

Appendix B7

Air Quality and Dust Management Sub Plan Infrastructure Works Stage 1

Parramatta Light Rail – Stage 1

November 2021

PLR1INF-CPBD-ALL-AH-PLN-000001 Rev 5

Construction Environment Management Plan

Appendix B7

Air Quality and Dust Management Sub-plan

Project Name: Parramatta Light Rail Stage 1
Infrastructure Contract

Project number	N81080
Document number	PLR1INF-CPBD-ALL-AH-PLN-000001
Revision date	26/11/2021
Revision	5

Rev.	Date	Prepared By	Reviewed By	Approved By	Remarks
A	08/05/19	SNC Lavalin			nil
B	09/05/19	SNC Lavalin			nil
0	12/05/19	SNC Lavalin			nil
1	21/06/19	Parramatta Connect			nil
2	19/07/19	Parramatta Connect			nil
3	26/07/19	Parramatta Connect			nil
4	26/08/2020	Parramatta Connect			nil
5	26/11/2021				nil

Details of Revision Amendments

Document Control

The Project Director is responsible for ensuring that this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Project Director and/or client before being distributed / implemented.

Revision	Details
Rev A	Parramatta Connect internal review
Rev B	Incorporation of Parramatta Connect review comments
Rev 0	First draft submitted to TfNSW and ER. Revision issued for external stakeholder consultation.
Rev 1	Second draft submitted to TfNSW and ER for consultation.
Rev 2	Incorporation of external stakeholder consultation comments. Issued to ER for endorsement.
Rev 3	Incorporation of ER endorsement letter and submission to the DPIE for information.
Rev 4	Annual review, minor amendments.
Rev 5	Annual review, minor amendments.

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Glossary/Abbreviations

Abbreviations	Expanded text
AQMP	Air Quality and Dust Management Sub-Plan
BoM	Australian Government Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Sub-plan
CoA	Conditions of Approval
CSSI	Critical State Significant Infrastructure
DPIE	NSW Department of Planning, Industry and Environment (the responsibilities of the former Department of Planning and Environment are now administered by the Department of Planning, Industry and Environment).
ECM	Environmental Control Map
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ESCP	Erosion and Sediment Control Plan
JV, the	Joint Venture, CPB Contractors and Downer EDI Works (Parramatta Connect)
OEH	Office of Environment and Heritage <i>Where reference in the planning approval, this Plan and consultation has been made to OEH it should be noted that OEH has been abolished from 1 July 2019. The OEH (environment) section is taken as a reference to Department of Planning, Industry and Environment (DPIE) and the OEH (heritage) section is taken as a reference to Heritage NSW.</i>
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
POEO (Clean Air) Regulation 2010	Protection of the Environment Operations (Clean Air) Regulation 2010
REMMM	Revised Environmental Mitigation and Management Measure
SaM	Stabling and Maintenance Facility

Abbreviations	Expanded text
SOM	Supply, Operate and Maintain
SPIR	Submissions and Preferred Infrastructure Report
SWMP	Soil and Water Management Sub-plan
TfNSW	Transport for New South Wales

1 Introduction

1.1 Context

This Air Quality and Dust Management Sub-Plan (AQMP or Sub-plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail Stage 1, Package 4 Infrastructure Works (Infrastructure Works). This AQMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) SSI-8285, the revised environmental mitigation and management measures (REMMMs) and Environmental Performance Outcomes (EPO's) listed in *Parramatta Light Rail Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement* (the EIS), as amended by the *Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report)* (February 2018) (the SPIR). In addition, this Sub-plan addresses all applicable legislation and contractual requirements, including the PLR Stage 1 Infrastructure Contract Project Deed (ISD-17-6721).

1.2 Background

1.2.1 Parramatta Light Rail – Stage 1 description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney.

Parramatta Light Rail Stage 1 (Stage 1) will connect Westmead to Carlingford via Parramatta Central Business District (CBD) and Camellia. Stage 1 is expected to be operational in 2023.

Stage 1 will create new communities, connect great places and help both local residents and visitors move around and explore what the region has to offer. The route will link Parramatta's CBD and train station to a number of key locations, including the Westmead Precinct, the Parramatta North Growth Centre, the new Western Sydney Stadium, the Camellia Town Centre, the new Powerhouse Museum and Riverside Theatre arts and cultural precinct, the private and social housing redevelopment at Telopea, the Rosehill Gardens Racecourse and the three Western Sydney University campuses.

In summary, the key features of Stage 1 include:

- A new dual track light rail network of approximately twelve (12) kilometres in length, including approximately seven (7) kilometres within the existing road corridor and approximately five (5) kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services
- Sixteen (16) stops that are fully accessible and integrated into the urban environment including a terminus stop at each end of Westmead and Carlingford
- High frequency 'turn-up-and-go' services operating seven days a week from 5am to 1am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7am and 7pm
- Modern and comfortable air-conditioned light rail vehicles, nominally 45 metres long and driver-operated, each carrying up to 300 passengers.
- Intermodal interchanges with existing public transport services at Westmead terminus, Parramatta CBD and the Carlingford terminus
- Creation of two light rail and pedestrian zones (no general vehicle access) within the Parramatta CBD along Church Street (generally between Market Street and Macquarie Street) and along Macquarie Street (generally between Horwood Place and Smith Street)

- A Stabling and Maintenance (SaM) Facility located in Camellia for light rail vehicles (LRV) to be stabled, cleaned and maintained
- New bridge structures along the alignment including over James Ruse Drive and Clay Cliff Creek, Parramatta River (near the Cumberland Hospital), Kissing Point Road and Vineyard Creek, Rydalmere
- Alterations to the existing road network including line marking, additional traffic lanes and turning lanes, new traffic signals, and changes to traffic flows
- Relocation and protection of existing utilities
- Public domain and urban design works along the corridor and at Stop precincts
- Closure of the heavy rail line between Carlingford and Clyde
- Active transport corridors and additional urban design features along sections of the alignment and within Stop precincts
- Integration with the Opal Electronic Ticketing System (ETS)
- Real time information in light rail vehicles and at Stops via visual displays and audio.

An overview of Parramatta Light Rail Stage 1 route is shown in **Figure 1-1**.

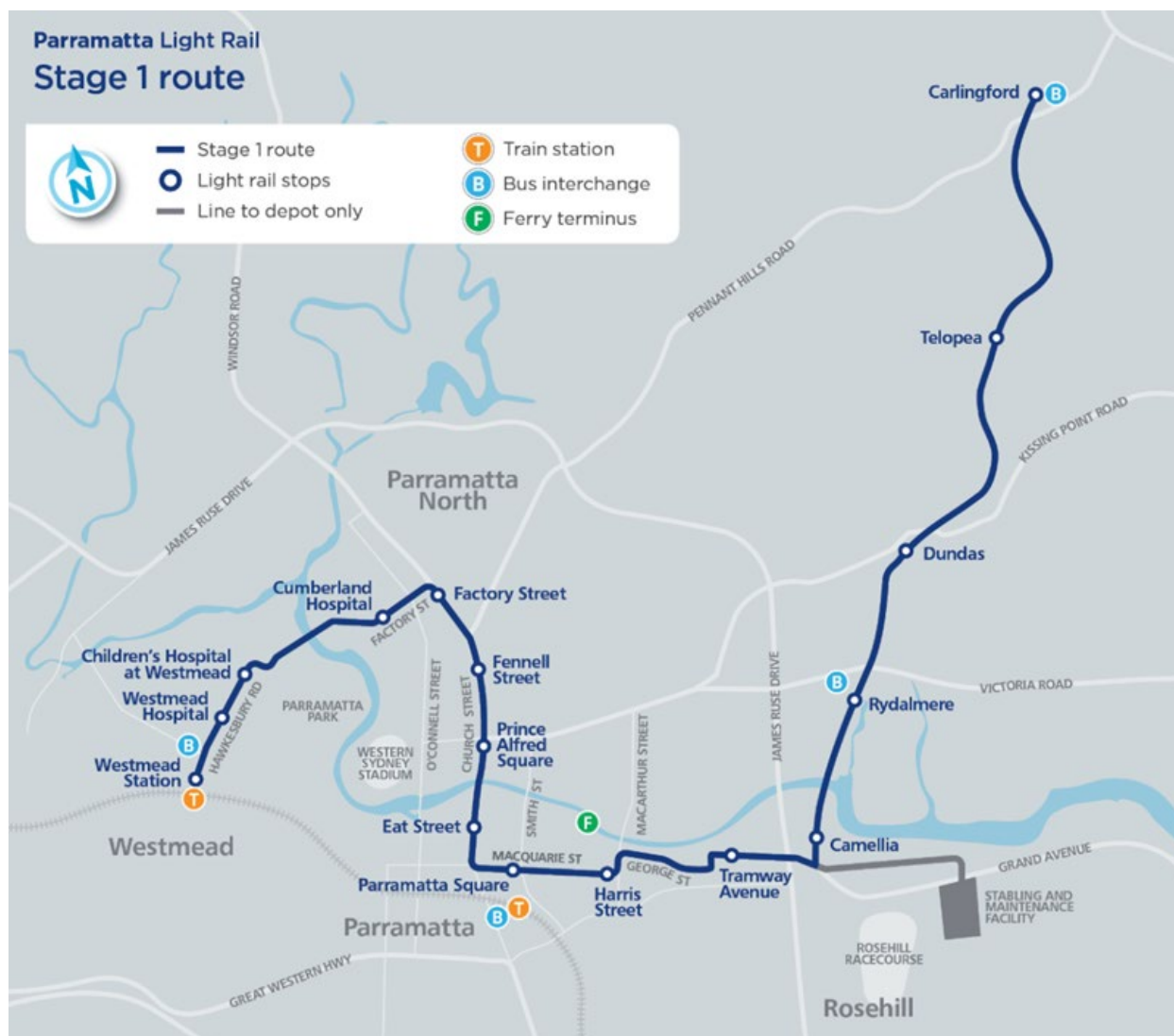


Figure 1-1: Parramatta Light Rail Stage 1 Route

1.2.2 Statutory Context

The Parramatta Light Rail is subject to environmental impact assessment under the *Environmental Planning and Assessment Act 1979* (EP&A Act). It is classified as Critical State Significant Infrastructure (CSSI). The EIS assessed impacts for Parramatta Light Rail Stage 1 (Westmead to Carlingford). This covered the light rail and associated works including road enabling work.

Stage 1 received Infrastructure Approval from the Minister for Planning under Section 5.19 of the EP&A Act on 29 May 2018 (Critical State Significant Infrastructure Application SSI-8285), subject to the conditions provided in the Instrument of Approval, specifically Schedule B – Ministerial Conditions of Approval.

The Infrastructure Approval was subsequently modified under Section 5.25 of the EP&A Act on 21 December 2018 and 25 January 2019.

The planning approval, modifications and related environmental assessment documents are located at: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285.

1.2.3 Stage 1 Delivery Strategy

Delivery of Stage 1 is achieved through the following five packages of work:

- **Enabling Works (Package 1)** – Local road network improvements including O’Connell Street and George Street (off-alignment)
- **Westmead Precinct Works (Package 2)** – Hawkesbury Road widening and demolition at Cumberland Hospital (east and west Campus)
- **Early Works (Package 3)** – Remediation of the Stabling and Maintenance (SaM) Facility
- **Infrastructure Works (Package 4)** (the subject of this Sub-plan) – Design and construction of civil works, public domain and light rail infrastructure up to road level/top of rail and to the top of the concrete slab at stops, including provision of utility services (excluding high-voltage power supply and cabling for rail systems), and decommissioning of the T6 Carlingford Line)
- **Supply, Operate and Maintain Works (Package 5)** – Design and construction of the light rail systems, high-voltage power supply and stops above slab level, the supply of light rail vehicles, and the design and construction of the SaM Facility, including all light rail operations, customer service and asset management.

Each package of work is to be delivered under separate contracts on behalf of the proponent Transport for NSW. While the packages will commence at different times under separate construction approvals, there will be periods during which the packages works will overlap. The interactions between the packages are shown in **Figure 1-2**.

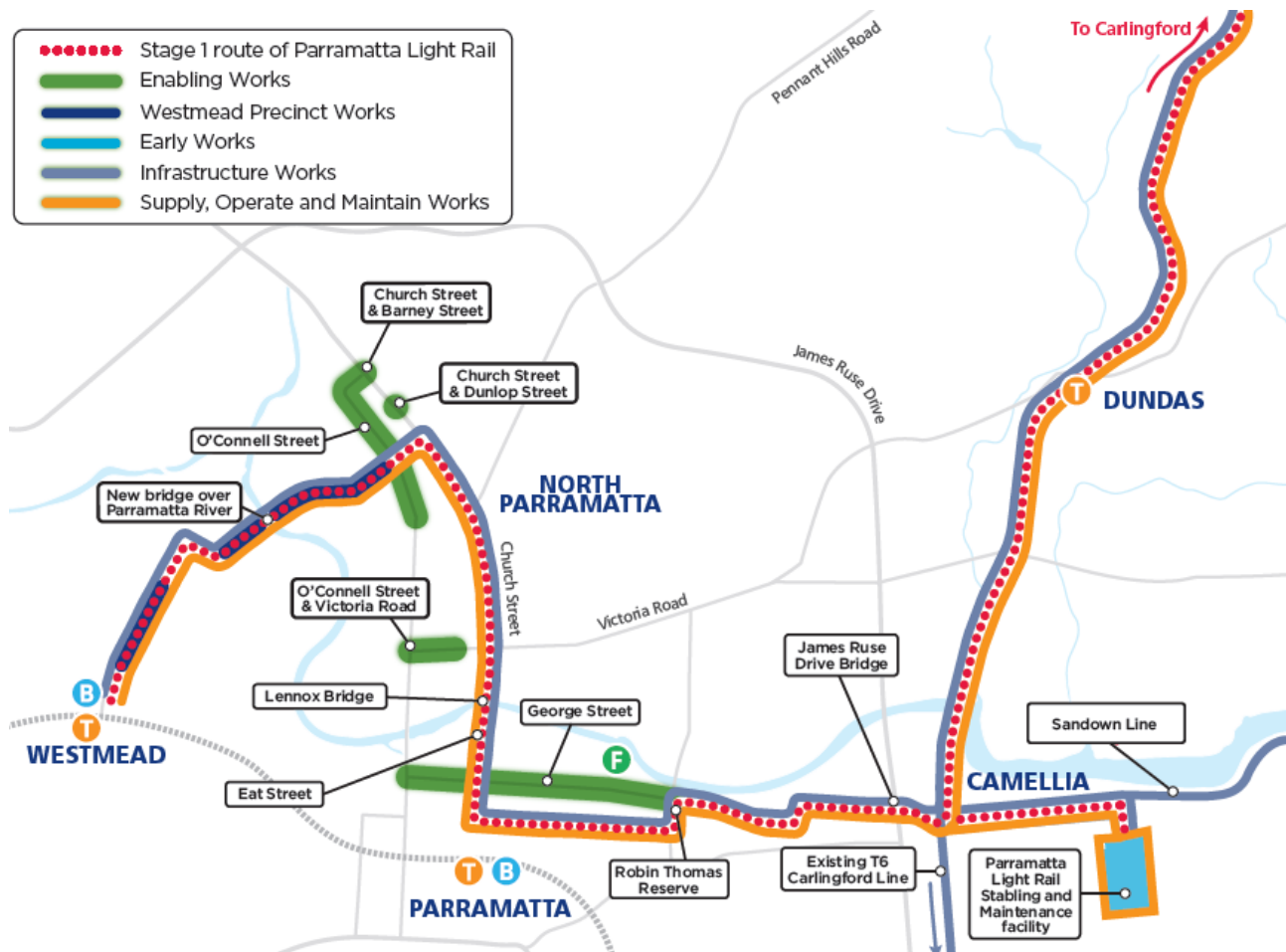


Figure 1-2: Parramatta Light Rail Stage 1 Delivery Strategy

1.3 Infrastructure Works

The CPB Contractors and Downer EDI Works Joint Venture (JV), Parramatta Connect, has been engaged to deliver Package 4 – Infrastructure Works (INF).

In summary the Infrastructure Works include:

- Utility Services adjustment and relocation works (for more than minor impact)
- Property demolition to make space for the light rail tracks and ancillary facilities
- Decommissioning of the existing Carlingford T6 heavy rail line and disused Sandown Line
- Earthworks and retaining structures
- Drainage works
- Intersection signalling works
- The light rail civil infrastructure and Stop slabs
- Urban and architectural design and finishes of the corridor and public domain
- Rail, track slabs, ballasted track and grass tracks
- Footpath and kerb realignment including intersection works and road upgrades to accommodate light rail and other traffic (both temporary and permanent)
- New light rail bridges carrying the light rail over the Parramatta River (at Cumberland Hospital), James Ruse Drive, Vineyard Creek and Kissing Point Road and bridge strengthening and modifications to existing bridges as required

- Provision of the Active Transport Link for pedestrians and cyclists
- Staff and passenger facilities at each light rail terminus
- Rail/road interaction including traffic signals and road sharing
- Testing and commissioning of the Infrastructure Works.

1.4 Relationship with SOM

The Infrastructure Works is closely aligned to the Package 5, Supply, Operate and Maintain (SOM) Works which is being delivered by the Great River City Light Rail consortium. A graphical representation of the split in scope between the two packages is depicted in **Figure 1-3**.

The reasoning for dividing this work into two stages is to ensure that suitably qualified and experienced sub-contractors are in place for each specialised component; civil infrastructure, and operational systems. The Infrastructure Works will deliver the civil infrastructure components of Stage 1 and will not trigger the operational conditions with the exception of those that relate to detailed design.

An interface between the two Joint Ventures has been established to monitor cumulative impacts and the coordination of environmental complaints management, site management controls, and the delineation of incident reporting and non-conformance management. Opportunities to share information, materials and resources will also be explored to support an overall minimisation of heritage impacts.

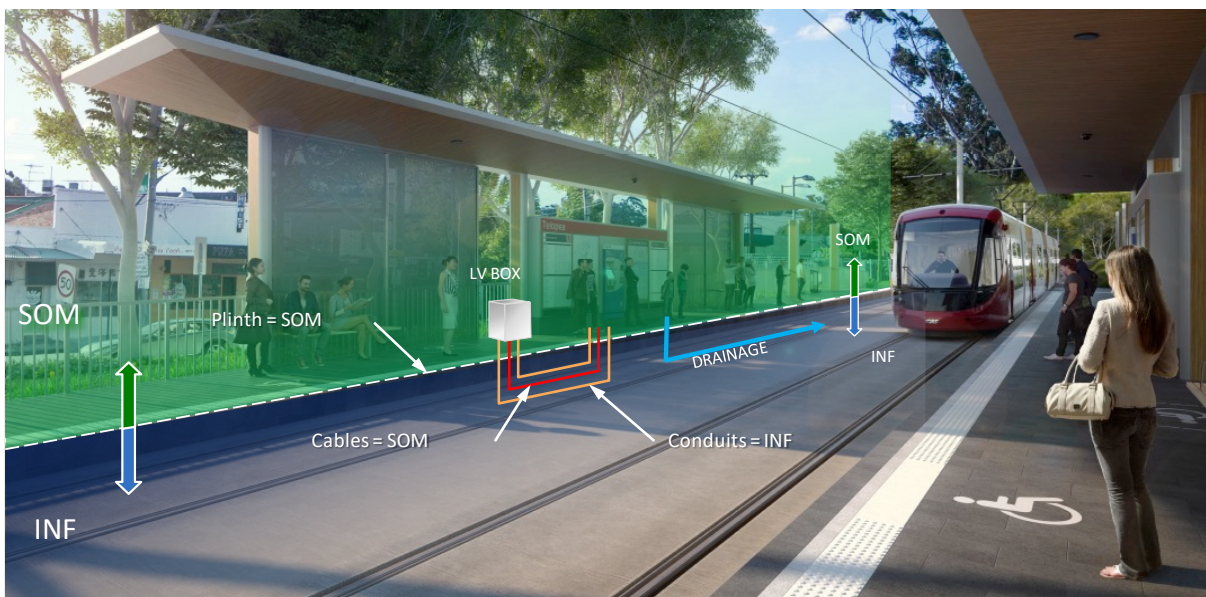


Figure 1-3: Relationship between Infrastructure Works and Supply, Operate and Maintain Works

1.5 Scope of the Sub-Plan

This Sub-plan outlines the mitigation and management measures the CPB Contractors and Downer EDI Works Joint Venture (the JV) will use to address potential air quality impacts and dust management during the design and construction of the Infrastructure Works, while complying with relevant approval, statutory and contract requirements. Sections 3.2, 3.3 and 3.4 provide compliance tables identifying where in this Sub-plan relevant requirements are addressed.

This Sub-plan is applicable to all activities during construction of the Infrastructure Works, including all areas where physical works will occur or areas that may be otherwise impacted by the construction works, and under the control of the JV. All the JV staff and sub-contractors are required to operate fully under the requirements of this Sub-plan and related environmental management plans, over the full duration of the construction program.

1.6 Environmental management systems overview

The environmental management system overview is described in Section 1.5 of the CEMP and detailed in **Figure 1-4**. The environmental management system overview is described in Section 1.5 of the CEMP.

To achieve the intended environmental performance outcomes, CPB have established, implemented, maintained and continually improved an EMS in accordance with the requirements of ISO14001:2015. The CPB EMS will be adopted as the guiding environmental management framework for the Infrastructure Works.

The EMS consists of governance documentation, including Sub Plans, procedures and tools as set out below and illustrated in **Figure 1-4**.

- **The JV Environment and Sustainability Policy.** Outlines the commitments and intentions established by the JV to ensure environmental performance and sustainability objectives and targets are achieved (Appendix A3 of the CEMP).
- **The CEMP.** This document details the processes and procedures to be implemented during the Infrastructure Works to comply with applicable CoA, REMMMs, EPOs, legislative obligations and contractual requirements. The relevant compliance obligations are detailed in **Appendix A1**, with a cross reference to where they are met in this Sub-plan.
- **Environmental Management Sub-plans.** These documents describe procedures and controls for specific environmental aspects requiring more rigorous management strategies.
- **Geographic Information System (GIS).** The GIS incorporate key features of the alignment and relevant environmental constraints. Features include waterways, heritage, biodiversity contamination and sensitive receivers amongst other site relevant features. The GIS forms the basis of Environmental Control Maps (ECMs).
- **Procedures, strategies and protocols.** Detailed procedures for inclusion in work packs.

Key interactions for this Sub-plan with other management plans include:

- Delivery Phase Sustainability Management Plan defines the sustainability targets, addresses the tracking and reporting of air quality including greenhouse gas emissions, and provides detailed strategies to achieve targets
- Energy and Carbon Sub-plan which forms part of the Delivery Phase Sustainability Management Plan defines the greenhouse reduction targets for the construction and operational stages of the project and addresses the Greenhouse Gas (GG-) REMMMs.

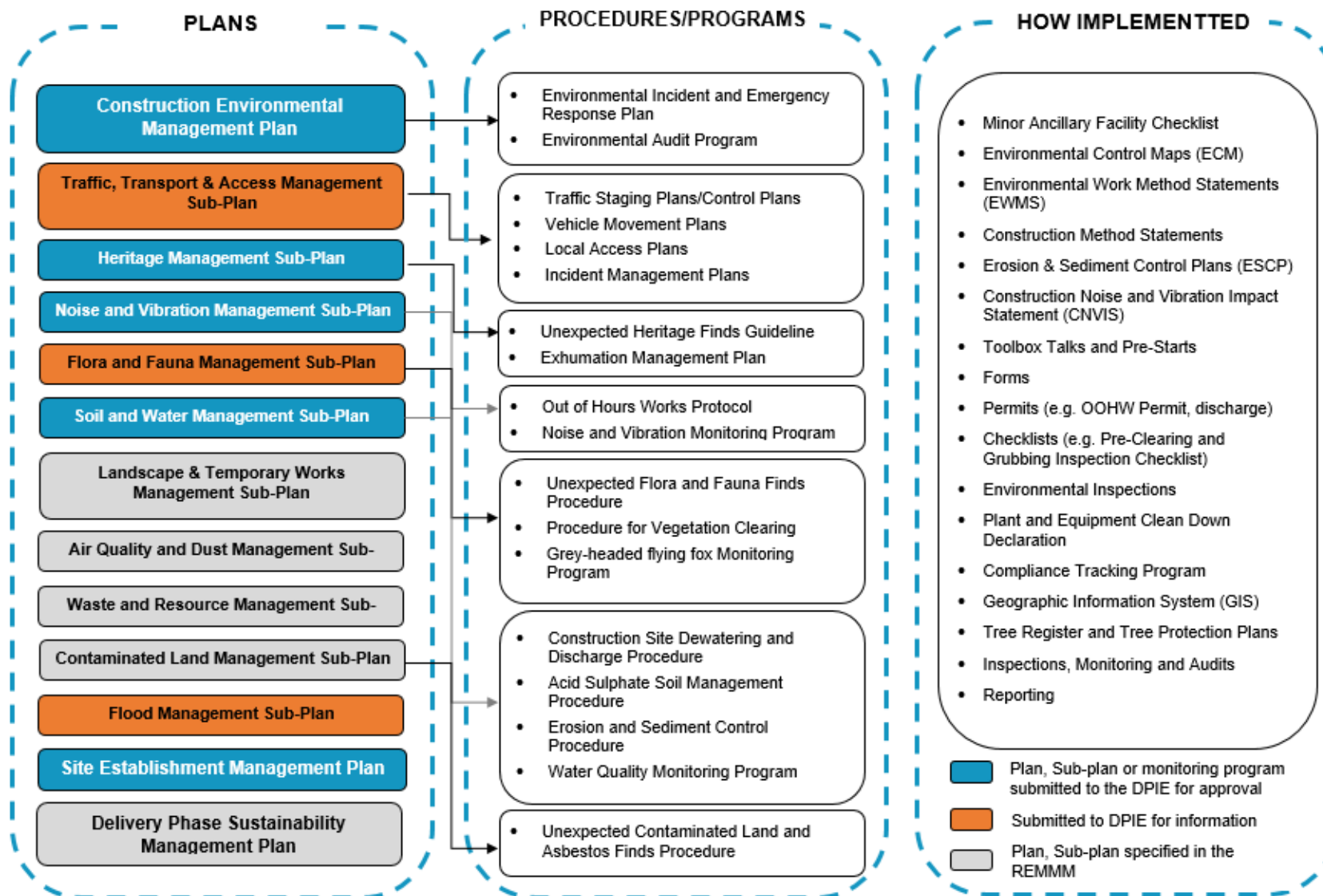


Figure 1-4: Environmental Management System

2 Purpose and objectives

2.1 Purpose

This Sub-plan addresses air quality and dust management for the Project, and the management of impacts to the environment and community. The purpose of this Sub-plan is to describe how (the JV) proposes to manage and protect air quality during construction of the Project. This Sub-plan will address the environmental management and requirements of air quality and dust management from the Project, and will be prepared in consultation with TfNSW.

2.2 Objectives

The key objective of the AQMP is to ensure all CoA, REMMMs and licence/permit requirements relevant to air quality are described, scheduled and assigned responsibility as outlined in:

- Environmental Impact Assessment prepared for Parramatta Light Rail – Stage 1
- Submissions and Preferred Infrastructure Report prepared for Parramatta Light Rail – Stage 1
- Conditions of Approval granted to the project on 29 May 2018 and modifications
- Transport for NSW's Air Quality Management Guideline 9TP-SD-107/3.0
- Project Deed (PLR Stage 1 Infrastructure Contract)
- PLR Sustainability Strategy.

Additional objectives and strategies of the Sub-plan include:

- Identifying and controlling potential dust and air pollutant sources
- Minimising gaseous and particle pollutant emissions from construction activities as far as reasonable and feasible
- Minimising the extent and duration of exposed surfaces (particularly those works that have the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard)
- Air quality monitoring program comprising of visual observations, dust deposition gauges and where appropriate real-time aerosol monitors
- Complying with inspection and monitoring requirements.

2.3 Targets

The following targets have been established for the management of air quality impacts during the project:

- Comply fully with all relevant legislative requirements, CoA, and REMMMs
- Meet environmental protection licence air quality parameters
- Receive no dust related complaints (due to the Project)
- Provide training on best practice air quality management to all construction personnel through site inductions
- Implement all feasible and reasonable mitigation measures to minimise dust emissions on the premises and the release of dust from the premises
- Maintain all plant and equipment in accordance with manufacturer's requirements

- Perform dust monitoring (visual) as part of weekly environmental inspections and as required by site team during construction activities
- Keep dust deposition and real-time aerosol monitoring results below criteria
- Remove any spillage or tracking onto public roadways at the end of each shift.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to air quality and dust management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- Protection of the Environment Operations (Clean Air) Regulation 2010 (POEO (Clean Air) Regulation 2010)
- *National Greenhouse and Energy Reporting Act 2007*.

All legislation relevant to this AQMP is included in Appendix A1 of the CEMP.

3.1.2 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Sub-plan include:

- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline)
- Approved Methods for the Sampling and Analysis of Air Pollutants (DEC 2006)
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC 2016).
- AS 3580.1.1-2007 Methods of Sampling Analysis of Ambient Air. Part 1.1 Guide to Siting Air Monitoring Equipment
- AS 3580.10.1-2003 Methods of Sampling Analysis of Ambient Air. Determination of Particulate Matter – Deposited Matter - Gravimetric Method
- Government Resource Efficiency Policy (OEH 2014)
- Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom 2004) and Volume 2 (DECC 2008) (the “Blue Book”)
- National Environment Protection Councils (NEPC) – National Environment Protection Measure (NEPM) for Ambient Air Quality Guidelines, Commonwealth Department of the Environment, 2016
- IS Technical Manual Version 1.2, Infrastructure Sustainability Council of Australia (ISCA, 2016).

3.1.3 Other references

Additional reference documents relevant to this Sub-plan include:

- Air Toxics Monitoring Program (ATMP) involving the collection of 24 hour-averaged measurements at the Sydney CBD, Rozelle, St Marys and Blacktown from 1996 to 2001
- Ambient Air Quality Monitoring and Fuel Quality Testing Project (AAQMFQTP) where 24 hour-averaged measurements were collected from October 2008 to October 2009 at Turrella and Rozelle.
- How to Safely Remove Asbestos Code of Practice (Safe Work Australia, April 2016)
- National Health and Medical Research Council, 1996. Ambient Air Quality Goals Recommended by the National Health and Medical Research Council
- National Energy Research Development and Demonstration Council, 1988. Air Pollution from Surface Coal Mining: Measurement, Modelling and Community Perception, Project No. 921

- National Energy Research Development and Demonstration Council, 1988. Air Pollution from Surface Coal Mining: Measurement, Modelling and Community Perception, Project No. 921
- Transport for NSW's Air Quality Management Guideline 9TP-SD-107/3.0
- Victoria Government Gazette, 2001. State Environment Protection Policy (Air Quality Management) No. S 240AUSPLUME Gaussian Plume Dispersion Model Technical User Manual, (Victorian Environment Protection Authority 2000)
- Western Sydney Airport Environmental Impact Statement Volume 4 Appendix F1 Local air quality and greenhouse gas, (Pacific Environment Limited, October 2016)
- World Health Organisation, 2000. WHO Air Quality Guidelines for Europe, 2nd Edition.

3.2 Air quality criteria

Relevant assessment criteria for the primary pollutants associated with construction of the project are presented below in Table 3-1. The original sources for each criterion from the Approved Methods are also listed.

These criteria relate to the 100th percentile, total cumulative concentration of pollutants in the air and not just contributions from project-specific sources. In this context, the term '100th percentile' refers to the highest value at a location over a period of analysis. The '99.9th percentile' result is the 99.9th highest value at a location over a given period of analysis.

Ambient pollutant concentrations determined in Table 4-2 must also be considered when evaluating against these criteria.

Table 3-1 Air quality impact assessment criteria

Pollutant	Averaging period	Impact assessment criteria	Source
Dust Emissions			
Particulate matter (PM ₁₀)	24 hours	50 µg/m ³	DoE, 2016
	Annual	25 µg/m ³	DoE, 2016
Particulate matter (PM _{2.5})	24 hours	25 µg/m ³	DoE, 2016
	Annual	8 µg/m ³	DoE, 2016
Total suspended solids (TSP)	Annual	90 µg/m ³	NHMRC, 1996
Deposited dust ^a	Annual (maximum increase)	2 g/m ² /month	NERDDC, 1988
	Annual (maximum total)	4 g/m ² /month	NERDDC, 1988
Airborne asbestos fibres/ml	Daily	0.01 fibres/ml	SafeWork Australia (2016)

Pollutant	Averaging period	Impact assessment criteria	Source
Gaseous Emissions			
Carbon monoxide (CO)	15 minutes	100 mg/m ³	WHO, 2000
	1 hour	30 mg/m ³	WHO, 2000
	8 hours	10 mg/m ³	NEPC, 1998
Nitrogen dioxide (NO ₂)	1 hour	246 µg/m ³	NEPC, 1998
	Annual	62 µg/m ³	NEPC, 1998
Sulfur dioxide (SO ₂)	10 minutes	712 µg/m ³	NHMRC, 1996
	1 hour	570 µg/m ³	NEPC, 1998
	24 hours	228 µg/m ³	NEPC, 1998
	Annual	60 µg/m ³	NEPC, 1998
Greenhouse Gas Emissions			
Volatile organic compounds (VOCs) as benzene	1 hour	29 µg/m ³	VGG, 2001

- a. Dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

3.3 Minister's Conditions of Approval

The CoA relevant to this Sub-plan are listed in Table 3-2. A cross reference is also included to indicate where the condition is addressed in this Sub-plan or other Project management documents.

Table 3-2 Conditions of Approval relevant to the AQMP

CoA No.	Condition Requirements	Document Reference	How Addressed
C4	The CEMP Sub-plans must state how:	-	-
(a)	the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;	Section 2	There were no specific environmental performance outcomes relating to air quality and dust in the documents listed in Condition A1.
(b)	the mitigation measures identified in the documents listed in Condition A1 will be implemented;	Section 3.3 Section 6 Table 6-1 Section 7.2	The air quality initiatives that are identified in the documents listed in Condition A1 are reflected in the air quality management measures and controls listed in Section 6 in Table 6-1. These will be implemented during pre-construction and construction phases of the Project and communicated through the processes described in Section 7.2.
(c)	the relevant terms of this approval will be complied with; and	Section 3.2 Section 7	The terms of this approval are outlined in Table 3-2 and will be complied with through the preparation and implementation of this Sub-plan. Confirmation of compliance with the terms of approval will be undertaken through the processes described in Section 7.

CoA No.	Condition Requirements	Document Reference	How Addressed
(d)	issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Section 5.4 The CEMP Section 6 Table 6-1	Issues that require management during construction are outlined in Section 5.4 as well as their predicted impact. The process for quantitative risk assessment for the Project is outlined in the CEMP Section 1.5.1. CEMP Appendix A2 is the environmental risk register for the construction activities associated with the Project. The risk register is reviewed annually, at minimum, and in response to significant issues, incidents and non-compliances. The management of these risks has been outlined in Section 6 in Table 6-1. These will be implemented during pre-construction and construction phases of the Project.
C5	The CEMP Sub-plans must be developed in consultation with relevant government agencies (including Relevant Council(s)). Details of all information requested by an agency to be included in a CEMP Sub-plan as a result of consultation, including all copies of correspondence from those agencies, must be provided to the Secretary with the relevant CEMP Sub-plan.	Section 3.5	This Sub-plan will be provided to the City of Parramatta Council, EPA and NSW Health for consultation. The results of this consultation will be incorporated and summarised in Section 3.5 and Appendix A.
C6	Any of the CEMP Sub-plans may be submitted along with, or subsequent to, the submission of the CEMP but in any event, no later than one month before construction.	Section 3.5	This AQMP will be submitted to the Secretary for information no later than one month before construction. This is to ensure adequate time is allowed for prior to construction. Details of this and other submission requirements have been incorporated into Section 3.5.

3.4 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed in Table 3-3 below. This includes reference to required outcomes, the timing of when the commitment applies and relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-3 Revised Environmental mitigation and management measures (REMMMs) relevant to this AQMP

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Communication	GEN-1	A construction environmental management plan (CEMP) would be prepared for the construction phase of the project. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in the Environmental Impact Statement, the submissions report, as well as any other relevant statutory approvals (e.g. conditions of approval, licences and permits). The CEMP would outline a framework for the management of environmental impacts during construction, including further details on the following:	Pre-construction	CEMP	The CEMP provides a central mechanism for all potential environmental impacts will be managed. The CEMP outlines the framework for the management of environment impacts. The CEMP has been prepared and will be implemented during construction.
Communication	GEN-1	Air quality and dust management.	Pre-construction	This Sub-plan	The AQMP outlines the air quality and dust management for the Project. This Sub-plan complies with relevant approval, statutory and contract requirements.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Communication	AQ-1	An air quality and dust management plan would be developed and implemented as part of the CEMP. This plan would identify triggers and procedures for dealing with significant dust generating activities, with the aim of minimising impacts on surrounding sensitive receivers. Air quality and dust management measures that would be identified in the CEMP would include:	Construction	This Sub-plan Section 6-1 Section 6-2	This Air Quality and Dust Management Sub-plan has been prepared as a sub-plan to the CEMP. Dust monitoring procedures are provided in Section 6-1. Triggers and procedures for dealing with significant dust generating activities are provided in Section 6-2.
Tracking of material on roads	AQ-1	Apply wheel-wash or rumble grid facilities as appropriate to remove loose material and prevent the tracking of spoil debris onto local roads.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality and dust impacts. These facilities will be installed as appropriate, be identified in ESCP and their use communicated through relevant ECMs, Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ09.
Tracking of material on roads	AQ-1	Clean loose materials and debris from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ10.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Tracking of material on roads	AQ-1	Ensure that all loads are covered when materials are being hauled to and from site.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ24.
Dust management	AQ-1	Ensure that compound area surfaces are well compacted or sealed to limit the potential for dust generation.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Temporary road and other exposed area sealing will be provided, such as spray sealing or the application of crusting or binding agents. This has been included as mitigation measure AQ11.
Dust management	AQ-1	Impose low speeds limits around compound sites to limit the generation of dust from vehicle movements.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. This process will be communicated through Toolbox talks and daily pre-starts and low speeds will be identified on TCP's. This has been included as mitigation measure AQ27.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Dust management	AQ-1	Install dust monitoring devices to quantify dust levels and determine whether control measures are adequate or whether further actions are required.	Construction	Table 6-1 Section 7.3	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Dust monitoring devices will be installed including dust deposition gauges and real-time aerosol monitors. This has been included as mitigation measure AQ03. Dust monitoring is also outlined in Section 7.3.
Dust management	AQ-1	Installation of perimeter screening around areas where there is a potential to generate emissions to air and around long-term compound and stockpile locations.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Perimeter screening will be installed around potential emission generating areas, and long-term compound and stockpile areas. This has been included as mitigation measure AQ05.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Dust management	AQ-1	Plan activities and avoid adversely windy conditions which may result in the generation of off-site dust impacts.	Construction	Table 6-1 Table 6-2	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Activity scheduling will be communicated through Toolbox talks and daily pre-starts, and altered in response to site conditions. This has been included as mitigation measure AQ06. Section 6-2 defines the trigger action criteria.
Dust management	AQ-1	On dry days, unsurfaced haul roads would be watered to aid dust suppression.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ17. Section 6-2 defines the trigger action criteria.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Demolition	AQ-1	Water demolition areas as necessary to minimise the generation of dust.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Water carts and/ or hoses will be used to spray dust generating activities or areas to minimise the potential for dust. The use of these will be communicated through Toolbox talks, daily pre-starts, the relevant ECMs and ESCPs. This has been included as mitigation measure AQ15.
Stockpile management	AQ-1	Position stockpiling areas as far as possible from surrounding receivers.	Construction	Table 6-1	Stockpiling areas will be positioned as far as possible from surrounding receivers. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ12.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Stockpile management	AQ-1	Regularly water exposed and disturbed areas and stockpiles especially during inclement weather conditions.	Construction	Table 6-1 Table 6-2	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality and dust impacts. Water carts and/ or hoses will be used to spray dust generating activities or areas to minimise the potential for dust, particularly during dry and windy weather conditions. The use of these will be communicated through Toolbox talks, daily pre-starts, the relevant ECMs and ESCPs. This has been included as mitigation measure AQ14. Section 6-2 defines the trigger action criteria.
Stockpile management	AQ-1	Stockpiles left for extended periods would be grassed or covered with appropriate material.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Various methods, such as hydro-spraying or covering with plastic or geofabric will be communicated through Toolbox talks, daily pre-starts and ECMs and ESCPs as a means of providing a protective temporary cover against dust erosion. This has been included as mitigation measure AQ18.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Stockpile management	AQ-1	Wherever possible and practical, limit the amount of materials stockpiled, extent of disturbed and exposed surfaces. Restoration of cleared areas is to occur as soon as possible.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ16.
Contamination management	AQ-1	Apply odour supressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts, including the generation of odour. Odour supressing agents will be procured and their use will be communicated through Toolbox talks, daily pre-starts and relevant ECMs. Use of odour suppressing agents for contaminated or hazardous materials will be in accordance with the CLMP. This has been included as mitigation measure AQ30.
Contamination management	AQ-1	Ensure that structures are inspected by a suitably qualified person to confirm that they do not contain any hazardous materials (e.g. asbestos) which could be broken and mobilised during demolition. Where such materials are identified, adhere to the requirements for removal and disposal listed in the Work Health and Safety Act 2011, and Work health and Safety Regulation 2011.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts, including the generation of contaminant laden dust. This process will be communicated through Toolbox talks, daily pre-start and relevant ECMs. This has been included as mitigation measure AQ26.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Equipment maintenance	AQ-1	Conduct routine servicing and maintenance, and subsequent inspections to ensure that equipment continues to operate efficiently.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. This process will be communicated through Toolbox talks and daily pre-starts. This has been included as mitigation measure AQ25.
Equipment maintenance	AQ-1	Construction plant and equipment would be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards.	Construction	Table 6-1 Table 6-2	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. Maintenance and servicing of construction plant and equipment will be regularly undertaken and service logs/ records will be retained onsite. This has been included as mitigation measure AQ31. Section 6-2 defines the trigger action criteria.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Equipment maintenance	AQ-1	All vehicles used on site, for transporting materials to or from site, or for any other activities associated with the project, shall be maintained to avoid the emission of excessive air impurities in accordance with Part 5.8 of the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (Clean Air) Regulation 2010.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. Maintenance and servicing of construction plant and equipment will be regularly undertaken and service logs/ records will be retained onsite. This has been included as mitigation measure AQ32.
Equipment maintenance	AQ-1	All on-road trucks would comply with the relevant Australian emission standards.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. All on-road trucks will comply with the relevant Australian emission standards. Service records/ logs will be retained onsite. This has been included as mitigation measure AQ33.
Storage	AQ-1	Chemical/fuel storage tanks would be fitted with a conservation vent (to prevent air inflow and vapour escape until a pre-set vacuum or pressure develops).	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts. Chemical/fuel storage tanks will be fitted with a conservation vent. This has been included as mitigation measure AQ37.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Storage	AQ-1	All chemicals and fuels would be stored in sealed containers as per appropriate regulations and guidelines.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. All chemicals and fuels will be stored in sealed containers. This process will be communicated through Toolbox talks, daily pre-starts and relevant ECMs. This has been included as mitigation measure AQ34.
Storage	AQ-1	The on-site storage of fuel would be kept to a minimum.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust. Mobile tankers will be used where feasible to limit the onsite fuel storage requirements. This process will be communicated through Toolbox talks and relevant ECMs/ ESCP for each ancillary facility. This has been included as mitigation measure AQ35.

Outcome	Ref #	Commitment	Timing	AQMP Reference	How Addressed
Fuel unloading	AQ-1	Unloading of fuels (diesel or liquefied nitrogen gas (LNG)) would be vented via return hoses that recirculate vapours from delivery to receiver.	Construction	Table 6-1	Table 6-1 details mitigation measures to be undertaken in order to reduce air quality impacts and the generation of dust and excessive emissions. Mobile tankers will be used where feasible to limit the onsite fuel storage requirements. Service logs and records will be checked and copies retained onsite. This has been included as mitigation measure AQ36.

3.5 Stakeholder Consultation

In accordance with the CoA A5, this Sub-plan was developed in consultation with EPA and relevant local Councils and agencies.

This Sub-plan was submitted along with, or subsequent to, the submission of the CEMP, no later than one month before construction.

This consultation is intended to assist in development and finalisation of the Sub-plan. Table 3-4 summarises relevant stakeholder reviews and response to review. Detailed consultation log and response to comments are provided in Appendix A.

Table 3-4 Summary of Consultation and Approval

Agency	Requirement	Status	Response	Date
EPA	No comments	-	-	09/07/19
City of Parramatta Council	Include Asbestos fibre air monitoring	Addressed	Closed	9/08/19
Cumberland Council	No comments	-	-	11/07/19
NSW Health - Cumberland Hospital	No comments	-	-	09/07/19
NSW Health – Westmead Precinct (Sydney Children’s Hospital Westmead)	Dust management	Addressed	Awaiting response	5/08/19

4 Existing Environment

The following sections summarise what is known about factors influencing air quality impacts and management associated with the project, within and adjacent to the Project corridor.

The key reference documents are:

- Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (EIS) Volume 1A – Main document
- Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (EIS) Volume 1B – Main document
- Parramatta Light Rail Transport for New South Wales Air Quality Working Paper – Technical Paper 9 Air Quality.

Ambient air quality throughout the Sydney Basin is influenced by a number of factors, including topography, prevailing meteorological conditions (such as wind and temperature, which vary seasonally) and local and regional air pollution sources (such as motor vehicles, industrial facilities and bushfires). Regional air quality can be highly variable and impacted by events occurring a significant distance away.

4.1 Air quality records

The primary pollutants of concern during construction are dust and particulate matter (PM₁₀, PM_{2.5}) including asbestos fibres and other hazardous materials, nitrogen dioxide (NO₂), carbon monoxide (CO), sulphur dioxide (SO₂), and volatile organic compounds (VOCs).

4.1.1 Quantitative Background Concentrations

The NSW OEH developed a metric known as the 'air quality index' to provide an indication of the overall air quality. The metric considers pollutant data measurements for ozone (O₃), NO₂, CO, SO₂ and particulates (such as PM₁₀ and PM_{2.5}), as well as visibility against criteria presented in the Variation to the National Environment Protection (Ambient Air Quality) Measure and OEH standard for visibility. Air quality index values measured at the nearest NSW OEH ambient air quality monitoring stations at Chullora and Prospect were generally recorded to be 'good' with occasional days of 'fair' to 'poor' air quality or worse, usually driven by particulate matter concentrations. These conditions are considered to be regionally representative of those around Parramatta.

Considering the monitoring data presented in the EIS, the following background concentrations were established for the receiving environment around the project (Table 4-1). It is noted that the 1-hour averaged CO and VOC (as benzene) background concentrations have been approximated using the formula provided in the AUSPLUME Gaussian Plume Dispersion Model Technical User Manual, (Victorian Environment Protection Authority 2000) for estimating sub-hourly concentrations from hourly data. The formula was modified to estimate the 1-hour concentration from the available 8 hours and 24-hour averaged data respectively. The below table includes the pollutant concentration criteria, as detailed in Table 3-1.

Table 4-1 Adopted pollutant background concentrations

Pollutant	Averaging time	Adopted background concentration ^a	Concentration Criteria
Dust Emissions			
PM ₁₀	24 hours	34 µg/m ³	50 µg/m ³
	Annual	19 µg/m ³	25 µg/m ³
PM _{2.5}	24 hours	18 µg/m ³	25 µg/m ³
	Annual	9.0 µg/m ³	8 µg/m ³
Gaseous Emissions			
NO ₂	1 hour	120 µg/m ³	246 µg/m ³
	Annual	25 µg/m ³	62 µg/m ³
SO ₂	1 hour	71 µg/m ³	570 µg/m ³
	Annual	2.1 µg/m ³	60 µg/m ³
CO	1 hour	2.9 mg/m ³	30 mg/m ³
	8 hours	2.0 mg/m ³	10 mg/m ³
Greenhouse Gas Emissions			
Volatile organic compounds (VOCs) as benzene	1 hour	7.9 µg/m ³	29 µg/m ³

a. Summary of ambient pollutant concentrations measured from 2013 to 2016 at Chullora and Prospect, (<https://www.environment.nsw.gov.au/AQMS/search.htm>)

4.1.2 Qualitative Background Concentrations

Table 4-2 outlines the key observations, which can be made regarding the background concentrations for each key pollutant of interest.

Table 4-2 Summary of ambient air quality in relation to concentration criteria

Pollutant	Results
Dust Emissions	
Particulate matter (PM10)	100th percentile (maximum) 24-hour averaged PM10 background concentrations were found to exceed the criterion of 50 µg/m ³ at both monitoring locations in 2013, 2015 and 2016, but were below this criterion in 2014. 95th percentile values of 24-hour averaged concentrations ranged from 29 to 34 µg/m ³ , with the highest value recorded at Prospect in 2016. Annually averaged PM10 background concentrations were consistently 18 to 19 µg/m ³ across all years considered. These levels are below the assessment criterion (25 µg/m ³).

Pollutant	Results
Particulate matter (PM2.5)	100th percentile (maximum) 24-hour averaged PM2.5 background concentrations were generally measured above the criterion of 25 µg/m³, but 95th percentile 24-hour averaged PM2.5 concentrations were below this value, ranging from 14 to 18 µg/m³. Annually averaged PM2.5 background concentrations (8.0 ug/m³ to 9.0 ug/m³) were measured to already be at or exceeding the assessment criterion of 8 µg/m³.
Gaseous Emissions	
Nitrogen dioxide (NO2)	100th percentile one-hour averaged NO2 background concentrations were measured to be well below the assessment criterion (246 µg/m ³) with a maximum value of 120 µg/m ³ recorded at Chullora in 2014. Annually averaged NO2 background concentrations were recorded below the assessment criterion (62 µg/m ³) during all measurements considered.
Sulfur dioxide (SO2)	100th percentile one-hour averaged SO2 background concentrations were found to be well below the criterion of 570 µg/m ³ , with the highest recorded value being 71 µg/m ³ at Prospect in 2015. Annually averaged SO2 background concentrations were measured well below the 60 µg/m ³ criteria.
Carbon monoxide (CO)	100th percentile eight-hour averaged CO concentrations were well below the assessment criterion (10 µg/m ³) during all measurements considered.
Volatile organic compounds (VOCs)	VOCs are not presently measured at any NSW OEH air quality monitoring stations. Two historical studies have previously been completed by the NSW EPA to investigate baseline concentrations of air toxics: Air Toxics Monitoring Program involving the collection of 24-hour averaged measurements at the Sydney CBD, Rozelle, St Marys and Blacktown from 1996 to 2001 Ambient Air Quality Monitoring and Fuel Quality Testing Project where 24-hour averaged measurements were collected from October 2008 to October 2009 at Turrella and Rozelle. During the Air Toxics Monitoring Program study, annual and 24-hour averaged benzene concentrations of 1.4 µg/m³ and 4.2 µg/m³ were measured at St Marys respectively. Annual benzene concentrations of 1.4 µg/m³ were measured at Turrella during the Ambient Air Quality Monitoring and Fuel Quality Testing Project. Using the formula provided in the AUSPLUME Gaussian Plume Dispersion Model Technical User Manual, (Victorian Environment Protection Authority 2000) for estimating sub-hourly concentrations from hourly data, an approximate one-hour averaged background concentration of 7.9 µg/m³ was estimated. This is well below the criterion of 29 µg/m³.

4.2 Local emission sources

Local emissions sources have the potential to release the pollutants listed in Table 4-3. Ambient concentrations of pollutants along the project alignment are expected to be primarily dependent on local and regional weather conditions and the overall local and regional air quality. The primary contributor to air pollutant levels in the vicinity of the project is expected to be emissions from motor vehicles along the road network.

Table 4-3 Local Emission Sources

Dust Emissions
Naturally occurring events such as bushfires and dust storms.
Mineral, metal and chemical wholesaling (at Camellia).
Waste treatment, disposal storage and remediation services (at Camellia, Clyde, Silverwater and Rosehill).
Cement, lime, plaster and concrete product manufacturing (at Camellia and Rosehill).
Recycling (at Camellia).
Domestic activities, such as wood-fired home heaters.
Other construction projects
Other light industrial activities.
Gaseous Emissions
Vehicle exhaust emissions from the existing road network.
Soft drink manufacturing (at Northmead).
Food product manufacturing (at Camellia and Ermington)
Waste treatment, disposal storage and remediation services (at Camellia, Clyde, Silverwater and Rosehill).
Hot mix asphalt manufacturing (at Rosehill and Camellia).
A commercial laundry (at North Rocks).
Mineral, metal and chemical wholesaling (at Camellia).
Recycling (at Camellia).
Petroleum product storage (at Silverwater and Rosehill).
Domestic activities, such as wood-fired home heaters.
Manufacture of home and personal care products (at North Rocks).
Commercial businesses, such as service stations and smash repairs.
Other light industrial activities.
Greenhouse Gas Emissions
Mineral, metal and chemical wholesaling (at Camellia).
A commercial laundry (at North Rocks).
Soft drink manufacturing (at Northmead).
Cement, lime, plaster and concrete product manufacturing (at Camellia and Rosehill).
Commercial businesses, such as service stations and smash repairs.
Recycling (at Camellia).

Greenhouse Gas Emissions	
Waste treatment, disposal storage and remediation services (at Camellia, Clyde, Silverwater and Rosehill).	
Domestic activities, such as wood-fired home heaters. Petroleum product storage (at Silverwater and Rosehill).	
Other light industrial activities.	

4.3 Rainfall and wind

Meteorological conditions are important for determining the direction and rate at which emissions from a source will disperse. The nearest weather station with long-term historical records operated by the BoM is the Parramatta North automatic weather station (AWS) (station number 066124). This station is located approximately 1.5 kilometres to the northeast of the Parramatta North Precinct segment of the project. Table 4-4 displays long-term temperature and rainfall averages recorded at this station from its date of commission in 1967 to December 2016.

Table 4-4 Long-term climate temperature and rainfall data from BoM Parramatta North AWS, (BoM, 2017)

Month	Mean maximum temperature (°C)	Mean minimum temperature (°C)	Mean rainfall (mm)	Mean number of rain days (> 1 mm)
January	28.4	17.6	105.7	9.1
February	27.8	17.6	121.2	9.1
March	26.3	15.8	106.7	9.5
April	23.8	12.9	93.6	7.3
May	20.6	9.9	69.5	7.1
June	17.8	7.6	91.2	7.5
July	17.4	6.3	46.2	5.5
August	19.1	7.1	56.9	5.3
September	21.7	9.4	52.5	5.9
October	24	12	66.7	7.5
November	25.5	14.1	85.5	8.8
December	27.4	16.2	73.6	7.7
Annual	23.3	12.2	973.5	90.3

The data indicates that the project experiences warm and wet summers with mean daily maximum temperatures of around 28 degrees Celsius. Months through winter and the beginning of spring are the coldest and driest periods of the year with average monthly rainfall from July to September of around 52 millimetres (mm) per month.

To determine prevailing wind conditions around the project area, annual and seasonal wind data were reviewed for the years 2013, 2014 and 2015 at the nearby Sydney Olympic Park AWS (no. 066212). Annual and seasonal trends were generally consistent over the three years, with winds blowing from the west northwest most common in autumn and winter, and winds from the east most prevalent in summer and spring. Calm conditions (i.e. wind speeds less than 0.5 metres per second) were most common in autumn and winter; occurring around 26 per cent of the time during these seasons.

4.4 Soil Characteristics

The topography and characteristics of the soil for the Parramatta Light Rail Stage 1 Project are detailed in Section 4.1 of the Soil and Water Management Sub-plan (SWMP).

Soils landscapes along the project alignment are varied, reflecting the influence of the diverse underlying geologies and topography of the study area. However, all substrate across the Project will be dominated by imported materials including road base and rail ballast. A review of the Soil Landscape Series Sheets (Penrith and Sydney) covering the project corridor indicates that soil zones are likely to be highly erodible when exposed, which will contribute to the generation of dust if not appropriately managed.

4.5 Sensitive land uses and receivers

The project alignment traverses a well-established urban environment that contains a wide range of sensitive receivers including:

- Residential properties
- Community facilities (such as a number of schools, university campuses, childcare centres, places of worship and health and medical facilities – including the Westmead health precinct)
- Recreational areas
- Commercial and retail premises.

A number of these receivers are located immediately adjacent to the project alignment. Table 4-5 outlines the sensitive receivers surrounding the project.

Table 4-5 Summary of surrounding sensitive receivers by project precinct

Precinct	Land use type	Location	Approximate distance to project (m)
Westmead	Medical	Westmead Hospital	100 m
		Children's Medical Research Institute	15 m
		The Children's Hospital at Westmead	60 m
		The Heart Centre for Children	30 m
		Cumberland Hospital	Typically, 10 m or further
	Aged Care	Uniting Mayflower Westmead	200 m

Precinct	Land use type	Location	Approximate distance to project (m)
	Place of Worship	Westmead Church – Parramatta Mission	15 m
	Residential	Residents along Hawkesbury Road and Hainsworth Street	Typically, 5 to 15 m
		Residents along Railway Parade, Queens Road, Caroline Street, Helen Street and Jessie Street	Typically, 10 m or further
Parramatta North	Medical	Cumberland Hospital	15 m
		Sydney West Area Health Service	40 m
	Educational	Health Education and Training Institute Higher Education	70 m
		Parramatta North Public School	60 m
		Care Training and Consultants	10 m
	Place of Worship	Redeemer Methodist Church	170 m
		Saint Patrick's Cathedral Parramatta	180 m
	Residential	Residents along Factory Street, Church Street and nearby cross streets (New Street, Fleet Street, O'Connell Street, Galloway Street, Albert Street, Pennant Hills Road and Harold Street)	Typically, 5 to 15 m or further
Parramatta CBD	Educational	Australian Institute of Fitness	90 m
		University of New England Future Campus Parramatta	5 m
		Arthur Phillip High School	10 m
		Parramatta Public School	15 m
		Rowland Hassall School	20 m
		Impact Training Institute	70 m
	Medical	Parramatta Medical Centre	15 m
	Recreational	Prince Alfred Square	15 m
		Robin Thomas Reserve	20 m

Precinct	Land use type	Location	Approximate distance to project (m)
	Place of Worship	Leigh Memorial Church	10 m
		Parramatta Mosque	110 m
		St Ioannis Greek Orthodox Church	60 m
	Residential	Residential/ missed use residential receivers along Church Street, Macquarie Street and George Street as well as nearby cross streets	Typically, 5 to 15 m
Rosehill and Camelia Precinct including Camelia maintenance depot and stabling facility	Recreational	Rosehill Gardens Racecourse	170 m
	Educational	University of Western Sydney Parramatta Campus	30 m
	Place of Worship	Dundas Ermington Uniting Church	170 m
		Sydney Young Nak Presbyterian Church	150 m
	Residential	Residents off Victoria Road	50 m
		Residents off George Street, Alfred Street, Tramway Avenue and associated cross streets	Typically, 10 to 20 m
Carlingford	Educational	Dundas Public School	160 m
		Carlingford West Kindergarten	170 m
	Residential	Residential receivers near the T6 Carlingford Line	Typically, 20 m or further

5 Environmental aspects and impacts

5.1 Construction activities

During construction, potential air quality impacts will be primarily associated with the generation of dust and emissions. Emissions to the atmosphere during construction that could result in adverse impacts to air quality are typically divided into two categories. These are:

- Dust and particulates including asbestos fibres
- Gaseous.

Key aspects of the Project that could result in dust emissions include:

- General earthworks particularly during site establishment
- Vegetation clearing
- Demolition of existing buildings or structures
- Bulk Earthworks and excavation activities
- Drilling
- Operating, crushing, screening and recycling
- Topsoil / material handling including stockpiling, material loading and material haulage
- Surface grading and compaction
- Vehicular movements over unpaved surface (including unsealed access roads)
- Wind erosion of exposed areas and temporary stockpiles
- Tracking of dirt onto roads.

Gaseous emissions which may be generated by construction activities include:

- Vehicle and plant exhaust emissions, which may be excessive if vehicles and plant are poorly maintained or when the engine is under load
- Fugitive emissions, of gases or vapours from pressurised equipment due to leaks and other unintended or irregular releases of gases
- Other odorous emissions, including gases released during excavation, asphaltting and sealing works.

5.2 Factors likely to affect dust generation

During construction, the primary risk to local air quality is the generation of dust. Airborne particulate matter has the potential to cause adverse health (such as potential respiratory effects) or nuisance impacts if not properly managed. Due to the existing urban setting, there is also potential for dust emissions to contain:

- Contaminants mobilised through the disturbance of contaminated soils
- Other hazardous materials, such as asbestos fibres or other hazardous material mobilised through the demolition of existing buildings or structures. These issues will however be managed to avoid any potential impacts through appropriate construction techniques and use of qualified material removal specialists.

The primary sources of dust and dust-generating activities as a result of the project are anticipated to include:

- Earthworks activities during enabling road and service reconfigurations, light rail civil works
- Storage, handling and management of excavated spoil and imported fill materials within the disturbance footprint and at the temporary construction compound areas
- Remediation of excavated materials
- Demolition activities
- Ballast screening, crushing and recycling activities within the Sandown line
- Demolition of existing buildings or structures.

Without the implementation of standard management and mitigation measures, dust emissions from the above activities could result in dust deposition leading to reduced local air quality around the nearest receiver locations.

Dust generation will primarily be limited to construction activities as they progress along the project alignment and will be expected to increase where higher dust generating activities are carried out. Dust emissions will also be expected to increase during unfavourable weather, such as dry windy conditions.

In addition to the inherent risks of specific construction activities creating the potential to generate dust, a number of other environment factors also affect the likelihood of dust emissions. These include:

- Wind direction – determines whether dust and suspended particles are transported in the direction of the sensitive receivers
- Wind speed – governs the potential suspension and drift resistance of particles
- Soil type - more erodible soil types have an increased soil or dust erosion potential
- Soil moisture – increased soil moisture reduces soil or dust erosion potential
- Rainfall or dew – rainfall or heavy dew that wets the surface of the soil and reduces the risk of dust generation.

Wind erosion from exposed surfaces will also generate dust emissions. Erosion rates (generating dust) from exposed surfaces will vary with wind gusts, threshold wind speeds, precipitation events, silt loadings and the number of disturbances that restore the erosion potential. The dispersion of particulate matter will depend on the meteorological conditions present during the works. It is expected that these particulate levels will drop significantly with distance. During unfavourable meteorological conditions, such as dry and windy conditions, particulate emissions may be higher and will require specific corrective measures.

Recycling of ballast from the T6 Carlingford Line will also potentially result in some dust and air quality impacts.

Overall, dust emissions will be comparable to other similar infrastructure projects and the risk of dust impacting on receivers will be readily manageable through standard management and mitigation measures, such as wetting stockpiles and exposed surfaces and minimising dust generating works during adverse weather conditions (refer to Section 6). The risk of mobilising hazardous materials (including contaminants, asbestos fibres or other hazardous materials) will also be adequately managed through standard air quality management planning as detailed in Section 6.

5.3 Factors likely to affect gaseous emissions

5.3.1 Vehicle emissions

Emissions from vehicles will be associated with the combustion of fuel (diesel and petrol) in construction plant, vehicles and machinery. These sources will generate emissions of particulate matter, CO, oxides of nitrogen (NO_x), SO₂ and trace amounts of non-combustible hydrocarbons. The rates of emission and potential impact on surrounding land uses will depend on the number and power output of the combustion engines, the quality of the fuel used, the condition of the engines and the intensity of use.

5.3.2 Fugitive emissions

Fugitive emissions will be expected from fuel and chemicals stored at construction compounds (e.g. LPG, diesel, lubricant oils, cleaning chemicals). These emissions are anticipated to be minor and will be readily manageable through the application of standard management and mitigation measures.

5.3.3 Other odorous emissions

Factors likely to affect odour and gas release during works include:

- Excavations of organic or contaminated materials
- Asphaltting and bitumen sealing works.

5.4 Air Quality Impacts

Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment.

5.4.1 Impacts of dust generation

Potential impacts from construction might include:

- Deposition of dust on surfaces where it may cause damage and/or lead to a need for increased cleaning or repair
- Aesthetic effects that arise from visible airborne dust plumes and from deposits of dust on surfaces
- Need for increased maintenance of air filtering systems (e.g. air conditioners etc.)
- Potential adverse health effects including eye, nose and throat irritation from excessive inhalation of fine particles or airborne asbestos fibres
- Impacts on water quality and/or vegetation health from dust deposition
- Impacts on residential sensitive receivers, including impacts on living areas, swimming pools and general amenities
- Complaints from the public relating to dust.

Measures proposed to implement to manage construction air quality impacts are listed in Section 6.

5.4.2 Impacts of gaseous emissions

Gaseous emissions from plant and equipment along the works corridor will be intermittent and transient in nature. Given the anticipated duration of works at any given location, the likely number of emission sources, the staging of construction, and scheduling of activities (i.e. not all machinery will be operating in the same location simultaneously), gaseous emissions will be manageable through the implementation of standard management measures. All vehicles used on site, for

transporting materials to or from site, or for any other activities associated with the project, will be maintained to avoid the emission of excessive air impurities in accordance with Part 5.8 of the POEO Act 1997 and the POEO (Clean Air) Regulation 2010.

Measures proposed to implement to manage construction air quality impacts are listed in Section 6.

6 Environmental mitigation and management measures

6.1 Air quality control measures

Key mitigation measures to manage air quality impacts during the construction phase of the Project are outlined in Table 6-1.

Table 6-1 Air Quality management and mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ01	All site personnel will undertake a project induction in relation to their role and responsibilities and identifying and managing risk of impacts to air quality during construction.	Site induction	Construction	Environment and Sustainability Manager	REMMM GG-3
Dust management					
AQ03	Dust monitoring devices will be installed to quantify dust levels and determine whether control measures are adequate or whether further actions are required. The dust monitoring program is outlined in Section 7.3.	Dust monitoring devices	Construction	Environment and Sustainability Manager	REMMM AQ-1 TfNSW Air Quality Management Guideline (9TP-SD-107)
AQ04	When construction works are stood down for an extended period (e.g. Christmas break), soil stabilisers or similar controls will be applied to reduce impacts of offsite nuisance dust as required.	ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ05	Boundary fencing that incorporates screening will be installed around areas where there is a potential to generate emissions to air and around long-term compound, ancillary facilities and stockpile locations.	ECM ESCP	Construction	Environment and Sustainability Manager / Construction Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ06	Activities will be planned and adversely windy conditions, which may result in the generation of off-site dust impacts, will be avoided. Seasonal variation in wind strength, with lighter winds during winter/spring, will also be considered when scheduling works. Refer to the Trigger Action Response Plan in Section 6-2 for action criteria.	Review of BoM local forecasts	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ07	Prevailing wind direction will be considered when planning works.	Review of BoM local forecasts ECM ESCP	Construction	Environment and Sustainability Manager Site Superintendent and Supervisors deliver at pre-starts.	REMMM AQ-1
AQ08	All site personnel will be informed of any impending inclement weather conditions and the possibility and potential for changed work activities.	Pre-start talks and weekly notification to the Construction Team	Construction	Environment and Sustainability Manager	REMMM-AQ1
AQ09	Wheel-wash and/or rumble grid facilities will be applied/installed at all site access gates where loose material/spoil is being transported by trucks to remove loose material and prevent the tracking of spoil debris onto local roads.	Wheel-wash and/or rumble grid facilities ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ10	Loose materials and debris will be cleaned from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	Wheel-wash and/or rumble grid facilities ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ11	Temporary road, compounds and other exposed area sealing will be provided, such as spray sealing or the application of crusting or binding agents. Compound area surfaces will be well compacted or sealed to limit the potential for dust generation.	Spray sealing / crusting or binding agents ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ12	Stockpiling areas will be positioned as far as possible from surrounding receivers.	ECM ESCP	Construction	Site Superintendent, Site Engineers. Environment and Sustainability Manager	REMMM AQ-1
AQ13	Relevant construction plant will have effective watering systems to suppress dust during works, particularly for rock hammering, cutting, profiling and breaking, and crushing, grinding and sorting.	Pre-commencement vehicle /plant assessment ECM Water sprays / Sprinkler systems	Construction	Construction Manager, Site Superintendent. Environment and Sustainability Manager	TfNSW Air Quality Management Guideline (9TP-SD-107)
AQ14	Exposed and disturbed areas, surfaces and stockpiles, including haul roads, will be regularly watered using water sprays or sprinkler systems, especially during inclement weather conditions.	Water sprays / Sprinkler systems Water Cart ECM ESCP	Construction	Site Superintendent, Site Engineers. Environment and Sustainability Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ15	Demolition areas will be watered as necessary to minimise the generation of dust.	Water sprays / Sprinkler systems Work Method Statements ECM ESCP	Construction	Site Superintendent, Site Engineers. Environment and Sustainability Manager	REMMM AQ-1
AQ16	Wherever possible and practical, the amount of materials stockpiled and, extent of disturbed and exposed surfaces will be limited. Restoration of cleared areas will occur as soon as possible.	ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ17	On dry days, unsurfaced haul roads will be watered by water cart to aid dust suppression. In addition, on days when wind exceeds 25km/h excavation will be restricted and all stockpiles covered, if wind exceeds 50km/h restrict loading into trucks, and if wind exceeds 60 km/h activities will be reduced to vehicular movements only, all stockpiles covered and biodegradable sealant applied to loose soil areas. Refer to the Trigger Action Response Plan in Section 6-2 for action criteria.	Water sprays / Sprinkler systems Water Cart ECM BoM local forecasts Wind gauge	Construction	Site Superintendent, Site Supervisors. Environment and Sustainability Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ18	The number of stockpiles onsite will be minimised and stockpiling in exposed areas will be avoided if practicable. Long-term stockpiles (>20 days) will be stabilised with grasses or appropriate (long-term) biodegradable soil binding material.	Stockpile covers e.g. grasses ECM ESCP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ19	Exposed areas on completion of different work stages will be progressively rehabilitated as early as possible including providing temporary cover and commencing permanent landscaping.	Rehabilitation using temporary cover ECM	Construction	Environment and Sustainability Manager	AQMG Section 6.2.
AQ20	Stabilised site access and clean roads and access points will be provided as required.	SEMP ECM	Construction	Environment and Sustainability Manager	AQMG Section 6.2.
AQ21	Existing vegetation and topsoil (including seed banks) will be retained wherever possible and stockpiled with stabilisation or covered as appropriate.	ECM ESCP LTWMP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ22	Topsoils and ground cover will be replaced following ground disturbance as soon as practical and/or during landscaping activities and rehabilitation phase.	ECM ESCP LTWMP	Construction	Site Engineer, Superintendent. Environment and Sustainability Manager	REMMM AQ-1 and SG-3
AQ23	Landscaping of completed works will be carried out as soon as possible after works completion to assist in limiting dust levels and assist in reestablishment.	ECM ESCP LTWMP	Construction	Site Engineers. Environment and Sustainability Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ24	All trucks and vehicles transporting soils, rock, other materials or any other load will be covered when materials are being hauled to and from site.	Site Inspection of covered tailgates	Construction	Superintendents, Site Supervisors. Environment and Sustainability Manager	REMMM AQ-1
Gaseous Emissions Management					
AQ25	Routine servicing and maintenance will be conducted, alongside subsequent inspections, to ensure that equipment continues to operate efficiently.	Pre-commencement vehicle /plant assessment. Servicing and Inspection logs	Construction	Construction Manager	REMMM AQ-1
AQ26	Structures and unanticipated finds (below ground level) will be inspected by a suitably qualified person to confirm that they do not contain any hazardous materials (e.g. asbestos) which could be broken and mobilised during demolition. Where such materials are identified, the requirements for removal and disposal as listed in the <i>Work Health and Safety Act 2011</i> , and Work health and Safety Regulation 2011 will be adhered to. Upon being loaded onto vehicles for removal, the requirements of the POEO Act 1997 also apply, until deposition at licensed waste facility.	A suitably qualified Hygienist Pre-demolition inspections Unexpected finds procedure	Construction	Construction Manager, Health and Safety Manager. (for Health aspects) Environment and Sustainability Manager (for transport and disposal aspects)	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ27	Vehicles and mobile plant will use designated haulage and access routes. Low speed limits (10km/hr) will be imposed in compound sites to limit the generation of dust from vehicle movements.	TTAMP	Construction	Environment and Sustainability Manager	REMMM AQ-1
AQ28	Waste generated will be removed from site for disposal at an appropriate licensed waste management facility at regular intervals to minimise offsite odour impacts.	WRMP	Construction	Environment and Sustainability Manager	Best practice
AQ29	No burning of vegetative or other waste material to be carried out to prevent air quality impacts through smoke emissions.	Project training (induction, toolbox, prestart or specific training)	Construction	Environment and Sustainability Manager	TfNSW Air Quality Management Guideline (9TP-SD-107)
AQ30	Odour suppressing agents will be applied to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works.	Odour suppressing agents ECM	Construction	Environment and Sustainability Manager	REMMM AQ-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ31	Construction plant and equipment will be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards.	Pre-commencement vehicle /plant assessment. Service logs TfNSW Air Emission Data Collection Workbook (9TP-FT-439) TfNSW Air Quality Management Guideline (9TP-SD-107)	Construction	Construction Manager, Procurement Manager/Contract Administrators.	REMMM AQ-1 National Environment Protection Councils (NEPC) – National Environment Protection Measure (NEPM) for Ambient Air Quality Guidelines
AQ32	All vehicles and plant will be maintained in accordance with manufacturer specifications.	Pre-commencement vehicle /plant assessment. Service logs Manufacturer specifications	Construction	Construction Manager, Plant Manager.	TfNSW Air Quality Management Guideline (9TP-SD-107)

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ32	All vehicles used on site, for transporting materials to or from site, or for any other activities associated with the project, will be maintained to avoid the emission of excessive air impurities in accordance with Part 5.8 of the POEO Act and the Protection of the Environment Operations (Clean Air) Regulation 2010.	Pre-commencement vehicle /plant assessment. Service logs Vehicle maintenance register	Construction	Construction Manager and Procurement Managers. Plant Manager to verify.	REMMM AQ-1 Part 5.8 of the POEO Act 1997 and the POEO (Clean Air) Regulation 2010.
AQ33	All on-road trucks will comply with the relevant Australian emission standards.	Pre-commencement vehicle /plant assessment. Service logs Vehicle maintenance register	Construction	Procurement Manager and Plant Manager. Environment and Sustainability Manager	REMMM AQ-1 Australian emission standards
AQ34	All chemicals and fuels will be stored in sealed containers as per appropriate regulations and guidelines.	TfNSW Chemical Storage & Spill Response Guideline (9TP-SD-066). ECM ESCP	Construction	Construction Manager, Site Engineers. Environment and Sustainability Manager	REMMM AQ-1 AS 1940 The Storage and handling of flammable and combustible liquids

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
AQ35	The on-site storage of fuel will be kept to a minimum.	Project training (induction, toolbox, prestart or specific training) ECM ESCP	Construction	Construction Manager Environment and Sustainability Manager	REMMM AQ-1
AQ36	Unloading of fuels (diesel or liquefied nitrogen gas (LNG)) will be vented via return hoses that recirculate vapours from delivery to receiver.	Vent system (i.e. return hoses) Pre-commencement vehicle /plant assessment	Construction	Site Superintendent. Environment and Sustainability Manager	REMMM AQ-1
AQ37	Chemical/fuel storage tanks will be fitted with a conservation vent (to prevent air inflow and vapour escape until a pre-set vacuum or pressure develops).	Confirm presence of conservation vent during Pre-commencement vehicle /plant assessment	Construction	Construction Manager, Superintendent.	REMMM AQ-1

6.2 Trigger, Action and Response Plan

The Trigger, Action and Response Plan (TARP) outlined in Table 6-2 provides an outline of remedial actions and responses for dealing with significant dust generating activities.

Table 6-2 Air Quality Trigger, Action and Response Plan

Source	Trigger Criteria	Action Response	Responsibility
Weather forecast	Wind forecast to exceed 25km/hr Temperate forecast to exceed >30°C	Notification to site crews Review availability of controls Review planned works	Environmental Coordinator
	Wind forecast to exceed 50km/hr	Restrict earthworks and loading of trucks with spoil Minimise vehicular movements on unsealed surfaces All stockpiles covered and biodegradable sealant applied to loose soil areas	Site Supervisor
Weather Observation	Wind observations exceed 25km/hr	Notification to site crews Complete Visual Observations	Environmental Coordinator
	Wind observations exceed 50km/hr	Restrict earthworks and loading of trucks with spoil Minimise vehicular movements on unsealed surfaces	Site Supervisor
	Wind observations exceed 60km/hr	Activities will be reduced to vehicular movements only	Site Supervisor
Site Inspection / reviews	Areas of unsealed, broken ground	Apply soil-binding polymer / hydroseed / cover with plastic or geofabric	Site Supervisor
	Long term stockpile (greater than 20 days)	Apply soil-binding polymer / hydroseed / cover with plastic or geofabric	Site Supervisor

Source	Trigger Criteria	Action Response	Responsibility
	Mud tracking on roads / access points	Sweep street by the end of each shift Review adequacy of access point controls	Site Supervisor
Visual Observations	Dust being generated on site as a result of active works	Review controls Increase frequency of water application	Site Supervisor
	Release of dust from the premises a result of active works (incident)	Stop works Notify Environmental Coordinator Review controls Increase frequency of water application Report incident	Site Supervisor
	Dust being generated on site with no active works	Review controls Apply ground cover within current or next shift (e.g. soil-binding polymer / hydroseed / cover with plastic or geofabric) or as soon as practical. At contaminated sites, apply water immediately and apply ground cover as soon as conditions allow.	Site Supervisor

Source	Trigger Criteria	Action Response	Responsibility
	Release of dust from the premises with no active works (incident)	Assess opportunity for preventative actions e.g. water application) Notify Environmental Coordinator Apply ground cover on next shift e.g. soil-binding polymer / hydroseed / cover with plastic or geofabric. At contaminated sites, apply water immediately and apply ground cover as soon as conditions allow. Report incident	Site Supervisor
Plant Inspections	Continuous visible vehicle / plant / equipment emissions for longer than 10 seconds.	Turn off vehicle / plant / equipment Quarantine until maintenance service completed	Plant Operator Site Supervisor
Dust Deposition Data	4 g/m ² /month	Review controls Increase ground cover (where practicable)	Site Supervisor
Aerosol Monitoring	Average PM ₁₀ >100µg/m ³ for consecutive 15-minute periods	Stop works Review controls Increase frequency of water application Report incident	Environmental Coordinator and Site Supervisor
Asbestos fibre air monitoring	0.01 fibres/ml	Notify workforce Health Screenings Review of adequacy of controls	Occupational Hygienist

Source	Trigger Criteria	Action Response	Responsibility
Community Complaint relating to air quality	Any complaint	Visual inspection Review controls Assess opportunity for preventative actions e.g. water application, additional ground cover	Environmental Coordinator and Site Supervisor
Incidents / non-compliance	Release of dust from the premises	Notify Environmental Coordinator Environmental Incident Report Assess if Pollution Incident Response Management Plan is triggered and if so notify EPA	Site Supervisor Environmental Coordinator

7 Compliance management

7.1 Roles and responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.3 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Sub-plan.

Key roles with relevant to the management of air quality are identified in Table 7-1.

Table 7-1 Roles and Responsibilities

Role	Authority and Responsibility
Environment and Sustainability Manager	• Monthly Environmental Monitoring Report • Quarterly Environment Report (Compliance Tracking Program) • Annual Environment Report
Environmental Coordinators / Graduate	• Weather forecasts • Weather observations • Weekly Inspections • Monthly Review of Dust Control Measures • Dust Deposition Monitoring • Real time aerosol dust monitoring
Superintendent	• Provide resources required for the effective management of air quality (water trucks, street sweepers, rumble grids/ wheel wash, soil binding polymers).
Site Supervisors	• Visual surveillance of dust • Daily visual observations • Modify or cease work activities in response to air quality issues
Plant operators	• Daily Plant Inspections
All personnel	• Comply with the measures outlined in this Sub-plan • Stop works and notify Site Supervisor if dust control measures are unable to minimise dust and prevent dust from leaving the premises.
Occupational Hygienist	• Asbestos fibre air monitoring • Display of daily reports from the previous day on site safety notice boards.

7.2 Training

All employees, contractors and utility staff working on site will undergo site induction training relating to air quality and dust management issues. The induction training will address elements related to air quality management including:

- Existence and requirements of this Sub-plan
- Relevant legislation
- Roles and responsibilities for air quality management
- Air quality mitigation and management measures
- Procedure to be implemented in the event of an incident (e.g. release of dust or gaseous emissions from site).

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in air quality management. Examples of training topics include:

- ESCP and ERSED control installation methodology
- Planning and preparedness for high wind events / dust risk periods
- Lessons learnt from dusty periods, incidents and other event, e.g. low rainfall / high wind.
- Burning of vegetative or other waste material
- On-site storage of fuel
- Management of emissions
- Energy efficient construction practices
- Energy efficient work practices.

Further details regarding staff induction and training are outlined in Section 3.4 of the CEMP.

7.3 Monitoring and inspection

Monitoring and Inspections requirements relevant to the air quality are identified in Table 7-2.

7.4 Reporting

Reporting requirements relevant to the air quality are identified in Table 7-3.

7.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Sub-plan, CoA and other relevant approvals, licenses and guidelines. Audit requirements are detailed in Section 3.8.4 of the CEMP.

7.6 Licences and permits

Environment Protection Licence requirements are identified in Attachment A1 of the CEMP and will apply to this Project in relation to air quality management. No additional permits or licences are expected to be required in relation to the management of air quality on the Project.

Table 7-2 Inspection and Monitoring Requirements

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Weather forecasts	Monitoring of weather forecasts to determine when adverse weather conditions are predicted. Specific notifications will be made if: - Winds >25 km/hr and/or - Temperatures >30°C are forecast.	Construction	Weekly forecast Daily updates when adverse weather is predicted	Environmental Coordinator / Graduate	Email alerts Pre-starts
Weather observations	Weather observations from the Parramatta BoM Parramatta North AWS. A wind speed gauge that can provide wind velocity alerts will be kept on site to identify periods when activities may need to be restricted or additional mitigation implemented.	Construction	Continual	Environmental Coordinator / Graduate	Monthly Environmental Monitoring Report
Visual surveillance of dust	No visible dust emissions during activities with high potential to produce dust and during prolonged dry or windy conditions	Construction	Continual	Site Supervisors	Report by exception in Daily Diary Notification of issues / incidents / non-compliance to Environmental Coordinator

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Daily visual observations	Site observations that: • No visible dust emissions from site • Minimise gaseous emissions. • No continuous visible vehicle/plant/equipment emissions for longer than 10 seconds. • No mud tracking off-site • Dust controls (e.g. watering down of materials, temporary coverage of exposed areas) are being implemented and are working effectively • Awareness of impending weather.	Construction	During any works	Site Supervisors	Report by exception in Daily Diary Notification of issues / incidents / non-compliance to Environmental Coordinator
Weekly Inspections	Inspection of the environmental controls and implementation of the air quality mitigation measures outlined in Table 6-1.	Construction	Weekly	Environmental Coordinator & Site Supervisor	Weekly Environmental Inspection Checklist ER Inspection Report
Daily Plant Inspections	Inspections to ensure that plant and equipment is operating efficiently. No continuous visible vehicle / plant / equipment emissions for longer than 10 seconds	Commencement of each shift	Daily	Plant operators Site Supervisors	Plant and vehicle inspection logs

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Dust Deposition Monitoring	Dust Deposition Gauges (DDGs) will be used to assess the deposited matter on a continuous, monthly basis. DDGs will be exposed for 30 days ($\pm$ 2 days) and will be analysed for Total Insoluble Matter (Solids) (TIM). Suitable for the Carlingford precinct only and 13A Grand Ave where broad scale earthworks are required.	Pre-construction to establish baseline Construction	Monthly	Environmental Coordinator	Monthly Environmental Monitoring Report
Real time aerosol dust monitors	Real time aerosol dust monitors with SMS capabilities to allow real time access to data will be used in Westmead and North Parramatta and Parramatta CBD precincts between active work front and sensitive receivers (refer to Table 4-5).	If weather forecasts or visual observations identify activities near sensitive receivers that pose risk of generating dust offsite.	Daily	Environmental Coordinator	Monthly Environmental Monitoring Report
Asbestos fibre air monitoring	Portable battery-operated air monitors to demonstrate that asbestos fibres are not present in detectable concentrations, and that there is no risk of exposure to employees or the general public within the area and neighbouring properties during removal works.	During any works involving disturbance of asbestos	Daily	Occupational Hygienist	Daily reports from the previous day to be displayed on site safety notice boards

Table 7-3 Reporting Requirements

Report	Scope	Timing	Frequency	Responsibility	Submission
Monthly Environmental Monitoring Report	Summary of months: • Weather observations • Key dust control measures and actions • Dust Deposition Monitoring • Real time aerosol dust monitors • Asbestos fibre air monitoring • Issues / incidents / non-compliances	Within seven days of the end of the reporting period	Monthly	Environment and Sustainability Manager	TfNSW IC EPA Made publicly available
Quarterly Environment Report (Compliance Tracking Program)	Compliance reporting against the Planning Approval and CEMP including the requirements identified in this Plan (Table 3-2 and Table 3-3).	Within seven business days after the relevant quarter end	Quarterly	Environment and Sustainability Manager	TfNSW IC
Annual Environment Report	Annual review of the monitoring and reporting requirements of the CEMP Sub-plans including this Sub-plan.	Within ten business days after the end of the relevant calendar year	Annually	Environment and Sustainability Manager	TfNSW IC
Asbestos fibre air monitoring reports	Daily reports from the previous day to be displayed on site safety notice boards	During any works involving disturbance of asbestos	Daily Reporting to be provided within 24hrs	Occupational Hygienist	Site safety notice boards

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Sub-plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

8.2 AQMP update and amendment

The processes described in Section 3.8 to Section 3.12 of the CEMP may result in the need to update or revise this Sub-plan. This will occur as needed.

Only the Environment and Sustainability Manager, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated Sub-plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.10.2 of the CEMP.

Appendix A

Consultation Evidence

Parramatta Light Rail – Stage 1

July 2019

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Table A- 1: Log of consultation with City of Parramatta Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19&20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 17:36	Email	Issue of Air Quality and Dust Management Sub-plan for review.
In	05/07/19, 17:01	Email	Response to Air Quality and Dust Management Sub-plan review with comments register.
Out	16/07/19 17:27	Email	Return of updated comments register confirming that recommendations had been incorporated into the plan.
In	9/08/19, 16:53	Email	Response confirming that City of Parramatta Council is satisfied with the response to the comments.

Table A- 2: Log of issues raised by City of Parramatta Council as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	The Trigger, Action Response Plan in Section 6.2 does not address action taken when/if trigger levels are exceeded during asbestos fibre air monitoring	Comment has been incorporated into the next revision of the AQMP. Asbestos fibre air monitoring added to the Trigger, Action Response Plan.	Section 6.2

Table A- 3: Log of consultation with Cumberland Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Air Quality and Dust Management Sub-plan for review.
In	11/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Air Quality and Dust Management Sub-plan.
Out	16/07/19 19:41	Email	Email requesting confirmation that Cumberland Council has no feedback on the Air Quality and Dust Management Sub-plan
In	17/07/19 9:11	Email	Email confirming that that Cumberland Council has no feedback on the Air Quality and Dust Management Sub-plan.

Table A- 4: Log of consultation with EPA as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended)
Out	21/06/19, 18:40	Email	Issue of Air Quality and Dust Management Sub-plan for review.
In	09/07/19, 17:21	Email	Response to CEMP and Sub-plan review received. No comments provided for the Air Quality and Dust Management Sub-plan.

Table A- 5: Log of consultation with Health NSW – Cumberland Hospital as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Air Quality and Dust Management Sub-plan for review.
Out	26/06/19	Meeting	The USB memory stick delivered with full CEMP, each sub-plan, SEMP and briefing sessions presentation.
In	11/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Air Quality and Dust Management Sub-plan review.

Table A- 6: Log of consultation with Health NSW – Westmead Precinct (Sydney Children’s Hospital Westmead) as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19& 20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Air Quality and Dust Management Sub-plan for review.
Out	10/07/19 11:02	Email	Request for comments or update on when comments may be received.
Out	17/07/19 20:03	Email	Request for comments or update on when comments may be received.
In	29/07/19 17:27	Email	Response with comment on the Air Quality and Dust Management Sub-plan
Out	5/08/19 12:53	Email	Return of updated comments register confirming that recommendations had been incorporated into the plan.
In			Confirmation that feedback on the Air Quality and Dust Management Sub-plan has been adequately addressed.

Table A-7: Log of issues raised by Health NSW – Westmead Precinct (Sydney Children’s Hospital Westmead) as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	Dust management, the dust management strategies are noted. The management of dust around a health facility is very important as dust presents a risk to health, especially for those with low immunity. We look forward to details and regular reporting.	Parramatta Connect recognise the importance of dust management within the vicinity of the SCHW and continue to engage on this matter.	N/A

For more information about the Parramatta Light
Rail project, visit Parramattalightrail.nsw.gov.au

Call: 1800 139 389

Email: Parramattalightrail@transport.nsw.gov.au



Appendix B

Environmental Representative Endorsement

Parramatta Light Rail – Stage 1

July 2019



26 November 2021

Transport for NSW

Attention to: [REDACTED]
Senior Manager Environment
Parramatta Light Rail
130 George St, Parramatta, NSW 2150

**Review of Appendix B7 - Air Quality and Dust Management Sub-Plan.
Infrastructure Works Stage 1 - Parramatta Light Rail
(PLR1INF-CPBD-ALL-AH-PLN-000001 Rev 5)**

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the updated document, Appendix B7 - Air Quality and Dust Management Sub-Plan. Infrastructure Works Stage 1 - Parramatta Light Rail (PLR1INF-CPBD-ALL-AH-PLN-000001, Rev 5), dated 26/11/2021, updated by Parramatta Connect, for consistency with the requirements of the Conditions of Approval.

The amendments to the aforementioned document are noted as either editorial in nature or are minor amendments that do not increase the type or magnitude of impact on the environment and are therefore approved in accordance with Condition of Approval C8. The document remains consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

Yours sincerely,

Australian Quality Assurance & Superintendence Pty Ltd (AQUAS)

A handwritten signature in black ink, appearing to be 'John'.

[REDACTED]

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For more information about the Parramatta Light Rail project, visit Parramattalightrail.nsw.gov.au

Call: 1800 139 389

Email: Parramattalightrail@transport.nsw.gov.au

