA, measured metal concentrations are consistent with data collected across the wider Tomago Sandbeds and have generally not exceeded the natural variation within metal concentrations recorded in the wider Tomago region. This is due to operations occurring above the deep grey sands and the groundwater table (by maintaining an exclusion zone from the PMGE), which are known to liberate metals in significant quantities if disturbed. The results presented in this report do not suggest any significant disturbance during the reporting period.

8 REHABILITATION AND LANDSCAPE MANAGEMENT

Rehabilitation objectives and targets for the Tanilba Northern Dune Extension Project are described in the LMP prepared to satisfy Schedule 3, Condition 17 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091). The LMP describes management measures for the extraction (disturbed) area and, in accordance with the Project Approval, includes a Rehabilitation Management Plan (RMP) and Long-Term Management Strategy.

8.1 Rehabilitation Management

Rehabilitation at the Tanilba Northern Dunes Extension area is undertaken in conjunction with works in areas mined as part of the approvals for the wider Tanilba Northern Dune. For rehabilitation purposes, works across both approval areas have been subdivided into several blocks: The extraction area within Tanilba Northern Dunes Extension is known as Block Q.

Inspection of revegetated areas forms part of monthly site inspections to identify issues requiring management (refer to Appendix 2). The outcomes and observations of inspection are incorporated into the future works program together with any items or recommendations resulting from the annual performance monitoring program (refer to Appendix 2 **Error! Reference source not found.**).

Works undertaken within the Tanilba Northern Dunes Extension during the reporting period include:

- Supplementary planting of assorted native species undertaken over several planting events
- Weed management inspections to identify areas requiring control by spraying.

The revegetation (planting) program at the Extension site was completed during the previous reporting period (2021/22). Sibelco previously implemented a regime of weed control across the whole of the Tanilba Northern Dunes mining area which is ongoing, and Holcim maintains a continued commitment to ongoing and progressive rehabilitation. Site wide weed management of the Extension area will continue to be undertaken following the completion of planting, as will the required ongoing vegetation monitoring program, to aid in management of the rehabilitation project.

8.2 Rehabilitation Monitoring

During the previous reporting period, monitoring of the progress of rehabilitation at the Tanilba Northern Dune Extension Project area was undertaken by Kleinfelder in July 2020 and January 2021. During the current reporting period, biannual monitoring was undertaken by Wedgetail Project Consulting (WPC), conducted on 8 June 2022, in Block Q6. This marked the final Biannual Monitoring event to take place at the Northern Dune Extension. The next monitoring event will be the first of the Post 3-Year monitoring events in October 2023.

The objective of the LMP is to progressively re-establish original vegetation community types, after extraction and landform rehabilitation has been completed, to as close as possible to that of the original vegetation. This recognises that the final landform will be lower in elevation than the original topography, and Section 4.5 of the LMP therefore describes performance measures to assess the success of the rehabilitation. This section addresses compliance to the following parts of the approved LMP:

- 4.5.1 Baseline Data – sets target figures for vegetation structure and content.
- 4.5.2 Performance Indicators – provides performance indicators for each stage of the rehabilitation program.

Section 4.5.3 of the LMP provides completion criteria to be applied to each rehabilitation block at the end of the monitoring program (8 years) to determine eligibility of operational areas for release from further rehabilitation or monitoring. Rehabilitation of the Northern Dunes Extension area commenced in 2016: Section 4.5.3 is therefore not discussed in the current report.

The Tanilba Northern Dunes Extension area has been subdivided into several blocks (known as Q1 to Q6 shown in **Error! Reference source not found.**) for ease of data collection. Rehabilitation blocks are prepared and biannually surveyed after 6 months of growth for a period of 3 years. Details of each block surveyed for the 2022/23 Annual Report are provided below.

Table 18: Block preparation and survey details for the North Dune Extension Rehabilitation Blocks

Block	Prepared	First Biannual Survey Conducted	Last Biannual Survey Conducted	Comments
Q1	December 2016 - July 2017	January 2018	July 2020	5 Year Monitoring completed – October 2022 (This report)
Q2	July 2018	January 2019	July 2021	All biannual monitoring completed – First post 3 Year Monitoring event – 4 Year Monitoring completed (This report)
Q3	July 2018	January 2019	July 2021	
Q4	July 2018	January 2019	July 2021	
Q5	July 2018	January 2019	July 2021	
Q6	July 2019	January 2020	Jan 2022	

The monitoring plan has been designed in accordance with principles of the EMP and will facilitate the stated aim of the EMP (Section 7.1) to re-establish stable and sustainable native vegetation cover in-line with the original vegetation community types pre-extraction, including similar structural components and species composition at similar elevations.

Furthermore, a permanent photographic record was established within this reporting period for each permanent 20m x 20m quadrat. A photograph is taken from each corner looking into the quadrat at each survey to allow a visual assessment of the rehabilitation progression for future monitoring reports.

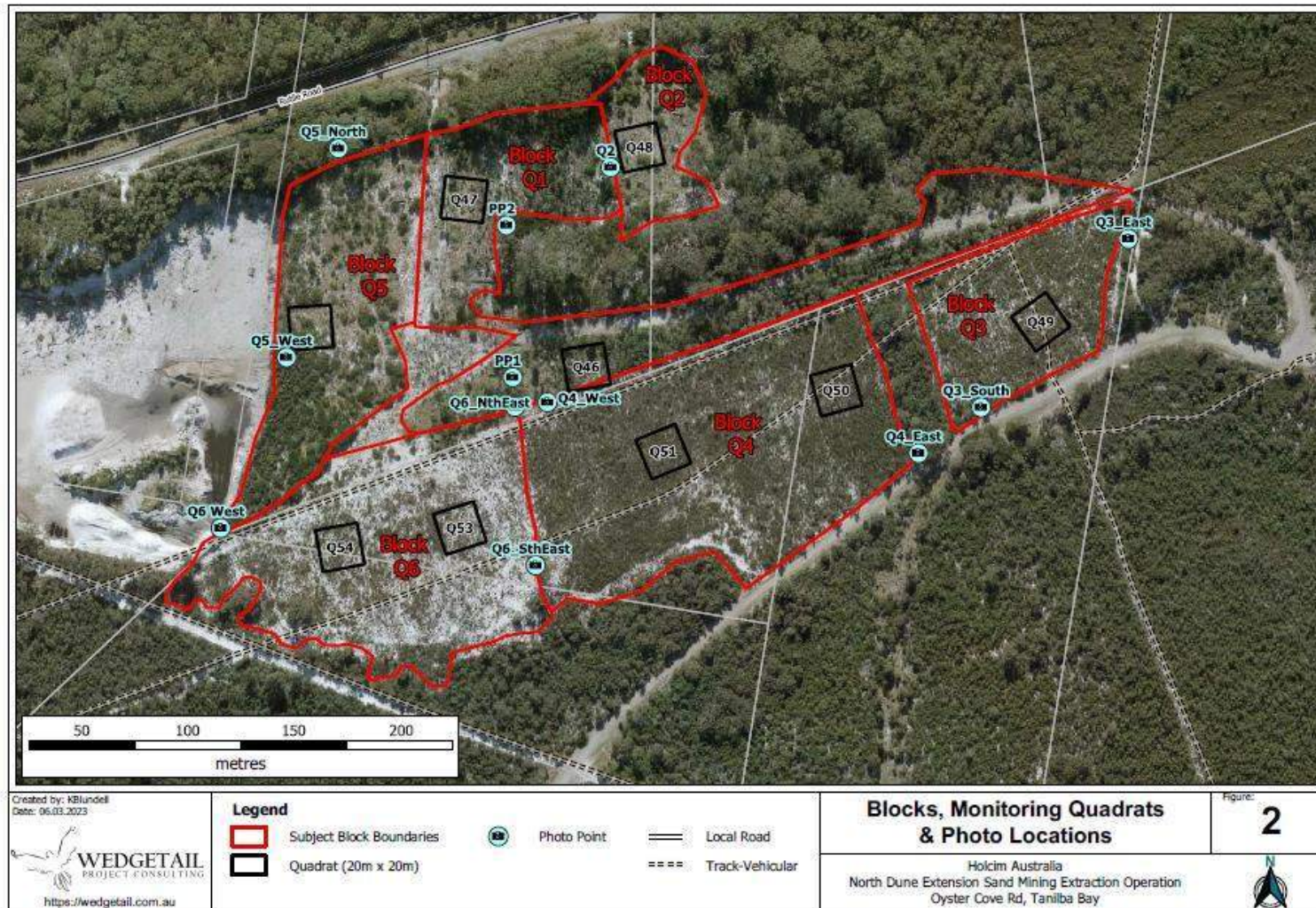


Figure 9: Locations of Blocks Q1 to Q6

A total of nine quadrats were surveyed for the purpose of the current annual report consisting of:

- 2 x quadrats (Q46 and Q47) on Block Q1,
- 1 x quadrat (Q48) on Block Q2,
- 1 x quadrat (Q49) on Block Q3,
- 2 x quadrats (Q50 and Q51) on Block Q4,
- 1 x quadrat (Q52) on Block Q5, and
- 2 x quadrats (Q53 and Q54) on Block Q6.

Each of the blocks has been established at different time intervals as per **Table 18**. Results for each of the blocks is therefore presented in summary separately below.

The full rehabilitation monitoring report is provided in Appendix 7 and includes survey results against rehabilitation and species composition targets established in the LMP. A summary of the results follows.

The Extension has been subdivided into several smaller blocks for ease of data collection. This report provides details for the monitoring of the revegetation of Blocks Q1, Q2, Q3, Q4, Q5 and Q6 for the Northern Dunes Extension.

Results show that the revegetation of the NDE can be divided into two sections with the old haul road the boundary. Sections or blocks north of the haul road have poorer revegetation than the blocks to the south of the haul road, with reasons discussed below.

Block Q1 monitoring straddles this divide and is now five years since first revegetated. Quadrat 46 (southern section) recorded 32 flora species, 29 of which were native species, below the target of 34. These consisted of four overstorey, two native midstorey, 23 native shrub species and six native ground stratum species. Plot data for this quadrat shows that almost all parameters have decreased since the previous survey, however this is attributed to a controlled burn that occurred on the day of the survey in June 2022, with many plants destroyed. Positively, there has been a reduction in the number of exotic species, including the grassy weed *Eragrostis curvula*. This area has sections of better and poorer revegetation, in the eastern and western sections respectively, and requires ongoing weed control efforts. The next monitoring round will determine the extent of recovery for this area.

Quadrat 47 located in the northern section of Block Q1 recorded a total of 31 flora species, of which only 16 were native, and were installed species, reflecting the amount of revegetation that has had to be undertaken due to extensive cover of *E. curvula*. This species has recovered despite revegetation efforts. Similarly, *Lantana camara* was also recorded and requires weed control due to the possibility of becoming a threat to the revegetation effort, together with a seeding program of native species to improve diversity. Noting this, however, the planted key species have survived quite well, with many individuals being quite large (heights up to 3.5m) and continuing to increase in size.

The paucity of shrub species highlights the lack of natives in this area of the NDE. The area surrounding Quadrat 47 had been the subject of significant previous weed control efforts by Holcim which included burning of the dominant weeds, African Lovegrass, scalping of the topsoil to remove the seed bank and replanting. Quadrat 47, which is north of the haul road, and is an area of poorer revegetation where native plant densities and diversity do not meet targets. This area was subject to removal of most of the vegetation by a controlled burn and topsoil scraping to reduce the prevalence of *E. curvula*.

Similarly **Block Q2** recorded few native species, with a large percentage of the flora being exotic species, to the point where several of the monitoring plots recorded only exotic species. 11 exotic species were recorded, and all seven key species were recorded, however with low cover-abundance scores. Usually, the early coloniser native species are in much higher numbers with higher CA scores in similarly revegetated blocks. Native species diversity is the major concern with this block, with 21 being well below targets. This block is below target for all growth parameters, with low species per plot, and the stratum proportions totally unbalanced due to the preponderance of exotic species and numbers of plants, with much of the groundcover being aggressive exotics. The majority of the native species in this block were the planted key species. Quadrat 48 has increased in cover and average height since the 3-Year monitoring, but overall is making little progress. Natural recruitment will be slow until the planted overstorey species achieve sufficient height to be shading these species out. Ongoing weed control could be continued to be utilised to suppress the weed species, coupled with a seeding program of native shrubs to increase diversity.

Block Q3 is monitored by Quadrat Q49 and represents excellent revegetation with continued increases with all parameters. Growth parameters – height and cover – have increased further, while species richness parameters are above targets. Stratum proportions, while not at target, are trending in the right directions. Target species numbers have improved, with *L. polygalifolium* being recorded for the first time in the quadrat, having not been recorded in this block for several surveys. While not all key species were recorded in the 4m² plots, all key species were recorded in the quadrat. Above target species diversity in the quadrat has been recorded, with on target diversity in the 2m x 2m plots. High CA scores for a number of species indicates good native coverage, these included early succession species, along with an abundance of flowering plants. Only a single weed species was recorded in the quadrat, *L. laevigatum*. It is also noted that while two key species are below target in numbers, it is not recommended to undertake in-fill planting as it may cause more damage to the existing vegetation in their present state. A short-term option may be to perform seed collection from adjacent areas and spreading. In the longer term, in-fill planting could be undertaken when the early succession species begin to die back.

Block Q4 has two monitoring quadrats, Q50 and Q51, and is five years since first being revegetated. Both quadrats are progressing well with excellent growth, most of the parameters at or above target, resulting good results across the averages. A particular feature of the re-planting effort has been the high numbers of *E. robusta* that have successfully established. Weed species within the block are limited to small native species individuals, being *L. laevigatum* and *M. quinquenervia* being still at seedlings stage, and not considered native to this vegetation community. *E. curvula* was observed to be encroaching from the adjacent block (Block 1). It is recommended that this grass needs control measures before it becomes established and interferes with the good progress that has been achieved to date.

Q50 has seen increased average cover and height, and above target native species diversity. All key species were recorded with excellent numbers and increasing CA scores, while still being dominated by early succession species, with the most abundant being *D. retorta*. Numbers of plants per plot is below target, however it is advised that achievement of analogue density requires further development, rather than a shortfall in the ongoing revegetation effort. No exotic species were recorded in the quadrat.

Q51 has almost identical results to Q50, recording excellent and improving growth parameters, with the only unimproved parameter being the average number of plants per 4m² plot. Again, this section of the block is dominated by early succession species, with three later succession species recorded with good CA scores (all 3), being *Leptomeria acida*, *Leucopogon ericoides* and *Monotoca elliptica*.

Block Q5 to the west of the NDE is in poor rehabilitation condition and is monitored by quadrat Q52. A very low number of 19 native species, and six exotic or weed species were recorded. The dominant

species in the quadrat were *L. laevigatum*, *E. curvula*, and *A. longifolia*, all with high CA scores. Two native species were present in good numbers and/or size, with remaining natives recorded in small numbers and CA scores. While average height and cover have increased for the last biannual monitoring event, all other parameters have decreased and remain below targets. There is a high proportion of ground stratum species, attributable to the prevalence of weedy grasses within the block. There is quite dense shrubby midstorey vegetation in the southern end of the block which thins out and becomes weedier at the northern end. This denser vegetation is largely composed of *A. longifolia*, *A. falcata* and *Dodonaea triquetra* with *L. laevigatum*. In the next 2-3 years the two *Acacia* species and *D. triquetra* will start to die back, leaving this block with less native vegetation cover than at present. They will have seeded during that time but will require a disturbance such as fire to stimulate a string germination response to dominate the block and help suppress weed species once again.

Block Q6 is the youngest of the rehabilitated areas, apart from the reworked area of Block 1, and is another rehabilitation block with excellent growth parameters, where all seven key species were recorded in good numbers in both monitoring quadrats, Q53 and Q54, including *E. robusta*. The domination of *D. retorta* will need to be monitored to ensure that this species has not prevented other species establishing in sufficient numbers. While no weed or exotic species were recorded in the quadrats, the exotic ground cover *Acanthium australe* and the grass *E. curvula* were observed in the northern section of this block, adjacent to Block Q5. Weed control in this area is the only recommendation for this block.

Q53 growth parameters are a little contradictory with average height remaining largely unchanged and average cover declining slightly from the last biannual monitoring event, whereas the total native species diversity is above target for both the whole quadrat and the average for the plots, with the average number of plants per 4m² on target. The quadrat is still dominated by early succession species with *D. retorta* the most common species with a CA score of 4. There is also indication of relatively few and/or young plants for the remaining native species, all with CA scores of 1 or 2.

Q54 recorded some very good growth parameters with 41 native species, above target average species richness per 4m² plot and average plant numbers per 4m² right on target. However, similar to Q53, the average cover and height has remained unchanged or decreased slightly from the last biannual monitoring. All seven key species plus *E. robusta* were recorded in the quadrat, albeit with low CA scores. *D. retorta* was even more dominant than Q53, with a CA score of 5. *C. recurvata* was the only other species to record a CA over 3, with the remaining 39 species all recording CA scores of 1 or 2, again indicating a combination of small plants and/or few numbers.

Discussion

It is apparent that the revegetation of the North Dunes Extension is divided into two sections. The “southern” blocks, Blocks Q3, Q4 and Q6 have excellent revegetation with good diversity, numbers, and coverage. This is supported by the growth parameters outlined above and highlighted in the charts appended to the monitoring report (Appendix 3). Chart 3 shows the average species richness per 4m² in the monitoring quadrats, with the southern blocks clearly much higher. Likewise, Chart 6 and Chart 7 show the proportion of ground stratum and shrub stratum species respectively. Again, these two charts split the blocks quite distinctly.

The likely explanation is the source topsoil that was used for the revegetation of these areas. The topsoil in the southern blocks was better vegetated with native species while the topsoil used in the northern blocks was of lower diversity. This is supported by the shrub stratum numbers and proportions. These species are not seeded at all as part of the revegetation effort but germinate from the topsoil, thus indicating that this was the case.

The higher proportion of ground stratum species recorded in the northern blocks are overwhelmingly weed species. Native ground stratum species have consistently been under target – this has been

apparent all through the revegetation in the NDE and on the North Dunes adjacent to this site which has been revegetated for over 15 years in the oldest sections. With the weed control efforts in Block Q1 and previously in Block Q2, most of the native species recorded were planted key species. Much of the remaining native diversity in these blocks was observed around the transplanted *X. glauca*, i.e., having germinated from the soil included in the transplanted stems.

From the above discussion, it indicates that the majority of positive observations relate mainly to the southern blocks. For instance, litter development is beginning to be apparent, especially under the overstorey trees or where dense *D. retorta* has dropped leaves and seed pods such as Block Q1 (southern section) and Blocks Q3 and Q4. The weedier northern blocks do not yet have that litter build up, and of course where controlled burns have occurred what litter had accumulated has been burned off.

The long-term establishment of successful revegetation requires the ability of self-recruitment and to this end a total of 64 native species were recorded across the NDE – 49 of which were recorded with reproductive features – fruit, flowers or seedlings. This is good a result and included overstorey species with fruit in Block Q1 – the oldest revegetation.

Weed species were much concentrated in the northern blocks, with the western most section of Block Q1 also an area of concern (hence the weed control burns in this section). Blocks Q3 and Q4 only had weed species observed at their edges, with no weed species recorded in the monitoring quadrats themselves. Block Q4, has *E. curvula* starting to encroach from Block Q1. Block Q6 has some minor encroachment Block Q5, but also has an on-going issue with *Acanthospermum australe*, a prostrate (ground-spreading), ground stratum weed species native to North America characteristic of disturbed sites and wasteland. Previous weed control efforts have reduced, but not eliminated this species in this area.

Key species plantings have been very successful in all blocks with overstorey species including *Eucalyptus robustus* generally in good numbers. The only exception is Block Q3 where a distinct lack of the midstorey species *Leptospermum polygalifolium* has been noted previously and is probably reducing the average height growth parameter in this section of the rehabilitation.

Recommendations

Increasing the native diversity of the northern blocks has been recommended as a priority to facilitate the land surrender. This would entail further weed control efforts but also a concerted seeding campaign with shrub species. Seed could be collected from the adjoining undisturbed vegetation – not from the better rehabilitation areas so as not to hinder their continued development – and applied to the blocks. This will likely require several rounds of control and seeding to achieve the desired results. Species that might be readily collected include but should not be limited to, *Dillwynia retorta*, *Hibbertia linearis*, *Leptospermum trinervium*, *Leucopogon ericoides*, *Acacia ulicifolia* and any of the three *Bossiaea*s found on site.

Planting of *L. polygalifolium* in Block Q3 would also be beneficial to improve vegetation structure and achieve key species targets in this area but may have to wait until the dense pioneer species begin to die back and open some space for ease of movement.

Weed control efforts should be on-going and frequent to bring the problematic weeds under control and to prevent these species spreading into the very good revegetation areas of the southern blocks. Targeted weeds are the very common *E. curvula*, *L. camara* and *A. australe*.

In summary, the NDE rehabilitation has both excellent and poorer areas of native revegetation. The excellent areas – Blocks Q3, Q4 and Q6 and the southern section of Block Q1 – only require some minor planting and on-going weed control along the edges to stop the spread of *E. curvula*. The northern blocks require additional work, weed control and seeding with native shrubs, to improve their flora diversity and numbers.

8.3 Weeds

As has been reported previously weeds are a major problem for the Northern Dune Extension. Weeds encroach into blocks Q3, Q4 and Q6 from the adjoining haul roads and weed infested areas adjacent to the site. The northern section of block Q1, the whole of Q2 and Q5 are heavily weed infested.

It should be noted that Holcim has undertaken several weed control measures in the period covered by this report including hand pulling, cut and paint, and herbicide application in Blocks Q1, Q2, Q3, Q5 and Q6. Weed control operations were undertaken between March and May 2022.

8.4 Plantings

Some additional planting occurred within the NDE area during the reporting period. Planting was previously performed up to December 2020 and is continuing to establish (see Section 8.2). On 20 October 2022, in conjunction with the haul road removal works, 450 trees were planted within Block Q1 and Block Q6.

8.5 Performance Indicators

At each stage of monitoring, rehabilitation is compared to the performance indicators outlined in Table 11 of the LMP. Those relevant to the rehabilitation stages of the Tanilba Northern Dunes Extension area (years 1 to 3) are summarised below in

Table 19. Performance indicators are relevant to age of each rehabilitation quadrat. As such, performance indicators not relevant to each quadrat in

Table 19 are listed as 'NA – Not Applicable'. If rehabilitation areas do not meet these performance indicators, specific management measures are required to be outlined in the AR (Section 8.6).

Table 19: Performance Indicators for Tanilba Northern Dune Extension rehabilitation

Year	Aims for Each Strategic Ecosystem Development Stage	Performance Indicators	Compliance						
			Q1 (Sth Haul Rd)	Q1 Nth Haul Rd)	Q2	Q3	Q4	Q5	Q6
1	Monitoring will be on a bi-annual basis until achieving the early pioneer stage, with the following features: Topsoil stabilized by primary colonizers (eg. acacias & pea species); Key species present and densities increasing towards target numbers. No significant erosion problems; and Weed and pest control program in place as outlined in sections 4.3.4 and 4.3.7.	Early pioneer stage appearing: Small seedlings (< 5 cm) regenerating from topsoil, < 5% surface cover; At least 25 transplanted mature Grass Trees per hectare; Brush-matting evident. Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	NA	NA	NA	NA	NA	NA	NA
2		Natural regeneration of pioneer species covering 20% of ground surface, average 20 cm tall; Seedlings developing under brush-matting; Planted trees and shrubs in predetermined numbers according to revegetation strategy, 20 - 30 cm tall; No significant erosion problems; Noxious or significant environmental weeds control programme in place; and Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	NA	NA	NA	NA	NA	NA	NA
3		All structural species present in predetermined density, 30 - 90 cm tall;	NA	NA	N	Y	Y	N	P

Year	Aims for Each Strategic Ecosystem Development Stage	Performance Indicators	Compliance						
			Q1 (Sth Haul Rd)	Q1 Nth Haul Rd)	Q2	Q3	Q4	Q5	Q6
		Shrub layer and ground cover strata evident;	NA	NA	N	Y	Y	N	Y
		Natural regeneration covering 40 – 60% of surface, average 50 – 80 cm tall;	NA	NA	N	Y	Y	Y	Y
		No significant erosion problems;	NA	NA	Y	Y	Y	Y	Y
		Weed control programme in place and weeds successfully controlled;	NA	NA	N	Y	Y	N	N
		Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	NA	NA	Y	Y	Y	Y	Y
4	Single annual monitoring event to determine development of mature pioneer stage characterised by: Gradual dieback of some primary <u>colonizers</u> ; Appearance of mature vegetation <u>species</u> ; Key species present at target densities, or showing increase towards target <u>numbers</u> ; Beginning of differentiation of	Structural species in predetermined density, average 1 m tall;	Y	Y	NA	NA	NA	NA	NA
		Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	Y	Y	NA	NA	NA	NA	NA
		Mature pioneer stage evident; cover 60 - 80%, average 80 cm;	Y	N	NA	NA	NA	NA	NA
		No significant erosion problems;	Y	Y	NA	NA	NA	NA	NA
		Weed control programme in place and weeds successfully controlled; an	N	N	NA	NA	NA	NA	NA

Year	Aims for Each Strategic Ecosystem Development Stage	Performance Indicators	Compliance						
			Q1 (Sth Haul Rd)	Q1 Nth Haul Rd)	Q2	Q3	Q4	Q5	Q6
5	structural layers (canopy, sub-canopy, shrub layer); No significant erosion problems; and Weed and pest control program in place as outlined in sections 4.3.4 and 4.3.7.	Decline in pioneer community, coinciding with emergence in canopy <u>species</u> ; Canopy layer emerging above shrub <u>layer</u> ; No significant erosion <u>problems</u> ; Weed control programme in place and weeds successfully controlled; and Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	NA	NA	NA	NA	NA	NA	NA
8*	Single monitoring event to determine development of early stages of mature vegetation assemblage characterised by: Increase in dominant shrub and tree <u>species</u> ; Development of structural layers; and Species composition <u>similar to pre-mining</u> .	<u>Overstorey and midstorey species increasing in height and percentage cover</u> ; <u>Overstorey and midstorey species density stable</u> ; Key overstorey and <u>midstorey species present at densities comparable to pre-mining at similar elevations</u> ; Increase in differentiation of structural layers, including litter; and Overstorey layer evident above shrub layer. Rehabilitation area will be (as far as reasonably practicable) free from rubbish.	NA	NA	NA	NA	NA	NA	NA
*Note – <u>in the event that rehabilitation has not yet achieved the completion criteria by year 8, 3-yearly monitoring and weed and pest control (as outlined in sections 4.3.4 and 4.3.7) will continue until rehabilitation achieves the completion criteria to the satisfaction of the Planning Secretary.</u>			-	-	-	-	-	-	-

8.6 Rehabilitation Actions

Weed control activities have been recommended to be substantially increased. Works need to be conducted regularly and frequently to break seed set cycles and to reduce overall weed densities. Weed control works, in the first instance should commence with the less dense areas and weeds encroaching into Blocks Q3, Q4 and Q6 to keep these blocks in their present excellent condition.

Weed works should proceed to the visual screen along Rutil Rd and remove the Lantana, *L. laevigatum*, and Slash Pine starting to encroach from the NDE Offsets, and other grassy weeds.

The northern blocks then require intense weed control efforts that should include but not be limited to spot spraying and hand removal of individual plants. These blocks could be progressively weeded in such fashion with intense seeding and/or planting of natives to follow up.

To maximise the weed control efforts, seed collection of native species is required. This seed collection and brush matting should incorporate collection of as wide a range of species as is possible.

An additional revegetation strategy for these northern blocks would be to seed with a high density of native grasses. There are 10 species of native grasses that have been identified during surveys of the various sand extraction projects and while they are usually found occurring in low densities between a dense shrub layer in the heath communities, this approach would at least introduce native species and provide a level of competition with exotic species and help suppress their spread.

9 COMMUNITY

9.1 Community Engagement Activities

Schedule 5, Clause 9 of the project approval requires specific information to be made available on the proponent's website.

Holcim provides information on operations at the Tanilba Northern Dune Extension Project to the public via its website. This includes a copy of approved strategies, management plans, monitoring data, approvals and annual reviews. This AR will be made available on Holcim's website once accepted.

9.2 Complaints

Holcim maintained a community complaint register that was updated quarterly throughout the reporting period to include any new community complaints.

There were no community complaints received during the reporting period.

10 INDEPENDENT AUDIT

Schedule 5 Clause 7 requires an Independent Environmental Audit (IEA) to be commissioned within one month of the completion of quarrying operations. As such an IEA was performed on 7 August 2019. No further IEA was required during the reporting period.

11 INCIDENTS AND NON-COMPLIANCE

Schedule 5 Clause 5 requires reporting of any incident associated with the project as soon as practicable after Holcim becomes aware of the incident. This includes circumstances that cause or threaten to cause material harm to the environment and / or breaches or exceeds the limits of performance measures/criteria in approval MP 09_0091.

No incidents or non-compliances were recorded during this AR period.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Along with the improvements discussed throughout this document, Holcim will undertake the following activities in the next reporting period (April 1 2023 – March 31 2024) to ensure compliance with the consent and to ensure that effective environmental management controls are in place and operating in accordance with the requirements of the Consent.

Table 20: Proposed works – 2023/24

Item	Requirement	2023-2024 program	Due Date
OPERATIONS/ADMINISTRATION			
1	Site condition	Inspection of site for identification of maintenance requirements including condition of roadside drainage and rehabilitated areas.	Monthly
2	S5, CI 3	Annual Review	Prepare and submit AR to DPE on activities undertaken in the 2023-2024 reporting period.
3	S5 CI 2	Performance review	Monitoring requirements will be reviewed to ensure all future monitoring and reporting following closure is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC.
GROUNDWATER			
4	Groundwater Level Monitoring	Monitor bores as per approved GMP.	Monthly (weekly for 4 weeks if >100 mm rain per 7 days)
5	Groundwater quality Monitoring	Third Party contractor to monitor bores as per approved GMP.	As per GMP.
6	GMP Review	The GMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC.	Following submission of AR.
7	Reporting	The results of the groundwater level and quality monitoring will be reported as per the GMP. Reporting frequency will be determined during the review of the GMP following consultation with DPI-Water and HWC.	Frequency determined following GMP review and consultation with DPI-Water and HWC.
Item Requirement 20232024 program Due Date			
S5, CI 17 - FORMER EXTRACTION AREA (LMP)			
8		Supplementary planting as required following the inspections and biannual monitoring.	As required
9	LMP 4.3.9	Weed management	Site wide weed control
10		Maintenance	Follow up inspections to identify and manage regrowth across all rehabilitated areas.
11	LMP 4.3.6	Performance monitoring	Implement recommendations in Annual Vegetation Rehabilitation Monitoring Report (Kleinfelder 2021).

12			Monitoring of rehabilitated areas to assess performance against the requirements of the BMP.	Biannual
13			Prepare report to summarise results of rehabilitation program, identify trends and any management measures required to achieve objectives of rehabilitation program.	April 2024
14	S5 CI 2	LMP Review	The LMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC.	Following submission of AR.
S3, CI15 - OFFSET AREAS (BMP)				
16	BMP 5.1.4	Fauna survey program	Targeted monitoring across all offset areas for Wallum Froglet to detect changes in recruitment success and assess impacts.	In accordance with seasonal survey requirements.
17	BMP 5.1.4, 5.2		Targeted monitoring across all offset areas for <i>Uperoleia sp nov</i> to identify habitat preferences of spp.	In accordance with seasonal survey requirements.
18	BMP 5.2		Monitoring to determine if Koala is utilising areas determined as Preferred Koala Habitat (Swamp Mahogany – Paperbark Swamp Forest) and Supplementary Habitat (Coastal Sand Apple – Blackbutt Forest) within the offset areas.	
19	5.1.5 of BMP	Vegetation management and monitoring program	Habitat restoration and rehabilitation program for proposed offset area in Lots 11, 12 and 13:	Annual
20			<ul style="list-style-type: none"> Inspection to identify areas requiring weed and pest control 	Annual
21			<ul style="list-style-type: none"> Weed and pest management Rehabilitation of the regenerating Grassland-Heath 	Annual
Item	Requirement		2020-2021 program	Due Date
22	BMP 5.1.7		<ul style="list-style-type: none"> Supplementary planting of <i>E robusta</i> within offset area to expand availability of habitat for Koala. 	During rehab program.
23	BMP 5.2		<ul style="list-style-type: none"> Monitoring of the offset area to ensure vegetation and habitat qualities are being maintained. 	
24	S5 CI 2	BMP Review	The BMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC.	Following submission of AR.
COMMUNITY				
25	S5, CI9	Information Access	Upload the Annual Review for 2022-2023 to the company website when approved.	N/A
26		Complaints Register	Maintain and update.	Quarterly

13 APPENDICES

APPENDIX 1
Project Approval MP-09-0091

Project Approval

Section 75J of the *Environmental Planning and Assessment Act 1979*

As delegate for the Minister of Planning, I approve the project application referred to in schedule 1, subject to the conditions in schedules 2 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the project.



Chris Wilson
Executive Director
Development Assessment Systems & Approvals

Sydney **8 MARCH** 2013

SCHEDULE 1

Project Application:	09_0091
Proponent:	Sibelco Australia Limited
Approval Authority:	Minister for Planning and Infrastructure
Land:	Lots 11, 12, 13 DP601306; Lot 408 DP1041934; and Lots 1, 2 DP408240.
Project:	Tanilba Northern Dune Extension Project

TABLE OF CONTENTS

DEFINITIONS	3
ADMINISTRATIVE CONDITIONS	4
Obligation to Minimise Harm to the Environment	4
Terms of Approval	4
Limits on Approval	4
Staged Submission of any Strategy, Plan or Program	4
Protection of Public Infrastructure	4
Operation of Plant and Equipment	5
ENVIRONMENTAL PERFORMANCE CONDITIONS	6
Identification of Boundaries	6
Noise	6
Air Quality	7
Soil and Water	7
Biodiversity	8
Rehabilitation and Landscaping	8
Aboriginal Cultural Heritage	10
Traffic and Transportation	10
Visual	11
Waste Management	11
Emergency and Hazards Management	11
Production Data	11
ADDITIONAL PROCEDURES	12
Notification of Landowners	12
Independent Review	12
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING	13
Environmental Management	13
Reporting	14
Auditing	14
Access to Information	15
APPENDIX 1: PROJECT SITE	16
APPENDIX 2: NOISE RECEIVER LOCATIONS	17
APPENDIX 3: STATEMENT OF COMMITMENTS	18
APPENDIX 4: BIODIVERSITY OFFSET STRATEGY	21

DEFINITIONS

Annual Review	The review required by condition 3 of schedule 5
Biodiversity Offset Strategy	The conservation and management of the Proponent's offset sites on the Tilligerry Peninsula, being Lots 11, 12, 13 DP601306 and Lot 24 DP579700
Conditions of this approval	Conditions contained in schedules 2 to 5 inclusive
Council	Port Stephens Council
Day	The period from 7.00am to 6.00pm, Monday to Saturday
Department	Department of Planning and Infrastructure
Director-General	Director-General of the Department of Planning and Infrastructure, or nominee
DRE	Division of Resources and Energy (within the Department of Trade and Investment, Regional Infrastructure and Services)
DST	Daylight Savings Time
EA	Environmental Assessment of the project titled <i>Tanilba Northern Dune Extraction Extension - Environmental Assessment Report</i> prepared by ERM Australia Pty Limited, dated June 2012 and the Proponent's response to the issues raised in submissions, dated November 2012
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPL	Environment Protection Licence under the <i>Protection of the Environment Operations Act 1997 (POEO Act)</i>
EST	Eastern Standard Time
Feasible	Feasible relates to engineering considerations and what is practical to build
HWC	Hunter Water Corporation
Incident	A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in this approval
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
m AHD	metres Australian Height Datum
Material harm to the environment	Material harm to the environment as defined in the <i>Protection of the Environment Operations Act 1997</i>
Minister	Minister for Planning and Infrastructure, or nominee
NOW	NSW Office of Water (within the Department of Primary Industries)
OEH	Office of Environment and Heritage (within the Department of Premier and Cabinet)
Privately-owned land	Land that is not owned by a public agency or a quarrying company (or its subsidiary)
Project	The development as described in the EA
Proponent	Sibelco Australia Limited, or its successors in title
Quarrying operations	The extraction, processing and transportation of extractive materials on the site and the associated removal of vegetation, topsoil and overburden
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Rehabilitation	The treatment or management of land disturbed by the project for the purpose of establishing a safe, stable and non-polluting environment
RMS	NSW Roads and Maritime Services
Statement of Commitments	The Proponent's commitments in Appendix 3
Site	Land to which the Project Approval applies, as listed in schedule 1 and shown in Appendix 1

SCHEDULE 2 ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation or rehabilitation of the project.

Terms of Approval

2. The Proponent shall carry out the project generally in accordance with the:
 - (a) EA;
 - (b) Statement of Commitments; and
 - (c) conditions of this approval.

Note: The general layout of the project is shown in the figure in Appendix 1.

3. If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.
4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
 - (a) any reports, plans, programs or correspondence that are submitted in accordance with this approval; and
 - (b) the implementation of any actions or measures contained in these reports, plans, programs or correspondence.

Limits on Approval

5. The Proponent may carry out quarrying operations on the site until 31 December 2020.

Note: Under this Approval, the Proponent is required to rehabilitate and revegetate the site and provide and implement a Biodiversity Offset Strategy to the satisfaction of the Director-General. Consequently this approval will continue to apply in all other respects other than the right to conduct quarrying operations until the site has been rehabilitated and revegetated and the Biodiversity Offset Strategy implemented to a satisfactory standard.

6. The Proponent shall not transport more than 150,000 tonnes of extractive materials from the site in any calendar year.
7. The Proponent shall ensure that no more than three hectares of the site would be exposed (ie cleared but not re-vegetated) at any one time.

Staged Submission of any Strategy, Plan or Program

8. With the approval of the Director-General, the Proponent may submit any strategy, plan or program required by this approval on a progressive basis.

Protection of Public Infrastructure

9. The Proponent shall:
 - (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the project; and
 - (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the project.

Operation of Plant and Equipment

10. The Proponent shall ensure that all plant and equipment used at the site, or to transport extractive materials from the site, is:
 - (a) maintained in a proper and efficient condition; and
 - (b) operated in a proper and efficient manner.

Section 94 Contributions

11. For the life of quarrying operations under the project, the Proponent shall pay Council a Section 94 contribution rate in accordance with the *Port Stephens Section 94 Development Contributions Plan 2007*.

Notification of Commencement

12. The Proponent shall notify the Department of its intention to commence quarrying operations at least two weeks prior to the commencement of quarrying operations.

**SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS**

IDENTIFICATION OF BOUNDARIES

1. Prior to the commencement of quarrying operations, the Proponent shall:
 - (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction; and
 - (b) ensure that these boundaries are clearly marked at all times in a permanent manner that allows operating staff and inspecting officers to clearly identify those limits.

NOISE

Impact Assessment Criteria

2. The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise impact assessment criteria

Receiver	$L_{Aeq (15 min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Notes:

- Receiver locations are shown in the Figure in Appendix 2; and
- Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.

Hours of Operation

3. The Proponent shall only conduct quarrying operations on the site:
 - (a) between 7.00 am and 6.00 pm EST, Monday to Friday;
 - (b) between 7.00 am and 7.00 pm DST, Monday to Friday; and
 - (c) at no time on Saturday, Sunday or public holidays.

Operating Conditions

4. The Proponent shall:
 - (a) implement best practice noise management to minimise the construction, operational and traffic noise of the project;
 - (b) maintain the effectiveness of any noise suppression equipment on site at all times and ensure defective equipment is not used operationally until fully repaired; and
 - (c) conduct extraction activities in a south to north direction so that the topography shields the sensitive receivers,
to the satisfaction of the Director-General.

Noise Monitoring Program

5. The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
 - (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
 - (b) include quarterly attended noise monitoring during at least the first two years of quarrying operations, to be conducted on days when at least 30 truck dispatches occur from the site; and
 - (c) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the noise criteria in this approval.

AIR QUALITY

Impact Assessment Criteria

6. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land.

Table 2: Long term criteria for particulate matter

Pollutant	Averaging Period	^d Criterion
Total suspended particulate (TSP) matter	Annual	^a 90 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	^a 30 µg/m ³

Table 3: Short term criterion for particulate matter

Pollutant	Averaging Period	^d Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	^a 50 µg/m ³

Table 4: Long term criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
^c Deposited dust	Annual	^b 2 g/m ² /month	^a 4 g/m ² /month

Notes to Tables 2 to 4:

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

Dust Management

7. The Proponent shall:
- implement best management practice to minimise the dust emissions of the project;
 - regularly assess air quality monitoring data and relocate, modify, and/or stop operations on site as may be required to ensure compliance with the relevant conditions of this approval;
 - minimise any visible off-site air pollution; and
 - minimise surface disturbance of the site, other than as permitted under this approval.

Dust Monitoring Program

8. The Proponent shall prepare and implement a Dust Monitoring Program for the project to the satisfaction of the Director-General. This program must:
- be submitted to the Director-General for approval prior to commencing quarrying operations;
 - include a program for the use of a water tanker on unsealed roads;
 - include details of how the air quality performance of the project would be monitored, and a protocol for evaluating compliance with the relevant air quality criteria in this approval.

SOIL AND WATER

Pollution of Waters

9. Except as may be expressly provided for by an EPL, the Proponent shall comply with section 120 of the *Protection of the Environment Operations Act 1997* in carrying out the project.

Management and Monitoring

10. The Proponent shall not extract sand or other extractive materials or carry out any work in the extraction area below a level of 0.7 m above the predicted maximum groundwater elevation (see condition 14 of schedule 3), other than the construction of any bores approved by NOW.
11. The Proponent shall ensure that the final landform of the extraction area must be at least 1 metre above the predicted maximum groundwater elevation.
12. The Proponent shall prepare and implement a Soil and Water Management Plan for the project to the satisfaction of the Director-General. This plan must:
 - (a) be prepared:
 - by suitably qualified person(s), approved by the Director-General; and
 - in consultation with HWC and NOW;
 - (b) include a(n):
 - Erosion and Sediment Control Plan; and
 - Groundwater Monitoring Program; and
 - (c) be submitted to the Director-General for approval prior to commencing quarrying operations.
13. The Erosion and Sediment Control Plan shall:
 - (a) be consistent with the requirements of *Managing Urban Stormwater, Soils and Construction Volume 2E Mines and Quarries*, (DECC 2008), or the latest edition;
 - (b) identify activities that could cause soil erosion and generate sediment;
 - (c) describe measures to minimise soil erosion and the potential for the transport of sediment off site;
 - (d) describe the location, function, and capacity of erosion and sediment control structures; and
 - (e) describe what measures would be implemented to maintain these structures over time.
14. The Ground Water Monitoring Program shall include:
 - (a) detailed baseline data on groundwater levels and quality, based on statistical analysis;
 - (b) groundwater impact assessment criteria;
 - (c) a program to monitor groundwater levels and quality;
 - (d) a protocol for the investigation, notification and mitigation of any identified exceedances of the groundwater impact assessment criteria;
 - (e) the outcome of groundwater modelling to establish the predicted maximum groundwater elevation for the site;
 - (f) a program to monitor any impacts of the project on groundwater dependent ecosystems, and
 - (g) a contingency plan to manage any acid sulfate soils and potentially acid sulfate soils encountered during quarrying operations.

BIODIVERSITY

Biodiversity Management Plan

15. The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General. This plan must:
 - (a) be prepared:
 - by suitably qualified person(s), approved by the Director-General; and
 - in consultation with Council and OEH;
 - (b) be submitted to the Director-General for approval prior to commencing quarrying operations;
 - (c) address both the project site and the offset areas;
 - (d) provide for the retention of hollow-bearing trees, wherever practicable;
 - (e) ensure the establishment and on-going monitoring (at least 6 years) of at least 2 nest boxes for each tree hollow removed during clearing;
 - (f) include a program to undertake targeted surveys for the novel *Uperoleia sp.*;

- (g) identify any areas within the offset areas requiring rehabilitation and/or re-vegetation and implement a program for this;
- (h) include a detailed description of the measures that would be implemented, including the procedures to be implemented for:
 - enhancing the quality of existing vegetation, fauna habitat and wildlife corridors;
 - landscaping the site to minimise any visual impacts of the project;
 - maximising the salvage of resources within the approved disturbance area – including vegetative, soil and cultural heritage resources – for beneficial reuse in the offset areas and/or rehabilitation areas;
 - minimising the impacts of the project on fauna, including undertaking pre-clearance surveys and minimising the use of insecticides, herbicides, pesticides and biocides;
 - controlling weeds and feral pests;
 - maintenance of a buffer zone at the northern edge of the extraction area;
 - controlling access;
 - minimising edge effects; and
 - bushfire management; and
- (i) include:
 - management measures;
 - monitoring procedures;
 - performance indicators; and
 - reporting frameworks,
 with particular reference to the novel *Uperoleia sp.*, Koala, and Wallum Froglet.

Long-term Security for Offset

- 16. By 31 December 2013, or otherwise agreed by the Director-General, the Proponent shall:
 - (a) enter into a Biobanking agreement in respect of the proposed offset areas (see Appendix 4) with the Minister for the Environment, in accordance with Part 7A of the *Threatened Species Conservation Act 1995*, to implement the Biodiversity Offset Strategy; or
 - (b) enter into an agreement with OEH to transfer the offset areas into the national parks estate, to the satisfaction of the Director-General.

REHABILITATION AND LANDSCAPING

Landscape Management Plan

- 17. The Proponent shall prepare and implement a Landscape Management Plan for the project to the satisfaction of the Director-General. This plan must:
 - (a) be prepared:
 - by suitably qualified person(s), approved by the Director-General; and
 - in consultation with Council and HWC;
 - (b) be submitted to the Director-General for approval prior to commencing quarrying operations; and
 - (c) include:
 - a Rehabilitation Management Plan; and
 - a Long Term Management Strategy.
- 18. The Rehabilitation Management Plan must include:
 - (a) rehabilitation objectives for the site;
 - (b) a description of the measures that would be implemented to:
 - rehabilitate and stabilise the site;
 - minimise the removal of mature trees; and
 - manage the remnant vegetation and habitat on the site;
 - (c) detailed performance and completion criteria for the rehabilitation and stabilisation of the site;
 - (d) a detailed description of how the performance of rehabilitation would be monitored over time to measure achievement of the performance and completion criteria and the rehabilitation objectives;
 - (e) a detailed description of what measures would be implemented to rehabilitate and manage the landscape of the site, including the procedures to be implemented for:
 - progressively rehabilitating and stabilising areas disturbed by quarrying;
 - implementing revegetation and regeneration within the disturbance areas;
 - protecting areas outside the disturbance areas;

- vegetation clearing protocols, including a protocol for clearing any trees containing hollows and the relocation of hollows from felled trees;
 - managing impacts on fauna, particularly threatened fauna and the novel *Uperoleia* sp.;
 - controlling weeds and pests;
 - controlling access;
 - bushfire management; and
 - reducing the visual impacts of the project;
- (f) a description of the potential risks to successful rehabilitation, and a description of the contingency measures that would be implemented to mitigate these risks; and
- (g) details of who is responsible for monitoring, reviewing, and implementing the plan.
19. The Long Term Management Strategy must:
- (a) define the objectives and criteria for quarry closure and post-extraction management;
 - (b) investigate and/or describe options for the future use of the site;
 - (c) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and
 - (d) describe how the performance of these measures would be monitored over time.

Rehabilitation Bond

20. Prior to commencing quarrying operations, the Proponent shall lodge a rehabilitation bond for the project with the Director-General. The Proponent may lodge the rehabilitation bond in two portions. The first portion for 4.5 hectares must be lodged with the Department prior to commencing quarrying operations, with no land disturbance to exceed 4.5 hectares until the second portion of the bond is accepted by the Department.

The sum of the bond shall be calculated at \$2.50/m² for the area to be disturbed by quarrying operations, to the satisfaction of the Director-General.

If rehabilitation and revegetation works have been completed in accordance with the Rehabilitation Management Plan and to the satisfaction of the Director-General, the Director-General will release the rehabilitation bond.

If rehabilitation and revegetation works are not completed to the satisfaction of the Director-General, the Director-General will call in all or part of the rehabilitation bond, and arrange for the satisfactory completion of the relevant works.

21. Within 3 months of each Independent Environmental Audit (see condition 8 of schedule 5), the Proponent shall review, and if necessary revise, the sum of the rehabilitation bond to the satisfaction of the Director-General. This review must consider:
- (a) the effects of inflation; and
 - (b) performance under the Rehabilitation Management Plan to date.

ABORIGINAL CULTURAL HERITAGE

Aboriginal Cultural Heritage Management Plan

22. The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Director-General. This plan must:
- (a) be prepared in consultation with all relevant local Aboriginal communities;
 - (b) be submitted to the Director-General for approval prior to commencing quarrying operations; and
 - (c) include:
 - measures for the protection and management of site 38-4-0318 within Lot 13 DP601306;
 - a program to complete prospective pre-clearance surveys of the extraction area in consultation with Aboriginal stakeholders;
 - measures for ongoing consultation with local Aboriginal communities and the involvement of these communities in pre-clearance surveys and the ongoing management of any Aboriginal cultural heritage values identified within the site;
 - an Aboriginal cultural education program for the induction of personnel and contractors involved in quarrying operations; and

- a description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project.

TRAFFIC

Haulage Route

23. All extractive materials dispatched from the site must be delivered to Sibelco's Salt Ash Sand Processing Plant by the most direct route available.

Road Signage

24. Prior to commencing quarrying operations, the Proponent shall:
- install "Trucks Crossing" and "Trucks Entering" warning signs on Nelson Bay Road on both the western and eastern approaches to the intersection of Lemon Tree Passage Road; and
 - pay the full cost of this installation, to the satisfaction of RMS.

On-Site Traffic Management

25. The Proponent shall ensure that:
- all vehicles do not exceed a speed of 25 kph on the site;
 - all loaded vehicles entering or leaving the site have their loads covered; and
 - all loaded vehicles leaving the site are cleaned of sand and other materials that may fall on the road, before leaving the site.

Traffic Management Plan

26. The Proponent shall prepare and implement a Traffic Management Plan for the project, to the satisfaction of the Director-General. This plan must:
- be submitted to the Director-General for approval prior to commencing quarrying operations;
 - include a drivers' code of conduct to minimise the impacts of project-related trucks on local residents and road users; and
 - describe the measures that would be put in place to ensure compliance with the drivers' code of conduct.

VISUAL

Visual Amenity

27. The Proponent shall minimise the visual impacts of the project to the satisfaction of the Director-General.

WASTE MANAGEMENT

28. The Proponent shall minimise the amount of waste generated by the project to the satisfaction of the Director-General.
29. The Proponent shall ensure that wastewater and/or sewage disposal is not undertaken on the site.
30. The Proponent shall not undertake any refuelling or maintenance of vehicles or equipment on the site, except to the extent necessary to remove vehicles or equipment from the site in the case of breakdowns.
31. The Proponent must not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal or any waste generated at the site to be disposed of at the site, except with the approval of the Director-General and as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*.

Note: This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the site if it requires an EPL under the Protection of the Environment Operations Act 1997.

EMERGENCY AND HAZARDS MANAGEMENT

Dangerous Goods

32. The Proponent shall ensure that chemicals and/or petroleum products are not stored on site.

Safety

33. The Proponent shall ensure public safety at the site to the satisfaction of the Director-General.

PRODUCTION DATA

34. The Proponent shall:
- (a) provide annual quarry production data to DRE using the standard form for that purpose; and
 - (b) include a copy of this data in the Annual Review (see condition 3 of Schedule 5).

**SCHEDULE 4
ADDITIONAL PROCEDURES**

NOTIFICATION OF LANDOWNERS

1. If the results of the monitoring required in schedule 3 identify that the impacts generated by the project on site are greater than the relevant impact assessment criteria, and there is no negotiated agreement in place to allow the impact, then within 2 weeks of obtaining the monitoring results the Proponent shall:
 - (a) notify the Director-General, the affected landowners and tenants (including tenants of any quarry-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the relevant criteria in schedule 3; and
 - (b) in the case of exceedances of the relevant air quality criteria, send the affected landowners and/or tenants a copy of the NSW Health fact sheet entitled "*Mine Dust and You*" (as may be updated from time to time).

INDEPENDENT REVIEW

2. If a landowner of privately-owned land considers the project to be exceeding the relevant criteria in schedule 3, then he/she may ask the Director-General in writing for an independent review of the impacts of the project on his/her land.

If the Director-General is satisfied that an independent review is warranted, then within 2 months of the Director-General's decision the Proponent shall:

- (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to:
 - consult with the landowner to determine his/her concerns;
 - conduct monitoring to determine whether the project is complying with the relevant criteria in schedule 3; and
 - if the project is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and
- (b) give the Director-General and landowner a copy of the independent review.

**SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING**

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Director-General. The strategy must:
 - (a) be submitted to the Director-General for approval prior to the commencement of quarrying activities;
 - (b) provide the strategic framework for environmental management of the project;
 - (c) identify the statutory approvals that apply to the project;
 - (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
 - (e) describe the procedures that would be implemented to:
 - keep the local community and relevant agencies informed about the operation and environmental performance of the project;
 - receive, handle, respond to, and record complaints;
 - resolve any disputes that may arise during the course of the project;
 - respond to any non-compliance; and
 - respond to emergencies; and
 - (f) include:
 - copies of the various strategies, plans and programs that are required under the conditions of this approval once they have been approved; and
 - a clear plan depicting all the monitoring to be carried out in relation to the project.

Management Plan Requirements

2. The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:
 - (a) detailed baseline data;
 - (b) a description of:
 - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
 - any relevant limits or performance measures/criteria; and
 - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;
 - (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
 - (d) a program to monitor and report on the:
 - impacts and environmental performance of the project; and
 - effectiveness of any management measures (see (c) above);
 - (e) a contingency plan to manage any unpredicted impacts and their consequences;
 - (f) a program to investigate and implement ways to improve the environmental performance of the project over time;
 - (g) a protocol for managing and reporting any:
 - incidents;
 - complaints;
 - non-compliances with statutory requirements; and
 - exceedances of the impact assessment criteria and/or performance criteria; and
 - (h) a protocol for periodic review of the plan.

Note: At the discretion of the Director-General, some of these requirements may be waived where they are either not relevant or necessary.

Annual Review

3. Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:
 - (a) describe the works (including rehabilitation) that were carried out in the previous year, and the works that are proposed to be carried out over current year;
 - (b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against:
 - the relevant statutory requirements, limits or performance measures/criteria;
 - the monitoring results of previous years; and
 - the relevant predictions in the EA;
 - (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
 - (d) identify any trends in the monitoring data over the life of the project;
 - (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
 - (f) describe what measures will be implemented over the next year to improve the environmental performance of the project.

Revision of Strategies, Plans & Programs

4. Within 3 months of:
 - (a) the submission of an annual review under condition 3 above;
 - (b) the submission of an incident report under condition 5 below;
 - (c) the submission of an audit report under condition 8 below; and
 - (d) any modifications to this approval,the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.

REPORTING

Incident Reporting

5. The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident.

Regular Reporting

6. The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval, and to the satisfaction of the Director-General.

AUDITING

Independent Environmental Audit

7. Within 1 month of the completion of quarrying operations, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
 - (a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
 - (b) include consultation with the relevant agencies;
 - (c) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant EPL (including any assessment, plan or program required under these approvals);

- (d) review the adequacy of strategies, plans or programs required under the abovementioned approval or licences; and
- (e) be completed within 2 months of the approval of the audit team.

Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.

- 8. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Proponent shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

ACCESS TO INFORMATION

- 9. From 1 July 2013, the Proponent shall:
 - (a) make the following information publicly available on its website:
 - a copy of all approved strategies, plans and programs;
 - a summary of all monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval, updated on a quarterly basis;
 - a complaints register, updated on a quarterly basis;
 - copies of any Annual Reviews;
 - copies of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit;
 - copies of the development consent and approved management plans for existing adjacent quarrying operations; and
 - any other matter required by the Director-General; and
 - (b) keep this information up-to-date, to the satisfaction of the Director-General.

APPENDIX 1 PROJECT SITE

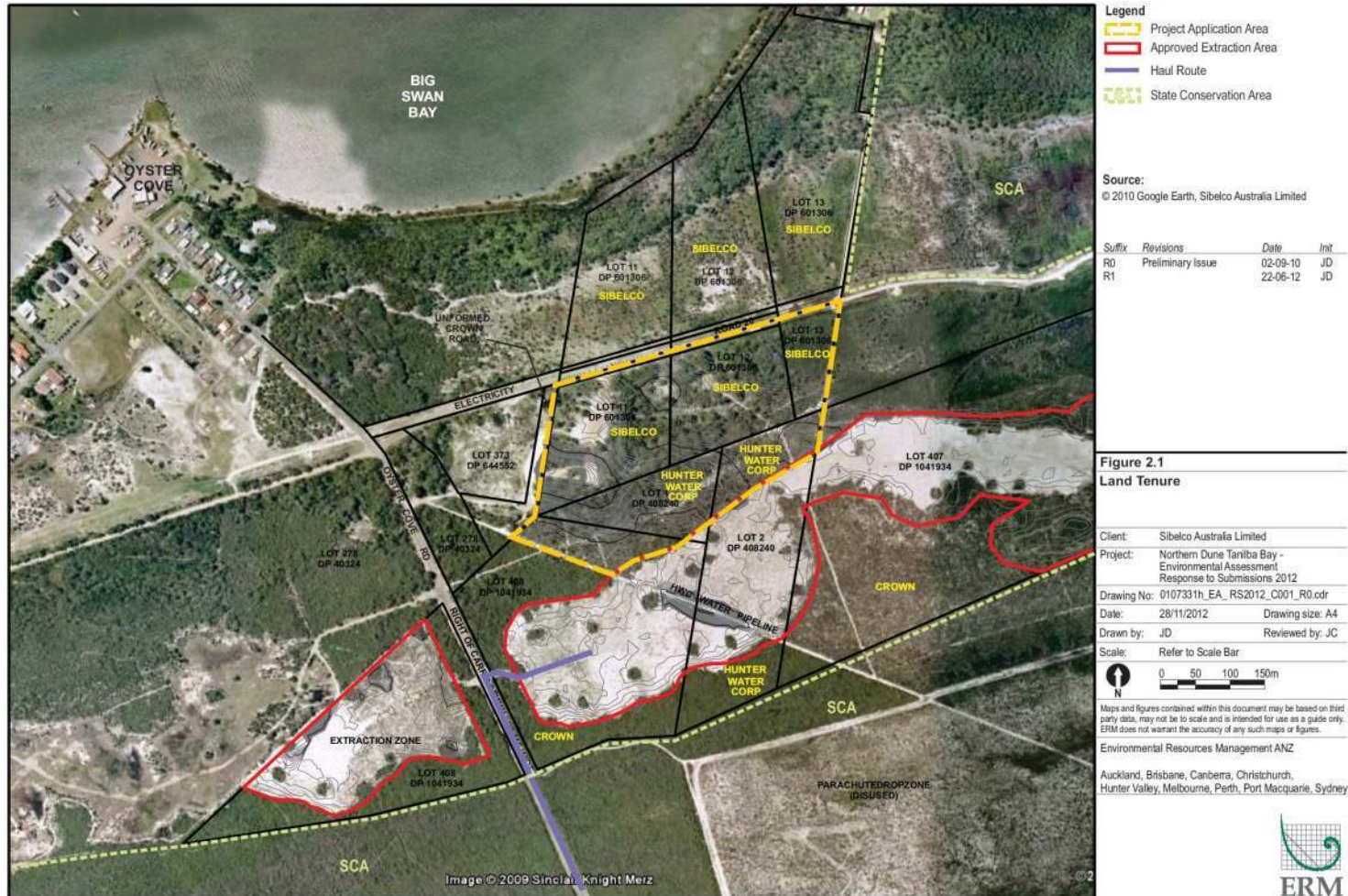


Figure 1: Project site

APPENDIX 2 NOISE RECEIVER LOCATIONS

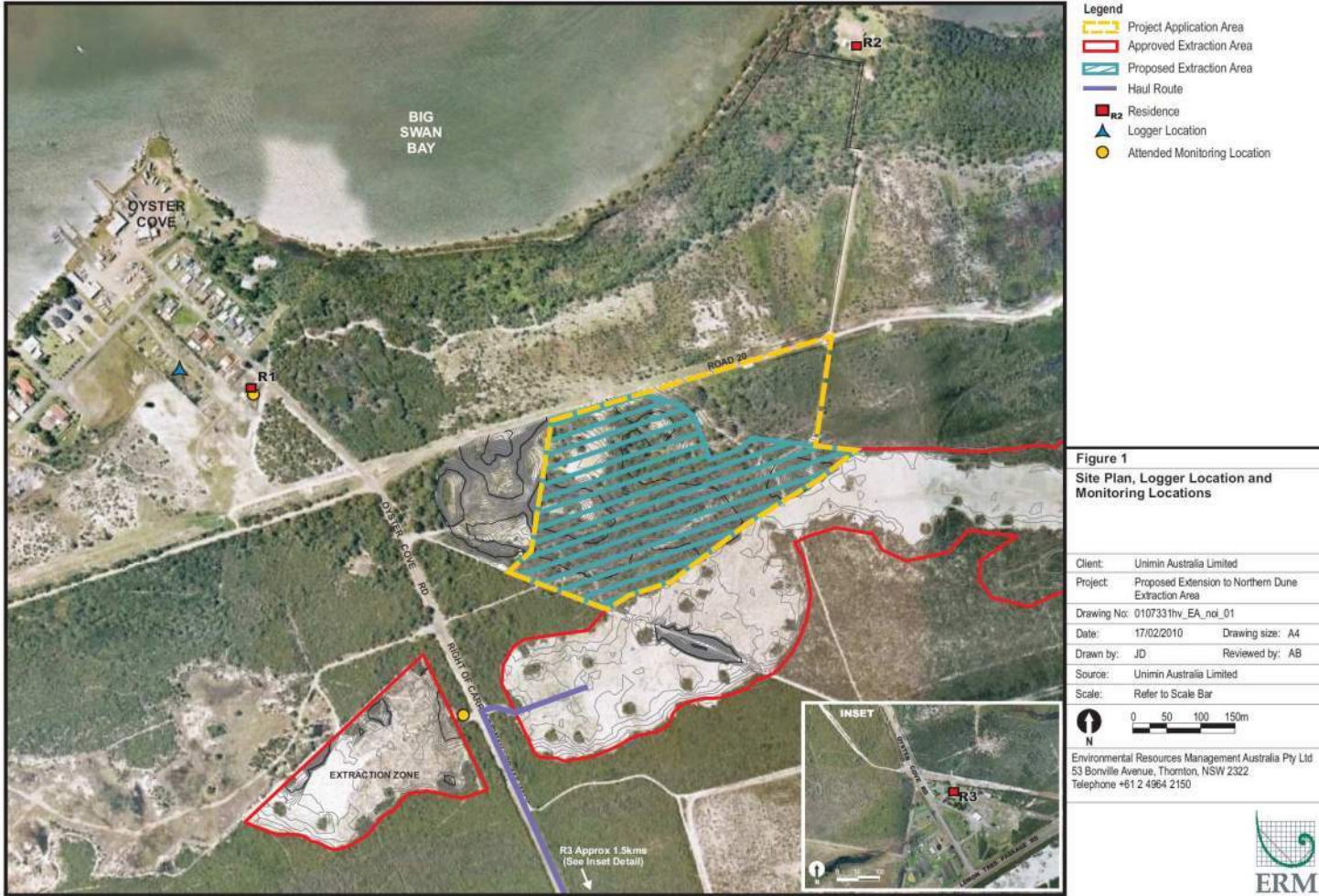


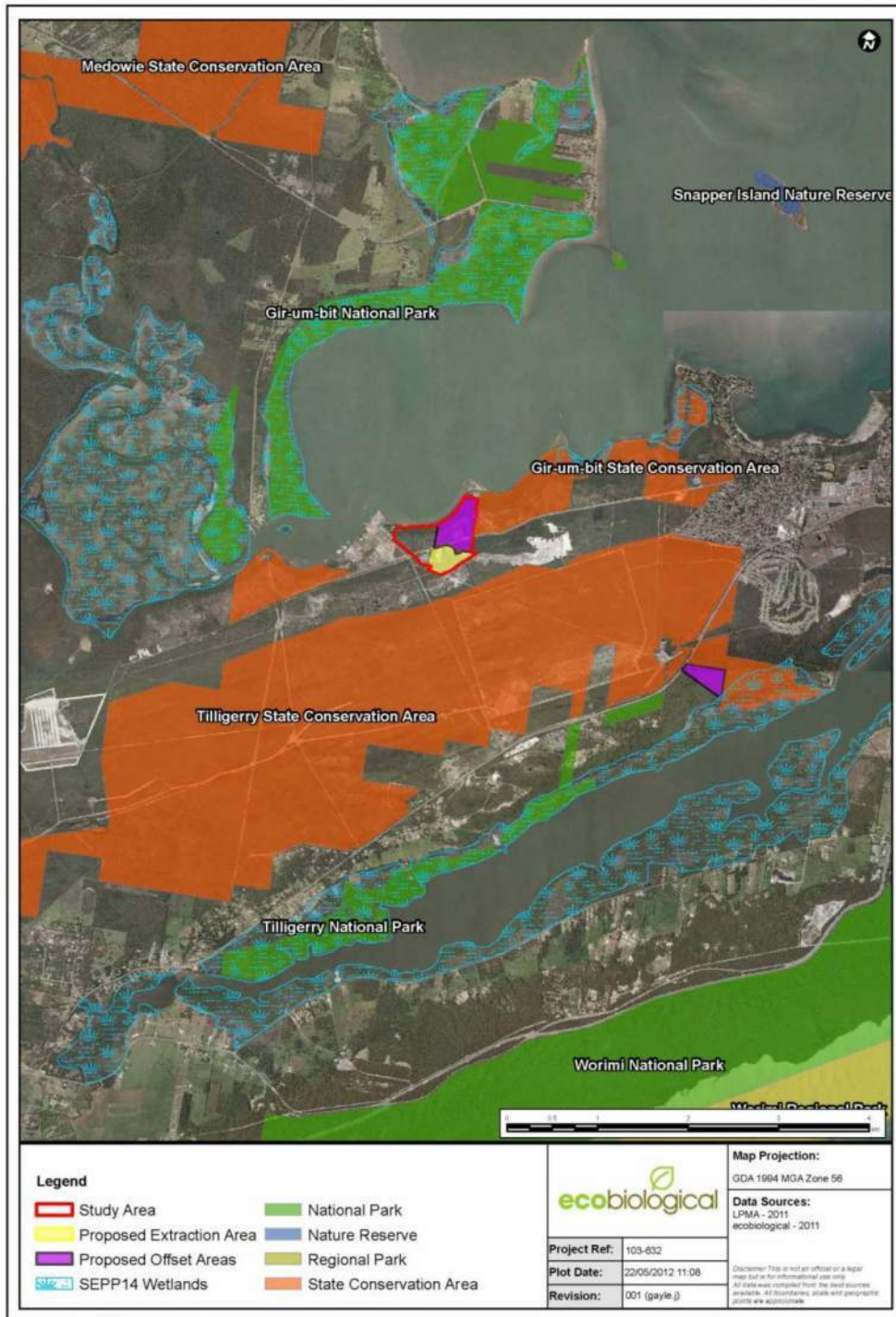
Figure 2: Noise receivers

APPENDIX 3 STATEMENT OF COMMITMENTS

Issue	Mitigation Measure/Commitment
Environmental Management Plan	<p>The currently approved EMP (2003) will be applied over all 9 EMPs and updated as necessary to meet the needs of the extension area. These include;</p> <ul style="list-style-type: none"> • EMP1 - Environmental Induction and Training • EMP2 - Hydrocarbon Spill Procedure • EMP3 - Operations Management Procedure • EMP4 - Extraction Depth and Area Monitoring • EMP5 - Groundwater • EMP6 - Cultural Heritage • EMP7 - Vegetation Rehabilitation • EMP8 - Landform Rehabilitation • EMP9 - Erosion and Sediment Control
Groundwater Monitoring	<p>The Groundwater Management Plan (GMP) in place for the existing operation will be updated to incorporate ongoing monitoring at additional bores SAL4 and SAL5 in accordance with the existing approved monitoring regime.</p> <p>Current environmental management commitments will be adopted for the extraction extension, including:</p> <ul style="list-style-type: none"> • groundwater quality and level monitoring, and reporting as part of the approved groundwater management plan; • regular review of environmental performance through the AEMR process; • maintenance of a minimum 1.0 m vertical buffer between the predicted maximum groundwater elevation and the final landform (extraction will occur to 0.7 m above predicted maximum groundwater elevation, with final rehabilitated landform being 1.0 m above these elevations following placement of 0.3 m topsoil); • staged rehabilitation of extraction areas; • avoiding storing machinery or hazardous materials onsite; and • avoiding servicing or refuelling equipment onsite.
Noise Emissions	<p>The currently approved EMP (2003) would continue to be applied, and updated as necessary to meet the needs of the proposed extension area.</p> <p>All reasonable steps would be undertaken to reduce noise emissions during extraction and transport.</p> <ul style="list-style-type: none"> • sequentially extracting from the south to the north, so that the topography will naturally help shield the sensitive receptors to the north against operational noise emissions; • ensuring all machines are in good working condition, with particular attention to exhaust silencers, engine covers and other noise reduction devices;
	<ul style="list-style-type: none"> • all work and transport will be restricted to daylight hours, typically from 7:00am to 6:00pm Monday to Friday, but when light permits continuing to 7:00pm; and • site imposed speed limits up to 25 km/hr to be enforced to minimise noise generation.
Air Emissions	<p>Air emissions related management measures are already in place and proposed to continue as part of the extension of operations to reduce the generation of particulate emissions.</p> <p>A water tanker will be used on all unsealed roads on an as-needs basis, dependant on weather conditions.</p> <p>Sand extraction cells will be progressively rehabilitated throughout the life of the extraction. It is anticipated that no more than three hectares will be exposed at any one time.</p>
Surface and Groundwater Quality	<p>Surface water management principles will be implemented to prevent contamination of surface (and therefore groundwater) quality. Management and monitoring actions stipulated in the existing Groundwater Management Plan (2011) for current operations will be</p> <p>Additional documents will be produced for the extraction extension area to mitigate any impacts to the quality of the groundwater, the adjoining forested wetlands and, to aid in the rehabilitation of the extraction area post sandmining including:</p> <ul style="list-style-type: none"> • Surface Water Management Plan to prevent runoff, pollution and sedimentation from the extraction area entering into adjoining forested wetlands; • Vegetation and Weed Management Plan for rehabilitation of the proposed sand extraction area; and • Offset Strategy and associated Habitat Management Plan which will detail management actions to be undertaken on the remaining portions of Lots 11, 12 and 13 and on Lot 24. This plan will cover vegetation, weed, fire and stormwater management, minimisation of edge effects, control of public access and management of habitat enhancement measures.
Ecology	<p>Hollow bearing trees 16, 17, 18 and 20 (refer to Figure 2.2, Northern Dune Submission Report) to be retained.</p> <ul style="list-style-type: none"> • avoidance of the use of biocides and implementing erosion and sediment controls; • incorporating implementation of pre-clearing surveys, a fauna displacement mitigation protocol, Koala mitigation measures, nestbox installation and monitoring, and a monitoring plan for the Wallum Froglet as detailed in Annex M of the EA; • staged rehabilitation of the extraction area (to be supported by a Vegetation Rehabilitation Management Plan), to be conducted in the same fashion as successful rehabilitation of Sibelco's existing approved extraction areas directly to the south; and • implementation of an Offset Strategy as detailed in Section 11.6.4 if the EA.
Vegetation Clearing	<p>At least one week prior to any vegetation clearing, a survey of habitat trees will be conducted in the planned clearing area in accordance</p>

Issue	Mitigation Measure/Commitment
	with the survey methodology outlined in Section 11.6.1 of the EA.
	Pre-clearing surveys will be conducted to check for the presence of any Koalas within the proposed extraction area.
	Hollow-bearing trees will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate. The actual felling of any habitat trees will be attended by a suitably experienced fauna ecologist in order to ensure the safety of any fauna found to be in the hollows. On all occasions, trees having potential habitat hollows should be 'soft felled' by an experienced machine operator in accordance with the procedure outlined in section 11.6.1 of the EA.
Fauna Displacement Protocol	A fully qualified, experienced and licensed ecologist will supervise clearing and encourage movement of any displaced animals into adjoining vegetation.
	Captured fauna and/or displaced fauna will be relocated to adjacent habitat by an ecologist. During tree removal or any other construction activity, Fauna Displacement protocols outlined in Section 11.6.2 of the EA will be followed in the case of an injured animal.
Wallum Froglet Management Plan	A management plan for the Wallum Froglet (<i>Crinia tinnula</i>) will be developed in accordance with the management guidelines outlined under Section 6 of the National Recovery Plan for the Wallum Sedgefrog and Other Wallum- dependent Frog Species. In particular this will include specifications on: <ul style="list-style-type: none"> • minimising affects from soil disturbance; • ensuring sufficient retention of vegetation particularly around breeding sites; and • monitoring the habitat condition and frog numbers to ensure the threats to the species are properly managed. This should be undertaken with sufficient regularity and should preferably be carried out a year or more before development starts and continue for the duration of extraction operations, including rehabilitation works.
Nestbox Installation and Monitoring Program	A nestbox installation and monitoring program will be implemented on a ratio of 2:1 to replace 38 hollows present in the 17 hollow-bearing trees mapped within the proposed extraction area. Nestboxes should be erected prior to clearing commencing in order to provide alternative den and/or nest sites for any displaced fauna.
Issue	Mitigation Measure/Commitment
	Nestboxes are to be erected within the Proposed Offset Areas on Lots 11, 12 and 13. Nest box designs should be selected to replace the natural hollow sizes removed (ie, 20 small, 16 medium and 2 large) and will target insectivorous bats, gliders and possums. Annual monitoring for a minimum 6-year period post installation is recommended to record uptake of the nestboxes and to attend to any maintenance issues. A brief letter confirming annual inspection of the nestboxes and documentation of results should be provided to OEH.
Vegetation Management and Monitoring Plan	Weed Management and Vegetation Management and Monitoring Plans will be prepared for the rehabilitation area and proposed Offset Areas on Lots 11, 12, 13 and 24, which will include a thorough and intensive program to protect the adjoining forested wetland communities against weed invasion, and surface and underground run-off that may occur both during and after sand extraction activities. The management and monitoring plans will consider: <ul style="list-style-type: none"> • the nature and control of sediment run-off during the extraction phase particularly as a result of an exceptional storm event; • the volume, path and content of stormwater discharging from the site during and after extraction; • the handling of hydrocarbon spills on the site ; • existing flow regime of surface and groundwater flow from the proposed extraction area into the forested wetlands; and • weed invasion
Biodiversity Offset Strategy	A biodiversity offset strategy will be adopted as outlined in detail in Annex P of the EA. Biodiversity offsets are proposed on lands currently owned by Sibelco, comprising portions of Lots 11 to 13, DP601306 (approximately 18.35 ha) and all of Lot 24, DP579700 (approximately 9.44 ha) (the offset lands). A secure offset mechanism (through a Voluntary Conservation Agreement or other similar tool for management in perpetuity) will be placed over these offset lands, which will result in permanent protection and management of the land and result in numerous ecological benefits.
Aboriginal Heritage	As ground visibility is limited within the extraction extension area, further archaeological work is required prior to commencement of extraction operations. The further assessment will be undertaken in accordance with any conditions of consent and will consist of a prospective clearing program that will be undertaken to improve ground visibility and allow the registered Aboriginal stakeholders to inspect the ground surface within the approved extraction area, to provide greater certainty of the presence or otherwise of Aboriginal archaeological sites. Sibelco will contact the three Aboriginal stakeholder groups at least three weeks prior to the proposed clearing and invite them to attend. Details of the methodology as agreed by the registered Aboriginal stakeholders is presented in Chapter 7 of Annex N of the EA, including procedures for undertaking the required site clearance, required actions should Aboriginal sites or artefacts be found during the prospective clearing program, and the requirements for updating the Cultural Heritage Management Plan, which will be undertaken prior to commencement of any extraction.
Issue	Mitigation Measure/Commitment
Bushfire	<ul style="list-style-type: none"> • provision of a separation distance (minimum of 10 m) between stockpiles of combustible material and remnant vegetation; • managing operations and the site to minimise likelihood of ignition sources through good 'housekeeping' (for example, all waste in bins); • emergency planning procedures in the event of a fire occurring on the site; • fitting of all earth moving machinery with spark arresting mufflers and haul trucks have serviceable exhaust systems to prevent accidental ignition of vegetation; and • equipping the operations to assist in the management of any fires on-site, including presence of fire extinguishers, water cart (as contracted), and the site front-end loader and bulldozer for any requisite fire fighting purposes.
Waste Management	<ul style="list-style-type: none"> • no burning of waste; • any noxious plant species will be removed from the site, bagged and disposed of at a licensed landfill; • any waste will be removed daily and recycled or disposed of directly at a licensed landfill; and • the site will be maintained and kept free of rubbish and cleaned up at the end of each working day.

APPENDIX 4 BIODIVERSITY OFFSET STRATEGY



APPENDIX 2

MONTHLY INSPECTIONS

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Craig Foo <i>M. Lynch</i> <i>foo</i>
Inspection Date	27 th April 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

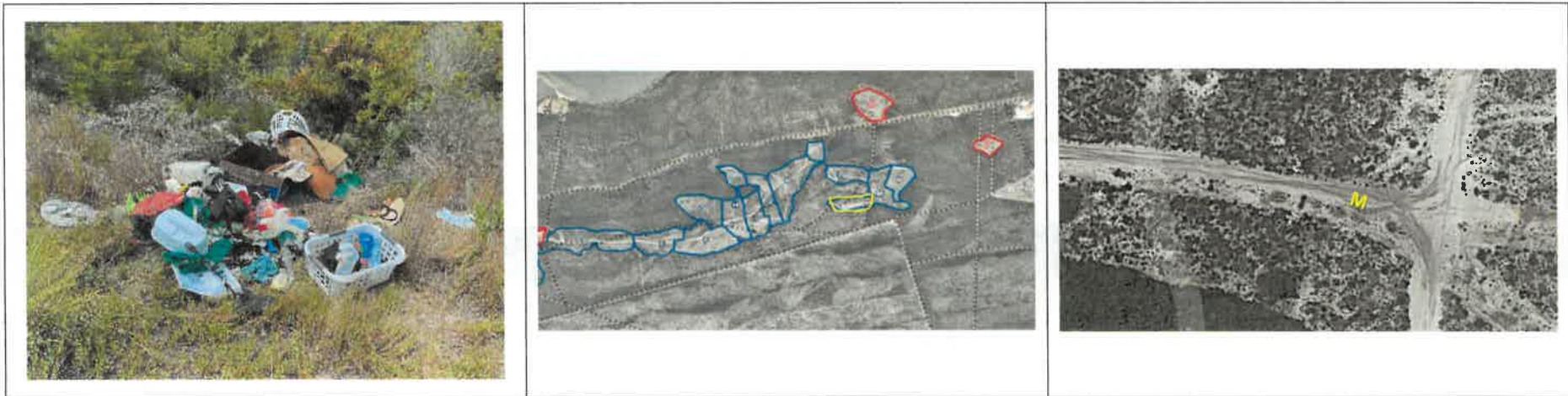
Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Lock still in place. Site secure			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		No noises detected, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Waste dumped on site	Waste cleaned up and remove from site		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare it's mandatory			
GENERAL HOUSEKEEPING						
Haul road at area "M" Will starting to be removed as part of the rehabilitation and land handback.	✓		All road base to be removed from site.			



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radziewicz <i>M. Lynch Peter Radziewicz</i>
Inspection Date	20 th May 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Lock still in place. Site secure			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		No noises detected, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Waste dumped on site	Waste cleaned up and remove from site		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare it's mandatory			
GENERAL HOUSEKEEPING						
Haul road at area "M" Will starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base to be removed from site.		





Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Rod Harwood <i>M. Lynch</i> <i>R. Harwood</i>
Inspection Date	24 th June 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Lock still in place. Site secure			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		No noises detected, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Waste dumped on site	Waste cleaned up and remove from site		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare it's mandatory			
GENERAL HOUSEKEEPING						
Haul road at area "M" Will starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base to be removed from site.		





Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)	
Inspection Completed By:	Michael Lynch & Roslyn Merrick	 
Inspection Date	27 th July 2022	

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Site gate has been vandalised and needs to be repaired. (See Photo)			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Waste dumped on site	Waste cleaned up and remove from site		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area "M" Will starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base to be removed from site.		



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radziewicz <i>M. Lynch</i> <i>Peter Radziewicz</i>
Inspection Date	25 th August 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Site gate has been vandalised and needs to be repaired. (See Photo)			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Waste dumped on site	Waste cleaned up and remove from site		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base is being removed from site to fix haul road.		



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radziewicz <i>M. Lynch</i> <i>Peter Radziewicz</i>
Inspection Date	27 th September 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Dumped car on site near entrance gate	Wait for loader to assigned to site for removal.		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base is being removed from site to fix haul road.		



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radzievic <i>Peter Radzievic</i> <i>M. Lynch</i>
Inspection Date	24 th October 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Site gate has been vandalised and needs to be repaired. (See Photo)			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Dumped car on site near entrance gate	Waiting for loader to be assigned to site for removal. CAR BURNT OUT		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base is being removed from site to fix haul road.		



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radziewicz <i>Peter Radziewicz</i> <i>M. Lynch</i>
Inspection Date	17 th November 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Site gate has been vandalised and needs to be repaired. (See Photo)			
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good no damage or sabotaged			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Dumped car on site near entrance gate	Waiting for loader to be assigned to site for removal. CAR BURNT OUT		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base is being removed from site to fix haul road.		



Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site Details	Northern Dune Sand (NDS) Northern Dune Sand Extension (NDSE)
Inspection Completed By:	Michael Lynch & Peter Radziewicz <i>M. Lynch</i> <i>Peter Radziewicz</i>
Inspection Date	16 th December 2022

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
PERMIT SPECIFIC REQUIREMENTS						
No material erosion issued identified on roadside drainage, rehabilitation areas and topsoil stockpiles (SWMP/LMP/DA4659-89)	✓		No Issues			
All installed sediment fencing is in good working order (SWMP)	✓		Yes			
Illegal waste dumping is identified and removed or action recorded to remove from site/ Northern Offset Area during annual clean up (EMP/BMP)	✓		All rubbish has been removed and constantly monitored. No issues			
Boundary to the Northern Offset Area (NOA) is protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area (BMP)	✓		Yes and in good order			
Any tracks leaving Rutile Road into the site have suitable barriers to prevent unauthorised access (e.g. gates/barriers) (BMP)	✓		Yes, ongoing monitoring and observation to site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Map of Koala habitat for the Site is located in the Salt Ash site office visible for all staff and contractors (BMP)	✓		Yes in Managers Office			
50 meter buffer is maintained between rehabilitation area and Wallum Froglet habitat areas (LMP)	✓		Yes			
No new weed infestations are observed within rehabilitated area. If new weeds are identified take appropriate action to control the outbreak (LMP).	✓		Some weeds have been removed and are constantly monitored and scheduled			
No material dieback or vegetation loss is evident for native re-vegetation within the rehabilitation areas (LMP/DA4659-89)	✓		Visually seems to be all good			
Any mobile equipment used at Site is equipped with fire extinguishers (LMP)	✓		There is no mobile equipment on site, site is non-operational			
A gate is installed and maintained on all site access roads that adjoin Oyster Cove Road and locked at all times (condition 52 DA4659-89)	✓		Site gate has been vandalised and needs to be repaired. (See Photos Page 4)	Gate has been removed and concrete blocks been place at site entrance.		
STORAGE PROVISIONS						
No hydrocarbons are stored on site no evidence of refueling activities on site (condition O4 EPL 11633)	✓		There is no mobile equipment or chemicals on site.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
Check for signs of spills, leaks, straining or contaminated runoff.	✓		There is no mobile equipment or chemicals on site.			
AIR EMISSIONS						
Check that all dust deposition gauges are in good working order and not vandalised (DMP)	✓		All good vegetation trimmed back around gauge.			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		No visible dust detected			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point.	✓		No visible dust detected			
NOISE CHECK (If residential properties are in close proximity to the site)						
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Detection of 4WD Tracks, site not operational.			
WASTE DISPOSAL						
No operational waste is stored on site	✓		Dumped car on site near entrance gate	Car has now been removed See Photos Page 4		
EMERGENCY RESPONSE EQUIPMENT						
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Not required site no longer operational.			

Attachment 6.02A - Environmental Hazard Inspection (Aggregate Operations)

Site no longer extracting, site now non-operational and is under rehabilitation.	Compliance		Comments	Action	Who	When
	Yes	No				
GENERAL						
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No material is stored near any fences or the likelihood of discharge onto Holcim site.			
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in ICare and effective action is being taken.	✓		All hazards, incidents and complaints are placed into ICare			
GENERAL HOUSEKEEPING						
Haul road at area starting to be removed as part of the rehabilitation and land handback.	✓		Roads are starting to be removed and replaced by sand	All road base is being removed from site to fix haul road.		



Environmental Hazard Inspection Worksheet (Aggregate Operations)

Site Details	Northern Dune.
Inspection Completed By:	Peter Radziewicz
Inspection Date	18.1.23

	Compliance		Comments	Action	Who	When
	Yes	No				
STORAGE PROVISIONS						
Check all chemical & hydrocarbons drums are labelled and stored in designated areas.	✓		NO STORAGE ON SITE.			
Check that bunded areas that are fitted with drain valves are locked in the closed position .	✓		" "			
Check bunds are in good condition (free from cracks, degradation and physical damage), are watertight and the bunds are reasonably clean.	✓		" "			
Check that stormwater that collects within the bund is regularly removed (not to the offsite stormwater system).	✓		NO WATER RUN OFF			
Check for signs of spills, leaks, straining or contaminated runoff.	✓					

STORMWATER DISCHARGE

Check that all spills have been cleaned up and that no residual spillage is free to wash into the off site stormwater system.	✓				
Check for evidence of contaminants or blockages in drains.	✓		NO EVIDENCE FOUND.		
Check that cleaning devices (grates, settling pits, interceptor traps etc.) are being maintained correctly.	✓		NA.		
Check that material build-up or damage to paved areas (including vehicle or plant wash down areas) does not allow contaminated water to bypass controls (pits or interceptors) or to flow into the off site stormwater system.	✓		NA.		
Check off site stormwater drains for signs of contamination.	✓		NA.		

AIR EMISSIONS

Check that water sprays, containment systems and/or dust extraction equipment is working correctly.			NA.		
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		DUST SAMPLES. BOTTLES ARE IN TACK.		
Check that dust emissions are not crossing the site boundary from an appropriate vantage point	✓				

NOISE CHECK (If residential properties are in close proximity to the site)					
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓				
WASTE DISPOSAL					
Check waste storage areas to ensure that waste is stored, labelled and segregated correctly.	✓		NA.		
EMERGENCY RESPONSE EQUIPMENT					
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		EMERGENCY RESPONSE KIT STORED IN		
GENERAL					
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		Rubbish on Oyster Cove Road.		
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓		NIL Reported.		
GENERAL HOUSEKEEPING					
Check equipment or operating plant for leaks or spills.	✓		No machines on site at time of inspection.		

Check the graveyard or lay down area to ensure only equipment or materials with a future use are held in storage (all other items should be removed and recycled or disposed of in an appropriate manner).	✓		NA			
CEMENT SILO						
Check the silo roof to ensure that silo access openings are closed and appropriately sealed and that there is no evidence of leakage during filling cycles.	✓		NA			
Check the outlet of the silo filter /pressure release ducting at ground level to determine if cement is being discharged during filling cycles.	✓		NA			
SLURRY PITS, SETTLING PONDS, SILT TRAPS AND OIL INTERCEPTORS						
Visually check that the slurry pits, settling ponds, silt traps and oil interceptors are maintained and emptied or cleaned as required.	✓		NA			
FLORA AND FAUNA						
Inspect site for any new outbreak of weeds. If new weeds are identified take appropriate action to control the outbreak.			Weeds are along Entrance Road.	Get some weed spraying completed when it cools down.		

Environmental Hazard Inspection Worksheet (Aggregate Operations)

Site Details	<i>Northern Dowl.</i>
Inspection Completed By:	<i>Peter Radziewicz, Craig Foo.</i>
Inspection Date	<i>20/2/23.</i>

	Compliance		Comments	Action	Who	When
	Yes	No				
STORAGE PROVISIONS						
Check all chemical & hydrocarbons drums are labelled and stored in designated areas.	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
Check that bunded areas that are fitted with drain valves are locked in the closed position .	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
Check bunds are in good condition (free from cracks, degradation and physical damage), are watertight and the bunds are reasonably clean.	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
Check that stormwater that collects within the bund is regularly removed (not to the offsite stormwater system).	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
Check for signs of spills, leaks, straining or contaminated runoff.	<input checked="" type="checkbox"/>	<input type="checkbox"/>				

STORMWATER DISCHARGE

Check that all spills have been cleaned up and that no residual spillage is free to wash into the off site stormwater system.	✓		Could not see any evidence of spills.			
Check for evidence of contaminants or blockages in drains.	✓					
Check that cleaning devices (grates, settling pits, interceptor traps etc.) are being maintained correctly.	✓					
Check that material build-up or damage to paved areas (including vehicle or plant wash down areas) does not allow contaminated water to bypass controls (pits or interceptors) or to flow into the off site stormwater system.	✓					
Check off site stormwater drains for signs of contamination.	✓					

AIR EMISSIONS

Check that water sprays, containment systems and/or dust extraction equipment is working correctly.	✓		NA.			
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		Samples checked			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point	✓					

NOISE CHECK (If residential properties are in close proximity to the site)					
Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		No Machines in area at time of inspection.	Nil Complaints.	
WASTE DISPOSAL					
Check waste storage areas to ensure that waste is stored, labelled and segregated correctly.	✓				
EMERGENCY RESPONSE EQUIPMENT					
Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		checked kit		
GENERAL					
Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓		No discharge		
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓		No Complaints by neighbours.		
GENERAL HOUSEKEEPING					
Check equipment or operating plant for leaks or spills.	✓				

Check the graveyard or lay down area to ensure only equipment or materials with a future use are held in storage (all other items should be removed and recycled or disposed of in an appropriate manner).	✓		No Machines stored on site			
CEMENT SILO						
Check the silo roof to ensure that silo access openings are closed and appropriately sealed and that there is no evidence of leakage during filling cycles.			NA			
Check the outlet of the silo filter /pressure release ducting at ground level to determine if cement is being discharged during filling cycles.			NA.			
SLURRY PITS, SETTLING PONDS, SILT TRAPS AND OIL INTERCEPTORS						
Visually check that the slurry pits, settling ponds, silt traps and oil interceptors are maintained and emptied or cleaned as required.			NA			
FLORA AND FAUNA						
Inspect site for any new outbreak of weeds. If new weeds are identified take appropriate action to control the outbreak.			NA			

Environmental Hazard Inspection Worksheet (Aggregate Operations)

Site Details	Northern Dune.
Inspection Completed By:	Rock Harwood, Peter Radziewicz
Inspection Date	8/3/23

	Compliance		Comments	Action	Who	When
	Yes	No				
STORAGE PROVISIONS						
Check all chemical & hydrocarbons drums are labelled and stored in designated areas.	✓					
Check that bunded areas that are fitted with drain valves are locked in the closed position .	✓					
Check bunds are in good condition (free from cracks, degradation and physical damage), are watertight and the bunds are reasonably clean.	✓					
Check that stormwater that collects within the bund is regularly removed (not to the offsite stormwater system).	✓					
Check for signs of spills, leaks, straining or contaminated runoff.	✓					

STORMWATER DISCHARGE

Check that all spills have been cleaned up and that no residual spillage is free to wash into the off site stormwater system.	✓					
Check for evidence of contaminants or blockages in drains.	✓					
Check that cleaning devices (grates, settling pits, interceptor traps etc.) are being maintained correctly.	✓					
Check that material build-up or damage to paved areas (including vehicle or plant wash down areas) does not allow contaminated water to bypass controls (pits or interceptors) or to flow into the off site stormwater system.	✓					
Check off site stormwater drains for signs of contamination.	✓		No signs of waste or contamination			

AIR EMISSIONS

Check that water sprays, containment systems and/or dust extraction equipment is working correctly.	✓					
Check the site boundary for noticeable dust deposits (settled dust or windborne).	✓		checked sample bottles.			
Check that dust emissions are not crossing the site boundary from an appropriate vantage point	✓					

NOISE CHECK (If residential properties are in close proximity to the site)

Walk along appropriate site boundaries to check for any new or annoying noises that may create a nuisance for nearby residences.	✓		Not in operation		
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WASTE DISPOSAL

Check waste storage areas to ensure that waste is stored, labelled and segregated correctly.	✓				
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EMERGENCY RESPONSE EQUIPMENT

Check that emergency response equipment (including spill kits) are intact, complete, readily accessible and stationed in an appropriate location.	✓		Kit Inspected		
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GENERAL

Complete a site boundary check to ensure that any risks posed by neighbours (such as discharge onto HOLCIM site, incorrect storage near fences, etc.) are identified and actioned.	✓				
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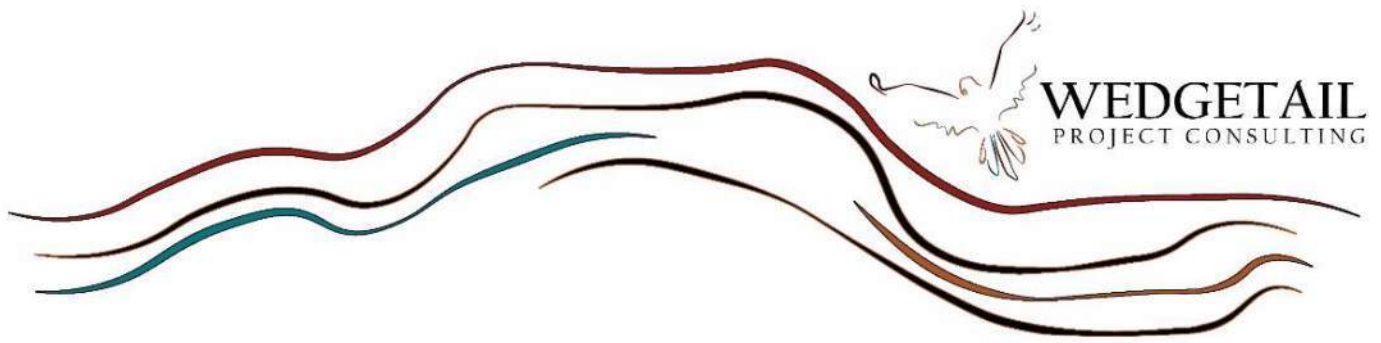
Check that all known hazards, incidents and complaints that have occurred throughout the month have been correctly recorded in INX and effective action is being taken.	✓				
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GENERAL HOUSEKEEPING

Check equipment or operating plant for leaks or spills.	✓		check No operation		
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Check the graveyard or lay down area to ensure only equipment or materials with a future use are held in storage (all other items should be removed and recycled or disposed of in an appropriate manner).						
CEMENT SILO						
Check the silo roof to ensure that silo access openings are closed and appropriately sealed and that there is no evidence of leakage during filling cycles.	✓		NA			
Check the outlet of the silo filter /pressure release ducting at ground level to determine if cement is being discharged during filling cycles.	✓		NA			
SLURRY PITS, SETTLING PONDS, SILT TRAPS AND OIL INTERCEPTORS						
Visually check that the slurry pits, settling ponds, silt traps and oil interceptors are maintained and emptied or cleaned as required.	✓		NA			
FLORA AND FAUNA						
Inspect site for any new outbreak of weeds. If new weeds are identified take appropriate action to control the outbreak.	✓		Weeds in North Dune Area D	Contact Warrini to get sprayed	PR	End March

APPENDIX 3
ANNUAL REHABILITATION
MONITORING REPORT

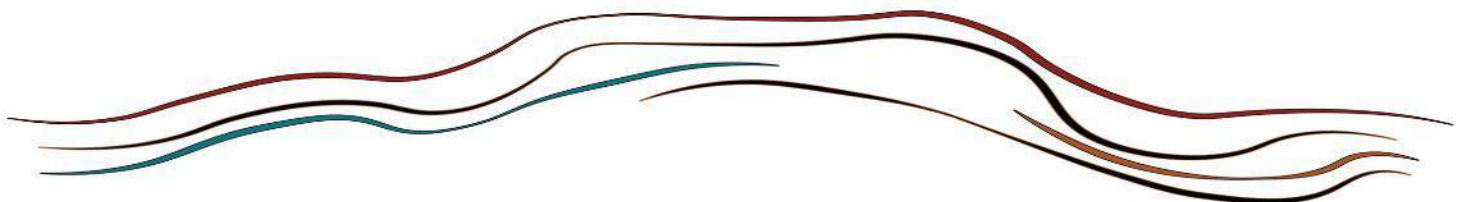


North Dune Extension 2022 Vegetation Rehabilitation Annual Monitoring Report

Oyster Cove, New South Wales



Rev 1
27 March 2023



North Dune Extension 2022 Vegetation Rehabilitation Annual Monitoring Report

Oyster Cove, New South Wales

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Contents

1. INTRODUCTION	1
2. SCOPE	1
3. METHODS	4
3.1 QUADRAT MONITORING DESIGN	4
3.1.1 20m x 20m Quadrat Monitoring	4
3.2 MONITORING OUTCOMES	5
3.2.1 Defining Targets	5
3.2.2 Assessment of Rehabilitation Parameters	5
4. MONITORING RESULTS	7
4.1 BLOCK Q1	7
4.1.1 Quadrat Q46	7
4.1.2 Quadrat Q47	8
4.1.3 Block Summary	8
4.2 BLOCK Q2	9
4.3 BLOCK Q3	10
4.4 BLOCK Q4	12
4.4.1 Quadrat Q50	12
4.4.2 Quadrat Q51	13
4.4.3 Block Summary	13
4.5 BLOCK Q5	13
4.6 BLOCK Q6	15
4.6.1 Quadrat Q53	15
4.6.2 Quadrat Q54	15
4.6.3 Block Summary	17
5. DISCUSSION AND RECOMMENDATIONS	18
5.1 DISCUSSION	18
5.2 RECOMMENDATIONS	19
5.3 CONCLUSIONS	19

Figures

Figure 1: Location of the North Dune Extension	3
Figure 2: Details of the location of the blocks, quadrats and photo points used for the NDE monitoring	6

Tables

Table 1: Block preparation and survey schedule details for the North Dunes Extension Rehabilitation blocks for the 2022 monitoring report.	2
Table 2: Modified Braun-Blanquet cover-abundance scale.	4
Table 3: A summary of which survey method addresses the performance criteria of the EMP.	5
Table 4: Growth parameters for Block Q1 monitoring quadrats for Post 3 Year monitoring and comparison to targets.	8
Table 5: Growth parameters for Blocks Q2 monitoring quadrats for Post 3 Year monitoring and comparison to targets and end of 3-year monitoring.	10
Table 6: Growth parameters for Block Q3 monitoring quadrats for Post 3 Year monitoring and comparison to targets.	11
Table 7: Growth parameters for Block Q4 monitoring quadrats for Post 3 Year monitoring and comparison to targets.	12
Table 8: Growth parameters for Block Q5 monitoring quadrats for Post 3 Year monitoring and comparison to targets.	14
Table 9: Growth parameters for Block Q6 monitoring quadrats for Post 3 Year monitoring and comparison to targets.	16

Plates

Plate 1: Controlled burn occurring in the vicinity of Q46 on the day of monitoring. Note the reduction in plants – native and exotic in the ground cover stratum.	7
Plate 2: Quadrat Q48 from the SW corner showing exotic groundcover, planted key species and prevalence of <i>A. longifolia</i>	10
Plate 3: Quadrat Q49 in Block Q3 from the SE corner showing the excellent native species coverage and the prodigious flowering of multiple species.	11
Plate 4: Block Q4, Quadrat 50, plot 2 showing that despite the excellent growth parameters, there is still considerable space between individual plants.	13
Plate 5: Block Q5, Quadrat 52 from the NW corner. Note the presence of <i>E. curvula</i> , <i>A. longifolia</i> and <i>L. laevigatum</i>	15
Plate 6: Block Q6 Quadrat Q53 showing that there is still a considerable amount of bare sand intermixed with excellent vegetation. Note the proliferation of flowers - largely <i>D. retorta</i> with some <i>H. linearis</i>	16
Plate 7: Block Q6 Quadrat Q54 from the NE corner showing the lack of height (poles are 2m high), the profusion of flowers and the occasional bare patch of sand.	17
Plate 8: View of Block Q1 from PP1 looking East (left) and West (right) January 2018	20
Plate 9: Block Q1 PP2 January 2018	21
Plate 10: Block Q1 PP2 July 2018	21
Plate 11: Block Q1 PP1 looking from east to west January 2019	22
Plate 12: Block Q1 PP2 looking west January 2019.	22
Plate 13: View of Block Q1 from PP1 looking East (left) and West (right) July 2019.	23
Plate 14: Block Q1 PP2 looking west July 2019	23
Plate 15: View of Block Q1 from PP1 looking East (left) and West (right) January 2020. Notice the dieback of shrub species and the height of the Eucalypt (left) and the prevalence of <i>Eragrostis curvula</i> (right).	24
Plate 16: Block Q1 PP2 looking west January 2020	24
Plate 17: Block Q1 PP2 looking south - west – north, July 2020 just after controlled burns.	25

Plate 18: Block Q1 PP1 looking west – north – east, October 2021	25
Plate 19: Block Q1 PP2 looking south - west – north, October 2021	26
Plate 20: Block Q2 looking east January 2019	27
Plate 21: Block Q2 looking east July 2019	27
Plate 22: Block Q2 looking east January 2020. Note the die back of <i>Acacia longifolia</i> around the perimeter of the block	28
Plate 23: Block Q2 looking east July 2020.	28
Plate 24: Block Q2 looking east January 2021.	29
Plate 25: Block Q2 looking east October 2021	29
Plate 26: Block Q3 east (looking west) January 2019	30
Plate 27: Block Q3 east (looking west) July 2019.....	30
Plate 28: Block Q3 east (looking west) January 2020	31
Plate 29: Block Q3 east (looking west) July 2020.....	31
Plate 30: Block Q3 east (looking west) January 2021	32
Plate 31: Block Q3 east (looking west) July 2021.....	32
Plate 32: Block Q3 south (looking east along haul road) January 2019.....	33
Plate 33 Block Q3 south (looking east along haul road) July 2019	33
Plate 34: Block Q3 south (looking east along the haul road) January 2020	34
Plate 35: Block Q3 south (looking east along haul road) July 2020	34
Plate 36: Block Q3 south (looking east along haul road) January 2021	35
Plate 37: Block Q3 south (looking east along haul road) October 2021	35
Plate 38: Block Q4 east (looking west) January 2019	36
Plate 39: Block Q4 east (looking west) July 2019.....	36
Plate 40: Block Q4 east (looking west) January 2020	37
Plate 41: Block Q4 east (looking west) July 2020.....	37
Plate 42: Block Q4 east (looking west) January 2021	38
Plate 43: Block Q4 west (looking east) January 2019	39
Plate 44: Block Q4 west (looking east) July 2019.....	39
Plate 45: Block Q4 west (looking east) January 2020. Note the grassy weeds adjacent to this block (far left and right of photo).....	40
Plate 46: Block Q4 west (looking east) January 2020.	40
Plate 47: Block Q4 west (looking east) January 2021. Note the dense weedy grass infestation in Block Q1 (left of photo) and the encroachment into this block.....	41
Plate 48: Block Q4 west (looking east) October 2021	41
Plate 49: Block Q5 looking east January 2019.....	42
Plate 50: Block Q5 looking east July 2019	42
Plate 51: Block Q5 looking east January 2020.....	43
Plate 52: Block Q5 North - looking south July 2020.....	43
Plate 53: Block Q5 north (looking south) January 2021. Growth of vegetation necessitated the relocation of the photo point for this block. Note the dominance of grasses (brown) and <i>Acacia longifolia</i> (large green shrubs).....	44
Plate 54: Block Q6 south-east (looking south-west to north-east) July 2020.	44
Plate 55: Block Q6 south-east (looking south-west to north-east) January 2021.	45
Plate 56: Block Q6 south-east (looking south-west to north-east) October 2021	45
Plate 57: Block Q6 south-east (looking south-west to north-east) February 2022.....	46
Plate 58: Block Q6 North-east (looking south and west) July 2020.	46
Plate 59: Block Q6 North-east (looking south and west) January 2021. Note the grassy weeds encroaching from Block Q1 at right of photo	47
Plate 60: Block Q6 West - looking east - south - west, January 2021.....	47

Plate 61: Block Q6 West - looking east - south - west, October 2021..... 48
 Plate 62: Block Q6 West - looking east - south - west, February 2022 48

Appendices

Appendix A: Photographic Monitoring Record..... 20
 Appendix B: North Dunes Extension Blocks Q1 to Q6 Growth Parameter Comparison Charts 49
 Appendix C: Predictive Trends..... 54
 Appendix D: Flora Species List by Block..... 58
 Appendix E: Staff Contributions and Qualifications 62

1. INTRODUCTION

Holcim Australia (formerly Sibelco Australia) was granted consent to extract white silica sand from the Tanilba North Dune Extension located in the Oyster Cove area, in the Port Stephens Council Local Government Area (**Figure 1**). While sand extraction operations have now ceased, consent conditions require the vegetative rehabilitation of mined areas following sand extraction. An ongoing vegetation monitoring program has been established to aid in management of the rehabilitation project.

The extraction of sand was granted by the Minister for Planning and Infrastructure (DP&I) for quarrying activities to occur over 9 ha in an area bounded by Rutile Rd to the north and previous sand extraction operations at Tanilba North Dune. This project is labelled the Tanilba North Dune Extension Project (the NDE) and is located within Lots 11, 12 and 13 DP 601306; Lot 408 DP 1041934; and Lots 1 and 2 DP 408240. The extension project was a Major Project assessment and is considered under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Kleinfelder was appointed by the former owners, Sibelco Australia to conduct the rehabilitation monitoring for this project in January 2017, and the new owners Holcim Australia Pty Ltd, appointed Kleinfelder to continue the monitoring program from July 2020. A modification to the Landscape Management Plan (LMP) was undertaken by Kleinfelder (Kleinfelder, 2020a) on behalf of Sibelco Australia in July 2020. The major outcome from that review that affected future reporting were changes to the monitoring requirement. At the completion of the initial three-year biannual monitoring, annual monitoring utilising the Post 3-Year Monitoring methodology was to be implemented. Monitoring for this report was undertaken by Wedgetail Project Consulting (WPC) after the movement of key personnel from Kleinfelder to WPC.

An annual report is prepared in autumn to support the Annual Environmental Management Report (AEMR). Monitoring is performed biannually to determine if significant changes are occurring.

2. SCOPE

The NDE has been subdivided into several smaller blocks for ease of data collection. This report provides details for the monitoring of the revegetation of Blocks Q1, Q2, Q3, Q4, Q5 and Q6 for the Northern Dunes Extension. Rehabilitation blocks were prepared and biannually surveyed after 6 months of growth, for a period of 3 years. Details of each block surveyed for the 2022 annual report are shown in **Table 1**. Biannual monitoring was completed on Block Q1 in July 2020 and the first of the Post 3 Year Monitoring events was completed in October 2021. This report presents the results from the second Post 3-Year Monitoring event for this block. The remaining blocks were monitored at the 4 year stage post revegetation for the first time and those results are presented in this report. Please note Block 6 monitoring was brought forward to align with blocks Q2 – Q5.

A comment is necessary on the labelling used throughout this report. The NDE rehabilitation blocks have been labelled “Block Q” as an extension to the labelling system that was utilised throughout the Tanilba North Dunes Sand Extraction Area – Blocks A - P. Post 3-Year monitoring also used quadrats that were numbered 1 through 45. This system was continued for the NDE and has resulted in both the Sand Extraction Area blocks and monitoring quadrats labelled with the prefix “Q”.

Table 1: Block preparation and survey schedule details for the North Dunes Extension Rehabilitation blocks for the 2022 monitoring report.

Block	Prepared for Revegetation	First Biannual Survey Conducted	Last Biannual Survey Conducted	Comments
Q1	December 2016 - July 2017	January 2018	July 2020	5 Year Monitoring Completed – October 2022 (This report)
Q2	July 2018	January 2019	July 2021	All Biannual Monitoring Completed – First Post 3 Year Monitoring event – 4 year monitoring completed (This report)
Q3	July 2018	January 2019	July 2021	
Q4	July 2018	January 2019	July 2021	
Q5	July 2018	January 2019	July 2021	
Q6	July 2019	January 2020	July 2022	



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Legend

- Subject Block Boundaries
- Other NDE Block Boundaries
- National Park
- Sub-Arterial Road
- Local Road
- Track-Vehicular
- Minor watercourse

Locality

Holcim Australia
North Dune Extension Sand Mining Extraction Operation
Oyster Cove Rd, Tanilba Bay

Figure:

1



3. METHODS

3.1 QUADRAT MONITORING DESIGN

The Post 3 Year monitoring established on each of the former extraction blocks is the same methodology as has been employed in all Post 3 Year monitoring on the Tanilba North Dunes site and ensures continuity of methodology.

3.1.1 20m x 20m Quadrat Monitoring

One permanent 20 m x 20 m (0.04 ha) quadrat per hectare of rehabilitation has been used to give a broad scale indication of the rehabilitation structure and diversity (the standard recommended for vegetation surveys by the Flora and Fauna Survey Guidelines for the Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS)). The location of these quadrats was selected and placed in areas that are most representative of the total rehabilitation block (**Figure 2**). The data collected from these quadrats included:

- Total species identification (richness) (Full species list in **Appendix D**).
- Species cover abundance (diversity) using the modified Braun-Blanquet cover-abundance scale, **Table 3**).
- Average height of each stratum.
- Reproductive status of species i.e., observations are made as to whether seedlings, fruit or flowers were recorded.
- General comments.

Table 2: Modified Braun-Blanquet cover-abundance scale.

Rating	Cover-abundance
1	< 5% cover, few individuals or sparse occurrence
2	< 5% cover, many individuals
3	5 - 25% cover
4	25 - 50% cover
5	50 - 75% cover
6	75 - 100% cover

1.1.1 2m x 2m Plot Monitoring

Within these 20 m x 20 m quadrats, six smaller 4 m² (2 m x 2 m) plots were surveyed to give a more detailed indication of the rehabilitation structure and diversity. The location of each of these plots within the 20 m x 20 m quadrats is selected at random each year. Within each of these plots the following data is recorded for each species:

- Average height of each species type,
- Total number of plants/species, and,
- Estimated percentage foliage cover.

The combination of the 20 m x 20 m quadrats and 2 m x 2 m plots identifies how the rehabilitation area compares against the performance criteria of the EMP. This information is summarised in **Table 4**.

Table 3: A summary of which survey method addresses the performance criteria of the EMP.

Performance criteria	Survey Type	
	20 m x 20 m Quadrat	2 m x 2 m Plot
Post 3 Year Monitoring to determine development of: Mature pioneer stage characterised by		
Gradual dieback of some primary colonisers	✓	✓
Appearance of mature vegetation species	✓	✓
Planted trees and shrubs present in predetermined numbers		✓
Beginning of differentiation of structural layers (canopy, sub-canopy, shrub layer)		✓
No significant erosion problems	✓	

A permanent photographic record was established for each permanent 20 m x 20 m quadrat. A photograph is taken from each corner looking into the quadrat at each survey to allow a visual assessment of the rehabilitation progression in future monitoring reports.

3.2 MONITORING OUTCOMES

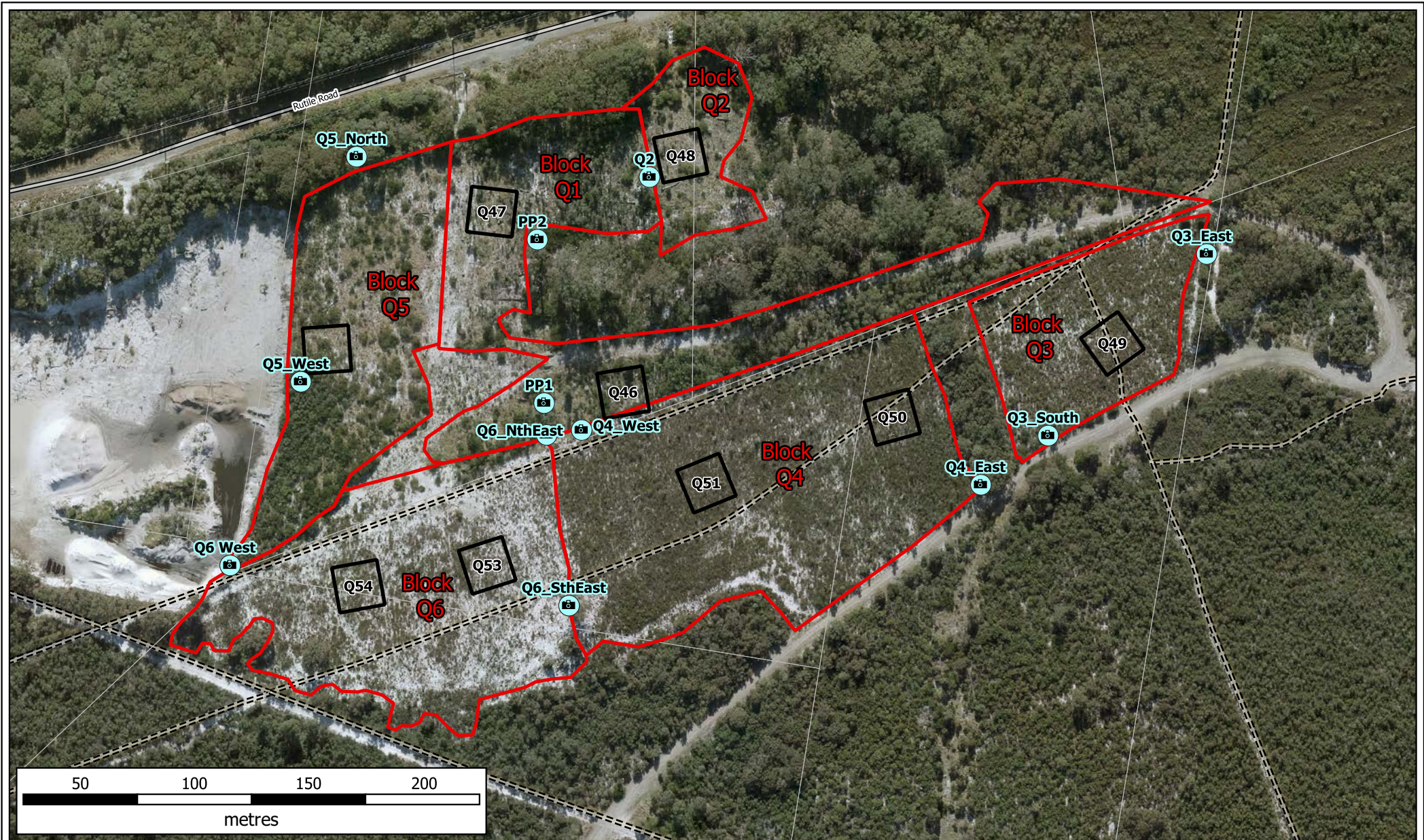
3.2.1 Defining Targets

The desired outcome for the vegetation rehabilitation of the sand extraction areas is to achieve a vegetative structure and composition comparable to that of the surrounding areas which have a similarly shallow elevation above the water table. The data collected from monitoring events has been compared with targets for these parameters. The target figures for the ideal outcome for the parameters described in **Table 2** were determined from two 20 m x 20 m (400 m² each) sample plots located in the undisturbed vegetation either side of the extraction area near Block A of the Tanilba North Dunes Sand Extraction Project in 2005. The target figures from these two survey plots have been used for all rehabilitation blocks.

3.2.2 Assessment of Rehabilitation Parameters

The total averages for each parameter at 6-month intervals, for each block, have been shown in charts (**Appendix B**). These charts compare the similarity and divergences between blocks by analysing the recorded data for each block against the same timeline (i.e. 3 years).

Predictive trends for height and foliage cover growth out to the end of operations has been analysed by plotting the initial data from the data recorded to date and extrapolating this inclination until it meets the targeted parameter (i.e., height or foliage cover targets). The results are given in **Appendix C**.



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Legend

- Subject Block Boundaries
- Quadrat (20m x 20m)
- 📷 Photo Point
- Local Road
- Track-Vehicular

**Blocks, Monitoring Quadrats
& Photo Locations**

Holcim Australia
North Dune Extension Sand Mining Extraction Operation
Oyster Cove Rd, Tanilba Bay



4. MONITORING RESULTS

4.1 BLOCK Q1

This block has two quadrats used for monitoring and is now five years since first revegetated.

4.1.1 Quadrat Q46

This quadrat recorded a total of 32 species, 29 of which were natives, below the target of 34 (**Table 3**). Four overstorey species were recorded – *Corymbia gummifera*, *Eucalyptus pilularis*, *E. robusta* and *Melaleuca nodosa*, the tallest which were estimated to be approximately 5.0m tall. Two midstorey species were recorded, *Leptospermum polygalifolium* and *Monotoca elliptica*, with *L. laevigatum* also counting as a midstorey species, but an exotic in this system. Twenty-three shrub species and six ground stratum species were also recorded in this quadrat. The most abundant species recorded was *Acacia longifolia* with an estimated cover abundance score (CA) of 4, i.e., between 25% and 50% of the quadrat. Two other native species recorded CA scores of 3 (between 5% and 15%) – *Banksia aemula* and *Dianella spp.* Only the grassy weed *Eragrostis curvula* recorded a CA score of 3, and this was much reduced, due to a controlled burn that occurred on the day of the survey.

Plot data for this quadrat shows that almost all parameters have decreased since the previous survey, attributed to the controlled burn with many plants destroyed (**Plate 1**). The positive is the reduction in the number of exotic species and as mentioned above the reduction in cover of *E. curvula*. The next round of monitoring will determine the extent of recovery for this area.



Plate 1: Controlled burn occurring in the vicinity of Q46 on the day of monitoring. Note the reduction in plants – native and exotic in the ground cover stratum.

4.1.2 Quadrat Q47

This quadrat recorded a total of 31 flora species, of which only 16 were native. This reflects the amount of revegetation that has had to be undertaken in this area due to the extensive cover *E. curvula*. A high proportion of the native species were installed species including *B. aemula*, *C. gummifera*, *E. piperita*, *L. polygalifolium* and *M. nodosa*. Many of these individuals were quite large with heights up to 3.5m recorded. Exotic species included a very high cover of *E. curvula* (CA score of 5 or 50% to 75%), indicating that this species has recovered despite the revegetation efforts. *Lantana camara* was also recorded on this quadrat and requires weed control before it can become a threat to the revegetation.

4.1.3 Block Summary

This block consists of two areas – Quadrat Q47 is located to the north of the haul road and is an area of poorer revegetation where native plant densities and diversity do not meet targets. This is the area that was subject to removal of most of the vegetation by a controlled burn and topsoil scraping to reduce the prevalence of *E. curvula* (**Plate 11 in Appendix A**), which has proved to be only partially successful. Further weed control efforts will be required, together with a seeding program of native species to improve diversity. The planted key species have survived quite well and continue to increase in size.

The area where Quadrat Q46 is located is south of the old haul road and adjacent to extraction areas Block 3 and Block 4 (**Figure 2**). This area also has sections of better and poorer revegetation – the western end has sparser native vegetation and a higher proportion of *E. curvula*. The eastern section is quite good revegetation. The planting of key *Eucalyptus* and midstorey species in this section has produced good cover and good litter build up. This section of the block requires ingoing weed control efforts.

Table 4: Growth parameters for Block Q1 monitoring quadrats for Post 3 Year monitoring and comparison to targets.

Parameter	Target	3 Yr Growth Param	4 Yr Mon (2021)			5 Yr Mon (2022)		
			Q46	Q47	Block Ave	Q46	Q47	Block Ave
Ave. Cover (%)	80	57.71	83.33	66.67	75.00	66.67	60.00	57.5
Ave. height (cm)	230	66.62	114.81	75.23	95.02	71.88	55.0	79.7
Total Native Species (400 m ²)	34	-	34	14	28.25	29	16	22.5
Total Weed Species (400 m ²)	-	-	7	11	9	3	15	9
Ave. No. of plants (plants/4 m ²)	40	17.14	45.17	95.50	70.33	15.67	45.17	30.42
Ave. No. Fire resistant species (plants/4 m ²)	1	1.46	1.33	1.67	1.50	1.33	1.33	1.33
Ave. Species Richness (species/4 m ²)	12	6.04	9.33	5.67	7.50	5.00	9.33	7.17

Parameter	Target	3 Yr Growth Param	4 Yr Mon (2021)			5 Yr Mon (2022)		
			Q46	Q47	Block Ave	Q46	Q47	Block Ave
Ave. Exotic Species (species/4 m ²)	0	-	1.5	1.83	1.67	0.67	2.66	1.67
Ave. Ground stratum proportion (%)	27	43.54	30.0	37.0	34.0	30.0	30.37	30.2
Ave. Shrub stratum proportion (%)	61	29.40	55.0	19.0	37.0	36.67	55.32	45.9
Ave. Midstorey stratum proportion (%)	7	14.60	9.0	21.0	15.0	30.00	9.22	19.6
Ave. Overstorey stratum proportion (%)	5	12.47	5.0	24.0	15.0	3.33	5.09	4.2

4.2 BLOCK Q2

This block is a small block in the north-east section of the NDE and is very similar to the area monitored by Q47. Quadrat Q48 has increased in cover and average height since the 3-year monitoring, but otherwise appears to be making little progress. From **Plate 2**, much of the groundcover is exotic. Indeed, a total of 11 exotic species were recorded in the quadrat including *L. laevigatum*. *E. curvula* recorded a CA score of 5 (between 50% and 75%). All seven key species were recorded, but *Xanthorrhoea glauca* recorded a CA score of 3 (5% to 25%), with the remaining only estimated to <5% (score of 2), but frequent. With increasing size, these scores will increase. Other native species of note included *E. robusta*, installed to provide future preferred koala feed trees, and *A. longifolia*. This latter covered a considerable portion of the block with a CA score of 3. Native early coloniser species such as *Dillwynia retorta* and *Hibbertia linearis* are not in large numbers as found in blocks with better revegetation. Usually these and other species are in much higher numbers and record CA scores of 3 and 4 (25% - 50%).

The major concern with this block is the lack of native species diversity which at 21 species is well below targets. Combined with the high cover of aggressive exotics, natural recruitment will be slow until the planted overstorey species achieve sufficient height to begin to shade these species out. In the meantime, ongoing weed control could be continued to suppress the more aggressive weed species and consideration given to a seeding program of native shrubs species to increase diversity.

Table 5: Growth parameters for Blocks Q2 monitoring quadrats for Post 3 Year monitoring and comparison to targets and end of 3-year monitoring.

Parameter	Target	3 Year Monitoring	4 Year Monitoring
Ave. Cover (%)	80	61.33	83.33
Ave. height (cm)	230	29.16	71.41
Total Native Species (400m ²)	34	-	21
Total Weed Species (400m ²)	-	-	11
Ave. No. of plants (plants/4 m ²)	40	97.67	89.83
Ave. No. Fire resistant species (plants/4 m ²)	1	1.00	1.33
Ave. Species Richness (species/4 m ²)	12	7.4	8.00
Ave. Exotic Species (species/4 m ²)	0	4.6	5.16
Ave. Ground stratum proportion (%)	27	66.5	61.23
Ave. Shrub stratum proportion (%)	61	21.77	16.03
Ave. Midstorey stratum proportion (%)	7	8.00	12.38
Ave. Overstorey stratum proportion (%)	5	3.73	10.36



Plate 2: Quadrat Q48 from the SW corner showing exotic groundcover, planted key species and prevalence of *A. longifolia*.

4.3 BLOCK Q3

This block is monitored by quadrat Q49 and represents excellent revegetation with continued increases in average cover, average height and above target species diversity in the quadrat as a whole, with on target diversity in the 2m x 2m plots (**Table 5**). While not all key species were recorded in the 4m² plots, all key species were recorded in the quadrat. This is a good result as previous surveys had not recorded *L. polygalifolium*. This species was below target numbers for this block, while *X. glauca* (no target) was also low in numbers. *B. aemula*, *C. gummifera*, *E. piperita*, *L.*

trinervium and *M. nodosa*, in addition to *E. robusta* were all recorded in good numbers. A number of other species were also recorded with high CA scores indicating that good native coverage. These were the early succession species *A. longifolia*, *A. ulicifolia*, *Caustis recurvata*, and *H. linearis* – all with a CA score of 3 and *D. retorta* at a CA score of 4. **Plate 3** shows the abundance of flowering plants on this block.

Table 6: Growth parameters for Block Q3 monitoring quadrats for Post 3 Year monitoring and comparison to targets.

Parameter	Target	3 Year Monitoring	4 Year Monitoring
Ave. Cover (%)	80	69.62	78.33
Ave. height (cm)	230	55.13	69.60
Total Native Species (400m ²)	34	-	44
Total Weed Species (400m ²)	-	-	1
Ave. No. of plants (plants/4 m ²)	40	27.62	28.33
Ave. No. Fire resistant species (plants/4 m ²)	1	1.74	1.33
Ave. Species Richness (species/4 m ²)	12	13.37	11.67
Ave. Exotic Species (species/4 m ²)	0	-	0
Ave. Ground stratum proportion (%)	27	9.64	8.30
Ave. Shrub stratum proportion (%)	61	77.71	80.44
Ave. Midstorey stratum proportion (%)	7	5.27	2.96
Ave. Overstorey stratum proportion (%)	5	7.38	8.29



Plate 3: Quadrat Q49 in Block Q3 from the SE corner showing the excellent native species coverage and the prodigious flowering of multiple species.

Only a single weed species, *L. laevigatum* was recorded in the quadrat. While as noted, two key species are below target in numbers, it is felt that at this stage it may cause more damage to the

existing vegetation if in-fill planting is undertaken at the present state of the vegetation. Seed collection from adjacent areas and spreading may be option in the short term. Otherwise in-fill plating could be undertaken when the early succession species begin to die back.

4.4 BLOCK Q4

This block has two monitoring quadrats, Q50 and Q51 and overall is another example of excellent revegetation as can be seen from **Table 7**.

4.4.1 Quadrat Q50

This quadrat recorded excellent growth parameters with increased average cover, average height, above target native species diversity in the quadrat and in the plots. Targets for numbers of plants per plot is below target, but probably reflects that achievement of analogue density will require some more development, rather than any shortfall in the revegetation effort (**Plate 4**). All key species and *E. robusta* were recorded in this quadrat with excellent numbers and increasing CA scores. This quadrat is still dominated by early succession species such as *D. retorta*, which with a CA score of 5 is the most abundant species.

Table 7: Growth parameters for Block Q4 monitoring quadrats for Post 3 Year monitoring and comparison to targets.

Parameter	Target	3 Yr Mon	4 Year Monitoring		
			Q50	Q51	Block Ave
Ave. Cover (%)	80	69.06	75.00	81.67	78.33
Ave. height (cm)	230	54.87	72.51	67.83	70.17
Total Native Species (400m ²)	34	-	40	39	39.5
Total Weed Species (400m ²)	-	1	2	0	2
Ave. No. of plants (plants/4 m ²)	40	31.68	26.00	28.17	27.08
Ave. No. Fire resistant species (plants/4 m ²)	1	1.33	1.83	0.83	1.33
Ave. Species Richness (species/4 m ²)	12	12.65	13.50	14.17	13.83
Ave. Exotic Species (species/4 m ²)	0	-	0	0	0
Ave. Ground stratum proportion (%)	27	4.04	6.31	7.18	6.75
Ave. Shrub stratum proportion (%)	61	84.93	72.62	79.97	76.29
Ave. Midstorey stratum proportion (%)	7	5.54	12.52	7.18	9.85
Ave. Overstorey stratum proportion (%)	5	5.49	8.54	5.67	7.11



Plate 4: Block Q4, Quadrat 50, plot 2 showing that despite the excellent growth parameters, there is still considerable space between individual plants.

No exotic species were recorded in the quadrat, but *L. laevigatum* and *Melaleuca quinquenervia* were recorded, still seedlings at this stage.

4.4.2 Quadrat Q51

This quadrat also recorded excellent and improving growth parameters, and again the only parameter that had not improved or was below target was the average number of plants per 4m² plot. All key species and *E. robusta* were again recorded within the quadrat with only *L. polygalifolium* and *X. glauca* in low abundance. Again, this section of the block is dominated by early succession species with *D. retorta* recording the highest CA score at 4. Other early succession species with high CA scores (3) included *A. ulicifolia*, *Bossiaea heterophylla* and *H. linearis*. Three later succession species were recorded with good CA scores (all 3) were *Leptomeria acida*, *Leucopogon ericoides* and *Monotoca elliptica*. No weed or exotic species were recorded in the quadrat.

4.4.3 Block Summary

This block has excellent growth parameters, and as the individual quadrats are above or at target for most of these parameters, so it follows that the averages will also be very good. A particular feature of the re-planting effort has been the high numbers of *E. robusta* that have successfully established. Cover abundance for this key koala feed tree was 3 (5% to 25%) with heights up to 3m estimated. Weed species within the block were limited to small individuals (at this stage) *L. laevigatum* and *M. quinquenervia*. Both of these are native species and are naturally found nearby but are not considered native to this vegetation community. *E. curvula* was observed to be encroaching from the adjacent block, Block 1 and this grass needs control before it becomes established and undoes the good work that has been achieved.

4.5 BLOCK Q5

This block is monitored by Quadrat Q52. The growth parameters for this quadrat are generally very poor (**Table 8**). This quadrat recorded a very low 19 native species and six exotic or weed species.

This quadrat is dominated by three species – *L. laevigatum* (CA score of 5), *E. curvula* (CA. of 4) and *A. longifolia* (CA of 4). Two other native species present in good numbers and/or size were *L. polygalifolium* and *X. glauca*, both with CA scores of 3. The remaining natives were only recorded in small numbers and CA scores of 1 (<5% and infrequent) or 2 (<5% but numerous). The growth parameters in **Table 8** show that while average height and average cover have increased for the last biannual monitoring event, all other parameters have decreased and remain well below targets. The high proportion of ground stratum species is attributable to the weedy grasses that are quite prevalent in this block (**Plate 5**).

Table 8: Growth parameters for Block Q5 monitoring quadrats for Post 3 Year monitoring and comparison to targets.

Parameter	Target	3 Year Monitoring	4 Year Monitoring
Ave. Cover (%)	80	79.81	82.50
Ave. height (cm)	230	93.75	100.31
Total Native Species (400m ²)	34	-	19
Total Weed Species (400m ²)	-	-	6
Ave. No. of plants (plants/4 m ²)	40	18.26	15.83
Ave. No. Fire resistant species (plants/4 m ²)	1	3.07	0.83
Ave. Species Richness (species/4 m ²)	12	4.08	5.33
Ave. Exotic Species (species/4 m ²)	0	2.27	1.0
Ave. Ground stratum proportion (%)	27	36.77	21.53
Ave. Shrub stratum proportion (%)	61	31.99	34.72
Ave. Midstorey stratum proportion (%)	7	23.89	32.64
Ave. Overstorey stratum proportion (%)	5	7.35	11.11

This block has quite dense shrubby and midstorey vegetation at its southern extent which becomes more open and weedier at its northern extent (**Figure 2**). This denser vegetation is largely composed of *A. longifolia*, *A. falcata* and *Dodonaea triquetra* with *L. laevigatum*. The two *Acacia* species and *D. triquetra* are relatively short-lived species and will in the next 2-3 years start to die back, leaving this block with less native vegetation cover than at present. These species will have seeded during that time but will require a disturbance such as fire to stimulate a strong germination response to dominate the block and help suppress weed species once again.



Plate 5: Block Q5, Quadrat 52 from the NW corner. Note the presence of *E. curvula*, *A. longifolia* and *L. laevigatum*.

4.6 BLOCK Q6

This block was monitored with two quadrats – Quadrats Q53 and Q54.

4.6.1 Quadrat Q53

The growth parameters for this quadrat are little perplexing with average height remaining largely unchanged and average cover declining slightly from the last biannual monitoring event (**Table 9**). Conversely, the total native species diversity is above target for both the quadrat as a whole (38 species) and the average for the plots (14.0), with the average number of plants per 4m² plot right on target. This quadrat recorded all seven key species with *B. aemula* and *L. polygalifolium* recording CA scores of 3 each indicating very good numbers. This quadrat is still dominated by early succession species with *D. retorta* the most common species with a CA score 4 (**Plate 6**). Other early succession species that were abundant included *H. linearis* and *C. recurvata* with CA scores of 3 each. The remaining native species all recorded CA scores of 1 or 2 indicating relatively few and/or young plants. No weed or exotic species were recorded in the quadrat.

4.6.2 Quadrat Q54

This quadrat recorded some very good growth parameter numbers with 41 native species for the quadrat, average species richness per 4m² plot above target at 13.0 species and average numbers of plant per 4m² plot also right on target at 40.83 plants/4m² (**Table 9**). Unfortunately, as for Q53, the average cover and height has remained unchanged or decreased slightly from the last biannual monitoring. All seven key species plus *E. robusta* were recorded in the quadrat, albeit with low CA scores. *D. retorta* was even more dominant than Q53, with a CA score of 5. *C. recurvata* was the only other species to record a CA over 3, with the remaining 39 species all recording CA scores of 1 or 2, again indicating a combination of small plants and/or few numbers.

Table 9: Growth parameters for Block Q6 monitoring quadrats for Post 3 Year monitoring and comparison to targets.

Parameter	Target	3 Yr Monitoring	4 Year Monitoring		
			Q53	Q54	Block Ave
Ave. Cover (%)	80	65.00	63.33	65.00	64.17
Ave. height (cm)	230	48.42	49.14	43.65	46.40
Total Native Species (400m ²)	34	-	38	41	39.5
Ave. No. of plants (plants/4 m ²)	40	37.92	40.33	40.83	40.58
Ave. No. Fire resistant species (plants/4 m ²)	1	2.10	1.83	1.00	1.42
Ave. Species Richness (species/4 m ²)	12	14.61	14.0	13.0	13.5
Ave. Exotic Species (species/4 m ²)	0	-	0	0	0
Ave. Ground stratum proportion (%)	27	5.63	2.67	3.74	3.20
Ave. Shrub stratum proportion (%)	61	72.11	71.91	82.11	77.01
Ave. Midstorey stratum proportion (%)	7	15.39	15.66	9.96	12.81
Ave. Overstorey stratum proportion (%)	5	6.87	9.76	4.19	6.97



Plate 6: Block Q6 Quadrat Q53 showing that there is still a considerable amount of bare sand intermixed with excellent vegetation. Note the proliferation of flowers - largely *D. retorta* with some *H. linearis*.



Plate 7: Block Q6 Quadrat Q54 from the NE corner showing the lack of height (poles are 2m high), the profusion of flowers and the occasional bare patch of sand.

4.6.3 Block Summary

Another rehabilitation block with excellent growth parameters. All seven key species were recorded in good numbers and includes *E. robusta*. The domination of *D. retorta* will need to be monitored to ensure that this species has not prevented other species establishing in sufficient numbers. While no weed or exotic species were recorded in the quadrats, the exotic ground cover *Acanthium australe* and the grass *E. curvula* were observed in the northern section of this block, adjacent to Block Q5. Weed control in this area is the only recommendation for this block.

5. DISCUSSION AND RECOMMENDATIONS

5.1 DISCUSSION

The revegetation of the North Dunes Extension is neatly divided into two sections. The “southern” blocks, Blocks Q3, Q4 and Q6 are excellent revegetation with good diversity, numbers, and coverage. This is supported by the growth parameters outlined in Section 4 Results above but highlighted in **Appendix B** charts. **Chart 3** shows the average species richness per 4m² in the monitoring quadrats, with the southern blocks clearly much higher. Likewise, **Chart 6** and **Chart 7** show the proportion of ground stratum and shrub stratum species respectively. Again, these two charts split the blocks quite distinctly. The likely explanation is the source topsoil that was used for the revegetation of these areas. The topsoil in the southern blocks was better vegetated with native species while the topsoil used in the northern blocks was of lower diversity. This is supported by the shrub stratum numbers and proportions. These species are not seeded at all as part of the revegetation effort but germinate from the topsoil and thus indicating that this was the case. The higher proportion of ground stratum species recorded in the northern blocks are overwhelmingly weed species. Native ground stratum species have always been under target – this has been apparent all through the revegetation in the NDE and on the North Dunes adjacent to this site which has been revegetated for over 15 years in the oldest sections. With the weed control efforts in Block Q1 and previously in Block Q2, most of the native species recorded were planted key species. Much of the remaining native diversity in these blocks was observed around the transplanted *X. glauca*, i.e., having germinated from the soil included in the transplanted stems.

From the above discussion, it would follow that the majority of positive observations relate mainly to the southern blocks. For instance, litter development is beginning to be apparent, especially under the overstorey trees or where dense *D. retorta* has dropped leaves and seed pods such as Block Q1 (southern section) and Blocks Q3 and Q4. The weedier northern blocks do not yet have that litter build up, and of course where controlled burns have occurred what litter had accumulated has been burned off.

The long-term establishment of successful revegetation requires the ability of self-recruitment and to this end a total of 64 native species were recorded across the NDE – 49 of which were recorded with reproductive features – fruit, flowers or seedlings. This is good a result and included overstorey species with fruit in Block Q1 – the oldest revegetation.

Weed species were much concentrated in the northern blocks, with the western most section of Block Q1 also an area of concern (hence the weed control burns in this section). Blocks Q3 and Q4 only had weed species observed at their edges, with no weed species recorded in the monitoring quadrats themselves. Block Q4, has *E curvula* starting to encroach from Block Q1. Block Q6 has some minor encroachment Block Q5, but also has an on-going issue with *Acanthospermum australe*, a prostrate (ground-spreading), ground stratum weed species native to North America characteristic of disturbed sites and wasteland. Previous weed control efforts have reduced, but not eliminated this species in this area.

Key species plantings have been very successful in all blocks with overstorey species including *Eucalyptus robustus* generally in good numbers. The only exception is Block Q3 where a distinct lack of the midstorey species *Leptospermum polygalifolium* has been noted previously and is probably reducing the average height growth parameter in this section of the rehabilitation.

5.2 RECOMMENDATIONS

Increasing the native diversity of the northern blocks is recommended as a priority to facilitate surrender. This would entail further weed control efforts but also a concerted seeding campaign with shrub species. Seed could be collected from the adjoining undisturbed vegetation – not from the better rehabilitation areas so as not to hinder their continued development – and applied to the blocks. This will likely require several rounds of control and seeding to achieve the desired results. Species that might be readily collected include but should not be limited to, *Dillwynia retorta*, *Hibbertia linearis*, *Leptospermum trinervium*, *Leucopogon ericoides*, *Acacia ulicifolia* and any of the three *Bossiaeas* found on site.

Planting of *L. polygalifolium* into Block Q3 would also be beneficial to improve vegetation structure and achieve key species targets in this area but may have to wait until the dense pioneer species begin to die back and open some space for ease of movement.

Weed control efforts should be on-going and frequent to bring the problematic weeds under control and to prevent these species spreading into the very good revegetation areas of the southern blocks. Targeted weeds are the very common *E. curvula*, *L. camara* and *A. australe*.

5.3 CONCLUSIONS

The NDE rehabilitation has both excellent and poorer areas of native revegetation. The excellent areas – Blocks Q3, Q4 and Q6 and the southern section of Block Q1 – only require some minor planting and on-going weed control along the edges to stop the spread of *E. curvula*. The northern blocks require additional work, weed control and seeding with native shrubs, to improve their flora diversity and numbers.

APPENDIX A: PHOTOGRAPHIC MONITORING RECORD

Block Q1



Plate 8: View of Block Q1 from PP1 looking East (left) and West (right) January 2018



Plate 9: Block Q1 PP2 January 2018



Plate 10: Block Q1 PP2 July 2018



Plate 11: Block Q1 PP1 looking from east to west January 2019



Plate 12: Block Q1 PP2 looking west January 2019



Plate 13: View of Block Q1 from PP1 looking East (left) and West (right) July 2019



Plate 14: Block Q1 PP2 looking west July 2019



Plate 15: View of Block Q1 from PP1 looking East (left) and West (right) January 2020. Notice the dieback of shrub species and the height of the Eucalypt (left) and the prevalence of *Eragrostis curvula* (right)



Plate 16: Block Q1 PP2 looking west January 2020



Plate 17: Block Q1 PP2 looking south - west – north, July 2020 just after controlled burns



Plate 18: Block Q1 PP1 looking west – north – east, October 2021



Plate 19: Block Q1 PP2 looking south - west – north, October 2021

Block Q2



Plate 20: Block Q2 looking east January 2019



Plate 21: Block Q2 looking east July 2019



Plate 22: Block Q2 looking east January 2020. Note the die back of *Acacia longifolia* around the perimeter of the block



Plate 23: Block Q2 looking east July 2020.



Plate 24: Block Q2 looking east January 2021.



Plate 25: Block Q2 looking east October 2021

Block Q3



Plate 26: Block Q3 east (looking west) January 2019



Plate 27: Block Q3 east (looking west) July 2019



Plate 28: Block Q3 east (looking west) January 2020



Plate 29: Block Q3 east (looking west) July 2020



Plate 30: Block Q3 east (looking west) January 2021



Plate 31: Block Q3 east (looking west) July 2021



Plate 32: Block Q3 south (looking east along haul road) January 2019



Plate 33 Block Q3 south (looking east along haul road) July 2019



Plate 34: Block Q3 south (looking east along the haul road) January 2020



Plate 35: Block Q3 south (looking east along haul road) July 2020



Plate 36: Block Q3 south (looking east along haul road) January 2021



Plate 37: Block Q3 south (looking east along haul road) October 2021

Block Q4



Plate 38: Block Q4 east (looking west) January 2019



Plate 39: Block Q4 east (looking west) July 2019



Plate 40: Block Q4 east (looking west) January 2020



Plate 41: Block Q4 east (looking west) July 2020



Plate 42: Block Q4 east (looking west) January 2021



Plate 43: Block Q4 west (looking east) January 2019



Plate 44: Block Q4 west (looking east) July 2019



Plate 45: Block Q4 west (looking east) January 2020. Note the grassy weeds adjacent to this block (far left and right of photo)



Plate 46: Block Q4 west (looking east) January 2020.



Plate 47: Block Q4 west (looking east) January 2021. Note the dense weedy grass infestation in Block Q1 (left of photo) and the encroachment into this block.



Plate 48: Block Q4 west (looking east) October 2021

Block Q5



Plate 49: Block Q5 looking east January 2019



Plate 50: Block Q5 looking east July 2019



Plate 51: Block Q5 looking east January 2020



Plate 52: Block Q5 North - looking south July 2020



Plate 53: Block Q5 north (looking south) January 2021. Growth of vegetation necessitated the relocation of the photo point for this block. Note the dominance of grasses (brown) and *Acacia longifolia* (large green shrubs)

Block Q6



Plate 54: Block Q6 south-east (looking south-west to north-east) July 2020.



Plate 55: Block Q6 south-east (looking south-west to north-east) January 2021.



Plate 56: Block Q6 south-east (looking south-west to north-east) October 2021



Plate 57: Block Q6 south-east (looking south-west to north-east) February 2022



Plate 58: Block Q6 North-east (looking south and west) July 2020.



Plate 59: Block Q6 North-east (looking south and west) January 2021. Note the grassy weeds encroaching from Block Q1 at right of photo



Plate 60: Block Q6 West - looking east - south - west, January 2021



Plate 61: Block Q6 West - looking east - south - west, October 2021



Plate 62: Block Q6 West - looking east - south - west, February 2022

APPENDIX B: NORTH DUNES EXTENSION BLOCKS Q1 TO Q6 GROWTH PARAMETER COMPARISON CHARTS

The following charts compare the different growth parameters at the same growth as measured from the commencement of rehabilitation. The charts are presented in the same order as the parameter tables in Section 3.

Chart 1 shows the average vegetative cover over the course of the monitoring. While reductions in cover are evident for individual blocks, the overall trend is for increasing cover with age. The results of the latest weed efforts are apparent for Block Q1 with the latest reduction in cover at the 5 Year point. The ability of the vegetation to recover and increase after disturbances due to drought (18 month point) suggests a degree of resilience that indicates good self-sustaining development.

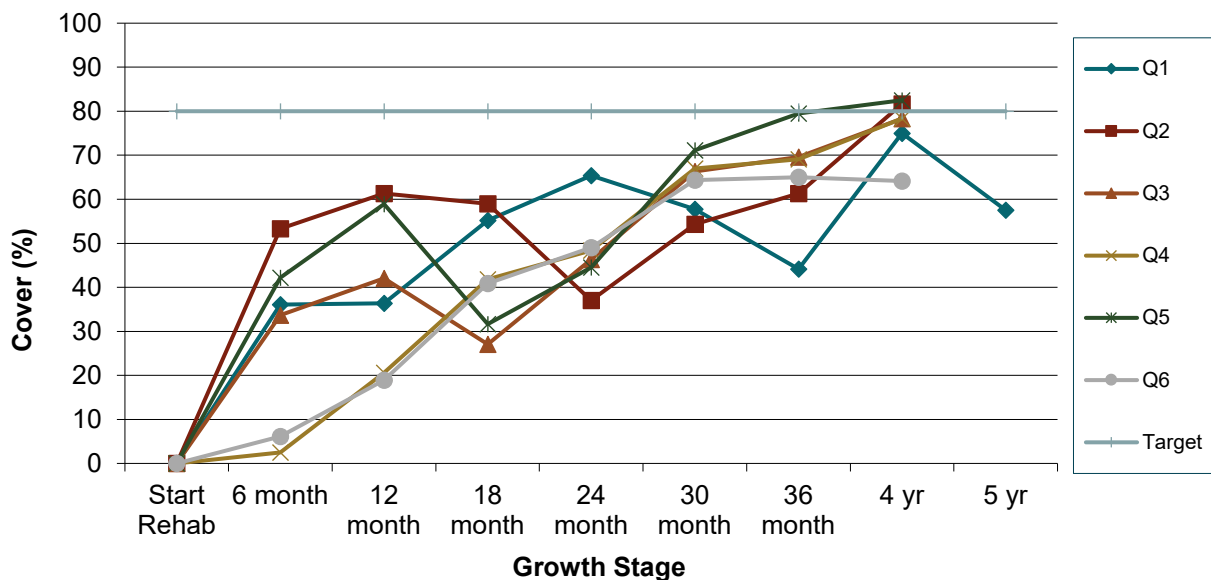


Chart 1: Comparison of average foliage cover across the blocks for the period of monitoring to date.

Chart 2 shows the average height of all species for each of the rehabilitation blocks. As expected, height increases with age of the revegetation, with minor dips due to die-back due to drought or weed control efforts. The continued maturation of overstorey and midstorey species will continue to increase this parameter.

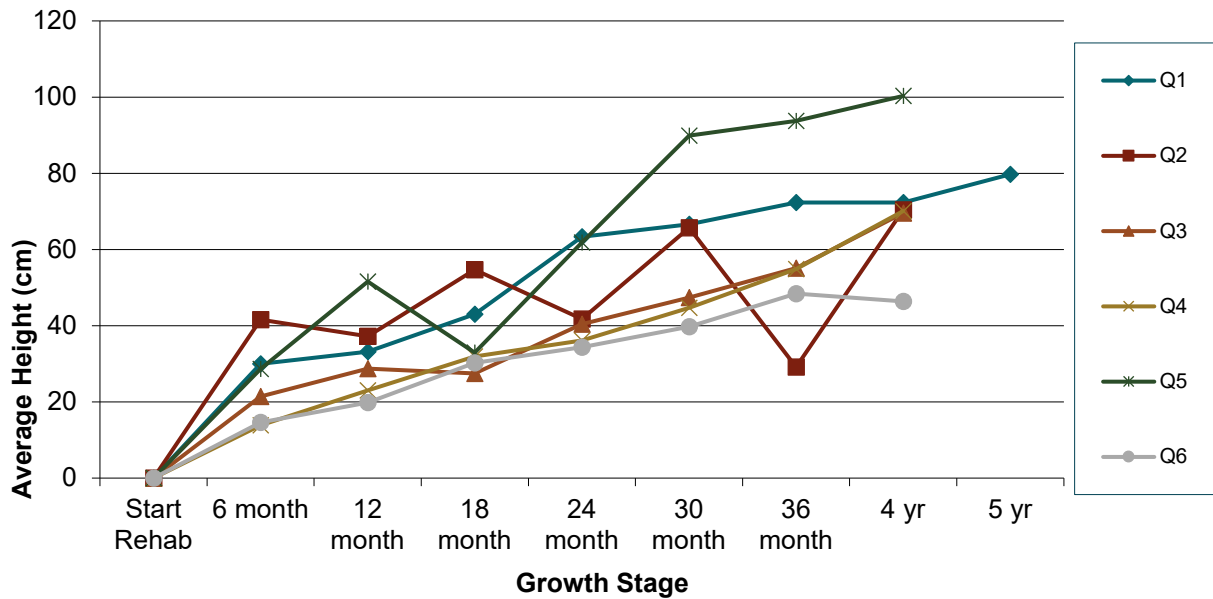


Chart 2: Comparison of average height of all strata across the blocks for the duration of the monitoring. The target of 213 cm average height is not shown.

Chart 3 shows the average species richness or diversity per 4m² in the quadrats. There is clear a difference between the northern blocks (Q1, Q2 and Q5) and the southern blocks (Q3, Q4 and Q6) with the southern blocks recording higher species diversity. This higher species diversity is equated to better revegetation, possibly due to better quality topsoil at the original clearing of the NDE.

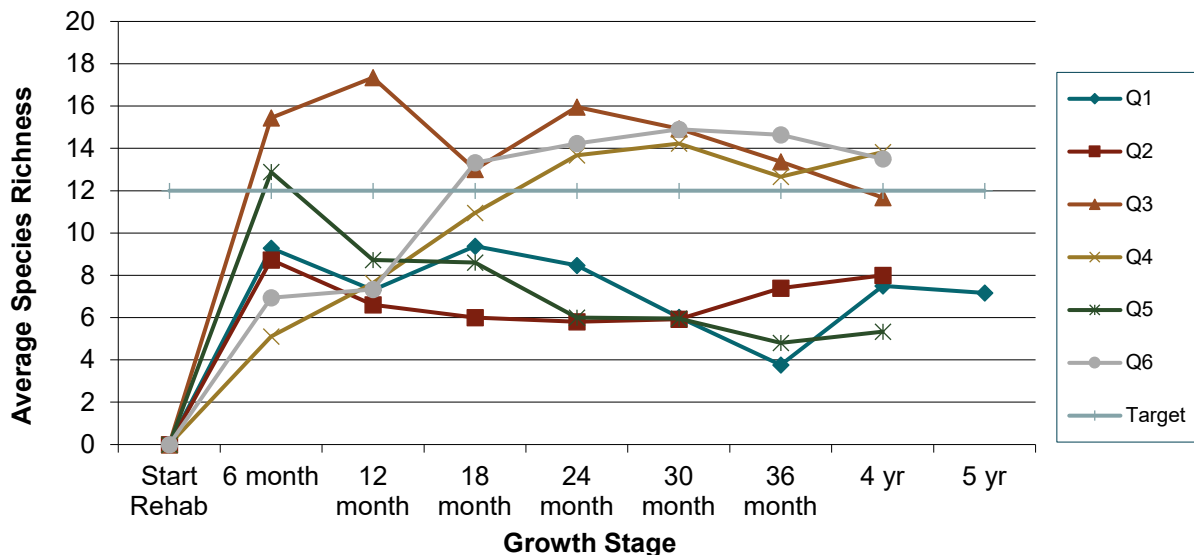


Chart 3: Comparison of the average species richness per 4m².

Chart 4 shows the average number of plants per 4m² plot within the monitoring quadrats. The two blocks with the highest plant numbers – Q1 and Q2 – have the greatest numbers of weeds, especially *E. curvula*. The results of weed control efforts shows as sharp reductions in plant numbers. Block Q5 has had consistently low plant numbers due to the prevalence of larger shrub species such as *A. longifolia* and *L. laevigatum*.

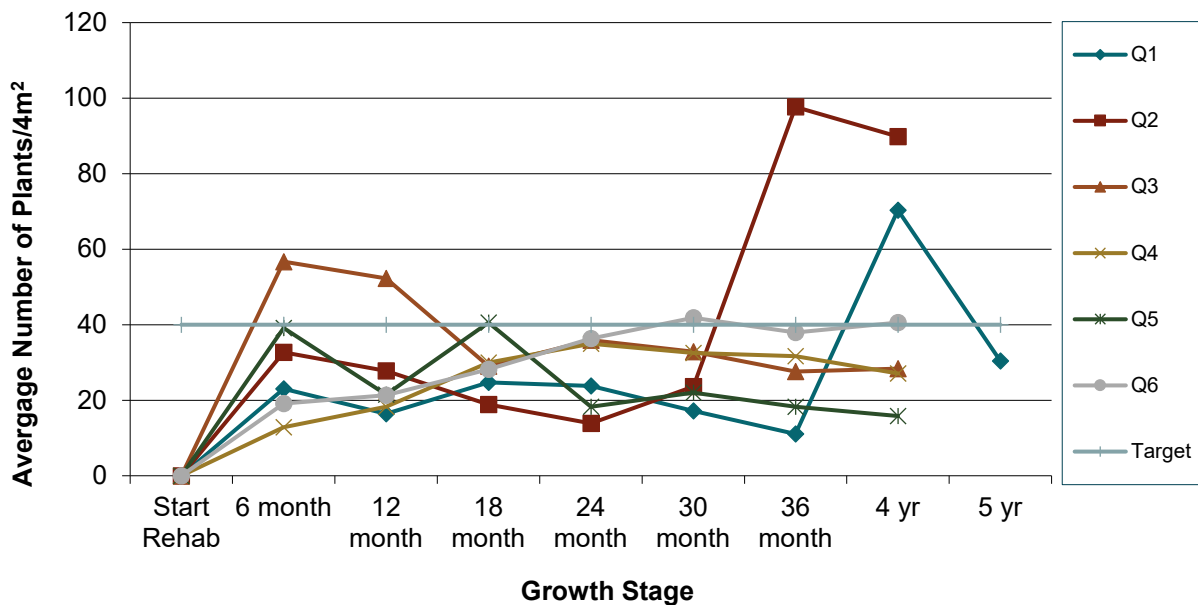


Chart 4: Comparison of the average number of plants/4m².

The average number of fire-resistant species has been fairly consistent across the blocks and throughout the revegetation and above target. The exception is Block Q5. Examination of past monitoring data reveals very high numbers of *L. laevigatum* in a small number of 4m² plots with evident die back of these plants.

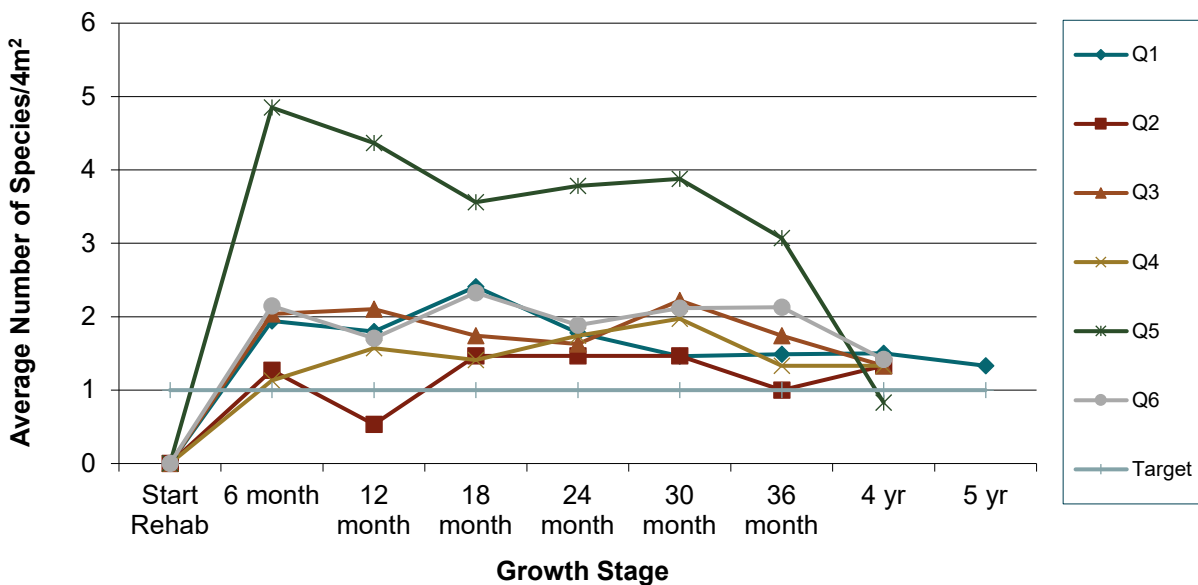


Chart 5: Comparison of the average number of fire-resistant species/4m²

Chart 6 shows the relative proportions of ground species across the blocks. Blocks Q1, Q2 and Q5 have a much higher proportion of ground species compared to Blocks Q3, Q4 and Q6. The weed species that have been recorded in these blocks are largely ground stratum species. The lack of native ground species has been noted throughout revegetation of the North Dunes and North Dunes Extension.

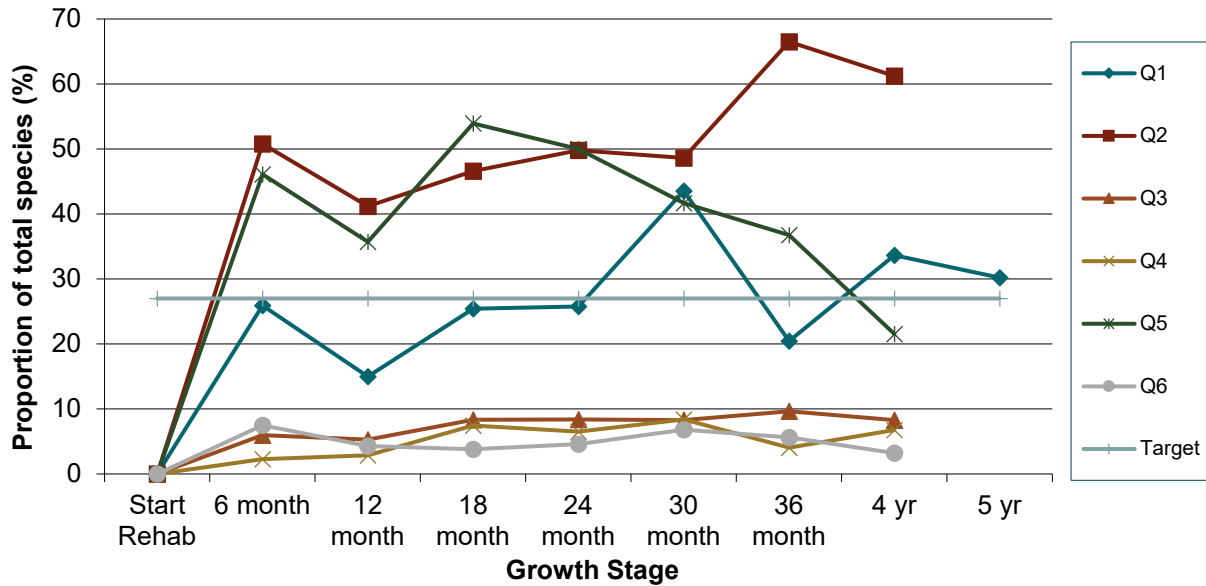


Chart 6: Comparison of the average proportion of ground stratum species/4m².

The proportion of shrub species has always been very high in both the NDE (**Chart 7**) and the Tanilba North Dunes revegetation as these species tend to be both early coloniser species and later succession species. All these species self-recruit from the soil seed bank. It is this stratum that is missing from the poorer blocks - Q1, Q2 and Q5 – and lends support to the argument that the topsoil that was stripped and respread over these blocks did not support vegetation as species rich as the topsoil used for the revegetation of Blocks Q3, Q4, and Q6.

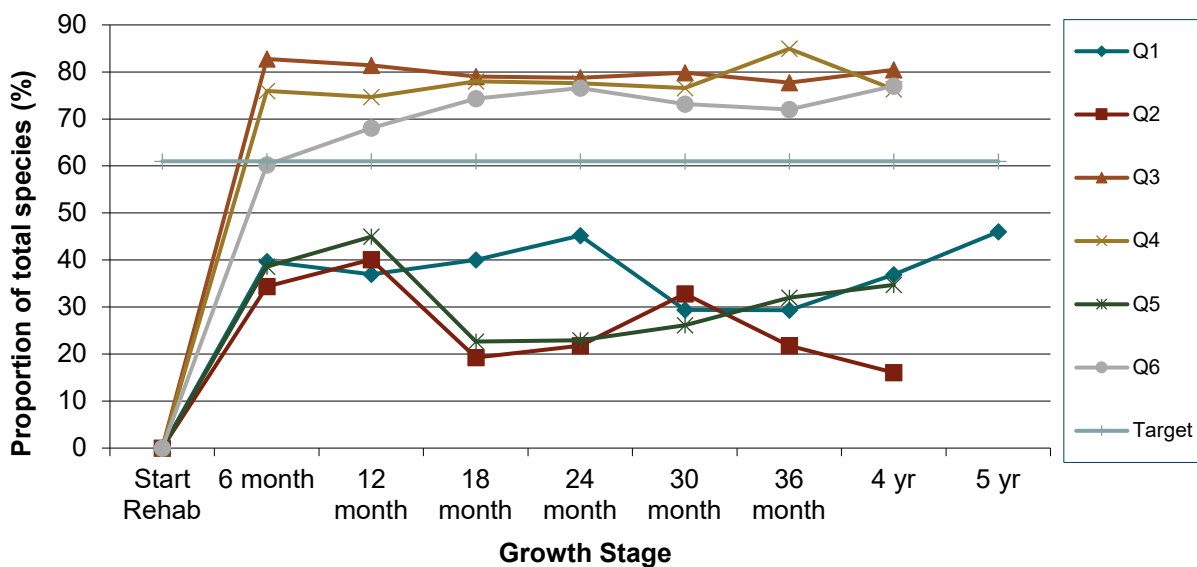


Chart 7: Comparison of the proportion of shrub stratum species/4m².

Midstorey species are predominantly planted, with some naturally recruited from the soil seed bank. Blocks with lower species diversity – e.g., Block Q5 – will then have a larger proportion of species in this stratum because of the planting of *B. aemula*, *L. polygalifolium* and *L. trinervium*.

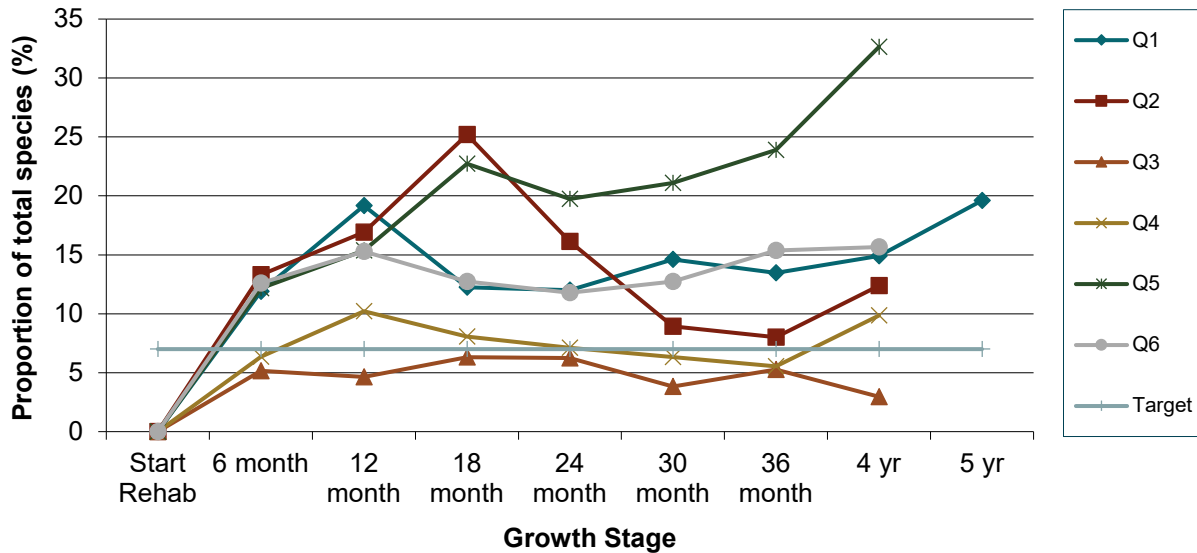


Chart 8: Comparison of the proportion of midstorey species/4m².

Overstorey species are almost totally planted and the fluctuations in the proportions of this stratum can be attributed to the timing of plantings by Sibelco and Holcim staff and contractors.

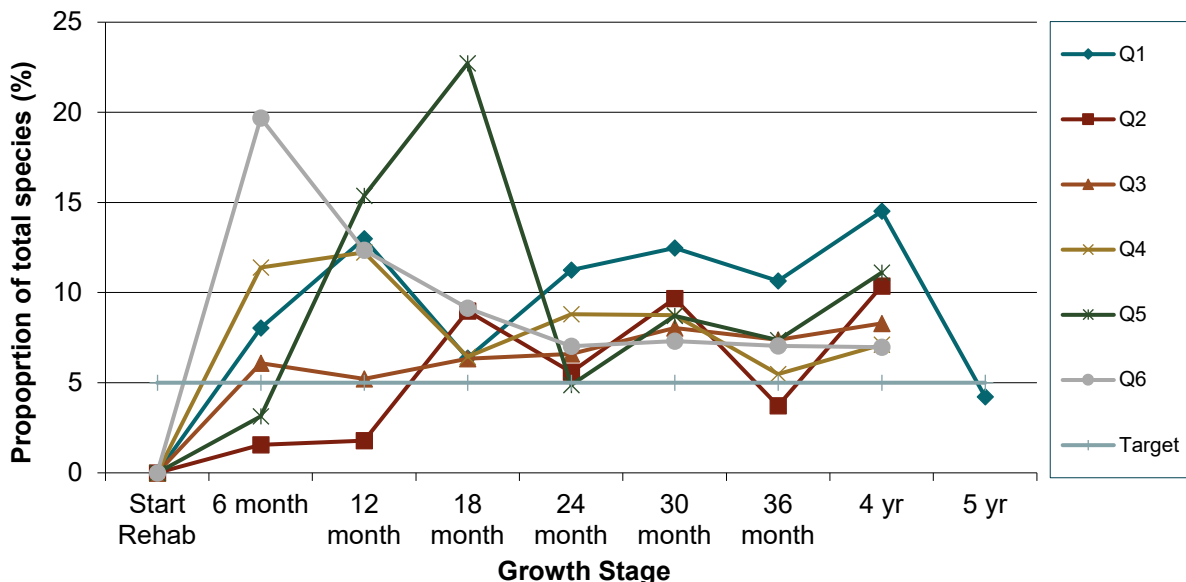


Chart 9: Comparison of the proportion of overstorey species/4m².

APPENDIX C: PREDICTIVE TRENDS

Available Data

Data is available for 5 Year monitoring for Block Q1, while Blocks Q2 to Q6 have been surveyed at the 4 Year point of revegetation.

Changes to Predictive Modelling

Given the relatively short period of time that the Extension has been subject to monitoring, the predictive models will be subject to change with the collection of additional data.

Results

Cover

Monitoring data shows that four of the blocks have achieved the target cover of 80% - Blocks Q2, Q3, Q4 and Q5 (**Chart 10**). With the caveat that only Blocks Q3 and Q4 have achieved the target entirely native vegetation. Blocks Q2 and Q5 have a high component of exotica and weed species.

Block Q1 had achieved the target at the previous survey but weed control efforts had reduced the cover at time of survey and the modelling is unable to project forward based on the measured reduction in average cover.

Block Q6 has had a marked slow down in the rate on increase of foliage cover between this and the previous survey and this has lead to the model projecting a long period to achieve target cover. It is postulated that additional data will show that target cover will be achieved much sooner.

Height

Chart 11 shows the projected time to achieve target height, with widely varying forward projections for the blocks. Blocks Q1, Q2 and Q4 have, or are projected to achieve the target by January 2025. The three remaining blocks are not projected to achieve target height for another 10 plus years. This can largely be attributed to the species mix in each of the blocks. For instance, Block Q5 was predicted to achieve the target by January 2026 in previous reports, attributed to the dominance of the fast-growing *Acacias*. But with the latest data this has been projected forward beyond 2047. This is probably because of the *Acacias* reaching their maximum height with the lack of other species not contributing to the heights. When these senesce, it is predicted that the average height will decrease before the planted overstorey species begin to mature and contribute to any increase. Block Q3 has a reported lack of midstorey species, and with the shrubs beginning to reach their maximum height, only a small increase in average height was recorded with the model extrapolating that as very slow increase to about July 2044. Again, time is required for the overstorey species to mature and contribute to the average height.

A Cautionary Note

Development of plants and communities over time is not a linear process. Combinations of allometry and complex thinning laws have been shown to govern how individuals and communities develop. Furthermore, the overall development of the total respiratory surface (green area) at any given location has been shown to be a function of the evaporative thermodynamics at the locality (See the attached bibliography for a selection of relevant references). Nor do the predictive models take into account disturbances such as fire or drought which has affected all blocks during the course of the

rehabilitation, or likewise the restorative effects of sustained rainfall once the drought has broken. Nor do they account for restarts in rehabilitation as has occurred in the northern section of Block Q1.

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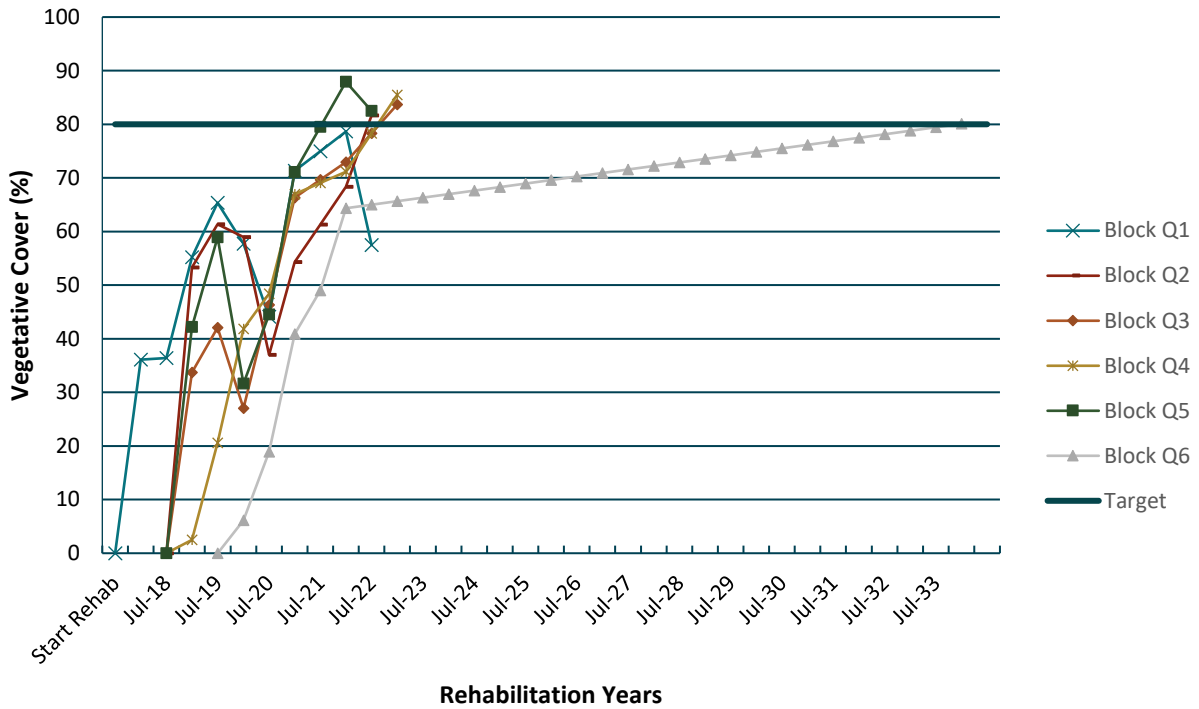


Chart 10: The projected dates for the achievement of the target average foliage cover of 80% for the NDE Blocks Q1 - Q6. Block Q1 is based on 8 surveys. Blocks Q2 – Q6 are based on 7 surveys.

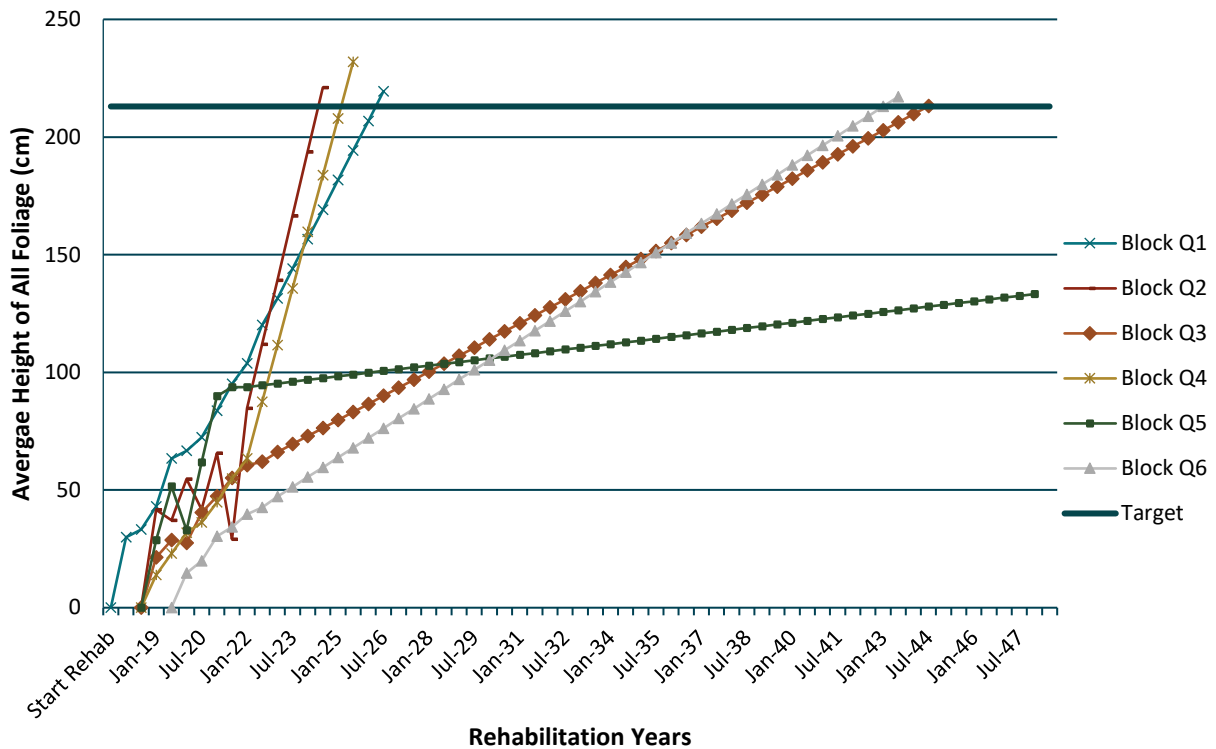


Chart 11: The projected dates for the achievement of the target average height of 213 cm for the revegetation of the NDE. Block Q1 is based on 8 surveys. Blocks Q2 to Q6 are based on 7 surveys.



APPENDIX D: FLORA SPECIES LIST BY BLOCK

Date: Oct 2022	Block	Q1		Q2	Q3	Q4		Q5	Q6		Seedlings	Flower	Fruit	S, F&F
Family	Species	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54				
Poaceae	* <i>Andropogon virginicus</i>	2												0
Poaceae	* <i>Briza maxima</i>		2										1	1
Asteraceae	* <i>Bidens pilosa</i>		2											0
Poaceae	* <i>Chloris gayana</i>			2										0
Asteraceae	* <i>Conyza bonariensis</i>		3	3										0
Cyperaceae	* <i>Cyperus brevifolius</i>												1	1
Amaranthaceae	* <i>Dysphania ambrosioides</i>		2	2								2		2
Poaceae	* <i>Eragrostis curvula</i>	3	5	5				4					1	1
Asteraceae	* <i>Facelis retusa</i>		2	1										0
Asteraceae	* <i>Gamochoaeta purpurea</i>		2											0
Asteraceae	* <i>Hypochaeris glabra</i>			3										0
Verbenaceae	* <i>Lantana camara</i>		1											0
Myrtaceae	* <i>Leptospermum laevigatum</i>	2	2	2	2	2		5			2	1		3
Primulaceae	* <i>Lysimachia arvensis</i>			3										0
Myrtaceae	* <i>Melaleuca quinquenervia</i>					1								0
Poaceae	* <i>Melinis repens</i>		2					2					1	1
Oxalidaceae	<i>Oxalis spp.</i>			1										0
Poaceae	Other grasses							2						0
	Misc weeds		3	3										0
Asteraceae	* <i>Senecio madagascariensis</i>		2	2										0
Poaceae	* <i>Setaria parviflora</i>		1											0
Rubiaceae	* <i>Richardia humistrata</i>		2									1		1
Malvaceae	* <i>Sida rhombifolia</i>		1					1				1		1
Fabaceae (Mimosoideae)	* <i>Acacia falcata</i>							2					1	1
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	4	2	3	3	1		4	2	2	1	3		4
Fabaceae (Mimosoideae)	<i>Acacia suaveolens</i>	2			2	1	2	2	2	2	3		5	8
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	2	2	1	3	3	3	2	3		2	1	6	9

Date: Oct 2022	Block	Q1		Q2	Q3	Q4		Q5	Q6		Seedlings	Flower	Fruit	S, F&F
Family	Species	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54				
Apiaceae	<i>Actinotus helianthi</i>			2								2		2
Euphorbiaceae	<i>Amperea xiphoclada</i>				2				2	2	1	1		2
Myrtaceae	<i>Angophora costata</i>													0
Fabaceae (Faboideae)	<i>Aotus ericoides</i>	2	1			2	1	1	2	1		4		4
Proteaceae	<i>Banksia aemula</i>	3	2	2	2	3	2	2	3	2		2	2	4
Rutaceae	<i>Boronia pinnata</i>				1	2	2		1		1	3		4
Fabaceae (Faboideae)	<i>Bossiaea ensata</i>				1		2		1	1		3	1	4
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>			1	2	3	3		2	2		1	6	7
Fabaceae (Faboideae)	<i>Bossiaea rhombifolia</i>	2						1						0
Cyperaceae	<i>Caustis recurvata</i>				3	2	2		3	3	2			2
Polygalaceae	<i>Comesperma ericinum</i>					1	1			2		1		1
Proteaceae	<i>Conospermum taxifolium</i>				2	1	2		2	2	1	4	1	6
Myrtaceae	<i>Corymbia gummifera</i>	2	3	2	2	2	1		2	2				0
Poaceae	<i>Cynodon dactylon</i>		3	2										0
Myrtaceae	<i>Darwinia leptantha</i>				1							1		1
Phormiaceae	<i>Dianella sp.</i>	3	2	2				2						0
Fabaceae (Faboideae)	<i>Dillwynia retorta</i>	2		1	4	5	4		4	5		5		5
Sapindaceae	<i>Dodonaea triquetra</i>	3	1	2							2		1	3
Rutaceae	<i>Eriostemon australasius</i>				1					1				0
Myrtaceae	<i>Eucalyptus pilularis</i>	1												0
Myrtaceae	<i>Eucalyptus piperita</i>		3	2	2	2	2		2	1		1		1
Myrtaceae	<i>Eucalyptus robusta</i>	1		2	2	2	3	1		1				0
Myrtaceae	<i>Eucalyptus signata</i>													0
Myrtaceae	<i>Euryomyrtus ramosissima</i>	1			2	2	2		2	2		6		6
Cyperaceae	<i>Gahnia spp.</i>	1			1	2	1					1		1
Fabaceae (Faboideae)	<i>Gompholobium virgatum</i>				1	2	2			1		4		4
Haloragaceae	<i>Gonocarpus teucrioides</i>	2												0
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>							1				1		1
Myrtaceae	<i>Harmogia densifolia</i>				2	2	2		2	2		4		4

Date: Oct 2022	Block	Q1		Q2	Q3	Q4		Q5	Q6		Seedlings	Flower	Fruit	S, F&F
Family	Species	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54				
Dilleniaceae	<i>Hibbertia acicularis</i>				1	1	1		1			4		4
Dilleniaceae	<i>Hibbertia fasciculata</i>				2	2	1		2	2		5		5
Dilleniaceae	<i>Hibbertia linearis</i>	2		2	3	2	3	2	3	2	2	8		10
Restionaceae	<i>Hypolaena fastigiata</i>				1					1				0
Proteaceae	<i>Isopogon anemonifolius</i>				2							1		1
Fabaceae (Faboideae)	<i>Kennedia rubicunda</i>							1				1		1
Santalaceae	<i>Leptomeria acida</i>				2	2	3		2	2		1	1	2
Myrtaceae	<i>Leptospermum polygalifolium</i>	2	3	2	1	2	1	3	3	2		3		3
Myrtaceae	<i>Leptospermum trinervium</i>	2		1	2	1		2	2	2	1			1
Restionaceae	<i>Lepyrodia scariosa</i>												1	1
Ericaceae (Epacridoideae)	<i>Leucopogon ericoides</i>	2			3	2	3	2	3	2		5	1	6
Ericaceae (Epacridoideae)	<i>Leucopogon juniperinus</i>						1			1				0
Ericaceae (Epacridoideae)	<i>Leucopogon virgatus</i>						1							0
Lomandraceae	<i>Lomandra longifolia</i>	2	2		1		1	1			1		1	2
Myrtaceae	<i>Melaleuca nodosa</i>	2	3	1										0
Myrtaceae	<i>Melaleuca quinquenervia</i>			2	2	2	2	2	2	2		4	2	6
Ericaceae	<i>Monotoca elliptica</i>	1	2	1	2	2	3		2	2	2			2
Ericaceae	<i>Monotoca scoparia</i>					2	2		2	1	2	1		3
Olacaceae	<i>Olax stricta</i>				1	2	2			1		4		4
Proteaceae	<i>Persoonia lanceolata</i>	2	1		2	2	1		2	2	4	1		5
Rutaceae	<i>Philotheca salsolifolia</i>				1									0
Thymelaeaceae	<i>Pimelea linifolia</i>			1	2	2	2		2	2		6		6
Apiaceae	<i>Platysace ericoides</i>	2			2	2	2		2	2		4		4
Apiaceae	<i>Platysace linearifolia</i>								1					0
Rhamnaceae	<i>Pomax umbellata</i>	2	2		1	1		2	1	1		5	2	7
Euphorbiaceae	<i>Pseudanthus orientalis</i>				2	1			2	2		3		3
Dennstaedtiaceae	<i>Pteridium esculentum</i>	2		1										0
Euphorbiaceae	<i>Ricinocarpos pinifolius</i>	1			2	1			2	1		5		5
Cyperaceae	<i>Schoenus ericetorum</i>				2	2	2	1	2	2		6		6

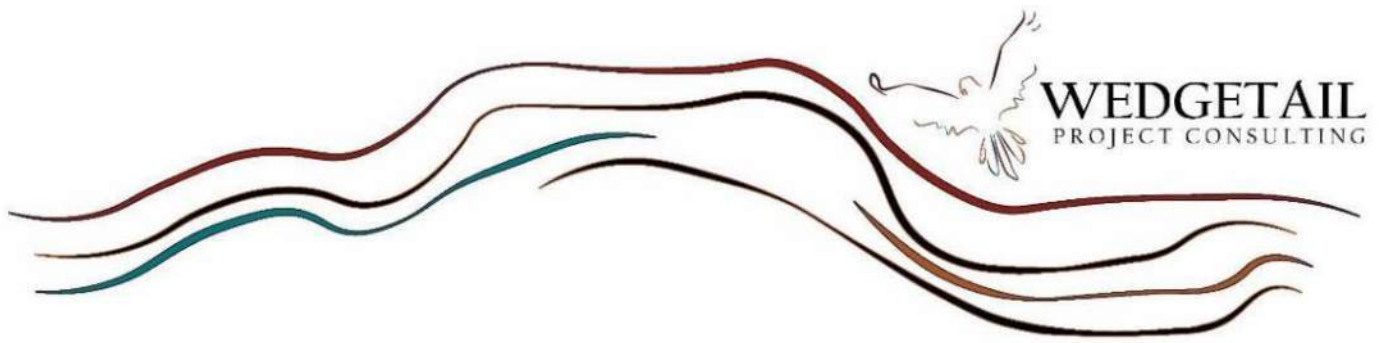
Date: Oct 2022	Block	Q1		Q2	Q3	Q4		Q5	Q6		Seedlings	Flower	Fruit	S, F&F
Family	Species	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54				
Elaeocarpaceae	<i>Tetratheca thymifolia</i>	2			1	2	2		2	2	3	5		8
Asphodelaceae	<i>Tricoryne elatior</i>											1		1
Ericaceae (Epacridoideae)	<i>Woollsia pungens</i>				2	2	2		2	2	1	4		5
Xanthorrhoeaceae	<i>Xanthorrhoea glauca</i>		1	3	1	1	2	3	1	2	1			1
Apiaceae	<i>Xanthosia pilosa</i>	2				1	2		2	2	1	4		5
	Total	32	31	32	45	42	39	25	38	41	19	45	16	49
	Natives	29	16	21	44	40	39	19	38	41				
	Average	Lot Q1				Lot Q4				Lot Q6				
	Ave Total spp	31.5				40.5				39.5				
	Ave Native spp	22.5				39.5				39.5				

APPENDIX E: Staff Contributions and Qualifications

The following staff were involved in the compilation of this report.

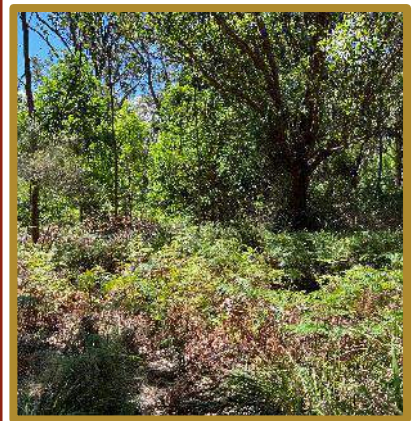
Name	Qualification	Title/Experience	Contribution
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Jake Mauger	BEnvSc & Mgt	Ecologist	Flora surveys
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Jonathon Berry	<i>B.AppSc(Hons)</i> <i>MEIANZ</i>	Principal Advisor	Report Review

APPENDIX 4
BIODIVERSITY OFFSET MONITORING
REPORT

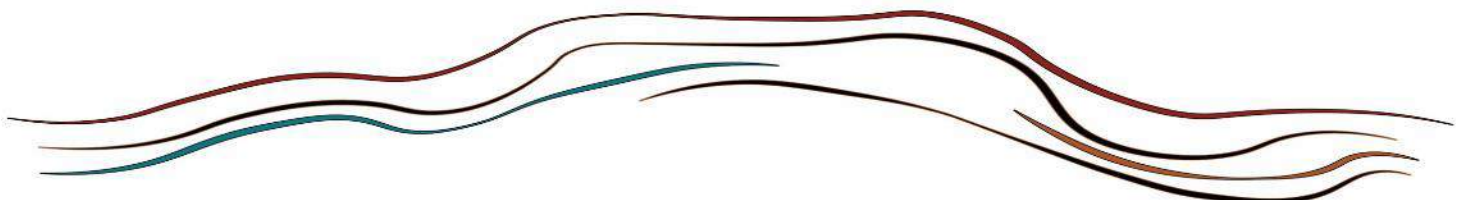


North Dune Extension Biodiversity Offset Area 2022 Monitoring Report

Tanilba North Dunes Extension Northern Biodiversity
Offsets Area



Rev 3
2 June 2023



North Dune Extension Biodiversity Offset Area 2022 Monitoring Report

Tanilba North Dunes Extension Northern Biodiversity Offsets Area

REPORT PREPARED FOR:

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REPORT PREPARED BY:

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Version Control

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Rev 2	31 May 2023	Mark Dean/Ecologist Nigel Fisher/Senior Ecologist	Nigel Fisher Senior Ecologist	Draft for Client Review
Rev 3	2 June 2023	Mark Dean/Ecologist Nigel Fisher/Senior Ecologist	Nigel Fisher Senior Ecologist	Final

EXECUTIVE SUMMARY

Holcim (Australia) has consent to extract white silica sand from the Tanilba North Dune Extension located in the Oyster Cove area, in the Port Stephens Council Local Government Area. Schedule 3, Condition 15 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091) required the preparation of a Biodiversity Management Plan (BMP) (Kleinfelder, 2019). The BMP outlines management measures for the approved Biodiversity Offsets Areas (BOA). BOAs for the project have been established in the north-east of the approved extraction area (Northern Biodiversity Offset Area, NBOA). The NBOA consists of an area of 18.3 ha of native vegetation in varying condition that is covered by Lots 11, 12 and 13 of DP 601306 and is located to the north and north-east of the Tanilba North Dunes Extension sand extraction project. The NBOA is owned as freehold by Holcim (Australia).

The BMP requires the following actions to be undertaken within the NBOA. The relevant sections of the BMP are noted:

- Annual inspection and monitoring to be conducted by a suitably qualified person/s (Section 5.1.3B) – results detailed in this report,
- Implementation of a nest box installation and monitoring program within the northern offset area to replace hollow bearing trees removed from the extraction area (Section 5.1.3F),
- Targeted fauna monitoring across all offset areas to monitor for Wallum Froglet (*Crinia tinnula*), Mahony's Toadlet (*Uperoleia mahonyi*), and Koala (*Phascolarctos cinereus*) (Section 5.2),
- Establishment of a habitat restoration and rehabilitation program across the offset areas (including the visual amenity buffer along the northern boundary of the extraction area) consisting of (Section 5.1.3D),
 - Annual inspections to identify areas requiring weed and pest control (5.1.3B),
 - A weed and pest management program (Section 5.1.3C),
 - Enhancement of the availability of habitat for the Koala through the installation of *Eucalyptus robusta* (Swamp Mahogany) within the offset area (Section 5.1.3D),
 - Rehabilitation of the regenerating Grassland-Heath to the surrounding Swamp Mahogany – Paperbark Swamp Forest through seeding and planting of appropriate species (Section 5.1.3D).

To satisfy the above requirements, Wedgetail Project Consulting (WPC) was engaged by Holcim to conduct targeted fauna monitoring for the amphibians and koalas as outlined above, annual monitoring of the 52 nest boxes that have been installed in the NBOA, an assessment of the vegetation of the NBOA and weed mapping to inform and conduct weed control works.

Amphibians

Targeted fauna monitoring for the Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*) was conducted by WPC ecologists on the 15 November 2022, 2 and 3 February 2023 over the three nights, following periods of rainfall. Surveys consisted of a meandering search in the NBOA. Nocturnal surveys for amphibian species employed visual and audible detection techniques with the aid of spotlights. *Crinia tinnula* was recorded within the NBOA on two of the three survey nights at multiple locations while *Uperoleia mahonyi* was not identified within the NBOA during this year's monitoring event. An adjacent waterbody to the east was visited to confirm the presence of *Uperoleia*

mahonyi and *Crinia tinnula* and only *Crinia tinnula* were found to be calling. Opportunistic sightings of non-target amphibian species were also recorded. Additional opportunistic sightings of non-amphibian species within the NBOA included the Brushtail Possum (*Trichosurus vulpecula*) and Sugar Glider (*Petaurus breviceps*). Results from the surveys show that one of the targeted species are utilising the NBOA for breeding and foraging habitat when the conditions are suitable. With no permanent water bodies on the NBOA, this is restricted to periods of higher rainfall. Nearby more permanent water bodies are presumed to be the core habitat for these species. Ongoing surveys after suitable rain events will determine if the species continue to utilise the NBOA.

Koala SAT Surveys

Koala monitoring was undertaken using the Spot Assessment Technique (SAT) within the NBOA as described by Phillips and Callaghan (2011). The SAT test involves a radial survey of koala “activity” within the immediate area of a tree that is known or deemed to be utilised by koalas. The search beneath each tree is conducted for two person minutes or until a single pellet is found, whichever occurs first. A tree is defined as a live woody stem of any species (except for cycads, palms, tree ferns and grass trees) which has a diameter at breast height (dbh) greater than 10cm. Two WPC ecologists conducted 15 SAT surveys on the 18th of March 2023. The SAT surveys conducted in 2023 did not find any Koala activity in the NBOA. Within the NBOA, the greater activities have been found to be within the Swamp Mahogany – Paperbark Swamp Forest in the north of the offset area where there are mature trees for feeding, although evidence of use was found throughout the extent of the NBOA in previous years monitoring. The NBOA has good habitat suitability for the koala to the north of the area, although parts of this area were hard to traverse due to of thick belt of *Lantana camara* (lantana) dominating the understory which has the potential to hinder Koala movement through the site, although this survey, vegetation was not present in area that have been previously inundated, making movement relatively easy. This survey, in conjunction with the Amphibian surveys WPC utilised thermal imaging binoculars to scan the vegetation for koalas over two nights. No koalas were observed over these nights. The remaining southern areas of the NBOA are still regenerating but have shown promising signs of koala use in previous years monitoring which will continue to improve as the trees mature.

Nest Box Monitoring

In December 2015, Kleinfelder installed 52 nest boxes within the NBOA as per the offset requirements for the Tanilba Northern Dune Extension Project. As per the Nest Box Installation and Monitoring Protocol within the Biodiversity Management Plan – Tanilba Northern Dune Extension (Kleinfelder 2019), the 52 nest boxes were required to be monitored annually for a period of six years. This was the sixth and final survey conducted on behalf of Holcim (Australia) and the previous owners of the site, Sibelco Australia. Nest boxes were monitored using a wireless GoPro™ camera mounted on an extension pole capable of reaching heights of over 6 m. A live video feed is transferred wirelessly from the camera to an iPhone device capable of capturing still HD images or video. Images were captured in the field and processed in the office. A handheld Global Positioning System (GPS), pre-loaded with co-ordinates, was used to locate the boxes. Once a box was located, the pole camera was used to open the lid and to observe the contents. In 2022, the percentage of all nest boxes exhibiting any sign of use was 56% (29). Fifteen percent (8) of the total number of nest boxes were determined to be unavailable for use resulting from the boxes being missing from its location on the site. Unlike previous years, no boxes were deemed to be unavailable due to insects such as wasps, bees or ants. In 2022, four boxes (8%) were observed to have animals present (A). There were three boxes showing recent evidence of use with four boxes within the “moderately fresh” category, and the total number of boxes showing old evidence was 17 boxes, or 33%. A total of eight

boxes were noted to being missing, believed stolen. This brought the total number of nest boxes available for fauna use to 44, one less than the 2021 survey as no boxes were deemed unusable due to insects. Two of the Possum boxes showed evidence of use with one being occupied by a Common Brushtail Possum (*Trichosurus vulpecula*), Glider boxes had a utilisation rate of 71% (27 out of 34 boxes) with two of the boxes being utilised by Sugar Gliders (*Petaurus breviceps*) with another box occupied by a Sydney Diamond Python (*Morelia spilota spilota*). Fauna uptake of the nest boxes was successful in the first year of installation with several species of mammals and reptiles recorded occupying boxes, and evidence of usage across many more boxes. Since that initial survey, no fauna has been recorded in the boxes in 2019 and 2020. In the recent survey in 2021 and 2022 has seen an increase in usage and fauna present within two and four of the nest boxes respectively. The surveys conducted in 2019 and 2020 where no occupation was recorded resulted in the surveys being conducted earlier in the year i.e., winter and spring on the hypothesis that the boxes were not being occupied in the heat of the summer months. This has been vindicated with occupation of boxes being recorded. The presence of non-target species such as the python suggests that the boxes are and have been utilised by a range of fauna. It should be noted that for two of the box types – possum and bat – little evidence of usage will be apparent, unless an animal is actually recorded in the box as neither of the target fauna generally leave nesting materials behind, as with gliders. This is the last survey required under consent conditions, but a good faith measure to replace the missing and damaged boxes – preferably in more secure locations, or much higher in the canopy to prevent theft, would be beneficial to fauna.

Vegetation Condition Survey

An annual inspection of the NBOA is to be conducted as per Section 5.1.3B of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2019). This survey was conducted on 17th of November 2022. As per the BMP, photo monitoring points were established, weed infestations were noted, locations of rubbish dumping were noted, survey the regeneration and health of the *Eucalyptus robusta* along one transect, east to west across the BOA noting the size in classes of trees 1m either side of the transect, noting the extent and requirement of any revegetation works in the BOA.

South of Rutile Rd, a small section of the NBOA abuts the extraction zone. Most of this area was affected by the 2018 fires but has recovered with increased rainfall in late 2020 and early 2021. The condition improves moving east from Coastal Sand Apple Blackbutt Forest that fringes the extraction zone and Block Q2 which is quite weed infested until good condition Swamp Mahogany – Paperbark Forest is encountered. This area has some scattered Fishpole Bamboo (*Phyllostachys aurea*), and Bugle Lily (*Watsonia meriana*). The 50m buffer zone of vegetation along Rutile Rd is quite weedy with exotic grasses, Lantana (*Lantana camara*) and some minor Blackberry (*Rubus fruticosus* spp. agg.), Glory Lilly (*Gloriosa superba*), *Watsonia meriana* and *Pinus elliottii* (Slash Pine) as well as others. Regeneration of the *E. robusta* within this “regenerating” area was assessed by measuring the health and size of *E. robusta* trees within 1 m of a transect running East to West across the NBOA. The individual trees were divided into five height classes (<1m, 1-2m, 2-10m, 10-15m and >15m or mature trees) for determination of age. Trees <1m in height were classified as seedlings/saplings, trees 1-2m in height were classified as saplings, trees between 2 and 10m were classified as immature trees, trees 10-15m were classified as intermediate, while trees estimated to be over 15m in height were classified as mature. This year, a total of 78 trees were assessed along the transect that is approximately 400m long. The 2021 survey assessed 114 trees, the difference attributed to GPS drift rather than any dieback or death of trees. The assessment found that there were two saplings <1m, only six were estimated to be between 1-2m, in height, with 39 trees

estimated to between 2-10m, 31 trees between 10-15m tall and no trees assessed as mature. This indicates that this southern of the NBOA is advanced re-growth, with no trees deemed to be old growth. The majority of the *E. robusta* – 66 trees - were located in the eastern section of regenerating Swamp Mahogany – Paperbark Swamp Forest. Two areas at the western end of the NBOA are classified as regenerating grassland where the density of trees and shrubs is greatly reduced. Since the initial survey in 2013, natural regeneration has occurred, with many shrubs and some midstorey species self-seeding. The northern most section of the NBOA has been classified as mature Swamp Mahogany – Paperbark Swamp Forest. This area contains mature *E. robusta* and *Melaleuca quinquenervia* trees with an understorey of Tall Saw-sedge (*Gahnia clarkei*) and other swamp flora.

Weed mapping was conducted as part of the monitoring of the BOA. The key weed species recorded on site that have the potential to restrict revegetation or native fauna use are the Slash Pine, Lantana and Bugle Lily. The Slash Pine is concentrated along Rutile Rd in the regenerating Swamp Mahogany – Paperbark Swamp Forest, but seedlings and saplings have spread throughout this entire section of the BOA. The density has been mapped from medium to heavy in these areas and there are many scattered immature and mature trees in other areas. The Slash Pine is rapidly spreading through the BOA and does pose a threat to the viability of the area as an offset. The Bugle Lily is concentrated in the central portion of the regenerating Swamp Mahogany – Paperbark Swamp Forest with a large central dense infestation that becomes less dense towards the edges. Lantana has colonised this section of the BOA with infestation levels varying from scattered individuals to very heavy (<75% cover), with a belt of dense Lantana acting to separate this section from the southern regenerating section of the BOA. Evidence of previous control works conducted by contractors is visible. Where weed species have not become established the condition of the native vegetation is quite good. Native vegetation is generally in good health with no visible dieback observed amongst the canopy species on site. The regenerating grassland is slowly self-seeding with some native species such as Coastal Wattle (*Acacia longifolia*) and Coast Teatree but would benefit from a modest planting program of tubestock installation of *E. robusta*, Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*). Sibelco Australia (the previous owners) had commenced a modest weed control program, and Holcim (Australia) have continued this program. Further on-going and more intense weed control efforts will be required to improve the condition of the BOA.

Weed Control Works

WPC was engaged by Holcim (Australia) to conduct weed control works in the BOA during the 2022 reporting period. These works consisted of a team of two Land Management Technicians working on site for two rounds of two days each. Works were performed on the 21st of November and 12th of December 2022, Environmental Technicians from WPC carried out weed control activities within the NBOA. On the 8th and 9th of March 2023, staff returned to site to continue the treatment of weeds previously identified by WPC staff during annual monitoring. The target weeds were *Lantana camara* (Lantana), *Pinus elliotii* (Slash Pine) and *Watsonia meriana* (Watsonia). The following recommendations are made –

- The weed control effort is increased to allow for a greater area to be worked. Given the level of infestation it is suggested that effort be increased – i.e., 12 person days per year. To this end, the next weed control proposal will recommend an additional two days a year, increasing to a team of two for three days, twice a year in autumn and spring.

- *The Slash Pine saplings that have been cut and dropped in the past control efforts should be removed – most can be removed by hand to Rutile Rd and chipped there. This will facilitate native species regeneration.*
- *The larger Slash Pine trees require a specialist arborist to safely be removed.*
 - *This is not a small undertaking given the proximity of the high voltage power lines and Rutile Rd, although Rutile Rd has now been blocked off to the east of the site and is essentially a dead end, making traffic control easier and operations safer.*
 - *The volume of material that is required to be removed also necessitates chipping and disposal off site.*

Contents

1. INTRODUCTION	1
1.1 BACKGROUND INFORMATION.....	1
1.2 SCOPE	1
2. TARGETED AMPHIBIAN SURVEYS	3
2.1 AMPHIBIANS	3
2.1.1 Methods and Results.....	3
2.1.2 Discussion.....	4
2.2 KOALA SPOT ASSESSMENT TECHNIQUE (SAT) TESTS	8
2.2.1 Monitoring Methodology	8
2.2.2 Results and Discussion	8
2.3 NEST BOX MONITORING	12
2.3.1 Background.....	12
2.3.2 Monitoring Methods.....	12
2.3.3 Results	14
2.3.4 Discussion.....	17
3. VEGETATION CONDITION SURVEY	18
3.1 BACKGROUND.....	18
3.2 RESULTS.....	18
3.2.1 General Condition	18
3.2.2 Weed Mapping	26
3.2.3 Vegetation Condition Discussion and Recommendations.....	30
4. WEED CONTROL WORKS.....	31
4.1 WORKS PERFORMED	31
4.2 DISCUSSION.....	31
5. REFERENCES	34

Figures

Figure 1: Locality of the Northern Biodiversity Offsets Area and its relationship to the Tanilba North Dunes Extension sand extraction project.....	2
Figure 2: Targeted Amphibian Survey Transects	5
Figure 3: Location of SAT test sites within the NBOA surveyed for the 2022 Monitoring report..	11
Figure 4: Location and summary of usage for 52 nest boxes surveyed in 2022.	13
Figure 5: Vegetation Condition Monitoring	22
Figure 6: Weed Mapping of the BOA 2022	29
Figure 7: Weed Control works conducted on the BOA in 2022 and 2023.....	33

Tables

Table 1:	Weather Conditions During Surveys	3
Table 2:	Amphibian presence during targeted nocturnal monitoring	4
Table 3:	Koala activity levels from the Spot Assessment Technique.....	10
Table 4:	Size class of the <i>Eucalyptus robusta</i> trees surveyed in the Northern Dunes Offsets Area in 2022	19
Table 5:	Chemicals Used in the 2022/2023 weed control campaign.	31
Table 6:	Monthly Rainfall recorded at the RAAF Williamtown weather station. Months of amphibian survey for the 2022 annual reporting period are highlighted in yellow.	36

Appendices

Appendix A:	Staff Contributions.....	35
Appendix B:	Monthly Rainfall for Previous 10 years	36

1. INTRODUCTION

1.1 BACKGROUND INFORMATION

Holcim (Australia) Sibelco Australia has consent to extract white silica sand from the Tanilba North Dune Extension located in the Oyster Cove area, in the Port Stephens Council Local Government Area.

Schedule 3, Condition 15 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091) required the preparation of a Biodiversity Management Plan (BMP) (Kleinfelder, 2019). The BMP outlines management measures for the approved Biodiversity Offsets Area (BOA).

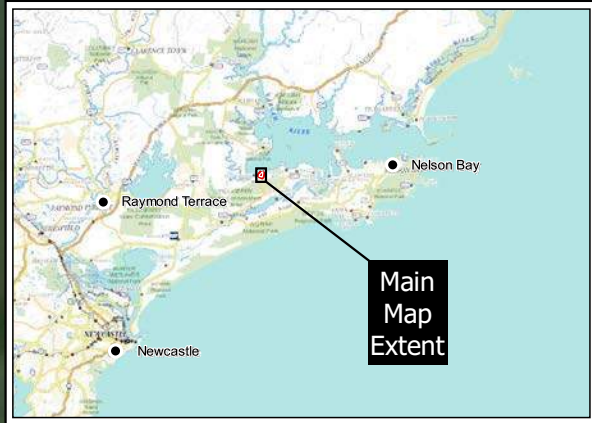
The Northern BOA consists of an area of 18.3 ha of native vegetation in varying condition that is covered by Lots 11, 12 and 13 of DP 601306 and is located to the north and north-east of the Tanilba North Dunes Extension sand extraction project. The NBOA is owned as freehold by Holcim (Australia) (**Figure 1**).

1.2 SCOPE

The BMP requires the following actions to be undertaken within the NBOA. The relevant sections of the BMP are noted:

- Annual inspection and monitoring to be conducted by a suitably qualified person/s (Section 5.1.3B) – results detailed in this report,
- Implementation of a nest box installation and monitoring program within the northern offset area to replace hollow bearing trees removed from the extraction area (Section 5.1.3F),
- Targeted fauna monitoring across all offset areas to monitor for Wallum Froglet (*Crinia tinnula*), Mahony's Toadlet (*Uperoleia mahonyi*), and Koala (*Phascolarctos cinereus*) (Section 5.2),
- Establishment of a habitat restoration and rehabilitation program across the offset areas (including the visual amenity buffer along the northern boundary of the extraction area) consisting of (Section 5.1.3D),
 - o Annual inspections to identify areas requiring weed and pest control (5.1.3B),
 - o A weed and pest management program (Section 5.1.3C),
 - o Enhancement of the availability of habitat for the Koala through the installation of Eucalyptus robusta (Swamp Mahogany) within the offset area (Section 5.1.3D),
 - o Rehabilitation of the regenerating Grassland-Heath to the surrounding Swamp Mahogany – Paperbark Swamp Forest through seeding and planting of appropriate species (Section 5.1.3D).

To satisfy the above requirements, Wedgetail Project Consulting (WPC) was engaged by Holcim to conduct targeted fauna monitoring for the amphibians and koalas as outlined above, annual monitoring of the 52 nest boxes that have been installed in the NBOA, an assessment of the vegetation of the NBOA and weed mapping to inform and conduct weed control works.



Regional Context



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Legend

- Northern Biodiversity Offset Area
- Cadastre
- National Park
- Sub-Arterial Road
- Local Road
- Track-Vehicular

Locality of the Northern Biodiversity Offsets Area

Holcim Australia
North Dunes Extension Offsets
Fauna & Vegetation Monitoring 2023

Figure:

1



2. TARGETED AMPHIBIAN SURVEYS

2.1 AMPHIBIANS

Targeted fauna monitoring for the Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*) was conducted by WPC ecologists as part of the requirements outlined in section 5.1.4 of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2014). Monitoring was conducted on the 15 November 2022, 2 and 3 February 2023 by two ecologists over the three nights, following periods of rainfall. Surveys were undertaken at night, after rainfall was received (**Table 1**). **Figure 2** shows the northern dune offset areas in which the nocturnal surveys were conducted.

Table 1: Weather Conditions During Surveys

Date	Temperature (°C)	Humidity (%)	Barometric pressure (hPa)	Wind (spd/direction)	Rain past 24 hours (mm)	Rain past 5 days (mm)
15/11/2022	17.5	85	1008	9/SW	24.2	27.0
02/02/2023	21.3	91	1002	7/N	0	21.4
03/02/2023	24.2	82	992	14/N	0	21.4

2.1.1 Methods and Results

A prior diurnal assessment of the offset areas was conducted in 2017 to determine habitat suitability. Surveys consisted of a meandering search in the NBOA. Survey effort was focused around ephemeral and semi-permanent water bodies using both spotlighting and call-playback techniques. Surveys revealed that no permanent water existed within the offset area. Several areas were noted which had the potential to contain water after rainfall and later became the target of nocturnal surveys. The greatest potential to detected threatened amphibian species was identified within the NBOA with habitats including areas of Melaleuca/Swamp Mahogany Forest and low-lying areas dominated by herbs, rushes and/or emergent vegetation.

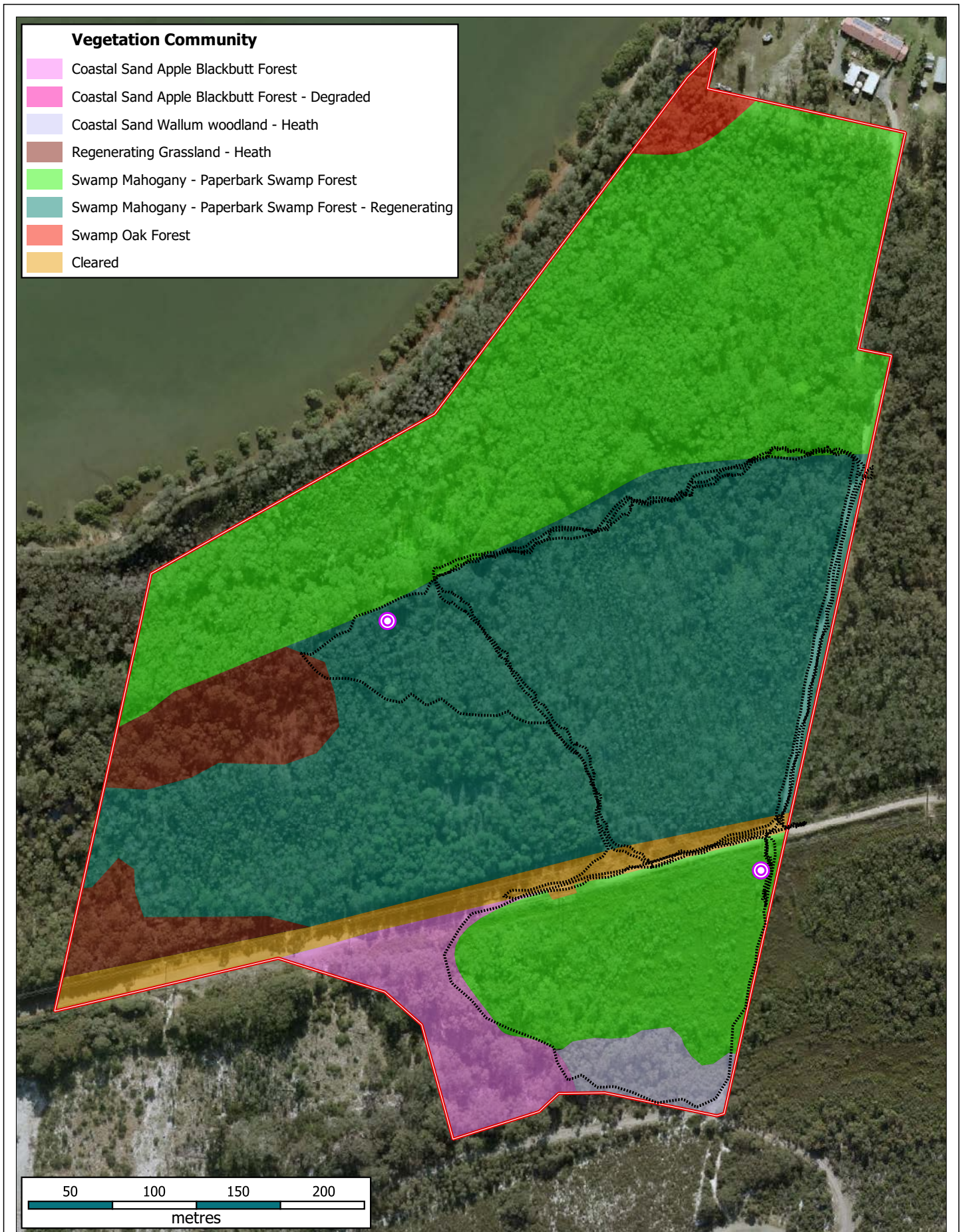
Nocturnal surveys for amphibian species employed visual and audible detection techniques with the aid of spotlights. *Crinia tinnula* was detected all survey nights within and adjacent to the NBOA area. *Crinia tinnula* was recorded within the northern offset area on two of the three survey nights at multiple locations while *Uperoleia mahonyi* was not identified within the NBOA (**Figure 1**). An adjacent waterbody to the East was visited to confirm the presence of *Uperoleia mahonyi* and *Crinia tinnula* and only *Crinia tinnula* was confirmed to be calling. *Uperoleia mahonyi* was not calling on any of the survey nights. **Table 2** represents amphibian records for the three nights of surveys in November 2022 and February 2023. Opportunistic sightings of non-target amphibian species were also recorded. Photos of representative amphibians taken over previous monitoring periods are included below. Additional opportunistic sightings of non-amphibian species within the offset areas include the Brushtail Possum (*Trichosurus vulpecula*) and the Sugar Glider (*Petaurus breviceps*).

Table 2: Amphibian presence during targeted nocturnal monitoring

Species detected	Observation type	15/11/2022	02/02/2023	03/02/2023
<i>Crinia signifera</i>	Heard	-	+	+
<i>Crinia tinnula</i>	Heard	-	+	+
<i>Limnodynastes peronii</i>	Heard/Observed	+	+	+
<i>Litoria fallax</i>	Heard/Observed	-	+	-
<i>Litoria latopalmata</i>	Heard	+	+	-
<i>Litoria freycineti</i>	Observed	-	-	+
<i>Litoria nasuta</i>	Observed	-	-	+
<i>Platyplectrum ornatum</i>	Observed	+	+	-
<i>Uperoleia mahonyi</i>	-	-	-	-

2.1.2 Discussion

Results from the surveys show that at least one of the targeted species, *Crinia tinnula* is utilising the NBOA for breeding and foraging habitat when the conditions are suitable. The lack of evidence of *Uperoleia mahonyi* utilising the NBOA should not be of concern. NSW Survey Guidelines for Threatened Frogs states surveys should target permanent and temporarily flooded swamps and depressions, which are typically, but not exclusively, on white sands. Waterbodies must be at least 70% full prior to survey. The guidelines do not state a minimum rainfall requirement, but a high rainfall event is implied with the water level requirement prior to survey. As part of these surveys, a control population located approximately one kilometre east on Rutile Rd, was used for comparison and was not found to be calling. This indicates that conditions were not suitable for breeding for this species at the time of surveys. With no permanent water bodies on the NBOA, suitable conditions are restricted to periods of higher rainfall. Nearby, more permanent water bodies are presumed to be the core habitat for these species – such as the area noted above and the colloquial named Mirror Lakes to the west. Ongoing surveys after suitable rain events will determine if the species continue to utilise the NBOA. The presence of multiple other species indicates that the NBOA and surrounding areas are being utilised by a range species, indicating the presence of healthy amphibian populations. The use of alternate survey methods such as pit-fall trapping could be utilised to determine whether *U. mahonyi* is present, but not breeding.



Vegetation Community

- Coastal Sand Apple Blackbutt Forest
- Coastal Sand Apple Blackbutt Forest - Degraded
- Coastal Sand Wallum woodland - Heath
- Regenerating Grassland - Heath
- Swamp Mahogany - Paperbark Swamp Forest
- Swamp Mahogany - Paperbark Swamp Forest - Regenerating
- Swamp Oak Forest
- Cleared

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Legend

- Northern Biodiversity Offset Area
- Nocturnal Herp Search
- Wallum Froglet (*Crinia tinnula*) Observation

Targeted Amphibian Surveys Transects

Holcim Australia
North Dunes Extension Offsets
Fauna & Vegetation Monitoring 2023

Figure:

2





Plate 1: Mahony's Toadlet (*Uperoleia mahonyi*). Photo included for illustrative purposes only.



Plate 2: Wallum Froglet (*Crinia tinnula*). Photo included for illustrative purposes only.



Plate 3: Ornate Burrowing Frog (*Platyplectrum ornatum*)



Plate 4: Broad-palmed rocket frog (*Litoria latopalmata*)

2.2 KOALA SPOT ASSESSMENT TECHNIQUE (SAT) TESTS

Koala monitoring for the NBOA was undertaken by WPC as part of the requirements of section 5.2 of the of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2019):

2.2.1 Monitoring Methodology

Koala monitoring was undertaken using the Spot Assessment Technique (SAT) within the NBOA as described by Phillips and Callaghan (2011). The SAT test involves a radial survey of koala “activity” within the immediate area of a tree that is known or deemed to be utilised by koalas. In the field this the test is applied as follows:

- Locate and mark a tree (the centre tree) that meets one of more of the following criteria,
 - o A tree of any species beneath which are one or koala fecal pellets and/or,
 - o A tree in which a koala has been overserved and/or,
 - o Any other tree known or considered to be a potentially important for koalas.
- Identify and mark the nearest 29 trees to the centre tree,
- Undertake a search for koala fecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 1m of the base of the tree. If no fecal pellets are found, a more thorough inspection of the leaf litter and ground cover is conducted.

The search beneath each tree is conducted for two person minutes or until a single pellet is found, whichever occurs first. A tree is defined as a live woody stem of any species (except for cycads, palms, tree ferns and grass trees) which has a diameter at breast height (dbh) greater than 10cm. Two WPC ecologists Nigel Fisher and Mark Dean conducted SAT surveys on the 18th of March 2023. A total of 15 SAT tests were conducted over the offset area in 2023.

2.2.2 Results and Discussion

The SAT surveys that were completed in 2023 did not find evidence of Koala activity in the NBOA. Please see **Table 3** and **Figure 3** for Koala activity levels for each SAT test for the NBOA. Additional opportunistic surveys were conducted on the nights of the amphibian surveys, February 2nd and 3rd where WPC ecologist Mark Dean utilised thermal imaging binoculars (Pulsar Merger XP50 LRF Thermal Binoculars) to scan the vegetation. No koalas were observed. A number of scats were observed but were judged to be kangaroo or wallaby scats.

In previous years’ surveys, activity has been found to be within the Swamp Mahogany – Paperbark Swamp Forest in the north of the offset area during the 2019 and 2020 where there are mature trees for feeding, although evidence of use was found throughout the extent of the NBOA. The NBOA has good habitat suitability for the koala with plenty of mature *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp She-oak) to the north of the area, although parts of this area were hard to traverse due to of thick belt of *Lantana camara* (Lantana) dominating the understory which has the potential to hinder Koala movement through the site. This year, the northern NBOA was dry and area that were previously inundated were dry, making movement quite easy. The remaining southern areas of the NBOA are still regenerating but have shown promising signs of koala use which will continue to improve as the trees mature. This will provide koalas with more habitat and a greater food source in the future.

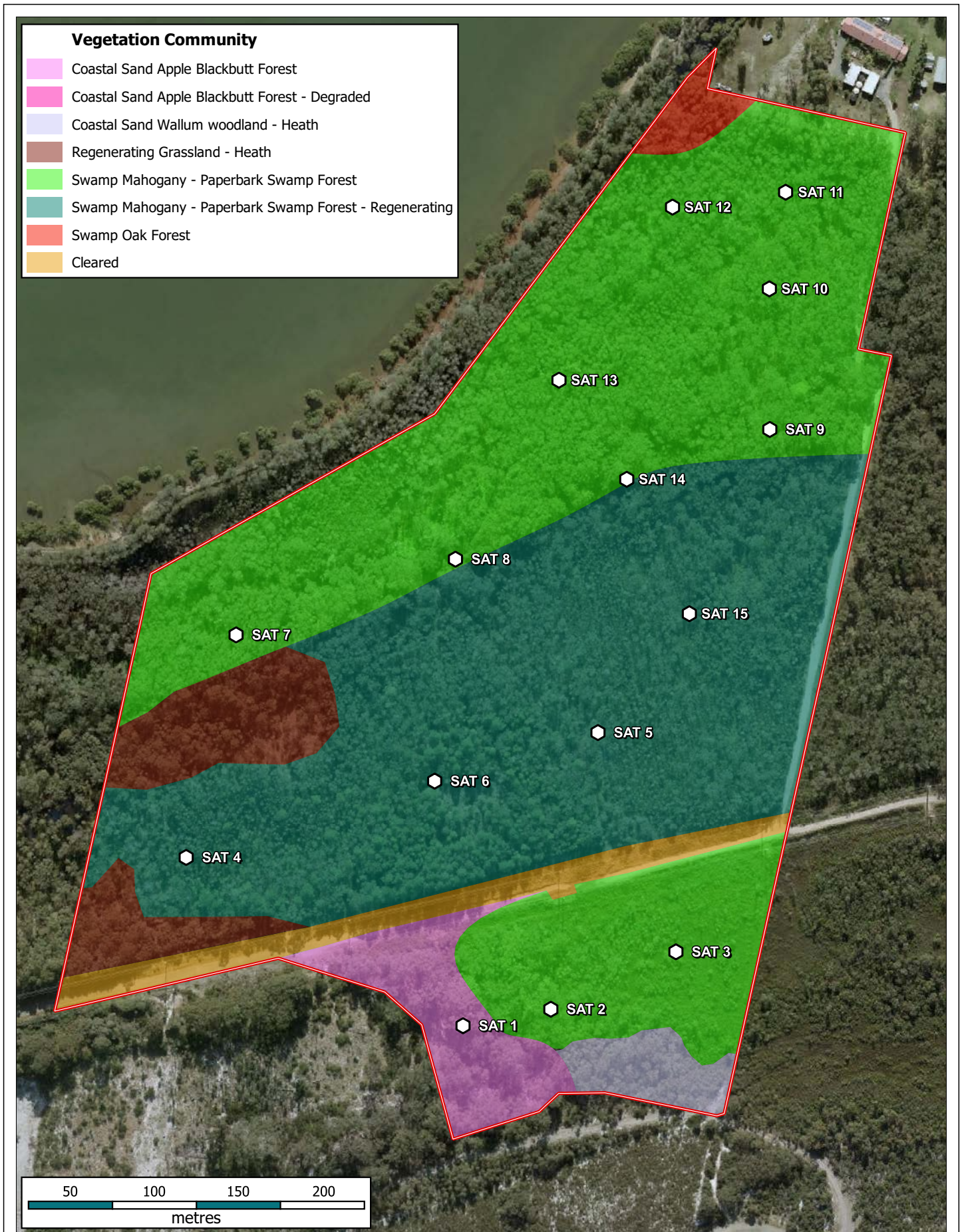
The assessed low activity levels within the NBOA suggest that koalas are not permanently resident within the site but use it to transition between other areas of higher populations. Despite the apparent suitability of the NBOA as habitat, a number of possible factors can be suggested as to why the site is not used at higher levels or even permanently. As alluded to above, there is a dense *lanata* understory that effectively separates the site in two (see Weed Mapping Section below). There has been historic and ongoing disturbance due to recent fires, and human activity including motorcycle riding, dog walking and rubbish dumping, although these activities within the NBOA have decreased as the vegetation has increased in density and made access to the site more difficult.

Additional monitoring techniques that could be employed include a more comprehensive use of the thermal binoculars, as well as acoustic recording devices such as a Wildlife Acoustics Song Metre SM4. This device can be left out over a period of seven days during the breeding season. Any males that are calling during this period should be recorded.

Table 3: Koala activity levels from the Spot Assessment Technique.

Location	No Activity				Low Activity				Medium Activity				High Activity			
	2019	2020	2021	2022/23	2019	2020	2021	2022/23	2019	2020	2021	2022/23	2019	2020	2021	2022/23
1	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-
2	-	-	-	+	+	+	+	-	-	-	-	-	-	-	-	-
3	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-
4	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
6	-	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	+	-	-	-	-	+		-	-	-	-	-	-
8	-	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-
9	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-
15	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-

Table Symbology – “+” indicates Koala scat present. “-“ no scat present



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Legend

- Northern Biodiversity Offset Area
- SAT Test Locations

Location of SAT test sites

Figure:

3

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Fauna & Vegetation Monitoring 2023



2.3 NEST BOX MONITORING

2.3.1 Background

In December 2015, Kleinfelder installed 52 nest boxes within the NBOA as per the offset requirements for the Tanilba Northern Dune Extension Project. The following types of nest boxes were installed within the Northern Offset Area:

- 16 Microchiropteran (Bat) boxes,
- 34 Glider boxes, and
- 2 Possum boxes.

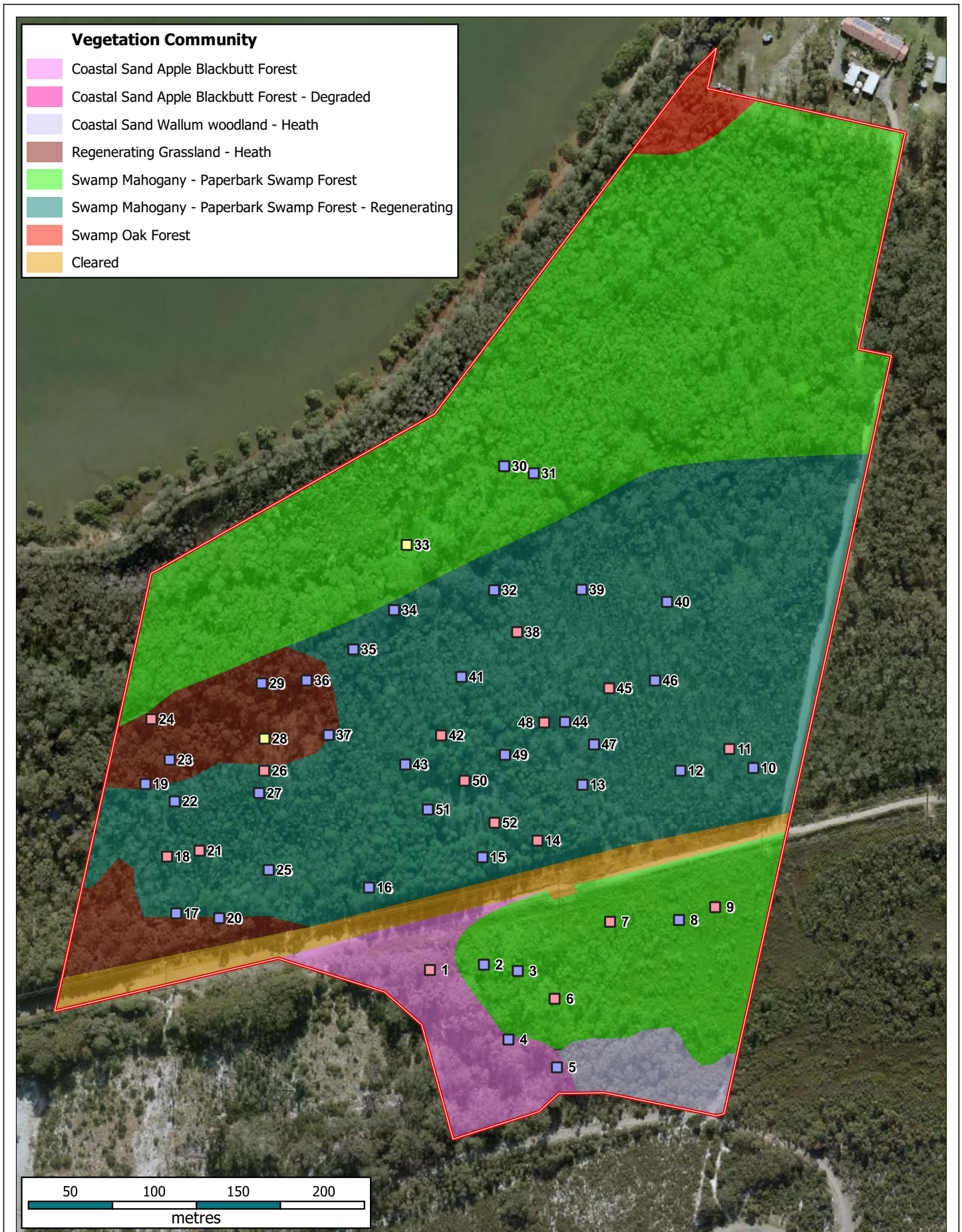
As per the Nest Box Installation and Monitoring Protocol within the Biodiversity Management Plan – Tanilba Northern Dune Extension (Kleinfelder 2019), the 52 nest boxes were required to be monitored annually for a period of six years (**Figure 4**). In 2018 fire destroyed six nest boxes (three Bat and three Glider boxes) which were replaced after the 2018 monitoring. This will be the sixth and final monitoring event conducted by WPC.

2.3.2 Monitoring Methods

Two WPC Ecologists, Nigel Fisher and Jake Mauger, with experience and accreditation in handling animals and working at heights attended the site on 16 September 2022. Nest boxes were monitored using a wireless GoPro™ camera mounted on an extension pole capable of reaching heights of over 6 m. A live video feed is transferred wirelessly from the camera to an iPhone device capable of capturing still HD images or video. Images were captured in the field and processed in the office. A handheld Global Positioning System (GPS), pre-loaded with co-ordinates, was used to locate the boxes. Once a box was located, the pole camera was used to open the lid and to observe the contents. Status of the boxes were recorded as either:

- A – Animal present,
- E1 – Fresh evidence of use (i.e., fresh nest or scats),
- E2 – Moderately fresh evidence of use (i.e., green leaves but beginning to age),
- E3 – Old signs of use (i.e., old leaf nest, old scats),
- N – No evidence of use,
- NA – Not available for use, and
- X – Missing.

If a box was found to be occupied, an attempt was made to capture the animal for positive identification, where required. Signs of use include the presence of hair, scats, nesting material or evidence of scratches/physical marks on the entrance of the nest box. Boxes which contained wasp nests or other pest species, had lids which were open or missing, or had fallen or were missing/destroyed were deemed to be not available for use by target animals. This year no boxes were deemed unavailable due to insects, but several were missing, presumed stolen. These boxes were not missed during the survey as evidence of their previous presence was visible on the trees where they had been installed.



2.3.3 Results

In 2022, the percentage of all nest boxes exhibiting any sign of use was 56% (29) (**Chart 1**). Fifteen percent (8) of the total number of nest boxes were determined to be unavailable for use resulting from the boxes being missing from its location on the site. Unlike previous years, no boxes were deemed to be unavailable due to insects such as wasps, bees or ants. Nest box numbers 2 (Bat), 16 (Glider), 32 (Glider) 44 (Glider), 45 (Bat), 46 (Glider) and 47 (Glider) were missing, presumed stolen. This reduces the number of available boxes to 44, but the remaining statistics regarding usage are based upon the original number (52) to provide a more accurate comparison. Use of nest boxes by insects is generally a temporary feature, and as the insects move on, the box becomes available for use by vertebrates.

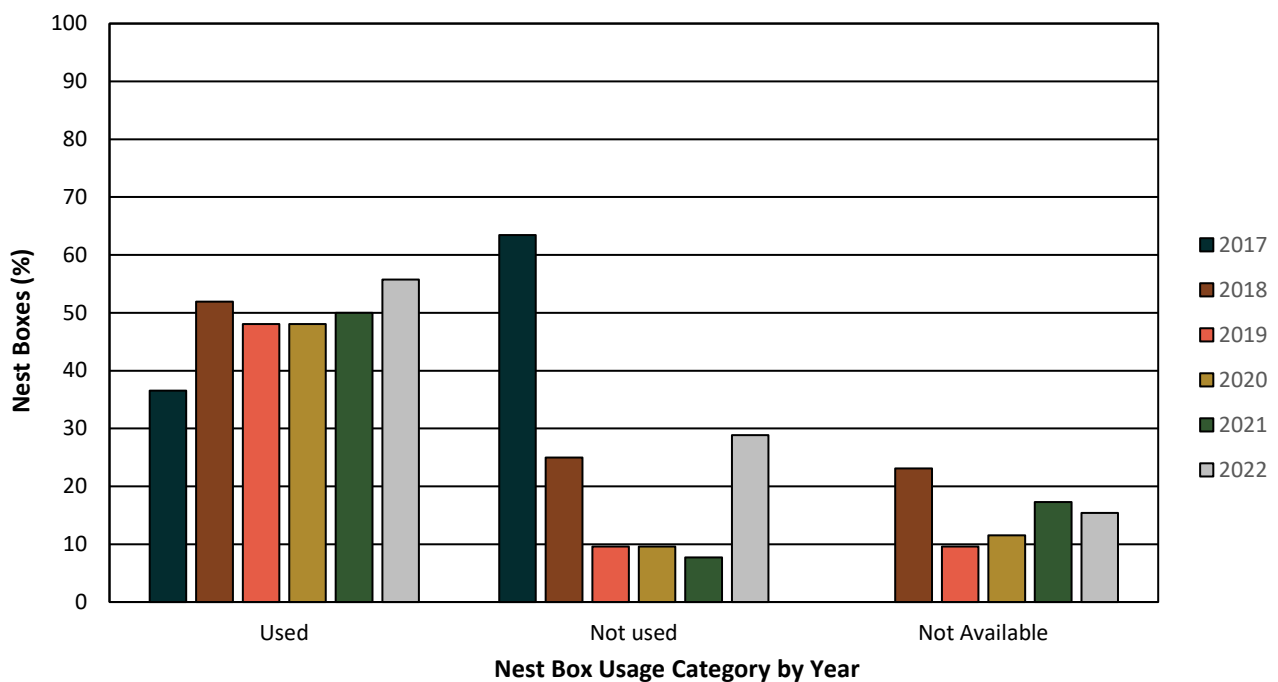


Chart 1: General usage rates of nest boxes in 2022 and comparison to previous surveys

In 2022, four boxes (8%) were observed to have animals present (A). There were three boxes showing recent evidence of use with four boxes within the “moderately fresh” category, and the total number of boxes showing old evidence was 17 boxes, or 33% (**Chart 2**). A total of eight boxes were noted to be missing, believed stolen. This brought the total number of nest boxes available for fauna use to 44, one less than the 2021 survey as no boxes were deemed unusable due to insects.

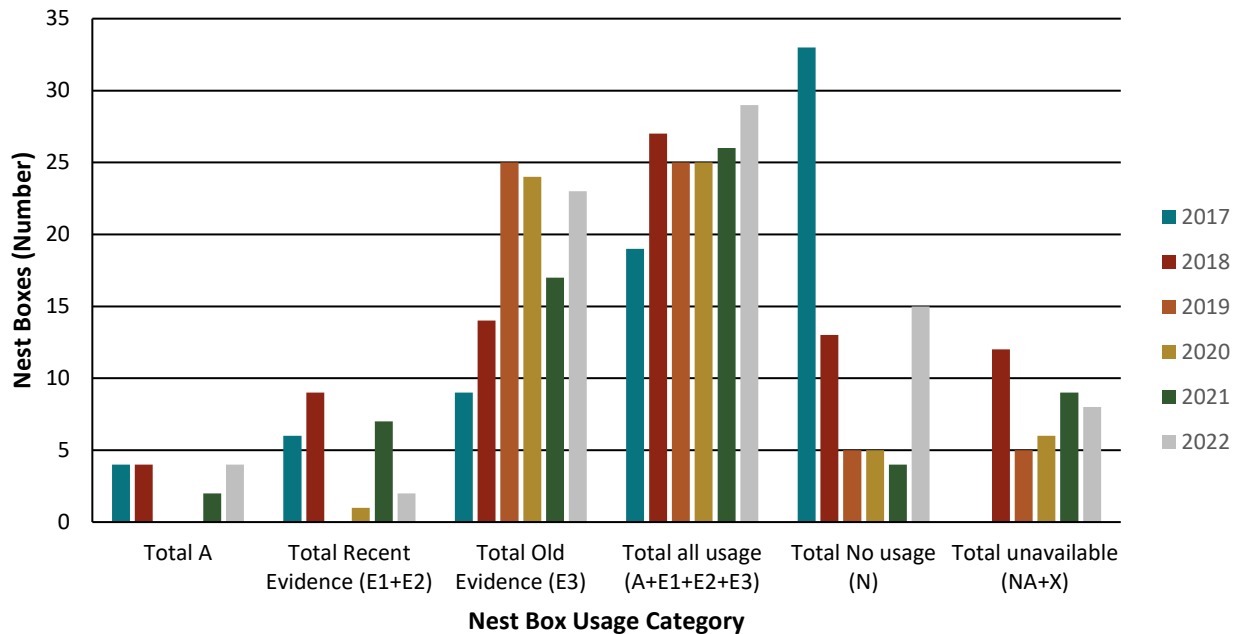


Chart 2: Detailed usage by category of nest boxes for the 2022 survey and comparison to the previous surveys

Usage by box type in 2022 is shown in **Chart 3**. Two of the Possum boxes showed evidence of use with one being occupied by a Common Brushtail Possum (*Trichosurus vulpecula*), Glider boxes had a utilisation rate of 71% (27 out of 34 boxes) with two of the boxes being utilised by Sugar Gliders (*Petaurus breviceps*) (**Plate 5**) with another box occupied by a Sydney Diamond Python (*Morelia spilota spilota*) (**Plate 6**)

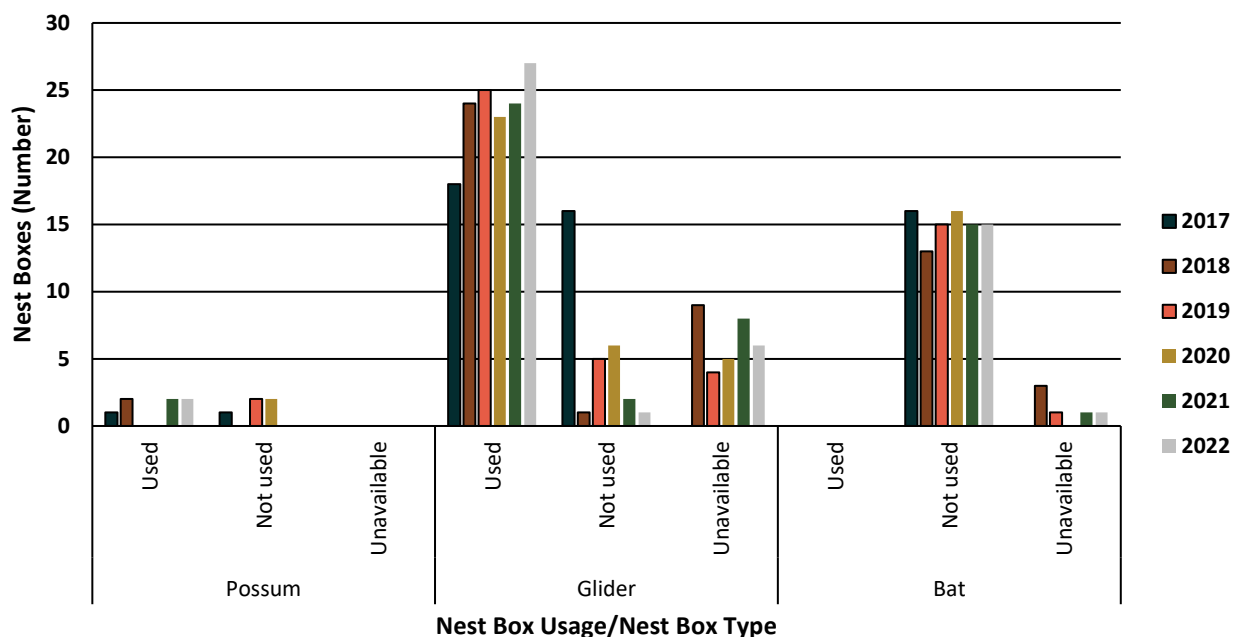


Chart 3: Nest Box usage by nest box type over the course of the monitoring



Plate 5: Nest box 10 with Sugar Gliders in residence



Plate 6: Nest box 12 occupied by a Sydney Diamond Python (*Morelia spilota spilota*)

2.3.4 Discussion

Fauna uptake of the nest boxes was successful in the first year of installation with several species of mammals and reptiles recorded occupying boxes, and evidence of usage across many more boxes. Since that initial survey, no fauna has been recorded in the boxes in 2019 and 2020. In the recent survey in 2021 and 2022 has seen an increase in usage and fauna present within two and four of the nest boxes respectively.

The surveys conducted in 2019 and 2020 where no occupation was recorded resulted in the surveys being conducted earlier in the year i.e., winter and spring on the hypothesis that the boxes were not being occupied in the heat of the summer months. The change to the timing of the monitoring has been vindicated with occupation of boxes being recorded. The presence of non-target species such as the python suggests that the boxes are and have been utilised by a range of fauna.

It should be noted that for two of the box types – possum and bat – little evidence of usage will be apparent, unless an animal is actually recorded in the box as neither of the target fauna generally leave nesting materials behind, as with gliders.

This is the last survey required under consent conditions, but a good faith measure to replace the missing and damaged boxes – preferably in more secure locations, or much higher in the canopy to prevent theft, would be beneficial to fauna.

3. VEGETATION CONDITION SURVEY

3.1 BACKGROUND

An annual inspection of the NBOA is to be conducted as per Section 5.1.3B of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2019). This survey was conducted on 17th November 2022. As per the BMP, photo monitoring points were established, weed infestations were noted, locations of rubbish dumping were noted, survey the regeneration and health of the *Eucalyptus robusta* along one transect, east to west across the BOA noting the size in classes of trees 1m either side of the transect, noting the extent and requirement of any revegetation works in the BOA.

3.2 RESULTS

3.2.1 General Condition

The vegetation condition of the NBOA is presented in **Figure 5**.

South of Rutile Rd, a small section of the NBOA abuts the extraction zone. Most of this area was affected by the 2018 fires but has recovered with the higher than average rainfall experienced over the past three years (**Plate 7** and **Appendix B**). The condition improves moving east from Coastal Sand Apple Blackbutt Forest that fringes the extraction zone and Block Q2 which is quite weed infested until good condition Swamp Mahogany – Paperbark Forest is encountered. This area has some scattered Fishpole Bamboo (*Phyllostachys aurea*), and Bugle Lily (*Watsonia meriana*). The Fishpole Bamboo is sprayed twice each year but was noted to have spread to another adjacent this survey.

The 50m buffer zone of vegetation along Rutile Rd is quite weedy with exotic grasses, Lantana (*Lantana camara*) and some minor Blackberry (*Rubus fruticosus* spp. agg.), Glory Lilly (*Gloriosa superba*), *W. meriana* and *Pinus elliotii* (Slash Pine) as well as others.

The main section of the NBOA lies north of Rutile Rd. and as can be seen from **Figure 5**, has been assessed as Swamp Mahogany – Paperbark Swamp Forest “regenerating” in the area immediately to the north, and “mature” at the farthest north section of the BOA.

This regenerating area can be further divided into an eastern section where weed control efforts have largely brought the woody weeds under control and a western section where several weed species are present and are the subject of on-going control efforts (see Section 4). These include Slash Pine, Bugle Lily (PP5 **Plate 11**) and Lantana (*Lantana camara*) (PP2 **Plate 8**) that exclude native species and shrubby regrowth are present, and evidence of some regeneration is present with seedlings and saplings apparent.

The Slash Pine is a concern to the general condition of this area. It is a fast-growing species and a prolific producer of seed with a multitude of seedlings visible each survey. It has formed dense thickets and the litter acts to suppress the regeneration of native species. Many of the larger trees are now of such a size as to present a major issue for removal – both as a safety issue and for the damage that would be caused to native vegetation.

Regeneration of the *E. robusta* within this “regenerating” area was assessed by measuring the health and size of *E. robusta* trees within 1 m of a transect running East to West across the NBOA (**Figure 5**). The individual trees were divided into five height classes (<1m, 1m - 2m, 2m - 10m, 10m - 15m and >15m or mature trees) for determination of age. Trees <1m in height were classified as seedlings/saplings, trees 1m - 2m in height were classified as saplings, trees between 2m and 10m

were classified as immature trees, trees 10m - 15m were classified as intermediate, while trees estimated to be over 15m in height were classified as mature (**Table 4**). This year, a total of 78 trees were assessed along the transect that is approximately 400m long. The 2021 survey assessed 114 trees, the difference attributed to GPS drift and differences in GPS equipment used between the two surveys, rather than any dieback or death of trees. No dieback or dead trees were observed along the transect.

The assessment found that there were two saplings <1m, only six were estimated to be between 1-2m, in height, with 39 trees estimated to be between 2-10m, 31 trees between 10-15m tall and no trees assessed as mature. This indicates that this southern of the NBOA is advanced re-growth, with no trees deemed to be old growth. The majority of the *E. robusta* – 66 trees - were located in the eastern section of regenerating Swamp Mahogany – Paperbark Swamp Forest.

Two areas at the western end of the NBOA are classified as regenerating grassland where the density of trees and shrubs is greatly reduced. Since the initial survey in 2013, natural regeneration has occurred, with many shrubs and some midstorey species self-seeding (**Plate 12**). However, very few *E. robusta* have established in these areas, and the southern-most section adjacent to Rutile Rd is a dense thicket of *Leptospermum laevigatum* (Coast Teatree) that will prevent any other re-growth of native species. **Table 4** has field notes of observations of native species in and around the grassland area traversed by the transect.

Table 4: Size class of the *Eucalyptus robusta* trees surveyed in the Northern Dunes Offsets Area in 2022

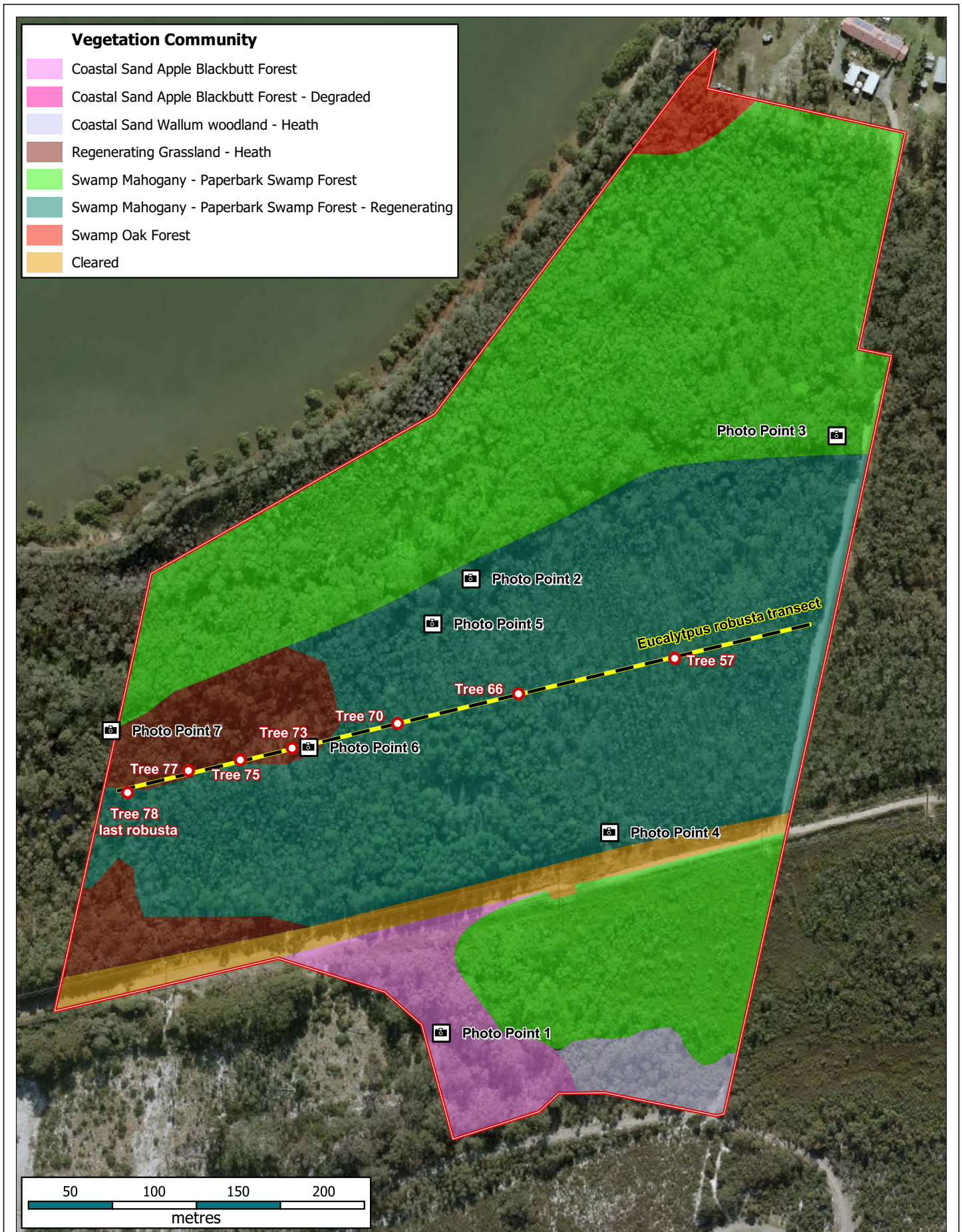
Tree No. (From East)	Tree Height (m)					Comments
	<1	1-2	2-10	>10-15	Mature >15m	
1		✓				
2				✓		
3			✓			
4			✓			
5			✓			
6			✓			
7			✓			
8			✓			
9	✓					
10			✓			
11		✓				
12		✓				
13			✓			
14			✓			
15			✓			
16			✓			
17			✓			
18	✓					
19			✓			

Tree No. (From East)	Tree Height (m)					Comments
	<1	1-2	2-10	>10-15	Mature >15m	
20			✓			
21				✓		
22				✓		
23			✓			
24				✓		
25			✓			
26				✓		
27			✓			
28				✓		
29			✓			
30			✓			
31			✓			
32				✓		
33				✓		
34			✓			
35		✓				New Seedlings and saplings appearing
36			✓			
37			✓			
38			✓			
39			✓			
40			✓			
41				✓		
42				✓		
43			✓			
44			✓			
45			✓			
46				✓		
47			✓			
48			✓			
49		✓				
50			✓			
51			✓			
52			✓			
53				✓		
54			✓			
55				✓		
56		✓				

Tree No. (From East)	Tree Height (m)					Comments
	<1	1-2	2-10	>10-15	Mature >15m	
57				✓		Most large trees with fruit
58				✓		
59				✓		
60				✓		
61			✓			
62			✓			
63			✓			
64				✓		
65				✓		
66				✓		Western side of NBOA
67				✓		
68				✓		
69				✓		
70				✓		
71				✓		
72				✓		
73				✓		
74				✓		
75				✓		
76				✓		
77			✓			
78				✓		Last <i>E. robusta</i> on western edge of NBOA

The northern most section of the NBOA has been classified as mature Swamp Mahogany – Paperbark Swamp Forest. This area contains mature *E. robusta* and *Melaleuca quinquenervia* trees with an understorey of Tall Saw-sedge (*Gahnia clarkei*) and other swamp flora. Lantana has colonised this section of the BOA with infestation levels varying from scattered individuals to very heavy (<75% cover), with a belt of dense Lantana acting to separate this section from the southern regenerating section of the BOA (**PP7 Plate 13**). Evidence of previous control works is visible, as is regrowth and re-sprouting.

An access track is becoming overgrown at PP4 (**Plate 10**). There is historical illegal rubbish dumping along this track that requires removal. Improving the access track via clearing of vegetation would facilitate the removal of this rubbish and the removal of felled Slash Pines, but may facilitate access by the public.



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Date: 30.05.2023



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Legend

- Northern Biodiversity Offset Area
- Vegetation Monitoring - Photo Points
- VegMonitoring - *Eucalyptus robusta* Transect
- Tree record

Vegetation Condition

Holcim Australia
North Dunes Extension Offsets
Fauna & Vegetation Monitoring 2023

Figure:

5





Plate 7: PP1 looking east showing poor condition (foreground) and better condition vegetation (background)



Plate 8: PP2 looking north showing dense Lantana and previous control works



Plate 9: PP3 looking north showing typical understory



Plate 10: PP4 looking north along access track showing Slash Pine infestation and control works (bottom left).



Plate 11: PP5 looking south showing dense Bugle Lily infestation



Plate 12: PP6 looking west showing the regenerating grassland area (north). Note the shrubby regrowth.



Plate 13: PP7 looking north at the dense Lantana "belt" that separates the regenerating and mature Swamp Mahogany – Paperbark Swamp Forest. Control efforts are visible in the foreground.

3.2.2 Weed Mapping

Weed mapping was conducted as part of the monitoring of the BOA (**Figure 6**). The key weed species recorded on site that have the potential to restrict revegetation or native fauna use are the Slash Pine, Lantana and Bugle Lily, all mentioned previously with minor occurrences of Senna and Pampas Grass (*Cortaderia selloana*).

The Slash Pine is concentrated along Rutile Rd in the regenerating Swamp Mahogany – Paperbark Swamp Forest, but seedlings and saplings have spread throughout this entire section of the BOA. The density has been mapped from medium to heavy in these areas and there are many scattered immature and mature trees in other areas. The Slash Pine is rapidly spreading through the BOA and does pose a threat to the viability of the area as an offset if not controlled. To date, control of this species has been limited to slowing the spread into the northern NBOA and to the east into the adjacent Gur-um-Bit State Recreation Area (**Plate 14**). Prolific seed production, rapid growth and production of pine needles that serves to suppress other vegetation acts to degrade the condition of the BOA, providing competition for the *Eucalyptus* species that are the preferred koala feed trees. Native fauna – with the possible exception of bird species such as Glossy-Black Cockatoo and Sulphur Crested Cockatoo and other large seed eating birds - do not use the pines for foraging or habitat.

The Bugle Lily is concentrated in the central portion of the regenerating Swamp Mahogany – Paperbark Swamp Forest with a large central dense infestation that becomes less dense towards the edges. This species is out-competing native species such as the Tall Saw-sedge and was observed to be spreading into the eastern section of the regenerating Swamp Mahogany – Paperbark Forest and has been observed in the southern section of the NBOA, adjacent to the revegetation Block Q2.

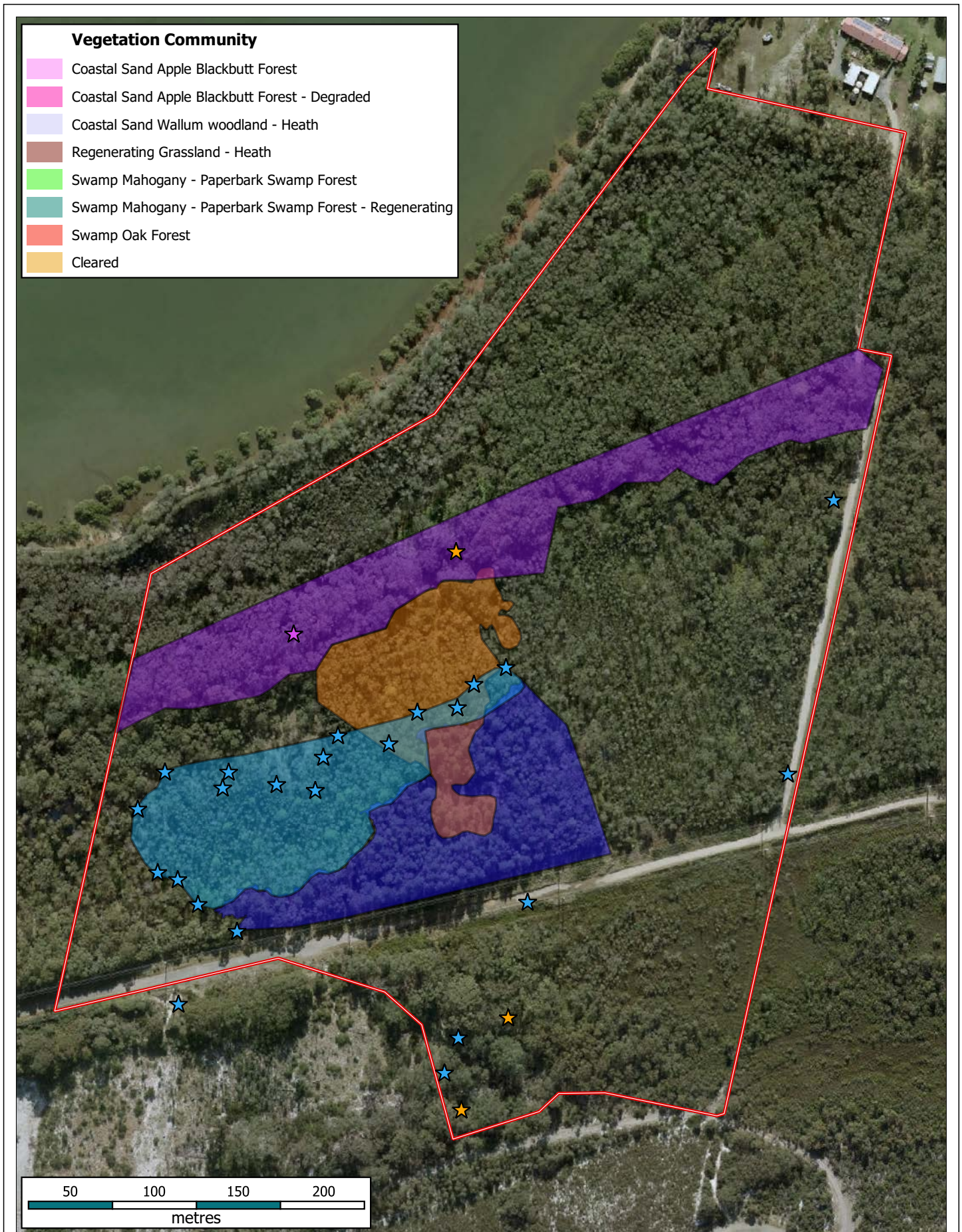


Plate 14: Slash Pine control efforts in the moderate to scattered density area of the NBOA. Note the stumps in the foreground.

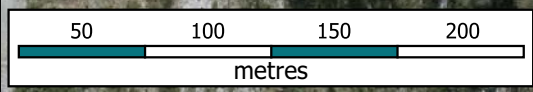
Lantana is the major threatening weed in the BOA, forming dense thickets at ground level and climbing into the mature tree canopies and covering a substantial portion of the BOA (**Figure 6**). The infestation density covers the full spectrum from isolated or scattered individuals to the dense thicket or belt referred to earlier (**Plate 15**). At its most dense, these thickets have the potential to hinder movement of koalas through the BOA and effectively divides the Swamp Mahogany – Paperbark Swamp Forest into two sections. This year’s weed mapping highlights the continued spread of this weed into the mature Swamp Mahogany – Paperbark Swamp Forest where scattered individuals are maturing and spreading into infestations.





Plate 15: Example of the dense Lantana that threatens to overwhelm native flora and restrict movement of native fauna.



Vegetation Community	
	Coastal Sand Apple Blackbutt Forest
	Coastal Sand Apple Blackbutt Forest - Degraded
	Coastal Sand Wallum woodland - Heath
	Regenerating Grassland - Heath
	Swamp Mahogany - Paperbark Swamp Forest
	Swamp Mahogany - Paperbark Swamp Forest - Regenerating
	Swamp Oak Forest
	Cleared



<p>Created by: KBlundell Date: 30.05.2023</p>  <p>https://wedgetail.com.au</p>	<p>Legend</p> <p> Northern Biodiversity Offset Area</p> <p>Weed Locations</p> <p> Lantana</p> <p> Slash Pine</p> <p> Watsonia</p> <p>Weedy Areas</p> <p> Lantana</p> <p> Dense Slash Pine</p> <p> Sparse Slash Pine</p> <p> Watsonia</p>	<p style="text-align: center;">Weed Mapping</p> <p style="text-align: center;">Holcim Australia North Dunes Extension Offsets Fauna & Vegetation Monitoring 2023</p>	<p>Figure: 6</p> 
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3.2.3 Vegetation Condition Discussion and Recommendations

Where weed species have not become established the condition of the native vegetation is quite good. Native vegetation is generally in good health with no visible dieback observed amongst the canopy species on site. Seedlings of *E. robusta* have been observed away from the transect where the lack of mature trees indicates that the regenerating Swamp Mahogany – Paperbark Swamp Forest is indeed regenerating, and not mature forest as is the case in the northern section of the BOA where trees are greater than 20m in height and hollows are visible. The lack of hollow bearing trees in this southern section of the NBOA highlights the need to continue with the maintenance of the nest box program.

The regenerating grassland is slowly self-seeding with several native shrub species such as Coastal Wattle (*Acacia longifolia*), Coastal Teatree, *Bossiaea rhombifolia*, *Dodonaea triquetra* (Sticky Hopbush), *Acacia ulicifolia* (Prickly Moses) and *Platysace ericoides*. The area still has African Lovegrass as the dominant groundcover, but this species will eventually be shaded out. Spot spraying of these grasses would encourage native species regeneration. A modest planting program of tubestock installation of *E. robusta*, Red Bloodwood (*Corymbia gummifera*) and Smooth-barked Apple (*Angophora costata*) would be beneficial for the revegetation and is a requirement of the BMP as noted in the Introduction.

Sibelco Australia (the previous owners) had commenced a modest weed control program, and Holcim (Australia) have continued this program. Further on-going and more intense weed control efforts will be required to improve the condition of the BOA.

The Slash Pine infestation requires specialist arborist and tree removal subcontractors. Previous weed control efforts have used a “cut and drop” approach to controlling this species, but the density of trees is so high that it is deemed necessary to remove the fallen timber. This will however result in considerable damage to the surrounding native vegetation, including to mature Swamp Mahogany as it will be necessary to employ machinery to achieve this. Additionally, this may “open up” the NBOA and allow greater access by the general public with consequent damage caused by 4WD and/or motor bikes and illegal rubbish dumping.

The access track at PP4 requires a locked gate to limit access. While it is acknowledged that this might attract attention that may facilitate illegal access, provision of access to the site for fire-fighting and weed control is desirable.

4. WEED CONTROL WORKS

WPC was engaged by Holcim (Australia) to continue the weed control works in the BOA during the 2022 reporting period. These works consisted of a team of two Land Management Technicians working on site for two rounds of two days each.

Figure 7 shows the areas targeted during these four days of works, outlined as the yellow boxes. The technicians were instructed to work from areas of low infestation towards higher infestation and concentrated on the section to the south of Rutile Rd and then southern regenerating section of the BOA.

4.1 WORKS PERFORMED

On 21 November and 12 December 2022, Environmental Technicians from WPC carried out weed control activities within the NBOA. On the 8th and 9th March 2023, staff returned to site to continue the treatment of weeds previously identified by WPC staff during annual monitoring (see **Figure 7**). The target weeds were *Lantana camara* (Lantana), *Pinus elliottii* (Slash Pine) and *Watsonia meriana* var. *bulbillifera* (Watsonia). For treatment methods, chemical usage and rates, see **Table 5** below.

The 2022 weed control works concentrated on the Slash Pine along the edge of Rutile Rd, both along the powerline easement and along the vegetation buffer adjacent to the North Dunes Extension rehabilitation area. Further work was conducted in the NBOA to the east of the NDE where scattered Lantana, Bugle Lily and Fishpole Bamboo were treated.

In the March 2023 treatment period, Slash Pine was targeted in the area marked as “scattered” in **Figure 7**. The medium-sized slash pines were felled with either a chainsaw or handsaw, while the seedlings and saplings were either hand pulled or cut with loppers. Trees that were deemed to be too large, destructive to the remaining vegetation or hazardous to be felled safely were left standing to be removed at a later date by arborists. Previously identified populations of Bugle Lilly were located but had already died back. Lantana in the dense “wall” was also targeted by back sprayer using a high concentration “splatter gun” mix.

Table 5: Chemicals Used in the 2022/2023 weed control campaign.

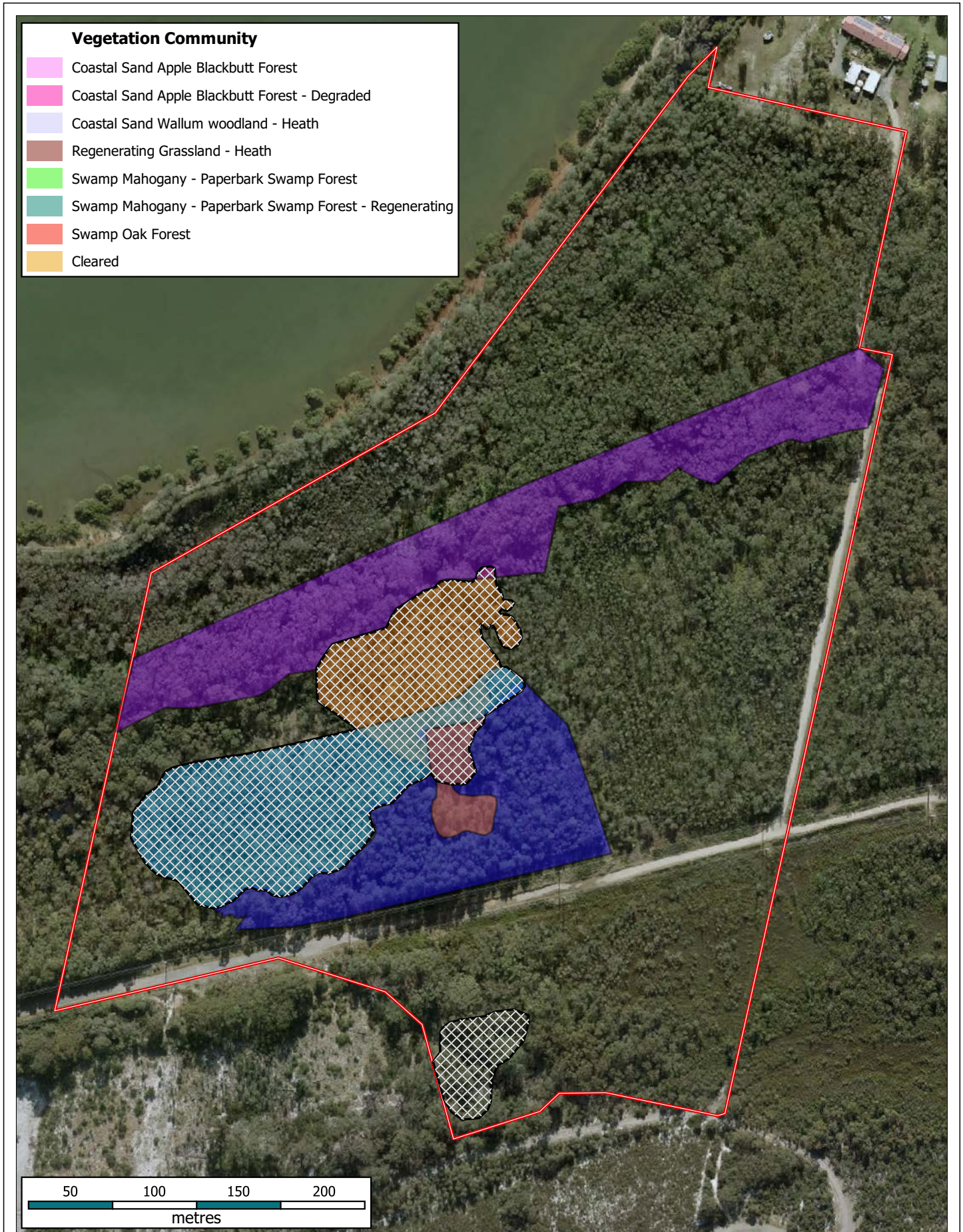
Weeds Treated	Mode of Application	Product Mixture	Rate (%)
Lantana	Backpack	4 L Weed master duo 360 40 mL EnviroDye Red 40 L water	10% (splatter mix)

4.2 DISCUSSION

The current effort of 8 person days per year is making minimal progress in the control of the weeds on the BOA. This was the first season that control works were conducted on the Bugle Lilly infestation, and a much larger area remains to be treated. Likewise, the other two major weed species – the Slash Pine and Lantana. Slash pine is a prolific seed producer and seedlings are removed each year. This effort is slowing the spread of the Slash Pine, but is not removing the source of the infestation, the large trees. The Lantana is spreading into the mature Swamp Mahogany – Paperbark Forest to the north of the Lantana “wall”.

The following recommendations are made –

- The weed control effort is increased to allow for a greater area to be worked. Given the level of infestation it is suggested that effort be increased – i.e., 12 person days per year. To this end, the next weed control proposal will recommend an additional two days a year, increasing to a team of two for three days, twice a year in autumn and spring.
- The Slash Pine saplings that have been cut and dropped in the past control efforts should be removed – most can be removed by hand to Rutile Rd and chipped there. This will facilitate native species regeneration.
- The larger Slash Pine trees require a specialist arborist to safely be removed.
 - o This is not a small undertaking given the proximity of the high voltage power lines and Rutile Rd, although Rutile Rd has now been blocked off to the east of the site and is essentially a dead end, making traffic control easier and operations safer.
 - o The volume of material that is required to be removed also necessitates chipping and disposal off site.



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Legend

- Northern Biodiversity Offset Area
- Weed Control Work
- Lantana
- Dense Slash Pine
- Sparse Slash Pine
- Watsonia

Weed Control Work

Holcim Australia
North Dunes Extension Offsets
Fauna & Vegetation Monitoring 2023

Figure:

7



5. REFERENCES

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Kleinfelder (2019b), Koala Monitoring within the Northern Dune Extension Biodiversity Offsets Areas. Report prepared for Sibelco Australia by Kleinfelder.

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Kleinfelder (2020b), 2019 Annual Nest Box Monitoring at the Northern Offsets Area – Northern Dune Extension Project. Report prepared for Sibelco Australia by Kleinfelder.

Kleinfelder (2021), 2020 North Dune Extension Biodiversity Offset Area Monitoring Report. Report prepared for Holcim (Australia) by Kleinfelder.

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NSW Survey Guidelines for Threatened Frogs. <https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-survey-guide-for-threatened-frogs>.

Phillips S and Callaghan J (2011). The Spot Assessment Technique: A tool for determining localised levels of habitat use by Koalas (*Phascolarctos cinereus*). Australia Koala Foundation. Australian Zoologist 35(3) 774-780.

APPENDIX A: STAFF CONTRIBUTIONS

The following staff were involved in the works required for the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Nigel Fisher	BSc (Hons) PhD	Senior Ecologist	Project Management, Field Work, Reporting
Mark Dean	BEnvSc & Mgt	Ecologist	Field Work, Reporting
Jake Mauger	BEnvSc & Mgt	Ecologist	Field Work
Nathan Ottley	BEnvSc & Mgt	Ecologist	Field Work, Reporting
Sarah Scott-Cochrane	Con&LandMGT (Cert 3)	Land Mgt Supervisor	Field Work

APPENDIX B: MONTHLY RAINFALL FOR PREVIOUS 10 YEARS

Table 6: Monthly Rainfall recorded at the RAAF Williamtown weather station. Months of amphibian survey for the 2022 annual reporting period are highlighted in yellow.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	99.4	118.8	128.0	109.6	108.2	123.0	75.6	72.0	60.6	76.1	82.9	77.1	1132.4
2013	203.4	202.8	167.4	117.8	85.4	117.4	70.8	6.8	21.8	41.6	246.4	18.2	1299.8
2014	10.2	67.4	94.4	106.4	75.0	73.0	34.8	145.4	55.2	40.6	57.4	108.2	868.0
2015	118.6	60.6	58.4	364.0	152.4	102.8	44.0	30.2	147.0	58.6	61.6	123.0	1321.2
2016	422.4	32.4	40.8	150.8	11.2	156.9	52.6	55.8	49.8	74.6	40.8	59.0	1147.1
2017	62.2	59.0	232.4	118.6	11.6	236.6	30.8	27.4	13.8	96.2	57.6	41.6	987.8
2018	15.4	109.0	169.2	91.0	21.0	244.2	0.6	18.2	111.0	137.4	77.6	51.4	1046.0
2019	14.6	33.6	145.8	36.0	47.2	157.2	23.4	98.6	75.4	45.0	51.8	0.8	729.4
2020	67.2	171.6	106.2	53.6	105.6	81.6	242.6	38.8	28.0	252.0	58.2	156.2	1361.6
2021	186.8	157.8	459.2	70.0	90.8	104.6	44.2	48.8	85.2	74.4	213.8	20.4	1556.0
2022	89.6	161.4	354.0	124.0	114.2	28.6	327.4	38.4	74.4	90.8	50.0	19.2	1472.0
2023	106.2	107.4	106.0										

Source: Monthly Rainfall Williamtown RAAF

http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=061078

APPENDIX 5

BIANNUAL MONITORING REPORT

8 July 2022

Holcim Australia Pty Ltd
Lvl 8 Tower B 799 Pacific Hwy
Chatswood, NSW 2067

Attention: Shilpa Shashi and Peter Radziewicz
Sent by email to: Shilpa.shashi@holcim.com

SUBJECT: Biannual Monitoring Report for the North Dune Extension Block Q6

This report marks the final Biannual Monitoring event to take place at the North Dunes Extension (NDE), or indeed anywhere within the rehabilitation at the Salt Ash Complex. Block Q6 is 13, 700 m² and is located at the western end of the NDE and is adjacent to another sand extraction area, The Knoll (**Figure 1**).

The monitoring was conducted on the 8th of June 2022. The next monitoring event is the first of the Post 3-Year monitoring events in October 2023.

1. GROWTH PARAMETERS

As of June 2022, the rehabilitation on this block was 36 months old. Growth parameters are positive, with average height and average cover increasing, and species richness parameters above target – very positive results.

Stratum proportions are trending in the desired direction, with the planting effort by Holcim increasing the density of the overstorey species substantially over target (**Table 1**).

Weeds are generally restricted to the northern edge along the old access road, adjoining Block Q5 and a section of the rehabilitation mentioned in previous reports surrounding plots 16 and 28. Weed control works have been undertaken in this area in the past in response to monitoring recommendations, but further efforts are required to prevent the relatively minor current infestation intensifying.

2. TARGET SPECIES

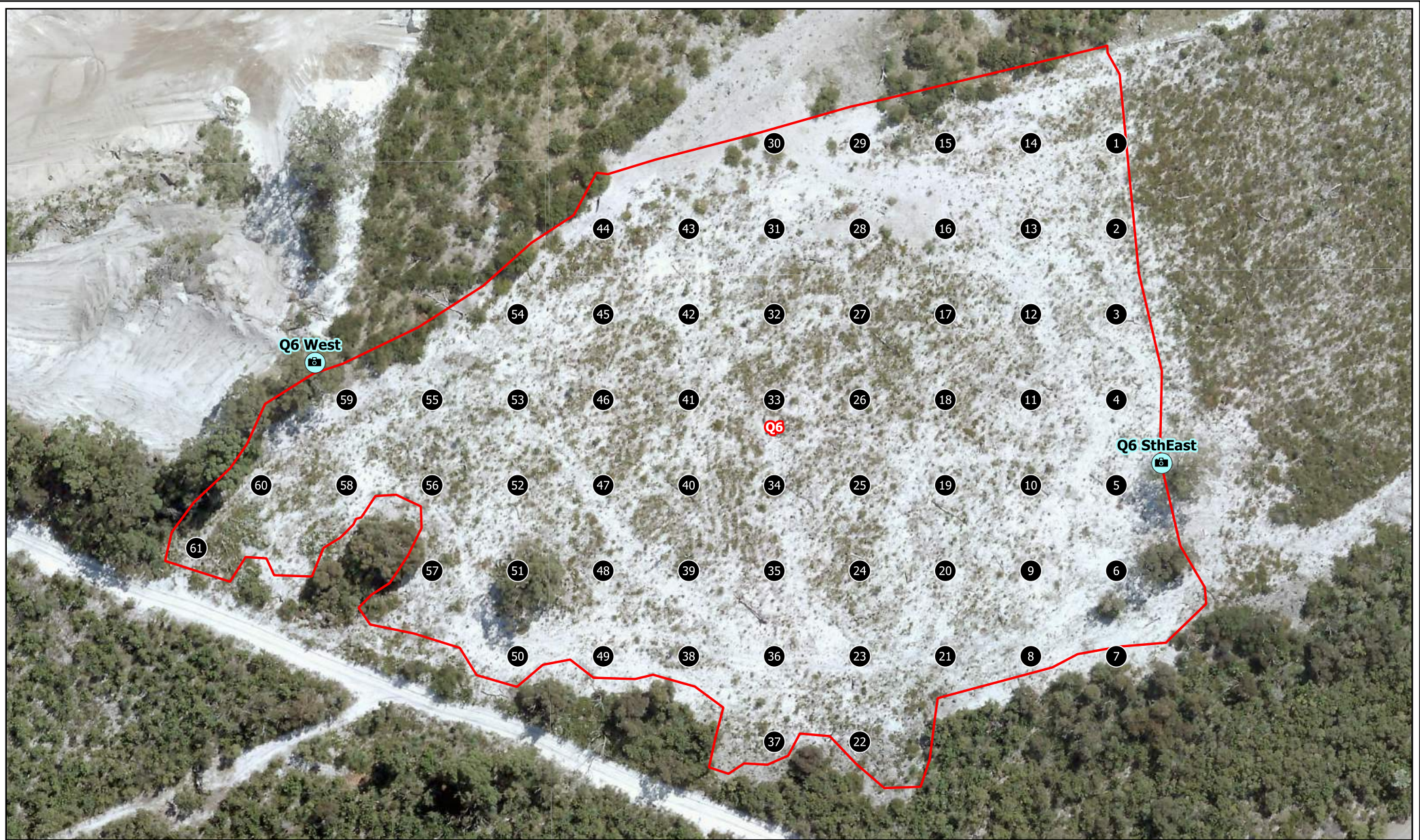
This block has some of the best target species densities in the NDE rehabilitation and does not, at this stage require any action with regards to additional planting (**Table 2**). Overstorey species were substantially over target ensuring a dense canopy cover at maturity (if they all survive to maturity) while the midstorey species *B. aemula* and *L. polygalifolium* are in adequate numbers to ensure seeding and spread and only require further monitoring to ensure numbers do not drop any further. *M. nodosa* numbers are estimated to be below target, but the substantial number of other canopy species suggests that no further planting is required, with the present numbers adequate to ensure this species is present in the revegetation.

3. DISCUSSION

Overall, this block represents excellent revegetation with excellent diversity (species numbers) and good density (numbers of individual plants) (**Plate 1**). Apart from the weeds mentioned in Section 1, weeds are generally not an issue for this block, but do have the potential to encroach from the northern end if remedial work is not undertaken. While the overall average cover is very good at 65%, a few areas recorded below average cover and would benefit from additional seeding and/or brush matting. (Please refer to **Figure 1** for plot locations). The northern section represented by Plots 1, 14, 15, 29 and 30 all recorded cover of between 30% and 50%. Likewise, the south-east section of the block (Plots 6 & 7) recorded cover percentages of 40%, again suggesting that some additional seeding and/or brush matting would be beneficial (**Plate 2**). The additional seeding would not only increase the native vegetation coverage but would also help to prevent or slow the spread of exotic weed species.

A total of 62 flora species was recorded, composed of 55 native and seven exotic species. Natural recruitment of canopy species was observed in the vicinity of the retained vegetation islands, with multiple seedlings of *C. gummifera* having germinated. While this was a winter survey, a total of 18 species were observed to have fruit, flowers or seed indicating the establishment of a self-sustaining ecosystem. Litter build-up is also evident, with several patches of decomposing fungi observed (**Plate 3**).

This block is well on target trajectory to achieving rehabilitation targets and some minor additional weed control and seeding will improve the minor issues observed from this event.

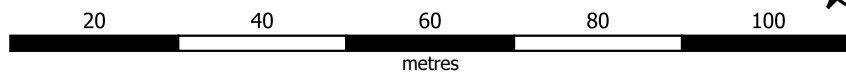


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 Date: 7/07/2022
 Version: 1



Legend

- NDE Block Q6
- Survey Point
- 📷 Photo Point



NDE Block Q6
Survey plots and photo points

Holcim Australia
 2022 Annual Vegetation Rehabilitation Monitoring
 North Dune Extension Sand Mining Extraction Operation
 Oyster Cove Rd, Tanilba Bay

Figure: **1**



Table 1: Progression of average monitoring parameter data and target projections for Block Q6 over the course of the first three years of the rehabilitation.

Parameter	Target	Rehab status Jan 2020	Rehab status Jul 2020	Rehab status Jan 2021	Rehab status Jul 2021	Rehab status Jan 2022	Rehab status June 2022	Percent Target Achieved (June 22)
Average Cover (%)	80	6.11	18.90	40.88	49.01	64.34	65.00	81.25
Average height (cm)	230	14.65	19.81	30.27	34.34	39.73	48.42	21.05
Ave. No. of plants (plants/4 m ²)	40	19.14	21.29	28.18	36.34	41.83	37.92	94.80
Ave. No. Fire resistant species (plants/4 m ²)	1	2.14	1.70	2.32	1.88	2.11	2.10	209.1
Ave. Species Richness (species/4 m ²)	12	6.93	7.32	13.32	14.22	14.90	14.61	121.72
Ave. Ground stratum proportion (%)	27	7.49	4.31	3.82	4.61	6.80	5.63	20.84
Ave. Shrub stratum proportion (%)	61	60.22	68.07	74.31	76.56	73.15	72.11	118.22
Ave. Midstorey stratum proportion (%)	7	12.59	15.28	12.73	11.80	12.73	15.39	219.80
Ave. Overstorey stratum proportion (%)	5	19.69	12.35	9.14	7.03	7.32	6.87	137.49

Table 2: Total estimated numbers of target species and additional species and comparison to targets for Block Q6 over the course of the three years of the rehabilitation.

Species	Target Number	Est No. Jan- 20	Est No. Jul- 20	Est No. Jan- 21	Est No. Jul- 21	Est No. Jan- 22	Est No. Jul- 22	Target Ach this Survey (%)
<i>Banksia aemula/serrata</i>	3562	1797	1853	2302	2134	2407	2519	70.93
<i>Corymbia gummifera</i>	110	1291	1291	1797	1348	1344	1344	1229.51
<i>Eucalyptus piperita</i>	411	449	730	730	505	784	952	232.24
<i>Leptospermum polygalifolium</i>	1644	2077	2190	2246	1909	1680	1903	116.12
<i>Leptospermum trinervium</i>	1863	0	56	4716	8871	7390	8398	452.03
<i>Melaleuca nodosa</i>	3836	2583	1460	1684	1909	1791	1288	33.67
<i>Xanthorrhoea glauca</i>	No target	287	337	730	393	336	224	No Target
<i>Eucalyptus robusta</i>	No target	0	168	56	56	112	112	No Target
<i>Angophora costata</i>	No target	0	0	0	0	0	0	No Target
<i>Eucalyptus spp.</i>	No target	0	0	0	0	0	0	No Target



Plate 1: NW Photo point (looking southeast) over Block Q6. Retained vegetation island is in centre of photo. Vegetation coverage and height is progressing well.



Plate 2: SE Photo point (looking NW). This photo was taken late in the afternoon but does show that the vegetation coverage is sparser in this section of the block and could benefit from some additional seeding and/or brush matting.



Handwritten mark

Plate 3: Photo of litter and decomposing fungi indicating nutrient cycling and increasing maturity of the revegetation

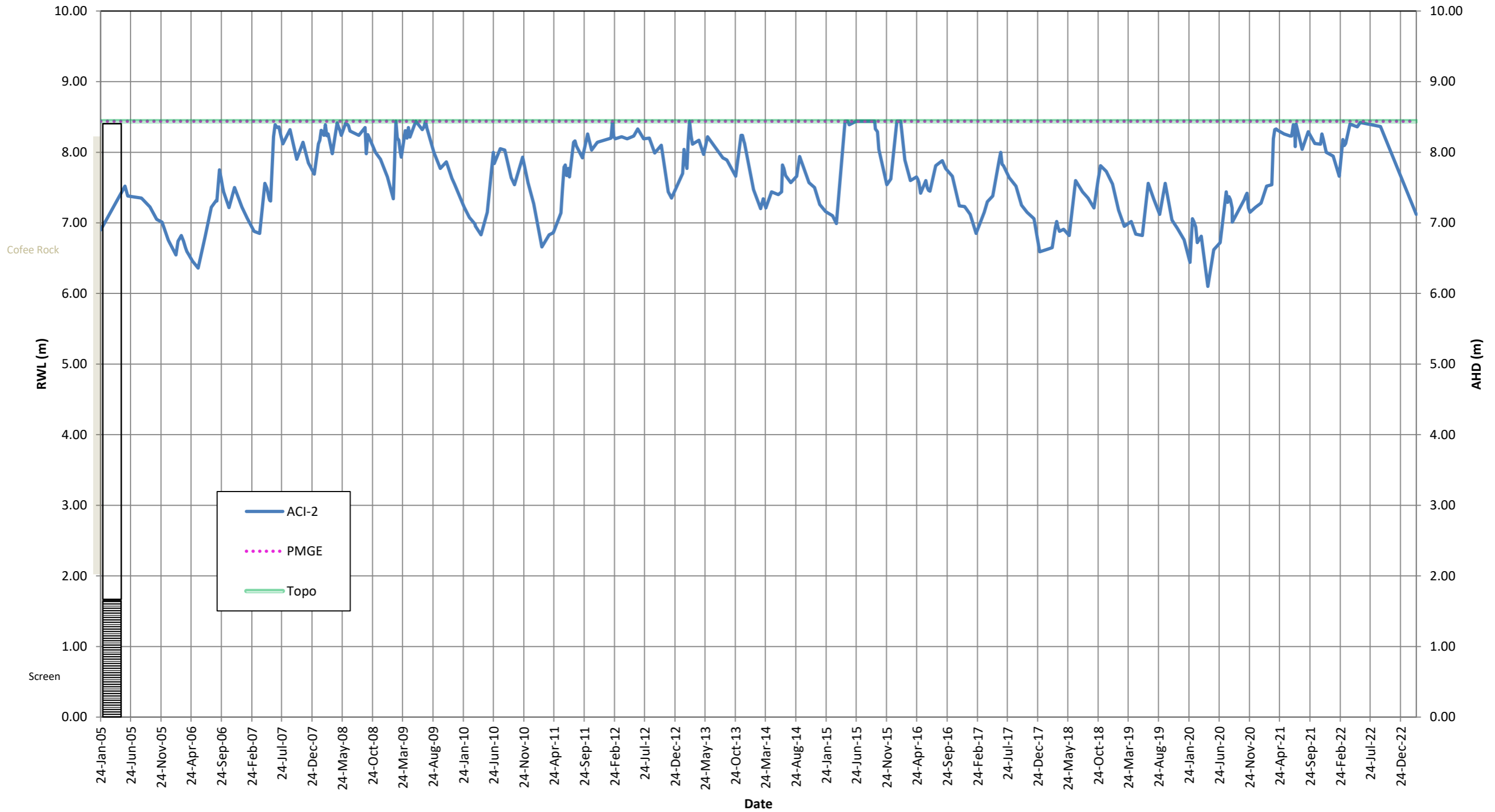
Please do not hesitate to contact me with any further questions or enquiries about this report.

Yours Sincerely

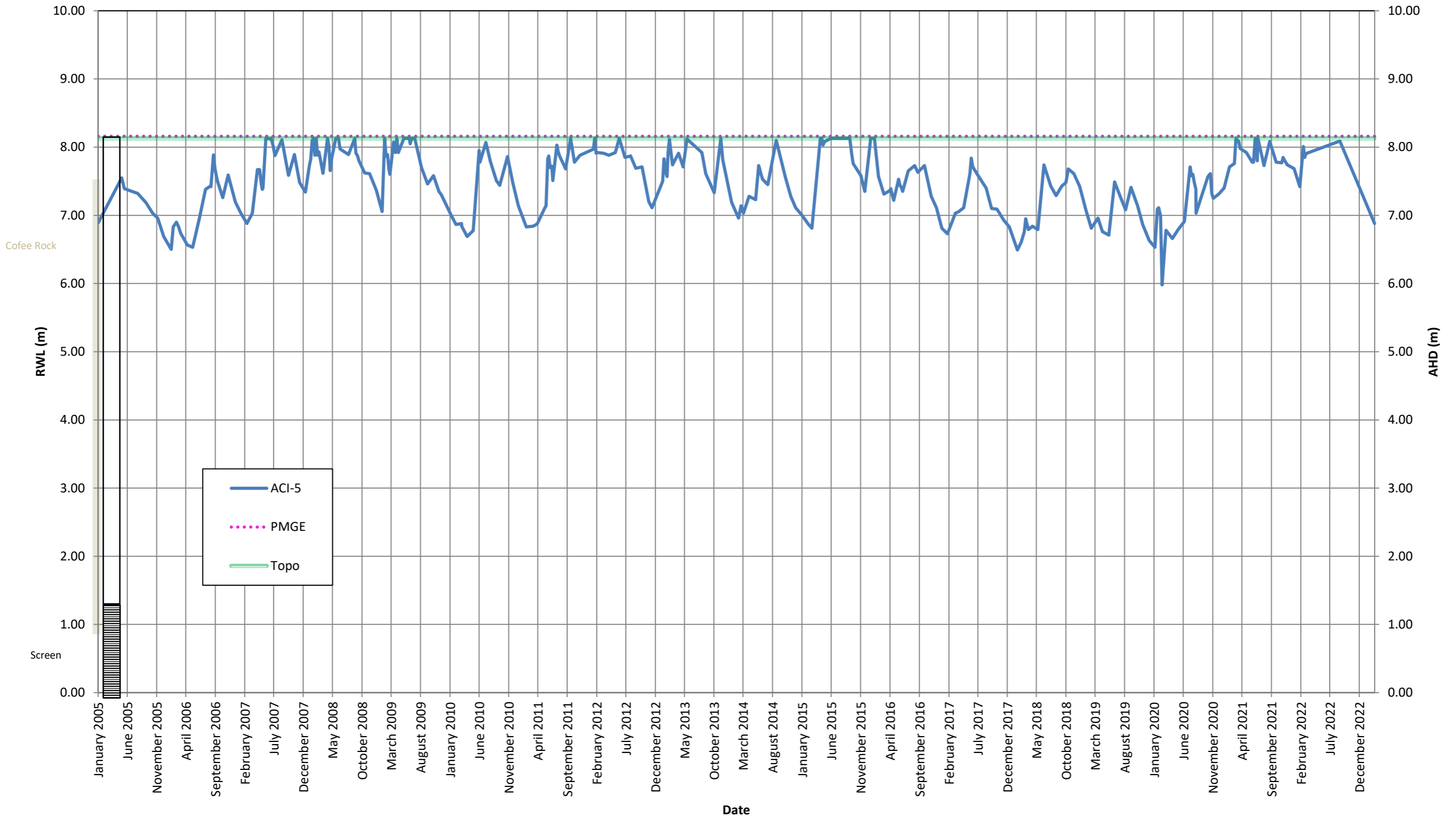
Nigel Fisher
Senior Ecologist
M: 0407 657 583
nfisher@wedgetail.com.au

APPENDIX 6
GROUNDWATER LEVEL TREND
HYDROGRAPHS

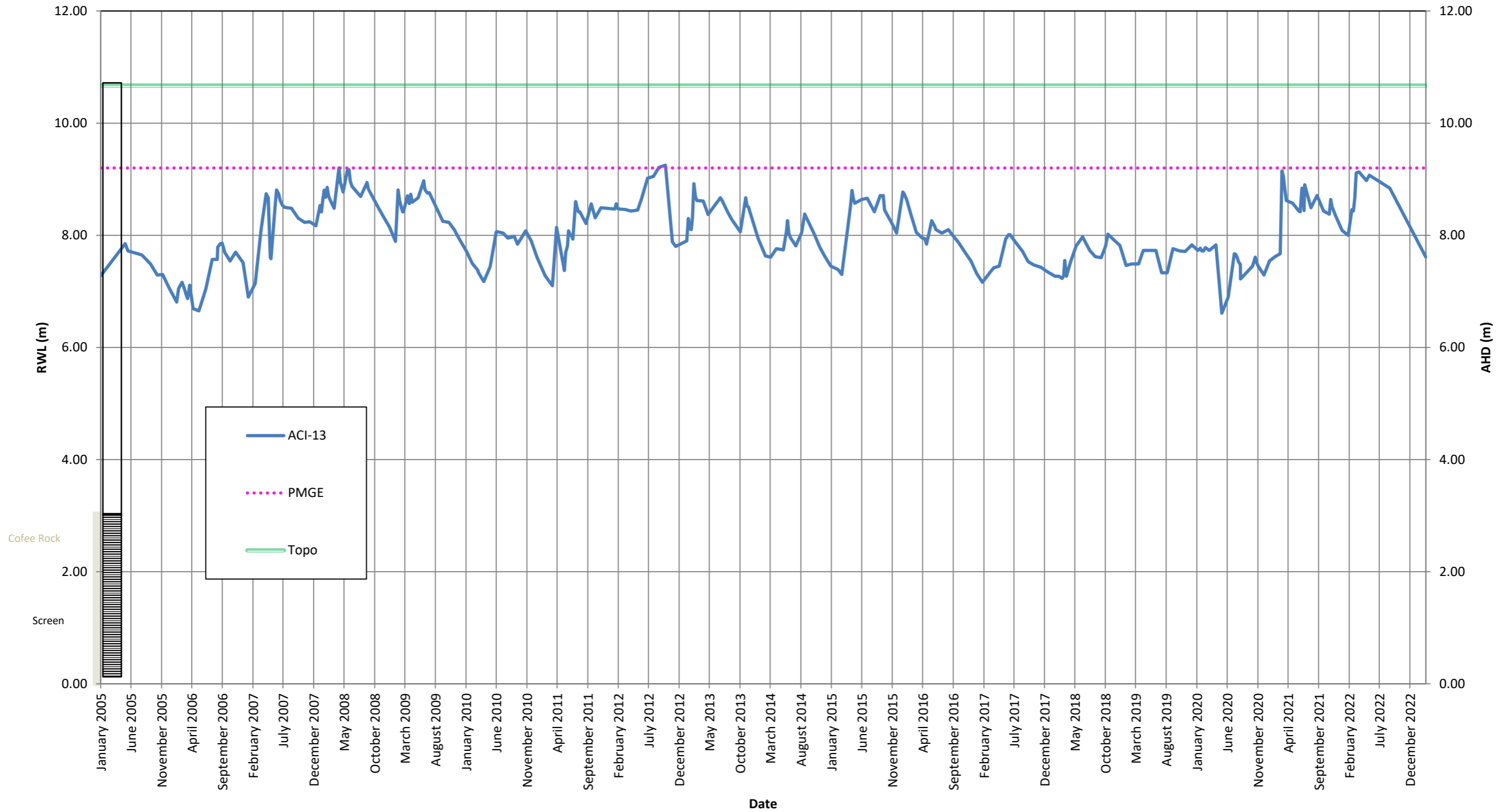
ACI-2 (level against PMGE)



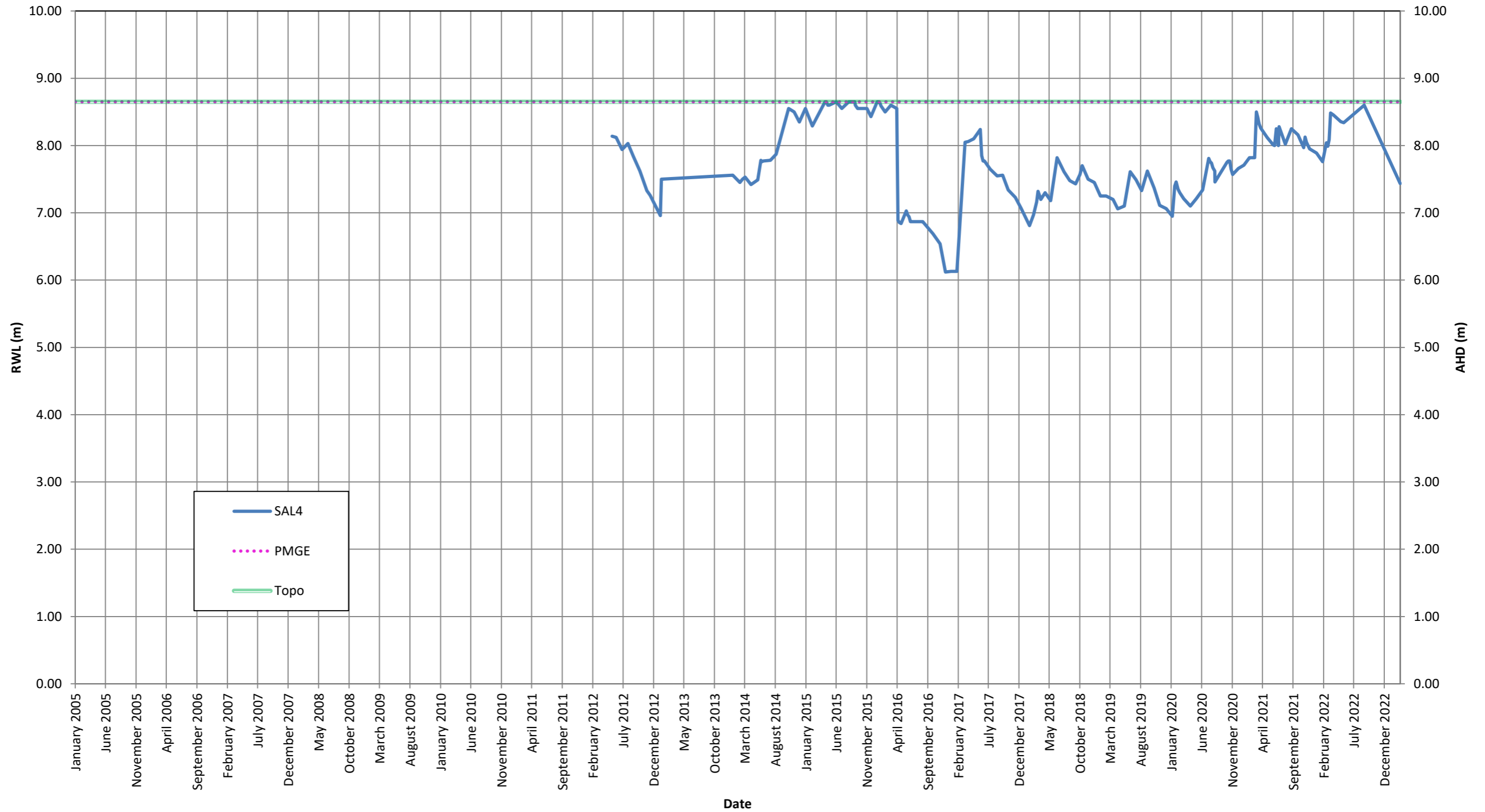
ACI-5 (level against PMGE)



ACI-13 (level against PMGE)

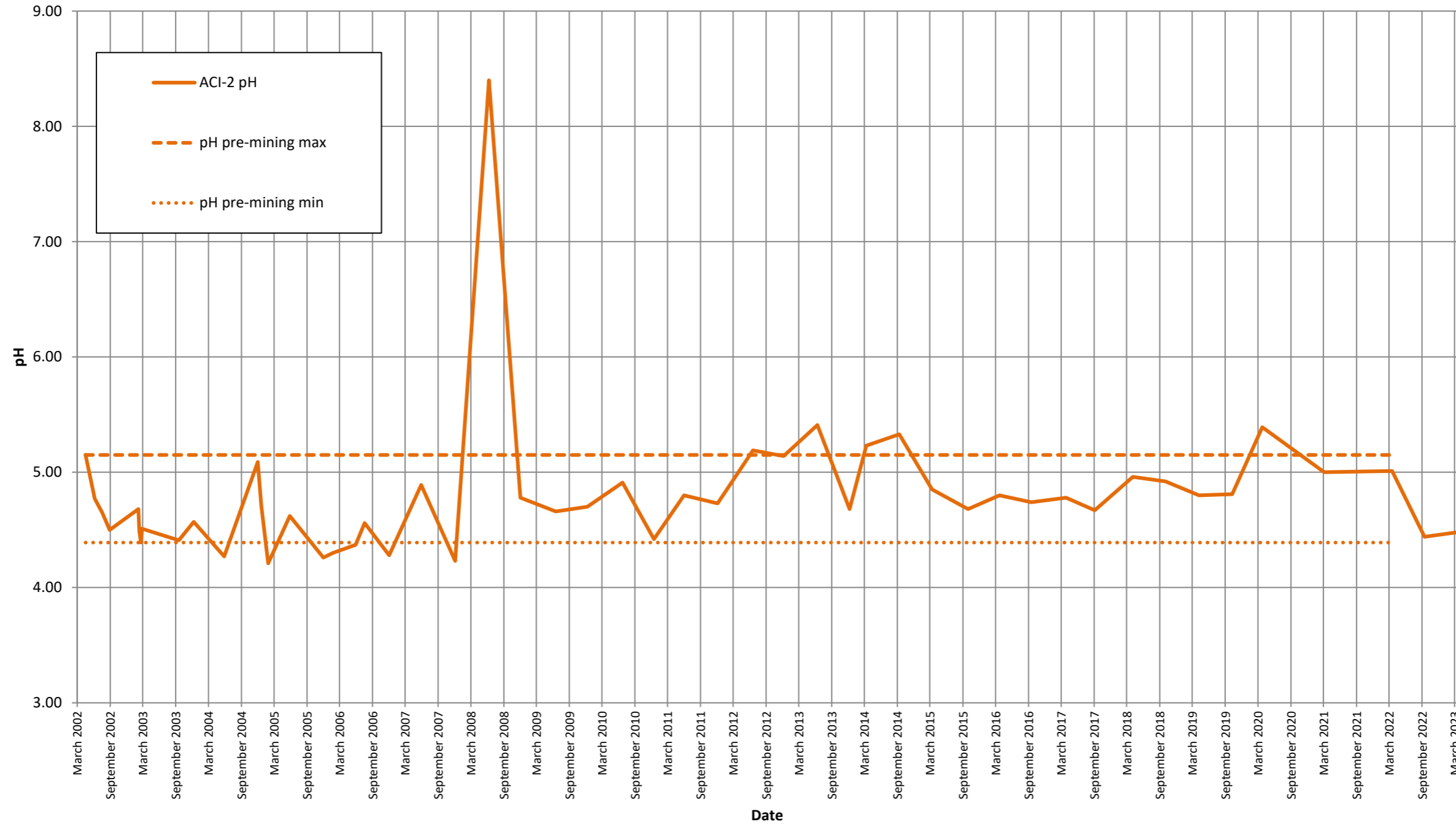


SAL4 (level against PMGE)

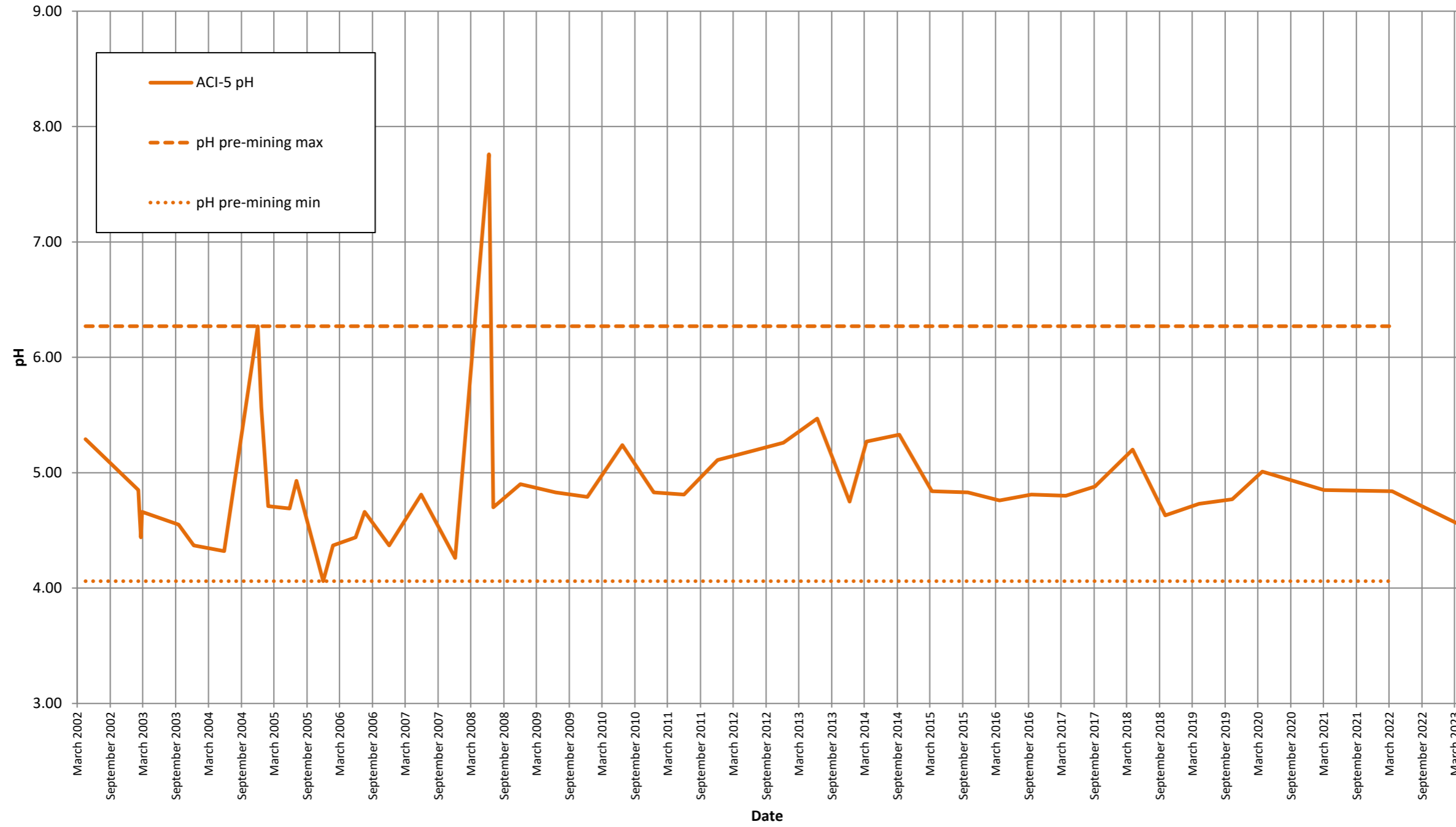


APPENDIX 7
GROUNDWATER QUALITY TREND
HYDROGRAPHS (QUALITY vs.
TRIGGER VALUES)

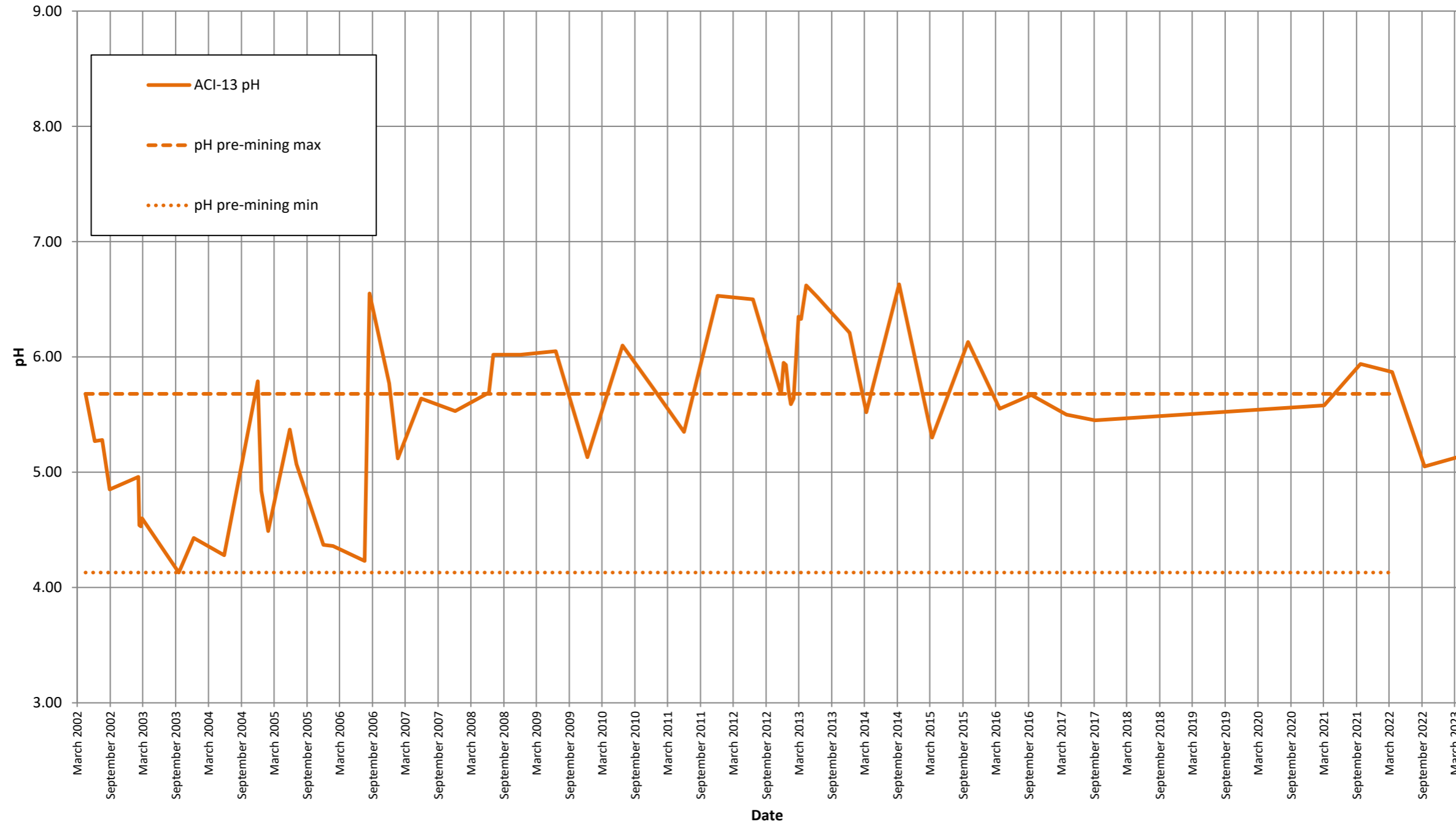
ACI-2 (pH)



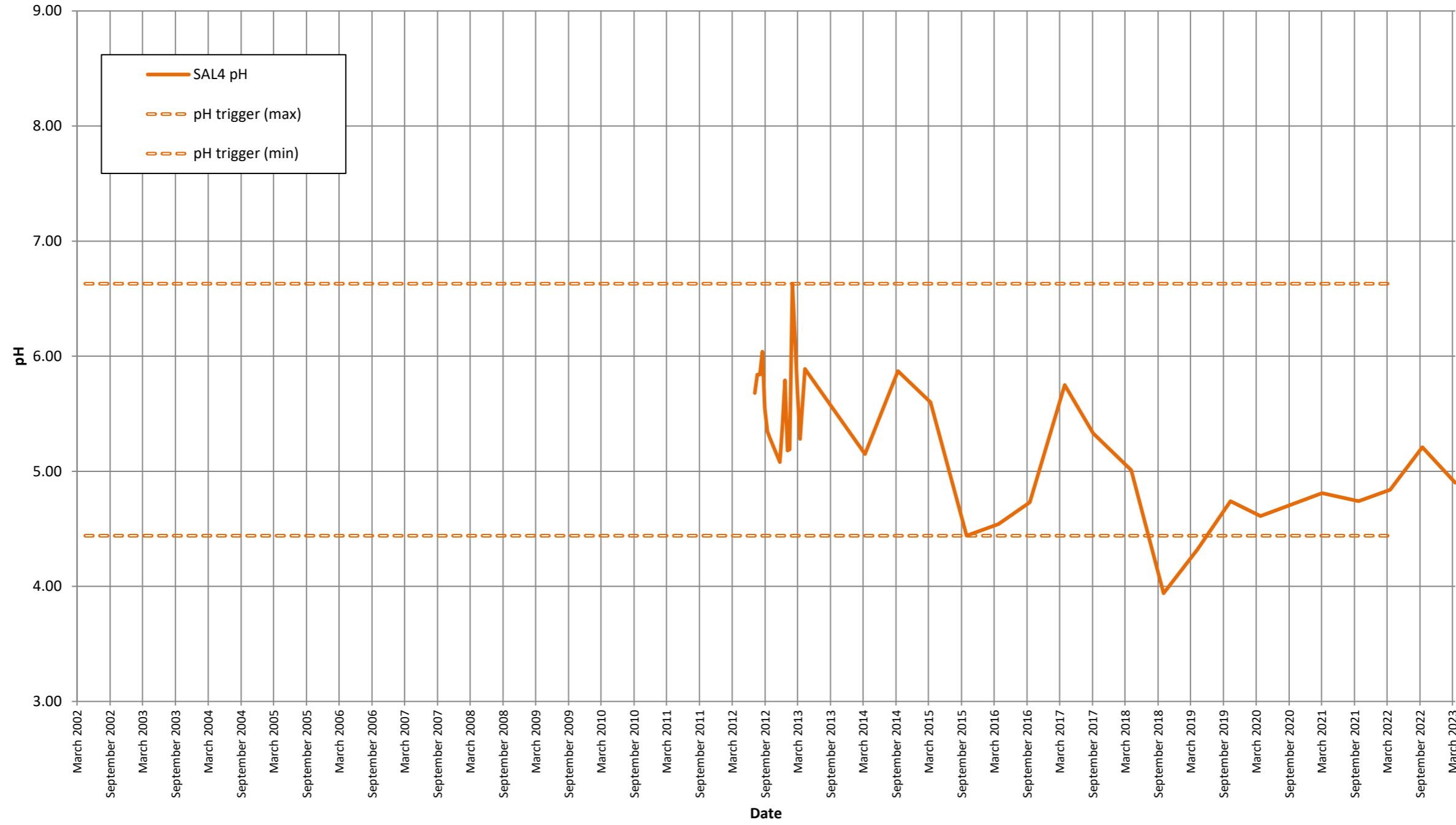
ACI-5 (pH)



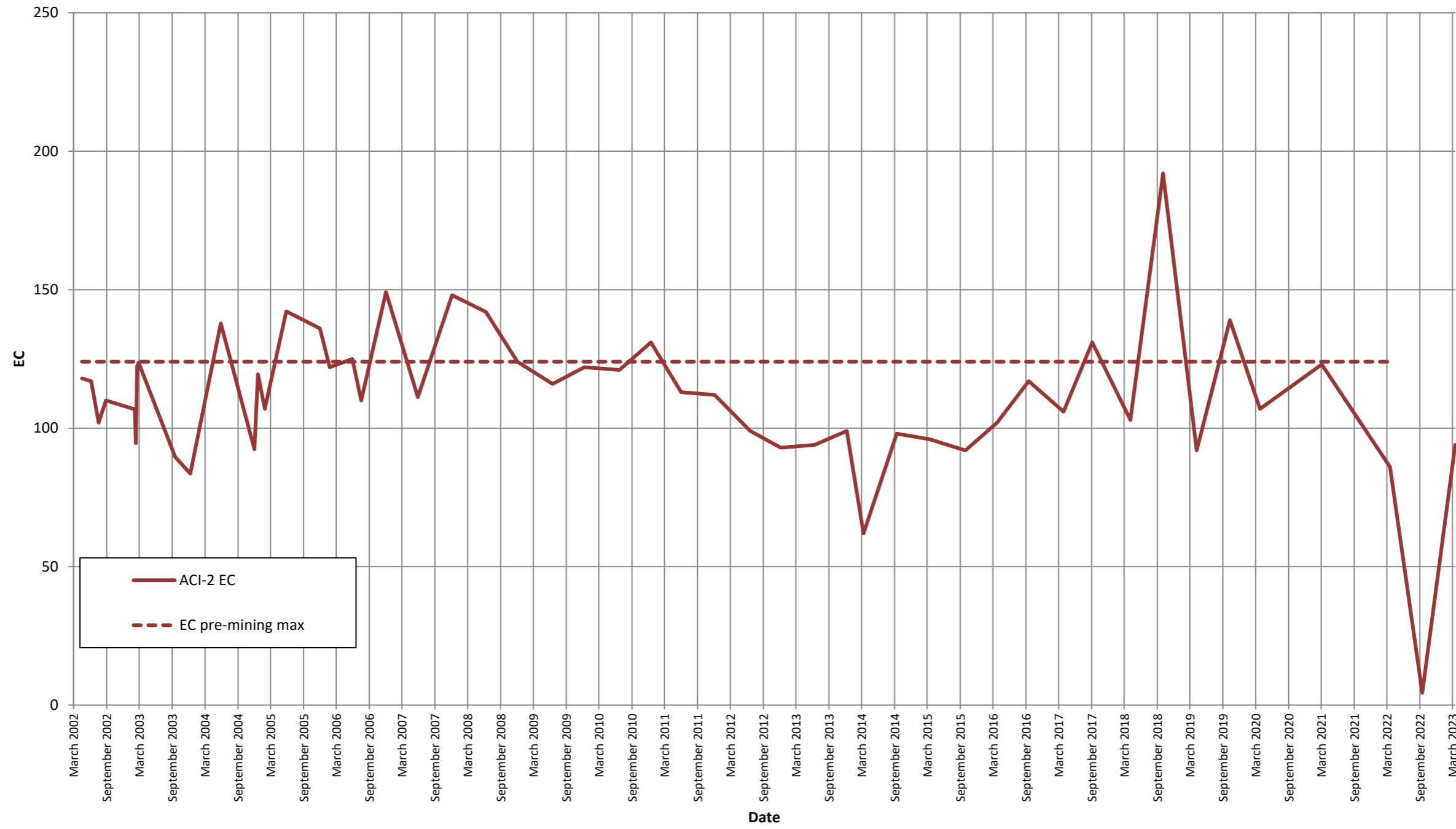
ACI-13 (pH)



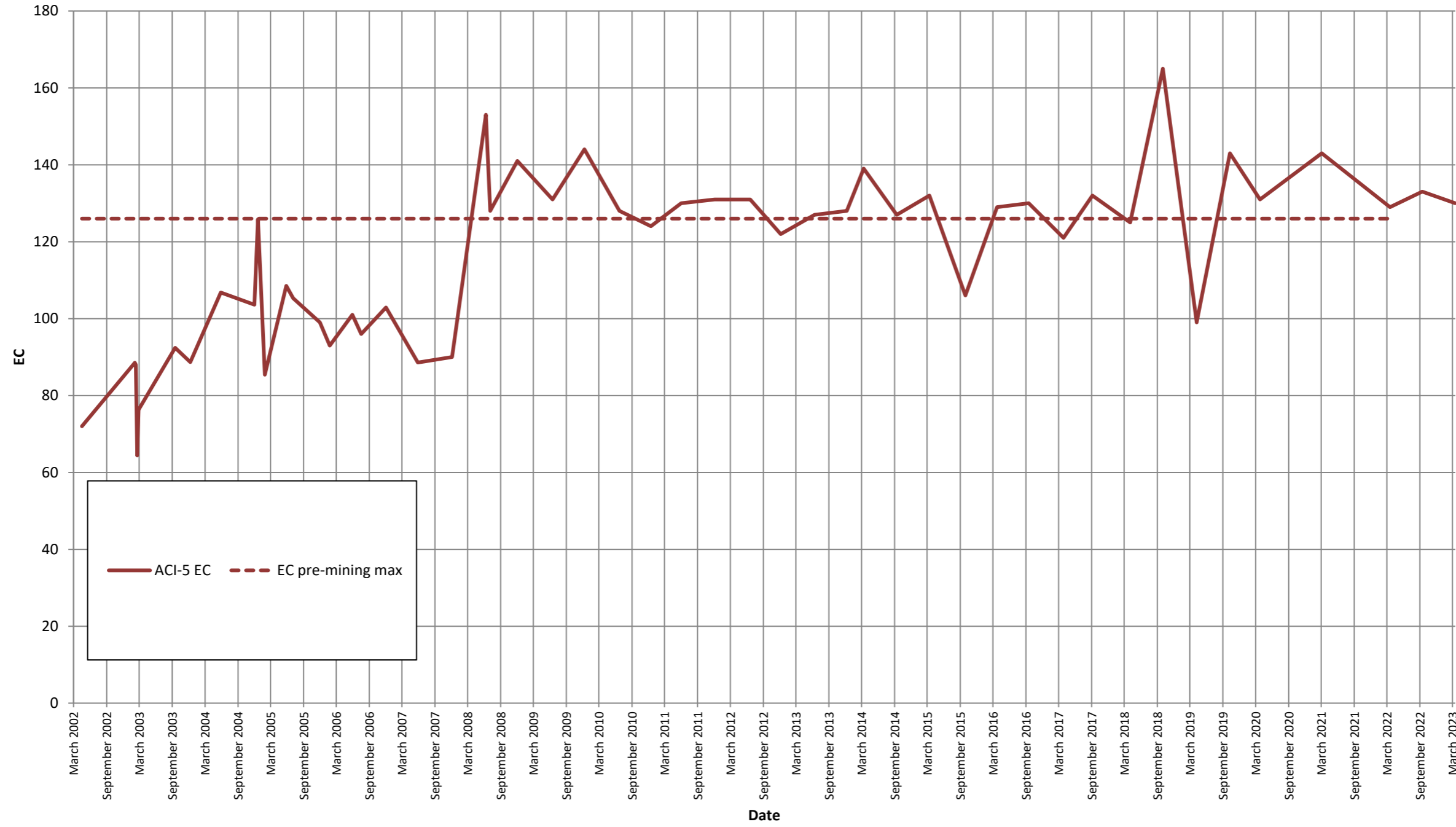
SAL4 (pH)



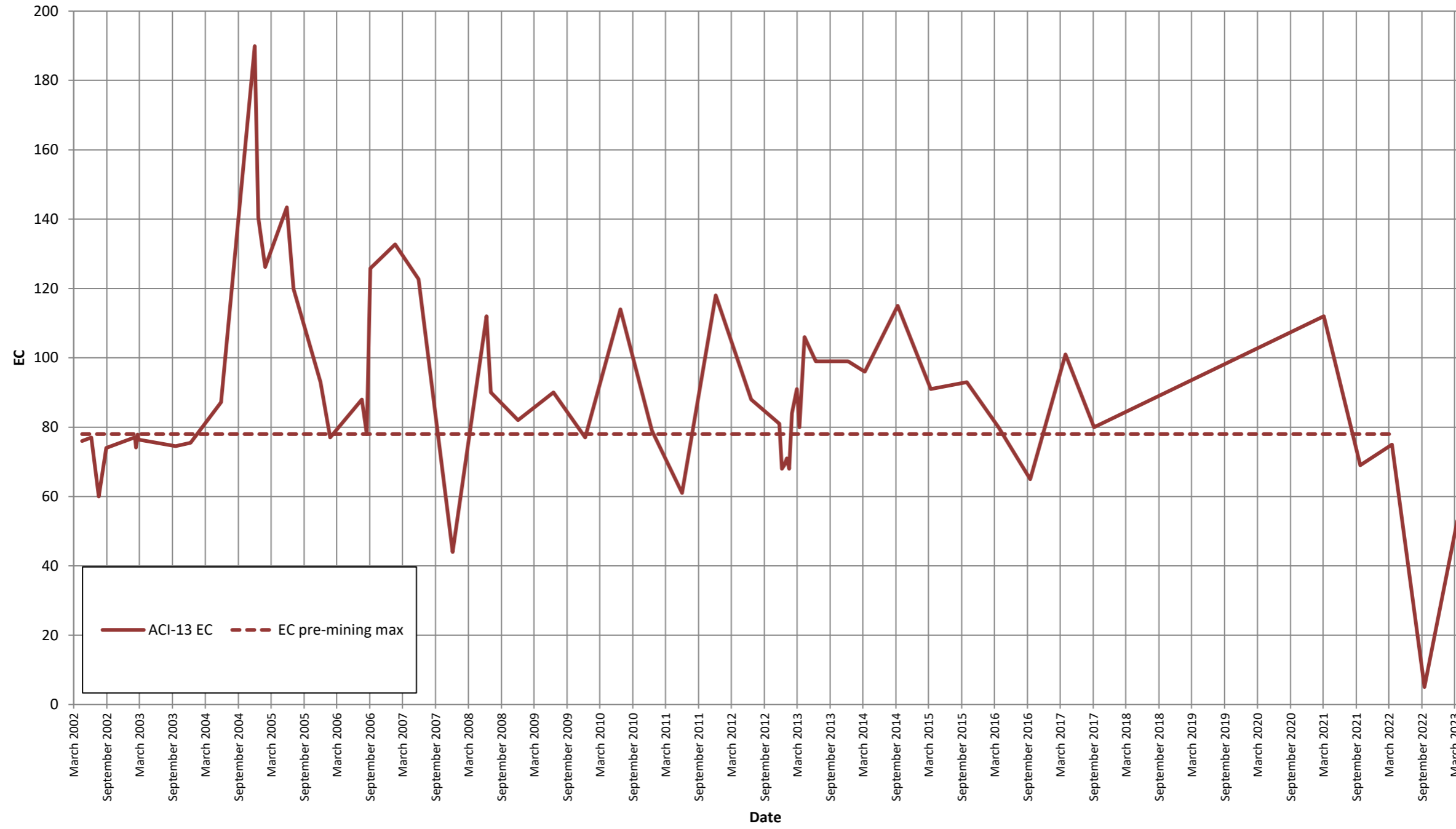
ACI-2 (EC)



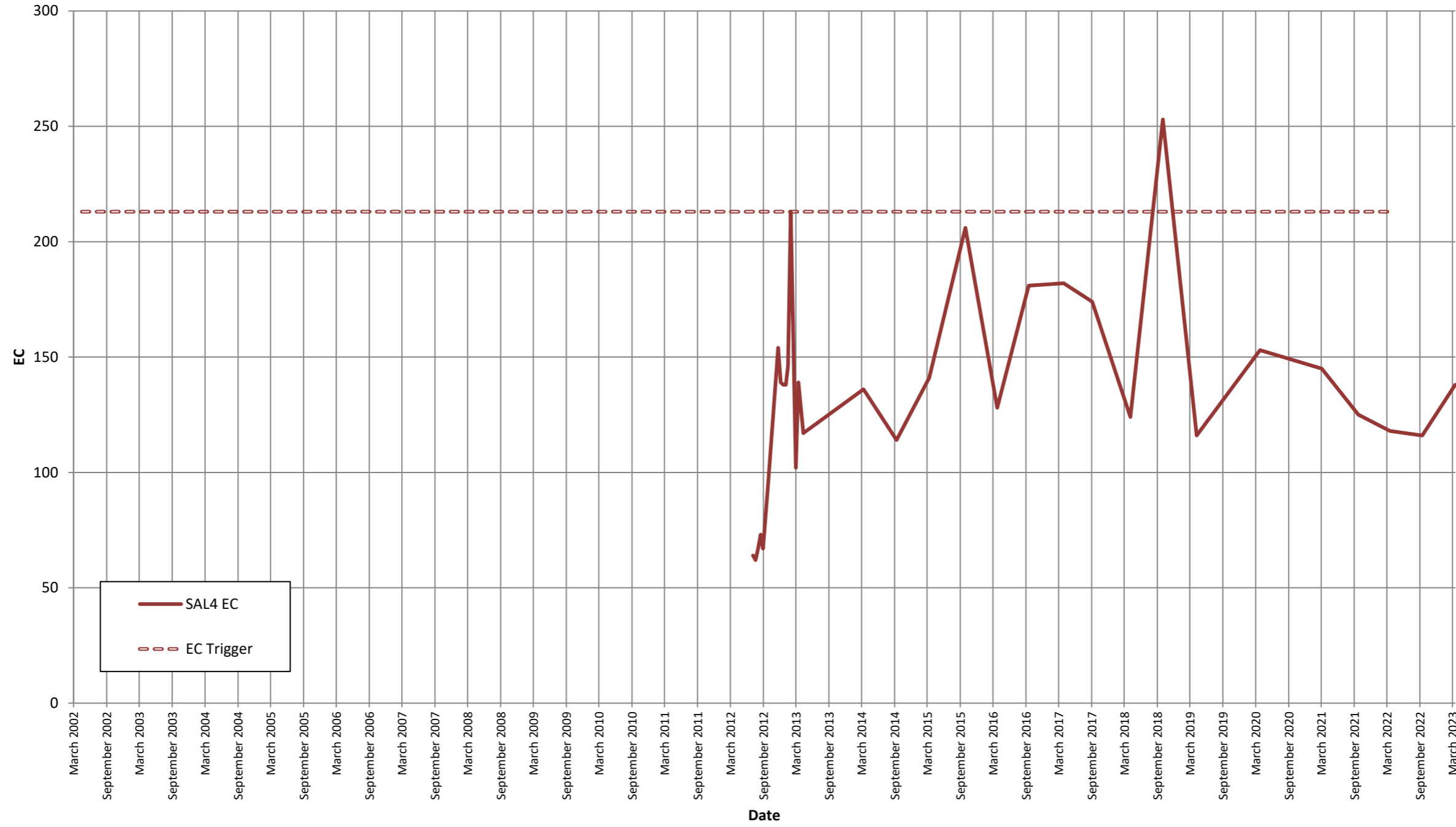
ACI-5 (EC)



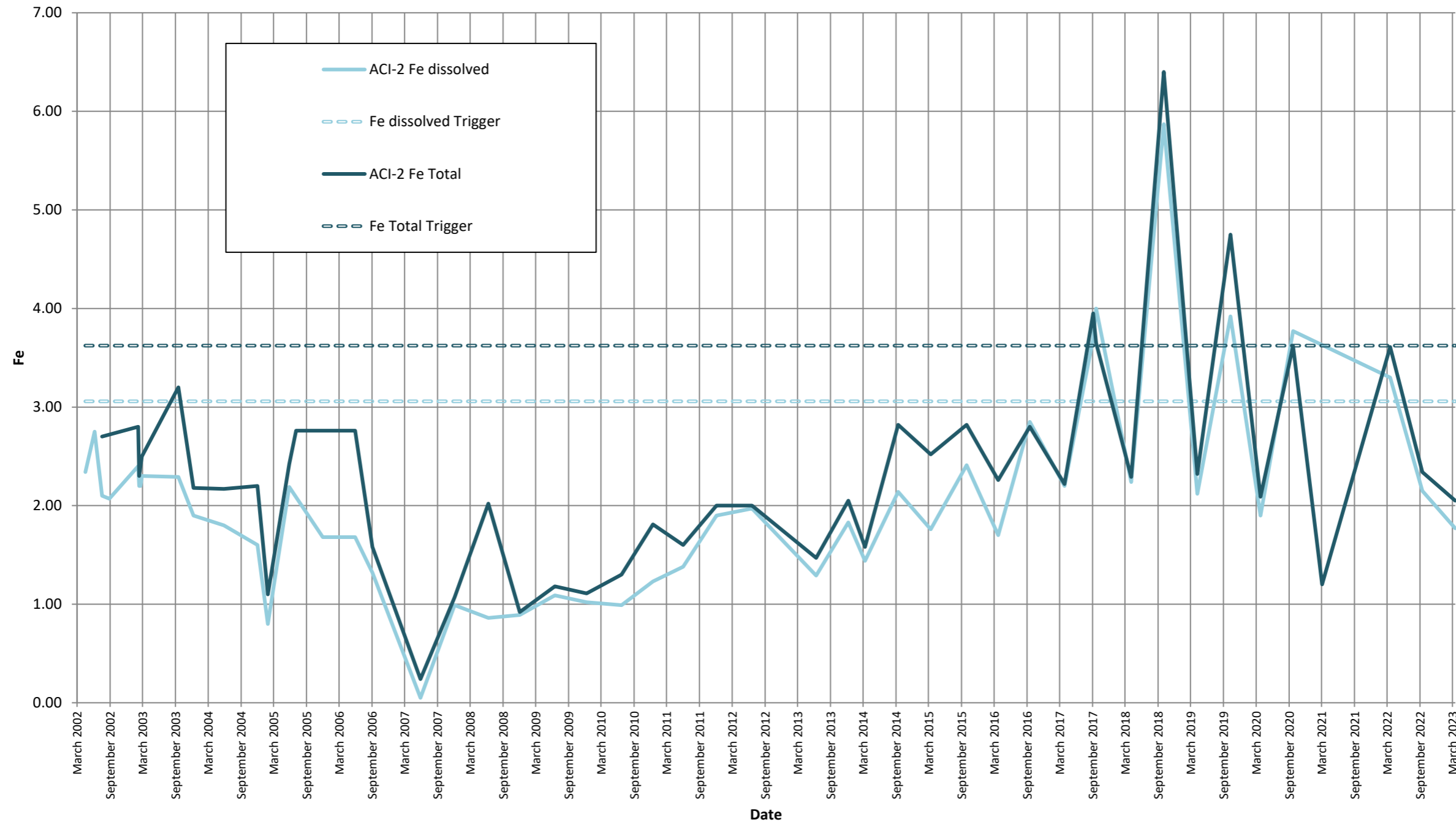
ACI-13 (EC)



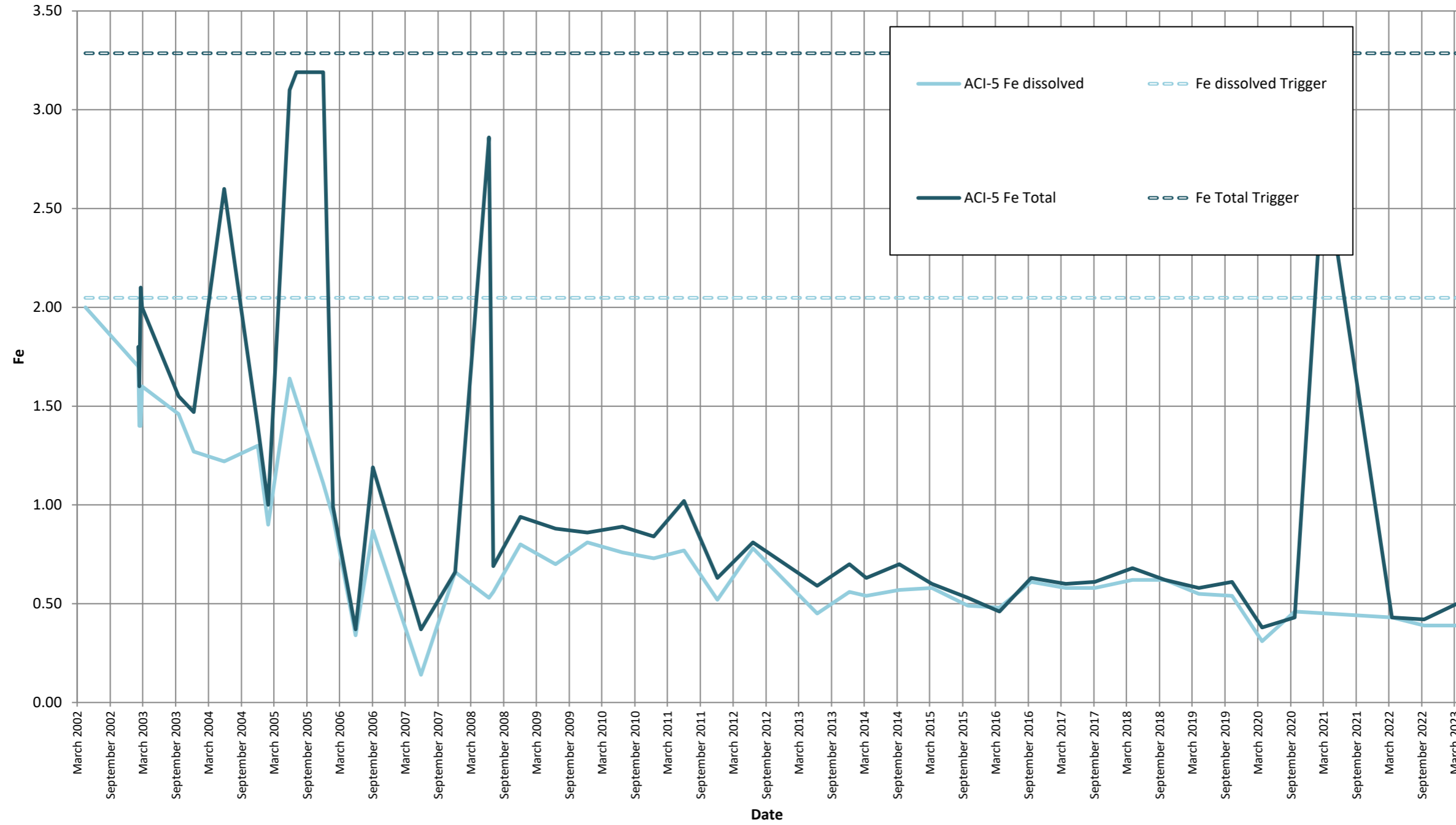
SAL4 (EC)



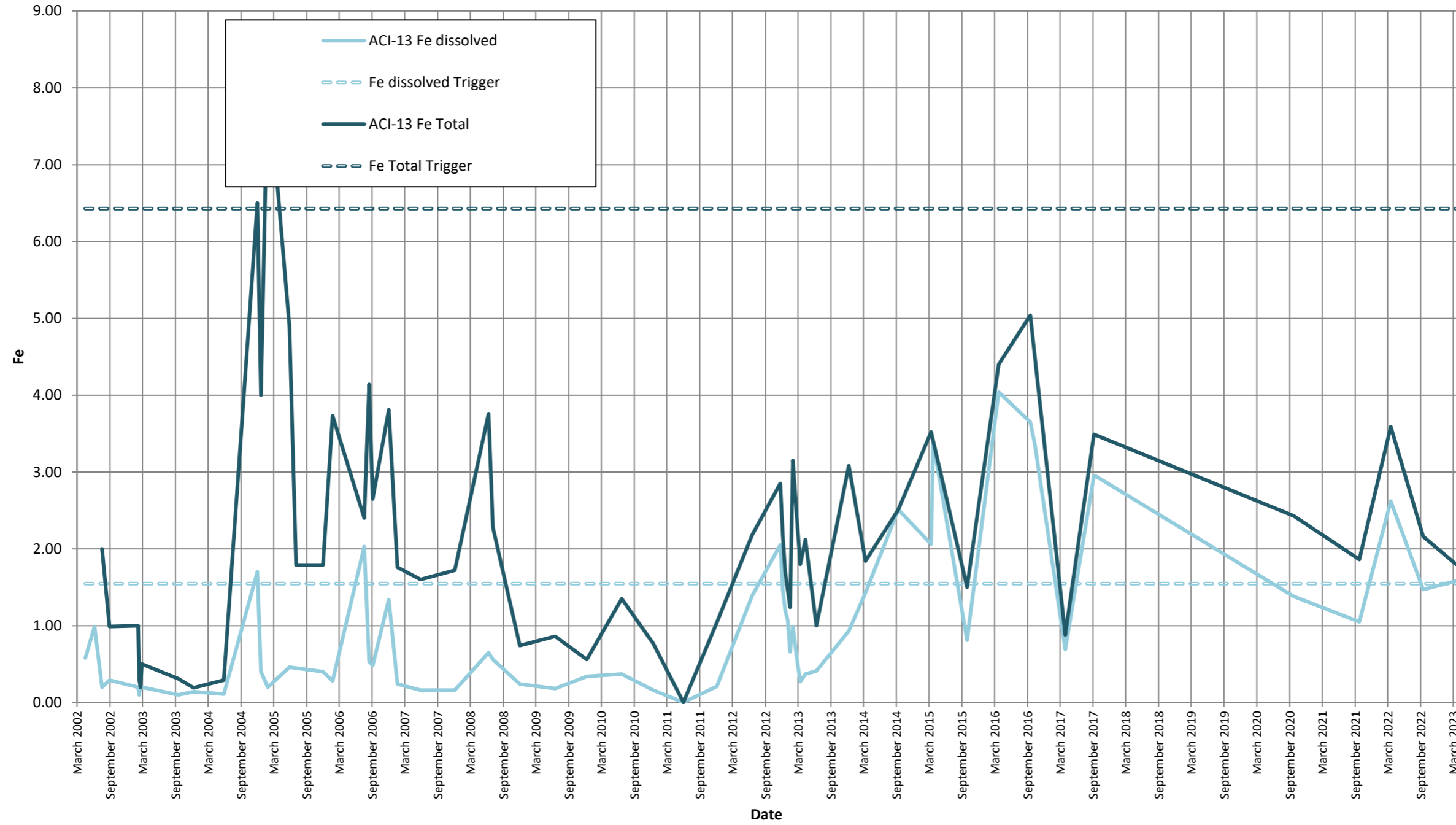
ACI-2 (Iron)



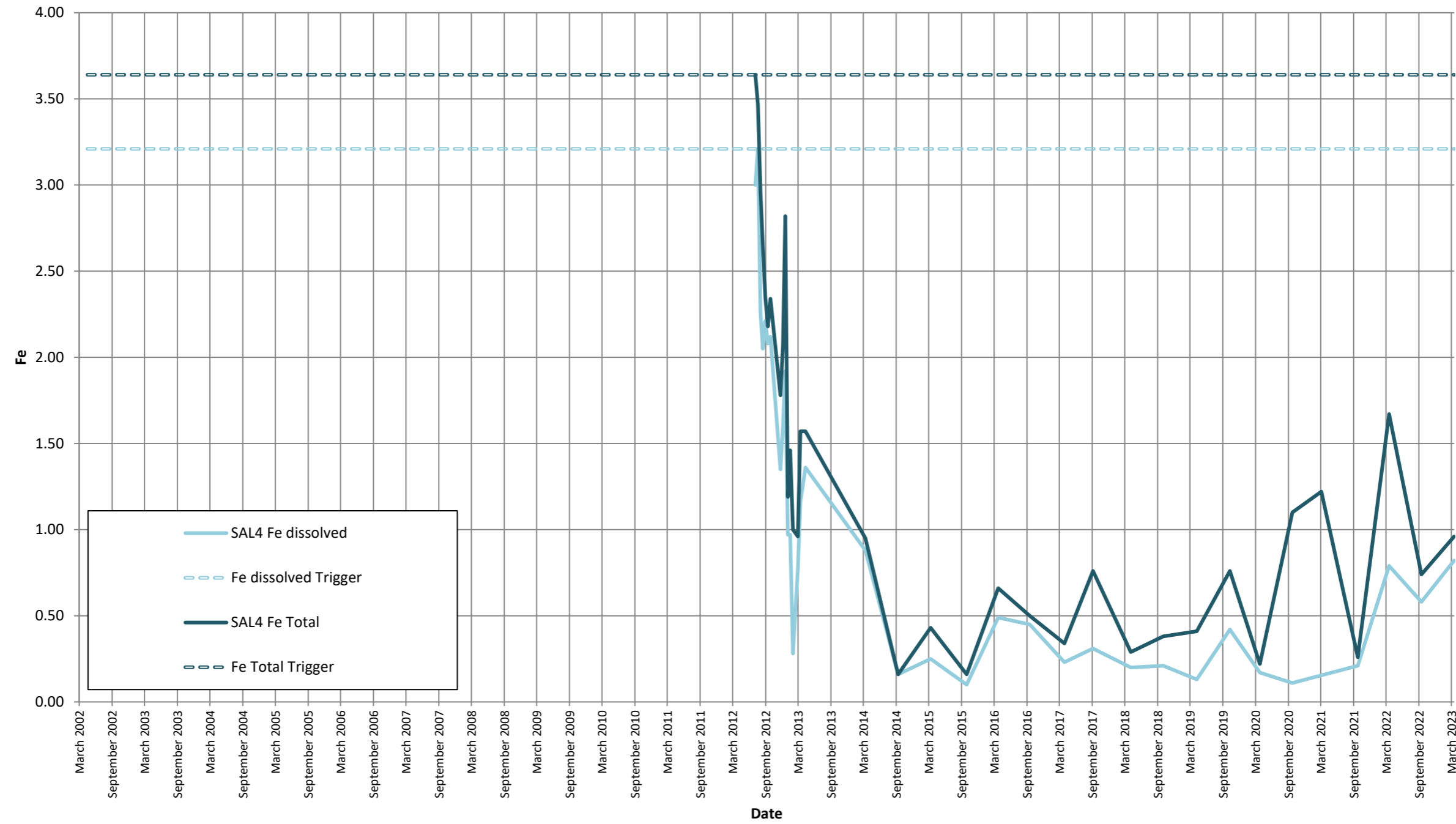
ACI-5 (Iron)



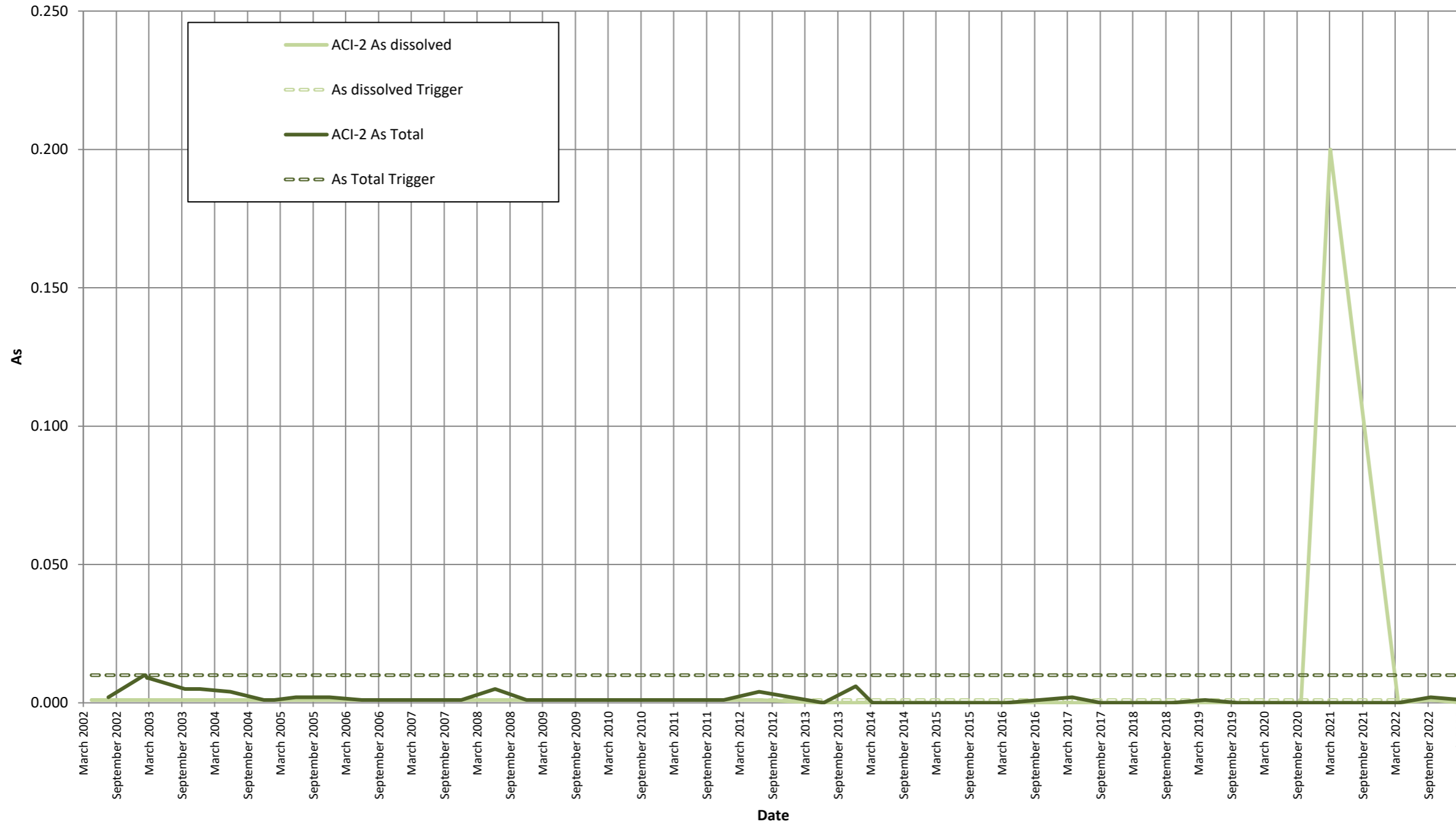
ACI-13 (Iron)



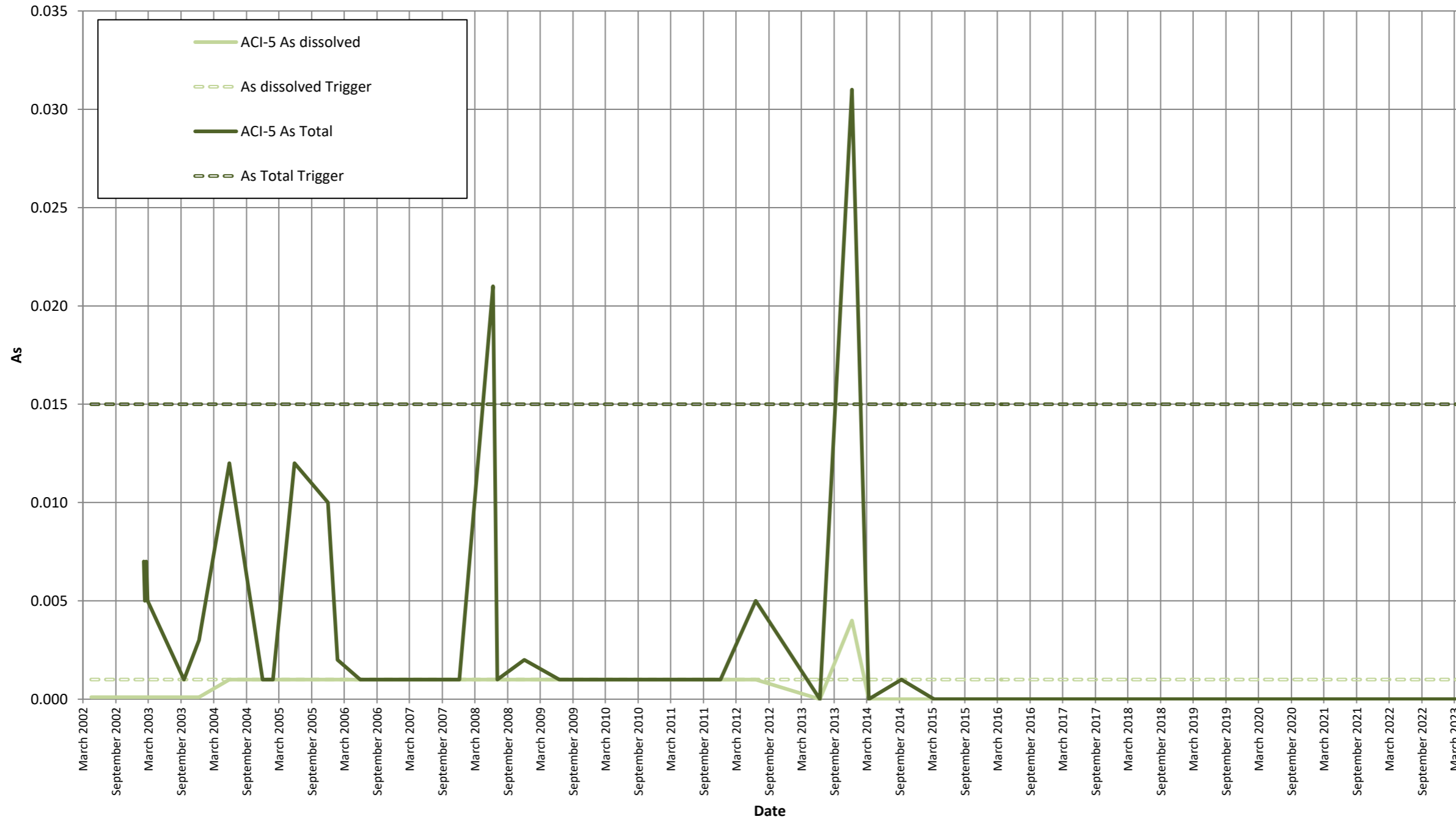
SAL4 (Iron)



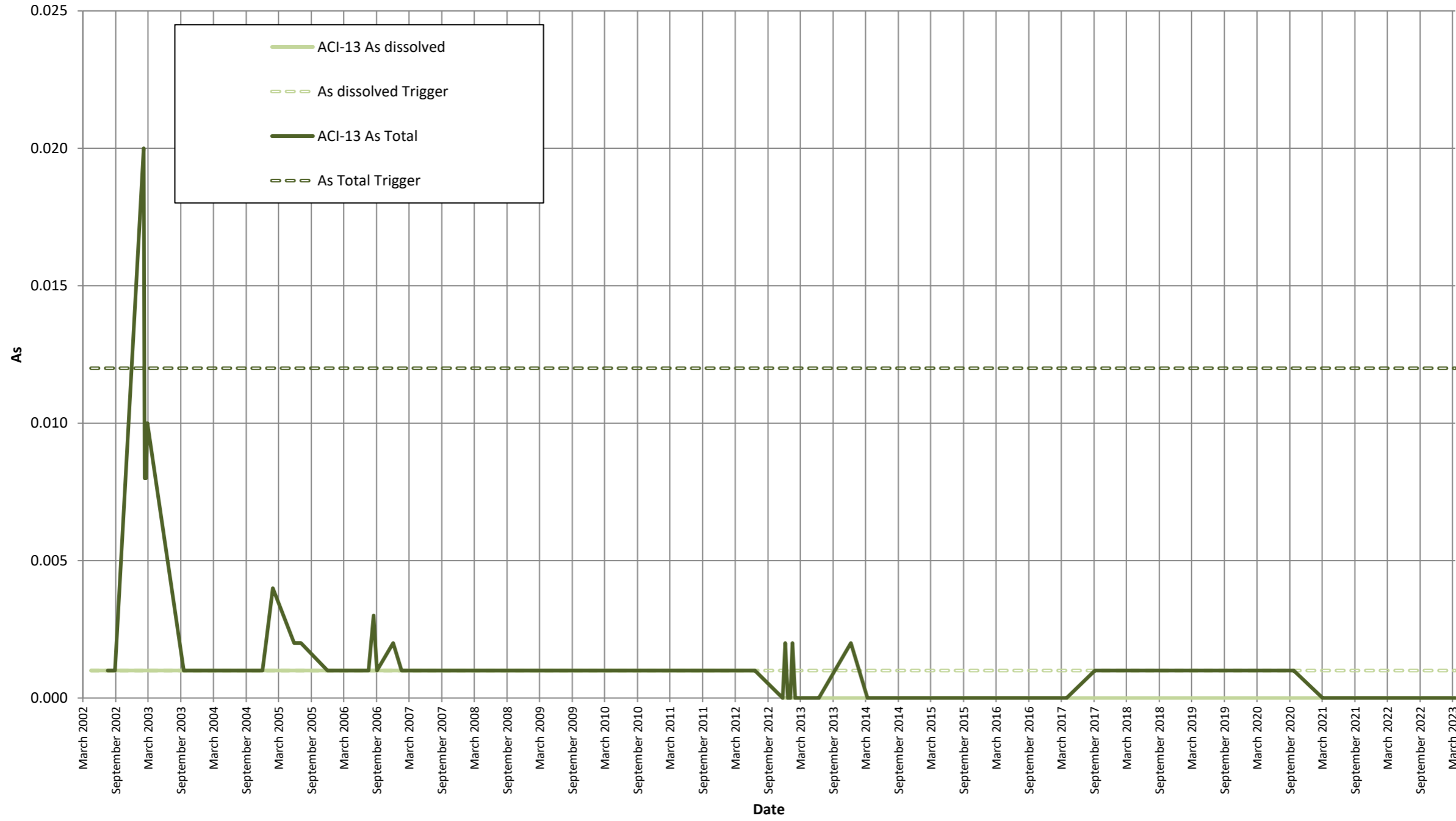
ACI-2 (Arsenic)



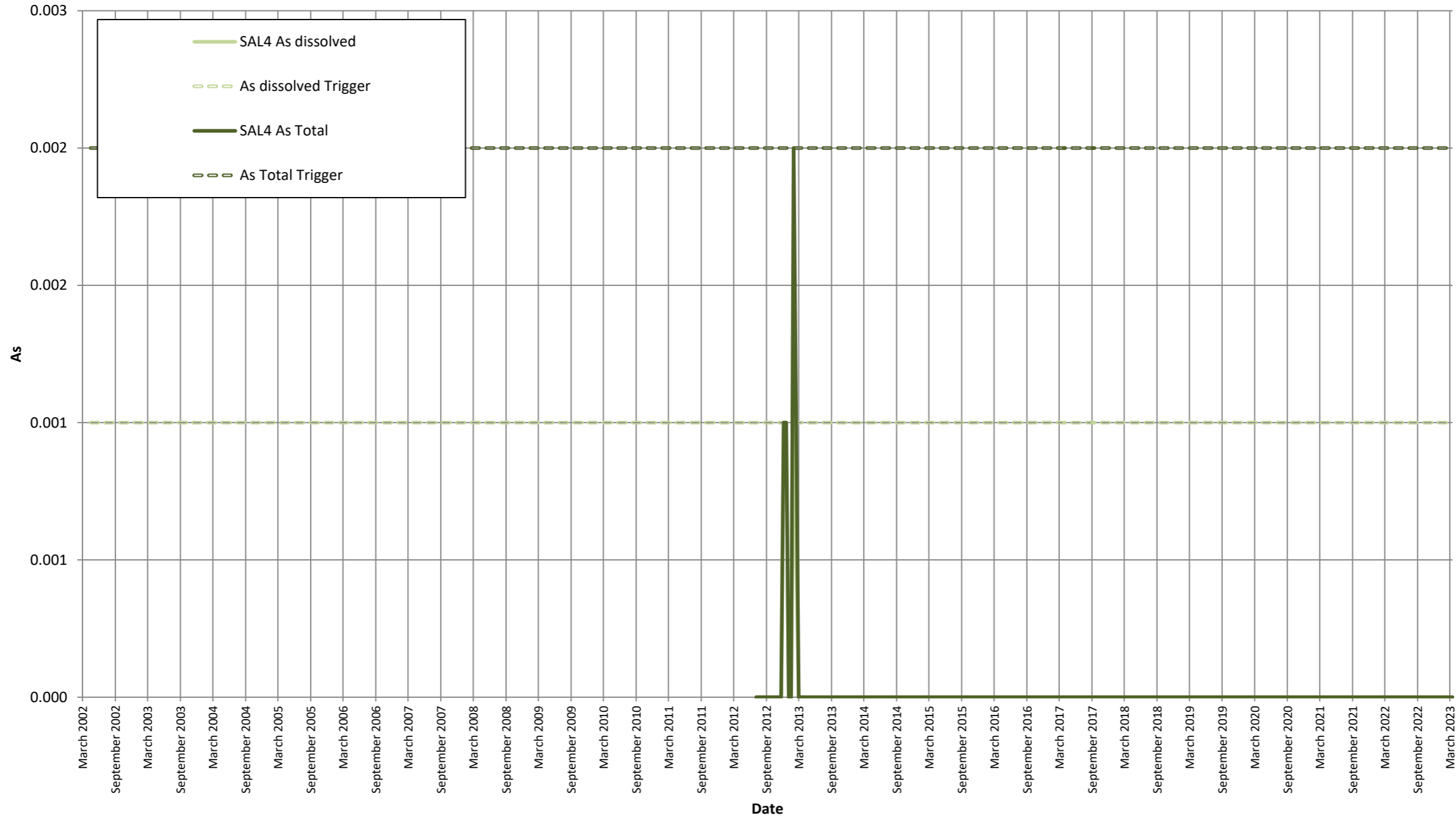
ACI-5 (Arsenic)



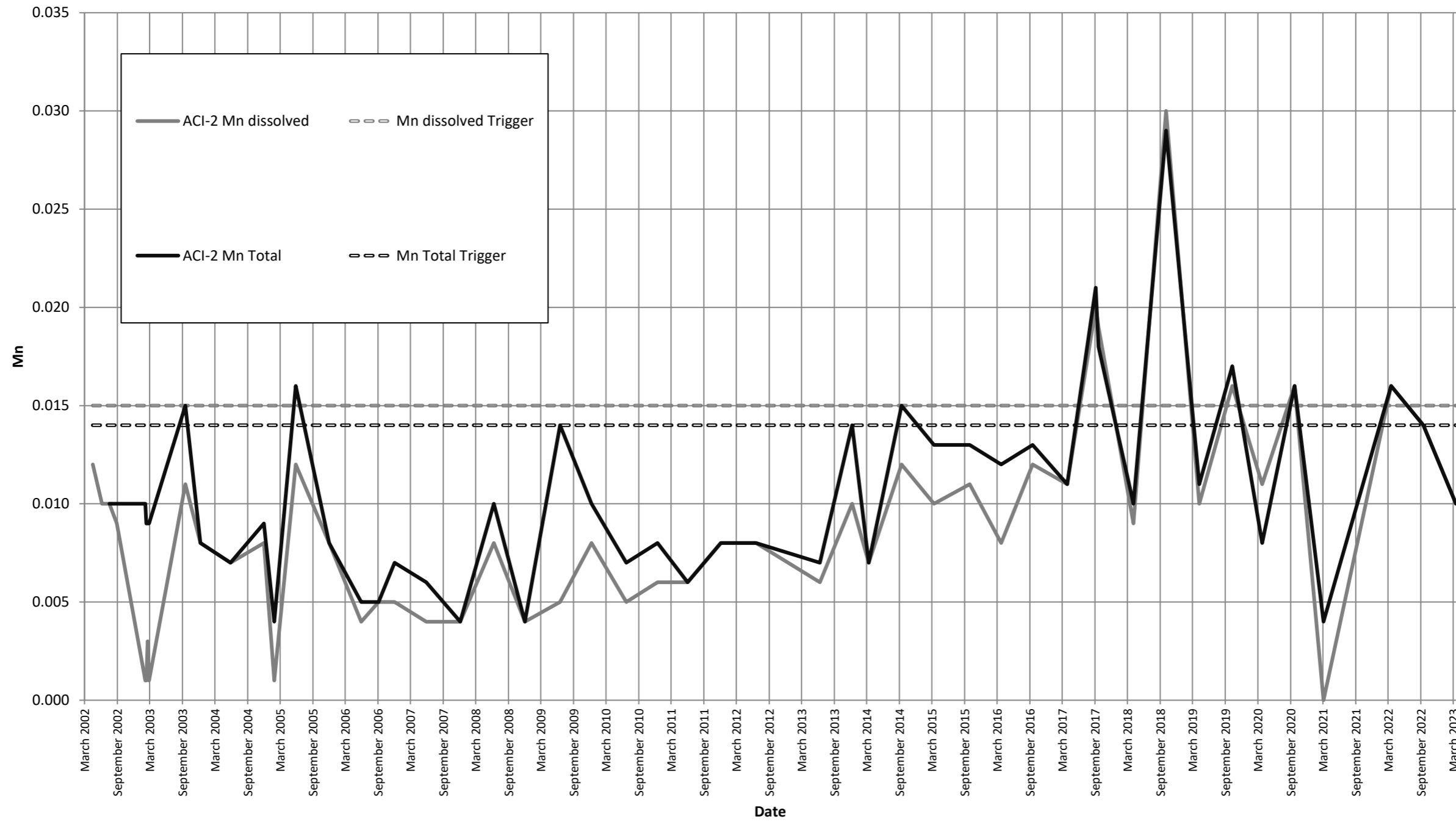
ACI-13 (Arsenic)



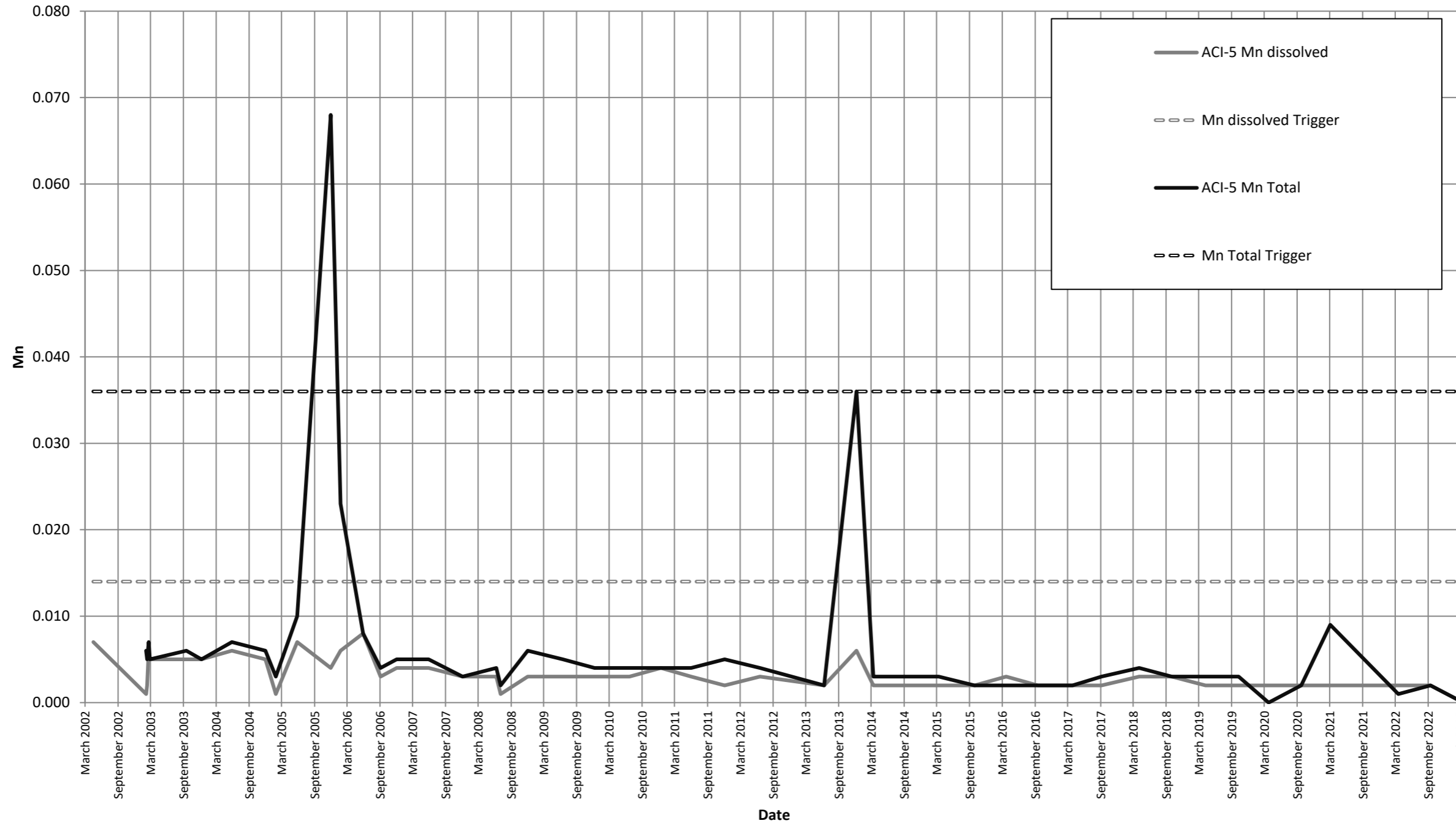
SAL4 (Arsenic)



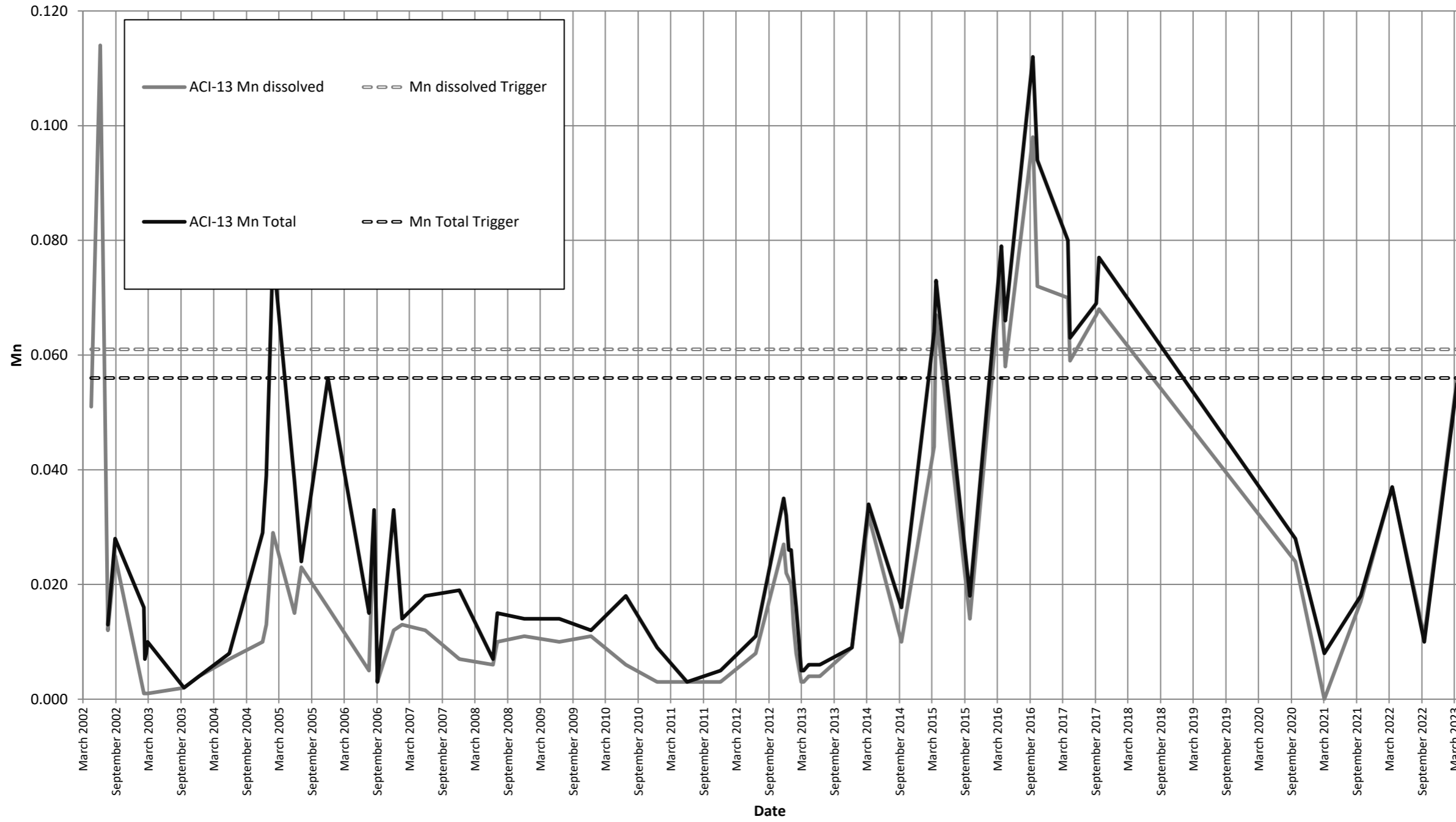
ACI-2 (Manganese)



ACI-5 (Manganese)



ACI-13 (Manganese)



SAL4 (Manganese)

