HORSLEY DRIVE BUSINESS PARK - CFC

Air Quality Assessment

Prepared for:

FDC Construction (NSW) Pty Ltd
22 - 24 Junction Street
Forest Lodge NSW 2037

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BASIS OF REPORT

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DOCUMENT CONTROL

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1 Introduction

FDC Construction & Fitout Pty Ltd (FDC), proposes a large-scale warehousing and distribution facility (the Project) at the Horsley Drive Business Park (HDBP) -CFC, located west of Cowpasture Road, NSW (the Project Site).

1.1 Background

HDBP is a cluster of regional business hubs located in Western Sydney Parkland (WSP), situated approximately 1.5 km to the east of the M7 Motorway, and immediately west of Wetherill Park Industrial Precinct. HDBP CFC (the Project Site) is situated to the north of the recently constructed HDBP Stage 1, with frontages along Cowpasture Road to the east and Trivet Street to the north-east (see **Figure 1**).

The Concept Proposal for HDBP CFC obtained Development Consent (SSD 7664) on 9 November 2017 from the New South Wales Department of Planning and Environment (NSW DPE). The proposed development of the individual lots, buildings and structures associated with future uses is subject to separate development applications.

The Proposal consists of construction and operation of a 24-hour warehouse and distribution centre, encompassing offices, car parking, delivery vehicle unloading and loading areas, landscaping and supporting infrastructure within the HDBP.

The site is located within Lots 17-22 DP 13961 and Lot 2 DP 1212087 within the Fairfield local government area.

1.2 Purpose of this Report

The purpose of this report is to address the Secretary's Environmental Assessment Requirements (SEARs) pertaining to potential air quality impacts as shown in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements, SDD10404, 18 December 2019

Key Issue	Assessment Requirement	Addressed in Section
11. Air Quality	A description of all air quality impacts (including dust) from the development, particularly from the outdoor storage area.	**Section 8**
	Details of dust control during site preparation and civil works.	**Section 7**

1.3 Approach to Assessment

Detailed information on the proposed operational activities within the building (ventilation rates, potential emission rates, location of ventilation stacks, etc.) is not yet available. A large number of assumptions would therefore be required to be used as input to any quantitative (i.e. air dispersion modelling) assessment. Similarly, a quantitative modelling assessment of potential dust emissions associated with the construction activities would also require a number of assumptions to be made to enable the estimation of particulate emission rates for input into the models. The uncertainty associated with the output of such studies means it would be of limited value and would not (in itself) assist with the identification of air quality control measures to actively manage the risks.

SLR has therefore performed a qualitative (risk-based) assessment of both construction and operational impacts, based on the information available, to identify those activities that have the potential for off-site air quality impacts if not adequately controlled, so that appropriate mitigation measures can be identified and incorporated into the project design and relevant environmental management plans.

1.3.1 Construction Impact Assessment Methodology

For the assessment of construction phase impacts, 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, 2014), has been used to provide a qualitative assessment method (see **Appendix A** for full methodology). The IAQM method uses a four-step process for assessing potential 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.

1.3.2 Operational Impact Assessment Methodology

A risk-based qualitative assessment approach has been adopted for the proposed operational activities at the Project Site (see **Appendix B** for full methodology). This risk-based assessment methodology takes account of a range of impact descriptors, including the following:

- **Nature of Impact**: does the impact result in an adverse or beneficial environment?
- **Sensitivity**: how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.
- **Magnitude**: what is the anticipated scale of the impact?

The integration of sensitivity with impact magnitude is used to derive the predicted significance of that change. Given the nature of the operations proposed to be performed, and the limited design data currently available, it is considered that this approach is appropriate to identify those key activities that have the potential to give rise to off-site air quality impacts, in order that recommended mitigation measures may be identified. If appropriate, these recommendations may include further detailed modelling assessment of key activities to confirm that the proposed mitigation measures will ensure compliance with relevant air quality criteria, once detailed design data is available.

2 Project Description

2.1 Site Location

The Project Site is located on the corner of Cowpasture Road and Trivet Street, Wetherill Park within Western Sydney Parklands (WSP) and is 30 kilometres (km) west of the Sydney Central Business District and covers approximately 16.5 hectares (ha) of WSP zoned land (see **Figure 1**).

Figure 1 Locational Context and Aerial View

2.2 The Proposed Development

The Project, which is proposed to operate on a 24-hour basis, is proposed to include:

- A Customer Fulfillment Centre (CFC) facility with ancillary office spaces and utilities buildings accommodating approximately 30,135m^2;

- Approximately 538 car parking spaces and 276 van parking spaces;
- Associated hardstand vehicle parking, loading and manoeuvring areas; and
- Associated landscaping.

The proposed operations include the receival, storage handling and dispatch of food and groceries associated with on-line retail. The operations include:

- Product delivery and storage;
- Product retrieval and packaging;
- Product preparation (bakery);
- Dispatch and distribution; and
- Ancillary office administration.

3 Project Setting

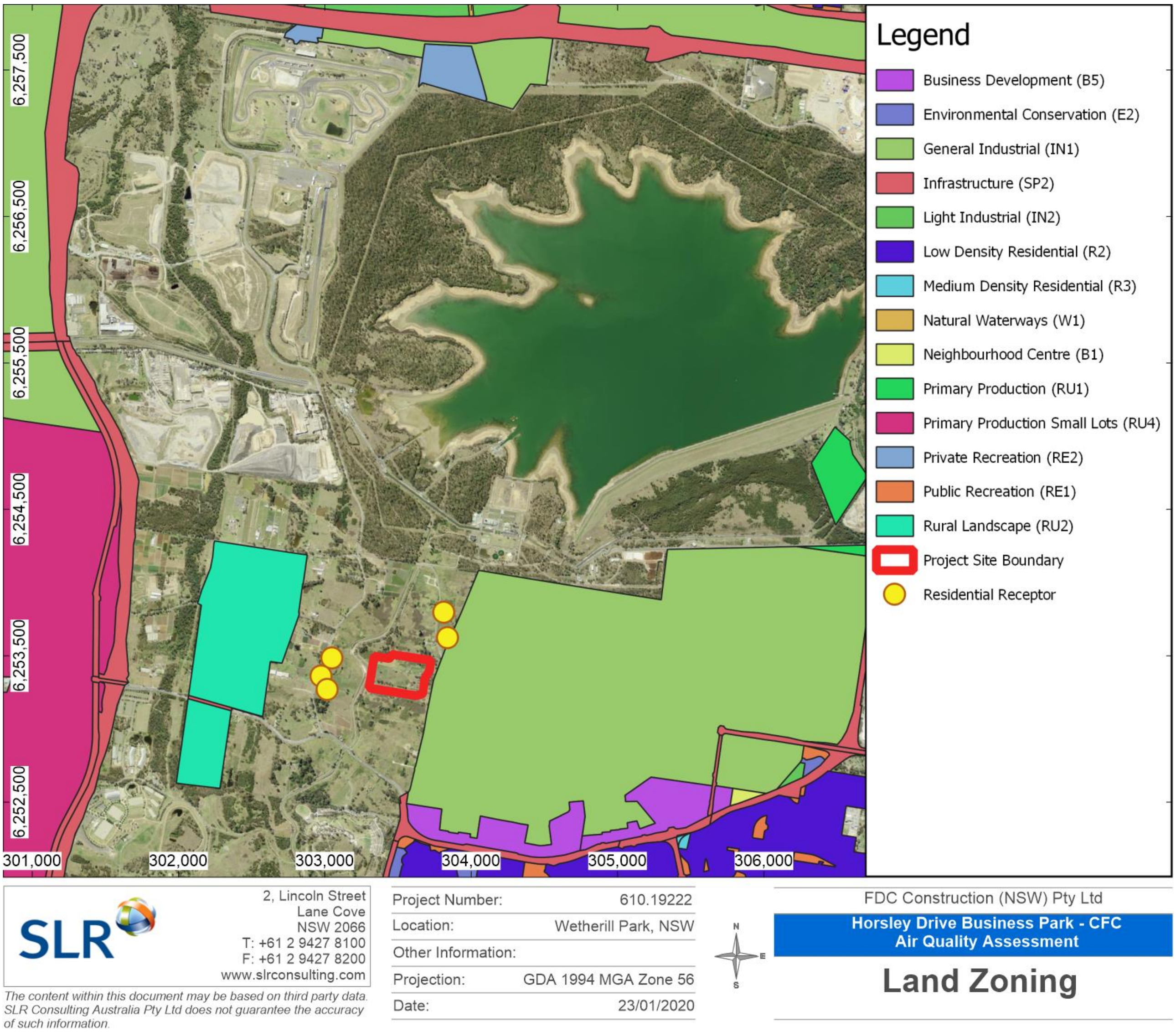
3.1 Sensitive Receptors

The Project Site is currently subject to the land use and development control provisions of the State Environmental Planning Policy (Western Sydney Parklands) 2009 (WSP SEPP). The area surrounding the Project Site includes land subject to WSP SEPP to the north west and south and land zoned General Industrial (IN1) to the east.

To the north and west of the Project Site are predominately agricultural uses with some scattered residential receptors. To the east of the Project Site is the Wetherill Park industrial precinct which contains over 570 ha of a variety of light industrial, warehouse and storage uses. To the south of the Project Site is the recently constructed HDBP Stage 1.

The nearest residential receptors are located approximately 60 m to the east and 130 m to the north-east of the Project Site Boundary. **Figure 2** illustrates the surrounding land zoning as specified in the *Fairfield Local Environmental Plan* 2013 and *Blacktown Local Environmental Plan* 2015 as well as the location of the closest nearby residential receptors.

Figure 2 Land Zoning of Surrounding Land



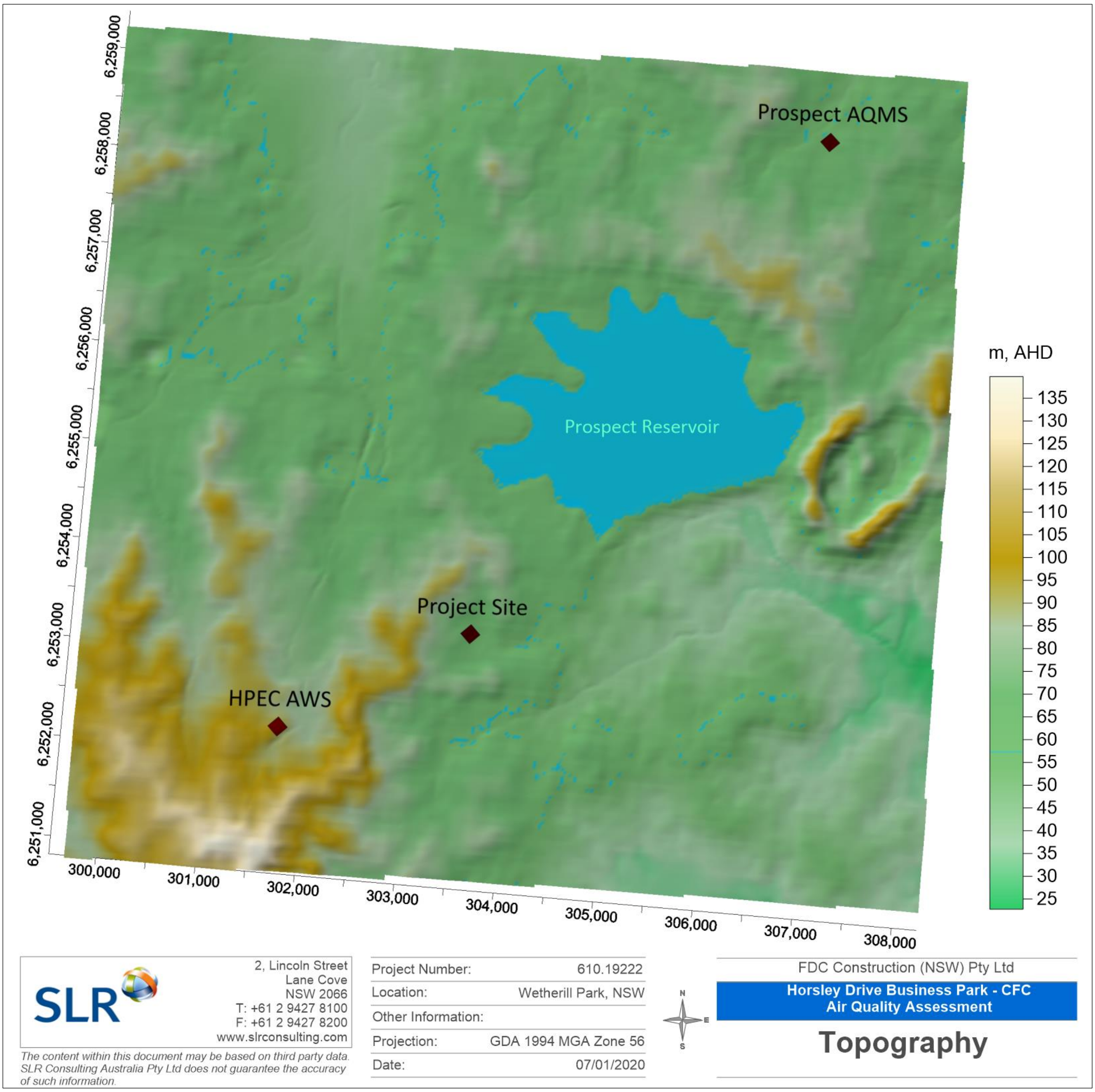
3.2 Local Topography

Topography is important in air quality studies as local atmospheric dispersion can be influenced by night-time katabatic (downhill) drainage flows from elevated terrain or channelling effects in valleys or gullies.

A three-dimensional representation of the area surrounding the Project Site is given in **Figure 3**. The topography of the local area ranges from an approximate elevation of 25 metres (m) to 135 m Australian Height Datum (AHD).

The topography of the Project Site itself comprises undulating rolling hills sloping marginally from west to east, with gradients ranging from two to ten degrees and is predominately cleared of natural vegetation, with some isolated clusters of trees.

Figure 3 Topography of Area Surrounding the Project Site



3.3 Local Meteorological Conditions

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) will also influence dispersion.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station to the Project Site is the Horsley Park Equestrian Centre Automatic Weather Station (HPEC AWS), which is located approximately 2 km to the southwest of the Project Site.

Annual and seasonal wind roses for the years 2014-2018 (inclusive), compiled from data recorded by the HPEC AWS is presented in **Figure 4**. 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.

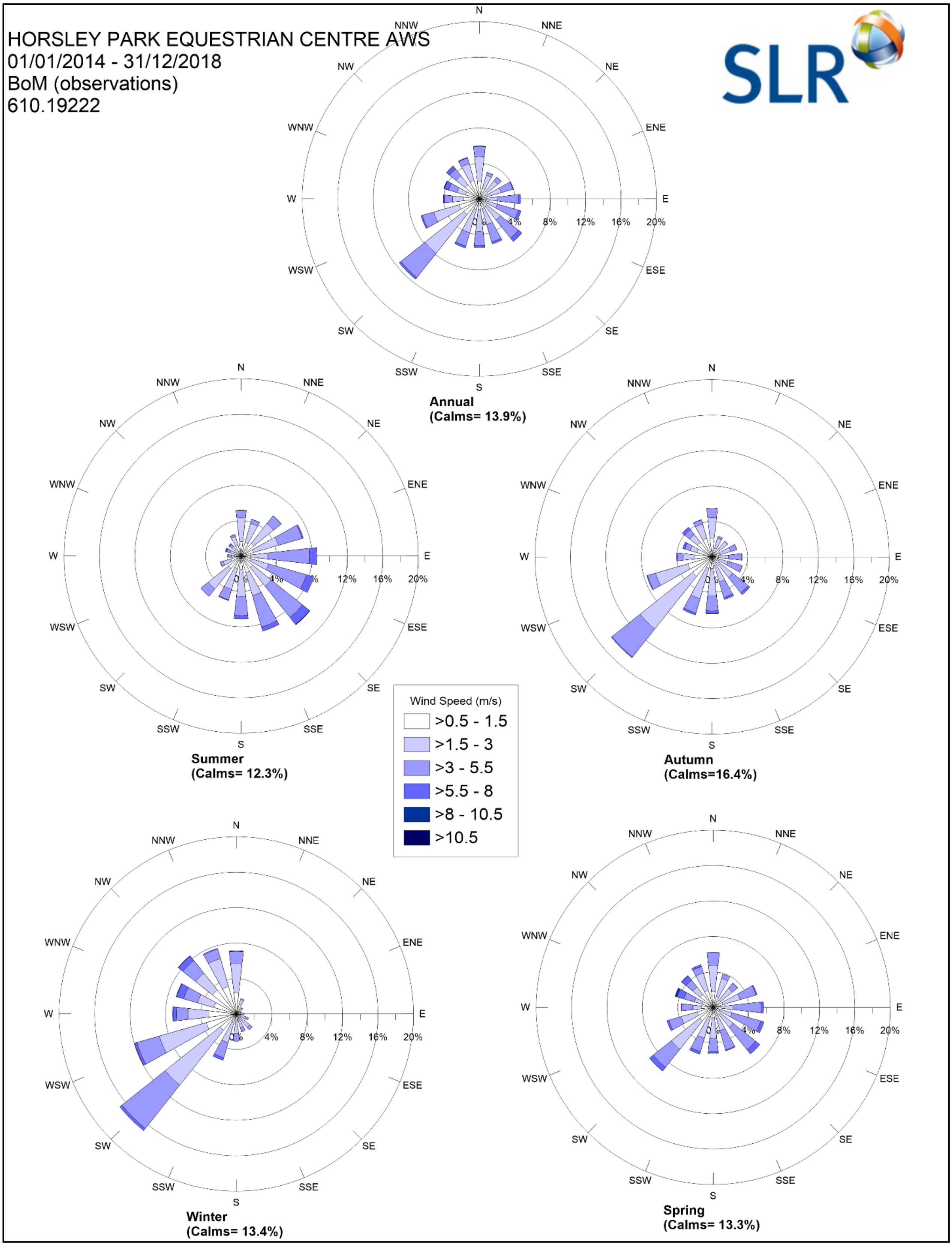
The annual wind rose indicates the predominant wind directions in the area are from southwest. Calm wind conditions (wind speed less than 0.5 m/s) were predicted to occur approximately 13.9% of the time throughout the investigated period. The average seasonal wind roses for the year 2014-2018 indicate that:

- In summer, winds are mostly gentle (between 3.0 m/s and 5.5 m/s) predominantly from the southeast quadrant, with very few winds from the northwest quadrant. Calms were predicted to occur 12.3% of the time during the summer months.
- In autumn, winds are light to gentle (between 0.5 m/s and 5.5 m/s) predominantly from the southwest direction, with very few winds from the northeast. Calms were predicted to occur 16.4% of the time during the autumn months.
- In winter, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and are from the southwest direction, with very few winds from the eastern quadrant. Calms were predicted to occur 13.4% of the time during the winter months.
- In spring, winds are mostly light to gentle (between 0.5 m/s and 5.5 m/s) and blow from all directions with the majority blowing from the southwest. Calms were predicted to occur 13.3% of the time during the summer months.

As identified in **Section 3.1**, the closest existing sensitive receptors are located east and northeast of the Project Site boundary. Winds from between the west and southwest directions, which would blow air emissions from the Project Site towards the existing residences, occur approximately 27% of the time.

It is noted that given the topographical features between the Project Site and HPEC AWS (see **Figure 3**), the actual winds experienced at the Project Site may be different to those recorded by the AQMS station.

Figure 4 Horsley Park Equestrian Centre AWS Annual and Seasonal Wind Roses 2014-2018



4 Pollutants of Concern

4.1 Air Emission Sources - Construction Phase

Potential air emissions associated with the construction phase include:

- Fugitive dust emissions from construction of buildings and other structures; and
- Products of combustion from construction plant and machinery.

4.1.1 Dust Emissions from Construction Phase Activities

During the construction phase, the potential for dust to be emitted from the Project Site will be directly influenced by the nature of the activities being performed. Activities that may lead to short-term emissions of dust, include:

- loading and unloading of materials;
- wheel-generated dust from trucks travelling along unpaved roads; and
- wind erosion of exposed surfaces and stockpiles.

These activities will need to be managed appropriately to ensure off-site impacts are minimised (refer **Section 7.2.4**).

Temporary elevation in the emissions of particulate matter and local dust is considered to be inevitable as part of the construction works, particularly where those activities are undertaken during periods of low rainfall and/or windy conditions. The impact of elevated dust emissions is dependent upon the potential for particulates to become and remain airborne prior to being deposited as dust or experienced as an ambient particulate concentration.

Based on the indicative construction schedule for the Project, construction works may require up to 18 months to complete. It is noted that dust-generating activities will not be occurring continuously throughout this period.

4.1.2 Products of Combustion from Construction Phase Plant and Machinery

Exhaust emissions from cranes, trucks, plant and other equipment associated with the construction of the Project will be a source of emissions to air during the construction phase.

Considering the size of the nature of the proposed development, air emissions from diesel-powered construction plant and machinery are anticipated to be relatively small compared to the existing background emission levels from vehicles on the surrounding road network (see **Section 4.2.3**).

4.2 Air Emission Sources - Operational Phase

Based upon a review of activities that are proposed to occur at the Project Site (presented in **Section 2.2**), potential air emission sources associated with the operational phase have been identified as follows:

- Odours and particulates from the proposed bakery;
- Odours from handling and storage of food and waste;
- Products of combustion from operational phase road traffic;

- Products of combustion from backup electricity generators; and
- Refrigerant gases from plant rooms.

A comprehensive ventilation system is being designed in order to capture and, if necessary treat, the emissions prior to release via dedicated discharge vents located on the roof of the warehouse building.

As outlined in **Section 1.3.2** detailed information on the proposed air extractions and filtration system is not yet available. However, it is noted that all ventilation systems will be designed to meet relevant Australian Standards (AS) and Building Council of Australia (BCA) requirements.

4.2.1 Odour and Particulate Emissions from Bakery

Odour is the principal air emission of concern from bakeries and is primarily generated from the cooking process. Odorous emissions from bakeries are the result of complex mixtures of odorous VOCs which are formed in the baking process as a result of chemical reactions between sugars and amino acids in the bread and breakdown of natural fats and oils.

Impacts from odorous air contaminants are often nuisance-related rather than health-related. There are various elements that are commonly regarded as combining to cause odour nuisance, which are listed below and are collectively known as the FIDOL factors:

- *Frequency:* how often the odour occurs;
- *Intensity:* how strong the odour is perceived to be;
- *Duration:* how long the odour is present for;
- *Offensiveness:* how offensive the odour is perceived to be; and
- *Location or Context:* where the person is experiencing the odour.

Other factors may also come into play when assessing odour impacts, such as:

- *Population sensitivity:* any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it may contain.
- *Background level:* whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- *Public expectation:* whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.

In addition to odour, particulates are also emitted from bakery operations in the form of fumes. Cooking methods such as solid fuel-fired cooking produce the most significant amount of particulates. It is understood that the proposed bakery will not be utilising solid fuel fired ovens for baking.

While emissions from bakery (particularly odour emissions) can be directly released into the atmosphere through openings in the building, a well-designed air extraction system is capable of capturing (and if required treating) emissions prior to release to atmosphere. The air extraction systems for the proposed bakery will be designed to meet AS and BCA requirements. It is understood that it is currently proposed that the bakery exhaust system(s) will discharge vertically above the roof level.

Odour emissions from bakeries may be effectively managed through the implementation of a combination of physical and management measures. This is discussed further in **Section 8.4**.

4.2.2 Odour Emissions from Handling and Storage of Food and Waste

If not appropriately managed, fresh food (including meat and fish products) delivered to the Project Site could be a source of odour emissions. In addition to the fresh food, organic waste produced on site also has the potential to be a source of odour emissions. The most effective way to minimise odours from the fresh food and waste storage and handling areas is by ensuring all material is stored at appropriate temperatures and that all areas are well ventilated.

Odour emissions from fresh food and waste handling and storage can be directly released into the atmosphere through openings in the buildings. While not all such emissions can be captured by air extraction systems (e.g. slightly positive pressures are required for chilled warehouse, odour emissions from waste being transferred off site will be emitted directly to atmosphere, etc.), suitable air extraction systems are being designed for all processing and storage areas to ensure odorous air is extracted in compliance with relevant AS and BCA guidelines. Moreover, it is understood that:

- Fresh food (including meat and fish products) will be vacuum packed for receivals/dispatch, minimising the potential for odour generation;
- Packing and repacking of fish and meat products will take place at the Manual Services Counter where the temperature is maintained at 2-4 °C;
- Containment measures for spillages will be provided at appropriate locations to reduce odorous emissions from waste spillages;
- Organic waste and general waste will be removed from site for off-site disposal three times per week; and
- The refrigerated warehouse ensures that all perishable food is kept at an appropriate temperature to avoid spoiling of fresh food.

Odour emissions from food and waste handling and storage may be effectively managed through the implementation of a combination of physical and management measures. Refer to **Section 8.4** for control measures.

4.2.3 Products of Combustion from Operational Phase Traffic

Emissions associated with the combustion of fuel (diesel, petrol, etc.) in road vehicles 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).

The rate and composition of air pollutant emissions from road vehicles is a function of a number of factors, including the type, size and age of the vehicles, the type of fuel combusted, number and speed of vehicles and the road gradient.

The current design includes 208 van parking spaces and 42 trailer parking bays at ground level, as well as 526 passenger car parking spaces over two levels. SLR understands that the passenger carpark is proposed to incorporate air extraction systems designed in accordance with relevant AS and BCA requirements.

In relation to traffic generated by the Project, data provided by Ason Group, who is preparing the Traffic Impact Assessment for the Project indicates that the Project will generate 2,434 vehicle movements per day. This includes:

- 202 truck movements;
- 1,178 delivery van movements; and
- 1,054 light vehicle movements.

According to Ason Group, the peak traffic generation period will be during the hour where staff depart site following the day shift (2-3pm). **Table 2** presents the breakdown of inbound and outbound traffic by vehicle type during the peak traffic generation hour.

Table 2 Project Peak Hour (2 - 3 pm) Traffic Generation

Vehicle Type	Truck Movements	Hourly
Trucks (90% Semi trailers, 10% B-Doubles)	Inbound	3
	Outbound	3
Delivery Vans	Inbound	57
	Outbound	57
Light Vehicles	Inbound	0
	Outbound	280
Total		**400**

Source: Ason Group

To put the above figures in context, the existing AM peak traffic volumes for the surrounding road network has been presented in **Table 3**.

Table 3 AM Peak Traffic Volumes – Surrounding Road Network

Location	Light Vehicle Movements	Heavy Vehicle Movements
The Horsley Dr & Cowpasture Rd Roundabout	3611	313
Cowpasture Rd & The Horsley Dr Signals	3272	631
Cowpasture Rd & Victoria St Roundabout	1532	315
Cowpasture Rd & Trivet St Intersection	1217	109

Source: Ason Group

4.2.4 Products of Combustion from Generators

Based on the current design for the Project Site, it is proposed that five (5) backup generators be installed at the Project Site for use in the event of a power outage. The proposed backup generators will be Cummins QSK60 2 megawatt (MW) diesel fired generators.

Air pollutants associated with the combustion of diesel include NO_x, CO, PM_{10}, $PM_{2.5}$, SO_2 and VOCs. As outlined in **Section 5.1**, the NSW POEO (Clean Air) Regulation 2010 exempts emergency standby plant (comprising a stationary reciprocating internal combustion engine for generating electricity) from the air impurities standard for NO_X specified in Schedule 4 in relation to that plant if the plant is used for a total of not more than 200 hours per year (see **Table 5**). Given the proposed uses of the diesel fired equipment (i.e. on standby for emergency use only), these units are not considered to represent a significant constraint to the development or sufficient to warrant further assessment.

4.2.5 VOC Emissions from Fuel Storage and Van Refuelling

Based on information provided to SLR, the Project will include a diesel refuelling system for refuelling of vans. The refuelling tanks, which are proposed to be Logitank Blue modular diesel storage and dispensing systems, will have a total capacity of 100 kilo litres (kL) diesel and 40 kL Diesel Exhaust Fluid (DEF).

Air quality issues associated with fuel storage and refuelling systems predominantly relate to emissions of volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and xylene (BTEX). VOC emissions at fuel storage and refuelling facilities occur due to evaporative losses during filling of the storage tanks and customer vehicles, as well as working and standing losses from the fuel storage tanks.

As described in the National Pollutant Inventory's *Emission Estimation Technique Manual for Fuel and Organic Liquid Storage* (DEWHA, 2012), working losses are the combined loss from filling and emptying a tank containing hydrocarbon liquids. As the liquid level increases, the pressure inside the tank increases and vapours containing VOCs are expelled from the tank. A loss during emptying occurs when air drawn into the tank becomes saturated with organic vapour and expands, thus exceeding the capacity of the vapour space. In addition to losses from the storage tanks, working losses can occur from the vehicle fuel tanks being filled at the bowser.

Standing losses occur through the expulsion of vapour from a tank due to the vapour expansion and contraction associated with changes in temperature and barometric pressure. This loss occurs without any change in the liquid level in the tank. Working and breathing losses from diesel storage tanks are minimal due to the lower volatility of diesel compared to petrol.

The van refuelling stations will be equipped with Stage 2 vapour recovery (VR2) equipment. VR2 equipment is designed to capture the displaced vapour from the fuel tanks in the vehicles being refuelled and return it to the fuel storage tank or other appropriate vessel. Usually, the fuel dispenser hose contains both fuel and vapour return lines. The vapour is drawn through the vapour return line by a vacuum pump. VR2 systems are intended to limit the emissions of fuel vapour when vehicles refuel by recovering at least 85% of the displaced vapour.

4.2.6 Refrigerant Emissions from Plant Room

The Refrigeration plant room will house refrigeration equipment and be served by dedicated AS and BCA compliant discharge vents. It is anticipated that under normal operations, the exhaust ventilation would only operate to remove heat from the plant room and all refrigerant is contained within the equipment. However, under emergency scenarios (accidental leakage), refrigerant may be discharged to through relief valves and emitted to atmosphere via the exhaust vents.

In light of Australia's commitment to a hydrofluorocarbon (HFC) phase-down (DEE, 2018), only refrigerants with a low Global Warming Potential (GWP) have been evaluated for the Project. Consideration is to be given to both natural and synthetic refrigerants. Where flammable and/or toxic refrigerants are used, their charge will be limited and confined to specifically designed areas with the appropriate safety systems in place.

Considering the nature of refrigerant gas release (i.e. accidental leakage) from the abovementioned plant rooms, refrigerant release is unlikely to significantly impact on local air quality and does not warrant further assessment.

5 Regulatory Framework

5.1 Relevant Legislation, Policy and Guidance

The following Air Quality Policy and Guidance documents have been referenced within this assessment and have been used to identify the relevant air quality criteria (see **Section 5.2**).

5.1.1 Protection of the Environment Operations (POEO) Act 1997 & Amendment Act 2011

The POEO Act (and Amendment Act 2011) is a key piece of environment protection legislation administered by the NSW Department of Planning, Industry and Environment's Environment, Energy and Science (EES) group which enables the Government to establish instruments for setting environmental standards, goals, protocols and guidelines.

The following sections of the POEO Act are of general relevance to the Project Site:

- Section 117 of the POEO Act states that the wilful or negligent release of ozone depleting substances such as chlorofluorocarbons (CFCs) to the atmosphere carries the highest of all penalties under NSW environmental law.
- Section 124 and 125 of the POEO Act states that any plant located at a premise (e.g. the bakery exhaust fans at the Project Site) should be maintained in an efficient condition and operated in a proper and efficient manner to reduce the potential for air pollution.
- Section 126 of the POEO Act requires that materials (e.g. raw food and waste storage/disposal at the Project Site) are managed in a proper and efficient manner to prevent air pollution (e.g. odour).
- Section 128 of the POEO Act states:
    1. The occupier of a premises must not carry out any activity or operate any plant in or on the premises in such a manner to cause or permit the emission at any point specified in or determined in accordance with the regulation of air impurities in excess of [the standard of concentration and/or the rate] prescribed by the regulations in respect of any such activity or any such plant.
    2. Where neither such a standard nor rate has been so prescribed, the occupier of any premises must carry on activity, or operate any plant, in or on the premises by such practicable means as may be necessary to prevent or minimise air pollution.

5.1.2 Protection of the Environment Operations (Clean Air) Regulation 2010

The POEO (Clean Air) Regulation 2010 (the Regulation) is the core regulatory instrument for air quality issues in NSW. In relation to industry, the Regulation:

- sets maximum limits on emissions from activities and plant for a number of substances;
- deals with the transport and storage of volatile organic liquids;
- restricts the use of high sulphur liquid fuel; and
- imposes operational requirements for certain afterburners, flares, vapour recovery units and other treatment plant.

Part 5 of the POEO (Clean Air) Regulation 2010 (the Regulation) also deals with emissions of air impurities from activities and plant, and sets maximum limits on emissions for a number of substances (including solid particles and visible smoke) as noted below in **Table 4** and **Table 5**. The standards of concentrations prescribed by Part 5, Division 3 do not apply to plant during startup and shutdown periods, however such emissions are still subject to the requirements of Section 128 (2) of the POEO Act in relation to the prevention and minimisation of air pollution.

Table 4 Schedule 6 Standards of Concentration for (Group C[1]) Non-Scheduled Premises

Air Impurity	Activity	Concentration [2]
Particles	Any activity/ plant	100 mg/m^3
Smoke	Solid fuel is burnt	Ringlemann 1 or 20% opacity
	Liquid fuel is burnt	Ringlemann 1 or 20% opacity

Note 1 Group C: Activity granted DA consent and commenced to operate after 1 September 2005.

Note 2 Reference conditions are: Dry, 273 K, 101.3 kPa for any activity.

Table 5 Schedule 4 Standards of Concentration for (Group 6[1]) Scheduled Premises

Air Impurity	Activity [2]	Concentration [3]
Solid Particles	Any activity/ plant	50 mg/m^3
NO_2 or NO or both, as NO_2 equivalent	Any turbine operating on gas, being a turbine used in connection with an electricity generating system with a capacity of less than 10 MW	70 mg/m^3
	Any turbine operating on gas, being a turbine used in connection with an electricity generating system with a capacity of 10 MW or greater but less than 30 MW	70 mg/m^3
	Stationary reciprocating internal combustion engines	450 mg/m^3
VOCs as n-propane	Any activity or plant involving combustion (except as listed below)	40 mg/m^3 VOCs or 125 mg/m^3 CO
	Any stationary reciprocating internal combustion engine using a gaseous fuel	40 mg/m^3 VOCs or 125 mg/m^3 CO
	Any stationary reciprocating internal combustion engine using a liquid fuel	1140 mg/m^3 VOCs or 5880 mg/m^3 CO
Smoke	An activity or plant in connection with which liquid or gaseous fuel is burnt	Ringlemann 1 or 20% opacity

Note 1 Group 6: Activity granted DA consent and commenced to operate after 1 September 2005.

Note 2 only concentration standards relevant to the operations at the Project Site have been listed.

Note 3 Reference conditions are: Dry, 273 K, 101.3 kPa for any activity.

The Regulation exempts emergency standby plant (comprising a stationary reciprocating internal combustion engine) for generating electricity from the air impurities standard for NO_2 and NO specified in Schedule 4 (see **Table 5**) relevant to that plant if the plant is used for a total of not more than 200 hours per year.

5.1.3 NSW Environment Protection Authority Air Quality Policy and Guidance

The EPA is the NSW regulatory authority responsible for air quality regulation and associated activities.

NSW Environment Protection Authority document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (hereafter 'the Approved Methods') (EPA 2017), lists the statutory methods for modelling and assessing air pollutants from stationary sources and specifies criteria which reflect the environmental outcomes adopted by the EPA. The Approved Methods are referred to in the POEO (Clean Air) Regulation 2002 for assessment of impacts of air pollutants. The air quality criteria set out in the Approved Methods have been reproduced and discussed in **Section 5.2.1** to **5.2.6**.

5.1.4 Odour Technical Framework and Notes

The EPA publications, *Technical Framework: Assessment and management of odour from stationary sources in NSW* and the associated *Technical Notes* (the Odour Policy) (NSW DEC, 2006a), provide a policy framework for assessing and managing activities that emit odour and offers guidance on dealing with odour issues. **Section 5.2.7** outlines relevant recommendations from these documents.

5.1.5 Local Air Quality Toolkit

The Local Government Air Quality Toolkit (AQ Toolkit) has been developed by the EPA to assist local government in their management of air quality issues and provides guidelines for air quality management and for the use of air pollution control techniques. Relevant AQ Toolkit air quality guidance notes include:

- Dust from urban construction sites (NSW EPA, 2007-1);
- Construction sites (NSW EPA, 2007-2); and
- Food outlets (NSW EPA, 2007-3).

5.1.6 Building Code of Australia and Australian Standards

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government with the aim of efficiently achieving nationally consistent, minimum necessary standards of relevant health and safety, amenity and sustainability objectives. The BCA contains mandatory technical provisions for the design and construction of BCA class buildings.

Australian Standard (AS) 1668.2-2012 *The use of ventilation and air conditioning in building, Part 2: Ventilation design for indoor air contaminant control* sets design requirements for mechanical ventilation systems. Mechanical ventilation is required in enclosures where specific health and ventilation amenity requirements cannot be met by natural means.

Section 3.10.1 states of the AS states "*All exhaust air shall be discharged to atmosphere in such a manner not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.*"

Section 5 of the AS states the following:

- 5.2.2 Exhaust locations: As far as practicable, exhaust-air intakes used for general exhaust-air collection shall be located on the opposite sides of the enclosure from the sources of make-up air, to ensure that the effluents are effectively removed from all parts of the enclosure.

- 5.3.2.1 General requirements: The effluent shall be collected as it is being produced, as close as practicable to the source of generation.
- 5.10.1 Air discharges: Where discharges are deemed to be objectionable (i.e. nuisance related), discharges shall:
  - Be emitted vertically with discharge velocities not less than 5 m/s.
  - Be situated at least 3 m above the roof at point of discharge.
  - Treated to reduce the concentration of contaminants where required.
  - Be emitted to the outside at velocities and in a direction that will ensure, to the extent practicable, a danger to health or a nuisance will not occur.
  - Be situated a minimum separation distance of 6 m (where the airflow rate is ≥ 1,000 L/s) from any outdoor) air intake opening, natural ventilation device or opening, and boundary to an adjacent allotment, except that where the dimensions of the allotment make this impossible, then the greatest possible distance shall apply.

5.2 Relevant Air Quality Criteria

Ambient air quality criteria for the pollutants identified in **Section 4.1** and **4.2** are prescribed by the Approved Methods.

Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria for each of the above pollutants. The criteria specified in the Approved Methods are the defining ambient air quality criteria for NSW and are considered to be appropriate for the setting. Those relevant to the identified emission sources at the Project are discussed below.

5.2.1 Carbon Monoxide

CO is an odourless, colourless gas formed from the incomplete burning of fuels in motor vehicles. CO bonds to the haemoglobin in the blood and reduces the oxygen carrying capacity of red blood cells, thus decreasing the oxygen supply to the tissues and organs, in particular the heart and the brain.

CO in urban areas results almost entirely from vehicle emissions and its spatial distribution follows that of traffic flow. The highest concentrations are found at the kerbside, with concentrations decreasing rapidly with increasing distance from the road.

The impact assessment criteria specified within the Approved Methods for CO are provided in **Table 6**.

Table 6 Impact Assessment Criteria for Carbon Monoxide (CO)

Pollutant	Averaging Period	Criterion
CO	15-min	87 ppm (100 mg/m^3)
	1-hour	25 ppm (30 mg/m^3)
	8-hour	9 ppm (10 mg/m^3)

Note: ppm = parts per million

5.2.2 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 form NO_2 which can have significant health effects including damage to the respiratory tract and increased susceptibility to respiratory infections and asthma. Long term exposure to NO_2 can lead to lung disease.

NO will be converted to NO_2 in the atmosphere after leaving a car exhaust. The impact assessment criteria specified within the Approved Methods for NO_2 are provided in **Table 7**.

Table 7 Impact Assessment Criteria for Nitrogen Dioxide (NO_2)

Pollutant	Averaging Period	Criterion
NO_2	1-hour	12 pphm (246 µg/m^3)
	Annual	3 pphm (62 µg/m^3)

Note: pphm = parts per hundred million

5.2.3 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 term “particulate matter” refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm and is termed total suspended particulate (TSP).

The annual impact assessment criteria for TSP recommended by the NSW EPA is 90 µg/m^3. The TSP impact assessment criteria was developed before the more recent results of epidemiological studies which suggested a relationship between health impacts and exposure to concentrations of finer particulate matter.

PM_{10} and $PM_{2.5}$ are considered important pollutants due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into 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.

The impact assessment criteria specified within the Approved Methods for suspended particulate matter are provided in **Table 8**.

Table 8 Impact Assessment Criteria for Suspended Particulate Matter

Pollutant	Averaging Period	Criterion
TSP	Annual	90 µg/m³
PM_{10}	24-hour	50 µg/m³
	Annual	25 µg/m³
$PM_{2.5}$	24-hour	25 µg/m³
	Annual	8 µg/m³

5.2.4 Deposited Particulate

Section 5.2.3 is concerned in large part with the health impacts of airborne particulate matter. Nuisance impacts also need to be considered, mainly in relation to deposited dust.

In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 grams per square metre per month (g/m^2/month).

Table 9 presents the impact assessment criteria set out in the Approved Methods for dust deposition, showing the allowable increase in dust deposition level over the ambient (background) level to avoid dust nuisance.

Table 9 EPA Impact Assessment Criteria for Allowable Dust Deposition

Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m^2/month	4 g/m^2/month

Source: Approved Methods, EPA 2017

5.2.5 Sulphur Dioxide

SO_2 is a colourless, pungent gas with an irritating smell. When present in sufficiently high concentrations, exposure to SO_2 can lead to impacts on the upper airways in humans (i.e. the noise and throat irritation). SO_2 can also mix with water vapour to form sulphuric acid (acid rain) which can damage vegetation, soil quality and corrode materials.

Main sources of SO_2 in the air are industries that process materials containing sulphur (e.g. wood pulping, paper manufacturing, metal refining and smelting, textile bleaching, wineries etc.). SO_2 is also present in motor vehicle emissions, however since Australian fuels are relatively low in sulphur, high ambient concentrations are not common.

The impact assessment criteria specified within the Approved Methods for SO_2 are provided in **Table 10**.

Table 10 Impact Assessment Criteria for Sulphur Dioxide (SO_2)

Pollutant	Averaging Period	Criterion
SO_2	10-min	25 pphm (712 µg/m^3)
	1-hour	20 pphm (570 µg/m^3)
	24-hour	8 pphm (228 µg/m^3)
	Annual	2 pphm (60 µg/m^3)

Note: pphm = parts per hundred million

5.2.6 Volatile Organic Compounds

VOCs are organic compounds (i.e. contain carbon) that have high vapour pressure at normal room-temperature conditions. Their high vapour pressure leads to evaporation from liquid or solid form and emission release to the atmosphere.

VOCs are emitted by a variety of sources, including motor vehicles, chemical plants, automobile repair services, painting/printing industries, and rubber/plastics industries. VOCs that are often typical of these sources include benzene, toluene, ethylbenzene and xylenes (BTEX). Biogenic (natural) sources of VOC emissions are also significant (eg vegetation).

Impacts due to emissions of VOCs can be health or nuisance (odour) related. Benzene is a known carcinogen and a key VOC linked with the combustion of motor vehicle fuels. The impact assessment criteria specified within the Approved Methods for BTEX compounds are provided in **Table 11**.

Table 11 Impact Assessment Criteria for VOCs

Pollutant	Averaging Period	Criterion*
Benzene	1-hour	0.029 mg/m^3
Cyclohexane	1-hour	19 mg/m^3
Ethylbenzene	1-hour	8.0 mg/m^3
Toluene	1-hour	0.36 mg/m^3
Xylenes	1-hour	0.19 mg/m^3

* Gas volumes are expressed at 25°C and at an absolute pressure of 1 atmosphere (101.325 kPa)

5.2.7 Odour

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance goals guide decisions on odour management, but are generally not intended to achieve "no odour".

The detectability of an odour is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation. This point is called the *odour threshold* and defines one odour unit (ou). An odour goal of less than 1 OU would theoretically result in no odour impact being experienced.

In practice, the character of a particular odour can only be judged by the receiver's reaction to it, and preferably only compared to another odour under similar social and regional conditions. Based on the literature available, the level at which an odour is perceived to be a nuisance can range from 2 ou to 10 ou depending on a combination of the following factors:

- **Odour quality**: whether an odour results from a pure compound or from a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- **Population sensitivity**: any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains.
- **Background level**: whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- **Public expectation**: whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than for odours from a landfill facility.
- **Source characteristics**: whether the odour is emitted from a stack (point source) or from an area (diffuse source). Generally, the components of point source emissions can be identified and treated more easily than diffuse sources. Emissions from point sources can be more easily controlled using control equipment. Point sources tend to be located in urban areas, while diffuse sources are more often located in rural locations.
- **Health effects**: whether a particular odour is likely to be associated with adverse health effects. In general, odours from agricultural activities are less likely to present a health risk than emissions from industrial facilities.

The NSW EPA recommends within the Technical Framework that, as a design goal, no individual be exposed to ambient odour levels of greater than 7 ou. This is based on experience gained through odour assessments from proposed and existing facilities in NSW indicating that an odour performance goal of 7 ou is likely to represent the level below which "offensive" odours should not occur (for an individual with a 'standard sensitivity' to odours).This is expressed as the 99th percentile value, as a nose response time average (approximately one second).

Odour performance goals need to be designed to take into account the range in sensitivities to odours within the community, and provide additional protection for individuals with a heightened response to odours, using a statistical approach which depends on the size of the affected population. As the affected population size increases, the number of sensitive individuals is also likely to increase, which suggests that more stringent goals are necessary in these situations. In addition, the potential for cumulative odour impacts in relatively sparsely populated areas can be more easily defined and assessed than in highly populated urban areas. It is often not possible, or practical, to determine and assess the cumulative odour impacts of all odour sources that may impact on a receptor in an urban environment. Therefore, the proposed odour performance goals allow for population density, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity.

The equation used by the NSW EPA to determine the appropriate impact assessment criteria for complex mixtures of odorous air pollutants, as specified in the Odour Framework, is expressed as follows:

$$Impact\ assessment\ criterion\ (ou) = \frac{(\log_{10} population - 4.5)}{-0.6}$$

A summary of the impact assessment criteria given for various population densities, as drawn from the Odour Framework, is given in **Table 12**.

Table 12 NSW EPA Impact Assessment Criteria for Complex Mixtures of Odorous Air Pollutants

Population of Affected Community (number of receptors)	Impact Assessment Criteria for Complex Mixtures of Odours (ou) (nose-response-time average, 99th percentile)
Urban area (≥ 2000)	2
~500	3
~125	4
~30	5
~10	6
Single residence (≤ 2)	7

For areas such as that surrounding the Project Site, the relevant odour impact assessment criterion set by the Approved Methods for complex mixtures of odorous air pollutants is 2 ou (nose-response-time average, 99th percentile).

The Approved Methods states that the impact assessment criteria for complex mixtures of odorous air pollutants must be applied at the nearest existing or likely future off-site sensitive receptor(s).

5.3 Recommended Separation Distances

The application of minimum recommended separation distances (or 'buffer' distances) provides a valuable screening tool to judge whether a detailed assessment is required to evaluate the potential risk of conflicting land uses. Separation distances provide guidance on the appropriate level of separation between a source of emissions and sensitive land uses in order to mitigate the impacts of intended and unintended emissions on people. This approach relies on the knowledge that impacts on the environment generally decrease with increasing distance from the source of emissions. Separation distances are based on an understanding of the types of emissions associated with various industries and their potential impacts on people. These distances can vary based on the scale and size of the industry, location topography, prevailing winds and other factors.

There are no separation guidelines issued by NSW EPA, hence the following sections refer to guidelines set by other regulatory agencies in Australia. These recommended separation distances have been developed to be applied to sensitive uses, such as residential dwellings, schools, hospitals and childcare centres.

5.3.1 Australian Capital Territory EPA

The document '*Separation distance guidelines for air emissions*', published by ACT EPA (ACT Government, 2018) includes recommended minimum separation distances for activities identified in **Section 4.2**, as shown in **Table 13**.

Table 13 Recommended Separation Distances, ACT EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Bakery	Bakery	> 40 tonnes/day < 40 tonnes/day	100 See note ~
Handling and Storage of Food and Waste	NA	NA	NA
Operational Phase Traffic	NA	NA	NA
Power Generators	NA	NA	NA
Fuel Storage and Refuelling	Petroleum storage	Petroleum products are stored in tanks with a total storage capacity exceeding 2,000 cubic metres	250
Refrigeration Plant	NA	NA	NA

Source: (ACT Government, 2018)

~ For food and beverage manufacturing where no separation distances are specified. For these cases it is recommended that there be no visible discharge of dust or emission of odours offensive to humans, beyond the boundary of the premises, subject to the adoption of BATEA.

It is understood that the proposed bakery production rate will be 9 tonnes per day (tpd) which is less than the throughput to which the 100 m separation distance applies. For such cases, the ACT EPA recommends that there be no visible discharge of dust or emission of odours offensive to humans, beyond the boundary of the premises, subject to the adoption of BATEA.

The total fuel storage capacity at the Project Site is anticipated to be approximately 100 m^3, which is significantly lower than the activity rate of less than 2,000 m^3 that the recommended separation distance for petroleum storage applies to.

5.3.2 Victoria EPA

The Victoria EPA document '*Recommended separation distances for industrial residual air emissions*', Publication No. AQ 1518 (EPAV, 2013) includes minimum recommended separation distances for relevant activities identified in **Section 4.2**, as shown in **Table 14**.

Table 14 Recommended Separation Distances, VIC EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Bakery	Bakery	> 200 tonnes/year < 200 tonnes/year	100 See note *
Handling and Storage of Food and Waste	NA	NA	NA
Operational Phase Traffic	NA	NA	NA
Power Generators	NA	NA	NA
Fuel Storage and Refuelling	Petroleum storage	Storage of petroleum products or crude oil in tanks, tanks exceeding 2,000 tonnes (fixed roof)	250
Refrigeration Plant	NA	NA	NA

Source: (EPAV, 2013)

* For food and beverage manufacturing producing less than 200 tonnes of product per year, no separation distances are specified. For these cases, EPA recommends there is no visible discharge of dust or emissions of odours offensive to the senses of human beings, beyond the boundary of the premises.

As outlined above, the proposed bakery will have a production rate of 9 tpd. Assuming the bakery operates at full capacity every day of the year, the annual production rate will be approximately 3,300 tonnes per year (tpy) which is greater than the 200 tpy threshold to which a 100 m separation distance applies. Therefore, the 100 m separation distance recommended by the Victoria EPA may be considered applicable to the Project operations.

The total fuel storage capacity at the Project Site is anticipated to be approximately 120 tonnes, which is significantly lower than the activity rate of greater than2,000 t that the recommended separation distance for petroleum storage applies to.

5.3.3 South Australia EPA

The document '*Evaluation distances for effective air quality and noise management*' published by South Australian EPA (EPA South Australia, 2016) includes recommended evaluation distances for relevant activities identified in **Section 4.2**, as shown in **Table 15**.

Table 15 Recommended Separation Distances, SA EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Bakery	Bakery	Using more than 20 tonnes of ingredients per week	200
Handling and Storage of Food and Waste	NA	NA	NA
Operational Phase Traffic	NA	NA	NA
Power Generators	Diesel fuel power generators	Individual Assessment	NA
Fuel Storage and Refuelling	Service station/retail outlet	All 24-hour operations (except on highways/freeways)	200
Refrigeration Plant	NA	NA	NA

Source: (EPA South Australia, 2016)

As outlined above, the proposed bakery will have a production rate of 9 tpd. Assuming the bakery operates at full capacity every day of the week, and the total ingredient weight is equal to total product weight the weekly ingredient throughput will be approximately 63 tonnes per week (tpw) which is less than the throughput to which the 200 m separation distance applies.

In relation to diesel generators, the EPA South Australia document notes that:

> *Diesel generator operations also result in emissions to air. The potential impact on air quality will depend on factors such as the number of generators, emission controls and frequency of use.*

The 200 m separation distance recommended by EPA South Australia may be considered applicable to the Project operations, based on the 24-hour operations of the refuelling station.

5.3.4 Western Australia EPA

In the Western Australia Environmental Protection Authority (EPAWA) policy documentation for minimum recommended separation distances - *Separation distances between Industrial and Sensitive Land Uses* (EPAWA, 2015), the EPAWA makes recommendations for assessing appropriate separation distances where amenity may be reduced for sensitive or incompatible land uses. Sensitive land uses which warrant protection from amenity-reducing off-site effects of industry by maintenance of a separation distance include residential areas and zones, hospitals and schools.

The EPAWA document lists a number of industries with their recommended separation distances and states that where the appropriate separation distance is unable to be provided by the emitter, the impact on neighbouring land uses may be reduced by careful site layout. EPAWA 2015 further states that '*It is not the purpose of a separation distance to 'sterilise' land from development; non-sensitive land uses can be located within the area between the source of emissions and sensitive land use*.'

The EPAWA recommends EPA consultation where site-specific circumstances indicate a lesser separation distance may be appropriate (i.e. where there is no history of complaints arising from residual emissions or where the plant is significantly smaller than that used in the recommendations etc.). A summary of the separation distances specified by EPAWA that may be applicable to the Project Site is provided in **Table 16**.

Table 16 Recommended Separation Distances, EPAWA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Bakery	Bakeries	Depending on size	100-200
Handling and Storage of Food and Waste	NA	NA	NA
Operational Phase Traffic	NA	NA	NA
Power Generators	Electric power generation	Generating electricity – 20 megawatts or more (total) for natural gas & 10 megawatts or more (total) for other fuels	3000-5000, depending on location & size
Fuel Storage and Refuelling	Service station	Involving vehicle cleaning/detailing facilities & the retailing of spare parts and food stuffs - All 24-hour operations (except on highways/freeways)	200
Refrigeration Plant	NA	NA	NA

Source: Appendix 1, (EPAWA, 2015)

In relation to the proposed bakery operations, according to the EPAWA document a separation distance of 100 m to 200 m may be applicable depending on the size. However, it is noted that the document does not specify thresholds for the separation distance requirements. Given the scale of the Project, a separation distance of 200 m may be considered applicable to the Project.

While the proposed diesel fired generators will have a combined electricity generation capacity of 10 MW, these will only be used under emergency conditions (during power outages and blackouts). Therefore, the EPAWA separation distances are not considered applicable.

The separation distance of 200 m prescribed by EPAWA for service stations may be applicable to the Project operations, based on the description of activities listed. It is consistent with the distance recommended by SA EPA.

5.3.5 Summary

In relation to the proposed bakery operations, a separation distance of 100 m to 200 m may be considered applicable depending on the referenced document and bakery production capacity. As a conservative measure, a separation distance of 200 m from the bakery has been adopted for the purpose of this qualitative assessment.

In relation to fuel storage and refuelling operations, the separation distances prescribed by the ACT EPA and VIC EPA for petroleum storage relate to the much larger scale activities than those proposed at the Project Site, and hence are not considered to be relevant for this Project.

The separation distance for service stations of 200 m, published by SA EPA and EPAWA, corresponds best to the to the types of activities proposed at the Project Site. It is noted that the proposed Project includes VR2 systems which is likely to reduce the separation distances recommended to avoid adverse impacts at nearby sensitive receptor locations, as installation of VR2 systems is not a standard requirement for service stations in South Australia and Western Australia. Nevertheless, a separation distance of 200 m from the dispensing area and fuel storage vents has been adopted for the purpose of this qualitative assessment as a conservative measure.

No separation distance guidelines directly relevant to the Handling and Storage of Food and Waste, Operational Phase Traffic and Refrigeration Plant were identified.

6 Review of Ambient Air Quality Monitoring Data

The NSW EES maintains a network of air quality monitoring stations (AQMS) across NSW. The nearest such station is located at Prospect, approximately 5.5 km to the northeast of the Project Site (see **Figure 3**).

The Prospect AQMS was commissioned in 2007 and is located in William Lawson Park, Myrtle Street, Prospect. It is situated in a residential area and is at an elevation of 66 m.

A number of air pollutants and meteorological variables are currently measured by the Prospect AQMS including:

- NO, NO_2 & NO_X
- SO_2
- PM_{10}
- $PM_{2.5}$
- CO

Air pollutant data recorded by the Prospect AQMS were obtained for the calendar years 2015 – 2019. The data are summarised in **Table 17** (red font indicates an exceedance of the relevant criterion), and presented graphically in **Figure 5** to **Figure 9**. To be consistent with the annual NSW compliance monitoring reports, the data for gaseous pollutants are presented in parts per hundred million (pphm) or parts per million (ppm), rather than µg/m^3 and mg/m^3.

A review of the data shows that exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criteria were recorded by the Prospect AQMS in all five years. A review of the available compliance monitoring reports indicates that the exceedances recorded by the Prospect AQMS were primarily due to exceptional events such as bushfire emergencies, dust storms and hazard reduction burns. The high number of exceedances recorded by the Prospect AQMS in 2019 is due to bush fires smoke that blanketed Sydney and the surrounding areas for a significant number of days in November and December of 2019.

Exceedances of the annual average $PM_{2.5}$ criterion were recorded by the Prospect AQMS in in all five years investigated. Ambient $PM_{2.5}$ concentrations often exceed the annual average criteria set out in the Approved Methods across the Sydney Greater Metropolitan Area. The annual average PM_{10} criterion was only exceeded in 2019. This is believed to be primarily due to the abovementioned bush fires in the areas surrounding Sydney in late 2019.

Ambient concentrations of the gaseous pollutants SO_2, NO_2, and CO were all below the relevant criteria for all years investigated.

Table 17 Summary of Prospect AQMS Data (2015 – 2019)

Pollutant	CO	NO_2		PM_{10}		$PM_{2.5}$		SO_2	
Averaging Period	Maximum 1-hour	Maximum 1-hour	Annual	Maximum 24-hour	Annual	Maximum 24-hour	Annual	Maximum 1-hour	Annual
Units	ppm	pphm	pphm	µg/m³	µg/m³	µg/m³	µg/m³	pphm	pphm
2015	1.9	5.3	1.1	68.7	17.6	29.6	8.2	2.7	0.1
2016	1.6	5.3	1.0	110.1	18.9	84.9	8.7	2.1	0.1
2017	1.6	6.0	1.0	61.1	18.9	30.1	7.7	2.3	0.1
2018	1.3	5.1	0.9	113.3	21.9	47.5	8.5	2.5	0.1
2019	5.5	4.9	0.9	182.8	26.0	134.1	11.9	2.1	0.1
Criterion	**25**	**12**	**3**	**50**	**25**	**25**	**8**	**20**	**2**

Notes:

1 For 2015, one (1) exceedance of the 24-hour average PM_{10} and one (1) exceedance of the 24-hour average $PM_{2.5}$ was recorded.

2 For 2016, four (4) exceedances of the 24-hour average PM_{10} and five (5) exceedances of the 24-hour average $PM_{2.5}$ were recorded.

3 For 2017, one (1) exceedance of the 24-hour average PM_{10} and three (3) exceedances of the 24-hour average $PM_{2.5}$ were recorded.

4 For 2018, eight (8) exceedances of the 24-hour average PM_{10} and four (4) exceedances of the 24-hour average $PM_{2.5}$ were recorded.

5 For 2019, 25 exceedances of the 24-hour average PM_{10} and 25 exceedances of the 24-hour average $PM_{2.5}$ were recorded.

Figure 5 Measured 1-Hour Average CO Concentrations at Prospect AQMS (2015 – 2019)

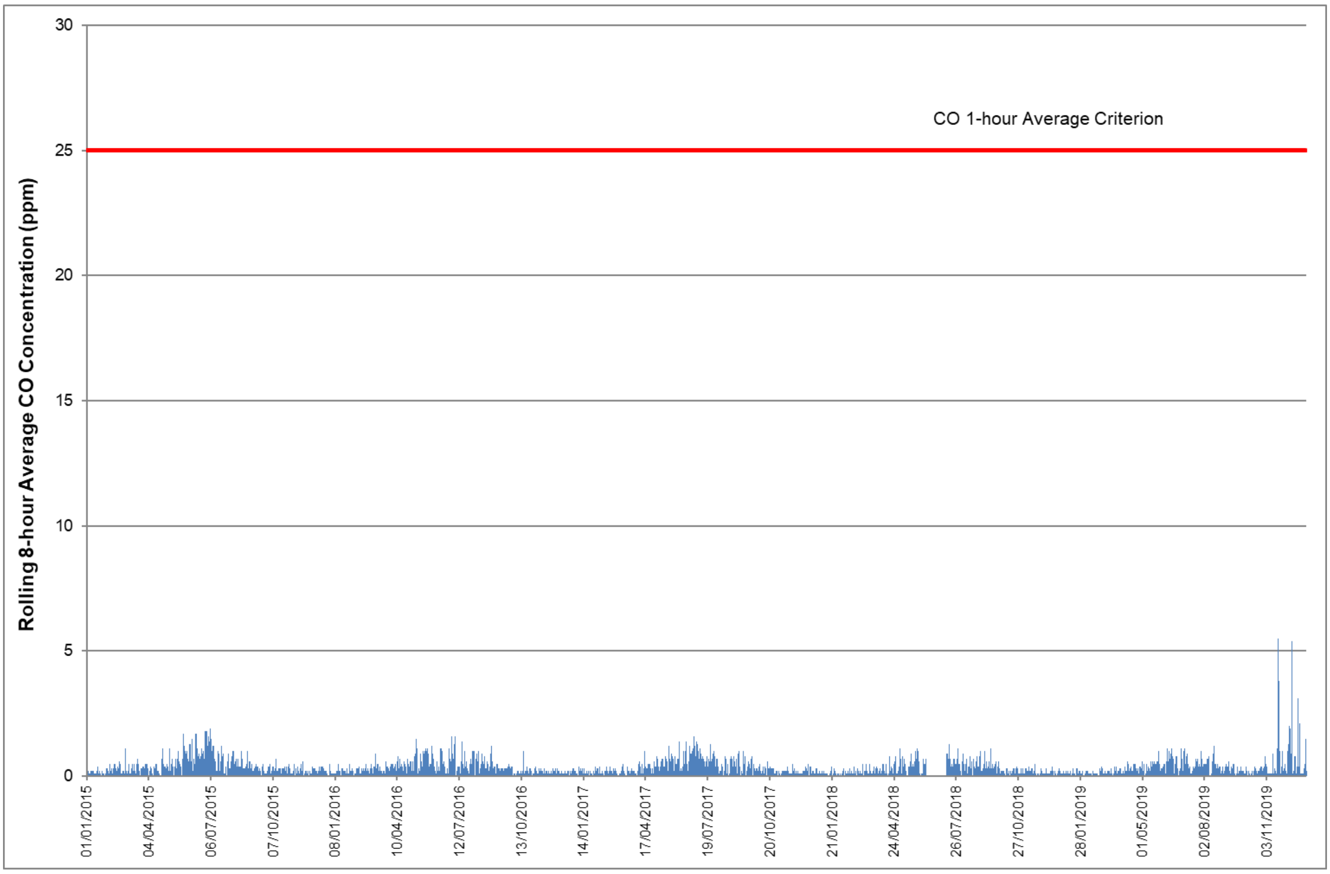


Figure 6 Measured 1-Hour Average NO_2 Concentrations at Prospect AQMS (2015 – 2019)

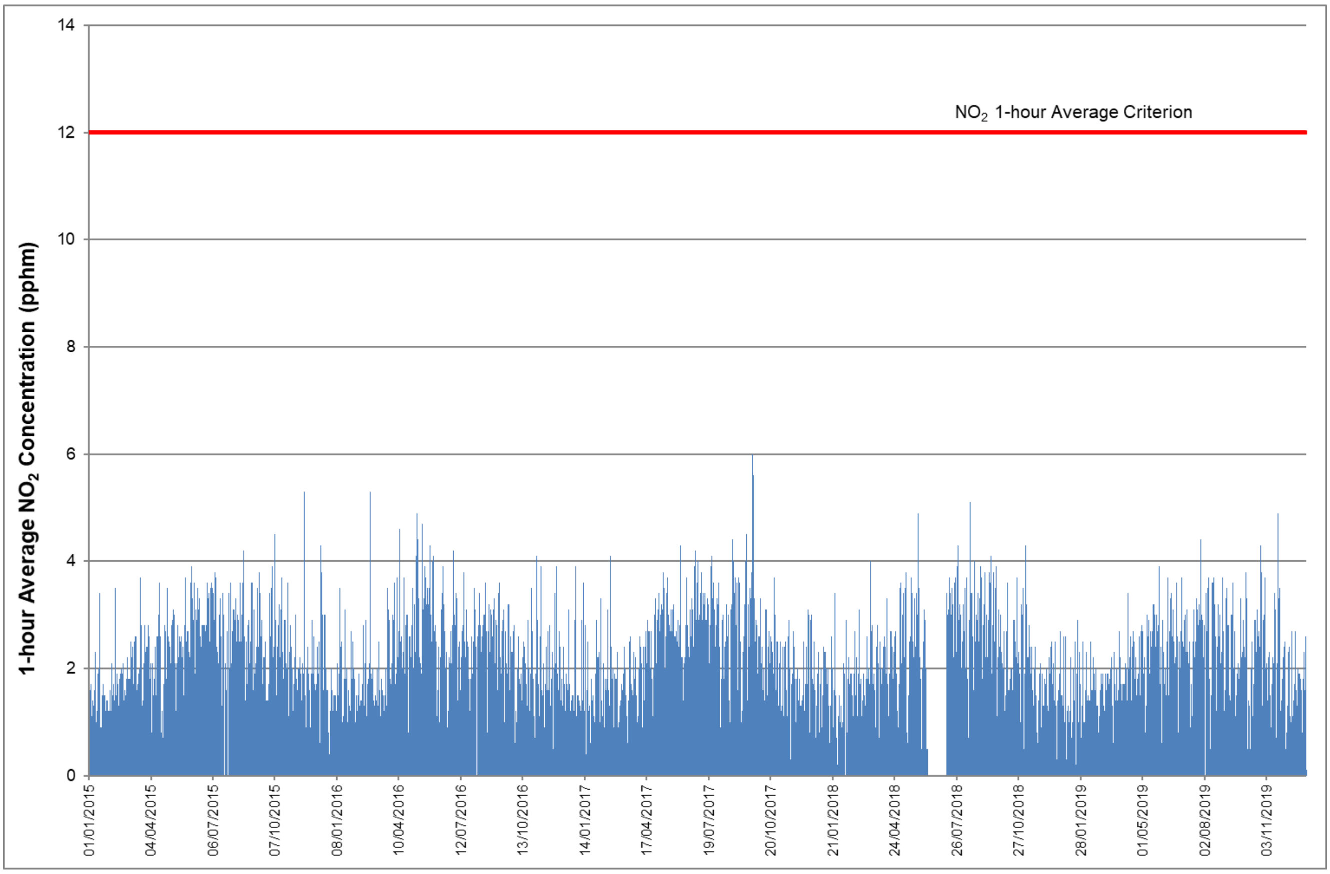


Figure 7 Measured 24-Hour Average PM_{10} Concentrations at Prospect AQMS (2015 – 2019)

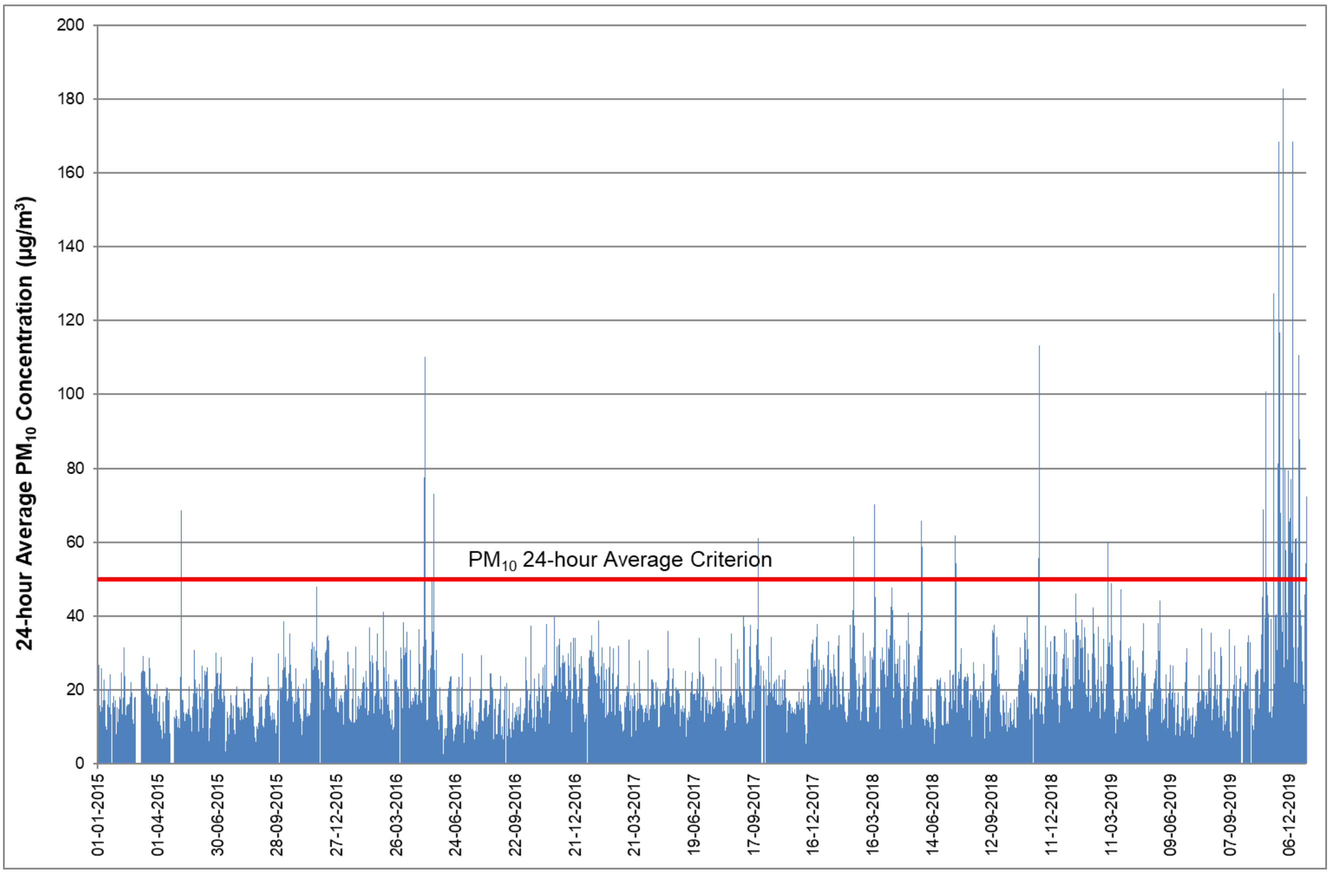


Figure 8 Measured 24-Hour Average $PM_{2.5}$ Concentrations at Prospect AQMS (2015 – 2019)

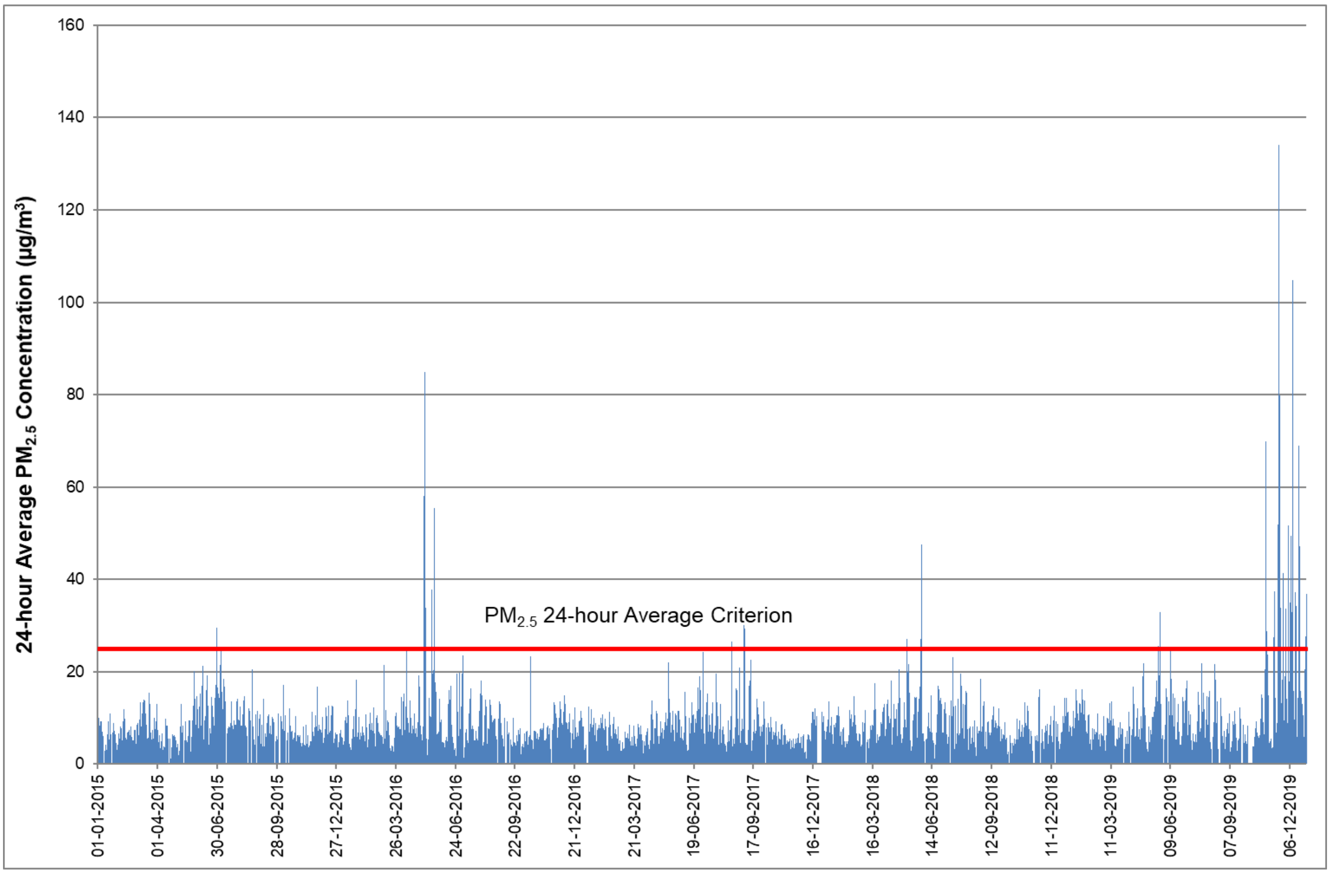
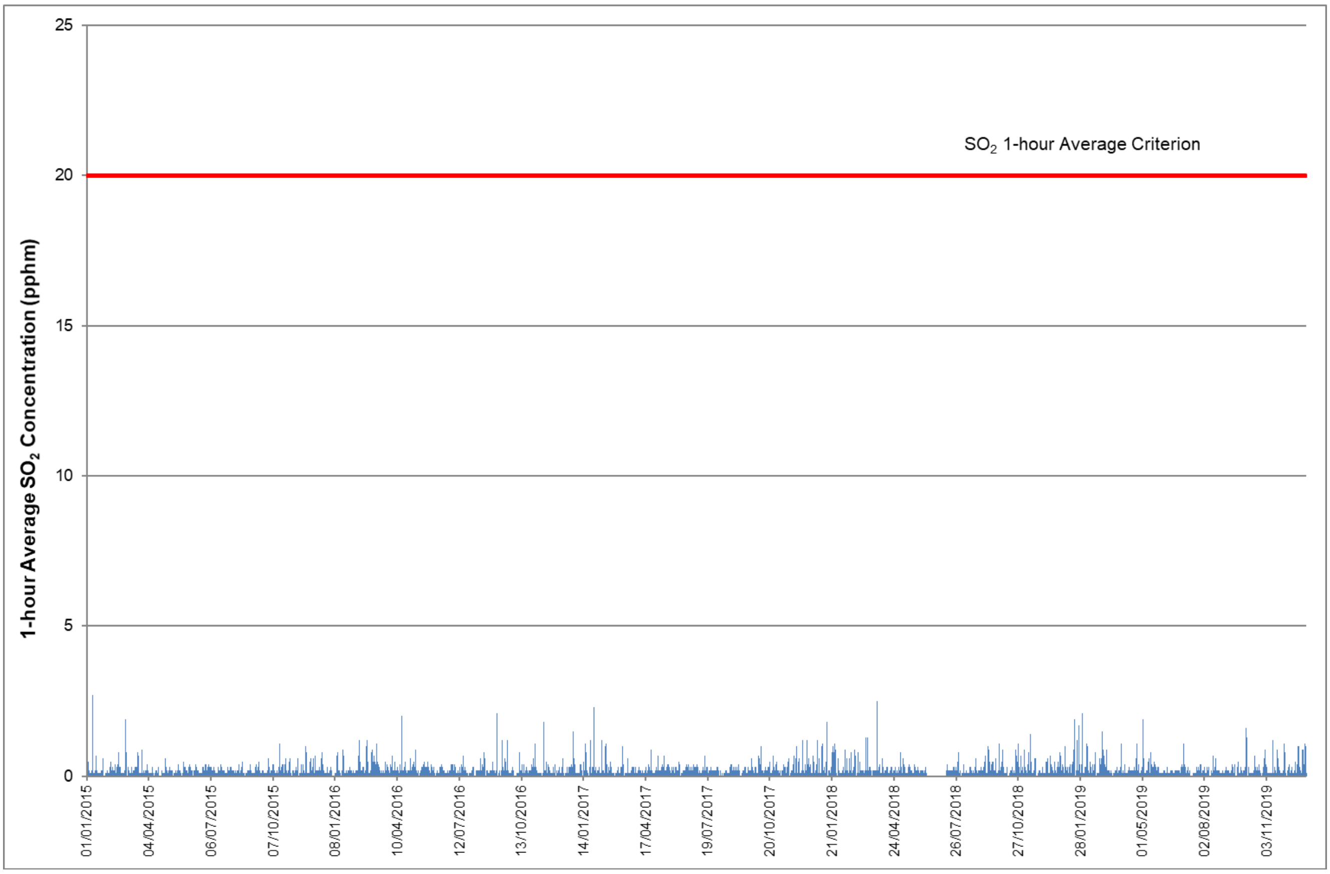


Figure 9 Measured 24-Hour Average SO_2 Concentrations at Prospect AQMS (2015 – 2019)



7 Assessment of Potential Impacts – Construction Phase

7.1 Products of Combustion due to Fuel Combustion

Ambient air quality monitoring performed in the Sydney area over the last few decades has shown that the city's air quality has typically improved and is continuing to improve. A major driver of this improvement in urban air quality is the fact that newer vehicles produce significantly less emissions than older vehicles. This is in part a result of improvements in the quality and composition of fuels, as well as improved engine designs and fuel efficiency. According to Trends in Motor Vehicles and their Emissions (NSW EPA, 2014), cars built from 2013 onwards emit only 3% of the NO_X emissions compared to vehicles built in 1976, and diesel trucks built from 2011 onwards emit just 8% of the particles emitted by vehicles built in 1996. Therefore, even as Sydney's population, and total vehicle kilometres travelled each year have increased (NSW EPA, 2014), key measures of air pollution have dropped significantly and this trend is expected to continue.

The results from the background air quality concentrations show that the monitored concentrations have been below the respective criteria for CO, NO_2 and SO_2 for five years running (2015-2019) (see **Section 6**).

Given the nature of the construction works, it is considered that the emissions generated due to the combustion of fuel in construction plant and machinery will be of limited duration and small compared to the emissions generated by road traffic on the surrounding road network. Given the short term and low level of emissions of these pollutants from the Project Site during the construction works, they are considered unlikely to have significant impacts on local air quality and have not been considered any further in this assessment.

7.2 Dust Impacts from Construction Works

The key potential air pollution and amenity issues associated with fugitive dust emissions from the proposed activities during the construction works at the Project Site are:

- Annoyance due to dust deposition (soiling of surfaces) and visible dust plumes; and
- Elevated suspended particulate concentrations (PM_{10}).

Modelling of dust from construction activities is generally not considered appropriate, as emission rates can vary significantly depending on a combination of the activity and prevailing meteorological conditions (i.e. rainfall and wind speed), which cannot be reliably predicted. The following sections therefore present a qualitative assessment of the potential risks to air quality associated with dust from construction activities at the Project. Details of the IAQM methodology used to perform the risk assessment are provided in **Appendix A**.

7.2.1 Step 1 – Screening Based on Separation Distance

As noted in **Section 3.1**, the nearest existing residential receptors have been identified as being located approximately 60 m of the Project Site boundary, on Trivet Street.

As the sensitive receptors are located within 350 m from the boundary of the Project Site, and within 500 m from the Project Site entrance, further assessment is required.

7.2.2 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 18**.

Table 18 Categorisation of Dust Emission Magnitude

Activity	Dust Emission Magnitude	Basis
Demolition	Small	**IAQM Definition:** 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. **Relevance to this Project:** *The approximate volume of structures to be demolished is estimated at 160 m^3. Therefore, a dust emission magnitude of small is considered appropriate.*
Earthworks	Medium	**IAQM Definition:** Total site area 2,500 m^2 to 10,000 m^2, moderately dusty soil type (e.g. 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. **Relevance to this Project:** *While the total area where the earthworks will be undertaken at the Project Site is estimated to be approximately 90,000 m^2, it is estimated that a maximum of up to six heavy earth moving vehicles may be active at any one time and the total quantity of soils to be excavated and moved is estimated to be approximately 40,000 tonnes (approximately 20,000 m^3). Given the above, the dust emission magnitude for the earthworks has been based on the amount of materials moved and number of active heavy vehicles.*
Construction	Medium	**IAQM Definition:** Total building volume 25,000 m^3 to 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching. **Relevance to this Project:** *While the total volume of the Project is estimated to be >100,000 m^3, the main structure would be constructed using material with relatively low potential for dust release (i.e. precast concrete walls, concrete floor slab, Colourbond roofing, Colourbond foil backed wall cladding). Moreover, no sandblasting is proposed. Therefore, a dust emission magnitude of medium is considered appropriate.*
Trackout	Medium	**IAQM Definition:** 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. **Relevance to this Project:** *While the unpaved road length is estimated to be greater than 100 m, a maximum of up to 12 heavy vehicle movements per day is anticipated during the peak construction period. Therefore, a dust emission magnitude of medium is considered appropriate.*

7.2.3 Step 2b – Risk Assessment

7.2.3.1 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 *high* for health impacts and *high* 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.

7.2.3.2 Sensitivity of an Area

Using the classifications shown in **Table A2** in **Appendix A**, the sensitivity of the area to dust soiling is classified as '*low*' and the sensitivity of the surrounding area to health effects (**Table A3** in **Appendix A**) has also been classified as '*low*'.

This categorisation has been made taking into account the individual receptor sensitivities derived above, the five-year average annual mean background PM_{10} concentration of 20 µg/m^3 recorded at the Prospect AQMS (see **Table 17**), and the anticipated number of receptors present, i.e. 1-10 within 100 m for both dust soiling and health impacts. It is noted that only one residential receptor is located within 100 m from the Project Site boundary.

7.2.3.3 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 18**, the resulting risk of air quality impacts is as presented in **Table 19**

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

Table 19 Preliminary Risk of Air Quality Impacts from the Project (Uncontrolled)

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

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'.

7.2.4 Step 3 - Mitigation Measures

Table 20 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 construction works at the Project Site, so these measures should be reviewed in consultation with the construction contractor or as part of the development of the Construction Environmental Management Plan (CEMP) before their implementation. For almost all construction activities, 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.

Table 20 Site-Specific Management Measures Recommended by the IAQM

	Activity	
1	**Communications**	
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	Erect solid screens or barriers around dusty activities or the site boundary that is at least as high as any stockpiles on site.	H
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

	Activity	
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
7.2	Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D
7.3	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.	H
8	Construction	
8.1	Avoid scabbling (roughening of concrete surfaces) if possible	D
8.2	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.	D
9	Trackout	
9.1	Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site.	D
9.2	Avoid dry sweeping of large areas.	D
9.3	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D
9.4	Record all inspections of haul routes and any subsequent action in a site log book.	D
9.5	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

7.2.5 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 21**.

Table 21 Residual Risk of Air Quality Impacts from Construction

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

The mitigated dust soiling and human health impacts for construction works at the Project Site are anticipated to be *negligible*.

8 Assessment of Potential Impacts – Operational Phase

This section presents a high-level assessment of the potential risks of adverse air quality impacts at sensitive receptors due to the proposed operations at the Project Site. The impact assessment uses the methodology summarised in **Section 1.3.2** of this report, which integrates the receptor sensitivity with impact magnitude to derive the potential significance of that change. Details of the operational risk assessment methodology used are provided in **Appendix B**. In the context of this methodology, the resultant risk is termed "impact significance".

8.1 Receptor Sensitivity

The nearest sensitive receptors to the Project Site are located approximately 60 m from the closest boundary (see **Section 3.1**). With regards to the methodology outlined in **Appendix B**, the sensitivity of the surrounding residential areas to air pollutant emissions generated by the Project Site has been classified as ***high***.

8.2 Potential Impacts Associated with Proposed On-site Sources

8.2.1 Odour and Particulate Emissions from Bakery

As discussed in **Section 4.2.1**, odours and particulate emissions will occur from activities at the proposed bakery. The bakery is proposed to be equipped with AS and BCA compliant air extraction systems.

As discussed in **Section 5.3.5**, a conservative separation distance of 200 m between bakery operations and sensitive land uses has been adopted for this study. This separation distance is to be applied to the distance between the nearest sensitive receptor and the bakery building or exhaust vents (noting that the exhaust vents will be located on the roof of the bakery building). The nearest sensitive receptor is located approximately 400 m northeast of the bakery building (see **Figure 10**) which means that the adopted separation distance would be met.

Given the above considerations, the magnitude for nearby sensitive receptors is predicted to be **negligible** (i.e. Impact is predicted to cause no significant consequences, **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **negligible magnitude** of the potential odour and particulate impact of the bakery activities, the potential impact significance for the local receptors is concluded to be of ***neutral significance***.

Figure 10 Bakery Operations – Separation Distance

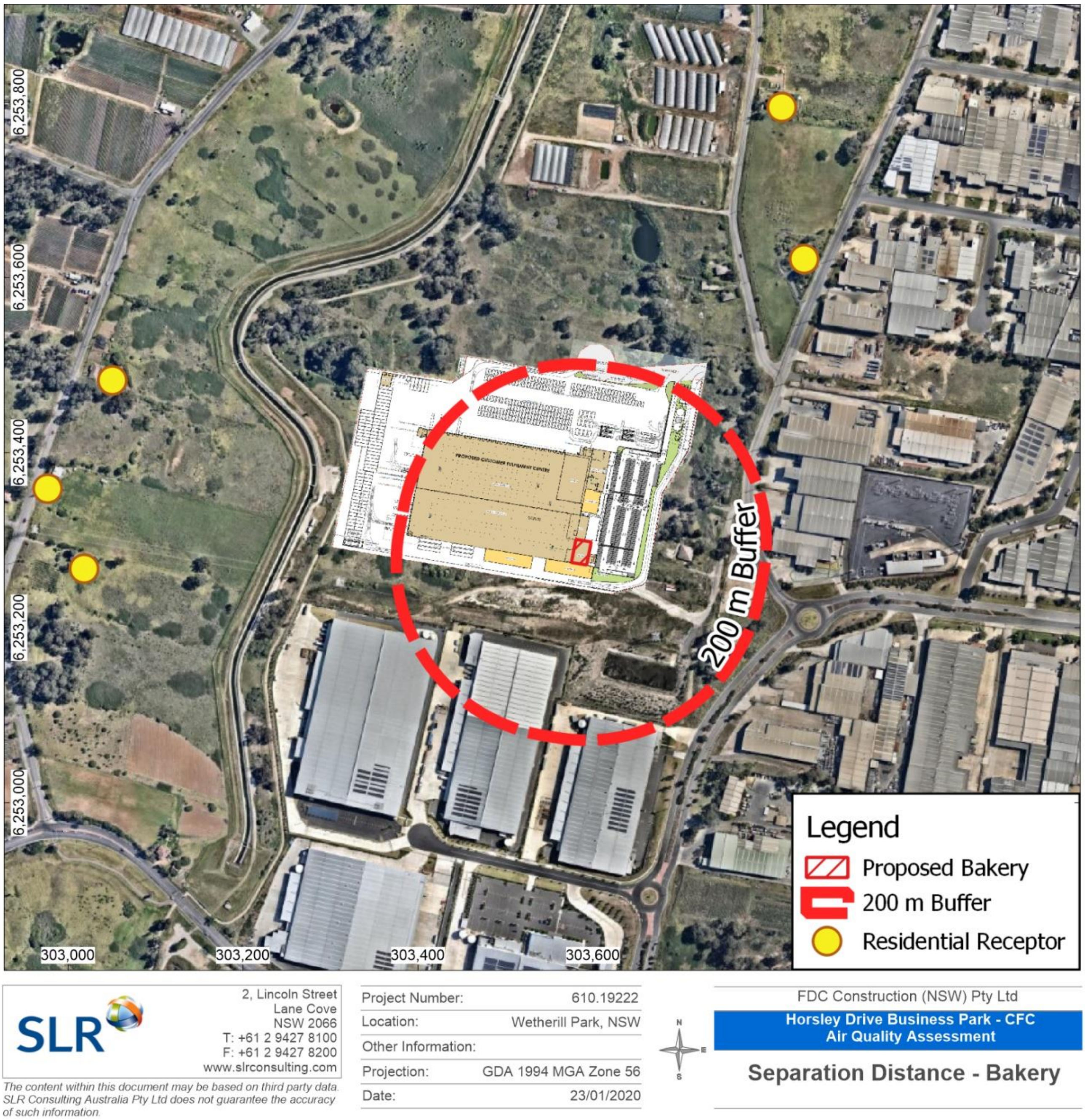


Table 22 Risk Assessment of Odour and Particulate Impacts – Bakery Operations

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	**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

Considering the neutral impact significance for receptors due to the bakery operations, additional mitigation measures are not deemed necessary. However, further mitigation measures can be put in place to further reduce or remove any impacts (refer to **Section 8.4)**.

8.2.2 Odour Emissions from Handling and Storage of Fresh Food and Waste

As discussed in **Section 4.2.2**, odour emissions could occur from handling and storage of fresh food and waste on site. All fresh food and waste handling and processing areas are proposed to be equipped with AS and BCA compliant air extraction systems.

By addressing the FIDOL factors, the potential for odour impacts from these sources at the sensitive receptors may be determined.

- Frequency – The closest residential areas have the potential to experience impacts when winds blow towards the receptors. As outlined in **Section 3.3** winds blow in the direction of the existing and future sensitive receptors approximately 27% of the time during the year, therefore there is a medium likelihood they would experience frequent potential odour impacts.
- Intensity – The fresh food and waste storage areas within the Project Site are proposed to be equipped with BCA and AS compliant ventilation systems which are designed to ensure effective dispersal of emissions. Moreover, all fresh food will be stored in temperature-controlled environment to avoid spoiling. Given the above, the intensity would likely be low.
- Duration – the duration of any potential odour impact may last as long as the wind is blowing in the direction of the sensitive receptors. Given that conducive winds occur approximately 27% of the time and the Project Site will be a 24/7 operation, the duration of any odour impact is likely to be medium.
- Offensiveness – Given organic waste will be stored on site (for up to three days), the offensiveness is likely to be medium.
- Location – the impact of location on the acceptability of odours from the Project Site has been accounted for by the receptor sensitivity classifications discussed in **Section 8.1**, as high.

Further to the above, it is noted that the closest sensitive receptors are located over 350 m away from the waste storage area and warehouse building.

Given the above considerations, the magnitude of odour is predicted to be of **slight** magnitude (ie predicted impact may be tolerated, **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **slight magnitude** of the potential odour impact of the handling and Storage activities, the potential impact significance for the local receptors is concluded to be of ***intermediate/minor significance***.

Table 23 Risk Assessment of Odour Impacts – Handling, Processing and Storage of Seafood and Waste

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	**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

In order to further reduce the impact significance, additional mitigation can be put in place to reduce or remove these impacts (refer to **Section 8.4**). It is expected that the residual risk of odour impacts could be reduced to **neutral significance** if additional mitigation measures (such as the operational controls listed in **Section 8.4** for waste management and raw materials handling) are put in place to reduce the frequency and duration of any odour events.

8.2.3 Products of Combustion from Operational Phase Traffic

As outlined in **Section 7.1**, improvements in the quality and composition of fuels as well as improved engine designs and fuel efficiency, have led to continuously improving air quality in the Sydney area. According to Trends in Motor Vehicles and their Emissions (EPA 2014), cars built from 2013 onwards emit only 3% of the NO_X emissions compared to vehicles built in 1976, and diesel trucks built from 2011 onwards emit just 8% of the particles emitted by vehicles built in 1996.

Given the scale of on-site vehicle parking and delivery van and truck operations it is considered that the emissions generated due to the combustion of fuel in light and heavy vehicles generated by the Project are small compared to the emissions generated by traffic on the surrounding road network (see **Section 4.2.3**). Moreover, it is noted that Selective Catalytic Reduction (SCR) technology is fitted to all delivery vans to reduce NO_X emissions. DEF (which is a non-toxic, colourless, odourless and non-flammable fluid) will be stored in a dedicated tank in each van and injected into the exhaust system to catalytically reduce the levels of NO_x emitted from the vehicle's exhaust system.

Given the above considerations, the magnitude for nearby sensitive receptors is predicted to be **slight** (i.e. predicted impact may be tolerated., **Table B2**).

Given the **high sensitivity** of the potentially affected receptors and the **slight magnitude** of the potential impacts from products of combustion from operational phase traffic activities, the potential impact significance for the local receptors is concluded to be of ***intermediate/minor significance*** for the closest receptors.

Table 24 Risk Assessment of Impacts from Products of Combustion – Operational Phase Traffic

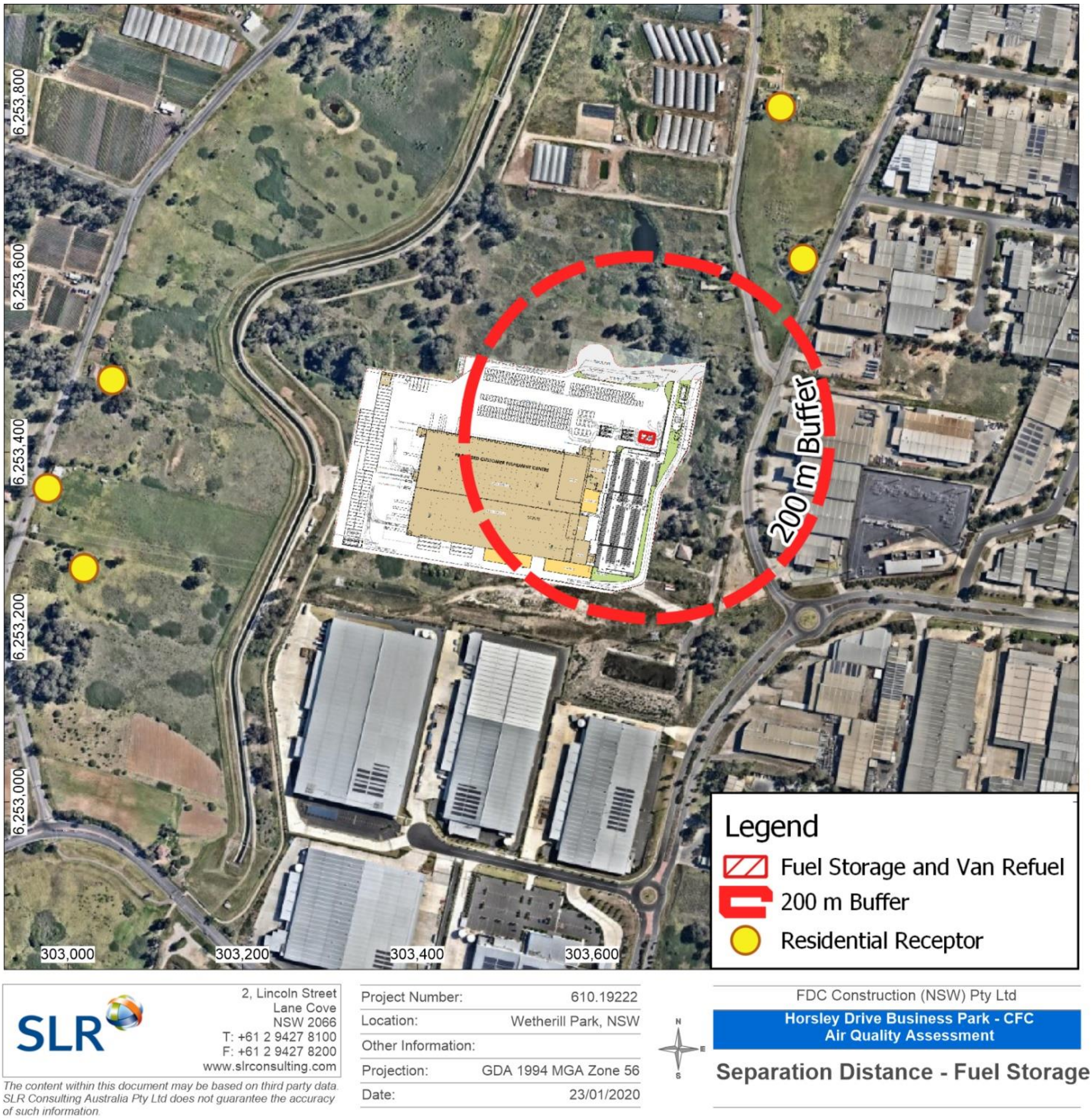
Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	**Very High Sensitivity**	Major Significance	Major/ Intermediate Significance	Intermediate Significance	Neutral Significance
	High Sensitivity	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

In order to further reduce the impact significance, additional mitigation can be put in place to reduce or remove these impacts (refer to **Section 8.4**). It is expected that the residual risk of odour impacts could be reduced to **neutral significance** if additional mitigation measures (such as the controls listed in **Section 8.4**) are put in place to reduce the frequency and duration of any odour events.

8.2.4 VOC Emissions from Fuel Storage and Van Refuelling

As discussed in **Section 5.3.5**, a separation distance of 200 m between 24-hour service stations and sensitive land uses as recommended by the SA EPA and WA EPA guidelines has been adopted for this study. This separation distance is to be applied to the distance between the nearest sensitive receptor and the dispensing area or fuel storage vents. The nearest sensitive receptor is located approximately 265 m northeast of the fuel storage and van refuelling area (see **Figure 11**) which means that the adopted separation distance would be met. Given the above considerations, the magnitude for nearby sensitive receptors is predicted to be **negligible** (i.e. Impact is predicted to cause no significant consequences, **Table B2**).

Figure 11 Fuel Storage and Van Refuelling – Separation Distance



Given the **high sensitivity** of the potentially affected receptors and the **negligible magnitude** of the potential impacts from fuel storage and van refuelling activities, the potential impact significance for the local receptors is concluded to be of ***neutral significance*** for the closest receptors.

Table 25 Risk Assessment of VOC Impacts - Fuel Storage and Van Refuelling

Sensitivity		Impact Magnitude [Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table B1]	**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

8.3 Predicted Impact Significance Summary

Table 26 presents a summary of predicted unmitigated and mitigated air quality impacts on sensitive receptors. The risk after the application of mitigation measures is referred to as a “residual” risk.

As outlined in **Section 8.1** , given the proximity of existing and potential future receptors to the Project Site, the sensitivity of the surrounding residential areas to all emissions generated by the Project has been classified as ***high***

Table 26 Impact Significance Residual Risks

Pollutant	Source	Predicted Unmitigated Impact		Predicted Residual Impact	
		Magnitude	Impact Significance	Magnitude	Impact Significance
Odour / VOCs	Bakery Operations	Negligible	Neutral	Negligible	Neutral
	Handling/Storage of fresh food and waste	Slight	Intermediate/ Minor	Negligible	Neutral
	Fuel Storage and Van Refuelling	Slight	Neutral	Negligible	Neutral
Products of Combustion	Operational Phase Traffic	Slight	Intermediate/ Minor	Slight	Intermediate/ Minor
Particulates	Bakery Operations	Negligible	Neutral	Negligible	Neutral

8.4 Mitigation Measures and Monitoring

8.4.1 Existing Controls

As outlined in **Section 4.2** a number of mitigation measures have been adopted by the Project. These include the following:

- The majority of potentially odorous activities will be enclosed (i.e. meat will be vacuum packed for receivals/dispatch, and the warehouse, waste storage areas, etc will be enclosed).
- Discharges of pollutants to the air from the majority of potentially odorous activities will be captured by a BCA and AS standard compliant extractions system and directed to rooftop vents.
- Packing and repacking of fish and meat products will take place at the Manual Services Counter where the temperature is maintained at 2-4 °C.
- Containment measures for spillages will be provided at appropriate locations to reduce odorous emissions from waste spillages.
- Organic waste and general waste will be removed from site for off-site disposal three times per week.
- Th refrigerated warehouse will ensure that all perishable food is kept at an appropriate temperature to avoid spoiling of fresh food.
- The van refuelling stations will be equipped with Stage 2 vapour recovery (VR2) equipment.
- Selective Catalytic Reduction (SCR) technology will be fitted to all delivery vans.

8.4.2 Additional Recommendations

In order to further reduce the potential for off-site air quality impacts during operation, additional mitigation measures can be put in place. The following outlines a number of mitigation measures relevant to the proposed activities at the Project Site. It is noted that some of these measures are being considered by the detailed design team. Recommended mitigation measures for the construction phase are provided in **Section 7.2.4**.

As outlined above, BCA/AS standard compliant extractions systems stem is being designed for the Project in order to extract emissions and discharge them to atmosphere via dedicated discharge vents. Air pollution control devices may be implemented to further reduce emissions where complaints are received in relation to nuisance odour or where prolonged smoke is visible during normal or peak operations (i.e. not during start up or shut down).

It is recommended that good housekeeping be maintained on all areas of the Project Site, including regular cleaning of all internal and external areas. In addition to good housekeeping, the following operational controls should be considered for implementation at the Project Site to control odours and other air emissions.

The physical controls (including ventilation fans, exhaust stacks, extraction hoods, grease traps, air pollution control devices etc.) should be designed to allow for easy and safe cleaning and maintenance. It is recommended that regular cleaning of physical controls be undertaken as per manufacturer's requirements.

In relation to waste removal and management, it is recommended that:

- All generated waste is identified and separated into common material streams or categories at the point of generation for separate collection. This would ensure that any waste that has the potential to cause odour emissions is dealt with appropriately.

- All organic waste is stored in closed containers and away from direct sun in the waste management room.
- All putrescible waste materials are covered during transport.

In relation to staff and contractor awareness and training it is recommended that general environmental awareness training be provided to relevant staff and contractors, including:

- Potential air quality and odour impacts which may be caused by activity during normal and abnormal circumstances;
- Prevention of accidental air emissions and actions to be taken when accidental emissions occur;
- Efficient and appropriate use and maintenance of equipment used on the Project Site (where relevant to their role); and
- Procedures for complaint handling.

All staff and contractors should be instructed to report any undue pollutant release (including odour) and visible emissions from the exhaust vents to the Site manager.

Practical and easy-to-read signage should be provided in waste management areas. Signage could also be provided to emphasise useful information relating to air quality control procedures and general housekeeping requirements to act as a daily reminder to staff working at the premises.

In order to reduce the company's overall carbon footprint and combustion gas emissions generated by vehicles, it is recommended that commuting to work using sustainable modes of travel (such as public transport, cycling, and car share) are encouraged through the implementation of an incentive scheme and facilities for cyclists such as bike storage areas, showers and lockers are provided.

8.4.3 Monitoring

Given the nature and scale of the Project, it is not anticipated that any impacts upon human health or amenity values would be experienced during the construction or operational phases.

Regular site walk overs and boundary inspections are recommended to be performed during the construction phase and ongoing monitoring of air quality is not considered to be required.

9 Conclusions

The main potential sources of air emissions were identified as dust impacts during the construction phase and odour, VOC, products of combustion and particulates during the operational phase.

The potential for off-site dust impacts was assessed using a qualitative risk-based approach prescribed by the Institute of Air Quality Management (IAQM). The results of this assessment indicate that dust impacts due to the construction works can be adequately managed with the implementation of site-specific mitigation measures, and that the residual impacts are likely to be negligible demolition, construction, earthworks and trackout activities.

The potential for off-site air quality impacts due to operation phase activities was also assessed using a qualitative risk-based approach. Although a qualitative assessment has been performed, given the nature of the operations proposed, and mitigation measures adopted the relevant air quality criteria outlined in **Section 5.2** will not be exceeded as a result of the operation of the Project.

Based on the above, it is concluded that air quality issues do not pose a constraint for the proposed development.

10 References

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APPENDIX A

Construction 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 Project Site, more than 50 m from the route used by construction vehicles on public roads, and more than 500 m from the Project 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 trackout (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 trackout, 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 (e.g. 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 (e.g. silt), five 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 (e.g. 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).

Trackout *(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.

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 A-1**. It is noted that user expectations of amenity levels (dust soiling) is dependent on existing deposition levels.

Table A-1 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 PM_{10}.*	*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 A-2**. The sensitivity of the area should be derived for each of activity relevant to the project (i.e. construction and earthworks).

Table A-2 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 A-3**. 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 (i.e. an annual average of 25 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 A-3 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 A-4** (demolition), **Table A-5** (earthworks and construction) and **Table A-6** (trackout) to determine the risk category with no mitigation applied.

Table A-4 Risk Category from Demolition Activities

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

Table A-5 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 A-6 Risk Category from Trackout 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

Step 3 - Site-Specific Mitigation

Once the risk categories are determined for each of the relevant activities, site-specific management measures can be identified based on whether the site is a low-, medium- or high-risk site.

Step 4 – Residual Impacts

Following Step 3, the residual impact is then determined after management measures have been considered.

APPENDIX B

Operational Assessment Methodology

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 or beneficial environment?
- **Sensitivity**: how sensitive is the receiving environment to the anticipated impacts? This may be applied to the sensitivity of the environment in a regional context or specific receptor locations.
- **Magnitude**: what is the anticipated scale of the impact?

The integration of receptor sensitivity with impact magnitude is used to derive the predicted **significance** of that change.

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 broad categories outlined in **Table B1**, which has been used in this assessment to define the sensitivity of receptors to air quality impacts.

Table B1 Methodology for Assessing Sensitivity of a Receptor to Air Quality Impacts

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

Magnitude of Impact

Magnitude describes the anticipated scale of the anticipated environmental change in terms of how that impact may cause a change to baseline conditions. **Table B2** outlines the methodology used in this assessment to define the magnitude of the identified potential air quality impacts.

Table B2 Methodology for Assessing 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 of Impact

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 Table B1]	**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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