STADIUM AUSTRALIA REDEVELOPMENT

AIR QUALITY IMPACT ASSESSMENT

A C O U S T I C S   A N D   A I R

REPORT NO. 19294
VERSION A

AUGUST 2019

PREPARED FOR

INFRASTRUCTURE NEW SOUTH WALES
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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
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A	Final	27 August 2019	Nic Hall	John Wassermann

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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

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 for the Stadium Australia redevelopment.

This report supports a State Significant Development (SSD) Development Application (DA) for the refurbishment of Stadium Australia, which is submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Infrastructure NSW is the proponent of the SSD DA.

1.1 Background

Stadium Australia opened in 1999 for the 2000 Sydney Olympic and Paralympic Games and, at the time, was the largest Olympic Stadium ever built and the second largest stadium in Australia. In March 2018, the NSW Premier announced plans to refurbish Stadium Australia to address deficiencies with the existing infrastructure and ensure that the stadium retains its status as a premier venue within a network of stadia and events infrastructure in NSW.

The NSW Stadia Strategy 2012 provides a vision for the future of stadia within NSW, prioritising investment to achieve the optimal mix of venues to meet community needs and to ensure a vibrant sports and event environment in NSW. A key action of the strategy includes developing Tier 1 stadia and their precincts covering transport, integrated ticketing, spectator experience, facilities for players, media, corporate and restaurant and entertainment provision. Stadium Australis is one of three Tier 1 stadia within NSW, the others being Sydney Football Stadium and the Sydney Cricket Ground.

In order to qualify for Tier 1 status, a stadium is required to include:

- seating capacity greater than 40,000;
- regularly host international sporting events;
- offer extensive corporate facilities, including suites, open-air corporate boxes and other function/dining facilities; and
- be the home ground for sporting teams playing in national competitions.

The refurbishment of Stadium Australia will address deficiencies in the existing infrastructure and improve facilities to be in line with contemporary Australian venue standards. The works ensure the stadium remains a modern, globally competitive venue that achieves the requirements for a Tier 1 stadium. The refurbishment of Stadium Australia addresses the following project objectives:

- transform the stadium into a 'fan favourite' destination for experiencing and enjoying sports and entertainment events;
- maximise the direct and indirect economic, social and cultural benefits to NSW from the project, including securing major, economically beneficial events within NSW to ensure the economic sustainability of the stadium into the future;
- deliver a multi-use contemporary rectangular venue that meets the needs of patrons, hirers and other users for rugby, football, concerts and other new forms of entertainment, and reaffirms the status of the stadium as Australia's largest purpose-built rectangular venue in Australia;
- improve the facility's sensitivity to the environmental conditions of the site by providing a roof

which provides cover to 100% of seats (to the drip line);

- provide new and refurbished corporate areas, members areas and general admission areas to enhance the patron experience;
- promote universal accessibility, safety and security such that the stadium is welcoming, inclusive and safe for all stadium users, including persons requiring universal access;
- promote environmental sustainability and embrace a whole of life approach to operations and maintenance; and
- achieve a high standard of design and reinforce the Stadium's status and identity within the NSW stadia network, and more broadly, nationally and internationally.

1.2 Purpose of this Report

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the project (ref. SSD 10342) relevant to air quality. The SEARs relevant to air quality are:

18. Air Quality, odour and waste

The EIS shall identify potential air quality, odour and waste impacts during the construction of the development and include any appropriate mitigation measures.

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.

The site has not been identified as contaminated; and therefore, no odour sources associated with the construction of the development have been identified.

Waste impacts associated with the construction of the development are addressed in the Construction Management Plan prepared by Aver.

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at 15 Edwin Flack Avenue within the Sydney Olympic Park. It is bound by Edwin Flack Avenue to the west, Dawn Fraser Avenue to the south, Olympic Boulevard to the east and Qudos Bank Arena to the north. The site is located within the City of Parramatta Local Government Area.

The site is legally described as Lot 4000 in DP 1004512 and part of Lot 4001 in DP 1004512. In 2017, the Minister for Sport assigned Venues NSW as the trustee of Stadium Australia under the *Sporting Venues Authorities Act 2008*.

In a broader context, the site forms part of Sydney Olympic Park which is a sporting and economic centre in metropolitan Sydney that covers 680 hectares. Sydney Olympic Park comprises a range of sports and entertainment venues, parklands, and commercial, retail and residential developments. It benefits from convenient access to Homebush Bay Drive, Parramatta Road and the M4 Western Motorway, as well as Olympic Park railway station. The Parramatta Light Rail Stage 2 and Sydney Metro West will also significantly increase accessibility.

The locational context of the Site is shown in Figure 2-1, whilst the site boundaries and existing site features are shown in Figure 2-2.

Figure 2-1 Regional Site Context

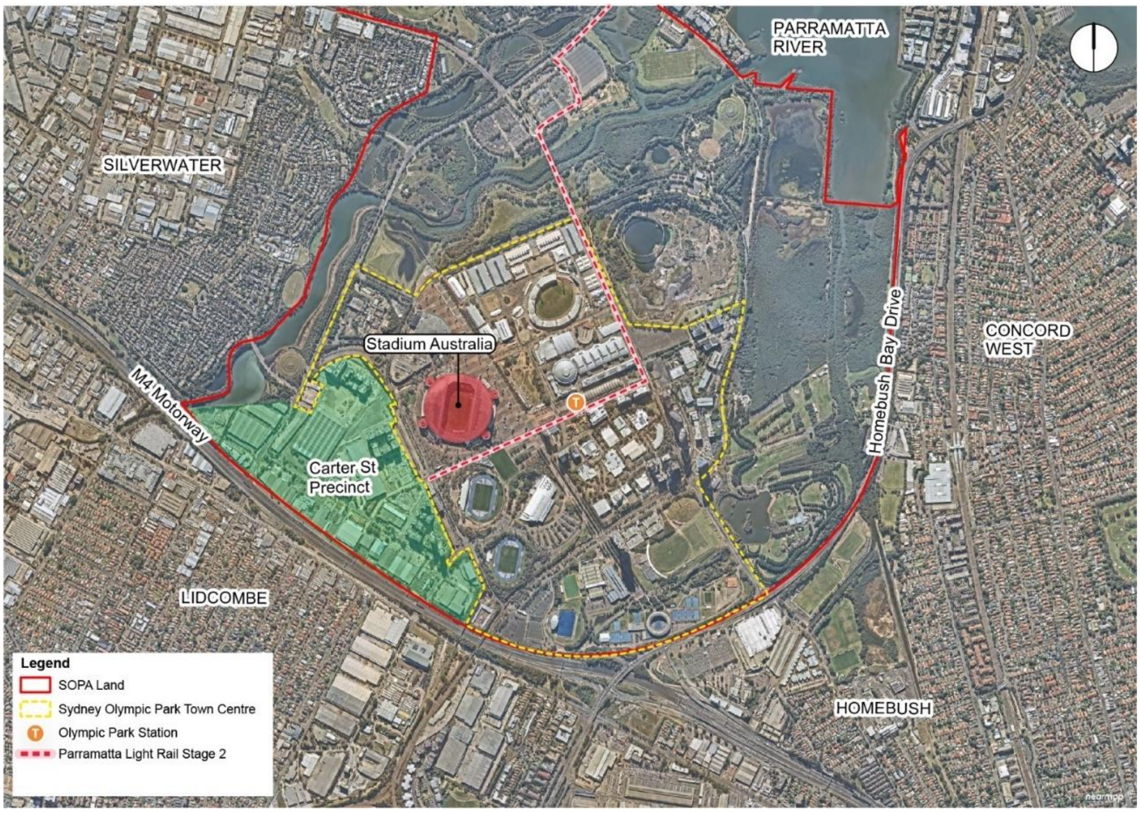
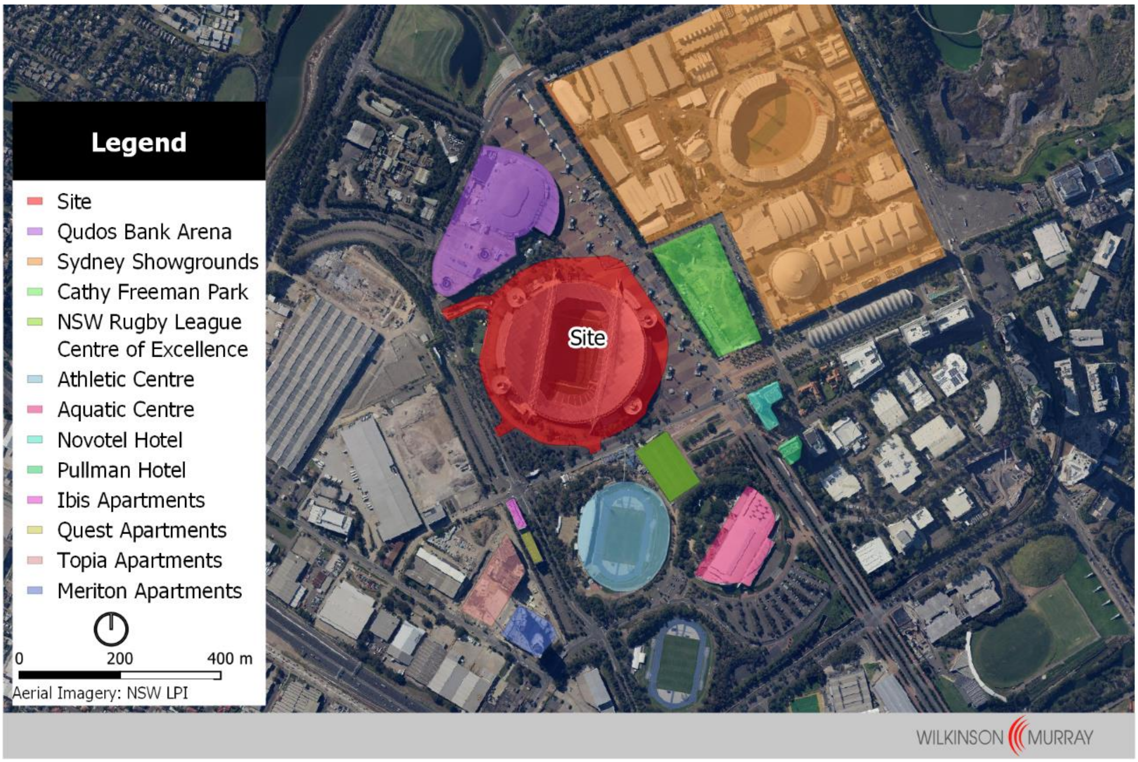


Figure 2-2 Site Area and Local Context

2.1.1 Sensitive Receptors

A range of sensitive receptors are located near the site. These receptors include residential, commercial and recreational land uses and are shown in Figure 2-3.

Figure 2-3 Sensitive Receptors



2.2 Overview of the Proposal

In March 2018 the NSW Government announced its commitment to refurbish the existing Stadium Australia and retain its status as a premier venue within a network of stadia and events infrastructure in NSW. This comprises the following:

- Reconfiguring the field of play to a permanent rectangular configuration.
- Redeveloping the lower and middle seating bowl to locate seating closer to the field and increase the pitch (steepness) of the seating bowl, which has the effect of reducing the capacity to approximately 70,000 seats (plus up to 20,000 persons on the field during concerts).
- Providing 100% drip-line roof coverage to all permanent seats by replacing the northern and southern sections of the roof and extending the existing eastern and western sections of the roof.
- Providing a new northern and southern public stadium entrance, including a new stadium facade and double-height concourse
- Renewing the food and beverage concessions, bathrooms, team facilities including new gender neutral changerooms, members and corporate facilities, press and broadcast facilities, and back of house areas.
- Providing new signage, high-definition video replay screens, LED lighting, and other functional improvements.
- Retaining the public domain areas surrounding the stadium that deliver a range of publicly accessible, event and operation areas, with minor works for tree removal.

Part of the existing stadium forecourt will be used as a construction compound during the construction phase and reinstated following the completion of works and prior to commencement of stadium operations.

2.3 Construction

The anticipated construction methodology is outlined in Table 2-1

Table 2-1 Indicative Construction Staging

Stage	Duration (approx.)
Procurement and Establishment	30 days
Demolition	210 days
Refurbishment	720 days

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:

- 100 – 400 tonne cranes and boom lifts;
- Excavators;
- Concrete pumps;
- Concrete trucks;
- Forklifts;
- Piling rigs;
- Jackhammers;
- Dump trucks ;
- Water carts; and
- Hand tools and other small equipment.

2.3.2 Hours

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.

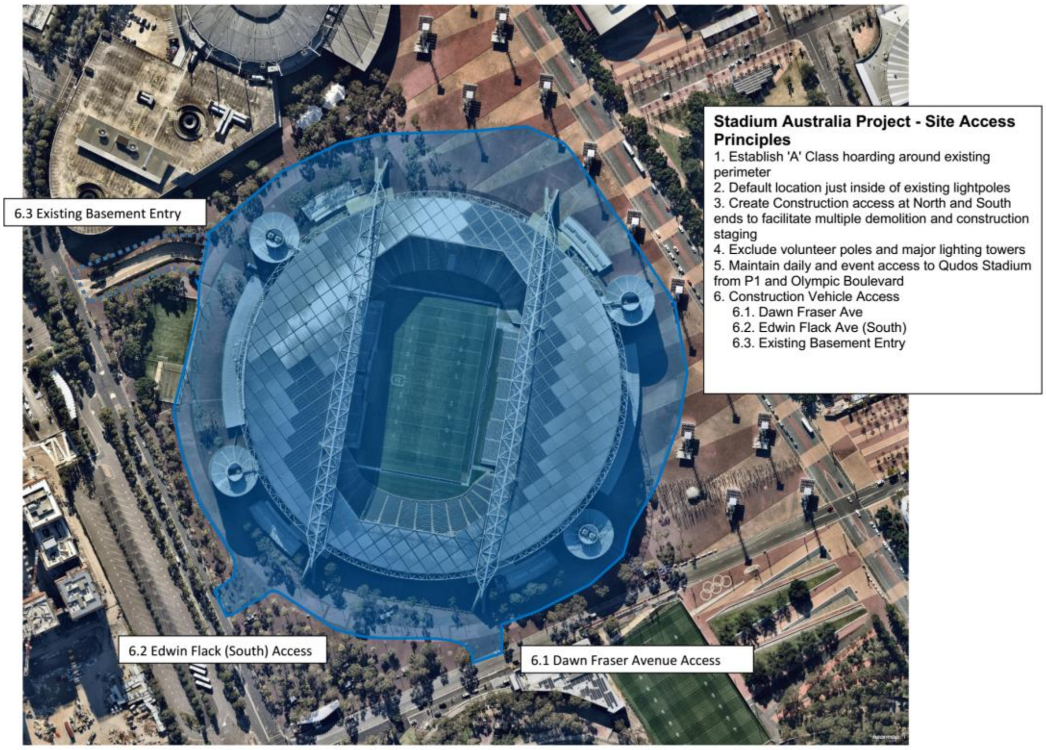
2.3.3 Site Access

Access to the site throughout construction would be via:

- The existing basement entry off Edwin Flack Avenue;
- The Edwin Flack Avenue (South) Access; and
- The Dawn Fraser Avenue Access.

These site access points are shown in Figure 2-4

Figure 2-4 Site Access



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,
- Deposited Dust.

The $PM_{2.5-10}$ fraction typically contributes approximately 90% of total PM_{10} emissions from construction activities, with $PM_{2.5}$ contributing approximately 10% of total PM_{10} emissions. Therefore, in accordance with the IAQM guidance, PM_{10} is adopted as the air pollutant most relevant to potential health impacts.

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
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 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 Sydney Olympic Park. The Sydney Olympic Park BoM station is located approximately 1.7 km north east 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 Sydney Olympic Park BoM station indicates that January is the hottest month of the year, with a mean daily maximum temperature of 28.4°C. July is the coolest month with a mean daily minimum temperature of 7.8°C. February is the wettest month with an average rainfall of 110 mm falling over 8 days. There are, on average, 82 rain days per year, delivering 912 mm of rain.

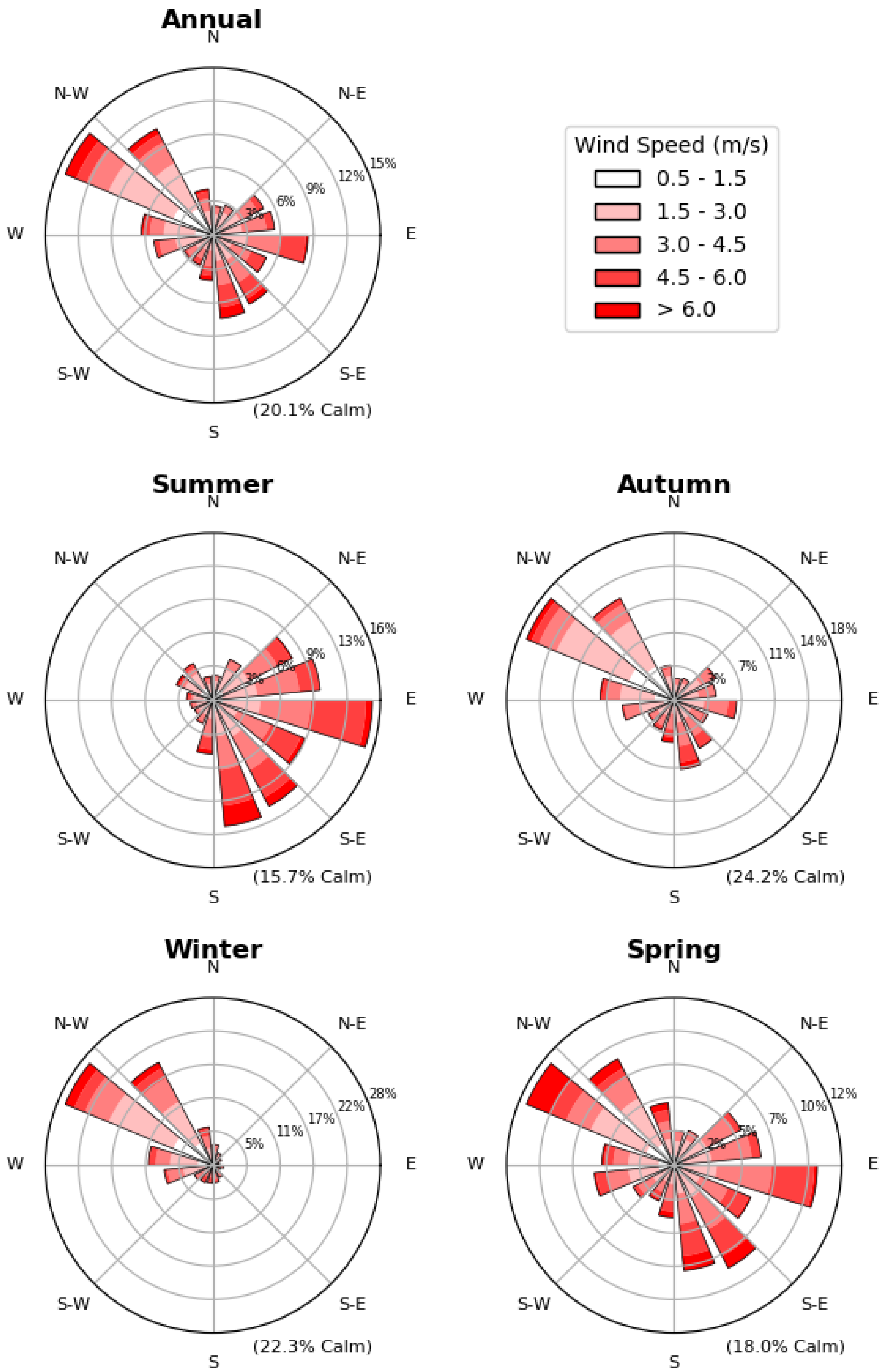
Table 4-1 Climate Averages for Sydney Olympic Park BoM Station

Obs.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
9am Mean Observations													
Temp (°C)	22.3	21.9	20.3	18.0	14.6	12.0	11.2	12.9	16.4	18.7	19.6	21.5	17.4
Hum (%)	67	72	72	68	70	71	68	61	57	56	64	64	66
3pm Mean Observations													
Temp (°C)	26.3	26.1	24.9	22.4	19.5	17.3	16.6	18.1	20.6	22.1	23.2	25.3	21.9
Hum (%)	53	55	53	51	51	52	48	41	43	45	51	50	49
Daily Minimum and Maximum Temperatures													
Min (°C)	19.3	19.4	17.8	14.3	11.2	8.9	7.8	8.7	11.6	13.7	15.8	17.9	13.9
Max (°C)	28.4	28.1	26.6	23.9	20.8	18.3	17.6	19.5	22.5	24.3	25.3	27.4	23.6
Rainfall													
Rain (mm)	84.4	109.8	66.0	89.2	88.2	75.8	63.5	56.7	52.7	64.9	76.2	58.0	911.8
Rain (days)	7.6	7.7	7.6	6.9	7.7	6.9	6.3	4.4	5.5	7.1	7.8	6.8	82.3

4.1.2 Wind

Observations of wind speed and direction from the Sydney Olympic Park BoM station have been selected to represent typical wind patterns in the area surrounding the site. Figure 4-1 presents annual and seasonal "wind rose" plots for the Sydney Olympic Park BoM station for the period 2014 to 2018, inclusive. The plots show that north-westerly winds are prevalent for much of the year, with easterly and south easterly winds also being prevalent in summer and spring.

Figure 4-1 Windrose Plot – Sydney Olympic Park, 2014-2018



4.2 Local Ambient Air Quality

Data from the Chullora 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} monitoring results collected at the Chullora AQMS over the period 2014 – 2018 is presented in Table 4-2.

From time to time, the 24-hour average concentrations of PM_{10} exceed the goal of 50 µg/m^3. These events are most often associated with extreme conditions such as bushfires, hazard reduction burning and dust storms. Where the maximum 24-hour average PM_{10} 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.

Table 4-2 Particulate Matter Monitoring Results – Chullora

Year	PM_{10} (µg/m^3)	
	24-hour average	Annual average
2014	40.0	18.1
2015	64.6 (48.2)	17.5
2016	63.5 (44.9)	18.1
2017	63.0 (57.1)	20.1
2018	90.7 (65.1)	21.9

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 2-3, 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. Therefore, the dust emission magnitude for the construction of the development 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 demolition and refurbishment activities, up to 50 heavy vehicle outward movements would be expected. 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.

Specific sensitivities for dust soiling and human health impacts at receptors relevant to this study are summarised in Table 2-1

Table 5-1 Receptor Sensitivities

Sensitivity	Example Land Uses	
	Dust Soiling	Human Health
High	Dwellings, museums and culturally important collections, medium-long term carparks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks and places of work	Offices and shops
Low	Playing fields, footpaths, short term carparks and roads	Footpaths, playing fields and parks.

Residents in nearby hotels and apartments are considered highly sensitive to both dust soiling and health impacts. These receptors would be located more than 100 m from the works, and there would be more than 100 highly sensitive receptors within 350 m of the works.

Workers in nearby offices and shops are considered to have a medium sensitivity to both dust soiling and health impacts. Receptors with this sensitivity are unlikely to be located within 20 m of the works but could 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 **low** 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 μg/m^3 (>18 μg/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 μg/m^3 (16-18 μg/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 μg/m^3 (14-16 μg/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 μg/m^3 (<14 μg/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 μg/m^3 (>18 μg/m^3 in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 μg/m^3 (16-18 μg/m^3 in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 μg/m^3 (14-16 μg/m^3 in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 μg/m^3 (<14 μg/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 5-2 Sensitivity of the Surrounding Area

Impact	Key Factors	Sensitivity of the Area
Dust Soiling	Receptor sensitivity = high >100 receptors within 350 m of works	Low (ref. IAQM Table 2)
Human Health	Receptor sensitivity = high >100 receptors within 350 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 5-4, Table 5-4 and Table 5-5, respectively.

Table 5-3 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 5-3, earthworks activities associated with the Proposal are considered to have a "Medium Risk" of both dust soiling and health impacts.

Table 5-4 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 5-4, general construction activities associated with the Proposal are considered to have a "Medium Risk" of both dust soiling and health impacts.

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

The identified dust risks associated with the construction of the Proposal are summarised in Table 5-6.

Table 5-6 Summary of Dust Risks

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Medium Risk	Medium Risk	Low 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 medium risk of both dust soiling and 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.
  - Display the name and contact details of the Responsible Person accountable for air quality and dust issues on the site boundary.
  - Display 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.
- **Monitoring**
  - 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.
  - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- **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 demolition**
  - Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
  - Avoid explosive blasting, using appropriate manual or mechanical alternatives.
  - Bag and remove any biological debris or damp down such material before demolition.
- **Measures specific to construction**
  - 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 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.

7 CONCLUSION

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 for the Stadium Australia 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 "Medium Risk" of both dust soiling and 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.