

Technical Memorandum

27 April 2022

То	Bilal Khan (GeelongPort)	Tel	(03) 5247 0200
Copy to	Rhys Armstrong, Lana Griffin (GHD)	Email	barry.cook@ghd.com
From	Barry Cook	Ref. No.	12559567
Subject	EES referral for the Geelong Hydrogen Hub – Air quality assessment		

1. Introduction

GHD Pty Ltd (GHD) is engaged by GeelongPort Pty Ltd (GeelongPort) to support the preparation of environmental referral documents in relation to the proposed development of the Geelong Hydrogen Hub at the Port of Geelong. GeelongPort is seeking to undertake the following referrals to the relevant agencies:

- Environmental Effects Statement (EES) referral to the Victorian Minister for Planning and the Department of Environment, Land, Water and Planning (DELWP) under the *Environment Effects Act* 1978
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) self-assessment, and potentially a referral under the same Act to the Commonwealth Department of Agriculture Water and the Environment (DAWE)

This memorandum has been prepared to support and inform the environmental referral documents through a preliminary assessment of the potential air quality impacts of the facility associated with movement of gases, inclusive of ammonia and hydrogen, once the facility is operational.

This technical memorandum presents the findings from the following activities:

- Desktop assessment of existing conditions
- Review of material transfer operations
- High level summary of relevant legislation
- Assessment of potential impacts of the proposed development on the local air quality

The Power of Commitment

2. Project overview

GeelongPort propose to develop a facility at Port of Geelong to import liquid ammonia, produce hydrogen and nitrogen by ammonia decomposition (or cracking over a catalyst), and distribute hydrogen to potential offtake users within the Port of Geelong as well as in wider Victoria. Use of hydrogen for these industrial processes will present a strong offset for gas production and consumption needs. The site layout highlights the key process buildings, pipeline routes and structures, and allows for future expansion or alternative applications for the ammonia/hydrogen (Figure 1). The proposed site for the facility comprises approximately 7.5 hectares of land that is wholly owned by GeelongPort. The key project components comprise:

- New ammonia import berth as an extension of Refinery Pier in Corio Bay
- Transfer pipeline to an onshore storage facility
- Onshore storage facility for liquid ammonia (60 m diameter storage tank(s))
- Catalytic cracking plant(s) to decompose ammonia into hydrogen and nitrogen
- Onshore distribution pipelines to potential industrial users either within the Port of Geelong or in adjacent industrial zones
- Vehicle refuelling facility (hydrogen)
- Carpark

An options assessment was undertaken for alternative berth layouts to accommodate future imports of ammonia. The preferred berth layout is located within the existing dredge pocket and therefore no capital dredging is required.



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3. Existing conditions

As illustrated in Figure 2, material transfer will occur from berthed vessels on Refinery Pier at Corio Bay to onshore processing and material transfer to potential industrial users either within the Port of Geelong or in adjacent industrial zones or hydrogen vehicles (trucks/tankers). All of these activities will occur east of the Melbourne-Geelong railway line. The nearest residential housing area is south of St Georges Road and east of the Princes Highway. All sensitive receptors (i.e., residential areas) have petroleum refining storage sites that are closer than the proposed facility chemical processing or transfer point locations. The proposed catalytic cracking plant(s) will be at least 1,000 m from the nearest residential location (corner of St Georges Road and Station Street).



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4. Material transfer

Material transfer, and transformation, occurs as ammonia is delivered by a dedicated floating tanker and then by pipeline from the berth to the storage tank(s). The ammonia is then subject to a chemical transformation (catalytic cracking plant) with hydrogen being exported off-site by pipeline or by road tanker. All material transfer and chemical transfer has the potential for fugitive emissions – this is especially so concerning pipeline valves and reaction vessels. The catalytic cracking plant is proposed to be as sealed as possible and no vents are required or provided. Nitrogen is a by product of the catalytic cracking plant.

5. Relevant legislation, policy and guidelines

Table 1 presents an overview of the key legislation, policy and guidelines that forms the regulatory framework for air quality management in Victoria and that would apply for the project.

Table 1 Relevant Air Quality legislation and guidelines

Legislation and strategies	Brief description	
Commonwealth		
National Environment Protection (Ambient Air Quality) Measure (NEPM AAQ)	Commonwealth legislation or policy that is not specifically relevant to this project – no criteria substances involved.	
National Environment Protection (Air Toxics) Measure (NEPM Air Toxics)	Commonwealth legislation or policy that is not specifically relevant to this project – no toxic substances involved.	
National Environment Protection (National Pollutant Inventory) Measure (NEPM NPI)	Provides the community, industry and government with free information about substance emissions in Australia. It has emission estimates for 93 toxic substances and the source and location of these emissions. Ammonia is a listed substance ¹ .	
	Part 5.2 of Environment Protection Regulations 2021 includes Air Division 1—National pollutant inventory.	
	The facility is not expected to exceed any reporting threshold.	
State legislation, regulations and standards		
<i>Environment Protection Act 2017</i> (EP Act) (as amended by the <i>Environment Protection Amendment Act 2018</i>)	Intends to help drive environmental improvements and replaces the existing EP Act. The GED (General Environmental Duty), requires Victorians, including citizens and businesses, to understand and minimise their risks of harm to human health and the environment, from pollution and waste.	
Environment Protection Regulations 2021	Part 5.2—Air Division 1—National pollutant inventory of Environment Protection Regulations 2021 includes Clause 104:	
	 "The occupier of a reporting facility must provide the Authority with the following information if a reporting threshold for a substance specified in the NEPM (NPI) is exceeded in a reporting period." 	
	The facility is not expected to exceed any reporting threshold as ammonia is contained before being converted to hydrogen, with nitrogen gas as a by- product, in the catalytic cracking plant.	

¹ "Ammonia (total)' refers to the mixture of two different, but related compounds: ammonia (NH₃) and the ionised form (NH₄⁺). The NH₃ compound is the volatile, potentially hazardous substance present in the mixture." http://www.npi.gov.au/resource/ammonia-total. Accessed 17 September 2021.

Legislation and strategies	Brief description	
Environmental Reference Standard (ERS)	The ERS identifies environmental values, air indicators and objectives that set the benchmark for the quality of the air environment needed to protect the environmental values. Includes protection of human health and ecological values.	
	To support the protection of human health and the environment from pollution and waste by providing benchmarks to be used to assess and report on environmental conditions in the whole or any part of Victoria.	
	Ammonia and nitrogen (inert atmospheric gas) are not included in Table 2.2: Indicators and objectives for the ambient air environment.	
Government guidelines and strategies		
Recommended separation distances for industrial residual emissions (EPA Victoria Publication 1518)	The guideline provides recommended minimum separation distances between (odour or dust) emitting industrial land uses and sensitive land uses.	
	The facility involves odorous ammonia and a chemical transformation (cracking) plant.	
	If conversion of ammonia to hydrogen is considered 'production of industrial gases', with a production scale exceeding of >2,000 tonnes per year, a 1,000 m residual separation distance applies.	
Guideline for assessing and minimising air pollution in Victoria (EPA Victoria Publication 1961)	The purpose of the guideline is to provide a framework to assess and control risks associated with air pollution.	
	This document is currently in Draft form and out for comment. EPA Victoria expect it to be finalised later in 2021.	
	The guideline outlines a risk management approach that involves a repeating cycle of four steps.	
	This risk management approach can be adopted for this assessment.	
Civil Construction, building and demolition guide (EPA Victoria Publication 1834, 2020)	Section 5.3 of the guideline deals with managing erosion, sediment and dust during construction activities, with section 5.3.3 outlining a number of mitigation measures specific to dust mitigation.	
	Guideline to be considered during the construction phase of the Project to demonstrate GED. Guideline to be considered by the contractor in the Dust Management Plan and/or the Construction Environmental Management Plan.	

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6. Potential air quality impacts

6.1 During construction

In general, the traffic generated from construction would be limited in terms of its duration. The construction period for the proposed facility would last up to a year. Access to the proposed onshore facilities would be via St. Georges Road. The construction materials for the new berth would be shipped by marine transport and would therefore not impact the key roads identified.

Construction of the onshore infrastructure, such as the storage facility for liquid ammonia and the catalytic cracking plant, would utilise an external party (contractor) with obligations to understand and minimise their risks of harm to human health and the environment, from pollution and waste.

Traffic generated due to the construction of the pipelines would be associated with the delivery of materials to the specific locations where they are laid out for construction. The impacts are expected to be highly localised and would be limited in duration. Contractors would be required to have an Environmental Management Framework cognisant of GED regarding construction dust.

The proposed site is located adjacent to industrial zones and therefore, construction would not impact areas such as residential premises, medical facilities or school zones.

6.2 During operations

During the operations stage of the facility, a small number of staff would be based on site and their office would be located near the hydrogen truck loading facilities. These staff are protected by Occupational, Health and Safety (OH&S) and major hazard facility provisions to protect them from any harm due to air quality.

For control of fugitive emissions, the following measures are available in the design where appropriate and utilising safety-in-design principles:

- Minimising flanged connections and use of high-grade sealing systems
- For valves use of high-grade stuffing box packing or bellows for all fluids
- For pumps use of double mechanical seals or related high grade sealing systems or seal less pumps (hermetically tight) for all fluids
- Use of dry gas seals for centrifugal compressors handling flammable fluids (H₂, O₂ and NH₃).
- Each open-ended valve or line in service shall be equipped with a cap, blind flange, plug, or a second valve
- Pressure relief valves in service shall be routed to atmosphere (elevated)
- Sampling-connection system in service shall be designed to avoid emissions to the atmosphere

Ammonia is an odorous compound; albeit the air quality assessment criteria (AQAC) in EPA Victoria publication 1961 is a class 2 substance but originally based on toxic properties in the State environment protection policy (Air Quality Management). The AQAC's for ammonia, 1-hour, daily and annual, are related to health hazard, inhalation minimal risk level and inhalation minimal risk level (again) respectively. However, ammonia is the input of the catalytic cracking plant that is to be contained as part of the material transfer infrastructure (pipe and duct work). Only minor fugitive emissions of ammonia are expected.

A catalytic cracking plant to decompose the ammonia into hydrogen and nitrogen is akin to a 'chemical plant' involving production of industrial gases. Only residual emissions of the odorous ammonia gas are expected. The risk to residential land uses at greater than 1,000 m is therefore low. Compliance with the GED results in the facility not requiring a licence, permit or permission from EPA Victoria in relation to air quality risk pathways.

7. Conclusions

Only low concentrations of ammonia are expected as fugitive emissions. Nitrogen is not considered a criteria pollutant or subject to air quality assessment criteria (EPA Victoria Publication 1961). Compliance with the GED results in the facility not requiring a licence, permit or permission from EPA Victoria in relation to air quality risk pathways. GED requirements also apply for dust impacts during the construction phase. The facility is very unlikely to trigger reporting thresholds of 'Ammonia (total)' for reporting to the NEPM NPI. As hydrogen, an explosive gas, is involved, the separation from the general population due to major hazard facilities risk will be sufficient to minimise odour impacts downwind of the plant.

Regards

Barry Cook Technical Director – Air Quality and Meteorology