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Report

PLANNING PROPOSAL AREA WITHIN SOUTH JERRABOMBERRA – AIR QUALITY ASSESSMENT

QUEANBEYAN CITY COUNCIL

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EXECUTIVE SUMMARY

Introduction and Site Description

An air quality and odour assessment was conducted for Queanbeyan City Council (QCC) to examine the potential constraints and risks associated with rezoning the parcel of land currently known as Forrest, Morrison and Tralee Station (Walsh) located in the South Jerrabomberra area, NSW.

The assessment reviewed the existing and potential air quality impacts in the vicinity of the proposed land release.

A number of areas to the north of the site have either been approved or are in planning for rezoning and development for residential, mixed use and commercial land use.

The site is located within the QCC area and is currently undeveloped. It is in proximity to a number of potential emission sources which have the potential to cause adverse impacts at sensitive land uses.

The site is located to the south west of an existing industrial zone located in the ACT, known as the Hume Industrial Area. The zone has been approved to expand west of its current location and along the northern boundary of the site.

The Monaro Highway is located in proximity to the site and runs from west to east to the north of the site, approximately 600m to 1km from the nearest point to the site. A disused section of the Goulburn to Bombala railway runs along the northern boundary of the site, between the Hume Industrial Area and the site. The railway marks the border between NSW and ACT.

Proposed Development

The proposed development comprises residential land uses across the site. As part of the development of the site and the surrounding area, a number of roads are proposed.

Existing Environment

The prevailing wind direction follows a northwest-southeast axis. In general, calmer winds tend to originate from the southeast quadrant and strong winds from the northwest.

With the exception of the 24-hour average $PM_{2.5}$, all pollutant measurements at Monash were below the relevant criteria for the given averaging period. Elevated measurements of 24-hour average $PM_{2.5}$ are considered to be a relatively common occurrence in more urbanised areas located inland, where the cooler winter temperatures combined with population density and use of domestic wood heaters compound the issue.

Assessment Methodology

A qualitative air quality and odour assessment was completed. Key documents and regulatory instruments were reviewed in addition to consultation with relevant stakeholders.

Two site inspections were carried out on 11 June 2014 and 19 June 2014. The site inspections were designed to identify potential local sources of dust, odour and other emissions to air.

Findings

The key pollutants considered to have the potential to impact the site were identified to be odour and particulate matter.

The two site visits were completed as part of the review and on both occasions an odour from either the asphalt plant or the Mugga Lane RMC was detected. Dust(particulate matter) from off-site sources was not considered to be a constraint.

Findings, based on site inspection, indicate that odour had the potential to be a constraint for the proposed development and may be associated with the asphalt plant and the Mugga Lane RMC.

The most significant potential source of odour in the immediate vicinity of the proposed site is the existing asphalt batching plant within the Hume Industrial Estate. Due to the age of this facility, there is no air quality assessment available in the public domain that quantitatively evaluates potential for odour impacts from this activity. Historical works completed for the assessment for South Tralee by **PAEHolmes (2010)** used a simplified quantitative assessment based on odour emission rates from the stack of a similar plant in Ulverstone, Tasmania.

In our opinion, the findings of the indicative modelling are likely to have underestimated the odour impacts associated with current activities at the asphalt plant. While odour from this source was discernible during site inspection, it is not possible to conclude that this is a constraint to the South Jerrabomberra land release.

The Mugga Lane RMC is the other potentially significant odour source in the vicinity of the site and is situated approximately 1.5km northeast, on the far side of the Hume Industrial Estate. Potential for odour emissions from landfill are considered the primary air quality concern. This finding is based on field observations made on both site visits, indicating that odour from the landfill has the potential to travel over a significant distance before effective dispersion.

For both the asphalt plant and RMC, odour buffer distances commonly referenced indicate that, theoretically, odour should not be regarded as a nuisance issue from a well-maintained facility given the separation distances between odour source and potential receptors.

In view of the above, it is suggested that, given the field observations, that these facilities may not be operating under best (or even reasonable) practice odour management.

Recommendations

To avoid the potential for future land use conflict, it is recommended that the relevant environmental regulator (in this case, ACT EPA) should be alerted early on that the odour management practices at nearby facilities may not be in line with current industry standards.

Conclusion

Findings indicate that generally most air emission sources in the vicinity of the study area are anticipated to result in negligible impact within the proposed land release. Based on field observations, the asphalt plant and Mugga Lane RMC were identified as having potential for adverse odour impact in the vicinity of the proposed land release. In view of the separation distances involved between source and receptor, it is concluded that potential odour impacts associated with these facilities should not be regarded as a constraint over future residential zoning. Rather, any potential odour impacts appear to be as a result of poor odour management at the facilities in question. This is an issue of compliance that should be addressed by the relevant environmental regulator (in this case, ACT EPA).

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1 INTRODUCTION

1.1 Background

Queanbeyan City Council (QCC) is proposing to rezone two parcels of land on the ACT/NSW Border near to Queanbeyan and Hume, known as South Jerrabomberra (the site). The land parcels are currently known as Tralee Station and Forrest/Morrison. The land is a greenfield and currently has limited residential development. The council intend to rezone the land to allow residential development across the site.

The area immediately to the north of the site, known as South Tralee, was successfully rezoned in 2012 and included zones for residential, commercial and mixed use land uses. Additional rezoning and development is also proposed to the north of South Tralee at the area known as Poplars which was rezoned in 2013 for employment lands.

The *South Jerrabomberra Structure Plan* (**QCC, 2013**) identifies that development at the site is in line with QCC's residential and economic strategy.

1.2 Objectives of study

The purpose of the project is to provide QCC with an understanding of the air quality constraints and proposed management practices within this new Planning Proposal area.

The results of this study will inform the Planning Proposal which is likely to rezone part of the land for urban purposes. It is also likely to inform a subsequent Development Control Plan which will be applied at development stage.

1.3 Scope of work

The scope of work was as follows:

- Review of all legislative and other regulatory requirements as well as relevant planning controls which may be relevant to air quality matters.
- Review of existing land uses adjoining the area as well as with potential land uses and other planning provisions of the ACT Territory Plan, any proposed variations to it as well as those local environmental plans affecting adjoining land.
- Consultation with the ACT Planning and Land Authority in regard to possible future variations to the Territory Plan and possible land uses in adjoining areas.
- Review of all previous studies and their findings and recommendations which relate to the immediate area. These include existing industries in the Hume area, including:
    - An asphalt batching plant;
    - Landscaping supply companies;
    - Joinery companies;
    - Pre-mix concrete batch plants;
    - The Mugga Lane Resource Management Centre; and
    - Truck maintenance facilities.
- Assessment of the air quality of the study area taking into account existing nearby land uses, proposed land uses, the climate and topography. Assess the air quality in the study area with standards as adopted by the NSW Environment Protection Authority (EPA) and other generally accepted international standards and the views of international bodies such as the World Health Organisation. This will include but is not limited to, consideration of dust impacts, meteorological conditions including fog, wind strength and direction, inversion layers and the effects that these will have on the proposed urban development with particular regard to residential.
- Review of existing ambient air quality in the study area and recommendations on the historical trends and seasonal variations,

- Assessment of potential odour and/or dust emissions produced by existing nearby industries and activities, or within the site that would affect the amenity of future residents.
- Whilst on site, inspect the surrounds of the site to identify potential air emissions sources within the general vicinity.
- Consultation with the NSW EPA (as required and instructed by QCC).
- Provide recommendations based on the findings of the air quality assessment.

1.4 Reviewed Documents

Table 1-1 provides a summary of the documents reviewed as part of this study.

Table 1-1: Summary of Reviewed Documents

Title	Year	Author	Reference
ACT Government	1997	Environment Protection Act	-
ACT Government	2005	Environment Protection Regulation	-
ACT Government	2014	ACT Territory Plan	-
ACT Government	2013	*ACT Air Quality Report 2012*	
ACT Government	2014	*ACT Environment and Planning website*	
Canberra Airport	2010	Canberra Airport Environment Strategy	-
NSW Department of Planning	2008	Development near busy roads and rail corridors – Interim Guideline NSW EPA	-
NSW Department of Planning	2009	Section 117 Ministerial Direction Chapter 3.5 "Development Near Licensed Aerodromes"	-
NSW Government	1979	Environmental Planning and Assessment Act 1979	-
NSW Government	2007	Infrastructure State Environmental Planning Policy	-
NSW EPA	2005	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW	-
EPA Victoria	2010	Recommended separation distances for industrial residual air emissions	Policy Document 1506
EPA Victoria	2012	Best practice environmental management siting, design, operation and rehabilitation of landfills	Publication 788.1
Queanbeyan City Council	2012	Queanbeyan Local Environmental Plan (LEP) (South Tralee) 2012 Queanbeyan City Council	-
Queanbeyan City Council	2013	South Jerrabomberra Structure Plan	C1356307
Renzo Tonin	2010	South Tralee Supplementary Report to LES – Acoustic Review	TE543-02F02 (Rev3)
Wilkinson Murray	2013	South Tralee Sub-Division Concept - DA Noise and Air Assessment	02147-DA Version D
Bureau of Meteorology	2014	Canberra Airport automatic weather station data; Tuggeranong (Isabella Plains) automatic weather station (AWS) data	-
PAEHolmes	2009	Re: South Tralee Residential Development - Review	-
PAEHolmes	2010	Re: South Tralee Residential Development - Review of Submissions on the Supplementary Report to the Local Environmental Study	-
SKM	2012	Cooma Road Quarry Continued Operations Project: Air Quality Assessment	-
EPA Victoria	2006	Environment Report: Review of Air Quality Near Major Roads	
Parsons Brinkerhoff	2012	North Sydney Freight Corridor Epping to Thornleigh Third track project Air Quality Impact Assessment	
TDG	2014	Queanbeyan City Council TRACKS Model, South Jerrabomberra & Queanbeyan Traffic Analysis 2014	

1.5 Consultation

Consultation on the project was carried out on 23 May 2014. Pacific Environment consulted the following people from a range of regulatory authorities in the ACT and NSW via telephone:

- Daniel Walters, ACT EPA
- Sharon Peters, NSW EPA
- Justineta Balberona, ACT Environment and Sustainable Development Directorate
- Alix Kaucz, ACT Environment and Sustainable Development Directorate
- Mike Thomson, Queanbeyan City Council

2 PROJECT DESCRIPTION

2.1 Study area

The proposed site is currently a greenfield area covering 111 hectares in South Jerrabomberra, NSW. The site is considered an extension of the South Tralee that has recently been rezoned for residential purposes. The site comprises two parcels of land under separate ownership, as shown in **Figure 2-1**.

The site is situated to the immediate southeast of the NSW/ACT border, separated by the (currently disused) Goulburn to Bombala Railway. To the northwest of the rail line is the existing Hume Industrial Estate.

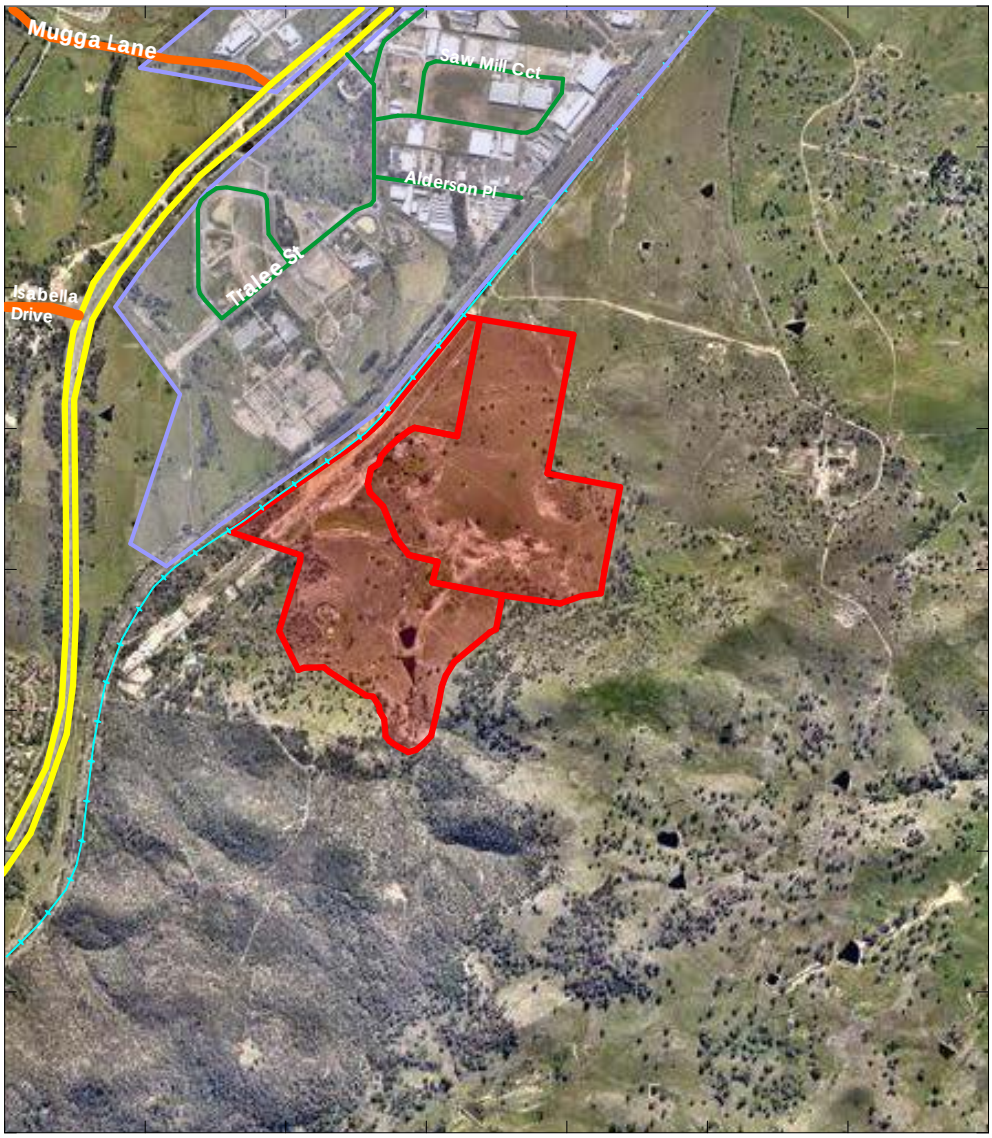
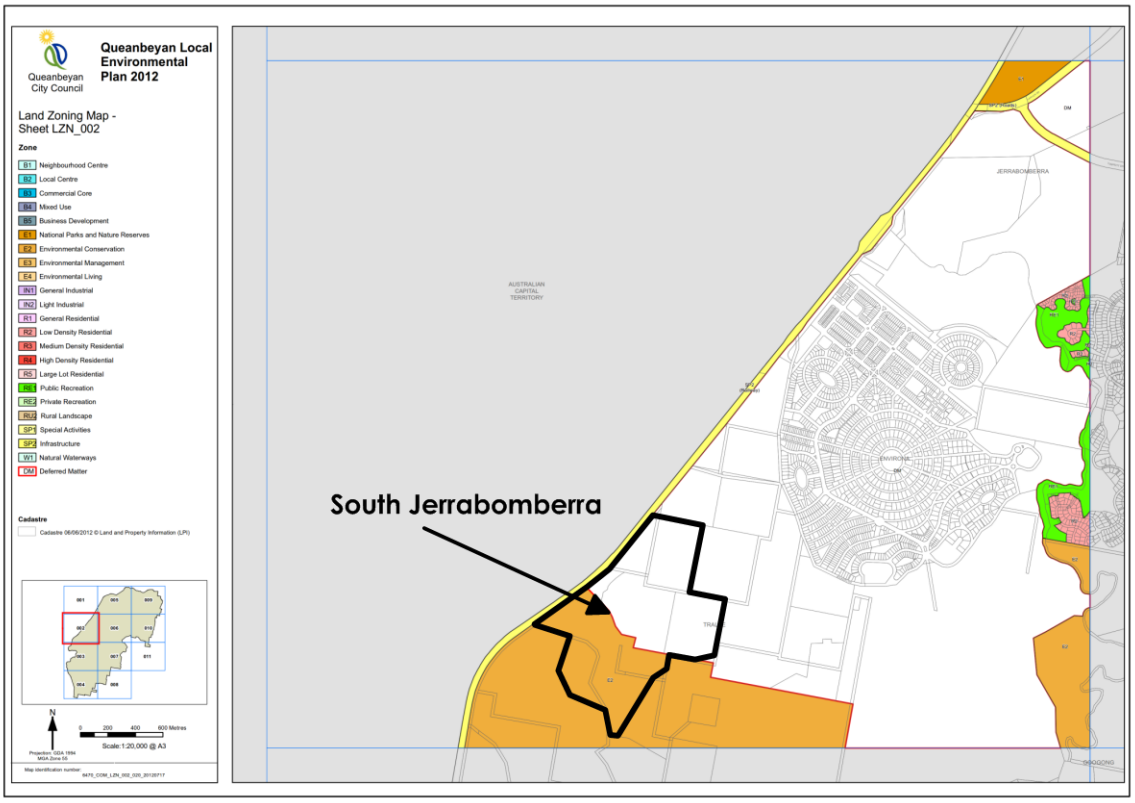


Figure 2-1: South Jerrabomberra planning proposal parcels

2.2 Surrounding land uses

The South Jerrabomberra site is currently zoned Environmental Conservation (E2) under the *Queanbeyan Local Environmental Plan* **(QLEP2012)** and 7(e) Environment Protection under the the *Yarrowlumla Local Environment Plan 2002* which was deferred from the QLEP 2012. The current land use is shown in **Figure 2-2**.



Source: *Queanbeyan Local Environmental Plan (LEP) (South Tralee)* 2012

Figure 2-2: Current land use at proposed site

The north-eastern component of the proposed site forms part of the now abandoned 'Environa' subdivision. The area currently has no specified land use and is currently used for grazing purposes. Further to the east forms part of the Jerrabomberra residential area.

As described in **Section 2.1** the (currently disused) Goulburn to Bombala railway line adjacent to the proposed site defines the NSW/ACT border. Therefore, any land located to the northwest of the railway is subject to the ACT Territory Plan zoning requirements (**ACT Government, 2014**). This includes the Hume Industrial Estate, located immediately adjacent to the proposed site.

Land use in Hume, for the most part, comprises 'IZ1 – General Industrial' that makes up the Hume Industrial Estate. A small portion of this area is allocated as 'IZ2 – Mixed Use Industrial', restricting the level of industry able to operate within this zone.

Further afield comprises 'NUZ1 – Broadacre', 'CZ6 – Leisure and Accommodation', 'NUZ3 – Hills Ridges and Buffer' transitioning to a mixture of 'RZ1 – Suburban' and 'RZ2 – Suburban Core' zones to the southwest.

2.3 Emission sources

The primary area with potential for the release of air emissions and potential subsequent impact on the South Jerrabomberra site is the Hume Industrial Estate. The following industries have been identified by QCC as being of interest:

- An asphalt batching plant;
- Landscaping supply companies;
- Joinery companies;
- Pre-mix concrete batch plants;
- The Mugga Lane Resource Management Centre (RMC); and
- Truck maintenance facilities.

Other industries and infrastructure in the vicinity of the proposed site that we identified through desktop review that have the potential to impact on the local air quality of South Jerrabomberra include:

- Googong Waste Water Treatment Plant;
- Cooma Road Quarry;
- Monaro Highway;
- Canberra airport; and
- Adjacent railway line.

These potential sources of emissions to air, along with other sources identified during our site inspection, are discussed below.

3 LEGISLATION AND GUIDELINES

3.1 Air quality assessment criteria

The NSW Environmental Protection Authority (EPA)'s *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* specify air quality assessment criteria relevant for assessing impacts from air pollution ("the Approved Methods"; **EPA, 2005**). The impact assessment criteria refer to the total pollutant load in the environment and consideration of background air quality needs to be made when using these goals to assess potential impacts. These criteria are in the main health-based (i.e. they are set at levels to protect against health effects).

These criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (referred to as the Ambient Air NEPM) (**NEPC, 1998**). However, the NSW EPA's criteria include averaging periods which are not specified in the Ambient Air NEPM, and also reference other measures of air quality, namely dust deposition and total suspended particulates (TSP).

Table 3.1 summarises the air quality goals for concentrations of air pollutants that are relevant to this assessment.

Table 3-1: Air Quality Criteria relevant to the Current Study

Air quality parameter	Averaging period	Standard/Goal	Agency
Total Suspended Particulate (TSP)	Annual mean	90 µg/m³	National Health and Medical Research Council
Particulate Matter less than 10 micrometres in aerodynamic diameter (PM_{10})	24-hour maximum	50 µg/m³	NSW EPA impact assessment criteria. Ambient Air NEPM reporting goal, allows five exceedences per year for bushfires and dust storms.
	Annual mean	30 µg/m³	NSW EPA impact assessment criteria.
Sulfur Dioxide (SO_2)	10-minute	712 µg/m³ (0.25 ppm)	NSW EPA impact assessment criteria.
	1-hour	570 µg/m³ (0.2 ppm)	NSW EPA impact assessment criteria.
	24-hour	228 µg/m³ (0.08 ppm)	NSW EPA impact assessment criteria.
	Annual	60 µg/m³ (0.02 ppm)	NSW EPA impact assessment criteria.
Nitrogen Dioxide (NO_2)	1-hour	246 µg/m³ (0.12 ppm)	NSW EPA impact assessment criteria.
	Annual	62 µg/m³ (0.03 ppm)	NSW EPA impact assessment criteria.
Carbon monoxide (CO)	15-minute	100 mg/m³ (87 ppm)	NSW EPA impact assessment criteria.
	1-hour	30 mg/m³ (25 ppm)	NSW EPA impact assessment criteria.
	8-hour	10 mg/m³ (9 ppm)	NSW EPA impact assessment criteria.

Notes: (a) µg/m³ – micrograms per cubic metre.

In May 2003, the National Environment Protection Council (NEPC) released a variation to the Ambient Air-NEPM (**NEPC, 2003**) to include advisory reporting standards for particulate matter with an equivalent aerodynamic diameter of 2.5µm or less ($PM_{2.5}$), as shown in **Table 3.2**. The purpose of the variation was to gather sufficient data nationally to facilitate the review of the Ambient Air NEPM, which is currently underway. The variation includes a protocol setting out monitoring and reporting requirements for $PM_{2.5}$.

It is noted that the Ambient Air NEPM $PM_{2.5}$ advisory reporting standards are not impact assessment criteria per se. Notwithstanding the above, in the absence of any other relevant standard/goal, the advisory reporting standards have been adopted for this assessment.

Table 3-2: EPA Advisory Reporting Standards for $PM_{2.5}$

Air quality parameter	Averaging period	Standard/Goal [(a)]	Agency
$PM_{2.5}$	Annual mean	8 µg/m³	Ambient Air NEPM Advisory Reporting Standard
	24-hour average	25 µg/m³	

Notes: (a) µg/m³ – micrograms per cubic metre.

In addition to health impacts, airborne dust also has the potential to cause nuisance effects by depositing on surfaces, including vegetation. Larger particles do not tend to remain suspended in the atmosphere for long periods of time and will deposit relatively close to the source. Dust deposition can soil materials and generally degrade aesthetic elements of the environment, and are assessed for nuisance or amenity impacts.

Table 3.3 shows the maximum acceptable increase and accumulation with other sources in dust deposition over the existing dust deposition levels from an amenity perspective. These criteria for dust deposition levels are set to protect against nuisance impacts (**EPA, 2005**).

Table 3-3: EPA Criteria for Dust (Insoluble Solids) Fallout

Air quality parameter	Averaging period	Maximum increase in deposited dust level [(a)]	Maximum total deposited dust level (cumulative) [(a)]
Deposited dust	Annual	2 g/m²/month	4 g/m²/month

Notes: (a) g/m²/month – grams per square metre per month.

3.2 Odour Assessment Criteria

The potential odour sources in the study area are considered to be complex mixtures of air pollutants, as opposed those associated with a single chemical compound. In such instances, the NSW EPA provide impact assessment criteria (expressed as odour units; OU) that take account of population density in the area of interest. **Table 3.4** lists the odour ground level concentration criterion not to be exceeded more than 1% of the time, for different population densities.

The difference between odour criteria is based on considerations of risk of odour impact rather than differences in odour acceptability between urban and rural areas. For a given odour level there will be a wide range of responses in the population exposed to the odour. In a densely populated area there will therefore be a greater risk that some individuals within the community will find the odour unacceptable than in a sparsely populated area.

Table 3-4: Performance Criteria for the Assessment of Odour

Population of affected community	Ground level concentration criterion for complex mixtures of odorous air quality parameters (OU)
~2	7
~10	6
~30	5
~125	4
~500	3
Urban (2000) and/or schools and hospitals	2

*Source: Approved Methods (**EPA 2005**)*

The odour criterion applicable to the proposed site at South Jerrabomberra is anticipated to be 2OU, representing the most stringent odour criterion, and reflective of an 'urban' population density (population of >500 potentially impacted).

4 EXISTING ENVIRONMENT

4.1 Meteorology

Air pollutant concentrations are strongly influenced by the prevailing meteorological conditions. Wind speed, wind direction, temperature and relative humidity all affect the dispersion and transport of air pollution. The local meteorology taken from Canberra Airport has been summarised based on the available data.

4.1.1 Wind speed and direction

The Canberra Airport automatic weather station (AWS) meteorological data have been reviewed for five consecutive years (2010 to 2014 year to date). Summary statistics for the wind data, including wind speed and percentage of 'calms' (wind speeds less than 0.5 m/s), are shown in **Table 4.1**.

Table 4-1: Wind data – summary statistics

Year	Average wind speed (m/s)	Calm periods (%)
2010	3.1	9.6%
2011	3.3	8.0%
2012	3.5	8.1%
2013	3.7	6.9%
2014 (year to date)	3.2	8.3%

The wind data for 2013 were found to be generally representative of the larger data set in terms of both average wind speed and percentage of calms and was therefore chosen to represent the meteorology in the analysis.

The annual and seasonal wind roses for 2013 are presented in **Figure 4-1**. On an annual basis, the prevailing wind direction follows a northwest-southeast axis. In general, calmer winds tend to originate from the southeast quadrant and strong winds from the northwest. There are two distinct seasonal patterns comprising summer/autumn and winter/spring. The stronger winds from the northwest dominate during the winter and spring while the opposite is the case for summer and autumn.

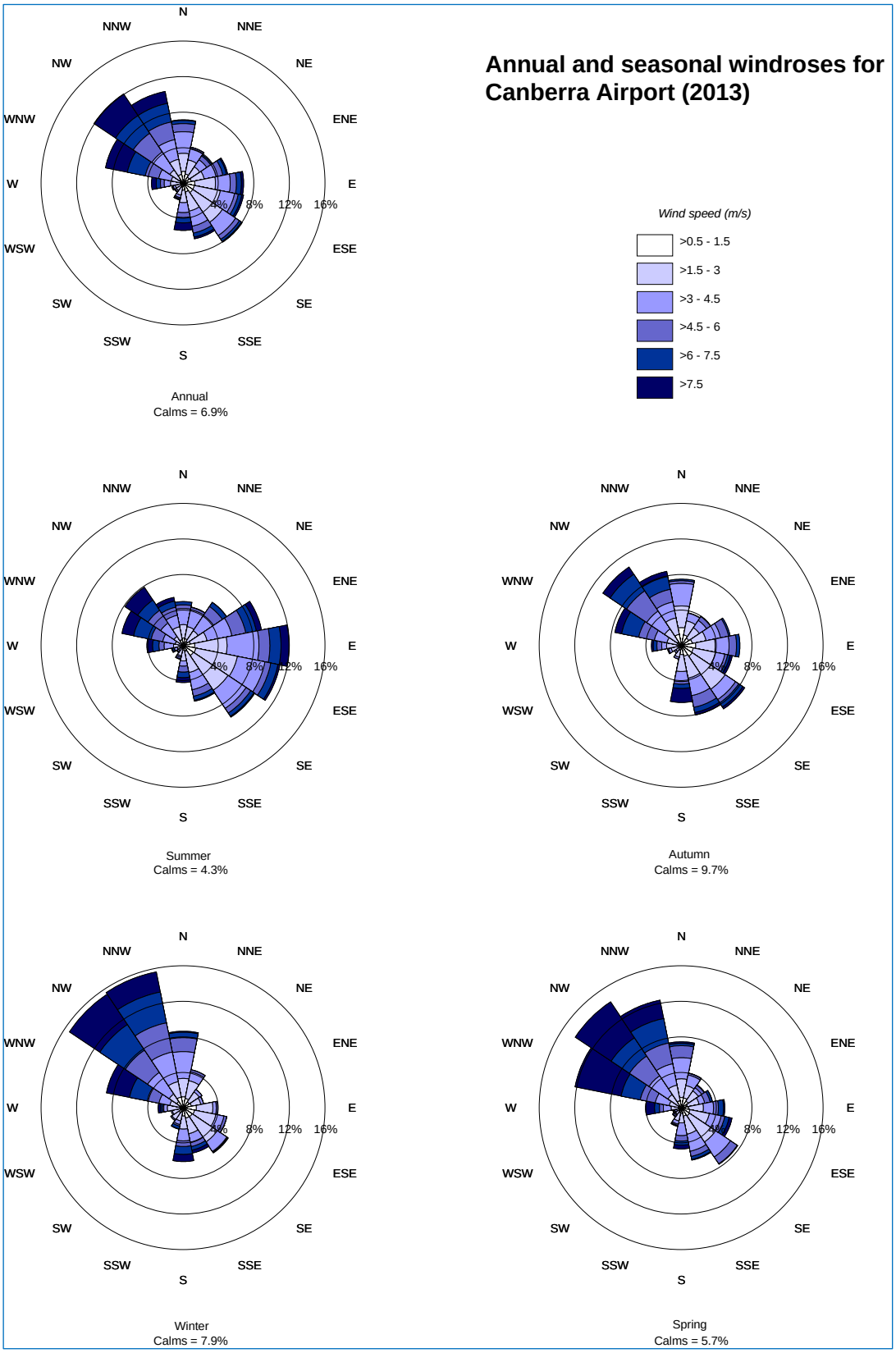


Figure 4-1: Annual and seasonal wind roses Canberra Airport AWS (2013)

4.1.2 Climatic Conditions

The Bureau of Meteorology (BoM) Canberra Airport AWS has only been measuring data from 2008, therefore it does not provide a long enough dataset to characterise climatic conditions. Alternatively, reference to the climatic information collected at Tuggeranong (Isabella Plains) AWS has been adopted and is presented in **Table 4-2** (**BoM, 2014**). This weather station is located 7km from the project site.

The maximum temperature of 29.5°C is recorded in January, while the minimum temperature of -0.2°C is recorded in July. The annual average humidity is 69% at 9am and 44% at 3pm. The annual average rainfall is 627 mm, falling over approximately 98 rain days.

Table 4-2: Temperature, Humidity and Rainfall for BoM Tuggeranong Automatic Weather Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Daily Maximum Temperature (ºC)													
Mean	29.5	27.9	25.2	21.0	16.5	13.0	12.3	14.1	17.6	20.6	24.1	26.9	**20.7**
Daily Minimum Temperature (ºC)													
Mean	14.3	14.3	11.2	6.6	2.4	1.2	-0.2	0.8	3.8	6.3	9.8	12.0	**6.9**
9am Mean Relative Humidity (%)													
Humidity	61	68	70	69	78	83	82	73	65	60	62	59	**69**
3pm Mean Relative Humidity (%)													
Humidity	34	39	38	42	50	57	56	50	46	41	39	34	**44**
Rainfall (mm)													
Monthly mean	49	78	53	28	22	49	42	48	63	55	75	66	**627**
Raindays (Number)													
Mean no. of raindays	7	7	7	6	6	10	11	9	9	9	10	8	**98**

Station number: 070339; Commenced 1996; Status: Open; Elevation: 587 m AHD; Latitude: 35.42 °S; Longitude: 149.09 °E.
Source: **BoM (2014)**

4.2 Topography

The surrounding terrain is for the most part undulating with steeper slopes emerging near ridgelines, prominent towards the southwest of the site. To the north and west of the site is the City of Canberra where the terrain becomes more flat, with elevations ranging between 580m and 700m above sea level. **Figure 4-2** shows a pseudo 3-dimensionsal representation of the terrain in the area of the site and surrounds.

The surrounding topography is capable of steering and channelling the wind such that the spatial distribution of wind patterns across the region can be highly localised.

When assessing the potential impact from a ground level pollutant source it is important to consider these local drainage flows. Katabatic drift and temperature inversion formation can result in plume entrapment and poor dispersion of airborne pollutants and the potential to cause greater off-site impacts. Plume entrapment and minimal horizontal or vertical diffusion is expected to readily occur throughout the study area and drainage flows that may impede dispersion are anticipated to occur to some extent.

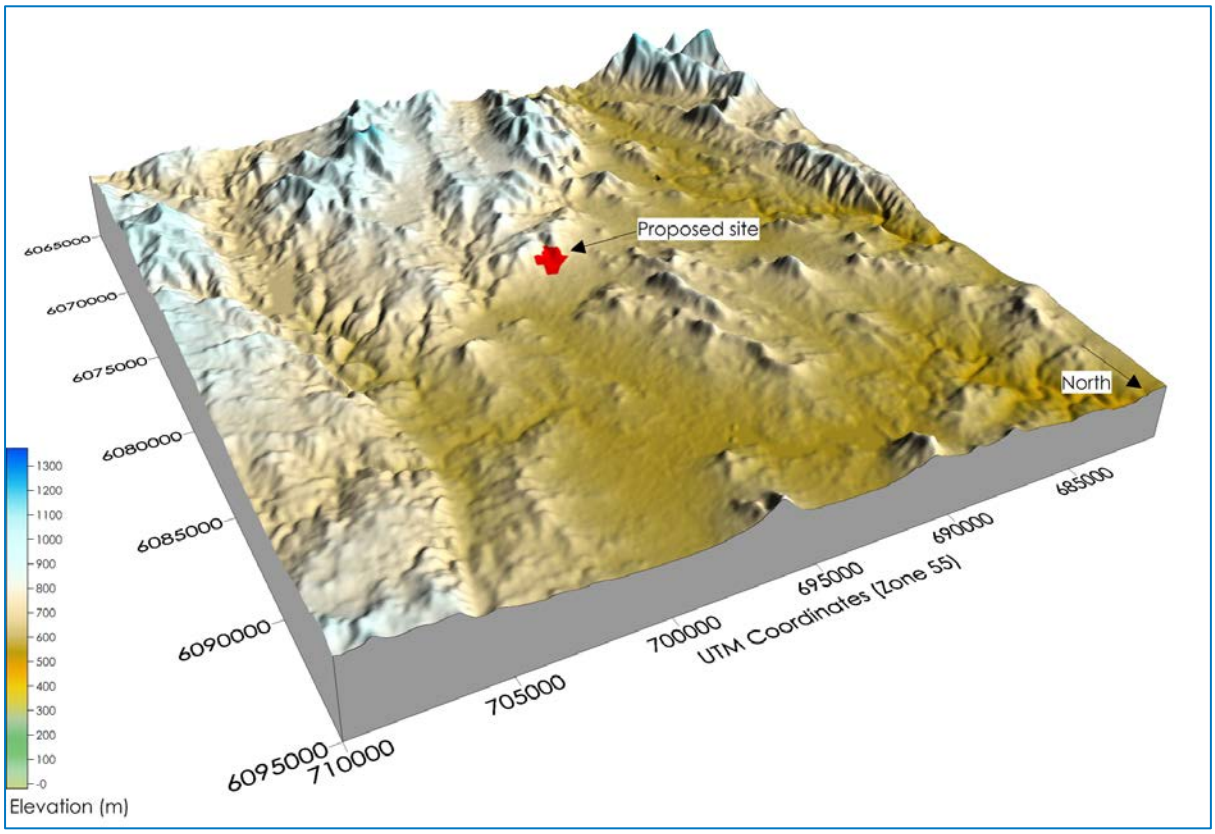


Figure 4-2: Pseudo 3-dimension plot of topography in study area

4.3 Fog

During the months of winter the study area is anticipated to experience significant fog events. The BoM reports an average of 44 fog events per year in Canberra with an average of 36 fog events occurring between April and September.

4.4 Ambient air quality

Monitoring of PM_{10} and dust deposition has historically been completed in the vicinity of the study area between March 2005 and January 2006. However, it is noted in **PAEHolmes (2009**) that the monitoring was not completed in line with the Australian Standards for monitoring PM_{10} and that a portion of the data was compromised with equipment needing to be replaced. Nevertheless, **PAEHolmes (2009)** concludes that particulate matter is unlikely to be a substantial issue in the vicinity of the site.

More recent monitoring data is available from the Ambient Air NEPM monitoring network station at Monash, located approximately 7km southwest of the proposed rezoning site. Measurements from this monitoring site are published in *ACT Air Quality Report 2012* (**ACT EPA, 2013**). Data are available for key pollutants with summary results for 2012 presented in **Table 4.3**.

Table 4-3: Monash ambient air quality data

Pollutant	Averaging period	NSW criteria / NEPM goal	Concentration	
			Highest	Second highest
Carbon monoxide (CO)	8-hour	9.0ppm	1.8ppm	1.7ppm
Nitrogen dioxide (NO_2)	1-hour	0.12ppm	0.033ppm	0.031ppm
Ozone (O_3)	1-hour	0.10ppm	0.055ppm	0.053ppm
	4-hour	0.08ppm	0.052ppm	0.047ppm
Particulate matter (PM_{10})	24-hour	50µg/m³	41.0µg/m³	23.6 µg/m³ (a)
Particulate matter ($PM_{2.5}$)	24-hour	25µg/m³	**29.2µg/m³**	22.1µg/m³ (a)

Notes: (a) 6th highest value
Source: ACT EPA, 2013

With the exception of the 24-hour average $PM_{2.5}$, all pollutant measurements at Monash were below the relevant criteria for the given averaging period.

There were three days where 24-hour average $PM_{2.5}$ measurements were above 25µg/m³, and occurred between May and June 2012. These elevated measurements are all attributed to particulate emissions from domestic wood heaters during winter (**ACT EPA, 2013)**. Elevated measurements of 24-hour average $PM_{2.5}$ are considered to be a relatively common occurrence in relatively urbanised areas located inland, where the cooler winter temperatures combined with population density and use of domestic wood heaters compound the issue. Needless to say, these kind of events are applicable not only to the study area but to the wider region, and the above is not considered to be a study-specific air quality issue.

Review of the long term trends in the monitoring data shows improvement in both PM_{10} and $PM_{2.5}$ concentrations from 2003 onwards (**ACT EPA, 2013)**.

5 BUFFER DISTANCES

Appropriate buffer distance must be maintained between the industry and sensitive land uses to protect sensitive receptors from adverse impacts resulting from a failure of design or management or abnormal weather conditions. Buffer areas are not an alternative to providing appropriate management practices, but provide for contingencies that may arise with typical management practices.

There are currently no land-use provisions in NSW or ACT that can be used as a guide to determine appropriate distances from which industry should be from residences, particularly in relation to amenity impacts such as odour. However, in Victoria such policy documents are available and include:

- Policy Document 1506 - Recommended separation distances for industrial residual air emissions **(EPA Victoria, 2012)**
- Publication 788.1 - Best practice environmental management siting, design, operation and rehabilitation of landfills **(EPA Victoria, 2010)**

The Mugga Lane RMC, Downer asphalt plant and Googong water treatment plant have been identified as having the potential to result in odour impacts at the proposed site. The Victorian provisions **(EPA Victoria 2010, 2012)** that apply to the respective industries are shown in **Table 5-1**.

Table 5-1: Buffer distances for industry (EPA Victoria 2010, 2012)

Industry	Buffer distance	Distance of site to industry
Landfill [1]	500 m from building or structures	1,500 m
Asphalt plant [2]	500 m	500 m
Water treatment plant [3]	400 m	8,000 m

Notes: 1. Putrescible (municipal) solid waste, solid insert waste and fill material.
2. Premises design to produce more than 100 tonnes per week of asphalt.
3. Worst case population of 50,000.

The proposed South Jerrabomberra site is located at and beyond the recommended buffer distances for the identified industries. Shown in **Figure 5-1** are the adopted buffer distances with respect to the proposed Jerrabomberra site. Note that the centre point of each buffer have been taken as the closest point at the site boundary to the Jerrabomberra site where odour emissions are likely to occur.

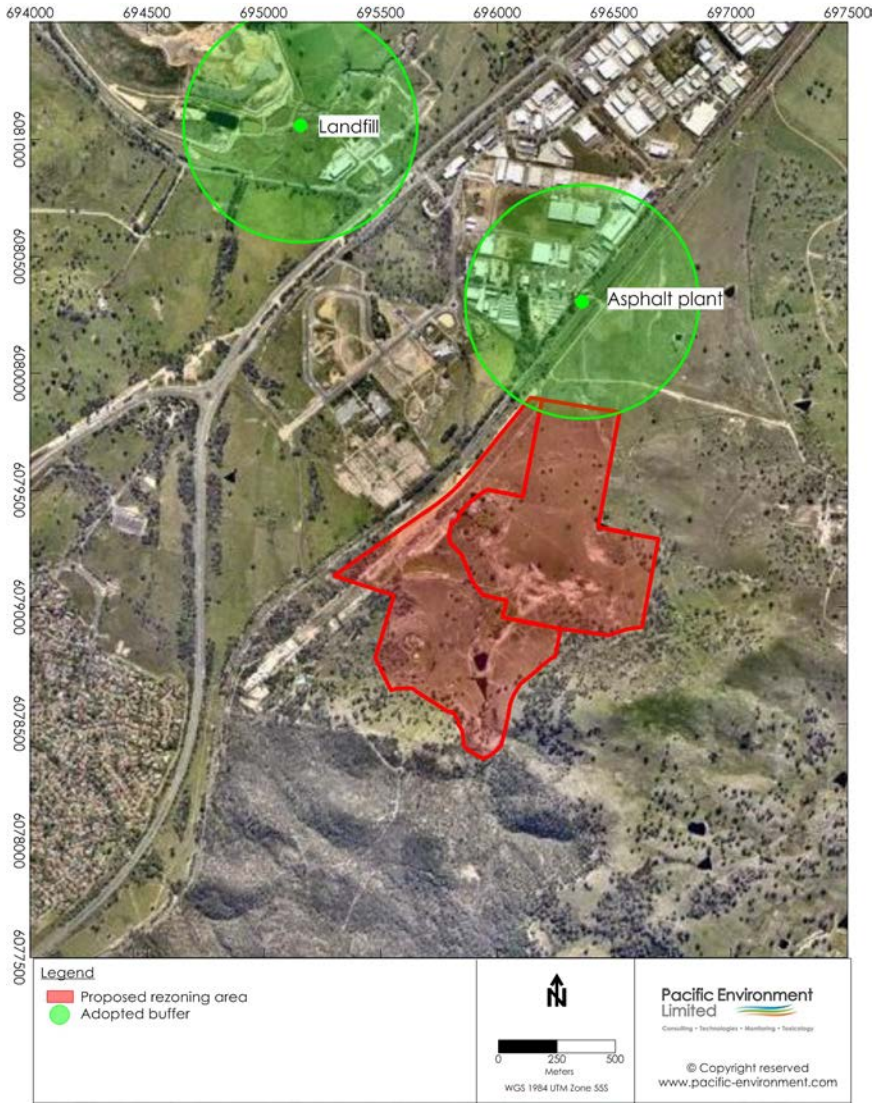


Figure 5-1: Appropriate buffer distances from potential odour sources

The applied buffer distances are designed to provide for worst case conditions, such as plant upsets, and should not be taken as an alternative to best practice management. The onus is on the facility to ensure that the facility is operated in such a manner to ensure that adverse impacts beyond the site boundary (typically) or the adopted buffer distances (in the worst-case) do not occur.

6 SITE INSPECTION

Two site inspections were carried out on 11 June 2014 and then again on 19 June 2014 (coinciding with the deployment and pick up of noise logging equipment).

The initial site inspection identified several potential local sources of dust, odour and other emissions to air. The wind conditions on the day of the site visit were calm to light winds west to northwest over the course of the day. Fog was observed creating damp ground conditions during the morning.

The potential local sources of dust emissions identified were:

- Within the Hume Industrial Estate:
  - Exposed, unstabilised land areas in the undeveloped sections of the Hume Industrial Area
  - Elvin Group Concrete Batching Plant
  - Landscaping supply companies with exposed stockpiles
  - The Downer EDI asphalt plant
  - Exposed, unstabilised areas of plots used for vehicle parking and storage for truck maintenance facilities, courier services, vehicle and equipment hire facilities
  - Joinery and fabrication facilities
- The Mugga Lane RMC operations on the landfill site and associated vehicle movements on unsealed roads within the facility.
- Exposed areas of earth and stockpiles on the Morrison Property.

During the site visit, visible plumes of dust were observed from the Mugga Lane RMC. Under the prevailing wind at the time, this dust plume was dispersed slowly overhead and was not observed to move towards the site. No other significant dust plumes were observed from the site with the exception of vehicles travelling on the unsealed access road to the properties within the subject site and the Morrison Property.

The potential local sources of odour emissions identified were:

- Downer asphalt plant
- SITA Waste Management Facility
- Mugga Lane RMC
- Transpacific Cleanaway Waste Transfer Facility
- Remondis facility and other waste management facilities in the resource recovery estate on Mugga Lane

Whilst on site, odour from the asphalt plant was detected in low concentrations at the closest point on site and close to the nearest dwelling (Forrest property) to the plant within the site during the day. Odour from the plant was also observed in low concentrations during the day at the rail crossing at the end of Alderson Place near the plant. During the evening and night no odour from the plant was detected.

Odour from the SITA Waste Management Facility or Mugga Lane RMC was not detected whilst on site. At locations close to each of these facilities, odour was detectable beyond the site boundary. Odour anticipated to be attributable to the SITA Waste Management Facility was detectable in very low concentrations near the entrance to the site. Odour anticipated to be associated with the Mugga Lane RMC was detectable at the intersection between Tralee Street and the Monaro Highway. This

odour increased in strength to the south of Mugga Lane and towards the entrance to the Mugga Lane RMC.

On the day of the second site visit heavy fog was present at the site, with visibility ranging between 30m and 100m. Odour with a similar character to landfill was detected during the mid-morning at Location 2, the closest corner of the site to the landfill.

A summary of the odour observations is presented in **Table 5-1**. The locations of the odour evaluations are presented in **Figure 5-1**.

For both the asphalt plant and RMC, the odour buffer distances discussed in **Section 5** indicate that, theoretically, odour should not be regarded as a nuisance issue from a well-maintained facility given the separation distances between odour source and potential receptors.

Based on the outcome of the field observations, it is suggested that these facilities may not be operating under best (or even reasonable) practice odour management.

Table 6-1: Odour Monitoring Summary

Date / time	Location (refer Figure 5-1)	Observation	Weather
11/6/14 11.56 am	1	Vegetation and non-anthropogenic odours at low concentrations	Overcast, calm wind conditions
11/6/14 2.10 pm	2	Coal fire/sooty odour (just detectable) or asphalt and vegetation and non-anthropogenic odours	Overcast, calm wind conditions
11/6/14 1.07pm	3	Coal fire/sooty odour (just detectable) or asphalt at very low concentrations only just detectable. Vegetation and non-anthropogenic odours at low concentrations	Overcast, calm wind conditions
11/6/14 8.50pm	1	Vegetation and non-anthropogenic odours at low concentrations	5/8 cloud, calm wind conditions
11/6/14 7.50pm	2	Vegetation and non-anthropogenic odours at low concentrations	5/8 cloud, calm wind conditions
11/6/14 8.21pm	3	Vegetation and non-anthropogenic odours at low concentrations	5/8 cloud, calm wind conditions
12/6/14 1.59am	1	Vegetation and non-anthropogenic odours at low concentrations	Overcast, misty, calm wind conditions
12/6/14 12.38am	2	Vegetation and non-anthropogenic odours at low concentrations	5/8 cloud, calm wind conditions
12/6/14 1.11am	3	Vegetation and non-anthropogenic odours at low concentrations	Overcast, misty and calm wind conditions
11/6/14 2.30pm	4	Asphalt odour just detectable.	4/8 cloud, calm wind conditions
11/6/14 2.45pm	5	Landfill/rubbish odour just detectable	4/8 cloud, calm wind conditions
11/6/14 3.30pm	6	Landfill/rubbish odour noticeable	4/8 cloud, calm wind conditions
11/6/14 3.45pm	7	Landfill/rubbish odour strong	4/8 cloud, calm wind conditions
19/6/14 10.30 am	1	No odour detected	Still, fog
19/6/14 9.30 am	2	Sweet putrescible waste odour distinguishable	Still, fog
19/6/14 11:00 am	2	No odour detected	Still, fog lifting
19/6/14 10.00 am	3	No odour detected	Still, fog lifting

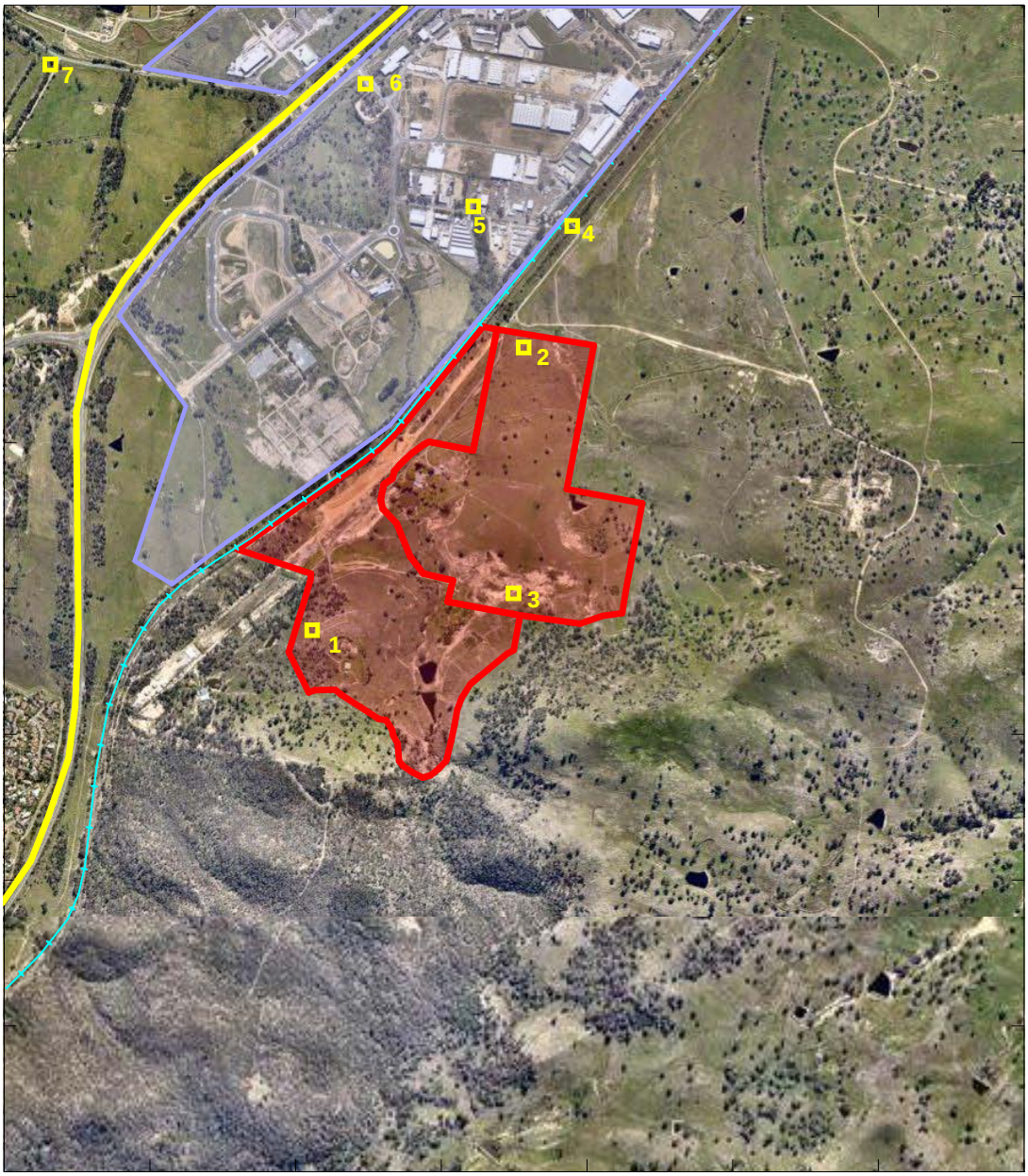


Figure 6-1: Odour Monitoring Locations

Other potential sources of air emissions (other than odour and dust-principally hydrocarbons) were identified as:

- Downer asphalt plant
- Caltex truck fuelling station
- SIMS scrap metal yard and other metal recyclers and fabricators in the Hume Industrial Estate
- Joinery companies and fabricators in the Hume Industrial Estate
- Transformer Maintenance Services
- Woolworths Fuel Station
- Emissions from heavy vehicle movements from current activities at the proposed site.

During the site visit a visible plume was observed to be emitted from the tower at the asphalt plant on a number of occasions. Due to the calm wind conditions, the plume did not disperse quickly.

Photos of emissions to air as observed on site are presented in **Figures 5-2** to **Figure 5-6.**

Figure 6-2: Visible Dust from Mugga Lane RMC and smoke from fire (View from Location 1)

Figure 6-3: Visible Dust Plumes from Mugga Lane RMC (View from Location 3)

Figure 6-4: Visible Dust Plumes from Mugga Lane RMC (View from western end of Tralee Street)

Figure 6-5: Visible Air Emissions from Downer Plant (View from Location 2)

Figure 6-6: Visible Emissions from Downer Plant (View from southern end of Couranga Crescent)

7 REVIEW OF AIR QUALITY RELATED ISSUES

Potential air emissions from the sources in **Section 2.3** have been reviewed. The key pollutants are considered to be odour and particulate matter.

As noted in **Section 1.4**, some significant work has been completed assessing potential air quality impacts on the adjacent South Tralee development. The following sections summarise and build upon on this work, providing a desktop analysis of the current air quality in the vicinity of the South Jerrabomberra site.

7.1 Odour

7.1.1 Asphalt plant

The most significant potential source of odour in the immediate vicinity of the proposed site is considered to be the existing asphalt batching plant within the Hume Industrial Estate. Due to the age of this facility, there is no air quality assessment available in the public domain that quantitatively evaluates potential for odour impacts from this activity.

As part of the historical works completed for the assessment for South Tralee by **PAEHolmes (2010)**, a simplified quantitative assessment was completed based on odour emission rates from the stack of a similar plant in Ulverstone, Tasmania.

The 99th percentile odour results presented as part of the **PAEHolmes (2010)** assessment have been reproduced in **Figure 6-1**. Note that area outlined in red represents the South Tralee site and the area coloured in blue is the proposed South Jerrabomberra site. The South Jerrabomberra site is located

500 m to the south of the existing asphalt plant; an additional 450 m further away from the plant than the South Tralee boundary (based on the 50 m buffer provided by the rail corridor).

The odour modelling results show that the 1 odour unit (OU) contour lies wholly within the South Tralee site. The 1 OU contour represents the theoretical threshold at which an odour is considered to be detectible.

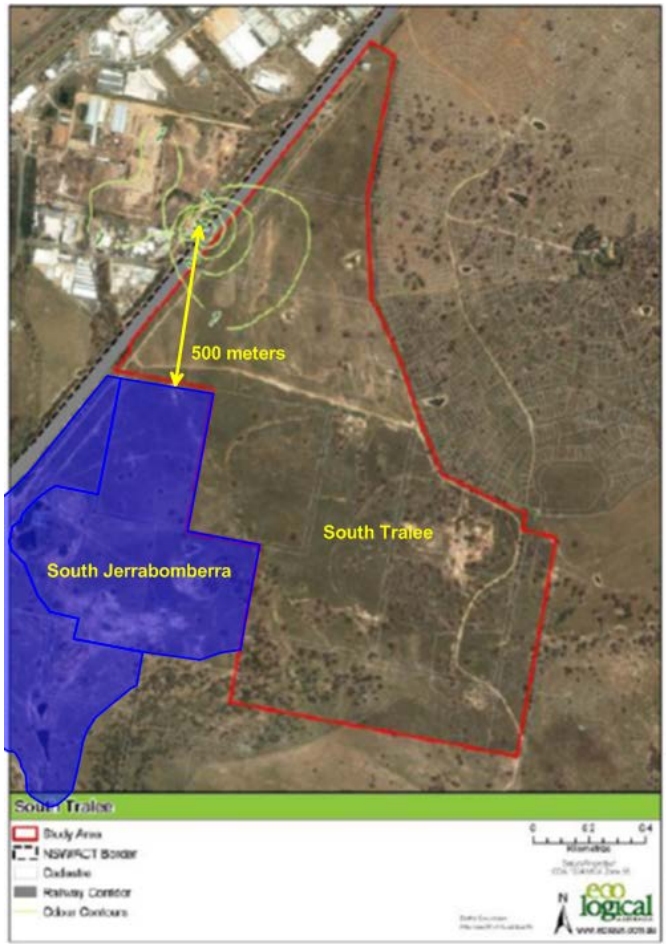
It is acknowledged that the **PAEHolmes (2010)** assessment considered these results to be indicative as it is based on limited information. Further, it is highlighted that this assessment dealt only with stack emissions to air. In reality, low or ground level fugitive (as opposed to stack) sources of odour may cause impacts beyond the boundary of such facilities. Fugitive emissions from asphalt plants may be an important source of potential odour. On the basis of field observations, it is our opinion that the indicative modelling competed as part of **PAEHolmes (2010)** is likely to have underestimated potential odour impacts of the asphalt plant under its current operations. It is unclear whether this is a result of the operations at the asphalt plant having changed since the **PAEHolmes (2010)** assessment or whether this report's conclusions was based on desktop assessment alone.

As noted in **Section 5**, at the time of the site visit, a faint odour of similar character to the asphalt plant was detected on occasion at sites 2 and 3, both of which are located within the boundary of the South Jerrabomberra site. Without further information / investigation, it is not possible to comment as to whether this odour is frequently present, nor whether it is associated with normal operations or upset conditions.

As noted above, the location of the proposed South Jerrabomberra site is significantly further removed (500 m) from the asphalt plant compared with the approved land release at South Tralee. It is therefore anticipated that any odour nuisance associated with the asphalt facility would be less of an issue at South Jerrabomberra as odour issues will be reported (and any mitigation actioned) as a result of the South Tralee approved land release.

Based on the information available, it is not possible to say if odour from this plant is (or may in future be) an issue. While odour from this source was discernible during site inspection, it is not possible to conclude that this is a constraint to the South Jerrabomberra land release.

Further, odour from this source was not flagged as an issue for the (closer) South Tralee land release investigations. It is considered that if adverse odour is reported from this source in future, this is likely to impact existing, approved land releases more significantly.



Source: PAEHolmes, 2010

Figure 7-1: Predicted odour concentrations at the 99th percentile due to the asphalt plant stack

7.1.2 Googong water treatment plant

The Googong water treatment plant (WTP) is an integrated water facility that comprises a potable drinking water system, sewerage system, water recycling plant, a recycled water system and a storm water system. The Googong WTP is located approximately 8 km east of the proposed site at the corner of Old Cooma Road and Googong Dam Road.

Given the high level of control that can now be achieved with water processing and that there is a significant separation distance between the the WTP to the proposed site, odour is not considered to be an issue.

It is noted in in the previous works by **PAEHolmes (2010)** that a waste water treatment plant was proposed to be located 1km northeast of South Tralee. It is understood that this development is not anticipated to proceed.

7.1.3 Mugga Lane Resource Management Centre

The Mugga Lane RMC is situated approximately 1.5km northeast of the proposed South Jerrabomberra site, on the far side of the Hume Industrial Estate. Potential for odour emissions from landfill are considered the primary air quality concern.

Review of the annual and season wind roses in **Figure 4-1** show that for approximate 30% of the year that prevailing winds would originate from the northwest, west-northwest and north-northwest and blow

towards the proposed site, of which the lower wind speeds are likely to be associated with poorer dispersion. In this case, the calmest winds originate from the south-eastern quadrant, with the stronger winds that more effectively disperse air emissions originate from the north-western quadrant.

On the day of the second site visit an odour was detected at Site 2 (see **Figure 5-1**) that was described as 'sweet putrescible waste' and was thought to have originated from the Mugga Lane RMC. No odour was detected at the other sites (Site 1 and Site 3) located approximately 1km further south and south-southwest of Site 2 and within the proposed site boundary.

Consistent with observations made in **Section 6.1.1**, while odour from this source was discernible during site inspection, it is not possible to conclude that this is a constraint to the South Jerrabomberra land release.

As with the nearby asphalt plant, odour from this source was not flagged as an issue for the (closer) South Tralee land release investigations.

As noted in **Section 6.1.1**, a conservative planning approach may involve the inclusion of Section 149, part 5 certificates on the titles of potentially odour affected lots.

7.2 Particulate matter

Review of the available documentation in conjunction with the site visit identified a number of particulate matter (dust) sources in the study area.

7.2.1 Hume Industrial Estate

As identified in **Section 5**, there are several facilities located within the Hume Industrial Estate that have the potential to generate limited volumes of particulate emissions on occasion.

Of these industries, the asphalt plant and pre-mix concrete batch plant are considered to have the highest potential to generate particulate matter emissions that could cause amenity type impacts at the proposed site. Due to the age of each of these facilities, neither site has an air quality assessment available in the public domain that quantitatively evaluates potential for particulate matter impacts from their operations.

It is understood that on occasion plumes of dust have been observed originating from the Hume Industrial Estate (communications with Mike Thompson of Environmental health QCC, 23 April 2014). As no information was available as to the time, location and prevailing meteorological conditions when such plumes have been observed it is not possible to determine the source of the dust emissions.

The site inspection of Hume Industrial Estate completed on 11 June 2014 showed no observed impact associated with dust deposition at the South Jerrabomberra site.

The historical monitoring completed by Heggies **(PAEHolmes, 2010)** indicates that particulate matter was unlikely to be a substantial issue at the Tralee site.

In view of the historical monitoring and field observations, dust impacts originating from the Hume Industrial Estate are considered to be limited, and therefore not a significant planning constraint. Observed dust plumes are anticipate to comprise of crustal (as opposed to combustion) material that typically comprises larger particles, visible to the human eye. Such large particles typically drop out of suspension over short distances, and are therefore not anticipated to reach the proposed South Jerrabomberra site in significant volumes.

7.2.2 Cooma Road Quarry

The Cooma Road Quarry is situated approximately 5km northeast of the proposed site. The quarry is considered a significant dust source in the region. In 2012, atmospheric dispersion modelling was

completed for the extension and expansion of the quarry (SKM, 2012). The results of this exercise indicate that the air quality impacts would be highly localised, with contour plots showing negligible impact beyond 1-2km from the Cooma Road Quarry source.

In view of the distance of the quarry from the proposed site and the limited predicted zone of impact **SKM (2012)**, the quarry is not considered to comprise an air quality constraint for the site.

7.3 Other gaseous emissions

7.3.1 Road traffic emissions

The Monaro Highway is likely to be the primary source of vehicle emissions in the study area, and is located approximately 500 m west of the proposed site boundary. The AM peak traffic throughput for the Monaro Highway north of Lanyon in the 2011 baseline is 3,550 vehicles, as reported in **TDG (2014)**. The same throughput is assumed for the Monaro Highway south of Lanyon, indicating that this is a moderately trafficked roadway when considered at a National scale.

The main pollutants from road vehicles - in terms of the quantity emitted and effects on health - are nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter with an aerodynamic diameter of less than 10 micrometres and less than 2.5 micrometres (PM_{10} and $PM_{2.5}$ respectively), and a range of volatile organic compounds (VOCs). Emissions from vehicles typically disperse relatively quickly, and pollutant concentrations decrease sharply within 20m of the roadway; at a distance of 500m the roadway contribution to concentrations will be minimal. While no monitoring data were available to verify this statement, reference has been made to the study by EPA Victoria entitled: *Environment Report: Review of Air Quality Near Major Roads* (**EPA Victoria, 2006**). This report summarises a four-year monitoring campaign alongside major roads in Victoria, with findings indicating that at a short distance from roads the air quality goals were generally met. Based on the above, and the fact that the proposed site will be 500m from the Monaro Highway, the Highway would not cause a significant adverse impact on the local air quality at South Jerrabomberra.

7.3.2 Railway line

The Goulburn to Bombala Railway that defines the NSW/ACT border also divides the Hume Industrial Estate with the proposed South Jerrabomberra site. From previous assessments, it is understood that the rail line has been temporarily suspended **(Renzo Tonin, 2010)**. Nevertheless, QCC has indicated that there may be potential in future for the rail line to become operational again and this therefore requires assessment.

It has been assumed that trains using the rail line would comprise both diesel and electric locomotives. As electric powered locomotives do not result in direct air emissions, only diesel locomotives have been considered.

A recent air quality study was completed as part of the Epping to Thornleigh Third Track (**Parsons Brinkerhoff, 2012**) rail line upgrade in a densely populated area of Sydney. The study investigated potential air quality impacts under a worst case scenario, where one of the four trains to use the rail corridor within a given hour would idle for a period of 30 minutes. The results of the dispersion modelling completed as part of that study showed that the air quality impacts were all well below the NSW EPA impact assessment criteria for NO_2, PM_{10} and CO at a separation distance of 50m from the track and beyond.

In view of the outcomes of the **Parsons Brinkerhoff (2012)** report, and in consideration that the worst case emissions scenario discussed would be very unlikely to occur on this railway line, emissions from rail have not been further addressed and are not considered a constraint for the South Jerrabomberra site.

7.3.3 Asphalt plant

As already discussed, a quantitative air quality assessment of the asphalt plant is not available. Typically, gaseous pollutants such as nitrogen dioxide, sulphur dioxide, benzene, poly-aromatic hydrocarbons and various metals (arsenic, cadmium chromium, beryllium, mercury, nickel) may be released.

These emissions are released from the exhaust stack at such facilities, as opposed to being released as a fugitive, ground level source. From the site visit the height of the stack at the asphalt plant was estimated to be between 15m and 20m. Stacks at this height are generally considered to provide adequate dispersion of atmospheric pollutants to reduce the potential for adverse ground level impacts to a minimal level.

7.3.4 Canberra Airport

Canberra Airport is located 10km north of the South Jerrabomberra site. The airport's activities are likely to release a range of emissions that primarily include NO_2, CO, SO_2, VOCs and particulate matter (PM_{10} and $PM_{2.5}$). The most recent available monitoring completed on by Canberra Airport was in 2009, measuring the air toxics benzene, toluene, ethylbenzene and xylene (BTEX), NO_2, PM_{10} and $PM_{2.5}$. The monitoring results were reported in the Canberra Airport Environment Strategy (**Canberra Airport, 2010**) to be well below the NEPM air quality goals.

In view of these results and the ability of aircraft emissions to be well dispersed, air emissions associated with operations at Canberra Airport are not considered to comprise a project constraint.

7.4 Future industries

Based on the current zoning in ACT as well as NSW (discussed in **Section 2**), it is considered that the most likely location for any future potential emissions to air would be located within the Hume Industrial Estate.

The ACT Government makes development applications open to the public on the ACTPLA website (**ACTPLA, 2014**). On 29 May 2014 the website listed two development applications for Hume, one comprising the construction of two new accommodation facilities and the other the office extension of an existing commercial facility. Both of these proposed developments are not considered to be a source of air emissions and therefore have not been further addressed.

Consultation with both the NSW EPA and ACT EPA did not identify any potential future industries within the planning system that would potentially release significant air emissions and therefore have the potential to impact the proposed site.

Any new developments within the Hume Industrial Estate with a potential for emissions to air should complete an air quality assessment if it is considered to be a source of air emissions (including odour). As part of this process, evaluation of potential impact on the South Jerrabomberra site (and appropriate mitigation) would necessarily need to be completed.

8 RECOMMENDATIONS

Review of the available documentation and site visits indicate that odour and particulate matter are the main pollutants with the potential to impact on future residential development within the proposed South Jerrabomberra site.

Potential impacts associated with visible dust as a result of nearby operations are considered to be minimal. It is acknowledged that on occasion that there may be exceedances of the 24-hour $PM_{2.5}$ NEPM goal, however, these exceedances are likely to be associated with domestic wood burning during the winter months, and are therefore regional in nature.

On the day of the site visit a faint odour of similar character to the asphalt plant was detected at two sites located within the South Jerrabomberra site. Similarly, odour thought to be associated with the Mugga Lane RMC was also detected on the day of the second site visit.

It is recommended that a buffer zone of 250m should be retained, consistent with the South Tralee LEP. This buffer distance had been adopted to allow sources of dust and odour from the industrial estate, in addition to other gaseous pollutants released from traffic emissions on the Monaro Highway, to more effectively disperse by the time the plume reaches the residences.

In specifically addressing known odour sources, the buffer distance of 500 meters from the asphalt plant should be incorporated into the design elements of the proposed development, limiting residences in these areas. **Figure 8-1** indicates where the buffer intersects the Jerrabomberra site.

Figure 8-1: Buffer distance for South Jerrabomberra

8.1 Potential Development Control Provisions

As noted above, for both the asphalt plant and RMC, the odour buffer distances discussed in **Section 5** indicate that, theoretically, odour should not be regarded as a nuisance issue from a well-maintained facility given the separation distances between odour source and potential receptors. On this basis, it is not anticipated that any specific development control provisions should be specified with respect to odour.

However, based on the outcome of the field observations, it is suggested that these potentially odorous facilities may not be operating under best (or even reasonable) practice odour management.

To avoid the potential for future land use conflict, it is recommended that the relevant environmental regulator (in this case, ACT EPA) should be alerted early on that the odour management practices at nearby facilities may not be in line with current industry standards.

9 CONCLUSIONS

This report has assessed the potential particulate matter, odorous and gaseous pollutant impacts associated with air emissions in the vicinity of the proposed land release at South Jerrabomberra, NSW.

Two site visits were completed as part of the review and on both occasions an odour from either the asphalt plant or the Mugga Lane RMC was detected. Dust from off-site sources was not considered to be a constraint.

Findings indicate that generally most air emission sources in the vicinity of the study area are anticipated to result in negligible impact within the proposed land release. Based on field observations, the asphalt plant and Mugga Lane RMC were identified as having potential for adverse odour impact in the vicinity of the proposed land release. In view of the separation distances involved between source and receptor, it is concluded that potential odour impacts associated with these facilities should not be regarded as a constraint over future residential zoning. Rather, any potential odour impacts appear to be as a result of poor odour management at the facilities in question. This is an issue of compliance that should be addressed by the relevant environmental regulator (in this case, ACT EPA).

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10 REFERENCES

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