BANKSTOWN AGED CARE FACILITY

Air Quality Assessment

Prepared for:

Hamptons Property Services
PO Box 954
Edgecliff NSW 2027

SLR Ref: 610.30035-R01
Version No: -v1.0
August 2020

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BASIS OF REPORT

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

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SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30035-R01-v1.0	18 August 2020	Varun Marwaha	Kirsten Lawrence	Varun Marwaha

CONTENTS

CONTENTS

APPENDICES

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by Hamptons Property Services (Hamptons) to provide an air quality assessment for a proposed aged care facility to be constructed at the existing premises of Bankstown Golf Club, Milperra (the Development Site).

An application for site compatibility certificate for the Development Site was submitted by Hamptons in September 2019. After an initial assessment of the Statement of Environmental Effects (SEE), the Department of Planning, Industry and Environment (DPIE) has requested further information related to land use conflicts, specifically:

> *"The application must demonstrate how potential land use conflicts can be appropriately and effectively managed to ensure use of the site for seniors housing will not have a detrimental impact on the current or future uses of the adjoining industrial area and nearby airport.*
>
> *You are encouraged to consider testing and confirming how potential **air, dust**, light, noise and **odour emissions** of industry within the area and airport operations can be managed at the site to ensure human health, amenity and wellbeing as well as protecting these strategic economic and commercial sites. This should include identifying suitable mitigation measures for the site. Any identified mitigation measures should not compromise appropriate amenity and sustainability outcomes of the proposed development."*

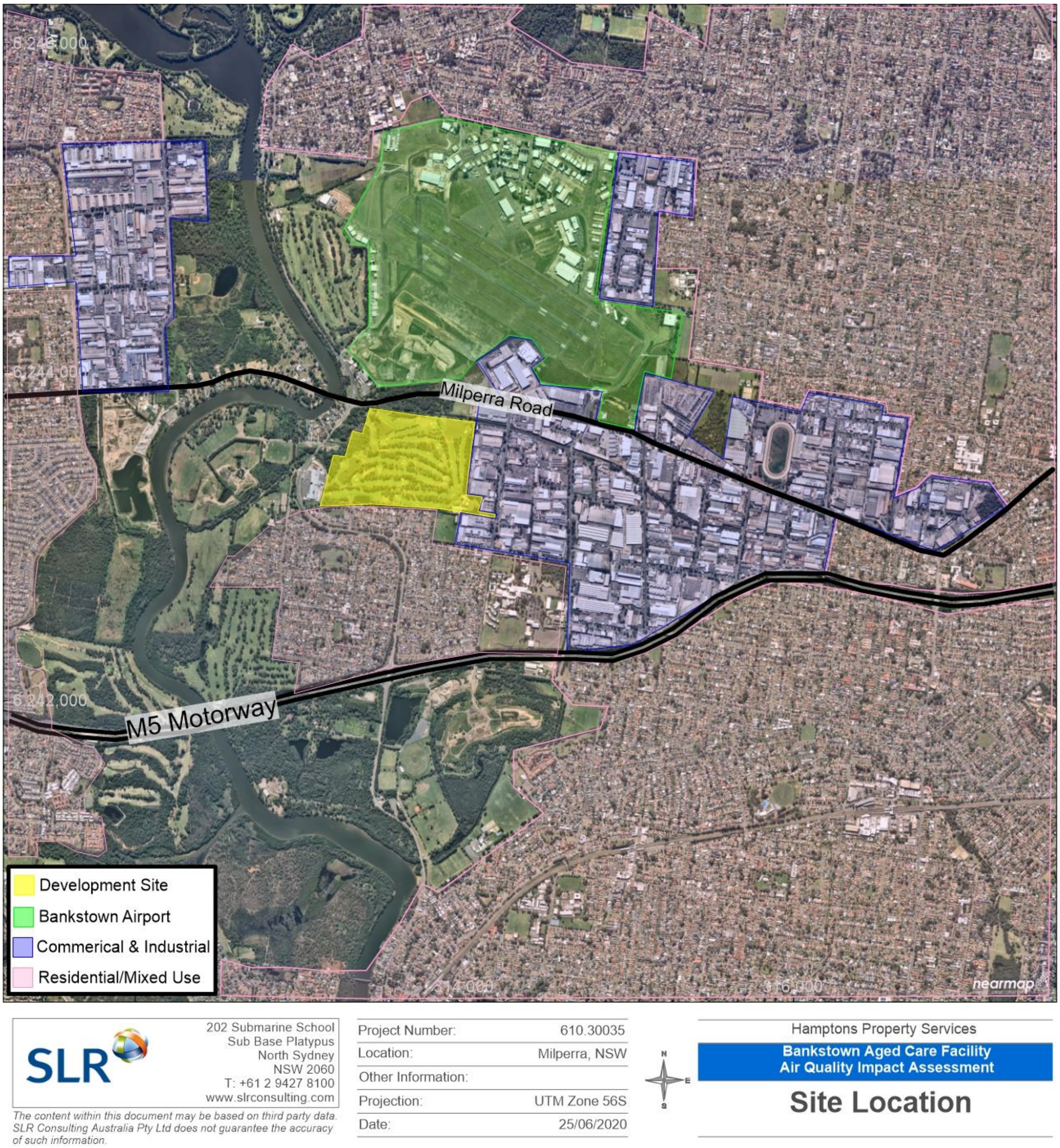
The aim of this report is to assess the suitability of the Development Site for use as an aged care facility, ie to assess the potential impacts that existing air pollution sources in the region could have on air quality at the Development Site.

A qualitative desktop assessment is presented, with a broad discussion around potential air quality impacts and building design considerations to mitigate any residual impacts.

2 Project Overview

The Development Site is located on 70 Ashford Avenue, Milperra, in the Canterbury Bankstown Local Government Area (LGA). The Development Site is located on the western boundary of an industrial estate, and approximately 800 m south of Bankstown Airport. The Development Site is bounded by residential receptors to the south, a garden and landscaping centre to the west, Ashford Reserve along the western and northern boundary, and Golf Course Industrial Estate to the east. The location of the Development Site is shown in **Figure 1**.

Figure 1 Location of the Proposed Development Site

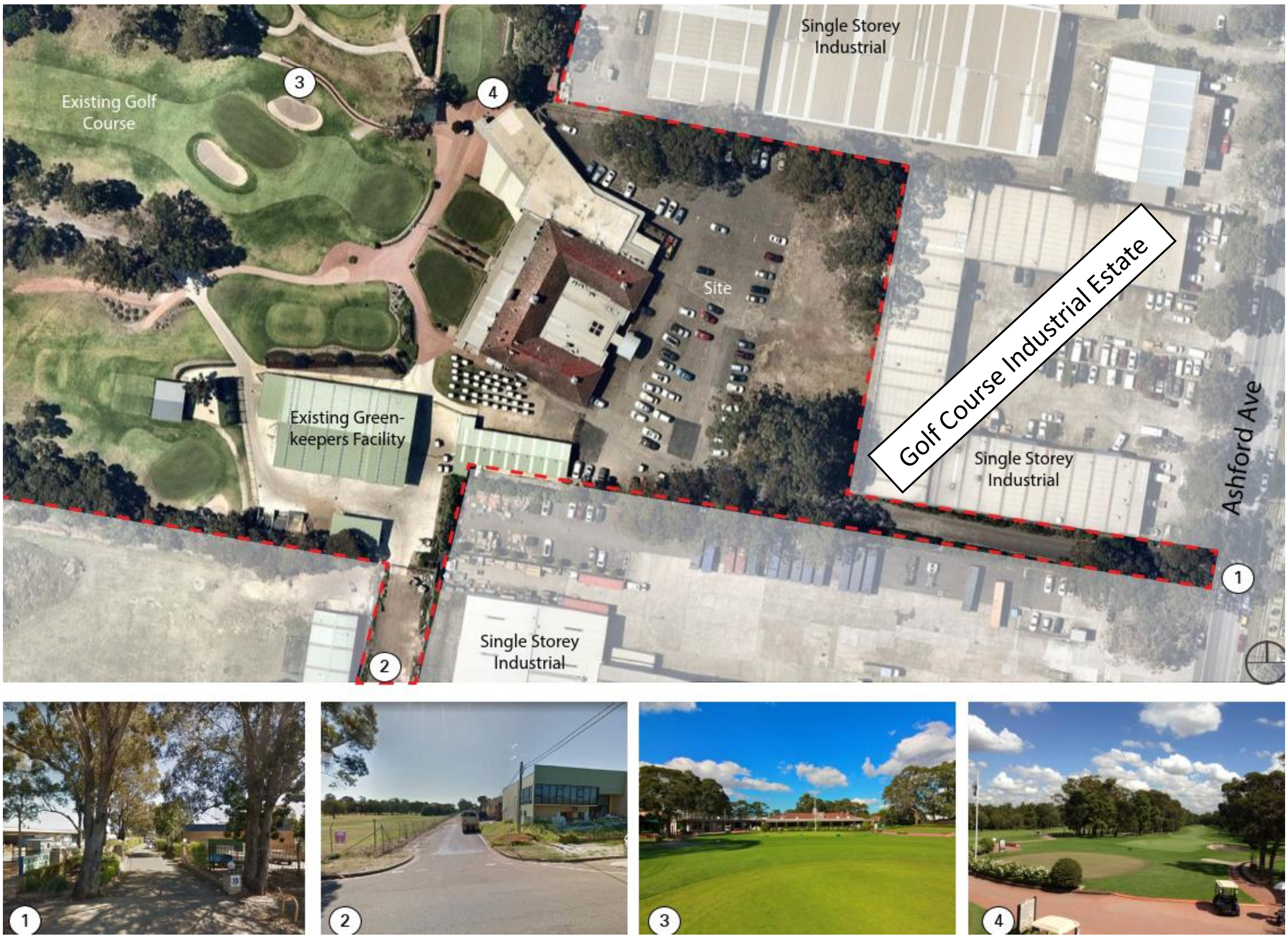


The Project involves:

- demolition of the existing Bankstown Golf Club buildings;
- construction of four serviced self-care housing buildings; and
- retainment of the existing golf course.

The existing and proposed setting of the Development Site is shown in **Figure 2** and **Figure 3** respectively.

Figure 2 Existing Setting of the Development Site



Source: Altis 2019

A total of three existing buildings are proposed to be demolished as part of the Project, namely the Golf Club building and two greenkeepers' buildings.

The total area to be developed is approximately 17,000 m^2, which is expected to encompass 149 Independent Living Units (ILUs), the detailed specifics of which would be resolved as part of a future development application. In addition to the ILUs, the Development Site would also accommodate the following:

- A new clubhouse facility, which would include a pro shop, amenities and storage areas for necessary equipment and maintenance facilities. This will also likely contain the resident's services in accordance with the requirements for serviced self-contained housing;

- A new learn to swim centre, located on the ground floor of the northern side of the site, to be available to the community, with an independent operator;
- Basement car parking for each of the uses proposed on the site;
- Designated drop off and pick up areas for the individual uses associated with the site; and
- Extensive landscaping and common open space works surrounding the built form.

Figure 3 Proposed Setting of the Development Site

Source: Altis 2019

It is noted that all the ILUs would be located within buildings B-D, and the clubhouse will be located within Building A. There is a separate 3-storey seniors development proposed on the land to the southwest of the Development Site, which is not part of this application and is not on land that is owned by Bankstown Golf Club.

Post construction, the closest industrial building will be located approximately 30 m east of Building C, and 35 m south of Building B. The proposed floor and elevation plans of the aged care facility are shown in **Appendix A**. As shown in **Figure 3**, the Development Site is proposed to be opened on the western side ie the Golf Course. This is illustrated in the proposed perspective shown in **Figure 4**.

Figure 4 Proposed Perspective of the Development Site

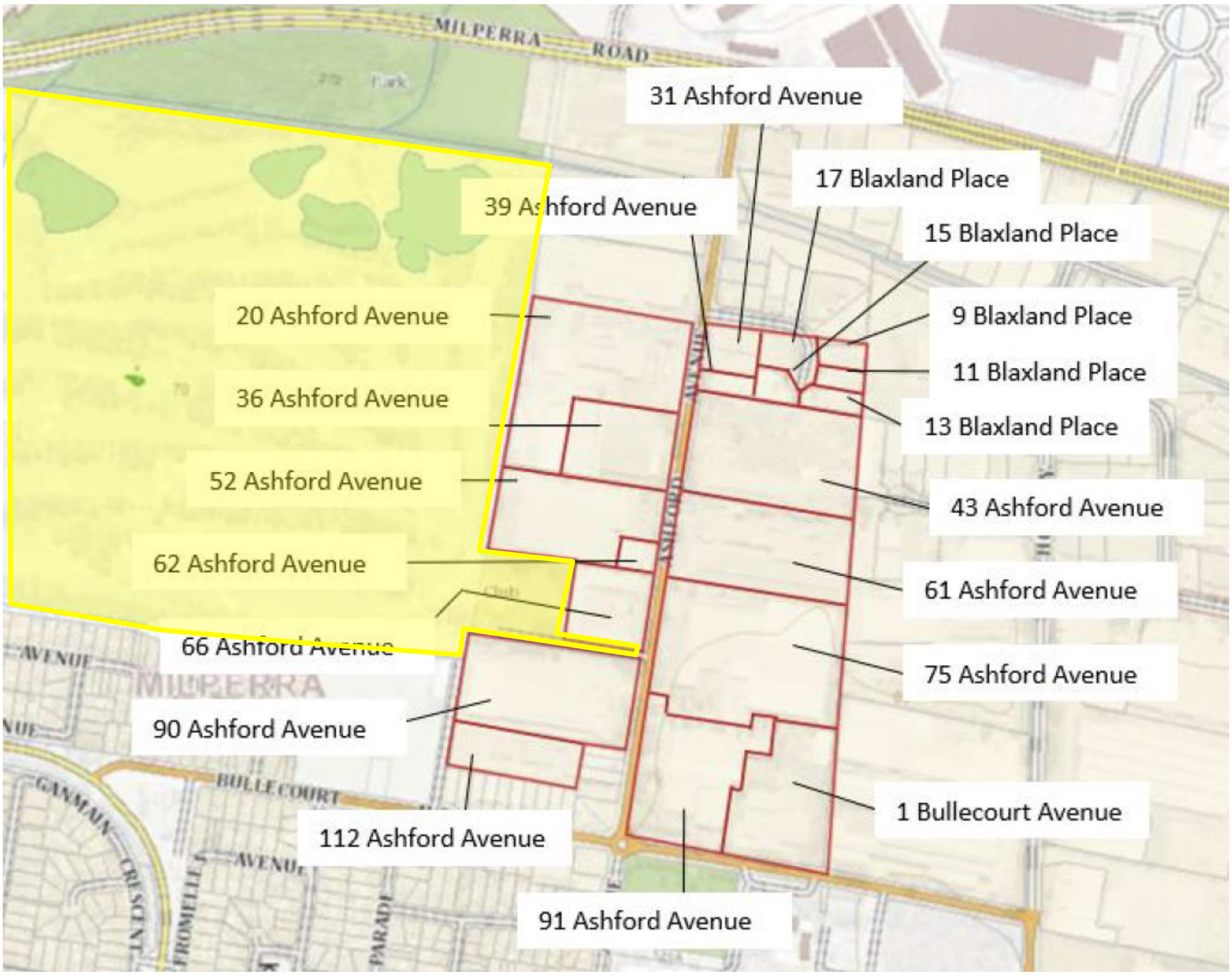
As can be seen from the proposed perspective of the Development Site, the residential buildings will be enveloped by the industrial buildings towards the north, east and south. Also, it is noted that existing vegetation (ie tall trees) exists between Development Site and the industrial facilities, which is to be supplemented by additional planting.

The industrial buildings to the east of the Development Site mainly consist of smash repair shops, car mechanics, building services providers and other auto care services, the closest of which is approximately 30 m to the proposed aged care facility boundary. In addition to the above, a service station is located approximately 250 m southeast of the aged care facility boundary, at the corner of Ashford and Bullecourt Avenues.

3 Investigation & Site Visit of Surrounding Area

A preliminary desktop investigation was undertaken to ascertain the existing industrial processes surrounding the Development Site. The street addresses of the identified nearby industries is shown in **Figure 5** with additional details shown in **Table 1**.

Figure 5 Map Nominating the Properties within the Study Area



Source: Hamptons 2020

Table 1 Summary of Surrounding Industrial Activities

Street Address	Activities
112 Ashford Avenue	Manufacture for metal products
90 Ashford Avenue	Warehouse and distribution
66 Ashford Avenue	Golf Course Industrial Estate (auto service centres, paper bag manufacturing, commercial offices)
62 Ashford Avenue	Air conditioning contractor - supplies and maintenance (Diamond Air)
52 Ashford Avenue	Use of premises for manufacture of sheet metal and wire products
36 Ashford Avenue	Factory building and use for clothing manufacture
20 Ashford Avenue	Use of Premises for Light Steel Distribution
39 Ashford Avenue	Recycling drop off collection centre (Envirobank)
31 Ashford Avenue	Use of Unit 2 for repair and replacement of hoses/fittings to vehicles, factory equipment and construction machinery
17 Blaxland Place	Furniture importer and manufacturer (Casa Mia Furniture)
15 Blaxland Place	Furniture manufacture and warehouse
9 Blaxland Place	Manufacture of barbecue and wood heater components
11 Blaxland Place	Furniture importer and manufacturer (Mulberry Co Pty Ltd)
13 Blaxland Place	Foam, floor matting and insulation distributors (PAO Leisure Pty Ltd)
43 Ashford Avenue	Recycling facility for scrap metal and steel products (SIMS)
61 Ashford Avenue	Use of premises as a transport depot for warehousing and distribution of general freight with ancillary office and internal alterations to warehouse
75 Ashford Avenue	Clothing warehouse and distribution centre
1 Bullecourt Avenue	Supplier of comprehensive range of material handling equipment, from the largest container handlers and reach stackers, to nearly every type and size of industrial forklift truck, to special warehousing equipment (Nacco Materials Handling Group Pty Ltd)
91 Ashford Avenue	The use of the proposed warehouse shall be in conjunction with the existing use of the premises for storage and distribution of computer software and computerised products

A site visit was conducted by SLR on 11 June 2020 (between 10:30 am to 1:00 pm) to confirm the sources identified from the desktop review (**Table 1**) and to verify that there are no other activities with potential for significant air emissions within the vicinity of the Precinct.

The following general observations were made during the site visit.

- The weather was fine and sunny at the time of site visit. The winds were blowing from the southwest, west-southwest direction during the hours of 10:30 am and 1:00 pm.
- A ‘Return & Earn’ console was found to be located within the carpark of the Development Site. This will be relocated as part of this Project.
- The immediate neighbours to the Development Site include a logistics centre to the south and the Golf Course Industrial Estate to the east.

- At least one exhaust stack was noted to be installed at one auto service centre within the Golf Course Estate (see **Figure 6**). It is possible that there are other stacks on the building that were not visible from the street level. The information obtained from the property manager indicates that the existing stack(s) are used for building ventilation purposes only and are not connected to any specific process (for example spray booth). Specifically, the communication from Bankstown Golf Club Manager is below:

  "I have spoken with the manager of the property next door, none of the stacks of the building are in use and have not been for some time (years)" (23 July 2020).

- The main industries located within the Golf Course Industrial Estate were identified to be auto workshops, paper bag printing, timber works (sawmill), concrete rendering works, in addition to the nearby Sims Metal Management facility (Sims facility).
- Access into the industrial premises around the Development Site was limited, with photos generally taken from the street. Access into the Golf Course Industrial Estate (ie industrial units between the Development Site and Ashford Avenue) was available, however no detailed information on the industrial processes undertaken is available.
- The industries located on Ashford Avenue and Bullecourt Avenues were found to be dominated by logistics providers and auto mechanic workshops/suppliers respectively.
- The main industries identified in the vicinity of the Development Site with potential to have cumulative air quality impacts were:
  - Auto service workshops within the Golf Course Industrial Estate;
  - Service station located approximately 250 m southeast; and the
  - Sims facility located approximately 250 m northeast.
- No odour was experienced in the car park of the Development Site, or on Ashford Avenue in the vicinity of the Development Site. During the site visit, SLR conducted an odour survey of the area, the results of which are presented in **Figure 7**. It is noted that an odour survey provides only a snapshot of the odour at these locations at these times and does not capture all meteorological conditions nor all operating conditions. The odour survey methodology is discussed in **Appendix A**.

Figure 6 Photos Showing Existing Industrial Activities within and around the Development Site

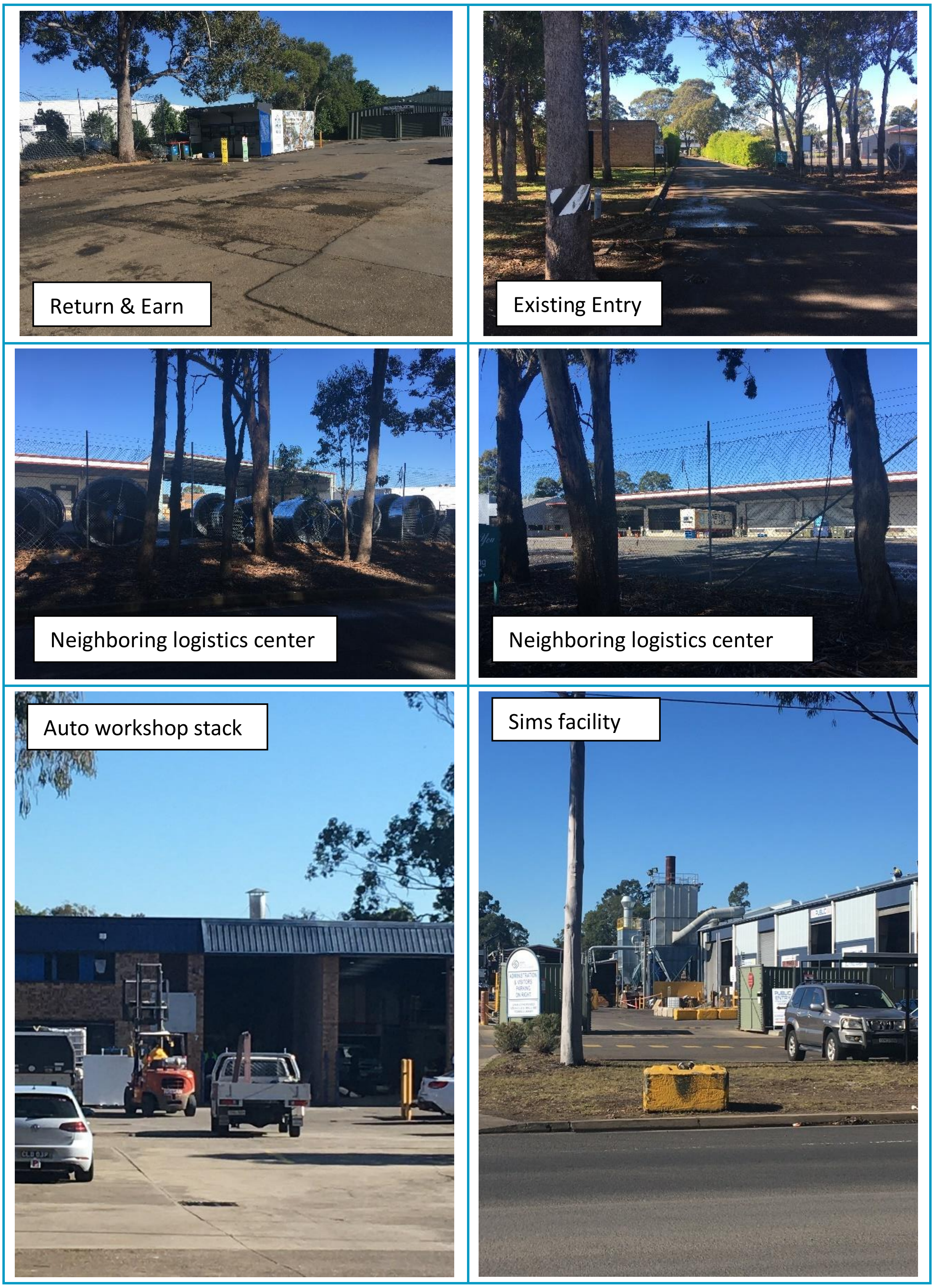


Figure 7 Odour Survey Results

4 Identification of Potential Air Emission Sources

4.1 Auto Service Centres

The auto service centres are located within the Golf Course Industrial Estate, to the east of the Development Site, and are the closest identified air emission source to the proposed sensitive receptor buildings. It is likely that the auto services centres undertake a range of general car repair and maintenance processes, including some smash repair capabilities and may even include surface coating operations, such as surface preparation (sanding, paint stripping etc), painting and equipment cleaning using solvents.

The local government air quality toolkit for spray painting operations (EPA 2017a) published by NSW EPA identifies the potential emissions to atmosphere from spray painting operations as:

- Evaporated solvents (ie volatile organic compounds, or VOCs) from drying of coating formulations, thinners and cleaners;
- Odours associated with odorous solvents/VOCs;
- Toxic compounds, to the extent that solvents, thinners and cleaners are toxic;
- Coating overspray or ‘carryover’, and
- Sanding and blasting dust arising from surface preparation in some activities, such as smash repairing or timber painting.

Based on the above, the key atmospheric pollutants being generated by these existing activities at the Golf Course Industrial Estate would be VOCs. The quantity and composition of these emissions would depend on the quantities and formulations of the oils, greases, solvents and paints handled at the sites. These VOC emissions also have potential to be odorous.

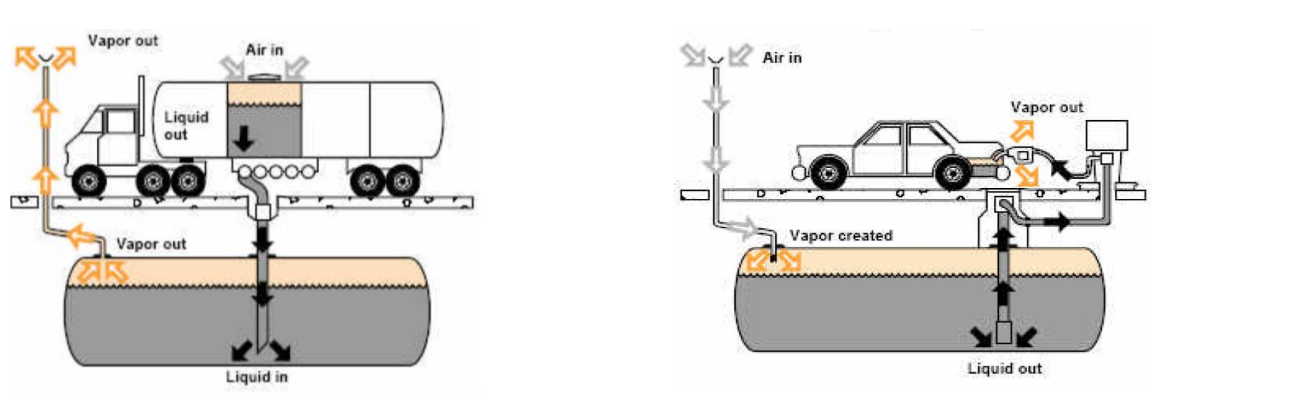
Some fuel combustion emissions are also anticipated from vehicles entering, leaving and idling at the site. Generally the vehicle engines would be turned off when in the auto services centre, unless they are undergoing quality control checks, therefore combustion emissions from the auto services centre operations are anticipated to be negligible.

4.2 Service Station

The service station will generate emissions of VOCs 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 underground storage tanks, working losses can occur from the vehicle fuel tanks being filled at the bowser, as illustrated in **Figure 8**.

Figure 8 Illustration of Working Losses at Service Stations



Source: DECCW 2009

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.

Some fuel combustion emissions will also occur as a result of vehicles entering, leaving and idling at the site. As vehicle engines must be turned off when re-fuelling, combustion emissions from the service station operations are anticipated to be negligible.

4.3 SIMS Metal Management Facility

There is limited information available publicly on the processes undertaken at the Sims facility in Milperra. It is understood that:

- the Sims facility accepts and recycles all types of scrap metal (ferrous and non-ferrous);
- crushing and screening is involved to sort out heavier metals, which has the potential to give rise to dust/particulate emissions; however
- no melting or any other such processes are undertaken with a high potential to give rise to other air emissions.

As shown in **Figure 6** a baghouse is installed at the Sims facility, presumably to control dust emissions from the crushing and screening operations. Some fuel combustion emissions are also anticipated from vehicles entering, leaving and idling at the site.

4.4 Road Traffic Emissions

The Development Site is located within an industrial estate with a network of roads predominantly used by trucks and heavy vehicles accessing the industrial estate, including the logistics centre immediately to the south. In addition, the Bankstown Airport is located approximately 800 m to the north.

A review of the National Pollutant Inventory Emission Estimation Technique Manual (NPI EET) for Combustion Engines (DEWHA 2008) identifies the primary pollutants from internal combustion engines as:

- Total Volatile Organic Compounds (TVOCs).

- Carbon monoxide (CO).
- Oxides of nitrogen (NOx).
- Particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$).
- Particulate matter less than 10 µm in aerodynamic diameter (PM_{10}).
- Sulfur dioxide (SO_2).

Other substances are also emitted in trace amounts as products of incomplete combustion, such as metallic additives which contribute to the particulate content of the exhaust (DEWHA 2008).

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

4.5 Bankstown Airport

The Bankstown Airport Environment Strategy (SMA 2014) identifies the primary sources of air emissions from activities at Bankstown Airport as:

- Point sources including stacks, storage of solvents, exhausts from paint spray booths and cooling towers;
- Fuel storage and refuelling operations;
- Vehicle traffic to, from and on the Airport;
- Aircraft engine ground runs;
- Dust, including possible asbestos fibres, generated during construction or building maintenance activities; and
- Ozone depleting substances, such as some refrigerants (chlorofluorocarbons) and fire-suppressants (halons).

4.6 Summary

Based on the above, the emissions to atmosphere that have been considered in this assessment are shown in **Table 2**. These include air emissions from neighbouring commercial and industrial operations and emissions due to road traffic in the area.

In addition to these identified air emission sources in the local area, ambient air quality experienced at the Development Site will be influenced by regional background levels of air pollutants (see **Section 6.2**).

Table 2 Summary of Identified Potential Air Pollutants

Project Component	Pollutants
Auto service centres	VOCs and odour associated with fuel vapours from the auto repair activities
Service station	VOCs and odour associated with fuel vapours from the refuelling/fuel storage activities
SIMS facility	Products of fuel combustion from on-site traffic movements, such as trucks entering/exiting/idling. Particulate emissions from crushing/screening operations (controlled by a baghouse).
Road traffic emissions	Products of fuel combustion from on-road vehicle movements Wheel-generated dust due to on-road vehicle movements
Bankstown airport	Products of fuel combustion from on-site airplane movements, such as airplanes entering/exiting/idling Wheel-generated dust due to on-site vehicle movements VOCs and odour associated with fuel vapours from the refuelling/fuel storage activities

5 Relevant Air Quality Criteria and Guidelines

5.1 Pollutants of Concern

Based on the types of air pollution sources identified above, the air pollutants of interest have been identified as:

- VOCs and odour from the use of solvents and paints at the auto services centre, fuel vapours from the service station and Bankstown Airport operations;
- Vehicle emissions (particulate matter, oxides of nitrogen and individual air toxics) from the Sims facility; and
- Products of fuel combustion (including particulate matter) and fugitive dust from the vehicular traffic in the area including at the Bankstown Airport.

The following sections outline the potential health and amenity issues associated with the above air emissions, while **Section 5.2** outlines relevant air quality assessment criteria.

5.1.1 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 Total Suspended Particulate (TSP) refers to a category of airborne particles, typically less than 30 microns (µm) in diameter and ranging down to 0.1 µm. Particulate matter with an aerodynamic diameter of 10 microns or less is referred to as PM_{10}.

The PM_{10} size fraction is sufficiently small to penetrate the large airways of the lungs, while $PM_{2.5}$ (2.5 microns or less) particulates are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

Larger particles primarily cause nuisance associated with coarse particles settling on surfaces.

5.1.2 Products of Combustion

Emissions associated with road traffic and the combustion of automotive fuel (diesel, petrol, etc.) 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).

Carbon Monoxide

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.

Oxides of Nitrogen

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.

Sulphur Dioxide

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 (i.e. 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.

5.1.3 Volatile Organic Compounds

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, cyclohexane, ethylbenzene, toluene and xylenes. Biogenic (natural) sources of VOC emissions are also significant (e.g. 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.

There is no criterion available for total VOCs, only for individual compounds. As noted above, the composition of VOC emissions from the auto services centres would depend on the quantities and formulations of the different fuels oils, greases, solvents and paints handled at each site. Air quality criteria for VOCs are therefore not presented.

5.1.4 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.
- *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.

An example for this can be shown in a theoretical case of a bakery. A person walking past the bakery may smell the bakery odours and like these baking odours (it can be shown that people generally react positively to baking odours). However, a person living next to the bakery and who experiences the baking odours throughout their house and garden on a continuous basis may find the baking odours offensive to the point where they complain to local authorities.

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.

5.2 Air Quality Criteria

5.2.1 Particulate Matter and Products of Combustion

State air quality guidelines specified by the NSW Environmental Protection Agency (EPA) for the pollutants identified in **Section 4.6** are published in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2017b) [hereafter 'Approved Methods']. The ground level air quality impact assessment criteria listed in Section 7 of the Approved Methods have been established by NSW EPA to achieve appropriate environmental outcomes and to minimise associated risks to human health as published in the Approved Methods. They have been derived from a range of sources and are the defining ambient air quality criteria for NSW, and are considered to be appropriate for use in this assessment.

A summary of the relevant impact assessment criteria for particulate matter and products of combustion is provided in **Table 3**.

Table 3 NSW EPA Goals for Particulate Matter and Combustion Gases

Pollutant	Averaging Period	Concentration	
CO	15 minutes	87 ppm	100 mg/m^3
	1 hour	25 ppm	30 mg/m^3
	8 hours	9 ppm	10 mg/m^3
NO_2	1 hour	12 pphm	246 µg/m^3
	Annual	3 pphm	62 µg/m^3
PM_{10}	24 Hours Annual	-	50 µg/m^3 25 µg/m^3
$PM_{2.5}$	24 Hours Annual	-	25 µg/m^3 8 µg/m^3
SO_2	10 minutes	25 pphm	712 µg/m^3
	1 hour	20 pphm	570 µg/m^3
	24 hours	8 pphm	228 µg/m^3
	Annual	2 pphm	60 µg/m^3
Pollutant	**Averaging Period**	**Maximum Increase in Deposited Dust Level**	**Maximum Total Deposited Dust Level**
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month

Source: EPA 2017b

5.2.2 Odour

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 document 'Technical framework: assessment and management of odour from stationary sources in NSW' (hereafter the Odour Framework), is expressed as follows:

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

A summary of the impact assessment criteria given for various population densities, as drawn from the Odour Framework, is given in **Table 4**. A criterion of 2 ou would be appropriate for the Development Site.

Table 4 NSW EPA Impact Assessment Criteria for Complex Mixtures of Odorous Air Pollutants

Population of Affected Community	Impact Assessment Criteria for Complex Mixtures of Odours (ou) (nose-response-time average, 99th percentile)
Urban area (≥ 2000)	2.0
~300	3.0
~125	4.0
~30	5.0
~10	6.0
Single residence (≤ 2)	7.0

Source: DEC 2006

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, and are considered appropriate for an aged care facility.

5.3.1 Australian Capital Territory EPA

The document '*Separation distance guidelines for air emissions*', published by ACT EPA (ACT EPA 2018) includes recommended minimum separation distances for relevant activities identified in **Section 4.6**, as shown in **Table 5**. As noted in **Section 4.3**, the Sims facility does not undertake any type of heating or melting, so the recommended separation distance of 500 m is expected to be overly conservative for this facility.

Table 5 Recommended Separation Distances, ACT EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Auto services centre	Surface coating	Spray painting and powder coating with a capacity to use less than 100 litres/day of paint or 10 kilograms/day of dry powder	100
Service station	Petroleum storage	Petroleum products are stored in tanks with a total storage capacity exceeding 2,000 cubic metres	250
Sims facility	Scrap metal recovery	Works at which scrap metals are treated in any type of fuel burning equipment or electrically heated furnaces or are disintegrated by mechanical means for recovery of metal, but excluding commercial printing establishments at which type metal is melted or re-melted in thermostatically controlled ports for the purpose of type casting	500
Bankstown airport	Petroleum storage	Petroleum products are stored in tanks with a total storage capacity exceeding 2,000 cubic metres	250

Source: ACT EPA 2018

5.3.2 Victoria EPA

The Victoria EPA document '*Recommended separation distances for industrial residual air emissions*', Publication No. AQ 1518 (VIC EPA 2013) includes minimum recommended separation distances for relevant activities identified in **Section 4.6**, as shown in **Table 6**.

Table 6 Recommended Separation Distances, VIC EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Auto services centre	NA	NA	NA
Service station	Petroleum storage	Storage of petroleum products or crude oil in tanks, tanks exceeding 2,000 tonnes (fixed roof)	250
Sims facility	Transfer station	Collecting, consolidating, temporarily storing, sorting or recovering refuse or used materials before transfer for disposal or use elsewhere	250
Bankstown airport	Storage of petroleum and hydrocarbon products	Storage of petroleum products or crude oil in tanks exceeding 2000 tones (fixed roof)	250

Source: VIC EPA 2013

5.3.3 South Australia EPA

The document '*Evaluation distances for effective air quality and noise management*' published by South Australian EPA (SA EPA 2016) includes recommended evaluation distances for relevant activities identified in **Section 4.6**, as shown in **Table 7**.

The separation distance recommended by SA EPA for service stations may be considered applicable to the Development Site, based on the 24 hour operations of the service station. Paint usage at the auto services centres (if applicable) would also be expected to be well below 100 L/day. As noted in **Section 4.3**, the Sims facility does not undertake any type of heating or melting, so the recommended separation distance of 500 m is expected to be overly conservative for this facility.

Table 7 Recommended Separation Distances, SA EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Auto services centre	Surface coating	Spray painting and powder coating with a capacity to use less than 100 litres/day of paint or 10 kilograms/day of dry powder	100
Service station	Service station/retail outlet	All 24 hour operations (except on highways/freeways)	200
Sims facility	Scrap metal recovery	Involves works at which scrap metals are treated in any type of fuel-burning equipment or electrically heated furnaces generating odours, or are disintegrated by mechanical means for the recovery of metal, generating noise and dust.	500
Bankstown airport	Petroleum bulk storage	Potential impacts are from odour, volatile organic compounds (VOCs), and noise from equipment.	500

Source: SA EPA 2016

5.3.4 Western Australia EPA

In the Western Australia Environmental Protection Authority (WA EPA) policy documentation for minimum recommended separation distances - *Separation distances between Industrial and Sensitive Land Uses* (WA EPA 2015), the WA EPA 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 WA EPA 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. WA EPA (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 WA EPA recommends EPA consultation where site-specific circumstances indicate a lesser separation distance may be appropriate (ie 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 WA EPA that may be applicable to the identified emission sources is provided in **Table 8**. As noted in **Section 4.3**, the Sims facility does not undertake any type of heating or melting, so the recommended separation distance of 500 m is expected to be overly conservative for this facility.

Table 8 Recommended Separation Distances, WA EPA

Project Component	Relevant Industry	Activity Notes	Separation Distance (metres)
Auto services centre	NA	NA	NA
Service station	Service station	Involving vehicle cleaning/detailing facilities & the retailing of spare parts and food stuffs - All 24 hour operations (except on highways/freeways)	200
	LPG retailing	LPG storage and handling at automotive retail outlets – underground tanks	55
Sims facility	Scrap metal recycling works	Scrap metal is fragmented or melted to recover metal (including lead battery reprocessing) – noise, dust & odour	300-500
Bankstown airport	Fuel storage	Crude oil and petroleum products in tanks or vessels exceeding 2,000 tonnes capacity (fixed roof)	200

Source: Appendix 1, WA EPA 2015

5.3.5 Summary

The separation distances recommended by various regulators indicate minimum separation distances of:

- 100 m for the auto service centres;
- 250 m for the service station;
- 250 m (conservative) for the Sims facility; and
- 800 m for Bankstown Airport.

5.4 State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004

The SEPP (Housing for Seniors or People with a Disability) sets out the following requirements for proposed developments:

Clause 33 - Neighbourhood Amenity and Streetscape

The proposed development should:

a. *recognise the desirable elements of the location's current character (or, in the case of precincts undergoing a transition, where described in local planning controls, the desired future character) so that new buildings contribute to the quality and identity of the area, and*

b. *retain, complement and sensitively harmonise with any heritage conservation areas in the vicinity and any relevant heritage items that are identified in a local environmental plan, and*

c. *maintain reasonable neighbourhood amenity and appropriate residential character by:*

   i. *providing building setbacks to reduce bulk and overshadowing, and*

   ii. *using building form and siting that relates to the site's land form, and*

   iii. *adopting building heights at the street frontage that are compatible in scale with adjacent development, and*

iv. *considering, where buildings are located on the boundary, the impact of the boundary walls on neighbours, and*

d. *be designed so that the front building of the development is set back in sympathy with, but not necessarily the same as, the existing building line, and*

e. *embody planting that is in sympathy with, but not necessarily the same as, other planting in the streetscape, and*

f. *retain, wherever reasonable, major existing trees, and*

g. *be designed so that no building is constructed in a riparian zone.*

There are no air quality specific development standards or provisions identified in the SEPP (Housing for Seniors or People with a Disability), however the broader environmental protection context defined above is considered relevant to this air quality and odour assessment.

5.5 State Environmental Planning Policy (Infrastructure) 2007

The aim of the Infrastructure SEPP is to facilitate the effective delivery of infrastructure across NSW by providing greater flexibility in the location of infrastructure and service facilities. The objective of clause 101 of the Infrastructure SEPP is to ensure that new development does not compromise the effective and ongoing operation and function of classified roads, and to reduce the potential for impacts from traffic noise and vehicle emissions on development adjacent to classified roads.

Reference is also made to the Rail and Road Guideline (DoP 2008), which supports the specific rail and road provisions of the Infrastructure SEPP. An aim of the Rail and Road Guideline is to assist in reducing the health impacts of adverse air quality from road traffic on sensitive adjacent development and assists in the planning, design and assessment of development adjacent to busy roads. Section 4.4 of the Rail and Road Guideline provides the following guidance on when air quality should be a design consideration and some of the principles that should be considered at the design stage to achieve improved air quality:

When air quality should be a design consideration:

- *within 10 m of a congested collector road (traffic speeds of less than 40 km/hr at peak hour) or a road grade > 4% or heavy vehicle percentage flows > 5%*
- *within 20 m of a freeway or main road (with more than 2,500 vehicles per hour, moderate congestion levels of less than 5% idle time and average speeds of greater than 40 km/hr)*
- *within 60 m of an area significantly impacted by existing sources of air pollution (road tunnel portals, major intersection / roundabouts, overpasses or adjacent major industrial sources)*
- *as considered necessary by the approval authority based on consideration of site constraints, and associated air quality issues.*

Air quality design considerations:

- *Minimising the formation of urban canyons that reduce dispersion. Having buildings of different heights interspersed with open areas, and setting back the upper stories of multi-level buildings helps to avoid urban canyons.*
- *Incorporating an appropriate separation distance between sensitive uses and the road using broad-scale site planning principles such as building siting and orientation. The location of living areas, outdoor space and bedrooms and other sensitive uses (such as aged care facilities) should be as far as practicable from the major source of air pollution.*
- *Ventilation design and openable windows should be considered in the design of development located adjacent to roadway emission sources. When the use of mechanical ventilation is proposed, the air intakes should be sited as far as practicable from the major source of air pollution.*
- *Using vegetative screens, barriers or earth mounds where appropriate to assist in maintaining local ambient air amenity. Landscaping has the added benefit of improving aesthetics and minimising visual intrusion from an adjacent roadway.*

6 Existing Environment

6.1 Local Wind 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) affects the degree of mechanical turbulence, which also influences the rate of dispersion of air pollutants.

The Bureau of Meteorology (BoM) maintains and publishes data from weather stations across Australia. The closest such station with available long term wind speed and wind direction data is the Bankstown Airport Automatic Weather Station (AWS), which is located less than 1 km to the north.

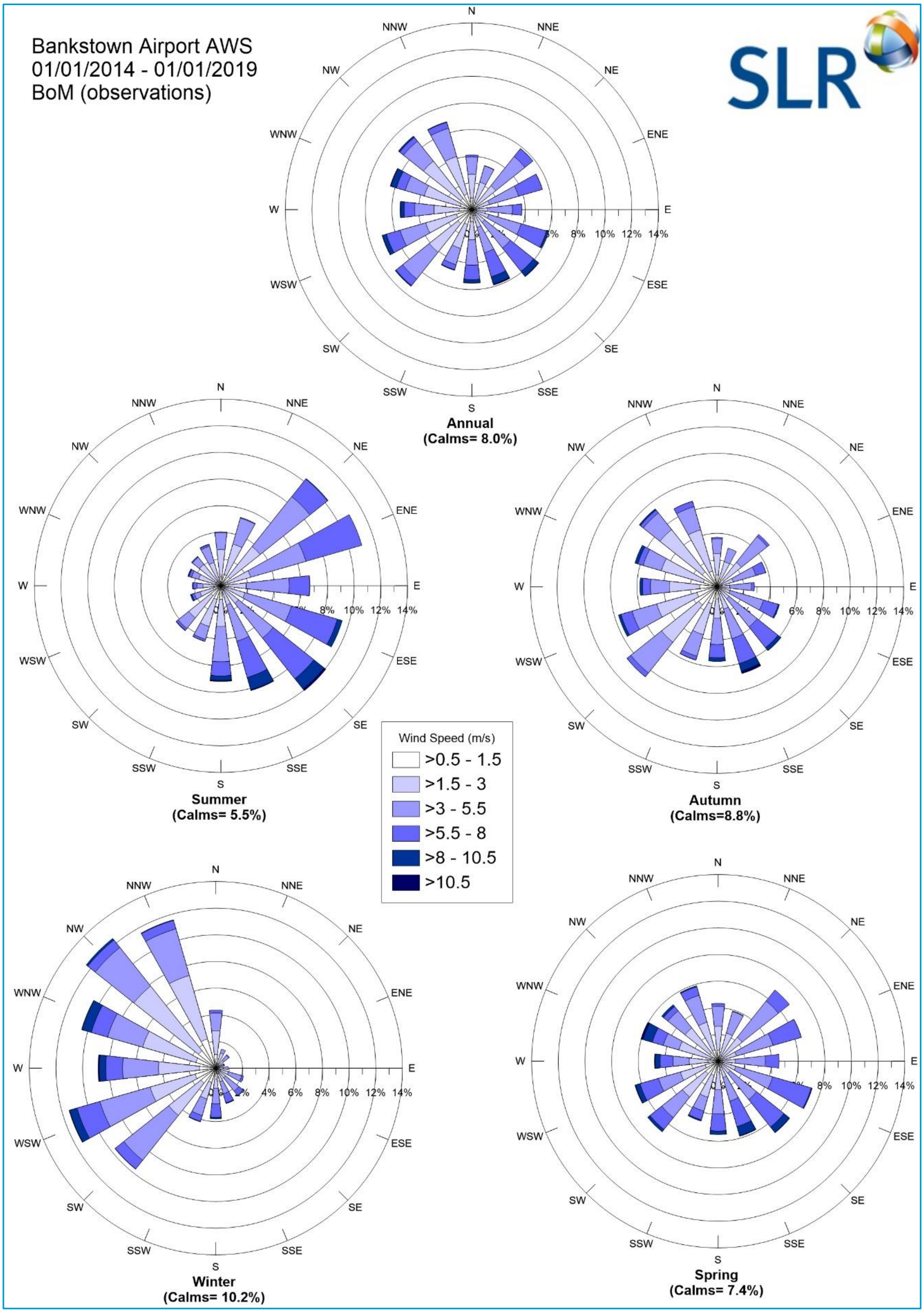
Annual wind roses for the years 2014 to 2018 are presented in **Figure 9**. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (degrees from north). The bar at the top of each wind rose diagram represents winds blowing from the north (i.e. northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds. Thus it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day. The 'Beaufort Wind Scale' (consistent with terminology used by the BoM) was used to describe the wind speeds experienced at the Development Site, outlined in **Table 9**.

Table 9 Beaufort Wind Scale

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

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

Figure 9 Annual Wind Roses for Bankstown Airport (2015 to 2019)



The annual average wind roses for the years 2015 to 2019 indicate that winds at Bankstown Airport blow almost evenly from all directions, without any particular direction dominating. Relatively low frequencies of winds from the north and north-northeast directions were recorded across all years. The average annual frequency of calm wind conditions was recorded to be approximately 8% for the years analysed.

Winds from between the northeast and southeast, which would blow air emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site, occur approximately 25% of the time.

The seasonal wind roses for the years 2015-2019 indicate that:

- In summer, the majority of winds blew from between the northeast and south directions, with very few winds from the west and north. Calm wind conditions were observed to occur 5.5% of the time during summer. Winds from between the northeast and southeast, which would blow air emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site were recorded to occur 50% of the time during summer.
- In autumn, winds blew almost evenly from all directions, except for winds from the north and east directions. Calm wind conditions were observed to occur less than 9% of the time during autumn. Winds from between the northeast and southeast, which would blow air emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site were recorded to occur 22% of the time during autumn.
- In winter, the majority of winds blew from between the southwest and north-northwest directions, with very few winds from the northeast, east and southeast directions. Calm wind conditions were observed to occur approximately 10% of the time during winter. Winds from between the northeast and southeast, which would blow air emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site were recorded to occur 6% of the time during winter.
- In spring, winds blew almost evenly from all directions, with a lower frequency of winds from the north and east directions. Calm wind conditions were recorded approximately 7% of the time during spring. Winds from between the northeast and southeast, which would blow air emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site were recorded to occur 35% of the time during spring.

Overall, the seasonal wind roses indicate that frequency of winds that would blow emissions from the Golf Course Industrial Estate towards the nearest sensitive receptors within the Development Site ranges between 6% (winter) to 50% (summer).

6.2 Background Air Quality

The NSW Office of Environment and Heritage (OEH) maintains a network of Air Quality Monitoring Stations (AQMS) across NSW. The nearest such OEH stations are located at Chullora, approximately 7 km to the northeast and Liverpool, approximately 8 km to the west of the Development Site.

The Chullora AQMS was installed in 2002 and is mainly surrounded by a commercial area, while the Liverpool AQMS was commissioned in 1998 and is mainly surrounded by residential areas. Since both stations have a similar surrounding land use as compared to the Development Site (ie within a commercial and residential areas), air pollutant concentrations recorded at the Chullora AQMS and Liverpool AQMS are likely to be representative of those experienced in the area surrounding the Development Site.

The following air pollutants are currently measured by both the AQMSs:

- Oxides of nitrogen (NO, NO_2 & NOX);
- Sulphur dioxide (SO_2);
- Fine particles less than 10 microns (PM_{10});
- Fine particles less than 2.5 microns ($PM_{2.5}$); and
- Carbon monoxide (CO).

A summary of the available measured ambient pollutant concentrations for the last five years (2015-2019) is tabulated in **Table 10**.

A review of the data shows that exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ criteria were recorded by both the Chullora and Liverpool AQMSs each year from 2015 to 2019. Only one exceedance of the PM_{10} annual average criteria was recorded at Chullora for 2019 while the $PM_{2.5}$ annual average criteria was exceeded at both stations every year from 2015 to 2019.

Short-term exceedances are generally regional-wide air quality events, associated with dust storms, hazard reduction burns and bushfires, which when prolonged or significant, can also have a significant contribution to elevated annual average concentrations. Plots of the 24-hour average PM_{10} and $PM_{2.5}$ concentrations for both monitoring stations are shown in **Figure 10** and **Figure 11** respectively.

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

Table 10 Summary of Air Quality Monitoring Data from Chullora and Liverpool AQMSs (2015 – 2019)

Pollutant	NO_2		PM_{10}		$PM_{2.5}$		SO_2			CO
Averaging Period	Maximum 1-hour	Annual	Maximum 24-hour	Annual	Maximum 24-hour	Annual	Maximum 1-hour	Maximum 24-hour	Annual Average	Maximum 8-hour
Units	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
Chullora AQMS										
2015	123.0	20.1	68.6	18.4	32.2	8.5	40.0	8.6	1.5	250
2016	96.4	23.7	68.7	19.5	50.8	8.7	40.0	8.6	1.7	2,000
2017	131.2	25.1	74.0	20.6	56.4	8.9	40.0	8.6	1.5	1,500
2018	127.1	25.3	101.5	24.2	45.4	10.1	60.1	8.6	1.8	4,250
2019	102.5	24.7	178.9	27.7	156.0	12.8	74.4	11.4	2.0	1,750
Criterion	**246**	**62**	**50**	**25**	**25**	**8**	**570**	**228**	**60**	**10,000**
Liverpool AQMS										
2015	110.7	25.7	64.6	17.5	37.2	8.0	ND	ND	ND	250
2016	94.3	25.8	63.5	18.1	49.4	8.0	20.0	5.7	2.0	2,375
2017	123.0	25.0	63.0	20.1	44.6	9.5	31.5	8.6	2.1	2,250
2018	116.9	24.1	90.7	21.9	29.1	8.6	57.2	11.4	2.0	2,375
2019	143.5	23.7	140.4	24.6	97.6	11.5	45.8	11.4	2.1	2,250
Criterion	**246**	**62**	**50**	**25**	**25**	**8**	**570**	**228**	**60**	**10,000**

Figure 10 24-Hour Average PM_{10} and $PM_{2.5}$ Concentrations – Chullora AQMS (2015-2019)

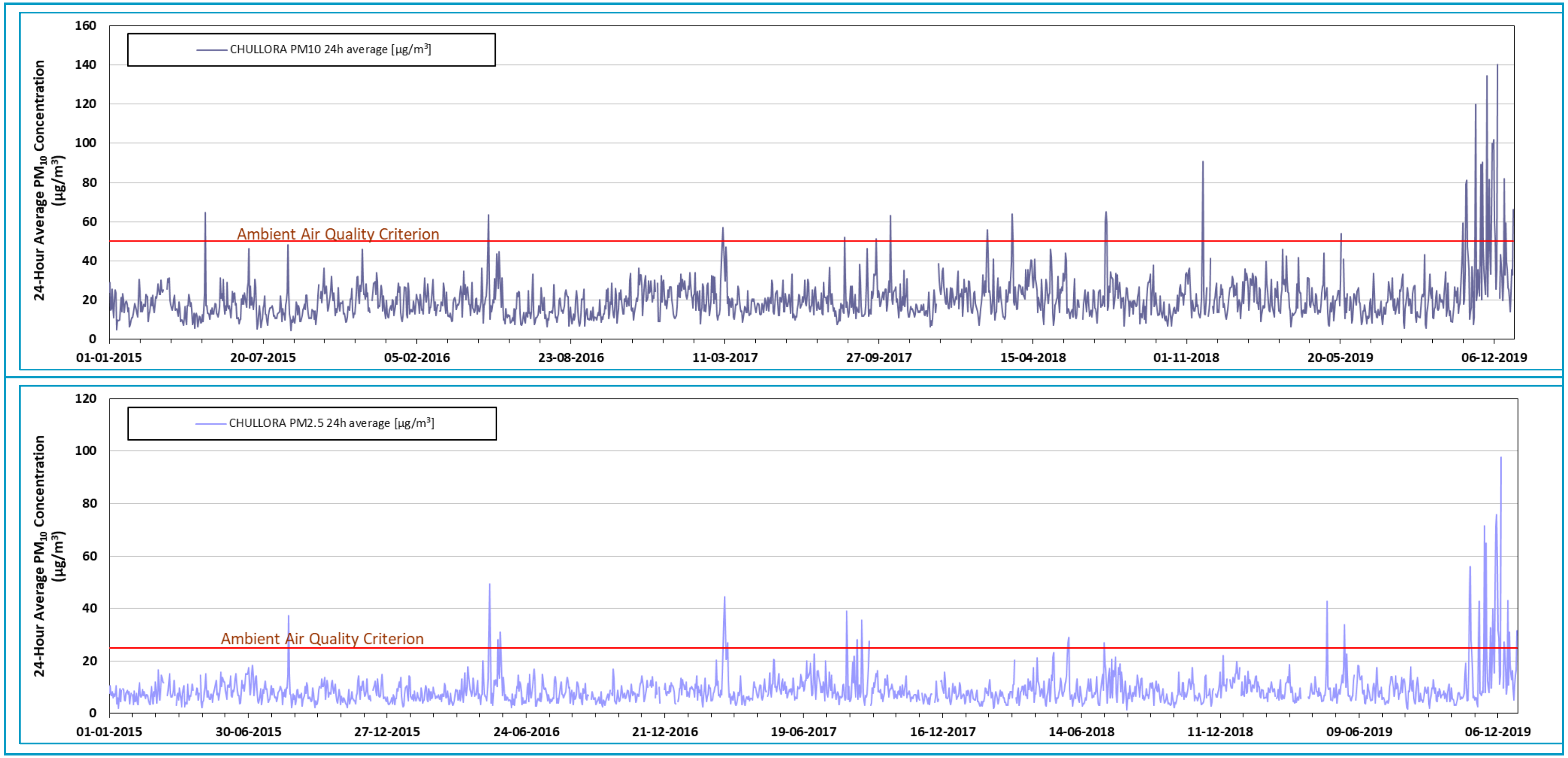
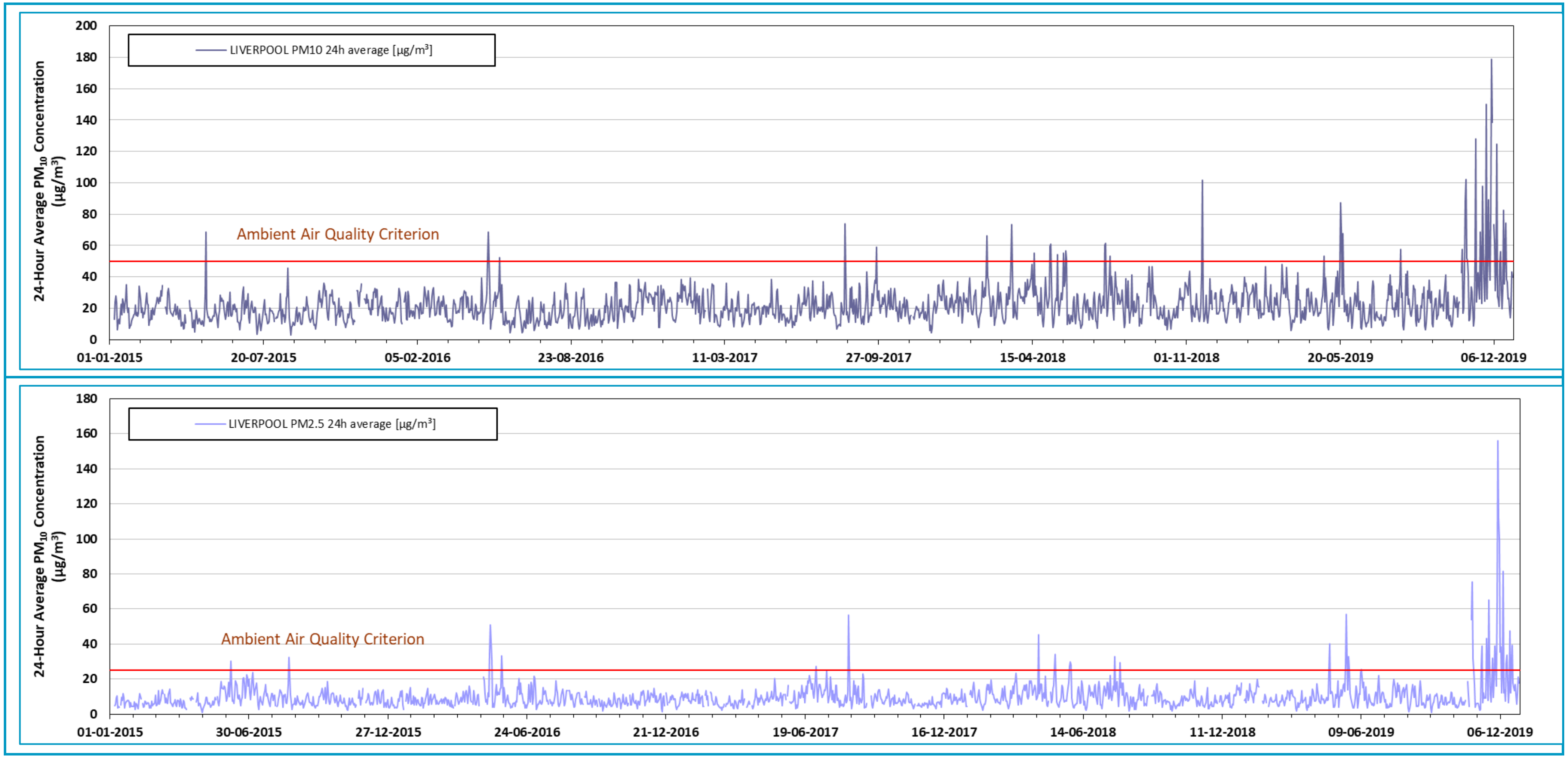


Figure 11 24-Hour Average PM_{10} and $PM_{2.5}$ Concentrations – Liverpool AQMS (2015-2019)



7 Assessment of Impacts

Considering the nature of existing activities around the Development Site (ie varied industrial and commercial operations and transport activities), limited publicly available data and the potential variability in activities being performed at any point in time, a large number of assumptions would be required to be used as input to any quantitative (ie air dispersion modelling) assessment. The uncertainty associated with the output of such studies means it would therefore be of limited value.

An ambient air quality monitoring programme would also need to be performed over a significant period of time (several months) in order to collect enough data under a range of meteorological and operational conditions. There would also need to be a wide range of pollutants monitored given the range of activities. Given the time constraints and prohibitive costs of such a monitoring programme, on-site ambient air quality monitoring has not been performed as part of this assessment, instead reference is made to the publicly available air quality data (see **Section 6.2**).

SLR has instead performed a qualitative (risk-based) assessment of the operational impacts, based on the information available, to identify those activities that have the potential for quality impacts at the Development Site, so that appropriate mitigation measures can be identified (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 proposed sensitive land use of the Development Site, it is considered that this approach is appropriate to identify those key activities that have the potential to give rise to air quality impacts so that recommended mitigation measures may be identified.

With regards to the methodology outlined in **Appendix B**, the sensitivity of the Development Site to air pollutant emissions generated by the nearby industrial sources has been classified as ***very high***.

7.1 Auto Service Centres

Assuming the normal working hours (ie 9:00 am to 5:00 pm) of the Golf Course Industrial Estate, and the types of activities undertaken at these facilities (ie smash repair shops, car mechanics and other auto care services), the nature of impact is considered to be *adverse*.

As noted in **Section 2**, post construction, the closest auto service centre identified as having a ventilation stack identified in **Figure 6**, will be located approximately 30 m east of Building C, and 35 m south of Building B. Also, the preliminary building designs indicate the proposed height for Buildings B and C to be 27.4 m, which is higher than the stack height of approximately 10 m. This may result in apartment windows/balconies impacted by the exhaust air from the existing stack.

As noted in **Section 5.3**, in lieu of any NSW-specific policy and guidance, the other regulators have recommended a separation distance of at least 100 m between auto service centres (with spray painting facilities) and sensitive receptors. However, it has been confirmed by the management of Golf Course Industrial Estate that the stacks are not connected to any spray paint booth, and are natural ventilation stacks. It is anticipated that the exhaust air through these stacks is likely to be non-odorous for most of the time, with potential to contain some odours only sometimes (eg during cleaning of parts using solvents etc). These emissions are unlikely to be detectable beyond the property boundary.

No background air quality monitoring data is available for VOCs, however based on SLR's experience it can be expected that levels across Sydney are generally low, except very close to major roads and specific industrial point sources. No odours were observed in the vicinity of this source during the odour survey.

Given the above considerations, the magnitude of impacts at the Development Site receptors is concluded to be **negligible** (ie Impact is predicted to cause no significant consequences [**Table B2]**).

Given the **very high** sensitivity of the potentially affected receptors and the **negligible** magnitude of the potential impacts from the auto service centres, the potential impact significance for the Development Site is concluded to be of ***neutral significance*** for the closest sensitive receptors.

Table 11 Risk Assessment of Impacts from Auto Service Stations

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

7.2 Service Station

As discussed in **Section 4.2**, VOC and odour emissions could occur from the storage and handling of fuel as well as any spillage of fuels. The separation distance between the Development Site and the service station (250 m) meets the recommended guideline of 250 m identified in **Section 5.3.5**, any VOC emissions are expected to be dispersed and very low. Also, all service stations in Sydney can be assumed to have vapour recovery systems installed.

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

Based on the **very high** sensitivity of the potentially affected receptors and the **negligible** magnitude of the potential impacts from service station, the potential impact significance for the local receptors is concluded to be of ***neutral significance*** for the closest receptors.

Table 12 Risk Assessment of Impacts from Service Station

Magnitude / 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

7.3 SIMS Facility

As discussed in **Section 4.3**, no melting or any other such processes are undertaken at the Sims facility with a high potential for air emissions.

Given the 250 m separation distance between Development Site and the Sims facility and the use of a baghouse to control dust emissions from the on-site operations, any residual dust emissions are expected to be well dispersed and very low.

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

Based on the **very high** sensitivity of the potentially affected receptors and the **negligible** magnitude of the potential impacts from Sims facility, the potential impact significance for the local receptors is concluded to be of ***neutral significance*** for the closest receptors.

Table 13 Risk Assessment of Impacts from Service Station

Magnitude / 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

7.4 Products of Combustion from Road Traffic

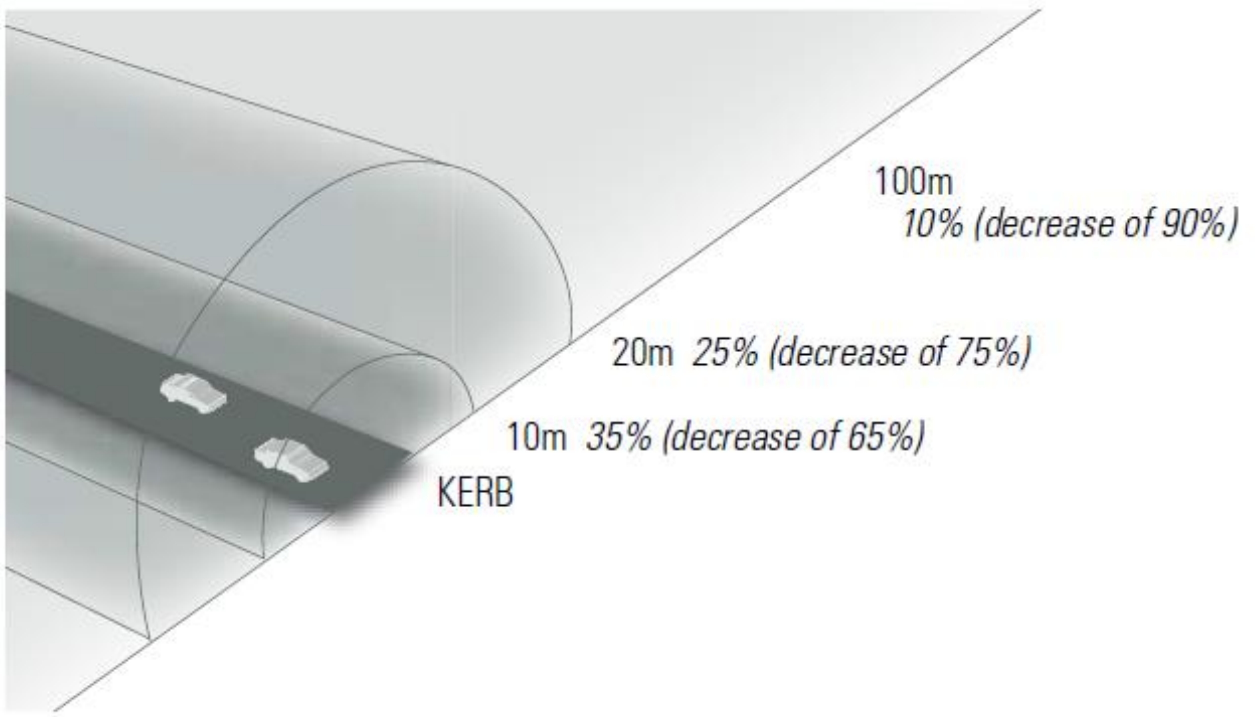
Ambient air quality monitoring performed in the Sydney area over the last few decades has shown that the city's air quality has improved and is continuing to improve. A major driver of this improvement in urban air quality is the fact that newer vehicles produce significantly less emissions than older 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 (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. Thus even as Sydney's population and total vehicle kilometres travelled each year have increased (EPA 2014), key measures of air pollution have dropped significantly and this trend is expected to continue.

The background air quality monitoring data show that the measured concentrations have been below the respective criteria for CO, NO_2 and SO_2 for five years running (2015-2019) (see **Section 6.2**). While vehicle emissions also contribute to elevated concentrations of PM_{10} and $PM_{2.5}$, which can be elevated in Sydney, most exceedances of these guidelines relate to regional events (bush fires and dust storms) and occur across Sydney.

Given the relatively low numbers of vehicles likely to be entering, exiting and idling within the Golf Course Industrial Estate close to the Development Site, and the neighbouring logistics facility, it is considered that the emissions generated due to the combustion of fuel in these vehicles will be small compared to the emissions generated by traffic on the surrounding road network (ie Ashford Avenue).

As outlined in the Guideline (DoP 2008), air pollutant concentrations from road traffic tend to decrease with increasing distance from the road. An indication of the relative decrease in pollutant concentrations with respect to the distance from the road is shown in **Figure 12**.

Figure 12 Percentage of Pollutant Concentration Relative to Kerb-side Concentration versus Distance



Source: DoP 2008

The distance between the kerbside of Ashford Avenue and the nearest openable window on the the Development Site is 100 m. According to the Guideline, pollutant concentrations would be almost back at background levels at these distances.

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

Given the **very high** sensitivity of the potentially affected receptors and the **negligible** magnitude of the potential impacts from products of combustion from traffic activities, the potential impact significance is concluded to be of ***neutral significance*** for the closest sensitive receptors.

Table 14 Risk Assessment of Impacts from Products of Combustion (Onsite Vehicle Movements)

Magnitude / Sensitivity		Impact Magnitude [Defined by Table A2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by Table A1]	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

7.5 Bankstown Airport

As discussed in **Section 4.5**, the onsite activities (such as fuel storage and refuelling operations, vehicle traffic to, from and on the Airport, and aircraft engine ground runs etc), can give rise to local air emissions.

Given the large separation distance between Development Site and Bankstown Airport (800 m), any VOC emissions are expected to be well dispersed and very low.

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

Based on the **very high** sensitivity of the potentially affected receptors and the **negligible** magnitude of the potential impacts from Bankstown Airport, the potential impact significance for the local receptors is concluded to be of ***neutral significance*** for the closest receptors.

Table 15 Risk Assessment of Impacts from Service Station

Magnitude / 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 Recommended Air Quality Mitigation Measures

A number of design considerations are outlined within the Rail and Road Guideline (refer **Section 5.5**) in regard to air quality impacts. Those of relevance to this Project are presented below:

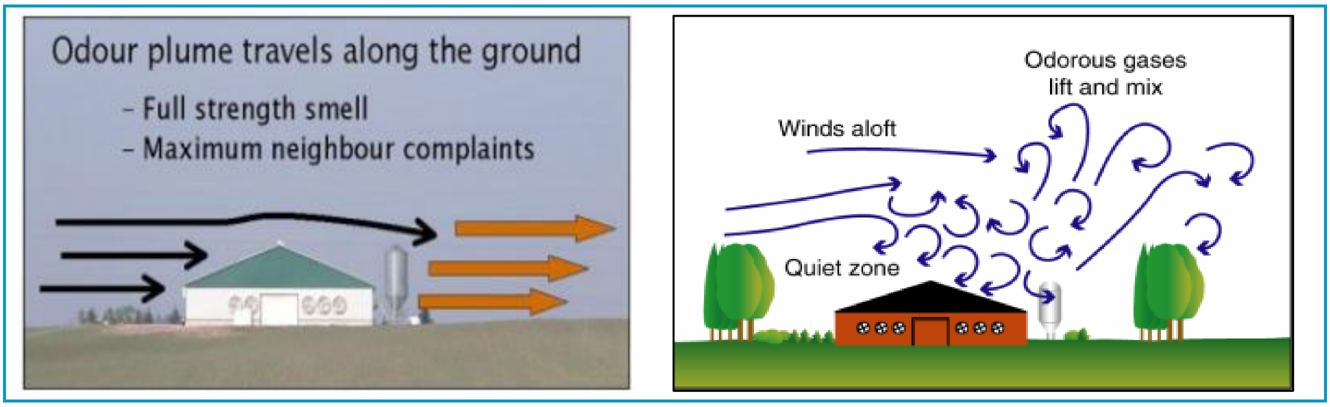
a. Incorporating an appropriate separation distance between sensitive uses and the road using broad scale site planning principles such as building siting and orientation. The location of living areas, outdoor space and bedrooms and other sensitive uses (such as aged care facilities) should be as far as practicable from the major source of air pollution. This has been incorporated into the proposed site layout with balconies and outdoor areas orientated to look over the golf course.

b. Ventilation design and open-able windows should be considered in the design of development located adjacent to roadway emission sources. Where the use of mechanical ventilation is proposed, the air intakes should be sited as far as practicable from the major source of air pollution. This should be a consideration in the proposed ventilation system for the Development Site, with ventilation system intakes located as far as practicable to the northwestern ends of the buildings.

c. Using vegetative screens, barriers or earth mounds where appropriate to assist in maintaining local ambient air amenity. Landscaping has the added benefit of improving aesthetics and minimising visual intrusion from an adjacent roadway. Vegetative windbreaks provide odour (and dust) mitigation by increasing the dispersion of odour plumes originating from the external sources. A schematic showing the odour plume path with and without windbreaks is shown in **Figure 13**.

   It is recommended that the existing vegetative barrier be protected and, where possible, extended/ expanded to maximise the filtering, dilution and masking of any odours. The site layout plans and perspective drawings show additional planting along the southern and eastern boundaries, which are likely to achieve this.

Figure 13 Schematic Showing the Odour Plume Path With and Without Windbreaks



d. Notwithstanding the predicted minor risk associated with the service centre stacks (Golf Course Industrial Estate), in case of any future air quality issues (for instance change of use for the workshops that have existing exhaust stacks on the roof), the tenants maybe approached and offered a low cost/low maintenance air purification system (such as carbon filters) to ameliorate any residual emissions from the workshop activities.

9 Conclusions

SLR was commissioned by Hamptons to provide an air quality assessment for a proposed aged care facility to be constructed at the existing premises of Bankstown Golf Club, Milperra (Development Site).

An application for site compatibility certificate for the Development Site was submitted by Hamptons in September 2019. After an initial assessment of the Statement of Environmental Effects (SEE), the Department of Planning, Industry and Environment (DPIE) has requested further information related to land use conflicts.

The aim of this report was to assess the potential air quality impacts due to existing sources of air pollution in the vicinity of Development Site and to assess its suitability for an aged care facility.

The potential for air quality impacts from the identified sources of air pollution (ie auto service centres, service stations, Sims facility, road traffic and Bankstown Airport) were assessed using a qualitative risk-based approach. Based on the qualitative assessment performed, SLR concludes that given the nature of these sources, the distances between the Development Site and the identified sources, and the local meteorological conditions, the predicted impacts from the identified sources are likely to be of **neutral** significance. It is highly unlikely for air quality at proposed aged care facility to be adversely impacted compared to other areas in Sydney.

To mitigate any residual air quality impacts from the surrounding industrial sources, the following building design measures may be considered:

- The air intakes should be sited as far as practicable from any sources of air pollution. For example, all openable windows should be on the western side (Golf Course side).
- The vegetative screens should be installed between the Development Site and Golf Course Industrial Estate buildings.
- In case of change of use for the workshops within the Golf Course Industrial Estate, the tenants maybe approached and offered a low cost/low maintenance air purification system (such as carbon filters) to ameliorate any residual emissions from the workshop activities.

This assessment is based on the existing industries with potential to have adverse air quality impacts on the Development Site. If approved, presence of an aged care facility on the boundary of an industrial zone may require an assessment of any new sources to ensure that they will not give rise to air emissions that could impact on the Development.

Given that the assessment of local air emission sources has concluded that they have a very low risk of resulting in any adverse impacts at the Development Site, and the generally good air quality in the Sydney region, and the management of air quality impacts from adjacent sources, air quality impacts are not considered to be a constraint to the development of an aged care facility at the Development Site.

10 References

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APPENDIX A

ODOUR SURVEY METHODOLOGY

Publicly accessible areas were surveyed (ie public roads and footpaths). Observations of the wind speed, wind direction were also recorded during each survey.

Odour Assessor

SLR only utilises personnel to conduct odour patrol surveys who have successfully undertaken and comply with the odour assessor sensitivity screening protocol in accordance with *AS/NZS 4323.3:2001 Stationary source emissions – Part 3: Determination of odour concentration by dynamic olfactometry*.

Odour Intensity

During the odour surveys, SLR adopted the approach prescribed by the German VDI 3882:1992 Part 1 *Olfactometry – Determination of Odour Intensity* to record odour intensity.

This method was utilised during the odour surveys as there is currently no Australian Standard for rating odour intensity. The German VDI 3882 standard is the standard most commonly referred to by the NSW Environment Protection Authority (EPA). To assess the odour intensity at each location for any discernible odours detected, the odour assessor classified their perception of the odour intensity in accordance with the scale outlined in **Table A1**.

Table A1 Summary of Odour Intensity Scale Utilised during the Field Odour Surveys

Perceived Odour Strength	Intensity Level Rating	Interpretation
Extremely Strong	6	In normal circumstances, this should be very rare in a field situation. For an offensive type of odour, the reaction would be to mitigate against further exposure. This remains the dominant thought and motivation until the exposure level is reduced. The odour cannot be tolerated.
Very Strong	5	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level is considered unpleasant/undesirable to the point that action to mitigate against further exposure is considered or taken.
Strong	4	The odour character is clearly recognisable. For an offensive type of odour, exposure to this level would be considered unpleasant/undesirable.
Distinct	3	The odour character is clearly recognisable. Note that this must still apply even if in a different context or situation - for example, not knowing or expecting what type of odour may be present. The odour is tolerable – even for an offensive odour.
Weak	2	The assessor is reasonably sure that odour is present but not 100% sure of the odour character. For example, at the “weak” level, suspended gravel dust is similar to a wet cement odour.
Very Weak	1	The odour character is not recognisable. There is probably some doubt whether the odour is actually present.
Not perceptible	0	No odour

APPENDIX B

OPERATIONAL PHASE RISK ASSESSMENT METHODOLOGY

Nature of Impact

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

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

Receptor Sensitivity

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

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

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

Table B1 Methodology for Assessing Sensitivity of a Receptor

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

Magnitude

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

Table B2 Magnitude of Impacts

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

Significance

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

Table B3 Impact Significance Matrix

Magnitude / Sensitivity		[Defined by Table B2]			
		Substantial Magnitude	Moderate Magnitude	Slight Magnitude	Negligible Magnitude
[Defined by TableA1]	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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