

MT GILEAD REZONING

AIR QUALITY REVIEW

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PREPARED FOR

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GLOSSARY OF TERMS

Air Pollutant – Any substance in air that could, in high enough concentration, harm man, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of airborne matter capable of being airborne. **L_{A1}** – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

Air Pollution – The presence of contaminants or pollutant substances in the air that interfere with human health or welfare, or produce other harmful environmental effects.

Air Quality Standards – The level of pollutants prescribed by regulations that are not being exceeded during a given time in a defined area.

Air Toxics – Any air pollutant for which a national ambient air quality standard (NAAQS) does not exist (i.e. excluding ozone, carbon monoxide, PM-10, sulphur dioxide, nitrogen oxide) that may reasonably be anticipated to cause cancer; respiratory, cardiovascular, or developmental effects; reproductive dysfunctions, neurological disorders, heritable gene mutations, or other serious or irreversible chronic or acute health effects in humans.

Airborne Particulates – Total suspended particulate matter found in the atmosphere as solid particles or liquid droplets. Chemical composition of particulates varies widely, depending on location and time of year. Sources of airborne particulates include dust, emissions from industrial processes, combustion products from the burning of wood and coal, combustion products associated with motor vehicle or non-road engine exhausts, and reactions to gases in the atmosphere.

Area Source – Any source of air pollution that is released over a relatively small area, but which cannot be classified as a point source. Such sources may include vehicles and other small engines, small businesses and household activities, or biogenic sources, such as a forest that releases hydrocarbons, may be referred to as nonpoint source.

Carbon Monoxide (CO) – A colourless, odourless, poisonous gas, produced by incomplete burning of carbon-based fuels, including gasoline, oil and wood. Carbon monoxide is also produced from incomplete combustion of many natural and synthetic products. For instance, cigarette smoke contains carbon monoxide. When carbon monoxide gets into the body, the carbon monoxide combines with chemicals in the blood and prevents the blood from bringing oxygen to cells, tissues and organs. The body's parts need oxygen for energy, so high-level exposures to carbon monoxide can cause serious health effects, with death possible from massive exposures.

Concentration – The relative amount of a substance mixed with another substance. Examples are 5 ppm of carbon monoxide in air and 1 mg/l of iron in water.

Emission – Release of pollutants into the air from a source. We say sources emit pollutants.

Emission Factor – The relationship between the amount of pollution produced and the amount of raw material processed. For example, an emission factor for a blast furnace making iron would be the number of pounds of particulates per ton of raw materials.

Emission Inventory – A listing, by source, of the amount of air pollutants discharged into the atmosphere of a community; used to establish emission standards.

Flow Rate – The rate, expressed in gallons -or litres-per-hour, at which a fluid escapes from a hole or fissure in a tank. Such measurements are also made of liquid waste, effluent, and surface water movement.

Fugitive Emissions – Emissions not caught by a capture system.

Hydrocarbons (HC) – Chemical compounds that consist entirely of carbon and hydrogen.

Hydrogen Sulphide (H₂S) – Gas emitted during organic decomposition. Also, a by-product of oil refining and burning. Smells like rotten eggs and, in heavy concentration, can kill or cause illness.

Inhalable Particles – All dust capable of entering the human respiratory tract.

Nitric Oxide (NO) – A gas formed by combustion under high temperature and high pressure in an internal combustion engine. NO is converted by sunlight and photochemical processes in ambient air to nitrogen oxide. NO is a precursor of ground-level ozone pollution, or smog.

Nitrogen Dioxide (NO₂) – The result of nitric oxide combining with oxygen in the atmosphere; major component of photochemical smog.

Nitrogen Oxides (NO_x) – A criteria air pollutant. Nitrogen oxides are produced from burning fuels, including gasoline and coal. Nitrogen oxides are smog formers, which react with volatile organic compounds to form smog. Nitrogen oxides are also major components of acid rain.

Mobile Sources – Moving objects that release pollution; mobile sources include cars, trucks, buses, planes, trains, motorcycles and gasoline-powered lawn mowers.

Particulates; Particulate Matter (PM-10) – A criteria air pollutant. Particulate matter includes dust, soot and other tiny bits of solid materials that are released into and move around in the air. Particulates are produced by many sources, including burning of diesel fuels by trucks and buses, incineration of garbage, mixing and application of fertilizers and pesticides, road construction, industrial processes such as steel making, mining operations, agricultural burning (field and slash burning), and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems.

Parts Per Billion (ppb)/Parts Per Million (ppm) – Units commonly used to express contamination ratios, as in establishing the maximum permissible amount of a contaminant in water, land, or air.

PM10/PM2.5 – PM10 is measure of particles in the atmosphere with a diameter of less than 10 or equal to a nominal 10 micrometers. PM2.5 is a measure of smaller particles in the air.

Point Source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Scrubber – An air pollution device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Source – Any place or object from which pollutants are released.

Stack – A chimney, smokestack, or vertical pipe that discharges used air.

Stationary Source – A place or object from which pollutants are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, houses etc.

Temperature Inversion – One of the weather conditions that are often associated with serious smog episodes in some portions of the country. In a temperature inversion, air does not rise because it is trapped near the ground by a layer of warmer air above it. Pollutants, especially smog and smog-forming chemicals, including volatile organic compounds, are trapped close to the ground. As people continue driving and sources other than motor vehicles continue to release smog-forming pollutants into the air, the smog level keeps getting worse.

1 INTRODUCTION

It is proposed to rezone land at Mount Gilead for residential development. The land is on Appin Road south of Rosemeadow.

The MDP dwelling numbers listed is as 1500 dwellings. The planning studies are investigating a range of 1400-1700 dwellings, with any number above the 1500 MDP number to be justified on the basis of capacity of the site and infrastructure. This study has assumed the maximum number of 1700 dwellings as a conservative base case for the generation of noise/ air quality/ traffic/economic and social impact.

A qualitative air quality impact review has been undertaken for this project to assess the viability of rezoning the Mount Gilead land to residential. The aspects covered are:

- Air quality impact of surrounding existing and proposed industrial facilities on the proposed housing lots; and
- Air quality impact of future traffic on the proposed housing lots.

2 SITE DESCRIPTION

The Mount Gilead site comprises a total area of 210 hectares. The boundary of the site is shown on **Figure 2-1**. There are two land owners being, Mt Gilead Pty Ltd, and S & A Dzwonnik. The ownership sites are shown on **Figure 2-2**.

The site is bordered by Appin Road to the east, and access to all residences will be through Appin Road. A 40m buffer zone has been set on the eastern side of Appin Road for a buffer which would allow for the future widening of Appin Road. Assuming the future widening of Appin Road the minimum distance between Appin Road to the nearest future residences would be at least 30metres.

Figure 2-1 Mount Gilead Site Boundary

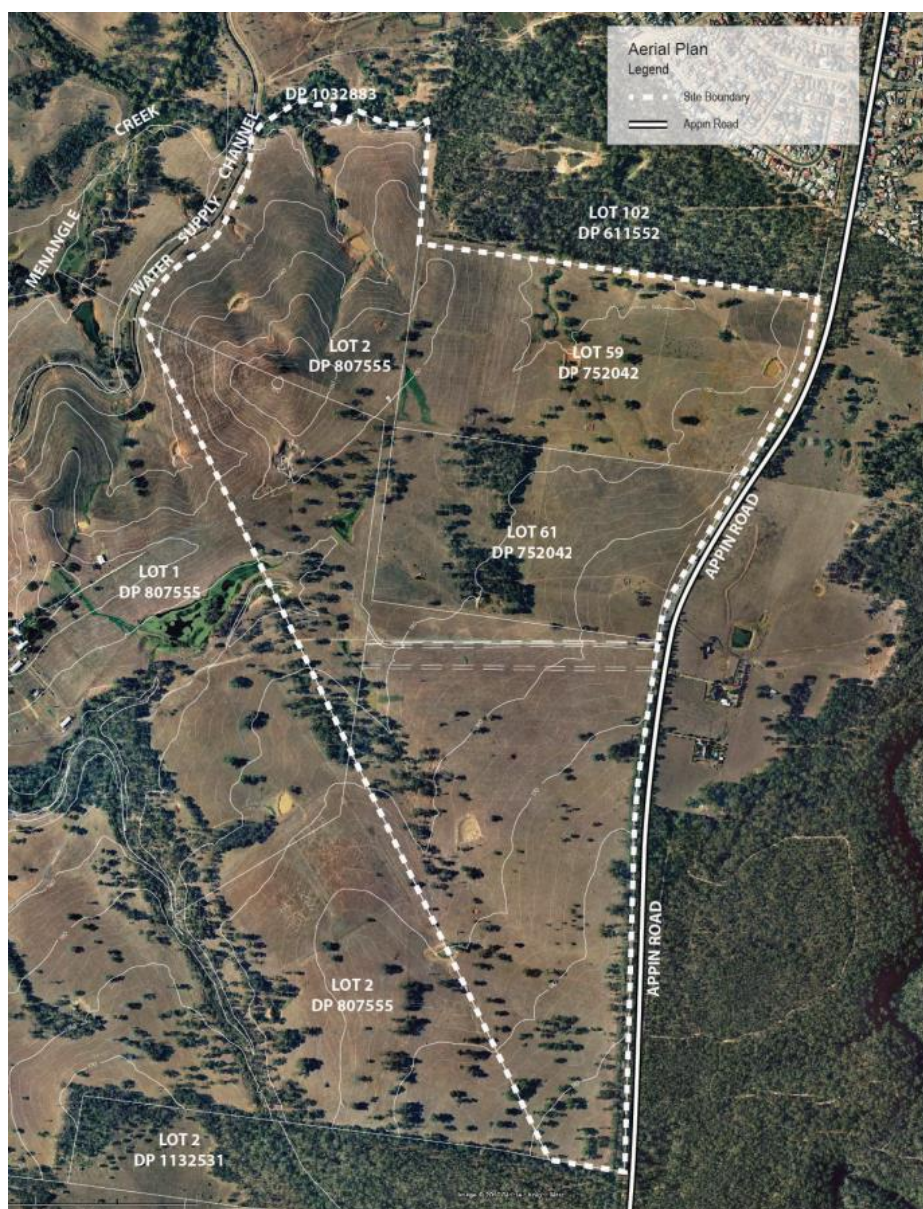
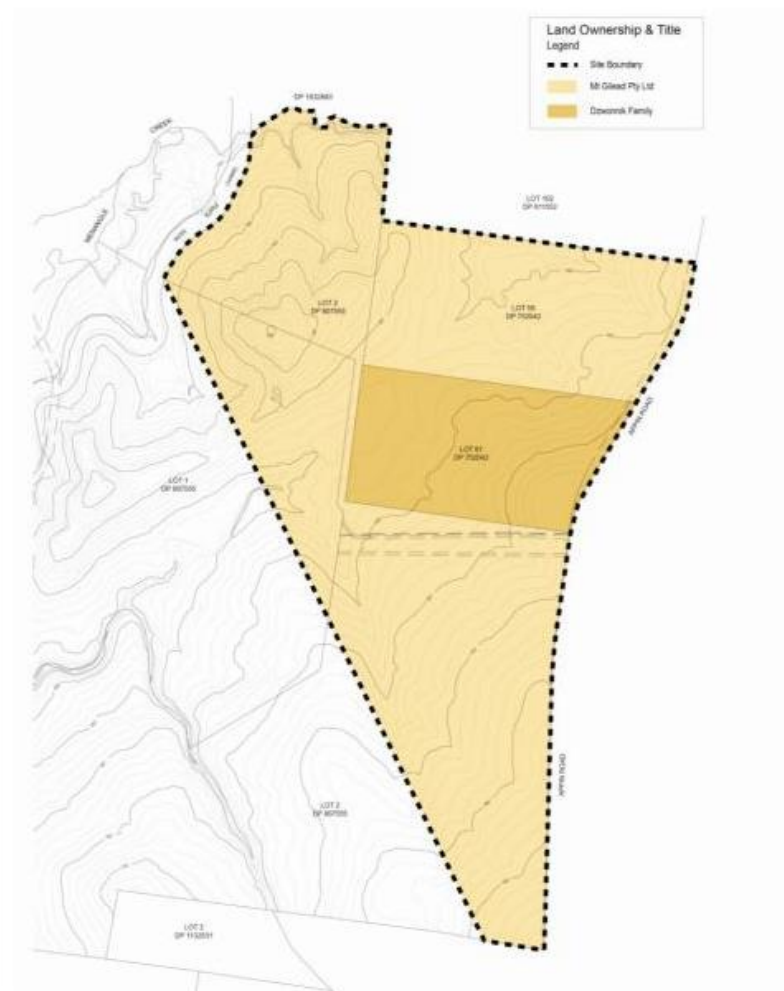


Figure 2-2 Mount Gilead Land Ownership



Source: Cox Richardson

2.1 Projected Traffic Flows

Traffic generated by the proposed development is presented in the Parsons Brinckerhoff report titled *Mt Gilead Rezoning – Traffic, Transport and Access Study*, dated 20 June 2013.

The arterial road that will serve the development is Appin Road. All traffic entering and exiting the development would approach from the north or south on Appin Road. The current AADT of Appin Road is 21,500 vehicles.

The traffic generated by the development will depend on the final number of dwellings built. At it's maximum this would be 1700 dwellings, resulting in a traffic flow on Appin Road north of the site of:

- 1,290 vehicles per hour during peak hour without the development; and
- 2,247 vehicles per hour with the development.

3 AIR QUALITY OBJECTIVES

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. This section identifies the relevant air quality criteria that are applicable to the proposed activity. The air quality goals that are relevant to this study are sourced from the NSW EPA document "*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*" (NSW DEC, 2005). **Table 3-1** summaries NSW air quality objectives.

Table 3-1 Summary of NSW Air Quality Objectives

Pollutant	Standard ¹	Averaging Time
Particulate Matter < 10 (PM10)	30 µg/m ³ 50 µg/m ³	annual mean 24 hour maximum
Carbon Monoxide	87ppm or 108 mg/m ³ 25ppm or 31 mg/m ³ 9ppm or 11 mg/m ³	15 minute maximum 1 hour maximum 8 hour maximum
Nitrogen dioxide	0.12 ppm or 246 µg/m ³ 0.03 ppm or 62 µg/m ³	1 hour maximum annual mean
Sulphur dioxide	0.20 ppm or 570 µg/m ³ 0.08ppm or 228 µg/m ³ 0.02 ppm or 60 µg/m ³	1 hour maximum 1 day maximum annual mean
Ozone	10 pphm 0.10 ppm or 214 µg/m ³ 0.08ppm or 171 µg/m ³	1 hour 4 hours

Note: 1. All concentration units have been converted at 0 degrees Celsius.

3.1 Particulates

The presence of particulate matter in the atmosphere can have an adverse effect on health and amenity. Particles lodged in the lungs can affect the respiratory system, especially if they contain adsorbed acid gases such as sulphur dioxide.

The health effects of particles are largely related to the extent to which they can penetrate the respiratory tract. Larger particles, that is those greater than 10 µm in aerodynamic diameter, generally adhere to the mucus in the nose, mouth, pharynx and larger bronchi and from there are removed by either swallowing or expectorating. The nature of particles in the air has an inverse relationship between the size of the particle and its diameter. So that as a particle diameter decreases, the number of similarly sized particles increases. This relationship is a factor resulting in increased scientific concern about the effects of fine particles. Fine particles are of concern for two principal reasons, since they have the ability to penetrate deeper into the lungs and the increased number of similarly sized particles that can reach the deep regions of the lung, like the alveolar sacs. The presence of particles can inflame tissue in this region and behind the alveolar sacs, since it is quite sensitive to foreign material. The human body does have defences against deposition of particles in this region but due to the increased number of particles this mechanism may be unable to cope, resulting in inflammation of the alveolar sacs. The health effects of particulate matter are further complicated by the chemical nature of the particles and by the possibility of synergistic effects with other air pollutants such as sulphur dioxide.

3.2 Carbon Monoxide

When CO is inhaled it enters the blood stream and may disrupt the supply of essential O₂ to the body's tissues. The health effects of CO result principally from its ability to displace O₂ from haemoglobin, forming carboxyhaemoglobin (COHb). The normal function of haemoglobin is to transport O₂ from the lungs to all body tissues. The consequent reduced O₂ availability can give rise to a wide range of health effects (depending on how much the supply of oxygen to the body is impeded). These health effects are usually related to blood levels of COHb (expressed as a percentage), which can in turn be related to exposure as a function of exposure time as well as concentration.

However, there is evidence that there is a risk for individuals with cardiovascular disease when the carboxyhaemoglobin concentration reaches 4% and WHO recommends that ambient concentrations be kept to values that would protect individuals from exceeding the 4% level.

The 15 minute goal of 87ppm, the 1 hour goal of 25ppm and 8 hour goal of 9ppm adopted by the EPA reflects the "no-observed effects" level with a significant margin of safety.

3.3 Nitrogen Oxides

The most important nitrogen compounds present in urban locations are nitric oxide (NO) and nitrogen dioxide (NO₂), referred to collectively as NO_x.

Nitric oxide is much less harmful to humans than is nitrogen dioxide and is not generally considered as a pollutant with health impacts at the concentration levels normally found in the urban environment. Concern with nitric oxide relates to its transformation to nitrogen dioxide and its role in the formation of photochemical smog.

A variety of respiratory system effects have been reported to be associated with exposure to NO₂. Young children and asthmatics are the groups at greatest risk from ambient NO₂ exposure. Chronic bronchitis and individuals with emphysema or other chronic respiratory diseases may also be sensitive to NO₂ exposure.

There are no air quality goals for nitric oxide. The EPA standard for NO₂ is 0.12 ppm or 246 µg/m³ and 0.03ppm or 62 µg/m³ (annual).

3.4 Sulfur dioxide

Sulfur dioxide is the chemical compound with the formula SO₂. It is a toxic gas with a pungent, irritating smell that is released in various industrial processes. Since coal and petroleum often contain sulfur compounds, their combustion generates sulfur dioxide unless the sulfur compounds are removed before burning the fuel.

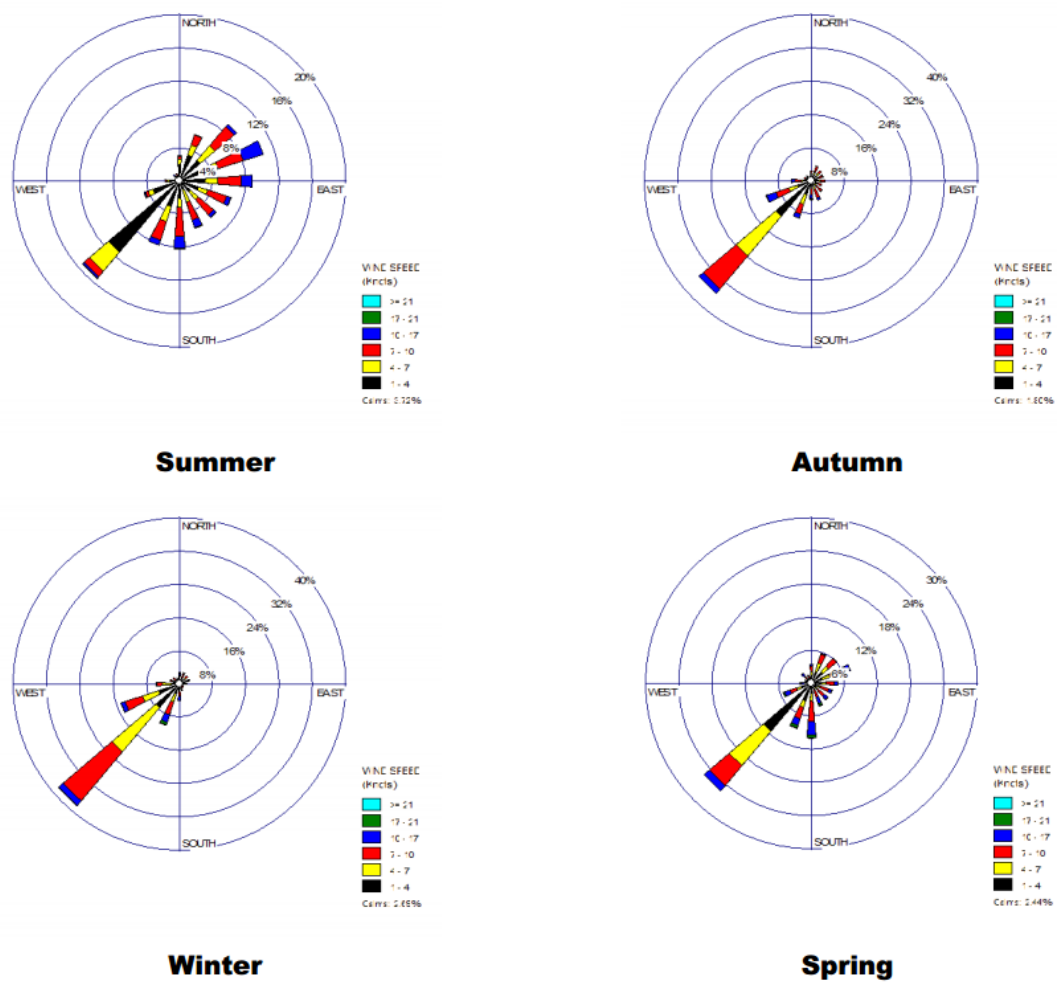
3.5 Ozone

Ozone (O₃) can irritate the lining of the nose, airways and lungs. People who are exposed to enough ozone might feel some pain in their ears, eyes, nose and throat, and they might start to cough. At ground level, when meteorological conditions are right, elevated levels of ozone are produced by reactions involving sunlight and other air pollutants, such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Combustion processes, including motor vehicle engines, and particularly bushfires, are major sources of nitrogen oxides and VOCs.

3.6 Meteorology

Figure 3-1 shows the seasonal wind roses for the area based on the old EPA Macarthur station located at UWS Campbelltown Campus (URS, 2007). The summer winds tend to blow primarily from the south west, however, there are also significant north east and south east components. Winter, Autumn and Spring appear similar in makeup where with winds blow primarily from the south west (URS, 2007).

Figure 3-1 Windroses (URS,2007)



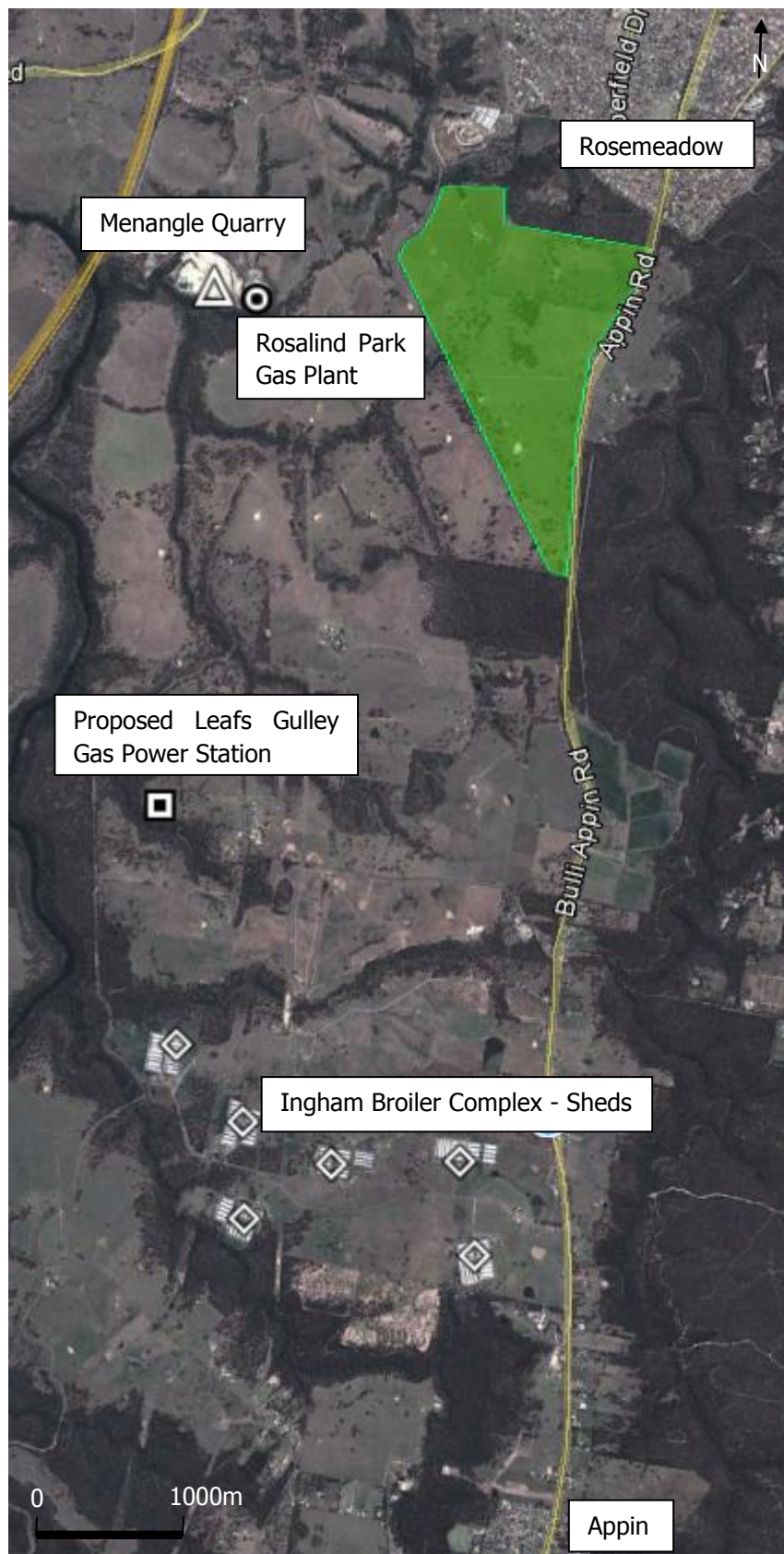
4 EXISTING ENVIRONMENT AT THE SITE

The background air quality in the vicinity of the proposed site is expected to be good given that the Mount Gilead site is situated away from significant urban development. The suburb of Rosemeadow is to the north and the township of Appin to the south. The surrounding landuses to the site are predominately rural in nature. The following surrounding land uses/activities that could influence air quality in the area are (see **Figure 4-1**):

- The F5 Motorway to the West at distance of approximately 1800 metres;
- Menangle Quarry to the South West at distance of approximately 1200 metres;
- Rosalind Gas Plant to the South West at distance of approximately 1000 metres; and
- Chicken Farms (Ingham's Broiler Complex) to the South at a distance of approximately 4000 metres.

The Leafs Gulley Gas Power Station proposal abandoned and will not influence air quality at the site.

Figure 4-1 Proposed location of Mount Gilead Land and surrounding landuses



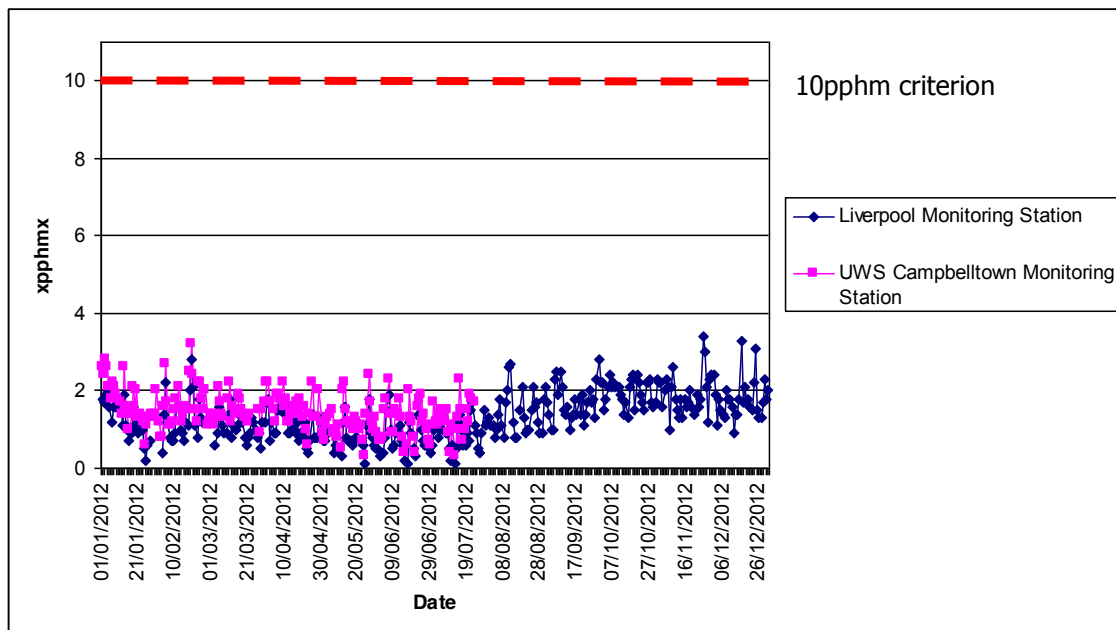
The closest EPA air quality monitoring station located to Mount Gilead is the Campbelltown West station. **Table 4-1** shows 2012 /2013 results for sulphur dioxide, nitrogen oxides, carbon monoxide and particulate matter monitoring. These levels have been presented in this report to show typical pollutant concentrations in the Mount Gilead area.

Table 4-1 Summary of Air Quality Monitoring Conducted at the Campbelltown West EPA monitoring station.

Date	SO ₂ monthly average [µg/m ³]	NO ₂ monthly average [µg/m ³]	CO maximum 8hr Average [mg/m3]	PM10 monthly average [µg/m ³]
Air Quality Criteria (Refer to Table 3-1)				
	60	62	11	30
Sep-12	2.8	24	1.8	17.1
Oct-12	<1	22	2.6	19
Nov-12	2.8	20	0.8	19.5
Dec-12	2.8	16	2	20.9
Jan-13	2.8	14	0.84	20.5
Feb-13	2.8	14	0.5	16.5
Mar-13	2.8	18	0.84	17
Apr-13	<1	24	1.2	13.7
May-13	2.8	24	6.0	14.4
Jun-13	<1	22	3.0	9.6
Jul-13	2.8	28	3.0	12.8
Aug-13	<1	22	1.2	11.8
Annual Average	2.3	21	-	16

With regard to ozone the closest EPA air quality monitoring stations are located at Liverpool and UWS Campbelltown Campus stations. **Figure 4-2** shows the results of 1 hour ozone monitoring.

Figure 4-2 Summary of Ozone Air Quality Monitoring



As can be seen in **Table 4-1** and **Figure 4-2**, the monitoring results indicate that the regional air quality is well below NSW air quality objectives; therefore the area has capacity for additional development.

5 AIR QUALITY IMPACT ASSESSMENT

A qualitative air quality impact review has been undertaken for this project to assess the viability of rezoning the Mount Gilead land to residential. This air quality review concentrates on the identified landuses that might influence air quality in the area and impact on the Mount Gilead site.

5.1 Air quality impact of existing and proposed industrial facilities on the proposed Mount Gilead site

5.1.1 Air Quality Impacts from Rosalind Park Gas Plant

The Rosalind Park Gas Plant is operated by AGL and is approximately 1100m west of the development.

The Rosalind Park Gas Plant currently holds an Environmental protection license (EPL) (licence number 12003). The Licence is regulated by the NSW Environment Protection Authority (EPA) and is required under the Protection of the Environment Operations Act 1997(POEO Act). The licence requires stringent stack air emissions limits for Nitrogen oxides, Sulfur dioxide (SO₂) and SO₃.

From our experience with similar plants, offsite impacts from NO₂, CO, SO₂ and particulate matter are usually within air quality goals. The location of the Rosalind Power Plant is more than 1100 metres from the proposed Mount Gilead site and would therefore not cause any air quality impact. (Heggies, 2007)

5.1.2 Menangle Quarry

The Menangle Quarry is located adjacent to the Rosalind Park Gas Plant. It operates during daytime hours. The quarry excavates sandstone on site, crushes the sandstone on site, stockpiles it and transports it off site.

The key air quality issue from this type of quarry is particulate matter (dust). From our experience with similar quarries, offsite impacts from particulate emissions are usually well within air quality goals within 500m from the quarry. Menangle Quarry is south west of the Mt Gilead site at a distance of approximately 1200 metres and therefore will not cause an air quality impact. (Heggies, 2007).

5.1.3 Proposed Leafs Gully Power Station

The Leafs Gully Power Station proposal has been abandoned and therefore will not influence air quality at the site.

5.1.4 Ingham Appin Broiler Complex

The Ingham Appin Broiler Complex Appin broiler complex currently holds an Environmental protection license (EPL) (licence number 11636). The Licence is regulated by the NSW Environment Protection Authority (EPA) and is required under the Protection of the Environment Operations Act 1997(POEO Act). The licence states in condition L2.1 that "*The licensee must*

not cause or permit the emission of offensive odour beyond the boundary of the premises.”

Odour is a sensation that can be caused by a great variety of gaseous compounds. When odorous compounds, or odorants, are present in sufficiently high concentrations in the air, they trigger responses in individuals who are exposed to them. Odour would be the key air quality issue from this site impacting on the Mt Gilead land.

Good management practices are essential to minimise odour sources. Appropriate separation between the source of odour and sensitive receptors is also critical to avoid land use conflict.

Broiler shed typically operate on a 60 day cycle. The Ingham Appin Broiler Complex is a very large development with approximately 6 complexes of 16 sheds. The potential for all the sheds to be at a stage where high levels of odour could result is very low.

There is approximately 4000m buffer distance between the closest sheds and the Mount Gilead land. Between the sheds and the proposed residential area there are rolling low level hills and valleys, trees and long grass which would provide additional odour dispersion.

From our experience with broiler sheds, offsite impacts can occur although these are generally localised to within 1500 to 2000m from a large site. These impacts can be controlled through good housekeeping which is required by the EPA licence (PAE Holmes, 2011). The location of the Ingham Broiler Complex within 4000m of the proposed Mount Gilead site should therefore not cause a nuisance impact. The prevailing wind for the region is from the southwest and is likely to direct any odours to the south of the Mt Gilead land. It should be noted that the township of Appin is to the south of the Broiler sheds at a distance of between 1500m to 2000m which is half the distance to the Mt Gilead land.

5.2 Air quality impact of future traffic on the proposed housing lots

Guidelines are given in Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline*. That document provides guidelines for compliance with the requirement of the State Environmental Planning Policy (Infrastructure) 2007 (SEPP), which was introduced to provide guidelines for new dwellings built beside road and rail corridors.

The SEPP applies to road corridors with an AADT greater than 40,000 and is recommended for road corridors greater than 20,000 AADT. Appin Road in the future would fall into the road corridors greater than 20,000 AADT category and as such the Department of Planning guidelines forms best practice.

The Department of Planning's guideline for building near busy roads gives detailed advice when air quality should be a design consideration, namely:

- *"Within 10 metres of a congested collector road (traffic speeds of less than 40 km/hr at peak hour) or a road grade > 4% or heavy vehicle percentage flows > 5%,*
- *Within 20 metres of a freeway or main road (with more than 2500 vehicles per hour, moderate congestions levels of less than 5% idle time and average speeds of greater than 40 km/hr),*
- *Within 60 metres of an area significantly impacted by existing sources of air pollution (road tunnel portals, major intersection / roundabouts, overpasses or adjacent major industrial sources), or*
- *As considered necessary by the approval authority based on consideration of site constraints, and associated air quality issues."*

As stated previously even with the future widening of Appin Road, a 30m distance from Appin Road to the nearest residence will be achieved. As the project will incorporate an appropriate separation distance no air quality impacts from Appin Road are expected.

6 CONCLUSION

The air quality aspects of the proposed rezoning at Mt Gilead were investigated. It has been concluded that:

- No industrial air quality impacts were found to have a significant impact at the Mount Gilead site.
- A 30m distance from Appin Road to the nearest residence will be achieved. As the project will incorporate an appropriate separation distance between sensitive uses and the road it is unlikely there would be any air quality impacts from vehicle emissions.

Accordingly it has been determined, that from an air quality perspective, the proposed site will be suitable for residential development.

APPENDIX

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