

ROOTY HILL DISTRIBUTION CENTRE

2025 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 2025
Document Revision	A
Author	IEMA
Project Identifier	HOL06-006
Annual review start date	1 January 2025
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<p>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 2025 – 31 DECEMBER 2025 and that I am authorised to make this statement on behalf of HOLCIM (AUSTRALIA) PTY LTD.</p> <p>Note.</p> <p>a) <i>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.</i></p> <p>b) <i>The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
Name of authorised reporting officer	Michael Ensor
Title of authorised reporting officer	Site Supervisor
Signature of authorised reporting officer	
Document Date	30 March 2026

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1 Statement of Compliance

The Statement of Compliance for the Rooty Hill Distribution Centre (RHDC) for the 2025 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 4** lists the non-compliances associated with MP05_0051-MOD 2 for 2025.

Table 1: Statement of Compliance

Relevant Approval	Were all conditions complied with?
Project Approval 05_0051	Yes

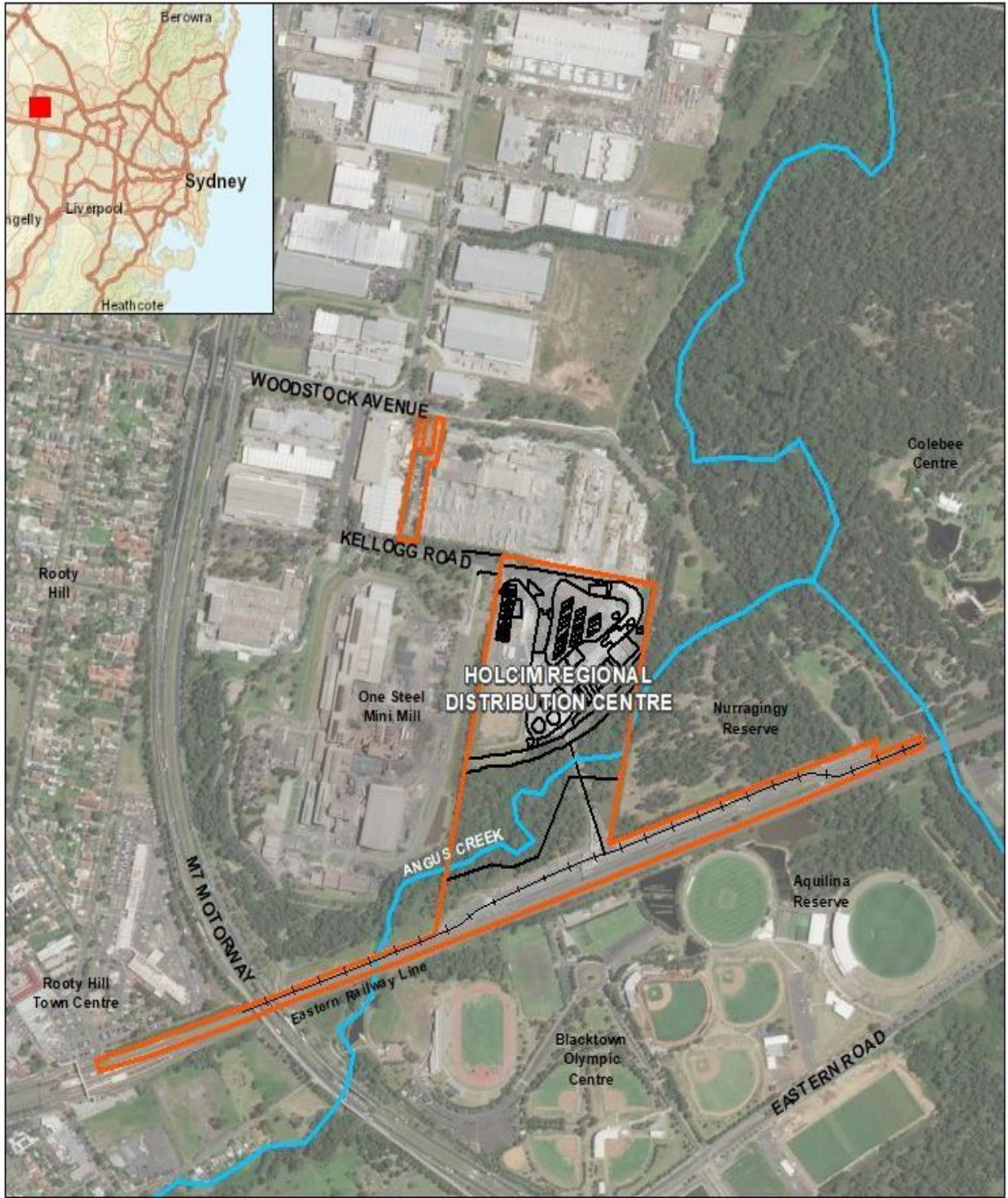
Note: EPL 20672 surrendered on 18 June 2020.

Table 2: Compliance Status Key

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> Potential for serious environmental consequences, but is unlikely to occur; or Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> Potential for moderate environmental consequences, but is unlikely to occur; or Potential for low environmental consequences, but is likely to occur
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).

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).



Legend

-  Regional Distribution Centre
-  Waterways
-  Site Layout
-  Railway

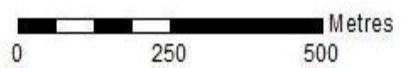


Figure 1 RHDC locality and primary features.

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 3**.

Table 3: Annual Review Requirements

Condition	Section addressed in Annual Review
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: Post-approval 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 Manager

Michael Ensor

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Email: Michael.ensor@holcim.com

Environment Manager - NSW

Dozie Egeonu

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Email: dozie.egeonu@holcim.com

3 Approvals

RHDC operates under the approvals listed in **Table 4**. 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 4: 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 5 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 (m³) per year.

Table 5: Annual Production Summary

Material	Approval Limit (per year)	2019	2020	2021	2022	2023	2024	2025	2026 (Forecast)
Concrete Production (m ³)	200,000	53,547	94,722	77,746	75,906	107,037	139,134	130,069	100,000

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 2025, RHDC distributed 1,041,073 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 2026.

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 2024 Annual Review was submitted by 31 March 2025. On 21 July 2025 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 2024 Annual Review

Table 6 provides an update on the actions proposed by Holcim in the previous Annual Review.

Table 6: Actions from Previous 2024 Annual Review

Improvement Measure	Activities	Actions Taken in the Reporting Period
Air Quality Monitoring	As TSP measurements commenced in 2023, Holcim propose the 2025 Annual Review will include annual average comparisons for TSP readings.	TSP data has been captured during the reporting period. This will allow long term trends to be identified over time.
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.
Independent Environmental Audit (IEA)	Continue to close out actions required from the 2024 IEA.	Site is progressing / completed actions recommended in the 2024 IEA.

6 Environmental Performance

6.1 Meteorological Monitoring

A summary of monthly rainfall was retrieved from the onsite Dust Sentry and is presented in **Table 7**. RHDC continued to review daily and forecast meteorological conditions to manage activities undertaken on site.

Table 7: Monthly Rainfall at the RHDC Dust Sentry

Month	Rainfall (millimetres (mm))
January	98.4
February	60.0
March	16.8
April	28.8
May	103.2
June	9.6
July	55.2
August	93.6
September	40.8
October	28.8
November	28.8
December	36.0
Annual TOTAL	600.0

During 2025, a total of 600.0 mm was recorded which is higher compared to the 2024 annual total of 573.6 mm. Since 2013, when Erskine Park Reservoir BOM Station became active, the average annual rainfall has been 772.0 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 8**.

Table 8: Approved Noise Criteria (Project Approval 05_0051)

Location	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	
	L _{Aeq} (15 minute) (dB(A))	L _{Aeq} (15 minute) (dB(A))	L _{Aeq} (15 minute) (dB(A))	L _{Aeq} (15 minute) (dB(A))	L _{A1} (1 minute) (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 Reserve is in use – L _{Aeq} 50 dB(A)				
Colebee Centre	When the 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)				

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 1 and 2 April 2025.

Table 9 summarises the noise monitoring results for this reporting period. The full Noise Monitoring Report can be found in **Appendix A**

Table 9: Noise Monitoring Results and Compliance Summary for 2025

Assessment Period	Receiver	Unit of measurement	Noise Criteria	Annual Monitoring Noise	Compliant
				1 - 2 April 2025	
Day ^{1, 2}	N1	(LAeq min)) (15	35	<44 ⁴	✓
	N2		40	<36	✓
	N3		36 (50 when Nurragingy Reserve is in use)	<38 ⁴	✓
	N4		36 (55when active recreational areas of the Blacktown Olympic Park are in use)	<35	✓
Evening ^{1, 2}	N1	(LAeq min)) (15	35	n/a ⁵	✓
	N2		44	n/a ⁵	✓
	N3		38 (50when Nurragingy Reserve is in use)	n/a ⁵	✓
	N4		38 (55when active recreational areas of the Blacktown Olympic Park are in use)	n/a ⁵	✓
Night ^{1, 2, 3}	N1	(LAeq min)) (15	35	<42 ⁴	✓
	N2		39	<40 ⁴	✓
	N3		35 (50 when Nurragingy Reserve is in use)	<39 ⁴	✓
	N4		45 (55 when active recreational areas of the Blacktown Olympic Park are in use)	<37 ⁴	✓

Notes:

¹ Noise criteria adopted from Project Approval 05_0051.

² 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.

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

⁴ Unable to measure quarry contribution due to dominating extraneous noise (e.g. road traffic, insects, birds) so quarry contribution assumed to be more than 10 dB below the L90.

⁵ Site not operational during evening period.

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 (<44 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 include:

- 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 10** below).

Table 10: Air Quality Criteria from Project Approval 05_0051, Condition 2.8A

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

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

PM₁₀ / 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 356 samples at HVAS 2 in the reporting period, as shown in **Table 11**. The PM₁₀ and TSP monitoring results for HVAS 1 and HVAS 2 can be found in **Table 11**.

Table 11: 2025 PM₁₀ and TSP Compliance Summary

Category	HVAS 1	HVAS 2
Total number of HVAS monitoring rounds required in 2025	365	365
Number of completed monitoring rounds	365	365
Number of incomplete monitoring rounds, contamination, or equipment failure	0	9
Number of valid samples	365	356

During the 2025 reporting period, there were nine missed samples due to HVAS 2 failing to report data properly.

Through 6 December 2025 to 14 December 2025 HVAS 2 was operational but had failed to upload monitoring data to the cloud database. On advice of RHDC’s environmental consultants, the unit was restarted and a connection re-established, however the data was not backed up. However given the annual averages for PM₁₀ and TSP continuing to fall significantly below the approval criteria in 2025 (see **Table 12** and **Table 13**), and no complaints air quality complaints received, it is considered unlikely that there was a non-compliance in this monitoring period.

The annual average at HVAS 1 was 2.89 µg/m³ for PM₁₀ and 5.78 µg/m³ for TSP, which are below the annual average criteria of 25 µg/m³ for PM₁₀ and 90 µg/m³ for TSP. This is compliant with the limits of the Approval.

Long-Term Trends

Table 12 summarises the long-term PM₁₀ results at RHDC. Note, the location of monitors changed in 2021. **Table 13** presents the long-term trends for TSP, however 2024 was the first annual reporting period that captured TSP data.

With the installation of the Dust Sentry in June 2023, which provides continuous PM₁₀ monitoring data, annual average for HVAS1 and HVAS 2 have decreased, recording the lowest annual averages since the site became operational.

Table 12: Long-term PM₁₀ Results

Monitor	PM ₁₀ Annual Average (µg/m ³) ¹							
	July 2017 - June 2018	2019	2020	2021	2022	2023	2024	2025
HVAS 1	30.2	35.2	36.1	32.4	33.2	11.1	3.8	2.9
HVAS 2	25.0	23.3	20.3	17.2 ²	21.7	8.6	3.2	2.1

Note:

¹Contaminated / invalid samples removed.

²January 2021 – September 2021

Table 13 Long-term TSP results

Monitor	TSP Annual Average (µg/m ³)	
	2024	2025
HVAS 1	7.66	5.78
HVAS 2	6.74	5.41

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

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).

6.4.3 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.

6.4.4 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.

6.4.5 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 14 shows the site-specific criteria for water quality parameters in dry weather from the OEMP and Soil and Water Management Plan.

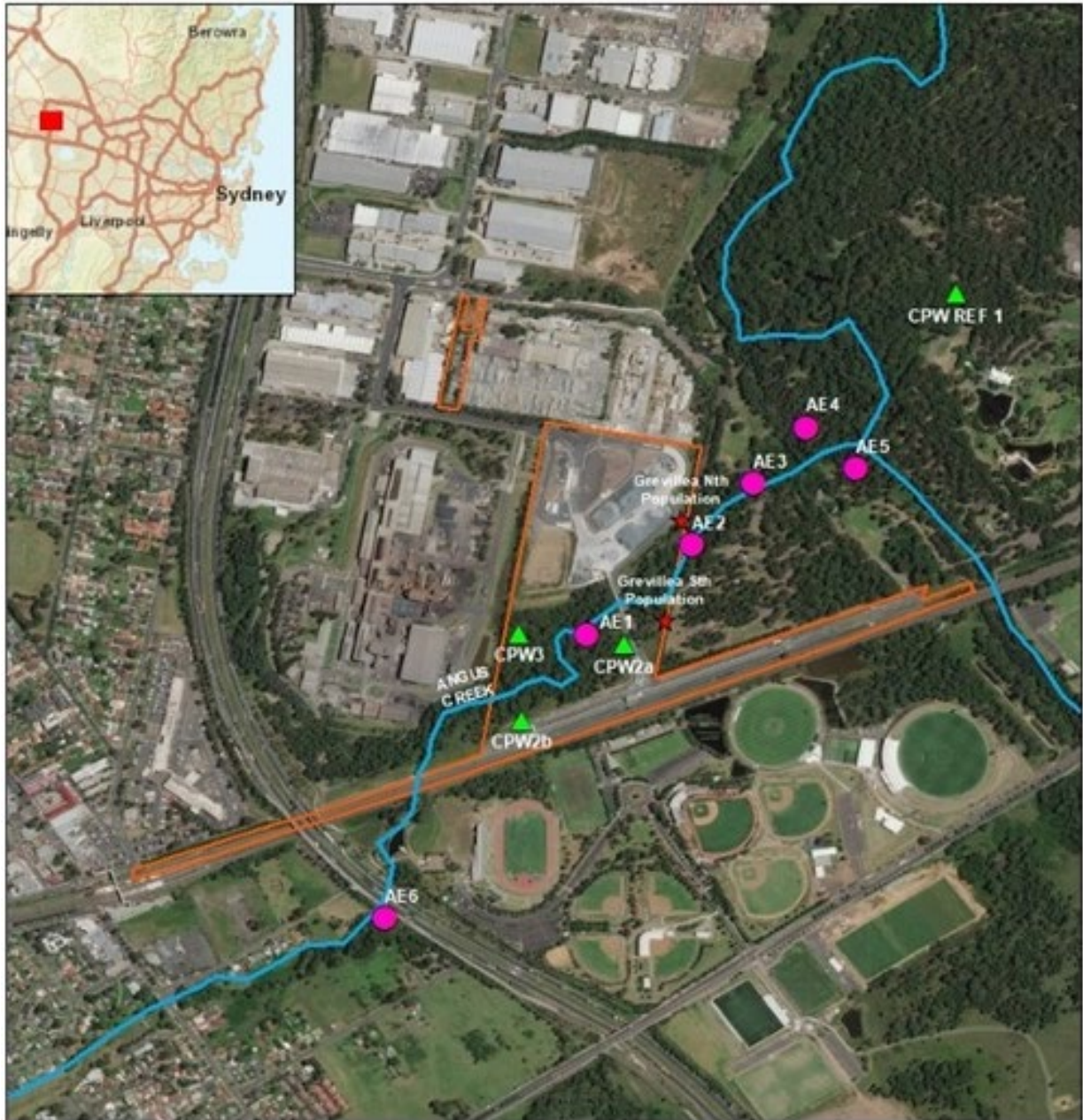
Table 14: ANZECC Guidelines (RHDC Soil and Water Management Plan)

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


Note:

¹Total Nitrogen equals (TKN+NOx)

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



Legend

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

0 250 500 Metres



Data Sources

Service Layer Credits: Source: 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 **Appendix D**. 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:

- 5 March 2025 (Q1)
- 7 May 2025 (Q2)
- 23 July 2025 (Q3)
- 15 October 2025 (Q4).

Surface Water Quality

Summaries of the 2025 water quality monitoring results for Angus Creek and Eastern Creek are presented in **Table 15** and **Table 16** respectively.

Table 15: 2025 Water Quality Results Summary for Angus Creek

Sampling period	Sampling Site	Temperature (°C)	Turbidity	Dissolved Oxygen (% sat)	Electrical Conductivity (µS/cm)	pH	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
Q1 2025	AE1	21.33	6.4	35.4	638	7.22	0.8	0.10
	AE2	21.63	4.6	22.1	608	7.07	0.8	0.09
	AE3	21.32	4.1	19.9	612	7.02	0.7	0.05
	AE6	22.67	17.9	22.3	889	7.32	1.0	0.05
Q2 2025	AE1	16.56	4.3	27.1	1005	7.74	0.6	0.05
	AE2	16.25	1.5	23.6	938	7.61	0.4	0.04
	AE3	16.33	2.4	25.7	909	7.68	0.4	0.06
	AE6	17.08	1.4	30.0	1046	7.6	0.9	0.10
Q3 2025	AE1 ¹	13.04	7.5	41.7	1662	6.68	1.7	0.05
	AE2 ¹	12.53	7.2	43.1	1213	7.25	0.9	0.04
	AE3 ¹	12.58	8.1	40.5	1343	7.42	1.0	0.06
	AE6 ¹	14.04	9.8	46.7	1856	7.49	1.8	0.10
Q4 2025	AE1	16.85	43.7	8.6	1737	8.60	1.2	0.52
	AE2	16.1	19.4	18.5	2051	8.24	0.5	0.12
	AE3	16.45	47.5	34.7	1917	8.43	0.5	0.14
	AE6	16.67	15.3	34.6	3789	8.47	1.0	0.17

Note:

Values outside of the ANZECC (2000) DTLs are in bold.

Table 16: 2025 Water Quality Results Summary for Eastern Creek

Sampling period	Sampling Site	Temperature (°C)	Turbidity	Dissolved Oxygen (% sat)	Electrical Conductivity (µS/cm)	pH	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
Q1 2025	AE4	21.7	20.8	24.0	748	7.07	0.8	0.10
	AE5	21.7	24.1	29.7	753	6.88	1.0	0.10
Q2 2025	AE4	15.66	57.2	46.5	549	7.43	0.9	0.11
	AE5	15.57	45.5	49.9	548	7.5	0.7	0.08
Q3 2025	AE4¹	12.37	9.7	39.3	1478	7.52	1.0	0.18
	AE5¹	10.95	20.2	42.4	1544	7.64	1.5	0.14
Q4 2025	AE4²	17.23	24.3	24.1	2000	8.20	1.3	0.32
	AE5	18.16	54.6	37.5	1490	8.19	1.0	0.14

Note:

Values outside of the ANZECC (2000) DTLs are in **bold**.

¹All sites had potential downstream impacts.

Water quality monitoring was undertaken on four occasions in 2025, with the results summarised in **Table 15** and **Table 16**.

Dissolved oxygen was below the ANZECC criteria of 80-110% for all 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 two 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 compliant across all sites through the reporting period with the exception of a single result at Eastern Creek in Q4.

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

Total Nitrogen generally exceeded guideline values at all sites over the 2025 reporting period, with the highest value of 1.8mg/L recorded at AE6 in Q3.

Total Phosphorous was also generally above criteria limits at all sites, with AE1 recording the highest at 0.52 mg/L in Q4.

Long-term Trends

There were exceedances in dissolved oxygen levels in 2025, which continued from results seen in 2024.

pH has continued to approach neutral since the beginning of 2017. The highest exceedance was at sampling location AE1 in Q4 with an exceedance of pH 8.6.

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 3 to 12 in the 2025 monitoring events. The greatest number of taxa (12) were observed in Eastern Creek (AE5) during the summer monitoring period.

In Autumn, site AE4 and AE5 were the only sites to record a sensitive macroinvertebrate family (both from the Trichoptera order). 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 2025, 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. A pollution sensitive macroinvertebrate family was found at two locations during monitoring in Autumn, 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 2025. 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 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 Table 17 for report detailing works undertaken.

Grevillea juniperina subsp. *juniperina* monitoring was undertaken in January, April, July and October 2025.

A summary of the 2025 *juniperina* monitoring results is presented in **Table 17**.

Table 17: Grevillea juniperin monitoring results (baseline comparison)

Zone 1	Individual plant counts										
	Oct-17	Sep-22	May-24	June-24	Sept-24	Oct-24	Jan-25	April-25	July-25	Oct-25	Difference ¹
South-East	60	98	105	105	115	171	171	161	130	133	-38
North-East	115	85	40	50	79	122	130	120	78	82	-40

Note 1: Difference is calculated from October 2024 to October 2025.

The variation in monthly count between April and July 2025 could be attributed to seasonal changes resulting in some of the juveniles failing to establish.

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 for 2026 as per the 2025 *Bushland Regeneration Report* by Toolijooa Environmental Restoration include:

- 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 to improve visual appeal and reduce habitat for snakes.
 - Maintain branch and vegetation clearance around the roadways.
 - Maintain areas around train tracks clear of vegetation.
 - Follow-up on Graveyard area to keep vegetation clear after high-volume spraying.

9 Summary of Environmental Performance

A summary of the performance of environmental management measures and sampling is detailed in **Table 18** below.

Table 18: Summary of Environmental Performance at RHDC

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / Key management implications	Implemented / Proposed management actions
Noise	EAR predictions are all below the Project Approval criteria.	All noise monitoring results were compliant with the Project Approval.	All noise monitoring results were compliant with criteria.	No further improvements proposed for noise management.
Air Quality	EAR (2005) and EA (2015) predictions are below the Project Approval criteria.	Nearly all HVAS 1 and HVAS 2 results were compliant with the Project Approval. There was a monitoring equipment failure between 6 December 2025 and 14 December 2025 at HVAS 2 where the monitor was operational but not reporting to the cloud database. Once the unit was restarted, data for that period was lost. See Section 6.3.3 for further details.	Air quality monitoring were significantly below approval criteria. Installation of Dust Sentry in 2023 is believed to assist this this.	No further improvements proposed for noise management.
Traffic	EAR predictions are consistent with the Project Approval conditions.	Met Project Approval criteria consistently.	Site consistently meets criteria.	No further improvements proposed for traffic management.
Water	EAR predictions are consistent with Project Approval conditions.	Majority of water quality results consistent with the <i>Soil and Water Management Plan</i> . There were some exceedances for turbidity, electrical conductivity, pH, total nitrogen and total phosphorus, however, these were found to have been caused by	Exceedances in OEMP water quality criteria and ANZECC guidelines not attributed to RHDC. Therefore, this is not considered a non-compliance with the Project Approval.	Continue monitoring as per the OEMP. No further actions required.

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / Key management implications	Implemented / Proposed management actions
		external factors outside of RHDC operations.		
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 2025.	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 2025 Bushland Regeneration Report. See Section 8.5 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 2025.

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 next IEA is due 12 December 2027.

12 Incidents and Non-Compliances

There were no incidents or non-compliances at RHDC in this Annual Review reporting period.

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 2026 to 31 December 2026. The activities to be completed in the next report period are detailed in **Table 19**.

Table 19: Improvement Actions for 2026

Improvement Measure	Activities
Air Quality Monitoring	As TSP measurements commenced in 2023, Holcim propose the 2026 Annual Review will continue to include annual average comparisons for TSP readings, and aim to identify long term trends.
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.



**Appendix A –
2025 Noise Monitoring Reports**

Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
May 2025

Rooty Hill Distribution Centre Annual Noise Monitoring Assessment 2025



Bright ideas.
Sustainable change.

Rooty Hill Distribution Centre Annual Noise Monitoring Assessment 2025

Project name **NSW Environmental Monitoring 2024-2025**
Project no. **31800100**
Recipient **Michael Ensor**
Document type **Report**
Version **1**
Date **02/05/2025**
Prepared by **Jake Bourke**
Checked by **Arnold Cho**
Approved by **Gavan Butterfield**
Description **Data collected on 1 and 2 April 2025 for the annual noise monitoring
program at Rooty Hill, NSW**

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Abbreviations and Definitions

	Description
ΔT	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
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.
DPHI	Department of Planning, Housing, and Infrastructure
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
INP	Industrial Noise Policy
m	Metre
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 (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmx	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment

Description	
NMP	Noise Management Plan
NPFI	Noise Policy for Industry 2017
NVIA	Noise and Vibration Impact Assessment
NSW	New South Wales
OEMP	Operational Environmental Management Plan
PSNL	Project Specific Noise Level
s	Second
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.
TAPM	The Air Pollution Model

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 2025 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 Nurrangy 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.

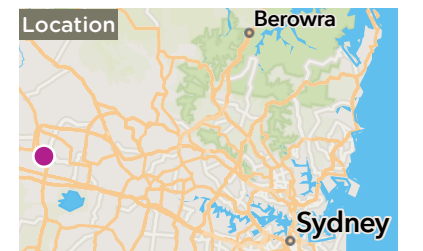
Monitoring locations were selected in accordance with the NMP and are representative of the nearest noise sensitive receivers to the RHDC. The monitoring locations with respect to the RHDC and assessed receivers are presented in the locality plan in **Figure 1**.



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 criteria

Location	Monitoring Location	Morning Shoulder ¹	Day ²	Evening ³	Night ⁴	
		L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (15min)	L _{Aeq} (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 Reserve is in use – L _{Aeq} 50 dB(A)				
Colebee Centre	N3	When the Centre is in use – L _{Aeq} 50 dB(A)				
Blacktown Olympic Park (Active recreation areas)	N4	When active recreational areas of the Park are in use – L _{Aeq} 55 dB(A)				

¹ 6 am – 7 am Monday to Saturday and 6 am – 8 am Sunday and public holidays

² 7 am – 6 pm Monday to Saturday and 8 am – 6 pm Sunday and public holidays

³ 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 developed 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 Tuesday 1 and Wednesday 2 April 2025. 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 during the day, evening, and night periods over two days at each monitoring location. Where possible, throughout each measurement the operator(s) quantified the contribution of each significant noise source. Where the RHDC was not distinctly audible during the attended monitoring, the RHDC contribution is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorological Conditions

Meteorology has an important influence on noise monitoring assessment. Where an onsite meteorological station with data recorded at 10m height has not been available, the nearest Department of Planning, Housing and Infrastructure (DPHI) meteorological station has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

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

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

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⁻¹ 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 was conducted on Tuesday 1 April 2025 and Wednesday 2 April 2025 with results presented in **Table 4-1**. The site was inaudible during the day and night periods. The site was not operational during the evening period. Measured predominant ambient noise sources include background motorway traffic, passing cars and fauna. These results are deemed to satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance (see Footnotes 3 and 5 below).

Table 4-1: Noise survey results and observations for Location N1

Date	Time (hrs)	Descriptor (dBA)			Meteorology (handheld at microphone height)	DPHI Met Station (at 10m) ¹	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
		LAm _{ax}	LA _{eq}	LA ₉₀					
01-04-25	12:37pm to 12:52pm (Day)	85.9	62.3	53.8	WD: n/a WS: 0 m/s Rain: Nil	WD: 198° WS: 3.7 m/s Rain: Nil Stability Category: B ²	Background motorway traffic, cars passing, birds 53-86 Site inaudible	<44 ³	35
01-04-25	6:22pm to 6:37pm (Evening)	81.6	64.0	52.5	WD: n/a WS: 0 m/s Rain: Nil	WD: 181° WS: 2.2 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, cars passing, birds 50-81 Site not operational	n/a ⁴	35
02-04-25	5:34am to 5:49am (Night)	83.7	64.3	51.6	WD: n/a WS: 0 m/s Rain: Nil	WD: 236° WS: 0.4 m/s Rain: Nil Stability Category: F ²	Background motorway traffic, insects 47-54 Passing cars 70-84 Site inaudible	<42 ⁵	35

¹ WD and WS data (at 10m) sourced from St Marys DPHI Station. Rain data (at 10m) sourced from Rouse Hill DPHI Station.

² Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

³ Measured LAeq value of 62.3 was dominated by road traffic and fauna, so unable to estimate contribution for quarry at the assessment location.

⁴ Site not operational.

⁵ Measured LAeq value of 64.3 was dominated by road traffic and fauna, so unable to estimate contribution for quarry at the assessment location.

4.2 Location N2

Noise monitoring at location N2 was conducted on Tuesday 1 April 2025 and Wednesday 2 April 2025 with results presented in **Table 4-2**. The site was inaudible during the day and night periods. The site was not operational during the evening period. Measured predominant ambient noise sources included background motorway traffic, a passing car, a garbage truck, flora & fauna and a lawn mower. These results satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance (see Footnote 4 below).

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

Date	Time (hrs)	Descriptor (dBA)			Meteorology (handheld at microphone height)	DPHI Met Station (at 10m) ¹	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}					
01-04-25	11:17am to 11:32am (Day)	70.4	52.1	46.0	WD: n/a WS: 0 m/s Rain: Nil	WD: 190° WS: 3.7 m/s Rain: Nil Stability Category: B ²	Background motorway traffic, trees, birds, lawn mower 45-50 Two passing trucks 60-69 Site inaudible	<36	40
01-04-25	7:20pm to 7:35pm (Evening)	76.6	53.4	50.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 202° WS: 1.3 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, insects 49-57 Passing car 64-76 Train 50-55 Site not operational	n/a ³	44
02-04-25	6:22am to 6:37am (Night)	73.6	52.6	49.7	WD: n/a WS: 0 m/s Rain: Nil	WD: 301° WS: 0.3 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, birds 47-56 Garbage truck 58-62 Passing car 70-73 Site inaudible	<40 ^{4,5}	39

¹ WD and WS data (at 10m) sourced from St Marys DPHI Station. Rain data (at 10m) sourced from Rouse Hill DPHI Station.

² Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

³ Site not operational.

⁴ Measured LAeq value of 52.6 was dominated by road traffic, garbage truck and fauna, so unable to separate extraneous noise from Holcim noise but estimated to be less than 40 dBA at the assessment location.

⁵ Negligible exceedance (NPF1 2017 – Table 4.1)

4.3 Location N3

Noise monitoring at location N3 was conducted on Tuesday 1 April 2025 and Wednesday 2 April 2025 with results presented in **Table 4-3**. The site was inaudible during the day and night periods. The site was not operational during the evening period. Measured ambient noise sources included background motorway traffic, a passing car, a motorcycle, an industrial hum, fauna and people in the park. These results are deemed to satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance (see Footnotes 3 and 6 below).

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

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	DPHI Met Station (at 10m) ¹	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
01-04-25	12:10pm to 12:25pm (Day)	76.4	52.5	48.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 198° WS: 3.7 m/s Rain: Nil Stability Category: B ²	Background motorway traffic, birds, people in the park 46-56 Car passing 70-76 Site inaudible	<38 ^{3,4}	36
01-04-25	6:00pm to 6:15pm (Evening)	76.9	54.0	47.5	WD: n/a WS: 0 m/s Rain: Nil	WD: 181° WS: 2.2 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, industrial hum 47-67 Passing car 60-65 Motorcycle 70-75 Site not operational	n/a ⁵	38
02-04-25	5:14am to 5:29am (Night)	76.9	54.9	49.4	WD: n/a WS: 0 m/s Rain: Nil	WD: 236° WS: 0.4 m/s Rain: Nil Stability Category: F ²	Background motorway traffic, industrial hum 46-76 Site inaudible	<39 ^{6,7}	35

¹ WD and WS data (at 10m) sourced from St Marys DPHI Station. Rain data (at 10m) sourced from Rouse Hill DPHI Station.

² Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

³ Measured LAeq value of 52.5 was dominated by road traffic and fauna, so unable to separate extraneous noise from Holcim noise but estimated to be less than 38 dBA at the assessment location.

⁴ Negligible exceedance (NPfI 2017 – Table 4.1)

⁵ Site not operational.

⁶ Measured LAeq value of 54.9 was dominated by road traffic and industrial hum, so unable to separate extraneous noise from Holcim noise but estimated to be less than 39 dBA at the assessment location.

⁷ Marginal exceedance (NPfI 2017 – Table 4.1)

4.4 Location N4

Noise monitoring at location N4 was conducted on Tuesday 1 April 2025 and Wednesday 2 April 2025 with results presented in **Table 4-4**. The site was inaudible during the day and night periods. The site was not operational during the evening period. Measured predominant ambient noise sources included background motorway traffic, passing cars, trains, Blacktown Sports Centre activities, a sports carnival, music, microphone announcements and fauna. These results are deemed to satisfy the established noise criteria and indicate that noise emissions from RHDC did not contribute to noise nuisance (see Footnote 4 below).

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

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	DPHI Met Station (at 10m) ¹	Apparent Noise Source, Description and SPL (dBA)	RHDC LAeq(15min) (dBA) Contribution	LAeq(15min) Criteria (dBA)
		L _{Amax}	L _{Aeq}	L _{A90}					
01-04-25	11:41am to 11:56am (Day)	67.2	51.8	45.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 190° WS: 3.7 m/s Rain: Nil Stability Category: B ²	Background motorway traffic, music, sports carnival, cicadas 43- 53 Microphone announcements (every 5 mins) 46-64 Train 50-58 Site inaudible	<35	36
01-04-25	6:52pm to 7:07pm (Evening)	59.5	48.7	46.1	WD: n/a WS: 0 m/s Rain: Nil	WD: 192° WS: 1.8 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, Blacktown Sports Centre activities, insects, birds 46-50 Car passing 50-57 Site not operational	n/a ³	38
02-04-25	6:00am to 6:15am (Night)	64.5	50.5	47.3	WD: n/a WS: 0 m/s Rain: Nil	WD: 301° WS: 0.3 m/s Rain: Nil Stability Category: E ²	Background motorway traffic, train 46-48 Passing car 60-64 Site inaudible	<37 ^{4,5}	35

¹ WD and WS data (at 10m) sourced from St Marys DPHI Station. Rain data (at 10m) sourced from Rouse Hill DPHI Station.

² Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

³ Site not operational.

⁴ Measured LAeq value of 50.5 was dominated by road and rail traffic, so unable to separate extraneous noise from Holcim noise but estimated to be less than 37 dBA at the assesment location.

⁵ Negligible exceedance (NPfI 2017 – Table 4.1)

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 Tuesday, 1 April and Wednesday, 2 April 2025 at four locations selected as representative of the sensitive receptors surrounding the RHDC.

No audible noise from site operations was observed at any of the four locations during the day and night periods. The site was not operational during the evening period.

The results presented in this NMA show compliance with the relevant noise criteria applicable to the operation of the Holcim RHDC, Rooty Hill, NSW.

It is noted that some exceedances of the noise criteria have been recorded as follows:

- At N1: during the day and night periods
- At N2: during the night period
- At N3: during the day and night periods
- At N4 during the night period

However, it should be noted about the noise environment during these periods, that noise monitoring was heavily affected by extraneous noise sources whilst the site was inaudible. Therefore, it can be concluded that the exceedances were not caused by the site operation.

6. References

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**Appendix B –
2025 PM10 and TSP Monitoring Results**

2025 PM₁₀ and TSP Monitoring Results

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
1/01/2025	1.26	2.24	Compliant	1.7	3.06	Compliant
1/02/2025	2.54	5.39	Compliant	2.98	5.22	Compliant
1/03/2025	2.04	3.24	Compliant	2.24	3.67	Compliant
1/04/2025	1.27	2.73	Compliant	1.6	3.23	Compliant
1/05/2025	1.27	2.85	Compliant	1.53	3.5	Compliant
1/06/2025	2.61	5.76	Compliant	2.46	7.18	Compliant
1/07/2025	1.06	1.62	Compliant	1.29	1.93	Compliant
1/08/2025	2.02	3.14	Compliant	1.9	2.81	Compliant
1/09/2025	2.87	6.94	Compliant	1.24	2.78	Compliant
1/10/2025	2.26	4.43	Compliant	1.35	2.25	Compliant
1/11/2025	1.01	1.71	Compliant	1.08	1.7	Compliant
1/12/2025	0.98	1.44	Compliant	1.64	2.59	Compliant
1/13/2025	1.87	3.22	Compliant	2.27	4.65	Compliant
1/14/2025	3.47	7.01	Compliant	1.99	4.55	Compliant
1/15/2025	2.38	4.34	Compliant	2.38	5.8	Compliant
1/16/2025	2.35	3.96	Compliant	2.19	3.49	Compliant
1/17/2025	4.07	7.77	Compliant	2.66	5.44	Compliant
1/18/2025	1.91	2.88	Compliant	2.22	2.89	Compliant
1/19/2025	2.19	3.21	Compliant	2.47	3.35	Compliant
1/20/2025	4.96	9.63	Compliant	2.81	5.56	Compliant
1/21/2025	3.96	7.59	Compliant	2.53	5.32	Compliant
1/22/2025	5.05	10.76	Compliant	3.14	7.61	Compliant
1/23/2025	5.72	10.54	Compliant	2.87	4.59	Compliant
1/24/2025	5.09	10.63	Compliant	1.96	4.35	Compliant
1/25/2025	1.72	2.58	Compliant	2.2	4.15	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
1/26/2025	2.17	3.96	Compliant	1.61	2.89	Compliant
1/27/2025	1.27	2.48	Compliant	1.56	3.56	Compliant
1/28/2025	3.93	8.84	Compliant	3.27	8.42	Compliant
1/29/2025	4.48	7.26	Compliant	3.62	5.59	Compliant
1/30/2025	2.64	4.4	Compliant	2.25	3.84	Compliant
1/31/2025	4.57	8.63	Compliant	1.77	3.09	Compliant
2/01/2025	1.61	2.65	Compliant	1.64	2.75	Compliant
2/02/2025	0.94	1.36	Compliant	1.33	2.11	Compliant
2/03/2025	3.42	7.06	Compliant	2.15	5.35	Compliant
2/04/2025	3.25	5.9	Compliant	2.25	5.44	Compliant
2/05/2025	6.42	13.08	Compliant	3.35	8.26	Compliant
2/06/2025	6.3	12.1	Compliant	2.46	4.91	Compliant
2/07/2025	3.44	6.93	Compliant	2.44	7.14	Compliant
2/08/2025	2.27	4.24	Compliant	1.47	3.38	Compliant
2/09/2025	0.87	1.25	Compliant	1.24	2.16	Compliant
2/10/2025	1.23	1.99	Compliant	1.45	2.68	Compliant
2/11/2025	1.6	2.88	Compliant	1.6	3.04	Compliant
2/12/2025	3.81	8.06	Compliant	1.42	2.67	Compliant
2/13/2025	3.72	6.92	Compliant	1.97	3.87	Compliant
2/14/2025	2.16	3.34	Compliant	2.29	4.14	Compliant
2/15/2025	2.44	4.62	Compliant	1.65	3.64	Compliant
2/16/2025	2.24	4.77	Compliant	1.19	2.95	Compliant
2/17/2025	7.36	15.31	Compliant	1.67	4.58	Compliant
2/18/2025	4.6	9.25	Compliant	1.95	5.23	Compliant
2/19/2025	5.36	10.8	Compliant	1.94	4.67	Compliant
2/20/2025	3.56	7.11	Compliant	1.88	3.67	Compliant
2/21/2025	6.05	12.19	Compliant	1.73	4.12	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
2/22/2025	1	1.72	Compliant	1.03	1.81	Compliant
2/23/2025	0.81	1.22	Compliant	1.11	2.06	Compliant
2/24/2025	5.26	10.59	Compliant	3.17	6.82	Compliant
2/25/2025	3.07	5.28	Compliant	2.32	4.24	Compliant
2/26/2025	2.89	5.33	Compliant	2.08	5.11	Compliant
2/27/2025	4.95	9.76	Compliant	1.84	4.52	Compliant
2/28/2025	4.64	8.97	Compliant	2.89	8.93	Compliant
3/01/2025	3.52	6.08	Compliant	3.91	8.32	Compliant
3/02/2025	2.45	4.12	Compliant	2.81	4.57	Compliant
3/03/2025	6.39	16.4	Compliant	2.29	5.79	Compliant
3/04/2025	4.33	10.71	Compliant	1.85	3.48	Compliant
3/05/2025	7.61	16.05	Compliant	2.19	4.02	Compliant
3/06/2025	4.38	9.43	Compliant	1.84	3.18	Compliant
3/07/2025	4.43	10.63	Compliant	1.32	2.58	Compliant
3/08/2025	1.67	2.89	Compliant	1.32	2.21	Compliant
3/09/2025	1.01	1.59	Compliant	1.29	1.99	Compliant
3/10/2025	1.48	2.57	Compliant	1.58	3.04	Compliant
3/11/2025	0.58	1.06	Compliant	0.56	0.98	Compliant
3/12/2025	1.58	2.91	Compliant	1.07	2.14	Compliant
3/13/2025	3.39	7.11	Compliant	1.79	4.9	Compliant
3/14/2025	2.49	4.44	Compliant	2.2	5.71	Compliant
3/15/2025	1.73	2.8	Compliant	2.18	5.11	Compliant
3/16/2025	1.42	3.49	Compliant	2.36	8.12	Compliant
3/17/2025	7.26	19.9	Compliant	2.31	6.55	Compliant
3/18/2025	3.62	8.09	Compliant	2.33	5.81	Compliant
3/19/2025	4.38	8.31	Compliant	3.93	9.22	Compliant
3/20/2025	3.32	6.38	Compliant	2.57	6.78	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
3/21/2025	2.04	3.67	Compliant	2.45	5.12	Compliant
3/22/2025	1.83	3.66	Compliant	1.11	2.16	Compliant
3/23/2025	1.07	2.04	Compliant	1.19	1.84	Compliant
3/24/2025	2.18	3.94	Compliant	1.87	3.44	Compliant
3/25/2025	3.32	6.13	Compliant	1.31	2.6	Compliant
3/26/2025	3.68	7.6	Compliant	1.83	4.75	Compliant
3/27/2025	5.31	10.68	Compliant	1.45	3.15	Compliant
3/28/2025	1.86	3.63	Compliant	1.12	2.26	Compliant
3/29/2025	1.38	2.25	Compliant	0.64	1.25	Compliant
3/30/2025	3.27	6.49	Compliant	0.75	1.57	Compliant
3/31/2025	3.53	7.25	Compliant	0.79	2.15	Compliant
4/01/2025	7.04	28.51	Compliant	1.93	10.76	Compliant
4/02/2025	7.53	14.68	Compliant	2.82	6.03	Compliant
4/03/2025	5.02	10.52	Compliant	2.48	5.73	Compliant
4/04/2025	4.22	8.11	Compliant	2.1	4.24	Compliant
4/05/2025	2.06	4.15	Compliant	1.95	4.47	Compliant
4/06/2025	1.68	3.48	Compliant	1.98	4.76	Compliant
4/07/2025	5.85	12.08	Compliant	2.3	6.44	Compliant
4/08/2025	4.51	9.49	Compliant	1.89	4.26	Compliant
4/09/2025	3.72	8.28	Compliant	1.7	3.8	Compliant
4/10/2025	2.11	4.23	Compliant	4.38	31.34	Compliant
4/11/2025	4.85	9.3	Compliant	3.93	7.92	Compliant
4/12/2025	2.74	5.2	Compliant	1.98	3.84	Compliant
4/13/2025	1.16	1.89	Compliant	1.39	2.41	Compliant
4/14/2025	4.67	9.31	Compliant	3.54	7.56	Compliant
4/15/2025	3.03	6.36	Compliant	1.5	3.24	Compliant
4/16/2025	5.27	10.31	Compliant	2.05	5.07	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
4/17/2025	4.08	7.2	Compliant	1.95	4.74	Compliant
4/18/2025	1.54	2.23	Compliant	1.67	2.9	Compliant
4/19/2025	1.27	1.73	Compliant	1.81	3.48	Compliant
4/20/2025	0.93	1.37	Compliant	1.53	3.31	Compliant
4/21/2025	1.89	3.18	Compliant	2.04	5.02	Compliant
4/22/2025	2.38	4.17	Compliant	1.42	3.26	Compliant
4/23/2025	1.6	2.19	Compliant	1.74	2.6	Compliant
4/24/2025	2.94	5.04	Compliant	1.79	2.76	Compliant
4/25/2025	1.27	1.71	Compliant	1.63	2.34	Compliant
4/26/2025	1.68	3.51	Compliant	1.94	3.61	Compliant
4/27/2025	2.05	3.02	Compliant	0.99	1.64	Compliant
4/28/2025	3.2	7.42	Compliant	1.28	2.73	Compliant
4/29/2025	2.58	6.71	Compliant	1.6	2.9	Compliant
4/30/2025	2.66	5.61	Compliant	1.15	2.37	Compliant
5/01/2025	3.55	7.69	Compliant	1.09	2.42	Compliant
5/02/2025	2.35	4.12	Compliant	1.32	2.33	Compliant
5/03/2025	1.62	2.97	Compliant	1.15	1.94	Compliant
5/04/2025	0.88	1.25	Compliant	1.26	1.9	Compliant
5/05/2025	2.69	5.24	Compliant	2.18	4.92	Compliant
5/06/2025	7.13	12.43	Compliant	2.49	5.34	Compliant
5/07/2025	4.86	9.14	Compliant	2.56	6.77	Compliant
5/08/2025	5.02	11.5	Compliant	4.53	35.79	Compliant
5/09/2025	3.1	8.05	Compliant	1.98	4.98	Compliant
5/10/2025	1.25	2.61	Compliant	1.07	2.23	Compliant
5/11/2025	1	1.86	Compliant	1.01	1.76	Compliant
5/12/2025	1.32	2.38	Compliant	1.14	2.02	Compliant
5/13/2025	3.82	6.48	Compliant	2.02	3.83	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
5/14/2025	2.26	3.77	Compliant	2.04	3.84	Compliant
5/15/2025	1.77	3.04	Compliant	1.4	2.81	Compliant
5/16/2025	1.58	2.54	Compliant	1.12	1.94	Compliant
5/17/2025	2.16	5.05	Compliant	1.41	3.13	Compliant
5/18/2025	1.61	3.51	Compliant	0.77	1.36	Compliant
5/19/2025	2.33	4.5	Compliant	1.32	2.2	Compliant
5/20/2025	2.37	4.03	Compliant	1.66	2.66	Compliant
5/21/2025	1.42	1.94	Compliant	1.43	2.02	Compliant
5/22/2025	1.09	1.52	Compliant	1.4	1.74	Compliant
5/23/2025	0.7	1.19	Compliant	0.94	1.41	Compliant
5/24/2025	0.89	1.72	Compliant	1.38	2.91	Compliant
5/25/2025	0.7	1.08	Compliant	1.03	1.69	Compliant
5/26/2025	1.25	1.88	Compliant	1.58	3	Compliant
5/27/2025	6.92	13.17	Compliant	7.37	18.64	Compliant
5/28/2025	2.95	5.57	Compliant	1.36	3.77	Compliant
5/29/2025	4.15	7.04	Compliant	1.42	3.08	Compliant
5/30/2025	3.23	5.53	Compliant	2.23	4.16	Compliant
5/31/2025	1.71	2.6	Compliant	1.75	2.88	Compliant
6/01/2025	1.52	2.41	Compliant	1.73	2.69	Compliant
6/02/2025	2.8	4.87	Compliant	2.55	5.17	Compliant
6/03/2025	2.4	4.02	Compliant	2.28	4.61	Compliant
6/04/2025	3.06	6.29	Compliant	1.14	3.25	Compliant
6/05/2025	4.63	7.84	Compliant	1.73	3.66	Compliant
6/06/2025	3.4	7.5	Compliant	2.62	6.35	Compliant
6/07/2025	2.45	6.01	Compliant	2.75	8.69	Compliant
6/08/2025	0.92	2.37	Compliant	1.96	4.8	Compliant
6/09/2025	0.58	1.26	Compliant	1.1	2.91	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
6/10/2025	4.65	7.98	Compliant	1.23	2.89	Compliant
6/11/2025	5.19	8.82	Compliant	1.83	3.96	Compliant
6/12/2025	3.82	6.06	Compliant	2.06	3.9	Compliant
6/13/2025	3.59	6.2	Compliant	0.99	3.13	Compliant
6/14/2025	1.96	3.07	Compliant	1.26	2.17	Compliant
6/15/2025	1.16	1.53	Compliant	1.76	2.53	Compliant
6/16/2025	2.11	3.73	Compliant	1.85	3.36	Compliant
6/17/2025	2.62	4.61	Compliant	2.36	4.8	Compliant
6/18/2025	4.49	7.18	Compliant	2.44	4.27	Compliant
6/19/2025	6.02	10.24	Compliant	3.41	5.72	Compliant
6/20/2025	3.18	5.15	Compliant	2.76	4.47	Compliant
6/21/2025	2.28	3.23	Compliant	2.39	3.35	Compliant
6/22/2025	1.86	2.55	Compliant	3.57	14.19	Compliant
6/23/2025	2.63	4.03	Compliant	2.94	5.31	Compliant
6/24/2025	1.15	2.27	Compliant	2.2	6.3	Compliant
6/25/2025	2.98	7.43	Compliant	4.04	15.25	Compliant
6/26/2025	4.93	8.93	Compliant	1.72	4.05	Compliant
6/27/2025	2.66	5.08	Compliant	1.48	3.39	Compliant
6/28/2025	1.69	2.76	Compliant	1.91	3.38	Compliant
6/29/2025	2.69	5.21	Compliant	2.72	5.25	Compliant
6/30/2025	2.41	4.61	Compliant	1.67	4.07	Compliant
7/01/2025	2.36	5.25	Compliant	0.78	2.9	Compliant
7/02/2025	1.5	3.15	Compliant	0.26	1.01	Compliant
7/03/2025	2.43	4.67	Compliant	0.66	1.65	Compliant
7/04/2025	2.47	4.71	Compliant	1.36	2.29	Compliant
7/05/2025	2	3.08	Compliant	2.14	2.99	Compliant
7/06/2025	1.06	1.62	Compliant	1.34	2.37	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
7/07/2025	2.1	3.51	Compliant	1.26	2.12	Compliant
7/08/2025	2.18	3.67	Compliant	1.84	3.53	Compliant
7/09/2025	3.25	5.9	Compliant	2.15	5.45	Compliant
7/10/2025	3.53	8.21	Compliant	3.39	9.46	Compliant
7/11/2025	5.31	11.44	Compliant	1.57	4.32	Compliant
7/12/2025	4.36	7.33	Compliant	1.65	2.62	Compliant
7/13/2025	2.02	2.95	Compliant	3.29	5.04	Compliant
7/14/2025	2.99	5.69	Compliant	2.44	6.38	Compliant
7/15/2025	2.98	5.79	Compliant	2.26	4.45	Compliant
7/16/2025	2.82	5.23	Compliant	3	6.94	Compliant
7/17/2025	3.71	6.21	Compliant	3.18	6.76	Compliant
7/18/2025	2.5	4.09	Compliant	2.11	4.19	Compliant
7/19/2025	3.78	6.09	Compliant	2.45	4.92	Compliant
7/20/2025	2.52	4.87	Compliant	2.18	4.26	Compliant
7/21/2025	1.73	2.51	Compliant	1.73	3.02	Compliant
7/22/2025	2.26	4.21	Compliant	2.39	4.45	Compliant
7/23/2025	2.7	4.99	Compliant	1.51	3.13	Compliant
7/24/2025	5.97	10.46	Compliant	2.05	4.11	Compliant
7/25/2025	3.1	5.35	Compliant	2.02	4.29	Compliant
7/26/2025	0.81	1.35	Compliant	1.02	2.06	Compliant
7/27/2025	0.36	0.75	Compliant	0.71	1.92	Compliant
7/28/2025	2.48	5.49	Compliant	2.58	6.89	Compliant
7/29/2025	3.3	6.47	Compliant	1.74	4.17	Compliant
7/30/2025	1.45	2.21	Compliant	1.19	2.1	Compliant
7/31/2025	1.72	3.03	Compliant	0.75	1.6	Compliant
8/01/2025	2.24	4.86	Compliant	0.67	1.48	Compliant
8/02/2025	1.17	1.73	Compliant	0.92	1.16	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
8/03/2025	1.27	1.56	Compliant	1.34	1.59	Compliant
8/04/2025	1.43	2.06	Compliant	1.29	1.86	Compliant
8/05/2025	7.97	16.11	Compliant	3.1	9.76	Compliant
8/06/2025	4.75	8.57	Compliant	1.59	3.5	Compliant
8/07/2025	2.95	5.14	Compliant	1.55	3	Compliant
8/08/2025	3.96	10.73	Compliant	1.55	3.98	Compliant
8/09/2025	1.19	2.51	Compliant	0.57	0.94	Compliant
8/10/2025	1.08	2.39	Compliant	0.48	0.65	Compliant
8/11/2025	1.5	2.87	Compliant	0.78	1.48	Compliant
8/12/2025	1.88	3.35	Compliant	1.13	2.4	Compliant
8/13/2025	2.47	4.42	Compliant	1.32	2.6	Compliant
8/14/2025	2.12	3.46	Compliant	1.35	6.78	Compliant
8/15/2025	1.69	3.01	Compliant	1.3	3.1	Compliant
8/16/2025	3.52	14.75	Compliant	1.15	2.8	Compliant
8/17/2025	3.86	13.5	Compliant	0.73	1.42	Compliant
8/18/2025	3	6.65	Compliant	0.96	1.98	Compliant
8/19/2025	1.1	2.08	Compliant	0.69	1.31	Compliant
8/20/2025	0.98	1.6	Compliant	0.74	0.99	Compliant
8/21/2025	0.99	1.54	Compliant	0.82	1.06	Compliant
8/22/2025	1.32	2.5	Compliant	0.99	1.65	Compliant
8/23/2025	2.63	5.05	Compliant	0.93	1.7	Compliant
8/24/2025	2.05	3.66	Compliant	0.63	1.15	Compliant
8/25/2025	2.66	4.91	Compliant	1.07	2.52	Compliant
8/26/2025	2.19	4.14	Compliant	1.4	3.62	Compliant
8/27/2025	5.86	11.97	Compliant	2.5	7.77	Compliant
8/28/2025	3.88	9.11	Compliant	3.56	10.64	Compliant
8/29/2025	3.04	6.94	Compliant	2.78	9.03	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
8/30/2025	2.97	6.9	Compliant	1.44	4.48	Compliant
8/31/2025	0.76	1.32	Compliant	0.96	1.92	Compliant
9/01/2025	3.39	8.14	Compliant	2.2	7.2	Compliant
9/02/2025	3.14	6.04	Compliant	1.84	4.26	Compliant
9/03/2025	2.76	5.34	Compliant	2.25	5.92	Compliant
9/04/2025	3.97	7.58	Compliant	2.44	7.28	Compliant
9/05/2025	2.71	4.9	Compliant	2.03	4.24	Compliant
9/06/2025	1.82	3	Compliant	1.78	3.39	Compliant
9/07/2025	1.22	1.89	Compliant	1.44	2.9	Compliant
9/08/2025	3.58	7.55	Compliant	7.5	22.24	Compliant
9/09/2025	2.43	4.61	Compliant	2.66	8.07	Compliant
9/10/2025	1.37	2.01	Compliant	1.15	1.87	Compliant
9/11/2025	2.43	4.26	Compliant	0.71	1.35	Compliant
9/12/2025	2.72	5.34	Compliant	1.37	3.1	Compliant
9/13/2025	1.78	3.57	Compliant	1.26	2.85	Compliant
9/14/2025	0.68	1.51	Compliant	0.94	2.16	Compliant
9/15/2025	2.33	4.85	Compliant	2.16	6.15	Compliant
9/16/2025	2.52	6.15	Compliant	5.24	19.58	Compliant
9/17/2025	3.68	7.61	Compliant	1.87	5.9	Compliant
9/18/2025	3.41	6.55	Compliant	1.94	4.99	Compliant
9/19/2025	2.73	5.31	Compliant	4.07	13.19	Compliant
9/20/2025	1.29	3.12	Compliant	2.15	5.52	Compliant
9/21/2025	1.21	2.09	Compliant	1.44	3.23	Compliant
9/22/2025	2.8	5.5	Compliant	1.27	3.41	Compliant
9/23/2025	6.39	11.48	Compliant	1.39	3.26	Compliant
9/24/2025	3.21	6.54	Compliant	1.59	4.48	Compliant
9/25/2025	2.85	5.68	Compliant	2.48	6.09	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
9/26/2025	3.7	8.06	Compliant	5.67	19.39	Compliant
9/27/2025	1.85	3.72	Compliant	3.67	12.62	Compliant
9/28/2025	1.96	3.16	Compliant	2.33	4.15	Compliant
9/29/2025	2.93	6.3	Compliant	1.43	3.96	Compliant
9/30/2025	2.53	4.92	Compliant	5.43	17.46	Compliant
10/01/2025	3.47	7.74	Compliant	3.33	12.92	Compliant
10/02/2025	4.26	10.14	Compliant	3.62	14.9	Compliant
10/03/2025	5.02	12.59	Compliant	2.45	8.82	Compliant
10/04/2025	2.47	5.35	Compliant	1.83	4.39	Compliant
10/05/2025	0.92	1.75	Compliant	1.49	3.94	Compliant
10/06/2025	2.2	4.1	Compliant	2.61	6.74	Compliant
10/07/2025	1.31	2.22	Compliant	2.29	5.51	Compliant
10/08/2025	3.73	7.79	Compliant	3.87	17.11	Compliant
10/09/2025	2.13	4.97	Compliant	3.17	11.4	Compliant
10/10/2025	2.04	4.56	Compliant	3.18	10.03	Compliant
10/11/2025	1.58	3.32	Compliant	2.4	7.36	Compliant
10/12/2025	2.19	5.26	Compliant	2.81	11.13	Compliant
10/13/2025	4.87	10.83	Compliant	2.24	5.56	Compliant
10/14/2025	2.64	4.92	Compliant	2.5	6.81	Compliant
10/15/2025	6.8	12.31	Compliant	3.05	7.85	Compliant
10/16/2025	4	7.02	Compliant	4.51	11.05	Compliant
10/17/2025	3.91	7.96	Compliant	4.32	13.73	Compliant
10/18/2025	2.54	5.02	Compliant	2.49	4.9	Compliant
10/19/2025	1.47	2.35	Compliant	2	4.03	Compliant
10/20/2025	7.62	13.06	Compliant	4.05	12.41	Compliant
10/21/2025	6.49	13.35	Compliant	3.52	7.07	Compliant
10/22/2025	5.76	13.05	Compliant	7.15	30.52	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
10/23/2025	6.58	14.32	Compliant	3.74	11.55	Compliant
10/24/2025	5.52	12.26	Compliant	2.66	7.27	Compliant
10/25/2025	2.02	4.35	Compliant	2.02	4.97	Compliant
10/26/2025	1.76	4.21	Compliant	2.35	7.73	Compliant
10/27/2025	4.68	11.92	Compliant	2.31	7.53	Compliant
10/28/2025	2.73	5.38	Compliant	1.82	4.61	Compliant
10/29/2025	0.91	1.55	Compliant	0.85	1.89	Compliant
10/30/2025	2.55	5.22	Compliant	1.94	12.98	Compliant
10/31/2025	2.56	5.15	Compliant	1.77	7.17	Compliant
11/01/2025	0.99	1.44	Compliant	1.53	3.31	Compliant
11/02/2025	0.99	1.28	Compliant	1.36	2.37	Compliant
11/03/2025	2.73	6.63	Compliant	3.22	12.57	Compliant
11/04/2025	1.87	5.54	Compliant	3.7	17.99	Compliant
11/05/2025	2.39	5.16	Compliant	3.15	13.62	Compliant
11/06/2025	2.74	5.96	Compliant	1.93	5.71	Compliant
11/07/2025	4.27	14.11	Compliant	3.77	24.54	Compliant
11/08/2025	2.72	6.26	Compliant	3.5	12.8	Compliant
11/09/2025	2.52	5.72	Compliant	1.22	3.94	Compliant
11/10/2025	2.26	4.69	Compliant	2.1	5.48	Compliant
11/11/2025	4.83	11.26	Compliant	3.03	11.57	Compliant
11/12/2025	3.81	8.79	Compliant	1.74	6.39	Compliant
11/13/2025	2.61	5.03	Compliant	2.41	7.44	Compliant
11/14/2025	5.43	10.67	Compliant	3.96	7.98	Compliant
11/15/2025	2.19	3.27	Compliant	3.27	7.24	Compliant
11/16/2025	1.02	1.98	Compliant	1.92	5.56	Compliant
11/17/2025	3.32	7.03	Compliant	1.62	5.86	Compliant
11/18/2025	2.26	5.03	Compliant	1.94	6.41	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
11/19/2025	3.44	6.62	Compliant	3.61	11.04	Compliant
11/20/2025	4.71	9.29	Compliant	2.77	6.07	Compliant
11/21/2025	1.68	2.82	Compliant	1.36	2.72	Compliant
11/22/2025	2.11	3.43	Compliant	1.81	3.53	Compliant
11/23/2025	0.71	1.31	Compliant	1.19	5.52	Compliant
11/24/2025	4.2	8.68	Compliant	1.13	2.61	Compliant
11/25/2025	2.52	4.78	Compliant	2.25	6.04	Compliant
11/26/2025	3.88	13.91	Compliant	4.51	21.52	Compliant
11/27/2025	4.36	8.59	Compliant	5.83	16.77	Compliant
11/28/2025	3.66	6.34	Compliant	3.76	10.58	Compliant
11/29/2025	3.05	7.24	Compliant	3.83	14.76	Compliant
11/30/2025	1.53	3.21	Compliant	2.28	7.77	Compliant
12/01/2025	1.9	4.32	Compliant	3.43	10.94	Compliant
12/02/2025	4.88	10.4	Compliant	1.69	6.26	Compliant
12/03/2025	3.49	6.79	Compliant	2.31	6.62	Compliant
12/04/2025	4.66	10.97	Compliant	2.55	8.49	Compliant
12/05/2025	4.17	9.61	Compliant	4.87	18.03	Compliant
12/06/2025	3.5	7.66	Compliant	- ¹	-	Compliant
12/07/2025	2.45	4.59	Compliant	-	-	Compliant
12/08/2025	3.24	6.2	Compliant	-	-	Compliant
12/09/2025	6.17	12.5	Compliant	-	-	Compliant
12/10/2025	5	10.42	Compliant	-	-	Compliant
12/11/2025	3.02	6.58	Compliant	-	-	Compliant
12/12/2025	1.42	2.71	Compliant	-	-	Compliant
12/13/2025	2.11	4.87	Compliant	-	-	Compliant
12/14/2025	1.31	2.3	Compliant	-	-	Compliant
12/15/2025	7.69	14.76	Compliant	3.58	6.38	Compliant

Sample Date	HVAS 1 (Site Office)			HVAS 2 (Rail)		
	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status	PM ₁₀ (µg/m ³)	TSP	24-hour PM10 Compliance Status
12/16/2025	4.23	7.53	Compliant	2.78	4.72	Compliant
12/17/2025	2.83	4.93	Compliant	2.34	4.76	Compliant
12/18/2025	2.5	4.73	Compliant	1.99	4.92	Compliant
12/19/2025	2.71	5.13	Compliant	2.71	7.47	Compliant
12/20/2025	1.11	3.09	Compliant	1.26	3.18	Compliant
12/21/2025	1.03	1.82	Compliant	1.37	3.44	Compliant
12/22/2025	3.63	7.83	Compliant	2.47	6.46	Compliant
12/23/2025	3.83	8.26	Compliant	2.72	6.56	Compliant
12/24/2025	1.71	2.89	Compliant	2.38	5.34	Compliant
12/25/2025	2.44	3.92	Compliant	3.08	5.54	Compliant
12/26/2025	1.22	2.2	Compliant	1.52	2.93	Compliant
12/27/2025	1.05	1.83	Compliant	1.24	2.46	Compliant
12/28/2025	1.29	2.16	Compliant	1.56	2.68	Compliant
12/29/2025	1.12	1.83	Compliant	1.45	2.79	Compliant
12/30/2025	0.91	1.4	Compliant	1.34	2.52	Compliant
12/31/2025	1.24	2.2	Compliant	1.71	3.22	Compliant
Annual Average	2.89	5.78	Compliant	2.10	5.41	Compliant
Valid Sample Count	365	365		356	356	
Number of Sampling Events Attempted	365	365		356	356	

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

1 Through 6 December 2025 to 14 December 2025 HVAS 2 was operational but had failed to upload monitoring data to the cloud database. No evidence of an exceedance being missed due to historical data and comparing with results from the Site Office device

Appendix C –

2025 Water Quality and Aquatic Ecology Reports by Niche Environment and Heritage

Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic ecology visual monitoring - summer 2025

Prepared for Holcim Australia Pty Ltd | 18/03/2025



Document control

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

Version	Author	Review	Status	Comments	Date
D1	Alan Davies	Luke Stone	Draft	-	17 March 2024
R0	Alan Davies	-	Version 1	-	18 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 5 March 2025 in summer. Water quality sampling 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

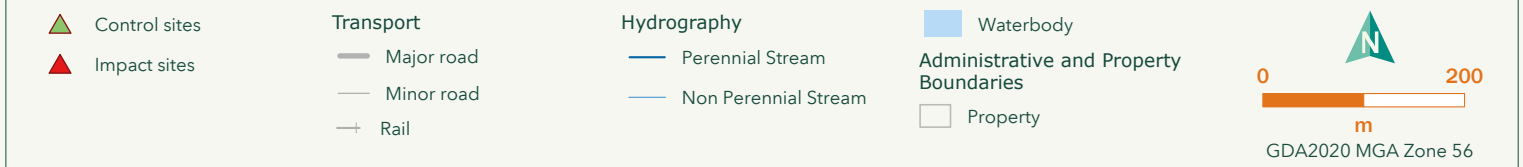


Figure 1
Location of sites
 Holcim Regional Distribution Centre - Aquatic Monitoring

Niche PM: David Wilkinson
 Niche Proj. #: 8601
 Client: Holcim



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: Airbus,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 and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

Drawn by: Alexander Carling File: C:\OneDrive\sync\Folder\Niche\GIS - APRX - APRX\A6600\A6601_Holcim\Aquatic\Monitoring - NSW\Pro\A6601_Holcim\Aquatic\Monitoring - Environment\NSW.aprx Last updated: 18/06/2024 11:03 AM



2.2 Field methods

The field survey was undertaken on the 5 March 2024 by aquatic Ecology Consultant Alan Davies. The field methods were consistent with standardised techniques for aquatic 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 ($\mu\text{S}/\text{cm}$)
- pH
- Dissolved oxygen (DO % saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO_3/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 (NO_x) + Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NO_x



3 Results

3.1 Rainfall

Antecedent rainfall from the month preceding the summer monitoring totalled 50.5 millimetres (mm) (Figure 2). 4.5 mm of rain was recorded in the week leading up to the sampling. The water level at the time of sampling was low to moderate.

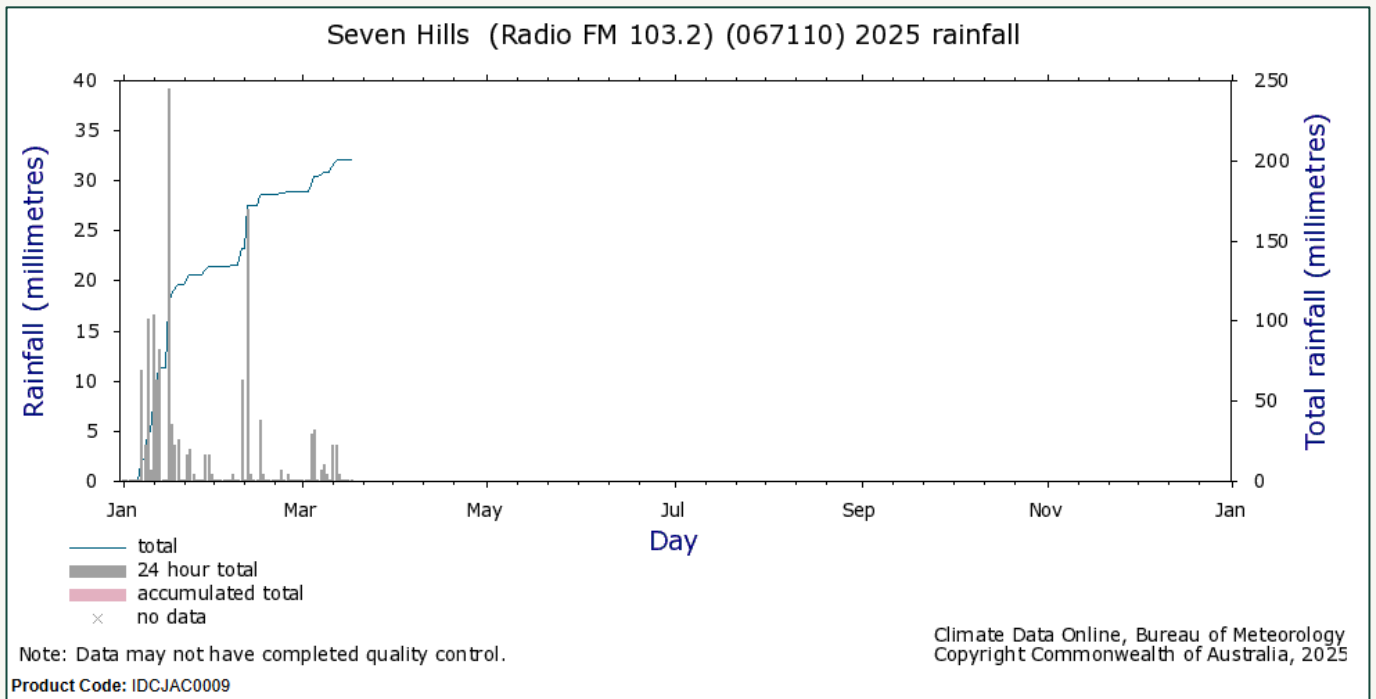


Figure 2: Rainfall January to March 2025

3.2 Visual survey

Results of the visual survey including photographs of each site are provided 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 had fallen since spring 2024 (Niche 2024) with water levels no longer elevated above the lower banks at site AE5 under the foot bridge.

Visual assessment at the sites indicated the streams were in 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 during previous monitoring seasons (Niche 2024). As previously observed in spring 2024 (Niche 2024) 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 spring 2024 (Niche 2024) (7 Annex 1)). The channel incision identified in 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 road



bridge above the stream, with completion of instream works consisting of instream additions of boulders and cobbles, 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 had visibly higher water clarity.

3.3 Water quality

3.3.1 Physico-chemical

Field recorded physico-chemical water quality results are shown in (Table 2). Electrical conductivity was within the ANZG Default Guideline Values (DGVs) at all sites. Electrical conductivity results remained relatively consistent between all sites with levels ranging between 608 – 889 $\mu\text{S}/\text{cm}$, notably the highest electrical conductivity readings were collected at upstream Angus Creek site AE6. Turbidity levels were below the upper limit of DGVs at all sites. Elevated turbidity levels were identified at the Eastern Creek Sites AE4 (downstream) and AE5 (control), as well as Angus Creek site AE6 (control), relative to the other sites. This trend has been recorded in previous monitoring rounds (Niche 2023, 2024), given the comparability to control site readings, this is unlikely to be associated with the project. Dissolved oxygen levels were below guidelines for all sites, which is typical of suburban streams in Western Sydney. The difference in dissolved oxygen values between the upstream and downstream sites was negligible. All pH readings were within the DGVs and consistent across all sites. Alkalinity values were also consistent across sites ranging between 100-120 mg CaCo_3/L .

Table 2: Field physico-chemical water quality results

Site	Stream	Temperature (C°)	Electrical conductivity ($\mu\text{S}/\text{cm}$)	Turbidity (NTU)	Dissolved Oxygen (% saturation)	pH*	Alkalinity (mg CaCo_3/L)
AE1	Angus Creek Control	21.33	638	6.4	35.4	7.22	120
AE2	Angus Creek	21.63	608	4.6	22.1	7.07	110
AE3	Angus Creek	21.62	612	4.1	19.9	7.02	110
AE4	Eastern Creek	21.7	748	20.8	24.0	7.07	100
AE5	Eastern Creek Control	21.7	753	24.1	29.7	6.88	110



Site	Stream	Temperature (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% saturation)	pH*	Alkalinity (mg CaCO ₃ /L)
AE6	Angus Creek Control	22.67	889	17.9	22.3	7.32	100

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, Total Nitrogen and Nitrogen Oxides were at the limit of, or above ANZG DGVs (Table 3) for lowland streams for all Angus Creek and Eastern Creek sites. These high values and exceedances have been previously recorded and is common for the monitoring program (Niche 2023, 2024). 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). The three upstream sites AE1, AE5 and AE6 recorded the highest Nitrogen Oxides and Total Nitrogen values. Upstream sites AE5 and AE1 also recorded the highest Total Phosphorus scores.

Table 3: Nutrients - laboratory results

Site	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen (TN) (TKN + NO _x) (mg/L)	Nitrogen Oxides (NO _x) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.10	0.8	0.25	0.5
AE2	Angus Creek	0.09	0.8	0.21	0.6
AE3	Angus Creek	0.05	0.7	0.21	0.5
AE4	Eastern Creek	0.10	0.8	0.16	0.6
AE5	Eastern Creek Control	0.10	1.0	0.32	0.7
AE6	Angus Creek Control	0.05	1.0	0.43	0.6

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



4 Discussion and conclusion

The field-recorded physico-chemical water quality results indicate that electrical conductivity and pH levels are within the ANZG Default Guideline Values (DGVs) for all monitoring sites in both Eastern Creek and Angus Creek. These results are consistent with previous monitoring rounds (Niche 2023, 2024) and do not exhibit any distinct patterns between upstream and downstream sites. Similarly, turbidity levels were below the upper DGV limits at all sites, with slightly elevated levels recorded at the Eastern Creek sites AE4, AE5 and AE6 (relative to other sites). This has been observed in past monitoring rounds and is not considered an anomaly. Dissolved oxygen levels were below the DGVs across all sites, which is consistent with previous assessments and typical of low-lying suburban streams in Western Sydney. The lack of substantial variation between upstream and downstream sites suggests that local stream characteristics and environmental factors contribute to the consistently low dissolved oxygen levels rather than site-specific influences.

Additionally, all nutrient analytes were at the limit of, or 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 2025

Overall, the two streams appear to be in reasonable health for urban waterways. 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.



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7 Annex 1: Visual observation – March 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	<i>L. lucidum</i> and <i>T. fluminensis</i>
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.



Category	Attribute	AE1 Upstream
	Water quality observations	Water visually turbid
Comments	Weeds and rubbish present. Lack of organic material in channel.	

AE2: Angus Creek



Upstream



Downstream

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	<i>T. fluminensis</i> 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



Category	Attribute	AE2 downstream
	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. Metal debris and litter in system. Concrete rubble in system.	

AE3: Angus Creek Downstream



Upstream



Downstream

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	<i>L. Lucidum</i> , <i>T. fluminensis</i>
Stream characteristics	Modal width	4 m
	Bank Condition	Stable, steep, exposed in sections, slight visible erosion.
	Substrate	Fine sediment, organic matter on banks



Category	Attribute	AE3 Downstream
	Flow/depth	Low flow/~1 metre
	Macrophytes/algae	Ribbon Weed (<i>Vallisneria</i> sp.)
	Water quality observations	Visually water appeared slightly opaque
Comments	Significant amount of plastic based rubbish in stream	

AE4: Eastern Creek Downstream



Upstream



Downstream

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</i> <i>L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>
	Stream shading	Moderate
	Exotic vegetation	<i>L. lucidum</i> and <i>T. fluminensis</i>
Stream characteristics	Modal width	8 m
	Bank condition	Unstable banks
	Substrate	Fine sediment



Category	Attribute	AE4 Downstream
	Flow/depth	Moderate flow/>1m
	Macrophytes/algae	Macrophytes not present
	Water quality observations	Visually Turbid
Comments	Rubbish from floating gross pollutant trap has been cleared out. Some smaller plastic rubbish still in stream.	

AE5: Eastern Creek Upstream



Upstream



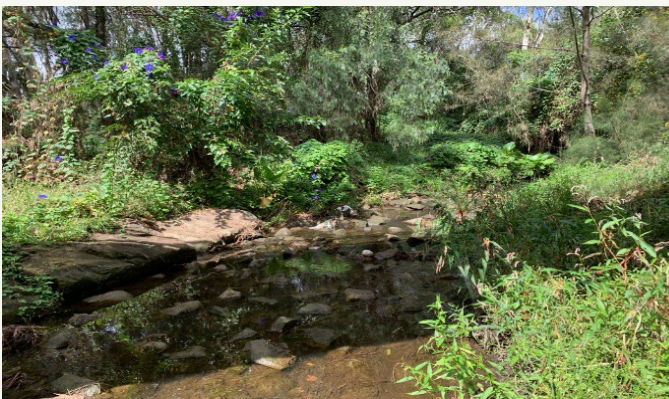
Downstream

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra (Lomandra longifolia)</i> and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
Stream characteristics	Modal width	12 m
	Bank condition	Unstable
	Substrate	Fine sediment and large woody debris.



Category	Attribute	AE5 Upstream
	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



Downstream

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra (Lomandra longifolia)</i> and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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. Large instream works have been conducted just downstream of the monitoring site. Including rock lining the banks with boulders, lining the creek bed small boulders and installation of a large culvert with scaffolding built on it.	



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Our Expertise



Natural capital
and offsetting



Ecology



Heritage
management



Environmental
planning, approvals
and management



Spatial Services

Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic Ecological Monitoring – Autumn 2025

Prepared for Holcim Pty Ltd
26 June 2025





Document control

Project number	Client	Project manager	LGA
9125	Holcim Pty Ltd	Alan Davies	Blacktown City Council

Version	Author	Review	Status	Comments	Date
D0	Alan Davies	Luke Stone	Draft		12/06/2025
R0	Alan Davies		Final	For Holcim	26/06/2025

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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 is required under condition 2.28 of the Project approval and includes:

- Quarterly visual monitoring and water quality sampling
- Bi-annual aquatic survey
- Quarterly reporting

The aim of the monitoring program is to compare sites downstream of the RDC (potential impact sites) to upstream (control) 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 7 May 2025 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



- ▲ Control sites
- ▲ Impact sites

- Transport**
- Major road
 - Minor road
 - Rail

- Hydrography**
- Perennial Stream
 - Non Perennial Stream

- Waterbody
- Administrative and Property Boundaries**
- Property

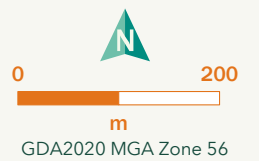


Figure 1
Location of sites
 Holcim Regional Distribution Centre - Aquatic Monitoring



Niche PM: David Wilkinson
 Niche Proj. #: 8601
 Client: Holcim



2.2 Field methods

The field survey was undertaken on the 7 May 2025 by Aquatic Ecology Consultants David Wilkinson and 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 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 ($\mu\text{S}/\text{cm}$)
- pH
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO_3/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. in-



stream 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 - <http://www.mdfrc.org.au/bugguide/>.

2.3 Data Analysis

2.3.1 SIGNAL2 (Stream Invertebrate Grade Number Average Level) scores

“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



SIGNAL2 grade (individual taxa)	Pollution tolerance
2-1	Indicates a greater tolerance to pollution
SIGNAL2 grade (individual taxa)	Pollution tolerance

Table 3: Signal2 score interpretation (site level)

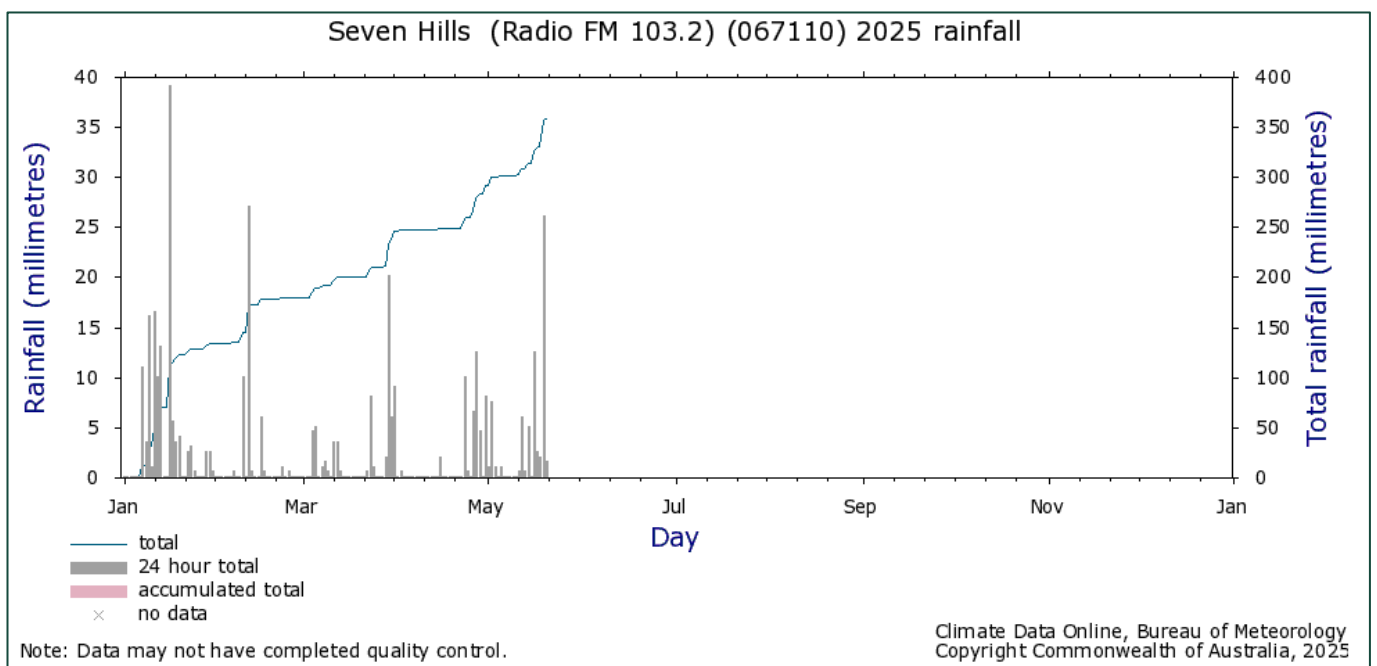
SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution



3. Results

3.1 Rainfall

Antecedent rainfall from the two weeks preceding the autumn monitoring totalled 41.5 millimetres (mm) (Figure 2). A total of 10 mm of rain was recorded in the week leading up to the sampling. The water level at the time of sampling was low to moderate.



Source: Bureau of Meteorology

Figure 2: Rainfall January to May 2025

3.2 Visual Survey

Results of the visual survey including photographs of each site are provided in 6. 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 Summer 2024 observation (Niche 2025) with water levels no longer elevated above the lower banks at site AE5 under the foot bridge.

Visual assessment at the sites indicated the streams were in 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 during previous monitoring seasons (Niche 2024). As previously observed in summer 2025 (Niche 2025) sites AE1 was 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 AE2 was observed to have a small improvement in organic matter available which has been slowly improving since summer 2024 (Niche 2024). Site AE3 is



recovering from significant erosion that was observed in spring and summer 2024 (Niche 2024, 2025) (6) The channel incision identified in 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 road bridge above the stream, with completion of instream works consisting of instream additions of boulders and cobbles, the removal of macrophyte beds and addition of large culvert.

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 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 had visibly 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 default guideline values (DGVs) for lowland streams at all sites. Compared to the previous sampling round (Niche 2024), electrical conductivity levels were generally higher, particularly at the Angus Creek sites, where values ranged between 909-1046 $\mu\text{S}/\text{cm}$, though remained relatively consistent across upstream control and downstream potential impact sites.

Turbidity was within DGVs for all Angus Creek sites (AE1-AE3, AE6), with low values ranging from 1.4-4.3 NTU. Both Eastern Creek sites (AE4 and AE5) had elevated turbidity, with site AE4 above DGV's, continuing a trend observed in previous monitoring events (Niche 2024).

Dissolved oxygen levels were below the DGVs at all sites, with values ranging from 23.6-49.9%, dissolved oxygen was higher at the Eastern Creek sites than Angus Creek sites but relatively consistent between upstream control and downstream potential impact sites. The observed recorded low dissolved oxygen readings are consistent with conditions often observed in suburban lowland streams in Western Sydney as seen in previous monitoring (Niche 2024).

The pH levels were within the DGVs across all sites, ranging from 7.43-7.74. Alkalinity values ranged from 100-240 $\text{mg CaCO}_3/\text{L}$, with the highest values recorded at Angus Creek control site AE6. These levels are broadly consistent with previous sampling rounds and are consistent between control and potential impact sites.

Table 4: Field physico-chemical water quality results

Site	Stream/status	Temp (C°)	Electrical conductivity ($\mu\text{S}/\text{cm}$)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCO_3/L)
AE1	Angus Creek Control	16.56	1005	4.3	27.1	7.74	200
AE2	Angus Creek Potential impact	16.25	938	1.5	23.6	7.61	220
AE3	Angus Creek Potential impact	16.33	909	2.4	25.7	7.68	200



Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo3/L)
AE4	Eastern Creek Potential impact	15.66	549	57.2	46.5	7.43	100
AE5	Eastern Creek Control	15.57	548	45.5	49.9	7.5	120
AE6	Angus Creek Control	17.08	1046	1.4	30.	7.6	240

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 exceeded the default trigger values

3.3.2 Nutrients

All sites exceeded the DGVs for total phosphorus, except for downstream potential impact site AE2, which was within the guideline range. Total nitrogen concentrations were within DGVs at potential impact sites AE2 and AE3, while all other sites—including both control sites—exceeded the guidelines. Levels of Nitrogen oxides were above DGVs at all sites. Downstream potential impact sites AE2 and AE3 recorded the lowest TKN. Overall, the downstream potential impact sites recorded comparable or better nutrient results than the control sites.

Table 5: 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	0.05	0.6	0.32	0.3
AE2	Angus Creek Potential impact	0.04	0.4	0.18	0.2
AE3	Angus Creek Potential impact	0.06	0.4	0.15	0.2
AE4	Eastern Creek Potential impact	0.11	0.9	0.27	0.6
AE5	Eastern Creek Control	0.08	0.7	0.28	0.4
AE6	Angus Creek Control	0.10	0.8	0.38	0.4

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 exceeded the default trigger values

3.4 Macroinvertebrate and SIGNAL2 scores

The number of taxa at each site was low (Table 6), ranging between 6 (downstream potential impact site AE4) and 12 (downstream potential impact site AE3).. The SIGNAL2 scores (Table 6) were below 4 at all sites,



indicative of severe levels of pollution (Table 3). Site based SIGNAL2 scores ranged between 2.43 and 3.22 and were reasonably consistent across sites, downstream site AE3 recording the highest score and control sites AE5 and AE6 recording the lowest scores. Downstream site AE4 although typically with the lowest SIGNAL2 score improved compared to Spring 2024 monitoring (Niche 2024).

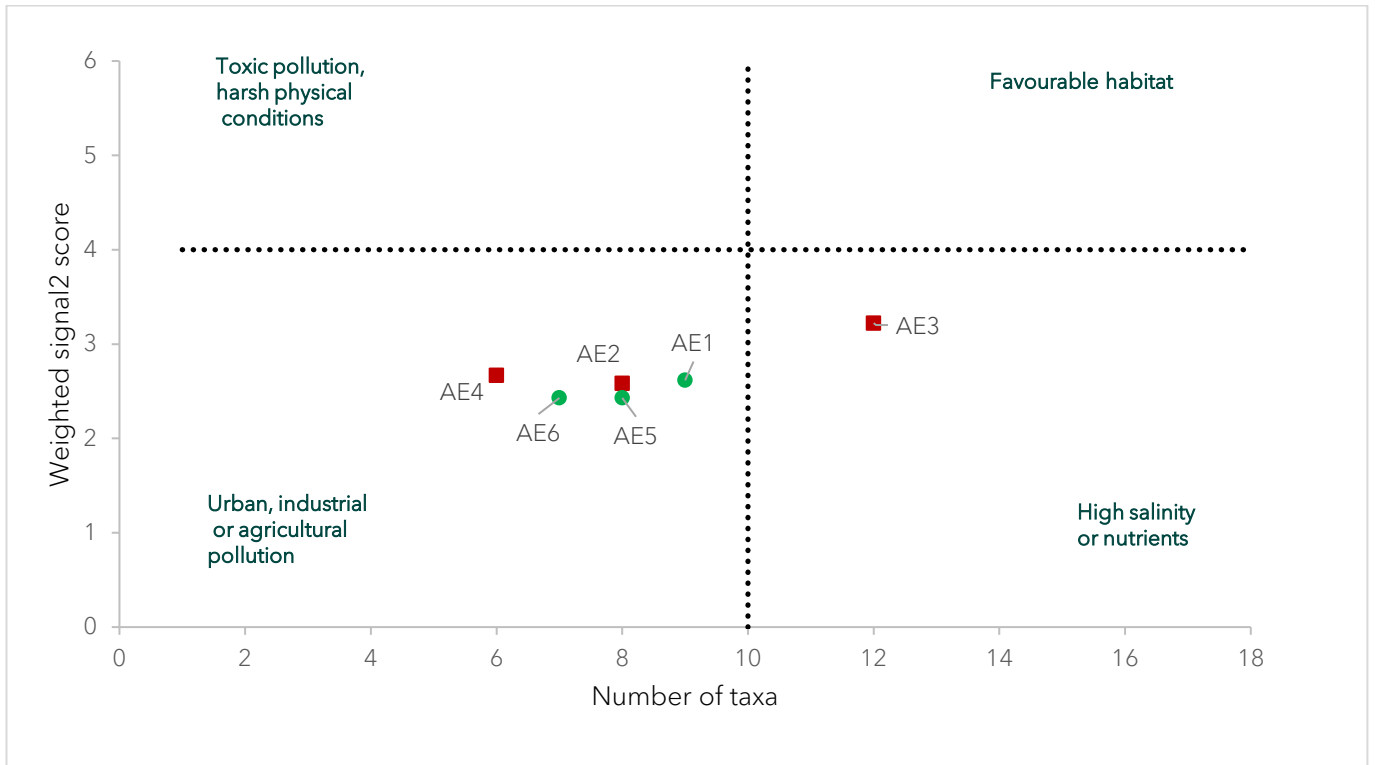
The two Eastern Creek sites (upstream control AE5 and downstream potential impact AE4) were only sites to record sensitive taxa, all from the Trichoptera (Caddisfly) order. Sites AE4 and AE5 were the only to record Macroinvertebrates from a sensitive Taxa, all being from Trichoptera. Both sites recorded Leptoceridae (SIGNAL2 grade:6), additionally AE4 recorded Ecnomidae (SIGNAL2 grade:4) and AE5 recorded Glossosomatidae (SIGNAL2 grade:9).

Table 6: Number of taxa and weighted SIGNAL2 scores autumn 2025

Site	Stream	Number of taxa	SIGNAL2 scores
AE1	Angus Creek Control	9	2.62
AE2	Angus Creek Potential impact	8	2.58
AE3	Angus Creek Potential impact	12	3.22
AE4	Eastern Creek Potential impact	6	2.67
AE5	Eastern Creek Control	8	2.43
AE6	Angus Creek Control	7	2.43

Source: [Enter source text]

The SIGNAL2 bi-plot (Figure 3) indicates that no sites represent favourable habitat, with all locations exhibiting signs of pollution or natural stress. Potential impact site AE3 recorded the highest SIGNAL2 score and the greatest number of macroinvertebrate taxa; however, the score still falls within a range considered poor. The remaining sites, including all control sites, tended to cluster together, suggesting relatively consistent and similarly degraded conditions across these locations.



Red squares represent downstream potential impact sites. Green circles represent upstream control sites.

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



4. Discussion and conclusion

The physico-chemical results were generally consistent with previous monitoring rounds (Niche 2024), with most parameters remaining within ANZG guideline values. Electrical conductivity levels were slightly elevated compared to previous monitoring (Niche 2025, Niche 2024), particularly at Angus Creek, but remained consistent across sites. Turbidity levels continued to be low at Angus Creek and elevated at Eastern Creek—especially at site AE4, where exceedances have been recorded in previous monitoring (Niche 2025). Dissolved oxygen remained low across all sites, which is typical of highly modified lowland streams in Western Sydney. The pH and alkalinity levels were stable and showed no clear differences between control and potential impact sites.

Nutrient levels showed marginal improvement compared to summer 2024 (Niche 2025). Downstream potential impact sites generally recorded similar or slightly better nutrient results than control sites, particularly for Nitrogen related parameters. While most sites still exceeded guideline values for nutrients, the results do not suggest evidence of nutrient enrichment related to the Project.

The total number of macroinvertebrate taxa remained low across all sites; results were slightly lower than but comparable with previous monitoring rounds (Niche 2025). High-energy flows caused by increased rainfall in the month preceding the autumn survey may have impacted macroinvertebrate assemblages, particularly at sites with limited available habitat. This contrasts with the spring 2024 survey (Niche 2025), which followed a period of minimal rainfall and likely more stable flow conditions (Niche 2025). Total taxa ranged from 6 to 12, with downstream site AE3 recording the highest richness and AE4 the lowest. SIGNAL2 scores were all below 4, indicating poor water quality and suggesting severe pollution or environmental stress across the study area. These results are reflective of the limited habitat quality and urbanised nature of the surrounding catchment. SIGNAL2 scores were comparable between sites and generally slightly better at the downstream potential impact sites suggesting there is no impact of the Holcim site on macroinvertebrate assemblage.

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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<http://ausrivas.ewater.com.au>



6. Annex 1 Visual observations

6.1 AE1: Angus Creek Upstream control



Figure 4: Upstream (left) and downstream (right) photos from AE1

Table 7: Riparian and stream conditions at site AE1

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	<i>L. lucidum</i> and <i>T. fluminensis</i>
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.	



6.2 AE2 Angus Creek downstream potential impact



Figure 5: Upstream (left) and downstream (right) photos from AE2

Table 8: Riparian and stream conditions at site AE2

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	<i>T. fluminensis</i> 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	Water visually clear.
Comments	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.	



6.3 AE3 Angus Creek downstream potential impact



Figure 6: Upstream (left) and downstream (right) photos from AE3

Table 9: Riparian and stream conditions at site AE3

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	<i>L. Lucidum</i> , <i>T. fluminensis</i>
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	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.	



6.4 AE4 Eastern Creek downstream potential impact



Figure 7: Upstream (left) and downstream (right) photos from AE4

Table 10: Riparian and stream conditions at site AE4

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</i> <i>L. lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>
	Stream shading	Moderate
	Exotic vegetation	<i>L. lucidum</i> and <i>T. fluminensis</i>
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 mostly in the gross pollutant floating trap	



6.5 AE5 Eastern Creek upstream control



Figure 8: Upstream (left) and downstream (right) photos from AE5

Table 11: Riparian and stream conditions at site AE5

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	



6.6 AE6 Angus Creek upstream control



Figure 9: Upstream (left) and downstream (right) photos from AE6

Table 12: Riparian and stream conditions at site AE6

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	Major landscaping works have been conducted both in stream-on-stream edge. Including large culvert	



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Natural capital
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Ecology



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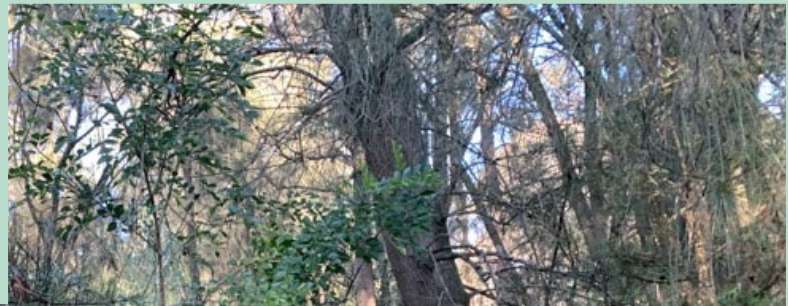


Spatial Services

Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic Ecological Monitoring – Winter 2025

Prepared for Holcim Pty Ltd
13 August 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 is required under condition 2.28 of the Project approval and includes:

- Quarterly visual monitoring and water quality sampling
- Bi-annual aquatic survey
- Quarterly reporting

The aim of the monitoring program is to compare sites downstream of the RDC (potential impact sites) to upstream (control) 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 visual and water quality assessment on 23 July 2025 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



- ▲ Control sites
- ▲ Impact sites

- Transport**
- Major road
 - Minor road
 - Rail

- Hydrography**
- Perennial Stream
 - Non Perennial Stream

- Waterbody
- Administrative and Property Boundaries**
- Property



Figure 1
Location of sites
 Holcim Regional Distribution Centre - Aquatic Monitoring



Niche PM: David Wilkinson
 Niche Proj. #: 8601
 Client: Holcim

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: Airbus,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 and labels shown around the border of the map are presented in GDA2020 MGA Zone 56.

Drawn by: Alexander Carling File: C:\OneDrive\sync\Folder\Niche\GIS - APRX - APRX\A6600\A6601_Holcim\Aquatic\Monitoring - NSW\Pro\A6601_Holcim\Aquatic\Monitoring - Environment\NSW.aprx Last updated: 18/06/2024 11:03 AM



2.2 Field methods

The field survey was undertaken on the 23 July 2025 by 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 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 ($\mu\text{S}/\text{cm}$)
- pH
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO_3/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

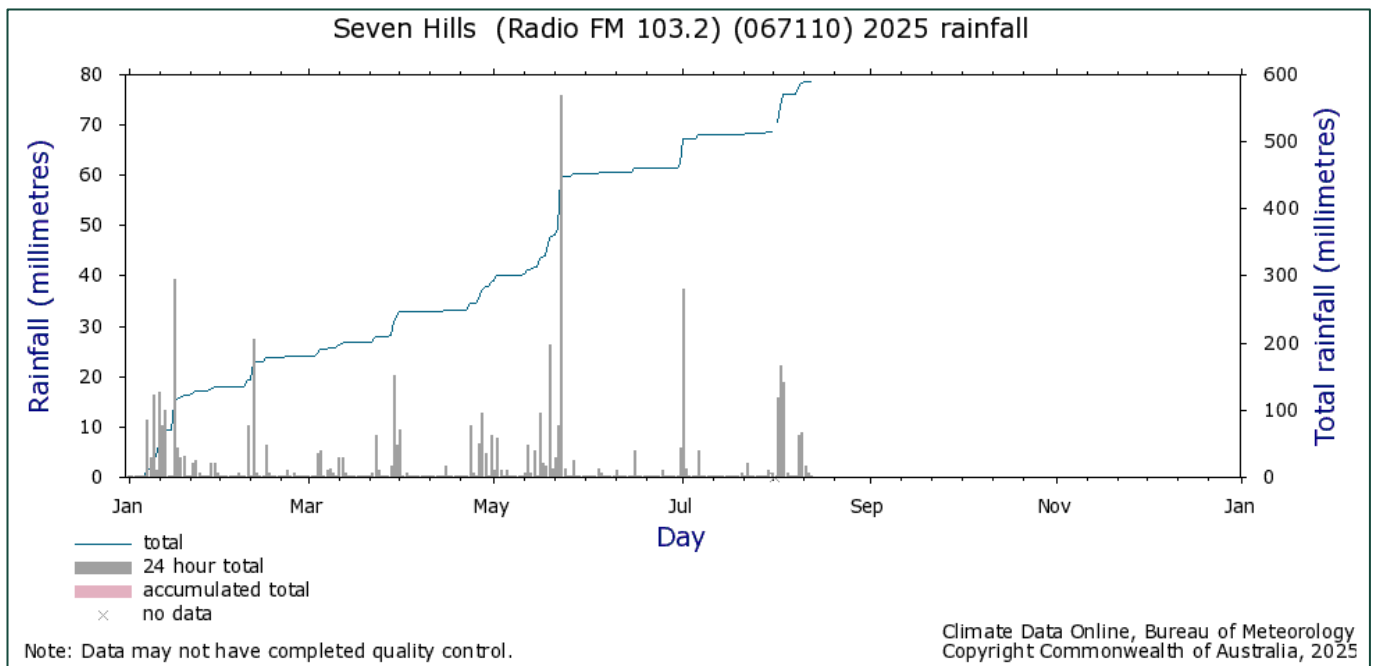
Water samples were taken at each location and sent to ALS laboratories to test for Total Phosphorus (TP), Total Nitrogen (TN) (Nitrogen Oxides (NO_x) + Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NO_x.



3. Results

3.1 Rainfall

Antecedent rainfall from the two weeks preceding the autumn monitoring totalled 0.5 millimetres (mm) (Figure 2). A total of 50 mm of rain was recorded in the month leading up to the sampling. The water level at the time of sampling was low to moderate.



Source: Bureau of Meteorology

Figure 2: Rainfall January to May 2025

3.2 Visual survey

Results of the visual survey including photographs of each site are provided in section 6. 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 autumn 2024 observation (Niche 2025b) with water levels no longer elevated above the lower banks at site AE5 under the foot bridge.

Visual assessment at the sites indicated the streams were in 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 during previous monitoring seasons (Niche 2024). Established Deer tracks to the creek were observed during winter 2025 survey. AE1 continues to lack organic matter accumulations along pool edges (see Figure 4), with aquatic habitat largely restricted to large woody debris tangled with litter along the banks and in stream sections. Site AE2 continues to show improved aquatic habitat availability (woody debris, detritus and overhanging bank



vegetation) with a positive trend first observed in autumn 2024 (Niche 2024). Site AE3 is recovering from significant erosion that was observed in spring and summer 2024 (Niche 2024, 2025). The channel incision identified in previous recent monitoring is also recovering, with a significant amount of sediment now accumulating along with organic matter. Encroachment of riparian vegetation down the banks towards the stream level was observed in winter 2025. Upstream site AE6 is currently being affected by landscaping works and major roadworks on the road bridge above the stream, with completion of instream works consisting of instream additions of boulders and cobbles, the removal of macrophyte beds and addition of large culvert (Niche 2024). Construction activity at site AE6 was observed again during winter 2025 survey.

The banks of Eastern Creek at both sites AE4 and AE5 are continuing to show signs of erosion and instability, with the channel zones 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 is in visually good condition considering the locality.

All sites continue to have some 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 had visibly higher water clarity.

3.3 Water quality

3.3.1 Physico-chemical

Field-recorded physico-chemical water quality results are shown in Table 2 below.

- Electrical conductivity readings were within default trigger values (DTV's) at all sites. No major difference in electrical conductivity levels were evident between upstream control and downstream potential impact sites.
- Turbidity and pH levels were within DTVs at all sites. No trends were identified between upstream control and downstream potential impact sites.
- Dissolved oxygen saturation readings were below DTVs for all sites. There was minimal range in dissolved oxygen levels across sites and no trend between upstream control and downstream potential impact sites.

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 CaCO ₃ /L)
AE1	Angus Creek Control	13.04	1662	7.5	41.7	6.68	120
AE2	Angus Creek Potential impact	12.53	1213	7.2	43.1	7.25	140
AE3	Angus Creek Potential impact	12.58	1343	8.1	40.5	7.42	140
AE4	Eastern Creek Potential impact	12.37	1478	9.7	39.3	7.52	120
AE5	Eastern Creek Control	10.95	1544	20.2	42.4	7.64	120
AE6	Angus Creek	14.04	1856	9.8	46.7	7.49	140



Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCO ₃ /L)
	Control						

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

Laboratory recorded nutrient results are shown in Table 3 below:

- Total Nitrogen, Total Phosphorus and Nitrogen Oxide levels were in exceedance of default trigger values (DTV's) at all sites
- Although Total Phosphorus was highest at potential impact site AE4, Phosphorus levels were lower at the downstream potential impact sites closest to the RDC (AE2 and AE3) than the upstream controls (AE1, AE6). Elevated Phosphorus levels at the downstream AE4 likely reflect inputs downstream of the RDC, including elevated levels entering from Eastern Creek (as seen in the elevated levels at the Eastern Creek control AE5).
- Total Nitrogen and Nitrogen Oxide levels were also highest at the upstream control sites. Generally, Nitrogen levels were lower at the downstream potential impact sites.

Table 3: Nutrients - Laboratory results

Site	Stream	Total Phosphorous (TP) (mg/L)	Total Nitrogen TN (TKN + NO _x) (mg/L)	Nitrogen Oxides (NO _x) (mg/L)	Total Kjeldahl Nitrogen (TKN) (mg/L)
AE1	Angus Creek Control	0.09	1.7	0.83	0.9
AE2	Angus Creek Potential impact	0.06	0.9	0.42	0.5
AE3	Angus Creek Potential impact	0.08	1.0	0.36	0.6
AE4	Eastern Creek Potential impact	0.18	1.0	0.32	0.7
AE5	Eastern Creek Control	0.14	1.5	0.26	1.2
AE6	Angus Creek Control	0.11	1.8	0.95	0.8

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



4. Discussion and conclusion

All sites surveyed as part of this monitoring program exhibited varying levels of anthropogenic impact. Visual observations did not indicate that these impacts were being exacerbated by Holcim Regional Distribution Centre (RDC), suggesting that any existing disturbance is more likely attributable to broader catchment influences.

Physico-chemical water quality levels were generally consistent with previous monitoring rounds (Niche 2025a, 2025b), with most parameters remaining within ANZG default trigger values. Low dissolved oxygen levels recorded in the winter 2025 monitoring are not uncommon in urbanised catchments such as Eastern and Angus Creeks, where increased surface runoff can influence nutrient levels. Nitrogen and phosphorus concentrations exceeding default trigger values also suggest that prevailing catchment, likely related to elevated surface runoff are affecting water quality. Importantly, both the physico-chemical readings and nutrient levels showed no consistent pattern between upstream control sites and downstream potential impact sites.

Overall, both Angus Creek and Eastern Creek appear to be in reasonable health for urban waterways. The water quality and visual 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 www.waterquality.gov.au/anz-guidelines.

Niche (2023a) Aquatic Ecology Monitoring Visual Report. Winter 2023

Niche (2023b) Aquatic Ecology Monitoring Bi-Annual Report. Spring 2023

Niche (2024) Aquatic Ecology Monitoring Visual Report. Autumn 2024

Niche (2025a) Aquatic Ecology Monitoring Visual Report. Summer 2025

Niche (2025b) Aquatic Ecology Monitoring Bi-Annual Report. Autumn 2025



6. Annex 1 Visual observations

6.1 AE1: Angus Creek Upstream control



Figure 3: Upstream (left) and downstream (right) photos from AE1

Table 4: Riparian and stream conditions at site AE1

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	<i>L. lucidum</i> and <i>T. fluminensis</i>
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.	



6.2 AE2 Angus Creek downstream potential impact



Figure 4: Upstream (left) and downstream (right) photos from AE2

Table 5: Riparian and stream conditions at site AE2

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	<i>T. fluminensis</i> 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	Water visually clear.
Comments	In-stream aquatic habitat continues to be observed. Weeds and rubbish. Concrete rubble in system.	



6.3 AE3 Angus Creek downstream potential impact



Figure 5: Upstream (left) and downstream (right) photos from AE3

Table 6: Riparian and stream conditions at site AE3

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	<i>L. Lucidum</i> , <i>T. fluminensis</i>
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	Incision erosion still observable. Riparian vegetation encroaching further down banks.	



6.4 AE4 Eastern Creek downstream potential impact



Figure 6: Upstream (left) and downstream (right) photos from AE4

Table 7: Riparian and stream conditions at site AE4

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</i> L. <i>lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>
	Stream shading	Moderate
	Exotic vegetation	<i>L. lucidum</i> and <i>T. fluminensis</i>
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 mostly in the gross pollutant floating trap	



6.5 AE5 Eastern Creek upstream control



Figure 7: Upstream (left) and downstream (right) photos from AE5

Table 8: Riparian and stream conditions at site AE5

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	



6.6 AE6 Angus Creek upstream control



Figure 8: Upstream (left) and downstream (right) photos from AE6

Table 9: Riparian and stream conditions at site AE6

Category	Attribute	AE6 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	Major landscaping works have been conducted both in stream-on-stream edge. Including large culvert	



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Natural capital
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Ecology



Heritage
management



Spatial Services

Holcim Regional Distribution Centre – Rooty Hill, NSW

Aquatic Ecological Monitoring – Spring 2025

Prepared for Holcim Pty Ltd
2 February 2026





Document control

Project number	Client	Project manager	LGA
9125	Holcim Pty Ltd	Alan Davies	Blacktown City Council

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1. Introduction

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- Bi-annual aquatic survey
- Quarterly reporting

The aim of the monitoring program is to compare sites downstream of the RDC (potential impact sites) to upstream (control) 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 15 October 2025 in spring. 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 across 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
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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



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The field survey was undertaken on 15 October 2025 by Aquatic Ecology Consultants David Wilkinson and 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
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- Bank stability
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- 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:

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- Conductivity ($\mu\text{S}/\text{cm}$)
- pH
- Dissolved oxygen (DO% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg CaCO_3/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 (NO_x) + Total Kjeldahl Nitrogen (TKN)). The results were compared with ANZG (2018) DTVs for TP, TN and NO_x.

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. in-stream 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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2.3 Data Analysis

2.3.1 SIGNAL2 (Stream Invertebrate Grade Number Average Level) scores

“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



SIGNAL2 grade (individual taxa)	Pollution tolerance
SIGNAL2 grade (individual taxa)	Pollution tolerance

Table 3: Signal2 score interpretation (site level)

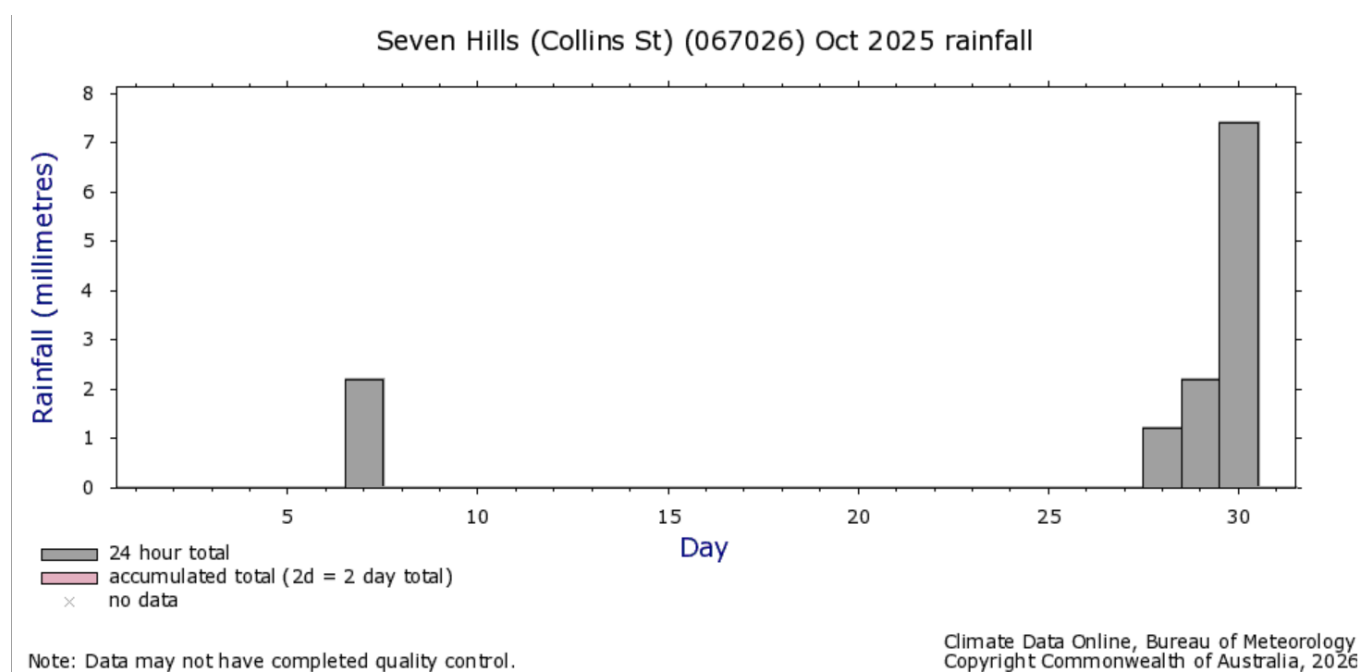
SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution



3. Results

3.1 Rainfall

Antecedent rainfall from the month preceding the spring monitoring totalled 17.2 millimetres (mm). A total of 2.2 mm of rain was recorded in the two weeks leading up to the sampling (Figure 2). The water level at the time of sampling was low to moderate.



Source: Bureau of Meteorology

Figure 2: Rainfall from October 2025

3.2 Visual Survey

Results of the visual survey, including photographs of each site, are provided in Annex1. Water levels at both Angus Creek and Eastern Creek during the spring 2025 sampling were lower than those recorded during previous monitoring (Niche 2025a; 2025b and 2024), consistent with reduced rainfall in the month preceding sampling. Despite lower water levels, all sites remained accessible and suitable for sampling.

Overall, visual assessment indicated that the streams remain in reasonable condition for urban waterways within the locality. At Angus Creek, the upper banks continue to support dense riparian and groundcover vegetation. At site AE1, the steep banks remain susceptible to erosion, with some undercutting still evident; however, small improvements in riparian vegetation encroaching onto the banks were observed again in spring 2025, although large areas remain relatively bare. In-pool habitat at AE1 is improving, with area's of detritus and overhanging vegetation present.

Site AE2 appeared visually similar to observations made during autumn 2025 (Niche 2025a), with no notable changes in channel form or habitat availability. At site AE3, a noticeable reduction in water level was observed,



along with a slight opaque colouration of the water during spring 2025. Lower water levels at this site improved access for sampling and exposed additional channel microhabitats particularly exposed roots from riparian vegetation.

At Eastern Creek, reduced water levels at site AE4 resulted in water levels falling below areas where overhanging vegetation previously extended into the creek, reducing available macroinvertebrate habitat. The lower water level also exposed additional sections of steep and slippery banks, making sampling more difficult. In contrast, reduced water levels at site AE5 exposed root structures and bank vegetation, increasing the availability of edge and structural habitat. Water clarity at AE5 was also visually improved relative to previous monitoring events (Niche 2025a), likely reflecting sustained low-flow conditions.

Upstream site AE6 continues to be influenced by recent works. Rock lining of the creek and completion of surrounding construction activities has created areas of makeshift rocky and riffle-like habitat suitable for sampling. Evidence of sedimentation remains present along the channel, and sandstone banks may continue to limit edge habitats.

Across all sites, anthropogenic litter remained prevalent within the channels and along the banks. Eastern Creek sites generally exhibited lower water clarity than Angus Creek sites at the time of sampling, although visual turbidity was reduced under the prevailing low-flow conditions in contrast to recent seasons.

3.3 Water quality

3.3.1 Physico-chemical readings

Electrical conductivity was within the relevant ANZG default guideline values (DGVs) at all monitoring sites, with the exception of the upstream control site AE6. Electrical conductivity was, however, generally elevated relative to other monitoring undertaken during 2025 (Niche 2025a; 2025b). Turbidity levels were also elevated compared to other 2025 monitoring results and exceeded guideline values at control site AE5. Elevated turbidity at this site has been consistently observed throughout the monitoring program (Niche 2024; 2025a).

Dissolved oxygen concentrations were below the applicable guideline values at all sites. No consistent pattern was observed between potential impact sites and control sites. pH levels were above DGV's at all sites, but remained relatively consistent across all monitoring sites. Alkalinity ranged from approximately 160 to 440 CaCO₃ mg/L, with no discernible pattern between potential impact sites and control sites.

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 CaCo3/L)
AE1	Angus Creek Control	16.85	1737	43.7	8.6	8.60	380
AE2	Angus Creek Potential impact	16.1	2051	19.4	18.5	8.24	360
AE3	Angus Creek Potential impact	16.45	1917	47.5	34.7	8.43	180
AE4	Eastern Creek Potential impact	17.23	2000	24.3	24.1	8.20	200



Site	Stream/status	Temp (C°)	Electrical conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg CaCo3/L)
AE5	Eastern Creek Control	18.16	1490	54.6	37.5	8.19	160
AE6	Angus Creek Control	16.67	3789	15.3	34.6	8.47	440

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 and total nitrogen concentrations exceeded the relevant ANZG default guideline values (DGVs) at all monitoring sites (see Table 5). One control site (AE1) and one potential impact site (AE4) recorded higher total phosphorus concentrations relative to the remaining sites; however, overall total phosphorus concentrations were lower at the potential impact sites. Total nitrogen exceedances at potential impact sites AE2 and AE3 were marginal and generally were comparable to control sites.

Nitrogen oxides (NOx) concentrations exceeded guideline values at all sites except for one control site (AE1) and one potential impact site (AE4). No consistent distinction was observed between control and potential impact sites with the results from the potential impact sites within the range of that collected at the control sites.

Total Kjeldahl nitrogen concentrations were lower at the potential impact sites relative to control sites.

Table 5: 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	0.52	1.2	<0.01	1.2
AE2	Angus Creek Potential impact	0.12	0.5	0.04	0.5
AE3	Angus Creek Potential impact	0.14	0.5	0.04	0.5
AE4	Eastern Creek Potential impact	0.32	1.3	<0.01	1.3
AE5	Eastern Creek Control	0.14	1.0	0.03	1.0
AE6	Angus Creek Control	0.17	1.0	0.05	1.0

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



3.4 Macroinvertebrate and SIGNAL2 scores

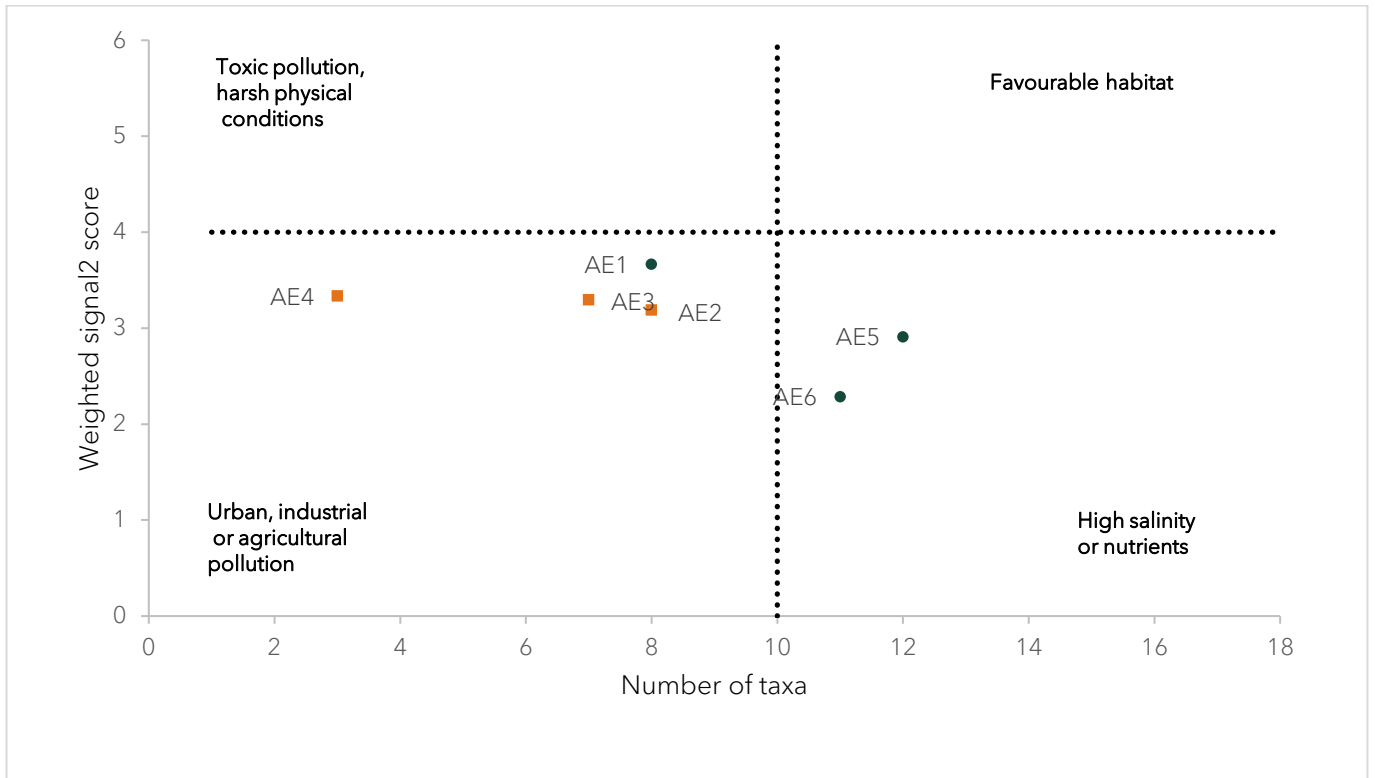
Taxa richness was low across all sites (Table 6), ranging from three taxa at the downstream potential impact site AE4 to twelve taxa at control site AE5. Taxa richness was generally higher at control sites compared to potential impact sites. The Angus Creek potential impact sites (AE2 and AE3) recorded taxa richness scores that are comparable to the upstream control sites (AE1 and AE6). The number of taxa recorded at potential impact site AE4 was lower than all other sites however, reflecting limited sampling ability and less habitat availability.

SIGNAL2 scores were low at all sites, indicating a system with high pollution. This is consistent with the elevated nutrient concentrations recorded across the study area. Despite this, SIGNAL2 scores were generally higher at the potential impact sites, with the exception of control site AE1. Notably, although only three taxa were recorded at AE4, its SIGNAL2 score was comparable to those recorded at the control sites.

Table 6: Number of taxa and weighted SIGNAL2 scores spring 2025

Site	Stream	Number of taxa	SIGNAL2 scores
AE1	Angus Creek Control	8	3.67
AE2	Angus Creek Potential impact	8	3.19
AE3	Angus Creek Potential impact	7	3.29
AE4	Eastern Creek Potential impact	3	3.33
AE5	Eastern Creek Control	12	2.91
AE6	Angus Creek Control	11	2.29

The SIGNAL2 bi-plot (Figure 3) indicates that no sites represent favourable habitat. sites do not show a tendency to cluster together, suggesting a range of conditions or influencing factors may be acting on the sites. While the number of taxa were lower at the potential impact sites, the SIGNAL2 scores are comparable to the control sites.



Orange quares represent downstream potential impact sites. Green circles represent upstream control sites.

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



4. Discussion and conclusion

Physico-chemical water quality results were generally consistent across the study area, with several parameters exceeding ANZG default guideline values at both control and potential impact sites. Electrical conductivity was within guideline values at most sites but elevated relative to other 2025 monitoring surveys. Turbidity and dissolved oxygen exceeded guideline values at multiple sites, including control locations, with no consistent spatial pattern indicative of project-related impacts. Low dissolved oxygen concentrations across all sites are characteristic of highly modified lowland streams in urbanised catchments. The pH and alkalinity levels were elevated but consistent across sites.

Nutrient concentrations exceeded guideline values at all sites, including control sites. While some individual sites recorded higher concentrations, overall nutrient levels—particularly total phosphorus, total nitrogen and total Kjeldahl nitrogen—were generally lower at potential impact sites. Oxidised nitrogen showed widespread exceedances but no consistent distinction between control and potential impact sites. The nutrient results are indicative of background catchment influences rather than localised enrichment associated with the Project.

Macroinvertebrate assemblages were characterised by low taxa richness across all sites, with control sites generally supporting higher taxa richness. SIGNAL2 scores were low at all sites, indicating a **highly impacted aquatic system** and consistent with the observed water quality and nutrient results. Despite low taxa richness at some potential impact sites, SIGNAL2 scores were generally comparable to, or higher than, those at control sites. Lower taxa scores are likely to reflect limited habitat availability, particularly at potential impact site AE4 with an overall low diversity of habitat types across the site. This is likely due to difficult sampling conditions at the site. Water levels were low, meaning at other sites (e.g AE5) access was increased and may have resulted in an increase in taxa for this site in spring 2025 (Niche 2025). Though at AE4 it increased the amount of unvegetated, silt-covered bank, not conducive to high taxa abundance. Though, the other potential impact sites AE2 and AE3 recorded comparable taxa counts.

Overall, the combined water quality, nutrient and macroinvertebrate results indicate that the waterways monitored in this program are subject to existing environmental stress associated with urbanisation. There is no clear evidence to suggest that the Holcim regional distribution Centre is adversely affecting downstream water quality or aquatic ecosystem condition.



5. References

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6. Annex 1 Visual observations

6.1 AE1: Angus Creek Upstream control



Figure 4: Upstream (left) and downstream (right) photos from AE1

Table 7: Riparian and stream conditions at site AE1

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	<i>L. lucidum</i> and <i>T. fluminensis</i>
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.	



6.2 AE2 Angus Creek downstream potential impact



Figure 5: Upstream (left) and downstream (right) photos from AE2

Table 8: Riparian and stream conditions at site AE2

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	<i>T. fluminensis</i> 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	Water visually clear.
Comments	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.	



6.3 AE3 Angus Creek downstream potential impact



Figure 6: Upstream (left) and downstream (right) photos from AE3

Table 9: Riparian and stream conditions at site AE3

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	<i>L. Lucidum</i> , <i>T. fluminensis</i>
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	Weeds and rubbish. Metallic rubbish in system. Concrete rubble in system.	



6.4 AE4 Eastern Creek downstream potential impact



Figure 7: Upstream (left) and downstream (right) photos from AE4

Table 10: Riparian and stream conditions at site AE4

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</i> L. <i>lucidum</i> . Dominant groundcover was the exotic <i>T. fluminensis</i>
	Stream shading	Moderate
	Exotic vegetation	<i>L. lucidum</i> and <i>T. fluminensis</i>
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 mostly in the gross pollutant floating trap	



6.5 AE5 Eastern Creek upstream control



Figure 8: Upstream (left) and downstream (right) photos from AE5

Table 11: Riparian and stream conditions at site AE5

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	



6.6 AE6 Angus Creek upstream control



Figure 9: Upstream (left) and downstream (right) photos from AE6

Table 12: Riparian and stream conditions at site AE6

Category	Attribute	AE5 Upstream
Riparian	Vegetation	Dominant overstorey species was <i>C. glauca</i> . Dominant grass/herb was <i>Lomandra</i> (<i>Lomandra longifolia</i>) and groundcover <i>T. fluminensis</i> .
	Stream shading	Moderate
	Exotic vegetation	<i>T. fluminensis</i>
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	Major landscaping works have been conducted both in stream-on-stream edge. Including large culvert	



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Our expertise



Natural capital
and offsetting



Ecology



Heritage
management



Spatial Services

Appendix D
2025 Bushland Regeneration Report by Toolijooa
Environmental Restoration



Toolijooa Environmental Restoration

Holcim Australia – Rooty Hill Distribution Centre

Bushland Regeneration Report
January 2025 – December 2025

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1. Summary of Works

Zone	Type of Work	Weed Type	Work Description
JANUARY 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> The area around the office was mown and brush cut. The area around the office, shed and across the road from the shed was sprayed. Weeds targeted included: <i>Bidens pilosa</i>, <i>Bromus catharticus</i>, <i>Centaurium sp.</i>, <i>Chloris gayana</i>, <i>Cirsium vulgare</i>, <i>Conyza sp.</i>, <i>Cynodon dactylon</i>, <i>Echinochloa crus-galli</i>, <i>Ehrharta erecta</i>, <i>Euphorbia maculata</i>, <i>Paspalum dilatatum</i>, <i>Setaria sp.</i>, and <i>Sonchus oleraceus</i>.
FEBRUARY 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> The eastern and western ends of the rails, the area around the train unloading zone, and the grass patch heading towards the rails from the loading zone were all brush cut. The purpose of the slashing was to improve aesthetics, mitigate fire hazards and reduce animal habitat in working areas. Weeds targeted included: <i>Bidens pilosa</i>, <i>Bromus catharticus</i>, <i>Centaurium sp.</i>, <i>Chloris gayana</i>, <i>Cirsium vulgare</i>, <i>Conyza sp.</i>, <i>Echinochloa crus-galli</i>, <i>Paspalum dilatatum</i>, <i>Setaria sp.</i>, and <i>Sonchus oleraceus</i>.
MARCH 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> The area around the office was mown. Brush cut around the office, sound wall, snake alley, and along the road heading towards the rails from the loading zone. The purpose of the slashing was to improve aesthetics, mitigate fire hazards and reduce animal habitat in working areas. The unloading area at the rails was sprayed with a 2% Roundup Biactive® solution. Weeds targeted included: <i>Bidens pilosa</i>, <i>Bromus catharticus</i>, <i>Centaurium sp.</i>, <i>Chloris gayana</i>, <i>Cirsium vulgare</i>, <i>Conyza sp.</i>, <i>Cynodon dactylon</i>, <i>Echinochloa crus-galli</i>, <i>Paspalum dilatatum</i>,

Zone	Type of Work	Weed Type	Work Description
			<i>Pennisetum clandestinum</i> , <i>Senecio madagascariensis</i> , <i>Setaria</i> sp., <i>Solanum nigrum</i> , <i>S. sisymbriifolium</i> , and <i>Sonchus oleraceus</i> .
APRIL 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> Sprayed the paths around the office, around the shed, the sound wall, the path at snake alley, within the loading zone, and along the path leading to the concrete loader. The purpose of the spraying was to improve aesthetics, mitigate fire hazards and reduce animal habitat in working areas. All weeds were sprayed with 2% Roundup Biactive® mixed with 1 gram of Associate and surfactant. 100L of mixed herbicides was used to treat weeds this month. Weeds targeted included: <i>Bidens pilosa</i>, <i>Chloris gayana</i>, <i>Cirsium vulgare</i>, <i>Conyza</i> sp., <i>Cynodon dactylon</i>, <i>Echinochloa crus-galli</i>, <i>Euphorbia peplus</i>, <i>Modiola caroliniana</i>, <i>Paspalum dilatatum</i>, <i>Pennisetum clandestinum</i>, <i>Senecio madagascariensis</i>, <i>Setaria</i> sp., <i>Solanum nigrum</i>, <i>Solanum sisymbriifolium</i>, <i>Sonchus oleraceus</i>, and <i>Verbena bonariensis</i>.
JULY 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> Sprayed the paths around the office, around the shed, the sound wall, the path at snake alley, within the loading zone, and along the path leading to the concrete loader. The purpose of the spraying was to improve aesthetics, mitigate fire hazards and reduce animal habitat. All weeds were sprayed with 2% Glyphosate mixed with 1g/10L Associate and surfactant. 100L of mixed herbicides was used to treat weeds this month. Weeds targeted included: <i>Bidens pilosa</i>, <i>Chloris gayana</i>, <i>Cirsium vulgare</i>, <i>Conyza</i> sp., <i>Cynodon dactylon</i>, <i>Echinochloa crus-galli</i>, <i>Euphorbia peplus</i>, <i>Modiola caroliniana</i>, <i>Paspalum dilatatum</i>, <i>Pennisetum clandestinum</i>, <i>Senecio madagascariensis</i>, <i>Setaria</i> sp., <i>Solanum nigrum</i>, <i>Solanum sisymbriifolium</i>, <i>Sonchus oleraceus</i>, and <i>Verbena bonariensis</i>.

Zone	Type of Work	Weed Type	Work Description
		Vine	<ul style="list-style-type: none"> Removed <i>Araujia sericifera</i> within shrubs adjacent to the access road, leading to the concrete plant, and seed pods, to inhibit further pods and establishment.
		Woody	<ul style="list-style-type: none"> Trimmed overhanging branches within the carpark to maintain access for crew cars.
AUGUST 2025			
Graveyard	Maintenance	Herbaceous	<ul style="list-style-type: none"> Vegetation was slashed within the revegetation bed at the top of the access road. Tall annual herbaceous and exotic grasses were spot sprayed (using 1.5% Roundup Biactive®) along the pathways of the western and eastern drainage lines surrounding the unloader building, around the electrical building, and along the access road from the bridge to sales yard edge to address growth, flowering, seeding and general aesthetics of the site. Tall annual herbaceous and exotic grasses were spot sprayed (using 1.5% Roundup Biactive® or 0.6% Starane Advanced®) throughout the depot. Areas worked included: main planting beds adjacent to the carpark, front entrance gates, carpark kerb edges, office building surrounds, around the lunchroom and bathroom, workshop gravel sections, entrance path to concrete plant and truck parking, snake alley pathway, conveyer belt sides and underneath, access road from the bridge to electrical buildings, and surrounding the electrical buildings.
		Woody	<ul style="list-style-type: none"> Stem treated <i>Casuarina glauca</i> in the eastern and western drainage lines, including along the walkways, to reduce growth to the original stands and prevent impact to worker safety.
Depot – Graveyard	Maintenance	Herbaceous	<ul style="list-style-type: none"> Slashed vegetation throughout the graveyard, surrounding all mobile plant material, to address growth and aesthetics. NB: Vegetation will be sprayed once adequate regrowth available.
SEPTEMBER 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> Tall annual herbaceous and exotic grasses were spot sprayed (using 2% Roundup Biactive®) along the access road edges with a focus in the

Zone	Type of Work	Weed Type	Work Description
			<p>western corner, including along rail line and ballast sections moving east.</p> <ul style="list-style-type: none"> Tall annual herbaceous and exotic grasses were spot sprayed (using 2% Roundup Biactive®) along the central soundwall from old Pug-mill to loader parking bay, to control growth, flowering and overall aesthetics. Vegetation was slashed at the western end of the site adjacent to the M7 to address aesthetics and prepare for spraying.
		Woody	<ul style="list-style-type: none"> Stem treated <i>Lantana camara</i> along the access road edge, adjacent to the conveyer belt underpass.
Depot – Graveyard	Maintenance	Herbaceous	<ul style="list-style-type: none"> Sprayed vegetation throughout the graveyard with a hi-vol sprayer using a 2% Roundup Biactive® solution.
OCTOBER 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> Annual herbaceous weeds and exotic grasses were spot sprayed using a 1.5% Roundup Biactive® solution to control growth and improve site aesthetics. Areas worked: adjacent to the main entrance gate, planting beds at carpark entrance, walkway from office building to workshop, surrounding the fuel cell and ballast rocks, along the snake alley walkway and shed, and along the back of the soundwall of the access road from the sales yard to vehicle bridge. Vegetation was slashed along the access road from the vehicle bridge moving towards the trainline, and within the northern drainage line, adjacent to the conveyer building, to reduce snake habitat adjacent to pedestrian walking/working areas.
1	Maintenance	Herbaceous	<ul style="list-style-type: none"> Annual weeds were targeted by spot spraying, using 0.6% Starane Advanced® + 1g/10L Associate®, through the north-eastern section of the of the zone, to control growth and flowering potential. Species targeted included <i>Cirsium vulgare</i>, <i>Conyza</i> spp., <i>Lactuca serriola</i>, <i>Senecio madagascariensis</i>, <i>Solanum nigrum</i>, <i>Solanum</i>

Zone	Type of Work	Weed Type	Work Description
			<i>sisymbriifolium</i> , <i>Sonchus oleraceus</i> , and <i>Verbena bonariensis</i> .
		Vine	<ul style="list-style-type: none"> Exotic vines were hand weeded, skirted and/or spot sprayed, using 0.6% Starane Advanced® + 1g/10L Associate®, through the north-eastern section of the zone, with a focus on <i>Passiflora suberosa</i> growth. Other species targeted included <i>Araujia sericifera</i>, and <i>Passiflora subpeltata</i>.
		Woody	<ul style="list-style-type: none"> <i>Erythrina x sykesii</i> were reduced, by means of stem treating, along the creek line, adjacent to the vehicle bridge on the eastern side, to control further growth and flowering. In addition, <i>Morus alba</i> and <i>Senna pendula</i> were also stem treated within the area.
DECEMBER 2025			
Depot	Maintenance	Herbaceous	<ul style="list-style-type: none"> Vegetation was slashed along the drainage ballast rocks, leading into the western retention basin to maintain vegetation free within and surrounding. Area is to be sprayed and maintained within future visits. Vegetation was slashed through Snake Alley to maintain heights and reduce habitat for wildlife. In addition, the grassland adjacent to the office and workshop was mowed. Tall annual herbaceous and exotic grasses were spot sprayed (using 2% Roundup Biactive® or 0.6% Starane Advanced®) throughout the depot to control growth, flowering, and improve aesthetics. Areas worked included main planting beds adjacent to the carpark, loader parking bays and central soundwall, front entrance gates, carpark kerb edges, surrounding the office building, lunchroom and bathroom, workshop gravel sections, entrance path to concrete plant, and truck parking bays.

Note:

- 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 at the start of each quarter in 2025. Previous data and current results are 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

Zone	Jan 25	April 25	July 25	Oct 25
Southeast	171	161	130	133
Northeast	130	120	78	82

The variation in monthly count between April and July 2025 could be attributed to seasonal changes resulting in some of the juveniles failing to establish.

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



Holcim Rooty Hill Distribution Centre

2025



Source: Sinclair Knight Mertz



Not to Scale

Species of Major Weeds Treated

Herbaceous: *Bidens pilosa*, *Chloris gayana*, *Cirsium vulgare*, *Conyza* sp., *Cynodon dactylon*, *Echinochloa crus-galli*, *Ehrharta erecta*, *Eragrostis curvula*, *Paspalum dilatatum*, *Pennisetum clandestinum*, *Senecio madagascariensis*, *Setaria* sp., *Solanum* spp., *Sonchus oleraceus*





Holcim Rooty Hill Distribution Centre

2025



Source: Sinclair Knight Mertz



Not to Scale

Species of Major Weeds Treated

Vine: <i>Araujia sericifera</i> , <i>Passiflora suberosa</i> , <i>Passiflora subpeltata</i>	
Woody: <i>Lantana camara</i> , <i>Ligustrum</i> spp., <i>Ochna serrulata</i> , <i>Olea europaea</i> subsp. <i>cuspidata</i> , <i>Senna pendula</i>	

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 to improve visual appeal and reduce habitat for snakes.
- Maintain branch and vegetation clearance around the roadways.
- Maintain areas around train tracks clear of vegetation.
- Follow-up on Graveyard area to keep vegetation clear after high-volume spraying.