HEGGIES

REPORT 10-3313-R3

Draft 1

Menangle Park Redevelopment
Air Quality Review
2010 Update

PREPARED FOR

APP Corporation Pty Ltd
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1 APRIL 2010

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Menangle Park Redevelopment

Air Quality Review

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
10-3313-R3	Draft 1	1 April 2010	Martin Doyle	Doug Boddy	

EXECUTIVE SUMMARY

Heggies Pty Ltd (Heggies) has been commissioned by APP Corporation Pty Ltd (APP) on behalf of Landcom and Campbelltown City Council to undertake an air quality review for the Menangle Park area. The assessment has been undertaken following previous reports undertaken by Heggies (formerly Richard Heggie Associates; report number 10-3313-R1, dated 7 June 2004 and report number 10-3313-R2). The 2004 and 2007 Air Reviews sought to assess potential air quality issues associated with the development of land within the study area. The current review brings together this work and also includes information not available during the production of the 2007 Air Review.

Existing and proposed industry both within and surrounding the Menangle Park area have been examined to assess the potential for air quality and odour impacts to be experienced in the study area. The following industries have been considered within this review:

- Camden Soil Mix;
- The Camden Gas Project;
- Menangle Sand and Soil;
- Jacks Gully Waste and Recycling Centre and Alternative Waste Treatment Facility;
- Prospective Sand and Coal Extraction Activities;
- Menangle Park Harness Racing Track;
- Industrial rezoning of the Glenlee Area; and
- Leafs Gully Power Station.

Where impacts have been predicted, suitable buffer distances have been suggested to ameliorate anticipated environmental (air quality) impacts as a result of current/future industrial activities:

A buffer zone of approximately **1 square kilometre** is suggested to ameliorate potential odour impacts from the activities of the **Camden Soil Mix Composting and Recycling Facility**. Any amendment to this buffer area should only be considered following evaluation of the detailed odour assessment undertaken as part of the future Development Application for an enclosed facility, and in any event not prior to the cessation of putrescible waste landfilling activities.

On the provision that gas processing will not be undertaken within the study area and assuming accidental release of gas can be considered to be negligible, a **buffer distance of at least 20 m from each well head** is suggested. Air quality impacts may be associated with the installation of well heads and laying of pipelines although these impacts will not be permanent.

Atmospheric dispersion modelling of the proposed Menangle Park West Sand and Soil Extraction activities was undertaken by Parsons Brinkerhoff in 2009. This assessment has been examined to establish suitable buffer distances associated with future sand extraction within the study area. It is found that appropriate buffer distances are dependant upon the implementation of suitable dust management practices but **may be of the order of 200 m from the site boundary**. Suitable separation distances between sand extraction and sensitive receptors are driven principally by the DECCW 24-hour PM_{10} criterion.

The Air Quality Review acknowledges the potential for photochemical smog generation in south west Sydney. Any development planned for south western Sydney should take note of the potential for ozone exceedances and take action to reduce the levels of precursor pollutants which they emit. Any increase in traffic associated with a development may increase the levels of NO_X and VOCs within the airshed, which may compound existing adverse air quality, especially in summer months.

TABLE OF CONTENTS

TABLE OF CONTENTS

1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been commissioned by APP Corporation Pty Ltd on behalf of Landcom and Campbelltown City Council to undertake an air quality review for the Menangle Park area. The assessment is an update of a previous report undertaken by Heggies (formerly Richard Heggie Associates; report number 10-3313-R1, dated 7 June 2004, hereafter "The 2004 Air Review" and a subsequent update undertaken by Heggies in 2007; report number 10-3313-R2, hereafter "The 2007 Air Review").

This report seeks to bring together information included in both the 2004 and 2007 Air Reviews together with information relating to the study which has been published since 2007. The aim of the current report is to review air quality parameters relating to a range of activities in the Menangle Park area to determine potential buffer zones to ameliorate anticipated environmental (air quality) impacts.

Additionally, the report reviews existing ambient air quality within the area and compares it to State and National air quality performance criteria.

2 PROJECT OVERVIEW

The Menangle Park Release Area has been earmarked for urban development since 1968. Originally it was envisaged that development of the area would occur in the late 1980s and early 1990s however in 1990 planning for the area stalled following concerns over air and water quality in South Western Sydney.

At the end of 2001 in light of concerns over Sydney's housing market and housing affordability, the State government announced further investigations of release areas in Western Sydney, including Menangle Park. The area was placed on the 'fast track' to urban release following research indicating that the previous concerns regarding air and water quality could be overcome in a sustainable and viable manner. At the same time the government established the Metropolitan Development Programme (MDP) which coordinates the planning, funding, servicing and development of all new major new residential projects in the Sydney region. Menangle Park was included within the MDP with a notional yield of 4,200 lots.

In light of its inclusion within the MDP, Campbelltown City Council in conjunction with Landcom and the Department of Planning commenced the preparation of a Local Environmental Study (LES). The LES was to identify the capability of the study area to accommodate urban development and recommend appropriate land use zones for incorporation into a subsequent draft local environmental plan (LEP) for the area.

In September 2004 a preliminary LES was prepared for the study area by MG Planning. The LES was supported by technical studies addressing geology and soils, air quality (the 2004 Air Review conducted by Heggies), local drainage, riverine flooding, flora and fauna, indigenous heritage, non indigenous heritage, transport and access, visual and landscape character, socio-economic issues, extractive resources, infrastructure and services, bushfire and noise. In addition preliminary Master Planning work was undertaken to test various development scenarios for the site and ultimately to conclude a preferred development option.

The preliminary LES concluded that the site is suitable and capable of urban development with a likely yield in the order of 3,600 lots having regard to the "moderate" development option. It was identified that this yield would contribute to land supply within the Sydney Metropolitan Region consistent with the objectives for the site under the MDP.

However, it was also identified that the site is underlain by a high quality coal resource which is of State significance. Consideration of the potential impacts of coal mining on the site determined that mining of the site would be likely to result in unacceptable impacts on urban development, primarily in the form of mine subsidence, should urban development occur prior to mining.

The report therefore concluded that the decision regarding what development should ultimately occur on the site is a matter for the State government in balancing the competing demands of coal mining and urban land supply. Related to the coal resource, coal bed methane is present and is currently being extracted at locations within the area although not on the study area at present.

Two deposits of sand have also been identified within the Menangle Park study area. Extraction of this resource will have air quality implications in terms of nuisance dust, respirable particulate and crystalline silica.

Following preparation of the preliminary LES in September 2004, work on the Menangle Park release area stalled pending a decision from the State Government regarding whether mining or urban development would be pursued on the site. The State government decided against supporting mining and in May 2006 advised that planning for the urban development of Menangle Park should be recommenced as a matter of priority.

Accordingly Landcom in conjunction with Campbelltown City Council, is now seeking to progress work on the release area.

2.1 Project Location

The site is located between the Nepean River to the west and the South Western Freeway (Hume Highway) to the east. The study area has the Nepean River as both its southern and western boundary. The eastern boundary of the study area is formed by the South Western Freeway (Hume Highway) to the south, extending eastwards at the junction with Menangle Road. The northern boundary is comprised of the water supply canal, a section of the southern railway, the coal railway line and the boundary with Camden Council up to the Nepean River.

The area itself is mildly undulating, and the land use may be considered as "rolling rural". Further afield, there are rolling hills to the north, west and south-southwest.

The limit of the present study area is presented in **Figure 1**.

Figure 1 Menangle Park Project Study Area

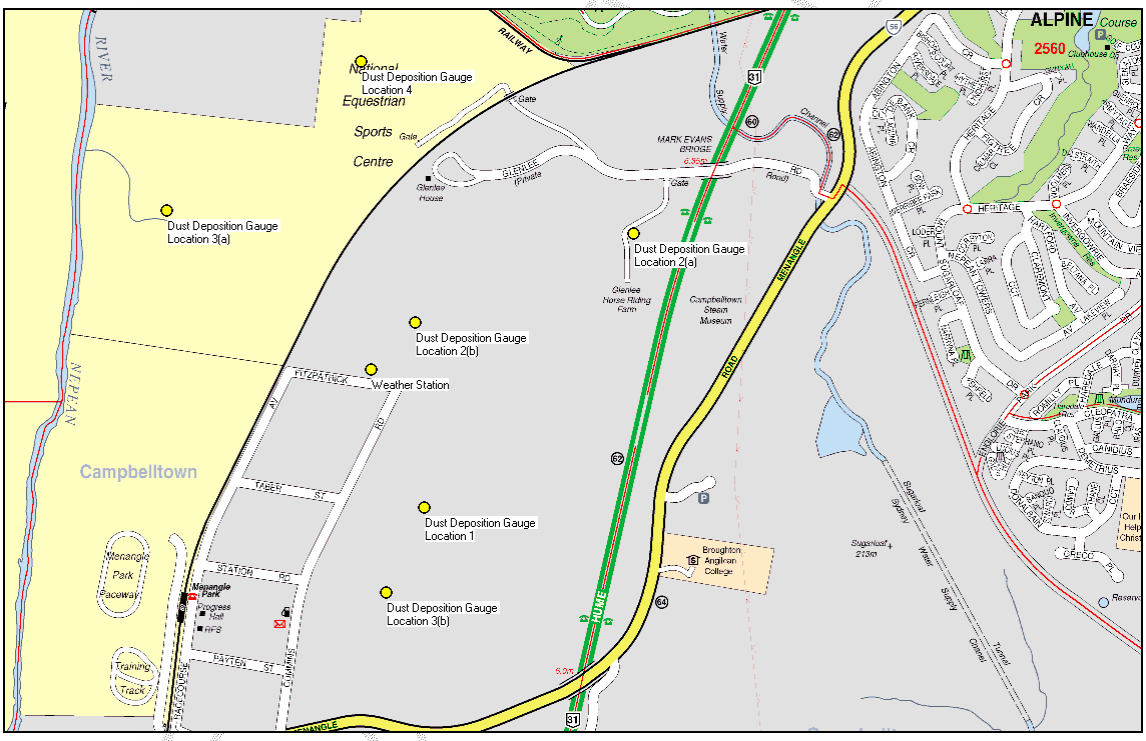
3 EXISTING AIR QUALITY ENVIRONMENT

3.1 Background Dust Deposition Environment

Background dust deposition rates relevant to the project site were monitored between 24 April 2002 and 25 October 2002 for use in the 2004 Air Review. No updated information has been collected since this time although these results can be deemed to be representative of the dust deposition environment of the area as no significant industry has commenced operations since the production of the 2004 Air Review.

Dust deposition gauges (DDGs) were initially set up at four locations on the northern, eastern, southern and western regions of the project area. Following a three month monitoring programme, two of the four DDGs (Location 2a and Location 3a) were relocated to survey at different locations within the project area, while maintaining two 'reference' monitoring locations. Dust monitoring locations over the six month monitoring period are presented in **Figure 2**.

Figure 2 Dust Gauge Locations – Menangle Park



The dust deposition results obtained during this period are presented in **Table 1**.

Table 1 Dust Deposition Monitoring, Menangle Park April 2002-October 2002

Sample Month	Insoluble Solids (g/m²/month)				Ash Residue (g/m²/month)			
	Location 1	Location 2[1]	Location 3[1]	Location 4	Location 1	Location 2[1]	Location 3[1]	Location 4
April – May 2002	10[2]	2.9	0.4	1.0	8.5	1.9	0.2	0.5
May – June 2002	1.4	0.5	0.3	0.6	0.4	0.2	0.2	0.3
June – July 2002	7.1[2]	0.4	0.2	1.1	2.8	0.2	0.1	0.5
July – August 2002	7.6[2]	2.4	1.0	1.3	5.4	1.2	0.8	0.7
August – Sept. 2002	14.0[2]	1.6	0.5	1.9	4.4	0.5	0.3	0.9
Sept. – October 2002	2.9[2]	5.8	0.5	0.5	-[3]	1.9	0.3	0.2
Average	7.2	2.3	0.5	1.1	4.3	1.0	0.3	0.5

Note 1: Dust gauge was relocated after 3 months.

Note 2: Nearby clearing and burning off impacting results for these samples.

Note 3: Results unavailable as crucible damage occurred during laboratory analysis.

The results at Location 1 are considerably higher than at the other monitoring sites. It was observed that clearing works associated with a mobile plant item and burning of vegetation occurred throughout the six month sampling period adjacent to and surrounding the area of this dust gauge location. Due to the consistent localised contamination of this sample, results from Location 1 have therefore been disregarded in this instance.

It is noted that results recorded at Location 3a may be considered as a background dust level for the area, as they are consistently low implying no localised impacts were experienced.

However, to derive suitable buffer distances for extractive operations, it is prudent to select a conservatively high estimation of existing dust deposition.

The dust deposition rate (insoluble solids) for the subject site for assessment purposes is therefore assumed to be of the order of 2.3 g/m²/month expressed as an annual average. This is the maximum of all the average deposition rates from the sites, excluding Location 1.

3.2 Background Particulate Matter Environment

The term *"particulate matter"* refers to a category of airborne particles typically less than 50 microns (µm) in diameter and ranging down to 0.1 µm in size. Particles less than 10 µm and 2.5 µm are referred to in this report as PM_{10} and $PM_{2.5}$ respectively.

Measurements of PM_{10} were undertaken historically using a TSI DustTrack instrument for a period of ten days at Location 2(b) during September and October 2002. Results of PM_{10} throughout the monitoring period varied significantly, with four of the ten 24-hour measurements indicating an exceedance the NSW Department of Environment, Climate Change and Water (DECCW) 24-hour goal for PM_{10} (50 µg/m³).

There was some evidence that the DustTrak results incorporated within the 2004 Air Review were influenced by the effects of local back-burning activities.

Further, to provide an indication of the background concentration of PM_{10} within the airshed of the Study Area, annual average and daily varying background PM_{10} data may be sourced from the closest DECCW ambient air quality monitoring station to the study area.

The 2004 Air Review examined data for 2002 from the DECCW air quality monitoring station at Campbelltown. This site has since been decommissioned.

Currently the closest DECCW air quality monitoring station to the site is the UWS MacArthur air quality monitoring site approximately 5 km northeast of Menangle Park which was commissioned in late 2004.

Additionally, the DECCW Liverpool air quality monitoring site is located approximately 26 km to the northeast of Menangle Park and has been routinely monitoring ambient PM_{10} concentrations since 1990 using a Tapered Element Oscillating Microbalance (TEOM) instrument.

In the absence of multiple years of data at the UWS MacArthur air quality monitoring site, data has been obtained from the Liverpool monitoring station for full years 2000 to 2005 to assess the year to year variability in particulate concentrations in the area. Annual mean PM_{10} concentrations and exceedances of the DECCW goal of 50 µg/m^3 are shown in **Table 2**.

The Liverpool air quality monitoring site is located in the Council depot, off Rose Street, Liverpool. It is situated in the centre of the Sydney basin in a mixed residential and commercial area and is at an elevation of 22 m.

Table 2 Annual Average PM_{10} and DEC Criteria Exceedance Frequency, 2000-2005

Year	Annual Average PM_{10} Concentration (µg/m^3)	Number of Exceedances of the DECCW 24 hour PM_{10} Criterion of 50 µg/m^3
2000	18	2
2001	19	2
2002	24	12
2003	22	5
2004	22	1
2005	21	2

Inspection of the above data set indicates that the calendar year 2002 yielded uncharacteristically high levels of PM_{10} compared with other years. This is consistent with speculation that PM_{10} monitoring conducted by Heggies within the 2004 Air Review was unrepresentative.

A summary of the PM_{10} monitoring data recorded at both the UWS Macarthur and Liverpool air quality monitoring sites for the calendar year 2005 is shown in **Table 3**.

Table 3 Summary of PM_{10} Monitoring Data, UWS Macarthur and Liverpool, 2005

Month	24-hour PM_{10} Concentration (µg/m³)		Number of Exceedances of the DECCW 24-hour PM_{10} criterion of 50 µg/m³	
	Macarthur	Liverpool	Macarthur	Liverpool
January	55	46	1	0
February	48	34	0	0
March	29	30	0	0
April	35	36	0	0
May	42	51	0	1
June	40	55	0	1
July	20	35	0	0
August	31	42	0	0
September	27	36	0	0
October	43	43	0	0
November	33	29	0	0
December	43	49	0	0
Average	**37**	**41**	**-**	**-**
Maximum	**55**	**55**	**-**	**-**
Minimum	**20**	**29**	**-**	**-**

A comparison between monthly 24 hour maxima and monthly exceedances of the 24-hour PM_{10} criterion at the Liverpool and MacArthur monitoring stations indicates that the maximum 24-hour concentration monitored at each site are the same (55 µg/m³). Averages of the monthly 24 hour maxima at both sites show that PM_{10} concentrations at Liverpool (41 µg/m³) are slightly greater than at MacArthur (37 µg/m³). The use of Liverpool PM_{10} data in any assessment in relation to Menangle Park will therefore result in a more conservative estimation of background particulate concentrations.

It is noted that the PM_{10} sub-set is typically 50% of total suspended particulate (TSP) in the ambient air of regions where road traffic is not the dominant particulate source, such as semi-rural locations (USEPA, 2001). In the absence of monitoring data for TSP, the annual average TSP concentration for the region may therefore be derived by multiplying the annual average PM_{10} concentration by a factor of two.

To predict a conservatively high background concentration of annual TSP, this report has taken the annual average (with exclusions) PM_{10} records at Liverpool for 2005 (21 µg/m³), and used the above multiplier to derive the annual average TSP concentration. This corresponds to a background TSP concentration of 42 µg/m³.

3.3 Background Crystalline Silica Environment

The existing background concentration of airborne crystalline silica originates from quartz (silicon dioxide) being emitted into the air as a component of particulate emissions produced by natural, industrial, and farming activities (US EPA, 1996). Within the Menangle Park area, these activities may include dust from vehicles travelling on sealed and unsealed roads, agricultural activities, bushfires, wind erosion of unsealed surfaces, local construction and demolition activities and extractive industries. The sandy nature of the soils around Menangle Park means they naturally contain high levels of quartz.

Epidemiological studies indicate that occupational exposure to high concentrations of respirable crystalline silica has associated adverse health effects. However, there are no known adverse health effects associated with exposure to respirable crystalline silica in non-occupational settings (IARC, 1997; CICAD, 2000).

As crystalline silica has its fibrogenic effects in the deeper areas of the respiratory system, it is the particles which are able to penetrate to the alveoli which are of prime concern (NIOSH, 2002; US EPA, 1996). It is generally considered that particles less than 3 – 5µm have a greater potential to reach the alveolar region (US EPA, 2004; IARC 1997; CICAD 2000).

Background ambient respirable silica concentrations in non-occupational environments are not measured in Australia and as a result, there is an absence of accessible information within the Australian context. It is known, however, that the crystalline silica component of ambient emissions has been observed to be higher within larger size particle size fractions (>10µm) than those fractions less than 10 µm. It is suggested that this unequal distribution may be due to quartz, which is harder than most minerals, resisting comminution to finer particle sizes (USEPA, 1996).

Therefore, a method of estimating ambient respirable silica concentrations is to determine the <10µm quartz content of the soils within the area of interest and assume that the percentage of crystalline silica within the emitted PM_{10} is equivalent to the fraction within the parent source (USEPA, 1996).

The US EPA (1996) concluded that an inferential method to estimate the crystalline silica fraction in ambient PM_{10} is to assess the nearby soil and that an inherent assumption is that the percentage of crystalline silica within the emitted PM_{10} is equivalent to the fraction within the parent source (USEPA, 1996).

Heggies are not aware of any site specific sampling for quartz, however, results obtained from a sand quarry project in NSW indicate that the quartz content of the <10µm fraction of sand is of the order of 4%. Thus, the derivation of estimated background annual average respirable quartz is as follows:

- The estimated background PM_{10} concentration (annual average) is 21 µg/m^3 (as discussed in **Section 3.2**)
- Therefore, the estimated existing background annual average respirable quartz concentration is of the order of 21 µg/m^3 x 4% = 0.8 µg/m^3.

It is acknowledged that this approach produces a conservative estimate because it is based on a sample taken at a depth from a sand quarry and in reality much of the landform in the Menangle Park area is covered by grass, native flora, bitumen and concrete and will not be affected by wind erosion.

The estimate of 0.8 µg/m^3 for the Menangle Park area is, however, similar to concentrations reported by Collin et al (2005) and the California EPA (OEHHA, 2004) for a rural site (0.6 µg/m^3) and a remote background site (0.2 µg/m^3).

3.4 Background Odour Environment

The Study Area may be impacted by the following potentially odorous industries:

- Jack's Gully Waste Management Centre (at a separation distance of approximately 0.4 km between the southern site boundary and the northern boundary of the study area); and
- Camden Soil Mix Composting and Recycling Facility (located at the northern boundary of the study area).

- Menangle Sand & Soil (located on Menangle road, Menangle approximately 1.5 km southwest of the site).
- Camden Coal Seam Methane Extraction (with the nearest wells located on the edge of the study area).
- Menangle Park Harness Racing Track and Associated Infrastructure.

The above operations have been subject to numerous odour investigations historically, including:

- *Environmental Impact Statement for the Glenlee Composting Facility* (International Environmental Consultants Pty Ltd, 1996);
- *Environmental Impact Statement (EIS) for the Expansion of Jack's Gully Waste Management Centre* (Woodward-Clyde, 1999);
- *Odour Evaluation of the Glenlee Composting Operation* (Australian Water Technologies, 2001); and
- Updated (untitled) report on odour impacts (Australian Water Technologies, 2002);
- *Camden Soil Mix Composting and Recycling Facility Local Environmental Study*, GHD Pty Ltd, 2003)
- *Air Quality Modelling Report - Jacks Gully Alternative Waste Technology Facility* (Holmes Air Sciences, 2006).

The potential odorous impacts of these operations predicted within the above documentation are further discussed in **Section 5** of this report.

3.5 Background Nitrogen Dioxide / Carbon Monoxide Environment

Background concentrations of emissions associated with Coal Bed Methane Gas Extraction are required to be compiled for assessment of any future operations of this type within / surrounding the study area. Concentrations of nitrogen dioxide (NO_2) have been derived from DECCW monitoring of this parameter at their UWS MacArthur site, obtained during 2005.

Carbon monoxide monitoring data (another product of gas extraction flaring) was not available. However, no significant existing source of this pollutant was identified within the locality. It is noted that the Camden Soil Mix composting facility is an aerobic process, and thus avoids the generation / flaring of combustible biogas. Therefore, concentrations of carbon monoxide in ambient air may be assumed to be negligible.

3.6 Background Air Quality Environment for Assessment Purposes

For the purposes of assessing the potential air quality impacts from the proposed facility, an estimate of different background air quality parameters is required. Conservatively high estimations of background concentrations have been selected, for each relevant averaging period, as per Section 5.2 of the Approved Methods. Based on the data and discussion earlier in **Section 3**, the site-specific background air quality levels adopted for the assessment of future activities conducted within the study area are presented in **Table 4**.

Table 4 Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level
TSP	Annual	42 µg/m^3
PM_{10}	24-Hour	Varies
	Annual	21 µg/m^3
Dust	Annual	2.3 g/m^2/month
Crystalline Silica	Annual	0.8 µg/m^3
Odour	Nose-Response Time (1 s)	Variable (refer **Section 3.4**)
Nitrogen Dioxide	Annual	1.2 pphm
	1-Hour	2.6 pphm
Carbon Monoxide	8-Hour	Negligible

4 AIR QUALITY CRITERIA

4.1 Criteria Applicable to Particulate Matter Less than 10 Microns (PM_{10})

Emissions of PM_{10} and $PM_{2.5}$ are considered important pollutants in terms of impact due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs. Potential adverse health impacts associated with exposure to PM_{10} and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

One of the difficulties in dealing with air quality criteria governing fine particles such as PM_{10} and $PM_{2.5}$ is that the medical community has not been able to establish a threshold value (for either PM_{10} or $PM_{2.5}$) below which there are no adverse health impacts.

The DECCW PM_{10} impact assessment criteria, as expressed in the Approved Methods document, are:

- A 24-hour maximum of 50 µg/m^3.
- An annual average of 30 µg/m^3.

The 24-hour PM_{10} reporting standard of 50 µg/m^3 is numerically identical to the equivalent National Environment Protection Measure (or NEPM) reporting standard except that the NEPM reporting standard allows for five exceedances per year. These NEPM goals were developed by the National Environmental Protection Council (NEPC) in 1998 to be achieved within 10 years of commencement.

4.2 Criterion Applicable to Total Suspended Particulate (TSP)

The annual average goal for Total Suspended Particulate (or TSP) is given as 90 µg/m^3, as recommended by the National Health and Medical Research Council (NHMRC) at their 92nd session in October 1981. It was developed before the more recent results of epidemiological studies suggested a relationship between health impacts and exposure to PM_{10} and $PM_{2.5}$ concentrations.

It is noted that the PM_{10} sub-set is typically 50% of total suspended particulate (TSP) mass in regions where road traffic is not the dominant particulate source (USEPA, 2001). This would be consistent with an annual average PM_{10} goal of approximately 45 µg/m^3 (derived from 50% of the annual NHMRC goal of 90 µg/m^3). Thus, the historical NHMRC goal may be regarded as not as stringent as the newer PM_{10} goal of 30 µg/m^3 expressed as an annual average.

4.3 Criteria Applicable to Particulate Matter Less than 2.5 Microns ($PM_{2.5}$)

In December 2000, the NEPC initiated a review to determine whether a new ambient air quality criterion for $PM_{2.5}$ was needed in Australia, and the feasibility of developing such a criterion. The review found that:

- there are health effects associated with fine particles;
- the health effects observed overseas are supported by Australian studies; and
- fine particle standards have been set in Canada and the USA, and an interim criterion proposed for New Zealand.

The review concluded that there is sufficient community concern regarding $PM_{2.5}$ to consider it an entity separate from PM_{10}.

As such, in July 2003 a variation to the Ambient Air Quality NEPM was made to extend its coverage to $PM_{2.5}$. This document references the following goals for $PM_{2.5}$:

- A 24-hour maximum of 25 µg/m^3.
- An annual average of 8 µg/m^3.

4.4 Nuisance Impacts of Fugitive Emissions

The preceding sections are concerned in large part with the health impacts of particulate matter. Nuisance impacts need also to be considered, mainly in relation to dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 g/m^2/month.

Table 5 presents the DECCW impact assessment criteria for dust fallout, showing the allowable increase in dust deposition level over the ambient (background) level which would be acceptable so that dust nuisance could be avoided.

Table 5 DEC Criteria for Allowable Dust Deposition

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

Source: *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, DECCW 2005.

4.5 Criteria Applicable to Crystalline Silica

The National Occupational Health and Safety Commission (NOHSC) in Australia has established a workplace exposure standard for crystalline silica (expressed as Respirable Quartz) of 0.1 mg/m^3.

While the NOHSC standard can be used as a guide, the California Office of Environmental Health Hazard Assessment (OEHHA) has adopted a chronic Reference Exposure Level (REL) of 3 µg/m^3 for respirable crystalline silica. A chronic REL is an airborne level of a substance at or below which no adverse health effects are anticipated in individuals indefinitely exposed to that level. RELs are developed from the best available published scientific data, based solely on health considerations.

4.6 Criteria Applicable to Odour Emissions

Impacts from odorous air contaminants are often nuisance-related rather than health-related. Odour performance criteria guide decisions on odour management, but are not specifically 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 per cubic metre (OU/m^3). Therefore, an odour criterion of less than 1 OU/m^3 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/m^3 to 10 OU/m^3 depending on a combination of the following factors:

- Odour Quality: whether an odour results from a pure compound or from a mixture of compounds. Pure compounds tend to have a higher threshold (lower offensiveness) than a mixture of compounds.
- Population Sensitivity: any given population contains individuals with a range of sensitivities to odour. The larger a population, the greater the number of sensitive individuals it contains.

- Background level: whether a given odour source, because of its location, is likely to contribute to a cumulative odour impact. In areas with more closely-located sources it may be necessary to apply a lower threshold to prevent offensive odour.
- Public expectation: whether a given community is tolerant of a particular type of odour and does not find it offensive, even at relatively high concentrations. For example, background agricultural odours may not be considered offensive until a higher threshold is reached than from odours from a chemical facility.
- Source characteristics: whether the odour is emitted from a stack (point source) or from an area (diffuse source). Generally, the components of point source emissions can be identified and treated more easily than diffuse sources. Emissions from point sources can be more easily controlled using control equipment. Point sources tend to be located in urban areas, while diffuse sources are more often located in rural locations.
- Health Effects: whether a particular odour is likely to be associated with adverse health effects. In general, odour from an agricultural operation is less likely to present a health risk than emissions from a chemical facility.

Experience gained through odour assessments from proposed and existing facilities in NSW indicates that an odour performance criterion of 7 OU/m^3 is likely to represent the level below which "offensive" odours should not occur (for an individual with a 'standard sensitivity' to odours). Therefore, the Approved Methods recommends that, as design criteria, no individual be exposed to ambient odour levels of greater than 7 OU/m^3. This is expressed as the 99th percentile value, as a nose response time average (approximately one second).

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

Where a number of the factors above simultaneously contribute to making an odour 'offensive', an odour criterion of 2 OU/m^3 at the nearest sensitive receptor (existing or any likely future receptor) is appropriate, which generally occurs for affected populations equal or above 2000 people. A summary of odour performance criteria for various population densities is shown in **Table 6**.

Table 6 NSW DECCW Odour Performance Criteria vs. Population Density

Population of Affected Community	Odour Performance Criteria OU/m^3
Urban area (≥ 2000)	2.0
500 – 2000	3.0
125 – 500	4.0
30-125	5.0
10-30	6.0
Single residence (≤ 2)	7.0

Note: These should be regarded as interim criteria to be refined over time through experience and case studies.
Source: *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, DECCW 2005.

In view of future residential development as part of the Menangle Park Urban Release Area, the project odour performance goal adopted for this assessment is:

- A maximum of 2.0 odour units per cubic metre (OU/m^3) expressed as a nose response average (1-second) value.

This is consistent with the view of the DECCW Air Policy Unit (Pers. Comm. Mr Andrew Mattes, 1 March 2006) that the boundaries of Campbelltown Council are part of a contiguous urban area for the purposes of odour assessment. Thus, the appropriate odour criterion for assessment purposes should indeed be 2 OU/m^3.

This criterion is to be applied for assessment at all existing / future existing off-site sensitive receptors.

4.7 Criteria Applicable to Combustion Emissions

The DECCW standards for combustion emissions relevant to the Project area are summarised in **Table 7**.

Table 7 National Environment Protection Measure (NEPM) Ambient Air Quality Goals

Pollutant	Averaging Time	Maximum Concentration	
		ppm	$\mu g/m^3$
Nitrogen dioxide (NO_2)	1-Hour	0.12	246
	Annual	0.03	62
Carbon Monoxide (CO)	15-Minute	87	100×10^3
	1-Hour	25	30×10^3
	8-Hour	9.0	10×10^3

5 INDUSTRIAL AIR QUALITY IMPACTS

A literature review of existing and proposed industry located within the vicinity of the Project Site has been undertaken and is summarised below. Potential air quality and odour impacts associated with these industries are summarised where data is available.

5.1 Camden Soil Mix

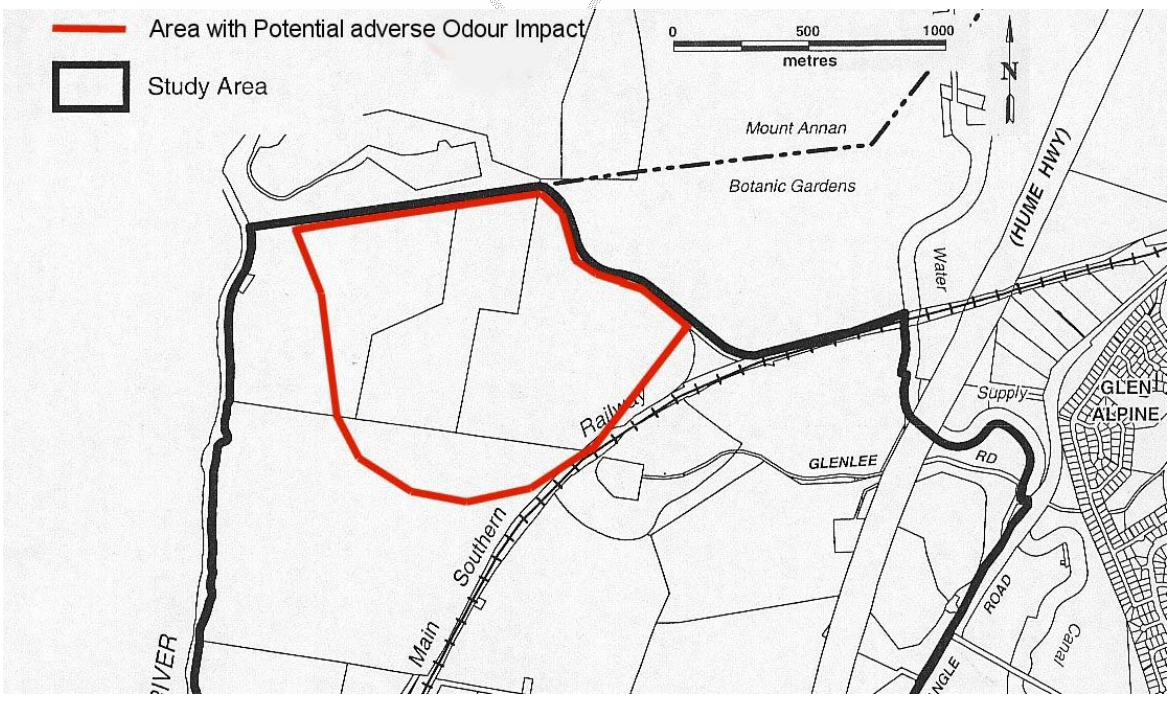
Camden Soil Mix Pty Ltd operates a composting facility on Glenlee Road, utilising kerbside green waste received from Councils and contractors. The composted organic matter is then blended with soil and on sold. Camden Soil Mix Pty Ltd operates under Environmental Protection Licence (EPL) number 5647 which stipulates that the premises must be maintained in a condition which minimises or prevents the emission of dust from the site.

The potential odorous impacts of operations at the Camden Soil Mix Composting and Recycling Facility are summarised in *Camden Soil Mix Composting and Recycling Facility Local Environmental Study*, GHD Pty Ltd, 2003).

Historically, adverse odour impacts from the current operation of the composting facility on adjacent land have been noted (submissions in response to the public exhibition of the Draft Campbelltown (Urban Area) Local Environmental Plan 2002 (Amendment No.10).

Modelling of existing operations at the composting facility (Australian Water Technologies, 2002) indicated that odour emissions may impact upon the site of the National Equestrian Centre to the north of the study area under worst case dispersion conditions. A representation of the impact zone lying within the study area (greater than 2.0 OU/m^3, 1-second nose response time) is shown in **Figure 3**.

Figure 3 Modelling of Odour Impacts from Camden Soil Mix Composting Operation



Source: Australian Water Technologies, 2002.

Investigation has additionally been undertaken into the potential pollution reduction techniques to further limit the impacts of the potentially odorous industries to the north of the study area. It is noted, however, that the most suitable odour outcome for residents to the north of the composting facility (50% of windrows located in an enclosed facility, composting undertaken at the southern end of the proposed expanded facility) would further increase the area of potential impact lying within the study area.

It is further noted that no historical odour modelling has addressed the cumulative impacts of both the proposed expanded facility and the Jacks Gully Waste Management Centre, which may further impact the study area.

The proposed rezoning of the Camden Soil Mix (CSM) site is designed to facilitate the movement of operations onto their adjoining land to the south (i.e. closer to the study area). This would assist Camden Soil Mix to comply with a current Pollution Reduction Program (PRP) as required by the DECCW. The PRP seeks to minimise potential impacts of emissions from the site on existing and proposed Urban Release Area within the study area. Section U1.1 of the EPL states that the licensee must have ceased putrescible waste landfilling at the premises by 20 June 2007.

In conclusion, it is recommended that a suitable buffer area to ameliorate odour impacts should be adopted as per **Figure 3** (approximately 1 km^2 centred on the soil mix operations).

Any amendment to this buffer area should only be considered following evaluation of the detailed odour assessment undertaken as part of the future Development Application for an enclosed facility, and in any event not prior to the cessation of putrescible waste landfilling activities.

5.2 The Camden Gas Project

The following information has largely been extracted from the "*Environmental Assessment of the Expansion of Stage 2 of the Camden Gas Project"* – AGL, September 2007.

The Camden Gas Project (CGP) is a major coal seam methane (CSM) project involving the extraction of CSM gas located within the Southern Coalfields of the Sydney Basin. Exploration and production titles associated with the CGP are issued under the *NSW Petroleum (Onshore) Act 1991*. Current CGP activities consist of approximately 100 existing coal seam gas wells, underground gas gathering pipes and gas treatment facilities.

HLA-Envirosciences Pty Limited (HLA ENSR) has prepared an Environmental Assessment (EA) on behalf of AGL Gas Production (Camden) Pty Limited (AGL) to assess the potential environmental impacts of the development of additional gas wells and associated infrastructure proposed to expand the CGP and its production capacity. The proposed locations of the additional wells are shown in **Figure 4**, **Figure 5** and **Figure 6**. The EA addresses the nature of proposed works and potential impacts for an area within the Camden, Campbelltown and Wollondilly Local Government Areas (LGAs) identified as Stage 2 of the CGP. Project Approval under Section 75J of the Environmental Planning & Assessment Act 1979 was granted on 4th April 2008.

Assessment of the potential air quality and odour impacts of the construction and operation of the gas wells was included within the EA documentation.

The EA identified primary potential impacts on air quality as a result of the proposed works which will occur during the construction phase of the project and will include the following:

- Dust generated as a result of soil disturbance during the construction of drill pads, drill pits and access roads;
- Dust generated by vehicular movements to and from construction sites along access roads, transporting equipment and materials;
- Exhaust emissions generated from civil operations, including equipment and vehicles; and

- Potential gas well emissions from leakages during drilling.

Drilling operations have the potential to generate odour as follows:

- Oxygenation of aquifer waters, which may cause the release of H_2S ("rotten egg gas") as sulphides convert to sulphates;
- Venting of trapped natural gases in overlying formations; and
- Venting of coal seam methane gases which may include odorous gases (methane gas itself is an odourless gas).

The potential for odour impacts is considered within the EA to be unlikely based upon past experience by AGL from similar operations and the siting of well surface locations relative to sensitive residential receivers.

The potential for the oxygenation of aquifer waters causing the release of H2S is not considered within the EA to be significant, as surface casing is set to prevent and isolate surface aquifers from having an influence on the drilling process. Occurrences of H2S are not likely to be natural deposits, but man made and as a result the probability of drilling through an occurrence and losing circulation during under-balanced drilling is therefore considered to be extremely low.

Previous well field developments in the CGP have demonstrated there are relatively minor air quality impacts during construction and this is also expected to be the case for construction of the Stage 2 well surface locations. Given the scale and localised nature of the construction of the proposed works and the implementation of effective mitigation measures, the abovementioned potential impacts are not expected to yield significant adverse effects on air quality in the locality.

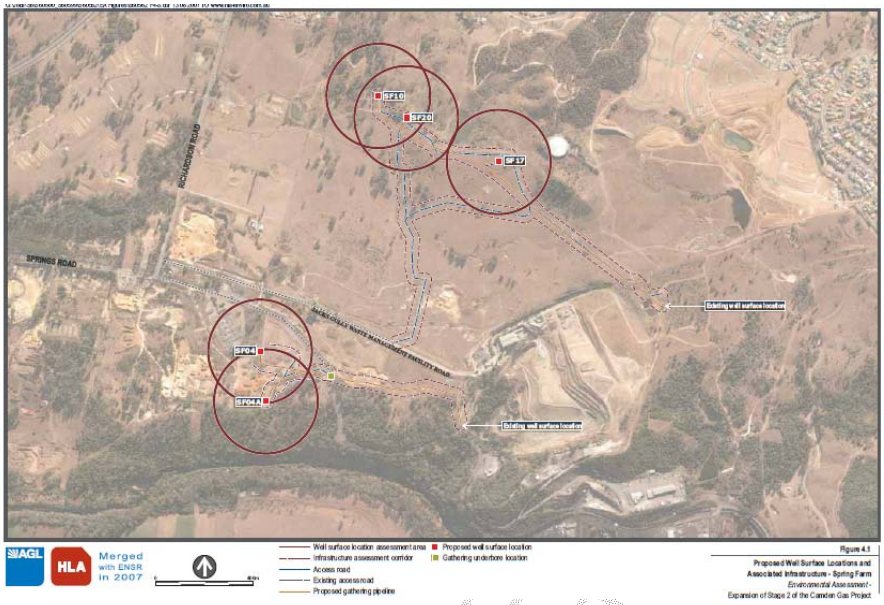
Potential air emissions during the production phase are related to the following:

- Dust generation during use of unsealed roads;
- Venting of gas during well commissioning; and
- Exhaust emissions generated from civil operations, including equipment and vehicles.

Emissions have the potential to occur through maintenance and work over activities, however, these impacts are infrequent, minor and occur only for short periods of time.

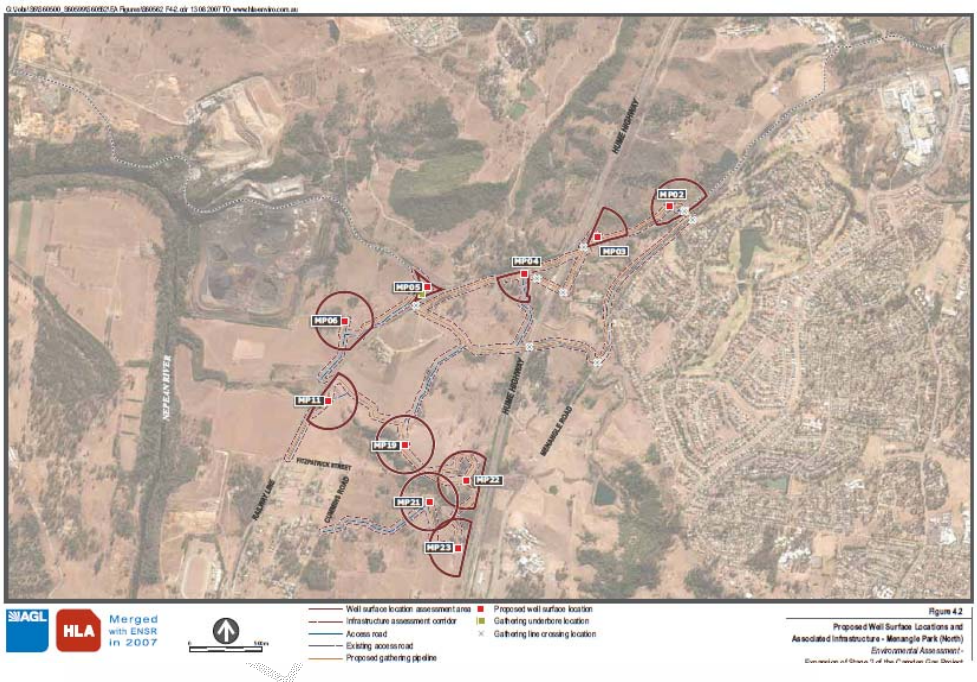
As identified within the EA, the Spring Farm and Menangle Park areas have been earmarked for future urban (residential, commercial, industrial development), which would result in development being located in close proximity to the well surface locations. The construction of well surface locations and associated infrastructure within these areas is expected to be completed prior to the land release of the area, thereby minimising the potential impacts on amenity resulting from minor air quality impacts during construction. Impacts during operation are also expected to be minimal.

Figure 4 Well Structure Locations - Springfarm



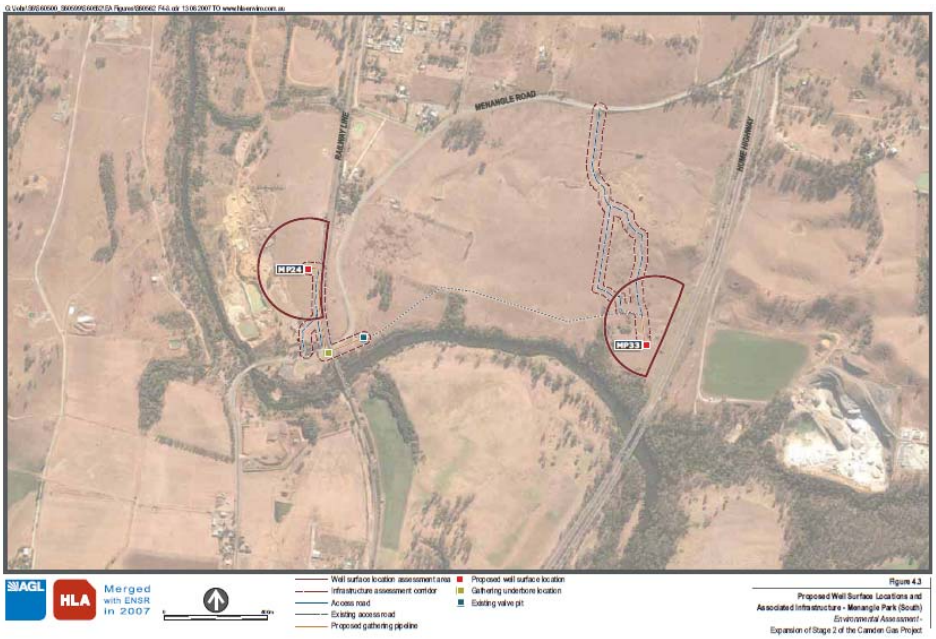
Source: *Environmental Assessment of the Expansion of Stage 2 of the Camden Gas Project* – AGL, September 2007

Figure 5 Well Structure Locations - Menangle Park (North)



Source: *Environmental Assessment of the Expansion of Stage 2 of the Camden Gas Project* – AGL, September 2007

Figure 6 Well Structure Locations – Menangle Park (South)



Source: *Environmental Assessment of the Expansion of Stage 2 of the Camden Gas Project* – AGL, September 2007

A further literature review of the documentation relating to Coal Bed Methane Gas Extraction air quality impacts includes the following:

- *Sydney Gas Air Quality Assessment Report* ERM Australia Pty Ltd, 2003
- *Assessment Report- Proposed Extension Stage 2 of the Camden Gas Project*, NSW Government Department of Planning, 2005
- *Environmental Impact Statement: Camden Gas Project Stage II Executive Summary* Sydney Gas, 2003.
- *Environmental Assessment Scoping Report – Expansion of Stage 2 of the Camden Gas Project*, AGL Gas Production (Camden) Pty Ltd, 19 October 2006
- *Development in the Vicinity of Operating Coal Seam Methane Wells,* - Department of Infrastructure, Planning and Natural Resources (DIPNR), May 2004.

The DIPNR guidelines for land use planning in the vicinity of coal seam methane wells suggests separation distances of between 5 m and 20 m depending on the well configuration (manual, automatically controlled) and the land use (residential or sensitive). The maximum separation distance for a manually operated well adjacent to sensitive land use is 20 m. It is noted that the guidelines are primarily based on safety (e.g. jet fires, flash fires and vapour cloud explosion) rather than amenity (odour impacts) considerations.

Suggested mitigation for odour impacts of the Camden Gas Project on the proposed development of Menangle Park includes the following:

- Good management practice in place to limit the accidental release of gas.
- Assuming accidental release of gas can be considered to be negligible, a buffer distance of at least 20 m from each well head is suggested.

5.3 Menangle Sand and Soil

Menangle Sand & Soil Pty Ltd operates an extractive industry with crushing, grinding and separating works at its site on Menangle Road. Menangle Sand & Soil Pty Ltd operates under Environment Protection Licence (EPL) number 3991. The Licence states that the licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises and must keep the premises in a condition which minimises or prevents the emission of dust from the site. A condition of the Licence is that continuous dust deposition monitoring must be undertaken. Additionally, the Licence states that modelling of dust deposition has been carried out (EPA file number 300687/A3). These data and reports were not available as part of this review.

Finally, it is noted that Section 05 of the EPL states that the licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises. On this basis, and without examination of detailed studies, it is inferred that if the facility is operated within the constraints of its EPL, the project criterion of 2 OU will not extend beyond the site boundary.

5.4 Jacks Gully Waste and Recycling Centre and Alternative Waste Treatment Facility

WSN Environmental Solutions operates Jacks Gully Waste and Recycling Centre (WRC) on Richardson Road, Camden, to the north of the study area. The WRC operates under Environment Protection Licence (EPL) number 5105. The 2004 Air Review addressed the issue of odour from the Jacks Gully WRC and drew information from the *Camden Soil Mix Composting and Recycling Facility Local Environmental Study*, GHD Pty Ltd, 2003 although this identified that no cumulative odour modelling of both the Camden Soil Mix Facility and the Jacks Gully WRC had been undertaken at that time.

An odour audit and impact assessment for the WRC site was conducted in 2002 (*Jacks Gully Waste Management Centre Odour Audit, Revision 1,* URS Australia Pty Ltd, January 2002) after a history of extensive and ongoing odour complaints from nearby residents.

WSN are currently operating the "Macarthur Resource Recovery Park" which opened in July 2008. The Park processes recyclables, organics and mixed solid waste from the Campbelltown, Camden, Wollondilly and Wingecarribee council areas.

WSN has submitted a Review of Environmental Factors (REF) for the facility, which includes an odour impact assessment report entitled *Jacks Gully Waste Management Centre Odour Modelling, URS, 26 April 2004.*

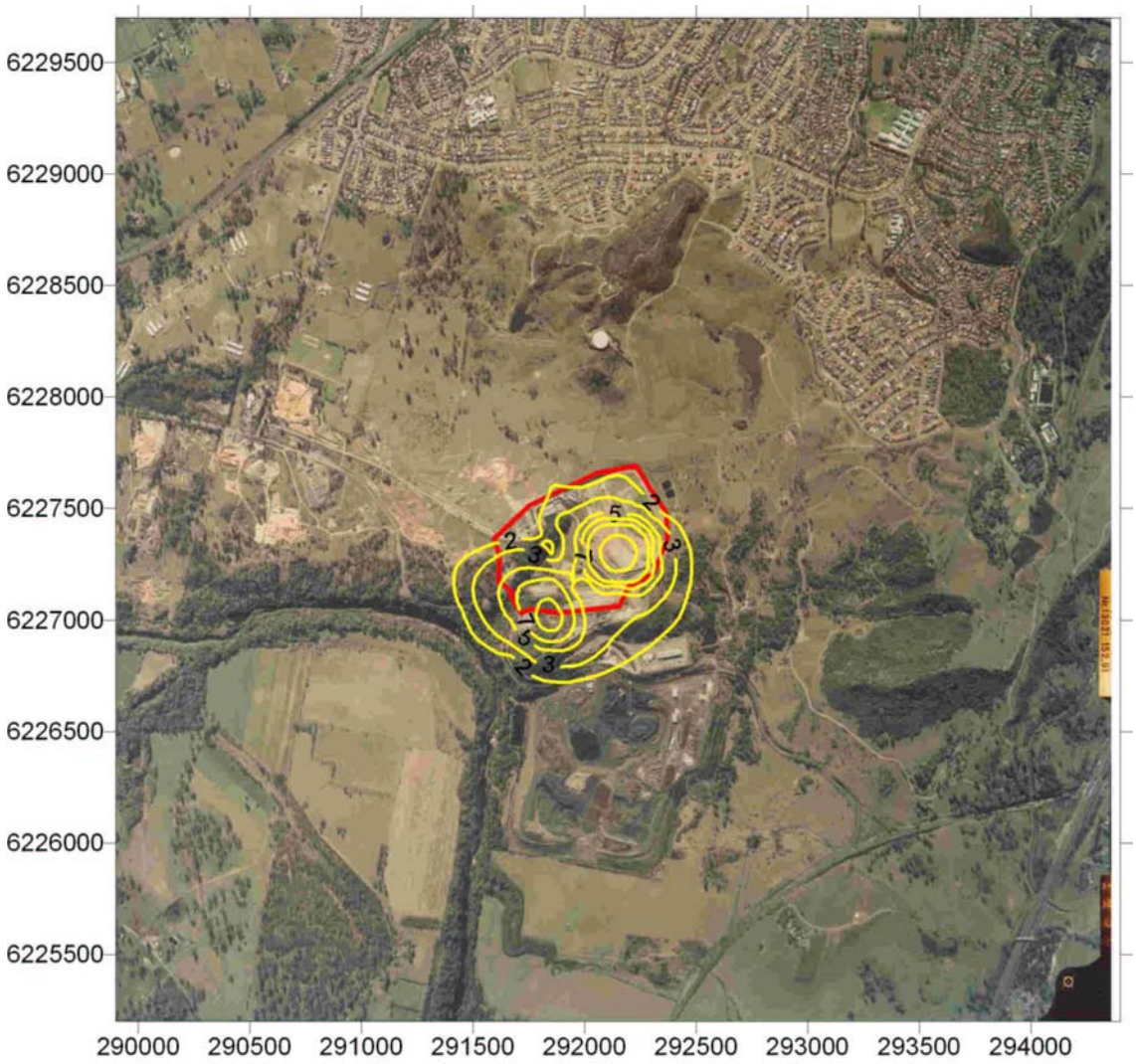
Odour modelling was carried out to assess the impact of the expansion to the WRC. Odour impacts were predicted to be less than 2 OU at three sensitive receptors on Kurrajong Avenue, Trema Place and Atlas Way to the north of the WRC facility.

An Alternative Waste Technology (AWT) facility gained approval in 2006 to be located at the current Jacks Gully Waste Recycling Centre (WRC). With reference to the *Air Quality Modelling Report – Jacks Gully Alternative Waste Technology Facility*, Holmes Air Sciences, March 2006, incineration processes and the transport to site of waste have the potential to generate odour and oxides of nitrogen.

Contours of the 99th percentile odour due to operations at the AWT indicate that the project criterion (2 OU isopleth) is generally contained within the site boundary, with some exceedance of the 2 OU limit to the southwest and south of the site. No exceedance of the 2 OU criterion is observed more than 250 m from the site boundary and is therefore not predicted to impact on the study area.

A reproduction of the worst-case odour modelling predictions undertaken within this report is included as **Figure 7**.

Figure 7 Modelling of Odour Impacts from Jacks Gully Active Landfill and Alternative Waste Treatment Facility (99th Percentile OU)



Source: *Air Quality Modelling Report – Jacks Gully Alternative Waste Technology Facility*, Holmes Air Sciences, 2006

5.5 Prospective Sand Extraction Activities

The Department of Primary Industries (DPI) has identified the project site as having sand resources which are important to the local sand extraction industry. Preliminary assessments of the resource capacity indicate that there are two principle deposits with the potential to yield:

- Western precinct – up to 2.9 Mt of quaternary sands
- Eastern precinct – up to 4.2 Mt of tertiary sands

Having regard to the constraints on extraction (best practice guidelines, area development timeline, operational constraints) it is proposed to seek approval for the extraction of the following quantities of sand;

- Western precinct – up to 1.6 Mt

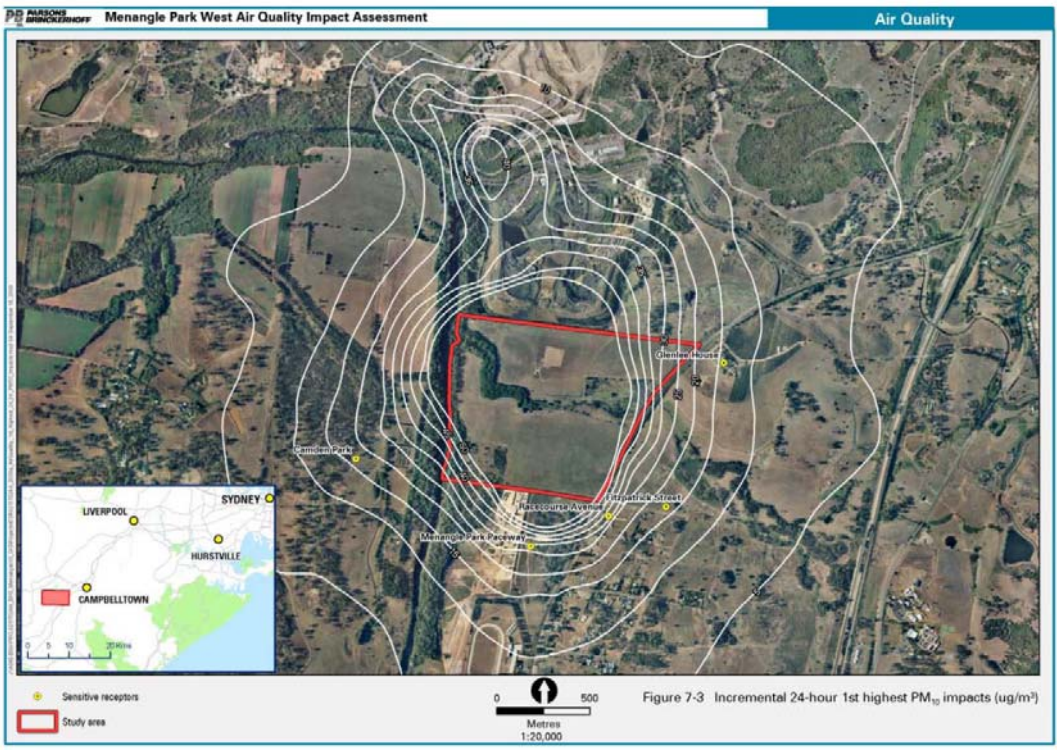
It is understood that at the present time, the Eastern Precinct resource is not be extracted.

If approval is granted, an assumed approximately 200,000 tonnes per annum would be extracted from the Western Precinct, subject to market conditions and the resource quality once operations commence.

Air quality impacts associated with the possible extraction of the Western Precinct sand resource have been quantitatively addressed (modelled) by Parsons Brinkehoff (PB) in *"Menangle Park West Sand and Soil Excavation Project – Air Quality Impact Assessment"* dated 24 September 2009. The assessment is currently under review by the relevant authorities and interested public parties (April 2010).

The dispersion modelling study by PB has assessed the likely impacts upon air quality in the surrounding local area and has concluded that exceedances of the DECCW 24 hr PM_{10} criterion (incremental) should not be experienced at distances greater than approximately 200 m to 250 m from the site boundary (refer **Figure 8**). Assessment of the cumulative impact (project related plus background sources) of the proposed extraction on 24-hour PM_{10} concentrations indicates that widespread exceedances of the criterion will be experienced. This is however due to the high background concentrations (e.g. 92.3 µg/m^3 in September 2006 [DECCW Macarthur monitoring site]). The report concludes that adoption of dust management practices at the extraction site (including corrective actions and dust suppression procedures) should ensure that all air quality goals are achieved.

Figure 8 Menangle Park West Sand and Soil Extraction Project – Predicted Incremental PM_{10} Concentration Isopleths



Source: *"Menangle Park West Sand and Soil Excavation Project – Air Quality Impact Assessment" – Parsons Brinkerhoff, 2009*

In light of the findings of the PB report, buffer distances for the western precinct extraction area may be determined to be approximately 200 m to 250 m from the Site boundary. Should the Eastern precinct extraction become the subject of further study in the future, more detailed dispersion modelling should be undertaken once the operational characteristics of the site are known in more detail. Heggies carried out dispersion modelling of the potential Eastern Precinct sand extraction in the 2004 Air Review, although this was based on a range of limited, conservative assumptions and was provided for indicative purposes only. As previously noted, extraction of the Eastern Precinct resource is not currently planned.

5.6 Prospective Coal Extraction Activities

The preliminary Local Environmental Study (LES) identified that the project site is underlain by a high quality coal resource which is of State significance. Consideration of the potential impacts of coal mining on the site determined that mining of the site would be likely to result in unacceptable impacts on urban development, primarily in the form of mine subsidence, should urban development occur prior to mining.

The LES therefore concluded that the decision regarding what development should ultimately occur on the site is a matter for the State government in balancing the competing demands of coal mining and urban land supply.

It is understood that at present there are no plans to remove the coal resource within the Project Site and accordingly air quality impacts associated with possible coal extraction activities have not been addressed further.

5.7 Menangle Park Harness Racing Track

A new harness racing track and associated structures at the existing Menangle Park Raceway facility was constructed in 2008. The proposed track is 1,400 m long and replaces the previous 800 metre long track, and is to be utilised for televised harness racing events from the site. The old track remains and is maintained for use as a training facility.

Ancillary structures such as steward's viewing towers around the track and alterations to the existing grandstand to incorporate a judge's room and broadcast facilities have also been constructed.

The potential for odour generation associated with the running of the stables is acknowledged. However it is anticipated that good housekeeping and odour management practices will be able to keep odour impacts to a minimum.

5.8 Glenlee Rezoning

Glenlee lies to the northwest of the study area and is owned by Sada Services Pty Ltd, Camden Soil Mix and the TRN group. The area covered by Glenlee is approximately 106 ha (71 ha useable land). Currently, activities being carried out on the site include a coal washing and reprocessing facility (operated by Sada Services Pty Ltd), a moderately sized transport fleet, Camden Soil Mix (refer **Section 5.1**), and TRN Group Earthmoving (depot only).

The owners / occupiers of the Glenlee site are currently examining rezoning options with a heavy industry / transport focus. The receipt, handling and transhipment of bulk materials is a primary focus for the rezoning although is not considered to be detrimental to the broader base of manufacturing and light industry which currently operates in the area. Specifically, the rezoning seeks to encourage the following activities:

- Intramodal train operations, including servicing and maintenance;
- Bulk materials handling;

- Container handling and storage;
- Manufacturing development;
- Distribution centres;
- Minerals processing;
- Concrete batching; and
- Warehousing and logistics.

In the event that inadequate air quality mitigation / management is undertaken, some of these activities may have adverse impacts on the air quality in the Menangle Park region, especially with regard to dust and particulate matter.

It is recommended that comprehensive air quality impact assessments be carried out as part of any rezoning application / siting of new industry within the area. Such air quality impact assessments should have regard to the cumulative impact of their combined operations.

5.9 Leafs Gully Gas Fired Power Station

On 11 August 2009 the NSW Planning Minister approved the Leafs Gully Power Project, located approximately 4 km south of the Menangle Park Study Area. Although air quality impacts will be experienced within the Menangle Park Study Area, the Environmental Assessment for the Leafs Gully Power Project has indicated that these will be small. Additionally, the environmental conditions imposed on this project are some of the most stringent for any similar project.

It is not envisaged that any significant issues with regard to air quality would be experienced within the Menangle Park Study Area which would warrant Structure Plan changes.

6 PHOTOCHEMISTRY IMPACTS

Ozone is the key atmospheric pollutant of concern during the summer months in Greater Sydney. Further, exceedances of ozone standards tend to occur more frequently in south western Sydney although emissions of ozone precursors such as oxides of nitrogen (NO_X) and volatile organic compounds (VOCs) from elsewhere within the Sydney airshed contribute to these elevated levels.

Air movement plays an important role in the formation and transportation of ozone in the Sydney basin. There are several mechanisms which give rise to elevated levels of ozone. One of the key mechanisms contributing to peak ozone levels in western Sydney is the Sydney sea breeze.

In summer, light drainage flows (movements of cool air down slopes) move across the Sydney region towards the coast and out over the sea. Emissions of VOCs and NOx, produced by morning peak hour traffic and other sources, can be transported offshore in these flows. The photochemical smog precursors remain offshore until the arrival of the sea breeze and, in the presence of sunlight, begin to react. Ozone is produced relatively slowly, over several hours. The sea breeze usually develops in the late morning to early afternoon and, in Sydney, is usually from the north-east. This sea breeze transports the reacting precursors across the Sydney basin arriving in western Sydney mid to late afternoon by which time the ozone concentration in the air has increased to the level where all the precursors have reacted. This "aged" photochemical smog concentration can increase as fresh emissions of NOx and VOCs are mixed into the air as it travels across the basin.

Elevated levels of ozone are associated with increases in mortality, hospital admissions, respiratory symptoms, and decreases in lung function. Studies in Sydney have demonstrated associations between ozone and mortality, and ozone and lung function, especially among susceptible sub-groups, such as asthmatics.

Ozone and NO_2 data have been obtained for the DECCW UWS MacArthur air quality monitoring site for 2005. This data can be seen in **Figure 9** and **Figure 10** respectively.

Figure 9 Ozone Data for UWS MacArthur monitoring site, 2005

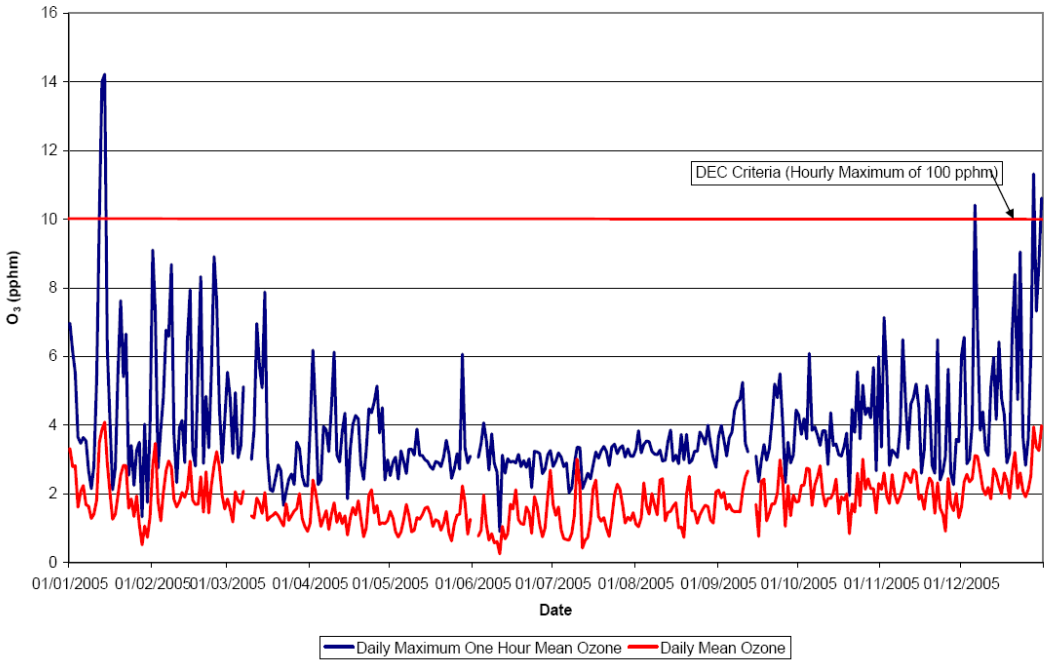
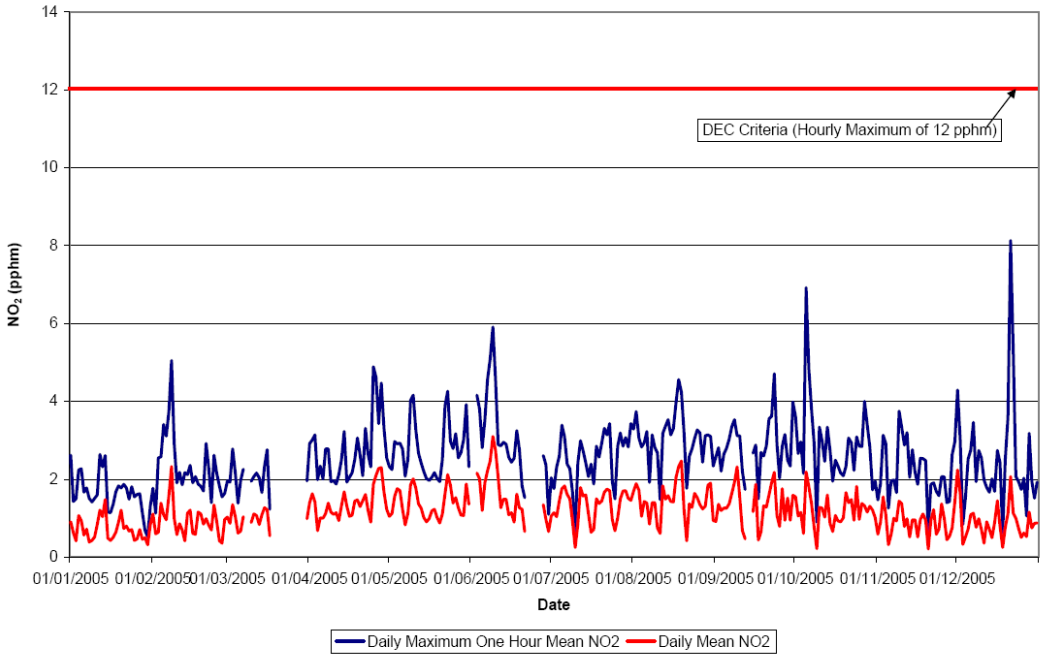


Figure 10 Nitrogen Dioxide Data for UWS MacArthur monitoring site, 2005



The elevated levels of ozone during the summer months can be seen in **Figure 9** in both the daily mean and maximum one hour data. Exceedances of the DECCW criterion can be observed in 2005 in January and December.

NO_2 data, shown in **Figure 10** indicates that concentrations are observed to be below the relevant project air quality goals throughout the year. Elevated concentrations of NO_2 (and parent NO_X) in the summer months is of concern, especially in south western Sydney, as any elevated levels of ozone precursor pollutants may result in a more pronounced ozone episode and resultant health effects.

In view of the foregoing, any developments planned for south western Sydney should take note of the potential for ozone exceedances and take action to reduce the levels of precursor pollutants which they emit. Any increase in traffic associated with a development may increase the levels of NO_X and VOCs within the airshed, which may compound existing adverse air quality, especially in summer months.

7 CONCLUSION

Heggies Pty Ltd (Heggies) has been commissioned by APP Corporation Pty Ltd (APP) on behalf of Landcom and Campbelltown City Council to undertake an air quality review for the Menangle Park area. The assessment has been undertaken following previous reports undertaken by Heggies (formerly Richard Heggie Associates; report number 10-3313-R1, dated 7 June 2004 and report number 10-3313-R2). The 2004 and 2007 Air Reviews sought to assess potential air quality issues associated with the development of land within the study area. The current review brings together this work and also includes information not available during the production of the 2007 Air Review.

Existing and proposed industry both within and surrounding the Menangle Park area have been examined to assess the potential for air quality and odour impacts to be experienced in the study area. The following industries have been considered within this review:

- Camden Soil Mix;
- The Camden Gas Project;
- Menangle Sand and Soil;
- Jacks Gully Waste and Recycling Centre and Alternative Waste Treatment Facility;
- Prospective Sand and Coal Extraction Activities;
- Menangle Park Harness Racing Track;
- Industrial rezoning of the Glenlee Area; and
- Leafs Gully Power Station.

Where impacts have been predicted, suitable buffer distances have been suggested to ameliorate anticipated environmental (air quality) impacts as a result of current/future industrial activities:

A buffer zone of approximately 1 square kilometre is suggested to ameliorate potential odour impacts from the activities of the Camden Soil Mix Composting and Recycling Facility. Any amendment to this buffer area should only be considered following evaluation of the detailed odour assessment undertaken as part of the future Development Application for an enclosed facility, and in any event not prior to the cessation of putrescible waste landfilling activities.

On the provision that gas processing will not be undertaken within the study area and assuming accidental release of gas can be considered to be negligible, a buffer distance of at least 20 m from each well head is suggested. Air quality impacts may be associated with the installation of well heads and laying of pipelines although these impacts will not be permanent.

Atmospheric dispersion modelling of the proposed Menangle Park West Sand and Soil Extraction activities was undertaken by Parsons Brinkerhoff in 2009. This assessment has been examined to establish suitable buffer distances associated with future sand extraction within the study area. It is found that appropriate buffer distances are dependant upon the implementation of suitable dust management practices but may be of the order of 200 m from the site boundary. Suitable separation distances between sand extraction and sensitive receptors are driven principally by the DECCW 24-hour PM_{10} criterion.

The Air Quality Review acknowledges the potential for photochemical smog generation in south west Sydney. Any development planned for south western Sydney should take note of the potential for ozone exceedances and take action to reduce the levels of precursor pollutants which they emit. Any increase in traffic associated with a development may increase the levels of NO_X and VOCs within the airshed, which may compound existing adverse air quality, especially in summer months.

8 REFERENCES

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