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Environmental Noise Impact Assessment
Supagas Pty Ltd
Proposed Alterations and Additions to CO_2 Plant

At:-

220 Bolong Road
Bomaderry NSW 2541

Prepared for: -

Supagas Pty Ltd
C/- Cowman Stoddart Pty Ltd
29 to 31 Kinghorn Street
Nowra NSW 2541

Attention: Mr Stephen Richardson

Reference: 2102007E-R

Prepared by: -

Matthew Harwood MAAS
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Supagas Pty Ltd commissioned Harwood Acoustics to carry out an Environmental Noise Impact Assessment for proposed alterations and additions to their existing Carbon Dioxide (CO_2) plant located at 220 Bolong Road, Bomaderry, NSW.

Accordingly, Harwood Acoustics has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics and may not be suitable for use beyond that scope.

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1. SITE AND DEVELOPMENT DESCRIPTION

Supagas Pty Ltd operates a Carbon Dioxide (CO_2) Plant at 220 Bolong Road, Bomaderry, NSW (the Site).

The Site is located adjacent to the former Dairy Farmers milk processing facility on the northern side of the Shoalhaven River. The surrounding area is a mix of commercial, industrial and residential premises. The nearest residences are located in Bolong to the north, in Bomaderry to the west and across the Shoalhaven River in Nowra to the south and Terara to the south-east. The nearest receptor is at a distance of approximately 540 metres and a location plan is shown in Figure 1.

It is proposed to install additional storage vessels at the Site to increase storage capability in order to enable:-

- Improved storage volume capacity of liquid CO_2 product during planned and unplanned outages,
- Better batching/quarantining of product and quality control, and
- Better availability of product during high demand periods.

It is a requirement of the NSW Department of Planning, Industry and Environment that an Environmental Noise Impact Assessment be prepared to determine the potential for noise emission arising from the proposed new equipment to impact the nearest residences to the Site.

Supagas Pty Ltd operates the Bomaderry CO_2 plant under Environment Protection Licence 21178 (the EPL) issued by the NSW Environment Protection Authority. The EPL sets Noise Limits at various receptor locations for the overall operation of the Site and these range between 38 and 42 dBA ($L_{eq,\ 15\ minute}$) during the day time, evening time and night time periods depending on the location of the receptor.

The new plant and equipment to be installed at the Site will include two 150 kilolitre (kl) cryogenic storage tanks, back up CO_2 vaporisers and a Nitrogen Oxide (NO_x) removal vessel. A proposed layout of the plant is shown in Figure 2 and an isometric diagram is shown in Figure 3. Noise sources associated with the new storage equipment will not be significant and include only pumps and motors servicing the storage tanks.

Calculations and predictions show that the level of the noise emission from the proposed new storage equipment will be well below the Environment Protection Licence Noise Limits at all receptor locations without the need for noise controls.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The Site is located adjacent to the former Dairy Farmers milk processing plant on the northern side of the Shoalhaven River. The surrounding area is a mix of commercial, industrial and residential premises. The nearest residences are located in Bolong to the north, in Bomaderry to the west and across the Shoalhaven River in Nowra to the south and Terara to the south-east.

The nearest residential receptor locations to the proposal are shown n Figure 1 and are as follows:-

- Location 1 – 39 Hanigan's Lane, Bolong approximately 540 metres to the north,
- Location 2 – Nobblers Lane, Terara approximately 1300 metres to the south east,
- Location 3 – Ferry Lane, Nowra approximately 1600 metres to the south west, and
- Location 4 – Meroo Street, Bomaderry approximately 1100 metres to the west.

Figure 1. Location Plan – Shoalhaven Starches, Bomaderry, NSW

(source: metromap.com.au ©)

2.2 Development Description

It is proposed to install additional storage vessels at the Site to increase storage capability in order to enable:-

- Improved storage volume capacity of liquid CO_2 product during planned and unplanned outages.
- Better batching/quarantining of product and quality control.
- Better availability of product during high demand periods.

The new plant and equipment to be installed at the Site will include two 150 tonne capcaity cryogenic storage tanks, back up CO_2 vaporisers and Nitrogen Oxide (NO_x) removal vessel. A proposed layout of the plant is shown in Figure 2 and an isometric diagram is shown in Figure 3. Noise sources associated with the new storage equipment will not be significant and include only the loud out pump servicing the new CO_2 storage tanks.

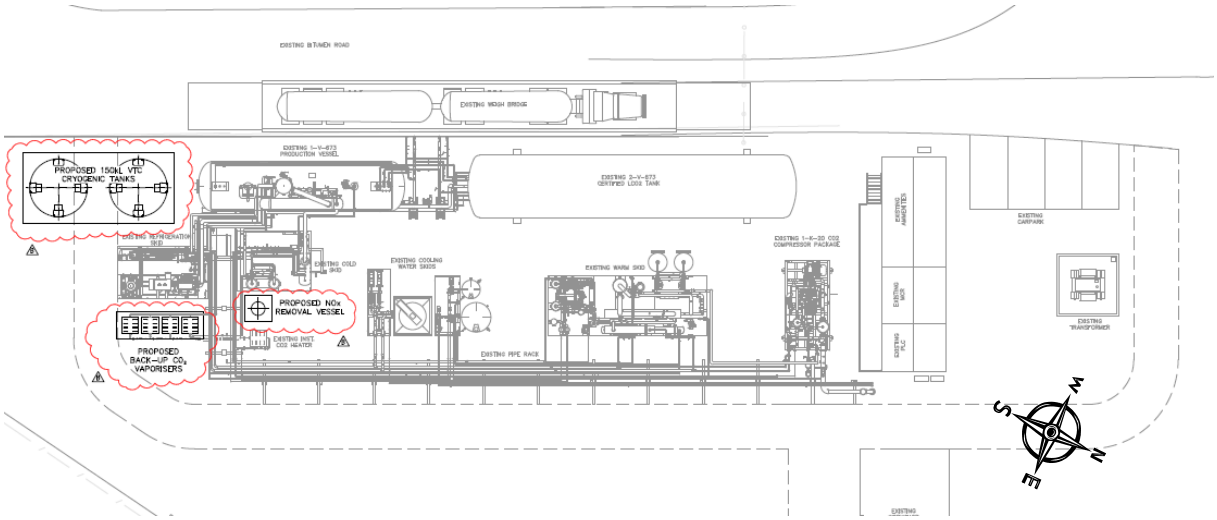

Figure 2. Site Plan

(source: Gas Liquid Processing Pty Ltd)

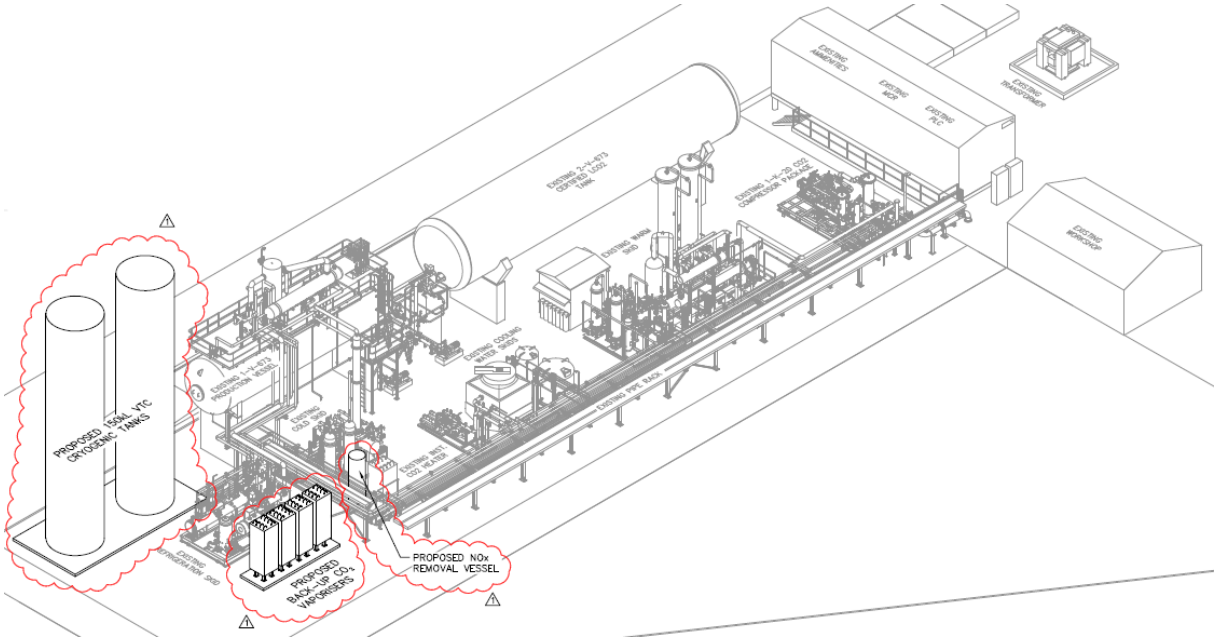

Figure 3. General Layout – Isometric View

(source: Gas Liquid Processing Pty Ltd)

3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise trigger levels and noise design goals.

3.1 NSW EPA's Environment Protection Licence 21178

Supagas Pty Ltd operates under Environment Protection Licence 21178 issued by the NSW Environment Protection Authority.

Section L3 'Noise Limits' of the licence states:-

"L3.1 the $L_{Aeq\ (15min)}$ sound pressure level contribution generated from the premises must not exceed the following levels when measured at or near the boundary of any residential premises:

Location	Day (7 am to 6 pm) $L_{Aeq\ (15\ min)}$	Evening (6 pm to 10 pm) $L_{Aeq\ (15\ min)}$	Night (10 pm to 7 am) $L_{Aeq\ (15\ min)}$	Night (10 pm to 7 am) $L_{A1\ (1\ min)}$
at locations in Terara on the south side of the Shoalhaven River	38	38	38	48
at locations in Nowra on the south side of the Shoalhaven River	38	38	38	48
at locations in Meroo Street, Bomaderry	42	42	42	52
at other locations in Bomaderry (Bolong)	40	40	40	50

"L3.2 Noise from the premises is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30m from the boundary, to determine compliance with Condition L3.1:

The modification factors in Fact Sheet C of the Noise Policy for Industry shall also be applied to the measured noise levels where applicable.

L3.3 Noise from the premises is to be measured at 1 metre from the dwelling facade to determine compliance with the $L_{A1\ (1\ minute)}$ noise limit in condition L3.1.

L3.4 Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the Noise Policy for Industry).

L3.5 The noise emission limits identified in condition L3.1 apply under meteorological conditions of:

a) Wind speed up to 3 metres per second at 10 metres about ground level; or

b) Temperature inversion conditions of up to 3°C/100 metres and wind speed up to 2 metres per second at 10 metres above ground level."

4. DEVELOPMENT NOISE EMISSION

Noise sources associated with the operation of the new storage equipment will consist of a new CO2 load out pump. This be located between the two new CO2 storage tanks, at ground level.

The author has carried out noise assessments at the existing Supagas facility, including:-

- Noise Impact Assessment reference 1708012E-R, dated 16/01/2018, and
- Noise Validation Report reference 1708012E-I2, dated 20/04/2021.

During the noise validation assessment, the author was able to measure the level of noise emission from each of the components associated with the existing plant.

This includes the existing load out pumps associated with the existing CO_2 storage tanks.

The new pump will be the same make and model as the existing pumps and produce the same level of noise emission.

It is worth noting that only one pump (being either of the two existing pumps or the new pump) will operate at any given time during either truck oud out or transfer of product between vessels (CO_2 storage tanks). Consequently, there will be no noticeable increase in noise emission from the site. However, noise predictions for the new pump noise are provided in this assessment for completeness.

These previous noise measurements, along with information of the proposed new CO_2 load out pump supplied by Supagas, have been used to establish a schedule of 'A' frequency weighted sound power levels, in decibels re: 1 pW as shown in Table 1 below.

Table 1 $L_{eq,\ 15\ minute}$ Sound Power Levels – Storage Facility Associate noise Producing Equipment

Equipment Description	Individual Sound Power Level $L_{eq,\ 15\ minute}$ (dBA)
Storage tank loud out pump	**80**

5.2 Noise Level Predictions

5.2.1 Noise Modelling Details and Parameters

A noise model has been developed using *SoundPLAN* Essential version 5.1.

Table 2 below provides details on the specific parameters used to develop the noise model.

Table 2 Computer Noise Model Parameters

Parameter	Details
Noise Sources and Modifying Factor Corrections	• The modelling scenario assumes that all noise sources are operating simultaneously at the full sound power levels shown in Table 1 for a minimum of 15 minutes, in any given 15 minute period, • The height of each noise source is between 1 and 3 metres above the existing natural ground level, • Attenuation is attributed only to distance loss, atmospheric absorption and ground absorption at each receptor location.
Algorithm & Meteorological conditions	Noise sources are modelled in accordance with the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:- • wind direction within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and • wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground, The equations for calculating downwind sound pressure level, including the equations for attenuation… are the average for meteorological conditions within these limits. These equations also hold, equivalently, for average propagation under well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights.

5.2.2 Predicted Noise Levels

The predicted noise levels at each of the receptors are shown in Tables 3 and 4 below where Table 3 shows the predicted noise levels against the intrusiveness noise limit in the day, evening and night time periods and Table 4 shows the predicted noise level against the sleep disturbance noise limit at night.

Table 3 Predicted L_{eq} Noise Levels – New Equipment Noise (Intrusiveness)

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Noise Limit (Day, Evening or Night)	**40**	**38**	**38**	**42**
New storage plant	<15	<10	<10	<10
Complies	**Yes**	**Yes**	**Yes**	**Yes**

Table 4 Predicted L_{eq} Noise Levels – New Equipment Noise (Sleep Disturbance)

Description	Predicted Noise Level $L_{1,\ 1\ minute}$ (dBA) at Receptor Location			
	Location 1	Location 2	Location 3	Location 4
Noise Limit (Day, Evening or Night)	**50**	**48**	**48**	**52**
New storage plant	<20	<15	<10	<15
Complies	**Yes**	**Yes**	**Yes**	**Yes**

Given that the level of noise emission from the plant and equipment associated with the storage equipment will be inaudible at each receptor location, no modifying factor adjustments are considered to be applicable.

5. CONCLUSION

An assessment of the potential noise emission arising from the proposed installation of storage equipment at Supagas Pty Ltd's CO2 plant at 220 Bolong Road, Bomaderry, NSW has been undertaken.

Noise modelling, calculations and predictions show that the level of noise emission from the operation of the facility will meet the Noise Limits prescribed under Environment Protection Licence 21178 at all receptor locations without the need for noise controls.

Matthew Harwood, MAAS

Principal Acoustical Consultant

Attachments: -
Important note
Appendix A – NSW EPA's Modifying Factors
Appendix B – *SoundPLAN* Noise Model Map

Important Note

All products and materials suggested by Harwood Acoustics are selected for their acoustical properties only.

Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's fields of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

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Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Modifying Factor Corrections (EPA NPI 2017)	Appendix A

Table B1Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017)

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (*ISO1996.2-2007 – Annex D*).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note:** Narrow-band analysis using the reference method in *ISO1996-2:2007, Annex C* may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2-dB(A) positive adjustment applies for the daytime period.	2 or 5 dB	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

Table B1Modifying Factor Corrections (from Table C.1 of the NSW Noise Policy for Industry 2017) *Cont…*

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Intermittent Noise	Subjectively Assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only**.
Duration	Single-event noise duration may range from 1.5 m to 2.5 h	One event in any 24-hour period	0 to -20dBA	The acceptable noise trigger level may be increased by an adjustment depending on duration of noise (see Table C.3)
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10 dBA[2] (excluding duration correction)	

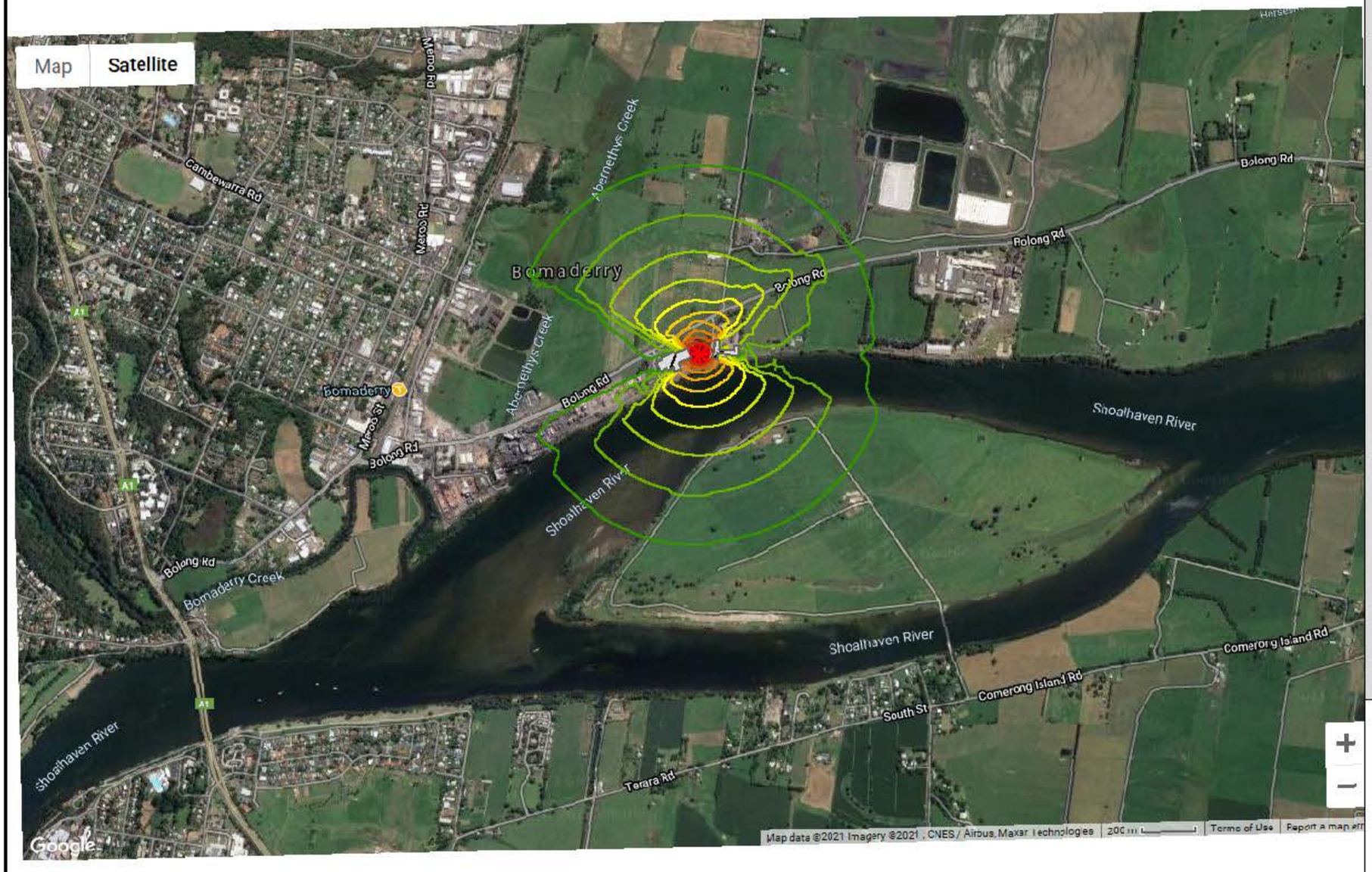
Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

Supagas
Alterations and Additions to CO2 Plant



Signs and symbols

✳ Storage tank pump motors

Levels in dB(A)

- = 10
- = 13
- = 16
- = 19
- = 22
- = 25
- = 28
- = 31
- = 34
- = 37
- = 40
- = 43
- = 46
- = 49
- = 52

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0 125 250 500 750 1000 m

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