POWERHOUSE PARRAMATTA
ENVIRONMENTAL IMPACT STATEMENT

APPENDIX T
AIR QUALITY IMPACT ASSESSMENT

Wilkinson Murray

NSW
GOVERNMENT

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

POWERHOUSE PARRAMATTA

AIR QUALITY IMPACT ASSESSMENT

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50 YEARS 1962–2012

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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

This report supports a State Significant Development (SSD) Development Application (DA) for the Powerhouse Parramatta at 34-54 & 30B Phillip Street and 338 Church Street, Parramatta. The Powerhouse Parramatta is a museum (information and education facility) that has a capital investment value in excess of $30 million and as such the DA 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

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's *A Plan for Grown Sydney* as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the *Greater Sydney Regional Plan*.

Powerhouse Parramatta will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs driven by original research and inspired by its expansive collections. It will be a place of collaboration, a mirror of its communities forever imbedded in the contemporary identity of Greater Sydney and NSW.

1.2 Site description

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in Figure 1-1 and Figure 1-2. The site excludes the GE Office building at 32 Phillip Street.

The site is currently occupied by a number of building and structures, including:

- Riverbank Car Park – a four-level public car park
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s
- St Georges Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- 36 Phillip Street – a two-storey building comprising retail and business premises
- 40 Phillip Street – a two-storey building comprising retail and business premises
- 42 Phillip Street – a substation building set back from the street.

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.

Figure 1-1 Aerial photograph of the site and its context

Source: Mark Merton Photography

Figure 1-2 Site boundary, key existing features and immediate local context

Source: Ethos Urban

1.3 Overview of the proposed development

The Powerhouse was established in 1879, and Powerhouse Parramatta will radically return to its origins though the creation of seven presentation spaces of extraordinary scale that will enable the delivery of an ambitious, constantly changing program that provides new levels of access to Powerhouse Collection. The Powerhouse will set a new international benchmark in experiential learning through the creation of an immensely scaled 360-degree digital space, unique to Australia.

Powerhouse Parramatta will reflect the communities and cultures of one of Australia's fastest growing regions. It will hold First Nations culture at tis core and set a new national benchmark in culturally diverse programming. The Powerhouse will be highly connected through multiple transport links, and integrate into the fine grain of the city.

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and participate in Powerhouse programs. The Powerlab will feature digital studios to support music and screen industries alongside co-working spaces, life-long learning and community spaces. Integrated into the Powerlab will be a research kitchen and library that will support a NSW industry development program including archives and oral histories.

This application will deliver an iconic cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Parramatta as a single stage, comprising:

- Site preparation works, including the termination of relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- Demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St Georges Terrace' and all other existing structures located on the site;
- Construction of the Powerhouse Parramatta, including:
    - Seven major public presentation spaces for the exhibition of Powerhouse Collection;
    - Front and back-of-house spaces;
    - Studio, co-working and collaboration spaces comprising the Powerlab, supported by 40 residences (serviced apartments) for scientists, researchers, students and artists;
    - Education and community spaces for staff, researchers and the Powerlab residents, the community and education and commercial hirers;
    - Commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events;
    - Film, photography and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
    - Public facing research library and archive for community, industry, students and researchers to access materials; and
    - A mix of retail spaces including food and drink tenancies with outdoor dining.
- Operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- Maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Land and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;
- Public domain withing the site including new public open space area, landscaping and tree planting across the site; and
- Building identification signage.

The project does not seek consent for the carrying out of works outside of the site boundary, and in particular does not involve and alterations to the existing edge of the formed concrete edge of the Parramatta River or to the waterway itself.

1.4 Assessment requirements

The Department of Planning, Industry and Environment have issues Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as summarised in Table 1-1.

Table 1-1 SEARs

SEAR	Where addressed
9. Environmental Amenity The EIS Shall: • Address potential air quality and odour impacts during construction and operation of the development and identify appropriate mitigation measures	Section 4

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 Powerhouse Parramatta development.

It is noted that asbestos has been detected on the site. The handling and monitoring of materials contaminated with asbestos will be conducted in accordance with the *Remedial Action Plan* (RAP) prepared for the project and are not addressed further herein.

Operational air quality impacts associated with the development are considered to be low risk. Smoke and odour from the Powerlab research kitchen and retail kitchens are considered to be the primary potential sources of operational air quality impacts. To minimise the risk of air quality impacts from the kitchens, the following measures should be considered during detailed design:

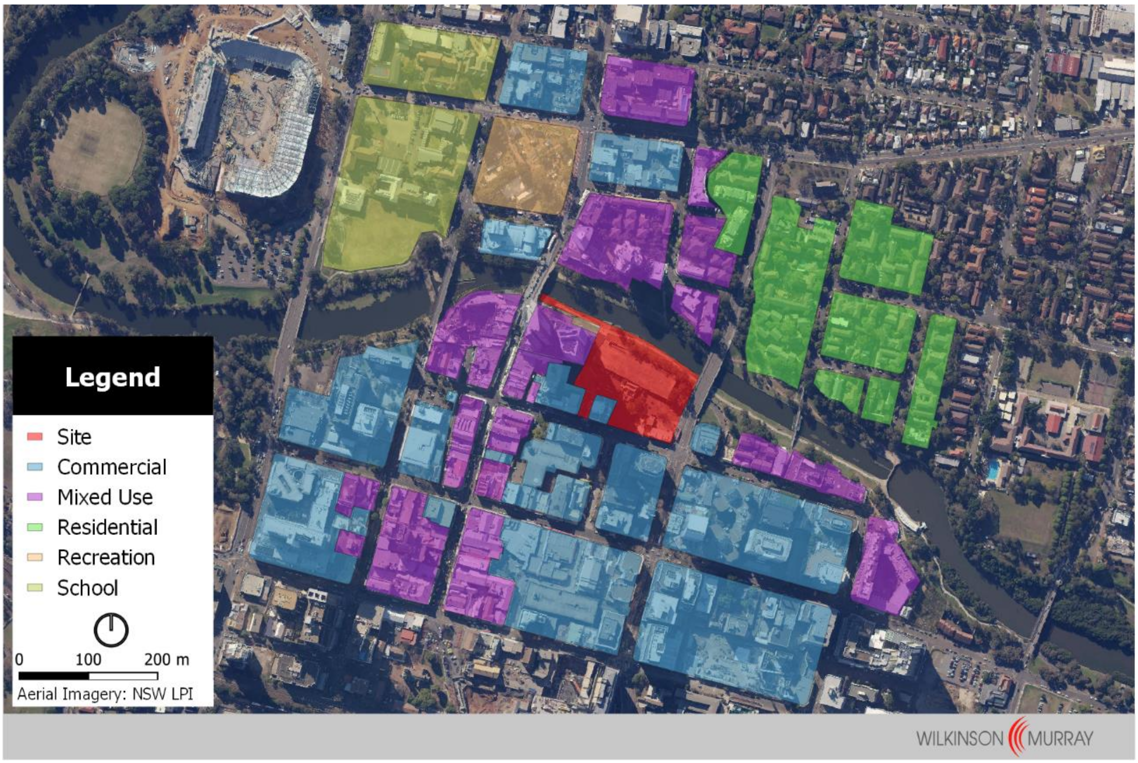
- Locating the kitchen exhaust(s) away from sensitive receptors; and,
- Incorporating fine filtration or electrostatic precipitation followed by carbon filtration or a UV ozone system into the kitchen exhaust(s).

2 EXISTING ENVIRONMENT

2.1 Sensitive Receptors

A range of sensitive receptors are located near the site. These receptors include commercial, mixed use, residential, recreational and school premises and are shown in Figure 2-1. Mixed use premises typically feature commercial premises on the ground floor, with residential premises above.

Figure 2-1 Sensitive Receptors



2.2 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.

2.2.1 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 6.5 km south 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 2-1. 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.

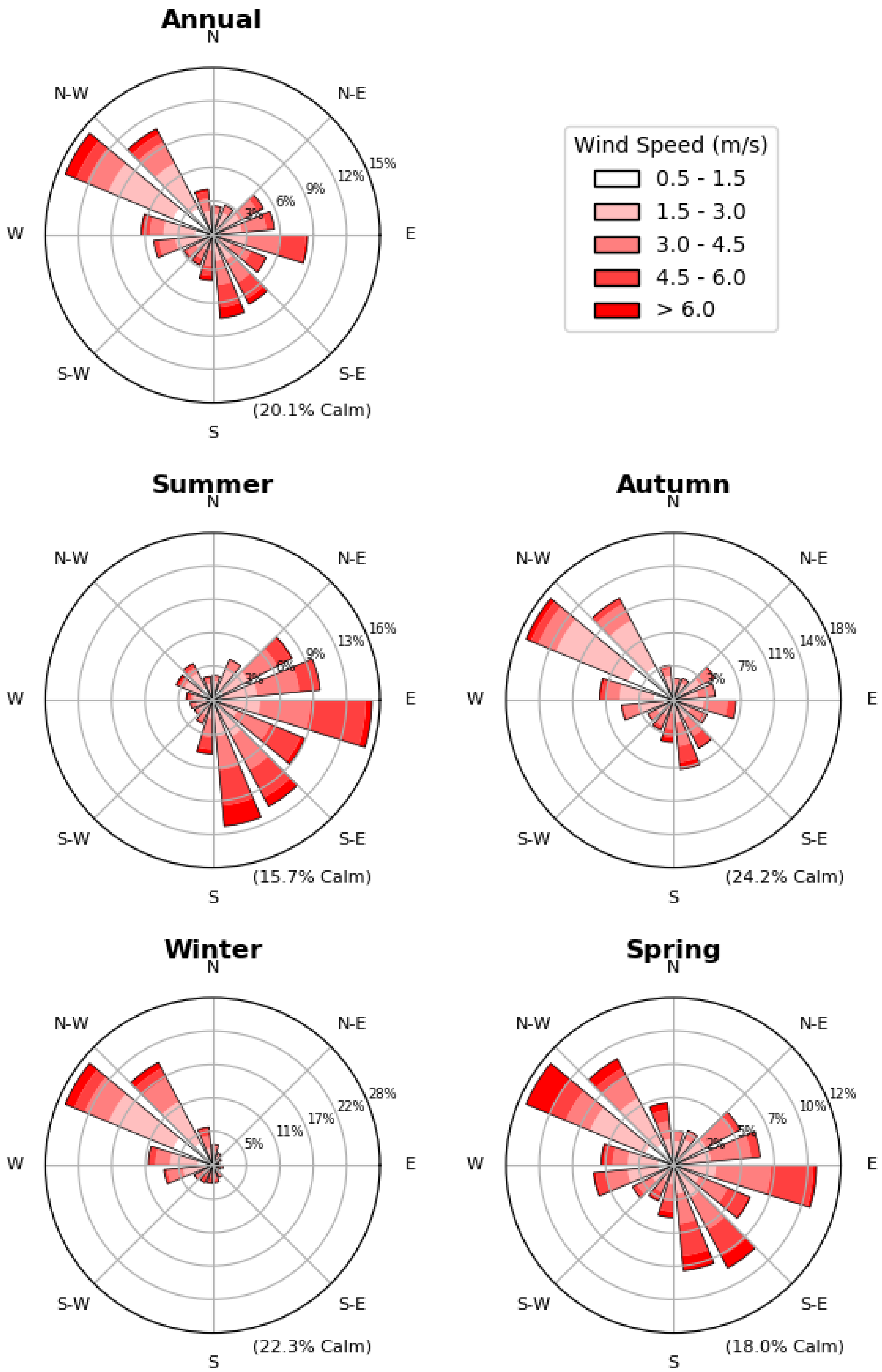
Table 2-1 Climate Averages for Sydney Olympic Park BoM Station

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

2.2.2 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 2-2 presents annual and seasonal "wind rose" plots for the Sydney Olympic Park BoM station for the period 2015 to 2019, 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 2-2 Windrose Plot – Sydney Olympic Park, 2015-2019



2.3 Local Ambient Air Quality

The NSW Office of Environment and Heritage (OEH) operates a network of air quality monitoring stations (AQMS) across NSW. The nearest OEH AQMS is located approximately 9 kilometres north west of the Proposal site, at Prospect. Data from the Prospect air quality monitoring station (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 Prospect AQMS over the period 2015 – 2019 is presented in Table 2-2.

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 2-2 presents the next highest value. Often, the next highest values comply with the goals. However, hazard reduction burns in 2016, dust storms in 2018 and bushfires in 2019 resulted in the second highest 24-hour average PM_{10} concentrations exceeding the goal.

The severe bushfires in late 2019 also resulted in a significant increase in the annual average PM_{10} concentrations, which were typically below 20 μg/m^3 in previous years.

Table 2-2 Particulate Matter Monitoring Results – Chullora

Year	PM_{10} (μg/m^3)	
	24-hour average	Annual average
2015	68.7 (48.0)	17.6
2016	110.1 (77.5)	18.9
2017	61.1 (40.2)	18.9
2018	113.3 (70.2)	21.9
2019	182.8 (168.5)	26.0

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 ASSESSMENT OF IMPACTS

4.1 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.

4.2 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.

4.2.1 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.

4.2.2 Step 2A – Potential dust emission magnitude

The following section evaluates the potential dust emission magnitude for demolition, 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).

Demolition dust emission magnitudes may be defined as:

- **Large:** total building volume > 50,000 m^3, potentially dust construction material (e.g. concrete), on-site crushing and screening, demolition activities > 20 m above ground level;
- **Medium:** total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction

material, demolition activities 10-20 m above ground level; and,

- **Small:** total building volume < 20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 10 m above ground level, demolition during wetter months.

The total volume of structures to be demolished is greater than 50,000 m^3. Therefore, the dust emission magnitude for the proposed demolition works is classified as **large**.

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.

Heavy vehicle outward movements are expected to range from 40-60 during demolition to 100-120 during construction. Therefore, the dust emission magnitude for trackout is classified as **large**.

4.2.3 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 4-1.

Table 4-1 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 and occupants of nearby schools are considered highly sensitive to both dust soiling and health impacts. These receptors are unlikely to be located withing 20 metres of the works. There is potential for more than 100 of these receptors to be located within 50 metres of the works.

Workers in nearby offices and shops are considered to have a medium sensitivity to both dust soiling and health impacts. There is potential for more than 100 of these receptors to be located within 20 metres 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 4-1, the area surrounding the works is determined to have a **high** sensitivity to dust soiling impacts.

Figure 4-1 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 4-2, the area surrounding the works is determined to have a **low** sensitivity to human health impacts from construction dust.

Figure 4-2 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/m³ (>18 μg/m³ 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/m³ (16-18 μg/m³ 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/m³ (14-16 μg/m³ in Scotland)	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 μg/m³ (<14 μg/m³ 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/m³ (>18 μg/m³ in Scotland)	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 μg/m³ (16-18 μg/m³ in Scotland)	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 μg/m³ (14-16 μg/m³ in Scotland)	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 μg/m³ (<14 μg/m³ 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 4-2 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)

4.2.4 Step 2C – Define the risk of impacts

To define the risk of impacts, the dust emission magnitudes for demolition (large), earthworks (large), general construction (large) and trackout (large) are combined with the sensitivity of the area, as per Table 4-3, Table 4-4, Table 4-5 and Table 4-6, respectively.

Table 4-3 Risk of Dust Impacts from Demolition

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

In accordance with Table 4-3, demolition activities associated with the Proposal are considered to have a **high** risk of dust soiling impacts and a **medium** risk of health impacts.

Table 4-4 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	Low Risk	Low Risk	Negligible

In accordance with Table 4-4, earthworks activities associated with the Proposal are considered to have a **high** risk of dust soiling impacts and a **low** risk of health impacts.

Table 4-5 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	Low Risk	Low Risk	Negligible

In accordance with Table 4-5, general construction activities associated with the Proposal are considered to have a **high** risk of dust soiling impacts and a **low** risk of health impacts.

Table 4-6 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	Low Risk	Low Risk	Negligible

In accordance with Table 4-6, vehicle trackout associated with the construction of the Proposal is considered to have a **high** risk of dust soiling impacts and a **low** risk of health impacts.

The identified dust risks associated with the construction of the Proposal are summarised in Table 4-7.

Table 4-7 Summary of Dust Risks

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

4.2.5 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 5.

4.2.6 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 5.

5 MITIGATION AND MANAGEMENT

5.1 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 low 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.
  - 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.
  - Hold regular liaison meetings with other high risk construction sites within 500 metres of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.
- **Monitoring**
  - Undertake daily on-site and off-site inspections, where receptors are nearby, to monitor dust, record inspection results, and make inspection log available to relevant authorities. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 metres of the site boundary.
  - 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 km/h on paved and 15 km/h on unpaved roads and work areas within the site.
  - 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**
  - Soft strip inside buildings before demolition, thereby retaining walls and windows in the rest of the building where possible to provide a screen against dust.
  - 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**
  - 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 store in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
  - 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.
- **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 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 Powerhouse Parramatta development.

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 impacts and a low 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.