

# Viva Geelong Gas Import Terminal

## **Inquiry and Advisory Committee Report No. 1**

*Environment Effects Act 1978*

*Planning and Environment Act 1987*

*Pipelines Act 2005*

**5 October 2022**

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*Environment Effects Act 1978*

Inquiry report under section 9(1)

*Planning and Environment Act 1987*

Advisory Committee report under section 151

*Pipelines Act 2005*

Panel report under section 47

**Viva Geelong Gas Import Terminal – Report No. 1 Main Report**

**5 October 2022**



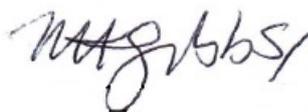
Sarah Carlisle, Chair



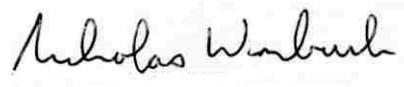
William O'Neil, Deputy Chair



Sandra Brizga, Member



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## Glossary and abbreviations

*Note: Legislation and government departments are Victorian unless noted otherwise.*

% SI	percentage of surface irradiance (in the context of light attenuation as a result of suspended solids in water from dredging)
µg/litre	micrograms per litre
AAQ NEPM	National Environment Protection (Ambient Air Quality) Measure
ACF	Australian Conservation Foundation Community Geelong (Submitter 1818)
ADGSM	Australian Domestic Gas Supply Mechanism

AEMO	Australian Energy Market Operator
ALARP	as low as reasonably practical (in the context of risk reduction)
ANZ Water Quality Guidelines	Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000
AS2885	Australian Standard 2885: Pipelines— Gas and liquid petroleum
CC Act	<i>Climate Change Act 2017</i>
CEE	Consulting Environmental Engineers
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
Cities Protocol	Greenhouse Gas Protocol for Cities (Global Protocol for Community-Scale Greenhouse Gas Emission Inventories)
CoGG	City of Greater Geelong (Submitter 15 and 1247)
Corporate Standard	Greenhouse Gas Protocol (Corporate Accounting and Reporting Standard)
D#	Document number
DELWP	Department of Environment, Land, Water and Planning
DELWP IAU	Impact Assessment Unit of DELWP
DGV	default guideline value
DMG	dredged material ground
draft PSA	draft Planning Scheme Amendment C442ggee to the Greater Geelong Planning Scheme
EE Act	<i>Environmental Effects Act 1978</i>
EES	Environment Effects Statement
EES Advisory Note	<i>Environment Effects Act Advisory Note</i> , DELWP updated 10/2/21
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EPA	Environment Protection Authority Victoria (Submitter 1884)
EP Act	<i>Environment Protection Act 2017</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
EP Regulations	Environment Protection Regulations 2021
ERS	Environmental Reference Standard
FSRU	floating storage and regasification unit

GED	general environmental duty under section 25 of the EP Act
GeelongPort	GeelongPort Pty Ltd and Ports Pty Ltd (Submitter 1974)
GGS	Geelong Grammar School (Submitter 1968)
GHG	greenhouse gas
GSOO	Gas Statement of Opportunities prepared by AEMO
FFG Act	<i>Flora and Fauna Guarantee Act 1988</i>
HDD	horizontal directional drilling
HIPAP No. 4	Hazard Industry Planning Advisory Paper No. 4 <i>Risk Criteria for Land Use Safety Planning</i> , January 2011, NSW Department of Planning
IAC	Inquiry and Advisory Committee
Incorporated Document	Viva Energy Gas Terminal Project Incorporated Document
LAC	Limits of Acceptable Change
LNG	liquified natural gas
MACA	<i>Marine and Coastal Act 2018</i>
MHF	major hazard facility
ML	megalitres
MM-#	Mitigation Measure number
MNES	Matters of National Environmental Significance
National Dredging Guidelines	National Assessment Guidelines for Dredging 2009
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i> (Cth)
Noise Protocol	<i>Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues</i> , EPA Publication 1826.4
NTU	nephelometric turbidity units (a measure of turbidity)
OEMP	Operations Environmental Management Plan
PAH	Polycyclic aromatic hydrocarbons
PE Act	<i>Planning and Environment Act 1987</i>
PFAS	Per- and polyfluoroalkyl substances
PFOS	Perfluorooctane sulfonate (a type of PFAS)
PIANC	Permanent International Association of Navigation Congresses
PJ	petajoule
Planning Scheme	Greater Geelong Planning Scheme
Port Strategy	<i>Port of Geelong Port Development Strategy 2018</i>

Project	Viva Gas Import Terminal
Proponent	Viva Energy Australia Pty Ltd
QRA	Quantitative Risk Assessment
RAP	Registered Aboriginal Party
RFI	Request for Information
Roadmap	<i>Victoria's Gas Substitution Roadmap 2022</i>
S#	Submission number
SCO	Specific Controls Overlay
Scoping Requirements	scoping requirements for the EES
SFARP	so far as reasonably practical (in the context of risk reduction)
Significant Impact Guidelines	<i>Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999</i> , Department of Environment, 2013
SIGTTO	Society of International Gas Tanker and Terminal Operators
SIRA	Simplified IALA Risk Assessment
the Port	Port of Geelong
the Ramsar site	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site
TMP	Traffic Management Plan
Victorian Dredging Guidelines	<i>Best Practice Environmental Management – Guidelines for Dredging 2001</i>
Viva AAQMS	Viva Energy Ambient Air Quality Monitoring Station
VTN	Victorian Transmission Network
WorkSafe Guidelines	<i>WorkSafe Victoria guidelines on land use planning near a major hazard facility</i>
WorkSafe	WorkSafe Victoria
WTOAC	Wadawurrung Traditional Owners Aboriginal Corporation

## Overview

### Project summary

The Project	Viva Geelong Gas Import Terminal
Brief description	A terminal to import liquified natural gas (LNG) into Victoria, using a floating storage and regasification unit (FSRU) moored at Refinery Pier in Corio Bay, Geelong. The Project would introduce a new source of natural gas supply to the southeast Australian gas market
Project location	Refinery Pier in the Port of Geelong and the Viva Energy Geelong Refinery located on the western shores of Corio Bay
The Proponent	Viva Energy Australia Pty Ltd
EES	On 28 December 2020, the Minister issued a decision determining that an EES was required. The Minister identified two primary areas of potential environmental impact (marine environment and greenhouse gases) and several areas of secondary impacts
The draft Planning Scheme Amendment (PSA)	Draft Amendment C442ggee to the Greater Geelong Planning Scheme
Exhibition	28 February to 11 April 2022
Submissions	Number of Submissions: 2043 (refer to Appendix B in Report No. 2)

### Inquiry and Advisory Committee (IAC) process

The IAC	Sarah Carlisle, Chair William O'Neil, Deputy Chair Sandra Brizga Meredith Gibbs Nick Wimbush
Directions Hearing	Online, 5 May 2022
Hearing	Online, 29 days across seven weeks between 20 June and 5 August 2022 (refer to Chapter 1.7)
Site inspections	Accompanied and unaccompanied across several days (refer to Chapter 1.6)
Parties to the Hearing	Refer to Appendix C in Report No. 2
Citation	Geelong LNG Import Terminal EES [2022] PPV
Date of this report	5 October 2022

## Executive summary and recommendations

Safe access to secure, reliable and affordable energy is critical to a strong and healthy economy and an equitable society. For decades, many Victorians have relied on natural gas to heat their homes and businesses and fuel their gas appliances. Natural gas has provided a critical energy source for industry, and a feedstock into many manufacturing processes.

However, the ongoing use of natural gas, like other fossil fuels, has significant implications for climate change. The Victorian government has put in place policy settings to transition away from natural gas toward a renewables based energy system. Government policy recognises that while natural gas has a continuing role in supporting that transition, this will diminish over time.

### (i) The Project

Viva Energy Australia Pty Ltd (the Proponent) proposes to construct and operate a liquified natural gas (LNG) import terminal at Refinery Pier in the Port of Geelong (the Project). LNG would be imported via ships (LNG carriers) and stored on a ship known as a floating storage and regasification unit (FSRU). When gas is needed, the LNG would be regasified on the FSRU and piped to a treatment facility to be constructed on the Geelong Refinery premises. The gas would be conditioned by adding odorant and nitrogen (if required), before being piped to a tie-in point to the Victorian Transmission Network near Lara.

The Refinery has been operating for over 60 years on the western shore of Corio Bay. It is one of only two refineries operating in Australia, and processes crude oil into a number of fuel types. The Refinery uses seawater from Corio Bay for cooling purposes. It draws in around 350 megalitres per day of seawater, which is dosed with chlorine to control biofouling. Around the same amount of cooling water is discharged to Corio Bay each day, with residual chlorine and at temperatures around 8 to 10 degrees above ambient.

The Project would have certain synergies with the Refinery. Seawater used in the FSRU to regasify the LNG is proposed to be piped to the Refinery's seawater intake, to be re-used as cooling water in the Refinery. The net result between the Refinery and the Project would be the same amount of seawater intake and discharge per day as currently occurs (350 megalitres per day). Discharges would have around the same chlorine levels as the existing discharge but would be closer to ambient temperatures.

### (ii) Context for assessment

The former Minister for Planning determined that the Project could potentially have significant environmental effects, and required an Environmental Effects Statement (EES) to be prepared. The Minister identified two primary areas of potential impact, and several areas of secondary impacts. The primary impacts are:

- impacts on the marine environment
- impacts of greenhouse gases.

The Project was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), due to potential significant impacts on three categories of matters of national environmental significance:

- the nearby Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (Ramsar site)

- listed threatened species and ecological communities
- listed migratory species.

The EES forms the basis of the assessment of environmental impacts under the EPBC Act.

The EES was exhibited together with draft Planning Scheme Amendment C442ggee to the Greater Geelong Planning Scheme (draft PSA) that would provide planning approval for the Project.

The Inquiry and Advisory Committee (IAC) is not tasked with recommending whether or not the Project should be approved, but rather to consider and report on its potential environmental effects, their significance and acceptability. To that end, this Report provides an analysis of the EES and the draft PSA and an integrated assessment of the environmental, social and economic impacts of the Project, having regard to the evaluation objectives in the EES Scoping Requirements and relevant policy and legislation.

The IAC has considered the exhibited material, all written submissions received in response to the exhibited material, and evidence, submissions and other material provided to the IAC during the Hearing. It has prepared two reports:

- Report No. 1 – key considerations, findings and recommendations
- Report No. 2 – Appendices.

Report No. 1 has three Parts:

- Part A provides background information about the IAC process, a summary of the Project and alternatives considered, and a summary and analysis of the Project rationale
- Part B provides the IAC's review and analysis of the impacts of the Project
- Part C provides the IAC's integrated assessment of the Project and a summary and findings in relation to Project implementation.

Report No. 2 includes the IAC's recommended mitigation measures, and its recommended draft PSA, should the Project proceed.

### **(iii) Summary of environmental impacts**

#### **Marine environment**

Further work is required to enable a proper understanding and assessment of the Project's likely impacts on the marine environment. The IAC recommends a program of further work that should be completed before decisions are made on the Project approvals (should they be issued).

The recommended program includes:

- a more detailed assessment of the existing marine environment including the intertidal zone
- further survey work to better establish the condition of the existing environment and the impacts of existing wastewater discharges from the Refinery
- refinement of the regional hydrodynamic modelling so that it is more closely calibrated to observed current and tide data for Corio Bay
- revisions to the nearfield hydrodynamic modelling to enable a better understanding of the effect of the FSRU on dispersion of marine discharges from the FSRU
- re-runs of the marine modelling which relied on key input parameters from the hydrodynamic modelling
- further assessment of:
  - dredging impacts on seagrass and other marine and marine-dependent biota

- shorebird and marine bird species that could be impacted by the Project
- confirmation that dredging will not impact the Ramsar site in light of the revised modelling.

### **Noise**

The noise assessments undertaken to date are not sufficient to determine background noise levels and appropriate noise limits for the Project. On the evidence before the IAC, the Refinery appears to not be complying with existing noise limits. Existing non-compliances will need to be addressed before it can be confirmed that the Project will be able to meet cumulative noise limits with existing industry (mainly the Refinery).

The experts agreed on a detailed set of mitigation measures that outlines the further work required to address the uncertainties associated with the noise impacts of the Project and the existing Refinery. The IAC supports the proposed approach.

### **Air quality**

There is some uncertainty regarding the Project's impacts on air quality. Sensitivity testing on the modelling of air emissions from the FSRU is required, to test the wake effects of the FSRU and to demonstrate that the modelling includes a 'worst case' scenario (but based on the use of the best available technology). The sensitivity testing should also demonstrate the implications on air quality of bubble limits and stack specific limits. Subject to this further work, it is likely that air quality impacts can be acceptably managed to achieve consistency with the evaluation objective and relevant policy and legislation.

### **Safety hazard and risk**

The safety hazard and risk assessments undertaken to date are appropriate for this stage in the Project's development. They represent a 'point in time' assessment. However there is a considerable amount of further work to be done, including further assessment of the risks associated with the mooring of the FSRU, navigation and berthing of LNG carrier transits, and unloading of LNG cargoes from carriers to the FSRU. The IAC is satisfied that future regulatory processes will ensure that risks are appropriately assessed and can be managed to an acceptable level or (if not) the Project will not proceed.

### **Aboriginal cultural heritage**

Some further assessment is required of impacts on Aboriginal cultural heritage values, to inform an updated Cultural Heritage Management Plan. Subject to this further work, it is likely that impacts on Aboriginal cultural heritage can be acceptably managed to achieve consistency with the evaluation objective and relevant policy and legislation.

### **Other impacts**

The following impacts of the Project can be effectively managed to meet the evaluation objectives and be consistent with relevant legislation and policy. In many cases the IAC recommends changes to the mitigation measures to ensure that impacts are minimised:

- terrestrial species including native vegetation (except for shorebirds and marine birds as discussed above)
- greenhouse gas impacts (discussed further below)
- vibration impacts
- groundwater and surface water impacts
- land use impacts

- social and business impacts
- onshore and offshore contamination impacts
- landscape and visual impacts
- transport impacts
- non-Aboriginal historical archaeological sites or maritime heritage places.

**(iv) Integrated assessment**

While some of the Project's environmental impacts require further assessment, many can (with mitigation) be managed to an acceptable level that is consistent with applicable legislation and policy and achieves the evaluation objectives.

In considering the potential social and economic impacts of the Project, there is a balance to be struck between the twin policy objectives of reducing greenhouse gas emissions and ensuring Victoria's energy system is secure, reliable and affordable.

Victoria's future gas needs are highly uncertain. The Project is one, but not the only, way of meeting Victoria's future gas demand. The Project could contribute to the orderly transition of Victoria's energy system by providing firming power when sufficient electricity is not able to be generated from renewable sources, but it is not clear how long this will be needed or how much gas would be required for this purpose.

A FSRU is a flexible supply option that could respond to seasonal and peak demands at short notice. The Project offers flexibility in terms of where gas is sourced. The capital investment required for the Project is relatively low (compared to other possible supply sources), and the risk of stranded assets is low. If gas is no longer needed the FSRU could be relocated, and the Refinery Pier extension could be repurposed to meet other needs of the Port of Geelong.

That said, there are some uncertainties regarding the Project's ability to deliver gas into the Victorian market reliably and at an affordable price. There is uncertainty about whether the Project will be able to secure a FSRU, whether the Proponent will be able to secure gas import contracts or contracts with retailers to supply gas into the network, and whether LNG carriers will be able to navigate to and berth alongside the FSRU safely. These are all Project risks that the Proponent will need to consider.

The Project will contribute to an increase in Victoria's greenhouse emissions, and will make it harder for federal, state and local government emissions reduction targets to be met. The Project's direct and indirect emissions will all contribute to climate change. However the Project cannot be said to be incompatible with policy to reduce emissions, because it does not preclude emissions reductions targets being achieved in other ways.

The Project has a range of potential social disbenefits. These include amenity impacts such as noise, air emissions, traffic generation and visual impacts. However, subject to further assessment in relation to noise and air quality, the amenity impacts of the Project are likely to be able to be acceptably managed with mitigation measures.

The more significant social impacts of the Project are its intangible impacts, which are more difficult to assess and to mitigate. These include real and deeply held fears in the community about the safety risks associated with the Project, and stress and anxiety around climate change. If the Project is approved, ongoing consultation with the community will be crucial in managing these less tangible (but no less real) social impacts of the Project. Good communication with the

community will be required, particularly in relation to how climate change impacts and safety hazard and risk will be managed going forward.

On balance, subject to the further assessment or testing of the Project's marine, noise and air quality impacts, the IAC is satisfied that the Project can deliver a net community benefit.

**(v) Process going forward**

It is beyond the scope of the IAC's task to make recommendations about the process for the IAC's recommended program of further work. That said, the IAC observes that third party involvement can result in superior assessment outcomes, as evidenced through the testing of the EES technical work through expert evidence in the Hearing. Now that the EES process is complete, there is no formal opportunity for further third party involvement in the statutory approvals processes should the Project proceed.

The IAC considers third party involvement in the further work recommended by the IAC should be facilitated. This could be done in a number of ways, including through a formal process such as a supplementary EES, or informally through further consultation. Whatever process is adopted, the IAC considers that it is important to provide a meaningful role for third parties, including the opportunity to test the further work where appropriate. While providing further information to the community can be valuable, this alone would not be sufficient to properly test the further work.

The IAC observes that it is possible some of the further work may identify the need for significant Project modifications. For example, the navigation assessments may identify that further dredging of the Corio Bay shipping channels is required to allow safe passage of LNG carriers. If this is the case, the environmental effects of any Project modifications may require further assessment.

**(vi) Consolidated recommendations**

The IAC's detailed recommendations throughout this Report have been consolidated and re-ordered into:

- recommendations for further work
- recommendations for changes to the Environmental Management Framework
- recommendations for conditions on the Development Licences (should they issue)
- a recommendation for the draft PSA (should it be approved).

**Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

- 1. Undertake further survey work to better establish the existing environment and the impacts of existing wastewater discharges from the Refinery to enable better understanding of Project impacts. The survey work should:**
  - a) cover intertidal, littoral and subtidal habitats that could potentially be affected by the Project, including the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site**
  - b) update seagrass mapping to include the intertidal zone, the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site and information on the different seagrass species**

- c) be carried out over a period of at least 12 months before construction or dredging starts, with a minimum of four sampling runs (one in each season) to address seasonal variability
  - d) establish a better baseline for monitoring during and after the Project to confirm predicted outcomes on shoreline and benthic communities, including seagrasses and macroalgae.
2. Refine the calibration of the regional hydrodynamic model so that it more accurately reproduces observed water levels, currents, tidal range and tidal exchange in Corio Bay. Consider:
  - a) the selection of the most appropriate wind data
  - b) more detailed horizontal resolution to represent the Hopetoun and North Channels more accurately
  - c) more detailed vertical resolution to represent discharge plumes in shallow waters more accurately
  - d) the effects of the presence of the floating storage and regasification unit on currents
  - e) peer review of the model calibration.
3. Re-run the wastewater discharge modelling with revised inputs based on the refined hydrodynamic model. Consider:
  - a) revising the nearfield modelling of discharges from the diffuser to address the matters raised by Dr McCowan in his written evidence (Document 75)
  - b) the Inquiry and Advisory Committee's recommended default guideline values for chlorine discharges (see Consolidated Recommendation 17).
4. Consider undertaking further targeted investigations into the effects of existing chlorine discharges from the Refinery to confirm likely Project impacts resulting from chlorination by-products, including measurement of chlorination by-product concentrations in:
  - a) seawater
  - b) biota that have high susceptibility to contamination.
5. Re-run the entrainment modelling with revised inputs based on the refined hydrodynamic model.
6. Re-run the sediment transport modelling with revised inputs based on the refined hydrodynamic model. Consider including a 'worst case' scenario for sediment fractions and settling rates which includes the largest expected proportions of fine and very fine materials that have the slowest expected settling velocities.
7. Undertake further assessment of dredging impacts on seagrass based on:
  - a) the revised sediment transport modelling
  - b) revised light thresholds of 10 percent to 20 percent surface irradiance (20 percent surface irradiance should be applied to any sediment plumes that extend to the Port Phillip Bay (Western Shoreline) and Bellarine Peninsular Ramsar site)
  - c) the updated seagrass mapping (see Consolidated Recommendation 1(b)).
8. Confirm the conclusion in the Environmental Effects Statement that dredging will not impact the Port Phillip Bay (Western Shoreline) and Bellarine Peninsular Ramsar site after considering:
  - a) the revised marine modelling
  - b) the revised assessment of impacts on seagrass.

9. Undertake further assessment of impacts on threatened and migratory bird species by:
  - a) establishing a complete list of threatened and migratory bird species that could potentially be affected by the Project (and consider including the black swan)
  - b) having the list peer reviewed
  - c) undertaking further analysis of the targeted shorebird surveys, to determine whether the surveyed sites individually or collectively support enough individuals of any particular migratory bird species to be an important site for that species in Australia or the East Asian-Australasian Flyway
  - d) considering the revised marine modelling.
10. Undertake the further assessment of noise impacts set out in mitigation measure MM-NV05.
11. Undertake sensitivity testing on the air quality modelling to confirm that operational impacts on air quality would be acceptable. Consider:
  - a) the significance of the wake effects of the floating storage and regasification unit
  - b) a 'worst case' scenario for air emissions (but based on the use of best available technology)
  - c) the implications of bubble limits and stack specific limits for sensitive receptors.
12. Undertake a cultural values assessment to identify intangible values relevant to the Project (both onshore and offshore in Corio Bay) and an underwater Aboriginal cultural archaeological assessment for the proposed dredging areas to inform an updated Cultural Heritage Management Plan. Review and update the mitigation measures and Incorporated Document to include any necessary changes to implement the updated Cultural Heritage Management Plan when approved.

#### Environmental management framework

The Part B chapters contain a number of detailed recommendations for changes to the mitigation measures. The IAC's consolidated recommendation is:

13. Amend the Part C mitigation measures (Document 456) as shown in Appendix G in the Inquiry and Advisory Committee's Report No. 2.

The IAC recommends:

14. Consider adding a requirement to the Environmental Management Framework to develop a conceptual model for coordinated ecosystem based management of environmental impacts and risks to the marine environment in subsequent stages of the Project, including detailed design, construction (including dredging), operation and decommissioning.
15. Include a requirement in the Environmental Management Framework to establish a Project-wide risk register to be maintained and updated as required throughout the detailed design, construction, operation and decommissioning phases of the Project. The requirements for the Project-wide risk register should be generally based on the approach outlined in the standard condition for a risk management and monitoring program applied by the Environment Protection Authority Victoria to development and operating licences issued under the *Environment Protection Act 2017*.
16. Include a requirement in the Environmental Management Framework to appoint an ecological coordinator to ensure appropriate coordination of further investigations,

including those recommended by the IAC, and for subsequent stages of the Project design and assessment process.

#### **Development Licence applications**

Should the Development Licences be issued, the IAC recommends:

- 17. For both Development Licences, adopt the following default guideline values for chlorine discharges:**
  - a) 7.2 microgram per litre in Corio Bay generally, including the Project area**
  - b) 2.2 microgram per litre at the Ramsar site.**
- 18. Include a condition on the Development Licence for the floating storage and regasification unit that when the Refinery is not operating, the floating storage and regasification unit seawater intake limit should be set consistent with seasonal gas production rates, with lower limits in spring and summer, capped at a maximum of 350 megalitres per day.**
- 19. Include a condition on the Development Licence for the floating storage and regasification unit that requires the Proponent to report annually on how it has preferenced lowest net embodied emissions liquified natural gas cargoes to be processed in the floating storage and regasification unit in accordance with mitigation measure MM-GG01.**
- 20. Include a condition on the Development Licence for the floating storage and regasification unit that limits operation of the floating storage and regasification unit in closed loop mode.**
- 21. Include a condition on the Development Licence for the floating storage and regasification unit that requires Scope 1, Scope 2 and Scope 3 greenhouse gas emissions within the Proponent's control to be offset annually by surrender of verified greenhouse gas offsets.**
- 22. Consider whether conditions should be included on the Development Licence for the floating storage and regasification unit regarding:**
  - a) the configuration of the floating storage and regasification, based on the results of the further air dispersion modelling that considers wake effects**
  - b) minimisation of odorant emissions.**

#### **Draft PSA**

The IAC recommends:

- 23. Update the exhibited draft Planning Scheme Amendment C442ggee as follows:**
  - a) update the exhibited Incorporated Document as shown in Appendix H**
  - b) replace Map 1 'Project Land and Special Controls Overlay Extent' in Explanatory Report with the final version of the plan to be included at Appendix 1 of the Incorporated Document.**

# PART A: INTRODUCTION AND BACKGROUND

# 1 The Inquiry Process

## 1.1 The Inquiry and Advisory Committee

Viva Energy Australia Pty Ltd (the Proponent) proposes to construct the Viva Geelong Gas Import Terminal (the Project). The Proponent has prepared an Environment Effects Statement (EES) for the Project. The EES was exhibited with:

- draft Planning Scheme Amendment C442ggee (draft PSA) that would provide planning approval for the Project
- two Development Licence applications (Application No. APP013874 and No. APP013841) under the *Environment Protection Act 2017* (EP Act)
- a Pipeline Licence application (Application No. PL007555) under the *Pipelines Act 2005*.

The Minister for Planning appointed an Inquiry and Advisory Committee (IAC) on 19 April 2022 pursuant to section 9 of the *Environment Effects Act 1978* (EE Act) and section 151 of the *Planning and Environment Act 1987* (PE Act) to inquire into and report on the Project, the EES, the draft PSA and the Development Licence applications. The IAC was appointed on 29 April 2022 as a Panel under the *Pipelines Act 2005* to advise on the Pipeline Licence application.

The IAC comprises:

- Sarah Carlisle, Chair
- William O’Neil, Deputy Chair
- Sandra Brizga
- Meredith Gibbs
- Nick Wimbush.

The IAC was assisted by staff at Planning Panels Victoria:

- Amy Selvaraj, Senior Project Officer
- Georgia Thomas, Project Officer
- Chris Brennan, Project Officer.

This is Report No. 1 of the IAC. Report No. 2 contains the Appendices.

## 1.2 The IAC’s role

The Minister for Planning signed Terms of Reference for the IAC on 20 March 2022. The Terms of Reference set out the scope of the IAC’s role and how it is to conduct the IAC process. A copy is provided in Appendix A in Report No. 2.

Clause 5 of the Terms of Reference requires the IAC to:

- (a) review and consider the environment effects statement (EES), submissions received in relation to the project, the predicted environmental effects, and the other exhibited documents;
- (b) consider and report on the potential environmental effects of the project, their significance and acceptability, and in doing so have regard to the draft evaluation objectives in the EES scoping requirements and relevant policy and legislation;
- (c) identify any measures it considers necessary and effective to avoid, mitigate or manage the environmental effects of the project within acceptable limits, including any necessary project modifications; and
- (d) advise on how this relates to relevant conditions, controls and requirements that could form part of the necessary approvals and consent for the project.

Clause 6 requires the IAC to:

- (a) review draft planning scheme amendment C442ggee (PSA), which has been prepared to apply a Specific Controls Overlay (SCO) and establish planning approval for the project under an incorporated document, along with any public submissions received in relation to the draft PSA; and
- (b) recommend any changes to the draft PSA that it considers necessary.

Clause 7 requires the IAC to produce a report of its findings and recommendations to the Minister for Planning to:

- inform the Minister’s assessment under the EE Act
- assist the Minister to make a decision about the draft PSA.

Clause 8 requires the IAC to provide advice to inform the consideration of the Development Licence applications by the Environment Protection Authority Victoria (EPA).

The IAC’s task as a Panel under the *Pipelines Act 2005* is set out in its letter of appointment and in the provisions of the Act. The Panel must prepare a report making recommendations as to the action that it believes should be taken with respect to the Pipeline Licence application (section 47). Matters to be considered include (section 49):

- potential environmental, social, economic and safety impacts of the proposed pipeline
- potential impact of the proposed pipeline on cultural heritage (including Aboriginal cultural heritage)
- benefit of the proposed pipeline to Victoria relative to its potential impacts.

The Proponent made detailed legal submissions about the scope of the IAC’s task under both the EE Act and the PE Act (D205). The IAC has had regard to these submissions in approaching its task and in preparing its advice and recommendations.

### 1.3 Scoping Requirements

The Minister for Planning issued Scoping Requirements for the EES in December 2020. The Scoping Requirements set out the matters that must be addressed in the EES, covering:

- general approach
- content and style
- project description
- project alternatives
- applicable legislation, policies and strategies
- evaluation objectives
- an Environmental Management Framework (EMF).

The Scoping Requirements set out the specific environmental effects that must be assessed, and evaluation objectives against which each impact is to be assessed (see Table 1).

**Table 1** Evaluation objectives

Environmental effect	Evaluation objectives
Energy efficiency, security, affordability and safety	To provide for safe and cost-effective augmentation of Victoria’s natural gas supply having regard to projected demand and supply in context of the State’s energy needs and climate policy.

Environmental effect	Evaluation objectives
Biodiversity	To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values.
Water and catchment values	To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.
Cultural Heritage	To avoid or minimise adverse effects on Aboriginal and historic cultural heritage.
Social, economic, amenity and land use	To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.
Waste management	To minimise generation of wastes by or resulting from the project during construction and operation including dredging and accounting for direct and indirect greenhouse gas emissions.

The EES includes 16 specialist technical studies that seek to respond to key issues identified in the Scoping Requirements, and to evaluate the potential environmental effects of the project design, construction, operation and decommissioning.

Each technical study assessed how potential adverse environmental effects could be avoided, minimised and managed. The findings are summarised in the EES main report.

An initial risk-based screening was applied to identify potential risks and impacts requiring assessment. The assessment framework is outlined in EES Chapter 7.

## 1.4 Exhibition and submissions

Clause 25 of the Terms of Reference provides for submissions to be lodged through the Engage Victoria website and collected by Planning Panels Victoria.

The EES was exhibited from 28 February to 11 April 2022. A total of 2,043 submissions were received. The submissions included:

- a submission from GeelongPort Pty Ltd and Ports Pty Ltd (GeelongPort) (S1974), the port manager and owner of some of the land and infrastructure on which the Project is proposed to be built
- submissions from four government agencies:
  - City of Greater Geelong Council (CoGG) (S15 and S1247)
  - Borough of Queenscliffe Council (S1999)
  - EPA (S1884)
  - Ports Victoria (S1895)
- 11 submissions from environment groups
- 22 from local community groups
- 2,005 from individual businesses and members of the community.

A full list of submitters is provided in Appendix B in Report No. 2.

**(i) Government agencies**

The IAC invited the following agencies to make a written submission and/or participate in the Hearing:

- WorkSafe Victoria (WorkSafe)
- Ports Victoria
- Southern Rural Water
- Corangamite Catchment Management Authority
- the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC), which is the Registered Aboriginal Party (RAP) for the land and waters on which the Project is proposed.

Responses were received from all but Corangamite Catchment Management Authority. WorkSafe and Southern Rural Water provided a written submissions (D76 and D26) but declined the invitation to appear at the Hearing. Ports Victoria referred the IAC to its original submission (S1895), but declined to participate in the Hearing (D62). The WTOAC provided two written submissions (D28 and D443), and elected to participate in the Hearing.

The submissions of these agencies have been helpful to the IAC in assessing the environmental effects of the Project and formulating its advice and recommendations. The IAC thanks these government agencies for their assistance and contributions to the process.

**(ii) Key issues raised in submissions**

The submissions raised concerns about the Project's environmental harm and pollution and the impact of the Project on climate change. Concerns raised were detailed and varied. Broadly speaking, the main themes were:

- the need for the Project
- the strategic justification for the Project, and its alignment with climate policy
- the economic justification for the Project
- concerns around greenhouse gas (GHG) emissions, the way they had been accounted for and reported, and their impact on climate change
- safety and hazard impacts
- impacts on the marine environment and biota
- impacts on the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (the Ramsar site)
- impacts on terrestrial and freshwater biodiversity
- impacts on the land based local environment
- local amenity impacts, including air quality, noise, visual impacts and traffic impacts
- impacts on other port facilities and operations
- impacts on the recreation and tourism values of Corio Bay
- social impacts, including through the loss of amenity, loss of access to recreational opportunities in and around Corio Bay, and the impacts of living with the fear of major incidents
- heritage impacts, including to Aboriginal cultural heritage values
- concerns about the extent and quality of consultation about the Project.

## 1.5 Requests for Information

The IAC prepared a Request for Information (RFI) that was provided to the Proponent on 4 May 2022 and tabled at the Directions Hearing the following day (D13). The Proponent provided a detailed written response in D111, and responded further through submissions, evidence and Technical Notes. It also responded to a range of other queries and information requested by the IAC and the parties through the Hearing process. The IAC thanks the Proponent and its team for its responsiveness in providing this information.

EPA issued two RFIs under section 50 of the EP Act seeking further information to inform EPA's assessment of the Development Licence applications:

- RFI001981 dated 14 April 2022 (D5)
- RFI002392 dated 27 July 2022 (D430).

At EPA's request, the IAC directed the Proponent to table its response to the first RFI which it did on 8 June 2022 (D74). The second RFI (D430) was issued by EPA to the Proponent on Day 26 of the Hearing, and there was insufficient time for the Proponent to prepare a detailed response before the close of the Hearing. It tabled an interim response on the final day of the Hearing (D480). No final response has been tabled or provided to the IAC.

The EPA RFIs and the Proponent's responses have assisted the IAC in formulating its advice to EPA to inform consideration of the Development Licence applications under clause 8 of the Terms of Reference.

## 1.6 Site inspections

The IAC undertook comprehensive accompanied and unaccompanied site inspections prior to and during the Hearing. An accompanied on-water tour of Geelong Port, Refinery Pier and the Ramsar wetland was undertaken during the Hearing, facilitated by Ports Victoria. The locations and features included on the site inspections were informed by suggestions from the parties. The list of main locations and features visited are outlined in D61, D93, D95 and D96. The IAC thanks the Proponent, GeelongPort, Geelong Grammar School (GGS) and Ports Victoria for facilitating the accompanied site inspections.

## 1.7 Hearings

The Directions Hearing was held via video conference on 5 May 2022, with nine participants and between 45 and 55 observers. At the Directions Hearing, the IAC introduced itself and its team, explained its role, discussed exhibition and submission issues, and discussed various directions in relation to the Hearing dates, site inspections, experts and cross examination, and the public availability of tabled documents.

The main Hearing was held via video conference over 29 days across seven weeks between 20 June and 5 August 2022. While attendance averaged at between 40 and 50 observers, around 70 people attended on the highest attendance days. The Hearing participants are listed in Appendix C in Report No. 2.

All documents and materials tabled during the IAC process were assigned a document number, recorded on the IAC's document list, and published on the Engage Victoria website (except for confidential documents). Tabled documents are listed in Appendix D in Report No. 2.

## 1.8 Report structure and terminology

The IAC has prepared two Reports:

- Report No. 1 – Main Report
- Report No. 2 – Appendices.

The material before the IAC is significant. It includes the EES, over 2,000 submissions, 32 statements of evidence, 509 tabled documents and the submissions and presentations of 90 parties who spoke to the IAC at the Hearing. The IAC has had to be selective in referring to the more relevant or determinative material in its Reports. All submissions and materials have been considered by the IAC in reaching its conclusions, regardless of whether they are specifically mentioned in the Reports.

The terminology used in the EE Act is ‘significant effects on the environment’. The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) refers to ‘significant impacts’ on matters of national environmental significance (MNES). The IAC’s Reports refer to impacts and effects interchangeably.

Submissions and evidence referred to the gas that is proposed to be imported to the terminal and distributed into the Victorian Transmission Network (VTN) as natural gas and fossil gas. The IAC uses these terms interchangeably. In its liquid form, it is referred to as liquified natural gas (LNG).

The Glossary and Abbreviations table contains a comprehensive list of acronyms used in these Reports.

## 1.9 Project documentation

The Project documentation consists of the Incorporated Document and the EMF, which includes a Mitigation Register listing all of the proposed mitigation measures.

The IAC directed the Proponent to circulate ‘Day 1’ versions of the Project documentation before the commencement of the Hearing, and ‘Part C’ versions with its closing submissions. The Proponent circulated:

- D34 – Day 1 changes to particular mitigation measures
- D36 – Day 1 version of the Incorporated Document
- D201 – Part B version of the Mitigation Register
- D456 – Part C version of the Mitigation Register
- D457 – Part C version of the Incorporated Document.

Parties were given the opportunity to provide written comments on the Part C versions following the close of the Hearing. Three parties elected to do so:

- D500 and D501 – the WTOAC
- D503 – EPA
- D505 and D506 – GGS.

The IAC has reviewed the various versions of the Project documentation, as well as the comments made by the parties on the Part C versions. The Part C versions included some substantive changes, and other drafting changes made for clarity. The IAC generally supports the Part C versions except where otherwise stated in its Reports. Its recommendations are based on the Part C versions.

## 1.10 Acknowledgements

It is not possible to acknowledge all who contributed to the EES process, through the original written submissions, suggestions for site inspections, the evidence, and the submissions and presentations of the parties.

The IAC thanks all who participated in this process. It appreciates the time people put into their submissions, and the way in which parties participated in the Hearing. The IAC thanks the Proponent for its assistance in setting up and hosting the online Hearing and document sharing platform, and providing technical support to the IAC and to the parties. This ensured a smoothly run and efficient Hearing process.

The IAC particularly thanks the office of Planning Panels Victoria for its support and assistance throughout the process, with special acknowledgment to Amy Selvaraj, Senior Project Officer and Georgia Thomas, Project Officer.

## 2 The Project

### 2.1 Introduction

This chapter provides a high level overview of the key elements of the Project drawn from the EES, particularly EES Chapters 1 and 4. This provides context for the discussion of the Project's environmental effects in Part B of this Report. EES Chapters 1 and 4 provide more detailed information about the Project.

### 2.2 Project description

The Proponent is planning to develop a terminal to import LNG into Victoria, using a ship known as a floating storage and regasification unit (FSRU) which would be continuously moored at Refinery Pier in Corio Bay, Geelong. The Project would introduce a new source of natural gas supply to the southeast Australian gas market.

The main components of the Project are:

- extension of the existing Refinery Pier with a new angled pier arm around 570 metres long, a new berth (Berth No. 5) and ancillary pier infrastructure including high pressure gas marine loading arms
- continuous mooring of a FSRU at the new Berth No. 5 to store and convert LNG into natural gas – LNG carriers would moor alongside the FSRU and unload the LNG directly into the FSRU
- transfer lines connecting the seawater discharge points on the FSRU to the seawater intake at the Refinery
- a new treatment facility on the Refinery site where odorant and nitrogen would be injected into the gas so it is suitable for the distribution and retail network (natural gas is odourless and the odorant makes the gas easily detectable if it leaks)
- around 3 kilometres of aboveground gas pipeline on the pier and within the Refinery connecting the FSRU to the treatment facility
- around 4 kilometres of underground gas pipeline connecting the treatment facility to the tie-in point to the VTN near Lara.

The EES contends the Project would provide a flexible option for short and medium term energy supply by providing a secure, stable source of gas.

### 2.3 Project objectives

The key objectives of the Project are set out on pages 1-3 of the EES:

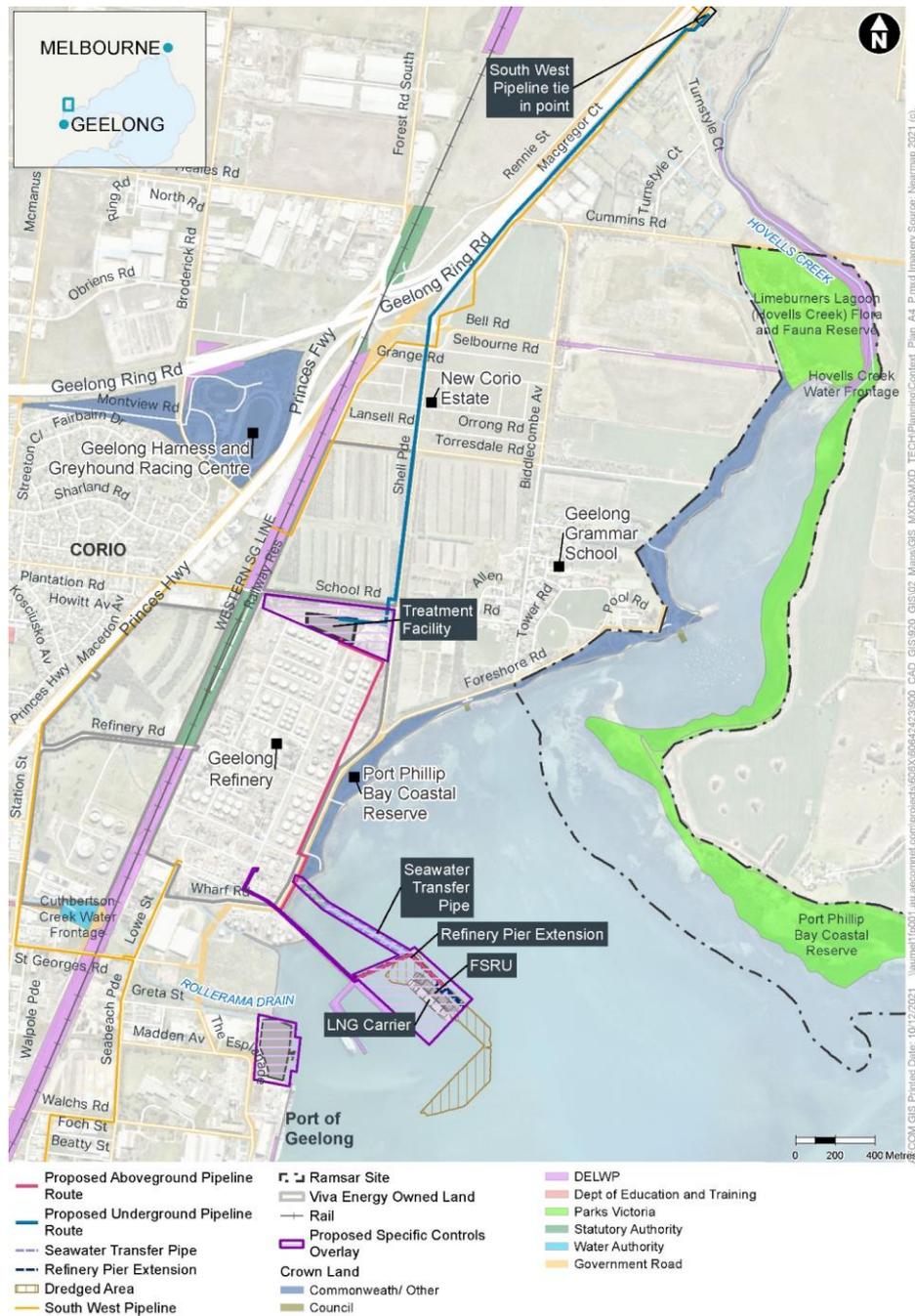
- Provide a new secure and flexible source of gas to the south-eastern Australian domestic gas market.
- Ensure forecast annual supply shortfalls in Victoria are avoided.
- Contribute to meeting peak seasonal and peak day demand for gas in Victoria.
- Support the Geelong Energy Hub vision for the Geelong Refinery, the Geelong economy and Victoria's energy transition.

## 2.4 Project area

### (i) Project location

The Project would be located in Geelong, 75 kilometres southwest of Melbourne. The Project area is within a heavily developed port and industrial area on the western shores of Corio Bay. The Geelong central business district is located around 7 kilometres south of the Project area.

Figure 1 Project overview



Source: Part C Incorporated Document (D457), Attachment A

**(ii) The Geelong Refinery**

The Geelong Refinery is owned and operated by the Proponent and is its largest operation, employing more than 700 people. The Refinery was established in 1954 and is one of only two operating refineries in Australia. It supplies around 10 percent of Australia's and around 50 percent of Victoria's fuel.

The Proponent has entered into an agreement with the Federal Government to operate the Refinery until at least mid 2028, with an option to extend to 2030.

The Refinery currently draws in around 350 megalitres per day (ML/day) of seawater from Corio Bay to use as cooling water for existing processes in the Refinery. The seawater intake is located just to the north of Refinery Pier. Chlorine is added to the seawater to control biofouling in Refinery plant and equipment.

The seawater is then discharged (at around 350 ML/day) from four discharge points located along the Corio Bay foreshore. The main discharge point (W1) is located just to the south of Refinery Pier. Three other smaller discharge points (W3, W4 and W5) are located to the north of Refinery Pier, along Shell Parade. The Refinery discharge contains residual chlorine levels, and is around 9 degrees warmer than the ambient temperature of the water in Corio Bay.

The Proponent provided further information about its future plans for the Refinery in its response to the IAC's RFI (D111). These include:

- continuing to supply fuels needed throughout the transition to electric vehicles or other future low carbon fuels, including by displacing existing imports of petrol
- introducing lower carbon and/or recycled feedstocks into the Refinery utilising existing plant and equipment but with a lower carbon footprint to produce more sustainable fuels
- a significant investment program to produce ultra-lower sulphur petrol
- the Geelong Energy Hub, which includes hydrogen, a 'New Energies Service Station', solar, strategic tank storage, biowaste and recycling
- co-location of the plant for a recently acquired polymer manufacturer and distributor.

**(iii) The Port of Geelong**

The Port of Geelong (the Port) is Victoria's second largest commercial trading port, and its premier bulk port. It has multiple berths across several wharves, one of which is Refinery Pier. Key activities involve importing and exporting bulk products such as crude oil, fertiliser, timber, grain and wind farm components. The Port handles close to 12 million tonnes of cargo per year and more than 600 vessel visits each year. Spirit of Tasmania vessels operating between Victoria and Tasmania will commence offering services from the Port in late 2022.

GeelongPort is one of the managers for the Port and is responsible for managing land-side infrastructure and wharves, including Refinery Pier and adjacent land. GeelongPort:

- holds the seabed lease for the land on which Refinery Pier is located
- owns and is responsible for managing safe and open access to Refinery Pier
- owns foreshore land on the landside of Refinery Pier, and at Lascelles Wharf, that the Proponent is proposing to use for purposes of the Project – including for the proposed gas pipeline, and a construction and laydown area at Lascelles Wharf.

As part of its role under the *Port Management Act 1995*, GeelongPort has the following responsibilities in respect of the parts of the Port that are under its management and control:

- safety and environmental management, including by the preparation of a Safety and Environment Management Plan
- managing (together with Ports Victoria) an Emergency Management Plan and a Maritime Security Plan
- the responsible entity for the Port under the *Security of Critical Infrastructure Act 2018* (Cth).

On Day 26 of the Hearing, GeelongPort advised the IAC it had entered into a commercial agreement with the Proponent for the construction and provision of necessary pier and berthing infrastructure for the Project, and was withdrawing from the Hearing (D410). For more detail, refer to Appendix E in Report No. 2.

## 2.5 Project delivery

### (i) Proponent

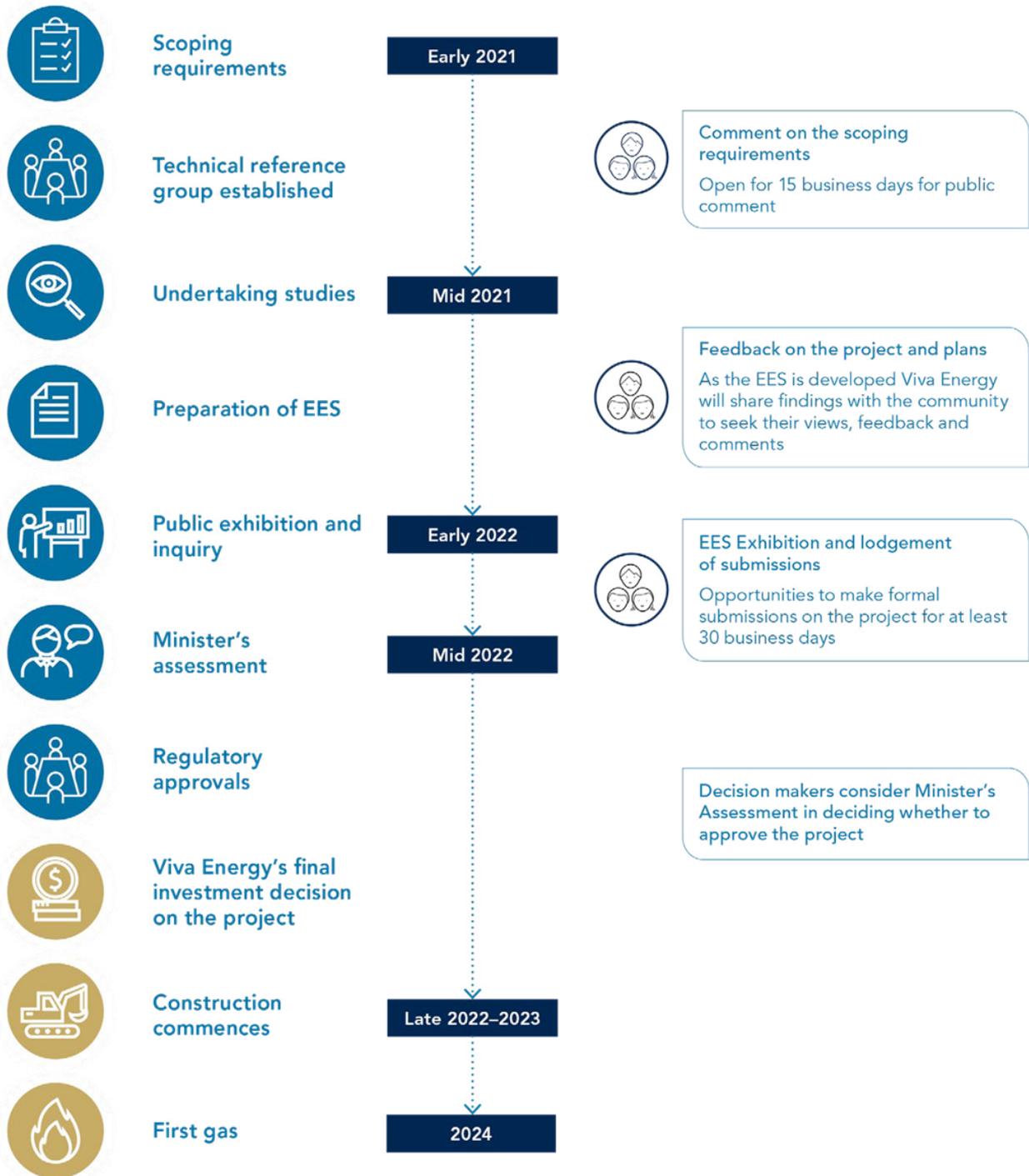
The Proponent is one of Australia's leading energy companies with more than 110 years of operations in Australia. It supplies around a quarter of the country's liquid fuel requirements. The Proponent is the exclusive supplier of Shell fuels and lubricants in Australia through a network of more than 1,300 service stations across the country.

As well as the Refinery, the Proponent owns and operates bulk fuels, aviation, bitumen, marine, chemicals and lubricants businesses supported by a large number of fuel import terminals, depots and airports and airfields.

### (ii) Project timeline

The timeline for the planning, design, construction, and operation of the Project is shown in Figure 2. This timeline is subject to receiving required approvals within certain timeframes.

Figure 2 Project timeline



 Environment Effects Statement (EES) process
  Project milestone
  Formal community involvement

These are target dates, creating an indicative timeline. Dates are subject to change and dependent on relevant approvals.

Source: EES Figure 1-2

## 2.6 The source of gas

The Proponent will not import LNG to the facility. It will only operate the facility. LNG cargoes will be imported by third parties. The gas may be sourced either domestically or internationally.

## 2.7 Open loop, closed loop and combined loop modes

The EES described three different operating modes for the regasification process on the FSRU:

- open loop
- closed loop
- combined loop.

In open loop mode, the FSRU would continuously take in seawater and use it to warm the LNG so it regasifies. The seawater would be treated with chlorine to control biofouling in the FSRU's heat exchange system. Used seawater would be discharged continuously from the FSRU either via the seawater transfer pipe to the Refinery intake for reuse in the Refinery as cooling water, or directly to Corio Bay via a diffuser located beneath Refinery Pier (for example during Refinery maintenance or if the Refinery is no longer operating). The diffuser would diffuse the discharge plume so that it is less concentrated.

In closed loop mode, seawater is recycled in the FSRU's heat exchange piping system rather than being continuously drawn in and discharged. Around 500 cubic metres of seawater would be drawn into the FSRU, treated with chlorine and heated using gas fired steam boilers on the FSRU. The used seawater would only need to be discharged when the FSRU reverts to open loop mode or if maintenance is required (anticipated annually).

Combined loop mode would be used when the ambient seawater temperature is lower than needed for effective and efficient regasification. In combined loop mode, seawater would be continuously drawn into the FSRU, treated with chlorine and heated using the gas-fired boilers, and then discharged.

Open loop mode is the preferred operating mode. Open loop mode uses less gas (open loop mode requires around 1.5 percent of the gas stored on the FSRU to fire the gas boilers compared to 2.5 percent for closed loop mode – refer to the EES main report at page 4-10). Consequently, open loop mode is cheaper and generates less greenhouse gas emissions.

The EES indicated that:

- FSRU discharge is to be capped at 350 ML/day
- in open loop and combined loop modes, indicative monthly discharges from the FSRU range from 150 ML/day in summer to 320 ML/day in winter, which appear to be determined by gas demand
- discharge from the FSRU to the Refinery would be capped at 344 ML/day to prevent backflow of seawater out of the Refinery's seawater intake channel.

## 2.8 Synergies with the Refinery

The EES contended that co-locating the Project with the Refinery provides an opportunity for synergies between the two. The main advantage is that seawater used on the FSRU in the regasification process (when operating in open loop mode) can be diverted via the proposed seawater transfer pipe to the Refinery and reused for cooling water, rather than being discharged

directly to Corio Bay. Once the seawater has been recycled as cooling water through the Refinery, it would be discharged from the existing Refinery discharge points.

The reused seawater discharge would have similar residual chlorine levels as current Refinery discharges, but would be closer in temperature to ambient conditions in Corio Bay (2 degrees above ambient, compared to 8 to 10 degrees above ambient).

The EES stated (at page 4-12 of the main report) that this is an “*environmental enhancement*”, as:

- It removes the need for two separate water intakes and two separate discharges from the refinery and the gas import terminal project if they were to be operated independently and without the synergy of co-location
- The project involves no change in the existing refinery seawater intake rate of 350 ML/d, no change to the existing refinery discharge rate of 350 ML/d, no change to the existing refinery chlorine concentration at the four refinery discharge points and a reduction in the temperature of the discharge plumes.

While the EES assessed the Project’s impacts largely on the basis of these synergies with the Refinery, it also assessed the impacts of the FSRU operating in open loop mode and discharging via the diffuser, and in closed loop mode. Both these operating modes are not reliant on discharging FSRU seawater via the Refinery intake.

## 2.9 Project approvals

### (i) Legislative and policy context

Key legislation and approvals required for the Project are outlined in EES Chapter 5. A full list of applicable legislation, policy and guidelines is contained in EES Appendix III (Legislation and policy report). The IAC’s summary of the legislative and policy context is contained in Appendix F in Report No. 2.

### (ii) Project approvals

EES Chapter 14.2 sets out the main approvals and consents that will be required for the Project to proceed. The key approvals are listed in Table 2. Legislation is Victorian unless otherwise indicated.

**Table 2** Statutory approvals and consents

Legislation	Statutory approval authority	Statutory approval
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth) (EPBC Act)	Commonwealth Minister for the Environment	Approval of the project which is a controlled action
<i>Marine and Coastal Act 2018</i> (MACA)	Minister for Energy, Environment and Climate Change	Consent to ‘undertake works on marine and coastal Crown land’ (dredging) Consent for the ‘use and development of marine and coastal Crown land’ (FSRU, pier extension and piping from the FSRU to the existing refinery cooling water intake)

Legislation	Statutory approval authority	Statutory approval
<i>Environment Protection Act 2017</i> (EP Act)	EPA	Development Licence and Operating Licence for the installation and operation of the FSRU  Development Licence or exemption for the Geelong Refinery for a new prescribed activity and a modification to the existing Operating Licence for the Geelong Refinery to permit new prescribed activity (as the holder of the current EPA Licence 46555 Viva Energy Refining Pty Ltd will be the applicant for this Development Licence)
<i>Planning and Environment Act 1987</i> (PE Act)	Minister for Planning	Planning Scheme Amendment (Specific Controls Overlay) to the Greater Geelong Planning Scheme
<i>Pipelines Act 2005</i>	Minister for Energy, Environment and Climate Change Energy Safe Victoria	Pipeline Licence to construct and operate a pipeline, including: <ul style="list-style-type: none"> <li>- Environment Management Plan</li> <li>- Safety Management Plan</li> <li>- Pipeline Consultation Plan</li> </ul>
<i>Aboriginal Heritage Act 2006</i>	First Nations – State Relations and relevant Registered Aboriginal Party	Cultural Heritage Management Plan
<i>Gas Safety Act 1997</i>	Energy Safe Victoria	Gas safety case
<i>Occupational Health and Safety Act 2004</i> (OHS Act)	WorkSafe	Major Hazard Facility Licence for FSRU and amendment to the current refinery Major Hazard Facility Licence for the treatment facility
<i>Flora and Fauna Guarantee Act 1988</i> (FFG Act)	Minister for Energy, Environment and Climate Change Minister for Agriculture	If required, a permit for vegetation clearance of FFG Act-listed species on public land.

Source: EES Chapter 14, Table 14-2

## 3 Environment Effects Statement

### 3.1 Statutory decisions

#### (i) The decision to require an EES

The Proponent referred the Project to the Minister for Planning under the EE Act on 11 November 2020. On 28 December 2020, the Minister issued a decision determining that an EES was required. The Minister identified two primary areas of potential environmental impact (marine environment and greenhouse gases) and several areas of secondary impacts.

#### (ii) The controlled action decision

On 21 January 2021, the Commonwealth Minister for the Environment determined the Project to be a controlled action under the EPBC Act. Controlled actions are those likely to have a significant impact on a MNES. The Project was determined to be a controlled action due to potential significant impacts on:

- the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (Ramsar site)
- listed threatened species and ecological communities
- listed migratory species.

The EES will serve as the accredited environmental assessment process for the purpose of the EPBC Act.

### 3.2 The EES documentation

The EES main report has 16 chapters, accompanied by a separate summary and list of references. The EES includes 16 Technical Reports dealing with the different environmental effects of the Project, as set out in Table 3.

**Table 3** EES Technical Reports

Reference	Title	Author
Technical Report A	Marine ecology and water quality impact assessment	Consulting Environmental Engineers (CEE)
Technical Report B	Dredged sediment disposal options assessment	AECOM
Technical Report C	Greenhouse gas impact assessment	AECOM
Technical Report D	Terrestrial ecology impact assessment	AECOM
Technical Report E	Surface water impact assessment	AECOM
Technical Report F	Groundwater impact assessment	AECOM
Technical Report G	Contamination and acid sulfate soils impact assessment	AECOM
Technical Report H	Air quality impact assessment	AECOM
Technical Report I	Noise and vibration impact assessment	AECOM
Technical Report J	Landscape and visual impact assessment	Hansen Partnership

Reference	Title	Author
Technical Report K	Transport impact assessment	AECOM
Technical Report L	Social and business impact assessment	AECOM
Technical Report M	Land use impact assessment	AECOM
Technical Report N	Safety, hazard and risk assessment	Nuffield Consultants
Technical Report O	Aboriginal cultural heritage impact assessment	Jem Archaeology
Technical Report P	Historic heritage impact assessment	Jem Archaeology

The EES includes seven attachments:

- Energy demand and market statement (Attachment I)
- Climate Change Risk (Attachment II)
- Legislation and Policy (Attachment III)
- Matters of National Environmental Significance (Attachment IV)
- Development License Applications (Attachment V)
- Pipeline Licence Application (Attachment VI)
- Draft PSA (Attachment VII).

### 3.3 Environmental Management Framework

EES Chapter 14 includes the proposed EMF. The EMF provides integrated measures to mitigate, manage and monitor the potential environmental impacts of the Project. The mitigation measures build on the recommendations in the Technical Reports.

The primary implementation of the EMF is through the Incorporated Document proposed under the draft PSA. Clause 4.6 of the Incorporated Document requires an Environmental Management Plan (EMP) to be prepared before use or development commences. The EMP must:

- include the mitigation measures
- set out the process for developing a Construction Environmental Management Plan (CEMP) and an Operations Environmental Management Plan (OEMP).

## 4 Project alternatives and development

### 4.1 Introduction

EES Chapter 3 includes discussion on project alternatives and development.

The Scoping Requirements required the EES to include an assessment of feasible alternatives, particularly where these offer potential to minimise or avoid significant environmental effects while meeting the Project objectives. The assessment of alternatives needed to include (among other things):

- an explanation of why the FSRU was selected in preference to onshore regasification
- consideration of open loop, closed loop and combined loop options for the FSRU
- an explanation of the interdependency of the FSRU and the Refinery and how they will operate during maintenance or shutdowns of one or the other
- how the pipeline route was selected
- design alternatives for any Project components
- environmental considerations, including effects on MNES
- short, medium and long term disadvantages of different alternatives.

### 4.2 What did the EES say?

#### (i) Onshore regasification

The EES described an alternative of a floating LNG storage (on a tanker similar to an FSRU) but with onshore regasification. A FSRU was selected in preference to onshore regasification because:

- a significant amount of land would be required on the Refinery site to build the regasification plant
- modifications to existing Refinery infrastructure would be required
- more construction would be required, extending the construction period by up to a year
- the regasification plant would be located closer to nearby sensitive uses, creating additional safety concerns
- a FSRU provides greater flexibility if there is a change in demand for gas (it can be relocated and used elsewhere in the world)
- more decommissioning would be required if there was an onshore regasification plant.

#### (ii) Alternative locations for the FSRU

Alternative locations for the FSRU were considered:

- near shore locations at a redeveloped Refinery Pier Berth No. 1, Lascelles Wharf or Point Henry
- more distant offshore locations in Port Phillip Bay.

More distant offshore locations were dismissed because:

- they would be outside existing port and industrial areas and likely to have more environmental constraints
- locations closer to Melbourne would be more problematic due to shipping congestion, conflict with recreational boating, visual impact and difficulty obtaining onshore pipeline access for connection to the VTN

- weather at anchorage in a more exposed setting could preclude ship to ship transfer of LNG, particularly during winter, which could affect reliability of gas supply
- reuse of FSRU discharge water in the Refinery would not be possible
- subsea pipeline construction is complex, and extensive lengths of subsea pipeline could potentially be required that may need to pass through a Ramsar site
- an offshore location could potentially conflict with the Bay West port proposal.

Point Henry had some advantages (greater separation to residential areas and less disruption to Port infrastructure), but was not preferred because:

- it would require significantly more dredging
- reuse of FSRU discharge water in the Refinery would not be possible
- a long pipeline would be required to deliver gas from the FSRU to the treatment facility, either subsea across Corio Bay or on land circling Geelong
- future channel deepening in Corio Bay could impact a subsea pipeline.

Lascelles Wharf had some advantages (mainly relative proximity to the Refinery) but was not preferred because:

- it is closer to residential areas than Refinery Pier and would have higher amenity impacts and safety concerns
- land acquisition would probably be required for the pipeline
- more dredging would be required
- reuse of FSRU discharge water in the Refinery would not be possible.

### 4.3 Discussion

A strong theme through submissions was that the proposed location for the Project is not appropriate. Submitters said that other than in Boston Harbour, there are no examples anywhere in the world of an LNG terminal being located so close to residential areas or sensitive uses. Many argued that Point Henry was a better location for the Project. Others argued that a more distant offshore location (as is proposed for the Vopak proposal) should have been selected.

The IAC's task is to assess the environmental effects of the Project as presented in the EES. It is not to assess whether other alternative locations would be preferable. That said, the IAC accepts that there would be certain advantages of locating the Project further from residential areas and sensitive uses, primarily to reduce potential safety and amenity impacts of the Project.

The IAC observes in passing that it does not consider Point Henry would likely be a strategically justified location for the Project. Point Henry is earmarked as a future residential and tourism precinct in the Moolap Coastal Strategic Framework Plan. Clause 02.03 of the Planning Scheme, which identifies future strategic directions for the municipality, states:

#### **Moolap-Point Henry**

Moolap-Point Henry is a key urban renewal site of 1200 hectares located five kilometres east of Central Geelong. The site is significant for its biodiversity, environmental assets, cultural heritage values and industrial history. The site is intended to be transformed into a mixed-use precinct with a mixture of residential, tourism, recreational, commercial and employment uses.

### **Strategic direction**

Facilitate the transformation of Moolap-Point Henry from an industrial area into a sustainable and integrated community.

While more distant offshore locations may have some advantages in terms of separation distances to residential areas and other sensitive uses, the IAC accepts that offshore locations also have a number of disadvantages as outlined in the EES.

The IAC is satisfied that the EES's assessment of alternatives broadly met the Scoping Requirements. EES Chapter 3 contains a description of open loop, closed loop and combined loop operating modes for the FSRU and explains why open loop was selected as the preferred alternative. It explains how the Project is intended to operate interdependently with the Refinery, and the IAC accepts that at a broad level, there are environmental advantages to reusing the FSRU discharge water as cooling water in the Refinery. EES Chapter 3 includes a detailed explanation of how the pipeline route was selected, and why the alignment presented in the EES was selected as the preferred option. It considered design alternatives for key Project components including the FSRU, and explained why the selected components were chosen, including their comparative advantages and disadvantages.

## **4.4 Findings**

The IAC finds:

- The EES's assessment of Project alternatives broadly meets the Scoping Requirements.

## 5 Project rationale

### 5.1 Introduction

The relevant evaluation objective is:

To provide for safe and cost-effective augmentation of Victoria's natural gas supply having regard to projected demand and supply in context of the State's energy needs and climate policy.

The evaluation objective has a number of elements. This chapter discusses projected demand and supply in the context of the State's energy needs, and cost effective augmentation of Victoria's natural gas supply. Safety is dealt with in Chapter 11. Consistency with climate policy is dealt with in Chapter 19.

The project rationale is discussed in EES Chapter 2. Supporting reports and studies include the Energy demand and market statement (EES Attachment I).

Table 4 lists the evidence relevant to the Project rationale.

**Table 4** Project rationale evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D58, D112	Rick Wilkinson, EnergyQuest	Gas market	Primary author of EES Attachment I (see D117)
D37, D78	Andrew Harpham, Frontier Economics	Economics of a transition to net zero emissions with and without gas	Independent expert, not involved in the preparation of the EES (see D118)
<b>GGS</b>			
D86	Jim Snow, Oakley Greenwood	Gas market	Independent expert
<b>Statement of agreed opinions and facts</b>			
D113	R Wilkinson, A Harpham, J Snow	Gas market	Independent expert

Additional information was provided in a range of documents. Key documents included:

- D114 and D115 – Viva Presentation Rationale Pt 1 and Pt 2
- D119 – AEMO Gas Statement of Opportunities, March 2022
- D184 – Victoria's Gas Substitution Roadmap
- D204 – Viva submission on the Victorian Government Gas Roadmap
- D253 – Technical Memorandum by Andrew Mathers on amount of gas supplied by 29 LNG carrier cargoes per year
- D264 – Consultation Paper on the high level design of a potential energy capacity mechanism, Energy Security Board, June 2022
- D267 – AEMO Demand Forecasts, Step Change Scenario, Victoria only
- D435 – Technical Note 11: Project Rationale

- D485 – Australian Competition and Consumer Commission Gas Inquiry 2017-2025 Interim Report, July 2022.

## 5.2 What did the EES say?

The Project is intended to provide a secure and flexible gas supply to support the energy needs of Victoria and southeast Australia as the energy market transitions to zero emissions alternatives. The Project objectives are recorded in Chapter 2.3 of this Report.

EES Chapter 2 and Attachment I highlighted the important role that gas plays in Victoria's energy market, noting that Victoria is more reliant on gas than other south eastern states with usage driven by residential winter heating demand. Gas is also a key input for manufacturing and plays a minor but important role in overall electricity generation in Victoria.

The EES considered future supply and demand projections prepared by the Australian Energy Market Operator (AEMO) for a number of different scenarios in its *Gas Statement of Opportunities* (GSOO) March 2021 and *Victorian Gas Planning Report* March 2021. The EES predicted significant volumes of gas will continue to be needed in southeast Australia (over 400 petajoules (PJ) annually) and Victoria (around 200 PJ annually) until 2040 and beyond.

The EES highlighted a number of supply constraints that are predicted to result in gas shortfalls:

The lack of new gas reserves and resources in southeast Australia, combined with inadequate transmission infrastructure, is expected to create a seasonal gas shortage for domestic customers in the south eastern states some time around 2025.

The key rationale for the Project is that it could address these predicted gas shortfalls.

The EES states that the Project would have additional gas supply related benefits including:

- providing flexible capacity for meeting daily peaks and seasonal swings in demand
- securing a gas supply under contracts without the risk of existing reserves running short
- operating as a 'virtual pipeline', that competes with monopoly pipelines and avoids long distance pipeline tariffs and expensive pipeline augmentations
- providing access to globally competitive gas markets and prices.

EES Chapter 2 concluded that the Project would be consistent with Victoria's energy policy objectives to ensure an efficient and secure energy system that delivers energy reliably and safely at affordable prices, at the same time ensuring environmental sustainability and reduced GHG emissions intensity.

## 5.3 Project need

### (i) Key issues

The key issues are whether the Project is needed to:

- address a gas supply shortfall in Victoria
- augment Victoria's energy security and reliability
- support Victoria's transition to renewables.

### (ii) Evidence and submissions

Mr Wilkinson and Mr Harpham gave evidence for the Proponent on the gas market. Mr Wilkinson's evidence focused on supply and demand. Mr Harpham's evidence focused on

Victoria's energy transition and costs. Mr Snow gave evidence for GGS on the gas market and the transition to renewables.

There was a high level of agreement between the experts on a number of matters, recorded in the statement of agreed opinions and fact (D113). Several issues remained in dispute.

### Gas supply shortfall

The Proponent submitted that the Project was needed to address a projected shortfall in gas supply, demonstrated by the EnergyQuest modelling (prepared by Mr Wilkinson) in EES Attachment I. Attachment I relied on AEMO's demand forecasting for southeast Australia in the GSOO 2021. While the updated forecasts in the GSOO 2022 suggested the shortfall might arise later than predicted in the GSOO 2021, a shortfall is still predicted.

The experts agreed that (D113):

- gas is very important in Victoria's energy mix with more energy supplied over gas pipelines (217 PJ) than over electricity wires (156 PJ) in 2020-2021
- gas demand in Victoria is highly seasonal, with winter gas demand around three times the summer demand
- future gas needs are highly uncertain
- Victorian gas reserves are in decline
- there are forecast supply shortfalls by 2030 to 2033, even if the Port Kembla LNG terminal in NSW comes online in 2025
- fossil gas alternatives (such as hydrogen gas, biomass and the like) are forecast to increase in supply, and decrease the demand for fossil gas
- other LNG projects (including Port Kembla) are being deferred due to difficulties in securing contracts with the major energy retailers.

AEMO's demand forecasting provides a number of different scenarios, the most relevant being:

- the Progressive Change scenario, which is based on current state and federal energy and climate policies
- the Step Change scenario, which involves a more rapid transition away from fossil gas, and is considered the most likely by the majority of industry stakeholders.

Mr Wilkinson preferred the Progressive Change scenario. Mr Snow preferred the more rapid Step Change scenario. That said, Mr Wilkinson considered that trying to pick the best or a single scenario is not a good approach, and it is better to examine whether a project is robust under a range of scenarios. His evidence was that *"all of the AEMO GSOO 2022 scenarios (and the EnergyQuest model referenced in the EES) show long term shortfalls as soon as 2029 and not later than 2033"* (D58).

Mr Snow's evidence was that the gas demand forecasts in the EES were out of date. He gave evidence that after the EES was prepared, there had been significant and material changes in new gas supplies, storage, pipeline capacity expansions and demand reduction expectations as a result of strong imperatives to reduce fossil gas use and rapidly decarbonise. He referred to:

- alternative sources of fossil gas supply including the Queensland gas fields, the Port Kembla LNG import terminal and the Outer Harbour LNG import terminal (both projects have been approved but are not yet constructed)
- alternatives to fossil gas such as hydrogen, biogas, biomethane and synthetic methane coming onto the market, taking market share from fossil gas.

He said that these changes had resulted in the “*prolonged deferment of the forecast shortfalls out to 2030 and as late as 2033, significantly deferring the perceived need for LNG imports into the southeast gas market until that time*” (D86).

Mr Wilkinson disputed the certainty of the new gas supplies referred to by Mr Snow and the impact they would have on predicted shortfalls.

GGs submitted that the EES’s assertion that the Project is necessary to meet a predicted gas shortfall in the next few years was “*nonsense*”. It submitted that the EES relied on questionable forecast scenarios that have been overtaken by recent events, including the release of *Victoria’s Gas Substitution Roadmap 2022* (Roadmap, D184). GGS submitted that the modelling in the Roadmap indicates that shortfalls will not occur until at least 2033, and by then the gas market could look very different.

Several submitters, including Mr Crosthwaite and Mr Nolan, submitted that Victoria has a gas management issue, not a gas supply issue. They:

- highlighted that Australia is one of the world’s largest LNG exporters, and that Victoria is a net exporter of LNG
- questioned whether Victorian reserves are depleting as fast as the EES and Mr Wilkinson suggested
- submitted that shortfalls can be avoided under the Australian Domestic Gas Supply Mechanism (ADGSM), which allows the Federal Government to direct LNG projects to limit exports in order to prevent supply shortfalls in the domestic market.

Several submitters were critical of the EnergyQuest modelling for failing to factor in the ADGSM. Mr Wilkinson conceded that if used aggressively, the ADGSM could be a ‘game changer’ in securing domestic supply, but he questioned how likely the government would be to trigger the ADGSM given it could affect the ability of LNG exporters to meet their supply obligations under long term LNG export contracts.

Other submitters considered that the EES failed to take account of the role of electrification and energy efficiency in its demand forecasting. They submitted that as household demand drops through electrification, more gas will be available to meet demands for industrial use and gas fired power generation. For example, Mr Crosthwaite submitted (D406):

Victoria’s proposed Gas Substitution Roadmap anticipates energy efficiency and electrification to result in significantly lower gas use, especially for households. Moreover, electrification is proceeding at a pace across Australia. Demand for gas will fall not just in Victoria, but also in New South Wales, South Australia and Tasmania.

### **Energy security and reliability**

The experts agreed (D113):

- LNG importation and regasification can technically increase gas availability in a flexible format to any gas market
- the Project is one of several supply options.

Mr Wilkinson’s evidence was that the energy system needs safety mechanisms to deal with unexpected situations and ensure security of supply. He considered that the Project uses proven technology to provide a flexible source of supply that is well placed to respond to peak demand days or unexpected energy constraints. He confirmed in response to a question from the IAC that gas from the FSRU could be available at the VTN tie-in point near Lara within a matter of hours.

Mr Snow's evidence was that the Project would be subject to supply chain risks, as with any seaborne traded commodity. He considered that expanded gas storage facilities (such as Iona in the Otway Basin) are a better solution to security and reliability issues. He acknowledged, however, that this is dependent on how much gas can be injected into the storages or the system during peak winter demand periods.

Adopting parts of GeelongPort's withdrawn submission, GGS submitted that the IAC could have little confidence that the Project will provide a secure and reliable source of 160 PJ of gas annually because:

- the Proponent is not sourcing the gas or supplying it into the Victorian market
- there is no guarantee that customers would use the facility, particularly given the experience of the Port Kembla project which has been put on hold due to not being able to secure customers
- Mr Snow's evidence was that at least one of the three Tier 1 gas retailers would be needed for the Project to achieve financial close – to date, no retailers have committed
- there is no guarantee that the Proponent will be able to secure a FSRU due to the tight international market for FSRUs resulting from the Russia-Ukraine war
- there is no certainty that LNG carriers will be able to safely transit to the FSRU or safely berth at Berth No. 5 to deliver their loads because the EES has not completed a proper end-to-end navigation simulation or mooring study (see Chapter 11 of this Report for more detail)
- the EES contains discrepancies about the number of LNG carrier movements (some chapters indicate 29 LNG carrier movements while others refer to 45 movements), and consequently there is a real question about whether the Project will in fact deliver the stated 160 PJ of gas per year.

### **The role of gas in Victoria's energy transition**

The Proponent submitted that there are a number of challenges facing Victoria's transition to a predominantly renewables based energy market. It submitted that the transition will take 20 to 30 years, and will require a massive amount of solar and wind capacity to come online, as well as the construction of major transmission infrastructure to deliver this new renewable generation to the market. Gas will continue to play an important role in supporting the transition. Without it, energy supply interruptions could occur which could undermine public support for the transition.

The experts agreed that gas will play an important part in Victoria's energy transition including gas fired generation (D113).

Mr Harpham's evidence was that a reliable supply of gas is crucial to support gas fired generation over the next 20 years while the transition occurs. Gas fired generation will be needed for:

- generating electricity at times of high demand and/or low generation from renewable sources
- responding quickly to rapid changes in electricity demand and/or supply.

Mr Harpham's evidence was that battery storage is not well suited as a source of firming power, as storage is limited to hours (not days). Mr Wilkinson gave evidence that gas fired generation will continue to play an important role as coal fired power stations (which currently supply the bulk of Victoria's electricity) retire.

While Mr Snow agreed that gas from the Project could be used to generate firming power, he considered that this is a relatively small market and based on the South Australian experience of transitioning to renewables, is likely to decline over time as higher levels of renewables are achieved. Under cross examination by Environment Victoria Mr Wilkinson conceded that gas fired generation plays a limited role in providing firming power to support the transition to renewables.

### (iii) Discussion

#### Gas supply shortfall

The IAC notes at the outset that many of the forecasts relied on by experts and submitters are for the southeast gas market rather than for Victoria specifically. This is no doubt due to how the southeast gas market operates. AEMO's GSOO modelling is generally for the southeast market. However the IAC's task is to assess the Project in terms of Victoria's energy needs. Therefore, the IAC has taken care to distinguish information relating to southeast demand and Victorian demand in its considerations.

There was no dispute over Victoria's heavy reliance on gas, particularly in meeting winter energy demands, or that Victoria's energy needs are 'peaky'. The question is whether this demand will decline over the short to medium term, and at what rate.

A range of predictions of Victorian gas demand in 2025, 2030 and 2040 were put to the IAC. These are summarised in Table 5. The amounts are annual demand, for Victoria only, and are approximate.

Table 5 Approximate Victorian gas demand in 2025, 2030 and 2040

Scenario	GSOO 2022 Progressive Change	GSOO 2022 Step Change	Roadmap 'No action'	Roadmap Core scenarios with net zero by 2050
2025 demand	200 PJ	180 PJ	210 PJ	150-160 PJ  Note the Victorian Gas Planning Report 2022 (D58) predicts higher demand of 175 PJ by 2026
2030 demand	220 PJ	150 PJ	210 PJ	100 PJ
2040 demand	215 PJ	140 PJ	210 PJ	50 PJ by 2040 in two of the three scenarios and somewhere around 10 PJ just after 2040 in the third

Source: IAC using information sourced primarily from D119, D184 and D267

Table 5 demonstrates that:

- demand forecasts are highly uncertain, and highly dependent on the scenario selected
- the Project would be supplying fossil gas into a declining market, although there is considerable uncertainty about how quickly demand will decline.

In these circumstances, the IAC agrees with Mr Wilkinson and the Proponent that it would be unwise to try to predict demand based on a single scenario.

The GSOO 2022 forecasts a tight east coast gas market over the next 20 years with significant but infrequent shortfalls under extreme conditions in the longer term. Some scenarios forecast a risk

of gas shortfalls in extreme weather conditions as early as winter 2023. The ACCC's July 2022 Gas Inquiry 2017–2025 interim report (D485) forecasts a supply shortfall in 2023 if east coast LNG producers export all of their uncontracted gas. The experts agreed that without the Project, gas shortfalls would likely occur in Victoria by 2030 to 2033, even assuming imports from Port Kembla would be occurring. If the Progressive Change scenario plays out, shortfalls could occur as early as 2027 according to Mr Wilkinson.

On the other hand, Mr Snow, Mr Crosthwaite and others suggested that shortfalls could be avoided entirely with government intervention or with a range of other system management measures.

The IAC accepts that the Federal Government could trigger the ADGSM if there is a predicted shortfall. That said, the ADGSM has limitations. It can only be activated on an annual cycle and does not have immediate effect. It is therefore limited in its ability to address short term market volatility and unforeseen risks to supply.

The EES stated that the Project could deliver up to 160 PJ a year. Based on the demand projections in the GSOO 2022 and the Roadmap (see Table 5), the Project alone could supply more than Victoria's total gas needs by 2030 (in the Step Change scenario and the Roadmap core scenarios). This does not take into account any competing supply into the Victorian market.

The demand projections and the evidence before the IAC demonstrate how much uncertainty there is around whether and when a gas shortfall might arise in Victoria. These uncertainties could crystallise so as to result in no Victorian gas shortfall, or perhaps a shortfall only on relatively few peak winter days in any given year. On the other hand, a shortfall might arise earlier than predicted. Neither the modelling nor the evidence demonstrate definitively that the Project is needed to meet gas shortfalls, or that it is not.

### **Energy security and reliability**

The IAC accepts that a FSRU is a flexible supply option that could moderate imports to reflect demand and respond to seasonal and peak demands on short notice. It could supplement other supply 'back ups' including the state's major gas storage facilities at Iona and Dandenong. As with other imported commodities, the gas may be subject to supply chain risks.

The IAC agrees that the Project's ability to deliver energy security depends on resolution of a number of uncertainties, including securing a FSRU, securing gas import contracts and contracts with retailers to supply gas from the Project into the network, and LNG carriers being able to safely navigate to and berth alongside the FSRU. Resolution of these uncertainties are Project risks.

### **The role of gas in Victoria's energy transition**

Victorian Government policy makes it clear that the transition to a net zero energy system must be 'smooth' and that energy security and reliability is a policy priority. The experts agreed that fossil gas will play an important role in the transition to net zero, in particular for providing firming power. However, there was dispute as to how much gas would be needed for this purpose. Mr Snow considered the firming role for gas would be important for five years from now, but not 10.

In the final analysis and given the high degree of uncertainty surrounding Victoria's future gas demand, it is difficult to say that the Project is *not* needed to support the transition. Equally, it is difficult to conclude with any certainty that the Project *is* needed. It is certainly one way of supporting the transition. It has the benefit of being a flexible way to meet demand, because the amount of LNG imported can be determined by the market at the time. The IAC observes that it is

likely that the Project will only be needed for a short time, and it will have to compete with other sources in a declining market, but these are not matters for the IAC.

#### (iv) Findings

The IAC finds:

- Victoria's future gas needs are highly uncertain.
- The Project is one way of meeting Victoria's future gas demand.
- If it proceeds, the Project could contribute to Victorian energy security and reliability.
- The Project could contribute to the orderly transition of Victoria's energy system by providing firming power, but it is not clear how long this will be needed or how much gas would be required for this purpose.

## 5.4 Cost effectiveness and affordability issues

#### (i) Key issues

The key issues are whether the Project would:

- provide a cost effective augmentation to Victoria's gas supply
- contribute to the affordability of energy, particularly in the transition to renewables
- result in stranded assets, the cost of which would be borne by consumers.

#### (ii) Evidence and submissions

##### Cost-effective augmentation to Victoria's gas supply

The Proponent submitted that the Project would provide a cost-effective augmentation to Victoria's gas supply and would reduce consumer costs in the transition away from gas as compared to the 'no gas' scenario. It submitted (D435):

For around \$200m, the Geelong LNG import terminal will be able to deliver an additional 270TJ/day of gas to Melbourne and will be able to do so day after day if necessary, unlike reliance on storage facilities like Iona which take months to replenish.

In terms of the Project's impact on gas prices:

- Mr Wilkinson's evidence was that LNG purchased under longer term contracts can moderate gas price volatility and upward trending domestic gas prices
- Mr Snow's evidence was that LNG imports "*are typically the most expensive gas supply option*" and it is a challenge to deliver LNG into the domestic market cheaply without long term supply contracts.

Mr Wilkinson's evidence was that LNG carriers are a cheaper option than pipelines over distances greater than 2,000 kilometres. Mr Snow's evidence was that "*without question*" it would be cheaper to pipe gas from the Queensland gas fields to Victoria than to ship it from the Western Australian gas fields.

##### Energy affordability

The experts agreed that wholesale electricity will be more expensive over the next 20 years without gas (D113).

Mr Harpham's evidence was that the transition to renewables, including electrification, will be more expensive without a medium term supply of fossil gas. He said the incremental cost of replacing natural gas appliances will be lowest if done at the end of life of the appliances. The

typical life for appliances is 10 to 15 years, so electrification should occur over a similar period. A fossil gas supply needs to be maintained in the meantime.

Mr Harpham's evidence was that switching to fossil gas alternatives such as hydrogen would require time for development of a hydrogen supply chain and for orderly transition of the network and appliances. Again, the continued supply of natural gas over this transition period would be required.

While Mr Snow agreed that wholesale electricity would be more expensive over the next 20 years without gas, he considered that Mr Harpham had overstated the additional costs of the 'no gas' scenario. He was critical that Mr Harpham:

- did not have regard to the latest Bioenergy Roadmap, which indicates fossil gas alternatives are starting to come online
- did not give sufficient weight to biomethane as a source of alternative gas
- understated the costs for hydrogen uptake
- did not analyse the zero emission synthetic methane option, which has a low marginal cost
- did not sufficiently acknowledge that first steps in the electrification process would be at low marginal cost.

Mr Snow conceded that fossil gas alternatives are currently more expensive than fossil gas, but expected they could become economic in time.

Several other submitters highlighted the affordability benefits of electrification and energy efficiency. For example, Mr Forcey submitted that fossil fuel alternatives have already become "*superior economic choices*" with more and more households and businesses moving away from "*uneconomic and damaging fossil gas and on to more cost-effective energy-efficiency measures and renewable-heat and renewable-electricity based energy services*" (S1611). He and others submitted that:

- recent increases in gas prices would force both residential and industrial users to move away from gas
- homes can be heated with electric reverse-cycle air conditioners for one third the cost of ducted gas
- similar savings could be made using electric heat pumps for water heating
- the payback period for recouping the cost of a fully electrified house is about 7 to 8 years.

### **The cost of stranded assets**

Mr Crosthwaite and others submitted that the Project would result in stranded assets. He submitted that new gas infrastructure will lead to unnecessary costs to consumers due to the initial investment, high annual rates of return and increased decommissioning costs.

The Proponent responded that there is no risk of stranded assets. It said the FSRU would simply sail away when no longer needed and the Refinery Pier extension and new berth would provide a productive and useful asset capable of being employed for other uses.

### **(iii) Discussion**

Energy affordability is a clear objective under both energy and climate policy.

Victorian gas prices have risen in recent times, and this trend is expected to continue. Domestic LNG prices are influenced by international prices, because uncontracted supply will only be sold

into the domestic market if a better international price cannot be obtained. This is reflected in the Roadmap, which states (at page 16):

Many Victorians have faced higher gas bills in the last three years, with the trend towards higher gas prices influenced by links to international prices. Indications are that global events will continue to place upward pressure on global gas prices.

Rising gas prices may prompt a more rapid transition away from fossil gas, as some submitters have suggested. The IAC accepts submissions (some of which were backed up by academic studies and papers) that the operating costs of electrical appliances are cost competitive compared to gas appliances. However, the cost of replacing gas appliances with electric appliances remains significant, and unaffordable to some. The IAC agrees with Mr Harpham that it is important to maintain a supply of fossil gas while this transition takes place.

There are a lot of variables that will influence the Project's ability to compete in an international market to bring affordable gas to Victorian consumers. The experts agreed that it would be very difficult for the Project to supply affordable gas unless long term supply contracts could be secured. As GGS pointed out, there is some uncertainty about whether this will occur.

The IAC considers that the Project could have a positive impact on affordability by contributing to security and reliability of supply of energy in the transition. The IAC also accepts Mr Wilkinson's evidence that once transport of gas across distances of more than 2,000 kilometres is involved, transporting LNG by ship is cheaper than transporting gas by pipeline. It therefore accepts that the Project could potentially supply domestically sourced gas from some states (principally Western Australia) into the Victorian market more cheaply than by pipelines.

The IAC accepts that the Project is a relatively low capital intensive project, and offers a degree of flexibility in terms of where gas is sourced. It accepts that the risk of stranded assets is low. If imported fossil gas is no longer needed the FSRU could sail away (as submitted by the Proponent), and the Refinery Pier extension could be repurposed to meet other needs of the Port of Geelong. The Project only requires a relatively short section of pipeline to connect into the VTN at the tie-in point near Lara. Potentially, this pipeline infrastructure could be used for non-fossil gas transmission in future.

Overall, the IAC is satisfied that the Project could potentially provide a cost effective augmentation of Victoria's natural gas supply. However, a significant degree of uncertainty remains as to whether this benefit of the Project as described in the EES will actually be realised.

#### **(iv) Findings**

The IAC finds:

- It is not clear whether or to what extent the Project can supply affordable gas into the Victorian market.
- The Project could play a part in easing the cost of the transition to renewables (as could any other source of fossil gas supply).
- There is little risk of the Project becoming a stranded asset.

## **5.5 Overall conclusions on project rationale**

Overall, the IAC concludes that the Project rationale is essentially sound, and that the Project could potentially meet the evaluation objective. However, there is some uncertainty as to whether the

asserted benefits of the Project in addressing potential gas shortfalls or providing a cost-effective augmentation of Victoria's gas supplies will be realised.

## **PART B: ENVIRONMENTAL EFFECTS**

## 6 Introduction

Part B of this Report provide the IAC's assessment of the key thematic issues addressed in the EES. Each Chapter includes the IAC's summary of key issues, findings, conclusions and recommendations (if any). It is important to note that the findings in one Chapter may be reliant on the findings in others. For this reason, it is important to consider the IAC's findings as a whole.

An overview of the general environmental duty (GED) and matters concerning the co-ordination between marine and terrestrial ecology assessments are provided below as they assist in framing the IAC's considerations in the following Chapters.

### 6.1 The general environmental duty

The GED imposes a general obligation on all persons to take all reasonably practicable steps to eliminate or minimise the risks of harm to human health or the environment from pollution or waste, with elimination being the clear preference (section 25 of the EP Act). The GED applies to all Victorians and all businesses operating in Victoria.

The GED is a key consideration for EPA in determining the Development Licence applications, and is a cornerstone of the IAC's assessment of the significance of the environmental effects of the Project having regard to relevant policy and legislation. However, application of the GED is not restricted to specific matters regulated through EPA's licensing system.

The *Pipelines Act 2005* imposes similar duties for safety and environmental protection on pipeline licensees (section 124). It states that pipeline licensees are required to minimise as far as is reasonably practicable hazards and risks to the safety of the public and the environment arising from the pipeline operation.

### 6.2 Coordination between marine and terrestrial ecology assessments

#### (i) Introduction

The Project area extends across terrestrial and marine environments, and has potential impacts on ecosystems and biota in both of these zones. The EES presents separate assessments of impacts on marine ecology (EES Chapter 8) and terrestrial ecology (EES Chapter 10), supported by separate Technical Reports (Technical Reports A and D). EES Attachment IV presents an integrated ecological assessment across the marine and terrestrial zones in terms of MNES.

The terrestrial ecology assessment (Technical Report D) was prepared by AECOM, and peer reviewed by Nature Advisory. The marine ecology assessment was prepared by CEE, with input from Hydronumerics (hydrodynamic modelling) and Jasco Applied Sciences (underwater noise). CEE provided several of the input parameters for the modelling to Hydronumerics. Dr Wallis advised that the marine ecology and water quality assessment had been independently peer reviewed, but the reviewer's report was not tabled.

Nature Advisory's peer review of the terrestrial ecology assessment identified some gaps. These were addressed in an Addendum to Technical Report D (D177), which was not exhibited with the EES and was not produced to the IAC or the parties until part way through the Hearing. The

circumstances in which the Addendum was produced are described in the IAC's discussion of procedural matters in Appendix E in Report No. 2 (refer to Item 5).

**(ii) Evidence and submissions**

The expert witnesses called by the Proponent (Dr Wallis, Mr Chidgey and Mr Lane) all gave evidence confirming the marine and terrestrial ecology assessments were undertaken as separate and discrete studies.

It appears from the evidence there was lack of clarity regarding responsibility for assessment of the intertidal zone. The assessment of saltmarsh and mangroves (components of the intertidal zone) provides an example. In response to questioning from the IAC, Mr Chidgey explained that saltmarsh and mangroves were not within the scope of the marine ecology assessment, and he assumed that they had been assessed in the terrestrial ecology assessment. The assessment of impacts on saltmarsh in the terrestrial ecology assessment was limited to a small patch near Refinery Pier, in the vicinity of the pipeline route (D177). Potential impacts on mangroves and saltmarsh via marine pathways were not considered in the terrestrial ecology assessment.

Another example is shorebirds and marine birds. The terrestrial ecology assessment included targeted surveys of shorebirds, which use the intertidal zone. Marine birds were not included in either assessment until the Addendum to Technical Report D (the terrestrial ecology assessment).

GGs submitted that the study program for the 'offshore study area' of the terrestrial ecology assessment was not well-designed, and the interface between the marine and terrestrial assessments was not well coordinated. It submitted (D379):

... an entire category of animal – marine birds, including listed and migratory bird species – was excluded from impact assessment because the authors of one technical report thought the authors of another technical report were dealing with it and vice versa.

AECOM acknowledged in the Addendum that neither the terrestrial nor marine ecology components of the EES assessed marine birds. AECOM explained that *"this has occurred as a result of misunderstanding between the two disciplines as to who would cover that topic."* This was addressed by including an assessment of marine birds in the Addendum.

The *Siting and design guidelines for structures on Victorian Coast*, Department of Environment, Land, Water and Planning (DELWP) (2020) were not mentioned in the terrestrial ecology assessment in EES Chapter 10 or EES Technical Report D. In response to questioning from the IAC, Mr Lane tabled a written response confirming these guidelines apply to the entire Project area because it is situated within five km of the coast and advising that the Project is generally consistent with the guidelines relating to 'vegetation and ecology' (D247).

The WTOAC (D28) drew attention to the lack of a sharp divide between the marine and terrestrial zones and highlighted the importance of the coastal zone ('Coastal Country') to Wadawurrung People, asking the IAC to pay particular attention to this zone. The WTOAC also drew attention to the blurring of boundaries between the marine and terrestrial zones through time. It explained that Corio Bay formerly consisted of freshwater chains of ponds bordered by open grassy plains with woodlands, which were inundated by seawater only 1,000 to 3,000 years ago.

**(iii) Discussion**

Many ecosystem components clearly fall into either the marine or terrestrial ecology component. However the boundary is blurred for some components, including mangroves and saltmarsh, marine birds and shorebirds.

Table 6 provides an overview of the scope of the marine and terrestrial ecology assessments in relation to key ecosystem components. A solid circle indicates the component was assessed, and an open circle indicates it was partly assessed.

**Table 6 Overview of the EES assessment of terrestrial and marine ecosystem components**

	Technical Report A – Marine ecology	Technical Report D – Terrestrial ecology
<b>Flora</b>		
Terrestrial vegetation		●
Saltmarsh	○	○
Mangroves	○	○
Seagrass	●	
Phytoplankton	●	
Algae	●	
	macroalgae (seaweed), microphytobenthos	
<b>Fauna</b>		
Invertebrates	●	●
	marine invertebrates, infauna, zooplankton	terrestrial invertebrates
Fish	●	
	marine and diadromous fish, ichthyoplankton	
Amphibians	●	
	frogs, toads	
Reptiles	●	●
	marine turtles	terrestrial reptiles
Mammals	●	●
	dolphins, seals, whales	terrestrial mammals
Birds	●	●
	penguins	terrestrial birds, aquatic birds (shorebirds, waterbirds*, seabirds/marine birds)

\* The EES definition of 'waterbirds' excludes shorebirds. The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan (D125) definition of 'waterbirds' includes shorebirds.

Source: the IAC

The interface between the marine and terrestrial ecology assessments was not well co-ordinated. The EES would have benefited from better overarching coordination of the ecological assessments across the marine and terrestrial zones.

Mangroves and saltmarsh were discussed in both the marine and terrestrial ecology assessments, but neither provided a complete assessment of impacts on these components.

The EES did not include an assessment of marine birds, apparently as a result of confusion between the consultants who prepared the marine and terrestrial ecology assessments regarding responsibility for assessment. An assessment of marine birds was completed as part of the Addendum to Technical Report D (D177) for the terrestrial ecology assessment, but there are important pathways for impact on marine birds through the marine environment. These are only assessed to a limited extent, in the Addendum and in Technical Report A.

Shorebirds were assessed as part of the terrestrial ecology assessment (Technical Report D). However, like for marine birds, there are important pathways for potential impacts through the marine environment that have not been fully assessed.

To address this issue going forward, should the Project proceed, the IAC considers that an ecological coordinator should be appointed to ensure appropriate coordination of further investigations relevant to the marine environment and terrestrial ecology, including those recommended by the IAC, and for subsequent stages of the Project design and assessment process. See Chapter 20.2.

To avoid confusion, in this Report impacts on:

- mangroves and saltmarsh from:
  - marine pathways are discussed in Chapters 7 and 8 (marine environment and dredging)
  - onshore pipeline construction are discussed in Chapter 9 (terrestrial ecology)
- aquatic birds, including marine birds and shorebirds are discussed in Chapter 9.4 (terrestrial ecology).

## 7 Marine environment

This chapter deals with marine impacts other than dredging. Dredging is dealt with in Chapter 8.

### 7.1 Introduction

The relevant evaluation objectives are:

To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values.

To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

To minimise generation of wastes by or resulting from the project during construction and operation, including dredging and accounting for direct and indirect greenhouse gas emissions.

The marine environment is discussed in EES Chapter 8 and Technical Report A: Marine ecology and water quality impact assessment. Technical Report A is supported by several more detailed technical reports (D193(a) to (h)) and regional hydrodynamic modelling (D123) which were not exhibited as part of the EES. Separate assessments were undertaken for:

- shorebirds (in the terrestrial ecology assessment in Technical Report D and the Addendum (D177))
- seabirds (in the Addendum)
- underwater noise (Technical Report A, Appendices A-1 to A-3).

Table 7 lists the marine evidence.

**Table 7** Marine environment evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D47	Dr Ian Wallis, CEE	Marine environmental assessment	Assessing the extent of effects resulting from dredging and discharges into Corio Bay. Hydrodynamic modelling of discharges (refer to D127)
D54	Scott Chidgey, CEE	Marine ecology and water quality impact (marine ecosystems and key impact pathways)	Studying and documenting marine ecosystem components (marine biodiversity) in Corio Bay and the areas that may be affected by the Project (refer to D135)
D57	Dr Peter Yeates, Hydr numerics	Marine modelling	Regional hydrodynamic modelling and processing model outputs used in the preparation of Technical report A (refer to D128)
D45	Craig McPherson, JASCO Applied Sciences	Underwater noise	Involved in the preparation of Appendices A-1 to A-3 of Technical Report A (refer to D139)

Doc	Expert	Subject matter	Role
<b>Geelong Grammar School</b>			
D72	Dr Matt Edmunds, Australian Marine Ecology	Marine ecology	Independent expert
D75	Dr Andrew McCowan, Water Technology	Marine hydrodynamics	Independent expert
<b>Statements of agreed opinions and facts</b>			
D101	I Wallis, S Chidgey, M Edmunds	Marine ecology	N/A
D102	I Wallis, P Yeates, A McCowan	Marine modelling	N/A

A large volume of material was tabled by the parties in relation to marine impacts. All material is listed in Appendix D in Report No. 2. While the material is too voluminous to list here, key documents included:

- D5 – EPA’s first RFI
- D74 – Proponent’s response to EPA’s first RFI
- D111 – Proponent’s response to the IAC’s RFI
- D123 – Hydronumerics 2022 Regional Modelling Report
- D136 – Additional material prepared by Mr Chidgey on seagrasses and components near Refinery Pier
- D150 – Addendum to Technical Report D (terrestrial ecology assessment)
- D237 – Response to IAC RFI prepared by Mr Chidgey
- D275 – images from camera tows over the seabed
- D430 – EPA’s second RFI
- D458 – Proponent’s response to EPA Submission
- D480 – Proponent’s interim response to EPA’s second RFI.

GGs tabled a large volume of information compiled by Dr Edmunds in response to questions from the IAC and requests for documents to be produced during his cross examination by the Proponent (D282 to D372, D424 and D425). This material is discussed in Appendix E in Report No. 2.

The Proponent and other parties tabled a number of guidelines and standards, including:

- D120 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- D426 – Canadian Water Quality Guidelines for the Protection of Aquatic Life – Reactive Chlorine Species.

## 7.2 What did the EES say?

### (i) Overview

The study area for Technical Report A focused on the marine environment in the vicinity of the Project area but also considered all of Corio Bay as well as the Ramsar site.

The seabed of Corio Bay is predominantly unconsolidated sediments, comprising mainly silt and clay (mud) in the central part of the bay. There are extensive seagrass beds, including along the north-western and northern shorelines of Corio Bay, near the Project area and in the Ramsar site.

Phytoplankton is the most significant primary producer in Port Phillip Bay. Recreational fishing from land and boat is popular in Corio Bay, which also provides habitat suitable for several fish species of conservation significance. Dolphins occur in Corio Bay, including the critically endangered Burrnunan dolphin and common bottlenose dolphin. Invasive exotic marine species are present in Port Phillip Bay and Corio Bay, including at Refinery Pier.

Corio Bay has a relatively noisy underwater environment.

The EES assessed the impacts of the following activities on the marine environment:

- construction of the Refinery Pier extension and temporary loadout facility at Lascelles Wharf, including pile driving
- continuous mooring of a FSRU for approximately 20 years, using seawater for regasification
- the supply of LNG to the FSRU by up to 45 LNG carriers per year
- dredging at the new berth, swing basin and seawater transfer pipe trench (discussed in Chapter 8).

The existing marine environment of Corio Bay has been receiving discharges of seawater used for cooling purposes from the Refinery for over 60 years. The wastewater discharged from the Refinery is chlorinated, and is 8 to 10 degrees above ambient seawater temperatures. Field surveys in the vicinity of the existing discharges did not identify evidence of negative impacts. Seagrass in the vicinity of the discharge plumes was observed to be generally abundant and healthy. Sea urchins (which are considered to be sensitive to residual chlorine) were found to be abundant in the discharge plumes, and showed no obvious adverse impacts. Mussels in the vicinity of discharge plumes did not show measurable levels of chlorine residuals.

Due to synergies with the Refinery (described in Chapter 2.8), the Project would result in:

- chlorine discharges that would not exceed current chlorine discharges from the Refinery
- a smaller thermal plume with lower temperatures.

The residual chlorine plume is expected to be localised and not reach the Ramsar site. Alternative discharge arrangements through a diffuser would result in a plume of cooler water in the vicinity of Refinery Pier.

Plankton are already being entrained via the existing Refinery intake. The Project would result in a slight increase in entrainment due to the change in intake location to the FSRU.

Impacts from additional underwater noise, additional shipping traffic and additional light spill can be acceptably managed and mitigated.

## **(ii) Mitigation measures**

Proposed mitigation measures are summarised in Table 8.

**Table 8** Proposed mitigation measures for marine environment

No.	Mitigation Measure	Project timing
MM-LS01	AS 4282: 2019 Control of the Obtrusive Effects of Outdoor Lighting and AS/NZS 1680.5 Interior and workplace lighting: Outdoor workplace lighting	Construction Operation
MM-LS03	National Light Pollution Guidelines for Wildlife Including marine turtles, seabirds and migratory shorebirds January 2020 Version 1.0	Operation
MM-ME01	Reuse of discharge from the FSRU in the refinery	Design Operation
MM-ME02 to MM-ME07	These relate specifically to dredging and are listed in Table 10	Construction
MM-ME08	Design seawater intake to minimise entrapment	Design Operation
MM-ME09	Locate seawater intake to minimise entrainment	Design Operation
MM-ME10	Design diffuser to achieve high dilution	Design Operation
MM-ME11	Design lighting to minimise adverse overspill	Design Operation
MM-ME12	Implement biosecurity measures on all vessels	Design Operation
MM-ME13	Manage cleaning and antifouling system on FSRU to avoid contamination	Operation
MM-ME14	Continue to use and upgrade spill management procedures	Operation
MM-ME15	Use pilots, tugs and comply with vessel speed restrictions	Construction Operation
MM-ME16	Minimise chlorine concentration at the discharge points	Operation
MM-ME17	Monitor rates and characteristics of all FSRU wastewater discharges	Operation
MM-UN01	Minimise underwater noise impacts	Construction Operation
MM-UN02	Deter marine animals from construction area	Construction
MM-UN03	Noise awareness training	Construction Operation
MM-UN04*	Performance monitoring and contingency mitigations	Operation

\* New proposed mitigation measure included in Part C Version (D456)

The EMF includes monitoring parameters for visual monitoring of marine animals during construction (as part of measures to deter them from construction areas to avoid underwater noise impacts), and for wastewater discharges from the Refinery and FSRU during operation. It also includes protocols for marine monitoring during operation in the OEMP.

**(iii) Conclusion**

EES Chapter 8 concluded that the Project is unlikely to have adverse impacts on the physical and chemical attributes of the marine environment, habitat conditions and the ecological character of Corio Bay, including the Ramsar site. Mitigation measures have been identified to avoid, minimise and manage impacts.

**7.3 Impact assessment methodology****(i) Key issues**

The key issues are:

- the source-path-receptor methodology versus an ecosystem impact methodology
- gaps in the marine ecology assessment (in particular the intertidal zone).

**(ii) Evidence and submissions**

Dr Wallis led the preparation of Technical Report A and adopted it as part of his evidence. He gave evidence that the EES used both an ecosystem based approach and a source-path-receptor approach in assessing impacts on the marine environment. He stated (D47):

The ecosystem based assessment in Technical Report A focused on the fundamental levels in the marine food chain (see Chapter 4). These levels are primary producers (phytoplankton, seagrass and macroalgae) and primary consumers (zooplankton and ichthyoplankton). A quantitative assessment is made of the change in primary production during dredging and operations of the Project.

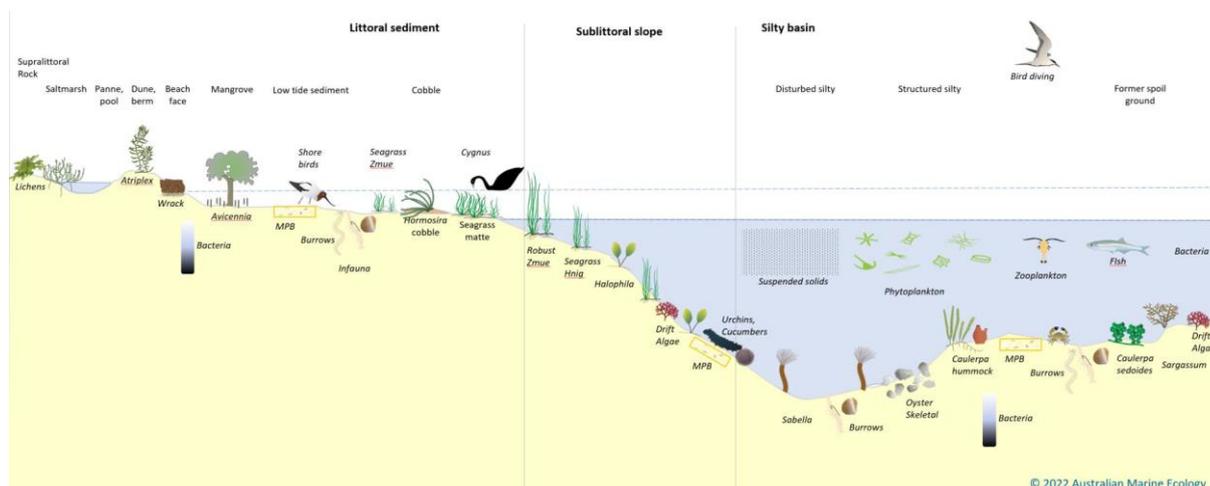
Dr Edmunds, who gave evidence for GGS, disagreed that the EES took an appropriate ecosystem based approach. His view was that the EES “*ignored the ecosystem based management principles of the Marine and Coastal Act*” and had instead taken a “*siloe*” approach with disconnected assessments of subtidal, intertidal, coastal and bird components. Dr Edmunds considered that (D72):

... the EES did not systematically identify impact pathways, key issues or risks and there was no application of ecosystem-level considerations and connections between habitats and ecological zones.

Dr Edmunds considered that the EES marine ecology assessment had a narrow focus on only a few ecosystem components, with a strong emphasis on seagrass. Key components not assessed included:

- microphytobenthos
- sediment biogeochemistry
- impacts on bird energetics
- swan grazing.

Dr Edmunds’ written evidence (D72) included a detailed discussion of ecosystem modelling including a conceptual model of the Corio Bay ecosystem (extracted in Figure 3), and examples of models for evaluating ecosystem impact pathways and outcome-based indicators. He advised these models are similar to the models being developed by DELWP in CoastKit (a tool that synthesises marine and coastal scientific data and resources), and provide examples of best practice with regard to the MACA.

**Figure 3 Conceptual model of the Corio Bay ecosystem proposed by Dr Edmunds**

Source: D72

GGs (D493) submitted that the EES “*ignored the intertidal zones, the sea bird populations and the ecological pathways beyond the modelled plumes*”. It noted that the Scoping Requirements specifically required the EES to characterise the intertidal zone. GGS (D379) submitted that the intertidal zone provides habitat and food resources for listed and migratory bird species, which need to be understood to analyse biological pathways of impacts. Both Mr Chidgey and Mr Lane (terrestrial ecology) confirmed under cross examination that they had not assessed mangroves or saltmarsh (intertidal species). Mr Chidgey also confirmed that there had been limited assessment of intertidal seagrass.

During the Hearing, Mr Chidgey presented field evidence regarding intertidal seagrass along the Refinery shoreline, including site photographs (D135) and NearMap images from April 2022 that were marked up to identify different types of seagrass, algae and other features in the intertidal zone in the vicinity of the Refinery discharge points (D136). Dr Edmunds was critical of this new material, noting that it has not been included in the EES, was largely limited to seagrass and did not include control sites. The intertidal zone near the Ramsar site was not covered by this new material.

The WTOAC highlighted the importance of the coastal zone (‘Coastal Country’), submitting (D28):

We would ask that the Advisory Committee does not discriminate this place as a space that is simply a red line between water and land. For Wadawurrung People is it far more than simply a black line on an ‘antique’ map, that has varying widths, has varying ecological and physical characteristics, and which hosts a rich tapestry of human and animal and vegetation stories.

Other submitters also drew attention to the importance of the intertidal zone. Submitter S1763 drew attention to the significance of the mangroves and saltmarsh at Hovells Creek for supporting marine and birdlife. Geelong Environment Council (S1583) drew attention to the variety of wetland habitats in the Ramsar site, including intertidal mudflats, seagrass beds, saltmarsh, reed beds and mangroves.

### (iii) Discussion

Ecosystem based management is a guiding principle of the MACA. Section 9(2) states:

An ecosystem based approach should underpin Victoria's marine and coastal planning and management system, incorporating:

- (a) avoiding detrimental cumulative or incremental ecosystem impacts; ...

The food chain model presented in Figure 4-1 of Technical Report A is inadequate for establishing linkages to other ecosystem components. A more detailed local conceptual model, such as the example of the Corio Bay marine ecosystem proposed by Dr Edmunds (Figure 3), could have assisted in applying a more thorough and comprehensive ecosystem based approach to the assessment.

The IAC agrees with Dr Edmunds and GGS that impacts on a number of key components of the marine environment were not adequately, if at all, assessed in the EES, including the intertidal zone (other than shorebirds) and seabirds. As discussed in Chapter 6.2, an assessment of marine birds was completed after the exhibition of the EES and tabled during the Hearing, and further assessments of the shorebird survey data were also undertaken (D150). However the deficiencies in the assessment of the intertidal zone have not been fully addressed.

Dr Edmunds identified black swan grazing as a key omission. The black swan is not listed under the FFG Act or EPBC Act but is relevant to the assessment because it is a component of the Ramsar site and has a close ecological relationship with seagrass. This would have been identified with a more comprehensive ecosystem based management approach to the assessment of marine impacts. The black swan also has cultural significance for the Wadawurrung People. That said, if the impact on seagrass is as limited as the EES suggests, impacts on the black swan are not anticipated to be significant.

#### (iv) Findings and recommendations

The IAC finds:

- Ecosystem based management is a guiding principle of the MACA. The marine assessment should have had a greater emphasis on ecosystem wide impacts both within the marine environment and across the marine and terrestrial environments.
- There are deficiencies in the scope of the EES's assessment of impacts to the marine environment, including in relation to the intertidal zone and marine birds. While the gap in relation to marine birds was addressed after exhibition (in the Addendum), the gaps in relation to the intertidal zone have not been fully addressed.

#### Environmental Management Framework

The IAC recommends:

**Consider adding a requirement to the Environmental Management Framework to develop a conceptual model for coordinated ecosystem based management of environmental impacts and risks to the marine environment in subsequent stages of the Project, including detailed design, construction (including dredging), operation and decommissioning.**

## 7.4 Assessment of existing conditions

By way of context, the EES asserted that the Project's impacts on the marine environment would not be significant because existing discharges from the Refinery would largely be replicated, due to the synergies described in Chapter 2.8. It asserted that the existing Refinery discharges have not had a significant impact on the marine environment based on the current condition of the marine environment in the vicinity of the Refinery discharge points.

#### (i) Key issues

The key issues are:

- characterisation of existing conditions, including seagrass
- assessment of existing impacts on the marine environment
- gaps in the identification of threatened marine species present in the existing environment.

## (ii) Evidence and submissions

### Characterisation of existing conditions

Technical Report A established the context for the existing conditions assessment by outlining historical and current pressures on Corio Bay, including port development, dredging (since the nineteenth century) and land use (including urban and industrial development). Historical changes in condition were noted, including an increase in seagrass abundance from the 1930s to 1990 followed by a significant decline, and more recent increases in sea urchin populations.

Dr Wallis and Mr Chidgey gave evidence that existing conditions were characterised based on existing data and extensive field studies. The field studies included camera tows over 9.2 kilometres of seabed (D275), a range of technical reports on field measurement and sampling (D193(a) to D193(h)) including benthic habitat surveys, sediment sampling for infauna analysis and water sampling for plankton analysis, and visual inspection of the Refinery shoreline.

The EES's approach to mapping existing conditions was discussed at the marine ecology expert meeting (D101). CEE used the DELWP CoastKit maps (2019 version of year 2000 mapping), updated with mapping from the camera tows and field studies undertaken over three field days. Further camera tow mapping was subsequently undertaken in the vicinity of the Refinery discharge points.

The experts agreed that the ecology and habitat distribution has changed since the 2000 CoastKit mapping, and that the 2000 mapping did not cover all the areas of interest, including the littoral fringe. There was disagreement about the status of the underwater towed camera results. Dr Wallis and Mr Chidgey (CEE) and Dr Hirst (EPA) considered them to be 'mapping' whereas Dr Edmunds did not.

GGs (D493) submitted that the mapping of the seabed biota is "*coarse grain, aggregated and simply insufficient for anything other than broad brush, anecdotal statements*". It submitted:

A considerable amount of work could have been undertaken here to understand better the receiving environment. That additional work is consistent with current practice and facilitated by modern technology in common use.

Dr Edmunds considered that given the Project is "*based around maintaining similar chlorine dosing discharges as the existing Refinery discharges, it would be reasonable to expect a comprehensive and intensive investigation of existing contaminant states and distribution through the ecosystem.*" He did not consider that this had been done:

- there has been no documented monitoring of seagrasses exposed to chlorine
- the design of the EES field surveys was inadequate for the detection of impacts or other environmental associations
- the sea urchin species observed in Corio Bay, *Heliocidaris erythrogramma*, is a ubiquitous species that is not a useful environmental indicator
- the mussel bioaccumulation study was "*rudimentary*" and not properly reported.

Dr Edmunds undertook a detailed review of the field sampling, including the field sampling technical reports and imagery from the camera tows, and concluded that the characterisation of

the existing marine environment, including the distribution of various seagrass communities and macroalgae, was inadequate. Dr Edmunds considered the field sampling program was unsuitable as a basis for baseline monitoring because:

- sampling of control sites was inadequate
- it did not include stratification by habitat
- the desktop component relied on outdated information, sometimes decades old, to characterise present conditions.

In relation to control sites, Mr Chidgey pointed out that the field survey included several transects in Stingaree Bay, which he considered to be appropriate control sites.

In relation to the use of old data, Dr Wallis advised (D47):

We use good old data and good new data as appropriate. The Port Phillip Bay study reports are 30 years old, but still contain valuable baseline data and descriptions of environmental processes.

The information from the camera tow surveys was the subject of some discussion at the Hearing. Dr Wallis and Mr Chidgey gave evidence that the information from the camera tows was fit for purpose for assessing the current condition of benthic habitat. Dr Edmunds and GGS disagreed. Relying on the evidence of Dr Edmunds, GGS (D379) submitted that the image quality of the underwater tows was unreliable and the level of effort (3 days of towed camera surveys along 66 transects, plus supplementary transects near the Refinery discharge points) was inadequate. The towed video survey:

- did not allow for an assessment of seasonal variation because of the short period in which the towed surveys were done
- provided insufficient biological discrimination to provide diversity, structural or functional inputs to an ecosystem based assessment.

GGS drew the IAC's attention to the conclusions of the Crib Point IAC in relation to towed camera footage relied on by Mr Chidgey in the Crib Point EES to characterise that environment, and submitted that the same criticisms could be applied here (D379):

- The footage did not present a clear image of the seabed and it would be difficult to verify benthic species, distribution and abundance across the surveyed transects.
- The survey transects lacked uniformity and information collected would not provide an adequate baseline for future assessments.

Dr Edmunds reported that his review of the imagery from the camera tows revealed species and conditions that were not reported in the EES. In particular, the range of seagrasses was wider than reported, with *Ruppia* and mixed subtidal *Zostera muelleri* seagrasses present but not reported. He considered that the information from the images was processed into broad categories with no quantitative analysis, resulting in the loss of critical resolution.

GGS (D379) was critical of the undifferentiated approach to seagrass, submitting that seagrasses are 'flagship species' in Corio Bay and a critical component of the Ramsar site. They also have an important role in shallow coastal and estuarine ecosystems. GGS submitted that in the absence of seagrass mapping by species (D379):

... the EES provides no ability to predict or assess the relative robustness of the seagrass and the extent of change it is likely to withstand. Having regard to the agreed importance of seagrass in the marine ecosystem, this is a critical and unacceptable omission.

### Threatened or migratory marine species identification

Table 5-21 of Technical Report A1 presents a list of threatened or migratory marine species potentially occurring in the study area, excluding bird species on the basis that birds were addressed in the terrestrial ecology assessment. This table includes threatened species listed in Victoria as well as threatened and migratory species listed under the EPBC Act.

Mr Chidgey advised (D54) that two seagrass species, *Heterozostera tasmanica* and *Heterozostera nigricaulis* were added to the FFG Act threatened species list in October 2021, after completion of EES studies and reports. At the request of the IAC, Mr Chidgey prepared a revised list of FFG Act-listed threatened marine species during the Hearing (in D237).

#### (iii) Discussion

In the IAC's view, the assessment in the EES does not provide an adequate characterisation of the existing marine environment. It is therefore difficult to conclusively determine that existing Refinery discharges are having acceptable impacts. The IAC is not assessing existing Refinery discharges, but such an assessment is relevant to the extent necessary for the IAC to consider impacts from the Project.

The existing condition assessment was based on reviews of existing data and field surveys and sampling. The IAC agrees with Dr Wallis that 'good old data' can provide useful baseline data and context. That said, it cannot be taken as representing current conditions without further assessment, particularly in an area such as Corio Bay which has been subject to extensive disturbance including port development and major dredging programs. In this context, older data may need to be interpreted as a snapshot of past conditions rather than providing a basis for characterising existing condition.

There are limitations with the underwater tow surveys, the sampling program and the presentation of results:

- The quality of the imagery from the underwater tows is variable, which limits the extent to which the underwater environment can be accurately characterised, including the identification and distribution of the species and sub-species present. The IAC was not persuaded that this was satisfactorily rectified through the supplementary material presented by Mr Chidgey at the Hearing (D136).
- The transect locations do not adequately cover all key areas of interest, including the full extent of the areas affected by wastewater discharge plumes and the Ramsar site.
- With limited exceptions, there is no evidence of water quality data having been collected in conjunction with the camera tow mapping in the vicinity of the Refinery discharge points to quantify temperature and chlorine levels to assist in the interpretation of the survey data in relation to the impacts of Refinery discharges.
- There were insufficient sampling points to characterise the extent of thermal plumes from the Refinery, and no chlorine data was presented (although the IAC notes Dr Wallis' advice regarding the difficulty of measuring very low concentrations of chlorine).
- The underwater tows of the control sites in Stingaree Bay did not include shallower waters, and the extent to which these control sites are affected by similar (or different) pressures to the study area has not been assessed.
- Surveys were only undertaken once for each site, therefore temporal variability cannot be characterised.

- As noted in Chapter 7.3, the EES did not provide an adequate assessment of intertidal and littoral habitats potentially impacted by the Project. Additional information about intertidal habitats adjacent to the Refinery was presented during the Hearing (D135 and D136) but is not adequately documented. No additional information was presented about the intertidal habitats in the Ramsar site.

The IAC is mindful that similar criticisms were made by the Crib Point IAC in relation to the assessment of existing conditions in that EES. While the Corio Bay marine environment is very different (and in some senses more compromised) to that at Crib Point, this does not justify a lesser standard of assessment of the existing environment – particularly given the EES’s assertion that the Project’s impacts will be acceptable because the existing impacts are acceptable.

Further work is required to address these issues. A monitoring program should be established to assess the existing impacts of Refinery discharges more rigorously, and establish a better baseline for ongoing monitoring of the effects of the Project on the marine environment. The monitoring program should be undertaken over at least a 12 month period before dredging or construction commences, to gather sufficient data to understand seasonal changes in the existing environment.

For completeness, the IAC notes that changes to the FFG Act list of threatened marine species occurred after the completion of the EES. The IAC accepts the revised list of FFG Act-listed threatened marine species prepared by Mr Chidgey in his response to the IAC’s RFI (D237) but notes that this list needs to be read in conjunction with Table 5-21 of Technical Report A1, which also includes EPBC Act-listed migratory species that are not included in the revised list provided by Mr Chidgey.

#### **(iv) Findings and recommendations**

The IAC finds:

- The EES’s assessment of the existing environment is not sufficient to enable a full understanding of the potential impacts of the Project.
- Further survey work and monitoring is required to determine the impacts of existing discharges from the Refinery and establish a better baseline for monitoring impacts of the Project.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Undertake further survey work to better establish the existing environment and the impacts of existing wastewater discharges from the Refinery to enable better understanding of Project impacts. The survey work should:**

- a) cover intertidal, littoral and subtidal habitats that could potentially be affected by the Project, including the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site**
- b) update seagrass mapping to include the intertidal zone, the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site and information on the different seagrass species**
- c) be carried out over a period of at least 12 months before construction or dredging starts, with a minimum of four sampling runs (one in each season) to address seasonal variability**

- d) **establish a better baseline for monitoring during and after the Project to confirm predicted outcomes on shoreline and benthic communities, including seagrasses and macroalgae.**

## 7.5 Regional hydrodynamic model

The regional hydrodynamic model provided the basis for all of the marine modelling. Wastewater discharge modelling (of water temperature and chlorine plumes) is discussed in Chapter 7.6. Entrainment modelling is discussed in Chapter 7.7. Sediment transport modelling (of dredging plumes) is discussed in Chapter 8.3.

### (i) Key issues

The key issue is:

- the calibration of the hydrodynamic model against observed currents and tides data.

### (ii) Evidence and submissions

Relying on the evidence of Dr Yeates, the Proponent's position was that there was a good degree of consistency between the currents and tides in Corio Bay modelled by the regional hydrodynamic model, and observed data. Dr McCowan disagreed, stating that the regional hydrodynamic model (D240):

... has not demonstrated that it can replicate measured currents and water levels sufficiently well to provide confidence in its predictions of the likely effects of the FSRU.

Dr McCowan identified that:

- the model does not accurately reproduce measured tides at Geelong – in particular the model overestimates water levels at low tide, and as a consequence underestimates tidal exchange between Corio Bay and the Outer Harbour
- modelled currents do not accurately replicate measured currents – measured currents are stronger and would carry pollutants further than modelled currents.

He advised that underestimation of the currents results in underestimation of the extent of wastewater discharge plumes and sediment plumes from dredging, and underestimation of the effects on the Ramsar site. He raised concerns about:

- the wind data used in the model
- the 'plaid grid' and horizontal resolution of important features of the model
- the vertical grid resolution
- a failure to consider the impacts of the FSRU hull on plume dispersion.

### Wind data

Wind data is available from three Bureau of Meteorology weather stations in the vicinity of the Project area – Geelong Racecourse, Avalon and Point Wilson. Dr Yeates tested the hydrodynamic model with wind data from both the Geelong Racecourse and Avalon weather stations. He adopted the Geelong Racecourse wind data because it gave a better fit between modelled and observed currents.

Dr McCowan gave evidence that it is inappropriate to use wind data as a variable that can be manipulated to improve model fit. He stated that wind is not a calibration parameter, it is a 'boundary condition', and that (D508):

The main model calibration parameters are not the wind speeds but the bed friction coefficients (which are site specific) and, to a lesser extent, the turbulence parameters.

Dr McCowan considered that the correct approach would have been to use the best available over water wind data, and where over water winds are not available then nearby over land winds can be used. He considered that the Avalon wind data provides a better representation of winds over Corio Bay than the Geelong Racecourse, based on surface roughness (D240).

### **Grid resolution**

Dr McCowan and Dr Yeates agreed that model grid selection involves a balance between model resolution and computational demand. However they disagreed that the horizontal and vertical resolution adopted in the model was appropriate.

The Hydrodynamic Modelling Report (D123) indicates that the model used a 20 x 20 metre horizontal grid in the Project area, which was extended in a plaid grid to a 400 x 400 metre horizontal grid in the outer regions of the model domain. In the Hopetoun Channel (which is 150 metres wide), a 400 x 20-50 metre grid was used.

Dr McCowan's evidence was that the plaid grid provided insufficient resolution for the Hopetoun Channel and North Channel, which connect Corio Bay to Port Phillip Bay. As a result, the tidal exchange to and from Corio Bay is not accurately simulated by the model. Dr McCowan advised that with currently available computer power, it should have been possible to use a finer horizontal grid resolution to simulate Hopetoun Channel and North Channel.

Dr Yeates explained that the model used a 1 metre vertical resolution to simulate the natural thermal stratification observed in Corio Bay and the effects on stratification arising from the cool FSRU and warm Refinery discharges.

Dr McCowan's evidence was that the water temperature profiles at the Refinery discharge points show significant temperature variations with depth, particularly within the top 1.0 metres. He advised that this cannot be accurately represented by a 1.0 metre vertical grid resolution, causing the model to incorrectly show downward mixing of the surface plume, resulting in underestimation of the extent and intensity of discharge plumes. In addition, Dr McCowan pointed out that water depths in the Ramsar site are shallow. He proposed that a 0.2 metre resolution would have been more appropriate.

### **FSRU hull**

The FSRU was not included in the regional hydrodynamic model. Dr Yeates gave evidence that this was because the 20 x 20 metre horizontal grid was too coarse to represent a 40 metre wide ship. Dr McCowan found it "*quite extraordinary*" the effects of the FSRU on currents was not studied (D240). He advised that potential hydrodynamic effects of the FSRU include:

- funnelling north going currents to enhance the flows along the coast toward the Ramsar site
- deflecting more of the winter west going currents to the northwest and ultimately to the north and northeast.

### **Proponent's response**

The Proponent acknowledged Dr McCowan's criticisms of the hydrodynamic modelling. It submitted that a good way to find out whether different assumptions about a range of variables would have made a difference to the modelling results is to re-run the model with alternative

inputs. The Proponent submitted that it *“invited that”* and *“we’re asserting that it doesn’t make a difference”* (D495).

The Proponent tabled Technical Notes 15 to 17 (D497 to D499) toward the end of the Hearing. The Technical Notes included some sensitivity testing of the regional hydrodynamic model inputs, including wind data and grids. Procedural concerns were raised in relation to the timing and content of these Technical Notes, which are discussed in Appendix E in Report No. 2. While the IAC has had regard to the Technical Notes, they have not been given significant weight.

### **(iii) Discussion**

The regional hydrodynamic model underpins the marine ecology assessment and also the terrestrial ecology assessment as it relates to shorebirds and marine birds. It provides key input parameters for the marine modelling on which the assessment of the Project’s marine impacts is based.

There was disagreement among the experts as to whether the regional hydrodynamic model is sufficiently closely calibrated to observed data on currents. The experts agreed that the regional hydrodynamic model underestimates the tidal exchange and tidal range.

Tides and particularly currents have implications for the movement of discharge and sediment plumes, including the likelihood of plumes reaching the Ramsar site. They also impact on the entrainment modelling.

The IAC considers that further work should be carried out to refine the calibration of the regional hydrodynamic model so that it more closely reproduces the observed tidal range, tidal exchange and currents, to provide more reliable inputs into the marine modelling and a more reliable basis on which to assess the Project’s effects on the marine environment.

Dr McCowan raised a number of concerns about the regional hydrodynamic model, including the selection of appropriate wind data, the inappropriate use of wind data (a boundary condition) to fit the model, and the horizontal and vertical resolutions used in the modelling. The IAC accepts Dr McCowan’s views and considers that these issues should be addressed in the refinement of the model calibration. The adequacy of the refined model should be confirmed through peer review before the model is used for further assessment of Project impacts.

The regional hydrodynamic modelling excluded the FSRU, with potential implications for currents, and therefore potential implications for operational discharge plumes and entrainment. This issue also needs to be resolved in the revised modelling of any scenarios in which the FSRU is present.

### **(iv) Findings and recommendations**

The IAC finds:

- Further work should be undertaken to refine the calibration of the regional hydrodynamic model with observed current and tide data, taking into account the factors addressed in Dr McCowan’s evidence including wind data and grid resolution of the model.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Refine the calibration of the regional hydrodynamic model so that it more accurately reproduces observed water levels, currents, tidal range and tidal exchange in Corio Bay.**

**Consider:**

- a) **the selection of the most appropriate wind data**
- b) **more detailed horizontal resolution to represent the Hopetoun and North Channels more accurately**
- c) **more detailed vertical resolution to represent discharge plumes in shallow waters more accurately**
- d) **the effects of the presence of the floating storage and regasification unit on currents**
- e) **peer review of the model calibration.**

## **7.6 Impacts of chlorine and temperature discharges**

Technical Report A modelled the discharged chlorine and temperature plumes in a range of operational scenarios including:

- FSRU discharges via the Refinery (preferred operating mode)
- FSRU discharges via the diffuser
- closed loop discharges from the FSRU.

In the preferred operating mode (discharges via the Refinery scenario), discharge water from the FSRU will be transferred via a seawater transfer pipe to the open channel of the Refinery intake, where the cooled FSRU discharge would mix with warmer (ambient) water from Corio Bay and be re-dosed with chlorine as required. Following reuse in the Refinery, the chlorinated and heated seawater would be discharged to Corio Bay using the same discharge points as are currently used for the Refinery.

In the other scenarios, used seawater from the FSRU would be discharged to Corio Bay either through the diffuser (when the FSRU is operating in open loop mode), or directly from the FSRU (when it is operating in closed loop mode). In open loop mode, the discharged seawater would be cooler than ambient. In closed loop mode, it would be warmer than ambient.

### **(i) Key issues**

The key issues are:

- whether the default guideline value for chlorine adopted in the EES is appropriate
- the accuracy of the chlorine and thermal plumes predicted by the wastewater discharge modelling
- impacts of chlorine and temperature on marine biota and implications for the Ramsar site.

### **(ii) Evidence and submissions**

#### **Default guideline value for chlorine**

There is no current guideline value for chlorine in marine waters in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000 (ANZ Water Quality Guidelines, D120). CEE engaged Batley and Simpson to develop a draft default guideline value (DGV). They recommended 7.2 micrograms per litre ( $\mu\text{g}/\text{litre}$ ), which was adopted in the EES and reflected in the Development Licence applications.

Dr Edmunds considered that the DGV of 7.2 µg/litre is less precautionary than other countries such as Canada, and cautioned against a higher DGV because of the risks associated with chlorine by-products, particularly organo-bromines.

GGs (D379) submitted that 7.2 µg/litre is inappropriate because it is based on the 95 percent species survival value. The ANZ Water Quality Guidelines state that the highest protection level (99 percent) is the default value for ecosystems with high conservation value. GGS noted that the Crib Point IAC considered that a time-averaged chlorine concentration of 2 µg/litre was appropriate.

### **Chlorine and thermal plumes**

Dr Wallis (D127) advised that for discharges via the Refinery, the chlorine concentration and total chlorine loads would be the same as existing, and chlorine plumes would be almost the same as existing. The alternative scenarios (open loop discharge via the diffuser and closed loop) would both result in smaller chlorine plumes in the vicinity of Refinery Pier. These scenarios assume the Refinery is not in operation, so there would not be a separate discharge from the Refinery.

In relation to thermal plumes, Dr Wallis gave evidence that:

- for discharges via the Refinery, the plume of warmer water is in the same general location as the existing thermal plume but much smaller with less elevated water temperatures (1 to 5 degrees above ambient, compared to the existing 8 to 10 degrees above ambient)
- for discharges via the diffuser, there is a plume of colder water extending south from the FSRU
- in the closed loop scenario, there is a small plume of warmer water in the vicinity of the FSRU.

### ***Will plumes reach the Ramsar site?***

Dr Wallis' evidence (D47) was that the hydrodynamic modelling shows that it takes approximately two tide cycles (24 hours) for the Refinery discharges to reach the Ramsar site, and that no chlorine from the Refinery can reach the Ramsar site in that time period because of the rate of decay of chlorine in seawater. His evidence was (D47):

Therefore, it is not appropriate to apply the chlorine limit to the plume at, or even near, the Ramsar site.

Dr Yeates sensitivity tested the chlorine decay rate (at 40 percent per hour and 50 percent per hour) and found that the slower (40 percent per hour) decay rate produced a larger chlorine plume. The more conservative rate (40 percent) was used in the modelling.

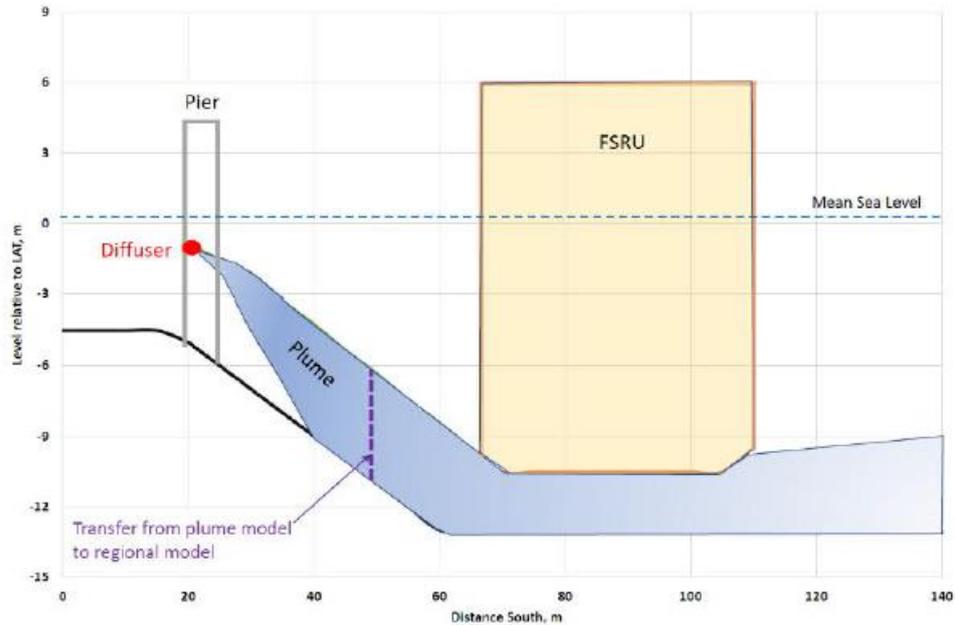
Dr McCowan disagreed that chlorine plumes were unlikely to reach the Ramsar site. His view was that the discharge plumes are likely to travel faster than predicted by the regional hydrodynamic model, which significantly underestimated current speeds. In his view, north-easterly currents that could be expected to flow along the coast with moderate to fresh south and west winds would transport plumes from the Refinery W1 outlet to the Ramsar site within 1.5 to 3.0 hours.

### ***Plumes from the diffuser***

Discharges via the diffuser are not the preferred operating mode, but will be required if the Refinery stops operating. Accordingly, they were assessed in the EES.

Technical Report A includes a schematic diagram of nearfield dispersion of discharge plumes from the diffuser (Figure 4).

**Figure 4** Schematic diagram of nearfield dispersion of discharge plumes from the diffuser

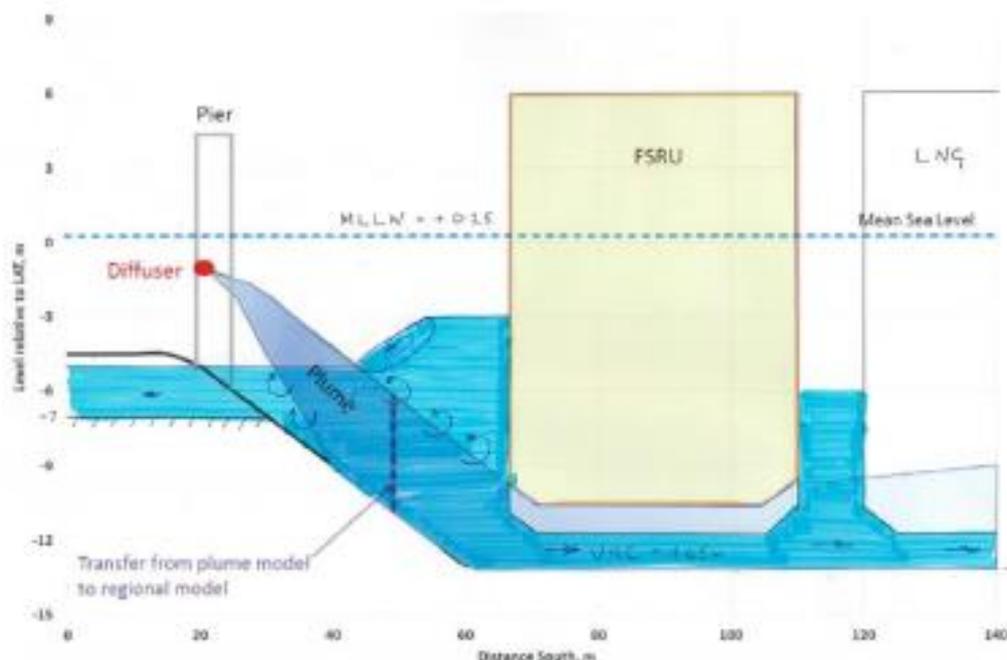


Source: Technical Report A Figure 6-7

Dr McCowan noted that the cold water and chlorine plumes associated with the diffuser flows in the regional hydrodynamic model appear to all be to the south of the FSRU, and have not allowed for any accumulation on the north side of the FSRU. He considered that the approach taken in the EES to the transition from the nearfield modelling to the regional hydrodynamic model is physically and conceptually incorrect and will significantly overestimate the nearfield dilution effects in the regional hydrodynamic model.

Dr McCowan proposed an alternative “*more realistic*” schematic (Figure 5), in which less of the plume water will flow under the FSRU and to the south and more will flow to the north and to either side of the FSRU. He considered that in this ‘more realistic’ scenario, cold chlorinated water discharges will extend further to the northeast of the FSRU (closer to the Ramsar site) than indicated in the EES.

Figure 5 Dr McCowan's alternative schematic diagram of dispersion of discharge plumes from the diffuser



Source: D240

EPA's second RFI (D430) sought additional information about the diffuser design. Further to Dr McCowan's advice regarding limitations of the nearfield modelling, EPA requested the Proponent to:

Substantiate that the FSRU diffuser can achieve dilutions of 20:1 in the nearfield and that dilution and dispersion of the chlorinated, cold-water discharge is not impaired by position of the FSRU hull.

## Impacts on the marine environment

### *Chlorine and chlorine by-products*

A significant number of submitters expressed concerns about the effects of chlorine discharges on the marine environment, including seagrasses, marine biodiversity and the Ramsar wetland, and the effects of chlorine by-products as secondary toxicants. For example, GGS (D379) submitted that the Crib Point IAC found that indirect impacts of chlorine-produced oxidants in the marine environment are not well understood, but noted there is evidence that chlorine produced oxidants can persist in the marine environment well after discharge.

Dr Wallis' evidence was that morbidity and mortality of fish and other marine fauna is not expected at the chlorine levels that will occur in Corio Bay. He considered that no chlorine would reach the Ramsar site, only bromoform, which is not an oxidant. He advised that small amounts of organohalogenes are produced by the breakdown of chlorine in seawater but these are also produced naturally in the marine environment, and are therefore not a concern.

Dr Edmunds disagreed. He advised (D72) that *"there is a major knowledge gap about chronic impacts of brominated disinfection secondary products in the marine environment and what constitute safe levels, for both the ecosystem and humans"*. He considered *"there is the real possibility of generating persistent toxicants that bioaccumulate in the ecosystem"*. Dispersal can be passive and current related, for example seagrass wrack washed ashore in the Ramsar site.

Apex predators are potentially vulnerable, including higher order feeding guilds of wetland and migratory birds.

### **Temperature**

Dr Wallis considered that both the existing thermal plumes and future thermal plumes (with FSRU operations) would pose a low risk to marine ecosystems. He noted:

- modelled thermal plumes at the Ramsar site are well below the ANZ Water Quality Guidelines threshold of +/- 2 degrees and do not extend into Limeburners Bay
- there is no detectable existing impact on the seagrass beds along the Refinery shoreline
- there are no significant effects from existing Refinery discharges on the abundance and diversity of zooplankton, pelagic species, infauna, waterbirds or other components of the marine food chain.

Dr Wallis cited a study of the effects of temperature on seagrass by Bulthuis (1987), which showed that seawater temperatures within the limits of physiological tolerance (between 6 and 30 degrees) have little effect on the photosynthesis-irradiance curve for seagrass. The modelling predicted that the thermal plumes associated with the Project will fall well within this range. Dr Wallis noted that marine organisms are subject to daily variations in temperature, particularly in the intertidal zone and shallow water, and considered that they would therefore be able to tolerate changes in temperature resulting from discharges.

Dr McCowan advised that stratification of the discharge plumes means that the seagrasses and benthic fauna observed within the footprint of the plumes may be living under the plumes rather than within them. He therefore questioned the conclusion reached in the EES that existing Refinery discharges were having little impact on the marine environment.

Dr Edmunds considered that the impact of temperature on existing biotopes was difficult to assess, because the EES did not map the distribution of temperature changes in relation to existing biota, or cite evidence from the ecological literature to identify potential biological responses to temperature change. He advised that temperature changes could result in changes in metabolism, epiphyte stimulation, pathogen susceptibility and bacterial regulation.

## **(iii) Discussion**

### **Default guideline for chlorine**

The proposed DGV of 7.2 µg/litre is accepted by EPA as being sufficiently conservative. The IAC accepts that 7.2 µg/litre, which is based on the 95 percent species survival value, is generally appropriate for Corio Bay and the waters in the vicinity of the discharge points. However, it considers that a DGV of 2.2 µg/litre, based on the 99 percent species survival rate, should be applied to any part of a chlorine plume that extends into the Ramsar site, on the basis that the 99 percent species survival rate is the default protection level in the ANZ Water Quality Guidelines for ecosystems with high conservation significance.

### **Chlorine and thermal plumes**

Mapping of modelled thermal and chlorine plumes presented in the EES shows they are localised in the vicinity of the discharge points from the Refinery or FSRU. However, the uncertainties in the hydrodynamic modelling discussed in Chapter 7.5 may result in more extensive chlorine and thermal plumes than predicted. This may impact on conclusions drawn about chlorine and thermal plumes not reaching the Ramsar site. The wastewater discharge modelling will need to be

re-run using the refined regional hydrodynamic model, to confirm the likely extent of chlorine and temperature plumes.

The EES included a mussel bioaccumulation study in relation to chlorine by-products, which did not indicate any significant contamination. However, five of the six mussel samples were not located within the chlorine plumes identified by the modelling. The IAC recommends that further consideration be given to the approach to assessing chlorination by-product concentrations taken in recent scientific studies, including Boudjellaba (D285), who reported significant bioaccumulation of chlorine by-products in fish.

More extensive field measurements of water temperature and chlorine (or chlorine by-products) would assist in confirming the present extent of the existing Refinery plumes. Technical Report A included temperature measurements in the vicinity of the W1 discharge point from the Refinery, but did not include measurements over a sufficiently wide area to characterise the full extent of the plumes. Additional monitoring of chlorine and chlorine by-products from the existing Refinery discharge at varying distances from the discharge point (including at the Ramsar area boundary) coupled with the refined modelling recommended by the IAC should confirm the predicted low level of impact (or not).

There is disagreement between the experts in relation to the nearfield modelling of discharges from the diffuser, and the question in EPA's second RFI in relation to this matter has not yet been responded to. While the IAC recognises that discharges from the diffuser are not proposed as part of the preferred operating mode of the FSRU, the Refinery may not continue to operate for the life of the Project and discharges via the diffuser may be required. The FSRU Development Licence application clearly contemplates discharges from the diffuser, as it includes proposed license limits for discharges from the diffuser (350 ML/day – see Table 9-1 in EES Attachment V2). Further work is therefore required to resolve the uncertainties in the nearfield modelling.

### **Impacts on the marine environment**

The IAC accepts that if FSRU discharges are reused in the Refinery (which is the preferred operating mode), the cumulative impacts of the Project and the Refinery will be lower. The effects on chlorine plumes will likely be similar to existing impacts and the temperature of the discharges will be closer to ambient than the current Refinery discharges.

That said, further work is required before it can be concluded that existing discharges are not having any negative impacts on the marine environment (see Chapter 7.4). Further, the IAC notes EPA's submission (D217) that:

While Dr Wallis' evidence, as far as it goes, indicates that chlorine discharges from the Refinery are generally at levels which do not pose significant risk to the marine environment, "current operations" is not an appropriate benchmark having regard to the requirements of the GED and the potential for this Project to contribute to better outcomes than those of the established Refinery.

Dr Edmunds raised concerns about by-products from the chlorination process, which may disperse through bioaccumulation and pooling in sediments, and may persist in the environment for long periods. Even if chlorine plumes do not reach the Ramsar site, these pathways involving chlorine by-products may lead to impacts on the Ramsar site including higher order predators such as migratory birds. Dr Edmunds tabled several papers on chlorination by-products and bioaccumulation but advised that there are significant gaps in scientific knowledge including acute and chronic toxicity.

The IAC notes Dr Wallis' opinion that the Boudjellaba investigation of chlorination by-product concentrations and bioaccumulation (D285) was a 'research project' and went beyond the scope of what would normally be expected in an EES investigation. However, the IAC considers that assessment of this issue would provide useful information on the existing impacts of chlorinated wastewater discharges from the Refinery. It recommends consideration of further targeted investigations of the effects of chlorinated wastewater discharges including effects on higher order predators.

While there are some uncertainties associated with the extent of temperature plumes (resulting from the uncertainties with the hydrodynamic modelling), the IAC does not expect that temperature changes are likely to have significant adverse effects on the marine environment, at least in the Refinery scenario where temperature changes will be less than existing impacts. Impacts of temperature changes are less certain in the diffuser scenario due to uncertainties regarding the nearfield modelling.

#### **(iv) Findings and recommendations**

The IAC finds:

- A DGV for chlorine of 7.2 µg/litre is generally appropriate for Corio Bay, and the waters in the vicinity of the discharge points. However, the DGV for any chlorine plumes extending into the Ramsar site should be 2.2 µg/litre at the Ramsar site.
- Before it can be concluded that chlorine plumes will not have a significant effect on the marine environment or the Ramsar site, further assessment is required of:
  - the effects of existing Refinery plumes (based on further field measurements)
  - the extent of plumes from FSRU discharges (based on the revised modelling)
  - further assessment of the ecological impacts of existing Refinery discharges (as discussed in Chapter 7.4).
- Further investigation of pathways by which chlorine by-products could lead to impacts on the Ramsar site should also be considered.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Re-run the wastewater discharge modelling with revised inputs based on the refined hydrodynamic model. Consider:**

- a) **revising the nearfield modelling of discharges from the diffuser to address the matters raised by Dr McCowan in his written evidence (D75)**
- b) **the Inquiry and Advisory Committee's recommended default guideline values for chlorine discharges (see Consolidated Recommendation 17).**

**Consider undertaking further targeted investigations into the effects of existing chlorine discharges from the Refinery to confirm likely Project impacts resulting from chlorination by-products, including measurement of chlorination by-product concentrations in:**

- a) **seawater**
- b) **biota that have high susceptibility to contamination.**

#### **Development Licence applications**

Should Development Licences be issued, the IAC recommends:

**For both Development Licences, adopt the following default guideline values for chlorine discharges:**

- a) 7.2 micrograms per litre in Corio Bay generally, including the Project area
- b) 2.2 micrograms per litre at the Ramsar site.

## 7.7 Entrainment

### (i) Key issues

The key issues are:

- impacts of plankton entrainment on productivity
- whether the FSRU's daily seawater intake should be limited in seasons of high plankton productivity
- adequacy of the plankton sampling program
- accuracy of the entrainment modelling.

### (ii) Evidence and submissions

#### Impacts of entrainment on productivity

Dr Wallis gave evidence that the impacts of the Project on entrainment could be acceptably managed with the proposed mitigation measures. He advised that the Project will not lead to a change in the total volume of seawater used in the Proponent's operations, as the proposed intake of seawater into the FSRU will be 350 ML/day, the same as the current seawater intake into the Refinery. He advised that extensive plankton sampling showed that the existing Refinery intake of around 350 ML/day is not affecting primary productivity and zooplankton abundance in Corio Bay.

Dr Wallis advised that the mitigation measures currently used to minimise the likelihood of fish entering the Refinery seawater intake, including a low inlet velocity, horizontal flow direction and a screen, are satisfactory and recommended the same measures be applied to the FSRU intake (this is reflected in mitigation measure MM-ME08).

GGs submitted (D379) that the assessment of potential entrainment impacts in the EES was undertaken using a very similar approach to the Crib Point EES (also by CEE). The Crib Point IAC criticised that approach, finding that entrainment of biota up to a minimum size of 100 millimetres would have an unacceptable impact on the ecology of the marine environment at Crib Point. GGS submitted that the IAC should reach the same conclusions here.

EPA described the potential entrainment of plankton as "*significant*". It submitted that there are significant uncertainties regarding ichthyoplankton, including the species for which eggs and larvae would be entrained, the extent of entrainment as a proportion of the annual production of eggs and larvae by those species, and the potential impact of entrainment on the recruitment of particular species.

EPA (D217) disagreed with statements in the EES claiming that the Project merely shifts the location of the intake rather than altering the risk of entrainment. It submitted that the modelling showed that there will be greater entrainment of plankton at the FSRU intake than the existing Refinery intake.

The Proponent responded (D458) that ichthyoplankton surveys showed similar abundances at the Refinery intake and the FSRU intake. It presented a summary figure showing 15 +/- 60 percent at the Refinery inlet and 17 +/- 55 percent at the FSRU intake. It noted that there will be a small

change in the source of entrained ichthyoplankton but submitted that this change is not ecologically significant. The Refinery intake has been operating for 60 years and it is “*theoretically possible*” that the fish population of Corio Bay has been slightly reduced but it is more likely that the fish ecology has adapted to the effects of the Refinery intake.

### Limiting the FSRU seawater intake

EPA submitted that mitigation measure MM-ME08 should include a limit on the FSRU intake volume during the late spring/early summer breeding season to minimise the impacts of entrainment on species reproduction. This could require FSRU operations to be reduced in springtime.

The Proponent partially accepted this requirement, subject to the proviso that it be done to the extent reasonably practicable, noting that this depends on cost and other factors rather than just environmental considerations (D495). It pointed out that the Refinery currently uses 350 ML/day of seawater for cooling purposes and is unable to reduce its seawater demand on a seasonal basis (D458). It submitted that there is therefore “*little benefit ‘capping’ the FSRU intake in any month or season as the Refinery will always take up an additional volume in order to make up the 350 ML/day total required*”.

### Plankton sampling program

GGs submitted that the sampling program was inadequate because it only took single samples during each sampling event (rather than replicates). The sampling showed a high degree of variability between samples and wide error bars on average values. GGS submitted that replicate sampling would have enabled more accurate estimation of average plankton levels.

EPA did not take issue with the plankton survey methodology employed, and submitted (D217):

... the nature of assessment of impacts on plankton is likely to mean some degree of uncertainty would remain despite further work and precautionary limits are likely to be required in any case.

### Particle modelling

Dr Wallis advised that particle modelling showed only a very small percentage (less than 0.5 percent) of fish eggs and larvae from the Ramsar site are captured at the Refinery and would be captured at the FSRU.

Dr Edmunds (D72) advised that the particle model assumed that “*all particles were passive (non-swimming), neutrally buoyant and static in population (no loss or gain)*”. The model was not adjusted to any field plankton survey results. He advised that (D72):

The dispersion of particles indicated that entrainment for species with widely dispersing propagules are unlikely to be impacted. The modelling did not test the possibility that sub-populations of animals or plants with small dispersion of propagules may incur a recruitment shadow...

The larval distribution of pipefish or seahorse colonies and other cryptic fishes may be candidates for impacts via larval recruitment shadows.

Biological scenarios where entrainment may be a particular issue were not modelled specifically in the EES.

GGs (D379) submitted the entrainment modelling was inadequate because it relied on the movement of a single release of neutrally buoyant particles. It therefore likely underestimated entrainment because once the released particles had moved out of the entrainment zone, there

were no more particles to be entrained. It does not account for the many ways in which plankton, particularly zooplankton, move.

### **(iii) Discussion**

The Refinery has been taking in seawater for the past 60 years. The Project will change the location of the seawater intake but no change in the total volume is proposed (350 ML/day).

The EES plankton monitoring and particle modelling provides an understanding of the effects of the existing Refinery inlet and proposed FSRU seawater intake on entrainment. Plankton surveys show similar abundances at both sites. Biota up to a maximum size of 100 millimetres are currently entrained by the Refinery intake and will also be entrained by the FSRU seawater intake. The modelling indicates greater entrainment of plankton at the FSRU intake than the Refinery inlet as well as a small change in the source of entrained plankton.

The IAC accepts that the EES plankton sampling program and modelling had limitations. However, it agrees with EPA that uncertainty would remain even if further work were undertaken and agrees that precautionary limits provide an appropriate approach to addressing uncertainty. That said, the entrainment modelling will need to be re-run after the hydrodynamic model calibration is confirmed, because entrainment is significantly affected by currents.

GGs urged the IAC to reach the same conclusions in regard to entrainment as the Crib Point IAC. The IAC disagrees. The impacts of entrainment for this Project are different from Crib Point in several significant ways.

In Crib Point, entrainment of biota into the FSRU intake introduced a new impact to Western Port. By comparison, entrainment has already been occurring at the Refinery intake for 60 years. As already noted, the Project will alter the location of the intake but will not change the volume of seawater extracted.

In Crib Point, the intake structure was located within a Ramsar site and would directly extract plankton from the Ramsar site. By comparison, the Project is proposed to be located around 700 metres from the Ramsar site at its nearest point, and only a fraction of the entrained plankton is likely to be sourced from the Ramsar site.

The Crib Point IAC recognised that context is a relevant factor in determining acceptability of entrainment impacts in the following conclusion:

The entrainment and impingement of marine biota may be acceptable in the context of the entire marine environment of Western Port Bay, but on a local scale at Crib Point, the impacts are considered to be greater.

EPA queried the justification for seawater intake licence limits that exceed requirements for projected gas production rates and submitted that the FSRU intake volume should be limited during late spring/summer to minimise entrainment.

Under current arrangements, where the Refinery requires 350 ML/day of seawater, there would be minimal, if any, benefit from imposing a seasonal limit on the FSRU seawater intake volumes because the balance would be made up by direct intake to the Refinery. Further, there is no information as to whether two simultaneous intakes, albeit for the same total volumes of seawater, would have the same effect (or greater or lesser effects) on entrainment than a single intake.

However, the IAC agrees that seasonal limits would be appropriate where the Refinery is not operating and the volume of seawater extracted would be determined solely by FSRU operations. Lower FSRU intakes in spring and summer than in winter would reflect the seasonal pattern of demand for gas and also be consistent with ecological requirements.

#### **(iv) Findings and recommendations**

The IAC finds:

- Due to the synergies with the Refinery, the total volume of seawater extracted will not change as a result of the Project compared to the existing situation (unlike Crib Point).
- Impacts of entrainment as a result of the Project (when compared to the existing situation) are likely to be relatively contained, as indicated by the entrainment modelling.
- That said, this should be confirmed by re-running the entrainment modelling based on revised input parameters from the revised hydrodynamic modelling.
- Development Licence limits for the FSRU intake where the Refinery is not operating should be consistent with expected gas production rates rather than adopting the same 350 ML/day limit as the Refinery inlet throughout the year. MM-ME08 should be adjusted accordingly.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Re-run the entrainment modelling with revised inputs based on the refined hydrodynamic model.**

#### **Environmental Management Framework**

The IAC recommends:

**Amend marine environment mitigation measure MM-ME08 as shown in Appendix G in the Inquiry and Advisory Committee's Report No. 2, to include a requirement that when the Refinery is not operating, the intake volume at the floating storage and regasification be limited so far as reasonably practicable to minimise entrainment during late spring/early summer.**

#### **Development Licence applications**

Should Development Licences issue, the IAC recommends:

**Include a condition on the Development Licence for the floating storage and regasification unit that when the Refinery is not operating, the floating storage and regasification unit seawater intake limit should be set consistent with seasonal gas production rates, with lower limits in spring and summer, capped at a maximum of 350 megalitres per day.**

## **7.8 Underwater noise**

### **(i) Key issues**

The key issues are:

- whether existing underwater ambient noise levels have been properly assessed

- potential impacts of the Project on underwater noise levels and implications for marine fauna.

**(ii) Evidence and submissions**

The underwater noise assessment was undertaken by Jasco Applied Sciences and documented in three appendices to Technical Report A:

- Baseline Monitoring of Ambient Underwater Noise Environment (Appendix A-1)
- Underwater Noise Modelling (Appendix A-2)
- Underwater Noise Impact Assessment (Appendix A-3).

A superseded version of Appendix A-3 had mistakenly been included in the exhibited EES, and an updated version was tabled prior to the Hearing (D104).

Mr McPherson was involved in the preparation of Appendices A-1 to A-3 and adopted them as part of his evidence (D45). He explained that the underwater noise assessment:

- undertook baseline acoustic monitoring near Refinery Pier over 37 days in August and September 2021
- modelled noise impacts of the Project (pile driving, dredging, FSRU operations and LNG carrier movements including tugs)
- assessed potential effects on marine mammals, fish, marine invertebrates, and diving birds based on noise criteria determined from international guidelines and scientific literature.

The modelling was undertaken without any mitigation measures ('inherent' noise levels) due to uncertainty as to the measures that would actually be employed. The EES did not quantify the extent of noise reduction that can be expected from the proposed mitigation measures. However, Mr McPherson expected that mitigation measures could significantly reduce impact and concluded that with the recommended mitigation measures the Project would only lead to localised increases in residual noise levels near the various activities. The residual noise levels are not expected have significant ecological impacts, including because the existing ambient noise levels in the project area are already high, and marine life is likely habituated to a relatively noisy marine environment.

Mr McPherson recommended a new mitigation measure (MM-UN04) which sets out performance monitoring and contingency mitigations "*if required*". The Proponent's Part B version of the mitigation measures (D201) included MM-UN04 (as did the Part C version).

Several submitters raised concerns about the impacts of underwater noise, including Friends of the Earth (D399), Geelong Environment Council (S1583) and the Victorian National Parks Association (S929). They were concerned about detrimental effects on seals, penguins and dolphins and other marine fauna that rely on echolocation. They pointed out that sound travels much faster and further underwater, submitting that marine mammals could be impacted for huge distances away from the noise source.

GGs (D379) and GeelongPort (whose submissions were adopted by GGS and others) submitted that the EES did not adequately assess impacts from underwater noise, raising concerns about:

- the assessment of existing underwater noise (including reliance on a single monitoring site and a short 37 day monitoring period, much shorter than the 6 months recommended by the Crib Point IAC)
- the use of proxy data to characterise noise emissions from the FSRU

- a lack of noise thresholds for many local marine species, including the critically endangered Burrunan dolphin
- a lack of information about abundance and densities of marine organisms in the Project area.

The Proponent responded (D453, D495) that Mr McPherson’s evidence showed that the Project involves little material change from existing conditions in terms of underwater noise, and that underwater noise is one of the “*inherent risks and impacts associated with a working and growing port*”.

### (iii) Discussion

Corio Bay is already a relatively noisy underwater soundscape. While this may reduce the significance of further impacts on marine fauna to some extent, it does not necessarily follow that additional underwater noise will have no further impacts.

Existing noise was monitored over 37 days, substantially less than the 6 month baseline monitoring period recommended by the Crib Point IAC. However, the IAC considers that the 37 day monitoring period is adequate in this instance given the monitoring period included a severe storm, and identified a predominance of anthropogenic noise.

The most disruptive impact on the soundscape will be caused by pile driving, which will extend to the Ramsar site. Without mitigation, pile driving noise is expected to exceed noise exposure thresholds for recoverable injury for fish at a distance of up to 60 metres and for onset of temporary hearing loss at a distance of up to 870 metres. The thresholds for behavioural responses extend much further for fish, marine mammals and diving birds, but are not considered to necessarily have any ecological significance. Pile driving will have short term temporary impacts.

The noise of LNG carrier movements will extend across a large area that extends to the Ramsar site.

Noise thresholds are not known for many local species. The noise thresholds used in the assessment were based on detailed reviews of international guidelines and scientific literature, and local information where available. This is a reasonable approach in the circumstances, but it reinforces the importance of a precautionary approach to managing potential underwater noise impacts through Project design, as well as through construction and operation (through mitigation measures).

The IAC considers that several of the underwater noise mitigation measures should be strengthened:

- MM-UN01 should include requirements to demonstrate that underwater noise will be reduced as far as reasonably practicable during construction and operation. Underwater noise monitoring should be undertaken during construction to confirm actual noise impacts and to identify if further mitigations need to be applied.
- MM-UN02 should be amended to include:
  - measures to deter fish from the construction area to the extent reasonably practicable
  - a requirement for implementation protocols developed by a suitably qualified marine ecologist, to provide more specific guidance about the measures required to be taken including the distance from the construction site that should be monitored and how visual monitoring should be undertaken.

The IAC generally supports Mr McPherson's recommended MM-UN04, but notes that it requires that further mitigation measures to reduce noise must be applied "*if noise emissions levels meaningfully exceed those presented in the EES*". The noise levels presented in the EES are inherent (unmitigated), rather than residual (mitigated) noise levels, and are therefore not a suitable benchmark. Residual noise levels would provide an appropriate reference point for MM-UN04, but they are not quantified in the EES and further modelling would be necessary to define the residual noise levels. The IAC considers that an acceptable alternative approach is to amend mitigation measure MM-UN04 to require noise levels to remain below the inherent noise levels presented in the EES, rather than being allowed to meaningfully exceed those levels before action is required.

MM-UN04 should also be amended to require underwater noise monitoring to be undertaken during the first operational use of the diffuser, as this is a potential additional underwater noise source that has not yet been quantified.

For completeness, the IAC notes that modelling of noise emissions from the FSRU was based on proxy data from two Floating Production Storage and Offload facilities, rather than actual data from a FSRU. This was because there was no literature available for FSRUs. While the IAC agrees with GGS that it would have been valuable to monitor and simulate the underwater noise emissions from a FSRU, the resulting uncertainty is addressed by the performance monitoring and contingency mitigations set out in the additional mitigation measure MM-UN04.

#### **(iv) Findings and recommendations**

The IAC finds:

- Uncertainties regarding the underwater sound thresholds for marine fauna and limitations in the available information regarding the acoustic properties of the FSRU require a precautionary approach to managing potential impacts.
- The mitigation measures presented in the EES need to be strengthened accordingly, including by the addition of MM-UN04 as recommended by Mr McPherson but with some minor adjustments as proposed by the IAC.

#### **Environmental Management Framework**

The IAC recommends:

##### **Amend the underwater noise mitigation measures as shown in Appendix G in the Inquiry and Advisory Committee's Report No. 2:**

- a) **amend MM-UN01 to require underwater noise to be minimised as far as reasonably practicable during construction and operation**
- b) **amend MM-UN02 so that it applies to marine mammals and fish and to require the development of implementation protocols by a suitable qualified marine biologist**
- c) **amend MM-UN04 to require:**
  - **noise levels to generally be lower than the inherent noise levels in Environmental Effects Statement Appendix A-2 to Technical Report A**
  - **underwater noise monitoring to be undertaken during the first operational use of the diffuser system.**

## 7.9 Additional shipping movements

### (i) Key issues

The key issues are:

- introduction and spread of marine pests
- vessels striking wildlife
- turbidity from tug operations
- leaks and spills, including from vessel groundings and collisions.

### (i) Evidence and submissions

The EES indicated up to 45 LNG deliveries each year, resulting in 90 additional shipping movements per year. By comparison, around 280 vessels currently berth at Refinery Pier each year (Technical Report A). Technical Report A concluded that potential impacts from additional shipping movements could be acceptably managed through the existing regulatory framework and management arrangements for shipping as well as mitigation measures included in the EMF.

Dr Wallis gave evidence that the risk of impacts arising from additional shipping movements is proportional to the increase in the number of vessels. He noted that 3,600 vessels currently use the Ports of Geelong and Melbourne, and advised that the risk already exists. He considered the magnitude of the increase in shipping traffic associated with the Project would be relatively minor.

Dr Edmunds (D72) advised potential impacts from the additional shipping movements would not be confined to the marine study area investigated in the EES, but would have impacts in the shipping transit zones in Port Phillip Bay and through the Heads. He advised that the vessel transits come close to some high-value ecosystems, including:

- bird roost, breeding and feeding sites at Mud Island
- high diversity seaweed communities and the Port Phillip Heads Marine National Park
- the Entrance Canyon sponge garden community, which is a nationally significant biodiversity hotspot.

Many submitters expressed concern about potential impacts on the marine environment resulting from the increase in shipping movements. Concerns included marine pests, vessel strikes on marine fauna, turbidity including from tugs, leaks and spills and vessel groundings or collisions.

### (ii) Discussion

The IAC agrees with Dr Edmunds that risks associated with increased shipping traffic are not just limited to northern Corio Bay but are also relevant to the shipping transit zones.

Technical Report A reported that Port Phillip Bay and Corio Bay have an established community of introduced marine pests. The Project has the potential to introduce further marine pest attached to the hull or in the ballast water of a vessel. Risks associated with marine pests will be managed in accordance with mitigation measure MM-ME12, which relies on measures established within the Commonwealth Government's regulatory framework for biosecurity, marine pests and ballast water management.

Additional shipping movements associated with the Project will lead to an increased risk of vessel strikes. The IAC accepts submissions which pointed out that this risk is not only relevant to whales (which were considered in the EES) but also to other marine fauna, particularly dolphins (including

the critically endangered Burrunan dolphin). Mitigation measure MM-ME15 should be broadened to include reference to marine mammal strikes, including dolphins.

Increased shipping movements would lead to increased sediment resuspension by tugs. The Project will bring tug operations slightly closer to the Ramsar wetland than existing operations. No mitigation measures are proposed in the EES and the IAC understands (from the evidence of Dr McCowan) that no practical mitigation options are available.

Leaks and spills, particularly the risk of a major oil spill, are a significant concern for many submitters. The FSRU and LNG carriers are significantly larger than most of the existing shipping traffic using the Port of Geelong and Refinery Pier, with small under-keel clearances in the shipping channel. This potentially increases the risk of groundings. However, the Proponent and Ports Victoria have a well-established spill management plan for existing port operations, which would be applied to the Project.

### (iii) Findings and recommendations

The IAC finds:

- Additional shipping movements associated with the Project bring increased risks of marine pests, vessel strikes, elevated turbidity from tug operations and leaks and spills.
- These risks are already being managed as part of existing port operations and the increased levels of risk arising from the Project can be satisfactorily mitigated through these arrangements and the mitigation measures.

### Environmental Management Framework

The IAC recommends:

**Amend marine environment mitigation measure MM-ME15 as shown in Appendix G in the Inquiry and Advisory Committee’s Report No. 2, to broaden from whale strikes to marine mammal strikes including dolphins.**

## 7.10 Mitigation measures

### (i) Discussion and findings

This section addresses submissions and evidence on the marine mitigation measures that are not dealt with elsewhere in this Chapter.

#### MM-ME01 Reuse of discharge from the FSRU in the refinery

EPA recommended that the volume of seawater withdrawn from Corio Bay should be “*minimised as far as reasonably practicable*” rather than required to be “*consistent with current operations*”.

It explained that:

... “current operations” is not an appropriate benchmark having regard to the requirements of the GED and the potential for this Project to contribute to better outcomes than those of the established Refinery.

The IAC supports this change, which was accepted by the Proponent.

GGs proposed that MM-ME01 should be amended to require monitoring of the impacts of the existing discharge from the Refinery to commence as soon as possible. The IAC supports this change, which is consistent with its Consolidated Recommendation 1 for further survey work.

### **MM-ME16 Minimise chlorine concentration at the discharge points and MM-ME17 Monitor rates and characteristics of all FSRU wastewater discharges**

Dr Edmunds' view was that "*pressure levels (discharge conditions) are not a surrogate for environmental outcomes*" and recommended that there should be an accompanying environmental performance assessment program to determine if the environmental outcomes are being achieved. The IAC agrees. Monitoring of the ecosystem is important for assessing performance, including measures relating to FSRU wastewater discharges.

The monitoring requirements proposed in the EMF are limited to those in MM-ME17 (monitoring of seawater discharges from FSRU operation). These monitoring requirements should be extended to require surveys to assess impacts on benthic habitats and communities, building on the further survey work recommended in Chapter 7.4.

#### **(ii) Recommendations**

##### **Environmental Management Framework**

The IAC recommends:

**Amend the marine environment mitigation measures as shown in Appendix G in the Inquiry and Advisory Committee's Report No. 2, to insert a new mitigation measure MM-ME19 to require regular monitoring to be undertaken to determine the effects of wastewater discharges from the floating storage and regasification unit (whether via the Refinery seawater intake or the diffuser) on shoreline and benthic communities including seagrasses, macroalgae and marine fauna.**

## **7.11 Overall conclusions and recommendations on marine environment**

The IAC concludes:

- The environmental effects of the Project on the marine environment can not be fully determined at this stage. Further work is required, including monitoring and assessment of the existing marine environment and impacts of existing discharges from the Refinery, and revised marine modelling.
- The IAC's recommendations for further work in this Chapter and in Chapters 8 and 9.4 provide an appropriate framework for the further consideration and future management of Project impacts.

## 8 Dredging impacts

### 8.1 Introduction

The relevant evaluation objectives are the same as for the marine environment (refer to Chapter 7.1).

Dredging is discussed in EES Chapter 8. Supporting reports and studies include:

- Technical Report A: Marine ecology and water quality impact assessment
- Technical Report B: Dredged sediment disposal options assessment.

Much of the evidence on the marine environment listed in Table 7 included dredging impacts. Additional evidence related to dredging is listed in Table 9.

Table 9 Dredging evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D42	Dr Belinda Goldsworthy, AECOM	Effects of dredging (offshore contamination)	Lead verifier for Technical Report B, reviewer and approver of the technical quality of Technical Report B (refer to D134)

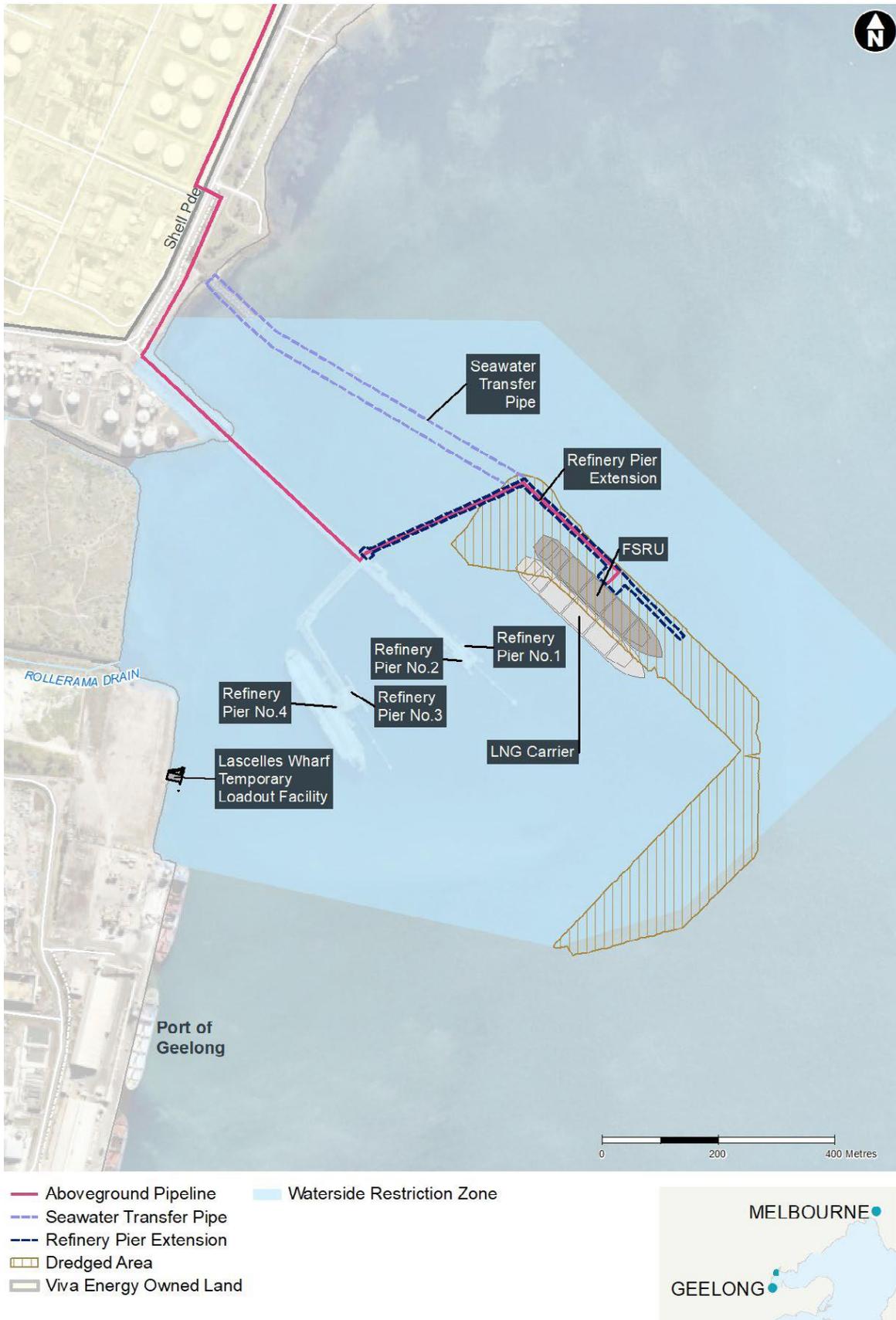
Additional material relevant to dredging is too voluminous to list here, but is listed in Appendix D in Report No. 2. It includes much of the additional material listed in Chapter 7.1.

### 8.2 What did the EES say?

#### (i) Overview

Dredging would remove 490,000 cubic metres of material over an area of about 12 hectares adjacent to the existing shipping channel to provide depth at the new berth and within the swing basin to accommodate LNG carriers. In addition, around 8,800 cubic metres of material would be excavated for the seawater transfer pipe. The dredged material will be deposited within the existing dredged material ground (DMG) in Port Phillip Bay east of Point Wilson. The dredging program is expected to take 8 weeks. The proposed dredging areas are shown in Figure 6.

Figure 6 Proposed dredging areas



Source: EES Figure 8-47

Dredging entrains sediment and biogenic material, which suspends in the water. The suspended solids result in turbidity which impacts light attenuation. Light attenuation can impact on the health of the seagrass meadows in the shallow waters of Corio Bay and Limeburners Bay.

The extent of sediment plumes is affected by weather patterns, particularly wind. The areas of highest suspended solids concentrations and turbidity are expected to be limited to the dredging zone and surrounding area. The Ramsar site and central Corio Bay are expected to have only minor increases in turbidity for short periods of time.

Temporary reductions in productivity of seagrass, phytoplankton, seaweed and microphytobenthos are expected during dredging but recovery is expected to begin shortly after dredging is completed. Light transmission would recover within one or two days, and any seagrass growth slowed by turbidity would recover shortly after completion of dredging.

Suspended solids from the proposed dredging would settle and accrete on the seabed. The highest accretion would occur in the dredged area (up to 20 millimetres), with accretion of up to 0.3 millimetres expected on seagrass meadows. The predicted accretion is expected to have negligible effects on muddy seabed and associated infauna and mobile marine communities.

Some limited areas of sediments within the area to be dredged showed slightly elevated levels of metals including antimony, arsenic, lead, mercury and nickel. However, elutriate concentrations were below guideline levels indicating a low potential for bioavailability (and hence ecotoxicity) to marine biota. The seabed infauna communities are habituated to these metal levels. The release of nitrogen from the seabed during dredging may cause a small, localised phytoplankton bloom, which depending on weather conditions may be a bloom of toxic algae.

No significant impacts from the Project are expected at the Point Wilson DMG, which has received material from past dredging programs in Corio Bay. The EES reported that the physical characteristics of the sediment within the area to be dredged and the DMG are generally very similar.

## (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 10.

**Table 10** Proposed mitigation measures for dredging

No.	Mitigation Measure	Project timing
MM-ME02	Avoid dredging in spring growth season	Construction
MM-ME03	Limit duration of overflow from barges	Construction
MM-ME04	Install silt curtain between dredging and refinery intake and seagrass	Design Construction
MM-ME05	Monitor turbidity and light attenuation during dredging, with threshold limits	Construction
MM-ME06	Seabed biota monitoring in dredged area and Point Wilson dredged material ground	Construction Operation
MM-ME07	Monitoring of plankton during and after dredging	Construction

The EMF includes monitoring parameters for turbidity, light attenuation and visual monitoring during dredging, as well as seabed biota monitoring and plankton monitoring.

**(iii) Conclusion**

EES Chapter 8 concluded that the impacts resulting from dredging would be temporary and localised and would not result in significant impacts to nearby populations and communities. Any altered conditions are expected to return to original conditions within a short period of time after dredging ceases.

**8.3 Sediment transport modelling**

Sediment transport modelling was used to assess the impacts of dredging on suspended solids, turbidity and sediment deposition, and to predict the extent of dredge plumes. The hydrodynamic modelling discussed in Chapter 7.5 was used as the basis for the sediment transport modelling. This chapter should be read with that Chapter.

**(i) Key issues**

The key issues are:

- impacts of turbidity and sediment deposition on the marine environment including the Ramsar site
- the settling rate for suspended solids used in the sediment transport modelling.

**(ii) Evidence and submissions**

The agreed statement from the marine experts (D102) reported *“an overall conclusion is that there is a risk that the dredging operation will result in higher than predicted concentrations [of suspended solids] in the Ramsar site”*. However, no agreement was reached on silt settling or resuspension of sediments in relation to the modelling.

The sediment transport modelling used a settling rate of 0.8 millimetres per second for silt. Dr Wallis provided the settling rate to Hydronumerics. His evidence was that this settling rate was based on a conservative approach. Dr McCowan disagreed, referring to work by Lawson and Treloar (1997) that verified modelled dredge plumes against monitoring results for the 1997/98 dredging program in Corio Bay. Lawson and Treloar’s validated settling rates were between 3 and almost 7 times slower than those provided to Hydronumerics and used in the modelling.

Dr McCowan’s evidence was that with *“more realistic”* settling velocities, sediments would remain in suspension for longer, increasing the likelihood of significant concentrations of sediment being transported to the Ramsar site. Together with more realistic simulation of currents showing stronger wind driven currents (as discussed in Chapter 7.5), the time required for dredged sediments to reach the Ramsar site would be less than 3 hours, rather than 24 hours as stated by Dr Wallis. This could enable significant concentrations of sediment to be transported into the Ramsar site.

The Proponent submitted that *“the real turbidity outcomes for the Project will not be determined by modelling, but rather by appropriate management of dredging operations, real time monitoring and management of dredging operations to achieve appropriate ... criteria”* (D200).

**(iii) Discussion**

The sediment transport modelling will need to be re-run after the regional hydrodynamic model calibration is confirmed, because currents have significant effects on sediment plumes. The extent of the plumes in relation to the Ramsar site will need to be checked.

The IAC notes differences in opinion between Dr Wallis and Dr McCowan in relation to sediment fractions and settling rates. The re-run of the sediment transport modelling should include sensitivity testing based on likely sediment fractions and settling rates, including a 'worst case' scenario involving the largest expected proportions of fine and very fine materials that have the slowest expected settling velocities.

#### (iv) Findings and recommendations

The IAC finds:

- Currents predicted by the regional hydrodynamic model are a key input parameter into sediment transport model. Uncertainties regarding currents lead to a risk that dredging plumes will extend further than predicted. This could result in higher sediment concentrations at the Ramsar site.
- The sediment transport modelling should be re-run once the hydrodynamic model calibration has been refined.
- The modelling should include sensitivity testing on the sediment fractions and settling rates, including a 'worst case' scenario which includes the largest expected proportions of fine and very fine materials that have the slowest expected settling velocities.

#### Further work

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Re-run the sediment transport modelling with revised inputs based on the refined hydrodynamic model. Consider including a 'worst case' scenario for sediment fractions and settling rates which includes the largest expected proportions of fine and very fine materials that have the slowest expected settling velocities.**

## 8.4 Contamination impacts of dredging impacts

### (i) Key issues

The key issues are:

- contamination levels at the loading site (dredging area at Refinery Pier)
- depth and stratification of sediment sampling
- suitability of the spoil disposal location (the DMG)
- whether dredged material should be disposed of onshore.

### (ii) Evidence and submissions

Dr Belinda Goldsworthy gave evidence for the Proponent on the potential for dredge material contamination and spoil disposal. Her role in the Project was as Lead Verifier for the Dredging and Offshore Contamination Assessment (Appendix A to Technical Report B of the EES). She adopted this report as part of her evidence.

In her evidence Dr Goldsworthy outlined the methodology for sediment sampling and assessment at the loading site (Refinery Pier), the DMG and an ambient baseline location. Her evidence was that the assessment was in accordance with the *National Assessment Guidelines for Dredging 2009* (National Dredging Guidelines). Dr Goldsworthy's evidence was that this guideline was followed in

preference to the *Victorian Best Practice Environmental Management – Guidelines for Dredging 2001* (Victorian Dredging Guidelines) as they generally align but the National Dredging Guidelines:

...provides more detailed and current scientific guidance on the staged approach for assessing the suitability of sediments for disposal and the preferred disposal option based on the contaminant status of the sediment.

Her evidence was that the sediment sampling at the loading site was undertaken in three domains (layers of sediments) from the sediment surface down to 6 metres below the sediment surface. The sampling program was reviewed by EPA and feedback incorporated in the final design. She explained that finer layers of sampling were not undertaken due to the non-cohesive nature of the sediments, which she described in the Hearing as 'oozy'. In some cases it was difficult obtaining sediment samples in the upper domain because of the nature of the material.

Dr Goldsworthy outlined the five phased assessment approach in the National Dredging Guidelines, these being:

- evaluate existing information (I)
- sample and analyse dredge spoil (II)
- compare elutriate data to water quality guidelines (III)
- acute/chronic toxicity and bioaccumulation (IV)
- assess the weight of evidence (V).

Elutriate testing in Phase III, where dredged materials are mixed in water from the DMG and the water tested for toxicants, showed low potential for bioavailability and thus Phase IV and V assessments were not required.

The findings of the EES adopted by Dr Goldsworthy included:

- similar physical parameters of sediment between the loading site and DMG
- elevated levels of antimony, arsenic, lead, mercury and nickel above screening guideline values at the loading site
- consequent elutriate testing of dredged sediments showed low levels of bioavailability resulting in low risk to marine biota
- silver and zinc elutriate concentrations identified in earlier Coffey work are discrete isolated occurrences that are unlikely to have adverse impacts on marine biota
- per- and polyfluoroalkyl substances (PFAS) were detected at low levels in seawater and are likely to be ubiquitous across Corio Bay in seawater
- perfluorooctane sulfonate (PFOS – a type of PFAS) was detected in sediments at low levels at all sites (loading, DMG and ambient) and below default guideline values.

Dr Goldsworthy highlighted that the elutriate testing process is noted in the National Dredging Guidelines as being conservative, and concluded that based on the sampling results, no special handling or management of the dredge spoil at the DMG is required.

Many submissions raised the issue of contamination from dredging. This was often in common wording which suggested:

- inadequate characterisation and assessment of an area (Refinery Pier) likely to be contaminated
- the Proponent has not measured contamination around Refinery Pier
- highly contaminated material might be a prescribed waste which needs to be disposed to land
- this would be expensive and might be needed to avoid impact on marine ecosystems.

EPA provided comments to the Proponent in relation to the characterisation and ‘partitioning’ of dredge spoil to isolate and manage any particular areas of contamination, but this was not listed as an outstanding item in its submission to the IAC.

Submitter 928 was a past manager of dredging for EPA and raised a number of issues with the dredging contamination assessment. These were, in summary:

- The reports on sediment contamination are long and poorly structured making it difficult to determine results.
- The stratification of sediment sampling by depth is inadequate and does not allow for the differential treatment of likely contaminated upper layers from likely uncontaminated deeper sediments.
- The Victorian Dredging Guidelines should have been used rather than the National Dredging Guidelines as the former are more relevant to the jurisdiction and require the establishment of past contamination history, of which there is a significant amount from past dredging campaigns.
- Concerns about the suite of chemicals measured, sampling intensity and the “opaque” analysis of the data.
- Petroleum hydrocarbon contamination was not measured and should have been at a Refinery wharf.

Environment Victoria (S2029) raised similar issues in relation to dredging and contamination.

Dr Goldsworthy provided a detailed response to these submissions in her expert evidence and provided a set of summary tables (D42(b)) showing contamination testing results for the different domains.

At the request of the IAC Dr Goldsworthy reviewed the proposed mitigation measures for dredging and sediment control and endorsed them as a general good practice approach (D254). She did not suggest any additional mitigation measures.

### **(iii) Discussion**

The IAC has reviewed the methodology and results of the dredging assessment and is satisfied that the sampling and assessment process has been undertaken in accordance with the National Dredging Guidelines. The IAC notes Dr Goldsworthy’s evidence that the sampling program was developed in consultation with EPA and although EPA did not have an ‘approval’ role in respect of the program, it appears it was kept informed and its feedback accommodated in the design of the program.

It is clear from the EES and the evidence of Dr Goldsworthy that there is some metals contamination above guideline values in the upper layers (domains 1a and 1b) of sediment at the loading site. This can be seen most clearly in the summary tables (for example D42(b) at page 14). Some of the contaminants also occur in the deeper layers (domain 2) and the EES suggests this may represent naturally occurring levels.

While the presence of contaminants is of concern and should always trigger a considered response, the Phase III elutriate and porewater testing (testing of the water extracted from between particles in the dredged sediment) of the sediments shows that the contaminants, which are bound to sediments, are not easily released (desorbed). This means they should have low levels of bioavailability and ecotoxicity, and should not have a significant impact on marine ecosystems.

The exception to this is arsenic, where the maximum concentration of 0.019 milligram per litre in elutriate samples exceeded the DGV of 0.0125 milligram per litre in the AECOM samples (Table 5-8, Technical Report B Appendix A). However, when averaged with earlier samples taken by Coffey the concentration is below the DGV. This averaging approach is supported by the National Dredging Guidelines (page 39).

PFOS values in elutriate testing (as both a maximum and average) were above the DGV but the DGV was developed for freshwater and is not considered reliable by experts when applied to seawater. The PFOS levels recorded in the elutriate samples were similar to the ambient levels in seawater in Corio Bay.

A number of submissions were critical of the sampling stratification, suggesting it should have been undertaken in thinner layers (of 0.5 metres) to more accurately characterise the contamination and whether treatment and disposal is required. The IAC has reviewed the sampling approach in detail and considers the use of a larger domain 1a (a depth down to 2.5 metres below surface level) is acceptable in the circumstances. The results indicate that no special treatment of dredge spoil will be required to avoid ecological impacts.

Review of the photo logs in Appendix F to the Dredging and Offshore Contamination Assessment suggests that more stratified sampling, let alone dredging, would be very difficult given the unconsolidated nature of the domain, particularly compared to the lower domains.

The IAC notes criticism of the suite of chemicals sampled but is satisfied that on the material in the EES the decision making over time as different sampling was undertaken appears logical. For example, Dr Goldsworthy's evidence (in response to a question from the IAC in its RFI) was that Total Petroleum Hydrocarbons were not detected in earlier studies and were therefore not included in the Phase III assessment (D42, page 16).

Given the findings on the material to be dredged, the IAC is satisfied that the DMG is an appropriate location for dredge spoil disposal and no confinement or special treatment is required at the disposal site. The IAC notes the Point Wilson DMG has been used for recent dredging campaigns including in 2015 at the Geelong Port.

The physical characteristics of the loading site and DMG are similar and the low level of risk of bioavailability of contaminants lead the IAC to conclude this form of disposal is appropriate. As discussed elsewhere in this Report the minimisation of turbidity plumes from dredging will be an important part of minimising environmental impacts at the loading site and surrounds.

While onshore dewatering and disposal of dredged material may be technically feasible, the IAC does not consider it necessary given the low levels of contamination. Onshore dewatering and disposal would give rise to a new and different set of potential impacts and costs with no appreciable environmental benefit.

While this section has focused on dredging for the construction of the Refinery Pier extension and the associated berthing pockets and turning basins, the area to be trenched for the sea water transfer pipe is also subject to contamination. For example, at location BH-SWPT-05, lead was recorded at 200 milligrams per kilogram, four times the DGV. Whether this has implications for the trenching method should be considered in the CEMP required under the Incorporated Document.

**(iv) Findings**

The IAC finds:

- The sampling and analysis process for contaminants in dredge spoil has been undertaken to an acceptable level in accordance with the National Dredging Guidelines. A suitable suite of contaminants was assessed, and the depth and stratification of sampling was appropriate.
- Dredge spoil from the loading site is suitable for disposal at the Point Wilson DMG and should have an acceptable level of environmental impact. Onshore disposal of dredged material is not required.

**8.5 Impacts on seagrass****(i) Key issues**

The key issues are:

- whether the light thresholds assumed in the EES for ongoing seagrass health were appropriate
- whether an alternative approach (to light thresholds) should have been used.

**(ii) Evidence and submissions**

The Proponent submitted that (D35):

The proposed dredging at and around Refinery Pier is of relatively short duration and marine modelling indicates that sediments mobilised by the dredging will not impact seagrass within Corio Bay or create unacceptable turbidity at the Ramsar site. Marine surveys confirmed that there is no seagrass within the area to be dredged for the project. Light attenuation will reduce photosynthesis opportunity for seagrass for a period of up to 8 weeks, however following the conclusion of dredging, seagrass will be unaffected.

The Proponent submitted that past dredging programs in Corio Bay indicate that mobilised sediments tend to settle within the general vicinity of the dredging as a result of the low current environment within Corio Bay (D35). Past dredging was monitored, and no long-lasting impacts on water quality or seagrass were reported.

Dr Wallis advised that the volume of sediment proposed to be dredged for the Project (490,000 cubic metres) is small in relation to total previous dredging in Corio Bay and Port Phillip Bay. It is much smaller than the 1996-97 dredging of Grain Pier, Lascelles Wharf and Refinery Pier (4,500,000 cubic metres).

**The appropriate light threshold**

The EES used thresholds of available light expressed as a percentage of surface irradiance (% SI) to determine the implications of changes in suspended solids concentration for seagrass. The EES relied on a paper by Bulthuis (1983), from which it determined the following light thresholds for seagrass:

- 12% SI for growth
- 5% SI for survival.

Technical Report A stated (at page 73) that 5% SI is needed for seagrass survival in summer, and this threshold was used as the basis for assessing dredging impacts on seagrass.

The Proponent tabled a copy of the Bulthuis paper (D202). Bulthuis studied the effects of light reduction on the seagrass species *Heterozostera tasmanica*, based on observations of the distribution of seagrass in Port Phillip Bay and Western Port Bay (including one site in Corio Bay near the Project area) as well as experimental studies using screens to shade seagrass to varying degrees.

Bulthuis concluded that the minimum light requirement for *H. tasmanica* is between 4.7 and 13 % SI. Other key conclusions were:

- even with less shading and higher % SI, leaf cluster density was reduced after prolonged shading
- seasonal variations were observed in the response to shading
- *H. tasmanica* may be more tolerant of lower light intensities than other species including *Zostera mulleri*.

Dr Edmunds' opinion was that the Bulthuis paper did not provide evidence for growth of seagrass at 12% SI, as claimed by Dr Wallis. He also queried the appropriateness of applying the 5% SI survival threshold, given the Victorian Dredging Guidelines are based on a nominal 10% SI but state that some species require up to 20% SI for survival. GGS (D379) submitted that 10% SI "appears to be a realistic annual light requirement in the south of [Port Phillip] Bay" and recommended an average value of 15% SI be used "as a conservative minimum".

The EES overlaid the turbidity contours that would result in a 5% SI light threshold on the seagrass mapping to determine actual areas of seagrass that would be impacted (shown in Figure 7). The mapping suggests that elevated turbidity levels detrimental to seagrass would largely only affect one patch of seagrass. No impacts are predicted on the seagrass in the Ramsar site or close to the shoreline adjacent to the Refinery.

**Figure 7** Suspended solids contours overlaid with seagrass beds



Source: Technical Report A1, Figure 7-20

## An alternative approach

Dr Edmunds did not support the use of a minimum light threshold to determine impacts on seagrass. He considered that a comprehensive biological model of seagrass productivity is a better approach. He put forward a number of reasons for this:

- The light requirements of seagrass reported in the literature are highly variable depending on the location and method of measurement, as well as within and between species.
- Light thresholds for seagrass survival at edge boundaries are not applicable to the broader seagrass population, because plants growing at their depth limit may have different photosynthetic capabilities than the main patch.
- Light thresholds are not applicable for prediction and management of the magnitude, extent, duration and recovery from impacts.
- Relative measures of light availability (expressed as % SI) are being superseded by benthic light dosage (as would be measured by a light logger), which is an absolute measure of light availability.
- The pattern of light delivery may be as important as the total dosage, therefore setting a single, average light dosage threshold is unlikely to be biologically appropriate.

Dr Edmunds conceded that there is no alternative standardised management approach, but *“there are common approaches that should be carefully considered and evaluated for inclusion in any dredging program involving management of benthic vegetation”* including from the Western Australian Marine Science Institution reflected in the Western Australian EPA’s Dredging Guidelines (D371).

The Proponent responded that *“the methods applied in the EES represent conventional, reliable approaches that integrate well with the Victorian regulatory framework”* (D454). It submitted that the Western Australian dredging guidelines and the Victorian Dredging Guidelines apply a fundamentally similar approach, which is to limit turbidity as far as reasonably practicable and achieve a certain amount of benthic light. It submitted that Dr Edmunds’ approach of direct biological modelling and monitoring procedures *“are not proven concepts and cannot reliably be applied in an EES process or in a real dredging program”* (D454). However, *“all this said, the Proponent does not oppose authorities requiring monitoring of biological indicators and light attenuation in addition to turbidity”* (D454).

It was agreed at the marine ecology expert meeting that the sub-tidal seagrass in the study area *“is a mixture of Zostera and Halophila, with slightly different depth ranges and light requirements, epiphytes and algae”*. It was agreed that dredging impacts extend to a wider area than the predicted turbidity plume, through biological impact pathways. It was also agreed that the subtidal and intertidal seagrass zones are linked, however there was *“no estimate of the effects of turbidity, temperature or contaminants on the intertidal environment, or from other biological impact pathways from the subtidal to intertidal environment”* (D101).

GGs drew attention to complexities resulting from concurrent impacts, such as where light reduction and sediment deposition occur concurrently in turbid plumes. GGS described the EES’s lack of seagrass mapping by species as a *“critical omission”*, because (D379):

... species level information enables discrete impact implications to be considered for the specific species and the implications this has further along the ecosystem pathways. For example, the *Zostera* and *Halophila* seagrass species have different depth ranges and light requirements - some species may be more impacted by reductions in light than others. As Dr Edmunds sets out in his evidence, *Z. muelleri* is a more robust morphotype of seagrass.

**(iii) Discussion**

Seagrass beds occur extensively in Corio Bay and seagrass is an important component of the ecological character of the Ramsar site. Seagrass beds provide habitat and food resources for fish, and play a key role in the ecology of the black swan. Seagrass wrack washed up on beaches also links marine and coastal ecosystems.

The source-path-receptor approach to determine the impacts of dredging on seagrass relies on embedded assumptions about hydrodynamic processes, sediment transport, light thresholds for seagrass survival and mapping of existing seagrass. While this is an acceptable approach, key assumptions have been queried, including the adoption of the light threshold of 5% SI for seagrass survival.

The IAC considers that the 5 % SI threshold for seagrass survival is not sufficiently conservative. The Victorian Dredging Guidelines considered the Bulthuis paper and other literature, and state that *“most seagrass species require more than 10 percent light for survival; typically, they require nearly 20 percent for survival”*. On that basis, the IAC considers the 10% SI and 20% SI thresholds in the Victorian Dredging Guidelines provide an appropriate basis for assessing the effects of dredging on seagrass, with the 20% SI threshold given greater weight at the Ramsar site to minimise risk.

On the question of whether a minimum light threshold approach is suitable for assessing impacts of dredging on seagrass, Dr Edmunds was unable to direct the IAC to an alternative contemporary standardised management approach. The Victorian Dredging Guidelines adopt a minimum light threshold approach, and provide guidance in relation to the currently accepted approach in Victoria. It was appropriate for the Proponent to rely on them for the EES.

That said, the IAC considers that the Western Australian Marine Science Institution conceptual model of seagrass monitoring indicators tabled by Dr Edmunds (D243) provides useful guidance for the selection of a more comprehensive set of indicators for ongoing seagrass monitoring that will be required under the CEMP.

The agreed expert statement drew attention to a number of other limitations in the EES assessment of dredging impacts on seagrass, including no assessment of effects on the intertidal zone, and simplification of different seagrass species and communities into a single category of seagrass. Different species of seagrass vary in terms of their light tolerances and likely sensitivity to turbidity, and also have different ecological associations (for example, *Zostera muelleri* and black swan).

The experts agreed at the expert meeting that the biological pathways extend the footprint of potential impacts of dredging beyond the area directly affected by the turbidity plumes. These pathways need to be outlined and assessed to have a more complete understanding of potential impacts of dredging beyond its effects on seagrass, including for the Ramsar site.

Finally, for completeness, the IAC acknowledges the various reports on past dredging campaigns in Corio Bay and other locations that were tabled during the Hearing. Evidence of past dredging campaigns can provide some guidance, but does not amount to an assessment of the likely impacts of the dredging proposed as part of the Project.

**(iv) Findings and recommendations**

The IAC finds:

- There are a number of deficiencies in the EES’s assessment of the impacts of dredging on seagrass.
  - The 5% SI light threshold is insufficiently conservative, and light thresholds of 10% SI to 20% SI should be adopted, with the 20% SI threshold given greater weight at the Ramsar site.
  - The EES assessment was largely limited to sub-tidal seagrass. Further assessment is required to confirm potential impacts on the intertidal zone.
  - Seagrass mapping should be updated based on the different species of seagrass, to enable a better understanding of the impacts on seagrass.
- Impacts on seagrass should be further considered in light of the revised sediment transport modelling.

### Further work

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Undertake further assessment of dredging impacts on seagrass based on:**

- a) **the revised sediment transport modelling**
- b) **revised light thresholds of 10 percent to 20 percent surface irradiance (20 percent surface irradiance should be applied to any sediment plumes that extend to the Port Phillip Bay (Western Shoreline) and Bellarine Peninsular Ramsar site)**
- c) **the updated seagrass mapping (see Consolidated Recommendation 1(b)).**

## 8.6 Monitoring during dredging

By way of context, mitigation measure MM-ME05 proposes real time turbidity monitoring during dredging operations, with thresholds for action based on mean turbidities of:

- a 12 hour mean concentration of 15 NTU (trigger warning)
- a 24 hour mean concentration of 12 NTU (action required).

NTU stands for nephelometric turbidity units, and is a measure of turbidity.

### (i) Key issues

The key issues are:

- the appropriateness of the turbidity thresholds
- whether alternative indicators should be monitored
- whether turbidity risks should be minimised as far as reasonably practicable.

### (ii) Evidence and submissions

Dr Edmunds’ opinion was that the proposed thresholds provide less protection to seagrass than the Victorian Dredging Guidelines, which (based on a nominated value of 10% SI) infer a trigger turbidity threshold of 5 NTU for maintaining a mean turbidity of 1.6-3.0 NTU over seagrass. His view was that there is “*no source, rationale or explanation*” for the 12 and 15 NTU trigger levels (D281), and that without supporting evidence, the EES should default to the values recommended in the Victorian Dredging Guidelines.

Dr Edmunds recommended that direct measurements of seabed irradiance replace turbidity (NTU) levels, and ‘near-real time’ ecological indicators should be added to the monitoring requirements.

EPA submitted that MM-ME05 could be improved by:

- requiring turbidity to be managed to minimise risks so far as reasonably practicable
- providing greater clarity regarding the action required if ‘trigger warning’ and ‘action required’ thresholds are exceeded.

### (iii) Discussion

#### Turbidity thresholds

The IAC accepts Dr Edmunds’ evidence that no basis has been shown for the 12 and 15 NTU trigger levels. These exceed the 5 NTU nominal level in the Victorian Dredging Guidelines by some margin. The 5 NTU nominal level is not overly conservative, because it is based on a light attenuation threshold of 10% SI rather than 20% SI.

The turbidity data presented in Technical Report A also suggests that the proposed 12 and 15 NTU trigger levels are high compared to background levels. Technical Report A states that the average background turbidity is 1.7 NTU. Figure 5-20 in Technical Report A presents a graph of EPA turbidity data for Corio Bay for 2014 to 2020 which shows turbidity was generally less than 2 NTU, with a few pulses to around 3 NTU and one pulse to 8.5 NTU. While Figure 5-21 in Technical Report A shows background turbidity is higher near the seabed, MM-ME05 does not specify that the turbidity thresholds would apply at the seabed. Therefore, the turbidity levels in Figure 5-20 provide a more relevant baseline.

The IAC notes GGS’s submission that the ‘trigger warning’ and ‘action required’ thresholds should be based on a threshold of 5 NTU. This warrants further consideration in Project development including the time averaged periods that should apply. The IAC further considers MM-ME05 should not be limited to turbidity caused by dredging.

The suspended solids concentrations at the water surface (see Figure 7 above) suggest that a 5 NTU threshold (equivalent to 15 milligram per litre based on the relationship between turbidity and suspended solids developed by CEE in EES Technical Report A page 205) would not be expected to unduly delay dredging. This should be confirmed in the revised modelling recommended by the IAC as extending the dredge program should be avoided to minimise the period of impact.

GGS also submitted (D505) that the time periods determining the ‘trigger warning’ and ‘action required’ thresholds should also be shortened. The basis for this proposed change is unclear and the IAC considers it to be unnecessarily restrictive.

#### Alternative indicators

The Western Australian Dredging Guidelines (D454) include a risk-based environmental monitoring and management framework, which is of assistance in evaluating potential monitoring indicators.

- Primary indicators signify an early warning of a potential threat and include measures linked to a pressure from dredging such as turbidity, light attenuation or a sediment deposition rate.
- Secondary indicators signify a moderate risk to biota of interest and include measures of biotic stress such as the shoot density of seagrass.
- Tertiary indicators signify and high and unacceptable level of risk to the biota of interest and include measures that are immediate precursors to an unacceptable impact.

In this classification scheme, turbidity is a ‘primary indicator’ which can be readily and routinely monitored in the field. The IAC considers that turbidity measured in NTU provides the most practical approach to real time monitoring to inform the management of the dredging operation and is appropriate in this instance.

Biological indicators such as vegetation attributes and microphytobenthos suggested by Dr Edmunds are ‘secondary indicators’. They provide more direct information about the ecological impacts of dredging than can be inferred from primary pressure-based indicators alone, but are typically more difficult to implement, and feedback for management of dredging can be delayed while data is being analysed and interpreted. They are more useful for a monitoring program to confirm impacts that have occurred rather than for proactive real time management. This should be considered in the CEMP approved under the Incorporated Document and/or the MACA consent (should one be issued), with a supporting mitigation measure (see the IAC’s recommended MM-ME19 in Chapter 7.10).

### **Minimising turbidity risks as far as reasonably practical**

The GED applies to all persons engaging in activities that may give rise to risks of harm to human health or the environment from pollution or waste. It is not restricted to activities regulated through the licensing system under the EP Act, and applies to waste generated by dredging.

The objectives of the MACA include protection and enhancement of the marine and coastal environment (section 7) and the use of ecosystem based management to avoid detrimental cumulative or incremental ecosystem impacts (section 9(2)).

The IAC considers that the general intent of MM-ME05 is to manage turbidity to minimise risks so far as reasonably practicable, and it would be helpful for the detailed requirements of MM-ME05 to be framed in relation to this overarching objective. The IAC has recommended changes to this effect in its recommended mitigation measures in Appendix G.

The Proponent made other changes to MM-ME05 to provide greater clarity regarding action requirements. These changes are reflected in the Part C Mitigation Register (D456), and are supported by the IAC.

### **(iv) Findings and recommendations**

The IAC finds:

- The turbidity thresholds of 12 NTU (trigger warning) and 15 NTU (action required) proposed in mitigation measure MM-ME05 are insufficiently precautionary. Consideration should be given to reducing them to 5 NTU subject to further assessment of the implications for dredge campaign timing.
- Real time monitoring of alternative biological indicators as suggested by Dr Edmunds is not practical or feasible. However, data for biological indicators should be collected as part of the longer term monitoring of the effects of dredging including seagrass response. This should be considered in the CEMP approved under the Incorporated Document, supported by the IAC’s recommended new mitigation measure MM-ME19 (see Chapter 7.10).
- MM-ME05 should be amended to include a requirement to manage turbidity to minimise risks so far as reasonably practicable, and the paragraph stating that MM-ME05 only applies to turbidity caused by dredging should be removed.

## Environmental Management Framework

The IAC recommends:

**Amend marine environment mitigation measure MM-ME05 as shown in Appendix G in the Inquiry and Advisory Committee’s Report No. 2, to:**

- a) amend the thresholds to a 12-hour mean concentration above 5 NTU (trigger warning) and a 24-hour mean concentration above 5 NTU (action required), with a note that it be subject to not unreasonably extending the dredging campaign
- b) delete the paragraph that states that MM-ME05 only applies to turbidity from dredging
- c) add a requirement to manage turbidity to minimise risks so far as reasonably practicable.

**Amend marine environment mitigation measure MM-ME06 as shown in Appendix G in the Inquiry and Advisory Committee’s Report No. 2, to require monitoring of the effects of dredging on seagrass including biological indicators.**

## 8.7 Impacts on the Ramsar site

### (i) Key issues

The key issues are impacts on the Ramsar site of:

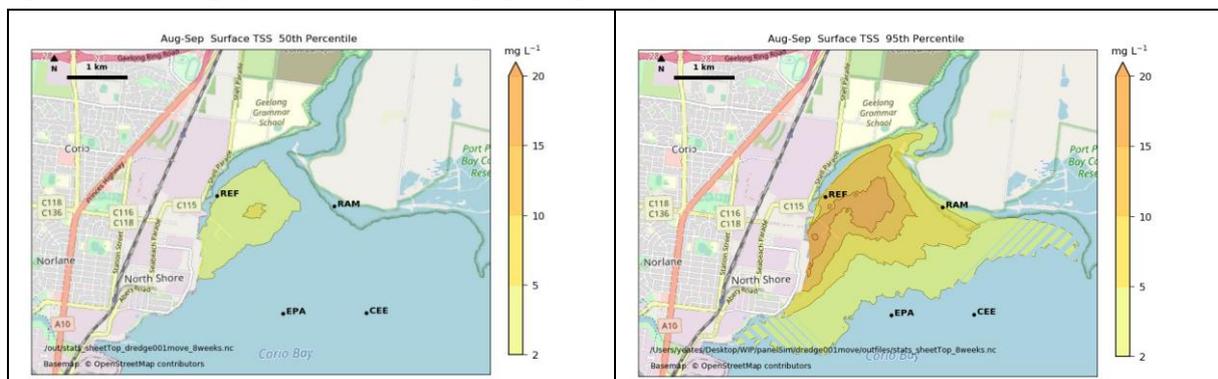
- turbidity generated by dredging
- deposition of dredged sediments.

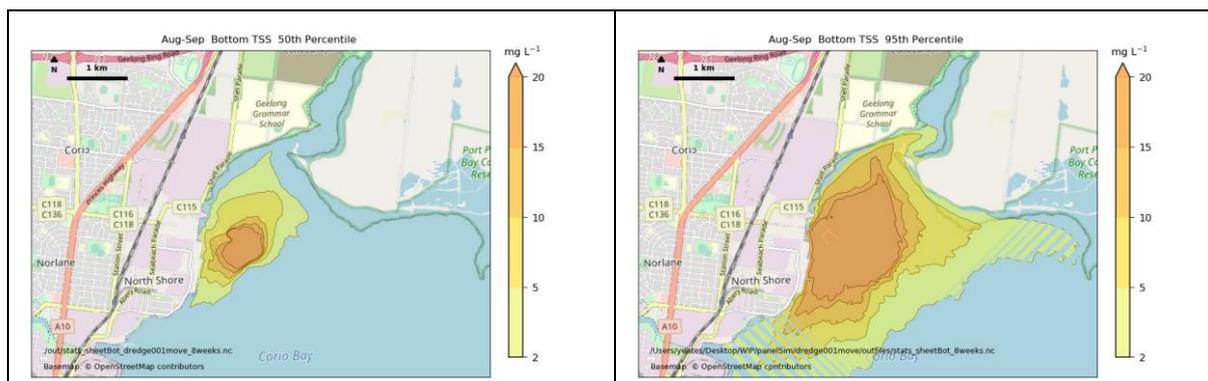
### (ii) Evidence and submissions

Dr Wallis’ evidence was that there will only be a minor increase in turbidity, insufficient to cause adverse impacts on productivity in the Ramsar site or central and south Corio Bay. His evidence was that based on the dredge plume modelling, no significant amount of suspended solids or turbidity will enter Limeburners Bay, therefore dredging would not affect the Critical Processes and Services of the Ramsar site.

Technical Report A presented predicted dredge plumes in two seasonal dredging scenarios, August–September and November–December. Dredge plumes were mapped showing median total suspended solids concentrations at the water surface and seabed for each seasonal dredging scenario. Figure 8 shows the August–September plots as an example.

**Figure 8 Dredge plumes based on dredging in August–September**





Source: EES Technical Report A1, Figure 7-9 and D165

The modelling showed ‘pulses’ of elevated suspended solids concentrations. The median plots (the left hand images in Figure 8) do not fully reflect the pulses. At the request of the IAC, Dr Yeates tabled plots of the 95<sup>th</sup> percentile suspended solids concentrations for the same scenario (D165), which are shown in the right hand images in Figure 8. These show that the dredge plumes can extend to the Ramsar site and into the southern part of Limeburners Bay during the pulses. The Proponent emphasised (D200) that the 95<sup>th</sup> percentile plots are not ‘worst case’ plumes and reflect short spikes rather than suspended solids concentrations that will be present for extended periods.

Technical Report A also presented maps showing incremental increases in seabed elevation after the dredging, which predict a spatial pattern of sediment deposition that reflects the modelled dredge plumes.

Dr McCowan advised that underestimation of currents in the hydrodynamic modelling (discussed in Chapter 7.5) and overestimation of sediment settling rates and sediment transport modelling (discussed in Chapter 8.3) means that the extent of sediment and turbidity plumes would be underestimated in the EES. He also advised that resuspension caused by wave action could prolong the duration of elevated suspended solids concentrations and turbidity well beyond the 8-week dredging period. Dr McCowan advised that increased shipping movements and berthings would further increase the risk of ongoing elevated suspended solids concentrations and turbidity.

GGs (D379) submitted that the dredging impact assessment assumes that the EES correctly identifies the extent of dredging required. However, the dredging volumes could be significantly larger than modelled if a greater amount of dredging is required for safe navigation as discussed in GeelongPort’s withdrawn submission and evidence from Mr Mannion (D70).

### (iii) Discussion

The conclusion in Technical Report A that dredging will not impact the Ramsar site needs to be confirmed in light of the revised modelling.

Model simulations of suspended solids concentrations and sediment deposition show dredging would cause elevated suspended solids concentrations in north-western Corio Bay. The Ramsar site would be affected by pulses of elevated suspended solids concentrations (demonstrated by the plots of the 95<sup>th</sup> percentile suspended solids concentrations in D165), but the modelling indicates that median concentrations are not predicted to be significantly elevated.

Dr McCowan’s opinion was that the extent of sediment and turbidity plumes was underestimated in the EES. If this is the case, higher suspended solids concentrations and greater penetration of sediment and turbidity plumes into Limeburners Bay may occur.

As previously discussed, the hydrodynamic model calibration needs to be refined, and the sediment transport modelling need to be re-run with revised outputs from the refined hydrodynamic model. These results need to be interpreted in relation to the further assessment of impacts on seagrass recommended in Chapter 8.5, including the revised light thresholds for seagrass.

#### (iv) Findings and recommendations

The IAC finds:

- The information presented in the EES does not show major impacts on the Ramsar site, however, it does indicate at least a minor level of impact and a credible possibility of more significant impacts if key assumptions in the modelling are varied.
- The EES conclusion that dredging will not impact the Ramsar site needs to be confirmed in light of the revised modelling and the further assessment of impacts of dredging on seagrass.

#### Further work

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Confirm the conclusion in the Environmental Effects Statement that dredging will not impact the Port Phillip Bay (Western Shoreline) and Bellarine Peninsular Ramsar site after considering:**

- a) the revised sediment transport modelling
- b) the revised assessment of impacts on seagrass.

## 8.8 Impacts on other ecosystem components

### (i) Key issues

The key issue is:

- impacts of dredging on other ecosystem components.

### (ii) Evidence and submissions

The Proponent submitted that (D200):

Birds, fish, plankton and invertebrates are not significantly affected by dredging related turbidity. The key impact pathway associated with dredging (aside from direct footprint impact) is to primary production via seagrasses as key photosynthesising primary producers.

As noted above, the marine ecology agreed expert statement (D101) indicates the experts agreed the biological footprint of dredging extends to a wider area than the modelled plume areas, via biological impact pathways.

Dr Wallis gave evidence in response to questioning from the IAC that fish and marine mammals may exhibit behavioural responses to turbid plumes from dredging, for example, citing anecdotal evidence of fish congregating to feed at the edges of plumes.

Dr Edmunds (D281) considered that dredging could have potentially significant effects on sediment biogeochemistry. Interference with supporting components of sediment biogeochemical regulation could potentially affect filter feeders, microphytobenthos, bio-irrigators and denitrification efficiency. He presented a conceptual model showing a generic pattern of

impact from sediment disturbance, which shows a general trend for a replacement of the biodiversity by opportunistic colonisers and lower oxygenation of sediments.

### **(iii) Discussion**

The EES assessment of dredging impacts focuses on primary producers (seagrass) and does not assess impacts on high trophic order organisms such as fish and birds. Potential impacts, including indirect impacts via biological impact pathways such as food webs and behavioural responses, should be addressed, at least qualitatively. A more ecosystem based approach, as discussed in Chapter 7.3, would address these issues.

The IAC notes Dr Edmunds' evidence that dredging could affect sediment biogeochemistry and the biodiversity of the muddy seabed. Dr Edmunds did not provide any advice on how further assessment of sediment biogeochemistry could be practically implemented in the EES.

The EES does not provide evidence to support the Proponent's assertion that dredging related turbidity will not significantly affect birds, fish, plankton and invertebrates. The limited scope of the EES assessment of dredging impacts means that the effects of dredging on threatened and migratory fauna species (including seabirds and shorebirds) and the Ramsar site are not fully understood. The EES does not discuss potential impact pathways for dredging effects on these species, which could include changes in food resources associated with reduced seagrass growth, to reduced ability of visual predators to catch aquatic prey due to elevated turbidity.

Given these limitations, a precautionary approach to management should be adopted. A list of threatened and migratory species that are likely to occur in the area and that could potentially be affected by dredge plumes should be established. Dredging should be timed to avoid key periods including the times when migratory species are likely to be present, and the breeding season of species that breed locally.

### **(iv) Finding**

The IAC finds:

- The EES has given little consideration to impacts of dredging aside from its effects on primary production (on seagrass). Further assessment should have been undertaken using an ecosystem based approach to confirm direct and indirect impacts on biota other than seagrass, including through biological pathways, and to inform monitoring requirements.
- A precautionary approach to dredging should be adopted by avoiding dredging at the following times:
  - during the breeding season of listed threatened species that breed locally, and which are likely to occur within the area potentially affected by dredge plumes
  - at the times when listed migratory species are likely to be present within the area potentially affected by dredge plumes.

The IAC has recommended changes to mitigation measures to avoid dredging during the most productive biological periods (see Chapter 8.9).

## 8.9 Mitigation measures

### (i) Discussion and findings

This section addresses submissions and evidence on the dredging mitigation measures that are not dealt with elsewhere in this Chapter.

#### **MM-ME02 Avoid dredging in spring growth season**

Dr Edmunds considered that spring and early summer is a key recruitment period for marine biota. He advised that the high sunlight period extending through summer to early autumn is also important for seagrass, and that summer is also an important time for migratory birds and intertidal feeding. Avoiding dredging during this period will be protective of most species and biological processes. The IAC accepts Dr Edmunds' advice, and recommends that MM-ME02 be amended to include an additional requirement to avoid dredging in summer to early autumn. This is included in the IAC's recommended mitigation measures in Appendix G in Report No. 2.

#### **MM-ME03 Limit duration of overflow from barges**

Dr McCowan advised that *"it would be impractical to enclose the hopper barge overflows within a silt screen. The only practical option for mitigating the effects of barge overflows would be to not allow the overflow in the first place"* (D75). He noted that this could have significant cost implications.

GGs (D505) submitted that MM-ME03 should be modified by inserting a requirement to prevent overflows from barges during conditions that would result in dredge plumes moving westwards to northwards, towards the seagrass beds and Ramsar site. The IAC considers this targeted approach strikes an appropriate balance between minimising turbidity and the time and cost implications of not allowing barge overflows. The IAC supports this change, and has included it in the IAC's recommended mitigation measures.

#### **MM-ME04 Install silt curtain between dredging and Refinery intake and seagrass**

GGs (D505) recommended modifying MM-ME04 to require silt screens be used to enclose the dredge. Dr McCowan and Dr Edmunds questioned the effectiveness of silt screens, although Dr McCowan advised that silt screens are most effective when used close to the dredge. The IAC accepts that enclosing the dredge could reduce turbidity, and has recommended that MM-ME04 be modified accordingly.

#### **MM-ME07 Monitoring of plankton during and after dredging**

The IAC accepts Dr Edmunds' advice that data on relevant water quality parameters should be collected in conjunction with the biological monitoring to assist in the interpretation of results, and has included changes to MM-ME07 in its recommended mitigation measures.

### (ii) Recommendations

#### **Environmental Management Framework**

The IAC recommends:

**Amend the marine environment mitigation measures as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to:**

- a) **add a requirement to MM-ME02 to avoid dredging in summer to early autumn as well as spring**

- b) add a requirement to MM-ME03 to avoid overflow from barges in certain conditions**
- c) amend MM-ME04 to require silt screens to enclose the dredge**
- d) add a requirement to MM-ME07 that water quality monitoring be undertaken in conjunction with plankton monitoring.**

## **8.10 Overall conclusions and recommendations on dredging**

The IAC concludes:

- Further assessment is required before it can be determined whether the risks associated with dredging can be managed to an acceptable level consistent with the evaluation objectives and applicable legislation and policy.
- Updated sediment transport modelling is required, based on revised input parameters from the refined hydrodynamic modelling.
- Further assessment is required of the impact of dredging on seagrass, and the EES conclusion that dredging will not impact the Ramsar site should be further considered based on the revised modelling.
- Further consideration should also be given to impacts on other ecological components (other than seagrass) including through biological pathways. This is particularly important for threatened and migratory species (including shorebirds and seabirds) that are likely to be present within the area potentially affected by dredge plumes.

## 9 Terrestrial ecology

### 9.1 Introduction

The relevant evaluation objectives are:

To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values.

To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and to the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

Terrestrial ecology impacts are discussed in EES Chapter 10. Supporting reports and studies include:

- Technical Report D: Terrestrial ecology impact assessment
- Technical Report A: Marine ecology and water quality impact assessment
- Technical Report I: Noise and vibration impact assessment
- Appendix A to Technical Report J: Light Spill Impact Assessment.

Table 11 lists the evidence relevant to terrestrial ecology.

**Table 11** Terrestrial ecology evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D43	Brett Lane, Nature Advisory	Expert statement on terrestrial ecology	Peer reviewer - terrestrial ecology (reviewed EES Technical Report D – refer to D140)
D51	Mark Cook, AECOM	Expert statement on lighting design (Mr Cook provided written evidence but was not called to present that evidence)	

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI
- D125 – Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site Management Plan
- D177 – Technical Report D Addendum – Peer Review Terrestrial Ecology Impact Assessment
- D246 – Update to the MNES assessment prepared by Nature Advisory
- D247 – Response to *Siting and Design Guidelines for Structures on the Victorian Coast*, B Lane.

Chapter 6.2 of this Report explains the preparation of Technical Report D and the Nature Advisory peer review process that led to the production of the Addendum to Technical Report D (D177).

## 9.2 What did the EES say?

### (i) Overview

The terrestrial ecology assessment focused on a study area shown in Figure 9, consisting of:

- an onshore study area (the area within 50 metres of the pipeline route)
- an offshore study area (where impacts could occur for shorebirds that use intertidal habitats in Corio Bay, Limeburners Bay and the Avalon Beach component of the Ramsar site).

Figure 9 Terrestrial ecology assessment study area



Source: Technical Report D Figure 3

The native vegetation assessment was confined to the onshore study area. The vegetation is dominated by exotic species, with 0.928 hectares of native vegetation. The pipeline route was sited to avoid impacting native vegetation wherever possible. The Project would lead to a total maximum loss of 0.104 hectares of native vegetation but a total likely loss of only 0.091 hectares taking into consideration vegetation loss avoided by horizontal directional drilling (HDD) and mitigation measures. Offsets will be required, and estimates in the EES will be confirmed after finalisation of the detailed design of the Project. Suitable offsets are available in the Native Vegetation Credit Register.

No threatened flora species listed under the EPBC Act or FFG Act are likely to occur in the onshore study area, but some threatened ecological communities are present. Western (Basalt) Plains Grassland is consistent with Heavier Soils Plains Grassland, listed as 'endangered' in the Victorian Volcanic Plain bioregion under the FFG Act. The 0.104 hectares of vegetation likely to be lost is Western (Basalt) Plains Grassland. Subtropical and Temperate Coastal Saltmarsh (EPBC Act-listed) occurs within the onshore study area but outside the pipeline alignment. Natural Temperate Grassland of the Victorian Volcanic Plain occurs adjacent to the onshore study area, but should not be directly affected by the Project.

Appendix B of Technical Report D presents a list of threatened terrestrial fauna species occurring within the onshore study area. Underground pipeline construction will impact on marginal or potential habitat for three EPBC Act-listed species (swift parrot, grey-headed flying-fox and golden sun moth) but is not expected to result in a significant impact on these species.

The offshore assessment focused on potential impacts on shorebirds. Based on the conclusion of the marine ecology assessment (Technical Report A) that the Project is unlikely to alter marine food webs, Technical Report D concluded that the Project is unlikely to significantly affect shorebirds or the Ramsar site. It also considered the effects of noise (Technical Report I) and lighting (Appendix A to EES Technical Report J) on shorebirds, and concluded that there would be no significant impacts.

## (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 12.

**Table 12 Proposed mitigation measures for terrestrial ecology impacts**

Mitigation ID	Mitigation Measure	Project Phase
MM-TE01	Complete works within construction right of way	Design
		Construction
MM-TE02	Establish No-Go Zones	Construction
		Operation
MM-TE03	Minimise soil erosion	Construction
MM-TE07	Minimise impacts to trees	Design
		Construction
MM-TE08	Conduct an arborist assessment	Construction
MM-TE09	Minimise disturbance, injury or death of wildlife	Design
		Construction

Mitigation ID	Mitigation Measure	Project Phase
MM-TE10	Control spread and/or introduction of weeds and/or pathogens	Construction
MM-TE11	Reduce erosion, sedimentation and contamination risk to retained vegetation and habitat	Construction
MM-TE12	Contractor/personnel awareness of ecological values	Construction
MM-LS01	AS 4282: 2019 Control of the Obtrusive Effects of Outdoor Lighting and AS/NZS 1680.5 Interior and workplace lighting: Outdoor workplace lighting	Construction Operation
MM-LS03	National Light Pollution Guidelines for Wildlife Including marine turtles, seabirds and migratory shorebirds January 2020 Version 1.0	Operation

It is unclear why there are no mitigation measures numbered TE04 to TE06 in EES Chapter 14.

The nine terrestrial ecology mitigation measures in the EMF consolidate 21 terrestrial ecology mitigation measures proposed in Technical Report D and 19 terrestrial ecology mitigation measures proposed in EES Chapter 10. The only significant omissions are the following mitigation measures proposed in Technical Report D:

- MM-TE17, which requires the spread of noxious weeds to be managed and controlled during operation in accordance with the requirements of the *Catchment and Land Protection Act 1994*
- MM-TE20 and MM-TE21, which set out monitoring and maintenance requirements during construction.

It is not clear why these mitigation measures were not included in the EMF. The IAC presumes this was an oversight, and has recommended changes to the Part C mitigation measures to ensure they are included (refer to Appendix G in Report No. 2).

The EMF includes protocols for native vegetation offset management and wildlife management. There are no monitoring parameters for terrestrial ecology.

### (iii) Conclusion

EES Chapter 10 concluded that with adoption of the recommended management and mitigation measures, Project construction would have minor residual impacts on terrestrial ecology. No significant residual impacts on terrestrial ecology are expected during operation.

## 9.3 Terrestrial vegetation

### (i) Key issue

The key issues are:

- native vegetation loss in the onshore study area
- impacts on listed threatened flora species and ecological communities.

### (ii) Evidence and submissions

Mr Lane (D43) advised that the native vegetation assessment in the EES was completed in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*, DELWP, 2017. He considered that appropriate measures have been taken to avoid, minimise and

mitigate native vegetation loss through Project design and mitigation measures in the EMF. He advised that removal of a small residual area of native vegetation is unavoidable and suitable offsets are available.

The Scoping Requirements require the conservation significance of flora and fauna species to be assessed based on DELWP Advisory lists. Mr Lane advised that the Advisory Lists have been superseded by a new threatened species list under the FFG Act, and are no longer current or authoritative.

During field surveys conducted as part of the peer review, Nature Advisory recorded fragrant saltbush (listed as vulnerable under the FFG Act) in the onshore study area, although it noted that it is outside its natural habitat. AECOM accepted this advice in the Addendum and confirmed that a permit under the FFG Act will be required for the proposed removal of four individual plants of fragrant saltbush.

Other key findings of the Nature Advisory peer review were:

- sufficient efforts had been made in the EES to determine the presence of spiny rice-flower and large-fruit fireweed in the Project area, and the absence of these species could be concluded
- the EPBC Act-listed threatened ecological community 'Natural Temperate Grassland of the Victorian Volcanic Plain' does not occur in the Project area but occurs within the adjacent Corio Native Grassland Reserve
- Technical Report D adequately identified risks to threatened ecological communities.

### **(iii) Discussion**

The IAC considers the native vegetation assessment for the onshore study area, reported in Technical Report D combined with the Addendum, to be appropriate.

Based on the Nature Advisory peer review (summarised in Mr Lane's evidence, D43) and AECOM's response in the Addendum (D177), the IAC notes that in the onshore study area:

- 0.098 hectares of the FFG-Act listed threatened ecological community Heavier Soils Plains Grassland will be lost (rather than 0.091 as indicated in the EES)
- no EPBC-listed threatened ecological community will be directly impacted.

Adequate measures have been taken to avoid, minimise and mitigate vegetation loss through the design of the Project and proposed mitigation measures in the EMF. The total loss of native vegetation will be small and will be addressed by offsets consistent with the Victorian native management framework.

The Scoping Requirements specifically required assessments of Project impacts on spiny rice-flower and large-fruit fireweed. The IAC accepts the advice of the Nature Advisory peer review that the absence of these species from the Project area can be concluded.

For completeness, the IAC notes that the EES states that no threatened flora species are likely to occur in the Project area. The Nature Advisory peer review shows that one FFG-Act listed threatened flora species, fragrant saltbush, is present and four individuals of this species will be removed for Project construction. This will require a permit under the FFG Act.

### **(iv) Findings**

The IAC finds:

- terrestrial vegetation in the onshore study area has been appropriately assessed
- impacts from the loss of native vegetation in the onshore study area are acceptable
- offsets have been demonstrated to be capable of being provided.

## 9.4 Shorebirds and marine birds

### (i) Key issues

The key issues are:

- whether all relevant shorebird and marine bird species have been identified
- whether impacts on shorebirds and marine birds, including from lighting and noise, have been adequately considered.

### (ii) Evidence and submissions

#### Identification of shorebirds and marine birds

Technical Report D did not include targeted surveys for any fauna species other than shorebirds. Marine birds were not included in Technical Report D, but they were included in the Addendum to Technical Report D (D177) (see Chapter 6.2).

Nature Advisory reviewed the targeted shorebird surveys undertaken for Technical Report D, and considered that the data analysis “*represents a literal interpretation of DAWE (2017, p. 13) minimum data requirements ... a very rudimentary analysis that only partly informs an impact assessment.*” It considered that shorebirds using the Avalon Beach Coast and former saltworks ponds at Avalon are part of a wider habitat including The Spit Nature Conservation Reserve and Western Treatment Plant, which together provide an important habitat for migratory shorebirds. Nature Advisory recommended further analysis of the data in the shorebird surveys, to help establish the extent to which the Project would impact this important habitat.

The Nature Advisory peer review found that a number of migratory species listed under the EPBC Act were not identified in Technical Report D, but have the potential to, or are likely to occur in the Project area. Mr Lane’s MNES reassessment (D246) included what he described as a “*final justified shortlist of MNES species*”.

AECOM accepted part of Nature Advisory’s recommendations but not the recommendation to undertake further analysis to determine whether the site supported enough individuals of any particular migratory bird species to be an important site for that species in the context of its population in Australia or the East Asian-Australasian Flyway. AECOM did not consider that this would change the impact assessment findings.

AECOM’s final species list in the Addendum (D177) differs from the list in Mr Lane’s MNES reassessment (D246).

#### **Orange-bellied Parrot**

A number of submitters including the Geelong Environment Council drew attention to the Orange-bellied Parrot, which uses areas within the Ramsar wetland. Mr Lane did not consider that the area affected by the onshore pipeline and vegetation proposed to be removed represents habitat suitable for the Orange-bellied Parrot.

**Black swan**

Several submitters including GGS drew attention to the black swan population in Limeburners Bay. The WTOAC (D28) drew attention to the cultural significance of black swan ('Connewarre'). Mr Lane highlighted the *"exceptionally large concentration of Black Swans (>4,000) ... found at Limeburner's Bay"* in the shorebird survey undertaken as part of the EES. He advised that *"this is a noteworthy occurrence and impacts on it should be considered"* (D43). The Addendum included a paragraph drawing attention to the large population in Limeburners Bay, but did provide any specific discussion of the implications of the Project for black swan.

**Impacts on shorebirds and marine birds**

The Proponent submitted (D35) that *"the Project would be constructed in a highly modified environment port and industrial setting"*. The shoreline in the vicinity of Refinery Pier is unlikely to be a nocturnal roost for shorebirds due to light and noise from the Refinery.

The Addendum (D177) confirmed the conclusion in the EES and Technical Report D that the Project would not have a significant impact on shorebirds, and concluded that there would be no significant impacts on marine birds.

Numerous submitters expressed concern about potential impacts of the Project on aquatic birds or waterbirds, including migratory shorebirds and seabirds. Concerns were raised that many bird species are already listed as threatened, and the Project would put them at further risk. Issues raised in submissions included:

- the proximity of the Project area to the Ramsar wetland, including Limeburners Bay and Avalon Beach
- the effects of dredging on aquatic birds via mobilisation of toxicants and disturbance of marine food chains
- other effects of construction on birds, including extra lights, noise and vibration
- the effects of constant illumination and noise from the gas terminal during Project operation on birds, including potential disruption of bird migration
- the effects of operational discharges on aquatic birds, including implications of changes in nearshore water temperature on feeding and roosting habits, and indirect effects via marine food chains.

**Impacts of lighting**

Numerous submitters raised concern about the effects of Project lighting on birds. For example, Submitter S1209 submitted that artificial light at night can affect the physiology of migratory birds, including hormone levels and stress responses, and in some species can interfere with orientation and navigation. Friends of the Earth Melbourne (S1889) highlighted *"the ongoing impact of 24/7 illumination which has the potential to disrupt complex water bird migration"*.

Mr Cook (D51) provided written evidence confirming that there will be a change to the brightness near the Refinery Pier extension (including the FSRU). However, light spill calculations showed that no direct measurable light is cast onto the shoreline from the FSRU. He advised that it will be possible through the detailed design of the Project to meet relevant standards including the *National Light Pollution Guidelines for Wildlife*, which aim to manage light so that wildlife is:

- not disrupted within, nor displaced from, important habitat
- able to undertake critical behaviours such as foraging, reproduction and dispersal.

Mr Cook recommended that a Lighting Report be commissioned at the detailed design stage to demonstrate that the Project complies with the standards.

### ***Impacts of noise***

Numerous submitters raised concern about the effects of Project noise on birds.

The Proponent submitted (D35) that:

During offshore construction work, the predicted increase in noise levels in the Avalon Area from 39 dB(A) to 46 dB(A) would be lower than the >60 dB(A) levels at which responses have been detected in migratory shorebirds according to studies. On the basis that predicted construction noise is well below levels which are known to affect birdlife, construction noise from the project would be unlikely to affect the ecological character of the Ramsar site or the foraging behaviour of migratory shorebirds...

Operation of the Project would not involve a significant change to noise ... The source of noise during operation would be regular but at levels below that of concern to terrestrial species.

Mr Lane (D140) advised that the mitigation measure suggested in Technical Report D (at page 117) to time piling and dredging to avoid the period when migratory shorebirds are present in the region is highly conservative. He argued that important populations of migratory shorebirds occur far enough from the Project so that such works would not cause disturbance to foraging and roosting.

### **(iii) Discussion**

#### **Identification of shorebirds and marine birds**

The IAC notes the advice provided by Mr Lane and AECOM regarding the general distribution and abundance of shorebirds. The coast immediately adjacent to the Project area does not provide suitable habitat for migratory shorebirds. However, significant numbers of migratory shorebirds occur in Limeburners Bay and along the Avalon foreshore.

Technical Report D reported that protected species database searches were undertaken for an area within a 5 kilometre radius of the proposed pipeline. The search zone included terrestrial and marine environments. However, the 'likelihood of occurrence' assessment for threatened and migratory fauna species was confined to the pipeline study area (50 metres either side of the pipeline). It did not include marine areas beyond the pipeline study area corridor.

In the IAC's view, the list of birds potentially affected by the Project should not be confined to species that are likely to occur within the limits of the pipeline study area. It must include species that occur in all the areas that could potentially be impacted directly or indirectly by the Project.

A complete species list is fundamental to describing the fauna in a particular category (in this case, threatened and migratory bird species) potentially affected by the Project, and for ensuring that potential impacts on all relevant species have been assessed, including significant impacts on MNES species are likely.

Technical Report D presented conceptual models showing how impacts of the Project on the marine environment could potentially affect birds through marine food webs and discussed potential impacts of light and noise beyond the immediate Project area or onshore study area. Based on these considerations, the likelihood of occurrence analysis for listed species should have included at least the following areas:

- Limeburners Bay

- Avalon Beach
- Corio Bay (at least within the 5 kilometre search radius).

The IAC agrees with Mr Lane that further analysis of the shorebird data should be undertaken to determine whether any of the surveyed areas support a sufficient number of individuals of any particular migratory bird species to be an important site for that species. It agrees with Mr Lane that this analysis would help to establish to extent to which the Project would impact important wider habitat for shorebirds.

The shorebird surveys confirmed that threatened and migratory bird species occur in the offshore study area, including species assessed as 'unlikely' in the likelihood of occurrence analysis. The Addendum reported that the following additional migratory species were not recorded during the shorebird surveys but have been observed by BirdLife Bellarine and the Geelong Field Naturalists Club, and are considered by AECOM as likely to occur in the offshore study area:

- red knot (also listed as endangered under the EPBC Act and FFG Act)
- pectoral sandpiper
- double-banded plover
- Caspian tern (migratory seabird).

Of these four species, only Caspian tern was included in the updated species lists in the Addendum (D177) and Mr Lane's updated MNES assessment (D246).

### ***Orange-bellied parrot***

A number of submitters raised concerns about potential impacts of the Project on the Orange-bellied Parrot (listed as 'critically endangered' under the EPBC Act and FFG Act). Technical Report D noted that:

There are very old records of Orange-bellied Parrots at Limeburners Bay but not at Avalon Beach. Habitat persists at Limeburners Bay and it is in a quiet reserve, therefore it is not impossible that the species uses the saltmarsh in the area occasionally.

EES Attachment IV (MNES assessment) reported that the Limeburners Lagoon (Hovells Creek) Flora and Fauna Reserve is not a stronghold area for Orange-bellied Parrot but may be used by the species for foraging or to facilitate movement to their winter stronghold at the Western Treatment Plant. The Ramsar site management plan aims to work towards the recovery of the Orange-bellied Parrot, with the Point Wilson section of the Ramsar site being a high-priority area.

While the IAC acknowledges submitters' concerns about potential impacts to the Orange-bellied Parrot, the IAC is not convinced that the Project would have a significant impact on this species, based on Limeburners Lagoon not being a stronghold for the species and consideration of potential impact pathways associated with noise, light and the marine environment.

### ***Black swan***

The IAC agrees that although the black swan is not listed under the EPBC Act or FFG Act, it is an important species in the offshore study area, because it occurs in very large numbers in Limeburners Bay and has cultural significance for the Wadawurrung. The impacts of the Project on black swan have not been specifically examined. This species is closely associated with seagrass. Black swan eat seagrass and their excrement forms a food source for scavengers in the seagrass community, including worms, shrimp, molluscs and crabs (Technical Report D). Any impacts of the Project on seagrass could potentially affect black swan, and the IAC has found that further assessment of the Project's impacts on seagrass is required (see Chapters 7 and 8.5).

## Impacts on shorebirds and marine birds

Based on the information before the IAC, a comprehensive assessment of the Project's likely impacts on shorebirds and marine birds is difficult.

Firstly, as discussed above, the EES (and additional information tabled at the Hearing) does not adequately identify all of the aquatic bird species of conservation significance that could potentially be impacted by the Project. Discrepancies remain in the various species lists in the EES and those presented to the IAC (in D177 and D246).

Secondly, shorebirds and marine birds can be affected by impacts to the marine environment via biological pathways such as food webs. Technical Report A concluded that the Project is unlikely to alter marine food webs. Based on that finding, Technical Report D concluded that the Project is unlikely to significantly affect shorebirds or the Ramsar site. However, as discussed in Chapters 7 and 8, there are uncertainties regarding the impacts of the Project on the marine environment. These lead to uncertainties regarding impacts on shorebirds and marine birds.

The Project's impact on shorebirds and marine birds should be further considered based on an updated comprehensive species list, and the results of the further work recommended by the IAC in Chapters 7 and 8 to address the uncertainties in the assessment of impacts on the marine environment.

### **Lighting impacts**

The IAC accepts the evidence of Mr Cook that lighting associated with the Project will not have unacceptable impacts on aquatic birds, based on the implementation of relevant mitigation measures including conformance with the *National Light Pollution Guidelines for Wildlife* and Australian Standard AS 4282: 2019 *Control of the Obtrusive Effects of Outdoor Lighting*. The IAC supports Mr Cook's recommendation to require a Lighting Report to be commissioned, and has recommended adjustments to MM-LS03 accordingly.

### **Noise impacts**

Technical Report D reported that there is little Australian information on the effects of noise on fauna, but studies of the effects of aircraft noise on birds at Avalon provide evidence of birds exhibiting behavioural responses to noise levels of 60 dB(A) and higher. The EES indicated that the predicted increase of noise in the Avalon area from 39dB(A) to 46 dB(A) as a result of the Project is well below this level. However there are unresolved issues in regard to the EES noise assessment (discussed in Chapter 12), which may have implications for birds as well as human receptors.

## **(iv) Findings and recommendations**

The IAC finds:

- Further work is required to establish a complete list of threatened and migratory bird species that could potentially be affected by the Project. This list should include birds that could be affected through direct and indirect impacts, including via the marine environment, and should include species that use habitats in Corio Bay, Limeburners Bay and Avalon Beach.
- Further analysis of the shorebird survey data is required to determine whether the survey sites individually or collectively support a sufficient number of individuals of any particular migratory bird species to be an important site for that species in Australia or the East Asian-Australasian Flyway.

- While not a listed species, black swan is an important species in the study area and closely linked to seagrass, and impacts to black swan should be considered.
- Mitigation measure MM-LS03 should be strengthened ensure effective implementation of the National Light Pollution Guidelines for Wildlife and AS 4282: 2019 Control of the Obtrusive Effects of Outdoor Lighting.

### Further work

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

#### Undertake further assessment of impacts on threatened and migratory bird species by:

- a) establishing a complete list of threatened and migratory bird species that could potentially be affected by the Project (and consider including the black swan)
- b) having the list peer reviewed
- c) undertaking further analysis of the targeted shorebird surveys, to determine whether the surveyed sites individually or collectively support enough individuals of any particular migratory bird species to be an important site for that species in Australia or the East Asian-Australasian Flyway
- d) considering the revised marine modelling.

### Environmental Management Framework

The IAC recommends:

**Amend light spill mitigation measure MM-LS03 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to require a Lighting Report to be commissioned at the detailed design stage to ensure the Project complies with relevant standards.**

## 9.5 Non-aquatic terrestrial fauna

### (i) Key issue

The key issue is:

- impacts of the Project on listed and threatened non-aquatic terrestrial fauna.

### (ii) Evidence and submissions

Mr Lane's evidence confirmed the EES's finding that although the onshore study area may provide occasional habitat for grey-headed flying fox, swift parrot, fork-tailed swift, white-throated needletail and black falcon, the Project would not have a significant impact on these species if implemented with the proposed mitigation measures.

Mr Lane (D43) noted that the little eagle occurs consistently in the Project area, and recommended targeted surveys to identify nests within 200 metres of the Project area, so that construction works could be avoided within 200 metres of any nest during the little eagle breeding season. AECOM disagreed with this recommendation, because:

- in its view the land in the vicinity of the Project area provides sub-optimal nesting habitat
- there are few, if any, large trees within 200 metres of the pipeline
- most of the land is privately owned, which may preclude access for surveys.

### (iii) Discussion

The IAC accepts the Mr Lane's advice that the Project will not have a significant impact on grey-headed flying fox, swift parrot, fork-tailed swift, white-throated needletail and black falcon if implemented with the proposed mitigation measures. While it acknowledges the Proponent's submissions on this issue, it prefers the more precautionary approach recommended by Nature Advisory that targeted surveys should be undertaken for the little eagle to avoid disturbance to nests during the breeding season.

### (iv) Findings and recommendations

The IAC finds:

- The Project is unlikely to have a significant impact on listed non-aquatic fauna species.
- Targeted surveys should be undertaken for the little eagle to avoid disturbance to nests during the breeding season.

### Environmental Management Framework

The IAC recommends:

**Amend terrestrial ecology mitigation measure MM-TE09 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to require targeted surveys of the little eagle to avoid disturbance to nests during the breeding season.**

## 9.6 Overall conclusions on terrestrial ecology

The IAC concludes:

- Impacts on native vegetation, including vegetation species and communities listed under the FFG Act and the EPBC Act, are consistent with the evaluation objectives and legislation and policy, and can be acceptably managed through the Part C mitigation measures.
- Based on the information before it, the IAC is not able to determine whether the impacts of the Project on aquatic birds, including shorebirds and marine birds, will be acceptable. Further assessment is required.
- The Project's impacts on non-aquatic terrestrial fauna are consistent with the evaluation objective, and can be acceptably managed through the IAC's recommended mitigation measures.

## 10 Greenhouse gas emissions

### 10.1 Introduction

The relevant evaluation objective is:

To minimise generation of waste by or resulting from the project during construction and operation, including dredging and accounting for direct and indirect greenhouse gas emissions.

GHG emissions are discussed in EES Chapter 9. Supporting reports and studies include Technical Report C: Greenhouse gas impact assessment.

Table 13 lists the greenhouse gas evidence.

**Table 13** Greenhouse gas emissions evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D40	Dr Anthony Hume, AECOM	Greenhouse gas impact	Author/designer and technical lead for AECOM in support of their Quality Management procedures for Technical Report C (refer to D141)
<b>ACF</b>			
D85, D213*	Matt Sullivan-Kilgour, Ironbark Sustainability	Greenhouse gas impact	Independent expert
<b>Statement of agreed opinions and facts</b>			
D137	A Hume, M Sullivan-Kilgour	Greenhouse gas assessment	N/A

\* Mr Sullivan-Kilgour's presentation to the IAC (D213) went beyond a summary of his written evidence (D85), and introduced new material. Hence this Report identifies whether references are to D85 or D213.

Additional information was provided in:

- D74 – Proponent's response to EPA's first RFI
- D111 – Proponent's response to the IAC's RFI
- D145 – Counsel opening remarks for greenhouse gas
- D215 – Dr Hume's questions to Viva Energy about operational control (June 2021)
- D216 – Viva Energy responses to Dr Hume's questions (August 2021)
- D220 – Emails provided by Dr Hume in relation to operational control.

### 10.2 What did the EES say?

#### (i) Overview

The EES estimated the total Scope 1, 2 and 3 emissions within the Project's operational boundary (emissions generated from activities over which the Proponent would have operational control).

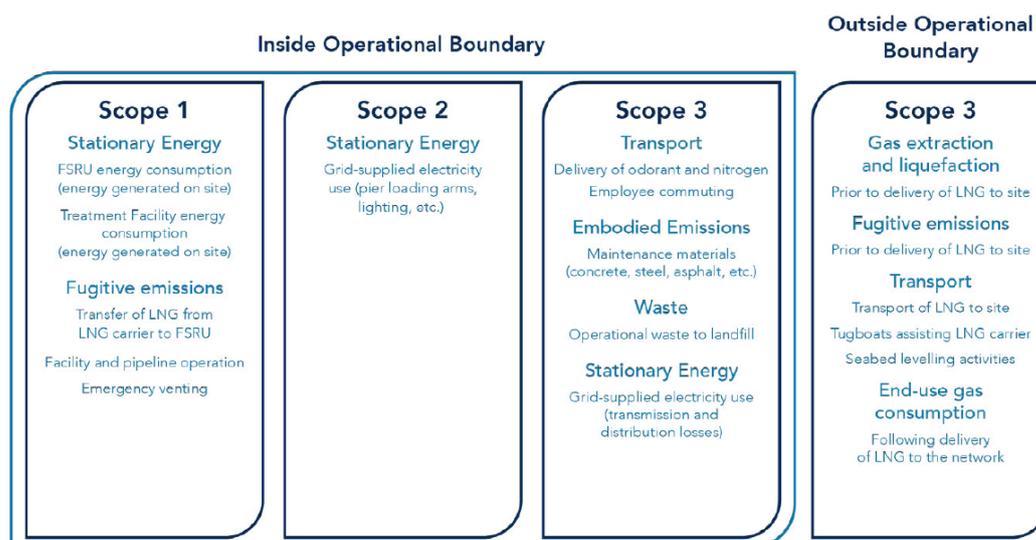
The 'Scopes' are described in EES Chapter 9:

- Scope 1 – Direct emissions of greenhouse gas from sources that are owned or operated by a reporting organisation (examples include combustion of diesel in company-owned vehicles or used in on-site plant and equipment)

- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include import of electricity from the grid, or heat)
- Scope 3 – Other indirect emissions, other than energy imports which are a direct result of the operations of the organisation, but from sources not owned or operated by them and due to upstream or downstream activities (examples include indirect upstream emissions associated with the extraction, production and transport of purchased construction materials; and business travel by ship, air or rail).

The operational boundary is shown in Figure 10.

**Figure 10** Operational phase emissions sources within the Project’s operational boundary



Source: Figure 9-3, EES Chapter 9 at page 9-6

For construction, emissions within the Project’s operational boundary were estimated to be 62,168 tonnes of carbon dioxide equivalent (t CO<sub>2</sub>-e) each year.

For operations, emissions depend on the operational mode of the FSRU (see Chapter 2.7 for more detail). Annual emissions are:

- 47,906 t CO<sub>2</sub>-e in open loop mode
- 178,985 t CO<sub>2</sub>-e in closed loop mode
- 65,280 t CO<sub>2</sub>-e in combined loop mode (assumes 30 days of closed loop mode per year of operation).

Project emissions would equate to 0.05 percent (open loop), 0.19 percent (closed loop) or 0.07 percent (combined loop) of Victoria’s annual GHG emissions. To minimise operational GHG emissions (and for synergies with the Refinery), the Project proposes to use open loop as the usual mode, with reuse of the FSRU discharge as cooling water in the Refinery.

Scope 3 emissions outside the Project’s operational boundary were not included in the GHG inventory for the Project. Instead, the EES estimated these emissions and provided them in Appendix A to Technical Report C. The estimates were (based on 160 PJ per year):

- emissions associated with the production of the gas:
  - 942,400 t CO<sub>2</sub>-e for Australian sourced gas
  - 1,064,000 t CO<sub>2</sub>-e for gas sourced from Qatar
- emissions associated with transporting the LNG to the Project:
  - 165,500 t CO<sub>2</sub>-e for Australian sourced gas

- 553,400 t CO<sub>2</sub>-e for gas sourced from Qatar.
- emissions associated with the end use of the gas:
  - 8,884,800 t CO<sub>2</sub>-e.

The EES used the *Greenhouse Gas Protocol (Corporate Accounting and Reporting Standard)* (Corporate Standard) to estimate the Project's emissions together with various quantification methods including the *National Greenhouse and Energy (Measurement) Determination 2008* and Standards ISO 14064-1:2018, 14040:2006 and 14044:2006. It also complied with EPA's *Guideline for managing greenhouse gas emissions* (consultation draft, January 2022).

The Proponent currently reports under the *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER Act) and should the Project proceed, the Project's emissions would be included in that reporting. The volume of GHG emissions for open or combined loop modes would not trigger the Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 because direct (Scope 1) emissions are not expected to be greater than 100,000 t CO<sub>2</sub>-e per year. However, closed loop mode would trigger these requirements.

## (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 14.

**Table 14** Proposed mitigation measures for greenhouse gas emissions

Mitigation ID	Mitigation Measure	Project timing
MM-GG01	Minimise embodied and transport GHG emissions of materials	Construction
MM-GG02	Manage quality of materials	Construction
MM-GG03	Source local plant and equipment	Construction
MM-GG04	Coordinate construction activities	Construction
MM-GG05	Implement sustainable procurement and resource management practices	Construction
MM-GG06	Engage local workforce, where possible, and implement a transport plan to minimise fuel GHG emissions from employee transport	Construction Operation
MM-GG07	Select fuel efficient plant and equipment	Construction Operation
MM-GG08	Avoid, reduce and reuse waste	Design Construction Operation
MM-GG09	Implement an energy management system Report on GHG emissions under the NGER Act and the Proponent's sustainability reporting	Operation
MM-GG10	Implement emergency management procedures to reduce unplanned and fugitive GHG emissions	Operation
MM-GG11	Quantify and offset Scope 1 and 2 GHG emissions (certified carbon offsets)	Construction Operation

**(iii) Conclusion**

EES Chapter 9 concluded that after implementation of the mitigation measures (which include offsetting Scope 1 and 2 emissions – see MM-GG11), GHG emissions would be avoided and minimised where possible and any additional contributions to Victoria’s annual GHG emissions would be minor and acceptable.

**10.3 The appropriate greenhouse gas standard**

By way of context, the Corporate Standard does not require emissions that are outside the operational boundary of a project to be included in a project’s GHG inventory.

**(i) Key issues**

The key issue is:

- whether the Corporate Standard was the appropriate standard to assess the Project’s GHG emissions.

**(ii) Evidence and submissions**

Dr Hume, author of Technical Report C, gave evidence that the Corporate Standard is the internationally accepted guidance for compiling project based inventories. He said that the *GHG Protocol for Cities (Global Protocol for Community-Scale Greenhouse Gas Emission Inventories)* (Cities Protocol) would not be appropriate for assessing the Project’s emissions because it is intended for larger geographical areas (cities, regions) as distinct from projects (or products or services) and is not sufficiently granular to estimate the emissions of a particular project.

Mr Sullivan-Kilgour gave evidence for Australian Conservation Foundation Community Geelong (ACF). His evidence (D85) was that the Corporate Standard was inappropriate “*because of the limitations it places on a reasonable assessment of the potential environmental impacts*” of the Project. He stated that although the EES was a reasonable application of the Corporate Standard for the purpose of identifying the GHG emissions of a business or corporate entity such as the Proponent, it was not appropriate in the context of an EES assessing the emissions of the Project.

Mr Sullivan-Kilgour said (in D213) that by excluding the upstream emissions generated by the transport of LNG to the Project, 72 to 89 percent of the Project’s emissions had not been counted. If upstream emissions generated by the extraction of the gas are also considered, the EES did not count up to 96 percent of the Project’s emissions. Given this, in his view the use of the Cities Protocol would have been more appropriate because it would have led to the full scope of emissions associated with implementation of the Project being included.

Under cross examination, Mr Sullivan-Kilgour could not identify another gas project that had used the Cities Protocol.

Relying on the work of Mr Sullivan-Kilgour in Ironbark Sustainability’s *Viva Energy Australia Gas Import Terminal Emissions Analysis* (Appendix to S1818), ACF also supported use of the Cities Protocol to better reflect the actual emissions of the Project. Many other submitters also supported use of the Cities Protocol for this reason.

EPA was generally satisfied with the GHG impact assessment for the purpose of quantifying direct and indirect emissions associated with the activities EPA will consider for the Development Licence applications (D217). It did not take issue with the use of the Corporate Standard.

**(iii) Discussion**

At a high level, there was no real dispute about the quality of work, assumptions and background information used for calculating and quantifying the Project's GHG emissions set out in the EES, including Technical Report C.

The IAC found Dr Hume to be a reliable witness. His evidence was clear that the Corporate Standard was appropriate for assessing the Project's emissions. Dr Hume drew on considerable experience of undertaking project based GHG inventories. Mr Sullivan-Kilgour's evidence that the Cities Protocol was appropriately applied to a project (as distinct from a geographical area) was less convincing and he conceded in cross examination that the EES had reasonably applied the Corporate Standard.

Mr Sullivan-Kilgour favoured the Cities Protocol because in his view it would give decision-makers and government authorities a more accurate, wholistic view of the overall GHG impacts of the Project, and would improve their ability to influence the Proponent to reduce emissions. He was concerned that without full information, opportunities to avoid, reduce or minimise emissions could be missed.

While these may be benefits of using the Cities Protocol, they do not necessarily lead to a conclusion that the Cities Protocol is the correct or appropriate method for estimating the Project's GHG emissions. After reviewing both the Corporate Standard and the Cities Protocol and considering the evidence before it, the IAC considers that the Corporate Standard is the appropriate standard to use.

The Corporate Standard states that it is designed to develop comprehensive, reliable and verifiable inventories of GHG emissions for companies and other bodies. It is accompanied by a range of tools that allow calculations of expected emissions to be made with a high level of detail. In contrast, the clear purpose of the Cities Protocol is to provide a framework for calculating and reporting city-wide GHG emissions.

The IAC accepts Dr Hume's evidence that the Corporate Standard is the appropriate and usual standard used to estimate project-based GHG emissions. Mr Sullivan-Kilgour could not point to an example of the Cities Protocol being used to compile a gas project GHG inventory.

**(iv) Findings**

The IAC finds:

- The Corporate Standard is appropriate to assess (quantify) the Project's GHG emissions.
- It would not be appropriate to use the Cities Protocol to assess (quantify) the Project's GHG emissions.

**10.4 Scope 3 emissions and fugitive emissions****(i) Key issues**

The key issues are:

- whether upstream and downstream Scope 3 emissions are within the Proponent's operational control
- impacts of the Project's Scope 3 emissions on achieving emissions reduction targets
- whether fugitive emissions and the warming potential of emissions have been properly considered and accounted for.

**(ii) Evidence and submissions****Whether Scope 3 emissions are within the Proponent's operational control**

The Proponent submitted that it was appropriate to exclude emissions generated by the transport of LNG to the Project, because this activity is outside its operational control given the Proponent will not source the gas (see Chapter 2.6 for more detail). It submitted (D200):

Decisions around where the LNG will be sourced from will be made unilaterally by customers and will not be controlled by the Proponent as terminal operator, subject only to the procured LNG quality being within overall terminal capability limits. Logically, terminal customers will be driven to source the most economic cargoes of LNG to ensure the imported product can best compete with gas being sold into the market from other sources. The procurement decision will be driven by a number of factors including the shipping distance from Geelong. All other things being equal, terminal customers will be incentivised to source cargoes with a shorter sailing distance to Geelong than a longer sailing distance.

The Proponent submitted that the exclusion of emissions outside its operational control is consistent with the Scoping Requirements, the Corporate Standard and with the Minister for Planning's conclusion in the environmental effects assessment for Crib Point. That assessment stated that it was not appropriate to include emissions outside of AGL's control, such as upstream LNG extraction and processing operations or downstream gas consumption. The Proponent highlighted that while these emissions are not included in the Project's inventory, they are presented in Appendix A of Technical Report C.

Dr Hume's evidence confirmed that the reason upstream transport emissions had not been included in the Project's inventory was because they were outside the Proponent's operational control. He explained that upstream transport emissions were included in the Crib Point EES because AGL was importing the gas and had direct operational control over this activity. This is a key difference to this Project, where the Proponent would only operate the LNG facility and would not itself source the gas.

Dr Hume was asked whether LNG transport emissions would come within the operational boundary if the Proponent did have capacity to influence incoming LNG cargoes. He said that this would "*trigger a discussion*" about whether the operational boundary needed to be reset.

Under cross examination by GGS, Dr Hume conceded that it would technically be possible to condition the approvals for the Project to require the Proponent to only allow or accept low emissions LNG cargoes. He did not, however, go so far as to concede that this would give the Proponent operational control over the sourcing and supply of LNG. The Proponent later submitted that it is unlikely to be in a commercial position to insist on low carbon LNG cargoes (in terms of either production of the gas, or the transport of the LNG to the facility).

Mr Sullivan-Kilgour accepted that Scope 3 transport emissions are not conventionally included in a Corporate Standard inventory. He accepted that the Proponent "*does not have executive operational control over sourcing of the gas (outside of traditional contractual arrangements with customers using the terminal)*". Nonetheless, he considered that they should have been included, which was the key difference between him and Dr Hume (D137).

Environment Victoria submitted that a Memorandum of Understanding with Woodside to supply gas to the facility (details of which are on the Proponent's website) demonstrated that the Proponent does have control over the sourcing of LNG cargoes.

Both ACF and Environment Victoria argued that upstream transport emissions should have been included to meet the *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*. ACF

submitted that the LNG transport emissions would meet the Corporate Standard's 'relevance criteria' for size, influence, risk, stakeholders, outsourcing and sector guidance, and should have been included.

Environment Victoria asked Dr Hume to explain why Scope 3 emissions had been excluded given the Corporate Standard's principle of 'completeness', which states companies should not exclude activities from the Scope 3 inventory that would compromise the relevance of the reported inventory. Dr Hume explained:

- Scope 3 emissions were not required to be reported under the Scoping Requirements
- the Corporate Standard 'suggests' and 'recommends', but does not 'require' material Scope 3 emissions be included
- in his view, including the Scope 3 emissions in Appendix A to Technical Report C fulfilled the Corporate Standard's requirements.

### **Impacts of Scope 3 emissions on emission reduction targets**

Mr Sullivan-Kilgour's evidence was that the Project's upstream transport emissions would form part of CoGG's municipal wide GHG emissions inventory. His evidence was that the Project's emissions would also impact on Victoria's emissions inventory, and would make it harder for both CoGG and Victoria to meet their emissions reduction targets.

The IAC questioned Dr Hume on how the Project's Scope 3 emissions would be accounted for by various levels of government. Dr Hume explained that:

- at a municipal level, half of the upstream transport emissions would be attributed to CoGG and the other half to the originating city from which the LNG was sourced (in accordance with the Cities Protocol)
- at a state level, the Victorian Government would have to account for the upstream transport emissions related to the Project in a similar way
- at a federal level, upstream transport emissions related to the Project would partially come within national GHG accounting.

Under cross examination by the Proponent, Mr Sullivan-Kilgour's evidence was that where the LNG source is outside the municipality, the entire amount of the upstream transport emissions could be included in the CoGG inventory (rather than the normal 50 percent) to ensure all emissions are accounted for, but this is still a matter of debate.

### **Fugitive emissions and methane warming potential**

Several people submitted that the EES underestimated fugitive emissions and the warming potential of methane, which they submitted is up to 34 times the warming potential of carbon dioxide. ACF referenced a US report to support its submission that fugitive methane emissions from gas processing operations are often underestimated.

## **(iii) Discussion**

### **Whether Scope 3 emissions are within the Proponent's operational control**

The IAC accepts Dr Hume's evidence on how the operational boundary was established, and why some Scope 3 emissions were included and others excluded. His explanation was clear, and the approach taken is generally consistent with the Corporate Standard.

That said, it appears that AECOM did not robustly interrogate the issue of whether the Proponent would have operational control over the incoming LNG. Instead, it appears to have largely relied

on the advice of the Proponent that it would not have operational control, as evidenced in email exchanges between the AECOM team preparing Technical Report C and the Proponent (D215, D216 and D220). AECOM, as the consultant preparing the Project's GHG inventory, should have scrutinised the issue of operational control more thoroughly, particularly given its impact on the volume of GHG emissions that would be included.

The IAC notes the submissions that the EES did not properly apply the Corporate Standard, in particular its supplementary *Corporate Value Chain (Scope 3) Accounting and Reporting Standard* with respect to 'relevance' and 'completeness'. The IAC accepts there is an element of interpretation and discretion in the application of the Corporate Standard and considers that the EES took a narrow (but very common) approach to defining the Project's operational boundary. That said, Technical Report C did present estimates for Scope 3 emissions considered to be outside the Project's operational boundary, albeit tucked away in an Appendix. On a narrow view, this achieves compliance with the Corporate Standard.

The fact that upstream transport emissions were included in the Crib Point EES does not mean they should have been included in this case. In Crib Point, AGL was itself proposing to import the gas and had direct operational control over this activity. Here, the Proponent will not source or transport the gas. This is a key difference between the two proposals and explains why Scope 3 transport emissions were considered appropriate to be included in the Crib Point GHG inventory but not here.

Submitters referred to the Memorandum of Understanding between the Proponent and Woodside as being evidence of the Proponent's operational control over the source of LNG. The IAC disagrees. A memorandum of understanding is not a legally binding agreement, and based on the limited information available on the Proponent's website the Memorandum merely sets out a framework and timeline to negotiate binding commitments should the Project proceed. There is no evidence that the issue of low carbon LNG (either in terms of production or transport) is even under consideration in those negotiations.

The IAC accepts the Proponent's submissions that in practice, it is unlikely to be in a commercial position to insist on low carbon LNG cargoes. Given this lack of actual control, the IAC considers that the GHG emissions associated with the upstream production and transport of LNG are outside the Project boundary and therefore appropriately excluded from the Project's GHG inventory.

EPA pursued this issue by requesting an addition to MM-GG01 to explicitly include "*preference for cargoes with lowest net embodied emissions, so far as reasonably practicable*", which was accepted by the Proponent. When questioned by the IAC about how this would be enforced, EPA conceded that the measure would not be enforceable as such, but would require the Proponent to report on how it had sought to influence or encourage low carbon LNG cargoes.

Material put before the IAC suggests that low carbon LNG cargoes are starting to emerge, and there may be future opportunities for reducing the emissions intensity of the LNG processed by the FSRU:

- Mr Wilkinson indicated in his response to submissions that the operator of an LNG import terminal could give priority to net zero carbon LNG cargoes "*which are beginning to be made available in the market*" (D112)
- Save Westernport Inc submitted that the carbon neutral LNG cargo market has the potential to grow in response to increasing demand, referencing a recent paper published by Columbia University (D400(a)).

Accordingly, the IAC supports EPA's proposed MM-GG01 because it provides an explicit reporting item that the Proponent will be required to address regularly. With the addition of this requirement, MM-GG01 will need to be adjusted to apply to the operations phase as well as the construction phase. The requirement should also be supported by a condition on the Development Licence should one be issued.

### **Impacts of Scope 3 emissions on emission reduction targets**

The IAC accepts the evidence of Mr Sullivan-Kilgour, which was confirmed by Dr Hume's responses to the IAC's questions, that at least some of the Project's upstream and downstream Scope 3 emissions will need to be accounted for at a federal, state and local government level, and the Scope 3 emissions will make it harder for government emissions reduction targets to be met, particularly CoGG's targets.

### **Fugitive emissions and methane warming potential**

The EES used the Corporate Standard and associated tools for its calculations. These rely on current fugitive emissions factors and the EES's estimations are expressed in t CO<sub>2</sub>-e which accounts for differing warming potentials of different GHGs (methane and carbon dioxide included). While it may be that these factors are not as accurate as they could be, the IAC must assess the Project based on the current approved methodologies. The IAC considers that the EES has used the appropriate factors.

#### **(iv) Findings and recommendations**

The IAC finds:

- The Proponent would not have operational control over upstream and downstream Scope 3 emissions, including LNG transport emissions.
- Nevertheless, the Proponent should be encouraged to preference LNG cargoes with lowest net embodied emissions so far as reasonably practicable, backed up with a reporting requirement.
- This should be reflected as a requirement in both the mitigation measures and in the Development Licence for the FSRU.

### **Environmental Management Framework**

The IAC recommends:

**Amend greenhouse gas mitigation measure MM-GG01 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to apply it to the operations phase of the Project as well as construction.**

### **Development Licence applications**

Should Development Licences be issued, the IAC recommends:

**Include a condition on the Development Licence for the floating storage and regasification unit that requires the Proponent to report annually on how it has preferred lowest net embodied emissions LNG cargoes to be processed in the floating storage and regasification unit in accordance with mitigation measure MM-GG01.**

## 10.5 Minimisation of the Project's emissions

### (i) Key issues

The key issues are:

- whether MM-GG11 which requires the Proponent to offset the Project's Scope 1 and 2 emissions is appropriate
- whether the operation of the FSRU in closed loop mode should be limited
- whether additional GHG minimisation measures should be included.

### (ii) Evidence and submissions

The Proponent submitted that the Project would minimise its GHG emissions through implementation of the mitigation measures (such as minimising embodied and transport GHG emissions of construction materials), offsetting all Scope 1 and Scope 2 emissions (MM-GG11) and through the proposed use of open loop as the usual operational mode of the FSRU.

EPA endorsed the approach of best practice emissions reduction measures designed to avoid and reduce emissions in preference to offsets, consistent with the principles of waste minimisation and the GED. EPA submitted that operational controls are a suitable technique by which risk and impacts may be minimised as far as reasonably practicable, and raised the possibility of confining the circumstances in which higher impact operating scenarios would be permissible.

The Proponent did not support a mitigation measure limiting the use of the FSRU in closed loop mode, because:

- it is not needed (closed loop would be more expensive to run, so the Proponent's 'self-interest' would be a strong deterrent to its use)
- it is not justified (operation in closed loop mode would result in 178,985 t CO<sub>2</sub>-e per annum, equating to 0.19 per cent of Victoria's annual GHG emissions, which would be only a minor additional contribution to the state's GHG emissions)
- limiting or prohibiting closed loop mode could stop the supply of gas to the market when it is most needed.

ACF expressed concern about the Project's reliance on offsets and submitted that offsets have efficacy and legitimacy concerns. It referenced a recent report by Professor Andrew Macintosh of the Australian National University which concluded that most carbon credits approved by the Clean Energy Regulator did not represent real or new cuts in GHG emissions. ACF also drew attention to a recent Australian Conservation Foundation report that found that one in three fossil fuel projects emits more GHG than estimated during the approval process, and that fugitive emissions are often underestimated. In this context, ACF submitted that the Project would be unlikely to have net zero emissions (assuming Scope 1 and Scope 2 emissions are offset). It also submitted the Project should be required to offset emissions associated with upstream LNG transport because these emissions would not occur if the Project did not exist.

Save Westernport Inc submitted that Victoria's emission reduction targets require an actual reduction in GHG emissions and not a net reduction outcome based on offsets.

Dr Hume's evidence was that while it is better to avoid emissions than to offset them, he supported the Project's Scope 1 and Scope 2 emissions being offset using verified carbon offsets. He explained that an offset requirement allows a proponent to make a judgment to pay to offset emissions or to invest in emissions reductions.

When asked by the IAC whether the Proponent should be required to offset Scope 3 emissions, as well as the proposed Scope 1 and Scope 2 emissions, Mr Sullivan-Kilgour responded that in general, it was unclear whether offsetting would be effective but that it was better to do it than not do it. Dr Hume did not support offsets being required for emissions outside the Proponent's operational control.

### **(iii) Discussion**

The Proponent is required to minimise the Project's GHG emissions so far as reasonably practicable in order to comply with the GED, and to prioritise avoidance and minimisation of GHG emissions over offsetting in accordance with the waste hierarchy. The evaluation objective also refers to the minimisation of GHG emissions (direct and indirect).

The Project relies on synergies with the existing Refinery which will enable it to operate in open loop mode without discharging seawater used in the FSRU's regasification process directly into Corio Bay (instead it will be diverted for reuse as cooling water in the Refinery). This significantly reduces the annual operational (Scope 1) GHG emissions (47,906 t CO<sub>2</sub>-e for open loop as compared to 178,985 t CO<sub>2</sub>-e for closed loop mode, an almost four-fold difference). It also is key to the Proponent's claim to have reduced GHG emissions so far as reasonably practicable, a matter relevant to EPA's consideration of the Development Licence applications, and to comply with the waste hierarchy.

As a result, the IAC considers it reasonable to limit the operation of the FSRU in closed loop mode as a condition of the Development Licence for the FSRU. As suggested by EPA, this could be in the form of confining the circumstances in which higher GHG impact (closed loop) operating scenarios would be permissible.

The IAC acknowledges the Proponent's concerns about being able to supply gas to the market when most needed and considers that appropriate conditions could be drafted to address this concern. For example, given the Proponent's submissions that in practical terms, closed loop would only ever be utilised in very limited circumstances (and anticipated to be hours or days rather than weeks), limiting the FSRU operation in closed loop mode to 30 days per year could be a reasonable balance between operational flexibility and waste minimisation. If more flexibility was required, the 30 day annual limit on closed loop could be averaged over a longer period, say 90 days over three years. EPA could discuss the exact details of such a licence condition with the Proponent.

The IAC accepts Dr Hume's evidence that it is appropriate for the Proponent to be required to offset only the GHG emissions over which it has operational control (mainly Scope 1 and 2 emissions). However, the operational boundary of the Project includes some Scope 3 emissions (refer to Figure 10). The offsetting requirement should be extended to include those Scope 3 emissions. MM-GG11 should be amended accordingly.

The IAC acknowledges the concerns of ACF in relation to the integrity of offsets and considers that they are addressed as best as possible by prioritising avoidance and minimisation of GHG emissions by limiting closed loop operation and preferencing low carbon LNG cargoes. The IAC notes that the Australian Government has appointed an independent panel to review the integrity of Australian Carbon Credit Units. The IAC accepts Dr Hume's evidence that it is possible to ensure that offsets are independently verified to ensure there are real carbon abatement projects sitting behind them.

**(iv) Findings and recommendations**

The IAC finds:

- Under the GED and the waste hierarchy, the Proponent must prioritise minimisation of GHG emissions over offsetting them.
- It is appropriate to impose a limitation on the operation of the FSRU in closed loop mode and a condition should be placed on the Development Licence for the FSRU requiring this.
- It is appropriate that the Project be required to offset its Scope 1 and Scope 2 emissions, together with the Scope 3 emissions over which it has control, using verified emissions offsets. MM-GG11 should be amended accordingly, and a condition should be placed on the Development Licence for the FSRU requiring this.
- Subject to the above and implementation of the proposed mitigation measures (as amended by the IAC), the Project would have met the evaluation objective to minimise its GHG emissions.

**Environmental Management Framework**

The IAC recommends:

**Amend greenhouse gas mitigation measure MM-GG11 as shown in Appendix G of the Inquiry and Advisory Committee’s Report No. 2, to require:**

- a) **the Project to first avoid or minimise emissions as far as reasonably practicable and**
- b) **then offset the remaining, actual emissions annually, including Scope 3 greenhouse gas emissions within the Proponent’s operational control.**

**Development Licence applications**

Should Development Licences be issued, the IAC recommends:

**Include a condition on the Development Licence for the floating storage and regasification unit that limits operation of the FSRU in closed loop mode.**

**Include a condition on the Development Licence for the floating storage and regasification unit that requires Scope 1, Scope 2 and Scope 3 greenhouse gas emissions within the Proponent’s control to be offset annually by surrender of verified greenhouse gas offsets.**

**10.6 Overall conclusions on greenhouse gas emissions**

With changes to the mitigation measures (including those recommended by EPA and those recommended by the IAC), the Project’s GHG impacts can be minimised to meet the evaluation objective. The broader question of whether the Project’s GHG impacts are consistent with climate policy is addressed in the IAC’s integrated assessment in Chapter 19.2.

# 11 Safety, hazard and risk

## 11.1 Introduction

The relevant evaluation objective is:

To provide for safe and cost-effective augmentation of Victoria's natural gas supply having regard to projected demand and supply in context of the State's energy needs and climate policy.

Safety, hazard and risk are discussed in EES Chapter 12. Supporting reports and studies include Technical Report N: Safety, hazard and risk assessment.

Table 15 lists the safety, hazard and risk evidence.

**Table 15** Safety hazard and risk evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D39	Andrew Mathers, Nuffield Consultants	Safety, hazard and risk	Regulatory safety advisor to the Project (refer to D181)
D50	Kylie McDonald, Viva Energy Australia	Maritime and port operations safety	Brief review of the EES and Technical Report N prior to exhibition, then engaged as an advisor during the SIRA workshop (refer to D50)
<b>GeelongPort*</b>			
D69	Dr Anand Pillay, DNV GL	Safety, hazard and risk	Independent expert
D70	Martin Mannion, Mannion Marine	Maritime and port operations safety	Independent expert
<b>GGS</b>			
D73 and D183	Nigel Cann, Arup	Process safety risks	Independent expert
<b>Statement of agreed opinions and facts</b>			
D103	A Mathers, A Pillay, N Cann	Safety, hazard and risk assessment	N/A
D138	K McDonald, M Mannion	Port operations and navigation safety	N/A

\* GeelongPort withdrew from the Hearing on Day 26, but had already presented its evidence

Additional information was provided in:

- D176 – Letter to the IAC regarding PIANC Study Clarification
- D178 – FSRU Mooring Analysis (preliminary draft)
- D179 – FSRU and LNGC Compatibility and Side by Side Mooring Analysis (preliminary draft)
- D183 – Supplementary Statement of Nigel Cann
- D207 – Proof of Concept Study
- D261 – Overpressure Levels of Concern, NOAA Office of Response and Restoration

- D376 – Technical Note 4: Regarding Sandia Report
- D478 – Technical Note 18: Safety and Risk Studies
- D459 – Technical Note 19: PIANC Study Update.

Two reports produced by Sandia Laboratories in the United States were tabled by other parties:

- D241 – Guidance on Risk Analysis and Safety Implications of a Large LNG Spill Over Water (tabled by ACF)
- D384 – Large Scale LNG Pool Fire Experiments, Dec 2011 (tabled by GeelongPort).

## 11.2 What did the EES say?

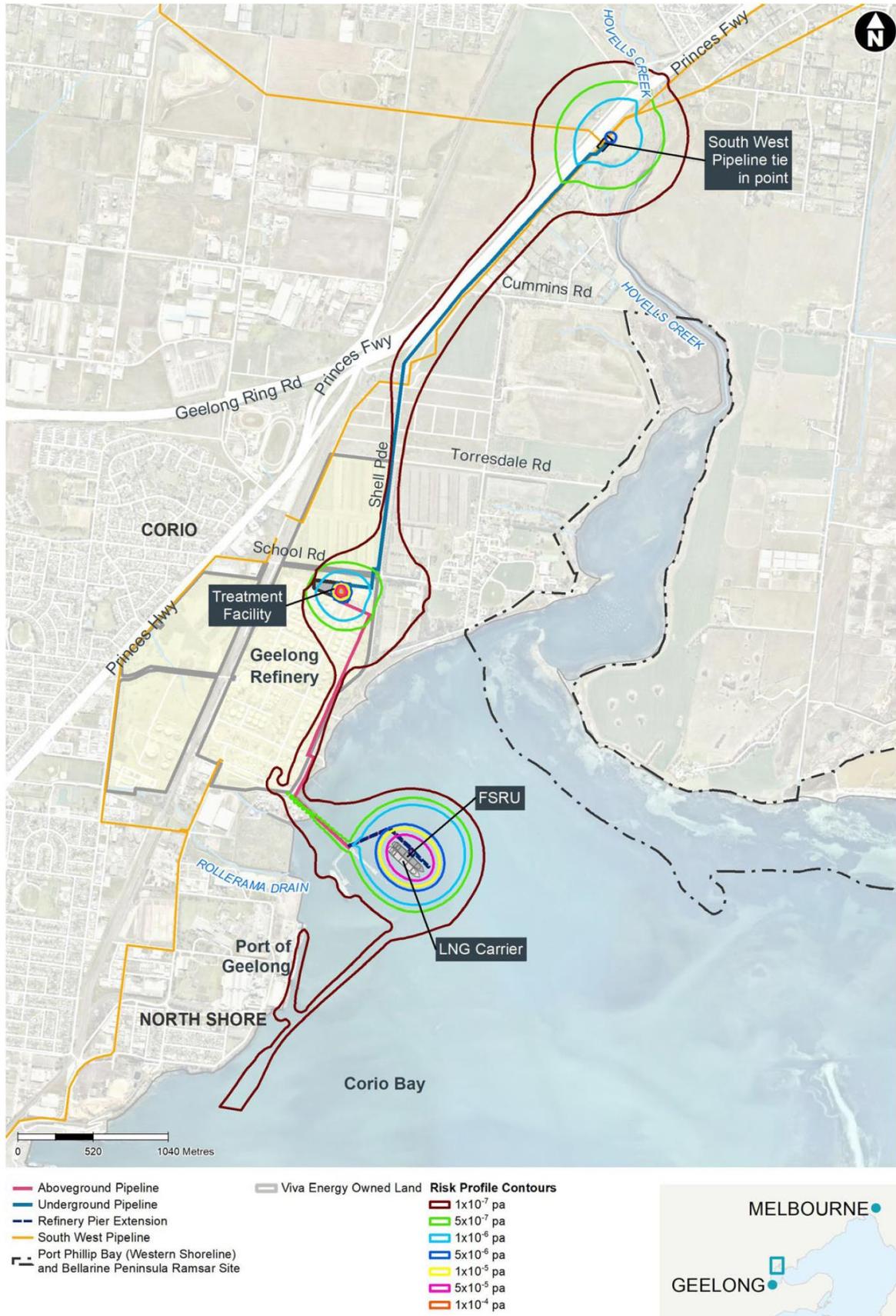
### (i) Overview

The EES outlined the safety risk and hazard assessments undertaken to date including hazard identification workshops, hazard and operability studies, a pipeline safety management study and a Quantitative Risk Assessment (QRA). The risk assessments identified a range of risks and design features, and controls to reduce the risks to an acceptable level – so far as reasonably practical (SFARP) or as low as reasonably practical (ALARP).

All components of the Project meet the individual fatality criteria based on land use under the NSW Hazard Industry Planning Advisory Paper No. 4 *Risk Criteria for Land Use Safety Planning* (HIPAP No. 4) when considered in conjunction with the existing Refinery.

The combined risk profile contours for the FSRU, treatment facility and pipeline are shown in Figure 11.

Figure 11 Project combined risk contours



Source: EES Figure 12-12 from page 12-33

**FSRU safety**

The FSRU will be a MHF under the *Occupational Health and Safety Act 2004* (OHS Act) and associated Occupational Health and Safety Regulations 2017. It will need a MHF licence from WorkSafe.

**Navigation safety risks**

The EES anticipated a maximum of 90 vessel movements a year of LNG carriers delivering LNG to the Project (45 deliveries). The LNG carriers will be up to 300 metres long. The largest ships currently accepted by the Port are 265 metres long.

The Corio Bay shipping channels would operate on a one way basis when being used by LNG carriers due to their width. The channels currently operate on a one way basis for larger vessels. Speed limits apply in the channels, generally reducing as ships move from the open waters of Port Phillip Bay into the Corio Bay channels and approaching the Port. There are wind speed limits for entering and exiting the channels.

Deep draft vessels require a minimum under keel clearance of 1.5 metres when underway or 0.6 metres when at a berth or in a swinging basin. The existing Corio Bay channels are currently dredged to 12.3 metres and tidal influence may mean at times there is insufficient under keel clearance for safe passage of an LNG carrier.

The EES considered that the risk of a release of LNG from an LNG carrier collision, allision (colliding with a stationary object) or grounding would be minimal, noting that there has never been a significant incident resulting in a fatality from an LNG release from a carrier.

**Pipeline and treatment facility**

The pipeline and treatment facility will be subject to a pipeline licence and gas safety case under the relevant legislation. These will build on existing safety studies already undertaken.

The pipeline will be designed and constructed to the highest standard (residential) in the relevant Australian Standard (AS2885 - Pipelines— Gas and liquid petroleum). The risk assessment for the pipeline (above and below ground) identified a range of risks, the main one being rupture and loss of containment with subsequent ignition causing fire and explosion. Two threats were identified for further assessment to inform detailed design:

- loss of containment in parallel fuel lines within the Refinery (above ground)
- impact from boring or exploration (below ground).

Similar to the pipeline, the main risk associated with the treatment facility is loss of containment of gas leading to fire and explosion. The treatment facility will also store quantities of odorant and nitrogen which could be accidentally released.

The treatment facility would increase the risk from the Refinery in the local area by a small amount but overall, the Refinery would continue to have an acceptable risk profile. A range of design and operational measures will be incorporated to ensure the treatment facility is built to appropriate standards and with active fire protection and suppression.

**(ii) Mitigation measures**

Proposed mitigation measures are summarised in Table 16.

**Table 16** Proposed mitigation measures for safety, hazard and risk

No.	Mitigation Measure	Project timing
MM-SHR01	FSRU safety standards	Design Construction Operation
MM-SHR02	Pipeline standards	Design Construction Operation
MM-SHR03	Facility standards	Design Construction Operation
MM-SHR04	Automated systems – safety and process control	Design Construction Operation
MM-SHR05	Dangerous goods – storage and handling	Design Construction Operation
MM-SHR06	Monitoring of chemical and fuel storage facilities	Construction Operation
MM-SHR07	Emergency response plans	Construction Operation
MM-SHR08	Fire and gas protection	Design Construction Operation
MM-SHR09	Separation distance	Design Operation
MM-SHR10	Site safety advisor	Construction

**(iii) Conclusion**

The EES concluded that safety hazards and risks from the Project can be effectively managed through detailed design and implementation and in accordance with the regulatory framework.

**11.3 Overall approach to risk assessment****(i) Key issues**

The key issues are:

- whether the risk assessments undertaken to date:
  - have been undertaken in accordance with accepted practice
  - are adequate for this stage in the Project's development
- whether the mitigation measures and future regulatory approvals can reduce the risk to the community to an acceptable level.

**(ii) Evidence and submissions**

The Proponent submitted that the IAC has a limited role to play in the assessment of safety, hazard and risk, largely because it “*will be subject to significant and stringent regulation, with multiple regulators having a role to play in assessing the safety and risk of the Project through further regulatory processes*” (D200). It submitted this was the way that the Crib Point IAC, appropriately, undertook its task.

The Proponent submitted that significant detailed work will be required to satisfy regulators such as Energy Safe Victoria and WorkSafe as the Project design is refined. In its closing submission the Proponent reiterated the “*multiple, evolving, and iterative stages of assessment*”, and submitted (D453):

It is unreasonable to critique the adequacy of the risk assessment that has been undertaken to this stage of the Project on the basis that it represents the totality of the analytical work that will be undertaken in identifying and mitigating issues of safety, hazard and risk.

At the IAC’s request, the Proponent provided Technical Note 18 (D478) towards the end of the Hearing. The note is a very useful and comprehensive summary of the studies that have been undertaken to date and future work to be done.

WorkSafe provided a written submission in response to an invitation from the IAC (D76). WorkSafe expressed the general view that the work done to date had been done in accordance with accepted standards and to a level commensurate with the stage of Project development.

Mr Mathers was the author of Technical Report N, which he adopted in his written evidence (D39). He summarised the findings in his written evidence:

- The studies have identified all events leading to a potential major incident.
- This allowed for the development of safeguards and controls which are consistent with those adopted by hazardous industries and those accepted by regulators.
- The studies and safeguards would continue to be refined and subject to approval from the relevant regulatory authorities after detailed design.
- After submission of the EES, a societal risk curve was completed which confirmed that the Project meets an acceptable risk level.

Mr Cann’s evidence primarily went to safety around the treatment facility and pipeline and is discussed in Chapter 11.7 below.

The experts agreed at the expert meeting (D103) that the QRA had been undertaken in accordance with industry standards. Mr Mathers and Dr Pillay agreed that HIPAP No. 4 was the appropriate guideline for risk assessment, with some commentary around the approach in the *WorkSafe guidelines for land use planning near a MHF* (WorkSafe Guidelines).

Mr Cann accepted that the risk from the FSRU and LNG carriers would not impact on GGS due to the separation distance. Dr Pillay acknowledged (D103):

... the additional consideration of most of the other typical major hazards ... were relevant only to workforce exposure, not public safety and [it] would not be unusual to see these conducted at a later stage of project development.

Despite this, Dr Pillay suggested in the expert meeting and his evidence that (in summary):

- he would have expected a number of additional risk assessments to have been done at the time of EES development
- the risk mitigation measures are generic and make no reference to specific measures

- there is a lack of detail in relation to emergency response planning, for example movement of the FSRU or an LNG carrier off Berth No. 5 in the event of an emergency.

Dr Pillay provided a list of recommended actions in his expert statement to address what he regarded as the gaps in the analysis to date. In cross examination the Proponent sought to highlight Dr Pillay's inexperience with the Victorian EES process and occupational health and safety regulatory regime, although not his experience in risk and hazards analysis.

Mr Mathers' view was that based on hazard identification, consequence modelling, the QRA, the pipeline safety management study, and workshops to consider the benefit of risk mitigation measures including a SFARP Workshop (D103):

... credible events (including ignited releases, unignited release, toxic exposure) have been adequately assessed appropriate to the stage of project development to ensure the appropriate need for risk management treatments.

Note that ongoing safety, hazard and risk assessment will continue to be conducted through all subsequent phases of project develop, including safety assessment and demonstration of SFARP / AFAP consistent with regulatory requirements.

Many individual and community group submitters raised significant and deep-felt concerns about Project safety and the potential for harm to the Geelong community. Concerns included (in summary):

- the hazardous nature of LNG has not been clearly communicated to the community
- the risk to 30,000 Geelong residents from LNG transportation
- underplaying the potential risk to the North Shore residential area
- the assumptions behind the risk assessments are unclear
- the failure of the risk assessments to cover societal risk
- technical deficiencies in the risk assessment process
- the combined risk of the Refinery and the FSRU has not been adequately assessed
- a lack of emergency response plans
- whether the risk of the Project has been reduced SFARP or ALARP.

The submissions from ACF (S1818) and the North Shore Residents Group (S1994) were representative of many of the community concerns, and the remainder of this Chapter focusses on the issues raised in the submissions from these two community groups.

The North Shore Residents Group submission reflected the concerns of the residential community of approximately 360 people which is only 220 metres from the shipping channel at the closest point. The Group's Hearing submission was made by a member with significant experience in the gas and LNG industry. The submission was highly critical of the Proponent's community engagement in relation to safety, and submitted that residents have increasing concerns about what they regarded as deteriorating safety management at the Refinery since the Proponent took over operating the Refinery from Shell Australia.

The North Shore Residents Group submitted that there are alternative more suitable locations for an LNG terminal. It submitted that by not properly considering risks borne by third parties (the community) and risks from external threats, the Proponent is not effectively undertaking its risk assessment obligations as required by the EES process. It submitted that as the inputs to the QRA have not been shared with the community, the community can not verify or trust the results of the QRA. The Group considered that there is limited information on emergency response and security and the community should be able to be involved to understand how their concerns are being addressed.

The North Shore Residents Group summed up their concerns as follows (S1994):

We, who are the residents of North Shore, do not want this dangerous proposal to proceed. There are options available to locate facilities away from residential areas - not just keeping us safe but also the safety of other communities. We do not want the proposal to proceed, but, should we fail to stop it, we want Viva to define appropriate risk reduction measures to keep the public safe, and to provide the appropriate visible deterrents to make the public feel safe.

ACF was critical of the documentation of safety studies in the EES, noting that there had apparently been risk assessments and workshops undertaken which were not part of the EES, with a resultant lack of transparency.

Mr Mathers provided a response to the issues raised by submitters in his written evidence (D39). The response addresses the specific concerns, but generally took a position consistent with the position he took in the expert meeting. He considered the risk assessments undertaken to date are appropriate given the stage of the Project development, have been undertaken in accordance with accepted industry practice, and further iterative risk assessment work will continue.

### **(iii) Discussion**

Safety for the people of Geelong (particularly the North Shore area) was arguably the greatest concern of submitters. This is understandable given the proximity of the shipping channel and the LNG carrier transit route to this area.

The IAC considers the assessments of safety, hazards and risks undertaken to date have been undertaken in accordance with the relevant standards for this stage of the Project's development. The experts all agreed that the QRA had been undertaken in accordance with industry standards, and there was general agreement that the appropriate guidelines for risk assessment had been applied. WorkSafe expressed the view that the work done to date had been done in accordance with accepted standards and to a level commensurate with the stage of Project development. The assessments included consideration of cumulative risk associated with incidents on the FSRU and other Project components affecting the Refinery and vice versa.

The EES and Technical Report N represent an assessment of the Project's risks at a point in time. There is a considerable amount of work that still needs to be done if the Project is to obtain regulatory approvals from the relevant safety and risk regulators. The Proponent has acknowledged as much in its submissions, and provided the details of the further work in Technical Note 18.

Submissions and evidence presented to the IAC raise a range of issues in relation to risk. While it is important these are addressed, they generally relate additional issues to be considered or more detail to be provided, rather than an identification of fundamental issues of concern.

The IAC finds Mr Mathers to be a credible witness. The work in Technical Report N, while subject to detailed criticism at times, was not fundamentally challenged given its 'point in time' nature and the host of work still being done or needing to be done. Similarly, the IAC considers the evidence of Dr Pillay and Mr Mannion was highly credible. Both experts have significant and highly relevant industry experience. That an expert may not be an expert on the Victorian assessment or regulatory processes does not mean their evidence should not be given significant weight.

The IAC acknowledges Dr Pillay's evidence that in his view, a number of additional risk assessments should have been done by this stage of the process. However the IAC is satisfied the regulatory process will ensure any outstanding issues are addressed appropriately, and that the currently

generic risk mitigation measures will be refined to provide specific measures that respond to the specific risks identified through the further work.

The IAC acknowledges the submissions (and the evidence of Dr Pillay) that raised concerns over the apparent lack of emergency response planning. The IAC is satisfied that the future regulatory processes will ensure that this gap is addressed. That said, some of the community concerns over risk may have been allayed if the EES provided more detail in relation to emergency response plans.

The IAC notes the submissions suggesting that community engagement around safety has not been to the level desired by many in the community. This should be addressed going forward. Arrangements should be put in place that allow the community to be made aware of safety considerations and how they are being addressed in Project implementation, and be involved in community emergency response where appropriate.

#### **(iv) Findings and recommendations**

The IAC finds:

- Safety, hazard and risk assessments for the key Project components have been undertaken to an acceptable level for this stage of the Project in accordance with accepted practice. Further assessment and risk controls will be applied through the regulatory process.
- The future risk assessment work should be informed by the issues presented to the IAC through submissions and evidence, in particular the issues raised by and recommendations of Dr Pillay (D69) and Mr Mannion (D70).

#### **Environmental Management Framework**

The IAC recommends:

**Include a new safety hazard and risk mitigation measure MM-SHR11 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to require specific consideration of the issues and recommendations raised by Dr Pillay and Mr Mannion in their expert evidence (Documents 69 and 70).**

## **11.4 The FSRU and Refinery Pier**

### **(i) Key issues**

The key issues are:

- whether the separation distances between the FSRU and nearby sensitive uses are appropriate
- whether the risk assessments for the FSRU and Refinery Pier are adequate for this stage in the Project's development, and have been undertaken in accordance with accepted practice.

### **(ii) Evidence and submissions**

The Proponent submitted that risks associated with the FSRU are primarily managed through its location and separation distances to sensitive uses. It highlighted that the risk contours from the FSRU are confined to areas covered by seawater, and submitted that the FSRU will be located such that an incident at the FSRU will not spread to the Refinery and vice versa. The Proponent outlined

elements of shipping safety (both in vessel design and operation) that will ensure risk is minimised to an acceptable level.

Mr Mathers' evidence was:

- the risk profile within the areas surrounding the FSRU and on nearby land uses would be acceptable as defined by HIPAP No. 4
- the risk contours for the FSRU are confined to an area over water and Refinery Pier and do not extend onto land (see Figure 11 above)
- safety studies have been conducted and will continue to be updated to meet the legislative requirements for a MHF licence to be granted for the FSRU
- the FSRU will have similar multiple layers of structural protection as an LNG carrier to prevent a significant loss of containment (discussed in detail in Chapter 11.5)
- GeelongPort's management of security at the Port will ensure minimal likelihood of security threats to the FSRU.

Dr Pillay highlighted a lack of detail in relation to movement of the FSRU or an LNG carrier off Berth No. 5 in the event of an emergency, including where the FSRU would be safely moored until any incidents were resolved.

Mr Mannion was critical of the Fire and Explosion Analysis in Technical Report N for omitting an analysis of the risks associated with an LNG carrier unloading LNG to the FSRU. He considered that a manifold release scenario between the FSRU and LNG carrier should have been included. The EES considered the FSRU operation the worst case scenario for this analysis, not the transfer. The analysis took the predicted worst case scenario and modelled the consequences of an incident.

WorkSafe's submission (D76) outlined in some detail the overall approach to licensing a MHF. As WorkSafe will need to consider the application for a MHF licence for the FSRU in future, it did not provide any view as to whether a licence would be issued.

ACF submitted that there is a lack of clarity about exclusion zones at the FSRU, and suggested that there had been inadequate consideration of the risk of multiplying incidents occurring with the adjacent MHF (Refinery) and other industries on shore. It submitted that even relatively small breaches from the FSRU or a visiting LNG carrier could lead to an LNG spill that could impact on those facilities.

The North Shore Residents Group submitted that it was not clear how the exclusion zone around the FSRU and the new Refinery Pier would be managed, noting this is a popular fishing area, one of the few low-cost popular activities in the area. They submitted that they had received 'mixed messages' from the Proponent about the extent and operation of the exclusion zone.

As noted in Chapter 11.3, Mr Cann accepted that the risk from the FSRU would not impact on GGS due to the separation distance.

### **(iii) Discussion**

While a number of uncertainties in relation to the safety risks associated with the FSRU remain, the IAC considers the approach to assessing safety, hazards and risks at the FSRU and Refinery Pier have been appropriately undertaken and in accordance with the relevant standards for this stage of Project development. The IAC acknowledges the considerable further work that will need to be undertaken if the FSRU is to obtain a MHF licence and is satisfied that the regulatory process will ensure any outstanding issues can be addressed.

The IAC is satisfied that the location of the FSRU on Refinery Pier is appropriate in terms of separation from residential communities and from GGS. It notes that this was a factor in selecting the location for the FSRU, as discussed in Chapter 4.

The EES indicated that a permanent exclusion zone will be required around the FSRU. This is in accordance with standard international practice for FSRUs, and the IAC regards it as appropriate. The details of the exclusion zone provided in the EES are somewhat uncertain. This will need to be finalised once the FSRU is selected, and the further risk assessments and navigation and mooring studies required for the Project are completed.

The assessment undertaken to date includes consideration of incidents on the FSRU affecting the Refinery and vice versa. The safety cases for both facilities as MHFs will need to further address this potential going forward, to ensure that cumulative or cascading risks are minimised.

As previously noted, the IAC found Dr Pillay and Mr Mannion to be highly credible witnesses with considerable relevant experience and expertise. The process (and ultimately the Project if approved) will benefit from Dr Pillay's review in D69 and his recommendations should be considered in the future development of the Project.

The IAC notes in particular Dr Pillay's concern that there has been no consideration to date of the circumstances under which the FSRU might need to relocate a safe distance from Refinery Pier in the event of an incident or emergency, how that would happen and where the FSRU would go. This will need to be considered in the future development of the Project. It may require modifications to the Project or further work (such as dredging or construction of an offshore temporary mooring location) that could have environmental impacts. If so, these will need to be subject to further assessment.

Similarly, Mr Mannion's criticisms about the omission of an analysis of the risks associated with unloading LNG from a carrier to the FSRU from the Fire and Explosion Analysis should be considered in the future safety and risk assessments and regulatory processes.

#### **(iv) Findings**

The IAC finds:

- While a number of uncertainties remain, safety, hazard and risk assessments for the FSRU to date have been undertaken to an acceptable level for this stage of the Project, in accordance with accepted practice.
- Further assessment and risk controls will be applied through the regulatory processes for the FSRU and for the gas pipeline along Refinery Pier.
- Based on the work done to date it appears the Project should be able to meet the evaluation objective of providing a safe augmentation of Victoria's gas supply (noting the IAC's comments in Chapter 5), however this will ultimately be decided through future regulatory approvals.

## **11.5 Incidents associated with LNG carriers**

This section focuses on incidents involving LNG carriers. Navigational risks are discussed in Chapter 11.6.

#### **(i) Key issues**

The key issues are:

- whether collision risks involving LNG carriers have been adequately considered
- whether the EES's 'credible threat' and hull breach scenarios are too limited
- the extent of the hazard zone from an LNG spill from an LNG carrier in transit.

**(ii) Evidence and submissions**

Community submitters raised concerns about the safety implications of importing LNG including:

- a lack of consideration of external threats to LNG carriers (such as terrorism)
- the scenarios for credible breach of an LNG carrier hull in the EES, and why larger more catastrophic breaches were not considered
- insufficient consideration of the risk of maritime incidents and past overseas events.

Mr Mathers' evidence was:

- LNG carriers have multiple layers of protection to prevent a significant loss of containment, including double hull construction and insulating material between storage tanks and the inner hull.
- Security is managed by GeelongPort and documented in the Maritime Security Plan which must be approved by the relevant Commonwealth agency. This would ensure minimal likelihood of security threats during the transit of LNG carriers.

One of Dr Pillay's specific recommendations was that LNG dispersal analysis and fire risk assessment should be carried out at high risk locations along the transit from Port Phillip Heads to the Port to better understand the risk to port users and nearby residents.

ACF submitted that the EES did not adequately address the risks posed by an LNG release onto water and did not accurately describe the risk to the community of an LNG release. Drawing on a report from Sandia Laboratories (D241), ACF submitted that the hazard zone could extend as far as 3.5 kilometres from the LNG carrier route or the FSRU. This could put at risk 30,000 people in Geelong and 8,000 in the vicinity of Port Phillip Heads (Point Lonsdale and Queenscliff).

The 3.5 kilometre hazard zone referred to in the Sandia report is based on an LNG release from a large (5 square metre) hole in the hull of an LNG carrier. A hull breach of this size could result in a substantial LNG spill onto water that could ignite in a pool fire, and flammable vapour clouds that could drift over neighbouring areas before igniting.

ACF questioned the 'credible threat' scenarios outlined in the EES, submitting that there was limited explanation of why relatively minor (small) hull breaches and holes were modelled while the Sandia report considered much larger breaches caused by intentional acts such as attacks. ACF also submitted that there was inadequate consideration of risk mitigation such as 'moving safety zones' around the LNG carrier.

In the Hearing ACF provided a series of slides highlighting these points and providing information on other incidents involving LNG carriers around the world. It submitted that the level of security required for LNG carriers entering the Port of Boston is very significant and might need to be replicated at Geelong to ensure community safety.

The Proponent provided a comprehensive response to the ACF submission through submissions in Technical Note 4 (D376). The Proponent's view was that while the Sandia report is a credible and well researched piece of work, ACF had selectively used its contents to derive the 3.5 kilometre hazard zone, suggesting a larger number of residents would be at risk than will actually be the case. In the Proponent's view:

- a major attack leading to such a large hole in a double hulled LNG carrier is not a credible risk in this location
- the large impact zone is not credible as it is based on a single large release which spreads a considerable distance before ignition
- in reality, early ignition is more likely from the attack itself or another source, a point also made in the Sandia report.

The Proponent submitted that the more likely scenarios of a low speed collision or grounding of an LNG carrier (which were considered in the EES) are unlikely to result in any breach or spill due to the double hull construction of LNG carriers. It noted that a future Permanent International Association of Navigation Congresses (PIANC) study is proposed to comprehensively assess LNG carrier movements under different conditions (discussed further in Chapter 11.6).

ACF provided a detailed rebuttal of Technical Note 4 (D451). Among other points, it contended that:

- the Proponent itself calculated that a collision with a vessel such as the Tasmania Ferry travelling at relatively low speed could cause a 5 square metre breach
- the 'site specific arguments' put forward by the Proponent were not valid as there is no air dispersion modelling of LNG spills onto water in the EES to show that there would be no impact to residents
- in the absence of such modelling, the Sandia hazard zones are the best available information for identifying possible dispersion
- a major breach with early ignition may still have serious impacts on residents, even if the vapour cloud does not spread as far.

The North Shore Residents Group provided a comprehensive overview of LNG shipping incidents around the world and provided photos of many collisions. They expressed concern as to how vessels the size of LNG carriers would be able to navigate the Corio Bay shipping channels and make the turn at the City Bend, probably needing four tugboats and noting that there are significant depth limitations, particularly at low tide. The LNG carrier visits will be at a time when the other Port traffic is increasing significantly, increasing collision risks.

The North Shore Residents Group drew attention to the particular risk of an LNG carrier colliding with the Tasmanian Ferries, which are proposed to take a 'short cut' across the City Bend and enter the new ferry terminal at right angles across the Corio Channel. They submitted that this could result in an accidental collision that causes a significant release as described in the Sandia report.

Like ACF, the North Shore Residents Group was extremely concerned about the risk of a terrorist incident with an LNG carrier. They submitted that the likelihood of such an attack is not zero. The attack on the Limburg tanker was a demonstration of how an incident does not necessarily require great sophistication to cause significant damage to an LNG carrier hull. They submitted that the consequences of such an attack for the North Shore would be catastrophic given the proximity of the North Shore area to the LNG carrier transit route.

Like ACF, the North Shore Residents Group identified the Sandia reports as a reputable source of information on LNG carrier breaches and LNG spills. They submitted that based on later Sandia reports focused on more modern tankers, the Proponent is underplaying the risk by not considering cryogenic fracturing of tanks leading to greater losses even from relatively small initial breaches.

The Proponent provided a detailed response to the North Shore Residents Group's submission in Technical Note 9 (D433). This covered some of the same issues raised in Technical Note 4 (the response to the ACF submission). It made submissions as to why a collision between an LNG carrier and a Tasmania Ferry was unlikely, and if it occurred, would be unlikely to result in an LNG release. In responding to the threat of a terrorist attack, the submission outlined the security planning arrangements for Australian ports.

### **(iii) Discussion**

The IAC understands that the risk of an LNG release from an LNG carrier in transit was included in the QRA and was assessed as a low concern. That said, the IAC accepts that considerably more detail will need to be developed in further risk planning. All of the risks that submitters have identified, including collisions or other accidents and terrorism, are risks that need to be considered in the ongoing risk assessments that will be undertaken as Project development progresses.

The IAC accepts the Proponent's submission that it is not appropriate to take the hazard zones developed in the Sandia report (D241) and apply them as suggested in some of the submissions (that is, to assume a potential impact out to 3.5 kilometres). While the IAC understands the reliance ACF and the North Shore Residents Group sought to place on the Sandia report, it does not consider this is a useful approach that accurately reflects the actual risks. It takes no account of:

- probability (likely, as opposed to possible, scenarios)
- mitigation (the risk controls that will be applied)
- the limited time that an LNG carrier will be in an area adjacent to residential areas (the North Shore).

The IAC considers that mitigation such as the security arrangements outlined by the Proponent and navigational directions discussed in Chapter 11.6 should reduce the risk to an acceptable level.

That said, the IAC recommends that the Proponent consider Dr Pillay's suggestion for additional dispersion modelling and fire and explosion assessment at higher risk points along the transit, for example North Shore, the City Bend and Port Phillip Heads. Outcomes of this work should then inform further risk controls and input to emergency response planning.

The IAC accepts that there is very low visibility in the community as to how these risks will be managed. Measures to manage security risks are often not provided in the public arena, partly to avoid providing information to those who may wish to cause harm. However, as noted in the discussion in Chapter 11.3, arrangements should be put in place to ensure that community leaders are made aware of safety considerations and how they are being addressed to the extent that this would not add to the risks.

Subject to the discussion in Chapter 11.6, the IAC considers that the risks associated with the transit of LNG carriers has been acceptably assessed for this stage in the process.

### **(iv) Findings**

The IAC finds:

- The risk of LNG release from a vessel in transit is low. It is likely that residual risk can be reduced to an acceptable level through the application of mitigation measures such as Port security arrangements and the more detailed navigation studies discussed in Chapter 11.6.

## 11.6 Navigation and mooring issues

### (i) Key issues

The key issues are:

- whether LNG carriers can safely navigate the shipping channels
- whether the FSRU and LNG carriers can be safely moored at Berth No. 5.

### (ii) Evidence and submissions

The Proponent submitted that while further detailed navigational safety and mooring work needs to be done, the assessment done to this point is suitable to demonstrate the feasibility of the Project from a navigational point of view. It noted that a simplified marine risk assessment was conducted in January 2022 to assess the safety of LNG carrier transit which found that (D200):

With the adoption of active vessel traffic services for Geelong waters, improvements in procedures for monitoring and tracking ferry transits, and the introduction of 'poor visibility procedures', the likelihood of collision reduces to the lowest probability category using this risk assessment methodology.

At the end of the Hearing the Proponent provided more information on the further navigation assessment being done, including (D459):

Simulations of inbound and outbound transits of each vessel design at 30 minute intervals over a 12 month metocean (hydrodynamics, waves, wind) period, with additional stochastically generated emergency scenarios providing key metrics around maximum leeway, drift angles/percentage channel occupancy, minimum clearance to channel toelines, bank effects, time average rudder, rates of turn and drift simulations.

The Proponent anticipated the study would take around eight weeks (from early August 2022) and would be used in conjunction with results from other risk assessments to inform regulators and formulate operating arrangements such as Harbour Master Directions within the Port.

Ports Victoria (S1895) submitted that the marine risk assessments to date are suitable for initial project design and assessment, although further marine risk assessment will be required:

Ports Victoria's principal concern with the project as presented in the EES is that the marine risk assessment of the movement and deployment of vessels involved in the regassification operations and interaction with other vessels using the port, is yet to be completed to our satisfaction.

Further advanced modelling and simulation of vessel movement through and within the port waters of Geelong and Melbourne needs to be conducted as primary input to the marine risk assessment that falls within Ports Victoria's remit. The results of the modelling and the risk assessment will enable Ports Victoria to specify Harbour Masters directions and other maritime controls to mitigate and manage identified risks.

Ms McDonald gave evidence for the Proponent in relation to navigation and port operations safety (D50). She identified that the existing channels in Corio Bay may not be wide enough for larger LNG carriers to manoeuvre, and considered further assessment would be required in the form of a PIANC study. She outlined in detail the considerations and input to such a study in her written evidence.

Mr Mannion advised the IAC that based on his experience, the separation distance between Berth No. 1 and an LNG carrier unloading LNG to the FSRU on Berth No. 5 is too close, even without a ship berthed at Berth No. 1. He expressed significant concern about the separation distance in terms of navigational risk, and considered that the EES had not demonstrated there is adequate room to berth vessels including tug movements.

Mr Mannion provided a table of other FSRU projects around the world which indicated generally higher separation distances between FSRUs and other berths and shipping, in many cases substantially higher (D278). He acknowledged that there is no established standard minimum separation distance in the international literature, for example that published by the Society of International Gas Tanker and Terminal Operators (SIGTTO).

Mr Mannion was provided with the preliminary draft mooring study for Berth No. 5 (D178) and noted that it outlined a number of issues including (D278):

- the mooring layout is not ideal and does not comply with industry standards
- FSRU and LNG carrier mooring line loads are exceeded for wind gusts
- limited wind data was used
- a wider range of vessels should be considered.

Mr Mannion also suggested that the Project has the potential to significantly impact on port operations, and that alternative locations should have been considered for the Project.

The experts disagreed at the expert meeting on the suitability of the navigation and mooring assessments done to date, but did agree that the following will be required (D138):

...a comprehensive navigation simulation, which includes full channel transit for a range of LNG carriers under a range of environmental conditions, as well as vessels to and from Berth 1. It should define the safe operating conditions, and meet the approval requirements of Ports Victoria.

The experts also agreed that a comprehensive mooring assessment should be done.

Ms McDonald agreed in the expert meeting that although mooring was outside her area of expertise, it likely that Berth No. 1 would need to be vacant when an LNG carrier berths at Berth No. 5. She suggested this would be a vessel scheduling management issue and recommended that further berthing simulation be done.

The Proponent provided detailed information in Technical Note 18 (D478) addressing navigation issues raised by Mr Mannion. It provided more detail on the vessel simulations undertaken to date in conjunction with Port Phillip Sea Pilots and Ports Victoria, and explained that this work was done *“to assess the feasibility of pilotage of LNG carriers through the existing channels and the proposed turning basin at Refinery Pier No. 5.”*

Technical Note 18 stated that the preliminary mooring study demonstrates that under most conditions, the proposed mooring is within acceptable limits. Mooring limits are only exceeded in one scenario considered in the mooring study (winds of 60 knots or approximately 110 kilometres per hour with an offset mooring arrangement). The Proponent submitted that if conditions are predicted that will result in mooring limits being exceeded, vessels would be de-berthed and required to anchor somewhere in Port Phillip Bay.

A few individual submitters, including ACF, raised the issue of the relatively narrow width of the shipping channels. ACF provided an analysis against the SIGTTO site selection criteria for LNG ports which it submitted clearly identified that Corio Bay is not suitable (D212). It submitted that Corio Bay and the proposed Project location do not meet SIGTTO criteria for navigable depths, channel widths, turning areas, long approach channels and jetty locations remote from populated area and other port activity.

**(iii) Discussion**

The investigation of navigation and mooring of the LNG carriers is a work in progress, with significant detailed investigation to come. Ports Victoria itself requires the additional work to develop the Harbour Master Directions and other maritime mitigations.

Corio Bay presents navigational challenges, including relatively narrow channels, a relatively sharp curve (the City Bend), and the introduction of frequent movements of the Tasmanian Ferries. Currently the largest ships that use Geelong Port are around 265 metres long, considerably smaller than either the FSRU or the LNG carriers are likely to be.

Areas of uncertainty include:

- whether LNG carrier movements can be planned successfully with other ship movements in Port Phillip Bay and Corio Bay, including transits to and from Port Phillip Heads
- whether LNG carriers will be able to successfully navigate the Corio Bay shipping channels
- whether there are enough weather, tidal and shipping windows for fully loaded LNG carriers to enter the Port with sufficient under keel clearance
- mooring arrangements and design, including the need for a vacant Berth No. 1 for LNG carrier berthing and de-berthing and whether there is enough room for safe operations, noting tug numbers are not yet finalised
- emergency management arrangements, including where LNG carriers would go if they needed to detach from the FSRU and move to safety, or where the FSRU would go if it needed to move to safety.

It appears to the IAC that the preliminary navigation and mooring studies have demonstrated that the Project is technically and theoretically possible, but the PIANC study will need to be completed to determine how this relates to real world constraints on vessel movements under different meteorological conditions, and what controls will need to be placed on LNG carrier movements through the navigation regulatory system (Harbour Master Directions). The risk of collision, allision and grounding will need to be carefully considered in the PIANC study and other further work on navigation and mooring.

Mr Mannion's evidence was that the distance between an LNG carrier and a ship on Berth No. 1 (or Berth No. 1 itself) is significantly less than required in his considerable international experience. On the information before the IAC, it is not in a position to say it is 'too close' such that the Project should not proceed or needs to be significantly modified. These issues will need to be looked at closely by Ports Victoria, GeelongPort and the Harbour Master. The IAC is satisfied that the regulatory framework around this future work is comprehensive and has a high degree of confidence in the technical ability of Ports Victoria to ensure that unsafe navigation operations are not allowed to occur.

If the further navigation and mooring studies including the PIANC study indicate that significant Projects modifications are required (for example additional dredging either in channels or at the Port), this may have additional environmental effects. The results of the further navigation and mooring studies will need to be fed back into the environmental impact assessment process, and would need to be considered at a future date by the relevant decision makers.

The IAC has noted the submissions and Mr Mannion's evidence in relation to alternative locations for the Project that may (or may not) be preferable for navigation and safety reasons. However, as discussed earlier in this Report, the IAC's task is to assess the Project before it.

**(iv) Findings**

The IAC finds:

- The preliminary work done through the EES process is acceptable to demonstrate at this stage of the Project development that safe navigation is technically possible.
- Significant additional work (including the PIANC study) is required to confirm that safe navigation and berthing can be undertaken to the standards required by navigation and maritime safety authorities.
- If any substantive Project modifications are required as a result of the further assessment, decision makers will need to consider how the potential environmental effects of these modifications are assessed.

**11.7 The pipeline and treatment facility****(i) Key issues**

The key issues are:

- whether the risks and hazards associated with the gas pipeline and treatment facility have been adequately assessed
- whether appropriate risk mitigation has been identified and applied.

**(ii) Evidence and submissions**

The Proponent submitted (D200) that the pipeline and treatment facility had been designed to minimise risk:

- the pipeline had been designed to exceed the residential requirements in Australian Standard AS/NZ 2885.6, even though much of the pipeline route is more rural than residential in nature
- above ground pipeline sections were designed to have an increased wall thickness of 20.6 millimetres to increase protection against threats
- the treatment facility had been moved 200 metres west from the originally proposed location to increase the separation distance to GGS.

The Proponent submitted that the QRA risk profile contours for the treatment facility are mostly contained within the Refinery's risk contours, and that the risk of fatality (the once in 2 million years contour line) only extends around 50 metres into the GGS paddocks east of Shell Parade.

Mr Mathers' evidence was that the risks of the pipeline and treatment facility have already been reduced through the design of the Project, including the location of the treatment facility, the routing of the pipeline and a reduction in the quantities of hazardous materials proposed to be stored at the treatment facility. All the relevant experts at the safety, hazard and risk expert meeting agreed that the relevant Australian Standard (AS/NZS 2885.6) had been applied appropriately in terms of pipeline design.

GGs submitted that its main concern was the proximity of the treatment facility and parts of the above ground gas pipeline to the school grounds and entrance. It submitted there is often queuing at the school entrance and a number of facilities such as the equestrian centre and some staff dwellings are nearby (D379). It noted that an updated safety case would need to be prepared for the Refinery, and reiterated that its concerns did not go to how the Project is licensed but

rather the concern about proximity. GGS submitted it is not good land use planning or avoidance of land use conflict to site the treatment facility within 1,000 metres of a sensitive use.

Mr Cann's evidence for GGS (D73) focussed on risks to the school from the treatment facility and pipeline, including from a methane vapour explosion following a gas release and from a release of odorant from the treatment facility. He undertook modelling that demonstrated that a methane vapour cloud explosion or odorant release could affect most parts of the school's Corio campus.

In the expert meeting Mr Mathers questioned Mr Cann's modelling results. Mr Cann reviewed the modelling and submitted a revised expert witness statement (D183) which reduced the modelled impact areas significantly and consequently significantly reduced potential impacts on GGS. His evidence was that there may still be impacts on glazing at the school, with potential window breakage and subsequent injury.

The Proponent questioned Mr Cann at length on the vapour cloud explosion issue and the assumptions behind a cloud forming in the stand of trees east of Shell Parade. It also suggested that Mr Cann's information on the pressures required to shatter glass was not consistent with the source material from the National Oceanic and Atmospheric Administration (D261) which Mr Cann conceded to some extent.

Mr Cann's revised odorant release modelling suggested there may be impacts on the school for up to 100 minutes. This would be at unpleasant levels but not levels harmful to human health, and would be one to two orders of magnitude below health concern levels.

Mr Cann recommended in his evidence that part of the above ground section of the pipeline be buried within the Refinery (chainage 2090 to 2935) to reduce the risk of it being affected by an incident within the Refinery. Under cross examination from the Proponent, he acknowledged that the above ground pipeline would have to be constructed to an appropriate grade and thickness of steel in accordance with the applicable Australian Standard.

### **(iii) Discussion**

The IAC considers that risks and hazards associated with the treatment facility and pipeline have been adequately assessed. The proposed mitigation measures are broadly appropriate. Further design and development and ultimate approvals for the treatment facility and pipeline are subject to a stringent pipeline and gas safety regulatory regime and the IAC is satisfied that this can satisfactorily reduce risk to an acceptable level.

The IAC has considered carefully the concerns raised by Mr Cann in relation to GGS. The IAC notes the revised modelling and the reduced consequence of both a vapour cloud explosion and an odorant release on the school. Coupled with the low likelihood of these incidents and the mitigation measures and controls on operations, the IAC is satisfied that the risk to GGS can be reduced to an acceptable level.

On this basis the IAC does not consider the suggested mitigation measure of installing laminated safety glass and robust window frames at the school is necessary in the circumstances.

The IAC is not satisfied that Mr Cann's recommendation to bury the section of the above ground pipeline at the northern end of the Refinery is justified, or would provide a superior outcome. The above ground pipeline is within the Refinery secure area, will be constructed to appropriate standards with thicker walls and can be isolated in the event of an incident in the Refinery. Placing the pipeline underground in this area would increase the contamination risk.

The IAC is cognisant of the submissions made by GGS about the proximity of the treatment facility and pipeline to the school, and whether this constitutes sound land use planning. The treatment facility is in the Industrial 2 Zone, and will not affect the inner and outer safety planning areas in the WorkSafe Guidelines. Further, the risk assessment indicates that there is no significant risk increase above the existing Refinery operations.

GGS has co-existed alongside the Refinery for many decades, and at times is subject to amenity impacts from the Refinery. The current situation is unlikely to be noticeably worse with the treatment facility and pipeline in place.

This is not to say the Project (or the Refinery) pose no risk to GGS or the surrounding community. Rather, the IAC is satisfied that risk can be satisfactorily addressed through detailed design and the regulatory processes including the safety management study for the pipeline and the revised safety case for the Refinery.

#### **(iv) Findings**

The IAC finds:

- The risk from the pipeline and treatment facility have been satisfactorily assessed.
- With the application of mitigation measures and subject to regulatory approvals, the risk can be managed to an acceptable level, consistent with the evaluation objective to provide for safe augmentation of Victoria's natural gas supply (noting the IAC's comments in Chapter 5).

### **11.8 Overall conclusions on safety, hazard and risk**

The IAC concludes:

- The safety hazard and risk assessments undertaken to date are appropriate for this stage in the Project's development.
- Subject to the significant further consideration and management of safety, hazard and risk through the regulatory process, risks associated with the FSRU should be able to be acceptably managed through the recommended mitigation measures.
- Further assessment of navigation and mooring risks is required before it can be determined whether risks associated with LNG transits, berthing and mooring of the FSRU and LNG carriers, and unloading of LNG cargoes from carriers to the FSRU can be managed to an acceptable level consistent with the evaluation objective and applicable legislation and policy.
- If the further navigation and mooring assessments identify the need for significant Project modifications, the environmental effects of any Project modifications may require further assessment.

## 12 Noise and vibration impacts

### 12.1 Introduction

The relevant evaluation objective is:

To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

Noise and vibration impacts are discussed in EES Chapter 11. Supporting reports and studies include Technical Report I: Noise and vibration impact assessment.

Table 17 lists the noise evidence.

**Table 17** Noise impact evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D48	Jaqueline Davis, AECOM	Noise impact	Technical lead for Technical Report I (refer to D155)
D53	Ross Leo, Clarity Acoustics	Noise impact	Peer reviewer of Technical Report I (refer to D156)
<b>GGS</b>			
D71	Darren Tardio, Enfield Acoustics	Noise impact	Independent expert
<b>Statement of agreed opinions and facts</b>			
D132	J Davis, R Leo and D Tardio	Noise impact	N/A
D168	J Davis, R Leo and D Tardio	Noise impact agreed opinions and facts statement with track changes	N/A

Additional information was provided in:

- D171(a) and (b) – Noise mitigation measures with track changes, J Davis, R Leo and D Tardio
- D157 – Review of existing noise environment, R Leo
- D170 – Supplementary statement on noise, J Davis
- D218 – Further noise measurement detail, R Leo
- D219 – Geelong Grammar attended measurements, R Leo.

### 12.2 The regulatory framework

The regulatory framework for noise was articulated in the EPA submission (D217). It includes the GED, which is summarised in Chapter 6.1. The Proponent and GGS also made legal submissions about the regulatory framework for noise (D203 and D379, Appendix A).

The EP Act requires that premises do not emit or allow to be emitted unreasonable noise (section 166), with unreasonable noise being defined in the Act.

The Environment Protection Regulations 2021 (EP Regulations) require the consideration of noise from industrial premises. Unreasonable noise is defined in regulation 118 with reference to noise limits. These in turn are determined under the *Noise limit and assessment protocol for the control of noise from commercial, industrial, and trade premises and entertainment venues* (EPA Publication 1826.4) (Noise Protocol).

The Noise Protocol provides the assessment pathways for determining unreasonable noise in an industrial context. It requires consideration of the existing noise environment and the establishment of noise limits with reference to the underlying land use zoning. Limits are established for day, evening and night periods.

The background noise level is used to set noise limits. The ambient noise level is used to assess environmental impacts.

One of the most critical requirements of the Noise Protocol is measuring background noise. This was a significant issue in the Hearing, and particularly the contribution from existing industry (the Refinery).

## 12.3 What did the EES say?

### (i) Overview

EES Chapter 11.2 outlined the approach to noise and vibration assessment for the Project, which included:

- establishing a study area
- assessing existing conditions, data and the regulatory framework
- measuring baseline noise levels to establish the day, evening and night noise environment
- assessing noise and vibration from construction and operation, including modelling to predict noise emissions
- developing mitigation measures for construction and operation
- evaluating the residual environmental impacts after mitigation.

The EES identified six sensitive receiver areas within 5 kilometres of the FSRU and used six noise monitoring locations to establish the:

- background noise level (LA90) being the noise level exceeded for 90 percent of the time
- ambient noise level (LAeq) being the noise level measured over a 15 minute period.

The construction noise assessment in the EES noted that most work would be done during the day (Monday to Saturday) with unavoidable out of hours work or work on Sundays and public holidays minimised and requiring specific controls.

The operational noise modelling used theoretical plant and equipment (such as the FSRU) operating under six different scenarios. The input data was taken from the Crib Point project.

### (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 18.

**Table 18** Proposed mitigation measures for noise and vibration impacts

Mitigation ID	Mitigation Measure	Project timing
MM-NV01	Managing noise from construction activities	Construction

Mitigation ID	Mitigation Measure	Project timing
MM-NV02	Construction noise mitigation measures	Construction
MM-NV03	Vibration safe working distances	Construction
MM-NV04	Noise and vibration monitoring	Construction
MM-NV05	Cumulative operational noise controls	Operation
MM-NV06	Construction noise mitigation measures – normal working hours	Construction
MM-NV07	Unavoidable works, horizontal directional drilling – noise control	Construction
MM-NV08	Unavoidable works, hydrotesting – noise control	Construction

### (iii) Conclusion

The EES concluded that the construction and operation noise impacts from the Project will be acceptable within the regulatory framework established by the EP Act, EP Regulations and policy.

## 12.4 The existing noise environment

### (i) Key issues

The key issues are:

- whether the existing noise environment has been characterised adequately to enable consideration of potential noise impacts from the Project
- what the background noise levels are – specifically whether the existing noise from industry (the Refinery) is ‘intrusive’
- what the Project noise limits should be (and whether the zoning approach to setting noise limits is appropriate)
- whether cumulative noise from the Refinery and Project will be capable of meeting those noise limits.

### (ii) Evidence and submissions

#### Evidence

All experts agreed that cumulative impacts from existing industry (the Refinery) and the Project will need to meet the regulatory framework established by the EP Act (including the GED), the EP Regulations and the Noise Protocol.

There was a significant point of disagreement between the experts around existing noise levels at Foreshore Road, in front of the GGS Corio campus (D132).

#### **Mr Tardio (GGS)**

Mr Tardio attended the Foreshore Road location between 1.00am and 2.00am on 28 May 2022 and recorded measurements in the range of 46-53 dB(A) Leq, 30-min. Mr Tardio’s evidence was that this is to be compared to the calculated night noise limit in the EES at 1 Biddlecombe Avenue Corio of 45dB(A). Based on his measurement, the Refinery is currently up to 8dB(A) in exceedance of limits established through the EP Regulations and the Noise Protocol.

His view expressed in the expert meeting was that the existing noise levels from industry (the Refinery) already exceed the noise limits on Foreshore Road without the Project. As a result, how

the Project and Refinery cumulatively will meet noise limits is not clear and thus noise impacts have not been determined.

Mr Tardio's evidence was that this exceedance is apparent in the AECOM unattended monitoring data (which is consistent with his data) and should have been identified and addressed in the EES.

On noise limits not being determined, Mr Tardio's evidence was that based on the low background noise levels in his data, it is possible that the Foreshore Road area could be defined as a 'low background' area requiring a different approach to setting limits in the Noise Protocol, with a consequently lower limit than the target of 45dB(A) (based on the zoning approach).

He noted that clause 42 of the Noise Protocol requires (IAC emphasis):

The background level must include all noise sources except noise from any commercial, industrial or trade premises which appears to be intrusive at the point where the background level is measured.

His view was that background noise levels should be recorded in the absence of existing industrial (Refinery) noise as the Refinery noise is intrusive.

### ***Ms Davis and Mr Leo (Proponent)***

Based on the monitoring data in Technical Report I, Ms Davis did not accept Mr Tardio's view that existing industry is exceeding noise limits. Ms Davis' view was that the AECOM data did not demonstrate the Refinery is non-compliant given that there are many noise sources at the Foreshore Road site. Mr Leo agreed with this view and stated that during his firm's site visits "*the existing industrial noise emissions did not constitute an issue of non-compliance*" (D132).

Mr Leo attended the Project area on 22 June 2022, after the expert meeting but before giving his evidence. He took attended noise measurements on Foreshore Road between 1.00am and 2.45am (D157). He measured noise at this location at "*between 42 dB LAeq, 30 min to 52 dB LAeq, 30 min which is consistent with Mr Tardio's noise monitoring data*". He concluded among other things that at the upper end of the range the Refinery dominated the noise measurement. He noted that (D157):

...the Refinery has an obligation to comply with noise limits derived under Part I of [the Noise Protocol]. For Geelong Grammar, the night time noise limit derived by AECOM is 45 dB Leff which was clearly exceeded during my measurements on the morning of 22 June 2022.

On further observation he identified the Refinery noise source as primarily a large piece of equipment on the southern end of the site, later identified as a cracking unit.

While Mr Leo accepted that the Refinery is currently exceeding noise limits, he did not accept that noise from the Refinery was generally 'intrusive'. He did, however, concede in response to a question from EPA that during his night time measurements the Refinery noise was 'dominant'. He did not consider that the Foreshore Road area could be characterised as 'low background' area under the Noise Protocol and did not expect the 45dB(A) limit to be reduced further.

On a separate matter Mr Leo noted in his evidence (D53) that the limit established for the Avalon area was based on a short term (15 minute) background noise level and had not been adjusted for the background noise environment or distance. He recommended that additional background monitoring be undertaken at Avalon to better establish noise limits.

**Agreement in relation to further work**

Prior to Mr Leo's additional site visit and noise monitoring confirming Mr Tardio's position in relation to existing exceedances from the Refinery, the expert meeting agreed on a way forward to address this issue.

Mr Tardio proposed 'practical conditions' for the Project, being (D132, section 3.10):

- Measurements to establish the noise emissions from existing industries prior to the commencement of the Project.
- Confirmation of Project noise limits which will not exceed the Noise Protocol limits with existing industrial noise emissions, in particular where existing noise emissions are at or above the limits.
- Operational noise monitoring for at least one month.
- Operational compliance noise monitoring at Geelong Grammar.
- Mitigation measures if the noise emissions exceed the noise limits.

Ms Davis and Mr Leo agreed to this approach and the implementation of a comprehensive noise measurement plan. If non-compliance is determined, noise emissions from existing industry and the Project will need to be managed to ensure that compliance can be achieved cumulatively for both new noise sources (the Project) and existing noise sources (the Refinery).

Mr Tardio agreed to this in principle but expressed concern that it may not be achievable. He remained concerned that it is not known if mitigation at the Refinery or Project is practicable or affordable. Mr Leo expressed a high degree of confidence that mitigation would be feasible on the Refinery or Project if required.

An agreed marked up version of revised mitigation measures was provided from the expert meeting to implement the practical conditions referenced above (D171) and these have been used to inform the IAC's recommended mitigation measure in Appendix G in Report No. 2. There was some concern expressed by Mr Tardio and GGS that his comments on the mitigation measures (D71(a)) had not been accurately communicated to the IAC. The IAC is confident that this issue has been addressed and the correct document received in full (D171(a)).

**Submissions**

Characterising the noise environment for the Project was an issue that received significant attention in the Hearing, and it became apparent that the existing exceedances at the Refinery have implications for the assessment and impact prediction for the Project. Given the movement on this issue through the Hearing, the following section focuses on the later and closing submissions of the main parties.

**The Proponent**

The Proponent submitted (D203) that the IAC should focus firstly on the potential noise impacts of the Project, in isolation from any existing noise emitting sources. It submitted that this is how the regulatory regime is meant to function and regulation 166 confines the consideration of unreasonable noise to the emitter. In other words, in this case the regulatory framework requires the Proponent in the first instance to consider the Project's potential emission and impact, not the broader picture in the area of the Project. That broader consideration is relevant for regulation 119, where cumulative noise must be considered, but that is a later and separate step.

The Proponent accepted that at some times there is a non-compliance issue at the Refinery and that this needs to be addressed. It indicated that assessment work has already begun which will build on existing monitoring and modelling. It submitted that (D453):

The further work required entirely stems from the Refinery cumulative noise issue. There is no uncertainty of noise outcome involved in this. The Proponent accepts that cumulative noise will need to be managed in accordance with regulation 119 of the Environment Protection Regulations 2021.

The Proponent submitted that as it also owns and operates the Refinery, it is in a strong position to consider the cumulative noise and will consider noise management and mitigation as necessary for the Refinery or the Project or both. It reiterated Mr Leo's view that it is possible to mitigate noise from the Refinery and the Project if this is necessary to achieve the cumulative noise limits. Either way the Proponent will be required to meet the cumulative noise limits.

The Proponent submitted that the zoning based noise limit of 45dB(A) under the Noise Protocol is unlikely to change given the evidence of Mr Leo, and rejected the proposition of Mr Tardio that the area might be established as a 'low background level' area (and therefore potentially have a lower noise limit).

Partly in response to IAC questions and partly in response to EPA questions and recommendations, the Proponent articulated in more detail the work that is being undertaken to address the cumulative noise issue and to bring the Refinery into compliance (D458).

### **GGG**

GGG was critical of the noise impact assessment in the EES, describing it as "*more or less useless*" (D379). It submitted that there continued to be sustained criticism of Mr Tardio's work through the expert meeting even though in Mr Tardio's view it was obvious that there was industrial noise in the background noise monitoring. It noted that at the time of the expert meeting Mr Tardio had still been the only expert to inspect the area and take measurements in the quiet part of the night.

GGG submitted that following Mr Tardio's and Mr Leo's night time measurements it is clear that the Refinery is exceeding noise limits at night, and this was not considered at all in the EES.

GGG submitted that on Mr Tardio's evidence and observations, reinforced by observations of the School Principal, it is an open question as to whether the zoning approach continues to be appropriate to establish the noise limit. In its view the apparent infection of the Lagoon Boat Club noise monitoring in the EES with industrial noise suggests there is a real possibility that GGG and surrounds may be a 'low background level' area with limits potentially well below 45dB(A) at night.

On mitigation and management, GGG observed that there is nothing before the IAC that demonstrates that mitigation is possible or practical or economically feasible if significant reductions in noise emissions are required from the Refinery, the Project or both. It pointed out several areas of uncertainty, including:

- no evidence the FSRU can be shut down if noise is propagating to sensitive receivers
- the tugs and LNG carriers and their arrival times are not controlled by the Proponent
- there is no certainty that existing Refinery noise can be reduced
- the FSRU already includes some noise mitigation, and further mitigation may not reduce noise emissions by much.

GGG concluded that (D379):

The legal arguments that Viva seek to advance in this case are a distraction from the more fundamental factual problem – being the absence of any evidence of proper assessment.

It submitted that any further investigations would be undertaken without third party (GGS) involvement if they were outside the EES assessment framework and that this would be unfair to affected parties.

### **EPA**

EPA noted in its main submission (D217) that it was focused on compliance with the GED and consistency with EP Act obligations regarding unreasonable noise. It submitted it had residual concerns about:

- the contribution of existing industry noise and cumulative noise
- drafting of the mitigation measures.

EPA's second RFI (D430) dealt extensively with noise issues.

EPA submitted that the regulatory framework requires background levels, and thus limits, to be established in the absence of industrial noise, expressing the clear view that the Refinery noise was intrusive in the context of clause 42 of the Noise Protocol (D217).

In response to questions from the IAC, EPA submitted that (D477):

.... EPA is conscious that the nature of those functions and obligations, and the matters with which EPA is concerned in discharging them, are distinct from the functions of the IAC pursuant to its Terms of Reference. EPA does not seek to make any submission in respect of the how the IAC approaches the discharge of its functions, save to note that the IAC's ability to advise EPA in respect of the Development Licence Applications will clearly be enhanced by any and all information which can be provided by the Proponent pursuant to the Second EPA RFI.

...., it does consider the material presently before the IAC in respect of noise impacts of the Project to be an inadequate basis on which the IAC and EPA may reach conclusions regarding the acceptability of noise impacts. ....

EPA went on to identify elements in its second RFI that should be prioritised in the provision of information.

### **(iii) Discussion**

Based on the information before it, the IAC is not able to determine whether the Project (and Refinery) can cumulatively meet the noise limits.

There is now clear agreement between the parties and most of the experts that a new or heavily revised noise assessment is required for the Project which considers:

- further characterisation of the existing noise environment and background noise monitoring, preferably when the Refinery is operating within acceptable noise limits
- determination of the noise limits for sensitive receivers including GGS but also residential communities to the south and west, including consideration of whether the zoning approach to setting noise limits is appropriate
- consideration of whether there are practical and feasible management measures that can be implemented to the Refinery, the Project or both to achieve the noise limits.

Ultimately this further assessment will need to be done to the satisfaction of EPA, both in its Development Licence role and, if necessary, its enforcement role. Whether it also requires a separate process going forward, such as a Supplementary EES, is a question for Government. The IAC considers that there should be a meaningful role for sensitive noise receiver third parties to be involved in the further noise assessment, although it is beyond the IAC's remit to make

recommendations about what process should apply. This issue is discussed further in Chapter 19.5.

The question of whether the zoning approach to setting the noise limit is appropriate or not is to some extent open and the further noise assessment should consider this issue. The Refinery is clearly audible from Foreshore Road and the Lagoon Boat Club – the evidence clearly demonstrates this and the IAC’s own experience (during the day at least) is that it can clearly be distinguished. Whether it is intrusive or not is another question, and the long history of Refinery operations may mean it is not intrusive either in principle or because people have become habituated to the particular noise.

It does seem to the IAC that if the Refinery noise was excluded from background (in itself a challenging thing to do) and a very low background noise level established, it may lead to a limit which the Refinery and potentially other industries and the Project can cumulatively never comply with. The IAC makes no conclusion on this issue but as stated above considers it should be examined in detail as part of the further noise assessment.

Importantly the revised mitigation measures agreed between the three experts include that the background noise measurements should be re-done, excluding the Refinery noise.

The IAC has before it differing expert opinions as to whether mitigation can be achieved, practically and feasibly. Until the further assessment is done and the necessity and feasibility of different mitigation options are properly developed and costed, this will remain a Project risk for the Proponent (and in its role as the owner and operator of the Refinery).

Until the additional assessment work is done, including mitigation at the Refinery, the IAC can not conclude definitively based on the submissions and evidence before it that the environment effects can be managed to an acceptable level.

#### **(iv) Findings and recommendations**

The IAC finds:

- Based on the information before it, it is not possible to determine whether the noise impacts of the Project can be managed to within acceptable levels having regard to the evaluation objective and the applicable legislation and policy.
- There is significant further assessment work to be done, in conjunction with noise assessment and mitigation of Refinery noise, to:
  - properly characterise the noise environment in the vicinity of the Project
  - determine the appropriate noise limits for the surrounding area
  - establish whether cumulative noise from the Refinery and Project will be able to comply with those noise limits and the requirements of the GED.
- Sensitive receivers should be provided with the opportunity to review and comment on the future noise assessment program.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Undertake the further assessment of noise impacts set out in mitigation measure MM-NV05 in Appendix G of the Inquiry and Advisory Committee’s Report No. 2.**

## 12.5 Operational noise

### (i) Key issue

The key issue is:

- whether the assessment of the predicted noise levels from the Project is appropriate to assess potential environmental impacts.

The potential for significant environmental effects from operational noise needs to be closely considered with the issues raised in the previous section.

### (ii) Evidence and submissions

The Proponent submitted that the modelling in Technical Report I demonstrated that operational noise from the Project (putting aside existing Refinery noise) can meet the noise limits at sensitive receivers in the area.

Submitters (including GGS) raised issues around the overall noise assessment, noting that it is not clear how much, if any, further noise mitigation will be possible from the Project in the event that limits set for nearby sensitive areas require significant noise mitigation, whether from the Project or the Refinery.

There were a number of discussions around the operational noise modelling in the expert meeting (D132). These included the:

- use of input data from the Crib Point project
- difficulty in controlling noise during operation from plant not controlled by the Proponent (such as tugs and LNG carriers)
- need for detailed design advice and data validation through future design stages
- need for more detailed noise surveys during commissioning and commencement phases of the Project.

The experts agreed on a set of revised mitigation measures (D71, D171) to address these issues.

Mr Tardio gave evidence that it was unclear how much mitigation was included in the Project modelling, for example the FSRU, and thus it not clear if the modelling is as conservative as the EES suggests.

### (iii) Discussion

The IAC is satisfied that the modelling of the operational noise from the FSRU, LNG carriers and other sources has been undertaken to an appropriate level and standard for this stage of the Project's development and demonstrates that noise should be able to managed to an acceptable level having regard to relevant legislation and policy.

This conclusion is necessarily contingent on the broader issue discussed in the previous section, in that the cumulative noise of the Refinery and the Project needs to meet limits at nearby sensitive receivers, and that the limits themselves need to be correctly established through further noise assessment.

The noise assessment will need to be repeated when the actual equipment to be used for the Project (as opposed to modelling based on typical or possible equipment) is identified. The IAC is satisfied that the revised mitigation measures provide a suitable framework for this to occur.

**(iv) Findings**

The IAC finds:

- The operational noise modelling has been undertaken to an acceptable level for this stage of the Project and appears to show that the operational noise effects of the Project will be able to be managed to an acceptable level.
- The above finding is contingent on further assessment of background and cumulative noise with the Refinery and other industrial sources and the assessment in future of the actual FSRU and Project components.
- The revised mitigation measures agreed to by the experts and refined by the IAC (as shown in Appendix G in Report No. 2) provide a suitable framework for the further assessment to occur.

**12.6 Construction noise****(i) Key issues**

The key issues are:

- adequacy of the construction noise impact assessment
- adequacy of the mitigation measures for construction noise.

**(ii) Evidence and submissions**

The experts discussed the EES's approach to construction noise in the expert meeting including (D132):

- the need to include educational buildings as sensitive receivers
- the merits of using the NSW Roads and Maritime Construction Noise and Vibration guideline
- agreement on external noise limits for education buildings
- the need for further background noise monitoring, whether with or without the presence of existing industrial noise.

There was agreement on most of these points and the experts agreed to changes to the mitigation measures (D71, D171) to address outstanding items. These include significant alterations and additions to manage out of hours work effectively to ensure this does not result in an unacceptable impact.

In closing, the Proponent submitted that construction noise has been "*thoroughly assessed*" and that there was no dispute that construction noise could be reduced and managed (D453).

Mr Tardio suggested the use of 'management triggers' for action. EPA did not support this approach on the basis that such levels, when calculated and justified, are to be used as reference levels above which the risk of harm increases. They are not to be used as levels that one can pollute up to.

EPA submitted a range of changes to the mitigation measures for noise and other issues (D383) which were accepted in principle by the Proponent. These changes are supported by the IAC and are included in Appendix G in Report No. 2.

GGs made extensive submissions on construction noise in its original submission (S1968) largely around proximity of the school and the need to ensure daytime levels recognise the learning environment at the school.

### **(iii) Discussion**

While there was some disagreement in evidence and submissions about construction noise, the IAC considers these are largely 'at the margins' and is satisfied that construction noise can be managed to an acceptable level under the regulatory framework including EPA Publication 1834 *Civil construction, building and demolition guide*.

The largest potential for construction noise impact is for unreasonable noise that may occur out of hours for work which is unavoidable. The mitigation measures have been substantially and significantly improved through the Hearing process by both expert and submitter input, particularly EPA.

The IAC is satisfied that the environment effects of construction noise can be managed to an acceptable level.

### **(iv) Findings**

The IAC finds:

- Construction noise from the Project should be able to be managed to an acceptable level with the IAC's recommended mitigation measures and the regulatory framework.

## **12.7 Vibration**

### **(i) Construction**

Ms Davis' evidence for the Proponent addressed vibration during pipeline construction. Her evidence was that there are unlikely to be significant activities generating vibration which will create a risk of either structural damage or that will affect human comfort.

She noted that on Macgregor Court, Cummins Road and Rennie Street dwellings are 40 metres from construction activities. Her evidence was that if vibration generating machinery is to be used (which is not proposed) human comfort could be affected in this area. Ms Davis recommended that there be monitoring at the commencement of pipeline construction to verify predicted vibration levels.

### **(ii) Operation**

Ms Davis' evidence reflected the findings in the EES that environmental effects from operational vibration are unlikely to be significant because:

- no operational plant or equipment is proposed that would generate significant ground vibration
- the FSRU and LNG carriers are surrounded by water which will limit propagation to sensitive receivers
- the distance from the treatment facility and other infrastructure to sensitive receivers should ensure vibration impacts are negligible.

**(iii) Discussion and conclusion**

There were limited submissions on vibration, and these were of a general nature. Having reviewed the EES and mitigation measures, the IAC is satisfied that the construction mitigation measures for vibration (MM-NV03 and MM-NV04) as shown in Appendix G in Report No. 2 are acceptable and should effectively manage any construction vibration environmental effects. The IAC is satisfied that vibration from operation is unlikely to lead to any significant environmental effects and no changes to the mitigation measures are recommended.

## **12.8 Overall conclusions on noise and vibration impacts**

The IAC concludes:

- The environmental effects of the Project from noise can not be determined at this stage and are subject to further assessment of the existing noise environment and the potential for cumulative noise from the Refinery and other industry.
- The mitigation measures in Appendix G in Report No. 2 provide an appropriate framework for the further assessment of noise and the monitoring, management and mitigation of Project noise.
- Vibration from construction and operation should not give rise to significant impacts and can be managed through the proposed mitigation measures.

## 13 Air quality

### 13.1 Introduction

The relevant evaluation objective is:

To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

Air quality impacts are discussed in EES Chapter 11. Supporting reports and studies include Technical Report H: Air quality impact assessment.

Table 19 lists the air quality impact evidence.

**Table 19 Air quality impact evidence**

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D46	David Rollings, AECOM	Expert statement on air quality	Lead verifier for Technical Report H (refer to D154)
D206	David Rollings, AECOM	Memorandum regarding emergency or maintenance air emissions	
D236	David Rollings, AECOM	Correspondence regarding sensitivity testing in air quality modelling	

Additional information was provided in:

- D5 – EPA’s first RFI
- D74 – Proponent’s response to EPA’s first RFI
- D111 – Proponent’s response to the IAC’s RFI
- D430 – EPA’s second RFI
- D480 – Proponent’s interim response to EPA’s second RFI
- D458 – Proponent’s response to EPA submission
- D477 – EPA’s response to IAC questions following closing submissions.

The Proponent also tabled copies of the following relevant standards and guidelines:

- D122 – Consolidated Environmental Reference Standard prepared by EPA, 29 Mar 2022
- D160 – EPA Guide to the Environment Reference Standard, publication 1992
- D158 – EPA *Guideline for Assessing and Minimising Air Pollution*, publication 1961.

### 13.2 What did the EES say?

#### (i) Overview

Background air quality was described based on monitoring at the Viva Energy Ambient Air Quality Monitoring Station (Viva AAQMS) and EPA’s Geelong South air quality station. Ambient air quality generally complies with National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) standards, except for visibility (at Geelong South) and some exceedances of particulates (PM<sub>10</sub> and PM<sub>2.5</sub>) (at the Viva AAQMS) due to bushfire smoke in January 2020.

Project construction has the potential to affect air quality, particularly by dust associated with the underground pipeline and treatment facility, and exhaust emissions from vehicles, barges and

support vessels. The potential dust emission magnitude was assessed as medium, but this impact would be mitigated by the implementation of industry standard dust mitigation measures through the CEMP. Construction impacts would be temporary and there are few sensitive receptors in the vicinity of the Project area. Air quality impacts from construction would be low.

During the operational phase of the Project, there will be air emissions from the FSRU resulting from fuel combustion in the engines and boilers. Potential pollutants include nitrogen dioxide, carbon monoxide, sulphur dioxide, particulates, benzene, formaldehyde and Polycyclic Aromatic Hydrocarbons (PAH). The FSRU Development Licence application sets out proposed FSRU engine emission limits to air.

The EES used the following ‘adopted criteria’ for air quality:

- carbon monoxide and particulate matter are based on the Environmental Reference Standard (ERS)
- nitrogen dioxide and sulfur dioxide are based on the AAQ NEPM
- PAH, benzene and formaldehyde are based on Air Quality Assessment Criteria within the framework of EPA Publication 1961 *Guideline for Assessing and Minimising Air Pollution in Victoria*.

Atmospheric dispersion modelling was conducted using the American Meteorological Society/Environment Protection Agency Regulatory Model (AERMOD). The modelling simulated six scenarios, including open loop, closed loop, gas-fuelled peak load and liquid-fuelled. The modelling showed no exceedances of air quality criteria at any of the sensitive receptors in the study area. The EES concluded air quality impacts from FSRU operations would be minor and localised in the vicinity of Refinery Pier and the Refinery.

## (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 20.

**Table 20** Proposed mitigation measures for air quality impacts

Mitigation ID	Mitigation Measure	Project timing
MM-AQ01	Dust suppression	Construction
MM-AQ02	Restricted vehicle movements	Construction
MM-AQ03	Crushed rock on access tracks	Construction
MM-AQ04	Speed restrictions	Construction
MM-AQ05	Covering vehicle loads	Construction
MM-AQ06	Weather monitoring	Construction
MM-AQ07	Dust monitoring	Construction
MM-AQ08	Odorous soils management	Construction
MM-AQ09	Equipment maintenance	Construction
MM-AQ10	Maintenance of the FSRU burners	Operation
MM-AQ11	Monitoring FSRU emissions	Operation

The EMF includes protocols for air quality management during pipeline construction in the CEMP and indicates that the CEMP and OEMP will include detailed protocols for air quality management

during construction and maintenance. The EMF includes the following air quality monitoring requirements:

- weather monitoring to determine if extreme heat and/or wind events require construction works to be modified to minimise dust impacts
- observational monitoring of dust along the underground pipeline construction route and at the treatment facility during construction
- an air quality monitoring program to monitor FSRU emissions and confirm that they comply with design specifications.

### (iii) Conclusion

EES Chapter 11 concluded that impacts on air quality can be acceptably managed through the recommended mitigation measures. Air emissions during construction and operation would be low, compliant with all regulatory requirements and unlikely to impact on air quality for sensitive receptors.

## 13.3 Impacts of the FSRU

### (i) Key issues

The key issues are:

- whether the atmospheric dispersion modelling for emissions from the FSRU:
  - assumed appropriate specifications
  - took account of the wake effects of the FSRU appropriately
- whether impacts of air emissions on local air quality will be acceptable.

### (ii) Evidence and submissions

Atmospheric dispersion modelling was conducted to assess the impacts of air emissions from the FSRU on local air quality. Mr Rollings evidence was that the modelling demonstrated air quality impacts from FSRU operation would be minor, even when an LNG carrier is also present. He stated (D46) that *“all modelled scenarios demonstrated there are no exceedances of adopted criteria at any of the sensitive, industrial or gridded receptor locations”*.

GGs expressed concern about the impacts of the FSRU on air quality, and short term and long term implications for human health. It noted that the modelling showed increases in pollutant concentrations impacting the school grounds (S1968). Geelong Environment Council submitted that air emissions from the FSRU could be a health hazard to residents (S1583).

GGs questioned whether the FSRU specifications used in the modelling are truly representative of what might be selected for the Project. The modelling was based on a specific model of FSRU (the Höegh Esperanza), which reflects best practice in terms of air emissions. The final FSRU could be different and have worse air emissions. The potential differences in impacts if a different FSRU were chosen could have been investigated through sensitivity analysis, but were not.

The Proponent submitted that it had sought tenders from a number of potential FSRU suppliers and had undertaken technical comparisons during the shortlisting process, which indicated that the specifications of the Höegh Esperanza were generally representative of all potential FSRUs for the Project. The Proponent submitted that *“emissions will not change significantly from the assessed reference design”* (D480).

In questioning by EPA, Mr Rollings confirmed the Höegh Esperanza represents current best practice and advised that FSRU selection should reflect the best available technology and techniques. He advised that it is possible that the FSRU ultimately selected for the Project could have higher emissions than the FSRU assumed in the modelling. This could change the conclusions of the air quality impact assessment. If this were the case, he advised that additional air quality assessment would need to be undertaken.

Mr Rollings advised that the modelled dispersion patterns from the FSRU reflected the prevailing wind patterns but are also highly dependent on wake effects associated with the FSRU. Mr Rollings confirmed that sensitivity analysis was undertaken by running the model with and without the FSRU present, which confirmed that wake effects are active. However no sensitivity analysis had been undertaken to examine the effect of different FSRU configurations or orientations (D236).

### **(iii) Discussion**

The IAC considers that the air quality criteria adopted in the EES are appropriate. It notes that EPA did not query or disagree with the adopted criteria.

The modelling results indicate that air emissions from the FSRU are not expected to cause air pollutants to exceed the adopted criteria, but would cause significant increases in some pollutants compared to background concentrations (all in micrograms per cubic metre):

- nitrogen dioxide would increase from a background concentration of 28.2 to a maximum of 86.2, compared to a criterion level of 150
- small particulates (PM<sub>2.5</sub>) would increase from a background concentration of 11.5 to a maximum of 19.5, compared to a criterion level of 25
- large particulates (PM<sub>10</sub>) would increase from a background concentration of 27.5 to a maximum of 37.0, compared to a criterion level of 50
- formaldehyde would increase from a background concentration of 6.7 to a maximum of 57.3, compared to a criterion level of 100.

The modelling demonstrates that if the Project is implemented in accordance with all the assumptions in the modelled scenarios, the impacts on air quality would be acceptable. However, there are uncertainties regarding key assumptions, and the effects on air quality if these assumptions are varied.

The concentrations of nitrogen dioxide and formaldehyde (and in some scenarios particulates) would increase substantially during operation, to concentrations much closer to the adopted criteria than current background levels. Without sensitivity testing, it is not possible to be confident that concentrations of these pollutants would not exceed the adopted criteria if key assumptions are varied.

The modelling was based on two key assumptions, neither of which were sensitivity tested:

- performance specifications of the FSRU (only the Höegh Esperanza was modelled)
- configuration of the FSRU (only one configuration was modelled even though pollutant dispersion is affected by wake effects from the FSRU).

Further, it is not clear on the information before the IAC whether the air dispersion modelling included a 'worst case' scenario.

The specific FSRU selected for the Project has not been confirmed. Supply constraints are expected to limit the choice of FSRUs and FSRU selection may need to be made primarily based on availability rather than other criteria such as environmental performance. The Höegh Esperanza represents current best practice, and it is possible that the FSRU selected could have greater impacts on air quality.

That said, the IAC agrees with EPA that the best available technology should be selected, and considers that the licence limits for the FSRU should be set accordingly. The Proponent is confident that the air emissions of the FSRU ultimately selected will not vary significantly from those of the Höegh Esperanza. The IAC does not consider that further sensitivity testing is required in this regard. It will be up to the Proponent to ensure that it selects a FSRU that is capable of meeting those limits.

In relation to wake effects, the IAC considers that some sensitivity testing should have been undertaken. Without it, there is uncertainty regarding the impacts of the Project on air quality (discussed above), and uncertainty as to whether the Project can meet the GED (discussed below). Sensitivity analysis to quantify these uncertainties and potential ‘worst case’ impacts is needed to confirm the Project’s impacts on air quality are able to be acceptably managed. This will also inform whether any conditions need to be included on the FSRU Development Licence regarding the configuration of the FSRU.

The sensitivity testing should also include a ‘worst case’ scenario for air emissions (but based on the use of the best available technology).

## 13.4 Consistency with the general environmental duty

### (i) Key issues

The key issues are:

- whether the air quality risks have been ‘designed out’ consistent with the GED
- whether the proposed ‘bubble limits’ for air emissions from the FSRU are consistent with the GED.

### (ii) Evidence and submissions

EPA indicated in its closing submissions and in response to questions from the IAC that further information from the Proponent regarding air emissions from the FSRU would be required to inform its assessment of the FSRU Development Licence application (D445, D477). EPA’s second RFI (D430) requires the Proponent to provide further information about air emissions, including *“detail regarding the assessment reported on in Technical Report H, proposed emissions limits and monitoring, and detail regarding management of fugitive gas emissions”*.

The Proponent provided an Interim Response that indicated how it intended to respond (D480), but was unable to provide a full response to EPA’s second RFI before the end of the Hearing. In the Interim Response (D480), the Proponent:

- outlined the measures that it would take to minimise air impact emissions during maintenance and start-ups
- reiterated that FSRU emissions are not expected to change significantly from the reference design, but noting that additional modelling may be required to confirm the conclusions of the air quality impact assessment

- submitted that the FSRU will be designed *“to limit the likelihood of fugitive emissions to close to zero”*.

The IAC put questions to EPA as to whether it considered that air quality risks had been appropriately minimised by being ‘designed out’ to the extent practical. EPA responded (D477):

... in general terms, EPA would expect a project at concept or preliminary stages of design to have been developed in a manner which is consistent with the identification of risks and decisions being made to eliminate or reduce those risks.

EPA submitted that based on the information available at the time of the Hearing, *“it is not presently possible to determine the extent to which that has been done, or could be done”* in relation to air emissions (as well as noise emissions and marine discharges) and has therefore requested further information in these areas (D477). Similarly, GGS submitted that *“the Proponent should be required to demonstrate that it is not possible to reduce air quality impacts further”* (S1968).

The Development Licence application for the FSRU proposes ‘bubble limits’ for air emissions based on *“worst case – 4 engines and 2 boilers operating at 100 percent load all year, plus 25 percent tolerance”* (EES Attachment V2, page 86). A ‘bubble limit’ is the maximum amount of a pollutant that is allowed to be discharged from a whole site (EPA Publication 1322.9, 2017).

EPA expressed concerns about the bubble limits, submitting that they *“may allow much higher levels of emissions contrary to the principle of waste minimisation under the GED”* (S1884). In EPA’s first RFI (D5), it required the Proponent to:

- justify bubble limits versus specific stack emission limits
- provide specific limits for each emission stack
- provide revised annual bubble limits, reflecting seasonal variations in regasification rates.

Mr Rollings addressed these matters in his evidence. In his expert witness statement (D46), he advised that bubble limits would give the Proponent greater operational flexibility to operate in peak mode to supply gas to meet market demand. In the Hearing, he explained that stack specific emission limits could also provide operational flexibility, but would require testing equipment to be in place to measure emissions from each individual stack.

Mr Rollings provided revised bubble limits for air emissions that reflect variations across four seasons (D46, Table 7) and these have been adopted by the Proponent for the FSRU Development Licence Application (D458). The revised bubble limits are lower than the bubble limits proposed in the exhibited Development Licence Application (EES Attachment V. Mr Rollings emphasised that the limits would need to be recalculated again when the FSRU has been selected and operational requirements confirmed.

The Proponent’s submissions reflected Mr Rollings’ evidence, including the revised bubble limits. The Proponent expressed a preference for bubble limits rather than stack-specific limits to give it operational flexibility. It submitted (D458) that it:

... requires capability to operate in peak mode to supply natural gas to Victoria when it is required. A constrictive licence limit on air emissions may reduce the ability for the FSRU to operate in peak load and meet market demand.

After considering the Proponent’s submissions and Mr Rollings’ evidence, EPA was not satisfied that the proposed licence limits were consistent with the GED (D445). Its primary concern with the bubble limits was that they were proposed on the basis of prioritisation of operational flexibility rather than minimisation of risks of harm.

The IAC asked EPA whether the FSRU air emission limits had to be either stack specific or bubble limits, or whether a combination could be adopted to provide the flexibility required to meet peak demand, while minimising air emissions to meet the GED. EPA responded that it did not have a concern with bubble limits in general, noting that bubble limits, stack specific limits, or a combination of both types are all potentially workable approaches to controlling air emissions. EPA emphasised the importance of minimising risks of harm. It submitted that (D445):

In this case, EPA is unable to identify whether a particular bubble limit or combination of bubble limits (for example, different limits for different times of year, or different operating modes, or the like) could be set in a way which does minimise risks of harm.

### **(iii) Discussion**

As discussed earlier in this Chapter, there is some uncertainty in the air dispersion modelling. Given the uncertainty, the IAC cannot be satisfied that air quality risks have been appropriately designed out to meet the GED. The IAC has recommended further sensitivity testing to address these uncertainties.

EPA requested the Proponent to provide further information regarding bubble limits versus stack specific limits. The Proponent's response emphasised the importance of operational flexibility. It did not provide any information about the environmental implications of bubble limits compared with stack limits, such as any effects on pollutant dispersal and impacts on sensitive receptors.

The IAC agrees with EPA that the GED requires licence limits to be set based on minimisation of risks of harm rather than prioritisation of operational flexibility. It accepts EPA's submissions that the Proponent has not adequately demonstrated air emission compliance with the GED in relation to proposed licence limits for FSRU air emissions because of its focus on operational flexibility rather than minimisation of environmental harm.

Bubble limits are permissible for air discharges (EPA Publication 1322.9 December 2017), and the IAC notes that EPA has no in principle objection to the use of bubble limits in this instance. However, the IAC does not have sufficient information before it to determine whether stack limits would provide significant environmental benefits compared to bubble limits. The sensitivity analysis on FSRU configurations should include a comparison of the effects of bubble limits versus stack limits in relation to air quality impacts on sensitive receptors.

The Proponent should continue to work with EPA to resolve this issue and other outstanding matters, including questions identified in EPA RFI002392 (D430).

## **13.5 Impacts of the treatment facility**

### **(i) Key issues**

The key issues are:

- whether odour impacts from the treatment facility should have been assessed
- whether odour impacts will be acceptable.

### **(ii) Evidence and submissions**

GGs (D379) submitted that the EES air quality assessment was incomplete because it did not model odour impacts from the treatment facility. It noted that the odorant (mercaptan) is extremely pungent, and raised a concern that no information was provided on the likely frequency of venting and maintenance at the treatment facility. Submitter S1655, a local resident, raised a

concern that the cumulative impacts of existing odours from the Refinery and additional odours from the Project would make the area unliveable.

Mr Rollings confirmed that the air quality assessment excluded the treatment facility because there were no expected fugitive emissions, and venting would only occur during maintenance and emergency situations. The air quality assessment also excluded FSRU venting, because venting is not a normal process or operating scenario and would only occur during maintenance or emergency situations.

In response to questioning from the IAC, Mr Rollings prepared a memorandum on emergency or maintenance air emissions from the treatment facility (D206). He confirmed that relevant pollutants are natural gas, nitrogen and mercaptan:

- Natural gas consists mainly of methane, which disperses easily, is non-toxic, non-carcinogenic and is not considered to be a pollutant by EPA (although it is a GHG). It is an asphyxiant and would require safe work procedures for the treatment facility and FSRU that would reduce the likelihood of offsite impacts.
- Nitrogen is non-toxic and non-carcinogenic. The potential for asphyxiation from a nitrogen loss of containment event is limited to the treatment facility site.
- Mercaptan is highly odorous but has very low toxicity and is unlikely to have effects on the health of sensitive receptors.

### **(iii) Discussion**

In addition to licensed operational releases, emergency or maintenance air emissions will occur but have not been included in the EES air quality assessment (either for the treatment facility or for the FSRU).

The IAC accepts Mr Rollings' advice (D206) that accidental releases of natural gas are appropriately addressed through the safety hazard and risk assessment. It also accepts his advice that workplace safety measures to address accidental releases of natural gas and nitrogen will contribute to minimisation of offsite impacts.

The IAC notes the concerns expressed by GGS and others about potential effects of odorant releases from the treatment facility on local amenity. It also notes advice from Mr Rollings (D206) that no intentional releases of odorant are proposed, and the treatment facility will include filters to remove any odorant if there should be a minor leak. Safety and hazards from a major incident are considered in Chapter 11.7.

The IAC recommends that the mitigation measures include a requirement for the odorant treatment and delivery to minimise the risk of odorant releases as far as reasonably practicable, and to monitor and publicly report all odorant releases, with a view to assessing and if necessary improving the performance of the odorant management arrangements. A similar condition should be included on the Development Licence should one be issued.

## **13.6 Construction impacts**

### **(i) Key issue**

The key issue is:

- whether the mitigation measures for controlling air quality during construction (primarily from dust) are appropriate.

**(ii) Evidence and submissions**

A number of submitters, including GGS, raised concerns about air quality impacts during construction. EPA, GGS and an individual submitter (Mr Dillon, S1852) all submitted that the mitigation measures to address construction impacts on air quality needed to be strengthened.

GGS submitted that the mitigation measures for dust needed to be improved by increasing the emphasis on avoiding dust creation in the first place, and providing clear, objective, and enforceable triggers for additional actions during heightened levels of dust. Submitter S1852 submitted that the mitigation measures for construction impacts on air quality are not sufficiently prescriptive and do not go far enough towards preventing impacts. He also expressed doubts about effective implementation without independent oversight.

Mr Rollings' evidence was that Project construction works have the potential to cause short term, localised air quality impacts, mainly from the generation of dust. He advised (D154):

... with the implementation of recommended construction dust mitigation measures ... it is anticipated that potential dust impacts would be 'negligible' at all nearby sensitive receptors and that there would be no residual impacts during the construction phase of the Project.

EPA proposed redrafting MM-AQ06 and MM-AQ07 to strengthen provisions for managing the impacts of construction on dust. The Proponent accepted EPA's proposed changes (D456). GGS proposed a further change to MM-AQ07 after the Hearing (D505).

**(iii) Discussion**

The IAC considers that the assessment of construction impacts on air quality in the EES (including Technical Report H) is appropriate. It agrees that the mitigation measures to address construction impacts on air quality should be strengthened by revising MM-AQ06 and MM-AQ07 as proposed by EPA. These are reflected in the Part C version of the Mitigation Register (D456). It also agrees with EPA and GGS (D503 and D505) that MM-AQ07 should be further amended to require dust suppression measures to be implemented for any dust source rather than that being contingent on whether dust is causing a hazard. It has included changes to MM-AQ07 to this effect in the IAC recommended version of the mitigation measures in Appendix G in Report No. 2.

**13.7 Findings and recommendations**

The IAC finds:

- Sensitivity analysis should be undertaken of wake effects of the FSRU. Depending on the results of the sensitivity testing, conditions may be required on the Development Licence (should one be issued) in relation to the configuration of the FSRU.
- Based on the information before it, the IAC is not satisfied that the proposed bubble limits for air emissions comply with the GED, on the basis that they prioritise operational flexibility rather than minimisation of risks of harm. The IAC is unable to determine on the information before it whether stack specific limits would provide any environmental benefits over bubble limits. This should be the subject of further sensitivity testing.
- The mitigation measures should include a requirement for the odorant treatment and delivery to minimise the risk of odorant releases as far as reasonably practicable, and to monitor and publicly report all odorant releases.
- Potential impacts of construction on air quality are predominantly associated with dust and can be acceptably managed by implementing relevant mitigation measures as amended by the IAC. MM-AQ07 should be amended to require dust suppression

measures to be implemented for any dust source rather than being contingent on whether dust is causing a hazard.

### Further work

The IAC recommends:

**Undertake sensitivity testing on the air quality modelling to confirm that operational impacts on air quality would be acceptable. Consider:**

- a) the significance of the wake effects of the floating storage and regasification unit
- b) a 'worst case' scenario for air emissions (but based on the use of best available technology)
- c) the implications of bubble limits and stack specific limits for sensitive receptors.

### Environmental Management Framework

The IAC recommends:

**Amend the air quality mitigation measures as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2:**

- a) amend MM-AQ07 to require dust suppression measures to be implemented for any dust source
- b) insert a new mitigation measure MM-AQ12 to require minimisation of odorant emissions.

### Development Licence

Should Development Licences be issued, the IAC recommends:

**Consider whether conditions should be included on the Development Licence for the floating storage and regasification unit regarding:**

- a) the configuration of the floating storage and regasification unit, based on the results of the further air dispersion modelling that considers wake effects
- b) minimisation of odorant emissions.

## 13.8 Overall conclusions on air quality impacts

Further information is required to determine whether air quality impacts are consistent with the evaluation objectives and relevant policy and legislation including the GED. This includes:

- sensitivity testing of the wake effects of the FSRU
- demonstration that the modelling includes a 'worst case' scenario (but based on the use of the best available technology)
- a comparison of the effects of bubble limits versus stack limits in relation to air quality impacts on sensitive receptors
- a response to the air quality issues raised in EPA's second RFI.

## 14 Groundwater and surface water

### 14.1 Introduction

The most relevant evaluation objective is:

To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

Groundwater impacts are discussed in EES Chapter 10. Supporting reports and studies include:

- Technical Report E: Surface water impact assessment
- Technical Report F: Groundwater impact assessment.

Table 21 lists the groundwater evidence. No evidence was called in relation to surface water.

**Table 21** Groundwater impact evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D44	Bryan Chadwick, AECOM	Groundwater impacts	Lead technical reviewer for AECOM (groundwater) in support of their Quality Management procedures (refer to D164)

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI
- D211 – Technical Report F Updated Figures.

The following relevant guidelines were tabled by the Proponent:

- D120 – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- D122 – Consolidated Environmental Reference Standard prepared by EPA, 29 Mar 2022
- D160 – EPA Guide to the Environment Reference Standard, publication 1992.

### 14.2 What did the EES say?

#### (i) Overview

##### Groundwater

The groundwater assessment investigated the effects of intrusive works and infrastructure on groundwater levels and flow in the onshore section of the Project area. It was based on a desktop review and targeted field program. The field program included five new groundwater monitoring wells that supplemented the information from the Refinery’s ongoing groundwater monitoring program.

The groundwater study area included the underground pipeline, treatment facility and Shell Parade culvert, together with a 200 metre buffer. Three shallow aquifers occur in the study area (Quaternary alluvium, Upper Tertiary/Quaternary Basalt and Upper Tertiary Aquifer). There are four registered private groundwater bores in the groundwater study area but no potential terrestrial or aquatic groundwater-dependent ecosystems.

The EES reported limited potential for groundwater to be intersected during construction, other than where the underground pipeline will be constructed by horizontal directional drilling (HDD). The water table is generally lower than the anticipated depth of works (generally up to 2 metres) except for HDD (which could be up to 25 metres in depth).

If groundwater is intersected during trenching, short term dewatering will be required, resulting in temporary localised lowering of the water table. Groundwater extraction or dewatering is not required for HDD.

Project operation is not expected to have any impacts on groundwater levels or flow.

### Surface water

Surface runoff from the Project area drains to Hovells Creek and Corio Bay. The Project is not located within a floodplain and does not intersect any low lying or flat areas that are subject to flooding.

The onshore pipeline has one waterway crossing, which will be constructed by open trenching. The waterway is a minor ephemeral tributary of Hovells Creek that has already been significantly modified. Construction of the pipeline crossing is expected to have minimal short term impacts on the waterway.

Runoff water quality may be impacted by Project construction, including trench dewatering, water and sediment runoff from disturbed areas, and spills. Industry standard mitigation measures are proposed to manage and mitigate these potential impacts.

Impacts of Project operation on surface water quality are expected to be limited. Stormwater runoff from the treatment facility will be diverted to the Refinery's existing runoff water system and spill management system.

Residual impacts of the Project on surface water are expected to be minor.

### (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 22.

**Table 22** Proposed mitigation measures for groundwater and surface water impacts

Mitigation ID	Mitigation Measure	Project Phase
MM-GW01	Loss of registered bores	Construction
MM-SW01	Discharge water	Construction
MM-SW02	Managing runoff	Construction
MM-SW03	Watercourse trenching	Construction
MM-SW04	Capture and treat runoff from treatment facility	Operation
MM-CO02	Contaminated groundwater	Construction
MM-CO03	Contaminant migration	Construction
MM-CO05	Acid sulfate soils	Construction
MM-CO07	Hydrotest water	Construction
MM-CO08	Fuel and chemical leaks and spills	Construction Operation

The EMF includes protocols for sediment, erosion and water quality (surface water and groundwater) management during construction and maintenance (in the EMP), surface water discharge management and groundwater management (in the CEMP – Pipeline), and monitoring parameters for discharge water from construction areas and watercourse trenching.

### **(iii) Conclusion**

EES Chapter 10 concluded that impacts of the Project on groundwater and surface water would be minor and can be acceptably managed through the mitigation measures.

## **14.3 Groundwater**

### **(i) Key issue**

The key issue is:

- impacts of underground pipeline, treatment facility and Shell Parade culvert construction on groundwater levels and flow.

Contamination issues relating to groundwater are discussed in Chapter 17.1 of this Report.

### **(ii) Evidence and submissions**

Mr Chadwick summarised and confirmed the findings of the EES assessment of groundwater impacts, and tabled time-series plots of groundwater levels (D211) at the IAC's request.

Mr Chadwick advised that the Project is not expected to impact groundwater flows or levels. Open trenching for construction of the gas pipeline is unlikely to intersect groundwater (trench depth would be typically 2 metres). Should groundwater be intersected, short term dewatering would cause temporary localised reductions in groundwater levels but no long term impact. The deeper sections of the pipeline constructed by HDD are expected to intersect groundwater, but dewatering is not anticipated to be necessary and the pipeline is not expected to obstruct groundwater levels or flow.

Southern Rural Water submitted that groundwater interception during construction is incidental to the purpose of the Project and does not require groundwater licences or bore construction licences (D26). It noted that Project construction will impact on groundwater systems through trenching, HDD, thrust boring and installation of foundations and piles. However, it considered that the EES provides "*a reasonable basis*" for understanding that groundwater impacts from construction and operation would be negligible.

EPA's submissions in relation to groundwater focused on exposure of acid sulfate soil and rock, and management of groundwater contaminant plumes. EPA recommended changes to mitigation measures and recommended that the CEMP should include triggers to monitor and manage impacts to groundwater (including groundwater levels, flow and quality) when intercepted (S1884).

GGs's and GeelongPort's submissions on groundwater related to contamination issues. LEAN Victoria (S1606) submitted that the EES does not demonstrate the Project meets the GED in relation to groundwater, amongst other things. Mr Dillon (S1852) made detailed submissions about the mitigation measures relating to groundwater. He raised concerns about impacts on private landholder bores, disposal of dewatered trench water, groundwater monitoring arrangements and management of contamination in relation to groundwater.

Mr Chadwick responded to Mr Dillon’s submission about impacts on private landholder bores by stating that “no registered bores exist within the groundwater study, nor have any bores have been sighted during site inspections of the proposed pipeline route” (D44). This advice differs from the EES, which identified four registered bores in addition to the Refinery monitoring network bores. Mr Chadwick advised that following detailed design of the Project, the location of registered and unregistered bores will be visually confirmed. Prior to construction, the Proponent would consult with bore owners or landholders and establish an agreement between the Proponent and the landholder/bore owner if the bore is deemed to be impacted by the Project.

### (iii) Discussion

The IAC accepts that the EES assessment of impacts on groundwater levels and flow is appropriate, and that impacts on groundwater will be minor.

Review of the time series plots of groundwater levels prepared by Mr Chadwick (D211) indicates that several bores in the vicinity of Shell Parade have groundwater depths of 2.5 to 3.0 metres. This compares with construction depths of 2 metres for open trenching or up to 3 metres for thrust boring (EES Technical Report F), suggesting that dewatering during construction may be required. Mitigation measure MM-CO03 requires that “dewatering of groundwater or perched water will be avoided”. The IAC recommends this should apply to Project design in addition to construction, for example to inform decisions regarding the suitability and maximum depth of thrust boring.

The IAC agrees with EPA that the CEMP should include triggers to monitor and manage impacts to groundwater (including groundwater levels, flow and quality) when intercepted, to minimise impacts associated with groundwater contaminant plumes. The IAC supports EPA’s proposed changes to mitigation measures to address acid from acid sulfate soils that may affect groundwater (see Chapter 17.1 for further discussion).

Four registered private landholder bores were identified in the EES. Mr Chadwick advised that the location of existing bores (registered and unregistered) will be confirmed following detailed design and landholder agreements negotiated, as required by MM-GW01. The IAC considers this to be an appropriate response.

## 14.4 Surface water

### (i) Key issues

The key issues are:

- local and downstream impacts of pipeline trenching across the unnamed tributary of Hovells Creek
- dewatering of surface water from open trenches and excavated areas during construction
- runoff from disturbed areas during construction
- stormwater runoff from the treatment facility during operation
- spills during construction and operation.

### (ii) Evidence and submissions

No evidence on surface water was called.

EPA (S1884) submitted that it had reviewed Technical Report E and reported that its comments from the EES Technical Reference Group process pertaining to surface water had been resolved. The Corangamite Catchment Management Authority did not make a submission.

A number of community submitters drew attention to the value of the Ramsar wetland and the local waterways that feed into it including Hovells Creek, and expressed broad concerns about the impacts of the Project on them. Mr Dillon (S1852) expressed concern about potential surface water and land pollution resulting from the Project despite, or even as a result of, the proposed mitigation measures.

### (iii) Discussion

The EES's assessment of impacts on surface water is appropriate, and demonstrates that impacts on surface water will be minor.

The most significant issue in relation to surface water is the trenched construction of the underground pipeline crossing through an unnamed tributary of Hovells Creek. This waterway already has significant modifications, including a freeway crossing, existing underground pipeline crossings and a dam. However, Hovells Creek has been identified as a high priority waterway in the *Corangamite Catchment Management Authority 2014 Waterway Strategy* due to its environmental condition and social amenity value.

The unnamed tributary joins Hovells Creek upstream of the Ramsar wetland, so runoff from the construction site could potentially also affect the Ramsar Wetland. Risks to Hovells Creek and the Ramsar Wetland will be reduced if the crossing is constructed during no flow conditions, and given the waterway is ephemeral, the IAC sees no need for this requirement to be qualified by only being required 'where practicable'. The IAC recommends MM-SW03 be modified by removing the qualification.

Impacts of watercourse trenching can be adequately mitigated through MM-SW03. Consent from the Corangamite Catchment Management Authority is also required under the *Water Act 1989*. The other surface water issues, including trench dewatering, stormwater runoff and spills, can be adequately managed by applying the mitigation measures set out in the EES.

## 14.5 Findings and recommendations

The IAC finds:

- The impacts of Project construction on groundwater levels and flow will be minor.
- Impacts on private land holder bores will be adequately managed through MM-GW01.
- Project operation is not expected to affect groundwater flows or levels.
- The potential impacts of the Project on surface water, including the receiving waters of Hovells Creek and Corio Bay and the Ramsar Wetland, are manageable through the mitigation measures proposed in the EES.
- The residual impacts of the Project on surface water are expected to be minor.
- Minor adjustments are recommended to MM-CO03 and MM-SW03.

### Environmental Management Framework

The IAC recommends:

**Amend the contamination and surface water mitigation measures as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2:**

- a) amend MM-CO03 to require that dewatering of groundwater or perched water be avoided in Project design as well as construction
- b) amend MM-SW03 by deleting the qualification that the requirement for the trenched watercourse crossing to be constructed during no flow conditions will only apply 'where practicable'.

## 14.6 Overall conclusions on groundwater and surface water

The groundwater and surface water impacts are consistent with the draft evaluation objectives and relevant policy and legislation, and can be acceptably managed through the IAC's recommended mitigation measures.

## 15 Land use impacts

### 15.1 Introduction

The relevant evaluation objective is:

To minimise potential adverse social economic, amenity and land use effects at local and regional scales.

Land use impacts are discussed in EES Chapter 11. Supporting reports and studies include Technical Report M: Land use impact assessment.

Table 23 lists the land use impact evidence.

**Table 23 Land use impact evidence**

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D49	Kristina Butler, AECOM	Land use impact	Technical reviewer of Technical Report M and draft PSA (refer to D163)
<b>GeelongPort*</b>			
D79	Stuart McGurn, Urbis	Planning	Independent expert

\* GeelongPort withdrew from the Hearing on Day 26, but had already presented its evidence.

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI
- D98 – Presentation to IAC from DELWP Impact Assessment Unit (IAU)
- D167 – Technical Note 1: Extension to Port Zone.

### 15.2 Context

The Planning Scheme sets out objectives, policies and provisions relating to the use, development, protection and conservation of land in CoGG. Relevant parts of the Planning Scheme are summarised in Report No. 2 in Appendix F.

The draft PSA has been prepared to provide planning approval for the Project. The draft PSA is discussed in Chapter 20.1.

### 15.3 What did the EES say?

The construction and operation of the Project potentially impact existing and future land uses or land use policies. Potential impacts from construction include temporary land use changes and temporary impacts to access and amenity. The EES assessed these impacts as being short-term. The EES did not identify any land use impacts from operation of the Project.

The study area for Technical Report M included land within:

- a 500 metre catchment of all above ground Project infrastructure including the FSRU, the Refinery Pier extension, the aboveground pipeline along Refinery Pier and within the Refinery, the treatment facility and the temporary loadout facility

- a 200 metre catchment of the underground pipeline connecting the treatment facility to the VTN tie-in point near Lara.

Technical Report M observed that the Project will be situated within a heavily developed port and industrial area, and that the Project is consistent with policies seeking to enhance the function of the Port.

There are no proposed mitigation measures for land use impacts. The EES stated that the residual impacts of the Project on land use and land use policies would be negligible or minor with the mitigation measures proposed as part of other technical studies and through the CEMP and OEMP.

EES Chapter 11 concluded the Project would have a minor impact on land use during construction and the operation of the Project would not impact upon current or foreseeable land uses within the area.

## 15.4 Key issues

The key issues are:

- the Project's consistency with land use planning policy
- the extent and duration of anticipated land use impacts.

## 15.5 Evidence and submissions

Ms Butler relied on other work undertaken in the EES process in relation to hazard, noise, air pollution, traffic, ecology, landscape and visual impacts and social and business impacts, as well as project need.

Ms Butler's evidence was that Technical Report M was thorough in its assessment of land use impacts. It:

- identified and assessed potential environmental impacts on existing and future land uses in the construction, operation and decommissioning stages of the Project
- included a desktop assessment of land uses within the study area
- considered land use impacts within the 1,000 metre 'Outer Safety Area' for MHFs, and the measurement length for the pipeline
- identified existing conditions within the study area
- described:
  - relevant state and local planning policies
  - port strategies
  - structure plans
  - planning zones and overlays
  - other statutory controls that informed the assessment of potential impacts
- considered what mitigation measures would be required to avoid, minimise and manage potential land use impacts.

Ms Butler's evidence was:

- the Project benefits from broad planning policy support as it would reinforce the continued function of the Port of Geelong and deliver new employment opportunities in the industrial sector

- impacts to the natural environment were mitigated through the Project being predominantly located in an industrial area, co-locating the infrastructure with existing infrastructure and by undergrounding a large portion of the pipeline
- relying on Technical Report N (the safety, hazard and risk assessment):
  - the Project, while introducing new risk profiles to land outside the Refinery, poses a negligible incremental risk
  - the Project is compatible with GGS and other sensitive uses in the study area
- from a land use planning perspective, the pipeline is compatible with all land uses along its alignment, noting that:
  - a residential construction classification (the most stringent sensitive use location class) was applied to the entire pipeline length despite a considerable portion of the alignment not being close to sensitive uses
  - the pipeline had been designed to a 'no rupture' standard.

Ms Butler concluded that subject to implementation of the EMF and development of the Project in accordance with the requirements of the Incorporated Document the key components of the Project are acceptable from a land use planning perspective and that Technical Report M had satisfactorily identified and assessed the relevant land use considerations.

Relying on the Technical Report M and Ms Butler's evidence, the Proponent submitted that the Project is consistent with relevant land use policy and the applicable zones, given its location within the Port of Geelong and surrounding industrial area. It submitted that the Project would support the overarching strategic imperatives of the Port and its ongoing role as a key economic driver for Geelong.

Mr McGurn gave planning evidence for GeelongPort. In summary, his opinions were:

- the Port is identified in state and local planning policy as state significant infrastructure, with a role as a 'national transport and logistics precinct', and is recognised as making a significant contribution to the economy of Geelong and Victoria
- at a high level the Project is consistent with the existing operations and functions of the Port and the applicable Port and Industrial zoning (subject to acceptable operation and environmental impacts)
- any development proposal at Refinery Pier must not prejudice the long term operations, viability or strategic objectives of the wider Port described within the *Geelong Port Development Strategy 2018*
- land use and development which has the potential to unreasonably frustrate the use of existing assets or expansion opportunities within the Port cannot be seen to be aligned with the strategic role of the Port
- given the strategic significance of the Port, there should be certainty that the Project will not unreasonably interfere with port operations.

Mr McGurn noted that the evidence of Mr Mannion and Dr Pillay raised concerns with respect to the operational impacts and risks of the Project on the Port and its surrounds. On this basis Mr McGurn concluded that the Project and the draft PSA "*could not be considered to be consistent with the overarching policies*" which apply to the Port.

Mr McGurn qualified this opinion, stating (D79):

Notwithstanding the above, I consider that if the Project can demonstrate that the impacts on the Port and environmental and offsite impacts of the Project are acceptable, then:

- The broader project impacts on the surrounding land use are acceptable, subject to my observations regarding risk and environmental impacts as well as implementation of stated mitigation measures through the Incorporated Document.

GGs submitted that the land use assessment paid insufficient attention to the impacts of introducing an additional MHF to an area adjacent to the school, noting that staff and students both live and work there. GGS relied on the submissions of GeelongPort that:

- the Project has the potential to have unacceptable impacts on the operations and future expansion opportunities at the Port
- it cannot conclude, on the information available to the IAC, that those impacts can be acceptably managed and mitigated
- the EES failed to identify and assess the land use impacts on the Port or GeelongPort as the landowner and port manager of the Port
- the EES failed to consider, at all, these impacts in context of the strategic planning policy that applies to the Port.

The Proponent responded that any submission that the Project was inconsistent with the strategic policy framework relating to the Port including the *Geelong Port Development Strategy 2018* (Port Strategy) would be inconsistent with Mr McGurn’s evidence, and that the Port Strategy “accommodates, if not encourages” the Project. It submitted (D453):

... it is difficult to envisage how a “State significant” industrial project intended to provide energy security can reasonably be said to be inconsistent with a strategy that seeks to emphasise the growth and development of the Port. This is especially so where the Project, if given approval, will result in the creation of infrastructure that will provide greater flexibility for the Port to accommodate future projects (e.g. pier and dredged ship basin).

CoGG was satisfied with the content and findings of Technical Report M and that it provides sufficient justification for the Minister to approve the draft PSA under section 20(4) of the PE Act.

Ms Fisher (D143) submitted that the PE Act establishes a framework for the planning, use, development and protection of land in Victoria in the present and long term interests of all Victorians. She urged the IAC to have particular regard in its assessment to the long term needs of all Victorians.

A large number of community and resident submitters expressed concern that the Project would create adverse and unacceptable safety and amenity risks, including due to the proximity of the shipping channel to existing residential communities. These submissions are addressed in Chapters 11, 12, 13 and 17.2 of this Report.

## 15.6 Discussion

The IAC is satisfied that Technical Report M has appropriately identified, documented and assessed the likely land use impacts associated with the construction and operation of the Project. The assessment was detailed and appropriately had regard to the recommendations and conclusions of relevant specialist impact assessments in relation to amenity, safety and heritage impacts. The IAC’s assessment and findings in relation to each of these specialist inputs are addressed separately.

That said, while Technical Report M provided an overview of the Port Strategy it did not provide a thorough assessment of how the Project could impact on existing or future Port operations. The withdrawal of the GeelongPort’s opposing submissions mitigate the IAC’s concern in this regard.

There is significant state and local planning policy support for the use and development of land in the Port and its environs in the manner proposed by the Project. Particular parts of the Planning Scheme that lend support to the Project (which are summarised in Report No. 2 in Appendix F) include:

- the objective and strategies in Clause 18.02-6S (Ports)
- the strategic directions for the Port outlined in Clause 02.03-7 (Economic development) of the Municipal Planning Strategy.

The IAC agrees with the Proponent that planning policy, when taken together, “*clearly earmarks the Project area as an area prioritised for uses and associated infrastructure vital to Victoria’s supply needs and State and local economies*” (D453).

Consistent with the evidence of both Ms Butler and Mr McGurn, the IAC is satisfied that the Project’s proposed location is identified by the planning policy framework as land prioritised for shipping, trade and industrial activity. The Project is compatible with the existing port and industrial setting, and the IAC is satisfied that the potential land use impacts of the Project on the operation of the Port can be acceptably managed.

This finding has been influenced significantly by the formal withdrawal of GeelongPort’s opposing submissions. The IAC considers that GeelongPort, as a manager of the Port, would not have withdrawn its submissions if it was concerned that the Project would materially impact the existing or future functioning of the Port.

The IAC acknowledges the submissions that the Project is located too close to sensitive land uses including GGS and the nearby residential areas of North Shore, Corio and Norlane. However no evidence was presented to the IAC that the proposed location is inconsistent with planning policies and controls relating to land use conflict, the location of MHFs or buffers around MHFs. Provided the safety and amenity impacts of the Project are appropriately managed, the IAC is not persuaded that the Project’s location in relation to GGS or nearby residential areas is inappropriate or inconsistent with land use policy.

The evaluation objective requires potential adverse land use effects to be minimised. The IAC is satisfied that the EMF and EMPs as proposed in the draft Incorporated Document are an appropriate way of minimising potential land use impacts. The IAC’s findings on whether specific impacts can be managed within acceptable limits are set out in the other chapters in Part B of this Report.

## 15.7 Findings

The IAC finds:

- Technical Report M provides an adequate assessment of the likely land use impacts associated with the construction and operation of the Project.
- The Project is generally consistent with land use planning policy for the Port of Geelong and the industrial area within which the Project is proposed to be located.
- Subject to the Project’s amenity and safety impacts being able to be managed appropriately, the IAC is satisfied that the Project is acceptable from a land use planning perspective.

## **15.8 Overall conclusions on land use impacts**

Provided the safety and amenity impacts of the Project can be managed appropriately, the land use planning impacts of the Project are consistent with the evaluation objective and relevant policy and legislation. There are no land use impacts that preclude the Project being approved.

## 16 Social and business impacts

### 16.1 Introduction

The relevant evaluation objective is:

To minimise potential adverse social economic, amenity and land use effects at local and regional scales.

Social and business impacts are discussed in EES Chapter 11. Supporting reports and studies include Technical Report L: Social and business impact assessment.

Table 24 lists the social and business impact evidence.

**Table 24 Social and business impact evidence**

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D41	Anthony King, AECOM	Business impacts	Final reviewer of Technical Report L (refer to D146)
N/A	Melissa Bailey, AECOM	Social impacts	Oversight of the methodology and rigour of the social impacts assessment, reviewer of the social impacts aspects of Technical Report L
<b>GeelongPort*</b>			
D70	Martin Mannion, Mannion Marine	Maritime and port operations safety	Independent expert

\* GeelongPort withdrew from the Hearing on Day 26, but had already presented its evidence

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI
- D175 – Viva Energy Gas Terminal Project Consultation Plan, July 2021
- D432 – Technical Note 8: Community Consultation and Engagement.

### 16.2 What did the EES say?

#### (i) Overview

The EES included a baseline socio-economic assessment that analysed statistical data relating to demographic, disadvantage, and health and wellbeing indicators in the local community. The assessment determined that the local area (with the exception of GGS) is disadvantaged when compared to wider Geelong and Greater Melbourne.

Key sensitive social receptors are housing and residential areas near the Project. The EES acknowledged community concern about safety issues associated with the Project.

The local business environment was identified as including the Port of Geelong and surrounding industrial areas. The EES identified the key business stakeholders that could be impacted by the Project as GeelongPort, Incitec Pivot, Quantem and GGS.

The EES identified and assessed the Project's likely impacts on local residents and businesses. The anticipated impacts during construction were broadly described as disruption to access, traffic, visual impacts, noise, light spill, marine ecology, safety and dust. All impacts were determined to have a rating of either negligible or minor negative.

The EES determined the impacts during operation would include increased psychological stress for some residents and businesses, potential economic impact to GGS through lower enrolments, the visual impact of the FSRU, possible delays to ship movements, potential ecological impacts to the health of the waterway impacting on the ability of locals and tourists to enjoy the natural environment, and potential economic impacts to aquaculture businesses in Corio Bay and the wider Port Phillip Bay. All of these impacts were rated either negligible, minor or moderate negative.

## (ii) Mitigation measures

Proposed mitigation measures are summarised in Table 25.

**Table 25** Proposed mitigation measures for social and business impacts

No.	Mitigation Measure	Project timing
MM-SB01	Consultative mechanism for information and enquiries	Construction Operation
MM-SB02	Consultation and arrangements with Quantem	Operation
MM-SB03	Employment plan	Construction Operation
MM-SB04	Social procurement plan	Construction Operation
MM-SB05*	Community Program	Construction Operation

\* New proposed mitigation measure included in Part C Version (D456)

## (iii) Conclusion

EES Chapter 11 concluded the majority of potential social and business impacts identified would be minor as a result of the:

- siting of the Project within an existing port and industrial area
- existing amenity in the immediate vicinity of the Project area
- limited number of businesses in the area
- limited number of residents nearby
- absence of social infrastructure in close proximity to the Project
- proposed mitigation measures to avoid, minimise and manage potential impacts.

## 16.3 Business impacts

### (i) Key issues

The key issues are:

- adequacy of the assessment of business impacts
- extent and adequacy of consultation with the business community

- adequacy and likely effectiveness of proposed mitigation measures.

**(ii) Evidence and submissions**

Mr King adopted Technical Report L as the basis of his evidence. His evidence statement only addressed business impacts. He gave evidence that the methodology adopted in assessing business impacts included:

- a desktop review of:
  - the findings and results of other EES technical studies
  - relevant legislation and social policies
  - ABS census data
  - concept plans and project description
- identification of a business impact study area that focused on the commercial and industrial area around the Port of Geelong, the Refinery site and GGS
- a review of existing conditions through a combination of desktop research, stakeholder consultation and a manual count of surrounding business sites using Google Maps
- identification of construction and operation issues and screening values consistent with the EES's risk-based screening methodology
- a total of 10 consultation meetings with the following identified stakeholders:
  - Geelong Chamber of Commerce (one meeting)
  - GGS (two meetings)
  - GeelongPort (two meetings)
  - G21 (two meetings)
  - Incitec Pivot (one meeting)
  - Ports Victoria (one meeting)
  - Quantem (one meeting)
- documentation of potential impacts to local businesses and the community.

Mr King identified that the key findings in relation to business impacts focused on the potential impacts to two businesses, GGS and GeelongPort.

In relation to the potential impacts on GGS, Mr King relied on the outcomes of other technical studies including air quality, traffic and noise. Based on the findings of those studies, he concluded that it is reasonable to assume that potential amenity and safety concerns would not materially affect the business of GGS.

In relation to business impacts on GeelongPort, Mr King's evidence was (D41):

GeelongPort also expressed concern about the impact that the construction and operational of the FSRU and pipeline would have on its operations. No detail was provided to evidence these concerns. It is understood, however, that GeelongPort's main concern at the time related to ongoing access to Refinery Pier. Viva Energy has indicated that access for GeelongPort staff and users (both landside and marine side) would be continued throughout the construction and operational phases of the project. It is my understanding that there are ongoing discussions between Viva Energy and GeelongPort on access and commercial issues which are beyond the scope of this evidence.

Mr King's evidence was the large-scale retail stores to the north and south of the Project area, and the dining and hotel establishments to the west, are unlikely to experience adverse impacts from the Project. Due to separation distance of 600 metres or more, *"emissions impacts are expected to be negligible, and their operations will not be impacted by changes in road access"* (D41).

Mr King's evidence was that aquaculture businesses in the wider Port Phillip Bay area are unlikely to be affected by water quality impacts as they are remote from the Project area.

Relying on Technical Report L and the evidence of Mr King, the Proponent submitted that the Project will bring new skills, economic activity and opportunities for Geelong including 150 to 200 construction jobs and 50 to 70 permanent positions. It submitted that (D200):

Any concerns raised about the sufficiency of Technical Report L are not justified and it represents a careful and detailed consideration of the likely social and business impact of the Project, which impacts are appropriately addressed by the proposed mitigation measures.

In relation to potential impacts on the operations of the Port of Geelong, the Proponent noted that over 50 percent of all trade at the Port is on behalf of the Proponent. Further, no concerns about compatibility with any future development proposals at the Port were raised in the consultation sessions involving GeelongPort.

Mr Mannion provided evidence on port planning and operations. Referencing the Hydrogen Hub project in particular, his evidence was (D70):

...the Project will impact on GeelongPort's strategic purpose in meeting the needs of existing and future trade, as well as conflict with GeelongPort's own development plans, which are intended to meet those needs.

In reaching this finding Mr Mannion highlighted a number of safety, risk and operational concerns with the marine elements of the Project. These matters are explored in Chapter 11 of this Report.

GGs submitted that the business impact assessment failed to adequately consider the relevant impacts, in part due to the failure to consult in a comprehensive and robust way with affected community and business stakeholders. It submitted (D379):

Even where this consultation did occur, it did not then lead to any meaningful consideration or investigation of the matters raised during the consultation.

In support of the above observation, GGS submitted that a number of concerns it raised through consultation meetings were not given due consideration or assessment in the EES including:

- potential impacts on its land adjacent to MacGregor Court for agricultural use and educational purposes
- the potential for the pipeline to preclude future uses and expansion of uses of its land
- the safety risks associated with the FSRU, pipeline and treatment facility
- diminished visual amenity
- diminished use and enjoyment of the Corio Bay foreshore area.

GGs submitted that Mr King's evidence was of little, if any utility to the IAC, noting:

His oral evidence was that he was not involved with the risk screening methodology and that he had not checked the results but assumed they were correct. Several times in answers to cross examination he was unable to provide any clarification or assistance, merely responding that he had neither prepared nor written the report.

GGs further submitted that the business impact assessment fails to set out the important contribution that the Corio campus of GGS makes to local employment opportunities, noting the campus has over 470 staff, many of whom live on site or locally in the Geelong region and that if the enrolments at GGS are impacted by the Project, broader flow on negative economic consequences could occur.

GGs adopted the withdrawn submission of GeelongPort concerning the inadequacy of Mr King's evidence, the inadequacy of the EES's assessment of the impacts of the Project on GeelongPort, and more generally on the function and operation of the Port.

A large number of community submitters expressed concern that the Project would have negative impacts on the region's tourism and eco-tourism businesses. Mr Murphy and Ms McGovern (Sea All Dolphin Swims) (S1876 and S1865) and Ms Cormack (S1648) submitted that they are particularly concerned that the Project could negatively impact leisure and educational eco-tourism businesses operating in Port Phillip Bay due to potential marine ecology impacts.

**(iii) Discussion**

The IAC is generally satisfied that the business impact assessment in Technical Report L adequately identified and assessed likely business impacts associated with the construction and operation of the Project. That said, the business impact assessment is heavily reliant on the findings and conclusions of other specialist impact assessments. The IAC has determined that further assessment of impacts associated with the marine environment, air emissions, noise and safety are required.

The IAC is generally satisfied that potential impacts on the operation of the Port can be acceptably managed. This finding has been significantly influenced by the withdrawal of GeelongPort's opposing submissions.

The IAC agrees with the findings of Technical Report L that business impacts from additional traffic can be effectively mitigated. This finding is supported by the submission of GGS that its concerns relating to traffic have largely been addressed. See Chapter 17.3 for more detail.

The IAC agrees with the findings of Technical Report L that the large-scale retail stores to the north and south of the Project area, and the dining and hotel establishments to the west, are unlikely to experience adverse impacts from the Project. In fact, such businesses may benefit from increased patronage from passing trade associated with additional employees during the construction of the Project, and to a lesser extent during its operation.

The IAC finds that based on the material before it, the Project is unlikely to have a material economic impact on GGS. The hearing process provided GGS with the opportunity to lead evidence to quantify potential economic impact that the Project may have on its operations. It chose not to. On balance, the IAC finds that while it is conceivable that the Project may have some negative impact on enrolments, the associated business and economic impacts are likely to be minor.

The IAC has found in Chapter 7 that there are uncertainties in relation to marine impacts due to gaps and unresolved matters in the marine modelling. Notwithstanding these uncertainties, the IAC is generally satisfied that the aquaculture and eco-tourism businesses in question are geographically separated from the Project and any impacts are therefore likely to be negligible.

The IAC supports the Proponent's proposed mitigation measures as they relate to business impacts. The proposed consultative mechanism for information and enquiries (MM-SB01) and consultation with Quantem (MM-SB02) should be effective in minimising logistical challenges arising from the construction and operation of the Project. The proposed Employment Plan (MM-SB03) and Social Procurement Plan (MM-SB04) should provide positive economic and employment outcomes for both the local and regional businesses and residents.

## 16.4 Social impacts

### (i) Key issues

The key issues are:

- extent and adequacy of consultation with the local community
- the social impact of fears and anxieties generated by the Project
- impacts on community resources such as Moorpanyal Park and local fishing spots
- adequacy and likely effectiveness of proposed mitigation measures.

### (ii) Evidence and submissions

Many submitters raised concerns about the social impacts of the Project. Many in the local community expressed deep felt fears and concerns about their safety, particularly from incidents involving the transit of LNG carriers through Corio Bay to Refinery Pier. Others expressed deep anxieties about the environmental and climate change implications of the Project, and spoke of the constant visual reminder that the Project would provide of the dire state of the environment and climate. Several submitters asserted that the community does not want the Project, and that it does not have a 'social licence to operate'.

Norlane Community Initiatives (S1864 and D439) submitted that Norlane is already a suburb that experiences some of the highest levels of social, economic and health related issues in the country, and expressed concern that the Project will exacerbate the disadvantage experienced in the local area. The key areas of concern of the organisation included:

- safety for residents
- loss of access to amenities for residents
- impact on the wellbeing of residents
- noise and air pollution
- a poor consultation process
- effects of community perception of the Proponent and its approach to safety.

Norlane Community Initiatives submitted that the Proponent has not responded adequately to community concerns regarding safety risks associated with LNG carrier movements, and has not provided adequate reassurance that the risks are acceptable. It expressed disappointment that the Proponent had not acknowledged the risks or satisfactorily explained why buffer zones are not required, "*despite an expensive public relations campaign*" (D439).

Norlane Community Initiatives submitted that the community is extremely worried that they will lose access to Moorpanyal Park and the waters around it as a result of the Project. It described Moorpanyal Park as an incredibly important community asset that not only provides for "*community connections and quality of life*" but is also critical for mental health and wellbeing of the local residents (D439).

Norlane Community Initiatives also submitted that industrial noise and air pollution are already issues in the neighbourhood and the community is concerned about the effects of cumulative noise and air pollution from adding another major industrial process, none of which has been discussed properly with residents.

In relation to consultation with the broader community, the Proponent submitted that the disadvantaged nature of the surrounding area was well understood, and engagement activities were designed to encourage wide engagement. It explained that consultation occurred in

accordance with the integrated EES and pipeline consultation plan prepared by the Proponent. Various measures were used to engage with the local community, including, but not limited to:

- videos and fact sheets in multiple languages
- bi-monthly mail drops
- meetings with community groups
- community information sessions both in person and online
- information booths at local shopping centres
- a session with a local high school.

In relation to potential impacts on community facilities and assets enjoyed by the community, the Proponent submitted that (D200):

... while there is a small extension to the existing exclusion zone around Refinery Pier, the overall area affected is minor in the context of Corio Bay and would not significantly impact on recreational boating and fishing. Further, while the expanded waterside exclusion zone will slightly restrict boating movements in the immediate vicinity of Refinery Pier, impacts will be modest and therefore locals and tourist are unlikely to notice a change to the environment because of the Project.

The Proponent submitted the Project would offer community support through continued contributions to the Proponent's community program, which supports not-for-profit community organisations, local sporting teams, disaster relief, awards for local volunteers and other community causes. The new mitigation measure (MM-SB05) included in the Part C version of the Mitigation Register actions this commitment. The new mitigation measure is:

To continue to work with the local community (e.g., Norlane Community Initiatives, Northern Futures, Give Where You Live) and provide ongoing support that is aligned with their needs and delivers positive impact and social benefit consistent with Viva Energy's existing Community Program.

The Proponent highlighted that it is, and has been, a significant employer in the Geelong region over a long period "*with over 90 percent of current employees from the local region*", and that it "*remains committed to providing employment opportunities for the local population where skill sets match those opportunities*" (D200).

Ms Bailey was called by the Proponent to respond to a limited range of matters concerning the preparation and content of the social impact assessment contained within Technical Report L. Ms Bailey confirmed that her role was limited to provision of a high order review of the social impact elements within Technical Report L. She gave oral evidence that the assessment was consistent with the EES Scoping Requirements. She did not present written evidence.

In relation to community safety concerns, Ms Bailey's evidence was that there is a significant conceptual distinction between the perception of risk and the assessment of risk. She explained that the social impact assessment had focussed on the latter, and relied on findings of the safety and risk assessment in Technical Report N.

The Proponent relied on Ms Bailey's evidence, and submitted that the social impact assessment expressly acknowledged that there was potential for some level of anxiety and fear in the community, in particular from residents of North Shore.

Dr Fisher (S411 and D388) was critical of the Proponent's engagement activities. He submitted that the engagement did not involve a true dialogue nor a genuine opportunity for the public to influence the Proponent's decision making regarding the Project. Dr Fisher provided an extensive overview of the engagement activities undertaken and concluded that that the engagement was

almost entirely at the lowest level of information provision, and was a one way process. Dr Fisher concluded that the Proponent has not provided fair opportunities for participation in assessment processes by stakeholders and the public. He provided examples of responsive engagement processes that could and should be adopted including:

- providing transport, childcare and food at meetings
- materials and meetings translated professionally in community languages (Korean, Hazaragi, Dari, Croatian and Vietnamese)
- giving local groups timely and accurate information
- correcting inaccuracies in public communication.

Environment Victoria (S2029) expressed similar concerns to those of Dr Fisher regarding the inadequacy of the stakeholder engagement. It submitted that of the thirteen modes of engagement highlighted by the Proponent, only three offered any opportunity for dialogue.

Similar to the concerns raised by Dr Fisher and Environment Victoria, Norlane Community Initiatives submitted that the consultation process “*actually felt and looked more like a promotions campaign*” (D439). It submitted that the Proponent’s engagement with the community seemed to be about ‘ticking a box’ rather than actually informing, addressing neighbourhood concerns and having genuine conversations. It acknowledged the challenges of engaging with a disadvantaged community, but submitted that the process lacked genuine transparency, dialogue and engagement. It submitted that the “*come to us approach*” did not account for literacy and educational challenges of many in the local community.

Norlane Community Initiatives submitted that some organisations and residents of the community are concerned not to say anything that would jeopardise the jobs that the Refinery provides or the sponsorship provided to local community groups by the Proponent. It submitted that as a result, “*critical voices and organisations*” were missed in the consultation process (D439).

In response to questioning from the IAC regarding the proposed mitigation measures, Norlane Community Initiatives expressed concern that based on the style of engagement undertaken to date, the proposed mitigations measures are unlikely to be suited and tailored to effectively reach large segments of the community.

In relation to the community’s understanding of the Project and its potential benefits, the Part B consultation report prepared by the WTOAC (D443) noted that:

- All Wadawurrung participants perceived that they had a reasonably good understanding of the proposal, and in particular where it was being proposed to be constructed, dredged and operated.
- Some 40% of Wadawurrung participants immediately pointed to the “employment” benefits from the proposal but there was a common consensus that there was “No benefit to locals”.

In its closing submissions the Proponent submitted that the IAC should be satisfied that there was sufficient, if not significant, community consultation undertaken by the Proponent in the course of preparing the EES. It further submitted the process of consultation is iterative and will continue if the Project progresses. It submitted that concerns raised about the sufficiency of the social and business impact assessment are not justified and that it represents a “*careful and detailed consideration*” of the likely social and business impact of the Project. It concluded (D453):

There has not been any submission made to, or evidence led before, the IAC which casts any substantial doubt upon the assessment of social and business impacts of the Project, including, for example, the impact of the Project on the recreational use of Corio Bay. The Proponent submits that the IAC should remain cognisant of the distinction between an

individual's perception of risk and a proper assessment of the likelihood and consequences of the risk. It is the latter which is relevant to the IAC's assessment and the detailed work reflected in Technical Report L is sufficient to demonstrate that the social and business impacts of the Project have been properly and carefully assessed.

### **(iii) Discussion**

Based on the submissions before the IAC, efforts undertaken by the Proponent to date have failed to effectively engage with some parts of the community. In forming this view the IAC accepts the submissions advanced by Dr Fisher, Norlane Community Initiatives, Environment Victoria and others, that the majority of community consultation methods implemented by the Proponent to date have been heavily skewed to the provision of information that has focused on the perceived benefits of the Project. It is evident from the submissions to the IAC that a large portion of the community do not feel that their concerns have been heard, let alone responded to adequately.

The IAC does not consider that methods of engagement with the community to date have been appropriately and adequately tailored and responsive to effectively engage with the large proportion of the community that have expressed anxiety and fear as a result of the Project. Nor was the IAC persuaded that the consultation methods were effective in engaging with a community consisting of culturally diverse backgrounds and higher levels of disadvantage, including higher levels of mental health issues. Submitters advised the IAC that for some in the community, participation in traditional community hall meetings is challenging if not prohibitive.

The IAC accepts that Technical Report L acknowledges that there are fears in the community about the safety risks associated with the Project. The IAC does not, however, accept that the social impact assessment is responsive to those fears. To rely on the distinction between the perception of risk and a proper assessment of risk misses the point. It is the perception of the risk, and the fear and anxiety that this generates, that is the social impact. It is not enough to say that the risk has been assessed as low, particularly given the further work that will be required to properly address safety, hazard and risk through the regulatory approval process.

Tangible impacts of the Project such as noise and air emissions can be quantified and measured. The significance and acceptability of those impacts can be assessed against accepted reference values or standards. Assessing the intangible psychological impacts of the Project is more difficult. That said, the IAC does not agree with the finding in Technical Report L that fears about public safety are a 'minor' impact (refer to Table 12 in Technical Report L). The safety fears and concerns expressed to the IAC were genuine, deeply felt and should not be underestimated.

The Project will generate a range of other intangible social impacts, including worry and stress associated with climate change and GHG impacts (rated as 'minor to moderate' in Technical Report L), and worry and stress about the broader environmental impacts of the Project, particularly impacts on the local marine environment.

If the Project is approved, ongoing engagement with the community will be crucial in managing the intangible social impacts of the Project. Both the mitigation measures and the draft Incorporated Document provide for ongoing community consultation. In conducting this future engagement and consultation, the Proponent should learn from and take on board the criticisms of the consultation process undertaken to date.

The IAC considers it particularly important that the scope, methodology and implementation of tasks associated with mitigation measures MM-SB01 (Consultative mechanism for information and enquiries) and MM-SB05 (Community Program) be guided and overseen by a dedicated

Community Reference Group that includes local community leaders and representatives of local community based organisations (such as Norlane Community Initiatives, Northern Futures, Give Where You Live) that have extensive community networks and good standing with the community. Effective community engagement will also be important if mitigation measures SB03 (Employment Plan) and SB04 (Social procurement plan) are to achieve their full potential.

The IAC considers the creation of a Community Reference Group should be viewed as a significant and positive opportunity for the Proponent. To maximise the effectiveness of the Community Reference Group, it will be important to ensure that the Reference Group and its subsequent work program is appropriately resourced and funded by the Proponent.

The IAC acknowledges that some in the community fear that if the Project is approved the public will lose access to valued public and community resources such as Moorpanyal Park and the waters around it that are enjoyed for recreational fishing and swimming. The IAC does not consider this a likely outcome. While an extension of the Port exclusion zone at the end of Refinery Pier is proposed, the Project does not contemplate any restrictions on the use of the identified public assets.

## 16.5 Findings and recommendations

The IAC finds:

- The assessment of business impacts of the Project was limited but adequate.
- GeelongPort's withdrawal of its opposing submissions provides the IAC with comfort that the Project's business impact on the operation and functioning of Geelong Port can be effectively managed.
- The Project is unlikely to have a material economic impact on GGS.
- The proposed mitigation measures to minimise business impacts are appropriate.
- A more thorough engagement process with the local community could and should have been undertaken in order to inform the assessment of potential social impacts and identify meaningful and tangible mitigation measures.
- The Proponent's proposed community, employment and social procurement initiatives provided for through MM-SB01, MM-SB03, MM-SB04 and MM-SB05, together with engagement requirements of the Incorporated Document, have the potential to achieve positive social and community outcomes and should be advanced with the input of a dedicated Community Reference Group.

### Environmental Management Framework

The IAC recommends:

**Insert a new social and business mitigation measure MM-SB06 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to require the establishment and resourcing of a Community Reference Group.**

## 16.6 Overall conclusions on social and business impacts

The business and social impacts can be acceptably managed through the IAC's recommended mitigation measures and the provisions of the Incorporated Document that require ongoing consultation and engagement with business and the community.

## 17 Other matters

### 17.1 Onshore contamination and acid sulfate soils

#### (i) Introduction

The relevant evaluation objectives are:

To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

To minimise generation of wastes by or resulting from the project during construction and operation, including dredging and accounting for direct and indirect greenhouse gas emissions.

Onshore (land) contamination and acid sulfate soils are discussed in EES Chapter 10. Supporting reports and studies include Technical Reports G1 and G2: Contamination and acid sulfate soils impact assessment.

Table 26 lists the contamination and acid sulfate soils evidence.

**Table 26** Contamination and acid sulfate soils evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D52	Mark Davidson, AECOM	Contamination and acid sulfate soils	Technical director for Technical Report G (refer to D162)

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI.

#### (ii) What did the EES say?

The main ground disturbance will be from pipeline trenching for the underground pipeline section from the treatment facility to the VTN tie-in point near Lara. The pipeline is in a trench generally no more than 2 metres deep and is not expected to intersect groundwater except in the sections that will be constructed by HDD.

The EES identified two zones of potential contamination. Zone 1 is within the Refinery and Zone 2 is the pipeline route north of the Refinery.

Soil and groundwater contamination in Zone 1 is primarily hydrocarbon compounds associated with the long term Refinery use. These exceed human health and ecological screening criteria. One site of potential acid sulfate soils was recorded in Zone 1.

The soil in Zone 2 is generally not contaminated. Nitrates and phosphorous were recorded in groundwater, possibly linked to agricultural use.

PFAS were recorded at low levels in soil in Zones 1 and 2 but below human health and ecological investigation levels. One sampling well recorded higher levels of PFAS (above groundwater dependent ecosystem investigation levels) in Zone 2 around 3 kilometres north of the Refinery, thought to be unrelated to the Refinery operation.

The proposed key mitigation measures to manage potential effects on contamination and acid sulfate soils are summarised in Table 27.

**Table 27 Proposed mitigation measures for contamination and acid sulfate soils**

Mitigation ID	Mitigation Measure	Project timing
MM-CO01	Managing contaminated soil in accordance with EPA guidelines and regulations	Construction
MM-CO02	Managing contaminated groundwater in accordance with EPA guidelines and regulations	Construction
MM-CO03	Avoiding contaminant migration in groundwater	Construction
MM-CO04	Management of unknown contamination during construction	Construction
MM-CO05	Managing acid sulfate soil	Construction

EES Chapter 10 concluded that risks from soil and groundwater contamination and acid sulfate soils within the Refinery (Zone 1) can be managed through the construction process. There is little contamination along the pipeline route north of the Refinery (Zone 2).

### (iii) Key issues

The key issues are:

- the adequacy of the contamination and acid sulfate soil assessment
- management of residual risks of contamination and acid sulfate soils to an acceptable level.

### (iv) Evidence and submissions

As the Lead Technical Director for Technical Report G, Mr Davidson adopted the conclusions from that report and confirmed in the Hearing that there is no departure from the findings or conclusions of Technical Report G.

His evidence (D52) addressed questions from the IAC in its RFI in relation to:

- reburial of contaminated materials
- the sampling density for the contamination assessment
- whether unexpected finds of contamination can be successfully identified
- the likelihood of potential acid sulfate soils along the pipeline route or at infrastructure locations.

Mr Davidson's evidence was that reburial of contaminated soils may be appropriate if levels are above background but do not pose a risk to human health and the environment. Higher levels of contamination may need to be removed and treated or disposed of safely in accordance with EPA requirements. His evidence was the type of contamination expected in Zone 1 should be able to be detected by smell (hydrocarbon compounds) or sight (for example asbestos) if unexpected finds are encountered. He reiterated that in Zone 2, given the past rural land use and results of sampling undertaken for the Project, he considered it unlikely there would be risk to human health and the environment.

On sampling density, Mr Davidson's opinion was that the sampling density was appropriate for the task as it was designed to give an indication of contamination on site, not categorise it in detail for

reuse, or removal off site. He confirmed that removal offsite for disposal would require further sampling and assessment.

Potential acid sulfate soils were unlikely to pose a significant risk in Mr Davidson's view, but as they were recorded in one location in Zone 1, an acid sulfate soil management strategy is proposed to provide appropriate management of spoil to minimise risk of acid runoff.

EPA (S1884 and D217) recommended changes to mitigation measures to address acid from acid sulfate soils as it may affect groundwater. The Proponent adopted these changes in the revised mitigation measures on Day 1 (D34). The IAC supports these changes.

GGs (S1968) were critical of the way contamination was addressed in the EES and suggested among other things that there should have been more consideration of potential contamination in the broader area including the Port. It also submitted that there should be a higher degree of mitigation proposed for PFAS contamination. GGS submitted that there is a lack of transparency about management measures, and not enough information in the EES to satisfactorily conclude that the potential environmental effects of contamination and acid sulfate soils can be managed.

#### **(v) Discussion**

There is clearly significant groundwater and soil contamination under the existing Refinery, perhaps unsurprising in an industrial facility that has been operating for over 60 years and that commenced in a time of different environmental standards.

Conversely, with some exceptions, outside of the Refinery the Project (primarily the trenched pipeline from the treatment facility to the tie-in point near Lara) will occur in a relatively uncontaminated environment, reflecting its rural and undeveloped nature.

The IAC is satisfied that the categorisation of contamination to this point is acceptable and the detailed management and operational requirements during project implementation can be guided by the mitigation measures and relevant EPA policy and regulation.

As the pipeline through the Refinery is above ground, there should be limited opportunities for disturbance of contaminated soil. The IAC is satisfied that the general strategy as articulated in mitigation measure MM-CO01 is acceptable. The management of contaminated soil is a highly regulated activity and the IAC is satisfied that compliance with the regulatory regime is achievable and will result in negligible environment effects.

Outside of the Refinery, in Zone 2, there is limited contamination along the pipeline route and the trenching should therefore not raise contamination concerns.

The Project infrastructure and particularly the underground section of the pipeline is not expected to intersect with groundwater (except in the sections that will be constructed by HDD) and groundwater contamination migration should not occur. The IAC is satisfied that mitigation measures MM-CO02 and MM-CO03 are an acceptable approach to this issue if groundwater is encountered. Groundwater is discussed further in Chapter 14.3.

#### **(vi) Findings**

The IAC finds:

- The assessment of onshore contamination and acid sulfate soils is adequate for this stage of Project development.

- The proposed management strategies in the mitigation measures, and compliance with the regulatory regime for contaminated soils, should ensure the environmental effects can be managed to an acceptable level.

### (vii) Overall conclusions

Contamination and acid sulfate soil impacts are consistent with the draft evaluation objective and relevant policy and legislation, and can be acceptably managed through the recommended mitigation measures.

## 17.2 Landscape and visual impact

### (i) Introduction

The relevant evaluation objective is:

To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

Landscape and visual impacts are discussed in EES Chapter 11.3. Supporting reports and studies include Technical Report J: Landscape and visual impact assessment.

Table 28 lists the landscape and visual impact and related evidence.

**Table 28** Landscape and visual impact evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D55	Steve Schutt, Hansen Partnership	Landscape and visual impact	Primary author of Technical Report J (refer to D148)
D51	Mark Cook, AECOM	Lighting design	Author/designer of Appendix A (Light Spill Impact Assessment) to Technical Report J (refer to D51).

Additional information was provided in:

- D111 – Proponent’s response to the IAC’s RFI.

### (ii) What did the EES say?

The construction and operation of the Project would result in changes to the landscape and has the potential to impact the visual amenity of the surrounding area.

The worst case visual impacts will occur during the operational phase of the Project, when the FSRU will be permanently berthed at Refinery Pier. Construction impacts will be less, because none of the plant or equipment needed for construction is as large as the FSRU, and construction impacts will be short term.

The Project’s visual impact during operations will be ‘low’ or ‘moderate’ given:

- the existing heavily industrialised context
- the immediately surrounding landscapes (industrial buffer, suburban and flat farmland) have ‘low’ landscape value
- impacts on nearby high value landscapes (the coastal wetlands, Geelong Waterfront and GGS) will be ameliorated by distance.

The only mitigation measure proposed is MM-LV01: School Road screen planting (to screen the treatment facility).

EES Chapter 11.3 concluded that with the implementation of MM-LV01 the residual landscape and visual impact of the Project would be low.

### (iii) Key issues

The key issues are:

- the visual impact of the FSRU and LNG carriers
- the visual impact of the treatment facility.

### (iv) Evidence and submissions

Mr Schutt provided an expert witness statement and adopted Technical Report J as part of his evidence.

Technical Report J defined the study area as the area within a 4 kilometre radius of the Project. This represents the 'Theoretical Limit of Viewshed Extent', which is the point beyond which the Project infrastructure occupies an "*unnoticeable*" portion of the field of view (5 percent). Although the Geelong Waterfront is located 7 kilometres from Project, it was included due to its high use and significance within the local area.

Technical Report J selected seven publicly accessible view locations within the study area, informed by concerns raised during stakeholder and community engagement sessions. Photomontages were prepared to demonstrate the visual presence of the FSRU, an LNG carrier berthed next to the FSRU and the treatment facility at these view locations.

Moderate impacts were assessed at four of the seven view locations. Mitigation measures were only considered necessary at one of these locations (view location 4, School Road opposite the treatment facility). MM-LV01 requires large native Eucalyptus trees to be planted along the School Road boundary to screen the treatment facility from the road.

Technical Report J did not consider that mitigation was necessary at any of the other view locations because:

- the view locations are in areas with a low landscape value or a highly industrialised setting with minimal existing visual and public amenity
- existing obstructions (including infrastructure and vegetation) screen the Project, and/or
- the Project infrastructure would not obstruct views of Corio Bay.

GGs acknowledged that the school enjoys a "*mixed visual amenity*" which includes the natural beauty of Limeburners and Corio Bays as well as the Refinery. It submitted (D379):

That said, the school is concerned with the nature of the analysis of visual impact in this case. The material understates the impact of a very large piece of infrastructure to be imposed into the view scape. On any objective assessment, the impact will be significant.

GGs submitted that the FSRU (at around 300 metres long, 50 metres wide, and rising up to 55 metres above the waterline) "*is the equivalent of an 18 storey residential building covering an area equivalent to 75 percent of a typical CBD block in Geelong*" (D379). The FSRU is significantly larger and closer to the shore than the ships currently visiting Corio Bay, will be permanently berthed, and requires a substantial jetty extension. Most images of FSRUs available on the internet are brightly coloured, increasing their visual impact. LNG carriers roughly the same size as the FSRU will be berthed next to the FSRU for 24 to 36 hours, increasing the visual impact.

GGs submitted that Mr Schutt's evidence minimises the Project's visual impacts on the school. View location 5 (the only location on the school campus for which a photomontage was prepared) is screened by vegetation. There are no photomontages showing impacts from the water (which is used by the school for sailing and boating), from upper level dormitories that face Corio Bay, or from the Corio Bay foreshore close to the Project. It submitted (D379):

These are all areas that regularly form part of the visual experience for various members of the school community. It is a shortcoming of the EES that the greatest impact on views has not been assessed.

GGs submitted that the view from view location 6 (Limeburners Lagoon Nature Reserve) is also partially obstructed by vegetation, and while the view from view location 7 (Avalon Coastal Reserve) is less obstructed by vegetation, it is significantly further away from the FSRU, and includes a significant amount of the Avalon foreground view because of the camera angle. Further, the photomontages selected relatively muted colours for the FSRU, whereas images of FSRUs readily available on the internet are far more brightly coloured.

GGs submitted that Technical Report J's most significant shortcoming is the failure to assess the Project's visual impacts at night. It submitted that Mr Cook's light spill assessment was limited to understanding light spill, and did not extend to the "crucial" impact of the FSRU being lit up at night. It also submitted that MM-LV01 should be strengthened to require understorey vegetation (as well as advanced Eucalypts) to screen the treatment facility.

Mr Schutt agreed that the photomontage from view location 5 underrepresents the visual impact of the Project when viewed from the school. He considered that without the vegetation, the impacts from view location 5 (or from other locations on the school campus that are not screened by existing vegetation along the foreshore) would be 'moderate'. However, his evidence was "*it is my opinion that mitigation measures are not necessary to address a moderate level of visual impact*" (D55).

Mr Schutt agreed that the landscape screening required under MM-LV01 should be more comprehensive. He recommended a lower level understorey planting of shrubs, groundcovers and grasses comprising primarily indigenous evergreen species, to ensure a layered screening effect.

Other submitters were concerned that the Project would represent a strong visual symbol of Geelong as an industrial town, which would impact negatively on Geelong's image as a clever forward looking city and its ability to attract tourism. Several submitters told the IAC that they regularly walk or ride along the foreshore from the Geelong Waterfront all the way to Limeburners Bay and beyond, and that the visual intrusion of the Project would impact on the character, quality and amenity of the coastal paths.

Technical Report J did not include an analysis of the Project's visual impacts against the *Siting and design guidelines for structures on the Victorian Coast* (DELWP, May 2020). The IAC sought more information about this in its RFI (D13). Mr Schutt provided a response in his written evidence. He considered that two of the Guidelines' 15 elements are relevant:

- Element 8 – Views
- Element 10 – Local character and sense of place.

Mr Schutt's opinion was that the Project is consistent with these elements. With respect to views (D55):

- there will be no intrusion into public views of the natural environment

- important views to and from the water, specifically those from the Geelong Waterfront, will be retained
- Technical Report J demonstrates that Project structures will be “*visually unobtrusive, with resultant visual impacts being typically very low or low*”
- vertical elements are limited to the FSRU and the LNG carrier, both of which would be located within the visual context of the Refinery and the heavily industrialised waterfront which is already characterised by large and visually bulky buildings and vertical structures.

With respect to local character and sense of place, he considered that:

- Project structures will not be visually prominent in highly visible locations such as the Geelong Waterfront
- the Project would be located within an area which has an industrialised character, including an existing working port
- the Project infrastructure will blend with the surrounding character and landscape.

The IAC also asked in its RFI whether further mitigation measures were considered necessary having regard to the several submissions that had raised concerns about the Project’s visual impacts. Mr Schutt’s opinion was that mitigation was only required to screen views of the proposed treatment facility from School Road, as this is the only location where visual impacts will be experienced “*at close range*”. He noted that existing trees would need to be removed to allow the treatment facility to be constructed, and the proposed planting under MM-LV01 will reintroduce screening vegetation in relation to existing structures as well as screening the new structures.

#### **(v) Discussion**

The FSRU is a very large piece of infrastructure, and will represent a substantial change in the existing landscape. The impacts will be even greater when an LNG carrier is moored alongside the FSRU (which could be up to 45 times per year, although only for 24 to 36 hours at a time).

The IAC accepts that the Project is proposed in a heavily industrialised location and a port setting, alongside the existing Refinery. Most views of the FSRU and berthed LNG carriers will include a backdrop of the existing Refinery, surrounding industrial buildings and port infrastructure. It is not a pristine natural setting, but rather is a setting and location in which industrial and maritime infrastructure is to be expected. This reduces the significance of the visual impact of the Project.

That said, the IAC considers that Technical Report J and Mr Schutt’s evidence did, to some extent, play down the visual impact of the Project. The photomontages show that views of the Project from several of the view locations selected (most notably view location 5 on the GGS campus) are screened by existing structures or vegetation. Based on the IAC’s observations on its site visit, there are plenty of other locations (particularly on the GGS campus and along Foreshore Road and the coastal path) where the Project will be far more visually prominent than the photomontages suggest.

The IAC is not suggesting that view location 5 was selected deliberately to underplay the visual impact of the Project on the school. As Mr Schutt explained, the location was selected in consultation with school staff. However it is somewhat unfortunate that the view of the Project from that location is almost entirely screened by vegetation. It does not represent a worst case scenario, or represent a complete picture in demonstrating the Project’s visual impacts on the school community.

The IAC asked Mr Schutt whether the nature of the viewer was a relevant consideration in determining visual impact. He confirmed that it was a relevant consideration, and considered that the Project will have a greater impact on tourists and sightseers along the Geelong Waterfront than, say, workers in the industrial precinct surrounding the Refinery.

His opinion was that because students and staff are at the school to study, the visual impacts of the Project will be of less significance to them. The IAC does not agree. As GGS submitted, the setting of the Corio Bay campus is an integral part of the student experience. The school conducts a lot of activities (including sailing and rowing) on the water – the impact on these activities were not addressed in Technical Report J. Further, most students and many staff (along with their families) live on the school campus. It is not just a place of work or study, it is also their home.

Many GGS staff and students spoke to the IAC of the pleasure, relief and relaxation they get from walking the coastal path along Foreshore Road and around Limeburners Bay, and being surrounded by nature. The Project will represent a further industrialisation of the setting which will detract from the visual amenity the school community currently enjoys both on the campus and from the surrounding areas.

Another matter that was not addressed in either Technical Report J or Technical Report L (the social and business impact assessment) is the psychological impacts of seeing the Project on a daily basis. This affects not only the GGS community, but also the surrounding residential communities of North Shore, Norlane and Corio Bay. Many submitters spoke to the IAC of their concerns that the prominence of the FSRU and LNG carriers will be constant reminders of the safety risks and climate risks presented by the Project, causing additional stress and anxiety among those who see it. These sorts of qualitative social implications of the Project's visual impacts have not been taken into account (but are discussed in Chapter 16.4).

On balance, however, the IAC does not consider that the visual impacts of the Project will be so significant as to be unacceptable. The Project location is in a Port Zone, surrounded by land zoned and developed for industrial uses. There is nothing in the legislative or policy framework (such as a Significant Landscape Overlay) that identifies the Project location as a significant landscape that should be protected from visual impacts. The IAC accepts Mr Schutt's evidence that the Project is broadly consistent with the DELWP *Siting and design guidelines for structures on the Victorian Coast* guidelines, given the FSRU's location close to shore and the adjacent Refinery, and the industrial and port setting in which the Project is proposed to be located.

The IAC accepts that while the Project will have some visual impact arising from being lit up at night, the location and surrounding area is already lit at night, and light spill from the Project is (according to Technical Report J and Mr Cook's evidence) likely to be minimal. While there are other activities that may require night lighting (such as dredging and possibly construction of the underground pipeline), these locations are relatively distant from high numbers of sensitive receptors.

The IAC considers that if the Project proceeds, its visual impacts will, with modified mitigation measures, be able to be acceptably managed to be consistent with the evaluation objective.

The IAC recommends a new mitigation measure which requires the FSRU to be in muted colours, to reduce its visual impact. While it would reduce the visual impacts of the Project even further if visiting LNG carriers were also required to be in muted colours, the IAC does not consider that this is likely to be practical given the Proponent will not be contracting with LNG carriers. Further, the

LNG carriers will only be present for limited periods of time, whereas the FSRU will be moored permanently for the life of the Project.

The IAC considers that the revised (Part C version) MM-LV01 should be further strengthened to better reflect the detailed recommendations of Mr Schutt regarding understorey planting to screen the treatment facility.

#### (vi) Findings and recommendations

The IAC finds:

- Technical Report J and Mr Schutt’s evidence did, to some extent, underplay the visual impacts of the Project, particularly on the staff, students and residents of GGS’s Corio campus.
- Impacts will also be felt by users of the coastal path along the Corio Bay foreshore, and the residents of nearby residential areas.
- That said, there is nothing in the legislative or policy framework that identifies the Project location as within a significant landscape that should be protected from further visual impacts or intrusions.
- On balance, subject to some strengthening of the mitigation measures, the Project’s visual impacts can be managed to within acceptable limits.

#### Environmental Management Framework

The IAC recommends:

**Amend the landscape and visual mitigation measures as shown in Appendix G of the Inquiry and Advisory Committee’s Report No. 2:**

- a) amend MM-LV01 to provide more detail in relation to understorey planting
- b) insert a new MM-LV02 requiring the floating storage and regasification unit to be in muted colours to reduce its visual impact, provided this is acceptable from a marine safety perspective.

#### (vii) Overall conclusions

Landscape and visual impacts are consistent with the draft evaluation objective and relevant policy and legislation, and can be acceptably managed through the IAC’s recommended mitigation measures.

## 17.3 Transport impacts

#### (i) Introduction

The relevant evaluation objective is:

To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

Transport impacts are discussed in EES Chapter 11.4. Supporting reports and studies include Technical Report K: Transport impact assessment.

Table 29 lists the transport impact evidence.

**Table 29** Transport impact evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D38	Adrian Koorn, AECOM	Traffic impact	Not involved in the development of Technical Report K. The report was prepared by a former AECOM employee (refer to D147)

**(ii) What did the EES say?**

The EES identified transport routes likely to be used by Project generated traffic during construction and operations. Traffic counts and queue surveys were undertaken at relevant intersections to determine existing conditions. The surveys showed relatively low traffic volumes in the area surrounding the Project.

Modelling was undertaken of intersection performance with the additional traffic generated by the Project, along with three other anticipated projects in the area:

- the relocation of the Spirit of Tasmania terminal from Port Melbourne to Geelong Port
- the Boral clinker grinding facility
- the Viva Diesel Storage Project.

The modelling indicated that the intersections, and the local road network more broadly, has more than adequate capacity to facilitate additional traffic volumes likely to be generated by the Project.

Over-dimensional vehicles may be needed to deliver components during construction, and to deliver nitrogen to the treatment facility during operations. Traffic management may be needed to allow for over-dimensional vehicle movements on a number of streets or intersections. Construction or over-dimensional vehicle movements may need to be scheduled to avoid times when public or school buses are operating.

Temporary road or lane closures may be required on Shell Parade and Macgregor Court during construction of the pipeline. Detours would be put in place that are suitable for heavy vehicles, ferry traffic and school buses. Access to the rural residential properties in Macgregor Court would be maintained throughout the construction period. Road closures and detours would be managed under traffic management plans (TMPs).

Proposed mitigation measures for Transport impacts are summarised in Table 30.

**Table 30** Proposed mitigation measures for Transport impacts

Mitigation ID	Mitigation Measure	Project timing
MM-TP01	Community, business and relevant authority stakeholder and communications plan	Pre-construction Construction Decommissioning
MM-TP02	A Project TMP	Pre-construction Construction Decommissioning
MM-TP03	Road safety audits	Pre-construction Construction Decommissioning

Mitigation ID	Mitigation Measure	Project timing
MM-TP04	Emergency access and evacuation plan	Pre-construction Construction Operation Decommissioning
MM-TP05	Specific worksite TMPs	Pre-construction Construction Decommissioning
MM-TP06	Over-dimensional transport route assessments	Pre-construction Construction
MM-TP07	An operational transport plan	Operation

EES Chapter 11.4 concluded the overall impacts to the transport network as a result of construction and operation of the Project would be minor, and could be effectively managed through standard traffic management measures typically applied for projects of this scale and nature, including TMPs.

### (iii) Key issues

The key issues are:

- traffic impacts of construction vehicles
- traffic impacts of truck deliveries to the treatment facility (nitrogen and odorant)
- cumulative impacts with other developments
- adequacy of the proposed mitigation measures.

### (iv) Evidence and submissions

Mr Koorn gave evidence that the approach taken in Technical Report K to the transport impact assessment was typical and included:

- establishing existing conditions for the study area
- establishing traffic generation and distribution for construction, operation and decommissioning phases of the Project
- identifying transport impacts in each phase, by overlaying Project generated traffic volumes on existing conditions
- developing mitigation measures in response to identified impacts.

He agreed with the findings in Technical Report K that the Project's traffic impacts would be minor. He considered that (in summary):

- the port and industrial area is well serviced by roads capable of accommodating heavy vehicles
- the traffic modelling indicated a maximum degree of saturation of nearby intersections of 0.652, which is well below the desired upper limit of between 0.8 and 0.9 depending on the type of intersection (roundabout, signalised etc)
- cumulative traffic impacts, including with the relocation of the ferry terminal to Geelong Port, were assessed and found to be minimal
- while road closures will be required during construction, individual property access will be maintained at all times

- swept path analysis indicated that traffic management needed to accommodate over-dimensional vehicle movements was limited to the intersections of Rennie Street/Princes Freeway off-ramp, Macgregor Court/Shell Parade and School Road/Shell Parade.

Relying on Technical Report K and Mr Koorn's evidence, the Proponent submitted that additional traffic during the construction phase could be readily absorbed by the existing road capacity and would not typically coincide with other traffic generating activities such as school access and vehicles using the ferry terminal. Once operational, the Project would not involve significant volumes of heavy vehicle traffic, and impacts would be negligible.

The IAC asked Mr Koorn what assumptions were made in relation to ferry traffic (volumes, traffic mix, peak times and so on), and whether those assumptions had been verified by either TT-Line (the ferry operator) or GeelongPort. Mr Koorn was not able to answer those questions. The Proponent explained in its Part B submission that it did not have access to GeelongPort's data in relation to relocation of the Tasmanian ferry and therefore had to make assumptions.

GGs raised several traffic concerns in its original submission (S1968):

- the traffic surveys informing the traffic impact assessment were inadequate (these were undertaken over the morning and evening peak on one day in May 2021)
- school bus routes and times had not been properly identified or analysed
- the traffic implications of the planned relocation of the primary school to the Corio campus had not been taken into account
- there was insufficient consideration of other activities involving large number of people on the Corio campus (such as when the school hires out its facilities).

However GGS indicated in its submission to the IAC that "*traffic outcomes have been agreed during the hearing process*" (D379).

The Proponent explained in its Part B submission that it was not aware of GGS's plans to relocate the junior school to the Corio campus when the traffic impact assessment was prepared. The Part B Mitigation Register (D201) included changes to address this issue:

- MM-TP01 was amended to require GGS to be included in stakeholder consultation
- MM-TP02 was amended to ensure that the Project TMP specifically takes account of the construction of the GGS junior school
- MM-TP02 and MM-TP03 were amended to ensure the TMP and operational transport plan are informed by the stakeholder consultation.

Geelong Environment Council (S1583) submitted that the large increase in truck movements in the area will impact on residents with increased traffic noise, an increase in emissions and general pollution. Other submitters raised safety concerns about accidents on roads that could impact on the above ground pipeline.

Mr Dillon (S1852) was critical that a TMP had not been exhibited with the EES. He submitted that the stakeholder consultation contemplated under MM-TP01 was insufficient, and should include emergency services, utility service providers and local residents and road users, "*since they are the ones having to deal with the implications on a daily basis during construction and beyond*". He raised concerns about the number of truck movements, the hours of usage, the use of exhaust brakes, exhaust emissions, vehicle roadworthy safety verification, prevention of overloading, compensation for disruption when dilapidated road infrastructure needs to be repaired post commissioning, footpath access, road closure alerts, contractor vehicle parking in public streets and a range of other matters.

**(v) Discussion**

Land based traffic (as opposed to increased shipping traffic) was not raised as a concern by many submitters. Shipping traffic impacts are discussed in Chapter 11.5 of this Report.

The IAC accepts Mr Koorn's evidence that the traffic impact assessment was broadly 'fit for purpose'. The IAC agrees with Mr Koorn that the general approach adopted in Technical Report K was typical, and is what the IAC would expect of a project of this nature, in the proposed location and setting.

Existing traffic volumes on the surrounding road network are relatively modest, and local roads and intersections are operating well within their capacity limits. While existing traffic surveys were fairly limited in scope, there is no suggestion of any existing traffic capacity issues that are likely to be exacerbated by the Project.

Much of the construction activity will be offshore, and will involve the use of barges rather than road based construction vehicles. There will be some disruption to the local road network during construction, but these impacts are not anticipated to be significant, and should be able to be managed with the proposed mitigation measures.

Technical Report K assumed a workforce of 12 during operations. This is substantially lower than the estimate of up to 60 local jobs in Technical Report L (the social and business impact assessment). The IAC asked Mr Koorn about this, but he was not able to explain the discrepancy. The Proponent responded in its Part B submission that the assumptions in the traffic impact assessment were based on 12 people being on the FSRU at one time, with an estimate of five shifts, which explains the reference to 60 jobs. Either way, traffic movements generated by employees attending the Project during operations are not likely to be significant.

Cumulative traffic impacts have been assessed and found to be acceptable. This included the relocation of the ferry terminal to Geelong Port (and other projects), but did not include the relocation of GGS's junior school to the Corio campus.

Assumptions made in relation to ferry traffic should have been confirmed with TT Line (the ferry operator). Further consultation with TT Line will be required to ensure that the cumulative effects of traffic generated by the Project and that generated by the ferry terminal are managed appropriately. The IAC has recommended an adjustment to mitigation measure MM-TP01 to ensure this occurs. Consultation with GeelongPort is already included MM-TP01.

The IAC supports changes to the traffic mitigation measures proposed by the Proponent to require further consultation with GGS. This should address GGS's traffic concerns, including in relation to the new junior campus.

The IAC is satisfied that the Project's traffic impacts should be able to be managed to within acceptable limits using the suite of relatively standard traffic mitigation measures proposed.

**(vi) Findings and recommendations**

The IAC finds:

- The assessment of traffic impacts is adequate for this stage of Project development.
- The proposed management strategies in the mitigation measures, with some minor adjustment, should ensure the environmental effects can be managed to an acceptable level.

## Environmental Management Framework

The IAC recommends:

**Amend traffic mitigation measure MM-TP01 as shown in Appendix G of the Inquiry and Advisory Committee’s Report No. 2, to require consultation with TT-Line (operator of the Tasmanian Ferry Service).**

### (vii) Overall conclusions

Transport impacts are consistent with the draft evaluation objective and relevant policy and legislation, and can be acceptably managed through the IAC’s recommended mitigation measures.

## 17.4 Heritage

### (i) Introduction

The relevant evaluation objective is:

To avoid or minimise adverse effects on Aboriginal and historic cultural heritage.

Heritage is discussed in EES Chapter 13. Supporting reports and studies include:

- Technical Report O: Aboriginal cultural heritage impact assessment
- Technical Report P: Historic heritage impact assessment.

Table 31 lists the heritage evidence.

**Table 31** Heritage evidence

Doc	Expert	Subject matter	Role
<b>Proponent</b>			
D56	Jen Burch, Jem Archaeology	Aboriginal cultural heritage and historic heritage	Author of Technical Reports O and P (refer to D56)
D99	Jen Burch, Jem Archaeology	Addendum responding to the WTOAC submission	

Additional information was provided in:

- D92(a) – Viva Site Visit Map – Aboriginal Place
- D111 – Proponent’s response to the IAC’s RFI
- D248 – Technical Note 2: Cultural Heritage Management Plan map.

### (ii) What did the EES say?

Ground disturbance works associated with construction of the Project, both onshore and offshore, have the potential to result in damage to or destruction of Aboriginal cultural heritage places and values and historical archaeological sites or maritime heritage places. The EES did not identify any potential impacts on heritage from the operational phase of the Project.

The Project will not impact any known Aboriginal places. It is highly unlikely that any unknown Aboriginal places are present within the onshore and offshore activity areas. Any residual impacts can be managed by the Cultural Heritage Management Plan (CHMP) and its associated management conditions.

There are no known historical archaeological sites or maritime heritage places located within the activity area and it is unlikely that any unrecorded historical places are present. Any residual impacts can be managed by implementing onshore and offshore unexpected finds protocols.

Proposed mitigation measures are summarised in Table 32.

**Table 32 Proposed mitigation measures for Heritage**

Mitigation ID	Mitigation Measure	Project timing
MM-AH01	Implementation of an approved CHMP	Design Construction Operation
MM-HH01	Implementation of an onshore unexpected finds protocol	Construction
MM-HH02	Implementation of an onshore unexpected finds protocol	Construction

EES Chapter 13 concluded that heritage impacts are consistent with the draft evaluation objective, and can be acceptably managed through the recommended mitigation measures.

### (iii) Key issues

The key issues are:

- the adequacy of the Aboriginal cultural heritage investigations
- the potential loss of significant Aboriginal cultural heritage values, including underwater values.

### (iv) Evidence and submissions

Ms Jen Burch gave evidence for the Proponent on cultural heritage matters (D56, D56a and D99). She was also author of the CHMP. Her evidence supported the findings of the EES.

#### Aboriginal cultural heritage

Ms Burch's evidence was that preparation of Technical Report O and the CHMP involved extensive consultation with the RAP, the WTOAC, and involved undertaking a desktop assessment, standard assessment (archaeological survey) and complex assessment (archaeological sub surface testing). As a result of the complex assessment, one new Aboriginal place was identified (Lara City Gate AS (7721-1455 [VAHR]) which will not be impacted by the Project.

Ms Burch's evidence was that possible tangible and intangible values associated with Corio Bay were not fully assessed in Technical Report O. She stated that *"the impracticability of assessing archaeological values of the bay floor was accepted by WTOAC during the CHMP assessments and consultation"* (D99) and that no intangible values were identified by the WTOAC during consultations for the CHMP or in the Technical Reference Group process.

The WTOAC's original submission (S28, also referred to as its Part A submission) was made by the WTOAC *"on behalf of the Wadawurrung People"* as distinct from its role as RAP under the *Aboriginal Heritage Act 2006*. Submission S28 expressed concern that the Project would trigger three threats to Wadawurrung country and values as identified in its *Paleert Tjaara Dja: Wadawurrung Country Plan 2020* (attached to S28) being 'urban development', 'weeds', and 'rabbits'. The Project could also impact on the WTOAC's ability to:

... protect and conserve our Country's 'Wadawurrung cultural sites and places', 'Yalluk', 'Coastal Country', 'Bush tucker, medicines and resources', 'Warre: Sea Country', and 'Native Animals' Values narrated in our Paleert Tjaara Dja: Wadawurrung Country Plan 2020.

The WTOAC submitted that Corio Bay, or Corayio, has existed for only a short time, some 1,000-3,000 years, when saline waters flooded the previous open grassy plains and woodlands of the Nerm (now Port Phillip Bay area) and Corayio. The Wadawurrung continue to see this cultural landscape and believe that the area contains Wadawurrung living cultural heritage sites, including middens and hearths, beneath the sea floor.

The WTOAC expressed concern about the "*substantive lack of marine archaeological knowledge and investigations as to what lies beneath the contemporary waters of Corayio*" and submitted that the Project presents risks of harm to these undocumented undisturbed cultural heritage places and values, which were not assessed in the EES. In response to questioning from the IAC (D280), the WTOAC submitted that the CHMP contains insufficient information on maritime archaeology. In its response to the Part C Project Documentation (D500), the WTOAC expressed concern that the relevant mitigation measure (MM-AH01) does not address marine issues as a result.

At the Hearing, the IAC asked the WTOAC about the practicalities associated with assessing the cultural values of an area that has now been inundated with seawater. In response, the WTOAC submitted that underwater Aboriginal cultural archaeological studies have been done before and gave the example of the work done assessing the potential for submerged archaeological sites as part of the CHMP for the Port Philip Bay Channel Deepening project (D222). In a follow up response (D280), the WTOAC referred to two current investigations into submerged cultural landscapes in progress in Victoria's coastal waters (one in Gunditjmara Country's waters in Portland Bay in respect of a proposed offshore wind farm proposal and the other associated with the proposed Marinus Link undersea electricity connection traversing GunaiKurnai Country and Palawa Country waters across Bass Strait). It submitted that a similar investigation should be undertaken here.

The WTOAC submitted that intangible values of the Project area (land and waters) have not yet been adequately assessed, noting (S28):

There are many more cultural places that are intangible and also carry the imprint of our ancestors. We can feel them in places where our songlines pass through and in the places in our creation stories. In this way all of Country is connected.

The WTOAC expressed concern that the EES had not undertaken a 'culturally-attuned' assessment of risks to Wadawurrung animal species due to its focus on "*Western ranking systems of animal 'significance'*" and had failed to adequately consider impacts on more common animals in the Project area that are important to the Wadawurrung people. At the Hearing, the WTOAC referred specifically to the egret, black swan, dolphin and stingray as examples of animals associated with intangible values.

Despite these reservations, the WTOAC did not take a definitive position on whether the Project should proceed or not and confirmed that it is satisfied with the level of "*engagement and voice recognition*" through its participation in the Technical Reference Group and associated consultations for the Project. However, its Part B submission (D443), which reported on consultation with Wadawurrung participants at a 'yarning circle' workshop, stated:

... there was common consensus that this proposal should not proceed because there were too many risks and problems, and a cumulative problem facing the future and health of Corio Bay and the Corio/Norlane locality and residents.

During the Hearing the WTOAC raised a concern whether the existing Area of Cultural Heritage Sensitivity would be extended commensurate with the proposed extension of the Planning Scheme as a result of the draft PSA (D198).

### **Non-Aboriginal cultural heritage**

Ms Burch gave evidence that Technical Report P was prepared following a desktop assessment and archaeological survey of the least disturbed portions of the onshore project area (D56). Her evidence was that it is highly unlikely that the Project will have any direct or indirect impacts to known or unknown historical archaeological sites or maritime heritage places both onshore and offshore, particularly given the proposed unexpected finds procedure which will manage previously unknown historical heritage resources in the unlikely event that these are encountered during the construction phase of the Project.

## **(v) Discussion**

### **Aboriginal cultural heritage**

The IAC is concerned that Technical Report O, and as a result the CHMP, does not adequately address intangible (onshore and offshore) and offshore (submerged) Aboriginal cultural heritage values. These are matters specifically referred to in the Scoping Requirements which (at section 4.4):

- list the potential for adverse effects on underwater Aboriginal cultural heritage values as a key issue
- require the Proponent to identify intangible cultural heritage values that could be affected by the Project, in consultation with the RAP, and areas of Aboriginal cultural heritage sensitivity, including consideration of submerged Aboriginal cultural heritage within Corio Bay.

The Proponent appears to have relied on the WTOAC (as RAP) not having identified any relevant intangible values in relevant consultations and having accepted that a marine archaeological study would not be undertaken. However, the IAC now has before it a submission from the WTOAC (albeit acting in its role as representing the Wadawurrung people rather than as the RAP) that there are intangible and submerged cultural heritage values that have not been identified in the EES or the current draft of the CHMP which could be impacted by the Project.

The IAC recommends that:

- a cultural values assessment be undertaken to identify intangible values that could be impacted by the Project (both onshore and offshore in Corio Bay)
- an underwater Aboriginal cultural archaeological assessment be undertaken for the proposed dredging areas.

Undertaking these studies would, of course, be subject to agreement with the WTOAC, and the IAC notes that the Proponent has indicated that it is open to undertaking a cultural values assessment. The result of both assessments should feed into an updated CHMP prior to finalisation.

Subject to the outcomes of these assessments, the IAC considers that the Project will not impact on any known Aboriginal cultural heritage values and the potential impacts on unknown Aboriginal cultural heritage values can be managed by the (updated) CHMP and its associated management conditions.

In relation to the issue of whether the existing Area of Cultural Heritage Sensitivity should be extended commensurate with the proposed extension of the Planning Scheme (discussed in Chapter 20.1 below), the IAC considers that this is likely to be a mapping issue and suggests that this matter be addressed as appropriate by the relevant Victorian Government department or agency in due course should the draft PSA proceed.

### **Non-Aboriginal cultural heritage**

The issue of non-Aboriginal cultural or historical heritage received very little attention in submissions. The IAC notes that the Project area is already highly disturbed, and is satisfied that any potential impacts on historical archaeological sites or maritime heritage places can be managed by implementing onshore and offshore unexpected finds protocols.

#### **(vi) Findings and recommendations**

The IAC finds:

- Further assessment of the impacts of the Project on intangible Aboriginal cultural heritage values (onshore and offshore) and on offshore (submerged) Aboriginal cultural heritage values is required in order to inform an updated CHMP.
- Potential impacts on non-Aboriginal historical archaeological sites or maritime heritage places can be acceptably managed by implementing onshore and offshore unexpected finds protocols.

#### **Further work**

The IAC recommends the following further work be undertaken before decisions are made on the Project approvals (should they be issued):

**Undertake a cultural values assessment to identify intangible values relevant to the Project (both onshore and offshore in Corio Bay) and an underwater Aboriginal cultural archaeological assessment for the proposed dredging areas to inform an updated Cultural Heritage Management Plan. Review and update the mitigation measures and Incorporated Document to include any necessary changes to implement the updated Cultural Heritage Management Plan when approved.**

#### **Environmental Management Framework**

The IAC recommends:

**Amend Aboriginal heritage mitigation measure MM-AH01 as shown in Appendix G of the Inquiry and Advisory Committee's Report No. 2, to require the Proponent to update the Cultural Heritage Management Plan after the cultural values assessment and underwater Aboriginal cultural archaeological assessment have been undertaken.**

#### **(vii) Overall conclusions**

Subject to the further work recommended above, heritage impacts are consistent with the draft evaluation objective and relevant policy and legislation, and can be acceptably managed through the IAC's recommended mitigation measures.

# 18 Matters of National Environmental Significance

## 18.1 Introduction

The Project was determined to be a controlled action under the EPBC Act due to potential significant impacts on:

- the Ramsar wetland
- listed threatened species and ecological communities
- listed migratory species.

Clause 43(i) of the Terms of Reference states that the IAC's Report must contain:

... specific findings and recommendations about the predicted impacts on matters of national environmental significance and their acceptability, including appropriate controls and environmental management.

## 18.2 Relevant information

### (i) What did the EES say?

Attachment IV to the EES addressed MNES, based on assessments of MNES undertaken as part of:

- Technical Report A: marine ecology and water quality assessment
- Technical Report D: terrestrial ecology impact assessment
- Technical Report E: surface water impact assessment
- Technical Report F: groundwater impact assessment.

The assessment of MNES included:

- desktop assessments of relevant government biodiversity databases, including the Victorian Biodiversity Atlas and the Commonwealth's Protected Matters Search Tool (an online tool to assist proponents to identify MNES in the area of a proposed project)
- desktop reviews of existing conditions reports, including previous field-based ecological investigations
- field investigations, including targeted flora and fauna surveys.

Impact assessments were undertaken in accordance with the *Matters of National Environmental Significance Significant impact guidelines 1.1* (Department of Environment, 2013) (Significant Impact Guidelines) to determine whether the Project would have a significant impact on MNES. More detail on these guidelines is provided in Appendix F in Report No. 2.

The EES concluded that a significant impact on MNES is unlikely.

### (ii) Additional information

The Proponent tabled the following additional information during the Hearing:

- D140 – Mr Lane's presentation, which included a revised list of terrestrial threatened species produced as part of Nature Advisory's peer review of Technical Report D
- D177 – the Addendum to Technical Report D, which included AECOM's updated list of terrestrial threatened species
- D246 – Update to the MNES assessment prepared by Nature Advisory

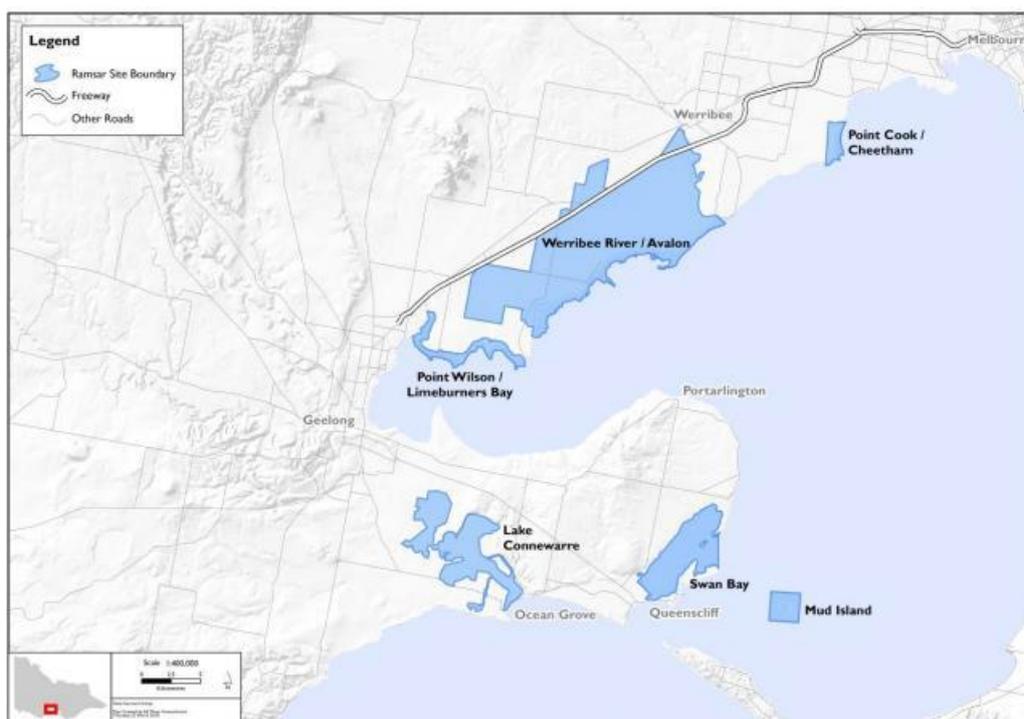
- D237 – Mr Chidgey’s response to the IAC’s RFI (which includes an updated list of marine threatened species).

## 18.3 The Ramsar wetland

### (i) Background

The Ramsar site covers 22,650 hectares and is comprised of six discrete sections as shown in Figure 12.

**Figure 12** Map of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site



Source: Figure 2-1, EES Attachment IV

The Limeburners Bay to Point Wilson section is around 700 metres from the Project area at the closest point.

The ecological character description for the Ramsar site draws attention to seagrass in the coastal areas adjacent to Point Wilson/Limeburners Bay as being one of three locations in the Ramsar site where seagrass is present.

The ecological character description sets Limits of Acceptable Change (LAC) for relevant ecological components. Some refer to specific locations but there are no specific references to the Point Wilson/Limeburners Bay section. EES Attachment IV reported that the most recent assessment of the LAC, by DELWP in 2020, showed that:

- most of the LAC were met except for lesser sand plover
- there was insufficient data to assess the native fish LAC
- the LAC for saltmarsh was met
- there had been a decline in Orange-bellied Parrot.

**(ii) Assessment**

Table 33 sets out the IAC's assessment of impacts on the Ramsar site assessed against the criteria in the Significant Impact Guidelines.

**Table 33** Impacts on the Ramsar wetland

Significant impact criteria	IAC's findings
Areas of the wetland being destroyed or substantially modified	No significant impacts are expected. The Project area is approximately 700 metres from the Ramsar site at the closest point, and does not involve any construction or works within the Ramsar site.
A substantial or measurable change in the hydrological regime of the wetland	No significant impacts are expected. Seawater intake and discharge volumes for the Project would be the same as existing volumes at the Refinery. The Project is not expected to change the hydrological regime of the wetland by altering surface water or groundwater flows. Refer to Chapter 14.
Serious effects to the habitat or lifecycle of native species dependent on the wetland	<p>There is some uncertainty as to whether the Project will result in significant impacts on native species dependent on the wetland.</p> <p><b>Vegetation</b></p> <p>The EES concluded that dredging at Refinery Pier may have localised short-term effects on seagrass near the Ramsar site resulting from increases in suspended solids concentrations and turbidity, but no long-term impacts. However further assessment is required to address uncertainties in the hydrodynamic model and ecological assessments on which this conclusion is based. Refer to Chapters 7 and 8.</p> <p>The EES predicted no serious impacts on mangroves or saltmarsh. However the assessments of the intertidal zone were limited. Refer to Chapter 7.3.</p> <p><b>Native fish</b></p> <p>Releases of chlorinated wastewater are currently occurring from the Refinery and will continue to occur at around the same rate (but potentially at a different location). Hydrodynamic modelling has shown that chlorine plumes are unlikely to reach the Ramsar site, but this conclusion should be validated through the revised modelling. Refer to Chapters 7.5 and 7.6.</p> <p>Chlorine by-products may be spread over a wider area through biological pathways with biomagnification in higher-order predators. Further assessment of the impacts of existing chlorine discharges from the Refinery is recommended to confirm the impacts of chlorine by-products. Refer to Chapter 7.6.</p> <p>The EES concluded that there would be only minor changes to the entrainment of fish eggs and larvae resulting from the relocation of the seawater intake from the Refinery to the FSRU. This should be confirmed by re-running the entrainment modelling with revised inputs based on the refined hydrodynamic model. Refer to Chapter 7.7.</p> <p>Further investigations are required to confirm the impacts of dredging on water quality and seagrass, and potential implications of the results of these investigations for native fish should be considered. Refer to Chapter 8.</p> <p>Fish may be vulnerable to sedimentation during fish spawning and juvenile development. Potential impacts will be mitigated to an acceptable level by not dredging during the spring breeding season. Refer to Chapter 8.9.</p>

**Significant impact criteria****IAC's findings****Aquatic birds**

Potential impacts on aquatic birds (waterbirds) via marine pathways were not assessed in detail in the EES, based on the assumption in Technical Reports A and D that the Ramsar site and shorebird habitat will not be impacted by the Project through marine pathways. Further investigations are required to confirm this assumption. Refer to Chapters 7 and 8. Further assessment of impacts on aquatic birds is recommended based on the outcomes of those further investigations. Refer to Chapter 9.4.

Higher-order predators are susceptible to biomagnification, but biological transmission of chlorine by-products from existing and proposed wastewater discharges was not investigated. Refer to Chapter 7.6.

Minor changes to entrainment are not expected to significantly alter food resources from zooplankton and ichthyoplankton, although entrainment effects should be reconfirmed based on the revised modelling. Refer to Chapter 7.7.

Noise and light from Project construction and operation is not expected to be disruptive to aquatic birds. Refer to Chapter 9.4.

A substantial and measurable change in the water quality of the wetland

There is some uncertainty as to whether the Project will result in a substantial change in the water quality of the wetland.

**Surface water runoff**

Surface water drainage from the onshore project area flows towards the Ramsar wetland. Risks to water quality, including sediment and pollutants, are expected to be acceptably managed with the proposed mitigation measures. Refer to Chapter 14.4.

**Dredging**

Dredging at Refinery Pier is predicted to lead to pulses of elevated suspended solids with plumes that are likely to extend, at least at low concentrations, to Avalon Beach and the entrance to Limeburners Bay. The suspended solids plumes are expected to be a temporary disturbance to water quality because the dredging program is only anticipated to continue for 8 weeks, and because suspended solids will quickly settle out of the water column (although there is some uncertainty regarding settling rates – refer to Chapter 8.3). Further assessment is required to confirm the extent, duration and suspended solids concentrations that are likely to occur at the Ramsar site. Refer to Chapter 8.7.

Dredging will result in short-term localised increases in metals concentrations in the water column but elutriate analysis has shown low bioavailability. Refer to Chapter 8.4.

Nutrient release during dredging brings the risk of phytoplankton blooms, although such blooms occur periodically due to natural events. Refer to Chapter 8.2.

**Operational discharges**

Synergies between the Project and existing Refinery mean that the chlorine discharges will not exceed existing chlorine discharges from the Refinery, but the impact of existing discharges requires further assessment. Refer to Chapter 7.4.

Significant impact criteria	IAC's findings
Establishment or spread of harmful invasive species in the wetland	<p>The location of operational discharges will change if the Refinery closes (discharges would be via the diffuser (in open loop mode) or directly from the FSRU (in closed loop mode)). If this occurs, it is predicted to lead to local increases in chlorine concentrations in the vicinity of Refinery Pier, but not extending to the Ramsar wetland, although further hydrodynamic modelling is recommended to confirm the extent of the plumes. Refer to Chapters 7.5 and 7.6.</p> <p>Chlorine discharges may have potential implications for the Ramsar wetland via chlorine by-products and biological pathways, but these are not well understood. Refer to Chapter 7.6.</p> <p><b>Impacts of additional shipping movements</b></p> <p>Up to 90 additional ship movements are expected per year, plus tugs, which is expected to increase turbidity. Refer to Chapter 7.9.</p> <p>No significant impacts are expected. The EES identified that some components of the Project are associated with risks of introducing or spreading invasive species, including onshore pipeline construction and increased shipping traffic. Mitigation measures will be applied to address these risks, and impacts are not anticipated to be significant. Refer to Chapter 7.9.</p>

### (iii) Findings

The IAC finds:

- There is some uncertainty regarding potential impacts on the Ramsar wetland. The IAC has recommended further investigations and revised modelling in Chapters 7, 8 and 9 to address this.

## 18.4 Listed threatened species and ecological communities and migratory species

### (i) Background

As discussed in Chapters 6.2 and 9.4, Technical Report D included a list of threatened terrestrial species and birds (other than penguins) that are considered possible or likely to occur in the Project area. After exhibition, three further versions of this list were tabled:

- the revised list produced by the Nature Advisory peer review (D140)
- the revised list in the Addendum to Technical Report D (D177)
- the update to the MNES assessment prepared by Nature Advisory (D246).

At the request of the IAC, Mr Chidgey prepared an updated list of threatened marine species (in D237), which added an assessment of likelihood of occurrence of each species (which was missing from Technical Report A1). Updates were also made to ensure consistency with the latest Victorian FFG Act threatened species list, which supersedes and incorporates the former DELWP advisory lists. Mr Chidgey's revised list excluded two EBPC Act-listed species identified in EES Technical Report A as possible rare visitors to the study area (green turtle and loggerhead turtle).

**(ii) Assessment**

Table 34 sets out the IAC's assessment of impacts on listed threatened species and migratory species.

**Table 34 Impacts on EPBC Act-listed threatened species and migratory species**

<b>Species</b>	<b>IAC's findings</b>
<b>Threatened flora species and ecological communities</b>	
Spiny rice-flower and large-fruit fireweed	The IAC considers that these species are unlikely to occur in the Project area. Although they were identified as species of interest in the Scoping Requirements, the EES investigations including a targeted search for spiny rice-flower indicated that these species are unlikely to occur in the Project area. Refer to Chapter 9.3.
Natural Temperate Grassland of the Victorian Volcanic Plain	The vegetation community does not occur in the Project area but is present adjacent to the Project area. No significant impacts are expected. Refer to Chapter 9.3.
Subtropical and Temperate Coastal Saltmarsh	A small patch of saltmarsh was identified within the pipeline corridor, but Mr Lane's evidence (D140) was that this patch was below the minimum size threshold to be counted as a threatened ecological community.
<b>Threatened fauna species</b>	
General	The EES does not provide a complete list of all of the threatened bird species that could potentially be affected by the Project. As a result, the IAC is not confident that all relevant species that could be impacted by the Project have been identified and assessed. Refer to Chapter 9.4.
Curlew sandpiper and red knot	These species were either recorded in the shorebird surveys at the Ramsar site or had been observed by local bird watching groups, yet were not included in the threatened species list in the updated MNES assessment prepared by Mr Lane (D246). As noted above, the lack of a comprehensive assessment of birds likely to be present in the Ramsar site may have led to further species not having been identified. Refer to Chapter 9.4.
Eastern curlew	This species was assessed in the EES and peer review as unlikely to occur in the pipeline study area, not recorded in the shorebird surveys or recently observed by local bird watching groups, and not included in the threatened species list in the updated MNES assessment prepared by Mr Lane (D246). As noted above, the lack of a comprehensive assessment of birds likely to be present in the Ramsar site may have affected the assessment of this species. Refer to Chapter 9.4.
Orange-bellied Parrot	Orange-bellied Parrots may possibly use habitat at Limeburners Lagoon to facilitate movement to their winter stronghold at the Western Treatment facility. This species was assessed in the EES and peer review as unlikely to occur in the pipeline study area and not included in the threatened species list in the updated MNES assessment prepared by Mr Lane (D246). As noted above, the lack of a comprehensive assessment of birds likely to be present in the Ramsar site may have affected the assessment of this species. Refer to Chapter 9.4.

Species	IAC's findings
Swift parrot, grey-headed flying-fox, white-throated needletail, white shark, leatherback turtle	On the basis of the assessments for these species presented during the Hearing (D246), the IAC considers that significant impacts on these species are unlikely.
Fairy tern	<p>Fairy tern had been reported to breed at the Avalon salt ponds and the Avalon foreshore (D246). Due to the narrow definition of the study area used in Technical Report D, potential impacts on fairy tern have not been adequately assessed. Further, the understanding of marine impact pathways is constrained by unresolved uncertainties relating to the marine assessments. Refer to Chapters 7, 8 and 9.4.</p> <p>That said, Nature Advisory advised that extensive areas of suitable habitat for fairy tern occur throughout western and southern Port Phillip Bay, and even if potential impacts were to be predicted for fairy tern at the Avalon foreshore, the overall significance of these impacts for the species may be limited. On that basis, the IAC considers that significant impacts on this species are unlikely.</p>
Golden sun-moth	This species was considered unlikely to occur in the Project area, but a precautionary approach was taken by assuming that it could potentially be present in grasslands along the onshore pipeline route near Lara. Nature Advisory (D246) considered golden sun-moth 'unlikely' to occur in the Project area and did not present a significant impact assessment for this species. The IAC considers this approach to be acceptable and significant impacts on this species are unlikely.
Striped legless lizard	This species was determined unlikely to occur in the study area based on targeted investigations undertaken as part of the terrestrial ecology assessment. On that basis, the IAC considers that significant impacts on this species are unlikely.
<b>Migratory species</b>	
General	The EES does not provide a complete list of all of the migratory bird species that could potentially be affected by the Project. As a result, the IAC is not confident that all relevant species that could be impacted by the Project have been identified and assessed. Refer to Chapter 9.4.
White-winged black tern, caspian tern, short-tailed shearwater, arctic Jaeger, pomarine jaeger, common tern, little tern, crested tern, fork-tailed swift	<p>Nature Advisory presented significant impact assessments for these species, made against the relevant criteria in the Significant Impact Guidelines based on conservation status, habitat and location (D246).</p> <p>White-throated needletail, leatherback turtle and white shark are also migratory, but were assessed against the significant impact criteria for threatened species, which address the same impact pathways.</p> <p>Nature Advisory concluded that the Project would have no significant impacts on any of these migratory species. Its conclusion relied on the assumption that only small numbers of migratory birds are likely to use the onshore study area, which is narrowly defined (50 metres from either side of the pipeline). The IAC considers that a wider study area should be considered that includes the Avalon foreshore and Limeburners Lagoon. Further, the understanding of marine impact pathways is constrained by</p>

Species	IAC's findings
	unresolved uncertainties relating to the marine assessments. Refer to Chapters 7, 8 and 9.4.

### (iii) Findings

The IAC finds:

- There is some uncertainty regarding potential impacts on migratory and aquatic bird species. The IAC has made recommendations for further investigations and revised modelling in Chapters 7, 8 and 9 to address this.

## 18.5 Overall conclusions on matters of national environmental significance

The IAC concludes:

- Further investigations and revised modelling are required to resolve uncertainties in the assessment of impacts on the marine environment and the Ramsar wetland.
- The EES does not provide a complete list of all of the threatened and migratory bird species that could potentially be affected by the Project.
- As a result, the IAC is unable to make findings on the significance of potential impacts on MNES in a number of respects.

# **PART C: INTEGRATED ASSESSMENT AND PROJECT IMPLEMENTATION**

# 19 Integrated assessment

## 19.1 Introduction

This chapter brings together the IAC's considerations in relation to:

- the overarching legislative and policy framework
- net community benefit
- the draft evaluation objectives.

## 19.2 Assessment against the legislative and policy framework

The legislative and policy framework is summarised in Appendix F in Report No. 2. Some of the legislative and policy considerations are overarching, and others relate to specific impacts and approval requirements for elements of the Project. This Chapter deals with the overarching considerations. More specific legislative and policy considerations are assessed in the issue specific chapters in Part B of this Report.

### (i) Discussion

#### Climate and energy legislation and policy

The vast majority of the over 2,000 submissions received were against the Project. Most raised concerns about climate change. Many said that the Roadmap clearly signals a rapid movement away from gas, and submitted that the Project would be incompatible with that policy imperative. ACF's submission (S1818) attached a petition against the Project signed by some 4,000 people stating that "*Geelong needs more renewables, not gas*" and the Project would take the community in the "*wrong direction*". Submitters were concerned that the Project would create 'carbon lock-in', making it more difficult to move to carbon-free pathways.

The Victorian Government does not have a 'no more fossil fuels' or 'no more gas' policy. Policies such as *Victoria's Climate Change Strategy* and the Roadmap recognise the essential link between climate and energy policy, and clearly articulate that the transition to net zero must be orderly and ensure that Victoria's energy system remains secure, reliable and affordable throughout the transition. Victorian government policy confirms a continuing, but declining, role for gas as a transitional fuel. There is a balance to be struck between the twin policy objectives of reducing GHG emissions and ensuring Victoria's energy system is secure, reliable and affordable. There may be times when these twin policy objectives cannot both be achieved to their fullest extent, and a compromise must be made.

The Proponent's position was that the Project's GHG emissions represent only a minor contribution to Victoria's emissions. The EES calculated that operating Scope 1 and Scope 2 emissions would equate to 0.05 percent (open loop), 0.19 percent (closed loop) and 0.07 percent (combined loop) of Victoria's annual GHG emissions. Further, all Scope 1 and 2 emissions within the Proponent's operational control would be offset.

Many submitters, including the Borough of Queenscliffe (S1999), considered that the Project's Scope 3 emissions should be taken into account in order to properly consider the environmental effects of the Project and its consistency with climate policy, particularly given the very significant amount of Scope 3 emissions. Submitters expressed concern that the EES had misrepresented the

true impact of the Project by excluding Scope 3 emissions. Others were concerned that the downstream emissions generated by the end use of the gas had not been counted.

Governments at all levels have set emissions reduction targets. State and Federal emissions reduction targets are legislated. If the Project proceeds, its Scope 1, 2 and some Scope 3 emissions will need to be accounted for in government GHG inventories. They will impact on Victoria's ability to meet its emissions reduction targets. The same applies to CoGG's targets. Scope 1, 2 and 3 emissions are also relevant to EPA's consideration of GHG emissions under the EP Act and section 17 of the CC Act.

The Project's Scope 3 emissions far exceed its Scope 1 and Scope 2 emissions. Mr Sullivan-Kilgour's evidence was that using the Scope 1 and Scope 2 operating emissions estimates from the EES, the Project would be seventh largest emitter in Victoria, and if Scope 3 emissions are included, the second largest emitter (D213). Environment Victoria suggested that the downstream Scope 3 emissions from burning 160PJ of gas per year would equate to 9.6 percent of Victoria's annual GHG emissions.

The IAC accepts that, if Scope 1, 2 and 3 emissions are considered, the Project would become one of the largest emitting facilities in Victoria and would make Victoria's GHG emissions reduction targets harder to achieve. However, it is not able to conclude that the Project would preclude the attainment of local, state and national emissions reduction targets, or that it would be contrary to the CC Act.

The CC Act requires that the Victorian Government "*endeavour*" to ensure that any decision made by it appropriately takes account of climate change by having regard to the need "*to reduce the State's greenhouse gas emissions consistently with the long term emissions reduction target and interim emissions reduction targets*". This is not a 'hard and fast' requirement. It is open to a decision-maker to consider the impacts of a project on the achievement of Victoria's emissions targets and conclude that, although a project will clearly increase emissions and make targets more difficult to achieve, other policy objectives (such as the need to ensure a secure, reliable and affordable energy system) should be given greater weight.

There are many ways that emissions reduction targets could be achieved, and the IAC has no evidence to support the proposition that the only way that such targets will be achieved is if this Project does not proceed. To this extent, the IAC considers the Project is not in conflict with Victoria's climate policy. Further, the Project will not preclude the Victorian Government implementing measures to accelerate the transition away from gas.

In the IAC's view, the Roadmap reflects the reality that the transition away from fossil fuels will take time and there is likely to be a continued important role for gas in that transition. Decarbonisation will require significant investment in infrastructure, alternative gases will take time to play their role, and there are considerable upfront costs to electrification and switching to alternative gases. The Roadmap itself recognises that "*new sources of gas supply and new infrastructure may be needed to maintain the reliability of gas supply*" and refers to the Project as a possible source of new supply.

The IAC therefore concludes that the Project is broadly consistent with climate and energy legislation and policy.

## Other legislation and policy

The legislative and policy framework, and the IAC's Terms of Reference, call for an integrated assessment having regard to principles of sustainable development. An integrated assessment requires a careful balance between the environmental, social and economic impacts of the Project. Short, medium and long term impacts must all be considered, including the need to preserve intergenerational equity and safeguard the welfare of future generations. This integrated assessment is undertaken as part of the IAC's net community benefit analysis in the following section.

### (ii) Findings

The IAC finds:

- There is a balance to be struck between the twin policy objectives of reducing GHG emissions and ensuring Victoria's energy system is secure, reliable and affordable.
- Although the Project will contribute to an increase in Victoria's GHG emissions, it is not incompatible with state climate policy, because it does not preclude the Victorian Government achieving its GHG emissions reductions targets.
- The Project is consistent with state energy policy because it could contribute to Victoria's energy security, reliability and affordability, although there are uncertainties as to whether these benefits will be realised.

## 19.3 Net community benefit

### (i) Discussion

Net community benefit is relevant for assessing whether the Project should receive planning approval (whether the draft PSA should be adopted). It is also a form of integrated assessment of the Project's environmental, social and economic impacts.

Clause 71.02-3 (Integrated decision making) of the Victoria Planning Provisions provides:

Society has various needs and expectations such as land for settlement, protection of the environment, economic wellbeing, various social needs, proper management of resources and infrastructure.

Planning aims to meet these needs and expectations by addressing aspects of economic, environmental and social wellbeing affected by land use and development. Planning and responsible authorities should endeavour to integrate the range of planning policies relevant to the issues to be determined and balance conflicting objectives in favour of net community benefit and sustainable development for the benefit of present and future generations.

However, in bushfire affected areas, planning and responsible authorities must prioritise the protection of human life over all other policy considerations.

Disappointingly for a project of this scope, neither the land use planning assessment nor the social and business impact assessment in the EES undertook a net community benefit assessment. Nor did the relevant witnesses. This was raised in the IAC's questions to Mr King, Ms Bailey and Ms Butler, none of whom engaged with the issue to any significant degree.

The Proponent submitted that a net community benefit assessment was not the task of the Proponent or its experts, but rather was the role of the IAC and ultimately the Minister for Planning and other statutory decision makers to assess. The IAC does not agree. Provision of an integrated net community benefit assessment should be part of a major project of this nature and would have been of assistance to the IAC.

The primary starting point for the IAC's net community benefit analysis is that the Project is proposed to be located in an industrialised port setting. The Project is broadly consistent with state and local planning policy, the applicable zoning of the land and the Port Strategy. That said, the Project's environmental, economic and social impacts must be able to be acceptably managed.

The environmental impacts of the Project on the marine environment are not able to be quantified or fully assessed based on the available information. The IAC has identified a number of gaps in the marine ecology assessment, and has made a number of recommendations for further assessment in relation to marine impacts, including revised modelling. This further work should be undertaken before a decision is made on whether statutory approvals should be granted for the Project.

The noise impacts of the Project are also not able to be quantified or assessed based on the information available to date. However the noise experts agreed on a range of mitigation measures that will ensure noise impacts are properly and thoroughly assessed. The IAC is satisfied that this can be addressed through the mitigation measures and, where required, conditions on relevant Project approvals.

There is also some uncertainty around the air quality impacts of the Project, primarily related to the wake effects of the FSRU. The IAC has recommended some further sensitivity testing to resolve this uncertainty. The sensitivity testing should be undertaken before a Development Licence for the FSRU is issued, so that it can be confirmed that the Project's air emissions will be able to be acceptably managed, and to inform a decision on whether to include conditions on the Development Licence relating to the configuration of the FSRU.

Further navigation and mooring assessments are required to determine whether the FSRU can safely be moored at Refinery Pier, and whether LNG carriers can safely navigate the Port Phillip Heads and the Corio Bay channels and berth alongside the FSRU to deliver their LNG cargoes. If the further assessment identifies the need for significant Project modifications such as further dredging, the environmental effects of any such modifications will require further assessment.

Some further assessment is required in relation to Aboriginal cultural heritage, including an assessment of intangible cultural heritage values and an underwater Aboriginal cultural archaeological assessment for the proposed dredging areas. These assessments should be undertaken to inform an updated CHMP for the Project, and the mitigation measures and Incorporated Document may require updates to include any necessary changes to implement the updated CHMP when approved.

The Project has the potential to impact on land use in the surrounding area, which could have economic impacts. The Port of Geelong is an infrastructure asset of state significance that plays a very significant role in Victoria's economy. Other surrounding land uses could also be impacted economically, such as GGS. However, the IAC has found that land use impacts, including impacts on existing and future operations at the Port of Geelong, can be acceptably managed. See Chapter 15 for more detail.

The Project's potential to augment Victoria's gas supply could deliver significant social and economic benefits. However the extent to which that is needed (and can be delivered) is subject to some uncertainty, as discussed in Chapter 5. There are other less significant social and economic benefits of the Project, including generating jobs and (if the mitigation measures are successfully implemented) providing local employment and training opportunities. These are discussed in more detail in Chapters 15 and 16.

While the Project potentially has a range of social and economic benefits, it will also have some social disbenefits. These include amenity impacts such as noise, air emissions, traffic generation and visual impacts. The IAC has found that, subject to some further assessment of noise and air quality impacts, the amenity impacts of the Project are likely to be able to be acceptably managed with mitigation measures.

The more significant social impacts of the Project are its intangible impacts, which are more difficult to assess and to mitigate. These include real and deeply held fears in the community about the safety risks associated with the Project, and stress and anxiety around climate change. While the social impact assessment in Technical Report L acknowledged these fears and anxieties, it has not really grappled with these impacts, for the reasons set out in Chapter 16.4.

The fears and anxieties around climate change are a less direct impact of the Project. They are, to some extent, more an impact of the state of the climate and climate policy. These broader concerns around climate change must be balanced against the broader policy around energy security, as discussed in the previous section. That said, effective ongoing communication and engagement with the community about how the Project is reducing its climate change impact may go some way to relieving these fears.

The safety concerns are a direct impact of the Project that must be addressed if the Project proceeds. Detailed regulatory processes apply to regulate the safety and hazard impacts of the Project. The IAC is satisfied that the impact assessment undertaken to date is satisfactory for this stage of the Project and that those regulatory processes will ensure that there is a thorough assessment of safety impacts, and that appropriate safeguards are put in place to ensure the safety of the surrounding community. Alternatively, if the safety implications of the Project are not able to be managed, those processes will ensure the Project does not proceed. As with anxieties relating to climate change, ongoing communication and engagement with the community will be crucial in managing fears relating to safety, hazard and risk.

## (ii) Findings

The IAC finds:

- On balance, subject to the further assessment of the Project's marine and noise impacts and some sensitivity testing in relation to its air quality impacts, the IAC is satisfied that the Project is capable of delivering a net community benefit.

## 19.4 Assessment against evaluation objectives

Table 35 summarises the IAC's assessment of whether the Project meets the evaluation objectives, and provides a cross reference to the relevant discussion in the Report.

Table 35 IAC's integrated assessment against the evaluation objectives

Evaluation objective	IAC's response
<b>Energy efficiency, security, affordability and safety</b>	
To provide for safe and cost-effective augmentation of Victoria's natural gas supply having regard to projected demand and supply in context of the State's energy needs and climate policy.	<b>Cost-effective augmentation of Victoria's natural gas supply having regard to projected demand and supply</b> The Project could meet the evaluation objective. However there are uncertainties as to whether the asserted benefits of the Project in addressing potential gas shortfalls or providing

Evaluation objective	IAC's response
	<p>a cost-effective augmentation of Victoria's gas supplies will be realised.</p> <p>Refer to Chapter 5.</p> <p><b>Safe augmentation of Victoria's natural gas supply</b></p> <p>Subject to the further consideration and management of safety, hazard and risk through the regulatory process, risks associated with the FSRU should be able to be acceptably managed to achieve a safe augmentation of Victoria's natural gas supply.</p> <p>Further assessment is required before it can be determined whether risks associated with LNG transits, berthing and mooring of the FSRU and LNG carriers, and unloading of LNG cargoes from carriers to the FSRU can be safely managed. This further assessment can be undertaken as part of the regulatory process.</p> <p>Refer to Chapter 11.</p>
<b>Biodiversity</b>	
<p>To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values</p>	<p><b>Marine ecology</b></p> <p>Based on the information before it, the IAC is not able to determine whether the Project's impacts on the marine environment, intertidal and marine species and habitat values have been sufficiently avoided or minimised to meet the evaluation objective. Further assessment is required, including monitoring and assessment of the existing marine environment and impacts of existing discharges from the Refinery, and revised marine modelling. The IAC's recommendations for further work provide an appropriate framework for the further assessment.</p> <p>Refer to Chapters 7, 8 and 9.4.</p>
<p>To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values</p>	<p><b>Terrestrial ecology</b></p> <p>Based on the information before it, the IAC is not able to determine whether the Project's impacts on shorebirds and marine birds have been sufficiently avoided or minimised to meet the evaluation objective. Further assessment is required, including revised marine modelling and further assessment of biological and marine pathways of impact. The IAC's recommendations for further work provide an appropriate framework for the further assessment.</p> <p>Impacts on native vegetation and non-aquatic terrestrial ecology are consistent with the evaluation objective, and can be acceptably managed through the IAC's recommended mitigation measures.</p> <p>Refer to Chapter 9.</p>
<b>Water and catchment values</b>	

Evaluation objective	IAC's response
To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site	<p><b>Groundwater and surface water</b></p> <p>With minor adjustments to the mitigation measures, adverse effects on water quality and movement can be minimised and can meet the evaluation objective.</p> <p>Refer to Chapter 14.</p>
	<p><b>Contamination and acid sulfate soils</b></p> <p>Adverse effects on water quality from contamination and acid sulfate soils can be minimised by application of the proposed mitigation measures and can meet the evaluation objective.</p> <p>Refer to Chapter 17.1.</p>
<b>Cultural Heritage</b>	
To avoid or minimise adverse effects on Aboriginal and historic cultural heritage	<p>Subject to undertaking assessments of intangible cultural values and underwater Aboriginal cultural archaeological values, adverse effects on heritage can be avoided or minimised to meet the evaluation objective, through the implementation of an approved Cultural Heritage Management Plan and the proposed mitigation measures.</p> <p>Refer to Chapter 17.4.</p>
<b>Social, economic, amenity and land use</b>	
To minimise potential adverse social, economic, amenity and land use effects at local and regional scales	<p><b>Noise and vibration</b></p> <p>Further assessment of the existing noise environment and the potential for cumulative noise from the Refinery and other industry is required before it can be determined whether potential adverse amenity impacts at a local scale can be minimised to meet the evaluation objective. The IAC's recommended mitigation measures provide an appropriate framework for the further assessment.</p> <p>With mitigation measures, vibration impacts are consistent with the evaluation objective.</p> <p>Refer to Chapter 12.</p>
To minimise potential adverse social, economic, amenity and land use effects at local and regional scales	<p><b>Air quality</b></p> <p>Subject to some sensitivity testing in relation to the wake effects of the FSRU on the dispersion of air emissions from the FSRU, air quality impacts should, with mitigation, be minimised to meet the evaluation objective.</p> <p>Refer to Chapter 13.</p>
	<p><b>Land use impacts</b></p> <p>Provided the safety and amenity impacts of the Project can be managed appropriately, land use impacts will be minimised to meet the evaluation objective.</p>

Evaluation objective	IAC's response
	Refer to Chapter 15.
	<p><b>Social and business impacts</b></p> <p>Ongoing consultation and engagement with business and the community will be essential to minimising social impacts to meet the evaluation objective.</p> <p>Refer to Chapter 16.</p>
	<p><b>Landscape and visual impacts</b></p> <p>Landscape and visual impacts can, with the IAC's recommended mitigation measures, be minimised to meet the evaluation objective.</p> <p>Refer to Chapter 17.2.</p>
	<p><b>Transport impacts</b></p> <p>Transport impacts can, with the IAC's recommended mitigation measures, be minimised to meet the evaluation objective.</p> <p>Refer to Chapter 17.3.</p>
<b>Waste management</b>	
<p>To minimise generation of wastes by or resulting from the project during construction and operation including dredging and accounting for direct and indirect greenhouse gas emissions</p>	<p><b>Greenhouse gas emissions</b></p> <p>The generation of greenhouse gas impacts within the Project's operational control can, with the IAC's recommended mitigation measures, be minimised to meet the evaluation objective. Greenhouse gas emissions associated with the Project (particularly indirect emissions) will make it harder for local and state emissions reduction targets to be achieved, but the Project cannot be said to be inconsistent with climate policy or emissions reduction targets. Direct and indirect greenhouse gas emissions associated with the Project have been appropriately accounted for.</p> <p>Refer to Chapter 10.</p>
	<p><b>Dredging</b></p> <p>Wastes associated with dredging can meet the waste management evaluation objective with the proposed mitigation measures. Refer to Chapter 8.4.</p> <p>Whether dredging can meet the biodiversity evaluation objective is discussed above.</p>
<p>To minimise generation of wastes by or resulting from the project during construction and operation including dredging and accounting for direct and indirect greenhouse gas emissions</p>	<p><b>Contamination and acid sulfate soils</b></p> <p>Contamination and acid sulfate soil impacts can meet the evaluation objective with mitigation measures. Refer to Chapter 17.1.</p>

## 19.5 Process going forward

It is beyond the scope of the IAC's task to make recommendations about the process for the IAC's recommended program of further work. That said, the IAC observes that third party involvement can result in superior assessment outcomes, as evidenced through the testing of the EES technical work through expert evidence in the Hearing. Now that the EES process is complete, there is no formal opportunity for further third party involvement in the statutory approvals processes should the Project proceed.

The IAC considers third party involvement in the further work recommended by the IAC should be facilitated as much as possible. This could be done in a number of ways, including through a formal process such as a supplementary EES, or informally through further consultation and engagement. Whatever process is adopted, the IAC considers that it is important to provide a meaningful role for third parties, including the opportunity to test the further work where appropriate. While providing further information to the community can be valuable, this would not be sufficient for properly testing the further work. A more comprehensive engagement process will be required.

The IAC also observes that it is possible that some of the further work may identify the need for significant Project modifications. For example, the navigation assessments may identify that further dredging of the Corio Bay shipping channels is required to allow safe passage of LNG carriers. If this is the case, the environmental effects of any Project modifications may require further assessment.

### (i) Findings

The IAC find:

- The process adopted for the IAC's recommended program of further work should provide appropriate opportunities for meaningful involvement by potentially affected third parties.

## 20 Project implementation

There are two key documents under which the Project, if approved, will be implemented:

- the draft PSA
- the EMF.

### 20.1 Draft Planning Scheme Amendment

#### (i) Introduction

Clause 6 of the Terms of Reference requires the IAC to review the draft PSA and recommend any changes that it considers necessary.

The draft PSA is contained in Attachment VII to the EES. It was publicly exhibited together with the EES. It proposes to apply a Specific Controls Overlay (SCO) to the Project land and waters, and introduce the Incorporated Document into the Planning Scheme to govern the use and development of the Project.

More specifically the draft PSA seeks to:

- apply the SCO to allow the use and development of land for the Project without a permit, provided the specific controls in the Incorporated Document are complied with
- extend the Port Zone to reflect the extended Refinery Pier and the berthing area for the FSRU and LNG carriers (that part of the proposed Project area currently sits outside the Scheme and has no zoning controls)
- make the Minister for Planning the responsible authority for the Project.

#### (ii) Submissions and evidence

Ms Butler gave evidence that the Incorporated Document is ‘fit for purpose’ and noted that the Proponent “*supported in full*” the proposed minor amendments to it sought by CoGG, EPA and GeelongPort. Her evidence was that Technical Report M (the land use planning assessment) provides the justification for the Minister to approve the draft PSA under section 20(4) of the PE Act without further notice or consultation.

CoGG submitted that it has no objections to the use of the SCO or the Incorporated Document and it is satisfied with the changes proposed by the Proponent in response to matters raised by CoGG including:

- inclusion of a plan showing the project components
- requiring land use and development permitted under the Incorporated Document to be generally in accordance with the endorsed Development Plan(s) required by the Incorporated Document.

CoGG further submitted that it supported the extension of the Port Zone to cover the Refinery Pier extension and berthing area for the FSRU and LNG carriers.

EPA submitted that the draft PSA:

... will establish an appropriate framework to manage and mitigate the potential impacts of the proposed amendment on the environment, amenity, and human health.

It requested that clause 4.6.4(b) of the draft Incorporated Document be amended to include ‘Marine and Terrestrial Ecology’ as one of the specific segments requiring a management plan.

Mr McGurn supported the use of the SCO and Incorporated Document, and considered that this makes proper use of the Victorian Planning Provisions. He considered that the Incorporated Document is “*generally appropriate*” subject to further revisions requiring GeelongPort to be consulted on documents (such as the Development Plans and EMPs) that are to be prepared for approval by the Responsible Authority.

### **(iii) Discussion**

The PSA provides a consistent planning framework across the Project area which provides a coordinated and integrated planning process to facilitate and control the Project. All relevant experts supported the use of the SCO and Incorporated Document, as did CoGG. The IAC agrees that it is an appropriate use of the Victorian Planning Provisions.

As discussed in Chapter 15, the IAC is satisfied that the Project is broadly consistent with the purposes, aims and objectives of the zoning and overlay controls that apply to the Project land. The IAC is satisfied that the extent of the SCO and Port Zone mapping is appropriate.

The IAC is satisfied that it is appropriate to introduce the Incorporated Document into the Planning Scheme having regard to *Planning Practice Note PPN13 - Incorporated and Background Documents*. The Incorporated Document is necessary to determine the planning controls that apply to land within the SCO.

The Proponent has been responsive to submissions that have sought to amend the draft Incorporated Document. The IAC endorses the changes reflected in the Proponent’s Part C version (D457) and has recommended a number of further modifications to provide for expanded consultation with the local community and GGS.

### **(iv) Findings**

The IAC finds:

- The planning controls in the draft PSA constitute an appropriate mechanism to facilitate the Project.
- The Part C Version of the Incorporated Document (D457), with further modifications as recommended by the IAC, is supported.

### **(v) Recommendation**

#### **Draft PSA**

The IAC recommends:

**Update the exhibited draft Amendment C442ggee as follows:**

- a) update the exhibited Incorporated Document as shown in Appendix H**
- b) replace Map 1 ‘Project Land and Special Controls Overlay Extent’ in Explanatory Report with the final version of the plan to be included at Appendix 1 of the Incorporated Document.**

## 20.2 Environmental Management Framework

### (i) The Scoping Requirements

The Scoping Requirements indicate that the EMF:

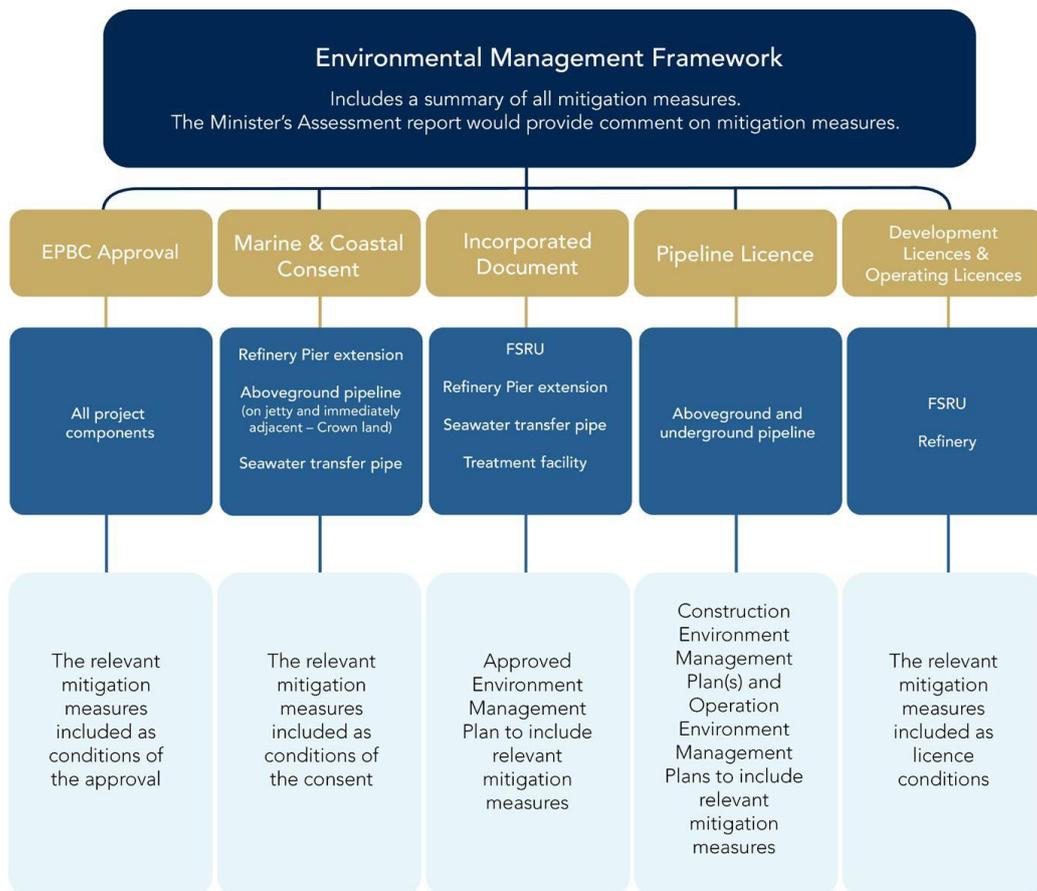
... will provide a transparent framework with clear accountabilities for managing and monitoring environmental effects and hazards associated with construction and operation phases of the Project.

### (ii) Key elements

The EMF is the framework that links the Proponent’s legislative responsibilities to onsite operational procedures, through detailed environmental management. The EMF is the mechanism through which the Project’s environmental impacts are minimised and managed.

Key elements of the EMF are the Incorporated Document, mitigation measures, an EMP approved under the Incorporated Document (which will include a CEMP and an OEMP), and a CEMP and OEMP approved under the Pipeline Licence. Development Licences and Operating Licences are also part of the broader EMF for the Project, and are discussed separately in Chapter 21.

Figure 13 Key elements of the EMF



Source: EES Chapter 14, Figure 14-1

The Scoping Requirements require the EMF to describe the baseline environmental conditions to be used to monitor and evaluate the efficacy of the environmental management and mitigation measures, as well as the residual environmental effects of the Project.

Other key elements that the EMF must include are:

- organisational responsibilities, accountabilities and governance arrangements
- an environmental risk register maintained during operation of the Project
- mitigation measures to address specific issues, including commitments to mitigate adverse effects and enhance environmental outcomes
- monitoring programs, or justification for any aspects where monitoring is not proposed
- auditing and reporting requirements
- review of the EMF's effectiveness for continuous improvement
- a program for community consultation, stakeholder engagement and communications for the Project, including a process for complaints recording and resolution.

The basic structure of the EMF was not contested at the Hearing, although the IAC questioned the Proponent as to why the EES did not contain an environmental risk register (see below).

### **(iii) Discussion**

#### **Baseline environmental conditions**

The EMF does not adequately describe the baseline environmental conditions in sufficient detail to allow monitoring and evaluation of the efficacy of the environmental management and mitigation measures, or the residual environmental effects of the Project.

The IAC has found (in Chapter 7.4) that the EES does not provide an adequate assessment of the existing marine environment for the purpose of assessing the impacts of existing discharges from the Refinery, or the potential impacts of the Project. The IAC has recommended further work to address this deficiency. This further work will establish baseline conditions more accurately and provide a more precise 'starting point' for identifying adverse changes caused by the Project.

The IAC has found (in Chapter 12.4) that the EES does not provide an adequate assessment of the existing noise environment for the purpose of assessing the noise impacts of the Project, particularly the cumulative noise impacts of the Project and existing industry (the Refinery). The noise experts agreed a detailed set of mitigation measures to address this deficiency, which the IAC supports. This further work will establish baseline conditions more accurately, and allow noise limits for the Project to be determined. It will also provide a baseline against which future compliance can be monitored.

#### **Organisational responsibilities**

EES Chapter 14.4 sets out the roles and responsibilities for the EMF.

As noted in Chapter 6.2, there was a lack of coordination between some of the Technical Reports prepared to assess the Project's impacts (in particular, the marine and terrestrial ecology assessments). To address this issue going forward, should the Project proceed, the IAC considers that an ecological coordinator should be appointed to ensure appropriate coordination of further investigations relevant to the marine environment and terrestrial ecology, including those recommended by the IAC, and for subsequent stages of the Project design and assessment process.

## Environmental risk register

The EMF does not technically meet the Scoping Requirements as it does not include an environmental risk register.

The *Environment Effects Act Advisory Note* (DELWP, updated 10/2/21) (the EES Advisory Note) states that the purpose of an EES is to clearly characterise likely environmental effects/impacts, rather than risks. It states:

While the environmental risk assessment should inform the focus of the assessment of impacts, the primary approach to the assessment of impacts/effects in the EES should be that of the impact assessment framework. The environmental risk assessment (should it be utilised at all) should not detract from or confuse the presentation and reader's understanding of predicted impacts/effects.

An environmental risk assessment was undertaken to inform the preparation of the EES. In response to the IAC's RFI, the Proponent submitted (D111):

... the environmental risk assessment conducted for the EES was used as a screening tool to inform the EES technical studies program and was not carried forward into the EES as a risk register. The EES focused on assessing impacts rather than risks. This approach was presented to the EES TRG and endorsed. Consistent with the approach adopted for large infrastructure projects, it is expected that a project risk register will be established at the implementation stage of the Project as suggested in the Scoping Requirement above.

The IAC accepts that the risk screening informed the impact assessment and resulting mitigation measures, consistent with the EES Advisory Note. However, the risk screening exercise undertaken by the Proponent (as a starting point for the EES assessments, rather than providing risk ratings based on the findings of the assessments) was of limited utility to the IAC in undertaking its task of reviewing the EES.

Further, the production and updating during the Hearing of a Project risk register would have provided a more transparent process for the community, parties and the IAC to ensure that risk identification and mitigation is being undertaken effectively at a whole of Project level.

EPA submitted in closing that it includes a standard condition on development and operating licences requiring a risk management and monitoring program to be developed which:

- identifies all the risks of harm to human health and the environment which may arise
- clearly defines environmental performance objectives and risk control performance objectives
- describes how the environmental and risk control performance objectives are being achieved
- identifies and describes how risks will continue to be eliminated or minimised SFARP
- describes how the risk information will be used and disseminated.

A condition to this effect on the Development Licences (should they issue) is an appropriate mechanism to manage risks relating to matters regulated by those licences, but the licences are limited in scope.

The IAC considers that the approach outlined by EPA provides a suitable basis for a Project-wide risk register that addresses all environmental risks associated with the Project. The Project-wide risk register should be regularly maintained, reviewed and updated as necessary. The risk registers for the Development Licences and Operating Licenses and to meet other regulatory requirements

(such as risk-management obligations under the *Pipelines Act 2005*) should be extracted from the Project-wide risk register.

### **Mitigation measures**

The proposed mitigation measures are a crucial element of the EMF. The relevant exhibited mitigation measures are summarised at the top of each issue chapter in this Report.

As part of the 'on the papers' without prejudice review of Project documentation, a number of parties, including EPA, GGS, and the WTOAC, provided detailed comments on the mitigation measures (D383, D500, D503, and D505).

Many of the suggested changes are minor and the Proponent has accepted them or made modifications to account for the comments and concerns. Extensive changes to the noise mitigation measures were agreed between the noise experts and these have been included with some restructuring for clarity.

The IAC has recommended several further changes to the mitigation measures to ensure that, should the Project proceed, impacts are minimised and the evaluation objectives are met. Substantive changes are summarised in Table 38 in Chapter 23. The IAC has also made a number of minor drafting changes to improve the clarity and operation of the mitigation measures. The IAC's recommended version of the mitigation measures is contained in Appendix G in Report No. 2, with changes tracked against the Proponent's Part C version (D456).

The mitigation measures are implemented through the Incorporated Document:

- The Development Plans approved under the Incorporated Document must be in accordance with the mitigation measures.
- The EMP must include mitigation measures generally in accordance with the Minister's Assessment.
- The EMP and other documentation prepared under the Incorporated Document must include an explanation of any difference between the mitigation measures included in the EMP and the mitigation measures set out in the Minister's Assessment.

These plans must be approved by the Minister for Planning after relevant consultation.

The IAC considers this structure will adequately implement the mitigation measures and is a similar approach taken for other major project approvals in recent years.

### **Monitoring, auditing and reporting**

EMF Chapter 14.11 outlines the approach to environmental monitoring, auditing and reporting.

Monitoring is essential both to ensure impacts are as predicted in the EES, and to undertake active management and response if they are not. Monitoring is also essential to ensure regulatory requirements are met, and that the impacts on the community and the environment are within acceptable limits.

Several mitigation measures are linked to monitoring and the EES summarises these in table 14-6. The IAC has recommended new mitigation measures, some of which extend the degree of monitoring required, particularly in the marine environment. Refer to Appendix G in Report No. 2.

Specific requirements for monitoring, reporting and auditing will also be attached to the different statutory approvals for the Project.

## Community consultation

The IAC discusses community consultation in Chapter 16.4 of this Report. The IAC has found that a more thorough engagement process with the local community could and should have been undertaken to inform the assessment of potential social impacts, and to identify meaningful and tangible mitigation measures. The IAC has recommended a new mitigation measure (MM-SB06) to require the establishment and resourcing of a Community Reference Group to address these concerns.

### (iv) Findings and recommendations

The IAC finds:

- The EMF does not meet the Scoping Requirements because the EES does not provide an adequate baseline assessment of the existing marine environment or noise environment. The IAC has recommended further work in Chapter 7.4 to address the deficiency in relation to the assessment of the marine environment. The noise experts agreed an approach to address the deficiency in relation to the assessment of the noise environment, which is included in the IAC's recommended mitigation measures in Appendix G (see Chapter 12.4).
- A Project-wide risk register should be established and maintained, based on the approach outlined in EPA's standard condition in development and operation licences. This will support a coordinated approach to managing risks associated with a range of regulatory requirements, including the Development Licences, Operating Licences and Pipeline Licence, as well as other approvals and requirements.
- The monitoring, auditing and reporting requirements in the EMF are appropriate subject to the additional mitigation measures recommended by the IAC. This should ensure there is appropriate accountability and transparency through construction and operation of the Project.
- Otherwise, the EMF meets the Scoping Requirements and is broadly appropriate.

### Environmental Management Framework

The IAC recommends:

**Include a requirement in the Environmental Management Framework to establish a Project-wide risk register to be maintained and updated as required throughout the detailed design, construction, operation and decommissioning phases of the Project. The requirements for the Project-wide risk register should be generally based on the approach outlined in the standard condition for a risk management and monitoring program applied by the Environment Protection Authority Victoria to development and operating licences issued under the *Environment Protection Act 2017*.**

**Include a requirement in the Environmental Management Framework to appoint an ecological coordinator to ensure appropriate coordination of further investigations, including those recommended by the IAC, and for subsequent stages of the Project design and assessment process.**

## 21 Development Licence applications

### 21.1 Introduction

Clause 21 of the Terms of Reference states:

The IAC is to provide advice that can be used to inform EPA's consideration of the development licence applications prepared by the proponent. The IAC may request any further information from the proponent that it considers necessary to assist it to provide that advice. The advice should recommend avoidance, mitigation or management measures that the IAC considers are necessary to ensure compliance with any relevant legislation and/or policy.

Clause 43(h) states that the IAC's report must contain recommendations with respect to the Development Licence applications, including recommendations about conditions that might appropriately be attached to the Development Licences if issued.

The EES was exhibited with Development Licence applications and supporting documentation for:

- operation of the FSRU and associated emissions and discharges from the FSRU, Scheduled Categories K01 (Power generation) and L01 (General emissions to air) (Application ID: APP013874)
- reuse of FSRU discharge water at the Refinery, Scheduled Category A04 (Industrial wastewater treatment) (Application ID: APP013841).

In determining the Development Licence applications EPA must consider the following under section 69 of the EP Act:

- the steps to be taken by the Proponent to minimise risks of harm from the Project (in order to meet the GED)
- the impact of the Project on human health and the environment
- the principles of environment protection
- the best available techniques or technologies.

EPA submitted that although the EP Act does not give rise to a licensing requirement for GHG emissions, in determining the Development Licence applications EPA must:

- have regard to the steps taken by the Proponent to minimise risks of harm from GHG (in order to meet the GED)
- consider GHG and climate change as required under section 17 of the CC Act including *"the potential contribution to the State's greenhouse gas emissions of the decision or action"* (section 178(2)(b) of the CC Act).

### 21.2 Advice to inform Development Licence applications

Based on the information before it, the IAC is not able to advise EPA whether a Development Licence for the FSRU should issue. Given the second Development Licence is for the use of the FSRU discharge in the Refinery, the IAC considers this licence will also be contingent on further investigation of the additional work in the marine environment recommended by the IAC.

#### Further work

The following further work needs to be undertaken before decisions are made on the Project approvals should they be issued (note the recommendation numbers refer to the IAC's consolidated recommendations in the Executive Summary):

**Marine and dredging:**

- further assessment of the existing environment including the intertidal zone (Consolidated Recommendation 1)
- recalibration and refinement of the hydrodynamic model (Consolidated Recommendation 2)
- revised wastewater discharge modelling (Consolidated Recommendation 3)
- further investigation of the potential effects of chlorine by-products (Consolidated Recommendation 4)
- revised entrainment modelling (Consolidated Recommendation 5)
- revised sediment transport modelling (Consolidated Recommendation 6)
- further assessment of dredging impacts on seagrass (Consolidated Recommendation 7)
- confirmation that dredging will not impact the Ramsar site in light of the revised modelling (Consolidated Recommendation 8).

**Terrestrial ecology:**

- further assessment of impacts on threatened and migratory bird species (Consolidated Recommendation 9).

**Noise:**

- further assessment discussed in Chapter 12.4 and Consolidated Recommendation 10 to:
  - properly characterise the noise environment in the vicinity of the Project
  - determine the appropriate noise limits for the surrounding area
  - establish whether cumulative noise from the Refinery and Project will be able to comply with those noise limits and the requirements of the GED.

**Air Quality:**

- sensitivity testing on the air quality modelling (Consolidated Recommendation 11).

**Conditions on the Development Licence for the FSRU**

The IAC has made a number of recommendations for conditions that should be included on the Development Licence for the FSRU (should one be issued):

- a condition adopting default guideline values for chlorine of 7.2 µg/litre in Corio Bay generally (including the Project area) and 2.2 µg/litre at the Ramsar site (Consolidated Recommendation 17)
- a condition setting the seawater intake consistent with expected gas production rates at times when the Refinery is not operating (Consolidated Recommendation 18)
- a condition requiring the Proponent to report on how it has preferred the lowest net embodied emissions LNG cargoes to be processed in the FSRU as far as reasonably practical (Consolidated Recommendation 19)
- a condition limiting operation of the FSRU in closed loop mode (Consolidated Recommendation 20)
- a condition requiring Scope 1, 2 and 3 GHG emissions within the Proponent's control to be offset with verified GHG offsets (Consolidated Recommendation 21)
- conditions about the configuration of the FSRU should the revised air quality modelling indicate that this is required, and minimising odorant emissions (Consolidated Recommendation 22).

### **Mitigation measures**

Some of the mitigation measures will be relevant to EPA's consideration of the Development Licences. The IAC recommends that, to the extent necessary, these are included as conditions of the relevant Development Licence.

## 22 Pipeline licence application

### 22.1 Introduction

The IAC's task as a Panel under the Pipelines Act is set out in its letter of appointment and in the provisions of the Act. The Panel must prepare a report making recommendations as to the action that it believes should be taken with respect to the Pipeline Licence application. Matters to be considered include:

- potential environmental, social, economic and safety impacts of the proposed pipeline
- potential impact of the proposed pipeline on cultural heritage (including Aboriginal cultural heritage)
- benefit of the proposed pipeline to Victoria relative to its potential impacts.

### 22.2 Discussion

The key environmental impacts of the proposed pipeline are:

- the impacts of construction of the Pipeline on terrestrial ecology considered in Chapters 9.3 and 9.5
- the air quality impacts during construction of the pipeline considered in Chapter 13.6
- the surface water and groundwater impacts during construction of the pipeline considered in Chapter 14
- the contamination and acid sulfate soils impacts during construction of the pipeline considered in Chapter 17.1.

The IAC concludes that all of these impacts can be acceptably managed with the application of mitigation measures.

In terms of the social and economic impacts of the pipeline, these have been assessed in Chapters 5 (project rationale) and 19.3 (net community benefit) of this Report as part of the IAC's assessment of the Project as a whole. A more detailed assessment is contained in Chapter 16. In summary, Victoria's future gas needs are highly uncertain. The Project is one, but not the only, way of augmenting Victoria's gas supply, and could contribute to Victorian energy security and reliability as the community transitions to a renewables based energy system. There are a number of uncertainties regarding whether the Project will be able to deliver gas into the Victorian market reliably and affordably but that said, the IAC concludes that the Project can deliver net community benefit and the potential benefits of the pipeline to Victoria (as part of the Project) outweigh its impacts.

The IAC's assessment of the safety impacts of the proposed pipeline is set out in Chapter 11.7. The IAC concludes that the risk from the pipeline has been satisfactorily assessed for this stage of the Project's development. The pipeline will require a detailed safety case under the Gas Safety Act and a Safety Management Plan under the Pipelines Act. The IAC is satisfied that these future regulatory processes will ensure that the safety risks of the pipeline are managed appropriately and to an acceptable level.

The IAC's assessment of the impacts of the pipeline on cultural heritage are considered in Chapter 17.4. It concludes that potential impacts of the pipeline on Aboriginal and non-Aboriginal heritage places can be acceptably managed by implementing onshore unexpected finds protocols, and the approved CHMP.

The IAC has not recommended the inclusion of any specific conditions on the Pipeline Licence. The incorporation of the IAC's recommended mitigation measures will satisfactorily address the impacts of the pipeline. The mitigation measures will need to be reflected in the CEMP and OEMP approved under the Pipeline Licence, should one be issued.

## 22.3 Findings

The IAC finds:

- The environmental, social, economic, heritage and safety impacts of the pipeline can be satisfactorily managed with the IAC's recommended mitigation measures and through the safety regulatory processes under the Gas Safety Act and the Pipelines Act.
- While there are a number of uncertainties associated with whether the Project will actually be able to deliver gas into the Victorian market reliably and affordably, the Project can deliver net community benefit and the potential benefits of the pipeline to Victoria (as part of the Project) outweigh its impacts.

## 23 Response to Terms of Reference

Clause 43 specifies the matters the IAC's report must contain. The IAC's response is included in Table 36. The IAC has formulated its advice and recommendations having regard to legislation, policy, best practice, and the principles and objectives of ecologically sustainable development as required under clause 43.

**Table 36 Summary of IAC response to Terms of Reference Clause 43**

Clause	Terms of Reference	IAC response and findings	Report reference
43(a)	Analysis and conclusions with respect to the environmental effects of the project and their significance and acceptability	Based on the information provided the IAC is not able to determine the significance of the Project's likely impacts on the marine environment, noise and air quality. Further work is required in these areas before their likely impacts can be determined.  Most other environmental effects of the Project are generally acceptable and can be managed applying the recommended changes to mitigation measures.	Part B
43(b)	Findings on whether acceptable environmental outcomes can be achieved	While some of the Project's environmental impacts (on the marine environment, noise and air quality) require further assessment before their impacts can be fully determined, most can (with mitigation) be managed to within acceptable levels. In some cases, the IAC has recommended changes to the mitigation measures, the draft PSA and proposed conditions for the Development Licences to ensure that impacts are minimised.	Part B
43(c)	Recommendations and/or specific measures that it considers necessary and appropriate to prevent, mitigate or offset adverse environmental effects	See Table 38 below.	Chapters 7 to 14, 16, 17

Clause	Terms of Reference	IAC response and findings	Report reference
43(d)	Recommendations as to any feasible modifications to the design or management of the project that would offer beneficial outcomes	No recommendations are made with respect to modifications to the design of the Project, although modifications may be required as a result of the further work and assessment on the marine environment, noise, air quality and Aboriginal cultural heritage recommended by the IAC, or the further navigation and safety work to be undertaken. Most of the IAC's findings and recommendations relate to the management of the Project, including its recommendations for changes to the mitigation measures. See Table 38 below.	Part B and Table 38
43(e)	Recommendations for appropriate conditions on Project approvals, or changes that should be made to the draft PSA in order to ensure that the environmental effects of the project are acceptable	Conditions are recommended in the form of mitigation measures that are implemented through the Project approvals.  The IAC has recommended conditions for the Development Licences should they be granted to ensure that impacts are minimised. See Table 38 below.	Part B and Chapters 20, 21, 22
43(f)	Recommendations as to the structure and content of the EMF, including with respect to monitoring of environmental effects, contingency plans and site rehabilitation	The content of the EMF is broadly appropriate. The IAC has recommended further work to establish an adequate baseline assessment of the existing marine and noise environments, and to monitor effects on the marine environment.  The monitoring, auditing and reporting requirements in the EMF are appropriate subject to the additional mitigation measures recommended by the IAC.  The EMF should ensure there is appropriate accountability and transparency for managing the impacts of the Project through construction, operation and decommissioning.  A Project-wide risk register should be established and maintained as part of the EMF.	Part B, Chapter 20.2 and Table 38

Clause	Terms of Reference	IAC response and findings	Report reference
43(g)	Recommendations about the structure and content of the draft PSA	The planning controls in the draft PSA constitute an appropriate mechanism to facilitate the Project. The Incorporated Document with the further modifications as recommended by the IAC is supported.	Chapter 20.1
43(h)	Recommendations about the Development Licence applications, including conditions	Based on the information before it, the IAC is not able to advise whether Development Licences should be issued. The further work recommended by the IAC in relation to impacts on the marine environment, noise and air quality should be completed first.  The IAC has made a number of recommendations for conditions that should be included on the Licences should they be issued. Several of the mitigation measures are also relevant to EPA's consideration of the Development Licences.	Part B, Chapters 19 and 21
43(i)	Specific findings and recommendations about the predicted impacts on MNES and their acceptability, including appropriate controls and environmental management	The IAC is unable to make findings on the significance of potential impacts on MNES. There is uncertainty regarding the potential impacts on the Ramsar wetland and what threatened and migratory bird species could potentially be affected by the Project. The IAC has recommended further investigations and revised modelling to address this.	Chapter 18

Clause 44 specifies the matters the IAC's report should include. This information is included in Table 37.

**Table 37** IAC's responses to clause 44 of the Terms of Reference

Clause	Terms of reference requirement	Report reference
44(a)	Information and analysis in support of the IAC's findings and recommendations	Part B, Report No. 1
44(b)	A list of all recommendations, including cross references to relevant discussions in the report	Table 38, Report No. 1
44(c)	A description of the public Hearing conducted by the IAC, and a list of those persons consulted with or heard	Chapter 1, Report No. 1 Appendices B and C, Report No. 2

Clause	Terms of reference requirement	Report reference
44 (d)	A list of all submitters in response to the exhibited EES and draft PSA	Appendix B, Report No. 2
44(e)	A list of the documents tabled during the proceedings	Appendix D, Report No. 2

Table 38 IAC's response to clause 44(b) of the Terms of Reference

Recommendation	Report reference
<b>Further work (to be undertaken before decisions are made on Project approvals, should they be issued)</b>	
Undertake further survey work to better establish the existing environment and the impacts of existing wastewater discharges from the Refinery to enable better understanding of Project impacts. The survey work should: <ul style="list-style-type: none"> <li>a) cover intertidal, littoral and subtidal habitats that could potentially be affected by the Project, including the Ramsar site</li> <li>b) update seagrass mapping to include the intertidal zone and information on the different seagrass species</li> <li>c) be carried out over a period of at least 12 months before construction or dredging starts, with a minimum of four sampling runs (one in each season) to address seasonal variability</li> <li>d) establish a better baseline for monitoring during and after the Project to confirm predicted outcomes on shoreline and benthic communities, including seagrasses and macroalgae.</li> </ul>	Consolidated Recommendation 1 Chapter 7.4
Refine the calibration of the regional hydrodynamic model so that it more accurately reproduces observed water levels, currents, tidal range and tidal exchange in Corio Bay. Consider: <ul style="list-style-type: none"> <li>a) the selection of the most appropriate wind data</li> <li>b) more detailed horizontal resolution to represent the Hopetoun and North Channels more accurately</li> <li>c) more detailed vertical resolution to represent discharge plumes in shallow waters more accurately</li> <li>d) the effects of the presence of the FSRU on currents</li> <li>e) peer review of the model calibration.</li> </ul>	Consolidated Recommendation 2 Chapter 7.5
Re-run the wastewater discharge modelling with revised inputs based on the refined hydrodynamic model. Consider: <ul style="list-style-type: none"> <li>a) revising the nearfield modelling of discharges from the diffuser to address the matters raised by Dr McCowan in his written evidence (D75)</li> <li>b) the IAC's recommended default guideline values for chlorine discharges in Consolidated Recommendation 17.</li> </ul>	Consolidated Recommendation 3 Chapter 7.6

Recommendation	Report reference
<p>Consider undertaking further targeted investigations into the effects of existing chlorine discharges from the Refinery to confirm likely Project impacts resulting from chlorination by-products, including measurement of chlorination by-product concentrations in:</p> <ul style="list-style-type: none"> <li>a) seawater</li> <li>b) biota that have high susceptibility to contamination.</li> </ul>	<p>Consolidated Recommendation 4 Chapter 7.6</p>
<p>Re-run the entrainment modelling with revised inputs based on the refined hydrodynamic model.</p>	<p>Consolidated Recommendation 5 Chapter 7.7</p>
<p>Re-run the sediment transport modelling with revised inputs based on the refined hydrodynamic model. Consider including a 'worst case' scenario for sediment fractions and settling rates which includes the largest expected proportions of fine and very fine materials that have the slowest expected settling velocities.</p>	<p>Consolidated Recommendation 6 Chapter 8.3</p>
<p>Undertake further assessment of dredging impacts on seagrass based on:</p> <ul style="list-style-type: none"> <li>a) the revised sediment transport modelling</li> <li>b) revised light thresholds of 10 percent to 20 percent surface irradiance (20 percent surface irradiance should be applied to any sediment plumes that extend to the Port Phillip Bay (Western Shoreline) and Bellarine Peninsular Ramsar site)</li> <li>c) the updated seagrass mapping (see Consolidated Recommendation 1(b)).</li> </ul>	<p>Consolidated Recommendation 7 Chapter 8.5</p>
<p>Confirm the EES conclusion that dredging will not impact the Ramsar site after considering:</p> <ul style="list-style-type: none"> <li>a) the revised marine modelling</li> <li>b) the revised assessment of impacts on seagrass.</li> </ul>	<p>Consolidated Recommendation 8 Chapter 8.7</p>
<p>Undertake further assessment of impacts on threatened and migratory bird species by:</p> <ul style="list-style-type: none"> <li>a) establishing a complete list of threatened and migratory bird species that could potentially be affected by the Project (and consider including the black swan)</li> <li>b) having the list peer reviewed</li> <li>c) undertaking further analysis of the targeted shorebird surveys, to determine whether the surveyed sites individually or collectively support enough individuals of any particular migratory bird species to be an important site for that species in Australia or the East Asian-Australasian Flyway</li> <li>d) considering the revised marine modelling.</li> </ul>	<p>Consolidated Recommendation 9 Chapter 9.4</p>
<p>Undertake the further assessment of noise impacts set out in mitigation measure MM-NV05.</p>	<p>Consolidated Recommendation 10 Chapter 12.4</p>

Recommendation	Report reference
<p>Undertake sensitivity testing on the air quality modelling to confirm that operational impacts on air quality would be acceptable. Consider:</p> <ul style="list-style-type: none"> <li>a) the significance of the wake effects of the floating storage and regasification unit</li> <li>b) a 'worst case' scenario for air emissions (but based on the use of best available technology)</li> <li>c) the implications of bubble limits and stack specific limits for sensitive receptors.</li> </ul>	Consolidated Recommendation 11 Chapter 13
<p>Undertake a cultural values assessment to identify intangible values relevant to the Project (both onshore and offshore in Corio Bay) and an underwater Aboriginal cultural archaeological assessment for the proposed dredging areas to inform an updated Cultural Heritage Management Plan. Review and update the mitigation measures and Incorporated Document to include any necessary changes to implement the updated Cultural Heritage Management Plan when approved.</p>	Consolidated Recommendation 12 Chapter 17.4
<b>Environmental Management Framework – mitigation measures</b>	
<p>Amend marine environment mitigation measure MM-ME08 to include a requirement that when the Refinery is not operating, the intake volume at the FSRU be limited so far as reasonably practicable to minimise entrainment during late spring/early summer.</p>	Consolidated Recommendation 13 Chapter 7.7
<p>Amend the underwater noise mitigation measures:</p> <ul style="list-style-type: none"> <li>a) amend MM-UN01 to require underwater noise to be minimised as far as reasonably practicable during construction and operation</li> <li>b) amend MM-UN02 so that it applies to marine mammals and fish and to require the development of implementation protocols by a suitable qualified marine biologist</li> <li>c) amend MM-UN04 to require: <ul style="list-style-type: none"> <li>- noise levels to generally be lower than the inherent noise levels in Appendix A-2 to Technical Report A</li> <li>- underwater noise monitoring to be undertaken during the first operational use of the diffuser system.</li> </ul> </li> </ul>	Consolidated Recommendation 13 Chapter 7.8
<p>Amend marine environment mitigation measure MM-ME15 to broaden from whale strikes to marine mammal strikes including dolphins.</p>	Consolidated Recommendation 13 Chapter 7.9
<p>Amend the marine environment mitigation measures to insert a new mitigation measure MM-ME19 to require regular monitoring to be undertaken to determine the effects of wastewater discharges from the FSRU (whether via the Refinery seawater intake or the diffuser) on shoreline and benthic communities including seagrasses, macroalgae and marine fauna.</p>	Consolidated Recommendation 13 Chapter 7.10

Recommendation	Report reference
<p>Amend marine environment mitigation measure MM-ME05 to:</p> <ul style="list-style-type: none"> <li>a) amend the thresholds to a 12-hour mean concentration above 5 NTU (trigger warning) and a 24-hour mean concentration above 5 NTU (action required), with a note that it be subject to not unreasonably extending the dredging campaign</li> <li>b) delete the paragraph that states that MM-ME05 only applies to turbidity from dredging</li> <li>c) add a requirement to manage turbidity to minimise risks so far as reasonably practicable.</li> </ul>	Consolidated Recommendation 13 Chapter 8.6
<p>Amend marine environment mitigation measure MM-ME06 to require monitoring of the effects of dredging on seagrass including biological indicators.</p>	Consolidated Recommendation 13 Chapter 8.6
<p>Amend the marine environment mitigation measures to:</p> <ul style="list-style-type: none"> <li>a) add a requirement to MM-ME02 to avoid dredging in summer to early autumn as well as spring</li> <li>b) add a requirement to MM-ME03 to avoid overflow from barges in certain conditions</li> <li>c) amend MM-ME04 to require silt screens to enclose the dredge</li> <li>d) add a requirement to MM-ME07 that water quality monitoring be undertaken in conjunction with plankton monitoring.</li> </ul>	Consolidated Recommendation 13 Chapter 8.9
<p>Amend light spill mitigation measure MM-LS03 to require a Lighting Report to be commissioned at the detailed design stage to ensure the Project complies with relevant standards.</p>	Consolidated Recommendation 13 Chapter 9.4
<p>Amend terrestrial ecology mitigation measure MM-TE09 to require targeted surveys of the little eagle to avoid disturbance to nests during the breeding season.</p>	Consolidated Recommendation 13 Chapter 9.5
<p>Amend greenhouse gas mitigation measure MM-GG01 to apply it to the operations phase of the Project as well as construction.</p>	Consolidated Recommendation 13 Chapter 10.4
<p>Amend greenhouse gas mitigation measure MM-GG11 to require:</p> <ul style="list-style-type: none"> <li>a) the Project to first avoid or minimise emissions as far as reasonably practicable and</li> <li>b) then offset the remaining, actual emissions annually, including Scope 3 greenhouse gas emissions within the Proponent's operational control.</li> </ul>	Consolidated Recommendation 13 Chapter 10.5
<p>Include a new safety hazard and risk mitigation measure MM-SHR11 to require specific consideration of the issues and recommendations raised by Dr Pillay and Mr Mannion in their expert evidence.</p>	Consolidated Recommendation 13 Chapter 11.3

Recommendation	Report reference
<p>Amend the air quality mitigation measures:</p> <ul style="list-style-type: none"> <li>a) amend MM-AQ07 to require dust suppression measures to be implemented for any dust source</li> <li>b) insert a new mitigation measure MM-AQ12 to require minimisation of odorant emissions.</li> </ul>	Consolidated Recommendation 13 Chapter 13
<p>Amend the contamination and surface water mitigation measures:</p> <ul style="list-style-type: none"> <li>a) amend MM-CO03 to require that dewatering of groundwater or perched water be avoided in Project design as well as construction</li> <li>b) amend MM-SW03 by deleting the qualification that the requirement for the trenched watercourse crossing to be constructed during no flow conditions will only apply 'where practicable'.</li> </ul>	Consolidated Recommendation 13 Chapter 14
<p>Insert a new social and business mitigation measure MM-SB06 to require the establishment and resourcing of a Community Reference Group.</p>	Consolidated Recommendation 13 Chapter 16
<p>Amend the landscape and visual mitigation measures:</p> <ul style="list-style-type: none"> <li>a) amend MM-LV01 to provide more detail in relation to understorey planting</li> <li>b) insert a new MM-LV02 requiring the FSRU to be in muted colours to reduce its visual impact, provided this is acceptable from a marine safety perspective.</li> </ul>	Consolidated Recommendation 13 Chapter 17.2
<p>Amend traffic mitigation measure MM-TP01 to require consultation with TT-Line (operator of the Tasmanian Ferry Service).</p>	Consolidated Recommendation 13 Chapter 17.3
<p>Amend Aboriginal heritage mitigation measure MM-AH01 to require the Proponent to update the Cultural Heritage Management Plan after the cultural values assessment and underwater Aboriginal cultural archaeological assessment have been undertaken.</p>	Consolidated Recommendation 13 Chapter 17.4
<b>Environmental Management Framework – other changes</b>	
<p>Consider adding a requirement to the Environmental Management Framework to develop a conceptual model for coordinated ecosystem based management of environmental impacts and risks to the marine environment in subsequent stages of the Project, including detailed design, construction (including dredging), operation and decommissioning.</p>	Consolidated Recommendation 14 Chapter 7.3

Recommendation	Report reference
<p>Include a requirement in the Environmental Management Framework to establish a Project-wide risk register to be maintained and updated as required throughout the detailed design, construction, operation and decommissioning phases of the Project. The requirements for the Project-wide risk register should be generally based on the approach outlined in the standard condition for a risk management and monitoring program applied by the Environment Protection Authority Victoria to development and operating licences issued under the <i>Environment Protection Act 2017</i>.</p>	<p>Consolidated Recommendation 15 Chapter 20.2</p>
<p>Include a requirement in the Environmental Management Framework to appoint an ecological coordinator to ensure appropriate coordination of further investigations, including those recommended by the IAC, and for subsequent stages of the Project design and assessment process.</p>	<p>Consolidated Recommendation 16 Chapter 20.2</p>
<p><b>Development Licences if they are issued</b></p>	
<p>For both Development Licences, adopt the following default guideline values for chlorine discharges:</p> <ul style="list-style-type: none"> <li>a) 7.2 µg/litre in Corio Bay generally, including the Project area</li> <li>b) 2.2 µg /litre at the Ramsar site.</li> </ul>	<p>Consolidated Recommendation 17 Chapter 7.6</p>
<p>Include a condition on the Development Licence for the FSRU that when the Refinery is not operating, the FSRU seawater intake limit should be set consistent with seasonal gas production rates, with lower limits in spring and summer, capped at a maximum of 350 ML/day.</p>	<p>Consolidated Recommendation 18 Chapter 7.7</p>
<p>Include a condition on the Development Licence for the FSRU that requires the Proponent to report annually on how it has preferenced lowest net embodied emissions LNG cargoes to be processed in the FSRU in accordance with mitigation measure MM-GG01.</p>	<p>Consolidated Recommendation 19 Chapter 10.4</p>
<p>Include a condition on the Development Licence for the FSRU that limits operation of the FSRU in closed loop mode.</p>	<p>Consolidated Recommendation 20 Chapter 10.5</p>
<p>Include a condition on the Development Licence for the FSRU that requires Scope 1, Scope 2 and Scope 3 greenhouse gas emissions within the Proponent’s control to be offset annually by surrender of verified greenhouse gas offsets.</p>	<p>Consolidated Recommendation 21 Chapter 10.5</p>
<p>Consider whether conditions should be included on the Development Licence for the FSRU regarding:</p> <ul style="list-style-type: none"> <li>a) the configuration of the FSRU, based on the results of the further air dispersion modelling that considers wake effects</li> <li>b) minimisation of odorant emissions.</li> </ul>	<p>Consolidated Recommendation 22 Chapter 13</p>

Recommendation	Report reference
<b>Incorporated Document</b>	
<p>Update the exhibited draft Amendment C442ggee as follows:</p> <ul style="list-style-type: none"> <li>a) update the exhibited Incorporated Document as shown in Appendix H</li> <li>b) replace Map 1 'Project Land and SCO Extent' in Explanatory Report with the final version of the plan to be included at Appendix 1 of the Incorporated Document</li> </ul>	<p>Consolidated Recommendation 23 Chapter 20.1</p>