Construction Air Quality Management Plan

N228

Moore Park Precinct Village and Carpark

1 May 2024

Project overview

Project Site Address:
Driver Avenue
Moore Park
NSW 2021

BESIX Watpac State Division Address:
Level 15, 210 George Steet
SYDNEY
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac ABN:
71 010 462 816

Document Control

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00	20/02/2024	Plan developed to address CC1 and internal BW requirements	Nicholas Papanikolaou
01	09/04/2024	Revised as per Savills Comments	Nicholas Papanikolaou
02	07/05/2024	Revised as per Savills comments received 5/05/24	Nicholas Papanikolaou

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Nicholas Papanikolaou	Reviewer / Project Manager	Nicholas Papanikolaou Digitally signed by Nicholas Papanikolaou DN: E=npapanikolaou@besixwatpac.com, CN=Nicholas Papanikolaou, OU=SYD, OU=Construction, OU=User Accounts, OU=Watpac Group, DC=watpac, DC=local Date: 2024.05.09 13:37:34+10'00'	27/02/2024

Note: A controlled copy of the Air Quality Management Procedure will be distributed to the VenuesNSW Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BESIX Watpac employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

Contents

Construction Air Quality Management Plan

1.1 Document Purpose & Compliance Matrix

The following compliance matrix demonstrates the alignment of the BESIX Watpac Construction Air Quality Management Plan (CAQMSP) with condition B26 (Table 1 Compliance Matrix) of the SSD 9835, approved on 6 December 2019 and modified thereafter.

Table 1 Compliance Matrix

Construction Air Quality Management Plan Requirements		Reference
B26	The Air Quality Management Plan Sub-Plan (CAQMSP) must address, but not to be limited to the following:	
a	Be prepared by a suitably qualified expert;	This Plan
b	Describe the measures that would be implemented on site to ensure: i) The control of air quality and odour impacts of the Development during bulk earthworks and piling activities. ii) That these controls remain effective over time. iii) That all reasonable and feasible air quality management practice and measures are employed, including the relevant measures listed in Section 6 of the Air Quality Impact Assessment (report 18274-S2 Version A) prepared by Wilkinson Murray dated May 2019 iv) That the mitigation and management measures are consistent with Guidance on the assessment of dust from demolition and construction (IAQM, 2014). v) The air quality impacts are minimised during adverse meteorological conditions or extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Planning Secretary; and vi) Compliance with the relevant conditions of this consent.	Section 1.8
c	Include performance objectives for monitoring dust and ensuring no unacceptable off-site air quality impacts to users of Moore Park, nearby residences, Kira Childcare centre, UTS and other businesses.	Section 1.9
d	Includes an air quality monitoring program in accordance with Section 6.2 of the Air Quality Impact Assessment (report 18274-S2 Version A) prepared by Wilkinson Murray dated May 2019 that: (i) Can evaluate the performance of the construction works. (ii) Includes a protocol for determining any exceedances of the relevant conditions of consent and responding to complaints. (iii) Adequately supports the air quality performance objectives; and (iv) Evaluates and reports on the effectiveness of air quality management for the construction works	Section 1.9
e	Details on monitoring weather conditions and communicating changing conditions to the workforce; and	Section 1.9

f	Stop work procedures if performance in B25(c) are not being met.	Section 1.11 & Section 1.11.1
C24	**Dust Minimisation** During construction works, the Applicant must ensure that: (a) Dust minimisation measures identified in the CEMP are always implemented. (b) All construction waste and stockpiles are always covered. (c) Exposed surfaces and stockpiles are suppressed by appropriate methods. (d) All trucks entering and leaving the site with loads have their loads secured and covered. (e) Trucks associated with the development do not track dirt onto the public road network. (f) Public road used by Project related trucks are kept clean; and (g) Hydraulic shears are used instead of rock breakers, where feasible.	This Plan and Section 1.8
C25	Air Quality Discharges The Applicant must install and operate equipment in line with best practices to ensure that the construction works comply with all load limits, air quality criteria / air emission limits and air quality monitoring requirements as specified in the CAQMSP required by Condition B26.	Section 1.11.1 & Section 1.7
C26	Air Quality Discharges Dust deposition monitoring must be undertaken during the construction works (as per AS/NZS 3580). This would include monitoring points in appropriate locations on the site boundary in Paddington and Moore Park. Monitoring locations must include sensitive receivers that are most likely to be affected. The locations and frequency of the monitoring are to be agreed in consultation with the EPA and detailed within the CAQMSP.	Section 1.9

1.2 Development of the CAQMSP

The CAQMSP was developed by BESIX Watpac professionals in consultation with Senior Consultant Anthony Richard, Curriculum Vitae attached as Appendix B.

1.3 Project Overview

Stage 2 of the Sydney Football Stadium (SFS) Redevelopment (SSD 9835) was approved by the Minister for Planning and Public Spaces on 6 December 2019. SSD 9835 has been modified on eight previous occasions as summarised in Table 2.

Table 2 Modifications to SSD 9835

Modification	Approved	Description
Modification 1	3 April 2020	Amend Conditions B14 and B15 to enable the condition to be satisfied in accordance with the principles and framework prescribed by the Contaminated Land Management Act 1997.
Modification 2	14 December 2020	Reinstate fitness facilities that were previously available within the former SFS.
Modification 3	7 December 2020	Alter the approved mezzanine slabs at the eastern and western stands and relocate the approved administration facilities. Design amendments to the southwestern glazed façade. Inclusion of an additional stadium signage condition.
Modification 4	22 April 2021	Relocate the photovoltaic (PV) cells from the stadium's roof to Level 5 (above the eastern and western plant rooms) and a reduction in the amount of kilowatts peak (kWp) generated.
Modification 5	8 June 2021	Minor modification to correct plan revisions and dates.
Modification 6	29 September 2021	Fit-out, use and operation of the eastern mezzanine of the stadium for the purpose of a dedicated training and administration facility for the Sydney Roosters NRL football club, known as the Sydney Roosters Centre of Excellence.
Modification 7	18 July 2022	Construction of a Precinct Village and 1,500 space multi-level carpark adjacent to the new stadium, incorporating a single storey retail pavilion, four tennis courts, landscaping and the reconfiguration of stadium pedestrian and vehicular access.
Modification 8	15 December 2023	This modification aims to achieve the following: - Increase concert events within Sydney Football Stadium from 6 to 20 per year.

		- Increase concert lengths from 5 hours to 10 hours (twice per year). - Alter rehearsal and sound test finish time from 7pm to 10pm. - Curfew exemption from Mardi Gras.

SSD 9835 MOD 9 was submitted to the Department of Planning, Housing and Infrastructure on Monday 18 March 2024 seeking approval to:

- temporarily remove 186 parking spaces within MP1;
- update the stamped plans with a revised construction staging approach; and
- commit to submission of a revised parking strategy pursuant to Condition D50, by way of an updated Event Car Parking Management Plan following the Modification Application's approval.

Public exhibition of SSD 9835 MOD 9 was completed between 28 March 2024 and 10 April 2024. Venues NSW has submitted a Submissions Response to the DPHI which is currently under assessment.

In accordance with Condition B26 of the consent (as modified), the CAQMSP must be prepared by a suitably qualified and experienced person(s) prior to commencement of construction. The CAQMSP must be approved by the Certifying Authority and a copy submitted to Council and the Planning Secretary for information prior to the commencement of any works. In addition, all mitigation and management measures identified in the CAQMSP, must be installed or implemented where reasonable and practical on the site prior to commencement of works on site.

This development will transform the Moore Park Precinct, offering visitors year-round access to quality food and beverage offerings linked with adjacent open spaces for gatherings and organised events. The development will enhance the Moore Park Precinct amenity, creating greater vibrancy and patronage year-round.

1.4 Potential Impacts

Dust, and other emissions, being generated on site because of construction activities may have the following negative impacts:

- Dust and the emissions from vehicle and other construction plant and equipment can have adverse health impacts on local residents as well as people working and carrying out recreational activities in proximity to the construction site
- Dust can settle on and impact property, resulting in community complaints and the need to carry out significant cleaning and potentially damage to property
- Dust emissions offsite can cause the site to be shutdown and/or result in prosecution by the regulator, and
- Odours from construction activities can travel beyond the boundary of the site causing nuisance to local receivers and impact water quality.

1.5 Roles and Responsibilities

An overview of the specific responsibilities for air quality management as they relate to each role on the project are outlined in Table 3 below:

Table 3 Roles and Responsibilities

Activity	Responsibility
Responsibility for implementation of the CEMP and this Air Quality Management Procedure	**Project Manager** **Project Director**

Activity	Responsibility
Environmental monitoring and visual inspections of mitigation measures Implementing mitigation measures Recording and reporting of effectiveness of mitigation measures Weekly look ahead of expected weather patterns	**Environmental Coordinator** **Site Foreman**
Daily weather monitoring Implementation of mitigation measures Inspection of mitigation measures Recording implementation of mitigation measures	**Site Foreman** **Environmental Coordinator**
The management, action and discharge of any complaints received in accordance with the process as outlined in the CCS and BMP	**Project Manager**

1.6 Key risk activities to air quality

Air quality is largely affected by any construction activities with the potential to generate dust in combination with wind and dry weather. The environmental risk assessment included in Appendix C of the CEMP identified the following activities:

- Trenching & backfilling
- Stockpiling of soil
- Concrete cutting and demolition
- Vehicles tracking soil
- Blockwork and drywall cutting
- Topsoil, compost, and organics
- Diesel powered plant and vehicle emissions too can contribute to poor air quality

1.7 Targets

The following are the air quality impact assessment criteria (dust and particulate matter) sed by Wilkinson Murray (May 2019).

Pollutant	Averaging Period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m3
Particulate matter ≤10 µm (PM10)	Annual	Total	25 µg/m3
Particulate matter ≤10 µm (PM10)	24-hour	Total	50 µg/m3
Particulate matter ≤2.5 µm (PM2.5)	Annual	Total	8 µg/m3

Particulate matter ≤2.5 µm (PM2.5)	24-hour	Total	25 µg/m3
Deposited Dust (DD)	Annual	Total	4g / m² / month
Deposited Dust (DD)	Annual	Incremental	2g / m² / month

1.8 Dust and Air Quality Management Action Planning

The following mitigation measures will be implemented during construction to minimise the risk of adverse air quality and dust impacts:

Inductions, Training and Awareness	Staff Responsible	When
Training will be provided to all Project personnel, including subcontractors on the requirements of this AQMP through inductions and toolbox meetings	Project Manager	Prior to personnel commencing onsite and at toolbox meetings

General Requirements	Staff Responsible	When
Training will be provided to all Project personnel, including subcontractors on the requirements of this AQMP through inductions and toolbox meetings	All Staff	At all times
During the Project, all reasonable and feasible measures will be implemented to minimise dust generation.	All Staff	At all times

Design and Planning	Staff Responsible	When
Plan the site layout to locate dust generating activities and spoil stockpiles away from sensitive receivers, as far as practicable.	Site Manager	At all times
Utilise existing perimeter hoarding as a solid screen or use temporary fencing with shade cloth to minimise fugitive dust emissions.	Site Manager	At all times
Keep site fencing, barriers and scaffolding clean using wet methods (or suitable alternative methods)	Foreman	As Required

Pre-Construction	Staff Responsible	When
A stabilised construction access / egress will be established where construction traffic enters or leave from a public road.	Site Manager	Prior to commencing works

Plant and Equipment Movement and Access	Staff Responsible	When
Spoil, mud or the like spilt onto internal sealed roads and public roads (as necessary) to be removed within a reasonable timeframe through use of a street sweeper or other means.	Foreman	At all times
All trucks entering or leaving the site with loads have their loads secured and covered where applicable.	Foreman	At all times
All plant and equipment (including trucks) are to minimise the amount of idling and shall be turned off (or throttled down if appropriate) when not in use for an extended period.	Foreman	At all times
Truck routes for construction waste transport to be in accordance with the endorsed Construction Traffic and Pedestrian Management Plan.	Foreman	At all times
Impose and signpost traffic speed limits to minimise dust generation which must be always adhered to	Foreman	At all times
Plant and equipment are to be regularly inspected and maintained to ensure it is running optimally. Use Pre-start Checks and Logbooks as appropriate to record and determine suitability of inspection and maintenance.	Foreman	At all times
Use diesel particulate filters on plant where feasible.	Site Manager	At all times

Dust Control Measures	Staff Responsible	When
Exposed surfaces and stockpiles are suppressed by appropriate methods.	Foreman	As Required
All trucks entering or leaving the site with loads must have their loads secured and covered where needed	Foreman	At all times
Where there is a risk of mud or dirt being tracked onto public roads, rumble grids or wash bays must be established for site entries and exits	Foreman	Prior to commencing works
Dust and other material likely to fall from wheels, underside or body of any vehicles, trailer or motorised plant leaving the site	Foreman	As Required

must be removed as far as practicable before leaving the premises.		
Public roads used by Project related trucks are kept clean.	Foreman	As required (within 24 hours of any tracking of spills)
Airborne dust to be kept to a minimum using dust suppression as appropriate, including but not limited to: • Wetting of stockpiles • Targeted dust suppression/wetting for specific activities. (e.g., loading of trucks, excavation).	Foreman	As required

Bulk Excavation	Staff Responsible	When
Earthworks and exposed areas/long-term soil stockpiles are to be stabilised as soon as practicable following completion of works.	Foreman	As Required
Exposed surfaces (and stockpiles) are suppressed by appropriate methods.	FM	During active works

Operations	Staff Responsible	When
Where there is a risk of concrete cutting / sawing or drilling resulting in concrete dust being blown to nearby receivers, use dust suppression techniques such as water sprays.	Foreman	During Construction
Ensure there is an adequate supply of water on site for effective dust suppression (using non-potable water supply where practicable)	Site Manager	Daily
Management and Removal of Excavated Materials	Staff Responsible	When required
Unless being reused on site, remove materials that have a potential to produce dust from site as soon as possible.	Foreman	At all times
Avoid any unnecessary movement of material from stockpiles	Foreman	At all times
Exposed surfaces and stockpiles are suppressed (dust minimisation) by appropriate methods	Foreman	At all times

Implement appropriate speed limits on internal haulage routes to prevent dust generation (e.g., 25 km/hr on surfaced haulage routes and 15 km/hr on un-surfaced haulage routes).	Foreman	At all times

Management and Removal of Asbestos Contaminated Soil	Staff Responsible	When
Capping of asbestos contaminated soils would be carried out in accordance with the RAP	Foreman	At all times
An will supervise all works in asbestos exclusion zones	Occupational Hygienist	At all times
Clearances certificates would be issued by the occupational hygienist progressively to allow works to proceed in capped areas	Occupational Hygienist	At all times
Water carts and foggers would be used to manage dust	Foreman	At all times
Asbestos air monitoring would be carried out in on the site boundary and other areas determined by the occupational hygienist	Occupational Hygienist	At all times

Adverse Weather Conditions	Staff Responsible	When
Construction activities to be modified, reduced, or controlled during adverse conditions (i.e., high, or unfavourable wind conditions, or during bushfires, prescribed burns, dust storms, fog, or fire) with the potential to increase off-site dust generation. Corrective Actions are provided in Section 1.10.	Foreman	As required
Minimise disturbance to surfaces at risk from wind erosion: • Minimise activities likely to produce dust during hot / windy conditions (visual determination based on intended activity) • Maintain landscaped areas to avoid or minimize areas of exposed soil. • Wet down or cover exposed areas.	Foreman	As required

Odour Management	Staff Responsible	When
The Project will ensure that the carrying out of works does not cause or permit the emission of offensive odours from the site, as defined under Section 129 of the POEO Act.	All staff	At all times
Odorous material that may cause a disturbance to nearby receivers shall be removed from site as soon as practicable or, if	Foreman	As required

stockpiling is required, stockpiled away from sensitive receivers, and covered to prevent fugitive emissions.	

Stakeholder Communications and Complaints	Staff Responsible	When
Develop and implement a Stakeholder Communications Plan that includes community engagement before commencing construction works. The Plan should include: • The name and contact details of the person responsible for air quality and dust issues at the site boundary. • Contact information for the relevant site office.	Project Manager	Prior to commencing works
Record all dust and air quality complaints, identify the causes, take appropriate measures to reduce emissions in a timely manner and record the measures taken.	Foreman	As required

1.9 Monitoring

Monitoring Required	Staff Responsible	When
Weather forecasts are to be reviewed daily and appropriate measures implemented if dry weather or strong winds are anticipated.	Foreman	Daily
Communicate adverse weather conditions to Fm to adjust work practices, or stop work, accordingly.	Foreman	As required
Public roads adjacent to site entry and exit points shall be inspected daily for soil or mud build-up because of construction activities. Material tracked onto roads shall be cleaned with water-assisted dust sweepers, as required.	Foreman	Daily (cleaning as required)
Visual monitoring of dust emissions should be carried out continually and appropriate controls put in place in the case of localised generation of excessive dust with potential to disperse beyond site boundaries. Corrective Actions are provided in Section 1.10.	Foreman	At all times
Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during any periods of prolonged dry or windy conditions.	Foreman	As required
Any excessive air quality or visual amenity issues shall be recorded on the Enviro Inspection Checklist. Informal daily observations to be recorded in site diaries – including consideration of weather conditions and certain activities with a high dust generation potential.	Foreman	Monthly

Asbestos air monitoring would be carried during works were asbestos may be impacted	Occupation Hygienist	Daily
Should complaints be received, review of monitoring data is to occur.	PER	Following a complaint
Record inspection results and make available to relevant authorities.	PER	At all times
Undertake audits to assess compliance with this Plan and the effectiveness of environmental controls, in accordance with the CEMP audit requirements.	PER	In accordance with CEMP

Dust Deposition Monitoring & PM10 Monitoring (Bulk Earthworks and Piling Activities)	Staff Responsible	When
Mitigation measures to be established in accordance with Air Quality Impact Assessment (Wilkinson Murray, May 2019). This report recommended that optical equipment, such as an Aerosol Dust Sentry, is used for the monitoring. While it is noted that these units are not approved under the Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (EPA, 2007), they are well suited to reactive management of construction dust as they can provide data in near real-time and have significantly lower capital costs compared to other equipment.	PER	During bulk earthworks and piling
PM10 monitoring equipment would be consistent with the equipment specified will be implemented as required, as per the reactive management trigger levels as specified in Air Quality Impact Assessment (Wilkinson Murray, May 2019). Monitoring equipment should be capable of measuring ambient PM10 concentrations are providing notifications when levels exceed certain thresholds. The notifications should be provided in a timely manner (i.e., 1 hour) to facilitate the implementation of reactive management.	PER	During bulk earthworks and piling

1.10 Record Management

Records will be maintained by the project Environmental Co-ordinator, as follows:

- Inspections of dust and air quality on site undertaken
- Corrective actions raised and close out
- Records of weather patterns throughout construction

- Records of implementation measures used
- Acceptance records for plant and equipment being used on the site

1.11 Corrective Action Plan

Problem	Suggested Corrective Action
Excessive dust from excavation	• Increase frequency of water truck spraying • Avoid excavation during high wind events, particularly if wind direction is likely to impact on any sensitive receivers. • Erect temporary dust screens, particularly between dust sources and sensitive receivers where practicable.
Excessive dust creation from hauling operations	• Spray haul roads with water, use soil stabilisation binder, apply crushed rock or a combination of these measures. • Reduce vehicle speeds. • Cover loads causing dust impacts. • Consider relocation of haul roads to fewer sensitive areas. • Clean dirty road surfaces increase frequency of spraying/chemical application. • Install shakedown devices at entry and exit points.
Excessive dust from stockpiles	• Spray stockpiles with water/water trucks. • Hydro mulching/seed or stabilise stockpiles, cover stockpiles with geofabric (or similar) where appropriate. • Locate stockpiles away from sensitive receivers. • Leave larger buffer zones. • Erect temporary dust screens, particularly between the source and sensitive receivers.
Creation of excessive vehicle emissions	• Repair or undertake maintenance on equipment, plant, and vehicles where necessary. • Remove non-compliant equipment, plant, and vehicles from operation where repair or maintenance is not practicable. • Restrict equipment, plant and vehicle hours of operation when working in the vicinity of sensitive receivers.
Community query / complaint on dust levels	• Investigate the complaint and affected area to determine cause. • Follow the reporting requirements in Section 8 of this AQMP. • Consult with Supervisors, Operators, Project Engineers, Construction Manager • Visually monitor the site if the activity is still occurring.

	• Application of dust suppression (i.e., water trucks, chemical suppressants) • Establish wind fencing where practicable. • Review and alter construction schedule to avoid certain activities such as earthworks during periods of high wind (based on weather forecasts) • Other practicable management controls as determined at the time by the SM / PER • Monitor the site visually and/or through reporting results to establish if the controls and/or mitigation measures are effective. • Where appropriate, exceedance and remediation methods implemented to be communicated to Project team and wider work force. • Summary of exceedances and remedial action to be submitted to the Client.
Exceedance of air quality criteria	• Application of dust suppression (i.e., water trucks, chemical suppressants) • Establish wind fencing where practicable. • Review and alter construction schedule to avoid certain activities such as earthworks during periods of high wind (based on weather forecasts) • Other practicable management controls as determined at the time by the SM / PER • Monitor the site visually and/or through reporting results to establish if the controls and/or mitigation measures are effective. • Where appropriate, exceedance and remediation methods implemented to be communicated to Project team and wider work force. • Summary of exceedances and remedial action to be submitted to the Client.

Annexure A

ACOUSTICS AND AIR

SYDNEY FOOTBALL STADIUM REDEVELOPMENT - STAGE 2

AIR QUALITY IMPACT ASSESSMENT

REPORT NO. 18274-S2
VERSION A

MAY 2019

PREPARED FOR

INFRASTRUCTURE NEW SOUTH WALES
167 MACQUARIE STREET
SYDNEY NSW 2000

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	3 May 2019	Nic Hall	John Wassermann
A	Final	29 May 2019	Nic Hall	John Wassermann

Note
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CASANZ
This firm is a member firm of the Clean Air Society of Australia and New Zealand and the work here reported has been carried out in accordance with the terms of that membership.

Celebrating 50 Years in 2012
Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. Today, with offices in Sydney, Newcastle, Wollongong, Orange, Queensland and Hong Kong, Wilkinson Murray services the entire Asia-Pacific region.

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GLOSSARY OF AIR QUALITY TERMS

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not to be exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H_2S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO_2) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NO_x) – A criteria air pollutant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. PM2.5 is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.

1 INTRODUCTION

A State Significant Development (SSD) application for the redevelopment of the Sydney Football Stadium has been submitted to the Minister for Planning, pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The redevelopment of the Sydney Football Stadium is proposed in a staged manner as follows:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works, including demolition of the existing facility and associated structures.
- Stage 2 – Detailed design, construction and operation of the stadium and supporting businesses, retail and functional uses.

Wilkinson Murray Pty Limited has been engaged by Infrastructure New South Wales to prepare an Air Quality Impact Assessment (AQIA) for the construction works proposed under Stage 2 of the Sydney Football Stadium redevelopment.

1.1 Purpose of this Report

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the project (ref. SSD 9835) relevant to air quality. The SEARs relevant to air quality are:

30. Construction Management (including construction traffic)

- *Provide an assessment of potential impacts of the construction on surrounding buildings and the public domain, including noise and vibration, air quality and odour impacts, dust emissions, water quality, stormwater runoff, groundwater seepage, soil pollution and construction waste.*
- *Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles.*

To address the above requirements, this report presents a qualitative assessment of potential dust impacts in accordance with the *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014), prepared by the UK Institute of Air Quality Management (IAQM), and identifies appropriate mitigation and management measures to minimise these impacts.

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at 40-44 Driver Avenue, Moore Park. The site is located on the eastern edge of the city, approximately 3 kilometres from the Sydney CBD, and forms part of a large entertainment and recreation precinct shared with Centennial and Moore parks, Fox Studios and the Entertainment Quarter. It is located in the north corner of the precinct and is bounded by Moore Park Road to the north, Paddington Lane to the east, the existing Sydney Cricket Ground stadium to the south and Driver Avenue to the west. The site is located immediately to the south of the suburb of Paddington, with the suburbs of Centennial Park to the east and Surry Hills to the West.

The location of the site is show in Figure 2-1.

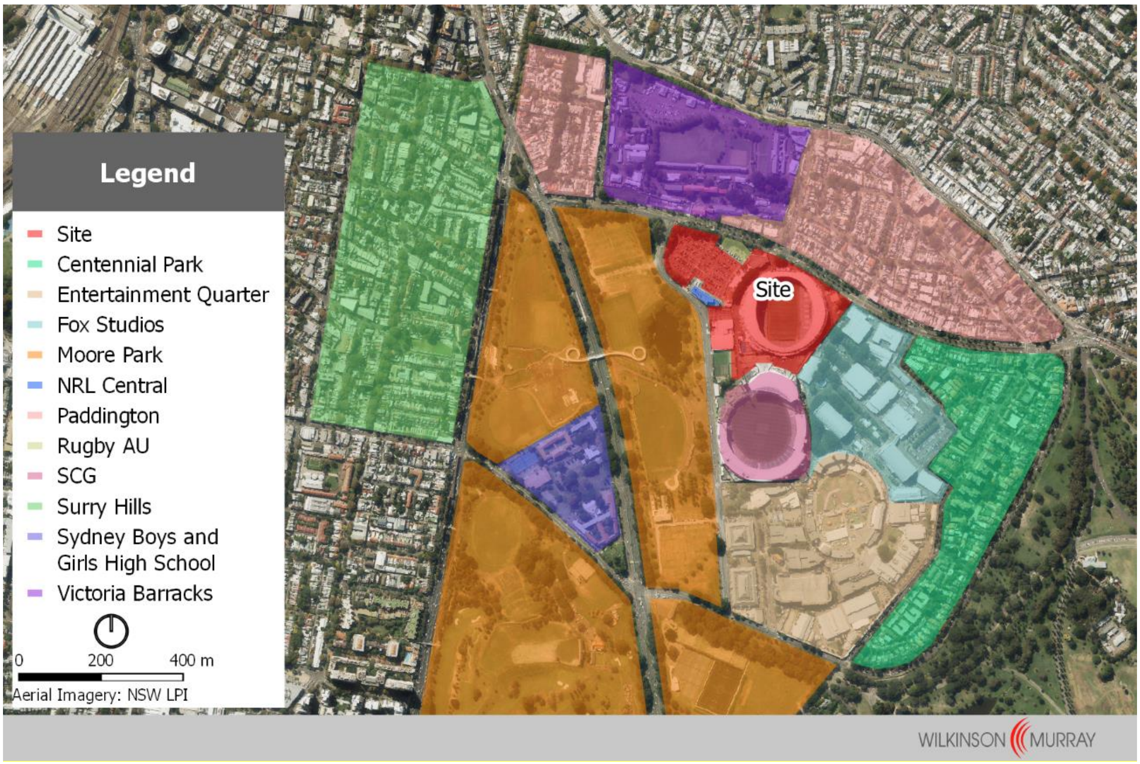
2.1.1 Sensitive Receptors

A number of sensitive receptors are located in proximity to the site, including:

- Residences in nearby Paddington, Centennial Park and Surry Hills;
- Places of work within:
    - Rugby AU/ UTS;
    - NRL Central;
    - The SCG;
    - Fox Studios; and,
    - The Entertainment Quarter;
- Moore Park
- Victoria Barracks;
- Kira Child Care Centre; and,
- Sydney Boys and Girls High School.

These sensitive receptors are shown in Figure 2-1.

Figure 2-1 Site Location and Sensitive Receptors



2.2 Overview of the Proposal

The proposed development, consistent with the Concept Proposal, will comprise:

- Construction and operation of a new stadium with up to 45,000 seats (55,000 capacity in concert-mode), including playing pitch, grandstands, administration areas, food an drink kiosks, corporate facilities and all other aspects of a modern stadium;
- Operation an use of the stadium and surrounding site area for a range of sporting and entertainment events;
- Vehicular and pedestrian access and circulation arrangements, including excavation to deliver a partial basement level for internal loading and servicing at the playing pitch level;
- Reinstatement of the MP1 car park following the completion of construction;
- Public domain improvements within the site boundary, including hard and soft landscaping, to deliver a range of publicly accessible, event and operational areas;
- Provision of new pedestrian and cycling facilities within the site; and,
- Signage, including building identification signage, business identification signage and a wayfinding signage strategy.

2.3 Construction

The anticipated construction methodology is outlined in Table 2-1

Table 2-1 Indicative Construction Staging

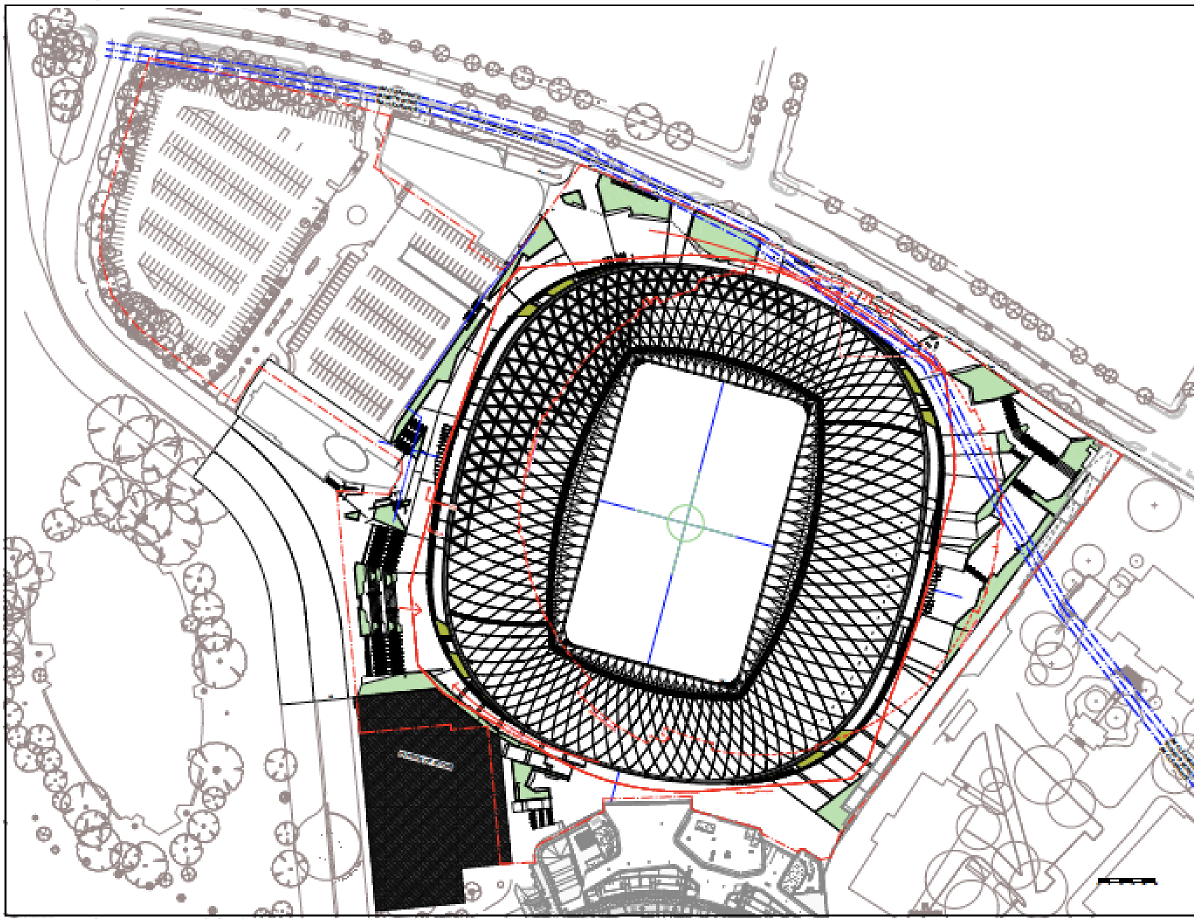
Stage	Duration (approx.)
1 – Stadium Bowl Construction	18 months
2 – Stadium Roof Construction	18 months
3 – Infrastructure Works	12 months
4 – Concourse Finishes	12 months
5 – Internal Finishes	18 months

2.3.1 Plant and Equipment

Plant and equipment required for the works would be determined by the contractor. However, the works are anticipated to require the following:

- 250 – 400 tonne cranes and boom lifts;
- 50 tonne mobile cranes;
- Excavators;
- Concrete pumps;
- Concrete trucks;
- Forklifts;
- Jackhammers;
- Dump trucks ;
- Water carts; and
- Hand tools and other small equipment.

Figure 2-2 Construction Site Plan



The works would largely be confined to the following standard construction hours:

- 7:00am to 6:00pm Monday to Friday;
- 8:00am to 1:00pm Saturday; and,
- No work on Sunday or public holidays.

2.3.3 Site Access

Access to the site throughout construction would be via:

- Paddington Lane, off Moore Park Road;
- Gate 4, off Moore Park Road opposite Oatley Road; and
- Through the existing MP1 car park entrance off Driver Avenue and Moore Park Road.

3 AIR QUALITY CRITERIA

3.1 Introduction

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods) sets out applicable impact assessment criteria for a number of air pollutants.

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the pollutants of interest in this study and the applicable air quality criteria for each pollutant.

3.2 Pollutants of Interest

Potential air pollutants associated with the Project comprise dust and particulate matter. Specifically, the following pollutants are identified:

- Total Suspended Particulates (TSP);
- Particulate Matter (PM_{10} and $PM_{2.5}$); and,
- Deposited Dust.

3.3 Impact Assessment Criteria

The Approved Methods specifies air quality assessment criteria for assessing impacts from dust generating activities. These criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (NEPC, 1998).

Table 3-1 summarises the air quality goals for dust and particulate matter that are relevant to this study. The air quality goals relate to the total concentrations of dust and particulate matter in the air and not just that from the project. Therefore, some consideration of background levels needs to be made when using these goals to assess impacts.

Table 3-1 Impact Assessment Criteria – Dust and Particulate Matter

Pollutant	Averaging period	Impact	Criteria
Total suspended particulates (TSP)	Annual	Total	90 µg/m³
Particulate matter ≤10 µm (PM_{10})	Annual	Total	25 µg/m³
	24-hour	Total	50 µg/m³
Particulate matter ≤2.5 µm ($PM_{2.5}$)	Annual	Total	8 µg/m³
	24-hour	Total	25 µg/m³
Deposited dust (DD)	Annual	Total	4 g/m²/month
	Annual	Incremental	2 g/m²/month

4 EXISTING ENVIRONMENT

4.1 Local Climate

Meteorological conditions strongly influence air quality. Most significantly, wind speed, wind direction, temperature, relative humidity, and rainfall affect the dispersion of air pollutants. The following sub-sections discuss the local meteorology near the Proposal site.

4.1.1 Wind

Observations of wind speed and direction from the Office of Environment and Heritage (OEH) air quality monitoring station (AQMS) at Randwick have been selected to represent typical wind patterns in the area surrounding the site. The Randwick AQMS is located approximately 5 kilometres south east of the site.

Figure 4-1presents annual and seasonal "wind rose" plots for the Randwick AQMS for the period 2013 to 2017, inclusive. The plots show that north-easterly winds are prevalent in summer and spring and westerly winds are prevalent in winter and autumn.

4.1.2 Temperature Humidity and Rainfall

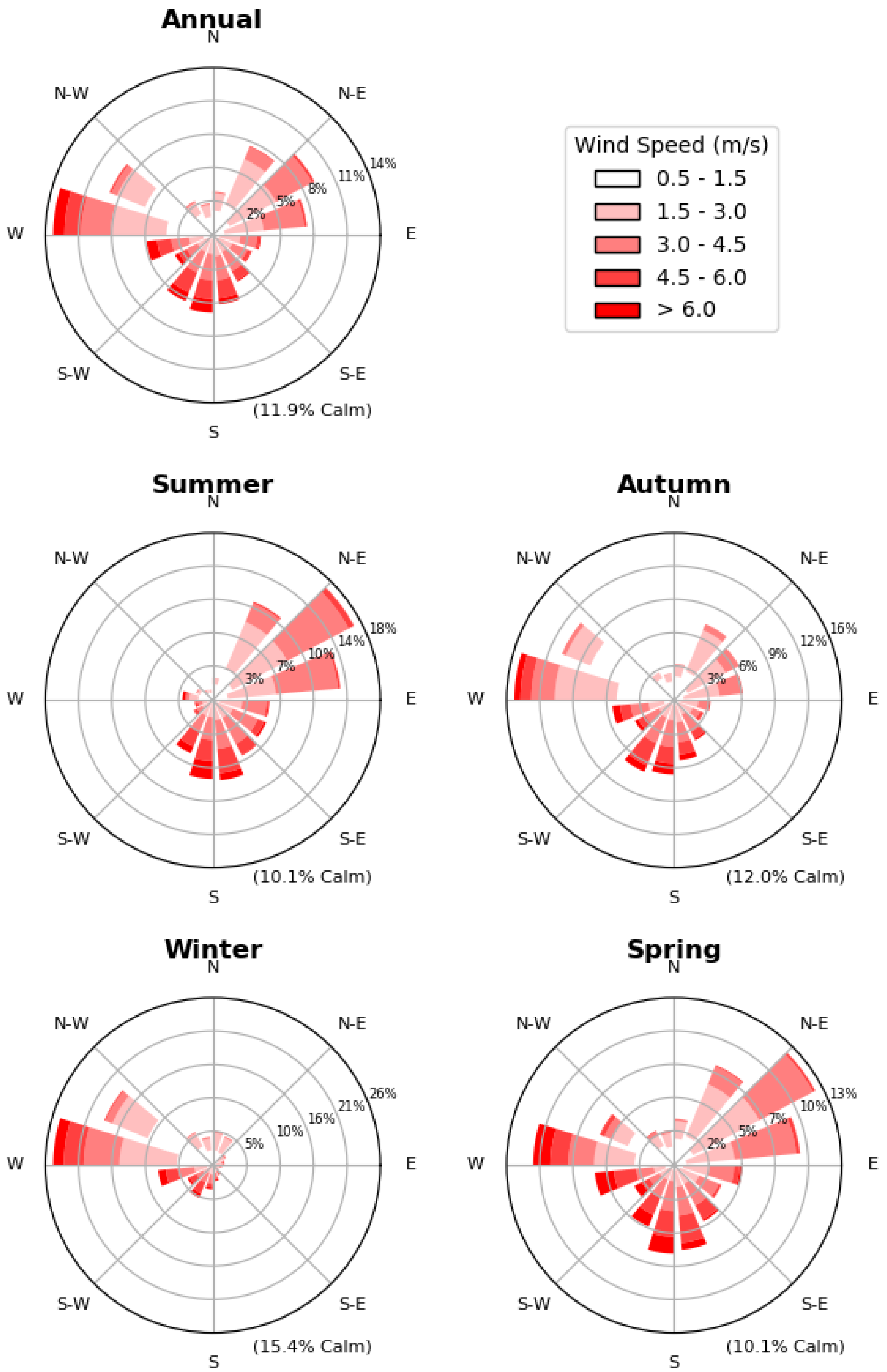
Long term meteorological data for the area surrounding the Site is available from the Bureau of Meteorology (BoM) operated weather station at Observatory Hill. The Observatory Hill BoM station is located approximately 3.7 km north west of the Proposal site and records observations of a number of meteorological parameters including temperature, humidity, and rainfall.

Long-term climate statistics are presented in Table 4-1. Temperature data recorded at the Observatory Hill BoM station indicates that January is the hottest month of the year, with a mean daily maximum temperature of 26.0°C. July is the coolest month with a mean daily minimum temperature of 8.1°C. June is the wettest month with an average rainfall of 133 mm falling over 9 days. There are, on average, 100 rain days per year, delivering 1,216 mm of rain.

Table 4-1 Climate Averages for Observatory Hill BoM Station

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temp (°C)	22.5	22.3	21.1	18.2	14.6	11.9	10.9	12.5	15.7	18.5	19.9	21.6	17.5
Hum (%)	71	74	74	72	74	74	71	66	62	61	66	67	69
3pm Mean Observations													
Temp (°C)	24.8	24.9	24.0	22.0	19.4	16.9	16.4	17.5	19.2	20.7	22.1	23.8	21.0
Hum (%)	62	64	62	59	57	57	51	49	51	56	58	59	57
Daily Minimum and Maximum Temperatures													
Min (°C)	18.8	18.8	17.6	14.7	11.6	9.3	8.1	9.0	11.1	13.6	15.7	17.6	13.8
Max (°C)	26.0	25.8	24.8	22.5	19.5	17.0	16.4	17.9	20.1	22.2	23.7	25.2	21.8
Rainfall													
Rain (mm)	101.7	117.5	130.8	127.9	118.0	133.2	96.6	80.7	67.9	76.4	83.6	77.5	1216
Rain (days)	8.6	9.0	9.8	9.0	8.6	8.7	7.5	7.2	7.2	7.9	8.4	8.0	99.9

Figure 4-1 Windrose Plot – Randwick OEH AQMS, 2013-2017



4.2 Local Ambient Air Quality

Data from the Randwick AQMS has been used to establish typical ground level concentrations of particulate matter in the area surrounding the Proposal. A summary of the PM_{10} and $PM_{2.5}$ monitoring results collected at the Randwick AQMS over the period 2013 – 2018 is presented in Table 4-2. It is noted that observations of $PM_{2.5}$ at the Randwick AQMS began in 2017.

From time to time, the 24-hour average concentrations of PM_{10} and $PM_{2.5}$ exceed the goals of 50 µg/m³ and 25 µg/m³, respectively. These events are most often associated with extreme conditions such as bushfires, hazard reduction burning and dust storms. Where the maximum 24-hour average particulate matter concentrations in a particular year exceeded the goal, Table 4-2 presents the next highest value. In the majority of cases, the next highest values comply with the goals. During 2018, wide spread dust storms during February, March, August and November resulted in PM_{10} concentrations exceeding the goal of 50 µg/m³ on 5 days of the year.

Table 4-2 Particulate Matter Monitoring Results – Randwick

Year	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)	
	24-hour average (100th percentile)	Annual average	24-hour average (100th percentile)	Annual average
2013	55.3 (45.3)	18.8	No data	
2014	46.1	18.1		
2015	77.4 (41.9)	18.6		
2016	44.1	17.9		
2017	56.0 (46.2)	19.2	45.3 (22.0)	6.9
2018	95.5 (67.1)	21.2	31.8 (24.7)	7.6

5 ASSESSMENT OF IMPACTS

5.1 Assessment Methodology

This section presents a qualitative assessment of potential air quality impacts associated with the proposed demolition works and has been conducted in general accordance with the methodology described in *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) prepared by the UK Institute of Air Quality Management (IAQM). This approach presents the risk of dust soiling and human health impacts associated with construction and demolition works and involves the following steps:

- Step 1: Screen the need for a detailed assessment;
- Step 2: Assess the risk of dust impacts arising, based on:
  - The potential magnitude of dust emissions from the works; and,
  - The sensitivity of the surrounding area.
- Step 3: Identify site-specific mitigation; and,
- Step 4: Consider the significance of residual impacts, after the implementation of mitigation measures.

5.2 Risk Assessment of Dust Impacts from Construction Works

The following qualitative risk assessment of potential dust impacts has been conducted for the proposed construction works.

5.2.1 Step 1 – Screen the need for a detailed assessment

The IAQM guidance document recommends that a risk assessment of potential dust impacts from construction activities be undertaken when sensitive receptors are located within:

- 350 m of the boundary of the site; or,
- 50 m of the route(s) used by construction vehicles on public roads up to 500 m from the site entrance(s).

As shown in Figure 2-1, a number of sensitive receptors are located within 350 m of the site and within 50 m of routes used by construction traffic. Therefore, an assessment of dust impacts is considered necessary under the guideline.

5.2.2 Step 2A – Potential dust emission magnitude

The following section evaluates the potential dust emission magnitude for earthworks, construction and trackout (i.e. haulage) activities. These emission magnitudes have been classified based on the examples provided in the IAQM guidance document (Section 7, Step 2: Assess the Risk of Dust Impacts).

The dust emission magnitude associated with earthworks activities may be classified as:

- **Large:** total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes;

- **Medium:** total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes; and,
- **Small:** total site area <2,500 m^2, soil type with large grain (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months.

The total site area is large than 10,000 m^2. Therefore, the dust emission magnitude for earthworks activities is classified as **large**.

The dust emission magnitude associated with general construction activities may be classified as:

- **Large:** total building volume >100,000 m^3, on site concrete batching, sandblasting;
- **Medium:** total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete) on site concrete batching; and,
- **Small:** total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

The total building volume of new structures to be built exceeds 100,000 m^3 and on-site concrete batching has not been proposed. Therefore, the dust emission magnitude for the construction of the Proposal is classified as **large**.

The dust emission magnitude associated with trackout by heavy vehicles may be classified as:

- **Large:** >50 heavy vehicle (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium:** 10-50 heavy vehicle outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m; and,
- **Small:** < 10 heavy vehicle outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

During concrete pours, more than 60 heavy vehicle outward movements would be expected. However, the majority of haulage roads within the site are paved, resulting in lower potential for dust release. Therefore, the dust emission magnitude for trackout is classified as **medium**.

5.2.3 Step 2B – Sensitivity of surrounding area

The sensitivity of the surrounding area to dust impacts considers a number of factors, including:

- Specific receptor sensitivities;
- The number of receptors and their proximity to the works;
- Existing background dust concentrations; and,
- Site-specific factors that may reduce impacts, such as trees that may reduce wind-blown dust.

The most sensitive receptors near the proposed works are residents in nearby Paddington. In accordance with the IAQM guidance document, these receptors are considered to have a "high" sensitivity to dust soiling and health impacts.

Furthermore, in accordance with the IAQM guidance document, workers in nearby offices would have a "medium" sensitivity to dust soiling and health impacts and nearby parks and recreational areas would have a "medium" sensitivity to dust soiling impacts and a "low" sensitivity to health impacts.

It is considered unlikely that significant construction works would be conducted within 20 m of sensitive receptors. However, there is the potential for more than 100 high sensitivity receptors to be located within 50 m of the works.

Based on the above factors and following the decision matrix in Table 2 of the IAQM guidance document and presented in Figure 5-1, the area surrounding the works is determined to have a **high** sensitivity to dust soiling impacts.

Figure 5-1 Area Sensitivity Decision Matrix – Dust Soiling

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

In accordance with the decision matrix in Table 3 of the IAQM guidance document and presented in Figure 5-2, the area surrounding the works is determined to have a **low** sensitivity to human health impacts from construction dust.

Figure 5-2 Area Sensitivity Decision Matrix – Human Health

Receptor Sensitivity	Annual Mean PM_{10} concentration[c]	Number of Receptors[d]	Distance from the Source (m)[e]				
			<20	<50	<100	<200	<350
High	>32 $\mu g/m^3$ (>18 $\mu g/m^3$ in Scotland)	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 $\mu g/m^3$ (16-18 $\mu g/m^3$ in Scotland)	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 $\mu g/m^3$ (14-16 $\mu g/m^3$ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 $\mu g/m^3$ (<14 $\mu g/m^3$ in Scotland)	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32 $\mu g/m^3$ (>18 $\mu g/m^3$ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 $\mu g/m^3$ (16-18 $\mu g/m^3$ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 $\mu g/m^3$ (14-16 $\mu g/m^3$ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 $\mu g/m^3$ (<14 $\mu g/m^3$ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

The determinations of area sensitivities to dust soiling and human health impacts from the proposed works are summarised in Table 5-1.

Table 5-1 Sensitivity of the Surrounding Area

Impact	Key Factors	Sensitivity of the Area
Dust Soiling	Receptor sensitivity = high >100 receptors within 50 m of works	High (ref. IAQM Table 2)
Human Health	Receptor sensitivity = high >100 receptors within 50 m of works Annual average PM_{10} concentration < 24 μg/m^3	Low (ref. IAQM Table 3)

5.2.4 Step 2C – Define the risk of impacts

To define the risk of impacts, the dust emission magnitudes for earthworks (large), general construction (large) and trackout (medium) are combined with the sensitivity of the area, as per Table 5-3, Table 5-3 and Table 5-4, respectively.

Table 5-2 Risk of Dust Impacts from Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

In accordance with Table 5-2, earthworks activities associated with the Proposal are considered to have a "High Risk" of dust soiling effects and a "Medium Risk" of health impacts.

Table 5-3 Risk of Dust Impacts from Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

In accordance with Table 5-3, general construction activities associated with the Proposal are considered to have a "High Risk" of dust soiling effects and a "Medium Risk" of health impacts.

Table 5-4 Risk of Dust Impacts from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Medium Risk	Low Risk	Negligible

In accordance with Table 5-4, vehicle trackout associated with the construction of the Proposal is considered to have a "Medium Risk" of dust soiling effects and a "Low Risk" of health impacts.

The identified dust risks associated with the construction of the Proposal are summarised in Table 5-5.

Table 5-5 Summary of Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	High Risk	High Risk	Medium Risk
Human Health	Medium Risk	Medium Risk	Low Risk

5.2.5 Step 3 – Site-specific mitigation

The IAQM guidance document identifies a range of appropriate dust mitigation measures that should be implemented as a function of the risk of impacts. These measures are presented in Section 6.

5.2.6 Step 4 – Significance of residual impacts

In accordance with the IAQM guidance document, the final step in the assessment is to determine the significance of any residual impacts, following the implementation of mitigation measures. To this end, the guidance states:

For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be "not significant".

Based on the proposed construction works, and the advice in the IAQM guidance document, it is considered unlikely that these works would result in unacceptable air quality impacts, subject to the implementation of the mitigation measures outlined in Section 6.

6 MITIGATION AND MANAGEMENT

6.1 Mitigation Measures

The preceding assessment of potential dust impacts from the proposed construction works indicates that, in the absence of specific mitigation measures, the works have a high risk of dust soiling impacts and a medium risk of health impacts.

Accordingly, the following mitigation measures are deemed "highly recommended" in accordance with the IAQM guidance document. A Dust Management Plan (DMP) should be developed prior to commencement of works and should consider the following measures where practicable:

- **Communications**
  - Develop and implement a stakeholder communications plan that includes community engagement before construction work commences on site, and:
    - Displays the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
    - Displays the head or regional office contact information.
  - Develop and implement a Dust Management Plan (DMP) that considers, as a minimum, the measures identified herein.
- **Site management**
  - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
  - Make the complaints log available to relevant authorities (Council, EPA, DP&E).
  - Record any exceptional incidents that cause dust and/or air emissions, either on or off site, and the action taken to resolve the situation in the log book.
  - Hold regular liaison meetings with any other high-risk construction sites within 500 m of the site boundary to ensure plans are coordinated.
- **Monitoring**
  - Undertake daily on-site and off-site inspection, where receptors are nearby, to monitor dust. Record inspection results and make available to relevant authorities. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary.
  - Carry out regular on site and off site inspections to monitor compliance with the DMP, record inspection results, and make inspection log available to relevant authorities.
  - Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during any periods of prolonged dry or windy conditions.
  - Agree any dust monitoring locations with the relevant authority. Where possible, commence baseline monitoring before work commences on site.
- **Preparing and maintaining the site**
  - Plan site layout so that machining and dust generating activities are located away from receptors, as far as possible.
  - Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on sit.

  - Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
  - Avoid site runoff of water or mud.
  - Keep site fencing, barriers and scaffolding clean using wet methods.
  - Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used, keep materials covered.
  - Cover, seed or fence stockpiles to prevent wind erosion.
- **Construction vehicles and sustainable travel**
  - Ensure all vehicles switch off engines when stationary - no idling vehicles.
  - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
  - Impose and signpost a maximum-speed-limit of 25 kph on surfaced and 15 kph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided).
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
  - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
- **Operations**
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
  - Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
  - Use enclosed chutes and conveyors and covered skips.
  - Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
  - Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- **Measures specific to earthworks**
  - Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
  - Use hessian, mulches or trackifiers (soil stabiliser) where it is not possible to re-vegetate or cover with topsoil as soon as practicable.
  - Only remove the cover in small areas during work and not all at once.
- **Measures specific to construction**
  - Avoid scabbling (roughening of concrete surfaces) if possible.
  - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
  - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of

material and overfilling during delivery.
    - For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
- **Measures specific to trackout (haulage)**
    - Use water-assisted dust sweeper(s) on the access and local roads, as necessary.
    - Avoid dry sweeping of large areas.
    - Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
    - Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
    - Record all inspections of haul routes and any subsequent action in a site log book.
    - Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
    - Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
    - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
    - Access gates to be located at least 10 m from receptors where possible.

Prior to the commencement of construction / demolition works, the dust mitigation management measures recommended by the IAQM guidance document should be considered and, where practicable, included in the *Construction Environmental Management Plan* (CEMP) for the project.

6.2 Dust Monitoring

It is recommended that dust monitoring is conducted during the works at locations representative of the most potentially affected sensitive receptors. The monitoring locations should have regard for the location of dust generating equipment and activities and the prevailing weather conditions.

The monitoring equipment should be capable of measuring ambient PM_{10} concentrations and providing notifications when levels exceed certain threshold values. The notifications should be provided in a timely fashion, say within one hour, to facilitate the implementation of reactive management. It is recommended that optical type equipment, such as an Aeroqol Dust Sentry, is used for the monitoring. While it is noted that these units are not approved under the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (EPA, 2007), they are well suited to reactive management of construction dust as they can provide data in near real-time and have significantly lower capital costs compared to other equipment.

The trigger levels in Table 6-1 are proposed for reactive management. These values have been developed with a view to ensuring that ambient dust and particulate matter concentrations in the surrounding area comply with the criteria presented in Section 3.3, but are expressed in time scales short enough to support reactive management. Similar trigger levels have been used on other large dust generating activities in NSW.

Table 6-1 Reactive Management Trigger Levels – PM_{10}

Trigger Stage	Averaging Period	Trigger Value ($\mu g/m^3$)	Action Required
1 Investigate	1 hour	85	Site Manager to undertake review of possible dust sources operating during the average period. Identify possible measures for these activities; action if deemed necessary.
	3 hour	80	
2 Action	1 hour	470	Site Manager to attend site and ensure implementation of the control. Effectiveness of control actions to be reviewed and escalate where appropriate.
	3 hour	160	
3 Stop Work	1 hour	940	Targeted shut down of dust-generating activities until the measured pollutant levels are below the stated trigger value. Identify long-term solutions to dust issues.
	3 hour	320	

Prior to the commencement of construction / demolition works, a dust monitoring plan should be prepared and included in the CEMP for the project.

It is noted that a dust monitoring system has been implemented for the Stage 1 demolition works which is generally consistent with the details above.

7 CONCLUSION

A State Significant Development (SSD) application for the redevelopment of the Sydney Football Stadium has been submitted to the Minister for Planning, pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The redevelopment of the Sydney Football Stadium is proposed in a staged manner as follows:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works, including demolition of the existing facility and associated structures.
- Stage 2 – Detailed design, construction and operation of the stadium and supporting businesses, retail and functional uses.

Wilkinson Murray Pty Limited has been engaged by Infrastructure New South Wales to prepare an Air Quality Impact Assessment (AQIA) for the construction works proposed under Stage 2 of the Sydney Football Stadium redevelopment.

A qualitative assessment of potential air quality impacts associated with the proposed construction works has been conducted in general accordance with the methodology described in *Guidance on the assessment of dust from demolition and construction* (IAQM, 2014) prepared by the UK Institute of Air Quality Management (IAQM).

In accordance with the IAQM assessment methodology, the construction of the Proposal is considered to have, at worst, a "High Risk" of dust soiling effects and a "Medium Risk" of health impacts. Accordingly, a range of management and mitigation measures have been identified to minimise these impacts.

Subject to the implementation of mitigation measures, the residual effects of dust from the project are expected to be not significant and to have a low risk of generating unacceptable air quality impacts.

Real time dust monitoring and reactive management, which have been employed for the Stage 1 demolition works, are recommended to confirm that dust impacts associated with the works are acceptable.

Annexure B

Anthony Richard

Senior Consultant

Anthony Richard is a Certified Environmental Practitioner (Registration number 1579) with ten years' experience working as a contaminated land consultant and an additional six years' experience in environmental education. Being involved with both large and small scale assessment and remediation projects, Anthony has worked alongside a diverse group of stakeholders and clients to bring about the best possible outcomes for the project in question. Notably, Anthony has been involved in the assessment of both largescale housing estate redevelopments and brownfield developments with ongoing work in greater metropolitan growth areas. Anthony has directed detailed environmental assessment across hundreds of hectares of mixed use land areas; in particular, the Landcom/UrbanGrowth Western Sydney portfolio and town centre redevelopments. Anthony has used this environmental data and research to develop dynamic and efficient remediation responses which are tailored to the constraints of each site and ensure compliance with regulatory requirements. As a Licensed Asbestos Assessor Anthony has produced numerous asbestos clearance certificates for Sites impacted by both bonded and friable asbestos, in both soils and building materials along with airborne asbestos monitoring and experience with the production of asbestos registers.

Experience: Ten years' experience in contaminated site management

LinkedIn:

Email: anthony.richard@erm.com

Education

- Masters in Sustainable Development – Graduate School of the Environment, Macquarie University, Australia, 2011
- Post Graduate Diploma of Environmental Education – Graduate School of the Environment, Macquarie University, Australia, 2005
- Bachelor of Environmental Management – Macquarie University, Australia, 2003

Professional Affiliations and Registrations

- Certified Environmental Practitioner – General Practice. No. 1579
- WorkCover NSW Licenses Asbestos Assessor – License Number LAA000181
- Bonded Asbestos Nominated Supervisor – NSW TAFE
- Australian Institute of Occupational Hygienists – Associate Member
- Environment Institute of Australia and New Zealand – Full Member

Languages

- English, native speaker

Fields of Competence

- Client relations
- Report and proposal writing
- Contaminated Land Assessment
- Asbestos assessment and Clearance Reporting
- Data interpretation and analysis

Key Industry Sectors

- Infrastructure & Property
- Government

Example Key Projects

Sydney Metro Central Tunnelling Package
Works including review of existing site documentation, site inspection and investigation assessment, groundwater monitoring well program and asbestos works across The Bays, Burwood and Sydney Olympic Park station box zones.

Menangle Park Release Area
Works including Site assessment, and preparation of Detailed Site Assessments, Remediation Action Plans and Asbestos Human Health Risk Assessment. 140ha primarily rural Site including former fireworks manufacturing facility.

Minto Urban Renewal Project – Stages 10, 11, 12 and 13
Works including Site assessment and preparation of Detailed Site Assessments, Salinity and Aggressivity Assessments, Remediation Action Plans, Asbestos Clearance Certificates, Airborne Asbestos Monitoring Reports and Validation Reports for a Site Audit Statement. 36ha former housing estate Site.

Airds/Bradbury Urban Renewal Project – Stages 1 and 2
Works including Site assessment and preparation of Detailed Site Assessment, Salinity and Aggressivity Assessments, Remediation Action Plans and Validation Reports for a Site Audit Statement. 20ha former housing estate Site.

Bonnyrigg Living Communities Project – Stages 4, 5, 6 and 7
Works including Site assessment, Hazardous Material Surveys and preparation of Detailed Site Investigations, Remediation Action Plans and Validation Reports for a Site Audit Statements. 15ha former housing estate Site.

Riverstone Scheduled Lands Project – Stage A
Works including Site Assessment, Hazardous Material Inspections, Clandestine Drug Lab Inspections, Assessment of dumped rubbish and preparation of Remediation Action Plans and Validation Reports for a Site Audit Statement. 10ha former residential and undeveloped lots.

Pitt Town – Fernadell, Bona Vista, Riverlands and Blighton Developments
Works including Site assessment and preparation of Detailed Site Assessments, Remediation Action Plans, Validation Reports, Airborne Asbestos Monitoring reports and Asbestos Clearance Certificates. One development subject to a Site Audit Statement. 85ha former rural residential properties.

DNSDC Moorebank
Supervision of materials handling and provision of Airborne Asbestos Monitoring Reports and Asbestos Clearance Certificates for former military storage site for warehouse development.

Perry Park
Works including the revision of previously existing and outdated Remediation Action Plan, supervision of remediation works, imported material reviews and preparation of waste classification and Validation Reports and a Long Term Environmental Management Plan for a Site Audit Statement. 0.85 inner city open space and sporting facility development.

Dyuralya Square
Works including the development of Remediation Action Plan, Asbestos Management Plan, supervision of remediation works, imported material reviews, preparation of waste classification and Validation Reports and a Long Term Environmental Management Plan for a Site Audit Statement. 0.25ha inner city open space area.

Caltex – Service Station Demolition
ERM were commissioned as primary contractor for the demolition and remediation works for multiple former service station sites within the greater Sydney region to be sold. Works included the supervision of the demolition and remediation works, including UST removal, and validation reporting required for the issue of Site Audit Statements for each Site.