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Ben Vocale
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Proposed modification to CO₂ Plant (Supagas): Air Quality Assessment

Dear Ben,

1. Introduction

In December 2017, GHD prepared an air quality assessment in relation to the construction of a Carbon Dioxide (CO₂) plant by Supagas, located adjacent to the former Dairy Farmers factory at 220 Bolong Road, Bomaderry (Lot 143 DP 1069758). The assessment found that emission from the plant were not anticipated to significantly increase the cumulative levels in the local area.

Supagas now wish to install additional storage vessels and associated plant on the site to increase storage capability to enable:

- Improved storage volume capacity of liquid CO₂ product during planned and unplanned outages.
- Better batching/quarantining of product and quality control.
- Better availability of product during high demand periods.

GHD have been engaged by Supagas to review the proposed changes and advise whether the proposal has the potential to cause significant air quality impacts. The review and assessment are detailed below.

2. Review of proposal and potential emissions

2.1 Site location and sensitive receptors

The existing CO₂ plant location is identified in Figure 2-1. The CO₂ plant is located to the northeast of Shoalhaven Starches manufacturing facility.

The site is proximate to a number of sensitive receptors. The township of Bomaderry lies to the northwest of the existing Shoalhaven Starches factory and west of the packing plant and the existing CO₂ plant. Nowra is situated south of the CO₂ plant.

The nearest receptors to the existing factory, packing plant and environmental farm, and the CO₂ plant are identified Table 1. The CO₂ plant is located further from the identified receptors than any existing site sources of odour or pollutants onsite.

Table 1 Summary of nearby sensitive receptors

Receptor	Range, m	To nearest odour source	Direction
R1	150	Packing Plant	W
R2	1300	Factory	SW
R3	700	Factory	S
R4	1300	Factory	SE

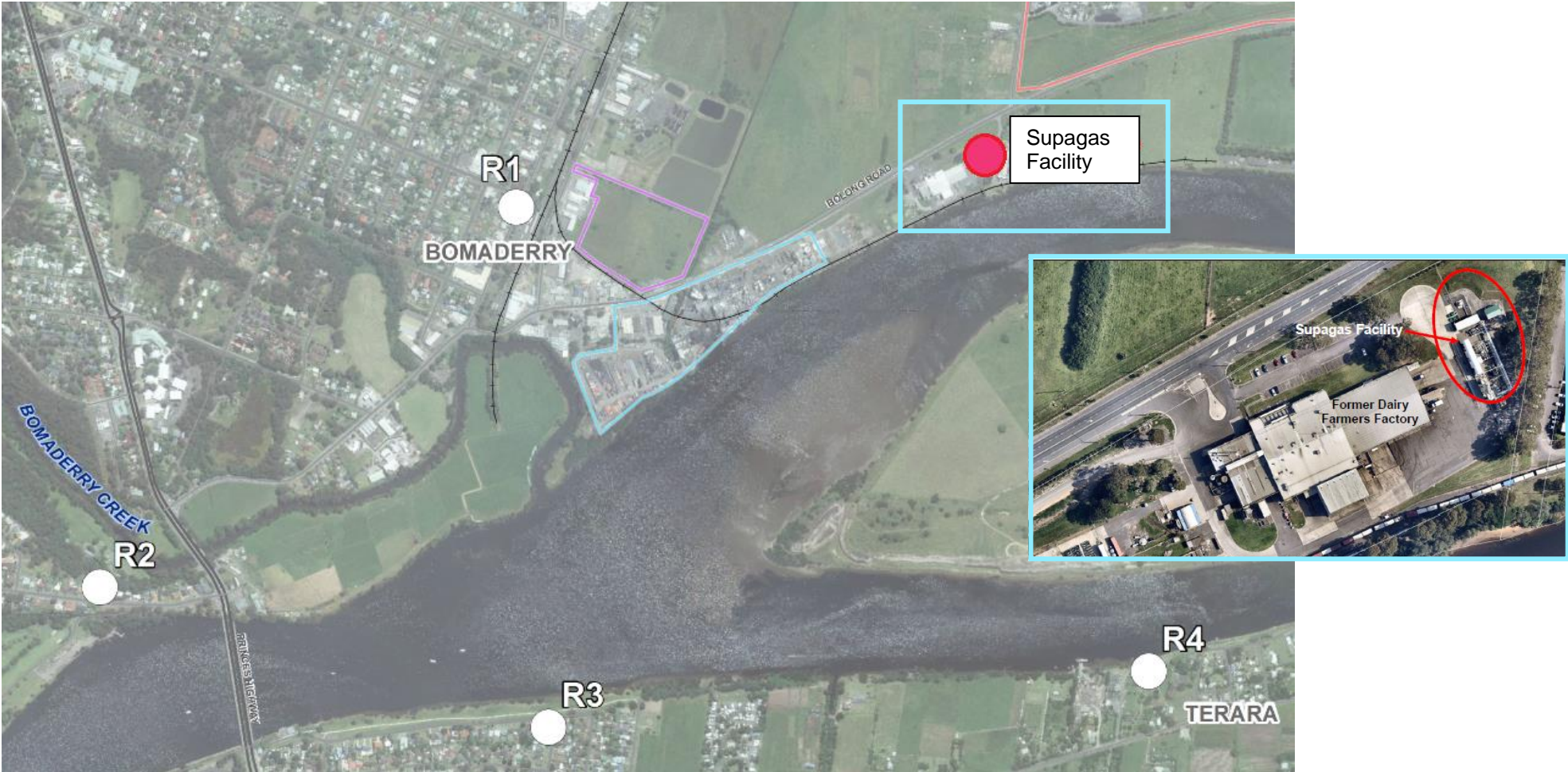


Figure 2-1 Site location and sensitive receivers

2.2 Existing facility

The existing Supagas operation takes CO₂ from the Shoalhaven Starches operations and then processes this gas to food grade quality for the food and beverage market.

These operations include the following plant and equipment:

- **Cold water scrubber.** This dehumidifies the warm, moist CO₂ existing the raw gas feed and will primarily remove water and alcohol from the feed stream.
- **CO₂ compressor.** The CO₂ compressor takes the dry CO₂ from the cold water scrubber and raises the CO₂ pressure to 1950 kPa.
- **Sulphide removal beds.** CO₂ is fed into the columns that contain an active ingredient and removes any organic sulphides. This active ingredient is removed when spent and sent for disposal at an authorised facility.
- **Cat Ox System.** CO₂ is fed through a CATOX (similar to a car exhaust) and all traces of Hydrocarbons are burnt into moisture and CO₂. This system runs at 330 degrees.
- **CO₂ driers.** The CO₂ is further dried to a point where its moisture content is reduced to less than 20 parts per million.
- **CO₂ liquifier.** The gaseous CO₂ at approximately 1900 kPa is liquefied.
- **CO₂ NO_x removal vessel.** Liquid CO₂ is run over a bed of molecular sieve. This absorbs any NO_x. This is changed every 9 months or so and disposed of in accordance with statutory requirements.
- **CO₂ tanks.** The CO₂ is then currently stored in one 100 tonne and one 200 tonne tanks (providing total storage of 300 tonnes) awaiting despatch.
- **Distribution.** The CO₂ is then distributed to customers via a B-Double or a single tanker.

2.3 Proposed modifications

The proposed modification will now involve the following additional storage vessels and plant:

- Installation of two (2) 150 kL capacity Liquid CO₂ storage vessels. Each vessel is 17,200 mm high and 3,800 mm diameter each.
- Installation of the above Liquid CO₂ storage vessels will require the relocation of a set of existing ambient vaporisers
- Installation of an additional NO_x removal bed to accommodate the expected longer running period the plant. Vessel dimensions are 2,400 mm high x 920 mm diameter.
- Interconnecting pipework from the process to the new equipment.
- Concrete bases for the above equipment items. This will include piling due to the substandard grade of the existing soil.

The proposed modification will:

- Improved storage volume capacity of liquid CO₂ product during planned and unplanned outages.
- Better batching/quarantining of product and quality control.
- Better availability of product during high demand periods.

This proposed modification will not require any additional vents or generate additional waste.

2.4 Emissions

A summary of existing plant emissions (as assessed in December 2017) is provided in Table 2. The existing system is primarily enclosed and only minor quantities of emissions are anticipated.

Table 2 Summary of existing plant emissions

Description	Flowrate	Temperature °C	Concentration (Mole %)						
			CO ₂	O ₂	N ₂	H ₂ O	**Oxygenates	pH (Typ)	Odour
Cold scrubber drain (Stream 1)	1,028 LPH	17.7	0.1	0	0	99.57	0.33	6.2	Probable
CO ₂ compressor after-cooler condensate drain (Stream 2)	1.8 LPH	35	0.3	Trace	Trace	99.7	Trace	3.0	Nil
Dehydration unit cooler condensate drain (Stream 3)	10.2 LPH	9.5	0.3	Trace	Trace	99.7	Nil	3.0	Nil
Drier regeneration gas vent (Stream 4)	60 sm ³ /hr	0 - 240	65.2	5.52	29.28	Nil	Nil	NA	Nil
CO ₂ liquefier gas vent (Stream 5)	128 sm ³ /hr	-28.7	65.2	5.52	29.28	Nil	Nil	NA	Nil
Cooling tower blow-down (Stream 6)	LPH	90	Trace	Trace	Trace	100	Nil	6.8	Nil

**Oxygenates comprises mixture of compounds given below in varying proportions with the predominate species being ethanol.

The previous assessment noted the following:

- Streams 1, 2,3 and 6 are liquid and are composed primarily of H₂O.
- Stream 1 (cold scrubber drain) is estimated to have vapour comprising of a number of potentially odorous oxygenated chemical compounds including Ethanol, Acetaldehyde and Ethyl Acetate. Supagas have advised that vapour exiting the cold scrubber is sent down the pipeline to the CO₂ plant on the Meats Works Site for further treatment. Therefore this stream will not be a source of odorous or toxic emissions.
- Stream 2 (CO₂ compressor after-cooler condensate drain) may contain trace levels of oxygenated chemical compounds, however this stream of up to 1.8 litres per hour (99.7% H₂O and 0.3% CO₂) is not a significant quantity to be a source of odorous emissions.
- Stream 3 (dehydration unit cooler condensate drain) and Stream 4 (Drier regeneration gas vent) contain no odorous or toxic air pollutants.
- The two sources of gaseous emissions are Stream 4 (Drier regeneration gas vent) and Stream 5 (CO₂ liquefier gas vent) and contain no odorous or toxic air pollutants.

2.4.1 Changes to emissions inventory as a result of the proposed modification

No new sources of emissions are proposed as part of this modification. The current operation of the plant is not proposed to change. In addition, Supagas have reiterated that:

- The vapour exiting the cold scrubber is piped to the purification plant via a closed pipe. The gas is then purified using a number of absorbers and a reactor is used to removed 'low level' impurities. No gas is vented until it gets to the distillation section. All possible odours have been removed at that point.
- No short-term increase in emissions would be anticipated when the CO₂ NO_x removal beds are changed over as the NO_x is a chemical reaction with the media and remains with the media.

Therefore, the emissions inventory will remain unchanged from the previous assessment.

3. Legislation and criteria

The *Protection of the Environment Operations Act 1997* (POEO Act 1997) establishes, amongst other things, the procedures for issuing licences for environmental protection in relation to aspects such as waste, air, water and noise pollution control. The owner or occupier of premises engaged in scheduled activities is required to hold an EPL and comply with the conditions of that licence.

The POEO Act 1997 requires that no occupier of any premises causes air pollution (including odour) through a failure to maintain or operate equipment or deal with materials in a proper and efficient manner. The operator must also take all practicable means to minimise and prevent air pollution (sections 124, 125, 126 and 128 of the POEO Act 1997).

The POEO Act 1997 includes the concept of 'offensive odour' (section 129) and states it is an offence for scheduled activities to emit 'offensive odour'.

Shoalhaven Starches operate as per Environmental Protection Licence Number 883 that states they must not cause or permit the emission of offensive odour beyond the boundary of the premises. Previous odour assessments undertaken for Shoalhaven Starches show that the site is currently predicted to comply with the odour criterion at the four assessed nearby receptors.

4. Potential Impacts

GHD has reviewed the project information and potential emissions associated with the modification. No changes to site emissions are proposed and no significant or assessable odour or other toxic emissions are anticipated. Based on the information provided there will be no impacts on any nearby sensitive receptors.

5. Conclusion

GHD has undertaken a review of the proposed changes to the CO₂ plant including any impacts on site emissions. Air quality impacts (odour and other pollutants) are not anticipated and there is no expected increase to the cumulative levels in the local area.

Regards



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