REPORT

FINAL DRAFT

MALDON REZONING PROJECT - AIR QUALITY REVIEW

Wollondilly Shire Council

Job No: 3966

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A PEL Company

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Wollondilly Shire Council (WSC) proposes to rezone three parcels of land in Maldon, New South Wales, from rural landscape to employment uses. The purpose of this study is to determine the suitability of the land for employment development with respect to air quality, with particular reference to odour and dust. In order to do this, PAEHolmes have investigated the air quality issues surrounding existing activities on and surrounding the land, as well those operations or activities which have been already proposed in the area. Recommendations have also been made as to which future activities may be considered suitable for the rezoned land in relation to air quality, as well as those which would be considered unsuitable.

2 SITE DESCRIPTION

WSC propose to rezone rural land to employment uses, on the southern side of Picton Road between the Nepean River and Maldon Bridge Road (hereafter referred to collectively as 'the site'). The site consists of nine properties in three locations. There are a number of existing activities operating in the surrounding area, some of which can potentially impact on local air quality, in particular dust and odour. This section lists these operations, and also a number of activities that are proposed for the area.

2.1 Existing Land Use

The site, which is currently owned by Allied Mills, is shown in **Figure 2.1** along with a number of other land owners in the area. The existing land uses include a mix of rural residential and commercial/industrial. The southern and eastern parcels of the site are predominantly rural residential and vacant land. The north-western area of the site consists of a Go Kart track, a road maintenance/civil engineering facility (240 Picton Road), vacant land for agistment, rural residential land, an electrical substation and a commercial vehicle/plant maintenance operation (300 Picton Road).

Figure 2.1 shows the location of surrounding land in the vicinity of the site, and **Table 2.1** presents the surrounding land owners and the main uses.

The main industrial operations are the cement works and flour mill, located adjacent to the site, which both generate dust emissions. Modelling studies for these operations have shown that both facilities are unlikely to cause adverse dust impacts at nearby sensitive receivers, either individually or cumulatively. Another dust source includes the motor cross facility north of the site, which is only in operation twice per year. While this may have short-term impacts at the site, it is not a source of concern for the rezoning study area.

There is an existing chicken hatchery run by Inghams on the southeast corner of Menangle and Picton Roads. An additional hatchery on the northern side of Picton Road opposite Maldon Bridge Road has also recently been approved by Council. These are potentially odorous sources, but relatively minor when managed well as will be discussed in **Section 5.1**. The Picton sewage treatment plant to the west is also an odorous source, but is sufficiently removed as to be unlikely to cause air quality impacts at the rezoning site.

There are also residential localities in the vicinity of the study area which include Wilton Park (adjacent to the south), Wilton (3km southeast), Picton (2km northwest), Tahmoor (3km southwest) and Douglas Park (5km northeast).

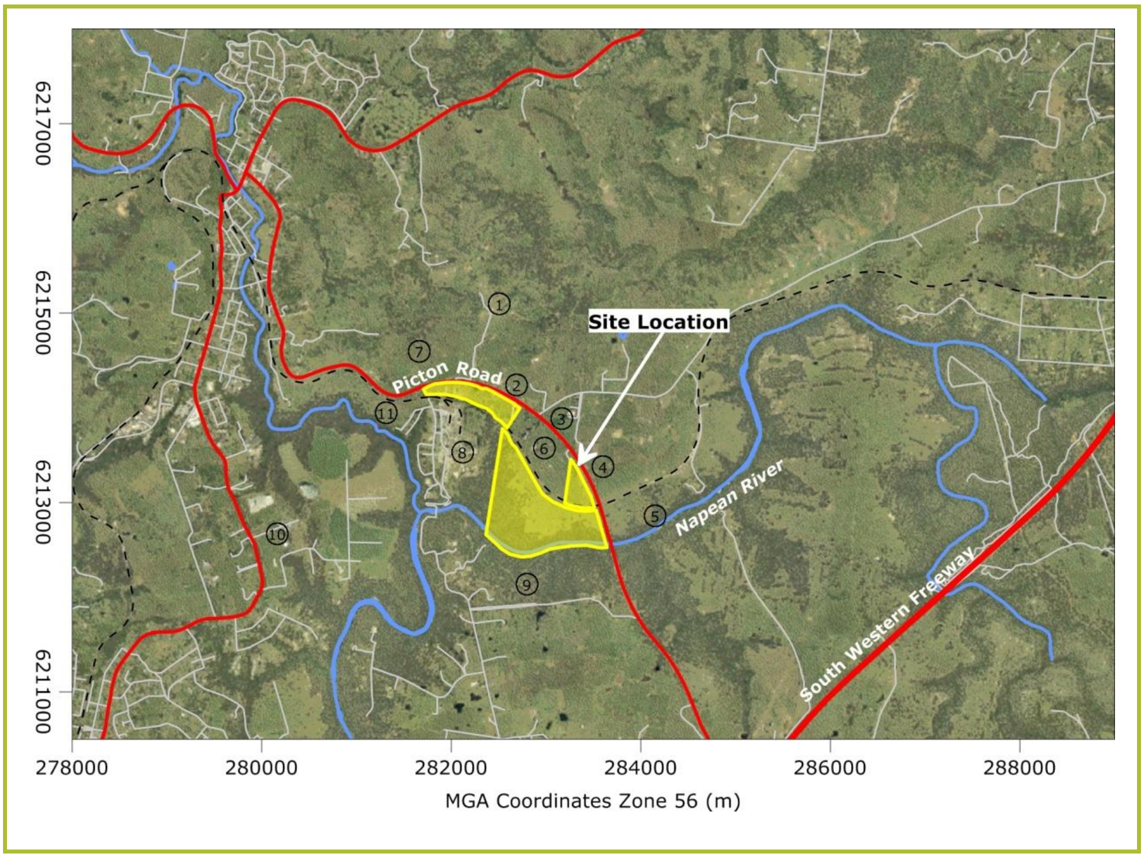

Figure 2.1: Location of the site

Table 2.1: Surrounding Land Uses

Location ID	Main Uses
1	Motor cross event (held twice a year)
2	Rural residential
3	Chicken hatchery (Inghams)
4	Clayshale quarry (not operational)
5	Agricultural
6	Flour mill
7	Proposed chicken hatchery (approved)
8	Cement works
9	Rural residential
10	Picton sewage treatment plant
11	Proposed rail maintenance facility

2.2 Proposed Land Use in Surrounding Area

There are two operations already proposed for the area surrounding the rezoning site which are as follows:

- A development application has been submitted by Boral for a new rail terminal within the cement works on the southern side of Picton Road. It is anticipated that this terminal will receive quarry material which will then be trucked to Sydney; and
- A resource recovery, transfer and waste management facility is proposed at the eastern end of the rezoning site (390-400 Picton Road).

The pollutants of note for these proposed operations are dust (rail terminal) and odour (waste recycling facility). Further discussion of these issues is presented in **Section Error! Reference source not found.**.

3 AIR QUALITY ISSUES

3.1 Introduction

Industry, agriculture, motor vehicles and other activities all emit pollutants that can potentially be harmful to human health or amenity. Pollutants of concern are dust or particulate matter, carbon monoxide (CO), nitrogen oxides (NO_x), sulphur dioxide (SO_2) and ozone (O_3) as well as odour. The following section outlines the air quality criteria relevant for each of these pollutants which are set to protect human health and amenity. A brief summary of the issues surrounding each pollutant is also found in the following sections.

3.2 Air Quality Criteria

The NSW Department of Environment, Climate Change and Water (DECCW), which incorporates the NSW Environment Protection Authority (EPA) has historically adopted air quality goals determined by the World Health Organisation (WHO), the United States Environmental Protection Agency (US EPA) and the National Health and Medical Research Council of Australia (NHMRC).

The National Environment Protection Council of Australia (NEPC) determined a set of air quality goals for adoption at a national level, which are part of the National Environment Protection Measures (NEPM). The NSW DECCW has adopted NEPC goals for carbon monoxide, nitrogen dioxide, sulphur dioxide, ozone and particulate matter.

The NSW DECCW specifies ground-level concentration (glc) criteria for criteria pollutants (**DEC, 2005**), as listed in **Table 3.1**. The basis of these air quality goals and, where relevant, the safety margins which they provide are outlined in the following sections.

Table 3.1: NSW DECCW Air Quality Criteria

Pollutant	Goal	Averaging Period	Agency
Carbon monoxide (CO)	30 mg/m^3	1 hour	WHO
	10 mg/m^3	8 hours	NEPC
Nitrogen dioxide (NO_2)	246 µg/m^3	1 hour	NEPC
	62 µg/m^3	Annual	NEPC
Ozone (O_3)	0.1 ppm	1 hour	NEPC
	0.08 ppm	4 hours	NEPC
Sulfur dioxide (SO_2)	712 µg/m^3	10 minutes	NHMRC
	570 µg/m^3	1 hour	NEPC
	228 µg/m^3	24 hours	NEPC
	60 µg/m^3	Annual	NEPC
Particulate matter (PM_{10})	50 µg/m^3	24 hours	NEPC
	30 µg/m^3	Annual	EPA
Deposited dust	2 g/m^2/month	Annual (maximum increase)	DECCW
	4 g/m^2/month	Annual (maximum total)	DECCW

3.1 Carbon Monoxide

Carbon monoxide (CO) is produced from incomplete combustion of fuels, where carbon is only partially oxidised instead of being fully oxidised to form carbon dioxide.

Carbon monoxide can be harmful to humans because its affinity for haemoglobin is more than 200 times greater than that of oxygen. When it is inhaled it is taken up by the blood and therefore reduces the capacity of the blood to transport oxygen. This process is reversible and reducing the exposure will lead to the establishment of a new equilibrium.

The goals noted by the DECCW provide a significant margin for safety to protect a wide range of people in the community including the very young and elderly. The 1-hour and 8-hour goals are 30 mg/m^3 and 10 mg/m^3 respectively.

3.2 Oxides of Nitrogen

Nitrogen oxides (NO_x) are comprised mainly of nitric oxide (NO, approximately 95 percent at the point of emission) and nitrogen dioxide (NO_2, approximately 5 percent at the point of emission). Nitric oxide is much less harmful to humans than nitrogen dioxide and is not generally considered a pollutant at the concentrations normally found in urban environments.

Concern with nitric oxide is related to its transformation to nitrogen dioxide and its role in the formation of photochemical smog. Nitrogen dioxide has been reported to have an effect on respiratory function, although the evidence concerning effects has been mixed and conflicting.

The DECCW has not set any air quality goals for nitric oxide, however it has set 1-hour and annual average goals for nitrogen dioxide. It has adopted the NEPM 1-hour goal of 246 µg/m^3 and the annual average goal of 62 µg/m^3.

3.3 Ozone

Ozone (O_3) is a powerful oxidant, formed in the atmosphere in the presence of sunlight, NO_x and volatile organic compounds (VOCs). It is a regional pollutant, being a major component of photochemical smog. Photochemical smog is formed by the reaction between NO_x and VOCs in the presence of sunlight. The rate at which photochemical smog forms depends on the ratio of VOC to NO_x. If the ratio favours NO_x, then the process by which ozone or smog is produced is delayed in onset until all the NO_x are consumed. The reaction then proceeds and the photochemical smog is formed.

Because of its highly reactive nature, ozone can combine with virtually all classes of biologically active molecules. Cellular membranes are a target for ozone which has also been reported to have an irritant effect on the respiratory system. The air quality goal for ozone is 10 pphm for a 1-hour maximum.

3.4 Sulfur Dioxide

Sulfur dioxide (SO_2) is an acid gas that can have harmful effects on the respiratory system as well as on vegetation and building materials. The 1-hour average air quality goal for SO_2 is 570 µg/m^3 compared with the 1-hour average goal for NO_2 which is 246 µg/m^3, given that the average SO_2 emissions are only 2% of the NO_2 emission rates, compliance with the NO_2 goal will ensure compliance with the SO_2 goal.

3.5 Particulate Matter

The presence of particulate matter in the atmosphere can have an adverse effect on health and amenity. Larger particles, that is, those greater than 10 µm, generally adhere to the mucus in the nose, mouth, pharynx and larger bronchi and from there are removed by the body. Finer particles can enter bronchial and pulmonary regions of the respiratory tract.

The DECCW has adopted the NEPM 24-hour standard of 50 µg/m^3, and references an annual average of 30 µg/m^3 as a long-term reporting goal.

3.6 Odour

The determination of air quality goals for odour and their use in assessing odour impacts is recognised as a difficult topic in air pollution science. The topic has received considerable attention in recent years and the procedures for assessing odour impacts using dispersion models have been refined considerably. There is still considerable debate in the scientific community about appropriate odour goals.

The DECCW has developed odour goals used to assess the likelihood of nuisance impact arising from the emission of odour.

There are two factors that need to be considered:

- what "level of exposure" to odour is considered acceptable to meet current community standards in NSW; and
- how can dispersion models be used to determine if a source of odour meets the goals which are based on this acceptable level of exposure.

The term "level of exposure" has been used to reflect the fact that odour impacts are determined by several factors the most important of which are:

- the **F**requency of the exposure;
- the **I**ntensity of the odour;
- the **D**uration of the odour episodes; and
- the **O**ffensiveness of the odour (the so-called FIDO factors).

In determining the offensiveness of an odour it needs to be recognised that for most odours the context in which an odour is perceived is also relevant. Some odours, for example the smell of sewage, hydrogen sulfide, butyric acid, landfill gas etc., are likely to be judged offensive regardless of the context in which they occur. Other odours such as the smell of jet fuel may be acceptable at an airport, but not in a house, and diesel exhaust may be acceptable near a busy road, but not in a restaurant.

In summary, whether or not an individual considers an odour to be a nuisance will depend on the FIDO factors outlined above and although it is possible to derive formulae for assessing odour annoyance in a community, the response of any individual to an odour is still unpredictable. Odour goals need to take account of these factors.

The DECCW outlines ground-level concentration (glc) criterion for complex mixtures of odorous air pollutants. They have been refined in recent years to take account of population density in the area. **Table 3.2** lists the odour glc criterion to be exceeded not more than 1% of the time, for different population densities.

The difference between odour goals 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.

The current study area would fall somewhere between a rural and an urban area due to the low-density living nature of the area. As shown in **Table 3.2**, a criterion of 3-4 odour units (ou) would be applicable. For adjacent industrial lots a less stringent criterion should be applicable as these areas would not be expected to be populated for long continuous periods of time.

Table 3.2: Odour assessment criteria

Population of affected community	Criterion for odorous air pollutants (ou)
≤ ~2	7
~10	6
~30	5
~125	4
~500	3
Urban (2000) and/or schools and hospitals	2

4 EXISTING ENVIRONMENT

4.1 Meteorology

This section describes the dispersion meteorology in the area based on local measurements and the influence of local terrain. Parameters such as wind speed and direction will determine the most likely path pollutants may travel, but other parameters such as atmospheric stability will determine how quickly or slowly that pollution will disperse. Under certain conditions and types of emissions, terrain features may also be important in determining the trajectory of emissions. Each of these features are discussed in the following sections.

4.1.1 Wind Speed and Direction

The closest meteorological station to the site is the Picton Sewage Treatment Plant (located approximately 2 km away) and the most recent data available from this site are from 2002. These meteorological data demonstrate strong correlation with the 2000/2001 meteorological data presented in the Allied Mills Air Quality Assessment (**HAS, 2004**). Meteorological data collected for 2002 have been analysed and annual and seasonal wind roses for the area are presented in **Figure 4.1**.

On an annual basis winds for the area are varied with the strongest winds predominantly from the northwest quadrant. There are noticeably fewer winds from the northern quadrant, a pattern which is seen in all seasons. The stronger winds from the west-northwest and northwest, occur mostly during winter and spring, and during winter there are very few winds from the eastern sector. In summer, winds are predominantly from the southern quadrant, and from the southwest quadrant in autumn.

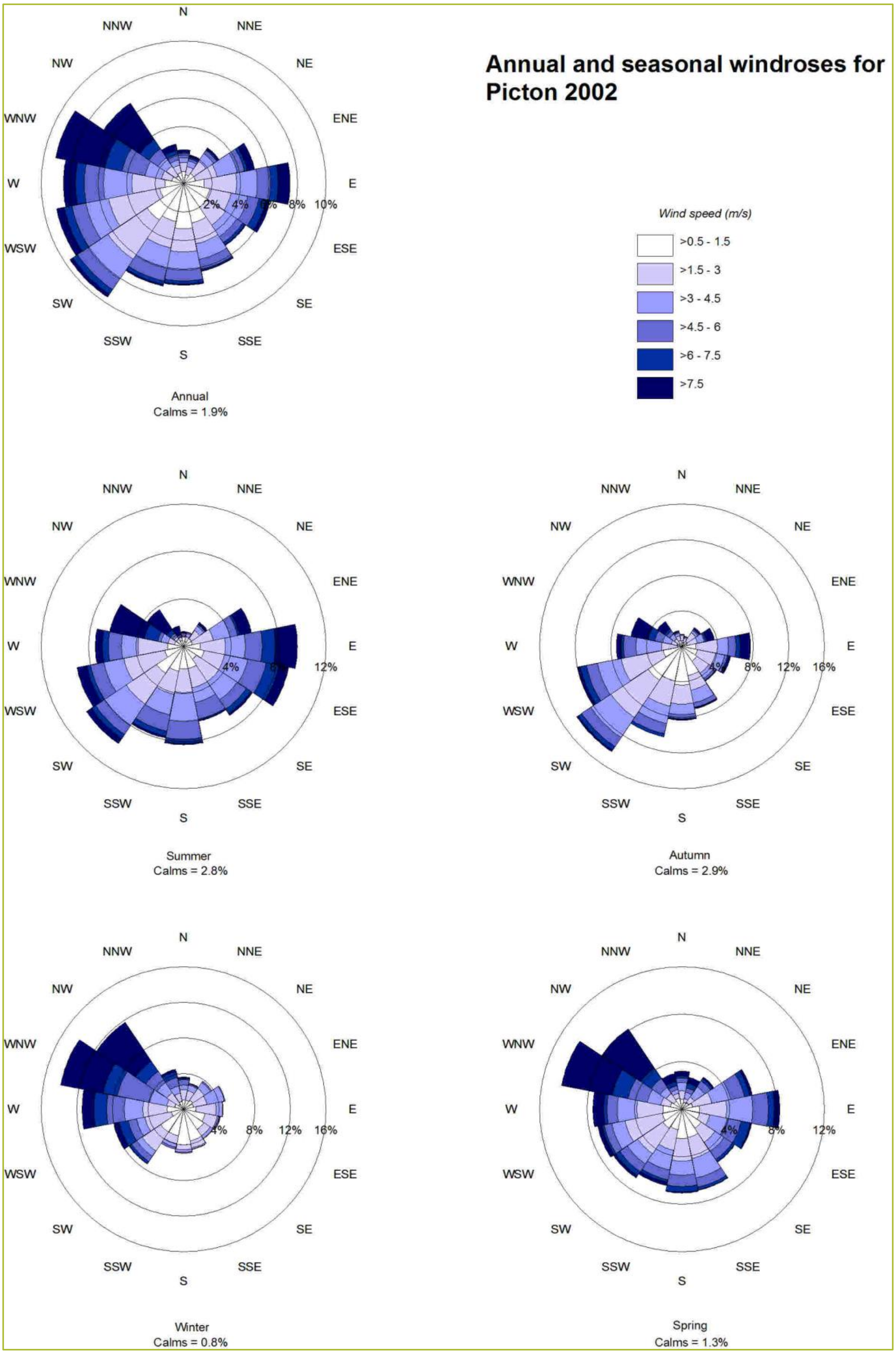

Figure 4.1: Wind Roses for Picton 2002

4.1.2 Atmospheric Stability

In order to better understand the dispersion characteristics in the area, it is useful to investigate atmospheric stability class[a] as well as wind speed and direction. **Table 4.1** presents the frequency of occurrence of stability classes at the site for 2001 and 2002, as derived from the Picton meteorological file. The most common stability occurrences were calculated to be D class stabilities (42% in 2001 and 34% in 2002) suggesting that emissions will disperse quickly for a large proportion of the time.

Table 4.1: Frequency of Occurrence of Stability Class

Stability Class	Frequency of Occurrence (%)	
	2001	**2002**
A	2.2	2.0
B	7.6	9.2
C	8.8	10.0
D	42.2	34.4
E	16.0	15.4
F	23.2	29.0

4.1.3 Local terrain and Katabatic Drift

The topography in the Maldon area is undulating with higher ground to the north of the Nepean River. A three-dimensional map of the local terrain is shown in **Figure 4.2**.

Katabatic drift, also referred to as drainage flow, is often invoked as the conditions under which maximum odour impacts from ground-based sources are likely to occur. It is the movement of cold air down a slope, generally under calm conditions. Under these conditions, dispersion will be slow and impacts can be greatest. Drainage flow conditions occur in the early morning or evening, when the atmosphere is at its most stable, and are more frequent in autumn and winter when the thermal mixing of the atmosphere is less.

In the context of the proposed rezoning, if drainage flow conditions occur they are likely to be in a southerly direction down the slopes north of the river, as seen in **Figure 4.2**. This would mean that under drainage flow conditions ground-based emissions would be more likely to move in a southerly direction with the potential to impact receptors to the south of the river towards Wilton Park. It should be noted however, that these conditions are likely to occur for a very low percentage of the time. This can be seen in the windroses in **Figure 4.1**, where winds from the north are relatively uncommon.

It is important to note that it is ground-based sources that are particularly sensitive to these dispersion conditions. Such sources may include odorous leachate ponds and other water bodies, as well as large area sources like composting pads or windrows. Emissions from tall stacks, such as those at the cement works and flour mill, will be less affected by these dispersion conditions.

[a] *Stability class is used to categorise the rate at which a pollutant will disperse. In the Pasquill-Gifford stability class assignment scheme there are six stability classes A through to F. Class A relates to unstable conditions such as might be found on a sunny day with light winds. In such conditions a pollutant plume will spread rapidly. Class F relates to stable conditions, such as occur when the sky is clear, the winds are light and an inversion is present. Plume spreading is slow in these circumstances. The intermediate classes B, C, D and E relate to intermediate dispersion conditions.*

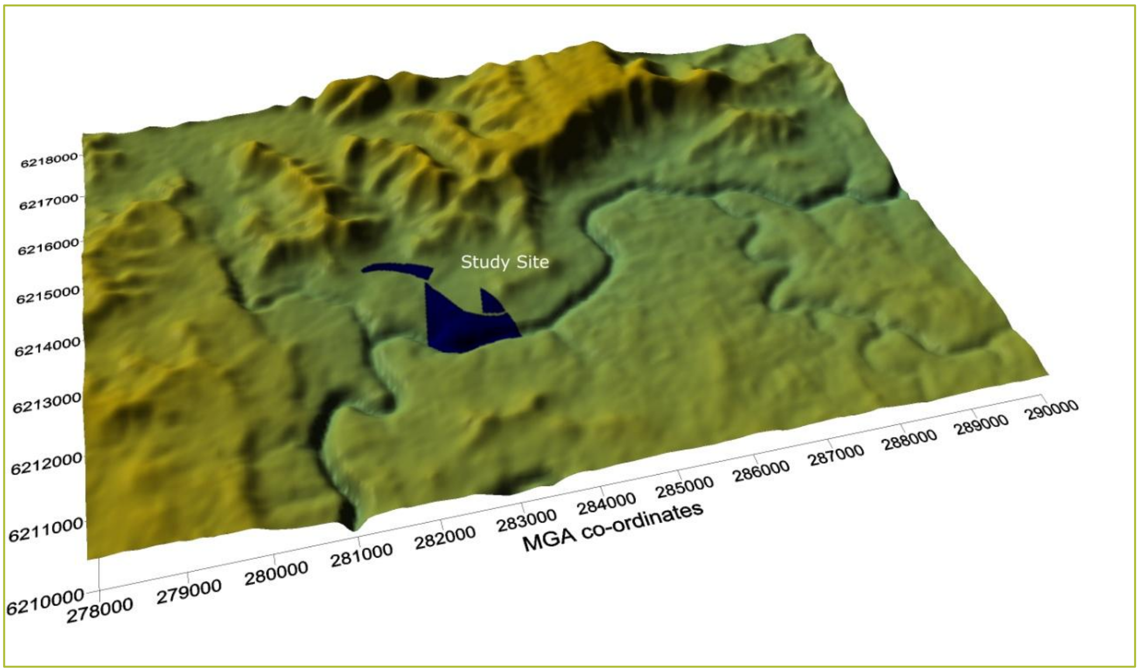

Figure 4.2: Local terrain features

4.2 Existing Air Quality

4.2.1 Introduction

Air quality monitoring stations have been established by the DECCW over the years to measure concentrations and trends of specific air pollutants in the greater Sydney area as well as in regional locations. While some pollutants can cause impacts directly and in the immediate vicinity of the emission point, others such as ozone and photochemical smog are categorised as secondary pollutants and have impacts on a more regional scale. Secondary pollutants, as the name suggests, are not emitted directly from a source, but are the result of chemical reactions in the atmosphere with other pollutants that are emitted directly. Long range transport of these pollutants, such as NO_2 and SO_2, may cause effects far removed from the point of emission. This is particularly relevant in Sydney and the south west of Sydney. That is why pollutants such as NO_2, SO_2 and ozone are measured at most of the DECCW air quality monitoring sites.

4.2.2 Monitoring data

The most representative data from the DECCW air quality monitoring network is from the Bargo monitoring station located approximately 12 km south of the site. The pollutants measured at Bargo include O_3, NO_2 and SO_2. The annual and maximum 1-hour averages from 1996 to 2010 for the above pollutants are shown in **Table 4.2**.

Table 4.2: DECCW Air Quality Monitoring Data for Bargo, 1996 to 2010

Year	O_3 (ppm) Goal[1] = 0.1 ppm		NO_2 (µg/m^3) Goal[1] = 246 µg/m^3		SO_2 (µg/m^3) Goal[1] = 570 µg/m^3	
	Average	Max	Average	Max	Average	Max
1996	0.018	0.10	-	-	-	-
1997	0.019	0.12	14.4	123	2.9	34.3
1998	0.013	0.09	-	-	2.9	25.7
1999	0.016	0.12	14.4	103	2.9	34.3
2000	0.018	0.13	14.4	133	2.9	68.6
2001	0.021	0.16	14.4	160	2.9	28.6
2002	0.020	0.11	16.4	123	2.9	68.6
2003	0.021	0.11	12.3	103	0.0	28.6
2004	0.022	0.09	12.3	121	0.0	31.5
2005	0.021	0.13	14.4	94.3	0.0	25.7
2006	0.022	0.12	12.3	117	0.0	25.7
2007	0.021	0.12	12.3	107	0.0	31.5
2008	0.019	0.09	12.3	80.0	-	-
2009	0.023	0.12	10.3	98.4	0.0	31.5
2010	0.021	0.06	10.3	75.9	0.0	14.3

[1] 1-hour averaging period

The NO_2 and SO_2 concentrations in the Bargo area are within the DECCW 1-hour goals. This is not unexpected given that these pollutants are usually related to the presence of power stations (in the case of SO_2), or high traffic areas (in the case of NO_2).

However, the O_3 DECCW 1-hour goal has been exceeded at least once in most years at the Bargo monitoring station. These exceedances generally occur in the summer months and are usually associated with an elevated level of reactive compounds produced from bushfire smoke, as well as high levels of sunlight. As discussed in **Section 0**, ozone is a regional pollutant formed in the atmosphere as opposed to a direct emission from industry and is a major component of photochemical smog. While there are likely to be some exceedances in the study area, this is also true of Sydney and the greater metropolitan area and would not preclude development of the site.

5 LOCAL AIR QUALITY ISSUES

5.1 Existing activities

The existing activities in the Maldon area with air emissions include the Boral cement works (previously Blue Circle Southern Cement), the Allied Mills flour mill, chicken hatcheries and sewage treatment plant, as well as other minor operations discussed in **Section 2.1**.

An air quality assessment was undertaken for the construction of the flour mill in 2004 (**HAS, 2004**) which investigated particulate emissions. The results of the assessment showed that the maximum predicted annual average concentration of PM_{10} due to the cumulative impact of the flour mill and the cement works was approximately 0.5 µg/m^3 in the residential areas of Maldon and less than 2.5 µg/m^3 at the closest isolated residences. The maximum predicted 24-hour PM_{10} concentration was estimated to be 11.7 µg/m^3 at the closest residence, well below the DECCW criteria of 50 µg/m^3.

The assessment did not take into account potential fugitive emissions from the cement works, and therefore localised levels of particulate matter may be higher around the perimeter of the cement works. Other potential contaminants such as products of combustion (SO_2, NO_x and CO) were also not assessed, but will be minor compared to dust emissions.

Other potential sources of odorous emissions include those from the existing and approved chicken hatcheries and the Picton sewage treatment plant. Well managed chicken hatcheries are relatively minor sources of odour. The main odour sources associated with these operations are egg waste (shells) and waste water used in the washdown process. Egg waste is often kept in a cool room, to reduce odour, and then processed through a cyclone to extract the water which can be either disposed of or used for irrigation. In comparison to broiler farms or other intensive livestock industries such as feedlots and piggeries, well managed hatcheries are generally not significant sources of odour.

The main source of nitrogen dioxide (which will contribute to photochemical smog) in the area will be motor vehicle emissions from both local residential traffic and industrial traffic due to bulk deliveries and off-site transport for businesses such as the cement works and Allied Mills. In relation to large urbanised centres such as Sydney, these will not be significant contributions and will be unlikely to result in adverse air quality impacts. Emissions from passing and idling locomotives will also be minor.

A source of PM_{10} in rural areas such as this may also be from solid wood heaters. This can cause issues in locations within a valley where cool winter air can become trapped overnight. This is unlikely to be the case for the project area, due to the nature of the local terrain. As discussed in **Section 4.1.2**, the direction of air flow under these conditions is likely to move southwards rather than remain trapped for significant periods of time.

5.2 Sensitive receptors

Sensitive receptors in terms of air quality may include those locations where people live and go to school as well as such premises as child care centres, hospitals and nursing homes. As discussed in **Section 2.1**, the surrounding land use is predominantly rural residential and industrial. Residential areas, schools and child care centres are located in the surrounding townships such as Picton and Tahmoor. However, these locations are not adversely affected by existing operations and very unlikely to be impacted by those activities recommended in **Section Error! Reference source not found.** of this report.

5.3 Future activities

A resource recovery, transfer and waste management facility is currently proposed for the eastern end of the site at 390-400 Picton Road. This will accommodate non-putrescible, non-hazardous waste and will be processed on site within a building. The nature of the waste will mean that there are unlikely to be any adverse odour impacts and dust will be managed within the building.

The current estimated population of the Wollondilly Shire is 43,976 and is expected to grow by an average of 1.46% per year. This rising population will almost certainly result in an increase in traffic. As discussed in the previous section, traffic increases will also result from the increased need for heavy vehicles used in existing and future industrial operations. The increasing prevalence of heavy vehicles has the potential to result in increases in dust emissions from on-site roadways and particularly from unsealed roadways. All on-site roadways should be sealed to keep these emissions to a minimum. In some cases, depending on the industry, it may be necessary to keep these sealed roads swept. Good management practices will result in emissions from this type of activity almost negligible.

In terms of general traffic along Picton Road, the volumes of traffic are unlikely to be such that would cause adverse impacts on any of the allocated lots on the site. The most effective way to reduce air quality impacts from motor vehicle emissions along roadways is to achieve the maximum setback distance possible from the edge of the road to the building. In general, a setback distance of at least 10 m is recommended for heavily trafficked roads to protect workers from vehicle emissions, so this would be more than sufficient at the study site.

6 POTENTIAL FUTURE USES

The updated Local Environment Plan (LEP) has been released (**WSC, 2011**) and replaces the LEP (1991). The document separates industrial zones into light industrial (IN2) and heavy industrial (IN3) and includes a list of permitted and prohibited activities for each. Of those activities permitted for both IN2 and IN3, the most complementary facilities and services would include warehouse and distribution centres, depots, freight transport facilities and storage establishments. These industries generally emit low levels of air pollutants, and potential air emissions characteristic of these industries consist of dust from traffic movement which would be almost negligible in most cases.

Take-away food facilities and smaller shops industries may also be complementary, providing services for workers and residents in the area. However, some take-away facilities which cook hot food on the premises (such as BBQ chickens and other fast-food) can emit odorous air and cause nuisance impacts in the immediate area.

It is noted that industries listed as being permitted with consent in an IN3 zone include hazardous and offensive industries and storage establishments (**WSC, 2011**). However, given the nature of the flour mill products and the fact that they are for human consumption, it is recommended that these types of industries not be set up on this rezoned site. Air emissions from such operations may contaminate product from the flour mill.

The converse will also be true if permission were to be granted to establish a hospital at the site (listed in the LEP as permitted with consent). In other words, emissions from the flour mill, cement works and other industries which occupy this area in the future, may not be compatible with patients at an adjacent hospital. This is not to say that those emissions are at dangerous levels, as it has been shown in multiple studies that these operations comply with the relevant air quality criteria. However, a hospital will comprise those whose health may already be compromised.

Industries or operations which would be most unsuited to this area would be those that emit heavy metals and chemicals which may contaminate food products. These would include, but not be limited to, such things as crematoria, vehicle body repair workshops with spray painting and chemical producers. These types of industries would each require individual air quality assessments.

Those industries which may emit bacteria and significant odours, would also not be suitable for this rezoned site. These may include abattoirs and intensive livestock production operations such as chicken farms, piggeries, feedlots and stock and sale yards. It is also recommended that major dust producing operations such as open-cut mining would not be suitable for this area, as they may lead to cumulative dust impacts when combined with the cement works and flour mill. These emissions are low and currently have no adverse impact on local air quality.

Suitable operations for the rezoned site would be for those which are vertically integrated with the flour mill. These may include bakeries or biscuit makers as well as warehousing, logistics and distribution operations providing complementary services at both ends of the flour milling process.

In the case of bakeries and biscuit makers, these industries can be odorous and result in impacts in the immediate vicinity, depending on the scale of the operation. In some cases where the proposal is for a large operation, it may be necessary to carry out an independent odour study, but this can be determined on a case by case basis.

In relation to warehousing and logistics operations, the only issue with regard to air quality may be dust from increased truck movements. As mentioned previously, these emissions will not be so significant as to influence cumulative impacts, particularly if all access and on site roadways are sealed. Dust may also be a short-term issue during construction of buildings and site development, but these will be short lived and very unlikely to cause off-site impacts that exceed the relevant air quality criteria.

7 CONCLUSIONS

This report has provided an overview of the issues relating to air quality in the Maldon area, including discussion of the existing air quality, emissions from existing and proposed operations in the area and the relevant air quality criteria for various pollutants.

The local meteorology and terrain effects have also been discussed in relation to the transport of emissions from sources to receptors. Winds are predominantly from the southern sector which will mean transport of emissions away from the closest residences in Wilton Park.

Suggestions regarding potential future industries for the rezoned site have been provided, as well as those which would not be suitable for the area.

Odour is not currently a significant issue in the area, with the main source being the Picton sewage treatment plant which is removed from the site. The existing and proposed chicken hatcheries are unlikely to contribute to off-site odour levels as they are relatively low sources of odour when well managed.

While there are currently no dust impacts at sensitive receptors, there is potential for cumulative impacts if significantly dusty operations are permitted on the site. Reducing cumulative dust impacts will also include good management practices in any of the industries permitted, by making sure all on-site roads are sealed.

If these strategies are adopted, it is not anticipated that the rezoning will exacerbate existing issues or create future problems from cumulative effects. Good management practices include regular maintenance and good engineering to ensure that any air emissions are effectively dispersed.

8 RECOMMENDATIONS

Rezoning of the study area to allow employment uses is supported from an air quality perspective, provided that the following development control measures are implemented;

- sealing of internal roadways to reduce dust emissions particularly from heavy vehicle traffic;
- a minimum setback distance of 10 m from Picton Road for all buildings to eliminate adverse impacts from vehicle emissions;
- submission of a separate air quality impact assessments for those uses which are likely to emit odour or hazardous chemicals or heavy metals, such as vehicle body repair workshops and crematoria or larger scale food producers; and
- detailed management practices for proposed employment uses to ensure the reduction and control of dust and odour emissions.

9 REFERENCES

EPA (1998)
"Action for Air", the NSW Government's 25-Year Air Quality Management Plan

HAS (2004)
"Air Quality Assessment – Allied Mills, Maldon", prepared by Holmes Air Sciences, December 2004.

NSW DEC (2005)
"Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", August 2005.

NSW DEC (2006)
"Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW". November, 2006.

NSW DECC (2007)
"The Local Government Air Quality Toolkit". June, 2007.

WSC (2011)
Local Environmental Plan for the Wollondilly Shire Council, February 2011.