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Air Quality Impact Assessment

Supplementary Report

Report prepared for

GHD

Santos Narrabri Gas Project

28 August 2019

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Authors:	Andrew Balch and Mike Power
Reviewed by:	Mike Power
Project director:	Andrew Balch

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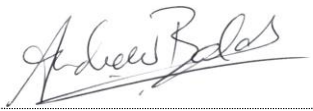

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Andrew Balch
Director and Principal Consultant
Air Environment Consulting (trading as Air Environment)

A: 12/783 Kingsford Smith Drive, Eagle Farm, Queensland 4009 Australia
P: PO Box 673, The Gap, Queensland 4061 Australia
E: info@airenvironment.com.au

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Term	Definition
Units of measurement	
m	metre
µg/m^3	microgram per cubic metre
mg/m^3	milligram per cubic metre
Scientific abbreviations and chemical nomenclature	
bkgd	background concentration
EPA	Environmental Protection Authority
NO_X	oxides of nitrogen
NO_2	nitrogen dioxide
O_3	ozone
pred	predicted
RTS	Response to Submissions

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Executive Summary

Air Environment Consulting (AEC) was commissioned by GHD to lead an air quality impact assessment study of Santos' proposed Narrabri Gas Project. In 2017, submissions were received from the NSW Environment Protection Authority (EPA), the public and various other agencies and concerned parties providing questions and comments with respect to methods employed and results presented in the air quality impact assessment (AEC, 2016). Questions raised in these submissions were addressed in the Air Quality Impact Statement - Response to Submissions Report prepared in December 2017 (AEC, 2017).

Further issues were identified in August 2019 with respect to the assessment of nitrogen dioxide (NO_2) and ozone (O_3) in AEC (2017). This report addresses these air quality issues.

A revised assessment of predicted NO_2 and O_3 impacts associated with the Narrabri Gas Project was conducted regarding potential exceedances of the ambient air quality criteria based on the initial assessment that used the overly conservative NSW EPA approved Method 1, 100% NO_2/NO_X, conversion ratio. To refine the predicted NO_2 concentrations, and subsequently the predicted O_3 concentrations, the NSW EPA Method 2, Level 1, Ozone Limiting Method has been applied. The OLM approach incorporates both the predicted incremental NO_X emissions and measured background concentrations of NO_2 and O_3.

The revised assessment determined that for either power supply option under routine operations, the:

- Predicted maximum cumulative 1-hour average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary is 104.0 µg/m^3.
- Predicted cumulative annual average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary is 27.0 µg/m^3.
- Predicted maximum cumulative 1-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary is 108.5 µg/m^3.
- Predicted maximum cumulative 4-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary is 97.6 µg/m^3.

The impacts are similar for the two power supply options due to the most significant contributing source of NO_X emissions being the four boilers located at Leewood.

The assessment also determined that the addition of a well head engine at the location of the predicted highest ground level concentration of NO_2 near the Leewood boundary would not cause an exceedance of the NO_2 and O_3 air quality criteria. This assessment determined that:

- Predicted maximum cumulative 1-hour average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary with the inclusion of a well head engine is 121.6 µg/m^3, which is 49% of the criterion.
- Predicted maximum cumulative 1-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary with the inclusion of a well head engine is 126.9 µg/m^3, which is 59% of the criterion.

This assessment indicates that the Narrabri Gas Project is unlikely to cause an adverse impact to air quality in the region.

1 Introduction

AEC was commissioned by GHD to lead the air quality impact assessment study for Santos' proposed Narrabri Gas Project environmental impact assessment. In 2017, submissions were received from the NSW EPA and other concerned parties providing questions and comments with respect to methods employed and results presented in the air quality impact assessment. Questions raised in these submissions were addressed in the Air Quality Impact Statement - Response to Submissions Report prepared in December 2017 (AEC, 2017).

Further issues were identified in August 2019, with respect to the assessment of nitrogen dioxide (NO_2) and ozone (O_3). This report addresses these air quality issues.

2 Issue with the Assessment of Nitrogen Dioxide and Ozone

2.1 Issue 1

The Air Quality Impact Statement - Response to Submissions Report (AEC, 2017), predicted ground-level concentration values of NO_2 and O_3 at and beyond the boundary of the Leewood Gas Processing Facility. The predicted concentrations of NO_2 and O_3 in the tables in Appendix A included the background concentrations measured as part of the assessment study.

The intent of these tables was to show the predicted ground-level concentrations of all substances at and beyond the boundary of the Leewood and Bibblewindi facilities, and at sensitive receptors for all project emissions under various operating scenarios including cumulative emissions. All pollutants including criteria and other hazardous air pollutants (HAPs) which include volatile organic compounds (VOCs) were presented in the tables. To avoid any inconsistency and confusion, only the project incremental impacts, i.e. without background concentrations, were presented for NO_2 and O_3. This follows the Approved Methods protocol of assessing HAPs, i.e. non-criteria pollutants, in isolation.

2.2 Issue 2

Does the addition of a background concentration cause the impact assessment criterion of NO_2 and O_3 to be exceeded?

The initial impact assessment was conducted based on overly conservative estimates using the Method 1 (of the NSW Approved Methods) for the conversion of NO_X to NO_2. This method assumes a 100% conversion ratio. Using this approach, it was determined that the 1-hour average assessment criterion of NO_2 and O_3 would be exceeded beyond the Wilga Park Power Station boundary.

To address this conservative prediction, the method for converting predicted NO_X concentrations to NO_2 has been refined using EPA's (2016) Method 2, Level 1 Ozone Limiting Method (OLM). The results of this assessment are presented in Section 3.

2.3 Issue 3

There was an inconsistency in the comparison of concentration data for 1-hour and 4-hour average O_3.

Air Environment reviewed the data presented in Appendix A of AEC (2017). This review identified an inconsistency in the selection of data for the tables for the predicted maximum concentration at and beyond the Leewood boundary for various averaging periods. In particular, concentrations presented for the 1-hour average of NO_2, and then used to convert NO_2 to O_3, were identified at the location of the highest prediction near the Leewood boundary. By contrast, the highest 4-hour average of O_3, based on the 4-hour average of NO_2 (which is not shown as it is not an assessment criterion) was identified in the vicinity of the Wilga Park Power Station boundary. Consequently, the modelled data was real but did not show comparable results, instead comparing predictions from near Leewood to predictions near Wilga Park, a significant distance apart. This has been corrected in this report.

3 Revised Assessment Method for Calculating Nitrogen Dioxide and Ozone

3.1 Nitrogen dioxide calculation

The impact assessment of NO_2 and O_3 has been revised from the original assessment method that used the EPA Method 1 NO_X to NO_2 conversion ratio of 100%. This assessment has refined the NO_X to NO_2 conversion approach by applying the Method 2, Level 1 Ozone Limiting Method (OLM), as described in the NSW EPA Approved Methods, (Section 8.1.2, p.39) (EPA, 2017). The OLM equation is as follows:

Equation 1:

$$[NO_2]_{total} = \{0.1 \times [NOx]_{pred}\} + Min\{(0.9) \times [NOx]_{pred} \; or \; (^{46}/_{48}) \times [O_3]_{bkgd}\} + [NO_2]_{bkgd}$$

Where:

- $[NO_2]_{total}$ = the predicted concentration of NO_2 in µg/m^3
- $[NO_X]_{pred}$ = the dispersion model prediction of the ground-level concentration of NO_X in µg/m^3
- Min = the minimum of the two quantities within the braces
- $[O_3]_{bkgd}$ = the background ambient O_3 concentration in µg/m^3
- (46/48) = the molecular weight of NO_2 divided by the molecular weight of O_3
- $[NO_2]_{bkgd}$ = the background ambient NO_2 concentration in µg/m^3

The data used to calculate NO_2 from predicted NO_X concentrations in the model domain using the OLM equation are presented in Table 3-1.

Table 3-1 Parameter values used to calculate NO_2 using the OLM

Parameter	Averaging period	Value
In-stack proportion of NO_2/NO_X	N/A	0.1
NO_2 background concentration	1-hour	18.5
	Annual	18.5
O_3 background concentration	1-hour	74.2
	4-hour	72

3.2 Ozone calculation

Ozone concentrations have been calculated on the basis of a 100% NO_2/O_3 conversion ratio using the molar ratio of NO_2/O_3 of 48/46, as prescribed in the OLM approach.

4 Impact Assessment Results

The results of the revised assessment based on the conversion of NO_X to NO_2 using the OLM and subsequent conversion of NO_2 to O_3 is presented for Leewood's two power supply options and for routine and non-routine (i.e. during flaring at Leewood) operations. Predicted ground-level concentrations are presented for power supply options 1 and 2 around the Leewood facility in Table 4-1 and Table 4-2 respectively. Predicted ground-level concentrations are presented for power supply option 1 around the Wilga Park Power Station facility under routine operating conditions in Table 4-3.

Table 4-1 Predicted ground-level pollutant concentrations around the Leewood facility for power supply option 1

Pollutant	Averaging period	Maximum along the site boundary	Maximum at and beyond site boundary	L169	L179	L182	L189	L191	L192
Routine operations									
Nitrogen dioxide	1-hour	97.7	104.0	33.9	38.0	45.8	45.7	49.1	40.2
	Annual	23.2	27.0	19.0	19.1	18.9	18.9	18.9	18.9
Ozone	1-hour	101.9	108.5	35.4	39.6	47.7	47.7	51.2	42.0
	4-hour	72.9	97.6	29.6	34.4	30.6	29.7	34.2	30.1
Non-routine operations									
Nitrogen dioxide	1-hour	97.7	104.0	33.9	38.0	60.0	45.7	49.1	40.2
	Annual	23.3	27.0	19.0	19.1	18.9	18.9	18.9	18.9
Ozone	1-hour	101.9	108.5	35.4	39.6	62.6	47.7	51.2	42.0
	4-hour	72.9	97.6	29.6	34.4	32.6	29.7	34.2	30.1

Table note:
NO_2 1-hour average assessment criterion is 246 µg/m^3
NO_2 annual average assessment criterion is 62 µg/m^3
O_3 1-hour average assessment criterion is 214 µg/m^3
O_3 4-hour average assessment criterion is 171 µg/m^3

Table 4-2 Predicted ground-level pollutant concentrations around the Leewood facility for power supply option 2

Pollutant	Averaging period	Maximum along the site boundary	Maximum at and beyond site boundary	L169	L179	L182	L189	L191	L192
Routine operations									
Nitrogen dioxide	1-hour	97.7	104.0	33.8	38.0	42.4	44.1	49.1	40.2
	Annual	23.0	26.8	18.9	19.0	18.8	18.8	18.8	18.7
Ozone	1-hour	101.9	108.5	35.3	39.6	44.2	46.1	51.2	42.0
	4-hour	72.9	96.8	29.6	34.4	30.5	29.3	34.1	30.1
Non-routine operations									
Nitrogen dioxide	1-hour	97.7	104.0	33.8	38.0	42.6	44.1	49.1	40.2
	Annual	23.0	26.8	18.9	19.0	18.8	18.8	18.8	18.7
Ozone	1-hour	101.9	108.5	35.3	39.6	44.5	46.1	51.2	42.0
	4-hour	72.9	96.8	29.6	34.4	30.5	29.3	34.1	30.1

Table note:
NO_2 1-hour average assessment criterion is 246 µg/m^3
NO_2 annual average assessment criterion is 62 µg/m^3
O_3 1-hour average assessment criterion is 214 µg/m^3
O_3 4-hour average assessment criterion is 171 µg/m^3

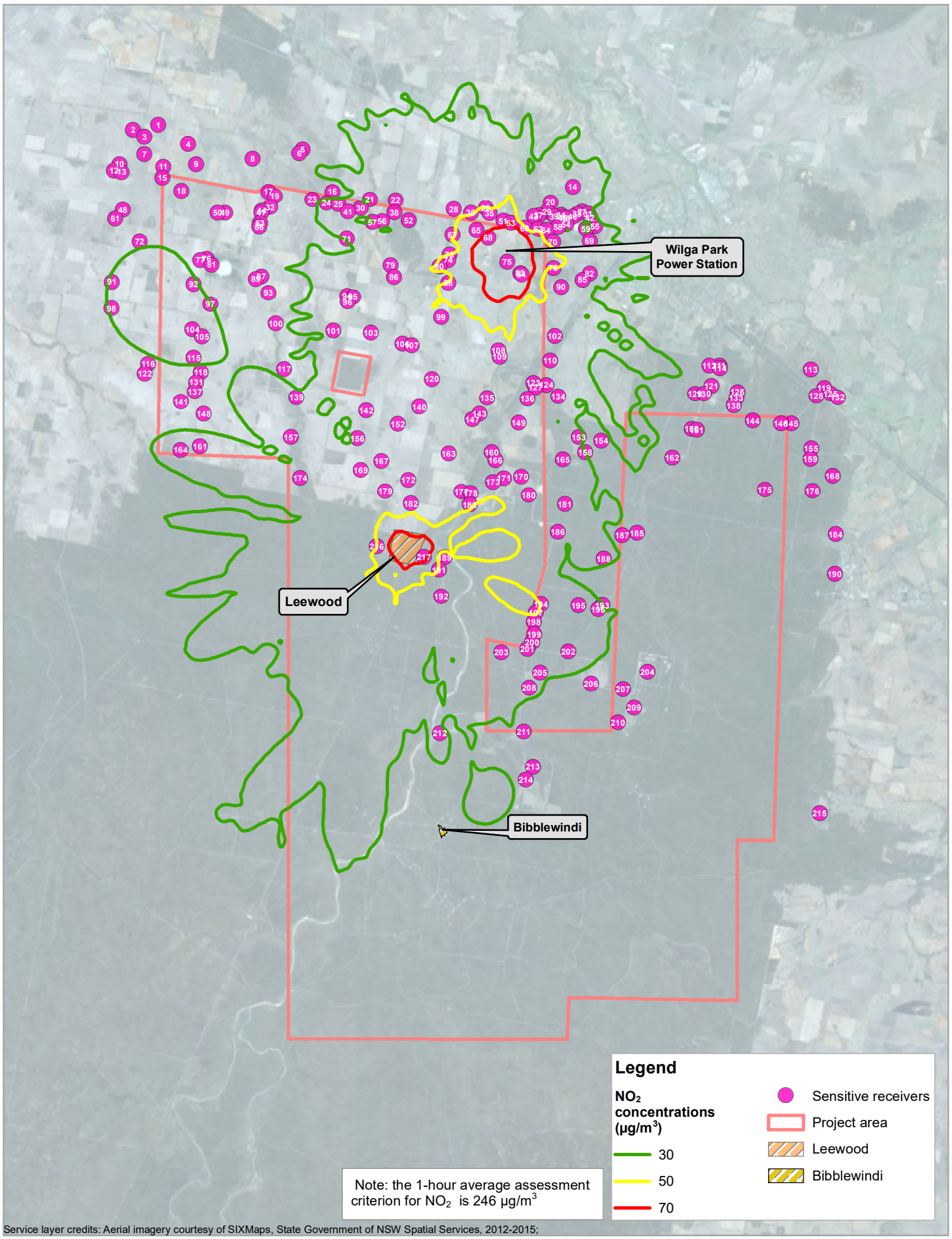
Table 4-3 Predicted ground-level pollutant concentrations around the Wilga Park Power Station for power supply option 1 under routine operating conditions

Pollutant	Averaging period	Maximum along the site boundary	Maximum at and beyond site boundary
Nitrogen dioxide	1-hour	115.4	124.9
	Annual	24.9	27.0
Ozone	1-hour	120.4	130.3
	4-hour	105.8	107.0

Table note: NO_2 1-hour average assessment criterion is 246 µg/m^3
NO_2 annual average assessment criterion is 62 µg/m^3
O_3 1-hour average assessment criterion is 214 µg/m^3
O_3 4-hour average assessment criterion is 171 µg/m^3

Predicted maximum and average cumulative ground-level concentrations of NO_2 and O_3 for power supply options 1 and 2 under routine operating conditions are presented as concentration isopleth maps in Figure 4-1 to Figure 4-8. NO_2 and O_3 concentrations have been calculated using the OLM.

A further cumulative assessment has been made based on situating a gas or diesel fired well head generator engine at the location of the predicted maximum ground-level concentration at and beyond the boundary of the Leewood facility. Emissions based on well head generator engines that comply with the NSW Clean Air Regulation NO_X emission concentration standard of 450 mg/m^3 were modelled to predict the maximum impact downwind of the generator stack at the boundary of the well head. At 30 m from the stack (i.e. the boundary of the well head), the 1-hour average concentration of NO_2 was predicted to be 17.6 µg/m^3. When this concentration is combined with the predicted maximum NO_2 concentration at and beyond the boundary of 104.0 µg/m^3 for either power supply option 1 or 2 under routine operating conditions, the highest cumulative ground-level concentration is 121.6 µg/m^3. This is well below, or 49% of, the NO_2 criterion of 246 µg/m^3. The corresponding maximum 1-hour average O_3 concentration is 126.9 µg/m^3, which is 59% of the O_3 criterion. This indicates that the installation of well head engines at a density of 750 m apart close to the Leewood boundary in the area of most significant impact would not cause the NO_2 and O_3 impact assessment criteria to be breached.



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Kilometers

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

N

GHD

Predicted maximum cumulative 1-hour average ground-level NO_2 concentrations (based on OLM) for power supply option 1 under routine operating conditions

Project No. **21-22463**
Revision No. **-**
Date **23/08/2019**

Figure 4-1

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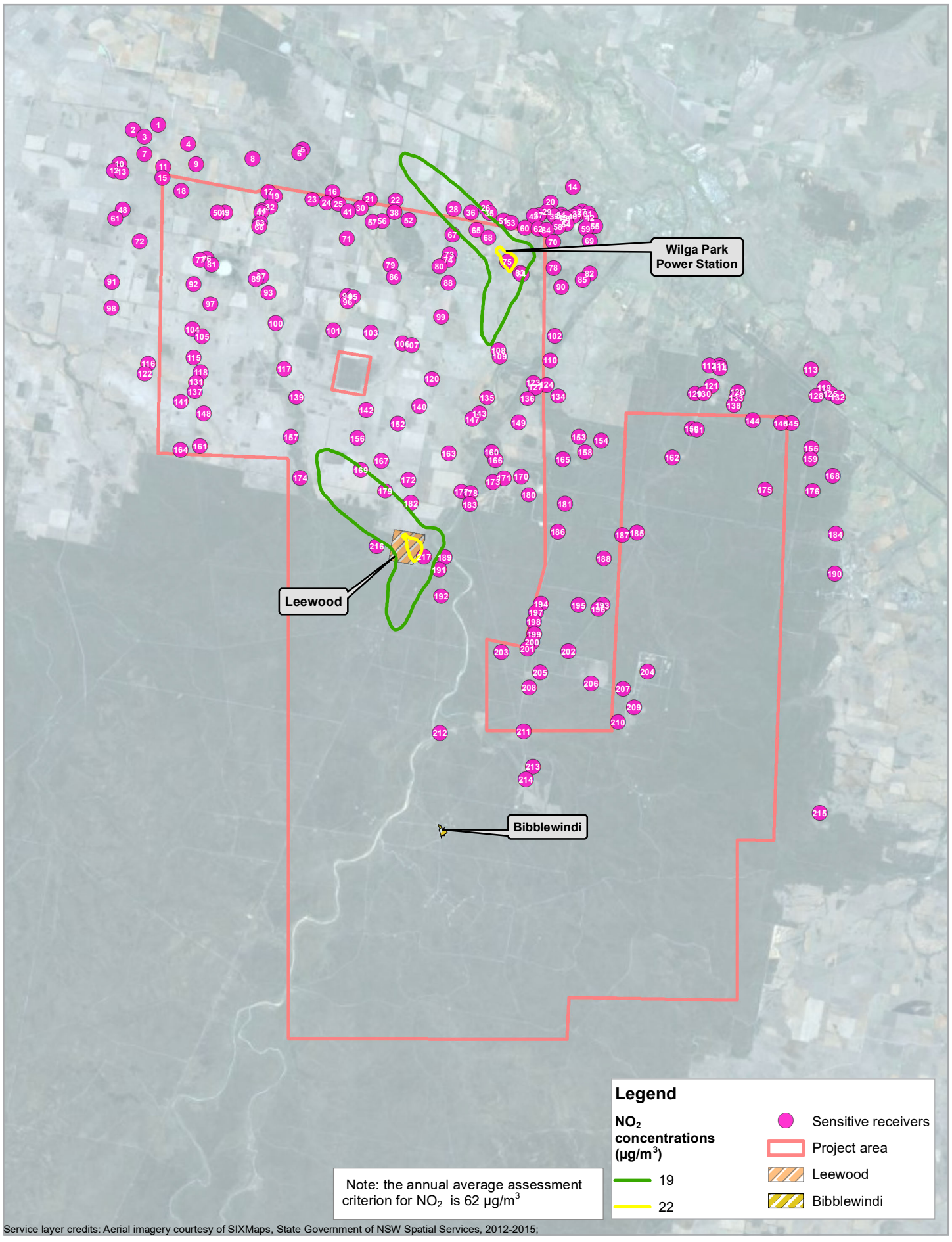

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GHD

Predicted cumulative annual average ground-level NO_2 concentrations (based on OLM) for power supply option 1 under routine operating conditions

Project No. **21-22463**
Revision No. **-**
Date **23/08/2019**

Figure 4-2

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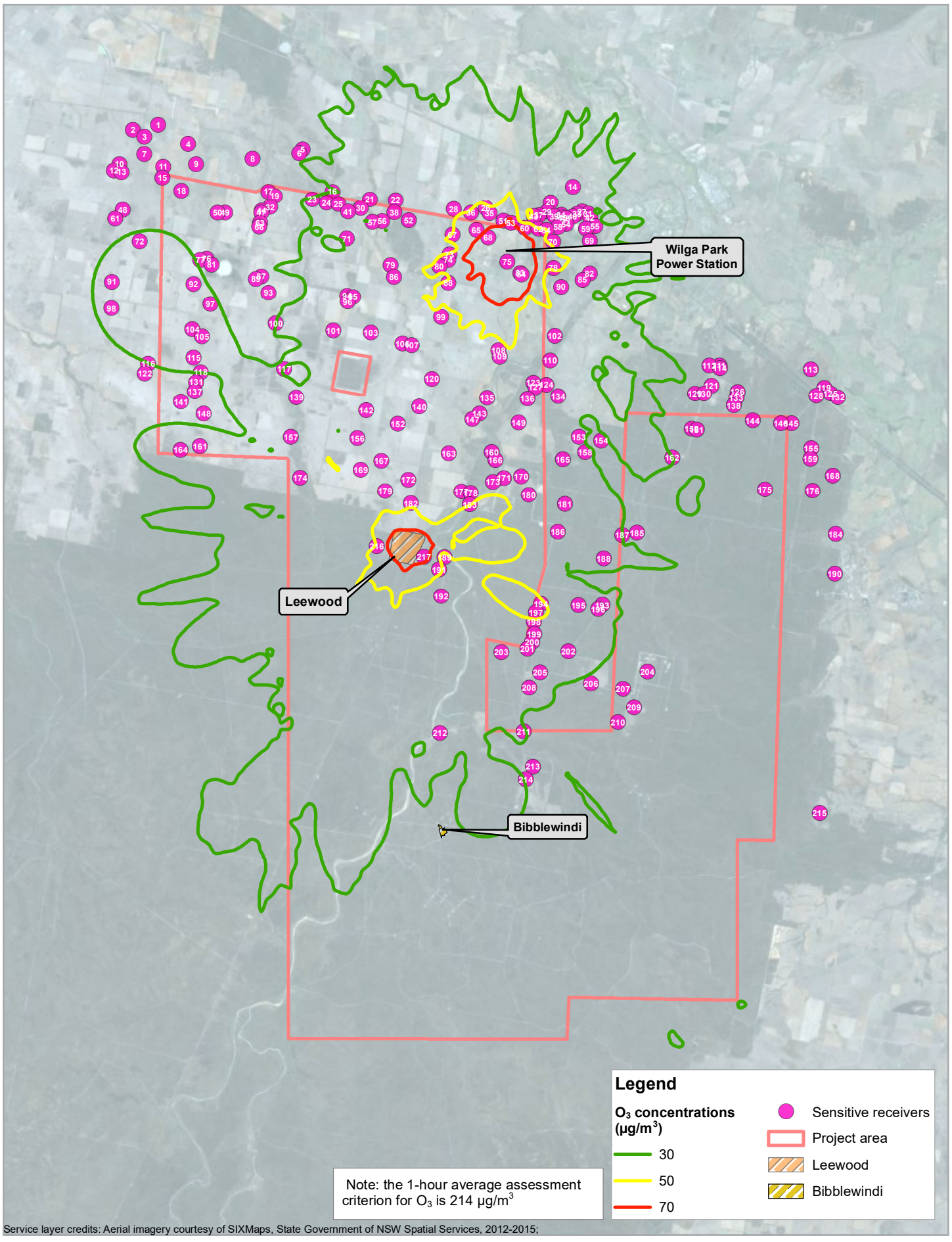

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Kilometers

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

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GHD

Predicted maximum cumulative 1-hour average ground-level O_3 concentrations (based on OLM) for power supply option 1 under routine operating conditions

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Figure 4-3

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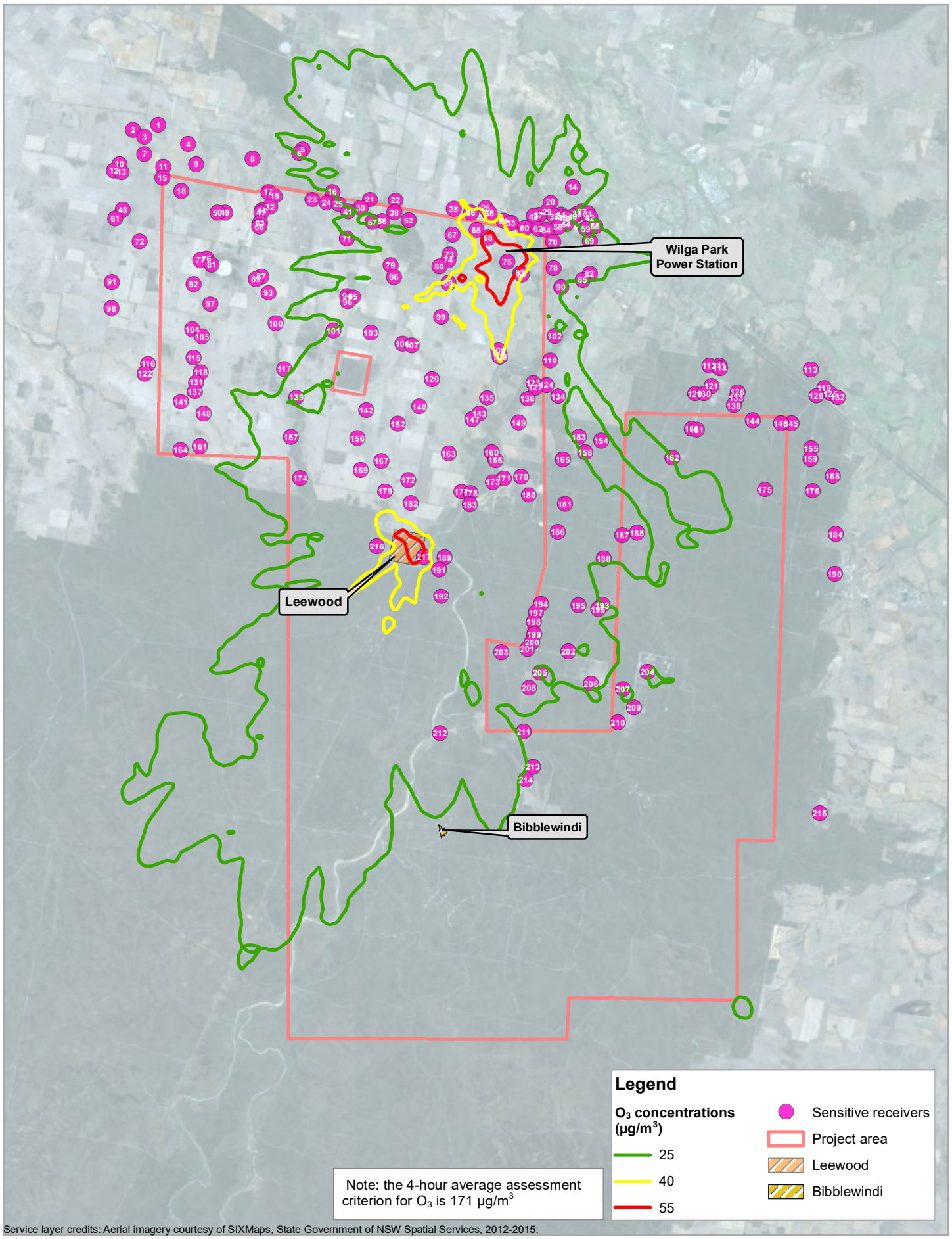

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Kilometers

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

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Predicted maximum cumulative 4-hour average ground-level O_3 concentrations (based on OLM) for power supply option 1 under routine operating conditions

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Revision No. **-**
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Figure 4-4

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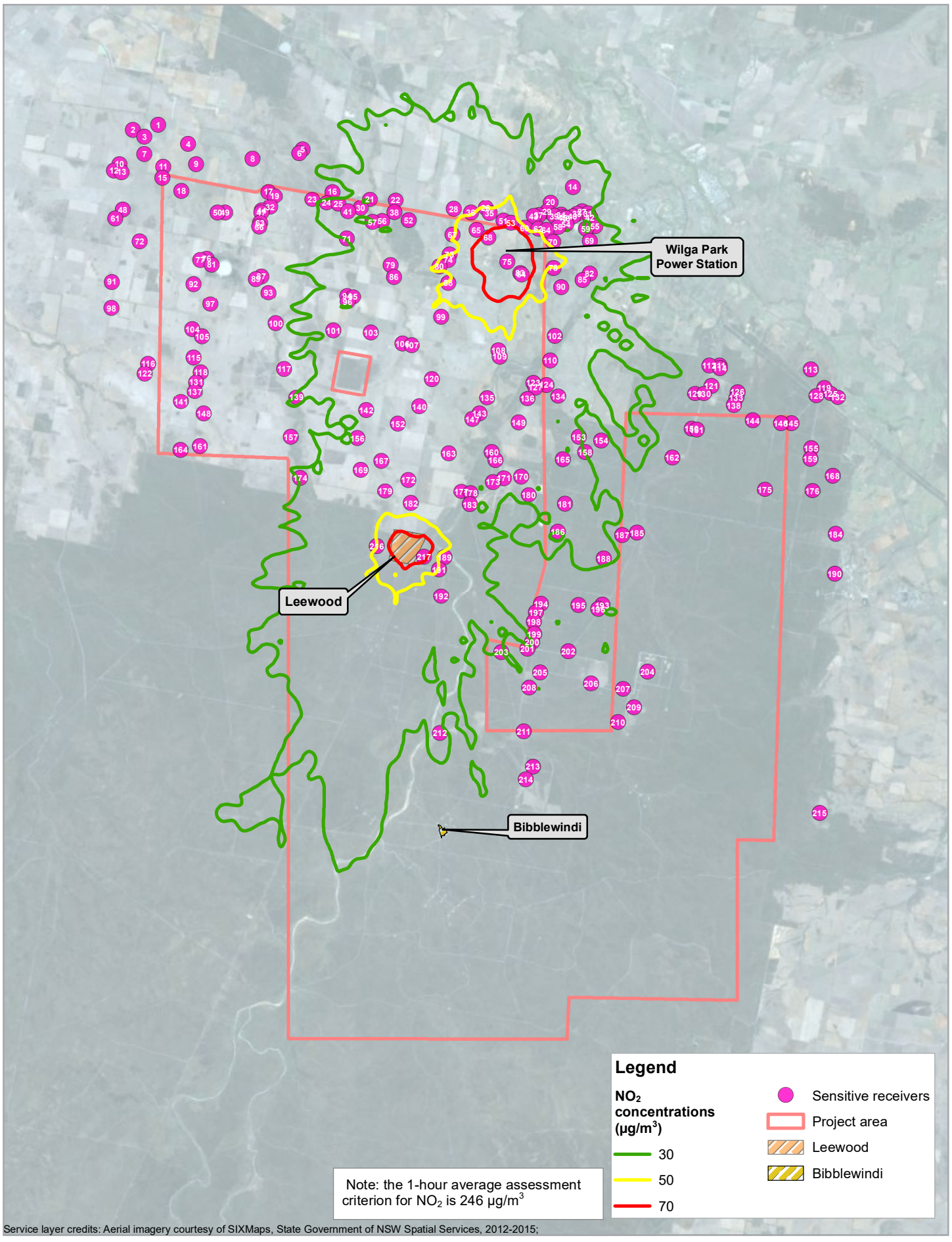

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Kilometers

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

N

GHD

Predicted maximum cumulative 1-hour average ground-level NO_2 concentrations (based on OLM) for power supply option 2 under routine operating conditions

Project No. **21-22463**
Revision No. **-**
Date **23/08/2019**

Figure 4-5

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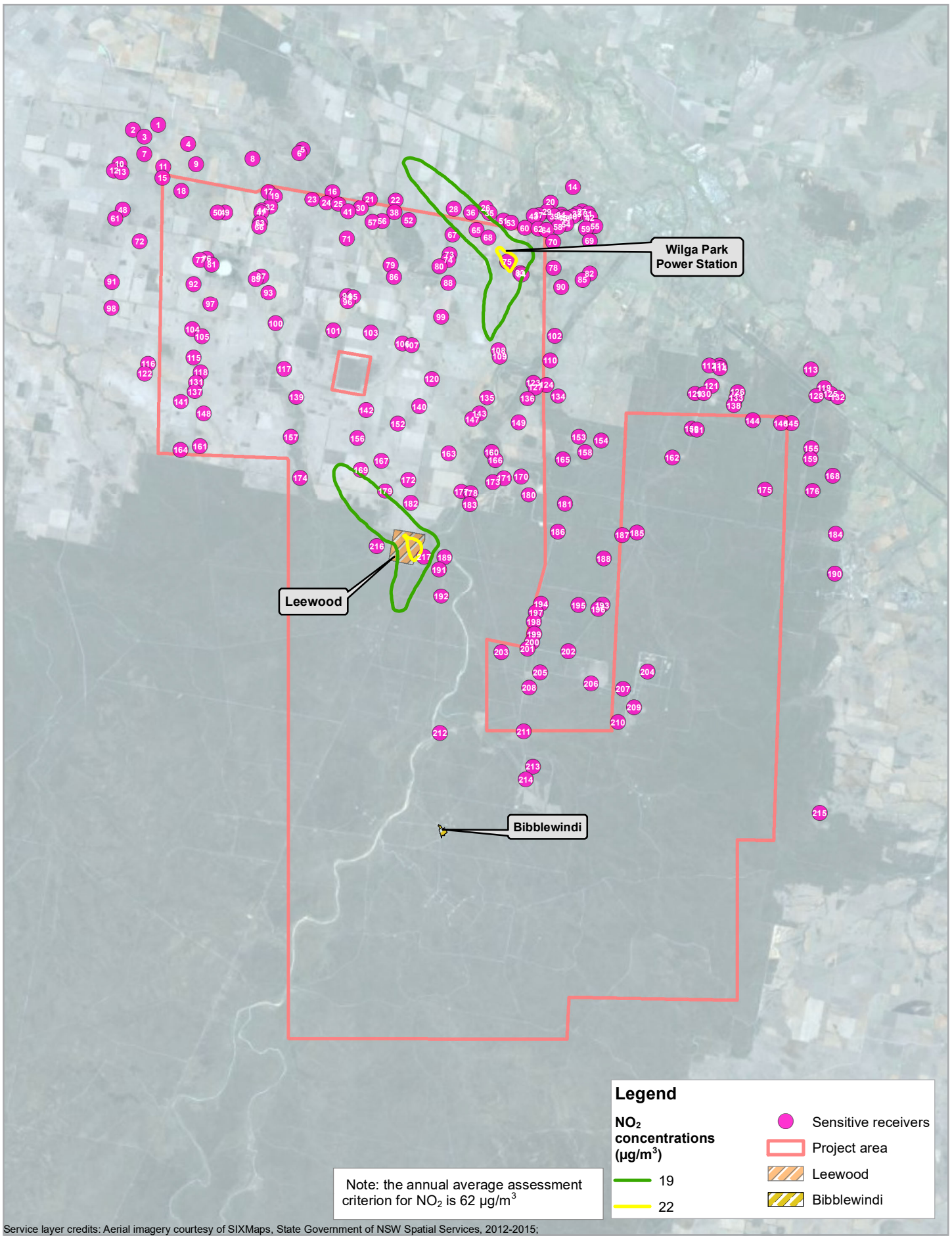

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Kilometers

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Grid: GDA 1994 MGA Zone 55

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Predicted maximum cumulative annual average ground-level NO_2 concentrations (based on OLM) for power supply option 2 under routine operating conditions

Project No. **21-22463**
Revision No. **-**
Date **23/08/2019**

Figure 4-6

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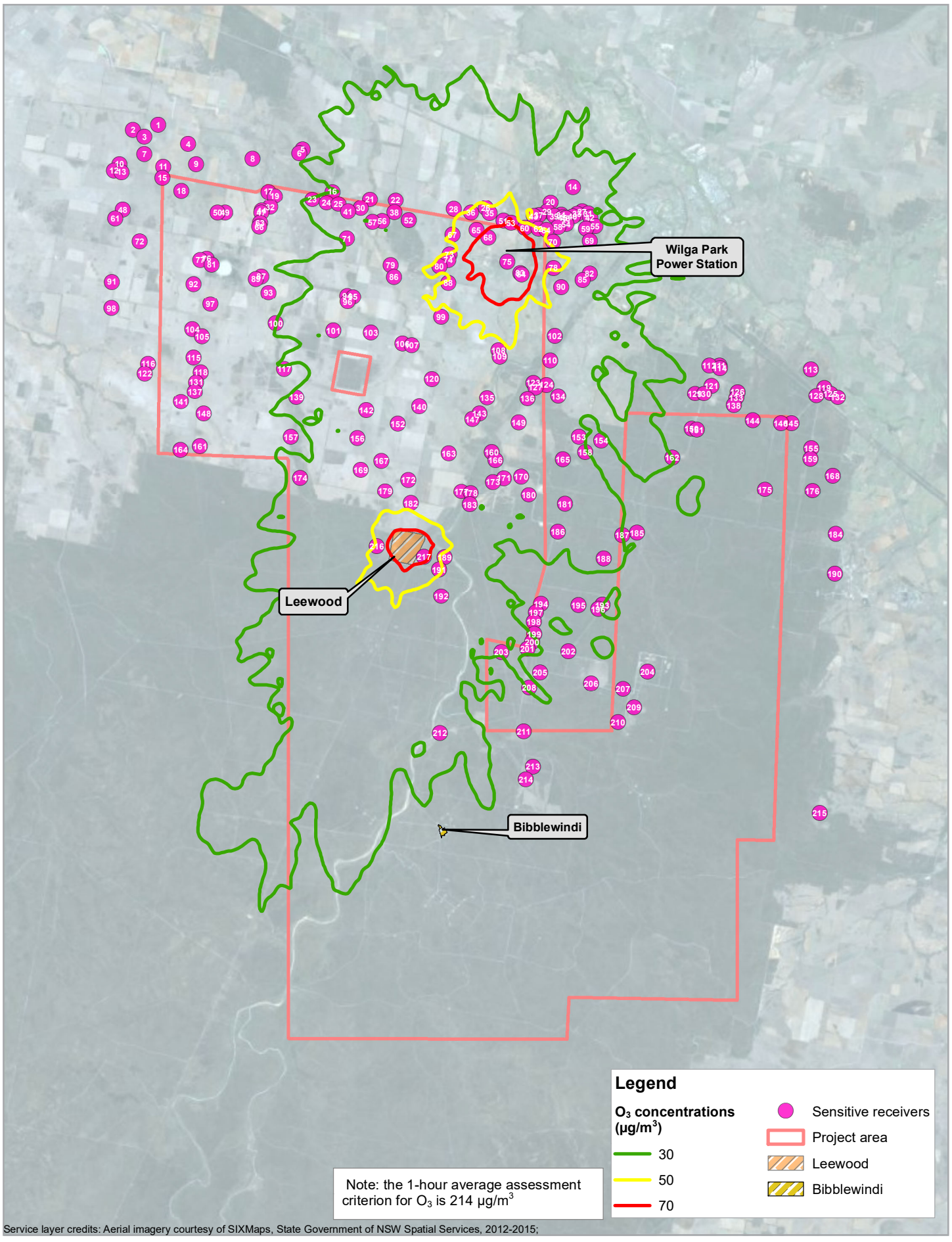

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Kilometers

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

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GHD

Predicted maximum cumulative 1-hour average ground-level O_3 concentrations (based on OLM) for power supply option 2 under routine operating conditions

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Revision No. **-**
Date **23/08/2019**

Figure 4-7

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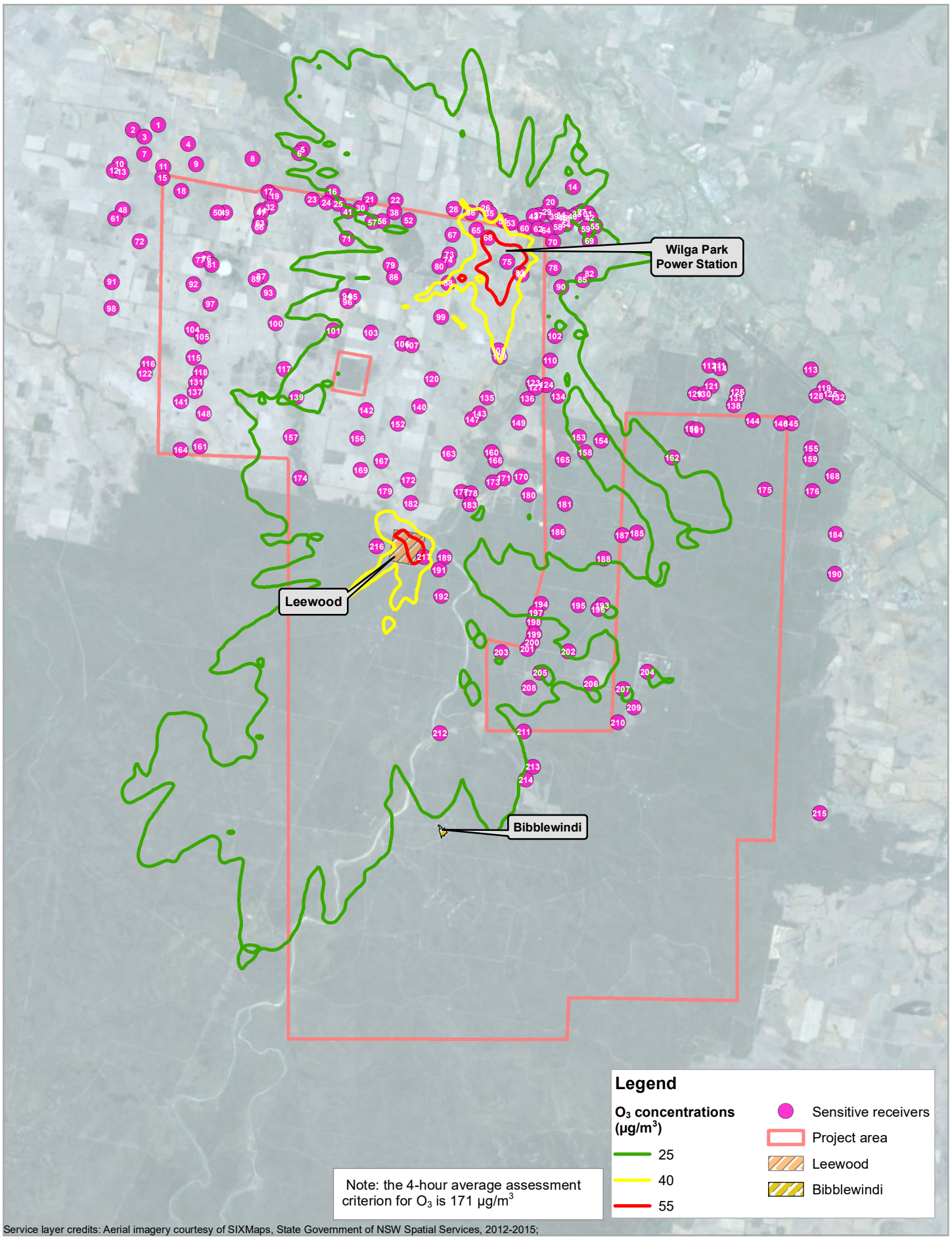

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Kilometers

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

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Predicted maximum cumulative 4-hour average ground-level O_3 concentrations (based on OLM) for power supply option 2 under routine operating conditions

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Figure 4-8

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5 Conclusions

A revised assessment of predicted NO_2 and O_3 impacts associated with the Narrabri Gas Project was conducted to address potential exceedances of the ambient air quality criteria based on the initial assessment that used the overly conservative NSW EPA approved Method 1, 100% NO_2/NO_X, conversion ratio. To refine the predicted NO_2 concentrations, and subsequently the predicted O_3 concentrations, the NSW EPA (2017) Method 2, Level 1, Ozone Limiting Method has been applied. The OLM approach incorporates both the predicted incremental NO_X emissions and measured background concentrations of NO_2 and O_3.

The revised assessment determined that for either power supply option under routine operations, the:

- Predicted maximum cumulative 1-hour average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary is 104.0 µg/m^3
- Predicted cumulative annual average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary is 27.0 µg/m^3
- Predicted maximum cumulative 1-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary is 108.5 µg/m^3
- Predicted maximum cumulative 4-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary is 97.6 µg/m^3

The impacts are similar for the two power supply options due the most significant contributing source of NO_X emissions being the four boilers located at Leewood.

The assessment also determined that the addition of a well head engine at the location of the predicted highest ground level concentration of NO_2 near the Leewood boundary would not cause an exceedance of the NO_2 and O_3 air quality criteria. This assessment determined that:

- Predicted maximum cumulative 1-hour average ground-level concentration of NO_2 at and beyond the Leewood processing plant boundary with the inclusion of a well head engine is 121.6 µg/m^3, which is 49% of the criteria.
- Predicted maximum cumulative 1-hour average ground-level concentration of O_3 at and beyond the Leewood processing plant boundary with the inclusion of a well head engine is 126.9 µg/m^3, which is 59% of the criteria.

This assessment indicates that the Narrabri Gas Project is unlikely to cause an adverse impact to air quality in the region.

6 References

AEC, 2016. Report prepared by Air Environment Consulting for GHD – Santos Narrabri Gas Project, Environmental Impact Statement Air Quality Impact Assessment, Brisbane, Australia.

AEC, 2017. *Report prepared by Air Environment Consulting for GHD – Santos Narrabri Gas Project, Air Quality Impact Assessment, Response to Submissions,* Brisbane, Australia.

NSW EPA, 2017. *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. Sydney, Australia, published in January 2017.