Chapter 18

Air quality

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Chapter 18 Air quality

The Secretary's environmental assessment requirements for the Narrabri Gas Project include a requirement to assess potential impacts on air quality in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005). An air quality assessment was undertaken in response to this requirement and is provided in Appendix L. This chapter summarises the findings of the air quality assessment.

The key findings of the impact assessment in relation to air quality were:

- Construction activities at Leewood and Bibblewindi comply with air quality criteria at sensitive receivers, with the implementation of appropriate control measures.
- Air emissions from the operation of the project would meet the relevant air quality criteria at all sensitive receivers.
- All reasonable and feasible measures would be implemented to ensure that air emissions would not exceed the criteria at occupied residences on private land.

The main project emission that would occur during construction was assessed to be particulate matter from construction sites. The main project emissions that would occur during operation were assessed to be oxides of nitrogen from generators at well pads, the central gas processing facility and power generation facility at Leewood—and safety flares at Leewood and Bibblewindi.

Distances were calculated at which emissions would be within air quality criteria. A distance of 30 metres would be sufficient for construction of access tracks and trenching, while 60 metres would be sufficient for construction of well pads. Where access track construction requires cut and fill earthworks, emissions may disperse further but were predicted to be within air quality criteria at around 140 metres from construction activities. These distances could be reduced through implementation of additional mitigation and management measures.

All reasonable and feasible measures would be implemented for project emissions to comply with regulatory air quality criteria at occupied residences on private land, unless subject to a negotiated agreement with the landholder.

An Air Quality Management Plan would be implemented during construction and operation of the project. The Plan would include an air quality monitoring program and a suite of measures that could be implemented to avoid, mitigate and manage potential air impacts associated with the project.

18.1 Methodology

In accordance with Part 5 of the *Protection of the Environment Operations (Clean Air) Regulation (2010)*: *Emission of Air Impurities from Activities and Plant*, the statutory methods that are to be used for modelling and assessing emissions of air pollutants from stationary sources are outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005). The document provides guidance on the air quality impact assessment process including the:

- preparation of emission inventories
- preparation of meteorological data
- quantification and accounting for background concentrations and cumulative impact assessment
- dispersion modelling methodology
- presentation and interpretation of dispersion model predictions
- impact assessment criteria and assessment outcomes.

The assessment of air emissions addresses potential impacts on human health and amenity. Greenhouse gas emissions are assessed separately in Chapter 24.

The following tasks were undertaken to assess the impact of the project on air quality:

- description of background air quality, based on background monitoring data
- quantification of project emissions during construction and operation
- development of meteorological models and dispersion models
- assessment of project emissions against relevant air quality criteria
- development of mitigation and management measures to control impacts.

Background air quality was described in terms of particulate matter, oxides of nitrogen and ozone. In the absence of publicly available data for Narrabri, background air quality was characterised through a review of data from regional monitoring stations operated by the NSW Office of Environment and Heritage and supplemented with four months of monitoring in the project area.

Regional monitoring stations considered included Tamworth, Beresfield, Bathurst, Muswellbrook and Singleton. In most cases, the reviewed data were not considered representative of the project area given the inclusion of other regional sources in these areas. Particulate matter recorded at Tamworth, was however, found to be suitable. Oxides of nitrogen and ozone were characterised from the monitoring conducted in the project area between April to August 2014 at the location shown in Figure 18-3.

An inventory of emissions from the project was developed in reference to emission factors in technical documentation as discussed in Section 2 of Appendix L. The key emissions for the purpose of impact assessment were then identified based on potential impacts to human health and potential to exceed relevant air quality criteria (determined as the ratio of the emission factor to the relevant criterion).

The key emissions included particulate matter, oxides of nitrogen, carbon monoxide and a range of trace air emissions, which were then subject to dispersion modelling. However, it is noted that potential impacts of all identified emissions are encompassed through this assessment approach. Meteorological models were developed based on observations at Narrabri Airport automatic weather station to predict local meteorology. The models were built on a representative meteorological year (March 2008 to February 2009 inclusive), selected to reflect inter-annual variation, including wind flows, temperature, rainfall patterns and El Nino and La Nina events.

The meteorological data selection process was based on determining which years provided the closest representation of the average state of the climate based on the variation of each meteorological parameter from the mean and each other year—which was March 2008 to February 2009. Local meteorological parameters, including wind speed, wind direction and atmospheric stability, were then derived from the meteorological model to predict atmospheric pollutant dispersion.

Dispersion models were developed to predict air emission concentrations at incremental distances from the major sources of air emissions. Potential for impacts was considered at identified sensitive receivers within the project area and a three kilometre buffer zone surrounding the project area.

The predicted concentrations were assessed against air quality criteria primarily defined the NSW Office of Environment and Heritage *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005). Construction dust emission rates for each construction site were calculated based on the area of the site, the nature of construction activities and the application of standard construction dust controls. Emissions during operation were quantified based on technical engine specifications, emissions factors and NSW emission standards.

A detailed methodology, including calculation procedures (emission factors) and model performance evaluation is provided in Appendix L.

18.2 Air quality criteria

The relevant air quality criteria are primarily defined in the NSW Office of Environment and Heritage *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005). The relevant air quality criteria are compiled in Table 18-1.

Table 18-1 Air quality impact assessment criteria

Parameter	Impact assessment criterion by averaging period					
	1-hour	4-hour	8-hour	24-hour	Annual	Unit
Total suspended particulates	--	--	--	--	90	$\mu g/m^3$
PM_{10}	--	--	--	50	30	$\mu g/m^3$
Deposited dust	--	--	--	--	$2^a/4^b$	g/m^2/month
Nitrogen dioxide	246	--	--	--	62	$\mu g/m^3$
Carbon monoxide	30,000		10,000	--	--	$\mu g/m^3$
Ozone	214	171	--	--	--	$\mu g/m^3$
Acrolein	0.42	--	--	--	--	$\mu g/m^3$
Formaldehyde	20	--	--	--	--	$\mu g/m^3$
Acetaldehyde	42	--	--	--	--	$\mu g/m^3$
Cadmium	0.018	--	--	--	--	$\mu g/m^3$
Nickel	0.18	--	--	--	--	$\mu g/m^3$

[a] Maximum increase in deposited dust
[b] Maximum total deposited dust

18.3 Existing environment

18.3.1 Climate

The climate of the Narrabri region is described by the Bureau of Meteorology as temperate with warm to hot summers and cool winters. Detailed climate statistics are collected at the Narrabri Airport automatic weather station. Summer months (December, January and February) tend to be wettest with the addition of June, ranging between 50 and 100 millimetres per month.

Rainfall tends to be well below 50 millimetres in the other months (refer to Figure 18-1).

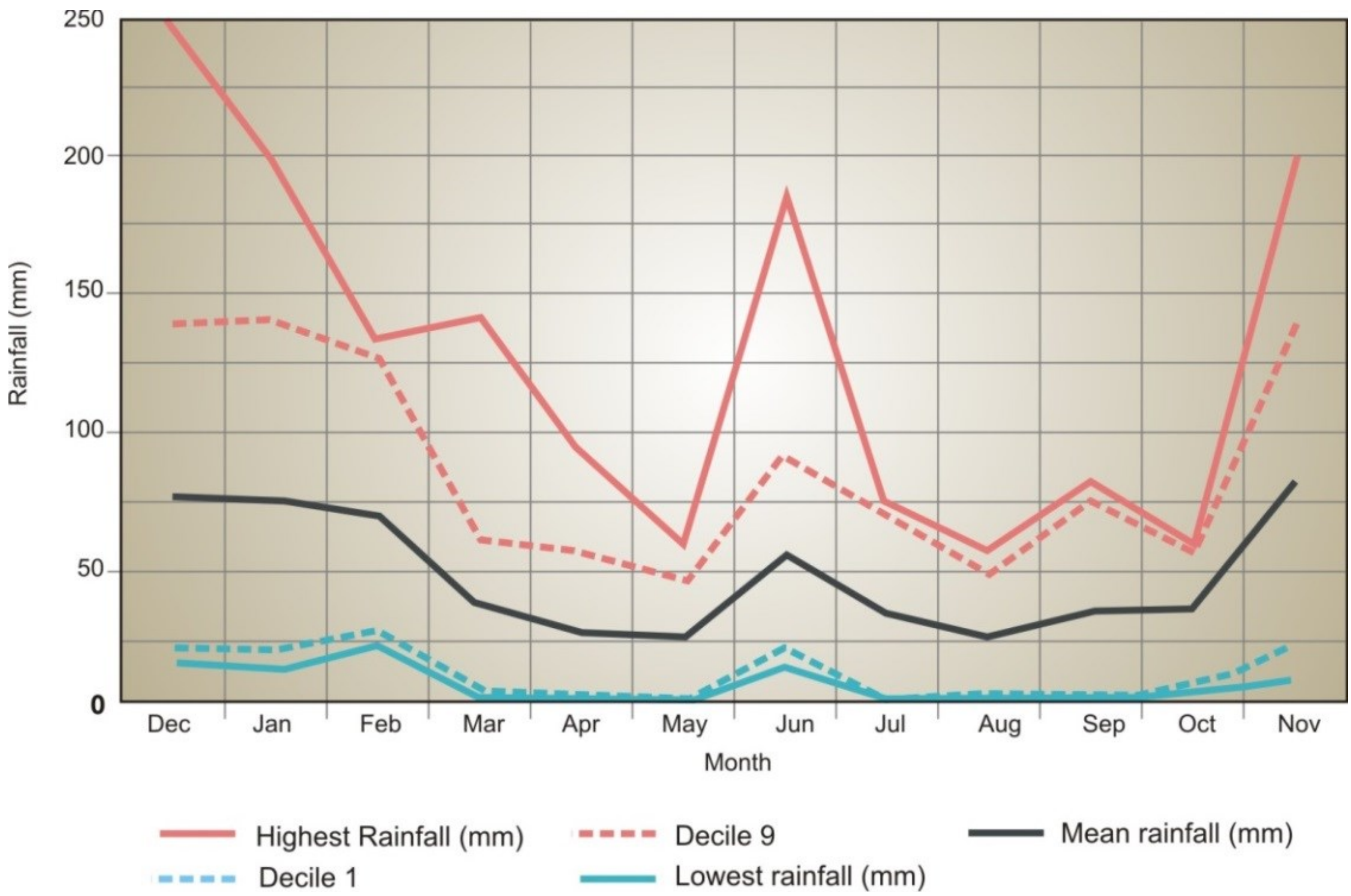


Figure 18-1 Rainfall in the Narrabri region

Winds in the Narrabri region are mainly from the south-east and the north (refer to Figure 18-2).

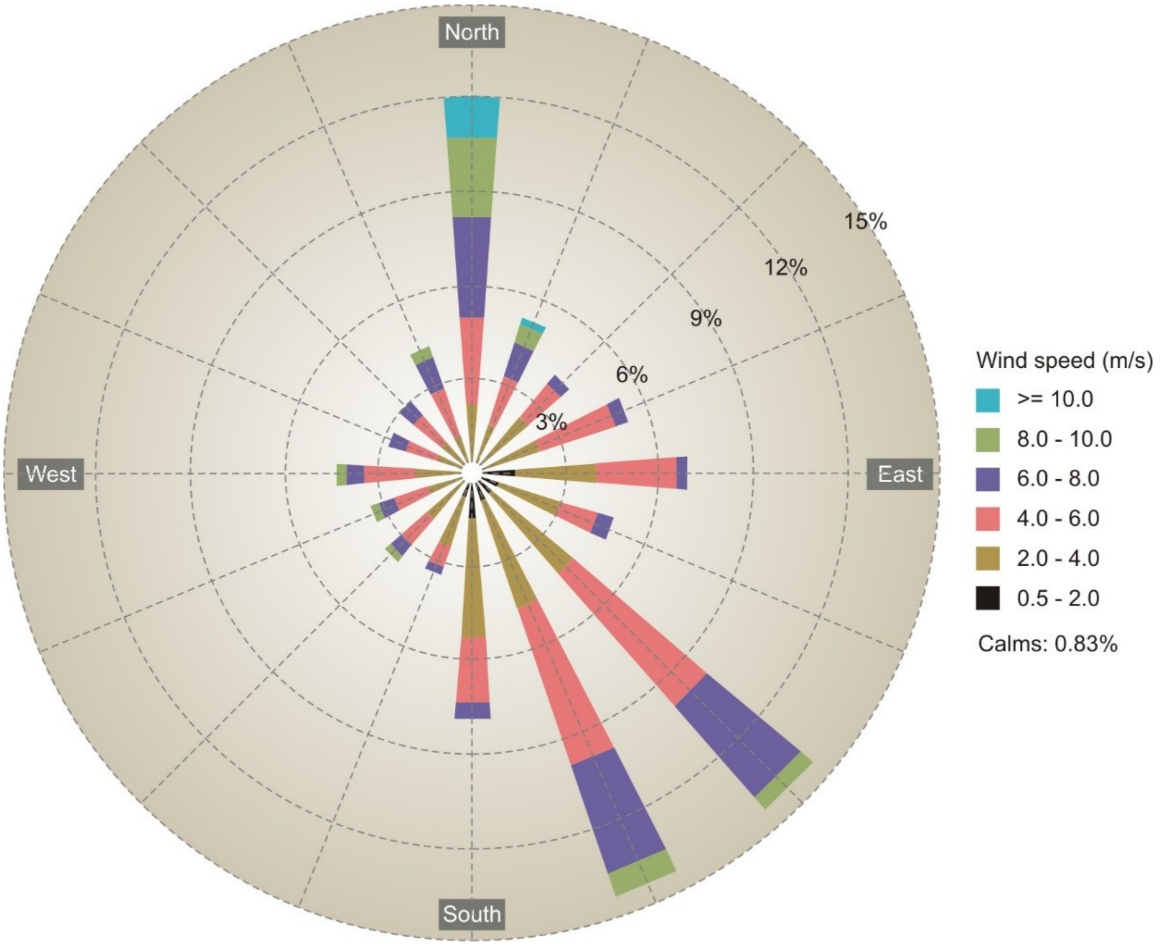


Figure 18-2 Wind frequency and speed by origin in the Narrabri region

18.3.2 Background air quality

The adopted background air quality for particulate matter, nitrogen dioxide and ozone are presented in Table 18-2. As stated in Section 18.1, background particulate matter was characterised in reference to data collected at the NSW Office of Environment and Heritage monitoring station at Tamworth, while oxides of nitrogen and ozone were characterised from the monitoring in the project area.

The particulate matter data showed relatively high concentrations typical of an urbanised environment with a mix of rural and commercial industry and a warm temperate climate. The data occasionally exceed the relevant air quality criteria due to extreme weather events (dust storms and bushfires).

Background particulate matter in the project area would likely be lower than that adopted, given the high vegetative and agricultural land cover and fewer traffic and industrial emissions sources in the project area compared to Tamworth. The adopted background levels of particulate matter are therefore considered to be conservative for the purpose of quantifying potential impacts.

Wilga Park Power Station is within the project area and would be a source of background emissions but was not operating at the time of monitoring. To account for this, Wilga Park Power Station was modelled at its approved 40 megawatt capacity and was included, in addition to measured background air quality data, in the predicted concentrations during the operation of the project (see Section 18.5).

Table 18-2 Adopted background air quality

Parameter	Background concentration (µg/m^3)			
	1-hour	4-hour	24-hour	Annual
PM_{10}	N/A	N/A	24.1[a]	16.3
Total suspended particulates	N/A	N/A	N/A	32.6
Nitrogen dioxide	18.5	N/A	N/A	18.5
Ozone	74.2	72.0	N/A	N/A

[a] Highest 70th percentile concentration of all reviewed years

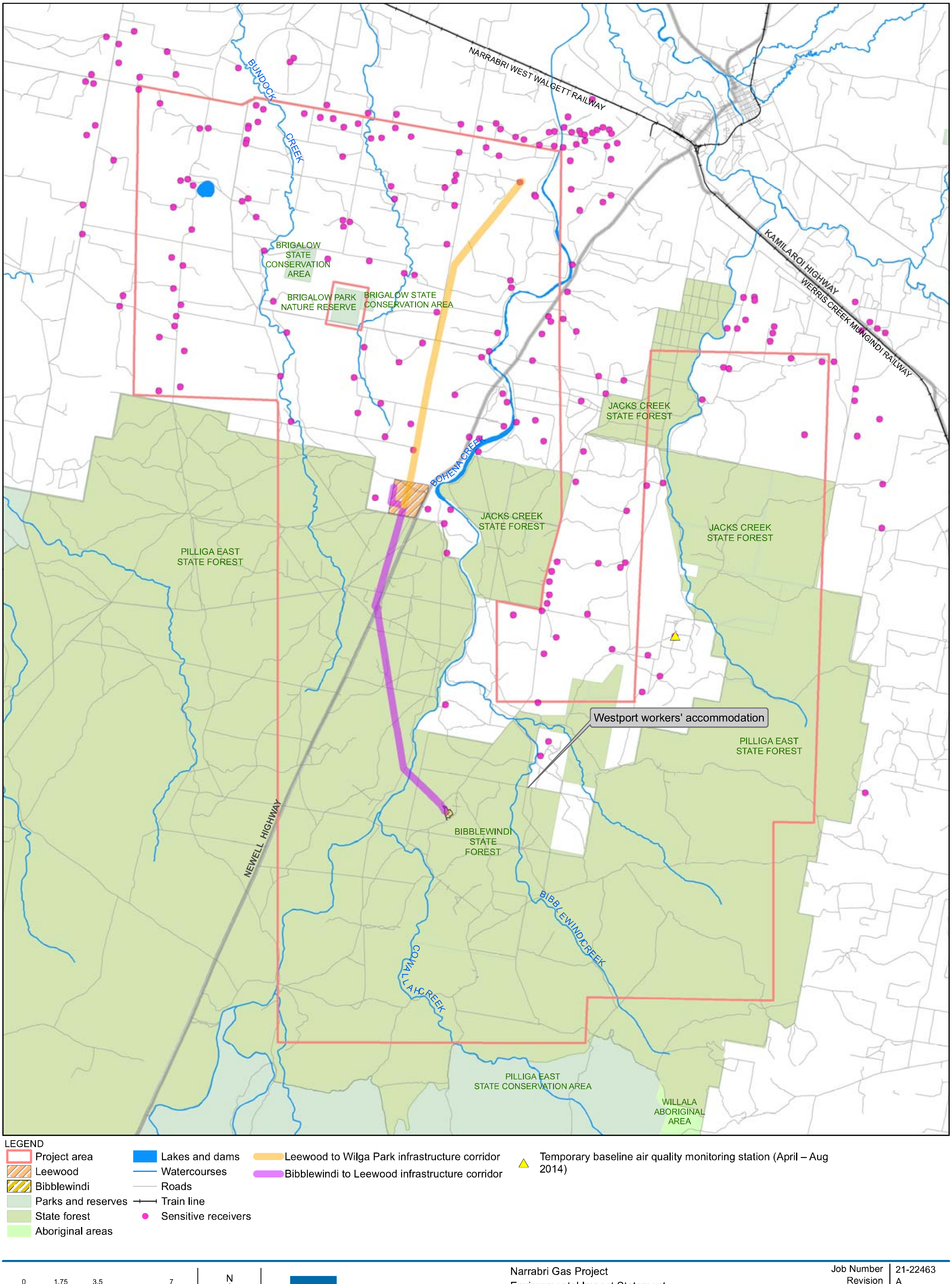
Although not considered a direct risk to human health or amenity, the proponent commissioned the University of Adelaide to record baseline atmospheric methane concentrations in the project region over three years. Baseline atmospheric methane concentrations were recorded at up to 1.8 parts per million. Localised increases were also recorded that were attributable to anthropogenic sources including roads near cattle saleyards (over 20 parts per million), roads near mining areas (over 30 parts per million) and farm bores (over 100 parts per million).

Greenhouse gas emissions, including fugitive methane emissions, for the project have been calculated by application of the Commonwealth Government's *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and *National Greenhouse Accounts Factors* (Commonwealth Department of Environment and Energy 2016a). Further information is provided in Chapter 24 (Greenhouse gas).

A leak detection and repair program is undertaken in accordance with Environment Protection Licence requirements. The program includes monitoring of all well site infrastructure, sets out repair response timeframes and reporting requirements if a leak is detected. A summary of monitoring results is provided as part of the annual report prepared for the Environment Protection Licence. No reportable leaks have been detected. The program will continue to be carried out in accordance with Environment Protection Licence requirements.

18.3.3 Sensitive receivers

The assessment identified 114 sensitive receivers within the project area at relatively low density. A further 103 sensitive receivers were identified within three kilometres of the boundary of the project area. These sensitive receivers identified in and around the project area are shown in Figure 18-3.



Narrabri Gas Project
Environmental Impact Statement

Sensitive receivers within three kilometres of the project area

Job Number	21-22463
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Date	FEB 2015

Figure 18-3

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Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Created by: afoddy

18.4 Potential impacts – construction

Emissions during construction would be short-term and readily managed with the implementation of standard control measures. Sources of air emissions during construction would include earthworks and exhaust from vehicles and other on-site plant and equipment.

The main air emission during construction would be particulate matter (PM_{10}). This emission was assessed to be the most likely to approach the relevant air quality criteria, and therefore defined the distance at which other emissions would be within the relevant air quality criteria.

Emissions from construction activities at Leewood and Bibblewindi were predicted to comply with the air quality criteria at identified sensitive receivers, noting that work planning during activities on the eastern boundary at Leewood will need to consider further mitigation measures in the event of north-westerly meteorological conditions to prevent a potential exceedance at a single receiver. As these particular meteorological conditions are expected to occur once per year on average the likelihood of this impact occurring would be minimal. In addition, vegetation in the vicinity of the receiver would also be expected to result in lower dust levels than predicted by the model.

Emissions from construction activities at construction sites for access tracks and gas and water gathering lines, the Leewood to Bibblewindi infrastructure corridor, the Leewood to Wilga Park underground power line, and the treated water release pipeline from Leewood to Bohena Creek were predicted be within air quality criteria about 30 metres from the construction activities. Where the construction of access tracks requires cut and fill earthworks, emissions may disperse further but were predicted to be within air quality criteria about 140 metres from the construction activities. Access tracks would typically follow existing tracks and topography and would therefore not usually require significant earthworks. Emissions from construction activities at well pad construction sites were predicted to be within air quality criteria about 60 metres away.

The upgrade of Westport workers' accommodation would involve minimal ground disturbance due to the planned construction methods and upgrade footprint, and is not predicted to affect sensitive receivers.

Sensitive receivers would typically be sufficiently distant from construction activities to ensure emissions are within air quality criteria. In any case the emissions would be readily managed with the implementation of control measures, such as frequent dust suppression.

Emissions to air also have the potential to affect the clarity of the night sky. Siding Spring Observatory, about 80 kilometres south-west of the project area, would be sensitive to changes to clarity. Air emissions would generally decrease with distance from the source and become indistinguishable from surrounding air quality. Impacts to observing conditions at Siding Spring Observatory are therefore not predicted.

Measures to limit air emissions would be implemented at all construction sites, regardless of proximity to sensitive receivers. These measures as discussed in Section 18.7.

18.5 Potential impacts – operation

Sources of air emissions during operation would include the central gas processing facility and power generation facility at Leewood, safety flares at Leewood and Bibblewindi, diesel or gas generators at well pads and a limited number of pilot well flares. Sources of emissions during operation listed in Table 18 3.

Nitrogen dioxide was assessed to be the pollutant most likely to approach the relevant air quality criteria, based on emission estimates. The predicted ground-level concentrations of nitrogen dioxide, therefore, defined the distance at which other identified pollutants would be within the relevant air quality criteria. Other air emissions such as ozone, particulate matter (PM_{10}) and a range of other trace air emissions were also considered independently to assess compliance with relevant air quality criteria.

The total rate of project emissions at a given time would depend on the configuration and status of the emission sources listed in Table 18 3. These operating scenarios include:

- Power Supply Option 1 (power generated at Leewood):
  - routine operations (Leewood)
  - non-routine operations (Leewood and Bibblewindi).
- Power Supply Option 2 (power sourced from the national electricity grid):
  - routine operations (Leewood)
  - non-routine operations (Leewood and Bibblewindi).
- Well pad power generation – power generated locally from gas or diesel-fired engines.
  - routine operations
  - non-routine operations.

Routine operations were defined as those that release emissions to air on a regular and continuous basis such as:

- the power generation plant and hot oil boilers at Leewood
- the generators at the well pads.

This infrastructure is considered critical to the continuous operation of the project.

Non-routine operations are defined as those that release emissions to air on an irregular and intermittent basis such as:

- the operation of the flares at Leewood and Bibblewindi, beyond the minimal flow requirements
- pilot well flares, where required.

This infrastructure is a necessary element of the project design for maintenance and safety management. Consequently, it would only be utilised intermittently.

The results of the air quality assessment indicated that emissions during operations would be within air quality criteria at all identified sensitive receivers.

As during construction (see Section 18.4), it is considered that air emissions from the project would be indistinguishable from background concentrations well before Siding Spring Observatory and are not expected to affect observing conditions.

Table 18-3 Sources of air emissions during operation

Project component	Source of air emissions
Leewood	Central gas processing facility[a]
	Safety flare
	Power generation facility[b]
Bibblewindi	Safety flare
Gas field	Diesel-fired generators
	Gas-fired generators
	Pilot well flares

[a] Hot oil boiler on amine carbon dioxide removal circuit

[b] 100 megawatts, assessed as ten, 9.7 megawatt gas-fired engines

18.5.1 Leewood

Routine operations – Power Supply Option 1 (power generated at Leewood)

The predicted maximum air quality concentrations during operation of the central gas processing facility and power generation facility at Leewood are presented in Table 18-4 for routine operations (Power Supply Option 1). The results in Table 18-4 show that emissions would be within the relevant air quality criteria at all locations when the central gas processing facility and power generation facility operate simultaneously. The predicted one hour maximum concentration of the main emission (nitrogen dioxide) is mapped in Figure 18-4. As shown, the predicted concentrations of nitrogen dioxide would be below the relevant air quality criterion of 246 micrograms per cubic metre (over a one-hour averaging period).

Table 18-4 Predicted maximum air quality concentrations at the boundary of Leewood during operation of central gas processing facility and power generation facility

Emission	Averaging period	Predicted concentration (µg/m^3)	Criterion (µg/m^3)
PM_{10}	24 hour[b]	0.9[f]	50
	Annual[b]	0.2[f]	30
Nitrogen dioxide	1 hour[a]	70[e] (51[f])	246
	1 hour[b]	117[e] (98[f])	246
	Annual[a]	21[e] (3[f])	62
	Annual[b]	23[e] (4[f])	62
Carbon monoxide	1 hour[c]	305[f]	30,000
	1 hour[b]	11[f]	30,000
	8 hour[c]	87[f]	10,000
	8 hour[b]	3.2[f]	10,000
Ozone	1 hour[a]	127[e] (53[f])	214
	1 hour[b]	176[e] (102[f])	214
	4 hour[a]	102[e] (28[f])	171
	4 hour[b]	127[e] (53[f])	171
Acrolein	1 hour[c]	0.3[f]	0.42
Formaldehyde	1 hour[c]	1.6[f]	20
Acetaldehyde	1 hour[c]	0.2[f]	42
Cadmium	1 hour[d]	< 0.001[f]	0.018
Nickel	1 hour[d]	< 0.01[f]	0.18

[a] As per nominal engine and/or boiler data

[b] As per NSW emission standards under the Environment Operations (Clean Air) Regulation 2010

[c] As per US EPA AP-42 emission factors

[d] As per National Pollutant Inventory emission factors

[e] Includes background concentrations

[f] Incremental contribution from project activities

Note - The predicted impacts of acrolein, formaldehyde, acetaldehyde, cadmium and nickel exclude background air quality, as per the Approved Methods; the predicted impacts of carbon monoxide and PM_{10} exclude background air quality to demonstrate their negligible incremental impact.

Routine operations – Power Supply Option 2 (power sourced from the national electricity grid)

The predicted maximum ground-level concentrations of nitrogen dioxide during operation of the central gas processing facility and power generation facility at Leewood for routine operations (Power Supply Option 2) are the same as those presented in Table 18-4 for routine operations (Power Supply Option 1). This is due to the hot oil boiler being the primary contributor to ground-level concentrations of nitrogen dioxide and its operation during both power supply options.

As discussed above, the results show that emissions would be within the relevant air quality criteria at all locations when the central gas processing facility and power generation facility operate simultaneously.

Non-routine operations – Power Supply Option 1 (power generated at Leewood)

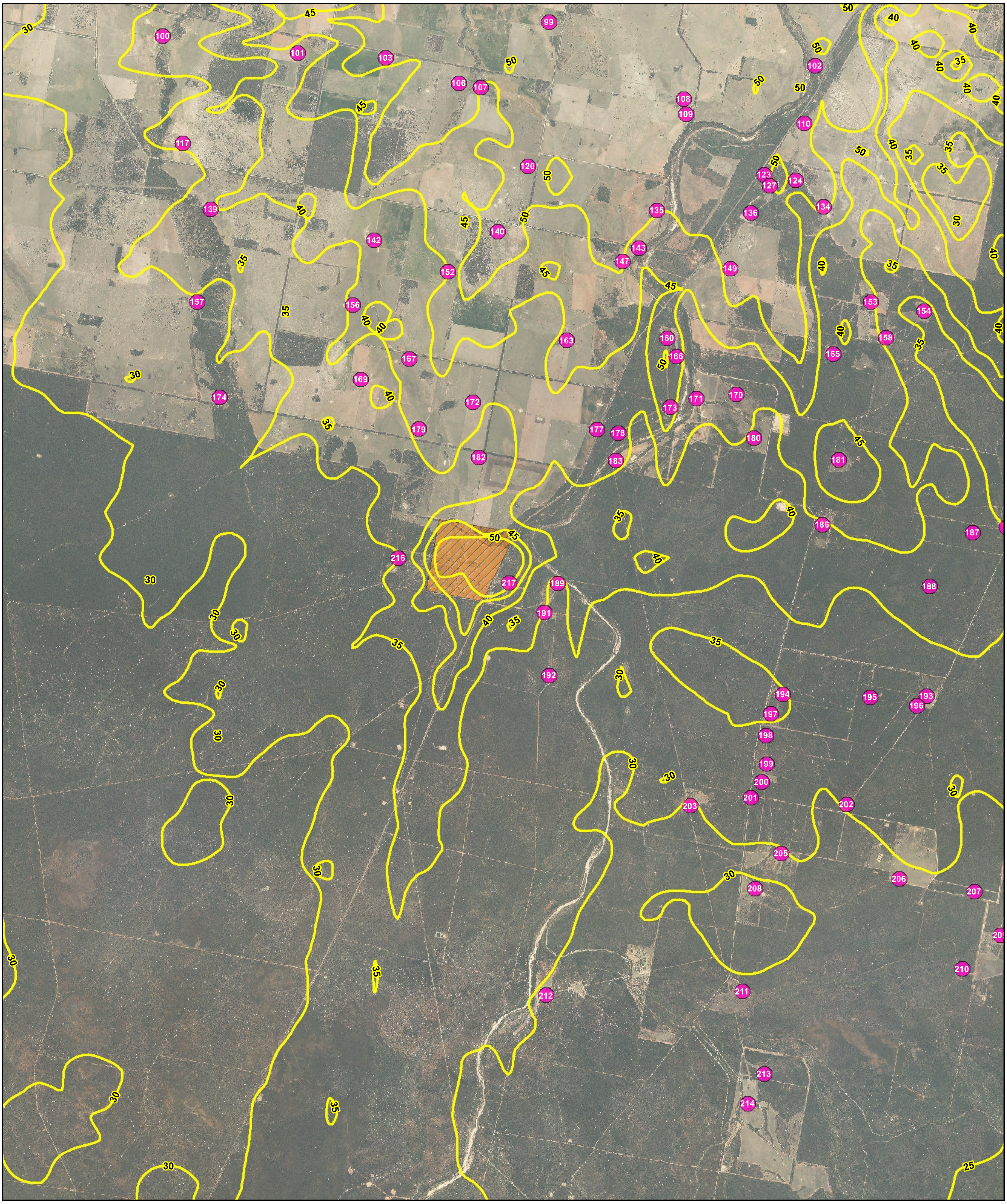
The predicted maximum ground-level pollutant concentrations during non-routine operations (safety flaring) at Leewood are presented in Table 18-5 for Power Supply Option 1. The predicted one hour maximum concentrations of nitrogen dioxide during non-routine operations are presented in Figure 18-5. The assessment of non-routine operations was assessed with the power plant and hot oil boilers operating simultaneously.

The results show that emissions would be within the relevant air quality criteria beyond the boundary of the facility during non-routine operations. The contribution of the safety flare to ground-level concentrations of assessed emissions would be negligible.

Table 18-5 Predicted maximum incremental one hour average ground-level pollutant concentrations beyond the boundary at Leewood during flaring

Emissions	Concentration, in isolation ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Percent of criterion (%)
Nitrogen dioxide	51	246	21
Carbon monoxide	146	30,000	0.5
Acetylene	3	26,600	0.01
Ethane	4	12,000	0.03
Propane	4	18,000	0.02
Propylene	13	8,750	0.1

Note: Predicted ground-level concentrations of nitrogen dioxide and carbon monoxide for total impact.



LEGEND

Leewood

Sensitive receivers

NO_2 concentration µg/m^3 (1 hour average)

0 0.75 1.5 3

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Narrabri Gas Project
EIS Technical Appendix Air Quality

Predicted maximum cumulative 1-hour average ground-level concentrations of nitrogen dioxide around Leewood for power supply option 1 routine operations, with background

Job Number	21-22463
Revision	A
Date	13 Mar 2015

Figure 18-4

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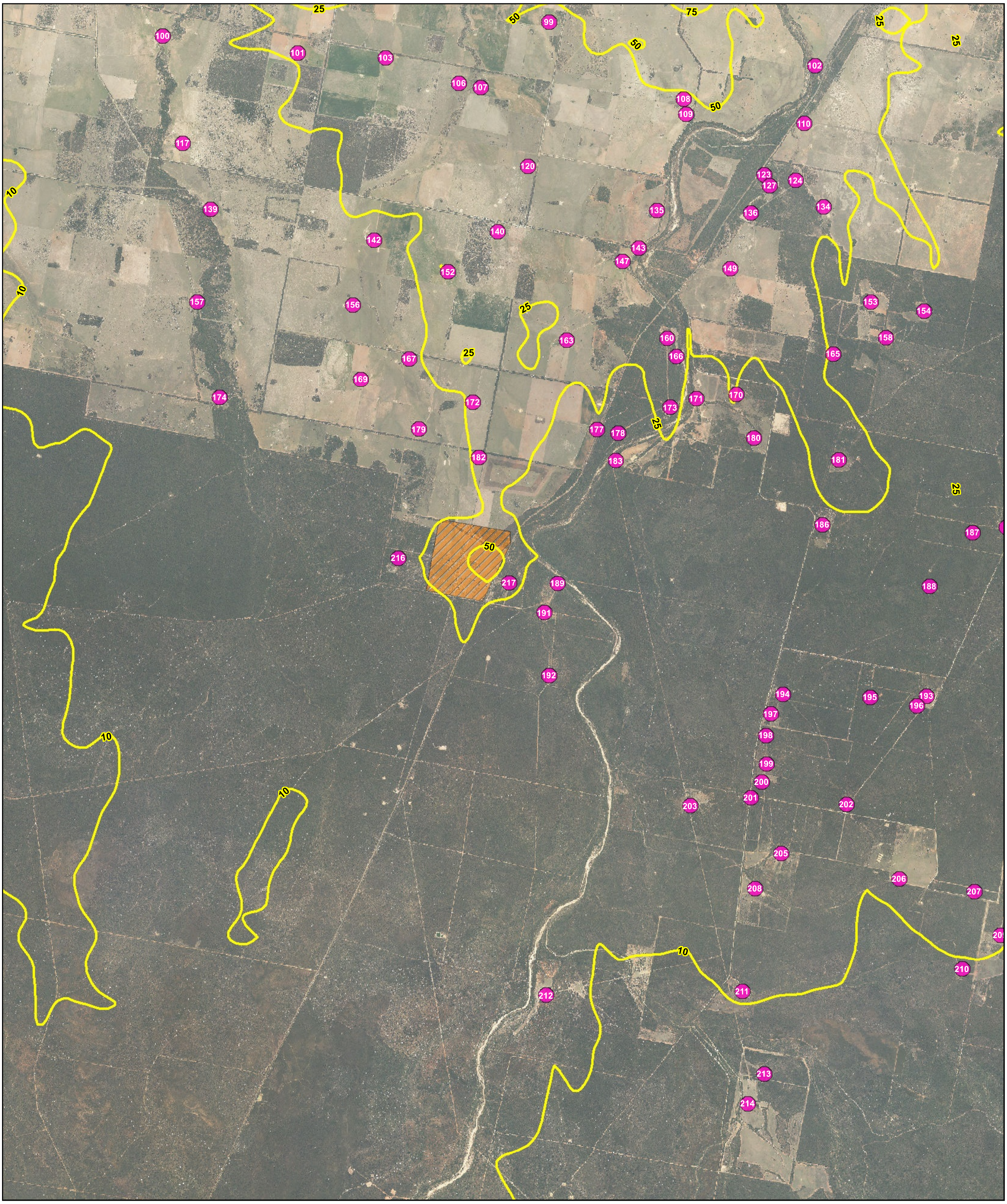
Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Geoscience Australia: Topographic Base Map - 2014. Created by: afoddy



LEGEND

Leewood

Sensitive receivers

NO_2 concentration µg/m^3(1 hour average)

0 0.75 1.5 3
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Narrabri Gas Project
EIS Technical Appendix Air Quality

Predicted 1-hour average ground-level concentrations of nitrogen dioxide around Leewood for power supply option 1 non-routine operations, no background

Job Number	21-22463
Revision	A
Date	13 Mar 2015

Figure 18-5

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Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Geoscience Australia: Topographic Base Map - 2014. Created by: afoddy

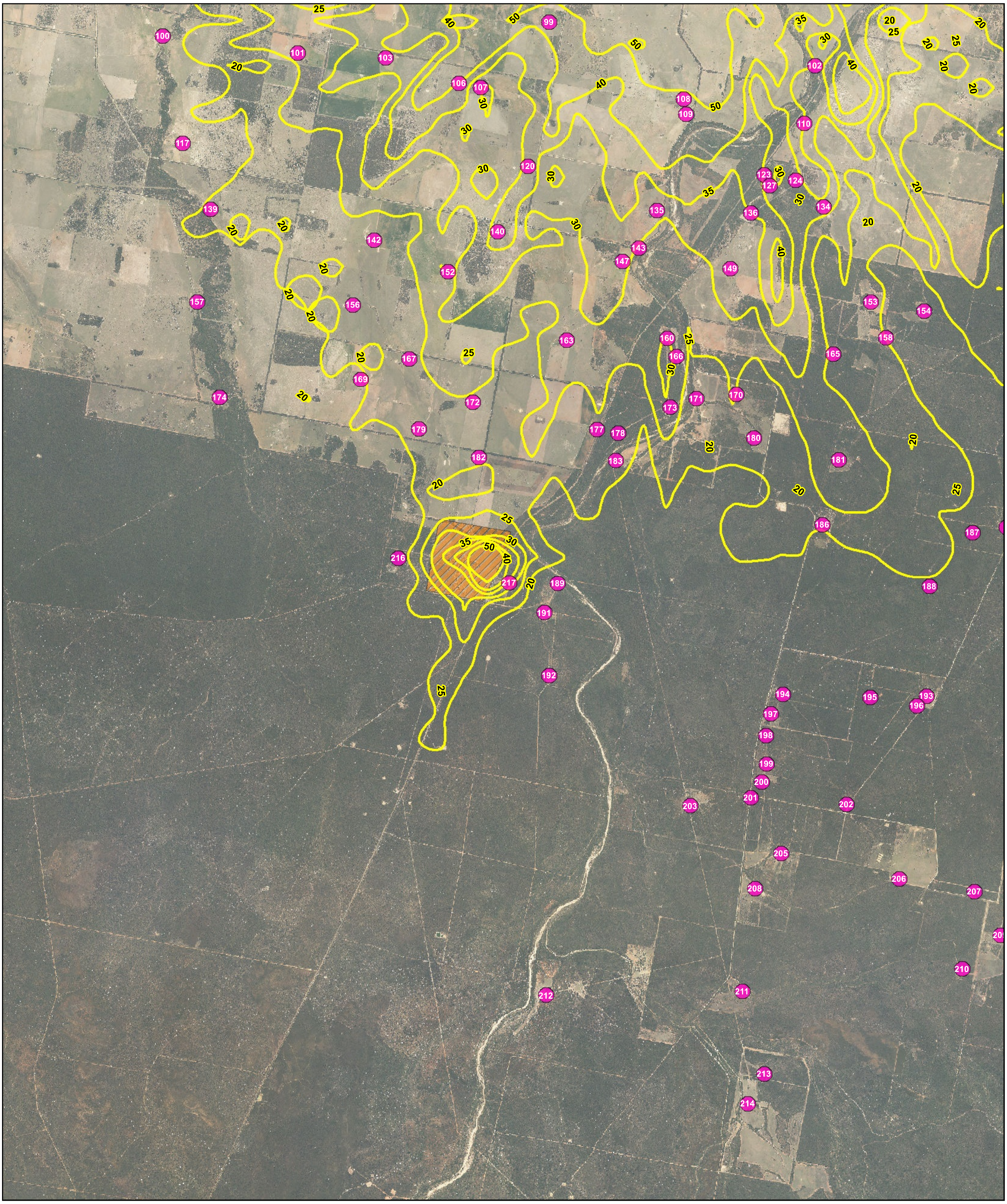
Non-routine operations – Power Supply Option 2 (power sourced from the national electricity grid)

The predicted maximum ground-level pollutant concentrations during non-routine operations (safety flaring) at Leewood are presented in Table 18-6 for Power Supply Option 2. The predicted one hour maximum concentrations of nitrogen dioxide during non-routine operations are presented in Figure 18-6. The assessment of non-routine operations was assessed with only the hot oil boilers operating simultaneously.

Similar to Power Supply Option 1, the results show that ground-level pollutant concentrations would be within the relevant air quality criteria beyond the boundary of the facility during non-routine operations.

Table 18-6 Predicted maximum incremental one hour average ground-level pollutant concentrations beyond the boundary at Leewood during flaring

Emission	Concentration, in isolation (μg/m^3)	Criterion (μg/m^3)	Percent of criterion (%)
Nitrogen dioxide	51	246	21
Carbon monoxide	141	30,000	0.5
Acetylene	3	26,600	0.01
Ethane	4	12,000	0.03
Propane	4	18,000	0.02
Propylene	13	8,750	0.1

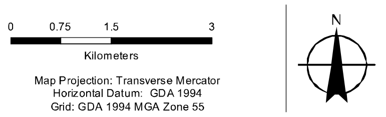


LEGEND

Leewood

Sensitive receivers

NO_2 concentration µg/m^3 (1 hour average)



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

Narrabri Gas Project
EIS Technical Appendix Air Quality

Predicted 1-hour average ground-level concentrations of nitrogen dioxide around Leewood for power supply option 2 non-routine operations, no background

Job Number	21-22463
Revision	A
Date	13 Mar 2015

Figure 18-6

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Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Geoscience Australia: Topographic Base Map - 2014. Created by: afoddy

18.5.2 Bibblewindi

As discussed above, routine operations were defined as those that release emissions to air on a regular and continuous basis and non-routine operations were defined as those that release emissions to air on an irregular and intermittent basis. There would be no routine operations at Bibblewindi. Rather, the proposed operations at Bibblewindi would include only non-routine operations (the operation of the safety flare). Therefore, only non-routine operations are discussed below.

Non-routine operations – Power Supply Option 1 (power generated at Leewood)

The predicted maximum ground-level pollutant concentrations during non-routine operations (safety flaring) at Bibblewindi are presented in Table 18-7 for Power Supply Option 1. The predicted one hour maximum ground-level concentrations of nitrogen dioxide during non-routine operations are presented in Figure 18-7. The results show that ground-level concentrations of all assessed emissions would be negligible and well below the air quality criteria.

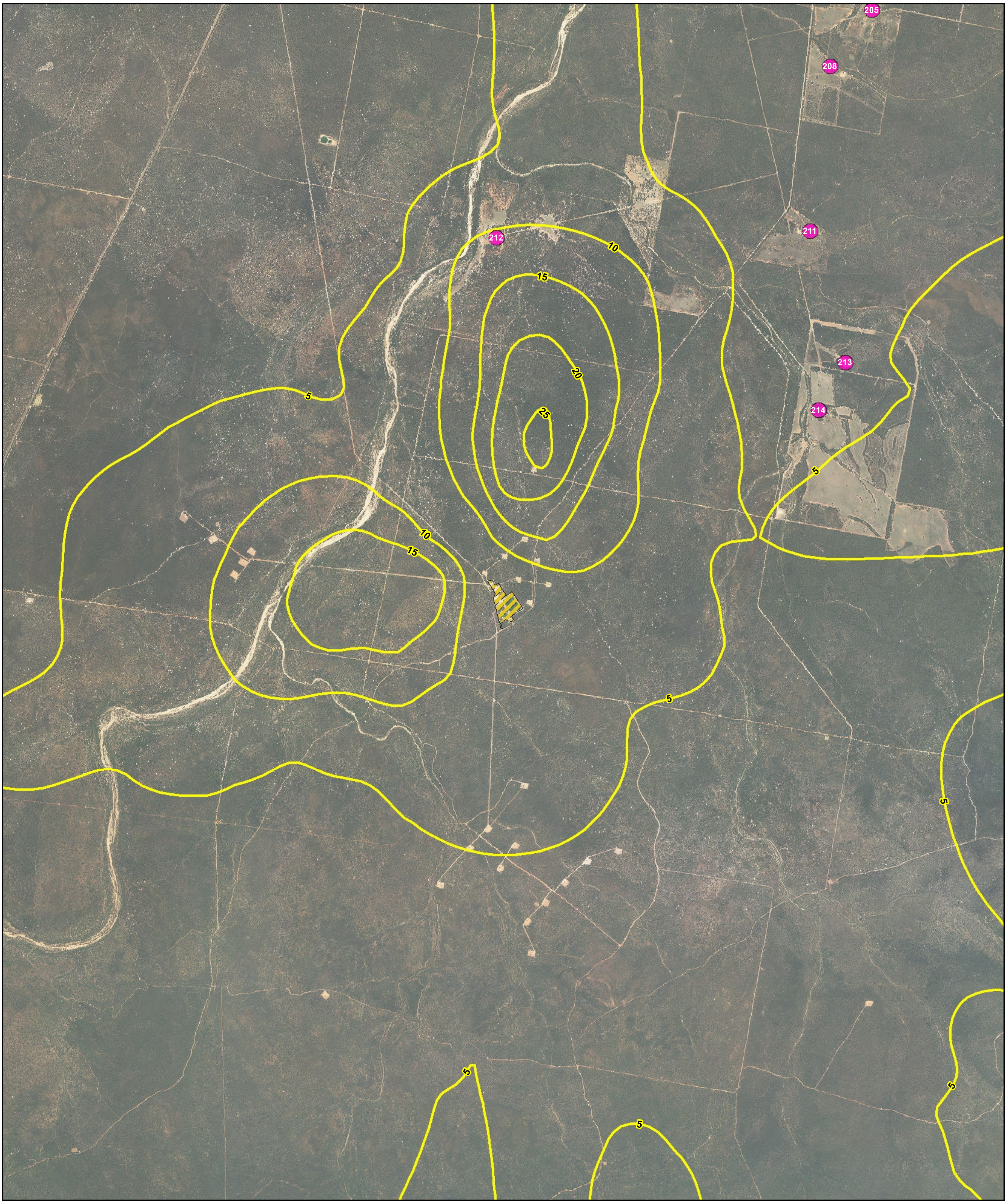
Table 18-7 Predicted maximum incremental one hour average ground-level pollutant concentrations beyond the boundary at Bibblewindi during safety flaring

Emission	Concentration, In isolation ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Percent of criterion (%)
Nitrogen dioxide	25	246	10.2
Carbon monoxide	135	30,000	0.5
Acetylene	2.4	26,600	0.01
Ethane	3.8	12,000	0.03
Propane	3.4	18,000	0.02
Propylene	12.0	8,750	0.1

Note: Predicted ground-level concentrations of nitrogen dioxide and carbon monoxide for total impact. i.e. flare emissions only due to no engines at Bibblewindi.

Non-routine operations – Power supply Option 2 (power sourced from the national electricity grid)

The predicted ground-level pollutant concentrations during non-routine operations (safety flaring) at Bibblewindi for Power Supply Option 2 would be the same as those for Power Supply Option 1 (discussed above). Ground-level concentrations of assessed emissions would be negligible and well below the air quality criteria.

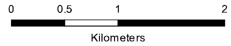


LEGEND

Bibblewindi

NO_2 concentration µg/m^3(1 hour average)

Sensitive receivers



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

Narrabri Gas Project
EIS Technical Appendix Air Quality

Predicted 1-hour average ground-level concentrations of nitrogen dioxide around Bibblewindi for power supply option 1 non-routine operations, no background

Job Number	21-22463
Revision	A
Date	13 Mar 2015

Figure 18-7

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Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

Data source: NSW Department of Lands: DTDB and DCDB - 2012-13. Santos: Operational and Base Data - 2013. Geoscience Australia: Topographic Base Map - 2014. Created by: afoddy

18.5.3 Gas field

The assessment of gas field infrastructure shows that the most important emission —nitrogen dioxide from the operation of generators at well pads—would comply with the relevant air quality criteria at the well pad and therefore all identified sensitive receivers. The assessment also showed that emissions of nitrogen dioxide from pilot well flares, if installed, would be negligible.

Routine operations

The assessment of nitrogen dioxide emissions from generators at well pads indicates that:

- predicted ground-level concentrations of nitrogen dioxide associated with both the gas and diesel-fired generator engines are well below the air quality criteria at the boundary of the well pad
- emissions associated with the gas-fired well pad generator engines are below the NSW emission concentration standards of nitrogen dioxide
- no additional separation beyond the boundary of the well pad is required for either generator engine operating on either fuel type.

The concentration of nitrogen dioxide emissions over distance from the diesel generators are shown in Figure 18-8.

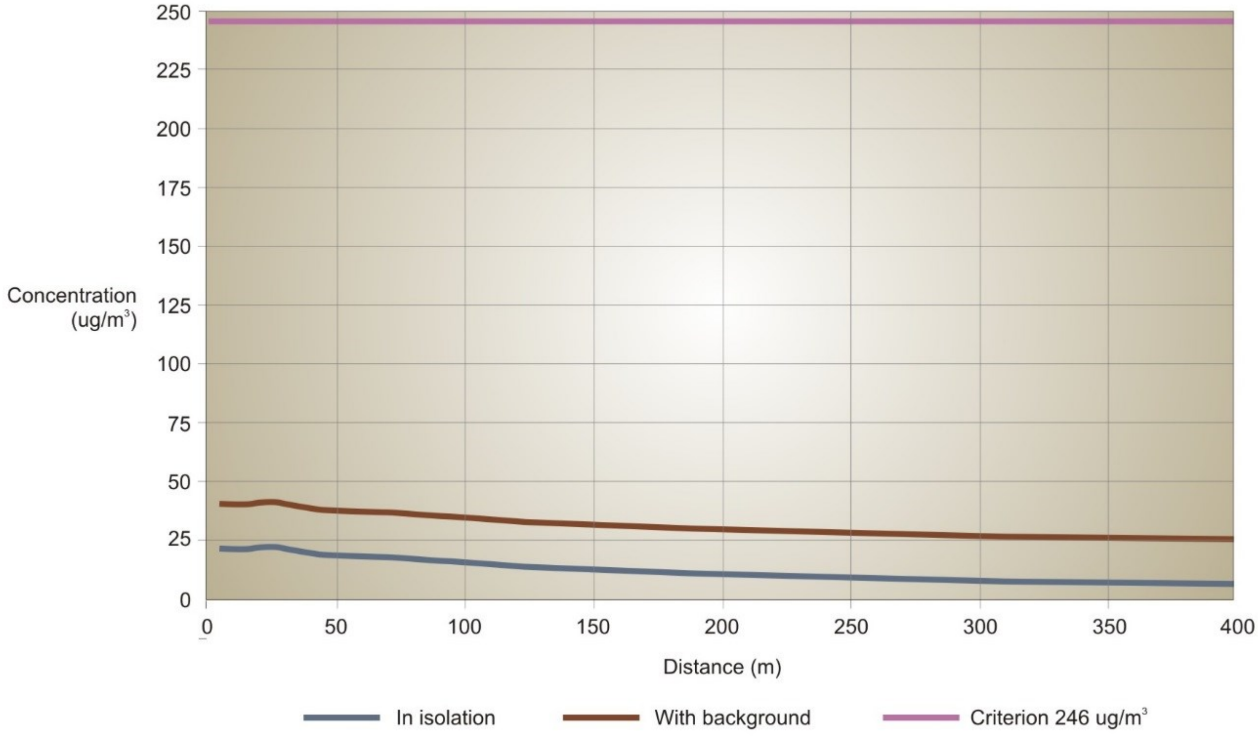

Figure 18-8 Nitrogen dioxide concentrations over distance from diesel generator

The concentration of nitrogen dioxide emissions over distance from gas generators are depicted in Figure 18-9.

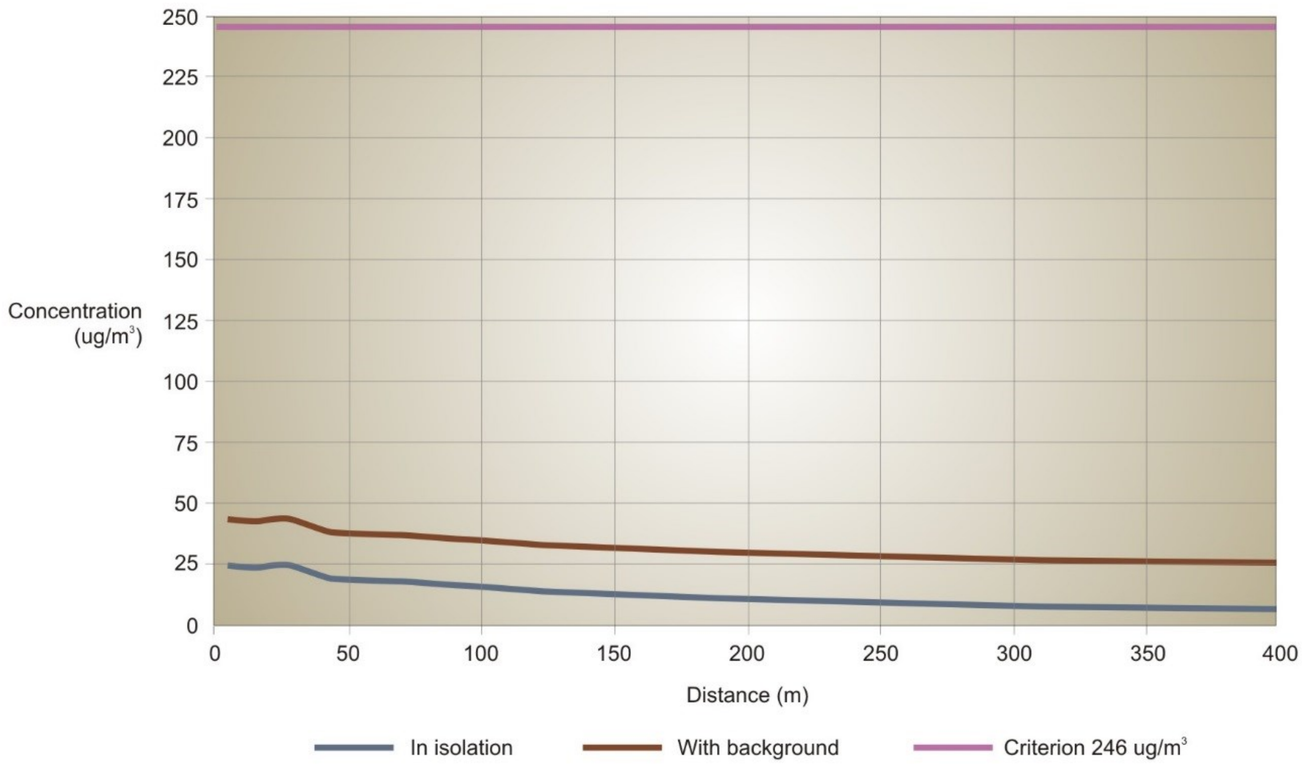

Figure 18-9 Nitrogen dioxide concentrations over distance from gas generator

As shown, the predicted concentrations are well within the relevant air quality criterion.

Non-routine operations

The assessment also showed that emissions of nitrogen dioxide from pilot well flares would be negligible, if required. Emissions of nitrogen dioxide during non-routine operations would therefore fall well within the relevant air quality criterion, as with routine operations.

18.6 Potential impacts – decommissioning

The removal of infrastructure during decommissioning has the potential to generate similar types of air emissions to those assessed during construction (refer to Section 18.4), although generally in lower quantities. Emissions would be temporary, generally short-term and readily managed with the implementation of dust control measures.

18.7 Mitigation and management

An Air Quality Management Plan would be implemented during construction and operation of the project. The Plan would include an air quality monitoring program and a suite of measures that could be implemented to prevent or minimise air emissions, where necessary.

Standard construction dust control measures that would be reflected in the Air Quality Management Plan include watering or application of commercial dust suppressants on disturbed soil surfaces, covering erodible material prior to transport and vehicle speed controls. The proposed mitigation and management measures are summarised in Table 18-8.

Table 18-8 Mitigation and management measures

Potential impact	Phase	Mitigation/management
Air emissions exceeding relevant air quality criteria at residences on private land	Construction Operation Decommissioning	All reasonable and feasible measures will be implemented to ensure that air emissions from the activity will be within the relevant air quality criteria at occupied residences on privately owned land. Plant and equipment will be operated in accordance with relevant NSW emission standards An Air Quality Management Plan will be implemented.

18.8 Conclusion

Emissions from the operation of the project were predicted to comply with air quality criteria at all identified sensitive receivers. These sensitive receivers would also typically be sufficiently distant from construction activities to ensure emissions are within air quality criteria. Otherwise emissions would be readily managed with the implementation of control measures, such as frequent dust suppression.

All reasonable and feasible measures would be implemented for project emissions to comply with regulatory air quality criteria at occupied residences on private land, unless subject to a private negotiated agreement with the landholder.

An Air Quality Management Plan would be implemented during the construction, operation and decommissioning of the project. The Plan would include an air quality monitoring program and a suite of measures that could be implemented to prevent or minimise air emissions.