


Air Quality Management Sub-Plan C2B

Line-wide Works Contract Sydney Metro City & Southwest

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Document Approval

	Environment and Sustainability Manager	Project Director
Signature:		
15/10/2020	M Billings	S Hunter

Details of Revision Amendments

Document Control

The Project Director is responsible for ensuring that this Sub-Plan is reviewed and approved. The Environment and Sustainability Manager is responsible for updating this Sub-Plan to reflect changes to Environmental, legal and other requirements, as required. A controlled version of this Sub-Plan will be available electronically at all Project locations.

Amendments

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

Revision Details

Revision	Date	Prepared by	Details
A	18/11/2019	K Truscott	Issued for review. This version of this Sub-Plan addresses compliance requirements under CSSI 7400 and CSSI 8256 Planning Approvals as per the Sydney Metro Staging reports.
B	17/12/2019	A Taylor	Updated to address comments from Sydney Metro and ER consultation.
0	13/02/2020	M Billings	Updated to address DPIE comments - For approval
1	15/10/2020	K Truscott	Scheduled review Updates to Section 2.2 Compliance Requirements, removed Section 3.2 and Section 4 Existing Environment

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AQMSP COMPLIANCE MATRIX

Planning Approval CSSI-7400		
No.	Requirement	Reference
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 CEMF and CEMF referred to in Condition C1 c) Air quality	This Sub-Plan Element 4
C4	The CEMP sub-plans must state how:	Element 4:
	a) The environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved;	Section 6.4 and Element 4:
	b) The mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented;	Section 2.2
	c) The relevant terms of this approval will be complied with; and	Section 5, 6 and Element 2:
	d) Issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	
C5	The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.	Section 1.6
C6	Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before commencement of construction.	Section 1.6
C8	Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.	Section 1.6
E5	In addition to the performance outcomes, commitments and mitigation measures specified in PIR, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the CSSI.	Section 6 and Element 4:

Planning Approval CSSI-8256		
No.	Requirement	Reference
E2	In addition to the performance outcomes, commitments and mitigation measures specified in the documents listed in Condition A1, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the Construction and Operation of the CSSI.	Section 6 and Element 4:

Construction Environmental Management Framework		
No.	Requirement	Reference
3.4a	<p>Subject to Section 3.3(b) and Section 3.2(b) the Principal Contractor will prepare issue specific environmental sub plans to the CEMP and SMP which address each of the relevant environmental impacts at a particular site or stage of the project. Issue specific sub plans will include:</p> <p>xi) Air quality management</p>	This Sub-Plan
16.2a	<p>Principal Contractors will develop and implement an Air Quality Management Plan which will include, as a minimum:</p> <p>i) The air quality mitigation measures as detailed in the environmental approval documentation;</p>	Section 6.4 and Element 4:
	<p>ii) The requirements of any applicable EPL conditions;</p>	Element 4:
	<p>iii) Site plans or maps indicating locations of sensitive receivers and key air quality / dust controls;</p>	Section 4 for sensitive receivers identified at each location. Section 6.4 - Sensitive receivers will be identified on SEPs as required prior to construction starting.
	<p>iv) The responsibilities of key project personnel with respect to the implementation of the plan;</p>	Section 3
	<p>v) Air quality and dust monitoring requirements;</p>	Section 6
	<p>vi) Compliance record generation and management.</p>	Section 6.5 and Element 2:

Glossary / Abbreviations

Abbreviations	Definition
BPS	Bulk Power Supply
C2B	Chatswood to Bankstown
C2S	Chatswood to Sydenham
CCS	Community Communications Strategy
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CO	Carbon monoxide
CoA	Conditions of Approval as per State Significant Infrastructure Planning Approvals as issue by the NSW Department of Planning and Environment, relevant staging reports and as listed in Schedule E3 of the Line-wide Works Contract, (ITC 600)
CPB	CPB Contractors Pty Limited
CSSI 7400	Approval of application SSI 7400 provides for construction and operation of a metro line approximately 16.5 kilometres long (of which approximately 15.5 is in underground rail tunnels) between Chatswood and Sydenham (C2S) including construction of a tunnel under Sydney Harbour, links with the existing rail network, seven metro stations and associated ancillary infrastructure. The proposal is declared as Critical State Significant Infrastructure (CSSI)
CSSI 8256	Approval of application SSI 8256 provides for construction and operation of a metro line, approximately 13 kilometres long between Marrickville and Bankstown (S2B), including ten metro stations and associated infrastructure
DPI	Department of Primary Industries (including Agriculture NSW, Fisheries NSW and NSW Office of Water)
DPIE	NSW Department of Planning Industry & Environment (formally Department of Planning and Environment)
EIS	Environmental Impact Statement
EMS	Environmental Management System (integrated as part of the PMS)
Environment and Sustainability Policy	Statement by an organisation of its intention and principles for environmental and sustainability performance.
Environmental aspect	Defined by AS/NZS ISO 14001:2004 as an element of an organization's activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2004 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
Environmental incident	An occurrence or set of circumstances, as a consequence of which pollution (air, water, noise, and land) or an adverse environmental impact has occurred or is likely to have occurred.
Environmental Issue	An occurrence or set of circumstances where Environmental Harm or Non-compliance could occur if not rectified.
Environmental Non-Compliance (NC)	A breach of an Environmental Requirement originating from Planning Approvals, Environment Protection Licenses, lease agreements, and other requirements documented in environmental management plans.
Environmental objective	Defined by AS/NZS ISO 14001:2004 as an overall environmental goal, consistent with the Environment Policy, that an organisation sets Line-wide to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2004 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 team	Members of LW environmental team including sub-contractors authorised by the Environment and Sustainability Manger to work on environmental issues related to the Project

Abbreviations	Definition
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ER	The Environmental Representative for the CSSI(s).
ERP	Emergency Response Plan
ESCP	Erosion and Sediment Control Plan
Hold Point	Activities which are not to proceed without objective review and approval by the nominated authority.
IC	Independent Certifier
LW	Line-wide
LW Works	Line-wide Works (contract scope under ITC 0600)
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
OEH	(NSW) Office of Environment and Heritage
OOHW	Out of Hours Works
PAC	Polycyclic Aromatic Compounds
PM ₁₀	Particulate matter with an aerodynamic diameter less than or equal to 10 microns
PM _{2.5}	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PMS	Project Management System
POEO Act	Protection of the Environment Operations Act 1997
REMM	Revised Environmental Mitigation Measures
S2B	Sydenham to Bankstown
SC Project Environmental Representative	Refers to Systems Connect Environment and Sustainability Manager or someone delegated by him to perform a task, release a hold point or approve a document
SDS	Safety Data Sheets
SEP	Site Environment Plan
SM	Sydney Metro
SMCSW	Sydney Metro City & Southwest
SMNW	Sydney Metro North West
SMTF	Sydney Metro Train Facility (formerly known as Rapid Transit Rail Facility)
SMTF South	Sydney Metro Train Facility South
SO ₂	Sulphur dioxide
SSI 5931	Approval of Application SSI 5931 provided for construction and operation of The Rapid Transit Rail Facility, now known as the Sydney Metro Train Facility (SMTF)
SWTC	Scope of works and technical criteria
TfNSW	Transport for New South Wales
TSP	Total Suspended Particles
UGL	UGL Engineering Pty Limited
VOC	Volatile Organic Compounds

PART A - OVERVIEW

1. Plan Overview

1.1 Purpose

The purpose of the Air Quality Management Sub-Plan (this Sub-Plan) is to describe how Systems Connect will minimise and manage impacts on air quality throughout the delivery of the Sydney Metro City & Southwest (SMCSW) Line-wide Works (LW) between Chatswood and Bankstown (C2B). Line-wide (LW) also referred to as the Project, will be delivered by Systems Connect (a CPB Contractors and UGL Engineering joint venture).

This Sub-Plan has been prepared to address the requirements of relevant Minister for Planning's Conditions of Approval (CoA), including CSSI 7400 and CSSI 8256, the Revised Environmental Mitigation Measures (REMMs), applicable legislation, the Environmental Impact Statements (EIS), contractual requirements including Schedule C1 Scope of Works and Technical Criteria (SWTC) of ITC 600, the Sydney Metro Construction Environment Management Framework (CEMF) and the LW Works' Environment Protection Licences. Further details about the above-mentioned compliance requirements are provided in section 2 and in the Construction Environmental Management Plan – C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).

1.2 Background

The LW Works will potentially impact air quality during the civil construction works. These potential impacts will require management and mitigation in accordance with relevant state legislation and government policies.

This Sub-Plan is based on the findings of Environmental Impact Statements (EIS) completed to inform development of the SMCSW. This Sub-Plan identifies potential air quality related impacts of the LW Works and sets out an integrated management framework to eliminate, manage, mitigate or minimise the potential impacts.

Activities and aspects which may potentially impact on air quality include:

- Earthworks – including stripping, trenching, excavation, loading and transporting soils and quarry materials, vehicle movements
- Exposed surfaces and stockpiles during periods of high winds
- Exhaust emissions from construction vehicles and plant.

The sections below provide an overview from the EIS about the existing air quality environment along the project alignment between C2B. Further details about the existing environment and planned LW activities are provided in Section 4.

1.2.1 Chatswood to Sydenham

The Chatswood to Sydenham EIS provides an assessment of the air quality considerations and emission sources associated with the LW Works. The LW Works will involve above-ground works at distinct sites and underground works (i.e. construction in the tunnel) between them.

Ambient air quality around the LW worksites is largely affected by motor vehicle emissions, commercial businesses (for example service stations and smash repairers), domestic activities (including wood fired home heaters), construction, and event-based emissions (for example bushfires or dust storms). There are industrial facilities at Lane Cove, Artarmon, St Leonards, North Sydney, Greenwich, Alexandria, Camperdown, Sydenham, Marrickville and Mascot that reported air emissions (under the National Pollutant Inventory reporting program) during the 2013-2014 reporting period. These facilities include:

- Basic ferrous and other fabricated metal product manufacturing (at Artarmon and Alexandria)
- Waste treatment, disposal and remediation services (at Artarmon and North Sydney)
- Hospitals (at St Leonards)
- Mineral, metal and chemical wholesaling (at Greenwich and Mascot)

- Airport operations and other air transport support services (at Mascot).

1.2.2 Sydenham to Bankstown

Air quality surrounding the project area is typical of a highly developed urban area that consists of a mix of land uses. Local air quality is mainly affected by vehicles on the road network, on major roads such as Canterbury Road, King Georges Road, and Stacey Street/Fairford Road. Air quality is also affected by the operation of diesel freight trains along the rail corridor between east of Marrickville Station and west of Campsie Station.

The typology of potential air pollution sources identified in the EIS are mostly identical to the ones identified in Chatswood to Sydenham EIS (as outlined in 1.2.1). Industrial facilities in the study area that reported air emissions during the 2014-2015 reporting period include:

- Petroleum and coal product manufacturing facility (in Alexandria)
- Sydney Trains Sydenham Maintenance Centre (in Sydenham)
- Airport operations and other air transport support services (in Mascot)
- Ceramic product manufacturing facility (in Punchbowl)
- Basic chemical manufacturing facility (in Bankstown).

Only one air pollution source, the XPT Maintenance Centre, on Way Street in Sydenham, is in the immediate vicinity of the project area (about 200 metres south-east). All other sources are located more than one kilometre from the project area.

1.3 Objectives and Targets

The key air quality objective for the LW Works is to maintain ambient air quality that provides for the adequate protection of human health (occupational air quality is not covered in this Sub-Plan). This objective is consistent with the objective of the Approved Methods for Modelling and Assessment of Air Pollutants in NSW (EPA 2016).

The air quality parameters of most relevance to the LW Works are PM₁₀ and PM_{2.5}, deposited dust, and total suspended particles (TSP). Diesel combustion emits a number of particulate compounds, and these may also be subject to management procedures. These compounds include sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and carbon monoxide (CO).

Systems Connect’s objectives for management of Air Quality during delivery of LW Works are aligned with the CEMF which states that the following management objectives will apply to construction:

- Identify and control potential dust and air pollutant sources.
- Minimise gaseous and particulate pollutant emissions from construction activities, as far as feasible and reasonable.

Based on the project requirements (listed in Section 2), the findings of project risk management processes and the potential impacts to the community, the following target has been set.

Table 1 - Air Quality project targets

Metric/Measure	Objective	Timeframe	Accountability
Number of complaints relating to dust	Zero	At all times	Area Manager

1.4 Plan Structure

Table 2 - Plan structure

Plan Structure	Details
Part A: Overview	<p>This Part defines:</p> <p>Section 1 Purpose, Background, Objectives, Applicability, Plan Revision and Update and Related Documents</p> <p>Section 2 Legal and other requirements</p> <p>Section 3 Roles and responsibilities with regards to Air Quality Management</p> <p>Section 4 Existing Environment</p> <p>Section 5 Aspects and Impacts</p> <p>Section 6 Air Quality Management Strategy</p>
Part B: Implementation	<p>This section outlines in detail the key processes and systems to support implementation of environmental management outcomes for the project:</p> <p>Element 1. Training</p> <p>Element 2. Monitoring and Reporting</p> <p>Element 3. Auditing, Review and Improvement</p> <p>Element 4. Project Specific Requirements</p>
Part C: Appendices	C1 – Air Quality and Dust Management Procedure

1.5 Plan Applicability, Staging and Interface

1.5.1 Applicability

This Air Quality Management Sub-Plan is applicable to Portions 2, 3 and 4 of LW, which includes all works associated with the corridor from Chatswood to Bankstown (C2B). It is not applicable to Portion 1, SMTF expansion works. The SMTF expansion works have a separate series of Construction Environmental Management Plans, approved under Planning Approval SSI 5931. An overview of LW scope and portions is provided in the CEMP C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).

Table 3 below provides a summary of the scope of works covered under each Portion.

Table 3 - Summary of LW scope for Portions 2, 3 and 4

LW Portions	Scope
Portion 2 – SMTF South (LW are Principal Contractor)	<p>Construction of Sydney Metro Trains Facility South, in Marrickville, including:</p> <ul style="list-style-type: none"> • Civil works • Track system comprising stabling, shunting and maintenance roads • Infrastructure maintenance facilities including a maintenance workshop, siding, materials storage facilities and parking • Train maintenance facilities • Overhead wiring for new track systems • Mechanical, hydraulic and electrical services for the facility • Administration buildings • Groundwater treatment plant
Portion 3 – Chatswood to Sydenham tunnels and stations works (LW are Principal Contractor for Northern Dive,	<p>Tunnel and underground station works including the systems, services and building works within, and required for operation of the tunnels, Barangaroo crossover cavern, trackway and the Southern Dive.</p> <p>Open Northern Dive works including civil, structural and track systems work to incorporate SMCSW with SMNW systems.</p> <p>Construction of Artarmon bulk supply infeed substation.</p>

Artarmon Substation, BPS routes, tunnels and a small area within Barangaroo site)	Bulk Power Supply works including cable routes of 33kV feeders from: <ul style="list-style-type: none"> • Ausgrid’s Willoughby Sub-Transmission Substation to the Artarmon bulk supply infeed substation • Ausgrid’s Surry Hills Sub-Transmission Substation to the bulk supply infeed substation within Waterloo Station
Portion 4 – Sydenham to Bankstown works (LW are Principal Contractors for Substation sites and BPS routes)	Bulk Power Supply works including cable routes of 33kV feeders from Ausgrid’s Canterbury Sub-Transmission Substation to the Campsie bulk supply infeed substation. Southwest corridor power works from Sydenham to Bankstown, including: <ul style="list-style-type: none"> • a HV Reticulation System • a Traction Power System • a Power Control System • an Earthing and Bonding System, Electrolysis Control Measures and Lightning Protection

1.5.2 Staging

To address the staged nature of SMCSW project, Sydney Metro has developed two Staging Reports:

- Chatswood to Sydenham Staging Report (July 2019)
- Sydenham to Bankstown Upgrade Staging Report (March 2019)

Each Staging Report defines the Conditions of Approval (CoA), Revised Environmental Management Mitigation Measures (REMM’s) and the Construction Environmental Management Framework (CEMF) requirements that Systems Connect (and the other Project Stage contractors) must address to deliver works between Chatswood and Bankstown under CSSI 7400 and CSSI 8256. The Staging Reports “turn on or off” whether each condition or requirement is “applicable”, “not applicable” or “partially applicable” to LW. If a requirement is applicable or partially applicable, it is included in the Element 4 table of Project Specific Requirements and addressed in this Sub-Plan.

The EIS assessments addressed all potential project impacts at all Project stages, including impacts during tunnel and station excavation and construction, being completed by other contractors. These activities will be in varying stages of completion at each worksite, by the time LW Works commence at each location (in accordance with the Staging Reports).

1.5.3 Interface

This Sub-Plan is applied when Systems Connect is the Principal Contractor at any SMCSW site. When Systems Connect is not the Principal Contractor, elements of this Sub-Plan will be implemented by Systems Connect where reasonable and feasible, to mitigate any potential air quality impacts and to prevent harm to the environment. In such cases, Systems Connect will conduct activities in accordance with the Principal Contractors’ Regulatory and contractual obligations.

Systems Connect will liaise and work with other SMCSW delivery contractors to plan and carry out all works, aiming to achieve this objective and ensure any potential cumulative impacts are managed and harm to the environment does not occur.

1.6 Agency Consultation

Planning Approval consultation obligations, in line with the staging reports, are outlined in Table 4 below.

This sub-plan will be submitted to the Planning Secretary at least one month before commencement of construction, be approved prior to commencement of works and be implemented for the duration.

Table 4 - Sub-Plan agencies consultation according with Staging Reports

Plan	CSSI	Contractor's Internal Review & Approval	Sydney Metro Review	Government Agency / Stakeholder Consultation	ER Review & Endorsement	Secretary Review & Approval
Air Quality Management Sub-Plan	7400	✓	✓	•	✓	✓
	8256	✓	✓	•		

1.7 Revision and Update

The document review process ensures that environmental documentation including this Sub-Plan is updated as appropriate for the specific works that are occurring on-site. This includes the management review process described in Element 3.

This Sub-Plan was developed to address the Air Quality compliance requirements throughout LW Works between C2B and it will be updated as the project progresses through each Portion.

Amendments would typically include those that:

- Are editorial in nature e.g. staff and agency/authority name changes
- Do not increase the magnitude of impacts on the environment when considered individually or cumulatively
- Do not compromise the ability of the Project to meet approval or legislative requirements
- Do not result in new environmental impacts.

Details of the plans and procedures revisions that will occur to address Planning Approval compliance requirements, across the delivery of all portions of LW Works, are provided in the project CEMPs.

Minor amendments to the Air Quality Management Sub Plan will be submitted to the Environmental Representative (ER) and Sydney Metro for review and endorsement. Minor amendments would generally include changes to systems or processes.

Where the change will have the potential to result in an additional environmental or community impact that the ER cannot approve, then the plan would be submitted to DPIE for review and approval.

Where necessary, amendments to this Sub-Plan will also be provided to relevant stakeholders for review and comment and/or forwarded for approval.

1.8 Related Documents

This document is a Sub-Plan of the Construction Environmental Management Plan - C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033). Table 5 shows the interrelationships with other project plans and documents:

Table 5 - Interaction with other project documents

Document	Description
Soil, Water and Groundwater Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000372)	Describes erosion and sediment control measures to be implemented during the LW Works, some of which will mitigate dust impacts. This includes procedures for preparing Erosion and Sediment Control Plans (ESCPs)

<p>Sustainability Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000024)</p>	<p>This Plan includes a carbon and energy management strategy that provides detail on emission reduction strategies</p>
<p>Exposure Control Plan – Occupational Dust (SMCSWLWC-SYC-1NL-HS-PLN-001029)</p>	<p>Includes occupational exposure limits and mitigation measures to manage air quality, dust and emissions occupational health risks. Adoption of Workplace health and safety standards for dust and asbestos management ensure that potential human health impacts are managed for our staff and workforce and surrounding sensitive receivers and members of the public in accordance with Sydney Metro Principal Contractor Health & Safety Standard (SM PS-ST-221) and as such these requirements do not need to be addressed or repeated in this Sub-Plan.</p>
<p>Occupational Health, Hygiene and Wellness Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000650)</p>	<p>This Plan identifies tasks, processes and work areas where exposures to contaminants and physical hazards of potential concern may occur.</p> <p>It provides information on development and implementation of personal exposure monitoring and static monitoring programs, including dust and air contaminants.</p> <p>It also addresses qualitative or quantitative risk assessments of exposure to air contaminants and physical hazards of potential concern.</p>
<p>Air Quality and Dust Management Procedure (SMCSWLWC-SYC-1NL-EM-PRO-000392)</p>	<p>Workflow procedure addressing key requirements for management of air quality by the project delivery team. Includes flow diagrams with required steps to monitor and manage air quality during construction and hold points for implementing controls.</p>

2. Legal and Other Requirements

2.1 Legislation

Key legislation relevant to air quality management includes:

- Protection of the Environment Operations Act 1997 (POEO Act)
- Protection of the Environment Operations (Clean Air) Regulations 2010

Refer to the Construction Environmental Management Plan - C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033) for details of the relevant legislation.

2.2 Compliance Requirements

Line-wide Works (C2B) have been assessed and approved via a number of applications under the Environmental Planning and Assessment Act 1979 (EP&A Act) and are classified as Critical State Significant Infrastructure:

- CSSI 7400. Sydney Metro City & Southwest Chatswood to Sydenham and
- CSSI 8256. Sydney Metro City & Southwest Sydenham to Bankstown.

Detailed environmental assessments have been carried out to gain the necessary planning approvals.

Element 4: Project Specific Requirements, includes the key compliance requirements for air quality management which are applicable to the LW Works. Requirements are drawn from Conditions of Approvals, Revised Environmental Mitigation Measures and the Sydney Metro Construction Environmental Management Framework (CEMF).

This plan will also deliver compliance with the Systems Connect EMS, contractual requirements including Schedule C1 Scope of Works and Technical Criteria (SWTC) of ITC 600 and any Environmental Protection License (EPL) issued to the Project. The EPA issued EPL 21423 to the Project on 31 July 2020 for the scheduled activity "Railway activities - railway infrastructure construction", which applies to certain prescribed premises between Chatswood Dive Site and Sydenham Dive Site.

2.3 Guidelines and Standards

Additional guidelines and standards relating to the management of air quality include:

- AS 3570 - Automotive Diesel Fuels
- Safe Work Australia 2013 - Workplace Exposure Standards for Airborne Contaminants
- BS6164:2001 - British Standard Code of Practice for Safety in Tunnelling in the Construction Industry
- WorkCover NSW 2006 - Code of practice: Tunnels under construction
- National Environment Protection Council 1998 - Ambient Air: National Environment Protection Measure for Ambient Air Quality
- NSW EPA 2016 - Approved Methods for the Modelling and Assessment of Air Pollutants in NSW

3. Roles and Responsibilities

3.1 Systems Connect Team

The roles and responsibilities of key Systems Connect personnel with respect to air quality are detailed in Table 6.

Table 6 - Key roles, authority and responsibility

Role	Authority and responsibility
Project Director	<ul style="list-style-type: none"> Managing the delivery of the LW Works including overseeing planning approval and environmental management Authority to direct personnel and/or subcontractors to carry out actions to avoid or minimise unintended environmental impacts Act as the Contractor's Representative
Environment and Sustainability Manager	<ul style="list-style-type: none"> Oversee the implementation of all air quality and dust management initiatives Prepare and implement this Sub-Plan Oversee air quality monitoring, inspections and auditing
Environmental Advisor	<ul style="list-style-type: none"> Assists the Environment Manger in the day to day environmental management of LW
Commercial Manager	<ul style="list-style-type: none"> Ensure that relevant air quality and dust management requirements are considered in procuring materials and services
Design Team Manager	<ul style="list-style-type: none"> Ensure relevant air quality and dust management requirements are addressed in design development
Construction Manager and delegates	<ul style="list-style-type: none"> Manage the delivery of the construction process in relation air quality and dust management for work activities in conjunction with the Project environment staff and Environment and Sustainability Manager Ensure compliance with this Sub-Plan and associated procedures.
Sustainability Advisor/Coordinator	<ul style="list-style-type: none"> Track and report air quality elements against sustainability targets
Environment Coordinators	<ul style="list-style-type: none"> Oversee and manage the on-ground application of air quality and dust management measures during construction (e.g. dust suppression using water, application of dust suppressants, covering stockpiles and training), in conjunction with construction delivery teams. Monitor and report on air quality management during construction
Superintendents	<ul style="list-style-type: none"> Construction delivery in relation to environmental management and compliance in conjunction with the Project Environment staff Authority to direct personnel and/or subcontractors to carry out actions to avoid or minimise unintended environmental impacts
Project Managers Project Engineers Site Engineers Supervisors	<ul style="list-style-type: none"> Implement and monitor onsite environmental management and compliance measures across all sites in conjunction with environmental coordinators Undertake site inspections
Stakeholder and Community Relations Manager	<ul style="list-style-type: none"> Assist in response to and management of complaints relating to air quality and dust
Plant Manager	<ul style="list-style-type: none"> Ensuring that mechanical inspections of plant and vehicles are undertaken for all new plant/equipment coming on to sites to check that appropriate emission control devices are fitted and in good working order. Ensuring that vehicles and construction plant and equipment are maintained in good condition and regularly serviced so that emissions remain within air quality standards.

Further details on roles and responsibilities are provided in the Construction Environment Management Plan - C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).

4. Existing Environment

This section provides an overview of the existing environment surrounding the LW C2B construction sites. As detailed in section 1.2 this information is based on the comprehensive assessment and analysis work performed for the EIS that cover LW scope of works. The existing environment is described in sections, based on each Planning Approval:

- Chatswood to Sydenham
- Sydenham to Bankstown

4.1 Chatswood to Sydenham

The *National Environment Protection (Ambient Air Quality) Measure* ('the Air NEPM') set a non-binding standard and ten-year goal (updated 2016) that particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM₁₀) has a maximum concentration of 50 micrograms per cubic metre (50 µg/m³) over a 24-hour average, with no exceedances per year. Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}) has a maximum concentration of 25 µg/m³ over a 24-hour average, again with no exceedances per year.

Data from the EIS shows that the concentrations of air pollutants were generally below the applicable air quality standards during the 2012, 2013 and 2014 reporting periods, except for occasional days when the maximum 24-hour average concentration levels of PM₁₀ exceeded the applicable criterion of 50 µg/m³. These occurrences are generally the result of natural events including dust storms, bushfires and sea spray arising from on-shore winds.

Table 7 provides a description of the existing and surrounding environments at each of the LW worksites between Chatswood and Sydenham, and identifies potential sensitive receivers at each site, with respect to air quality and dust management.

Table 7 - Surrounding environment and potential sensitive receivers between Chatswood and Sydenham

Worksite	Existing/Surrounding Characteristics	LW Works Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Chatswood dive site and Northern Corridor	<p>The worksite comprises a length of railway corridor extending approximately 800m from Brand Street at Artarmon to Albert Avenue in Chatswood and the Ausgrid compound situated between Mowbray Road and Nelson Street.</p> <p>Set adjacent to the T1 North Shore Line in Chatswood, medium density residential dwellings are located to the north and south of the site, with low density housing located to the east. Commercial and industrial premises are located immediately to the south and west of the site.</p>	<ul style="list-style-type: none"> • Establishment of work site (takeover and modify existing worksite established by previous contractor) • Building demolition (at end of works) • Earthworks associated with building northern dive connection • Removal, storage and/or transport of spoil from the northern dive excavation • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Operation of ventilation systems 	<ul style="list-style-type: none"> • Nearest sensitive receivers are the residential receivers set immediately to the north along Nelson Street and the residents east of the worksite, on the opposite side of the rail corridor along Orchard Road • Residents on the western side of the rail corridor • Mowbray House • Chatswood South Uniting Church on Mowbray Road. • Residents in Drake Street to the east of the site, as this is a vehicle and plant

Worksite	Existing/Surrounding Characteristics	LW Works Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Crows Nest *	<p>At this location, there will be a combination of acoustic sheds, existing buildings and open spaces where LW Works will be completed.</p> <p>The worksite is located adjacent to the Pacific Highway between Oxley Street and to the south-east of Hume Street within the commercial district.</p> <p>The Crows Nest precinct has a mixture of built form typologies of varying ages, heights, styles, uses and setbacks, and is influenced by a recent influx of high-rise and mid-rise office and residential tower developments. Low scale highway-oriented showroom developments are located along the Pacific Highway, alongside a concentration of 19th century two store shopfront facades to the south of Hume Street.</p> <p>The site will be controlled by Systems Connect for the early access period (Q3 & Q4 2020), until another SMCSW contractor takes over in Q1 2021.</p>	<ul style="list-style-type: none"> • Cutting/grinding of concrete or other dust and fume-generating materials <ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant during deliveries • Excavation associated with local area works and utilities relocations • Operation of ventilation systems • Cutting/grinding of concrete or other dust and fume-generating materials (within the station box and tunnels). 	<p>access route to the worksite in the rail corridor</p> <ul style="list-style-type: none"> • The worksite is bordered to the north by a commercial district and mixed use commercial and residential premises • The St Leonard's Centre, located adjacent to the project site at the corner of Oxley and Clarke Streets • Kelly's Place Children's Centre • Community Church • Hume Street park
Artarmon substation And Bulk Power Supply Route	<p>The Artarmon Substation is located adjacent to Reserve Road between Whiting Street and Curry Lane, within an industrial zoned area. The Gore Hill Freeway is to the north.</p>	<ul style="list-style-type: none"> • Earthworks/piling associated with building Artarmon Substation and BPS • Removal, storage and/or transport of spoil • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting/grinding of concrete or other dust and fume-generating materials 	<ul style="list-style-type: none"> • The site is surrounded by light industrial/commercial businesses • Freeway Hotel • The nearest residents are to the north, on the other side of the Gore Hill Freeway
Victoria Cross * (existing northern site, proposed new northern site,	<p>The worksites are located along Miller Street around the intersections with McLaren Street, and between Berry and Mounts streets.</p> <p>Generally, the built character of this area is of a high-rise typology in the south, stepping down to mid-rise and low-rise frontages to the north.</p>	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Operation of ventilation systems 	<ul style="list-style-type: none"> • Commercial and retail land uses with some interspersed residential uses. • The Monte Sant' Angelo Mercy College is located between the two construction sites, along Miller Street. • Wenona School • Goodstart Early Learning, Berry Street

Worksite	Existing/Surrounding Characteristics	LW Works Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
and southern site)	<p>This predominantly commercial area is interspersed with schools, tertiary education facilities, restaurants and retail.</p> <p>It includes several heritage buildings and conservation areas.</p> <p>The Pacific Highway comprises six lanes in this area, providing a through route to Crows Nest in the north and Milsons Point in the south. Miller Street intersects with the Highway and is one of the principal north-south access routes through the North Sydney CBD.</p> <p>The site will be controlled by another SMCSW contractor at the time that Systems Connect accesses it for LW Works.</p>	<ul style="list-style-type: none"> • Cutting/grinding of concrete or other dust and fume-generating materials (within the station box and tunnels). 	<ul style="list-style-type: none"> • The nearest single dwelling residential receivers are set along McLaren Street, immediately west of the Victoria Cross station north construction site • Heritage listed 'Montrose' building • Only About Children childcare centre located at 65 Berry Street
Blues Point Site	<p>The Blues Point temporary construction site covers an area of about 2,100 square metres within Henry Lawson Reserve, at the end of Blues Point Road. The site has mostly residential and some commercial land use in the immediate vicinity.</p>	<ul style="list-style-type: none"> • Building demolition (at end of works) • Exhaust emissions from operation of delivery vehicles • Operation of ventilation systems 	<ul style="list-style-type: none"> • The multi-storey residential building Blues Point Tower is set just to the west of the site with other residential premises around 50 to 150 metres away along Warung Street. • Public playground on Blues Point Road • One residential receiver is also present adjacent to the site to the east.
Barangaroo	<p>The site would be located within the road reserve of Hickson Road and the adjacent Barangaroo development area.</p> <p>There will be an acoustic shed at the Hickson Road site for the duration of LW Works and works will be underground in new station/tunnel cavern.</p>	<ul style="list-style-type: none"> • Building demolition (at end of works) • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Operation of ventilation systems 	<ul style="list-style-type: none"> • Nearest residential premises are located immediately to the east along High Street and High Lane, and to the north along Argyle Place • Barangaroo Reserve • New Barangaroo development along Hickson Road to the south • KU Lance Children's Centre, High Street
Martin Place * (north, south and Bligh Street sites)	<p>Both sites are currently occupied by commercial and residential mixed-use buildings. Both areas are surrounded by mixed use commercial and retail users, including residential.</p>	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Operation of ventilation systems 	<ul style="list-style-type: none"> • Sydney Eye Hospital is located around 150 metres to the east of the site • Chifley Square • Commonwealth Bank • Macquarie Bank • BNP Paribas

Worksite	Existing/Surrounding Characteristics	LW Works Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
	<p>The worksite is located in the heart of Sydney's financial district, one of the busiest precincts of the city for vehicular and pedestrian movement.</p> <p>The site will be controlled by another SMCSW contractor at the time that Systems Connect accesses it for LW Works.</p>	<ul style="list-style-type: none"> • Cutting/grinding of concrete or other dust and fume-generating materials (within the station box and tunnel) 	<ul style="list-style-type: none"> • Channel 7 • Reserve Bank of Australia • War Memorial • MLC Centre • Cafes and food trucks with outdoor seating at 8 Chifley Place, Corner of Blight and Hunter Streets, MLC centre and Martin Place • Residents in O'Connell Street • Hotels and serviced apartments – Sofitel Wentworth; Radisson Blu Plaza; Medina serviced apartments; Commercial Travellers' Association Hotel
<p>Pitt Street * (north and south sites)</p>	<p>The Pitt Street Station construction sites would be located on the corner of Pitt, Park and Castlereagh streets; and around the corner of Pitt and Bathurst streets. Both areas are surrounded by a mixture of commercial, residential, retail and educational land uses.</p> <p>Works will be completed within partially completed below-ground station cavern.</p>	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Operation of ventilation systems • Cutting/grinding of concrete or other dust and fume-generating materials 	<ul style="list-style-type: none"> • Several hotels (Edinburgh Castle) and short-term accommodation premises are also located nearby. • Commercial and residential buildings • The Great Synagogue • Pitt Street Uniting Church
<p>Surry Hills Bulk Power Supply Route (including Central Station*)</p>	<p>The BPS route is trenched from the existing Ausgrid substation in Surry Hills through Frog Hollow Reserve and on the road through mixed residential and commercial areas, entering the rail corridor at the east of Central Station to the new Waterloo Traction Substation.</p> <p>The BPS route crosses two major traffic corridors:</p> <ul style="list-style-type: none"> • Elizabeth is a major hub for bus and rail interchange • Albion Street, also notable for its historical background and heritage -listed buildings. <p>The zoning in the Central station surrounds is mixed use, residential, metropolitan centre and public recreation.</p>	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant • Excavation of road trenches to install the BPS route 	<ul style="list-style-type: none"> • Commercial and residential buildings • Numerous hotels and hostels • Many restaurants, bars and cafes • Bureau of Meteorology

Worksite	Existing/Surrounding Characteristics	LW Works Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Waterloo *	<p>Set at a block bounded by Raglan Street, Cope Street, Wellington Street and Botany Road, the site is surrounded in all directions by lands zoned for 'Mixed Use' and 'General Residential' uses.</p> <p>The site will be controlled by another SMCSW contractor at the time that Systems Connect accesses it for LW Works.</p>	<ul style="list-style-type: none"> Exhaust emissions from operation of construction vehicles and plant Excavation associated with local area works and utilities relocations Operation of ventilation systems Cutting/grinding of concrete or other dust and fume-generating materials 	<ul style="list-style-type: none"> The nearest residential premises are located to the south along Wellington Street and the east along Cope Street. The heritage listed Congregational Church Social housing estate SDN Lois Barker Waterloo Children's Education and Care Centre
Marrickville dive site (including SMTF south)	<p>Located adjacent to the T3 Bankstown Line in the Marrickville industrial area, the site is mostly surrounded by industrial uses.</p> <p>The area includes heritage items dating back to its time as an industrial and manufacturing hub during the 19th and early 20th centuries when activities included: steel works; mills; brick making and pottery. In particular, this includes a local heritage listed brick-lined Marrickville flood storage reserve on the corner of Garden Street and Railway Parade.</p> <p>The area comprises a mix of residential and industrial buildings reflective of its historical development. Land use within the area is mainly light manufacturing with a mix of tertiary uses such as light industry and urban support services, retail, residential, freight and logistics, and office development.</p>	<ul style="list-style-type: none"> Establishment of work site Building demolition (at end of works) Earthworks associated with building southern dive connection Removal, storage and/or transport of spoil from the southern dive excavation Exhaust emissions from operation of construction vehicles and plant Excavation associated with local area works and utilities relocations Operation of ventilation systems Cutting of concrete or other dust-generating materials Cutting/grinding of concrete or other dust and fume-generating materials 	<ul style="list-style-type: none"> Camdenville Park is located to the east, Nearest residential receivers located around 150 meters away to the south east along Unwins Bridge Road and to the north on Lord and Darley streets.

* Sites where other SMCSW Contractors will act as Principal Contractor

4.2 Sydenham to Bankstown

Data from the EIS show that the average daily air quality index values for the monitoring stations at Earlwood, Chullora, and Liverpool varied between 46 and 51 in the available monitoring years (2013 – 2015). These values correspond with an air quality index outcome of 'good', indicating that air quality is generally of an acceptable quality. The data shows that the concentrations of air pollutants were generally below the applicable air quality criteria, with the exception of occasional days when PM₁₀ exceeded 50 µg/m³. These occurrences are generally the result of natural events such as dust storms and bushfires.

Table 8 provides a description of the existing and surrounding environments near each of the LW worksites between Sydenham and Bankstown, and also identifies potential sensitive receivers at each site, with respect to air quality and dust management.

Table 8 - Surrounding environment and potential sensitive receivers between Sydenham and Bankstown

Worksite	Existing/Surrounding Characteristics	Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Dulwich Hill Traction Substation (within rail corridor)	Works for the traction substations will be within the rail corridor, at the traction substation location, which is near the end of Randall Street. Surrounding land use is low-density residential.	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the site preparation works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Local residents • Maronite Sisters Of The Holy Family Village assisted living facility is approximately 100m to the north, on the other side of the rail corridor • St Nicholas Greek Orthodox Church is approximately 250m north-east
Canterbury Traction Substation (within rail corridor)	Works for the traction substations will be within the rail corridor, at the traction substation location, which is to the north of Hutton Street, west of the intersection with Hurlston Avenue. Surrounding land uses are residential and recreational.	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the site preparation works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Local residents • The Boat Harbour Nature Preserve is on the Cooks River Foreshore to the south • Warwick Reserve is on the other side of the rail corridor to the north
Campsie Traction Substation (within rail corridor)	Works for the traction substations will be within the rail corridor, at the traction substation location, which is around 250m west of Campsie Station, within the Campsie local town centre. Surrounding land use is residential.	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the site preparation works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Local residents • The Campsie RSL is approximately 100m to the east • The Carrington Occasional Care Centre is approximately 200m to the south • The Campsie Police Station is on the other side of the rail corridor to the north
Bulk Power Supply Route (external to rail corridor)	The bulk power supply route is trenched from the existing Ausgrid substation in Canterbury to the rail corridor between Canterbury and Campsie Stations. From the substation, the route initially goes through Pat O'Conner Reserve and through residential areas to the rail corridor. It crosses a major transport corridor (Canterbury Road) which is zoned	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the trenching works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Residents and businesses along the route • Pat O'Conner Reserve

Worksite	Existing/Surrounding Characteristics	Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Lakemba Traction Substation (within rail corridor)	Business Development, having a range of commercial and retail premises as well as residences.		
	Works for the traction substations will be within the rail corridor, at the traction substation location, which is near the junctions of Dennis Street and Taylor Street and The Boulevard. At the Lakemba Traction Substation location, the surrounding land use is residential, with the Lakemba local town centre approximately 200m to the west.	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the site preparation works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Local residents • The Canterbury City Community Centre is approximately 150m to the west
Punchbowl Traction Substation (within rail corridor)	Works for the traction substations will be within the rail corridor, at the traction substation location, which is to the north of the roundabout at the north end of Scott Street. At the Punchbowl Traction Substation location, the surrounding land use is all low density residential.	<ul style="list-style-type: none"> • Removal, storage and/or transport of spoil from the site preparation works • Exhaust emissions from operation of construction vehicles and plant • Excavation associated with local area works and utilities relocations • Cutting of concrete or other dust-generating materials 	<ul style="list-style-type: none"> • Local residents • Warren Reserve adjoins the rail corridor to the north-east • Punchbowl Boys High School, which adjoins the rail corridor, is to the north • Bankstown Childcare Academy is opposite the substation, across South Terrace
High Voltage Cable Installation Bankstown to Sydenham (within rail corridor)	High voltage cable will be pulled through existing conduit and cable trays in the rail corridor between each substation from Bankstown to Sydenham.	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant 	<ul style="list-style-type: none"> • Residents and businesses along the route
Station Sites: Marrickville Dulwich Hill Hurlstone Park Canterbury Campsie Belmore Lakemba	Package substation installation onto existing pad mounts within the station sites using franna crane to lift into place and hand tools	<ul style="list-style-type: none"> • Exhaust emissions from operation of construction vehicles and plant 	<ul style="list-style-type: none"> • Rail passengers

Worksite	Existing/Surrounding Characteristics	Activities Potentially Affecting Air Quality	Potentially Sensitive Receivers
Wiley Park Punchbowl Bankstown			

5. Aspects and Impacts

Activities potentially affecting air quality described in Table 8 above are described in further detail in this section.

The key aspects and potential impacts in relation to the overall management of air quality during the LW Works are listed in Table 9 below.

Table 9 - Summary of overall aspects and potential impacts

Aspects	Potential Impacts
Worksite establishment	<p>Dust generation due to:</p> <ul style="list-style-type: none"> • Clearing and grubbing to level site (removal of surface cover) • Stockpiling of topsoil and mulched vegetation • Wind erosion of exposed surfaces and stockpiles • Wheel-generated dust from vehicular traffic on unsealed roads and work site access points • Operation of construction vehicles and plant
Civil works	<p>Dust generation due to:</p> <ul style="list-style-type: none"> • Operation of excavators, front end loaders, bulldozers, dump trucks and other plant on exposed surfaces • Loading/unloading trucks with spoil and aggregate • Wind erosion of exposed surfaces and stockpiles • Wheel-generated dust from vehicular traffic on unsealed roads and work site access points • Cutting and grinding • Operation of construction vehicles and plant
Spoil handling, storage and transport	<p>Dust generation due to:</p> <ul style="list-style-type: none"> • Spoil stockpiles • Spoil haulage (covered loads) • Wheel-generated dust from heavy vehicle movements around construction sites and along haulage routes • Operation of construction vehicles and plant
Plant and vehicle emissions movement	<p>Dust generation (wheel generated) from:</p> <ul style="list-style-type: none"> • Construction vehicles • Construction equipment, generators and other plant • Operation of construction vehicles and plant <p>Exhaust emissions:</p> <ul style="list-style-type: none"> • Operation of construction vehicles and plant (including PM10, PMS2.5, CO, SO₂, NO_x, VOCs and PACs)

6. Air Quality Management Strategy

6.1 Air Quality and Dust Management Procedure

An Air Quality and Dust Management Procedure (SMCSWLWC-SYC-1NL-EM-PRO-000392) has been developed for the LW Works and is included in Appendix C1. The procedure outlines:

- Training via inductions and tool box talks
- Air quality and dust control implementation
- Visual monitoring procedures
- Requirement to undertake an environment inspection and stop work or modify work practices if:
 - Visible dust has potential to leave the site
 - Winds exceed 30 km/hr on average over 1hr.

6.2 Meteorological Factors

Meteorological factors that need to be considered when evaluating the risk of dust generation include:

- Wind Direction – determines whether dust and suspended particles are suspended and transported in the direction of sensitive receivers
- Wind Speed – governs the potential suspension and drift distance of particles
- Soil Moisture – increased soil moisture reduces soil or dust erosion potential
- Rainfall or Dew – rainfall or heavy dew which wets the surface of the soil.

These factors will influence the day-to-day risk of dust generation and suspension. Accordingly, they are to be considered by the Supervisors, in consultation with the Environmental Coordinators, to ensure appropriate mitigation measures are adopted.

6.3 Plant and Equipment Management and Maintenance

The main impacts from plant and vehicle emissions include an increase in greenhouse gases and a general reduction in air quality. The main compounds associated with diesel combustion in plant and equipment include carbon monoxide, sulphur dioxide and nitrogen dioxide. The potential reduction of air quality from plant and vehicle emissions associated with LW Works is not considered significant in isolation, however, the accumulated impact in conjunction with other adjacent sources (i.e. motor vehicle emissions, commercial businesses, domestic sources, vegetation burning, and dust storms etc.) has the potential to diminish air quality in the immediate vicinity and region of the project worksites.

To minimise the impacts on local and regional air quality, the exhausts of all major plant shall be fitted with suitable exhaust emission cleaners, such as catalytic converters, maintained in accordance with the manufacturers' recommendations. Mechanical inspections of plant, equipment and vehicles will be undertaken to ensure all have appropriate emission control devices and are in good working order.

Vehicles and construction plant and equipment will be maintained in good condition and regularly serviced so that vehicular emissions remain within air quality standards set by the EPA/OEH. Engines will be switched off when vehicles are not in use and refuelling areas will be located away from areas of public access and sensitive receivers wherever possible.

In addition to emission control devices, mechanical inspections and emissions testing, regular site inspections will be undertaken by Site Supervisors and Environmental Coordinators to monitor and reduce any unnecessary running of plant and vehicles. These inspections will also be used to detect any plant or vehicles emitting excessive fumes or smoke.

6.4 Air Quality and Dust Mitigation Measures

The key air quality and dust mitigation measures to be implemented during the LW Works are listed in Table 10 below. Responsibility for implementation of measures is also outlined for each mitigation measure.

Table 10 - Air quality management and mitigation measures

Management and Mitigation Measures	Responsibility
Pre-Construction	
Identify sensitive land uses/sensitive receivers in Site Environment Plans (SEPs), prior to works commencing.	Environmental Advisor/ Coordinator
Incorporate information on dust sources, impacts and mitigation measures into Site Induction and on-going Toolbox Talks.	Project Engineers Environmental Coordinators
Site Establishment	
Temporary spoil stockpiles during site establishment are to be maintained.	Project Engineers Site Supervisors
Wind breaks, which may include site hoardings, may be constructed where construction works are in close proximity to sensitive receivers (where feasible and reasonable).	Environmental Coordinators Project Engineers
Wheel-wash facilities or rumble grids will be provided and used near the site exit points, as appropriate.	Site Supervisors
General Construction	
Undertake on-going monitoring for dust (site inspections) to assess the effectiveness of mitigation measures.	Environmental Coordinators
A sweeper will be used to clean dirt tracked on hardstand, pavements, or roads.	Site Supervisors
Water sprays and/or water carts to be used as required for dampening exposed surfaces to control dust generation.	Project Engineers
Burning or incineration is not permitted at any of the LW Worksites.	Site Supervisors Environmental Coordinators Project Engineers
Silt accumulated in sediment control devices (e.g. silt fences and spoon drains) to be removed on a regular basis to prevent dust generation.	Site Supervisors
Dust complaints will be addressed by the Stakeholder and Community Relations Manager and the Environment and Sustainability Manager, in accordance with the complaints handling process in the Community Communications Strategy (CCS-LW) (SMCSWLWC-SYC-1NL-PM-PLN-000027)	Environment and Sustainability Manager Stakeholder and Community Relations Manager
Dust suppression measures, such as water lines, will be used if concrete/rock cutting is required.	Site Supervisors
If any demolition is required, it would be managed to minimise dust generation.	Project Engineers Site Supervisors
Cutting, grinding or sawing equipment must only be used in conjunction with suitable dust suppression techniques, such as water sprays or local extraction.	Site Supervisors
Plant and equipment will be serviced and maintained in good working order to reduce unnecessary emissions from exhaust fumes. All equipment and vehicles are to be regularly maintained and records kept of maintenance.	Project Engineers Plant Manager

Management and Mitigation Measures	Responsibility
	Sub-contractors
Ventilation from acoustic shed would be filtered.	Project Managers
Use of erosion control techniques such as geotextiles, organic fiber mats, mulches and soil polymer stabilisers/binders.	Site Supervisors
The engines of all on-site vehicles and plant would be switched off when not in use for an extended period.	Site Supervisors
Low emission vehicles and plant fitted with catalysts, diesel particulate filters, or similar devices are to be used, where feasible and reasonable.	Project Managers
Plant must be well maintained and serviced in accordance with manufacturers' recommendations.	Project Managers Site Supervisors
Haul routes and plant (including generators) to be sited away from sensitive receivers, such as dwellings and schools, where feasible and reasonable.	Project Engineers Site Supervisors Traffic engineers
Workers will be encouraged to use public transport and consider other modes of transport such as car-pooling.	Project Managers
Excavation and Earthworks	
Water suppression to be used for active earthwork areas, stockpiles, gravel roads to reduce wind-blown dust emissions.	Site Supervisors
All vehicles carrying loose or potentially dusty material to and/or from the site must be covered.	Site Supervisors Environmental Coordinators Project Engineers
Spoil handling, storage and transport	
Any dirt tracked or spilt onto public roadways resulting from construction vehicles exiting the worksite(s), to be removed and appropriately disposed of using brooms or a street sweeper as required.	Site Supervisors
Trucks carrying spoil onto or off site are to be covered. Tailgates, under-rigs, wheels and towing apparatus of all trucks to be checked to ensure they are clean and secure, prior to leaving the worksite.	Project Engineers Site Supervisors
Unsealed haul roads must be regularly damped down in dry and windy conditions.	Project Engineers Site Supervisors
Longer term and/or heavily used haul roads to generally be sealed. The criteria for sealing haul roads would be defined during detailed construction planning. Sealed haul roads would be regularly cleaned.	Senior Project Managers
Extreme Weather Conditions	
Dust generating activities would be assessed during periods of strong winds and rescheduled, where required.	Site Supervisors Environmental Coordinators Project Engineers

6.5 Monitoring and Inspection

6.5.1 Monitoring Dust Generating Activities

Monitoring the impacts from dust generating activities will be undertaken using visual inspections of onsite construction activities in conjunction with the prevailing and forecasted metrological conditions. This risk-based approach will highlight the effectiveness of implemented dust controls and the need for any additional measures.

Visual inspections will be undertaken by Site Supervisors, Site Engineers and Environmental Coordinators periodically to ensure construction activities are not generating excessive amounts of dust with the potential to adversely impact nearby receivers. This includes monitoring the following key mitigation measures:

- Dust covers on haulage trucks are in place prior to leaving the construction site and whenever the load is in transit
- Stockpiles, spoil movements and cleared areas are being managed in accordance with the Construction Soil, Water and Groundwater Management Plan
- Inspection of public roads adjacent to construction worksites for tracked dust or mud.

If dust has potential to leave site, the construction activities causing this will be assessed. Construction activities may be suspended, relocated, or modified to minimise the emission of dust from the premises to the greatest extent practicable.

6.5.2 Monitoring Plant and Vehicle Emissions

Inspections of plant and construction vehicles will be undertaken to ensure that they have appropriate emission controls that are being maintained correctly. The occupational health risks associated with tunnel and station ventilation management and diesel exhaust emissions are addressed in the Occupational Health, Hygiene and Wellness Management Plan (SMCSWLWC-SYC-1NL-PM-PLN-000650). The following monitoring requirements will be implemented:

- The Plant Manager will ensure that mechanical inspections of plant and vehicles will be undertaken for all new plant/equipment coming on to sites and regularly during use on the LW Works. This will ensure all equipment have appropriate emission control devices and are in good working order. The Plant Manager will maintain records of plant/ equipment and maintenance undertaken.
- The Safety Manager will ensure that air quality monitoring is conducted in the tunnels to ensure the health and safety of workers.
- The Construction Manager will oversee monitoring done to ensure effectiveness of tunnel and station ventilation systems.
- Site Supervisors, Project Engineers and Environmental Coordinators will undertake visual inspections of plant and haulage trucks to ensure there is no unnecessary running of plant and vehicles or any excessive emission of fumes or smoke.

6.5.3 Meteorological Monitoring

Monitoring local meteorological conditions can provide information on the risk of dust to become airborne and mobilised from onsite construction activities and any exposed areas. The use of predetermined alert values for some meteorological parameters can be used to trigger specific mitigation measures or action plans to prevent and/or minimise dust and impacts to air quality, as detailed in Table 11.

Weather data including daily weather conditions and forecasts may be obtained from the Bureau of Meteorology website (<http://www.bom.gov.au/places/nsw>). In the absence of electronic meteorological information, the Site Supervisor, Site Engineers and Environmental Coordinator will monitor local wind conditions onsite.

Table 11 - Meteorological monitoring programme

Event	Criteria	Response
Wind event	Average wind speeds exceeding 30 km/h over a 1-hour period	<ul style="list-style-type: none"> Inspect all active work areas including any exposed areas and stockpiles.

Inspection records will be used to record the effectiveness of dust mitigation measures and any actions that may need to be implemented during adverse meteorological conditions. Records of monitoring will be retained in the Project EMS.

6.6 Ongoing Environmental Risk Identification and Management

The ongoing identification and management of environmental risks and opportunities is a key consideration during all project risk assessment activities and is fully described in Section 5.2 Environment Risk Management of the CEMP (SMCSWLWC-SYC-1NL-PM-PLN-000033).

A Project Preliminary Environmental Risk Assessment has been conducted to identify key risks and control measures; to inform the preparation of the CEMP, Sub-Plans and Procedures; and to provide input into the Project Risk Register. The Project Risk Register is a dynamic document that will be reviewed and updated as the project progress.

Environmental risk assessments are completed at each stage of project planning and delivery, and each level of risk assessment is periodically reviewed. The key documents and activities underpinning ongoing environmental risk assessment are:

- Construction Area Plan (CAP) Risk Assessments
- Work Pack Risk Assessments
- Safe Work Method Statements (SWMS), which also address environmental risks
- Pre-start Meetings.

PART B - IMPLEMENTATION

Elements and Expectations

Part B of this Sub-Plan explains how potential air quality and dust impacts during the LW Works will be minimised and managed. Compliance with all elements is required at all times to minimise the likelihood of causing unauthorised environmental harm and maximise the uptake of opportunities to reduce environmental impact.

Part B contains the following:

- **Environmental Elements and Expectations:** These describe what is required of Systems Connect to implement the objectives of the Environment and Sustainability Policy Statement:
 - **Element** – Key aspects for managing this function in delivering the LW Works
 - **Intent** – A one-line statement describing the overall purpose of the Element
 - **Expectation** – The outcomes achieved as part of each Element.
- **Requirements:** These are the specific actions required to demonstrate compliance with the Elements and Expectations.
- **Responsibility and Key Contributor:** Designation of responsibility for achieving compliance with the stated Expectation. Key contributors assist/contribute to achieving compliance.
- **Deliverables:** Tangible outcomes produced to demonstrate compliance with the environmental Elements and Expectations.

Element 1: Training

Systems Connect will ensure that LW personnel can competently perform their duties and meet environmental obligations.

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
1.1 All personnel have completed an induction containing relevant environmental information before they are authorised to work on the Project	Induction presentation will include: <ul style="list-style-type: none"> • Potential sources of dust • Impacts to the environment and surrounding community • Mitigation measures • Hold Points (visible dust has potential to leave site or strong wind) 	Human Resources Manager Environment and Sustainability Manager Environmental Advisor Environmental Coordinators	Induction presentation Induction records
1.2 Toolbox talks are used to reinforce key management requirements and lessons learnt	Toolbox talks will be held regularly during site establishment and throughout construction. They will reinforce and reiterate information from inductions. Toolbox talks will be undertaken on the Air Quality and Dust Management Procedure (SMCSWLWC-SYC-1NL-EM-PRO-000392).	Environment and Sustainability Manager Site Supervisors Environmental Advisor Environmental Coordinators	Toolbox records

Element 2: Monitoring and Reporting Monitoring and Reporting

All staff, employees and subcontractors will actively drive compliant environmental performance of LW.

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
2.1 Worksites are regularly inspected to ensure the adequacy of controls	<p>Systems Connect will regularly review the LW sites to ensure compliance with this Sub-Plan. A regular inspection program for air quality monitoring will be conducted as follows:</p> <ul style="list-style-type: none"> • Details of daily inspections undertaken by the Site Supervisor will be logged in their respective site diaries. • Routine weekly inspections are to be conducted to monitor air quality and dust mitigation measures in active worksites. Weekly inspections will be documented in System Connect’s electronic system. • Environment inspections are to be completed by the Environmental Coordinator and/or Superintendents/ Site Supervisor, and works are to be stopped or modified if: <ul style="list-style-type: none"> - Visible dust has potential to leave the site - Winds exceed 30 km/hr on average over 1hr • ER inspections will include review of implementation of air quality management and mitigation measures 	Environment and Sustainability Manager Site Supervisors Environmental Advisor Environmental Coordinators	Environment and Sustainability Inspection Checklists Site Diary entries

Element 3: Auditing, Review and Improvement Auditing, Review and Improvement

Systems Connect will continually improve its environmental systems and environmental performance by monitoring and reviewing their effectiveness.

Expectations	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Deliverables
3.1 Audits are undertaken to ensure compliance with the requirements of this Sub-Plan	<p>Procedures for corrective actions are addressed in the Construction Environmental Management Plan - C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).</p> <p>Audits will be performed in accordance with the CEMP and this Sub-Plan and/or associated documents or procedures will be updated if required.</p>	<p>Environment and Sustainability Manager Environmental Advisor Environmental Coordinators Sustainability Manager</p>	<p>Audit Reports Corrective Action Reports</p>
3.2 All non-compliances are reported and actioned	<p>An air quality non-compliance can generally be defined as a failure to comply with:</p> <ul style="list-style-type: none"> • Relevant environmental legislation • Project Planning Approvals • Environment Protection Licence • Deed (including SWTC) • Air Quality Management Sub-Plan and related documents <p>Where a non-compliance is raised as part of an audit or an incident or complaint investigation the audit, incident or complaint report may be used to close out the non-compliance and it is not necessary to raise a separate non-compliance reporting process.</p> <p>Corrective and Preventative Actions may also be raised in accordance with the Construction Environmental Management Plan - C2B (SMCSWLWC-SYC-1NL-PM-PLN-000033).</p>	<p>Environment and Sustainability Manager Sustainability Manager Environmental Advisor Environmental Coordinators</p>	<p>Audit Reports Corrective Action Reports</p>

Element 4: Project Specific Requirements

Planning Approval CSSI 7400 – Chatswood to Sydenham (CoA)

Planning Approval CSSI-7400 (CoA)				
No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
E5	In addition to the performance outcomes, commitments and mitigation measures specified in PIR, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the CSSI.	<ul style="list-style-type: none"> Refer to Section 6 and Element 4: 	Environment and Sustainability Manager Environmental Coordinator Site Supervisors	During Construction and Operation

Planning Approval CSSI 8256 – Sydenham to Bankstown (CoA)

Planning Approval CSSI-8256 (CoA)				
No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
E2	In addition to the performance outcomes, commitments and mitigation measures specified in the documents listed in Condition A1, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the Construction and Operation of the CSSI.	<ul style="list-style-type: none"> Refer to Section 6 and Element 4: 	Environment and Sustainability Manager Environmental Coordinator Site Supervisors	During Construction and Operation

Planning Approval CSSI 7400 – Chatswood to Sydenham (REMMs)

Planning Approval CSSI-7400 (REMMs)				
No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
AQ1	The engines of all on-site vehicles and plant would be switched off when not in use for an extended period.	• Refer to Sections 6.3 and 6.4	Plant Manager Site Supervisors	For Duration of Construction
AQ2	Plant would be well maintained and serviced to minimise emissions. Emissions from plant would be considered as part of pre-acceptance checks.	• Refer to Section 6.4, Table 10	Plant Manager Site Supervisors	For Duration of Construction
AQ3	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.	• Refer to Section 6.4, Table 10	Plant Manager Site Supervisors	For Duration of Construction
AQ4	Hard surfaces would be installed on long term haul routes and regularly cleaned.	• Refer to Section 6.4, Table 10	Senior Project Managers	For Duration of Construction
AQ5	Unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions.	• Refer to Section 6.4, Table 10	Project Engineers	For Duration of Construction
AQ6	All vehicles carrying loose or potentially dusty material to or from the site would be fully covered.	• Refer to Section 6.5.1	Site Supervisors Site Engineers Environmental Coordinator	For Duration of Construction
AQ7	Stockpiles would be managed to minimise dust generation.	• Refer to Section 6.5.1	Site Supervisors Site Engineers Environmental Coordinator	For Duration of Construction
AQ9	Ventilation from acoustic shed would be filtered.	• Refer to Section 6.4, Table 10	Senior Project Managers	For Duration of Construction

Planning Approval CSSI 8256 – Sydenham to Bankstown (REMMs)

Planning Approval CSSI-8256 (REMMs)				
No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
AQ1	An air quality management plan would be prepared and implemented during construction, to define the measures to minimize air quality impacts during construction.	<ul style="list-style-type: none"> This Sub-Plan and Section 6 	Environment and Sustainability Manager Environmental Coordinator	Pre-Construction

Construction Environmental Management Framework

Construction Environmental Management Framework				
No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
16.1a	The following air quality management objectives will apply to the construction of the project:	<ul style="list-style-type: none"> Refer to Section 1.3 	Construction Managers Site Supervisors Project Engineer Environmental Coordinator	For Duration of Construction
	i) Minimise gaseous and particulate pollutant emissions from construction activities as far as feasible and reasonable; and ii) Identify and control potential dust and air pollutant sources.	<ul style="list-style-type: none"> Refer to Section 1.3 	Environmental Coordinator Site Supervisor	
16.2b	Air quality and dust monitoring will involve the following as a minimum:	<ul style="list-style-type: none"> Refer to Section 6.5.3 	Environmental Coordinator	For Duration of Construction
	i) Meteorological conditions will be monitored and appropriate responses will be organised and undertaken periodically by the Principal Contractor;	<ul style="list-style-type: none"> Refer to Section 6.5.1 	Site Supervisors Site Engineers Environmental Coordinator	
	ii) Regular visual monitoring of dust generation from work zones;	<ul style="list-style-type: none"> Refer to Section 6.5.2 	Plant Manager Site Supervisors Project Engineers Environmental Coordinator	
	iii) Monitoring emissions from plant and construction vehicles to ensure they have appropriate emission controls and are being maintained correctly.			

Construction Environmental Management Framework

No.	Requirement	How we will meet the Expectations (minimum requirements)	Responsibility Key Contributor	Timing
16.2c	The following compliance records will be kept by the Principal Contractor: i) Records of any meteorological condition monitoring;	<ul style="list-style-type: none"> Refer to Section 6.5.3 	Site Supervisors Project Engineers Environmental Coordinator	For Duration of Construction; Post-Construction
	ii) Records of any management measures implemented as a result of adverse, windy weather conditions; and	<ul style="list-style-type: none"> Refer to Section 6.5.3 	Environmental Coordinator	
	iii) Records of air quality and dust inspections undertaken.	<ul style="list-style-type: none"> Refer to Section 6.5.3 and Element 2: 	Site Supervisors Environmental Coordinator	
16.3	Examples of air quality mitigation measures include:	<ul style="list-style-type: none"> Refer to Section 6.4, Table 10 	Site Supervisors Senior Project Managers Project Engineers Environmental Coordinator	For Duration of Construction
	i) Plant and equipment will be serviced and maintained in good working order to reduce unnecessary emissions from exhaust fumes.			
	ii) Water suppression will be used for active earthwork areas, stockpiles, unsurfaced haul roads and loads of soil being transported to reduce wind-blown dust emissions.			
	iii) Wheel-wash facilities or rumble grids will be provided and used near the site exit points, as appropriate.			

PART C – APPENDICES

Appendix C1 – Air Quality and Dust Management Procedure