MOOREBANK LOGISTICS PARK

Moorebank Precinct East:
Six-Monthly Operations Compliance Report

Report: #7

Period: June 2023 – October 2023

03 APRIL 2024

Moorebank Intermodal Precinct

MOOREBANK INTERMODAL PRECINCT

June 2023 – October 2023

Author	[redacted]	[redacted]
Checker	[redacted]	[redacted]
Approver	[redacted]	[redacted]

Date 3/04/2024

Revision Text 01

Author Details

Author Details	Qualifications and Experience
[redacted]	BSc Environmental Science

REVISIONS

Revision	Date	Description	Prepared by	Approved by
00	1/02/2024	Final	Tactical Group	[redacted]
01	3/04/2024	Updated to reflect National Intermodal and QUBE review	Tactical Group	[redacted]

KEY TERMS AND ACRONYMS

Acronym/Term	Meaning
CNBMP	Container Noise Barrier Management Plan
CoC	Conditions of Consent
DPE	Department of Planning and Environment
DPH&I	Department of Planning, Housing and Infrastructure
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
ERP	Emergency Response Plan which includes the Bushfire Emergency and Evacuation Plan (BEEP), Bushfire Management Plan (BMP) and Flood Emergency Management Plan (FEMP)
IMEX	Import Export
MLP	Moorebank Logistics Park
OAQMP	Operational Air Quality Management Plan
OCR	Six Monthly Operational Compliance Report
OCCS	Operational Community Communication Strategy
OEMP	Operational Environmental Management Plan
ONVMP	Operational Noise and Vibration Management Plan
OTAMP	Operational Traffic and Access Management Plan
OWRMP	Operational Waste and Resource Management Plan
POCR	Pre-operations Compliance Report
POPD	Program for Operational Phase Delivery
SIOMP	Operational Stormwater Infrastructure and Operation and Maintenance Plan
SSD	State Significant Development
UDLP	Urban Design and Landscape Plan
WTP	Workplace Travel Plan
SSD 6766	Stage 1 of the MPE Concept Approval (MP 10_0193) as approved under SSD 6766. It involves the construction and operation of an IMEX terminal and associated Rail Link.
SSD 7628	Stage 2 of the MPE Concept Approval (MP 10_0193) as approved under SSD 7628. It involves the construction and operation of warehousing and distribution facilities on the MPE site and upgrades to approximately 1.5 kilometres of Moorebank Avenue from

Acronym/Term	Meaning
	approximately 35 metres south of the northern boundary of the MPE site to approximately 185 metres south of the southern MPE site boundary.

Moorebank Intermodal Precinct

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 EXECUTIVE SUMMARY

In accordance with SSD 7628 Condition of Consent (CoC) C21(c)(iii), a Six-monthly operational compliance report (OCR) must be prepared.

The Department approved the Program for Operational Phase Delivery (POPD) on 21 May 2019 which outlined the staged submission of operational documents under condition A14 of SSD 7628. The Department also considered the combining of strategies, plans or programs to be acceptable, provided that all relevant conditions across both SSD 6766, and SSD 7628 are met.

Regular reviews of compliance against the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC 2011/6229) Conditions of Approval are undertaken but are not the subject of this compliance report.

This OCR has been prepared in accordance with the requirements of the *Compliance Reporting Post Approval Requirements (NSW DP&E, June 2018)* and has been prepared to outline the progress of compliance for all operational requirements against the Project Approvals from May 2023 to November 2023.

1 INTRODUCTION

1.1 Project Overview

Application Number	
Project name:	Moorebank Logistics Park – Operational Area 1 and 2
Proponent	Moorebank Intermodal Precinct
Site Address	MLP East Precinct site, Moorebank Avenue, Moorebank
Project Phase	Six Monthly Operation Compliance Report (OCR)
Project Activity	Operation of an import-export terminal, rail link and warehouse and distribution facilities and associated infrastructure.
Report date	Wednesday, 03 April 2024

1.2 Project Approvals

Approval for the construction and operation of the MLP East Precinct was obtained progressively as follows:

- The Project obtained (EPBC 2011/6229) approval dated 6 March 2014
- Moorebank Precinct East (MPE) Concept Approval – 10_0193
- MPE Stage 1 – SSD 6766
- MPE Stage 2 – SSD 7628
- MPE Stage 2 – SSD 7628 – Subdivision partial development consent
- MPE Stage 2 – SSD 7628_MOD 1 – Modification 1
- MPE Stage 2 – SSD 7628_MOD 2 – Modification 2
- MPE Stage 2 – SSD 7628_MOD 3 – Modification 3
- MPE Stage 2 – SSD 7628_MOD 4 – Modification 4

1.3 Scope and Purpose

In accordance with SSD 7628 Condition C21 (c) (iii), a Six-Monthly Operation Compliance Report (OCR) is required to outline progress of compliance for all operation requirements against the MPE Stage 1 and Stage 2 approval.

There is no specific requirement under SSD 6676 for the submission of an OCR, however this report has been prepared to address the operational requirements for both SSD 6766 and SSD 7628 and has been prepared in accordance with the requirements of the *Compliance Reporting Post Approval Requirements* (NSW DP&E, June 2018).

2 PROJECT DESCRIPTION

2.1 Site Location

The Moorebank Logistic Park (MLP) is an integral component of the Freight, Ports and Transport strategies of both the NSW and Commonwealth governments to help manage the challenges of an expected tripling of freight volumes at Port Botany by 2031.

The MLP aims to streamline the freight logistics supply chain from port to store, deliver savings to businesses and consumers, and help service the rapidly growing demand for imported goods in south-west Sydney. It is located approximately 27 kilometres (km) south-west of the Sydney Central Business District and approximately 26 km west of Port Botany within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue, respectively.

The MLP East Precinct commenced operations in May 2020 and is the subject of this Operation Compliance Report (OCR), while the MLP West Precinct is still currently under construction.

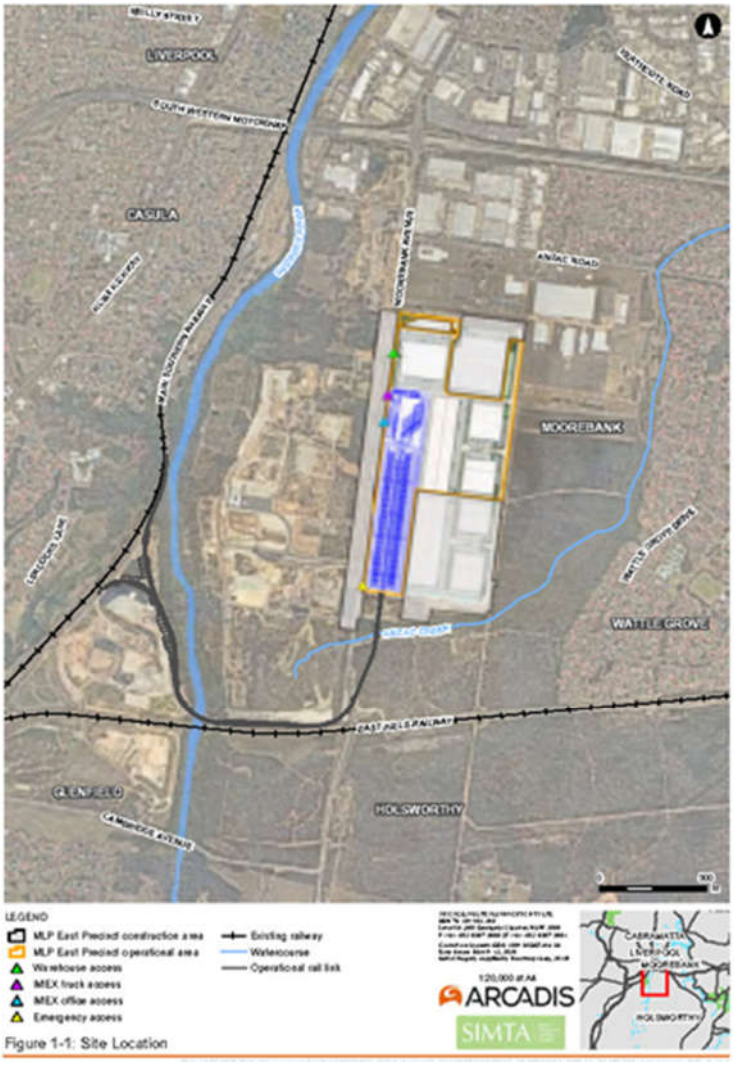


Figure 1 MLP East Precinct Layout – sourced MPE STAGE 2 OEMP Rev 18

2.2 Scope of Works

The main features of the MLP East Precinct include:

- The Import Export (IMEX) Terminal. The IMEX Terminal comprises:
  - Truck processing, holding, and loading areas with an entrance and exit from Moorebank Avenue.
  - Rail loading and container storage areas serviced by container handling equipment.
  - An Administration facility and associated car parking with light vehicle access from Moorebank Avenue.
- A Rail Link connecting the IMEX terminal and the Southern Sydney Freight Line (SSFL) traversing Moorebank Avenue, Anzac Creek and Georges River.
- Associated ancillary infrastructure including signage, lighting, landscaping, water management.
- Warehouse and distribution facilities including warehousing up to 21 m in height, typically ranging in size from 20,000 m^2 to 62,000 m^2. Individual warehouses typically comprise the following:
  - Office and administration facilities
  - Amenities
  - Car parking
  - Truck loading/unloading docks
  - Internal parking for pick-up and delivery vehicles (PUD)
  - Specialised sortation and conveyor equipment
  - Hardstand areas that provide trailer parking spaces, external PUD parking spaces, vehicle manoeuvring areas and access to the main internal site road
  - Signage for business identification purposes, including backlit illuminated signage on each warehouse
  - Internal fit out, comprising racking and storage.
- A freight village including a mix of retail, commercial and light industrial spaces typically up 15 m in height and varying in size and design.
- An internal road network to enable efficient movement of vehicles, dispatch of freight from the warehouses and transport of containers between the IMEX Terminal and warehouse and distribution facilities.
- Security and Administration offices and demountable.

2.3 Operational activities undertaken

Documents can be submitted in stages as permitted by CoC A14 and CoC A15. The application of the operational documents will be staged to take progressive affect across the MLP East Precinct site as construction is completed and operations commences was detailed in the POPD approved by the DPIE on 21 May 2019.

This OCR has been prepared in accordance with the requirements of the Compliance Tracking Program (CTP) to outline progress of compliance for all operation requirements against both SSD 6766 and SSD 7628. This OCR covers the period from June 2023 – October 2023.

The following works have been undertaken:

- Movement and storage of containers in and out of the terminal via rail
- Truck processing, holding, and loading areas.
- Primary and secondary container loading/ unloading areas.
- Transfer of containers between terminal and warehouses vis internal transfer vehicles
- Pickup and delivery of goods to warehouses via truck movements
- Warehouses 1, 3a, 3b, 4a, 4b and 5 are occupied and operational.
- Warehousing and Administrative Activities
- Warehouse Construction (6 & 7)
- Security, maintenance and monitoring of all infrastructure and equipment related to the above activities.

Project Compliance Summary

This OCR outlines the progress of compliance for all operational requirements against Project Approvals. Compliance against the project CoC and the Final Compilation of Mitigation Measures (FCMM) are outlined in SSD 6766 Conditions of Consent and SSD 7628 Conditions of Consent, Appendix A and B respectively.

A declaration of compliance is available in **Appendix G**.

2.4 Environmental Monitoring

In accordance with the CoC and OEMP, environmental monitoring activities are required to be undertaken for the operation phase of the MPE Stage 1 and Stage 2 project. These activities include air quality monitoring, noise monitoring, storm water infrastructure and water quality monitoring, Biodiversity Monitoring, and Biannual trip and origin destination reports. A summary of the monitoring results required for this reporting period is addressed in the following sections. The full reports for each of these monitoring requirements are available in the Appendices Section.

2.4.1 Air Quality Monitoring

Air quality monitoring and compliance results are summarised in the section below for the last reporting period:

2.4.1.1 Dust deposition

Dust deposition data from seven DDGs located around the site is provided by SERS and have been provided for incorporation into the monitoring program since May 2021.

DPE has set the criteria for dust deposition rates, and these are provided in Table 1.

Table 1 Dust deposition criteria

Averaging Period	Maximum increase in deposited dust* level	Maximum total deposited dust level
Annual	2 g/m^2/month (incremental)	4 g/m^2/month (cumulative)

* Deposited dust is assessed as insoluble solids. This is the mass of the insoluble portion of the deposited matter, as defined under AS 3580.10.1: 2016.

7 https://www.environment.nsw.gov.au/topics/air/understanding-air-quality-data/standards-and-goals

2.4.1.2 Dust deposition gauge results

The results of the collection period 15 March 2023 to 10 November 2023 as provided by SERS is shown in Table 2.

Table 2Dust deposition (insoluble solids g/m^2/month) results from 15 March to 10 November 2023

Date	Stage 1 DDG 1	Stage 2 DDG 1	Stage 2 DDG 2	Stage 2 DDG 3	Stage 2 DDG 4	Stage 2 DDG 5	Stage 2 DDG 6	Average
May 2023	1.8	0.6	0.9	N/A*	0.8	0.9	0.1	0.9
June 2023**	1.8	0.6	0.9	N/A*	0.8	0.9	0.1	0.9
July 2023	0.7	0.8	**3.6**	**2.1**	0.9	1.4	1.0	1.5
August 2023	0.7	0.8	**3.6**	**2.1**	0.9	1.4	1.0	1.5
September 2023	1.0	0.8	1.8	**2.2**	0.5	1.0	1.0	1.2
October 2023**	1.2	**3.5**	**2.5**	1.8	0.6	1.7	0.8	1.7

NOTE: Bold/grey indicates an exceedance of the criteria.

* Stage 2 DDG3 was missing during this collection period. It has been reinstated from June 2023.

** These reports used two different DDG reports to ensure the entire month was covered as some collection periods ended during the month rather than at the beginning or end of the month and sometimes covered over two months' worth of data

As shown in Table 4-3, there were seven individual gauge exceedances between July and October 2023. However, no monthly average exceedances of the dust deposition (insoluble solids)

2 g/m^2/month (incremental) and 4 g/m^2/month (cumulative) criteria occurred between 15 March 2023 and 10 November 2023.

2.4.1.3 Continuous monitoring results

Monitoring data for $PM_{2.5}$, PM_{10}, NO_2 and CO for the reporting period have been summarised into tables and graphs and are provided in Appendix A. The following sections summarise the results for this reporting period.

2.4.2 Annual exceedances

Twelve months of air quality monitoring are provided graphically and in table form in Appendix A. It should be noted that AQM04 did not record any data from November 2022 to 24 March 2023 and AQM03 did not record any data between 29 May 2023 and 19 September 2023.

See Table3 for the monitoring station availability (%) over a 12-month period.

4.3.1.1 PM2.5 and PM10 Monitoring

The 12-month rolling annual average for the period November 2022 to October 2023 for all four monitors combined was below the annual average criteria (i.e. 8.0 µg/m^3 for $PM_{2.5}$ and 25.0 µg/m^3 for PM_{10}) for each month (See Appendix A.1 and Appendix A.2 for more details).
As of October 2023, the 12-month rolling annual average for all four monitors was 2.1 µg/m^3 for $PM_{2.5}$ and 5.8 µg/m^3 for PM_{10}.

2.4.2.1 Monitor AQM03

The rolling annual average for monitor AQM03 for the period May 2022 to October 2023 exceeded the annual average criteria for $PM_{2.5}$ and PM_{10} for most months during the reporting period, except for September and October 2023.

AQM03 is located on the western extent of MWP Stage 2, therefore the exceedances could be the result of construction activities being undertaken at the MWP site. Ongoing monitoring of the site will continue; however, it is expected that the observed anomalies will cease with the completion of the Western Works.

2.4.2.2 NO_2 Monitoring

The 12-month rolling annual average for all four monitors for the period November 2022 to October 2023 was below the annual average criteria (0.03 ppm) for each month.

As of October 2023, the 12-month rolling annual average for NO_2 for all four monitors is 0.011 ppm, below the annual average criteria of 0.03 ppm.

2.4.2.3 CO

CO does not require annual reporting.

2.4.2.4 24-hour exceedances

As discussed above, no data was recorded at AQM03 from 29 May 2023 and 19 September 2023.

2.4.2.5 $PM_{2.5}$ Monitoring

A review of the data for the reporting period identified no exceedance of the 24-hour average criteria (25 µg/m^3) for $PM_{2.5}$.

2.4.2.6 PM_{10} Monitoring

Four exceedances of the 50 µg/m³/day limit for PM_{10} were recorded during the 6-month reporting period. These are summarised in Table 4-4. The table includes the 24-hour average for PM_{10} recorded at the Liverpool monitoring station for comparison and includes analysis of the exceedance.

Table 4-4: Summary of exceedances of the PM_{10} 50 µg/m³/day limit

Date of exceedance	AQM01 µg/m³	AQM02 µg/m³	AQM03 µg/m³	AQM04 µg/m³	Liverpool average[8]	Analysis of exceedance	Train operation
5/07/2023	-	52.7	-	-	11.4	Exceedance occurred mainly between midnight and 9 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were occurring during the time of exceedance.	Five trains arrived/ departed the terminal on this day, with two during times of exceedance.
18/07/2023	-	57.9	-	-	15.2	Exceedance occurred mainly between midnight and 9 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were occurring during the time of exceedance.	Five trains arrived/ departed the terminal on this day, with one during times of exceedance.
28/09/2023	-	-	50.1	-	12.4	Exceedance occurred mainly between midnight and 4 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were occurring during the time of exceedance. Hazard reduction burns were occurring in Sydney and surrounds this month.	Four trains arrived/ departed the terminal on this day, with two during times of exceedance.

2/10/2023	-	-	51.2	-	37.8	Exceedance occurred mainly between midnight and 9 am and again from 8pm to midnight. This exceedance **coincided with a 'fair'** reading of PM_{10} at the Liverpool monitoring station. Out of hours works along Moorebank Avenue and Anzac Road were occurring during the time of exceedance. Hazard reduction burns were occurring in Sydney and surrounds this month.	One train arrived/ departed the terminal on this day during times of exceedance.

Two exceedances of the PM_{10} 24-hour average occurred at AQM03. As discussed in Section 4.3.1.1, AQM03 is located on the western extent of MWP Stage 2, therefore the exceedances could be the result of construction activities being undertaken at the MWP site or potentially related to out of hours works occurring along Moorebank Avenue, Anzac Road and Bapaume Road. It should also be noted that hazard reduction burns were occurring in Sydney and surrounds during the months of exceedance for monitor AQM03.

Two exceedances of the PM_{10} 24-hour average occurred at AQM02 which is located to the east of MEP and approximately 500 m away from the trains. No night works were occurring in this area during the exceedances, although out of hours roadworks were occurring along Moorebank Avenue, Anzac Road, and Bapaume Road. It is unclear what could have contributed to these exceedances

2.4.2.7 NO_2 1-hour exceedances

No exceedance of NO_2 1-hour criteria (0.12 ppm / 120 ppb) were observed during the 6-month reporting period.

2.4.2.8 CO 8-hour exceedances

No 8-hour criteria exceedances for CO occurred during the 6-month reporting period.

2.4.3 Complaints

One complaint was made relating to air quality on 27 June 2023. A local resident provided feedback about dust generation on Moorebank Avenue. The project team investigated and found no exceedances of the criteria for deposited dust in the last three months. A letter response explaining specific methods for the management and monitoring of dust generation at the Precinct was provided to the resident.

- **CO** - CO does not require annual reporting.
- **Complaints** - One complaint was received on 19 January 2023 within this reporting period. The complaint was related to construction dust along Moorebank Avenue. The complainant was advised of mitigation measures in place including dust suppression, the use of water carts, wheel washing and sweeper trucks.

The Six-Monthly Compliance Operational Air Quality reports completed during this period are available in **Appendix C** of this report. Actioning requirements and recommendations raised from the report are consistently being addressed as a part of daily operations.

2.4.4 Noise Monitoring

Noise monitoring measurements have been performed, consistent with the requirements of SSD 6766 and SSD 7628 and the Operational Noise and Vibration Management Plan. During this reporting period that following noise measurements were undertaken:

- **Continuous Noise Monitoring**
    - Next annual report is due in May 2024.
    - No exceedances of the planning approval noise limits were measured during the period.
    - 3 complaints were received in relation to operational noise levels. These complaints were managed in accordance with the complaints reporting procedure.

- **Angle of Attack Rail Noise Report**
  The commissioned report covers rail movements between 1 May 2023 and 31 October 2023. A summary of the key statistics is provided below:
    - Number of valid train passby events — 274
    - Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST — 12 (representing 4% of passbys).
    - A detailed review of the AoA exceedances identified that Wagon ID CQMY 003099 exceeded the AoA alarm level on seven occasions. The owner of this wagon has been notified of these exceedances and is in the process of determining the required rectification works.
    - None of the twelve train passby events with AoA alarm levels resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated noise levels at 30 m were above 60dB(A).
- **Warehouse Noise Mechanical Plant** monitoring occurred for relevant operational warehouses during the period.

Annual noise monitoring reports will be located in **Appendix D** of this report. Actioning requirements and recommendations raised from the report are consistently being addressed as a part of daily operations.

2.4.5 Water Quality Monitoring

The baseline monitoring forms the basis for the ongoing Biodiversity Monitoring Strategy (BMS) to assess stream health in accordance with CoC B106, to determine any change in stream health or water quality throughout the life of the Project and to ascertain whether these changes can be attributed to the Project works. The BMS outlines monitoring requirements and includes the Stormwater Monitoring Strategy required by CoC B43 and B44.

Examination of the results from the 2023 surveys found no evidence of changes in the indicator variables (bed and bank stability, water quality, assemblages of aquatic macroinvertebrates and fish) that could be attributed to the Project works. Thus, in accordance with the Biodiversity Monitoring Strategy, no adaptive management contingency measure was triggered.

Water quality monitoring in the 2023 period found that concentrations of lead in sediments collected at Site AQ1 continue to exceed the guideline value (50 mg/kg). All other toxicants monitored at that site, including total petroleum hydrocarbons and poly-fluoroalkyl substances (e.g. PFAS and PFOS), continue to be within guideline levels. Site AQ1 is situated upstream of potential inputs from the Project, so no additional testing of heavy metals at this site is considered necessary.

Alligator Weed continues to be abundant at the most upstream site (Site AQI), although there has been considerable defoliation of the noxious plant since the spring 2022 surveys. Cooler temperatures in autumn and the presence of Flea beetles, commonly used to control floating mats of Alligator Weed, are thought to have contributed to large amounts of decaying Alligator weed litter observed on the creek bed and reduced dissolved oxygen levels.

Water quality monitoring report and infrastructure inspection reports are available in **Appendix E** of this report. Actioning requirements and recommendations raised from the report are consistently being addressed as a part of daily operations.

2.4.6 Storm Water Infrastructure

Stormwater infrastructure managed under the Stormwater Infrastructure Operation and Maintenance Plan were inspected and assessed during the period. No significant actions were required for the operation of Stormwater infrastructure at the site.

The annual independent audit was undertaken in September by a suitably qualified WSUD professional.

The audit found that:

1) In general, the WSUD infrastructure is being diligently maintained in accordance with CoC51.

2) The condition of the systems are generally good with clear evidence of rectification works undertaken where there was active erosion. This especially relevant given the very rainfall depths experienced in the last 2 years. The high rainfall and effort by Apical has also seen excellent vegetation growth within OSD 1 which is now well established and likely to be performing as a best practice.

3) It is very likely that the constructed elements of the system are working as intended to deliver best practice WSUD.

4) The systems are being cleaned and maintained so they remain functional and the maintainer has a good understanding of the systems.

5) No excessive build-up of material is evident.

6) OSD 10 (swale alongside Moorebank Avenue) has been removed, Warehouses (WH) 6 and 7 were constructed during this last audit period. There have been some observed impacts on the OSD and water quality basins (OSD 2) to the south of the precinct. Monitoring will continue.

2.4.7 Biodiversity Monitoring

The following Biodiversity Monitoring are required to be undertaken in Spring 2023.

- Monitoring of weed cover
- Monitoring of threatened species occurrence
- Monitoring of viability of native vegetation adjoining the rail easement
- Monitoring of feral fauna occurrence
- Monitoring of Nest boxes

The biodiversity (Flora and Fauna) monitoring report has been provided to the department for information. Actioning requirements and recommendations raised from the report are consistently being addressed as a part of daily operations.

Results during this reporting period:

Lands adjoining the Rail Link (BA341 Boot Land)

- Assessment of the vegetation in BA341 Lands is restricted to within 10 metres either side of the Rail Link and is sampled during the spring/summer season. Biodiversity works under BA341 are separate to this approval and this reporting does not provide any recommendations that would alter the current approach to the management of these areas.

- Native vegetation adjoining the Rail Link is in good condition and has a similar condition to what was recorded in last year monitoring event. There has been a minor increase in weeds, however this has been restricted to disturbed areas immediately adjacent to the Rail Link. Weeds are mostly present in areas which were disturbed during construction of the rail link rather than in areas of intact native vegetation that did not experience disturbance.. From observations, it is evident that most exotic species within the Rail Link are not able to readily colonise adjacent areas of bushland. This may be due to the low fertility of the naturally occurring sandy soils which are not suitable to exotic species, and high competition from regenerating native species. The weed species *Senecio madagascariensis* (Fireweed) and *Eragrostis curvula* (African Lovegrass) were recorded immediately adjacent to the Rail Link fence. These species have the potential to infiltrate natural areas, however neither of these weed species were observed to be degrading the condition of native vegetation during monitoring.
- The number of individuals of the threatened plant species *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea) and *Hibbertia puberula* subsp. *puberula* has increased since last year's monitoring event, with most individuals occurring in the south-eastern section of the lands adjoining the Rail Link. Individuals of these species appeared to be in a healthy condition with some bearing flowers and seed. The number of *Acacia bynoeana* (Bynoe's Wattle) within the monitored area has experienced a decline with half the number of individuals re-found (3 individuals) during the monitoring event. The individuals re-found did not appear to be in a healthy condition. It is unknown why this species has experienced decline over the past year. There are no signs to suggest current management practices within the Rail Link (or lack) of has negatively impacted on this species.

Riparian vegetation management (RVMP reporting)

- The Anzac Creek management site was not monitored as no bush regeneration works have occurred in this location in the reporting period.
- Georges River management site was monitored. The sites assessed are those identified in the *MPE Annual Flora and Fauna Monitoring Report 2022/23* (Arcadis 2023).
- Revegetated areas continue to grow and colonise bare areas, specifically on the floodplain and lower batters. The high cover of native species in these areas has suppressed the growth of weeds, however some aggressive weed species were observed and present a risk to the future condition of the area. Some aggressive weed species observed which will require control include *Cardiospermum grandiflorum* (Balloon Vine), *Arundo donax* (Giant Reed) and *Ligustrum sinense* (Small-leaved Privet).
- Areas further from the Georges River which had remnant vegetation and were improved through bush regeneration works including weed control are in a moderate condition. A suite of native species area present which contribute to a moderate to high vegetative cover. Weeds are present in these areas however do not comprise infestations. Monitoring will continue in 2023.

Koala management & fencing

- No Koala structures (bridges, culverts, refuge posts) have been installed to prevent the movement of Koalas into the MPE operational facility or facilitate the movement of Koala from the Wattle Grove offset area to adjoining areas of suitable habitat in the Holsworthy defence areas.
- Monitoring will continue in 2023.

Feral animals and weeds

- Four species of feral animal were recorded in Wattle Grove offset area, immediately adjacent to the MPE operational facility including *Lepus europaeus* (Brown Hare), *Felis catus* (Domestic Cat), *Vulpes vulpes* (Red Fox) and *Rattus rattus* (Black Rat). It is expected that these feral animals are using the MPE operational facility when moving around the local landscape.
- Monitoring of feral animals occurred in the 2023 reporting period.

Nest Box Monitoring

- In August 2023 to assess the 216 functional nest boxes in the Bootland and Georges River Corridors were undertaken. The team identified that 34 nest boxes required maintenance and were repaired and reinstalled on the same tree at a lower more management height.
- Nest Box Monitoring occurred in Spring 2023.

Fauna connectivity

- Surveys were undertaken in 2023 to assess fauna habitat connectivity, determine feral animal presence and review the effectiveness of fauna habitat features relevant to the operation of the MPE facility.
- Native and feral animals were recorded using the Anzac Creek culvert and moving across the ballast beneath the Rail Link bridge. The fauna furniture at Anzac Creek culverts remains functional.
- The Cyclone mesh fencing beneath the Rail Link bridge, on the eastern side of the Georges River, is preventing the movement of macropods species and potentially Koala between the Moorebank offset area and riparian vegetation to the south. Monitoring will continue in 2023.

Annual EPBC Offset Site Monitoring

- A Threatened Species Offset Management Plan (TFOMP) and undertook surveys to assess impacts for the 2 species listed, Small-flower Grevillea and *Persoonia nutans* (Nodding Geebung), in the reporting period. The assessment found that additional bush regeneration activities in the Nodding Geebung offset areas (P1-P3) should be implemented over the coming year to support existing populations and encourage regeneration of juveniles. This should include weed control works targeting African Love Grass, and native vegetation pruning where smothering is occurring.

Weeds

- Weed cover across the MPE operation facility is generally low and has been effectively managed across the 2022/2023 monitoring year.
- Works are ongoing within the Rail Link to suppress weeds and promote the germination and establishment of native species following a rehabilitation project undertaken by contractors actions are provided in the weed monitoring report.

2.4.8 Biannual Trip and Origin Destination Report

The BTODR has been undertaken for the 2023 reporting period and addresses the relevant requirements of the Project Approvals and other guidelines and standards applicable during operations of MPE. The BTODR is proposed to keep an accurate record of the shipping containers and vehicle arrivals / departures against approved volumes.

The data provided within this report has been collected in accordance with the BTODR Framework report and enables a comparative assessment of traffic accessing the Site and future growth in operational activities.

All data is a fair and accurate representation of the operational traffic for MPE and its surrounding road network. This data has been collected for the 2023 reporting period.

The Biannual trip and origin destination report has been completed for this period and has been provided to Secretary for information in accordance with B28.

2.5 Previous Report Actions

The previous Six-Monthly Operational Compliance Report had no actions identified. Ongoing actions being tracked will be reported in the next Six-Monthly Operational Compliance Report.

2.6 Incidents

There were no operational incidents reported in MPE operations in the reporting period.

2.7 Complaints Management

No complaints were received relating to MPE operations in this period.

Moorebank Intermodal Precinct

APPENDIX A - SSD 6766 CONDITIONS OF CONSENT

COMPLIANCE REQUIREMENT	UNIQUE (ID)	COMPLIANCE REQUIREMENT	DEVELOPMENT PHASE	COMPLIANCE STATUS	MONITORING METHODLOGY	EVIDENCE AND COMMENTS
SSD 6766	E34 (d)	d) a Construction Flora and Fauna Management Plan to detail how impacts on ecology (as detailed in the most recent mapping endorsed by OEH) will be minimised and managed. The Plan shall be developed by a suitably qualified and experienced ecologist and in consultation with the OEH, and shall include, but not necessarily be limited to: (i) plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities have been recorded; including pre-clearing surveys to confirm the location of threatened flora and fauna species and associated habitat features; (ii) the identification of areas to be cleared and details of management measures to avoid residual habitat damage or loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat such as: a) clearing minimisation procedures (including fencing), b) clearing procedures (including nest box plan), c) removal and relocation of fauna during clearing, d) habitat tree management, and e) construction worker education; f) installation of exclusion fencing prior to commencement of construction (iii) rehabilitation details, including identification of flora species and sources, and measures for the management and maintenance of rehabilitated areas; (iv) a Weed Management Strategy, incorporating weed management measures focusing on early identification of invasive weeds and effective management controls (including for those related to aquatic and riparian zones); (v) a description of how the effectiveness of these management measures would be monitored; (vi) a procedure for dealing with unexpected EEC/ threatened species identified during construction, including cessation of work and notification of the OEH and DPI Fisheries, determination of appropriate mitigation measures in consultation with the OEH and DPI Fisheries (including relevant re-location measures) and updating of ecological monitoring and/ or biodiversity offset requirements; and (vii) mechanisms for the monitoring, review and amendment of this plan.	operation	Compliant	CHMP implementation	The CHMP was submitted to DP&E for approval on 24 February 2017. Comments have been received and addressed. Approval of the CHMP was issued by DP&E on 09/05/17 . Pre-construction works are being undertaken in accordance with the EWMS. Will be updated following the EDO Court Case approved by DPE 18/06/2018 Recent Report: Recent Report - MPE_Ops_NestBox_AMR_2023_Arcadis
SSD 6766	G1	Within 6 weeks of commencement of operation, unless otherwise agreed by the Secretary, the Applicant shall undertake road pavement deflection testing of the truck routes as defined by Condition E34(a). If the deflection tests show an increase in defection as a result of the truck routes associated with construction, the Applicant shall undertake pavement rehabilitation of the affected road pavements to achieve the pavement deflection that existing prior to the commencement of works.	operation	Not Triggered	OTMP	Condition Superseded by email 22/2/2019
SSD 6766	G2	Within 3 months of commencement of operation, unless otherwise agreed by the Secretary, the Applicant shall carry out rectification work to the extent of the damage resulting from the construction works at the Applicant's expense and to the reasonable requirements of the owners.	operation	Not Triggered	OTMP	Condition Superseded by email 22/2/2019

SSD 6766	G3	Within 3 months of commencement of operation, the Applicant shall provide to the Certifying Authority evidence that all easements required by this approval, and other licences, approvals and consents, have been lodged for registration or registered at the NSW Land and Property Information.	operation	Not Triggered	OTMP	No easements exist or are required under the MPE Stg 1 footprint. Easements will be required under MPE Stg 2 footprint (separate to this approval). This will not be triggered under MPE Stg 1.
SSD 6766	G4	Signage shall be installed in accordance with Drawing A3001 Issue C (Terminal – Signage Details) dated 14/04/2015, unless otherwise agreed by the Secretary.	operation	Compliant	Road Pavement Deflection Report	Signages with the Terminal are per approved detailed design drawings
SSD 6766	G5	The quantities of Dangerous Goods present at any time on the site or transported from and to the terminal site shall be kept below the screening threshold quantities listed in the Hazardous and Offensive Development Guidelines Applying SEPP 33, (DP&E 2011). The screening threshold quantities for each Dangerous Goods shall be defined in accordance with Table 1: Screening Methods of Applying SEPP 33.	operation	Ongoing	Road Pavement Deflection Report	No Dangerous Goods have been transported during this reporting period
SSD 6766	G6	Port shuttle operations must use: a) Locomotives that incorporate available best practice noise and emission technologies. Prior to the construction of the rail link connecting to the site, the Applicant must submit a report to the Secretary for consideration and approval that has been prepared in consultation with TfNSW and the EPA that justifies the technology proposed and how it meets the objective of best practice noise and emission technologies; and b) Wagons that incorporate available best practice noise technologies such as “one-piece” freight bogies or three-piece freight bogies fitted with cross-bracing or steering arms; and including as a minimum permanently coupled ‘multi-pack’ steering wagons using Electronically Controlled Pneumatic (ECP) braking with a wire based distributed power system (or better practice technology). Prior to the commencement of operation, the Applicant must submit a report to the Secretary for consideration and approval that has been prepared in consultation with TfNSW and the EPA that justifies the technology proposed and how it meets the objective of best practice noise technologies.	operation	Ongoing	N/A	MPE_AQ_Best Practice Progress Review_2023_FINAL

SSD 6766	G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train pass by noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) LAeq(15hour) and LAeq(9hour) from rail operations; and d) LAF(max) and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with the Secretary. The results from the noise monitoring system shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website ideally within 24 hours of it passing the monitor. The LAeq(15hour) and LAeq(9hr) results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	operation	Compliant	N/A	Covered in TL116-05F21 Annual Review May 2023 (r1)
SSD 6766	G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle pass by; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	operation	Compliant	N/A	Covered in AOA report - TL116-05F20 AoA Report May 2023 (r1)

SSD 6766	G7B	The Applicant shall: (a) not less than three months and not more than twelve months from commencement of operation, engage an appropriately qualified and experienced acoustic engineer to undertake a night-time noise survey at Glenfield Farm (or an equivalent location if access is denied). (b) the noise survey shall be conducted in accordance with the EPA's Rail Infrastructure Noise Guideline 2013 to determine: (i) the contribution of any new rail traffic travelling to and from the development; and, (ii) the increase in the total rail traffic noise level caused by any new rail traffic to and from the development. (c) the noise survey shall be conducted for not less than 12 contiguous days in the winter months (July, August or September). (d) if as a result of the noise survey there is a sustained increase in the total rail traffic noise level due to the noise level from rail traffic travelling to and from the development of more than 2dB(A) for more than 30% of nights surveyed, the Applicant shall within twelve months, construct a noise barrier along the relevant sections of rail link in accordance with the specifications provided by an appropriately qualified and experienced acoustic engineer so as to limit the increase in the total rail traffic noise level at Glenfield Farm caused by any new rail traffic to and from the development to not exceed 2dB(A). (e) the report of the noise survey including the results and recommendations shall be provided to the Secretary.	operation	Compliant	Best Practice Review (BPR)	The Locomotive Best Practice Review was developed in consultation with EPA and TfNSW and a final document has been issued, with confirmation from both parties that consultation comments have been closed out in the final report. This was approved by DP&E on 17/09/2017 The Moorebank Intermodal Terminal Project Best Practice Wagon Report (Condition G6B) was published on 16 April 2019 by Renzo Tonin and is currently in consultation with TfNSW Report submitted in 12 May 2021
SSD 6766	G8	The following measures must be implemented during operation: a) The use of top of rail friction modifiers and automatic rail lubrication equipment in accordance with ASA Standard T HR TR 00111 ST Rail Lubrication, where required; and b) Measures to ensure the rail cross sectional profile is maintained in accordance with ETN–01-02 Rail Grinding Manual for Plain Track to ensure the correct wheel / rail contact position and hence to encourage proper rolling stock steering.	operation	Ongoing	FCMM Monitoring	Use of Automatic Rail Lubrication Equipment / Maintain Rail Cross Sectional Profile
SSD 6766	G10	Containers must be transferred between the site and Port Botany predominantly by rail, unless where unforeseen circumstances have occurred (e.g. an incident, breakdown, derailment or emergency maintenance on the rail line). The Secretary may at any time request the Applicant to demonstrate that the transport of containers between the site and Port Botany container terminals is by rail. This is to be demonstrated upon request by the Secretary for the prior 12 month period.	operation	Ongoing	N/A	Containers are to be transferred by rail unless there is track maintenance or unforeseen circumstances
SSD 6766	G11	The Applicant shall prepare a six-monthly report to the Secretary with the results of container and vehicle monitoring for a period of 3 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 3. The report shall include: a) The number of twenty foot equivalent units dispatched and received during the period; b) A record of heavy vehicle entry by date and approximate time; and c) The number of light vehicles turning right into the terminal site from Moorebank Avenue and turning left from the terminal site onto Moorebank Avenue for a representative day.	operation	Compliant	N/A	Part of BTODR Covered in BTODR report submission August 2022
SSD 6766	G12	All containers handling equipment, purchased after 2019 must meet US EPA Tier 4 or EU Stage IV emission standard or achieve an equivalent emission control performance to those standards listed in this condition.	operation	Ongoing	N/A	
SSD 6766	G13	The Applicant must carry out any activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.	operation	Ongoing	N/A	Continuous air monitoring is ongoing

SSD 6766	G14	Heavy road freight vehicles are not permitted to use Moorebank Avenue south of the East Hills Railway corridor. A main gate monitoring system (e.g. CCTV) shall be installed to identify heavy vehicles turning left from the terminal site onto Moorebank Avenue, or turning right from Moorebank Avenue to the terminal site. The Secretary may at any time request the Applicant to provide a heavy vehicle monitoring report for the prior 12 month period.	operation	Compliant	N/A	No heavy road freight vehicle from the project has been identified usng the East Hills Railway Corridor
SSD 6766	G16	Within 60 days of commissioning this audit, or as otherwise agreed by the Secretary, the Applicant shall submit a copy of the audit report to the Secretary and relevant public authorities, together with its response to any recommendations contained in the audit report. The audit report and response to any recommendations shall be published on the Project website.	operation	Compliant	N/A	Undertaken on 10 May 2021. Report submitted 28/06/21

Moorebank Intermodal Precinct

APPENDIX B - SSD 7628 CONDITIONS OF CONSENT

COMPLIANCE REQUIREMENT	UNIQUE (ID)	COMPLIANCE REQUIREMENT	DEVELOPMENT PHASE	COMPLIANCE STATUS	MONITORING METHODLOGY	EVIDENCE AND COMMENTS
SSD 7628	A8	The container freight road volume must not exceed 250,000 TEUs p.a., subject to the exception identified in condition A9, which may only be considered under condition A9 after the facility has been in operation.	Operation	Not triggered		
SSD 7628	A9	The movement of container freight by road may exceed the 250,000 TEU limit p.a. by up to a further 250,000 TEU p.a., if the Secretary is satisfied that traffic monitoring and modelling of the operation of the facility demonstrate that traffic movements resulting from the proposed increase in TEU will achieve the objective of not exceeding the capacity of the transport network.	Operation	Not triggered		
SSD 7628	A11	The maximum GFAs for the following uses apply: (a) 300,000m2 for the warehousing and distribution facilities; and (b) 8,000m2 for the freight village.	Operation	Not triggered	GFA monitoring	
SSD 7628	A12	The warehousing and distribution facilities must only be used for activities associated with freight using the MPE Stage 1 rail intermodal terminal.	Operation	Not triggered		
SSD 7628	A13	Freight village tenants and occupations are restricted to those activities that provide: (a) ancillary support for the development, its tenants, worker population and visitors; (b) a nexus with activities undertaken in relation to the warehouse, logistics functions of the IMT development and/ or; (c) provide aligned services to the intermodal functions. Prior to occupancy of any freight village tenancy, and every subsequent occupation of these tenancies, details of the tenant and occupation activity is to be submitted to the Secretary demonstrating that the proposed activity complies with this condition.	Operation	Not triggered		

SSD 7628	B28	The Applicant is to prepare a **Biannual Trip Origin and Destination Report** each six months following commencement of any operation (in a format agreed with TfNSW and RMS) that advises: (a) the number of actual and standard twenty foot equivalent shipping containers despatched and received during the period; (b) the number of days in the period that the truck gate was open for despatching trucks 24 hours a day, 7 days a week and detail any exceptions to this and advise actual hours of operation; (c) records of vehicle numbers accessing the site; and (d) representative vehicle origins and destinations, based on a cordon in the surrounding network. A framework for recording and reporting on the data required for the report, prepared to the satisfaction of TfNSW and RMS, is to be submitted to the Secretary three months prior to the commencement of operation. The report is to be submitted within one month of its preparation throughout operation of the project, starting six months from the commencement of operation, unless otherwise agreed by the Secretary, TfNSW and RMS. The cordon count at (d) above will: • apply to all classes of vehicles; and • cover the intermodal terminal, the warehousing facility and any other uses such as the freight village.	Operation	Compliant		1065r08v1_BTODR Nov 2023
SSD 7628	B30	The Applicant must ensure that the **Workplace Travel Plan** is implemented for the life of the development.	Operation	Compliant		Approval of the WTP was received by DPIE on 6/12/2019
SSD 7628	B51	The annual independent audit must be undertaken by a suitably qualified WSUD professional. The audit is to verify the condition of the treatment system(s), verify and document that the system(s) is working as intended, verify the system(s) has been cleaned adequately, verify there is no excessive build-up of material in the system(s) and identify any issues with the treatment system(s) which require rectification for the system(s) to adequately perform its intended function.	Operation	Compliant		2023 MPE Audit Report - COC51 - WSUD
SSD 7628	B79	The permitted hours of warehouse and distribution operation are detailed in **Table 4**.	Operation	Compliant		OEMP
SSD 7628	B80	Noise generated by operation of the development inclusive of MPE Stage 1 operations must not exceed the noise limits in **Table 5**.	Operation	Ongoing		OEMP

SSD 7628	B85	The Applicant must carry out **noise monitoring of mechanical plant and other noisy equipment** for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.	Operation	Compliant		WH1 - New Tenant completed Scheduled for Warehouse 6 and 7 in 2024
SSD 7628	B86	Within 12 months of occupation of the first warehouse, 50% occupation of the site and 100% occupation of the site, or as otherwise agreed by the Secretary, the Applicant must undertake **operational noise monitoring** to compare actual noise performance of the project against predicted noise performance, and prepare an **Operational Noise Report** to document this monitoring. The Report must include, but not necessarily be limited to: a) noise monitoring to assess compliance with the predicted operational noise levels and the noise limits specified in Table 5; b) a review of the operational noise levels in terms of criteria and noise goals established in the NSW RNP (EPA, 2011); c) sleep disturbance impacts compared to those determined in documents specified under condition A2; d) impacts associated with annoying characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity and dominant low-frequency content; e) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which project noise levels are ascertained, with specific reference to locations indicative of impacts on sensitive receivers; f) details of any complaints and enquiries received in relation to operational noise generated by the project between the date of commencement of operation and the date the report was prepared; g) any required recalibrations of the noise model taking into consideration factors such as actual traffic numbers and heavy vehicle proportions; and h) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of all feasible and reasonable mitigation measures.	Operation	Compliant		Industrial noise assessment report completed as part of 50% occupation of the site submitted 8/6/21 Next required 100% occupation
SSD 7628	B87	The Applicant must provide the Secretary and the EPA with a copy of the Operational Noise Report within 60 days of completing the operational noise monitoring referred to in (a) above or as otherwise agreed by the Secretary.	Operation	Compliant	Required by May 2021	50% - submitted on 8/6/21
SSD 7628	B88	To ensure the operational noise impacts are appropriately managed, the following measures apply: a) use of best practice plant; and b) preparation of a risk assessment to determine if non-tonal reversing alarms can be fitted as a condition of site entry. Alternatively, site design may include traffic flow that does not require or precludes reversing of vehicles9	Operation	Not triggered		Not required unless identified by B85

SSD 7628	B89	For the duration of operation heavy road freight vehicles are not permitted to use Moorebank Avenue south of the East Hills Railway corridor. A main gate monitoring system (e.g. CCTV) must be installed to identify heavy vehicles turning left from the terminal site onto Moorebank Avenue, or turning right from Moorebank Avenue to the terminal site. The Secretary may at any time request the Applicant to provide a **heavy vehicle monitoring report** for the prior 12 month period.	Operation	Compliant		No heavy road freight vehicle from the project have been identified using the East Hills Railway corridor
SSD 7628	B90	For the duration of operation, the Applicant must: a) continue to implement all reasonable and feasible best practice noise mitigation measures; b) continue to investigate ways to reduce the noise generated by the development, including maximum noise levels which may result in sleep disturbance; and c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.	Operation	Compliant		Ongoing monitoring. To be reported in the Annual Review. Annual review to be submitted to Secretary
SSD 7628	B121	Waste must be secured and maintained within designated waste storage areas at all times and must not leave the site or be deposited on or otherwise enter neighbouring public or private properties.	Operation	Compliant		No community waste complaints identified. Warehouse tenant have procured Waste Contractor to dipose any waste
SSD 7628	B126	The collection of waste generated during operation of the development must be undertaken between 7 am to 10 pm Monday to Friday	Operation	Compliant		Review of Warehouse Waste Registers
SSD 7628	B153	The Applicant must obtain a certificate from a suitable qualified tradesperson, certifying that kitchen, food storage and food preparation areas have been fitted in accordance with Australian Standard AS4674. The Applicant must provide evidence of receipt of the certificate to the satisfaction of the Certifying Authority prior to occupation.	Operation	Not triggered		No Warehouses contain any food stoarge or food prepration areas
SSD 7628	C5	Overall responsibility of the development, including the freight village environmental management during operation, must be by the entity responsible for the Precinct environmental management.	Operation	Not triggered		OEMP

SSD 7628	C21	The Proponent must prepare and implement a **Compliance Tracking Program** to track compliance with the requirements of this approval. The **Compliance Tracking Program** must be submitted to the Secretary for approval prior to the commencement of construction. The Compliance Tracking Program must include, but not be limited to: (a) provision for the notification of the Secretary prior to the commencement of construction and prior to the commencement of operation of the development (including prior to each stage, where works are being staged); (b) provision for periodic review of the compliance status of the development against the requirements of this approval and the environmental management measures committed to in the documents referred to in condition A2; (c) provision for periodic reporting of compliance status to the Secretary, including but not limited to: (i) a **Pre-Construction Compliance Repor**t prior to the commencement of construction, (ii) quarterly Construction Compliance Reports, for the duration of construction, and (iii) a **Pre-Operation Compliance Report** prior to the commencement of operation, and six monthly operational compliance reports; (d) a program for independent environmental auditing; (e) mechanisms for recording environmental incidents during construction and actions taken in response to those incidents; (f) provision for reporting environmental incidents to the Secretary during construction; (g) procedures for rectifying any non-compliance identified during environmental auditing, review of compliance or incident management; and (h) provision for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.	Operation	Compliant		This 6 monthly complaince Report

Moorebank Intermodal Precinct

APPENDIX C – AIR QUALITY MONITORING COMPLIANCE REPORT

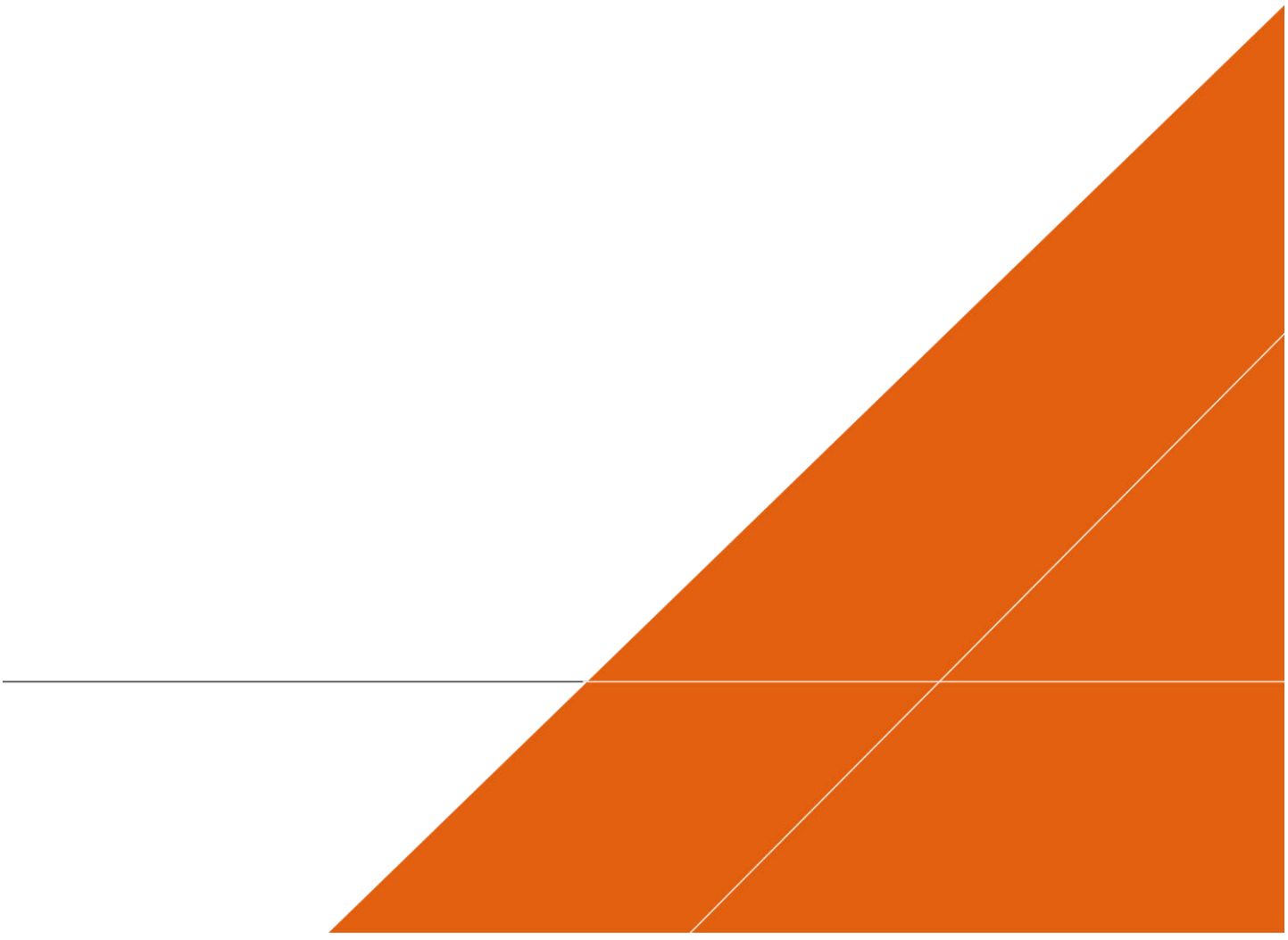
ARCADIS Design & Consultancy for natural and built assets

MOOREBANK INTERMODAL PRECINCT – EAST PRECINCT

Operational Air Quality Six Monthly Compliance Report #7

May 2023 – October 2023

13 DECEMBER 2023



CONTACT

SAMUEL BROWN
Environmental Consultant

T +61 2 8907 2684
M +61431 941 703
E sam.brown@arcadis.com

Arcadis
Level 16
580 George Street
Sydney NSW 2000

Copyright © 2015 Arcadis. All rights reserved. arcadis.com

MOOREBANK INTERMODAL PRECINCT – EAST PRECINCT

Operational Air Quality Six Monthly Compliance Report #7

May 2023 – October 2023

Author	Samuel Brown	
Checker	Heather Tilley	
Approver	Heather Tilley	

Report No PREC-ARC-EN-RPT-0014

Date 13/12/2023

Revision Text 002

This report has been prepared for Tactical Group in accordance with the terms and conditions of appointment for MLP Precinct East Operational Air Monitoring Program dated 20 December 2019. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
001	13/12/2023	Submitted draft to client for review	SB	HT
002	13/12/2023	Submitted final to client	SB	HT

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 Background

The Moorebank Logistics Park[1] – Precinct East Operational Air Quality Monitoring Programme Framework (OAQMPF - dated 19/03/2020) provides a framework to monitor air quality during operation of the Moorebank Intermodal Precinct (MIP) East Precinct and has been developed to support the implementation of the Operational Air Quality Management Plan (OAQMP - Revision 18 dated 20/01/2023) monitoring and reporting requirements. In 2022, LOGOS Property took over the management of the warehouse and distribution facilities, as well as the overall management of the MIP East Precinct (MEP). Qube Logistics will continue to maintain responsibility for the IMEX (Import Export Rail Terminal) and the Rail Link. This change in ownership does not impact the current reporting period or the current reporting requirements.

The OAQMP includes requirements of the:

- EPBC Act Approval (2011/6229) Condition of Approval (CoA) 8(f) which requires the implementation of a comprehensive air quality monitoring program (including locations, frequency, and duration)
- Moorebank East Precinct Stage 1 (SSD 6766):
  - Condition of Consent (CoC) F4(f)(iv) which requires measurement of air emissions generated by the Facility.
  - Final Compilation of Mitigation Measures (FCMM) 2C which requires the implementation of an air quality monitoring programme during operation for nuisance dust and air emissions [PM_{10}[2] and nitrogen dioxide (NO_2)].
- Moorebank East Precinct Stage 2 (SSD 7628):
  - CoC C21(c)(iii) which requires the submission of six-monthly operational compliance reports for the life of the project.
  - CoC B59(d)(i), (ii), (iii), (iv) and (vii) which require the identification of air quality monitoring methods and implementation of compliance monitoring for all emissions associated with operations of the Facility.
  - FCMM 3C which requires real-time boundary monitoring be undertaken during operation of the Facility.

1.2 Site operation

The MIP Operational Environmental Management Plan (OEMP - Revision 18 dated 20/01/2023) and sub-plans are applicable to the entire MEP. The MEP operates 24 hours, 7 days a week. This currently includes operation of the IMEX terminal, Rail Link, Warehouse 1, Warehouse 3, Warehouse 4, Warehouse 5, and Warehouse 7a. All bulk earthworks for the warehouses at MEP have now been completed. Operation of Warehouse 6 and 7b are expected to commence in Quarter 4 of 2023 and Quarter 2 2024 (respectively). No major construction related activities are occurring at MEP, with only internal fit-out and preparation for operations at the remaining Warehouses occurring. These activities would be undertaken during standard working hours, unless stated otherwise.

MIP West Precinct (MWP) Stage 2 is located west of Moorebank Avenue and is currently under construction. MWP Stage 2 is a separate project and operates under a different approval (SSD 7709) to MEP. MWP

[1] With LOGOS purchasing the MLP, the MLP will now be referred to as Moorebank Intermodal Precinct (MIP).

[2] PM_{10} - Particles with a diameter of 10 micrometres or less, which are small enough to pass through the throat and nose and enter the lungs.

Stage 2 has been granted approval to receive imported material outside of standard construction hours, along with specific types of work.

There are also works and activities outside of standard construction hours that occur from time-to-time under specific approvals processes. These can include construction works and activities associated with both MEP and MWP.

Table 1-1 summarises the works, activities and material importation undertaken outside of standard construction hours during the six-monthly reporting period.

Table 1-1: Summary of works outside of standard construction hours

Dates	Activities undertaken
27 March 2023 to 30 June 2023	General works
1 April 2023 to 30 June 2023	Works on Moorebank Avenue and Anzac Road
From 4 May 2023	Traffic changes on Bapaume Road and Chatham Avenue
27 May 2023	Helicopter lifting
26 June 2023	Deliveries
1 July 2023 to 30 September 2023	Moorebank Avenue upgrade (Including Anzac and Bapaume Roads)
8 July 2023	Helicopter lifting
23 July 2023	General works
29 and 30 July 2023	Works along Bushmaster Avenue
5 August 2023	Helicopter lifting
7 and 8 September 2023	Deliveries
26 and 27 September 2023	Deliveries
1 October 2023 to 31 December 2023	Road works on Moorebank Avenue and Anzac Road
10 and 11 October 2023	Deliveries
16 October 2023	Deliveries
20-23 October 2023	Road works on Moorebank Avenue and Anzac Road
20, 30 and 31 October 2023	Deliveries
30 October to 6 November 2023	General works

1.3 Purpose of the report

This six-monthly air quality report has been prepared to meet reporting requirements of CoC C21(c)(iii) of SSD 7628 as outlined in Section 5 of the OAQMPF.

This six-monthly air quality report includes:

- A background to the air quality monitors and their locations (Section 2)
- Weather data and regional air quality (Section 3)
- Analysis of the raw data and comparison against identified criteria / trigger level, identification of exceedances, complaints or ad hoc monitoring undertaken (Section 4)
- An overview of any investigations undertaken to determine the cause of the exceedance or complaint (Sections 4.2, 4.3, 4.4 and 4.5)
- A high-level overview of the dust deposition data (Section 4.2).

- Conclusions and recommendations based on the 6-month's data (Section 5)
- Summarised data in graphs and tables (Appendix A).

1.4 Reporting period

The MEP operations commenced on 13 May 2020.

This six-monthly internal air quality report has been prepared to provide an overview of operational air quality results for the six-month operational period from 1 May 2023 to 31 October 2023 (inclusive) to inform the six-monthly operational compliance reports required for the life of the project.

This report will be the seventh report for MEP since operations began in May 2020.

1.5 Limitations

All findings contained in this report are based on downloaded monitoring data at the time of writing the monthly reports and information relating to air quality provided by Tactical Group and Site Environmental and Remediation Services (SERS) who manage the dust deposition gauges (DDG). Arcadis do not take responsibility for the accuracy or limitations of the downloaded and provided DDG data.

2 OVERVIEW OF AIR QUALITY MONITORING

2.1 Air quality monitors

The dust and air quality monitoring system installed at the MEP comprises four Cairnet air quality units integrated with Sentinel™ software, which is hosted in the cloud. The system has been provided by EMS Brüel & Kjaer.

The Cairnet unit measures the following dust and air quality parameters:

- NO_2 (range: 0-25 ppb)
- PM_{10}
- $PM_{2.5}$ (range: 0-1000 µg/m^3)
- CO (installed since March 2020).

2.2 Dust deposition gauges

Seven DDG which are provided and serviced by SERS. The gauges consist of 5-litre glass bottles with 150 mm diameter glass funnels and silicone bungs. The purpose of this sampling is to determine which particles settle from the ambient air over an approximate 31-day sampling period. This equipment is compliant with the Australian Standard AS/NZS 3580.10.1:2016.

The DDGs were installed in May 2021 and are currently managed and monitored by SERS. SERS provide monthly to quarterly DDG reports which are used to inform the monthly Air Quality Reports.

2.3 Monitoring locations

The locations of the continuous air quality monitoring stations are identified on Figure 2-1 and the DDG locations are shown on Figure 2-2.

For this reporting period, the site boundary was considered representative of the closest receptors (including the adjacent commercial premises). The locations of the continuous air quality monitors means that the construction and operation activities for both MEP and MWP Stage 2 have been captured.

DDG locations were also chosen so that a true representation of dust generated from site operation activity of MEP could be established and to a slightly lesser extent, the construction activities of MWP Stage 2.

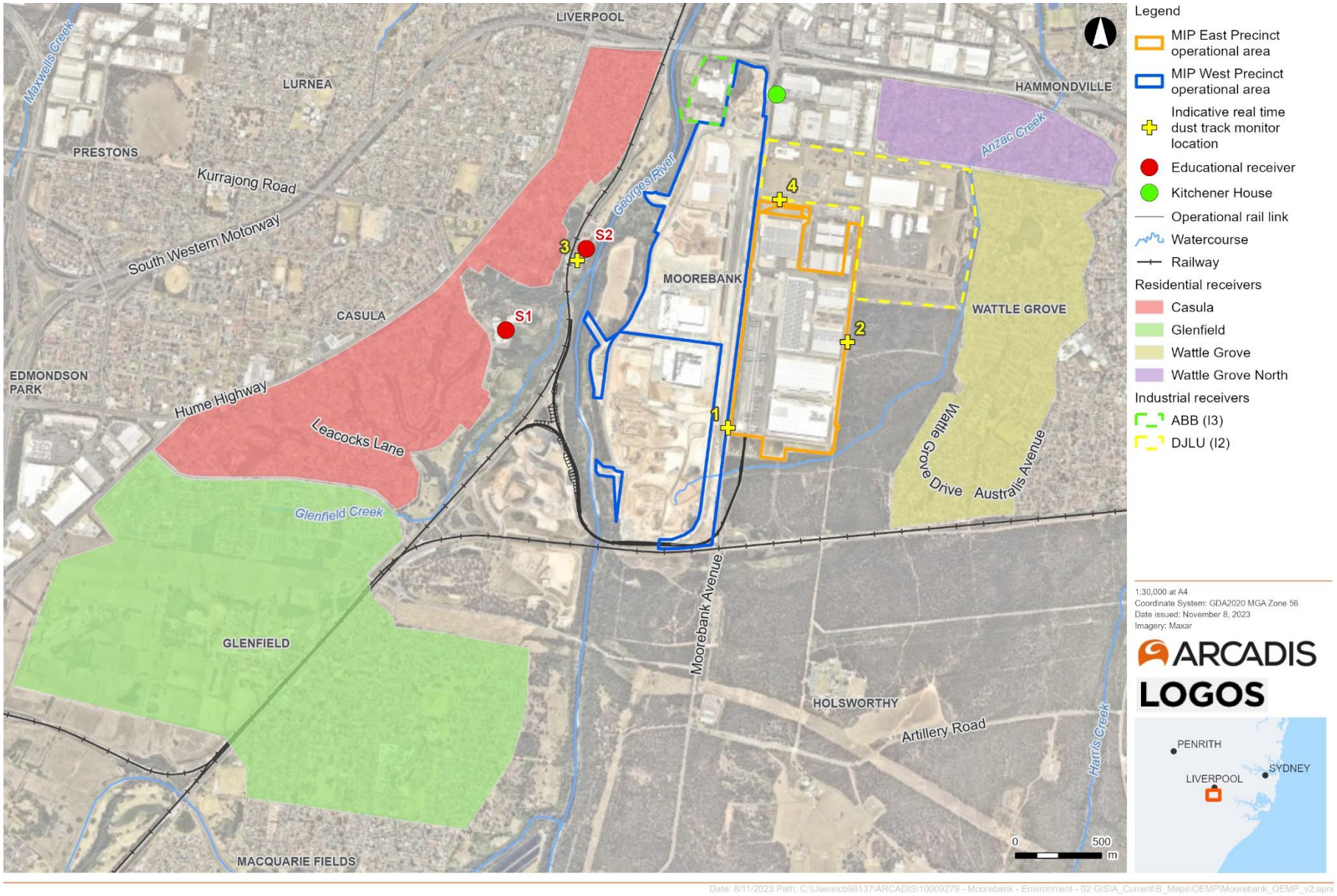


Figure 2-1: Continuous real-time air quality monitors (Source: Arcadis, 2023)

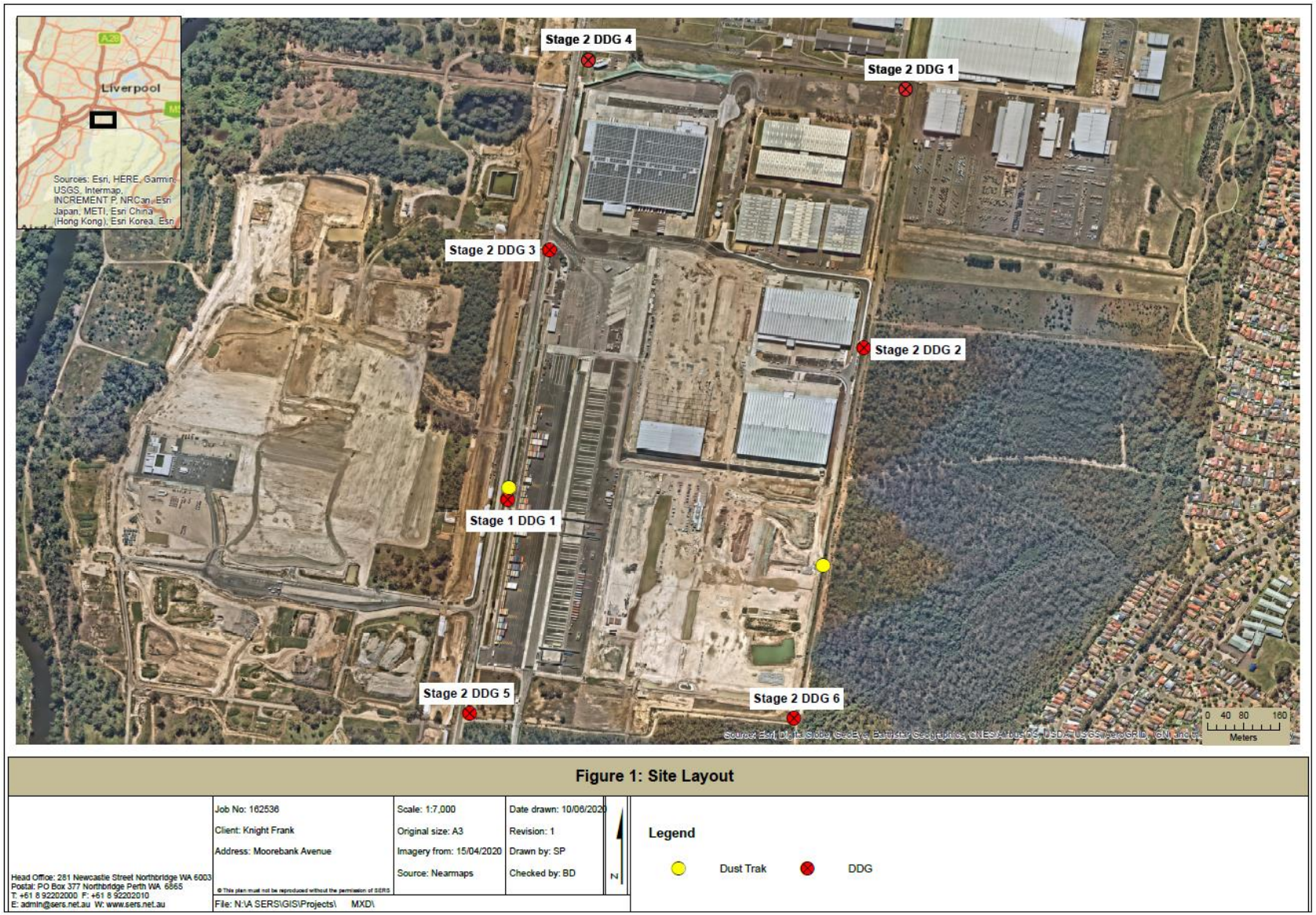


Figure 2-2: Location of Dust Deposition Gauges (Source: SERS, November 2023)

2.4 Air quality monitoring station availability

A summary of availability (time of operation) of the continuous air quality monitoring stations for this reporting period is summarised in Table 2-1, with the most recent calibration date also stated.

Table 2-1: Monitoring station availability (%)

Monitoring station	May 2023	June 2023	July 2023	August 2023	September 2023	October 2023	Average	Calibration#
AQM01	100	100	100	100	100	100	100	Feb 2023^
AQM02	100	100	100	100	93	55	91	Feb 2023
AQM03	92	0	0	0	33	83	35	Apr 2022^
AQM04	98	100	98	100	100	100	99	Dec 2022/ Feb 2023

#Latest calibration date. Gauges were not calibrated for particulate matter.

^CO was not calibrated, only NO_2.

Monitors AQM01 and AQM04 were available and recorded data for the majority of the 6-month period (100% and 99% respectively), however there has been significant variability in monitor availability throughout this reporting period for monitor AQM03 and to a lesser extent AQM02.

- AQM02 only started recording PM data from 15 October. However, most months prior to October 2023, the availability was 93% or better.
- No data was recorded from June 2023 through to August 2023 at AQM03, with only a 33% availability in September 2023.

To maintain accurate data for reporting, it is recommended that the monitors are checked regularly for damage or faults and repaired, maintained, or replaced promptly.

3 WEATHER

3.1 Meteorological Conditions

3.1.1 Prevailing wind conditions

Prevailing winds influence the dispersion of dust, and other air emissions potentially generated by the Facility. A weather station was initially located in Wattle Grove around 500 metres east of MEP. This weather station operated well for the first 18 months of the project but became increasingly unreliable. The weather station was removed in May 2023 and replaced by a new weather station and relocated close to Moorebank Avenue on MEP. During times when the weather station was not operating, Bankstown Airport Automatic Weather Station (AWS) was used as a reference station. The prevailing wind speed and direction is discussed in more detail below.

3.1.2 Observed wind data

3.1.2.1 Bankstown Airport AWS

The AWS was used as a reference station for May and June 2023 due to the removal and relocation of the site weather station. The average wind speed and direction data at 9 am and 3 pm from the Bankstown Airport AWS in May 2023 and June 2023 is summarised below.

Table 3-1: Bankstown Airport AWS Wind direction for May and June 2023

Month	9am wind direction	3pm wind direction
May 2023	West-northwest	West
June 2023	Northwest	West-northwest

Table 3-2: Bankstown Airport AWS Wind speed for May and June 2023

Month	9am wind speed (m/s)	Beaufort Wind scale category[3]	3pm wind speed (m/s)	Beaufort Wind scale category
May 2023	2.5	Light breeze	4.1	Gentle breeze
June 2023	2.2	Light breeze	3.6	Gentle breeze

3.1.2.2 Site weather station

The average wind speed and direction data from the site weather monitor from July 2023 to October 2023 is summarised below in Table 3-3.

Table 3-3: Site weather station Wind direction for July to October 2023

Month	Wind speed (m/s)	Beaufort Wind scale category	Wind direction
July 2023	0.8	Light air	West-southwest (243°)

[3] Based on the **Beaufort wind force scale which is** an empirical measure that relates wind speed to observed conditions at sea or on land (https://en.wikipedia.org/wiki/Beaufort_scale)

Month	Wind speed (m/s)	Beaufort Wind scale category	Wind direction
August 2023	0.9	Light air	Southwest (220°)
September 2023	1.0	Light air	South-southwest (212°)
October 2023	1.7	Light breeze	Southwest (220°)

3.1.3 Ambient temperature and rainfall

Monthly mean temperatures (minimum and maximum) and rainfall (long-term monthly average and total) recorded at the Bankstown Airport AWS for the reporting period are summarised in Table 3-4.

Generally, rainfall for the reporting period was well below the long-term monthly average rainfall except for August and September 2023, where the monthly rainfall was marginally above the long-term monthly average (shown in bold).

Table 3-4: Temperature and rainfall recorded at the Bankstown Airport AWS for the reporting period

Month	Mean minimum temperature (°C)	Mean maximum temperature (°C)	Total rainfall (mm)	Long-term monthly average rainfall (mm)
May 2023	6.5	20.4	13.0	62.7
June 2023	5.9	19.1	13.2	76.5
July 2023	5.7	20.2	12.0	47.9
August 2023	7.3	20.9	**52.8**	49.4
September 2023	9.0	25.0	**47.4**	44.5
October 2023	12.1	26.2	25.0	62.1

Source: Bankstown, NSW - October 2023 - Daily Weather Observations (bom.gov.au)

3.2 Ambient Air Quality

Since November 2020, the Department of Planning and Environment (DPE) has implemented air quality categories (AQC) for NSW. These categories are based on air quality data readings which are taken continuously from the various monitoring sites throughout NSW and are averaged to give hourly and daily air quality information. DPE use minute data, and report concentrations as hourly and daily averages. All averages are arithmetic means. Air quality data is updated hourly, and a daily air quality forecast is made for the Greater Sydney Metropolitan Region at 4 pm each day.

The AQC is generally used by government agencies to communicate to the public how polluted the air currently is or how polluted it is forecast to become. The AQC range from 'Good' to 'Extremely Poor' and are summarised in Figure 3-1[4].

[4] https://www.environment.nsw.gov.au/topics/air/understanding-air-quality-data/air-quality-categories

			Air quality categories (AQC)				
Air pollutant	Averaging period	Units	GOOD	FAIR	POOR	VERY POOR	EXTREMELY POOR
Ozone O_3	1-hour	pphm	<6.7	6.7–10.0	10.0–15.0	15.0–20.0	20.0 and above
	4-hour rolling	pphm	<5.4	5.4–8.0	8.0–12.0	12.0–16.0	16.0 and above
Nitrogen dioxide NO_2	1-hour	pphm	<8	8–12	12–18	18–24	24 and above
Visibility Neph	1-hour	bsp	<1.5	1.5–3.0	3.0–6.0	6.0–18.0	18.0 and above
Carbon monoxide CO	8-hour rolling	ppm	<6.0	6.0–9.0	9.0–13.5	13.5–18.0	18.0 and above
Sulfur dioxide SO_2	1-hour	pphm	<13.3	13.3–20.0	20.0–30.0	30.0–40.0	40.0 and above
Particulate matter < 10 µm PM_{10}	1-hour	µg/m^3	<50	50–100	100–200	200–600	600 and above
Particulate matter < 2.5 µm $PM_{2.5}$	1-hour	µg/m^3	<25	25–50	50–100	100–300	300 and above

Figure 3-1: Air quality categories

The PM_{10}, $PM_{2.5}$, NO_2, Visibility and CO air quality data from the Liverpool[5] monitoring station was reviewed for the six-month reporting period. Table 3-5 is a summary of the review:

Table 3-5: Summary of AQC from the Liverpool monitoring station for the reporting period

Month	Average for Reporting Period	Comment for reporting period
NO_2 (ppm) maximum 1 hourly average	Good	Good every day
CO (ppm) maximum rolling 8 hourly average	Good	Good every day
PM_{10} 24-hour average	Mostly good, with 17 days fair, 1 day very poor and 1 day poor	'Good' every day except for: • Wednesday 24 May 2023 had 'fair' PM_{10} (43.3 µg/m^3) • Wednesday 31 May 2023 had 'fair' PM_{10} (39.9 µg/m^3) • Thursday 1 June 2023 had 'fair' PM_{10} (33.9 µg/m^3) • Friday 2 June 2023 had 'fair' PM_{10} (37.1 µg/m^3) • Wednesday 21 June 2023 had 'fair' PM_{10} (38.1 µg/m^3) • Thursday 13 July 2023 had 'fair' PM_{10} (35.8 µg/m^3) • Friday 4 August 2023 had 'fair' PM_{10} (43.4 µg/m^3) • Saturday 26 August 2023 had 'fair' PM_{10} (39.9 µg/m^3) • Thursday 7 September 2023 had 'fair' PM_{10} (43.9 µg/m^3) • Wednesday 13 September 2023 had 'very poor' PM_{10} (76.4 µg/m^3) • Thursday 14 September 2023 had 'fair' PM_{10} (41.7 µg/m^3) • Friday 15 September 2023 had 'poor' PM_{10} (52.6 µg/m^3)

[5] Data download facility | NSW Dept of Planning, Industry and Environment

Month	Average for Reporting Period	Comment for reporting period
		• Saturday 16 September 2023 had 'fair' PM_{10} (35.8 µg/m^3) • Monday 18 September 2023 had 'fair' PM_{10} (40.3 µg/m^3) • Tuesday 19 September 2023 had 'fair' PM_{10} (44.9 µg/m^3) • Wednesday 20 September 2023 had 'fair' PM_{10} (34.3 µg/m^3) • Monday 2 October 2023 had 'fair' PM_{10} (37.8 µg/m^3) • Wednesday 25 October 2023 had 'fair' PM_{10} (42.7 µg/m^3) • Tuesday 31 October 2023 had 'fair' PM_{10} (35.2 µg/m^3).
$PM_{2.5}$ 24-hour average	Mostly good, with 9 days fair, 3 days poor, 1 day very poor, and 1 day extremely poor.	'Good' every day except for: • Wednesday 24 May 2023 had 'fair' $PM_{2.5}$ (17.6 µg/m^3) • Sunday 11 June 2023 had 'fair' $PM_{2.5}$ (18.2 µg/m^3) • Monday 12 June 2023 had 'fair' $PM_{2.5}$ (22.1 µg/m^3) • Saturday 17 June 2023 had 'fair' $PM_{2.5}$ (20.2 µg/m^3) • Thursday 13 July 2023 had 'fair' $PM_{2.5}$ (17.3 µg/m^3) • Friday 14 July 2023 had 'fair' $PM_{2.5}$ (17.1 µg/m^3) • Friday 4 August 2023 had 'fair' $PM_{2.5}$ (20.1 µg/m^3) • Saturday 5 August 2023 had 'fair' $PM_{2.5}$ (19.3 µg/m^3) • Thursday 7 September 2023 had 'poor' $PM_{2.5}$ (30.2 µg/m^3) • Monday 11 September 2023 had 'very poor' $PM_{2.5}$ (21.5 µg/m^3) • Wednesday 13 September 2023 had 'extremely poor' $PM_{2.5}$ (66.2 µg/m^3) • Thursday 14 September 2023 had 'poor' $PM_{2.5}$ (31.9 µg/m^3) • Friday 15 September 2023 had 'poor' $PM_{2.5}$ (35.6 µg/m^3) • Saturday 16 September 2023 had 'fair' $PM_{2.5}$ (24.3 µg/m^3).
Visibility[6],	Mostly good, with 8 days fair, 5 days poor, and 2 days very poor.	'Good' every day except for: • Monday 12 June 2023 had 'fair' Visibility (1.52 10^{-4}m^{-1}) • Saturday 17 June 2023 had 'fair' Visibility (1.68 10^{-4}m^{-1}) • Friday 4 August 2023 had 'fair' Visibility (1.52 10^{-4}m^{-1}) • Saturday 5 August 2023 had 'fair' Visibility (1.53 10^{-4}m^{-1}) • Friday 18 August 2023 had 'poor' Visibility (3.40 10^{-4}m^{-1}) • Saturday 2 September 2023 had 'poor' Visibility (3.65 10^{-4}m^{-1}) • Wednesday 6 September 2023 had 'fair' Visibility (2.12 10^{-4}m^{-1}) • Thursday 7 September 2023 had 'poor' Visibility (4.12 10^{-4}m^{-1}) • Sunday 10 September 2023 had 'fair' Visibility (2.42 10^{-4}m^{-1})

[6] In NSW, visibility (or NEPH) is reported in units of 10^{-4} m^{-1}. This means that a NEPH value of 1.5 should be read as $1.5x10^{-4}$ m^{-1}. NSW has adopted a 1-hour visibility standard of $2.1x10^{-4}$ m^{-1}, which corresponds to a visual distance of approximately 18.6 km. This means that NEPH > 2.1 will trigger 'POOR' (or worse) air quality due to reduced visual range (<18.6 km)

Month	Average for Reporting Period	Comment for reporting period
		• Monday 11 September 2023 had 'very poor' Visibility (7.73 $10^{-4}m^{-1}$) • Wednesday 13 September 2023 had 'very poor' Visibility (9.26 $10^{-4}m^{-1}$) • Thursday 14 September 2023 had 'poor' Visibility (4.33 $10^{-4}m^{-1}$) • Friday 15 September 2023 had 'poor' Visibility (4.73 $10^{-4}m^{-1}$) • Saturday 16 September 2023 had 'fair' Visibility (2.68 $10^{-4}m^{-1}$) • Sunday 1 October 2023 had 'fair' Visibility (1.50 $10^{-4}m^{-1}$).

The higher number of 'fair' to 'extremely poor' ratings at the Liverpool ambient air monitor seems likely to be related to the hazard reduction burns that were occurring in Sydney and the surrounding areas in September and October 2023.

4 MONITORING RESULTS

4.1 Air quality criteria

4.1.1 Criteria for $PM_{2.5}$, PM_{10}, NO_2 and CO

The National Environment Protection Measure for Ambient Air (Air NEPM)[7] has established new national standards for assessment of air quality for NO_2 and CO, which came into effect 13 May 2021. These criteria are detailed in Table 4-1. The air quality data at MEP was assessed against the new criteria from June 2021.

Table 4-1: Monitoring criteria (applied from June 2021)

Monitoring focus	Averaging period	Criteria / Trigger
$PM_{2.5}$	24-hour average	25 µg/m^3
	Annual average	8 µg/m^3
PM_{10}	24-hour average	50 µg/m^3
	Annual average	25 µg/m^3
NO_2	1-hour average	0.12 ppm
	Annual average	0.03 ppm
CO	1-hour average	NA
	8 -hour average	9.0 ppm

It is also worth noting that in 2025, the criteria for $PM_{2.5}$ will change to 20 µg/m^3 for the 24-hour averaging period and 7 µg/m^3 for the annual average.

4.1.2 Dust deposition

Dust deposition data from seven DDGs located around the site is provided by SERS and have been provided for incorporation into the monitoring program since May 2021.

DPE has set the criteria for dust deposition rates, and these are provided in Table 4-2.

Table 4-2 Dust deposition criteria

Averaging Period	Maximum increase in deposited dust* level	Maximum total deposited dust level
Annual	2 g/m^2/month (incremental)	4 g/m^2/month (cumulative)

* Deposited dust is assessed as insoluble solids. This is the mass of the insoluble portion of the deposited matter, as defined under AS 3580.10.1: 2016.

[7] https://www.environment.nsw.gov.au/topics/air/understanding-air-quality-data/standards-and-goals

4.2 Dust deposition gauge results

The results of the collection period 15 March 2023 to 10 November 2023 as provided by SERS is shown in Table 4-3.

Table 4-3: Dust deposition (insoluble solids g/m^2/month) results from 15 March to 10 November 2023

Date	Stage 1 DDG 1	Stage 2 DDG 1	Stage 2 DDG 2	Stage 2 DDG 3	Stage 2 DDG 4	Stage 2 DDG 5	Stage 2 DDG 6	Average
May 2023	1.8	0.6	0.9	N/A*	0.8	0.9	0.1	0.9
June 2023**	1.8	0.6	0.9	N/A*	0.8	0.9	0.1	0.9
July 2023	0.7	0.8	**3.6**	**2.1**	0.9	1.4	1.0	1.5
August 2023	0.7	0.8	**3.6**	**2.1**	0.9	1.4	1.0	1.5
September 2023	1.0	0.8	1.8	**2.2**	0.5	1.0	1.0	1.2
October 2023**	1.2	**3.5**	**2.5**	1.8	0.6	1.7	0.8	1.7

NOTE: Bold/grey indicates an exceedance of the criteria.

* Stage 2 DDG3 was missing during this collection period. It has been reinstated from June 2023.

** These reports used two different DDG reports to ensure the entire month was covered as some collection periods ended during the month rather than at the beginning or end of the month and sometimes covered over two months' worth of data

As shown in Table 4-3, there were seven individual gauge exceedances between July and October 2023. However, no monthly average exceedances of the dust deposition (insoluble solids) 2 g/m^2/month (incremental) and 4 g/m^2/month (cumulative) criteria occurred between 15 March 2023 and 10 November 2023.

4.3 Continuous monitor results

Monitoring data for $PM_{2.5}$, PM_{10}, NO_2 and CO for the reporting period have been summarised into tables and graphs and are provided in Appendix A. The following sections summarise the results for this reporting period.

4.3.1 Annual exceedances

Twelve months of air quality monitoring are provided graphically and in table form in Appendix A. It should be noted that AQM04 did not record any data from November 2022 to 24 March 2023 and AQM03 did not record any data between 29 May 2023 and 19 September 2023.

See Table 2-1 for the monitoring station availability (%) over a 12-month period.

4.3.1.1 $PM_{2.5}$ and PM_{10} Monitoring

The 12-month rolling annual average for the period November 2022 to October 2023 for all four monitors combined was below the annual average criteria (i.e. 8.0 µg/m^3 for $PM_{2.5}$ and 25.0 µg/m^3 for PM_{10}) for each month (See Appendix A.1 and Appendix A.2 for more details).

As of October 2023, the 12-month rolling annual average for all four monitors was 2.1 µg/m^3 for $PM_{2.5}$ and 5.8 µg/m^3 for PM_{10}.

Monitor AQM03

The rolling annual average for monitor AQM03 for the period May 2022 to October 2023 exceeded the annual average criteria for $PM_{2.5}$ and PM_{10} for most months during the reporting period, except for September and October 2023.

AQM03 is located on the western extent of MWP Stage 2, therefore the exceedances could be the result of construction activities being undertaken at the MWP site.

4.3.1.2 NO_2 Monitoring

The 12-month rolling annual average for all four monitors for the period November 2022 to October 2023 was below the annual average criteria (0.03 ppm) for each month.

As of October 2023, the 12-month rolling annual average for NO_2 for all four monitors is 0.011 ppm, below the annual average criteria of 0.03 ppm.

4.3.1.3 CO

CO does not require annual reporting.

4.3.2 24-hour exceedances

As discussed above, no data was recorded at AQM03 from 29 May 2023 and 19 September 2023.

4.3.2.1 $PM_{2.5}$ Monitoring

A review of the data for the reporting period identified no exceedance of the 24-hour average criteria (25 µg/m^3) for $PM_{2.5}$.

4.3.2.2 PM_{10} Monitoring

Four exceedances of the 50 µg/m^3/day limit for PM_{10} were recorded during the 6-month reporting period. These are summarised in Table 4-4. The table includes the 24-hour average for PM_{10} recorded at the Liverpool monitoring station for comparison and includes analysis of the exceedance.

Table 4-4: Summary of exceedances of the PM_{10} 50 µg/m^3/day limit

Date of exceedance	AQM01 µg/m^3	AQM02 µg/m^3	AQM03 µg/m^3	AQM04 µg/m^3	Liverpool average[8]	Analysis of exceedance	Train operation
5/07/2023	-	52.7	-	-	11.4	Exceedance occurred mainly between midnight and 9 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were	Five trains arrived/ departed the terminal on this day, with two during times of exceedance.

[8] Liverpool average: The 24-hour average is the average of the 1-hour averages recorded for the day (i.e., between 01:00 and 24:00)

Date of exceedance	AQM01 µg/m³	AQM02 µg/m³	AQM03 µg/m³	AQM04 µg/m³	Liverpool average[8]	Analysis of exceedance	Train operation
						occurring during the time of exceedance.	
18/07/2023	-	57.9	-	-	15.2	Exceedance occurred mainly between midnight and 9 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were occurring during the time of exceedance.	Five trains arrived/ departed the terminal on this day, with one during times of exceedance.
28/09/2023	-	-	50.1	-	12.4	Exceedance occurred mainly between midnight and 4 am. Out of hours works along Moorebank Avenue, Anzac Road and Bapaume Roads were occurring during the time of exceedance. Hazard reduction burns were occurring in Sydney and surrounds this month.	Four trains arrived/ departed the terminal on this day, with two during times of exceedance.
2/10/2023	-	-	51.2	-	37.8	Exceedance occurred mainly between midnight and 9 am and again from 8pm to midnight. This exceedance coincided with a 'fair' reading of PM_{10} at the Liverpool monitoring station. Out of hours works along Moorebank Avenue and Anzac Road were occurring during the time of exceedance. Hazard reduction burns were occurring in Sydney and surrounds this month.	One train arrived/ departed the terminal on this day during times of exceedance.

Two exceedances of the PM_{10} 24-hour average occurred at AQM03. As discussed in Section 4.3.1.1, AQM03 is located on the western extent of MWP Stage 2, therefore the exceedances could be the result of construction activities being undertaken at the MWP site or potentially related to out of hours works occurring along Moorebank Avenue, Anzac Road and Bapaume Road. It should also be noted that hazard reduction burns were occurring in Sydney and surrounds during the months of exceedance for monitor AQM03.

Two exceedances of the PM_{10} 24-hour average occurred at AQM02 which is located to the east of MEP and approximately 500 m away from the trains. No night works were occurring in this area during the exceedances, although out of hours roadworks were occurring along Moorebank Avenue, Anzac Road, and Bapaume Road. It is unclear what could have contributed to these exceedances.

4.3.3 NO_2 1-hour exceedances

No exceedance of NO_2 1-hour criteria (0.12 ppm / 120 ppb) were observed during the 6-month reporting period.

4.3.4 CO 8-hour exceedances

No 8-hour criteria exceedances for CO occurred during the 6-month reporting period.

4.4 Complaints

One complaint was made relating to air quality on 27 June 2023. A local resident provided feedback about dust generation on Moorebank Avenue. The project team investigated and found no exceedances of the criteria for deposited dust in the last three months. A letter response explaining specific methods for the management and monitoring of dust generation at the Precinct was provided to the resident.

4.5 Ad-hoc monitoring

No ad-hoc monitoring was undertaken between during this reporting period.

5 CONCLUSION

This six-monthly operational air quality report covers the period May 2023 to October 2023 (inclusive).

The following summarises the monitoring results for this reporting period:

- The rolling annual average for all four monitors combined was below the annual average criteria (8.0 µg/m^3 for $PM_{2.5}$ and 25.0 µg/m^3 for PM_{10}) for each month during the reporting period.
- The combined rolling annual average for monitor AQM03 exceeded the annual average criteria for $PM_{2.5}$ and PM_{10} each month except for September and October 2023.
- There were no exceedances of the $PM_{2.5}$ 24-hour average criteria (25 µg/m^3) during the 6-month reporting period.
- There were four exceedances (out of 184 days) of the PM_{10} 24-hour average criteria (50 µg/m^3) during the 6-month reporting period (about 2%).
  - Two exceedances were recorded at AQM03 and occurred in September and October 2023.
  - Two exceedances were recorded at AQM02 and occurred in July 2023.
  - All exceedances coincided with higher readings overnight and during the early morning periods.
  - The 2 October 2023 exceedance coincided with a 'fair' reading at the Liverpool station possibly indicating more regional alterations to air quality (which may be due to hazard reduction burns).
  - July and October 2023 were drier months compared to long-term averages, which may have contributed to exceedances in these months.
  - Out of standard hours work occurred during times of PM_{10} exceedance. These activities could potentially have influenced the higher values recorded; however further investigation is needed.
  - Hazard reduction burns were occurring in Sydney and surrounds during September and October 2023 which may have influenced the higher readings in these months.
  - The exceedances occurred on days when trains where entering/exiting MEP, although based on the location of the monitors from the trains (at least 500m) it is considered unlikely to be attributed to these.
  - Investigations at MEP upon receipt of the exceedances has not identified significant dust or emissions issues from MEP.
- There were no exceedances of NO_2 1-hour criteria (0.12 ppm / 120 ppb) during the 6-month reporting period.
- There were no exceedances of the CO criteria (9.0 ppm) at AQM02 and AQM04 (the only monitors that record CO) during the 6-month reporting period.
- There were seven individual gauge exceedances of the dust deposition (insoluble solids) 2 g/m^2/month (incremental) criteria between July and October 2023. However, no monthly average exceedances of the dust deposition (insoluble solids) 2 g/m^2/month (incremental) and 4 g/m^2/month (cumulative) criteria occurred between 15 March 2023 and 10 November 2023 as reported by SERS.
- One complaint relating to air quality was received on 27 June 2023 in the 6-month reporting period. The complaint related to dust generation along Moorebank Avenue. The project team investigated and found no exceedances of the criteria for deposited dust in the last three months. A letter response explaining specific methods for the management and monitoring of dust generation at the Precinct was provided to the resident.

- There has been variability in monitor availability throughout this reporting period for monitors AQM02 and AQM03. To maintain accurate data for reporting, monitors should be checked regularly for damage or faults and repaired, maintained, or replaced promptly.
- It is noted that the calibration of monitor AQM03 for NO_2 was completed in April 2022 and is over one year since it was last calibrated. It is recommended that this monitor be calibrated. None of the monitors were calibrated for PM.
- It is recommended that the operation of monitor AQM03 is investigated to determine whether there is a malfunction, incorrect calibration, vandalism, or isolated source of exceedance in proximity to this monitor. AQM03 data is also consistently higher than the other monitors and may be influenced by works at MWP.

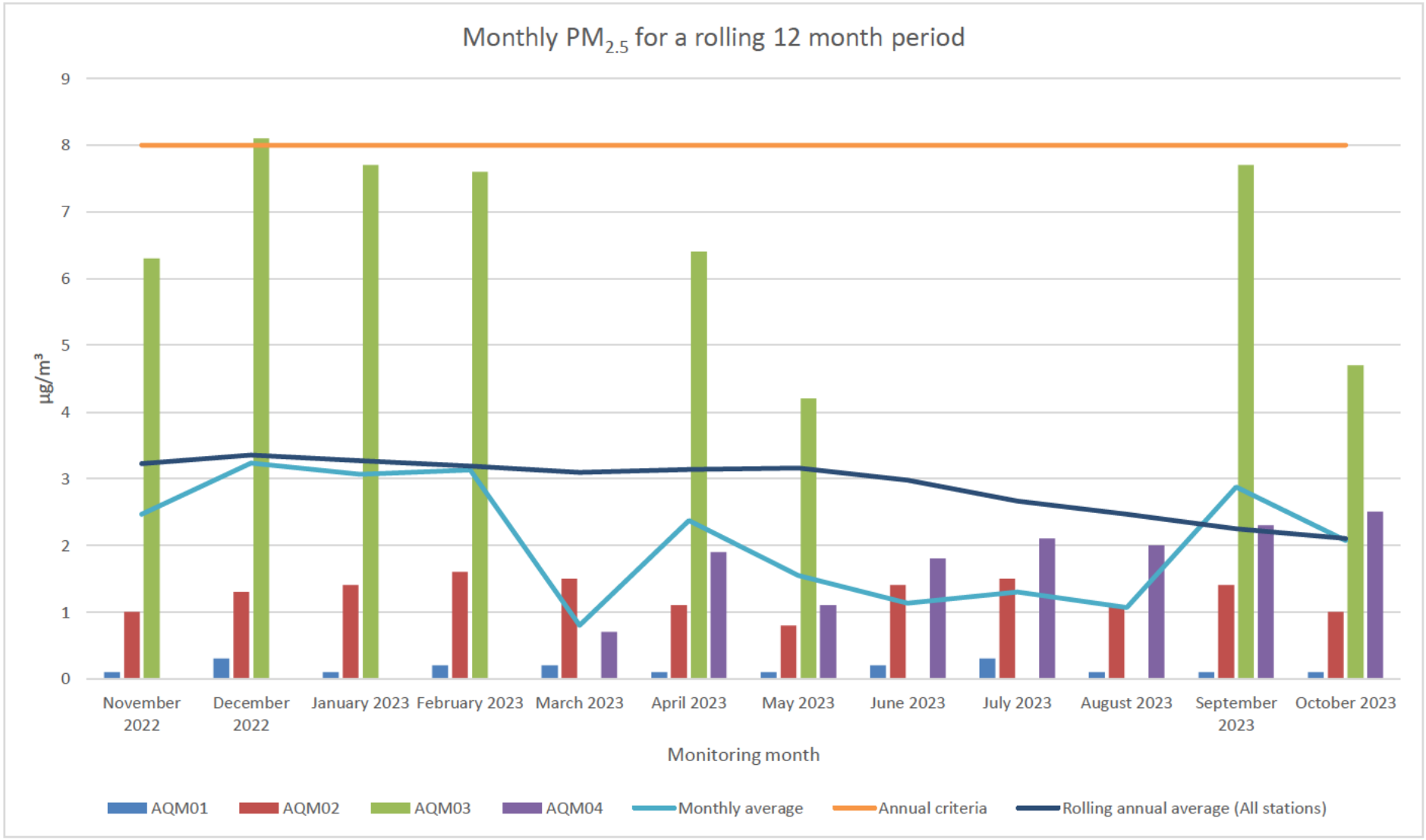
APPENDIX A

Appendix A.1: Rolling 12-month particulate data ($PM_{2.5}$)

Month	Average AQM01	Average AQM02	Average AQM03	Average AQM04	Months Average All stations	Rolling annual average All stations	Annual average criteria	Comments
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	
November 2022	0.1	1.0	6.3	**No reading**	2.5	3.2	8.0	No exceedance of annual average criteria.
December 2022	0.3	1.3	**8.1**	**No reading**	3.2	3.4	8.0	No exceedance of annual average criteria.
January 2023	0.1	1.4	7.7	**No reading**	3.1	3.3	8.0	No exceedance of annual average criteria.
February 2023	0.2	1.6	7.6	**No reading**	3.1	3.2	8.0	No exceedance of annual average criteria.
March 2023	0.2	1.5	**Malfunction**	0.7	0.8	3.1	8.0	No exceedance of annual average criteria. AQM03 recorded abnormal figures during the month, particularly relating to averages. AQM04 only started recording data from 24 March 2023.
April 2023	0.1	1.1	6.4	1.9	2.4	3.1	8.0	No exceedance of annual average criteria.
May 2023	0.1	0.8	4.2	1.1	1.6	3.2	8.0	No exceedance of annual average criteria.
June 2023	0.2	1.4	**No reading**	1.8	1.1	3.0	8.0	No exceedance of annual average criteria.
July 2023	0.3	1.5	**No reading**	2.1	1.3	2.7	8.0	No exceedance of annual average criteria.
August 2023	0.1	1.1	**No reading**	2.0	1.1	2.5	8.0	No exceedance of annual average criteria.
September 2023	0.1	1.4	7.7	2.3	2.9	2.3	8.0	No exceedance of annual average criteria. AQM03 only started recording data from 20 September 2023.
October 2023	0.1	1.0	4.7	2.5	2.1	2.1	8.0	No exceedance of annual average criteria. AQM02 only started recording data from 15 October 2023.
Rolling 12-month average	0.2	1.3	6.6	1.8	-	-	8.0	No exceedance of annual average criteria.
All months^	0.8	3.2	6.8	2.5	3.2	-	8.0	No exceedance of annual average criteria.

Bold/grey indicates an exceedance of the criteria.

^ All months since May 2020



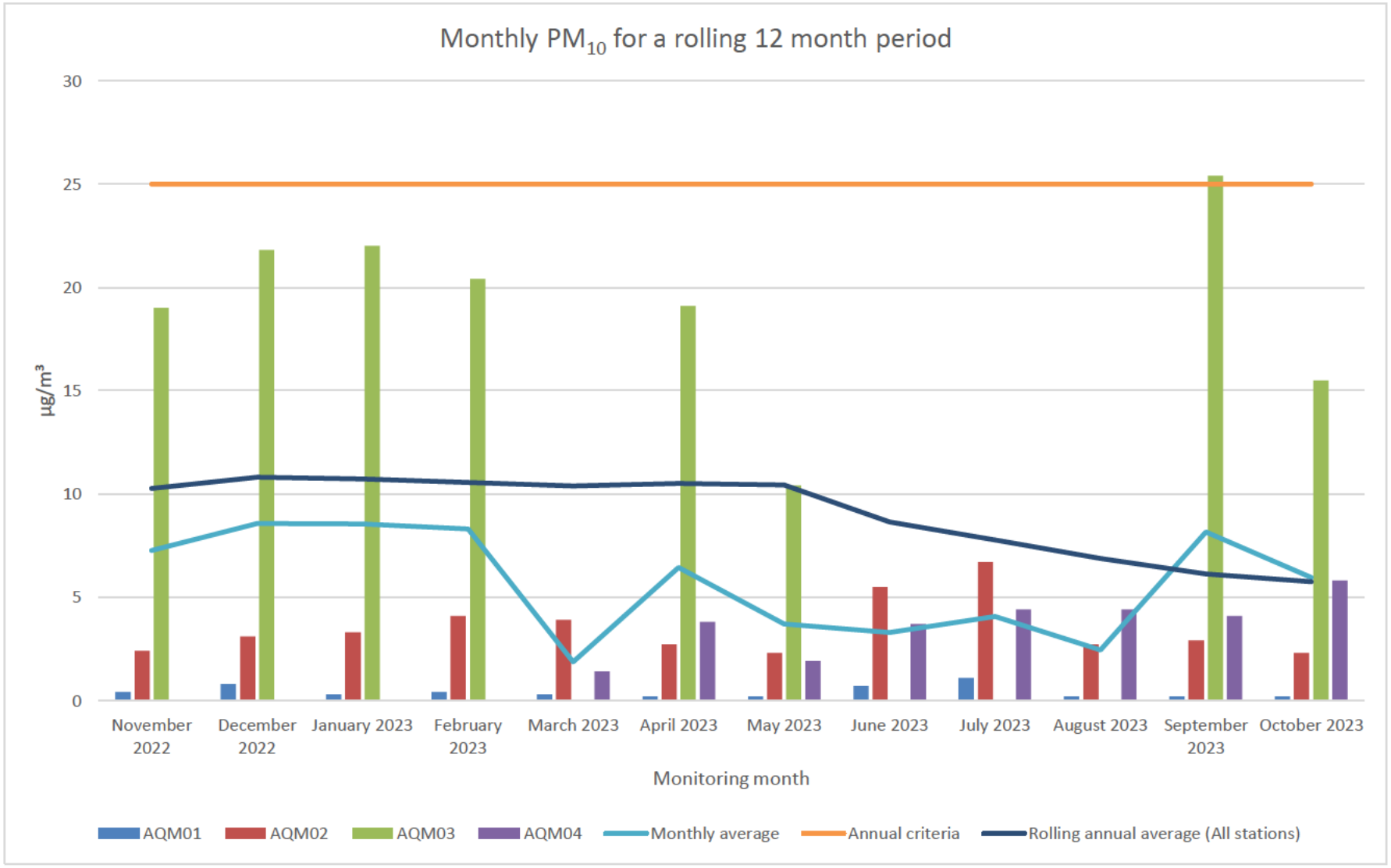
Monthly $PM_{2.5}$ over 12 months including the 6-months for this report

Appendix A.2: Rolling 12-month particulate data (PM_{10})

Month	Average AQM01	Average AQM02	Average AQM03	Average AQM04	Months Average All stations	Rolling annual average All stations	Annual average criteria	Comments
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	
November 2022	0.4	2.4	19.0	**No reading**	7.3	10.3	25.0	No exceedance of annual average criteria.
December 2022	0.8	3.1	21.8	**No reading**	8.6	10.8	25.0	No exceedance of annual average criteria.
January 2023	0.3	3.3	22.0	**No reading**	8.5	10.7	25.0	No exceedance of annual average criteria.
February 2023	0.4	4.1	20.4	**No reading**	8.3	10.6	25.0	No exceedance of annual average criteria.
March 2023	0.3	3.9	**Malfunction**	1.4	1.9	10.4	25.0	No exceedance of annual average criteria. AQM03 recorded abnormal figures during the month, particularly relating to averages. AQM04 only started recording data from 24 March 2023.
April 2023	0.2	2.7	19.1	3.8	6.5	10.5	25.0	No exceedance of annual average criteria.
May 2023	0.2	2.3	10.4	1.9	3.7	10.4	25.0	No exceedance of annual average criteria.
June 2023	0.7	5.5	**No reading**	3.7	3.3	8.7	25.0	No exceedance of annual average criteria.
July 2023	1.1	6.7	**No reading**	4.4	4.1	7.8	25.0	No exceedance of annual average criteria.
August 2023	0.2	2.7	**No reading**	4.4	2.4	6.9	25.0	No exceedance of annual average criteria.
September 2023	0.2	2.9	**25.4**	4.1	8.2	6.1	25.0	No exceedance of annual average criteria. AQM03 only started recording data from 20 September 2023.
October 2023	0.2	2.3	15.5	5.8	6.0	5.8	25.0	No exceedance of annual average criteria. AQM02 only started recording data from 15 October 2023.
Rolling 12-month average	0.4	3.5	19.2	3.7	-	-	25.0	No exceedance of annual average criteria.
All months^	2.2	10.1	23.3	5.1	9.9	-	25.0	No exceedance of annual average criteria.

Bold/grey indicates an exceedance of the criteria.

^ All months since May 2020



Monthly PM_{10} over 12 months including the 6-months for this report

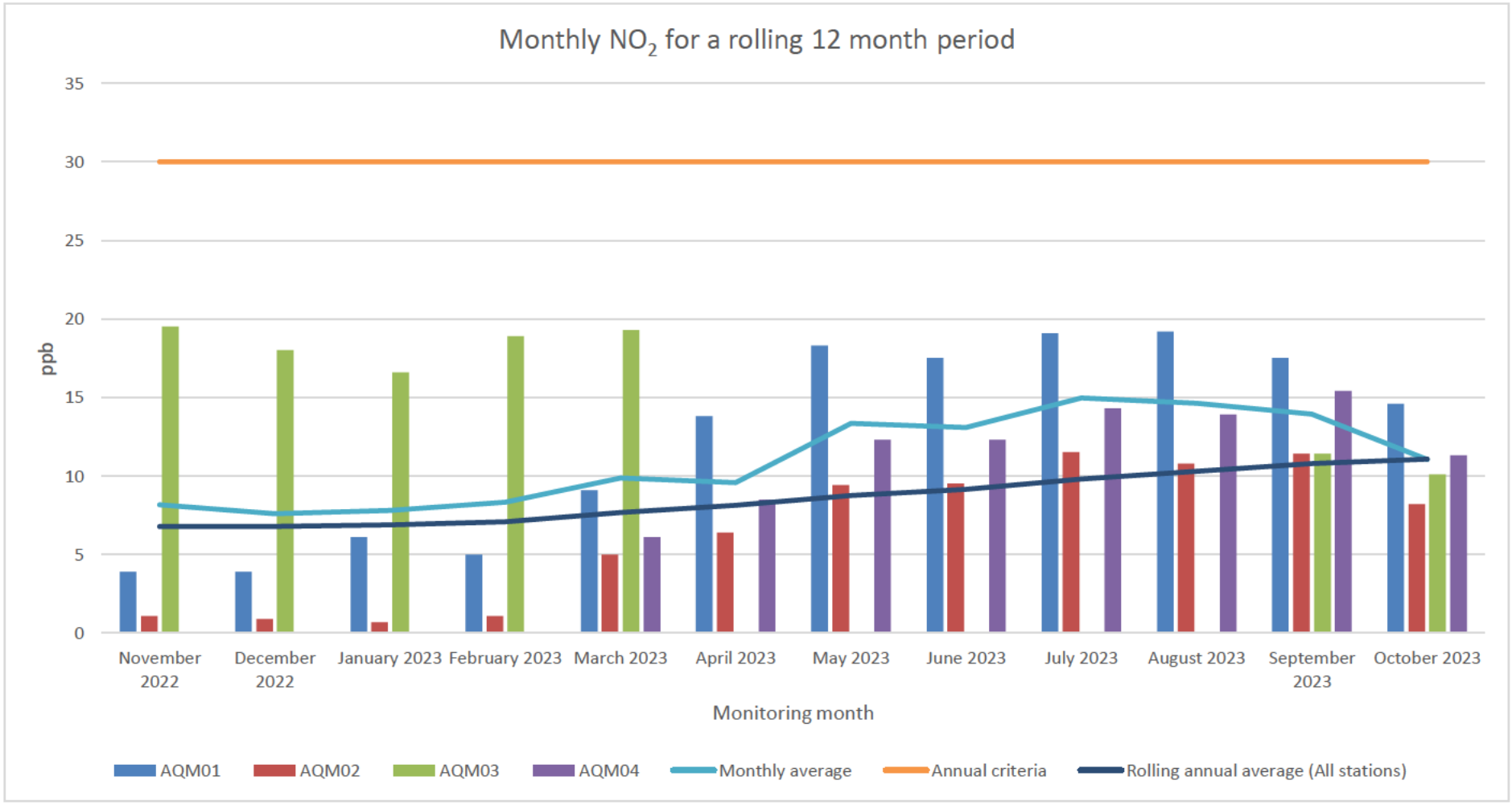
Appendix A.3: Rolling monthly and annual particulate data (NO_2)

Month	Average AQM01	Average AQM02	Average AQM03	Average AQM04	Months Average All stations	Rolling annual average All stations	Annual average criteria	Comments
	ppb	ppb	ppb	ppb	ppb	ppb	ppm / ppb*	
November 2022	3.9	1.1	19.5	**No reading**	8.2	6.8	0.03 / 30.0	No exceedance of annual average criteria.
December 2022	3.9	0.9	18.0	**No reading**	7.6	6.8	0.03 / 30.0	No exceedance of annual average criteria.
January 2023	6.1	0.7	16.6	**No reading**	7.8	6.9	0.03 / 30.0	No exceedance of annual average criteria.
February 2023	5.0	1.1	18.9	**No reading**	8.3	7.1	0.03 / 30.0	No exceedance of annual average criteria.
March 2023	9.1	5.0	19.3	6.1	9.9	7.7	0.03 / 30.0	No exceedance of annual average criteria. AQM04 only started recording data from 24 March 2023.
April 2023	13.8	6.4	**No reading**	8.5	9.6	8.1	0.03 / 30.0	No exceedance of annual average criteria.
May 2023	18.3	9.4	**No reading**	12.3	13.3	8.8	0.03 / 30.0	No exceedance of annual average criteria.
June 2023	17.5	9.5	**No reading**	12.3	13.1	9.2	0.03 / 30.0	No exceedance of annual average criteria.
July 2023	19.1	11.5	**No reading**	14.3	15.0	9.8	0.03 / 30.0	No exceedance of annual average criteria.
August 2023	19.2	10.8	**No reading**	13.9	14.6	10.3	0.03 / 30.0	No exceedance of annual average criteria.
September 2023	17.5	11.4	11.4	15.4	13.9	10.8	0.03 / 30.0	No exceedance of annual average criteria. AQM03 only started recording data from 20 September 2023.
October 2023	14.6	8.2	10.1	11.3	11.1	11.1	0.03 / 30.0	No exceedance of annual average criteria. AQM02 only started recording data from 15 October 2023.
Rolling 12-month average	0.012 ppm / 12.3 ppb	0.006 ppm / 6.3 ppb	0.016 ppm / 16.3 ppb	0.012 ppm / 11.8 ppb	-	-	0.03 / 30.0	No exceedance of annual average criteria.
All months^	0.007 ppm / 7.0 ppb	0.006 ppm / 5.8 ppb	**0.050 ppm / 49.9 ppb**	0.011 ppm / 11.4 ppb	0.017 ppm / 17.3 ppb	-	0.03 ppm / 30.0 ppb	No exceedance of average criteria for all sites for all months. However, AQM03 has exceeded the annual average for the period since monitoring began.

Bold/grey indicates an exceedance of the criteria.

*Results are shown in ppb due to reporting output, however the criteria is set in ppm and therefore the equivalent criteria in ppb is also shown.

^ All months since May 2020



Monthly NO_2 over 12 months including the 6-months for this report

ARCADIS Design & Consultancy for natural and built assets

Moorebank Intermodal Precinct

APPENDIX D – NOISE MONITORING REPORTS

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL TERMINAL

Annual Noise Review - April 2022 to April 2023

6 July 2023

QUBE c/o Tactical

TL116-05F21 Annual Review May 2023 (r2).docx

40 YEARS 1982-2022 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

aaac Association of Australian Acoustical Consultants

Document details

Detail	Reference
Doc reference:	TL116-05F21 Annual Review May 2023 (r2).docx
Prepared for:	QUBE c/o Tactical
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	Mark Howley

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
23/06/2023	Draft	0	1	C. Weber	-	P. Karantonis
6/07/2023	Final	-	2	C. Weber	-	P. Karantonis

File Path: R:\AssocSydProjects\TL101-TL150\TL116 cw Moorebank IMT Temporary Noise Monitoring\Task 5 - cw Operation Compliance Monitoring\1 Docs\Report 21 2023 Annual Review\TL116-05F21 Annual Review May 2023 (r2).docx

Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

External cladding disclaimer: No claims are made and no liability is accepted in respect of any external wall and/or roof systems (eg facade / cladding materials, insulation etc) that are: (a) not compliant with or do not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes.

Contents

List of tables

List of figures

1 Introduction

1.1 Project overview

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the Moorebank Precinct East (MPE) Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193).

This **Annual Noise Review** report **for Year 3 Operations (April 2022 to April 2023)** has been prepared to address the requirements of Approval Condition B90 of SSD 7628 as follows:

> *For the duration of operation, the Applicant must:*
>
> *a) continue to implement all reasonable and feasible best practice noise mitigation measures;*
>
> *b) continue to investigate ways to reduce noise generated by the development, including maximum noise levels which may result in sleep disturbance; and*
>
> *c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.*

Table 1 provides a summary of the noise-related Approval Conditions and how these are addressed in this Annual Noise Review.

Appendix A contains a glossary of acoustic terms used in this report.

Appendix B contains a copy of the reports referred to in this report that are not publicly available on the SIMTA website.

2 Compliance Matrix

Table 1 provides a summary of the Approval Conditions which relate to operational noise emissions for Year 3 operations, and a discussion of the operational noise monitoring results. Where required, additional information is provided in later sections of this report or the appendices.

Table 1 Compliance matrix

Condition ID	Condition	Comments on compliance	Reference for further information
SSD 6766			
G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train passby noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ from rail operations; and d) $L_{AF(max)}$ and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with, or required by, the Secretary. The results from the noise monitoring system, shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances (i.e. a system malfunction) have occurred. The $L_{Aeq(15hour)}$ and $L_{Aeq(9hr)}$ results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring, including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	The commencement of IMT operations occurred in May 2020. The new rail link was commissioned in November 2019. A description of the noise monitoring systems are provided in Section 5 and capture the information required by this approval. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the noise monitoring results for Year 3 operations is provided in Section 5.1.	https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/ Section 5

Condition ID	Condition	Comments on compliance	Reference for further information
G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle passby; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	An Angle of Attack (AoA) monitoring system was installed on the new rail link in May 2020. The monitoring system captures the AoA of each axle passby and compares the measured values with the acceptable value in the applicable Asset Standards Authority minimum operating standard. The AoA values for each axle are available to operators in accordance with the approval condition. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the AoA noise monitoring results of the Year 3 operations is provided in Section 6.1. The monitoring identified 2 trains where the maximum AoA value exceeded the alarm level. None of these events resulted in elevated noise levels at the permanent noise monitoring location. Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.	Section 6
G8	The following measures must be implemented during operation: a) The use of automatic rail lubrication equipment in accordance with ASA Standard T HR TR 00111 ST Rail Lubrication and top of rail friction modifiers, where required; and b) Measures to ensure the rail cross sectional profile is maintained in accordance with ETN–01-02 Rail Grinding Manual for Plain Track to ensure the correct wheel / rail contact position and hence to encourage proper rolling stock steering.	Two rail friction modifier systems were installed on the rail link on 22 November 2019 per ASA Standard. These are positioned on the MIMT North Track at Chainage 39.840 km and the MIMT South Track at Chainage 39.580 km. Monthly track inspections and maintenance is undertaken by Qube's maintenance contractor, Taylor Rail, to ensure alignment with maintenance standards. Rail grinding has been performed so that the rail profile is consistent with maintenance standards.	FCCM 3B
SSD 7628			
B79	The permitted hours of warehouse and distribution operation as detailed in Table 4. Table 4: Hours of Operation **Activity** / **Day** / **Time** Operation / Monday to Sunday / 24 hours	MPE operates 24 hours per day, 365 days per year, consistent with the permitted hours of operation.	n/a

<table>
<tr><th>Condition ID</th><th>Condition</th><th>Comments on compliance</th><th>Reference for further information</th></tr>
<tr><td>B80</td><td>B80. Noise generated by operation of the development inclusive of MPE Stage 1 operations must not exceed the noise limits in Table 5.
Table 5: Noise Limits dB(A)
<table><tr><th>Location (residential receivers)</th><th>Day (LAeq(15min))</th><th>Evening (LAeq(15min)</th><th>Night (LAeq(15min))</th><th>Night (LA1(1min))</th></tr><tr><td>Casula</td><td>35 dB</td><td>35 dB</td><td>35 dB</td><td>52 dB</td></tr><tr><td>Wattle Grove (NCA 2)</td><td>35 dB</td><td>35 dB</td><td>35 dB</td><td>52 dB</td></tr><tr><td>Glenfield (NCA 4)</td><td>35 dB</td><td>35 dB</td><td>35 dB</td><td>52 dB</td></tr></table>Notes:
To determine compliance with the LAeq,15 minute noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.
To determine compliance with the LA1,1 minute noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).
The noise emission limits identified above apply under meteorological conditions of:
(i) wind speeds of up to 3 m/s at 10 metres above ground level; or
(ii) 'F' atmospheric stability class.</td><td>This condition specifies the operational noise criteria for MPE Stage 1 operations. For each new warehouse and when noise monitoring is undertaken in response to complaints, the measured noise levels are compared with the criteria in this condition.</td><td>Section 3
Section 7</td></tr>
<tr><td>B85</td><td>The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plan must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.</td><td>Warehouse noise monitoring is required to be undertaken following the occupation of each warehouse. No additional warehouses commenced operations within the current reporting period.</td><td>Section 3</td></tr>
</table>

Condition ID	Condition	Comments on compliance	Reference for further information
B88	To ensure the operational noise impacts are appropriately managed, the following measures apply: a) use of best practice plant; and b) preparation of a risk assessment to determine if non-tonal reversing alarms can be fitted as a condition of site entry. Alternatively, site design may include traffic flow that does not require or precludes reversing of vehicles.	The following additional best practice plant / measures have been implemented within the current reporting period: 1. The use of electric cranes commenced so that all rail loading and container stacking is performed by the electric cranes, with reach stackers now only required for truck loading. 2. 'Quackers' or broadband reversing alarms were fitted to all reach stackers on site and empty twin pick machines. 3. IMEX truck briefings were undertaken, reminding drivers of noise management obligations and will be ongoing as part of regular reminders. The risk assessment relating to the use of non-tonal reversing alarms is addressed in the Table 2-3 of the ONVMP. [The above measures are consistent with the information provided in QUBE's letter to the Department of Planning and Environment dated circa November 2022]	ONVMP https://moorebankintermodalprecinct.com.au/?cpt_document_library=mpe-s1-onvmp-v12-redacted Section 7
B90	For the duration of operation, the Applicant must: a) continue to implement all reasonable and feasible best practice noise mitigation measures; b) continue to investigate ways to reduce noise generated by the development, including maximum noise levels which may result in sleep disturbance; and c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.	The following additional best practice plant / measures have been implemented within the current reporting period: 1. The use of electric cranes commenced so that all rail loading and container stacking is performed by the electric cranes, with reach stackers now only required for truck loading. 2. 'Quackers' or broadband reversing alarms were fitted to all reach stackers on site and empty twin pick machines. 3. IMEX truck briefings were undertaken, reminding drivers of noise management obligations and will be ongoing as part of regular reminders. The permanent rail noise monitoring results (Section 5) for Year 3 operations indicate similar passby noise levels to Year 1 operations and increased L_{Aeq} noise levels consistent with the rail link usage. The AoA monitoring data for train axles is reviewed by operators to identify wagons that may require maintenance to improve steering performance. A noise monitoring program is in progress to review the implemented noise mitigation and management measures and verify site noise emissions against the operational noise emissions requirements (Section 7). [The above measures are consistent with the information provided in QUBE's letter to the Department of Planning and Environment dated circa November 2022]	Sections 3, 4, 5, 6 and 7

Condition ID	Condition	Comments on compliance	Reference for further information
Final Compilation of Mitigation Measures (FCMM) for MPE Stage 1 and Stage 2			
Stage 2 2D	In the event of any noise or vibration related complaint or adverse comment from the community, noise and ground vibration levels (as relevant) would be investigated. Remedial action would be implemented where feasible and reasonable. The procedures for managing complaints would be provided within the Community Information and Awareness Strategy.	A noise monitoring program is in progress to review the implemented noise mitigation and management measures and verify site noise emissions against the operational noise emissions requirements (Section 7).	Section 7
Operational Noise and Vibration Management Plan – Section 4.1.1 Summary of Monitoring Requirements			
Table 4.1 Rail noise monitoring	Continuous rail noise monitoring will be undertaken from the commencement of operations of the IMEX terminal. The monitoring system will capture the following information: • Noise from each train passby • Time and date of each train passby • Imagery or video recording to identify rolling stock • $L_{AF(max)}$ and Sound Exposure Level (SEL) of individual train passbys, measured in accordance with ISO 3095:2013 • $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ noise levels for each 24-hour period, which will be calculated based on the number of train passbys during the day and night periods and the corresponding SEL noise levels, consistent with the procedure in Clause 3.4.1.1 of the Rail Infrastructure Noise Guideline (EPA, 2013). • Other information as required by the Secretary	Refer comments related to SSD 6766 G7	SSD 6766 G7
Wayside Angle of Attack Monitoring	Continuous wayside angle of attack monitoring will be undertaken from the commencement of operations of the IMEX terminal. The monitoring system will capture the following information: • Angle of attack from a wheel on each axle of every train • Time and date of each axle passby • Identification number of each item of rolling stock	Refer comments related to SSD 6766 G7A	SSD 6766 G7A
Brake Squeal Noise	Continuous (unattended monitoring system) from the commencement of operations of the IMEX terminal – to assess potential noise impacts of rail link at western receivers	Refer comments related to SSD 6766 G7. The permanent noise monitoring system is positioned at a location on the rail link where it can capture noise levels associated with curve brake squeal should this occur.	SSD 6766 G7
Operational Noise Monitoring	Noise monitoring to compare actual noise performance of the MLP East Precinct against the noise management levels will be undertaken as follows: • Regular performance monitoring • Within 12 months of the commencement of operation of the IMEX terminal and Warehouse 1 Precinct • Within 12 months of occupation of the first warehouse, 50% occupation of the site and 100% occupation of the site, or as otherwise agreed by the Secretary • For a minimum of 12 months following occupation of the entire site	Sections 3, 4, 5, 6 and 7	Sections 3, 4, 5, 6 and 7

Condition ID	Condition	Comments on compliance	Reference for further information
Operational Noise Monitoring	Attended noise monitoring will be undertaken to determine compliance against the noise management levels upon receipt of a noise complaint	A noise monitoring program is in progress to review the implemented noise mitigation and management measures and verify site noise emissions against the operational noise emissions requirements (Section 7).	Section 7
Noise Assessment of Mechanical Plant	Conducted for the freight village and each warehouse for a period of 1 week after construction and submitted to secretary within 2 weeks of occupation. Compliance against the noise management levels.	Refer comments related to SSD 7628 B85	SSD 7628 B85
Continuous Unattended Noise Monitoring	Continuous noise monitoring will be conducted at the following locations for a period of twelve months following the occupation of the entire site: • CM1: 26 Woodlake Court, Wattle Grove • CM2: 22 Glenelg Court, Wattle Grove North • CM3: 14 Dunmore Crescent, Casula • CM4: 26 Goodenough Street, Glenfield	Refer comments related to SSD 7628 B64 (refer Section 4)	SSD 7628 B64 Section 4

3 Warehouse noise monitoring

Warehouse noise monitoring is required to be undertaken following the occupation of each warehouse. No additional warehouses commenced operations within the reporting period.

4 Continuous noise monitoring in residential areas

Continuous noise monitoring at sensitive receivers is required to be undertaken at sensitive receivers in accordance with the approval conditions for MPE Stage 2 (SSD 7628 Condition B64). Whilst this condition relates to construction noise, the noise monitoring results can also be utilised to measure operational noise and to investigate noise complaints (if required).

Details of the continuous noise monitoring and measurement locations (CM1 to CM4) are provided in Section 4.1.2 and Figure 3-1 of the CNVMP. The measurement systems comprise four Envirosuite permanent noise monitors.

The primary purpose of the permanent noise monitoring systems is to measure construction-related noise in accordance with the requirements of SSD 7628 Condition B64. This noise monitoring is ongoing.

5 Continuous rail link noise monitoring

The commencement of Intermodal Terminal operations occurred in May 2020. The new rail link was commissioned earlier in November 2019. In conjunction with the rail link commissioning, a temporary rail noise monitoring system (RNMS) was established to quantify the passby noise levels in accordance with the requirements of SSD6766 Condition G7.

The temporary RNMS was positioned at a location near one of the small radius curves and where freight trains are likely to be braking. The microphone of the RNMS monitoring system was positioned on the western side of rail link at a distance of 10.5 m from the near track centreline (Up track) and 15.5 m from the far track centreline (Down track).

The temporary RNMS was operational between 1 November 2019 and 8 July 2020. During this period, procurement of a permanent noise monitoring system occurred, compliant with the requirements of the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*. This functional specification provided justification supporting the appropriateness of the proposed monitoring location and was approved by the Secretary.

The permanent noise monitoring system was commissioned on 9 July 2020 at the same location as the temporary RNMS. The permanent system incorporates two microphones, one adjacent to each track, at a distance of 7.5 m from the track centreline. Noise measurement results of all passbys are provided here[1].

Below is a summary of the noise monitoring results for Year 3 operations.

5.1 Year 3 rail operations noise monitoring report

This report covers rail movements between 10 May 2022 and 9 May 2023. A summary of the key statistics are provided below:

- Number of days in monitoring period - 365 days.
- Number of valid train passby events – 864 (day), 301 (night), 1165 (day + night)
- Number of days that included one or more train events – 316, representing 87% of days (6.1 days per week)
- Number of nights that included one or more train events – 207, representing 57% of nights (4.0 nights per week)

[1] Available https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/

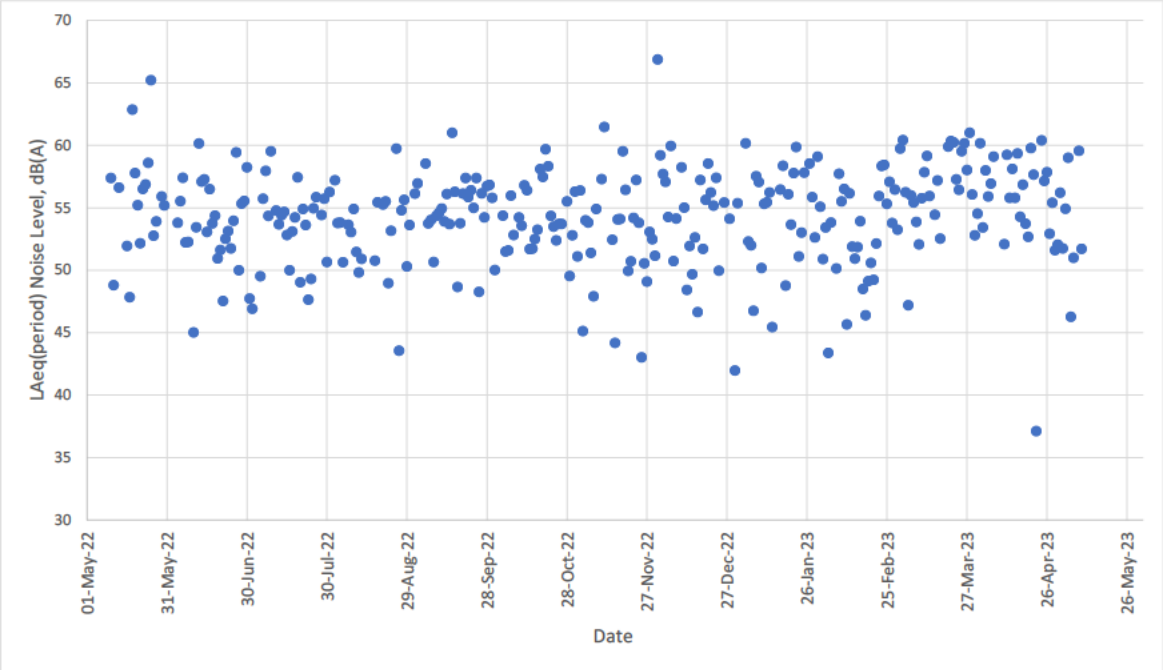
For each train passby, the noise monitoring system recorded the L_{AFmax} and SEL[2] noise levels at a measurement distance of 7.5 m from the track centreline. The SEL noise levels are utilised to calculate the $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ noise levels each day.

A summary of the measured $L_{Aeq(15hour)}$ daytime noise levels, normalised to a measurement distance of 30 m is provided in Figure 1. The corresponding noise levels for the night-time period are provided in Figure 2.

It is noted that the nearest residential receiver (Glenfield Farm) is approximately 400 m from the rail link at the closest point and approximately 850 m from the noise monitoring system. The noise levels at Glenfield Farm are estimated to be approximately 14 dB(A) or more below the values in Figure 1 and Figure 2.

Based on the results in Figure 1 and Figure 2, the measured $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ noise levels appear to be approximately 5 dB(A) higher than the Year 1 noise monitoring results (see Reference 3). This increase is related to the increased usage of the rail link between Year 1 and Year 3 (i.e. additional trains), rather than a result of increased noise levels from individual train passbys.

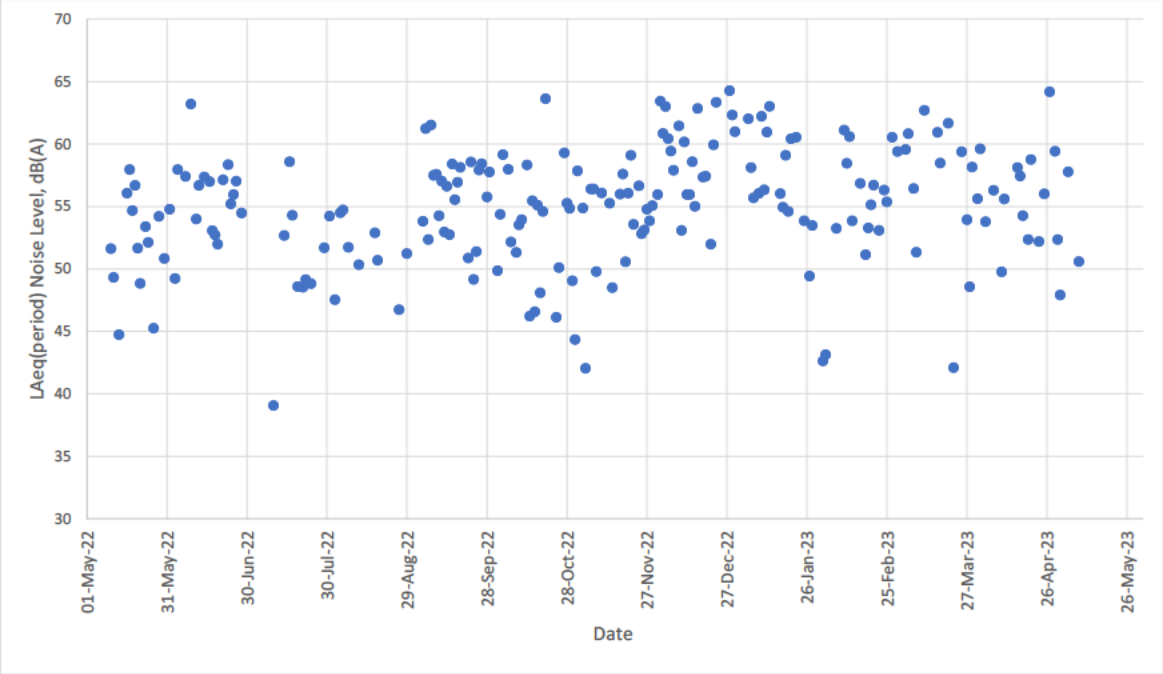
Figure 1 Measured $L_{Aeq(15hour)}$ daytime noise levels at 30 m from track centreline



[2] SEL represents the single-event Sound Exposure Level of the train passby. This represents the total noise energy of the train passby event, normalised to a measurement interval of one second. The SEL is expressed as a dB(A) noise level.

[3] Moorebank Intermodal Terminal Annual Noise Review - April 2021, Renzo Tonin & Associates Report TL116-05F11 Annual Review April 2021 (r2) dated 21 June 2021

Figure 2 Measured $L_{Aeq(9hour)}$ night-time noise levels at 30 m from track centreline



A summary of the measured L_{AFmax} daytime noise levels at a measurement distance of 7.5 m is provided in Figure 3. The corresponding noise levels for the night-time period are provided in Figure 4.

Figure 3 Measured L_{AFmax} daytime noise levels at 7.5 m from track centreline

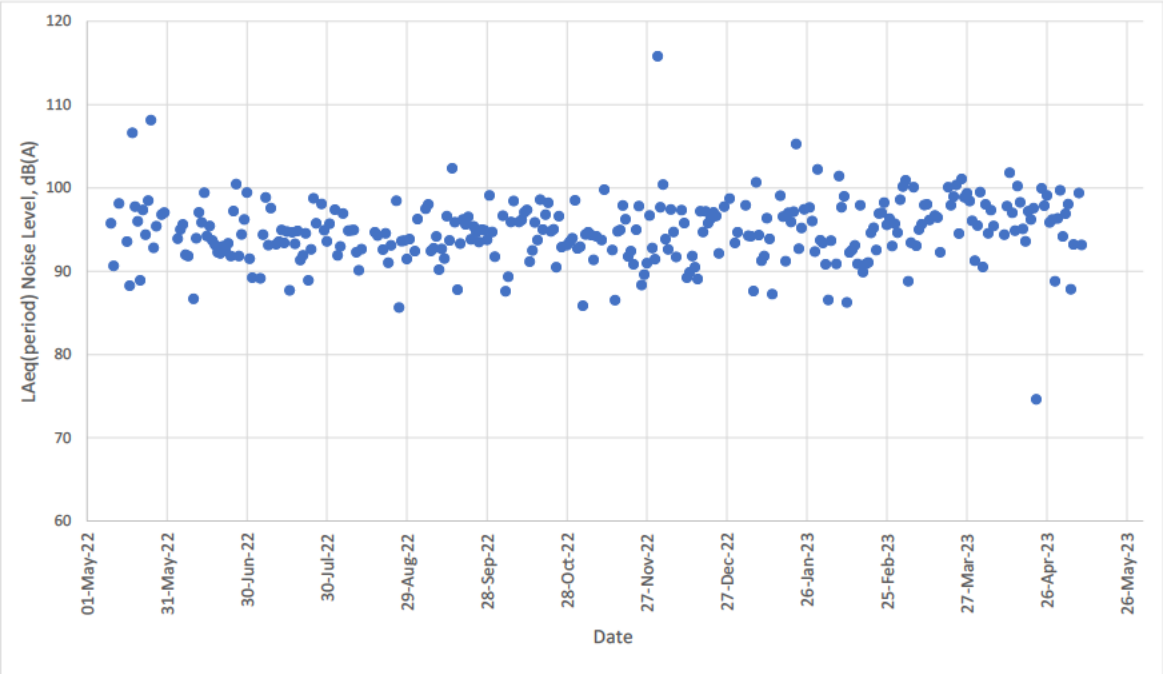
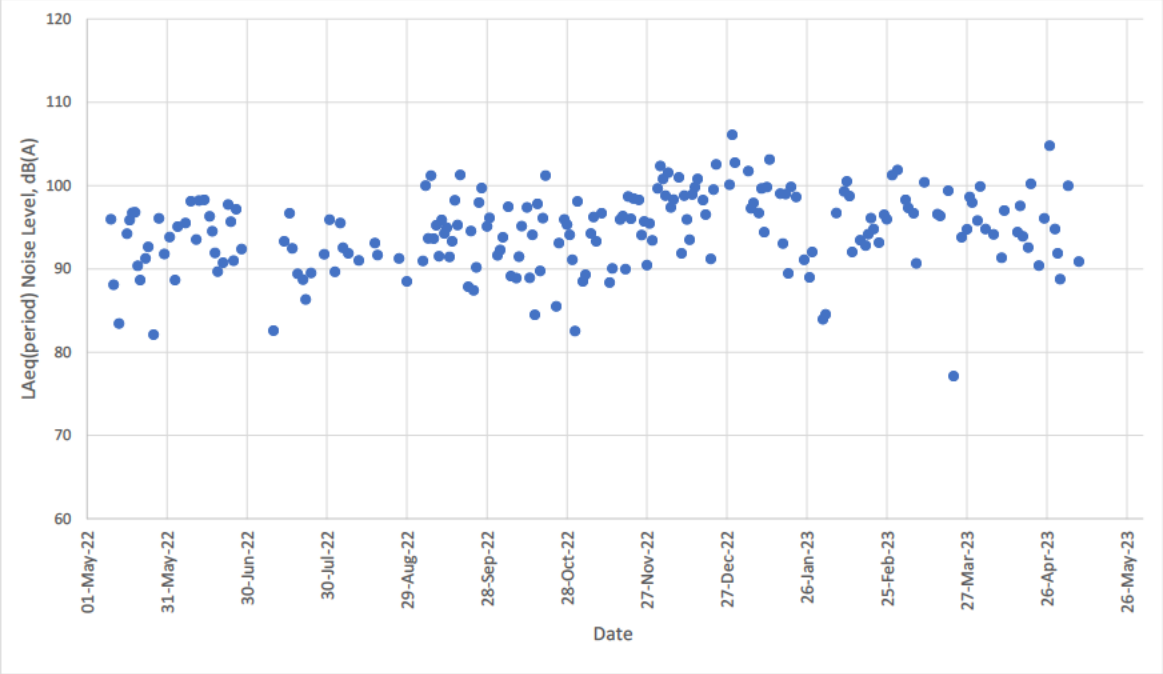


Figure 4 Measured L_{AFmax} night-time noise levels at 7.5 m from track centreline



Based on the results in Figure 3 and Figure 4, there does not appear to be any obvious trend in the measured L_{AFmax} noise levels during the monitoring period. The maximum noise levels are consistent with the Year 1 noise monitoring results (see Reference 3).

6 Rail link angle of attack (AoA) monitoring

The performance of wagon bogies and their ability to negotiate small radius curves without generating curve squeal, is assessed in terms of the angle of attack (AoA) of the wheelset. Acceptable AoA values are defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST[4] and are a function of the curve radius and wheel base.

An AoA measurement system was installed on the rail link and partially commissioned on 13 May 2020. The system was fully commissioned on 9 July 2020 at the same time as the permanent noise monitoring system. The AoA system is installed on the eastern track.

Justification supporting the appropriateness of the proposed monitoring location is provided in the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*[5], and was approved by the Secretary.

The AoA monitoring system was off-line for the period between 28 April 2022 and 1 December 2022. Additional details are provided in the letter from QUBE to the Department of Planning and Environment dated 9/12/2022.

AoA measurement data for Year 3 operations is available in the following six monthly report:

- Moorebank Intermodal Terminal - Six Monthly Review of AoA – May 2023
  (rail movements between 1 December 2022 and 30 April 2023)

In accordance with the requirements of the SSD 6766 Condition G7A, the AoA of a wheel of each axle of each train is captured by the measurement system. This data is accessible by train operators on a website maintained by QUBE.

Below is a summary of the noise monitoring results for Year 3 operations.

6.1 Year 3 rail operations AoA monitoring

A summary of the key statistics are provided below:

- 1 December 2022 and 30 April 2023
  - Number of valid train passby events – 190
  - Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST – 2, representing 1% of passbys.

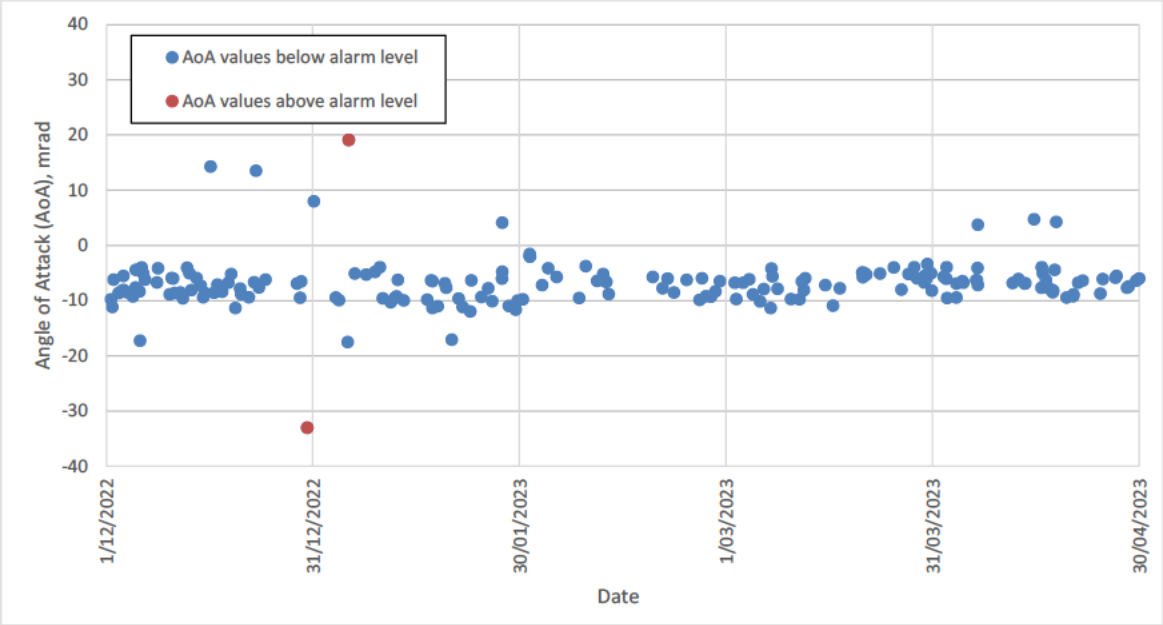
[4] Transport for NSW Asset Standards Authority T HR RS 00400 ST *RSU 400 Series – Minimum Operating Standards for Rolling Stock – Freight Vehicle Specific Interface Requirements* Version 2.0 dated 24 August 2017

[5] Renzo Tonin & Associates Report TJ741-04F04 AoA and Functional Spec for Permanent Noise Monitor (r8)

A summary of the maximum AoA value measured for each train is provided in Figure 5. The results show that the maximum AoA value is typically less than 10 mrad. 2 train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad.

None of these AoA alarm events resulted in elevated noise levels at the permanent noise monitoring location (refer Section 5.1). Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.

Figure 5 Maximum AoA value for each train - 1 December 2022 and 30 April 2023



7 Noise monitoring in response to complaints

In the current reporting period, a number of complaints relating to operational noise levels were reported by residents in Wattle Grove. The complaints related to container movement noise, on-site truck noise and general night-time / early morning noise (related to hours of operation).

The number of operational noise-related complaints each month is summarised in the below table. The number noise complaints were highest in July and August 2022. No noise complaints were received in the last seven months of the current reporting period.

Period	Number of operational noise-related complaints
April 2022	0
May 2022	0
June 2022	2
July 2022	5
August 2022	10
September 2022	1
October 2022	0
November 2022	0
December 2022	0
January 2023	0
February 2023	0
March 2023	0
April 2023	0

In response to the operational noise complaints received in June / July 2022, QUBE promptly responded by reviewing the noise monitoring results from the continuous noise monitors (refer Section 4), and subsequently engaged Renzo Tonin & Associates to carry out a detailed noise investigation.

An initial detailed noise investigation was conducted at four representative receivers in Wattle Grove between Friday 5 August 2022 and Saturday 6 August 2022. The results of this investigation are set out in the Operational Noise Complaint Investigation report dated 15 August 2022 (the August Investigation Report), which was provided to the Department of Planning and Environment on 28 September 2022.

The August Investigation Report did not identify any non-compliances with the operational noise criteria in the Consent. However, given the number of complaints received, QUBE committed to undertaking further noise monitoring in the community to review the ongoing implementation of noise mitigation and management measures.

Renzo Tonin and Associates were subsequently engaged to undertake a Noise Measurement Program to review the following noise mitigation measures that were implemented by the development:

a) Commencement of container stacking to east of the IMEX terminal, forming a defacto noise barrier as the container stacks will provide a natural mitigation barrier for noise to the east

b) The commencement of electric cranes, with all rail loading and container stacking performed by the electric cranes with reach stackers only required for truck loading

c) 'Quackers' or broadband reversing alarms were fitted to all reach stackers onsite and empty twin pick machines

d) IMEX truck briefings were undertaken reminding drivers of noise management obligations and will be ongoing as part of regular reminders.

This noise monitoring program remains ongoing and includes:

- Observations of on-site activities to review implemented noise mitigation and management measures and aid the effectiveness of the operational noise measurement program.
- At-receiver noise monitoring to verify site noise emissions against the operational noise emissions requirements. These measurements will be performed on three separate occasions during periods that are representative of typical operations.
- Reporting of the outcomes of the above investigation.
- Unattended noise monitoring to review ongoing operational noise performance.

Details of the above program were provided to the Department of Planning and Environment in November 2022. The outcomes of the noise monitoring program will be made available to the Department of Planning and Environment at the conclusion of the program.

8 Other noise-related tasks

8.1 IMEX operations

Mitigation and management measures are being investigated as part of proposals to increase the IMEX throughput, which include consideration of cumulative impacts across the Moorebank Intermodal Precinct. This includes both mitigation and management measures for noise emissions and maximum noise levels which may result in sleep disturbance.

This work is ongoing.

8.2 Warehouse operations and Moorebank Noise Management Precinct

Planning work is underway for the implementation of the Moorebank Noise Management Precinct. This includes allocation of noise quotas to warehouse operations, to manage cumulative noise emissions as part of the Moorebank Noise Management Precinct.

9 Conclusion

This **Annual Noise Review** report **for Year 3 Operations** has been prepared to address the requirements of Approval Condition B90 of SSD 7628.

The following operational noise monitoring has been performed in accordance the Approval Conditions in SSD 6766 and 7628:

- Continuous rail noise and angle of attack (AoA) monitoring on the rail link to monitoring rail traffic noise and to assist in identifying potential high noise events (e.g. excessive locomotive noise, brake squeal or curve squeal).
- Noise monitoring has been undertaken in response to complaints received from residents in Wattle Grove between June and September 2022. In response to these complaints, additional noise mitigation and management measures were implemented and a noise management program is in progress to review their effectiveness.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
AoA	Angle of Attack - As the wheels on a bogie negotiate a tight curve, the leading wheelset typically presents an Angle-of-Attack (AoA) to the rail. The AoA of a leading wheelset with good steering performance can be calculated from AoA = wheelbase (m) / curve radius (m). AoA is normally measured in milliradian (mrad).
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
ASA	Asset Standards Authority
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard

CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		10 dB	Human breathing
	almost silent	20 dB	
		30 dB	Quiet bedroom or in a quiet national park location
	generally quiet	40 dB	Library
		50 dB	Typical office space or ambience in the city at night
	moderately loud	60 dB	CBD mall at lunch time
		70 dB	The sound of a car passing on the street
	loud	80 dB	Loud music played at home
		90 dB	The sound of a truck passing on the street
	very loud	100 dB	Indoor rock band concert
		110 dB	Operating a chainsaw or jackhammer
	extremely loud	120 dB	Jet plane take-off at 100m away
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.		
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
ENMM	Environmental Noise Management Manual, Roads and Maritime Services (Transport for NSW)		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.		

Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1 hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24 hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmax.
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmin.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.

Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
MPE	Moorebank Precinct East
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound
Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.

SSFL	Southern Sydney Freight Line
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.
Wheelbase	The wheelbase is the distance between the centres of the front and rear wheels on a 2-axle bogie.

APPENDIX B Detailed noise assessment reports

B.1 Angle of Attack Monitoring Report - 1 December 2022 and 30 April 2023

Renzo Tonin Report TL116-05F20 AoA Report May 2023 (r2)

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL TERMINAL

Six Monthly Review of AoA - May 2023

5 July 2023

Tactical Group

TL116-05F20 AoA Report May 2023 (r2).docx

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

aaac Association of Australian Acoustical Consultants

Document details

Detail	Reference
Doc reference:	TL116-05F20 AoA Report May 2023 (r2).docx
Prepared for:	Tactical Group
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	Mark Howley

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
25.05.2023	First Issue	0	1	C. Weber	-	A. Leslie
25.07.2023	Final	-	2	C. Weber	-	A. Leslie

File Path: R:\AssocSydProjects\TL101-TL150\TL116 cw Moorebank IMT Temporary Noise Monitoring\Task 5 - cw Operation Compliance Monitoring\1 Docs\Report 20 2023-05 AoA\TL116-05F20 AoA Report May 2023 (r2).docx

Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

External cladding disclaimer: No claims are made and no liability is accepted in respect of any external wall and/or roof systems (eg facade / cladding materials, insulation etc) that are: (a) not compliant with or do not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes.

Contents

List of tables

List of figures

1 Introduction

1.1 Project overview

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the Moorebank Precinct East (MPE) Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193).

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

Appendix A contains a glossary of acoustic terms used in this report.

2 Compliance Matrix

Table 1 provides a summary of the Approval Conditions which relate to this report.

Table 1 Compliance matrix

Condition ID	Condition	Comments on compliance	Reference for further information
SSD 6766			
G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train passby noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ from rail operations; and d) $L_{AF(max)}$ and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with, or required by, the Secretary. The results from the noise monitoring system, shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances (i.e a system malfunction) have occurred. The $L_{Aeq(15hour)}$ and $L_{Aeq(9hr)}$ results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring, including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	This condition is not directly related to this report. It is referenced herein on the basis that noise levels from the rail noise monitoring system provides information that may correlate with the Angle of Attack measurement results.	https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/

Condition ID	Condition	Comments on compliance	Reference for further information
G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle passby; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	An Angle of Attack (AoA) monitoring system was installed on the new rail link in May 2020. The monitoring system captures the AoA of each axle passby and compares the measured values with the acceptable value in the applicable Asset Standards Authority minimum operating standard. The AoA values for each axle are available to operators in accordance with the approval condition. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the AoA noise monitoring results for the current six month period is provided in Section 3.1. The monitoring identified 2 trains where the maximum AoA value exceeded the alarm level. None of these events resulted in elevated noise levels at the permanent noise monitoring location. These were viewed as one-off instances, occurring irregularly.	Section 3

3 Rail link angle of attack (AoA) monitoring

The performance of wagon bogies and their ability to negotiate small radius curves without generating curve squeal, is assessed in terms of the angle of attack (AoA) of the wheelset. Acceptable AoA values are defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST[1] and are a function of the curve radius and wheel base.

An AoA measurement system was installed on the rail link and partially commissioned on 13 May 2020. The system was fully commissioned on 9 July 2020 at the same time as the permanent noise monitoring system. The AoA system is installed on the eastern track.

Justification supporting the appropriateness of the proposed monitoring location is provided in the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*[2], and was approved by the Secretary.

This report provides a summary of the AoA measurement data for the period between 1 December 2022 and 30 April 2023. In accordance with the requirements of the SSD 6766 Condition G7A, the AoA of a wheel of each axle of each train is captured by the measurement system. This data is accessible by train operators on a website maintained by QUBE.

Below is a summary of the monitoring results.

3.1 AoA monitoring results for current six-month period

This report covers rail movements between 1 December 2022 and 30 April 2023. A summary of the key statistics is provided below:

- Number of valid train passby events – **190**
- Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST – **2** (representing 1% of passbys).

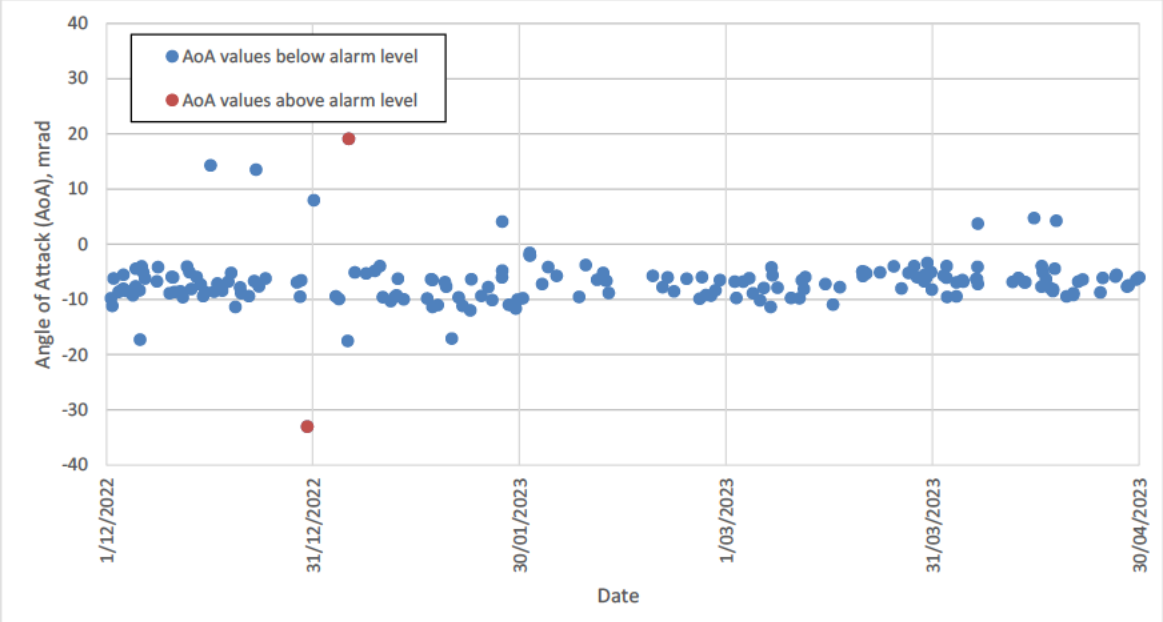
A summary of the maximum AoA value measured for each train is provided in Figure 1. The results show that the maximum AoA value is typically less than 10 mrad. Two train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad. These were viewed as one-off instances, occurring irregularly, and further rectification actions by the train operator as a result are not deemed required.

[1] Transport for NSW Asset Standards Authority T HR RS 00400 ST *RSU 400 Series – Minimum Operating Standards for Rolling Stock – Freight Vehicle Specific Interface Requirements* Version 2.0 dated 24 August 2017

[2] Renzo Tonin & Associates Report TJ741-04F04 AoA and Functional Spec for Permanent Noise Monitor (r8) – available https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf

None of these AoA alarm events resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)].

Figure 1 Maximum AoA value for each train passby



4 Conclusion

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of train passbys and wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

For rail movements between 1 December 2022 and 30 April 2023, two train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad. These were viewed as one-off instances, occurring irregularly and further rectification actions by the train operator as a result are not deemed required. None of these events resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)].

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
AoA	Angle of Attack - As the wheels on a bogie negotiate a tight curve, the leading wheelset typically presents an Angle-of-Attack (AoA) to the rail. The AoA of a leading wheelset with good steering performance can be calculated from AoA = wheelbase (m) / curve radius (m). AoA is normally measured in milliradian (mrad).
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
ASA	Asset Standards Authority
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard

CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		10 dB	Human breathing
	almost silent	20 dB	
		30 dB	Quiet bedroom or in a quiet national park location
	generally quiet	40 dB	Library
		50 dB	Typical office space or ambience in the city at night
	moderately loud	60 dB	CBD mall at lunch time
		70 dB	The sound of a car passing on the street
	loud	80 dB	Loud music played at home
		90 dB	The sound of a truck passing on the street
	very loud	100 dB	Indoor rock band concert
		110 dB	Operating a chainsaw or jackhammer
	extremely loud	120 dB	Jet plane take-off at 100m away
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.		
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
ENMM	Environmental Noise Management Manual, Roads and Maritime Services (Transport for NSW)		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.		

Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1 hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24 hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmax.
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmin.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.

Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
MPE	Moorebank Precinct East
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound
Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.

SSFL	Southern Sydney Freight Line
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.
Wheelbase	The wheelbase is the distance between the centres of the front and rear wheels on a 2-axle bogie.

Moorebank Intermodal Precinct

APPENDIX E - B106/B43 REPORT

MOOREBANK PRECINCT EAST STAGE 2: BIODIVERSITY MONITORING IN ANZAC CREEK

SPRING 2023 SURVEY

Report Prepared for
ARCADIS

9 January 2024

BIO-ANALYSIS Pty Ltd
Marine & Freshwater Ecology
2/1 Botham Close, Charmhaven, NSW 2263
(Mobile) 0414 477 066; (Email) info@bioanalysis.com.au

Document Information

Project Name	Moorebank Precinct 2 East Stage 2: Biodiversity Monitoring in Anzac Creek (Spring 2023 Survey)
Prepared for	Arcadis Australia Pacific
Prepared by	Dr Sharon Cummins
File Name:	MPES2 B106 Anzac Creek Monitoring Report Spring 2023
Citation	BIO-ANALYSIS (2023). MPES2 B106 Anzac Creek Monitoring Report- Spring 2023.
Cover Photo	Anzac Creek @ Site AQ12, 15 November 2023

Contact Information

Dr Sharon Cummins
Telephone: 043 811 2962
Email: cumminssharon@bigpond.com

Dr Dan Roberts
Telephone: 0414 477 066
Email: dan@bioanalysis.com.au

Document Control

Version	Date Issued
Draft Version 02	22/12/2023
Final Version	9/01/2024

Acknowledgements

Shane Murray is thanked for assistance in the field and laboratory. Dan Roberts, Jan Roberts, Nick Roberts (BIO-ANALYSIS), Heather Tilley and Nathan Banks (Arcadis) and Mark Howley (Tactical) provided management support.

EXECUTIVE SUMMARY

Introduction

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 2 (the Project) of the Moorebank Precinct East (MPE) Project, which comprises the second stage of development under the MPE Concept Approval (MP10_0193) and approved under Development Approval SSD 7628.

The MPE site, including the Project site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany and includes the former Defence National Storage and Distribution Centre (DNSDC) site. The MPE site is situated within the Liverpool Local Government Area (LGA), in Sydney's Southwest subregion, approximately 2.5 km from the Liverpool City Centre.

The MPE Project involves the development of an intermodal facility including warehouse and distribution facilities, freight village (ancillary site and operational services), stormwater infrastructure, landscaping, servicing and associated works on the eastern side of Moorebank Avenue. Stage 2 of the MPE Project (MPES2) involves the construction and operation of warehousing and distribution facilities on the MPE site and upgrades to approximately 2.1 kilometres of Moorebank Avenue.

Water during construction will be managed in accordance with the currently approved Construction Environmental Management Plan (CEMP) and will be discharged into the sediment (SED) Basins and into Anzac Creek (via DP5 and DP7). It was also considered likely that runoff from some areas of the MPES2 site would be collected by a vegetated dam situated within Commonwealth Department of Defence land. Flow from this dam enters Anzac Creek upstream of Site AQ14 via a culvert.

A Baseline Aquatic Ecological Monitoring Program (BAEMP) was developed by Biosis Pty Ltd for Arcadis in March 2018, to address CoC B106. The purpose of the BAEMP was to establish baseline stream health and water quality conditions within selected sites along Anzac Creek prior to commencement of Early Works. This was undertaken in autumn 2018. Construction activities commenced soon after.

The baseline monitoring forms the basis for the ongoing Biodiversity Monitoring Strategy (BMS) to assess stream health in accordance with CoC B106, to determine any change in stream health or water quality throughout the life of the Project and to ascertain whether these changes can be attributed to the Project works. The BMS outlines monitoring requirements and includes the Stormwater Monitoring Strategy required by CoC B43 and B44.

BIO-ANALYSIS Pty Ltd was commissioned by Arcadis on behalf of Tactical Group to assess stream health and water quality at six monitoring sites along Anzac Creek (the Study Area) in spring 2023, in accordance with the BMS.

Methods

The BMS focusses on four main indicators: i) aquatic habitat, including riparian habitat, aquatic macrophytes and fish habitat; ii) surface water quality and sediment characteristics; iii) aquatic macroinvertebrates sampled using the Australian River Assessment System (AUSRIVAS) protocol; and iv) fish sampled using a backpack electro-fisher.

The primary aim of monitoring is to determine whether any change in stream health or water quality occur throughout the life of the MPE Project in accordance with the BMS and to ascertain whether these changes can be attributed to the Project works. Should an indicator variable deteriorate below the range for its baseline value, a stream health investigation protocol is to be initiated under the BAEMPs Adaptive Management Plan.

The sampling design included six sites (approximately 100 m in length). Site AQ1 is situated upstream of the MPE Project. Sites AQ4, AQ8, AQ12, AQ13 and AQ14 are situated at increasing distances downstream of the MPE Project. Stream health monitoring is to be done on two occasions within each of autumn and spring.

The results of the spring 2023 monitoring event were compared with those obtained in autumn 2018 (baseline), spring 2018, autumn and spring 2019, autumn and spring 2020, autumn and spring 2021, autumn and spring 2022, and autumn 2023 (during construction).

Results

This report presents the results of i) spring 2023 surveys 1 and 2 and ii) comparisons of the findings of the current survey with the Baseline survey (autumn 2018) and subsequent surveys done each autumn and spring.

Within the current reporting period (after June 2023), two construction discharges occurred via DP 7. There was no exceedance (as per communication with Tactical) and no sediment was evident along the discharge pathway. Extensive cover by vegetation within the riparian zone and stream channel contribute stability to the refuge pool and the majority of Anzac Creek.

Throughout the survey period, concentrations of lead in sediments collected at Site AQ1 (range = 21 to 130 mg/kg) continue to exceed the guideline value (50 mg/kg), including at the time of the baseline (91 mg/kg) survey. Copper, nickel and zinc have occasionally exceeded guideline values, but total petroleum hydrocarbons and poly-fluoroalkyl substances (e.g. PFAS and PFOS), continue to comply. Site AQ1 is situated upstream of potential inputs from the Project, so no additional testing at this site is considered necessary.

Reduced dissolved oxygen levels, elevated nitrogen, aluminium, copper and zinc measured at the refuge pool (Site AQ12), including prior to commencement of the Project, have consistently suggested that aquatic habitat and biota within Anzac Creek are influenced by various types of anthropogenic disturbance. Recent dry conditions and the presence of accumulations of macro-algae within the pool are also likely to have contributed to poor water quality. Importantly, the data collected to date indicate that there has been no further degradation of water quality since the Project related construction work began.

Over the course of the monitoring program, the diversity of aquatic macroinvertebrates, Australian River Assessment System (AUSRIVAS) and Stream Invertebrate Grade Number Average Level (SIGNAL2) scores have been relatively low, indicating that the aquatic macroinvertebrate fauna have experienced one or more forms of human impact. Despite this, some pollution tolerant taxa have commonly been identified, including dragonfly, caddis fly and mayfly families. Importantly, comparison of the AUSRIVAS and SIGNAL2 scores

between the baseline and construction phase continue to indicate an overall stability in aquatic health.

Altogether, ten species of fish have been collected from within the refuge pool: three native species of gudgeon, two native species of eel, one native galaxiid species, one native cat-fish species and three introduced species (Gambusia, Goldfish and Oriental weatherloach), confirming that the creek does provide some habitat for native species of fish. All of the species caught are common within NSW. No threatened species of fish listed under the *NSW Fisheries Management Act, 1994* or the *Environment Protection and Biodiversity Conservation Act, 1999* have been recorded.

Conclusions

Examination of the results from the spring 2023 monitoring event found no evidence of changes in the indicator variables (bed and bank stability, surface water and sediment quality, assemblages of aquatic macroinvertebrates and fish) that could be attributed to the Project works. Thus, in accordance with the Biodiversity Monitoring Strategy, no adaptive management contingency measure was triggered.

Recommendations

It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the program.

In addition, it is recommended that Land Managers focus on containment and on-going suppression of the Alligator Weed infestation at Site AQ1 and downstream habitats, and the aquarium plant, Egeria, detected within the refuge pool at Site AQ12 in spring 2020 and 2023. Signage and public information at popular points of entry by the public to the creek and other local waterways may reduce the chance of unintentional human-assisted introductions (e.g. by using live bait, or by being released by aquaria) of aquatic plants and fish.

TABLE OF CONTENTS

List of Tables

List of Figures

1.0 INTRODUCTION

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 2 (the Project) of the Moorebank Precinct East (MPE) Project, which comprises the second stage of development under the MPE Concept Approval (MP10_0193) and approved under Development Approval SSD 7628.

The MPE site, including the Project site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany and includes the former Defence National Storage and Distribution Centre (DNSDC) site. The MPE site is situated within the Liverpool Local Government Area (LGA), in Sydney's Southwest subregion, approximately 2.5 km from the Liverpool City Centre.

The MPE Project involves the development of an intermodal facility including warehouse and distribution facilities, freight village (ancillary site and operational services), stormwater infrastructure, landscaping, servicing and associated works on the eastern side of Moorebank Avenue. Stage 2 of the MPE Project involves the construction and operation of warehousing and distribution facilities on the MPE site and upgrades to approximately 2.1 kilometres of Moorebank Avenue. Warehouses 1, 3, 4, 5 and 7a are now operational. The location of Warehouses 6-8[1] was left as compacted pads until earthworks for the construction of Warehouses 6 and 7 commenced on 9/06/22. Operation of Warehouses 6 and 7b are expected to commence in Quarter 4 of 2023 and Quarter 2 2024 (respectively). Water during construction will be managed in accordance with the currently approved CEMP and will be discharged into the sediment (SED) Basins and discharged into Anzac Creek (via DP5 and DP7).

BIO-ANALYSIS Pty Ltd has been commissioned by Arcadis on behalf of Tactical Group to assess stream health and water quality along Anzac Creek (the Study Area) in spring 2023. Monitoring is to be done in accordance with a Biodiversity Monitoring Strategy (BMS) developed by Biosis (2018) to satisfy the Minister's Conditions of Consent (CoC) B106. The BMS also includes the Stormwater Monitoring Strategy required by CoC B43 and B44.

[1] Following a redesign of MPE, only Warehouses 6 and 7 will be constructed within the area designated for Warehouses 6-8. Warehouse 8 will no longer be constructed.

The primary aim of monitoring is to determine whether any change in stream health or water quality occur throughout the life of the MPE Stage 2 (MPES2) Project in accordance with the BMS and to ascertain whether these changes can be attributed to the Project works. Sampling commenced in autumn 2018 (Biosis, 2018).

2.0 METHODS

2.1 Study Area

Anzac Creek is a small tributary of the Georges River and lies entirely within the Liverpool Local Government Area. The catchment covers an area of approximately 10.6 km^2 (Figure 1).

The headwaters of Anzac Creek lie within the Commonwealth Department of Defence Lands in Moorebank. The creek is approximately 4 km long and highly urbanised: it flows past the suburb of Wattle Grove, underneath the M5 and Heathcote Road intersection, through the Moorebank Industrial Area and underneath Newbridge Road.

While predominantly ephemeral, Anzac Creek has been noted to hold permanent water in isolated pools (Arcadis, 2016). An unnamed first order tributary of Anzac Creek flows from south to north along the eastern boundary of the MPE Project area (GHD, 2016).

Surface water from the MPES2 site was expected to enter Anzac Creek as a licensed discharge between Site AQ4 and AQ8 (Figure 1). It was also considered likely that runoff from some areas of the MPES2 site would be collected by a vegetated dam situated within Commonwealth Department of Defence land (Biosis, 2018). Flow from this dam enters Anzac Creek upstream of Site AQ14 via a culvert (Figure 1).

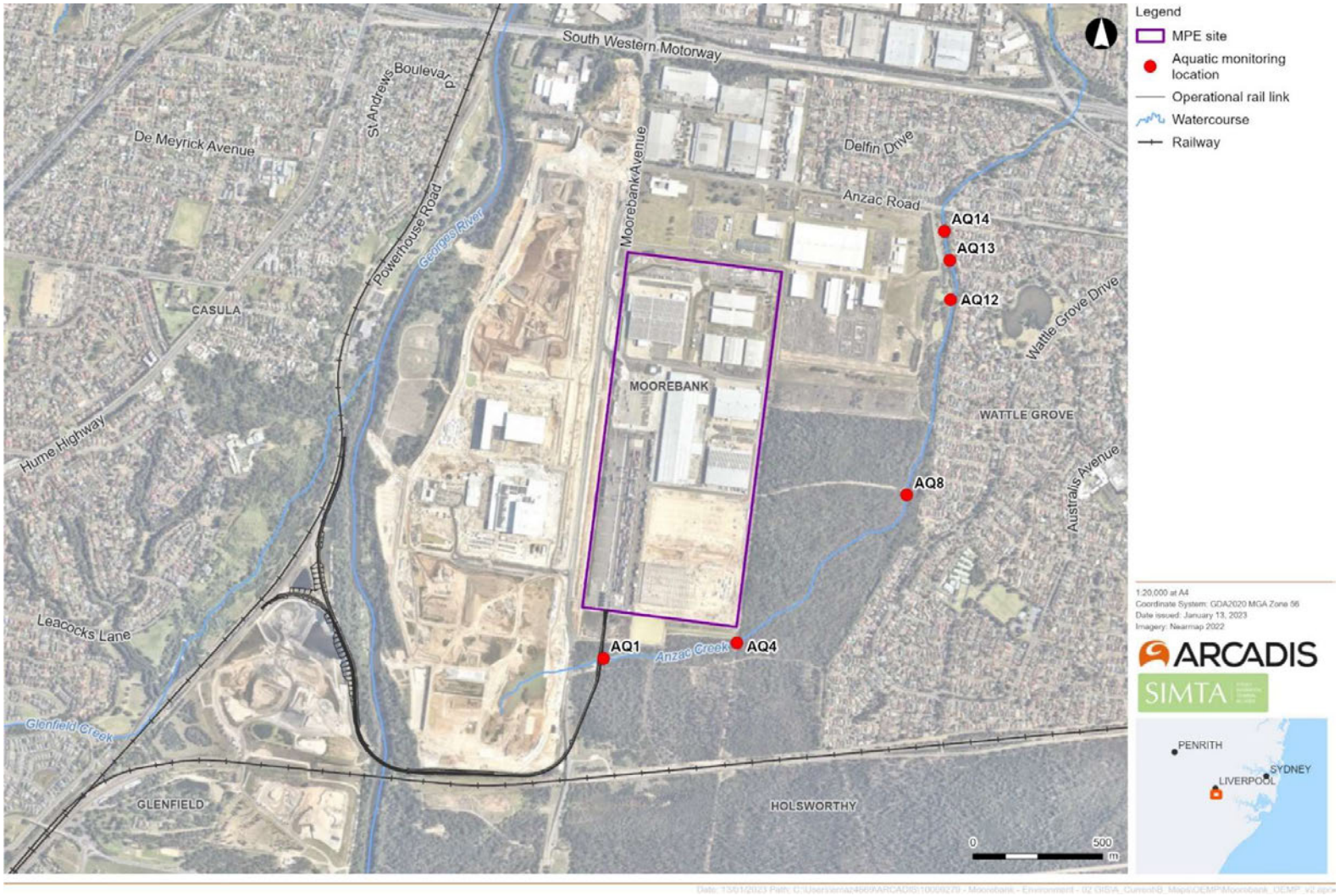


Figure 1. Project Location

2.2 Sampling Dates

The dates and phases of the stream health monitoring program for the MPES2 Project are outlined in Table 1.

Table 1. Date and information on aquatic ecology monitoring completed for the Project.

Project Phase	Event	Dates	Comments
Baseline	Autumn 2018	12&19 April 2018	Only one Baseline survey was able to be sampled in autumn 2018, due to the May 2018 bushfire.
Construction	Spring 2018	6&12 December 2018	
Construction	Autumn 2019	14&30 May 2019	Construction of culvert upstream of Site AQ1 largely completed on 30 May 2019. Site AQ12 was inaccessible to undertake Survey 2 due to restricted access.
Construction	Spring 2019	24 September 2019 21 November 2019	Warehouses 3 and 4 under construction. Moorebank Ave upgrade works ongoing.
Construction /Operation	Autumn 2020	25 May 2020 2 September 2020	Sampling required for the autumn 2020 survey season was unable to commence until late May 2020 due to COVID-19 related delays. The second survey was further delayed due to the time taken to receive parts required to repair the Electrofisher. Warehouses 3 and 4 were operational whilst Warehouse 5 was under construction. Moorebank Ave upgrade works ongoing.
Construction /Operation	Spring 2020	11&30 November 2020	Warehouses 3, 4 and 5 were operational. No further warehouses were being constructed at the time of monitoring
Construction /Operation	Autumn 2021	28 April 2021 11 June 2021	Warehouses 3, 4 and 5 are now operational and the location of Warehouses 6-8 have been left as compacted pads. Any water sheets off into the SED Basin and discharges into ANZAC Creek (via DP5 and DP7). No warehouses were being constructed at the time of monitoring.
Construction /Operation	Spring 2021	21 September 2021 8 November 2021	As above
Construction /Operation	Autumn 2022	5 & 31 May 2022	As above
Construction /Operation	Spring 2022	10 October 2022 30 November 2022	Warehouses 6&7 earthworks commenced on 9/06/22.
Construction /Operation	Autumn 2023	18 May & 3 July 2023	Warehouses 6&7 earthworks completed. It is expected that these warehouses will become operational in Q3 of 2023.

Project Phase	Event	Dates	Comments
Construction /Operation	Spring 2023	20 September & 15 November 2023	Warehouse 7a is now operational. Warehouses 6&7 earthworks completed. Operation of Warehouse 6 and 7b are expected to commence in Quarter 4 of 2023 and Quarter 2 2024.

2.3 Performance Measures and Indicators

No instream or riparian works are being undertaken as part of the Project. Alteration to hydrology (increased stormwater inputs from both the stormwater network and surface flows from increases in non-permeable surfaces) and earthworks that have the potential to mobilise sediments into Anzac Creek were identified as potential impacts associated with the construction phase of the project (Biosis, 2018).

Biosis (2018) indicated that increased stormwater inputs to Anzac Creek could result in:

- Bed and bank scour as a result of increased volume and velocity of water during rainfall events;
- Alterations in vegetation structure as a result of altered hydrological regime;
- Introduction of sediments and pollutants via stormwater, with common pollutants including nitrogen, phosphorous, copper, aluminium and zinc.

Water Sensitive Urban Design (WSUD) measures such as onsite detention basins and rainwater gardens were incorporated into designs for the Project to mitigate impacts. A key outcome of this monitoring program was to determine whether these measures functioned as intended. Six monitoring sites (Sites AQ1, AQ4, AQ8, AQ12, AQ13 and AQ14 (Figure 1) are to be assessed in accordance with the BMS to satisfy the CoC B43, B44 and B106 (Table 2). The assessment types to be applied at each site are outlined in Table 2.

Should an indicator variable deteriorate below the range for its baseline value, a stream health investigation protocol is to be initiated under the BAEMPs Adaptive Management (Table 3).

Baseline values are presented in Table 4, Table 5 and Table 6 (Results).

Table 2. Assessment types recommended for each monitoring site (Biosis, 2018).

Assessment Type	Assessment Protocol/ Indicator Variable	AQ1	AQ4	AQ8	AQ12	AQ13	AQ14
Visual	DPI Classification	√	√	√	√	√	√
	NSW AUSRIVAS	√	√	√	√	√	√
	HABSCORE	√	√	√	√	√	√
	Ephemeral Stream Assessment	√	√	√	√	√	√
Surface Water & Sediment Quality Monitoring	*In situ* water quality				√		
	Nutrient, dissolved metal & PFAS				√		
	Sediment & PFAS	√	√				√
Aquatic Macroinvertebrates	NSW AUSRIVAS & Signal2				√		
Fish	Assemblage structure				√		

Table 3. Indicator variables and adaptive management contingency measures.

Result	Potential Problem	Contingency measure
Increases in results of water quality parameters	Introduction or exacerbation of pollutants entering Anzac Creek.	Identify source and undertake corrective measures.
Reduction in results of biological monitoring	Subtle effects of construction and operation are influencing stream health within Anzac Creek.	Identify components causing decline. Assess feasibility of suitable corrective actions. If corrective measures can be implemented, these aspects are to be the focus of future monitoring. If corrective measures cannot be implemented, regulatory authority to be notified of change.
Increase scour of bed and banks of waterways	Reduction in bed and bank stability or loss of instream vegetation.	Identify point source/s of increased flow velocities or changes in stream hydraulics and discuss with project engineers to determine best methods for flow reduction or rectification of stream hydraulics

2.4 Field Methods

To fulfil the requirements of the BMS, monitoring is to be undertaken at 6 sites along Anzac Creek (Figure 1) four times annually during the pre-construction and construction phases of the Project, with the frequency reduced to twice annually during the operational phase of the Project. Surveys should take place during autumn and spring (Biosis, 2018). Sites are to be assessed using the methods outlined below, in accordance with Table 2.

2.4.1 Visual Stream Assessments

A visual assessment was undertaken at each site regardless of the availability of aquatic habitat (i.e. wet or dry). The condition of aquatic habitat at each site was assessed according to the *NSW Department of Primary Industries Policy and Guidelines for Fish Habitat Conservation and Management* (DPI NSW, 2013). The two key indices were habitat *type* and *class*.

Information on stream characteristics was recorded at each site in accordance with the New South Wales (NSW) Australian River Assessment System (AUSRIVAS) protocol (Turak et al., 2004). Characteristics recorded included a visual assessment of surrounding landforms, instream features, presence, extent and type of aquatic vegetation, stream substratum, potential areas of refuge during low flow periods, presence of fish habitat, presence of barriers to fish movement, indicators of point source and diffuse pollution.

HABSCORE assessments were also completed at each site, based on the presence and condition of pool substratum characteristics, pool variability, channel flow status, bank vegetation and stability, width of riparian zone, and epifaunal substrate/cover. The *CSIRO Ephemeral Stream Assessment* guideline was also used to provide an assessment of the geomorphic integrity of each site and to identify the processes operating within each site.

Each site was photographed and the locations recorded with a hand-held GPS (satellite-based Global Positioning System).

2.4.2 Surface Water Quality & Sediment Monitoring

Where sufficient amounts of water were present, *in situ* water quality was measured using a Yeo-Kal 618 probe. Physico-chemical properties measured included electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L), pH (pH units), temperature (°C) and turbidity (NTU). Three replicate measures of each variable were collected from just below the water surface at each site.

Alkalinity was also determined in the field at Site AQ12, using a CHEMetrics' total alkalinity field kit.

As required by the BMS, water chemical and sediment sampling were undertaken for a range of nutrients, metals and hydrocarbons:

- Total Phosphorus (surface water only);
- Total Kjeldahl Nitrogen (TKN) (Total Organic Nitrogen + Total Ammonia) (surface water only);
- Total Nitrogen (TKN + (Nitrate + Nitrite) (surface water only);
- Dissolved metals (standard 19 relevant to aquatic assessment) (surface water);
- Total metals (standard 19 relevant to aquatic assessment) (sediment only);
- Total petroleum hydrocarbons, BTEX (benzene, toluene, ethylbenzene, trimethylbenzenes and three xylene isomers) hydrocarbons;
- PFAS: Poly-fluoroalkyl substances (including Perfluorohexane sulfonate PFHxS).

Samples were sent to the National Measurement Institute (NMI) laboratory (a NATA accredited laboratory) for analysis.

Construction Discharges

All earthworks have been completed. Construction of the warehouses was above ground and included fit-out. Two construction discharges occurred via DP 7 within the reporting period (after June 2023). There was no exceedance (as per communication with Tactical) and no sediment was evident along the discharge pathway.

2.4.3 Aquatic Macroinvertebrates

Aquatic macroinvertebrates were required to be collected by the BMS at Site AQ12 (Biosis, 2018) using the NSW AUSRIVAS protocol (Turak et al., 2004). Biosis (2018) considered this large pool to provide reliable and valuable aquatic habitat. Stream edge habitats were sampled using a 250 µm dip net.

The contents of each net sample were placed into a white sorting tray and animals collected for a minimum period of 30 minutes. Thereafter, removals were done in 10-minute periods, up to a total of one hour (Turak et al., 2004). If no new taxa were found within a 10-minute period, removals ceased (Turak et al., 2004). The animals were collected and placed inside a labelled container and preserved with 70 % alcohol.

In the laboratory, taxa were identified to family level with the exception of Acarina (to order), Chironomidae (to sub-family), Nematoda (to phylum), Nemertea (to phylum), Oligochaeta (to class), Ostracoda (to subclass) and Polychaeta (to class). Some families of Anisoptera (dragonfly larvae) were identified to species, because they could potentially include threatened aquatic species.

2.4.4 Fish Community Survey

Fish sampling is done at Site AQ12 using a Smith Root LR-24 backpack electrofisher. The Electrofisher is used to stun fish in open water, around the edge of the pool, around snags and aquatic vegetation and any overhanging banks. All fish caught were identified and the length of up to 30 individuals of each species measured. Incidental observations such as evidence of disease were also noted before native fish species were returned to the water.

2.4.5 Data Analysis

Water quality measurements were used to assess health of the aquatic ecosystem by comparison with guideline values recommended by ANZECC[2] and ARMCANZ[3] (2000) for the protection of lowland streams (i.e. systems at < 150 m altitude) in south-east Australia.

For aquatic macroinvertebrates, data were analysed using the appropriate AUSRIVAS predictive models developed for NSW. The ecological health of a waterway was assessed by comparing the macroinvertebrates collected at a site (i.e. Observed) to those predicted to occur (Expected) as if the site was in an undisturbed or 'reference' condition.

The principal outputs of the AUSRIVAS model include:

- Observed to Expected ratio (OE50): the ratio of the number of macroinvertebrate families collected at a site which had a predicted probability of occurrence of greater than 50 % (i.e. Observed) to the sum of the probabilities of all of the families predicted with greater than a 50 % chance of occurrence (i.e. Expected) (Ransom et al., 2004);
- BAND: for each model, the OE50 taxa ratios were divided into bands representing different levels of impairment. Band X represents a more diverse assemblage of macroinvertebrates than control sites; Band A was considered equivalent to reference condition; Band B represents sites below reference condition (i.e. significantly impaired); Band C represents sites well below reference condition (i.e. severely impaired); and Band D represents impoverished sites (i.e. extremely impaired) (Ransom et al., 2004).

The SIGNAL2 biotic index (Stream Invertebrate Grade Number Average level) developed by Chessman (2003) was also used to give an indication of water quality at the sites sampled. The SIGNAL score for a macroinvertebrate sample was calculated by averaging the pollution sensitivity grade numbers of the families present, which may range from 10 (most sensitive) to 1 (most tolerant). The SIGNAL2 scores from samples collected between autumn 2018 and autumn 2023 were presented graphically to provide an indication of changes over time.

[2] ANZECC – Australian and New Zealand Environment and Conservation Council
[3] ARMCANZ – Agriculture and Resource Management Council of Australia and New Zealand

2.4.6 Quality Assurance/Quality Control (QA/QC)

Data collected in the field were checked for accuracy and completeness before leaving each site. In the office, field data and other records were incorporated into appropriate excel data sheets and checked. Spreadsheets were locked prior to analysis to prevent accidental over-writes or corruption.

In the laboratory, macroinvertebrate samples were identified by an appropriately qualified staff member. Data for each sample were entered into an excel spreadsheet and then checked.

3.0 RESULTS

For the spring 2023 monitoring event, sites were sampled on 20 September 2023 (Survey 1) and 15 November 2023 (Survey 2). Each site was approximately 100 m in length with their GPS co-ordinates listed in Appendix A. Collections of fish and macroinvertebrates were completed in accordance with Section 37 of the *NSW Fisheries Management Act 1994* using Scientific Collection Permit Number P03/0032(B) and NSW Agriculture, Animal Research Authority Care and Ethics Certificate of Approval Number 03/2445.

3.1 Aquatic Habitat Characteristics

The section of Anzac Creek within the study area was not mapped as Key Fish Habitat (KFH) under the NSW DPI Key Fish Habitat mapping for the Sydney LGA (DPI 2007; Appendix A). Nevertheless, this section of Anzac Creek is ranked as TYPE 1 KFH according to the DPI (2013) classification scheme due to the presence of native aquatic plants and snags. According to the waterway CLASS scheme, a permanent pool with freshwater aquatic vegetation situated at Site AQ12 is considered CLASS 2 KFH. The remaining reaches of Anzac Creek within the Study Area were considered to be CLASS 3 KFH despite the presence of aquatic vegetation, due to the ephemeral nature of any pools that were present (DPI, 2013).

Vegetation within the channel and banks of Anzac Creek has been classified as Parramatta Red Gum woodland in high condition (GHD, 2016).

Within the two months prior to the 2023 spring Survey 1 (20 September 2023) and 2023 spring Survey 2 (15 November 2023), a total of 66 mm and 112 mm rainfall was recorded respectively by the meteorological station situated near Bankstown Airport (Station ID: 66137) (Figure 2).

All earthworks have been completed. Construction of the warehouses was above ground and includes fit-out. Two construction discharges occurred within the reporting period (after June 2023) via DP 7. There was no exceedance (as per communication with Tactical) and no sediment was evident along the discharge pathway.

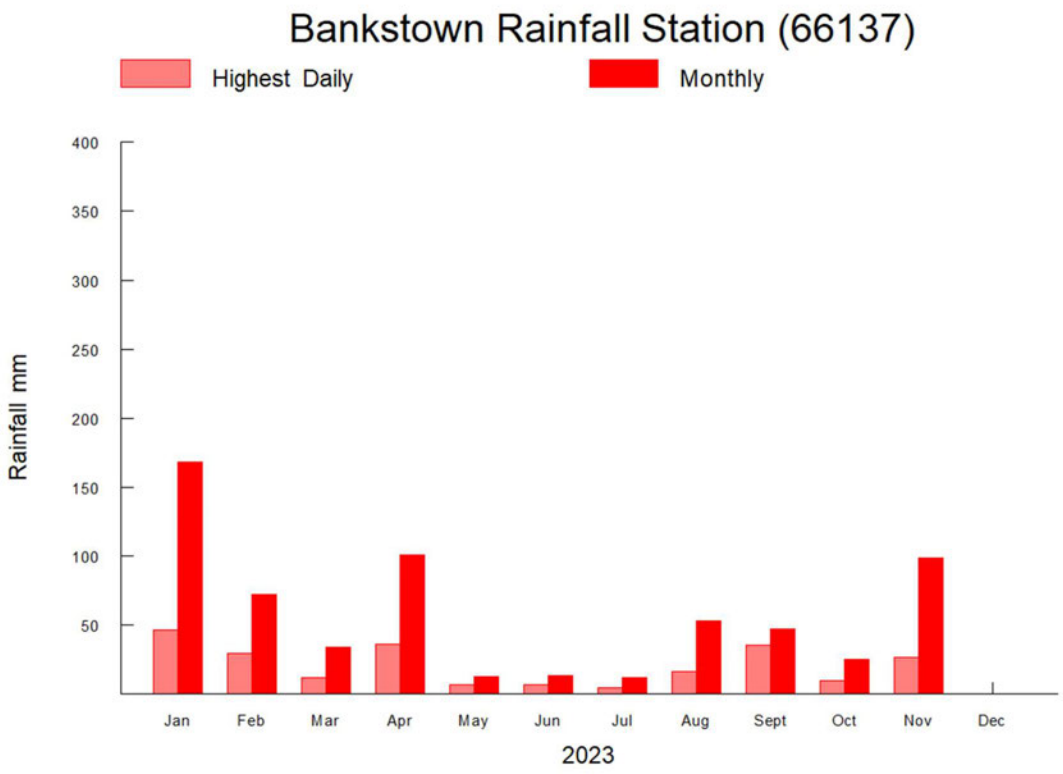


Figure 2. Rainfall (mm) measured at Bankstown Rainfall Station (66137) between 1 January and 30 November 2023.

Site AQ1

Site AQ1 was situated approximately 750 m downstream of the source of Anzac Creek (Figure 1), and approximately 100 m downstream of a culvert built across Anzac Creek as part of the MPE Stage 1 project. The culvert was composed of box culverts to a length of 15 m and supports one rail track and a maintenance access footway. Construction of the culvert was completed by CPB and handed over to the proponent, Qube Holdings Limited, in July 2019.

The active channel zone at this site (up to approximately 5 m wide) remains stable (i.e., no signs of active erosion), due to the absence of flow, cover of remaining aquatic plants and the relatively intact woody riparian vegetation (Appendix 2). The channel bed consisted of fine sediment, the upper layers of which were anoxic (Plate 1).

Alligator Weed (*Alternanthera philoxeroides*) had recolonised much of the channel since autumn 2023 surveys and the first spring 2023 survey in September 2023 (Plates 1&2), most likely due to rainfall during November 2023. Native plant species included Marsh Club-rush (*Bolboschoenus fluviatilis*), Typha (*Typha* sp.), Slender knotweed (*Persicaria decipiens*) and *Myriophyllum variifolium*. The tree canopy was mostly comprised of *Melaleuca* spp. and *Eucalyptus* spp. (Plates 1&2).

Plate 1: AQ1 – View upstream (20/09/23)

Plate 2: AQ1 – View upstream (15/11/23)

Site AQ4

Site AQ4 was situated approximately 400 m downstream of Site AQ1 (Figure 1).

The stream channel at Site AQ4 has occasionally been dry, including at the time of the Baseline survey (i.e. autumn 2018). Since the autumn 2020 surveys, surface water has been observed along the study reach (up to approximately 0.4 m deep), including at the time of spring 2023 Survey 2 (up to approximately 0.15 m deep) but not Survey 1 (Plates 3&4).

Since the baseline survey, stands of the emergent macrophyte, Jointed Twig Rush (*Baumea articulata*) and Twig Rush (*Baumea rubiginosa*) have colonised a large proportion of the stream channel (Plates 3&4). Jointed Twig Rush and Twig Rush continues to be common (Plates 3&4). Typha, Slender Knotweed and Frog's Mouth (*Philydrum lanuginosum*) were also present.

The active channel zone, composed of fine sediments, was up to approximately 4 m wide (Plates 3&4). No indicators of significant erosion were observed suggesting that Anzac Creek continues to be relatively stable at this site, particularly since colonisation of the stream channel by emergent macrophytes and reduced flow within the creek since spring 2022 (Plate 3&4, Appendix 2).

Plate 3: AQ4 – View upstream (15/11/23)

Plate 4: AQ4 – View downstream (15/11/23)

Site AQ8

Site AQ8 was situated approximately 1 km downstream of Site AQ4 (Figure 1). At the time of Surveys 1 and 2, surface water was mostly absent.

Most notably, taller species of emergent macrophyte, including Jointed Twig Rush and Tall Spikerush (*Eleocharis sphacelata*) have encroached upon habitat previously dominated by Heron Bristle Sedge (*Chorizandra cymbaria*) (Plates 5&6). Other shorter plants, including Frogsmouth (*Philydrum lanuginosum*), Slender Knotweed and the introduced species, Umbrella Sedge (*Cyperus eragrostis*) have also declined in abundance. Riparian vegetation continues to be dominated by *Casuarina* trees. Common Reed/Phragmites (*Phragmites australis*) was present at the downstream end of the site. Blackberry (*Rubus fruticosus*), which is listed as a weed of national significance, was also present.

The stream channel at Site AQ8 (up to approximately 20 m wide) continues to be classified as stable, mostly due to the dense cover by emergent macrophytes in addition to a relatively intact, woody riparian zone (Appendix 2).

Plate 5: Site AQ8 – view upstream (20/09/23)

Plate 6: Site AQ8 – view downstream (15/11/23)

Site AQ12

Site AQ12 was situated approximately 750 km downstream of Site AQ8 (Figure 1). Similar to the findings of biodiversity surveys done since autumn 2018, a large pool (approximately 20 m wide) and a relatively diverse assemblage of aquatic plants, including submerged species, were present (Plates 7&8). The pool substratum was composed primarily of fine sediment with a considerable cover of detritus and green macro-algae.

Water level in the pool was up to approximately 0.7 m deep. Flow was apparent at the downstream end of the pool at the time of Survey 2 but not Survey 1. Water clarity was considered fair. Extensive cover of vegetation within the riparian zone contributes stability to the edges of the pool at Site AQ12. An area of active erosion was apparent at the downstream end of the pool since the autumn 2020 surveys, associated with heavy rainfall and bank overflows. Much of the scouring observed in spring 2022 has been re-colonised by exotic grasses.

The submerged macrophyte species, Ribbonweed (*Vallisneria* sp.) and *Potamogeton ochreatus* were common, in addition to Slender Knotweed and dense stands of Typha, Phragmites and Tall Spike Rush (Plate 7). *Nymphoides geminata* (Entire Marshwort), with mostly floating leaves, and accumulations of green filamentous algae continue to be abundant in areas close to the shore (Plates 7&8). Also noted during spring 2022, autumn and spring 2023 was the native perennial, *Utricularia* sp., which occurs on wet soil and in freshwater as terrestrial or aquatic species. Egeria (*Egeria densa*), which was collected close to the left-bank (facing downstream) of the pool in spring 2020, was present. Riparian vegetation included

Casuarina, Eucalyptus and Melaleuca trees and Spiny-head Mat-rush/Basket Grass (*Lomdandra longifolia*) (Plates 7&8).

Plate 7: Site AQ12 – view upstream (15/11/23)

Plate 8: Site AQ12 – view downstream (15/11/23)

Site AQ13

Site AQ13 was situated approximately 200 m downstream of Site (Figure 1). This site was located approximately 150 m downstream from an overflow channel that enters the creek from Wattle Grove. Water to a depth of approximately 0.6 m was present at Site AQ13 at the time of the second survey. Flow was apparent at the time of Survey 2 (Plates 9&10). There was an apparent anoxic layer covering the stream substratum.

A large proportion of the stream channel and edges were colonised by Typha and Slender Knotweed. The aquatic weed, *Sagittaria platyphylla* (Sagittaria) continued to expand its distribution within the channel of the creek. River Clubrush (*Schoenoplectus validus*) was also common. The stream channel appeared stable (Appendix 2).

Plate 9: Site AQ13 – view downstream (15/11/23)

Plate 10: Site AQ13 – view downstream (15/11/23)

Site AQ14

Site AQ14 was situated approximately 150 m downstream of Site AQ13 and immediately downstream of the culvert that links the dam within Commonwealth Department of Defence land to Anzac Creek (Figure 1). Flow was not apparent at the time of both spring 2023 surveys (Plates 11&12).

Typha, Slender Knotweed, River Clubrush and Whorled Pennywort/Shield Pennywort continue to be common (Plates 11&12). Sagittaria continued to expand its distribution within the channel of the creek (Plates 11&12). This section of Anzac Creek remains mostly stable due to dense instream vegetation and vegetated banks (Appendix 2). Water visibility was 'good' at the time of both surveys (Plates 11&12).

Plate 11: Site AQ14 – view downstream (20/09/23)

Plate 12: Site AQ14 – view upstream (15/11/23)

3.2 Water & Sediment Characteristics

3.2.1 Water Quality

Physico-chemical measurements were collected at Site AQ12 in accordance with the requirements of the BMS (cf Biosis, 2018) and at sampling sites where sufficient water was present to submerge a water quality instrument probe. The data were compared to the default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000) for the protection of slightly disturbed lowland river ecosystems in southeast Australia (Table 4).

Results from the 2023 spring surveys 1 and 2 indicated that:

- Water temperature was 12.9 to 19.0 °C at the time of survey 1. Temperature was unable to be measured during survey 2 due to instrument malfunction;
- pH (range = 6.5 to 8.3) was above the recommended DTV at site AQ12 at the time of Survey 2 but within range during Survey 1;
- Conductivity (range = 189 to 367 µS/cm) was within the recommended DTVs at all the sites sampled;
- Dissolved oxygen (DO) measurements (range = 29 to 80 % saturation) were below the lower DTV at all sites during Survey 1 and Survey 2;
- Turbidity levels were within the recommended DTV at all sites during spring 2023 (range = 4.7 to 35.8 NTU);
- Concentrations of total phosphorous (range = <0.05 mg/L) were within the recommended DTV (0.05 mg/L) at Site AQ12;
- Total nitrogen (range = 0.61 – 5.6 mg/L) exceeded the upper DTV (0.5 mg/L) at Site AQ12 during Survey 1 and Survey 2. Nitrogen levels commonly exceeded the upper limit, including at the time of the baseline survey (see Table 4);
- Total Kjeldahl Nitrogen (TKN) (Total Organic Nitrogen + Ammonia) measured at AQ12 during Survey 1 was considerably lower than the Total Nitrogen (TKN + (Nitrate + Nitrite) value, indicating that the source of nitrogen within the refuge pool at that time was most likely inorganic (e.g. fertiliser) rather than organic (e.g. algae or decomposing plant material) (Table 4). Similar TKN and TN values were recorded at the time of the second survey (Table 4).

A range of toxicants were also measured in the water between autumn 2018 (baseline) and spring 2023 (during construction) within the vicinity of Site AQ12 (Table 5&6) in accordance with the BMS (cf Biosis, 2018).

Results indicated that:

- Aluminium commonly exceeded the DTV (80 µg/L) (i.e. 13 of 20 surveys), including at the time of the baseline survey (260 µg/L), but not during autumn 2023 (Survey 1: 30 Survey 2: 42 µg/L);
- Cadmium exceeded the DTV (0.4 µg/L) at Site AQ12 in autumn 2019 (Survey 1: 0.49 µg/L; Survey 2: 0.41 µg/L) and autumn 2021 Survey 1 (3.8 µg/L), but not subsequently;
- Copper commonly exceeded the DTV (1.8 µg/L) (i.e. 14 of 20 surveys, including the baseline survey (2 µg/L) and during spring 2023 (Survey 1: 2.7 µg/L; Survey 2: 2.5 µg/L);
- Zinc exceeded the DTV during autumn 2021 (Survey 2: 20 µg/L) and autumn 2023 (Survey 2: 53 µg/L) (Table 5);
- BTEX compounds and total recoverable hydrocarbons were not detected (Table 6)
- PFOA (perfluoro-octanoic acid) was occasionally detected but has always been well within the recommended DTV (Table 6): PFOA was not detected during spring 2023(Table 6);
- PFOS was commonly detected, including during the spring 2023 (Survey 1: 0.031 µg/L; Survey 2: 0.032 µg/L) but continues to be within the recommended DTV (Table 6).

Table 4. Mean (± SE) physico-chemical water quality and nutrient values recorded at the time of the Baseline (autumn 2018, *n* = 1) and the spring 2023 (*n* = 3) surveys and the appropriate Default Trigger Values (DTV). Values highlighted in bold type indicate where results were outside the recommended DTV.

Indicator Variable	DTV*	Baseline[A]	Survey 1 (20/09/23)					
			AQ1	AQ4	AQ8	AQ12	AQ13	AQ14
Temperature °C (*n* =3)	-	-	I/A	I/A	I/A	19.0 (0.0)	15.5 (0.0)	12.9 (0.0)
pH (*n* =3)	**6.5-8.0**	7.01	I/A	I/A	I/A	6.8 (0.0)	6.9 (0.0)	7.0 (0.0)
Conductivity (µS/cm) (*n* = 3)	**125-2200**	354	I/A	I/A	I/A	319.7 (4.4)	367.3 (4.4)	234.0 (0.0)
Dissolved Oxygen (%) (*n* = 3)	**85-110**	**62**	I/A	I/A	I/A	**29.3** (0.7)	**57.4** (0.4)	**79.0** (0.1)
Turbidity (NTU) (*n* = 3)	**<50**	**91**	I/A	I/A	I/A	35.8 (0.7)	25.6 (0.4)	4.7 (0.0)
Alkalinity (mg/L) *(n* = 1)	-	-	N/R	N/R	N/R	16	N/R	N/R
Total Phosphorous (mg/L) *(n* = 1)	**0.05**	**0.58**	N/R	N/R	N/R	<0.05	N/R	N/R
Total Nitrogen (mg/L) *(n* = 1)	**0.5**	**8.2**	N/R	N/R	N/R	5.6	N/R	N/R
Total Kjeldahl (mg/L) *(n* = 1)	-	-	N/R	N/R	N/R	1.0	N/R	N/R
Indicator Variable	**DTV***	**Baseline**	**Survey 2 (15/11/23)**					
			AQ1	**AQ4**	**AQ8**	**AQ12**	**AQ13**	**AQ14**
Temperature °C (*n* =3)	-	-	I/A	9.0 (0.0)	I/A	I/M	I/M	I/M
pH (*n* =3)	**6.5-8.0**	7.01	I/A	6.9 (0.0)	I/A	**8.3** (0.0)	6.5 (0.0)	6.5 (0.0)
Conductivity (µS/cm) (*n* = 3)	**125-2200**	354	I/A	345.7 (2.3)	I/A	200.7 (0.7)	202.7 (0.9)	188.7 (0.3)
Dissolved Oxygen (%) (*n* = 3)	**85-110**	**62**	I/A	**82.4** (0.5)	I/A	**80.3** (0.3)	**70.3** (0.5)	**67.7** (0.3)
Turbidity (NTU) (*n* = 3)	**<50**	**91**	I/A	9.1 (0.2)	I/A	13.0 (0.3)	13.1 (0.5)	8.5 (0.3)
Alkalinity (mg/L) *(n* = 1)	-	-	N/R	N/R	N/R	30	N/R	N/R
Total Phosphorous (mg/L) *(n* = 1)	**0.05**	**0.58**	N/R	N/R	N/R	<0.05	N/R	N/R
Total Nitrogen (mg/L) *(n* = 1)	**0.5**	**8.2**	N/R	N/R	N/R	0.61	N/R	N/R
Total Kjeldahl (mg/L) *(n* = 1)	-	-	N/R	N/R	N/R	0.61	N/R	N/R

*ANZECC/ARMCANZ (2000) – slightly disturbed systems

[A] Baseline values for pH, conductivity, dissolved oxygen and turbidity were obtained from Site AQ12, whilst baseline data for phosphorous and total nitrogen were obtained from Site AQ11 (Biosis, 2018)

I/A: Insufficient Aquatic Habitat; N/R: Not Required; I/M: Instrument Malfunction. Samples were collected in the field and measured at the laboratory.

Table 5. Summary of dissolved metal compound results for Site AQ12 in autumn 2018 (Baseline), autumn and spring 2019, autumn and spring 2020 and autumn and spring 2023 (n = 1).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Autumn 2019 Site AQ12		Spring 2019 Site AQ12	
		April 2018	14/05/19	30/05/19	24/09/19	21/11/19
Aluminium pH >6.5	**80**	**260**	**150**	68	**2730**	**280**
Aluminium pH <6.5	-	-	-	-	-	-
Arsenic Total (µg/L)	**42**	<1	<1	<1	1.1	<1
Barium	-	2	55	34	21	32
Beryllium	-	<1	<1	<1	<1	<1
Boron	**680**	<50	20	17	14	14
Cadmium (µg/L)	**0.4**	<0.1	**0.49**	**0.41**	<0.1	<0.1
Chromium	**6**	<1	<1	<1	2.3	<1
Cobalt	-	<1	<1	<1	<1	<1
Copper (µg/L)	**1.8**	**2**	**2**	1.1	**3**	**2.3**
Iron	-	450	300	100	1650	900
Lead (µg/L)	**5.6**	<1	<1	<1	2.6	<1
Manganese	**2500**	3	33	6.2	60	47
Mercury (µg/L)	**1.9** [A]	<0.1	<0.1	<0.1	0.12	<0.1
Molybdenum	-	<1	<1	<1	<1	<1
Nickel (µg/L)	**13**	<1	<1	N/R	1.7	1.1
Selenium Total	**18**	<10	<2	<1	<1	<1
Strontium	-	52	120	120	73	53
Vanadium	-	<10	<1	<1	3.8	1.4
Zinc (µg/L)	**15**	<5	6.8	N/R	13	14

*ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection)
[A] = inorganic mercury; N/R: not recorded

Table 5 (Cont'd). Summary of dissolved metal compound results for Site AQ12 (n = 1).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Autumn 2020 Site AQ12		Spring 2020 Site AQ12	
		April 2018	25/05/20	2/09/20	11/11/20	30/11/20
Aluminium pH >6.5	**80**	**260**	**230**	70	**230**	**100**
Aluminium pH <6.5	-	-	-	-	-	-
Arsenic Total (µg/L)	**42**	<1	<1	<1	<1	<1
Barium	-	2	31	19	36	39
Beryllium	-	<1	<1	<1	<1	<1
Boron	**680**	<50	21	<5	32	31
Cadmium (µg/L)	**0.4**	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	**6**	<1	<1	<1	<1	<1
Cobalt	-	<1	<1	<1	<1	<1
Copper (µg/L)	**1.8**	**2**	**1.9**	<1	**2**	1.3
Iron	-	450	620	270	460	280
Lead (µg/L)	**5.6**	<1	1.5	<1	<1	<1
Manganese	**2500**	3	19	8.8	6.9	12
Mercury (µg/L)	**1.9** [A]	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	-	<1	1.3	<1	<1	1.1
Nickel (µg/L)	**13**	<1	1.1	<1	1.1	<1
Selenium Total	**18**	<10	<1	<1	<1	<1
Strontium	-	52	120	140	120	130
Vanadium	-	<10	<1	<1	<1	<1
Zinc (µg/L)	**15**	<5	8.5	3.6	5.7	2.9

*ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection)
[A] = inorganic mercury; N/R: not recorded

Table 5 (Cont'd). Summary of dissolved metal compound results for Site AQ12 (n = 1).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Autumn 2021 Site AQ12		Spring 2021 Site AQ12	
		April 2018	28/04/21[4]	11/06/21	21/9/21	8/11/21
Aluminium pH >6.5	**80**	**260**	**150**	**1260**	62	**200**
Aluminium pH <6.5	-	-				
Arsenic Total (µg/L)	**42**	<1	<1	<1	<1	<1
Barium	-	2	29	<1	31	13
Beryllium	-	<1	<1	<1	<1	<1
Boron	**680**	<50	20	10	20	15
Cadmium (µg/L)	**0.4**	<0.1	**3.8**	<0.1	<0.1	<0.1
Chromium	**6**	<1	<1	1.5	<1	<1
Cobalt	-	<1	<1	<1	<1	<1
Copper (µg/L)	**1.8**	**2**	**2.1**	**3.3**	1.7	**3.2**
Iron	-	450	160	420	150	180
Lead (µg/L)	**5.6**	<1	<1	<1	<1	<1
Manganese	**2500**	3	6.9	4.7	10	2
Mercury (µg/L)	**1.9** [A]	<0.1	<0.1	<0.1	<0.1	0.15
Molybdenum	-	<1	<1	<1	<1	<1
Nickel (µg/L)	**13**	<1	1.1	<1	<1	<1
Selenium Total	**18**	<10	<1	<1	<1	<1
Strontium	-	52	130	46	110	40
Vanadium	-	<10	<1	2.7	<1	1.9
Zinc (µg/L)	**15**	<5	9	**20**	8.3	12

*ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection)
[A] = inorganic mercury; N/R: not recorded

[4] NB Data reported here for autumn 2021 Survey 1 and Survey 2 differ from those reported in the autumn 2021 report. Data had been entered incorrectly in the autumn 2021 report but have since been corrected.

Table 5 (Cont'd). Summary of dissolved metal compound results for Site AQ12 (n = 1).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Autumn 2022 Site AQ12		Spring 2022 Site AQ12	
		April 2018	5/05/22	31/05/22	10/10/2022	30/11/2022
Aluminium pH >6.5	**80**	**260**		**200**	**1400**	**93**
Aluminium pH <6.5	-	-	70			
Arsenic Total (µg/L)	**42**	<1	<1	<1	<1	<1
Barium	-	2	18	19	15	28
Beryllium	-	<1	<1	<1	<1	<1
Boron	**680**	<50	21	18	26	29
Cadmium (µg/L)	**0.4**	<0.1	<0.1	0.13	<0.1	<0.1
Chromium	**6**	<1	<1	<1	1.1	<1
Cobalt	-	<1	<1	<1	<1	<1
Copper (µg/L)	**1.8**	**2**	1.4	1.5	**2.6**	<1
Iron	-	450	560	320	1500	350
Lead (µg/L)	**5.6**	<1	<1	<1	2.3	<1
Manganese	**2500**	3	99	5.9	9.1	16
Mercury (µg/L)	**1.9** [A]	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	-	<1	<1	<1	<1	<1
Nickel (µg/L)	**13**	<1	<1	<1	<1	<1
Selenium Total	**18**	<10	<1	<1	<1	<1
Strontium	-	52	93	56	35	99
Vanadium	-	<10	<1	<1	2.2	<1
Zinc (µg/L)	**15**	<5	8	6.7	12	5.2

*ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection)
[A] = inorganic mercury; N/R: not recorded

Table 5 (Cont'd). Summary of dissolved metal compound results for Site AQ12 (n = 1).

Indicator Variable (µg/L)	DTV*(µg/L)	Baseline Site AQ11	Autumn 2023 Site AQ12		Spring 2023 Site AQ12	
		April 2018	18/05/23	3/07/23	20/09/23	15/11/23
Aluminium pH >6.5	**80**	**260**	37	**160**	30	42
Aluminium pH <6.5	-	-				
Arsenic Total (µg/L)	**42**	<1	<1	<1	<1	<1
Barium	-	2	19	21	20	12
Beryllium	-	<1	<1	<1	<1	<1
Boron	**680**	<50	19	22	19	24
Cadmium (µg/L)	**0.4**	<0.1	0.25	0.27	<0.1	<0.1
Chromium	**6**	<1	<1	<1	<1	<1
Cobalt	-	<1	<1	<1	<1	<1
Copper (µg/L)	**1.8**	**2**	1.7	**2.5**	**2.7**	**2.5**
Iron	-	450	220	400	170	120
Lead (µg/L)	**5.6**	<1	<1	<1	<1	<1
Manganese	**2500**	3	20	40	120	11
Mercury (µg/L)	**1.9** [A]	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	-	<1	<1	<1	<1	<1
Nickel (µg/L)	**13**	<1	<1	<1	<1	<1
Selenium Total	**18**	<10	<1	<1	<1	<1
Strontium	-	52	67	88	74	66
Vanadium	-	<10	<1	<1	<1	<1
Zinc (µg/L)	**15**	<5	13	**53**	11	2

*ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection)
[A] = inorganic mercury; N/R: not recorded

Table 6. Summary of BTEX and perfluoronated compound results (n = 1).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Spring 2018 Site AQ12		Autumn 2019 Site AQ12	
		April 2018	6/12/18	12/12/18	14/05/19	30/05/19
BTEXN (µg/L)						
Benzene (µg/L)	**1300**	<1	<1	<1	<1	<1
Toluene (µg/L)	-	<2	<1	<1	<1	<1
Ethylbenzene (µg/L)	-	<2	<1	<1	<1	<1
Ortho-Xylene (µg/L)	**470**	<2	<1	<1	<1	<1
Perfluoronated Compounds (µg/L)						
PFHxS (µg/L)	-	0.02	0.02	0.12	0.039	0.039
PFOS (µg/L)	**0.13**	0.03	0.043	0.070	0.068	0.069
PFOA (µg/L)	**220**	<0.01	<0.01	0.011	0.011	0.010
Sum of PFHxS and PFOS	-	0.05	0.063	0.19	0.107	0.108
Sum of PFAS (WA DER List)[B]	-	0.05	0.128[C]	0.185[C]	0.188[C]	0.19[C]
Indicator Variable	**DTV* (µg/L)**	**Baseline Site AQ11**	**Spring 2019 Site AQ12**		**Autumn 2020 Site AQ12**	
		April 2018	**24/9/19**	**21/11/19**	**25/5/20**	**2/9/20**
BTEXN (µg/L)						
Benzene (µg/L)	**1300**	<1	<1	<1	<1	<1
Toluene (µg/L)	-	<2	<1	<1	<1	<1
Ethylbenzene (µg/L)	-	<2	<1	<1	<1	<1
Ortho-Xylene (µg/L)	**470**	<2	<1	<1	<1	<1
PFHxS (µg/L)	-	0.02	0.091	0.025	0.044	0.068
PFOS (µg/L)	**0.13**	0.03	0.084	0.057	0.055	0.076
PFOA (µg/L)	**220**	<0.01	<0.01	0.013	<0.01	<0.01
Sum of PFHxS and PFOS	-	0.05	0.175	0.082	0.099	0.144
Sum of PFAS (WA DER List)[B]	-	0.05	0.252[C]	0.164[C]	0.178[C]	0.219[C]

*BTEXN: ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection); PFAS suite: DEE (2016) – Freshwater (95 % species protection – slightly to moderately disturbed ecosystems).

[B] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS.

[C] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01).

Table 6 (Cont'd).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Spring 2020 Site AQ12		Autumn 2021 Site AQ12	
		April 2018	11/11/20	30/11/20	28/04/21	11/06/21
Benzene (µg/L)	**1300**	<1	<1	<1	<1	<1
Toluene (µg/L)	-	<2	<1	<1	<1	<1
Ethylbenzene (µg/L)	-	<2	<1	<1	<1	<1
Ortho-Xylene (µg/L)	**470**	<2	<1	<1	<1	<1
PFHxS (µg/L)	-	0.02	0.026	0.041	0.065	0.011
PFOS (µg/L)	**0.13**	0.03	0.054	0.062	0.065	<0.02
PFOA (µg/L)	**220**	<0.01	0.005[C]	0.014	<0.01	<0.01
Sum of PFHxS and PFOS	-	0.05	0.080	0.103	0.13	0.021[C]
Sum of PFAS (WA DER List)[B]	-	0.05	0.151[C]	0.196[C]	0.222[C]	0.086[C]
Indicator Variable	**DTV* (µg/L)**	**Baseline Site AQ11**	**Spring 2021 Site AQ12**		**Autumn 2022 Site AQ12**	
		April 2018	**21/9/21**	**8/11/21**	**5/05/22**	**31/05/22**
BTEXN (µg/L)						
Benzene (µg/L)	**1300**	<1	<1	<1	<1	<1
Toluene (µg/L)	-	<2	<1	<1	<1	<1
Ethylbenzene (µg/L)	-	<2	<1	<1	<1	<1
Ortho-Xylene (µg/L)	**470**	<2	<1	<1	<1	<1
PFHxS (µg/L)	-	0.02	0.037	<0.01	0.044	0.039
PFOS (µg/L)	**0.13**	0.03	0.032	0.021	0.047	0.054
PFOA (µg/L)	**220**	<0.01	0.013	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	-	0.05	0.069	0.026[C]	0.091	0.093
Sum of PFAS (WA DER List)[B]	-	0.05	0.169[C]	0.091[C]	0.166	0.176

*BTEXN: ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection); PFAS suite: DEE (2016) – Freshwater (95 % species protection – slightly to moderately disturbed ecosystems).

[B] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS.

[C] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01).

Table 6 (Cont'd).

Indicator Variable	DTV* (µg/L)	Baseline Site AQ11	Spring 2022 Site AQ12		Autumn 2023 Site AQ12	
		April 2018	30/10/22	30/11/22	18/05/2023	3/07/2023
Benzene (µg/L)	**1300**	<1	<1	<1	<1	<1
Toluene (µg/L)	-	<2	<1	<1	<1	<1
Ethylbenzene (µg/L)	-	<2	<1	<1	<1	<1
Ortho-Xylene (µg/L)	**470**	<2	<1	<1	<1	<1
PFHxS (µg/L)	-	0.02	0.031	0.026	0.028	0.020
PFOS (µg/L)	**0.13**	0.03	0.030	0.044	0.040	0.024
PFOA (µg/L)	**220**	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	-	0.05	0.061	0.070	0.068	0.044
Sum of PFAS (WA DER List)[B]	-	0.05	0.126[C]	0.135[C]	0.145	0.122
Indicator Variable	**DTV* (µg/L)**	**Baseline Site AQ11**	**Spring 2023 Site AQ12**			
		April 2018	**20/09/23**	**15/11/23**		
Benzene (µg/L)	**1300**	<1	<1	<1		
Toluene (µg/L)	-	<2	<1	<1		
Ethylbenzene (µg/L)	-	<2	<1	<1		
Ortho-Xylene (µg/L)	**470**	<2	<1	<1		
PFHxS (µg/L)	-	0.02	0.029	0.028		
PFOS (µg/L)	**0.13**	0.03	0.031	0.032		
PFOA (µg/L)	**220**	<0.01	<0.01	<0.01		
Sum of PFHxS and PFOS	-	0.05	0.060	0.060		
Sum of PFAS (WA DER List)[B]	-	0.05	0.154[C]	0.136[C]		

*BTEXN: ANZECC/ARMCANZ (2000) – slightly disturbed systems (90% species protection); PFAS suite: DEE (2016) – Freshwater (95 % species protection – slightly to moderately disturbed ecosystems).

[B] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS.

[C] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01).

3.2.2 Sediment Characteristics

Sediment samples were collected at Site AQ1, AQ4, AQ14 between autumn 2018 (baseline) and spring 2023 (during construction) (Table 7&8).

Results indicated that:

- At the time of Survey 1 during spring 2023, concentrations of lead, copper, nickel and zinc measured at Site AQ1 exceeded the Interim Sediment Quality Guidelines (ISQG) threshold limit's (ANZECC/ARMCANZ 2000);
- Concentrations of lead measured at Site AQ1 (Survey 1: 94 mg/kg; Survey 2: 87 mg/kg) exceeded the guideline value (50 mg/L) on both sampling occasions within spring 2023. The majority (i.e. 13 of 15 times) of measurements of lead at AQ1 (range = 21 to 130 mg/kg) exceeded the threshold limit (50 mg/kg) detailed in the Interim Sediment Quality Guidelines (ISQG) (ANZECC/ARMCANZ 2000), including at the time of the baseline (91 mg/kg) survey (discussed further in Section 5.1);
- Nickel measured in sediments at Site AQ1 marginally exceeded the upper ANZECC/ARMCANZ (2000) guideline level on one other occasion, during spring 2022 (25 mg/kg);
- Concentrations of lead (56 mg/kg), nickel (23 mg/kg) and zinc (220 mg/kg) measured at AQ4 marginally exceeded the ANZECC/ARMCANZ (2000) guideline levels during Survey 1 in autumn 2022 (Table 7);
- Concentrations of lead measured at Sites AQ4 and AQ14, situated downstream of any inputs from the Project, were consistently within the Baseline value;
- Concentrations of mercury measured at AQ1 exceeded the recommended trigger level during the autumn 2022 (Survey 1: <0.2 mg/kg; Survey 2: 0.29 mg/kg) but not subsequently, including during autumn and spring 2023 (Table 7);
- A spike in barium was detected at Site AQ14 in autumn 2019 (Survey 1: 902 mg/kg) but not subsequently. There are no guideline criteria for barium in sediments or water (ANZECC/ARMCANZ 2000);
- PFOS was consistently detected at the sites sampled (range = <0.002 to 0.044 mg/kg) but concentrations continued to be below the recommended guideline value for Urban Residential/Public Open Spaces (32 mg/kg) as well as National Parks/Areas with High Ecological Values (6.6 mg/L);

- PFAS (range = <0.001 to 0.0483 mg/kg) measured at each site continued to be similar to baseline values and below the recommended guideline value for Urban Residential/Public Open Spaces (29 mg/kg) and National Parks/Areas with High Ecological Values (1.0 mg/L) (Tables 7&8).

Table 7. Mean (± SE) sediment metal results (mg/L) for surveys done between autumn 2018 (*n* = 1) and autumn 2023 (*n* = 2).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Autumn 2019			Spring 2019		
		AQ1	AQ4	AQ14	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	26,800	24,300 (700)	2,295 (365)	-	-	-
Antimony	-	-	-	-	<0.5	<0.5 (0)	<0.5 (0)	-	-	-
Arsenic	**20**	<5	<5	<5	4	6 (0.9)	1 (0.2)	3.90 (0.6)	2.75 (0.5)	2.65 (0.3)
Barium	-	110	60	<10	100	66 (4.5)	455 (447)	135 (15)	76.5 (7.5)	29.5 (1.5)
Beryllium	-	<1	1	<1	0.96	1.2 (0.0)	<0.5 (0)	1.20 (0.1)	1.01 (0.1)	<0.5 (0.00)
Boron	-	<50	<50	<50	2.9	0.8 (0.3)	<1 (0)	<1.0 (0.0)	<1.0 (0.0)	<1.0 (0.0)
Cadmium	**1.5**	<1	<1	<1	<0.5	<0.5 (0)	<0.5 (0)	0.43[A] (0.2)	<0.5 (0.0)	<0.5 (0.0)
Chromium	**80**	23	21	3	21	23 (2.0)	3 (0.4)	21.0 (2.0)	13.5 (0.5)	6.3 (0.7)
Cobalt	-	8	6	<2	9	8 (1.9)	1 (0.1)	-	-	-
Copper	**65**	31	12	<5	28	11 (2.1)	2 (0.3)	30.0 (5.0)	6.1 (1.7)	9.0 (1.0)
Lead	**50**	**91**	44	<5	**72**	35 (0.0)	4 (0.2)	**78.0** (32.0)	21.5 (0.5)	12.0 (1.0)
Manganese	-	45	69	16	32	80 (2.0)	7 (0.8)	85.0 (55.0)	50.0 (15.0)	32.5 (12.5)
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2	<0.2 (0)	<0.2 (0)	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)
Molybdenum		-	-	-	2.2	1.0 (0.4)	<0.5 (0)	-	-	-
Nickel	**21**	14	9	<2	16	9 (0.0)	1 (0.0)	20.5 (0.5)	10.6 (1.4)	3.85 (0.2)
Selenium Total	-	<5	<5	<5	1	1 (0.0)	<0.5 (0)	2.65 (1.4)	1.59 (0.9)	0.63[A] (0.4)
Strontium	-	-	-	-	23	17 (4.5)	1 (0.1)	-	-	-
Vanadium	-	48	54	10	36	60 (9.5)	9 (0.9)	-	-	-
Zinc	**200**	93	96	17	100	64 (4.0)	14 (1.5)	119 (61.5)	29 (17.5)	74 (17.0)

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000)**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Autumn 2020			Spring 2020		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	-	-	-	-
Arsenic	**20**	<5	<5	<5	1.90 (0.2)	3.4 (0.4)	5.1 (3.1)	1.90 (0.4)	3.4 (1.2)	2.4 (0.3)
Barium	-	110	60	<10	83 (15)	63.5 (3.5)	41.3 (31.7)	87.0 (33.0)	69.5 (9.5)	37.5 (9.5)
Beryllium	-	<1	1	<1	0.72 (0.1)	0.98 (0.0)	0.5 (0.3)	0.71 (0.2)	0.79 (0.1)	<0.5 (0.0)
Boron	-	<50	<50	<50	0.85 (0.4)	0.5 (0.0)	0.5 (0.0)	1.95 (0.4)	1.25 (0.2)	0.75
Cadmium	**1.5**	<1	<1	<1	0.25 (0.0)	0.25 (0.0)	0.3 (0.0)	<0.05 (0.0)	<0.5 (0.0)	1.0[B] (0.5)
Chromium	**80**	23	21	3	14.5 (0.5)	18.5 (0.5)	12.9 (8.2)	13.5 (3.5)	13.0 (0.0)	6.2 (0.3)
Cobalt	-	8	6	<2	-	-	-	-	-	-
Copper	**65**	31	12	<5	16.5 (0.5)	11.0 (2.0)	16.7 (12.3)	16.5 (6.5)	7.9 (0.2)	7.2 (1.2)
Lead	**50**	**91**	44	<5	**71** (5.0)	33.5 (3.5)	23.5 (15.6)	**53.5** (10.5)	26.0 (1.0)	11.5 (0.5)
Manganese	-	45	69	16	38.5 (0.5)	66.5 (10.5)	49.5 (38.5)	56.5 (16.5)	52.5 (4.5)	31.0 (3.0)
Mercury	**0.15**	<0.1	<0.1	<0.1	0.10 (0.0)	0.10 (0.0)	0.1 (0.0)	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)
Molybdenum		-	-	-	-	-	-	-	-	-
Nickel	**21**	14	9	<2	10.7 (1.3)	8.65 (0.5)	5.4 (3.3)	11.5 (2.6)	6.5 (0.5)	2.8 (0.6)
Selenium Total	-	<5	<5	<5	0.70 (0.0)	0.44 (0.2)	0.6 (0.4)	0.63[B] (0.4)	0.40[B] (0.2)	<0.5 (0.0)
Strontium	-	-	-	-	-	-	-	-	-	-
Vanadium	-	48	54	10	25 (1.0)	41 (2.0)	36.0 (21)	23 (5.0)	32 (5.5)	19.0 (1.0)
Zinc	**200**	93	96	17	78 (6.0)	144 (46.5)	111.0 (79)	86 (24)	58 (6.0)	45.5 (19.5)

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Autumn 2021			Spring 2021		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	-	-	-	-
Arsenic	**20**	<5	<5	<5	3.65 (1.3)	6.10 (0.0)	4.30 (0.8)	14.55 (9.5)	3.5 (2.6)	2.85 (0.7)
Barium	-	110	60	<10	116.5(23.5)	99.5 (10.5)	68.0 (5.0)	74.5 (18.5)	48.0 (41.0)	84.5 (11.5)
Beryllium	-	<1	1	<1	1.20 (0.2)	0.87 (0.1)	0.50[A] (0.2)	0.81 (0.2)	0.38 (0.4)	0.44[A] (0.4)
Boron	-	<50	<50	<50	2.00 (0.9)	1.75[A] (1.3)	1.40[A] (0.9)	0.80[A] (0.3)	<1 (0.0)	0.95[A] (0.5)
Cadmium	**1.5**	<1	<1	<1	0.41[A] (0.2)	<0.5 (0.0)	<0.5 (0.0)	<0.5 (0.0)	<0.5 (0.0)	<0.5 (0.0)
Chromium	**80**	23	21	3	24 (7.0)	24.5 (1.5)	13.0 (2.0)	17.5 (0.5)	12.7 (10.3)	12.0 (1.0)
Cobalt	-	8	6	<2	-	-	-	-	-	-
Copper	**65**	31	12	<5	23 (8.0)	13.5 (1.5)	12.8 (3.3)	13.0 (2.0)	6.55 (5.5)	12.3 (2.8)
Lead	**50**	**91**	44	<5	**80** (50)	31.5 (2.5)	27.5 (7.5)	25.5 (4.5)	16.2 (12.9)	27.0 (7.0)
Manganese	-	45	69	16	28 (8)	150 (40)	46 (5)	95 (75)	57.1 (53)	27.5 (13.5)
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)	<0.2 (0.0)
Molybdenum		-	-	-	-	-	-	-	-	-
Nickel	**21**	14	9	<2	17.5 (3.5)	9.75 (2.3)	5.85 (1.4)	10.5 (3.6)	4.1 (3.4)	7.3 (2.8)
Selenium Total	-	<5	<5	<5	1.20 (0.00)	0.88 (0.00)	0.41 (0.2)	0.88 (0.3)	0.44 [A] (0.4)	1.18 [A] (0.9)
Strontium	-	-	-	-	-	-	-	-	-	-
Vanadium	-	48	54	10	10 (13)	56 (2.0)	31 (3.0)	34 (7.0)	32 (22.4)	26 (2.0)
Zinc	**200**	93	96	17	92 (68)	77 (14.0)	94.5 (35.5)	46 (22.0)	35 (28.2)	43 (16.0)

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Autumn 2022 (5/5/22)			Autumn 2022 (31/5/22)		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	-	-	-	-
Arsenic	**20**	<5	<5	<5	4.3	10	6	2.9	3.6	4.6
Barium	-	110	60	<10	140	150	61	87	71	52
Beryllium	-	<1	1	<1	1.2	1.7	0.61	0.84	0.83	<0.5
Boron	-	<50	<50	<50	3.7	5	1.8	2	1.8	1
Cadmium	**1.5**	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**80**	23	21	3	23	49	11	17	20	9.9
Cobalt	-	8	6	<2	-	-	-	-	-	-
Copper	**65**	31	12	<5	24	32	14	19	14	13
Lead	**50**	**91**	44	<5	**54**	**56**	30	**55**	29	17
Manganese	-	45	69	16	28	320	66	25	110	41
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	**0.29**	<0.2	<0.2
Molybdenum		-	-	-	-	-	-	-	-	-
Nickel	**21**	14	9	<2	17	**23**	5.1	13	8.8	4.2
Selenium Total	-	<5	<5	<5	3.4	3	1.3	1.1	0.68	0.57
Strontium	-	-	-	-	-	-	-	-	-	-
Vanadium	-	48	54	10	37	99	31	35	46	33
Zinc	**200**	93	96	17	48	**220**	73	76	96	56

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Spring 2022 (10/10/22)			Spring 2022 (30/11/22)		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	-	-	-	-
Arsenic	**20**	<5	<5	<5	1.9	3.6	9.8	6.1	4.1	2.1
Barium	-	110	60	<10	100	80	61	110	61	71
Beryllium	-	<1	1	<1	0.86	1	1.2	1.1	1.2	0.65
Boron	-	<50	<50	<50	4.4	2.6	4.2	1.7	<1	<1
Cadmium	**1.5**	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**80**	23	21	3	19	24	22	56	14	7.3
Cobalt	-	8	6	<2	-	-	-	-	-	-
Copper	**65**	31	12	<5	20	15	25	36	6.7	5.4
Lead	**50**	**91**	44	<5	**79**	32	44	**62**	23	12
Manganese	-	45	69	16	57	130	62	53	78	74
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum		-	-	-	-	-	-	-	-	-
Nickel	**21**	14	9	<2	14	11	9.9	**25**	6.3	3.4
Selenium Total	-	<5	<5	<5	0.62	0.61	1.1	1	0.54	<0.5
Strontium	-	-	-	-	-	-	-	-	-	-
Vanadium	-	48	54	10	24	48	67	35	40	21
Zinc	**200**	93	96	17	93	110	160	84	45	23

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Autumn 2023 (18/05/23)			Autumn 2023 (3/07/23)		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	26700	24500	20600	-	-	-
Antimony	-	-	-	-	<0.5	<0.5	<0.5	-	-	-
Arsenic	**20**	<5	<5	<5	2.8	3.1	4.6	2.9	5.1	4.2
Barium	-	110	60	<10	88	70	92	100	42	54
Beryllium	-	<1	1	<1	0.91	0.81	0.99	0.9	0.59	0.63
Boron	-	<50	<50	<50	4.5	2.2	3	2.6	<1	<1
Cadmium	**1.5**	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**80**	23	21	3	19	20	19	15	18	15
Cobalt	-	8	6	<2	7.4	7.7	6.5	-	-	-
Copper	**65**	31	12	<5	22	12	18	17	9.6	16
Lead	**50**	**91**	44	<5	**120**	25	36	37	19	32
Manganese	-	45	69	16	38	91	130	23	90	44
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum		-	-	-	1.8	0.86	0.66	-	-	-
Nickel	**21**	14	9	<2	14	9.9	8.3	12	5.5	6.7
Selenium Total	-	<5	<5	<5	1.3	0.79	1.1	1.6	0.53	0.68
Strontium	-	-	-	-	28	19	9.5	-	-	-
Vanadium	-	48	54	10	33	39	43	26	43	34
Zinc	**200**	93	96	17	100	97	77	48	54	72

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 7 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Spring 2023 (20/09/23)			Spring 2023 (15/11/23)		
		AQ1	AQ4	AQ1	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
Aluminium	-	-	-	-	-	-	-	-	-	-
Antimony	-	-	-	-	-	-	-	-	-	-
Arsenic	**20**	<5	<5	<5	8	3.8	2.3	3.7	3.7	4.3
Barium	-	110	60	<10	140	48	42	150	79	78
Beryllium	-	<1	1	<1	1.5	0.63	<0.5	1.3	1.2	1.3
Boron	-	<50	<50	<50	6.4	<1	<1	3.7	4.2	1.2
Cadmium	**1.5**	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	**80**	23	21	3	30	14	6.8	31	22	12
Cobalt	-	8	6	<2	-	-	-	-	-	-
Copper	**65**	31	12	<5	**78**	8.7	4.5	24	19	10
Lead	**50**	**91**	44	<5	**94**	20	13	**87**	28	17
Manganese	-	45	69	16	95	54	42	31	130	55
Mercury	**0.15**	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Molybdenum		-	-	-	-	-	-	-	-	-
Nickel	**21**	14	9	<2	**26**	5.4	2.6	20	11	8.2
Selenium Total	-	<5	<5	<5	2.1	0.89	0.61	0.91	0.65	<0.5
Strontium	-	-	-	-	-	-	-	-	-	-
Vanadium	-	48	54	10	51	33	20	46	40	31
Zinc	**200**	93	96	17	**230**	52	24	150	120	60

***Interim Sediment Quality Guideline – Low (Trigger value) (ANZECC/ARMCANZ 2000**

[A] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (eg. <0.02 taken as 0.01)

NB Aluminium, Antimony, Molybdenum, Strontium and Vanadium were not tested for by the Spring 2019 surveys because they were not required by the BMS (cf Biosis, 2018)

Table 8. Mean (± SE) sediment results for perfluoronated compounds between autumn 2018 (*n* = 1) and autumn 2023 (*n* = 2).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Spring 2018			Autumn 2019		
		AQ1	AQ4	AQ14	AQ1	AQ4	AQ14	AQ1[C]	AQ4	AQ14
Perfluoronated compound (mg/kg)										
PFHxS	-	0.0036	0.0007	<0.0002	0.0023 (0.00)	<0.001 (0.00)	<0.001 (0.00)	0.0037	<0.001 (0.00)	<0.001 (0.00)
PFOS	32	0.0444	0.0061	0.0005	0.0310 (0.01)	0.0049 (0.00)	<0.002 (0.00)	0.0220	0.0085 (0.01)	<0.002 (0.00)
PFOA	29	-	-	-	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001	<0.001 (0.00)	<0.001 (0.00)
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0333 (0.01)	0.0055[B] (0.00)	0.002[B] (0.00)	0.0257	0.0090[B] (0.01)	0.0015[B] (0.00)
Sum of PFAS (WA DER List)[A,B]	-	0.0483	0.0068	0.0005	0.0369[B] (0.01)	0.0096[B] (0.00)	0.0058[B] (0.00)	0.0329	0.0150[B] (0.01)	0.0075[B] (0.00)
Indicator Variable	**Trigger Value***	**Baseline (Autumn 2018)**			**Spring 2019**			**Autumn 2020**		
		AQ1	**AQ4**	**AQ14**	**AQ1**	**AQ4**	**AQ14**	**AQ1**	**AQ4**	**AQ14**
Perfluoronated compound (mg/kg)										
PFHxS	-	0.0036	0.0007	<0.0002	0.0016 (0.00)	<0.001 (0.00)	<0.001 (0.00)	0.0005 (0.00)	0.0005 (0.00)	0.0005 (0.00)
PFOS	32	0.0444	0.0061	0.0005	0.0075 (0.01)	0.0062 (0.00)	0.0028 (0.00)	0.0115 (0.00)	0.0015 (0.00)	0.0052 (0.00)
PFOA	29	-	-	-	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0231 (0.08)	0.0067[B] (0.00)	0.0033[B] (0.00)	0.0120 (0.00)	0.0020 (0.00)	0.0057 (0.00)
Sum of PFAS (WA DER List)[A,B]	-	0.0483	0.0068	0.0005	0.0281[B] (0.08)	0.0117[B] (0.00	0.0083[B] (0.00)	0.0170 (0.00)	0.0070 (0.00)	0.0107 (0.00)

*DEE (2016) - Urban residential/public open spaces

[A] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS

[B] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01), the Sum of PFHxS and PFOS and the Sum of PFAS.

[C] Only one survey was undertaken at Site AQ1 in autumn 2019.

Table 8 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Spring 2020			Autumn 2021		
		AQ1	AQ4	AQ14	AQ1	AQ4	AQ14	AQ1[C]	AQ4	AQ14
Perfluoronated compound (mg/kg)										
PFHxS	-	0.0036	0.0007	<0.0002	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001[B] (0.00)	<0.001 (0.00)	<0.001 (0.00)
PFOS	32	0.0444	0.0061	0.0005	0.0070 (0.00)	0.0022[B] (0.00)	<0.002 (0.00)	0.016 (0.004)	0.006 (0.002)	0.004 (0.003)
PFOA	29	-	-	-	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0075[B] (0.00)	0.0032[B] (0.00)	0.0015[B] (0.00)	0.0164[B] (0.003)	0.0069[B] (0.002)	0.0042[B] (0.003)
Sum of PFAS (WA DER List) [A,B]	-	0.0483	0.0068	0.0005	0.0125[B] (0.00)	0.0082[B] (0.00)	0.0065[B] (0.00)	0.021[B] (0.003)	0.0119[B] (0.002)	0.0090[B] (0.003)
Indicator Variable	**Trigger Value***	**Baseline (Autumn 2018)**			**Spring 2021**			**Autumn 2022**		
		AQ1	**AQ4**	**AQ14**	**AQ1**	**AQ4**	**AQ14**	**AQ1**	**AQ4**	**AQ14**
PFHxS	-	0.0036	0.0007	<0.0002	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	0.0015 (0.0010)	<0.001 (0.00)	<0.001 (0.00)
PFOS	32	0.0444	0.0061	0.0005	0.0090 (0.00)	0.0030[B] (0.00)	0.009[B] (0.01)	0.0265 (0.0075)	0.0056 (0.0014)	0.0038 (0.0033)
PFOA	29	-	-	-	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0075[B] (0.00)	0.0032[B] (0.00)	0.0015[B] (0.00)	0.0280 (0.01)	0.0056 (0.00)	0.0036 (0.0036)
Sum of PFAS (WA DER List) [A,B]	-	0.0483	0.0068	0.0005	0.0168[B] (0.01)	0.0089[B] (0.00)	0.0148[B] (0.01)	0.034[B] (0.0075)	0.0111[B] (0.0014)	0.0096[B] (0.0031)

*DEE (2016) - Urban residential/public open spaces

[A] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS

[B] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01), the Sum of PFHxS and PFOS and the Sum of PFAS.

[C] Only one survey was undertaken at Site AQ1 in autumn 2019.

Table 8 (Cont'd).

Indicator Variable	Trigger Value*	Baseline (Autumn 2018)			Spring 2022			Autumn 2023		
		AQ1	AQ4	AQ14	AQ1	AQ4	AQ14	AQ1	AQ4	AQ14
PFHxS	-	0.0036	0.0007	<0.0002	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)
PFOS	32	0.0444	0.0061	0.0005	0.0134 (0.01)	0.0008[B] (0.00)	<0.003 (0.00)	0.017[B] (0.00)	0.002[B] (0.00)	0.007[B] (0.00)
PFOA	29	-	-	-	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)	<0.001 (0.00)
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0139[B] (0.01)	0.0013[B] (0.00)	0.0038[B] (0.00)	0.018[B] (0.01)	0.001[B] (0.00)	0.004[B] (0.00)
Sum of PFAS (WA DER List) [A,B]	-	0.0483	0.0068	0.0005	0.0035[B] (0.00)	0.0046[B] (0.00)	0.0091[B] (0.00)	0.023[B] (0.00)	0.0075[B] (0.001)	0.013[B] (0.004)
Indicator Variable	**Trigger Value***	**Baseline (Autumn 2018)**			**Spring 2023**					
		AQ1	**AQ4**	**AQ14**	**AQ1**	**AQ4**	**AQ14**			
PFHxS	-	0.0036	0.0007	<0.0002	<0.005 (0.00)	<0.001 (0.00)	<0.001 (0.00)			
PFOS	32	0.0444	0.0061	0.0005	0.009[B] (0.01)	0.0021[B] (0.01)	0.0085[B] (0.01)			
PFOA	29	-	-	-	<0.005 (0.00)	<0.001 (0.00)	<0.001 (0.00)			
Sum of PFHxS and PFOS	-	0.0480	0.0068	0.0005	0.0198[B] (0.00)	0.0034[B] (0.00)	0.0098[B] (0.00)			
Sum of PFAS (WA DER List) [A,B]	-	0.0483	0.0068	0.0005	0.0242 (0.01)	0.0076[B] (0.00)	0.014[B] (0.01)			

*DEE (2016) - Urban residential/public open spaces

[A] = PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTS and 8:2 FTS

[B] For any site, where a value has been recorded as less than the detection limit, it was assigned a value of half the detection limit in order to calculate the mean (e.g. <0.02 taken as 0.01), the Sum of PFHxS and PFOS and the Sum of PFAS.

[C] Only one survey was undertaken at Site AQ1 in autumn 2019.

3.3 Aquatic Macroinvertebrates

A total of 14 taxon were identified from edge habitat samples collected at Site AQ12 in spring 2023 (Survey 1: 12 taxon; Survey 2: 9 taxon) (Table 11, Appendix 3). Seven taxa, Acarifomes (Water mites), Chironominae (True flies), Tanypodinae (True flies), Oxygastridae and Libellulidae (Dragonflies), Leptoceridae (Caddis flies) and Lymnaeidae (Freshwater snails) were collected on both sampling occasions (Appendix 3). The alien species of fish, Gambusia, was also collected in net samples (Survey 1: 8 individuals; Survey 2: 4 individuals).

Site AQ12 obtained an OE50 score of 0.40 for Survey 1 and 0.50 for Survey 2 during spring 2023 (Table 11, Figure 3), indicating that the macroinvertebrate assemblage at Site AQ12 was severely impaired (Band C) relative to reference sites selected by the AUSRIVAS model. The most recent OE50 scores were within the range of scores obtained since the baseline survey (Figure 3).

Similar to the findings of the previous surveys, taxon with > 0.80 probability of occurrence but not collected at the Anzac Creek site were the mayfly family, Leptophlebiidae, the aquatic bug family, Veliidae, and the beetle family, Hydrophilidae.

SIGNAL2 scores of 3.82 and 4.00 were obtained for both surveys (Table 4). The absence of Leptophlebiidae was likely to have contributed to the lower score (Table 4, Figure 4). In summary, SIGNAL 2 scores obtained for Site AQ12 have changed little over time and indicate that the macroinvertebrate assemblage at AQ12 has commonly been dominated by pollution-tolerant taxa since the commencement of sampling in autumn 2018 (Table 11, Figure 4).

Table 9. Total number of taxa, AUSRIVAS & SIGNAL 2 outputs for Site AQ12 (n = 1).

Survey	No Taxa	SIGNAL-2	OE50	Band
Autumn 2018	13	4.00	0.49	B
Spring 2018 – Survey 1	9	3.25	0.39	C
Spring 2018 – Survey 2	5	3.07	0.10	D
Autumn 2019 – Survey 1	10	2.69	0.41	C
Autumn 2019 – Survey 2	8	3.41	0.20	C
Spring 2019 – Survey 1	11	2.09	0.38	C
Spring 2019 – Survey 2	11	2.18	0.19	D
Autumn 2020 – Survey 1	19	3.00	0.68	B
Autumn 2020 – Survey 2	13	3.33	0.49	B
Spring 2020 – Survey 1	10	3.10	0.40	C
Spring 2020 – Survey 2	13	3.33	0.40	C
Autumn 2021 – Survey 1	13	3.38	0.49	B
Autumn 2021 – Survey 2	12	3.64	0.41	C
Spring 2021 – Survey 1	10	2.41	0.30	C
Spring 2021 – Survey 2	6	3.00	0.30	C
Autumn 2022 – Survey 1	13	3.86	0.49	B
Autumn 2022 – Survey 2	7	4.58	0.31	C
Spring 2022 – Survey 1	12	3.25	0.30	C
Spring 2022 – Survey 2	9	4.74	0.40	C
Autumn 2023 – Survey 1	7	0.30	0.29	C
Autumn 2023 – Survey 2	8	0.30	0.29	C
Spring 2023 – Survey 1	12	3.82	0.40	C
Spring 2023 – Survey 2	9	4.00	0.50	C

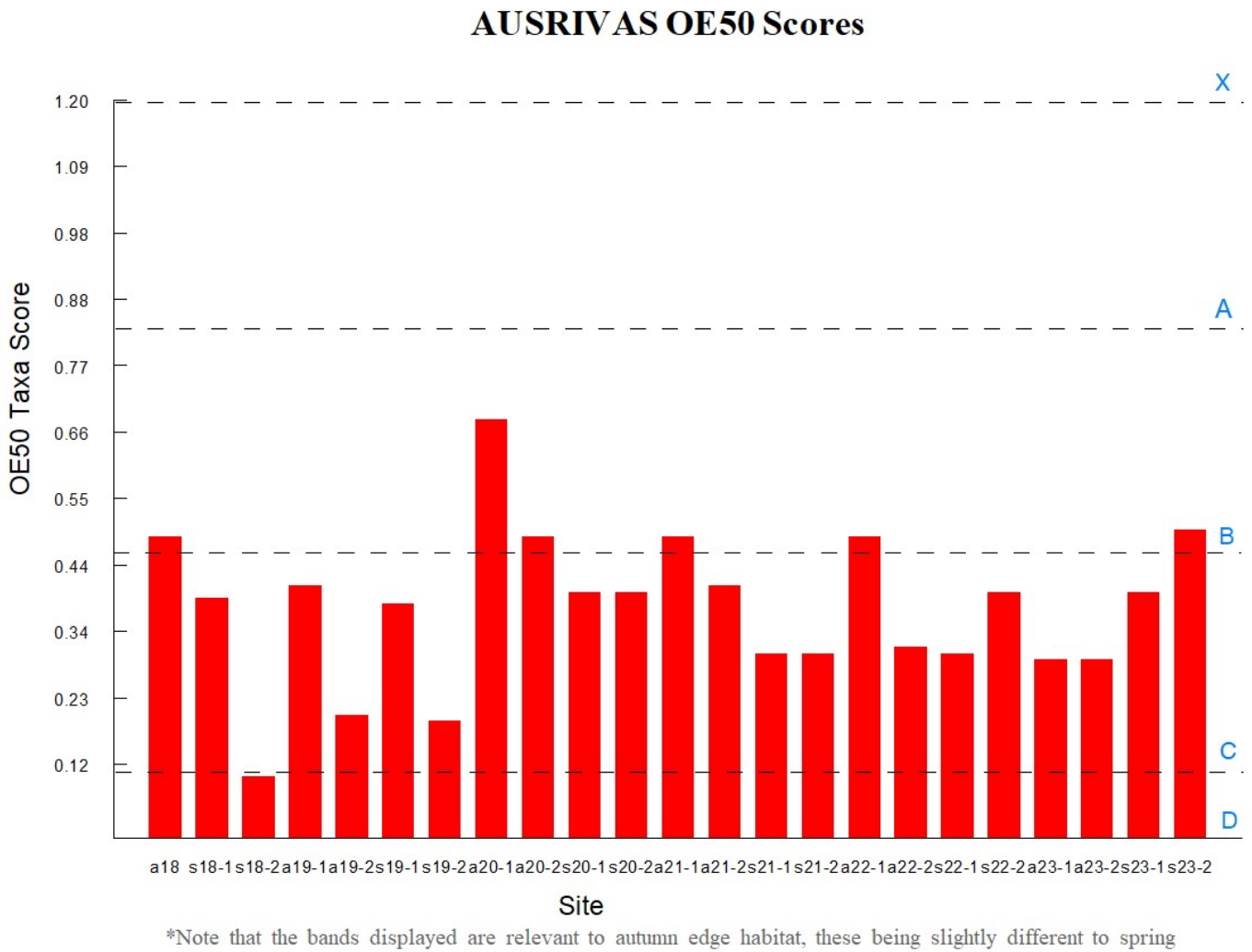


Figure 3. OE50 Taxa Scores and their respective Band Scores (B-D) for AUSRIVAS samples collected at Site AQ12 since autumn 2018.

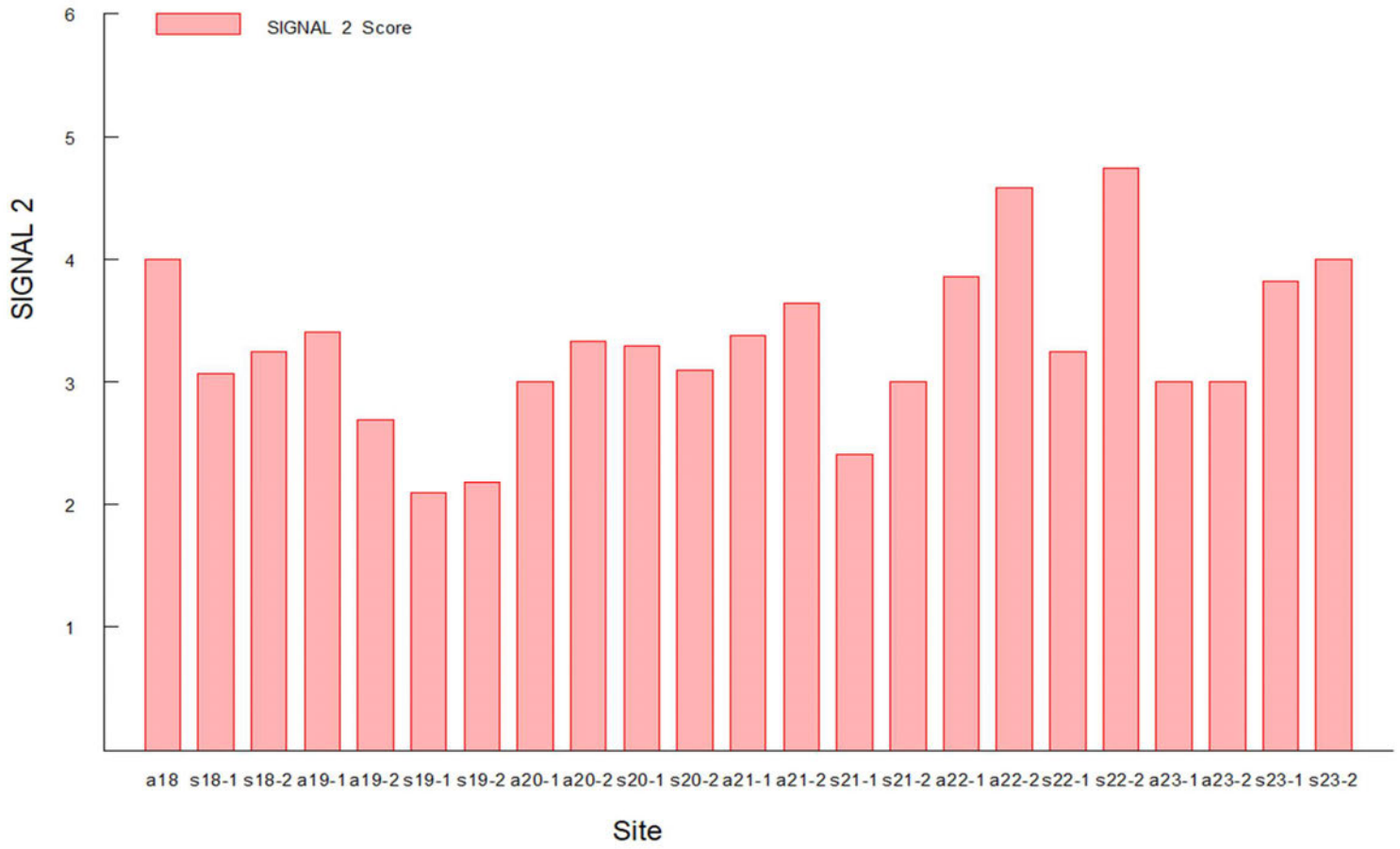


Figure 4. Quadrant diagram showing SIGNAL 2 results for Site AQ12 sampled in Anzac Creek since autumn 2018.

3.4 Fish

Due to extensive cover of green macroalgae at Site AQ12, fish were unable to be sampled using the electro-fisher at the time of the spring 2023 surveys (Table 10). Gambusia (*Gambusia holbrooki*) were observed and also caught in dip nets used to sample aquatic macroinvertebrates in spring 2023 (Table 6).

In total, ten species of fish, including three introduced species, were collected since sampling commenced in autumn 2018 (Table 10). All the species caught were common within NSW (McDowall, 1996; DPI 2006; Howell and Creese, 2010). No threatened species of fish listed under the *NSW Fisheries Management Act, 1994* or the *Environment Protection and Biodiversity Conservation Act, 1999* were recorded.

Plate 13: Eel-tailed catfish collected at Site AQ12 (18/05/2023).

Table 10. Fish collected at Site AQ12 between autumn 2018 and autumn 2023[#].

Species	Common Name	Aut-18 (Biosis, 2018)	Sp-18	Au-19	Sp-19	Sp-20	Au-21	Sp-21	Au-22	Sp-22	Au-23
Anguilla reinhardtii	Long-finned eel	2	3	2	-	4	1	2	1	1	-
Anguilla australis	Short-finned eel	-	13	-	9	13	2	4	2	4	1
Galaxias maculatus	Common galaxias								8		-
Gobiomorphus australis	Striped gudgeon	28	8	3	2	-	-	-	2	2	3
Hypseleotris compressa	Empire gudgeon	13	-	-	-	-	-	-	-	-	1
Hypseleotris cf *galii*	Firetail gudgeon	-	-	-	1	1	-	-	-	-	-
Tandanus tandanus	Eel tailed catfish										1
*Carassius auratus**	Goldfish	-	2	-	-	-	1	-	-	1	-
*Gambusia holbrooki**	Gambusia	328	100's	10's	10's	100's	100's	100's	10's	100's	100's
*Misgurnus anguillicaudatus**	Oriental weatherloach	-	-	-	1	-	-	-	2	1	1
Unidentified sp.								1	-	-	-

*Introduced species;

[#]Fish were unable to be sampled at Site AQ12 within the autumn 2020 survey period (due to instrument malfunction) or during autumn 2023 (due to the presence of extensive mats of green macro-algae).

3.5 Limitations

- Only one Baseline survey was able to be sampled in autumn 2018, due to the May 2018 bushfire (Biosis, 2018);
- Due to restricted access through the construction worksite, it was not possible to access Site AQ1 on 30 May 2019 to undertake the 2019 autumn survey 2. Whilst the collection of replicate samples at each site provides important measures of variability in habitat characteristics and concentrations of toxicants, the results from Survey 1 and subsequent surveys were within the range of results collected in the Baseline survey. Therefore, it is considered that the missing sample did not detract from being able to interpret the findings of the 2019 autumn sampling event, and that the intent and outcomes of the MPES2 monitoring survey were achieved;
- Water quality measurements collected during the biological sampling only provide a snapshot of quality at the time of sampling under the prevailing flow conditions;
- In the absence of external reference sites (i.e. similar sites but in systems not subject to the Project activities), it is not possible to account for changes in the variable examined that may occur naturally at a broader regional scale.

5.0 DISCUSSION

After construction of Warehouses 1, 3, 4 and 5, the location of Warehouses 6-8 was left as compacted pads in December 2020. Warehouses 6 and 7 earthworks commenced on 9/06/22 and have since been completed, Warehouse 7a is now operational. Operation of Warehouses 6 and 7b are expected to commence in Quarter 4 of 2023 and Quarter 2 2024 (respectively). During construction, water is managed is accordance with the approved CEMP and water is discharged via the sediment (SED) Basins and into Anzac Creek (via DP5 and DP7).

5.1 Aquatic Habitat & Environmental Conditions

Reduced pool water levels and flow were noted in the spring 2023 survey 1, compared to the autumn 2023 and spring 2022 surveys. At the most upstream site sampled (Site AQ1), aquatic habitat was limited to a shallow, anoxic pool. Subsequent rainfall refilled the channel prior to the second survey and Alligator Weed, Marsh Club-rush, Typha and Slender knotweed had recolonised a large proportion of Site AQ1.

Levels of lead, copper, nickel and zinc collected from the isolated pool at Site AQ1 by Survey 1 exceeded the Interim Sediment Quality Guidelines (ISQG) (ANZECC/ARMCANZ 2000) and baseline values measured by the BAEMP survey. In sediments collected in the second survey, only lead exceeded the recommended guideline values. Most measurements of lead at AQ1 (range = 21 to 130 mg/kg) have exceeded the threshold limit (50 mg/kg), including at the time of the baseline (91 mg/kg) survey. ALS (2011), JBS&G (2016) and Biosis (2018) attributed these impacts to historical contributions from Commonwealth Department of Defence lands, industrial and urban run-off, among others. A number of factors contribute to the variability in sedimentary concentrations of metals within a site. For instance, when aquatic habitats are dried during extended periods without rain and then re-flooded, metals (including lead, copper, nickel and lead) can be released from the sediments, particularly in areas with a legacy of heavy metal pollution (Hansen and Horne, 2022). Sediment grain size is also a factor, with coarser grains often present at the outer edges of channels, while finer sediment is commonly distributed along the inside of the channel

In any case, all other toxicants monitored within sediments within spring 2023, including total petroleum hydrocarbons and poly-fluoroalkyl substances (e.g. PFAS and PFOS), continued to be within the ANZECC/ARMCANZ (2000) guideline levels. Heavy metals (including lead) bound in sediments were not identified as specific contaminants of concern for the MPES2 Project (Biosis, 2018). Further, Site AQ1 was situated upstream of potential inputs from the Project and therefore no additional testing of heavy metals at Site AQ1 should be considered necessary at this stage.

Reduced dissolved oxygen levels, elevated nitrogen, aluminium, and copper measured in surface water in the large refuge pool (Site AQ12), including prior to commencement of the Project, also reflect historic and current activities (ALS, 2011; Biosis, 2018). Concentrations of total petroleum hydrocarbons and poly-fluoroalkyl substances measured during spring 2023 remain similar to baseline values and within the recommended Australian-derived guidelines for water.

While the Project may also be influencing water quality within the creek, measures of water quality continue to be comparable to those measured previously (including prior to the commencement of the Project). Additional degradation of water quality does not appear to have occurred since the Project related construction work began.

5.2 Biological Monitoring

The macroinvertebrate assemblage supported by the refuge pool appears to experience some degree of environmental stress. This is evident in the OE50 Taxa Scores and Bands, which have generally been indicative of an assemblage that is less diverse compared to reference sites selected by the AUSRIVAS model. Low values of the SIGNAL 2 score and the number of macroinvertebrate types (only 14 taxa) were also indicative of a site suffering from one or more forms of human impact (see Chessman, 2003a&b).

Lower than expected macroinvertebrate indices were not unexpected given exposure to multiple stressors (e.g., floating mats of macro-algae, very little flow, elevated levels of nitrogen, and excessive aquatic plant growth) that can adversely affect the condition of aquatic habitat. The presence of extensive mats of green macroalgae and other aquatic vegetation within the refuge pool are a symptom of nutrient enrichment and reduced inflows.

While the plants provide substrata for attachment of filter-feeders, predators and other macroinvertebrate taxa, they alter microhabitats by slowing or modifying currents, trapping detritus, blocking light and altering oxygen regimes (Gregg and Rose, 1985; Cummins et al., 2004). Dissolved oxygen levels within the refuge pool have consistently been below the ANZECC/ARMCANZ (2000) guideline.

The introduced fish, Gambusia (*Gambusia holbrooki*), has also consistently been observed within the refuge pool. Predation by Gambusia is listed as a Key Threatening Process by the NSW *Biodiversity Conservation Act 2016*, because of known effects on frogs, freshwater fishes and aquatic macroinvertebrates.

Nevertheless, some pollution sensitive taxa were identified (including caddis fly and dragonfly larvae) and ten species of fish, including seven native species, were collected, indicating that the creek continues to provide important habitat for aquatic species. Of the species collected, all are common within NSW (McDowall, 1996; DPI 2006; Howell and Creese, 2010).

6.0 CONCLUSION & RECOMMENDATIONS

Examination of the results from the spring 2023 monitoring event found no evidence of changes in the indicator variables (bed and bank stability, surface water and sediment quality, assemblages of aquatic macroinvertebrates and fish) that could be attributed to the Project works. Thus, in accordance with the Biodiversity Monitoring Strategy, no adaptive management contingency measures were triggered.

Recommendations include:

- Sampling of the stream health monitoring program to be repeated in autumn 2024;
- Land managers focus on containment and on-going suppression of Alligator Weed within Anzac Creek, particularly at Site AQ1, and the popular aquarium plant, *Egeria densa* (Egeria), observed within the refuge pool (Site AQ12) in spring 2020 and spring 2023.

7.0 REFERENCES

ALS (2011). *Assessment of the Sydney Intermodal Transport Hub, Moorebank*. Aquatic Ecology. Report prepared for Hyder Consulting Pty Ltd by Ecowise Australia Pty Ltd trading as ALS Water Resources Group.

Arcadis (2016). *Moorebank Precinct East – Stage 2 Proposal. Biodiversity Assessment Report prepared for SIMTA: Sydney Intermodal Terminal Alliance*. Part 4, Division 4.1, State Significant Development.

Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (2000). National Water Quality Management Strategy: *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality.* Canberra, Australia.

Biosis (2018). *Baseline Aquatic Ecological Monitoring Autumn 2018*. Report for Arcadis Authors: Stone, L. & Cable, A., Biosis Pty Ltd, Sydney. Project no. 26648.

Bureau of Meteorology [BOM] (2023). *New South Wales in 2023*. http://www.bom.gov.au/climate/current/season/nsw/summary.shtml#:~:text=The%20New%20South%20Wales%20area,autumn%20daily%20rainfall%20on%20record. (Accessed 11 December 2023)

Chessman, B. (2003a). *SIGNAL 2 – A Scoring System for Macroinvertebrates ('Water Bugs') in Australian Rivers*. Monitoring River Health Initiative Technical Report No. 31. Commonwealth of Australia, Canberra.

Chessman, B.C. (2003b). New sensitivity grades for Australian river macroinvertebrates. *Marine and Freshwater Research*, 2003, 54: 95-103.

Cummins, S. P., Roberts, D. E., Zimmerman, K. D. (2004). Effects of the green macro-alga, *Enteromorpha intestinalis* (L.) Link, on macrobenthic and seagrass assemblages in a shallow coastal estuary. *Marine Ecology Progress Series* 266: 77-87.

DPI NSW (2007). *Key Fish Habitat Maps Sydney LGA*. Website: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/634347/PortStephens.pdf (Accessed November 2020).

DPI NSW (2019). *NSW WeedWise*. NSW Department of Primary Industries. Website: https://weeds.dpi.nsw.gov.au/Weeds/Allifgator. (Accessed February 2020)

GHD (2016). *Moorebank, NSW Environmental Management Plan*. Prepared for Department of Defence Former DNSDC.

Golder (2015). *Moorebank Precinct West (MPW): Site Contamination Summary Report - Stage 2 State Significant Development*. Prepared for Tactical Group on behalf of Sydney Intermodal Terminal Alliance.

Gregg, W. W., Rose, F. L. (1985). Influences of aquatic macrophytes on invertebrate community structure, guild structure, and microdistribution in streams. *Hydrobiologia* 128: 45-56.

Howell, T. and Creese, B. (2010). *Freshwater Fish Communities of the Hunter, Manning, Karuah and Macquarie-Tuggerah Catchments: a 2004 Status Report*. Industry and Investment New South Wales, Cronulla, New South Wales.

JBS&G Australia Pty Ltd (2016). *Moorebank Precinct East (MPE) - Stage 2 Proposal: Contamination Summary Report*. Prepared for Tactical Group on behalf of Sydney Intermodal Terminal Alliance.

McDowall, R. M. (1996). *Freshwater Fishes of South-Eastern Australia.* 2nd.Edition. Reed Books, Chatswood, NSW.

Ransom, G., Coysh, J., Nichols, S. (2004). AUSRIVAS User Manual. Website: http://ausrivas.canberra.edu.au/Bioassessment/Macroinvertebrates/Manuals and Datasheets/User Manual. Date Retrieved: 27 November 2006.

Roberts, D. E., Church, A. G., Cummins, S. P. (1999). Invasion of Egeria into the Hawkesbury-Nepean River, Australia. *Journal of Aquatic Plant Management* 37: 31-34.

Sainty, G. R., Jacobs, S. W. L. (2003). *Waterplants in Australia: A Field Quide*. 4th Edn. Sainty & Associates Pty Ltd, Potts Point.

Sainty, G., McCorkelle, G., Julien, M. H. (1998). Control and Spread of alligator weed, *Alternanthera philoxeroides*, in Australia: lessons for other regions. *Wetlands Ecology Management* 5: 195–201.

Turak, E., Waddell, N., Johnstone, G. (2004). *New South Wales Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual*. Department of Environment and Conservation, Sydney, Australia.

APPENDICES

Appendix 1 - GPS positions (UTMs) for stream monitoring sites (spring 2023).

Site Code	Easting	Northing
AQ1	308116	6240233
AQ4	308557	6240282
AQ8	309220	6240814
AQ12	309385	6241601
AQ13	309383	6241735
AQ14	309365	6241881

Datum: WGS 84, Zone 56H

Appendix 2 – Visual Assessment Scores

Appendix 2a – Ephemeral stream assessment results

	Autumn 2018		Spring 2018		Autumn 2019	
Site	**Score (%)**	**Category**	**Score (%)**	**Category**	**Score (%)**	**Category**
AQ1	88	Very Stable	75	Stable	80	Stable
AQ4	88	Very Stable	75	Stable	78	Stable
AQ8	91	Very Stable	93	Very Stable	93	Very Stable
	Spring 2019		**Autumn 2020**		**Spring 2020**	
Site	**Score (%)**	**Category**	**Score (%)**	**Category**	**Score (%)**	**Category**
AQ1	88	Very Stable	90	Very Stable	90	Very Stable
AQ4	80	Stable	88	Very Stable	89	Very Stable
AQ8	92	Very Stable	93	Very Stable	93	Very Stable
	Autumn 2021		**Spring 2021**		**Autumn 2022**	
Site	**Score (%)**	**Category**	**Score (%)**	**Category**	**Score (%)**	**Category**
AQ1	80	Very Stable	90	Very Stable	92	Very Stable
AQ4	89	Very Stable	89	Very Stable	90	Very Stable
AQ8	93	Very Stable	93	Very Stable	93	Very Stable
	Spring 2022		**Autumn 2023**		**Spring 2023**	
Site	**Score (%)**	**Category**	**Score (%)**	**Category**	**Score (%)**	**Category**
AQ1	92	Very Stable	88	Very Stable	88	Very Stable
AQ4	92	Very Stable	93	Very Stable	93	Very Stable
AQ8	94	Very Stable	94	Very Stable	94	Very Stable

Appendix 2b – HABSCORE assessment results

	Autumn 2018		Spring 2018		Autumn 2019	
Site	Score (%)	Category	Score (%)	Category	Score (%)	Category
AQ1	27	Marginal	29	Marginal	32	Marginal
AQ4	28	Marginal	25	Marginal	25	Marginal
AQ8	41	Marginal	38	Marginal	38	Marginal
AQ12	55	Suboptimal	51	Suboptimal	53	Suboptimal
AQ13	21	Poor	23	Poor	21	Poor
AQ14	22	Poor	23	Poor	22	Poor
	Spring 2019		Autumn 2020		Spring 2020	
Site	Score (%)	Category	Score (%)	Category	Score (%)	Category
AQ1	30	Marginal	32	Marginal	27	Marginal
AQ4	26	Marginal	29	Marginal	28	Marginal
AQ8	41	Marginal	41	Marginal	41	Marginal
AQ12	51	Suboptimal	50	Suboptimal	53	Suboptimal
AQ13	19	Poor	21	Poor	22	Poor
AQ14	21	Poor	22	Poor	23	Poor
	Autumn 2021		Spring 2021		Autumn 2022	
Site	Score (%)	Category	Score (%)	Category	Score (%)	Category
AQ1	29	Marginal	31	Marginal	31	Marginal
AQ4	36	Marginal	38	Marginal	40	Marginal
AQ8	41	Marginal	41	Marginal	41	Marginal
AQ12	55	Suboptimal	55	Suboptimal	50	Suboptimal
AQ13	23	Poor	23	Poor	25	Poor
AQ14	24	Poor	24	Poor	25	Poor
	Spring 2022		Autumn 2023		Spring 2023	
Site	Score (%)	Category	Score (%)	Category	Score (%)	Category
AQ1	31	Marginal	32	Marginal	27	Marginal
AQ4	39	Marginal	40	Marginal	29	Marginal
AQ8	41	Marginal	41	Marginal	38	Marginal
AQ12	53	Suboptimal	53	Suboptimal	50	Suboptimal
AQ13	21	Poor	25	Poor	25	Poor
AQ14	25	Poor	25	Poor	25	Poor

Appendix 3 - Macroinvertebrate taxa collected at Site AQ12 in spring 2023 using the NSW AUSRIVAS protocol.

Taxa	Survey 1 (20 September 2023)	Survey 2 (15 November 2023)
Acariformes	12	3
Ceratopogonidae	0	10
Chironomidae - Chironominae	14	8
Chironomidae - Tanypodinae	2	2
Coenagrionidae	3	0
Dytiscidae	0	1
Oligochaeta	1	0
Oxygastridae	1	3
Physidae	2	0
Hemicorduliidae	2	0
Hydrobiidae	16	0
Leptoceridae	1	2
Libellulidae	1	1
Lymnaeidae	2	2
Number of Taxa	**12**	**9**

Moorebank Intermodal Precinct

APPENDIX F – MPE OPERATIONS INCIDENT REGISTER

Moorebank Intermodal Precinct Complaints Register - as of 30 November 2023			
Date received	**Complainant**	**Nature of complaint**	**Status**
22/09/2023	Road User	Traffic lights: A road user made a complaint about traffic congestion at the intersection of Moorebank Avenue and Anzac Road during peak morning and evening hours. According to the complainant, the congestion is attributed to an auto-sensor system on Anzac Road that causes delays for road users traveling on Moorebank Avenue. The project team advised the complainant that these traffic signals are controlled by TfNSW and not by the Precinct, therefore the concern is to be raised with TfNSW. The complaint has been closed.	Closed
04/09/2023	Community member	Noise: A complainant reported noise in the late-night hours near the Fire and Rescue Station on Anzac Road. The area is outside of MIP development boundary, hence there are no construction works or operations being undertaken within the vicinity of the Fire and Rescue station on Anzac Road. The noise appears not related to the MIP development. The complaint has been closed.	Closed
21/08/2023	Community member	Noise: A Wattle Grove resident complained about a metallic clunking noise most often at night-time from a west facing wall (towards the precinct). The project team investigated and found no works that could initiate noises described by the complainant were being undertaken within the precinct during night-time hours at the time of complaint. The complainant was advised that the precinct could not identify any specific events that would have caused any excessive night-time noise. However, operational teams were reminded to stay vigilant when operating at night.	Closed
27/06/2023	Community member	Dust: A Wattle Grove resident provided feedback about dust generation on Moorebank Avenue. The project team investigated and found no exceedances of the criteria for deposited dust in the last three months. A letter response explaining specific methods for the management and monitoring of dust generation at the Precinct was provided to the complainant. The complaint has been closed.	Closed
30/05/2023	Community member	Noise: A Wattle Grove resident complained about noise in the early hours of the morning which they believed originated from the precinct. The project team investigated and found no works were being undertaken within the precinct on the night in question. The complaint has been closed.	Closed
10/05/2023	Road user	Traffic congestion: The complainant reported traffic congestion along Moorebank Avenue resulting in increased commute time. The project team investigated and found traffic signals controlled by TfNSW TMC had malfunctioned on the morning in question. A response was provided to the complainant advising of the signal outage and how to report future signal faults. Information about the closure of Chatham Road intersection was also provided.	Closed
27/04/2023	Road user	Road conditions: The complainant reported damage to their vehicle while driving on Moorebank Avenue. Further information required to investigate the complaint was not	Closed

		provided. The complaint has been closed.	
07/02/2023	Road user	Road conditions: The complainant reported damage to their vehicle while driving on Moorebank Avenue. The project team liaised with the vehicle owner to resolve the complaint.	Closed
02/02/2023	Community member	Noise monitoring: Resident raised concern about specific locations of attended noise monitoring undertaken in 2022. The resident was provided with further clarification regarding the location of the noise monitoring as well as details of the noise monitoring requirements under the project's conditions of consent.	Closed
19/01/2023	Road user	Construction dust and mud: Road user complained about construction dust and mud on Moorebank Avenue. Road user was advised of mitigation measures in place including dust suppression, the use of water caters, wheel washing and sweeper trucks.	Closed
2022 Complaints			
Date Received	**Complainant**	**Nature of Complaint**	**Status**
31/12/2022	Community member	Development impacts: Resident raised concern about the height of MPW warehousing and its impact on views. Resident was advised of initiatives to reduce impacts for community and was advised of the previous community consultation related to the development, including height of warehousing.	Closed
14/11/2022	CCC member	Construction schedule and upcoming works: CCC member (Casula resident) complained about helicopter lifting work continuing past standard construction hours. The project team investigated the incident with the relevant contractor, who has been instructed to implement measures to ensure that any future helicopter lifts do not exceed construction hours. Further, the team notified the complainant of upcoming helicopter lifting work in December.	Closed
10/10/2022	Local business	Water / Flooding: Water entered the premises of a site neighbour during a heavy rainfall event. Site contractors have undertaken remediation works to repair, regrade and lift the bund to drain the area, pump out remaining water and revegetate the area to stabilise the bund. Contractors will continue to monitor the area to pump excess water as required.	Closed
20/09/2022	Community member	General project and noise: A Wattle Grove resident complained about noise and hours of operation at the site, and about the project more broadly. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
21/08/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site, including out of hours works helicopter activity undertaken on site. The complainant was advised the works were an approved activity under the approved MPE Stage 2 Construction Noise and Vibration Management Plan (CNVMP) and noise monitoring undertaken as required by out of hours work consent identified noise levels were under the predicted levels outlined in the CNVMP.	Closed

		The complainant was also advised their observations of noise at other days/times are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	
18/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
17/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
16/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
13/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
13/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
12/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
12/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed

11/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
10/8/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
31/7/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
30/7/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
29/7/2022	Community member	Noise: A Wattle Grove resident complained about noise and hours of operation at the site. The complainant was advised their observations are being investigated further through additional noise monitoring. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
28/7/2022	Community member	Noise: A Wattle Grove resident made a complaint about truck and container movement noise at the site. The complainant was advised the project has approval to operate 24/7 within limits of the Operational Noise and Vibration Management Plan and the project undertakes ongoing noise management and monitoring, including permanent noise monitors. Further, the team notified the complainant that staged commencement of automated electric crane operations later this year which are expected to result in more environmentally friendly operations on site. The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
19/7/2022	Community member	Noise: A Wattle Grove resident complained about noise emanating from the site, particular trucks and container movement noise. The complainant was advised the project has approval to operate 24/7 within limits of the Operational Noise and Vibration Management Plan and the project undertakes ongoing noise	Closed

		management and monitoring, including permanent noise monitors. Further, the team notified the complainant that staged commencement of automated electric crane operations later this year which are expected to result in more environmentally friendly operations on site. The complainant was advised further additional attended noise monitoring will be undertaken	
4/7/2022	Local business	Flooding: Water entered the premises of a site neighbour during a heavy rainfall weather event (300mm +). Following an investigation, SIMTA contractors undertook cleaning of the site and repair to verges. Further work will be undertaken to repair swale damage.	Closed
18/06/2022	Community member	Noise: A resident in Wattle Grove made a complaint relating to container movement noise. The project team investigated and noise monitoring at the time described included some container noise which was within approved noise parameters for the site. As a result of the community member's observations, attended noise monitoring will be undertaken in the area to further explore (in addition to permanent noise monitoring already in place at locations determined by DPE). The complainant was advised further additional attended noise monitoring will be undertaken.	Closed
10/06/2022	Community member	Noise: A resident in Wattle Grove made a complaint about container movement noise. The project team investigated and noise monitoring at the time described included some container noise which was within approved noise parameters for the site. As a result of the community member's observations, attended noise monitoring will be undertaken in the area to further explore (in addition to permanent noise monitoring already in place at locations determined by DPE).	Closed
26/04/2022	CCC member	Noise: Complainant noted sound from a water pump has been operating 24/7 near the Georges River at the north of the site for about a week. The project team investigated the complaint and discovered the water level within the excavation works area had recently receded, causing the pump to function incorrectly. The complainant was informed acoustic blankets would be installed for additional noise attenuation and the pump would only be running during standard construction hours until they are in place. Further noise modelling will be undertaken before overnight pumping resumes.	Closed
19/02/2022	CCC member	Noise: Complainant noted weekend work was being carried out after 1pm Saturday. The complainant was advised a new extended weekend construction hours order had been issued by the NSW Minister for Planning and was supplied a copy of the order.	Closed
11/01/2022	CCC member	Noise: Complainant noted heavy vehicle noise late at night. No work was being undertaken on our project at that time, which complainant was advised.	Closed

2021 Complaints			
Date received	**Complainant**	**Nature of complaint**	**Status**
25/11/2021	Road user	Condition of road: A motorist complained about potholes on Moorebank Avenue between East Hills railway line and Cambridge Avenue. The project team advised the motorist that the potholes are within the section of the road owned and managed by the Department of Defence and was not related to the project. The complainant was directed to contact Department of Defence. (Issue not related to project).	Closed
05/11/2021	Road user	Condition of road: A road user complained about the condition of Anzac Road. The project team investigated the specific location of Anzac Road and discovered this is an area of Anzac Road currently being upgraded by Liverpool City Council. This upgrade is unrelated to the project.	Closed
04/11/2021	CCC member	Dust: A CCC member reported dust coming from the southern end of Moorebank Precinct West. The project team reminded all contractors to ensure mitigation strategies continue to be implemented appropriately. Further discussions about dust management from active stockpiles were conducted with the overall project team. The complaint occurred on a day where the wind was 80-90km/hr - while water carts were suppressing dust on the day, it was impossible to eliminate the dust due to these high wind speeds.	Closed
01/11/2021	Community member	Noise: A resident in Wattle Grove complained about night works noise coming from Anzac Road. The project team discovered that these works are undertaken by Liverpool City Council and advised the resident to contact council. (Issue not related to project).	Closed
28/10/2021	Road user via Liverpool City Council	Condition of road: Liverpool City Council on behalf of road users complained about the condition of Bapaume Road, Moorebank. The project team is investigating ways to temporary remedy potholes and conditions of the road where possible. Please note this is a local controlled council road.	Closed
25/10/2021	Community member	Noise: A resident complained about noise coming from the Moorebank Intermodal Terminal direction. The project team acknowledged the complainant's concerns and requested more information about the noise so the team could carry out further investigation to identify the source. No further information was provided by the complainant, and project teams confirmed that no out of hours works were undertaken at the time by Moorebank Intermodal Terminal.	Closed
16/10/2021	Community member	Noise: A resident in Wattle Grove complained about night works noise. The project team investigated the complaint and discovered that night works (asphalting) were undertaken by nearby Holsworthy Army Barrack. Stakeholder was advised and encouraged to provide additional detail for future noise issues. (Issue not related to project.)	Closed

09/09/2021	CCC member	Noise: A CCC member complained about trucks beeping noise from a heavy vehicle in the early hours. The project team investigated the noise and discovered that it came from a Fire & Rescue NSW truck inspecting a local business premises. (Issue not related to project.)	Closed
07/09/2021	Community member	General project: A resident in Glenfield complained about the height of warehousing on MPW hindering his cityscape view. The project team provided information to assist complainant understanding of works currently underway and those planned and approved for the near future.	Closed
17/07/2021	Road user	Vehicle Damage: A motorist reported a pothole on Anzac Road, east of Anzac Creek. The project team advised that the pothole was within the section of the road owned and managed by the Department of Defence and was not related to the project. The complainant was directed to DoD. (Issue not related to project.)	Closed
14/07/2021	Road user	Vehicle Damage: A motorist reported windscreen damaged by a rock from a truck on Moorebank Avenue. The project team investigated the claim and discovered the truck was not working on the project on the day of the incident. The motorist was directed to contact the truck company directly. (Issue not related to project.)	Closed
14/05/2021	Road user	Driver behaviour: Site neighbour advised that vehicle leaving site failed to completely stop moving at a stop sign. SIMTA contractors issued road safety to relevant team members.	Closed
13/05/2021	Community member	Noise: A resident from East Moorebank complained of OOH excavator noise during a one-month period. Further information was requested from the complainant, but no response was provided. Investigations indicated the noise was not related to the project.	Closed
06/05/2021	Local Business	Water/Flooding: Site neighbour advised that water was flowing from SIMTA property into culvert situated along fence line on private property. SIMTA introduced measures to help prevent runoff during heavy rainfall.	Closed
13/04/2021	Road user	Traffic lights: A road user complained about traffic congestion on Moorebank Avenue causing major delays. Roads and Maritime Services advised the light sequencing system was faulty. The project team had also directly reported the issue to TfNSW. (Issue not related to project.)	Closed
08/04/2021	Local Business	Water/Flooding: Advised by site neighbour that a water hose situated on SIMTA property was leaking. The project team inspected the hose and repaired it.	Closed
29/03/2021	Road user	Traffic lights: A road user complained about traffic congestion on Moorebank Avenue causing major delays. Roads and Maritime Services advised the light sequencing system was faulty.	Closed

		(Issue not related to project.)	
29/03/2021	Road user	Traffic lights: A road user complained about traffic congestion on Moorebank Avenue causing major delays. Roads and Maritime Services advised the light sequencing system was faulty. (Issue not related to project.)	Closed
22/03/2021	Local Business	Water/Flooding: Water entered the premises of a site neighbour during heavy rainfall. As a gesture of goodwill, SIMTA offered to pay for the clean-up.	Closed
09/01/2021	CCC member	Noise: A CCC member complained about trucks tailgates making noise during the delivery of material to the site. The project team investigated the complaint and noted that the complaint related to trucks operating during standard construction hours and within approval conditions.	Closed
2020 Complaints			
Date received	**Complainant**	**Nature of complaint**	**Status**
12/12/2020	CCC member	Noise: A CCC member complained about noise from night work. The project team acknowledge the CCC member's concerns and informed that they have amended the work methodology in response to previous complaints. The team advised they have moved the out-of-hours work to a section of the site located further away from homes in Casula, endeavouring to ensure all plant and machinery on MPW uses non-tonal reversing sounders. Furthermore, the project team also introduced several initiatives to reduce the impact of night works. Noise monitoring indicates that these initiatives appear to be working in helping reduced noise impacts from night works.	Closed
10/12/2020	Community member	Dust: A community member complained about dust impacts on her home. The project team outlined the measures used to mitigate the impact of dust; including frequent use of dust suppression vehicles, continually monitoring dust levels and work practices being altered during strong winds. The project team apologised the community member for any impacts.	Closed
09/11/2020	CCC member	Noise: A CCC member visited BMD gate on MPW and complained about noisy night work. The site supervisor discussed new noise mitigation measures had been put in place for the night work and the CCC member agreed the noise level had dropped. The supervisor also explained to the CCC member that ongoing toolbox talks with contractors/drivers on the need to keep noise levels down, especially with the use of horns and closing tailgates. The CCC member agreed that everyone was doing their best to keep noise levels down.	Closed
04/11/2020	Road user	Truck driver behaviour: A road user complained about an interaction with a truck driver on Moorebank Avenue. The project team investigated the complaint and dashcam footage was inconclusive in terms of the account of the incident. The project team also discussed with the truck driver the importance of always ensuring road safety and road rules are adhered to when entering and leaving site.	Closed

		The project team apologised the road user for any concerns caused by the incident.	
22/10/2020	CCC member	Noise: A CCC member complained about noisy night work. The project team acknowledge the CCC member's concerns and advised that they have amended the work methodology in response to his expressing dissatisfaction with the level of out-of-hours work noise. The team advised they have moved the out-of-hours work to a section of the site located further away from homes in Casula. In addition, the project team also introduced additional noise monitoring to help confirm noise sources. Feedback from the CCC member indicated that this eliminated the noise issues he had been experiencing.	Closed
20/10/2020	CCC member	Dust: A CCC member complained about dust coming up from the northern end of MPW. The project team investigated the complaint and informed the CCC member they could not conclusively identify any work that caused the dust complaint reported. The project team organised additional street sweeping and dust suppression vehicles to mitigate any possible dust issues.	Closed
15/10/2020	Community member	A resident in Casula complained about construction noise. The project team acknowledge the resident's concerns and advised that they have amended the work methodology in response to residents expressing dissatisfaction with the level of out-of-hours work noise. The team did this by relocating the out-of-hours work to a section of the site located further away from homes in Casula. In addition, the project team also introduced additional noise monitoring to help confirm noise sources.	Closed
14/10/2020	Community member	Noise: Two residents in Casula complained that they could hear loud metallic bangs at night. The project team acknowledged the residents' concerns and advised that the "banging" noises were determined to be caused by tipper trucks' tailgates delivering crushed sandstone to the site during extended hours. The team reiterated to drivers that they should take care to ensure their tailgates closed as quietly as possible after they deposited their load on-site. In addition, the project team relocated the out-of-hours work to a section of the site further away from homes in Casula and introduced additional noise monitoring. Feedback from the community indicated that this eliminated the noise issues they had been experiencing.	Closed
09/10/2020	Community member	Noise: A resident in Wattle Grove complained that he could hear hydraulic excavator or similar making loud noises at night. The project team investigated the complaint and informed the resident that there had not been any night-time activity on the site other than out-of-hours deliveries of crushed sandstone to Moorebank Precinct.	Closed
24/09/2020	Neighbour	Traffic lights: A representative of the Department of Defence complained about the traffic light timing at the intersection of Moorebank Ave and Frank Partridge Drive. Roads and Maritime Services advised that	Closed

		the signals operate on an auto-sensor system. Complainant was provided RMS details to advise of traffic delays that may require adjustment to the signaling.	
24/09/2020	Community member	Noise: A resident in Casula complained about the noise generated by nightworks. The project team investigated and informed the resident that the noise was caused by trucks delivering crushed sandstone to the site during extended hours. The project team apologised for the inconvenience caused and reminded the contractor of the importance of minimising the noise created by this work.	Closed
21/09/2020	CCC member	Noise: A CCC member complained about noisy night work, including jackhammering. The project team investigated and confirmed that no work of high-impact nature caused the excessive noise claimed. The only work which used plant machinery and a bulldozer was the ongoing importation of materials to site.	Closed
15/09/2020	Community member via DPIE	Dust: A community member complained via DPIE about rubbish and sand on Moorebank Avenue. The project team organised additional street sweeping and dust suppression.	Closed
02/09/2020	Community member	Noise: A resident in Casula complained that he could hear loud metallic bangs at night. The project team investigated the complaint and informed the resident that the noise was likely caused by a truck's tailgate closing after it delivered crushed sandstone to the site during extended hours. The project team apologised for the inconvenience caused and reminded the contractor of the importance of minimising the noise created by this work.	Closed
02/09/2020	Community member	Vehicle Damage: A motorist reported that a pothole on Moorebank Avenue caused damaged to her car. The project team investigated the complaint and discovered that the pothole was within the section of the road owned and managed by the Department of Defence. The complainant was directed to DoD to discuss further.	Closed
26/08/2020	CCC member	Noise: A CCC member complained about loud metallic bangs from trucks' tailgate while unloading crushed sandstone to site. The project team investigated the complaint and believed that the noise might have been caused by a truck's tailgate closing after it had tipped its load. The project team reminded the contractor of the importance of this work being carried out more quietly in future and has also been carrying out noise monitoring of this work.	Closed
25/08/2020	Community member	Environmental impacts: A resident in Casula complained about the height of the proposed Woolworths warehousing on MPW affecting the view from his backyard. The project team advised the resident the proposal was open for public consultation and directed him to the online information link to provide a submission detailing his concerns.	Closed

24/08/2020	Community member	Condition of road: A member of the community complained about her vehicle being damaged by the pothole in Moorebank Avenue south of the East Hills rail line. The project team investigated the complaint and discovered that the pothole is in the area owned and managed by Department of Defence and advised her to raise her concerns with DoD.	Closed
18/08/2020	CCC member via DPIE	Environmental impacts: CCC member complained via DPIE that the colour scheme of the IMEX crane located on the Moorebank Precinct East site is considered visually intrusive. The project team confirmed to the complainant that this is the final colour scheme of the equipment.	Closed
17/08/2020	Community member	Condition of road: A community member complained about a pothole in Moorebank Avenue. The project team investigated the location of the pothole and found that it is in the area owned and managed by Department of Defence and advised the resident to contact the DoD.	Closed
27/05/2020	CCC member	Noise: CCC member noted that noise was audible until 8.30 pm on 26/5 as trucks delivered materials to the worksite. Project team confirmed that this is permitted by project approvals.	Closed
20/04/2020	CCC member	Lighting: CCC member asked that on-site lighting be trimmed down as one unit is directing light towards his home. Project team adjusted the relevant lighting, including light shields and further engaged with complainant to ensure temporary lighting units were not placed in locations that directed light towards his home.	Closed
13/03/2020	Community member via DPIE	Vegetation: Resident claimed that Aboriginal Scar trees were being removed from site. Project team confirmed and provided evidence that this had not occurred.	Closed
10/03/2020	Community member via Liverpool City Council	Condition of road: Local resident observed potholes on Moorebank Ave near Anzac Avenue and wanted the potholes repaired. Project team worked with LCC to identify and repair potholes.	Closed
24/02/2020	Community member	Environmental impacts: Request that traffic controllers stop feeding bread to the cockatoos. Personnel ceased doing so immediately.	Closed
18/02/2020	Local business	General construction: Noting runoff of water from site detention basins following 450mm rainfall storm event. Project team confirmed that this is in line with project approvals.	Closed
22/01/2020	Community member	General construction: Stacked containers wall fell during supercell storm. Project team reduced height of stack and altered stacking method to further reinforce the noise wall.	Closed
22/01/2020	Community member	General construction: Stacked containers wall fell during supercell storm.	Closed

		Project team reduced height of stack and altered stacking method to further reinforce the noise wall.	
2019 Complaints			
Date received	**Complainant**	**Nature of complaint**	**Status**
27/11/2019	RAID via DPIE	Dust: RAID member claimed dust that had settled on outdoor furniture was produced by project construction. No further evidence was able to be supplied.	Closed
25/11/2019	Local business	Condition of road: Roadside bollards damaged by turning truck. Project team repaired bollards.	Closed
25/10/2019	Community member via DPIE	Dust: Resident noted dust issues affecting his home and pool, as well as Moorebank Avenue. Project team noted dust mitigation and management protocols that are in place.	Closed
11/10/2019	Road user	Condition of road: Three pot holes on the road approaching the bridge on Cambridge Ave, Moorebank. Project team reported potholes to road owner.	Closed
7/09/2019	Road user	Vehicle damage: Road user reported that her vehicle was damaged by site fencing during heavy wind. Investigation by relevant insurance agency determined that the damage had been existing on the vehicle.	Closed
2/09/2019	Community member	Dust: Resident noted dust issues affecting his home. Project team noted dust mitigation and management protocols that are in place.	Closed
21/08/2019	Community member	Noise: Complainant reported excessive night-time noise over three nights, which they believed to have been caused by project construction. Project team confirmed that construction took place on only two of the three dates, and that the activities reported as occurring around 2am had concluded by midnight. Project team was able to ascertain that MS Motorway roadworks were also carried out on the dates in question.	Closed
21/08/2019	Community member	Noise: Complainant reported excessive night-time noise, which they believed to have been caused by project construction. Project team confirmed that construction took place on the reported date, with MS Motorway roadworks also carried out on the date in question.	Closed
20/08/2019	Community member	Noise: Complainant reported excessive night-time noise, which they believed to have been caused by project construction. Project team confirmed that construction took place on the reported date, with MS Motorway roadworks also carried out on the date in question.	Closed
17/08/2019	Community member	Noise: Complainant reported excessive night-time noise, which they believed to have been caused by project construction. Project team confirmed that construction took place on the reported date, with MS Motorway roadworks also carried out on the date in question.	Closed
16/08/2019	Community	Noise:	Closed

	member	Complainant reported excessive night-time noise, which they believed to have been caused by project construction. Project team confirmed that construction took place on the reported date, with MS Motorway roadworks also carried out on the date in question.	
18/07/2019	Community member	Water use: Repeat of 9/7/19 complaint, project team reiterated that water use was legal, approved, paid for and only took place when captured rainwater was unavailable.	Closed
16/07/2019	Community member	Truck movements: Resident noted heavy vehicle use of Anzac Road in exceedance of weight limit. Was unable to provide any registration number or other identifying features of the vehicles he witnessed.	Closed
9/07/2019	Community member	Water use: Complainant witnessed project water suppression tankers filling up from Sydney Water pumping station and alleged water was being stolen. Project team confirmed that this was approved under licence by Sydney Water, that the water was paid for and that mains refilling only took place when project water basins were empty.	Closed
2/07/2019	Local business	Condition of road: Complainant noted dirt "tracking" from worksite onto Bapaume Road and dirt in drains from site runoff. Project team cleaned Bapaume Road with street sweeper, improved site features to reduce tracking, cleaned gutters and pumped out roadside drains.	Closed
28/06/2019	Community member	Water use: Complainant witnessed project water suppression tankers filling up from Sydney Water pumping station. Project team confirmed that this was approved under licence by Sydney Water and that mains refilling only took place when project water basins were empty.	Closed
20/05/2019	Community member via DPIE	Noise: Complainant reported hearing an 'evacuation warning siren'. Project team was unable to identify a source of the noise within the worksite.	Closed
9/04/2019	Road user via Transport for NSW	Condition of road: Road user reported a "lip" in the road surface above the new rail underpass. Project team confirmed this was not the final road surface and that a weekend road closure to apply the final surface was upcoming.	Closed
3/04/2019	RAID via Liverpool City Council	Condition of road: Complainant reported localised flooding on the road along Moorebank Ave and its effect on road users. Project team worked with Liverpool City Council to clear drains, and confirmed that a new drainage system delivered with the Moorebank Ave upgrade would resolve this issue.	Closed
15/03/2019	Community member	Consultation: Complaint about lack of notification for upcoming helicopter movements. Project team confirmed that a letterbox notification was delivered across an area twice the size of that required by approval condition and the complainant resided outside that area. Also	Closed

		advised that all project notifications are made available on the project website.	
15/02/2019	Community member	Noise: Complainant reported noise being produced on-site before 7am start of works. Project team reminded contractors about noise requirements and ensuring staff arrival noise was minimised.	Closed
2018 Complaints			
Date received	**Complainant**	**Nature of complaint**	**Status**
23/11/2018	Road user	Condition of road: Road user reported a near-miss on Moorebank Avenue attributed to vehicle swerving to avoid a pothole. Project team arranged repair of pothole.	Closed
6/11/2018	Community member	Worker behaviour: Complainant reported contractor parking on property. Project team reminded work crews of respectful interface with neighbours and community.	Closed
5/11/2018	Community member	Truck movements: Resident noted heavy vehicle use of Anzac Road in exceedance of weight limit. Provided vehicle details and sub- contractor was reminded of approved truck travel routes.	Closed
25/10/2018	Road user	Vehicle damage and condition of road: Road user reported that two tyres on his vehicle were burst by Moorebank Ave pothole. Project team arranged reimbursement of the cost of two new tyres.	Closed
22/10/2018	Road user via Liverpool City Council	Vehicle damage: Liverpool City Council received advice of damage to two vehicles caused by Moorebank Ave road surface. Project team referred complainants to relevant insurance agency.	Closed
19/10/2018	Community member via Sydney Trains	Truck movements: Trucks producing dust and blocking entry to Sydney Trains maintenance facility. Project team met with Sydney Trains, erected signage advising trucks not to stop in designated areas and increased dust suppression on entry road.	Closed
3/10/2018	Road user	Condition of road: Cyclist advised of dissatisfaction with arrangements for cyclists on Moorebank Avenue during construction and identified safety hazard of damaged signposts. Project team confirmed that footpath that had closed was not a cycle path and use by cyclists was not legally permitted. Project team advised of the approved method for cyclists to navigate during construction, including using road traffic lanes as permitted by the road rules, and ensured dangerous signposts were removed.	Closed
21/9/2018	Local business	Condition of road: Roadside bollards damaged by turning truck. Project team repaired bollards.	Closed
10/9/2018	Community member	General project: Complainant expressing disgust in the SIMTA project and asking to see proof of approvals from the Land and Environment Court. Project team provided relevant approvals.	Closed
27/8/2018	Community	Dust:	Closed

	member	Reiteration of earlier complaint.	
24/8/2018	Community member via DPIE	Environmental impacts: Resident raised concerns about vegetation clearing beside Moorebank Avenue and asked whether approval had been sought. Project team confirmed this work had been approved and provided relevant approval documents.	Closed
23/8/2018	Road user	Condition of road: Complaint about dust and debris on Moorebank Ave. Project team advised of systems in place to manage dust/dirt and regular sweeping of the road surface. Project team reviewed dust suppression measures as a result of this and two other complaints and introduced an additional mitigation measure - spraying a polymer binder to seal dirt that would remain exposed long-term.	Closed
23/8/2018	Community member	Condition of road: Complaint about dust and debris on Moorebank Ave. Project team advised of systems to manage dust/dirt and regular sweeping. Project team reviewed suppression measures as a result of this and two other complaints and introduced an additional mitigation measure - spraying a polymer binder to seal dirt that would remain exposed long-term.	Closed
21/8/2018	Community member	Dust: Complainant reported his house and car were being regularly made dirty by dust caused by construction and sought compensation for cleaning that he had been carrying out. Project team reviewed dust suppression measures as a result of this and two other complaints and introduced an additional mitigation measure - spraying a polymer binder to seal dirt that would remain exposed long-term.	Closed
8/8/2018	Road user	Traffic: Complainant reporting delays on Moorebank Ave caused by the management of project's traffic control. Traffic controllers were advised to ensure priority was given to vehicles travelling on Moorebank Ave during peak periods.	Closed
6/8/2018	Community member	Damage to property: Concrete slurry was left. Construction team cleaned this.	Closed
12/7/2018	Community member	Noise: Casula resident complaint about beeping noises before 7am. Project team confirmed no site vehicles have reversing "beepers" fitted, and reminded crews to arrive quietly.	Closed
2/7/2018	Community member	Condition of road: Resident advised on Moorebank Ave potholes. Project team organised for road to be repaired.	Closed
26/6/2018	Community member via Liverpool City Council	General construction: Temporary reinstatement of footpath with asphalt viewed by pedestrian as insufficient. Requested better permanent surface. This was provided after construction was completed in the area.	Closed
17/6/2018	Community member	Truck movements: Resident had observed trucks parking alongside Anzac Road so drivers could frequent take-away food store. Also noted exceedance of Anzac Rd weight limit and claimed vehicles were parking in a No Stopping zone. Project team investigated and confirmed that roadside parking in the relevant section of Anzac Rd was legal, but ensured truck	Closed

		drivers were reminded not to block footpath when parking and that Anzac Rd past fire station carried a weight limit.	
28/5/2018	Community member	General project: General Concerns around the amount of trucks that will be on local roads in the coming years. Complainant commented that the trucks are too noisy, and she believes they are speeding, especially on her street. Project team advised of project benefits around reduction of heavy vehicle movements and investigated claim re truck speeding on complainant's street. Complainant lives on the northern side of Moorebank in an area not used by project vehicles.	Closed
28/5/2018	Community member	General project: Caller advised that she received a letter re Moorebank Intermodal Terminal Facility and she would like more information. Resident lives on Junction Rd, Moorebank, and has many concerns around traffic and project works impacting on Junction Rd. Project team provided additional information on project.	Closed
24/5/2018	Local business	Truck movements: Complaint about trucks parking on nature strip outside business's premises. Nature strip was fenced off to ensure trucks were unable to park at that location.	Closed
16/5/2018	Road user	Vehicle damage: Complainant's vehicle was sprayed with a substance from a project vehicle. Project team arranged repair of the vehicle.	Closed
4/4/2018	Community member	General project: Complainant generally opposes the project. Project team noted the complaint.	Closed
2/3/2018	Community member	Dust: Caller advised of large plume of dust going high into the air, viewed from Casula. Project team spoke with demolition crews and was unable to identify cause or confirm this was related to the project.	Closed
1/3/2018	Community member	Environmental impacts: A resident advised they had provided EPA with photos of what they say is a sediment control incident. Project team liaised with EPA to resolve matter.	Closed
21/2/2018	Community member	Lighting: Report that temporary traffic lights are left on all night. Project team resolved.	Closed
16/2/2018	Community member via OPIE	Noise: Resident alleged that loud banging noise was audible at Sam. Project team confirmed no work was underway on site at that time.	Closed
8/2/2018	Community member	General project: Complaint made about ignoring community feedback. Project team noted this complaint.	Closed
5/2/2018	Community member	Traffic: Complainant reporting delays on Moorebank Ave caused by the management of project's traffic control. Traffic controllers were advised to ensure priority was given to vehicles travelling on Moorebank Ave during peak periods.	Closed

19/1/2018	Community member via OPIE	Noise: Resident alleged that loud banging noise was audible at 4.25am. Project team confirmed no work was underway on site at that time.	Closed

Moorebank Intermodal Precinct

APPENDIX G - COMPLIANCE REPORT DECLARATION FORM

Moorebank Intermodal Precinct

COMPLIANCE REPORT DECLARATION

Project Name	Moorebank Logistics Park (MLP) – East Precinct
Project Application Number	SSD 6766 & SSD 7628
Description of Project	Moorebank Logistics Park aims to streamline the freight logistics supply chain from port to store, deliver savings to businesses and consumers, and help service the rapidly growing demand for imported goods in south-west Sydney. It is located approximately 27 kilometres (km) south-west of the Sydney Central Business District and approximately 26 km west of Port Botany within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively. The East Precinct includes the 24/7 operation of an import-export terminal (IMEX), rail link connecting to the South Sydney Freight Line (SSFL), warehousing and distribution facilities and freight village.
Project Address	Moorebank Logistics Park, Moorebank, NSW, 2170
Proponent	The Trust Company Limited (ACN 004 027 749
Title of Compliance Report	Moorebank Logistics Park East Precinct – Operation Compliance Report
Date	Wednesday, 3 April 2024

I declare that I have reviewed relevant evidence and prepared the contents of the attached Compliance Report and to the best of my knowledge:

- the Compliance Report has been prepared in accordance with all relevant conditions of consent;
- the Compliance Report has been prepared in accordance with the Compliance Reporting Post Approval Requirements;
- the findings of the Compliance Report are reported truthfully, accurately and completely.
- due diligence and professional judgement have been exercised in preparing the Compliance Report; and
- the Compliance Report is an accurate summary of the compliance status of the development.

Notes:

- Under section 10.6 of the Environmental Planning and Assessment Act 1979 a person must not include false or misleading information (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is false or misleading in a material respect. The proponent of an approved project must not fail to include information in (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that

Moorebank Intermodal Precinct

COMPLIANCE REPORT DECLARATION

the information is materially relevant to the monitoring or audit. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000; and

- The Crimes Act 1900 contains other offences relating to false and misleading information: section 307B (giving false or misleading information – maximum penalty 2 years' imprisonment or 200 penalty units, or both).

Name of Authorised Reporting Officer	Richard Mason
Title	MD Possum Environmental Consulting
Signature	
Qualification	Bachelor of Science – Environmental Science
Company	Possum Environmental Consulting
Company Address	7 Delprat Terrace, Whyalla South Australia 5600