

Appendix B1

Traffic, Transport and Access Management Sub-Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1

April 2020

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Parramatta Light Rail – Stage 1

Portion 2 Early Works (Package 3) – Staging Report (CoA 13)

Document Control

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04	30/04/20	TfNSW Comments		

Glossary / Abbreviations

Abbreviation	Expanded text
ATC	Australian Turf Club
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CoA	NSW Minister for Planning Conditions of Approval
CSSI	Critical Stage Significant Infrastructure
DP&E	NSW Department of Planning and Environment
the EIS	<i>Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017</i> Environmental Impact Statement
ECM	Environmental Control Maps
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects
Environmental incident	An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve
Environmental policy	Statement by an organisation of its intention and principles for environmental performance
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives

Abbreviation	Expanded text
Environmental Representative	A suitably qualified and experienced person independent of the Contractor and Proponent, and project design and construction personnel, employed for the duration of construction. The Environmental Representative sits under the Independent Certifier.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPO	Environmental Performance Outcomes
Minister, the	Minister of the NSW Department of Planning and Environment (or delegate)
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation
NVMP	Noise and Vibration Management Plan
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report
PLR	Parramatta Light Rail
Principal, the	Transport for NSW
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
Project, the	Parramatta Light Rail – Stage 1 (Westmead to Carlingford)
RAP	Remediation Action Plan for 6-10 Grand Avenue, Camellia, NSW, November 2017)
RMS	Roads and Maritime Services
SaM Facility	Stabling and Maintenance Facility
SCO	Sydney Coordination Office
TCP	Traffic Control Plan
TTAMP	Construction Traffic, Transport and Access Management Sub-Plan
OEH	Office of Environment and Heritage
REMMM	Revised Environmental mitigation and management measures
Roads and Maritime	Roads and Maritime Services
TMP	Traffic Movement Plan
VMP	Vehicle Movement Plan

1 Introduction

1.1 Context and scope

This Construction Traffic, Transport and Access Management Sub-Plan (TTAMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the upgrade of the Parramatta Light Rail – Stage 1 (PLR Stage 1 or the Project). This TTAMP has been prepared to target specifically Package 3: Early Works in Portion 2 (referred hereafter as Portion 2 Early Works) as part of the Enabling Stage of the Project. Refer to the *Parramatta Light Rail (Stage 1) Staging Report (Project Wide)* (TfNSW 2019) for further detail.

Package 3: Early Works Portion 2: the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue, Rosehill. This is the allocated site for the SaM Facility.

Ventia Utility Services Pty Ltd (Ventia) has been appointed by Transport for NSW (TfNSW) as the head contractor for Portion 2 Early Works, responsible for delivering the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue Rosehill (refer to Section 1.4 of CEMP for project scope).

This TTAMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMM) listed in the Submissions and Preferred Infrastructure Report (SPIR) (TfNSW 2018), *Parramatta Light Rail – Stage 1 Environmental Impact Statement, August 2017* (the EIS) and all applicable legislation.

This TTAMP provides the management approach and requirements (including environmental mitigation measures, controls, monitoring and reporting) for managing traffic and access during construction of Portion 2 Early Works. This Plan forms one of six sub-plans which are collectively covered by the CEMP. Effective implementation of the CEMP (and associated sub-plans) will ensure that environmental resources, responsibilities and management measures are adopted during the construction activities.

The implementation of the CEMP and associated sub-plans are aligned with Project level management plans including the Community and Stakeholder Engagement Plan and the Sustainability Plan as illustrated in Figure 1.

The review and document control process for this Plan are described further in Section 8.

The context of this TTAMP in relation to the environmental management system is presented below in Figure 1-1.

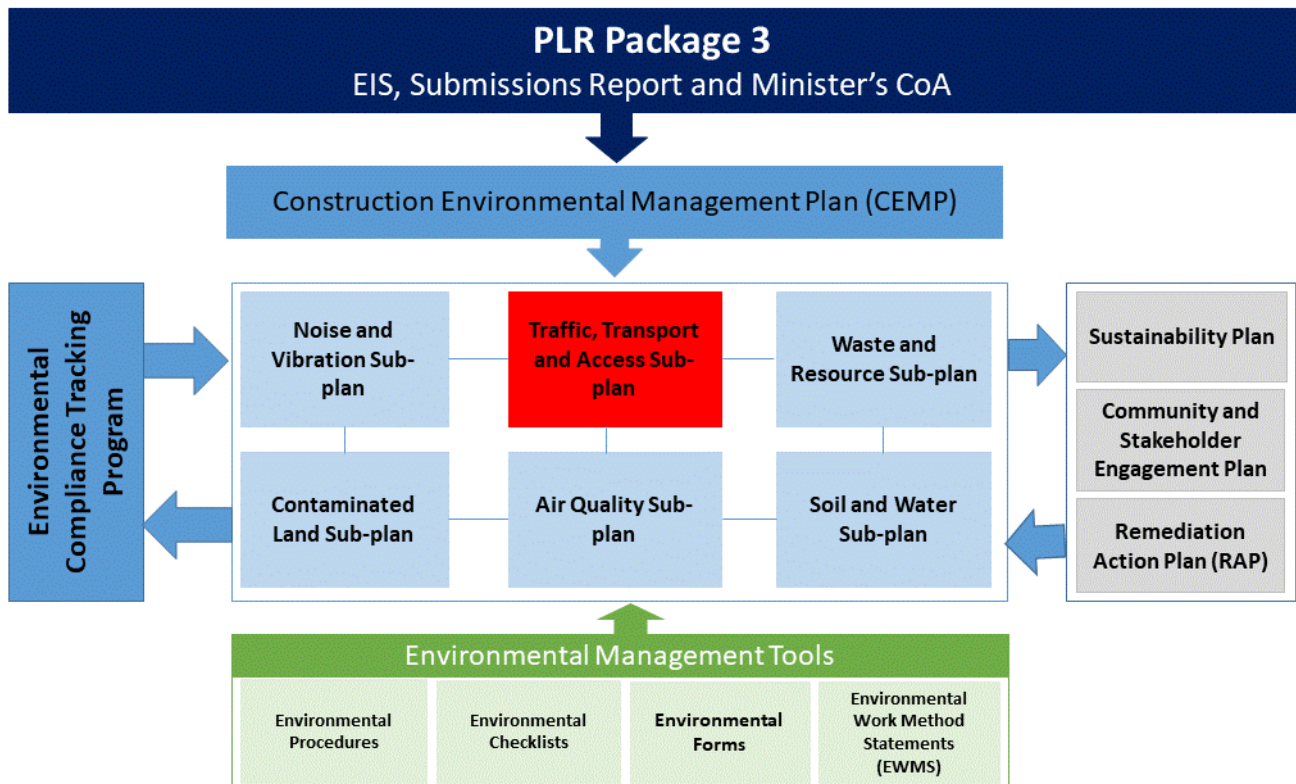


Figure 1-1: Portion 2 Early Works Environmental Management System and CEMP Context

1.2 Background and project description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney population, particularly the population growth of the Parramatta Local Government Area (LGA).

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

PLR Stage 1 project will link Parramatta's central business district (CBD) and train station to a number of key locations, including the following:

- Westmead Precinct;
- Parramatta North Growth Centre;
- The new Western Sydney Stadium;
- The Camellia Town Centre;
- The new Powerhouse Museum;
- 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 the project include:

- A new dual track light rail network of approximately 12 kilometres in length (including approximately seven kilometres within the existing road corridor and approximately five kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services);
- A total of 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 5 am to 1 am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7 am and 7 pm;
- 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 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); and
- 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 of the CEMP.

1.2.1 Stabling and Maintenance Facility

As part of the development of the Project, the TfNSW owned land located at 6-8 Grand Avenue Camellia was identified as the preferred site for the Stabling and Maintenance Facility (SaM Facility). The SaM Facility is being constructed on the former industrial site adjacent to the Rosehill Gardens Racecourse within the Rosehill and Camellia precinct (refer to Figure 1-2: **Portion 2 Early Works - SaM Facility location**).

The SaM Facility would provide for the storage of light rail vehicles, maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities as well as the operations control centre for the light rail network will be located within the maintenance building. Parking for staff and visitors will be provided on

site, including maintenance vehicle parking. An electrical substation will be installed on the site to power the facility and light rail.

To accommodate the development of the SaM facility, and reduce the potential for interaction with contaminated material during construction, the following activities will be undertaken as part of the enabling works, specifically *Package 3: Early Works Portion 2* and subject of the CEMP:

- Importation and placement of appropriate fill material across the site to raise the surface finish level by about two metres;
- Installation of an appropriate capillary break to eliminate subsurface contamination migration;
- Installation of an appropriate vapour barrier and structural surface capping layer;
- The Temporary Works encompasses establishment of plant, equipment and facilities on the Site to support the delivery of the Works;
- The Enabling Works encompasses establishment and management of utilities and other below-ground infrastructure on the Site to support the delivery of the Works;
- Construction of a berm for the retention and containment of waste materials on-site;
- Implementation of Ground Improvement Works where required;
- Implementation of the monitoring and validation program; and
- Preparation of Stage 2 Site Validation Report and a Long Term Environmental Management Plan (LTEMP) to the satisfaction of the Site Auditor.

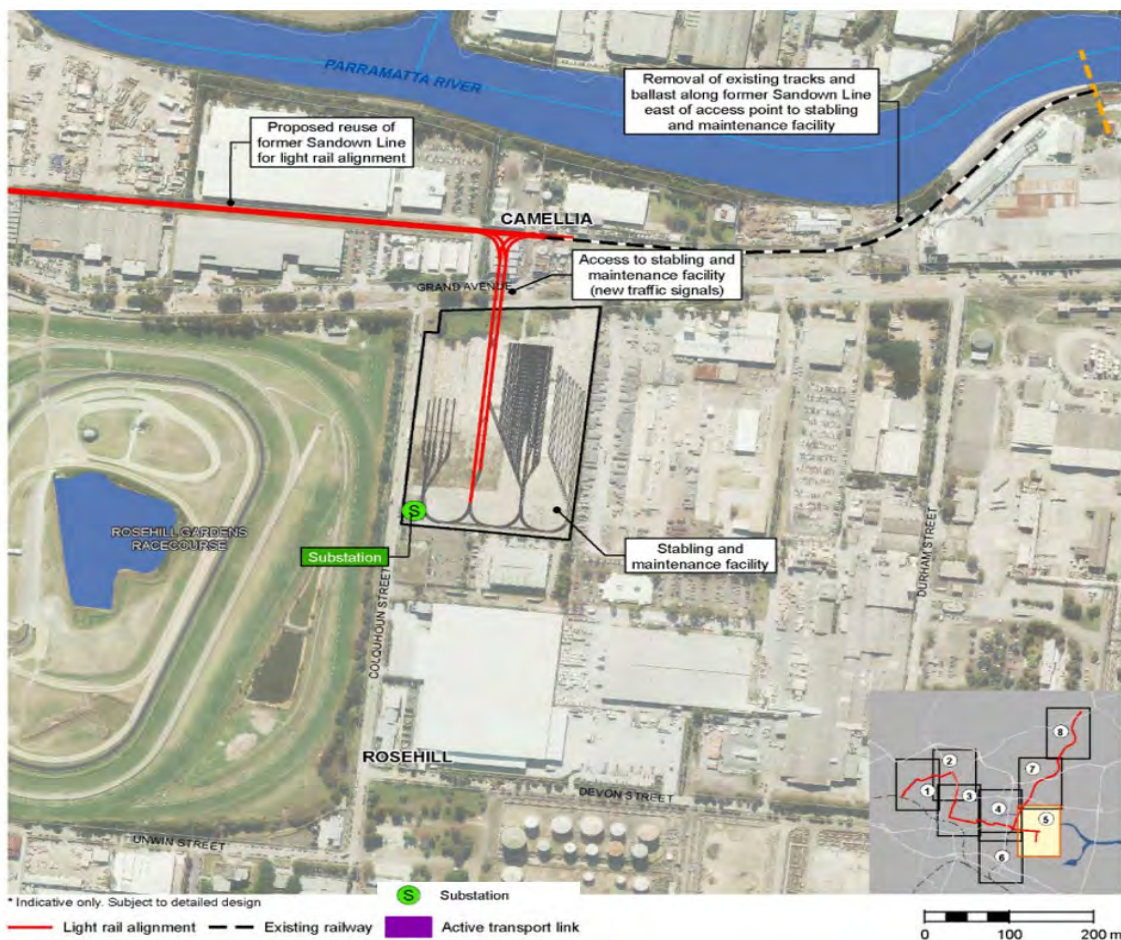


Figure 1-2: Portion 2 Early Works - SaM Facility location

(Source: EIS Figure 6.2e)

1.2.2 Statutory Context

The Project is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The Minister for Planning is the approval authority for the Project.

In accordance with section 5.22(2) of the EP&A Act, the only environmental planning instruments that apply to the proposal are State Environmental Planning Policy (Infrastructure) 2007 (insofar as it relates to the declaration of development that does not require consent) and State Environmental Planning Policy (State and Regional Development) 2011 (as it pertains to the declaration of infrastructure as SSI). There are no other environmental planning instruments that substantially govern the carrying out of the project.

The Portion 2 Early Works site has been subject to long term regulation by the NSW Environmental Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act). The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP). The RAP has been reviewed and endorsed by a NSW EPA-accredited Site Auditor in accordance with the CLM Act.

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described below in Section 1.2.3.

1.2.3 Parramatta Light Rail Planning Approval

An Environmental Impact Statement (EIS) for the project was placed on public exhibition between 23 August and 23 October 2017. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the project to the Department of Planning and Environment (DP&E). Following the conclusion of the public exhibition period, Transport for NSW prepared a Submissions Report and Preferred Infrastructure Report for the project to address the issues raised in community and stakeholder submissions, and to document a number of proposed design changes and additional investigations undertaken since exhibition of the EIS.

In May 2018, the Minister for Planning granted approval of the Project, under Section 115ZB of the EP&A Act. Following approval of the CSSI, a modification was assessed by the DP&E and subsequently approved on the 21st December 2018 under section 115ZI of the EP&A Act (Modification 1). Modification 2 was requested from DP&E and approved on the 25th January 2019. The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.3 Environmental management systems overview

The environmental management system overview is described in section 1.5 of the CEMP and is summarised in Figure 1-1.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to provide the foundation for the management of traffic, transport and access impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Portion 2 Early Works.

Specifically, this Plan details the traffic, transport and access management requirements that must be satisfied in order to demonstrate compliance with Condition C3 of the Minister's Conditions of Approval (CoA).

Mitigation measures (specific to traffic, transport and access) required to satisfy the CoA requirements are derived from the EIS and through risk assessment processes (refer [Section 3.2](#)) and included within this TTAMP. Refer to [Section 3.3](#) for relevant traffic, transport and access mitigation measures and controls and refer [Section 3.4](#) for relevant Environmental Performance Outcomes.

Implementation of these measures is ensured through monitoring, training and competence, inspection, audit and reporting actions detailed in Sections 7.2 – 7.6, with the responsibilities for implementation identified in Section 7.1. Continual improvement processes in relation to compliance with regulatory requirements are detailed in Section 8.

Effective implementation of this Plan will assist the Contractor and relevant sub-contractors to achieve compliance with necessary environmental regulatory and policy requirements in a systematic manner with an outcome of continual environmental management performance.

2.2 Objectives

The key objective of this Plan is to ensure that movements of construction traffic (including any oversize vehicles) is appropriately managed and within the scope permitted by the planning approval.

To achieve these objectives, the Contractor will undertake the following:

- Minimise disturbance to the local and regional road network;
- Maintain communication with the potentially affected local residents, visitors and businesses to minimise disruption;
- Ensure access to the Camellia site does not compromise the safety of the local road network;
- Ensure appropriate controls and procedures are implemented during construction activities to address potential traffic and access impacts along the Project corridor;
- Ensure appropriate measures are implemented to address the relevant CoA outlined in Table 3-1 and Table 3-2, and the safeguards detailed in the EIS; and
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in [Section 3.1](#) of this Plan.

2.3 Targets

Targets have been established for the management of traffic impacts during the construction of Portion 2 Early Works. These targets include:

- Full compliance with the relevant legislative requirements, TfNSW project specifications and relevant project approvals;
- Complaints from the community and stakeholders are minimised;
- Minimise traffic delays; and
- Maintain satisfactory property access.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation and regulatory requirements

Identified regulatory requirements are:

- Workplace Health and Safety Act 2011;
- Work Health and Safety Regulation 2017;
- Protection of the Environment Operations Act 1997;
- Roads Act 1993 (NSW);
- An approved and valid Road Occupancy Licence (ROL);
- An approved relevant Speed Zone Authorisation (SZA); and
- Australian Road Rules.

Legislation relevant to traffic management also includes the *Environmental Planning and Assessment Act 1979* (EP&A Act), under which the project approval was granted. Relevant provisions of the EP&A Act are explained in the register of legal and other requirements included in Appendix A2 of the CEMP.

Further discussion is included in [Section 1.2.2](#) for the statutory context.

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- Roads and Maritime Traffic Control at Worksites Manual (2010);
- AUSTROADS Guide to Traffic Management 2009 – Parts 1-13;
- AUSTROADS Guide to Road Design 2009 – Parts 1-7;
- AUSTROADS Guide to Road Safety 2009 – Parts 1-9;
- AS1742 Manual of Uniform Traffic Devices; and
- AS1742.3-2009 Part 3 – Spoil Control Devices for Works on Roads.

3.2 Ministers Conditions of Approval

The CoA relevant to this Plan are listed in Table 3-1 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1: Conditions of Approval relevant to the TTAMP

CoA No.	Condition Requirements	Document reference	How Addressed
C3 (a)	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan and be consistent with the CEMP referred to in Condition C1: Required CEMP Sub-plan – Traffic, transport and Access Relevant government agencies to be consulted - Relevant Council(s), Roads and Maritime Services, Emergency Services Secretary Approval or Information - Information	Appendix A of TTAMP	Consultation evidence is tabulated under Appendix A and will be updated accordingly.
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 3.4 in TTAMP	Section 3.4 demonstrates how the Environmental Performance Outcomes for Portion 2 Early Works are addressed.
	(b) the mitigation measures identified in the documents listed in Condition A1 will be implemented	Section 3.3 in TTAMP	Section 3.3 demonstrates how the revised mitigation measures for Portion 2 Early Works are addressed.
	(c) the relevant terms of this approval will be complied with	Section 3.2 in TTAMP	This section demonstrates how the relevant CoA for Portion 2 Early Works are addressed.

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 5.1.1 in TTAMP	Traffic Impact Assessment (refer Section 5.1.1) identified approximately 9000 average vehicles per day in Grand Avenue. Section 5.2 & EIS shows the estimated truck movements for SaM facility Precinct to be approximately 100/day, ~6% increase to the existing traffic movement from this project, therefore EIS notes the impacts are to be minimal.
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.	Appendix A	Consultation evidence is tabulated under Appendix A and will be updated accordingly.
C21	All construction spoil haulage vehicles, and construction plant must be clearly marked as being for the CSSI in such a manner to enable immediate identification within at least 50 metres of the vehicles and plant.	Section 6.4 in TTAMP	Transferrable Magnetic signs will be used to clearly indicate construction spoil haulage vehicles and construction plant within at least 50 metres when conducting project works.
E1	The CSSI must be designed, constructed and operated so that it does not adversely impact network connectivity, or the safety and efficiency of the transport system near the CSSI in a manner which is consistent with the impacts predicted in the documents referred to in condition A1.	Section 2.2 in TTAMP	This project is located within a 6.2 hectare site boundary, located within the IN3 Heavy Industrial zone, connecting to major transportation routes including Grand Avenue, connecting directly to James Ruse Drive.

CoA No.	Condition Requirements	Document reference	How Addressed
E5	Construction vehicles (including staff vehicles) associated with the CSSI must:		
	(a) minimise parking or queuing on public roads and utilise the light rail corridor for construction vehicle and staff movements to the greatest extent practicable;	Section 6.1.4 in TTAMP	The Portion 2 Early Works construction site shall have onsite dedicated parking facilities for all construction vehicles and staff vehicles to ensure no impacts to surrounding roads.
	(b) not idle or queue in local residential streets;	Section 6.1 in TTAMP	The location of the project is within an IN3 Heavy Industrial zone with direct connection to major arterial routes, including James Ruse Drive. Wherever practical, the majority of truck movements are to provide importation of a clean fill cap which will use imported material from Sydney Metro 2 spoil, planned for delivery by barge at the eastern end of Grand Avenue.
	(c) minimise use of routes on local roads that directly pass schools or childcare centres, or where no alternative route is available, restrict heavy vehicle movements between 8:00am and 9:30am and between 2:30pm and 4:00pm Monday to Friday, during the school term;	Section 6.1 in TTAMP	The location of the project is within an IN3 Heavy Industrial zone with direct connection to major arterial routes, including James Ruse Drive. No planned transportation routes require the regular movement of trucks through local roads.
	(d) not use local roads (including residential streets) to gain access to construction sites and compounds unless no alternatives are available. Construction sites must be accessed from arterial roads and the rail corridor used for transportation of construction materials and the like to work sites to the greatest extent practicable; and	Section 6.1 in TTAMP	This project site is located within a heavy industrial area with direct access to Grand Avenue and Colquhoun Street, traffic routes with extensive truck use. The site has connection to major arterial roads with Grand Avenue directly connected to James Ruse Drive and access to Parramatta Road, via Colquhoun Street.

CoA No.	Condition Requirements	Document reference	How Addressed
	(e) adhere to the nominated haulage routes identified in the Construction Traffic, Transport and Access Management Plan required under Condition C3.	Section 6.1.5 in TTAMP	The site has connection to major arterial roads with Grand Avenue directly connected to James Ruse Drive and access to Parramatta Road, via Colquhoun Street. Driver's inductions will contain information on nominated haulage routes.
E6	Current condition reports for all existing roads and all existing property and infrastructure in the road reserve where the physical condition is likely to be adversely affected during works must be prepared before commencement of such works. The report must state the current condition of the asset. A copy of the report must be provided to the asset owner no later than one month before the commencement of construction of the CSSI.	Section 6.9 Section 5.1.1 Section 5.2	Road condition surveys were conducted for Grand Avenue and Colquhoun Street prior to commencing Early Works remediation activities.
E10	Traffic Network Management The Proponent must prepare and implement a Network Management Strategy for construction of the CSSI, in consultation with RMS, Sydney Coordination Office and Relevant Council(s) before impacts on the road network (including intersections) occur.	Section 6.1.2 of TTAMP	Network Management Strategy will be prepared by TfNSW. The strategy will provide a governance framework to meet the requirements for network management that will be progressively implemented throughout the Portion 2 Early Works. Sydney Coordination Office and Roads and Maritime Services will be consulted to determine the hours of when construction deliveries and spoil removal would be undertaken within Rosehill and Camellia precinct.

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed in Table 3-2 below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2: REMMMs relevant to this TTAMP

Ref#	Commitment	Timing	TTAMP reference	How Addressed
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: Traffic, transport and access management. The CEMP would be prepared by the responsible contractor(s) and approved by the Secretary of the NSW Department of Planning and Environment.	Pre-construction	This Plan	TTAMP has been prepared as a part of CEMP demonstrating compliance with the commitments made in the Environmental Impact Statement), the submissions report, as well as any other relevant statutory approvals.
TT-24	Existing cycle routes would be maintained or diverted during construction.		Section 6.5 in TTAMP	The project site is located within a heavy industrial area and will not be required to alter adjacent roads or cycle routes during construction.

Ref#	Commitment	Timing	TTAMP reference	How Addressed
TT-25	To maintain safe motorist, pedestrian and cyclist access where construction works would occur, mitigation and management measures would be detailed in the Construction Traffic Management Plan and implemented during construction. This would include:			
TT-25 (a)	Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers	During construction	Section 6.4	The project site will not be required to alter adjacent roads during construction. Appropriate signposting will be installed at site access and egress points to provide for the easy and safe passage of vehicles, pedestrians and cyclists. Signage will be in consistent with relevant Australian Standards.
TT-25 (b)	Appropriate controls where vehicles are required to cross footpaths to access construction areas, including manual supervision, physical barriers or temporary traffic signals	During construction	Section 6.5	The project site is located within a heavy industrial area and does not currently have pedestrian footpaths on the boundaries.
TT-25 (c)	Consideration of shared experience educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle	During construction	Section 6.5	Project site is located within a heavy industrial area with no pedestrian and cycle paths. Project activities will be limited within the site boundary and do not require changes to surrounding roads. The majority of planned truck movements will be along Grand Avenue when the project is able to use Metro2 spoil being barged to Camellia.
TT-25 (d)	Consideration of pedestrian access needs for elderly people, children and people with disability where, reasonably practicable	During construction	Section 6.5	The project site is located within a heavy industrial area and does not currently have pedestrian footpaths on the boundaries.
TT-25 (e)	Specific construction driver training to understand route constraints, expectations, safety issues and to limit the use of compression braking	During construction	Section 6.5	Site induction package for commercial drivers will include information regarding haulage routes, incident management and safety hazards.

Ref#	Commitment	Timing	TTAMP reference	How Addressed
TT-25 (f)	Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn.	During construction	Section 6.5	No project works are proposed to be carried out in the road reserve during the project. Site construction site traffic management controls, such as exclusion zones, the use of spotters and people/plant management. A daily pre-start of all on-site construction plant and equipment shall be conducted by the operator to identify any faults or damage to the plant or equipment before use. Site haulage routes will be configured to ensure single-lane in each direction only. No overtaking or passing of moving vehicles is permitted on-site. Site induction package for commercial drivers will include information regarding use of side and rear mirrors, blind spot monitoring, use of indicators when turning and access/egress to the site.
TT-25 (g) i	Site specific construction traffic management plans and site specific traffic control plans would be prepared and implemented, including mitigation and management responses associated with the temporary closures (including weekend closures) of: » Church Street and Pennant Hills Road » Church Street and Barney Street » Church Street and Board Street » Church Street and Victoria Road » Smith Street and Macquarie Street » Church Street and George Street » James Ruse Drive	Pre-construction	This Plan	A site-specific construction traffic management plan (this Plan) (incorporating a vehicle movement plan) has been prepared for the project. No temporary road closures are proposed for the project (refer to Section 6.2).

Ref#	Commitment	Timing	TTAMP reference	How Addressed
	» Grand Avenue » Kissing Point Road.			
TT-28	Hours of when construction deliveries and spoil removal would be undertaken within the Parramatta CBD and Rosehill and Camellia precincts would be determined in consultation with the Sydney Coordination Office and Roads and Maritime Services.	During construction	Section 6.1.2 & 6.1.3 Appendix A	Opportunities to reduce traffic movements during peak periods has been identified with several opportunities to reduce impacts, including use of materials in proximity to the project site, where practical, and out of hours spoil deliveries, which has been assessed in accordance with the NVMP. A record of consultation with Sydney Coordination Office and Roads and Maritime Services is further documented in Appendix A.
	These site specific traffic management plans would detail:			
TT-29 (g) ii	Site access and associated route and turning movements	During construction	Section 6.1.6	A Vehicle Movement Plan has been prepared and will be communicated throughout the project to project personnel including the site access, haulage routes and traffic controls.
TT-29 (g) iii	Potential activities that could result in the disruption to traffic and transport networks, including pedestrian, cyclist and public transport networks and during special events.	During construction	Section 5.2 Sections 6.5 , 6.6 , 6.7 & 6.8	Impacts on existing traffic conditions associated with this project would be negligible as this site is located within a heavy industrial area. Consultation with the ATC will be ongoing throughout the project with consideration of special events at Rosehill Gardens Racecourse. However, no road works are planned which will disrupt Grand Avenue or Colquhoun Street, surrounding the site during special events.

Ref#	Commitment	Timing	TTAMP reference	How Addressed
TT-29 (g) iv	The timing to limit disruptions to the road and transport networks.	During construction	Section 6.2	No disruptions for road or transport networks are proposed during the project.
TT-29 (g) v	The maintenance of access and safety of transport networks, parking and property.	During construction	Section 6.7	The project has no planned works to affect the access of other properties as the works are planned within the project site boundary. No parking offsite is planned for the duration of the works. No planned disruption to access or safety of transport networks is planned for the duration of the works.
TT-29 (g) vi	Details responses to the management of an event that directly involves or impacts on traffic and transport networks.	During construction	Section 6.8	Ongoing consultation with the ATC regarding special events at Rosehill Gardens Racecourse. The majority of planned project truck movements will be from the eastern end of Grand Avenue to the project site, away from special event parking and entrances.
TT-28	Hours of when construction deliveries and spoil removal would be undertaken within the Parramatta CBD and Rosehill and Camellia precincts would be determined in consultation with the Sydney Coordination Office and Roads and Maritime Services.	Pre-construction	Appendix A	The project will consult with the Sydney Coordination Office and Roads and Maritime Services will be undertaken with the Traffic, Transport and Access Management Plan (this plan).

3.4 Environmental Performance Outcomes

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

Table 3-3: Environmental Performance Outcomes relevant to this TTAMP

ID Ref#	Environmental Performance Outcome	Timing	TTAMP reference	How Addressed
EPO-TT-1 Construction	The project would implement measures to minimise impacts on the road network, including staging.	During construction	Section 6.1	The location of the project is within an IN3 Heavy Industrial zone with direct connection to major arterial routes, including James Ruse Drive and Parramatta Road with no planned transportation routes require the regular movement of trucks through local roads. The site is 6.2 hectares in size and spoil movements will be coordinated to ensure that trucks are staged within the project boundaries.
EPO-TT-2 Construction	Pedestrian and cyclist safety would be maintained.	During construction	Section 6.5	Project site is located within a heavy industrial area with no pedestrian and cycle paths around the site boundary. Project activities will be limited within the site boundary and do not require changes to surrounding roads, footpaths or cycle routes.

4 Consultation

The following sections summarises the consultation undertaken as part of development of this TTAMP.

4.1 Consultation Requirements under the Infrastructure Approval

Condition A5 outlines how consultation should be documented.

A5) Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Secretary with the document or monitoring program for review. The evidence must include:

- a) Documentation of the engagement with the party (ies) identified in the relevant condition of approval before submitting the document for approval;
- b) Log of the points of engagement or attempted engagement with the identified party(ies) and a summary of the issues raised by the identified party(ies);
- c) Documentation of any follow-up with the identified party(ies), where feedback has not been provided, to confirm that the identified party(ies) has none or has failed to provide feedback after repeated requests;
- d) Outline of the issues raised by the identified party(ies) and how they have been addressed, including evidence that the party(ies) is satisfied the issues have been addressed; and
- e) A description of any outstanding issues raised by the identified party (ies) and the reasons why.

A summary of consultation undertaken during the preparation of this TTAMP is provided in Appendix A of this TTAMP.

4.2 Consultation Requirements under the EIS

The size of the project requires effective and ongoing interaction between several different organisations, key stakeholders and the general public.

Consultation will continue with agencies, councils and other relevant stakeholders throughout the Project where there is a significant change to the TTAMP, or as required in consultation with TfNSW. The outcomes of consultation of the TTAMP will be further documented in Appendix A.

5 Construction traffic aspects and impacts

5.1 Existing environment

5.1.1 Existing road network

The Rosehill and Camellia precinct is dominated by existing industrial land within the Camellia Peninsula. Access to existing properties along the project alignment is provided via Grand Avenue. Grand Avenue intersects with James Ruse Drive, providing access to the surrounding arterial road network.

The key roads located adjacent to the Portion 2 Early Works site are Grand Avenue to the north of the site and Colquhoun Street to the west of the site.

A Traffic Impact Assessment assessing the potential construction and operational traffic and access impacts associated with the Early Works remediation activities was carried out in 2017. A summary of this assessment is provided below.

Grand Avenue

Grand Avenue is classified as a two-way local road with two lanes and a separate carriageway with kerbside parking and footpath along the north side of the road. The posted speed limit is 60 km/hr with no school zones and no key intersections. A traffic impact assessment of Grand Avenue identified approximately 6,000 average vehicles per day near its intersection with Colquhoun Street and approximately 9,000 average vehicles per day (20% of it classified as heavy vehicles) east of James Ruse Drive. According to the Roads and Maritime's Restricted Access Vehicle Map Grand Avenue is a 25/26 metres approved B-double route.

Colquhoun Street

Colquhoun Street is a two-way street with two lanes, kerbside parking and no designated pedestrian walkway. Colquhoun Street has a posted speed limit of 60 km/h with no school zones nor key intersections. Colquhoun Street consists of approximately 2,500 average vehicles per day with approximately 30% of vehicles classified as heavy vehicles. Similar to Grand Avenue, Colquhoun Street is also an approved 25/26 metres B-double route.

According to the Roads and Maritime's Restricted Access Vehicle (RAV) map, the majority of the roads within the Camellia industrial precinct are approved 25/26 metres B-double route. This is shown in appendix D.

5.1.2 Freight and access routes

Key freight and access routes (B-double routes that allow for vehicles up to 26 metres long) that would be utilised to access the site include Grand Avenue, which connects to the major arterial road, James Ruse Drive.

5.1.3 Road safety

Relatively low volume of crashes along the Grand Avenue were recorded in crash history data from July 2011 to June 2016. Crashes include typical intersection collisions between vehicles travelling in opposing directions and from vehicles manoeuvring off-path.

5.1.4 Public transport

There are limited bus services within the Rosehill and Camellia precinct, with the main bus routes operating along James Ruse Drive and Hassall Street. The nearest train station to the site is Camellia, located approximately 750 m west-northwest of the site.

5.1.5 Pedestrians and cyclists

Grand Avenue and the adjacent Colquhoun Street service highly industrialised areas, with a footpath running along the northern side of Grand Avenue (opposite side to the site). The use of the area adjacent to the site and along the main access roads to site have low pedestrian and cyclist usage.

5.2 Construction impacts

Overall the EIS notes that impacts on existing traffic conditions associated with this project would be minimal as this site is located in a heavy industrial area with minimal pedestrian access and no public transport.

The EIS provided an estimate of truck movements based on the quantities of the total materials estimated to be excavated, removed or imported, with a specific estimation provided for the Stabling and Maintenance Facility (Portion 2 Early Works). A summary is provided below in **Table 5-1: Heavy vehicle movement estimates**.

Table 5-1: Heavy vehicle movement estimates

Precinct	Daily average ⁽¹⁾	Peak daily average ⁽²⁾	Peak hour ⁽³⁾
Stabling and Maintenance Facility	96	103	9

Source: Table 2.1 from the *Parramatta Light Rail Construction Traffic and Transport Impact Assessment Report*, GTA Consultants 2017.

[1] Average daily vehicle movements represent the total inbound and outbound truck movements (two-way) for the precinct (excluding testing phase).

[2] Peak average daily vehicle movements include the total inbound and outbound truck movements (two-way) for the precinct (including asphalt delivery, civil and drainage materials, concrete trucks, flatbeds for steel and rail, rigid tippers, truck and dogs and water carts).

[3] Peak hour vehicle movements assume the peak average daily volumes are evenly distributed over weekday construction hours (7 am to 6 pm).

Overall the total number of additional trucks would be small compared to the total truck volumes across the regional network (refer to [Section 5.1.1](#)). It is estimated that the truck moments from Portion 2 Early Works will only increase the truck movements in existing conditions by ~6%. It is estimated that predicted heavy vehicle movements generated by site works associated with Portion 2 Early Works will primarily come from the delivery of plant and importation of materials (e.g. spoil and quarry material) onsite. Wherever possible, the project aims to minimise traffic impact to the arterial road network due to re-use of 50,000 m³ spoil from Sydney Metro Barangaroo Station site. Spoil will be transported via Parramatta River to the Camellia Peninsula then to the Project site, via Grand Avenue. This will significantly reduce impacts to the road network from City to the project site, which results in a significant positive impact to construction traffic and energy consumption.

Given the early stages of the site works and capacity of the site to adequately accommodate plant / vehicle storage and site personnel parking, it is considered that the predicted heavy vehicle movements shown in the EIS are conservative of the expected traffic volumes.

A summary of the associated traffic, transport and access impacts are expected to be negligible assuming the implementation of the appropriate environmental mitigation measures and controls detailed further in Section 3.3. A summary of the impacts is as follows:

- Additional traffic volumes associated with construction of Portion 2 Early Works is expected to be minimal and therefore impacts on existing road networks and intersections is expected to be minimal;
- Access to adjacent properties will be maintained throughout the works of this project;
- There are no public transport facilities located in close proximity to the site and therefore impacts on public transport are expected to be negligible;
- Pedestrian facilities along Grand Avenue are limited to footpaths, primarily on the northern side (on the opposite side of the road to the site) with no marked crossings. The pedestrian and cyclist numbers in the Rosehill and Camellia precinct are expected to be low due to the industrial nature of the site and distance from public transport and other amenities. Therefore, the impacts can be sufficiently mitigated;
- No designated disabled parking spaces, taxi zones or loading or mail zones have been identified in close proximity to the site and therefore impacts are expected to be negligible;
- The Rosehill Gardens Racecourse holds several major special events each year however as the site will maintain parking and the majority of traffic movements are associated with material importation from the eastern end of Grand Avenue. Impacts by the works associated with Portion 2 Early Works are predicted to be low;
- Access to the site, including for emergency vehicles, will be maintained at all times; and
- The project will not have significant impacts on any specific intersections, with traffic impacts limited to minor localised traffic demand increases mainly from construction vehicles and haulage of materials (including spoil and quarry material) to and from the site. The size of the site will allow staging to occur to minimise any disturbance to the traffic network.

6 Construction Traffic Management

6.1 Construction stage traffic management

The effective management of construction traffic to and from construction sites is critical for the efficient delivery of the project and to minimise impacts to road users and the surrounding community. The processes and controls described in the following sub-sections will be implemented and managed in accordance with the legislations and guidelines identified in [Section 3.1](#), following consultation with the relevant roads authorities and stakeholders (Refer Appendix A).

6.1.1 Construction staging

The site is considered a static site with minimal interfaces with the existing road networks (primarily Grand Avenue), public transport and pedestrians / cyclists. Construction staging is therefore not considered a significant mitigation requirement. However, construction traffic management will be undertaken such as coordination of spoil movement and planned scheduling of site deliveries. Refer to [Section 6.1.2](#) for further detail.

6.1.2 Construction site traffic management

The traffic impact associated with vehicle movements, including material and plant deliveries, will be managed through the scheduling of deliveries and availability of fleet. Sydney Coordination Office and Roads and Maritime Services will be consulted to determine the hours of when construction deliveries and spoil removal would be undertaken within Rosehill and Camellia precinct. Wherever practical, importation of spoil material will be delivered to the Camellia peninsula by barge from the Metro 2. This will minimise vehicle movements required on the traffic network.

The dimensions of the Grand Avenue access driveways and associated break in the median island are of adequate geometry to accommodate the majority of truck types proposed to service the remediation works, including single unit trucks (dump trucks and water pump trucks) and articulated trucks (i.e. transport vehicles for the machineries proposed on-site).

Should there be a need for longer vehicles to access the site, it is considered that the access driveway located at the south-western corner of the site onto Colquhoun Street (approximately 15 metres wide) will provide sufficient dimension to the site.

Where driveways are in active use signposting and delineation will be established to maintain clear visual access to the driveways throughout the works (refer to [Section 6.4](#) for further details).

Management of site traffic will be undertaken in accordance with Vehicle Movement Plans (VMPs) as required (refer to [Section 6.1.7](#) for further details).

6.1.3 Hours of Operation

In accordance with Condition E23, the site is able to operate 24 hours a day, seven days a week as long as sensitive receivers are not affected by noise levels greater than 5 dBA above the rating background at any residence between 10:00 pm and 7:00 am. Out of hours deliveries, such as spoil delivery would minimise impact to the road network.

Consultation workshop will be held prior to commencement of Portion 2 Early Works and Sydney Coordination Office and Roads and Maritime Services will be consulted to determine the hours of

when construction deliveries and spoil removal would be undertaken within Rosehill and Camellia precinct.

The site will assess vehicle movements during peak periods and will stage accordingly to minimise impacts. Consideration of the delivery of spoil materials and oversized materials such as oversized plant (if required) at night time will be given to minimise disruption to traffic flow. Consideration of night-time impacts has been further assessed within the Noise and Vibration Management Plan (NVMP).

6.1.4 Site compound traffic management

The Portion 2 Early Works construction site is approximately 6.2 hectares in area and will be coordinated to ensure site storage and parking is adequate. Ancillary site compounds will not be required for this package of works.

Parking and access requirements of the site will be maintained on an ongoing basis to ensure suitable parking and staging based on the size of the workforce as construction activities progress.

Where temporary works are required for safe access and egress within the site, they will be designed to minimise disturbance to traffic flows. Site vehicle movement plans (VMPs) will also provide details of the layout within the worksite including:

- The movement of construction and other vehicles within the worksite and the associated signage including off-road plant movements;
- Dedicated light and heavy vehicle turning areas;
- Movement of vehicles for haulage of spoil to a stockpile site;
- The location of and access to parking areas and the associated signage;
- Visitor parking areas;
- Exclusion zones;
- Access paths to amenities, offices etc.; and
- All associated signage.

6.1.5 Construction traffic routes

The effective management of construction vehicle movement onsite and throughout the road network will aim to minimise the risk to other road users and keep the traffic generated by the project to minimum. Wherever possible, the project shall prioritise minimise traffic impact to arterial road network due to re-use of 50,000 m³ spoil from Sydney Metro sites. Spoil will be transported via Parramatta River to Camellia Peninsula then to the Project site via Grand Avenue, rather than using the road network from the City to the site which result in a significant impact to construction traffic and energy consumption.

The types of construction vehicle movements may include:

- Deliveries of materials, supplies, plant or equipment to site;
- Transportation of over dimension loads;
- Haulage of materials on and offsite associated with earthworks operations; and
- Regular trips by construction personnel in work trucks and utility vehicles.

The types of vehicles used on projects will vary depending on the type of infrastructure being constructed.

The on road registered vehicles may include 4WD utilities, single unit trucks with or without dog trailers, semi-trailers, B-doubles and over dimension floats/platforms, etc.

Site access points will be constructed and maintained to ensure minimal impact on adjacent traffic on the Project. Typically, access points will allow for safe entry / exit from local road networks for construction vehicles and will be located in areas along the upgrade alignment that provide sufficient sight distance.

Driver's inductions will contain information on nominated haulage routes to ensure the construction vehicles (including staff vehicles) associated with Portion 2 Early Works adhere to the nominated haulage routes identified for the site (refer to Appendix C).

6.1.6 Vehicle Movement Plan

The Vehicle Movement Plan (VMP) for the Site shall be a 'live' document which is regularly updated throughout the work. An example is shown in Appendix B. The VMP is a diagram showing the preferred travel paths for vehicles moving through designated routes across the site, as well as entering or leaving the site. Overview of the proposed haulage routes are shown in Appendix C.

Vehicle Idling and Parking Areas will be staged and updated regularly as works progress. All heavy vehicle traffic will follow a single lane, one-way traffic flow, to ensure that all heavy vehicles enter and exit the site forward facing. No overtaking or passing of moving vehicles is permitted on-site.

Heavy and Light vehicles will be coordinated to access the site from either Grand Avenue and/or Colquhoun Street. Designated routes shall be established from the site entrance(s) to the on-site parking area. Routes will be established to avoid exclusion zones, active work fronts, including the groundwater treatment plan. Designated parking for all light and visitor vehicles shall be located adjacent to the site offices with additional vehicle spaces created where necessary as works progress.

Pedestrian walkways will be delineated with fencing to separate it from the light and heavy vehicle lanes.

6.2 Road occupancy

No special arrangements for road or lane closures are proposed during this project.

6.3 Speed management

There will be no adjustment to existing speed limit on the road network are required by activities or site set up of this project.

6.4 Signposting and delineation

Appropriate signposting should be located and installed to provide for the easy and safe passage of vehicles, pedestrians and cyclists. All road features including signage will be consistent with the requirements of AS: 1742 (Australian standard: *Manual of uniform traffic control devices, street name and community facility name signs*) and will be shown on the Project's VMP. Clear road markings and safety signage compliant with AS:1319 (Australian standard: *Safety signs for the occupational environment*) will be installed. Messages should be clear and easily interpreted by drivers, pedestrians and cyclists, and should not create a safety hazard.

Transferrable Magnetic Stickers will be used as signage to identify haulage vehicles and construction plant within at least 50 meters as being for this project.

6.5 Pedestrians and cyclists

Given the static nature of the construction site and the site is located on a dead-end road within a heavy industrial land-use, the potential for interaction with cyclists and external pedestrians is expected to be negligible.

The focus of the mitigation measures and controls for the Portion 2 Early Works is on the management of internal pedestrian movements and education of site personnel and plant and machinery operators.

In areas where plant movements vary from day to day, temporary exclusion zones will be established and relocated as required. Temporary exclusion zones will be communicated to all site personnel during the prestart meetings as necessary and identified on an updated VMP.

Mobile plant will be prevented from moving outside operational zones. Pedestrian walking zones will be delineated on site through a combination of either pavement marking, mesh, barriers, fencing or similar. People and plant interaction will be established ensuring that interface with operational traffic is minimised, particularly in high traffic use areas such as refuelling zones, loading bays, entry or exit points. Positive communication must be made by plant operators and pedestrians before entering exclusion zones or leaving the designated pedestrian routes.

Where possible the need for reversing will be eliminated through the use of drive through loading/unloading routes or the use of multi directional mobile plant. Light vehicles and mobile plant shall have roof mounted amber coloured flashing beacons as well as reversing alarms.

Site induction package will include information regarding awareness and management measures to be adhered to when operating plant and machinery and also when walking around on site. In addition, commercial drivers entering the site will be made aware of any management measures to be adhered to when accessing the site.

Tool-box talks will be rolled out as required, targeting specific issues such as temporary pedestrian exclusion zones, changes in site layout and changes to site activities that may impact on the safe movement of site personnel across site. Refer to [Section 7.2](#) for further details with regards to site tool-box talks.

6.6 Public transport

There are no planned disruption or changes to the operations of public transport from site works. No bus stops are located nearby to the project boundary and the nearest train station to the site is Camellia, located approximately 750 m west-northwest of the site.

6.7 Property access

The main access to the site will be from either the northern boundary, off Grand Avenue or the western boundary of the site, off Colquhoun Street. There are no planned impacts to other properties access during the project.

6.8 Special events

There are a number of special events in Rosehill Racecourse including race days with a corresponding estimated attendance of 5,000 to 10,000 people as well as the potential for various functions, events, conferences and exhibitions.

The entrance to Rosehill Gardens Racecourse is located approximately 650 metres from the Grand Avenue site entrance and 850 metres from the Colquhoun Street entrance. Consultation with the ATC commenced during previous remediation activities, as part of Portion 1 Early Works.

During Portion 1 Early Works, no parking or pedestrian impacts were recorded, or complaints received during special events. Consultation with the ATC of special events being held at Rosehill Gardens Racecourse will continue during Portion 2 Early Works.

6.9 Road condition surveys

Road condition surveys were conducted for Grand Avenue and Colquhoun Street prior to commencing Early Works remediation activities. Due to the minimal transition period, estimated at less than 3 months, between the stages of Early Works remediation activities, no additional road condition surveys are proposed.

In the event of any damage to the surrounding roads attributable to the site works, which is not attributable to normal wear and tear, consultation will be undertaken with the asset owner to determine suitable compensation or a process for rectification of the damage. Repairs to the road condition will be completed prior to the commencement of the operation of the Parramatta Light Rail.

6.10 Road safety audits

No new or modified local road, parking, pedestrian or cycle infrastructure is to be delivered as part of the Portion 2 Early Works. Therefore Condition of Approval E3 is not triggered.

6.11 Incident management and response

Refer to the Incident Management Plan which includes standard operating procedures for managing emergencies and unplanned incidents including incidents that could occur on roads and those associated with road users.

The types of emergencies or unplanned incidents that may occur include, but not limited to:

- Traffic crashes;
- Hazardous material spillage or chemical spills and leak;
- Power failure or fire;
- Inclement weather conditions, including flooding and major storm events; and
- Construction type incidents involving closure of a lane, or footpaths.

In the event of a traffic and transport related incident the primary point of contact for incident management is the Transport Management Centre.

In case of flammable or hazardous substances, instruct the site personnel not to approach these substances until NSW Fire and Rescue have declared the site safe and close the roadway at a safe distance until Fire and Rescue arrives and issues appropriate instructions.

6.12 Emergency Services Access

An Emergency Management Plan has been prepared in consultation with emergency services and the relevant Road Authority providing a framework for the site specific VMPs. Access for emergency vehicles would be maintained at all times to the site. Access arrangements would be detailed in the site VMP.

Whilst no such activities are anticipated, in the event that temporary traffic arrangements, planned road switches, anticipated delays, likely network disruptions or any other information likely to impact response times then emergency services would be consulted of the planned impacts.

7 Compliance management

7.1 Roles and responsibilities

The Contractor 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 the site construction traffic, transport and access management is detailed below.

7.1.1 Contractor Project Manager

The environmental responsibilities of the Contractor Project Manager include (but are not limited to):

- Provide resources to ensure compliance with this TTAMP is achieved;
- Mandate and ensure that environmental protection remains an integral element of all project activities; and
- Authorise resourcing with regards to traffic, transport and access management.

7.1.2 Contractor Environment Manager

The Contractor Environment Manager is responsible for leading the planning, approvals and environmental function and is responsible for the ongoing requirements associated with the management of traffic and access as follows:

- Coordinate and manage the preparation of this TTAMP and associated documents / plans / procedures;
- Identify resources required for implementation of this TTAMP;
- Carefully select suppliers and subcontractors based upon their ability to meet stated requirements;
- Coordinate ongoing training in environmental awareness for all levels of site personnel (including sub-contractors) as required to implement this TTAMP;
- Ensure that an appropriate environmental induction and training program is developed such that personnel are aware of their environmental responsibilities under relevant legislation and the contract, including the requirements associated with traffic and access management;
- Program toolbox talks and daily pre-start meetings to include any relevant traffic and access management requirements;
- Implement, maintain, monitor, report and advise the Contractor Project Manager on all environmental matters including those associated with traffic and access management;
- Liaise with the TfNSW and Environmental Representative on environmental issues, including the written notification of non-conformances;
- Monitor the implementation of all environmental management requirements as detailed in this TTAMP;
- Ensure Project sub-contractors comply with all relevant statutes, regulations, rules, procedures, standards and policies as detailed in this TTAMP;

- Ensure the timely review and assessment of environmental monitoring, auditing and inspection outcomes to ensure identification and implementation of continual improvement with regards to environmental management; and
- Overall reporting of the environmental performance of the Project.

7.1.3 Contractor Site Environment Officer (or representative)

The environmental responsibilities of the Contractor Site Environmental Officer (or site representative) include (but are not limited to):

- Daily interaction and coordination with Project contractor representatives to ensure their environmental management requirements are discharged; and
- Work collaboratively with the Contractor Environment and Hygiene Manager to ensure desired environmental outcomes are achieved.

7.2 Training

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

- Existence and requirements of this sub-plan;
- Relevant legislation; and
- Roles and responsibilities for traffic, transport and access management.

Targeted training in the form of toolbox or specific training will also be provided to personnel with a key role in traffic, transport and access management.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

7.3 Communication

All external communication with the community, including business, must follow the guidelines set out in the Community Communication Strategy prepared by TfNSW.

The community must be notified of any current and upcoming works, temporary works or contractor activities that have the potential to impact on stakeholders and the community before they happen.

7.4 Inspections

Requirements and responsibilities in relation to inspections are documented in Section 3.9 of the CEMP.

7.5 Auditing

Audits may be undertaken to assess the effectiveness of traffic management measures, compliance with this sub plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 3.9 of the CEMP.

7.6 Reporting

Reporting requirements and responsibilities are documented in Section 3.9 of the CEMP.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this 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 traffic management;
- 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; and
- Make comparisons with objectives and targets.

8.2 TTAMP update and amendment

The processes described in Section 3.9 and Section 3.12-3.13 of the CEMP may result in the need to update or revise this Plan. This TTAMP will be reviewed at least six monthly and or it will occur:

- Following reportable environmental incidents;
- Upon identification of new risks, including risks identified during risk register updates;
- When non-compliances are identified;
- Following environmental audits that identify matters that require attention;
- In response to project change (including modifications);
- Within three months of any of the above occurrences;
- As part of a continuous improvement process; and,
- The effect of changes in standards and legislation.

Should the review process identify any issues that needs updating, the Environment and Hygiene Manager will update this TTAMP. Revisions to this TTAMP will be approved by the Contractor Project Manager and TfNSW Project Manager followed by a comprehensive review.

Revised versions of this TTAMP will be made available through the document control process, described in Section 3.11.2 of the CEMP.

Revised TTAMP must be then submitted to the ER for approval. Reviews will be undertaken in consultation with key stakeholders to ensure all locations/functions are considered. A record of the date and comments relating to any revisions of this TTAMP will be included in the revision table. A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.11.2 of the CEMP.

Appendix A - Consultation Evidence

Table A- 1: Log of consultation with Stakeholders as per CoA A5

In / Out	Date and time	Method of contact	Details of contact
Out	19/02/2019 17:23	E-mail	Invitation to PLR Consultation Workshop (RMS, Police, Fire & Rescue NSW, NSW Health, EPA, OEH, City of Parramatta Council, DoI Water)
Out	20/02/2019 17:07	E-mail	Invitation to PLR Consultation Workshop (Site Auditor, SCO)
In	21/02/2019 09:49	E-mail	RMS not attending workshop – may review traffic related management plans
In	26/02/2019 08:36	E-mail	SCO not attending workshop – will review traffic related management plans
Out	06/03/2019 09:30	Workshop	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to attending stakeholders
In	07/03/2019 08:22	E-mail	SCO comments (SCO-01 to SCO-06) received on TTAMP.
Out	07/03/2019 11:21	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to non-attending stakeholders (RMS)
In	18/03/2019 11:13	E-mail	Fire & Rescue NSW – no comments.

In / Out	Date and time	Method of contact	Details of contact
In	18/03/2019 13:16	E-mail	RMS is satisfied with SCO reviewing the traffic related management plans and don't raise any further comments raised in SCO's email dated 7th March.
In	22/03/2019 18:40	E-mail	NSW Health comment (HEA-01) received on TTAMP. Comment noted did not require further update.
In	18/03/2019 13:16	E-mail	RMS is satisfied with SCO reviewing the traffic related management plans and don't raise any further comments raised in SCO's email dated 7th March.
Out	26/03/2019 07:40 - 08:02	E-mail	Additional correspondence requesting comments to Police – Cumberland, EPA, Council, DoI Water
In	27/03/2019 21:27	E-mail	City of Parramatta Council Environmental Health Compliance Team reviewed – CEMP, NVMP, SWMP, AQMP, WRMP and CLMP - no comments received.
In	27/03/2019 21:30	E-mail	City of Parramatta Council comments (COP-01 to COP-05) received on SWMP.
Out	04/04/2019 10:33	E-mail	Response on City of Parramatta Council comments (COP-01 to COP-05) to SWMP provided to Council.
-	14/04/2019	-	Nil comments received by NSW Police – Cumberland PAC throughout process. Consultation closed 14/04/2019

Table A- 2: Log of issues raised by Stakeholders as per CoA A5

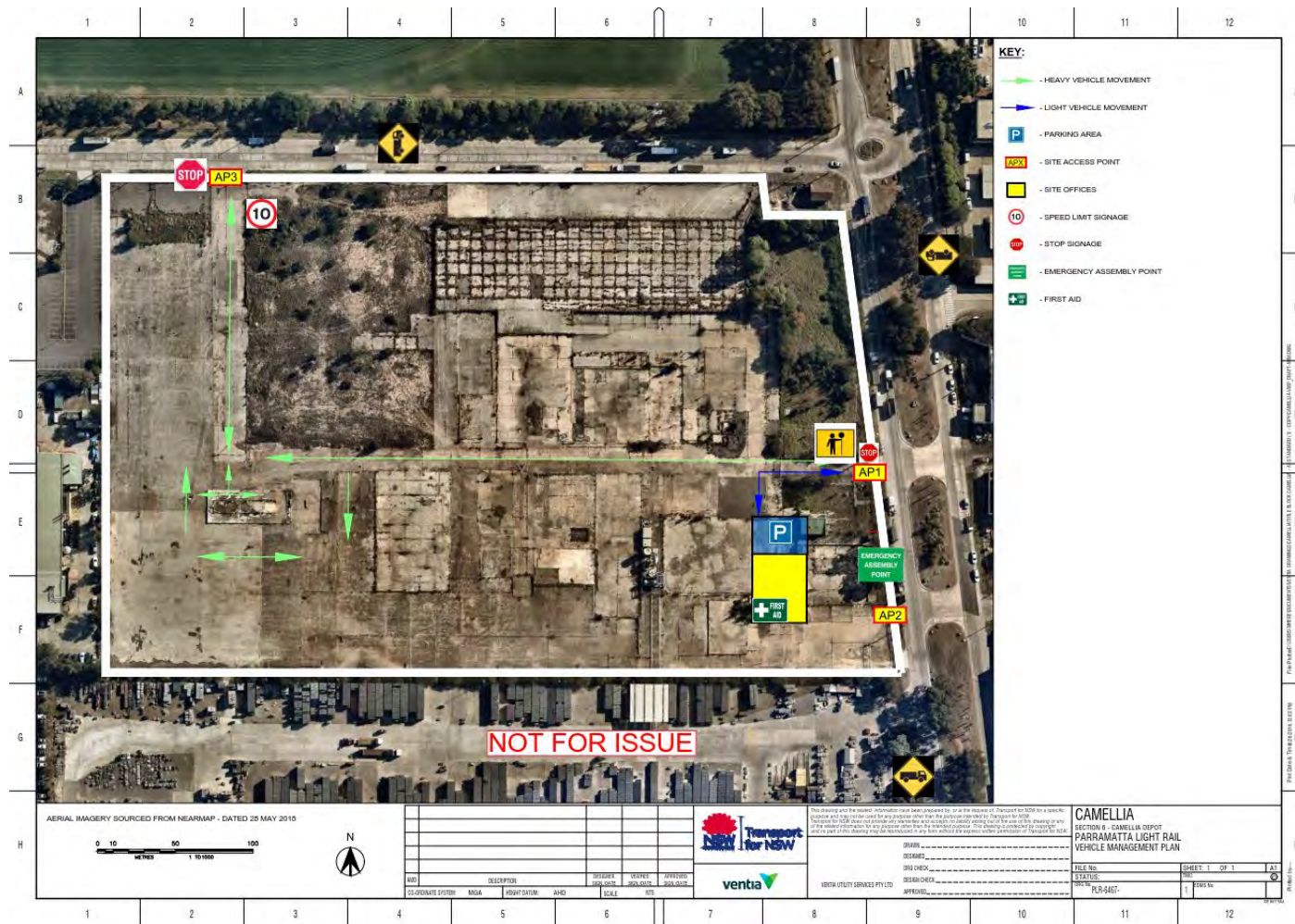
Reference	Comment	How addressed	Management plan reference location	Reference	Status
Sydney Coordination Office SCO-01	Please confirm that RMS have also been provided a copy of the TTAMP for review. Noting that RMS will be the approver of this document.	A copy of the TTAMP, CEMP and other associated sub-plans has been issued to RMS for review. No further comment from Stakeholder following response.	Appendix A – Consultation Evidence	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed
Sydney Coordination Office SCO-02	Future revisions of this document should be signed.	The final version will be signed and approved, prior to submission to the DP&E. No further comment from Stakeholder following response.	Version Control	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed
Sydney Coordination Office SCO-03	Please add Sydney Coordination Office SCO to the list of abbreviations.	Sydney Coordination Office has been added to Glossary / Abbreviations. No further comment from Stakeholder following response.	Glossary / Abbreviations	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed
Sydney Coordination Office SCO-04	James Ruse Dr and Parramatta Rd can be very congested during peak periods. SCO would encourage the contractor to schedule haulage and	Opportunities to reduce traffic movements during peak periods has been identified with several opportunities to reduce impacts, including use	Section 6.1.2 & Section 6.1.3	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
	deliveries outside of AM and PM peaks Mon-Fri where practical.	of materials in proximity to the project site. No further comment from Stakeholder following response.			
Sydney Coordination Office SCO-05	Given the sites direct access to the arterial road network, without the need to drive through residential areas, SCO would encourage haulage operations at night.	Additional Opportunities to reduce traffic movement impacts by out of hours deliveries has been assessed in the NVMP. No further comment from Stakeholder following response.	Section 6.1.3	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed
Sydney Coordination Office SCO-06	Please check all turning paths into and out site to ensure driveway widths are appropriate, noting that parking adjacent to driveways may need to be restricted.	The dimensions of the Grand Avenue access driveways and associated break in the median island are of adequate geometry to accommodate the majority of truck types proposed to service the remediation works, including single unit trucks (dump trucks and water pump trucks) and articulated trucks (i.e. transport vehicles for the machineries proposed on-site).	Section 6.1.2	Annexure A of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 08:22	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
		Should there be a need for longer vehicles to access the site, it is considered that the access driveway located at the south-western corner of the site onto Colquhoun Street (approximately 15 metres wide) will provide sufficient dimension to the site. No further comment from Stakeholder following response.			
NSW Health / Ambulance HEA-01	If road access is inhibited that traffic controllers give priority and right of way to Ambulances driving under lights and sirens and where possible on dual carriage way, if closures are occurring, 1 lane is left available for emergency access vehicles to use. By the report it does not appear that road closures are part of the scope of works so this should not be an issue.	No special arrangements for road or lane closures are proposed during this project. No further comment from Stakeholder following response.	Section 6.2 of the TTAMP	Annexure F of CEMP Stakeholder Consultation Evidence, dated 22/03/2019 18:40	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
Roads and Maritimes Services	RMS is satisfied with SCO reviewing the traffic related management plans and don't raise any further comments raised in SCO's email dated 7th March			Annexure B of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 13:16	Closed
City of Parramatta Council	Comments on CEMP and SWMP provided to Council. No traffic, transport and access comments raised by Council throughout the consultation process			Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed
Fire & Rescue NSW	Fire & Rescue NSW response following review of the plans and provided information with no comments			Annexure E of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed
Police – Parramatta PAC	Police (Parramatta PAC) confirmed that the Project falls under Cumberland Police Area Command			Annexure C of CEMP Stakeholder Consultation Evidence, dated 20/02/2019 07:59	Closed
Police – Cumberland PAC	Nil comments received by NSW Police – Cumberland PAC throughout process. Consultation closed 14/04/2019			Annexure D of CEMP Stakeholder Consultation Evidence	Closed

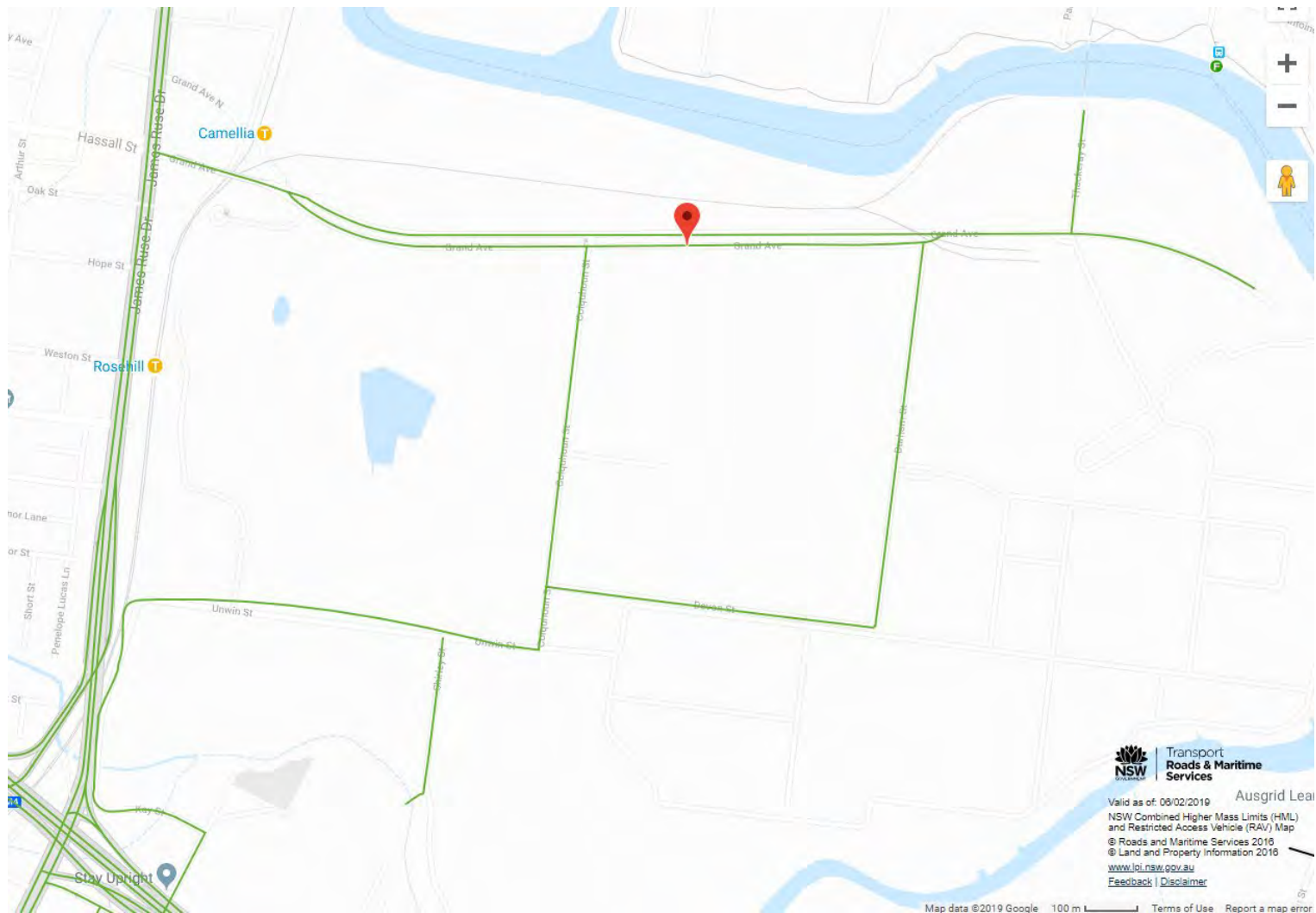
Appendix B - Vehicle Movement Plan Example



Appendix C - Proposed Haulage Route Overview



Appendix D – Restricted Access Vehicle Route



Appendix E - ER Endorsement



20 May 2020

Transport for NSW

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

**Review of Parramatta Light Rail Package 3
Portion 2 Remediation Works Ventia – Traffic Transport Access Management
Plan (PLR-VNT-SAM-TT-PLN-000001 - Rev 4)**

Pursuant to SSI-8285 Condition of Approval A23 (d), as the approved Environmental Representative, I confirm that I have reviewed the Parramatta Light Rail Package 3 Portion 2 Remediation Works Ventia – Traffic Transport Access Management Plan (TTAMP) (PLR-VNT-SAM-TT-PLN-000001, Rev 4, 30 April 2020).

The document was updated with minor amendments as part of the six-monthly review of the CEMP which is approved by the ER as per condition of approval C8 for implementation at the site for the duration of construction.

Yours sincerely,

[Redacted signature block]

[Redacted footer block]

Parramattalightrail.nsw.gov.au
Parramattalightrail@transport.nsw.gov.au
1800 139 389
Level 10, 130 George Street Parramatta 2150

Appendix B3

Noise and Vibration Management Sub Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1

April 2020

PLR-VNT-SAM-NV-ASS-000007

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Parramatta Light Rail – Stage 1

Portion 2 Early Works (Package 3) – Construction Noise and Vibration Management Sub-plan

Document control

Title	Parramatta Light Rail – Stage 1 Portion 2 Early Works (Package 3) Construction Noise and Vibration Management Sub-plan
Prepared by	[REDACTED] [REDACTED]
Signed	[REDACTED]
Dated	30/04/2020
Approved on behalf of Ventia Utility Services Pty Ltd by	[REDACTED]
Signed	[REDACTED]
Dated	30/04/2020
Endorsed by Environment Representative	[REDACTED], Environmental Representative
Signed	<i>Refer Annexure F</i>

Version control

Revision	Date	Description	Prepared by	Approval
01	28/02/2019	For Review	[REDACTED]	[REDACTED]
02	27/03/2019	Address comments from ER and AA	[REDACTED]	[REDACTED]
03.01	08/04/2019	Post consultation update	[REDACTED]	[REDACTED]
03.02	11/04/2019	ER + AA Endorsement	[REDACTED]	[REDACTED]
03.03	09/05/2019	Post consultation update (EPA)	[REDACTED]	[REDACTED]
04.02	27/06/2019	DP&E Comments	[REDACTED]	[REDACTED]
05.01	30/08/2019	DPIE Comments and scope update	[REDACTED]	[REDACTED]
06.01	25/02/2020	6 Monthly Review inclusion of Vibration Monitoring Report following Trial GI works in	[REDACTED]	[REDACTED]
07	30/04/2020	TfNSW Comments	[REDACTED]	[REDACTED]

Glossary/Abbreviations

Abbreviations	Expanded Text
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
AMMM	Additional Mitigation Measures Matrix
Attenuation	The reduction in the level of sound or vibration.
AS2436	Standards Australia AS 2436–2010™ – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.
AS61672 or AS1259	Standards Australia AS IEC 61672.1–2004™ – Electro Acoustics – Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ – Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device.
AVTG	NSW Department of Environment and Conservation – NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline (AVTG), February 2006.
BS 6472	British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) dated 1992;
BS 7385	British Standard BS7385: Part 2-1993 – Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration, dated 1993.
CEMP	Construction Environmental Management Plan
CNVS	Construction Noise and Vibration Strategy
CNVIS	Construction Noise and Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
CoA	Condition of Approval
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DDC	Drilled Displacement Columns
DIN4150:3	German Institute for Standardisation – DIN 4150 (2016-12) Part 3 – Structural Vibration – Effects of Vibration on Structures.

Abbreviations	Expanded Text
DPIE	NSW Department of Planning, Industry and Environment (formerly known as Department of Planning and Environment)
EIS	Environmental Impact Statement
Emergency	A serious, unexpected, and often dangerous situation requiring immediate action. Works required to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.
EMS	Environmental management system
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPO	Environmental Performance Outcomes
ER	Environmental Representative
ERG	Environmental Review Group
ERM	Environmental Resources Management Australia Pty Ltd
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
HNAML	Highly Noise Affected Management Level
ICNG	NSW Department of Environment and Climate Change – NSW Interim Construction Noise Guideline, July 2009.

Abbreviations	Expanded Text
IEC60942	Standards Australia AS/IEC 60942:2004/IEC 60942:2003 – Australian Standard™ – Electroacoustic – Sound Calibrators.
L _{aeq} , 15 minute	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
L _{amax}	The A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
NML	Noise Management Level
NPI	NSW Environment Protection Authority – Noise Policy for Industry, October 2017
OEH	Office of Environment and Heritage
OOHW	Out-of-hours Work
PLR	Parramatta Light Rail (Stage 1)
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
REMMM	Revised Environmental Mitigation and Management Measure
RNP	NSW Department of Environment, Climate Change and Water – NSW Road Noise Policy, March 2011.
SCN	Construction Scenario ID
SWL, L _w	Sound Power Level
SPIR	Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018)
SPL	Sound Pressure Level
TfNSW	Transport for New South Wales
Project, the	Parramatta Light Rail – Camellia Remediation Works
Ventia	Ventia Utility Services Pty Ltd
VCC	Vibration Controlled Columns

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub Plan (CNVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for Stage 1 of the Parramatta Light Rail – Camellia Remediation (the Project).

This CNVMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) C3 and the revised environmental mitigation and management measures (REMMM) listed in the Parramatta Light Rail (Stage 1) Submissions and Preferred Infrastructure Report (SPIR) Environmental Impact Statement (EIS) and all applicable legislation.

The Construction Noise and Vibration Monitoring Program is included in Appendix D of this CNVMP to address the requirement of CoA C9.

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

The project 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 the project 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 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*.

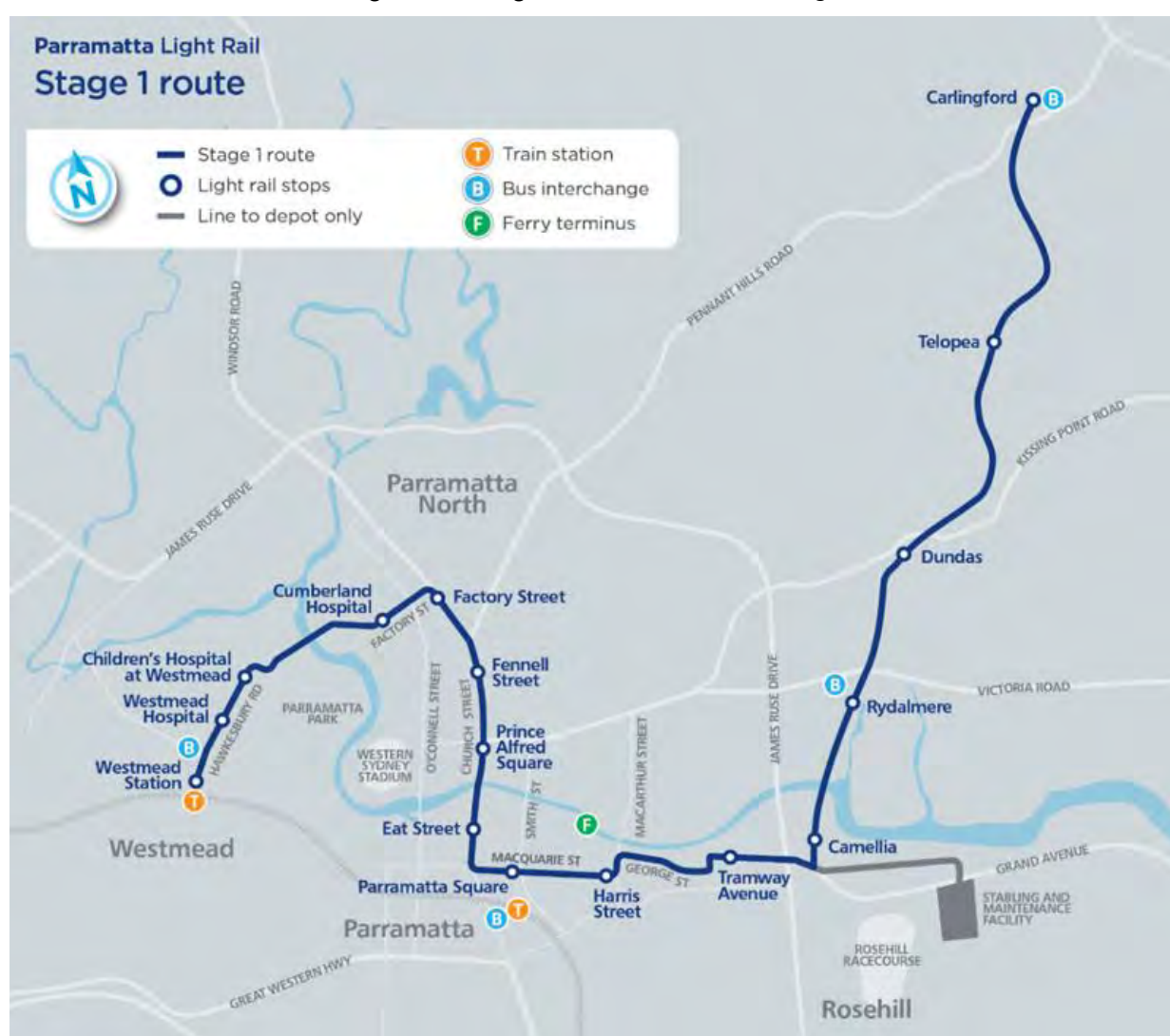


Figure 1-1: Parramatta Light Rail Stage 1 Route

1.3 Scope of the Sub-Plan

Parramatta Light Rail is one of the NSW Government's major public transport projects, part of a record \$89.7 billion infrastructure investment across the state. Stage 1 of Parramatta Light Rail will connect Westmead to Carlingford via the Parramatta CBD and Camellia.

As part of the project, the site of the proposed Stabling and Maintenance facility at 6 Grand Avenue, Camellia, will be remediated to address contamination resulting from the land's historical industrial use.

Ventia Utility Services Pty Ltd (Ventia) has been engaged by Transport for NSW to complete this work. The works will be delivered in two portions:

- Portion 1 - groundwater contamination remediation: installation of a hydraulic barrier wall along the site boundary to prevent groundwater migration, and replacement of the existing groundwater treatment plant
- Portion 2 – site capping: installation of an engineered capping system to form a barrier between contaminated and non- contaminated materials.

This CNVMP outlines the approach to Portion 2 remediation works, to ensure all risks associated with noise and vibration issues are considered and managed effectively and in accordance with the Project's legal, planning and contractual requirements.

1.4 Environmental management systems overview

The environmental management system overview is described in *Section 1.4* of the CEMP.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how Ventia Utility Services Pty Ltd (Ventia) proposes to manage potential noise and vibration impacts during construction of the Project.

2.2 Objectives

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

- The environmental impact assessment prepared for Parramatta Light Rail – Stage 1
- Consolidated Conditions of Approval for Parramatta Light (Stage 1) – CSSI 8285 (MOD 2) determined on 25 January 2019
- Transport for NSW's Construction Noise and Vibration Strategy (2018)

2.3 Targets

Targets have been established for the management of noise and vibration impacts during the Project to ensure:

- Full compliance with the relevant legislative requirements, CoA, EPOs and REMMMs.
- Implement feasible and reasonable noise mitigation measures with the aim of achieving the construction noise management levels detailed in this CNVMP in accordance with the Interim Construction Noise Guideline (DECC, 2009).
- Any damage to buildings or heritage items from vibrations is avoided.
- Complaints from the community and stakeholders are minimised.

Targets for the management of noise and vibration impacts during the Project are presented in *Table 2-1* with key performance indicators (KPI).

Table 2-1 Targets and KPIs for Noise and Vibration

Target	KPI	Records
Full compliance with the relevant legislative requirements, CoA and REMMs	Throughout the project, Ventia would comply with all CoAs and REMMs	Environmental inspection checklist, audits
Implementation of all feasible and reasonable mitigation measures detailed in this CNVMP	Demonstrable implementation of noise and vibration mitigation measures	Environmental inspection checklist, audits and noise and vibration monitoring records
Complaints from the community and stakeholders are minimised and appropriately managed.	Compliance with CNVMP and Community Consultation Strategy	Audits

For the purpose of this CNVMP, a feasible mitigation measure is considered to be a measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending construction practices to reduce noise impacts by carrying out the works during less noise sensitive times, as is detailed in the CNVMP.

3 Environmental requirements

3.1 Relevant legislation

3.1.1 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).

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described in *Section 3.1.2*.

3.1.2 Parramatta Light Rail Planning Approval

The Environmental Impact Statement (EIS) assessed impacts for Parramatta Light Rail Stage 1 (Westmead to Carlingford). This covered the light rail and associated works including road enabling work. It was approved by the Minister for Planning on 29 May 2018, with minor administrative modifications made subsequently.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

3.1.3 Legislation

In NSW, noise pollution is regulated through the *Protection of the Environment Operations Act 1997* (POEO Act) as the key piece of environmental protection legislation. Noise pollution is defined under the POEO Act as:

'the emission of offensive noise, which means noise that by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances, is harmful (or is likely to be harmful) to or interferes unreasonably (or is likely to interfere unreasonably) with the comfort or repose of a person outside the premises from which the noise is emitted.'

Various noise assessment guidelines endorsed by NSW consent and regulatory authorities provide a guideline framework and methodology for deriving acceptable levels and standard methods for assessing and measuring construction and operational impacts with due regard to the POEO Act.

The key documents, policy, guidelines and standards relevant to the Project works are listed in *Section 3.1.4* below.

This CNVIS has been developed to address the requirements of the Parramatta Light Rail (Stage 1) Critical State Significant Infrastructure Conditions of Approval (CoA) (SSI 8285) E42 dated January 2019.

CoA – C3 to C6 outline the requirements for a Construction Noise and Vibration Management Plan to be prepared for each construction site prior to noise and vibration impacts occurring and include specific mitigation measures identified through consultation with affected sensitive receptors.

The purpose of this CNVMP and the Monitoring Program have been prepared to address the requirements of CoA C3 and C9 to C17.

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

3.1.4 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009

- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS1055–2018™ (AS1055) – Description and Measurement of Environmental Noise;
- Australian Standard AS IEC 61672.1–2004™ (AS61672) – Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ (AS1259) – Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device;
- Australian Standard AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard™ – Electroacoustic – Sound Calibrators;
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz)'
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures
- Transport for NSW's Construction Noise and Vibration Strategy (7TP-ST-157/4.0)
- Transport for NSW's Construction Noise Estimation Tool (9TP-FT-150)

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed *Table 3-1* below. A cross reference is also included to indicate where the condition is addressed in this Plan or other project management documents.

Table 3-1: Minister's Conditions of Approval

CoA No.	Condition Requirements	Document Reference	How Addressed
A1	The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (dated August 2017) (the EIS) as amended by (a) the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018) (the SPIR); (b) SSI 8285 Administrative modification (November 2018) (MOD 1); and (c) SSI 8285 Correction to Administrative modification (January 2019) (MOD 2).	Section 3.1, Section 3.2	Compliance with the <i>Parramatta Light Rail Stage 1 - Consolidated Conditions of Approval</i> .
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Secretary with the document or monitoring program or review.	Section 4, Appendix A	This CNVMP (including Monitoring Program) has been prepared in consultation with the Parramatta City Council, EPA and NSW Health.
A19	Works must not commence until an ER has been approved by the Secretary and engaged by the Proponent.	Section 4, Section 10.1	ER has reviewed / endorsed this CNVMP.
A26	A suitably qualified and experienced Acoustics Advisor (AA) must be engaged for the duration of construction and for no less than six months following completion of construction of the CSSI. The AA must provide a statutory declaration to the Secretary that they are independent of the design and construction personnel. The Proponent must cooperate with the AA by: (a) providing access to noise and vibration monitoring activities as they take place;	Section 4, Section 10.1	AA has reviewed / endorsed this CNVMP.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(b) providing for review noise and vibration plans, assessments, monitoring reports and data analyses undertaken; and (c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.		
C3	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan and be consistent with the CEMP referred to in Condition C1: (b) Noise and vibration - Relevant Council(s), EPA, NSW Health	Section 4, Appendix A	This CNVMP (including Monitoring Program) has been prepared in consultation with the Parramatta City Council, EPA and NSW Health.
C2	The CEMP must provide: (j) for training and induction for employees, including contractors and sub-contractors, in relation to environmental and compliance obligations under the terms of this approval; (k) for periodic review and update of the CEMP and all associated plans and programs.	(j) Section 10.2 (k) Section 11	Section 10.2 outlines training and induction for employees relevant to this CNVMP. Section 11 outlines periodic review and updates of the CNVMP.
C4	The CEMP Sub-plans must state how: (a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved; (b) the mitigation measures identified in the documents listed in Condition A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	(a) Section 3.4, (b) Section 9, (c) Section 3.2 (d) Section 3.2.1 of the CEMP outlines the approach to environmental risk assessment and control. The project risk register is also presented in Appendix A2 of the CEMP.	This CNVMP outlines EPOs, mitigation and management measures and how compliance with the CoA will be achieved.
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	Section 4, Appendix A	This CNVMP (including Monitoring Program) has been prepared in consultation with the

CoA No.	Condition Requirements	Document Reference	How Addressed
	consultation, including all copies of correspondence from those agencies, must be provided to the Secretary with the relevant CEMP Sub-plan.		Parramatta City Council, EPA and NSW Health.
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 4	This CNVMP was submitted to DPIE no later than one month before construction.
C8	Construction must not commence until the CEMP and any CEMP Sub-plan specified in Condition C3 have been submitted to or approved by the Secretary. The CEMP and CEMP Sub-plans submitted to approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where construction of the CSSI is staged, construction of a stage must not commence until the CEMP and Sub-plans for that stage have been submitted to or approved by the Secretary.	This CNVMP	No construction will commence until this CNVMP has been submitted to or approved by the Secretary. Any minor amendments will be implemented for the duration of construction.
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies for each to compare actual performance of construction of the CSSI against performance predicted in the documents listed in Condition A1 or in the CEMP: (b) Noise and Vibration Monitoring - Relevant Council(s), EPA, NSW Health (as relevant)	Section 10.3, Appendix D	A Construction Noise and Vibration Monitoring Program has been prepared along with this CNVMP.
C10	Each Construction Monitoring Program must provide: (a) details of baseline data available; (b) details of baseline data to be obtained and when; (c) details of all monitoring of the project to be undertaken; (d) the parameters of the project to be monitored; (e) the frequency of monitoring to be undertaken; (f) the location of monitoring; (g) the reporting of monitoring results against relevant criteria; (h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and (i) any consultation to be undertaken in relation to the monitoring programs.	Section 10.3, Appendix D	A Construction Noise and Vibration Monitoring Program has been prepared along with this CNVMP.

CoA No.	Condition Requirements	Document Reference	How Addressed
C11	The noise and vibration monitoring data collected during monitoring required by Condition C9 must be available to the Proponent, ER, AA, Relevant Council(s) and the community to inform construction scheduling, the level of impacts and whether additional mitigation is required. The Department must also be provided access to this data if specifically requested.	Section 10.3	All monitoring data will be available to the construction team, Ventia, ER, AA, Parramatta City Council, DPIE and the EPA, as required.
C12	The Construction Monitoring Programs must be developed in consultation with relevant government agencies and Relevant Council(s) as identified in Condition C9 of this approval and must include, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency, including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 4, Appendix D	This CNVMP (including Monitoring Program) has been prepared in consultation with the Parramatta City Council, EPA and NSW Health.
C13	The Construction Monitoring Programs must be endorsed by the ER and submitted to the Secretary for information at least one month before the commencement of construction.	Section 4, Appendix F	ER has reviewed / endorsed this CNVMP.
C14	Construction must not commence until the Secretary has received all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Section 10.3, Appendix D	A Construction Noise and Vibration Monitoring Program has been prepared along with this CNVMP.
C15	The Construction Monitoring Programs, as submitted to the Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Section 4, Section 11, Appendix D	ER has reviewed / endorsed this CNVMP (including monitoring program. Any amendments to the CNVMP or monitoring program will be approved by ER/AA. Monitoring program will be implemented for the duration of construction.

CoA No.	Condition Requirements	Document Reference	How Addressed
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Section 10.6	The results of the Construction Monitoring Program will be submitted in a Construction Monitoring Report to EPA, the Parramatta City Council and the DPIE for information on a six monthly basis.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 10.3, Appendix D	A Construction Noise and Vibration Monitoring Program has been prepared along with this CNVMP.
C19	Boundary fencing that incorporates screening must be erected around all construction ancillary facilities that are adjacent to sensitive receivers for the duration of site establishment and construction of the CSSI unless otherwise agreed with Relevant Council(s), affected residents, business operators and/or landowners and in accordance with Condition B2(b).	-	These two conditions do not apply as there are no sensitive receivers adjacent to the project site. Receivers adjacent to the site are all classified as industry, therefore, not considered to be sensitive receivers according to Table 1: Definitions of the Conditions of Approval document.
C20	Boundary screening required under Condition C19 of this approval must reduce visual, noise and air quality impacts on adjacent receivers.	-	
E20	A detailed land use survey must be undertaken to confirm sensitive receivers (including critical working areas such as operating theatres, precision laboratories housing sensitive equipment and drama theatres) potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of works which generate construction or operational noise, vibration or ground-borne noise in that area. The results of the survey must be used to develop the Noise and Vibration Management Sub-Plan required by Condition C3 and Construction Noise and Vibration Impact Statements required by Condition E42.	Section 5.1	A detailed land use survey was undertaken by undertaking a walk-through of the surrounding areas to the Project site. The detailed land use survey has identified sensitive receptor locations closest to and/or potentially most affected by the Project's construction activities. The survey was

CoA No.	Condition Requirements	Document Reference	How Addressed
			conducted within 1.5 kilometres radius from the Project site.
Hours of Work			
E21	Works must be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 12:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 7	No works are to be conducted within the Eat Street precinct and works within the Camellia and Rosehill precinct are managed in accordance with E23, therefore this condition is not triggered.
E22	Notwithstanding Condition E21, and with the exception of 'Eat Street', works may be undertaken during the following hours: (a) 6:00pm to 7:00pm Mondays to Fridays, inclusive; and (b) 12:00pm to 6:00pm Saturdays.	Section 7	Works in the Camellia and Rosehill precinct are managed in accordance with E23 and therefore this condition is not triggered.
E23	Notwithstanding Condition E21, works may be undertaken in the Camellia and Rosehill precincts (east of James Ruse Drive) and the Carlingford precinct (from Parramatta River to Victoria Road) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), between 10.00pm and 7.00am.	Section 7	This CNVMP outlines all requirements for hours of work.
Emergency Works			
E26	On becoming aware of the need for emergency construction works, the Proponent must notify the ER of the need for those activities or works. The Proponent must also use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.	Section 7.4	This CNVMP outlines all requirements for hours of work.
Highly Noise Intensive Works			

CoA No.	Condition Requirements	Document Reference	How Addressed
E27	Except as permitted by an EPL, or through the Out-of-Hours Work Protocol, Highly Noise Intensive Works that result in an exceedance of the applicable NML at the same sensitive receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. For the purposes of this condition, 'continuous' includes any period during which there is less than a one (1) hour respite between ceasing and recommencing any of the work that are the subject of this condition. Note: A trial period of the Highly Noise Intensive Work undertaken with the approval of the Out of Hours Work Protocol may be established.	Section 7	Partially triggered, notwithstanding the hours of work specified in E23, respite periods shall be implemented such that for continuous blocks not exceeding three (3) hours each there is a minimum respite from those activities and works of not less than one (1) hour between each block.
Out of Hours Works Protocol			
E28	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of works which are outside the permitted hours defined in Conditions E21 to E22, where an EPL does not apply. The Protocol must be approved by the Secretary before commencement of out-of-hours works. The Protocol must be prepared and implemented in consultation with AA. The Protocol must: (a) provide a process for the consideration of out-of-hours works against the relevant noise and vibration criteria; (b) provide a process for the identification and implementation of mitigation and management measures for residual impacts, in consultation with the community at each affected location, consistent with the requirements of Condition E39; (c) identify an approval process that considers the risk level of activities (in accordance with AS/NZS ISO 31000:2009 "Risk Management"), proposed mitigation, management, and coordination, including where: i) low and moderate risk activities can be approved by the ER in consultation with the AA, and ii) high risk activities that are approved by the Secretary; and	Section 7.2	Refer to Parramatta Light Rail – Stage 1 Out-of-hours work protocol (<i>PLR-TFNSW-CBD-PE-FRM-000002</i>) Version 7.01 prepared 4 February 2019

CoA No.	Condition Requirements	Document Reference	How Addressed
	(d) identify Department and community notification arrangements for approved out of hours works, which will be detailed in the Communication Strategy. Note: This condition does not apply where work is required for an emergency (as defined in Condition E25 (b)).		
E29	Out-of-hours works that may be regulated through an EPL or the Out of Hours Work Protocol as per Condition E28 include, but are not limited to: (a) carrying out works that during standard hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 "Risk Management"; or (b) the relevant road authority has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to road network operational performance and a road occupancy licence will not be issued; or (c) the relevant utility service operator has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to the operation and integrity of the utility network; or (d) where the TfNSW Transport Management Centre (or other road authority) has advised the Proponent in writing that a road occupancy licence is required and will not be issued for the works or activities during the hours specified in Condition E21 and Condition E22; or (e) where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required.	Section 7.2	This CNVMP outlines all requirements for out-of-hours works.
Construction Noise Mitigation Measures			
E30	Mitigation measures must be applied to construction activities that are predicted to result in the following residential ground-borne noise levels being exceeded as a result of the CSSI: (a) Evening (6.00pm to 10.00pm) – internal LAeq(15 minute): 40 dBA; and (b) Night (10.00pm to 7.00am) – internal LAeq(15 minute): 35 dBA. The mitigation measures must be outlined in the Construction Noise and Vibration Management Sub-Plan and the Out of Hours Works Protocol.	Section 8.2	Ground-borne noise impacts are not anticipated as significant vibration generating source(s), with the potential to generate perceptible ground-borne noise, does not form part of the Project design and has not been triggered in the Staging Report.

CoA No.	Condition Requirements	Document Reference	How Addressed
E31	Noise generating works near places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services and accommodation) must not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution. This must be determined through ongoing consultation with the community during construction.	Section 9	Ongoing consultation with the community during construction will be undertaken to determine sensitive periods.
E32	The Proponent must consult with proponents or applicants of other State Significant development and infrastructure works near the CSSI and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers.	Section 7.3, Section 8, Section 9	Ventia will consult with proponents of other construction works in the vicinity of the Project and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receptors.
E33	Construction noise mitigation measures must be implemented in accordance with Tables 4, 5, 6 and 7 of TfNSW's Construction Noise and Vibration Strategy (2018), regardless of the number of sensitive receivers impacted.	Section 9	Construction noise mitigation measures must be implemented in accordance with the CNVS.
E34	Piling activities that affect sensitive receivers must be undertaken using quieter alternative methods than impact or percussion piling, such as bored piles or vibrated piles, where practicable.	Section 8, Appendix B	All piling undertaken that may affect sensitive receivers as part of the Project design will be bored piling.
E35	Nothing in this approval permits blasting for construction of the CSSI.	N/A	Blasting does not form part of the project design.
Construction Noise Mitigation – Respite			

CoA No.	Condition Requirements	Document Reference	How Addressed
E36	The Proponent must provide respite periods for sensitive receivers where any construction activity during the hours specified in Condition E21 results in noise levels that exceed the Highly Noise Affected Level of 75 dB (LAeq,15 minute).	Section 7.3, Section 9	Section 7.3 and Table 9-1, CNV4 outlines the requirements for respite management measures,
E38	All works undertaken for the delivery of the CSSI, including those undertaken by utility contractors, must be coordinated to ensure respite, including the respite required by Condition E37. The Proponent must: (a) schedule any works to provide respite to impacted noise sensitive receivers so that all respite periods are achieved; or (b) consider the provision of alternative mitigation, including the provision of at receiver treatments and alternative accommodation to impacted noise sensitive receivers; and (c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Section 7.3, Section 9	Section 7.3 and Table 9-1, CNV4 outlines the requirements for respite management measures.
E39	In order to undertake out-of-hours work described in Condition E25(c) and (d), the Proponent must identify appropriate work and respite periods for the works in consultation with the community at each affected precinct at three monthly intervals. This consultation must be ongoing and include (but not be limited to) providing the community with: (a) a schedule of likely out-of-hours work for a period of no less than two (2) months for medium to high risk work (as defined in the Out-of-Hours Work Protocol (Condition E28)); (b) a schedule of likely out-of-hours work for a period of no less than seven (7) days for low risk work (as defined in the Out-of-Hours Work Protocol (Condition E28)); (c) the potential works, location and duration; (d) the noise characteristics and likely noise levels of the works; and (e) likely mitigation and management measures. The Proponent shall consider and respond to the affected community's preference for alternative hours and/or durations.	Section 7.3, Section 9	Section 7.3 and Table 9-1, CNV4 outlines the requirements for respite management measures.

CoA No.	Condition Requirements	Document Reference	How Addressed
	The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works must be provided to the AA, ER and the Secretary.		
E40	The provision of respite periods does not preclude the application of other construction noise management measures, including the provision of at receiver treatments and or alternate accommodation.	Section 7.3, Section 9	Section 7.3 and Table 9-1, CNV4 outlines the requirements for respite management measures.
Workplace Health and Safety for Nearby Workers			
E41	At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq, 8h, of 85dB(A) for any employee working at a location near the CSSI.	Section 6.3, Section 9	Section 6.3 outlines project noise management levels. Table 9-1, CNV4 outlines the requirements for respite management measures.
Construction Noise and Vibration Impact Statements			
E42	Construction Noise and Vibration Impact Statements (CNVIS) must be prepared and implemented for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. Each Construction Noise and Vibration Impact Statement will supplement the Noise and Vibration Management Sub-Plan and must specifically address each of the major construction sites and must include but not be limited to: (a) a description of the proposed activities; (b) predicted noise and vibration levels based on background noise levels; (c) examination of alternative methods of construction that would potentially reduce noise and vibration if the potential noise and vibration exceeds the relevant criteria; (d) description and commitment to work practices which limit noise and vibration; (e) description of specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency;	Section 8	A CNVIS has been prepared for the Project. Results of the CNVIS are summarised in Section 8.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(f) justification for any activities to be undertaken outside the specified construction hours defined in Conditions E21 and E22; (g) internal noise audit systems including recording of daily hours of construction, progressive impact assessments as work proceeds, conducting informal checks by the AA, providing active and communication links to Council and surrounding residents and sensitive receivers; (h) assessment of potential noise from the proposed construction methods including noise from construction vehicles and noise impacts from required traffic diversions; (i) community consultation and notification; (j) all reasonable and feasible measures including adopting the least noisy available construction methods, systems and equipment; (k) additional noise and vibration mitigation measures as negotiated with affected residents and other sensitive receivers. Note: Existing noise levels, pre-construction noise levels, or the like for the purposes of identifying rating background noise levels, noise management levels and construction noise impacts are noise levels that do not include any other construction related noise.		
Vibration			
E43	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred dose values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Section 10.3.2	Vibration monitoring requirements are outlined in Section 10.3.2 8.3.1
E44	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	Section 5.3	No heritage items have been identified within close proximity to the Project. Impacts to heritage structures are not anticipated

CoA No.	Condition Requirements	Document Reference	How Addressed
Building Condition Survey			
E45	Before commencement of any construction, and with the agreement of the landowner, a structural engineer must undertake building condition surveys of all buildings identified in the documents listed in Condition A1 as being at risk of damage. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than one month before the commencement of construction.	Section 9	Table 9-1, CNV10 outlines the requirements for building condition surveys.
E46	After completion of construction and with the agreement of the landowner, Building Condition Surveys of all buildings for which building condition surveys were undertaken in accordance with Condition E45 of this approval must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than three (3) months following the completion of construction.	Section 9	Table 9-1, CNV10 outlines the requirements for building condition surveys.
E47	Any physical damage caused to a property as a result of the CSSI shall be rectified or the property owner compensated, within a timeframe agreed to by the property owner with the costs borne by the Proponent. This condition is not intended to limit any claims that the property owner may have against the Proponent.	Section 9	Table 9-1, CNV10 outlines the requirements for building condition surveys.

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed *Table 3-2* below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2: Revised environmental mitigation measures relevant to this CNVMP

Ref #	Commitment	Timing	CNVMP reference	How Addressed
NV-1	A Construction Noise and Vibration Management Plan (CNVMP) would be developed in accordance with the requirements of Transport for NSW's Construction Noise Strategy and the Interim Construction Noise Guidelines (DECC 2009). It would document all necessary measures to manage and mitigate potential noise and vibration levels during standard working hours and for all out-of-hours construction activities (refer to section 17.2.3 of the EIS). The CNVMP would also provide the framework and mechanisms for: • The mitigation and management of the noise and vibration impacts from the project. • Development of site specific construction noise management plans. • Out-of-hours work associated with the project.	Pre-Construction	This CNVMP, Section 7, Section 8, Section 9	This CNVMP has been developed in accordance with the CNVS and the ICNG. Predicted impacts are outlined in Section 8. Mitigation and management measures are outlined in Section 9. Requirements for OOHW are outlined in Section 7.
NV-2	The CVNMP prepared for the project would include mitigation and management measures for the works with reference to the NSW Interim Construction Noise Guideline (ICNG) and Transport for NSW Construction Noise Strategy (CNS). Mitigation and management measures which would be considered include: • For construction concentrated in a single area, such as at the stops, worksites, substation construction sites, bridge sites and the stabling and maintenance facility location, temporary acoustic fencing/barriers around the site perimeter would be considered where feasible and reasonable to mitigate off-site noise levels. • Given the potentially high noise levels at residential receivers, adherence to daytime construction hours	Pre-Construction	This CNVMP, Section 9	This CNVMP has been developed in accordance with the CNVS and the ICNG. Mitigation and management measures are outlined in Section 9.

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	would be used for excavation, demolition or rock breaking activities, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out-of-hours activities for safety reasons or to minimise disruption to road networks). • Where possible, noisy works would be scheduled to minimise impacts to adjacent businesses and commercial properties, such as avoiding undertaking noisy activities on Eat Street during lunch and dinner periods. • Out of hours works would be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors. • Consultation would be carried out with local schools and other educational facilities prior to noise intensive works to ensure impacts are minimised during examination periods and/or other critical periods in the school calendar (where works are predicted to exceed the relevant construction noise management level for this receiver). Consultation with nearby childcare centres would be carried out to potentially avoid noisy works during rest periods at the centres (where possible). • Simultaneous operation of noisy plant in close proximity to sensitive receptors would be avoided (where possible). • Equipment which is used intermittently would be shut down when not in use. • Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors would be as great as possible. • Where possible, equipment with directional noise emissions would be oriented away from sensitive receptors.			

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	- Construction compounds would use 2.4 metre high hoarding of solid construction where required to minimise noise on sensitive receivers, where safe to do so. - Structures such as site sheds would be positioned to further shield sensitive and residential receivers from works activities. - Regular compliance checks for noise emissions from all plant and machinery used for the project would be carried out to indicate whether noise emissions from plant items are higher than predicted. This would also identify defective silencing equipment on the items of plant. - Ongoing noise monitoring would be carried out during construction at sensitive receptors during critical periods to identify and assist in managing high risk noise events. - Where possible heavy vehicle movements should be limited to daytime hours. - Reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms, which would be limited to the use of non-tonal reversing alarms. - Loading and unloading should be carried out away from sensitive receptors, where practicable. - Work should be scheduled to provide respite periods from the noisiest activities, and impacted residents should be communicated with to clearly explain the duration and noise levels for the works.			
NV-3	In the event of predicted exceedances of the noise goals, particularly during out-of-hours works, additional noise mitigation and management measures to be considered in the CNVMP as described in the CNS. Additional mitigation	Pre-Construction	Section 6.5 Section 8 Appendix C	This CNVMP has been developed in accordance with the CNVS and the ICNG.

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	and management measures would be determined on a site specific basis and are dependent upon the level of predicted impact. Additional mitigation and management measures which would be considered include: • Periodic notifications – These include regular newsletters, letterbox drops or advertisements in local papers to provide an overview of current and upcoming works and other topics of interest. • Website updates – The project website would form a resource for members of the community to seek further information, including CNVPs and current and upcoming construction activities. • Project info-line and construction response line – Transport for NSW will operate a construction response line and a project info-line (1800 775 465). These numbers will provide a dedicated 24-hour contact point for any complaints regarding construction works and for any project enquiries. All complaints require a verbal response within two hours. All enquiries require a verbal response within 24 hours during standard construction hours, or on the next working day during out-of-hours work (unless the enquirer agrees otherwise). • Email distribution list – An email distribution list would be used to disseminate project information to interested stakeholders. • Signage – Signage on construction sites would be provided to notify stakeholders of project details and project emergency or enquiry information. • Specific notifications – Specific notifications would be letterbox dropped or hand distributed to the nearby residences and other sensitive receptors no later than seven days ahead of construction activities that are likely to exceed the noise objectives. This form of			The Additional Mitigation Measures Matrix (AMMM) are outlined in Section 6.5 Predicted impacts are outlined in Section 8. Requirements of the AMMM based on predicted results are outlined in Appendix C. Note: The AMMM is only applicable to commercial or other sensitive receptors (i.e. offices / places of worship) when these receptors are in use it should be noted that these receptors may not be in use during the night time period.

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	communication is used to support periodic notifications, or to advertise unscheduled works. • Phone calls – Phone calls may be made to identified/affected stakeholders within seven days of proposed work. For these works considering the large numbers of receptors, phone calls are not likely to be considered a reasonable mitigation and management measure in all cases, but could be used to inform specific receptors if requested (after notification of the works as above). • Individual briefings – Individual briefings may be used to inform stakeholders about the impacts of high noise activities and mitigation and management measures that would be implemented. Communications representatives from the contractor(s) would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Considering the large numbers of potentially affected receptors, individual briefings may not be considered a reasonable mitigation and management measure in all cases, but could be used for specific receptors if requested (after notification of the works as above). • Monitoring – Ongoing noise monitoring during construction at sensitive receptors during critical periods would be used to identify and assist in managing high risk noise events. Monitoring of noise would also be carried out in response to complaints. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures. • Project specific respite offer – Residents subjected to lengthy periods of noise or vibration may be eligible for a project specific respite offer. The purpose of such an offer is to provide residents with respite from an ongoing			

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	impact. An example of a respite offer might be pre-purchased movie tickets. The provision of this measure would be determined on a case-by-case basis. Project specific respite offers are unlikely to be reasonable and feasible in the CBD precinct. This is partly due to the impracticability of providing respite offers to large numbers of people during the proposed 24-hour works, but also reflects the existing evening and weekend noise environment in the Parramatta CBD precinct. Alternative accommodation – As described in the CNS, provision of alternative accommodation for residents should be considered in the event that highly intrusive noise impacts are predicted during the night-time period (between 10 pm and 7 am). However, as the project is likely to require night-time works at many locations (particularly in the Parramatta CBD precinct), provision of alternative accommodation in all cases may not always be feasible or reasonable.			
NV-4	For sensitive receiver that operate outside standard construction hours, for example hospitals which operate on a 24-hour basis, feasible and reasonable noise mitigation options and measures would be developed in consultation with the sensitive receiver.	Pre-Construction / Construction	Section 9	Mitigation and management measures are outlined in Section 9.
NV-5	The use of noise intensive plant items would be scheduled for normal working hours. If the works cannot be carried out during the daytime, it has been recommended to complete them before 11 pm, where practicable. This would be particularly relevant for works impacting the following noise catchment areas (NCAs) where a number of activities have been predicted to result in high impacts on many residential receivers during the night-time: NCA04 in the Westmead precinct	Construction	Section 7	Work hours are outlined in Section 7.

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	- NCA06 and NCA07 in the Parramatta North precinct - NCA11 in the Rosehill and Camellia precinct.			
NV-6	Opportunities to reduce road traffic noise during construction would be investigated during construction planning, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Construction	Section 9	Mitigation and management measures are outlined in Section 9.
NV-7	Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works would be confined to the less sensitive daytime period where possible. The potential impacts from vibration are to be considered in the site-specific Construction Noise and Vibration Impact Statements (to be developed during detailed design). In general, mitigation and management measures that would be considered include: - Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts. - Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment. - Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers). - Minimise consecutive works in the same locality (if applicable). - Use dampened rock breakers to minimise the impacts associated with rock breaking works. If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration	Construction	Section 9	Mitigation and management measures are outlined in Section 9.

Ref #	Commitment	Timing	CNVMP reference	How Addressed
	trials would be carried out to ensure that levels remain below the cosmetic damage criterion. Building condition surveys would be completed both prior to the commencement of construction works and following the completion of construction works to identify existing damage and any damage due to the works. Measurements of existing ambient vibration levels would be carried out at receivers with vibration sensitive equipment during the detailed design. This information would be used to inform the site-specific Construction Noise and Vibration Impact Statements for works near these locations.			

3.4 Environmental Performance Outcomes

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

Table 3-3: Environmental Performance Outcomes relevant to this CNVMP

ID Ref#	Environmental Performance Outcome	Timing	CNVMP reference	How Addressed
EPO-1	Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable.	Construction	This CNVMP, Section 2, Section 9	The purpose and objectives of the CNVMP are outlined in Section 2. Mitigation and management measures are outlined in Section 9.
EPO-2	The project would avoid any damage to buildings or heritage items from vibrations.	Construction	This CNVMP, Section 2, Section 9	The purpose and objectives of the CNVMP are outlined in Section 2. Mitigation and management measures are outlined in Section 9.

4 Consultation

This section summarises the consultation undertaken as part of developing this CNVMP.

4.1 Consultation Requirements under the Infrastructure Approval

In accordance with **CoA-A5**, **CoA-C3** and **CoA-C5**, this CNVMP (including Monitoring Program) has been prepared in consultation with the Parramatta City Council, NSW Environmental Protection Authority (EPA) and NSW Health.

A consultation copy of the CNVMP (including Monitoring Program) was provided to Parramatta City Council, EPA and NSW Health on 06 March 2019 for review and comment. Parramatta City Council responded on 27 March 2019. NSW Health responded on 22 March 2019. No comments were received by the EPA.

A summary of consultation undertaken during the preparation of this CNVMP is provided in *Appendix A*. In accordance with **CoA - C6** and **CoA - C13**, this CNVMP (including monitoring program) was endorsed by the ER / AA and submitted to DPIE no later than one month before construction.

5 Existing environment

A key element in assessing environmental noise impacts is an understanding of the existing ambient and background noise levels in the vicinity of the closest and/or potentially most affected receptors situated in proximity to the site. The noise environment of the receptors that are located in the vicinity of the project is best described as ‘urban’ - defined by the NSW Environment Protection Authority (EPA) NPI as an area with an acoustical environment that:

- Is dominated by ‘urban hum’ or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources.
- Has through-traffic with characteristically heavy and continuous traffic flows during peak periods.
- Is near commercial districts or industrial districts.
- Has any combination of the above.

The project site is located in a “heavy industrial” zone as defined on an LEP or other planning instrument, and adjacent to a “private recreation” zone which is the Rosehill Garden to the west. Nearest residential zones are located approximately 870 metres to the west, across James Ruse Drive. The nearest residential zones include mixed-use residential/commercial, low density residential, medium density residential and high density residential.

5.1 Sensitive receivers

In accordance with **CoA - E20**, ERM conducted a detailed land use survey by undertaking a walk-through of the surrounding areas to the Project site. The detailed land use survey has identified sensitive receptor locations closest to and/or potentially most affected by the Project’s construction activities. The survey was conducted within 1.5 kilometres radius from the Project site.

5.1.1 Residential Receptors

The nearest and/or potentially most affected residential receptor areas in relation to the Project site are the residences to the west of James Ruse Drive, between Oak Street and A’Becketts Creek. Most of the residential properties in the surrounding area have been identified to be either single storey or two-storey low-rise buildings. Seven multi-storey residential apartment buildings identified in the surrounding area and they are all located along James Ruse Drive. The multi-storey apartments identified are:

- APX Apartments, 8 Hope Street, Rosehill – three levels
- Raceview Apartments, 120 James Ruse Drive, Rosehill – nine levels
- Ascot Apartments, 3-5 Weston Street, Rosehill – eight levels
- Rydges Hotel, 116-118 James Ruse Drive, Rosehill – nine levels
- Waldorf Apartments, 110-114 James Ruse Drive, Rosehill – 12 levels
- 102-108 James Ruse Drive – nine levels
- 82-88 James Ruse Drive – five levels
- ATC Gardening Residence, East of James Ruse Drive

Residential receptors to the north, east and south of the project site are more than 1 km away and are shielded by the immediate industrial buildings. The noise attenuation afforded by the large intervening distances and shielding from the intervening industrial buildings, would ensure that residential receptors to the north, east and south are not likely to be adversely affected and are likely to comply with the NMLs. That said, as the project has been assessed to comply with the NMLs at the closer residential receptors (to the west), compliance will also be achieved at the residential receptors to the north, east and south as they are much further away from the project. Based on the above analysis, residences to the north, east and south are not considered to be potentially most affected receptors and have therefore, not been considered in our assessment.

An additional residential sensitive receptor has been identified, that being the ATC Gardening residence east of James Ruse Drive. This residential address was not identified until after the CNVIS and CNVMP were prepared. Upon the identification of this receptor, it was confirmed that the predicted noise levels/management recommendations at Receptor R07 were representative of the new receptor.

5.1.2 Sensitive Receptors (Non-Residential)

The nearest non-residential receptors in relation to the project site are:

- Industrial premises to the north, east and south of the project site;
- Educational facilities –
 - Rosehill Community School (103-105 Hassall Street, Rosehill);
 - Rainbow Village Child Care (42 Weston Street, Harris Park);
 - Rosehill Montessori Kindergarten (42 Weston Street, Harris Park);
 - Little Angels Kindergarten (29 Prospect Street, Rosehill);
 - Rosehill Public School (Prospect Street, Rosehill);
 - Fun2Learn Early Learning Centre (2-4 Virginia Street, Rosehill); and
 - Kinderoo Preschool (38 Eleanor Street, Rosehill).
- Place of worship – BAPS Shri Swaminarayan Mandir (40 Eleanor Street, Rosehill).
- Offices and retail outlets – precinct bounded by Hassall Street to the north, Oak Street to the south, James Ruse Drive to the east and Arthur Street to the west.
- Active Recreational Area – Rosehill Garden racecourse adjacent to the west of the project site and Rosehill Bowling Club located at James Ruse Drive and Hassall Street.

5.1.3 Representative Receptors for CNVIS

Based on the land use survey, representative receptors have been determined and were used in the noise modelling as part of the CNVIS (in accordance with **CoA-E42**). The representative receptors are indicated in *Figure 5-1* and detailed in *Table 5-1* below.

Table 5-1: Representative Sensitive Receptors

Receptor ID	Receptor Address	Receptor Type	GPS Co-ordinates (UTM, Zone 56H)	
			Easting	Northing
R1	22 Oak St, Rosehill NSW	Medical Centre	316733.74	6256046.46
R2	132 James Ruse Dr, Rosehill NSW	Commercial	316904.22	6256041.19
R3	7 Grand Ave, Camellia NSW	Commercial	317377.11	6255998.67
R4	15 Grand Ave, Camellia NSW	Industrial	317954.98	6255991.37

Receptor ID	Receptor Address	Receptor Type	GPS Co-ordinates (UTM, Zone 56H)	
			Easting	Northing
R5	13 Grand Ave, Camellia NSW	Industrial	317895.1	6255989.91
R6	11A-11C Grand Ave, Camellia NSW	Commercial	317688.2	6255987.48
R7	126 James Ruse Dr, Rosehill NSW	Residential	316897.05	6255937.01
R8	15 Hope St, Rosehill NSW	Residential	316799.66	6255918.92
R9	122 James Ruse Dr, Rosehill NSW	Residential	316882.31	6255809.7
R10	10 Grand Ave, Camellia NSW	Industrial	317992.29	6255808.39
R11	17 Weston St, Rosehill NSW	Residential	316731.84	6255748.13
R12	Rosehill Gardens, Unwin St, Rosehill NSW	Recreational	317121.14	6255738.94
R13	116-118 James Ruse Dr, Rosehill NSW	Hotel	316862.61	6255671.79
R14	James Hardie Research & Product Development Centre, 10 Colquhoun St, Rosehill NSW	Industrial	317882.66	6255634.4
R15	Rosehill Public School, Prospect St, Rosehill NSW	School	316714.79	6255609.53
R16	5 Devon St, Rosehill NSW	Industrial	317957.44	6255602.64
R17	Forster DC, 10 Colquhoun St, Rosehill NSW	Industrial	317748.37	6255544.74
R18	100 James Ruse Dr, Rosehill NSW	Residential	316844.03	6255433.49
R19	2 Unwins St, Rosehill NSW	Industrial	317120.49	6255235.08
R20	5 Unwins St, Rosehill NSW	Industrial	317348.95	6255206.4

5.2 Existing Background Noise Levels

Quantifying the existing noise environment (via measurement) at the closest and/or potentially most affected receptors situated within the potential area of influence of a site is a key feature of assessing and managing potential noise impacts.

Existing ambient and background noise levels were quantified via monitoring, with due regard to the requirements described in NPI, 2017, applicable parts of Standards Australia AS1055–2018™ (AS1055) – Description and Measurement of Environmental Noise and other relevant Australian and international standards for environmental noise monitoring. Further details of monitoring methodology, equipment and results are outlined in the CNVIS.

Unattended noise logging was undertaken at two locations which are presented in *Figure 5-1*. The first logging location, L01, was at the backyard of 5 Hope Street, and the second logging location, L02 was at the frontyard of 20 Weston Street. These location were selected for this assessment as they allowed the measurement of existing ambient and background noise levels that are considered representative of the most affected receptors situated close to the project. Based on the outcomes of the CNVIS, the lower rating background noise levels (RBLs) measured at L02 were adopted to establish the project specific construction noise management levels for residential receptors.

RBLs are utilised to establish project specific noise management levels (NMLs) for residential receptors, this is further outlined in *Chapter 6*. Non-residential NMLs are established from fixed values derived from the ICNG, therefore establishing RBLs for non-residential receptors is not considered necessary. RBLs for residential receptors are provided in *Table 5-2*.

Table 5-2: Rating Background Noise Levels

Receptor Type	Daytime RBL (7am - 6pm)	Evening RBL (6pm - 10pm)	Night-time RBL (10pm - 7am)
Residential	45	44	41

5.3 Heritage buildings

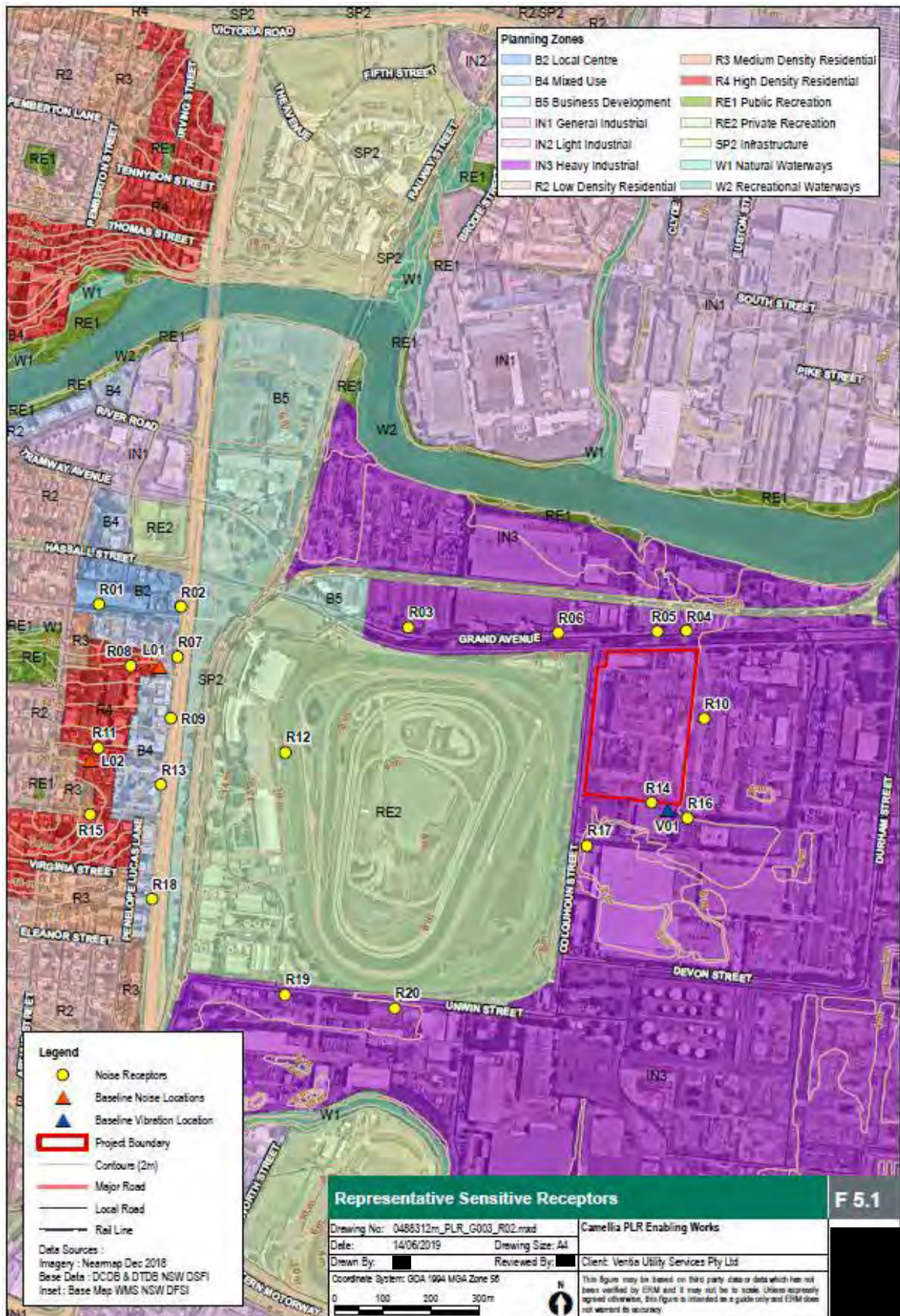
As per **EPO-2**, the Project aims to avoid any damage to buildings or heritage items from vibrations.

In accordance with **CoA-E43**, Ventia must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred dose values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.

CoA-E44 states that the advice of a heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.

No heritage items have been identified within close proximity to the Project. Impacts to heritage structures are therefore not anticipated. Note: one local heritage item (Air Raid Shelter) was investigated, recorded and removed in the previous stage of the project.

Figure 5-1: Representative Sensitive Receptors



6 Noise and vibration criteria for NSW

The EPA recommends management levels and goals when assessing construction noise and vibration. These are outlined in:

- The Interim Construction Noise Guideline (ICNG)
- Assessing Vibration: a technical guideline (AVTG)

Relevant elements of these documents are summaries and discussed in this Chapter.

6.1 Construction noise and assessment objectives

The DECC Interim Construction Noise Guideline (ICNG, July 2009) provides guidelines for the assessment and management of construction noise. The ICNG focuses on applying a range of work practices to minimise construction noise impacts rather than focusing on achieving numeric noise levels.

The main objectives of the ICNG are to:

- Identify and minimise noise from construction works
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts
- Encourage construction during the recommended standard hours only, unless approval is given for works that cannot be undertaken during these hours
- Reduce time spent dealing with complaints at the project implementation stage
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

6.2 Quantitative noise assessment criteria

The ICNG and CNVS are relevant to the Project works and provide guidance to establishing noise (and vibration) management levels (criteria) for the purpose of assessing and managing noise impacts.

For residential receptors, the noise management levels are established based on existing background noise levels (i.e. thresholds above which the background noise level may be exceeded). For other sensitive receptors the management levels are fixed values.

For residential and other sensitive receptors (human); and potentially sensitive structures (buildings) vibration management levels are fixed values established for either human comfort or structural/cosmetic damage. The levels vary depending on the potential sensitivity of the receptor and do not rely on existing conditions.

A summary of each in the context of the ICNG and CNVS is provided in the sections below.

6.2.1 Residential Receptors

The method for establishing ICNG Noise Management Levels for residential receptors is summarised in *Table 6-1* below. Separate criterion is provided for works during and outside the ICNG standard construction hours. The ICNG recommends more stringent noise criterion for works outside these standard hours. These hours of work generally align with the approved hours described in **CoA – E21**.

Table 6-1: Construction Noise Management Levels – Residences

Time of Day	Noise Management Level (LAeq, 15minute)	How to Apply
Recommended Standard Hours: Monday to Friday, 7am to 6pm Saturday, 8am to 1pm	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq,15minute is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
No work on Sundays or Public Holidays	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent would consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent would communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside the Recommended Standard Hours	Noise affected RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.
Source: ICNG, CNVS		

6.2.2 Sleep Disturbance

For residential receptors it is also important to consider potential sleep disturbance impacts associated with OOHW conducted during the night time (10pm to 7am) period. The RNP provides indicative sleep disturbance thresholds and was utilised as the basis for establishing 'sleep disturbance screening levels' in the CNVS and CNVIS.

This method (RBL + 15 dB) is widely accepted as the appropriate method for assessing and managing sleep disturbance impacts (using the LA1, 1minute or LAmix parameters) and is adopted here to establish criteria for use in the CNVMP.

6.2.3 Non-Residential Receptors

As noted above the ICNG defines fixed management levels for other sensitive receptors and non-residential sensitive land uses. These values are reproduced in *Table 6-2* below.

Table 6-2: Noise Levels for non-residential sensitive land use

Land Use	Noise Management Level: LAeq, 15minute (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal Noise Level 45dB ¹
Hospital wards and operating theatres	Internal Noise Level 45dB ¹
Places of worship	Internal Noise Level 45dB ¹
Active recreation	External noise level 65dB
Passive recreation	External noise level 60dB
Community centre	Depends on intended use – see AS2107/CNVS
Industrial premises	External Noise Level 75 dB
Commercial premises (e.g. offices, retail outlets)	External Noise Level 70 dB.
Source: ICNG 1. External goal of 55dBA applies. The ICNG recommends that construction noise levels do not exceed 45 dB (LAeq, 15minute) internally within school classrooms when in use. For the purpose of the CNVIS (and as adopted here to verify criteria for use in the CNVMP) the internal noise level has been translated to an external level of 55dB (LAeq, 15minute) based on the accepted level of attenuation (10dB) that is readily achieved through windows, partially opened for ventilation.	

6.3 Adopted project noise management levels

This section presents the construction noise management levels established for the project based on the assessment methodology presented above and in accordance with the ICNG.

6.3.1 Air-borne Noise Management Levels

The project-specific construction “Noise Management Levels” (NML), for works within and outside the recommended standard hours for construction, are presented in *Table 6-3* below.

These NML have been established with due regard to the requirements of the ICNG for all identified residential (dwelling) and other sensitive (non-residential) receptors. NML for all periods are provided as works could potentially be carried 24 hours a day, 7 days a week.

For residential (dwelling) receptors the NML are based on the RBL values presented in *Section 5.2*.

As per the NPI and detailed in the CNVIS, two thresholds have been considered to establish sleep disturbance criteria based on which impacts to residential receptors can be evaluated.

It is also a requirement under **CoA - E41**, that noise generated by construction must not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of 85dB (LAeq,8h) for any employee working at a location near the CSSI. With the implementation of the mitigation and management measures outlined in *Section 9* of this CNVMP construction noise levels are not predicted to exceed the limits of **CoA – E41**.

Table 6-3: Construction Noise Management Levels (NML)

Receptor Type	Construction Noise Management Levels, dBA				HNML, L _{eq} , 15 minute, dBA	Sleep Disturbance Criteria, dBA	
	Standard Hours	Out-of-Hours			Daytime (Standard Hours)	Night-time only	
	Day	Day	Evening	Night		L _{eq} , 15 minute	L _{max}
Residences	54	49	49	46	75	46	56
Educational Facility	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Medical Facility	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Places of Worship	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Active Recreation	65	65	65	65	– ²	– ²	– ²
Commercial	70	70	70	70	– ²	– ²	– ²
Industrial	75	75	75	75	– ²	– ²	– ²
1. This management level applies to external noise level, as outlined in Table 6-2. 2. Dash “–” indicates that this criteria does not apply at that receptor.							

6.3.2 Road Traffic Noise Management Levels

The ICNG does not include any criteria to assess off-site traffic noise associated with construction and demolition. Criteria for off-site road traffic noise applicable to ‘existing residences affected by additional traffic on existing roads generated by land use developments’ are specified in the RNP.

An objective of the RNP is to protect sensitive receptors against excessive decreases in amenity as the result of a project by applying relevant permissible noise increase criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dBA represents a minor impact that is considered barely perceptible to the average person.

On this basis, as outlined in the CNVS, construction traffic NMLs set at 2 dBA above the existing road traffic noise levels during the daytime and night-time periods are considered appropriate to identify the onset of potential noise impacts. Where the road traffic noise levels are predicted to increase by more than 2 dBA as a result of construction traffic, consideration would be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity.

In considering feasible and reasonable mitigation measures where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the road traffic noise criteria in the RNP, refer *Table 6-4*.

Table 6-4: Road Traffic Noise Management Levels

Category	Applicable Road	Noise Management Level – dBA	
		Daytime ¹	Night-time ²
Sub-arterial roads	e.g. James Ruse Drive	Leq, 15 hour ≤ 60 (external)	Leq, 9 hour ≤ 55 (external)
Local roads	e.g. Grand Avenue	Leq, 1 hour ≤ 55 (external)	Leq, 1 hour ≤ 50 (external)

Source: CNVS and RNP

- Daytime means between 7:00am and 10:00pm, Monday to Sunday inclusive; and
- Night time means between 10:00pm to 7:00am, Monday to Sunday inclusive.

6.4 Vibration criteria

Based on the CNVIS methodology, impacts from vibration will be considered in terms of effects on building occupants (human comfort), the effects on the building structure (structural/cosmetic damage) and the effects on sensitive medical/scientific equipment. The following construction vibration management levels / criteria will apply to the Project as presented below.

6.4.1 Human Comfort

The AVTG and the CNVS provides guidance for assessing human exposure to vibration. These documents are based on *British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) dated 1992*. The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in *Table 6-5*.

Table 6-5: Human Comfort – Vibration Dose Values

Location	Assessment Period	Preferred Values		Maximum Values	
		z axis	x and y axes	z axis	x and y axes
Continuous Vibration (m/s ²)					
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.020	0.014	0.040	0.028
Workshops	Daytime or Night-time	0.040	0.029	0.080	0.058
Impulsive Vibration (m/s ²)					

Location	Assessment Period	Preferred Values		Maximum Values	
		z axis	x and y axes	z axis	x and y axes
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.64	0.46	1.28	0.92
Workshops	Daytime or Night-time	0.64	0.46	1.28	0.92
Intermittent Vibration (m/s ^{1.75})					
Critical Areas	Daytime or Night-time	0.10		0.20	
Residences	Daytime	0.20		0.40	
	Night-time	0.13		0.26	
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.40		0.80	
Workshops	Daytime or Night-time	0.80		1.60	
Note: Daytime is 7am-10pm and Night-time is 10pm-7am.					
Note: For continuous and impulsive vibration, the preferred and maximum values are weighted acceleration values (Wg for z axis and Wd for x and y axes)					
Note: For intermittent vibration, the preferred and maximum values are Vibration Dose Values (VDVs), based on the weighted acceleration values					

6.4.2 Building Damage (Structural / Cosmetic Damage)

To achieve the requirements of the CNVS, British Standard BS7385: Part 2-1993 (BS 7385) - Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration, dated 1993 is presented in *Table 6-6* and will be considered during works where applicable. BS 7385 provides safe limit guideline values, below which vibration is considered insufficient to cause structural or cosmetic damage to buildings.

Table 6-6: Building Damage (BS 7385) – Peak Particle Velocity

Line	Type of Building	Peak Particle Velocity (PPV in mm/s) in the Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	4 Hz to 15 Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	

2	Unreinforced or light framed structures. Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz
Source: BS 7385 and CNVS			

For most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receptor type is given below:

- Reinforced or framed structures: 25.0 mm/s
- Unreinforced or light framed structures: 7.5 mm/s

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level.

Heritage Structures: in accordance with the CNVS, if a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criteria of 2.5 mm/s peak component particle velocity from the German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150:3) – Structural Vibration - Effects of Vibration on Structures, dated 1999 would be considered.

There were no heritage structures identified in close proximity to the Project. The DIN4150:3 criteria for heritage structures are therefore not used for assessment in the CNVIS. Note: one local heritage item (Air Raid Shelter) was investigated, recorded and removed in the previous stage of the project.

6.4.3 Sensitive Scientific and Medical Equipment

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

Where it has been identified that vibration sensitive scientific and/or medical instruments are likely to be in use inside the premises of an identified vibration sensitive receptor, objectives for the satisfactory operation of the instrument would be sourced from manufacturer's data. Where manufacturer's data is not available, generic vibration criterion (VC) curves as detailed in the CNVS and presented below in *Table 6-7* and in *Figure 6-1* would be adopted as vibration goals.

It should be noted that these criterion are very conservative, therefore baseline vibration measurements may be undertaken at receptors that are identified to contain sensitive scientific / medical equipment prior to construction activities being undertaken. The baseline data in combination with the VC curves presented below would ascertain project / equipment specific vibration criteria.

Table 6-7: Application and Interpretation of the Generic Vibration Criterion (VC) Curve

Criterion Curve	Max Level (µm/sec, rms) ¹	Detail Size (microns) ²	Description of Use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.

VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes and E-Beam systems, operating to the limits of their capability.
VC-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

Source: CNVS

1. As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.
2. The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given take into account the observation requirements of many items depend upon the detail size of the process.

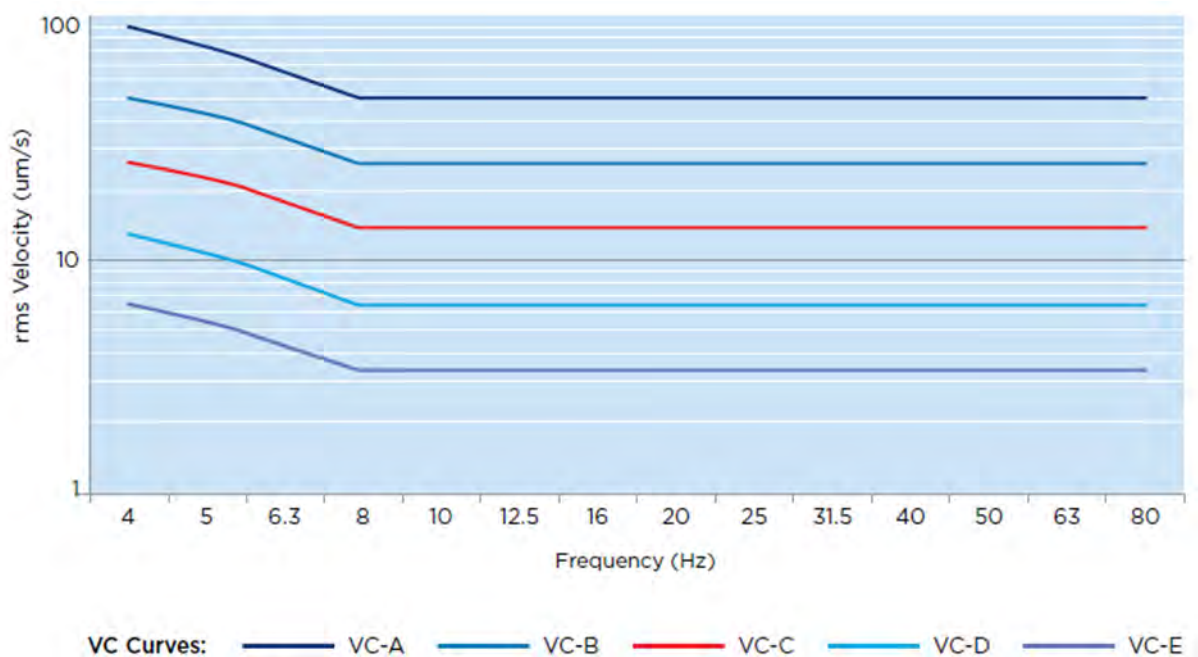


Figure 6-1: Vibration Criterion (VC) Curves

6.5 Transport for NSW's Construction Noise and Vibration Strategy

Construction noise mitigation measures are to be implemented in accordance with the Conditions of Approval and Tables 4, 5, 6 and 7 of Transport for NSW's Construction Noise and Vibration Strategy (2018) (**CoA-E33**)¹.

Standard mitigation (and practices) applicable to the Project works are described in Section 8 of the CNVS and the actions set out must be implemented on the construction of the Project. Where the predicted "mitigated" construction noise levels are above the ICNG noise management levels, the Additional Mitigation Measures Matrix (AMMM) identified in the CNVS is to be implemented. The approach, guided by the AMMM, is primarily aimed at pro-active engagement with affected sensitive receptors rather than additional noise reducing mitigation. The AMMM applies to all receptor types where these receptors are in-use.

The types of additional mitigation measures are listed in *Table 6-8* and described in the CNVS.

Table 6-8: Additional Mitigation Measures

Additional Mitigation Measure	Abbreviation
Alternative accommodation	AA
Alternative construction methodology	AC
Duration reduction	DR
Project notification	PN
Project specific respite offer	RO
Respite period	RP
Specific notification, individual briefings or phone call	SN
Verification monitoring	V
<i>Source: CNVS</i>	

The project-specific AMMM for construction (air-borne) noise are identified in **Table 6-9**. Any air-borne noise level exceedances of the AMMM thresholds are highlighted in red, blue, olive green or purple (as shown in Appendix C) as is applicable to the findings of this assessment. The project-specific AMMM for ground-borne vibration are identified in **Table 6-10**.

¹ In the event of an inconsistency or discrepancy, the conditions of approval (CoA) shall take precedence over the CNVS (TfNSW, 2018).

Table 6-9: Additional Mitigation Measures Matrix (AMMM) – Construction Air-Borne Noise

Period	Time of Day	Mitigation Measures Predicted LAeq, 15minute Noise Level Above RBL			
		0 to 10 dBA Noticeable	10 to 20 dBA Clearly Audible	20 to 30 dBA Moderately Intrusive	>30 dBA Highly Intrusive
Standard	7am – 10pm	-	PN	PN, V, SN	PN, V, SN, RP
Out of Hours Works (OOHW)	10 pm – 7 am	PN	PN, V	PN, V, SN, RP, DR	PN, V, SN, AA, RP, DR
Source: CNVS (modified for project specific conditions of approval)					

Table 6-10: Additional Mitigation Measures Matrix (AMMM) – Construction Vibration

Period	Time of Day	Mitigation Measures Predicted Vibration Levels Exceed Vibration Management Level (VML)	
		>Human Disturbance Management Level (HVML)	>Building Damage Management Level (DVML)
Standard	7am – 10pm	PN, V, RO	V, AC
Out of Hours Works (OOHW)	10 pm – 7 am	PN, V, SN, RO, AA, RP, DR	V, AC
Source: CNVS			

7 Work Hours

7.1 Hours of Work

As specified in **CoA – E23**, works may be undertaken in the Camellia precinct (east of James Ruse Drive) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the ICNG, between 10.00pm and 7.00am.

Where works are required to be undertaken between 10.00pm and 7.00am AND noise levels are greater than 5 dBA above the rating background level at any residence, works shall be managed in accordance with The *Parramatta Light Rail – Stage 1 Out-of-Hours Protocol* (Reference: PLR-TFNSW-CBD-PE-FRM-000002, Revision 7.01, dated February 2019).

Table 7-1 below summarises the hours of work applicable to this project in relation to noise management levels, CoAs and management responses.

Table 7-1: Hours of Work

ID	Hours of Work	Noise Management Levels	CoA	Management Response
1	07:00 am – 10:00 pm	75 dBA (LAeq) or less	E23 E31 E33	- Consult with sensitive receivers (James Hardie & ATC Rosehill) regarding sensitive periods (e.g. racing calendar) - Ensure periodic notifications (monthly) to nearby stakeholders of planned upcoming works - Maintain community notification info line and project website - Induct all workers to the site with content on noise and vibration, including expected behavioural practices - Perform noise monitoring program (<i>specified in Appendix D</i>) - Implement controls and mitigation measures in accordance with Table 9-1 of this plan.
		> 75 dBA (LAeq) & ≤ 85 dBA	E27 E32 E36 E38	Where sensitive receivers impacted: - Respite periods of 3 hours on, 1 hour off to be implemented - Where applicable, coordination with other works, including relevant utility contractors, to ensure suitable respite periods.
		>85 dBA	E41	Manage activities or consult with all affected receivers: - CSR is large, open, storage yard environment – not fixed working locations - James Hardie is work within a cladded structure, limited works external

2	10:00 pm - 07:00 am	< 46 dBA at any residence with a site contribution of noise	E23 E31 E33	- Implement controls and mitigations, consistent with Scenario 1 - Implement plant & equipment activities, including types and numbers of plant consistent with the CNVIS. - Verification monitoring where proposed changes may lead to an increase. - Respite periods of 3 hours on, 1 hour off to be implemented
3	10:00 pm - 07:00 am	≥ 46 dBA at any residence with a site contribution of noise	E23 E25 E27 E28 E29 E37 E39	- Implement controls and mitigations, consistent with Scenario 2 - Works implemented in accordance with TfNSW OOHW Protocol - Apply for an Out-of-Hours Work Approval, subject to TfNSW and ER approval for low-moderate risk activities - Apply for an Out-of-Hours Work Approval, subject to TfNSW, ER and DPIE approval for high risk activities - Verification monitoring to be performed at commencement of activity - Respite periods to be provided to ensure maximum of 4 days before 3 days of clear respite is implemented - Consultation with community at 3-monthly intervals regarding the type of works, noise levels, scheduling and mitigation and management measures.
			E26	Emergency construction works only be undertaken in the event of an 'emergency' commonly defined as a serious, unexpected, and often dangerous situation requiring immediate action. Notify TfNSW, ER and AA as soon as become aware of the need for the works

7.2 Out of Hours of Work

Out of Hours Work (OOHW) (i.e. works outside the approved Project standard hours) may be required during the works. Impacts for all potential OOHW are assessed in the CNVIS.

In accordance with **CoA – E28**, TfNSW have prepared an Out-of-Hours Work protocol for the Parramatta Light Rail – Stage 1 project to identify a process for the consideration, management and approval of works. The protocol shall be implemented for scenarios specified in Scenario 3 in **Table 7-1**. Refer to *Parramatta Light Rail – Stage 1 Out-of-hours work protocol (PLR-TFNSW-CBD-PE-FRM-000002) Version 7.01* prepared 4 February 2019. Due to the size of the OOHW protocol it has not been re-produced in this CNVMP. The OOHW protocol along with this CNVMP were prepared in consultation with the AA and will be implemented on the project.

7.3 Respite Hours

In accordance with **CoA - E36**, respite periods must be provided for sensitive receivers where any construction activity results in Leq, 15 minute noise levels that exceed 75 dBA.

It should be noted that with the implementation of the mitigation and management measures outlined in *Section 9* of this CNVMP (e.g. reduced equipment fleet for OOHW scenarios SCN02b

and SCN04b) construction noise levels are not predicted to exceed the limits of **CoA – E37** and therefore this condition is not triggered.

In accordance with **CoA - E38**, all works undertaken for the delivery of the Project, including those undertaken by utility contractors, will be coordinated to ensure respite, including the respite required by **CoA - E37**. Ventia will:

- a. schedule any works to provide respite to impacted noise sensitive receivers so that all respite periods are achieved; or
- b. consider the provision of alternative mitigation, including the provision of at receiver treatments and alternative accommodation to impacted noise sensitive receivers; and
- c. provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.

With the implementation of the mitigation and management measures outlined in *Section 9* of this CNVMP construction noise levels are not predicted to exceed the limits of **CoA – E23** (refer *Section 8*). If a circumstance does arise where the noise limits of **CoA – E23** will be exceeded, then in accordance with **CoA – E39**, in order to undertake out-of-hours work Ventia must identify appropriate work and respite periods for the works in consultation with the community at each affected precinct at three monthly intervals. This consultation will be ongoing and include (but not be limited to) providing the community with:

- a. a schedule of likely out-of-hours work for a period of no less than two (2) months for medium to high risk work (as defined in the Out-of-Hours Work Protocol (**CoA - E28**));
- b. a schedule of likely out-of-hours work for a period of no less than seven (7) days for low risk work (as defined in the Out-of-Hours Work Protocol (**CoA - E28**));
- c. the potential works, location and duration;
- d. the noise characteristics and likely noise levels of the works; and
- e. likely mitigation and management measures.

Ventia will also consider and respond to the affected community's preference for alternative hours and/or durations (refer *Section 9 and Section 9.1*). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works will be provided to the AA, ER and the Secretary.

The provision of respite periods does not preclude the application of other construction noise management measures, including the provision of at receiver treatments and or alternate accommodation (**CoA – E40**). However as stated above with the implementation of the mitigation and management measures outlined in *Section 9* of this CNVMP construction noise levels are not predicted to exceed the limits of **CoA – E23**, therefore at receiver treatments and alternative accommodation are not envisaged for this project.

7.4 Emergency Construction

In the event that emergency construction works are triggered, Ventia will notify TfNSW, the ER and the AA in writing (e.g. e-mail) as soon as becoming aware of the need for those activities or works. Ventia and TfNSW must also use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works in accordance with **CoA – E26**.

Emergency construction works would only be undertaken in the event of an 'emergency' commonly defined as a serious, unexpected, and often dangerous situation requiring immediate action. To avoid any misunderstanding, an emergency does not relate to general issues associated with sequencing or scheduling risks that do not represent an emergency as defined by this CNVMP.

8 Construction noise and vibration assessment

8.1 Construction activities

A number of key construction scenarios (SCN / Work Phases) were identified in the CNVIS. These assessment scenarios were developed to identify significant noise and vibration generating plant, equipment and machinery that may be in use or activities that will be undertaken as part of the Project works. These scenarios were informed through information provided by Ventia and the indicative construction schedule provided in the CEMP.

A summary of the indicative construction schedule that was considered is provided in *Table 8-1* below. Details of these construction works (reproduced from the CNVIS) and scenarios are presented in *Appendix B*. As seen in *Table 8-1* there may be some overlap between these work phases.

Table 8-1: Indicative Construction Schedule – Construction Scenarios

Assessment Scenario ID	Activity	Area of Works	Schedule	Timing Details - OOHV?	Potential Impact/s
SCN 01	Site establishment	NE corner	July 2019	24/7	Air-borne Noise
SCN 02 a) 7am to 10pm b) 24/7	Excavate contaminated material to stockpile	Predominantly central-western portion of site	July – December 2019	a) 7am to 10pm b) 24/7	Air-borne Noise / Vibration
SCN 03	Install berm [stockpile]	Full length of eastern boundary	Target Q3 2020	24/7	Air-borne Noise
SCN 04 a) 7am to 10pm b) 24/7	Install capping layers	Whole site	Target Q4 2020	a) 7am to 10pm b) 24/7	Air-borne Noise / Vibration
SCN 05	Vapour collection pipework	Whole site	Target Q4 2020	24/7	Air-borne Noise
SCN 06a	Ground improvement works	Primarily vegetated zone (north)	Target Q3 2020	24/7	Air-borne Noise
SCN 06b		Primarily vegetated zone (south)			
SCN 07	Site disestablishment	NE corner	Target Q4 2020	24/7	Air-borne Noise
<i>Note: Hours of work are subject to ongoing consultation with sensitive receptors, refer to Section 9.1 for Project Specific Mitigation Management Measures Identified during consultation with sensitive receivers</i>					

8.2 Predicted Construction Impacts

In general, noise (and vibration) impacts may occur due to Project emissions that are considered offensive by the community and may result in complaints being received, additional mitigation or management measures being implemented, or additional monitoring being required.

For airborne noise impacting residential and other sensitive receptors, the potential impacts relate to annoyance or an unacceptable noise amenity. The noise receptors considered in the CNVIS and the predicted value at each is presented in *Appendix C*.

For ground-borne noise impacting residential and other sensitive receptors, potential impacts also relate to annoyance or an unacceptable noise amenity. Ground-borne construction noise is usually present on tunnelling projects when significant tunnel boring equipment is operated underground. Ground-borne noise impacts (generated by vibration) from the Project are therefore not anticipated as significant vibration generating source(s) have not been identified and all project works will be conducted in accordance with the safe working distances of the Transport for NSW CNVS (2018), further specified in Section 8.3.1.

For ground-borne vibration impacting residential (and other sensitive receptors) or building structures, the potential impacts relate to human comfort and structural or cosmetic damage. These however are unlikely to occur with good practice construction management, adherence to safe work distances and monitoring of significant vibration activities to verify compliant levels.

With the above features in mind cumulative impacts associated with nearby construction works (e.g. Parramatta Light Rail) will be managed through the community consultation process, as well as the recommended measures detailed in Sections 9 and 10 of this sub-plan. TfNSW takes the lead on communications that are occurring within TfNSW land and the project works undertaken by Ventia will be included as a combined notification. Further detail of the community consultation process is detailed in the overarching PLR Community Communication Strategy.

Further detail of the construction noise and vibration impact assessment is outlined below.

8.2.1 General construction

The CNVIS provided a detailed breakdown of the key construction periods and associated equipment, and their source noise emission (Sound Power Levels, LW or SWL). Preliminary results of the CNVIS indicated that noise emissions from the Project would exceed the NML during Out-of-Hours Work (OOHW) for SCN02 and SCN04. This is primarily due to the proposed equipment and activities to be utilised during these scenarios. In consultation with Ventia, alternative scenarios were modelled for SCN02 (a/b) and SCN04 (a/b), the (b) scenario provides reduced scope of work to limit the high noise generating activities and equipment that will be utilised during the OOHW assessment periods.

These values and the predicted LAeq, 15minute noise levels from the CNVIS (determined via modelling for each scenario) are reproduced in *Appendix B* and *Appendix C*. Values that exceed the NML are highlighted in bold typeset. Values that exceed the Highly Noise Affected Management Level (HNAML) (fixed at 75 dB for residential receptors) are highlighted in bold and underlined typeset.

In each scenario, it was assumed in the CNVIS that all plant would operate simultaneously, which is considered to be representative of potential worst-case conditions. The CNVIS results (reproduced in *Appendix C* for ease of reference) indicated that construction noise emissions would exceed the Project NMLs at a number of locations during SCN02a and SCN04a. The magnitude by which they exceeded the NML did however vary depending on the work phase and necessary equipment. The extent by which they exceeded the NML is constrained to the closest receptors, i.e. the highest impacts are limited to those directly adjacent the site.

The highest predicted (Leq, 15 minute in dBA) noise level is 80 dBA associated with the “Install Capping Layers” (SCN04) works at the adjoining commercial receptor to the south of the Project site (R14 – James Hardie). Other scenarios with the similarly elevated predicted noise levels at receptors are associated with “Excavate Contaminated Material to Stockpile” (SCN02) and “Install berm” (SCN03) works.

Some noise from construction sites is inevitable, such that the ICNG focuses on minimising construction noise impacts, rather than only on achieving numeric noise levels. These results and noted exceedances identify that best-practice construction noise management and control techniques will be required to reduce noise levels as far as practicable. To minimise impacts additional noise control, mitigation and management measures may also be warranted, refer *Section 6.5*. These will need to be implemented in conjunction with community and stakeholder consultation and notification processes outlined in the AMMM in *Section 6.5*.

For all construction scenarios assessed during daytime standard construction hours, daytime non-standard hours and evening hours, additional mitigation is only required at R14 (James Hardie, Research Centre). This additional mitigation consists of project notification, verification monitoring and specific notifications. Where OOHW becomes necessary for SCN02 and SCN04, it is recommended that the reduced equipment fleet outlined in SCN02b and SCN04b is utilised to minimise noise impacts below the NMLs. This will allow OOHW in accordance with CoA – E23.

The AMMM is only applicable to commercial or other sensitive receptors (i.e. offices / places of worship) when these receptors are in use it should be noted that these receptors may not be in use during the night time period. Specific mitigation measures in consultation with nearby receptors are detailed in *Section 9.1* and will be managed, on an ongoing basis throughout the community consultation process, as the project progresses.

Based on these general construction noise levels exceeding the NML during the night time period, it is also considered likely that sleep disturbance screening criteria will be exceeded at the nearest and most sensitive residential/dwelling receptors when OOHW is undertaken at night.

Potential Effects of Concurrent Work

Air-borne noise levels have been predicted via 3D noise modelling for a range of works and activities associated with the projects construction. These predicted noise levels are detailed in *Appendix C* of this CNVMP and address each work area/activity so that any additional mitigation and management measures (to those already incorporated into the construction design and noise modelling) may be defined for each representative worst-case assessment scenario.

The predicted values do not represent a constant noise emission that would be experienced by the community on a daily basis throughout the Project's construction schedule, they will only be experienced for limited periods of time when those specific activities are occurring, and they will not be experienced over the whole daytime, evening or night time periods.

When evaluating potential effects of concurrent work it is also important to consider how noise levels add together. For example, if two separate activities are occurring and the noise level from each is 55 dBA at the receptor, then the resultant noise level is 58 dBA. This increase in noise level (3 dBA) will be just perceptible and a significant change in impact unlikely. If two separate activities are occurring and the noise level from one is 55 dBA and the other is 53 dBA, then the resultant noise level is 57 dBA. This increase in noise level (2 dBA) will be hardly perceptible in practice and a significant change in impact is highly unlikely.

Based on the information presented above a set of provisions, safeguards and monitoring contingencies are provided in the unlikely event that additional issues associated with concurrent works are identified and further mitigation is required. As mentioned above, cumulative impacts will also be managed through liaison with other projects in the vicinity where construction activities are occurring within the same timeframe. These provisions, safeguards and contingencies are outlined in *Section 10.3.3* below.

8.3 Construction vibration impacts

8.3.1 Vibration assessment

With respect to the construction plant identified in the assessment scenarios presented in *Appendix B*, the highest levels of vibration would be expected to occur due to construction activities involving vibratory rollers, excavators with hydraulic hammers and bored piling.

These activities have been identified to occur during the following above ground scenarios; SCN02, SCN04 and SCN06. A summary of these scenarios is provided in *Appendix B*.

As outlined in the CNVIS, vibration was assessed based the applicable safe work distances published in the CNVS. These safe working distances are outlined in *Table 8-2* below.

Table 8-2: Ground-Borne Vibration Safe Working Distances

Plant Item	Rating / Description	Safe Working Distance – metres (m)	
		Cosmetic Damage (BS 7385)	Human Comfort (BS 6472)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Pile Boring	≤ 800 mm	2 m (nominal)	n/a
Source: CNVS			

As noted above vibration intensive equipment/plant are anticipated to be used in three work scenarios (SCN02, SCN04 and SCN06). Where reasonable and feasible all vibration intensive works will be undertaken outside the cosmetic damage (BS7385) safe working distances to avoid structural vibration impacts.

Consideration resulting from Appendix E – Vibration Analysis Report, has been given to the effect of Ground Improvement Works on the Endeavor Energy Substation located on the corner of Colquhoun Street and Grand Avenue. Table 3.2 of the report states that Predicted Peak Particle Velocity (PPV) at 25 metres is <0 mm/s for both VCC and DDC. Considering this, vibration associated with the Ground Improvement Works will not reach or effect the Endeavour Energy Substation and subsequently there is no additional actions required.

The nearest receptors that would potentially be impacted by the vibration of the Project's construction activities are the industrial buildings to the north, across Grand Avenue, and the James Hardie Research Centre building to the south of the Project site. The industrial buildings to

the north is approximately 50 metres from the northern boundary of the Project site, and the James Hardie Research Centre building is approximately 20 metres from the southern boundary of the Project site.

As the nearest residential receptors are approximately 800 metres from the Project site, vibration impacts were assessed to be negligible and are deemed to comply with the vibration management levels (VMLs) for residential receptors.

Grand Avenue Industrial Buildings (North of Project Site)

Based on the separation distances between the Grand Avenue buildings to the nearest boundary of the Project site, vibration impacts are likely to comply with the building damage VMLs but likely to exceed the human comfort VMLs. The human comfort VMLs are likely to be exceeded if a heavy vibratory roller (≥ 7 tonnes) or a large hydraulic hammer is used. Therefore vibration intensive works conducted near or at the northern boundary will either:

- use a light vibratory roller (< 7 tonnes) and a small or medium hydraulic hammer during the Project works; or
- adhere to the safe working distances presented *Table 8-2* during the Project works.

James Hardie Research Centre (South of Project Site)

Due to the close proximity of the James Hardie Research Centre (James Hardie) building to the Project, vibration impacts are likely to exceed the critical sensitive scientific equipment vibration criterion and human comfort VMLs, but is likely to comply with the cosmetic damage VMLs.

To comply with cosmetic VMLs a vibratory roller > 18 tonnes will not be used during the Project works. Adherence to the safe working distances for human comfort might not be a practicable measure to achieve levels below the sensitive scientific equipment vibration criterion and human comfort VMLs. Therefore vibration monitoring will be undertaken during the early stages of vibration significant activities, to ensure that VMLs are not exceeded.

Attended vibration monitoring was undertaken during trial GI (Ground Improvement) works with subsequent Vibration Analysis Report (ERM, 04/12/2019) recommending attended vibration monitoring to be undertaken for vibration generating activities such as Drilled Displacement Columns (DDC) and Vibration Controlled Columns (VCC) within 26m of the James Hardie Building. The Vibration Analysis Report is contained within Appendix E and shall be adhered to during relevant works as part of this overarching CNVMP.

A summary of the vibration impact assessment and baseline monitoring is provided in Section 9.1.2.

Guidance Note

This assessment has utilised the safe work distances for vibration generating construction activities and equipment established with due regard to the Project. The Project safe work distances were derived from BS7385 as relevant to cosmetic damage to buildings. BS7385 is a frequency (Hz) dependant criterion (less stringent at higher frequencies) and as such, works and activities may be able to occur at distances closer than those nominated in *Table 8-2* without any cosmetic or structural damage impacts occurring. Monitoring will be required during vibration intensive activities to establish compliant levels during the early stages of the Project works.

9 Environmental control measures

The standard mitigation measures that will be adopted during the Project works (in accordance with the CoA and CNVS²) are described in *Table 9-1* and will be implemented for the works to manage and potentially reduce construction noise and vibration impacts. These mitigation measures are designed to address contract specifications, CoA and REMMMs in relation to impacts from noise and vibration.

For each item the Project personnel responsible is nominated. For each item a unique identification number (ID) is provided, which correlates to the document references shown in the traceability matrix. The following project-specific mitigation/management measures will be implemented to minimise impacts:

- Any site buildings, equipment or other useful obstacles/objects will be positioned to act as a temporary barrier to minimise noise emissions towards the residential receptors situated in the first row of buildings surrounding the Project. Other barriers such as hoardings or temporary enclosures will also be used. Site emissions may be reduced by these barriers by between approximately 5 dBA and 10 dBA.
- All mechanical plant and equipment is to be selected to provide quieter and less vibration emitting construction methods where the project design permits.
- All mechanical plant and equipment is to be silenced by the best practical means using current technology. Mechanical plant, including noise-suppression devices, will be maintained to the manufacturer's specifications. Internal combustion engines are to be fitted with a suitable muffler in good repair.
- Extended periods of high noise level generating plant, equipment or machinery (excavators, hand tools, grinders etc.) will be avoided.
- The site and staging of works be proactively managed to avoid unnecessary clustering of plant, equipment or machinery near receptors.
- The site will be orientated to minimise the need for reversing of equipment or vehicles, particularly during any out-of-hours work. Furthermore, non-tonal or broadband movement/reversing warning systems (such as reversing squawker) for equipment and vehicles should be considered, utilised if they will operate during OOHW or for extended periods or in close proximity to the most affected receptors. Occupational health and safety requirements for use of warning systems must be followed.
- All plant, equipment or machinery (and heavy vehicles, trucks etc.) will be turned off when not being used.
- In accordance with **CoA – E31** noise generating works near places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services and accommodation) will not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution. This must be determined through ongoing consultation with the community during construction. It is understood that the only receptor that this CoA would be applicable to is the adjoining James Hardie Research Centre. Through consultation, it has been determined that there are no sensitive periods for the James Hardie Research Centre. However, James Hardie will be consulted with a monthly upcoming works notification and a specific notification (72 hours prior) in the event of a planned high noise intensive works unless otherwise agreed. Sensitive periods were identified that the Rosehill Gardens Racecourse. This includes 30 minutes before the first race. Ventia will limit high noise impact works or works with special noise characteristics during this period. Ventia has been provided with the race schedule and will provide

² In the event of an inconsistency or discrepancy, the conditions of approval (CoA) shall take precedence over the CNVS (TfNSW, 2018).

construction updates three days prior to any races. This is detailed further below in *Section 9.1*.

- In accordance with **CoA – E33**, construction noise mitigation measures must be implemented in accordance with Tables 4, 5, 6 and 7 of TfNSW's Construction Noise and Vibration Strategy (2018), regardless of the number of sensitive receivers impacted.
- During SCN02 "Excavate Contaminated Material to Stockpile" works, the reduced equipment fleet outlined in SCN02b will be utilised to minimise noise impacts below the NMLs. This will allow OOHV in accordance with **CoA – E23**.
- During SCN04 "Install Capping Layers" works, the reduced equipment fleet outlined in SCN04b will be utilised to minimise noise impacts below the NMLs. This will allow OOHV in accordance with **CoA – E23**.
- Vibration monitoring will be undertaken at the James Hardie building at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria, further site investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms will be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the calculated safe-working distances. It should be noted that as of V04 of this CNVMP, vibration monitoring and ongoing consultation was carried out during remediation activities within the safe working distances (during "portion 1 early works" which was covered under an REF). No complaints or impacts to sensitive equipment was noted when working in proximity to the Research Centre. Consultation will remain ongoing during the works to determine any additional mitigation measures.
- Cumulative impacts may occur with other construction projects proposed for the area, therefore due care may be required of consent authorities to manage any works occurring concurrently. Where issues arise associated with nearby construction works cumulative impacts will be managed through the community consultation process as outlined in *Section 8*. In accordance with **CoA – E32**, Ventia will consult with proponents of other construction works in the vicinity of the Project and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receptors. No other SSD or SSI have been identified in the vicinity of the project.
- In accordance with **NV-4**, for other sensitive receivers that operate outside standard construction hours, for example hospitals which operate on a 24-hour basis, feasible and reasonable noise mitigation options and measures will be developed in consultation with the sensitive receiver. Consultation has identified that the James Hardie Research Centre does not require any further noise mitigation measures. However, it was identified that the Rosehill Gardens Racecourse does have specific requirements, these are outlined below in *Section 9.1*.
- General monitoring of noise and vibration levels at James Hardie premises will be undertaken in daytime hours during the installation of the Integrated Capping System. This is in accordance with Section 5.1 and Table 5-1 in Appendix D – Noise and Vibration Monitoring Program.

9.1 Project Specific Mitigation/Management Measures identified through consultation with sensitive receptors

9.1.1 Rosehill Gardens Racecourse

Early consultation with nearby receptors in accordance with **CoA – E42** identified one receptor with specific mitigation/management requirements. Rosehill Gardens Racecourse is situated to the west of the project site, adjacent to Colquhoun Street. The Racecourse consists of horse stables and grandstand buildings, located on the eastern boundary of the precinct.

A specific project briefing was held with the Australian Turf Club (ATC), the stakeholder managing Rosehill Gardens Racecourse, prior to commencing remediation activities (namely conducted under a Review of Environmental Factors) to discuss the nominated control measures. The briefing discussed an update of the project operation on the controls and communication protocols and, in particular, around specific events such as the racing calendar and shows.

Through consultation with this receptor, specific noise mitigation controls have been nominated to address the impact to the Rosehill Gardens Racecourse. Ventia will implement the following:

- Shade cloth shall be continuously established around the perimeter of the site as a physical barrier between the racecourse and the site.
- High noise impact, (e.g. impulsive or tonal noise emissions) shall be limited to standard hours, starting no earlier than 8am. This will be in line with the scheduled finish of track work as advised by the ATC.
- High noise and vibration generating activities, as measured at the boundary, may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block.
- A specific project briefing shall be held with the Australian Turf Club (ATC), the stakeholder managing Rosehill Gardens Racecourse to discuss the nominated control measures. This briefing shall occur within the first two months of the project operation on the controls and communication protocols.

Ongoing consultation will identify any other mitigation/management measures required by specific receptors (e.g. ATC).

9.1.2 James Hardie Research Centre

Prior to commencing previous remediation construction activities on the site, a Construction Vibration Impact Assessment (CVIA) was conducted for the James Hardie Research and Product Development Centre.

Consultation with James Hardie identified that existing potentially vibration sensitive equipment is located within the X-Ray and Chemical Laboratory of the Research & Product Development Centre. Sensitive scientific equipment include an XRF (x-ray diffraction), TGA (thermogravimetric analysis) and LECO (metallography).

Due to the identification of vibration sensitive operations, vibration baseline monitoring was conducted at the James Hardie building prior to the commencement of construction works. The baseline data in combination with the VC curves presented in *Section 6.4.3* was used to determine project / equipment specific vibration goals.

An overview of the baseline vibration monitoring conducted for the Project at the James Hardie is summarised below:

- Recorded vibration levels within the James Hardie Laboratory were very low, as was expected for this type of environment. The highest vibration level (after excluding extraneous data) was 0.302 mm/s with a characteristic frequency of 16 Hz.
- The highest transient vibration event that was excluded from the assessment was 0.635 mm/s with a characteristic frequency of 15 Hz. This was likely caused by James Hardie staff foot fall in close proximity to the device geophone.
- Based on previous project experience the threshold for the perception of vibration is approximately 0.2 mm/s. Based on the measured data-set, ambient vibration levels recorded during the baseline monitoring campaign exceeded this threshold on occasion. As such, some existing vibration is being experienced within the James Hardie Laboratory.
- Results of the monitoring campaign identify that existing vibration levels are significantly above the Sensitive Scientific and Medical Equipment criteria outlined in Section 3 of this report.
- Based on the results from the monitoring campaign a safe limit for vibration monitoring of 0.300 mm/s (PPV) within the James Hardie laboratory should be adopted.

Based on the results and findings of this CVIA, it was concluded that:

- Event based vibration monitoring (attended measurements) are conducted at the commencement of vibration generating activities to confirm that vibration levels align with those presented in this report i.e. below 0.300 mm/s (PPV).
- Continuous vibration monitoring (unattended with audible and visible alarms) should be conducted at the nearest sensitive receptors/building whenever vibration generating activities need to be undertaken within 21 metres from the nearest sensitive receptor.
- If measured vibration levels, associated with the project's excavation are:
 - Below the predicted values presented in the CVIA report and compliant with the relevant TfNSW CNVS guideline values, no further mitigation and/or management measures are required.
 - Above the predicted values presented in the CVIA but compliant with measured baseline safe limits, no further mitigation and/or management measures are required but due care should be taken to prevent any significant increase in vibration.
 - Above the measured baseline safe limits presented in the CVIA, works should cease until further mitigation and/or management measures can be implemented.

Table 9-1: Noise and vibration management and mitigation measures

ID	Measure / Requirement	When to implement	Responsibility	Reference
CNV1	Implement community consultation measures: in line with the Parramatta Light Rail (Stage 1) <i>Community Communications Strategy</i>, Revision 3, dated 15 January 2019. e.g. periodic notification (meetings, newsletters, factsheets, notifications and website). Ventia will issue written notifications to stakeholders at least seven (7) days prior to such works being undertaken or as required by the EPA where an environment protection licence (EPL) is in effect. The distribution area for each written notification will be agreed to with TfNSW. website: www.parramattalightrail.nsw.gov.au	Pre-Construction, Throughout Construction	Community Liaison Manager	CoA - E33, CoA - E31, CoA - E37, CoA - E39, CoA - E42, NV-2, NV-3, NV-4
CNV2	Register of noise and vibration sensitive receivers: A register of most affected noise and vibration sensitive receivers (NVSRs) would be kept on site. The register may be included as part of the Project's Community Liaison Plan or similar document and maintained in accordance with the requirements of the CNVS.	Throughout Construction	Community Liaison Manager	CoA - E33
CNV3	Construction hours and scheduling: Where feasible and reasonable, construction will be carried out during the standard daytime working hours. Work generating noise with special audible characteristics and/or vibration levels will be scheduled during less sensitive time periods. Where possible heavy vehicle movements should be limited to daytime hours. The use of noise intensive plant items (as defined in the CNVS and ICNG) would be scheduled for normal working hours. If the works cannot be carried out during the daytime period, they would be completed before 10pm in accordance with CoA – E23, unless approved by the Secretary.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, CoA - E21, CoA – E23, CoA – E27, NV-2, NV-5
CNV4	Construction respite period: In accordance with CoA - E36, respite periods must be provided for sensitive receivers where any construction activity during the hours specified in CoA - E21 results in Leq, 15 minute noise levels that exceed the HNML of 75 dBA. Therefore in accordance with CoA – E27 and the CNVS, high impact noise and vibration generating activities may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block. 'Continuous'	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, CoA - E27, CoA - E36, CoA - E37, CoA - E38, CoA - E39, CoA – E40, CoA - E41, NV-2

ID	Measure / Requirement	When to implement	Responsibility	Reference
	includes any period during which there is less than a 1 hour respite between ceasing and recommencing any of the work. In accordance with the OOHw protocol, coordination of OOHw will occur to provide respite, minimise the duration and impact on sensitive receivers, and to respond to community consultation at a project-wide level. In accordance with CoA - E41, noise generated by construction must not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of 85dB (LAeq,8h) for any employee working at a location near the CSSI. The implementation of respite periods defined above (along with other measures outlines in <i>Section 9</i>) will assist compliance with CoA – E41.			
CNV5	Site inductions: All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard • noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on noise generating activities with special audible characteristics • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures.	Throughout Construction	Environment Manager	CoA - E33, CoA – C2(j)
CNV6	Behavioural practices: • No swearing or unnecessary shouting or loud stereos/radios on site. • No dropping of materials from height, throwing of metal items and slamming of doors. • No excessive revving of plant and vehicle engines. • Controlled release of compressed air. • Turning equipment and plant off when not in use.	Throughout Construction	Environment Manager	CoA - E33

ID	Measure / Requirement	When to implement	Responsibility	Reference
CNV7	Monitoring: A noise/vibration monitoring program will be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions. Refer <i>Appendix D</i> of this CNVMP	Throughout Construction	Environment Manager	CoA - E33, CoA - C9, CoA – C10, CoA - C17, NV-2
CNV8	Attended vibration measurements: shall be undertaken at all buildings within 25 m of vibration generating activities when these activities commence to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.	Throughout Construction	Environment Manager	CoA - E33, NV-7, EPO - 2
CNV9	Update CEMP: The CEMP and sub-plans will be reviewed at least six monthly and/or may occur: • Following reportable environmental incidents; • Upon identification of new 'significant' risks, including risks identified during risk register updates; • When non-compliances are identified; • Following environmental audits that identify matters that require attention; • In response to significant project change (including modifications to the CSSI); • Within three months of any of the above occurrences; • As part of a continuous improvement process; and • The effect of changes in standards and legislation.	Throughout Construction	Environment Manager	CoA - E33, CoA - C2(k)
CNV10	Building condition surveys: Undertake building dilapidation surveys on all buildings located within the TfNSW safe working distances (Table 8.2) prior to and after major project construction activities with the potential to cause property damage. Preconstruction condition survey reports will be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than one month before the commencement of construction. Post-construction condition surveys will then be provided within three weeks of completing the surveys and no later than three months following the completion of construction. Any physical damage caused to a property as a result of the Project will be rectified or the property owner compensated, within a timeframe agreed to by the property owner with the costs borne by the Proponent. As per CoA – E47, this is not intended to limit any claims that the property owner may have against the Proponent.	Pre-Construction, Throughout Construction, Post-Construction	Environment Manager	CoA - E33, CoA - E45, CoA - E46, CoA - E47, NV-7, EPO - 2

ID	Measure / Requirement	When to implement	Responsibility	Reference
CNV11	Plan worksites and activities to minimise noise and vibration: Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	Throughout Construction	Environment Manager	CoA - E33, NV-2, NV-7
CNV12	Equipment Selection: Use quieter and less vibration emitting construction methods where feasible and reasonable, refer <i>Section 8</i> and CNVS. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. All piling undertaken as part of the Project design will be bored piling.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, CoA – E34, NV-2, NV-7
CNV13	Maximum noise levels: The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the allowable noise levels in the CNVS.	Throughout Construction	Environment Manager	CoA - E33, NV-2
CNV14	Rental plant and equipment: The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the allowable noise levels in the CNVS.	Throughout Construction	Environment Manager	CoA - E33, NV-2
CNV15	Use and siting of plant: Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2
CNV16	Non-tonal reversing alarms: Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work, including delivery vehicles.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2
CNV17	Minimise disturbance arising from delivery of goods to construction sites: Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2

ID	Measure / Requirement	When to implement	Responsibility	Reference
CNV18	Construction Related Traffic: Schedule and route vehicle movements away from sensitive receivers and during less sensitive times. Limit the speed of vehicles and avoid the use of engine compression brakes. Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-6
CNV19	Silencers on Mobile Plant: Where possible reduce noise from mobile plant through additional fittings including: • Residential grade mufflers • Damped hammers such as “City” Model • Rammer Hammers • Air Parking brake engagement is silenced.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2, NV-7
CNV20	Prefabrication of materials off-site: Where practicable, pre-fabricate and/or prepare materials off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33
CNV21	Engine compression brakes: Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained original equipment manufacturer exhaust silencer or a silencer that complies with the National Transport Commission’s ‘In-service test procedure’ and standard.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-6
CNV23	Shield stationary noise sources: Stationary noise sources such as pumps, compressors, fans etc. will be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 lists materials suitable for shielding.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2
CNV24	Shield sensitive receivers from noisy activities: Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when siting plant.	Throughout Construction	Environment Manager / Site Supervisor	CoA - E33, NV-2

10 Compliance management

10.1 Roles and responsibilities

The Ventia 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 *Chapter 9* of this Plan. Relevant roles and responsibilities associated with this CNVMP are presented in *Table 10-1*.

Table 10-1: Roles and responsibilities

Roles	Responsibilities
Environment Manager / Site Supervisor	• Oversee the overall implementation of this CNVMP. • Ensure that sufficient resources are allocated for the implementation of this CNVMP. • Consider and advise senior management on compliance obligations. • Ensure that the outcomes of compliance monitoring / incident reporting are systematically evaluated as part of ongoing management of construction activities. • Ensure all appropriate noise and vibration mitigation measures are implemented. • Where standard mitigation measures are deemed insufficient, undertake reasonable steps to manage adverse impacts and implement all additional measures. • Authorise cessation of construction activities on-site if exceedances are identified. • Ensure construction activity records / monitoring records/ incident reports are kept and maintained on-site. • Ensure audits of construction site activity records / monitoring records/ incident reports are undertaken as needed, findings are shared with relevant site personnel and corrective actions are implemented. • Ensure all relevant personnel have and understand the most up-to-date copy of this CNVMP. • Ensure that all requirements of this CNVMP are effectively implemented. • Ensure that any required actions arising from incident investigation processes during compliance construction monitoring are reported to the relevant personnel for further action and ensure that the actions are effectively implemented. • Coordinate the implementation of monitoring requirements and corrective actions. • Ensure that experienced, trained or qualified personnel conduct the noise (or vibration) monitoring. • Ensure all monitoring reporting requirements are met and maintained on site. • Acts as a primary site contact for any valid complaints received via the Community Place Manager. • Authorise all monitoring reports and any revisions to this CNVMP.
Site personnel and subcontractors	• Understand and implement mitigation as required in the CNVMP and any additional required measures identified during construction. • Participate (or conduct if authorised) in relevant training to implement the requirements of this CNVMP.

Roles	Responsibilities
Community Place Manager	• Provide key stakeholders and the community with information about construction progress. • Ensure people understand the scope of the works and mitigation measures. • Ensure key stakeholders and the community understand the proposed timing of the works. • Take steps to minimise potential impacts from construction works. • Work closely with the Project team to coordinate consultation activities with the community and other stakeholders. • Be the single point of contact for affected stakeholder and the community and the project team, who will proactively doorknock properties and also respond quickly to any issues or complaints raised. • Be available at all times that any activities are being performed on any construction site to answer any questions, concerns, complaints or enquires in relation to activities. • Produce and distribute all community notifications relating to contractor activities. • Develop, produce and distribute site specific quarterly newsletters to inform the community of the progress and key milestones or activities taking place during the following three months. • Distribute newsletters to all affected commercial and residential properties within a minimum of 500 metre radius of the construction site. • Record all interactions with stakeholders on Consultation. • Provide an initial response to email/written correspondence (letters/faxes) within 48 hours. • Provide feedback to requests for information from the Sydney Metro Communication and Engagement team Sydney Metro Communication and Engagement team within two hours. • Refer enquiries not associated with contractor activities to Sydney Metro Project Communications team immediately. • Record all interactions with stakeholders in accordance with Consultation Manager data entry procedure within 48 hours. • Manage calls to the community information line and redirect to appropriate team members or contractors. • Provide at least an oral response to calls forwarded from the community information line within two hours unless otherwise agreed. • Lead or be involved in any consultation activities arising from community enquiries as notified by the contractor.

Roles	Responsibilities
Environmental Representative	In accordance with CoA – A23 the ER has the following roles and responsibilities: (a) receive and respond to communication from the Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Secretary on matters specified in the terms of this approval; (c) consider and recommend to the Proponent any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and the community; (d) review documents identified in Table 2 of the CoA and any other documents that are identified by the Secretary, for consistency, in the opinion of the ER, with requirements in or under this approval and if so: i. make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary); or ii. make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary for information or are not required to be submitted to the Secretary); (e) regularly monitor the implementation of the documents listed in Table 2 of the CoA to ensure implementation is being carried out in accordance with the document and the terms of this approval; (f) as may be requested by the Secretary, help plan, attend or undertake audits of the CSSI commissioned by the Department including scoping audits, programming audits, briefings and site visits, but not independent environmental audits required under CoA - A41 of this approval; (g) as may be requested by the Secretary, assist the Department in the resolution of community complaints; (h) assess and, if acceptable, approve the impacts of minor ancillary facilities comprising lunch sheds, office sheds and portable toilet facilities or other ancillary facilities determined by the ER to have a minor environmental impact; and (i) prepare and submit to the Secretary and other relevant regulatory agencies, for information, an Environmental Representative Monthly Report providing the information set out in the Environmental Representative Protocol under the heading "Environmental Representative Monthly Reports." The Environmental Representative Monthly Report must be submitted within seven days following the end of each month for the duration of the ER's engagement for the CSSI.

Roles	Responsibilities
Acoustics Advisor	In accordance with CoA – A29 , the AA has the following roles and responsibilities: (a) receive and respond to communication from the Secretary about the performance of the CSSI in relation to noise and vibration; (b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration; (c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts; (d) consider consultation outcomes with affected receivers to determine the adequacy of noise mitigation and management measures including work hours and respite periods; (e) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary); (f) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval; (g) in conjunction with the ER, the AA must: i. as may be requested by the Secretary, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; ii. if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; iii. consider relevant minor amendments made to the CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature and are consistent with the terms of this approval and the management plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary, endorse the amendment. This does not include any modifications to the terms of this approval; iv. assess the noise impacts of minor construction ancillary facilities; and (h) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or another timeframe agreed with the Secretary). The Noise and Vibration Report must be submitted within seven days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary.

10.2 Training

As per the **CoA – C2 (j)**, recommendations of the CNVIS and commitments made in the EIS, training will be undertaken in accordance with the CEMP and any additional measures set out in the CEMP sub-plans, including this CNVMP.

In summary, all site personnel, contractors and sub-contractors shall undergo site specific induction training, which will include noise and vibration management training developed with an emphasis on understanding and managing impacts from the work activities being undertaken.

This site specific induction training will include:

- All relevant project specific and standard noise and vibration mitigation measures
- Relevant licence and approval conditions
- Permissible hours of work
- Any limitations on noise generating activities with special audible characteristics
- Location of nearest sensitive receivers
- Construction employee parking areas
- Designated loading/unloading areas and procedures
- Site opening/closing times (including deliveries)
- Environmental incident procedures.

The site specific induction will also outline the consequences of not complying with these measures.

Toolbox meetings will also be undertaken as and when required; covering specific environmental issues and will include noise and vibration control measures where required, including but not limited to:

- Ensuring work occurs within approved hours;
- Relevant noise and vibration mitigation measures;
- Locating noisy equipment away from sensitive receptors;
- Ensuring plant and equipment is well maintained and not making excessive noise;
- Emphasis that there should be no swearing, shouting or loud stereos/radios on site
- Turning off machinery when not in use; and
- Designated loading/unloading areas and procedures.

Toolbox training on noise and vibration management requirements and measures will be completed by the Environmental Manager (or nominated delegate) during the Project.

Personnel directly involved in implementing noise and vibration control measures on site will be given specific training in the various measures to be implemented. Records of all training will be filed in accordance with Ventia project filing system. Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

10.3 General Monitoring Requirements

All construction noise and vibration monitoring will be undertaken in accordance with the CNVS and other relevant policy and guidelines outline in *Section 3.1*.

Attended noise monitoring and unattended vibration monitoring will be the focus of monitoring however unattended noise and attended vibration monitoring may be undertaken where specific circumstances warrant. An unattended vibration monitoring device will be installed at the closest and most sensitive buildings in close proximity to Project works. Attended noise monitoring will be conducted at locations representative of the nearest and potentially most affected receptors, as outlined in *Appendix C* in accordance with the AMMM requirements.

Unattended real-time noise monitoring devices may be supplemented with operator attended noise monitoring. The benefit of attended noise monitoring is that the results can be fed back directly to the Project team and actions taken without delay. For vibration it is typical that unattended monitoring is undertaken, however the device may be observed by Ventia (or their specialist) during the early stages of certain works to provide real time feedback of results to the Project team, based on which actions can be taken without delay.

All attended measurements will be conducted by appropriately trained personnel in the measurement and assessment of construction noise and vibration. They will be familiar with the requirements of the relevant standards and procedures.

As per **CoA - C11** all monitoring data will be available (on the PLR project website, under the relevant package) to the construction team, Ventia, ER, AA, Parramatta City Council, DPIE, EPA and the community. Further detail on noise and vibration requirements are outlined in the Noise and Vibration Monitoring Program presented in *Appendix D*. A summary of noise and vibration monitoring requirements is provided below.

10.3.1 Noise monitoring requirements

Attended noise measurements will be conducted by an operator using a hand held Type 1 or Type 2 'integrating-averaging' sound level meter. The device will be calibrated prior to and after all measurement rounds, with any change in calibration levels noted. Measurements will be completed with the sound level meter mounted to a tripod (if possible) at a height of between 1.2 and 1.5 metres above ground and with a windscreen fitted. Instantaneous noise levels for all noted noise emission sources (extraneous or otherwise), meteorological conditions (average and maximum wind speeds, temperature, precipitation and cloud cover etc.) shall be recorded during all measurements. The location of monitoring, time of measurement and all relevant measurement parameters (i.e. LAeq, LAmin, LAmax, LA1, LA10 and LA90) will also be recorded.

Unattended noise measurements will be conducted using a Type 1 or Type 2 environmental noise logger. The device will be calibrated prior to and after installation (and periodically during the monitoring period), with any change in calibration levels noted. Measurements will be completed with a windscreen fitted.

Noise monitoring will not be completed within 3 m of any reflective structure or wall, if possible. Where it is not possible to measure more than 3 m from any reflective structure or wall, a reduction of up to 2.5 dB will be applied to the measured ambient and site noise contribution (LAeq, 15 minute) to account for the likely increase in noise associated with reflective surfaces. Noise levels monitored during inclement weather conditions (wind speeds exceeding 5 m/s at the microphone or rain events) should be excluded from and not be relied upon for the compliance analysis.

Monitoring will be conducted as per the requirements of this CNVMP and with due regard to AS1055; AS61672, AS1259 (or similar); IEC60942; or the NSW Vibration Guideline as relevant to the monitoring being conducted.

All noise samples shall be recorded using the "fast" time response of the sound level meter.

Site activity records will be maintained during any noise (or vibration) monitoring events.

10.3.2 Vibration monitoring requirements

Unattended vibration monitoring will be undertaken with due regard to and in accordance with the requirements of the CNVS and ICNG using a calibrated vibration logger.

In accordance with **CoA – E43**, when vibration intensive activities are required (e.g. vibratory rollers, excavators with hydraulic hammers and bored piling), the device will be placed (fixed to the structure, or embedded in the ground nearby the structure) at the potentially most affected receptor or structure prior to works commencing.

Where other activities are identified to include risk that levels may exceed structural damage criteria attended vibration monitoring will also be conducted, with measured values to be observed during the first 30 minutes of works to ensure structural damage criteria are not exceeded.

The device will be set to continuously record vibration levels (PPV data in mm/s) at sample intervals (e.g. 5 second, 15 second or 1 minute) appropriate to the activity. Vibration Dose Values (VDV, mm/s) are reliant on 1) the duration of vibration events and 2) the component frequency (in Hz) associated with the vibration being generated. Hence VDV will be estimated and evaluated regularly during the early stages of the activity and monitoring period. A PPV trigger level will be established during these early stages to inform the real time management of vibration (e.g. alternate construction methods or respite).

10.3.3 Provisions, Safeguards and Monitoring Contingencies (Concurrent Works)

The purpose of this monitoring contingency is consistent with that of the overall noise monitoring program documented in *Appendix D* of this CNVMP. It will inform the relevant personnel if the noise management levels are being approached (or exceeded) so that the work methodology or equipment being used can be altered, and / or additional management measures may be implemented. This will assist to reduce emissions and avoid/minimise any impacts (or future increase in impact to those addressed by this CNVMP) so that the surrounding community and broader acoustics environment are safeguarded against further nuisance, or temporary reduction in amenity.

As recommended by the CNVIS and addressed as commitments in this CNVMP, noise monitoring will occur as per the requirements and specification presented in *Section 10.3.1*.

This monitoring will already occur for specific Project construction activities that are likely to exceed the relevant noise management levels, as per the AMMM requirements, and in the form of either unattended monitoring or operator attended measurements.

All monitoring will enable the site noise level to be established in the absence of any influential source not associated with the Project, and comparison to the predicted values (refer *Appendix C*) and criteria presented in *Section 6* of this CNVMP. Monitoring will consider all Project works occurring at the time “i.e. concurrent works” so that the overall site noise level contribution is established before further evaluation. Should circumstances arise during the works that the potential for increased air-borne noise emissions are identified, or valid complaints are received on this regards; additional noise monitoring will occur. The processes for measuring and evaluating the noise data as presented in *Section 10.3.1* will be adhered to.

10.4 Complaints

Complaints will be recorded and managed as detailed in *Section 3.7.3* of the CEMP.

10.5 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 3.9.3* of the CEMP.

10.6 Reporting

Reporting requirements and responsibilities are documented in Section 3.9.4 and 3.9.5 of the CEMP.

All noise and vibration monitoring results will be assessed against the nominated goals. Noise and vibration monitoring data, and any other relevant information, will be provided to the AA to assist the AA in producing the monthly Noise and Vibration Report as required under **CoA - A29**. As per **CoA - C16**, the results of the Construction Monitoring Program will be submitted in a Construction Monitoring Report to EPA, the Parramatta City Council and the DPIE for information on a six monthly basis.

The following will be included in as a minimum (where relevant) in noise/vibration monitoring reports:

- The type of monitoring conducted (for example, at a particular project stage or following complaints) and a brief statement of the measurement method;
- The noise/vibration conditions on the consent / licence, or the relevant noise management objectives;
- Descriptions of the nearest affected residences and other sensitive land uses or, in the case of complaints, description of the complainant location and complaint;
- Description of the instrumentation used;
- The results of monitoring at each monitoring location, including a comparison with the consent conditions or relevant noise management objectives;
- Vibration monitoring results summary together with notes describing any vibration intensive activities (if applicable);
- Summary of measurements exceeding the vibration criteria levels and descriptions of the plant or operations causing these exceedances (if available);
- Details of corrective action applicable to vibration criteria exceedances and confirmation of its successful implementation. Where corrective action has not yet been implemented, it may be shown as pending and the status of its implementation will be carried forward to following reports;
- The location of the construction works in relation to the monitoring position (sketch plan & sections, photos);
- Details of the various construction equipment in use during the measurement period;
- Details as to the likely dominant noise sources;
- Meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- A clear statement outlining the Project's compliance or non-compliance with the conditions or objectives where the monitored level is higher than the conditions or objectives; and
- The reasons for non-compliance should be stated, strategies for minimising noise identified and stated, and the appropriate actions to implement the mitigation and or management strategies.

Further noise and vibration reporting requirements are outlined in the Noise and Vibration Monitoring Program presented in *Appendix D*.

11 Review and improvement

11.1 Continuous improvement

Continuous improvement of this 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.

11.2 Update and amendment

The CNVMP (including the Noise and Vibration Monitoring Program) will be reviewed on a case by case basis and where circumstances arise during the works that require amendments to the plan. The processes described in Chapter 3.9 and Chapter 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed. CNV9 of Table 9-1, Section 9 outlines that the CEMP and sub-plans (i.e. this CNVMP, including monitoring program) will be reviewed at least six monthly. CNV9 also outlines other triggers that may require updates of amendments outside of the six monthly review.

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

The type of circumstances that may trigger a CNVMP review could include, but are not limited to, significant changes in construction procedures, management protocols or environmental requirements; trends in validated noise or vibration complaints are identified; and/or an increase in noise and vibration impacts is identified.

Where noise or vibration levels are repeatedly identified (e.g. via monitoring) to be above management levels or the predicted values in the CNVIS, a review of this CNVMP will be undertaken. The following steps will be completed:

- review and identify the cause of any noise (or vibration) exceedances. This should focus on the plant, equipment or machinery in use at the time, or activities undertaken so that any trends can be identified;
- confirm the type and extent of any mitigation or corrective actions implemented during the non-compliant events;
- identify, develop and implement any opportunities for improvement or additional mitigation or management measures that will assist to minimise impacts associated with any trends; and
- revise this management plan document or supplement this plan (e.g. with separate work instructions) to reflect the outcomes of the review.

The revised management plan (or supplementary documentation) will be developed to the satisfaction of the Environmental Manager, ER and the AA, so that the management strategy and management measures continue to assist to minimise impacts at receptors and to ensure that the plan remains an effective instrument for noise management and mitigation.

The ER and the AA has the authority to approve minor amendments to plans (Condition C8). Only Department of Planning, Industry and Environment has the authority to approve major amendments to plans. A minor change (not material) is considered to be a change that is insignificant to the implementation of the approved document or plan, such as administrative changes or content that does not change the implementation of previously approved documents. Anything not considered a minor change would be considered as major.

Any review of the CNVMP will also be undertaken in consultation with relevant government agencies (i.e. Parramatta City Council, EPA and NSW Health).

The CNVMP review will reflect these considerations and upon final approval of the revised CNVMP, the document will be circulated to relevant personnel. Updates to this plan will be numbered consecutively and issued to holders of controlled copies. The CEMP and sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Revised versions of the CEMP and sub-plans will be updated and notifications sent to the Project team. Further details regarding document review and control are outlined in Section 3.11.2 of the CEMP.

References

British Standard – BS5228-2:2009+A1:2014 (BS5228) – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration*.

British Standard (BS 6472–1992) – *Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*, dated 1992.

British Standard BS7385: Part 2-1993 (BS 7385) - *Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration*, dated 1993.

German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150:3) – *Structural Vibration - Effects of Vibration on Structures*, dated 1999.

International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation*.

NSW Department of Environment and Climate Change – *NSW Interim Construction Noise Guideline (ICNG)*, July 2009.

NSW Department of Environment and Conservation – *NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline (AVTG)*, February 2006.

NSW Department of Environment, Climate Change and Water – *NSW Road Noise Policy (RNP)*, March 2011.

NSW Environment Protection Authority – *NSW Noise Policy for Industry (NPI)*, October 2017 and relevant application notes.

NSW Government – Transport for NSW (TfNSW) – *Construction Noise and Vibration Strategy (7TP-ST-157/4.0) (CNVS)*, May 2018.

NSW Government – Transport for NSW (TfNSW) – *Parramatta Light Rail: Stage 1 – Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report, incorporating Preferred Infrastructure Report*, February 2018.

NSW Government – Transport for NSW (TfNSW) – *Parramatta Light Rail – Stage 1 Out-of-hours work protocol (PLR-TFNSW-CBD-PE-FRM-000002)*, February 2019.

Standards Australia AS1055–2018™ (AS1055) – *Description and Measurement of Environmental Noise*.

Standards Australia AS 2436–2010™ (AS2436) – *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

Standard Australia AS IEC 61672.1–2004™ (AS61672) – *Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ (AS1259) – Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device*

Standard Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – *Australian Standard™ – Electroacoustic – Sound Calibrators*

Appendix A - Consultation Evidence

Table A- 1: Log of consultation with Stakeholders as per CoA A5

In / Out	Date and time	Method of contact	Details of contact
Out	19/02/2019 17:23	E-mail	Invitation to PLR Consultation Workshop (RMS, Police - Parramatta, Fire & Rescue NSW, NSW Health, EPA, OEH, City of Parramatta Council (CoPC), DoI Water)
Out	20/02/2019 17:07	E-mail	Invitation to PLR Consultation Workshop (Site Auditor, SCO).
In	20/02/2019 07:59	E-mail	Police (Parramatta) – Project falls under Cumberland Police Area Command
Out	20/02/2019 10:54	E-mail	Invitation to PLR Consultation Workshop (Police – Cumberland).
Out	06/03/2019 09:30	Workshop	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans (i.e. CNVMP including monitoring program) presented to attending stakeholders (Attendees include Police, Fire & Rescue NSW, CoPC, DoI Water, Site Auditor and ER).
Out	06/03/2019 14:37 - 15:23	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans (i.e. CNVMP including monitoring program) presented to non-attending stakeholders (EPA, DoI Water, SCO, NSW Health)
Out	07/03/2019 11:21	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans (i.e. CNVMP including monitoring program) presented to non-attending stakeholders (RMS)
Out	07/03/2019 17:12	E-mail	Provided response to Council relating to a noise and vibration query (COP-01) raised at the PLR Consultation Workshop for Package 3: Portion 2 Early Works

In / Out	Date and time	Method of contact	Details of contact
Out	18/03/2019 11:08 - 11:23	E-mail	Additional correspondence requesting comments to RMS, Police – Cumberland, Fire & Rescue NSW, EPA, Council, Site Auditor, DoI Water
In	22/03/2019 18:40	E-mail	NSW Health comment (HEA-01) received on TTAMP. Comment noted did not require further update.
Out	25/03/2019 12:00	Briefing / Site Visit	NSW EPA Contaminated Site Team project briefing from TfNSW and site visit with Portion 2 Early Works Environment & Hygiene Manager and TfNSW
Out	26/03/2019 07:40 - 08:02	E-mail	Additional correspondence requesting comments to Police – Cumberland, EPA, Council, DoI Water
In	27/03/2019 21:27	E-mail	City of Parramatta Council Environmental Health Compliance Team reviewed – CEMP, NVMP, SWMP, AQMP, WRMP and CLMP - no comments received.

Table A- 2: Log of issues raised by Stakeholders as per CoA A5

Reference	Comment	How addressed	Management plan reference location	Reference	Status
City of Parramatta Council COP-01	Confirm that residential receptors to the north of the site, beyond the Parramatta River have been considered.	Residential receptors to the north, east and south of the project site are more than 1 km away and are shielded by the immediate industrial buildings. The noise attenuation afforded by the large intervening distances and shielding from the intervening industrial buildings, would ensure that residential receptors to the north, east and south are not likely to be adversely affected and are likely to comply with the NMLs. That said, as the project has been assessed to comply with the NMLs at the closer residential receptors (to the west), compliance will also be achieved at the residential receptors to the north, east and south as they are much further away from the project. Based on the above analysis, residences to the north, east and south are not considered to be potentially most affected receptors and have therefore, not been considered in our assessment.	Section 5.1.1 of the CNVMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 07/03/2019 17:12 (P52)	Closed

NSW Environment Protection Authority EPA-01	Please consider changing: "As outlined in CoA - E27, except as permitted by an EPL, or through the Out-of-Hours Work Protocol..." TO "As outlined in CoA - E27, except as stated in an EPL, or through the Out-of-Hours Work Protocol..."	Text updated as requested.	Section 7.1 of the CNVMP	Annexure H of CEMP Stakeholder Consultation Evidence, dated 08/05/2019 16:22 (P60)	Closed
NSW Environment Protection Authority EPA-02	"Notwithstanding CoA - E21 (hours of work), works may be undertaken in the Camellia precincts (east of James Ruse Drive) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the ICNG, between 10:00pm and 7:00am (CoA - E23)"	Minor edits to improve readability as follows. This text is however largely based on the actual CoA. Edited text is: "As specified in CoA – E23 and notwithstanding CoA - E21, works may be undertaken in the Camellia precinct (east of James Ruse Drive) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the ICNG, between 10.00pm and 7.00am."	Section 7.1 of the CNVMP	Annexure H of CEMP Stakeholder Consultation Evidence, dated 08/05/2019 16:22 (P60)	Closed

NSW Environment Protection Authority EPA-03	Emergency Construction - Emergencies should be defined if they haven't in the OOH Protocol and within the Management Plan's dictionary/definition sections. As a comment: Emergency Works should only be used for an actual emergency and not, for example, as a result of poor planning and/or improper scheduling.	Definition of 'emergency' included in glossary/abbreviations section of the CNVMP. The following text was added to Section 7.4 in the CNVMP - Emergency construction works would only be undertaken in the event of an 'emergency' commonly defined as a serious, unexpected, and often dangerous situation requiring immediate action. To avoid any misunderstanding, an emergency does not relate to general issues associated with sequencing or scheduling risks that do not represent an emergency as defined by this CNVMP. These edits align with the definitions provided in the TfNSW OOH Protocol.	<i>Glossary / Abbreviations and Section 7.4</i> of the CNVMP	Annexure H of CEMP Stakeholder Consultation Evidence, dated 08/05/2019 16:22 (P60)	Closed
NSW Health / NSW Ambulance	NSW Health / NSW Ambulance response following review of the plans and provided information with no comments on the CNVMP (including the monitoring program). NOTE: No sensitive receivers relevant to NSW health were identified during the land use survey.			Annexure F of CEMP Stakeholder Consultation Evidence, dated 22/03/2019 18:40 (P41).	Closed

Appendix B - Construction Scenarios (CNVIS)

Schedule	Timing Details	Area of Works	Activity	Assessment Scenario ID	Potential (AB / GB / Vb) Impacts	Equipment	LW, Item	Quantity (Q)	Penalty (P)	Duty Factor (DF)	LW, Modified (Q / P / DF)	Spectral Data - dBA per 1/1 Octave - Frequency in Hertz (Hz)								
												31.5	63	125	250	500	1000	2000	4000	80000
Jun-19	24/7	NE Corner	Site Establishment	SCN 01-A	AB Noise	Truck	107.0	1.0	0.0	100%	107.0	62.7	88.1	92.4	98.8	102.1	99.4	101.4	90.4	83.6
				SCN 01-B	AB Noise	50 Tonne Crane	104.0	1.0	0.0	75%	102.8	65.2	76.3	85.9	88.1	95.8	95.8	91.7	99.1	88.7
				SCN 01-C	AB Noise	Power Tools (Grinder)	102.0	2.0	5.0	75%	108.8	65.5	89.2	94.3	94.0	104.6	104.7	100.0	88.3	78.2
				SCN 01-D	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Jun-19	24/7	NE Corner	Site Establishment	↑ SCN 01	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	110.9	-	-	-	112.4	69.7	91.9	98.2	101.4	107.4	107.1	105.5	100.3	92.0
Aug - Sept 19	7am - 10pm	Predominantly central-western portion of site – ramp up from Grand Ave & maintenance pits for future building	Excavate contaminated material to stockpile	SCN 02-A	AB Noise	3 X 30 Tonne Excavators (W/ Rock Hammers)	118.0	3.0	5.0	50%	124.8	84.2	102.9	111.1	111.7	122.6	117.5	113.7	108.9	102.4
				SCN 02-B	AB Noise	Concrete Saw	117.0	1.0	0.0	50%	114.0	66.9	81.6	105.7	104.7	105.7	109.2	107.5	98.4	91.8
				SCN 02-C	AB Noise	5 X Moxy Dump Trucks	117.0	5.0	0.0	50%	121.0	51.8	76.8	101.8	109.8	117.9	114.8	111.8	108.8	101.8
				SCN 02-D	AB Noise	1 X Compactor	113.0	1.0	0.0	75%	111.8	61.2	79.4	94.5	105.0	105.4	106.6	104.8	96.6	90.5
				SCN 02-E	AB Noise / Vibration	1 X Smooth Drum Roller (17 Tonne)	108.0	1.0	0.0	75%	106.8	56.2	74.4	89.5	100.0	100.4	101.6	99.8	91.6	85.5
				SCN 02-F	AB Noise	1 X Water Cart	107.0	1.0	0.0	75%	105.8	68.6	85.1	85.8	86.2	91.4	105.0	95.0	89.4	80.4
				SCN 02-G	AB Noise	Water Pumps	97.0	2.0	0.0	100%	100.0	60.9	78.9	85.4	83.5	94.0	96.0	93.3	87.4	82.4
				SCN 02-H	AB Noise	Generators	99.0	2.0	0.0	100%	102.0	67.9	90.1	94.4	90.4	95.7	94.2	95.2	90.8	81.6
				SCN 02-I	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Aug - Sept 19	7am - 10pm	Predominantly central-western portion of site	Excavate contaminated material to stockpile	↑ SCN 02a	AB Noise / Vibration	↑ TOTAL EMISSION (LW, 15minute in dBA)	123.0	-	-	-	126.8	84.6	103.3	112.8	115.0	124.0	120.2	117.0	112.3	105.6
Aug - Sept 19	24/7	Predominantly central-western portion of site – ramp up from Grand Ave & maintenance pits for future building	Excavate contaminated material to stockpile	SCN 02-A	AB Noise	1 X 30 Tonne Excavators (W/ Rock Hammers)	118.0	1.0	5.0	50%	120.0	84.2	102.9	111.1	111.7	122.6	117.5	113.7	108.9	102.4
				SCN 02-B	AB Noise	1 X Moxy Dump Trucks	117.0	1.0	0.0	50%	114.0	51.8	76.8	101.8	109.8	117.9	114.8	111.8	108.8	101.8
				SCN 02-C	AB Noise	1 X Smooth Drum Roller (17 Tonne)	108.0	1.0	0.0	75%	106.8	56.2	74.4	89.5	100.0	100.4	101.6	99.8	91.6	85.5
				SCN 02-D	AB Noise	1 X Water Cart	107.0	1.0	0.0	75%	105.8	68.6	85.1	85.8	86.2	91.4	105.0	95.0	89.4	80.4
				SCN 02-E	AB Noise	Water Pumps	97.0	2.0	0.0	100%	100.0	60.9	78.9	85.4	83.5	94.0	96.0	93.3	87.4	82.4
				SCN 02-F	AB Noise	Generators	99.0	2.0	0.0	100%	102.0	67.9	90.1	94.4	90.4	95.7	94.2	95.2	90.8	81.6
Aug - Sept 19	24/7	Predominantly central-western portion of site	Excavate contaminated material to stockpile	↑ SCN 02b	AB Noise / Vibration	↑ TOTAL EMISSION (LW, 15minute in dBA)	121.0	-	-	-	121.3	84.5	103.3	111.7	114.0	123.9	119.6	116.0	111.9	105.2
Feb-20	24/7	Full length of eastern boundary - 30m wide, 40 m off north boundary	Install berm [stockpile]	SCN 03-A	AB Noise	2 X 30 Tonne Excavators	107.0	2.0	0.0	50%	107.0	64.5	85.2	93.9	96.5	101.8	102.8	98.1	92.8	85.6
				SCN 03-B	AB Noise	5 X Moxy Dump Trucks	117.0	5.0	0.0	50%	121.0	51.8	76.8	101.8	109.8	117.9	114.8	111.8	108.8	101.8
				SCN 03-C	AB Noise	1 X Compactor	113.0	1.0	0.0	75%	111.8	61.2	79.4	94.5	105.0	105.4	106.6	104.8	96.6	90.5
				SCN 03-D	AB Noise	1 X Water Cart	107.0	1.0	0.0	75%	105.8	68.6	85.1	85.8	86.2	91.4	105.0	95.0	89.4	80.4
				SCN 03-E	AB Noise	Water Pumps	97.0	2.0	0.0	100%	100.0	60.9	78.9	85.4	83.5	94.0	96.0	93.3	87.4	82.4
				SCN 03-F	AB Noise	Generators	99.0	2.0	0.0	100%	102.0	67.9	90.1	94.4	90.4	95.7	94.2	95.2	90.8	81.6
				SCN 03-G	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Feb-20	24/7	Full length of eastern boundary	Install berm [stockpile]	↑ SCN 03	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	119.3	-	-	-	121.9	72.9	92.8	104.1	111.3	118.3	116.1	113.1	109.3	102.4
Sept 19 - Mar 20	7am - 10pm	Whole Site	Install capping layers	SCN 04-A	AB Noise	4X 30 Tonne Excavators	107.0	4.0	0.0	75%	111.8	69.3	90.0	98.7	101.3	106.6	107.6	102.9	97.6	90.4
				SCN 04-B	AB Noise	5X Moxy Dump Trucks	117.0	5.0	0.0	75%	122.7	53.5	78.5	103.5	111.5	119.6	116.5	113.5	110.5	103.5
				SCN 04-C	AB Noise	1X Compactor	113.0	1.0	0.0	50%	110.0	59.4	77.6	92.7	103.2	103.6	104.8	103.0	94.8	88.7
				SCN 04-D	AB Noise	1X D10 Bulldozer	121.0	1.0	0.0	50%	118.0	68.0	82.4	99.9	102.5	113.2	112.8	111.7	107.1	98.5
				SCN 04-E	AB Noise / Vibration	1X Smooth Drum Roller (17 Tonne)	108.0	1.0	0.0	75%	106.8	56.2	74.4	89.5	100.0	100.4	101.6	99.8	91.6	85.5
				SCN 04-F	AB Noise	Truck And Dog (Delivery – 3 Onsite At Any One Time)	107.0	3.0	0.0	75%	110.5	66.2	91.6	95.9	102.3	105.6	102.9	104.9	93.9	87.1
				SCN 04-G	AB Noise	Bobcat	105.0	1.0	0.0	75%	103.8	56.2	65.8	91.4	93.5	96.2	98.6	99.0	88.3	86.2
				SCN 04-H	AB Noise	1X Watercart	107.0	1.0	0.0	75%	105.8	68.6	85.1	85.8	86.2	91.4	105.0	95.0	89.4	80.4
				SCN 04-I	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Sept 19 - Mar 20	7am - 10pm	Whole Site	Install capping layers	↑ SCN 04a	AB Noise / Vibration	↑ TOTAL EMISSION (LW, 15minute in dBA)	123.5	-	-	-	124.8	74.6	94.9	107.0	113.5	120.9	119.0	116.7	112.5	105.2
Sept 19 - Mar 20	24/7	Whole Site	Install capping layers	SCN 04-A	AB Noise	4X 30 Tonne Excavators	107.0	4.0	0.0	75%	111.8	69.3	90.0	98.7	101.3	106.6	107.6	102.9	97.6	90.4
				SCN 04-B	AB Noise	1 X Moxy Dump Trucks	117.0	1.0	0.0	75%	115.8	53.5	78.5	103.5	111.5	119.6	116.5	113.5	110.5	103.5
				SCN 04-C	AB Noise	1X Compactor	113.0	1.0	0.0	50%	110.0	59.4	77.6	92.7	103.2	103.6	104.8	103.0	94.8	88.7
				SCN 04-D	AB Noise	Truck And Dog (Delivery – 3 Onsite At Any One Time)	107.0	3.0	0.0	75%	110.5	66.2	91.6	95.9	102.3	105.6	102.9	104.9	93.9	87.1
				SCN 04-E	AB Noise	1X Watercart	107.0	1.0	0.0	75%	105.8	68.6	85.1	85.8	86.2	91.4	105.0	95.0	89.4	80.4
Sept 19 - Mar 20	24/7	Whole Site	Install capping layers	↑ SCN 04b	AB Noise / Vibration	↑ TOTAL EMISSION (LW, 15minute in dBA)	119.3	-	-	-	118.9	73.2	94.6	105.5	112.8	120.0	117.6	114.7	110.9	103.9

Schedule	Timing Details	Area of Works	Activity	Assessment Scenario ID	Potential L _{AB} / G _B / V _{ib} Impacts	Equipment	LW, Item	Quantity (Q)	Penalty (P)	Duty Factor (DF)	LW, Modified (Q / P / DF)	Spectral Data - dBA per 1/1 Octave - Frequency in Hertz (Hz)								
												31.5	63	125	250	500	1000	2000	4000	80000
Sept 19 - Feb 20	24/7	Whole Site	Vapour Collection Pipework	SCN 05-A	AB Noise	HDPE Pipe Welder	105.0	1.0	0.0	100%	105.0	70.9	93.1	97.4	93.4	98.7	97.2	98.2	93.8	84.6
				SCN 05-B	AB Noise	Hand Tools (Drills, Grinders Etc)	102.0	2.0	5.0	75%	108.8	65.5	89.2	94.3	94.0	104.6	104.7	100.0	88.3	78.2
				SCN 05-C	AB Noise	30 Tonne Excavator	107.0	1.0	0.0	50%	104.0	61.5	82.2	90.9	93.5	98.8	99.8	95.1	89.8	82.6
				SCN 05-D	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Sept 19 - Feb 20	24/7	Whole Site	Vapour Collection Pipework	↑ SCN 05	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	111.1	-	-	-	112.1	72.5	94.9	100.5	100.0	106.9	107.3	104.8	96.9	90.4
Jul - Aug 19	24/7	Primarily vegetated zone on western boundary - North	Ground Improvement Works	SCN 06a-A	AB Noise	2 X 30 Tonne Excavators	107.0	2.0	0.0	50%	107.0	64.5	85.2	93.9	96.5	101.8	102.8	98.1	92.8	85.6
				SCN 06a-B	AB Noise	1 X Batching Plant / Agitator Trucks (3 Onsite)	109.0	3.0	0.0	75%	112.5	72.0	88.0	96.2	97.7	104.5	109.9	105.1	98.4	91.9
				SCN 06a-C	AB Noise	1 X Bored Piling Rig	110.0	1.0	0.0	75%	108.8	61.8	76.5	98.3	99.6	100.7	104.3	102.7	93.6	86.8
Jul - Aug 19	24/7	Primarily vegetated zone on western boundary	Ground Improvement Works	↑ SCN 06a	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	113.6	-	-	-	114.8	73.1	90.0	101.3	102.9	107.4	111.6	107.6	100.5	93.8
Jul - Aug 19	24/7	Primarily vegetated zone on western boundary - South	Ground Improvement Works	SCN 06b-A	AB Noise	2 X 30 Tonne Excavators	107.0	2.0	0.0	50%	107.0	64.5	85.2	93.9	96.5	101.8	102.8	98.1	92.8	85.6
				SCN 06b-B	AB Noise	1 X Batching Plant / Agitator Trucks (3 Onsite)	109.0	3.0	0.0	75%	112.5	72.0	88.0	96.2	97.7	104.5	109.9	105.1	98.4	91.9
				SCN 06b-C	AB Noise	1 X Bored Piling Rig	110.0	1.0	0.0	75%	108.8	61.8	76.5	98.3	99.6	100.7	104.3	102.7	93.6	86.8
Jul - Aug 19	24/7	Primarily vegetated zone on western boundary	Ground Improvement Works	↑ SCN 06b	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	113.6	-	-	-	114.8	73.1	90.0	101.3	102.9	107.4	111.6	107.6	100.5	93.8
Mar-20	24/7	NE Corner	Site disestablishment (repeat of site establishment)	SCN 07-A	AB Noise	Truck	107.0	1.0	0.0	100%	107.0	62.7	88.1	92.4	98.8	102.1	99.4	101.4	90.4	83.6
				SCN 07-B	AB Noise	50 Tonne Crane	104.0	1.0	0.0	75%	102.8	65.2	76.3	85.9	88.1	95.8	95.8	91.7	99.1	88.7
				SCN 07-C	AB Noise	Power Tools (Grinder)	102.0	2.0	5.0	75%	108.8	65.5	89.2	94.3	94.0	104.6	104.7	100.0	88.3	78.2
				SCN 07-D	AB Noise	4T Manitou	105.0	1.0	0.0	100%	105.0	57.4	67.0	92.6	94.7	97.4	99.8	100.2	89.5	87.4
Mar-20	24/7	NE Corner	Site disestablishment (repeat of site establishment)	↑ SCN 07	AB Noise	↑ TOTAL EMISSION (LW, 15minute in dBA)	110.9	-	-	-	112.4	69.7	91.9	98.2	101.4	107.4	107.1	105.5	100.3	92.0

Appendix C - Airborne Noise Results (CNVIS)

Table C.1	Site Establishment	SCN01	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	32	-23	-23	-23	-23	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	36	-34	-34	-34	-34	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	45	-25	-25	-25	-25	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	65	-10	-10	-10	-10	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	66	-9	-9	-9	-9	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	53	-17	-17	-17	-17	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	36	-18	-13	-13	-10	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	33	-21	-16	-16	-13	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	34	-20	-15	-15	-12	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	59	-16	-16	-16	-16	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	15	-39	-34	-34	-31	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	41	-24	-24	-24	-24	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	33	-21	-16	-16	-13	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	54	-21	-21	-21	-21	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	32	-23	-23	-23	-23	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	51	-24	-24	-24	-24	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	44	-31	-31	-31	-31	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	35	-19	-14	-14	-11	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	38	-37	-37	-37	-37	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	36	-39	-39	-39	-39	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.2a	Excavate Contaminated Material to Stockpile	SCN02a	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	48	-7	-7	-7	-7	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	52	-18	-18	-18	-18	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	61	-9	-9	-9	-9	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	70	-5	-5	-5	-5	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	72	-3	-3	-3	-3	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	69	-1	-1	-1	-1	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	52	-2	3	3	6	-	-	-	PN, V
R08	Residential - 15 Hope St, Rosehill NSW	49	-5	0	0	3	-	-	-	PN
R09	Residential - 122 James Ruse Dr, Rosehill NSW	50	-4	1	1	4	-	-	-	PN
R10	Industrial - 10 Grand Ave, Camellia NSW	71	-4	-4	-4	-4	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	32	-22	-17	-17	-14	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	57	-8	-8	-8	-8	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	49	-5	0	0	3	-	-	-	PN
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	72	-3	-3	-3	-3	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	49	-6	-6	-6	-6	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	67	-8	-8	-8	-8	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	62	-13	-13	-13	-13	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	51	-3	2	2	5	-	-	-	PN, V
R19	Industrial - 2 Unwins St, Rosehill NSW	54	-21	-21	-21	-21	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	55	-20	-20	-20	-20	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.2b	Excavate Contaminated Material to Stockpile - OOH	SCN02b	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	42	-13	-13	-13	-13	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	46	-24	-24	-24	-24	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	55	-15	-15	-15	-15	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	64	-11	-11	-11	-11	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	66	-9	-9	-9	-9	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	63	-7	-7	-7	-7	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	46	-8	-3	-3	0	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	43	-11	-6	-6	-3	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	44	-10	-5	-5	-2	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	65	-10	-10	-10	-10	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	26	-28	-23	-23	-20	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	51	-14	-14	-14	-14	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	43	-11	-6	-6	-3	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	66	-9	-9	-9	-9	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	43	-12	-12	-12	-12	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	61	-14	-14	-14	-14	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	56	-19	-19	-19	-19	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	45	-9	-4	-4	-1	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	48	-27	-27	-27	-27	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	49	-26	-26	-26	-26	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.3	Install Berm [Stockpile]	SCN03	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	41	-14	-14	-14	-14	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	45	-25	-25	-25	-25	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	53	-17	-17	-17	-17	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	64	-11	-11	-11	-11	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	64	-11	-11	-11	-11	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	59	-11	-11	-11	-11	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	45	-9	-4	-4	-1	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	42	-12	-7	-7	-4	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	43	-11	-6	-6	-3	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	74	-1	-1	-1	-1	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	36	-18	-13	-13	-10	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	51	-14	-14	-14	-14	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	43	-11	-6	-6	-3	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	73	-2	-2	-2	-2	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	43	-12	-12	-12	-12	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	71	-4	-4	-4	-4	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	55	-20	-20	-20	-20	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	45	-9	-4	-4	-1	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	46	-29	-29	-29	-29	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	46	-29	-29	-29	-29	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.4a	Install Capping Layers	SCN04a	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	45	-10	-10	-10	-10	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	49	-21	-21	-21	-21	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	58	-12	-12	-12	-12	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	69	-6	-6	-6	-6	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	71	-4	-4	-4	-4	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	66	-4	-4	-4	-4	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	49	-5	0	0	3	-	-	-	PN
R08	Residential - 15 Hope St, Rosehill NSW	46	-8	-3	-3	0	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	47	-7	-2	-2	1	-	-	-	PN
R10	Industrial - 10 Grand Ave, Camellia NSW	72	-3	-3	-3	-3	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	38	-16	-11	-11	-8	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	55	-10	-10	-10	-10	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	47	-7	-2	-2	1	-	-	-	PN
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	80	5	5	5	5	PN, V, SN	PN, V	PN, V	PN, V
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	46	-9	-9	-9	-9	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	69	-6	-6	-6	-6	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	61	-14	-14	-14	-14	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	48	-6	-1	-1	2	-	-	-	PN
R19	Industrial - 2 Unwins St, Rosehill NSW	51	-24	-24	-24	-24	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	51	-24	-24	-24	-24	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.4b	Install Capping Layers - OOH	SCN04b	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	39	-16	-16	-16	-16	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	43	-27	-27	-27	-27	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	52	-18	-18	-18	-18	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	63	-12	-12	-12	-12	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	65	-10	-10	-10	-10	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	60	-10	-10	-10	-10	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	43	-11	-6	-6	-3	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	40	-14	-9	-9	-6	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	41	-13	-8	-8	-5	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	66	-9	-9	-9	-9	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	32	-22	-17	-17	-14	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	49	-16	-16	-16	-16	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	41	-13	-8	-8	-5	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	74	-1	-1	-1	-1	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	40	-15	-15	-15	-15	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	63	-12	-12	-12	-12	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	55	-20	-20	-20	-20	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	42	-12	-7	-7	-4	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	45	-30	-30	-30	-30	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	45	-30	-30	-30	-30	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.5	Vapour Collection Pipework	SCN05	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	33	-22	-22	-22	-22	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	37	-33	-33	-33	-33	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	46	-24	-24	-24	-24	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	57	-18	-18	-18	-18	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	59	-16	-16	-16	-16	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	54	-16	-16	-16	-16	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	37	-17	-12	-12	-9	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	34	-20	-15	-15	-12	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	35	-19	-14	-14	-11	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	60	-15	-15	-15	-15	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	26	-28	-23	-23	-20	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	43	-22	-22	-22	-22	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	35	-19	-14	-14	-11	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	67	-8	-8	-8	-8	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	34	-21	-21	-21	-21	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	57	-18	-18	-18	-18	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	49	-26	-26	-26	-26	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	36	-18	-13	-13	-10	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	39	-36	-36	-36	-36	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	39	-36	-36	-36	-36	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.6a	Ground Improvement Works (North)	SCN06a	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	35	-20	-20	-20	-20	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	40	-30	-30	-30	-30	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	49	-21	-21	-21	-21	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	62	-13	-13	-13	-13	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	64	-11	-11	-11	-11	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	59	-11	-11	-11	-11	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	40	-14	-9	-9	-6	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	36	-18	-13	-13	-10	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	37	-17	-12	-12	-9	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	60	-15	-15	-15	-15	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	18	-36	-31	-31	-28	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	45	-20	-20	-20	-20	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	37	-17	-12	-12	-9	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	58	-17	-17	-17	-17	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	35	-20	-20	-20	-20	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	55	-20	-20	-20	-20	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	48	-27	-27	-27	-27	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	38	-16	-11	-11	-8	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	41	-34	-34	-34	-34	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	43	-32	-32	-32	-32	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.6b	Ground Improvement Works (South)	SCN06b	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	35	-20	-20	-20	-20	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	40	-30	-30	-30	-30	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	49	-21	-21	-21	-21	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	55	-20	-20	-20	-20	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	56	-19	-19	-19	-19	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	55	-15	-15	-15	-15	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	40	-14	-9	-9	-6	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	37	-17	-12	-12	-9	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	38	-16	-11	-11	-8	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	59	-16	-16	-16	-16	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	23	-31	-26	-26	-23	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	46	-19	-19	-19	-19	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	37	-17	-12	-12	-9	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	64	-11	-11	-11	-11	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	40	-15	-15	-15	-15	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	58	-17	-17	-17	-17	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	53	-22	-22	-22	-22	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	39	-15	-10	-10	-7	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	43	-32	-32	-32	-32	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	43	-32	-32	-32	-32	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Table C.7	Site Disestablishment	SCN07	Comparison to NML				Mitigation / Management (AMMM)			
Location ID	Description - Address	Predicted Noise Level	Day Standard	Day Non-Standard	Evening	Night	Day Standard	Day Non-Standard	Evening	Night
R01	Medical Centre - 22 Oak St, Rosehill NSW	32	-23	-23	-23	-23	-	-	-	-
R02	Commercial - 132 James Ruse Dr, Rosehill NSW	36	-34	-34	-34	-34	-	-	-	-
R03	Commercial - 7 Grand Ave, Camellia NSW	45	-25	-25	-25	-25	-	-	-	-
R04	Industrial - 15 Grand Ave, Camellia NSW	65	-10	-10	-10	-10	-	-	-	-
R05	Industrial - 13 Grand Ave, Camellia NSW	65	-10	-10	-10	-10	-	-	-	-
R06	Commercial - 11A-11C Grand Ave, Camellia NSW	53	-17	-17	-17	-17	-	-	-	-
R07	Residential - 126 James Ruse Dr, Rosehill NSW	36	-18	-13	-13	-10	-	-	-	-
R08	Residential - 15 Hope St, Rosehill NSW	33	-21	-16	-16	-13	-	-	-	-
R09	Residential - 122 James Ruse Dr, Rosehill NSW	34	-20	-15	-15	-12	-	-	-	-
R10	Industrial - 10 Grand Ave, Camellia NSW	59	-16	-16	-16	-16	-	-	-	-
R11	Residential - 17 Weston St, Rosehill NSW	15	-39	-34	-34	-31	-	-	-	-
R12	Recreational - Rosehill Gardens, Unwin St, Rosehill NSW	41	-24	-24	-24	-24	-	-	-	-
R13	Hotel - 116-118 James Ruse Dr, Rosehill NSW	33	-21	-16	-16	-13	-	-	-	-
R14	Industrial - James Hardie, 10 Colquhoun St, Rosehill NSW	54	-21	-21	-21	-21	-	-	-	-
R15	School - Rosehill Public School, Prospect St, Rosehill NSW	32	-23	-23	-23	-23	-	-	-	-
R16	Industrial - 5 Devon St, Rosehill NSW	51	-24	-24	-24	-24	-	-	-	-
R17	Industrial - Forster DC, 10 Colquhoun St, Rosehill NSW	44	-31	-31	-31	-31	-	-	-	-
R18	Residential - 100 Jame Ruse Dr, Rosehill NSW	35	-19	-14	-14	-11	-	-	-	-
R19	Industrial - 2 Unwins St, Rosehill NSW	38	-37	-37	-37	-37	-	-	-	-
R20	Industrial - 5 Unwins St, Rosehill NSW	35	-40	-40	-40	-40	-	-	-	-

Notes:

PN	Project notification
V	Verification monitoring
RP	Respite period
AA	Alternative accommodation
SN	Specific notification, individual briefings, phone call
DR	Duration reduction
RO	Project specific respite offer

Appendix D - Noise and Vibration Monitoring Program

Appendix D

Noise and Vibration Monitoring Program

Parramatta Light Rail – Stage 1 / Camellia

PLR-TFNSW-PJT-NV-PRG-000001.A.08.A.02 - Revision #V.04

July 2019

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Document control

Version control

Revision	Date	Description	Approval
V.01	01/03/2019	Draft Construction Noise and Vibration Monitoring Program	
V.02	27/03/2019	Address comments from TfNSW, ER and AA	
V.03	19/06/2019	Address comments from DPE	
V.04	31/07/2019	Address comments from DPE	

Glossary / Abbreviations

Abbreviations	Expanded Text
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
AMMM	Additional Mitigation Measures Matrix
Attenuation	The reduction in the level of sound or vibration.
AS2436	Standards Australia AS 2436–2010™ – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.
AS61672 or AS1259	Standards Australia AS IEC 61672.1–2004™ – Electro Acoustics - Sound Level Meters Specifications Monitoring or Standards Australia AS1259.2-1990™ – Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device.
AVTG	NSW Department of Environment and Conservation – NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline (AVTG), February 2006.
BS 6472	British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) dated 1992;
BS 7385	British Standard BS7385: Part 2-1993 - Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration, dated 1993.
CEMP	Construction Environmental Management Plan
CNVS	Construction Noise and Vibration Strategy
CNVIS	Construction Noise and Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
CoA	Condition of Approval
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DIN4150:3	German Institute for Standardisation – DIN 4150 (2016-12) Part 3 – Structural Vibration - Effects of Vibration on Structures.
DPE	NSW Department of Planning and Environment
EIS	Environmental Impact Statement

EMS	Environmental management system
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
ER	Environmental Representative
ERG	Environmental Review Group
ERM	Environmental Resources Management Australia Pty Ltd
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements..
HNAML	Highly Noise Affected Management Level
ICNG	NSW Department of Environment and Climate Change – NSW Interim Construction Noise Guideline, July 2009.
IEC60942	Standards Australia AS/IEC 60942:2004/IEC 60942:2003 – Australian Standard™ – Electroacoustic – Sound Calibrators.
LAeq,15 minute	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
LAmx	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.

NML	Noise Management Level
NPI	NSW Environment Protection Authority – Noise Policy for Industry, October 2017
OEH	Office of Environment and Heritage
OOHW	Out-of-hours Work
PLR	Parramatta Light Rail (Stage 1)
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
REMMM	Revised Environmental Mitigation and Management Measure
RNP	NSW Department of Environment, Climate Change and Water – NSW Road Noise Policy, March 2011.
SWL, LW	Sound Power Level
SPIR	Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018)
SPL	Sound Pressure Level
TfNSW	Transport for New South Wales
Project, the	Parramatta Light Rail – Camellia Remediation Works
Ventia	Ventia Utility Services Pty Ltd

1 Introduction

1.1 Context

This Construction Noise and Vibration Monitoring Program (Program) describes how Ventia Utility Services Pty Ltd (Ventia) will monitor and compare actual performance for noise and vibration during construction of the Parramatta Light Rail (Stage 1) Camellia Remediation (the Project).

1.2 Purpose of this report

This Program has been prepared to address the requirements of the Conditions of Approval (CoA) for the Project Infrastructure Approval. The requirements of the Program related CoA are listed in *Table 1-1*.

Table 1-1 Conditions applicable to the Noise and Vibration Monitoring Program

CoA No.	Condition Requirements	Document reference	How Addressed
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies for each to compare actual performance of construction of the CSSI against performance predicted in the documents listed in Conditions A1 or in the CEMP. (b) Noise and Vibration Monitoring Relevant government agencies to be consulted: Relevant Council(s), EPA, NSW Health (as relevant)	This monitoring program, The CNVMP, Appendix A of the CNVMP	A Construction Noise and Vibration Monitoring Program has been prepared in consultation with relevant government agencies along with the CNVMP.
C10	The Construction Monitoring Program must provide: (a) details of baseline data available	Section 3.1	Details of baseline noise data are outlined in Section 3.1.
	(b) details of baseline data to be obtained and when	Section 3.1	Details of baseline noise data are outlined in Section 3.1.
	(c) details of all monitoring of the project to be undertaken	Section 5	Noise and vibration monitoring requirements are outlined in Section 5.
	(d) the parameters of the project to be monitored	Section 4	Noise management levels and criteria are outlined in Section 4.
	(e) the frequency of monitoring to be undertaken	Section 5	Noise and vibration monitoring requirements are outlined in Section 5.

CoA No.	Condition Requirements	Document reference	How Addressed
	(f) the location of monitoring	Section 5	Noise and vibration monitoring requirements are outlined in Section 5.
	(g) the reporting of monitoring results against relevant criteria	Section 5.5	Reporting requirements are outlined in Section 5.5.
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 5.4	Required actions following monitoring are outlined in Section 5.4.
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 2	Consultation undertaken in relation to the monitoring program is outlined in Section 2
C11	The noise and vibration monitoring data collected during monitoring required by Condition C9 must be available to the Proponent, ER, AA, Relevant Council(s) and the community to inform construction scheduling, the level of impacts and whether additional mitigation is required. The Department must also be provided access to this data if specifically requested.	Section 5.1	All monitoring data will be available to the construction team, Ventia, ER, AA, Parramatta City Council, DPE and the EPA, as required.
C12	The Construction Monitoring Programs must be developed in consultation with relevant government agencies and Relevant Council(s) as identified in Condition C9 of this approval and must include, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency, including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	Section 2	The Monitoring Program has been prepared in consultation with the Parramatta City Council, EPA and NSW Health.
C13	The Construction Monitoring Programs must be endorsed by the ER and submitted to the Secretary for information at least one month before the commencement of construction.	Section 2	ER has reviewed / endorsed this Monitoring Program.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 2	This Monitoring Program has been incorporated into the CNVMP.

2 Consultation

This section summarises the consultation undertaken as part of developing this Program.

2.1 Consultation Requirements under the Conditions of Approval

This sub-plan has been prepared in consultation with relevant Government Agencies and Councils in line with **CoA – C9**. Consultation included the following stakeholders:

- NSW Environment Protection Authority (EPA)
- City of Parramatta Council
- NSW Health

This monitoring program has been incorporated into the CNVMP as per **CoA – C17**. A summary of consultation undertaken during the preparation of this CNVMP is provided in *Appendix A*. In accordance with **CoA - C6** and **CoA - C13**, this CNVMP (including monitoring program) was endorsed by the ER / AA and submitted to DPE no later than one month before construction.

3 Existing Environment

3.1 Background Noise Levels

This section presents the measured noise levels from unattended noise logging and operator attended noise measurements completed adopting the methodology described above.

3.1.1 Unattended Noise Logging

Ambient and background noise levels were quantified via monitoring in January 2019, with due regard to the requirements described in NPI, 2017, applicable parts of Standards Australia AS1055–2018™ (AS1055) – *Description and Measurement of Environmental Noise* and other relevant Australian and international standards for environmental noise monitoring. Further detail of background noise monitoring is outlined in the *Construction Noise and Vibration Impact Statement* (CNVIS), prepared by ERM in February 2019.

Unattended noise logging was undertaken at two locations, which are presented in *Figure 3-1* below. The first logging location (L01) was located in the back yard of 5 Hope Street, and the second logging location (L02) was located in the front yard of 20 Weston Street. These locations were selected for this assessment as they allowed for the measurement of existing ambient and background noise levels that are considered representative of the most affected receptors situated close to the Project.

The measured daily and overall, ambient and background noise levels, for the two noise logging locations (L01 and L02) are presented in *Table 3-1* and *Table 3-2* below. These daily and overall summary values were established as per the requirements of the NPI, 2017.

The L_{eq} acoustical parameter corresponds to the level of noise equivalent to the energy average of ambient noise levels occurring over a measurement period. L_{90} represents the level exceeded for 90 percent of the measurement period and is referred to as the average minimum or background noise level. In accordance with the NPI, 2017 the assessment periods are defined as follows:

- Daytime is the period from 7 AM to 6 PM, Monday to Saturday or 8 AM to 6 PM on Sundays and public holidays;
- Evening is the period from 6 PM to 10 PM, Monday to Sunday (seven days per week); and
- Night time is all remaining periods.

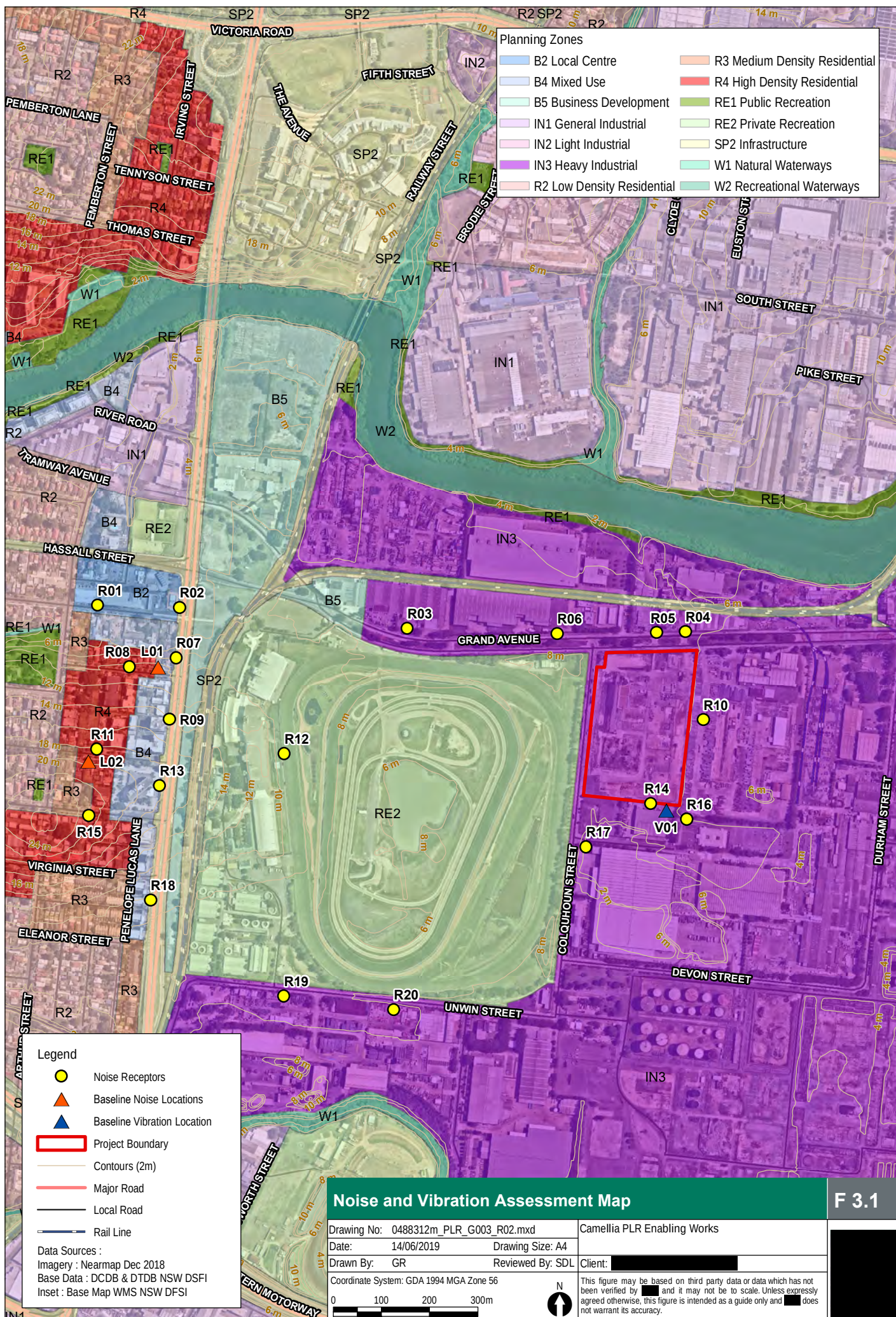


Table 3-1 Unattended Noise Logging (L01)

Date	Measured Existing Noise Levels, in dBA					
	L90, 11 hour (Daytime)	L90, 4 hour (Evening)	L90, 9 hour (Night-time)	Leq, 11 hour (Daytime)	Leq, 4 hour (Evening)	Leq, 9 hour (Night-time)
Friday-18-Jan-19	-	47.4	42.6	52.7	52.7	50.0
Saturday-19-Jan-19	45.8	43.9	38.0	53.7	53.2	48.5
Sunday-20-Jan-19	44.2	45.2	38.8	52.3	53.1	50.6
Monday-21-Jan-19	47.7	45.7	41.2	54.5	53.5	51.1
Tuesday-22-Jan-19	47.4	45.9	43.6	55.4	53.6	51.4
Wednesday-23-Jan-19	47.7	44.8	41.4	55.7	51.8	50.3
Thursday-24-Jan-19	47.2	45.6	42.3	55.1	54.1	51.3
Friday-25-Jan-19	47.8	45.7	-	55.1	53.2	47.0
Overall L90 and Leq Values	47.3	45.6	41.4	54.5	53.2	50.2
Assessment L90 and Leq Values	47	46	41	55	53	50
1. Daytime is the period from 7 AM to 6 PM, Monday to Saturday or 8 AM to 6 PM on Sundays and public holidays; 2. Evening is the period from 6 PM to 10 PM, Monday to Sunday (seven days per week); and 3. Night time is all remaining periods.						

Table 3-2 Unattended Noise Logging (L02)

Date	Measured Existing Noise Levels, in dBA					
	L90, 11 hour (Daytime)	L90, 4 hour (Evening)	L90, 9 hour (Night-time)	Leq, 11 hour (Daytime)	Leq, 4 hour (Evening)	Leq, 9 hour (Night-time)
Friday-18-Jan-19	-	46.6	41.5	53.6	55.7	50.2
Saturday-19-Jan-19	43.0	43.6	39.4	54.4	53.2	48.9
Sunday-20-Jan-19	41.5	43.2	40.4	53.7	54.8	49.5
Monday-21-Jan-19	45.0	44.3	41.0	56.6	54.1	50.4
Tuesday-22-Jan-19	45.1	45.9	41.9	55.6	55.9	51.8
Wednesday-23-Jan-19	45.7	43.0	39.6	54.7	54.7	51.6
Thursday-24-Jan-19	43.8	44.3	38.8	56.4	55.5	50.6
Friday-25-Jan-19	46.2	45.0	40.9	55.9	55.0	50.0
Saturday-26-Jan-19	44.8	43.4	-	56.9	53.8	-
Overall L90 and Leq Values	44.8	44.3	40.6	55.5	54.8	50.0
Assessment L90 and Leq Values	45	44	41	56	55	50
- Daytime is the period from 7 AM to 6 PM, Monday to Saturday or 8 AM to 6 PM on Sundays and public holidays; - Evening is the period from 6 PM to 10 PM, Monday to Sunday (seven days per week); and - Night time is all remaining periods.						

Discussion

The results of the noise logging at the two locations (L01 and L02) are considered representative of the surrounding noise environment. The results of the continuous unattended noise logging show levels typical of an urban noise environment with high daytime, evening and night-time noise levels dominated by the urban/industrial “hum” and road traffic.

Ambient noise levels which varied between 49 dBA and 57 dBA, for all assessment periods, are considered representative of general ambient noise conditions at these locations.

The dominant noise source contributing to the baseline noise levels was observed to be the road traffic noise from James Ruse Drive. The existing industrial noise was observed to be noticeable at both logging locations in the form of “industrial hum”.

It was observed that birds and insects had some minor contribution to the baseline noise levels recorded.

The logging location at L01 is closer to James Ruse Drive than logging location L02. The loggers were placed at these two locations to determine if the background noise levels further set back from James Ruse Drive would be lower (quieter) than at the receptor locations nearer to James Ruse Drive. Based on the logging results, it can be concluded that background levels at both logging locations are only marginally different. The daytime and evening L90 levels at L01 are 2 dB higher than the levels at L02, and the night-time L90 levels are the same at both locations. Based on this understanding and for simplification of the assessment, the lower background noise levels measured at L02 will be used to establish the project specific construction noise management levels for residential receptors.

3.2 Representative Sensitive Receptors

Based on the land use survey, representative receptors have been determined and will be used in the noise modelling. The representative receptors are indicated in *Figure 3-1* and detailed in *Table 3-3* below.

Table 3-3 Representative Sensitive Receptors

Receptor ID	Receptor Address	Receptor Type	GPS Co-ordinates (UTM, Zone 56H)	
			Easting	Northing
R1	Medical Centre - 22 Oak St, Rosehill NSW	Medical Facility	316733.7	6256046.5
R2	132 James Ruse Dr, Rosehill NSW	Commercial	316904.2	6256041.2
R3	7 Grand Ave, Camellia NSW	Commercial	317377.1	6255998.7
R4	15 Grand Ave, Camellia NSW	Industrial	317955.0	6255991.4
R5	13 Grand Ave, Camellia NSW	Industrial	317895.1	6255989.9
R6	11A-11C Grand Ave, Camellia NSW	Commercial	317688.2	6255987.5
R7	126 James Ruse Dr, Rosehill NSW	Residential	316897.1	6255937.0
R8	15 Hope St, Rosehill NSW	Residential	316799.7	6255918.9
R9	122 James Ruse Dr, Rosehill NSW	Residential	316882.3	6255809.7
R10	10 Grand Ave, Camellia NSW	Industrial	317992.3	6255808.4
R11	17 Weston St, Rosehill NSW	Residential	316731.8	6255748.1
R12	Rosehill Gardens, Unwin St, Rosehill NSW	Active Recreation	317121.1	6255738.9
R13	116-118 James Ruse Dr, Rosehill NSW	Hotel ¹	316862.6	6255671.8
R14	James Hardie, 10 Colquhoun St, Rosehill NSW	Industrial	317882.7	6255634.4
R15	Rosehill Public School, Prospect St, Rosehill NSW	Educational Facility	316714.8	6255609.5
R16	5 Devon St, Rosehill NSW	Commercial	317957.4	6255602.6
R17	Forster DC, 10 Colquhoun St, Rosehill NSW	Industrial	317748.4	6255544.7
R18	100 James Ruse Dr, Rosehill NSW	Residential	316844.0	6255433.5
R19	2 Unwins St, Rosehill NSW	Industrial	317120.5	6255235.1
R20	5 Unwins St, Rosehill NSW	Industrial	317349.0	6255206.4
<i>Note 1: Hotel type receptor will be assessed as residential receptor</i>				

4 Management Levels and Criteria

Based on the ICNG and the CNVS methodology summarised in the CNVMP the following construction Noise Management Levels (NMLs) and vibration criteria will apply to the Project as presented below.

4.1 General Construction Noise

The following general construction NML will apply externally and will be assessed at the most-affected point on or within the receptor property boundary or, if that is more than 30 metres (m) from the receptor, at the most-affected point within 30 m of the receptor.

Table 4-1: Construction Noise Management Levels (NML)

Receptor Type	Construction Noise Management Levels, dBA				HNML, Leq, 15 minute, dBA	Sleep Disturbance Criteria, dBA	
	Standard Hours	Out-of-Hours			Daytime (Standard Hours)	Night-time only	
	Day	Day	Evening	Night		Leq, 15 minute	Lmax
Residences	54	49	49	46	75	46	56
Educational Facility	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Medical Facility	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Places of Worship	55 ¹	55 ¹	55 ¹	55 ¹	– ²	– ²	– ²
Active Recreation	65	65	65	65	– ²	– ²	– ²
Commercial	70	70	70	70	– ²	– ²	– ²
Industrial	75	75	75	75	– ²	– ²	– ²
1. This management level applies to external noise level, as outlined in Table 6-2. 2. Dash “–” indicates that this criteria does not apply at that receptor.							

4.2 Construction Road Traffic Noise

An objective of the RNP is to protect sensitive receptors against excessive decreases in amenity as the result of a project by applying apply relevant permissible noise increase criteria. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dBA represents a minor impact that is considered barely perceptible to the average person. Whilst these criteria do not specifically apply to construction/demolition traffic movements, they have been conservatively adopted for the CNVMP and monitoring program and are summarised in *Table 4-2* below.

Table 4-2: Road Traffic Noise Management Levels

Category	Applicable Road	Noise Management Level – dBA	
		Daytime ¹	Night-time ²
Sub-arterial roads	e.g. James Ruse Drive	Leq, 15 hour ≤ 60 (external)	Leq, 9 hour ≤ 55 (external)
Local roads	e.g. Grand Avenue	Leq, 1 hour ≤ 55 (external)	Leq, 1 hour ≤ 50 (external)
Source: CNVS and RNP 1. Daytime means between 7:00am and 10:00pm, Monday to Sunday inclusive; and 2. Night time means between 10:00pm to 7:00am, Monday to Sunday inclusive.			

The road traffic noise management levels differ from general construction NML and apply 1 m from the property façade. Road traffic impacts are not anticipated such that direct assessment of Project related road traffic noise will not be undertaken unless it becomes necessary (i.e. impacts are identified or complaints are received) during the works. Where impacts are identified or complaints are received the extent of assessment will be determined on a case by case basis.

4.3 Vibration Management Levels

Refer Section 6.4 of the CNVMP which describes how the human comfort structural/cosmetic damage criteria will be evaluated, selected and applied as appropriate to the receptor and potential impacts.

4.3.1 Human Comfort

The AVTG and the CNVS provides guidance for assessing human exposure to vibration. These documents are based on *British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)* dated 1992. The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in *Table 4-3*.

Table 4-3: Human Comfort – Vibration Dose Values

Location	Assessment Period	Preferred Values		Maximum Values	
		z axis	x and y axes	z axis	x and y axes
Continuous Vibration (m/s ²)					
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.020	0.014	0.040	0.028
Workshops	Daytime or Night-time	0.040	0.029	0.080	0.058
Impulsive Vibration (m/s ²)					
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.64	0.46	1.28	0.92
Workshops	Daytime or Night-time	0.64	0.46	1.28	0.92
Intermittent Vibration (m/s ^{1.75})					
Critical Areas	Daytime or Night-time	0.10		0.20	
Residences	Daytime	0.20		0.40	
	Night-time	0.13		0.26	
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.40		0.80	
Workshops	Daytime or Night-time	0.80		1.60	
Note: Daytime is 7am-10pm and Night-time is 10pm-7am.					
Note: For continuous and impulsive vibration, the preferred and maximum values are weighted acceleration values (Wg for z axis and Wd for x and y axes)					
Note: For intermittent vibration, the preferred and maximum values are Vibration Dose Values (VDVs), based on the weighted acceleration values					

4.3.2 Building Damage (Structural / Cosmetic Damage)

To achieve the requirements of the CNVS, British Standard BS7385: Part 2-1993 (BS 7385) - *Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration*, dated 1993 is presented in *Table 4-4* and will be considered during works where applicable. BS 7385 provides safe limit guideline values, below which vibration is considered insufficient to cause structural or cosmetic damage to buildings.

Table 4-4: Building Damage (BS 7385) – Peak Particle Velocity

Line	Type of Building	Peak Particle Velocity (PPV in mm/s) in the Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	4 Hz to 15 Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz
Source: BS 7385 and CNVS			

For most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receptor type is given below:

- Reinforced or framed structures: 25.0 mm/s
- Unreinforced or light framed structures: 7.5 mm/s

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level.

Heritage Structures: in accordance with the CNVS, if a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criteria of 2.5 mm/s peak component particle velocity from the German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150:3) – *Structural Vibration - Effects of Vibration on Structures*, dated 1999 would be considered.

There were no heritage structures identified in close proximity to the Project. The DIN4150:3 criteria for heritage structures are therefore not used for assessment in the CNVIS.

4.3.3 Sensitive Scientific and Medical Equipment

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

Where it has been identified that vibration sensitive scientific and/or medical instruments are likely to be in use inside the premises of an identified vibration sensitive receptor, objectives for the satisfactory operation of the instrument would be sourced from manufacturer's data. Where manufacturer's data is not available, generic vibration criterion (VC) curves as detailed in the CNVS and presented below in *Table 4-5* would be adopted as vibration goals.

It should be noted that these criterion are very conservative, therefore baseline vibration measurements may be undertaken at receptors that are identified to contain sensitive scientific / medical equipment prior to construction activities being undertaken. The baseline data in combination with the VC curves presented below would ascertain project / equipment specific vibration criteria.

Table 4-5: Application and Interpretation of the Generic Vibration Criterion (VC) Curve

Criterion Curve	Max Level ($\mu\text{m/sec, rms}$) ¹	Detail Size (microns) ²	Description of Use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes and E-Beam systems, operating to the limits of their capability.
VC-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.
Source: CNVS 1. As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz. 2. The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given take into account the observation requirements of many items depend upon the detail size of the process.			

5 Noise and Vibration Monitoring

Monitoring for the Project will be implemented in the event of a complaint being received and confirmed to be Project related or during OOHV where the AMMM has identified monitoring.

Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals (as is the case for select project works), noise or vibration monitoring may be conducted at the affected receptor(s) or a nominated representative location (typically the nearest receptor where more than one receptor have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goals are being approached so that changes to the configuration of equipment or practices can be made in an effort to reduce noise levels to meet the noise or vibration goal. Additional management measures may also be required.

5.1 General Monitoring

All construction noise and vibration monitoring will be undertaken in accordance with the CNVS and other relevant policy and guidelines outline in Section 3.1 of the CNVMP.

Attended noise monitoring and unattended vibration monitoring will be the focus of monitoring however unattended noise and attended vibration monitoring may be undertaken where specific circumstances warrant. An unattended vibration monitoring device will be installed at the closest and potentially most sensitive buildings in close proximity to Project works. Attended noise monitoring will be conducted at locations representative of the nearest and potentially most affect receptors, as outlined in Appendix C of the CNVMP in accordance with the AMMM requirements.

Based on the scenarios assessed in the CNVIS (which informed the preparation of the CNVMP) the closest and/or potentially most affected noise/vibration sensitive receptor locations that require monitoring are presented in *Table 5-1* below:

Table 5-1: Sensitive Receptor Locations identified for monitoring in CNVIS

Receptor ID	Receptor Description	Type of Impact	Construction Scenario	Assessment Period
R14	Industrial receptor - James Hardie, 10 Colquhoun St, Rosehill NSW	Airborne Noise / Vibration	SCN04a: Install capping layers	Daytime
1. Noise monitoring has not been triggered for OOHV where reduced fleet e.g. SCN02b and SCN04b will be operating.				

This receptor location (R14) is identified in *Figure 3-1*. Noise monitoring will target this location (R14) during the commencement of the relevant construction scenario (SCN04a) to verify the actual noise levels with those predicted in the CNVIS and compare to project NMLs. Ongoing monitoring and subsequent frequency will be determined following the results of the verification monitoring at the commencement of the activity. The precise monitoring position will be selected on a case-by-case basis and adjusted where necessary to ensure that these locations remain valid, and if not, that alternate monitoring locations are selected. Consideration of this feature will occur prior to works occurring as part of the normal planning and application processes, and then verified during noise monitoring.

Receptors R07, R09 and R18 are not identified as monitoring locations as all works undertaken during the night-time period (i.e. 10pm -7am) for SCN02 and SCN04 will be undertaken with a reduced fleet e.g. SCN02b and SCN04b. Therefore NMLs will not be exceeded during these activities.

Unattended real-time noise monitoring devices may be supplemented with operator attended noise monitoring. The benefit of attended noise monitoring is that the results can be fed back directly to the Project team and actions taken without delay.

For vibration, it is typical that unattended monitoring is undertaken, however the device may be observed by Ventia (or their specialist) during the early stages of certain works to provide real time feedback of results to the Project team, based on which actions can be taken without delay. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receptors (at the building/structure) whenever vibration generating activities need to be undertaken inside the TfNSW CNVS safe-working distances.

Due to the identification of vibration sensitive scientific equipment at adjoining James Hardie Research Centre, a Construction Vibration Impact Assessment (CVIA) was conducted including vibration baseline monitoring at the James Hardie building prior to the commencement of construction works. The baseline data in combination with the VC curves presented in Section 6.4.3 of the CNVMP was used to determine project / equipment specific vibration goals.

Based on the results and findings of this CVIA, it was concluded that:

- Event based vibration monitoring (attended measurements) are conducted at the commencement of vibration generating activities to confirm that vibration levels align with those presented in this report i.e. below 0.300 mm/s (PPV).
- Continuous vibration monitoring (unattended with audible and visible alarms) should be conducted at the nearest sensitive receptors/building (i.e. James Hardie) whenever vibration generating activities need to be undertaken within 21 metres from the building structure.
- If measured vibration levels, associated with the project's excavation are:
 - Below the predicted values presented in the CVIA report and compliant with the relevant TfNSW CNVS guideline values, no further mitigation and/or management measures are required.
 - Above the predicted values presented in the CVIA but compliant with measured baseline safe limits, no further mitigation and/or management measures are required but due care should be taken to prevent any significant increase in vibration.
 - Above the measured baseline safe limits presented in the CVIA, works should cease until further mitigation and/or management measures can be implemented.

These will be implemented in conjunction with community and stakeholder consultation and notification processes outlined in the AMMM for ground-borne vibration in the CNVMP.

All attended measurements will be conducted by appropriately trained personnel in the measurement and assessment of construction noise and vibration. They will be familiar with the requirements of the relevant standards and procedures.

As per **CoA - C11** all monitoring data will be available (on the PLR project website, under the relevant package) to the construction team, Ventia, ER, AA, Parramatta City Council, DPE, EPA and the community, as required. Noise and vibration monitoring requirements is provided below.

5.2 Noise Monitoring Requirements

Attended noise measurements will be conducted by a suitably qualified and experienced Acoustic Consultant using a hand held Type 1 or Type 2 'integrating-averaging' sound level meter. The Acoustic Consultant is to be directly engaged by Ventia. The device will be calibrated prior to and after all measurement rounds, with any change in calibration levels noted. Measurements will be completed with the sound level meter mounted to a tripod (if possible) and with a windscreen fitted. Instantaneous noise levels for all noted noise emission sources (extraneous or otherwise), meteorological conditions (average and maximum wind speeds, temperature, precipitation and cloud cover etc.) shall be recorded during all measurements. The location of monitoring, time of measurement and all relevant measurement parameters (i.e. LAeq, LAmin, LAmax, LA1, LA10 and LA90) will also be recorded.

Unattended noise measurements will be conducted using a Type 1 or Type 2 environmental noise logger. The device will be calibrated prior to and after installation (and periodically during the monitoring period), with any change in calibration levels noted. Measurements will be completed with a windscreen fitted.

Noise monitoring will not be completed within 3 m of any reflective structure or wall, if possible. Where it is not possible to measure more than 3 m from any reflective structure or wall, a reduction of up to 2.5 dB will be applied to the measured ambient and site noise contribution (LAeq, 15 minute) to account for the likely increase in noise associated with reflective surfaces. No noise monitoring will be completed during periods where wind speeds exceed 5 m/s at the microphone or during any rain events.

Monitoring will be conducted as per the requirements of this CNVMP and with due regard to AS1055; AS61672, AS1259 (or similar); IEC60942; or the NSW Vibration Guideline as relevant to the monitoring being conducted.

All noise samples shall be recorded using the "fast" time response of the sound level meter.

Site activity records will be maintained during any noise (or vibration) monitoring events.

5.3 Vibration Measurement Requirements

Unattended vibration monitoring will be undertaken with due regard to and in accordance with the requirements of the CNVS and ICNG using a calibrated vibration logger. The vibration monitoring should be conducted by a suitably qualified and experienced Acoustic Consultant directly engaged by Ventia.

In accordance with **CoA – E43**, when vibration intensive activities are required e.g. vibratory rollers, excavators with hydraulic hammers and bored piling, the device will be placed (fixed to the structure, or embedded in the ground nearby the structure) at the potentially most affected receptor or structure prior to works commencing.

Where other activities are identified to include risk that levels may exceed structural damage criteria attended vibration monitoring will also be conducted, with measured values to be observed during the first 30 minutes of works to ensure structural damage criteria are not exceeded.

Measurement positions will be taken at the base of the building on the side of the building facing the source of vibration, to define the vibration input to the building. Where this is not feasible the measurement will be taken on the ground outside of the building.

The geophone will be mounted to reproduce the vibration in the frequency and magnitude ranges in which vibration response may be expected (i.e. the geophone will be firmly placed with adhesive to a concrete slab or substantially weighted to the ground in order to experience the ground-borne vibration).

Unattended vibration monitoring would be undertaken with due regard to and in accordance with the requirements of the CNVS and ATVG using a calibrated vibration logger.

The device will be set to continuously record vibration levels (PPV data in mm/s) at sample intervals (e.g. 5 second, 15 second or 1 minute) appropriate to the activity. Vibration Dose Values (VDV, m/s²) are reliant on 1) the duration of vibration events and 2) the component frequency (in Hz) associated with the vibration being generated. Hence VDV will be estimated and evaluated regularly during the early stages of the activity and monitoring period. A PPV trigger level will be established during these early stages to inform the real time management of vibration (e.g. alternate construction methods or respite).

5.4 Actions Following Monitoring in the Community

Actions to mitigate or manage noise or vibration emissions will be considered as per the measures described in Section 9 of the CNVMP and the overall monitoring protocol identified in *Figure 5-1* below.

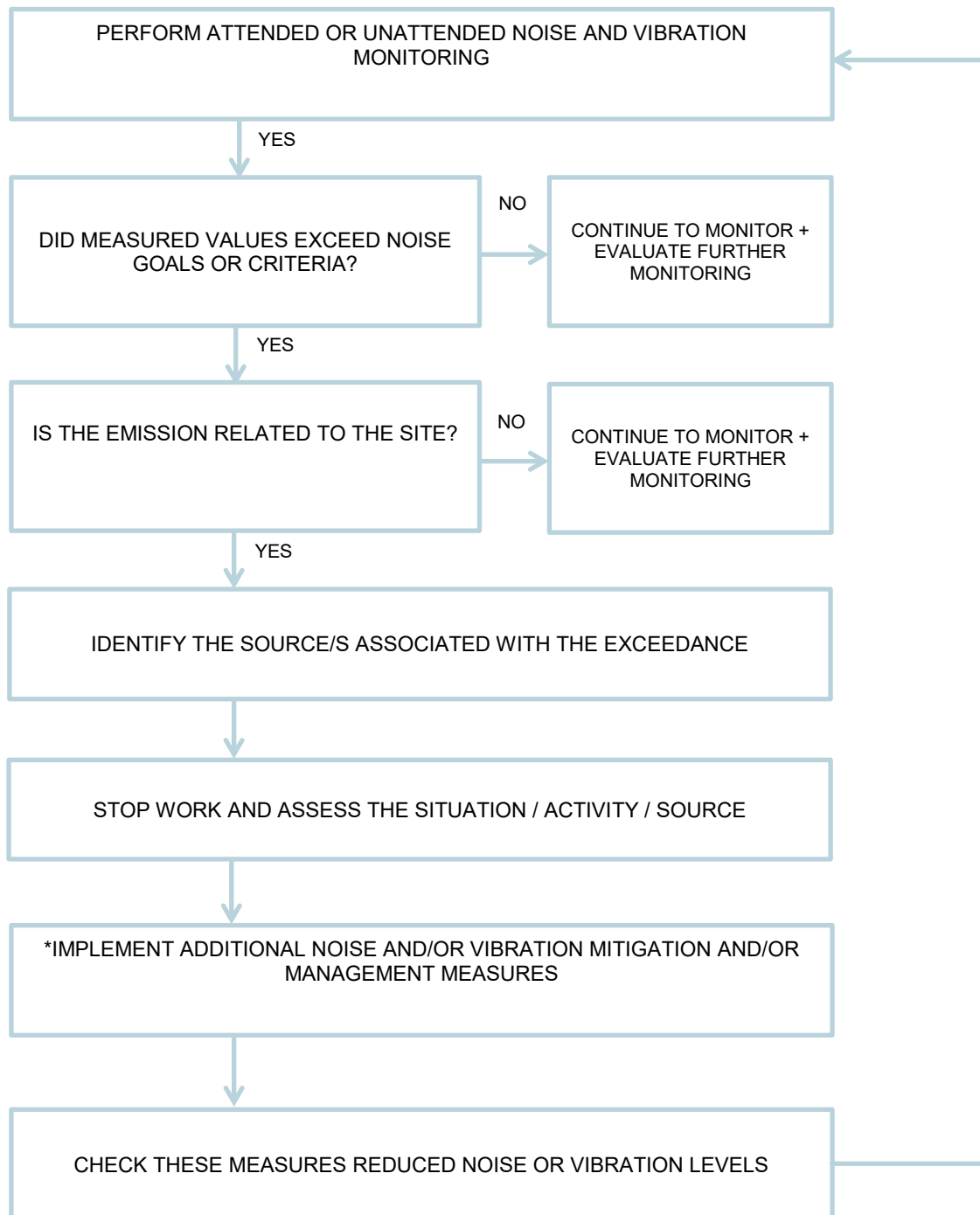


Figure 5-1 Monitoring and Action Protocol

* Noise and/or vibration mitigation and management measures are outlined in Section 9 of the CNVMP. Additional mitigation measures may include additional and/or modified respite schedules, changes to construction methodology, further noise attenuation and alternate accommodation. Consultation with sensitive receptors will be undertaken as the project progresses where sensitive periods can be refined based on the type of activities, expected impacts and the particular circumstances of the receptor at that time. All consultation will be undertaken prior to the start of the relevant portion of works predicted to affect those receptors. Mitigation measures can then be tailored based on the consultation feedback.

5.5 Noise and Vibration Reporting

All noise and vibration monitoring results will be assessed against the nominated goals. Noise and vibration monitoring data, and any other relevant information will be provided to the AA to assist the AA in producing the monthly Noise and Vibration Report as required under **CoA - A29**. As per **CoA - C16**, the results of the Construction Monitoring Program will be submitted in a Construction Monitoring Report to EPA, the Parramatta City Council and the DPE for information on a six monthly basis.

The following will be included as a minimum (where relevant) in noise/vibration monitoring reports:

- The type of monitoring conducted (for example, at a particular project stage or following complaints) and a brief statement of the measurement method;
- The noise/vibration conditions on the consent / licence, or the relevant noise management objectives;
- Descriptions of the nearest affected residences and other sensitive land uses or, in the case of complaints, description of the complainant location and complaint;
- Description of the instrumentation used;
- The results of monitoring at each monitoring location, including a comparison with the consent conditions or relevant noise management objectives;
- Vibration monitoring results summary together with notes describing any vibration intensive activities (if applicable);
- Summary of measurements exceeding the vibration criteria levels and descriptions of the plant or operations causing these exceedances (if available);
- Details of corrective action applicable to vibration criteria exceedances and confirmation of its successful implementation. Where corrective action has not yet been implemented, it may be shown as pending and the status of its implementation will be carried forward to following reports;
- The location of the construction works in relation to the monitoring position. (sketch plan & sections, photos);
- Details of the various construction equipment in use during the measurement period;
- Details as to the likely dominant noise sources;
- Meteorological conditions (i.e. temperature, humidity, cloud cover, and wind speed and direction);
- A clear statement outlining the Project's compliance or non-compliance with the conditions or objectives where the monitored level is higher than the conditions or objectives; and
- The reasons for non-compliance should be stated, strategies for minimising noise identified and stated, and the appropriate actions to implement the mitigation and or management strategies.

References

British Standard – BS5228-2:2009+A1:2014 (BS5228) – *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration*.

British Standard (BS 6472–1992) – *Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*, dated 1992.

British Standard BS7385: Part 2-1993 (BS 7385) - *Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration*, dated 1993.

German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150:3) – *Structural Vibration - Effects of Vibration on Structures*, dated 1999.

International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation*.

NSW Department of Environment and Climate Change – *NSW Interim Construction Noise Guideline (ICNG)*, July 2009.

NSW Department of Environment and Conservation – *NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline (AVTG)*, February 2006.

NSW Department of Environment, Climate Change and Water – *NSW Road Noise Policy (RNP)*, March 2011.

NSW Environment Protection Authority – *NSW Noise Policy for Industry (NPI)*, October 2017 and relevant application notes.

NSW Government – Transport for NSW (TfNSW) – *Construction Noise and Vibration Strategy (7TP-ST-157/4.0) (CNVS)*, May 2018.

NSW Government – Transport for NSW (TfNSW) – *Parramatta Light Rail: Stage 1 – Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report, incorporating Preferred Infrastructure Report*, February 2018.

NSW Government – Transport for NSW (TfNSW) – *Parramatta Light Rail – Stage 1 Out-of-hours work protocol (PLR-TFNSW-CBD-PE-FRM-000002)*, February 2019.

Standards Australia AS1055–2018™ (AS1055) – *Description and Measurement of Environmental Noise*.

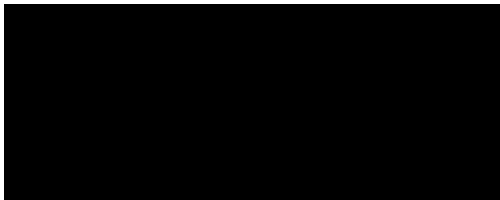
Standards Australia AS 2436–2010™ (AS2436) – *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

Standard Australia AS IEC 61672.1–2004™ (AS61672) – *Electro Acoustics - Sound Level Meters Specifications Monitoring* or Standards Australia AS1259.2-1990™ (AS1259) – *Acoustics – Sound Level Meters – Integrating/Averaging as appropriate to the device*

Standard Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – *Australian Standard™ – Electroacoustic – Sound Calibrators*

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Appendix E – Vibration Analysis Report

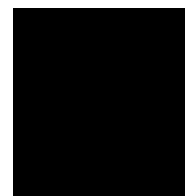


Parramatta Light Rail – Camellia Stabling and Maintenance Facility

Vibration Analysis Report

4 December 2019

Project No.: 0488312



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Signature Page

4 December 2019

Parramatta Light Rail – Camellia Stabling and Maintenance Facility

Vibration Analysis Report

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4 December 2019

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[REDACTED] was commissioned by [REDACTED]
[REDACTED] to analyse vibration monitoring data and estimate a safe working distance offset for ground improvement works at the Parramatta Light Rail Stabling and Maintenance Facility located in Camellia, New South Wales (NSW) (the Project).

Parramatta Light Rail is one of the NSW Government's major public transport projects, part of a record \$89.7 billion infrastructure investment across the state. Stage 1 of Parramatta Light Rail will connect Westmead to Carlingford via the Parramatta Central Business District (CBD) to Camellia. As part of the Parramatta Light Rail project, the site of the proposed Stabling and Maintenance Facility (the Project) at 6 Grand Avenue, Camellia, will be remediated to address contamination resulting from the land's historical industrial use. [REDACTED] has been engaged by Transport for NSW (TfNSW) to undertake this work.

The vibration monitoring was conducted by [REDACTED], between 22 October and 1 November 2019 as part of the ground improvement works for the Camellia project site. Refer [REDACTED], *Trial Report – Rigid Inclusions (Controlled Stiffness Columns) (0335-FTR-01)* dated 6 November 2019 ([REDACTED]). The [REDACTED] report includes vibration monitoring data from the installation of Vibro Concrete Columns (VCC) and Drilled Displacement Columns (DDC) which are also the focus of this assessment.

This report has been prepared to summarise the analysis of vibration data in the [REDACTED] report, and present the results and findings of estimated safe working distance offsets for future ground improvement works. This report has focused on the closest and/or potentially most affected vibration receptor/building being James Hardie, Research & Product Development Centre (James Hardie) that is situated south of the Project. The closest and/or potentially most affected vibration receptor (James Hardie) has been identified as an industrial/receptor.

The report structure is as follows:

- **Chapter 1 (this Chapter):** summary of the project and vibration monitoring.
- **Chapter 2:** vibration criteria.
- **Chapter 3:** summary of vibration data and analysis.
- **Chapter 4:** summary of the estimated safe working distance offset (and any recommendations).
- **Chapter 5:** report closing.
- **Appendix A:** vibration analysis charts.
- **Appendix B:** detailed vibration data set.
- **Appendix C:** vibration assessment map.

2. VIBRATION CRITERIA

As outlined in the Construction Noise and Vibration Management Plan (CNVMP) for the Project, in accordance with Transport for NSW (TfNSW) - *Construction Noise and Vibration Strategy (CNVS)*, 7TP-ST-157/4.0, dated May 2018, impacts from vibration are considered in terms of effects on building occupants (human comfort), the effects on the building structure (structural/cosmetic damage) and the effects on sensitive medical/scientific equipment.

The focus of this report is assessing any potential operational impacts to sensitive equipment and structural or cosmetic damage issues associated with the works, however consideration of potential annoyance issues (also an important feature) is addressed.

2.1 Building Damage (Structural/Cosmetic Damage)

In accordance with the CNVMP, British Standard BS7385: Part 2-1993 (BS 7385) - *Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration*, dated 1993 has been considered for Structural / Cosmetic vibration criteria. BS 7385 provides safe limit guideline values, below which vibration is considered insufficient to cause structural or cosmetic damage to buildings, refer **Table 2.1** below.

Table 2.1 – Building Damage (Structural/Cosmetic Damage)

Line	Type of Building	Peak Particle Velocity (PPV in mm/s) in the Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	4 Hz to 15 Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz

Source: BS 7385 and CNVS

2.2 Sensitive Scientific Equipment

Previous construction vibration assessments have been undertaken at James Hardie for the Project, including a baseline vibration monitoring campaign, refer [REDACTED] Pty Ltd - *Construction Vibration Impact Assessment (CVIA) – James Hardie, Research & Product Development Centre*, dated April 2019. A sensitive equipment safe limit of 0.30 mm/s PPV was adopted for James Hardie from the baseline monitoring campaign and applied to the Project.

2.3 Human Comfort

The approved assessment parameter identified in the CNVMP for “intermittent” vibration is the Vibration Dose Value (VDV) in m/s^{1.75}. This parameter is an “exposure” based metric contingent on the measured levels (PPV or acceleration), associated characteristic frequency for each individual sample and the duration of vibration within either the daytime and/or night time assessment periods. It is intended to evaluate the potential for annoyance to occur and complaints to be received.

Given that ground improvement works have not yet commenced in the vicinity of the James Hardie building, and no complaints have been received there is limited or no value calculating an estimated VDV to validate a complaint. There is however merit in understanding thresholds of PPV levels that could give rise to a complaint. PPV values are not “exposure” based metrics and can be directly evaluated based on the measured data. British Standard 5228: *Part 2-2009+A1:2014 (BS 5228, 2014) – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration* provides the following guidance:

- 0.14 mm/s: vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
- 0.3 mm/s: vibration might be just perceptible in residential environments.
- 1.0 mm/s: it is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
- 10 mm/s: vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

Based on the thresholds reproduced above the PPV value of 0.14 mm/s has been adopted as the level of perceptibility for vibration.

3. VIBRATION DATA

The trial ground improvement works and associated vibration monitoring by [REDACTED] were undertaken to verify ground-borne vibration generated during the installation of Vibro Concrete Columns (VCC) and Drilled Displacement Columns (DDC). The vibration measurements were conducted at varying distances from the vibration generating activity as outlined in **Table 3.1** below.

Table 3.1 – Vibration Monitoring Distances

Column ID	Column Type	Distance Offset from Column (m)	
		Measurement Position 1 (MP1)	Measurement Position 2 (MP2)
C1	VCC	2.7	7.7
C2	VCC	3.8	8.7
C3	DCC	5	10
C4	DCC	4.2	8.9
C5	VCC	3.6	8.6

3.1 Summary of Analysis

Based on the distance offsets for measured vibration, refer **Table 3.1**, Peak Particle Velocity (PPV, mm/s) was plotted on a scatter chart to present PPV against distance in metres (m). This scatter chart is presented in **Appendix A**. The full vibration dataset is presented in **Appendix B**. As to be expected for ground-borne vibration, measured PPV levels were lower at distances further away from the activity. Trend line analysis was then undertaken on the scatter plot using the 'line of best fit' method. A logarithmic trend line was the best fit for the VCC activity as this method is generally used to plot data that quickly increases or decreases and then levels off. A linear trend line was the best fit for the DCC activity as this line shows that something is increasing or decreasing at a steady rate. The trend analysis was used to determine a predictive equation which allows vibration levels to be estimated at varying distances away from the vibration generating activity.

The reliability of trend lines is expressed as R-squared (R^2), the nearer R^2 is to 1, the better the trend line fits the data. As noted in the equations below, the R^2 value for VCC was 0.2169 (i.e. reliability of ~22%) and for DDC was 0.0534 (i.e. reliability of ~5%). Given the limited dataset provided in the [REDACTED] report, best-fit trend line analysis were not considered very reliable for vibration predictions, therefore a buffer of +5 mm/s has been added to the predictions to provide a conservative buffer.

The trend line equation for the VCC activity is presented below in **Equation 1.1**.

$$y = -18.55 \times \ln(x) + 49.743$$

Where:

$y = \text{PPV (mm/s)}$

$x = \text{distance (m)}$

$R^2 = 0.2169$

The trend line equation for the DDC activity is presented below in **Equation 1.2**.

$$y = -0.6638x + 12.079$$

Where:

$y = \text{PPV (mm/s)}$

$x = \text{distance (m)}$

$R^2 = 0.0534$

Based on the trend analysis described above, VCC and DDC vibration levels (PPV in mm/s) have been predicted to external James Hardie building structure at relevant distances as presented below in **Table 3.2** below. Where PPV values are predicted to be at or below the sensitive equipment safe limit (0.30 mm/s) and the limit perceptibility for vibration (0.14 mm/s) the distance has been highlighted in **bold** typeset. Based on the measured vibration monitoring data for the VCC and DDC activities, the component frequency range anticipated for the predicted vibration events/levels is between 15 to 35 Hz.

Table 3.2 – Predicted PPV Vibration Levels (to external building structure)

Distance, m	Predicted VCC Vibration Level PPV, mm/s	Predicted DDC Vibration Level PPV, mm/s
5.0	24.89	13.76
6.0	21.51	13.10
7.0	18.65	12.43
8.0	16.17	11.77
9.0	13.98	11.10
10.0	12.03	10.44
11.0	10.26	9.78
12.0	8.65	9.11
13.0	7.16	8.45
14.0	5.79	7.79
15.0	4.51	7.12
16.0	3.31	6.46
17.0	2.19	5.79
18.0	1.13	5.13
19.0	0.12	4.47
20.0	<0	3.80
21.0	<0	3.14
22.0	<0	2.48
23.0	<0	1.81
24.0	<0	1.15
25.0	<0	0.48
26.0	<0	<0

3.2 Discussion of Results

The results presented in **Table 3.2** above identify that the predicted VCC activity PPV, mm/s values to the external building structure comply with the sensitive equipment safe limit (0.30 mm/s) and the limit perceptibility for vibration (0.14 mm/s) at distances of 19 m and beyond. The predicted DDC activity PPV, mm/s values to the external building structure comply with the sensitive equipment safe limit (0.30 mm/s) and the limit perceptibility for vibration (0.14 mm/s) at distances of 26 m and beyond.

Based on these findings, compliant levels of vibration are anticipated at James Hardie and impact to sensitive equipment is unlikely to occur if VCC and DDC activities remain beyond 19 m and 26 m from the building respectively, this is presented in **Appendix C** in the form of a vibration assessment map. It should be noted that vibration levels are predicted at the external building structure, therefore the Project vibration levels experienced within the building at the actual location of the sensitive equipment is likely to be significantly less than those experienced outside the building. The **Appendix C** map also identifies a 20 m vibratory piling distance buffer. Determined by a third party for the assessment of vibration in the north-west corner of the site it has been included at the request of [REDACTED].

All predicted values are estimates only and may vary depending on geotechnical features and intervening structures, amongst other things. Given the limited dataset provided in the [REDACTED] report, best-fit trend line analysis were not considered very reliable for vibration predictions, therefore +5 mm/s have been added to the predictions to provide a conservative buffer. In our experience this approach is typically conservative but offers a useful guide for the purpose of assessing impacts, evaluating mitigation and management measures and defining monitoring requirements.

These results identify that best-practice construction vibration management should be implemented to reduce vibration levels as far as practicable.

4. RECOMMENDATIONS

In accordance with the CNVS, attended vibration measurements should be undertaken at all buildings within 25 m of vibration generating activities when these activities commence to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. This approach should also be applied for the VCC and DDC activity to ensure that vibration levels are within the acceptable range to prevent impacts to sensitive scientific equipment / human comfort at James Hardie.

Attended vibration measurements are therefore recommended at the commencement of vibration generating activities wherever VCC and DDC are within 25 m from the James Hardie building, to confirm that levels satisfy the criteria for that activity. A representative vibration monitoring location is presented in the vibration assessment map in **Appendix C**. Based on the outcomes of this report, continuous vibration monitoring with audible and visible alarms should be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the calculated safe-working distance of 26 metres for DDC works.

Alternative piling methods, including non-displacement bored piles may be utilised as a low-vibration alternative to VCC and DDC. Other vibration reducing mitigation, management measures, safeguards and/or provisions for monitoring are outlined in the CNVMP for the Camellia project.

5. CLOSING

Construction vibration levels were predicted to remain compliant with vibration management levels at James Hardie and impact to sensitive equipment is unlikely to occur if VCC and DDC activities remain beyond 19 m and 26 m from the building respectively. Construction vibration levels will be reduced and impacts minimised with the successful implementation of the actions documented in Section 5 above. Impacts may not be reduced to negligible levels for all receptors during all construction activities; however, the actions presented above will ensure that any residual impacts are minimised as far as is practically achievable.

REFERENCES

British Standard 5228: Part 2-2009+A1:2014 (BS 5228, 2014) – **Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration**

British Standard BS7385: Part 2-1993 (BS 7385) - **Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration**, dated 1993

██████████ Trial Report – Rigid Inclusions (*Controlled Stiffness Columns*) (0335-FTR-01) dated 6 November 2019

Transport for NSW (TfNSW) - **Construction Noise and Vibration Strategy (CNVS)**, 7TP-ST-157/4.0, dated May 2018

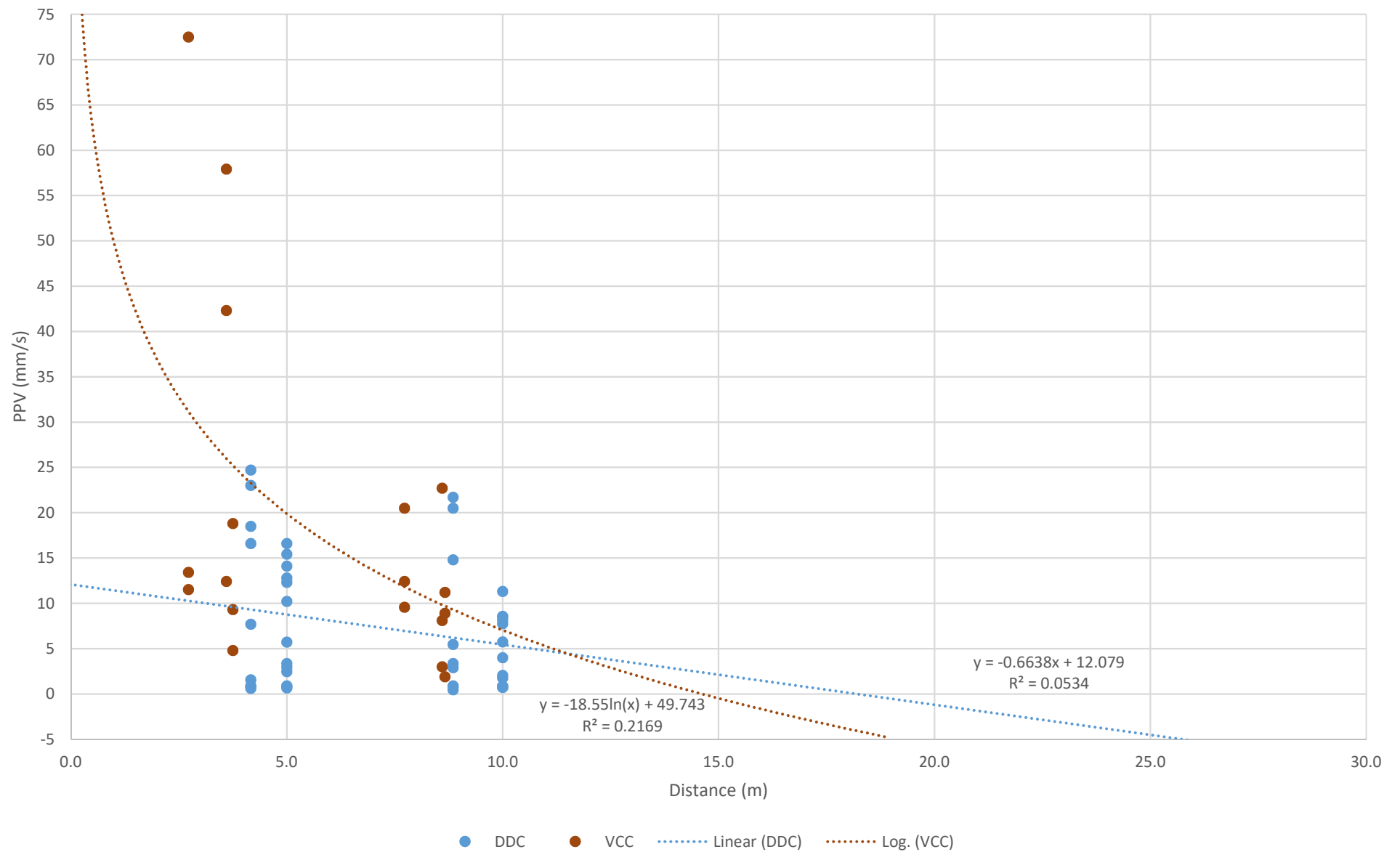
NSW Department of Environment and Conservation – **NSW Environmental Noise Management – Assessing Vibration: a Technical Guideline** (the NSW Vibration Guideline), February 2006

██████████ - **Construction Vibration Impact Assessment (CVIA)** – James Hardie, Research & Product Development Centre, prepared by ██████████, dated April 2019.

APPENDIX A

APPENDIX A – VIBRATION ANALYSIS CHART

VIBRATION DURING DDC + VCC WORKS



APPENDIX B

APPENDIX B – DETAILED VIBRATION DATA SET

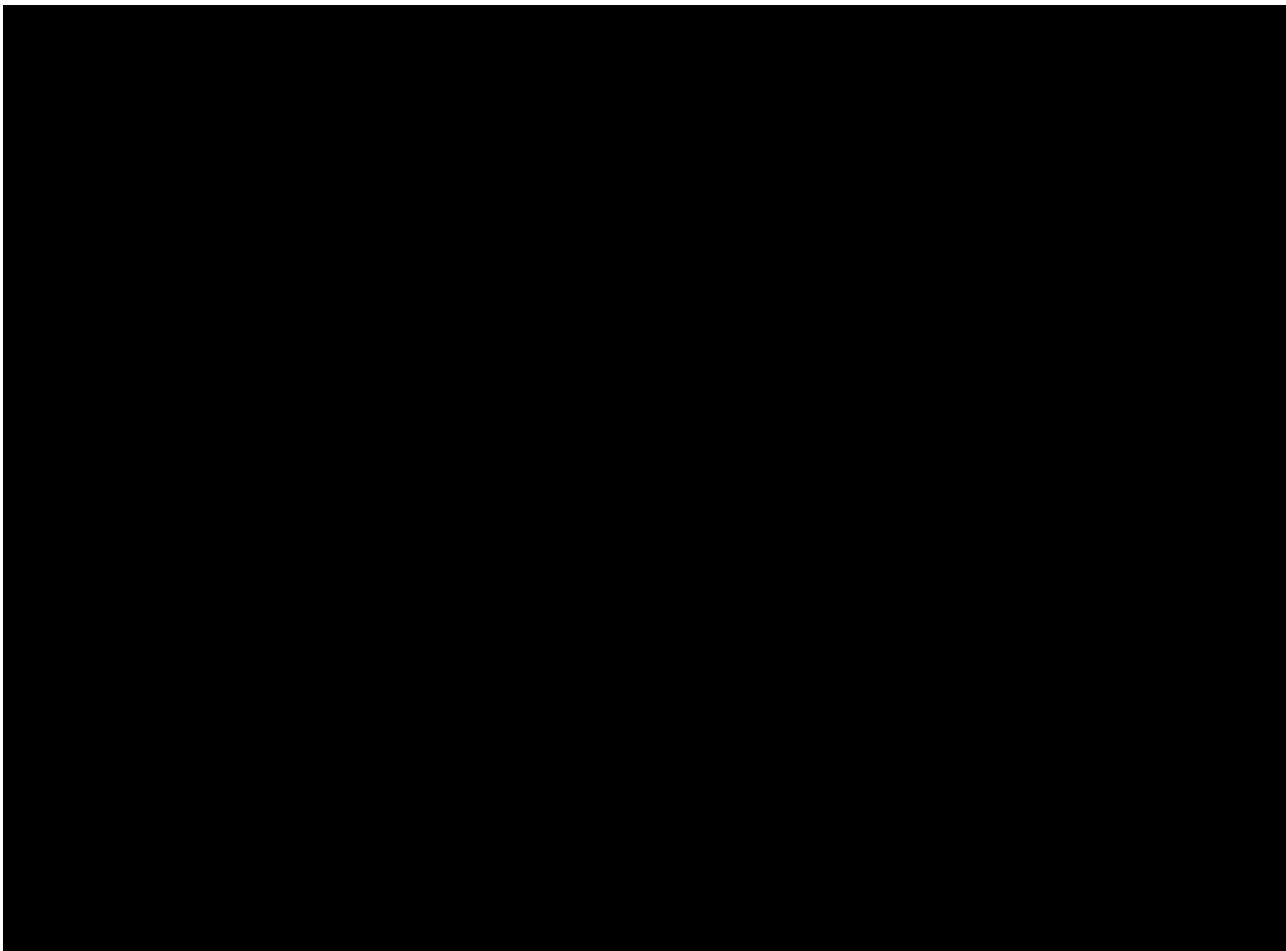
Monitor ID	Date / Time	Column ID	Column Type	Distance	PPV (mm/s)			Frequency (Hz)		
					V	L	T	V	L	T
MP1	2019-10-22 09:34:00				0.3	1.3	0.75	-	26.6	34.7
MP1	2019-10-22 09:36:00				0.2	0.35	0.25	-	-	-
MP1	2019-10-22 09:38:00				0.15	0.35	0.25	-	-	-
MP1	2019-10-22 09:40:00				0.1	0.35	0.25	-	-	-
MP1	2019-10-22 09:42:00				0.2	0.15	0.2	-	-	-
MP1	2019-10-22 09:44:00				0.25	0.8	0.45	-	28.1	33.6
MP1	2019-10-22 09:46:00				0.1	0.15	0.2	-	-	-
MP1	2019-10-22 09:50:00				0.25	0.25	0.25	-	-	-
MP1	2019-10-22 09:52:00				0.15	0.65	0.4	-	25.6	31.5
MP1	2019-10-22 09:54:00				0.1	0.3	0.25	-	-	-
MP1	2019-10-22 09:56:00				0.1	0.25	0.2	-	-	-
MP1	2019-10-22 09:58:00				0.1	0.25	0.2	-	-	-
MP1	2019-10-22 10:00:00				0.1	0.25	0.2	-	-	-
MP1	2019-10-22 10:02:00				0.1	0.25	0.2	-	-	-
MP1	2019-10-22 10:04:00				0.1	0.35	0.25	-	-	-
MP1	2019-10-22 10:06:00				0.15	0.55	0.9	-	31	64
MP1	2019-10-22 13:52:00				0.40, 0.45	1.25, 0.90	0.55, 0.95	23.8, 22.8	19.1, 20.9	23.0, 23.3
MP1	2019-10-22 13:54:00				0.15	0.9	0.5	-	13.6	28.8
MP1	2019-10-22 13:56:00				0.2	0.75	0.6	-	14.6	25.3
MP1	2019-10-22 13:58:00				0.2	0.75	0.6	-	18.6	25
MP1	2019-10-22 14:00:00	C3	DCC	10.0	0.2	0.7	0.85	-	21.8	21.8
MP1	2019-10-22 14:02:00	C3	DCC	10.0	0.2	0.6	0.8	-	13.7	25.9
MP1	2019-10-22 14:04:00	C3	DCC	10.0	0.25	0.7	0.55	-	22.5	26.6
MP1	2019-10-22 14:06:00	C3	DCC	10.0	0.45	1.15	2.05	24.1	19.7	25
MP1	2019-10-22 14:08:00	C3	DCC	10.0	3.65	8.55	1.8	32.5	29.7	27.3
MP1	2019-10-22 14:10:00	C3	DCC	10.0	4.65	8.5	3.4	32	31	30.6
MP1	2019-10-22 14:12:00	C3	DCC	10.0	0.25	1.75	1.35	-	18.3	18.1
MP1	2019-10-22 14:14:00	C3	DCC	10.0	1.9	8.15	2.6	30.1	28.8	30.1
MP1	2019-10-22 14:16:00	C3	DCC	10.0	1.65	5.75	2.3	29.7	29.3	28.8
MP1	2019-10-22 14:18:00	C3	DCC	10.0	2.45	11.3	4.4	28.8	25.6	25.9
MP1	2019-10-22 14:20:00	C3	DCC	10.0	1.8	4	3.25	33	27.3	25.3
MP1	2019-10-22 14:22:00	C3	DCC	10.0	0.25	0.75	0.5	-	16.3	16.7
MP1	2019-10-22 14:24:00	C3	DCC	10.0	1.8	7.75	2.25	14.1	16.1	13.3
MP1	2019-10-22 14:26:00	C4	DCC	8.9	0.9	3.35	1.5	10.3	18.3	19.3
MP1	2019-10-22 14:28:00	C4	DCC	8.9	5.65	20.5	5.35	28.8	15.3	22
MP1	2019-10-22 14:30:00	C4	DCC	8.9	6.1	14.8	14.8	28.1	23.3	17.4
MP1	2019-10-22 14:32:00	C4	DCC	8.9	0.2	0.45	0.45	-	20.5	18
MP1	2019-10-22 14:34:00	C4	DCC	8.9	0.35	0.8	0.35	-	16.5	-
MP1	2019-10-22 14:36:00	C4	DCC	8.9	7.6	21.1	21.7	18	18.1	17.8
MP1	2019-10-22 14:38:00	C4	DCC	8.9	2.75	5.45	2.3	34.1	29.7	30.1
MP1	2019-10-22 14:40:00	C4	DCC	8.9	0.9	2.9	2.1	22.8	18.6	22.5
MP1	2019-10-22 14:42:00	C4	DCC	8.9	0.2	0.9	0.55	-	19.1	22
MP1	2019-10-22 14:44:00				0.3	0.85	0.6	-	17.7	18.6
MP1	2019-10-22 14:46:00				0.25	0.9	0.6	-	18.5	19.3
MP1	2019-10-22 14:48:00				0.2	0.95	0.55	-	18.5	16.5
MP1	2019-10-22 14:50:00				0.3	1.35	0.8	-	19.9	24.1
MP1	2019-10-22 14:52:00				0.35	3.45	1.8	-	17.4	16.9
MP1	2019-10-22 14:54:00				0.4	1.65	1.6	-	20.7	18.8
MP1	2019-10-22 14:56:00				0.4	1.55	1.05	21.6	20.1	20.1
MP1	2019-10-22 14:58:00				0.5	2.05	1.6	17.5	16.1	24.4
MP1	2019-10-22 15:00:00				0.3	1.4	1.4	-	18.1	23.5
MP1	2019-10-22 15:02:00				0.35	1.2	1.75	-	21.3	24.1
MP1	2019-10-22 15:04:00				0.25	0.7	0.5	-	18.1	21.8
MP1	2019-10-22 15:06:00				0.3	0.9	0.55	-	19.1	19.1
MP1	2019-10-22 15:08:00				0.25	1.3	0.75	-	19	19.7
MP1	2019-10-22 15:10:00				0.3	1.35	0.75	-	17.8	13.6
MP1	2019-10-22 15:12:00				1.2	2.15	2.25	25	17.8	21.6
MP1	2019-10-22 15:14:00				0.2	1	0.7	-	18	19.9
MP1	2019-10-22 15:16:00				0.3	1	0.65	-	19.5	13
MP1	2019-10-22 15:18:00				0.25	0.6	0.6	-	23.3	20.9
MP1	2019-10-22 15:20:00	C2	VCC	8.7	0.25	1.9	1.75	-	19.9	17.5
MP1	2019-10-22 15:22:00	C2	VCC	8.7	2.9	11.2	4.1	28.8	28.1	18.3
MP1	2019-10-22 15:24:00	C2	VCC	8.7	2.05	8.9	3.25	29.7	28.8	26.3
MP1	2019-10-22 15:26:00	C1	VCC	7.7	3.95	20.5	6.95	23.3	14.8	14.9
MP1	2019-10-22 15:28:00	C1	VCC	7.7	4.05	12.4	4.25	26.9	28.8	26.9
MP1	2019-10-22 15:30:00	C1	VCC	7.7	2.3	9.55	2.65	28.4	19.7	15.8
MP1	2019-10-22 15:32:00	C5	VCC	8.6	4.3	22.7	7.2	16.1	13.3	6.3
MP1	2019-10-22 15:34:00	C5	VCC	8.6	2.1	8.1	4.25	30.6	30.1	28.1
MP1	2019-10-22 15:36:00	C5	VCC	8.6	1.3	3	2.45	14.2	13.5	13.9
MP1	2019-10-22 15:38:00				0.25	0.9	0.5	-	27.7	28.8
MP2	2019-10-22 08:02:00				0.95	0.8	0.95	2	2	18.3
MP2	2019-10-22 09:34:00				0.8	1.55	2.5	40.2	32.5	26.3
MP2	2019-10-22 09:36:00				0.35	0.6	0.75	-	34.7	28.1
MP2	2019-10-22 09:38:00				0.4	0.55	0.65	62.1	36.6	32
MP2	2019-10-22 09:40:00				0.25	0.45	0.65	-	37.9	31
MP2	2019-10-22 09:42:00				0.25	0.15	0.4	-	-	24.7

Monitor ID	Date / Time	Column ID	Column Type	Distance	PPV (mm/s)			Frequency (Hz)		
					V	L	T	V	L	T
MP2	2019-10-22 09:44:00				0.35	0.65	1.6 -		28.4	26.6
MP2	2019-10-22 09:46:00				0.05	0.1	0.15 -	-	-	-
MP2	2019-10-22 09:50:00				0.65	0.65	0.7	2	2	2
MP2	2019-10-22 09:52:00				0.4	0.95	0.8 -		28.4	28.8
MP2	2019-10-22 09:54:00				0.15	0.35	0.3 -	-	-	-
MP2	2019-10-22 09:56:00				0.15	0.35	0.3 -	-	-	-
MP2	2019-10-22 09:58:00				0.15	0.3	0.3 -	-	-	-
MP2	2019-10-22 10:00:00				0.1	0.3	0.25 -	-	-	-
MP2	2019-10-22 10:02:00				0.1	0.3	0.3 -	-	-	-
MP2	2019-10-22 10:04:00				0.15	0.3	0.45 -	-		29.3
MP2	2019-10-22 10:06:00				0.2	0.65	0.35 -		30.1 -	
MP2	2019-10-22 13:52:00				0.9	2.4	1.6	24.1	19.3	27.7
MP2	2019-10-22 13:54:00				0.35	0.85	0.5 -		26.9	30.1
MP2	2019-10-22 13:56:00				0.7	1.5	0.45	28.8	23.8	34.7
MP2	2019-10-22 13:58:00				0.35	0.65	0.45 -		12.9	28.4
MP2	2019-10-22 14:00:00	C3	DCC	5.0	0.75	3.35	1.35	37.9	20.1	12.1
MP2	2019-10-22 14:02:00	C3	DCC	5.0	0.3	0.65	0.6 -		23	25
MP2	2019-10-22 14:04:00	C3	DCC	5.0	0.75	0.8	0.75	30.1	32	17.2
MP2	2019-10-22 14:06:00	C3	DCC	5.0	1.1	2.45	1.45	10.1	21.3	12.1
MP2	2019-10-22 14:08:00	C3	DCC	5.0	6	15.4	3.05	31.5	33.6	30.6
MP2	2019-10-22 14:10:00	C3	DCC	5.0	5.5	14.1	3.8	34.1	30.6	31.5
MP2	2019-10-22 14:12:00	C3	DCC	5.0	0.85	2.95	1.55	23.5	22.8	21.8
MP2	2019-10-22 14:14:00	C3	DCC	5.0	4.05	12.3	2.35	30.1	28.4	30.6
MP2	2019-10-22 14:16:00	C3	DCC	5.0	3.4	10.2	1.65	34.1	29.7	31
MP2	2019-10-22 14:18:00	C3	DCC	5.0	5.45	16.6	4.55	33.6	26.3	27.3
MP2	2019-10-22 14:20:00	C3	DCC	5.0	3.5	12.8	5.15	27.7	30.1	32.5
MP2	2019-10-22 14:22:00	C3	DCC	5.0	0.4	0.9	0.75	36.6	28.4	23.3
MP2	2019-10-22 14:24:00	C3	DCC	5.0	4.15	4.85	5.7	15.9	22	13.9
MP2	2019-10-22 14:26:00	C4	DCC	4.2	2.25	7	7.7	31.5	31.5	31.5
MP2	2019-10-22 14:28:00	C4	DCC	4.2	13.9	23	18.6	33.6	16.9	12.7
MP2	2019-10-22 14:30:00	C4	DCC	4.2	18.5	17.5	10.1	17.2	16	19.7
MP2	2019-10-22 14:32:00	C4	DCC	4.2	0.25	0.85	0.5 -		25.9	27.7
MP2	2019-10-22 14:34:00	C4	DCC	4.2	0.3	0.8	0.6 -		28.1	25.6
MP2	2019-10-22 14:36:00	C4	DCC	4.2	24.7	22.1	16.9	17.2	18.3	20.5
MP2	2019-10-22 14:38:00	C4	DCC	4.2	5.4	16.6	6.25	35.3	32	29.7
MP2	2019-10-22 14:40:00	C4	DCC	4.2	0.4	1.55	1.1	21.3	19.9	21.6
MP2	2019-10-22 14:42:00	C4	DCC	4.2	0.2	0.55	0.6 -		20.1	22.5
MP2	2019-10-22 14:44:00				0.85	1.35	1.15	30.1	25.3	27.7
MP2	2019-10-22 14:46:00				0.2	0.5	0.45 -		21.6	16.9
MP2	2019-10-22 14:48:00				0.2	0.5	0.45 -		16.3	16.4
MP2	2019-10-22 14:50:00				0.3	0.95	0.75 -		22.3	19.9
MP2	2019-10-22 14:52:00				0.5	1.45	0.8	20.1	19.5	20.7
MP2	2019-10-22 14:54:00				0.4	1.05	0.8 -		20.7	11.8
MP2	2019-10-22 14:56:00				0.3	0.95	0.75 -		19.5	20.3
MP2	2019-10-22 14:58:00				0.5	1.05	0.9	17.2	14.9	15.9
MP2	2019-10-22 15:00:00				0.3	0.75	0.5 -		16.7	19.7
MP2	2019-10-22 15:02:00				0.3	1.3	0.6 -		23.3	23.5
MP2	2019-10-22 15:04:00				0.25	0.5	0.5 -		23.8	15.4
MP2	2019-10-22 15:06:00				0.4	0.5	0.45 -		15.5	14
MP2	2019-10-22 15:08:00				0.4	0.65	0.65 -		22.3	19.7
MP2	2019-10-22 15:10:00				0.35	0.85	0.55 -		15.6	15.2
MP2	2019-10-22 15:12:00				1	1.75	1.9	23.5	22.3	23.8
MP2	2019-10-22 15:14:00				0.25	0.75	0.4 -		19.7 -	
MP2	2019-10-22 15:16:00				0.3	0.8	0.7 -		21.3	9.55
MP2	2019-10-22 15:18:00				0.25	1.25	0.55 -		23.8	21.1
MP2	2019-10-22 15:20:00	C2	VCC	3.8	1.5	4.8	2.05	21.6	19	16
MP2	2019-10-22 15:22:00	C2	VCC	3.8	14.1	18.8	8.2	22.3	13.9	10.5
MP2	2019-10-22 15:24:00	C2	VCC	3.8	6.6	9.3	6.05	35.3	33	32
MP2	2019-10-22 15:26:00	C1	VCC	2.7	20.2	72.5	14.7	17.4	13	15.6
MP2	2019-10-22 15:28:00	C1	VCC	2.7	8.2	13.4	5.15	33.6	29.7	27.3
MP2	2019-10-22 15:30:00	C1	VCC	2.7	8.95	11.5	6.05	30.6	30.6	30.6
MP2	2019-10-22 15:32:00	C5	VCC	3.6	13.4	42.3	8.4	14.2	16.3	14.2
MP2	2019-10-22 15:34:00	C5	VCC	3.6	5.8	12.4	4.75	32	31	30.1
MP2	2019-10-22 15:36:00	C5	VCC	3.6	30.1	44.9	57.9	5.2	30.6	10.4

APPENDIX C

APPENDIX C – VIBRATION ASSESSMENT MAP





Appendix F - AA and ER Endorsement



Parramattalightrail.nsw.gov.au
Parramattalightrail@transport.nsw.gov.au
1800 139 389
Level 10, 130 George Street Parramatta 2150



Attention: Transport for NSW (PLR)

Ref: PLR_VNT-SAM-NV-AA Endorsement 24Apr2020

24 April 2020

RE: CEMP, CNVMP, CNVIS (Package 3 - Portion 2 Early Works), AA Review

██████████ BEng(Mech), MAAS, RPEQ 09343, appointed Acoustic Advisor (AA), reviewed the **CNVMP V06.1** documentation with regard to the PLR – Stage 1 project, updating the review history including associated documents as per the table below:

Title:	Document Reference:	AA Endorsements
CEMP Construction Environmental Management Plan Package 3 - Portion 2 Early Works	PLR-VNT-SAM-PE-PLN-000018	Ver 04, 1 July 2019
		Ver 05, 15 July 2019
CNVMP Appendix B3 Noise and Vibration Management Sub Plan Package 3 – Portion 2 Early Works Parramatta Light Rail – Stage 1	PLR-VNT-SAM-NV-ASS-0000007 200424 Appendix B3 CNVMP V07 Tracked.docx	Revision 3, 8 Apr 2019
		Revision 4.02, 27 June 2019
		Revision 7, 24 Apr 2020 (current)
	Monitoring Plan	27 March 2019
CNVIS	PLR Package 3 RSR - CNVIS	Ver 01, 25 March 2019

Pursuant to Conditions of Approval A29, the review confirms the documents have been reviewed for consistency by the AA, and the document remains in agreement with the acoustic requirements of the Terms of Approval (NSW Government – Infrastructure Approval (Application No.: SSI 8285)), as well as best practice methodologies for acoustics.

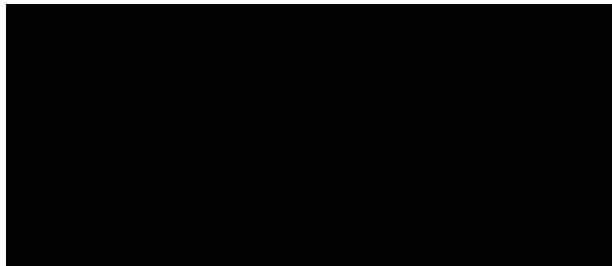
Yours sincerely

for ██████████



██████████ BE(Mech), MAAS, RPEQ
Senior Environmental Engineer

Note: All professional advice provided by ██████████, including any information contained in this letter, is subject to the terms of the Disclaimer shown on our website at ██████████



30 April 2020

Transport for NSW

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

**Review of Parramatta Light Rail Stage 1 - Package 3
Portion 2 Remediation Works Ventia – CEMP Appendix B3
Noise and Vibration Management Sub Plan
Package 3 – Portion 2 Early Works**

Pursuant to SSI-8285 Condition of Approval A23 (d) (ii), as the approved Environmental Representative, I confirm that I have reviewed and provided comments on the following document and with the Acoustic Advisor endorsement (24 April 2020):

- CEMP Appendix B3 Noise and Vibration Management Sub Plan Package 3 – Portion 2 Early Works (PLR-VNT-SAM-NV-ASS-0000007 200424 Appendix B3 CNVMP V07 Tracked.docx)

The document was reviewed and updated (minor amendments) as part of the six-monthly review of the CEMP and sub-plans which is consistent with the relevant conditions of approval C3b and REMMM and is approved under Condition of Approval C8 minor amendments for implementation at the site.

Yours sincerely,

[REDACTED]

[REDACTED]

Environmental Representative

[REDACTED]

Filename: [REDACTED]

[REDACTED]

Appendix B4

Soil and Water Management Sub Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1

January 2020

PLR-VNT-SAM-PE-PLN-000019

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Parramatta Light Rail – Stage 1
Portion 2 Early Works (Package 3)
Soil and Water Management Sub-plan

Document Control

Title	Parramatta Light Rail – Stage 1 Portion 2 Early Works (Package 3) Soil and Water Management Sub-plan
Prepared by	, Environment & Hygiene Manager
Signed	
Dated	03/12/2019
Approved on behalf of Ventia Utility Services Pty Ltd by	Project Manager
Signed	
Dated	05/12/2019
Endorsed by Environment Representative	
Signed	<i>Refer Appendix C</i>

Version control

Revision	Date	Description	Prepared by	Approval
00	22/02/2019	For Review		
01	18/03/2019	Post TfNSW & ER Review		
02.01	11/04/2019	CoPC Review / ER Endorsement		
03	09/05/2019	Updated Consultation Process		
04	01/11/2019	TWTP water management		
05.01	03/12/2019	Post TfNSW, ER & Internal Review		
05.02	14/01/2020	ER Endorsement		

Glossary / Abbreviations

Abbreviations	Expanded text
ASS	Acid Sulfate Soil
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CoA	NSW Minister for Planning Conditions of Approval
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
ECM	Environmental Control Maps
EEC	Endangered Ecological Community
The EIS	<i>Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017</i>
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects
Environmental incident	An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives
Environmental Representative	A suitably qualified and experienced person independent of the Contractor and Proponent, and project design and construction personnel, employed for the duration of construction. The Environmental Representative sits under the Independent Certifier.

EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPO	Environmental Performance Outcomes
ERSED	Erosion and Sediment
ESCP	Erosion and Sediment Control Plan
GTP	Groundwater Treatment Plant
Minister, the	Minister of the NSW Department of Planning and Environment (or delegate)
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation
OEH	Office of Environment and Heritage
PESCP	Progressive Erosion and Sediment Control Plan
PIRMP	Pollution Incident Response Management Plan
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Project, the	Parramatta Light Rail – Stage 1 (Westmead to Carlingford)
RAP	Remediation Action Plan for 6-10 Grand Avenue, Camellia, NSW, November 2017)
REMMM	Revised Environmental Mitigation and Management Measure
RUSLE	Revised Universal Soil Loss Equation
SaM Facility	Stabling and Maintenance Facility
SPIR	Submissions and Preferred Infrastructure Report
SWMP	Soil and Water Management Plan
TSC Act	<i>Former Threatened Species Conservation Act 1995</i>
TWTP	Temporary Water Treatment Plant
WTP	Water Treatment Plant

1 Introduction

1.1 Context and scope

This Soil and Water Management Sub-plan (SWMP or this Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail – Stage 1 (PLR Stage 1 or the Project) and has been prepared to target specifically *Package 3: Early Works in Portion 2* (referred to hereafter as Portion 2 Early Works) as part of the Enabling Stage of the Project. Refer to the Parramatta Light Rail (Stage 1) Staging Report (Project Wide) (TfNSW 2019) (the Staging Report) for further detail.

The Staging Report details the project as follows:

Package 3: Early Works Portion 2: the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue, Rosehill. This is the allocated site for the SaM Facility.

Ventia Pty Ltd (Ventia) has been appointed by Transport for NSW (TfNSW) as the head contractor for Portion 2 Early Works, responsible for delivering the remediation of the TfNSW owned site at 6-8 Grand Avenue Rosehill (Portion 2 Early Works Site) (refer to Section 1.4 of CEMP for project scope).

This SWMP has been prepared by Ventia to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMM) listed in the *Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017* (the EIS) and the subsequent Submissions Report (incorporating Preferred Infrastructure Report) (TfNSW 2018) and all applicable legislation. This SWMP specifically addresses REMMM HY-5 & HY-6, with the broader applicable CoA's and REMMM's outlined in **Table 3-1: Conditions of Approval relevant to the SWMP & Table 3-2: REMMMs relevant to this SWMP** respectively. This plan has also been prepared in accordance with the Ventia Environmental Management System, accredited to ISO 14001.

This SWMP provides the management approach and requirements (including environmental mitigation measures, controls, monitoring and reporting) for managing soil and water quality impacts during construction of Portion 2 Early Works. This Plan forms one of six sub-plans which are collectively covered by the Construction Environmental Management Plan (CEMP). Effective implementation of the CEMP (and associated sub-plans) will ensure that environmental resources, responsibilities and management measures are adopted during the construction activities.

The implementation of the CEMP and associated sub-plans are aligned with Project level management plans including the Community and Stakeholder Engagement Plan and the Sustainability Plan as illustrated in Figure 1-1.

The review and document control process for this Plan are described further in Section 7.

The context of this SWMP in relation to the Project environmental management system is presented in Figure 1-1.

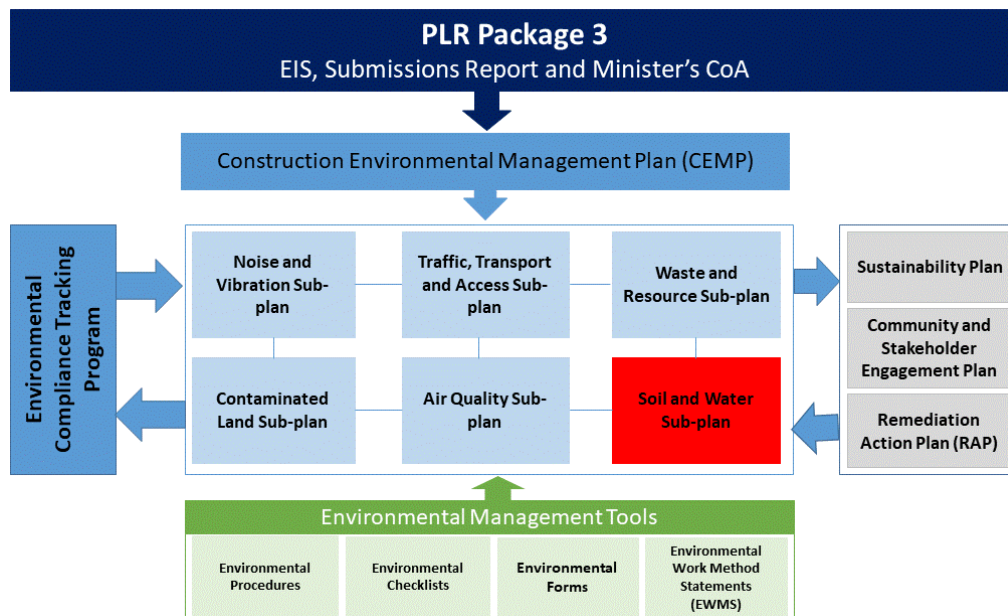


Figure 1-1: Portion 2 Early Works Environmental Management System and SWMP Context

1.2 Background and project description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney population, particularly the population growth of the Parramatta Local Government Area (LGA).

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

PLR Stage 1 will link Parramatta's central business district (CBD) and train station to a number of key locations, including the following:

- Westmead Precinct;
- Parramatta North Growth Centre;
- The new Western Sydney Stadium;
- The Camellia Town Centre;
- The new Powerhouse Museum;
- 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 PLR 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 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); and
- Real time information in light rail vehicles and at Stops via visual displays and audio.

Details of the Project alignment and station locations is provided in Figure 1-1 of the CEMP.

1.2.1 Stabling and Maintenance Facility

As part of the development of the Project, the Transport for NSW (TfNSW) owned land located at 6-8 Grand Avenue Camellia was identified as the preferred site for the stabling and maintenance facility (SaM Facility). The SaM Facility is being constructed on the former industrial site adjacent to the Rosehill Gardens Racecourse within the Rosehill and Camellia precinct (refer to Figure 1-2).

The SaM Facility would provide for the storage of light rail vehicles, maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities as well as the operations control centre for the light rail network will be located within the maintenance building. Parking for staff and visitors will be provided on site, including maintenance vehicle parking. An electrical substation will be located at the rear of the site to power the facility and light rail.

To accommodate the development of the stabling and maintenance facility, and reduce the potential for interaction with contaminated material during construction, remediation activities will be undertaken as part of the Camellia Remediation project (Early Works):

- a) Importation and placement of appropriate fill material across the site to raise the surface finish level by about two metres;
- b) Installation of an appropriate capillary break to eliminate subsurface contamination migration;
- c) Installation of an appropriate passive vapour collection system, comprised of a HDPE perforated pipe and ventilation network;
- d) Installation of an appropriate vapour barrier and structural surface capping layer;
- e) The Temporary Works encompasses establishment of plant, equipment and facilities on the Site to support the delivery of the Works;
- f) The Enabling Works encompasses establishment and management of utilities and other below-ground infrastructure on the Site to support the delivery of the Works;
- g) Construction of a berm for the retention and containment of waste materials on-site;
- h) Implementation of Ground Improvement Works where required;
- i) Implementation of the monitoring and validation program; and
- j) Preparation of Stage 2 Site Validation Report and a Long Term Environmental Management Plan (LTEMP) to the satisfaction of the Site Auditor.

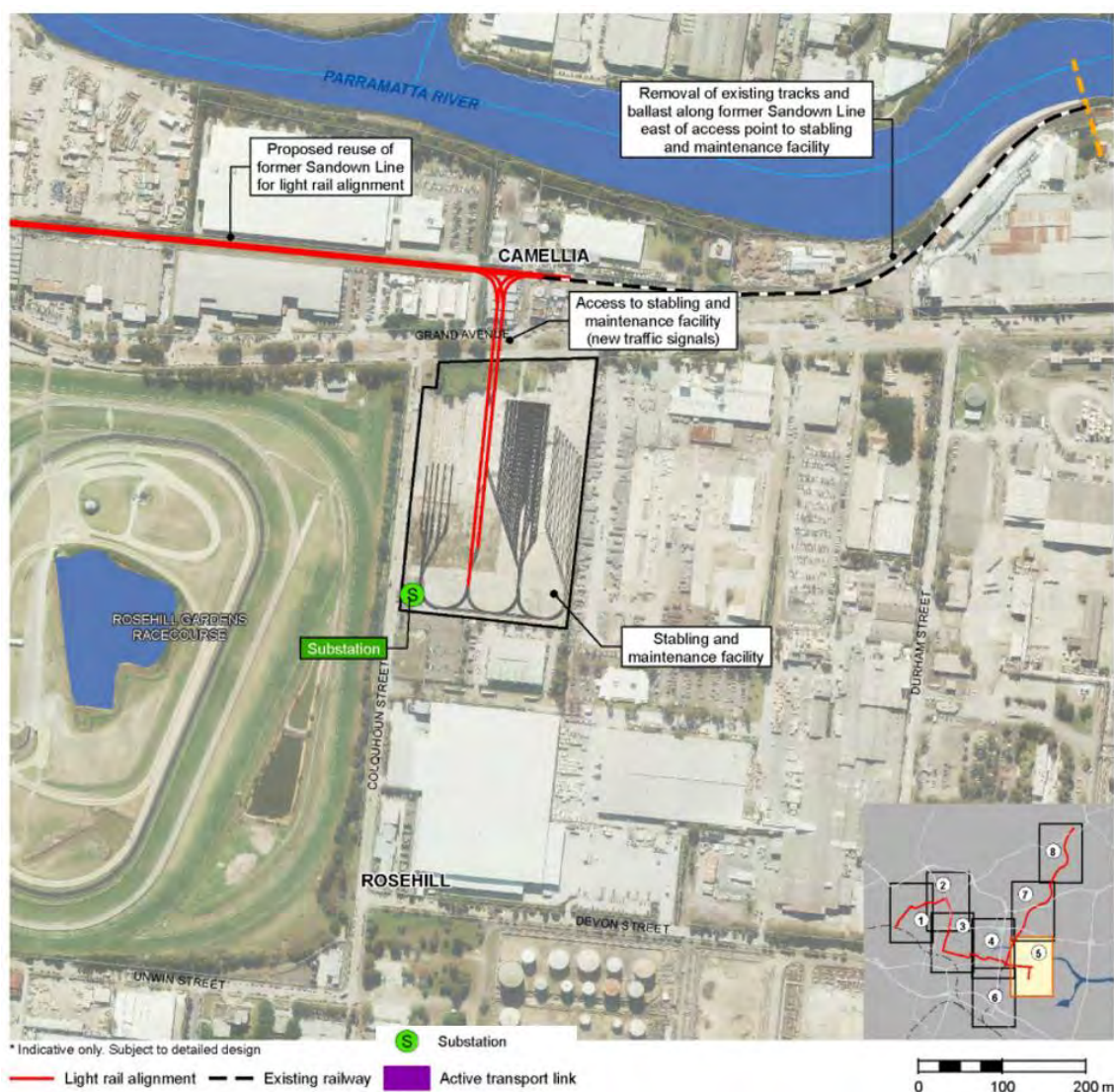


Figure 1-2: Portion 2 Early Works - SaM Facility location (Source: EIS Figure 6.2e)

1.3 Statutory Context

The Project is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the Environmental Planning and Assessment Act, 1979 (EP&A Act). The Minister for Planning is the approval authority for the Project.

In accordance with section 5.22(2) of the EP&A Act, the only environmental planning instruments that apply to the proposal are State Environmental Planning Policy (Infrastructure) 2007 (insofar as it relates to the declaration of development that does not require consent) and State Environmental Planning Policy (State and Regional Development) 2011 (as it pertains to the declaration of infrastructure as SSI). There are no other environmental planning instruments that substantially govern the carrying out of the project.

The Portion 2 Early Works site has been subject to long term regulation by the NSW Environmental Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act). The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP). The RAP has been reviewed and endorsed by a NSW EPA-accredited Site Auditor in accordance with the CLM Act.

1.3.1 Approvals, permits and licenses

The site has been subject to long term regulation by the NSW EPA under the CLM Act. Therefore activities of the Portion 2 Early Works has been reviewed and endorsed by NSW EPA-accredited site auditor in accordance with CLM Act, as part of review process of RAP prior to the commencement of Portion 2 Early Works.

The site is registered on the EPA Section 58 Contaminated Sites Register. Voluntary Remediation Proposals and Management Orders. The site is currently working under Voluntary Management Proposal (VMP) number 20181709 (Dated 03 October 2018, issued under Section 17 of the *CLM Act 1997*).

The site has an existing interim GTP. The GTP is designed to remove contaminants from groundwater pumped from the north-eastern boundary of the site. Based on available historical data, the volume of groundwater treated daily by the GTP is approximately 2 m³/day. Discharge of treated groundwater is licensed under Trade Waste Agreement (TWA) Number 15831.

The site is registered on the EPA Section 58 Contaminated Sites Register. Voluntary Remediation Proposals and Management Orders relevant to this site is summarised in Table 3-1 of CEMP.

1.3.2 Remediation Strategy

The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP). The strategy involves a combination of physical containment and physical separation components intended to mitigate off-site migration of contaminants and minimise and control receptor exposure pathways. The remediation strategy includes the following objectives:

- Installation of a hydraulic barrier wall along the Site perimeter to prevent groundwater migration to and from the Site (during previous Early Works remediation);
- Installation, commissioning, maintenance and operation of a replacement GTP at the Site as an interim remediation (and future contingency) measure during delivery of the Works; and
- Installation of an integrated capping system and passive vapour collection system across the surface of the Site to mitigate soil vapour exposure pathways and hexavalent chromium wicking processes, and to physically separate future Site users from remnant contamination.

1.4 Parramatta Light Rail Planning Approval

An Environmental Impact Statement (EIS) for the project was placed on public exhibition between 23 August and 23 October 2017. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the project to the Department of Planning and Environment. Following the conclusion of the public exhibition period, Transport for NSW prepared a Submissions Report and Preferred Infrastructure Report for the project to address the issues raised in community and stakeholder submissions, and to document a number of proposed design changes and additional investigations undertaken since exhibition of the EIS.

In May 2018, the Minister for Planning granted approval of the Project, under Section 115ZB of the EP&A Act. Following approval of the CSSI, a modification was assessed by the DPIE and subsequently approved on the 21st December 2018 under section 115ZI of the EP&A Act (Modification 1). Modification 2 was requested from DPIE and approved on the 25th January 2019.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located on Department of Planning and Environment's Major Project website:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.5 Environmental management systems overview

The environmental management system overview is described in Section 1.4 of the CEMP and is summarised in **Figure 1-1**.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to provide the foundation for the management of soil and water quality impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Package 3.

Specifically, this Plan details the soil and water quality management requirements that must be satisfied in order to demonstrate compliance with Revised Mitigation and Management Measures HY-5 and HY-6.

Mitigation measures required to satisfy the CoA requirements are derived from the EIS and through risk assessment processes (refer [Section 3.2](#)) and included within this SWMP. Refer to [Section 3.3](#) for relevant soil and water quality mitigation measures and controls. [Section 3.4](#) outlines the relevant Environmental Performance Outcomes.

Effective implementation of these measures will be ensured through a program of monitoring and inspections, training, auditing and reporting as detailed further in Sections [6.4](#), [6.6](#), [6.7](#) and [6.8](#) with the responsibilities for implementation identified in [Section 6.2](#). Continual improvement processes in relation to compliance with regulatory requirements are detailed in [Section 7](#).

Effective implementation of this Plan will assist the Contractor and relevant sub-contractors to achieve compliance with necessary environmental regulatory and policy requirements in a systematic manner with an outcome of continual environmental management performance.

2.2 Objectives

The key objectives and strategies of this SWMP applicable to the project activities are to ensure that impacts associated with soil and water quality are managed to within permitted criteria as far as practicable and to ensure that best practice controls and procedures are implemented.

To achieve this objective, the following will be undertaken:

- Ensure appropriate measures are implemented to address the applicable Table 8.2 of the Parramatta Light Rail Stage 1 Submissions and Preferred Infrastructure Report (SPIR) Revised Mitigation and Management Measures (REMMMs)
- Minimise 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);
- Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork activities;
- Where possible, reuse excavated materials as fill on other parts of the project in preference to disposing off-site in accordance with EPA's Waste Classification Guidelines (201);
- Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance;
- Where unable to be re-used, excavate pre-classified contaminated materials and transfer such materials directly into haulage trucks for off-site disposal at a waste facility licensed to accept the contaminated material; and

- Develop procedures for the assessment, handling and stockpiling of potentially contaminated materials, in accordance with the EPA's Waste Classification Guidelines (EPA 2014).

2.3 Targets

The following targets have been established for the management of soil and water impacts during the project:

- Ensure full compliance with the relevant legislative requirements, CoA and environmental mitigation measures;
- Ensure meeting relevant Environmental Performance Outcomes;
- Manage off-site release of water runoff, including full-compliance with the requirements of the Sydney Water Trade Waste agreement;
- Manage downstream water quality impacts attributable to the project (i.e. maintain water waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by ANZECC guidelines);
- Establishment and maintenance of erosion and sedimentation controls in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004);
- Disposal of any material from site in accordance with the EPA's Waste Classification Guidelines (EPA, 2014);
- Ensure training on best practice soil and water management is provided to all construction personnel through site inductions and targeted training programs where required; and
- No proposed extraction of groundwater for construction use to ensure no impact on potable water supplies, groundwater dependant ecosystems, licenced abstractions or overlying soils.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

All legislation relevant to this SWMP is included in the *Legal and Other Requirements Register*, attached as Appendix A1 of the CEMP. In summary, relevant legislation to this SWMP include:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation);
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Protection of the Environment Operations (Waste) Regulation 2014*;
- *Contaminated Land Management Act 1997*;
- *Protection of the Environment (General) Regulation 2009* (as amended);
- *Water Management Act 2000*;
- *Water Management Amendment Act 2014*;
- *Water Management (General) Regulation 2011*;
- *Fisheries Management Act 1994*; and
- *Soil Conservation Act 1938*.

3.1.2 Guidelines and standards

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

- Waste Classification Guidelines (NSW EPA, 2014);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZAST, 2018);
- Bunding & Spill Management. Insert to the Environment Protection Manual for Authorised Officers - Technical section "Bu" November 1997, Department of Environment and Conservation (DEC);
- Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006) (the "Blue Book"). Volume 1 and Volume 2;
- Policy and Guidelines for Fish Habitat Conservation and Management (2013 update), DPI Fisheries;
- *Transport* for NSW's Water Discharge and Reuse Guideline (7TP-SD-024/3.0);
- *Transport* for NSW's Guide to Environmental Control Map (3TP-SD-015/8.0); and
- Environmental Best Management Practice Guideline for Concreting Contractors (DEC, 2004).

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in Table 3-1. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1: Conditions of Approval relevant to the SWMP

CoA No.	Condition Requirements	Resources Needed	When to implement	Responsibility	Document Reference	How Addressed
C2	The CEMP must provide (listed are conditions related to sub-plans)	CEMP SWMP	During Construction	Project Manager Environment & Hygiene Manager Site Supervisor	<i>Refer below:</i>	
C2 h)	(h) a list of all the CEMP Sub-plans required in respect of construction, as set out in Condition C3. Where staged construction of the CSSI is proposed, the CEMP must also identify which CEMP Sub-plan applies to each of the proposed stages of construction.	CEMP SWMP	During Construction	Project Manager Environment & Hygiene Manager Site Supervisor	Section 1.2 in CEMP	Sub-plans required for this package of works is listed in Appendix A5 – Document Register of the CEMP
C2 i)	(i) a description of the roles and environmental responsibilities for relevant employees and their relationship with the ER.	CEMP SWMP	During Construction	Project Manager Environment & Hygiene Manager Site Supervisor	Section 3.3.1 in CEMP & Section 6.2 in SWMP	Description of roles and responsibilities are recorded in section 3.3.1 of this CEMP. Summary table of roles and responsibilities are recorded in section 6.2 in this SWMP.
C2 j)	(j) for training and induction for employees, including contractors and sub-contractors, in relation to environmental and compliance obligations under the terms of this approval.	CEMP SWMP	During Construction	Project Manager Environment & Hygiene Manager Site Supervisor	Section 3.4 in CEMP & Section 6.3 in SWMP	Training and induction requirement is documented in section 3.4 of the CEMP. Training requirements related to soil and water in listed in section 6.3 in SWMP.

CoA No.	Condition Requirements	Resources Needed	When to implement	Responsibility	Document Reference	How Addressed
C2 k)	(k) for periodic review and update of the CEMP and all associated plans and programs.	CEMP SWMP	During Construction	Project Manager Environment & Hygiene Manager Site Supervisor	Section 3.11 & Section 3.12 in CEMP & Section 7.2 in SWMP	Requirement for reviews and updates are documented in section 3.11 & section 3.12 of the CEMP and section 7.2 in this SWMP.
C4	The CEMP Sub-plans must state how:	<i>Refer below:</i>				
C4 a)	(a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved	CEMP SWMP	Pre-Construction	Environment & Hygiene Manager	Section 3.4 in SWMP	Details of how EPO identified for Packaged 3 will be addressed are listed in Table 3-3: Environmental Performance Outcomes relevant to this SWMP in this SWMP. Refer to the how addressed column in the table for further details.
C4 b)	(b) the mitigation measures identified in the documents listed in Condition A1 will be implemented	CEMP SWMP	Pre-Construction	Environment & Hygiene Manager	Section 3.3 in SWMP	Details of how REMMM identified for Packaged 3 will be addressed are listed in Table 3-2 in this SWMP. Refer to the how addressed column in the table for further details.
C4 c)	(c) the relevant terms of this approval will be complied with	CEMP SWMP	Pre-Construction	Environment & Hygiene Manager	Table 3-1 (this table)	Details of how conditions identified for Packaged 3 will be addressed are listed in this table. Refer to the how addressed column for each condition in the table for further details.

CoA No.	Condition Requirements	Resources Needed	When to implement	Responsibility	Document Reference	How Addressed
C4 d)	(d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed	CEMP SWMP	Pre-Construction	Environment & Hygiene Manager	Section 7.1 in SWMP	Continuous improvement of this plan will ensure the issues arise during construction of the project are identified and mitigated accordingly.
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.	Consultation Workshop	Pre-Construction	Environment & Hygiene Manager	Section 3.6.2 in CEMP	Evidence of consultation for relevant documents or monitoring programs identified within the CoA will be compiled and presented to DPIE along with each document or program. This will include engagement processes, log of points or attempted engagement, issues raised and evidence of satisfactory close out or, where agreement cannot be reached, reasons for why they could not be adopted or closed out.
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.	This SWMP CEMP	Pre-construction	Environment & Hygiene Manager	Section 2 in CEMP	CEMP and sub-plans shall be endorsed by the ER and then submitted to the Secretary for approval no later than one month before commencement of construction works.
C7	The CEMP must be endorsed by the ER and then submitted to the Secretary for approval no later than one month before the commencement of construction.	This SWMP CEMP	Pre-construction	Environment & Hygiene Manager	Section 2 in CEMP	CEMP and sub-plans shall be endorsed by the ER and then submitted to the Secretary for approval no later than one month before commencement of construction works.
C8	Construction must not commence until the CEMP and any CEMP Sub-plan specified in Condition C3	This SWMP CEMP	Pre-construction	Environment & Hygiene Manager	Section 2 in CEMP	Construction works, as defined by the CSSI, shall not commence until CEMP

CoA No.	Condition Requirements	Resources Needed	When to implement	Responsibility	Document Reference	How Addressed
	have been submitted to or approved by the Secretary. The CEMP and CEMP Sub-plans , as submitted to or approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where construction of the CSSI is staged, construction of a stage must not commence until the CEMP and Sub-plans for that stage have been approved by the Secretary.					and sub-plans are submitted to, or approved by the Secretary.
E111	Water Quality Before undertaking any works and during maintenance or construction activities, erosion and sediment controls must be implemented and maintained to prevent water pollution consistent with LandCom's Managing Urban Stormwater series (The Blue Book).	SWMP	Construction	Environment & Hygiene Manager	Section 6.1.1 & Appendix A in SWMP	As outlined in Section 6.1.1 , erosion and sediment controls will be implemented prior to commencement and maintained during maintenance and construction activities for Portion 2 Early Works.
E112	The CSSI must be designed, constructed and operated so as to maintain the <i>NSW Water Quality Objectives</i> where they are being achieved as at the date of this approval, and contribute towards achievement of the <i>NSW Water</i>	SWMP	Construction	Environment & Hygiene Manager	Section 6.1.1 , Section 6.1.3 , Section 4.3 & Appendix A in SWMP	Water shall be managed in compliance with Condition E111 and the TfNSW Water Reuse and Discharge Guideline. As outlined in Section 6.1.1 , erosion and sediment controls will be implemented prior to commencement and maintained during maintenance and

CoA No.	Condition Requirements	Resources Needed	When to implement	Responsibility	Document Reference	How Addressed
	<i>Quality Objectives</i> over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the <i>NSW Water Quality Objectives</i> , in which case those requirements must be complied with.					construction activities for Portion 2 Early Works. The existing drainage systems have been progressively isolated. Site surface water is directed through to the Temporary Water Treatment Plant (TWTP). The TWTP actively removes sediment, contaminants of concern and corrects pH of site surface water prior to discharge to sewer under the Sydney Trade Waste Agreement (TWA) (Discharge License 15831).

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs as outlined in Table 8.2 Parramatta Light Rail Stage 1 SPIR and as applicable as per Table E-4 of the Staging Report are listed in Table 3-2. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2: REMMMs relevant to this SWMP

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GEN-2	A construction compounds plan would be prepared for the project as part of the overall CEMP. This sub-plan would set out details for each of the approved construction compounds, including stockpile areas, laydown areas and other ancillary activities required to construct the project. The sub-plan would supplement, in greater detail, the information provided in the main body of the CEMP. The objectives and strategies of the construction compounds and ancillary facilities management sub-plan would include the following:	Portion 1 CEMP and sub-plans	Pre-construction	Project Manager Environment & Hygiene Manager	CEMP	Remediation activities have been conducted as works prior to the commencement of Portion 2 Early Works. The project site was established for previous remediation activities that have been performed on the site. The establishment was conducted in accordance with an approved CEMP and associated sub-plans, prepared to meet the Determination Report and Review of Environmental Factors. Portion 2 Early Works will utilise existing construction compounds and site facilities, located completely within the site boundary.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GEN-2 (i)	Minimise the impact of construction compounds on surrounding land uses and sensitive receivers.	Portion 1 CEMP and sub-plans	Project Manager Environment & Hygiene Manager	Pre-construction and during construction of Portion 2 Early Works	Section 4.10 of CEMP	Refer to CEMP
GEN-2 (ii)	Locate construction compounds away from sensitive land uses and receivers, wherever practical and feasible, or configure internal compound layouts in a manner that considers noise and light sensitive receivers	Portion 1 CEMP and sub-plans	Project Manager Environment & Hygiene Manager	Pre-construction and during construction of Portion 2 Early Works	Section 4.10 and 4.11 of CEMP	Refer to CEMP
GEN-2 (iii)	Manage stockpile areas to minimise potential pollution of watercourses, groundwater and local air quality.	Erosion and Sediment Control Plan Environmental Control Map (ECM)	Environment & Hygiene Manager Site Supervisor	During construction	Section 6.1.2 of SWMP	Stockpiles will be maintained with ERSER controls, such as sandbags, sediment traps and sediment fencing. These controls will be implemented around stormwater entry points and site boundaries. Stockpile locations will be maintained to minimise the overall impact on all neighbours with permanent stockpiles being designed with suitable coverage to prevent adverse dust emissions being generated. Active stockpiles shall be regularly consolidated and compacted to minimise dust generation throughout the works.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GEN-2 (iv)	Minimise the clearing of vegetation (e.g. street trees and trees within public open spaces) to the minimum amount necessary to construct the project, particularly where construction compounds are proposed in public open spaces/parkland areas.	Portion 1 Arborist Report	Project Manager Environment & Hygiene Manager	Pre-construction	Section 4.7 of CEMP	Refer to CEMP
GEN-2 (v)	Locate construction compounds away from (or able to be managed in such a way so as to not impact on) heritage items and high retention value trees.	Portion 1 Arborist Report and Heritage Report	Project Manager Environment & Hygiene Manager	Pre-construction	Section 4.7 & 4.10 of CEMP	Refer to CEMP
GEN-2 (vi)	Locate construction compounds away from or implement management measures so as to not impact on waterways.	ECM	Environment & Hygiene Manager	During construction	Section 4.1 of CEMP and Section 6.1 in SWMP	The EIS modelling and assessment for construction of the stabling and maintenance facility identified there is expected to be negligible obstruction of overland flow associated with site filling, and management of sediment/pollutant transport would be through on-site construction phase stormwater and erosion controls outlined in this plan.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GEN-2 (vii)	Flood response measures for compounds that are located on land affected by the 20 year ARI flood level (e.g. bridge support construction compounds).	Section 3.6.9 in EIS	Environment & Hygiene Manager	During construction	Section 4.7 of SWMP	Based on flood modelling conducted during the EIS, compounds are not located on land affected by the 20 year ARI level.
GEN-2 (viii)	Situate construction compounds and ancillary facilities on relatively level ground, and avoid excavation in construction compounds where risk of heritage impacts or disturbance of contaminated material.	Design Review	Environment & Hygiene Manager	During construction	Section 4.10 of CEMP	The project site was established for previous remediation activities that have been performed on the site. The establishment was conducted in accordance with an approved CEMP and associated sub-plans, prepared to meet the Determination Report and Review of Environmental Factors. Portion 2 Early Works will utilise existing construction compounds and site facilities, located completely within the site boundary. Portion 2 Early Works will utilise existing construction compounds and site facilities, located completely within the site boundary.
GEN-2 (ix)	Minimise the visual impact of construction compounds and ancillary facilities through either siting such facilities away from sensitive receivers (where practical and feasible) and/or providing screening.	Design Review	Design Manager Environment & Hygiene Manager	Pre-construction	Section 4.10 of CEMP	Refer to CEMP

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GEN-2 (x)	Reinstatement strategies for construction compounds		Project Manager	Post-construction	Section 4.12 of CEMP	Refer to CEMP
GEN-2 (xi)	Environmental management measures for construction compounds would be developed as part of the overall CEMP, with the construction compounds sub-plan identifying where such measures are documented within the CEMP.		Environment & Hygiene Manager	During construction	Section 4.10 of CEMP	Refer to CEMP
GW-1	The design of embankments would incorporate adequate drainage to reduce compaction and/or sealing of the underlying aquifer.	SWMP	Environment & Hygiene Manager	Pre-construction	Section 1.2.1 in SWMP	The project site primarily consists of existing hardstand. The Portion 2 Early Works will construct a clean fill cap, along with other remediation controls, to reduce infiltration into the underlying aquifer. During previous remediation works a hydraulic barrier wall will be completed to isolate contaminated groundwater within the site boundary. A Groundwater Treatment Plant (GTP) will provide a contingency for dewatering and maintaining hydraulic containment.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
GW-4	Hazardous material procedures (including procedures for managing spills and refuelling and maintaining construction vehicles/equipment) would be developed and implemented as part of the CEMP to minimise potential for groundwater quality impacts due to chemical spills.	SWMP Incident Response Management Plan	Environment & Hygiene Manager	Pre-construction	Appendix A7 - Emergency Response Management Plan	An Emergency Response Management Plan has been prepared and incorporates the following: All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and Transport for NSW's Chemical Storage and Spill Response Guidelines (Transport for NSW, 2015g). Chemical spill kits would be readily available and accessible on-site with personnel trained in reporting spills as part of project induction. All hazardous materials spills and leaks would be reported to Site Supervisors and actions would be immediately taken to clean up spills and leaks. An Environmental Control Map (ECM) shall be developed for the project. The ECM will include hazardous storage locations, bunds, fuel store and any other locations identified in the TfNSW Chemical Storage and Spill Response

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
						Guidelines. The ECM shall be displayed within the project site office and regularly communicated to personnel at weekly toolboxes or when updated. All personnel involved in refuelling and plant maintenance shall be trained in a Standard Operating Procedure for Plant Refuelling & Maintenance (US-059090-HS-PR-006) and assessed by a Level of Understanding Questionnaire (LOUQ).
GW-5	No new wells would be drilled to extract water for construction use.		Design Manager	During Construction	Section 4.4 in CEMP	Due to the contaminated groundwater underlying site, no wells for extraction of water for construction use are proposed.
HR-5	Environmental management measures relating to hazards and risk would be developed and implemented as part of the CEMP. These would include:	<i>Refer below:</i>				
HR-5 i)	(i) The storage of hazardous materials, and refuelling / maintenance of construction plant and equipment would be carried out in clearly marked and bunded areas within the construction site that are designed to contain spills	SWMP, Contaminated Land Management Plan (CLMP)	Environmental & Hygiene Manager	During construction	Section 4.3 in CEMP Appendix B9 – Contaminated Land	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and Transport for NSW's Chemical Storage and Spill Response Guidelines (Transport for

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	and leaks in accordance with Australian Standards and DECCW guidelines.				Management Plan	NSW, 2015g). Updated Safety Data Sheets (SDS) for each chemical that will be using/stored shall be made available at all times. All personnel involved in refuelling and plant maintenance shall be trained in a Standard Operating Procedure for Plant Refuelling & Maintenance (US-059090-HS-PR-006) and assessed by a Level of Understanding Questionnaire (LOUQ).
HR-5 ii)	(ii) Hazardous materials would not be stored below the ten per cent AEP flood level flood level.	SWMP, CLMP	Environmental & Hygiene Manager	During construction	Section 4.3 in CEMP	The EIS did not identify the site as an area impacted by mainstream flooding during a one percent AEP and modelling and assessment for construction of the stabling and maintenance facility identified there is expected to be negligible obstruction of overland flow associated with site filling, and management of sediment/pollutant transport would be through on-site construction phase stormwater and erosion controls as well as treatment and discharge of surface water through Temporary Water Treatment Plant (TWTP). Hazardous materials will be stored within self-bunded storage areas.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
HR-5 iii)	(iii) Chemical spill kits would be readily available and accessible to construction workers. Kits would be kept at site compounds and on specific construction vehicles, and all hazardous materials spills and leaks would be reported to site managers and actions would be immediately taken to remedy spills and leaks. Employees would be trained in the correct use of spill kits.	SWMP, CLMP	Environmental & Hygiene Manager	During construction	Section 4.3 in CEMP Section 6.1 in SWMP	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and Transport for NSW's Chemical Storage and Spill Response Guidelines (Transport for NSW, 2015g). Chemical spill kits will be readily available on-site as required. All hazardous materials spills and leaks will be reported and appropriate corrective actions will be taken in a timely manner. Site personnel will be given appropriate training on use of spill kits. Spill kits (including on refuelling trucks and at all locations where risk assessment has identified the potential for spillages) will be maintained on site and should be well-stocked according to provider's instructions for spills.
HY-5	The CEMP would include soil and water management measures to manage the risk of sedimentation, littering and chemical pollution of the Parramatta River, Clay Cliff Creek, Vineyard Creek and other	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.1.1 in SWMP Appendix A – Erosion and Sediment Control Plan	The pre-existing drainage systems have been progressively disconnected. Site surface water is directed through to the Temporary Water Treatment Plant (TWTP). The TWTP actively removes sediment, contaminants of concern and corrects

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	nearby waterways within the study area during construction.					pH of site surface water prior to discharged to sewer under the Sydney Trade Waste Agreement (TWA) (Discharge License 15831). Control measures (detailed in section 6.1.1) will be implemented to manage risk of sedimentation, littering and chemical pollution of Parramatta River by Portion 2 Early Works. An example erosion and sediment control plan has been prepared and incorporated in Appendix A. This document will be regularly updated and remain 'live' as works progress.
HY-6	A soil and water management plan would be prepared as part of the CEMP. Specific measures would be identified in consultation with relevant government agencies and would be consistent with the principles and practices detailed in Landcom's (2004) Managing Urban Stormwater: Soils and Construction. The objectives and strategies of the soil and water management sub-plan would include the following:	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Refer below:	
HY-6 i)	(i) Minimise the extent and duration of exposed surfaces (particularly those works that have	SWMP Erosion	Environment and Hygiene Manager	During construction	Section 6.1 in SWMP	The majority of the site is capped by existing concrete hardstand, where surfaces are exposed, additional steps

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	the greatest potential to disturb soils that are contaminated or have a high erosion and runoff hazard).	and Sediment Control Plan	Site Supervisor			will be followed to minimise the extent and duration of exposed surfaces; • Establish exclusion zones to limit disturbance of areas. • Stabilising disturbed areas as soon as practicable. • Use of water suppression (e.g. water cart), tarps/covers and/or dust binding agents to control emissions from disturbed surfaces • Install erosion control measures to control runoff and erosion from stockpiles and exposed surfaces • Protect stormwater points to prevent run-off.
HY-6 ii)	(ii) Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork or bridge construction activities.	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager Site Supervisor	During construction	Section 6.4 and Section 6.1.3 in SWMP Appendix A – Erosion and Sediment Control Plan	Environmental Site Inspections (especially following significant rainfall and prior to significant earthwork activities) of water quality mitigation controls (e.g. sediment fences) shall be conducted to ensure the suitability for controlling erosion and sediment. Stormwater controls to be established as per the Erosion and Sediment Control Plan (Appendix A). Isolation of existing stormwater infrastructure, with Site surface water directed into the Temporary Water Treatment Plant (TWTP) for

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
						treatment, testing and discharge under existing Sydney agreement. The groundwater treatment plant (GTP) serves as an additional layer of protection for the collection and treatment of contaminated water sources at depth, that may be generated during remediation activities. Note that no bridge construction activities are part of Portion 2 Early Works Scope.
HY-6 iii)	(iii) Minimise and manage impacts on water quality and downstream receiving environments during in stream activities.	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager Site Supervisor	During construction	Section 6.1.1 , Section 6.1.3 and Section 4.3 in SWMP	No in-stream activities are proposed for Portion 2 Early Works. Appropriate erosion control measures shall be installed and maintained throughout the site to minimise impacts to water quality. Stormwater shall be retained within excavations for evaporation or where this is not possible, directed for treatment in the temporary water treatment plant (TWTP).
HY-6 iv)	(iv) Flood response measures for activities located on land affected by the 20 year ARI flood level (e.g. bridge support construction)	SWMP Erosion and Sediment	Environment and Hygiene Manager Site Supervisor	During construction	Section 4.7 in SWMP	Based on an assessment in the Parramatta Light Rail - Flooding Technical Paper (Arup, 2017), The site is considered to have low potential for flooding due to its location within a low flood risk area and raised

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	compounds), or works within waterways (such as bridge works).	Control Plan				surfaces present from the residual building slabs. The site is located outside the one per cent annual exceedance probability, but within the probable maximum flood extent which inundates the majority of the Camellia area. The site is currently not subject to local overland flows from areas external to the site. Localised ponding of surface water may occur on some parts of the site due to the variations in elevation, differential pavement condition and presence, and the existing condition of the drainage system. During construction works, stormwater systems and/or water treatment plants shall be maintained to remove surplus water from the site and ERSED controls shall be maintained to prevent erosion of soils and sedimentation being washed into stormwater drains and waterways and will be maintained in accordance with the Landcom <i>'Managing Urban Stormwater: Soils and Construction'</i>
HY-6 v)	(v) Where possible, reuse excavated materials as fill on other parts of the project in preference to	SWMP Erosion and	Environment and Hygiene Manager	During construction	Section 5.1.2 of WRMP	Where possible, excavated materials shall be retained on-site in preference to off-site disposal.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	disposing off-site in accordance with EPA's Waste Classification Guidelines (2014).	Sediment Control Plan	Site Supervisor			All materials shall be managed in accordance with the site Remediation Action Plan (RAP) and site auditor endorsed documentation Any excavated material not remaining on site shall be classified in accordance with EPA's Waste Classification Guidelines (2014). Refer to section 5.1.2 of WRMP for further details.
HY-6 vi)	(vi) Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance.	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager Site Supervisor	During construction	Section 4.2 & Section 6.1.1 in SWMP	The project has a Remediation Action Plan (RAP). The RAP identifies contamination concerns and areas of concern. Temporary control measures (i.e. exclusion zones, sediment control) would be implemented to manage the disturbance of such areas. The Portion 2 Early Works is necessary to complete the remediation controls for the long term use of the site and for facilitation of an endorsed site audit statement.
HY-6 vii)	(vii) Excavate pre-classified contaminated materials and transfer such materials directly into haulage trucks for off-site disposal	SWMP Erosion and Sediment	Environment and Hygiene Manager Site Supervisor	During construction	Section 5.1.4 in WRMP	Contaminated materials that are unable to be reused or recycled will be disposed of offsite to an appropriately licenced waste management facility following classification in accordance

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	at a waste facility licensed to accept the contaminated material.	Control Plan				with EPA's Waste Classification Guidelines (2014).
HY-6 viii)	(viii) Transport for NSW would also undertake consultation with DPI Fisheries with respect to the development for the CEMP, and Erosion and Sediment Control Plan for the project.	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager	During construction	Table 5-2, Section 5 in CEMP	The majority of the site is capped by existing concrete hardstand and as a result of the heavily modified and disturbed nature of the site, assessed to have low or no biodiversity value. Furthermore, in accordance with the Staging Report, CoA E100 is not triggered due to the limited impact to vegetation, habitats for native fauna or threatened species, populations or ecological communities on the project site, including .
HY-6 ix)	(ix) Develop procedures for the assessment, handling and stockpiling of potentially contaminated materials, in accordance with EPA's Waste Classification Guidelines (2014).	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager Site Supervisor	During construction	Section 5 in WRMP	The classification and storing of waste will be undertaken in accordance with the EPA Waste Classification Guidelines (2014). In the event of unexpected finding of contaminated materials, the Unexpected Finds Procedure (located within Appendix A7 – Contaminated Land Management Plan) will be followed.
HY-7	During construction, any water collected from the worksites would be treated and discharged in accordance with current guidelines to avoid any potential	SWMP	Environment & Hygiene Manager	During construction	Section 6.1 and Section 6.1.3 in SWMP	All water (including groundwater) requiring disposal during construction would be tested and treated in accordance with the Sydney Water Trade waste agreement, Transport for NSW Water Discharge and Reuse

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	contamination or local stormwater system impacts. These guidelines include: • The Blue Book - Managing Urban Stormwater: Soils and Construction (Landcom, 2004 and DEC 2008). • Transport for NSW Water Discharge and Reuse Guideline 7TP-SD-024.					Guideline 7TP-SD-024 and/or the Waste Classification Guidelines (EPA, 2014) prior to disposal. The existing drainage systems have been progressively disconnected. Site surface water is directed through to the Temporary Water Treatment Plant (TWTP). The TWTP actively removes sediment, contaminant's of concern (COC) and corrects pH of site surface water prior to discharge under the existing Sydney Water Trade Waste Agreement (TWA)(Discharge License 15831).
HY-8	Large areas of disturbance such as compound areas and stockpile sites would, where feasible and reasonable, be located away from any surface runoff flow paths and above the 10% AEP flood levels.	SWMP	Environment & Hygiene Manager	During construction	Section 6.1 in SWMP	As per Section 10.4.3.2 of the EIS, the SaM facility is located outside the one percent AEP but within the PMF flood extent. The EIS did not identify the site as an area impacted by mainstream flooding during a one percent AEP. The flood model (ARUP, 2017) also identified that the stabling and maintenance facility site is not subject to local overland flows from external areas to the site and capping works associated with site filling is expected to result in

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
						'negligible obstruction of overland flow'.
HY-9	The design of stormwater outlets would consider the need for scour protection measures. Typical scour protection might include concrete energy dissipating structures or dumped stone rip rap.	SWMP	Environment & Hygiene Manager	During construction	Section 6.1.1 and Section 6.1.3 in SWMP	Stormwater will be managed with ERS&D controls, such as sandbags, sediment traps and sediment fencing. These controls will be implemented around stormwater entry points and site boundaries. Surface water shall be retained within excavations for evaporation or where this is not possible, directed for treatment in the temporary water treatment plant (TWTP)
SG-3	To manage potential impacts to geology and soils, the soil and water management plan prepared as part of the CEMP (refer HY-6 above) would include standard management measures to be implemented during construction, including (but not limited to):	<i>Refer below:</i>				
SG-3 i)	(i) Erosion and sediment control plans would be prepared for each worksite in accordance with Volume 2D of Managing Urban Stormwater: Soils and	SWMP Erosion and Sediment	Environmental & Hygiene Manager Site Supervisor	During Construction	Section 6.1.1 and Section 6.1.3 in SWMP	An example erosion and sediment control plan has been prepared and incorporated in Appendix A. This document will be regularly updated and remain 'live' as works progress.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
	Construction (Landcom, 2004). Due to the potential high erosion of soils along the alignment, the erosion and sediment control plans would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during construction.	Control Plan			Appendix A in SWMP	Stormwater will be managed with ERSED controls, such as sandbags, sediment traps and sediment fencing. These controls will be implemented around stormwater entry points and site boundaries. Stormwater shall be retained within excavations for evaporation or where this is not possible, directed for treatment in the temporary water treatment plant (TWTP)
SG-3 ii)	(ii) Stabilised surfaces would be reinstated as quickly as practicable after construction.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	Construction	Section 4.12 in CEMP	Portion 2 Early Works scope includes installation of an engineered site wide capping layer over the project site. This will provide a permanent remediation solution to prevent rainwater infiltration and containment of contaminated materials beneath the surface. Following completion of the works, the site will be transitioned to other contractors for establishment of the SaM facility.
SG-3 iii)	(iii) All stockpiled materials would be stored in bunded areas and kept away from waterways to avoid sediment entering the waterways.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.1 in SWMP	Stockpiles will be maintained with ERSED controls, such as sandbags, sediment traps and sediment fencing. These controls will be implemented around stormwater entry points and site boundaries.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
SG-3 iv)	(iv) Sediment would be prevented from moving off-site and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.1 in SWMP	To control sediment transfer, sediment control devices (such as gravel filter socks, geofabric drainage socks, sediment fencing, hay bales, stakes/star pickets and/or plastic) shall be established to prevent run-off into the site stormwater system. A stormwater isolation gate was installed in the site stormwater system during previous remediation activities which can be closed in the event of spill.
SG-3 v)	(v) Clean water would be diverted around the work site in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004).	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.1 in SWMP	The project site currently has a kerb around the majority of the site perimeter with hardstand and grading preventing clean water from entering the site.
SG-3 vi)	(vi) Erosion and sediment control measures would be regularly inspected (particularly following rainfall events) to ensure their ongoing functionality.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.4 in SWMP	Environmental Site Inspections (especially following significant rainfall and prior to significant earthwork activities) of water quality mitigation controls (e.g. sediment fences) shall be conducted to ensure the suitability for controlling erosion and sediment.

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
SG-3 vii)	(vii) Erosion and sediment control measures would be left in place until the works are complete and areas are stabilised.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	During construction	Section 6.1 in SWMP	Erosion and sediment control measures will be maintained in place until site works are completed. Following completion of Portion 2 Early Works, the site will be transition to other contracts for establishing the SaM facility.
UT-2	Consultation with utility service providers would be carried out during detailed design to ensure that appropriate measures are taken regarding the potential integration of future utilities requirements along the project alignment, and to ensure that the project does not preclude the development or installation of these proposed utilities.	SWMP Erosion and Sediment Control Plan	Environmental & Hygiene Manager Site Supervisor	Pre-construction, during construction	Table 5-1 in CEMP	Previous remediation and geotechnical design works have undertaken extensive site service location and investigations to inform utilities locations within and around the project site boundary. Prior to any excavation, dial before you dig searches will be conducted. When approaching known or possible services, non-destructive digging (such as pot-holing or hand-digging) will be carried out to determine exact locations. Any guidelines provided by relevant utility authorities will be followed. Consultation with utility owners affected by site works has been conducted through previous remediation activities and will continue to be taken to appropriately control works to ensure the project does not impact to utilities. Detailed design shall be undertaken in consultation with TfNSW and future

Ref #	Commitment	Resources Needed	Responsibility	Timing	Reference	How Addressed
						contractors for the installation of site utilities.

3.4 Environmental Performance Outcomes

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

Table 3-3: Environmental Performance Outcomes relevant to this SWMP

ID Ref#	Environmental Performance Outcome	Resources Needed	Responsibility	Timing	SWMP reference	How Addressed
EPO-HY-1	No aspect of the project would materially adversely affect existing flood behaviour in the vicinity of the project.	SWMP	Environmental & Hygiene Manager Site Supervisor	During construction	Section 4.7 and Section 6.1.1 in SWMP	During the works it is expected that localised ponding of surface water will occur on some parts of the site due to the variations in elevation, differential pavement condition and presence, and poor condition of the drainage system. Site topography shall be heavily altered as works progress for the construction of the remediation capping system, additional water control measures shall be implemented during the works to remove and temporarily store, treat and discharge to sewer surplus water through the groundwater treatment plant (GTP). Existing stormwater drainage points, wherever possible, shall be maintained to accommodate changes to the site conditions with supplementary ERSED Controls (e.g. as sand bags, hay

						bales and sediment fencing) installed on boundaries and discharge points to prevent run-off leaving the site. The ERSED control plan measures would be implemented prior to commencement of works and maintained throughout construction to ensure minimal affect to flood behaviour from Portion 2 Early Works. It should be noted that Project Wide Flood Modelling will be undertaken during future PLR works (Stage 2 Package 4 works) with any outcomes implemented by Stage 2 Package 4 and Stage 3 Package 5 Works. Necessary controls or mitigation measures shall be conducted to avoid adversely affect existing flood behaviour in the vicinity of SaM facility project site.
EPO-HY-3	Where reasonably practicable, existing drainage directly impacted by the project would be replaced in a manner compliant with current laws and applicable standards.					Remediation works shall utilise both TWTP and GWTP as site drainage and discharge controls. A permanent, replacement stormwater shall be installed as part of future works for the SaM facility.

EPO-SG-1	Erosion and sediment controls during construction would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a).	SWMP Erosion and Sediment Control Plan	Environment and Hygiene Manager Site Supervisor	During construction	Section 6.1.1 and Section 6.1.3 in SWMP	An erosion and sediment control plan has been prepared and incorporated in Appendix A and will remain 'live' throughout the works. Stormwater will be managed with ERSED controls, such as sandbags, sediment traps and sediment fencing. These controls will be implemented around stormwater entry points and site boundaries. Surface water shall be retained within excavations for evaporation or where this is not possible, directed for treatment in the temporary water treatment plant (TWTP).
EPO-SG-2	There would be no impacts on aquatic environments associated with the disturbance of ASS during construction.			During construction	Section 4.1	The ASS mapping indicates that the project area contains "Disturbed Terrain" (fill material); therefore, overall risk of disturbing ASS is considered minimal.

4 Existing Environment

The following sections summarise the findings of soil and water existing environment from the EIS relevant to the site. Further detail can be found in Sections 10.4, 10.5 and 10.6 of the EIS and Technical Paper 6 – *Water Quality Impact Assessment* and Technical Paper 8 – *Contaminated Land Assessment*.

4.1 Topography and soil characteristics

The project corridor consists of a predominantly undulating landscape, with generally flat-lying area. This project site is an area mapped as manmade fill mixed with older estuarine deposits as shown in **Figure 4-1**. The acid sulfate soils (ASS) analyses in the EIS indicated that both actual and potential ASS are unlikely to occur within the site. The ASS mapping indicates that the project area occupies an area that is overlain by “Disturbed Terrain” (fill material); therefore, overall risk of disturbing ASS is considered to be low if not nil. The ASS map including the site is provided in **Figure 4-2**.

The bounding streets of Grand Avenue to the north and Colquhoun Street to the west are effectively level at an elevation of between 6.0 and 6.2 m AHD. The elevation of the site is generally in the range from 6.0 to 7.0 m AHD, although there are local irregularities and uneven surfaces across the site.

The former roadway pavements through the Portion 2 Early Works Site comprise asphalt and concrete. The former building footprint pavements comprise concrete. The condition of the pavements varies from reasonable to poor (with multiple fractures). The residual building slabs are generally elevated above the level of the surrounding site and a flooding retention basin in the southeast corner of the site creates a local depression.

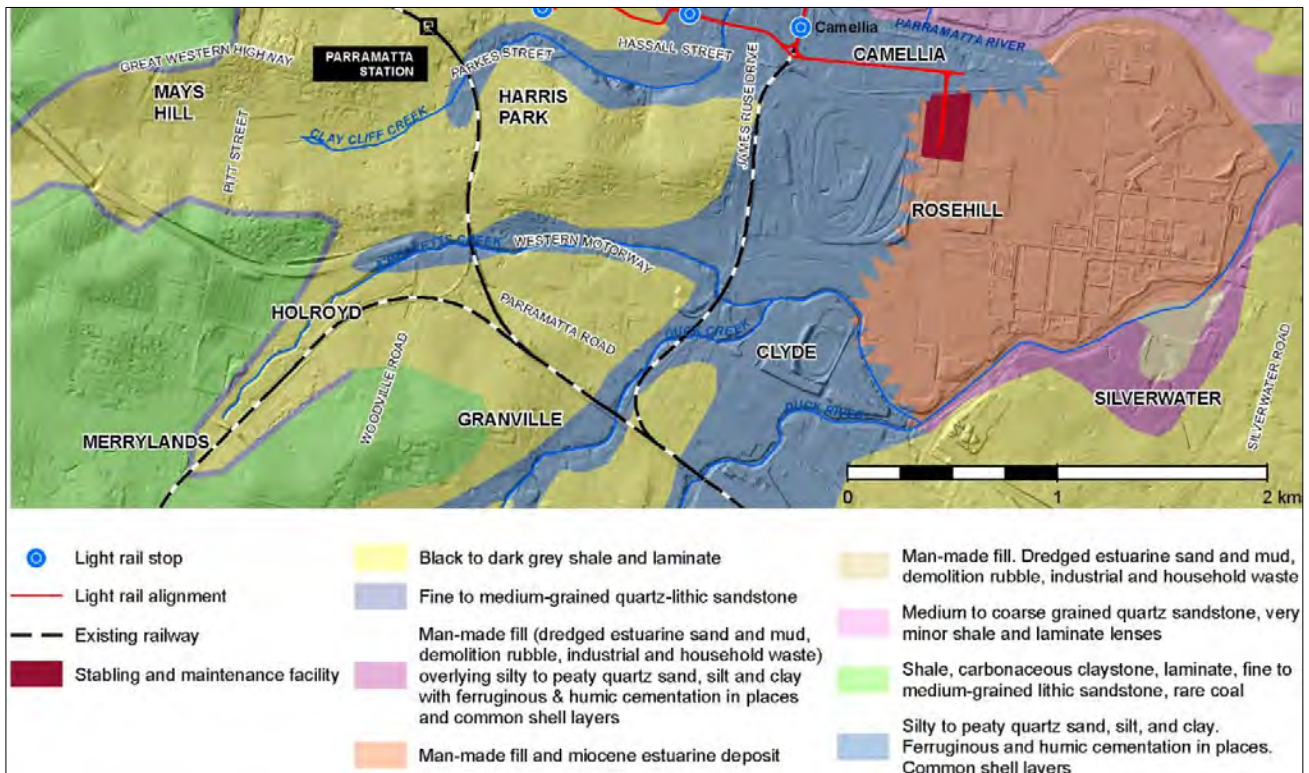


Figure 4-1: Site geology (Source: EIS Figure 10.5)

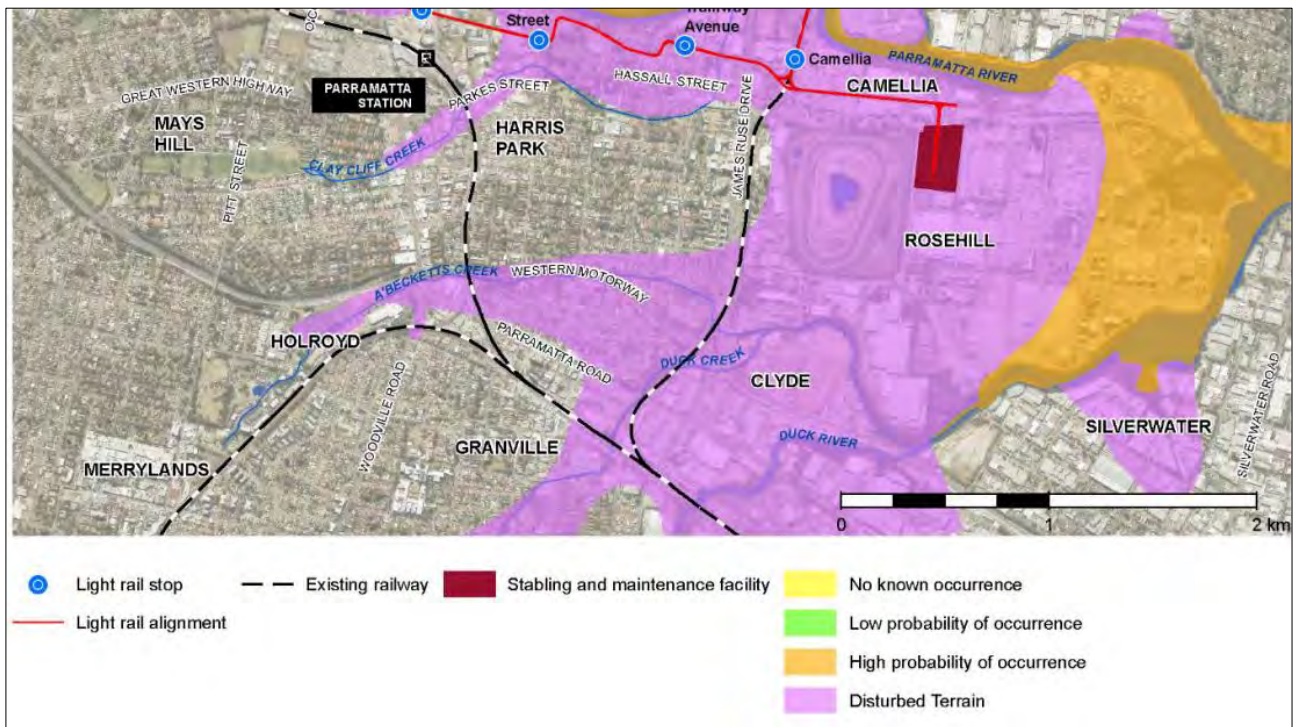


Figure 4-2: ASS map (Source: EIS Figure 10.7)

4.2 Contamination

A Contaminated Land Management Plan (Appendix B9 of the CEMP) has been prepared to address contamination in further detail.

4.3 Surface water

There are no existing surface water bodies located on the site and as such, potential impacts would be associated with runoff or sediment leaving the site and entering the stormwater network. Without controls and mitigation measures, this would have the potential to impact receiving waters down-stream of the site.

Where required, temporary water detention basins may be established within red zones to temporarily hold water. Water will be retained within the area until treated through the TWTP or evaporation.

Further details on water treatment is contained in Section 6.1.3

4.4 Groundwater

The EIS identifies two major aquifer systems are known to exist within the vicinity of the project alignment including:

- A shallow groundwater system comprising shallow weathered sandstone and shale overlain by alluvial deposits and fill.
- A regional groundwater unit is expected to exist within the deeper confined Hawkesbury Sandstone.

The average depth to groundwater in the shallow aquifer has been identified as being about five metres below ground level, with groundwater levels beneath the site, known to be at approximately 3 metres below ground level, due to its close proximity to the Parramatta River.

Groundwater yields in the shallow aquifer are indicated to be relatively low (0.1 litres per second), which likely represents the relatively poor hydraulic conductivity in the weathered shale unit. Where bores penetrate within overlying fill and alluvial units, groundwater yields are likely to be higher compared to the underlying weathered sandstone and shale, potentially in the order of two litres per second to five litres per second.

As detailed in the section above, DPIE published the *Camellia Precinct Land Use and Infrastructure Analysis* (NSW Department of Planning and Environment 2015), which includes a high level contamination review of the Camellia industrial area, and identified localised groundwater contamination associated with the history of industrial activities within the area, with a range of contaminants identified including asbestos, hexavalent chromium, petroleum hydrocarbons, chlorinated hydrocarbons and arsenic.

The Biodiversity Assessment Report (EIS Volume 3, Technical Paper 3) indicates there to be no groundwater dependant ecosystems reliant on the surface expression of groundwater within or near the study area (associated with the broader Project) and therefore this project is unlikely to significantly affect any groundwater dependant ecosystems.

Due to the contaminated groundwater underlying site, no wells for extraction of water for construction use are proposed.

4.5 Rainfall

A summary of the rainfall records from the Bureau of Meteorology (Site 066124 – Parramatta North, Masons Drive) is provided in **Table 4-1: Summary of rainfall records** below. The average annual rainfall recorded at North Parramatta is 972.0 mm. February is the wettest month with an average monthly rainfall of 121.3 mm. July is the driest month with an average monthly rainfall of 44.5 mm.

Table 4-1: Summary of rainfall records

	Jan	Feb	Mar	Apr	Mar	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall (mm)	103.1	121.3	110.4	91.0	67.2	92.8	44.5	55.3	51.1	68.7	84.6	73.1	972.0
Mean rain days (≥1mm)	8.9	9.1	9.7	7.2	6.9	7.5	5.4	5.2	5.9	7.6	8.7	7.8	89.9

4.6 Rainfall erosivity factor

The rainfall erosivity factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equation RUSLE). The rainfall erosivity factor is used to determine the soil loss in tonnes per hectare over one year and is used in calculations when sizing construction sediment basins. The Project has a Rainfall Erosivity Factor of 2500 SI based on the Rainfall Erosivity maps on the Blue Book (Managing urban stormwater: soils and construction – Volume 1, 4th Edition). Sydney is the closest location with detailed R-factor data.

4.7 Flooding

The site is located within the Parramatta River floodplain and is located higher than 0.5 m above the 1% Annual Exceedance Probability (AEP) flood level. Therefore, the Portion 2 Early Works site is not affected by flooding based on 1 in 100 year flood data and is not subject to local overland flows in the one percent AEP event.

Further assessment, conducted in the *Parramatta Light Rail - Flooding Technical Paper* (Arup, 2017), identified the site as a 'low' potential for flooding. This assessment was determined due to its location within a low flood risk area, shown in Figure 4-1 below. This shows the flood risk ratings for the site and surrounding Camellia Precinct. The assessment also considered the existing raised surfaces present from the residual building slabs. As the capping works for Portion 2 Early Works progresses, this will continue to increase the topography levels of the site and minimise impacts due to flooding.

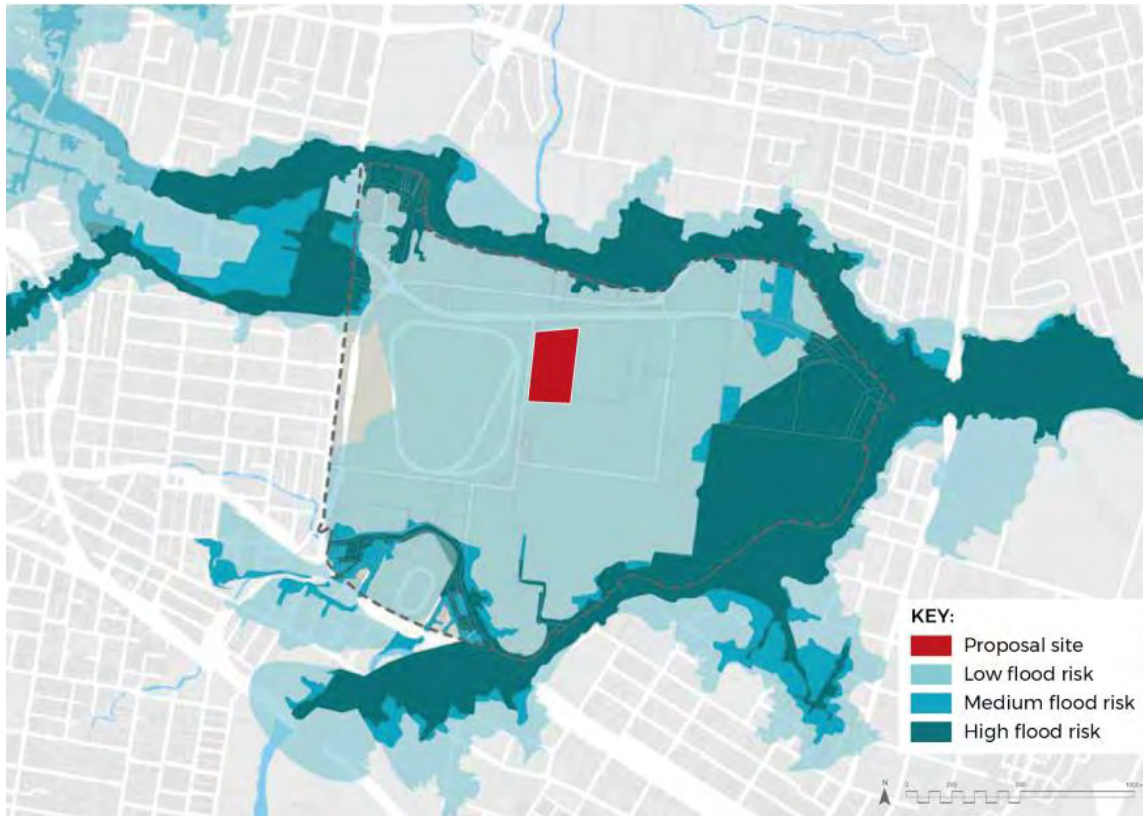


Figure 4-1: Flood risk ratings for the Camellia Precinct (Source Department of Planning & Environment and City of Parramatta Council, 2015 *Camellia Precinct – Land Use and Infrastructure Analysis*)

The flood model (ARUP, 2017) also identified that the stabling and maintenance facility site is not subject to local overland flows from external areas to the site and capping works associated with site filling is expected to result in 'negligible obstruction of overland flow'.

During the works, it is expected that localised ponding of surface water will occur on some parts of the site due to variations in elevation, different pavement condition and the condition of the existing drainage system. Site topography will be heavily altered as works progress for the construction of the remediation capping system, additional water control measures shall be implemented during the works to remove and temporarily store, treat and discharge to sewer surplus water via the groundwater treatment plant (GTP). Existing stormwater drainage points, wherever possible, shall be maintained to accommodate changes to the site conditions with supplementary ERSED Controls (e.g. as sand bags, hay bales and sediment fencing) installed on boundaries and discharge points to prevent sediment-laden or impacted run-off, leaving the site. These controls

shall be maintained throughout the remediation works to mitigate the risk of overland flows throughout the works.

Ongoing development of the final layout of the stabling and maintenance facility will be conducted to refine the stormwater drainage design and re-assess flood impacts, to ensure an acceptable level of flood immunity for the facility and that negative impacts on flood behaviour are avoided or minimised and will form a separate package of works.

5 Environmental aspects and impacts

5.1 Construction activities

Key aspects of the Projects that could result in adverse impacts to soils and water include:

- Geotechnical and soil investigations;
- Earthworks and transport of material to stockpile/s;
- Spreading and compaction of imported clean fill;
- Site access including movement of heavy vehicles across exposed earth;
- Utility and drainage works;
- Removal of existing concrete hardstand;
- Material stockpiling;
- Water use for site operations;
- Water treatment of contaminated groundwater; and
- Compound operation including fuel and chemical storage, vehicle wash down, refuelling and chemical handling.

Refer also to the Environmental Risk Register included in Appendix A2 of the CEMP.

5.2 Impacts

The potential for impacts on soil and water will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction of Portion 2 Early Works may include:

- Increased turbidity of surface waters resulting from erosion and sediment laden runoff as a result of earthworks and construction traffic;
- Increased turbidity of surface waters as a result of water and wind erosion of stockpiles and access roads;
- Contamination of surface water caused by offsite release of wastewater or runoff;
- Exposure of soils during earthworks, creating the potential for off-site dispersion of eroded sediments and pollutants;
- Contamination of soils, and surface and groundwater from accidental spills and / or oil leaks of fuel from plant, machinery and from fuel and chemical storage and handling practices;
- Increase in the volume of contaminated material movement through disturbance of impacted soil; and
- Increased volume of stormwater management following removal of existing concrete hardstand to facilitate design levels of the stabling and maintenance facility.

Relevant aspects and the potential for related impacts have been considered in a risk assessment at Appendix A2 of the CEMP.

6 Compliance management

6.1 Site Management

Prior to commencement of works, a site-specific erosion and sediment control plan would be prepared in accordance with the 'Blue Book' Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The erosion and sediment control plan measures would be implemented prior to commencement of works and maintained throughout construction.

There will be a minimisation of the extent and duration of exposed areas, particularly those works that have the greatest potential to disturbed contaminated soils or have a high vulnerability to erosion and runoff. Exclusion zones would be designated on construction sites to limit disturbance.

All chemicals and fuels that has the potential to emit toxic vapours or odours will be stored and kept as per MSDS. On-site storage of fuel shall be as minimal as practicable. All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and Transport for NSW's Chemical Storage and Spill Response Guidelines (Transport for NSW, 2015g).

Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled off-site, or in a designated refuelling area.

Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the Transport for NSW Chemical Storage and Spill Response Guidelines (Transport for NSW 2015g) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill.

The existing drainage systems have been progressively disconnected. Site surface water is directed through to the Temporary Water Treatment Plant (TWTP). The TWTP actively removes sediment, contaminants of concern (COC) and corrects pH of site surface water prior to discharge under the existing Sydney Water Trade Waste Agreement (TWA)(Discharge License 15831).

Erosion and sediment control measures will be functional until the construction of Portion 2 Early Works is complete and areas are stabilised.

6.1.1 Stormwater and Sediment Erosion Controls

Site surveys have been conducted prior to commencement of remediation to record the topography of the site (slopes and contours). This information is collated into a Stormwater and Sediment Erosion Control Plan. This plan is developed to prevent erosion of soils and sedimentation being washed into stormwater drains and waterways and will be written in accordance with the Landcom '*Managing Urban Stormwater: Soils and Construction*'. This plan can be found in Annexure A.

Disturbed areas will be constructed to divert as much stormwater as possible away from the site. To control sediment transfer, sediment control devices, including gravel filter socks, geofabric drainage socks, sediment fencing, hay bales, stakes/star pickets and plastic/geofabric (or other material) to act as stockpile covers shall be established and maintained as a mitigation measure for sediment runoff. Fencing, concrete kerbs and hay bales acts as a sediment barrier and helps to reduce sediment movement on and off-site.

Gravel filter socks and geofabric drainage socks will be set up locally around drains and gutters to prevent sediment ingress into the storm water system. These controls will be regularly inspected for integrity and repaired as necessary. Sandbags or silt socks will be emplaced around any existing stormwater drains which may be affected. Silt fencing or hay bales will be emplaced around any potentially affected site boundaries.

Where an exclusion zone is established for active remediation works (e.g. excavation of contaminated materials), stormwater and other water sources shall be contained within that exclusion zone. Surface water shall be retained within excavations for evaporation, or where this is not possible, directed for treatment in the temporary water treatment plant (TWTP). If stormwater drains are located within an active exclusion zone, these shall be temporarily closed and progressively removed to prevent any run-off into the stormwater system.

All erosion and sediment controls shall be captured on an Erosion and Sediment (ERSED) Control Map, as shown in Appendix A. It is noted that throughout the works, topography and drainage points may be altered. Where controls are altered a revision to the ERSED Control Maps will be issued.

6.1.2 Materials Tracking & Stockpiling

Stockpiling of both imported clean fill and excavated contaminated materials will be designed and managed in accordance with the requirements of the Landcom Blue Book - Managing Urban Stormwater: Soils and Construction, to minimise the potential risks associated with stockpiles (e.g. potentially contaminated materials, dust generation, etc.).

Stockpile area will be maintained with ERSED controls, such as sandbags, sediment traps, hay bales and sediment fencing to prevent run off to the stormwater. Controls will be implemented around stormwater entry points and site boundaries.

Excavated contaminated material stockpiles will be maintained within contaminated exclusion zones, known as 'red zones'. Imported clean fill materials shall be maintained outside contaminated exclusion zones. Plant and equipment shall be decontaminated, such as vehicle wash down, prior to leaving a contaminated exclusion zone. Decontamination will be managed to prevent the cross-contamination of imported clean fill materials and areas external to contaminated exclusion zones. Further controls for contaminated excavation materials are detailed in the Contaminated Land Management Plan (CLMP).

Active stockpiles shall be regularly consolidated and compacted to minimise dust generation throughout the works. Inactive stockpiles shall be covered or stabilised (e.g. tarpaulins, geotextile, stabilisation matting or other suitable material). Stockpile environmental controls will be detailed on relevant ECMs (refer to Appendix A6 of CEMP).

Materials tracking, sampling, imported clean fill and excavated contaminated control measures are further addressed in the Waste and Resource Management Plan (WRMP).

6.1.3 Temporary Water Treatment Plant

Water generated during construction, including surface waters and groundwater, will be pumped to the Temporary Water Treatment Plant (TWTP).

Following collection and diversion to the TWTP, water will be directed to a mixing reactor and initially treated with ferrous sulphate heptahydrate and aluminium chlorohydrate. Ferrous sulphate heptahydrate acts as a reducing agent for Chromium (VI) to the lesser toxic Chromium III, whilst the aluminium chlorohydrate acts as a coagulant. These processes enable an initial high percentage removal of Chromium (VI) through precipitation and settling. Mechanical mixers will ensure that the solution remains homogeneous. Within the reactor, the pH of the process water, will be constantly monitored and corrected by pH meter as required. Once the reactor completes the initial treatment stage and the pH set point is suitable will the system be allowed to continue onto the next stage.

Following reduction, coagulation and pH correction, water will be processed through settling tanks and lamella plate separators. This process, along with flocculant dosing, will help to 'clarify' the water. The process ensures suitable settling time for solids to be dropped out of the water column. Following the clarification step, water will flow from the lamella plate separators to the filtration feed tank prior to the filtration bank.

Water in the filtration feed tank will then be fed through a series of filtration banks. The filtration banks include a three (3) stage process:

- The first stage of the filtration banks is to pass water through a system of vessels filled with a granular zeolite. The zeolite will act as a physical filtration media removing any residual TSS and precipitated metals that passed through the clarification stage. Additionally, some ionic state metals will also be removed via the zeolite's ion exchange properties.
- In the second stage of filtration banks, water will be passed through granular activated carbon vessels. The activated carbon will provide a second physical barrier but is primarily there to remove organic material, such as hydrocarbons, from the influent.
- The final stage of treatment through the filtration banks will pass water through vessels with modified titanium dioxide. The modified titanium dioxide will remove any remaining chromium VI, chromium III and other residual heavy metals within the water.

Following filtration all treated water will enter the discharge tank prior to discharge to trade waste. All discharge water will be sent to the discharge tank will be monitored with a turbidity and pH probe. If during discharge the probes register an NTU above 0.5 or pH outside of the constraints of the discharge criteria shown in Table 2-1, the discharge pump will shut down and an error message will be sent to the TWTP Operator. Discharge pH and turbidity will be manually recorded twice daily. Notifications will be sent periodically throughout the day to the TWTP operator to monitor each probe and gauge throughout the system.

The rates of discharge to sewer as per the TWA (#15831) are as follows;

- An instantaneous maximum rate of gravitated discharge of 2 litres per second
- Maximum daily discharge 220 Kilolitres
- Average daily discharge of 165 Kilolitrescomp

Table 2-1: TWA #15831 Water Quality Discharge Criteria

SUBSTANCE	STANDARD (mg/L or pH)
Total Dissolved Solids	10000
Sulphate	2000
Chromium	3
Manganese	10
pH	7-10

6.2 Roles and responsibilities

The Ventia Project Team's organisational structure and overall roles and responsibilities are outlined in Section 3.3 of the CEMP.

The following table outlines the main parties who will be involved in use of the Plan, and their corresponding roles and responsibilities. This table is not intended to list all responsibilities under relevant legislation, but is presented as a brief clarification of the respective responsibilities in implementing this Plan.

Table 6-3: Parties Involved in this Plan and Associated Responsibilities

Title	Responsibility
Project Owner: TfNSW	Promote good environmental and WHS management.
Project Manager	Ensure all personnel entering the site are inducted to an appropriate level in environmental and emergency procedures Provide subcontractors with the requirements of this Plan prior to commencement of work
Environment & Hygiene Manager	Preparation of this Plan Implement, control and maintain the Plan Provide subcontractors with the requirements of this Plan prior to commencement of work Ensure that all changes to the Plan are communicated to relevant authorities (stated in all personnel working on site, including subcontractors)
Site Supervisor	Take all practical measures to ensure the workplace under their supervision is operating according to the agreed principles of the Plan, and without risks to health or the environment Ensure all personnel under their control entering the site are inducted to an appropriate level in environmental and emergency procedures Respond to any WHS or environmental incident Ensure any changes to this Plan or procedures are communicated to all personnel under their control
Subcontractors	All subcontractors are required to comply with this Plan and to comply with directions from the Project Manager and/or Environment & Hygiene Manager in this respect.
Employees and Visitors to Site	Attend appropriate induction and training sessions, following procedures and making the Project Manager and/or Environment & Hygiene Manager aware of any actual or potential breaches of procedures. Where encountered, reporting of previously unidentified areas of contamination to the Site Manager.

6.3 Training

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

- Existence and requirements of this sub-plan;
- Relevant legislation;
- Roles and responsibilities for soil and water management;
- The location and identification of contamination; and
- Water quality management and protection measures.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in soil and water management such as:

- Erosion and sediment control installation methodology and maintenance;
- Unexpected finds relating to contamination;
- Storage of hazardous materials and use of spill kits
- Refuelling of plant and equipment
- Dewatering; and
- Awareness of appropriate emergency response measures in high rainfall events.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

6.4 Monitoring and inspection

The site has a groundwater treatment plant (GTP) which is designed to remove contaminants from groundwater pumped from the north-eastern boundary of the site. Based on available historical data, the volume of groundwater treated daily by the GTP is approximately 2 m³/day. A temporary water treatment plant (TWTP) is designed to treat an additional 200 m³/day.

Discharge of treated water from both the GTP and TWTP is licensed under Trade Waste Agreement (TWA) Number 15831. Monitoring requirements include:

- Collection of a composite sample collected from the discharge point at 1 kilolitre intervals with a total volume of at least 5 litres over a 24 hour period. This is conducted every 60 operating days (approximately 6 sampling events);
- Measurement of pH of discharge at the start and end of each sampling period (i.e. at time of 0 hours and at 24 hours);
- Record the volume of wastewater discharged;
- Analysis of one composite sample per sampling event at a National Association of Testing Authorities (NATA), Australia accredited laboratory for total chromium (Cr), sulphate, manganese and total dissolved solids (TDS);
- Collection of a discrete sample per sampling event and analysis for pH; and
- Preparation of a report in the pro-forma included in the TWA (15831) for issue to Sydney Water within 21 days from the date of sampling.

The existing GTP is complemented during the remediation works by the TWTP which has been installed at the north eastern boundary of the site. Installation of the TWTP has been carried out prior to decommissioning of the existing GTP therefore, treatment of groundwater would occur continuously.

Sampling, analysis and discharge of the TWTP will be undertaken in accordance with Sections 6.1.3 and the Sydney Water TWA (Discharge License 15831).

Regular Inspection of water quality mitigation controls (e.g. sediment fences) would be performed especially following significant rainfall or prior to significant earthwork activities to identify effectiveness.

It is the accountability of the Environment and Hygiene Manager and Project Manager to ensure all monitoring is performed according to these requirements.

Further detail on the Materials tracking process, classification and transportation of waste materials is in the Appendix B8 - Waste and Resource Management Plan.

Additional requirements and responsibilities in relation to inspections are documented in Section 3.9.1 and Section 3.9.2 of the CEMP.

6.5 Licences and permits

Discharge of treated groundwater and surface water is licensed under Trade Waste Agreement (TWA) Number 15831. An instantaneous maximum rate of gravitated discharge of 2 litres per second with a maximum daily discharge of 220 kilolitres is permitted.

6.6 Weather monitoring

Monitoring of weather forecasts will be performed for planning and site securing purposed on daily basis using Bureau of Meteorology weather forecast.

A weather station shall be established for collecting on-site weather data, including temperature, humidity, wind speed and direction, rainfall and pressure.

Rainfall at the premises will be measured and recorded in millimetres per 24-hour period at the same time each day from the time that the site office associated with the activities is established.

6.7 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 3.9.3 of the CEMP.

6.8 Reporting

The quantity of water used from potable supplies will be captured (water meter readings) and reported in the project monthly report.

In order to comply with this legislative requirement sediment controls will be installed to remove suspended solids from the stormwater prior to flowing offsite. During rainfall, regular checks will be made to confirm the sediment controls remain intact and are operating effectively. These checks will be recorded on the Ventia INX Environmental inspection form.

All tracking, monitoring, sampling and testing information and data associated with water management at the Site will be reported on, including:

- Water collected and discharged via the existing and/or replacement WTPs, in accordance with the TWA; and
- Water generated in the course of the works

A Monthly Report will be developed for TfNSW, this report will include materials tracking information, data and documentation for the reporting period will be included, including tracking of:

- Materials scheduled for on-site re-use;
- Materials disposed off-site; and
- Materials imported to site

Ongoing quarterly stormwater monitoring program will produce subsequent reports and submitted to Parramatta City council. This will be performed throughout the duration of Portion 2 Early Works until the stormwater system is decommissioned, or as otherwise agreed with TfNSW.

Where monitoring determines non-compliance to be a risk or to have occurred, an incident report and corrective actions shall be raised in contractors' official reporting system and also in TfNSW INX reporting system. Corrective actions may include:

- Use of covers or other means to suppress dust if water availability is restricted;
- Carry out repairs to erosion and sediment controls;
- Install additional erosion and sediment controls;
- Improve storage of chemicals; and
- Additional training in the use of chemicals near waterways and sensitive environments.

It is the responsibility of the Environment and Hygiene Manager to ensure all reporting is performed according to these requirements.

7 Review and improvement

7.1 Continuous improvement

Continuous improvement of this 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.

7.2 SWMP 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 Plan. This will occur as needed.

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

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.2 of the CEMP.

8 References

1. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)
2. Landcom 2004. *Managing Urban Stormwater: Soils and Construction*. (4th Edition) March 2004 (reprinted 2006) (the “Blue Book”). Volume 1 and Volume 2.
3. NSW Environment Protection Authority (EPA), 2014. *Waste Classification Guidelines*.
4. Rainfall data: http://www.bom.gov.au/climate/averages/tables/cw_066124.shtml

Appendix A – Erosion and Sediment Control Plan

Appendix B – Consultation Evidence

Table B- 1: Log of consultation with Stakeholders as per CoA A5

In / Out	Date and time	Method of contact	Details of contact
Out	19/02/2019 17:23	E-mail	Invitation to PLR Consultation Workshop (RMS, Police - Parramatta, Fire & Rescue NSW, NSW Health, EPA, OEH, City of Parramatta Council (CoPC), DoI Water)
Out	20/02/2019 17:07	E-mail	Invitation to PLR Consultation Workshop (Site Auditor, SCO).
In	20/02/2019 07:59	E-mail	Police (Parramatta) – Project falls under Cumberland Police Area Command
Out	20/02/2019 10:54	E-mail	Invitation to PLR Consultation Workshop (Police – Cumberland).
In	21/02/2019 10:57	E-mail	OEH Biodiversity – no need to attend due to apparently limited biodiversity values on site.
In	26/02/2019 11:28	E-mail	OEH Flooding - As there is negligible flood issues for this portion my attendance is not required at this stage.
Out	06/03/2019 09:30	Workshop	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to attending stakeholders (Attendees include Police, Fire & Rescue NSW, CoPC, DoI Water, Site Auditor and ER).
Out	06/03/2019 14:37 - 15:23	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to non-attending stakeholders (EPA, DoI Water, SCO, NSW Health)

In / Out	Date and time	Method of contact	Details of contact
In	07/03/2019 08:22	E-mail	SCO comments (SCO-01 to SCO-06) received on TTAMP.
Out	07/03/2019 11:21	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to non-attending stakeholders (RMS)
In	07/03/2019 12:55	Teambinder	OEH Heritage comment (HER-01) received on Unexpected Heritage Finds Procedure, identified within CEMP. Comment noted did not require further update.
Out	07/03/2019 17:12	E-mail	Provided response to Council relating to a noise and vibration query (COP-01) raised at the PLR Consultation Workshop for Package 3: Portion 2 Early Works
Out	07/03/2019 17:16	E-mail	Provided evidence of previous consultation of remediation activities between TfNSW and DoI Water to DoI water.
In	18/03/2019 11:13	E-mail	Fire & Rescue NSW – no comments.
Out	18/03/2019 11:08 - 11:23	E-mail	Additional correspondence requesting comments to RMS, Police – Cumberland, Fire & Rescue NSW, EPA, Council, Site Auditor, DoI Water
Out	18/03/2019 11:55	E-mail	Response on SCO comments (SCO-01 to SCO-06) provided to SCO.
Out	18/03/2019 12:16	E-mail	PLR Consultation Workshop for Package 3: Portion 2 Early Works held – CEMP and associated sub-plans presented to non-attending stakeholders (Sydney Water)
In	18/03/2019 13:16	E-mail	RMS is satisfied with SCO reviewing the traffic related management plans and don't raise any further comments raised in SCO's email dated 7th March.

In / Out	Date and time	Method of contact	Details of contact
In	20/03/2019 17:05	E-mail	Site Auditor comment (AUD-01) received on AQMP.
In	22/03/2019 18:40	E-mail	NSW Health comment (HEA-01) received on TTAMP. Comment noted did not require further update.
Out	25/03/2019 07:02	E-mail	Additional correspondence on flood management and groundwater treatment provided to Sydney Water
Out	25/03/2019 12:00	Briefing / Site Visit	NSW EPA Contaminated Site Team project briefing from TfNSW and site visit with Portion 2 Early Works Environment & Hygiene Manager and TfNSW
Out	26/03/2019 07:40 - 08:02	E-mail	Additional correspondence requesting comments to Police – Cumberland, EPA, Council, DoI Water
In	26/03/2019 08:01	E-mail	NSW NRAR DoI Water confirmed groundwater team are reviewing the management plans and expected to provide comments 'in the next week' on the SWMP
Out	26/03/2019 15:13	E-mail	Response on Site Auditor comment (AUD-01) to AQMP provided to Site Auditor.
In	27/03/2019 21:27	E-mail	City of Parramatta Council Environmental Health Compliance Team reviewed – CEMP, NVMP, SWMP, AQMP, WRMP and CLMP - no comments received.
In	27/03/2019 21:30	E-mail	City of Parramatta Council comments (COP-01 to COP-05) received on SWMP.
In	30/04/2019 09:57	E-mail / Letter	Letter receive via e-mail from NSW NRAR DoI Water. One comment on cross-references and hyperlinks raised.

In / Out	Date and time	Method of contact	Details of contact
Out	04/04/2019 10:33	E-mail	Response on City of Parramatta Council comments (COP-01 to COP-05) to SWMP provided to Council.
Out	04/04/2019 10:33	E-mail	Additional correspondence on flood management provided to Sydney Water
In	16/04/2019 06:56	E-mail	Sydney Water responses following review of the plans and provided information with ' <i>No further comment on the information you have provided.</i> '
In	30/04/2019 09:57	Letter / E-mail	Letter received by NSW NRAR DoI Water. One (1) comment (DOI-01) received on SWMP. One comment on cross-references and hyperlinks raised, this had been resolved during the ER/TfNSW review process and was closed.
Out	02/05/2019 17:26	E-mail	Additional correspondence requesting comments to NSW EPA
Out	07/05/2019 09:54	Phone	Phone call to discuss NSW EPA regarding comments on CNVMP and SWMP.
Out	08/05/2019 15:19	Phone	Phone call to discuss NSW EPA regarding comments on CNVMP and SWMP.
In	08/05/2019 16:22	E-mail	NSW EPA (EPA-01 to EPA 03) received on CNVMP. No formal comments received on SWMP.

Table B- 2: Log of issues raised by Stakeholders as per CoA A5

Reference	Comment	How addressed	Management plan reference location	Reference	Status
City of Parramatta Council COP-02	Reference should be labelled as (ii) but missing.	HY-5 and HR-5 ii) are incorporated within Section 3.3, Table 3-2 of the SWMP.	Section 3.3 of the SWMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed
City of Parramatta Council COP-03	Show "Stormwater isolation gate" on Site Map. Was unable to find and presume may have been on Appendix A Erosion and Sediment Control Plan, however not supplied on USB	The Stormwater Isolation gate is on the Environmental Control Map, found in Appendix A6 of the CEMP and the Erosion and Sediment Control Plan, found in Appendix A of the SWMP.	Appendix A – Erosion and Sediment Control Plan of the SWMP and Appendix A6 – Environmental Control Map of the CEMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed
City of Parramatta Council COP-04	Measure refers to flood response measures for activities on land affected by 20yr ARI. Issues only addressed in the context of flood inundation by mainstream and does address any overland or impact from rainfall aerially given the site area.	Based on an assessment in the <i>Parramatta Light Rail - Flooding Technical Paper</i> (Arup, 2017), The site is considered to have low potential for flooding due to its location within a low flood risk area and raised surfaces present from the residual building slabs. The site is located outside the one per cent annual exceedance probability, but within the probable maximum flood extent which inundates the majority of the Camellia area.	Section 4.7 of the SWMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
		The site is currently not subject to local overland flows from areas external to the site. Localised ponding of surface water may occur on some parts of the site due to the variations in elevation, differential pavement condition and presence, and the existing condition of the drainage system.			
City of Parramatta Council COP-05	Measure requires for Large areas e.g. compound areas and stockpile sites to be located away from any surface runoff flow paths and above the 10% AEP flood levels. CoPC notes this is addressed as "The EIS modelling and assessment for construction of the stabling and maintenance facility identified there is expected to be negligible obstruction of overland flow associated with site filling....". This statement appears incongruous given the	Based on an assessment in the <i>Parramatta Light Rail - Flooding Technical Paper</i> (Arup, 2017), The site is considered to have low potential for flooding due to its location within a low flood risk area and existing raised surfaces present from the residual building slabs. The flood models indicates that the stabling and maintenance facility site is not subject to local overland flows from external areas to the site. Therefore, there is expected to be negligible obstruction of overland flow associated with site filling, and management of sediment/pollutant transport would be through on-site construction	Section 4.7 of the SWMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
	section provided at the workshop on 6 March titled "Integrated remediation concept design" identified a capping/filling resulting in an increase of ground levels across the entire site of approx. 1.5m, and hence significant obstruction of overland flow.	phase stormwater and ERSED controls. Site topography and drainage points may be altered as the works progress but will be maintained through ERSED Controls to prevent run-off. Where controls are altered a revision to the ERSED Control Maps will be issued. Ongoing development of the final layout of the stabling and maintenance facility will be conducted to refine the stormwater drainage design and re-assess flood impacts, to ensure an acceptable level of flood immunity for the facility and that negative impacts on flood behaviour are avoided or minimised and will form a separate package of works.			
City of Parramatta Council COP-06	"Outcome" and "How Addressed" requires review with regards to context and qualify. First issue (context) - The Performance Outcome notes "No aspect of the	See Comment COP-05	Section 4.7 of the SWMP	Annexure G of CEMP Stakeholder Consultation Evidence, dated 18/03/2019 11:13	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
	project would ...adversely affect...flood behaviour in vicinity of project" however is addressed only in reference to the compounds. The wording "No aspect of the project" taken literally suggests this capping. Second issue (qualify) - Whilst land is not affected by 20 year from mainstream, land is likely to be affected by overland or aerially (i.e. on the land itself)				
NSW EPA	Nil formal soil and water management comments raised by NSW EPA			Annexure F of CEMP Stakeholder Consultation Evidence, dated 22/03/2019 18:40	Closed
NSW Department of Industry Water – National	The plan should be updated to correct the cross-references and hyperlinks in the document (e.g. references to Section	Formatting of cross-references and hyperlinks were revised during the document review process and have been corrected.	Section 6 of the SWMP	Annexure L of CEMP Stakeholder Consultation Evidence, dated 30/04/2019 09:57	Closed

Reference	Comment	How addressed	Management plan reference location	Reference	Status
Resources Access Regulator DOI-01	8 in table 3-1, which should be made to Section 6 and “Error! Reference source not found”) to enable checking compliance of the works with the plan as may be required.				
Sydney Water	Sydney Water response following review of the plans and provided information with ‘ <i>No further comment on the information you have provided.</i> ’			Annexure M of CEMP Stakeholder Consultation Evidence, dated 16/04/2019 06:56	Closed
Office of Environment & Heritage (OEH) - Flooding	OEH – Flooding response following invitation to PLR Portion 2 Early Works Consultation Workshop for CEMP and sub-plans with ‘ <i>As there is negligible flood issues for this portion my attendance is not required at this stage.</i> ’			Annexure I of CEMP Stakeholder Consultation Evidence, dated 26/02/2019 11:28	Closed

Appendix C – ER Endorsement

14 January 2020

Transport for NSW

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

Review of Parramatta Light Rail Stage 1 - Package 3 Portion 2 Remediation Works Ventia –CEMP Appendix B4 - Construction Soil and Water Management Plan (CSWMP) Version 5.1

Pursuant to SSI-8285 Condition of Approval A23 (d) (i), as the approved Environmental Representative, I confirm that I have reviewed, provided comments and I approve the minor amendments of the following document pursuant to condition of approval C8:

- CEMP Appendix B4 - Soil and Water Management Sub Plan for Package 3 – Portion 2 Early Works (PLR-VNT-SAM-PE-PLN-000019 – Version 5.1, December 2019). The plan was updated to include the update on stormwater management (temporary water treatment plant) and closing out TfNSW comments. There was no major change on the plan only minor amendments.

Yours sincerely,

[REDACTED]

Environmental Representative

Phone: [REDACTED]

email: [REDACTED]

Filename: AQ1148.05 PLR P3P2 VENTIA CSWMP V5.1 ER ENDORSEMENT 20200114

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Level 10, 130 George Street Parramatta 2150



Appendix B7

Air Quality Management Sub Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1
April 2020

PLR-VNT-SAM-AT-PLN-000003

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Parramatta Light Rail – Stage 1

Portion 2 Early Works (Package 3) – Air Quality Management Sub-plan

Document Control

Title	Parramatta Light Rail – Stage 1 Portion 2 Early Works (Package 3) Air Quality Management Sub-plan
Prepared and reviewed by	██████████ - Environment and Hygiene Manager ██████████ Environmental Scientist
Signed	██████████
Dated	16/04/2020
Approved on behalf of Ventia Utility Services Pty Ltd by	██████████ Project Manager
Signed	██████████
Dated	16/04/2020
Endorsed by Environment Representative	██████████, Senior Environmental Project Manager
Signed	<i>Refer Appendix A</i>
Dated	14/04/2020

Version control

Revision	Date	Description	Prepared by	Approval
00	25/02/2019	For Review	[REDACTED]	[REDACTED]
01.02	29/03/2019	Post TfNSW & ER Review	[REDACTED]	[REDACTED]
02	11/04/2019	ER Endorsement	[REDACTED]	[REDACTED]
03	26/02/2020	6 Monthly Review	[REDACTED] [REDACTED]	[REDACTED]
04	16/04/2020	6 monthly Review - TfNSW Comments	[REDACTED] [REDACTED]	[REDACTED]

Glossary/ Abbreviations

Abbreviations	Expanded text
AQMP	Air Quality Management Sub-Plan
BoM	Australian Government Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CoA	NSW Minister for Planning Conditions of Approval
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
ECM	Environmental Control Map
EEC	Endangered Ecological Community
The EIS	<i>Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017</i>
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects
Environmental incident	An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve
Environmental policy	Statement by an organisation of its intention and principles for environmental performance
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives
Environmental Representative	A suitably qualified and experienced person independent of the Contractor and Proponent, and project design and construction personnel, employed for the duration of construction. The Environmental Representative sits under the Independent Certifier.
EMS	Environmental Management System

EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ESCP	Erosion and Sediment Control Plan
GREP	Government Resource Efficiency Policy
Mbgl	Metres below ground level
Minister, the	Minister of the NSW Department of Planning and Environment (or delegate)
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation
O&M	Operation and Maintenance
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report
PLR	Parramatta Light Rail
Principal, the	Transport for NSW
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)
Project, the	Parramatta Light Rail – Stage 1 (Westmead to Carlingford)
RAP	Remediation Action Plan for 6-10 Grand Avenue, Camellia, NSW, November 2017)
SaM Facility	Stabling and Maintenance Facility
SDS	Safety Data Sheet

1 Introduction

1.1 Context and scope

This Air Quality Management Sub Plan (AQMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail – Stage 1 (PLR Stage 1 or the Project) and has been prepared to target specifically *Package 3: Early Works in Portion 2* (referred to hereafter as Portion 2 Early Works) as part of the Enabling Stage of the Project. Refer to the *Parramatta Light Rail (Stage 1) Staging Report (Project Wide)* (TfNSW 2019) for further detail.

Package 3: Early Works Portion 2: the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue, Rosehill. This is the allocated site for the SaM Facility.

Ventia Pty Ltd (Ventia) has been appointed by Transport for NSW (TfNSW) as the head contractor for Package 3 works, responsible for delivering the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue Rosehill (refer to Section 1.4 of the CEMP for project scope).

This AQMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMM) listed in the *Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017* (the EIS) and the subsequent Submissions Report (incorporating Preferred Infrastructure Report) (TfNSW 2018) and all applicable legislation.

This AQMP provides the management approach and requirements (including environmental mitigation measures, controls, monitoring and reporting) for managing air quality during construction of Portion 2 Early Works. This Plan forms one of six sub-plans which are collectively covered by the Construction Environmental Management Plan (CEMP). Effective implementation of the CEMP (and associated sub-plans) will ensure that environmental resources, responsibilities and management measures are adopted during the construction activities.

The implementation of the CEMP and associated sub-plans are aligned with Project level management plans including the Community and Stakeholder Engagement Plan and the Sustainability Plan as illustrated in Figure 1-1.

The review and document control process for this Plan are described further in [Section 8](#).

The context of this AQMP in relation to the environmental management system is presented below in **Figure 1-1**.

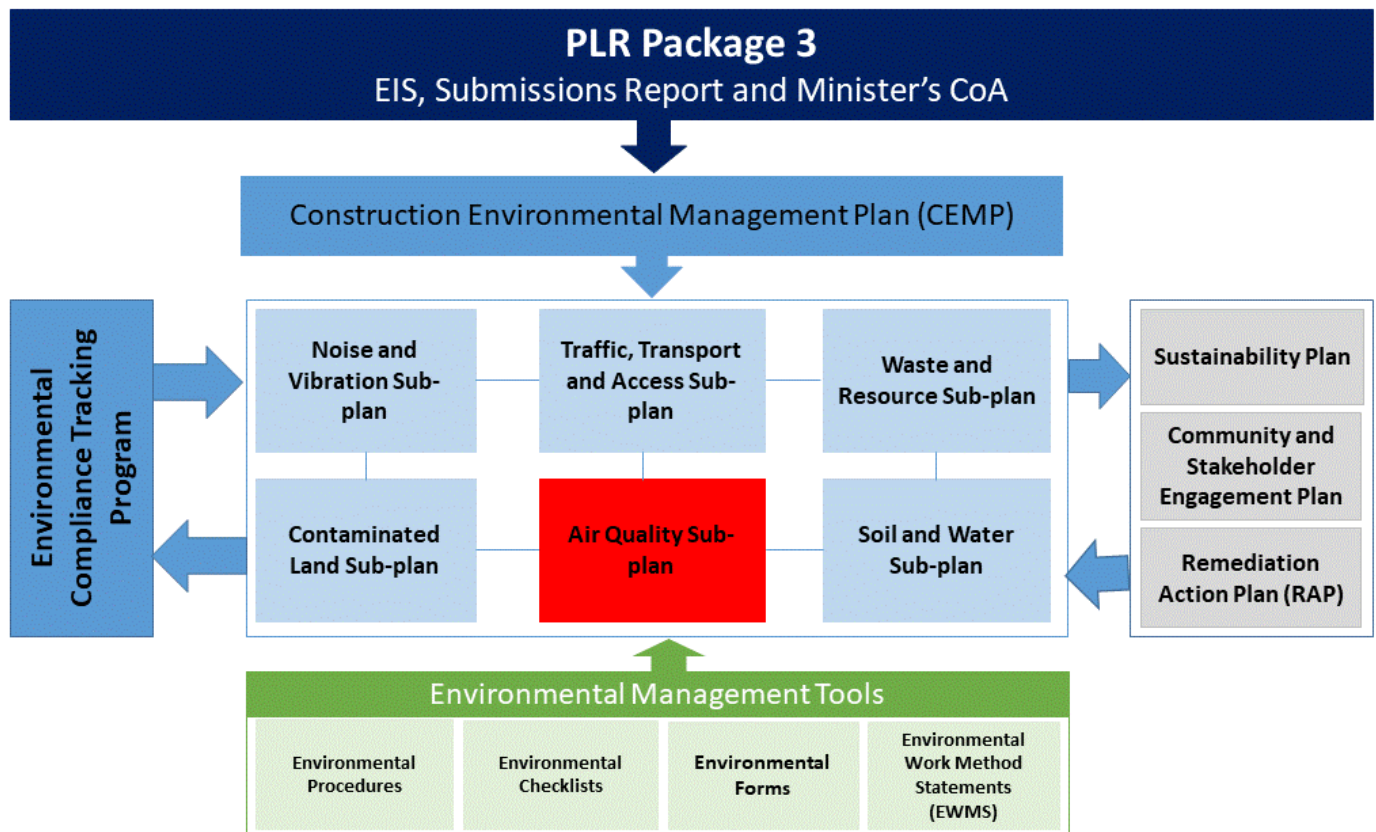


Figure 1-1: Package 3 Environmental Management System and CEMP Context

1.2 Background and project description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney population, particularly the population growth of the Parramatta Local Government Area (LGA).

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

PLR Stage 1 project will link Parramatta's central business district (CBD) and train station to a number of key locations, including the following:

- Westmead Precinct;
- Parramatta North Growth Centre;
- The new Western Sydney Stadium;
- The Camellia Town Centre;
- The new Powerhouse Museum;
- 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 PLR Stage 1 project include:

- A new dual track light rail network of approximately 12 kilometres in length (including approximately seven kilometres within the existing road corridor and approximately five kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services);
- A total of 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 5 am to 1 am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7 am and 7 pm;
- 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 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); and
- Real time information in light rail vehicles and at Stops via visual displays and audio.

Details of the Project alignment and station locations is provided in Figure 1-1 of the CEMP.

1.2.1 Stabling and Maintenance Facility

As part of the development of the Project, the TfNSW owned land located at 6-8 Grand Avenue Camellia was identified as the preferred site for the stabling and maintenance facility (SaM Facility). The SaM Facility is being constructed on the former industrial site adjacent to the Rosehill Gardens Racecourse within the Rosehill and Camellia precinct (refer to **Figure 1-2**).

The SaM Facility would provide for the storage of light rail vehicles, maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities as well as the operations control centre for the light rail network will be located within the maintenance building. Parking for staff and visitors will be provided on site, including maintenance vehicle parking. An electrical substation will be located at the rear of the site to power the facility and light rail.

To accommodate the development of the stabling and maintenance facility, and reduce the potential for interaction with contaminated material during construction, the following activities will

be undertaken as part of the enabling works, specifically *Package 3: Early Works Portion 2* and subject of this AQMP:

- Importation and placement of appropriate fill material across the site to raise the surface finish level by about two metres;
- Installation of an appropriate capillary break to eliminate subsurface contamination migration;
- Installation of an appropriate vapour barrier and structural surface capping layer;
- The Temporary Works encompasses establishment of plant, equipment and facilities on the Site to support the delivery of the Works;
- The Enabling Works encompasses establishment and management of utilities and other below-ground infrastructure on the Site to support the delivery of the Works;
- Construction of a berm for the retention and containment of waste materials on-site;
- Implementation of Ground Improvement Works where required;
- Implementation of the monitoring and validation program; and
- Preparation of Stage 2 Site Validation Report and a Long Term Environmental Management Plan (LTEMP) to the satisfaction of the Site Auditor.

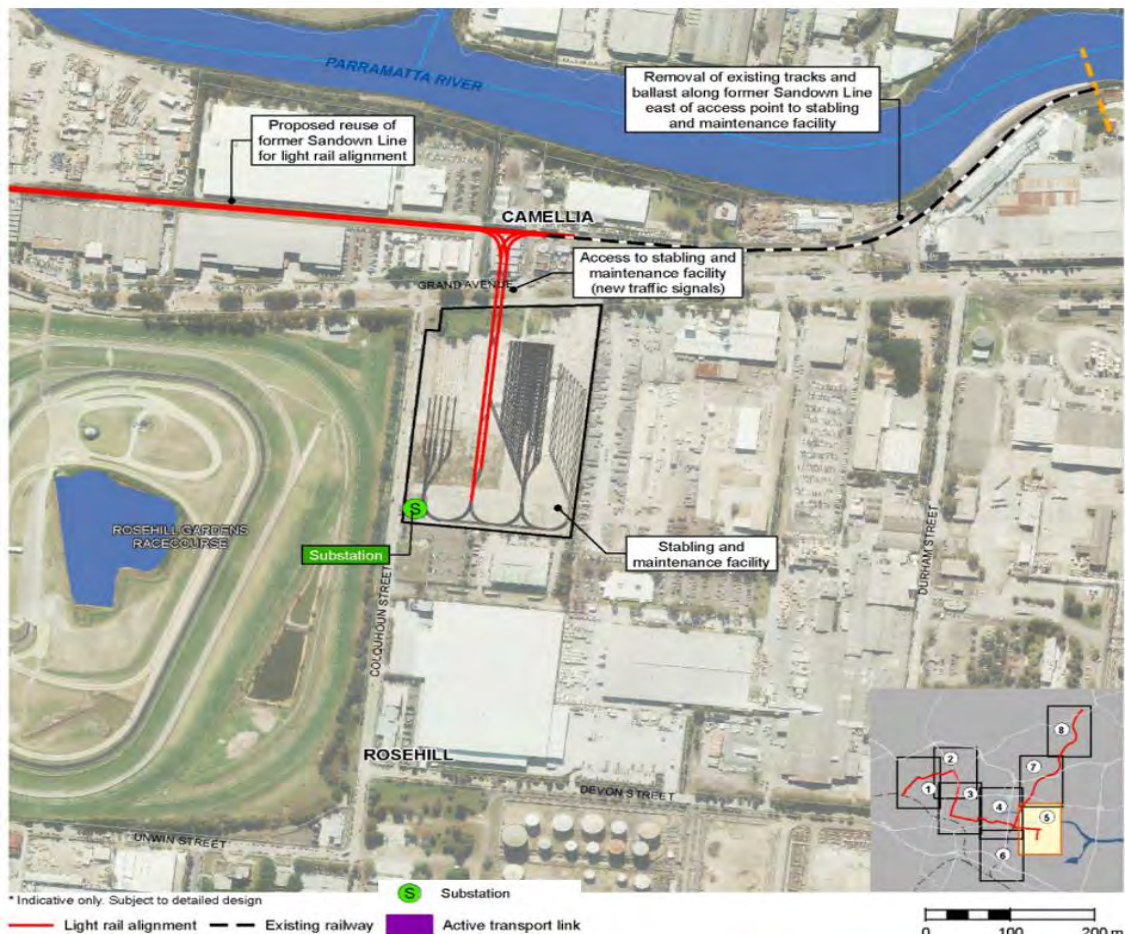


Figure 1-2: Package 3 - Portion 2 Early Works - SaM Facility location (Source: EIS Figure 6.2e)

1.2.2 Statutory Context

The Project is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the Environmental Planning and Assessment Act, 1979 (EP&A Act). The Minister for Planning is the approval authority for the Project.

In accordance with section 5.22(2) of the EP&A Act, the only environmental planning instruments that apply to the proposal are State Environmental Planning Policy (Infrastructure) 2007 (insofar as it relates to the declaration of development that does not require consent) and State Environmental Planning Policy (State and Regional Development) 2011 (as it pertains to the declaration of infrastructure as SSI). There are no other environmental planning instruments that substantially govern the carrying out of the project.

The Portion 2 Early Works site has been subject to long term regulation by the NSW Environmental Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act). The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP). The RAP has been reviewed and endorsed by a NSW EPA-accredited Site Auditor in accordance with the CLM Act.

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described below in [Section 1.2.3](#).

1.2.3 Parramatta Light Rail Planning Approval

An Environmental Impact Statement (EIS) for the project was placed on public exhibition between 23 August and 23 October 2017. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the project to the Department of Planning and Environment. Following the conclusion of the public exhibition period, Transport for NSW prepared a Submissions Report and Preferred Infrastructure Report for the project to address the issues raised in community and stakeholder submissions, and to document a number of proposed design changes and additional investigations undertaken since exhibition of the EIS.

In May 2018, the Minister for Planning granted approval of the Project, under Section 115ZB of the EP&A Act. Following approval of the CSSI, a modification was assessed by the DP&E and subsequently approved on the 21st December 2018 under section 115ZI of the EP&A Act (Modification 1). Modification 2 was requested from DP&E and approved on the 25th January 2019.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.3 Environmental management systems overview

The environmental management system overview is described in section 1.6 of the CEMP.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to provide the foundation for the management of air quality impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Portion 2 Early Works.

Specifically, this Plan details the air quality management requirements that must be satisfied in order to demonstrate compliance with the REMMMs. Mitigation measures (specific to air quality) are derived from the EIS and through risk assessment processes (refer [Section 3.3](#)) and included within this AQMP. Refer to [Section 3.4](#) for relevant air quality mitigation measures and controls.

Implementation of these measures is ensured through monitoring, training and competence, inspection, audit and reporting actions detailed in Sections [7.2](#), [7.4](#), [7.5](#) and [7.6](#) with the responsibilities for implementation identified in [Section 6](#). Continual improvement processes in relation to compliance with regulatory requirements are detailed in [Section 8](#).

Effective implementation of this Plan will assist the contractor and relevant sub-contractors to achieve compliance with necessary environmental regulatory and policy requirements in a systematic manner with an outcome of continual environmental management performance.

2.2 Objectives

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

- The environmental impact assessment prepared for Parramatta Light Rail Stage 1;
- Conditions of Approval granted to the project on 29 May 2018; and
- Transport for NSW's Air Quality Management Guideline 9TP-SD-107/3.0.

To achieve these objectives, contractor will undertake the following:

- Detail best practicable management practices or controls be implemented to minimise off-site odour, fume and dust emissions from project activities;
- Minimise visible air pollution by the project;
- Assess the effectiveness of air quality control measures;
- Minimise the surface disturbance of the site negated by the project and ensure dust concentrations and deposition levels remain below relevant air quality criteria;
- Obtain information to provide a basis for ongoing impact air quality assessment; and
- Provide assessment results to demonstrate compliance with the CoA of the Project Approval.

2.3 Targets

Air quality specific targets and performance criteria have been established for the management of air quality impacts during Portion 2 Early Works. The targets and performance criteria for Portion 2 Early Works air quality management are as follows:

- Ensure full compliance with the relevant legislative requirements, CoA and REMMMs;

- No off-site emissions of nuisance dust levels / air emissions resulting in complaints; and
- Ensure training on best practice air quality management is provided to all construction personnel through site inductions.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

All legislation relevant to this AQMP is included in the *Legal and Other Requirements Register*, attached as Appendix A1 of the CEMP. In summary, relevant legislation to this AQMP include:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Protection of the Environment Operations Act, 1997* (POEO Act); and
- *Protection of the Environment Operations (Clean Air) Regulation 2010* (POEO (Clean Air) Regulation).

3.1.2 Guidelines and standards

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

- National Environment Protection Councils (NEPC) – National Environment Protection Measure (NEPM) for Ambient Air Quality Guidelines;
- 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;
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC 2005);
- Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom 2004) and Volume 2 (DECC 2008) (the “Blue Book”);
- Transport for NSW’s Air Quality Management Guideline 9TP-SD-107/3.0;
- Government Resource Efficiency Policy (OEH 2014); and
- Air Quality Monitoring Criteria for Deposited Dust (DEC Guideline), Refer to Table 5.1 below.

3.2 Air quality criteria

The relevant air quality criteria applicable to the Portion 2 Early Works are detailed in the POEO Act and POEO (Clean Air) Regulation as follows:

Protection of the Environment Operations Act, 1997 (POEO Act)

- Do not cause air pollution by failing to maintain and operate plant, or carry out maintenance work on plant, in a proper and efficient manner;
- Must not allow soil or dust to be deposited or blown onto a public place; and
- Material harm pollution incidents involving only odour are required to be notified to the EPA in the same manner as other environmental incidents.

Protection of the Environment Operations (Clean Air) Regulations, 2010

- Vehicles must not emit visible air impurities for a continuous period of 10 seconds or more (Clauses 8 & 9).

Air Quality Guidelines

Air quality is measured in terms of particulate matter - Total Suspended Particles (TSP), particulate matter with a diameter less than 10 microns (PM₁₀), and dust deposition (measured as insoluble solids). The NSW Office of Environment and Heritage (OE&H) specify assessment criteria for each of these parameters in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005).

Relevant assessment criteria to be applied for the primary pollutants associated with the construction phase of the Portion 2 Early Works are presented below in **Table 3-1: Air quality impact assessment criteria**. The original sources for each criterion from the approved methods are also listed.

Table 3-1: Air quality impact assessment criteria

Pollutant	Averaging Period	Impact assessment criteria*	Source
Particulate matter (PM ₁₀)	24 hours	50 µg/m ³	NEPM DoE, 2016
	Annual	25 µg/m ³	NEPM DoE, 2016
Particulate matter (PM _{2.5})	24 hours	25 µg/m ³	NEPM DoE, 2016
	Annual	8 µg/m ³	NEPM DoE, 2016
Total suspended solids (TSP)	Annual	90 µg/m ³	NHMRC, 1996
Deposited dust	Annual (max. increase)	2 g/m ² /month	NERDDC, 1988
	Annual (max. total)	4 g/m ² /month	NERDDC, 1988

- µg/m³ = Micrograms per cubic metre
- g/m²/month = Grams per square metre per month
- Max. = maximum

Any exceedance of the above criteria will be reported to the Department of Planning and Environment in accordance with Section 3.9 of the CEMP.

3.3 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in Table 3-2 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents. A risk assessment process capturing risks and mitigation measures relating to project effects on Air Quality is contained within CEMP Appendix A2 – Project Risk Register.

Table 3-2: Conditions of Approval relevant to the AQMP

CoA No.	Condition Requirements	AQMP Reference	How Addressed
C20	Boundary screening required under Condition C19 of this approval must reduce visual, noise and air quality impacts on adjacent sensitive receivers. (C19 - Boundary fencing that incorporates screening must be erected around all construction ancillary facilities that are adjacent to sensitive receivers for the duration of site establishment and construction)	Section 7.3.1	Perimeter branded screening will be established along the public facing site boundaries to limit off-site dust emissions generated during Portion 2 Early Works activities.

3.4 Revised Environmental Mitigation and Management Measures

Relevant REMMMs as per the SPIR and Staging Report 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 relevant to this AQMP

Ref #	Commitment	Timing	AQMP Reference	How Addressed
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:			
	Apply wheel-wash or rumble grid facilities as appropriate to remove loose material and prevent the tracking of spoil debris onto local roads.	During construction	Section 7.3.5	A rumble grid or wheel wash will be established at the exit of project exclusion zone to decontaminate plant and facilities will be available to dislodge any materials, prior to leaving site.
	Clean loose materials and debris from the tailgate of vehicles unloading materials to stockpiles prior to departure from site.	During construction	Section 7.3.5	All truck tail gates shall be securely fixed prior to loading and immediately after unloading solid materials. Vehicles leaving the site must be clean so as to prevent sediment tracking onto the local road network. Tail gates and Vehicles will be inspected prior to leaving the site.

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	Conduct routine servicing and maintenance, and subsequent inspections to ensure that equipment continues to operate efficiently.	During construction	Section 7.4	Prior to use on-site, a Hired in Plant Inspection will be performed by a qualified mechanic. This inspection will be reviewed by the Site Supervisor prior to use. Daily Pre-start Plant/Equipment inspections shall be conducted by operators prior to commencing works. Additional routine maintenance, including reviewing emissions, shall be conducted in accordance with the O&M requirements of the Plant/Equipment.
	Ensure that all loads are covered when materials are being hauled to and from site.	During construction	Section 7.3.5	All trucks transporting material, including imported fill and off-site disposal of spoil and waste materials shall be secured and completely covered by trucks fitted with auto-retractable tarps. Tarps will be closed after loading the material and be maintained until the final destination for unloading the trucks.
	Ensure that compound area surfaces are well compacted or sealed to limit the potential for dust generation.	During construction	Section 7.3.1	The majority of the project site is covered with concrete hardstand. This hardstand will be maintained as far as practicably possible during the capping of the project site. As capping layers are installed on the project site, areas will be progressively compacted to install the remediation capping layers. Additional dust mitigation controls, such as water suppression through water carts, sprinklers and application of dust binding agents, such as Dustex shall be introduced to minimise dust generation throughout the works.

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	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.	During construction	Section 7.3.2	Prior to demolition activities, any structures shall be inspected by an Occupational Hygienist or other suitably qualified person to confirm that they do not contain any hazardous materials (e.g. asbestos) which could be broken and mobilised during demolition activities. Where such materials are identified, the materials will be appropriately removed and disposed or controlled in accordance with the Work Health and Safety Act 2011 and Work Health and Safety Regulations 2017
	Impose low speeds limits around compound sites to limit the generation of dust from vehicle movements.	During construction	Section 7.3.1	Low speeds limits of 10km/h shall be established around site compounds to limit the generation of dust from vehicle movements.
	Install dust monitoring devices to quantify dust levels and determine whether control measures are adequate or whether further actions are required.	During construction	Section 7.4.2	Monthly dust deposition gauge monitoring will be performed during Portion 2 Early Works. Dust deposition gauges were installed at the commencement of previous remediation activities and were installed along the eastern, southern and western perimeter of the site. These locations affect the nearest neighbours and project stakeholders. Each location will be mapped onto the Environmental Control Map (ECM).

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	Installation of perimeter screening around areas where there is a potential to generate emissions to air and around long-term compound and stockpile locations.	During construction	Section 7.3.1	TfNSW branded screening is established on the perimeter fencing of all externally visible boundaries surrounding the site to limit off-site dust emissions. Installation of geofabric shall also be installed as an additional screening will be provided for specific activities.
	Plan activities and avoid adversely windy conditions which may result in the generation of off-site dust impacts.	During construction	Section 7.3.2	The Site Supervisor will review the weather forecast daily and coordinate certain activities at the daily pre-start meeting. The Supervisor will review activities throughout the day and reassess activities on a regular basis. Controls, such as the use of water cart will be introduced. In the event that conditions are unable to be adequately controlled, activities may be rescheduled or relocated.
	Position stockpiling areas as far as possible from surrounding receivers.	During construction	Section 7.3.1	The project site is situated within a heavy industrial zone, with impacts on sensitive land uses and receivers identified as low. Stockpile locations will be maintained to minimise the overall impact on all neighbours with permanent stockpiles being designed with suitable coverage to prevent adverse dust emissions being generated. Active stockpiles shall be regularly consolidated and compacted to minimise dust generation throughout the works.

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	Regularly water exposed and disturbed areas and stockpiles especially during inclement weather conditions.	During construction	Section 7.3.1 & 7.3.3	A water cart or other water suppression techniques will be used to wet down exposed areas to prevent dust borne emissions. Additional mitigation measures, such as applying a dust binding agent (e.g. Dustex) may also be applied to reduce air quality emissions during adverse weather conditions.
	Water demolition areas as necessary to minimise the generation of dust.	During construction	Section 7.3.3	Use of water to wet down an area or an operation is an effective dust control technique and will be implemented where practicable to do so. Water carts may be used to spray water onto haul roads and other hardstand areas where there is a potential for dust generation. Water carts may also be fitted with a water cannon and/or hose, capable of directing water at localised operations such as excavator operations, concrete breaking, stockpiles and exposed surfaces as well as a spray bar for hardstand areas.
	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.	During construction	Section 7.3.1	Measures will be taken to minimise the amount of and volume of materials in stockpiles on site as far as practicable. Inactive stockpiles shall be covered or stabilised. As part of Portion 2 Early Works, the site will be capped by a fill layer.

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	Apply odour suppressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works.	During construction	Emergency Response Management Plan (A7 of the CEMP) Contaminated Land Management Plan (Appendix B9 of the CEMP)	In an unexpected finding of contaminated or hazardous material event, Environmental Emergency and Incident Response Plan will be implemented to minimise impacts.
	Construction plant and equipment would be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards.	During construction	Section 7.4	Hired in plant inspections will be performed by the Supervisor prior to use. This inspection will consider maintenance and servicing of plant and equipment.
	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.	During construction	Section 7.3.5	All vehicles used for Portion 2 Early Works, shall be regularly serviced and maintained to avoid excess emission of air impurities to comply with relevant Australian emission standards.
	All on-road trucks would comply with the relevant Australian emission standards.	During construction	Section 7.3.5	All vehicles used for Portion 2 Early Works, shall be regularly serviced and maintained to avoid excess emission of air impurities to comply with relevant Australian emission standards.
	All chemicals and fuels would be stored in sealed containers as per appropriate regulations and guidelines.	During construction	Section 7.3.1	All chemicals and fuels that have the potential to emit toxic vapours or odours will be stored and kept as per Safety Data Sheets (SDSs).

Ref #	Commitment	Timing	AQMP Reference	How Addressed
	The on-site storage of fuel would be kept to a minimum.	During construction	Section 7.3.1	On-site storage of fuel shall be as minimal as practicable and in accordance with the Storage and Handling of Dangerous Goods (WorkCover NSW, 2005).
AQ-1	Unloading of fuels (diesel or liquefied nitrogen gas (LNG)) would be vented via return hoses that recirculate vapours from delivery to receiver.	During construction	Section 7.3.1	Unloading of fuel and refuelling operations (e.g. diesel or liquefied nitrogen gas (LNG)) would be conducted with vapour recovery nozzles with return hoses that allow vapours to be collected and recirculated through the system.
	On dry days, unsurfaced haul roads would be watered to aid dust suppression	During construction	Section 7.3.1	On dry days, additional dust mitigation controls, such as water suppression through water carts and sprinklers shall be maintained to minimise dust generation throughout the works.
	Stockpiles left for extended periods would be grassed or covered with appropriate material.	During construction	Section 7.3.1	Inactive stockpiles shall be covered or stabilised (e.g. tarpaulins, geotextile, stabilisation matting or other suitable material) when they are planned to remain inactive for 14 business days or greater or when adverse weather conditions (e.g. high winds) are forecast or where there is a potential for generation of odours or contaminated vapours or particulate outside of exclusion zones.
	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)	During construction	Section 7.3.1	Chemical storage cabinets and Fuel storage tanks shall have breather pipes to prevent build-up of vapour pressure

4 Existing Environment

The following sections summarise what is known about factors influencing air quality impacts and management associated with the Portion 2 Early Works and adjacent land users/ receivers.

The key reference documents are in section 10.8 of the EIS and Technical Paper 9, Volume 4 of the EIS.

4.1 Air quality records

The NSW OEH operates a state wide air quality monitoring network which provides information on current and historical air quality. The nearest station in relation to the Portion 2 Early Works site is the Parramatta North air quality monitoring station, which is located at Cumberland Hospital, Fleet Street (approximately four and a half kilometres to the northwest). The Parramatta North monitoring location has only been commissioned since December 2017. Therefore, data from Prospect (approximately eleven and a half kilometres to the west) has been used to characterise ambient air quality conditions for the Portion 2 Early Works site and adjacent areas.

The following air pollutants and meteorological variables are considered in this plan:

- Fine particles as PM₁₀;
- Fine particles as PM_{2.5};
- Wind speed, wind direction and sigma theta;
- Ambient temperature; and
- Relative humidity.

4.1.1 Air Quality Index

NSW OEH developed a metric known as the 'air quality index' (AQI) to provide an indication of the overall air quality.

For each pollutant, the AQI is the data value expressed as a percentage of the level specified by the National Environment Protection Measure for Ambient Air (NEPM) standard (or, in case of visibility, of the relevant NSW standard). An AQI of 100 corresponds to the NEPM level. A lower value indicates better air quality and a higher value, worse. The AQI value classifications are:

- 0 – 33 (Very good);
- 34 – 66 (Good);
- 67 – 99 (Fair);
- 100 – 149 (Poor);
- 150 – 199 (Very poor); and
- >200 (Hazardous).

Statistics generated from daily AQI values calculated at the OEH air quality monitoring station at Prospect are presented below in **Table 4-1**. These statistics indicate that daily AQI values are generally 'good' with occasional days of 'fair' to 'poor' air quality or worse, usually driven by particulate matter concentrations.

Table 4-1: AQI value statistics

Period	Annual daily average	95 th percentile of daily values	Annual daily maximum
2013	57.8 (Good)	112.1 (Poor)	641.0 (Hazardous)
2014	48.0 (Good)	85.0 (Fair)	140.0 (Poor)
2015	49.5 (Good)	89.7 (Fair)	186.0 (Very Poor)
2016	56.6 (Good)	99.6 (Poor)	810.0 (Hazardous)
2017	48.9 (Good)	87.2 (Fair)	249.0 (Very Poor)
2018	54.9 (Good)	109.0 (Poor)	318.0 (Hazardous)

A summary of the ambient pollutant concentrations measured from 2013 to 2018 inclusive, has been tabulated and is presented below in **Table 4-2**.

Table 4-2: Summary of ambient pollutant concentrations measured from 2013 to 2018 at Prospect

Year	Ambient Pollutant Concentrations		Criterion
	Maximum 24 hour averaged PM ₁₀ in µg/m ³	95 th percentile of 24 hour averaged PM ₁₀ in µg/m ³	
2015	68.7	30.1	50
2016	110.1	33.8	
2017	61.1	32.1	
2018	113.3	37.5	
	Maximum annual averaged PM ₁₀ in µg/m ³		
2015	17.6		25
2016	18.9		
2017	18.9		
2018	21.9		
	Maximum 24 hour averaged PM _{2.5} in µg/m ³	95 th percentile of 24 hour averaged PM _{2.5} in µg/m ³	
2015	29.6	15.6	25
2016	84.9	18.0	
2017	30.1	15.8	
2018	47.5	16.2	
	Maximum annual averaged PM _{2.5} in µg/m ³		
2015	8.2		8
2016	8.7		
2017	7.7		
2018	8.5		

Source : <https://www.environment.nsw.gov.au/AQMS/search.htm>

Considering the results presented in Table 4-2: **Summary of ambient pollutant concentrations measured from 2013 to 2018 at Prospect** against the assessment criteria established in [Section 3.2](#), the following observations were made regarding the background concentrations for each key pollutant of interest.

Particulate matter (PM₁₀)

- Maximum 24 hour-averaged PM₁₀ background concentrations were found to exceed the criterion of 50 µg/m³ through all years considered. 95th percentile values of 24 hour-averaged concentrations ranged from 30 to 38 µg/m³, with gradually increasing values in each year and the highest value recorded at Prospect in 2018.
- Annually averaged PM₁₀ background concentrations were consistently 18 to 22 µg/m³ across all years considered. These levels are below the assessment criterion (25 µg/m³).

Particulate matter (PM_{2.5})

- Maximum 24 hour-averaged PM_{2.5} background concentrations were also found to be exceeding above the criterion of 25 µg/m³, but 95th percentile of 24 hour-averaged PM_{2.5} concentrations were well below the criterion, ranging from 15 to 18 µg/m³.
- Annually averaged PM_{2.5} background concentrations were ranged between 7.7 to 8.7 µg/m³, which were recorded to be at or exceeding the assessment criterion of 8 µg/m³.

4.2 Rainfall, soil dryness and wind

Long-term mean climate data recorded at the North Parramatta automated weather station (BoM weather station no. 66124) has been adopted to represent the climate conditions at the Portion 2 Early Works site which is located approximately 3.3 km northwest from the site. A summary of key monthly climate data statistics from the North Parramatta weather station for the period of 1965-2018 is presented below in **Table 4-3**.

Table 4-3: Monthly climate data (North Parramatta weather station – No. 66124)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean max temperature (°C)	28.5	27.9	26.3	23.8	20.6	17.8	17.5	19.1	21.7	24.0	25.5	27.5
Mean min temperature (°C)	17.6	17.6	15.9	12.9	9.9	7.6	6.2	7.1	9.3	12.0	14.1	16.3
Mean rainfall (mm)	103.1	121.2	110.4	91.0	67.2	92.8	44.5	55.3	51.1	68.7	84.6	73.4
Mean number of rain days (>1 mm)	8.9	9.1	9.7	7.2	6.9	7.5	5.4	5.2	5.9	7.6	8.7	7.7
Mean 9am wind speed (km/h)	7.3	6.4	6.4	6.7	6.7	7.2	7.7	9.1	9.8	9.8	8.4	8.1

http://www.bom.gov.au/climate/averages/tables/cw_066124.shtml

Table 4-3 illustrates historic data for the climatic factors that contribute to the generation of dust particles. In addition to the exposure of unconsolidated material during project activities such as earthworks, climatic factors such as dry weather, high winds and high evaporation has the potential to elevate the likelihood of dust emissions.

Records from the North Parramatta Weather Station show that the area near the Project site experiences warm and wet summers with mean daily maximum temperature 28°C. 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 50 mm per month and therefore a higher likelihood of dust generation. Rainfall is typically highest in February.

4.3 Soil Characteristics

According to data available in the Remediation Action Plan (Golder, November 2017)) (RAP), the site is located partly on disturbed terrain over Tertiary sediments (deposited 65 - 1.8 million years ago) and partly on Holocene sediments (<12,000 years old). A review of NSW Resources and Geoscience data¹ (Herbert, 1983) of the region surrounding the site indicates underlying these materials geological units of the Ashfield Shale, of the extensive Wianamatta Group. Other geological units that are present in the area surrounding the site include the Hawkesbury Sandstone (part of the older Narrabeen Group) to the north and the Bringelly Shale (also part of the Wianamatta Group) to the south. Both units have been encountered in intrusive investigations at the site with the Hawkesbury Sandstone mostly beneath the northern portion and the Ashfield Shale underlying the remainder of the site.

Site stratigraphy was determined by review of available bore logs and includes the following downward stratigraphic sequence (Coffey 2017a and 2017b, Golder 2015, Environmental Earth Sciences 2011a): (refer to Figure 1a from RAP for locations of areas specified below)

- Fill material including mixed clays, sand, ash and demolition rubble (0.2-1.2.3 mbgl, and down to approximately 3.5-4 m in the areas of the former Eastern Chromium Liquor Residue Pond and southern settling ponds);
- Fill material in the area of the former neutralisation pits (immediately north of Area B) including gravelly sands and gravelly clays with layers of ash, occasional crushed concrete and brick, hydrocarbon and chemical odours and one potential asbestos containing material fragment (0.2-3.5 mbgl);
- Fill material within Remediation Area A (<11 mbgl), Area B (<12 mbgl). Areas A and B comprised reworked natural material (see below) that was either remediated, or overburden generated during excavation works. Fill material found to be containing asbestos was placed in Area B at depths of more than 2 mbgl (Environmental Earth Sciences, 2010b). The Western Chromium Liquor Residue Pond (WCLRP) was in-filled (<4 mbgl) with: fill material that was removed from the WCLRP only (post-processing);
- Grey/brown/orange clay with some sand and laterite lenses (0.25-5.25 m in thickness);
- Grey/red clay with some sand and laterite lenses (0.25-8.75 m in thickness);
- Residual grey clay (0.25-2.75 m in thickness); and
- Bedrock – shale or sandstone (encountered from ~7 mbgl in the north-west to 20 mbgl in the southeast).

¹ Map from 1:100,000 Geological Series Sheet 9130 (Herbert, 1983) source - https://resourcesandgeoscience.nsw.gov.au/_data/assets/image/0006/343527/Sydney_100K_Geological_Sheet_9130_1st_edition_1983.jpg

5 Environmental aspects and impacts

5.1 Construction activities

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; and
- Gaseous.

Key construction activities that could result in dust emissions include:

- Geotechnical and soil investigations;
- Operation of site compound (vehicle and plant movement);
- Bulk earthworks;
- Material handling, crushing and screening;
- Soil handling and stockpiling;
- Concrete cutting and demolition;
- Vehicular movements over unpaved surface (including unsealed access roads);
- Wind erosion of exposed areas and temporary stockpiles; and
- Tracking of dirt onto roads.

Key construction activities that could result in air emissions, other than dust include:

- Vehicle and plant exhaust emissions, which may be excessive if vehicles and plant are poorly maintained;
- Odours / gases released during:
 - Excavations of contaminated materials.
 - During sealing works.
 - Construction amenities – ablution facilities, waste storage etc.

5.2 Factors likely to affect dust generation and impacts

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 content – 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;
- Evaporation – dries out the surface of the soil and leads to increased risk of dust generation;

- Exposed surfaces – during construction unsealed surfaces will be exposed prior to completion of works, which is a key factor influencing dust emissions;
- Effectiveness of protective measures; and
- Adjacent land uses and activities that may create dust resulting in a cumulative impact on air quality.

5.3 Impacts

Construction activities have the potential to increase airborne particulate matter and cause nuisance impacts where construction is in close proximity to sensitive receivers. The potential for impacts on air quality will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with the natural environment.

Generation of dust from construction activities is considered to be the main source of potential air quality impact. The settlement of dust may impact on nearby properties and substantial dust generation could result in health impacts to nearby receivers. Air quality impacts due to dust generation are expected to be insignificant and will be minimised through the implementation of management measures as detailed in [Section 6](#) of this AQMP.

Construction activities that involve handling, disturbance and management of soil, aggregate and other materials have the highest potential to generate air quality impacts during construction. The impact of exhaust fumes from machinery and other construction vehicles will be limited throughout the Portion 2 Early Works. Operation of machinery and other construction vehicles will be undertaken to meet the relevant criteria to minimise the generation of exhaust emissions.

Potential impacts attributable to 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;
- Impacts on water quality and/or vegetation health from dust deposition; and
- Complaints from the public relating to dust or odours.

Some impacts on air quality attributable to the Project are anticipated and have been described in the EIS. [Section 6](#) provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts. Overall, potential air quality impacts during construction are expected to be short-term and minor, provided the safeguards and management measures identified in Section 6 are implemented.

5.4 Sensitive receivers

In accordance with CoA - E20, a detailed land use survey was conducted by undertaking a walk-through of the surrounding areas to the Project site. The detailed land use survey has identified sensitive receptor locations closest to and/or potentially most affected by the Project's construction activities. The survey was conducted within 1.5 kilometres radius from the Project site.

5.4.1 Residential Receptors

The nearest and/or potentially most affected residential receptor areas in relation to the Project site are the residences to the west of James Ruse Drive, between Oak Street and A'Becketts Creek.

Most of the residential properties in the surrounding area have been identified to be either single storey or two-storey low-rise buildings. Seven multi-storey residential apartment buildings identified in the surrounding area and they are all located along James Ruse Drive.

5.4.2 Sensitive Receptors (Non-Residential)

The nearest non-residential receptors in relation to the Project site are:

- Industrial premises to the north, east and south of the Project site;
- Educational facilities –
 - Rosehill Community School (103-105 Hassall Street, Rosehill);
 - Rainbow Village Child Care (42 Weston Street, Harris Park);
 - Rosehill Montessori Kindergarten (42 Weston Street, Harris Park);
 - Little Angels Kindergarten (29 Prospect Street, Rosehill);
 - Rosehill Public School (Prospect Street, Rosehill);
 - Fun2Learn Early Learning Centre (2-4 Virginia Street, Rosehill); and
 - Kinderoo Preschool (38 Eleanor Street, Rosehill).
- Place of worship – BAPS Shri Swaminarayan Mandir (40 Eleanor Street, Rosehill).
- Offices and retail outlets – precinct bounded by Hassall Street to the north, Oak Street to the south, James Ruse Drive to the east and Arthur Street to the west.
- Active Recreational Area – Rosehill Garden racecourse adjacent to the west of the Project site and Rosehill Bowling Club, located at James Ruse Drive and Hassall Street.

6 Environmental control measures

Specific measures and requirements to meet the objectives of this AQMP and to address impacts on air quality 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
AQ1	Perimeter shade cloth will be established surrounding the site to limit off-site dust emissions	Environmental control map	Pre-construction	Project Manager Environment & Hygiene Manager	CoA C20
AQ2	Dedicated haulage routes will be established, wherever possible, haulage routes will be on sealed or compacted hardstand areas	Vehicle movement plan Environmental inspection	During construction	Project Manager Design Manager	REMMM AQ-1
AQ3	Minimise vegetation or hardstand removal and reduce disturb areas	Environmental control map	During construction	Project Manager Design Manager Environment & Hygiene Manager Site Supervisor	REMMM AQ-1
AQ4	Minimise number of stockpiles as far as practicable	Environmental control map	During construction	Site Supervisor	REMMM AQ-1
AQ5	Active stockpiles will be regularly consolidated and compacted	Environmental control map	During construction	Site Supervisor	REMMM AQ-1
AQ6	Inactive stockpiles will be covered or stabilised	Environmental control map	During construction	Site Supervisor	REMMM AQ-1
AQ7	Remove stockpiles as soon as practicable	Environmental control map	During construction	Site Supervisor	REMMM AQ-1

AQ8	All chemicals and fuels will be stored and kept as per Safety Data Sheets (SDSs)	Safety Data Sheets Environmental control map Environmental inspection	During construction	Environment & Hygiene Manager	REMMM AQ-1
AQ9	Minimal on-site storage of fuel	Environmental inspection	During construction	Site Supervisor	REMMM AQ-1
AQ10	Establishment of decontamination and vehicle wash down points	Vehicle decontamination facilities Site induction Environmental Control Map	During construction	Design Manager Site Supervisor	REMMM AQ-1
AQ11	Establish exclusion zones for high risk activities	Environmental control map	During construction	Design Manager Site Supervisor	REMMM AQ-1
AQ12	Appropriate and effective watering or other dust suppression measures will be implemented	Environmental inspection Site induction Water cart operation	During construction	Site Supervisor	REMMM AQ-1
AQ13	Review weather conditions and plan site activities ahead to avoid adversely weather conditions	Weather station Weather forecast monitoring Daily pre-start meetings	During construction	Environment & Hygiene Manager Site Supervisor	REMMM AQ-1

AQ14	All equipment and Plant will be serviced regularly and maintained	Plant pre-start Hired in plant inspections	During construction	Site Supervisor	REMMM AQ-1
AQ15	All trucks will be completely covered prior to leaving the site and keep the cover until unloading.	Commercial driver's induction Environmental inspection	During construction	Site Supervisor	REMMM AQ-1
AQ16	All truck tail gates will be securely fixed prior to loading and after unloading	Commercial driver's induction	During construction	Site Supervisor	REMMM AQ-1
AQ17	Vehicles leaving the site will be clean, this will be inspected prior to leaving the site	Commercial driver's induction Environmental inspection	During construction	Site Supervisor	REMMM AQ-1
AQ18	Establishment of rumble grid at the exit of exclusion zone and facilities	Environmental Control Map	During construction	Design Manager Site Supervisor	REMMM AQ-1
AQ19	Disturbed areas with a high risk of off-site impact shall be managed using dust suppressants (water/biodegradable polymer-based application)	Environmental Control Map	During construction	Site Supervisor Environment & Hygiene Manager	REMMM AQ-1
AQ20	Install dust monitoring devices on site	Monthly dust deposition gauges Environmental inspection	During construction	Environment & Hygiene Manager Site Supervisor	REMMM AQ-1

AQ21	Regular visual monitoring of dust emission	Environmental inspection	During construction	Environment & Hygiene Manager Site Supervisor	REMMM AQ-1
AQ22	Monthly dust deposition monitoring	Monthly dust deposition gauges Environmental inspection	During construction	Environment & Hygiene Manager Site Supervisor	REMMM AQ-1
AQ23	Monitoring of emissions from plant and equipment	Environmental inspection	During construction	Environment & Hygiene Manager Site Supervisor	REMMM AQ-1
AQ24	Daily inspections of dust controls to ensure implemented and effectiveness	Environmental inspection	During construction	Site Supervisor	REMMM AQ-1
AQ25	An Environmental control map (ECM) will be developed displaying traffic routes, location of monitoring equipment, restrictions on certain activities and other air quality mitigation measures as required	CEMP ECM	Pre-construction	Design Manager Environment & Hygiene Manager	REMMM AQ-1
AQ26	Impose low speed limits around the site to limit the generation of dust from vehicle movements	Commercial driver's induction Site induction Vehicle movement plan	During construction	Project Manager	REMMM AQ-1
AQ27	Wherever practical, measures will be taken to minimise the extent of exposed or disturbed contaminated areas. Where this may not be possible, other measures such as temporary covers	Environmental inspection	During construction	Site Supervisor Environment & Hygiene Manager	REMMM AQ-1

	shall be implemented where the potential for dust emissions, odours or contaminated vapours is noted.	Tool box talk if required			
AQ28	Apply odour suppressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works	Stockpile coverings (e.g. tarps) Odour suppressant Environmental inspection	During construction	Site Supervisor	REMMM AQ-1
AQ29	Disturbed areas with a high risk of off-site impact shall be managed using dust suppressants (water/biodegradable polymer-based application) at a frequency that minimises the risk	Environmental inspection	During construction	Environment & Hygiene Manager	REMMM AQ-1

7 Compliance management

7.1 Roles and responsibilities

The Contractor's 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 Plan.

7.2 Training

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

- Existence and requirements of this sub-plan;
- Relevant legislation, regulations and conditions;
- Roles and responsibilities for air quality management;
- Incident response, management and reporting;
- Air quality mitigation and management measures (including dust suppression and surface stabilisation);
- Procedure to be implemented in the event of an incident (e.g. release of dust or gaseous emissions from site);
- Location of sensitive receivers; and
- Complaints response and reporting procedure.

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 or those undertaking an activity with a high risk of environmental impact. Specifically this will include a review of the weather forecast and potential implications for construction activities and dust generation.

Daily pre-start meetings conducted by the Site supervisor will inform the site crew of any environmental issues relevant to air quality that could potentially be impacted by, or impact on, the project activities.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

7.3 Site activities management

7.3.1 Site management

Dedicated haulage routes are to be established for vehicle movements throughout the site which will be documented on the Vehicle Movement Plan (VMP).

Wherever possible, haulage routes shall be on sealed or compacted hardstand areas, such as concrete slabs or compacted imported fill. Crushed rock/ballast or other suitable materials may be used for establishing temporary high trafficable areas where existing roads are not present.

Low speeds limits of 10km/h shall be established around site compounds to limit the generation of dust from vehicle movements.

The majority of the project site is covered with concrete hardstand. This hardstand will be maintained as far as practicably possible during the capping of the project site.

As capping layers are installed on the project site, areas will be progressively compacted to install the remediation capping layers.

Additional dust mitigation controls, such as water suppression through water carts, sprinklers and application of dust binding agents, such as Dustex shall be maintained to minimise dust generation throughout the works, including on dry days.

TfNSW branded screening is established on the perimeter fencing of all externally visible boundaries surrounding the site to limit off-site dust emissions. Installation of geofabric shall also be installed as an additional screening will be provided for specific activities.

There will be an emphasis on minimising active areas in which vegetation or hardstand is removed or disturbed to reduce the area where dust emissions can be generated.

The project site is situated within a heavy industrial zone, with impacts on sensitive land uses and receivers identified as low. Stockpile locations will be maintained to minimise the overall impact on all neighbours with permanent stockpiles being designed with suitable coverage to prevent adverse dust emissions being generated. Active stockpiles shall be regularly consolidated and compacted to minimise dust generation throughout the works.

Inactive stockpiles shall be covered or stabilised (e.g. tarpaulins, geotextile, stabilisation matting or other suitable material) when they are planned to remain inactive for 14 business days or greater or when adverse weather conditions (e.g. high winds) are forecast or where there is a potential for generation of odours or contaminated vapours or particulate outside of exclusion zones.

All chemicals and fuels that have the potential to emit toxic vapours or odours will be stored and kept as per Safety Data Sheets (SDSs). On-site storage of fuel shall be as minimal as practicable and in accordance with the *Storage and Handling of Dangerous Goods* (WorkCover NSW, 2005). Chemical storage cabinets and Fuel storage tanks shall have breather pipes to prevent build-up of vapour pressure

Unloading of fuel and refuelling operations (e.g. diesel or liquefied nitrogen gas (LNG)) would be conducted with vapour recovery nozzles with return hoses that allow vapours to be collected and recirculated through the system.

7.3.2 Construction activities

Decontamination and vehicle wash down points shall be established on-site to wash and remove soil from vehicle and mobile plant undercarriages and wheels to prevent material being tracked onto sealed road surfaces or out of contaminated exclusion zones. The location of the wash-down points will be included on the Environmental Control Maps (ECMs) and also provided in the site induction material.

Exclusion zones are to be established for all contaminated excavation activities, prior to commencement. Appropriate and effective watering or other dust suppression measures to be available before commencement and maintained throughout demolition works which include concrete/rock hammering, crushing, concrete cutting and breaking.

Prior to demolition activities, any structures shall be inspected by an Occupational Hygienist or other suitably qualified person to confirm that they do not contain any hazardous materials (e.g. asbestos) which could be broken and mobilised during demolition activities. Where such materials are identified, the materials will be appropriately removed and disposed or controlled in accordance with the Work Health and Safety Act 2011 and Work Health and Safety Regulations 2017.

Stockpiles shall be covered or removed as soon as practicable where the potential for the generation of dust is identified as a potential risk.

Planning of site activities shall be to avoid adversely weather conditions (high winds) which may result in on-site and off-site dust emissions. The Site Supervisor is to review the weather forecast daily and plan the daily construction activities appropriately.

7.3.3 Dust suppression by water application

Use of water to wet down an area or an operation is an effective dust control technique and will be implemented where practicable to do so.

Water carts may be used to spray water onto haul roads and other hardstand areas where there is a potential for dust generation. Water carts may also be fitted with a water cannon and/or hose, capable of directing water at localised operations such as excavator operations, concrete breaking, stockpiles and exposed surfaces as well as a spray bar for hardstand areas.

Additional mitigation measures, such as applying a dust binding agent (e.g. Dustex) may also be applied to reduce air quality emissions during adverse weather conditions.

7.3.4 General requirements

All plant used which has the potential to adversely affect air quality shall be operated in a proper manner by a competent person or persons. All plant shall be maintained in a clean and safe condition at all times. All air quality measures provided for the plant shall be in good working order and shall be used for the duration of the works.

All plant not in use shall be switched off and not left idling to reduce vehicle emissions. Deliveries to site and plant movements on site shall be planned to minimise idling times and avoid vehicles idling in close proximity to adjacent receptors.

7.3.5 Transportation control measures

The following controls will be placed on the movement of vehicles from work areas:

- All trucks transporting material, including soils, off-site shall be secured and completely covered immediately after loading the material to reduce the potential for wind-blown emissions and spillage. Such covering shall be maintained until immediately before unloading the trucks. Trucks or equipment shall be operated in a manner so as to prevent any loss of materials during loading, transport and unloading activities;
- All truck tail gates shall be securely fixed prior to loading and immediately after unloading solid materials. Tail gates shall be inspected and verified prior to leaving site;
- Trucks or equipment shall only move within designated transportation corridors and haulage routes (as per the site VMP). No trucks or equipment carrying contaminated materials shall be allowed to move across remediated or clean areas except via designated transportation corridors;
- Vehicles leaving the site must be clean so as to prevent sediment tracking onto the local road network. Vehicles will be inspected prior to leaving the site;
- A rumble grid will be established at the exit of an exclusion zone and facilities will be available to dislodge any materials, prior to leaving site; and
- All vehicles used on site, for transporting or for any other activities associated with the project, shall be regularly serviced and maintained to avoid excess emission of air impurities to comply with relevant Australian emission standards.

7.3.6 Contamination control measures

The following controls will be implemented for the management of contamination from work areas:

- Use of water to wet down an area or an operation through use of water carts or sprinklers is, to wet down contaminated areas to control dust emissions, including controlling asbestos fibres in air and particulate borne hexavalent chromium, which may be present;
- Exclusion zones will be set-up for all contamination impacted excavation, handling, segregation or disposal activities. Access to exclusion zones will be restricted using decontamination units, temporary fencing and signage;
- Decontamination and vehicle wash down points shall be established on-site to wash and remove soil from vehicle and mobile plant undercarriage and wheels to prevent material being tracked onto sealed road surfaces or out of contaminated exclusion zones;
- Wherever practical, measures shall be taken to minimising the extent of exposed or disturbed contaminated areas, such as open excavations. Where this may not be possible, other measures such as temporary covers shall be implemented where the potential for dust emissions, odours or contaminated vapours is noted;
- Appropriate personal protective equipment to be implemented for all tasks in accordance with the Qualitative Occupational Hygiene Assessment (QOHA) US-050056-HS-PR-002 and workplace surveillance inspections;
- Implement an exposure monitoring program for hexavalent chromium and asbestos during excavation, handling or segregation of impacted soils to determine the concentration of the contaminants of concern and verify the adequacy of controls. Samples should be collected at a minimum of monthly during contaminated works with results assessed by the Environment and Hygiene Manager to determine any additional monitoring frequency;
- Exposure monitoring shall be performed by a competent person, such as an Occupational Hygienist and assessed against relevant workplace exposure standards for compliance and analysed by a NATA accredited laboratory;
- Periodic audits by a competent person, such as an Occupational Hygienist will conduct to verify the effectiveness of controls on the site, including exclusion zones, work areas and decontamination facilities.
- The use of a competent person, such as an Occupational Hygienist, to undertake asbestos control air monitoring, as appropriate in accordance with the SafeWork NSW Code of Practice: *How to Safely Remove Asbestos* and in accordance with NOHSC:3003 (2005) with analysis of samples by a NATA-accredited laboratory;
- Establish Air Quality Goals and Limits which the results of the air monitoring program will be assessed. Air Quality Goals will act as triggers for the implementation of appropriate management measures. Where an exceedance of an Air Quality Limit is recorded, either as a result of regular monitoring or monitoring in response to a complaint, action will be taken to identify the source of the emission and determine appropriate mitigation measures;
- Specific training will be provided for all personnel conducting works within a contaminated exclusion zone on the project. This will include the provision of asbestos awareness training for workers who may in the course of their regular activities potentially uncover asbestos containing materials; and
- Briefings and communication to the project workforce and adjacent site neighbours on air quality management measures, include communication of air quality monitoring results when received. Any adverse monitoring results (e.g. above the workplace exposure standard), shall be communicated within 8 hours of becoming aware of the result to TfNSW Environmental Representative.

7.4 Monitoring and inspection

Regular monitoring and inspections will be undertaken throughout the Portion 2 Early Works construction phase. Prior to works commencing, an assessment should be made of the requirements for monitoring air quality. Visual and olfactory inspection of the air quality management techniques employed will be routinely undertaken. General observations of air quality on site will be a part of routine site inspections which would typically be conducted during scheduled weekly and informal site inspections. Regular Monitoring will include, but not limited to:

- Monthly dust deposition monitoring, in accordance with Approved Methods for Modelling and Assessment of Air Pollutants in NSW (EPA, 2016) and AS 3580.10.1-2003 (*Methods for sampling and analysis of ambient air Determination of particulate matter - Deposited matter - Gravimetric method*). The location of the dust monitoring gauges will be documented on the ECMs;
- Weather data at the premises, including rainfall measured and recorded in millimetres per 24-hour period at the same time each day;
- Visual monitoring of dust emissions by Site Supervisor and Environment Manager;
- Asbestos in air monitoring shall be determined in accordance with the Asbestos Removal Control Plan (ARCP) (US-050056-HS-MP-005);
- Occupational Health and Hygiene (OHH) monitoring shall be conducted in accordance with the Qualitative Occupational Hygiene Assessment (QOHA) (US-050056-HS-PR-002);
- Prior to use on-site, a Hired in Plant Inspection will be performed by a qualified mechanic. This inspection will be reviewed by the Site Supervisor prior to use;
- Daily Pre-start Plant/Equipment inspections shall be conducted by operators prior to commencing works; and
- Additional routine maintenance, including reviewing emissions, shall be conducted in accordance with the O&M requirements of the Plant/Equipment.

Regular inspections will include, but not limited to the following,

- Weekly site inspections for visible dust emissions, dust deposits on surfaces, no continuous visible vehicle/plant/equipment emissions by the Environmental Site Representative;
- Weekly and other routine inspections by the TfNSW Environmental Representative will occur throughout the project duration;
- Daily visual surveillance for dust emissions or mud tracking off-site by Site Supervisor;
- Daily inspections of dust controls to ensure implemented and effectiveness by Site Supervisor;
- Weekly haul road integrity by Site Supervisor; and
- Plant/Equipment inspections including maintenance and emissions as required prior to use by Site Supervisor.

Additionally, all personnel will be made responsible for ongoing inspection of environmental controls as part of their normal work and shall notify their supervisor if any issues are identified.

If potential problems are identified (i.e. plant, equipment and/or environmental controls are damaged, malfunctioning, or not performing the intended function), the SHEQ Advisor or Site Supervisor will be immediately notified and appropriate action taken.

It is the accountability of the Environment Manager and Project Manager to ensure all monitoring is performed according to these requirements.

Additional requirements and responsibilities in relation to inspections are documented in Section 3.9.1 and Section 3.9.2 of the CEMP.

7.4.1 Air Quality Monitoring Program

Air Quality monitoring will be implemented to ensure factors that can impact on the air quality of the site and surrounding area are in compliance with the project approval and relevant legislation. The data obtained in the Air quality monitoring program will be divided into the following areas:

- Dust monitoring;
- Meteorology monitoring; and
- Occupational Health and Hygiene Monitoring – incorporating asbestos in air monitoring.

7.4.2 Dust Monitoring

Monthly dust deposition gauge monitoring will be performed during Portion 2 Early Works. Dust deposition gauges were installed at the commencement of previous remediation activities and were installed along the eastern, southern and western perimeter of the site. These locations affect the nearest neighbours and project stakeholders. Each location will be mapped onto the Environmental Control Map (ECM).

Dust deposition gauges shall be analysed by a NATA-accredited laboratory in accordance with AS/NZS 3580.10.1:2003 (R2014): Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter- Gravimetric method.

Additional dust deposition gauges may be introduced at other site boundaries to determine whether control measures are adequate throughout the works. It is however noted an assessment of off-site dust emission impacts on southern and eastern boundaries may be required due to their existing light industrial land use.

7.4.3 Meteorology Monitoring

Daily monitoring of weather forecasts shall be conducted to determine when adverse weather conditions are predicted. A Bureau of Meteorology Weather Station is located nearby at Sydney Olympic Park and shall be used for forecasting and monitoring.

Unexpected meteorological conditions which could affect environmental performance, such as: increases in dry conditions and high winds resulting in increased risk of dust; prolonged rainfall affecting surface water quality; and/or low atmospheric pressure conditions resulting in increased potential for vapour emissions shall be evaluated by the Environment & Hygiene Manager. Additional contingency measures, such as increased air monitoring and/or additional controls shall be implemented based on an assessment of the forecast conditions and previous monitoring events.

7.4.4 Occupational Health and Hygiene Monitoring

Occupational Health and Hygiene (OHH) monitoring shall be conducted in accordance with the Qualitative Occupational Hygiene Assessment (QOHA) US-050056-HS-PR-002. OHH monitoring shall consist of contaminants of concern identified on the project site during previous environmental site investigation and remediation activities.

Monitoring shall be conducted on the project workforce and para-occupational static sampling. Monitoring shall be assessed against workplace exposure standards for compliance and analysed by NATA accredited laboratories.

The OHH air sampling program shall consist of assessment for hexavalent chromium, asbestos in air and volatile chlorinated hydrocarbons where activities might have an exposure pathway. Following conclusion of remediation capping activities, activities will be reassessed by the Environment & Hygiene Manager.

Monitoring summaries for each project site neighbour shall be developed and provided to the neighbours on a monthly basis. A monitoring dashboard summary was developed in consultation with the neighbours during previous remediation works. Additional consultation, such as workforce toolboxes were also conducted prior to previous site remediation activities.

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 3.9.3 of the CEMP.

7.6 Reporting

Reporting on air quality management measures will be in accordance with established protocols as determined with the client. All routine checks of air quality measures will be recorded in Ven-Safe and available for inclusion in weekly or monthly reports as required.

Results of workplace air quality measures, such as asbestos, hexavalent chromium or volatile chlorinated hydrocarbons shall be communicated to the project workforce at regular pre-start meetings and weekly toolboxes. All air quality monitoring shall be communicated to the nominated TfNSW project representative with the monthly report. However, any adverse monitoring results (e.g. above the workplace exposure standard), shall be communicated within 8 hours of becoming aware of the result.

Where monitoring determines non-compliance to be a risk or to have occurred, an incident report and corrective actions shall be raised in Ven-Safe. Corrective actions may include:

- Equipment maintenance to improve exhaust emissions;
- Use different methodology to allow equipment substitution;
- Use additional dust suppression methods such as sheeting or polymer additives in water; and
- Reduce the number and size of exposed areas (dust or odour).

It is the accountability of the Environment Manager and Project Manager to ensure all monitoring is performed according to these requirements.

Detailed reporting requirements and responsibilities are documented in Section 3.9.5 of the CEMP

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this 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;
- Identify environmental risks not already included in the risk register;
 - 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; and
 - Make comparisons with objectives and targets.

Contractor is responsible for ensuring Project environmental risks are identified and included in the risk register. Appropriate mitigation measures shall be implemented throughout the duration of the Portion 2 Early Works as part of the continuous improvement process. The process for ongoing risk identification and management during construction is outlined in Section 3.9 of the CEMP.

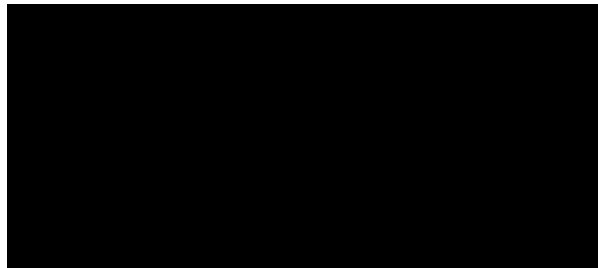
8.2 AQMP update and amendment

The processes described in Section 3.9 to Section 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

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

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.11.2 of the CEMP.

Appendix A – ER Endorsement



12 May 2020

Transport for NSW

Attention to: 
A/Senior Manager Environment
Parramatta Light Rail

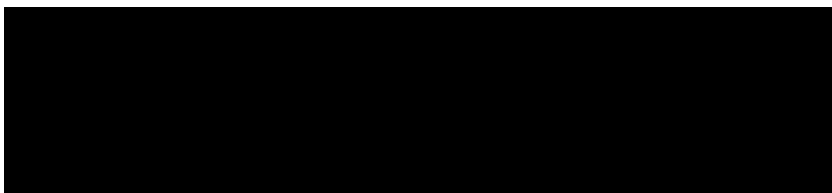

**Review of Parramatta Light Rail Stage 1 - Package 3
Portion 2 Remediation Works Ventia –CEMP Appendix B7 - Construction
Air Quality Management Plan (CAQMP)**

Pursuant to SSI-8285 Condition of Approval A23 (d) (ii), as the approved Environmental Representative, I confirm that I have reviewed and provided comments on the following documents against the requirements of Submissions Report incorporating Preferred Infrastructure Report (SPIR) Revised Environmental Mitigation and Management Measures (REMMM) AQ-1:

- CEMP Appendix B7 –Construction Air Quality Management Plan (AQMP Rev 4 - PLR-VNT-SAM-EE-PLN-000003, provided on 11 May 2020 for review)

The document was reviewed as part of the six-monthly review of the CEMP and sub-plans which is consistent with the relevant conditions of approval and REMMM and is approved under Condition of Approval C8 minor amendments for implementation at the site.

Yours sincerely,



Environmental Representative



Parramattalightrail.nsw.gov.au
Parramattalightrail@transport.nsw.gov.au
1800 139 389
Level 10, 130 George Street Parramatta 2150

Appendix B8

Construction Waste and Resource Management Sub Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1
January 2020

PLR-VNT-SAM-WM-PLN-000002

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Parramatta Light Rail – Stage 1

Package 3 Portion 2 Early Works – Waste and Resource Management Sub-plan

Document Control

Title	Parramatta Light Rail – Stage 1 Package 3 - Portion 2 Early Works Waste and Resource Management Sub-plan
Prepared by	██████████, Environment & Hygiene Manager
Signed	██████████
Dated	03/12/2019
Approved on behalf of Ventia Utility Services Pty Ltd by	██████████, Project Manager
Signed	██████████
Dated	05/12/2019
Endorsed by Environment Representative	██████████
Signed	<i>Refer Appendix C</i>

Version control

Revision	Date	Description	Prepared by	Approval
00	01/03/2019	For Review	██████████	██████████
01	11/04/2019	Post TfNSW & ER Review	██████████	██████████
02	25/10/2019	Waste facilities review & imported fill	██████████	██████████
03.01	05/12/2019	Post TfNSW, ER & Internal review	██████████	██████████
03.02	15/01/2020	ER Endorsement	██████████	██████████

Glossary/ Abbreviations

Abbreviations	Expanded text
ACM	Asbestos containing material
ARCP	Asbestos Removal Control Plan
CEMP	Construction Environmental Management Plan
CERT	Carbon Estimate and Reporting Tool
CLMP	Contaminated Land Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CoA	NSW Minister for Planning Conditions of Approval
DP&E	NSW Department of Planning and Environment
ECM	Environmental Control Map
The EIS	<i>Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017</i>
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects
Environmental incident	An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives
Environmental Representative (ER)	A suitably qualified and experienced person independent of the Contractor and Proponent, and project design and construction personnel, employed for the duration of construction. The Environmental Representative sits under the Independent Certifier.

Abbreviations	Expanded text
EMS	Environmental Management System
ENM	Excavated Natural Material, as defined in <i>The excavated natural material exemption</i>
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environmental Protection Licence
GREP	Government Resource Efficiency Policy
Minister, the	Minister of the NSW Department of Planning and Environment (or delegate)
Non-compliance	Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements
Non-conformance	Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation
OEH	Office of Environment and Heritage
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report
PLR	Parramatta Light Rail
Principal, the	Transport for NSW
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)
Project, the	Parramatta Light Rail – Stage 1 (Westmead to Carlingford)
RAP	Remediation Action Plan for 6-10 Grand Avenue, Camellia, NSW, November 2017)
REMMM	Revised Environmental Mitigation and Management Measures
Resource	Resource covers energy, fuel, oil, water and other materials used for construction of the project.
RWVP	Remediation Works Validation Plan
SaM Facility	Stabling and Maintenance Facility
SDG	TfNSW Sustainable Design Guideline
SPIR	Submissions and Preferred Infrastructure Report
SWMP	Soil and Water Management Plan

Abbreviations	Expanded text
VENM	Virgin Excavated Natural Material
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WRMP	Waste and Resource Management Sub-Plan
WRAPP	Waste Reduction and Purchasing Policy

1 Introduction

1.1 Context and scope

This Waste and Resources Management Sub Plan (WRMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the upgrade of the Parramatta Light Rail – Stage 1 (PLR Stage 1 or the Project) and has been prepared to target specifically *Package 3: Early Works in Portion 2* (referred to hereafter as Portion 2 Early Works or Package 3) as part of the Enabling Stage of the Project. Refer to the *Parramatta Light Rail (Stage 1) Staging Report (Project Wide)* (TfNSW 2019) for further detail.

Package 3: Early Works Portion 2: the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue, Rosehill. This is the allocated site for the SaM Facility.

Ventia Pty Ltd (Ventia) has been appointed by Transport for NSW (TfNSW) as the head contractor for Portion 2 Early Works, responsible for delivering the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue Rosehill (refer to Section 1.3 in CEMP for project scope).

This WRMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMM) listed in the *Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017* (the EIS) and the subsequent Submissions Report (incorporating Preferred Infrastructure Report) (TfNSW 2018) and all applicable legislation. This WRMP specifically addresses CoA E127-E131 and REMMM Gen-1 & WM2, with the broader applicable CoA's and REMMM's outlined in **Table 3-1: Conditions of Approval relevant to the WRMP** and **Table 3-2: Revised Environmental mitigation and management measures relevant to this WRMP** respectively. This plan has also been prepared in accordance with the Ventia Environmental Management System, accredited to ISO 14001.

This WRMP provides the management approach and requirements (including environmental mitigation measures, controls, monitoring and reporting) for managing waste and resource during construction of Portion 2 Early Works. This Plan forms one of six sub-plans which are collectively covered by the Construction Environmental Management Plan (CEMP). Effective implementation of the CEMP (and associated sub-plans) will ensure that environmental resources, responsibilities and management measures are adopted during the construction activities.

The implementation of the CEMP and associated sub-plans are aligned with Project level management plans including the Community and Stakeholder Engagement Plan and the Sustainability Plan as illustrated in Figure 1-1.

The review and document control process for this Plan are described further in Section 9.

The context of this WRMP in relation to the environmental management system is presented below in Figure 1-1: **Portion 2 Early Works Environmental Management System and CEMP Context**.

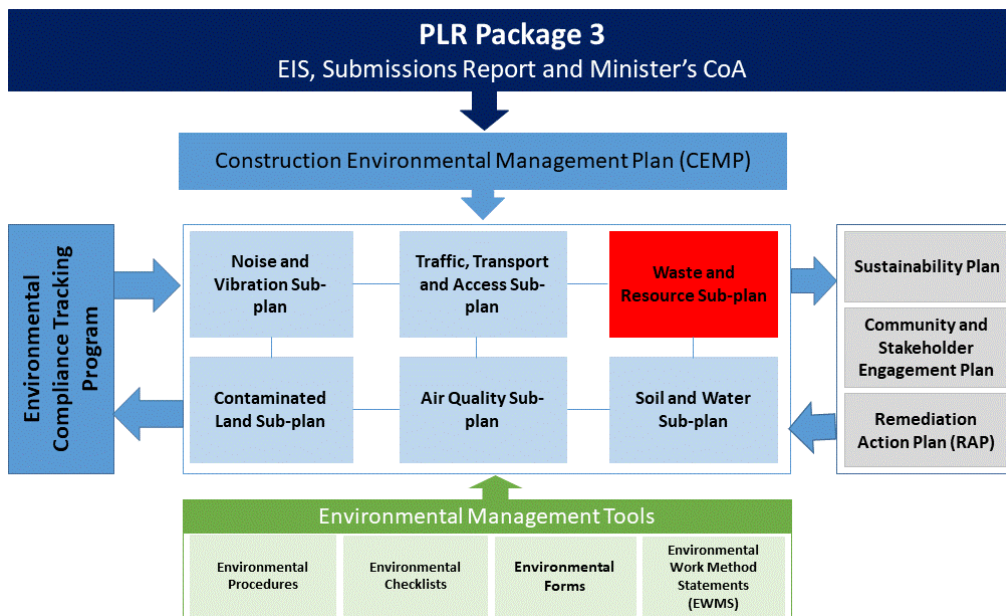


Figure 1-1: Portion 2 Early Works Environmental Management System and CEMP Context

1.2 Background and project description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney population, particularly the population growth of the Parramatta Local Government Area (LGA).

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

PLR Stage 1 project will link Parramatta's central business district (CBD) and train station to a number of key locations, including the following:

- Westmead Precinct.
- Parramatta North Growth Centre.
- The new Western Sydney Stadium.
- The Camellia Town Centre.
- The new Powerhouse Museum.
- Riverside Theatre arts and cultural precinct.
- The private and social housing redevelopment at Telopea.
- The Rosehill Gardens Racecourse.
- The three Western Sydney University campuses.

In summary, the key features of the project include:

- A new dual track light rail network of approximately 12 kilometres in length (including approximately seven kilometres within the existing road corridor and approximately five kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services).

- A total of 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 5 am to 1 am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7 am and 7 pm.
- 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 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 of the CEMP.

1.2.1 Stabling and Maintenance Facility

As part of the development of the Project, the TfNSW owned land located at 6-8 Grand Avenue Camellia was identified as the preferred site for the Stabling and Maintenance Facility (SaM Facility). The SaM Facility is being constructed on the former industrial site adjacent to the Rosehill Gardens Racecourse within the Rosehill and Camellia precinct (refer to Figure 1-2: **Portion 2 Early Works - SaM Facility location**).

The SaM Facility would provide for the storage of light rail vehicles, maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities as well as the operations control centre for the light rail network will be located within the maintenance building. Parking for staff and visitors will be provided on site, including maintenance vehicle parking. An electrical substation will be located at the rear of the site to power the facility and light rail.

To accommodate the development of the SaM facility, and reduce the potential for interaction with contaminated material during construction, the following activities will be undertaken as part of the enabling works:

- Importation and placement of appropriate fill material across the site to raise the surface finish level by about two metres;
- Installation of an appropriate capillary break to eliminate subsurface contamination migration;
- Installation of an appropriate vapour barrier and structural surface capping layer;
- The Temporary Works encompasses establishment of plant, equipment and facilities on the Site to support the delivery of the Works;
- The Enabling Works encompasses establishment and management of utilities and other below-ground infrastructure on the Site to support the delivery of the Works;
- Construction of a containment cell for the retention and containment of waste materials on-site;
- Implementation of Ground Improvement Works where required;
- Implementation of the monitoring and validation program; and
- Preparation of Stage 2 Site Validation Report and a Long Term Environmental Management Plan (LTEMP) to the satisfaction of the Site Auditor.

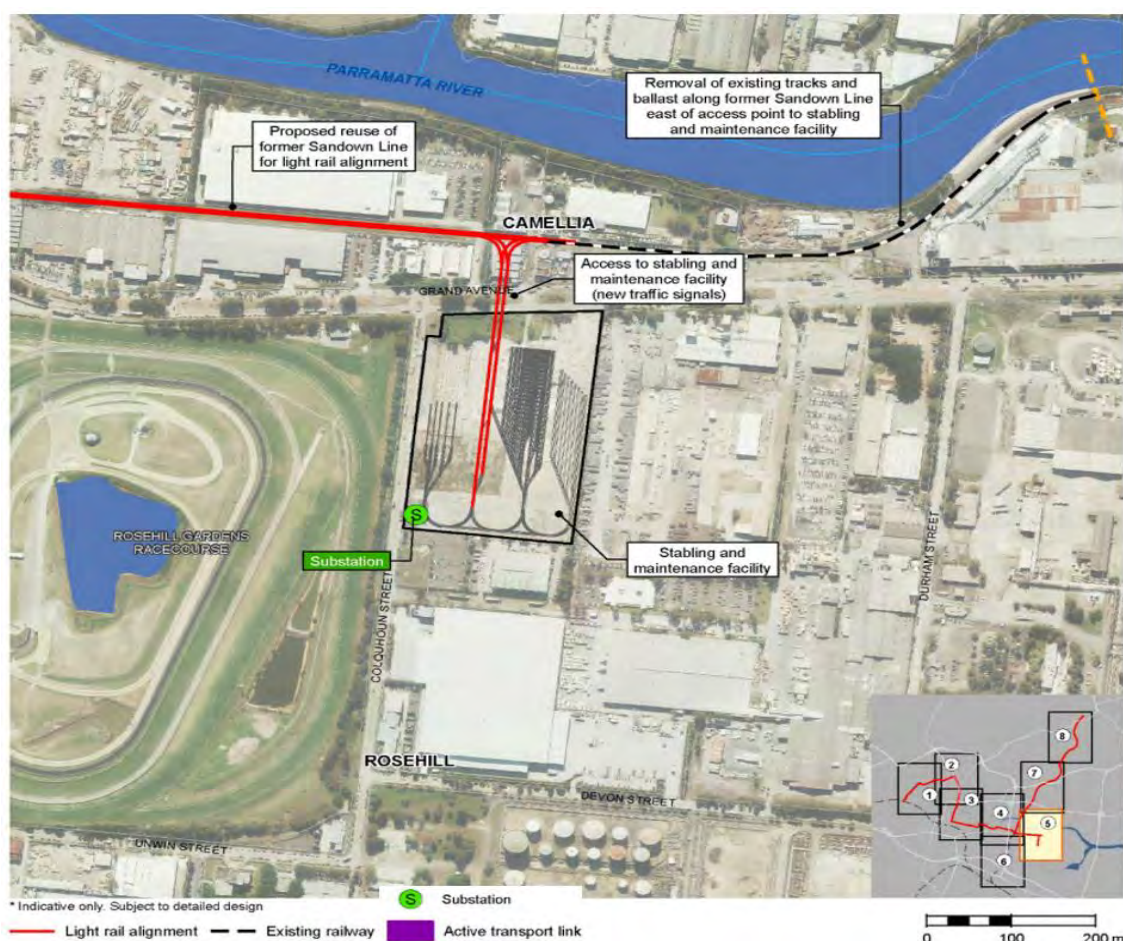


Figure 1-2: Portion 2 Early Works - SaM Facility location (Source: EIS Figure 6.2e)

1.2.2 Statutory Context

The Project is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The Minister for Planning is the approval authority for the Project.

In accordance with section 5.22(2) of the EP&A Act, the only environmental planning instruments that apply to the proposal are State Environmental Planning Policy (Infrastructure) 2007 (insofar as it relates to the declaration of development that does not require consent) and State Environmental Planning Policy (State and Regional Development) 2011 (as it pertains to the declaration of infrastructure as SSI). There are no other environmental planning instruments that substantially govern the carrying out of the project.

The Portion 2 Early Works site has been subject to long term regulation by the NSW Environmental Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act). The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP) including the requirements of the CLM Act. The objective of the RAP is to document the preferred remediation option and outline the methodology for the installation, verification and validation of the preferred remediation option.

The Portion 2 Early Works will be undertaken to achieve Objective 3 of the RAP (as outlined in Section 7.1). Objective 3 is as follows:

Render the site suitable for commercial / industrial land use, specifically for the redevelopment of the site as the SaM facility for the PLR Project.

This objective is to be achieved by:

- Design and implementation of a capping system, appropriately integrated with the cut-off wall, and incorporating layered components appropriate to;
- Mitigate and manage soil vapour (both indoor and outdoor as dictated by the facility design) from VCHs;
- Create a physical barrier to prevent site users from accessing contaminated materials; and
- Prevent Cr (VI) wicking into future site structures/ infrastructure and paved surfaces.

The RAP has been reviewed and endorsed by a NSW EPA-accredited Site Auditor in accordance with the CLM Act.

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described below in [Section 1.2.3](#).

1.2.3 Parramatta Light Rail Planning Approval

The Environmental Impact Statement (EIS) for the project was placed on public exhibition between 23 August and 23 October 2017. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the project to the Department of Planning and Environment. Following the conclusion of the public exhibition period, Transport for NSW prepared a Submissions Report and Preferred Infrastructure Report for the project to address the issues raised in community and stakeholder submissions, and to document a number of proposed design changes and additional investigations undertaken since exhibition of the EIS.

In May 2018, the Minister for Planning granted approval of the Project, under Section 115ZB of the EP&A Act. Following approval of the CSSI, a modification was assessed by the DP&E and subsequently approved on the 21st December 2018 under section 115ZI of the EP&A Act (Modification 1). Modification 2 was requested from DP&E and approved on the 25th January 2019.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located on Department of Planning and Environment's major project website:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.3 Environmental management systems overview

The environmental management system overview is described in section 1.6 of the CEMP and is summarised in Figure 1-1.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to provide the foundation for the management of waste and resource impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Portion 2 Early Works.

Mitigation measures (specific to waste and resource) required to satisfy the CoA requirements are derived from the EIS and through risk assessment processes (refer [Section 3.2](#)) and included within this WRMP. Refer to [Section 3.3](#) for relevant waste and resource mitigation measures and controls and refer [Section 3.4](#) for relevant Environmental Performance Outcomes.

Effective implementation of these measures is ensured through monitoring, training and competence, inspection, audit and reporting actions detailed in Sections [8.2](#), [8.3](#), [8.4](#) & [8.5](#), with the responsibilities for implementation identified in [Section 8](#). Continual improvement processes in relation to compliance with regulatory requirements are detailed in [Section 9](#).

Effective implementation of this Plan will assist the Contractor and relevant sub-contractors to achieve compliance with necessary environmental regulatory and policy requirements in a systematic manner with an outcome of continual environmental management performance.

2.2 Objectives

The key objectives and strategies of this WRMP is to ensure that waste disposal and energy use are minimised and reuse/recycle of waste is maximised.

To achieve these objectives, the contractor will undertake the following;

- Ensure appropriate measures are identified and implemented to address the applicable management and mitigation measures detailed in Table 17.2 of the EIS to minimise waste, manage waste and conserve energy throughout the construction of the Project;
- Ensure the preferred waste management hierarchy of avoidance, minimisation, reuse, recycling and disposal as the last option is followed;
- Ensure staff awareness regarding waste and resource use management issues;
- Ensure appropriate measures are implemented to address the relevant CoA, Revised Environmental Mitigation and Management Measures (REMMM) and environmental performance outcomes (EPO);
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in [Section 3.1](#) of this Plan; and
- Meet sustainability objectives and commitments outlined within the Sustainability Management Plan developed by TfNSW.

2.3 Targets

The following targets have been established for the management of waste and resource utilisation during the Project:

- Implementation of waste minimisation initiatives where practical;

- Waste products are recovered and reused on site where reasonable and practical (in line with the targets in Table 2-1);
- Undertaken recovery/recycling of all recyclable materials on site or at an offsite recovery facility (in line with the targets in Table 2-1: **Construction waste streams and targets for Portion 2 Early Works**);
- Dispose of waste materials in accordance with legislative requirements and are sent to appropriately licenced facility;
- Minimise / reduce the quantities of resources to be used (in line with the targets in Table 2-1); and
- Documentation of the intended management of wastes e.g. avoid, reduce, reuse, recycle or dispose to ensure waste is managed in accordance with accepted standards and appropriately implemented waste control measures.

Based on the requirements defined at [Section 2.2](#) above, the following targets have been nominated for managing waste and resources on the project (refer to Table 2-1). Any deviance from the targets will result in project management review and implementation of corrective actions where appropriate.

Table 2-1: Construction waste streams and targets for Portion 2 Early Works

Metric / measure	Target	Timeframe	Accountability
% of waste quantified in waste management reports	100%	At all times	Engineers Environment and Hygiene Manager
% of prescribed wastes for which transfer certificates are retained	100%	At all times	Engineers Environment and Hygiene Manager
Number of enforcement notices and penalties received from regulators and/or client	Zero	At all times	Environment and Hygiene Manager Project Manager
% of waste reused or recycled	>90% of waste generated	12 months	Environment and Hygiene Manager Project Manager
% reduction of construction related GHG emissions by from project baseline	5%	Duration of project	Environment and Hygiene Manager Project Manager

All waste correctly classified and disposed of appropriately	100%	At all times	Environment and Hygiene Manager Project Manager
Number of loss of hazardous materials to the environment as a result of the works	Zero	Duration of project	Engineers Environment and Hygiene Manager

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation and regulations relevant to waste and energy management includes:

- Protection of the Environment Operations Act 1997 (POEO Act);
- Protection of the Environment Operations (Waste) Regulation 2014;
- Waste Avoidance and Resource Recovery Act 2001 (WARR Act);
- Contaminated Land Management Act 1997 (CLM Act);
- National Greenhouse and Energy Reporting Act 2007 (NGER Act);
- Environmentally Hazardous Chemicals Act 1985 (EHC Act);
- Protection of the Environment Operations (General) Regulation 2009; and

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

3.1.2 Guidelines and standards

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

- NSW Government Resource Efficiency Policy (GREP) (OEH 2014);
- Waste Classification Guidelines (EPA 2014);
- NSW Government Resource Efficiency Policy (OEH, 2014);
- NSW Waste Avoidance and Resource Recovery Strategy 2014 – 2021 (EPA, 2014);
- Best Practice Waste Reduction Guidelines for the Construction and Demolition Industry (tools for Practice), Natural Heritage Trust, 2000;
- NSW Waste Reduction and Purchasing Policy; and
- NSW Environment Protection Authority (EPA) Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd edition) (2017).

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed in **Table 3-1** below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1: Conditions of Approval relevant to the WRMP

CoA No.	Condition Requirements	Document Reference	How Addressed
E127	Waste generated during construction and operation must be managed in accordance with the following priorities:		
	(a) waste generation must be avoided and where avoidance is not reasonably practicable, waste generation must be reduced;	Section 2.3 of WRMP Section 5.1 of WRMP	Waste generation will be avoided where practicable. If this is not possible, waste generation will be minimised. Material disturbance, including the retention of existing hardstand, will be minimised as much as possible to reduce waste volumes, whilst meeting Excavation activities will be limited The Portion 2 Early Works is conducting remediation activities to install an integrated capping system and engineered, on-site containment berm for maintaining waste on-site.
	(b) where avoiding or reducing waste is not possible, waste must be re-used, recycled, or recovered; and	Section 2.3 of WRMP Section 5.1 of WRMP	Remediation works will require the generation of potentially contaminated materials, where possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(c) where re-using, recycling or recovering waste is not possible, waste must be treated or disposed of.	Section 2.3 of WRMP Section 5.1 of WRMP	Where materials cannot be retained, they will be classified in accordance with the NSW EPA Waste Classification Guidelines. Waste that are unable to be reused or recycled will be disposed of offsite to an appropriately licenced waste management facility following classification.
E128	The importation of waste and the storage, treatment, processing, reprocessing or disposal of such waste must comply with the conditions of a current EPL for the CSSI (if applicable), or be done in accordance with a Resource Recovery Exemption or Order issued under the Protection of the Environment Operations (Waste) Regulation 2014, as the case may be.	Sections 5.1.5 of WRMP	Imported materials are required for Portion 2 Early Works as an important component of the integrated capping system. Imported materials shall be validated as either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) as defined under the POEO Act 1997 and the POEO (Waste) Regulation 2014. Imported VENM or ENM will be assessed in accordance with the ENM Order 2014 (NSW EPA 2014). Prior to importation, the source site of the imported materials will be investigated. The site history will be reviewed to ensure previous activities undertaken on the source site have not caused contamination of the imported materials. For VENM, the materials being excavated are visually assessed by the validation consultant to confirm that no sign of contamination is present and that the materials are undisturbed. In some cases existing documentation/classification reports may be available and an adequacy review may be sufficient (coupled with a site inspection if required) by the Validation Consultant prior to importation of materials.

CoA No.	Condition Requirements	Document Reference	How Addressed
E129	Waste must only be exported to a site licensed by the EPA for the storage, treatment, processing, reprocessing or disposal of the subject waste, or in accordance with a Resource Recovery Exemption or Order issued under the Protection of the Environment Operations (Waste) Regulation 2014, or to any other place that can lawfully accept such waste. Disposal of waste at these facilities must include GPS tracking of waste vehicles, audits of waste facility receipts and cross verification with the facility. All asbestos waste over 10m ³ must be tracked through EPA's WasteLocate service.	Sections 5.1.3 & 5.1.4 of WRMP	Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility. Disposal of waste will include GPS tracking of trucks, materials tracking documentation, including weighbridge receipts, stockpile maps, waste classification reports etc. Where necessary, EPA waste transport certificates shall be generated for each waste consignment. If asbestos waste needs to be disposed offsite, it will also be tracked through EPA's <i>WasteLocate</i> service.
E130	All waste must be classified in accordance with the EPA's Waste Classification Guidelines, with appropriate records and disposal dockets retained for audit purposes.	Section 5.2 of WRMP	Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility. Disposal of waste will include GPS tracking of trucks, materials tracking documentation, including weighbridge receipts, stockpile maps, waste classification reports etc. Where necessary, EPA waste transport certificates shall be generated for each waste consignment.

CoA No.	Condition Requirements	Document Reference	How Addressed
E131	Asbestos or asbestos-contaminated materials be uncovered during demolition and construction activities of the CSSI must be strictly managed in accordance with the requirements under the Protection of the Environment Operations (Waste) Regulation 2014 and any guidelines or requirements in force at the date of this approval and issued by the EPA in relation to those materials.	Section 5.3 of WRMP & Contaminated Land Management Plan (CLMP)	Asbestos has been identified as a potential contaminant of concern on the site during previous site investigation and remediation works. Where asbestos is identified, the project Asbestos Removal Control Plan shall be implemented to ensure the removal is carried out in accordance with the Code of Practice for How to Safely Remove Asbestos (SafeWork NSW, 2016). Disposal of waste will include GPS tracking of trucks, materials tracking documentation, including weighbridge receipts, stockpile maps, waste classification reports etc. Where necessary, EPA waste transport certificates shall be generated for each waste consignment. Asbestos waste needs to be disposed offsite, it will also be tracked through EPA's <i>WasteLocate</i> service.

3.3 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed in **Table 3-2: Revised Environmental mitigation and management measures relevant to this WRMP** below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 3-2: Revised Environmental mitigation and management measures relevant to this WRMP

Ref #	Commitment	Timing	WRMP reference	How Addressed
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: • Traffic, transport and access management. □ Noise and vibration management. • Heritage management. • Air quality and dust management. • Soil and water management. • Flora and fauna management. • Waste and resource management. • Site compound and ancillary works management. • Landscape and temporary works management. • Emergency and incident response management.	Pre-construction	This Plan	This purpose of this sub-plan to the CEMP is to provide the foundation for the management of waste and resource impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Portion 2 Early Works. The CEMP and this sub-plan would be prepared by the responsible contractor(s) and approved by the Secretary of the NSW Department of Planning and Environment.

Ref #	Commitment	Timing	WRMP reference	How Addressed
	The CEMP would be prepared by the responsible contractor(s) and approved by the Secretary of the NSW Department of Planning and Environment.			
GG-3	Management of emissions would be incorporated into site inductions, training and pre-start talks.	During construction	Section 8.2	Management of plant emissions shall be incorporated into site inductions and periodically communicated during site toolbox presentations. Controls for operators such as turning off idling plant, identifying issues on the daily pre-start inspection form if visible exhaust emissions 10 seconds after start up and ongoing plant and equipment maintenance in accordance with plant requirements.
GG-4	The CEMP would incorporate measures to minimise the emission of greenhouse gases during construction. Activities with the potential to cause substantial emissions (such as material delivery and loading and bulk earthworks) would be identified in the energy and greenhouse gas emissions strategy. Emissions management actions would be investigated and applied where reasonable and feasible. These would potentially include: • The use of biodiesel and other low carbon fuels in vehicles and equipment. • The use of fuel-efficient construction equipment. • The use of energy efficient construction practices. • Use of energy efficient or solar powered lighting for temporary construction facilities.	During construction	Section 6	A Carbon Estimate and Reporting Tool (CERT) shall be conducted in accordance with the TfNSW Carbon Estimate and Reporting User Manual (7TP-ST-035) to establish a baseline footprint for the project and identify a reduction in construction related GHG emissions by 5% from project baseline as determined by the Carbon Estimate and Reporting Tool (CERT). Construction methodologies will be appraised to identify reasonable and feasible measures to meet the project sustainability targets. The methodology appraisal will include consideration of energy and GHG emissions, waste volume generation and impacts to water. All mobile non-road diesel plant and equipment (with an engine greater than 19kW) to report engine conformity with relevant United States Environmental Protection Agency (US EPA), European Union (EU) or equivalent emissions

Ref #	Commitment	Timing	WRMP reference	How Addressed
				standards and the fitting of any exhaust after-treatment devices.
GG-5	Local procurement of construction services and materials would be undertaken (where feasible and cost effective) to reduce fuel consumption for transport. Where practical and reasonable, construction planning would ensure that deliveries are managed in an efficient manner to minimise the number of trips required and therefore reduce the amount of emissions.	During construction	Section 6	The project's primary material is imported spoil and wherever practical, materials for the clean fill cap will be sourced from Sydney based Infrastructure Projects. Procurement and transport of locally sourced materials for the site works reduce emissions by reusing materials close to the source.
GG-6	Energy efficient work practices, such as switching off construction plant, vehicles and equipment when not in use to minimise idling, would be implemented during construction.	During construction	Section 6	Energy efficient work practices will be implemented as far as practicable such as switching off energy using devices (including vehicles) when not in use.
GG-7	Regular monitoring, auditing and reporting on energy, resource use and associated greenhouse gas emissions would form part of the environmental reporting requirements specified within the CEMP, and would be carried out.	During construction	Section 8.3	Regular monitoring, auditing and reporting on energy, resource and greenhouse gas emissions will be performed. A Sustainable Design Guideline Checklist will be updated every 6 months to monitor performance with sustainability, including the Carbon Estimate and Reporting Tool. Findings and reports are communicated as per reporting requirements outlined in Table 3-6 and Table 3-7 of CEMP.
HY-6	A soil and water management plan would be prepared as part of the CEMP. Specific measures would be identified in consultation with relevant government agencies and would be consistent with the principles and practices detailed in Landcom's (2004) Managing	Pre-construction	Section 5 & Section 6	Addressed in the SWMP and partially address in this sub-plan. As required by REMMM HY-6, remediation works will require the generation of potentially

Ref #	Commitment	Timing	WRMP reference	How Addressed
	Urban Stormwater: Soils and Construction. The objectives and strategies of the soil and water management sub-plan would include the following: • Minimise 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). • Develop and implement adequate water quality control measures prior to the carrying out of significant earthwork or bridge construction activities. • Minimise and manage impacts on water quality and downstream receiving environments during instream activities. • Flood response measures for activities located on land affected by the 20 year ARI flood level (e.g. bridge support construction compounds), or works within waterways (such as bridge works). • Where possible, reuse excavated materials as fill on other parts of the project in preference to disposing off-site in accordance with OEH's Waste Classification Guidelines (2016). • Areas of potential contamination concern would be identified and works in these areas managed to minimise disturbance. • Excavate pre-classified contaminated materials and transfer such materials directly into haulage trucks for off-site disposal at a waste facility licensed to accept the contaminated material. • Transport for NSW would also undertake consultation with DPI Fisheries with respect to the development for the			contaminated materials, where possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm. Construction waste from Portion 2 Early Works will be managed through waste hierarchy from the Waste Avoidance and Resource Recovery Act 2001. Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste as required by REMMM HY-6 is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility.

Ref #	Commitment	Timing	WRMP reference	How Addressed
	CEMP, and Erosion and Sediment Control Plan for the project. Develop procedures for the assessment, handling and stockpiling of potentially contaminated materials, in accordance with EPA Waste Classification Guidelines (2014).			
WM-1	During detailed design and detailed construction planning, the following resource and material minimisation initiatives would be explored, and if determined to be reasonable and feasible, implemented:			
	(i) Use of recycled materials, such as the maximum permitted recycled content for asphalt and concrete (including use of fly ash and blast furnace slag).	During construction	Section 5.1.2	The project's primary material is imported spoil and wherever practical, materials for the clean fill cap will be sourced from Sydney based Infrastructure Projects. Procurement and transport of locally sourced materials for the site works reduce emissions by reusing materials close to the source. Reuse of excavated material as general fill under or as part of the integrated capping system where it meets the contaminated land management and project specification requirements. This will reduce volumes requiring off-site disposal to an appropriately licensed landfill facility. Reuse of removed concrete slabs under the integrated capping system as part of the capillary break and structural fill layer where it meets specification and environmental requirements. This will reduce volumes requiring off-site disposal to an appropriately licensed landfill facility.

Ref #	Commitment	Timing	WRMP reference	How Addressed
	(ii) Use of wastewater or recycled water to reduce potable water demand during construction and operation.	During construction	Section 5.1.2	Due to the contaminated nature of the remediation works, re use of water from contaminated areas will not be permitted. An assessment of feasibility of using treated water from the Aquanet, recycled water system was investigated in previous remediation activities. Due to the length of project it was not practicable to be used for Portion 2 Early Works however details have been shared with the TfNSW for distribution to the future stabling and maintenance (SaM) facility operator for potential incorporation into future works.
WM-2	A waste and resource management plan would be prepared for the project as part of the overall CEMP. This plan would set out details for managing waste generation and resource consumption. The plan would be informed by the Parramatta Light Rail Sustainability Plan and the requirements of the Waste Avoidance and Resource Recovery Act 2001. The objectives and strategies of the waste and resource management plan would include the following:			
	(i) Construction waste would be managed through the waste hierarchy established under the <i>Waste Avoidance and Resource Recovery Act 2001</i> management hierarchy.	During construction	Section 5.1	Construction waste from Portion 2 Early Works will be managed through waste hierarchy from the <i>Waste Avoidance and Resource Recovery Act 2001</i> .
	a) Classification of waste during construction in accordance with the current guidelines	During construction	Section 5.2	Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility.
	b) Segregation of waste into stockpiles of spoil, concrete, steel, timber, paper and cardboard and vegetation to make it easier to recycle components and prevent cross contamination.	During construction	Section 5.1.3	Waste segregation onsite will be performed for various waste materials, including spoil and demolition waste. Waste will be separated onsite into dedicated stockpiles or bins for either reuse

Ref #	Commitment	Timing	WRMP reference	How Addressed
				onsite or collection by a waste contractor and transport to appropriate off-site facilities.
	c) Procurement of materials would be carried out on an 'as-needed' basis to reduce over-ordering and wastage, and exploring opportunities to reuse materials, where applicable.	During construction	Sections 5.1.1 , 5.1.2 & Section 6	Prior to commencing construction, a detailed design shall be conducted of key project stages, including to identify material volumes and cut-to-fill profiles for the Portion 2 Early Works. The detailed design will be used to prepare an Earthworks plan to identify staging works and will address requirements and constraints identified by the specifications. The Earthworks Plan will be developed in accordance with the applicable ASA Standard(s) for the project. The design assessments shall also be utilised to estimate materials required for the works. Ongoing materials tracking, including Imported material volumes, such as VENM and ENM shall be tracked in accordance with a Materials Tracking System. The project's primary material is imported spoil and wherever practical, materials for the clean fill cap will be sourced from Sydney based Infrastructure Projects. Procurement and transport of locally sourced materials for the site works reduce emissions by reusing materials close to the source. Reuse as part of the ground improvement works and/or integrated capping system will reduce volumes requiring disposal at other sources, such as landfill.

Ref #	Commitment	Timing	WRMP reference	How Addressed
	(ii) Targets for materials use, waste disposal and recovery, recycling or reuse of construction waste, and beneficial reuse of spoil. A Construction Waste, Reuse, Recycling and Energy Plan would be prepared as part of the CEMP. It would ensure resource energy use is minimised by tracking and reporting performance, and applying corrective action as required.	During construction	Section 5.1.2 & Section 6	This plan has been prepared as a part of CEMP to manage waste and resource related to Portion 2 Early Works. The project has established environmental targets for waste and sustainability. These are shown in Section 2.3 and include, minimise waste production, >90% re-use/recycle of produced waste and minimal recourse usage. All related actions will be reported as stated in section 8.5.
	(iii) Identification of carbon and energy strategies and initiatives to minimise carbon and energy use associated with construction (e.g. selection of equipment, inclusion of renewable energy sources to power temporary facilities and equipment, designing site offices for energy efficiency, and efficient operation of vehicles and equipment).	During construction	Section 5.1.1 & Section 6	A Carbon Estimate and Reporting Tool (CERT) shall be conducted in accordance with the TfNSW Carbon Estimate and Reporting User Manual (7TP-ST-035) to establish a baseline footprint for the project and identify a reduction in construction related GHG emissions by 5% from project baseline as determined by the Carbon Estimate and Reporting Tool (CERT).
	(iv) Consideration of materials mitigation and management measures including use of recycled materials, recycling and reuse of materials on site, use of materials with lower embodied impact, and consideration of whole of life costs during procurement.	During construction	Sections 5.1.1 & 5.1.2	The project's primary material is imported spoil and wherever practical, materials for the clean fill cap will be sourced from Sydney based Infrastructure Projects. Procurement and transport of locally sourced materials for the site works reduce emissions by reusing materials close to the source. Concrete stockpiles classified as GSW where practicable are to be crushed and blended with imported material to achieve compaction specifications and to facilitate onsite reuse. Reuse as part of the ground improvement works and/or integrated capping system will reduce volumes

Ref #	Commitment	Timing	WRMP reference	How Addressed
				requiring disposal at other sources, such as landfill. Remediation works will require the generation of potentially contaminated materials, where possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm.
	(v) Prior to disposal/removal or reuse off-site, all wastes would be classified in accordance with the waste classification guidelines (Waste Classification Guidelines (OEH , 2016) and Waste Avoidance and Resource Recovery Strategy 2014-2021 (EPA, 2014) to ensure the most appropriate disposal or reuse option.	During construction	Section 5.2	Remediation works will require the generation of potentially contaminated materials, where possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm. Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility. Disposal of waste will include GPS tracking of trucks, materials tracking documentation, including weighbridge receipts, stockpile maps, waste classification reports etc. Where necessary, EPA waste transport certificates shall be generated for each waste consignment.
	(vi) Monitoring and compliance requirements.	During construction	Section 8.3	Regular monitoring, auditing and reporting on waste management and resource consumption will be performed throughout the construction. Findings will be reported as per the requirements outlined in section 8.5.

Ref #	Commitment	Timing	WRMP reference	How Addressed
WM-3	The project would achieve a diversion rate for construction waste from landfill of a minimum of 90 per cent of waste by volume, with a target of 95 per cent. The project would also reuse 100 per cent of paving and other reusable materials or facilitate reuse of such materials. Contaminated waste which cannot be diverted from landfill would be excluded from this calculation. Where targets cannot be achieved, the project must demonstrate all feasible measures have been taken to achieve as close to the targets as possible.	During construction	Section 2.3 & Section 5.1.2	Remediation works will require the generation of potentially contaminated materials, where possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm. Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines (2014), transported by a licensed waste transporter and disposed of to an appropriately licenced facility.
WM-4	Construction waste would be segregated and stockpiled on site, with materials such as bricks and tiles, timber, plastic, metals and existing track materials (such as rail and ballast materials) being separated where practicable and sent to a waste facility with recycling capabilities.	During construction	Section 5.1.3	Waste segregation onsite will be performed for various waste materials, including spoil and demolition waste. Waste will be separated onsite into dedicated stockpiles or bins for either reuse onsite or collection by a waste contractor and transport to appropriate off-site facilities.
WM-5	The disturbance, movement and disposal of asbestos containing materials would be carried out in accordance with the Work Health and Safety Regulation 2011 and other relevant guidelines.	During construction	Section 5.2 Unexpected Finds Procedure (Appendix A of CLMP)	Asbestos has been identified as a potential contaminant of concern on the site during previous site investigation and remediation works. Where asbestos is identified, the project Asbestos Removal Control Plan shall be implemented to ensure the removal is carried out in accordance with the Code of Practice for How to Safely Remove Asbestos (SafeWork NSW, 2016).
WM-6	Where possible and fit for purpose, spoil would be beneficially reused within the project before off-site reuse or disposal options are pursued. A spoil management strategy would be developed prior to the commencement of construction and implemented during	During construction	Section 5.1	Waste generation will be avoided where practicable. If this is not possible, waste generation will be minimised. Remediation works will require the generation of potentially contaminated materials, where

Ref #	Commitment	Timing	WRMP reference	How Addressed
	construction. The strategy would identify spoil disposal sites and describe the management of spoil on-site and during off-site transport.			possible material will be retained on-site within the integrated capping system or an engineered, on-site containment berm. All remediation activities will be carried out in accordance with a Remediation Works Validation Plan, which will be endorsed by the EPA accredited, Site Auditor. This will outline the strategy for the management of materials on-site and where necessary, the process for off-site disposal to an appropriately licensed off-site facility.

3.4 Environmental Performance Outcomes

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

Table 3-3: Environmental Performance Outcomes relevant to this WRMP

ID Ref#	Environmental Performance Outcome	Timing	WRMP reference	How Addressed
EPO-SU-2	The project would comply with the relevant requirements of the NSW Government Resource Efficiency Policy.	During construction	Section 6	Prior to commencement, the project shall complete the Sustainable Design Guideline Checklist and a Greenhouse Gas Inventory Report using the TfNSW Carbon Estimate and Reporting Tool (CERT). The SDG Checklist is to demonstrate compliance with elements of the NSW Government Resource Efficiency Policy (GREP).

4 Environmental aspects and impacts

4.1 Construction waste streams and resource use

The following construction related waste streams have been identified:

- Contaminated materials generated from remediation activities;
- Wastes from existing structures that require demolition, pipe work, pavements and concrete pathways;
- Excavation wastes including excavated natural material (ENM), virgin excavated natural material (VENM) and contaminated soils;
- Vegetation from removal of shrubs and plants;
- Residual water generated from construction activities;
- Packaging materials associated with items delivered to site such as pallets, crates, cartons, plastics and wrapping materials;
- Wastes produced from the operation and maintenance of various heavy construction equipment including liquid hazardous wastes from cleaning, repairing and maintenance;
- Non-hazardous wastes would be generated through the use of worker's facilities such as toilets;
- General wastes including office wastes, scrap materials and biodegradable wastes; and
- Used spill kit materials.

The following sources of construction related resource consumption (fuel and power) have been identified:

- Procurement and delivery of materials to site;
- Site establishment, including compound set up;
- Removal, relocation and compaction of excavated materials for ground improvement works;
- Removal of hard stand materials such as concrete;
- Operation of site compounds and lighting;
- Construction plant and machinery;
- Importation of material to site; and
- Removal of waste from the site.

4.2 Impacts

The potential environmental impacts associated with construction waste generation and resource use include:

- Generation of construction waste, such as excavated soil and rock;
- Generation of domestic waste from construction personnel;
- Inappropriate handling and disposal of hazardous waste;

- Generation or spread of contaminated waste/soils, e.g. groundwater, used or expired chemicals, or construction materials;
- Water pollution due to sediment runoff from soil excavation and excess spoil storage;
- Weed infestation from dispersion of seeds and so forth during clearing and access upgrading activities;
- Consumption of non-renewable resources such as energy, diesel and other chemicals;
- Greenhouse gas emissions due to consumption of energy from non-renewable resources;
- Excessive volumes of spoil directed to landfill due to inadequate recycling and reuse;
- Excessive volumes of waste directed to landfill due to excessive resource consumption and inadequate collection, classification and disposal of waste;
- Contamination of soil, surface and / or groundwater from the inappropriate storage, transport and disposal of liquid and solid waste;
- Generation of excessive waste; and
- Generation or spread of contaminated waste/soils.

Refer also to the Environmental Risk Register included in Appendix A2 of the CEMP.

5 Waste management

5.1 Waste management hierarchy

The *Waste Avoidance and Resource Recovery Act 2001* aims to promote waste avoidance and resource recovery through (amongst other things) the establishment of the following waste hierarchy:

1. Avoidance of unnecessary waste and resource consumption – the first priority in waste management includes actions to reduce the amount of waste generated;
2. Resource recovery – the second priority in waste management involves opportunities for reuse (without further processing), recycling (processing waste materials to make the same or different products), reprocessing and energy recovery; and
3. Disposal – the least desirable option in the waste management hierarchy involves the disposal of waste in an appropriate manner so as to minimise the potential adverse environmental impacts associated with its disposal.

Refer to **Figure 5-1** for the most recent waste hierarchy provided by the EPA in the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21, 2014*.



Figure 5-1: The Waste Hierarchy

The approach to the steps in the waste hierarchy most relevant to the Portion 2 Early Works is briefly described below.

5.1.1 Reduce or avoid

The waste hierarchy nominates reduction and/or avoidance of waste as the primary aim in waste management. During the Portion 2 Early Works activities, the following measures will be implemented to avoid generation of waste;

- Conduct a detailed design to identify the excavation cut-to-fill profile to minimise the disturbance of materials to be retained and maximise the potential reuse of materials on-site;
- Construction of an engineered containment cell for the retention and containment of waste materials on-site;
- Ensure necessary planning and efficient management of the delivery and storage of materials to avoid spoilage of materials;
- Establish agreements with suppliers for 'take back' arrangements for packaging/pallets/drums where possible;
- Procurement of materials with minimal packaging;
- Procurement of materials on 'as needed' basis, based on design or assessment of necessary quantities;
- Ensure correct types and quantities of materials are ordered to avoid excess material waste;
- Avoid waste and disposal from slab demolition through crushing and processing concrete by Concrete Crusher or similar for re use in ICS or GI works where practicable
- Coordinate site activities to minimise waste through utilisation of unused materials;
- Employ trained and qualified plant and machinery operators to avoid damage to materials and reduce wastage of consumables during plant and machinery operation and maintenance; and
- Ensure protection of stored materials from inclement weather

5.1.2 Reuse and recycling

Waste separation and segregation will be managed on-site for Portion 2 Early Works to facilitate reuse and recycling as a priority of the waste management program as follows:

- Waste segregation onsite- waste materials, including spoil and demolition waste, will be separated onsite into dedicated stockpile areas or bins for either reuse onsite or collection by a waste contractor and transport to off-site facilities;
- Construction of an engineered containment cell for the retention and containment of waste materials on-site;
- Use of recycled materials, spoil from other projects will be prioritised where applicable for Portion 2 Early Works;
- Crushing and re-use of demolished concrete slabs as part of the ICS and GI works will be employed where practicable. This may include blending with other recycled materials to achieve necessary specifications.
- Portion 2 Early Works will aim to meet waste management and sustainability targets; and
- Assess the feasibility of using treated water from the Aquanet, recycled water system.

5.1.3 Waste handling and storage

Where waste is required to be handled and stored onsite prior to onsite reuse or offsite recycling/disposal, it shall be stored in accordance with Waste Storage (Clause 42) limits within schedule 1 of the POEO Act. The following measures apply:

- Spoil, topsoil and mulch are to be stockpiled onsite in allocated areas, where appropriate, and mitigation measures for dust control and surface water management will be implemented as per the Air Quality Management Sub-plan and the Soil and Water Management Sub-plan (SWMP);
- Ongoing materials tracking, including waste and imported material volumes shall be tracked in accordance with the Materials Tracking System requirements identified in the Remediation Works Validation Plan (RWVP), which will be endorsed by the EPA-accredited Site Auditor;
- Stockpiles will be clearly marked and their location tracked on the Stockpile tracking map. Stockpile locations, along with appropriate environmental controls will be further detailed on the relevant ECMs (refer to Appendix A6 of the CEMP);
- Liquid wastes are to be stored in appropriate containers in bunded areas until transported offsite. Bunded areas will have the capacity to hold 110 per cent of the liquid waste volume for bulk storage or 120 per cent of the volume of the largest container for smaller packaged storage;
- Hazardous waste will be managed by appropriately qualified and licensed contractors, in accordance with the requirements of the *Environmentally Hazardous Chemicals Act 1985* and the EPA waste disposal guidelines; and
- All other recyclable or non-recyclable wastes are to be stored in appropriate covered receptacles (e.g. bins or skips) in appropriate locations onsite and contractors commissioned to regularly remove/empty the bins to approved disposal or recycling facilities.

5.1.4 Waste disposal

Waste (and spoil) disposal is to be in accordance with the *Protection of the Environment Operations Act 1997* and the *Waste Avoidance and Resource Recovery Act 2001*. Wastes that are unable to be reused or recycled will be disposed of offsite to an appropriately licenced waste management facility following classification (refer to section 5.2). Details of waste types, volumes and destinations shall be recorded in a Materials Tracking Register. Disposal of waste at licensed facilities shall include GPS tracking of waste vehicles, audits of waste facility receipts and cross verification with the facility. If asbestos waste needs to be disposed offsite, it will be tracked through EPA's *WasteLocate* service.

The site has an existing groundwater treatment plant (GTP). The GTP is designed to remove contaminants from groundwater pumped from the north-eastern boundary of the site. Discharge of treated groundwater to sewer is licensed under Trade Waste Agreement (TWA) Number 15831.

5.1.5 Imported Materials

Imported materials are required for Portion 2 Early Works as an important component of the integrated capping system. Imported materials shall be validated as either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) as defined under the POEO Act 1997 and the POEO (Waste) Regulation 2014.

Imported VENM or ENM will be assessed in accordance with the ENM Order 2014 (NSW EPA 2014). Prior to importation, the source site of the imported materials will be investigated. The site history will be reviewed to ensure previous activities undertaken on the source site have not

caused contamination of the imported materials. For VENM, the materials being excavated are visually assessed by the validation consultant to confirm that no sign of contamination is present and that the materials are undisturbed.

In some cases existing documentation/classification reports may be available and an adequacy review may be sufficient (coupled with a site inspection if required) by the Validation Consultant prior to importation of materials.

5.2 Classification of waste streams

Where waste cannot be avoided, reused or recycled it will be classified and appropriate disposal will then occur. The classification of waste is undertaken in accordance with the EPA Waste Classification Guidelines Part 1: Classifying Waste (2014). This document identifies six classes of waste: Special, Liquid, Hazardous, Restricted Solid, General Solid (putrescible) and General Solid (non-putrescible), and describes a six step process to classifying waste. That process is summarised below:

Step 1: Is it 'special waste'?

Establish if the waste should be classified as special waste. Special wastes are: clinical and related, asbestos, waste tyres. Definitions are provided in the guidelines.

Note: Asbestos and clinical wastes must be managed in accordance with the requirements of Part 7 of the *Protection of the Environment Operations (Waste) Regulation 2014* which outline special requirements in the areas of transportation, disposal, re-use or recycling. Relevant WorkCover requirements will also be complied with and detailed further in Project Work Health and Safety (WHS) documentation.

If it is established that the waste is not special waste, progress to waste classification under Step 2.

Step 2: If not special, is it 'liquid waste'?

If it is established that the waste is not special waste it must be decided if it is 'liquid waste'. Liquid waste means any waste that: has an angle of repose of less than 5° above horizontal becomes free-flowing at or below 60° Celsius or when it is transported is generally not capable of being picked up by a spade or shovel.

Liquid wastes are sub-classified into:

- Sewer and stormwater effluent
- Trackable liquid waste according to *Protection of the Environment Operations (Waste) Regulation 2014*
- Non-trackable liquid waste

If it is established that the waste is not liquid waste, progress to waste classification under Step 3.

Step 3: If not liquid, has the waste already been pre-classified by the NSW EPA?

The EPA has pre-classified several commonly generated wastes in the categories of hazardous, general solid waste (putrescibles) and general solid waste (non-putrescibles). If a waste is listed as 'pre-classified', no further assessment is required.

Note: Wastes that have been classified by the EPA cannot be reclassified by any other party. A list of all pre-classified waste streams is located in *NSW EPA Waste Classification Guidelines – Part 1: Classifying Waste (pg. 7-10)*.

If it is established that the waste is not pre-classified waste, progress to waste classification under Step 4.

Step 4: If not pre-classified, is the waste hazardous?

If the waste is not special waste (other than asbestos waste), liquid waste or pre-classified, establish if it has certain hazardous characteristics and can therefore be classified as hazardous waste.

Hazardous waste includes items such as explosives, flammable solids, substances liable to spontaneous combustion, oxidizing agents, toxic substances and corrosive substances.

If it is established that the waste is not hazardous waste, progress to waste classification under Step 5.

Step 5: If the waste does not have hazardous characteristics, undertake chemical assessment to determine classification

If the waste does not possess hazardous characteristics, it needs to be chemically assessed to determine whether it is hazardous, restricted solid or general solid waste (putrescible and non-putrescible). If the waste is not chemically assessed, it must be treated as hazardous.

Waste is assessed by comparing Specific Contaminant Concentrations (SCC) of each chemical contaminant, and where required the leachable concentration using the Toxicity Characteristics Leaching Procedure (TCLP), against Contaminant Thresholds (CT).

If it is established that the waste is not hazardous or restricted waste, it is then general solid waste. Progress to waste classification under Step 6 and determine whether the general solid waste is putrescible or non-putrescible.

Step 6: Is the general solid waste putrescible or non-putrescible?

If the waste is chemically assessed as general solid waste, a further assessment is available to determine whether the waste is putrescible or non-putrescible. The assessment determines whether the waste is capable of significant biological transformation. If this assessment is not undertaken, the waste must be managed as general solid waste (putrescible).

5.3 Classification of potential waste streams

The types of wastes which may be generated during construction are outlined within classifications in **Table 5-1**.

Table 5-1: Classification of potential waste streams

Construction Activity	Waste Type	Waste Classification	Proposed reuse/recycling/disposal methods
Bulk Earthworks / Excavations	VENM (Virgin Excavated Natural Material) or ENM (Excavated Natural Material)	Imported materials shall be validated as either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) as defined under the POEO Act 1997 and the POEO (Waste) Regulation 2014.	Beneficial reuse on site as engineering fills and where possible, optimise reuse on the Project. Beneficial reuse offsite. Offsite disposal at an approved facility.
	Potentially contaminated soils	If material is taken off site classification will be carried out, based on soil tests carried out prior to construction and in accordance with the EPA Waste Classification Guidelines: Parts 1 & 2.	On-site containment of contaminated materials in an engineered containment cell. Off-site disposal at an approved facility Off-site reuse as engineering fill or used in earthworks On site burial / remediation
Vegetation Removal	Potentially contaminated soils	General solid waste (non-putrescible)	On-site containment of contaminated materials in an engineered containment cell. Off-site disposal at an approved facility Off-site reuse as engineering fill or used in earthworks On site burial / remediation

Construction Activity	Waste Type	Waste Classification	Proposed reuse/recycling/disposal methods
General Demolition	Concrete, asphalt, bricks and gravel	General solid waste (non-putrescible)	Re-use onsite – Crush and use as backfill/road base, access tracks, landscape mounds and other applications where suitable and approved by TfNSW. Resource recovery offsite – Reuse, recycle, reprocess or energy recovery at an appropriately licensed waste facility in accordance with EPA Waste Classification Guidelines (2009). On-site containment of contaminated materials in an engineered containment cell.
	Scrap metal	General solid waste (non-putrescible)	Off-site recycle
	Glass	General solid waste (non-putrescible)	Off-site recycle
Asbestos Removal	Asbestos	Special Waste (Asbestos)	On-site containment of contaminated materials in an engineered containment cell. Dispose offsite at a licenced facility to accept asbestos waste
General Site Operations	Waste generated by the maintenance of plant and equipment including air and oil filters and rags	General solid waste (non-putrescible)	Offsite disposal at an approved facility

Construction Activity	Waste Type	Waste Classification	Proposed reuse/recycling/disposal methods
	Oils, grease, fuel, chemicals and other fuels	Liquid	Offsite disposal at an approved facility
	Tyres	Special waste	Offsite disposal/ recycling at an approved waste facility
	Batteries	Hazardous waste	Offsite disposal/recycling at an approved facility
	Radiator fluid	Hazardous waste	Offsite disposal at an approved facility
	Hydraulic fluid	Hazardous waste	Offsite disposal at an approved facility
	Domestic waste generated by workers	General solid waste (putrescible)	Offsite disposal at an appropriate licensed waste facility
	Sewage from amenities	General solid waste (putrescible)	Offsite disposal at an appropriately licensed waste facility
	Waste water / recycled water / storm water	Liquid	Treated and/or reused on-site when biologically and chemically suitable
Office Operations	Paper, cardboard and plastic	General solid waste (non-putrescible)	Offsite recycling
	Glass bottles and aluminium cans	General solid waste (non-putrescible)	Offsite recycling
	Ink cartridges	General solid waste (non-putrescible)	Offsite recycling

Construction Activity	Waste Type	Waste Classification	Proposed reuse/recycling/disposal methods
	Food waste	General solid waste (putrescible)	Offsite disposal at an approved facility
	Effluent	Liquid	Offsite disposal at an appropriately licensed waste facility and/or treated and reused on site
Groundwater Treatment	Contaminated groundwater	Trade waste	On-site treatment of treated groundwater through a groundwater treatment plant (GTP) to sewer. Licensed under Trade Waste Agreement (TWA) Number 15831.

5.4 Waste exemption

Clause 51 Protection of the Environment Operations (Waste) Regulation 2005 enables the EPA to grant exemptions to the licensing and payment of levies for the land application or use of waste. The EPA has issued general exemptions for a range of commonly recovered, high volume and well characterised waste materials that allow their use as fill or fertiliser at unlicensed, off-site facilities. The general Resource Recovery Exemptions and Orders may be applicable to this project are defined in **Table 5-2** below. These are general gazette exemptions that do not require approval. A specific exemption may be granted where an application is made to the EPA.

Table 5-2: Waste Recovery Exemptions and Orders and associated conditions

Exemption/Order	General Conditions
Effluent Exemption 2014 Effluent Order 2014	- The effluent can only be applied to land for the purposes of irrigation or as a soil amendment material. - The consumer must apply the effluent within a reasonable period of time.
The excavated natural material exemption 2014 The excavated natural material order 2014	- The chemical concentration or other attributes of the excavated natural material listed in the Excavated Natural Material Exemption must not be exceeded. - The excavated natural material can only be applied to land as engineering fill or used in earthworks. - ENM handling, processing and testing requirements are outlined in detail in the exemption.
The excavated public road material exemption 2014 The excavated public road material order 2014	- The excavated public road material can only be stored within the road corridor at the site where it is to be applied to land. - The excavated public road material can only be applied to land within the road corridor for public road related activities including road construction, maintenance and installation of road infrastructure facilities. This exemption does not apply to the land application of excavated public road material on any land outside the road corridor. - The excavated public road material cannot be applied on private land. - The consumer must land apply the relevant waste within a reasonable period of time.
The mulch exemption 2016 The mulch order 2016	- The raw mulch can only be applied to land for the purposes of filtration or as a soil amendment material or used either singularly or in any combination as input material(s) to a composting process. - The consumer must land apply the raw mulch within a reasonable period of time.

Exemption/Order	General Conditions
The recovered aggregate exemption 2014 The recovered aggregate order 2014	• The chemical concentration or other attribute of the recovered aggregate listed in the Recovered aggregate Exemption must be met. • The recovered aggregate can only be applied to land for road making activities, building, landscaping and construction works. This approval does not apply to any of the following applications: • Construction of dams or related water storage infrastructure, • Mine site rehabilitation, • Quarry rehabilitation, • Sand dredge pond rehabilitation, • Back-filling of quarry voids, • Raising or reshaping of land used for agricultural purposes, and • Construction of roads on private land unless: the relevant waste is applied to land to the minimum extent necessary for the construction of a road, and a development consent for the development has been granted under the relevant Environmental Planning Instrument (EPI), or it is to provide access (temporary or permanent) to a development approved by a Council, or the works undertaken are either exempt or complying development.
The blast furnace slag exemption 2014 The blast furnace slag order 2014	• Blast furnace slag or blended slag can only be applied to land in cementitious mixes such as concrete or in non-cementitious mixes such as an engineering fill in earthworks or roadmaking activities.
The reclaimed asphalt pavement exemption 2014 The reclaimed asphalt pavement order 2014	• Reclaimed asphalt can only be applied to land for road related activities including road construction or road maintenance
Project Specific Exemptions	• Issued by EPA on a case-by-case basis. Exemption only valid if implemented in accordance with its requirements.

6 Resource management and conservation

The Project team is dedicated to implementing resource conservation best practice and the reduction of greenhouse gases by adopting energy efficient work practices according to *NSW Government Resource Efficiency Policy*. Steps include:

Developing and implementing effective procurement practices to minimise energy and resource use such as;

- Prepare and track sustainability compliance with the TfNSW NSW Sustainable Design Guidelines to achieve a minimum 'Pass' design rating;
- A Carbon Estimate and Reporting Tool (CERT) shall be conducted in accordance with the TfNSW Carbon Estimate and Reporting User Manual (7TP-ST-035) to establish a baseline footprint for the project and identify innovations and methods to achieve a minimum 5% reduction in project greenhouse gas emissions;
- Use of energy efficient construction equipment and vehicles;
- Procurement of locally sourced materials from other Sydney based Infrastructure Projects on 'as needed' basis to reduce over-ordering and wastage;
- Switching off construction plant, vehicles and equipment when not in use to minimise idling; and
- Conducting awareness programs through inductions, tool-box talks and other methods for all site personnel regarding energy conservation methods.

Considering sustainable design principles in the establishment of the Project compound sites. These shall include but are not limited to:

- Investigation and implementation of emissions management actions such as use of energy efficient construction practices and fuel-efficient construction equipment and vehicles;
- Onsite crushing and reuse of concrete where practicable;
- Identify and implement feasible sustainability initiatives into the project works;
- Install and operate temporary site facilities in compliance with sustainability targets identified for the project;
- Maximise the potential for beneficial spoil reuse on the project, in accordance with contaminated land site reuse criteria; and
- Tracking of water, energy, waste and materials volumes and GHG emissions throughout the duration of the project.

7 Environmental control measures

Specific measures and requirements to meet the objectives of this WRMP and to address contract specifications, CoA and REMMMs are outlined in Table 7-1.

Table 7-1: Waste, energy, and water management and mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
WR1	A waste and resource management plan will be prepared detailing how Portion 2 early works will manage waste generation and resource consumption.	WRMP	Pre-construction	Environment & Hygiene Manager	REMMM GEN-1, WM-2
WR2	Waste generation will be avoided where practicable.	WRMP Waste hierarchy - <i>Waste Avoidance and Resource Recovery Act 2001</i>	During construction	Environment & Hygiene Manager Site Supervisor	CoA E127 REMMM WM-2
WR3	Where avoidance of waste generation is not possible, measures will be taken to minimise the waste generation.	WRMP Waste hierarchy - <i>Waste Avoidance and Resource Recovery Act 2001</i>	During construction	Environment & Hygiene Manager Site Supervisor	CoA E127 REMMM WM-2
WR4	Portion 2 Early works targets to recycle or reuse >90% waste generated onsite	WRMP	During construction	Environment & Hygiene Manager	REMMM HY-6, WM-3, WM-6
WR5	Beneficial reuse of recycled materials/spoil will be carried out where possible.	WRMP	During construction	Project Manager Environment & Hygiene Manager	REMMM WM-3, WM-6
WR6	Where waste from Portion 2 Early Works needs to be disposed offsite, classification of waste is undertaken prior to disposal in accordance with the EPA Waste Classification Guidelines Part 1: Classifying Waste (2014) and disposed of to a licenced facility.	WRMP Waste hierarchy - <i>Waste Avoidance and Resource Recovery Act 2001</i>	During construction	Environment & Hygiene Manager	CoA E127, E129, E130 REMMM HY-6, WM-2

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
WR7	Disposal of waste will include GPS tracking, audits or receipts and cross verification.	WRMP Material Tracking Waste Transport Certificates GPS tracking Receipts from Waste facilities	During construction	Environment & Hygiene Manager	CoA E129, E130, REMMM HY-6
WR8	If asbestos is found unexpectedly, the Unexpected Finds Procedure will be implemented.	WRMP Asbestos Removal Control Plan (ARCP) Unexpected Finds Procedure (Appendix A of CLMP)	During construction	Environment & Hygiene Manager	REMMM WM-5
WR9	If asbestos waste needs to be disposed offsite, it will be tracked through EPA's WasteLocate service.	Unexpected Finds Procedure WRMP	During construction	Environment & Hygiene Manager	CoA E129, E131
WR10	Waste segregation onsite will be performed for waste materials	WRMP	During construction	Environment & Hygiene Manager	REMMM WM-2, WM-4
WR11	Use of recycled materials, spoil from other projects, wastewater or recycled water will be prioritised where applicable	WRMP	During construction	Environment & Hygiene Manager	REMMM WM-1
WR12	Management of emissions will be incorporated into staff inductions.	WRMP, CEMP Site Induction	During construction	Environment & Hygiene Manager	REMMM GG-3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
WR13	Relevant measures as stated in CEMP and WRMP will be taken to minimise the emissions and will be included in site induction / training material.	WRMP, CEMP Site Induction	During construction	Environment & Hygiene Manager	REMMM GG-4, GG-5, GG-6 EPO-SU-2
WR14	Energy efficient work practices will be implemented as far as practicable	WRMP	During construction	Environment & Hygiene Manager	REMMM GG-6, WM-2 EPO-SU-2
WR15	Procurement of materials will be performed on 'as needed' basis	WRMP	During construction	Environment & Hygiene Manager	REMMM WM-2 EPO-SU-2
WR16	Regular monitoring, auditing and reporting will be performed against the requirements of this WRMP.	WRMP Sustainable Design Checklist	During construction	Environment & Hygiene Manager	REMMM GG-7, WM-2

8 Compliance management

8.1 Roles and responsibilities

The Portion 2 Early Works 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 7](#) of this Plan.

The following table outlines the main parties who will be involved in use of the Plan, and their corresponding roles and responsibilities. This table is not intended to list all responsibilities under relevant legislation, but is presented as a brief clarification of the respective responsibilities in implementing this Plan.

Table 8-1: Roles and Responsibilities of Portion 2 Early Works

Role	Responsibility
TfNSW	Promote good environmental and WHS management.
Project Manager	Ensure all personnel entering the site are inducted to an appropriate level in environmental and emergency procedures. Provide subcontractors with the requirements of this Plan prior to commencement of work.
Environment & Hygiene Manager	Preparation of this Plan. Implement, control and maintain the Plan. Provide subcontractors with the requirements of this Plan prior to commencement of work. Ensure that all changes to the Plan are communicated to relevant authorities (stated in all personnel working on site, including subcontractors).
Site Supervisor	Take all practical measures to ensure the workplace under their supervision is operating according to the agreed principles of the Plan, and without risks to health or the environment. Ensure all personnel under their control entering the site are inducted to an appropriate level in environmental and emergency procedures. Respond to any SHEQ incidents. Ensure any changes to this Plan or procedures are communicated to all personnel under their control.
Subcontractors	All subcontractors are required to comply with this Plan and to comply with directions from the Project Manager and/or Environment & Hygiene Manager in this respect.

Environmental Representative	Review, provide comment on and endorse this plan to verify its compliance with relevant environmental legislation, standards and planning approval for Portion 2 Early Works. Ensure implementation of this plan, facilitated through inspections and that environmental auditing is performed in accordance with all relevant project requirements. Provide independent guidance and advice to TfNSW and the Contractor in relation to environmental compliance issues and the clarification of planning approval conditions;
Employees and Visitors to Site	Attend appropriate induction and training sessions, following procedures and making the Project Manager and/or Environment & Hygiene Manager aware of any actual or potential breaches of procedures. Where encountered, reporting of previously unidentified areas of contamination to the Site Manager.

8.2 Training

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

- Existence and requirements of this sub-plan;
- Existence and requirements of other management plans and guidelines such as Spoil Management Strategy within the SWMP;
- Relevant legislation;
- Incident response, management and reporting;
- Waste reporting requirements;
- Requirements of the waste hierarchy;
- Waste/ recycle storage requirements;
- Potential for contaminated material (including asbestos containing material) to be present on site and management requirements for such material if identified;
- Energy and resource efficient best practices;
- Waste handling requirements and details of the types of wastes that are intended for on-site reuse;
- Management of emissions;
- Other specific responsibilities for waste and reuse management; and
- Other specific responsibilities for resource management.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in waste and energy management.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

8.3 Monitoring and inspection

Compliance with the requirements of this WRMP, its implementation and effectiveness will be monitored through regular inspections of worksite and activities and quarterly compliance tracking. A Compliance Tracking Report will be prepared for submission to the Department of Planning and Environment (DP&E) on a 6-monthly basis. This includes regular monitoring of energy, resource use and associated greenhouse gas emissions related to Portion 2 Early Works.

Additional requirements and responsibilities in relation to inspections are documented in Section 3.8.1 and Section 3.8.4 of the CEMP.

8.3.1 Materials Tracking Procedure

Waste and Materials tracking is based on a strict sequence of decisions that are followed to allow waste and material to proceed from its origin through to its final use. Waste and materials tracking data is collected on the project to allow reporting of the following:

- The quantity of each type of waste sent to landfill;
- The quantity of each type of waste recycled;
- The quantity of each type of waste reused;
- The quantity of each type of waste treated;
- The quantity of each type of hazardous / regulated waste generated on the project;
- Its method of treatment and disposal;
- The location of treatment and disposal;
- Copies of records confirming the legal transport, treatment and disposal; and
- Measurement of any reduction in waste generation that has been achieved.

The quantity of waste in each solid waste stream is measured by weight and liquid waste stream by volume, with records provided by the waste transport contractor.

Waste and materials tracking data will be captured in a Materials Tracking Register. The Materials Tracking Register will include a Stockpile Register and Stockpile Map to track materials generated throughout the project. These documents will be provided to TfNSW and NSW EPA accredited Site Auditor via the Monthly Reports and Monthly Remediation Tracking Reports. Waste and materials tracking data will be maintained and updated as soon as reasonably practicable to inform weekly environmental site inspections.

The disposal of materials from Site will follow the process shown in Figure 8-1 below:

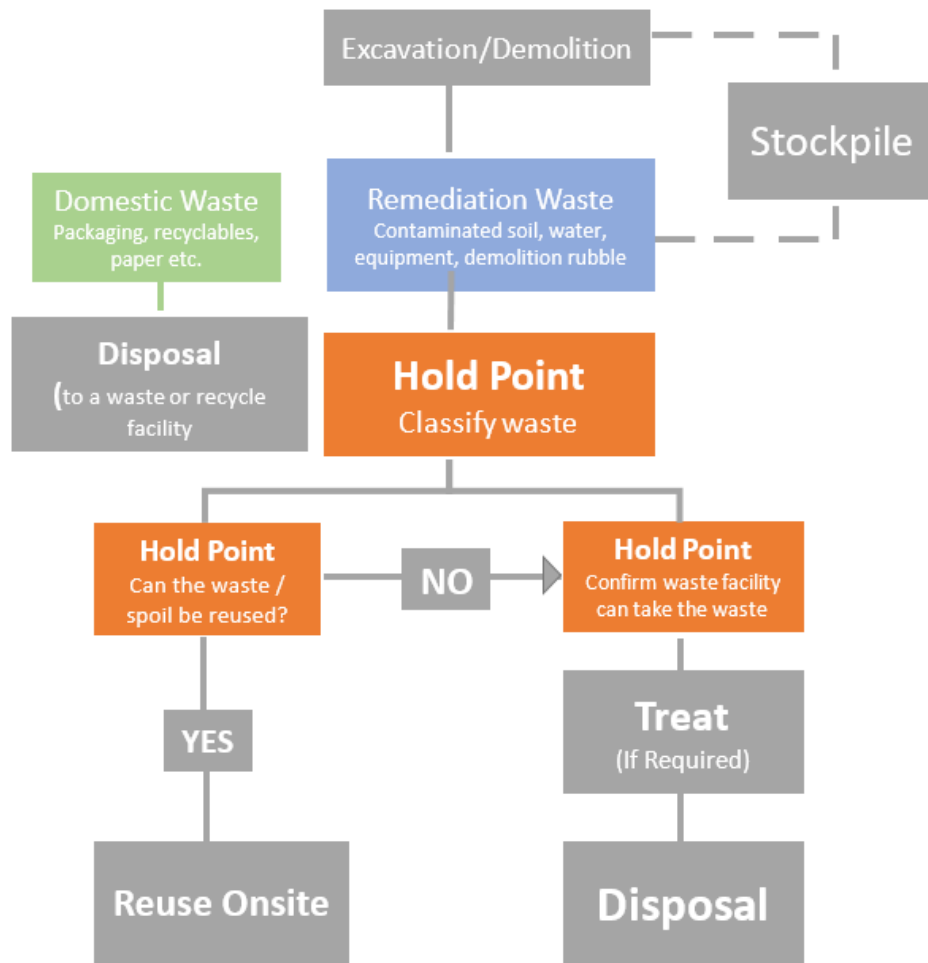


Figure 8-1: Process of disposal of materials

8.4 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 3.9.3 of the CEMP.

8.5 Reporting

Reporting requirements and responsibilities are documented Section 3.9.5 of the CEMP.

All relevant waste disposal information is summarised and included in the project monthly environmental report which is provided to the Environmental Representative (ER) and TfNSW Project Manager.

Waste tracking certificates and any other waste dockets will be retained on site in a designated folder.

All tracking, monitoring, sampling and testing information and data associated with waste management at the Portion 2 Early Works site will be reported on, including:

- Demolition waste;

- Materials scheduled for on-site re-use;
- Materials disposed off-site; and
- Materials imported to site

All concrete washout areas and sediment controls or areas that store water / waste water will be inspected in accordance with the TfNSW Guidelines for Concrete Washout and Water Discharge and Reuse (refer to Erosion and Sediment Control Plan of SWMP).

Inspection checklists assessing their integrity and capacity will be completed, as a minimum, at the following times:

- Weekly during dry weather;
- Prior to forecast rainfall events; and
- During rainfall events (as often as possible) and as soon as possible following a rainfall event when the site is unattended.

Water quality testing, including on trade waste, shall be conducted in accordance with the SWMP.

Incident reports will be generated if an incident occurs on site. Examples of incidents include:

- Bins overflowing and not being managed correctly;
- Waste taken to incorrect waste facility (not licensed for that waste);
- Failure to retain waste dockets and provide them to staff for entering into waste registers;
- Failure to maintain waste registers; and
- Failure to use a licensed transporter for prescribed waste.

Corrective actions may include:

- Training on correct segregation and identification of waste streams;
- Improved signage on bins;
- Temporary supervision to oversee waste management at the site;
- Selective removal of non-compliant waste to another disposal facility; and
- Implementation of a new or improved procedure to clarify issues.

9 Review and improvement

9.1 Continuous improvement

Continuous improvement of this 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; and
- Make comparisons with objectives and targets.

9.2 WRMP update and amendment

The processes described in Section 3.9 to Section 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed in consultation with TfNSW and the ER.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.12.1 of the CEMP.

A copy of the ER endorsement is included in Appendix C of the plan.

Appendix A – Material Tracking Register

The material tracking register is filed as '*Materials Tracking Register (US-050056-OPS-REG-002)*'. A copy of the template is provided below.

[illegible]

Appendix B – Licensed Transporter and Waste Facility Register



Licensed Transporter and Waste Facility Register

Licence No	Licensee	Premises	Contact Number	Contact Name	Licensed to Accept or Transport							Comments
					GSW	RSW	HAZ	PASS	ACM	Liquid	B&D	
20916	Lantrak NSW PTY LTD	PO BOX 744, STANHOPE GARDENS NSW 2768			Y	Y	Y	Y	Y	Y	Y	Designated transporter for solid waste
20982	EPH NSW PTY LTD	14/85 BOURKE ROAD MASCOT NSW 2020			Y	Y	Y	Y	Y	Y	Y	Designated transporter for solid waste
4068	SITA Australia P/L	1725 Elizabeth Drive, Kemps Creek NSW			Y	Y	N	N	Y	N	Y	Designated disposal facility for GSWa, RSW, RSWa and immobilised waste.
5065	SITA Australia P/L	New Illawarra Road, Lucas Heights NSW 2234			Y	N	N	N	Y	N	Y	Alternative disposal facility for GSW, GSWa and GSW (B&D).
4608	Breen Holdings P/L	Captain Cook Drive, Kurnell NSW			Y	N	N	N	N	N	Y	Designated disposal facility for GSW.
20271	CLEANAWAY CO PTY LTD	42-46 CHARLES STREET ST MARYS NSW 2760			N	Y	Y	Y	Y	Y	N	Designated receiving facility for hazardous waste and offsite treatment of ASS/PASS where required. Note: Not an end destination.
6664	CONCRETE RECYCLERS (GROUP) PTY LIMITED	14 THACKERAY STREET, CAMELLIA NSW			Y	N	N	N	N	N	Y	Designated facility for disposal of unimpacted concrete and asphalt.
13426	DIAL-A-DUMP (EC) PTY LTD	HONEYCOMB DRIVE, EASTERN CREEK NSW 2766			Y	N	N	Y	Y	N	Y	Alternate disposal option for GSW/GSWa on Saturdays.
20339	VEOLIA ENVIRONMENTAL SERVICES (AUSTRALIA) PTY LTD	WALLGROVE ROAD, HORSLEY PARK NSW 2175			Y	N	N	N	Y	N	Y	Alternate disposal option for GSW/GSWa on Saturdays.
12618	BRANDOWN PTY. LIMITED	Lot 90 Elizabeth Drive, KEMPS CREEK, NSW, 2178			N	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete
5186	BRANDOWN PTY. LIMITED	Lot 90 Elizabeth Drive, KEMPS CREEK, NSW, 2178			Y	N	N	N	Y	N	N	Alternate disposal option for Asphalt, GSW, ACM, concrete
12857	MCPHERSON RECYCLING PTY LTD	38 McPherson St, Banksmeadow NSW 2019			Y	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete, GSW
10935	ADOERLEY RECYCLING PTY LTD	3-5 DUCK STREET AUBURN NSW 2144			Y	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete, GSW
4849	N. MOIT & SONS (NSW) PTY. LTD.	ROCK AND DIRT RECYCLING 306 RACECOURSE ROAD SOUTH WINDSOR NSW 2756			Y	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete, GSW
4504	WARRINGAH GRAVEL & STONE SUPPLIES PTY LTD	WARRINGAH GRAVEL & STONE SUPPLIES END OF CHALLENGER DRIVE BELROSE NSW 2085			N	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete
4602	CLEANAWAY CO PTY LTD	CNR BLACKMAN CRES & FAIREY ROAD SOUTH WINDSOR NSW 2756			Y	Y	Y	Y	Y	Y	N	Disposal option for HAZ
13274	CLEANAWAY CO PTY LTD	PO Box 1108 OSBORNE PARK DC WA 6916			Y	Y	Y	Y	Y	Y	Y	Licence to transport trackable waste category 1 & 2
4560	CLEANAWAY OPERATIONS PTY LTD	HOMEBUSH BAY LIQUID TREATMENT PLANT CORNER OF PONDAGE LINK & HILL RD HOMEBUSH BAY NSW 2127			N	N	N	N	N	Y	N	Liquid Waste Disposal Facility
10771	TRANSPACIFIC INDUSTRIAL SOLUTIONS PTY LTD	Lot 3 Charcoal Close, Unanderra NSW 2526			Y	Y	Y	Y	Y	Y	N	Alternate disposal/treatment option for GSW(a), RSW and RSW
6172	CLEANAWAY OPERATIONS PTY LTD	CNR PONDAGE LINK & HILL RDS HOMEBUSH BAY NSW 2127			Y	Y	Y	Y	Y	Y	Y	Alternate Transporter of Waste
6245	Hi-Quality Waste Management PTY LTD	PO BOX 42, KEMPS CREEK NSW 2171			Y	Y	Y	Y	Y	Y	Y	Alternate Transporter of Waste
5857	Hi-Quality Waste Management PTY LTD	37 Lee Holm Street, St Marys 2760			Y	N	N	N	N	N	Y	Waste disposal facility for GSW (R) Rock.
12943	CLEANAWAY CO PTY LTD	66 LINKS ROAD, ST MARYS, NSW 2760			N	Y	Y	N	Y	Y	N	Waste Storage Facility
11555	Sell and Parker Pty Ltd	45 Tattersall Road, Kings Park, NSW 2148			N	N	N	N	N	N	Y	Scrap Metal facility
13013	Central Waste Plant Pty Ltd	8 Styles Street, Kurri Kurri, NSW 2327			Y	N	N	N	N	N	N	Alternate disposal option for GSW
10699	ECO Cycle Materials Pty Ltd	155 Newton Rd, Wetherill Park, NSW 2164			Y	N	N	N	N	N	Y	Alternate disposal option for Asphalt/concrete, GSW
4865	Enviroguard Pty Ltd	Erskine Park Landfill, 50 Quarry Road, Erskine Park NSW 2759			Y	N	N	N	Y	N	Y	Alternative facility for GSW(a) soils

25/10/2019

1

Appendix C – ER Endorsement

14 January 2020

Transport for NSW

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

Review of Parramatta Light Rail Stage 1 - Package 3 Portion 2 Remediation Works Ventia –CEMP Appendix B8 - Construction Waste and Resource Management Sub Plan (CWRMP) Version 3.01

Pursuant to SSI-8285 Condition of Approval A23 (d) (i), as the approved Environmental Representative, I confirm that I have reviewed, provided comments and I approve the minor amendments of the following document pursuant to condition of approval C8:

- CEMP Appendix B8 - Construction Waste and Resource Management Sub Plan (CWRMP) Version 3.01 (PLR-VNT-SAM-WM-PLN-000002 – Version 3.01, December 2019). The plan was updated to include the update on source of imported materials, waste facilities and closing out TfNSW comments. There was no major change on the plan only minor amendments.

Yours sincerely,

Environmental Representative
Phone: [REDACTED]
email: [REDACTED]

Filename: AQ1148.05 PLR P3P2 VENTIA WRMP V3.01 ER ENDORSEMENT 20200114

Appendix B9

Contaminated Land Management Sub-Plan

Transport for NSW Package 3 – Portion 2 Early Works

Parramatta Light Rail – Stage 1
April 2020

PLR-VNT-SAM-CO-PLN-000004

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Parramatta Light Rail – Stage 1

Portion 2 Early Works (Package 3) – Contaminated Land Management Sub-plan

Document Control

Title	Parramatta Light Rail – Stage 1 Portion 2 Early Works (Package 3) Contaminated Land Management Sub-plan
Prepared and updated by	██████████ Environment & Hygiene Manager ██████████ Environmental Scientist
Signed	██████████
Dated	17/04/2020
Approved on behalf of Ventia Utility Services Pty Ltd by	██████████ Project Manager
Signed	██████████
Dated	17/04/2020
Endorsed by Environment Representative	██████████ Senior Environmental Project Manager
Signed	<i>Refer Appendix D</i>

Version control

Revision	Date	Description	Prepared by	Approval
00	01/03/2019	For Review	██████████	██████████
01	11/04/2019	Post TfNSW & ER Review / ER Endorsement	██████████	██████████
02	16/07/2019	Post DPIE CEMP Review	██████████	██████████
03	05/03/2020	6 Monthly Annual Review + TWTP Inclusion + Updated VMP	██████████ ██████████	██████████
04	17/04/2020	TfNSW Comments	██████████ ██████████	██████████

Glossary / Abbreviations

Abbreviations	Expanded text
ACM	Asbestos containing material
ASS	Acid Sulfate Soils
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CoA	NSW Minister for Planning Conditions of Approval
DPIE	NSW Department of Planning, Industry and Environment (formerly known as Department of Planning and Environment)
ECM	Environmental Control Map
The EIS	<i>Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017</i>
Environmental Representative	A suitably qualified and experienced person independent of the Contractor and Proponent, and project design and construction personnel, employed for the duration of construction. The Environmental Representative sits under the Independent Certifier.
EMS	Environmental Management System
EPA	NSW Environment Protection Authority
EPO	Environmental Performance Objectives
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ERSED	Erosion and Sediment
GTP	Groundwater Treatment Plant – Constructed in Portion 1 Works which replaced the pre-existing Groundwater Treatment Plant
LTEMP	Long Term Environmental Management Plan
mbgl	metres below ground level
OEH	Office of Environment and Heritage
PASS	Potential Acid Sulfate Soils
PCI	Pacific Chemical Industries
POEO Act	<i>Protection of the Environment Operations Act 1997</i>

RAP	Remediation Action Plan
REMMM	Revised Environmental Mitigation and Management Measure
SAR	Site Audit Report
SAS	Site Audit Statement
SPIR	Submissions and Preferred Infrastructure Report
TWTP	Temporary Water Treatment Plant
VCH	Volatile Chlorinated Hydrocarbons
VMP	Voluntary Management Plan

1 Introduction

1.1 Context and scope

This Contaminated Land Sub-Plan (CLMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail – Stage 1 PLR (Stage 1 or the Project) and has been prepared to target specifically *Package 3: Early Works in Portion 2* (referred hereafter as Portion 2 Early Works) as part of the Enabling Stage of the Project. Refer to the Parramatta Light Rail (Stage 1) Staging Report (Project Wide) (TfNSW 2019) for further detail.

Package 3: Early Works Portion 2: the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue, Rosehill. This is the allocated site for the SaM Facility.

Ventia Pty Ltd (Ventia) has been appointed by Transport for NSW (TfNSW) as the head contractor for Portion 2 Early Works, responsible for delivering the remediation (capping) of the TfNSW owned site at 6-8 Grand Avenue Rosehill (refer to Section 1.4 of the CEMP for project scope).

This CLMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMM) listed in the *Parramatta Light Rail (Stage 1) – Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement, August 2017* (the EIS) and the subsequent Submissions Report (incorporating Preferred Infrastructure Report) (TfNSW 2018) and all applicable legislation.

This CLMP provides the management approach and requirements (including environmental mitigation measures, controls, monitoring and reporting) for managing contaminated land during construction of Portion 2 Early Works. This Plan forms one of six sub-plans which are collectively covered by the Construction Environmental Management Plan (CEMP). Effective implementation of the CEMP (and associated sub-plans) will ensure that environmental resources, responsibilities and management measures are adopted during the construction activities associated with Portion 2 Early Works.

The implementation of the CEMP and associated sub-plans are aligned with Project level management plans including the Community and Stakeholder Engagement Plan and the Sustainability Plan as illustrated in Figure 1-1.

The review and document control process for this Plan are described further in [Section 8](#).

The context of this CLMP in relation to the environmental management system is presented below in **Figure 1-1**.

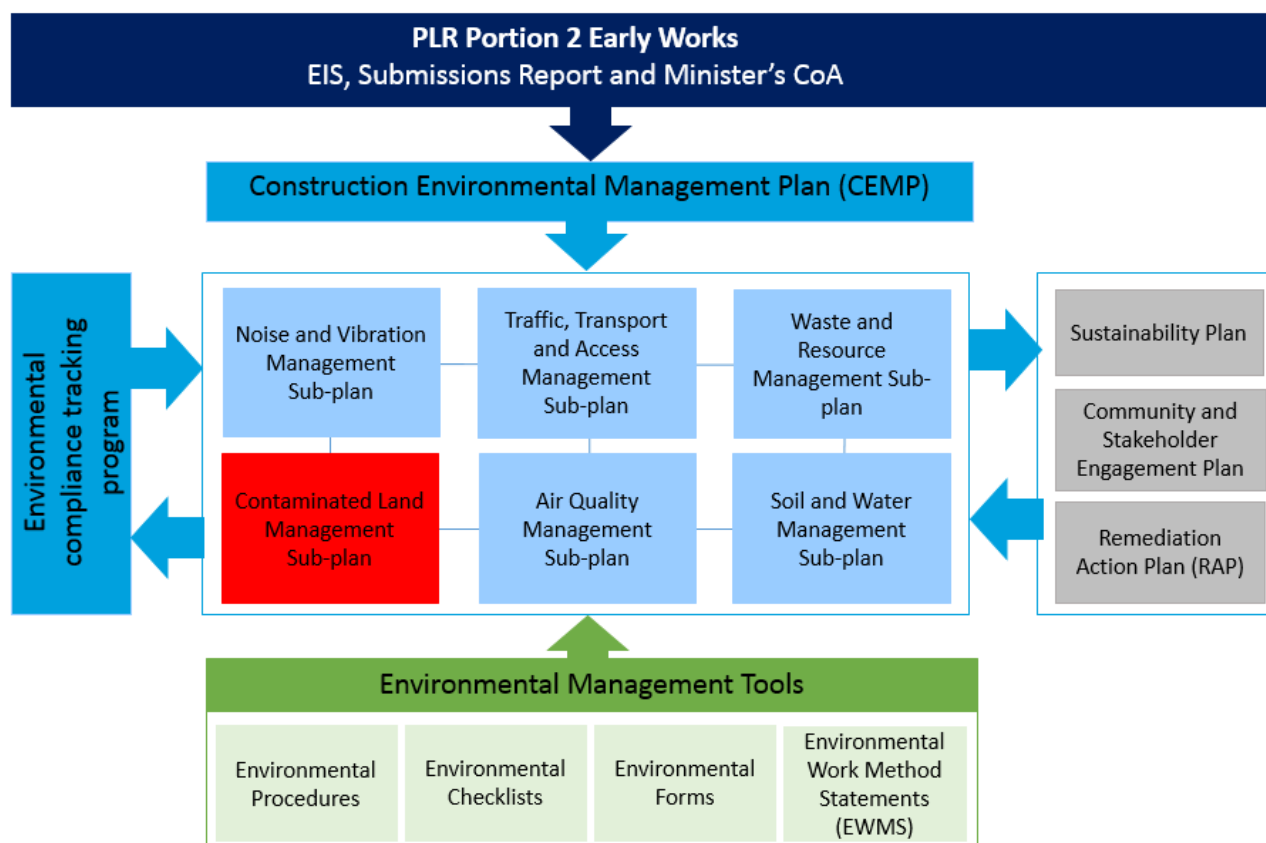


Figure 1-1: Portion 2 Early Works Environmental Management System and CEMP Context

1.2 Background and project description

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney population, particularly the population growth of the Parramatta Local Government Area (LGA).

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

PLR Stage 1 project will link Parramatta's central business district (CBD) and train station to a number of key locations, including the following:

- Westmead Precinct.
- Parramatta North Growth Centre.
- The new Western Sydney Stadium.
- The Camellia Town Centre.
- The new Powerhouse Museum.
- Riverside Theatre arts and cultural precinct.
- The private and social housing redevelopment at Telopea.
- The Rosehill Gardens Racecourse.
- The three Western Sydney University campuses.

In summary, the key features of PLR Stage 1 project include:

- A new dual track light rail network of approximately 12 kilometres in length (including approximately seven kilometres within the existing road corridor and approximately five

kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services).

- A total of 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 5 am to 1 am. Weekday services will operate approximately every 7.5 minutes in the peak period between 7 am and 7 pm.
- 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 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 of the CEMP.

1.2.1 Stabling and Maintenance Facility

As part of the development of the Project, the TfNSW owned land located at 6-8 Grand Avenue Camellia was identified as the preferred site for the stabling and maintenance facility (SaM Facility). The SaM Facility is being constructed on the former industrial site adjacent to the Rosehill Gardens Racecourse within the Rosehill and Camellia precinct (refer to **Figure 1-2**).

The SaM Facility would provide for the storage of light rail vehicles, maintenance, repair, refurbishing, upgrading, stabling, cleaning of light rail vehicles and a base for infrastructure maintenance activities and will operate 24 hours a day and 7 days a week.

Administration and staff facilities as well as the operations control centre for the light rail network will be located within the maintenance building. Parking for staff and visitors will be provided on site, including maintenance vehicle parking. An electrical substation will be located at the rear of the site to power the facility and light rail.

To accommodate the development of the stabling and maintenance facility, and reduce the potential for interaction with contaminated material during construction, the following activities will be undertaken as part of the enabling works:

- Importation and placement of appropriate fill material across the site to raise the surface finish level by about two metres;
- Installation of an appropriate capillary break to eliminate subsurface contamination migration;
- Installation of a passive vapour collection system and ventilation network to manage soil vapours;
- Installation of an appropriate vapour barrier and structural surface capping layer;
- The Temporary Works encompasses establishment of plant, equipment and facilities on the Site to support the delivery of the Works;
- The Enabling Works encompasses establishment and management of utilities and other below-ground infrastructure on the Site to support the delivery of the Works;
- Construction of a containment cell for the retention and containment of waste materials on-site;
- Implementation of Ground Improvement Works where required;
- Implementation of the monitoring and validation program; and
- Preparation of Stage 2 Site Validation Report and a Long Term Environmental Management Plan (LTEMP) to the satisfaction of the Site Auditor.

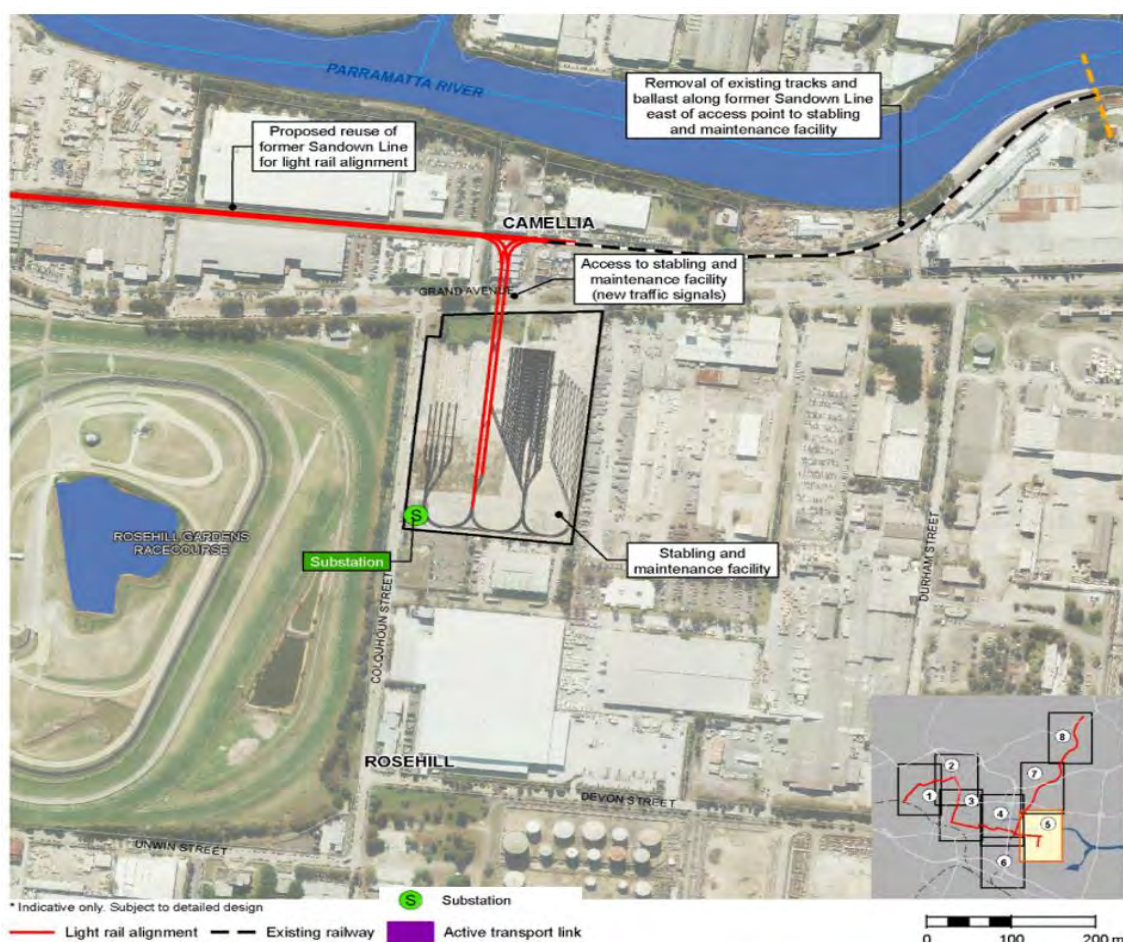


Figure 1-2: Portion 2 Early Works - SaM Facility location (Source: EIS Figure 6.2e)

1.2.2 Statutory Context

The Project is Critical State Significant Infrastructure (CSSI) pursuant to section 5.13 of the (EP&A Act). The Minister for Planning is the approval authority for the Project.

In accordance with section 5.22(2) of the EP&A Act, the environmental planning instruments that apply to the proposal are *State Environmental Planning Policy (Infrastructure) 2007* (insofar as it relates to the declaration of development that does not require consent) and *State Environmental Planning Policy (State and Regional Development) 2011* (as it pertains to the declaration of infrastructure as SSI). There are no other environmental planning instruments that substantially govern the carrying out of the Project.

The Portion 2 Early Works site has been subject to long term regulation by the NSW Environmental Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act). The remediation strategy for the Site is detailed within the Remediation Action Plan (RAP) including the requirements of the CLM Act. The objective of the RAP is to document the preferred remediation option and outline the methodology for the installation, verification and validation of the preferred remediation option.

The Portion 2 Early Works will be undertaken to achieve Objective 3 of the RAP (as outlined in Section 7.1). Objective 3 is as follows:

Render the site suitable for commercial / industrial land use, specifically for the redevelopment of the site as the SaM facility for the PLR Project.

This objective is to be achieved by:

- Design and implementation of a capping system, appropriately integrated with the cut-off wall, and incorporating layered components appropriate to;
- Mitigate and manage soil vapour (both indoor and outdoor as dictated by the facility design) from VCHs;
- Create a physical barrier to prevent site users from accessing contaminated materials; and
- Prevent Cr (VI) wicking into future site structures infrastructure and paved surfaces.

The RAP has been reviewed and endorsed by a NSW EPA-accredited Site Auditor in accordance with the CLM Act.

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described below in [Section 1.2.3](#).

1.2.3 Parramatta Light Rail Planning Approval

An Environmental Impact Statement (EIS) for the project was placed on public exhibition between 23 August and 23 October 2017. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the project to the Department of Planning and Environment (DP&E). Following the conclusion of the public exhibition period, Transport for NSW prepared a Submissions Report and Preferred Infrastructure Report for the project to address the issues raised in community and stakeholder submissions, and to document a number of proposed design changes and additional investigations undertaken since exhibition of the EIS.

In May 2018, the Minister for Planning granted approval of the Project, under Section 115ZB of the EP&A Act. Following approval of the CSSI, a modification was assessed by the DP&E and subsequently approved on the 21st December 2018 under section 115ZI of the EP&A Act (Modification 1). Modification 2 was requested from DP&E and approved on the 25th January 2019.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.3 Environmental management systems overview

The environmental management system overview is described in section 1.6 of the CEMP and is summarised in Figure 1-1.

2 Purpose and objectives

2.1 Purpose

The purpose of this plan is to provide the foundation for the management of contaminated land impacts in accordance with best practice and legal requirements (including environmental mitigation measures, controls, monitoring and reporting) during the construction phase of Portion 2 Early Works.

Specifically, this plan details the contaminated land management requirements that must be satisfied in order to demonstrate compliance with mitigation measure CM-2 of the Revised Environmental Mitigation and Management Measure along with CoA's outlined in **Table 3-2: Conditions of Approval relevant to the CLMP**.

Mitigation measures (specific to contaminated land) required to satisfy the CoA requirements are derived from the EIS and through risk assessment processes (refer [Section 3.2](#)) and included within this CLMP. The 'how addressed' column in condition ID C4 in the CEMP of the CoA outlines how EPO's and Mitigation Measures are to be achieved, refer to [Section 3.3](#) for relevant contamination land mitigation measures and controls and [Section 3.4](#) for environmental performance outcomes related to contaminated land.

Implementation of these measures is ensured through monitoring, training and competence, inspection, audit and reporting actions detailed in Sections [7.3](#), [7.4](#), [7.5](#) and [7.6](#) with the responsibilities for implementation identified in [Section 6](#). Continual improvement processes in relation to compliance with regulatory requirements are detailed in [Section 8](#).

Effective implementation of this Plan will assist the contractor and relevant sub-contractors to achieve compliance with necessary environmental regulatory and policy requirements in a systematic manner with an outcome of continual environmental management performance.

2.2 Objectives

The key objective and strategies of this CLMP is to ensure that contaminated land is managed appropriately throughout the delivery of Portion 2 Early Works. To achieve these objectives, the contractor will undertake the following:

- Detail relevant procedures for remediation activities, including handling, treatment and management, of existing contamination and contaminated materials during excavation to protect human health and the environment;
- Detail relevant procedures for the management of unexpected finds of contaminated materials that may be encountered onsite;
- Prevent migration of contamination off the site as a result of remediation activities, such as prevention of cross-contamination of clean materials;
- Implement appropriate management measures to protect the health of current and future users of the site and surrounding lands, and the local environment (including groundwater), both during and after completion of remediation works; and
- Ensure appropriate measures are implemented to address safeguards consistent with all relevant legislation and other requirements as described in [Section 3.1](#) of this Plan.

2.3 Targets

Contaminated land specific targets and performance criteria have been established for the management of contaminated land during Portion 2 Early Works. The targets and performance criteria for Portion 2 Early Works are as follows:

- Ensure full compliance with the relevant legislative requirements, CoA, REMMMs and NSW Auditor Guidelines;
- Implement proper management of contaminated sites, particularly during changes of land use to ensure public health and the environment are protected through implementation of the NSW EPA accredited Site Auditor endorsed RAP;
- Follow contamination control measures outlined in Section 7.1 of this plan and Section 7.3.6 of the AQMP to manage contaminants of concern, i.e. contaminants expected to be encountered on site;
- Ensure training on best practice contaminated land management is provided to all construction personnel through site inductions and targeted tool-box talks as required;
- Implement the Unexpected Finds Procedure (Appendix A) to manage potentially contaminated materials that are not expected at the site, but may be encountered during Portion 2 Early Works; and
- Demonstrate that contamination and contaminated materials have been appropriately managed throughout the works to the satisfaction of the Site Auditor.

3 Environmental Requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation and regulations relevant to this CLMP includes:

- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Contaminated Land Management Act (1997) (CLM Act)
- Protection of the Environment Operations Act (1997) (POEO Act)
- Protection of the Environment Operations (General) Regulation (2009)
- Protection of the Environment Operations (Waste) Regulation (2014)
- Work Health and Safety Act (2011) (WHS Act)
- Work Health and Safety Regulation (2017).

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

3.1.2 Additional approvals, licences, permits and requirements

The site has a replacement groundwater treatment plant (GTP) and a Temporary Water Treatment Plant (TWTP). The GTP is designed to remove contaminants from groundwater pumped from the north-eastern boundary of the site. The implementation of the TWTP has increased capacity to treat and remove contaminants from water which accumulates on the site. Post treatment from the GTP or TWTP, the water is discharged to trade waste under the licensed Trade Waste Agreement (TWA) Number 15831.

The site is registered on the EPA Section 58 Contaminated Sites Register. Voluntary Remediation Proposals and Management Orders relevant to this site is summarised in Table 3-1.

Table 3-1: Summary of Regulatory Notices, Declarations, Agreements and Approvals

Item	Description*
Voluntary Management Proposal (VMP) number 20181709	Dated 03 October 2018, issued under Section 17 of the <i>CLM Act 1997</i> . Subject: Remediation activities as outlined in <i>Remediation Action Plan for 6-10 Grand Avenue, Camellia</i> (██████████, 1775480-006-R-Rev0 RAP, 2 November 2017
Voluntary Management Proposal (VMP) number 20191710	20/12/2019 Portion 2 Early Works remediation activities including key milestones and other actions. Teambinder ref; PLRP-TFNSW-VNT-CORR-001727
Sydney Trade Waste Agreement	Dated 01 July 2016, issued by Sydney Water under the <i>Sydney Water Act 1994 (NSW)</i> Subject: Consent to Discharge Industrial Trade Wastewater (Consent No. 15831)

Item	Description*
Sydney Trade Waste Agreement	Dated 08 May 2019, issued by Sydney Water under the <i>Sydney Water Act 1994 (NSW)</i> Subject: Consent to Discharge Industrial Trade Wastewater (Consent No. 15831)

*(refer to Appendix B for locations of areas specified in Table 3-1)

3.1.3 Guidelines and standards

The main guidelines, specifications and policy documents relevant to this Plan include:

- National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM), Schedule B5a, Guideline on Ecological Risk Assessment.
- How to Safely Remove Asbestos Code of Practice (SafeWork NSW, 2016).
- Waste Classification Guidelines – Part 1: Classification of waste (NSW EPA 2014).
- NSW Environment Protection Authority (EPA) Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd edition) (2017).
- NSW Department of Planning State Environmental Planning Policy 55 – Remediation of Land.
- Department of Urban Affairs and Planning and Environment Protection Authority Planning Guidelines SEPP 55 – Remediation of Land (1998).
- NSW Office of Environment and Heritage (2011) Guidelines for Consultants Reporting on Contamination Sites.
- Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 OEH (2009).

3.2 Minister's Conditions of Approval

The CoAs relevant to this Plan are listed in **Table 3-** below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-2: Conditions of Approval relevant to the CLMP

CoA No.	Condition Requirements	Document Reference	How Addressed
E118	Notification must be provided and, where relevant, approvals must be sought directly from the EPA before commencement of any works which will intersect or disturb the surface of sites which are regulated by the EPA under the CLM Act.	Section 7.1 of CLMP	A Voluntary Management Proposal (VMP) has previously been endorsed by the NSW EPA to carry out the earlier remediation actions, works and other components relating to remediation, as set out in: Remediation Action Plan for 6-10 Grand Avenue, Camellia (██████████, 1775480-006-R-Rev0 RAP, 2 November 2017). TfNSW has been granted a second VMP endorsed on the 20/12/2019 which reflects updates in Portion 2 Early Works, principal features of the proposal, key milestones and other actions.
E119	Before commencement of any activities that would result in the disturbance of land and/or soil in Areas of Environmental Interest (AEI) identified as having a high risk of contamination, or identified as medium risk subject to further desktop assessment as specified in the documents listed in Condition A1, a Site Contamination Report must be prepared by a suitably qualified person(s) in accordance with the requirements of the CLM Act and associated guidelines. The Site Contamination Report must outline the potential contamination risks from the AEIs to human health and receiving waterways and detail, where relevant, whether the land is suitable (for the intended land use) or can be made suitable through remediation. For AEIs where there is insufficient information and data available to draw such	Section 4.4 of CLMP	A Remediation Action Plan (RAP) for the project has been prepared by ██████████ in 2017. This details how the environmental and human health risks will be managed during the disturbance and remediation of the site, including activities with contaminated soil or groundwater. A Site Contamination Report, prepared by ██████████ in 2015 (██████████, 2015) and Data Gap Assessment, reported by ██████████ in 2017 (██████████, May 2018) have also been prepared. Combined they provide further details with regards to potential contamination risks from the AEIs to human health and receiving waterways and details that this site can be made suitable for land use through remediation. Portion 1 and Portion 2 Early Works are

CoA No.	Condition Requirements	Document Reference	How Addressed
	conclusions, the Site Contamination Report must also detail the outcomes of Phase 2 site contamination investigations within those AEIs.		part of the remediation to make this site suitable for the intended use of the SaM facility. Note; A RAP had been prepared by the previous site owner which was superseded by the RAP prepared by [REDACTED] 2017.
E120	For those AEIs where a Site Contamination Report is to be prepared in accordance with Condition E119, where the investigations identify that the site is suitable for the intended operations and that there is no need for a specific remediation strategy, measures to identify, handle and manage potential contaminated soils, materials and groundwater must be identified in the Site Contamination Report and incorporated into the CEMP or relevant sub-plan.	Section 4.4 of CLMP	The Site Contamination Report and Data Gap Assessment have identified that the site requires further remediation works prior to land use as the future stabling and maintenance (SaM) facility. A Remediation Action Plan (RAP (Nov 2017) has been prepared for this site. It includes how the environmental and human health risks will be managed during the disturbance, remediation and/or removal of contaminated soil or groundwater in disturbed areas. The RAP was endorsed by the NSW EPA accredited Site Auditor prior to commencing early works remediation activities on the site.
E121	For those AEIs where a Site Contamination Report concludes the site can be made suitable for its intended land use subject to remediation, the Site Contamination Report must include a Remediation Action Plan to address disturbed areas, and how the environmental and human health risks will be managed during the disturbance, remediation and/or removal of contaminated soil or groundwater.	Section 7.5.1 of CLMP	The RAP (Nov 2017) has been prepared for this site. It includes how the environmental and human health risks will be managed during the disturbance, remediation and/or removal of contaminated soil or groundwater in disturbed areas. The RAP was endorsed by the NSW EPA accredited Site Auditor prior to commencing early works remediation activities on the site.
E122	For those AEIs where remediation is required, the Site Contamination Report and Remediation Action Plan must be accompanied by a Site Audit Statement(s), prepared by a NSW EPA Accredited Site Auditor under the CLM Act, verifying that the disturbed area has been or can be remediated to a standard consistent with the intended land use. Where land is remediated, a final Site Audit Statement(s) must be prepared by an accredited Site Auditor, certifying that the contaminated and disturbed areas have	Section 7.5.2 of CLMP	A Site Audit of the remediation works shall be carried out by a NSW EPA accredited Site Auditor in order to prepare a Site Audit Statement (SAS). The SAS shall confirm that the site has been remediated to a condition that renders it suitable for the proposed PLR land use.

CoA No.	Condition Requirements	Document Reference	How Addressed
	been remediated to a standard consistent with the intended land use.		
E123	For those AEIs where remediation is required, the land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement determines that the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with.	Section 7.5.2 of CLMP	TheSaM facility shall not commence operations and maintenance activities until the Site Auditor has issued a Site Audit Statement. The Site Audit Statement shall determine the suitability of the site, along with any other ongoing management conditions.
E124	A copy of the final Site Audit Statement must be submitted to the Secretary and relevant Council no later than one month before the commencement of CSSI operations.	Not triggered by the Enabling Work Stage – Package 3 as per Staging Report (Appendix C) Package 3: Portion 2 Early Works (PLR-VNT-SAM-PE-RPT-000018)	
E125	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be implemented should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction. This can be provided as part of the CEMP or relevant sub-plan.	Appendix A of CLMP	An Unexpected Finds Procedure has been prepared and is included as Appendix A of this CLMP. The Unexpected Finds Procedure will be implemented in the event of unexpected discovery of potential contamination within the Portion 2 Early Works project site.
E126	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Appendix A of CLMP	Unexpected Finds Procedure will be implemented throughout the duration of the construction phase of the Portion 2 Early Works.
E131	Asbestos or asbestos-contaminated materials (ACM) uncovered during demolition and construction activities of the CSSI must be strictly managed in accordance with the requirements under the Protection of the Environment Operations (Waste) Regulation 2014 and any guidelines or requirements in force at the date of this approval and issued by the EPA in relation to those materials.	Appendix A of CLMP	In the event of unexpected discovery of asbestos or ACM during Portion 2 Early Works, the Unexpected Finds Procedure will be implemented and the identified material will be managed in accordance with the requirements of the CEMP and associated sub-plans. In the event material is unable to be retained on-site, the materials shall be disposed of in accordance <i>Protection of the Environment Operations (Waste) Regulation 2014</i> , the Code of Practice for How to Safely Remove Asbestos (2016) or any other applicable guidelines or requirements.

3.3 Revised Environmental Mitigation and Management Measures

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

Table 3-3: Revised Environmental mitigation and management measures relevant to this CLMP

Ref #	Commitment	Timing	CLMP Reference	How Addressed
CM-1	During detailed design, a desktop risk assessment would be carried out for the following Areas of Environmental Interest (AEI) to confirm high or medium risk of contamination: 6 Grand Avenue, Rosehill (former Akzo Nobel site) (AEI 27). This would involve a review of available data, collaboration with stakeholders and consideration of the extent of disturbance by the project in the vicinity of the AEI. Based on the results of this assessment: - Mitigation and management measure CM-2 would apply to AEIs classified as high risk - Mitigation CM-4 would apply to AEIs classified as medium risk.	Pre-construction	Technical Paper 8, Volume 4 - <i>Contaminated Land Assessment</i> .	The EIS initially classified Portion 2 Early Works site as a medium risk site. However, remediation works are being carried out in accordance with a Remediation Action Plan, endorsed by a NSW EPA Accredited Site Auditor. Therefore, REMMM CM-2 will be applied to this site.

Ref #	Commitment	Timing	CLMP Reference	How Addressed
CM-2	Prior to the commencement of construction in the vicinity of these sites, site investigations would be carried out at the following high risk AEI: • Former gas works at Queens Wharf Reserve (AEI 15) • 13A Grand Avenue, Camellia (AEI 21). The results from the site investigations would be assessed against criteria contained within the National Environment Protection (Assessment of Site Contamination) Measure 1999 (2013) to determine any need for remediation. Remediation works would be performed in accordance with the hierarchy of preferred strategies in the Guidelines for the NSW Site Auditor Scheme (DECCW 2006). Where practical, remediation works would be integrated with excavation and development	Pre-construction	Section 7.6 of CLMP	The project site is noted to contain contamination present and is the subject of remediation activities to cap and contain contamination for future work activities. Sampling and monitoring will be carried out in accordance with a Remediation Works Validation Plan, endorsed by a NSW EPA Accredited Site Auditor. It should be noted that remediation activities under the RAP have already commenced during previous remediation activities for the site (Portion 1 works).

Ref #	Commitment	Timing	CLMP Reference	How Addressed
	works performed during construction.			
CM-3	For low and medium risk sites, environmental management measures would be applied as detailed in a Construction Contaminated Land Management Plan (CCLMP), as a sub-plan to the CEMP. The measures would be tailored to address any specific locations where contamination is identified through the current contaminated land investigations. This includes worker health and safety measures.	Pre-construction	This CLMP	This CLMP has been prepared as a part of the CEMP and it details how the environmental and human health risks will be managed during the disturbance, remediation and/or removal of contaminated soil or groundwater in disturbed areas in accordance with the Remediation Action Plan (RAP) that has already been prepared. It should be noted that some of the requirements under the RAP have already been undertaken during the previous remediation activities (Portion 1 works).
CM-4	Visual inspections and monitoring would be performed during excavation activities at medium risk AEIs to identify potential indicators of contamination. If suspected contamination is encountered, the materials would be subject to sampling and analysis to determine management	Pre-construction (during Portion 1 works) and during construction (of Portion 2 Early Works)	Section 7.4 of CLMP	The project site is noted to contain contamination present and is the subject of remediation activities to cap and contain contamination for future work activities. Sampling and monitoring will be carried out in accordance with a Remediation Works Validation Plan, endorsed by a NSW EPA Accredited Site Auditor. It should be noted that remediation activities under the RAP have already commenced during previous remediation activities for the site (Portion 1 works).

Ref #	Commitment	Timing	CLMP Reference	How Addressed
	requirements and suitability for reuse, recycling or remediation.			
CM-6	An unexpected finds procedure would be developed and implemented as part of the project CLMP, outlining a set of potential contamination issues which could be encountered, and detailing the corrective actions to be implemented.	Pre-construction	Appendix A of CLMP	An Unexpected Finds Procedure has been prepared and is included as Appendix A of this CLMP. The Unexpected Finds Procedure details the management requirements and controls to be implemented in the event of unexpected discovery of known or potential contaminated materials.
WM-5	The disturbance, movement and disposal of asbestos containing materials (ACM) would be carried out in accordance with the Work Health and Safety Regulation 2011 and other relevant guidelines.	During construction	Appendix A of CLMP	An Asbestos Removal Control Plan (ARCP) shall be prepared in accordance with the Code of Practice for How to Safely Remove Asbestos (2016). In the event of unexpected discovery of ACM during Portion 2 Early Works, the Unexpected Finds Procedure and the ARCP will be implemented. Handling of ACM will be carried out in accordance with the Work Health and Safety Regulation 2017 and other relevant guidelines.

3.4 Environmental Performance Outcomes

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

Table 3-4: Environmental Performance Outcomes relevant to this CLMP

ID Ref#	Environmental Performance Outcome	Timing	CLMP reference	How Addressed
EPO-SG-2	There would be no impacts on aquatic environments associated with the disturbance of ASS during construction.	During construction	Section 4.1 of CLMP	The acid sulfate soils (ASS) analyses in the EIS indicated that both actual and potential ASS are unlikely to occur within the Portion 2 Early Works site. In addition, ASS or potential acid sulphate soils (PASS) have not been identified during remediation activities to date. Therefore ASS impacts on aquatic environments associated with the Portion 2 Early Works is not anticipated.
EPO-SG-3	Any contamination on project sites would be remediated to suit future land use.	Pre-construction (Portion 1) and construction of Portion 2 Early Works	Section 7.5.1 of CLMP	A Remediation Action Plan (RAP) (██████ 2017) has been developed to establish remediation objectives and Portion 2 Early Works project site will be remediated prior to the intended construction of SaM facility. Note; A RAP had been prepared by the previous owner which was superseded by the RAP prepared by ██████ 2017.

4 Existing Environment

This section describes the existing environment of the Project, specific to contaminated land. It also summarises previous contaminated land investigations undertaken to date and outlines further investigation required. The key reference document is the Remediation Action Plan (RAP) (Nov 2017). Further details of contaminated land can be found in the Section 10.7 of the EIS, Technical Paper 8, Volume 4 - *Contaminated Land Assessment*. The Portion 2 Early Works site is a declared remediation site as per the provisions of the *Contaminated Land Management (CLM) Act*.

4.1 Site geology and acid sulphate soils

The project corridor consists of a predominantly undulating landscape, with generally flat-lying area. The Portion 2 Early Works site is an area mapped as manmade fill mixed with older estuarine deposits as shown in Figure 4-1. The acid sulfate soils (ASS) assessment in the EIS indicates that both actual and potential ASS are unlikely to occur within the Portion 2 Early Works Site. The ASS mapping indicates that the Portion 2 Early Works site occupies an area that is overlain by “Disturbed Terrain” (fill material); therefore, overall risk of disturbing ASS is considered to be low if not nil (Refer **Figure 4-2**:).

The former roadway pavements through the Portion 2 Early Works Site comprise asphalt and concrete. The former building footprint pavements comprise concrete. The condition of the pavements varies from reasonable to poor (with multiple fractures). The residual building slabs are generally elevated above the level of the surrounding site and a flooding retention basin in the southeast corner of the site creates a local depression.

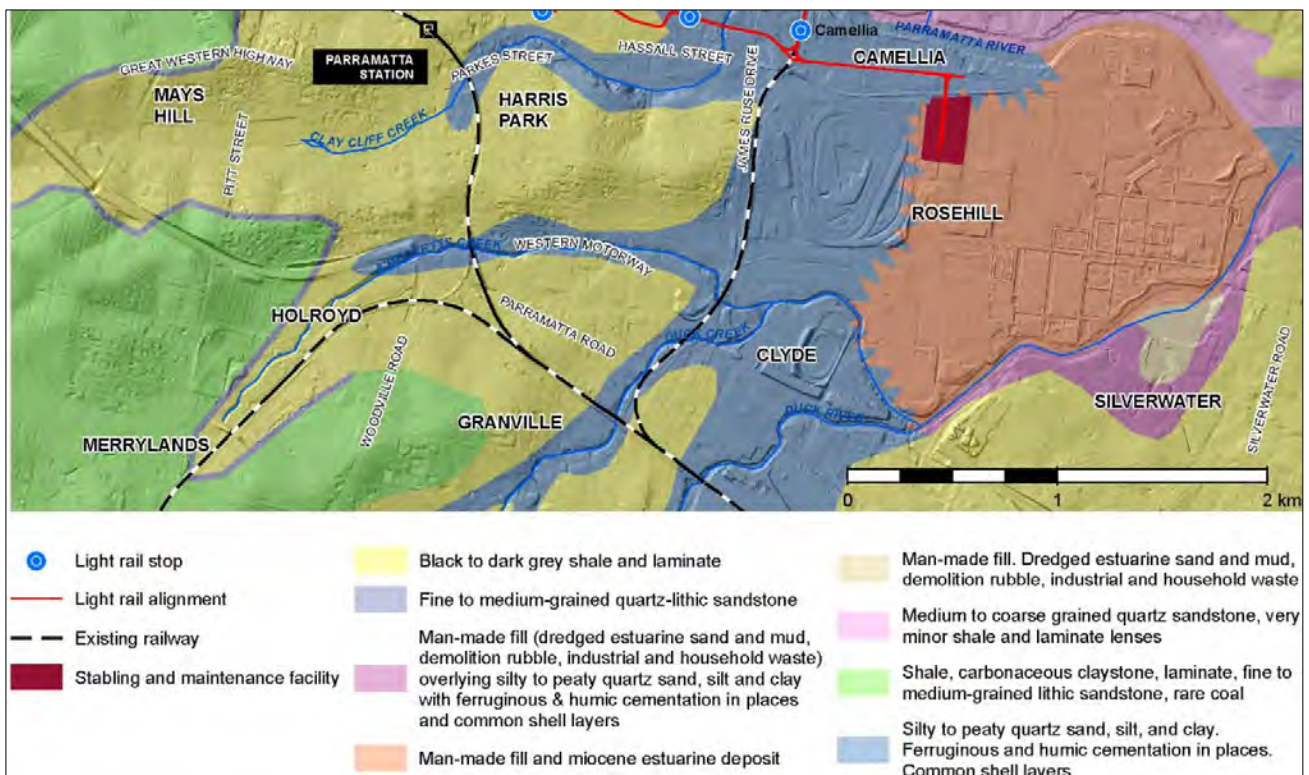


Figure 4-1: Site geology (Source: EIS Figure 10.5)

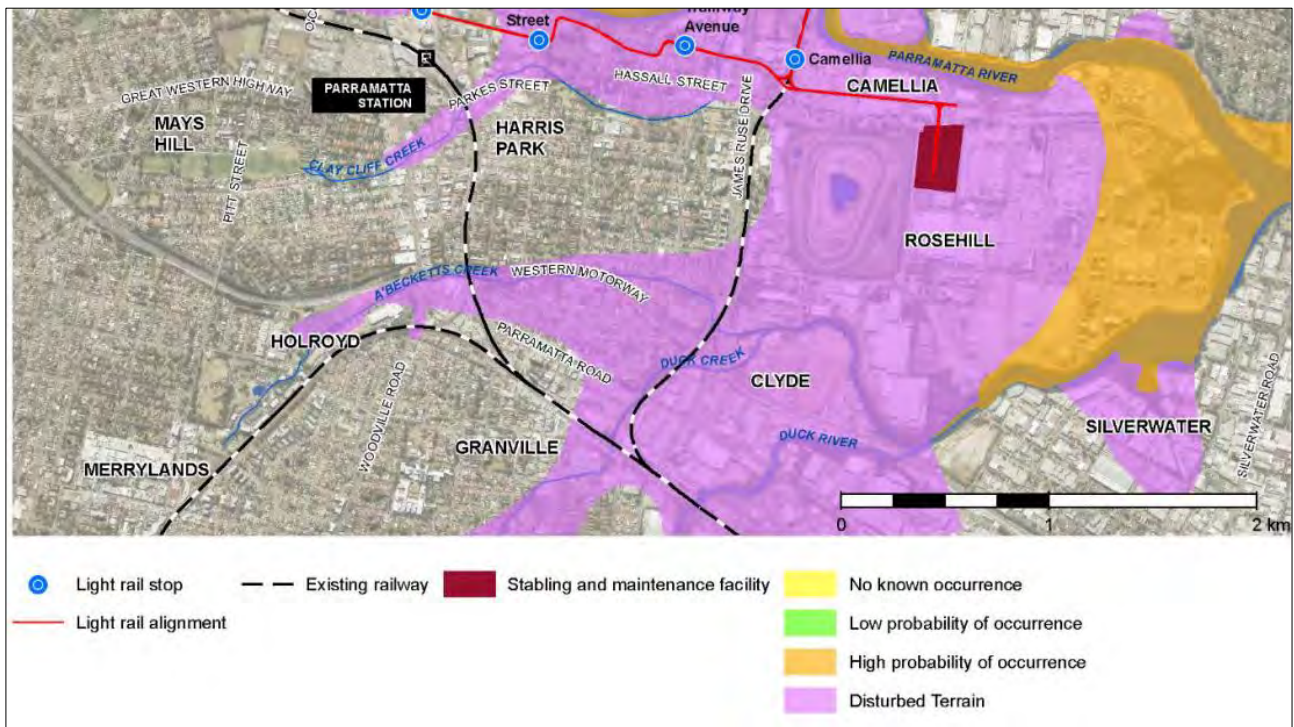


Figure 4-2: Existing acid sulfate soils (Source: EIS Figure 10.7)

4.2 Contamination

A search of the NSW Environment Protection Authority (EPA) record of notices under section 58 of the CLM Act and notifications under section 60 of the CLM Act was carried out in April 2017 as part of the preparation of the EIS.

The search identified that the location of the Portion 2 Early Works Site was formerly occupied by a chemical manufacturing process facility and was listed under section 60 of the CLM Act. A summary of the findings presented in the EIS regarding the Portion 2 Early Works site is presented below in Table 4-1.

Table 4-1: CLM Act Notified Site

Site Name	Site Address	Notified activity	Site status	Location in relation to the Project
Former Akzo Nobel site	6 Grand Avenue, Camellia	Chemical industry	Regulated under CLM Act	Within the project disturbance footprint (the stabling and maintenance facility in the Rosehill and Camellia precinct).

The NSW Department of Planning and Environment (DP&E) published the *Camellia Precinct Land Use and Infrastructure Analysis* (2015) which includes a high level contamination review of the Camellia industrial area, including land within and adjacent to the Rosehill and Camellia precinct. The report identified localised soil and groundwater contamination associated with the history of industrial activities within the area, with a range of contaminants identified including asbestos, hexavalent chromium, petroleum hydrocarbons, chlorinated hydrocarbons and arsenic. The report also identified the potential for more widespread contamination to be present across the precinct,

including asbestos and hexavalent chromium. The majority of the area assessed as part of the report is identified as having a medium to high risk of being contaminated.

Remediation Works have been separated into two (2) main portions. The first portion was carried out prior to commencement of Portion 2 Early Works, these remediation works involved a combination of physical containment and physical separation components intended to mitigate off-site migration of contaminants and minimise and control receptor exposure pathways. Installation of a hydraulic barrier wall adjacent to the site perimeter to prevent the groundwater migration to and from the site. A key objective of Portion 2 Early Works is to install an integrated capping system across the surface of the site to mitigate soil vapour exposure pathways and hexavalent chromium wicking processes, therefore to physically separate future site users from remnant contamination. The integrated capping system, incorporating a passive vapour collection system and ventilation network, will be designed to tie into the hydraulic barrier wall.

4.3 Site History

The history of the development of the site is presented in detail within the RAP (██████, 2017). The site was occupied by a series of industrial operations since the 1940s. The following chronology has been summarised in Table 4-2 below for the Portion 2 Early Works site.

Table 4-2: Summary of Site History

Year	Description
Prior to 1940s	The site was undeveloped but appeared to contain a horse trotting track, presumably associated with the adjacent Rosehill Racecourse.
1940s – 1970s	Chrome manufacturing plant was operated on-site.
1960s – 1995	Chlorofluorocarbons (CFC) manufacturing was operated on-site. Production ceased in 1995.
2009 – 2014	Various light industrial and warehouse activities.
2014-2017	Demolition of all structures was undertaken by 2015 (the Endeavour Energy substation was subsequently decommissioned and in 2017), with the exception of Groundwater Treatment Plant & the air raid shelter.
2018-2019	Portion 1 Remediation activities to install a hydraulic barrier wall to prevent off-site groundwater migration, demolition of redundant infrastructure and structures and installation of a new groundwater treatment plant.

The site previously comprised three (3) main areas:

1. North West Sector - comprising former chemical storage and offices;
2. North East Sector - comprising a former chromium ore processing plant; and
3. Pacific Chemical Industries (PCI) Sector - in the south of the site, comprising a former fluorocarbon production plant.

These areas, together with former buildings and infrastructure are shown on Appendix B for reference.

4.4 Previous investigations and Site Investigation Report

A number of contamination investigations, remedial action plans, voluntary remediation proposals, site remediation and site audits have been undertaken at the site. This includes investigations to inform the Site Contamination Report, which satisfies the requirements of CoA E119. “*Project Ruby: Summary Site Contamination Report; report to Akzo Nobel*” was prepared by [REDACTED] in 2015 ([REDACTED], 2015). A Data Gap Assessment, reported by Coffey in 2017 (Coffey, May 2018) has also been prepared. Combined they provide further details with regards to potential contamination risks from the AEs to human health and receiving waterways and details that this site can be made suitable for land use through remediation. Portion 2 Early Works is a stage of remediation activities that are being performed to make this site suitable for the intended use of the SaM facility.

Table 4- sets out a summary of key findings of investigations undertaken.

Table 4-3: Previous key investigations and findings

Year	Report Title	Location	Outcome
1988	<i>Geochemical site characterisation</i>	Former chromium ore processing plant	Elevated chromium in soil.
1989	<i>Environmental remediation study</i>	Former chromium ore processing plant	Elevated total and leachable chromium and high levels of chromium and sulphate.
1991	<i>Completion report site rehabilitation project, Akzo Chemicals Limited, Camellia</i>	Former chromium ore processing plant	Demolition of the recycled chromium ore silo. Installation of vertical subsurface wall enclosing chromium contaminated fill and capping with concrete. Installation of stormwater drain system. Construction of chromium treatment plant.
1994	<i>Remedial investigation/feasibility study, Pacific Chemical Industries, Colquhoun Rd, Camellia, NSW</i>	Pacific Chemical Industries portion	Shallow fill – elevated chromium, lead, zinc and volatile hydrocarbons. Shallow groundwater – elevated chromium, lead, zinc, copper and low concentrations of volatile hydrocarbons. Deep groundwater – low concentrations of lead and zinc (no volatile hydrocarbons or chromium). The settling ponds – elevated volatile hydrocarbons.
1995	<i>Remedial investigation/feasibility study, northwest sector for Akzo Nobel Chemicals Ltd</i>	North west portion of the site	Southern end of the western warehouse – elevated lead, zinc, arsenic, copper and low levels of volatile hydrocarbons. Ground water - Elevated chromium, lead, zinc and copper. Very high levels of chloroform and carbon tetrachloride.
1995	<i>Groundwater investigation for EPA sign-off</i>	North west site boundary	No impact by chromium.
1996	<i>Investigations of deep groundwater</i>	entire site and off site for VCHs	Groundwater – elevated carbon tetrachloride and chloroform levels, minor levels of dichloromethane and hexachlorobenzene.

Year	Report Title	Location	Outcome
	<i>contamination, Pacific Chemical Industries, Camellia, NSW</i>		
1997	<i>Completion report, containment remediation, Akzo Nobel Chemicals, Camellia</i>	Entire site	Installation of a cut off wall around perimeter of the site and capping unsealed areas with concrete. Development of a stormwater system.
1997	<i>Post demolition investigation and trial programme, deep groundwater remediation project</i>	Pacific Chemical Industries portion of site	Development of the deep groundwater interception and source area. Remediation schemes.
1998	<i>Remedial investigation – chromium in deep groundwater</i>	North west site boundary	Groundwater – elevated chromium.
1998	<i>Remedial investigation – Stage 2 chromium in deep groundwater</i>	North west site boundary	Chromium migration offsite.
1998	<i>Site contamination audit, 6 Grand Avenue, Camellia for Akzo Nobel Chemicals Ltd</i>		Review of previous investigations.
2001	<i>Groundwater VCH remediation programme</i>	VCHs across site and off site	On-site - decreased volatile chlorinated hydrocarbons (VCHs). Off-site - no VCHs, low concentrations of trichloroethane and tetrachloroethane (in one bore) and low concentration of cis-1,2-Dichloroethane (in one bore).
2002	<i>Annual groundwater monitoring, volatile chlorinated hydrocarbons remediation system</i>	VCHs across site and off site	On-site - increased VCH levels. Off-site - no chemicals of concern.
2003	<i>Annual groundwater monitoring, volatile chlorinated hydrocarbons remediation system</i>	VCHs across site and off site	On-site – stable (lower) VCH levels except for one borehole (increased VCH). Off-site - no chemicals with exceeded limits.

Year	Report Title	Location	Outcome
2004	<i>Annual groundwater monitoring, volatile chlorinated hydrocarbons remediation system</i>	VCHs across site and off site	On-site - stable VCH levels. Off-site - no chemicals with exceeded limits.
2006	<i>Targeted Soil and Groundwater Investigations, 6 Grand Avenue, Camellia, NSW</i>	Across site	VCH contamination in the south western (source area) section had moved along north. East and south east direction and VCH contamination in the north eastern corner had flowed in south west direction. Prevention of offsite migration by perimeter pumping system and source recovery system. No concern of dissolved hexavalent-chromium.
2006	<i>Revised Soil-Vapour Assessment for 6-10 Grand Avenue, Camellia, NSW</i>	Across site	Soil Vapour Assessment
2009	<i>Addendum to the Remedial Action Plan for the Chromium Liquor Residue Ponds at 6 Grand Avenue, Camellia, NSW</i>	Chromium Liquor Residue Ponds	Analytical results were less than the criteria for hexavalent-chromium in soil. No concentrations above criteria for VCH.
2009	<i>Investigation of Cr-VI Impact on Fill Material Surrounding a Stormwater Pipe Near the Eastern Boundary of 6 Grand Avenue, Camellia, NSW</i>	Surrounding stormwater pipe near eastern boundary	Fill material – above criteria for hexavalent-chromium. No other organic or inorganic analytes were detected above criteria.
2009	<i>Targeted Investigation of Volatile Chlorinated Hydrocarbon Impacts to the North of Warehouse No. 5 at 6 Grand Avenue, Camellia, NSW</i>	North of warehouse No.5	VCH was identified within fill and natural clay at concentrations above site adopted guidelines. PCE (tetrachloroethylene) impacts in groundwater were identified above site adopted criteria.

Year	Report Title	Location	Outcome
2010	<i>Report on the Investigation of Chromium Impacts and Possible Remedial Options for the Chromium Liquor Residue Ponds at 6 Grand Avenue, Camellia, NSW</i>	Surrounding Chromium Liquor Ponds	Southern setting pond – hexavalent-chromium lower than the criteria and minor impacts to perched groundwater. Eastern Chromium Liquor Residue Pond – below hexavalent-chromium site adopted criteria and dissolved hexavalent-chromium was detected in perched groundwater. Western Chromium Liquor Residue Pond – higher hexavalent-chromium than site adopted criteria for both soil and groundwater.
2010	<i>Targeted Investigation of Volatile Chlorinated Hydrocarbon Impacts in the Area of TPSP19 at 6 Grand Avenue, Camellia, NSW</i>	east and south of test pit location TPSP19	Volatile Chlorinated Hydrocarbon groundwater impact testing
2010	<i>Targeted Investigation of Off-Site Hexavalent Chromium Impacts to the North of the Site at 6 Grand Avenue, Camellia, NSW</i>	North of site (offsite)	Hexavalent chromium groundwater impact testing
2015	<i>Project Ruby: Summary Site Contamination Report; report to Akzo Nobel</i>	Across Site	Soil is impacted with hexavalent-chromium to <2 mbgl. Soil is impacted with VHCs at various locations on the Site. Groundwater beneath parts of the Site is impacted with hexavalent-chromium and selected VCHs (chloroform, carbon tetrachloride and tetrachloroethene) at concentrations exceeding the Site adopted criteria. Positive soil vapour impacts.
2017-2018	<i>Contamination Data Gap Assessment for the Proposed Stabling and Maintenance (SaM) Facility</i>	Across Site	Additional contamination and geotechnical investigations

Year	Report Title	Location	Outcome
2019	<i>Groundwater Flow Model – Parramatta Light Rail, Camellia Stabling Facility</i>	Across Site	Numerical groundwater modelling of the site, with the HBW and various concept designs of the cover system.

4.5 Previous remediation

Due to past industrial activities, the site has been impacted by a range of contaminants primarily hexavalent chromium, volatile chlorinated hydrocarbons (VCH) and asbestos. Remediation works have been undertaken for selected areas of the Portion 2 Early Works site as summarised in Table 4-4 below.

Table 4-4: Summary of previous remediation

Year	Area	Remediation action
1991	Around the Chrome Plant – Eastern part of the site, except for the southern end	Construction of groundwater cut-off wall around Chrome Plant Capping of some unpaved areas Installation of localised groundwater treatment system
1996-1997	Remainder of the site (after 1991 remediation action)	Extension of groundwater cut-off wall
1997-1999	Across site	Installation and operation of VCH groundwater remediation system
2009-2010	Area A*	Construction of contiguous pile wall along the northern and eastern boundary of Area A Excavation of Area A to bedrock Backfilling of Area A after treatment
2009-2010	Area B*	Excavation and backfilling (after treatment) of Area B Installation of groundwater abstraction/injection system
2010	Western Chromium Liquor Residue Pond (WCLRP)	Remediation of WCLRP
2018-2019	Across site	Installation of hydraulic barrier wall to isolate groundwater within the site Install a replacement groundwater treatment system Demolish redundant infrastructure and structures

*Refer to Appendix B for locations of areas specified in Table 4-4

5 Environmental aspects and impacts

5.1 Construction activities

Key aspects of the Portion 2 Early Works that could result in adverse impacts to soils and water include:

- Early works including utility adjustment, site access provisions, property adjustments;
- Contaminated earthworks;
- Ongoing treatment of contaminated water;
- Investigative drilling and geotechnical assessment;
- Demolition of redundant concrete hardstand; and
- Installation of an on-site containment berm.

Refer to Appendix A2 of the CEMP – Environmental Risks Register.

5.2 Impacts

The potential for contaminated land disturbance and impacts will depend on a number of factors. Primarily impacts will be dependent on the nature, extent and magnitude of construction activities and their interaction with known and potential contaminated land sources. Potential impacts attributable to Portion 2 Early Works construction might include:

- Exposure of contaminated soils and/or groundwater to humans;
- Mobilisation, migration and exposure of hexavalent chromium (Cr(VI)) contaminated dust and groundwater
- Release of asbestos fibres;
- Affect surrounding environment from change to groundwater subsurface flow;
- Release of odours from contaminated materials; and
- Disturbance of unidentified contaminated land and subsequent generation of contaminated waste and runoff.

Relevant aspects and the potential for related impacts have been considered in a risk assessment at Appendix A2 of the CEMP. [Section 6](#) provides a suite of mitigation measures that will be implemented to avoid or minimise those impacts specifically relating to contamination.

6 Environmental control measures

Specific environmental control measures and requirements to meet the objectives of this CLMP are detailed in Table 6-.

Table 6-1: Contaminated land management mitigation measures

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
CL1	Prior to commencement of any works which may intersect and/or disturb the areas regulated by EPA under the CLM Act, notification to EPA will be provided and approvals will be obtained when required.	CLM Act	Pre-construction	Environment & Hygiene Manager	CoA E118

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
CL2	Performance outcomes, commitments and mitigation measures as specified in CEMP relevant to contaminated land and in this CLMP will be implemented and achieved during construction	CEMP CLMP	During construction	Project Manager Environment & Hygiene Manager	CoA A1, C1, C2 REMMM GEN-1 EPO-SG-3

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
CL3	Erosion and sediment controls will be implemented prior to commencement of Portion 2 Early Works to minimise the risk of sedimentation.	Soil and Water Management Plan Erosion and Sediment Control Plan	During construction	Environment & Hygiene Manager Site Supervisor	CoA E111 REMMMM SG-3, HY-6 EPO-SG-1

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
CL4	Project induction and targeted toolbox talks will include details of known contaminated areas and the procedure to follow if contamination is suspected.	CEMP Site induction Unexpected Finds Procedure Environmental control maps	During construction	Environment & Hygiene Manager Site Supervisor	CoA C2
CL5	Areas of known or likely contaminated land will be assessed and managed in accordance with environmental requirements as stated in Section 3 and Section 7.1.	RAP CLMP Environmental control map	During construction	Environment & Hygiene Manager	CoA E121, E122 REMMM CM-1, CM-2, CM-3, CM-4

ID	Measure/Requirement	Resources needed	When to implement	Responsibility	Reference
CL6	Any recycled material delivered on site will be spot-checked for potentially contaminated material prior to use. If suspected contaminated material is encountered, Unexpected Finds Procedure will be implemented.	Unexpected Finds Procedure	During construction	Environment & Hygiene Manager Site Supervisor	CoA E126 REMMM CM-2, CM-3, CM-4, CM-6
CL7	Soil stockpiling will be designed and managed in accordance with the Landcom Blue Book - <i>Managing Urban Stormwater: Soils and Construction</i> , to minimise the potential risks associated with the potentially contaminated soil.	Soil and Water Management Sub-plan Environmental control map	During construction	Environment & Hygiene Manager Design Manager Site Supervisor	REMMM CM-2, CM-3, SG-3
CL8	Follow the Unexpected Finds Procedure if previously unknown contaminated material is encountered or exposed. Where potentially contaminated material is discovered, notification to relevant Project and agency representatives will be undertaken.	Site induction Unexpected Finds Procedure	During construction	Environment & Hygiene Manager Site Supervisor	CoA E125, E126 REMMM CM-2, CM-3, CM-4, CM-6
CL9	Removal of waste from Portion 2 Early Works will be performed in accordance with the Waste and Resource Management Plan and must be classified in accordance with the NSW EPA Waste Classification Guidelines (2014)	Waste and Resource Management Plan NSW EPA Waste Classification Guidelines (2014)	During construction	Environment & Hygiene Manager	CoA E131 REMMM CM-2, CM-3, WM-5, HY-6

7 Compliance management

7.1 Site Management

All known contaminated areas will be managed in accordance with this Plan and Section 7 of the Air Quality Management Plan (AQMP). Environmental control measures detailed in Section 6 will be implemented throughout the duration of the Portion 2 Early Works. Key control measures are as follows;

- Use of water to wet down an area or an operation through use of water carts or sprinklers to wet down contaminated excavation areas or demolition activities to control dust emissions, including controlling asbestos fibres in air and particulate borne hexavalent chromium, which may be present;
- Establishing exclusion zones for all contamination impacted excavation, handling, segregation or disposal activities. Access to exclusion zones will be restricted using decontamination units, temporary fencing and signage;
- Appropriate personal protective equipment to be implemented for all tasks in accordance with the Qualitative Occupational Hygiene Assessment (QOHA) US-050056-HS-PR-002 and workplace surveillance inspections;
- Implement an exposure monitoring program for hexavalent chromium and asbestos during excavation, handling or segregation of impacted soils to determine the concentration of the contaminants of concern and verify the adequacy of controls. Samples should be collected at a minimum of monthly during contaminated works with results assessed by the Environment and Hygiene Manager to determine any additional monitoring frequency;
- Site specific training for personnel working within contaminated area. Training includes the occupational hygiene hazards identified on the project, exposure monitoring programs, use of personal protective equipment, decontamination procedures for people, plant and equipment and a fit test for an appropriate respirator;
- Occupational hygiene workplace inspections to verify the effectiveness of contamination control measures;
- Conduct baseline and periodic medical assessments for hazardous substances, including hexavalent chromium, asbestos and volatile chlorinated hydrocarbons. Medicals will be managed by an Occupational Physician, a specialist doctor in workplace health;
- Stormwater control measures to prevent contaminated materials or water leaving site. Water from a contaminated exclusion zone would be collected and treated through either the groundwater treatment plant (GTP) or Temporary Water Treatment Plant (TWTP);
- Isolate contaminated excavated materials in designated stockpile area with appropriate covers, geotextiles, water suppression or dust binding agents to be applied to prevent windborne dust generation and erosion and sediment controls, such as sandbags, bunds or hay bales to prevent water run-off;
- Materials tracking of all excavated contaminated materials to ensure it is tracked on-site, and if applicable, offsite to an appropriately licensed landfill facility. Asbestos containing materials would be tracked using EPA's WasteLocate service;
- Visible hexavalent chromium deposits to be removed by wet vacuum technique with excess water during removal collected for treatment through the GTP or TWTP;

- Waste materials will be sampled and tested in accordance with the Waste and Resource Management Plan and must be classified in accordance with the NSW EPA Waste Classification Guidelines (2014); and
- Proposed containment cell to be designed and constructed on site that will retain wastes materials generated by the remediation works. The containment cell will be engineered to suitably contain hazardous, special waste and other designated wastes to the satisfaction of the NSW EPA accredited Site Auditor. The proposed containment cell will seek to minimise offsite disposal of waste materials.

Prior to commencement of remediation works which may intersect and/or disturb the areas regulated by EPA under the CLM Act, notification to EPA was provided and approvals were obtained by TfNSW. TfNSW is currently consulting with the NSW EPA to determine the requirements for ongoing regulation of the site under the *Contaminated Land Management (CLM) Act 1997*. Following this a new VMP will be established for the Portion 2 Early Works to meet the objectives of the RAP. A copy of the current VMP is included in Appendix C.

7.2 Roles and responsibilities

The Contractor's 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 Plan.

The remediation and validations works are being conducted in accordance with a Remediation Action Plan (RAP) and Remediation Works Validation Plan (RWVP) which has been approved by a NSW EPA accredited Site Auditor. Remediation management and tracking of the RAP in accordance with the CLM Act compliance is met shall be tracked by the Site Auditor and be considered when issuing a Site Audit Statement, prior to construction of the stabling and maintenance (SaM) facility.

7.3 Training

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

- Existence and requirements of this Plan;
- Relevant legislation;
- Roles and responsibilities for contaminated land management;
- Location of identified potential contaminated land sites including environmentally sensitive locations and no-go/exclusion zones;
- Signs of contaminated soil;
- Contamination management and protection measures; and
- Procedure to follow in the event of unexpected contaminated land findings during construction works (Refer to Appendix A).

If contamination is unexpectedly discovered onsite, all workers involved in the remediation or removal will receive a toolbox informing them of the site specific controls required for remediation process including:

- Site access restrictions;

- Correct use of PPE;
- Decontamination procedures;
- Use of monitoring equipment;
- Waste handling procedures; and
- Water and dust control measures and performance measures.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in contaminated land management or those undertaking activities in high-risk areas.

Daily pre-start meetings will inform the site personnel of any environmental issues relevant to potential contaminated land.

Further details regarding staff induction and training are outlined in Section 3.5 of the CEMP.

7.4 Monitoring and inspections

Regular compliance activities, such as inspections, observations and monitoring will be undertaken for the purposes of this CLMP throughout the Portion 2 Early Works project duration. Inspection and monitoring for contaminated land will include, but not be limited to;

- Implementation of exclusion zones with contaminated land controls and mitigation measures where contaminated land is anticipated, such as ERSR controls and elevated levels of personal protective equipment (PPE);
- Monitoring of site activities and stockpiles on a daily basis for any signs of previously unidentified contamination by plant operators, engineers and site supervisor;
- Weekly inspections and monitoring of construction & excavation activities to ensure compliance with the requirements of the CoA, REMMM and this Plan by the Environment team;
- Visual inspections and monitoring to identify potential indicators of contamination during excavation activities will occur. Suspected contamination will be sampled and analysed to determine management requirements and suitability for reuse, recycling or remediation;
- An actions form will be completed for issues requiring attention and issued to the site supervisor for action. These actions will be tracked to ensure items are closed out within the appropriate timeframes; and
- An incident report would be completed for all unexpected contamination finds in accordance with the Unexpected Finds Procedure (Appendix A).

Additional requirements and responsibilities in relation to inspections are documented in Section 3.9.1 and Section 3.9.2 of the CEMP.

Monitoring and Auditor inspections will also be undertaken to satisfy the Portion 2 Early Works requirements under the CLM Act and Project Approval are met. This will include but not limited to;

- Site visits by the NSW EPA accredited Site Auditor;
- Review of validation and materials tracking documentation through Remediation Tracking Reports, issued to TfNSW and the NSW EPA accredited Site Auditor; and
- Independent Audits and Compliance Reports.

7.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Plan, CoA and other relevant approvals, licenses and guidelines. Audit requirements are detailed in Section 3.9.3 of the CEMP.

7.6 Remediation Action Plan (RAP)

A Remediation Action Plan (RAP) has been developed to establish the remediation objectives and details the strategy for Portion 2 Early Works identified as requiring remediation to make them suitable for the intended construction of SaM facility. The RAP demonstrates how the risks of contamination of soil and groundwater will be reduced as far as practicable (within acceptable levels) and prevent migration within and off the site. The RAP was endorsed by the NSW EPA accredited Site Auditor prior to commencing early works remediation activities on the site.

An addendum to the RAP will be prepared to the satisfaction of the NSW EPA accredited Site Auditor to incorporate the proposed containment of contaminated waste on site, should that option be exercised.

7.7 Site Audit Statement (SAS)

A final Site Audit Statement will be prepared by the NSW EPA accredited Site Auditor, certifying that the contaminated areas have been remediated to a standard consistent with the intended construction of SaM facility. This site will not be used to construct the SaM facility until a Site Audit Statement determines the suitability of this site and any other conditions on the Site Audit Statement have been complied with in accordance with CoA E123.

7.8 Reporting

The Weekly Environmental Inspection Checklist will be used to ensure that all environmental aspects are reviewed during inspection of the project. Actions arising from the inspections will be documented.

Contamination identified on site will be recorded on the Weekly Environmental Inspection Checklist.

Remediation Tracking Reports will be prepared to track the progress of the remediation works. The objective of the Remediation Tracking Report is to provide all remediation and validation data and information to TfNSW and the NSW EPA accredited Site Auditor in a progressive and sequential manner to facilitate the eventual validation of the site.

Further reporting will be undertaken in accordance with Section 8 of the CEMP.

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this 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;
- Identify environmental hazards/risks not previously included in the risk register;;
- 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; and
- Make comparisons with objectives and targets.

The Contractor is responsible for ensuring project environmental risks are identified and included in the risk register. As a part of the continuous improvement process, contractor will ensure appropriate mitigation measures are implemented throughout the duration of the project.

8.2 CLMP update and amendment

The processes described in Section 3.9 to Section 3.13 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

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

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 3.11.2 of the CEMP.

Appendix A - Unexpected Finds Procedure

SOP UNEXPECTED FINDS

1 Purpose

This Safe Operating Procedure (SOP) (PLR-VNT-SAM-CO-PRO-000001) provides guidance on the standards to be applied for tasks unanticipated discovery is made on the Project and forms part of the Portion 2 Early Works Appendix B9 - Contaminated Land Management Plan (PLR-VNT-SAM-CO-PLN-000001).

This SOP does not cover all the possible legal, regulatory or contractual requirements that may apply to an unanticipated discovery at the Project site. Instead, it defines a work process that may be used to determine the project-specific requirements based on the individual circumstances of the discovery.

A separate Unexpected Heritage Finds procedure (PLR-TFNSW-SAM-PE-PLN-000002) has been prepared for the project, including archaeological material.

2 Scope

This procedure applies to all persons working on the Camellia Remediation Project.

3 Legislation

- Work Health and Safety Act - 2011;
- Work Health and Safety Regulations - 2017;
- Contaminated Land Management Act - 1997;
- Protection of the Environment Operations Act - 1997;
- Environmental Planning & Assessment Act - 1979;
- Heritage Act - 1977;
- SafeWork NSW Code of Practice: How to safely remove asbestos - 2016; and
- SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace - 2016.

4 Site Background

Numerous environmental investigations and targeted remedial activities in selected areas have been undertaken at the Site. The investigations and assessments performed to date have identified the following contaminants of concern that drive the need for remediation of the Site:

- Hexavalent chromium (Cr(VI));
- Volatile chlorinated hydrocarbons (VCHs), including carbon tetrachloride, chloroform, tetrachloroethene and associated daughter products; and
- Other contaminants of concern are present on the Site, including asbestos.

Further information is documented in the Remediation Action Plan (RAP).

5 Process

5.1 Hazards

The following hazards have been identified (especially during excavation works) as having the potential to cause injury and harm to the environment:

- Unexpected Contamination (i.e. hexavalent chromium in an unexpected area, unknown contamination, potential acid sulfate soils (PASS));
- Hazardous material or asbestos containing material (ACM);
- Human remains;
- Unexploded munitions; and
- Buried tanks or utilities.

6 Controls

The following Work Process shall be used to help determine the appropriate protocol to be followed when an unanticipated discovery is made.

6.1 STOP Work

When an unanticipated discovery is made at the Project site, personnel including subcontractors will immediately stop work in the vicinity of the discovery. In general, the most common types of unanticipated discoveries include:

- Old rubbish dumps (includes bottles, coins etc.);
- Cast iron or metal pipes (in unexpected areas);
- Large stone blocks (could be a drain/culvert);
- Free-phase contamination (in unexpected areas);
- PASS (in unexpected areas);
- Unexpected services;
- Unexpected brick walls or floors;
- Unexpected brick drains; and
- Combustible, flammable or other hazardous materials.

Notes:

1 A change in material type i.e. fill transitioning to marine sediments is not a cause to stop work. Materials displaying visual signs of contamination unlike the surrounding material being excavated, is considered an unexpected find and Ventia will engage the validation classification consultant. However, in this case the material will be stockpiled separately and is not a cause to stop work.

2 If excavating likely PASS, Restricted Solid Waste or Hazardous Waste, pockets of impacted material is expected and is not necessarily a cause to stop work;

3 Any combustible or flammable material exposed in the excavation shall be kept physically separated from the enclosure fabric and/or a fire watch maintained until the material can be removed;

4 Where ongoing excavation uncovers combustible or flammable materials that were not anticipated, works are to stop and area isolated until the risk of burning/explosion is removed. Additional portable fire extinguishers shall be employed as an emergency control measure, with differing extinguishing media and capacity to be provided as necessary based on a risk assessment of the type and quantity of material.

6.2 Secure the area

Once construction activities have been halted, the area in the immediate vicinity of the discovery is to be secured to prevent further disturbance.

The discovery area is to be cordoned off by an exclusion zone, such as flagging or barricading, to create a visual/physical barrier and control access.

6.3 Notification

Immediately after an unanticipated discovery, the Site Supervisor shall be notified of the discovery. The Project Manager and Environment and Hygiene Manager will also be notified so that communication and coordination with TfNSW and other stakeholders (e.g. Validation Consultant, Site Auditor, NSW Police) can be initiated as determined. The Project Manager shall advise on the need to notify the Ventia Utility Services Environmental and Engineering Business Unit of the unanticipated discovery as required.

6.4 Inspections

A visual inspection of the area is required before using any tools to disturb the unexpected find. This inspection will determine the most appropriate way to handle the unexpected find, which may involve segregation, exclusion zones, recovery and/or notifications. Hazards and controls are to be documented on the SHEWMS and a Start Card is to be completed/amended as necessary. Note: a Permit may also be required if the work involves a high risk activity. The Supervisor shall authorise the removal of the discovery once permission has been given by the Project Manager and all hazards and controls have been implemented.

6.5 Prepare documentation

The appropriate Ventia representative will prepare an Unexpected Finds Record Form US-059090-ENV-FO-001. The report shall include information such as:

- The time and place of the discovery;
- The nature of the discovery i.e. all materials uncovered shall be identified;
- Where the object is deemed combustible, flammable, or hazardous, the properties and behaviour of the material will be established, including handling methodology and safe quantities to be exposed. Note: If the material is extensive, any special fire-fighting media shall be provided such as portable foam, dry chemical, or CO2 extinguishers;
- Immediate actions taken to secure the discovery site; and
- Any notifications made.

A Project representative (typically an Environmental Representative) shall take photographs of the discovery (as necessary) and attach them to the report, if possible.

6.6 Discovery notifications

It may be necessary to report the unexpected discovery to the following personnel:

- Regulatory or law enforcement personnel;
- Emergency services;
- Principal representatives;
- Appropriate Consultants; and
- Other concerned parties.

In such cases the Project Manager (or a delegate of his choosing) is responsible for notifying the relevant stakeholders.

6.7 Resume Work

Project personnel and subcontractors shall not resume work in the immediate area of any unanticipated discovery until permission has been given by the Project Manager and/or Supervisor. Personnel shall be made aware of any additional actions required for personal protection prior to resuming work.

7 Information and Training

Project personnel shall be made aware of this SOP Unexpected Finds and the actions that are required at the Project's site induction and via pre-starts and toolbox talks.

8 Monitoring and Review

The on-going application and effectiveness of this SOP shall be monitored via the following processes:

- Task observations (LEADs) to confirm correct work methods;
- Daily walkthrough site inspections;
- Formal weekly inspections to confirm workplace conditions are conducive to project activities; and
- Critical risk audits to be undertaken to confirm correct application of this SOP.

Unless otherwise triggered via an incident, process change, or other event, this SOP shall be reviewed annually.

9 Responsibility and Accountability

9.1 Project Manager

- Ensure that all Project personnel are instructed on the immediate actions to take if an item of significance is discovered;
- Secure the area and perform notifications as required;
- Authorise the re-commencement of work once all hazards and controls have been implemented; and
- Ensure the application of this SOP.

9.2 Supervisor

- Act on any reported unexpected discoveries;
- Ensure personnel STOP work (if required), are in a safe area and that the discovery area is secured;
- Ensure hazards and controls have been implemented prior to recommencement of work; and
- Ensure the application of this SOP.

9.3 SHEQ Personnel

- Provide training and instruction on this SOP - Unexpected Finds;
- Prepare Discovery / Incident Reports as required; and
- Monitor the application of this SOP.

9.4 Site Personnel

- Comply with this SOP;
- Immediately STOP work and report any unexpected find;
- Await further instructions before re-commencing work; and

- Report any improvements to procedures for review.

10 Related documents

Document	Reference
START Card	US-059090-HS-FO-035
HSE Activities and Lead Indicators	US-059090-HS-GL-008
HSE Communication and Consultation	US-059090-HS-GL-004
Risk Assessment - Manual Labouring Activities	US-059090-HS-FO-021
Unexpected Finds Record Form	US-059090-ENV-FO-001
Unexpected Heritage Finds Procedure	PLR-TFNSW-SAM-PE-PLN-000002
Contaminated Land Management Plan	PLR-VNT-SAM-CO-PLN-000001
Guidelines for Management of Human Skeletal Remains	NSW Heritage Office, 1998
Remediation Action Plan for 6-10 Grand Avenue, Camellia NSW	Golder, 2017

11 Definitions

Term	Meaning
LEAD	Lead-Engage-Analyse-Discuss
PPE	Personal protective equipment. Refer to site and area PPE requirements.
RAP	Remediation Action Plan
SOP	A document that provides detailed step-by-step information on how work activities will be carried out. May document risks and controls associated with each step (then is titled a SHEWMS)
SHEWMS	A task level hazard identification tool concentrating on current conditions, interactions and resources.
Start Card	Low-level review of agreed procedures or practices against actual work conditions or interactions.
Workplace	Any place where work is carried out for Ventia and includes any place where an employee goes, or is likely to be, during their employment. Examples of workplaces for the purposes of this policy include but are not limited to: • Ventia locations, during or outside of working hours • work locations of customers or clients • vehicles, machines or other heavy equipment • other locations employees visit for work, including when travelling for business or being accommodated overnight

Term	Meaning
	work functions, Ventia functions or other events related to work with Ventia.

12 Approval

Document SME:	S.Meulman
Document approver:	C.McNiven
Review date:	22/03/2019

13 Version history

Version	Effective Date	Author	Change Notes
0.1	20/03/19	S.Meulman	Updated from Environmental Services SOP
1.0	22/03/19	S.Meulman	Post TfNSW and ER review

14 Appendices

Appendix	Document	Reference
A	Unexpected Finds Form	US-059090-ENV-FO-001



Appendix A - Unexpected Finds Form

Initial Inspection / Actions Undertaken		
Date and time:		Person:
Area:		
Works that uncovered the find:		
Is it a suspected object of heritage significance?	Yes / No	<i>If yes stop work immediately in the area and contact Project Supervisor &/or Project Manager</i>
Has the heritage site/object been damaged?	Yes / No	<i>If yes, complete Incident Report Form</i>
Observation/description of the object:		
Actions:		
Is unexpected high contamination uncovered?	Yes / No	<i>If yes stop work immediately in the area and contact Project Supervisor &/or Project Manager</i>
Description of source of highly contaminated material?	<i>(e.g. free phase contamination)</i>	
Actions:		
Has unexpected asbestos containing material (ACM) been uncovered? <i>(e.g. friable asbestos)</i>	Yes / No	<i>If yes stop work immediately in the area and contact Project Supervisor &/or Project Manager.</i>
Actions:		

Sampling / Clearance Reports (ENVIRO TEAM TO COMPLETE)
Were samples taken?

Yes / No

Sample ID's
Comments:
Disposing of material / Closing out
Recommendations/ disposal actions:
Can Works Recommence?

Yes / No

Signed (Project Manager)
Date
Signed (Client)
Date

Please attach the **Waste Classification and/or EPA Waste Tracking Form (if any contaminated material is taken off site) and any photos taken.*

Photos

Appendix B – Site layout



Appendix C – Voluntary Management Proposal (VMP) number 20191710

[REDACTED]

Our reference: [REDACTED]

[REDACTED]

Dear [REDACTED]

**Amendment to the Approved Voluntary Management Proposal (VMP) (No.20191710)
Former Akzo Chemicals Site - 6 Grand Avenue, Camellia NSW 2142**

The NSW Environment Protection Authority (EPA) has amended the deadlines in the approved VMP No.20191710 for the site located at 6 Grand Avenue, Camellia (the site), in response to your letter dated 18 December 2019.

The notice to amend the approved VMP (Notice No. 20194452) is enclosed in this letter and will also be placed on our public register. Parramatta City Council will also be informed of the amendments.

If Transport for NSW is unable to meet any deadline identified in the amendment to the approved VMP, a written request for an extension must be provided. The request must be made 21 days before the deadline, and must outline the reasons for the delay, a revised time within which the deadline will be achieved and a statement explaining why enforcement action should not be taken.

If you have any questions on this matter, please contact [REDACTED]
[REDACTED]

Yours sincerely

[REDACTED]

20 December 2019

**Manager Contaminated Land Regulation
Environment Protection Authority**

Attached: s44 notice to amend the voluntary management proposal (No. 20194452)

CC: [REDACTED]

[REDACTED]

Notice to amend Approved Voluntary Management Proposal

(Section 44 of the *Contaminated Land Management Act 1997*)

Notice Number 20194452; Area Number 3017

Background

The land to which this notice applies was declared as “significantly contaminated land” (Declaration No. 21035) by the Environment Protection Authority (EPA) and is the subject of an EPA approved Voluntary Management Proposal (VMP) with Transport for NSW (TfNSW - Approval No. 20191710). The VMP implements the remediation works required to mitigate future migration of contamination from the site into the surrounding environment and render the site suitable for use as the stabling and maintenance facility for Parramatta Light Rail.

Land to which this notice applies

Description	Address
Lot 3 DP 843591	6 Grand Avenue Camellia NSW 2142

Amendment of Approved VMP

A request has been made by TfNSW to amend the milestone dates in the VMP due to delays in the development of the detailed design for the Portion 2 remediation works (the integrated capping system), and the corresponding finalisation of the Remediation Works and Validation Plan (RWVP) for the Portion 2 remediation works. The EPA considers that the request from TfNSW for the amendment is reasonable and agrees to amend **Part 3 Performance Schedule** of the VMP as detailed below.

Item 2 - Principal features of the proposal

Item P11 is amended to reflect the future land use of the site, as follows:

- P11. Provision of a Site Audit Statement indicating the objectives of this VMP and the RAP have been achieved, and that the site is suitable for use as the stabling and maintenance facility for Parramatta Light Rail.

Item 3 - Key milestones for investigation, remediation and other actions

All works set out in the proposal must be completed by the revised deadlines specified below:

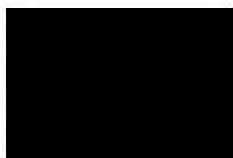
Works	Amended Date
T1. Completion of the Portion 1 remediation works	Complete
T2. Completion of detailed design of the Portion 2 remediation works	30 April 2020
T3. Completion of the Portion 2 remediation works	31 January 2021
T4. Completion of final remediation infrastructure components	30 September 2022

Item 4 - Reporting requirements and timeframe for submission of reports

The EPA must be provided with the following reports by the revised deadlines specified below:

Report	Amended Date
R1. Community Engagement Plan for Portion 2 Remediation Works	Complete
R2. Remediation Works and Validation Plan for Portion 2 remediation works, including Site Auditor endorsement	30 April 2020
R3. Portion 1 Validation Report, including Site Auditor endorsement	30 April 2020
R4. Site Audit Statement for the Portion 1 remediation works	30 April 2020
R5. Portion 2 Validation Report, including Site Auditor endorsement	30 June 2021
R6. Long Term Site Environmental Management Plan (LTSEMP), including Site Auditor endorsement	30 June 2021
R7. Site Audit Statement for the Portion 2 remediation works and LTSEMP	30 June 2021
R8. Site Audit Statement indicating the objectives of this VMP and RAP have been achieved, and that the site is suitable for use as the stabling and maintenance facility for Parramatta Light Rail	31 December 2022

Other than the amendments set out above, the remaining terms of the VMP No.20191710 remain in force.



20 December 2019

Manager Contaminated Land Regulation
Environment Protection Authority

NOTE:

Information recorded by the EPA

Section 58 of the CLM Act requires the EPA to maintain a public record. A copy of this notice will be included in the public record.

Information recorded by councils

Section 59 of the CLM Act requires the EPA to give a copy of this notice to the relevant local council. The council may then make appropriate consequential modifications to the planning certificate issued in relation to the land to which this notice applies pursuant to s10.7 of the *Environmental Planning and Assessment Act 1979*.

Relationship to other regulatory instrument

This notice does not affect the provisions of any relevant environmental planning instruments which apply to the land or provisions of any other environmental protection legislation administered by the EPA.

Previous regulatory instrument

As of 1 July 2009, all current declarations of investigation area and declarations of remediation site are taken to be declarations of significantly contaminated land, all current investigation orders and remediation orders are taken to be management orders and all current agreed voluntary investigation proposals and agreed voluntary remediation proposals are taken to be approved voluntary management proposals.

Appendix D - ER Endorsement



12 May 2020

Transport for NSW

Attention to: 
A/Senior Manager Environment
Parramatta Light Rail
130 George St, Parramatta, NSW 2150

**Review of Parramatta Light Rail Stage 1 - Package 3
Portion 2 Remediation Works Ventia –CEMP Appendix B9 - Contaminated Land
Management Sub-Plan (CLMP)**

Pursuant to SSI-8285 Condition of Approval A23 (d) (ii), as the approved Environmental Representative, I confirm that I have reviewed and provided comments on the following documents against the requirements of conditions of approval CoA E118-E126 and Submissions Report incorporating Preferred Infrastructure Report (SPIR) Revised Environmental Mitigation and Management Measures (REMMM) CM-3:

- CEMP Appendix B9 - Contaminated Land Management Sub-Plan (CLMP) (CLMP Rev 4 - PLR-VNT-SAM-CO-PLN-000004, 11 May 2020)

The document was reviewed as part of the six-monthly review of the CEMP and sub-plans which is consistent with the relevant conditions of approval and REMMM and is approved under Condition of Approval C8 minor amendments for implementation at the site.

Yours sincerely,





Environmental Representative







