

# ROOTY HILL DISTRIBUTION CENTRE

2024 Annual Review



## **Site Details**

Organisation	Holcim (Australia) Pty Ltd
Project	Rooty Hill Distribution Centre
Developmental Consent / Project Approval #	PA 05_0051
Document Title	Annual Review 2024
Document Revision	A
Author	IEMA
Project Identifier	HOL06-005
Annual review start date	1 January 2024
Annual review end date	31 December 2024

I, Michael Ensor, certify that this audit report is a true and accurate record of the compliance status of the ROOTY HILL DISTRIBUTION CENTRE for the period of 1 JANUARY 2024 – 31 DECEMBER 2023 and that I am authorised to make this statement on behalf of HOLCIM (AUSTRALIA) PTY LTD. Note.

- a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.
- b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).

Name of authorised reporting officer	Michael Ensor
Title of authorised reporting officer	Site Supervisor
Signature of authorised reporting officer	A
Document Date	27/03/2024

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# **1** Statement of Compliance

The Statement of Compliance for the Rooty Hill Distribution Centre (RHDC) for the 2024 reporting period is provided in **Table 1**. The Compliance Status Key, outlined in **Table 2**, explains the risk levels and definitions used to classify non-compliances. **Table 5** lists the non-compliances associated with MP05\_0051-MOD 2 for 2024.

#### Table 1: Statement of Compliance

Relevant Approval	Were all conditions complied with?
Project Approval 05_0051	No

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

#### Table 2: Compliance Status Key

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Table 3: Non-Compliances

Relevant approval	Condition	Condition Description	Compliance Status	Section Addressed in Annual Review	Comment
PA 05_0051	Schedule 2, Condition 8	<ul> <li>Air Quality</li> <li>The Proponent must design, construct, commission, operate and maintain the project in a manner that minimises dust emissions from the site, as specified in paragraph of the final Statement of Commitments submitted by the Proponent to the Department on 17 March 2006, including: <ul> <li>a) all dust control systems for transfer, load out and unloading points, as well as materials handling activities must be designed and operated to comply with a solid particles emission limit of 20 mgm-3 as required by Part 4 of the Protection of the Environment (Clean Air) Regulation 2002;</li> <li>b) all storage bins must be enclosed;</li> <li>c) water spray systems must be installed to service all stockpiles;</li> <li>d) all paved trafficable areas must be swept as required by a permanently stationed street sweeper to minimise dust; and</li> </ul> </li> </ul>	Administrative Non- compliance	Section 6.3.3	Please note, this non- compliance was identified during the 2024 Independent Environmental Audit (IEA). There is a discrepancy in part (b) of this condition, the 'enclosure of storage bins'. 'Bins' as envisaged in the MOD 2 application and other plans were not implemented due to an apparent design change. The approach that has been taken involves large, open storage bins and manual loading of trucks via a Front-End Loader (FEL). The monitoring data and other lines of evidence (i.e. lack of complaints, observations etc.) suggest the air quality outcomes required at the Site can be achieved based on the current layout. Ultimately,





Relevant approval	Condition	Condition Description	Compliance Status	Section Addressed in Annual Review	Comment
		e) the application of Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA), where reasonable and practicable, to minimise dust impacts during construction and operation of the project.			the site does not comply with the condition as it currently reads resulting in an administrative non- compliance with Schedule 2, Condition 8.



### 2 Introduction

Holcim (Australia) Pty Ltd (Holcim) is the owner and operator of the Rooty Hill Distribution Centre (RHDC), an aggregate storage and distribution facility located on Lot 1 DP 1150066 at 21 Kellogg Road, Rooty Hill, as seen in **Figure 1.** A Development Consent was granted in 2006 by the Land and Environment (L&E) Court (Decision No. 10406 of 2006) to construct and operate a distribution centre to receive aggregates by rail from Holcim's Lynwood Quarry. The RHDC officially commenced operations on 1 October 2015. The RHDC facility is the primary unloading and distribution centre for construction materials extracted from Lynwood Quarry (located in Marulan, NSW).









In accordance with Condition 6.3 (Annual Performance Monitoring) of the modified Project Approval 05\_0051 the site is required to undertake an Annual Review of the site. These Annual Review requirements are presented in **Table 4**.

#### **Table 4: Annual Review Requirements**

Co	ndition	Section addressed in Annual Review		
The Ani Env cor Re	The Proponent must, throughout the life of the project, prepare and submit to the Secretary, an Annual Review. The Annual Review must review the performance of the project against the Operation Environmental Management Plan (refer to condition 5.4 and condition 5.5 of this approval), the conditions of this approval and other licences and approvals relating to the project. The Annual Review must include, but not necessarily be limited to:			
a)	details of compliance with the conditions of this approval;	Section 1, 6, and 12		
b)	a copy of the Complaints Register (refer to condition 4.3 of this approval) for the preceding twelve-month period (exclusive of personal details), and details of how these complaints were addressed and resolved;	Section 10.2		
c)	a comparison of the environmental impacts and performance of the project against the environmental impacts and performance predicted in those documents listed under condition 1.1 of this approval;	Section 6, 7.2, and 8.3		
d)	results of all environmental monitoring required under this approval and other approvals, including interpretations and discussion by a suitably qualified person; and	Section 6, 7.2, and 8.3		
e)	a list of all occasions in the preceding twelve-month period when environmental performance goals for the project have not been achieved, indicating the reason for failure to meet the goals and the action taken to prevent recurrence of that type of incident.	Section 1, 6 and 11		

This Annual Review has been prepared in accordance with the Annual Review Guidelines: Postapproval requirements for State Significant Mining Developments (October 2015).

#### 2.1 Key Personnel

The following details are for those key personnel managing the environmental performance of RHDC:

#### **RHDC Site Supervisor**

Michael Ensor Mob: +61 419 476 052 Email: <u>Michael.ensor@holcim.com</u>

Environment Manager - NSW Dozie Egeonu Mob: +61 429 557 493 Email: <u>dozie.egeonu@holcim.com</u>



# 3 Approvals

RHDC operates under the approvals listed in **Table 5**. The original Project Approval 05\_0051 was modified in 2011 (MOD 1) to approve alterations to site layout. In 2017, the Project Approval was modified (MOD 2) to secure a larger area for material storage and handling.

#### Table 5: Approvals for RHDC Operations

Approval	Regulatory Authority	Date of Approval
MOD 2 to PA 05_0051	Department of Planning, Industry & Environment (DPIE).	29 June 2017
MOD 1 to PA 05_0051	Department of Planning.	22 March 2011
L&E Court Decision No. 10406 of 2006.	Department of Planning, Housing, and Infrastructure	26 April 2006

On 18 June 2020, the EPA approved Holcim's application to surrender the Environment Protection Licence (EPL) 20672 for RHDC. EPL 20672 is no longer applicable to the RHDC and therefore it is not mentioned any further in this Annual Review.



### **4** Operations Summary

All operations undertaken at RHDC during the reporting period were undertaken in general accordance with the Project Approval. Fixed and mobile plant are serviced as required by their respective original equipment manufacturer's maintenance schedule and as required to ensure efficient and effective use. Compliance-based maintenance of fixed and mobile plant is prioritised as required.

RHDC has approval to operate 24 hours a day, seven days a week. There were no construction activities carried out during the reporting period. However, any construction activities should be completed within the hours specified in Condition 2.2 of the Project Approval which are as follows:

- a) 7:00am to 6:00pm, Mondays to Fridays,
- b) 8:00am to 1:00pm on Saturdays, and
- c) At no time on Sundays or public holidays.

**Table 6** includes a summary of the product distributed from RHDC in each calendar year which apply to this Annual Review reporting period. As per Condition 1.5, the production capacity of the concrete batching plant must not exceed 200,000 cubic metres (m<sup>3</sup>) per year.

Material	Approval Limit (per year)	2018	2019	2020	2021	2022	2023	2024	2025 (Forecast)
Concrete Production (m <sup>3</sup> )	200,000	68,700	53,547	94,722	77,746	75,906	107,037	139,134	110,000

#### **Table 6: Annual Production Summary**

As per Condition 1.4, RHDC must not distribute more than four million tonnes (t) of construction materials (excluding concrete) a year from site. In 2024, RHDC distributed 1,043,059 t of construction material (excluding concrete) which is compliant with the approval limit. RHDC forecast 1,072,000 t of construction material (excluding concrete) will be distributed in 2025.

In accordance with the Operational Environmental Management Plan (OEMP), road trucks must be covered when leaving the site. Compliance against this condition is audited, including random or "spot" inspections, and training is provided to drivers through the induction process.

#### 4.1 Next Reporting Period

It is anticipated that RHDC will continue to operate within the current footprint and scope of the existing operations.

Development activities proposed to be carried out at RHDC in 2025 include:

- Stockpiling of product;
- Operation of the concrete batching plant; and
- Loading and unloading of product by truck and train.



# 5 Actions Required from Previous Annual Review

RHDC's 2023 Annual Review was submitted by 31 March 2023. On 15 May 2024 DPHI responded with a letter stating that '*NSW Planning has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the approval and the Annual Review Guideline (October 2015)*'.

#### 5.1 Update on Proposed Actions from 2023 Annual Review

**Table 7** provides an update on the actions proposed by Holcim in the previous Annual Review.

Improvement Measure	Activities	Actions Taken in the Reporting Period
Air Quality Monitoring	Ensure that all monitoring is conducted and recorded as per the OEMP.	All air quality monitoring during the reporting period was conducted and reported as per the OEMP.
Vegetation Monitoring	Ensure that all monitoring is conducted and recorded as per the OEMP.	All vegetation monitoring during the reporting period was conducted and reported as per the OEMP.
IEA	Undertake an IERA by December 2024.	An IEA inspection was conducted on 12 December 2024.

#### Table 7: Actions from Previous 2023 Annual Review



### 6 Environmental Performance

#### 6.1 Meteorological Monitoring

A summary of monthly rainfall was retrieved from the onsite Dust Sentry and is presented in **Table 8**. RHDC continued to review daily and forecast meteorological conditions to manage activities undertaken on site.

Month	Rainfall (millimetres (m))
January	62.4
February	62.4
March	12
April	148.8
Мау	48
June	91.2
July	16.8
August	9.6
September	19.2
October	28.9
November	43.2
December	31.2
Annual TOTAL	573.6

#### Table 8: Monthly Rainfall at the RHDC Dust Sentry

During 2024, a total of 573.6 mm was recorded which is higher compared to the 2023 annual total of 552.6 mm. Since 2013, when Erskine Park Reservoir BOM Station became active, the average annual rainfall has been 830 mm.



#### 6.2 Noise

#### 6.2.1 EIS Predictions

The Noise Impact Assessment of the 2005 Environmental Assessment Report (EAR) concluded that noise and vibration resulting from construction, traffic, and operations related to the Project will comply with the project specific noise criteria for all periods. Furthermore, the maximum noise amenity levels at locations such as Blacktown Olympic Centre or Nurragingy Reserve would not be exceeded for all phases of the Project.

The 2017 Environmental Assessment for MOD 2 found that the modification would cause a minor increase in the noise levels at the residential receivers, however this increase would not exceed the approved noise criteria levels. No further management measures beyond those already in place were recommended.

#### **Approved Criteria**

The Project must comply with the noise criteria in Condition 2.3 of the Project Approval as well as the noise monitoring criteria outlined in the Noise Management Plan. These approved criteria are shown in **Table 9.** 

Location	Morning Shoulder (6am – 7am Monday to Saturday and 6am – 8am Sundays and Public Holidays	DayEvening7am - 6pm6pm - 10pm10pmnMonday toMonday tooSaturday andSundayid8am - 6pmSundays andidPublicHolidays		Nig 10pm – 7am Mor ar 10pm – 8a	Night 10pm – 7am Monday to Saturday and 10pm – 8am Sunday			
	L <sub>Aeq(15 minute)</sub> (dB(A))	L <sub>Aeq(15 minute)</sub> (dB(A))	L <sub>Aeq(15 minute)</sub> (dB(A))	L <sub>Aeq(15 minute)</sub> (dB(A))	L <sub>A1(1 minute)</sub> (dB(A))			
Any residences in Station Street	39	44	44	39	53			
Any Residences in Crawford Road	40	40	39	39	53			
Any residences in Mavis Street	35	35	35	35	53			
Nurragingy Reserve		When the R	eserve is in use – L	<sub>Aeq</sub> 50 dB(A)				
Colebee Centre		When the C	Centre is in use – L⊭	Aeq 50 dB(A)				
Blacktown Olympic Park (active recreation areas)	When active recreational areas of the Park are in use – $L_{Aeq}$ 55 dB(A)							

Table 9: Approved Noise Criteria (Project Approval 05\_0051)

#### 6.2.2 Key Environmental Performance

The results of noise monitoring and assessments must be reported in Annual Reviews. Ramboll Australia Pty Ltd (Ramboll) undertook noise monitoring for Holcim in this report period at monitoring locations as per the Project Approval.

It should be noted that the attended noise monitoring does not measure noise in the Morning Shoulder Period, as operational activities are not taking place during this period. Noise monitoring was undertaken at locations representative of the nearest noise sensitive receivers to RHDC.



The frequency of monitoring changed from a quarterly to annual basis in 2020. Holcim conducted the first annual noise monitoring assessment in February 2021. Holcim conducts the annual noise monitoring assessment in the second quarter of the calendar year. In this report period, noise monitoring was completed on 29 and 30 April 2024.

**Table 10** summarises the noise monitoring results for this reporting period. The full Noise Monitoring

 Report can be found in Error! Reference source not found..



Assessment Period	Receiver	Unit of measurement	Noise Criteria	Annual Noise Monitoring	Compliant
				29 - 30 April 2024	
	N1		44	<38 <sup>4</sup>	$\checkmark$
	N2	(LAeg (15	40	<25	$\checkmark$
Day <sup>1, 2</sup>	N3	(10 min))	50 (when Nurragingy Reserve is in use)	<26 <sup>6</sup>	$\checkmark$
	N4		55 (when active recreational areas of the Blacktown Olympic Park are in use)	<24	$\checkmark$
	N1	- (LAeq (15 min))	44	<34	$\checkmark$
	N2		39	<33	$\checkmark$
Evening <sup>1, 2</sup>	N3		50 (when Nurragingy Reserve is in use)	<33 <sup>6</sup>	$\checkmark$
	N4		55 (when active recreational areas of the Blacktown Olympic Park are in use)	<27	$\checkmark$
	N1		39	36 <sup>5</sup>	$\checkmark$
	N2		39	n/a²	$\checkmark$
Night <sup>1, 2, 3</sup>	N3	(LAeq (15 min))	50 (when Nurragingy Reserve is in use)	<36 <sup>5</sup>	$\checkmark$
	N4		55 (when active recreational areas of the Blacktown Olympic Park are in use)	n/a	$\checkmark$

#### Table 10: Noise Monitoring Results and Compliance Summary for 2024

Notes:

<sup>1</sup> Noise criteria adopted from Project Approval 05\_0051.

<sup>2</sup> Morning shoulder 6am-7am Monday to Saturday and 6am-8am Sundays and public holidays; Day 7am-6pm Monday to Saturday and 8am-6pm Sundays and public holidays; Evening 6pm-10pm Monday to Sunday; Night 10pm-7am Monday to Saturday and 10pm-8am Sunday.

<sup>3</sup> Nurragingy Reserve closed during the evening and night monitoring periods. Opening hours for the reserve are 7am-6pm Monday to Friday.

<sup>3</sup> LA90 value of less than 50 (estimated) was dominated by road traffic noise so unable to estimate contribution for site at assessment location.

<sup>4</sup>Negligible exceedance (NPfI 2017 – Table 4.1 and Table 4.2)

<sup>5</sup> Value estimated based on sound level exposure calculations in Appendix 1 of the Ramboll – RHDC Noise Monitoring Assessment 2024

RHDC noise emissions were generally inaudible during the annual noise monitoring. All noise results were compliant with criteria.

The highest reading was recorded at Location N1 (<38 LAeq(15min) (dBA)) during the 'Day' monitoring period, however, this was due to the reading being dominated by road traffic noise, therefore, no estimate contribution could be recorded for the site.

RHDC was not audible at any other location, with other extraneous noise sources including birds, local traffic noise, insects, aircraft noise, alarms, soccer players yelling, trains, and nearby construction activities.

#### 6.2.3 Long-term Trends

Noise monitoring reports from 2015 to this reporting period record no exceedances in noise criteria. Noise emissions from site have been inaudible at the receivers and negligible in comparison to other sources of noise. The noise monitoring results represented in this Annual Review support RHDC's continued compliance with the Project Approval noise criteria.

#### **Management Measures**

The Operational Noise Management Protocol as well as the OEMP contain noise management measures including:

- During the morning shoulder and night-time periods, the storage bins are not loaded from an empty state, front end loader reversing alarms are replaced with visual warnings, and conveyor start-up warnings are visual.
- Plant and equipment are maintained, fitted wherever practical with mufflers or noise insulation, and operated efficiently.
- Noise barriers and enclosures are inspected regularly.

#### 6.2.4 Proposed Improvements

There are no further improvements proposed for noise management at RHDC.

#### 6.3 Air Quality

#### 6.3.1 EIS Predictions

The 2005 EAR reported the level of impact from the Project to air quality would be acceptable, with no reason for concern regarding the health and safety of those within or in the vicinity of the project area (Volume 2, Section F). The MOD 2 Environmental Assessment (2017) supported these findings in that no exceedances of the 24-hour criteria are predicted to occur in the operational phase of the Project.

#### 6.3.2 Approved Criteria

Air quality monitoring at RHDC is compared to the monitoring criteria stipulated in Condition 2.8A of the Project Approval to ensure compliance (see **Table 11** below)

Pollutant	Averaging Period	Criterion
Particulate Matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a, d</sup> 25 μg/m <sup>3</sup>
Particulate Matter < 10 µm (PM <sub>10</sub> )	24 hours	<sup>b, d</sup> 50 μg/m <sup>3</sup>
Particulate Matter < 2.5 µm (PM <sub>2.5</sub> )	Annual	<sup>a, d</sup> 8 µg/m³
Particulate Matter < 2.5 µm (PM <sub>2.5</sub> )	24 hours	<sup>b, d</sup> 25 µg/m³
Total suspended particulates (TSP)	Annual	<sup>a, d</sup> 90 µg/m³

#### Table 11: Air Quality Criteria from Project Approval 05\_0051, Condition 2.8A

Note:

"Reasonable and feasible avoidance measures" includes, but is not limited to, the operational requirements in conditions 2.8, 3.1(b) and 5.3(d) to develop and implement an air quality management system that ensures operational responses to the risks of exceedance of the criteria.

a Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).

b Incremental impact (ie increase in concentrations due to the development alone, with zero allowable exceedances of the criteria over the life of the development.

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 or any other activity agreed by the Secretary."

#### 6.3.3 Key Environmental Performance

#### PM<sub>10</sub> / TSP

PM10 monitoring via HVAS 1 (Site Office) and HVAS 2 (Rail) was undertaken during the reporting period. There were 365 sampling events at HVAS 1 and HVAS 2 in the reporting period, as shown in **Table 12**. The PM<sub>10</sub> and TSP monitoring results for HVAS 1 and HVAS 2 can be found in Error! Reference source not found.

Category	HVAS 1	HVAS 2
Total number of HVAS monitoring rounds required in 2024	365	365
Number of completed monitoring rounds	365	365
Number of incomplete monitoring rounds, contamination, or equipment failure	1	0
Number of valid samples	364	365

#### Table 12: 2024 PM10 and TSP Compliance Summary

During the 2024 reporting period, there was one invalidated sample at RHDC due to the monitor failing to collect a valid result for that 24-hour period. See **Table 13** for details.

#### Table 13: Summary of Invalid PM<sub>10</sub> and TSP Monitoring Results

Date	PM10	TSP	Cause			
HVAS 1 (Site Office)						
9-June-2024	5275.48	5294.45	Short-term spike caused by either digital noise that was soon auto corrected or an insect that got temporarily stuck in the inlet of the HVAS monitor.			

Holcim investigated the anomalous sample with air quality specialists. DPHI was notified of the anomalous sample and on 17 June 2024 acknowledged via email the sample should be invalidated and removed from datasets for accuracy. See Error! Reference source not found. for the c orrespondence between Holcim, Ramboll, and DPHI.

Please note, this non-compliance was identified during the 2024 IEA. According to Part (b) of Schedule 2, Condition 8 Air Quality, *all storage bins must be enclosed,* however, there is a discrepancy in this part of the condition. 'Bins' as envisaged in the MOD 2 application and other plans were not implemented due to an apparent design change. The approach that has been taken involves large, open storage bins and manual loading of trucks via a FEL. The monitoring data and other lines of evidence (i.e. lack of complaints, observations etc.) suggest the air quality outcomes required at the Site can be achieved based on the current layout. Ultimately, the site does not comply with the condition as it currently reads resulting in an administrative non-compliance with Schedule 2, Condition 8.

The annual average at HVAS 1 was 3.77  $\mu$ g/m<sup>3</sup> for PM<sub>10</sub> and 7.66  $\mu$ g/m<sup>3</sup> for TSP, which are below the annual average criteria of 25  $\mu$ g/m<sup>3</sup> for PM<sub>10</sub> and 90  $\mu$ g/m<sup>3</sup> for TSP. This is compliant with the limits of the Approval.

The annual average at HVAS 2 was 3.22  $\mu$ g/m<sup>3</sup> for PM<sub>10</sub> and 6.74  $\mu$ g/m<sup>3</sup> for TSP, which are below the annual average criteria of 25  $\mu$ g/m<sup>3</sup> for PM<sub>10</sub> and 90  $\mu$ g/m<sup>3</sup> for TSP. This is compliant with the limits of the Approval.

#### Long-Term Trends

Table 14 summarises the long-term  $PM_{10}$  results at RHDC. Note, the location of monitors changed in 2021.

With the installation of the Dust Sentry in June 2023, which provides continuous PM<sub>10</sub> monitoring data, annual average for HVAS1 and HVAS 2 have decreased, recording the lowest annual averages since the site became operational.

	PM <sub>10</sub> Annual Average (μg/m³) <sup>1</sup>									
Monitor	October 2015 - September 2016	July 2017 - June 2018	2019	2020	2021	2022	2023	2024		
HVAS 1	9.5	30.2	35.2	36.1	32.4	33.2	11.1	3.8		
HVAS 2	24.2	25.0	23.3	20.3	17.2 (January 2021 – September 2021)	21.7	8.6	3.2		

#### Table 14: Long-term PM<sub>10</sub> Results

Note:

<sup>1</sup>Contaminated / invalid samples removed.

#### 6.3.4 Management Measures

The site undertook dust management measures in accordance with the OEMP throughout operations to ensure compliance with the Project Approval.

Dust management measures undertaken include:

- Provision and use of a permanent water cart onsite.
- Provision and use of a permanent street sweeper onsite.
- Installation and use of water cannons on all stockpiles.
- All heavy vehicles exiting the site leave via the wheel wash (located at the weighbridge).
- Trucks cover loads at all times, except for during loading and unloading.
- Water sprays and covering of all material conveyors.
- Stockpile spray maintenance.
- Internal roads are swept to minimise dust and sediment tracking.
- Staff training for dust control measures, including recognising dust as a hazard of high priority for resolution.
- Scope of works for monitoring contractors to include cleaning and general maintenance of samplers.
- Site speed limits are signed and enforceable at all times.

#### 6.3.5 Proposed Improvements

Holcim will look at commencing long-term trend analysis of TSP results in the next Annual Review.

There are no further improvement measures proposed for RHDC.

#### 6.4 Traffic Management

#### 6.4.1 EIS Predictions

In Appendix D of Volume 3 of the 2005 EAR, a traffic assessment found that the existing road network around the project area would be sufficient for the performance of project-associated traffic. Furthermore, pedestrian safety was not found to be impacted as a result of the Project. It was also noted that road upgrades may be necessary within the lifetime of the project. The 2010 and 2017 environmental assessments did not find any additional impacts to traffic volumes or routes as a result of RHDC operations.

#### 6.4.2 Approved Criteria

Traffic management is outlined in the RHDC Transport Code of Conduct and the OEMP. The Project Approval outlines requirements for traffic in Conditions 2.11 - 2.21A (Traffic and Transport).

#### **Key Environmental Performance**

There were no traffic incidents or non-compliances at RHDC within this Annual Review period. Holcim continue to execute traffic management measures consistent with the Project Approval.

#### 6.4.3 Management Measures

Management measures for traffic are outlined in the OEMP. Some of these key controls include:

- The Transport Code of Conduct and site driver requirements must always be complied with.
- Vehicles must be maintained and serviced regularly.
- Site roads and access must be monitored and kept in good order including in terms of road condition and sediment tracking.
- Speeds are limited to 20 kilometres per hour (km/hr) and traffic routes are signed.

#### 6.4.4 Proposed Improvements

Holcim staff are responsible for regularly reviewing traffic management against the Transport Code of Conduct and OEMP. The site will continue to conduct traffic monitoring and management measures committed to within the approved OEMP in the next reporting period.

# 7 Water Management

#### 7.1 EIS Predictions

#### Surface Water Quality

The Executive Summary from the 2005 EAR stated that *"the proposed RHDC would not materially change the drainage patterns on the site"* and there would be no negative impact on Angus Creek from the Project. Furthermore, modelling that was presented in the 2005 EAR showed there would be minor changes to flood levels as a result of the Project.

Section 6.4 of the 2017 Environmental Assessment for MOD 2 outlines the negligible impact to the site surface water management systems that the minor increase in runoff volume the RHDC Modification would create.

#### Aquatic Ecology

The Aquatic Ecology Impact Assessment (Volume 2, Section E) in the 2005 EAR found that there were no endangered ecological communities or threatened species within the riparian areas of the site. Angus Creek and Eastern Creek were categorised as disturbed lowland creeks.

#### Groundwater

The 2005 EAR found the RHDC would have minimal to no impact on the groundwater as a result of altered water flows due to increased impervious surfaces and not allowing potential sources of contamination to pass through such as spilled oils, fuels, or other chemicals stored on site.

#### **Approved Criteria**

The Project Approval requires surface water management at RHDC, including the expectation that Holcim follows best-practice guidelines for urban stormwater management. Holcim is expected to operate in accordance with:

- Protection of the Environment Operations Act 1997.
- Draft Guidelines Watercourse Crossing Design and Construction (DPI Water).
- Why do Fish Need to Cross the Road? Fish Requirements for Waterway Crossings (2004, NSW Fisheries).
- Policy and Guidelines for Fish Friendly Waterway Crossings (2004, NSW Fisheries).
- Water Sensitive Urban Design and Integrated Water Cycle Management, Blacktown Development Control Plan (2015).
- Sensitive Urban design Technical Guidelines for Western Sydney (upper Parramatta River Catchment Trust, 2004).
- Managing Urban Stormwater Soils and Construction: Volume 1 (the 'Blue Book') by Landcom.

As per Condition 2.28A (Aquatic Ecology) of the Project Approval as well as the Statement of Commitments, RHDC conduct a surface water and aquatic ecology monitoring program in Angus Creek and Eastern Creek which also includes monitoring locations in Nurragingy Reserve. Water quality monitoring and visual assessments for habitat and vegetation are required to occur as per the monitoring program.

**Table 15** shows the site-specific criteria for water quality parameters in dry weather from the OEMP and Soil and Water Management Plan.

#### Table 15: ANZECC Guidelines (RHDC Soil and Water Management Plan)

Parameter	Measure	Default Trigger Level
Electrical Conductivity (EC)	μS/cm	125-2200
Turbidity	NTU	6-50
рН	рН	6.5-8.0
Dissolved Oxygen	%	80-110
Total Phosphorous	(mg/L)	50
Total Nitrogen <sup>1</sup>	(mg/L)	500

Note:

<sup>1</sup>Total Nitrogen equals (TKN+NOx)

Aquatic monitoring is undertaken at the locations shown in Figure 2.



#### Legend

- Regional Distribution Centre
- L Cumberland Plain Woodland Monitoring Site
- 🛨 Juniper Leaved Grevillea Monitoring Sites
  - Water Quality and Riparian Monitoring Sites

- Waterways and waterbodies

# 0 250 500





#### Data Sources

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance

#### Figure 2: RHDC Monitoring Locations for Aquatic Monitoring and Vegetation Monitoring

#### 7.2 Key Environmental Performance

RHDC has conducted water monitoring as per the OEMP, the Soil and Water Management Plan, and Operational Monitoring Program. Water quality and aquatic ecology monitoring was undertaken by Niche Environment and Heritage in this reporting period. These reports can be found in Error! R eference source not found.. Monitoring sites AE1, AE2, AE3, and AE6 involved monitoring at Angus Creek, and AE4-AE5 involved monitoring along Eastern Creek.

Monitoring occurred on the following dates:

- 20 February 2024 (Q1)
- May 2024 (Q2)
- 25 July 2024 (Q3)
- 4 December 2024 (Q4).

#### **Surface Water Quality**

Summaries of the 2024 water quality monitoring results for Angus Creek and Eastern Creek are presented in **Table 16** and **Table 17** respectively.



Sampling period	Sampling Site	Temperature (°C)	Turbidity	Dissolved Oxygen (% sat)	Electrical Conductivity (µS/cm)	рН	Total Nitrogen (TKN + NOx) (mg/L)	Total Phosphorous (mg/L)
ANZECC (2000) Default Trigger Levels for Lowland Streams		6 - 50	80 - 110	125 - 2200	6.5 - 8	0.5mg/L	0.05mg/L	
	AE1	21.51	154	73.8	184	7.86	1.4	0.08
01 2024	AE2	21.6	132	63.4	234	7.75	1.5	0.09
QT 2024	AE3	21.66	88	62.7	235	7.71	1.3	0.09
	AE6	22.47	28	80.7	334	7.97	2.0	0.08
	AE1	16.56	10.5	68.8	140	7.80	1.4	0.07
02 2024	AE2	16.58	11	58.3	147	7.44	1.2	0.06
QZ 2024	AE3	16.6	14.1	57.3	152	7.35	1.2	0.06
	AE6	17.48	15.3	80.4	110	7.56	1.7	0.08
	AE1 <sup>1</sup>	10.08	2.9	53.4	3088	8.48	1.4	0.07
03 2024	AE2 <sup>1</sup>	9.89	10.5	40.5	2884	8.44	2.1	0.07
Q3 2024	AE3 <sup>1</sup>	9.89	10.4	40.3	2880	8.41	2.6	0.12
	AE6 <sup>1</sup>	10.20	3.5	96.6	3138	8.95	1.2	0.05
	AE1	23.18	3.9	89.9	937	7.01	0.9	0.15
04 2024	AE2 <sup>2</sup>	22.87	0.3	91	813	6.94	0.6	0.18
Q7 2024	AE3 <sup>2</sup>	22.83	20.9	67.4	785	6.94	0.7	0.19
	AE6	24.84	8.4	108.6	1322	7.03	0.8	0.17

#### Table 16: 2024 Water Quality Results Summary for Angus Creek

Note:

NS stands for Not Sampled. Values outside of the ANZECC (2000) DTLs are in **bold.** 

<sup>1</sup>All sites had potential downstream impacts.



Sampling period	Sampling Site	Temperature (°C)	Turbidity	Dissolved Oxygen (% sat)	Electrical Conductivity (µS/cm)	рН	Total Nitrogen (TKN + NOx) (mg/L)	Total Phosphorous (mg/L)
ANZECC (2000) Lowland Stream	) Default Trig ns	ger Levels for	6 - 50	80 - 110	125 - 2200	6.5 - 8	0.5mg/L	0.05mg/L
01 2024	AE4	21.76	112	58.5	256	7.66	1.7	0.13
QT 2024	AE5	21.72	165	69.8	218	7.41	1.4	0.15
02 2024	AE4	15.94	110.2	76	112	6.93	1.0	0.10
QZ 2024	AE5	15.95	103.9	77.1	125	7.10	1.1	0.10
02 2024	AE4 <sup>1</sup>	9.96	45.5	39.9	2945	8.49	2.2	0.14
Q3 2024	AE5 <sup>1</sup>	9.24	108.5	74.4	972	8.89	1.9	0.11
Q4 2024	AE4 <sup>2</sup>	23.61	20.7	109.2	483	6.7	0.8	0.15
	AE5	23.76	27.5	109.2	468	6.7	0.9	0.13

#### Table 17: 2024 Water Quality Results Summary for Eastern Creek

Note:

NS stands for Not Sampled. Values outside of the ANZECC (2000) DTLs are in **bold**.

<sup>1</sup>All sites had potential downstream impacts.

Water quality monitoring was undertaken on four occasions in 2024, with the results summarised in **Table 16** and **Table 17**.

Dissolved oxygen was below the ANZECC criteria of 80-110% for the majority of samples in all quarters. Low dissolved oxygen has been a consistent feature at the Angus Creek and Eastern Creek sites.

Turbidity was elevated in Eastern Creek in three of the monitoring events, which has been observed over previous years and is considered to be within background levels for the creek. Angus Creek was generally within ANZECC guidelines indicating that there has been no suspended solid runoff from the Holcim site.

EC was generally compliant across all sites in Q1, Q2 and Q4, however, exceedances were recorded at all sampling locations except AE5 in Q3. Higher rainfall before sampling is likely to have contributed to increased urban and parkland runoff resulting in higher EC scores across all sites.

pH levels were within the ANZECC criteria levels at all monitoring sites in Q1, Q2, and Q4, however, exceedances were recorded at all sampling locations in Q3.

Total Nitrogen was exceeded at all sites over the 2024 reporting period, with AE3 recording 2.6mg/L in Q3.

Total Phosphorous was also above criteria limits at all sites, with AE1 recording the highest at 0.19mg/L in Q4.

#### Long-term Trends

There were exceedances in dissolved oxygen levels in 2024, which continued from results seen in 2023.

pH has continued to approach neutral since the beginning of 2017. The highest exceedance was at sampling location AE6 in Q3 with an exceedance of pH 8.95.

Comparisons between the control upstream location as well as sampling sites in downstream Angus Creek across multiple reporting periods have concluded that the RHDC site is unlikely to be the cause of these exceedances in the local water quality profile. Water quality or poor environmental conditions observed are the result of existing catchment disturbances unrelated to the site.

With this in mind, Holcim does not consider these water quality exceedances as a non-compliance against Condition 5.5 Operation Environmental Management Plan of the Project Approval.

#### **Aquatic Ecology**

Aquatic ecology was monitored as per the bi-annual macroinvertebrate monitoring program. The same sampling sites were used for macroinvertebrate sampling. Across this Annual Review period the stream habitats exhibited a macroinvertebrate profile which indicates pollution, as supported by the SIGNAL2 assessments.

The number of taxa ranged from 4 to 13 in the 2024 monitoring events. The greatest number of taxa (13) were observed in Eastern Creek (AE5) during the summer monitoring period.

In Autumn, site AE2 and AE5 were the only sites to record sensitive macroinvertebrate families (Scirtidae at AE5 and Leptoceridae at AE2 – SIGNAL2 grade of 6). Despite this, SIGNAL2 scores continued to indicate that the creek system has a dominance of pollution-tolerant taxa, possibly indicating moderate to severe pollution.

Throughout 2024, all monitoring sites had SIGNAL2 low scores (below 4). This indicates that no sites have favourable habitat, and all locations are exhibiting some form of pollution or natural stress. Two pollution sensitive macroinvertebrate families were found during monitoring in Autum, but none during the summer monitoring event.

There is a variety of upstream impacts and land use activities that are likely to affect stream health conditions in these waterways and, as such, the low scores observed are likely the result of a combination of natural and anthropogenic catchment stressors, which is common in disturbed Western Sydney streams. During the Aquatic Ecology report, no endangered ecological communities or threatened species were identified within the riparian areas of the site.

In summary, the reports by Niche Environment and Heritage found that it was highly unlikely that RHDC affected the stream ecology of the Angus Creek and Eastern Creek waterways. Multiple activities occurring upstream to the site have a higher potential to impact creek health than RHDC operations.

#### Long-term Trends

The health of aquatic ecology has not seen significant improvement nor decline from 2015 to 2024. Macro-invertebrate monitoring has consistently shown the aquatic ecology in the local waterways are in poor ecological condition. Monitoring reports have consistently reported there is no physiochemical or ecological evidence to suggest RHDC has affected the downstream environment.

#### 7.3 Management Measures

RHDC implement multiple management measures to maintain surface water quality and control storm water across the project area. The management measures for water on the site include:

- Storm water management measures (such as swales, detention basins, and gross pollutant traps) constructed to have minimal impacts to the flood regime and are regularly maintained.
- Silt traps and HumeCeptors in place to capture runoff.
- Maintenance of detention basins on the northern side of the project area.
- Maintenance of a truck wash facilities.
- Minimisation of freshwater demand by storing and recycling water collected on site.

#### 7.4 **Proposed Improvements**

There are no improvements suggested for water management at RHDC for the next reporting period. Holcim will continue to collect surface water quality data to monitor and build the profile of the water quality at Angus Creek and Eastern Creek, and thus improve the site-specific monitoring parameters.

# 8 Rehabilitation and Landscape Management

The site is required to undertake rehabilitation and vegetation maintenance in accordance with their *Vegetation Management Plan*.

#### 8.1 EIS Predictions

The 2005 EAR stated that the Project would require the removal of the Endangered Ecological Communities under the Threatened Species Conservation Act, including areas of Cumberland Plain Woodland and River-flat Eucalypt Forest. Threatened species, including *Grevillea juniperina ssp. juniperina* and the Cumberland Plain Land Snail (*Meridolum corneovirens*), were identified outside of the development area.

#### 8.2 Approved Criteria

The RHDC *Vegetation Management Plan* is to be implemented as per Condition 2.24 (Flora and Fauna) of the Project Approval. Rehabilitation monitoring is required in accordance with Condition 2.25. MOD 1 of the Project Approval outlines the need to implement a post-construction rehabilitation program, which includes a weed control program and planting local native species.

#### 8.3 Key Environmental Performance

As a result of the findings of the EAR (2005), a Compensatory Habitat Package was agreed upon between Holcim, the Office of Environment and Heritage, and the Sydney Western Parklands Trust in July 2011 satisfying Condition 2.27 of PA 05\_0051. Furthermore, RHDC's landscape management plans and procedures designed to control project impacts to surrounding threatened species.

The primary rehabilitation works undertaken in this reporting period was the maintenance of vegetated areas. Herbaceous weed activities such as mowing, herbicide spraying, slashing, and hand weeding were undertaken in the main planting bed adjacent to the front office, entrance gates, central sound wall and unloader parking, pathway, and surrounding workshop. Weed species targeted included: *Bidens Pilosa, Bromus catharticus, Chloris Gayana, Cirsium vulgare, Conyza sp, Cynodon dactylon, Echinochloa crus-galli, Ehrharta erecta, Eragrostis curvula, Medicago sp, Paspalum dilatatum, Plantago lanceolata, Senecio madagascariensis, Solanum nigrum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.* 

Woody vegetation activity included trimming back overhanging branches of *Casuarina glauca* in the carpark and along the entrance road, between the boom gates and tare bridge, to improve line of sight for workers and security cameras. See Error! Reference source not found. for report detailing works u ndertaken.

Grevillea juniperina subsp. juniperina monitoring was undertaken in May, June, and September 2024.

A summary of the 2024 *juniperina* monitoring results is presented in **Table 18**.

Zone 1	Individual plant counts							
	Oct-17	Sep-22	May-24	June-24	Sept-24	Oct-24	Difference	
South-East	60	98	105	105	115	171	+111	
North-East	115	85	40	50	79	122	+7	

#### Table 18: Grevillea juniperin monitoring results (baseline comparison)

The variation in monthly count between September 2024 and October 2024 could be attributed to fluctuations in seasonal growth, increased familiarity in identifying emerging Grevillea juveniles, or human error.

#### 8.4 Management Measures

The actions committed to within the Vegetation Management Plan (VMP) must be undertaken to achieve its performance criteria. The key management controls include:

- The use of local native species for rehabilitation vegetation.
- Monitoring the performance of plantings.
- Weed management.
- General maintenance of riparian areas, rehabilitated areas, and Juniper-leaved Grevillea populations.

#### 8.5 Proposed Improvements

Proposed improvements as per the 2024 Bushland Regeneration Report by Toolijooa Environmental Restoration include:

- Bushland:
  - o Continue maintenance of previously revegetated areas and monitor for planting health.
  - o Push back vine and woody weeds throughout bushland zones.
  - Monitor health of *Grevillea juniperina* subsp. juniperina populations and consider reduction of other native species around the clusters to reduce competition and encourage expansion.
- Landscape:
  - o Continue maintenance as per current specification.
  - o Landscaping zones require constant brush cutting.
  - o Maintain branch and vegetation clearance around the roadways.
  - Keep removing Casuarina from the Graveyard area.



# **9** Summary of Environmental Performance

A summary of the performance of environmental management measures and sampling is detailed in Table 19 below.

#### Key Approval Criteria / Performance during the reporting Trend Implemented / Proposed management Aspect **EIS Prediction** period implications management actions EAR predictions are No further improvements All noise monitoring results were compliant All noise monitoring results were all below the Project proposed for Noise noise with the Project Approval. compliant with criteria. Approval criteria. management. Nearly all HVAS 1 and HVAS 2 results were compliant with the Project Approval. EAR (2005) and EA Air quality monitoring results recorded Holcim to look at There was a monitoring anomaly on 9 June (2015) predictions are lowest annual average since site commencing long-term trend 2024 which was investigated and approved Air Quality operation. Installation of Dust Sentry analysis of TSP results in the below the Project to be removed from the reporting dataset Approval criteria. in 2023 is believed to assist this this. net Annual Review. for accuracy purposes. See Section 6.3.3 for further details. EAR predictions are No further improvements consistent with the Traffic Met Project Approval criteria consistently. Site consistently meets criteria. for traffic proposed Project Approval management. conditions. Majority of water quality results consistent with the Soil and Water Management Plan. Exceedances in OEMP water quality EAR predictions are There were some exceedances for criteria and ANZECC guidelines not Continue monitoring as per turbidity, electrical conductivity, pH, total consistent with attributed to RHDC. Therefore, this is the OEMP. No further actions Water nitrogen and total phosphorus, however, Project Approval not considered a non-compliance with required. these were found to have been caused by conditions. the Project Approval. external factors outside of RHDC operations.

#### Table 19: Summary of Environmental Performance at RHDC



Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / Key management implications	Implemented / Proposed management actions
Biodiversity and Rehabilitation	EAR predictions are consistent with Project Approval criteria.	Consistent with Project Approval. Holcim failed to undertake vegetation monitoring as stated in the Vegetation Management Plan (VMP).	All biodiversity and rehabilitation actions were done in accordance with the VMP, OEMP, and Project Approval in 2024.	Vegetation monitoring and biodiversity and rehabilitation management as per the 2021 VMP appended to the 2023 OEMP as per the VMP to continue in 2025. There were also some additional actions noted for 2025 in the 2024 Bushland Regeneration Report. See <b>Section 8.5</b> for further details.



# **10 Community**

#### **10.1 Community Engagement Activities**

Holcim has maintained community engagement measures during the reporting period by undertaking the following activities in accordance with Condition 4.1, 4.2 & 4.3 of the Project Approval:

- Maintenance of a website (containing publicly available documents).
- A telephone number, email, and postal address (on the website) for community complaints and feedback.
- A copy of the Complaints Register is maintained on the company website.
- All documents and items displayed on the website are regularly updated by Holcim staff.

Holcim has also communicated with the local community through periodic newsletters which provide information on the status of the Project and its possible impacts. During previous reporting periods the RHDC Community Liaison Group was arranged to engage stakeholders. However, from 2017 and into this reporting period there has been no demand from community stakeholders for this group to be reassembled. RHDC staff continue to look for opportunities to engage with stakeholders.

#### **10.2 Complaints**

All complaints received by RHDC are documented by Holcim and incorporated into RHDC's complaints register. An external complaints register is made available to the public on Holcim's website, via the link: https://www.holcim.com.au/community-complaint-register.

There have been zero community complaints regarding RHDC from 2018 to 2024.


## **11 Independent Audit**

After the approval of MOD 2 of the Project Approval, Condition 3.5A (Independent Environmental Auditing) directs Holcim to commission an independent expert to conduct an IEA of the Project within one year, and every three years hence.

Holcim engaged an independent auditor to satisfy Condition 3.5A of the Approval in 2024. The IEA site inspection occurred on 12 December 2024.

The IEA Report concluded as follows:

The RHDC is being implemented with a high standard of environmental management. The Project is compliant with the vast majority of its approval and operational requirements and the project has a good standing with regulators and the community. The proponent is resourcing the Project well and has highly capable personnel overseeing operations and environmental management.

Continued attention to detail in implementing the Consent and broader environmental requirements will ensure high performance in the future. Implementation of the recommendations and observations from this audit will also assist in continued high levels of compliance and strong audit performance in the future.



## **12 Incidents and Non-Compliances**

Incidents and non-compliances at RHDC in this Annual Review reporting period are summarised in **Table 20.** 

Date	Incident/Non-Compliance	Action	
	Schedule 2, Condition 8 Air Quality		
2024	Please note, this non-compliance was identified during the 2024 IEA.		
	There is a discrepancy in part (b) of this condition, the 'enclosure of storage bins'. 'Bins' as envisaged in the MOD 2 application and other plans were not implemented due to an apparent design change. The approach that has been taken involves large, open storage bins and manual loading of trucks via a FEL. The monitoring data and other lines of evidence (i.e. lack of complaints, observations etc.) suggest the air quality outcomes required at the Site can be achieved based on the current layout.	Holcim will review the specific requirements this condition and come up with the mo appropriate method to comply with the requirements as per the reccomendation in the 2024 IEA Report.	
	Ultimately, the site does not comply with the condition as it currently reads resulting in an administrative non- compliance with Schedule 2, Condition 8.		

#### Table 20: Summary of Incidents and Non-Compliances



## 13 Activities to be completed in the next reporting period

The DPE Annual Review Guidelines require the Annual Review to outline actions proposed during the next reporting period. The next reporting period will cover 1 January 2024 to 31 December 2024. The activities to be completed in the next report period are detailed in **Table 21**.

Improvement Measure	Activities
Air Quality Monitoring	As TSP measurements commenced in 2023, Holcim propose the 2025 Annual Review will include annual average comparisons for TSP readings.
Vegetation Monitoring	Ensure that all monitoring is conducted and recorded as the OEMP.
IEA Action Plan	Continue to close out actions required from the 2024 IEA.

#### Table 21: Improvement Actions for 2025



Appendix A –

**2024 Noise Monitoring Reports** 

Intended for Holcim (Australia) Pty Ltd

Document type
Report

Date July 2024

# Rooty Hill Distribution Centre Annual Noise Monitoring Assessment 2024



### Rooty Hill Distribution Centre Annual Noise Monitoring Assessment 2024

Project name	NSW Environmental Monitoring 2023-2024	
Project no.	318001799	Ramboll
Recipient	Michael Ensor	The Arc, 45a Watt St
Document type	Report	Newcastle, NSW 2300
Version	2	Australia
Date	02/07/2024	T +61 2 4962 5444
Prepared by	Jake Bourke	https://www.ramboll.com/
Checked by	Arnold Cho	
Approved by	Gavan Butterfield	
Description	Data collected on 29 and 30 April 2024 for the annual noise monitoring program at Rooty Hill, NSW	

Revision	Date	Prepared by	Checked by	Approved by	Description
1	19/06/2024	J. Bourke, M. Englert	A. Cho	G. Butterfield	Initial version.
2	02/07/2024	J. Bourke	A. Cho	G. Butterfield	Updated following Holcim comments

Ramboll Australia Pty Ltd. ACN 095 437 442 ABN 49 095 437 442

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## Appendices

Appendix 1 Sound Exposure Level Calculations

### Abbreviations and Definitions

Ambient	The all-encompassing noise within a given environment. It is the composite of
Noise	sounds from many sources, both near and far.
Background	The underlying level of noise present in the ambient noise, excluding the noise
noise	source under investigation, when extraneous noise is removed. This is described
	using the LA90 descriptor (see below).
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm
	(to base 10) of the ratio of a given sound pressure to a reference pressure, and 10
	times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the
	sound level measurement to approximate the response of the human ear.
Extraneous	Noise resulting from activities that are not typical of the area. Atypical activities
noise	may include construction, and traffic generated by holiday periods. Normal daily
	traffic is not extraneous noise.
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the
	measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time
	over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This
	measure can approximate to the maximum noise level but may be less if there is
	more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time,
	referred to as the background noise level.
	This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a
	defined measurement period.
LAeq	The average equivalent noise level, measured in dB(A), during a measurement
(period)	period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level
	measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the
	sound pressure expressed on a decibel scale.

Source: Noise Guide for Local Government (NSW EPA, 2023)

### 1. Overview

#### 1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for the Holcim Rooty Hill Distribution Centre (RHDC) at Rooty Hill, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017);
- Noise Management Plan (NMP) within Rooty Hill Distribution Centre, Operational Environmental Management Plan (OEMP) (Holcim, 2022);
- Environment Protection Licence (EPL) number 20672 (NSW EPA, 2015).
- Development Consent 05\_0051 (June 2017 Modification) (Minister for Planning, 2017);
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018); and
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019).

This NMA is part of the annual monitoring requirement for the 2024 assessment period set out in the Development Consent and the NMP.

#### 1.2 Site Location and Sensitive Receivers

The RHDC is located at 5 Kellogg Road, approximately 1 km to the northeast of the Rooty Hill railway station and town centre. Sensitive receptors in the locality surrounding the RHDC are primarily industrial, recreational, and urban residential. The RHDC is bounded by the railway line to the south, industry to the west and recreational areas to the east.

The residential areas potentially affected by noise from the operation are to the east, beyond the Nurragingy Reserve in Doonside, NSW (Crawford Street and Knox Road); and to the west, beyond industrial zones and the M7 Motorway in Station Street, Rooty Hill, NSW. Road traffic from the M7 Motorway is a dominant noise source in the area along with urban hum and railway noise.

Monitoring locations were selected in accordance with the NMP and are representative of the nearest noise sensitive receivers to the RHDC. The monitoring locations with respect to the RHDC and assessed receivers are presented in the locality plan in **Figure 1**.



#### Legend

• Noise monitoring location





Figure 1: Noise monitoring locations at Rooty Hill Distribution Centre

### 2. Noise Criteria

The applicable noise criteria for this NMA were adopted from the NMP and are shown in **Table 2-1**.

Table 2-1: Monitoring locations and noise criteri	Table 2-1:	Monitoring	locations	and	noise	criteria
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		Morning Shoulder <sup>1</sup>	Day <sup>2</sup>	Nigl	Night⁴		
Location	Monitoring Location	LAeq (15min)	LAeq (15min)	LAeq (15min)	LAeq (15min)	LA1 (1min)	
		dB(A)					
Any residences in Station Street	N1	39	44	44	39	53	
Any residences in Coughlan Crescent	N2	40	40	39	39	53	
Any residences in Mavis Street	N1/N4	35	35	35	35	53	
Nurragingy Reserve	N3		When the Reser	ve is in use – LA	eq 50 dB(A)		
Colebee Centre	N3		When the Centr	e is in use – LAe	eq 50 dB(A)		
Blacktown Olympic Park (Active N4 When active recreational areas of the Park are in use – LAeq 55 dB(A) recreation areas)							
<sup>1</sup> 6 am – 7 am Monday to Saturday and 6 am – 8 am Sunday and public holidays <sup>2</sup> 7 am – 6 pm Monday to Saturday and 8 am – 6 pm Sunday and public holidays							

<sup>3</sup> 6 pm – 10 pm Monday to Sunday

 $^4$  10 pm – 7 am Monday to Saturday and 10 pm – 8 am Sunday and public holidays

### 3. Methodology

The monitoring program was designed in accordance with the procedures described in Australian Standard AS 1055:2018 and the Approval Documents referenced in Section 1. The measurements were carried out using a RION Sound Level Meter NL-52 on Monday 29 and Tuesday 30 April 2024. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672-1:2019 class 1. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with IEC 60942:2017. Drift in calibration did not exceed ±0.3 dBA.

Attended noise monitoring was conducted for 15-minutes in duration at each monitoring location during the day, evening, and night periods over two days. Where possible, throughout each measurement the operator quantified the contribution of each significant noise source.

#### 3.1 Meteorological Conditions

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the nearest Bureau of Meteorology data has been adopted to inform this assessment and modelled using The Air Pollution Model (TAPM) to determine the atmospheric stability category as outlined in **Table 3-1**.

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	ΔT ≤ -1.9
Moderately unstable	В	-1.9 < ΔT ≤ -1.7
Slightly unstable	С	-1.7 < ΔT ≤ -1.5
Neutral	D	-1.5 < ΔT ≤ -0.5
Slightly stable	E	-0.5 < ΔT ≤ 1.5
Moderately stable	F	1.5 < ΔT ≤ 4.0
Extremely stable	G	ΔT > 4.0

#### Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

As stated in the Development Consent, the noise criteria in **Table 2-1** applies under all meteorological conditions except the following:

- wind speed up to 2 m/s<sup>-1</sup> at 10 metres above ground level.
- temperature inversion conditions of up to 3°C/100m and wind speed up to 2 m/s-1 at 10 metres above the ground.

### 4. Results and Discussion

#### 4.1 Location N1

Noise monitoring at location N1 conducted on Monday 29 April 2024 and Tuesday 30 April 2024 resulted in inaudible site noise during morning shoulder and day periods. During the night period there was a negligible exceedance of the criteria (<1 dBA). Measured ambient noise sources include background road traffic, birds, wind, rustling trees, and aircraft. These results satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location N1 are presented in **Table 4-1**.

		Des	criptor (d	BA)					
Date	Time (hrs)	LAmax	LAeq	LA90	Meteorology (handheld at microphone height)	Onsite Met Station (2m height) <sup>3</sup>	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
29-04-24	12:15pm to 12:30pm (Day)	63.8	52.5	48.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 341° WS: 1.0 m/s Rain: nil Stability Category: D <sup>2</sup>	Background motorway traffic 43-52 Cyclists 46-48 Site inaudible	<384	35
29-04-24	6:29pm to 6:44pm (Evening)	71.2	49	43.7	WD: n/a WS: 0 m/s Rain: Nil	WD: 84° WS: 0.3 m/s Rain: nil Stability Category: E <sup>2</sup>	Background motorway traffic 38-45 Horn 57 Cars passing 49-71 Site inaudible	<34	35
30-04-24	5:55am to 6:10am (Night)	70	51.5	46.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 150° WS: 0.7 m/s Rain: nil Stability Category: E <sup>2</sup>	Background motorway traffic 42-50 Cars passing 50-60 Truck 69 Site inaudible	365	35

<sup>1</sup> Site not operational.

<sup>2</sup> Temperature data used from BOM (Station ID 94760) to undertake modelling using TAPM to determine Stability Category.

<sup>3</sup> data downloaded with an averaging period of 1 hour.

<sup>4</sup> LA90 value of less than 50 (estimated) was dominated by road traffic noise so unable to estimate contribution for site at assessment location.

<sup>5</sup> Negligible exceedance (NPfI 2017 – Table 4.1 and Table 4.2)

#### 4.2 Location N2

Noise monitoring at location N2 conducted on Monday 29 April 2024 and Tuesday 30 April 2024 resulted in inaudible site noise during the day and evening periods. The site was not operational during the evening period. Measured ambient noise sources included background motorway hum, aircraft, birds, train, passing cars, barking dog, insects, and frogs. These results satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location N2 are presented in **Table 4-2**.

#### Table 4-2: Noise survey results and observations for Location N2

		Descriptor (dBA)							
Date	Time (hrs)	LAmax	LAeq	LA90	Meteorology (handheld at microphone height) Onsite Met Station (2m height) <sup>3</sup>		Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
29-04-24	10:43am to 10:58am (Day)	71.5	45.6	35.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 346° WS: 1.2 m/s Rain: nil Stability Category: D <sup>2</sup>	Background motorway hum 38 Aircraft 35-40 Cars passing 45-67 Birds 35-41 Train 40-60 Site inaudible	<25	40
29-04-24	6:00pm to 6:15pm (Evening)	72.4	51.4	42.6	WD: n/a WS: 0 m/s Rain: Nil	WD: 84° WS: 0.3 m/s Rain: nil Stability Category: E <sup>2</sup>	Background frogs/insects/motorway hum 39- 40 (hard to distinguish) Dog barking 40-43 Cars passing 39-72 Site inaudible	<33	44
30-04-24	5:08am to 5:23am (Night)	76	43.6	33.8	WD: n/a WS: 0 m/s Rain: Nil	WD: 151° WS: 0.8 m/s Rain: nil Stability Category: E <sup>2</sup>	Background motorway 31-40 Train 44-52 Car passing 38-76 Site not operational	n/a <sup>1</sup>	39

<sup>1</sup> Site not operational.

<sup>2</sup> Temperature data used from BOM (Station ID 94760) to undertake modelling using TAPM to determine Stability Category.

<sup>3</sup> data downloaded with an averaging period of 1 hour.

#### 4.3 Location N3

Noise monitoring at location N3 conducted on Monday 29 April 2024 and Tuesday 30 April 2024 resulted in audible site noise during the day and evening period. Due to Nurragingy Reserve being closed during the evening and night period monitoring was completed at N3 (alternative). Holcim reverse squawkers were observed and measured for approximately 3-7 seconds on four occasions during the day monitored period. Holcim alarms were observed and measured for approximately 3-10 seconds on 10 occasions during the evening monitored period. Measurements for both were below the 15min LAeq criteria using sound level exposure calculations included in **Appendix 1**. During the night period there was a negligible exceedance of the criteria (<1 dBA). Measured ambient noise sources included aircraft, children, birds, a motorbike, and a dozer from an adjacent site. These results satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location N3 are presented in **Table 4-3**.

		Descriptor (dBA)							
Date	Time	LAmax	LAeq LA90		Meteorology (handheld at microphone height)	Onsite Met Station (2m height) <sup>3</sup>	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
29-04-24	11:09am to 11:26am (Day)	63.6	42.9	37.9	WD: n/a WS: 0 m/s Rain: Nil	WD: 324° WS: 1.1 m/s Rain: nil Stability Category: D <sup>2</sup>	Aircraft 40-45 Children 40-42 Birds 40-43 Alarms 34-35 Fans form adjacent site 38-39 (background noise) Holcim reverse squawkers 40-41 (4 times for 3-7 secs)	<264	36
29-04-24	6:53pm to 7:08pm (Evening)	61.3	47.2	42.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 96° WS: 0.3 m/s Rain: nil Stability Category: E <sup>2</sup>	Motorbike 46-48 Holcim alarms 39-43 (10 times for 3-10 secs each)	<334	38
30-04-24	5:31am to 5:46am (Night)	63.2	52.5	46.2	WD: n/a WS: 0 m/s Rain: Nil	WD: 151° WS: 0.8 m/s Rain: nil Stability Category: E <sup>2</sup>	Dozer from adjacent site to north 58-62 Site inaudible	365	35

#### Table 4-3: Noise survey results and observations for Location N3

<sup>1</sup> Site not operational.

<sup>2</sup> Temperature data used from BOM (Station ID 94760) to undertake modelling using TAPM to determine Stability Category.

<sup>3</sup> data downloaded with an averaging period of 1 hour.

<sup>4</sup> Value estimated based on sound level exposure calculations in **Appendix 1**.

<sup>5</sup> Negligible exceedance (NPfI 2017 – Table 4.1 and Table 4.2)

#### 4.4 Location N4

Noise monitoring at location N4 conducted on Monday 29 April 2024 and Tuesday 30 April 2024 resulted in inaudible site noise during the day and evening period. The site was not operational during the night period. Measured ambient noise sources included background motorway traffic, trains, aircraft, insects, cars, and soccer players yelling. These results satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance. The results and observations taken during the monitoring events at location N4 are presented in **Table 4-4**.

		Des	criptor (d	IBA)					
Date	Time	LAmax	LAeq	LA90	Meteorology (handheld at microphone height)	Onsite Met Station (2m height) <sup>3</sup>	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
29-04-24	11:40am to 11:55am (Day)	54.2	38.6	34.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 325° WS: 1.1 m/s Rain: nil Stability Category: D <sup>2</sup>	Background motorway 32-25 Trains 38-40 Aircraft 35-39 Site inaudible	<24	36
29-04-24	7:39pm to 7:54pm (Evening)	62.7	39.9	36.7	WD: n/a WS: 0 m/s Rain: Nil	WD: 98° WS: 0.6 m/s Rain: nil Stability Category: E <sup>2</sup>	Background motorway hum 34-38 Car passing 42-50 Soccer players yelling 39-40 Site inaudible	<27	38
30-04-24	4:44am to 4:59am (Night)	66.3	38.2	35.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 130° WS: 1.0 m/s Rain: nil Stability Category: E <sup>2</sup>	Background motorway/insects 33- 38 Loud car 66 Site not operational	n/a <sup>1</sup>	35

#### Table 4-4: Noise survey results and observations for Location N4

<sup>1</sup> Site not operational.

<sup>2</sup> Temperature data used from BOM (Station ID 94760) to undertake modelling using TAPM to determine Stability Category.

<sup>3</sup> data downloaded with an averaging period of 1 hour.

### 5. Conclusion

This NMA was completed by Ramboll at the Holcim Rooty Hill Distribution Centre, Rooty Hill, NSW as an annual requirement of the NMP. Monitoring was carried out on Monday 29 April 2024 and Tuesday 30 April 2024 at four locations selected as representative of the sensitive receptors surrounding the RHDC.

Audible noise identified as emitted from the site was recorded during the day and evening at location N3. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim RHDC, Rooty Hill, NSW.

### 6. References

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### Appendix 1 Sound Exposure Level Calculations

### N3 day monitoring period (11:09AM - 11:26AM)

Noise source	Holcim reverse squawkers
Meas. Dist from source (m)	-
Meas. Time (s)	7
Meas. LAeq dB	41
Calc Sel dB	49
No. Events in 15min	4
Total LAeq (15min)	26

### N3 evening monitoring period (6:53PM - 7:08PM)

Noise source	Holcim alarms
Meas. Dist from source (m)	-
Meas. Time (s)	10
Meas. LAeq dB	43
Calc Sel dB	53
No. Events in 15min	10
Total LAeq (15min)	33



Appendix B –

2024 PM10 and TSP Monitoring Results



### 2024 PM<sub>10</sub> and TSP Monitoring Results

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM10 (μg/m³)	TSP	24-hour PM10 Compliance Status
1-Jan-24	2.57	3.07	Compliant	4.24	5.55	Compliant
2-Jan-24	2.01	2.57	Compliant	3.3	4.33	Compliant
3-Jan-24	1.52	1.92	Compliant	2.55	3.78	Compliant
4-Jan-24	4.7	12.02	Compliant	4.83	7.34	Compliant
5-Jan-24	2.15	2.93	Compliant	3.51	4.98	Compliant
6-Jan-24	2.12	3.02	Compliant	3.23	4.8	Compliant
7-Jan-24	2.65	3.66	Compliant	4.33	6.01	Compliant
8-Jan-24	2.01	2.87	Compliant	5.88	12.18	Compliant
9-Jan-24	3.9	7.44	Compliant	2.81	4.45	Compliant
10-Jan-24	2.83	4.47	Compliant	4.15	6.86	Compliant
11-Jan-24	5.05	9.7	Compliant	4.12	9.17	Compliant
12-Jan-24	3.81	7.28	Compliant	3.27	4.63	Compliant
13-Jan-24	3.93	6.2	Compliant	4.43	6.67	Compliant
14-Jan-24	2.87	4.2	Compliant	4.16	5.67	Compliant
15-Jan-24	3.81	6.04	Compliant	5.04	6.03	Compliant
16-Jan-24	3.57	5.55	Compliant	4.74	6.3	Compliant
17-Jan-24	2.36	3.3	Compliant	4.55	7.28	Compliant
18-Jan-24	2.65	5.03	Compliant	3.75	8.78	Compliant
19-Jan-24	5.57	11.42	Compliant	4.28	9.71	Compliant
20-Jan-24	3.41	5.45	Compliant	3.89	5.64	Compliant
21-Jan-24	2.82	4.98	Compliant	5.06	10.5	Compliant
22-Jan-24	7.58	14.18	Compliant	6.71	10.6	Compliant
23-Jan-24	9.15	31.93	Compliant	3.29	5.38	Compliant
24-Jan-24	4.32	9.89	Compliant	6.6	16.69	Compliant
25-Jan-24	5.78	11.41	Compliant	6.18	12.25	Compliant

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	AS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
26-Jan-24	5.12	12.86	Compliant	6.17	13.72	Compliant	
27-Jan-24	2.86	6.58	Compliant	4.91	7.15	Compliant	
28-Jan-24	2.58	5.72	Compliant	3.96	5.61	Compliant	
29-Jan-24	3.64	6.95	Compliant	4.42	7.52	Compliant	
30-Jan-24	5.14	9.65	Compliant	5.19	6.94	Compliant	
31-Jan-24	5.04	9.61	Compliant	4.72	6.62	Compliant	
1-Feb-24	4.1	7.42	Compliant	4.42	7.8	Compliant	
2-Feb-24	6.56	13.47	Compliant	5.77	10.2	Compliant	
3-Feb-24	5.47	7.86	Compliant	9.41	13.22	Compliant	
4-Feb-24	3.4	4.76	Compliant	6.7	9.83	Compliant	
5-Feb-24	6.48	12.33	Compliant	7.57	12.11	Compliant	
6-Feb-24	3.66	7.53	Compliant	3.75	6.08	Compliant	
7-Feb-24	6.12	13.9	Compliant	5.42	20.37	Compliant	
8-Feb-24	6.18	12.57	Compliant	4.48	8.63	Compliant	
9-Feb-24	6.45	13.37	Compliant	3.49	7.22	Compliant	
10-Feb-24	4.58	9.79	Compliant	4.5	6.89	Compliant	
11-Feb-24	3.19	4.55	Compliant	5.36	6.84	Compliant	
12-Feb-24	3.43	5.99	Compliant	6.02	11.24	Compliant	
13-Feb-24	6.05	12.62	Compliant	4.61	9.73	Compliant	
14-Feb-24	4.81	10.73	Compliant	4.29	8.79	Compliant	
15-Feb-24	2.5	3.73	Compliant	3.08	4.98	Compliant	
16-Feb-24	3.29	4.93	Compliant	5.49	8.03	Compliant	
17-Feb-24	2.12	3.16	Compliant	4.72	6.42	Compliant	
18-Feb-24	2.31	2.85	Compliant	5.16	6.73	Compliant	
19-Feb-24	2.66	4.07	Compliant	4.48	6.6	Compliant	
20-Feb-24	2.5	3.78	Compliant	3.49	5.17	Compliant	
21-Feb-24	3.15	6.09	Compliant	2.53	3.76	Compliant	

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	S 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
22-Feb-24	3.64	6.37	Compliant	4.82	7.39	Compliant	
23-Feb-24	3.81	6.56	Compliant	6.11	11.49	Compliant	
24-Feb-24	2.98	4.71	Compliant	4.23	5.92	Compliant	
25-Feb-24	1.68	2.55	Compliant	3.05	4.58	Compliant	
26-Feb-24	6.45	13.08	Compliant	5.69	9.75	Compliant	
27-Feb-24	4.21	7.51	Compliant	5.11	9.11	Compliant	
28-Feb-24	4.25	7.55	Compliant	5.73	8.9	Compliant	
29-Feb-24	5.37	9.79	Compliant	5.67	10.18	Compliant	
1-Mar-24	6.33	10.76	Compliant	9.29	11.98	Compliant	
2-Mar-24	3.39	5.02	Compliant	6.68	8.76	Compliant	
3-Mar-24	2.23	3.63	Compliant	3.86	6.16	Compliant	
4-Mar-24	6.16	11.78	Compliant	7.23	10.93	Compliant	
5-Mar-24	4.51	8.93	Compliant	6.06	13.03	Compliant	
6-Mar-24	9.07	18.2	Compliant	7.49	14.82	Compliant	
7-Mar-24	7.42	14.34	Compliant	8.37	15.6	Compliant	
8-Mar-24	3.83	7.28	Compliant	3.23	5.92	Compliant	
9-Mar-24	2.75	5.43	Compliant	2.26	5.31	Compliant	
10-Mar-24	1.72	2.78	Compliant	2.24	3.68	Compliant	
11-Mar-24	4	7.64	Compliant	3.18	5.52	Compliant	
12-Mar-24	10.52	22.49	Compliant	3.66	8.55	Compliant	
13-Mar-24	4.92	8.88	Compliant	4.45	8.72	Compliant	
14-Mar-24	5.58	11.82	Compliant	4.36	8.96	Compliant	
15-Mar-24	5.3	12.24	Compliant	2.71	4.95	Compliant	
16-Mar-24	2.33	4.87	Compliant	1.77	3.78	Compliant	
17-Mar-24	0.98	1.39	Compliant	1.37	2.13	Compliant	
18-Mar-24	3.93	8.11	Compliant	2.2	3.97	Compliant	
19-Mar-24	2.56	4.67	Compliant	2.75	5.06	Compliant	

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	VAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
20-Mar-24	3.69	7.07	Compliant	3.95	6.96	Compliant	
21-Mar-24	6.23	13.63	Compliant	3.12	6.03	Compliant	
22-Mar-24	12.05	25	Compliant	3.51	9.76	Compliant	
23-Mar-24	3.28	6.43	Compliant	2.55	4.81	Compliant	
24-Mar-24	1.35	2.28	Compliant	1.72	2.66	Compliant	
25-Mar-24	9.64	20.72	Compliant	3.22	7.62	Compliant	
26-Mar-24	4.37	9.7	Compliant	2.85	6.49	Compliant	
27-Mar-24	6.25	12.54	Compliant	3.49	7.33	Compliant	
28-Mar-24	5.88	11.6	Compliant	2.94	5.39	Compliant	
29-Mar-24	1.94	3.27	Compliant	2.57	4.08	Compliant	
30-Mar-24	1.52	2.45	Compliant	2.42	3.64	Compliant	
31-Mar-24	1.5	2.11	Compliant	2.48	3.61	Compliant	
1-Apr-24	1.38	2.24	Compliant	2.27	4.38	Compliant	
2-Apr-24	2.66	5.76	Compliant	4.8	11.21	Compliant	
3-Apr-24	4.44	9.09	Compliant	4.22	7.96	Compliant	
4-Apr-24	3.6	8.23	Compliant	2.71	5.27	Compliant	
5-Apr-24	1.57	3	Compliant	2.15	2.77	Compliant	
6-Apr-24	0.64	1.33	Compliant	1.08	2.17	Compliant	
7-Apr-24	0.94	1.38	Compliant	1.86	3.02	Compliant	
8-Apr-24	1.71	2.72	Compliant	2.81	4.84	Compliant	
9-Apr-24	3.27	5.79	Compliant	2.17	4.13	Compliant	
10-Apr-24	6.12	16.38	Compliant	1.84	4.04	Compliant	
11-Apr-24	4.86	10.12	Compliant	2.44	4.81	Compliant	
12-Apr-24	3.19	6.6	Compliant	2.56	4.92	Compliant	
13-Apr-24	1.95	3.6	Compliant	2.39	3.7	Compliant	
14-Apr-24	1.55	2.67	Compliant	2.27	3.24	Compliant	
15-Apr-24	3.89	8.07	Compliant	4.05	9.19	Compliant	

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
16-Apr-24	3.64	7.05	Compliant	3.22	6.69	Compliant	
17-Apr-24	3.32	6.55	Compliant	2.73	4.49	Compliant	
18-Apr-24	4.37	8.99	Compliant	3.15	4.94	Compliant	
19-Apr-24	3.62	7.03	Compliant	3.06	6.46	Compliant	
20-Apr-24	5.76	13.11	Compliant	1.83	3.73	Compliant	
21-Apr-24	2.08	3.64	Compliant	2.12	2.95	Compliant	
22-Apr-24	5.3	11.01	Compliant	2.61	5.36	Compliant	
23-Apr-24	4.6	9.33	Compliant	3.38	6.06	Compliant	
24-Apr-24	4.69	9.24	Compliant	3.37	7.54	Compliant	
25-Apr-24	2.67	4.56	Compliant	2.44	4.33	Compliant	
26-Apr-24	3.91	7.93	Compliant	2.27	6.16	Compliant	
27-Apr-24	2.08	5.16	Compliant	1.82	3.24	Compliant	
28-Apr-24	2.19	4.5	Compliant	3.68	6.5	Compliant	
29-Apr-24	6.24	15.42	Compliant	5.59	10.8	Compliant	
30-Apr-24	4.35	9.36	Compliant	2.67	5.42	Compliant	
1-May-24	4.61	9.75	Compliant	2.3	5.37	Compliant	
2-May-24	2.04	3.89	Compliant	1.5	3.48	Compliant	
3-May-24	2.1	3.56	Compliant	1.63	3.24	Compliant	
4-May-24	1.23	2.43	Compliant	1.25	2.05	Compliant	
5-May-24	0.98	1.46	Compliant	0.9	1.47	Compliant	
6-May-24	2.89	5.55	Compliant	1.76	2.82	Compliant	
7-May-24	2.77	5.92	Compliant	1.16	1.9	Compliant	
8-May-24	1.78	4.16	Compliant	1.62	2.39	Compliant	
9-May-24	1.94	4.92	Compliant	2.17	3.87	Compliant	
10-May-24	1.64	3.19	Compliant	1.74	2.7	Compliant	
11-May-24	0.96	1.3	Compliant	1.86	2.57	Compliant	
12-May-24	1.58	2.76	Compliant	0.77	1.24	Compliant	

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	/AS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
13-May-24	3.95	7.38	Compliant	1.61	2.74	Compliant	
14-May-24	2.88	5.27	Compliant	3.31	5.51	Compliant	
15-May-24	2.79	4.92	Compliant	3.12	5.12	Compliant	
16-May-24	2.8	4.27	Compliant	3.68	5.68	Compliant	
17-May-24	3.19	5.35	Compliant	4.47	6.96	Compliant	
18-May-24	7.29	16.23	Compliant	1.88	4.39	Compliant	
19-May-24	3.14	5.63	Compliant	2.21	3.72	Compliant	
20-May-24	4.95	10.03	Compliant	3.49	6.5	Compliant	
21-May-24	6.43	13.48	Compliant	1.85	4.6	Compliant	
22-May-24	7.69	16.33	Compliant	2.84	5.62	Compliant	
23-May-24	4.37	8.17	Compliant	4.33	8.22	Compliant	
24-May-24	3.3	5.88	Compliant	4.43	8.18	Compliant	
25-May-24	2.99	4.79	Compliant	4.55	7.01	Compliant	
26-May-24	3.74	8.64	Compliant	5.33	9.3	Compliant	
27-May-24	6.01	11.59	Compliant	4.79	9.4	Compliant	
28-May-24	5.65	12.42	Compliant	6.54	14.09	Compliant	
29-May-24	3.61	6.54	Compliant	4.99	8.31	Compliant	
30-May-24	3.53	6.27	Compliant	4.49	9.13	Compliant	
31-May-24	1.94	3.7	Compliant	2.99	8.25	Compliant	
1-Jun-24	2.27	3.74	Compliant	2.08	3.42	Compliant	
2-Jun-24	2	3.51	Compliant	1.12	1.84	Compliant	
3-Jun-24	2.32	5.17	Compliant	2.63	5.14	Compliant	
4-Jun-24	2.87	6.64	Compliant	3.58	6.35	Compliant	
5-Jun-24	3.22	6.15	Compliant	2.64	4.25	Compliant	
6-Jun-24	3.38	13.29	Compliant	1.56	3.64	Compliant	
7-Jun-24	1.35	3.16	Compliant	0.96	1.53	Compliant	
8-Jun-24	0.97	1.8	Compliant	1.72	3.19	Compliant	

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)	/AS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	
9-Jun-24	5275.48*	5294.45*	N/A	1.63	2.12	Compliant	
10-Jun-24	3.16	11.28	Compliant	2.02	2.86	Compliant	
11-Jun-24	2.83	7.7	Compliant	3.16	5.93	Compliant	
12-Jun-24	6.42	16.45	Compliant	2.59	7.34	Compliant	
13-Jun-24	5.8	12.96	Compliant	1.77	3.84	Compliant	
14-Jun-24	3.38	7.33	Compliant	2.4	4.4	Compliant	
15-Jun-24	1.85	4.33	Compliant	0.95	1.57	Compliant	
16-Jun-24	2.73	6.02	Compliant	0.95	1.56	Compliant	
17-Jun-24	4.11	9.19	Compliant	2.23	4.53	Compliant	
18-Jun-24	3.96	8.26	Compliant	3.1	5.44	Compliant	
19-Jun-24	4.31	9.3	Compliant	3.79	5.94	Compliant	
20-Jun-24	3.62	7.01	Compliant	4.78	7.87	Compliant	
21-Jun-24	4.09	7.53	Compliant	3.48	5.89	Compliant	
22-Jun-24	1.3	2.5	Compliant	1.5	2.14	Compliant	
23-Jun-24	1.89	3.55	Compliant	1.48	2.03	Compliant	
24-Jun-24	2.57	6.01	Compliant	3.18	6.29	Compliant	
25-Jun-24	2.14	4.26	Compliant	5.27	9.44	Compliant	
26-Jun-24	2.93	5.41	Compliant	3.73	6.74	Compliant	
27-Jun-24	3.22	6.03	Compliant	5.61	12.53	Compliant	
28-Jun-24	2.41	4.37	Compliant	3.51	5.65	Compliant	
29-Jun-24	2.53	4.45	Compliant	3	4.79	Compliant	
30-Jun-24	0.96	1.76	Compliant	1.13	1.71	Compliant	
1-Jul-24	3.68	11.87	Compliant	1.29	2.96	Compliant	
2-Jul-24	2.55	8.25	Compliant	1.09	1.87	Compliant	
3-Jul-24	2.01	6.31	Compliant	0.96	1.76	Compliant	
4-Jul-24	2.3	6.11	Compliant	1.36	2.15	Compliant	
5-Jul-24	1.57	3.29	Compliant	1.48	2.09	Compliant	

Sample	HVAS 1 (Site O		HVAS 2 (Rail)			
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
6-Jul-24	1.12	2.43	Compliant	1.01	1.58	Compliant
7-Jul-24	0.83	1.33	Compliant	1.29	1.94	Compliant
8-Jul-24	1.24	1.88	Compliant	1.83	2.36	Compliant
9-Jul-24	1.53	3.42	Compliant	2.84	4.22	Compliant
10-Jul-24	3.45	7.14	Compliant	2.25	4.22	Compliant
11-Jul-24	3.45	6.14	Compliant	3.37	5.33	Compliant
12-Jul-24	3.45	6.13	Compliant	3.51	5.66	Compliant
13-Jul-24	2.52	4.87	Compliant	1.52	3.01	Compliant
14-Jul-24	1.43	2.7	Compliant	1.87	2.71	Compliant
15-Jul-24	3.96	8.32	Compliant	3.45	8.58	Compliant
16-Jul-24	3.03	6.78	Compliant	2.26	6.31	Compliant
17-Jul-24	4.69	8.87	Compliant	1.79	4.56	Compliant
18-Jul-24	4.53	8.77	Compliant	2.22	4.13	Compliant
19-Jul-24	2.85	6.05	Compliant	2.75	6.04	Compliant
20-Jul-24	6.57	17.11	Compliant	6.72	25.41	Compliant
21-Jul-24	2.54	5.36	Compliant	3.04	7.94	Compliant
22-Jul-24	3.66	7.48	Compliant	3.9	7.52	Compliant
23-Jul-24	3.38	6.77	Compliant	3.67	6.55	Compliant
24-Jul-24	3.73	6.28	Compliant	4.39	6.94	Compliant
25-Jul-24	3.08	6.6	Compliant	3.92	12.96	Compliant
26-Jul-24	2.3	4.57	Compliant	1.91	3.49	Compliant
27-Jul-24	1.53	2.44	Compliant	2.48	3.52	Compliant
28-Jul-24	1.78	3.59	Compliant	2.22	5.8	Compliant
29-Jul-24	5.77	11.85	Compliant	1.43	4.02	Compliant
30-Jul-24	5.69	10.87	Compliant	1.7	4.79	Compliant
31-Jul-24	5.87	11.27	Compliant	1.99	4.79	Compliant
1-Aug-24	4.57	8.56	Compliant	2.27	5.19	Compliant

Sample	HVAS 1 (Site O		HVAS 2 (Rail)			
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
2-Aug-24	3.71	6.36	Compliant	2.28	5.24	Compliant
3-Aug-24	2.23	4.06	Compliant	3.4	5.52	Compliant
4-Aug-24	2.23	3.16	Compliant	3.71	5.13	Compliant
5-Aug-24	3.04	4.74	Compliant	4.56	7.35	Compliant
6-Aug-24	5	11.96	Compliant	2.65	5.06	Compliant
7-Aug-24	4.98	10.4	Compliant	3.26	6.56	Compliant
8-Aug-24	2.78	5.65	Compliant	2.98	5.65	Compliant
9-Aug-24	3.15	6.45	Compliant	2.86	5.44	Compliant
10-Aug-24	2.19	4.24	Compliant	2.3	3.65	Compliant
11-Aug-24	1.73	2.69	Compliant	1.84	2.6	Compliant
12-Aug-24	2.01	3.61	Compliant	2.01	3.33	Compliant
13-Aug-24	1.72	2.46	Compliant	2.9	3.8	Compliant
14-Aug-24	1.59	1.98	Compliant	2.74	3.26	Compliant
15-Aug-24	2.55	4.86	Compliant	2.8	5.46	Compliant
16-Aug-24	2.22	3.69	Compliant	2.55	5.22	Compliant
17-Aug-24	1.91	4.39	Compliant	2.51	5.7	Compliant
18-Aug-24	1.69	2.67	Compliant	1.57	2.42	Compliant
19-Aug-24	2.79	4.85	Compliant	2.94	5.48	Compliant
20-Aug-24	2.49	4.94	Compliant	2.75	5.63	Compliant
21-Aug-24	4.43	9.61	Compliant	3.78	9.49	Compliant
22-Aug-24	4.87	8.93	Compliant	2.33	5.52	Compliant
23-Aug-24	2.74	5.14	Compliant	2.87	6.83	Compliant
24-Aug-24	1.33	2.84	Compliant	2.31	7.01	Compliant
25-Aug-24	1.62	2.95	Compliant	1.93	4.01	Compliant
26-Aug-24	4.44	9.13	Compliant	2.59	8.62	Compliant
27-Aug-24	3.42	6.53	Compliant	6.51	37.74	Compliant
28-Aug-24	9.92	23.53	Compliant	8.45	39.32	Compliant

Sample	HVAS 1 (Site O		HVAS 2 (Rail)			
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
29-Aug-24	5.64	10.7	Compliant	4.26	10.34	Compliant
30-Aug-24	10.42	22.87	Compliant	7.5	25.88	Compliant
31-Aug-24	2.74	6.74	Compliant	3.95	12.56	Compliant
1-Sep-24	1.41	3.46	Compliant	3.03	9.49	Compliant
2-Sep-24	13.65	30.25	Compliant	9.26	36.88	Compliant
3-Sep-24	7.15	14.25	Compliant	2.9	8.24	Compliant
4-Sep-24	6.62	13.81	Compliant	4.53	13.19	Compliant
5-Sep-24	6.53	13.07	Compliant	4.99	16.38	Compliant
6-Sep-24	4.84	10.52	Compliant	6.87	22.34	Compliant
7-Sep-24	3.72	7.44	Compliant	3.32	8.64	Compliant
8-Sep-24	1.68	2.67	Compliant	2.66	5.31	Compliant
9-Sep-24	6.7	12.92	Compliant	3.35	9.7	Compliant
10-Sep-24	6.55	12.88	Compliant	3.01	7.3	Compliant
11-Sep-24	3.84	6.83	Compliant	5.9	36.02	Compliant
12-Sep-24	5.81	12.51	Compliant	3.64	9.93	Compliant
13-Sep-24	5.04	9.39	Compliant	2.52	6.25	Compliant
14-Sep-24	3.23	6.36	Compliant	2.16	5.24	Compliant
15-Sep-24	4.1	9.61	Compliant	1.47	5.41	Compliant
16-Sep-24	4.47	9.2	Compliant	2.35	6.62	Compliant
17-Sep-24	3.25	6.09	Compliant	3.4	8.49	Compliant
18-Sep-24	3.74	8.04	Compliant	9.68	24.06	Compliant
19-Sep-24	11.34	25.11	Compliant	6.83	26.15	Compliant
20-Sep-24	6.14	13.01	Compliant	3.95	10.9	Compliant
21-Sep-24	2.11	4.45	Compliant	2.43	6.91	Compliant
22-Sep-24	2	3.81	Compliant	2.73	5.7	Compliant
23-Sep-24	5.91	11.08	Compliant	5.08	13.29	Compliant
24-Sep-24	6.38	12.28	Compliant	5.17	14.56	Compliant

Sample	HVAS 1 (Site Office)			HVAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
25-Sep-24	5.68	11.03	Compliant	4.46	10.46	Compliant
26-Sep-24	2.4	3.89	Compliant	1.28	2.29	Compliant
27-Sep-24	2.23	4.37	Compliant	1.56	2.85	Compliant
28-Sep-24	1.62	3.41	Compliant	1.08	1.9	Compliant
29-Sep-24	1.06	1.45	Compliant	1.29	2.1	Compliant
30-Sep-24	7.67	32.32	Compliant	3.83	18.86	Compliant
1-Oct-24	3.33	6.66	Compliant	2.65	7.52	Compliant
2-Oct-24	3.12	5.28	Compliant	2.62	4.25	Compliant
3-Oct-24	4.95	9.39	Compliant	2.63	4.67	Compliant
4-Oct-24	2.87	4.93	Compliant	2.83	6.83	Compliant
5-Oct-24	1.41	2.59	Compliant	1.87	4.97	Compliant
6-Oct-24	1.34	2.64	Compliant	2.29	6.44	Compliant
7-Oct-24	1.56	2.93	Compliant	2.2	5.4	Compliant
8-Oct-24	3.48	6.2	Compliant	2.66	4.77	Compliant
9-Oct-24	5.04	9.91	Compliant	1.78	4.16	Compliant
10-Oct-24	3.15	7.26	Compliant	2.31	6.34	Compliant
11-Oct-24	6.25	14.23	Compliant	3.26	6.89	Compliant
12-Oct-24	4.95	12.02	Compliant	2.97	4.58	Compliant
13-Oct-24	2.46	5.83	Compliant	1.95	3.19	Compliant
14-Oct-24	2.99	6.46	Compliant	2.2	5.32	Compliant
15-Oct-24	10.51	35.53	Compliant	2.46	3.91	Compliant
16-Oct-24	3	5.17	Compliant	2.24	4.53	Compliant
17-Oct-24	5.94	12.24	Compliant	1.98	5.31	Compliant
18-Oct-24	1.21	2.12	Compliant	1.39	3.21	Compliant
19-Oct-24	1.91	3.98	Compliant	1.09	2.15	Compliant
20-Oct-24	1.78	3.32	Compliant	2.04	3.2	Compliant
21-Oct-24	6.35	14.15	Compliant	1.89	4.28	Compliant

Sample	HVAS 1 (Site Office)			HVAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
22-Oct-24	6.14	13.06	Compliant	2.18	5.11	Compliant
23-Oct-24	5.51	10.52	Compliant	3.31	8.28	Compliant
24-Oct-24	6.16	12.83	Compliant	3.27	7.29	Compliant
25-Oct-24	5.23	11.72	Compliant	2.07	4.97	Compliant
26-Oct-24	3.21	6.78	Compliant	1.97	5.75	Compliant
27-Oct-24	1.31	2.29	Compliant	1.76	4.57	Compliant
28-Oct-24	8.4	17.7	Compliant	3.56	8.91	Compliant
29-Oct-24	6.01	12.43	Compliant	3.91	8.41	Compliant
30-Oct-24	4.77	8.92	Compliant	3.81	9.13	Compliant
31-Oct-24	6.28	12.32	Compliant	3.29	7.96	Compliant
1-Nov-24	3.67	7.25	Compliant	1.72	3.52	Compliant
2-Nov-24	1.89	3.27	Compliant	1.96	4.76	Compliant
3-Nov-24	1.12	2.06	Compliant	1.66	3.7	Compliant
4-Nov-24	4.75	7.63	Compliant	4.36	5.98	Compliant
5-Nov-24	5.39	9.9	Compliant	2.83	4.7	Compliant
6-Nov-24	3.45	6.16	Compliant	2.93	5.7	Compliant
7-Nov-24	5.4	10.27	Compliant	3.37	8.7	Compliant
8-Nov-24	3.89	8.2	Compliant	2.4	6.71	Compliant
9-Nov-24	3.36	5.93	Compliant	2.38	4.19	Compliant
10-Nov-24	5.06	10.52	Compliant	2.54	4.54	Compliant
11-Nov-24	4.74	8.16	Compliant	3.35	6.71	Compliant
12-Nov-24	2.67	5.14	Compliant	1.92	3.84	Compliant
13-Nov-24	2.77	4.63	Compliant	2.57	4.66	Compliant
14-Nov-24	3.73	6.66	Compliant	2.22	3.87	Compliant
15-Nov-24	2.7	4.79	Compliant	2.24	3.64	Compliant
16-Nov-24	1.76	2.44	Compliant	2.22	3.06	Compliant
17-Nov-24	1.16	2.24	Compliant	1.43	3.79	Compliant

Sample	HVAS 1 (Site Office)			HVAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
18-Nov-24	4.16	9.16	Compliant	2.09	5.1	Compliant
19-Nov-24	4.4	8.57	Compliant	2.35	3.36	Compliant
20-Nov-24	5.08	10.06	Compliant	2.69	5.43	Compliant
21-Nov-24	2.95	5.97	Compliant	1.76	4.24	Compliant
22-Nov-24	3.24	6.2	Compliant	2.33	5.62	Compliant
23-Nov-24	2.42	4.78	Compliant	1.99	5.36	Compliant
24-Nov-24	1.46	2.98	Compliant	1.59	3.6	Compliant
25-Nov-24	5.09	10.1	Compliant	2.93	6.48	Compliant
26-Nov-24	4.23	8.22	Compliant	3.24	8.56	Compliant
27-Nov-24	4.83	9.93	Compliant	6.32	22.85	Compliant
28-Nov-24	2.67	5.35	Compliant	2.41	7.63	Compliant
29-Nov-24	1.38	2.53	Compliant	1.41	2.37	Compliant
30-Nov-24	0.73	0.9	Compliant	1.37	2.08	Compliant
1-Dec-24	0.86	1.46	Compliant	1.35	2.42	Compliant
2-Dec-24	8.89	20.9	Compliant	4.74	16.74	Compliant
3-Dec-24	3.37	7.13	Compliant	3	10.23	Compliant
4-Dec-24	6.84	13.78	Compliant	3.24	5.04	Compliant
5-Dec-24	4.25	8.02	Compliant	2.78	5.35	Compliant
6-Dec-24	5.79	10.48	Compliant	3.45	5.95	Compliant
7-Dec-24	1.41	2.11	Compliant	2.17	3.4	Compliant
8-Dec-24	2.33	4.66	Compliant	2.6	3.82	Compliant
9-Dec-24	2.9	4.57	Compliant	2.76	3.94	Compliant
10-Dec-24	7.54	15.64	Compliant	2.43	4.45	Compliant
11-Dec-24	4.69	9.33	Compliant	2.18	4.63	Compliant
12-Dec-24	4.5	9.5	Compliant	3.01	8.31	Compliant
13-Dec-24	6.25	12.27	Compliant	2.8	7.15	Compliant
14-Dec-24	4.83	9.27	Compliant	2.29	4.21	Compliant

Sample	HVAS 1 (Site O	ffice)		HVAS 2 (Rail)		
Date	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status	PM <sub>10</sub> (μg/m³)	TSP	24-hour PM10 Compliance Status
15-Dec-24	1.67	2.7	Compliant	2.1	3.79	Compliant
16-Dec-24	3.92	7.8	Compliant	2.6	7.16	Compliant
17-Dec-24	6.56	14.57	Compliant	3.2	9.89	Compliant
18-Dec-24	8.61	19.99	Compliant	2.46	4.36	Compliant
19-Dec-24	7.07	14.61	Compliant	2.3	4.22	Compliant
20-Dec-24	4.44	9.4	Compliant	2.29	5.38	Compliant
21-Dec-24	5.21	11.62	Compliant	2.14	4.98	Compliant
22-Dec-24	1.93	2.91	Compliant	2.5	4.31	Compliant
23-Dec-24	3.47	8.12	Compliant	3.55	12.25	Compliant
24-Dec-24	3.6	7.61	Compliant	1.61	5.23	Compliant
25-Dec-24	1.18	2.06	Compliant	1.46	3.02	Compliant
26-Dec-24	1.13	1.87	Compliant	1.56	3.29	Compliant
27-Dec-24	2.22	4.2	Compliant	3.79	12.34	Compliant
28-Dec-24	1.91	2.86	Compliant	2.51	4.47	Compliant
29-Dec-24	1.71	3.07	Compliant	2.06	4.45	Compliant
30-Dec-24	1.42	2.17	Compliant	1.69	3.21	Compliant
31-Dec-24	1.29	2.01	Compliant	1.67	3.01	Compliant
Annual Average	3.77	7.66	Compliant	3.20	6.74	Compliant
Valid Sample Count	364	364		365	365	
Number of Sampling Events Attempted	365	365		365	365	

Note: Invalid results are marked with an asterisk (\*) and have been removed from the annual average.



Appendix C –

**Correspondence between Holcim, Ramboll and DPHI regarding Air Quality Monitoring Anomaly**
Mon, Jun 17, 2024 at 12:36 PM

#### Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266) Alert

Sam Condon <Samuel.Condon@planning.nsw.gov.au> To: Michael Ensor <michael.ensor@holcim.com> To: Michael Ensor <michael.ensor@holcim.com> Cc: Dozie Egeonu <dozie.egeonu@holcim.com>

Afternoon Michael,

Given the extreme increases from what appears to be normal and then back to normal after the 6.30 am and 6.31 am two-minute readings, we are also unsure how the reading would be accurate.

Accordingly, at this stage we are satisfied from what you have provided from Ramboll and the supplier that the reading is likely an error and can be removed from the reporting datasets for accuracy.

Please however retain a record of the reading occurrence/reporting itself and include this information any annual reporting/any audits covering this period, indicating that it occurred but was removed for the reasons provided by your consultants and in consultation with the Department. This email may also be included in those records for confirmation.

If you have any questions, please let me know

Regards

Samuel Condon

Senior Compliance Officer Compliance Department of Planning, Housing and Infrastructure

E samuel.condon@planning.nsw.gov.au

dphi.nsw.gov.au

4 Parramatta Square 12 Darcy Street

Parramatta NSW 2124

Working days Monday to Friday, 9:00am - 5:00pm



I acknowledge the traditional custodians of the land and pay respects to Elders past and present. I also acknowledge all the Aboriginal and Torres Strait Islander staff working with NSW Government at this time.

If you are submitting a compliance document or request as required under the conditions of consent or approval, please note that the Department is no longer accepting lodgement via compliance@planning.nsw.gov.au.

The Department has upgraded the Major Projects Website to improve the timeliness and transparency of its post approval and compliance functions. As part of this upgrade, proponents are now requested to submit all post approval and compliance documents online, via the Major Projects Website. To do this, please refer to the instructions available here.

Please consider the environment before printing this email.

From: Michael Ensor <michael.ensor@holcim.com> Sent: Monday, 17 June 2024 10:01 AM To: Sam Condon <a href="https://www.gov.au">sam Condon </a> (and to sam Condon <a href="https://www.gov.au">sam Condon </a> (and to sam Condon <a href="https://www.gov.au

Hi Sam,

Comments from Ramboll are in the below email in regards to the investigation into the spike exceedance from Sunday 09.06.2024

Could you please consider the findings and let me know what action I need to take?

Kind Regards

Michael Ensor Site Manager - Rooty Hill DC Holcim (Australia)

M 0419 476 052 E michael.ensor@holcim.com P PO Box 597 Plumpton, NSW, 2761

------ Forwarded message ------From: Jake Bourke <-JBOURKE@ramboll.com> Date: Fri, Jun 14, 2024 at 5:38 PM Subject: RE: Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266) Alert To: Michael Ensor <michael.ensor@holcim.com> Cc: Mohammed Khan <mohammed.r.khan@holcim.com>, Rachel Condon <RCONDON@ramboll.com>

Hey Mick,

Upon further investigation it appears the spike was only for 2 minutes, but on the graph, it looks like two hours. You can see this when viewing the data tables with a 1-minute average as shown in the below snip. Given we can rule out a site event like truck dumping or a weather event using CCTV footage, the supplier has indicated that it could be either a digital noise that was soon auto corrected or an insect stuck in the inlet but now gone. Given the readings appear to have resumed to normal the supplier recommends removing the spike from your reportable dataset as it is not a real occurrence.

Time	PM1 µg/mª	<b>ΡΜ2.5</b> μg/m <sup>s</sup>	<b>ΡΜ10</b> μg/m <sup>s</sup>	TSP μg/m <sup>s</sup>
06/09/2024 00:37 am	1.05	1.00	5.00	40.13
06/09/2024 06:36 am	1.05	1.53	5.01	28.00
06/09/2024 06:35 am	1.09	1.83	8.98	54.00
06/09/2024 06:34 am	1.16	2.38	13.06	88.25
06/09/2024 06:33 am	1.14	2.02	10.30	44.78
06/09/2024 06:32 am	1.10	1.90	9.29	41.86
06/09/2024 06:31 am	1.06	1,264,970.00	1,264,980.00	1,265,000.00
06/09/2024 06:30 am	1.04	6,324,860.00	6,324,860.00	6,324,880.00
06/09/2024 06:29 am	1.05	2.26	5.92	20.29
06/09/2024 06:28 am	1.14	1.92	8.92	40.05
06/09/2024 06:27 am	1.11	1.77	6.78	47.49
06/09/2024 06:26 am	1.08	1.67	6.73	34.50

Have a great weekend.

#### Kind regards

Jake Bourke

Consultant

#### jbourke@ramboll.com

Ramboll Australia Pty Ltd

ACN 095 437 442

ABN 49 095 437 442

Classification: Confidential

From: Jake Bourke <JBOURKE@ oll.com>

Sent: Wednesday, June 12, 2024 9:03 AM To: Michael Ensor <michael.ensor@holcim.com> Cc: Mohammed Khan <mohammed.r.khan@holcim.com>; Rachel Condon <RCONDON@ramboll.com> Subject: Re: Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266) Alert [Filed 12 Jun 2024 16:57]

Hi Mick.

Thanks for confirming. I've passed onto the supplier who will also get in touch with the manufacturers engineer team. I have not seen a concentration so high before and to me it seems like a possible calculation error, but to cover all bases I have also requested advice from our air quality principal. He is based in Perth though so won't be online for a few hours yet.

Cheers

Jake

From: Michael Ensor <michael.ensor@holcim.com> Sent: Wednesday, June 12, 2024 8:44:08 AM To: Jake Bourke <JBOURKE@ramboll.com> Co: Mohammed Khan <mohammed.rkhan@holcim.com>; Rachel Condon <<u>RCONDON@ramboll.com></u> Subject: Re: Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266) Alert

I have spoken to Mt Druitt Fire Station, they have no fires listed for Sunday 9th June around the time of the spike. (6-7am)

The CCTV footage for our site that I have looked at does not show any smoke or dust either.

I am really unsure how this could of happened.

How much dust would need to be generated to create a reading this high?

Kind Regards,

Michael Ensor Site Manager - Rooty Hill DC Holcim (Australia)

M 0419 476 052 E michael.ensor@holcim.com P PO Box 597 Plumpton, NSW, 2761

On Tue, Jun 11, 2024 at 6:14 PM Jake Bourke <JBOURKE@ramboll.com> wrote:

#### Hey Mick,

Confirming I had a conversation with the supplier today and he is investigating this to rule out a technical error. It does seem erroneous to me given the RAIL DSP didn't show even a mild spike.. Can you confirm whether any of the nearest properties have house fires that may have contributed? That was one of the main considerations the supplier had initially.

Kind regards

Jake Bourke

Consultant

#### jbourke@ramboll.com

Ramboll Australia Pty Ltd.

ACN 095 437 442

ABN 49 095 437 442

Classification: Confidential

From: Michael Ensor <michael.ensor@holcim.com> Sent: Tuesday, June 11, 2024 9:29 AM To: Jake Bourke <JBOURKE@ramboll.com> Co: Mohammed Khan <mohammed.rkhan@holcim.com>; Rachel Condon <rcondon@ramboll.com> Subject: Re: Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266) Alert

I had a look at the data from Sunday and have found that the exceedance was between 6am and 7am.

Apart from this spike, the data looks to be all ok.

CCTV footage does not show any signs of wind or dust during the time of the exceedance or for the day as well.

The site was closed on Sunday as well.

Is there anything else that could cause this massive spike?

PM10 (µg/m²)						×
DP 04042023-2266						*
150000		26,504.06 pg/m* Jan 9.06:00				
	λ					
100000	/\					
50000						
303	00.00	09:00	12:00	16:00	20.00	300.10

Ramboll Australia Pty Ltd · Holcim - Rooty Hill Distribution Centre · Holcim RHDC Site Office (DP 04042023-2266)

Instrument Data export

6/9/2024 to 6/9/2024

#### (UTC+10:00) Canberra, Melbourne, Sydney

Averaging period: 1 hour

Time	PM1 (µg/m³)	PM2.5 (µg/m³)	PM10 (µg/m <sup>3</sup> )	TSP (µg/m³)	WS (m/s)	WD (°)	RAIN (mm/hr)	HAIL (/cm²h)	PRESS (hPa)	AIR T (°C)	AIR RH (%)
9/06/2024 0:00	1.19	1.41	1.61	1.76	0.3	73	0	0	1009.3	8.7	97.8
9/06/2024 1:00	1.23	1.45	1.88	2.75	0.27	81.5	0	0	1009.5	8.1	98.3
9/06/2024 2:00	1.47	3.93	29.39	169.12	0.35	86.6	0	0	1009.4	7.7	98.8
9/06/2024 3:00	1.32	2.4	12.44	65.89	0.25	78.7	0	0	1009.3	7.1	98.9
9/06/2024 4:00	1.27	2.26	11.17	59.02	0.28	84.1	0	0	1009.6	6.7	99.2
9/06/2024 5:00	1.25	1.97	7.75	39.38	0.39	94.9	0	0	1010.1	6.3	99.5
9/06/2024 6:00	1.1	126498.82	126504.06	126531.16	0.32	51.2	0	0	1010.5	6.1	99.7
9/06/2024 7:00	0.98	1.48	5.63	26.43	0.29	84.5	0	0	1011.2	6	99.9
9/06/2024 8:00	1.04	1.56	5.82	27.52	0.38	83.5	0	0	1011.9	8	100
9/06/2024 9:00	0.71	1.03	3.56	16.71	0.55	91.4	0	0	1012	11.5	97.8
9/06/2024 10:00	0.36	0.61	2.4	11.25	0.5	8.9	0	0	1012.2	16.8	64.5
9/06/2024 11:00	0.14	0.28	1.3	6.58	0.77	137.7	0	0	1011.8	18.4	49.9
9/06/2024 12:00	0.15	0.38	2.16	9.62	0.87	128.7	0	0	1011	18.9	46.2
9/06/2024 13:00	0.14	0.32	1.7	7.75	0.75	125	0	0	1010.5	19.6	46.1
9/06/2024 14:00	0.11	0.25	1.3	5.04	0.83	127.9	0	0	1010.5	19.6	47.5
9/06/2024 15:00	0.13	0.25	1.1	5.98	0.47	87.4	0	0	1010.8	19.5	48.5
9/06/2024 16:00	0.25	0.37	0.92	3.12	0.18	72.6	0	0	1011.1	17	65.5
9/06/2024 17:00	0.53	0.77	2.66	12.07	0.36	101.8	0	0	1011.7	14	78.7
9/06/2024 18:00	0.33	0.64	2.88	13.48	1.01	138.2	0	0	1012.6	15.3	58
9/06/2024 19:00	0.24	0.54	2.48	11.98	1.06	145	0	0	1013.6	14.5	56.6
9/06/2024 20:00	0.32	0.61	2.62	11.56	0.9	134.1	0	0	1014.4	13.8	60.2
9/06/2024 21:00	0.4	0.73	2.06	7.71	0.5	116.9	0	0	1014.8	12.8	64.1
9/06/2024 22:00	0.32	0.51	1.69	7.47	0.29	69.6	0	0	1015.1	10	79.6
9/06/2024 23:00	0.44	0.74	2.88	13.46	0.29	70.2	0	0	1015.2	8.4	89.7

Kind Regards,

Michael Ensor Site Manager - Rooty Hill DC Holcim (Australia)

M 0419 476 052 E michael.ensor@holcim.com P PO Box 597 Plumpton, NSW, 2761 PM10 exceeded set point (50.00 µg/m³) at 6/9/2024 12:00 AM



Appendix D –

2024 Water Quality and Aquatic Ecology Reports by Niche Environment and Heritage





# Holcim Regional Distribution Centre – Rooty Hill, NSW

# Aquatic Ecology Visual Monitoring - Summer 2024

Prepared for Holcim Australia Pty Ltd | 25/03/2024



# Document control

Project nu	t number Client		Project manager		LGA	
7971	1 Holcim Australia		David Wilkinson		Hills Shire	
Version	Author		Review	Status	Comments	Date
D1	David Wi Alan Davi	lkinson, ies	Luke Stone	Draft	-	25 March 2024
R0	David Wi	lkinson	-	Review	-	25 March 2024

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# 1 Introduction

# 1.1 Background

This document reports on results of the visual and stream health assessment of Angus Creek and Eastern Creek as part of the Holcim Regional Distribution Centre (RDC) (the Project) aquatic ecology monitoring program (hereafter referred to as the monitoring program). The monitoring program, including quarterly visual monitoring, bi-annual aquatic survey, and reporting, is required under condition 2.28 of the Project approval.

The aim of the monitoring program is to compare sites downstream of the RDC to upstream sites and determine whether the RDC is affecting stream health in receiving waterways, adjacent to or downstream of the Project.

This report presents the results of quarterly monitoring undertaken on the 20th of February 2024 in Summer 2024. Water quality monitoring and visual monitoring of stream condition was conducted at six sites: three sites on Angus Creek and two sites on Eastern Creek.



# 2 Methods

## 2.1 Project overview

A total of six sites were sampled on Angus Creek and Eastern Creek (Figure 1, Table 1). Four sites were located on Angus Creek (two upstream and two downstream of the Project) and two sites were located on Eastern Creek (one upstream and one downstream of the Project).

#### Table 1: Location of sites

Site Name	Location	Control / impact	Latitude	Longitude
AE1	Angus Creek upstream near property boundary	Control	-33.76798576	150.8516665
AE2	Angus Creek downstream -near property boundary in Nurragingy Reserve.	Potential impact	-33.76563506	150.854665
AE3	Angus Creek upstream of Eastern Creek confluence in Nurragingy Reserve.	Potential impact	-33.76496807	150.8554235
AE4	Eastern Creek downstream of Angus Creek in Nurragingy Reserve	Potential impact	-33.76419362	150.8576059
AE5	Eastern Creek upstream of Angus Creek in Nurragingy Reserve	Control	-33.76411307	150.8570044
AE6	Angus Creek upstream above railway.	Control	-33.77017801	150.8499068







Niche PM: David Wilkinson Niche Proj #7971 Client: Holcim

## Location of sites Holcim Regional Distribution Centre - Aquatic Monitoring

sixmaps/LPI Imagery Best: © Department of Finance, Services & Innovation 2017

Figure 1



# 2.2 Field methods

The field survey was undertaken on the 20th of February 2024 by Graduate Aquatic Ecology Consultant Alan Davies. The field methods were consistent with standardised techniques for field sampling.

## 2.2.1 Visual assessment

A description of aquatic habitat was also produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

## 2.2.2 Water quality

#### 2.2.2.1 Physico-Chemical field measurement

Surface water quality was measured in situ using a Yeokal 618 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- рН
- Dissolved oxygen (DO % saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO3/L) was measured with a standard titration kit. Water quality data were compared with the ANZG (2018) default trigger values (DTVs) of physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia.

#### 2.2.2.2 Water sampling

Water samples were taken at each location and sent to ALS laboratories to test for Total Phosphorus (TP), Total Nitrogen (TN) (Nitrogen Oxides (NOx) +Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NOx



# 3 Results

# 3.1 Rainfall

Antecedent rainfall from the month preceding the summer monitoring totalled 01 millimetres (mm) (Figure 2). No rain was recorded in the week leading up to the sampling. The water level at the time of sampling was low to moderate.



Figure 2: Rainfall January to March 2024

# 3.2 Visual survey

Results of the visual survey including photographs of each site are provided in Annex 1. Overall, the streams were visibly in reasonable condition for urban waterways. The upper banks of Angus Creek remain heavily vegetated with riparian ground cover. Some sections of site AE1 have areas of undercutting of the bank. As previously noted, Angus Creek AE1 and both Eastern Creek sites (AE4 and AE5) have very little organic matter on the edges of the pools. At the time of sampling, Eastern Creek's water level was moderate with no visible flow. The banks of Eastern Creek are showing signs of good vegetation recovery and stability. All sites continue to have large amounts of plastic-based rubbish present in the systems, observed within the water and on the banks. Angus Creek Sites AE1 and AE2 and Eastern Creek Sites AE4 and AE5, were all visually turbid. While Sites AE3 and AE6 appeared to have a higher level of clarity.



# 3.3 Water quality

#### 3.3.1 Physico-chemical

Field physico-chemical water quality results are shown in (Table 2). Electrical conductivity (EC) was within the ANZG Default Guideline Values (DGVs) for both Eastern Creek sites and all Angus Creek sites. EC results remained consistent between all sites with the range of scores being between 184 – 334  $\mu$ S/cm, with upstream Angus Creek site AE6 having the highest score. Turbidity was shown to be above DGVs at all sites except for Angus Creek downstream site AE3 and upstream site AE6. Dissolved oxygen (DO) was below guidelines for all sites, which is typical of suburban streams in Western Sydney, the exception being Angus Creek upstream site AE6 which was only marginally above the DGVs. All pH readings were within the DGVs and alkalinity ranged from 60 – 140 with Angus Creek site AE1 and AE6 having the highest score.

Site	Stream	Temp (C°)	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	рН*	Alkalinity (mg CaCo₃/L)
AE1	Angus Creek Control	21.51	184	154	73.8	7.86	140
AE2	Angus Creek	21.6	234	132	63.4	7.72	60
AE3	Angus Creek	21.66	235	88	62.7	7.71	80
AE4	Eastern Creek	21.76	256	112	58.5	7.66	100
AE5	Eastern Creek Control	21.72	218	165	69.8	7.41	80
AE6	Angus Creek Control	22.47	334	28	80.7	7.97	140

#### Table 2: Field physico-chemical water quality results

ANZG default trigger values (DTVs) for lowland streams: Electrical conductivity (125-2200 µS/cm), Turbidity (6-50 NTU), pH (6.5-8), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the default trigger values

#### 3.3.2 Nutrients

Total phosphorus, nitrogen oxides and total nitrogen were all above ANZG DGVs (Table 3) for lowland streams for all Angus Creek and Eastern Creek sites. These exceedances have been previously noted and is common for the monitoring program. Importantly, upstream site AE6 also shows results above DGVs for all values. It is noted that the highest total phosphorus level was recorded at site AE5 along Eastern Creek, which is not associated with the Project. The highest total nitrogen level was recorded at site AE6, upstream of the Project. No significant increase in nutrient levels were recorded along sites AE2 and AE3 downstream of the Project.



## Table 3: Nutrients - laboratory results

Table Heading	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen TN (TKN + NOx) (mg/L)	Nitrogen Oxides (NOx) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.08	1.4	0.65	0.7
AE2	Angus Creek	0.09	1.5	0.86	0.6
AE3	Angus Creek	0.09	1.3	0.84	0.5
AE4	Eastern Creek	0.13	1.7	0.82	0.9
AE5	Eastern Creek Control	0.15	1.4	0.41	1.0
AE6	Angus Creek Control	0.08	2.0	1.16	0.8

ANZG default trigger values (DTVs) for lowland streams: TP (0.05 mg/L), TN (0.5 mg/L),NOx (0.02 mg/L). Text in bold indicate those variables that exceed the default trigger values.



# 4 Discussion and Conclusion

All sites have shown a decrease in electrical conductivity levels in Summer 2024 in comparison to the previous monitoring round in Spring 2023 (Niche 2023), with all sites being within the DGVs. Turbidity levels in both Angus Creek and Eastern creek were elevated during this period of monitoring with all sites except for AE3 and AE6 being above DGVs. Though high, Eastern Creek routinely has turbidity levels above DGVs and has been observed on most monitoring occasions. All sites showed dissolved oxygen levels below ANZG DGVs, with the exception of upstream site AE6, though this is to be expected for disturbed urban streams in the locality. All sites within Angus Creek and Eastern Creek had a pH reading within the ANZG DGVs. Additionally, all nutrient analytes were above the ANZG DGVs for all six sites surveyed this monitoring period. The exceedance in nutrient parameters have been routinely observed over the monitoring program in both upstream and downstream sites in Angus Creek and Eastern Creek. Importantly, the water quality results suggest that conditions at the potential downstream impact sites are comparable to, or better than, those at the upstream controls in Summer 2024. Therefore, the data indicates that Holcim RDC is not affecting the receiving environment and any exceedance in water quality or poor environmental conditions observed are the result of existing catchment disturbances unrelated to the site operations.

Overall, the two streams appear to be in reasonable health for urban waterways. The physico-chemical results do not suggest that the RDC is affecting the downstream aquatic environment.



# 5 References

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian State and Territory Governments, Canberra ACT, Australia. Available at <a href="http://www.waterquality.gov.au/anz-guidelines">www.waterquality.gov.au/anz-guidelines</a>.

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Chessman B. C., Growns J.E and Kotlash A.R. (1997) Objective derivation of macroinvertebrate family sensitivity grade numbers for the SIGNAL biotic index: allocation to the Hunter River system, New South Wales. Marine and Freshwater Research. 48, 159-172.

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# 7 Annex 1: Visual observation– February 2024

AE1: Angus Creek Upstream



Upstream



Downstream

Category	Attribute	AE1 Upstream		
Riparian	Vegetation	The dominant tree species comprised Swamp Oak ( <i>Casuarina glauca</i> ) and Broad-leaf Privet ( <i>Ligustrum lucidum</i> ). Groundcover was dominated by <i>Tradescantia fluminensis</i> .		
	Stream shading	Moderate shading		
	Exotic vegetation	L. lucidum and T. fluminensis		
Stream characteristics	Modal width	3 m		
	Bank condition	Slightly vegetated banks and stable. Slight erosion of lower bank.		
	Substrate	Fine sediment; silt. Hardened clay bottom.		
	Flow/depth	Moderate flow/ ~1 m		
	Macrophytes/algae	Macrophytes not present.		
	Water quality observations	Water visually turbid		
Comments	Weeds and rubbish present. Lack of organic material in channel.			



## AE2: Angus Creek





Upstream

Category	Attribute	AE2 DOWNSTREAM	
Riparian	Vegetation	Dominant tree species included ( <i>C. glauca</i> ). Dominant groundcover was <i>T. fluminensis</i> and mixture of exotic and native grasses and herbs.	
	Stream shading	Moderate shading	
	Exotic vegetation	T. fluminensis and other groundcover species.	
Stream characteristics	Modal width	2 m	
	Bank Condition	Slightly unstable and heavily vegetated by groundcover	
	Substrate	Silt and bedrock	
	Flow/depth	Moderate flow/<1 m	
	Macrophytes/algae	Emergent macrophytes present - Bulrush ( <i>Typha</i> sp.), <i>Cyprus</i> sp. <i>Potamogeton crispus</i>	
	Water quality observations	Clear water	
Comments	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.		



## AE3: Angus Creek Downstream





Upstream

Category	Attribute	AE3 DOWNSTREAM			
Riparian	Vegetation	Dominant tree species was <i>C. glauca</i> . Dominant grass/herb species was <i>T. fluminensis</i>			
	Stream shading	Moderate shading			
	Exotic vegetation	L. Lucidum, T. fluminensis			
Stream	Modal width	l m			
characteristics	Bank Condition	Stable, steep, exposed in sections, slight visible erosion.			
	Substrate	Fine sediment, organic matter on banks			
	Flow/depth	Low flow/~1 metre			
	Macrophytes/algae	Ribbon Weed ( <i>Vallisneria</i> sp.)			
	Water quality observations	r quality Visually water appeared slightly opaque rvations			
Comments	Significant amount of plastic based rubbish in stream				



## AE4: Eastern Creek Downstream



Upstream

Category	Attribute	AE4 DOWNSTREAM	
Riparian	Vegetation	Dominant canopy species included <i>C. glauca</i> and Prickly-leaved Tea Tree ( <i>Melaleuca styphelioides</i> ). Dominant mid-storey species were <i>C. glauca L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>	
	Stream shading	Moderate	
	Exotic vegetation	L. lucidum and T. fluminensis	
Stream characteristics	Modal width	8 m	
Characteristics	Bank condition	Unstable banks	
	Substrate	Fine sediment	
	Flow/depth	Moderate flow/>1m	
	Macrophytes/algae	Macrophytes not present	
	Water quality observations	Visually Turbid	
Comments	Significant amount of plastic based rubbish in stream		



# AE 5: Eastern Creek Upstream



Upstream

Category	Attribute	AE5 UPSTREAM	
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .	
	Stream shading	Moderate	
	Exotic vegetation	T. fluminensis	
Stream	Modal width	12 m	
characteristics	Bank condition	Unstable	
	Substrate	Fine sediment and large woody debris.	
	Flow/depth	Moderate flow/ >1 m	
	Macrophytes/algae	Macrophytes not present.	
	Water quality observations	Visually turbid	
Comments	Lots of large woody debris and plastic based rubbish		



## AE 6: Angus creek Upstream



Upstream

Category	Attribute	AE5 UPSTREAM	
Riparian	Vegetation	Dominant overstorey species was C. glauca. Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover T. fluminensis.	
	Stream shading	Moderate	
	Exotic vegetation	T. fluminensis	
Stream	Modal width	5 m	
	Bank condition	Stable, man made.	
	Substrate	Fine sediment and cobble	
	Flow/depth	Moderate flow/ >1 m	
	Macrophytes/algae	Macrophytes present.	
	Water quality observations	Visually clear	
Comments			



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Spatial Services



# Holcim Regional Distribution Centre – Rooty Hill, NSW

# Aquatic Ecological Monitoring - Autumn 2024

Prepared for Holcim Australia Pty Ltd | 20/06/2024



#### Document control

Project number	Client	Project manager	LGA
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Version	Author	Review	Status	Comments	Date
D1	David Wilkinson	Luke Stone	Draft	Internal Review	19 June 2024
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# 1 Introduction

# 1.1 Background

This document reports on results of the visual and stream health assessment of Angus Creek and Eastern Creek as part of the Holcim Regional Distribution Centre (RDC) (the Project) aquatic ecology monitoring program (hereafter referred to as the monitoring program). The monitoring program, including quarterly visual monitoring, bi-annual aquatic survey, and reporting, is required under condition 2.28 of the Project approval.

The aim of the monitoring program is to compare sites downstream of the RDC to upstream sites and determine whether the RDC is affecting stream health in receiving waterways, adjacent to or downstream of the Project.

This report presents the results of bi-annual aquatic macroinvertebrate monitoring undertaken on 8 March 2024 in autumn. Aquatic ecological monitoring and visual monitoring of stream condition was conducted at six sites: four sites on Angus Creek and two sites on Eastern Creek.



# 2 Methods

## 2.1 Project overview

A total of six sites were sampled on Angus Creek and Eastern Creek (Figure 1, Table 1). Four sites were located on Angus Creek (two upstream and two downstream of the Project) and two sites were located on Eastern Creek (one upstream and one downstream of the Project).

#### Table 1: Location of monitoring sites

Site name	Location	Control / impact	Latitude	Longitude
AE1	Angus Creek upstream near property boundary	Control	-33.76798576	150.8516665
AE2	Angus Creek downstream -near property boundary in Nurragingy Reserve.	Potential impact	-33.76563506	150.854665
AE3	Angus Creek upstream of Eastern Creek confluence in Nurragingy Reserve.	Potential impact	-33.76496807	150.8554235
AE4	Eastern Creek downstream of Angus Creek in Nurragingy Reserve	Potential impact	-33.76419362	150.8576059
AE5	Eastern Creek upstream of Angus Creek in Nurragingy Reserve	Control	-33.76411307	150.8570044
AE6	Angus Creek upstream above railway.	Control	-33.77017801	150.8499068



NSW Office of Environment and Heritage's BioNet Atlas, which holds the data from a number of custodians. Data Obtained 13/12/2023. | public/NSW\_Imagery: © Department of Customer Service 2020/ Terrain: Multi-Directional Hillshade: Airbox,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks an labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



# 2.2 Field methods

The field survey was undertaken on the 8 May 2024 by Aquatic Ecology Consultant David Wilkinson and Graduate Aquatic Ecology Consultant Alan Davies of Niche. The field methods were consistent with standardised techniques for field sampling as applied in previous iterations of the monitoring program.

## 2.2.1 Visual assessment

A description of aquatic habitat was also produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

## 2.2.2 Water quality

#### 2.2.2.1 Physico-chemical field measurements

Surface water quality was measured in situ using a Yeokal 618 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- рН
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO<sup>3</sup>/L) was measured with a standard titration kit. Water quality data were compared with the ANZG (2018) default guideline values (DGVs) of physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia.

#### 2.2.2.2 Water sampling

Water samples were taken at each location and sent to ALS laboratories to test for Total Phosphorus (TP), Total Nitrogen (TN) (Nitrogen Oxides (NOx) +Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NOx.

#### 2.2.3 Macroinvertebrates

Samples were collected from pool edges for a length of 10 metres, either as a continuous line or in disconnected segments. Sampling in segments was undertaken to ensure the sub-habitats such as macrophyte beds, bank overhangs, submerged branches and root mats were appropriately sampled. Segmented sampling was also employed where pool length was short, and it was logistically difficult to sample in a continuous line (e.g. instream logs). A 250 µm dip net was drawn through the water with short sweeps towards the bank to dislodge benthic fauna while scraping submerged rocks and debris, sides of the stream bank and the bed substrate. Further sweeps in the water column targeted suspended fauna. Each sample was rinsed from the net onto a white sorting tray from which animals were picked using forceps, pipettes and or paint brushes. Each tray was picked for a minimum period of 40 minutes, after which they were picked at 10-minute intervals for either a total



of one hour or until no new specimens had been found. Care was taken to collect cryptic and fast-moving animals, in addition to those that were conspicuous or slow. The macroinvertebrates collected at each site were placed into a labelled jar containing 70% ethanol.

#### 2.2.3.1 Laboratory methods invertebrate identification

Macroinvertebrate samples were identified to family level with the exception of Oligochaeta (to class), Polychaeta (to class), Ostracoda (to subclass), Nematoda (to phylum), Nemertea (to phylum), Acarina (to order) and Chironomidae (to subfamily). Keys used to identify fauna included:

- Dean, J., Rosalind, M., St Clair, M., and Cartwright, D. (2004) Identification keys to Australian families and genera of caddis-fly larvae (Trichoptera). Cooperative Research Centre for Freshwater Ecology.
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- Smith, B. (1996) Identification keys to the families and genera of bivalve and gastropod molluscs found in Australian inland waters. Murray Darling Freshwater Research Centre.
- Online resource <u>http://www.mdfrc.org.au/bugguide/</u>.

## 2.3 Data analysis

## 2.3.1 SIGNAL2 (Stream Invertebrate Grade Number Average Level) scores

The revised SIGNAL2 biotic index developed by Chessman (2003a, 2003b) was used to determine the "environmental quality" of sites. This method assigns grade numbers to each macroinvertebrate family or taxa found, based largely on their response to a range of environmental conditions (Table 2). The sum of all grade numbers for that habitat is then divided by the total number of families recorded in each habitat to calculate the SIGNAL2 index. A weighted SIGNAL2 score was also calculated (see Chessman 2003b). The SIGNAL2 index therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site. Table 3 provides a broad guide for interpreting the health of the site according to the SIGNAL2 score of the site.

#### Table 2: SIGNAL2 grade and the level of pollution tolerance for individual taxa

SIGNAL2 grade (individual taxa)	Pollution tolerance
10-8	Indicates a greater sensitivity to pollution
7-5	Indicates a sensitivity to pollution
4-3	Indicates a tolerance to pollution
2-1	Indicates a greater tolerance to pollution



## Table 3: SIGNAL2 score interpretation

SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution



# 3 Results

# 3.1 Rainfall

Antecedent rainfall from the month preceding the autumn monitoring totalled 1.5 millimetres (mm) (Figure 2). No rain was recorded in the week leading up to the sampling. The water level at the time of sampling was low to moderate.





# 3.2 Visual survey

A summary of the visual survey observations, including photographs of each site, are presented in Annex 1.

The water level within Angus Creek at the time of the autumn sampling was low to moderate with no visible flow, except for site AE6 where slow flows were observed. The water level within Eastern Creek was lower than summer 2024 (Niche 2024), however the water level was still elevated above the lower banks at site AE5 under the foot bridge.

Overall, the streams were visibly reasonable condition for urban waterways within the locality. The upper banks of Angus Creek remain heavily vegetated with dense groundcover and riparian vegetation. The steep banks located at site AE1 are continuing to be affected by erosion post high flow events, with some sections observed to have undercutting of the banks below the water level. As previously observed in summer 2024 (Niche 2024) and spring 2023 (Niche 2023), both sites AE1 and AE2 were observed to have minimal organic matter present within the edged of the pools, and had microhabitats limited to woody debris and anthropogenic rubble. Site AE3, has suffered significant erosion from recent high flow events, with much of the groundcover vegetation on the left bank (looking downstream) being scoured (Annex 1 ), the channel has also suffered from erosion and channel incision from previous recent monitoring. Upstream site AE6 is currently being affected by landscaping works


and roadworks on the bridge above the stream, with completion of instream works consisting of in stream additions of sandstone boulders and cobble, and the removal of macrophyte beds.

The banks of Eastern Creek at both sites AE4 and AE5 are showing signs of erosion from recent high flow events, with the channels having been scoured out in sections, producing much deeper sections of the stream than previously observed. The higher banks of Eastern Creek appear to be unaffected by the recent high flows with the riparian vegetation in visually good condition.

All sites continue to have large amounts of anthropogenic litter present within the systems, observed in the water, on the banks and hanging in the lower branches of the riparian vegetation. Both Eastern Creek sites were visually turbid at the time of sampling, while all Angus Creek sites were visually higher clarity.

### 3.3 Water quality

### 3.3.1 Physico-chemical

Field recorded physico-chemical water quality results are shown in Table 4 below. Electrical conductivity was within the ANZG DGVs for all sites except for the potential impact site AE4 along Eastern Creek and Angus Creek upstream control site AE6, which were both below the DGVs for lowland streams. Overall, all sites recorded far lower EC levels than in the previous summer sampling (Niche 2024) and were relatively consistent between all sites with scores ranging between  $110 - 152 \mu$ S/cm with only minor differences between upstream and downstream. Turbidity was within DGVs at all Angus Creek sites, while being above DGVs for both Eastern Creek sites, as has been previously observed on multiple monitoring occasions. Dissolved oxygen (DO) was below DGVs for all sites except for upstream control AE6, which is typical of suburban lowland streams in Western Sydney. The pH levels at all sites were within DGVs. Alkalinity levels ranged from 80 – 160 with Angus Creek and are comparable to previous results.

Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo₃/L)
AE1	Angus Creek Control	16.56	140	10.5	68.8	7.80	140
AE2	Angus Creek Potential impact	16.58	147	11	58.3	7.44	160
AE3	Angus Creek Potential impact	16.6	152	14.1	57.3	7.35	140
AE4	Eastern Creek Potential impact	15.94	112	110.2	76.	6.93	80
AE5	Eastern Creek Control	15.95	125	103.9	77.1	7.10	80

#### Table 4: Field physico-chemical water quality results



Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo <sub>3</sub> /L)
AE6	Angus Creek Control	17.48	110	15.3	80.4	7.56	120

ANZG DGVs for lowland streams: Electrical conductivity (125-2200 µS/cm), Turbidity (6-50 NTU), pH (6.5-8.0), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the default trigger values

### 3.3.2 Nutrients

Total phosphorus, nitrogen oxides and total nitrogen were all above ANZG DGVs (Table 5) for lowland streams at all sites. These exceedances are within the range of previous results collected from these sites and is common for the monitoring program. Importantly, upstream control site AE6 recorded elevated nutrient levels above DGVs for all values. It is important to note that nutrient levels tend to be higher at upstream control sites rather than downstream impact sites. Total Nitrogen, Total Kjeldahl Nitrogen and Nitrogen oxides recorded highest scores at upstream sites.

Site	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen TN (TKN + NOx) (mg/L)	Nitrogen Oxides (NOx) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.07	1.4	0.91	0.5
AE2	Angus Creek Potential impact	0.06	1.2	0.83	0.4
AE3	Angus Creek Potential impact	0.06	1.2	0.81	0.4
AE4	Eastern Creek Potential impact	0.10	1.0	0.56	0.4
AE5	Eastern Creek Control	0.10	1.1	0.57	0.5
AE6	Angus Creek Control	0.08	1.7	1.19	0.5

#### Table 5: Nutrients - Laboratory results

ANZG default trigger values (DTVs) for lowland streams: TP (0.05 mg/L), TN (0.5 mg/L), NOx (0.02 mg/L). Text in bold indicate those variables that exceed the default trigger values.

### 3.3.3 Macroinvertebrate and SIGNAL2 scores

Macroinvertebrate and SIGNAL2 stream health index results are presented in Table 6. Raw data is provided in Annex 2.



The number of taxa was low, ranging between 4-11, with the most taxa (11) observed in Angus Creek downstream sites AE2 and AE3. The least taxa (4) observed was in Eastern Creek sites AE4 and AE5. The SIGNAL2 scores (Table 6) were below 4 at all sites, indicative of severe levels of pollution (Table 3). Angus Creek site AE2 and Eastern Creek site AE5 were the only sites to record sensitive macroinvertebrate families during this round of monitoring (Scirtidae at AE5 and Leptoceridae at AE2 – SIGNAL2 grade of 6). Sites AE2 and AE5 both recorded higher SIGNAL2 scores than the previous macroinvertebrate sampling round in spring 2023 (Niche 2023). While sites AE1, AE3 and AE6 all had marginally lower SIGNAL2 scores during autumn 2024.

Site AE4 (the furthest downstream potential impact site) recorded the same SIGNAL2 score as spring 2023, and commonly has lower overall scores than the other downstream potential impact sites. As is the case in this iteration of the monitoring program. This is likely to be at least partly due to the limited habitat available at this site. Overall, the stream health index results suggest that conditions at the potential downstream impact sites are comparable to those at the upstream controls.

Site	Stream	Number of taxa	SIGNAL2 weighted scores
AE1	Angus Creek Control	6	3.50
AE2	Angus Creek Potential impact	11	3.60
AE3	Angus Creek Potential impact	11	2.82
AE4	Eastern Creek Potential impact	4	2.33
AE5	Eastern Creek Control	4	3.17
AE6	Angus Creek Control	7	2.63

#### Table 6: Number of taxa and weighted SIGNAL2 scores: autumn 2024

The SIGNAL2 bi-plot (Figure 3), indicates that no sites have favourable habitat, and all locations are exhibiting some form of pollution or natural stress. Potential impact site AE2 (Angus Creek) recorded the highest SIGNAL2 score of any site but is still considered a low score. The control site results are observed to cluster together with potential impact site AE4, suggesting relatively consistent (poor) conditions across these sites. Potential impact sites AE2 and AE3 had a higher richness of less sensitive macroinvertebrate taxa, pushing the two sites further away from the cluster of control sites.





Figure 3: Bi-plot - SIGNAL2 and number of taxa scores



# 4 Discussion and conclusion

All sites have shown an overall decrease in electrical conductivity levels in autumn 2024 in comparison to the previous monitoring in summer 2024 (Niche 2024), with all sites being within DGVs, except for sites AE4 and AE6 being below DGVs. Turbidity levels were within DGVs at all Angus Creek sites, while being above DGVs at both Eastern Creek sites. Though high, Eastern Creek routinely has turbidity levels above DGVs and has been observed on most monitoring occasions. All sites showed dissolved oxygen levels below DGVs, with the exception of upstream site AE6, though this is to be expected for disturbed urban streams in the locality. All sites within Angus Creek and Eastern Creek recorded pH levels within the DGVs. Additionally, all nutrient analytes were above the DGVs for all sites. The exceedance in nutrient parameters have been routinely observed over the monitoring program in both upstream and downstream sites in Angus Creek and Eastern Creek. Importantly, the water quality results suggest that conditions at the potential downstream impact sites are comparable to those at the upstream controls in autumn 2024. Therefore, the data indicates that Holcim RDC is not affecting the receiving environment and any exceedance in water quality or poor environmental conditions observed are the result of existing catchment disturbances unrelated to the site operations.

Low numbers of taxa were observed in autumn 2024 at both upstream and downstream sites in both Angus and Eastern Creek. This pattern has also been observed in the previous monitoring period in spring 2023 (Niche 2023). Low SIGNAL2 scores (<4) were recorded at all sites and only two pollution sensitive macroinvertebrate taxa were found at the time of survey (Scirtidae at AE5 and Leptoceridae at AE2 – SIGNAL2 grade of 6). Considering the SIGNAL2 scores and the water quality results both upstream and downstream were comparable, it is unlikely that the RDC is affecting stream ecology. Furthermore, there is a variety of upstream impacts and land use activities that are likely to affect stream health conditions in these waterways and, as such, the low scores observed are likely the result of a combination of natural and anthropogenic catchment stressors, which is common in disturbed Western Sydney streams.

Overall, both Angus Creek and Eastern Creek appear to be in reasonable health for urban waterways. The physico-chemical and ecological results do not suggest that the RDC is affecting the downstream aquatic environment.



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# 7 Annex 1: Visual observations

AE1: Angus Creek Upstream



Upstream

Category	Attribute	AE1 Upstream				
Riparian	Vegetation	The dominant tree species comprised Swamp Oak ( <i>Casuarina glauca</i> ) and Broad-leaf Privet ( <i>Ligustrum lucidum</i> ). Groundcover was dominated by <i>Tradescantia fluminensis</i> .				
	Stream shading	Moderate shading				
	Exotic vegetation	L. lucidum and T. fluminensis				
Stream	Modal width	3 m				
characteristics	Bank condition	Slightly vegetated banks and stable. Slight erosion of lower bank.				
	Substrate	Fine sediment; silt. Hardened clay bottom.				
	Flow/depth	Moderate flow/ ~1 m				
	Macrophytes/algae	Macrophytes not present.				
	Water quality observations	Water visually clear				
Comments	Weeds and rubbish pre	sent. Lack of organic material in channel.				



## AE2: Angus Creek



Upstream

Category	Attribute	AE2 Downstream
Riparian	Vegetation	Dominant tree species included (C. glauca). Dominant groundcover was T. fluminensis and mixture of exotic and native grasses and herbs.
	Stream shading	Moderate shading
	Exotic vegetation	T. fluminensis and other groundcover species.
Stream	Modal width	2 m
characteristics	Bank Condition	Slightly unstable and heavily vegetated by groundcover
	Substrate	Silt and bedrock
	Flow/depth	Moderate flow/<1 m
	Macrophytes/algae	Emergent macrophytes present - Bulrush ( <i>Typha sp.</i> ), <i>Cyprus sp.</i> <i>Potamogeton crispus</i>
	Water quality observations	Water visually clear.
Comments	Weeds and rubbish. Me	tallic rubbish in system. Concrete rubble in system.



## AE3: Angus Creek Downstream



Upstream

Category	Attribute	AE3 Downstream				
Riparian	Vegetation	Dominant tree species was <i>C. glauca</i> . Dominant grass/herb species was <i>T. fluminensis</i>				
	Stream shading	Moderate shading				
	Exotic vegetation	L. Lucidum, T. fluminensis				
Stream characteristics	Modal width	4 m				
	Bank Condition	Stable, steep, exposed in sections, visible erosion.				
	Substrate	Fine sediment, organic matter on banks				
	Flow/depth	Low flow/~1 metre				
	Macrophytes/algae	Ribbon Weed ( <i>Vallisneria</i> sp.)				
	Water quality observations	Visually water appeared slightly turbid.				
Comments	Significant amount of e	erosion on banks.				



### AE4: Eastern Creek Downstream



Upstream

Category	Attribute	AE4 Downstream
Riparian	Vegetation	Dominant canopy species included <i>C. glauca</i> and Prickly-leaved Tea Tree ( <i>Melaleuca styphelioides</i> ). Dominant mid-storey species were <i>C. glauca L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>
	Stream shading	Moderate
	Exotic vegetation	L. lucidum and T. fluminensis
Stream	Modal width	8 m
Characteristics	Bank condition	Unstable banks
	Substrate	Fine sediment
	Flow/depth	Moderate flow/>1m
	Macrophytes/algae	Macrophytes not present
	Water quality observations	Visually turbid
Comments	Significant amount of p	plastic based rubbish in stream



## AE 5: Eastern Creek Upstream



Upstream

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	T. fluminensis
Stream characteristics	Modal width	12 m
	Bank condition	Unstable
	Substrate	Fine sediment and large woody debris.
	Flow/depth	Moderate flow/ >1 m
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Visually turbid
Comments	Lots of large woody de	bris and plastic based rubbish



## AE 6: Angus creek Upstream





Upstream

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	T. fluminensis
Stream	Modal width	5 m
characteristics	Bank condition	Stable, man-made.
	Substrate	Fine sediment and cobble
	Flow/depth	Moderate flow/ >1 m
	Macrophytes/algae	Macrophytes present.
	Water quality observations	Visually clear
Comments	Recent landscaping wor	ks have been conducted on stream edge.



8

# Annex 2: Macroinvertebrate data – autumn 2024

Site	AE1	AE2	AE3	AE4	AE5	AE6
Glossophionidae	1		19			3
Hydrobiidae		9	8			
Oligochaeta	1	3	3			1
Ostracoda	2	2	7			
Hydrophilidae			1	1	2	
Scirtidae					1	
Stratiomiyidae		1	1			
Tanypodinae		2	1			3
Chironominae	3	2	11	3		2
Veliidae				2	6	
Corixidae				3	2	1
Notonectidae			1			
Coenagrionidae		2	2			
Megapodagrionidae	5	4				
Libellulidae	1	3	1			2
Hydroptilidae		1				
Leptoceridae		1				
Tricladida						9



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# Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic Ecological Monitoring - Autumn 2024

Prepared for Holcim Australia Pty Ltd | 15/08/2024





#### Document control

Project number	Client	Project manager	LGA
8601	Holcim Australia Pty Ltd	David Wilkinson	Hills Shire

Version	Author	Review	Status	Comments	Date
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# 1 Introduction

# 1.1 Background

This document reports on results of the visual and stream health assessment of Angus Creek and Eastern Creek as part of the Holcim Regional Distribution Centre (RDC) (the Project) aquatic ecology monitoring program (hereafter referred to as the monitoring program). The monitoring program, including quarterly visual monitoring, bi-annual aquatic survey, and reporting, is required under condition 2.28 of the Project approval.

The aim of the monitoring program is to compare sites downstream of the RDC to upstream sites and determine whether the RDC is affecting stream health in receiving waterways, adjacent to or downstream of the Project. Aquatic ecological monitoring and visual monitoring of stream condition is conducted at six sites: four sites on Angus Creek and two sites on Eastern Creek.

This report presents the results of quarterly water quality monitoring undertaken for the winter period.



# 2 Methods

## 2.1 Monitoring sites

A total of six sites were sampled on Angus Creek and Eastern Creek (Figure 1, Table 1). Four sites were located on Angus Creek (two upstream and two downstream of the Project) and two sites were located on Eastern Creek (one upstream and one downstream of the Project).

#### Table 1: Location of monitoring sites

Site name	Location	Control / impact	Latitude	Longitude
AE1	Angus Creek upstream near property boundary	Control	-33.76798576	150.8516665
AE2	Angus Creek downstream -near property boundary in Nurragingy Reserve.	Potential impact	-33.76563506	150.854665
AE3	Angus Creek upstream of Eastern Creek confluence in Nurragingy Reserve.	Potential impact	-33.76496807	150.8554235
AE4	Eastern Creek downstream of Angus Creek in Nurragingy Reserve	Potential impact	-33.76419362	150.8576059
AE5	Eastern Creek upstream of Angus Creek in Nurragingy Reserve	Control	-33.76411307	150.8570044
AE6	Angus Creek upstream above railway.	Control	-33.77017801	150.8499068



## Figure 1: Location of monitoring sites



NSW Office of Environment and Heritage's BioNet Atlas, which holds the data from a number of custodians. Data Obtained 13/12/2023. | public/NSW\_Imagery: © Department of Customer Service 2020/ Terrain: Multi-Directional Hillshade: Airbox,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks an labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



# 2.2 Field methods

The field survey was undertaken on 25 July 2024 by Niche Aquatic Ecology Consultant David Wilkinson. The field methods were consistent with standardised techniques for field sampling as applied in previous iterations of the monitoring program.

### 2.2.1 Visual assessment

A description of aquatic habitat was produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

### 2.2.2 Water quality

#### Physico-chemical field measurements

Surface water quality was measured in situ using a Yeokal 618 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- рН
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO<sup>3</sup>/L) was measured with a standard titration kit. Water quality data were compared with the ANZG (2018) default guideline values (DGVs) of physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia.

#### Water sampling

Water samples were taken at each location and sent to ALS laboratories to test for Total Phosphorus (TP), Total Nitrogen (TN) (Nitrogen Oxides (NOx) +Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NOx.



# 3 Results

# 3.1 Rainfall

Antecedent rainfall from the month preceding the winter monitoring totalled 29.5 millimetres (mm) (Figure 2). No rain was recorded in the week leading up to the sampling. The water level at the time of sampling was low to moderate.





# 3.2 Visual survey

A summary of the visual survey observations, including photographs of each site, are presented in Annex 1.

The water level in Angus Creek at the time of the winter survey was low with no visible indication of flow. Within Eastern Creek, the water levels were low to moderate with the lower banks previously inundated in autumn (Niche 2024b) now exposed with areas of pooling water on top of these lower banks observed. Eastern Creek also showed no visible flow at the time of survey.

Overall, the streams continue to be in visibly reasonable condition for urban waterways within the locality. The upper banks of Angus Creek are showing some signs of slight die back of the previously heavily vegetated dense groundcover vegetation within the riparian zone, while the midstory and canopy species remain the same as previously observed. The steep banks at site AE1 continue to remain unstable and effected by undercutting erosional forces below the low water level line. Masses of exposed roots were also present within the channel from erosion on the channel banks (Annex 1). Sites AE1 and AE2 continue to have minimal build-up of organic detritus within the channels with the substrate comprising mainly of compact soil/hard clay with microhabitats limited to sparse woody debris and anthropogenic rubble. Site AE3 is still recovering from the significant erosional event that it suffered prior to the autumn 2024 surveys, with little ground cover regrowth present. The main channel below the road bridge is still visibly incised and is deeper than in previous rounds of survey (even with the lower overall water level).



Angus Creek sites AE1, AE2 and AE3 all had visible opaque discolouration to the water at the time of the Winter surveys, this discolouration has previously been observed at these sites (Niche 2022) and will be monitored during the next quarterly survey in spring 2024.

The banks of Eastern Creek at both sites AE4 and AE5 continue to suffer from instability, with the channels having been scoured out in sections, producing much deeper sections of the stream than previously observed as well as being continuously wetted and unable to dry. The higher banks of Eastern Creek appear to be unaffected and the riparian vegetation leading into the parkland is in visually good condition.

All sites continue to have large amounts of anthropogenic litter present within the systems, observed in the water, on the banks and hanging in the lower branches of the riparian vegetation. Both Eastern Creek sites were visually turbid at the time of sampling, while all Angus Creek sites were visually higher clarity.

It has been previously noted in summer (Niche 2024a) and autumn (Niche 2024b) that the upstream site AE6 has undergone instream works to construct a raised walking path as well as excavation of existing substrate and macrophyte beds. During the winter 2024 survey it was noted that these instream works have now expanded to include a major instream modification with the construction of a culvert (Plate 1). This construction has the potential to alter flow conditions and water quality conditions downstream. While this level of modification is within the range of disturbances common in the locality, interpretation of data collected from this site must take these modifications into account.





Plate 1: Angus Creek control site AE6 culvert (looking downstream)



## 3.3 Water quality

### 3.3.1 Physico-chemical readings

Field recorded physico-chemical water quality results are shown in Table 2 below. Electrical conductivity levels were elevated across all sites and above ANZG DVG's at all sites except AE5. All sites recorded higher EC levels than in the autumn monitoring (Niche 2024b) as well as winter 2023 monitoring (Niche 2023) which were within DGVs. Angus Creek potential impact sites AE2, AE3 and AE4 had comparable readings of around 2900  $\mu$ S/cm, exceeding DGVs. While Angus Creek control sites AE1 and AE6 both recorded electrical conductivity readings beyond 3000  $\mu$ S/cm, exceeding DGVs also, indicating elevated electrical conductivity levels occur upstream of the RDC. Control site. AE5 on Eastern Creek was considerably lower than other sites (972  $\mu$ S/cm) and was within DGVs at the time of sampling.

Turbidity was within DGVs for all sites, with the exception of AE5 which exceeded the upper DGV range. Site AE1 recorded turbidity levels below the DGV range, however this is not considered deleterious to stream health conditions. Elevated turbidity at sites AE4 and AE5 is consistent with previous monitoring (Niche 2023d, 2024a). Dissolved oxygen was below DGVs for all sites, except for upstream control AE6. Low dissolved oxygen levels are typical of suburban lowland streams in Western Sydney.

The pH levels at all sites were above DGV levels, with sites ranging between 8.41 – 8.95 pH units (with upstream site AE6 recording the highest). The pH results were comparable between the upstream controls and downstream potential impact sites at the time of sampling.

Alkalinity levels ranged from 140 – 440 mg CaCo<sub>3</sub>/L, an increase from autumn monitoring (Niche 2024b), with Angus Creek sites recording 400 - 460 mg CaCo<sub>3</sub>/L. Sites AE5 and AE4 recorded lower alkalinity levels, not exceeding 200 mg CaCo<sub>3</sub>/L.

Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo₃/L)
AE1	Angus Creek Control	10.04	3088	2.9	53.4	8.48	440
AE2	Angus Creek Potential impact	9.89	2884	10.5	40.5	8.44	400
AE3	Angus Creek Potential impact	9.89	2880	10.4	40.3	8.41	400
AE4	Eastern Creek Potential impact	9.96	2945	45.5	39.9	8.49	200
AE5	Eastern Creek Control	9.24	972	108.5	74.4	8.89	140

#### Table 2: Field physico-chemical water quality results



Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo₃/L)
AE6	Angus Creek Control	10.20	3138	3.5	96.0	8.95	460

ANZG DGVs for lowland streams: Electrical conductivity (125-2200 µS/cm), Turbidity (6-50 NTU), pH (6.5-8.0), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the default trigger values

### 3.3.2 Nutrients

Total Phosphorus, Nitrogen Oxides, and Total Nitrogen levels exceeded (ANZG DGVs) for lowland streams at all sites (Table 3). While exceedances of the DGVs have been frequently recorded as part of the monitoring program, the current results indicate an increase compared to data from the last survey in autumn 2024 (Niche 2024b) and the previous equivalent survey in winter 2023 (Niche 2023). The results indicate that elevated nutrient levels occur upstream of the RDC. While the nutrient levels are observed to increase progressively downstream along Angus Creek (and are higher at the potential impact sites) this trajectory is observed between sites AE6 (most upstream control) and AE1 (upstream control). This is suggestive that the increasing levels of nutrients with distance downstream may be related to catchment processes, rather than the project.

#### Table 3: Nutrients - Laboratory results

Site	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen TN (TKN + NOx) (mg/L)	Nitrogen Oxides (NOx) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.07	1.4	0.65	0.8
AE2	Angus Creek Potential impact	0.07	2.1	0.70	1.4
AE3	Angus Creek Potential impact	0.12	2.6	0.76	1.8
AE4	Eastern Creek Potential impact	0.14	2.2	0.96	1.2
AE5	Eastern Creek Control	0.11	1.9	0.96	0.9
AE6	Angus Creek Control	0.05	1.2	0.71	0.5



ANZG default trigger values (DTVs) for lowland streams: TP (0.05 mg/L), TN (0.5 mg/L), NOx (0.02 mg/L). Text in bold indicate those variables that exceed the default trigger values.



# 4 Discussion and conclusion

The results of the winter 2024 quarterly monitoring recorded a significant increase in electrical conductivity levels at all sites when compared to autumn 2024 (Niche 2024b), with all sites being above DGVs with the exception of Eastern Creek site AE5. Higher rainfall before sampling is likely to have contributed to increased urban and parkland runoff resulting in higher EC scores across all sites. Turbidity levels in both Angus Creek and Eastern Creek were relatively consistent with previous observations, with Eastern Creek site AE5 being the only site above DGVs at the time of sampling. Though AE5 recorded high turbidity levels, Eastern Creek has routinely recorded turbidity levels above DGVs and has been observed on most occasions to exceed these values. All sites showed dissolved oxygen levels below DGVs, except for upstream Angus Creek control site AE6, though this is to be expected for highly disturbed urban streams in the locality. All sites within Angus Creek and Eastern Creek recorded a pH reading exceeding the ANZG DGVs, with upstream control AE6 having the highest recorded value.

Additionally, all nutrient analytes were above the ANZG DGVs for all six sites surveyed this monitoring period. The exceedance in nutrient parameters has been continuously observed over the monitoring program in both upstream and downstream sites in Angus Creek and Eastern Creek. While nutrient levels were slightly higher at downstream sites, increased levels were recorded across all sites. It is likely that downstream sites are naturally impacted by overarching environmental factors to a greater extent.

Overall, the two streams appear to be in reasonable health for urban waterways. The physico-chemical results do not suggest that the RDC is affecting the downstream aquatic environment, though the trends in nutrient levels within the downstream environment will need to be reassessed in detail with reference to macroinvertebrate data in the next round of monitoring in spring.

The significant in-stream construction works that have been completed at the Angus Creek upstream site AE6 will need to be monitored and considered in future for potential changes in flow regime downstream as well as potential impacts to the stream health of the downstream environment.



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# 7 Annex 1: Visual observations

AE1: Angus Creek Upstream





### Upstream

Category	Attribute	AE1 Upstream
Riparian	Vegetation	The dominant tree species comprised Swamp Oak ( <i>Casuarina glauca</i> ) and Broad-leaf Privet ( <i>Ligustrum lucidum</i> ). Groundcover was dominated by <i>Tradescantia fluminensis</i> .
	Stream shading	Moderate shading
	Exotic vegetation	L. lucidum and T. fluminensis
Stream	Modal width	3 m
characteristics	Bank condition	Slightly vegetated banks and stable. Slight erosion of lower bank.
	Substrate	Fine sediment; silt. Hardened clay bed.
	Flow/depth	No visible flow
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Surface water visually clear
Comments	Weeds and rubbish present. Lack of submerged organic material in channel. Some floating leaf debris at time of sampling.	



## AE2: Angus Creek



Upstream

Category	Attribute	AE2 Downstream	
Riparian	Vegetation	Dominant tree species included (C. glauca). Dominant groundcover was T. fluminensis and mixture of exotic and native grasses and herbs.	
	Stream shading	Moderate shading	
	Exotic vegetation	T. fluminensis and other groundcover species.	
Stream characteristics	Modal width	2 m	
characteristics	Bank Condition	Slightly unstable and heavily vegetated by groundcover	
	Substrate	Silt and bedrock	
	Flow/depth	No visible flow	
	Macrophytes/algae	Emergent macrophytes present - Bulrush (Typha sp.), Cyprus sp. Potamogeton crispus	
	Water quality observations	Water visually clear.	
Comments	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.		



## AE3: Angus Creek Downstream



Upstream

Category	Attribute	AE3 Downstream	
Riparian	Vegetation	Dominant tree species was <i>C. glauca</i> . Dominant grass/herb species was <i>T. fluminensis</i>	
	Stream shading	Moderate shading	
	Exotic vegetation	L. Lucidum, T. fluminensis	
Stream	Modal width	4 m	
characteristics	Bank Condition	Stable, steep, exposed in sections, visible erosion.	
	Substrate	Fine sediment, organic matter on banks	
	Flow/depth	No visible flow	
	Macrophytes/algae	Macrophytes not present.	
	Water quality observations	Visually water appeared slightly opaque.	
Comments	Significant amount of erosion on banks.		



### AE4: Eastern Creek Downstream



Upstream

Category	Attribute	AE4 Downstream	
Riparian	Vegetation	Dominant canopy species included <i>C. glauca</i> and Prickly-leaved Tea Tree ( <i>Melaleuca styphelioides</i> ). Dominant mid-storey species were <i>C. glauca, L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i> .	
	Stream shading	Moderate	
	Exotic vegetation	L. lucidum and T. fluminensis	
Stream	Modal width	8 m	
characteristics	Bank condition	Unstable banks	
	Substrate	Fine sediment	
	Flow/depth	No visible flow	
	Macrophytes/algae	Macrophytes not present	
	Water quality observations	Visually turbid	
Comments	Significant amount of plastic based rubbish in stream		


## AE 5: Eastern Creek Upstream



Upstream

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	T. fluminensis
Stream	Modal width	12 m
Characteristics	Bank condition	Unstable
	Substrate	Fine sediment and large woody debris.
	Flow/depth	Low/no flow
	Macrophytes/algae	Macrophytes not present.
	Water quality observations	Visually turbid
Comments	Lots of large woody de	bris and plastic based rubbish



# AE 6: Angus creek Upstream



## Upstream

Category	Attribute	AE5 Upstream	
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>L. longifolia</i> ) and groundcover <i>T. fluminensis</i> .	
	Stream shading	Moderate	
	Exotic vegetation	T. fluminensis	
Stream characteristics	Modal width	5 m	
	Bank condition	Stable, man-made.	
	Substrate	Fine sediment and cobble	
	Flow/depth	No visible flow	
	Macrophytes/algae	Macrophytes present.	
	Water quality observations	Visually clear	
Comments	Recent landscaping works have been conducted on stream edge. With major instream works including the addition of a culvert being built within the stream.		



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# Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic Ecological Monitoring - Spring 2024

Prepared for Holcim Australia Pty Ltd | 10/01/2025



#### Document control

Project number	Client	Project manager	LGA
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# 1 Introduction

# 1.1 Background

This document reports on results of the visual and stream health assessment of Angus Creek and Eastern Creek as part of the Holcim Regional Distribution Centre (RDC) (the Project) aquatic ecology monitoring program (hereafter referred to as the monitoring program). The monitoring program, including quarterly visual monitoring, bi-annual aquatic survey, and reporting, is required under condition 2.28 of the Project approval.

The aim of the monitoring program is to compare sites downstream of the RDC to upstream sites and determine whether the RDC is affecting stream health in receiving waterways, adjacent to or downstream of the Project.

This report presents the results of bi-annual aquatic macroinvertebrate monitoring undertaken on 4 December 2024 by Aquatic Ecologist David Wilkinson. Aquatic ecological monitoring and visual monitoring of stream condition was conducted at six sites: four sites on Angus Creek and two sites on Eastern Creek.



# 2 Methods

## 2.1 Project overview

A total of six sites were sampled on Angus Creek and Eastern Creek (Figure 1, Table 1). Four sites were located on Angus Creek (two upstream and two downstream of the Project) and two sites were located on Eastern Creek (one upstream and one downstream of the Project).

#### Table 1: Location of monitoring sites

Site name	Location	Control / impact	Latitude	Longitude
AE1	Angus Creek upstream near property boundary	Control	-33.76798576	150.8516665
AE2	Angus Creek downstream -near property boundary in Nurragingy Reserve.	Potential impact	-33.76563506	150.854665
AE3	Angus Creek upstream of Eastern Creek confluence in Nurragingy Reserve.	Potential impact	-33.76496807	150.8554235
AE4	Eastern Creek downstream of Angus Creek in Nurragingy Reserve	Potential impact	-33.76419362	150.8576059
AE5	Eastern Creek upstream of Angus Creek in Nurragingy Reserve	Control	-33.76411307	150.8570044
AE6	Angus Creek upstream above railway.	Control	-33.77017801	150.8499068



NSW Office of Environment and Heritage's BioNet Atlas, which holds the data from a number of custodians. Data Obtained 13/12/2023. | public/NSW\_Imagery: © Department of Customer Service 2020/ Terrain: Multi-Directional Hillshade: Airbox,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community | Watercourses, Waterbodies, Road and Rail alignments, Protected areas of NSW © Spatial Services 2021. | Niche uses GDA2020 as standard for all project-related data. In order to ensure that data from numerous sources and coordinate systems is aligned, on-the-fly transformation to GDA2020 MGA Zone 56 is used in the map above. For ease of reference, the grid tick marks an labels shown around the border of the map are presented in GDA2020 MGA Zone 56.



# 2.2 Field methods

The field survey was undertaken on the 4<sup>th</sup> of December 2024 by Aquatic Ecology Consultant David Wilkinson of Niche. The field methods were consistent with standardised techniques for field sampling as applied in previous iterations of the monitoring program.

#### 2.2.1 Visual assessment

A description of aquatic habitat was also produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

#### 2.2.2 Water quality

#### 2.2.2.1 Physico-chemical field measurements

Surface water quality was measured in situ using a Yeokal 618 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- рН
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO<sup>3</sup>/L) was measured with a standard titration kit. Water quality data were compared with the ANZG (2018) default guideline values (DGVs) of physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia.

#### 2.2.2.2 Water sampling

Water samples were taken at each location and sent to ALS laboratories to test for Total Phosphorus (TP), Total Nitrogen (TN) (Nitrogen Oxides (NOx) +Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NOx.

#### 2.2.3 Macroinvertebrates

Samples were collected from pool edges for a length of 10 metres, either as a continuous line or in disconnected segments. Sampling in segments was undertaken to ensure the sub-habitats such as macrophyte beds, bank overhangs, submerged branches and root mats were appropriately sampled. Segmented sampling was also employed where pool length was short, and it was logistically difficult to sample in a continuous line (e.g. instream logs). A 250 µm dip net was drawn through the water with short sweeps towards the bank to dislodge benthic fauna while scraping submerged rocks and debris, sides of the stream bank and the bed substrate. Further sweeps in the water column targeted suspended fauna. Each sample was rinsed from the net onto a white sorting tray from which animals were picked using forceps, pipettes and or paint brushes. Each tray was picked for a minimum period of 40 minutes, after which they were picked at 10-minute intervals for either a total



of one hour or until no new specimens had been found. Care was taken to collect cryptic and fast-moving animals, in addition to those that were conspicuous or slow. The macroinvertebrates collected at each site were placed into a labelled jar containing 70% ethanol.

#### 2.2.3.1 Laboratory methods invertebrate identification

Macroinvertebrate samples were identified to family level with the exception of Oligochaeta (to class), Polychaeta (to class), Ostracoda (to subclass), Nematoda (to phylum), Nemertea (to phylum), Acarina (to order) and Chironomidae (to subfamily). Keys used to identify fauna included:

- Dean, J., Rosalind, M., St Clair, M., and Cartwright, D. (2004) Identification keys to Australian families and genera of caddis-fly larvae (Trichoptera). Cooperative Research Centre for Freshwater Ecology.
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- Online resource <u>http://www.mdfrc.org.au/bugguide/</u>.

### 2.3 Data analysis

#### 2.3.1 SIGNAL2 (Stream Invertebrate Grade Number Average Level) scores

The revised SIGNAL2 biotic index developed by Chessman (2003a, 2003b) was used to determine the "environmental quality" of sites. This method assigns grade numbers to each macroinvertebrate family or taxa found, based largely on their response to a range of environmental conditions (Table 2). The sum of all grade numbers for that habitat is then divided by the total number of families recorded in each habitat to calculate the SIGNAL2 index. A weighted SIGNAL2 score was also calculated (see Chessman 2003b). The SIGNAL2 index therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site. Table 3 provides a broad guide for interpreting the health of the site according to the SIGNAL2 score of the site.

#### Table 2: SIGNAL2 grade and the level of pollution tolerance for individual taxa

SIGNAL2 grade (individual taxa)	Pollution tolerance
10-8	Indicates a greater sensitivity to pollution
7-5	Indicates a sensitivity to pollution
4-3	Indicates a tolerance to pollution
2-1	Indicates a greater tolerance to pollution



## Table 3: SIGNAL2 score interpretation

SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution



# 3 Results

# 3.1 Rainfall

Antecedent rainfall from the month preceding the spring monitoring totalled 49 millimetres (mm) (Figure 2). 26 mm of rain was recorded in the week leading up to the sampling. No rain was recorded for two days before sampling. The water level at the time of sampling was low to moderate.



Figure 2: Rainfall January to December 2024

### 3.2 Visual survey

A summary of the visual survey observations, including photographs of each site, are presented in Annex 1.

The water level within Angus Creek at the time of the spring sampling was low to moderate with slow flows observed. The water level within Eastern Creek was similar to winter 2024 (Niche 2024) with water levels elevated above the lower banks at site AE5 under the foot bridge.

Overall, the streams were visibly reasonable condition for urban waterways within the locality. The upper banks of Angus Creek remain heavily vegetated with dense groundcover and riparian vegetation. The steep banks located at site AE1 are continuing to be affected by erosion with some sections observed to have progressive undercutting of the banks below the water level. Some of the erosional activity can also be attributed to feral deer activity, as deer were observed entering and exiting the creek at Site AE1. As previously observed in winter 2024 (Niche 2024) and spring 2023 (Niche 2023), both sites AE1 and AE2 were observed to have minimal organic matter present within the edges of the pools, and microhabitats were limited to woody debris and anthropogenic rubble and plastics. Site AE3, is recovering from significant erosion that was observed in Winter 2024 (Annex 1). The channel incision from previous recent monitoring is also recovering, with a significant amount of sediment now accumulating along with organic matter. Upstream site AE6 is currently being affected



by landscaping works and major roadworks on the bridge above the stream, with completion of instream works consisting of in stream additions of boulders and cobble, and the removal of macrophyte beds.

The banks of Eastern Creek at both sites AE4 and AE5 are continuing to show signs of erosion and instability, with the channels having been scoured out in sections, producing much deeper sections of the stream than previously observed. The higher banks of Eastern Creek appear to be less affected, and the riparian vegetation in visually good condition.

All sites continue to have large amounts of anthropogenic litter present within the systems, observed in the water, on the banks and hanging in the lower branches of the riparian vegetation. Both Eastern Creek sites were visually turbid at the time of sampling, while all Angus Creek sites were visually higher water clarity.

### 3.3 Water quality

#### 3.3.1 Physico-chemical

Field recorded physico-chemical water quality results are shown in Table 4 below. Electrical conductivity was within the ANZG DGVs for all sites, though considerably higher at control site AE6 and decreasing downstream. Turbidity was within DGVs at all sites. Turbidity was typically higher at Eastern Creek sites compared to Angus Creek which has been recorded in previous monitoring rounds (Niche 2023 and Niche 2024). Turbidity was elevated at site AE3 but still within DGV's. Dissolved oxygen (DO) was within DGV's for all sites except for AE3 (67.4%). The pH levels at all sites were within DGVs. Alkalinity levels were relatively consistent between sites ranging from 100 – 160mg CaCo3/L which is comparable to previous results.

Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	рН*	Alkalinity (mg CaCo₃/L)
AE1	Angus Creek Control	23.18	937	3.9	89.9	7.01	140
AE2	Angus Creek Potential impact	22.87	813	0.3	91	6.94	140
AE3	Angus Creek Potential impact	22.83	785	20.9	67.4	6.94	160
AE4	Eastern Creek Potential impact	23.61	483	20.7	109.2	6.7	100
AE5	Eastern Creek Control	23.76	468	27.5	103.5	6.77	120
AE6	Angus Creek Control	24.84	1322	8.4	108.6	7.03	180

#### Table 4: Field physico-chemical water quality results

ANZG DGVs for lowland streams: Electrical conductivity (125-2200 µS/cm), Turbidity (6-50 NTU), pH (6.5-8.0), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the default trigger values



#### 3.3.2 Nutrients

Total phosphorus, total Nitrogen and nitrogen oxides were above ANZG DGVs (Table 5) for lowland streams at all sites. These exceedances are within the range of previous results collected from these sites and is common for the monitoring program. Importantly, it was the upstream control sites recorded the highest Nitrogen Oxides and Total Nitrogen scores. It is also important to note that nutrient levels continue to tend to be higher at the upstream control sites as previously observed (Niche 2024).

Site	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen TN (TKN + NOx) (mg/L)	Nitrogen Oxides (NOx) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.15	0.9	0.27	0.6
AE2	Angus Creek Potential impact	0.18	0.6	0.02	0.6
AE3	Angus Creek Potential impact	0.19	0.7	0.02	0.7
AE4	Eastern Creek Potential impact	0.15	0.8	0.19	0.6
AE5	Eastern Creek Control	0.13	0.9	0.24	0.7
AE6	Angus Creek Control	0.17	0.8	0.02	0.8

#### Table 5: Nutrients - Laboratory results

ANZG default trigger values (DTVs) for lowland streams: TP (0.05 mg/L), TN (0.5 mg/L), NOx (0.02 mg/L). Text in bold indicate those variables that exceed the default trigger values.

#### 3.3.3 Macroinvertebrate and SIGNAL2 scores

Macroinvertebrate and SIGNAL2 stream health index results are presented in Table 6. Raw data is provided in Annex 2.

The number of taxa was low, ranging between 5-13, with the most taxa (13) at the Angus Creek control site AE5. The least taxa (5) observed was at the Eastern Creek control site AE1. The SIGNAL2 scores (Table 6) were below 4 at all sites, indicative of severe levels of pollution (Table 3). Downstream Angus Creek Site AE3 recorded a sensitive macroinvertebrate taxa (Acarina – SIGNAL2 grade of 6). Upstream control Eastern Creek Site AE5 recorded two sensitive macroinvertebrate taxa (Telephebiidae – SIGNAL2 grade 9 and Leptoceridae – grade 6). Signal 2 scores at the two downstream sites AE3 and AE4 were higher than the upstream control sites (AE1, AE2 and AE6). These three control sites recorded declines in SIGNAL2 scores when compared to Spring 2023 (Niche 2023).

This is likely to be at least partly due to the limited habitat available at this site. Overall, the stream health index results suggest that conditions at the downstream potential impact sites are comparable to those at the upstream controls.



Site	Stream	Number of taxa	SIGNAL2 weighted scores
AE1	Angus Creek Control	5	2.0
AE2	Angus Creek Potential impact	7	2.4
AE3	Angus Creek Potential impact	9	3.4
AE4	Eastern Creek Potential impact	6	2.9
AE5	Eastern Creek Control	13	3.5
AE6	Angus Creek Control	6	2.3

#### Table 6: Number of taxa and weighted SIGNAL2 scores: summer 2024

The SIGNAL2 bi-plot (Figure 3), indicates that no sites have favourable habitat, and all locations are exhibiting some form of pollution or natural stress. Control site AE5 (Eastern Creek) recorded the highest SIGNAL2 score of any site but is still considered a low score. The Angus Creek control site results are observed to cluster together with potential impact sites AE2 and AE4, suggesting relatively consistent (poor) conditions across these sites.

Potential impact sites AE2 and AE3 had a higher richness of less sensitive macroinvertebrate taxa, pushing the two sites further away from the cluster of control sites.





Figure 3: Bi-plot - SIGNAL2 and number of taxa scores



# 4 Discussion and conclusion

All sites have shown an overall increase in electrical conductivity levels in Spring 2024 in comparison to the previous monitoring in Winter 2024 (Niche 2024), with all sites, though elevated, within DGVs.

Overall, the physico-chemical water quality across all sites recorded almost all parameters being within DGVs, with the only exception being dissolved oxygen at Site AE3. Turbidity levels were within DGVs and represented an improvement from the previous spring monitoring (Niche 2023). Turbidity is typically higher at sites AE4 and AE5 (Niche 2023, 2024), although observed in Spring 2024 this was less pronounced. Turbidity was higher at downstream site AE3 compared to the Angus creek control sites, although still within DGV's and comparable to previous monitoring (Niche 2023). Dissolved oxygen is typically low at Angus and Eastern creeks as is characteristic of urban streams in Western Sydney. In Spring 2024 DO levels were within DGV's at all sites except for one, marking an improvement over previous assessment (Niche 2023, 2024). This is potentially due to rainfall in the week leading up to the survey. pH levels were within DGV's across all sites.

Additionally, all nutrient analytes were above the DGVs for all sites. The exceedance in nutrient parameters have been routinely observed over the course of the monitoring program in both upstream and downstream sites in Angus Creek and Eastern Creek. Importantly, the water quality results suggest that conditions at the potential downstream impact sites are comparable to those at the upstream controls in spring 2024. Therefore, the data indicates that Holcim RDC is not affecting the receiving environment and any exceedance in water quality or poor environmental conditions observed are the result of existing catchment disturbances unrelated to the site operations.

Low numbers of taxa were observed in spring 2024 at both upstream and downstream sites in both Angus and Eastern Creek. This pattern has also been observed in the previous monitoring period in spring 2023 and Autumn 2024 (Niche 2023 and Niche 2024). Low SIGNAL2 scores (<4) were recorded at all sites. Downstream Angus Creek Site AE3 recorded sensitive macroinvertebrate taxa (Acarina – SIGNAL2 grade of 6) and Upstream control Eastern Creek Site AE5 recorded two sensitive macroinvertebrate taxa (Telephebiidae – SIGNAL2 grade 9 and Leptoceridae – grade 6). Considering the SIGNAL2 scores and the water quality results both upstream and downstream were comparable, it is unlikely that the RDC is affecting stream ecology. Furthermore, there is a variety of upstream impacts and land use activities that are likely to affect stream health conditions in these waterways and, as such, the low scores observed are likely the result of a combination of natural and anthropogenic catchment stressors, which is common in disturbed Western Sydney streams.

Overall, both Angus Creek and Eastern Creek appear to be in reasonable health for urban waterways. The physico-chemical and ecological results do not suggest that the RDC is affecting the downstream aquatic environment.



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Online resources:



http://ausrivas.ewater.com.au http://www.mdfrc.org.au/bugguide



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# 7 Annex 1: Visual observations

AE1: Angus Creek Upstream



Upstream

Category	Attribute	AE1 Upstream	
Riparian	Vegetation	The dominant tree species comprised Swamp Oak ( <i>Casuarina glauca</i> ) and Broad-leaf Privet ( <i>Ligustrum lucidum</i> ). Groundcover was dominated by <i>Tradescantia fluminensis</i> .	
	Stream shading	Moderate shading	
	Exotic vegetation	L. lucidum and T. fluminensis	
Stream characteristics	Modal width	3 m	
	Bank condition	Slightly vegetated banks and stable. Slight erosion of lower bank.	
	Substrate	Fine sediment; silt. Hardened clay bottom.	
	Flow/depth	Moderate flow/ ~1 m	
	Macrophytes/algae	Macrophytes not present.	
	Water quality observations	Water visually clear	
Comments	Weeds and rubbish present. Lack of organic material in channel.		



## AE2: Angus Creek



Upstream

Category	Attribute	AE2 Downstream		
Riparian	Vegetation	Dominant tree species included (C. glauca). Dominant groundcover was T. fluminensis and mixture of exotic and native grasses and herbs.		
	Stream shading	Moderate shading		
	Exotic vegetation	T. fluminensis and other groundcover species.		
Stream characteristics	Modal width	2 m		
	Bank Condition	Slightly unstable and heavily vegetated by groundcover		
	Substrate	Silt and bedrock		
	Flow/depth	Moderate flow/<1 m		
	Macrophytes/algae	Emergent macrophytes present - Bulrush (Typha sp.), Cyprus sp. Potamogeton crispus		
	Water quality observations	Water visually clear.		
Comments	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.			



## AE3: Angus Creek Downstream



Upstream

Category	Attribute	AE3 Downstream			
Riparian	Vegetation	Dominant tree species was <i>C. glauca</i> . Dominant grass/herb species was <i>T. fluminensis</i>			
	Stream shading	Moderate shading			
	Exotic vegetation	L. Lucidum, T. fluminensis			
Stream characteristics	Modal width	4 m			
	Bank Condition	Stable, steep, exposed in sections, visible erosion.			
	Substrate	Fine sediment, organic matter on banks			
	Flow/depth	Low flow/~1 metre			
	Macrophytes/algae	Ribbon Weed ( <i>Vallisneria</i> sp.)			
	Water quality Visually water appeared slightly turbid. observations				
Comments	Significant amount of erosion on banks.				



#### AE4: Eastern Creek Downstream



Upstream

Category	Attribute	AE4 Downstream		
Riparian	Vegetation	Dominant canopy species included <i>C. glauca</i> and Prickly-leaved Tea Tree ( <i>Melaleuca styphelioides</i> ). Dominant mid-storey species were <i>C. glauca L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>		
	Stream shading	Moderate		
	Exotic vegetation	. lucidum and T. fluminensis		
Stream characteristics	Modal width	8 m		
	Bank condition	Unstable banks		
	Substrate	Fine sediment		
	Flow/depth	Moderate flow/>1m		
	Macrophytes/algae	Macrophytes not present		
	Water quality observations	Visually turbid		
Comments	Significant amount of plastic based rubbish in stream			



## AE 5: Eastern Creek Upstream



Upstream

Category	Attribute	AE5 Upstream		
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .		
	Stream shading	Moderate		
	Exotic vegetation	T. fluminensis		
Stream characteristics	Modal width	12 m		
	Bank condition	Unstable		
	Substrate	Fine sediment and large woody debris.		
	Flow/depth	Moderate flow/ >1 m		
	Macrophytes/algae	Macrophytes not present.		
	Water quality observations	Visually turbid		
Comments	Lots of large woody debris and plastic based rubbish			



## AE 6: Angus creek Upstream



Upstream

Category	Attribute	AE5 Upstream	
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was Lomandra ( <i>Lomandra longifolia</i> ) and groundcover <i>T. fluminensis</i> .	
	Stream shading	Moderate	
	Exotic vegetation	T. fluminensis	
Stream characteristics	Modal width	5 m	
	Bank condition	Stable, man-made.	
	Substrate	Fine sediment and cobble	
	Flow/depth	Moderate flow/ >1 m	
	Macrophytes/algae	Macrophytes present.	
	Water quality observations	Visually clear	
Comments	Recent landscaping works have been conducted on stream edge.		



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# Annex 2: Macroinvertebrate data – spring 2024

Site	AE1	AE2	AE3	AE4	AE5	AE6
Lumbriculidae	4	2	1			4
Sphaeriidae			1			
Lymnaeidae	10	37	5	3	1	1
Physidae	4	2		1	2	3
Baetidae					4	
Coengrionidae		1			6	
lsostictidae					4	
Megapodagrionidae					3	
Gomphidae				1		
Libellulidae				1		
Hemicorduliidae		1	3			
Telephebiidae					1	
Corixidae			3		7	2
Veliidae					5	
Chironominae (subfamily)	2	3	24	38	22	79
Tanypodinae (subfamily)	1	6	3	3	5	
Leptoceridae					4	



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### Our Expertise



Natural capital and offsetting

Ecology

7 Heritage S management



Environmental planning, approvals and management

Spatial Services



Appendix E –

2024 Bushland Regeneration Report by Toolijooa Environmental Restoration



# **Toolijooa Environmental Restoration**

# Holcim Australia – Rooty Hill Distribution Centre

Bushland Regeneration Report November 2023 – December 2024 [Blank Page]

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# 1. Summary of Works

Zone	Type of Work	Weed Type	Work Description	
DECEMBER 2023				
Depot	Maintenance	Herbaceous	<ul> <li>Slashing was undertaken at Snake Alley.</li> <li>The area around the office was mown.</li> <li>Weeds around the office, depot, loading zone, sound walls, beside the conveyor belt, Snake Alley and the rails were sprayed with a 2% Roundup Biactive® solution. This was to improve aesthetics, mitigate fire hazards, and reduce animal habitat in working areas.</li> <li>Weeds targeted included: Bidens pilosa, Chloris gayana, Cirsium vulgare, Conyza sp., Echinochloa crus-galli, Paspalum dilatatum, Solanum sisymbriifolium, Sonchus oleraceus, and Varbana banariansir.</li> </ul>	
JANUARY 2024				
Depot	Maintenance	Herbaceous	<ul> <li>Slashing was undertaken at Snake Alley.</li> <li>The area around the office was mown.</li> <li>Weeds around the office, depot, loading zone, central sound wall, conveyor belt, Snake Alley and the rails were sprayed with a 2% Roundup Biactive® solution. This was to improve aesthetics, mitigate fire hazards, and reduce animal habitat in working areas.</li> <li>Weeds targeted included: Bidens pilosa, Chloris gayana, Cirsium vulgare, Conyza sp., Echinochloa crus-galli, Paspalum dilatatum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>	
	Γ	FEBR	UARY 2024	
Depot	Maintenance	Herbaceous	<ul> <li>The area around the office was mown.</li> <li>Weeds around the office, central sound wall, and snake alley were sprayed with a 2% Roundup Biactive® and 1g/10L Associate Herbicide solution. This was to improve aesthetics, mitigate fire hazards, and reduce animal habitat in working areas.</li> </ul>	

Zone	Type of Work	Weed Type	Work Description
			<ul> <li>Weeds targeted included: Bidens pilosa, Chloris gayana, Cirsium vulgare, Conyza sp., Echinochloa crus-galli, Paspalum dilatatum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>
		MA	RCH 2024
Depot	Maintenance	Herbaceous	<ul> <li>Overgrown vegetation was slashed behind the soundwall and the eastern and western ends of the rails.</li> <li>Weeds behind the soundwall, the road heading towards the rails, around the conveyor belt and around the buildings at the rails were sprayed with a 2% Roundup</li> </ul>
			Biactive® and 1g/10L Associate Herbicide solution. This was to improve aesthetics, mitigate fire hazards, and reduce animal habitat in working areas.
			<ul> <li>Weeds targeted included: Bidens pilosa, Chloris gayana, Cirsium vulgare, Conyza sp., Echinochloa crus-galli, Paspalum dilatatum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>
	Other	N/A	<ul> <li>Overgrown branches were pruned around the office, weighbridge, behind the soundwall and the western end along the rails.</li> </ul>
		AP	PRIL 2024
Depot	Maintenance	Herbaceous	<ul> <li>Overgrown vegetation was slashed around the office, depot and loading zone.</li> </ul>
			<ul> <li>Weeds around the office, depot, soundwall, loading zone, stockpiles and the eastern half of the rails were sprayed with a 2% Roundup Biactive® solution.</li> </ul>
			<ul> <li>Weeds targeted included: Bidens pilosa, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Paspalum dilatatum, Senecio madagascariensis, Solanum nigrum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>

Zone	Type of Work	Weed Type	Work Description						
		M	AY 2024						
Graveyard	Maintenance	Herbaceous	<ul> <li>Slashed, cleared thatch, and sprayed (2% Roundup Biactive®) within the Graveyard in preparation for storage for mobile concrete plant and equipment.</li> </ul>						
		Woody	<ul> <li>Stem treated Casuarina glauca throughout graveyard and piled vegetation accordingly.</li> </ul>						
Depot	Maintenance	Herbaceous	<ul> <li>Vegetation was sprayed (using 2% Roundup Biactive®) along the access path of Snake Alley, old walkway leading to the concrete plant and sections surrounding the lunchroom and workshop to help control vegetation growth and limit seeding potential.</li> </ul>						
			<ul> <li>Trimmed vegetation within the carpark planting bed to improve line of sight for workers.</li> </ul>						
		Woody	<ul> <li>Trimmed overhanging branches along the entrance road, between the boom gates and tare bridge, to improve line of sight of security cameras for the weigh bridge operations.</li> <li>Vegetation piled nearby on slope accordingly.</li> </ul>						
		JU	NE 2024						
Depot	Maintenance	Herbaceous	<ul> <li>Overgrown vegetation was slashed around the office and west side of the rails.</li> </ul>						
			<ul> <li>Weeds around the office, depot, soundwall, loading zone and snake alley were sprayed with a 2% Glyphosate solution.</li> </ul>						
			<ul> <li>Target species included: Bidens pilosa, Bromus catharticus, Cardamine hirsuta, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Medicago sp., Paspalum dilatatum, Plantago lanceolata, Senecio madagascariensis, Solanum nigrum, Solanum sisymbriifolium, Sonchus oleraceus, Verbena bonariensis, and Vicia sp.</li> </ul>						
		Woody	<ul> <li>Trimmed vegetation within the carpark planting bed to improve line of sight for workers, as requested by client.</li> </ul>						
Zone	Type of Work	Weed Type	Work Description						
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JULY 2024									
Depot	Maintenance	Herbaceous	The area around the office was mown.						
			<ul> <li>Overgrown vegetation was slashed beside the road between the rails and the stockpile loading zone.</li> </ul>						
			<ul> <li>Weeds around the office, depot, soundwall and north of the rails around the conveyor belt were sprayed with a 2% solution of Roundup Biactive.</li> </ul>						
			<ul> <li>Weeds targeted included: Bidens pilosa, Bromus catharticus, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Eragrostis curvula, Medicago sp., Paspalum dilatatum, Plantago lanceolata, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>						
		Other	<ul> <li>Tree branches that had been cut at the eastern end of the rails were relocated and piled.</li> </ul>						
		SEPTE	MBER 2024						
Depot	Maintenance	Herbaceous	• The area around the office was mown.						
			Snake Alley was brush cut.						
			<ul> <li>Weeds around the office, depot, soundwall, stockpiles, Snake Alley, and the loading zone were sprayed with a 2% solution of Roundup Biactive.</li> </ul>						
			<ul> <li>Weeds targeted included: Bidens pilosa, Bromus catharticus, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Ehrharta erecta, Eragrostis curvula, Medicago sp., Paspalum dilatatum, Plantago lanceolata, Senecio madagascariensis, Solanum nigrum, Solanum sisymbriifolium, Sonchus oleraceus, and Verbena bonariensis.</li> </ul>						
		OCT	OBER 2024						
Depot	Maintenance	Herbaceous	• The area around the office was mown.						
			<ul> <li>Snake Alley and the road heading towards the rails were brush cut. Weeds targeted included:</li> </ul>						

Zone	Type of Work	Weed Type	Work Description						
			Bromus catharticus, Chloris gayana, Cynodon dactylon, Echinochloa crus-galli, Ehrharta erecta, and Paspalum dilatatum						
NOVEMBER 2024									
Depot	Maintenance	Herbaceous	<ul> <li>The area around the office was mown. Select weeds on the path edge were sprayed.</li> </ul>						
			• Snake Alley, around the conveyer belt, and area around the rails were sprayed.						
			<ul> <li>Weeds targeted included: Bidens pilosa, Bromus catharticus, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Ehrharta erecta, Paspalum dilatatum, Sonchus oleraceus, Typha sp., and Verbena bonariensis.</li> </ul>						
DECEMBER 2024									
Depot	Maintenance	Herbaceous	<ul> <li>The area around the office was mown and brush cut.</li> </ul>						
			<ul> <li>Snake Alley was brush cut and weeds sprayed along the path to improve aesthetics, mitigate fire hazards and reduce animal habitat in working areas.</li> </ul>						
			<ul> <li>Sprayed along the sound wall, starting at the southern end and concluding at the shipping container near the truck wash station.</li> </ul>						
			<ul> <li>Weeds were slashed at the western and eastern ends of the rails, and side of the road leading to the rails. Weeds targeted included- Bidens pilosa, Bromus catharticus, Chloris gayana, Cirsium vulgare, Conyza sp., Cynodon dactylon, Echinochloa crus-galli, Ehrharta erecta, Paspalum dilatatum, Sonchus oleraceus, Typha sp., and Verbena bonariensis.</li> </ul>						

## Note:

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All spraying utilised a 1% solution of 'Roundup Biactive®' unless stated otherwise. All cut/scrape and painting and drill and stem injecting was done using neat 'Roundup • Biactive®'.

## 2. Grevillea juniperina subsp. juniperina Monitoring

Grevillea juniperina subsp. juniperina monitoring was undertaken in May, June, and September 2024. Results as followed:

Zone	Oct 17	Sep 22	May 24	June 24	Sep 24	Oct 24
Southeast	60	98	105	105	115	171
Northeast	115	85	40	50	79	122

The variation in monthly count between September and October could be attributed to fluctuations in seasonal growth, increased familiarity in identifying emerging *Grevillea* juveniles, or human error.

Grasses and groundcovers surrounding the clusters could be reduced to promote germination into areas outside of existing stands. Mid-storey species could be thinned of branches or removed entirely to reduce competition and prevent shading out of juveniles.

## 3. Works Mapping



## 4. Recommendations

Bushland

- Continue maintenance of previously revegetated areas and monitor for planting health.
- Push back vine and woody weeds throughout bushland zones.
- Monitor health of Grevillea juniperina subsp. juniperina populations and consider reduction of other native species around the clusters to reduce competition and encourage expansion.

Landscape

- Continue maintenance as per current specification.
- Landscaping zones require constant brush cutting.
- Maintain branch and vegetation clearance around the roadways.
- Keep removing Casuarina from the Graveyard area.