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Coal & Allied Land

Report on Lower Hunter Lands Development at Minmi

Air Quality Assessment

January 2009

Revision 0

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

GHD was engaged to provide an assessment of air quality impact upon the proposed residential development on Coal & Allied land at Minmi, hereafter referred to as the Minmi Estate.

The Director General's Requirements (DGR) for the air quality component of the environmental assessment of the Minmi Estate is a follows:

> *"Assess the odour and air quality impacts of the nearby existing development and any proposed any proposed development including sewage treatment plants on the site and in light of potential coal mining and coal-bed methane extraction on the subject land."*

There is no sewage treatment plant proposed for the Minmi Estate. Therefore, the scope of work of the air quality assessment was to:

- Characterise the local meteorology and ambient air quality at the Minmi Estate;
- Assess the potential air quality impact to Minmi Estate from adjacent industrial/commercial facilities, including, in particular, the Summerhill Waste Management Facility (WMF); and
- Assess air quality impacts from potential coal mining and coal-bed methane extraction on the Minmi Estate.

The scope of work was conducted with consideration to the to the Department of Environment and Climate Change (DECC) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005) and *Assessment and Management of Odour from Stationary Sources in NSW (2006*), as appropriate.

2. Local Environment

2.1 Site Description

The Minmi Estate site is comprised of five precincts:

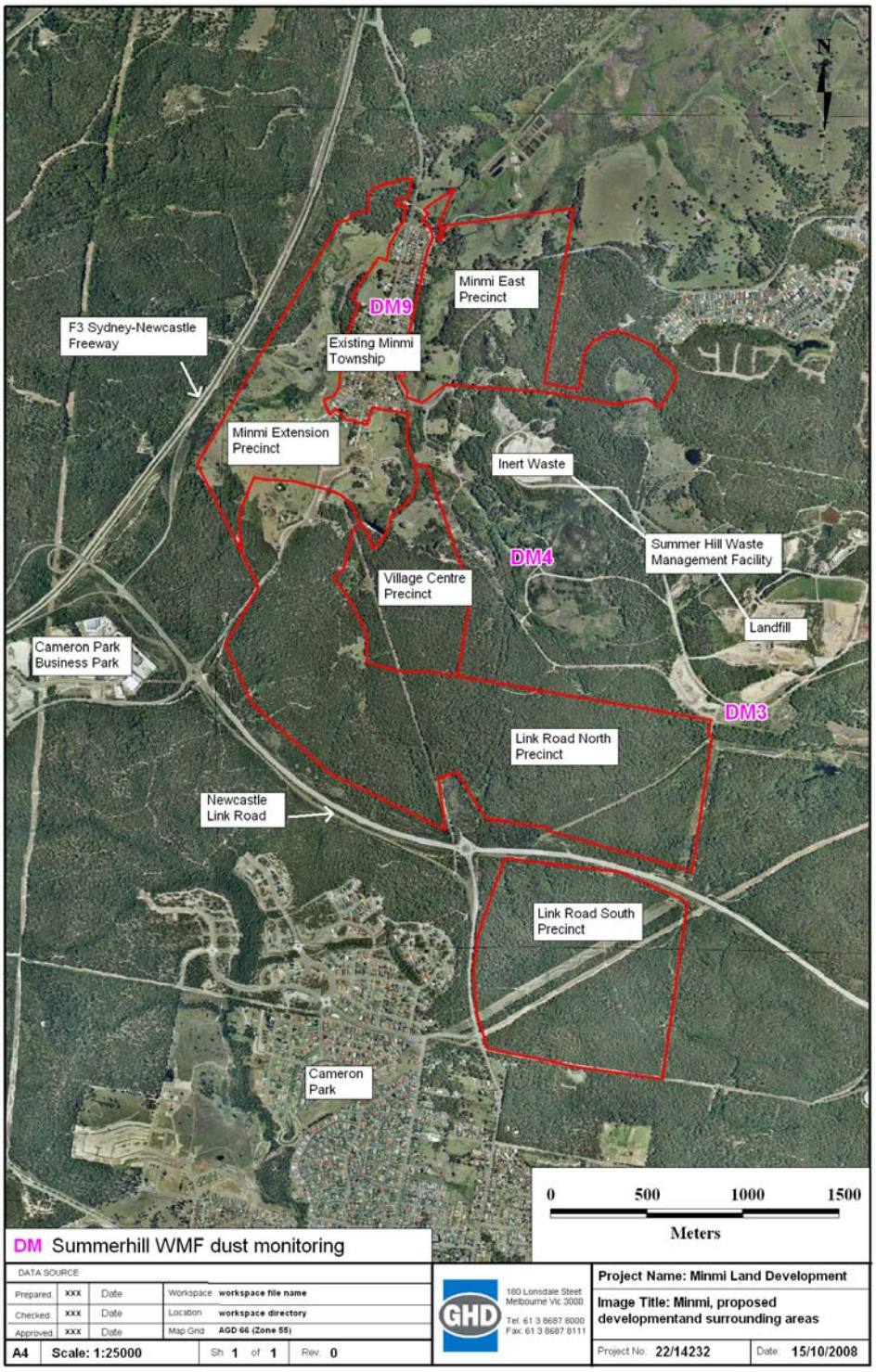
- Minmi Extension;
- Minmi East;
- Village Centre;
- Link Road North; and
- Link Road South.

The Minmi Extension, Minmi East and Village Centre precincts surround the existing township of Minmi. The Link Road North and Link Road South precincts are situated south of the Minmi precinct and are divided by the Newcastle Link Road.

The Summerhill Waste Management Facility (WMF) is located east of the site and the Cameron Park Business Park is located to the south-west the site.

Figure 2-1 shows the key features of the study area.

Figure 2-1 Minmi Estate Study Area



2.2 Ambient Air Quality

Ambient air quality data was obtained for the years 2002 -2006 from the Wallsend air quality monitoring station operated by the Department of Environment and Climate Change (DECC), which is the closest monitoring station to the site. Located approximately 5 km to the southeast of the site, this monitoring location is considered to be a good representation of the ambient air quality data for Minmi.

Table 2-1 presents a summary of the ambient air quality at Wallsend from 2002 to 2006.

The highest 1-hour average value of nitrogen dioxide (NO_2) was 0.05 parts-per-million (ppm), which is less than half of the 0.12 ppm criterion. The highest annual average was 0.009 ppm, which is less than a third of the 0.03 ppm annual average criterion.

The highest 1-hour average value of sulphur dioxide (SO_2) was 0.067 ppm, which is a third of the 0.2 ppm criterion. The highest 24-hour average was 0.014 ppm, which is well below the criterion of 0.08 ppm. The highest annual average was 0.002 ppm, which is an order of magnitude below the 0.02 ppm annual average criterion.

The highest 24-hour average fine particulate matter (refered to as PM_{10})[1] concentration was 48 $\mu g/m^3$ in 2002, which is 96% of the 50 micrograms per cubic metre ($\mu g/m^3$) criterion. The highest annual average PM_{10} value was 21$\mu g/m^3$ in 2002, which is below the 30 $\mu g/m^3$ criterion. The elevated PM10 concentrations were influenced by bushfire smoke and drought conditions.

Table 2-1 Ambient Air Quality – Wallsend, NSW for years 2002 - 2006

Pollutant	NO_2 (ppm)		SO_2 (ppm)			PM_{10} ($\mu g/m^3$)	
Averaging Period	Maximum 1-Hour Average	Annual Average	Maximum 1-Hour Average	Maximum 24-Hour Average	Annual Average	Maximum 24-Hour Average	Annual Average
2002	0.043	0.009	0.045	0.011	0.002	48	21
2003	0.050	0.008	0.047	0.010	0.002	42	18
2004	0.041	0.008	0.067	0.014	0.002	34	19
2005	0.038	0.008	0.048	0.007	0.001	31	18
2006	0.037	0.009	0.058	0.009	0.001	39	19
DECC Criteria	***0.12***	***0.03***	***0.2***	***0.08***	***0.02***	***50***	***30***

[1] PM_{10} – particulate matter less than 10 microns in equivalent aerodynamic diameter.

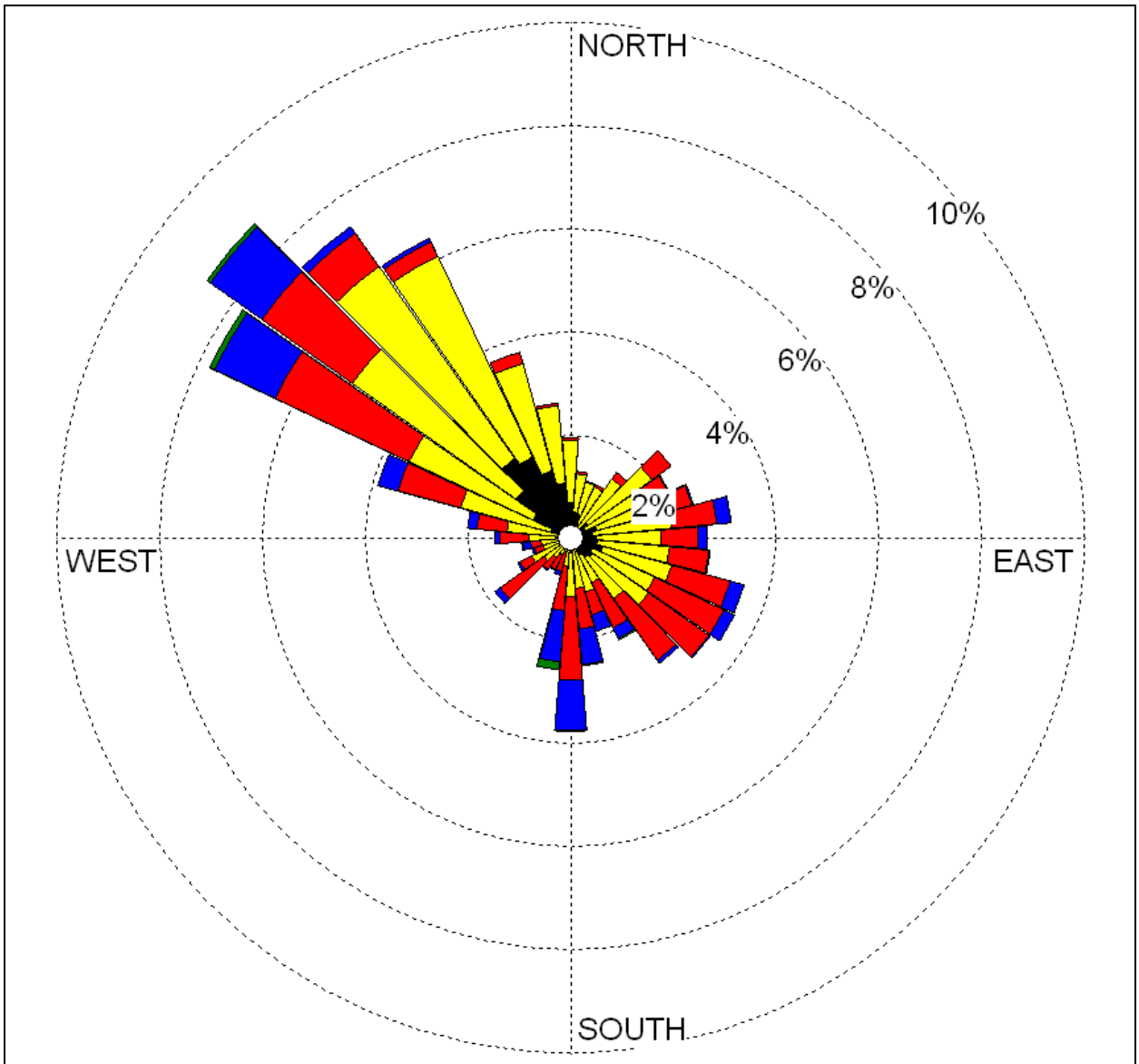
2.3 Local Meteorology

The transport and dispersion of the air emissions from the construction of the proposed development will be influenced by prevailing synoptic flows, local sea breezes, and vertical temperature profiles that will alter both diurnally and with wind direction, depending on whether flows are coming off the land or water.

GHD holds meteorological data from a previous air quality assessment at Tomago (located approximately 10 km to the north-east of Minmi), which is considered to be representative of the wind climate at Minmi. GHD note that wind patterns are likely to be slightly different at Minimi because the Minmi Estate site is in a more sheltered location than the Tomago location but the prevailing wind pattern and is considered to be sufficiently representative for the purposes of this qualitative assessment.

Figure 2-2 shows a wind rose that illustrates the distribution of wind speed and direction at Tomago. On an annual basis the prevailing winds are from the north-west and to a lesser extent from the south-east. Higher speed winds are associated with north-westerly winds. The highest frequency of light winds also occurs from the north-west, which corresponds with the regional scale cool air drainage flows down the Hunter Valley from the north-west under stable atmospheric conditions. At the Minmi site, to a lesser extent, local drainage flows from the elevated terrain to the north and west of the site would also be prevalent.

Figure 2-3 shows the seasonal variation in wind climate, and it can be seen that south-easterly winds occur more frequently during summer (sea-breeze), while a north-westerly dominates during the other seasons, in particular during winter.



Legend

WIND SPEED (m/s)

- >= 10.0
- 8.0 - 10.0
- 5.0 - 8.0
- 3.0 - 5.0
- 1.0 - 3.0
- 0.5 - 1.0

Calms: 0.00%

Figure 2-2 Tomago – Annual Wind Rose

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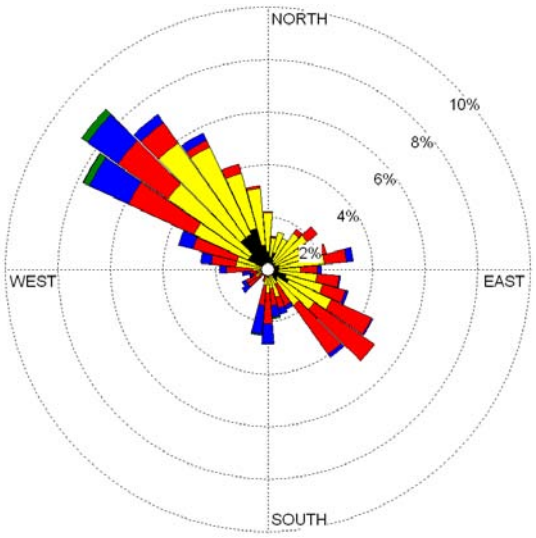
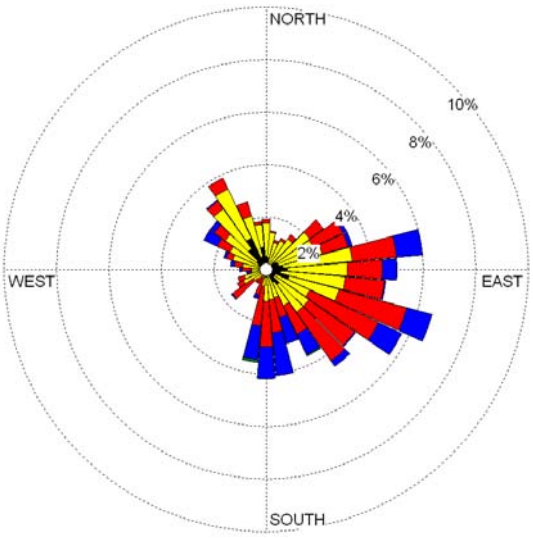
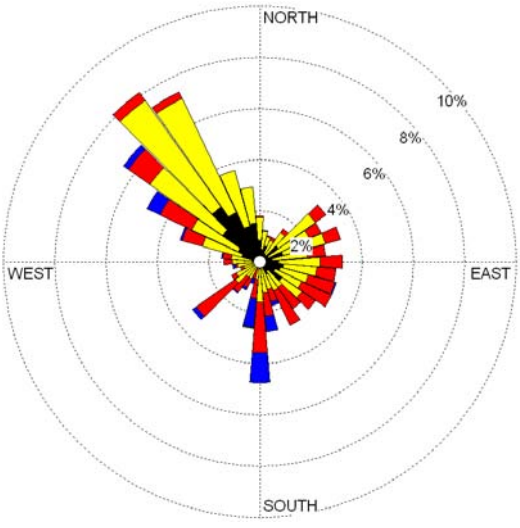
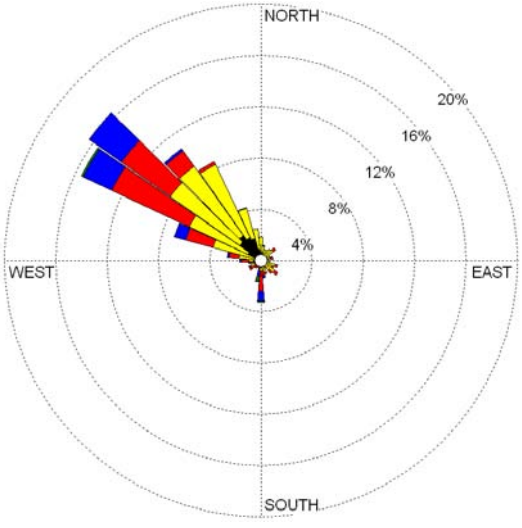
Spring	Summer
	
Autumn	**Winter**
	

Figure 2-3 Tomago – Seasonal Wind Roses

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3. Air Quality Assessment

A desktop review of aerial photography, the National Pollutant Inventory (NPI) database and information provided via Coal & Allied lead to the following significant sources contributing to the air emissions inventory:

- Odour and dust emissions from landfill activities at the Summerhill Waste Management Facility (WMF) and proposed Regional Waste Facility (RWF), to be built within the existing WMF site;
- Industrial/commercial air emissions from the nearby Cameron Park business park; and
- Fugitive dust and methane emissions from Coal-bed methane extraction at existing bore sites on Coal & Allied land.

Coal & Allied has advised GHD that there will not be any sewage treatment works within the subject site.

The following sub-sections discuss the air emission inventory and provide a screening assessment to gauge the potential for air quality impacts on the proposed Minmi Estate.

3.1 Summerhill Waste Management Facility

The existing WMF operates on approximately 220,000 tonnes per year of municipal waste of which approximately 70,000 tonnes is inert waste. Putrescible solid waste is placed in the active cells centrally located within the WMF. Inert waste is disposed at the open-cut disposal site to the north west of the facility, adjacent the Minmi Estate site boundary.

GHD is not aware of previous off-site odour impact assessments using atmospheric dispersion modelling to determine the impact of odorous emissions from the WMF during its operation.

The Site Manager for the WMF has advised GHD that the existing landfill is licensed to operate until the year 2015, however, the operators will be seeking Development Approval for a 30 year extension to their license. As part of that approval process, it is considered likely that the proponent will be required undertake a detailed air quality impact assessment (including odour and dust dispersion modelling) to determine the impact of the proposed WMF at the nearest existing **or likely future** off-site sensitive receptors.

Furthermore, GHD also understand that a Regional Waste Facility (RWF), to process municipal solid waste into products such as compost, is being proposed to be built on land near the Link Road North Precinct. It is also considered likely that the proponent will be required to undertake a detailed air quality impact assessment to determine the impact of the proposed RMF at the nearest existing or likely future off-site sensitive receptors.

Insufficient information is available to GHD at present with which to characterise odour emissions from the WMF (existing or future scenarios) and the proposed RWF to undertake odour impact modelling, and it possible that the life spans of both of these activities (approximately 15 years) may finish prior to the opening of the nearest (and likely most potentially exposed) precinct of Link Road North. Hence, it was considered reasonable at this time to undertake a screening level (semi-quantitative) assessment to gauge the potential for air quality impacts under existing conditions. More detailed air quality assessments would in any event need to be undertaken in the future by proponents of the WMF extension and/or RWF development.

This screening level assessment gauges the potential for air quality impacts by examining the following aspects:

- Emission inventory;
- Local wind climate patterns;
- Dust monitoring;
- Odour complaint history; and
- Available separation distances.

3.1.1 Emission Inventory

Typical sources of odour with the potential to affect air quality at the development site include:

- Putrescible waste landfill cells;
- Landfill leachate pond; and
- Garden organic stockpiles.

Typical sources of dust include:

- Earthworks and waste handling at the tipping face and within the landfill cells;
- Processing of stockpiled garden organics and timber;
- Vehicle movements on unsealed roads about the site and on the landfill cells; and
- Wind erosion from disturbed/unconsolidated areas on the site.

For the purposes of this assessment GHD assumes that the WMF operators apply normal dust and odour mitigation measures, which minimises the potential for dust and odour emissions generation from these sources.

3.1.2 Wind Climate

As discussed in Section 2.2, the local wind climate indicates a higher occurrence of wind from the north-west, which means sensitive receptors at the Minmi Estate will have a lower than average frequency of exposure to dust and odour potentially emitted from the WMF.

Atmospheric stability is an important factor in the dispersion of emissions to air, and the incidence of stable conditions coupled with light wind will define the direction of maximum impact. The dominant direction of poor dispersion will be in alignment with the drainage flow (stable light winds) from the northwest, that is, the direction of poor dispersion from the WMF is towards the southeast away from the proposed Minim Estate.

Furthermore, wind erosion or dust lift-off from unconsolidated surfaces within the WMF site can become significant under strong winds (greater than 5 m/s). As discussed in Section 2.2, these stronger prevailing winds predominantly occur from the north-west. Figure 2-1 shows that winds from the east (in the direction of the landfill to the proposed development) infrequently occur and when they do occur, these winds are typically less than 5 m/s, thus reducing the potential for dust lift-off.

3.1.3 Dust Monitoring

Environmental effects of airborne particulate matter (dust) are generally related to the size of the particle size range of the dust. Health effects are often associated with fine particles less than 10 micrometres in equivalent aerodynamic diameter (PM10), whereas coarser particles (generally 10 to say 100 micrometres) are associated with effects on amenity (e.g. visible dust plumes or deposition on surfaces). As a dust plume is transported downwind from a source, the coarser particulates progressively drop-out of the air column to deposit on surfaces (land, water, cars etc) downwind of the source, while the finer particulate fractions will be retained in the air column longer by turbulent mixing. Typically, a high proportion of the coarse particulate matter emissions are likely to be deposited within 500 metres of the dust source.

The Summerhill WMF undertakes dust deposition monitoring at locations on and off the WMF site as part of its licence requirements. The dust deposition rates measured over a 12-month period (2006/2007) at monitoring stations located between the proposed Estate and the WMF are shown in Table 3-1. The locations of each monitoring location are shown in Figure 2-1.

Table 3-1 Dust Deposition Results for Summerhill WMF

Period	Dust Deposition (g/m^2/month)		
	DM2	DM3	DM9
Year 2007 - 2008	1.0	0.8	1.2

Source: Data from draft 2007/2008 Annual Environmental Report for Summerhill WMF

The DECC impact assessment criterion to prevent dust nuisance is 4 g/m^2/month of total deposited dust over an annual average period. The dust monitoring results presented in Table 3-1 indicate that this dust impact criterion is readily achieved at the designated monitoring stations. Based on this information, it is unlikely that dust levels within the proposed Minmi Estate would exceed nuisance dust levels as a result of the existing WMF activities.

GHD is not aware of any monitoring of fine particulate matter at the Summerhill WMF. GHD has measured the increment in fine particulate matter (PM10) concentrations at a monitoring station 300 metres downwind of an active landfill cell, of a landfill operating operating on municipal waste at 275,000 tonne per year, to be less than 1 microgram per cubic metre. The Summerhill WMF at 220,000 tonne per year would likely give rise to similar increments in PM10 levels and is therefore unlikely to cause a significant increase in ambient fine particulate levels at the location of the proposed Minmi Estate.

3.1.4 Odour Complaint History

The WMF site manager has advised GHD that the odour complaints against the WMF are infrequent, and when complaints do occur, they are typically confined to two residential premises located north of the WMF. The source-attribution made in the odour complaints has not yet been verified and the WMF is currently undertaking investigations to resolve the complaints[2].

3.1.5 Separation Distance

Odour and dust are acknowledged emissions from landfills that, on occasion, can give rise to odour and/or dust impact outside the site boundaries. It is in recognition of this that separation (or buffer) distances are commonly used as a planning tool to ensure that there is adequate separation between the pollution source and sensitive uses in the vicinity – where typically the sensitive use is a residence. The separation distance is taken as the distance between the activity boundary within a facility and the property boundary of a sensitive land use nearest to the emission source.

The DECC Technical Framework for *Assessment and Management of odour from stationary sources in NSW* (DECC, 2006) provides separation distance guidelines for a range of intensive agricultural activities, however, it does not specify a separation distance for landfills. Therefore, GHD has relied on the use of separation distance guidelines from other regulatory jurisdictions for this assessment. The separation distance guidelines for Western Australia, Victoria and South Australia are summarised in Table 3-2 below.

Table 3-2 Separation Distances – Landfills

State	Industry Description	Separation Distance
South Australia [1]	Putrescible landfill	500m
Western Australia [2]	Putrescible landfill	500m
Western Australia [2]	Inert landfill	150m
Victoria [3]	Putrescible landfill	500m

1. EPA South Australia: Guidelines for Separation Distances, December 2007;

2. EPA Western Australia: Guidance for the Assessment of Environmental Factors – Separation distances between industrial and sensitive land uses, No. 3, June 2005; and

3. EPA Victoria: AQ 2/86 : Recommended Buffer Distances for Industrial Residual Air Emissions

[2] Personal communication with the Summerhill WMF site Manager (Mr Mark Johnson) on 1st October 2008.

The Minmi Estate site boundary is a minimum range of approximately 600 metres from the existing putrescible solid waste landfill (existing and future cells) and is at 250 metres from the inert open cut disposal site[3]. Each separation readily meets the buffer distance guidelines of 500 metres and 150 metres, respectively.

GHD note that a significant portion of the separation distance (approximately 400 metres) is contained within the Summerhill WMF site boundary, which provides a secure buffer zone for the facility.

Furthermore, established stands of trees are situated within the buffer area, in particular to the west of the WMF at the Blue Gum Hills Regional Park, which can aid dispersion and potentially remove dust particles through impingement on the foliage.

3.2 Cameron Park Business Park

A search of the National Pollutant Inventory database (NPI) for facilities in the Cameron Park business park revealed no significant industrial or commercial sources of air emissions[4], therefore, it is not further addressed in this report.

3.3 Coal-Bed Methane Extraction

At this stage, Coal & Allied that coal mining has advised GHD and coal-bed methane extraction will not occur on the subject land.

It is understood that all existing wells on the subject land will remain capped, and as such, residual emissions of methane from the wells should be negligible.

[3] Lower Hunter Lands Development Minmi – Phase 2 Acoustic Study draft report, Renzo Tonin & Associates, 26 March 2008.

[4] www.npi.gov.au (accessed on 30/09/2008).

4. Conclusions

The key findings of the air quality assessment for the proposed Minmi Estate site are:

- Odour and dust emissions from the Summerhill Waste Management Facility (WMF) are not expected to impact on the Minmi Estate based on its current configuration and hours of operation for the following reasons:
  - Standard mitigations measures are applied to key odour and dust sources;
  - Prevailing winds predominantly transport odour and dust emissions towards the south-east, away from the Minmi Estate;
  - Total deposited dust levels around the WMF are likely below the DECC criteria for nuisance dust[5];
  - Odour and dust complaints made by existing residents living near the WMF are at a low base; and
  - In principle, adequate separation distance (> 500 metres) exists between the WMF putrescible landfill and the proposed Minmi Estate. However, consideration should also be given to establishing/maintaining a stand of trees or other suitable vegetation along the boundary of the Estate to aid dispersion and potentially remove dust particles through impingement on the foliage.
- Coal mining and coal-bed methane extraction is not expected to occur within the boundary of the proposed Minmi Estate.

The conclusions given above are subject to the limitations described in Section 5.

[5] This statement needs to be confirmed upon receipt of dust deposition data from the Summerhill WMF

5. Limitations

This report has been prepared for Coal & Allied Land in order to comply with local regulatory requirements. The purpose of the report is to provide an independent review of the Project and assess the potential impact of local air quality on the Project.

It is not the intention of the assessment to cover every element of the ambient environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the air quality assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient air environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

The air quality mitigation measures recommended in this report are in-principle only. The assistance of an air quality consultant is recommended at the detailed design phase of the project or when there is more detailed information available to provide more accurate recommendations.

In conducting this assessment and preparing the report, current guidelines for air quality were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

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