ORICA WAREHOUSE ESTATE

28 McPherson Street, Banksmeadow
Air Quality Impact Assessment

Prepared for:

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GPO Box 4311
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Orica Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18518-R01-v2.0	13 February 2019	Varun Marwaha	Fardausur Rahaman	Ali Naghizadeh
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Orica Australia Pty Ltd (Orica) to prepare an Air Quality Impact Assessment (AQIA) report for a proposed warehouse development to be located at 28 McPherson Street, Banksmeadow in the Bayside local government area (Development Site).

This report has been prepared to form part of a State Significant Development Application (SSDA) for the construction and operation of a warehouse estate, comprising:

- a suspended concrete platform above the flood detention basin to support warehouse buildings and hardstand / parking areas; and
- construction of two warehouse buildings for the storage and distribution of general merchandise including goods arriving from Port Botany.

This report addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the Project (SSD 9691) issued on 14 December 2018. The SEARs require the following matters to be addressed in relation to air quality:

- an assessment of the air quality impacts (including dust) during the construction and operation of the development, in accordance with the relevant Environment Protection Authority guidelines;
- details of proposed mitigation, management and monitoring measures.

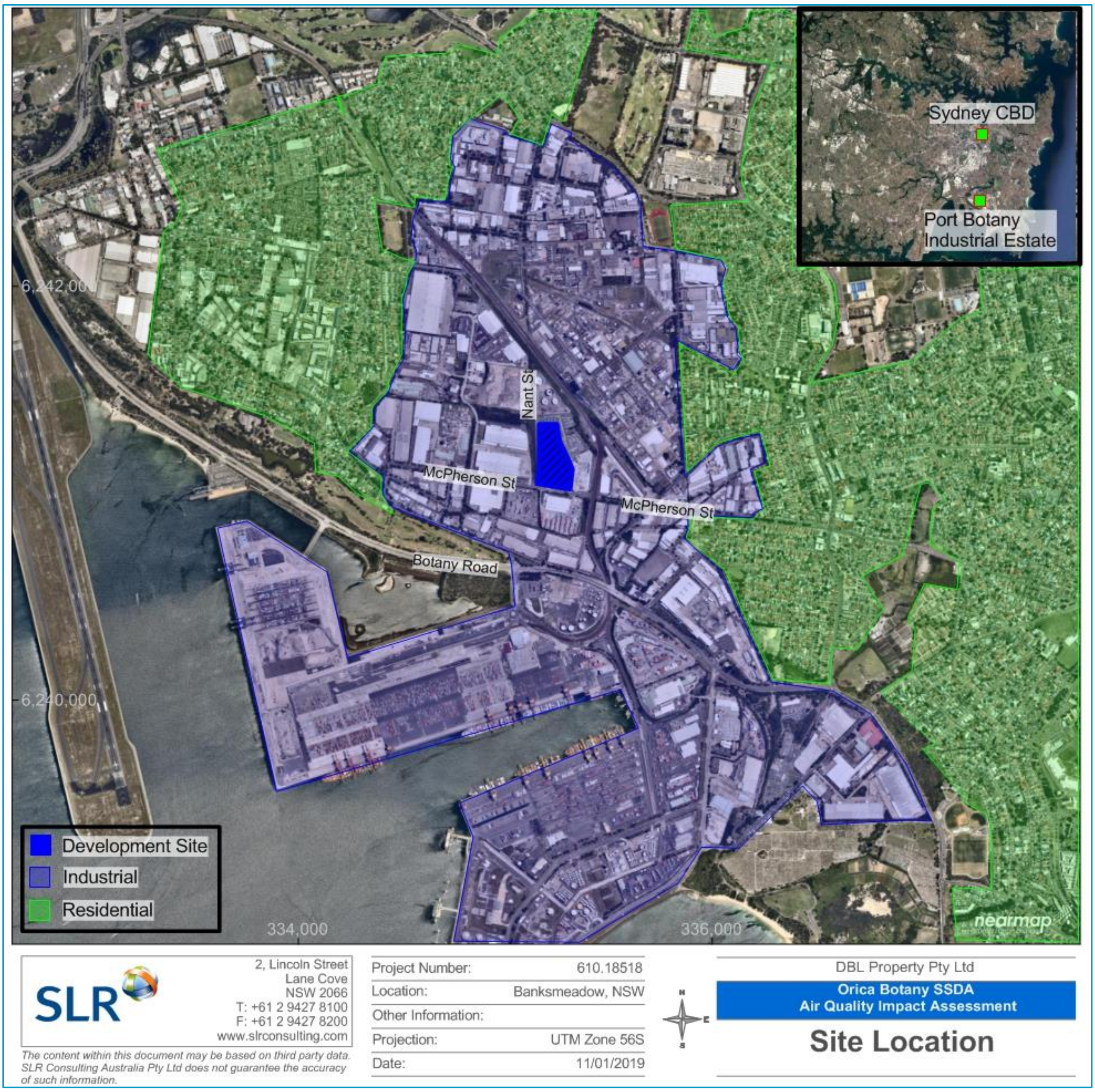
The aim of this AQIA is to determine the risk associated with the potential air quality impacts during construction and operation of the proposed development.

2 Project Overview

2.1 Regional Setting

The proposed Development Site is located at 28 McPherson Street, Banksmeadow in the Bayside local government area. The location of the Development Site in context to the surrounding industrial and residential land uses including Port Botany is shown in **Figure 1**.

Figure 1 Satellite Image of the Proposed Development Site

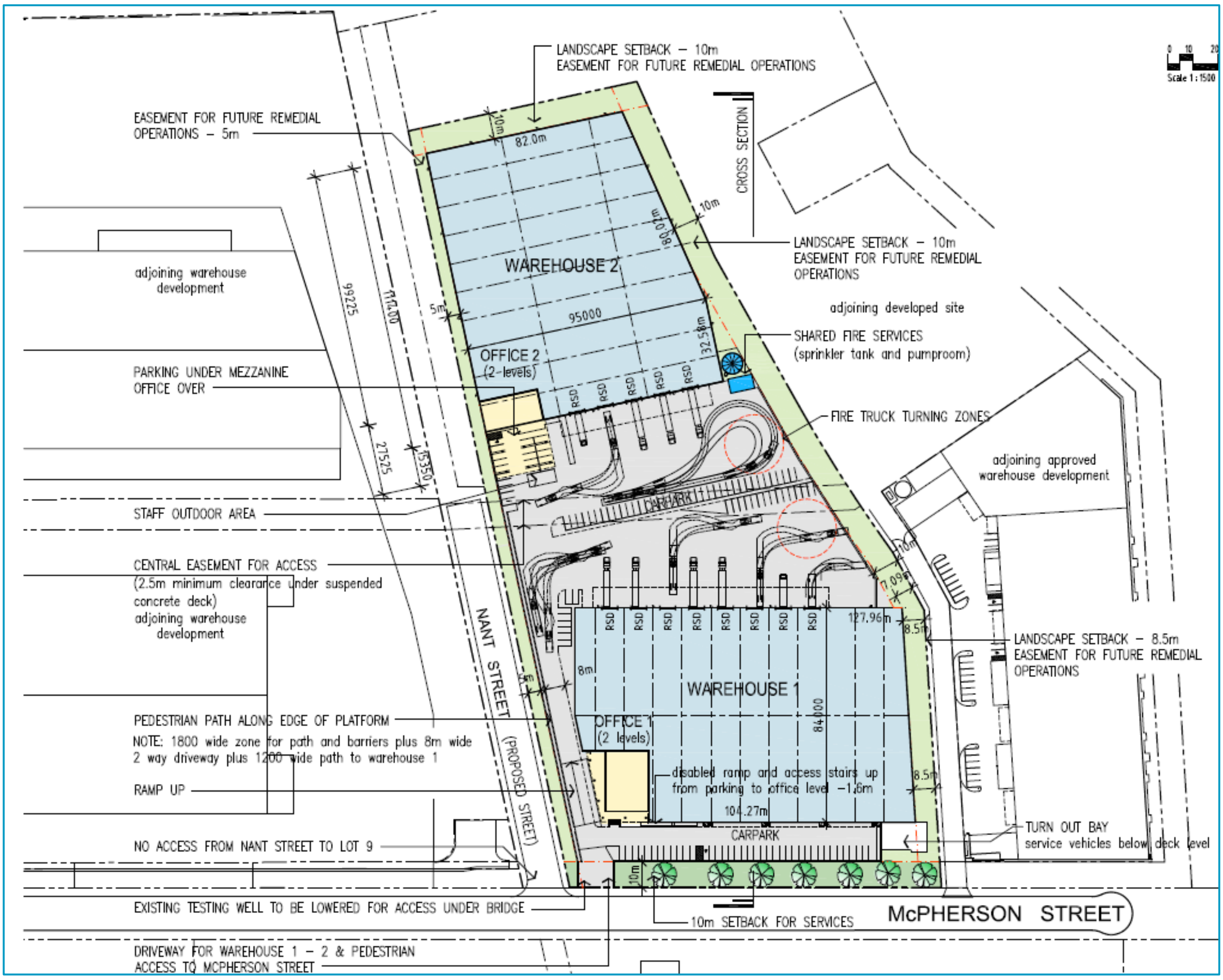


As shown in **Figure 1**, the Development Site is surrounded by a number of industrial and warehousing facilities. The industrial warehousing facilities are referred to as the medium sensitivity receptors and the residential receptors are referred to as the high sensitivity receptors.

The nearest existing warehouse is located approximately 60 m from the closest Development Site boundary and the nearest proposed warehouse (located at 28A McPherson Street) will be located approximately 30 m from the closest Development Site boundary. The nearest residential receptors are located approximately 600 metres (m) east and 800 m west of the Development Site boundary.

The indicative layout of the Development Site is shown in **Figure 2**.

Figure 2 Indicative Site Layout of the Proposed Development Site



Source: Site Plan – Option 6, Project no. 180101, drawing # SK-A106, issue: P2; January 2018.

2.2 Construction Activities

This report includes an assessment of the potential air quality impacts associated with the proposed staged construction activities at the Development Site (see **Section 6**) that includes:

- Stage 1 – Construction of concrete platform

    - Site stripping a proof rolling of the site and the subsequent capping of the site with a geotextile fabric and road base;
    - Suspended concrete platform to support the warehouse buildings and hardstand/parking areas above the flood detention basin (total concrete platform area of 34,130 m^2);
    - The suspended platform will be supported by a grid of piles constructed approximately 1.5 m above the existing ground level to retain the flood retention capability of the basin below.
- Stage 2 – Building works for two warehouses with ancillary office space
    - Total warehouse gross floor area (GFA) of 19,780 m^2; and
    - Total ancillary office space GFA of 2,000 m^2.

The construction works are anticipated to take place over 12 months. The proposed working hours for the construction period are 7:00am to 6:00pm, Monday to Friday, between 8:00am to 1:00pm on Saturdays and no work to be conducted on Sundays or public holidays (subject to conditions of consent).

2.3 Operational Activities

The Development Site is proposed to be utilised for storage and distribution of general merchandise and goods arriving from Port Botany including the following activities:

- Delivery and storage/warehousing of goods;
- Dispatch and distribution; and
- Ancillary office administration.

Access to the site is proposed via a new driveway access from McPherson Street.

The site is proposed to operate 24 hours per day.

A shared hardstand area is proposed for the two warehouse structures and on-site car parking area. As part of the operations, a maximum of 113 vehicle trips per hour (vph) and 122 vph are expected in the AM and PM peak period respectively, in addition to necessary gantry and forklift (electronic) use for the loading/unloading activities.

3 Potential Sources and Impacts of Dust Emissions

3.1 Potential Sources of Dust Emissions During Construction

During the construction works, fugitive dust emissions are likely to be generated which could give rise to nuisance and/or health impacts for the surrounding sensitive areas. Potential air quality impacts associated with the construction phase of the project have been addressed in **Section 6**. The following key sources of dust associated with the construction of the Development Site have been identified. Dust generating activities are generally likely only to occur for a short period of time (approximately 4- 6 weeks) as the site is stripped of existing vegetation and proof rolled prior to the installation of the site capping layer (ie geotextile and road base cover):

- Wind-generated dust from disturbed surfaces and stockpiles particularly during site stripping and proof rolling, and prior to the installation of the capping layer; and
- Wheel-generated dust and combustion emissions from equipment during site stripping.

In addition to the construction activities being carried out at any point in time, a number of other environmental factors may also affect the generation and dispersion of dust emissions, including:

- Wind direction - determines whether dust and suspended particles are transported in the direction of the sensitive receptors;
- Wind speed - determines the potential suspension and drift resistance of particles;
- Surface type - more erodible surface material types have an increased soil or dust erosion potential;
- Surface material moisture - increased surface material moisture reduces soil or dust erosion potential; and
- Rainfall or dew - rainfall or heavy dew that wets the surface of the soil reduces the risk of dust generation.

Where diesel-powered mobile machinery and vehicles are being used, localised elevations in ambient concentrations of combustion-related pollutants may occur, however potential for exceeding the relevant criteria of these pollutants at surrounding sensitive areas can be considered as minimal. Fugitive dust emissions are generally considered to have the greatest potential to give rise to downwind air quality impacts at construction sites.

3.2 Potential Sources of Emissions During Operations

Potential sources of emissions associated with the operation of the Development Site have been identified as follows:

- Products of fuel combustion (including particulates) from onsite vehicle movements and/or idling at the site during loading/unloading operations; and
- Wind-generated dust from the vehicle movements on the hardstand areas.

The number of vehicle movements and the amount of emissions associated with onsite fuel combustion is anticipated to be minor compared to pollutant levels due to traffic on road network within the locality.

4 Relevant Air Quality Criteria and Guidelines

4.1 Pollutants of Concern

As identified in **Section 3**, potential air pollutants of interest for the Development Site include:

- Suspended particulate matter;
- Deposited dust; and
- Products of fuel combustion (including particulates).

The following sections outline the potential health and amenity issues associated with the above pollutants, while **Section 4.2** outlines relevant air quality assessment criteria.

4.1.1 Suspended Particulate Matter

Airborne contaminants that can be inhaled directly into the lungs can be classified on the basis of their physical properties as gases, vapours or particulate matter. In common usage, the terms “dust” and “particulates” are often used interchangeably. The health effects of particulate matter are strongly influenced by the size of the airborne particles. Smaller particles can penetrate further into the respiratory tract, with the smallest particles having a greater impact on human health as they penetrate to the gas exchange areas of the lungs. Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

The term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter is termed as total suspended particulate (TSP). Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM_{10}. The PM_{10} size fraction is sufficiently small to penetrate the large airways of the lungs, while $PM_{2.5}$ (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

4.1.2 Deposited Dust

Section 4.1.1 is concerned in large part with the health impacts of particulate matter. Nuisance impacts need also to be considered, mainly in relation to deposited dust. Dust can cause nuisance by settling on surfaces and possessions, affecting visibility and contaminating tank water supplies. High rates of dust deposition can also adversely affect vegetation by blanketing leaf surfaces.

The rate of dust deposition is measured by means of a collection gauge, which catches the dust settling over a fixed surface area and over a period of about 30 days.

4.1.3 Products of Combustion

Emissions associated with road traffic and the combustion of automotive fuel (diesel, petrol, etc.) will include carbon monoxide (CO), oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and volatile organic compounds (VOCs).

CO is an odourless, colourless gas formed from the incomplete burning of fuels in motor vehicles. It can be a common pollutant at the roadside and highest concentrations are found at the kerbside with concentrations decreasing rapidly with increasing distance from the road. CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow. The incomplete combustion of fuel in diesel powered vehicles can generate particulate in the form of black soot.

Oxides of nitrogen (NO_X) is a general term used to describe any mixture of nitrogen oxides formed during combustion. In atmospheric chemistry, NO_X generally refers to the total concentration of nitric oxide (NO) and nitrogen dioxide (NO_2). NO is a colourless and odourless gas that does not significantly affect human health. However, in the presence of oxygen, NO can be oxidised to NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. NO will be converted to NO_2 soon after leaving a vehicle exhaust.

Vehicle exhausts can contain emissions of sulfur dioxide (SO_2) due to impurities in the fuel. The sulfur content in diesel fuel has significantly reduced over the years ambient SO_2 concentrations in Australian cities are typically well below regulatory criteria.

Volatile organic compounds (VOC) may be emitted as a result of the incomplete combustion of fuel. VOC emissions are reducing significantly due to the improved combustion processes offered by modern engines.

4.2 Ambient Air Quality Criteria

4.2.1 Particulate Matter and Products of Combustion

Air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 4.1** are published in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017a) [hereafter 'Approved Methods']. The ground level air quality impact assessment criteria listed in Section 7 of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise associated risks to human health as published in the Approved Methods. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW and are considered to be appropriate for use in this assessment.

A summary of the relevant impact assessment criteria for particulate matter and products of combustion is provided in **Table 1**.

Table 1 NSW EPA Goals for Particulate Matter and Combustion Gases

Pollutant	Averaging Period	Concentration	
CO	15 minutes	87 ppm	100 mg/m³
	1 hour	25 ppm	30 mg/m³
	8 hours	9 ppm	10 mg/m³
NO_2	1 hour	12 pphm	246 µg/m³
	Annual	3 pphm	62 µg/m³
PM_{10}	24 Hours	-	50 µg/m³
	Annual		25 µg/m³
$PM_{2.5}$	24 Hours	-	25 µg/m³
	Annual		8 µg/m³

Pollutant	Averaging Period	Concentration	
SO_2	10 minutes	25 pphm	712 µg/m^3
	1 hour	20 pphm	570 µg/m^3
	24 hours	8 pphm	228 µg/m^3
	Annual	2 pphm	60 µg/m^3

Source: EPA 2017a

4.2.2 Deposited Dust

A summary of the relevant impact assessment criteria for deposited dust is provided in **Table 2**.

Table 2 NSW EPA Approved Methods for Modelling & Assessment of Air Pollutants – Assessment Criteria

Pollutant	Averaging Period	Assessment Criteria (g/m^2/month)
Deposited dust	Annual	2 (maximum increase in deposited dust level) 4 (maximum total deposited dust level)

4.3 Local Government Air Quality Toolkit

The NSW EPA has developed the Local Government Air Quality Toolkit (EPA 2018), in response to requests from local Council officers for information and guidance on the common air quality issues they manage. Guidance is available under Part 3 of the Local Government Air Quality Toolkit for Construction Sites.

This document lists the common sources of emissions and mitigation and management measures to control airborne dust levels from construction sites and has been consulted in the development of this AQIA.

5 Existing Environment

5.1 Local Meteorological Conditions

5.1.1 Wind Speed and Wind Direction

Local wind speed and direction influence the dispersion of air pollutants. Wind speed determines both the distance of downwind transport and the rate of dilution as a result of 'plume' stretching. Wind direction, and the variability in wind direction, determines the general path pollutants will follow and the extent of crosswind spreading. Surface roughness (characterised by features such as the topography of the land and the presence of buildings, structures and trees) affects the degree of mechanical turbulence, which also influences the rate of dispersion of air pollutants.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station recording wind speed and wind direction data is the Sydney Airport Automatic Weather Station (AWS), located approximately 4 kilometres (km) west of the Development Site (Station ID 66037). Considering the relatively flat terrain between Development Site and Sydney Airport AWS, it may be assumed that the wind conditions recorded at the Sydney Airport AWS are a reasonable representation of the wind conditions experienced at the Development Site.

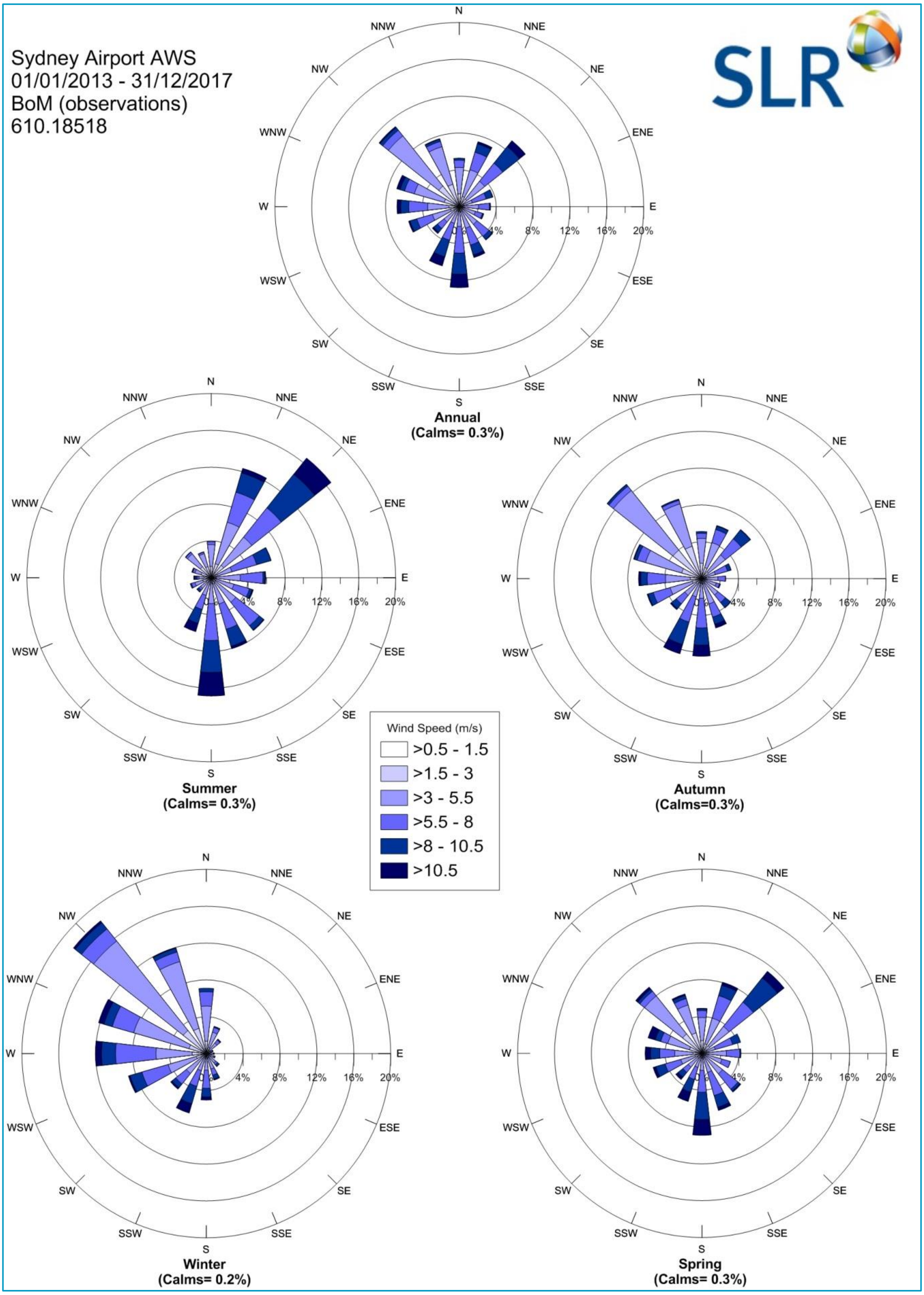
Annual and seasonal wind roses for the years 2013-2017 (inclusive), compiled from the data recorded at the Sydney Airport AWS is presented in **Figure 3**. The wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from north). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus, it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day. The 'Beaufort Wind Scale' (consistent with terminology used by the BoM) was used to describe the wind speeds experienced at the Development site, outlined in **Table 3**.

Table 3 Beaufort Wind Scale

Beaufort Scale #	Description	m/s	Description on land
0	Calm	0-0.5	Smoke rises vertically
1	Light air	0.5-1.5	Smoke drift indicates wind direction
2-3	Light/gentle breeze	1.5-5.3	Wind felt on face, leaves rustle, light flags extended, ordinary vanes moved by wind
4	Moderate winds	5.3-8.0	Raises dust and loose paper, small branches are moved
5	Fresh winds	8.0-10.8	Small trees in leaf begin to sway, crested wavelets form on inland waters
6	Strong winds	>10.8	Large branches in motion, whistling heard in telephone wires; umbrellas used with difficulty

Source: http://www.bom.gov.au/lam/glossary/beaufort.shtml

Figure 3 Sydney Airport AWS Annual and Seasonal Wind Roses, 2013-2017

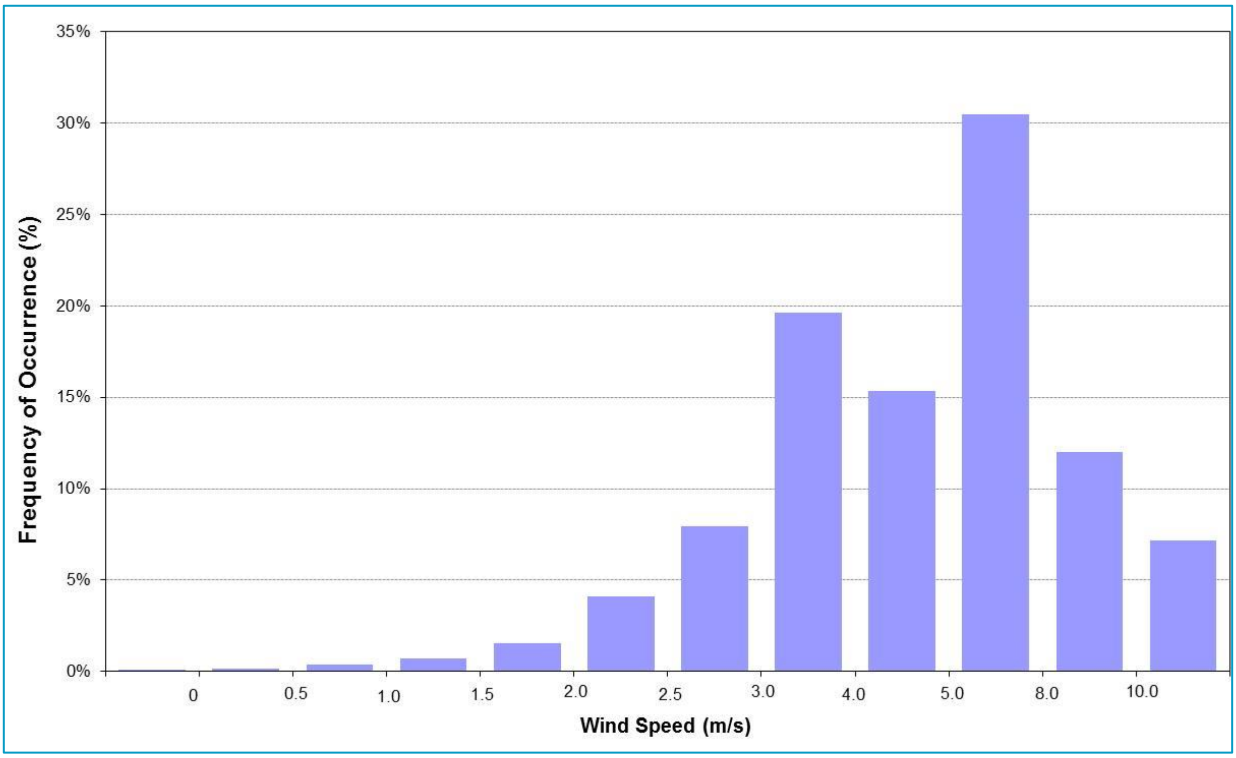


The wind roses for the years 2013 to 2017 (**Figure 3**) indicate the winds from northwest, northeast and southern quadrants are predominant. Very low frequencies of winds from eastern quadrant were recorded across all years. The annual frequency of calm wind conditions was recorded to be less than 0.5% of the time per year. The seasonal wind roses for the 2013-2017 period indicate that:

- In summer, winds are predominantly from the northeast and southern quadrants, with negligible winds from the western quadrant. Calms were recorded to occur approximately 0.3% of the time during the summer months.
- In autumn, winds are predominantly from the northwest quadrant with relatively high wind speed frequency from southern quadrants. Calms were recorded for approximately 0.3% of the time during the autumn months.
- In winter, winds are predominantly from the northwest and western quadrants with very few winds originating from the eastern quadrant. Calms were recorded for approximately 0.2% of the time during the winter months.
- In spring, winds from all directions with the exception of eastern quadrant are significant. The highest frequency of winds is originated from the northeast quadrant. Calms were recorded for approximately 0.3% of the time during the spring months.

Winds from the east and west directions, which would blow air emissions from the Development Site towards the nearest residential receptors occurred for 3% and 7% respectively. The wind speed frequency chart for the period 2013-2017 is shown in **Figure 4**. Wind erosion of dust from exposed surfaces (ie, during the construction phase of the development) is usually initiated when wind speeds exceed the threshold friction velocity for a given surface or material, however a general rule of thumb is that wind erosion can be expected to occur above 5 m/s (USEPA 2006). The frequency of wind speeds exceeding 5 m/s for the period 2013-2017 at Sydney Airport AWS was approximately 50%.

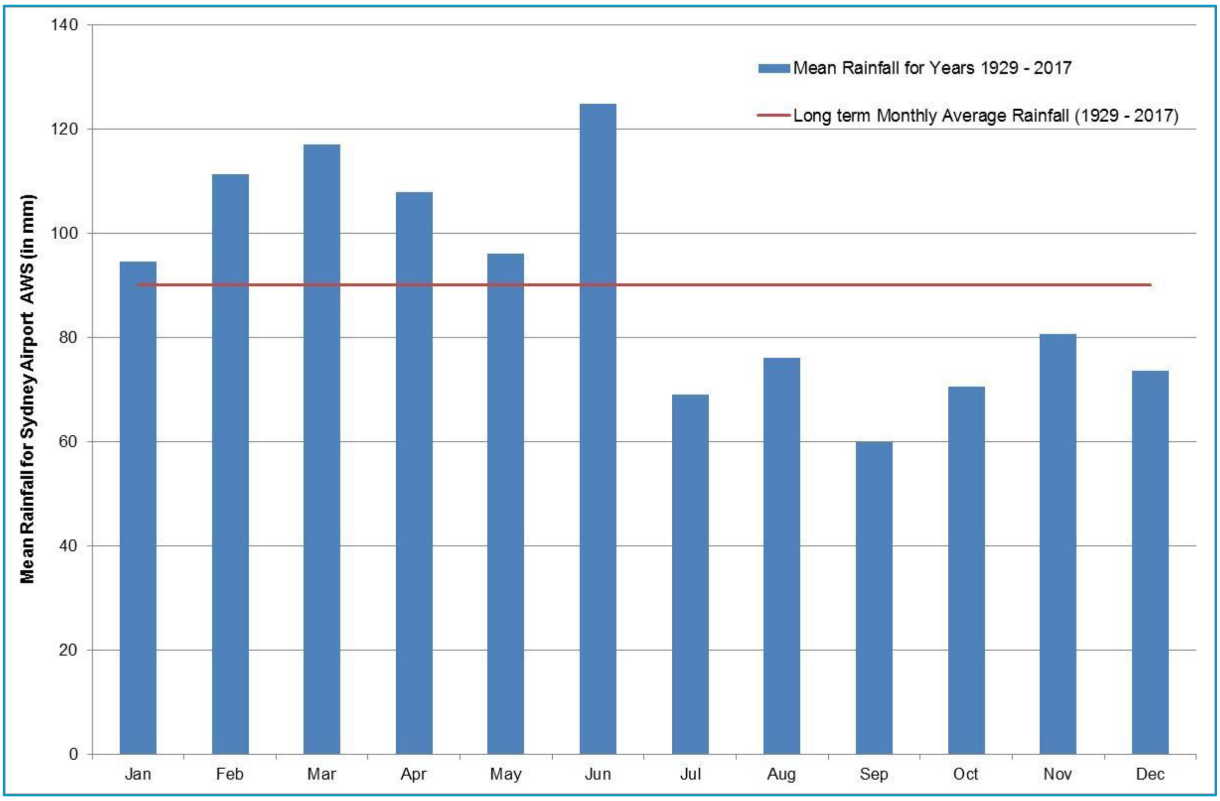
Figure 4 Wind Speed Frequency Chart for Sydney Airport AWS – 2013-2017



5.1.2 Rainfall

Dry periods (no rainfall) have the greatest potential for fugitive dust emissions during construction. The long term monthly rainfall averages recorded at Sydney Airport AWS is shown in **Figure 5**. It is noted that generally the periods between July to December have recorded the lowest monthly rainfalls compared to long term monthly average rainfall.

Figure 5 Long term Mean Rainfall for Sydney Airport AWS – 1995 to 2017



5.1.3 Summary of Meteorological Conditions

The long term wind and rainfall patterns suggest that the construction at the Development Site have the greatest potential to impact on surrounding sensitive receptors during the months of winter and spring.

5.2 Background Air Quality

Air quality monitoring is performed by the NSW Office of Environment and Heritage (OEH) at a number of monitoring stations across NSW. The closest such station is the Randwick Air Quality Monitoring Station (AQMS) (approximately 2.4 km to the northeast of the Development Site). The following air pollutants are monitored by the Randwick AQMS:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO, NO_2 and NO_X);
- Fine particles ($PM_{2.5}$ and PM_{10}); and
- Sulfur dioxide (SO_2).

It is noted however that Randwick AQMS started monitoring $PM_{2.5}$ concentrations as recently as March 2017, and is deemed unsuitable for long term analysis. Therefore, $PM_{2.5}$ data from the Earlwood AQMS (located approximately 8.5 km northwest of the Development Site) has instead been used to analyse $PM_{2.5}$ background levels.

For this assessment, a summary of the air pollutants analysed and the respective AQMSs is presented in **Table 4**.

Table 4 Air Pollutants and the Respective AQMSs

Air Pollutant	Randwick AQMS	Earlwood AQMS
Carbon monoxide (CO)	✓	×
Oxides of nitrogen (NO, NO_2 & NO_X)	✓	×
Fine particles less than 10 microns (PM_{10})	✓	×
Fine particles less than 2.5 microns ($PM_{2.5}$)	×	✓
Sulfur dioxide (SO_2)	✓	×

Air quality monitoring data recorded by the Randwick AQMS were obtained for the calendar years 2013 - 2017 and are summarised in **Table 5**. To be consistent with the NSW OEH monitoring reports, the data for gaseous pollutants are presented in parts per hundred million (pphm) or parts per million (ppm), rather than $\mu g/m^3$ and mg/m^3 as used in **Section 4.2**.

Ambient concentrations of NO_2 were below the relevant criteria for all years of available data.

A review of the data shows that exceedances of the 24-hour average PM_{10} criterion were recorded by the Randwick AQMS in 2013, 2015 and 2017. A review of the exceedances recorded during 2013 (OEH 2014), 2015 (OEH 2017) and 2017 (OEH 2018b) indicates that these were associated with natural events such as bushfires or dust storms, or hazard reduction burns.

The $PM_{2.5}$ data recorded by the Earlwood AQMS was obtained for the calendar years 2013 - 2017 and is also summarised in **Table 5**.

Exceedances of the 24-hour average $PM_{2.5}$ criterion were recorded at the Earlwood AQMS in 2013, 2015, 2016 and 2017. Exceedances of the annual average $PM_{2.5}$ criterion were recorded by the Earlwood AQMS in 2015 and 2016.

A review of the exceedances recorded during 2013 (OEH 2014), 2015 (OEH 2017), 2016 (OEH 2018a) and 2017 (OEH 2018b) indicates that they were associated with natural events such as bushfires or dust storms, or hazard reduction burns.

It has been noted the NSW EPA in their publication – Air Quality in NSW (EPA 2017b) that air quality is generally good in New South Wales based on information from the 43 station NSW Air Quality Monitoring Network. For 2013-2017, the air quality was 'very good' or 'good' for 70-85% of days in Sydney. During this time, exceedances of the national air quality standards for particle pollution have usually been associated with regional dust storms and vegetation fires.

Annual average $PM_{2.5}$ levels in Sydney are comparable to levels in other Australian cities and are low by world standards, according to a global comparison of air pollution levels conducted by the World Health Organisation (WHO) in 2016. The Australian annual average $PM_{2.5}$ standard is more stringent than standards or guideline values set by the European Union, United States and the WHO.

PM_{10} concentrations vary across years with higher levels and more exceedances occurring in bushfire and dust storm affected years. Dry El Niño years (2002–2007) have been associated with a greater frequency of bushfires and dust storms and therefore higher particle pollution levels. Lower particle pollution levels have occurred during wetter La Niña years (2010–2012). Regional dust storms, bushfires and planned burns contributed significantly to particle levels in 2009, 2013 and 2016 respectively.

Table 5 Summary of Randwick AQMS Data (2013 – 2017)

Pollutant	Averaging Period	Criteria	Year	Randwick AQMS		Units
				Maximum Concentration	Number of Exceedances	
NO_2	1-hour	12 pphm	2013	4.6	0	pphm
			2014	4.7	0	pphm
			2015	4.3	0	pphm
			2016	4.4	0	pphm
			2017	4.1	0	pphm
	Annual	3 pphm	2013	0.7	0	pphm
			2014	0.6	0	pphm
			2015	0.9	0	pphm
			2016	0.8	0	pphm
			2017	0.7	0	pphm
PM_{10}	24-hour	50 µg/m^3	2013	55[1]	3	µg/m^3
			2014	46	0	µg/m^3
			2015	77[1]	1	µg/m^3
			2016	44	0	µg/m^3
			2017	56[1]	1	µg/m^3
	Annual	25 µg/m^3	2013	19	0	µg/m^3
			2014	18	0	µg/m^3
			2015	19	0	µg/m^3
			2016	18	0	µg/m^3
			2017	19	0	µg/m^3
Pollutant	**Averaging Period**	**Criteria**	**Year**	**Earlwood AQMS**		**Units**
				Maximum Concentration	**Number of Exceedances**	
$PM_{2.5}$	24-hour	25 µg/m^3	2013	37[2]	4	µg/m^3
			2014	23	0	µg/m^3
			2015	28[3]	2	µg/m^3
			2016	33[4]	5	µg/m^3
			2017	51[5]	2	µg/m^3
	Annual	8 µg/m^3	2013	7.9	0	µg/m^3
			2014	7.8	0	µg/m^3
			2015	8.5	1	µg/m^3
			2016	8.1	1	µg/m^3
			2017	7.3	0	µg/m^3

Notes:
1 The maximum 24-hour average PM_{10} concentrations were recorded on 8 November 2013, 6 May 2015 and 14 August 2017.
2 For 2013, the maximum 24-hour average $PM_{2.5}$ was recorded on 17 May 2013.
3 For 2015, the maximum 24-hour average $PM_{2.5}$ was recorded on 21 August 2015.
4 For 2016, the maximum 24-hour average $PM_{2.5}$ was recorded on 9 May 2016.
5 For 2017, the maximum 24-hour average $PM_{2.5}$ was recorded on 14 August 2016.

6 Assessment of Dust Emissions During Construction

6.1 Construction Dust Risk Assessment Methodology

For this assessment, the *IAQM Guidance on the Assessment of Dust from Demolition and Construction* developed in the United Kingdom by the Institute of Air Quality Management ([IAQM], Holman *et al* 2014) has been used to provide a qualitative assessment method (refer to **Appendix A** for full methodology). The IAQM method uses a four-step process for assessing dust impacts from construction activities:

- **Step 1**: Screening based on distance to the nearest sensitive receptor; whereby the sensitivity to dust deposition and human health impacts of the identified sensitive receptors is determined.
- **Step 2**: Assess risk of dust effects from activities based on:
  - the scale and nature of the works, which determines the potential dust emission magnitude; and
  - the sensitivity of the area surrounding dust-generating activities.
- **Step 3**: Determine site-specific mitigation for remaining activities with greater than negligible effects.
- **Step 4**: Assess significance of remaining activities after management measures have been considered.

6.2 Construction Phase Dust Risk Assessment

6.2.1 Step 1 – Screening Based on Separation Distance

As noted in **Section 2.1**, the nearest commercial (medium sensitivity) and residential (high sensitivity) receptor is located approximately 60 m and 480 m respectively from the nearest Development Site boundary. It is understood that the nearest proposed commercial receptor will be located approximately 30 m from the nearest Development Site boundary.

As the sensitive receptors are located within 350 m from the boundary of the site and less than 50 m from the route used by construction vehicles on public roads, it is deemed that the nearest receptor is located within 500 m from the site entrance, therefore further assessment is required.

6.2.2 Step 2a – Assessment of Scale and Nature of the Works

Based upon the above assumptions and the IAQM definitions presented in **Appendix A**, the dust emission magnitudes have been categorised as presented in **Table 6**.

Table 6 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Earthworks	Large	Total site area greater than 10,000 m^2, potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t. *Total area where the earthworks will be undertaken at the Development Site is estimated to be approximately 34,130 m^2* (**Section 2.2**).

Activity	Dust Emission Magnitude	Basis
Construction	Large	Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting. *The total volume of new buildings is estimated to be approximately 217,800 m^3. This is based on total building area of 21,780 m^2 and average height of 10 m.*
Trackout	Small	Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

6.2.3 Step 2b – Risk Assessment

6.2.3.1 Receptor Sensitivity

Based on the criteria listed in **Table A1** in **Appendix A**, the sensitivity of the identified receptors in this study is concluded to be *medium* for health impacts and *medium* for dust soiling, as they include residential areas where people may be reasonably expected to be present continuously as part of the normal pattern of land use.

6.2.3.2 Sensitivity of an Area

Based on the classifications shown in **Table A2** and **Table A3** in **Appendix A**, the sensitivity of the area to dust soiling and health effects may be classified as '*low*' and '*low*' respectively. This categorisation has been made taking into account the individual receptor sensitivities derived above, the annual mean background PM_{10} concentration of 18.6 µg/m^3 recorded at Randwick AQMS (see **Section 5.2**) and the anticipated number of sensitive receptors present in the vicinity of the Development Site.

6.2.3.3 Risk Assessment

Given the sensitivity of the general area is classified as '*low*' for dust soiling and *'low'* for health effects, and the dust emission magnitudes for the various construction phase activities as shown in **Table 6**, the resulting risk of air quality impacts is as presented in **Table 7**.

Table 7 Preliminary Risk of Air Quality Impacts from Construction Activities (Uncontrolled)

Impact	Sensitivity of Area	Dust Emission Magnitude			Preliminary Risk		
		Earthworks	Construction	Trackout	Earthworks	Construction	Trackout
Dust Soiling	Low	Large	Large	Small	Low Risk	Low Risk	Negligible
Human Health	Low				Low Risk	Low Risk	Negligible

The results indicate that there is a low risk of adverse dust soiling and a low risk of human health impacts occurring at the off-site sensitive receptor locations if no mitigation measures were to be applied to control emissions during the works.

6.2.4 Step 3 - Mitigation Measures

A reappraisal of the predicted unmitigated air quality impacts on sensitive receptors has been performed to demonstrate the opportunity for minimising risks associated with the use of mitigation strategies. These are termed 'residual impacts'.

Table 8 lists the relevant mitigation measures designated as *highly recommended* (H) or *desirable* (D) by the IAQM methodology for a development shown to have a low risk of adverse impacts. Not all these measures would be practical or relevant to the proposed Development Site, however they will be relevant for the initial stage of site clearing and stripping until the new capping layer is in place. This period of works will likely be relatively short and estimated at say 4 – 6 weeks. Piling for the new deck will therefore take place once the site has been capped. The capping layer should therefore minimise any dust impacts on neighbouring sites.

A detailed review of the recommendations should be performed as part of the development of the Construction Environmental Management Plan (CEMP) and the most appropriate measures adopted.

Table 8 Site-Specific Management Measures Recommended by the IAQM

	Activity	
1	**General**	
1.1	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
1.2	Display the head or regional office contact information.	H
1.3	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.	D
2	**Site Management**	
2.1	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.	H
2.2	Make the complaints log available to the local authority when asked.	H
2.3	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	H
3	**Monitoring**	
3.1	Perform daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary.	D
3.2	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	H
3.3	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 prolonged dry or windy conditions.	H
4	**Preparing and Maintaining the Site**	
4.1	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
4.2	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	D

	Activity	
4.3	Keep site fencing, barriers and scaffolding clean using wet methods.	D
4.4	Cover, seed or fence stockpiles to prevent wind erosion	D
5	Operating Vehicle/Machinery and Sustainable Travel	
5.1	Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable	H
5.2	Ensure all vehicles switch off engines when stationary - no idling vehicles	H
5.3	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable	H
6	Operations	
6.1	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate	H
6.2	Use enclosed chutes and conveyors and covered skips	H
6.3	Minimise drop heights from loading shovels and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate	H
7	Waste Management	
7.1	Avoid bonfires and burning of waste materials.	H
8	Trackout	
8.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	D
8.2	Avoid dry sweeping of large areas.	D
8.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D
8.4	Record all inspections of haul routes and any subsequent action in a site log book.	D
8.5	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D

H = Highly recommended; D = Desirable

The mitigated dust deposition and human health impacts during the construction phase of the development is anticipated to be *negligible*, as the site will be stripped and open for only a short period of time before it is capped with geotextile and a road base cap. For almost all construction activity, the IAQM Methods notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

6.2.5 Step 4 - Residual Impacts

A reappraisal of the predicted unmitigated air quality impacts on sensitive receptors has been performed to demonstrate the opportunity for minimising risks associated with the use of mitigation strategies. These are termed 'residual impacts'. The results of the reappraisal are presented below in **Table 9**.

Table 9 Residual Risk of Air Quality Impacts from Construction

Impact	Sensitivity of Area	Residual Risk		
		Earthworks	Construction	Trackout
Dust Soiling	Low	Negligible	Negligible	Negligible
Human Health	Low	Negligible	Negligible	Negligible

The mitigated dust deposition and human health impacts for earthworks activities are anticipated to be *negligible*. For almost all construction activity, the IAQM Methods notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

7 Assessment of Impacts from Warehouse Operations

As discussed in **Section 2.3**, air quality issues associated with the proposed warehouse operations predominantly relate to emissions of wheel generated dust and products of combustion from trucks and other vehicles accessing and idling at the site.

These emissions will be of a similar nature to existing emissions from traffic on McPherson Street and Botany Road (major road in the area). However the scale and magnitude of emissions from the Development Site will be significantly lower for the Development Site, compared to the estimated annual average daily traffic on Botany Road of ~51,000 vehicles day). It is noted that the traffic volumes for Botany Road are estimated based on 2018 traffic volumes available at Wentworth Avenue, Botany (sourced from RMS Traffic Volume Viewer[1]). To assess the risk of air emissions from the Development Site impacting on surrounding sensitive receptors during the operational phase, the following "risk based" approach has therefore been adopted.

The risk-based assessment takes account of a range of impact descriptors, including the following:

- **Nature of Impact**: does the impact result in an adverse, neutral or beneficial environment?

  The nature of impact is anticipated to be *neutral* to the environment.

- **Receptor Sensitivity**: how sensitive is the receiving environment to the anticipated impacts?

  The nearest sensitive receptors to the Development Site include residences approximately 600 m to the east (see **Section 2.1**). In terms of the methodology in **Appendix B**, the sensitivity of the surrounding residential areas to emissions from the Development Site should be considered *high*.

- **Magnitude**: what is the anticipated scale of the impact?

  Based on the small amount of traffic movements on site, the magnitude of these emissions considered to be *negligible*.

Given the above considerations, and the scale of operations, the potential impact of the Development Site on the local sensitive receptors is concluded to be ***neutral*** for all receptors (see **Table 10**).

Table 10 Impact Significance

Magnitude / Sensitivity	Substantial Magnitude	Moderat Magnitude	Slight Magnitude	Negligible Magnitude
Very High Sensitivity	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

[1] http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/aadt-map/index.html#/?z=15&lat=-33.94096185373267&lon=151.20037799569195&yr=2017&id=16129

8 Conclusion

SLR was commissioned by Orica to prepare an AQIA for the proposed warehouses to be located at 28 McPherson Street, Banksmeadow.

This report has been prepared to form part of a State Significant Development Application (SSDA) for the construction and operation of a warehouse estate, comprising of:

- a suspended concrete platform above the flood detention basin to support warehouse buildings and hardstand / parking areas; and
- construction of two warehouse buildings for the storage and distribution of general merchandise including goods arriving from Port Botany.

The aim of this AQIA is to determine the risk associated with the potential air quality impacts associated with the construction and operations of the proposed development.

Available meteorological data from nearest meteorological station located at Sydney Airport have been examined to provide an estimate of the prevailing wind environment in the local area. This review indicated that winds from the east and west directions, which would direct air emissions from the Development Site towards the nearest residential receptors occur for 3% to 7% of the time. In addition, construction activities at the Development Site have the greatest potential to impact on receptors located towards the north and east of the Development Site during the months of winter and spring, based on the low rainfall and conducive wind directions during these seasons. Additional controls may be required (higher levels of watering for example) if construction occurs at these times.

The findings of the assessment are as follows:

- Off-site impacts associated with dust deposition and suspended particulate during the construction phase are anticipated to be *negligible* for construction activities, as the site will be stripped and open for only a short period of time before it is capped with geotextile and a road base cap . A range of mitigation measures have been recommended for consideration as part of the CEMP.
- The potential for offsite air impacts from the operations at the Development Site is concluded to be *neutral*.

Based on the above, it is concluded that the risk of any exceedances of air quality criteria at nearby industrial or residential receptors due to air emissions from the Development Site is expected to be minimal.

9 References

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APPENDIX A

CONSTRUCTION PHASE RISK ASSESSMENT METHODOLOGY

Step 1 – Screening Based on Separation Distance

The Step 1 screening criteria provided by the IAQM guidance suggests screening out any assessment of impacts from construction activities where sensitive receptors are located more than 350 m from the boundary of the site, more than 50 m from the route used by construction vehicles on public roads and more than 500 m from the site entrance. This step is noted as having deliberately been chosen to be conservative, and will require assessments for most projects.

Step 2a – Assessment of Scale and Nature of the Works

Step 2a of the assessment provides "dust emissions magnitudes" for each of four dust generating activities; demolition, earthworks, construction, and track-out (the movement of site material onto public roads by vehicles). The magnitudes are: *Large*; *Medium*; or *Small*, with suggested definitions for each category. The definitions given in the IAQM guidance for earthworks, construction activities and track-out, which are most relevant to this Development, are as follows:

Demolition *(Any activity involved with the removal of an existing structure [or structures]. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time)*:

- ***Large***: Total building volume >50,000 m^3, potentially dusty 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 <10m above ground, demolition during wetter months.

Earthworks *(Covers the processes of soil-stripping, ground-levelling, excavation and landscaping)*:

- ***Large***: Total site area greater than 10,000 m^2, potentially dusty soil type (eg clay, which will be prone to suspension when dry due to small particle size), more than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 8 m in height, total material moved more than 100,000 t.
- ***Medium***: Total site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (eg silt), 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 4 m to 8 m in height, total material moved 20,000 t to 100,000 t.
- ***Small***: Total site area less than 2,500 m^2, soil type with large grain size (eg sand), less than five heavy earth moving vehicles active at any one time, formation of bunds less than 4 m in height, total material moved less than 20,000 t, earthworks during wetter months.

Construction *(Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc)*:

- ***Large***: Total building volume greater than 100,000 m^3, piling, on site concrete batching; sandblasting.

- ***Medium***: Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (eg concrete), piling, on site concrete batching.
- ***Small***: Total building volume less than 25,000 m^3, construction material with low potential for dust release (eg metal cladding or timber).

Track-out *(The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network)*:

- ***Large***: More than 50 heavy vehicle movements per day, surface materials with a high potential for dust generation, greater than 100 m of unpaved road length.
- ***Medium***: Between 10 and 50 heavy vehicle movements per day, surface materials with a moderate potential for dust generation, between 50 m and 100 m of unpaved road length.
- ***Small***: Less than 10 heavy vehicle movements per day, surface materials with a low potential for dust generation, less than 50 m of unpaved road length.

Note: No demolition of existing structures will be performed as part of this Development.

In order to provide a conservative assessment of potential impacts, it has been assumed that if at least one of the parameters specified in the 'large' definition is satisfied, the works are classified as large, and so on.

Step 2b – Risk Assessment

Assessment of the Sensitivity of the Area

Step 2b of the assessment process requires the sensitivity of the area to be defined. The sensitivity of the area takes into account:

- The specific sensitivities that identified sensitive receptors have to dust deposition and human health impacts;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Other site-specific factors, such as whether there are natural shelters such as trees to reduce the risk of wind-blown dust.

Individual receptors are classified as having *high*, *medium* or *low* sensitivity to dust deposition and human health impacts (ecological receptors are not addressed using this approach). The IAQM method provides guidance on the sensitivity of different receptor types to dust soiling and health effects as summarised in **Table A1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table A1 IAQM Guidance for Categorising Receptor Sensitivity

Value	High Sensitivity Receptor	Medium Sensitivity Receptor	Low Sensitivity Receptor
Dust soiling	Users can reasonably expect a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling, and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land.	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	The enjoyment of amenity would not reasonably be expected; or Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
	Examples: Dwellings, museums, medium and long term car parks and car showrooms.	*Examples: Parks and places of work.*	*Examples: Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.*
Health effects	Locations where the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).	Locations where human exposure is transient.
	Examples: Residential properties, hospitals, schools and residential care homes.	*Examples: Office and shop workers, but will generally not include workers occupationally exposed to PM10.*	*Examples: Public footpaths, playing fields, parks and shopping street.*

According to the IAQM methods, the sensitivity of the identified individual receptors (as described above) is then used to assess the *sensitivity of the area* surrounding the active construction area, taking into account the proximity and number of those receptors, and the local background PM_{10} concentration (in the case of potential health impacts) and other site-specific factors. Additional factors to consider when determining the sensitivity of the area include:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area and if relevant, the season during which the works will take place;
- any conclusions drawn from local topography;
- the duration of the potential impact (as a receptor may be willing to accept elevated dust levels for a known short duration, or may become more sensitive or less sensitive (acclimatised) over time for long-term impacts); and

- any known specific receptor sensitivities which go beyond the classifications given in the IAQM document.

The IAQM guidance for assessing the sensitivity of an area to dust soiling is shown in **Table A2**. The sensitivity of the area should be derived for each of activity relevant to the project (ie construction and earthworks).

Table A2 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of receptors	Distance from the source (m)			
		<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

Note: Estimate the total number of receptors within the stated distance. Only the *highest level* of area sensitivity from the table needs to be considered. For example, if there are 7 high sensitivity receptors < 20m of the source and 95 high sensitivity receptors between 20 and 50 m, then the total of number of receptors < 50 m is 102. The sensitivity of the area in this case would be high.

A modified version of the IAQM guidance for assessing the *sensitivity of an area* to health impacts is shown in **Table A3**. For high sensitivity receptors, the IAQM methods takes the existing background concentrations of PM_{10} (as an annual average) experienced in the area of interest into account and is based on the air quality objectives for PM_{10} in the UK. As these objectives differ from the ambient air quality criteria adopted for use in this assessment (ie an annual average of 19.8 µg/m^3 for PM_{10}) the IAQM method has been modified slightly.

This approach is consistent with the IAQM guidance, which notes that in using the tables to define the *sensitivity of an area*, professional judgement may be used to determine alternative sensitivity categories, taking into account the following factors:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area, and if relevant the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact; and
- any known specific receptor sensitivities which go beyond the classifications given in this document.

Table A3 IAQM Guidance for Categorising the Sensitivity of an Area to Dust Health Effects

Receptor sensitivity	Annual mean PM_{10} conc.	Number of receptors [a,b]	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	21-25 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	17-21 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<17 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>25 µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	21-25 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	17-21 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<17 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Notes:

(a) Estimate the total within the stated distance (e.g. the total within 350 m and not the number between 200 and 350 m); noting that only the highest level of area sensitivity from the table needs to be considered.

(b) In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties.

Risk Assessment

The dust emission magnitude from Step 2a and the receptor sensitivity from Step 2b are then used in the matrices shown in **Table A4** (earthworks and construction) and **Table A5** (track-out) to determine the risk category with no mitigation applied.

Table A4 Risk Category from Earthworks and Construction Activities

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

Table A5 Risk Category from Track-out Activities

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

APPENDIX B

OPERATIONAL PHASE RISK ASSESSMENT METHODOLOGY

Nature of Impact

Predicted impacts may be described in terms of the overall effect upon the environment:

- **Beneficial**: the predicted impact will cause a beneficial effect on the receiving environment.
- **Neutral**: the predicted impact will cause neither a beneficial nor adverse effect.
- **Adverse**: the predicted impact will cause an adverse effect on the receiving environment.

Receptor Sensitivity

Sensitivity may vary with the anticipated impact or effect. A receptor may be determined to have varying sensitivity to different environmental changes, for example, a high sensitivity to changes in air quality, but low sensitivity to noise impacts. Sensitivity may also be derived from statutory designation which is designed to protect the receptor from such impacts.

Sensitivity terminology may vary depending upon the environmental effect, but generally this may be described in accordance with the following broad categories - Very high, High, Medium and Low.

Table B1 outlines the methodology used in this study to define the sensitivity of receptors to air quality impacts.

Table B1 Methodology for Assessing Sensitivity of a Receptor

Sensitivity	Criteria
Very High	Receptors of very high sensitivity to air pollution (e.g. dust or odour) such as: hospitals and clinics, and retirement homes.
High	Receptors of high sensitivity to air pollution, such as: schools, residential areas, food retailers, glasshouses and nurseries.
Medium	Receptors of medium sensitivity to air pollution, such as: farms / horticultural land, offices/recreational areas, painting and furnishing, hi-tech industries and food processing, and outdoor storage (ie new cars).
Low	All other air quality sensitive receptors not identified above, such as light and heavy industry.

Magnitude

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. Magnitude may be described quantitatively or qualitatively. Where an impact is defined by qualitative assessment, suitable justification is provided in the text.

Table B2 Magnitude of Impacts

Magnitude	Description
Substantial	Impact is predicted to cause significant consequences on the receiving environment (may be adverse or beneficial)
Moderate	Impact is predicted to possibly cause statutory objectives/standards to be exceeded (may be adverse)
Slight	Predicted impact may be tolerated.
Negligible	Impact is predicted to cause no significant consequences.

Significance

The risk-based matrix provided below illustrates how the definition of the sensitivity and magnitude interact to produce impact significance.

Table B3 Impact Significance Matrix

Magnitude / Sensitivity		[Defined by Table B2]			
		Substantial Magnitude	**Moderate Magnitude**	**Slight Magnitude**	**Negligible Magnitude**
[Defined by TableB1]	**Very High Sensitivity**	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	Major/ Intermediate Significance	Intermediate Significance	Intermediate/Minor Significance	Neutral Significance
	Medium Sensitivity	Intermediate Significance	Intermediate/Minor Significance	Minor Significance	Neutral Significance
	Low Sensitivity	Intermediate/Minor Significance	Minor Significance	Minor/Neutral Significance	Neutral Significance

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