Planning Panels Victoria

Viva Geelong Gas Import Terminal

Report No. 3 - Supplementary Environment Effects Statement

Environment Effects Act 1978

Planning and Environment Act 1987

12 March 2025

VICTORIA State Government

Planning Panels Victoria acknowledges the Wurundjeri Woi Wurrung People as the traditional custodians of the land on which our office is located. We pay our respects to their Elders past and present.

Viva Geelong Gas Import Terminal

Report No. 3 – Supplementary Environment Effects Statement

Environment Effects Act 1978 – Inquiry report under section 9(1)

Planning and Environment Act 1987 – Advisory Committee report under section 151(1)

12 March 2025

Sarah Carlisle, Chair

William O'Neil, Deputy Chair

Sandra Brizga, Member

Kym Burgemeister, Member

Planning Panels Victoria

Contents

List of Tables

Page

List of Figures

Glossary and abbreviations

Note: All legislation is Victorian unless indicated otherwise.

AEM3D	Aquatic Ecosystem Model 3D
CEE	Consulting Environmental Engineers
CEMP	Construction Environment Management Plan
CHMP	Cultural Heritage Management Plan
CO	carbon monoxide
CVA	cultural values assessment
D[number]	tabled document [number]
DEECA Regions	Department of Energy, Environment and Climate Action (Regions)
DGVs	default guideline values
DTP	Department of Transport and Planning
EE Act	*Environment Effects Act 1978*

EMF	Environmental Management Framework
EP Act	*Environment Protection Act 2017*
EPA	Environment Protection Authority Victoria
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPBC Significant Impact Guidelines	*Matters of National Environmental Significance Significant impact guidelines 1.1* (Department of Environment, 2013)
ERS	Environment Reference Standard
FFG Act	*Flora and Fauna Guarantee Act 1988*
FSRU	floating storage and regasification unit
GED	General Environmental Duty
GGS	Geelong Grammar School
Hydrodynamic Model Report	A 'working draft' dated February 2024 (D13) and an updated draft dated November 2024 (D14)
IAC	Inquiry and Advisory Committee
IAU	Impact Assessment Unit, Department of Transport and Planning
Jacobs Report	Viva Salt Cooling Water (SCW) Intake Upgrade, Coastal Modelling Technical Note (13 March 2020) (D133)
LNG	Liquefied Natural Gas
MACA	*Marine and Coastal Act 2018*
MMs	Mitigation measures
NTU	nephelometric turbidity units (a measure of turbidity)
Noise Protocol	*Noise limit and assessment protocol for the control of noise from commercial, industrial, and trade premises and entertainment venues* (EPA Publication 1826.4)
NO_x	nitrogen oxides
OEMP	Operations Environment Management Plan
PE Act	*Planning and Environment Act 1987*
Proponent	Viva Energy Australia Pty Ltd
PSA	Draft Greater Geelong Planning Scheme Amendment C442ggee
Ramsar site	Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site
the Refinery	Viva Energy Geelong Refinery

Report No. 1	Viva Geelong Gas Import Terminal, Inquiry and Advisory Committee Report No. 1 (Main Report) dated 5 October 2022
Report No. 2	Viva Geelong Gas Import Terminal, Inquiry and Advisory Committee Report No. 2 (Appendices) dated 5 October 2022
RTA	Renzo Tonin & Associates
S[number]	submission [number]
Stantec Report	Stantec's peer review of the marine assessments forming part of the Supplementary EES, a copy of which is Attachment 1 to the Supplementary EES
STN[number]	Supplementary Technical Note [number]
Victorian Dredging Guidelines	*Best Practice Environmental Management Guidelines for Dredging* (EPA, 2001)
VOCs	Volatile Organic Compounds
WA Dredging Guidelines	*Technical Guidance – Environmental impact assessment of marine dredging proposals* (Western Australian EPA, 2021)
Water Quality Guidelines	*Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand), 2000)
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
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
Draft Planning Scheme Amendment	Draft Amendment C442ggee to the Greater Geelong Planning Scheme
Exhibition	12 September to 24 October 2024
Submissions	Refer to Appendix B

Inquiry and Advisory Committee process	
The IAC	Sarah Carlisle, Chair William O'Neil, Deputy Chair Sandra Brizga, Member Kym Burgemeister, Member
Supported by	Planning Panels Victoria staff including Amy Selvaraj, Sarah Vojinovic and Georgia Brodrick
Directions Hearing	Planning Panels Victoria, online, 12 November 2024
Hearing	15 sitting days between: - 9 December to 20 December at Cliftons Event Centre, Melbourne - 13 to 20 January at Deakin University Waterfront Campus, Geelong
Site inspections	Accompanied and unaccompanied, 4 December 2024
Parties to the Hearing	Refer to Appendix C
Citation	Viva Geelong Gas Import Terminal Supplementary EES [2025] PPV
Date of this report	12 March 2025

Executive summary

(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 on ships (LNG carriers) and stored on a ship known as a floating storage and regasification unit (FSRU). When gas is needed, the FSRU would regasify the LNG and the gas would be piped to a new treatment facility at the Viva Energy Geelong Refinery (the Refinery). The gas would be conditioned by adding odorant and nitrogen (if required), before being piped to the Victorian Transmission Network near Lara.

The Refinery has been operating for over 60 years on the western shore of Corio Bay. The Refinery extracts seawater from Corio Bay for cooling purposes. It draws in around 350 megalitres of seawater a day, which is chlorinated to control biofouling. Around the same amount of cooling water is discharged to Corio Bay each day. The discharges contain residual chlorine, and are 8 to 10 degrees celcius above the ambient water temperature.

The Project would have 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 reused 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 as currently occurs (350 megalitres a day). Discharges would have around the same chlorine levels as existing discharges, but would be closer to ambient temperatures.

(ii) Context for assessment

The former Minister for Planning determined the Project could potentially have significant environmental effects, and required an Environment Effects Statement (EES) to be prepared. The Project was also determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), due to potential significant impacts on:

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

An EES was prepared and exhibited in 2022, and considered by an Inquiry and Advisory Committee (IAC) in Report No. 1 (Main Report) and Report No. 2 (Appendices) dated 5 October 2022. The IAC found further work was required to understand the Project's likely environmental effects in four key areas (collectively, the Relevant Environmental Effects):

- the marine environment
- noise
- air quality
- Aboriginal cultural heritage.

The IAC made recommendations for a detailed program of further work.

After considering Reports No. 1 and No. 2, the Minister directed the Proponent to prepare a Supplementary EES addressing the further work identified in Report No. 1. The Minister issued

Directions that outlined the objective of the Supplementary EES, and a series of recommendations for further work that reflected the IAC's recommendations in Report No. 1.

The Supplementary EES was prepared and exhibited in 2024. The IAC received 387 submissions, and conducted a public hearing to hear from the Proponent and submitters in December 2024 and January 2025.

This Report No. 3 contains the IAC's findings in relation to the assessment of the Relevant Environmental Effects in the Supplementary EES.

(iii) Marine environment

Regional hydrodynamic model

One of the key issues identified in Report No. 1 was the accuracy and reliability of the regional hydrodynamic model which underpinned the assessment of impacts on the marine environment. In Report No. 1 the IAC recommended the model be:

- revised to provide a more detailed and accurate simulation of hydrodynamic movements in Corio Bay
- recalibrated to demonstrate that the model was able to accurately replicate measured water levels, currents, tidal range and tidal exchange in Corio Bay.

This would enable more accurate predictions of the movement and extent of sediment from the dredging proposed as part of the Project, and wastewater discharges from the Refinery and the Project.

While the Supplementary EES did not contain sufficient information to enable a full and proper review of the revised hydrodynamic model, this information was provided through the course of the IAC process, largely at the insistence of Geelong Grammar School (GGS).

Having reviewed the material, the IAC is satisfied the revised model is better calibrated to measured data and is able to predict relevant hydrodynamic parameters in Corio Bay accurately. The data outputs from the revised hydrodynamic model were appropriate to input into the revised wastewater discharge modelling, sediment transport modelling and entrainment modelling used to assess the likely effects of the Project on the marine environment.

Existing marine environment and impacts of existing Refinery discharges

In Report No. 1 the IAC recommended a detailed program of further work to better establish the existing environment and the impacts of existing wastewater discharges from the Refinery, to enable a better understanding of the Project's likely impacts. This included:

- updated seagrass mapping
- better characterisation of the temperature and chlorine plumes generated by existing Refinery discharges
- further assessment of the impacts of existing Refinery discharges on seagrass.

The updated seagrass mapping in the Supplementary EES broadly identifies where the different seagrass species occur or are likely to occur. A more granular map showing a finer grained distribution of the different seagrass species on a specific date would not have aided greatly in understanding the impacts of existing discharges on seagrass, as it would only represent a 'point in time' and could not capture the natural temporal variations in seagrass cover and distribution in northern Corio Bay.

The IAC is satisfied the updated assessment, which included field measurements and wastewater discharge modelling, appropriately characterises the existing temperature and chlorine plumes generated by cooling water discharges from the Refinery.

The IAC is broadly satisfied the revised assessment of the impact of existing Refinery discharges on seagrass is appropriate for this stage of the assessment and approvals process. Despite over 60 years of Refinery operations, none of the material put before the IAC indicated that existing Refinery discharges have had unacceptable ecological impacts. While there were methodological limitations in the comparisons of seagrass cover within the existing discharges plumes and the reference sites in the nearby Ramsar site, the comparisons demonstrated that seagrass was present at both groups of sites, with similar average seagrass cover.

Further assessment of the Project's likely effects on the marine environment

The main impacts of the Project on the marine environment will be from dredging. The sediment transport modelling was re-run based on the revised hydrodynamic modelling, and demonstrated that the applicable surface irradiance thresholds required for seagrass survival can be met within the Ramsar site and generally within Corio Bay.

There is some uncertainty as to whether the revised sediment transport model predicted the worst case suspended solids concentration (and therefore the worst case scenario in terms of light availability for seagrass). However, the IAC is satisfied there are sufficient safeguards built into the Environmental Management Framework (EMF) to ensure dredging impacts are appropriately monitored and managed if suspended solids concentrations are higher than predicted. These include:

- a comprehensive monitoring program before, during and after dredging that will include continuous monitoring of turbidity and surface irradiance
- adaptive management requirements that must be applied during dredging if turbidity reaches specified trigger levels (to be determined).

There were some methodological flaws in the updated assessment of the effects of dredging on seagrass. These were not overly significant, and can be addressed through the dredging monitoring program required under the EMF.

In terms of operational impacts, the revised assessments (based on updated wastewater discharge modelling and some field measurements) demonstrated that discharges from the FSRU will not have unacceptable impacts on the marine environment, including through the bioaccumulation of chlorine byproducts. The entrainment modelling was re-run and demonstrated the Project will have minimal impacts on entrainment of fish eggs, larvae and other small marine organisms in northern Corio Bay.

Threatened and migratory birds

The IAC is satisfied the updated assessment of impacts on threatened and migratory birds was appropriate, and met the requirements outlined in the IAC's recommendations for further work in Report No. 1.

Overall, the IAC is satisfied the Project's impacts on the marine environment can be managed to an acceptable level consistent with the evaluation objectives through the application of the EMF. The IAC has recommended several changes to the EMF to ensure impacts on the marine environment are appropriately managed and impacts are further minimised.

(iv) Noise

In Report No. 1 the IAC found that Project noise required further assessment, in conjunction with further assessment and mitigation of Refinery noise, to properly characterise the noise environment in the vicinity of the Project and determine appropriate noise limits that must be met in the surrounding area. The IAC is satisfied the updated noise assessment applied an appropriate methodology and met the requirements outlined in the IAC's recommendations for further work in Report No. 1.

The noise experts for the Proponent and GGS agreed on revised mitigation measures to manage the Project's operational noise impacts. The IAC considers these provide a suitable framework for managing noise, and will ensure that operational noise from the Project is able to be managed to an acceptable level, consistent with the evaluation objective.

In relation to the issues remaining in dispute between the experts, the IAC finds:

- The Project should be evaluated based on the Project's ability to comply with the Project Noise Criteria, and should not be contingent on compliance with the regulatory noise limits for cumulative industrial noise (from the Refinery and other sources) at the sensitive receivers.
- The adjusted Project Noise Criteria recommended by the Proponent's noise expert, Mr Evans, are reasonable.

Existing noise from the Refinery continues to be an issue. The IAC is satisfied the Proponent is aware of the issue and taking steps to address it, but more needs to be done including preparing a comprehensive noise management plan for the Refinery. Ultimately, however, this is a matter for Environment Protection Authority Victoria as the regulator. Accordingly the IAC makes no formal recommendations in this regard.

(v) Air quality

Report No. 1 found that while the air quality assessment undertaken for the original EES was broadly appropriate, further sensitivity testing was required to consider the significance of the wake effects of the FSRU, a worst case scenario for air emissions, and the implication of bubble limits and stack specific limits for sensitive receptors.

The updated assessment demonstrated:

- wake effects of the FSRU (and LNG carriers berthed alongside the FSRU) do not significantly affect the air quality modelling and assessment
- the worst case operating scenario for air emissions has been clarified, and does not significantly affect the air quality outcomes at sensitive receivers
- stack limits, in combination with an annual bubble limit, are the most appropriate approach to control air emissions from the Project.

The IAC is satisfied the Project's impacts on air quality will be able to be managed to an acceptable level, consistent with the evaluation objectives. If the Project proceeds, the IAC recommends the Development Licence for the FSRU includes a combination of stack and bubble limits.

(vi) Aboriginal cultural heritage

In Report No. 1 the IAC found that a Cultural Heritage Management Plan (CHMP) was the appropriate mechanism to manage cultural heritage impacts, but that the CHMP should be informed by:

- a cultural values assessment (CVA) that identifies intangible values relevant to the Project (both onshore and offshore in Corio Bay)
- an underwater archaeological assessment for the proposed dredging areas to assess the possible presence of underwater Aboriginal cultural heritage.

The Proponent has been working with the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC), who is preparing a CVA. The Proponent has undertaken substantial underwater archaeological research, and based on that research the IAC is satisfied the Project is unlikely to have significant impacts on underwater Aboriginal cultural heritage.

The EMF contains appropriate commitments by the Proponent to ensure impacts on Aboriginal cultural heritage are avoided and minimised, and are acceptable. These include updating the CHMP (which needs to be approved by the WTOAC) in light of the CVA and the findings of the underwater archaeological assessment.

Matters of national environmental significance

The IAC is satisfied that with the implementation of the EMF, the Project's impacts on matters of national environmental significance can be acceptably managed.

Recommendations

The IAC is not tasked with recommending whether the Project should be approved. However it sees no reason, based on the material before it, not to approve the Project.

Based on the reasons set out in this Report, if the Project proceeds the IAC recommends:

1. **Revise the Environmental Mitigation Measures as shown in Appendix E:**
    a) **revise AH04 (underwater cultural heritage) to incorporate a requirement to undertake an underwater archaeological sampling program during the construction phase where dredging is to take place**
    b) **revise ME05a (baseline turbidity and light attenuation monitoring) and ME05 (turbidity and light attenuation monitoring during dredging) to require turbidity and light attenuation to be monitored in the same areas as the monitoring sites for seagrass under ME06**
    c) **revise ME05 (turbidity and light attenuation monitoring during dredging) to:**
        - **remove the references to the 12 and 15 NTU thresholds**
        - **require the thresholds (which will be based on the baseline monitoring undertaken under ME05a) to be established to the satisfaction of Environment Protection Authority Victoria**
        - **include 'cessation of dredging' as one of the actions to be taken in response to turbidity thresholds being exceeded**
    d) **revise ME06 (seagrass and seabed biota monitoring) to require:**
        - **consideration of the implications for the Corio Bay ecosystem for any impacts identified through the monitoring**
        - **12 months of baseline monitoring**
        - **monitoring of intertidal as well as subtidal seagrass**
        - **seagrass monitoring to include the area within the 5 mg/L contour on Figure 10 in this Report, to assess any impacts on seagrass outside the Ramsar site and confirm recovery if there are impacts**

e) **revise ME10 (design of the diffuser) to include a requirement for the design of the diffuser to have regard to effects on the stability of the seabed and minimise risks of erosion**
f) **revise ME12 (biosecurity measures on vessels) and ME14 (spill management procedures on vessels) to make them applicable to construction as well as operation**
g) **include a new ME17a to require 12 months of baseline monitoring of existing Refinery discharges to assist in the interpretation of data collected under ME19 (monitoring the effects of operational discharges on the marine environment)**
h) **revise ME19 (monitoring the effects of wastewater discharges on the marine environment) to require:**
   - **consideration of the implications for the Corio Bay ecosystem for any impacts identified through the monitoring**
   - **the monitoring program to be designed to detect potential impacts on water quality and key ecosystem components such as seagrass**
i) **revise ME21 (monitoring the effects of entrainment by the FSRU) to include a requirement for relevant water quality data to be collected as part of the monitoring of the effects of entrainment.**

2. **Revise the Incorporated Document as shown in Appendix F:**
   a) **include a requirement in clause 4.6.5(a)(iii) for Project noise emissions to be verified against the adjusted Project Noise Criteria extracted in Figure 11 of this Report**
   b) **include a new clause 4.6.6 to require a Project-wide risk register to be established**
   c) **make the minor corrections shown in Appendix F.**
3. **Revise the Environmental Management Framework to correct references to First Nations State Relations to read First Peoples State Relations.**
4. **Specify a combination of stack specific limits and an annual bubble limit for air emissions on the Development Licence for the FSRU.**

PART A: INTRODUCTION AND BACKGROUND

1 The Project

1.1 Overview

Viva Energy Australia Pty Ltd (the Proponent) is planning to develop a terminal to import liquefied natural gas (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. It would take 18 months to construct and commission, and is anticipated to operate for around 20 years.

1.2 Project description

Inquiry and Advisory Committee (IAC) Report No. 1 dated 5 October 2022 provides a full overview of the Project. This report summarises the Project at a higher level.

The main components of the Project are:

- extension of 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 regasify LNG (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 Viva Energy Australia Geelong Refinery (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
- around 3 kilometres of aboveground gas pipeline on Refinery 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 Victorian Transmission Network near Lara.

1.3 The Project area

The Project area is in Geelong, 75 kilometres southwest of Melbourne. It is within a 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.

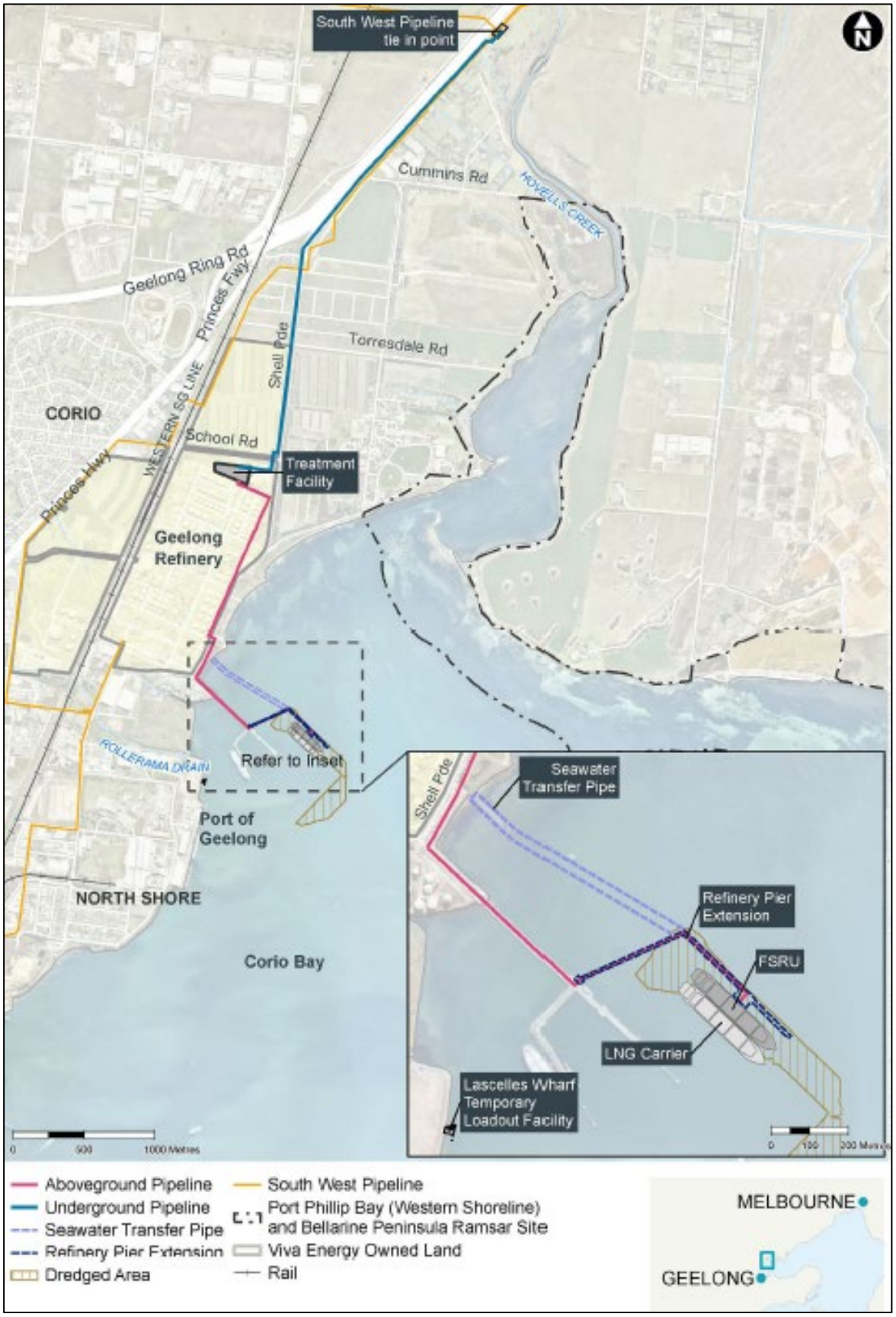
Figure 1 shows the Project area including key elements and the surrounding context.

(i) Geelong Refinery and Refinery Pier

The Refinery is located between Corio Bay and the Melbourne – Geelong rail line. The Refinery is owned and operated by the Proponent.

The existing Refinery Pier extends from the Refinery into Corio Bay, and is shown in pink/red in Figure 1. The pier extension and new berths for the FSRU and visiting LNG carriers are shown in dark blue.

Figure 1 Project area



Source: Supplementary EES Summary Document

(ii) Seawater transfer pipe

The Refinery currently uses seawater from Corio Bay as cooling water for various processes on the Refinery site. It draws seawater direct from Corio Bay, chlorinates the seawater to prevent biofouling of the cooling water system, and discharges the used cooling water back into the Bay through four discharge points (W1, W3, W4 and W5).

The Project proposes to reuse seawater used on the FSRU in the regasification process (which will be chilled as a result of warming the LNG) as cooling water in the Refinery. A seawater transfer pipe would be constructed from the FSRU to the Refinery's existing seawater intake. The seawater transfer pipe is shown in light blue in Figure 1.

(iii) Dredging area

Dredging of approximately 490,000 cubic metres of seabed sediment is proposed to allow for sufficient water depth for a berth and swing basin for the FSRU and visiting LNG carrier vessels. The dredging area is shown by brown hatching in Figure 1. The original Environment Effects Statement (EES) also noted that a small amount of sediment would be excavated for the seawater transfer pipe.

(iv) Project surrounds

The surrounding area includes:

- other industrial uses to the south along Seabeach Parade and Station Street
- the Geelong Grammar School (GGS) Corio Campus to the north east, which sits on the shores of Corio Bay and Limeburners Bay
- residential areas in North Shore, Norlane and Corio
- part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site (Ramsar Site), which is around one kilometre to the north-east of the Project (see Figure 1).

1.4 Dredging method

As noted in the IAC's Report No. 1, the berth and swing basin would be dredged to a depth of 13.1 and 12.7 metres respectively using a barge-mounted backhoe dredger with a large bucket excavator. The spoil is proposed to be placed into split hopper barges for transport to the spoil disposal area in Port Phillip Bay to the east of Point Wilson. The dredging program is anticipated to take around eight weeks.

1.5 Project operation

The regasification process would produce discharges to the air and marine environment.

The regasification process is explained in Report No. 1. In summary:

- The FSRU can operate in either open loop mode or close loop mode.
- Open loop mode involves:
  - continuously drawing in seawater through intakes on the FSRU
  - chlorinating the seawater using an electrolysis process
  - pumping the treated seawater through pipes to 'warm' the LNG so it regasifies

  - discharging the (now chilled) seawater through the seawater transfer pipe for reuse as cooling water in the Refinery, or directly from the FSRU into the Bay through a diffuser.
- Closed loop mode uses gas-fired steam boilers to heat a closed loop of circulating seawater in the FSRU. The boilers would generate air emissions. The used seawater would be discharged to Corio Bay via the diffuser once it was no longer required.
- A combined loop mode is also possible, which involves a combination of open loop and closed loop modes.

Normal operating conditions would involve the FSRU operating in open loop mode and transferring the seawater used in the regasification process to the Refinery for reuse as cooling water. Seawater would only be discharged from the FSRU via the diffuser when it is unable to be reused as cooling water (for example due to maintenance or pump failure).

The EES states that the open loop mode would have the following environmental benefits in the context of the existing use of seawater as cooling water in the Refinery:

- The reuse of seawater as cooling water removes the need for two separate discharges – one from the Refinery and one from the FSRU (via the diffuser).
- The reuse of seawater as cooling water would result in no change to the existing seawater discharge rate or chlorine levels at the Refinery discharge points.
- After reuse in the Refinery, the seawater discharged into Corio Bay would be closer to ambient temperature than:
  - existing cooling water discharged from the Refinery, which is around 7 degrees above ambient after being used to cool Refinery processes
  - direct discharges from the FSRU, which would be below ambient temperature after being used to raise the temperature of the LNG in the regasification process.
- Open loop mode does not require the use of the FSRU boilers, and will reduce the Project's air emissions.

2 Background and context

2.1 Impact assessment decisions

(i) Background

Report No. 1 outlines the:

- decision by the former Minister for Planning to require an EES for the Project
- preparation and exhibition of the EES
- IAC's findings on the EES, which included recommendations for further work to allow a full assessment of the Project's significant environmental effects.

(ii) The Minister's Directions for a Supplementary EES

After considering Report No. 1, the Minister directed that a supplementary EES be prepared "*to complete the assessment of the project's environmental effects and inform decision making*".

The Minister's Directions describe the objectives of the Supplementary EES as follows:

> **Objectives of the supplementary EES**
>
> The specific objectives of the supplementary EES, as part of the extended assessment process under the Environment Effects Act, are to:
>
> - provide an assessment of the environmental effects of the project on the marine environment, noise, air quality and Aboriginal cultural heritage necessary for the making of the Minister's assessment, especially with respect to the consolidated recommendations for further work outlined in the IAC report dated 5 October 2022 and extracted herein (Table 1)
> - consolidate and integrate the results of the supplementary EES studies with the key outcomes of the EES studies, having regard to relevant legislative and policy provisions
> - facilitate third party involvement in the process.

The four underlined environmental effects are referred to in the IAC's Terms of Reference and this Report as the Relevant Environmental Effects.

The Minister's Directions outline the steps required for preparing the Supplementary EES. Step 1 required the Proponent to develop a study program that addresses the further work identified in the IAC's Report No. 1. It reads:

> 1. Viva Energy will develop a draft study program to inform the supplementary EES outlining how it plans to undertake the environmental assessments required to address gaps and further work highlighted in Table 1.

Table 1 in step 1 restates (with some minor modifications) the IAC's consolidated recommendations in Report No. 1. It reads:

Table 1: IAC consolidated recommendations for further work

Rec	Further work to be undertaken
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 Ramsar site b. update seagrass mapping to include the intertidal zone 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 FSRU 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 (D75) b. the IAC's recommended default guideline values for chlorine discharges (7.2 microgram per litre in Corio Bay Generally, including the project area; 2.2 microgram per litre at the Ramsar site).
4.	Consider undertaking further targeted investigations into the effects of existing chlorine discharges from the Refinery to confirm likely Project impacts resulting from chlorination byproducts, including measurement of chlorination byproduct 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 Ramsar site) c. the updated seagrass mapping (Rec. 1(b)).
8.	Confirm the EES conclusion that dredging will not impact the 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.

2.2 Evaluation objectives

The Minister for Planning issued Scoping Requirements for the EES in December 2020. The Scoping Requirements include evaluation objectives against which the Project's environmental effects are to be assessed. Those applicable to the Relevant Environmental Effects are set out in Table 1.

Table 1 Evaluation objectives

Environmental effect	Evaluation objective
Marine environment	
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.
Waste management	To minimise generation of wastes by or resulting from the project during construction and operation including dredging.
Noise, air quality	
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.

Underwater Aboriginal cultural heritage	
Cultural Heritage	To avoid or minimise adverse effects on Aboriginal and historic cultural heritage.

The Scoping Requirements also set out requirements in relation to the Environmental Management Framework (EMF), which are summarised in Chapter 13.

2.3 The Supplementary EES documentation

The Supplementary EES includes five Technical Reports dealing with the Relevant Environmental Effects. The Technical Reports are listed in Table 2.

Table 2 Supplementary EES Technical Reports

Reference	Title	Author
Technical Report A	Supplementary marine environment impact assessment	Consulting Environmental Engineers (CEE)
Technical Report B	Supplementary threatened and migratory birds impact assessment	AECOM
Technical Report C	Supplementary air quality impact assessment	AECOM
Technical Report D	Supplementary noise impact assessment	Renzo Tonin & Associates
Technical Report E	Underwater Aboriginal Cultural Archaeological a\Assessment (Confidential)	Cosmos Archaeology

Technical Report E was provided in full to the IAC, but was not exhibited at the request of the Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC) as it contained culturally sensitive information.

2.4 Exhibition and submissions

The Supplementary EES was exhibited from Thursday 12 September 2024 to Thursday 24 October 2024. A total of 387 submissions were received, including:

- submissions from three government agencies:
  - Department of Environment, Energy and Climate Change (Regions) (DEECA Regions)
  - Environment Protection Authority Victoria (EPA)
  - City of Greater Geelong
- 23 submissions from environmental action or community groups
- 361 submissions from individual members of the community.

A full list of submitters is provided in Appendix B.

Submissions raised the following key issues in relation to the Relevant Environmental Effects:

- Adequacy of the further technical work, in particular whether it:
  - met the requirements outlined in the IAC's Report No. 1 and the Minister's Directions
  - adequately responded to the concerns of the Independent Peer Reviewer, Stantec
  - appropriately referenced external information relied on in the Technical Reports to allow independent verification.
- Adequacy of the characterisation of the existing marine, noise and air environments, including the reliance on meteorological data that does not represent local conditions.

- Adequacy of the updated hydrodynamic modelling, including calibration against measured conditions.
- Adequacy of the seagrass assessment, including seagrass mapping and the assessment of impacts of existing Refinery discharges on seagrass.
- Concerns that dredging (and consequent impacts on the marine environment) will be more extensive than indicated and assessed in the Supplementary EES, in particular because the shipping channels in Corio Bay will likely need to be dredged to allow safe passage of visiting LNG carriers.
- Consistency of the proposed monitoring and management of dredging impacts with the *Best Practice Environmental Management Guidelines for Dredging* (EPA, 2001) (Victorian Dredging Guidelines).
- Non-compliant noise emissions from the Refinery.
- The ability to meet applicable cumulative noise limits.
- Concerns in relation to whether Volatile Organic Compounds (VOCs) and secondary air pollutants have been properly assessed.
- Adequacy of the assessment of impacts on cultural heritage.

EPA (S330) raised issues in relation to impacts on the marine environment, air quality, and noise, and made 19 recommendations spanning requests for further work and changes to the MMs.

DEECA Regions (S338) raised issues in relation to native vegetation (including seagrass) and the Environmental Management Framework (EMF).

Submissions (both supporting and opposing) raised other matters that do not relate to the Relevant Environmental Effects, including:

- the Project's impacts on climate change
- consistency of the Project with net zero policy and legislation
- safety and hazard concerns around locating the Project close to residential areas and schools
- navigational issues
- the demand for gas in Victoria and the broader need for the Project
- the Project's contribution to the economy and protecting existing jobs and industry.

2.5 Site inspection

The IAC conducted an accompanied and unaccompanied inspection of the Project area on 4 December 2024 based on an itinerary prepared by the Proponent (D54) in accordance with the IAC's Directions. The accompanied inspection included the Refinery and Refinery Pier. The unaccompanied inspection included parts of the GGS Corio Campus, the area surrounding the Project site and the locations of several sensitive receptors used in the air and noise assessments.

2.6 Updated Project documentation

The Project documentation consists of:

- the EMF, which includes mitigation measures (MMs) to manage the Project's environmental impacts
- the Incorporated Document, which sets out conditions that must be met by the Project as part of its planning approval.

Both the EMF and Incorporated Document have been updated since the original EES was exhibited.

(i) Mitigation measures exhibited in the Supplementary EES

The MMs in the Supplementary EES included:

- changes to the MMs as exhibited with the original EES shown in blue text (these were largely in response to the IAC's detailed recommendations in Report No. 1)
- additional changes arising from the studies underpinning the Supplementary EES shown in red text.

Many of the blue text changes in the MMs exhibited with the Supplementary EES do not directly relate to the Relevant Environmental Effects. For completeness, the IAC has had regard to the blue text updates and considers they appropriately respond to the detailed recommendations in the IAC's Report No. 1.

(ii) Day 1 and Day 2 versions

The IAC directed the Proponent to circulate 'Day 1' versions of the Project documentation before the commencement of the Hearing, and 'Day 2' versions with its closing submissions. The Proponent circulated:

- D48 – Day 1 MMs
- D49 – Day 1 Planning Scheme Amendment (PSA) including the Incorporated Document
- D101 and D102 – Day 2 MMs
- D100 – Day 2 PSA including the Incorporated Document.

The Day 1 MMs included:

- the blue and red text shown in the updated MMs exhibited as part of the Supplementary EES
- green text indicating further changes made since the exhibition of the Supplementary EES, largely in response to the EPA (S330) and DEECA Regions (S338) submissions and the Proponent's expert evidence.

The Day 2 MMs included further changes (indicated in purple text) largely in response to:

- EPA's submissions to the IAC (D68, D77 and D96)
- the Joint Expert Statement on Noise (D60)
- the Joint Expert Statement on Noise Management and Monitoring Requirements (D89)
- further recommendations of marine experts Dr Wallis and Dr Edmunds.

Many of EPA's recommendations in its original submission S330 were incorporated in the Day 1 and Day 2 MMs, and were therefore considered resolved by EPA. This Report focusses on the unresolved issues in the EPA submissions.

Parties were given the opportunity to provide written comments on the Day 2 versions following the close of the Hearing. Two parties elected to do so:

- Environment Victoria (D146)
- GGS (D147 to D149).

The IAC has used the Proponent's Day 2 versions as the starting point for its recommended MMs in Appendix E and its recommended Incorporated Document in Appendix F. The IAC has considered all comments on the Day 2 versions in developing its recommended MMs and Incorporated Document.

3 Inquiry and Advisory Committee process

3.1 The role of the Inquiry and Advisory Committee

The Minister for Planning appointed the IAC on 29 October 2024 to inquire and report on the Supplementary EES and the updated draft PSA. The Minister signed Terms of Reference for the IAC on 8 September 2025. 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.

Clause 5 of the Terms of Reference states:

> The IAC is appointed by the Minister for Planning under section 9(1) of the EE Act [*Environment Effects Act 1978*] to hold an inquiry into and report on the Relevant Environmental Effects of the project The IAC must:
>
> a. review and consider the exhibited Supplementary EES, relevant referenced material and submissions in relation to Relevant Environmental Effects (i.e. those on the marine environment, noise, air quality and underwater Aboriginal cultural heritage);
> b. consider and report on the significance and acceptability of Relevant Environmental Effects, having regard to relevant policy and legislation;
> c. consider and report on the updated assessment of likely significant impacts on relevant MNES, in light of the updated information in the Supplementary EES attachment examining MNES, including the significance and acceptability of residual impacts;
> d. consider new information in the Supplementary EES that is relevant to the EPA Development Licence applications that were exhibited with the original EES;
> e. identify any additional mitigation measures or modifications, beyond those identified in the Supplementary EES, to avoid, mitigate or manage the Relevant Environmental Effects; and
> f. advise on how these measures and modifications should be implemented through the necessary approvals and consents for the project.

Clause 6 states:

> The IAC must assess the Relevant Environmental Effects in the context of the Minister's Directions, and in accordance with these terms of reference and in doing so should consider relevant aspects of the original EES, only where matters and investigations documented in the Supplementary EES rely upon or are integrated with the original EES. It is not the role of the IAC to re-examine effects that are outside the scope of the Supplementary EES.

Clause 7 states:

> In its capacity as an Advisory Committee, the IAC must:
>
> a. review the Updated PSA;
> b. consider any issues raised in public submissions that relate to the Relevant Environmental Effects or the updates to the PSA; and
> c. recommend any changes to the Updated PSA that it considers necessary to address the Relevant Environmental Effects.

Clause 8 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 PSA.

3.2 The public Hearing

(i) The Hearing

Clause 32 of the Terms of Reference required the IAC to hold a public Hearing. Clause 36 required the IAC to conduct its processes in accordance with the following principles:

- the Hearing is to be conducted in an open, orderly and equitable manner, in accordance with the principles of natural justice
- the Hearing is to be conducted with a minimum of formality and without legal representation being necessary for parties to be effective participants
- the process is to be exploratory and constructive, with adversarial behaviour discouraged.

The IAC conducted the public Hearing in person over 15 hearing days, in venues in Melbourne and Geelong. Parties were offered their requested amount of time to make submissions. Evidence was called by both the Proponent and GGS, and tested through cross examination by the parties and through questions from the IAC.

(ii) Themed evidence and questions of experts

With the support of the Proponent and GGS, the IAC directed that evidence be presented in themes, after opening submissions and before the main submissions of the parties. This allowed the IAC to hear all the evidence in December 2024, uninterrupted by the Christmas and New Year break. Main submissions followed when the Hearing recommenced on 13 January 2025.

Cross examination occurred directly after the experts presented their evidence. With the support of the parties, the IAC held its questions over until both experts in a particular field had presented their evidence and been cross examined. The IAC then put its questions to the experts concurrently. This more inquisitorial format allowed the IAC to hear the views of all experts on particular matters at the same time, and facilitated a more in depth discussion of the issues. It proved efficient and helpful to the IAC, and the IAC thanks the parties and their experts for their cooperation.

(iii) Submissions on other matters

The IAC encouraged parties to limit their submissions to the Relevant Environmental Effects, in accordance with the Terms of Reference. Nevertheless, several community groups and individuals made submissions that related to other matters. The IAC heard from these submitters, but the submissions on other matters have not influenced the IAC's advice and recommendations as they are not within the IAC's remit. See Chapter 3.6 for more detail.

(iv) Confidential cultural heritage session

The Hearing included a closed session that considered Aboriginal cultural heritage matters. The session is summarised in Chapter 10.

3.3 General approach

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. All material relating to the Relevant Environmental Effects that was put before the IAC has been considered, although not all of that material is specifically referenced in this Report.

3.4 The Report

This Report has three Parts:

- Part A provides a summary of the Project and background information about the EES, Supplementary EES and IAC processes.
- Part B provides the IAC's analysis, advice and recommendations in relation to the Relevant Environmental Effects, including updated advice and recommendations in relation to matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).
- Part C provides the IAC's advice and recommendations in relation to Project approvals (including the Incorporated Document) and implementation, should the Project proceed.

3.5 Response to the Terms of Reference

Clause 42 of the Terms of Reference sets out the IAC's reporting requirements. Table 3 provides references to the parts of the Report that meet these requirements.

Table 3 IAC's response to reporting requirements in Clause 42

Clause	Reporting requirement	Reference
42(a)	Analysis and conclusions with respect to the Relevant Environmental Effects of the Project (namely likely impacts on the marine environment, noise, air quality and underwater Aboriginal Cultural heritage) and their significance and acceptability	Part B
42(b)	Findings on whether acceptable environmental outcomes can be achieved in relation to the Relevant Environmental Effects, having regard to legislation, policy, best practice, and the principles and objectives of ecologically sustainable development	Part B
42(c)	Recommendations and/or specific measures that it considers necessary and appropriate to prevent, mitigate or offset adverse Relevant Environmental Effects	Part B, Appendix E and Appendix F
42(d)	Recommendations relating to any feasible modifications to the design or management of the Project considered necessary to reduce or mitigate Relevant Environmental Effects	Part B, Appendix E and Appendix F
42(e)	Recommendations for appropriate conditions that may be lawfully imposed on any approval for the Project to manage the Relevant Environmental Effects to acceptable levels, including recommendations for the EPA Development Licences, and changes (if any) to the updated PSA	Chapters 5, 9 and 13
42(f)	Recommendations as to the structure and content of the proposed EMF dealing with Relevant Environmental Effects, including with respect to monitoring, contingency plans and site rehabilitation	Part B, Appendix E and Appendix F
42(g)	Specific findings and recommendations about the residual impacts on MNES and their acceptability, including appropriate controls and environmental management	Chapter 11

Clause 43 of the Terms of Reference sets out what the IAC's Report must include. Table 4 provides references to the parts of the Report that meet these requirements.

Table 4 IAC's response to reporting requirements in Clause 43

Clause	Reporting requirement	Reference
43(a)	Information and analysis of the Relevant Environmental Effects in support of the IAC's findings and recommendations	Part B
43(b)	A list of all recommendations, cross referenced to relevant discussions in the Report	Consolidated recommendations are in the Executive Summary. Supporting discussion is in the Part B chapters
43(c)	A description of the public hearing, and a list of those consulted with or heard	Chapter 3.2, Chapter 11.1, Appendix C
43(d)	A list of submitters to the exhibited Supplementary EES and draft PSA	Appendix B
43(e)	A list of documents tabled during the proceedings	Appendix D

3.6 Limitations

(i) Matters outside the Relevant Environmental Effects

Clause 6 of the Terms of Reference specifically state "*it is not the role of the IAC to re-examine effects that are outside the scope of the Supplementary EES*". In accordance with its Terms of Reference, the IAC has not reported on matters that fall outside the Relevant Environmental Effects. Many of the issues raised in submissions that fall outside the Relevant Environmental Effects, including climate change, safety and risk issues and navigational issues, were dealt with in Report No. 1.

(ii) Dredging of the shipping channels

The argument

Many submissions expressed scepticism about the statements in both the original EES and the Supplementary EES to the effect that dredging will be confined to the brown hatched areas shown in Figure 1. The IAC received extensive submissions in both the original EES Hearing and the Supplementary EES Hearing to the effect that significant dredging of the channels will be required to allow safe passage of LNG carriers to and from Refinery Pier. These submissions argued that the IAC should have regard to the likely need to dredge the channels, as it would increase the Project's impacts on the marine environment (which is a Relevant Environmental Effect).

The Ports Victoria correspondence

Ports Victoria wrote to the IAC part way through the Hearing providing the IAC with information about the progress of the assessment of shipping navigation and mooring risks in response to the IAC's recommendations in Report No. 1 (D105). The correspondence indicated that the further assessments "*have not sufficiently progressed*" and "*do not adequately determine whether the scope of operations are achievable within the proposed footprint without further modifications exceeding the design scope as presented during the EES*". The correspondence states:

> Any required reconfiguration of shipping channels or manoeuvring basins could have the consequence of increasing the area of environmental impact.

The IAC's assessment

The IAC's assessment of effects of dredging on the marine environment in Chapter 6 is based on the extent of dredging indicated and assessed in the Supplementary EES (and the original EES), shown as brown hatching in Figure 1.

The IAC makes no finding as to whether or not dredging of the channels may be required to facilitate safe access by LNG carriers. If further dredging is required, it is not part of the Project assessed in the Supplementary EES and is not a matter before the IAC.

Any dredging of the shipping channels would be subject to a separate assessment and approvals process, including potentially an EES if the dredging has the potential to result in significant environmental effects.

3.7 Acknowledgements

The IAC thanks all who participated in the IAC process. The IAC appreciates the time people put into their submissions and evidence, and the way in which parties participated in the Hearing. Submissions, evidence and cross examination were generally constructive and exploratory, and assisted the IAC in understanding the issues.

The IAC thanks the Proponent for its assistance in finding appropriate venues for the Hearing, setting up the 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, Sarah Vojinovic and Georgia Brodrick.

4 Procedural matters

4.1 Scope of the IAC's task

The IAC received detailed legal submissions from the Proponent and GGS on the scope of its task having regard to the EE Act, the Terms of Reference and the Minister's Directions for the preparation of the Supplementary EES.

The IAC is not tasked with recommending whether or not the Project should be approved. Nor is it tasked with assessing whether the Supplementary EES meets the requirements of the Minister's Directions. Further, a finding that the Supplementary EES may have met the requirements of the Minister's Directions does not amount to a finding that the Relevant Environmental Effects of the Project are acceptable.

The IAC's task is to consider and report on the Relevant Environmental Effects, their significance and acceptability. As part of that assessment, it is tasked with advising on:

- specific measures that it considers necessary and appropriate to prevent, mitigate or offset adverse Relevant Environmental Effects
- feasible modifications to the design or management of the Project considered necessary to reduce or mitigate Relevant Environmental Effects.

To that end, this Report provides an analysis of the Supplementary EES, and assesses the Relevant Environmental Effects having regard to the Terms of Reference, the Minister's Directions (in particular the Recommendations in Table 1), the evaluation objectives in the Scoping Requirements and relevant policy and legislation. The IAC has considered the EMF including the proposed MMs and provided advice on changes to the MMs to reduce or mitigate Relevant Environmental Effects.

In considering the acceptability of the Relevant Environmental Effects, the IAC has applied the following principles:

- 'acceptable' does not mean 'negligible' or 'non-existent'
- an assessment of acceptability must consider existing conditions of the environment in which the Relevant Environmental Effects will be felt
- an assessment of acceptability requires an assessment of the likelihood of the Relevant Environmental Effect occurring, the consequences of the Relevant Environmental Effect on the environment, and the likely effectiveness of measures to mitigate the Relevant Environmental Effect
- the geographic extent and duration of the Relevant Environmental Effects are relevant in assessing their acceptability
- an assessment of acceptability must be evidence based
- that evidence must be sufficiently robust to enable a proper assessment of the significance of the Relevant Environmental Effects.

4.2 Timing of the IAC process

GGS submitted that the failure of the Proponent to provide critical material which in GGS's submission should have been exhibited, coupled with the "*onerous*" timetable for the IAC Hearing and the limited time leading up to the Hearing, resulted in GGS being rushed in undertaking its assessment of the Supplementary EES and the related technical material. It submitted:

> The overall timing and structure of these hearings, which have been imposed upon the Committee and third parties, should be of concern to the Committee. The School is, comparatively, the most resourced contradictor for this proposal. It has been forced into responding to material which was prepared over more than a year within the space of a little over 4 weeks, and in some instances, days.
>
> It is not known to the School how the timeframes for such hearings are set. These processes are intended to engage the community in a proper and careful consideration of environmental impacts. As one of the most resourced submitters, the School has found it incredibly difficult to assess, marshal and respond to the Supplementary EES. There are matters which the School has not pursued because it lacked time.

The IAC acknowledges GGS's concerns, and agrees with GGS that a proper contradictor – one able to properly test the Proponent's evidence and technical material, and present independent expert evidence in relation to a project's impacts – is an invaluable part of the process.

The timeframes for the IAC process are set by the Terms of Reference, which require the IAC to:

- hold a Directions Hearing no later than 20 business days after the final day of exhibition
- commence the Hearing no later than 40 business days after the final day of exhibition.

In conducting the process and scheduling the Hearing, the IAC was mindful of the Terms of Reference, and the need to balance efficiency with allowing sufficient time for interested parties to properly prepare their cases.

Planning Panels Victoria agreed the hearing dates with the Impact Assessment Unit (IAU) of Department of Transport and Planning (DTP) prior to exhibition of the Supplementary EES, as required under the Terms of Reference. The dates were included on all public notices relating to exhibition, which commenced on 12 September 2024. The public effectively had three months' notice of the commencement of the Hearing.

The IAC considers that the timing of the process struck an appropriate balance between efficiency and the rights of the public to meaningfully participate in the IAC process. It is satisfied the timeframes allowed sufficient time for interested parties, including GGS and its experts, to properly understand the technical material presented in the Supplementary EES and prepare contradictory evidence.

GGS's evidence and submissions, along with the submissions of other parties, have been very helpful in assisting the IAC to understand the Relevant Environmental Effects, their significance and their acceptability. Two of GGS's three experts (as well as the Proponent's experts) appeared in the 2022 Hearing considering the original EES, and the IAC benefitted from this continuity. This also meant the experts were familiar with the issues raised in the original EES, and were not 'starting from scratch' in their assessments of the Supplementary EES.

4.3 Independent peer review of the marine technical work

(i) Background

Clause 4 of the Terms of Reference states:

> 4. The Department of Transport and Planning (DTP) engaged an Independent Peer Reviewer to review and provide advice regarding the Supplementary EES, including the proponent's study program, specifically in relation to coastal processes, hydrodynamics, marine ecology and birds. The Independent Peer Reviewer will remain engaged by DTP until the IAC hearing concludes, to respond to any specific queries from the IAC. Queries from the IAC to the Independent Peer Reviewer must be communicated in writing to DTP via the Impact Assessment Unit.

The IAU retained Stantec as the Independent Peer Reviewer. Stantec reviewed a draft of Technical Report A, but did not review the final (exhibited) version. Attachment 1 to the Supplementary EES includes Stantec's peer review report (the Stantec Report) and responses from the Proponent and Consulting Environmental Engineers (CEE) who were primary authors of the Supplementary EES main report, and Technical Report A. The IAC understands this additional information was not reviewed by Stantec prior to the Supplementary EES being finalised and exhibited. In that sense, the Stantec peer review was not 'closed out' prior to exhibition of the Supplementary EES.

(ii) Process for engaging with Stantec

At the Directions Hearing, the IAC:

- indicated it intended to put some written questions to Stantec, through IAU, in relation to CEE's response to the Stantec Report
- indicated it may have subsequent questions for Stantec depending on the responses to its initial questions and the IAC's review of the marine evidence
- indicated it may ask Stantec to be available to respond to any further questions that may arise during the Hearing
- confirmed that all queries put to Stantec by the IAC, and Stantec's responses, will be in writing, tabled and made available to the parties.

The Proponent supported the IAC's approach and acknowledged the peer review process needed to be 'closed out'.

Following the Directions Hearing, the IAC and IAU exchanged correspondence regarding the process for Stantec's involvement (D6 and D7). The IAU advised (in D7):

> It is not within the scope of the Independent Peer Reviewer to offer general expert opinion or undertake further technical review of material exhibited as part of the Supplementary EES or to offer general expert opinion or undertake technical review of material provided as part of the panel hearing process.

The IAC notes that the IAU's comments in D7 are not consistent with the open nature of Stantec's engagement as described in clause 4 of the Terms of Reference, in particular to "*respond to any specific queries from the IAC*".

The IAC issued Directions outlining the process for engaging with Stantec, consistent with Stantec's role as described in the Terms of Reference. These are Directions 16 to 19 in D10.

The IAC issued questions to Stantec on 14 November 2024 (D8). Stantec provided a written response on 20 November 2024 (D32).

Shortly thereafter, the IAC received further correspondence from the IAU (D44) expressing concerns in relation to the process for Stantec's involvement, and in relation to correspondence to the IAU from the Proponent's legal advisor seeking:

- clarification as to whether Stantec had reviewed Dr Wallis' expert report when it prepared its response to the IAC's queries
- to facilitate a meeting between Stantec and Dr Wallis if that would assist.

At the start of the Hearing, the IAC reiterated that in accordance with its Directions, parties were not permitted to contact Stantec either directly or through the IAU, and any request for further information from Stantec must be put through the IAC.

The IAC's request (D8) and Stantec's response (D32) were tabled and available to all parties and the public. Dr Wallis prepared a response to D32 in the form of a Supplementary Statement (D69) which was also tabled and available to all parties and the public.

Apart from the IAC's request in D8, no further requests were made of Stantec. All engagements with Stantec have been through the IAU. Neither the IAC nor any party has had direct contact with Stantec.

(iii) The weight to be given to the peer review and related material

GGS submitted that while the work behind the Supplementary EES had been peer reviewed:

- the engagements with Stantec were not transparently recorded in the Supplementary EES
- the peer review was not the subject of evidence from Stantec or any independent experts
- the only record of the peer review was in writing, and the authors of that commentary were not examined in the Hearings
- the content of the peer review is sometimes confusing and in some instances contradictory
- the only evidence led by the Proponent to resolve areas of doubt or confusion was from Dr Wallis, the principal author of the Supplementary EES.

The IAC is not surprised Stantec's engagement was not recorded in the Supplementary EES, as Stantec was engaged by DTP through the IAU, not by the Proponent.

Neither the Stantec Report nor Stantec's response to the IAC's questions (D32) were presented as evidence or tested through the Hearing process. The IAC has therefore not afforded the Stantec material the same weight as the marine evidence that was presented and tested through the Hearing, both by the Proponent (Dr Wallis, Mr Lane and Dr Yeates), and GGS (Dr Edmunds and Dr Guard).

PART B: RELEVANT ENVIRONMENTAL EFFECTS

5 Operational impacts on the marine environment

Construction impacts on the marine environment, including from dredging, are addressed in Chapter 6.

5.1 Introduction

(i) Terms of Reference

The Terms of Reference seek the IAC's advice on:

- the significance and acceptability of the Project's impacts on the marine environment
- whether feasible modifications to the design or management of the Project, or changes to the MMs, would reduce or mitigate impacts on the marine environment.

(ii) Minister's Directions

Relevant recommendations in Table 1 of the Minister's Directions (see Chapter 2.1(ii)) are:

- Recommendation 1 (further survey work to better establish the existing environment)
- Recommendation 2 (revised regional hydrodynamic modelling)
- Recommendation 3 (revised wastewater discharge modelling)
- Recommendation 4 (further investigations into impacts of chlorine byproducts)
- Recommendation 5 (revised entrainment modelling)
- Recommendation 9 (further assessment of impacts on threatened and migratory bird species).

(iii) Evaluation objectives

Relevant evaluation objectives are:

- **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 Ramsar site
- **Waste management** – To minimise generation of wastes by or resulting from the Project during construction and operation including dredging.

(iv) EES documentation

Marine impacts are assessed in:

- Supplementary EES Chapter 3 (Marine environment)
- Supplementary EES Chapter 4 (Threatened and migratory birds)
- Technical Report A (Supplementary marine environment impact assessment)
- Technical Report B (Supplementary threatened and migratory birds impact assessment)
- Supplementary EES Attachment I (Peer Review Report B - Stantec Report)

- Supplementary EES Attachment II (MNES).

(v) Evidence and key documents

Table 5 lists the experts providing evidence on the marine environment.

Table 5 Evidence on marine ecological effects

Party	Expert	Firm	Area of expertise
Proponent	Dr Ian Wallis (D27)	CEE	Environmental engineering
Proponent	Dr Peter Yeates (D62)	Hydronumerics	Hydrodynamic modelling
Proponent	Mr Brett Lane (D29)	Nature Advisory	Threatened and migratory birds
GGS	Dr Paul Guard (D43)	BMT	Hydrodynamic modelling
GGS	Dr Matthew Edmunds (D46)	Australian Marine Ecology	Marine ecology

The Proponent provided the following Supplementary Technical Notes:

- STN01 – Hydrodynamic Model Report (D12) and attachments 1 (D13) and 2 (D14)
- STN02 – Response to DEECA Regions' submission (D24)
- STN03 – Response to EPA's submission (D25)
- STN04 – Response to GGS Request for Information (D37)
- STN06 – Proponent response to questions from the IAC (D103).

Other key documents are:

- D32 – Stantec response to IAC questions
- D59 – Joint Expert Statement (Marine ecology)
- D69 – Supplementary Statement of Dr Wallis addressing Stantec responses
- D78 – DEECA Regions response to IAC questions
- D79 – Joint Expert Statement (Hydrodynamics)
- D84 – Hearing presentation of Dr Yeates
- D85 – Proponent's opening submissions (hydrodynamic modelling)
- D88 – Hearing presentation of Dr Wallis
- D90 – Marine environment list of documents
- D91 – Hearing presentation of Dr Edmunds
- D92-D95 – Material used in cross examination of Dr Wallis by GGS
- D96 – EPA response to IAC questions
- D99 – Dr Wallis' response to IAC questions
- D133 – Viva Salt Cooling Water (SCW) Intake Upgrade, Coastal Modelling Technical Note (13 March 2020) (the Jacobs Report)
- D138 – Dr Parry opinion of the Supplementary EES [Appendix to Environment Victoria S332]
- D144 – Response to IAC request for suspended solids maps.

In relation to D138, the IAC has weighted Dr Parry's opinion as submissions, as he did not appear at the Hearing (due to availability constraints) and his opinion was not able to be tested through cross examination or questions.

5.2 Relevant legislation, policy and guidelines

The IAC has had regard to relevant legislation, policy and guidelines, including:

- relevant legislation including the *Biosecurity Act 2015* (Cth), EE Act, *Environment Protection Act 2017* (EP Act)*, Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), *Fisheries Act 1995, Flora and Fauna Guarantee Act 1988* (FFG Act), *Marine and Coastal Act 2018* (MACA), *Pipelines Act 2005*, *Planning and Environment Act 1987* (PE Act) and the *Wildlife Act 1975*
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand), 2000) (Water Quality Guidelines)
- Victorian Dredging Guidelines
- *Technical Guidance – Environmental impact assessment of marine dredging proposals* (Western Australian Environmental Protection Authority, 2021) (WA Dredging Guidelines)
- *Guidelines for the removal, destruction and lopping of native vegetation* (Department of Environment, Land, Water and Planning, 2017a)
- Biodiversity 2037
- Environment Reference Standard
- Marine and Coastal Policy.

5.3 Hydrodynamic modelling

(i) The issues

The issues are whether the:

- Supplementary EES contained sufficient information about the revised regional hydrodynamic model
- revised model appropriately addressed wave effects and current direction.

(ii) What did the Supplementary EES say?

The regional hydrodynamic model

Hydronumerics developed a three-dimensional hydrodynamic and water quality model for the original EES using Aquatic Ecosystem Model 3D (AEM3D). AEM3D has been used for several previous assessments in Port Phillip Bay.

In response to Recommendation 2 in Table 1 in the Minister's Directions, Hydronumerics revised the model as follows:

- It replaced the wind data for the model with a wind field based on data from Geelong, Avalon and Point Wilson using the CALMET model. This provided a better match between predicted and measured current speeds and temperature plumes than the wind data for Geelong or Avalon originally used.

- It increased the horizontal resolution of the model and updated the tidal boundary conditions. Comparisons of recorded and predicted sea levels at Geelong showed good agreement, with improvement in the ability of the model to reproduce low tide levels.
- It increased the vertical resolution of the model, enabling the model to better represent thermal gradients in the vicinity of the Refinery discharges.
- It included a fully loaded FSRU in the model, which showed the FSRU slightly increases current speeds and mixing, resulting in minor increases in the rate of dilution of discharges from the diffuser.

The Supplementary EES reported that model predictions satisfactorily matched field measurements of:

- frequency distribution of current speeds
- tide height over time
- vertical temperature distribution over the depth
- current speed over time
- length, width and extent of temperature plumes from the existing discharges.

Peer review by Stantec

Stantec peer reviewed the updated model and concluded:

> The regional hydrodynamic modelling calibration is sound, and the model reflects observed current and tide data, however a number of potential discrepancies were identified and it is recommended that additional comparisons between modelled and measured data be made in the final report to further quantify the models calibration metrics.

Stantec elaborated as follows:

> The information presented in Technical Report A V2 in relation to hydrodynamics and modelling … is not completely satisfactory. The technical work underlying the report appears to be satisfactory with the changes to the modelling providing improved and satisfactory simulations. However the presentation and explanation of this work is not considered acceptable and does not sufficiently demonstrate that the model is adequate.

CEE responded to the Stantec Report in Technical Report A, Appendix A, providing further information including comparisons of measured and predicted currents, tide heights, temperature profiles and temperature plumes. As noted in Chapter 4.3 above, the IAC understands Stantec did not review this additional information before the Supplementary EES was finalised and exhibited.

Stantec's response to the IAC's questions (D32) advised that even with the additional information in Technical Report A, Appendix A, the information in the Supplementary EES remained insufficient to demonstrate the hydrodynamic model is adequate. They advised that:

> … it is likely that the model is adequate, however because there is no comparison of current direction, or 3D currents presented in Section 3 of Appendix A (or the main report), there is not enough information to address the concerns raised in relation to model calibration.

The Hydrodynamic Model Report

The Supplementary EES did not include the technical report on the updated hydrodynamic modelling undertaken by Hydronumerics (the Hydrodynamic Model Report). The IAC directed the Proponent to table the Hydrodynamic Model Report. The Proponent tabled two versions, which were explained in STN01 (D12):

- a 'working draft' dated February 2024 (D13)
- an updated draft dated November 2024 (D14).

The Proponent submitted the November 2024 version (D14) documents the hydrodynamic modelling used for the purposes of the final (exhibited) Supplementary EES and also includes material requested by GGS on 6 November 2024 in D5.

(iii) Evidence and submissions

The Proponent submitted the revised hydrodynamic model was 'fit for purpose' for the Supplementary EES, relying on Dr Wallis' evidence that the model had been revised in accordance with the requirements of Recommendation 2 in Table 1 in the Minister's Directions.

Information in the Supplementary EES

GGS submitted the Supplementary EES did not contain the necessary information about the hydrodynamic modelling to enable a proper review. Its submission set out a chronology of the efforts GGS was "*forced*" to make to get access to information which it said should have been published in the Supplementary EES. GGS further submitted there were delays in the provision of important information:

> On 5 December 2024, four days before the hearing was to commence, Dr Yeates was permitted to file expert evidence [for the Proponent], out of sequence, in effect answering the matters contained in Dr Guard's report [for GGS]. Dr Yeates' report contained more new information which should have been recorded and reported in the Supplementary EES.

GGS expressed concerns about the lack of transparency about the simulation of waves in the model, including the late production of the Jacobs (2020) report (D133) which Dr Yeates used to validate the wave effects predicted by the hydrodynamic model. D133 was filed a day before the end of the Hearing, long after the hydrodynamics evidence was heard.

Wave effects

The main disagreement between Dr Guard (for GGS) and Dr Wallis and Dr Yeates (for the Proponent) was in regard to the representation of waves in the model – specifically, the effect of waves on sediment resuspension. Dr Guard's evidence was:

> If my concern around the treatment of wave-related processes can be adequately addressed, then in my opinion the calibrated AEM model is otherwise an appropriate modelling system for the assessment of potential environmental effects caused by the project.

Dr Yeates gave evidence that the AEM3D model included the effect of waves on sediment resuspension, by using a module that calculates wind-wave induced bed stress using formulae from the United States Geological Survey.[1] He advised:

- total bed stress is highest in the shallow areas along the shoreline which have seagrass meadows which reduce resuspension (so sediment resuspension will be less than calculated by the model)
- in deeper waters, bed stress is very low, and resuspension is minimal
- the calculations of bed stress in the model were consistent with model predictions of bed stress in Corio Bay made by Jacobs in 2020 using a SWAN model[2] to simulate waves (D133).

[1] Laenen, A. and LeTourneau A.P. (1996). Upper Klamath Basin Nutrient-Loading Study. Estimate of Wind-Induced Resuspension of Bed Sediment During Periods of Low Lake Elevation" U.S. Geological Survey Open-File Report 95-414. https://pubs.usgs.gov/of/1995/0414/report.pdf

[2] SWAN is a model for simulating waves in coastal regions and inland waters developed at Delft University of Technology.

Dr Wallis gave evidence that the simple wave model used by Dr Yeates was suitable for the Project because Corio Bay is low wave energy environment.

Dr Guard acknowledged that Corio Bay is sheltered from oceanic waves, but considered locally generated wind waves would be an important driver of resuspension of sediment in shallow areas. He considered a wave model (such as a SWAN model) would be preferable for simulating the effects of waves.

GGS submitted the approach of validating bed stress calculations by comparing them to the Jacobs 2020 model was not appropriate:

> Proper validation of the Supplementary EES wave model would have required comparisons between modelled and measured wave parameters, which was not done. Superficial comparison of bed shear stress plots from very different model scenarios between one model and another model is not the same thing, and does not demonstrate model validation with respect to waves.

The Proponent submitted the Minister's Directions did not require the measurement of waves in Corio Bay or the calibration of the hydrodynamic model in relation to waves. It argued:

> … it is unfair to criticise the Proponent for failing to calibrate the hydrodynamic model to consider the impact of waves when that was not a matter required or requested by either the Minister or the IAC [in Report No. 1].

Current direction

Dr Guard noted the model did not always accurately replicate measured current direction, which may have implications for the prediction of the sediment plumes from dredging. Stantec also raised concerns in relation to currents, as noted above.

The Joint Expert Statement (Hydrodynamics) (D79) records that Dr Wallis, Dr Yeates and Dr Guard agreed:

- the predicted current directions were generally consistent with measured current directions at times of strong currents, but there were discrepancies at times of low current speeds
- the current speed and direction validation may be difficult to improve because of the inherently low current speeds in Corio Bay.

(iv) Discussion

Information in the Supplementary EES

The revised hydrodynamic model is pivotal to the Supplementary EES, as it underpins many of the tasks required by the Ministers' Directions. The Hydrodynamic Model Report should have been part of the exhibited Supplementary EES, to enable proper peer review by Stantec and to enable submitters to fully understand the modelling.

It troubles the IAC that the Hydrodynamic Model Report had not been completed prior to the finalisation of the Supplementary EES. Critical information was missing from the February 2024 version (D13). While this information was added to the November 2024 version (D14) or made available during the Hearing (D133), there is no evidence that the information was considered as part of the preparation of the Supplementary EES.

That said, the IAC notes Dr Guard generally agreed the revised hydrodynamic model was fit for purpose except in relation to the validation of the effects of waves on bed stress and sediment resuspension, discussed below.

Wave effects

The IAC accepts that the Minister's Directions did not specifically identify waves as a matter for further assessment. However, it does not necessarily follow that the model should not be properly calibrated against waves in Corio Bay, if this is necessary to demonstrate the model was properly calibrated against field data.

The IAC agrees with:

- Dr Guard that a wave model (such as SWAN) can be expected to provide a better representation of waves than Dr Yeates' simplified approach
- GGS that validation of the model using field data is preferable to validation against another model (the Jacobs 2020 model).

However, the IAC accepts the advice of Dr Wallis and Dr Yeates that in this case, the simplified representation of waves in the model, and calibration against the Jacobs 2020 model, is acceptable given the low wave energy conditions in Corio Bay, and the effect of seagrass on reducing sediment resuspension by waves in shallow waters.

Overall, the IAC accepts the revised regional hydrodynamic model is appropriate to inform the marine assessments undertaken for the Supplementary EES.

(v) Findings

The IAC finds:

- A final version of the Hydrodynamic Model Report should have formed part of the exhibited Supplementary EES.
- The revised hydrodynamic model provides an acceptable basis for assessing the likely effects of the Project on the marine environment, although its limitations ought to be recognised.

5.4 Existing condition of the marine environment

The Minister's Directions required further survey work to better establish the existing environment and the impacts of existing Refinery discharges, to enable better understanding of the Project's likely impacts. The Minister's Directions stated the further survey work should:

- cover intertidal, littoral and subtidal habitats (Recommendation 1a)
- update seagrass mapping to include the intertidal zone and information on the different seagrass species (Recommendation 1b).

Recommendations 1c and 1d relate to establishing a better baseline for monitoring the Project's effects going forward. This is discussed separately in Chapter 5.6.

(i) The issues

The issues are whether, in characterising the existing marine environment:

- the marine assessments should have adopted an ecosystem based approach
- the updated seagrass mapping is adequate and fit for purpose
- the extent and impact of temperature and chlorine plumes from existing Refinery discharges have been appropriately characterised.

(ii) What did the Supplementary EES say?

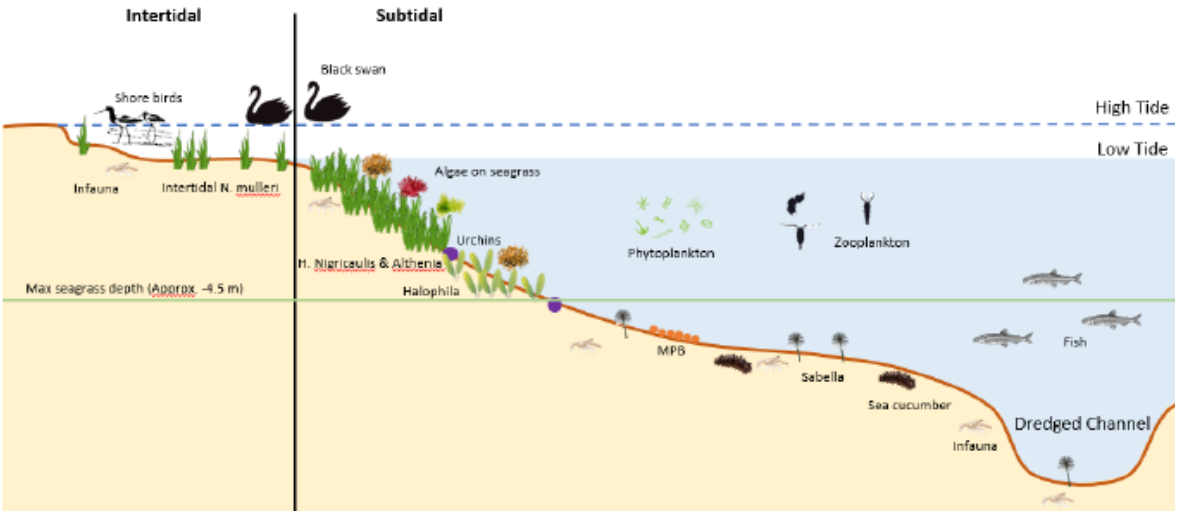
The Supplementary EES sought to address Recommendations 1a and 1b by presenting:

- a conceptual model of the Corio Bay ecosystem
- updated seagrass mapping
- further assessment of the extent of existing Refinery plumes and their effects on seagrass.

Conceptual model of the marine ecosystem

Technical Report A presented a conceptual model of the Corio Bay ecosystem, which shows key ecological components in the intertidal and subtidal areas (Figure 2). Like the marine assessments for the original EES, the assessments for the Supplementary EES focussed on impacts on seagrass on the basis that seagrass plays a key role in the Corio Bay ecosystem, is particularly sensitive to the Project's potential impacts (principally dredging), and is therefore an 'indicator species' that can be used to predict impacts on other components of the ecosystem.

Figure 2 Conceptual model of the Corio Bay ecosystem



Source: Technical Report A, Figure 3-21

Updated seagrass mapping

Seagrass mapping was undertaken in the intertidal, littoral, and subtidal zones, using low-level drone imagery, towed camera surveys and ground truthing. The map (Figure 3) showed the distribution of the three main seagrass species that occur in Corio Bay:

- *Nanozostera muelleri* (*N. muelleri*), which grows mostly in intertidal or shallow water
- *Heterozostera nigricaulis* (*H. nigricaulis*), which grows in shallow water
- *Halophila australis* (*H. australis*), which grows in deeper water.

The EES stated there is insufficient light to support seagrass at depths greater than 5 metres below mean sea level. The seabed at these (and greater) depths is bare sand with microphytobenthos (microscopic primary producers such as microalgae living in association with benthic (seabed) substrates).

Figure 3 Map of seagrass distribution in northern Corio Bay

Source: Technical Appendix A, Figure 3-7

Impacts of existing Refinery discharges on water quality and seagrass

The Refinery has four licensed wastewater discharge points into Corio Bay, where seawater extracted for cooling purposes in the Refinery is discharged back into the Bay (note there is no W2 discharge). Discharges contain chlorine, and are at an elevated temperature above ambient.

Default Guideline Values

The Supplementary EES adopted the following default guideline values (DGVs) for the Project:

- temperature: +3 degrees centigrade (°C) (Corio Bay), +2°C (Ramsar site)
- chlorine: 10 micrograms per litre (µg/L) (Corio Bay), 4.3 µg/L (Ramsar site).

The DGVs for temperature were derived by CEE applying the Water Quality Guidelines to modelled seawater temperatures in Corio Bay. The DGVs for chlorine were based on updated DGVs provided by EPA via the Technical Reference Group which are slightly higher than the DGVs in Recommendation 3b of the Minister's Directions (7.2 µg/L in Corio Bay and 2.2 µg/L at the Ramsar site).

Temperature and chlorine plumes of existing discharges

Monitoring data from the Refinery showed the water temperature at three of the discharge points (W1, W4 and W5) was elevated by 10°C to 11°C above ambient seawater temperature, whereas the fourth discharge (W3) was small in volume and at ambient temperature. Chlorine concentrations at the discharge points ranged from 18 µg/L to 40 µg/L.

CEE made monthly measurements of the water temperature near the discharge points between July 2023 and January 2024 (except December 2023) and used the data to:

- determine vertical temperature profiles
- map the maximum extent of the temperature plumes over the measurement period.

This information was used to verify the regional hydrodynamic model and inform the assessment of the effects existing wastewater discharges on seagrass.

The Supplementary EES stated it was not feasible to measure low chlorine concentrations in seawater, therefore the chlorine plumes from existing Refinery discharges were determined by converting the temperature survey results into chlorine concentrations, based on the relationship between temperature and residual chlorine.

The temperature (Figure 4) and chlorine (Figure 5) plumes were mapped in relation to the DGVs for the Project. The maps indicate the plumes extended beyond some of the mixing zones[3] for the wastewater discharge points but did not exceed the DGVs for the Ramsar site.

Figure 4 Temperature plumes (existing discharges) – measured

Source: Technical Report A, Figure 3-3

[3] The State Environment Protection Policy (Waters of Victoria) defines a mixing zone at page 51 as "*an area of a waterway or waterbody where the receiving water environment is detrimentally affected by a waste discharge. It is an area with explicitly defined boundaries where specified environmental quality objectives may be exceeded (and consequently some beneficial uses may not be protected in the mixing zone).*"

Figure 5 Chlorine plumes (existing discharges) – inferred

Source: Technical Report A, Figure 3-5

Assessment of impact of existing discharges on seagrass

Technical Report A assessed the impacts of the existing wastewater discharge from the Refinery on seagrass by comparing seagrass cover within the discharge plumes ('discharge sites') with sites within the Ramsar site adjacent to Avalon Beach ('reference sites').

The surveys showed that seagrass cover at the discharge and reference sites was seasonally variable, which is consistent with the temporal variability in seagrass cover in Corio Bay and Port Phillip Bay reported in previous studies. Average intertidal seagrass cover across the seasons was slightly higher at the discharge sites than the reference sites.

Technical Report A reported that based on statistical t-tests,[4] the differences in seagrass cover between the discharge sites and the reference sites were not statistically significant.

Stantec peer review

The Stantec Report concluded the assessment of existing conditions in the Supplementary EES was generally accurate and comprehensive. However, it questioned the statistical analysis of the comparison between seagrass cover at the discharge sites and the reference sites.

[4] A t-test is a statistical technique used to determine whether the difference between the mean (average value) of two samples is statistically significant.

(iii) Evidence and submissions

Overall adequacy of the marine studies

Many submitters including GGS, Environment Victoria, Geelong Sustainability, ACF Geelong Community and the Victorian National Parks Association, submitted the marine studies were inadequate. GGS submitted that while the Supplementary EES goes "*some way*" to advancing an understanding of existing conditions and effects on the marine environment, it remains incomplete.

A key concern was that Technical Report A did not satisfactorily address the matters raised in the Stantec peer review, leaving unaddressed gaps and unresolved issues, as confirmed in Stantec's response to the IAC's queries (D32). Stantec's key criticisms in relation to the assessment of existing conditions related to the statistical design and analysis of the effects of existing discharges on seagrass. GGS submitted the Stantec Report and D32 themselves included confusing and in some instances contradictory statements.

EPA and DEECA Regions submitted the marine studies adequately addressed matters within their remits.

Ecosystems based approach

Dr Wallis' evidence was that Technical Report A included a conceptual model of the Corio Bay ecosystem (Figure 2) and all relevant components of the ecosystem were adequately characterised in the original and supplementary marine assessments. He explained that the assessment of the existing marine environment (and Project impacts) focused on seagrass as an indicator because seagrass is:

- a key component of the marine ecosystem as it provides food and shelter for many marine organisms
- at least as, if not more sensitive to potential impacts from the Project than other ecosystem components.

Therefore if impacts on seagrass are avoided, the other ecosystem components will also be protected.

Dr Edmunds agreed seagrass is an important and dominant part of the Corio Bay marine ecosystem. However he considered the conceptual ecosystem model in the Supplementary EES was overly simplistic, and omitted important ecological components. He noted the supplementary marine assessment presented no additional survey work (beyond seagrass) to establish the existing environment. Several submitters made similar criticisms.

GGS submitted the Supplementary EES did not consider the principles of ecosystem based management, which is required by the MACA. The Proponent acknowledged (and did not disagree with) the IAC's recommendation in Report No. 1 for the development of a conceptual model for coordinated ecosystem based management under the EMF, but submitted an ecosystems based approach was not required for the supplementary marine assessment by either the IAC's recommendations in Report No. 1 or the Minister's Directions.

Updated seagrass mapping

Dr Wallis and Dr Edmunds agreed considerable survey work had been undertaken in the Supplementary EES to document the dominant seagrass habitat, and that the underwater video and drone techniques used were best practice (D59).

Many submitters considered the updated seagrass mapping was inadequate, too coarse and failing to account for seasonal variations in the presence of seagrass. Dr Edmunds considered the spatial resolution of the updated seagrass map was too coarse for assessing the effects of existing wastewater discharges from the Refinery.

Dr Wallis responded that in his opinion, for the purposes of the Supplementary EES it was more important to define broad areas where different seagrass species can be found, than to provide a detailed map of the actual distribution of seagrass at a single point in time. He considered the latter would be less useful for predicting the likely impacts of the Project on seagrass, due to natural temporal variability in seagrass cover.

Characterisation of the temperature and chlorine plumes

The characterisation of the temperature and chlorine plumes from existing Refinery discharges was also criticised, including:

- the survey period (July 2023 to January 2024) was too short to adequately assess the impact of the existing discharges on water temperature
- insufficient information was provided to determine the adequacy of the method used to derive estimated chlorine concentrations from water temperature
- the assumption that the chlorine concentrations were too low to be measured in the field was not substantiated.

Dr Wallis responded:

- the six water temperature surveys, which were carried out by CEE each month over the survey period, were sufficient to sample an appropriate range of water temperature conditions in Corio Bay
- field measurements of chlorine in seawater were not feasible, and not necessary given the calculated extents of the chlorine plumes were small (see Figure 5 above).

Impacts of existing Refinery discharges on seagrass and water quality

The assessment of impacts of existing Refinery discharges on seagrass was criticised by Stantec, Dr Edmunds and several submitters. Key concerns included:

- the use of a generic seagrass category, rather than examining particular species, may have obscured differences in seagrass distribution between the discharge and reference sites
- the use of 6 months (rather than a full year) of seagrass data did not adequately account for seasonal variability in seagrass
- the design of the assessment (based on comparisons of average seagrass cover at discharge sites and reference sites) was insensitive to gradients in temperature and chlorine with distance from the Refinery discharge points
- the methodology used to quantity seagrass cover
- natural differences between the discharge sites and reference sites (including differences in aspect, hydrodynamic environment and presence of rock) would have confounded the assessment
- the statistical test used to determine significance was flawed.

Relying on Dr Parry's opinion, Environment Victoria submitted plots of seagrass density with distance from the discharge outfalls provided a stronger basis for understanding the impacts of existing Refinery discharges than statistical analysis comparing seagrass cover between the

discharge and reference sites. Dr Parry noted that Technical Report A contained plots of seagrass density with distance from the outfalls (in Figures 3-13 to 3-16), but he considered the spatial scale was too coarse to detect the true effects of the outfalls. He considered the samples should have been analysed at much closer intervals near the outfall.

Dr Wallis responded that local variations in seagrass cover near the outfalls were due to factors other than elevated water temperature and chlorine, including elevated nutrient levels (resulting from seagrass accumulation at the Refinery intake backwash), and scour of the substrate due to hydraulic forces. He did not consider this to be a significant impact, noting that the comparisons demonstrated no meaningful difference in seagrass cover between the discharge sites and the reference sites.

Stantec (in the Stantec Report and D32), Dr Edmunds and Dr Parry all advised that the statistical design was not appropriate or fit for purpose. Dr Wallis responded that the appropriateness of the statistical design had been checked and confirmed by Professor Michael Keogh, a marine biologist with expertise in statistical data analysis.

(iv) Discussion

Overall adequacy of the marine studies

The IAC notes EPA and DEECA Regions' submissions that the marine studies adequately addressed matters within their remits, but is concerned that Stantec's concerns about the assessments of the marine environment were not fully resolved prior to the exhibition of the Supplementary EES. Stantec's response to the IAC's queries (D32) indicated it was not satisfied with the responses in the Supplementary EES and there remained significant outstanding issues in relation to the characterisation of the existing environment and effects of existing wastewater discharges. These matters should have been resolved prior to the exhibition of the Supplementary EES.

Ecosystems based approach

The MACA, under which one of the Project's key approvals is required, requires planners and decision makers to apply an ecosystem based approach as a guiding principle (section 9(2)). The Marine and Coastal Policy (*Marine and Coastal Policy* 2020) states (at page 19) that an ecosystem based approach requires consideration of:

- ecosystem connections
- connections across space and time
- the dynamic nature of ecosystems
- scientific and cultural knowledge
- the impacts – direct, cumulative and incremental – on ecosystems of many
- decisions (small and large)
- the climate resilience of the ecosystems over time.

The IAC's Report No. 1 found that the original EES did not have sufficient regard to connections between various components of the marine ecosystem (including birds):

> The marine assessment [in the EES] should have had a greater emphasis on ecosystem wide impacts both within the marine environment and across the marine and terrestrial environments.

It recommended:

> Consider adding a requirement to the EMF 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

The supplementary marine assessment included some elements of an ecosystem based approach, such as the conceptual model of the Corio Bay marine ecosystem (Figure 2). Further, an ecosystem based approach, as outlined in the Marine and Coastal Policy, does not require every component of an ecosystem to be examined in detail. Rather, it requires consideration of ecosystem connections, including across space and time.

The Minister's Directions did not specifically require the Supplementary EES to apply an 'ecosystem based approach' as that term is used in the MACA and the Marine and Coastal Policy.

The IAC is satisfied that sufficient information was presented in expert evidence (including oral evidence during the Hearing) for the IAC to form a broad understanding of the marine ecosystem of northern Corio Bay. In this context, the IAC is satisfied that:

- an indicator species approach was acceptable to inform a threshold assessment of whether impacts on marine ecosystems will be acceptable
- enough work has been done to accurately identify a suitable indicator species
- seagrass is a suitable indicator for assessing the likely effects of the Project on the marine environment, based on its:
  - ecological significance in Corio Bay
  - sensitivity to the effects of dredging, which is discussed in Chapter 6.

Going forward, the IAC maintains its view (expressed in Report No. 1) that an ecosystem based approach is required to monitor and manage the Project's effects on the marine environment. This is already reflected in the marine environment MMs, which are not limited to seagrass and require monitoring of a wider range of ecosystem components including macroalgae, plankton and marine fauna, as well as relevant physiochemical indicators. Key MMs (ME06 and ME19) should be strengthened to make it clear that an ecosystems based approach should be adopted.

Updated seagrass mapping

The IAC considers the updated seagrass mapping provides an adequate understanding of the areas where different seagrass species (or groups of species) were present at the time of the surveys, or are likely to occur, based on light availability.

This is generally appropriate for the purposes of characterising the existing marine environment and framing the assessment of dredging impacts on seagrass (discussed in Chapter 6). The actual presence of seagrass in areas of suitable habitat is temporally variable, and 'point in time' mapping of actual seagrass presence would carry the risk of not identifying areas where different species of seagrass can occur if they were not actually present at the time of the survey.

If seagrass mapping is contemplated as part of monitoring and managing the Project's effects (as opposed to predicting its likely effects), establishment of a suitable baseline would require mapping of seagrass present at specific point in time. This is addressed in Chapter 5.6.

Characterisation of the temperature and chlorine plumes

The IAC considers the existing temperature and chlorine plumes from the Refinery have been appropriately characterised. The IAC acknowledges submitters' concerns about the derivation of chlorine concentrations based on temperature data. However, GGS' experts raised no concerns in this regard. The IAC accepts that chlorine concentrations in seawater are difficult to measure, and

considers the approach taken in the supplementary assessment (of deriving chlorine concentrations from water temperatures) was adequate.

The IAC notes the DGVs for chlorine used in Technical Report A were different (and slightly higher) than the DGVs identified by the IAC in Report No. 1 (and reflected in the Minister's Directions) due to the adoption of updated DGVs provided by EPA. The IAC considers this change to be reasonable.

Assessment of the impacts of existing Refinery discharges on seagrass

The comparisons of seagrass cover between the discharge sites and the reference sites had methodological limitations, including:

- the methodology used to describe and quantify seagrass cover
- the statistical test used to assess significance (t-test) of the differences in cover.

Notwithstanding these limitations, the comparisons are sufficient for the IAC to be satisfied there is no indication that existing Refinery discharges have had unacceptable impacts on seagrass. The comparisons demonstrated that seagrass was present at both the discharge sites and the reference sites, with similar average seagrass cover. Despite over 60 years of Refinery operations, the evidence and submissions did not point to any impacts on seagrass that were clearly evident, other than physical scour of the seabed at the outlet of one discharge point and minor nutrient enrichment at the backwash point (where organic matter is removed from the seawater before it is used as cooling water).

That said, the methodological limitations in the assessment of existing Refinery discharges on seagrass should be addressed in the design of the monitoring programs for the Project, to ensure detection of any effects resulting from dredging or Project operation. This is discussed in Chapter 5.6.

(v) Findings and recommendations

The IAC finds:

- The approach of focussing on seagrass as an indicator species, while not a comprehensive ecosystems based approach, was acceptable for the purposes of the Supplementary EES.
- ME06 and ME19 should be strengthened to ensure an ecosystems based approach is adopted going forward, to monitor and manage the Project's effects on the marine environment.
- The updated seagrass mapping is appropriate for establishing the context for assessing the effects of the Project (particularly dredging) on seagrass.
- The extent of existing temperature and chlorine plumes from the Refinery have been appropriately characterised.
- While the assessment of impacts of existing Refinery discharges on seagrass had some methodological flaws, it was sufficient for the IAC to be satisfied that existing discharges have not had unacceptable impacts on seagrass.

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measures as shown in Appendix E:

a) revise ME06 (seagrass and seabed biota monitoring) and ME19 (monitoring the effects of wastewater discharges on the marine environment) to require

consideration of the implications for the Corio Bay ecosystem for any impacts identified through the monitoring.

5.5 Operational impacts

(i) The issues

The issues are whether the following elements of the Supplementary EES are adequate:

- the revised wastewater discharge modelling from the Project
- the assessment of impacts from chlorine byproducts
- the revised entrainment modelling
- the proposed monitoring of operational impacts.

(ii) What did the Supplementary EES say?

Revised wastewater discharge modelling

Technical Report A presented revised predictions of the temperature and chlorine concentrations of discharges from the Project based on the revised regional hydrodynamic model. It presented:

- revised nearfield modelling of discharges from the FSRU via the diffuser
- revised maps of discharges via the Refinery (after reuse of seawater from the FSRU as cooling water in the Refinery).

Discharge amounts were assumed to be:

- 250 megalitres (ML) a day from the diffuser
- 350 M a day from the Refinery (consistent with the current discharge of cooling water from the Refinery).

The assessment of chlorine impacts was based on the revised DGVs for chlorine advised by EPA (4.3 µg/L at the Ramsar site, 10 µg/L in the rest of Corio Bay).

Discharges from the diffuser

Discharges from the FSRU before dilution through the diffuser would:

- contain chlorine at levels of 50 µg/L
- be 7^{o}C below ambient temperatures.

Maps of predicted temperature change and chlorine plumes of discharges from the diffuser indicated impacts will be localised, in the vicinity of the diffuser and Refinery Pier. This is because the diffuser is expected to dilute discharges at a rate of 20:1 within 10 to 20 metres from the diffuser outlet. The effect of the diffuser is that:

- the expected chlorine levels are reduced to 2.5 µg/L – well below the 10 µg/L DGV for chlorine in Corio Bay
- the expected temperature differential is reduced to 0.3^{o}C – well below the DGV of 3^{o}C for Corio Bay.

The calculation of the nearfield dilution rate was checked by an independent expert, Professor Lee of Hong Kong University, using his Visjet model. He predicted nearfield dilution of 20:1, consistent with CEE's dilution prediction (which used other jet dispersion models).

Discharges via the Refinery

Technical Report A presented maps showing temperature and chlorine discharges from the FSRU via the Refinery. Thermal plumes were predicted to be smaller than existing plumes (shown in Figure 4) and would have smaller maximum temperature increases. Chlorine plumes were predicted to be the same as existing plumes (shown in Figure 5). Consistent with the existing discharges from the Refinery, the temperature and chlorine plumes with the Project added were not predicted to reach the Ramsar site, and DGVs at the Ramsar site for both temperature and chlorine are predicted to be met.

Impacts from chlorine byproducts

CEE undertook additional testing of mussels to assess impacts from chlorine byproducts. Mussels from the Portarlington mussel farm were deployed at seven sites along the Refinery shore in Corio Bay for four weeks and then tested for trihalomethanes, haloacetic acids and bromophenols, which showed all chlorine byproducts tested were below detection level.

The Supplementary EES concluded that existing chlorine byproduct levels in Corio Bay resulting from discharges from the Refinery are not high and there is no evidence that chlorine byproducts are a significant ecological risk in Corio Bay. As noted above, the Project (operating in open loop mode and diverting seawater used in the FSRU to the Refinery for reuse as cooling water) is not anticipated to increase chlorine concentrations (and therefore chlorine byproduct levels) in the Refinery discharges.

Revised entrainment modelling

The refined regional hydrodynamic model (discussed in Chapter 5.3) was used to re-run the modelling of fish egg entrainment by the:

- existing Refinery seawater intake
- seawater intake on the FSRU.

Two scenarios were modelled, with different source areas for the fish eggs:

- the scenario used in the original EES, where the source area was confined to seagrass areas in the Ramsar site
- a new scenario where the source area included all seagrass areas in Corio Bay.

For fish eggs sourced from the Ramsar site, entrainment was predicted to be the same at the FSRU as the Refinery seawater intake (0.12 percent). For fish eggs sourced from all seagrass areas in Corio Bay, entrainment was predicted to be slightly greater at the FSRU (0.34 percent) than at the Refinery (0.25 percent). The Supplementary EES concluded the effects of entrainment were negligible compared to natural losses such as starvation and predation.

Technical Report A also included the results of additional investigations to confirm the number of fish species that breed in Corio Bay, including:

- further analysis of ichthyoplankton samples
- eDNA surveys
- information from Professor Jenkins (University of Melbourne).

Based on this information, Technical Report A estimated between 20 to 40 fish species breed in Corio Bay.

Stantec peer review

Stantec was critical of the mussel study, drawing attention to various methodological shortcomings including the failure to test the mussels for chlorine byproducts before they were deployed near the Refinery. Stantec stated (D32):

> It is agreed that the risk of uptake once the project is underway is likely to be small. However, even though the risk of accumulation and adverse effects (e.g. mortality or sub-lethal effects) may be small, it would be far better to have maximum confidence that the pre-operational study conforms to best practice.

The Stantec Report was also critical of the eDNA surveys because the timeframe was very limited (2 weeks of sampling, 2 weeks apart). Stantec considered this could result in an incomplete species list because species not spawning around the time of sampling would not be detected.

Mitigation measures

The following MMs are particularly relevant to the discussion below:

- MM-ME10 (design the diffuser to achieve high dilution)
- MM-ME19 (monitoring the effects of wastewater discharge on the marine environment)
- new MM-ME21 (monitoring the effects of entrainment by the FSRU on plankton).

In assessing the operational impacts of the Project on the marine environment, the IAC has had regard to all relevant MMs.

(iii) Evidence and submissions

Revised wastewater discharge modelling

In his evidence for GGS, Dr Edmunds was critical that:

- the revised wastewater discharge modelling did not consider toxicants other than chlorine that may be present in the wastewater (for example from spill events), nor the possibility of synergistic 'cocktail' effects such as effects of variations in organic loading on chlorine byproducts
- Technical Report A only modelled physico-chemical effects of wastewater discharges, which is not a surrogate for biological impact assessment
- the mapping of the Project's temperature and chlorine plumes in Technical Report A presented only 50th percentile results rather than the full spatial envelope of potential effects.

Dr Wallis confirmed the predicted temperature and chlorine plumes for discharges from the diffuser were based on medians (50th percentiles). He acknowledged the maximum plume extents would be greater but did not consider this significant, because the discharges from the diffuser were already diluted to below the DGVs in the immediate vicinity of the diffuser, and would be even further diluted by the time they reached the Ramsar site.

EPA's submission (S330) queried whether additional chemicals (such as anti-rust or anti-scaling agents) will be added to the seawater used on the FSRU that is then circulated through the Refinery as cooling water. The Proponent responded:

> Neither anti-scaling nor anti-rust treatments would be added to the seawater taken into the FSRU and subsequently recycled through the refinery cooling water system, nor added as part of the refinery system. As stated previously there are no proposed changes to the cooling water system within the refinery and currently the refinery cooling water intake is treated only with sodium hypochlorite to control biological growth.

Geelong Sustainability submitted:

> Although the reruns of the wastewater discharge modelling with revised inputs provided a better understanding of the potential environmental effects, the nearfield modelling still requires further refinement. The [Stantec] peer review indicated that the Supplementary EES does not fully address the matters raised in previous reviews, particularly concerning the dispersion of marine discharges from the FSRU.

The City of Greater Geelong submission (S316) questioned the adoption of less conservative DGVs for temperature and chlorine for Corio Bay than the Ramsar site, given that values associated with the Ramsar site, including seagrass, fish and migratory bird habitat extend further into Corio Bay, and the health of the Ramsar site depends on the ecological health of Corio Bay. The City of Greater Geelong also expressed concerns about potential effects of the diffuser in terms of friction on the seabed, which could potentially affect the persistence of seagrass, light availability and habitat.

Impacts from chlorine byproducts

Several submitters were critical of the mussel study in the Supplementary EES, and the conclusions drawn from the mussel study about the effects of chlorine byproducts on the marine environment. For example, the City of Greater Geelong (S316) submitted the mussel study used a small sample and did not provide sufficient basis to infer there is negligible risk to mussels or other biota from the wastewater discharge.

Dr Edmunds noted the Supplementary EES did not present information on the nature of the wastewater discharges during the period of mussel deployment. He advised that toxicant production in chlorinated water varies according to levels of organic material and the presence of other chemicals (which could enter the discharges during spills, particularly in the Refinery). He considered the four week deployment period for the mussels may not have been representative of conditions over a longer timeframe. Dr Edmunds was also critical of the use of a single species for the bioaccumulation study, on the basis that mussels are not a surrogate organism for other types of marine life that can also accumulate chlorine byproducts.

Dr Wallis and Dr Edmunds agreed that (D27 and D59):

- available Australian laboratories are unable to analyse seawater for chlorine byproducts at very low concentrations
- mussels are a suitable species for testing chlorine byproduct accumulation
- there could be ethical barriers to testing higher order species such as swans and fish
- the laboratory used for the mussel testing (Leeder Laboratory) achieves the lowest detectible concentrations of chlorine byproducts of any known commercial laboratory in Australia
- the laboratory detection limit was mostly in the range of 10 to 50 micrograms per kilogram (µg/kg)
- it would be more informative if the detection levels in Australian laboratories matched the much lower detection limits reported in overseas studies (reported as 0.5 to 0.7µg/kg in the Supplementary EES).

Responding to Stantec's concerns, Dr Wallis confirmed the mussels were not tested for chlorine byproducts prior to deployment, but he considered this was not material because after deployment, chlorine byproducts in all mussels in the study were below detection levels.

Revised entrainment modelling

Dr Edmunds was critical of the fact that the Supplementary EES did not consider the possibility of a recruitment shadow near the FSRU intake. He agreed with Dr Wallis that the potential for a recruitment shadow is not limited to the proposed new intake for the FSRU, and also exists for the existing Refinery intake. Dr Wallis responded that a recruitment shadow at either the FSRU or the Refinery intake is unlikely, because the species that would be affected by entrainment occur more widely in Corio Bay.

Stantec's response to the IAC's questions (D32) indicated it had ongoing concerns about the limitations of the eDNA analysis and recommended further analysis to estimate species richness. Dr Wallis responded in his Supplementary Statement (D69) that the eDNA testing was intended to identify species using seagrass rather than measure species richness. Further, *"the limited library of small fish DNA restricts the number of marine fish (species richness) that can be identified by that technique"*. He noted the additional information about fish, including the eDNA analysis, was not specifically required by the Minister's Directions, and *"extra eDNA tests would not have altered the decision on inputs to the particle modelling or the outcome of the particle modelling"*.

Dr Edmunds was supportive of the use of eDNA to identify fish populations potentially affected by entrainment.

The City of Greater Geelong (S316) submitted the effects of the Project on ichthyoplankton should have been assessed as a cumulative effect that compounds other factors affecting fish mortality rates.

Monitoring operational impacts

EPA submitted the EMF did not adequately address monitoring of operational effects on plankton and seagrass. In response, the Proponent:

- proposed a new mitigation measure, MM-ME21, which requires monitoring of the effects of entrainment by the FSRU on plankton
- amended MM-ME19 to add a requirement to identify suitable thresholds based on the baseline monitoring of existing Refinery discharges.

EPA subsequently confirmed that while the Day 2 MMs (particularly the new MM-ME21) generally satisfied its concerns, it expected that:

- relevant water quality measures will be taken alongside plankton monitoring
- if necessary, continuous chlorophyll (Chl a) fluorescence monitoring will be considered.

(iv) Discussion

Revised wastewater discharge modelling

The IAC is satisfied the Supplementary EES provides an adequate basis for assessing the effects of wastewater discharges from the FSRU.

The hydrodynamic modelling experts were all satisfied with the revised wastewater discharge modelling in the Supplementary EES. The key conclusions from the revised modelling and analysis were:

- For discharges from the diffuser, temperature differentials and chlorine concentrations will be well below the DGVs for both Corio Bay and the Ramsar site.

- For discharges via the Refinery, thermal plumes are predicted to be smaller than the existing plumes from the Refinery, with chlorine plumes predicted to have the same extent. The plumes are not expected to reach the Ramsar site.

Discharges from the diffuser

The IAC notes Dr Edmunds' concern that the temperature and chlorine plume maps for the discharges from the diffuser were based on the 50th percentile rather than the full spatial envelope. However it accepts Dr Wallis' evidence that this has limited significance for the assessment of the Project's impacts, because the temperature differentials and chlorine levels at the diffuser are predicted to be well below the DGVs. They will be even further diluted and dispersed with increased distance from the diffuser.

Geelong Sustainability's concerns about the nearfield modelling were not consistent with the Stantec Report, which stated *"the revised nearfield modelling enables a better understanding of the effect of the FSRU on dispersion of marine discharges from the FSRU"* and did not identify any outstanding issues.

Discharges via the Refinery

The Supplementary EES did not clearly explain how the predicted temperature and chlorine concentration maps for Project discharges via the Refinery were derived. Based on a clarification from Dr Wallis, the IAC understands the maps were based on the envelopes of site measurements of existing Refinery discharges, rather than revised modelling. The IAC considers this to be acceptable, given the synergies between the Project and Refinery mean the thermal plumes will be reduced compared to existing, and chlorine plumes will be similar to existing.

Biological impact assessment

The IAC notes Dr Edmunds' opinion that physico-chemical modelling is not a surrogate for biological impact assessment. However, discharges from the diffuser will be diluted to well below the DGVs, and the plumes are predicted to be limited to the immediate vicinity of the diffuser, Refinery Pier, and the FSRU.

For discharges via the Refinery, existing discharges have been occurring for over 60 years and have been found to have no obvious ecological effect other than minor localised disturbances. As discussed in Chapter 5.4, the assessment of the effects of existing wastewater discharges on seagrass had methodological limitations, but ultimately showed that seagrass was present in the Refinery discharge plumes with broadly similar seagrass cover to the reference sites. With the Project, discharges will have the same chlorine concentration and a smaller temperature differential. In these circumstances, the IAC does not consider that further biological investigations are warranted.

Default Guideline Values

The IAC does not agree with the City of Greater Geelong that the more conservative DGVs for temperature and chlorine adopted for the Ramsar site should be applied across Corio Bay. The reasons for the Ramsar site having different (and more stringent) DGVs than the rest of Corio Bay were explained in the IAC's Report No. 1.

Other chemicals

The IAC notes the concerns raised by Dr Edmunds and EPA regarding the possibility of chemicals other than chlorine occurring in the wastewater discharges. EPA proposes to consider this matter

further when completing its assessments of the Development Licence applications. The IAC is supportive of this.

Impacts from chlorine byproducts

Recommendation 4 in Table 1 of the Minister's Directions contemplated targeted investigations into the effects of existing chlorine discharge from the Refinery on chlorine byproduct concentrations in seawater and biota with high susceptibility to contamination. Technical Report A confined the work on this matter to chlorine byproduct concentrations in mussels.

The IAC accepts the advice of Dr Wallis and Dr Edmunds that seawater cannot be analysed for chlorine byproducts at very low concentrations by available Australian laboratories. Therefore, it was not feasible for the Supplementary EES to present data on chlorine byproduct concentrations in seawater.

The mussel testing indicated chlorine byproduct levels in mussels were below detection limits for Australian commercial laboratories. However, Australian commercial laboratory detection limits are substantially higher than the levels of chlorine byproducts reported as being able to be detected in international literature. As a result, the mussel studies are inconclusive (at least in regard to comparisons with the international literature).

Mussels are not a surrogate organism for other types of marine life, as Dr Edmunds pointed out. However, the IAC considers there is no point in testing other species unless laboratory facilities are available for testing with much lower detection limits, consistent with the levels reported in the international literature.

Revised entrainment modelling

The results of the revised entrainment modelling in the Supplementary EES confirmed the FSRU will have a very minor effect on entrainment of ichthyoplankton, slightly greater than the existing Refinery. This is the case even if entrainment is regarded as a cumulative effect, together with natural causes of mortality such as starvation and predation (as suggested by the City of Greater Geelong).

The IAC accepts Dr Wallis' evidence that a recruitment shadow is unlikely given the fish species likely to be affected by entrainment are widespread, and the risk of a recruitment shadow would be similar to the existing situation, where some entrainment already occurs at the Refinery intake.

The Supplementary EES included additional investigations to confirm the fish species that could be affected by entrainment. This included a limited eDNA study which was criticised by Stantec for its limited temporal scope. The IAC considers the eDNA study provided useful information, however, it agrees with Stantec that the limitations of the eDNA study could have been more clearly articulated in the Supplementary EES.

The IAC notes that the additional investigations to confirm the fish species present were not required by the recommendations for further work in the Minister's Directions, and are not determinative given the limited effect of the Project on entrainment shown by the revised entrainment modelling.

Scour from the diffuser on the seabed

The IAC notes the City of Greater Geelong's concerns about potential effects of the diffuser in terms of erosion of the seabed. Mitigation measure ME10 should be amended to include a

requirement for the design of the diffuser to have regard to effects on the stability of the seabed and minimise risks of erosion.

Monitoring operational impacts

The Proponent inserted an additional mitigation measure ME21 in the Day 2 MMs to address EPA's recommendations in relation to monitoring the effects of the FSRU on entrainment. The IAC accepts EPA's submission that relevant water quality data should be collected alongside the plankton monitoring, including consideration of continuous chlorophyll (Chl a) fluorescence monitoring. MM-ME21 should be amended accordingly.

The IAC supports the change to MM-ME19 to require suitable thresholds to be identified based on the monitoring of existing Refinery discharges.

(v) Findings and recommendations

The IAC finds:

- The revised wastewater discharge modelling provides a suitable basis for assessing the impacts of the Project's operational discharges on the marine environment.
- The effects of wastewater discharges from the diffuser and the Refinery are expected to be within the DGVs for temperature and chlorine, and will be acceptable.
- The mussel study did not indicate significant bioaccumulation of chlorine byproducts in mussels as a result of the existing Refinery discharges, although the findings of the studies are limited by the low sensitivity of testing available in Australian commercial laboratories.
- EPA should consider the potential presence and management of other contaminants in the wastewater when assessing the Development Licence applications.
- The Project is not expected to have a significant impact on fish populations in Corio Bay via entrainment of fish eggs into the FSRU intake.
- Some adjustments are required to the marine MMs to further minimise the Project's operational impacts on the marine environment:
  - MM-ME10 should be amended to include a requirement for the design of the diffuser to have regard to effects on the stability of the seabed and minimise risks of erosion
  - MM-ME21 should be amended to include a requirement for relevant water quality data to be collected as part of the monitoring of the effects of entrainment by the FSRU.

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measures as shown in Appendix E:

a) revise ME10 (design of the diffuser) to include a requirement for the design of the diffuser to have regard to effects on the stability of the seabed and minimise risks of erosion

b) revise ME21 (monitoring the effects of entrainment by the FSRU) to include a requirement for relevant water quality data to be collected as part of the monitoring of the effects of entrainment.

5.6 Baseline monitoring

(i) The issues

The issues are whether the:

- baseline monitoring should have been undertaken as part of the Supplementary EES, rather than in the 12 months before dredging starts
- baseline monitoring requirements in the EMF are adequate and appropriate.

(ii) What did the Supplementary EES say?

Technical Report A did not present the 12 months of monitoring data required under Recommendation 1c of the Minister's Directions, and stated the baseline monitoring should be undertaken in the year immediately prior to dredging. Technical Report A outlined a proposed methodology for the future baseline monitoring, focused on assessing the effects of dredging. The monitoring program set out baseline monitoring parameters, locations and frequency, including:

- two months of continuous baseline monitoring of turbidity and light attenuation prior to dredging (new ME05a)
- quarterly baseline surveys of seagrass and benthic fauna prior to dredging (this has not been fully translated into the EMF – ME06 requires a minimum of two baseline surveys three months apart)
- phytoplankton surveys at two weekly intervals commencing two weeks prior to dredging (this has not been fully translated into the EMF – ME07 requires the plankton surveys to commence eight weeks prior to dredging).

Technical Report A did not recommend baseline monitoring in relation to the operational effects of the Project:

- no baseline monitoring is proposed in relation to MM-ME17 (monitoring of the rates and characteristics of all FSRU wastewater discharges)
- for ME19 (monitoring of the effects of wastewater discharge from the FSRU on the marine environment), Technical Report A proposed to rely on the existing conditions assessment undertaken for the Supplementary EES to establish the baseline.

In response to EPA's submission (S330), the Proponent proposed:

- amending MM-ME05a to increase continuous baseline monitoring of turbidity and light attenuation prior to dredging from two to 12 months
- adding ME21 to require 12 months of baseline monitoring in relation to the effects of entrainment by the FSRU on plankton.

(iii) Evidence and submissions

Timing of baseline monitoring

Dr Wallis confirmed the 12 months of baseline monitoring required by Recommendation 1c in the Minister's Directions was proposed to be undertaken in the 12 months prior to commencement of dredging. He advised:

> … the key tasks in the baseline study are to measure turbidity and light prior to dredging and develop thresholds for use during dredging to manage dredging (principally the barge overflow rate) to stay below the thresholds.

Dr Wallis advised:

- this timing was preferable because of natural variability in the marine ecosystem
- the final monitoring program will be developed in consultation with relevant government agencies and approved prior to implementation.

Dr Edmunds and many submitters were critical that a full year of baseline monitoring was not undertaken for the Supplementary EES. GGS submitted that the monitoring proposed in MM-ME05a should have been completed prior to the publication of the Supplementary EES, and should have informed the Supplementary EES' assessment of impacts on the marine environment.

Dr Edmunds' evidence was that a baseline monitoring period longer than 12 months would be beneficial in terms of understanding the Project's ecological impacts going forward. He did not consider it was necessary to wait until 12 months before commencement of construction or dredging to commence baseline monitoring. In his view, conditions can differ significantly in consecutive years due to natural variability, so conditions in the year immediately prior to dredging will not necessarily be more representative or comparable than conditions in other years.

Baseline monitoring design and parameters

Dr Edmunds was critical of the baseline monitoring program outlined in Technical Report A. He considered the design had poor capability to detect and understand ecological states and impact responses. His key concerns included:

- Technical Report A did not explain the rationale around monitoring design options and decisions
- the monitoring design was not constructed around predictions for all relevant ecosystem components and all Project phases
- the monitoring sites for physical parameters were not aligned with each other, the biological variables or disturbance gradients (for example, distance from the source of impact)[5]
- only a limited number of biological variables were proposed to be monitored
- the proposed method for monitoring seagrass and macroalgae (which is the same method as used for the surveys informing the Supplementary EES) was unreliable
- intertidal seagrass was excluded from the proposed monitoring program based on the assumption it would not be impacted by dredging.

(iv) Discussion

Timing of baseline monitoring

The Minister's Directions require 12 months of baseline monitoring prior to commencement of construction or dredging, but do not stipulate it must be completed as part of the Supplementary EES. The IAC agrees with Dr Wallis that it is preferable for baseline monitoring to be undertaken in the 12 months prior to commencement of construction and dredging because of variability in the marine ecosystem.

[5] 'Disturbance gradient' is a range of disturbance severity (such as decreasing chlorine concentrations with distance from a wastewater discharge point), and the changes that occur in response to that severity.

Baseline monitoring design and parameters

The IAC agrees with Stantec and Dr Edmunds that the baseline monitoring program outlined in Technical Report A is not adequate to inform a detailed understanding of the Project's impacts and how they should be managed. The IAC's key concerns include:

- the proposed baseline monitoring program is limited to the effects of dredging, whereas baseline data is also required for monitoring the effects of Project operation
- the Supplementary EES' approach to the assessment of the effects of existing wastewater discharges on seagrass had methodological deficiencies (see Chapter 5.4), and the approach taken for monitoring of future impacts on seagrass should be modified to address the issues raised
- not all of the MMs currently require 12 months of baseline monitoring.

It is important that the ecological monitoring programs (including baseline) are sufficiently sensitive to detect potential impacts on water quality and marine biota including seagrass, should they occur. Data on relevant water quality parameters (including temperature and chlorine for operational discharges, and turbidity and light availability for dredging impacts) should be collected concurrently with data on ecological parameters, such as seagrass, sea urchins and mussels.

The exhibited MMs did not align the monitoring sites for various parameters proposed to monitor dredging impacts. This was addressed in the Day 2 version of MM-ME05, which requires concurrent turbidity and light attenuation monitoring at the same six sites. Turbidity and light attenuation monitoring should be conducted in the same areas where seagrass is monitored, to ensure any changes in seagrass can be assessed in relation to changes in turbidity and light attenuation.

The IAC agrees with Dr Edmunds that intertidal seagrass should be included in the baseline monitoring for dredging.

On the proposed duration of the baseline monitoring program, only MM-ME05a and MM-ME21 require 12 months of baseline monitoring. The other MMs addressing monitoring in relation to dredging require between 8 weeks and 3 months of baseline data respectively. MM-ME06, which addresses impacts of dredging on seagrass and seabed biota, should be amended to require 12 months of baseline monitoring (rather than 3 months). The proposed 8 week baseline monitoring period for MM-ME07 (plankton surveys) is sufficient for determining whether there is a bloom of toxic phytoplankton resulting from dredging.

The MMs addressing monitoring during Project operations rely in part on the baseline monitoring completed as part of the Supplementary EES (MM-ME19). However, the Supplementary EES did not include 12 months of monitoring data, and the surveys undertaken for the Supplementary EES did not include all of the ecosystem components required to be monitored by MM-ME19. Further baseline monitoring will therefore be required, including:

- 12 months of baseline monitoring prior to commencement of dredging, to cover a full year and include all seasons of the year (MM-ME19)
- data on the flow rate, temperature and residual chlorine concentrations of wastewater discharges from the Refinery prior to Project operations (a new MM-ME17a), to compliment the monitoring of the flow rate, temperature and residual chlorine concentration of discharges from the FSRU (via the Refinery and via the diffuser) required under MM-ME17.

(v) Findings and recommendations

The IAC finds:

- It was not necessary (and not required by the Minister's Directions) for the baseline monitoring to be undertaken as part of the Supplementary EES.
- The baseline monitoring should be undertaken in the 12 months prior to commencement of dredging (except for ME07, where the 8 week baseline monitoring period proposed in the Supplementary EES is sufficient).
- The baseline monitoring program requires revision to address methodological concerns in relation to the Supplementary EES assessment of existing conditions (outlined in Chapter 5.4), including a requirement to monitor relevant parameters (particularly turbidity and light attenuation) in the same areas as the relevant ecological characteristic (seagrass).

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measures as shown in Appendix E:

a) revise ME06 (seagrass and benthic fauna monitoring) to require 12 months of baseline monitoring

b) revise ME05a (baseline turbidity and light attenuation monitoring) and ME05 (turbidity and light attenuation monitoring during dredging) to require turbidity and light attenuation to be monitored in the same areas as the monitoring sites for seagrass under ME06

c) include a new ME17a to require 12 months of baseline monitoring of existing Refinery discharges to assist in the interpretation of data collected under ME19 (monitoring the effects of operational discharges on the marine environment)

d) revise ME19 (monitoring the effects of wastewater discharges on the marine environment) to include a requirement for the monitoring program to be designed to detect potential impacts on water quality and key ecosystem components such as seagrass.

5.7 Overall findings

In relation to the Project's operational impacts on the marine environment, the IAC finds:

- the evaluation objectives relating to biodiversity, water and catchment values, and waste management can be met
- residual impacts are not likely to be significant, and can be acceptably managed with the application of the IAC's recommended MMs
- no design changes or further modifications are required to further reduce the Project's operational impacts on the marine environment.

6 Construction impacts on the marine environment

6.1 Introduction

Chapter 5.1 summarises the Terms of Reference, evaluation objectives, EES documentation, evidence and other key documents relevant to construction impacts on the marine environment, including from dredging. Relevant legislation, policy and guidelines are summarised in Chapter 5.2.

Relevant recommendations in Table 1 of the Minister's Directions are:

- Recommendation 6 (revised sediment transport modelling)
- Recommendation 7 (further assessment of dredging impacts on seagrass)
- Recommendation 8 (confirming that dredging will not impact the Ramsar site).

6.2 What did the Supplementary EES say?

Like the EES, the Supplementary EES assessed the impacts of removing 490,000 cubic metres of sediment from the proposed dredging areas at Refinery Pier (see Figure 1). It did not include any dredging of the shipping channels or other parts of Corio or Port Phillip Bays (see Chapter 3.6(ii) for more detail).

(i) Revised sediment transport modelling

The sediment transport modelling was re-run based on:

- the revised hydrodynamic model discussed in Chapter 5.3
- refined sediment size fractions and settling velocities based on more detailed information about the area proposed to be dredged
- expected spill rates during dredging, advised by Boskalis (an experienced dredging operator).

The model predicted the following, based on an 8 week dredging period and weather conditions in August to September 2020:

- suspended solids concentrations in the water
- accretion (settlement and buildup) of sediments on the seabed.

Both factors affect seagrass health. Suspended solids concentrations in the water affect the amount of light reaching seagrass while accretion of sediments on the seabed can cause smothering of seagrass if accretion rates are excessively high.

Modelling results

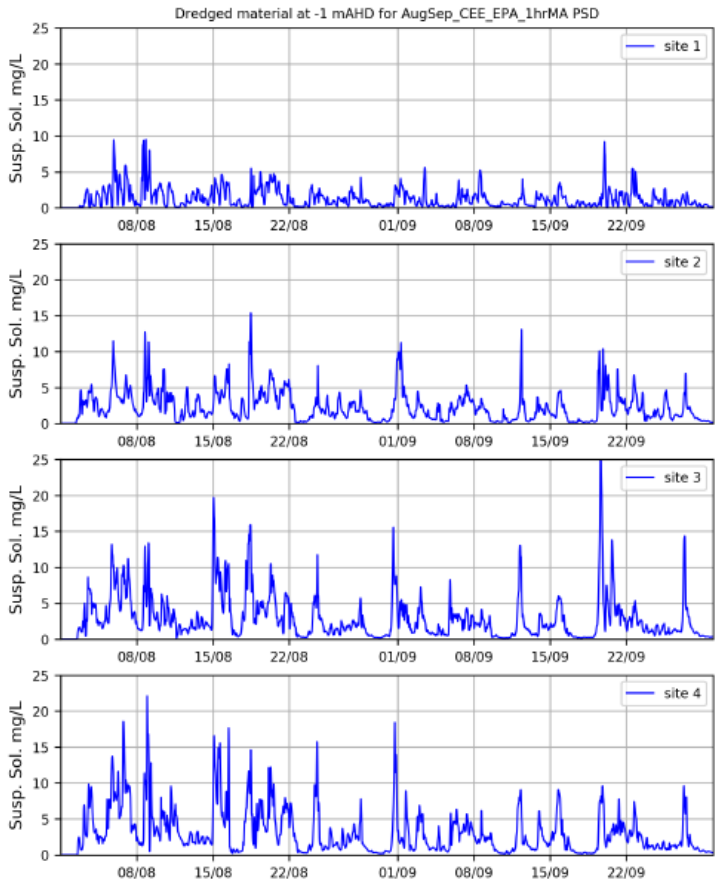
Technical Report A presented maps of the predicted median increases in suspended solids concentration (above background) at the sea surface and seabed, which showed the median increase in suspended solids concentration was generally less than 2 mg/L at the Ramsar site (refer to Figure 6).

Figure 6 **Predicted median increases in suspended solids concentration (above background) at the water surface (L) and seabed (R)**

Source: Technical Report A, Figures 9-2 (L) and 9-3 (R)

Time series plots of the predicted increase in suspended solids concentrations were prepared for the four sites shown in Figure 6 above. Sites 1 to 3 were on the outer edge of the Ramsar site. Site 4 was in Corio Bay closer to the Refinery. The plots (extracted in Figure 7) showed significant temporal variability depending on weather conditions.

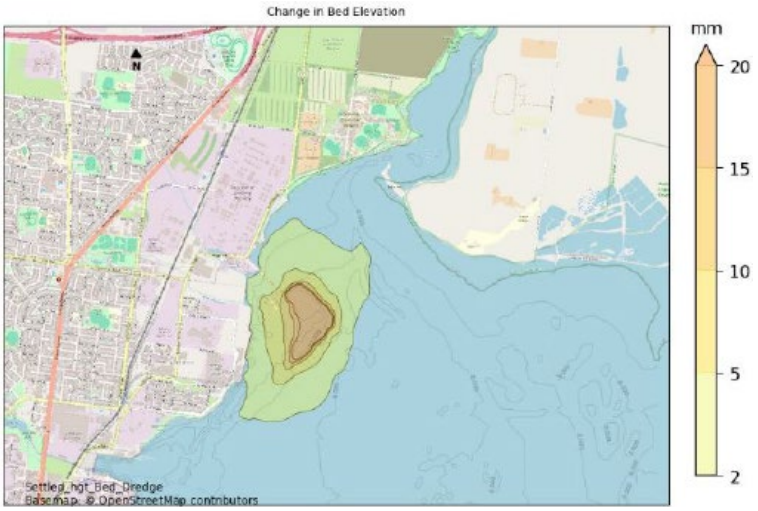
Figure 7 **Predicted time series of the increase in suspended solids concentration (above background) resulting from dredging**



Source: Technical Report A, Figure 8.8

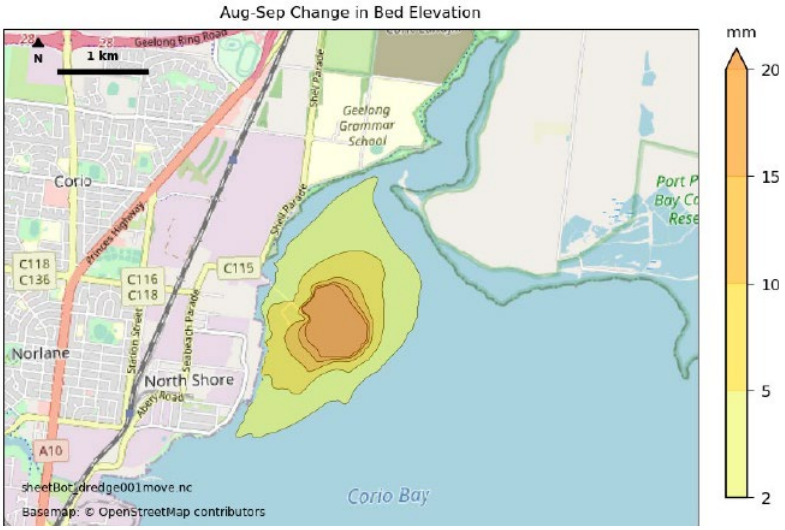
Figures in Technical Report A showed predicted changes in seabed elevation resulting from settlement of sediments disturbed by dredging. Figure 8-12 (extracted in Figure 8) showed the area predicted to be affected by sediment accretion was well south of the Ramsar site, whereas Figure 9-8 (extracted in Figure 9) showed the area of accretion extended to the edge of the Ramsar site. Technical Report A did not explain the difference between the two maps.

Figure 8 Predicted accretion of suspended solids on the seabed



Source: Technical Report A, Figure 8-12

Figure 9 Predicted increment in seabed elevation due to sedimentation



Source: Technical Report A, Figure 9-8

The sediment transport model predictions were verified by comparisons with turbidity measurements and the outputs of a suspended solids verification model prepared by Lawson and Treloar for the 1996-97 Corio Bay channel improvement program. The comparisons showed reasonable agreement.

Worst case scenarios

Technical Report A defined two 'worst case' scenarios for suspended solids in response to the Minister's Directions, one based on a higher proportion of fine sediments and the other on slower settling rates (but not both together). The worst case scenario predictions were only calculated for Site 3 (one of the sites at the outer edge of the Ramsar site).

Technical Report A reported the worst case assessments would lead to an increase in the average predicted suspended solids increment at Site 3:

- from 3.0 to 3.4 mg/L (for the scenario involving a higher proportion of fine sediments)
- from 3.0 to 4.9 mg/L (for the scenario involving slower settling rates).

The peak suspended solids increment in the worst case scenarios was predicted to increase from 25 mg/L (as shown on Figure 7) to 28 mg/L.

(ii) Revised assessment of dredging impacts on seagrass

Technical Report A analysed the results of the revised sediment transport modelling to determine the extent of seagrass that may receive reduced light as a result of dredging. Light availability at the four sites shown in Figure 6 was assessed against the light thresholds specified in Recommendation 7b in the Minister's Directions:

- 20 percent surface irradiance for any sediment plumes that extend to the Ramsar site
- 10 percent surface irradiance for sediment plumes in Corio Bay outside the Ramsar site.

Technical Report A concluded that during the dredging program:

- all seagrass in the Ramsar site will receive more than 20 percent surface irradiance
- almost all seagrass in Corio Bay will receive more than 10 percent surface irradiance
- deep sparse seagrass near the dredging site may experience a setback in growth rates.

Technical Report A converted the 14 day average suspended solids concentrations (which include the background suspended solids concentrations plus the increment resulting from dredging) to surface irradiance, and concluded that the surface irradiance thresholds would be met and elevated suspended solids concentrations would not significantly affect seagrass survival. While the peak concentrations would be significantly higher than the average, peak events occur for only a few hours, and half of them occur at night when seagrass would not be receiving sunlight. Short term peak concentrations are therefore not anticipated to impact seagrass.

Technical Report A concluded:

- the dredging will not have any impact on seagrass in the Ramsar site
- no significant volume of dredging related suspended solids will enter Limeburners Bay.

After completion of the eight week dredging program, any seagrass affected by reduced light availability resulting from dredging is predicted to recover to normal growth within two months, as rhizomes will not be damaged by the dredging. Dredging is not expected to have any impact on intertidal seagrass, as that seagrass is exposed to air and high light availability every low tide (during daylight hours) regardless of suspended solids levels.

(iii) Stantec peer review

The Stantec Report noted that increasing the water depth in the dredged area could result in potential changes to hydrodynamics or wave action on the shoreline, which could affect shoreline stability. Stantec noted that the supplementary marine assessment did not assess these potential effects of dredging. The Proponent and CEE responded (in Supplementary EES Attachment I) that Corio Bay has low wave heights generated locally by winds and *"the proposed dredging will not alter the wave climate on the north shore or the Ramsar site"*.

(iv) Mitigation measures

The effects of dredging on the marine environment are proposed to be managed through MMs ME02 to ME07. Other relevant MMs include those relating to:

- lighting (MM-LS01 and MM-LS02)
- underwater noise impacts (MM-UN01 to MM-UN03)
- biosecurity measures on vessels (MM-ME12)
- spill management procedures on vessels (MM-ME14).

The IAC has had regard to all relevant MMs in assessing the impacts of dredging on the marine environment, including threatened and migratory birds (addressed in detail in Chapter 7).

6.3 Dredging history

(i) The issue

The issue is whether the dredging history of Corio Bay is relevant to assessing the effects of the dredging proposed for the Project.

(ii) Submissions

The Proponent submitted Corio Bay has regularly been dredged, and the history of dredging demonstrates the relatively robust nature of the marine ecosystem. It noted the dredging program proposed for the Project is relatively small compared to previous dredging programs.

Many submitters were concerned the proposed dredging is too close to the Ramsar site, as it is closer than any previous dredging in Corio Bay. ACF Geelong Community submitted that while the proposed dredging program may be smaller than previous campaigns, it is more concentrated and the volume of material proposed to be removed is relatively large compared to the small size of the dredging area.

(iii) Discussion

The brief history of dredging in Corio Bay compiled in Technical Report A provides useful context. Technical Report A used the studies undertaken in conjunction with the 1996-97 Corio Bay channel improvement program as a source of information for verifying the suspended solids modelling for the Project.

The IAC has considered the dredging history of Corio Bay in its assessment of the significance and acceptability of the impacts of the proposed dredging, alongside the other information in the Supplementary EES and the evidence before the IAC. However, the effects of the proposed dredging for the Project cannot be directly inferred from past dredging programs, due to differences in scale and location.

6.4 Sediment transport modelling

(i) The issues

The issues are whether the:

- revised sediment transport modelling adequately reflected the variability in dredging plumes
- assumption of a constant background suspended solids concentration was appropriate

- mapping of the sediment plumes in Technical Report A should have showed 95th percentile results (rather than medians).

(ii) Evidence and submissions

Dr Wallis advised the sediment transport modelling did not assume implementation of any mitigation measures to reduce plume source rates.

Background suspended solids concentrations

EPA suspended solids monitoring data for Corio Bay and measurements made by CEE were used to inform background suspended solids. Dr Wallis explained that the modelling assumed a constant background suspended solids concentration, based on the average over the eight week dredging period.

Dr Edmunds did not support this approach. He gave evidence that:

- the average background suspended solids concentration was based on old, potentially unsuitable data
- time series background suspended solids concentrations, based on measured data, should have been used
- natural variability in background turbidity and sunlight should have been factored into the assessment of the impacts of dredge plumes on plant production and survival.

Dr Wallis responded that:

- incorporation of natural variability in background suspended solids concentrations and sunlight into the assessment of dredging impacts on seagrass requires a large amount of additional data and understanding of seagrass behaviour, and was beyond the scope of a dredging risk assessment
- according to the literature, light availability needs to be reduced for quite significant periods (at least 2 weeks) before seagrass survival is impacted
- short term increases in suspended solids concentrations over hours or days (such as during a storm event or unfavourable weather conditions) would not affect seagrass.

Variability in dredging plumes and worse case scenarios

Dr Wallis and Dr Guard disagreed as to whether variability resulting from the weather, backhoe production rates and spill rates was adequately addressed by the revised sediment transport modelling.

Dr Guard gave evidence that the modelling did not sufficiently address potential effects of variability in weather conditions on the behaviour of dredging related plumes. He noted (and Dr Wallis agreed):

- the revised modelling used weather data from a particular year, and did not examine other wind conditions that could be found in the long term weather data
- the weather during dredging could be more adverse than assumed in the revised modelling.

Dr Guard noted the plume source rate for the Supplementary EES was lower than was adopted in the EES. Further, he considered variability in backhoe production rates should have been incorporated into the model inputs. His evidence was:

> … the derivation of plume generation rates associated with the dredging program have not been demonstrated to be sufficiently conservative, and therefore the environmental effects of dredging may have been underestimated.

Dr Wallis advised the backhoe spill rate used in the revised sediment transport modelling was based on advice from Boskalis and included a margin of safety. He agreed backhoe production rates will vary but he expected the actual average rate should be close to the assumed average rate. He noted the EMF requires continuous monitoring of light attenuation and turbidity during the dredging, so the dredging contractor can adapt to reduce backhoe production rates in the event of higher readings. Further, the spill rate could be decreased by about 30 percent by reducing or preventing barge overflows, although this would slow the dredging and likely result in an extension of the dredging program beyond 8 weeks.

Dr Guard gave evidence that Technical Report A presented insufficient assessment of the worst case scenario, and had not, in his view, demonstrated that the 20 percent surface irradiance threshold would be met in the Ramsar site in the worst case scenario.

Sediment plume mapping

Dr Guard and Dr Edmunds were critical that the Supplementary EES did not present maps showing the 95th percentile increase in suspended solids resulting from dredging. Dr Guard noted 95th percentile mapping was produced as part of the original IAC process and considered it should have been included in the Supplementary EES.[6]

Dr Guard's evidence was that it was common industry practice to map the 50th and 95th percentiles of the daily dredging-related sedimentation rate, to assess the magnitude of short term spikes and longer term rates of sediment deposition. He noted Technical Report A only presented the final deposition thickness (see Figure 8), which in his view provides insufficient information on the frequency and intensity of deposition processes.

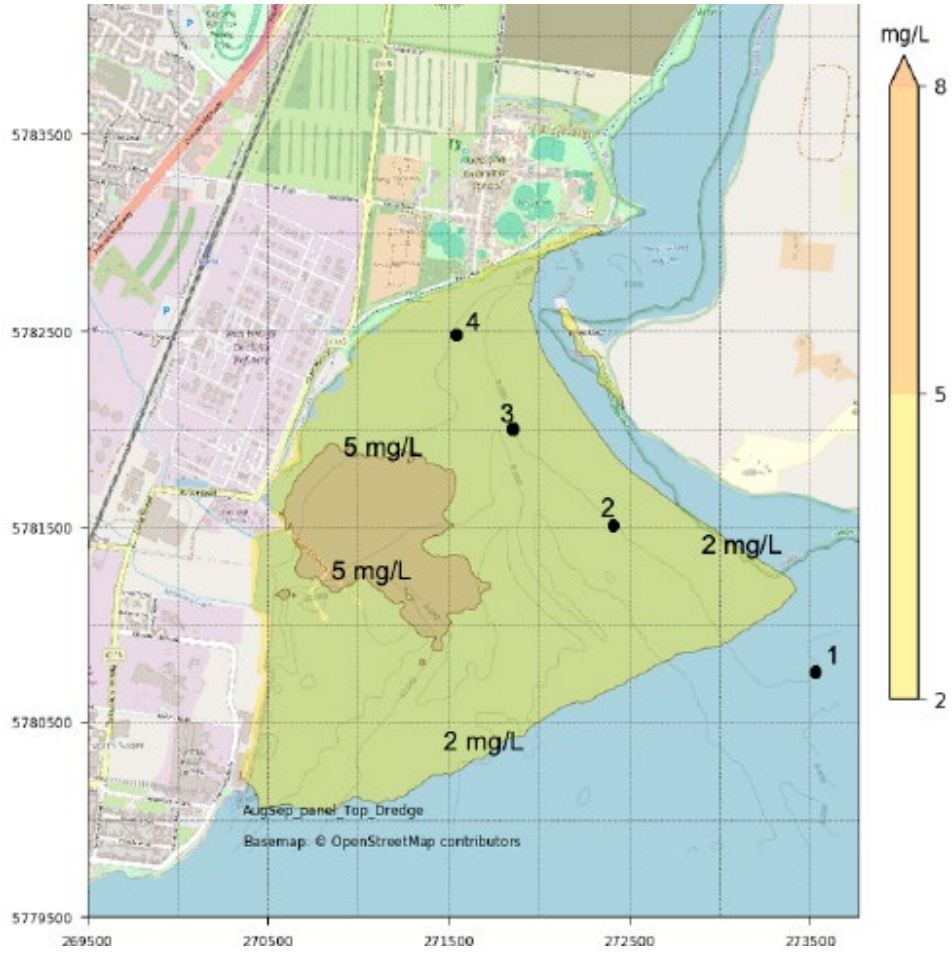
Dr Wallis did not agree that the 95th percentile increase in suspended solids was an appropriate way to indicate acute effects. He considered the 95th percentile could be misleading because it would show a large area affected, but without showing that the brief increases in suspended solids concentrations would be too short to have any effect on seagrass. He noted the WA Dredging Guidelines recommend 2 week averaging based on seagrass having a 2 week response time to diminished light, and other literature suggests 30 day averaging may be appropriate. His evidence was that over an 8 week dredging period, the 95th percentile suspended solids concentration is exceeded for a much shorter time than these recommended averaging periods.

In response to a question from the IAC, Dr Wallis agreed the 25th and 75th percentile suspended solids concentration would be a more useful measure of variability in suspended solids caused by the Project. At the request of the IAC, the Proponent tabled a memorandum prepared by Dr Yeates and Dr Wallis including maps of the 25th and 75th percentiles (D144). The 75th percentile map is reproduced in Figure 10 below. CEE noted in the memorandum:

- the Supplementary EES used the highest 14 day suspended solids concentration to assess available light
- the highest 14 day suspended solids concentration was similar to the 75th percentile suspended solids.

[6] Figure 8 in Report No. 1 was produced at the request of the IAC – it was not contained in the original EES.

Figure 10 Plot of 75th percentile increase in suspended solids concentrations (above background)



Source: D144

(iii) Discussion

Background suspended solids concentrations

The IAC considers the approach of using a single average background suspended solids concentration level is acceptable. It accepts Dr Wallis' evidence that detailed representation of short term variations in suspended solids concentrations (over hours and days) introduces considerably more complexity to the modelling. The IAC notes that the WA Dredging Guidelines recommend 2 week averaging of light attenuation levels, and other literature suggests even longer response times, before seagrass survival is impacted. On that basis, the IAC does not consider that consideration of short term variations in background suspended solids concentrations is warranted.

Variability in dredging plumes and worst case scenario

The revised sediment transport modelling did not fully explore potential variability in the effects of dredging on suspended solids concentrations due to weather conditions or plume source rates. Nor did it fully explore the worst case scenario. Suspended solids concentrations in the worst case scenarios assumed in Technical Report A were only calculated for one of the four reporting sites. The effect of the worst case scenarios on the other three reporting sites, and the extent of dredging plumes in the worst case scenarios, is not known.

Consequently, there is some uncertainty regarding the conservatism of the revised sediment transport modelling, and what the suspended solids concentration is likely to be in the worst case scenarios.

Notwithstanding the uncertainty, the IAC is broadly satisfied that the revised sediment transport modelling was sufficient for this stage of the assessment process, and provided a reasonable basis for the updated assessment of the impacts of dredging on seagrass health. This is because:

- the modelling is inherently conservative, as it did not factor in the application of any mitigation measures designed to manage sediment loads in the water during dredging
- the dredging program is relatively confined in duration
- as discussed in Chapter 6.5, the EMF requires:
  - a comprehensive monitoring program before, during and after dredging to confirm the existing state of seagrass health, monitor impacts during dredging and confirm recovery after dredging (MMs ME05a and ME06)
  - adaptive management of dredging (ME05), so if turbidity thresholds are exceeded, dredging needs to be modified to ensure the surface irradiance thresholds can be met.

Sediment plume mapping

It is important to understand the extent of acute as well as average increases in suspended solids concentration. Mapping of the 75th percentile increase in suspended solids concentration (Figure 10) provides ecologically useful information regarding acute effects. The 75th percentile map shows dredging plumes are likely to extend into the Ramsar site unless appropriate mitigation measures are applied, highlighting the importance of the mitigation measures for preventing impacts on the Ramsar site.

(iv) Findings

The IAC finds:

- The approach of using of a constant average background suspended solids concentration in the revised sediment transport modelling is acceptable.
- While there is some uncertainty regarding the conservatism of the suspended solids concentrations predicted by the model, sufficient safeguards are built into the EMF to ensure dredging impacts are appropriately monitored and managed if turbidity is higher than predicted.
- Mapping of the 75th percentile suspended solids concentrations is important for understanding acute effects and the full extent of the area expected to be affected by dredging plumes.

6.5 Revised assessment of dredging impacts on seagrass

(i) The issues

The issues are whether the:

- supplementary assessment of dredging impacts on light availability was sufficient
- use of formulae to calculate light availability based on suspended solids concentrations was appropriate
- surface irradiance thresholds will be met
- seagrass productivity should be considered rather than just seagrass survival

- impacts of dredging on intertidal seagrass have been sufficiently assessed.

(ii) Evidence and submissions

The Proponent noted the Supplementary EES had assessed the impacts of dredging without mitigations applied (as noted above), and submitted the acceptability of dredging impacts needs to be assessed with reference to the MMs that have been designed to ameliorate or address identified effects. It submitted:

> Conventional mitigation techniques will successfully ameliorate any risk of material impact on either seagrass in the Ramsar site or other seagrass. As Dr Wallis explains, common experience is that dredging will be undertaken in accordance with adaptive management techniques which will allow for the process of dredging to be altered or attenuated when impacts reach specified levels.

Limited assessment of light availability

Dr Guard gave evidence that best practice is to present dredging impact predictions using a 'zonation' approach representing the range of likely impacts across a broad area. Dr Guard and Dr Edmunds noted the Supplementary EES only calculated light attenuation at the four sites shown in Figure 6, and for four discrete two week periods over the eight week dredging campaign. Dr Guard considered the calculations should have been undertaken for multiple overlapping two week periods. Dr Edmunds noted that no assessment had been done of light attenuation in Limeburners Lagoon or at locations close to the dredging area. Submitters were also critical of the use of only four sites.

In response, Dr Wallis:

- agreed that zones of influence and impact could have been used to present the results of the assessment, but did not agree with Dr Guard that this should have been done
- agreed that overlapping two week windows could have been used rather than four non-overlapping windows, but argued this would not have materially changed the outcomes of the assessment
- advised that the impact of dredging on suspended solids concentrations decreases with distance from the dredging area, so if the light requirements for seagrass are met at the outer edge of the Ramsar site (Sites 1 to 3 in Figure 6), seagrass within the Ramar site, including in Limeburners Lagoon, will receive even more light
- it was therefore not necessary to assess locations further within the Ramsar site.

The use of formulae to calculate light availability

Dr Wallis gave evidence that light availability was calculated based on formulae in the Victorian Dredging Guidelines that quantify relationships between suspended solids concentration and turbidity, and between turbidity and light availability. He considered this to be a reasonable and appropriate approach, and that field measurements of the relationship between suspended solids and light availability were not necessary.

GGS' experts gave evidence that:

- measured data demonstrates that the relationships between suspended solids concentration, turbidity and light availability have considerable scatter (in other words, the relationship is not consistent and can vary depending on other factors) (Dr Guard)
- while conservative assumptions were used to calculate light availability, the most conservative possible relationship for the derivation of light availability had not been used (Dr Guard)

- the preferable approach was to use field measurements of the relationship between suspended sediment concentration and light availability, rather than making calculations based on formulae (Dr Edmunds).

Several submitters were also critical of the use of calculations to determine light availability rather than actual measurements. Environment Victoria's submission attached an opinion from Dr Parry, author of the Victorian Dredging Guidelines, which indicated that the calculations are complex and involve many uncertainties. The Proponent responded that Dr Parry's opinion (D138) took no issue with how the Victorian Dredging Guidelines were used to inform the assessment, including the use of formulae within the Victorian Dredging Guidelines to calculate light availability.

The surface irradiance thresholds and effects on seagrass

Dr Wallis gave evidence that the calculated available light at Sites 1 to 3 in Figure 6 ranges from 24 to 50 percent, depending on the formula used. While he acknowledged there was an error range in the calculations, he emphasised that all calculations showed there will be at least 20 percent available light for seagrass at the Ramsar site, and the surface irradiance thresholds are therefore predicted to be met.

As noted in Chapter 6.4, Dr Guard raised concerns that Technical Report A presented insufficient assessment of the worst case scenario, and had not demonstrated that the 20 percent light threshold would be met in the Ramsar site in the worst case scenario.

GGS and ACF Geelong Community were critical of the focus of the Supplementary EES on seagrass survival, rather than the maintenance of thriving productive seagrass beds, which ACF Geelong Community submitted also had important implications for the ecosystem as a whole including for swans, shark nurseries and migratory birds. Dr Edmunds considered seagrass productivity was an important measure of impact. He considered the Project could result in a reduction in productivity even though the light thresholds for survival will likely be met.

Dr Wallis agreed that depending on the conditions during the actual dredging program, there could be some reduction in primary production (from both seagrass and phytoplankton). He acknowledged this would flow through the ecosystem. However, his evidence was that a temporary reduction in seagrass productivity, should it occur, would not be ecologically significant, and (as noted above) seagrass is expected to fully recover after the completion of the dredging program.

Effects on intertidal seagrass

Dr Wallis gave evidence that intertidal seagrass is only submerged for part of the time and will receive adequate light for survival when it is exposed by tide, even if light availability is reduced by turbidity. Dr Wallis considered intertidal seagrass is therefore less sensitive to the effects of dredging than seagrass below the low tide level, and intertidal seagrass did not need to be assessed in detail.

Dr Edmunds disagreed, and considered the Supplementary EES incorrectly assumed that intertidal seagrass was not vulnerable to dredge plumes. He noted there is evidence in the literature (including local studies in Western Port) demonstrating intertidal seagrass can be affected by suspended sediments and sediment accretion.

(iii) Discussion

Limited assessment of light availability

While the IAC acknowledges Dr Guard's advice that a zonation approach is generally more informative, it considers light availability calculations for the three locations at the outer edge of the Ramsar site is adequate for assessing potential impacts on the Ramsar site. These sites are closer to the dredging area than the rest of the Ramsar site and therefore would indicate maximum likely impacts on light availability within the Ramsar site.

However, the IAC does not consider that information for a single site (Site 4 on Figure 6) can be taken as being representative of impacts on Corio Bay outside the Ramsar site. Therefore, Technical Appendix A does not demonstrate with certainty that the 10 percent surface irradiance threshold will be met outside the Ramsar site.

For that reason, MM-ME06 (which requires seagrass monitoring before, during and after dredging) should be amended to require monitoring at additional sites within the 5 mg/L contour on Figure 10, to assess any impacts on seagrass and confirm recovery if there are impacts.

The IAC acknowledges Dr Guard's advice that it would have been preferable for the light availability calculations to have been undertaken for multiple overlapping two week periods rather than four discrete two week periods, as this would have identified the maximum impact on two week average light availability over the eight week dredging campaign. However, having regard to the time series plots of suspended solids shown in Figure 7, the IAC accepts Dr Wallis's evidence that this would not have changed the outcomes of the assessment.

The use of formulae to calculate light availability

The IAC considers the approach taken to the calculation of light levels in the Supplementary EES to be reasonable. The calculations were based on relationships between suspended solids concentration, turbidity and light levels published in the Victorian Dredging Guidelines, which the IAC considers appropriate. The IAC accepts the advice of Dr Wallis and Dr Guard that the calculations were based on generally conservative assumptions (although not the most conservative).

While the IAC agrees with Dr Edmunds that the use of field measurements of the relationship between suspended solids concentrations and light levels may have delivered more accurate predictions, it considers the use of formulae to calculate the light levels to be acceptable at this stage of the assessment processes, because:

- this approach is consistent with the Victorian Dredging Guidelines
- field data on the relationship between suspended sediment concentrations and light levels are currently not available for the study area
- the dredging program is relatively confined in area and duration.

Further, the EMF requires concurrent field measurements of turbidity and light attenuation and monthly measurements of suspended solids at the same locations during the 12 month pre-dredging baseline surveys (MM-ME05a). This will assist in confirming the relationships between suspended solids, turbidity and light availability.

The surface irradiance thresholds and effects on seagrass

The IAC acknowledges the general agreement between Dr Wallis and Dr Edmunds that the Project is expected to meet the 20 percent surface irradiance threshold for the Ramsar site and would generally meet the 10 percent threshold elsewhere in Corio Bay.

The IAC shares Dr Guard's concern that the worst case scenarios in the sediment transport model assumptions were not worked though in the Supplementary EES to test the robustness of light availability calculations. However, as discussed in Chapter 6.4, the modelling did not incorporate adaptive management during dredging that will mitigate impacts on turbidity and light availability. Therefore the uncertainty regarding the worst case assessment does not raise significant concerns in relation to seagrass survival.

The IAC accepts Dr Wallis' evidence that a temporary reduction is seagrass productivity, should it occur, will not be significant for the marine ecology of the Ramsar wetland or Corio Bay, for several reasons:

- the effects, if any, would be temporary
- dredging will avoid the ecologically sensitive months from September to January inclusive (MM-ME02).

Effects on intertidal seagrass

The Supplementary EES assessment focused on subtidal seagrass, and uncertainty remains regarding impacts on intertidal seagrass. Intertidal seagrass should be included in the dredging monitoring program required under the EMF. Mitigation measure ME06 should be amended accordingly.

(iv) Findings and recommendations

The IAC finds:

- The four assessment sites used in the supplementary assessment provided a sufficient basis to draw conclusions about the effects of dredging on seagrass in the Ramsar site, but not in Corio Bay. Additional sites should therefore be included in the dredging monitoring program.
- The use of formulae to calculate light availability based on suspended solids concentrations was appropriate in the circumstances.
- Based on the suspended solids concentrations predicted by the revised sediment transport modelling, the Project is expected to meet the surface irradiance thresholds for seagrass in the Minister's Directions, and dredging effects on seagrass are not expected to be significant.
- The uncertainties in the revised assessment of impacts on seagrass arising from the uncertainties in the sediment transport modelling can be addressed in the dredging monitoring program and the adaptive management of dredging.
- Given the relatively short duration of the proposed dredging, an assessment of impacts on seagrass productivity (as opposed to survival) was not required.
- Intertidal seagrass should be considered in the dredging monitoring program required under the EMF. MM-ME06 should be amended accordingly.

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measures as shown in Appendix E:

a) revise ME06 (seagrass and seabed biota monitoring) to require:

- **monitoring of intertidal as well as subtidal seagrass**
- **seagrass monitoring to include the area within the 5 mg/L contour on Figure 10 in this Report, to assess any impacts on seagrass outside the Ramsar site and confirm recovery if there are impacts.**

6.6 Monitoring and mitigation of dredging effects

As noted above, the mitigation measures relating to dredging require a comprehensive monitoring program before, during and after dredging, and the use of adaptive management arrangements to minimise impacts on seagrass. Mitigation measure ME05 requires turbidity and light attenuation to be monitored continuously during dredging. Turbidity thresholds will be used to trigger implementation of measures to reduce turbidity releases, such as reducing or eliminating overflow from barges and adjusting the silt curtains.

(i) The issues

The issues are whether the following requirements of the MMs are appropriate:

- turbidity thresholds (MM-ME05)
- turbidity and light attenuation monitoring (MM-ME05 and MM-ME05a)
- requirements in relation to silt curtains (MM-ME04).

(ii) Evidence and submissions

Turbidity thresholds

As part of the proposed adaptive management of dredging impacts, MM-ME05 proposes the following thresholds for action to restrict turbidity releases:

- 12 hour concentration above 15 nephelometric turbidity unit (NTU) (trigger warning)
- 24 hour concentration above 12 NTU (action required).

EPA (S330) submitted it was premature to establish seabed NTU thresholds without turbidity data for the study area and it was important to establish thresholds that correlate to values that prevent impacts to the marine environment and seagrasses. In response, the Proponent proposed amendments to require the turbidity thresholds in MM-ME05 to be informed by the baseline monitoring conducted in accordance with MM-ME05a.

Environment Victoria submitted the proposed trigger values for turbidity were much less stringent than for past dredging or the Victorian Dredging Guidelines. Dr Parry's opinion (D138) stated the turbidity trigger values for the 1997-98 Geelong channel improvement program were 3 NTU (median) and 6.6 NTU (80th percentile), whereas the Supplementary EES values were much higher, at 12 and 15 NTU.

Turbidity and light attenuation monitoring

MM-ME05a includes requirements for baseline turbidity and light attenuation monitoring before dredging starts. MM-ME05 requires turbidity and light attenuation monitoring during dredging, with management responses if the turbidity thresholds are reached.

Dr Parry (D138) recommended that the monitoring during dredging should include measurements of suspended solids concentrations, turbidity and light availability at the same sites, to provide data for confirming relationships between these parameters in northern Corio Bay. He was critical that the proposed monitoring did not include suspended solids concentrations and proposed to measure turbidity and light availability at different sites.

Similarly, EPA (S330) submitted MM-ME05 should be amended to require concurrent light attenuation monitoring in conjunction with the turbidity monitoring, to more comprehensively assess and respond to risks to seagrass during dredging.

The Proponent responded to EPA's submission S330 in STN03 (D25), proposing amendments to the mitigation measures to include:

- a requirement for baseline turbidity and light attenuation monitoring to occur at the same locations (MM-ME05a)
- clarification that actions to reduce turbidity may include reviewing the use, location and effectiveness of silt curtains and adjusting the silt curtains (MM-ME05).

EPA confirmed it was satisfied with the Proponent's response (D68, D112).

GGS submitted:

> … if turbidity levels are exceeded, dredging must cease until the exceedance falls below the warning levels. This is because there is no evidence that the alternate measures proposed by [the Proponent] will be effective and to what extent. It is not appropriate to 'test' measures in circumstances where there are exceedances occurring. Rather these should be in built into the resumed dredging.

Silt curtain

GGS submitted that Dr McCowan's evidence in relation to the original EES indicated that:

- silt screens are frequently not as effective as they are supposed to be
- they would be most effective when used close to the dredge and could be used to enclose a backhoe dredge
- it would be impractical to enclose the hopper barge overflows with 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.

Dr Wallis responded that the silt curtain would be more effective if placed between the dredging site and seagrass beds along the Refinery shoreline, rather than to enclose the dredge. The Day 2 version of MM-ME04 includes amendments to this effect.

(iii) Discussion

Adaptive management measures applied by the dredging contractor in response to turbidity and light attenuation monitoring will have a significant influence on the effects of the dredging on the marine environment. If the thresholds are appropriate, and the monitoring and adaptive management requirements are both appropriate and effectively implemented, the IAC is confident dredging impacts can be managed to an acceptable level, consistent with the evaluation objectives.

Turbidity thresholds

The turbidity thresholds are critical for minimising the effects of dredging through adaptive management.

In Report No. 1, the IAC reviewed the turbidity thresholds of 12 NTU (trigger warning) and 15 NTU (action required) proposed in mitigation measure MM-ME05 and concluded they were insufficiently precautionary. It recommended that consideration should be given to reducing them to 5 NTU subject to further assessment of the implications for dredge campaign timing (see Report No. 1, Chapter 8.6). The IAC considers this recommendation remains appropriate in relation to the Supplementary EES. No evidence has been presented as part of the Supplementary EES or Inquiry for the IAC to change its view.

The IAC agrees with EPA that the turbidity thresholds should be defined from the baseline monitoring required by MM-ME05a. To avoid confusion, the 12 NTU (trigger warning) and 15 NTU (action required) thresholds should be removed from MM-ME05.

While the IAC supports the thresholds being informed by the baseline monitoring conducted under MM-ME05a, MM-ME05 provides little guidance regarding the criteria for revising the turbidity thresholds. The IAC considers independent review is necessary. MM-ME05 should be amended to include a requirement for the thresholds to be defined to EPA's satisfaction.

Turbidity and light attenuation monitoring

The IAC supports the Day 2 changes to MM-ME05a that require baseline turbidity and light attenuation monitoring to occur at the same locations. This will provide a better understanding of the baseline conditions and the relationship between turbidity and light attenuation in north Corio Bay, and in turn will better inform adaptive management to ensure the impacts of dredging on the marine environment are appropriately managed.

The IAC notes GGS' submission that dredging should cease if turbidity thresholds are exceeded, but does not consider this to be necessary in all instances, and might unnecessarily prolong the dredging program. Temporary cessation of dredging may be suitable in some instances, and the IAC considers MM-ME05 should be amended to require consideration to be given to cessation of dredging as an option for addressing turbidity threshold exceedances.

Silt curtains

The use of silt curtains is one of a number of methods available to the dredging contractor to achieve compliance with the turbidity thresholds through adaptive management of the dredging. The IAC supports the Day 2 changes to MM-ME04 (relating to the placement of the silt curtains) and to MM-ME05 (relating to reviewing the use, location and effectiveness of the silt curtains in response to monitoring undertaken during the dredging campaign).

Other relevant mitigation measures

The IAC considers MM-ME12 (biosecurity measures on vessels) and MM-ME14 (spill management procedures) are relevant to construction (dredging vessels) as well as operation (LNG carriers, tugs and the like). The vessels used for dredging will travel from ports outside Corio Bay and will therefore bring the potential risk of spreading marine pests. Spills during dredging are a potential threat to water quality. These MMs should be amended to require them to applied during construction (dredging) as well as operation.

(iv) Findings and recommendations

The IAC finds:

- With effective implementation of the dredging monitoring program and the adaptive management requirements in the EMF, the IAC expects dredging effects can be acceptably managed to meet the evaluation objectives.
- The 12 NTU and 15 NTU turbidity thresholds specified in MM-ME05 are insufficiently precautionary and should be removed. Turbidity thresholds should be determined to EPA's satisfaction, based on local turbidity data from the baseline monitoring.
- Cessation of dredging should be one of the adaptive management measures considered if the turbidity thresholds are triggered. MM-ME05 should be amended accordingly.
- The Day 2 changes to MM-ME05 and MM-ME05a that require measurements of suspended solids concentrations, turbidity and light availability at the same sites are appropriate as this enables a proper understanding of the relationships between these parameters in northern Corio Bay.
- The IAC supports the Proponent's changes relating to silt curtains in MM-ME04 and MM-ME05.

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measure as shown in Appendix E:

a) revise ME05 (turbidity and light attenuation monitoring during dredging) to:
- **remove the references to the 12 and 15 NTU thresholds**
- **require the thresholds (which will be based on the baseline monitoring undertaken under ME05a) to be established to the satisfaction of the Environment Protection Authority Victoria**
- **include 'cessation of dredging' as one of the actions to be taken in response to turbidity thresholds being exceeded**

b) revise ME12 (biosecurity measures on vessels) and ME14 (spill management procedures on vessels) to make them applicable to construction as well as operation.

6.7 Overall findings

In relation to the Project's impacts of construction and dredging on the marine environment, the IAC finds:

- the evaluation objectives relating to biodiversity, water and catchment values, and waste management can be met
- residual impacts are not likely to be significant, and can be acceptably managed with the application of the IAC's recommended MMs
- no design changes or further modifications are required to further reduce the Project's construction impacts on the marine environment.

7 Threatened and migratory birds

The Supplementary EES addressed Recommendation 9 from Table 1 in the Minister's Directions.

7.1 The issues

The issues are whether:

- impacts on threatened and migratory birds (including Orange-bellied parrots) have been properly assessed
- the Project will have acceptable impacts on threatened and migratory birds.

7.2 What did the Supplementary EES say?

AECOM were the primary authors of the threatened and migratory birds assessment in Technical Report B. AECOM developed a consolidated list of threatened and migratory bird species, including black swan, that could be affected by the Project. The list was confirmed by Stantec.

Over 70 species of threatened and migratory birds potentially occur in the Project area or surrounding environment (Limeburners Bay, Avalon Beach and Corio Bay). A total of 45 species are listed as threatened under the FFG Act. Nineteen species are listed as threatened, 54 species are listed as migratory and 45 species listed as marine under the EPBC Act. The threatened and migratory species listed under the EPBC Act are MNES.

Four EPBC Act listed migratory shorebird species were recorded in the targeted shorebird surveys undertaken for the original EES:

- Sharp-tailed Sandpiper
- Red-necked Stint
- Curlew Sandpiper
- Common Sandpiper.

No further surveys were undertaken for the Supplementary EES (nor were they required by the Minister's Directions). Instead, the Supplementary EES presented further analysis of the targeted shorebird surveys undertaken for the original EES to determine whether the data showed the surveyed sites individually or collectively supported enough individuals of any particular migratory bird species to be an important site for that species in Australia or the East Asian-Australasian Flyway.

The further analysis:

- did not show that any of the survey sites are individually or collectively internationally important for any of the above four shorebird species
- showed that one survey site supports enough Sharp-tailed Sandpiper to be an important site for that species in Australia and the East Asian-Australasian Flyway.[7]

These results do not reduce the overall significance of the shorebird habitats at the survey sites, which are all internationally important due to their inclusion in a Ramsar site.

The revised marine modelling was reviewed in relation to the consolidated list of threatened and migratory bird species, and Technical Report B concluded (at page iii):

[7] The important site is Site 3T - Avalon Coastal Park and the former Avalon saltworks.

> … no residual impacts on the ecological character of the Ramsar site, seagrass or food availability for threatened and/or migratory birds are anticipated as a result of sediment mobilisation during construction or discharge to the marine environment or entrainment during operation of the FSRU.

Taking into account the conclusions of the terrestrial ecology assessment in the original EES and the additional information in the Supplementary EES, the Supplementary EES concluded:

> …species with potential to occur in the Project Area or offsite environment are unlikely to be significantly impacted by the Project.

Stantec peer review

The Stantec Report concluded that Technical Report B satisfactorily addressed Recommendation 9 in Table 1 of the Minister's Directions, with no outstanding matters to be resolved.

7.3 Mitigation measures

Proposed MMs for terrestrial ecology are relevant to the management of impacts on threatened and migratory birds. Other MMs are also relevant, via effects on habitat, food resources and disturbance, including the:

- light spill mitigation measures (MM-LS01 and MM-LS02)
- marine environment mitigation measures (MM-ME01 to MM-ME21)
- noise and vibration mitigation measures (NM-NV01, MM-NV02, MM-NV03, MM-NV04, MM-NV05, MM-NV07, MM-NV08)
- surface water mitigation measures (MM-SW01 to MM-SW04)
- safety, hazard and risk mitigation measures (MM-SHR01 to MM-SHR07).

The IAC has had regard to all relevant MMs in assessing the impacts of the Project on threatened and migratory birds.

7.4 Evidence and submissions

(i) Adequacy of the assessment, including in relation to Orange-bellied parrots

Mr Lane provided independent peer review evidence of the threatened and migratory birds assessment. He considered the Supplementary EES (particularly Technical Report B):

> … responded adequately to the Minister's Directions, providing updated and additional information, impact assessments and conclusions in relation to the acceptability of impacts on threatened and migratory birds to inform decision-making.

Mr Lane confirmed that the final list and likelihood ratings for threatened and migratory bird species that could potentially be affected by the Project are accurate and comprehensive.

Mr Lane gave evidence that the methodology used for further analysis of the targeted shorebird surveys was unnecessarily conservative because it was based on summed counts of birds over multiple surveys and was therefore likely to have double-counted some individuals. He suggested that Site T3 (the one site identified as important habitat) may not have met the threshold for nationally important habitat for Sharp-tailed Sandpiper if a less conservative methodology had been used.

Some submitters expressed concern about the adequacy of the assessment of threatened and migratory birds in the Supplementary EES, including S196 and S256. City of Greater Geelong (S316) sought clarification of whether the EPBC Act guidelines were followed when undertaking

the targeted surveys. Mr Lane clarified that no further fieldwork was undertaken for the Supplementary EES. The analysis of impacts on shorebirds relied on the targeted shorebird surveys undertaken for the original EES, which he said had been undertaken in accordance with the EPBC Act guidelines.

Submitter 256 drew attention to recent sightings of Orange-bellied Parrot, comprising ten individuals recorded in the Western Treatment Plant and eight individuals seen on the Bellarine Peninsula in 2024. She submitted the Supplementary EES did not document these sightings, which raised the question of whether Orange-bellied Parrot have also returned to sites closer to the Project area. She submitted further surveys of Orange-bellied Parrot habitat should be undertaken within a 5 kilometre radius of the Project area, at an appropriate time of year when the birds are likely to be present.

(ii) Impacts on threatened and migratory birds

A number of submitters expressed concerns about potential impacts on birds, including:

- ongoing impacts of the FSRU and regular LNG carrier visits
- changes in water quality and temperature
- light pollution and noise disturbance
- physical displacement from critical habitat areas
- declines in environmental condition, habitat availability and food resources.

GGS submitted that *"if birds move away from the area, that is of itself, an impact of consequence. When they move along, they consume food that would have been available for other parts of the ecosystem"*.

Mr Lane gave evidence that the Project area is not used by significant numbers of migratory waterbirds and but is occasionally used by some species of terns. He advised "*the most likely potential for detrimental impacts on threatened and migratory waterbirds lies away from the Project area in the more important habitats in the Ramsar site".* Based on the information in Technical Report B, Mr Lane concluded:

> There is no reason to conclude that the Project will detrimentally affect the availability of food and habitat for threatened and migratory birds away from the immediate Project area, including in the important migratory and other waterbird habitats of the Avalon region of western Port Philip Bay...
>
> As Black Swan rely particularly on seagrasses, this finding applies also to this species and its habitat in Limeburner's Lagoon and the Avalon coast.

In response to cross examination and questions from the IAC, Mr Lane gave evidence that threatened and migratory birds were not expected to be very sensitive to the effects of a short term dredging program. He advised:

- Marine birds are highly mobile and can avoid areas of temporary disturbance during dredging, although some species such as cormorants may be attracted to the edges of dredging plumes as fish often school in these areas.
- Migratory shorebirds are less mobile than marine birds. However, shorebirds would be able to temporarily relocate to other parts of the Ramsar site during dredging if areas in the vicinity of the Project area are affected by dredging plumes, and could be expected to return when dredging was complete.
- A short term dredging program would not result in a permanent reduction in the occupancy of such birds within Corio Bay, nor would it fragment populations.

- That said, effects on primary production, including seagrass beds, algal beds and the microphytobenthos layer, are important for birds, and it is important for these impacts to be minimised through the EMF to avoid and minimise effects on birds.

Mr Lane reviewed the proposed EMF, and was satisfied the MMs will satisfactorily avoid and minimise impacts on threatened and migratory birds, providing the EMF is effectively implemented. His evidence was the EMF provides a comprehensive environmental monitoring framework that will enable a quick response to any non-conformances, minimising the chance of prolonged construction or operational impacts outside the approved limits.

In response to questioning from the IAC, Mr Lane gave evidence that specific monitoring of potential impacts on birds was not required because of the low risk from the Project. Further, he indicated there is a high degree of natural variability in bird populations which would confound the detection of any effects from the Project.

DEECA Regions (D63) submitted:

> … the Project adequately avoids and minimises potential impacts to threatened and migratory birds, subject to the preparation of an EMF as a requirement of any associated Incorporated Document for the Project.

7.5 Discussion

(i) Adequacy of the assessment, including in relation to Orange-bellied parrots

The IAC is satisfied on the basis of Mr Lane's evidence that the Supplementary EES includes a comprehensive and accurate list of threatened and migratory bird species relevant to the Project. The list was reviewed by Stantec and no issues were identified. Nor did DEECA Regions raise concerns in relation to the list.

The IAC notes Mr Lane's advice that the methodology used in Technical Report B for further analysis of the EES shorebird surveys was acceptable but conservative. In the absence of an alternative assessment using a less conservative methodology as recommended by Mr Lane, the IAC accepts the findings of the assessment in Technical Report B that the Avalon Coastal Reserve shoreline is nationally important habitat for the Sharp-tailed Sandpiper. This is in addition to the international significance of the Avalon Coastal Reserve shoreline already acknowledged by its inclusion in the Ramsar site.

Orange-bellied Parrot is included in the revised list of threatened and/or migratory bird species that have potential to occur in the Project area or surrounding environment, as an occasional visitor to Limeburners Bay and the former Avalon Saltworks. The locations of recent sightings reported by Submitter 256 are known strongholds for the species that are noted in Technical Report B. The IAC does not consider any further targeted surveys for Orange-bellied Parrot in the Project area are warranted.

(ii) Impacts on threatened and migratory birds

Based on the evidence from Mr Lane, the IAC accepts the conclusions of Technical Report B that the Project is not expected to have significant impacts on threatened and migratory birds, noting that:

- these groups are mobile
- any effects of dredging on marine habitat and food resources will be temporary

- operational effects on the marine environment will be similar to the effects of existing Refinery operations.

7.6 Findings

The IAC finds:

- The Supplementary EES includes a comprehensive and accurate list of threatened and migratory bird species relevant to the Project.
- Further analysis of the EES targeted shorebird surveys showed that in addition to providing internationally significant bird habitat as part of the Ramsar site, the Avalon Coastal Reserve shoreline is nationally important habitat for the Sharp-tailed Sandpiper, a migratory shorebird.
- The Project is not expected to have significant impacts on threatened and migratory birds, including the EPBC Act listed Sharp-tailed Sandpiper.

7.7 Overall findings

In relation to the Project's impacts on threatened and migratory birds, the IAC finds:

- the evaluation objective relating to biodiversity can be met
- residual impacts are not potentially significant, and can be acceptably managed with the application of the IAC's recommended MMs
- no design changes or further modifications are required to further reduce the Project's impacts on threatened and migratory birds.

8 Noise

8.1 Introduction

(i) Terms of Reference

The Terms of Reference seek the IAC's advice on:

- the significance and acceptability of the Project's noise impacts
- whether feasible modifications to the design or management of the Project, or changes to the MMs, would reduce or mitigate noise impacts.

(ii) Minister's Directions

The relevant recommendation in Table 1 of the Minister's Directions is:

- Recommendation 10 (further assessment of noise impacts set out in MM-NV05 in Report No. 1).

(iii) Evaluation objective

The relevant evaluation objective is:

- **Social, economic, amenity and land use** – To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

(iv) EES documentation

Noise impacts are assessed in:

- Supplementary EES Chapter 6 (Noise)
- Technical Report D (Supplementary noise impact assessment).

(v) Evidence and key documents

Table 6 lists the experts providing evidence on noise.

Table 6 Evidence on noise effects

Party	Expert	Firm	Area of expertise
Proponent	Tom Evans (D28)	Resonate Consultants Pty Ltd	Noise and vibration
GGS	Darren Tardio (D42)	Enfield Acoustics Pty Ltd	Noise and Vibration

Mr Evans was not involved in the preparation of the Supplementary EES or Technical Report D. His evidence was in the nature of an independent review of the supplementary assessment prepared by Renzo Tonin & Associates (RTA).

The Proponent provided the following Supplementary Technical Notes:

- STN03 – Response to EPA's submission (D25)
- STN03a – Response to EPA's submission (additional meteorological information) (D36)
- STN04 – Response to GGS Request for Information (D37)
- STN05 – Refinery Noise (D74)
- STN06 – Proponent response to questions from the IAC (D103).

Other key documents are:

- D60 – Joint Expert Statement (Noise)
- D64 – GGS opening submission
- D68 – EPA opening submission
- D73 – Proponent's opening submission (Noise)
- D76 – Noise infographic to assist EPA questions to Tom Evans
- D77 – EPA proposed amendments to noise Mitigation measures
- D86 – IAC site diagram reviewing cumulative and project noise limits at GGS
- D89 – Mr Tardio and Mr Evans Joint Expert Statement– Noise Management and Monitoring Requirements
- D104 – Proponent's closing submission
- D135 – GGS closing submission
- D142 – Proponent reply submission.

8.2 Relevant policy and guidelines

The IAC has had regard to relevant policy and guidelines, including:

- EP Act and Environment Protection Regulations 2021
- *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)
- Environment Reference Standard (ERS) and *Guide to the Environment Reference Standard* (EPA Publication 1992).

8.3 The issues

The issues are:

- whether appropriate background noise levels have been used to establish the applicable noise limits
- whether the Project should be evaluated based on noise emissions from the Project alone, or cumulative noise at the sensitive receivers
- whether construction noise from dredging can comply with the applicable noise limits
- whether operational noise from the FSRU and treatment plant can comply with the applicable noise limits
- whether the proposed noise control and management procedures are practical
- how the post-construction noise monitoring will be undertaken to assess compliance.

8.4 What did the Supplementary EES say?

(i) Context

The IAC's Report No. 1 found that Project noise required further assessment, in conjunction with further assessment and mitigation of Refinery noise, to properly characterise the noise environment in the vicinity of the Project and determine appropriate noise limits for the surrounding area. These were documented in MM-NV05, as reflected in Recommendation 10 in Table 1 of the Minister's Directions.

(ii) Overview

The supplementary noise impact assessment presented in Technical Report D was prepared by Renzo Tonin & Associates (RTA).

Additional background noise monitoring

RTA undertook further background noise monitoring at eight noise sensitive locations surrounding the Project, with a view to determining background noise levels that are not influenced by intrusive noise from existing commercial, industrial or trade premises as required by the Noise Protocol. Existing industrial noise sources include the Refinery operations and other nearby industrial facilities.

Recalculated regulatory noise limits and determination of the Project Noise Criteria

RTA recalculated the noise limits at the identified sensitive receivers in accordance with the Noise Protocol, based on the revised background noise level measurements and the areas of the planning zones around the receiver locations. While the background noise measurement locations used for the Supplementary EES were not identical to those used in the EES, the supplementary assessment generally resulted in lower day, evening and night-time regulatory noise limits than were adopted in the EES.

The regulatory noise limits determined in accordance with the Noise Protocol apply to the *cumulative noise* from all industrial sites at the sensitive receiver location. The noise level measurements undertaken by RTA demonstrated that in adverse meteorological conditions, the regulatory noise limits are already exceeded by existing industrial noise at some of the measurement locations.

Therefore, RTA's revised assessment adopted Project Noise Criteria, that is, noise criteria which are to be applied to the noise emissions from the proposed FSRU and treatment plant operations alone, which are 10 dB below the applicable regulatory noise limits. These have been selected so as to ensure that the contribution from the Project's noise emissions to the cumulative industrial noise level at the receivers is negligible, and would not cause the regulatory noise limits to be exceeded as a result of the operation of the Project.

Furthermore, since the regulatory noise limits already appear to be exceeded by existing cumulative industrial noise under some meteorological conditions, the selection of Project Noise Criteria at 10 dB below the regulatory noise limits will ensure that the cumulative noise level will be able to brought into compliance with the regulatory noise limit in the future, as noise from existing industrial sources is reduced as part of ongoing noise management activities.

For example, the night-time regulatory noise limit[8] at GGS, determined in accordance with the Noise Protocol, is 45 dBL_{Aeq}. The existing industrial noise at GGS has been measured at 43 dBL_{Aeq}, and estimated at 47 dBL_{Aeq} under adverse meteorological conditions (which would exceed the regulatory noise limit during the night). RTA have therefore adopted a Project Noise Criteria of 35 dBL_{Aeq} for the Project, which is 10 dB below the 45 dBL_{Aeq} regulatory noise limit. At that level, noise from the Project would not make any significant contribution to existing cumulative

[8] The night-time noise limits are more critical than the day and evening period noise limits, because background noise levels from road traffic and other anthropogenic activities are generally higher during the day and evening, leading to higher noise limits in those periods.

industrial noise measured at GGS, and would allow the 45 dBL_{Aeq} regulatory noise limit to be achieved in future as existing industrial noise is reduced.

Impacts from existing industrial noise

As noted above, noise impacts from existing industrial sources were measured, where possible, and estimated considering noise enhancing weather conditions.[9] The Supplementary EES found that under neutral weather conditions, existing industrial noise, which includes the cumulative contributions from the existing Refinery operations and other nearby industrial sources (not associated with the Proponent), is compliant with the recalculated regulatory noise limits. However, existing industrial noise could marginally exceed the regulatory noise limits (by 1 to 2 dB) under noise enhancing weather conditions.

Assessment of construction and operational noise impacts

RTA assessed the potential noise impacts from construction (dredging) and operation (of the FSRU and treatment facility), against the recalculated regulatory noise limits.

The Supplementary EES found that predicted construction noise levels from dredging were at or below the regulatory noise limits for both neutral and noise enhancing weather conditions during the day and evening periods, but there was a potential for cumulative noise exceedances of up to 4 dB under noise enhancing weather conditions at some receivers during the evening and night-time periods. The Supplementary EES noted that potential cumulative noise impacts would be temporary in nature and limited in time.

Noise predictions from the operation of the Project considered several operational scenarios including open and closed loop operation of the FSRU, nitrogen injection and unloading at the treatment facility, and LNG carrier berthing. The revised noise assessment presented in Appendix C of Technical Report D adopted less conservative assumptions than used in the previous noise modelling reflecting more realistic usage of the FSRU and treatment facility, and design optimisations.

Technical Report D Annexure 1 *Noise assessment mitigation and contingency measures* described further mitigations that are required to be adopted to allow the Project to achieve the Project Noise Criteria for all receivers. These included:

- removal of noise sources including transformers, air compressors, ventilation fans and the like from the Project design
- removal of concurrent operation of redundant and standby plant and equipment
- additional noise attenuation (such as acoustic enclosures or silencers) for the treatment facility, marine loading arms, control valves, and tugboat and ship exhausts
- ceasing certain operations in noise enhancing weather conditions.

The assessment concluded that the operational noise from the Project could comply with the Project Noise Criteria. However this was based on less conservative assumptions than adopted in the EES, and assumed additional noise management procedures were in place.

The Supplementary EES concluded that the construction and operational noise impacts from the Project will be acceptable within the regulatory framework established by the EP Act, EP regulations and policy.

[9] That is, weather conditions such as downwind conditions or temperature inversions, which can result in increased noise propagation compared to more typical weather conditions encountered during the measurement period.

(iii) Mitigation measures

In assessing the noise impacts of the Project, the IAC has had regard to all relevant MMs. Proposed mitigation measures are in MM-NV01 to MM-NV08. MM-AQ09 (equipment maintenance) is also relevant. The following MMs are of particular relevance to the discussion below:

- NV01a (managing and assessing dredging noise)
- NV04 (noise and vibration monitoring)
- NV05 (cumulative operational noise controls).

8.5 Evidence and submissions

(i) Background noise measurements

Mr Evans (for the Proponent) gave evidence that measuring background noise levels at noise sensitive areas near the Project site is difficult due to existing industrial noise sources. He attended the Project site and surrounding area to review the background noise measurement locations that were adopted in the Supplementary EES and concluded that the background noise monitoring locations were appropriately selected, and the analysis presented in the Supplementary EES (including the calculation of revised noise limited based on the updated background noise measurements) has been conducted appropriately.

Mr Tardio's evidence was that the Supplementary EES has progressed the assessment of noise impacts and addressed many issues he had identified with the noise assessment for the EES, particularly in regard to the measurement of background noise levels. He was satisfied that the additional background noise measurements were appropriate, including the locations at which background noise levels were measured.

EPA submitted that the selection of the background equivalent location at Avalon College (BG4) as representative of GGS without the influence of existing industrial noise was not supported by sufficient evidence.

(ii) Project Noise Criteria versus cumulative noise limits

The Joint Expert Statement (D60) on Noise sets out the agreed and disagreed items between Mr Evans and Mr Tardio. The experts agreed on most matters. The key issue of disagreement related to whether the Project should be assessed on the basis of noise limits applicable to the Project's noise emissions only (the Project Noise Criteria) or the regulatory noise limit calculated under Part 5.3, Division 3 of the EP Regulations (which applies to the cumulative noise from all industry). The key difference in these approaches is, effectively, whether existing Refinery noise should be considered when assessing whether to approve the Project.

Mr Tardio noted the Supplementary EES noise assessment predicted only marginal exceedances of the cumulative noise limit at GGS during adverse weather conditions. He conducted his own measurements at the school, and gave evidence that his measurements indicated that noise emission from Refinery operations were regularly found to be between 51–52 $dBL_{Aeq,30min}$, indicating a more significant exceedance of the regulatory noise limit of up to 7 dB. On this basis, Mr Tardio recommended the Project be assessed on the cumulative noise limit applicable at the receivers, and should only be approved if the Proponent brings existing noise emissions from the Refinery into compliance with the regulatory noise limits.

Mr Tardio's evidence was that in his experience, existing impacts from an operator are normally taken into account when considering an application to expand the operations. He considered that the cumulative noise impacts from the Project and the existing emissions from the Refinery need to be addressed by a commitment from the Proponent to comply with the cumulative noise limits. He did not consider that the Supplementary EES or the material tabled by the Proponent (including STN05) demonstrated that the Proponent was committed to managing the existing noise impacts from the refinery.

Mr Evans' evidence was that Project Noise Criteria set 10 dB below the cumulative noise limit is an appropriate approach because:

- achieving the Project Noise Criteria would ensure the Project does not cause noticeable or measurable changes in cumulative industrial noise levels at GGS
- existing non-compliance should be managed through existing enforcement processes under the EP Act
- requiring the Project to achieve the cumulative limit would be unworkable at some noise sensitive locations where existing industrial noise has significant contributions from noise sources outside of the control of the Proponent.

The Proponent submitted the IAC is required to assess the environmental effects of the Project, and that Project Noise Criteria set 10 dB below the applicable cumulative noise limit is appropriate since it would ensure that the Project does not contribute to any exceedance of the statutory noise limits, even where existing industrial noise sources (some of which are beyond the Proponent's control) exceed the criteria.

GGS submitted the Supplementary EES has not advanced the technical analysis or responded to the Minister's Directions in any material way. It submitted approval should be contingent on the Proponent meeting the cumulative noise limits at the school, and that the IAC should not recommend the approval of the Project unless it is satisfied cumulative noise can comply with applicable limits. It noted that Mr Evans had made no contribution to STN05, and expressed concern that he had relied on operational assumptions regarding Project noise emissions (in Technical Report D Appendix C and Annexure 1) supplied by the Proponent and hadn't independently interrogated the noise levels generated by the FSRU and treatment plant equipment.

Finally, Mr Evans' evidence was that the Project Noise Criteria in Figure 2 of Technical Report D were overly conservative in circumstances where existing industrial noise is not a significant factor, namely:

- at the noise measurement locations that are not currently affected by industrial noise
- during the daytime and evening periods where existing industrial noise does not significantly contribute to the background noise level.

He considered the Project should be allowed to emit more noise during the day and evening, when the cumulative noise (from the Project and existing industry) was predicted to remain at or below the applicable regulatory noise limits. He presented 'adjusted' Project Noise Criteria, extracted in Figure 11.

Figure 11 Mr Evans' adjusted Project Noise Criteria

Table 2 Adjusted Project noise criteria to account for existing industrial noise

	Project noise criteria, dB $L_{Aeq,30min}$		
	Day	Evening	Night
Geelong Grammar School	50	41	35
Macgregor Court etc (Lara dwellings)	71	66	55
12 Myrtle Grove (North Shore dwellings)	51	43	30
19 Zinnia St (Norlane dwellings)	53	45	39
365 Princes Hwy (Corio dwellings)	63	54	37
Avalon College	47	47	43

Source: Mr Evans' Expert Report, Table 2 (D28)

Mr Tardio's evidence was that he "*did not take issue*" with Mr Evans' adjusted Project Noise Criteria because he believed the "*reasoning is sound*".

EPA was supportive of Project Noise Criteria set 10 dB below the cumulative regulatory noise limits. However, it was concerned that adopting the adjusted Project Noise Criteria recommended by Mr Evans was potentially inconsistent with the general environmental duty (GED), as it may not ensure that noise from the Project is reduced so far as reasonably practicable.

(iii) Predicted compliance (construction noise from dredging)

EPA originally suggested (S330) that dredging noise should meet the Project Noise Criteria, but subsequently accepted that dredging noise should be considered a temporary construction impact, and should be subject to the regulatory noise limits rather than the more onerous Project Noise Criteria. Mr Evans agreed.

Mr Evans and Mr Tardio agreed that the proposed mitigation measures (in particular MM-NV04) will appropriately control noise from dredging activities, and noted the need to prevent dredging operations during adverse meteorological conditions for noise propagation.

(iv) Predicted compliance (operational noise)

Many of the submissions received from members of the community noted that residential, sport and leisure areas close to the Project site are already significantly impacted by relatively high levels of industrial noise from the existing Refinery and other industrial facilities, and were concerned about the potential for the Project to result in increased noise pollution in the nearby area.

Mr Evans' evidence was that predicted noise levels from the Project are generally expected to comply with the Project Noise Criteria for all operational scenarios. He accepted that noise levels might exceed the Project Noise Criteria under noise enhancing meteorological conditions, but this would only likely occur very infrequently, due to the small amount of time the plant would be operating at its highest output, and for that operation to occur simultaneously with adverse meteorological conditions.

Mr Tardio did not dispute the technical outputs of the noise modelling in support of the Supplementary Noise Assessment (presented in Appendix C of Technical Report D). His primary concern was that the modelling was based on overly optimistic assumptions about how noise would be managed during operations as outlined below.

(v) Assumptions regarding noise control and management procedures

Mr Evans reviewed the proposed noise control and management procedures presented in Appendix C and Annexure 1 of Technical Report D, which included the removal of Project noise sources through engineering design, and less conservative assumptions about plant operations as described in Chapter 8.4 above. Under cross examination by the EPA, Mr Evans expressed 'optimism' that the proposed noise mitigation and management procedures would be sufficient to ensure the Project meets the Project Noise Criteria.

Mr Tardio considered noise control measures such as scheduling the operation of plant and equipment at certain times of the day and under particular weather conditions are prone to human error, and may not be practicable to implement. Consequently, the modelling may have underpredicted Project noise. He recommended a more sophisticated noise management and alert system using telemetry and 'real-time' permanent noise monitoring be implemented to ensure compliance.

(vi) Monitoring and assessing compliance

Adopting a Project Noise Criteria 10 dB below the regulatory noise limit (and, possibly, up to 12–15 dB below the prevailing cumulative industry noise) means that it is practically impossible to measure the direct noise, or the cumulative contribution to industrial noise from the Project itself at the nearby sensitive receivers.

Mr Tardio's evidence was that it would be difficult to demonstrate compliance with the Project Noise Criteria, particularly at GGS, because the cumulative industrial noise (including existing Refinery noise) would be likely to mask any noise from the Project itself. He considered high noise from the existing Refinery operations might act as a 'smokescreen' for the Project noise emissions. Therefore, it is unlikely to be practical to monitor noise impacts from the Project directly at the GGS site.

Both experts agreed that a permanent continuous noise monitoring system should be installed to assist in managing noise emissions from the Project site and the existing Refinery noise moving forward, with a view to both demonstrating that the Project is compliant with the Project Noise Criteria, as well as managing ongoing noise emissions from the existing Refinery operations.

The precise nature of the operational noise monitoring system, and the type and location of the monitoring points, are required to be more fully resolved under MM-NV05.

(vii) Mitigation measures

Revisions to the proposed MMs for noise and vibration impacts were discussed by Mr Tardio and Mr Evans in their Joint Expert Statement (D60). The IAC requested that the experts provide recommendations for agreed alterations to the MMs that would ensure that an appropriate noise management and monitoring scheme is developed and implemented. The experts subsequently produced a Joint Expert Statement on Noise Management and Monitoring Requirements (D89) which agreed proposed changes to the MMs.

EPA also provided recommendations for amendments to the noise MMs (D77).

The revisions agreed between Mr Evans and Mr Tardio were to MMs NV01a, NV04 and N05, related to management of dredging noise, construction noise and vibration monitoring and the

establishment and implementation of operational noise controls respectively, were documented in the Day 2 version (D102).

8.6 Discussion

The IAC disagrees with GGS that the Supplementary EES has not advanced the technical analysis on noise or responded to the Minister's Directions in any material way. On the contrary, the supplementary noise assessment has:

- identified that existing industrial noise sometimes exceeds the cumulative industrial noise limits
- determined that lower cumulative noise limits would apply, which in turn has led the Proponent to adopt much lower Project noise limits
- considered a suite of additional physical and management noise controls for the FSRU equipment, operations and treatment plant.

(i) Background noise measurements

The IAC has considered EPA's concerns regarding the selection of representative background noise monitoring locations that are not subject to existing industrial noise. Under cross examination by EPA, Mr Tardio confirmed he had not visited the Avalon College site personally to confirm that it would be reasonably representative of GGS.

The IAC accepts that there are practical challenges to selecting an ideal location for determining representative background noise levels that are not affected by existing industrial noise. On balance, the IAC considers that the acoustic consultants have done their best, and the supplementary assessment provides a reasonable justification for the selection of these locations. The IAC disagrees with EPA that further justification is required.

The regulatory noise limits developed in the Supplementary EES, which necessarily apply to *cumulative* industrial noise at the receivers, are therefore considered by the IAC to be reasonably determined, and appropriate for the development of Project Noise Criteria which apply specifically to the noise emissions from the Project.

(ii) Project Noise Criteria versus cumulative noise limits

The experts agreed that industrial noise emissions at sensitive receivers exceed the regulatory noise limits established by the Noise Protocol, and that there are contributions from the existing Refinery and other nearby industrial sources (including, for example, the nearby Incitec Pivot facility).

IAC Report No. 1 recommended that "*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)".*

If approval of the Project were to turn on the issue of cumulative compliance with the regulatory noise limits, the Project would not be able to be developed until significant noise mitigation was undertaken at the Refinery, and potentially at other industrial sites that are beyond the Proponent's control.

As noted by Mr Evans, requiring the Project to achieve the cumulative noise limit would be unworkable for noise sensitive areas where existing industrial noise above the regulatory noise limit is created by noise sources outside of the control of the Proponent.

Therefore, the IAC considers it is reasonable and sufficient for the Project to demonstrate it will be compliant with Project Noise Criteria – provided the criteria are appropriately determined in the context of the existing industrial noise emissions.

The adoption of Project Noise Criteria that are 10 dB below the recalculated cumulative regulatory noise limit is a reasonable way of ensuring that the Project will not contribute to overall cumulative industrial noise levels.

EPA was concerned that Mr Evans' adjusted Project Noise Criteria are potentially inconsistent with the GED. The IAC makes the observation that the night-time noise limits at the most critical locations (those closest to the Project area) are likely to drive the selection of noise controls required for the facility. The adoption of slightly higher Project Noise Criteria at other times would allow some additional operational flexibility and avoid potentially perverse operational management approaches. Mr Tardio did not take issue with this approach.

In the Joint Expert Statement on Noise Mr Tardio stated "*there is no intention from the Proponent via this process to bring the Refinery into compliance or mitigate its noise emissions".* The IAC disagrees. STN05 (D74) provides details of noise generation at the Refinery and identifies opportunities to reduce noise emissions.

That said, given the continuous '24/7' nature of the production processes at the Refinery, and the very long intervals between programmed maintenance shutdowns, meaningful reductions in noise emissions from the Refinery could not be expected in the short term. Further, STN05 is somewhat cursory, and is not sufficiently detailed to form a robust noise management plan for the Refinery.

The IAC considers the Proponent should engage an acoustic engineer to prepare a more detailed and comprehensive noise management plan for the Refinery as a whole. A Refinery noise management plan would also be a helpful way of documenting the risk assessment that the Proponent is required to undertake for its operations to demonstrate compliance with the GED. The IAC makes no formal recommendation in this regard, as it relates to impacts of existing noise rather than the impacts of Project noise.

In the IACs view, the issue of existing compliance of noise emissions from industrial facilities near to GGS and other noise sensitive receivers is a matter for EPA, under its existing role as regulator of the EP Act and Regulations. If GGS or other submitters have legitimate concerns about impacts from existing industrial noise from nearby facilities, exceedances of the regulatory noise limits, or whether the Proponent is fulfilling the GED, there are established regulatory pathways for them to seek relief, such as by initiating formal complaints with the nearby industrial operators, engaging with EPA, or taking legal action under the EP Act.

(iii) Predicted compliance (construction noise from dredging)

Noise from dredging is a short term construction impact. The IAC accepts that it should be assessed with respect to the appropriate construction site noise and dredging guidelines rather than the Project Noise Criteria.

The supplementary assessment indicates that noise from the dredging works is likely to meet the required noise limits under most conditions during the day and evening periods. Dredging works during the night period, if required to meet the program, will need careful management, and should be avoided during adverse noise propagating meteorological conditions. Construction noise monitoring will be required and appropriate contingencies will be required in the

construction program to accommodate loss of production due to adverse meteorological conditions. This is already provided for in the MMs.

(iv) Predicted compliance (operational noise)

The operational noise emissions appear likely to be achievable, although significant noise control works and operational management procedures will be required (see below).

The IAC considers Mr Evans' adjusted Project Noise Criteria are appropriate to ensure the regulatory noise limits for cumulative noise can be met, assuming compliant noise emissions are achieved for other nearby industrial sites including the Refinery.

The IAC notes EPA's concern regarding the potential for the adjusted Project Noise Criteria to be inconsistent with the GED. However the IAC considers the adjusted Project Noise Criteria allow scope to prioritise the noisiest activities to less sensitive periods of the day, minimising the potential for perverse outcomes from unnecessarily low daytime noise limits. Furthermore, there are other avenues for the regulator to test whether an operator has met the GED.[10]

(v) Assumptions regarding noise control and management procedures

Since the existing industrial noise levels are at (or exceed) the regulatory noise limit, the Project has been required to adopt very onerous Project Noise Criteria to be applied to the operational noise emissions from the FSRU and treatment plant. Achieving the Project Noise Criteria will require substantial noise control to the plant and equipment (including the tugs, shore-based equipment and the FSRU itself), as well as operational management controls to limit concurrent operations at night (particularly during adverse meteorological conditions).

As noted by Mr Tardio, the management controls are likely to require the use of a sophisticated automated permanent monitoring system which is integrated with the operational controls of the FSRU. The Day 2 MMs can accommodate this if needed.

(vi) Monitoring and assessing compliance

Practically demonstrating compliance with the Project Noise Criteria is clearly a difficult prospect given:

- existing levels of industrial noise at the key sensitive receivers near the Project area will potentially mask noise emissions from the FSRU and treatment plant
- the best locations to measure the noise emissions from the Project would be to the south-east of the FSRU, in Corio Bay itself.

Therefore, the measurement and compliance approach required to be developed under MM-NV05 will require careful consideration of the constraints, and the implementation of state-of-the-art automated noise monitoring stations, potentially with directional noise measurement capabilities to separate noise from the project from other industrial noise sources. Nevertheless, the IAC accepts that practical solutions exist, and are likely to be necessary to be adopted for the Project. The Day 2 MMs can accommodate this if needed.

[10] For example, developing and implementing a Risk Management and Monitoring Program (RMMP) following EPA Publication 1695 *Assessing and controlling risk: A guide for business*, and determining what is *Reasonably practicable* (EPA Publication 1856).

(vii) Mitigation measures

The Day 2 MMs proposed revisions to NV01a, NV04 and NV05 (for the management of dredging noise, construction noise and vibration monitoring and the establishment and implementation of operational noise controls) that were generally agreed by Mr Tardio and Mr Evans. The IAC accepts that the agreed proposed MMs represent a reasonable and practical way of managing the construction and operational impacts of the Project.

8.7 Findings and recommendation

The IAC finds:

- Appropriate background noise level measurements have been used to re-establish the applicable cumulative industrial noise criteria at GGS and other nearby sensitive receivers.
- The Project should be evaluated based on the Project's ability to comply with the Project Noise Criteria, and should not be contingent on compliance with the regulatory noise limits for cumulative industrial noise at the sensitive receivers.
- Mr Evans' adjusted Project Noise Criteria for operational noise from the FSRU and the treatment plant (extracted in Figure 11) are reasonable. The Incorporated Document should be amended to require noise to be verified against the adjusted Project Noise Criteria (not the exhibited Project Noise Criteria).
- Construction noise from the dredging associated with the Project should be able to be managed to an acceptable level with the recommended mitigation measures and the regulatory framework.
- The operational noise modelling has been undertaken to an acceptable level for this stage of the Project and shows that operational noise effects of the Project will be able to be managed to an acceptable level.
- The Day 2 revised noise and vibration MMs agreed to by the experts provide a suitable framework for the future assessment of the actual FSRU, treatment plant, and operational management approaches and scheduling that will be implemented.
- The Proponent should prepare a detailed noise management plan to:
  - document noise emissions from the existing Refinery
  - undertake a formal risk assessment related to noise emissions
  - document the proposed operational noise monitoring system that is proposed to be implemented
  - provide a plan for implementing any necessary noise controls required to bring noise emissions from its existing facilities into compliance with the Noise Protocol
  - demonstrate it has fulfilled its duties under the EP Act and Regulations, including the GED.

If the Project proceeds, the IAC recommends:

Revise the Incorporated Document as shown in Appendix F:

a) include a requirement in Clause 4.6.5(a)(iii) for Project noise emissions to be verified against the adjusted Project Noise Criteria extracted in Figure 11 of this Report.

8.8 Overall findings

In relation to the Project's noise impacts, the IAC finds:

- the evaluation objectives related to construction and operational noise emissions from the Project can be met
- residual impacts of noise emissions from the Project are not likely to be significant, and can be acceptably managed with the application of the Day 2 MMs (including those agreed by Mr Evans and Mr Tardio)
- apart from the modifications outlined in Technical Report D Appendix C and Annexure 1, no additional design changes or further modifications are required to further reduce the Project's noise impacts.

9 Air quality

9.1 Introduction

(i) Terms of Reference

The Terms of Reference seek the IAC's advice on:

- the significance and acceptability of the Project's air quality impacts
- whether feasible modifications to the design or management of the Project, or changes to the MMs, would reduce or mitigate air quality impacts.

(ii) Minister's Directions

The relevant recommendation in Table 1 of the Minister's Directions is:

- Recommendation 11 (sensitivity testing on the air quality modelling).

(iii) Evaluation objective

The relevant evaluation objective is:

- **Social, economic, amenity and land use** – To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

(iv) EES documentation

Air quality impacts are assessed in:

- Supplementary EES Chapter 5 (Air quality)
- Technical Report C (Supplementary air quality impact assessment).

(v) Evidence and key documents

Table 7 lists the experts providing evidence on air quality.

Table 7 Evidence on air quality

Party	Expert	Firm	Area of expertise
Proponent	David Rollings (D30)	AECOM	Air quality

The Proponent provided the following Supplementary Technical Notes:

- STN03 – Response to EPA's submission (D25)
- STN06 – Proponent response to questions from the IAC (D103).

9.2 Relevant policy and guidelines

The IAC has had regard to relevant policy and guidelines, including:

- EP Act and Regulations
- *Guideline for Assessing and Minimising Air Pollution in Victoria* (EPA Publication 1961)
- ERS and *Guide to the Environment Reference Standard* (EPA Publication 1992).

9.3 The issues

The issues are whether:

- the wake effects of the FSRU and LNG carriers significantly impact on the air quality modelling and assessment
- the 'worst case' scenario for air emissions has been appropriately determined
- bubble limits or stack limits, or some combination of limits, is most appropriate to control air emissions.

9.4 What did the Supplementary EES say?

(i) Context

The IAC's Report No. 1 found that the air quality criteria adopted in the EES were appropriate, and that the potential impacts on air quality would likely be acceptable. However, the IAC recommended further sensitivity testing on the air quality model to consider the significance of the wake effects of the FSRU, a worst case scenario for air emissions, and the implication of bubble limits and stack specific limits for sensitive receptors. This is reflected in Recommendation 11 in Table 1 of the Minister's Directions.

AECOM prepared the supplementary air quality assessment presented in Technical Report C.

(ii) Overview

Operation of the FSRU creates air pollutants from the engine and boilers, including nitrogen oxides (NO_x), carbon monoxide (CO) and some VOCs.

Significance of wake effects

There was concern that wake effects from the presence of the FSRU and LNG carriers could affect the plume dispersion. The previous modelling only considered the FSRU in one orientation.

The supplementary assessment investigated predicted pollutant concentrations at sensitive receivers for:

- two differently configured FSRUs
- with the FSRU oriented with the bow facing southeast or northwest
- with and without an LNG carrier berthed alongside the FSRU.

The Supplementary EES stated that having the FSRU oriented with the bow facing southeast is the preferred orientation due to safety concerns for maritime and port operations.

The supplementary assessment found that there were some small differences in the air quality modelling between the two FSRU configurations and based on the orientation of the FSRU. The modelling with a LNG carrier berthed alongside the FSRU predicted slightly higher concentrations at the receptors than the scenario without the carrier due to the wake effects.

Clarification of worst case operating scenario

The 'Esperanza FSRU', with its bow facing southeast and with a LNG carrier berthed alongside was found to be the worst case operating scenario.

A statistical analysis indicated that the worst case operating scenario would result in one hour average NO_2 concentrations at sensitive receivers of less 5micrograms per cubic metre ($\mu g/m^3$) for

96 percent of operations, and less than 55 µg/m^3 for 99.92 percent of operations, compared to a regulatory criteria of 150µg/m^3.

PM_{10} concentrations are predicted to be less than 1 µg/m^3 for over 98 percent of operations, and less than 5.2 µg/m^3 for 99.9 percent of operations, compared to a regulatory criteria of 50 µg/m^3.

Overall, Technical report C demonstrated that the wake effects were not significant, and all modelled pollutants were predicted to comfortably comply with the relevant regulatory criteria in the worst case operating scenario. It concluded the air quality impacts from the operation of the FSRU would be negligible and localised in the vicinity of the Project. During most operations, pollutant concentrations from operation of the FSRU would not be discernible from background concentrations.

Consideration of stack limits and bubble limits

Finally, the study considered the implication of bubble limits and stack specific limits for sensitive receptors. Stack limits refer to the maximum amount of pollutant allowed to be discharged by each individual stack, expressed as an emission rate limit in grams per minute. Bubble limits refer to the maximum amount of pollutant that is allowed to be discharged from the whole Project site per year, expressed as annual emissions in tonnes per year.

Stack limits were proposed for each of the four FSRU exhaust stacks and two 60 MW boiler stacks based on 100 percent gas production load, representative of the worst case operating scenario described above. Annual bubble limits for NO_x, CO and VOCs were derived based on the proposed seasonal operating scenarios and corresponding stack emission rates.

The study concluded that stack specific limits, by themselves, would potentially allow all engines and boilers to be run at peak 100 percent load continuously (since the stack limits are set based on the 100 percent load). Including a bubble limit would place an overall annual limit on emissions based on the predicted gas demand and production profile over a typical year. Therefore, a combination of stack specific and annual bubble limits was considered to be most appropriate for the Project, since that would result in the lowest long term annual average impact to sensitive receivers, while allowing for flexibility for the Project to operate at 100 percent load when required to meet operational requirements.

(iii) Mitigation measures

Proposed mitigation measures to manage air quality impacts are in AQ01 to AQ12.

9.5 Evidence and submissions

(i) Significance of wake effects

Mr Rollings from AECOM gave evidence on behalf of the Proponent. His evidence was that enabling wake effects in the model changed the plume behaviour. However, this resulted in:

- no material difference when considering different FSRU configurations
- lower ground level concentrations when the FSRU bow was facing northwest compared to southeast.[11]

[11] This is because when the FSRU bow is orientated towards the southeast,the exhaust and boiler stacks on the FSRU are located closer to the sensitive receiver locations on the shore.

Mr Rollings' evidence was that the modelling indicated ground level concentrations of air pollutants would be higher when a LNG carrier is berthed alongside the FSRU compared to the FSRU alone, but all modelled scenarios resulted in predicted pollutant levels that complied with the relevant air quality criteria by a significant margin at the sensitive receivers.

(ii) Clarification of worst case operating scenario

Mr Rollings' evidence confirmed that the worst case operational scenario, which resulted in the highest predicted ground level pollutant concentrations, was the 'Esperanza' FSRU, with its bow facing southeast, and with a LNG carrier adjacent to the FSRU. This worst case operating scenario was adopted in the Supplementary EES air quality assessment.

(iii) Consideration of stack limits and bubble limits

Mr Rollings proposed bubble limits for the annual emissions for the Project based on the Project operating to deliver the proposed gas production profile (more gas in winter, less in summer). His evidence was that this would result in lower annual emissions for the Project than stack specific limits alone. He therefore considered that a combination of stack specific limits and annual bubble limits were most appropriate for the Project.

EPA was concerned that a bubble limit could allow the Proponent to 'trade off' low production (and therefore lower emissions) in some production periods, with higher production – and emissions – at other times. EPA submitted this approach was potentially inconsistent with the GED, in that it may not incentivise emissions to be minimised at all times as required by the GED. It emphasised that the limits are not intended to be levels that may be 'polluted up to'.

EPA submitted the Proponent is always required to reduce emissions so far as is reasonably practicable, and must always have an incentive to do so. It suggested longer term stack limits (for example, monthly or seasonal) were a better approach.

In response to a question from the IAC, Mr Rollings expressed his concern that, because the FSRU equipment is designed to be most efficient when operating at 100 percent capacity, then longer term stack limits as proposed by EPA could result in perverse outcomes. This is because it might require the FSRU to be operated, for example, with two engines at 50 percent capacity rather than one engine at 100 percent capacity – which is more efficient and would result in lower emissions.

Mr Rollings' evidence was that the stack limits were sufficient to drive the adoption of 'best available technology', while the annual bubble limit would provide a limit on the annual emissions while still allowing the required operational flexibility.

The IAC questioned Mr Rollings about whether the longer term stack limits suggested by EPA were in practical terms similar to annual bubble limits. It was his view that while they operated similarly, the nature of the longer term stack limits did not allow sufficient operational flexibility, and could result in the perverse outcomes described above. Mr Rollings considered the annual bubble limit was a more reasonable way to manage air emissions from the Project over the longer term.

Submissions from the community were concerned that there were no 'safe levels' of air pollution, and that the supplementary air quality study did not adequately address emissions of VOCs and secondary pollutants. They were also concerned that air quality monitoring around the existing refinery and industrial area was inadequate.

9.6 Discussion

(i) Significance of wake effects

The original EES included the following statement:

> Sensitivity analysis showed that dispersion patterns from the FSRU are highly dependent on wake effects.

This prompted the IAC to recommend further work regarding the significance of the wake effects on the results of the study.

The supplementary air quality assessment demonstrated that the wake effects due to a LNG carrier berthed adjacent to the FSRU (during unloading) result in increased pollution levels predicted by the modelling, compared to the FSRU alone. The orientation and configuration of the FSRU also result in marginal changes in the predicted pollution levels. However, none of these effects are significant, since the *absolute levels* of pollution predicted in the analysis are almost negligible, and generally indiscernible from background concentrations.

A more reasoned presentation of the material in the original EES, and in the first hearing, and the use of less alarmist language in caveating the initial study may have alleviated the need for the Proponent to undertake what turned out to be a largely academic study.

(ii) Clarification of worst case operating scenario

The IAC is satisfied that the supplementary assessment demonstrated that the worst case operating scenario is with the LNG carrier berthed adjacent to the FSRU, and the FSRU orientated to the southeast (with the exhaust and boiler stacks closest to the shore). The IAC is satisfied this scenario has been used as the basis for the updated air quality assessment.

(iii) Consideration of stack limits and bubble limits

It is apparent that the stack limit proposed in the Supplementary EES is based on the emissions profile of the proposed engines and boilers operating at full load. This has the effect of setting a 'ceiling' on the emissions performance of the Project. Furthermore, the supplementary assessment demonstrates that the air quality criteria can be achieved even with the plant operating at 100 percent load continuously 24 hours a day, 7 days a week – even though such an operating profile is not necessary to meet the anticipated gas demand from the facility. In fact, the Project is only anticipated to operate at full load for several days per year, during peak demand in winter. The actual operation of the FSRU will necessarily be subject to demand and market forces.

It is therefore self-evident that the bubble limit, which sets an annual limit on the emissions for the whole Project based on the demand profile, will result in lower annual emissions than stack limits alone – which could theoretically allow the facility to run at 100 percent production continuously for the whole year.

The IAC acknowledges EPA's concerns that a bubble limit could allow the Proponent to 'trade off' low production (and therefore lower emissions) in some production periods, with higher production – and emissions – at others.

In the IAC's view, adopting a combination of short term stack limits and annual bubble limits avoids this risk. It allows operational flexibility to respond to high market demand, while limiting annual emissions to a reasonable level based on anticipated usage. A combination approach means that it isn't possible for the bubble limit to 'hide' short term emission peaks, since they are

still limited by the stack specific limits. The Development Licence for the FSRU (if it issues) should provide for a combination of stack specific and bubble limits.

The long term stack limits suggested by EPA do not appear to offer any practical advantages over the adoption of an annual bubble limit. Further, if the stack limits are set too low, perverse operating outcomes could occur which would result in inefficient operation of the FSRU.

The IAC notes that the proposal to adopt stack limits and an annual bubble limit corresponds closely with the limits recommended in the ERS, which adopts 1-day and 1-year average limits for PM_{10} and $PM_{2.5}$.

Regarding the GED, the IAC considers a combination of stack limits and a bubble limit provides an appropriate balance between controlling overall emissions from the Project, and allowing the Proponent sufficient operational flexibility to respond to fluctuating market demand. Furthermore, as noted in the discussion regarding proposed noise limits for the Project, there are other avenues for the regulator to test whether an operator has met the GED.[12]

9.7 Findings and recommendation

The IAC finds:

- wake effects of the FSRU do not significantly affect the air quality modelling and assessment
- the worst case operating scenario has been clarified, and does not significantly affect the air quality outcomes at sensitive receivers
- stack limits, in combination with an annual bubble limit, are the most appropriate approach to control air emissions from the Project.

If the Project proceeds, the IAC recommends:

Specify a combination of stack specific limits and an annual bubble limit for air emissions on the Development Licence for the FSRU.

9.8 Overall findings

In relation to the Project's air quality impacts, the IAC finds:

- the evaluation objective of minimising potential adverse social and amenity effects at local and regional scales can be met
- residual impacts are not likely to be significant, and can be acceptably managed with the application of the Day 2 MMs
- no design changes or further modifications are required to further reduce the Project's impacts on air quality.

[12] For example, developing and implementing a Risk Management and Monitoring Program (RMMP) following EPA Publication 1695 *Assessing and controlling risk: A guide for business*, and determining what is *Reasonably practicable* (EPA Publication 1856).

10 Aboriginal cultural heritage

Culturally sensitive information has been kept confidential at the request of the WTOAC, and has not been included in this Report. As a result, this chapter presents a high level analysis of the supplementary assessment of cultural heritage impacts. All quoted material is from the publicly exhibited Supplementary EES Chapters 7 and 8.

10.1 Introduction

(i) Terms of Reference

The Terms of Reference seek the IAC's advice on:

- the significance and acceptability of the Project's impacts on underwater Aboriginal cultural heritage
- whether feasible modifications to the design or management of the Project, or changes to the MMs, would reduce or mitigate impacts on underwater Aboriginal cultural heritage.

(ii) Minister's Directions

Recommendation 12 in the Minister's Directions includes the following items of further work:

- a CVA to identify intangible values relevant to the Project (both onshore and offshore in Corio Bay)
- an underwater Aboriginal cultural archaeological assessment for the proposed dredging areas to inform an updated CHMP for the Project
- review and update the MMs and the Incorporated Document to include any necessary changes to implement the updated CHMP when approved.

(iii) Evaluation objective

The relevant evaluation objective is:

- **Cultural Heritage** – To avoid or minimise adverse effects on Aboriginal and historic cultural heritage.

(iv) EES documentation

Impacts on underwater Aboriginal cultural heritage are assessed in:

- Supplementary EES Chapter 7 (Underwater Aboriginal cultural archaeology)
- Technical Report E (Underwater Aboriginal Cultural Archaeological Assessment) (confidential at the request of the WTOAC).

Matters concerning the CVA are addressed in:

- Supplementary EES Chapter 8 (Cultural values assessment).

(v) Evidence

Table 8 lists the experts providing evidence on underwater Aboriginal cultural heritage.

Table 8 Evidence underwater Aboriginal cultural heritage impacts

Party	Expert	Firm	Area of expertise
Proponent	Cosmos Coroneos (D31)	Cosmos Archaeology Pty Ltd	Maritime archaeology, historical archaeology, First Nations underwater cultural heritage

(vi) Confidential cultural heritage session and material

The Hearing included a closed session that considered underwater Aboriginal cultural heritage matters. The session was held online, and was attended by Members Carlisle and O'Neil, a representative of the WTOAC, two of the Proponent's legal team and two staff from PPV. The session was conducted on a confidential basis at the request of the WTOAC, given culturally sensitive matters were to be discussed.

Mr Coroneos did not attend the session due to availability constraints. Rather, the IAC put questions to him in writing (D80). He provided a written response (D83).

Chapters 7 and 8 of the Supplementary EES were publicly exhibited. Technical Report E was not publicly exhibited at the request of the WTOAC, as it contained culturally sensitive information. The IAC was provided with a complete copy of Technical Report E.

The following tabled documents were also kept confidential at the request of the WTOAC, on the basis of culturally sensitive content:

- the expert report of Cosmos Coroneos in relation to underwater Aboriginal cultural heritage (D31)
- the Proponent's underwater Aboriginal cultural heritage submissions (D82)
- Mr Coroneos' response to the IAC's questions (D83).

The IAC had regard to these documents in preparing its advice and findings in relation to underwater Aboriginal cultural heritage.

(vii) Other documents under preparation

The IAC understands the following documents are under preparation:

- a CHMP for the Project
- a CVA, which will inform the CHMP.

Neither of these documents were before the IAC.

10.2 The issues

The issues are whether the:

- Underwater Aboriginal Cultural Archaeological Assessment is adequate
- ongoing commitments in the MMs and the EMF more broadly are appropriate to minimise adverse effects on Aboriginal cultural heritage.

10.3 What did the Supplementary EES say?

(i) Overview

Chapter 7 of the Supplementary EES provides a high level summary of the Underwater Aboriginal Cultural Archaeological Assessment that was undertaken in response to Recommendation 12 of the Minister's Directions. It addressed impacts to tangible cultural heritage only. Chapter 8 of the Supplementary EES stated that intangible cultural heritage is being considered through a separate CVA, in partnership with the WTOAC. The CVA will inform the CHMP for the Project.

The key tasks undertaken in the Underwater Aboriginal Cultural Archaeological Assessment included:

- preparation of an underwater archaeological predictive model
- assessment of cultural heritage value of archaeological site types
- assessment of potential underwater Aboriginal cultural archaeology impacts
- identification of additional MMs for consideration by the WTOAC.

Dredging, piling for the extension to Refinery Pier and trench excavation for the seawater transfer pipe may impact underwater Aboriginal cultural archaeology. Chapter 7 of the Supplementary EES concluded:

> Bathymetric and geotechnical evidence, particularly from the piston cores collected and analysed in this study, indicate that the surface of the late Pleistocene lake bed has been altered and reworked by marine inundation and water flow from Hovells Creek watercourse, which likely passed near or through parts of the activity area. Due to this reworking, there is low confidence in the integrity of any potential archaeological sites within the activity area. Any artefacts that might have been part of such sites could now be found within erosional lag deposits that formed in depressions and other low points, distant from their original locations.
>
> Consequently, it was concluded that there is a low risk of consequential impact from the Project on lag deposits containing stone artefacts potentially present in the activity area.

In relation to ongoing tasks and commitments, the Assessment states:

> If the Project receives a favourable assessment from the Minister for Planning, the next steps would involve Viva Energy, WTOAC and First Peoples State Relations developing an agreed approach to addressing the matters considered by WTOAC to require further consideration. Discussions to date have indicated that any further agreed actions could be implemented following the Minister's assessment of the Supplementary Statement and, where relevant, incorporated into the project CHMP as determined by WTOAC in collaboration with Viva Energy and First Peoples State Relations.
>
> The CHMP will be updated to outline the necessary management processes determined by WTOAC in collaboration with Viva Energy to be followed during construction (refer to MM-AH01).

Chapter 8 of the Supplementary EES provided an update on the preparation of the CVA sponsored by the Proponent and being undertaken by the WTOAC. It noted that in February 2024 a representative of the WTOAC gave a presentation on the CVA to the Technical Reference Group and that the CVA is still in progress. Consultation between the Proponent, the WTOAC, First Peoples State Relations and DTP is ongoing and recommendations from the CVA (once finalised) will inform an updated CHMP. The chapter concludes by listing the commitments made by the Proponent through MM-AH02 and MM-AH03 which are incorporated into the updated EMF. These MMs outline the process for ongoing collaboration with the WTOAC in assessing potential impacts on intangible cultural values.

(ii) Mitigation measures

Proposed mitigation measures to manage impacts on Aboriginal cultural heritage are AM01 to AH04. Mitigation measures AM02, AH03 and AH04 were additions in the exhibited updated EMF.

10.4 Relevant policy and guidelines

The IAC has had regard to relevant policy and guidelines, including CHMP requirements under the *Aboriginal Heritage Act 2006* and the Aboriginal Heritage Regulations 2018.

10.5 Evidence and submissions

The Southern Ocean Protection Embassy Collective is a not-for-profit national Indigenous led organisation dedicated to the protection of Sea Country and safeguarding Indigenous cultural heritage, ancient songlines, whale and Sea Country ancestors. A representative of the Collective presented to the IAC on Day 13 of the Hearing. She highlighted the interconnectedness between First Nations People and the land, sea and sky of their Country. She spoke of the role Corio Bay played in First People's culture and practice, including as a nursery space where women taught children how to hunt and harvest food from the ocean. She talked of ancient aquaculture practices, and the importance of mussels as a very significant cultural resource to Sea Country people and their importance to the protection and revival of culture for Sea Country people.

Numerous submissions were made in response to the exhibited Supplementary EES that were critical that the CVA required by Recommendation 12 in the Minister's Directions had not been completed and made available for public review.

Mr Coroneos' expert report summarised the findings of his Underwater Aboriginal Cultural Archaeological Assessment. He recommended a change to MM-AH04 to elaborate on measures that should be undertaken to mitigate any potential dredging impacts of the Project on underwater Aboriginal cultural heritage values – specifically, to require an underwater archaeological sampling program to be undertaken during the construction phase where dredging is to take place. The change was not included in the Day 2 MMs.

10.6 Discussion

The IAC acknowledges the many submissions that raised concerns about the CVA not having been completed and made available for public review. A CVA is a requirement of Recommendation 12 in the Minister's Directions, and it will be important that the CVA is finalised before dredging starts. The IAC is confident that this will occur as part of the processes under the Aboriginal Heritage Act for the finalisation and approval by the WTOAC of the CHMP. The CHMP must be approved before any project approvals are issued.

Regarding concerns about the CVA not being available for public review, the IAC respects the views of the WTOAC that the CVA will likely contain culturally sensitive information. That information belongs to the Wadawurrung people, and it is up to the WTOAC to determine whether or not it is appropriate for that information to be made public.

The IAC is satisfied that the Proponent has engaged (and is continuing to engage) in an effective partnership with the WTOAC which is focused on avoiding and or minimising adverse effects on Aboriginal cultural heritage.

Having reviewed all of the material before it, including the confidential material, the IAC is satisfied the Underwater Aboriginal Cultural Archaeological Assessment is adequate to inform the Minister's Assessment of the Supplementary EES. The Assessment applied an appropriate methodology, and involved comprehensive investigations in relation to the likely presence of cultural heritage values and artefacts in the Project area. The IAC accepts the findings of the Assessment that the risk to underwater Aboriginal cultural heritage presented by the Project is low, and that the Project's impacts on underwater Aboriginal cultural heritage will not be significant.

The IAC supports the additional proposed mitigation measures MM-AH02, MM-AH03 and MM-AH04 that arise from the Assessment, and considers that they are responsive to the issues identified through the Assessment. The IAC supports Mr Coroneos' recommended changes to MM-AH04.

The IAC accepts the ongoing commitments articulated in the EMF appropriately reflect the scope of further work required to be undertaken to minimise adverse effects on Aboriginal and historic cultural heritage, including completion of the CVA by the WTOAC and updating the CHMP for the Project. While further work is still required to be undertaken, the process of finalising the CVA and the CHMP are appropriately matters for the WTOAC.

10.7 Findings and recommendation

The IAC finds:

- the Proponent has undertaken substantial underwater archaeological research
- the Proponent should continue its engagement with the WTOAC in respect of the development and finalisation of the CVA and CHMP
- the EMF contains appropriate commitments by the Proponent to ensure impacts on underwater Aboriginal cultural heritage are avoided and minimised, and are acceptable
- mitigations can form the subject of an agreed CHMP.

If the Project proceeds, the IAC recommends:

Revise the Environmental Mitigation Measures as shown in Appendix E:

a) revise AH04 (underwater cultural heritage) to incorporate a requirement to undertake an underwater archaeological sampling program during the construction phase where dredging is to take place

10.8 Overall findings

In relation to the Project's impacts on underwater Aboriginal cultural heritage, the IAC finds:

- the evaluation objective of avoiding or minimising adverse effects on Aboriginal cultural heritage can be met
- residual impacts are not likely to be significant, and can be acceptably managed with the application of the IAC's recommended MMs (including the changes to MM-AH04 recommended by Mr Coroneos) and through the approved CHMP
- no design changes or further modifications are required to further reduce the Project's impacts on Aboriginal cultural heritage.

11 Matters of National Environmental Significance

11.1 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 42(g) of the Terms of Reference require the Report to contain:

> Specific findings and recommendations about the residual impacts on MNES and their acceptability, including appropriate controls and environmental management.

The relevant evaluation objectives are as for the marine environment (refer to Chapter 5).

11.2 What did the Supplementary EES say?

Attachment II to the Supplementary EES addressed MNES, based on the further assessments of MNES undertaken as part of the:

- supplementary marine environment impact assessment (Technical Report A)
- supplementary threatened and migratory bird impact assessment (Technical Report B).

The supplementary assessment of MNES focused on the implications of the revised marine modelling for the Ramsar site and threatened and/or migratory birds. It is complementary to the assessments of other MNES in the original EES.

Impact assessments were undertaken in accordance with the *Matters of National Environmental Significance Significant impact guidelines 1.1* (Department of Environment, 2013) (EPBC Significant Impact Guidelines) to determine whether the Project would have a significant impact on MNES.

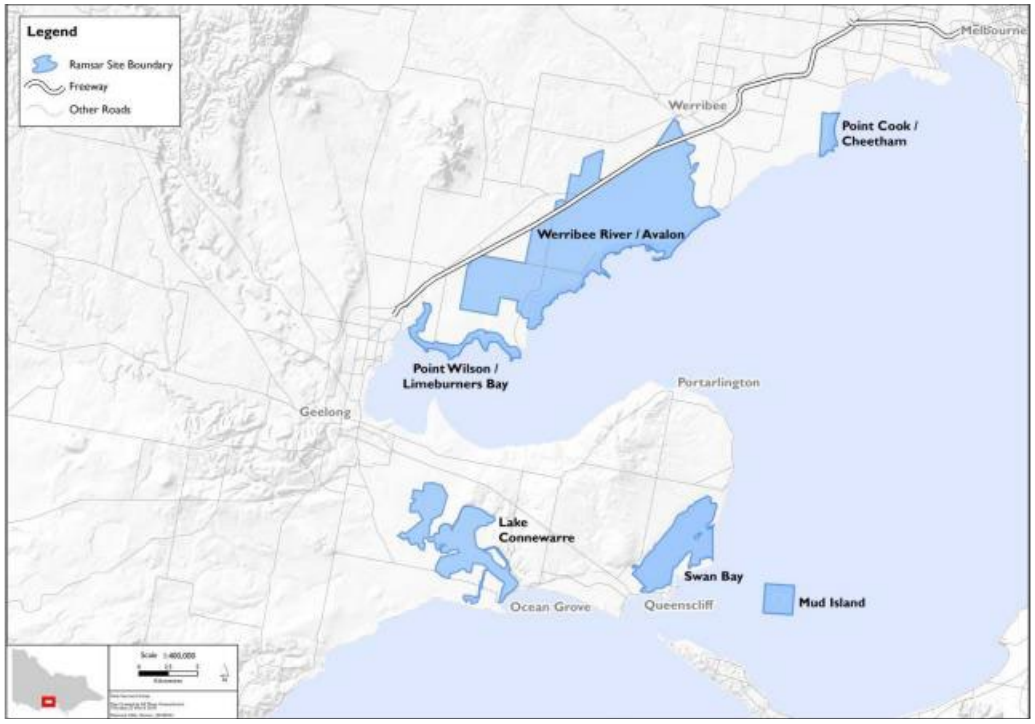
The Supplementary EES concluded the Project would not have a significant impact on MNES.

11.3 Impacts on the Ramsar site

(i) Background

As noted in the IAC's Report No. 1, the Ramsar site covers 22,650 ha and is comprised of six discrete sections as shown in Figure 12. The Point Wilson/Limeburners Bay 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.

Figure 12 Map of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site



Source: Supplementary EES Attachment II, Figure 2-1

(ii) Assessment

Table 9 sets out the IAC's assessment of impacts on the Ramsar site, assessed against the criteria in the EPBC Significant Impact Guidelines and based on the updated assessments in the Supplementary EES.

Table 9 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. No works are proposed within the Ramsar site. No loss of saltmarsh, mangrove or seagrass communities from the Ramsar site is expected. The revised modelling has shown that any effects of dredging on seagrass via increased turbidity are likely to be temporary and localised. The MMs required by the EMF include continuous turbidity monitoring during dredging with restriction of sediment releases as necessary to protect seagrass at the Ramsar site. The supplementary marine assessments showed that temperature and chlorine plumes from wastewater discharges during operation are not expected to impact seagrass at 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 for the Refinery.

Significant impact criteria	IAC's findings
Serious effects to the habitat or lifecycle of native species dependent on the wetland	No loss of saltmarsh, mangrove or seagrass communities at the Ramsar site is expected. Dredging will be avoided during spring, which is the high growth season for seagrass and phytoplankton, and important for fish breeding. Approximately 0.5 ha of seagrass near Refinery Pier will be disturbed/removed during the installation of the seawater transfer pipe, but this is not expected to have any implications for the Ramsar site. Releases of wastewater are not expected to result in temperature changes or chlorine levels exceeding guideline levels at the Ramsar site. The seawater intake at the FSRU is expected to have negligible effects on native fish species populations through entrainment of fish eggs and larvae. Shorebird habitat and food resources at the Ramsar site are not expected to be affected. Potential impacts on infauna (fauna living in soft sediments on the sea floor) closer to the dredging site and spoil disposal area will be monitored.
A substantial and measurable change in the water quality of the wetland	**Surface water runoff** Surface water drainage from the onshore project area flows towards the Ramsar wetland. However, risks to water quality, including sediment and pollutants, are expected to be satisfactorily managed with the proposed mitigation measures. For further detail refer to the IAC's Report No. 1 at 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 expected to continue for eight weeks and because suspended solids will quickly settle out of the water column. Nutrient release during dredging brings the risk of phytoplankton blooms, although such blooms occur periodically due to natural events. For further detail refer to the IAC's Report No. 1 at Chapter 8.2. Dredging will result in short term localised increases in metals concentrations in the water column but elutriate analysis has shown low bioavailability. For further detail refer to the IAC's Report No. 1 at Chapter 8.4. **Operational discharges** Synergies between the Project and existing Refinery mean that the chlorine discharges will not exceed existing chlorine discharges from the Refinery. Chlorine concentrations are not expected to exceed guideline values at the Ramsar site. Temperature plumes will be smaller than existing and not expected to exceed guideline values at the Ramsar site. Chlorine discharges may have potential implications for the Ramsar wetland via chlorine byproducts and biological pathways, but these are not well understood. Refer to Chapter 5.5 and the IAC's Report No. 1 at Chapter 7.9.

Significant impact criteria	IAC's findings
	Impacts of additional shipping movements Up to 90 additional ship movements are expected per year, plus tugs, which is expected to increased turbidity. These effects have not been quantified. For further detail refer to the IAC's Report No. 1 at Chapter 7.9.
Establishment or spread of harmful invasive species in the wetland	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.

11.4 Impacts on listed threatened and migratory bird species

(i) Background

Technical Report B of the Supplementary EES presented a consolidated list for threatened and migratory birds that could potentially be affected by the Project, and considered the implications of the Project for these species with regard to the revised marine modelling and assessment.

(ii) Assessment

Table 10 sets out the IAC's assessment of impacts on listed threatened and migratory bird species, assessed against the criteria in the EPBC Significant Impact Guidelines and based on the updated assessments in the Supplementary EES. Technical Report B and Attachment II of the Supplementary EES satisfactorily addressed the concerns raised by the IAC in relation to the original EES.

Table 10 Impacts on EPBC Act listed threatened species and migratory bird species

Group	IAC's findings
Threatened shorebirds and seabirds	No significant impacts are expected. The Ramsar site is not proposed to be modified by the Project, and is not expected to be significantly impacted by dredging or operational discharges. Seabird foraging habitat in Corio Bay is not expected to be substantially modified given the localised extent of the Project. Seabirds are unlikely to be reliant on Corio Bay as their sole foraging resource
Migratory shorebirds and seabirds	No significant impacts are expected (reasons set out above)
Threatened terrestrial birds	No significant impacts are expected. Refer to Chapter 7.
Migratory terrestrial birds	No significant impacts are expected, including to the Orange-bellied Parrot. Refer to Chapter 7.

11.5 Overall findings

In relation to the Project's impacts on MNES, the IAC finds:

- the evaluation objectives relating to biodiversity, water and catchment values, and waste management can be met
- residual impacts are not likely to be significant, and can be acceptably managed with the application of the IAC's recommended MMs in Chapters 5 and 6
- no design changes or further modifications are required to further reduce the Project's impacts on MNES.

PART C: APPROVALS AND IMPLEMENTATION

12 Draft Planning Scheme Amendment

12.1 Overview

The draft PSA documentation is contained in Attachment III of the Supplementary EES, at Appendix A of the Planning Report prepared by AECOM. It includes the draft Incorporated Document which sets out the conditions that apply to the use and development of land for the Project. The affected land is identified in the draft Specific Controls Overlay (SCO) Map.

12.2 Updates to the Incorporated Document

The exhibited version of the updated Incorporated Document (July 2024) includes:

- changes to clause 4.6 to require an overarching EMF that includes:
  - MMs
  - the process and timing for the development of a Construction Environment Management Plan (CEMP), Operations Environment Management Plan (OEMP) and other plans and procedures required by the MMs
  - an overview of the process and timing of consultation with relevant stakeholders
- changes to clause 4.6.4(b) recommended by EPA at the original EES hearing (S1884, April 2022) to include 'marine and terrestrial ecology' as one of the specific segments requiring a management plan
- changes to clause 4.11 that includes additional decommissioning requirements
- other changes recommended by the IAC in Report No. 1.

The IAC supports these changes, which provide additional clarity.

No changes were made between the exhibited version and the Day 1 version of the draft PSA (D49). The Day 2 version (D100) incorporated further minor changes sought by DEECA Regions, which submitted it was broadly comfortable with the updated Incorporated Document subject to:

- including a requirement to consult with DEECA in the preparation of the EMF, CEMP and OEMP
- replace references to the Department of Environment, Land, Water and Planning with references to DEECA.

DEECA Regions submitted that with these changes, it was comfortable that any adjustments (including to the MMs) that may be needed can be incorporated by the Proponent (and reviewed by DEECA) when the detailed EMF, CEMP and OEMP are prepared post-approval (should the Project be approved).

The IAC considers it is appropriate for DEECA to be consulted in the preparation of the EMF, CEMP and OEMP and supports the Day 2 changes which facilitate this outcome.

EPA explained (in S330) that it provided early views on the potential impacts of the updated draft PSA on the environment, amenity and human health as part of its participation in the Technical Reference Group considering the EES prior to exhibition. It confirmed all its recommendations have been incorporated into the updated draft PSA (exhibited version) and that it has no outstanding concerns with the PSA.

12.3 Discussion

The updated Planning Report accompanying the updated draft PSA states the Incorporated Document would be subject to several conditions which have been drafted on the basis that they are strategic, outcomes focused and proportional to the permission granted by the control. It states there is a clear nexus between the conditions in the Incorporated Document and the local planning context.

Consistent with its findings in Report No. 1, 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 considers the updated draft PSA appropriately utilises the tools provided by the Victorian Planning Provisions, and provides a coordinated and integrated planning approval to facilitate the Project and manage its impacts. Further, the IAC considers the extent of the Specific Controls Overlay and Port Zone mapping (unchanged from the original version of the draft PSA) are appropriate.

The IAC considers that with the additions recommended by the IAC in this Report, the conditions in the updated Incorporated Document are appropriate to manage the impacts of the Project should it be approved. It considers that the Day 2 version is fit for purpose, subject to the IAC's recommended additions and some minor corrections.

12.4 Finding and recommendation

The IAC finds:

- The planning controls in the draft PSA constitute an appropriate mechanism to facilitate the Project and manage its impacts.

If the Project proceeds, the IAC recommends:

Revise the Incorporated Document to make the minor corrections shown in Appendix F.

13 Environmental Management Framework

13.1 Introduction

(i) Terms of Reference

Clause 42(f) of the Terms of Reference seeks recommendations on the structure and content of the EMF dealing with Relevant Environmental Effects, including with respect to monitoring, contingency plans and site rehabilitation.

(ii) 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.

(iii) Key elements

As outlined in the IAC's Report No. 1, the EMF is the framework that links the Proponent's legislative responsibilities to onsite operational procedures, through detailed environmental management. The EMF was documented in Chapter 14 of the original EES, and updated in Chapter 9 of the Supplementary EES.

Key elements of the EMF are:

- the MMs
- an Environmental Management Plan approved under the Incorporated Document, which will include a CEMP and OEMP
- a CEMP and OEMP approved under the Pipeline Licence.

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 and residual environmental effects of the Project
- set out organisational responsibilities, accountabilities and governance arrangements
- include an environmental risk register maintained during operation of the Project
- include monitoring programs, or justification where monitoring is not proposed
- include auditing and reporting requirements
- include a review mechanism for continuous improvement
- include a program for community consultation, stakeholder engagement and communications for the Project, including complaints recording and resolution.

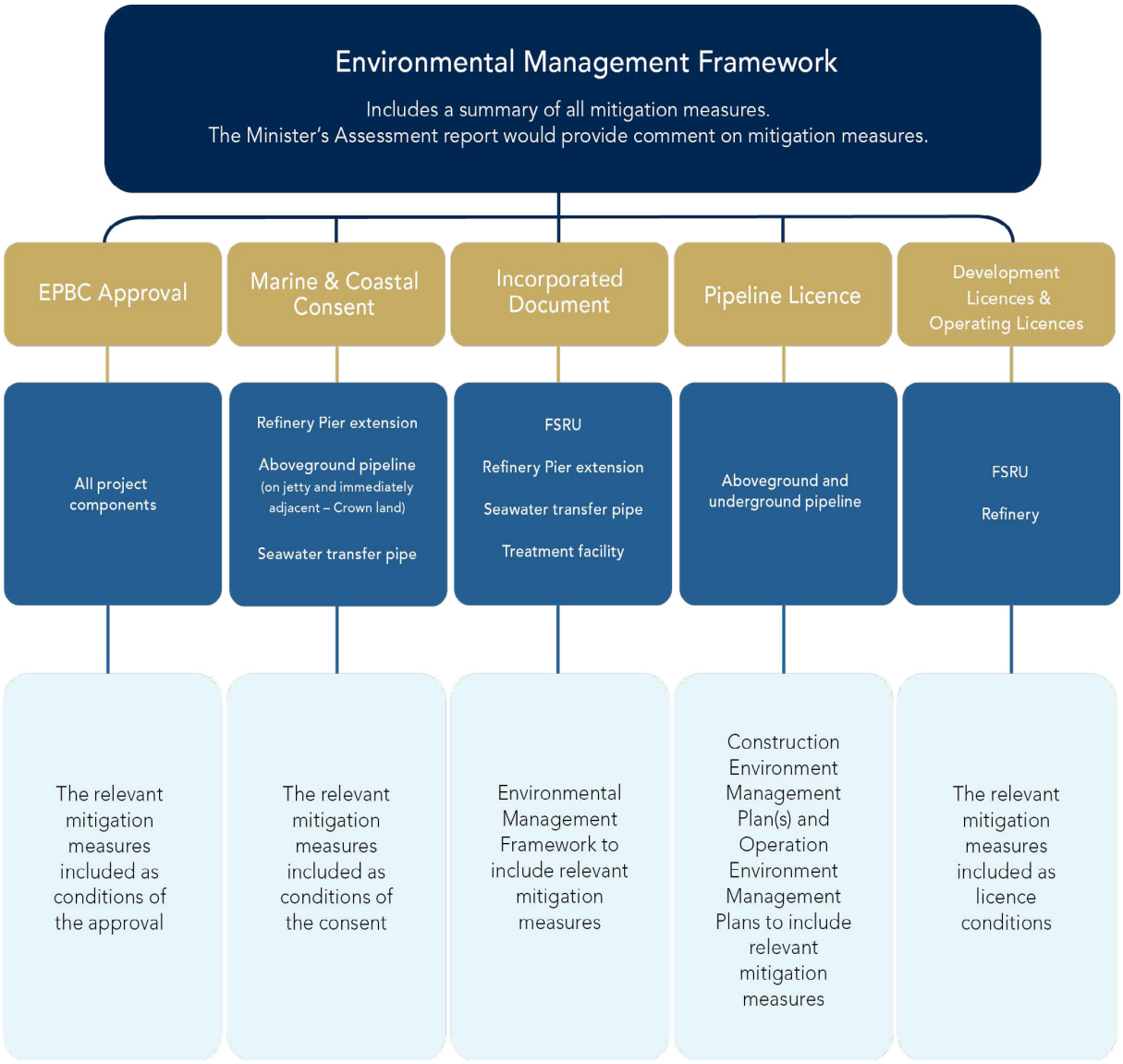
The basic structure of the EMF was not contested at either the EES or Supplementary EES Hearings.

(iv) Statutory implementation

The EMF outlines the relevant statutory approvals and consents required for the Project and how MMs will be incorporated in the approval conditions or environmental management plans to be

developed pursuant to the approvals. Figure 13 outlines the key approvals for each Project component.

Figure 13 Relationship between EMF and key statutory approvals



Source: Supplementary EES Chapter 9, Figure 9-1

Other statutory approvals will also be required, including under the FFG Act, the *Aboriginal Heritage Act 2006* and the *Gas Safety Act 1997*.

The roles and responsibilities of key stakeholders are defined in the EMF to ensure there are clear accountabilities for the implementation of the environmental management requirements. Refer to section 9.4 of the Supplementary EES for further detail.

(v) Findings from Report No. 1

In relation to the adequacy of the EMF documented in the EES, the IAC found:

- the EMF did not meet the Scoping Requirements because the EES did not provide an adequate baseline assessment of the existing marine environment or noise environment
- 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

- the monitoring, auditing and reporting requirements in the EMF are broadly appropriate, subject to the additional MMs recommended in Report No. 1
- this should ensure there is appropriate accountability and transparency through construction and operation of the Project.

13.2 Discussion

(i) Relevant Environmental Effects

This section includes the IAC's review of the structure and content of the EMF dealing with Relevant Environmental Effects (as required by clause 42(f) of the Terms of Reference).

Marine environment

As noted in section 9.7.1.4 of the EMF, the supplementary marine and water quality assessment has provided additional information regarding potential effects of construction and operation on the marine environment, including threatened and migratory birds. The conclusions were consistent with the original EES.

Three new mitigation measures were added by the Proponent, MM-ME20 in relation to the installation of the seawater transfer pipe, and ME-ME05a and MM-ME21 in response to recommendations from EPA. The Proponent also made changes to MMs ME02, ME04, ME05a, ME05, ME19 and ME20 in response to expert evidence and submissions from EPA and DEECA Regions.

The IAC recommends the EMF should take an ecosystem based approach to managing the effects of the Project on the marine environment (as required by the IAC's version of the Incorporated Document in Appendix F). This could be facilitated by appointing an ecological coordinator, as recommended by the IAC in Report No. 1.

The monitoring requirements for the marine environment outlined in the EMF rely on MMs ME05, ME06, ME07, ME17 and ME19. The monitoring requirements should be updated to reflect the IAC's recommended versions of MMs ME05, ME06, ME17a and ME19 (refer to Appendix E).

The EMF does not require any specific contingency measures for the marine environment, and the IAC does not consider any to be necessary.

The EMF proposed seagrass transplantation to facilitate rehabilitation of the area of seagrass that will be disturbed by installation of the seawater transfer pipeline. The rehabilitation is proposed to be undertaken in accordance with the published Western Australian seagrass transplantation manual (MM-ME20).[13] The IAC considers this appropriate.

Noise

As noted in section 9.7.1.5 of the EMF, the supplementary noise assessment has provided additional information regarding the operational noise impacts from the Project and construction noise from dredging. Construction and operational noise MMs documented in NV01a, NV04 and NV05 were reviewed by the Proponent, GGS and EPA, and changes were agreed.

Procedures for monitoring noise emissions are documented in section 9.15.1.2 of the EMF and are generally appropriate. However, the EMF should be revised to make it clear that the Project's

[13] Transplanting Posidonia Seagrass in Temperate Western Australian Waters: A Practical 'How To' Guide, BMT Oceanica, July 2013.

noise emissions will be monitored and assessed against the adjusted Project Noise Criteria (rather than the exhibited Project Noise Criteria).

The proposed additional measures which could be implemented to minimise noise emissions (similar to contingency plans) are appropriate. As noted in Chapter 8, noise from the existing Refinery will need to be actively managed.

Site rehabilitation measures are not relevant to noise.

Air quality

The supplementary air quality assessment has not resulted in any proposed changes to the air quality MMs relevant to the operation of the FSRU (AQ10 and AQ11). The proposed verification of air emissions (described in section 9.15.1.1 of the EMF) should include methods to confirm both the stack limits for the engines and boilers, as well as a verification of an annual bubble limit, should that be adopted. The proposed additional measures which could be implemented to minimise air emissions are reasonable. Site rehabilitation measures are not relevant to air emissions.

Underwater Aboriginal cultural heritage

The EMF in the Supplementary EES includes three new mitigation measures designed to manage impacts on Aboriginal cultural heritage (MM-AH02, MM-AH03 and MM-AH04), as well as updates to MM-AH01. The EMF states (at section 9.7.11) these additional measures have been adopted:

> … to demonstrate a commitment to ongoing collaboration with WTOAC in assessing, and avoiding or mitigating, potential impacts on underwater cultural heritage and intangible cultural values, both onshore and offshore.

The IAC broadly supports these additional MMs, although it recommends an additional requirement in MM-AH04 for a sampling program in association with the dredging program (as discussed in Chapter 10). This could be regarded as an additional monitoring requirement or a contingency plan.

The contingency measures to be applied in the event of the discovery of previously unidentified Aboriginal cultural heritage set out in the revised MM-AH01 and section 9.12 of the EMF are appropriate, although the reference to First *Nations* State Relations should be updated to First *Peoples* State Relations.

The EMF does not include site rehabilitation requirements in relation to Aboriginal cultural heritage, which is appropriate.

(ii) Baseline environmental conditions

As discussed in the Part B chapters, the IAC is satisfied the deficiencies in the original EES documentation regarding establishment of baseline environmental conditions have been adequately resolved. In particular, the IAC considers the further assessments undertaken in the Supplementary EES concerning the marine and noise environments are adequate to establish baseline conditions against which future compliance can be monitored.

(iii) Mitigation measures

The MMs are a crucial element of the EMF, and will be primarily implemented through the Incorporated Document (clause 4.6.2 states the Environmental Management Plan must include

the mitigation measures outlined in the Minister's Assessment). The MMs in the Minister's Assessment should also inform the conditions on other statutory approvals for the Project.

The IAC has recommended several changes to the Day 2 MMs to ensure that, should the Project proceed, impacts are minimised and the evaluation objectives are met.

In its comments on the Day 2 MMs (D146), Environment Victoria submitted the EMF should include a new *MM-SHR12 – Marine and navigation risk assessments to be integrated with Supplementary EES through additional marine ecology studies*. It submitted:

> Findings from marine risk and navigation assessments described in Ports Victoria letter to Viva Energy and the IAC (D105), and the subsequent navigation risk assessment by Ports Victoria, must be integrated with the Supplementary EES through additional marine studies that take into account any changes to the design scope of the project, including footprint, timing, duration and volume of dredging. An additional environmental assessment will be required with submissions and public exhibition.

As noted in Chapter 3.6(ii), the IAC's remit is confined to assessing the impacts of the Project before it, as described in the Supplementary EES. It is not tasked with assessing the impacts of any additional dredging of the shipping channels that may be required. Accordingly, the IAC makes no findings or recommendations in relation to the additional MM-SHR12 as sought by Environment Victoria. Any dredging of the shipping channels would be subject to a separate assessment and approvals process, including potentially an EES if the dredging has the potential to result in significant environmental effects.

(iv) General requirements

The EMF outlines the approach to monitoring, reporting, auditing , complaints management and contingency measures in sections 9.11 to 9.15. The IAC is generally satisfied with the proposed approaches to these tasks.

(v) Project-wide risk register

The revised EMF does not include a requirement for a Project-wide risk register to be established as recommended in Chapter 20.2 of Report No. 1.The IAC maintains the view that a Project-wide risk register will aid effective Project risk management, and that if the Project proceeds:

- a Project-wide risk register should be established
- the risk registers for the Development 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.

A new clause should be added to the Incorporated Document to require this.

13.3 Findings and recommendations

The IAC finds:

- The monitoring, auditing and reporting requirements in the updated EMF are broadly appropriate subject to the additional MMs recommended by the IAC.
- The updated EMF (with the IAC's recommended MMs) provides for appropriate accountability and transparency for the management of the Project's environmental impacts through construction, operation and decommissioning of the Project.
- The updated EMF meets the Scoping Requirements and is broadly appropriate.

If the Project proceeds, the IAC recommends:

Revise the Environmental Management Framework to correct references to First Nations State Relations to read First Peoples State Relations.

Revise the Incorporated Document as shown in Appendix F:

a) include a new clause 4.6.6 to require a Project-wide risk register to be established.

Appendix A Terms of Reference

Inquiry & Advisory Committee Terms of Reference

Supplementary Environment Effects Statement

Viva Energy Gas Terminal Project

VICTORIA State Government | Department of Transport and Planning

Version: August 2024

The Viva Energy Gas Terminal Project Supplementary Environment Effects Statement (EES) Inquiry and Advisory Committee (IAC) is appointed to inquire into, and report on, the likely environmental effects of the proposed Viva Energy Gas Terminal Project (the project) assessed in the Supplementary EES, namely, likely effects on the marine environment, noise, air quality and underwater Aboriginal cultural heritage (i.e. Relevant Environmental Effects).

The IAC is appointed pursuant to:

- section 9(1) of the *Environment Effects Act 1978* (EE Act) as an Inquiry to consider the Supplementary EES and the Relevant Environmental Effects; and
- part 7, section 151(1) of *the Planning and Environment Act 1987* (P&E Act) as an Advisory Committee to consider the updated draft planning scheme amendment C442ggee (Updated PSA).

By way of background, the Minister determined on 28 December 2020 that an EES was required to assess the likely significant environmental effects of the project. The original EES was exhibited and then considered by the Viva Energy Gas Terminal Inquiry and Advisory Committee, which submitted its report to the Minister on 5 October 2022. Having considered the original IAC's report, the Minister determined that a supplementary EES was required to further address Relevant Environmental Effects. The Minister directed that a supplementary EES was required on 6 March 2023 (the Minister's Directions).

The Supplementary EES provides an updated assessment of the project's impacts on the marine environment, noise, air quality and underwater Aboriginal cultural heritage. It also includes:

- an updated assessment of likely significant impacts on relevant Matters of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act); and
- the Updated PSA, which has been prepared to establish planning approval for the project under a Specific Controls Overlay and an incorporated document.

Name

1. The IAC is to be known as the 'Viva Energy Gas Terminal Project Supplementary EES Inquiry and Advisory Committee'.

Skills

2. The IAC should consist of members with expertise in:
   a. marine biodiversity and ecology (including marine flora and threatened and migratory bird species);
   b. coastal processes and hydrodynamics (including with respect to water quality);
   c. air quality and noise;
   d. Aboriginal cultural heritage; and
   e. statutory planning.
3. The IAC will comprise a Chair (IAC Chair), a Deputy Chair and other appropriately qualified members.
4. The Department of Transport and Planning (DTP) engaged an Independent Peer Reviewer to review and provide advice regarding the Supplementary EES, including the proponent's study program, specifically in relation to coastal processes, hydrodynamics, marine ecology and birds. The Independent Peer Reviewer will remain engaged by DTP until the IAC hearing concludes, to respond to any specific

queries from the IAC. Queries from the IAC to the Independent Peer Reviewer must be communicated in writing to DTP via the Impact Assessment Unit.

Purpose of the IAC

5. The IAC is appointed by the Minister for Planning under section 9(1) of the EE Act to hold an inquiry into and report on the Relevant Environmental Effects of the project The IAC must:

   a. review and consider the exhibited Supplementary EES, relevant referenced material and submissions in relation to Relevant Environmental Effects (i.e. those on the marine environment, noise, air quality and underwater Aboriginal cultural heritage);
   b. consider and report on the significance and acceptability of Relevant Environmental Effects, having regard to relevant policy and legislation;
   c. consider and report on the updated assessment of likely significant impacts on relevant MNES, in light of the updated information in the Supplementary EES attachment examining MNES, including the significance and acceptability of residual impacts;
   d. consider new information in the Supplementary EES that is relevant to the EPA Development Licence applications that were exhibited with the original EES;
   e. identify any additional mitigation measures or modifications, beyond those identified in the Supplementary EES, to avoid, mitigate or manage the Relevant Environmental Effects ; and
   f. advise on how these measures and modifications should be implemented through the necessary approvals and consents for the project.

6. The IAC must assess the Relevant Environmental Effects in the context of the Minister's Directions, and in accordance with these terms of reference and in doing so should consider relevant aspects of the original EES, only where matters and investigations documented in the Supplementary EES rely upon or are integrated with the original EES. It is not the role of the IAC to re-examine effects that are outside the scope of the Supplementary EES.

7. In its capacity as an Advisory Committee, the IAC must:

   a. review the Updated PSA;
   b. consider any issues raised in public submissions that relate to the Relevant Environmental Effects or the updates to the PSA; and
   c. recommend any changes to the Updated PSA that it considers necessary to address the Relevant Environmental Effects.

8. The IAC must produce a report of its findings and recommendations to the Minister for Planning on the Relevant Environmental Effects and the Updated PSA only, to inform:

   a. the Minister's assessment under the EE Act, which will be considered by statutory decision makers for the project; and
   b. the Minister's consideration of the Updated PSA under the P&E Act in due course.

Background

Project outline

9. The project comprises the development of a gas terminal using a ship known as a floating storage and regasification unit (FSRU) at Refinery Pier in Corio Bay, adjacent to Viva Energy's Geelong refinery. The project would bring natural gas from other parts of the country and overseas to meet south-eastern Australian gas market demand.

10. The key components of the project include:

    a. extension of the existing Refinery Pier – a new pier arm, new berth and ancillary pier infrastructure;
    b. localised dredging for the new berth and ship turning basin, and deposition of dredged sediment at the existing Point Wilson dredged material ground;

c. the FSRU continuously moored at the new berth, which would receive liquefied natural gas (LNG) from visiting LNG carriers, store and convert the LNG into natural gas when needed;
d. a treatment facility located within the Geelong Refinery site to check that the gas meets transmission system standards, where odorant and nitrogen (when required) is added; and
e. a 7-kilometre pipeline to transfer the gas from the FSRU to the South West Pipeline connection point at Lara, comprising a 3-kilometre aboveground section and a 4-kilometre underground section.

11. The project's proponent is Viva Energy Gas Australia Pty Ltd, who is responsible for preparing technical studies, consulting with the public and stakeholders and preparing the Supplementary EES and Updated PSA.

Supplementary EES process

12. On 6 March 2023, the Minister for Planning directed that a supplementary EES is required for the project, in accordance with sections 5 and 8C(2) of the EE Act (the Minister's Directions), before the Minister completes her assessment of the project's environmental effects for consideration by statutory decision-makers.

13. The Minister was informed by the original IAC's report dated 5 October 2022, which found that there was insufficient information to advise on the acceptability of the Relevant Environmental Effects.

14. The Supplementary EES provides a further assessment of the Relevant Environmental Effects, necessary for the Minister to complete the Minister's assessment under the EE Act.

15. The Supplementary EES was prepared by the proponent in response to the Minister's Directions and the Study Program (April 2024) that was developed by the proponent in response to Item 1 of the 'Procedures to be applied to the Supplementary Statement'.

16. The Supplementary EES is to be placed on public exhibition for 30 business days. This public comment process is in accordance with the procedures and requirements issued for this Supplementary EES by the Minister. The proponent is responsible for public notice of Supplementary EES exhibition.

Commonwealth assessment process

17. Because of its likely significant impacts on MNES, the project was determined to be a controlled action on 21 February 2020, requiring assessment and approval under the EPBC Act. The relevant controlling provisions under the EPBC Act relate to Ramsar wetlands (section 16 and 17B), listed threatened species and communities (sections 18 & 18A), and listed migratory species (sections 20 & 20A).

18. Under the EPBC Act bilateral agreement between the Australian and Victorian governments, the Victorian EES process is serving as the accredited process to address EPBC Act assessment requirements for the project. The assessment of environmental effects to be made by the Victorian Minister for Planning will be provided to the Minister for the Environment and Water to inform the approval decision under the EPBC Act.

19. The Supplementary EES includes further assessment of impacts to threatened and migratory bird species and to the Port Phillip Bay (western shoreline) and Bellarine Peninsula Ramsar site, documented in an updated MNES report.

Planning approval process

20. As part of the original EES documentation, a draft PSA was prepared and exhibited for public review. The draft PSA includes planning controls and provisions for various works and activities associated with construction and operation of the project, which is proposed to be introduced through a Specific Controls Overlay, that enables regulation of the use and development of the project in accordance with an incorporated document.

21. The IAC appointed to consider the original EES and submissions considered the draft PSA and any relevant submissions received on these exhibited documents.

22. The exhibited Supplementary EES documentation includes an updated draft of this PSA (C442ggee).

23. The Supplementary EES IAC is to consider and provide advice on the updates to the draft PSA.

Other approvals

24. The project will require other statutory approvals or consents, as outlined in the Supplementary EES, including:

    a. Pipeline licence under the *Pipelines Act 2005;*
    b. Development licences under the *Environment Protection Act 2017* (EP Act) for the FSRU component of the project and for the discharge of FSRU wastewater from the existing Viva Energy Refinery;
    c. an approved Cultural Heritage Management Plan under the *Aboriginal Heritage Act 2006*;
    d. consents under the *Marine and Coastal Act 2018*;
    e. a permit to remove listed and protected flora and fauna under the *Flora and Fauna Guarantee Act 1988;*
    f. a permit/approval under the P&E Act (Clause 52.17) to remove native vegetation; and
    g. approvals under the *Water Act 1989* for works on relevant waterways.

Process

Stage 1 – Submissions

25. Submissions on the Supplementary EES and Updated PSA are to be provided in writing on or before the close of submissions. Submissions are to be limited to Relevant Environmental Effects, and updates to the draft PSA.

26. Submissions will be collected by the office of Planning Panels Victoria (PPV) through the Engage Victoria platform. All submissions must state the name and address of the person making the submission. Submissions will be collected and managed in accordance with the '*Guide to Privacy at PPV*'.

27. Petition responses will be treated as a single submission and only the first names from a petition submission will be registered and contacted.

28. Pro-forma submitters will be registered and contacted individually if they provide their contact details. However, the IAC should encourage pro-forma submitters who want to be heard at the hearing to present as a group, given their submissions raise the same issues.

29. All written submissions and other supporting documentation or evidence received through the course of the IAC process must be published online, unless the IAC specifically directs that the submission or other material, or part of it, is to remain confidential.

30. Electronic copies of each submission on the Supplementary EES and Updated PSA are to be provided to the proponent, DTP (State Planning Assessment and Facilitation), City of Greater Geelong Council and the Wadawurrung Traditional Owners Aboriginal Corporation.

31. PPV must retain any written submissions and other documentation provided to the IAC for five years after its appointment.

Stage 2 – Public hearing

32. The IAC must hold a public hearing and may make other such enquiries as are relevant to undertaking its role.

33. Prior to the commencement of the public hearing, the IAC must hold a directions hearing to make directions it considers necessary or appropriate as to the conduct or scheduling of the public hearing.

34. When it conducts a public hearing, the IAC has all the powers of an advisory committee that are specified in section 152(2) of the P&E Act.

35. The IAC may inform itself in any way it sees fit, but must review and consider:

    a. the Minister's Directions and these Terms of Reference;
    b. the exhibited Supplementary EES and Updated PSA;
    c. all submissions and evidence in relation to the Supplementary EES, but only to the extent they relate to Relevant Environmental Effects;
    d. all submissions and evidence in relation to the Updated PSA, but only to the extent they relate to potential changes or updates to the draft PSA;
    e. the views (if known) of the Wadawurrung Traditional Owners Aboriginal Corporation;
    f. any other information that is provided to, or obtained by, the IAC that is relevant to the Relevant Environmental Effects or the updates to the draft PSA.

36. The IAC must conduct its process in accordance with the following principles:

    a. The public hearing will be conducted in an open, orderly and equitable manner, in accordance with the principles of natural justice.
    b. The public hearing will be conducted with a minimum of formality and without legal representation being necessary for parties to be effective participants.
    c. The IAC process is to be exploratory and constructive, with adversarial behaviour discouraged and with cross-examination/questioning to be regulated by the IAC, in the context of these three principles.

37. The IAC may limit the time of parties appearing before it.

38. The IAC may direct that a submission or evidence is confidential in nature and the hearing be closed to the public for the purposes of receiving that submission or evidence.

39. The IAC may conduct a public hearing when there is a quorum of at least two of its members present or participating through electronic means, one of whom must be the IAC Chair or Deputy Chair.

40. If directed by the IAC, an audio recording of the hearing must be undertaken by the proponent. If recorded, the audio recording will be provided to PPV as a weblink and would be made publicly available by PPV as soon as practicable after the conclusion of each day of the hearing, or otherwise as directed by the IAC.

41. Any other recording of the hearing by any other person or organisation may only occur with the prior consent of, and strictly in accordance with, the directions of the IAC.

Stage 3 – Report

42. The IAC must produce a written report for the Minister for Planning containing its:

    a. analysis and conclusions with respect to the Relevant Environmental Effects of the project (namely likely impacts on the marine environment, noise, air quality and underwater Aboriginal cultural heritage) and their significance and acceptability;

    b. findings on whether acceptable environmental outcomes can be achieved in relation to the Relevant Environmental Effects, having regard to legislation, policy, best practice, and the principles and objectives of ecologically sustainable development;

    c. recommendations and/or specific measures that it considers necessary and appropriate to prevent, mitigate or offset adverse Relevant Environmental Effects;

    d. recommendations as to any feasible modifications to the design or management of the project considered necessary to reduce or mitigate Relevant Environmental Effects;

    e. recommendations for appropriate conditions that may be lawfully imposed on any approval for the project to manage Relevant Environmental Effects to acceptable levels, including recommendations for the EPA Development Licences, and changes (if any) to the Updated PSA;

f. recommendations as to the structure and content of the proposed environmental management framework dealing with Relevant Environmental Effects, including with respect to monitoring, contingency plans and site rehabilitation; and

g. specific findings and recommendations about the residual impacts on MNES and their acceptability, including appropriate controls and environmental management.

43. The report must include:

a. information and analysis of the Relevant Environmental Effects in support of the IAC's findings and recommendations;

b. a list of all recommendations, including cross-references to relevant discussions in the report;

c. a description of the public hearing conducted by the IAC, and a list of those persons consulted with or heard;

d. a list of all submitters in response to the exhibited Supplementary EES and Updated PSA; and

e. a list of the documents tabled during the proceedings.

Timing

44. The IAC should hold a directions hearing no later than 20 business days from the final date of the exhibition period.

45. The IAC should commence the hearing no later than 40 business days from the final date of exhibition period.

46. The IAC must submit its report in writing to the Minister for Planning within 30 business days from the last day of its proceedings, unless the report writing period spans the Christmas-New Year period, in which case 40 business days will apply.

47. The DTP's Impact Assessment Unit must liaise with PPV to agree on the directions hearing and hearing dates, which are to be included on all public notices.

Minister's assessment

48. The Minister for Planning will make an assessment of the environmental effects of the project under the EE Act, having considered the IAC report, the Supplementary EES, submissions on the Supplementary EES, as well as the original IAC report dated 5 October 2022, the original EES and any other relevant matters.

49. PPV will notify submitters of the release of the Minister's assessment and the IAC report.

Miscellaneous

50. The IAC may apply to the Minister for Planning to vary these terms of reference in writing at any time before submission of its report. This includes to vary the required hearing or reporting timeframe if there are special circumstances that necessitate a longer timeframe.

51. The IAC may retain specialist expert advice, additional technical support and/or legal counsel to assist if considered necessary.

52. PPV is to provide administrative support to the IAC. The proponent is to provide administrative or technical support to the IAC in relation to the conduct of the hearing.

Fee

53. The fees for the members of the IAC will be set at the current rate for a panel appointed under part 8 of the P&E Act.

54. All costs of the IAC, including the costs of obtaining any expert advice, technical administration and legal support, venue hire, accommodation, recording proceedings and other costs must be met by the proponent.

Sonya Kilkenny MP
Minister for Planning

Date: 8/9/2024

The following information does not form part the Terms of Reference.

Project Management

1. For matters regarding the IAC process, please contact Planning Panels Victoria, by phone (03) 5381 9457 or email Planning.Panels@transport.vic.gov.au.
2. For matters regarding the EES process please contact the Impact Assessment Unit in DTP by phone 03) 8622 7633 or email environment.assessment@transport.vic.gov.au.

Appendix B List of submitters

No.	Submitter	No.	Submitter
1	Paul Dainton	31	Andy Stretton
2	Lance Breguet	32	Sharon McIntyre
3	Linette Harriott	33	Jelmer Hoekstra
4	Robert Wigg	34	Keila (surname not provided)
5	Roger Armstrong	35	Peter Cowell
6	Martine Holberton	36	Dennii Barrie
7	Karen Negrau	37	Wendy Smith
8	Georgia Radley	38	Ingrid Hindell
9	Russell Mitten	39	Deborah Gordon
10	Rosemary Nugent	40	Peter (surname not provided)
11	Sanja van Huet	41	Katelyn Dooley
12	Maja Gajic	42	Marie Bliss
13	Sarah Hanley	43	Catherine Merry
14	Sue Crisp	44	Gary Saunders
15	Natalie White	45	Merryn Padgett
16	Melissa Ferguson	46	Vanessa Whittem
17	Paul Gleeson	47	Wyatt Foderaro
18	Anna James	48	Jemina Wilson
19	Erica Hunt	49	Tiffany Paterson
20	Dave Moyle	50	Marnie Brooks
21	Emily Wade	51	Kelli Lavelle
22	Noelene Carr	52	Jess Hobbs
23	Glen Osborne	53	Fiona Kersten
24	Susan Strong	54	Tim Wood
25	Dianne Crea	55	Tahlee Rouillon
26	Merilyn Harris	56	Michael Louey
27	Christine Hooper	57	Susanne Thomas
28	Robert Paul	58	Jean Christie
29	David Spear	59	Susan Firth-McCoy
30	Bruce Whimpey	60	Edmund Hapsburg

No.	Submitter	No.	Submitter
61	Bianca Smith	91	Margaret Gove
62	Grace McKenzie-McHarg	92	Jan Calaby
63	Phyllis Palma	93	Gregory Dikmans
64	Susan Dwyer	94	Thomas Gledhill
65	Chris Breaden	95	Jane Leitinger
66	Ronald Dunn (Geelong Sustainability)	96	Guy Abrahams
67	Anke Spear	97	Karen Stagnitti
68	Jelke Spear	98	Lesley Mitchell
69	Maxine Barry	99	Jennifer Tilleard
70	Helga Saunders	100	Behzad Falahati
71	Karen Lamb	101	Dr James Thom
72	David Myer	102	Ulrike (Rikki) Bandekow
73	Sue Johnson	103	May Power
74	John Seal	104	Yvonne Parker
75	John de Figueiredo	105	Jenny Barrett
76	Rebecca Parker	106	Alan Baker
77	Kevin Williamson	107	Jessica Gray
78	Tanya Tankard	108	Miranda Laird
79	Megan Knott	109	Ken Laird
80	Peter Cerasuolo	110	Sue Guymer
81	Carrie van der Weyden	111	Catherine Cameron
82	Barb Sheehan	112	Adrian Evans
83	Melinda Nutting	113	Louise Segrave
84	IXL Group	114	Gavin Pocock
85	Rosemary Kiss	115	Rebecca Kilinski
86	Felicity Spear	116	Dave Campbell
87	Peter Spear	117	Marie Harris
88	Jennifer Mary Hurley	118	Lyn Bouvier
89	Allan Warrack McCasker	119	Kristy Rethus
90	Nancy Isabel Donkers	120	Colleen Ross

No.	Submitter	No.	Submitter
121	Joy Porter	151	Noreen Nicholson
122	David Armstrong	152	Roman Goeppert
123	Monica Esmond	153	Kate Heffer
124	Johanne Walker	154	Helen Percy
125	Sally Moseby	155	Robert (surname not provided)
126	Tess Oliver	156	Sarah Dekiere
127	Vikki Davey	157	Otway Coastal Environment Action Network (OCEAN)
128	Sue Carolane	158	Dr Helen Butler
129	Harry Perrin	159	Sophia Marsden-Smith
130	Derek Ryan	160	Katie Iwanuch
131	Norm Cheale	161	Christine Fox
132	Susan Fielding	162	Stuart Thomson
133	Kaye Widdowson	163	Alan Barlee
134	Barb Miles	164	Cassie Moss
135	Wayne Jury	165	Sunny Syme
136	Ariel Liddicut	166	Daniel Cowdell
137	Andrew Pyle	167	Vicki Green
138	Marcus May	168	Emily Prewett
139	Anthony Long	169	Adam Stone
140	Sophie Mercier	170	Whitehall Guesthouse Queenscliff
141	Jeanne Beale	171	David Huck
142	Katherine Messer	172	Jan Mitchell
143	Russell Kealey	173	Cheryl Duffin
144	Sarah Treacy	174	Barry Hedgespeth
145	Janet Skilton	175	Geelong Manufacturing Council
146	Peter Kealey	176	Nicole Rubio
147	William Nicholson	177	Dr Ray Watson
148	Madeline Hogan	178	Vicki Philipp
149	David Brown	179	Brianna Duke
150	Geelong Renewables Not Gas, including ACF Geelong and Geelong Sustainability	180	Phoebe Crockett

No.	Submitter	No.	Submitter
181	Nadine Joy	211	Anthony Stott
182	Marilyn Billeam	212	Sophie Stewart
183	Emma Chessell	213	Australian Conservation Foundation (ACF) Geelong Community
184	Kathryn O'Halloran	214	Reverend Karen Eller
185	Mark Harrison	215	Kate Grant
186	Josef Rafalowicz	216	Jennifer Foy
187	Lynette Coombes	217	Lyn Hovey
188	Pauline Roberts	218	David Wood
189	Jessica Sejean	219	Hayley Stokes
190	Britt Olsen	220	Erik Vahl Meyer
191	Cathryn Mason-Payne	221	Dr Peter Cook
192	Susan Langridge	222	Labour Environment Action Network Victoria
193	Tim Green	223	Chris Halpin
194	Gail Pett (Geelong Sustainability)	224	Queenscliff-Point Lonsdale Congregation of the Uniting Church in Australia
195	Sylvia van der Peet	225	Guy Begley
196	Dale Martin	226	Charlotte Nikakis (Geelong Grammar School)
197	John Finlayson	227	Protect the West Victoria
198	Tiffany Gunning	228	Sophie Radalj
199	Marilyn Taylor	229	Jessica Chapman
200	Rowan Russell	230	Joshua Bye
201	Emilie Flynn	231	Patricia Mackle
202	Wendy Cox	232	Warren Chapman
203	Brian Steadman	233	Kylie Thomas
204	Lauren Dillon	234	Meredith Rose
205	Nicole (surname not provided)	235	Glenys Parslow
206	Alison Morgan	236	Peter Greenwood
207	Lisa Minchin	237	Jeannette Johanson and Margaret Fraser
208	Angela Morgan	238	Dr Matthew Dingle
209	Phoebe (surname not provided)	239	Neil Plummer
210	Geelong One Fire Reconciliation Group Inc	240	Graeme Wilkinson

No.	Submitter	No.	Submitter
241	Victorian National Parks Association	271	Darcy Dunn
242	Jeanette Swain	272	Angus Baines
243	Felicity Crombach	273	Susan McCulloch
244	Chloe Campbell	274	Maurice Latino
245	Andrea Page	275	Neve Lovadina
246	Sarah Brown	276	Maurice Perry
247	S Zwolinski	277	Sophie Small
248	Cassandra Arnold	278	Friends of the Earth Melbourne
249	Rupert Steiner	279	Andrew Wilson
250	Dr Sarah Mansfield	280	Meagan Wilson
251	Susan Rechter	281	Ian Sheppard
252	D Pont	282	Prof David Chalmers
253	John Godfrey	283	Sina Lengelsen
254	Barbara Moulin	284	Dale Stohr
255	Angus Cormick	285	Dr Jackie Myers
256	Sally Fisher	286	Andre Limsowtin
257	Linden M Young	287	Stephen Segrave
258	Anna Whitehead	288	Julie Heath
259	David Dillon	289	Joan Kelly
260	Urszula Wynd	290	David Cooper
261	John Foss	291	Colleen Wysser - Martin
262	Sunshine Rink	292	Jarred (surname not provided)
263	Stephanie Sabrinskas	293	SOPEC - Southern Ocean Protection Embassy Collective
264	Ramona Headifen	294	Jeff Butler
265	Tania Bartlett	295	Fred Ritman
266	Stephen Easom	296	Kate Simpson
267	Monika Doepgen	297	Ruth Blackhirst
268	Will Lindskog	298	Barbara West
269	Belinda Nixon	299	Massimo Amerena
270	Timothy Davis	300	Colin Ridges
301	Frances Murphy	331	Surf Coast Energy Group (SCEG)
302	Hilary McAllister	332	Environment Victoria
303	Jason Thomas	333	Sean (surname not provided)

No.	Submitter	No.	Submitter
304	Janet Wade	338	Department of Energy, Environment and Climate Action (DEECA) Regions
305	Dita Kasal	339	Port Phillip EcoCentre / Port Phillip Baykeeper
306	Jen Farrer	340	Liz Zetzmann
307	Peter Monie	341	Tracey Gibbs
308	Geelong Sustainability	342	Benjamin Cronshaw
309	Christine Cook	343	Simone Tolson
310	Julia Wood	344	APA
311	Roger Dingle	345	Jo Lane
312	Mark Crittenden	346	CLIMARTE
313	Alexandra Bell	347	Glen Cowan
314	Teagan Mitchell	348	North Shore Residents Group
315	Annie Malesic	349	Peter Harrington
316	Jacqueline Randles	350	Jeremy Klitzing
317	Claire Robson	351	Andy Breaden
318	Harry Peeters	352	Claudia Bell
319	Mary Budd	353	Grace Hamilton
320	Emma Bouvier	354	Kate Patterson
321	Anne Jaques	355	Robert Patterson
322	Frances Winfield	356	Daniel Hercott
323	Marina Lewis	357	Dominique Souter
324	Claire Weekley	358	Jason Jin
325	Linda Wo	359	Karina Donkers
326	James Brooksby	360	Neil Longmore
327	Suzanne D'Ombrain-Allain	361	Geelong Football Club
328	Doctors for the Environment Australia	362	Committee for Geelong
329	Jacquelene Dunn	363	Courtney Gardner
330	Environment Protection Authority (EPA)	364	Dr Johanna Donkers
334	The Good Neighbourhood Project (formerly Norlane Community Initiatives)	365	Heather Turland
335	Tarryn (surname not provided)	366	Susan Camilleri
336	Chris Woods	367	Laura Billings
337	Nicholas Green	368	Robin Gardner

No.	Submitter
369	Joan Lindros
370	Amy Tacey
371	Geelong Grammar School
372	Elizabeth Sager
373	Briony Pemberton
374	Russell Mondon
375	Jeremy Sager
376	Connor Parker
377	Save Westernport Inc.
378	Katharine Balson
379	Lachie Chomley
380	Matt Limb
381	Leigh Pettingill
382	Patrick Bongiorno
383	Stephanie Wysser
384	Surfrider Foundation Surf Coast Branch
385	Climate and Health Alliance
386	Gavin Gamble
387	Australian Manufacturing Workers' Union (AMWU) Victoria Branch

Appendix C Parties to the IAC Hearing

Submitter	Represented by
Viva Energy Australia Pty Ltd (Proponent)	Chris Townshend KC, Barnaby Chessell SC, Roshan Chaile and Stephanie Mann of Counsel instructed by Davis Advisory, who called expert evidence on: - air quality from David Rollings of AECOM - hydrodynamic modelling from Dr Peter Yeates of Hydronumerics - noise from Tom Evans of Resonate Consultants - marine ecology from Dr Ian Wallis of CEE - threatened migratory birds species from Brett Lane of Nature Advisory - underwater Aboriginal cultural heritage from Cosmos Coroneos of Cosmos Archaeology
DTP Impact Assessment Unit	Marco Gutierrez Gonzalez
Department of Energy Environment and Climate Action Regions	Jayne Cluning
Environment Protection Authority	Marissa Chorn and Jamie Blaker of Counsel instructed by EPA legal
Wadawurrung Traditional Owners Aboriginal Corporation (WTOAC)	Kristen Ellis
Geelong Grammer School	Adrian Finanzio SC, Nicola Collingwood and Serena Armstrong of Counsel instructed by Harwood Andrews, who called expert evidence on: - hydrodynamic modelling from Dr Paul Guard of BMT Commercial Australia - noise from Darren Tardio of Enfield Acoustics - marine ecology from Dr Matthew Edmunds of Australian Marine Ecology
Australian Conservation Foundation (ACF) Geelong Community	Peter Chomley
Chris Haplin	
Christine Cook	
Claire Weekley	
CLIMARTE	Deborah Hart
Dale Martin	
Darcy Dunn	
Prof David Chalmers	
David Huck	
David Spear	

Doctors for the Environment Australia	Seung Baek
Environment Victoria	Greg Foyster
Friends of the Earth Melbourne	Freja Leonard
Geelong One Fire Reconciliation Group Inc	Vicky Grosser
Geelong Sustainability	David Spear
Dr Jacquelene Dunn	
Jemina Wilson	
Jessica Chapman	
John Godfrey	
Josef Rafalowicz	
Julia Wood	
Lachie Chomley	
Lauren Dillon	
Matt Limb	
Melinda Nutting	
North Shore Residents Group	Garth Norman
Dr Peter Cook	
Port Phillip EcoCentre / Port Phillip Baykeeper	Neil Blake OAM
Queenscliff-Point Lonsdale Congregation of the Uniting Church in Australia	Richard Allen
Robert Patterson	
Roman Goeppert	
Sally Fisher	
Dr Sanja van Huet	
Southern Ocean Protection Embassy Collective	Yaraan Bundle
Sophia Marsden-Smith	
Surf Coast Energy Group	Graeme Stockton
Surfrider Foundation Surf Coast Branch	Dr Sanja Van Huet
The Good Neighbourhood Project (formerly Norlane Community Initiatives)	Simon Reeves
Ulrike (Rikki) Bandekow	
Victorian National Parks Association	Shannon Hurley
Warren Chapman	

Appendix D Document list

No	Date	Description	Presented by
1	29 Oct 2024	Directions Hearing notice	Planning Panels Victoria (PPV)
2	6 Nov 2024	Requests to be heard and key issues	PPV
3	7 Nov 2024	Letter to IAC – Representation and hearing arrangements	Geelong Grammar School (GGS)
4	7 Nov 2024	Email to IAC - Procedural matters and representation	Environment Protection Authority Victoria (EPA)
5	12 Nov 2024	Letter to Proponent - Request for materials dated 6 November 2024	GGS
6	12 Nov 2024	Email to IAU - Proposed process for seeking information from Independent Peer Reviewer	PPV
7	13 Nov 2024	Email from IAU – Response to proposed process for seeking information from Independent Peer Reviewer	Department of Transport and Planning, Impact Assessment Unit (DTP IAU)
8	14 Nov 2024	IAC queries for Independent Peer Reviewer (IPR) (Stantec)	PPV
9	14 Nov 2024	Letter to Wadawurrung Traditional Owners Aboriginal Corporation	PPV
10	14 Nov 2024	IAC Directions and Distribution List (v1)	PPV
11	13 Nov 2024	Email to IAC - Closing submissions in reply	EPA
12	15 Nov 2024	Supplementary Technical Note 01 (STN01) - Hydrodynamic Model Report	Viva Energy Australia Pty Ltd (Viva Energy) (Proponent)
13	15 Nov 2024	Attachment 1 STN01 - HN Report Refinement of Hydrodynamic Model_V3 - Working Draft Feb 2024	Proponent
14	15 Nov 2024	Attachment 2 STN01 - HN Report Refinement of Hydrodynamic Model_v4 - Updated Draft Nov 2024	Proponent
15	15 Nov 2024	Letter to IAC - Expert witness list (Direction 9)	Proponent
16	18 Nov 2024	Letter to parties - Instructions for Document Sharing Platform (Direction 4)	Proponent
17	19 Nov 2024	Email to IAC - Nominations for site visit (Direction 12)	EPA
18	19 Nov 2024	Letter to IAC - Expert witness list and time required (Direction 9)	GGS

No	Date	Description	Presented by
19	19 Nov 2024	Letter to IAC - IAC Refinery site visit details (Directions 12 and 13)	Proponent
20	19 Nov 2024	Letter to IAC - Site inspection details (Directions 12 and 13)	GGS
21	19 Nov 2024	GGS -TD93 Viva EES - Geelong Grammar School Part C -Site visit map - 16 June 2022	GGS
22	19 Nov 2024	Email to IAC - Requested attendees for site visit (Direction 12)	EPA
23	20 Nov 2024	Part A Submission	Proponent
24	20 Nov 2024	Supplementary Technical Note 2 (STN02) – Response to DEECA Regions' submission	Proponent
25	20 Nov 2024	Supplementary Technical Note 3 (STN03) – Response to EPA's submission	Proponent
26	20 Nov 2024	Submissions Summary Table	Proponent
27	20 Nov 2024	Expert Witness Statement of Ian Wallis (Marine Environment)	Proponent
28	20 Nov 2024	Expert Witness Statement of Tom Evans (Noise)	Proponent
29	20 Nov 2024	Expert Witness Statement of Brett Lane (Threatened Migratory Birds Species)	Proponent
30	20 Nov 2024	Expert Witness Statement of David Rollings (Air Quality)	Proponent
31	20 Nov 2024	**[CONFIDENTIAL]** Expert Witness Statement of Cosmos Coroneos (Aboriginal Cultural Heritage)	Proponent
32	20 Nov 2024	Independent Peer Reviewer response to queries from the IAC	DTP IAU
33	21 Nov 2024	Letter to proponent - Site inspection arrangements	PPV
34	21 Nov 2024	Email to IAC - Update on Geelong Hearing venues	Proponent
35	21 Nov 2024	Hearing Timetable (v1)	PPV
36	22 Nov 2024	Supplementary Technical Note 3(a) (STN03a) - Response to EPA's submission (additional meteorological information)	Proponent
37	22 Nov 2024	Supplementary Technical Note 4 (STN04) - Response to GGS Request for Information (dated 6 Nov 2024)	Proponent
38	28 Nov 2024	Email to Parties - Response from IAC on Supplementary Statement	PPV
39	28 Nov 2024	Email to Parties - Confirmation Supplementary Statement removed	Proponent
40	28 Nov 2024	Email to Parties - Update on circulation of final site inspection itinerary and maps	Proponent
41	29 Nov 2024	Letter to IAC- Filing of Expert Evidence	GGS
42	29 Nov 2024	Expert Witness Statement of Darren Tardio (noise)	GGS
43	29 Nov 2024	Expert Witness Statement of Dr Paul Guard (hydrodynamics)	GGS

No	Date	Description	Presented by
44	27 Nov 2024	Email to PPV - Process for Peer Reviewer and letter from Proponent	DTP IAU
45	29 Nov 2024	Email to IAC - Direction 30 attendance expert meetings	Proponent
46	2 Dec 2024	Expert Witness Statement of Dr Matt Edmunds (marine ecology)	GGS
47	2 Dec 2024	Email to Parties – Proponent order of evidence (Direction 26) and Day 1 Project Documentation (Direction 28)	Proponent
48	2 Dec 2024	Day 1 version – Environmental Mitigation Measures (EMF)	Proponent
49	2 Dec 2024	Day 1 version - Draft Greater Geelong Planning Scheme Amendment (PSA)	Proponent
50	2 Dec 2024	Email to Parties - Update final site inspection itinerary and maps (Direction 14)	Proponent
51	2 Dec 2024	Letter to Proponent - marine conclave and other procedural matters	PPV
52	3 Dec 2024	Letter to IAC - Response on experts' conclave and Dr Yeates	GGS
53	3 Dec 2024	Letter to parties - Yeates evidence	PPV
54	3 Dec 2024	Email to IAC - Final site visit itinerary (Direction 14): a. Refinery Site Visit Itinerary b. Visitors car park access c. IAC Refinery Tour stops d. IAC Site Tour Map – surrounds e. Site Inspection – GGS Corio Campus f. Unaccompanied Tour Map g. Geelong Refinery Near Map	Proponent
55	3 Dec 2024	Email to IAC - Clarification on final site visit itinerary	GGS
56	4 Dec 2024	Letter to IAC -Update on marine evidence and conclave and Direction 26	Proponent
57	4 Dec 2024	Letter to IAC - Response to update on marine evidence and conclave and Direction 26	GGS
58	5 Dec 2024	Hearing Timetable (v2)	PPV
59	5 Dec 2024	Joint Expert Statement - Marine ecology	Proponent
60	5 Dec 2024	Joint Expert Statement - Noise	Proponent
61	5 Dec 2024	Overview of the EES Process	DTP IAU
62	5 Dec 2024	Expert Witness Statement of Dr Peter Yeates (Hydrodynamics)	Proponent
63	5 Dec 2024	Hearing submission (Day 1)	DEECA Regions
64	6 Dec 2024	Opening Submissions	GGS
65	6 Dec 2024	Opening Submissions	Proponent

No	Date	Description	Presented by
66	6 Dec 2024	Project Introduction	Proponent
67	6 Dec 2024	Letter to IAC - Procedural Matters and Hearing Timetable	Proponent
68	6 Dec 2024	Opening Submissions	EPA
69	9 Dec 2024	Supplementary Statement of Ian Wallis addressing Peer Reviewers Responses - 9 Dec 2024	Proponent
70	9 Dec 2024	Hearing Presentation of David Rollings of AECOM (Air Quality)	Proponent
71	9 Dec 2024	Hearing Presentation of Brett Lane (Birds)	Proponent
72	10 Dec 2024	Hearing Presentation of Tom Evans (Noise)	Proponent
73	10 Dec 2024	Opening Submission (Noise)	Proponent
74	10 Dec 2024	Supplementary Technical Note 5 (STN05) - Refinery Noise	Proponent
75	10 Dec 2024	Visual summary of monthly emission outputs and limits	PPV
76	10 Dec 2024	Noise Infographic to assist EPA questions to Tom Evans	EPA
77	11 Dec 2024	Proposed amendments to noise Mitigation Measures	EPA
78	11 Dec 2024	Response to Committee Questions	DEECA Regions
79	11 Dec 2024	Joint Expert Statement (Hydrodynamics)	Proponent
80	12 Dec 2024	Letter to proponent - IAC Cultural Heritage Questions	PPV
81	12 Dec 2024	Hearing Timetable (v3)	PPV
82	13 Dec 2024	**[CONFIDENTIAL]** Underwater Aboriginal Cultural Heritage Submissions	Proponent
83	13 Dec 2024	**[CONFIDENTIAL]** Cosmos Coroneos written answers to IAC's question regarding Aboriginal Cultural Heritage	Proponent
84	13 Dec 2024	Hearing Presentation of Dr Peter Yeates (Hydrodynamic Modelling)	Proponent
85	13 Dec 2024	Opening Submissions (Hydrodynamic Modelling)	Proponent
86	13 Dec 2024	Site diagram reviewing cumulative and project noise limits at GGS	PPV
87	13 Dec 2024	Letter to IAC and Parties - January hearing dates	GGS
88	16 Dec 2024	Hearing Presentation of Ian Wallis (Marine Ecology)	Proponent
89	16 Dec 2024	Joint Statement of Tom Evans and Darren Tardio - Noise Management and Monitoring Requirements	Proponent
90	17 Dec 2024	Marine Environment - List of Documents	Proponent
91	17 Dec 2024	Hearing Presentation of Dr Matt Edmunds (Marine Ecology)	GGS
92	17 Dec 2024	Material used in cross examination of Dr Wallis - ME-Slide-10	GGS
93	17 Dec 2024	Material used in cross examination of Dr Wallis - ME-Slide-11	GGS
94	17 Dec 2024	Material used in cross examination of Dr Wallis - ME-Slide-12	GGS

No	Date	Description	Presented by
95	17 Dec 2024	Material used in cross examination of Dr Wallis - Survey 2 and 3 Example Image Positions	GGS
96	18 Dec 2024	Response to IAC Questions	EPA
97	6 Jan 2025	Hearing Timetable (v4)	PPV
98	10 Jan 2025	Hearing Presentation	Geelong Sustainability
99	10 Jan 2025	Response from Dr Wallis to questions raised by the Committee	Proponent
100	10 Jan 2025	Day 2 version of the draft Planning Scheme Amendment	Proponent
101	10 Jan 2025	Day 2 version of the Environmental Mitigation Measures: mark up of all changes	Proponent
102	10 Jan 2025	Day 2 version of the Environmental Mitigation Measures: mark up of only the day 2 changes	Proponent
103	10 Jan 2025	Supplementary Technical Note STN6 with response to questions raised by the Committee	Proponent
104	10 Jan 2025	Closing submissions	Proponent
105	10 Jan 2025	Letter to IAC - Progress of navigational studies	Ports Victoria
106	10 Jan 2025	Hearing Presentation	Surfrider Foundation Surf Coast Branch
107	13 Jan 2025	Hearing Submission	Surf Coast Energy Group (SCEG)
108	13 Jan 2025	Hearing Presentation	SCEG
109	13 Jan 2025	Herman Daly mini video	SCEG
110	13 Jan 2025	Hearing Presentation	North Shore Residents Group
111	13 Jan 2025	Deadship Tow Gladstone movie – 231201	North Shore Residents Group
112	13 Jan 2025	Hearing Submission	EPA
113	13 Jan 2025	Hearing Submission	Mr Godfrey
114	13 Jan 2025	Hearing Timetable (v5)	PPV
115	14 Jan 2025	Hearing Submission	Ms Marsden-Smith
116	14 Jan 2025	Hearing Presentation	Ms Marsden-Smith
117	14 Jan 2025	Hearing Presentation	Ms Fisher

No	Date	Description	Presented by
118	14 Jan 2025	Hearing Presentation	Port Phillip EcoCentre / Port Phillip Baykeeper
119	14 Jan 2025	Hearing Presentation	Environment Victoria
120	15 Jan 2025	Hearing Presentation	Australian Conservation Foundation (ACF) Geelong Community
121	15 Jan 2025	Hearing Submission	Queenscliff-Point Lonsdale Congregation of the Uniting Church
122	15 Jan 2025	Hearing Presentation	Dr van Huet
123	15 Jan 2025	Hearing Submission	Mr Limb
124	15 Jan 2025	Hearing Presentation	Mr Limb
125	15 Jan 2025	Email from Geelong Sustainability to IAC – Response to question	Geelong Sustainability
126	15 Jan 2025	Hearing Presentation speaking notes	Geelong Sustainability
127	15 Jan 2025	Hearing Presentation speaking notes	Ms Fisher
128	15 Jan 2025	Hearing Presentation	Southern Ocean Protection Embassy Collective (SOPEC)
129	15 Jan 2025	Hearing Submission speaking notes	Climarte
130	15 Jan 2025	Hearing Submission speaking notes	Ms Dunn
131	16 Jan 2025	Hearing Submission	Friends of the Earth Melbourne
132	16 Jan 2025	Email to IAC - Redacted copy of Viva SCW Intake Upgrade (Jacob Report)	Proponent
133	16 Jan 2025	Viva SCW Intake Upgrade, Coastal Modelling Technical Note (13 March 2020) (the Jacobs Report)	Proponent
134	16 Jan 2025	Hearing Submission speaking notes	ACF
135	16 Jan 2025	Closing submission (formatting corrected)	GGS
136	16 Jan 2025	The cost and feasibility of marine coastal restoration (2016) paper	Mr Martin

No	Date	Description	Presented by
137	16 Jan 2025	Hearing Presentation speaking notes	Environment Victoria
138	16 Jan 2025	Dr Parry Review Viva Supplementary EES 2024 [*Appendix to submission 332*]	Environment Victoria
139	16 Jan 2025	Hearing Submission speaking notes	Mr Halpin
140	17 Jan 2025	Response to further questions on notice	EPA
141	17 Jan 2025	Closing submission speaking notes	EPA
142	20 Jan 2025	Reply Submission	Proponent
143	20 Jan 2025	Response to Committee's questions	GGS
144	24 Jan 2025	Response to IAC request for suspended solids maps	Proponent
145	24 Jan 2025	Material referred to in Hearing Presentation - Gas Export Spotlight report	Doctors for the Environment Australia
146	28 Jan 2025	Comments on Day 2 Environmental Mitigation Measures	Environment Victoria
147	30 Jan 2025	Letter to IAC and Parties – Drafting comments	GGS
148	30 Jan 2025	Comments on Day 2 Environmental Mitigation Measures	GGS
149	30 Jan 2025	Comments on Draft Planning Scheme Amendment	GGS

Appendix E Recommended Environmental Mitigation Measures

Tracked Added

~~Tracked Deleted~~

Note: Only Mitigation Measures for which the IAC recommends changes are included. The IAC has used the Proponent's Day 2 version (D101 and D102) as the base.

MM ID	Mitigation measure	Project component	Statutory implementation	Project timing	Potential impact	Reason for Day 2 change
Aboriginal cultural heritage EES evaluation objective: To avoid or minimise adverse effects on Aboriginal and historic cultural heritage						
MM-AH04	**Underwater cultural heritage** Viva Energy will continue to collaborate with WTOAC to identify appropriate measures to avoid or mitigate any potential impacts of the project on underwater cultural heritage values in the project area. In order to mitigate the potential impact to the archaeological/scientific values of the stone artefacts that may be present in lag deposits in the study area, undertake an underwater archaeological sampling program during the construction phase where dredging is to take place. The underwater archaeological sampling program will comprise the following components: • Undertake a high resolution, high density sub-bottom profiling survey prior to dredging to identify optimum locations for sampling. • Obtain sub-seabed samples during dredging for sieving ashore. • Undertake further geotechnical (piston) coring if it is determined it would aid in the interpretation of the high resolution, high density sub-bottom profiling survey.	Refinery Pier extension Seawater transfer pipe Dredging	Incorporated Document CHMP	Pre-construction Construction	Known or unknown underwater Aboriginal cultural heritage values	
Marine ecology and water quality EES evaluation objective: 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.						

MM-ME05a	**Baseline turbidity and light attenuation monitoring** Baseline monitoring and surveys for TSS, turbidity and light attenuation will be individually derived and used to inform and refine threshold limits in MM-ME05 prior to dredging activities. *Turbidity and light attenuation monitoring at the edges of seagrass* Baseline turbidity (NTU) and light attenuation (PAR) monitoring will be conducted commencing 12 months prior to dredging. Turbidity will be continuously monitored at a minimum of three sites along the 3 m depth contour at the offshore boundary of the main seagrass beds proximate to dredging activity which may be affected by turbidity, including seagrass in the Ramsar site. Light attenuation monitors will be located at the same sites identified for turbidity monitoring. Loggers will be deployed at mid-depth along the 3 m depth contour (approx. 1.5 m). Monitoring should be conducted in the same areas as the baseline monitoring of seagrass required by MM-ME06. Water samples for TSS analysis will be collected monthly during the period of baseline monitoring at the turbidity and light attenuation monitoring locations.	Dredging	Consent under the *Marine and Coastal Act 2018*	Prior to construction	Impacts to primary productivity and seagrass communities from dredging	Change made in response to Dr Wallis' and Dr Edmunds' recommendations during oral evidence.
MM-ME05	**Monitor turbidity and light attenuation during dredging, with threshold limits** Manage dredging program to minimise ecological risks associated with elevated turbidity as far as reasonably practicable. *Turbidity monitoring at the edges of seagrass* Turbidity (NTU) will be monitored during the dredging program continuously in north Corio Bay, with a minimum of three sites along the 3 m depth contour at the offshore boundary of the main seagrass beds proximate to dredging activity which may be affected by turbidity, including seagrass in the Ramsar site. Loggers will be deployed at mid-depth along the 3 m depth contour (approx.1.5 m). Monitoring should be conducted in the same areas as the monitoring of seagrass required by MM-ME06. ~~The following limits are proposed as thresholds for action to restrict turbidity releases:~~	Dredging	Consent under the *Marine and Coastal Act 2018*	Construction	Impacts to primary productivity and seagrass communities from dredging	

	~~• 12-hour concentration above 15 NTU (trigger warning)~~ ~~• 24-hour concentration above 12 NTU (action required)~~ ~~The above limits only apply insofar as turbidity is materially contributed to at the monitoring location by dredging activity (as compared with natural spikes in turbidity caused by storms, wave action and the like).~~ *Turbidity monitoring at disposal ground* Turbidity will be monitored continuously at two sites 600 m inshore of the Point Wilson dredged material ground (DMG) to confirm that there is not regular transport of turbidity from barge disposal into shallow water near Point Wilson. *Concurrent light attenuation monitoring* Light attenuation (PAR) will be monitored at the same six sites where turbidity is recorded. Loggers will be deployed at mid-depth along the 3 m depth contour (approx. 1.5 m). *Turbidity thresholds* Turbidity thresholds (a 'trigger warning' threshold and an 'action required' threshold) are to be established to the satisfaction of the EPA prior to commencement of dredging. The thresholds are to be informed by baseline monitoring in MM-ME05a. ~~The following limits are proposed as thresholds for action to restrict turbidity releases:~~ ~~• To be informed by baseline monitoring in MM-ME05a. (trigger warning)~~ ~~• To be informed by baseline monitoring in MM-ME05a (action required)~~ The ~~above limits~~ turbidity thresholds will only apply insofar as turbidity is materially contributed to at the monitoring location by dredging activity (as compared with natural spikes in turbidity caused by storms, wave action and the like). *Contingency measures - ~~trigger~~ action~~s~~ required* Where action is required to reduce turbidity these may include, without limitation~~, actions that will include the following~~:					

	a. reducing the period of overflow from barges to zero, and slowing the dredging cycle of the backhoe b. review the use, location and effectiveness of silt curtains and adjust the silt curtains if needed; and c. dredging during current flows favourable to reduced dispersion of sediment towards seagrasses~~.~~ d. cessation of dredging. Such actions will continue until turbidity drops below the trigger warning level.					
MM-ME06	**Seagrass and seabed biota monitoring in dredged area and Point Wilson dredged material ground** Monitoring will be undertaken to assess the effects of dredging on: • seagrass in the vicinity of the dredged area, including the Ramsar wetland and north-western Corio Bay. The monitoring sites in north-western Corio Bay should include the area within the 5 mg/L suspended solids increment contour on Figure 10 in the IAC Report No. 3 dated 12 March 2025, to assess any impacts on seagrass and confirm recovery if there are impacts. • benthic fauna abundance, diversity and composition in the dredged area and the Point Wilson DMG (to detect any significant changes to infauna communities in the dredged area and the recovery of the Point Wilson DMG) The monitoring of effects on seagrass will include surveys before, during and after dredging to assess impacts on seagrass. The baseline surveys should be undertaken for a period of 12 months prior to dredging. Consideration should be given to the use of monitoring indicators developed by the Western Australian Marine Science Institution (WAMSI). Monitoring must include intertidal and subtidal seagrass. ~~A minimum of two baseline surveys will be made with a 3-month gap prior to dredging, and e~~Eight post-commissioning surveys will be undertaken in the same locations every 3 months for 2 years of benthic fauna abundance, diversity and composition to detect any significant changes to infauna communities in the dredged area and the recovery of the Point Wilson DMG.	Dredging	Consent under the *Marine and Coastal Act 2018*	Construction Operation	Impacts to primary productivity (seagrass) and seabed biota from dredging	

	Assess the implications of any impacts detected by the monitoring for the Corio Bay ecosystem.					
MM-ME07	**Monitoring of plankton before, during and after dredging** Plankton populations will be monitored at four sites in north Corio Bay (as used in the 2020-2021 plankton surveys) before, during and after the dredging period, at two weekly intervals. The purpose is to identify if there is a bloom of toxic phytoplankton as a result of release of nitrogen or toxic algal spores during dredging. Data on relevant water quality parameters will be collected in conjunction with the biological monitoring to assist in the interpretation of results. The phytoplankton surveys will commence 8 weeks before dredging and will continue for 8 weeks after dredging has been completed. The standard notifications to EPA and aquaculture will be made in the event that there is a bloom.	Dredging	Consent under the *Marine and Coastal Act 2018*	Construction	Impacts to primary productivity and plankton populations from dredging	
MM-ME10	**Design diffuser to achieve high dilution** The diffuser for cool water discharge from the FSRU will be designed to achieve a minimum initial dilution of 20:1 to ensure that the chlorine concentration in the diluted discharge is minimised and a temperature change from ambient of less than 0.4°C. The design of the diffuser should have regard to effects on the stability of the sea bed, and be designed to minimise risks of erosion.	FSRU	EPA Development Licence and Operating Licence Consent under the *Marine and Coastal Act 2018*	Design Operation	Temperature impacts related to use and discharge of seawater from the FSRU through the diffuser	
MM-ME12	**Implement biosecurity measures on all vessels** There are well-established measures to control and minimise the introduction of marine pests in Corio Bay and all applicable measures will be implemented, including: • Antifoul coating to prevent the encrusting of biota on the hull; • Vessels from certain ports will be cleaned before entry;	FSRU LNG carriers	Consent under the *Marine and Coastal Act 2018* EPA Development Licence and Operating Licence	Construction Operation	Impacts to the marine environment of Corio Bay through the introduction of marine pests	

	• Manage ballast water in accordance with the Australian Ballast Water Management Requirements (DAWR, 2017); • Manage vessel activities in accordance with the National System for the Prevention and Management of Marine Pest Incursions.					
MM-ME14	**Continue to use and upgrade spill management procedures** Viva Energy and Ports Victoria have a well-established spill management plan. The existing plan will be updated as required and implemented. Where new and improved monitoring procedures are identified these will be implemented.	Refinery Pier FSRU	Incorporated document Consent under the *Marine and Coastal Act 2018* EPA Development Licence and Operating Licence	Construction Operation	Potential impacts to the marine environment from chemicals used	
MM-ME17a	**Baseline monitoring of wastewater discharges from the Refinery** Collect and record at least 12 months of baseline data on existing discharges from the Refinery prior to commencement of construction to assist the interpretation of the data collected under MM-ME19. The baseline data should include flow rate, temperature and residual chlorine concentration of all discharges from the Refinery, to be used as a baseline for comparisons with the data collected under MM-ME17 and MM-ME19, and to identify suitable thresholds.	Refinery	EPA Development Licences and Operating Licences	Prior to operation	Chlorine and temperature impacts related to use and discharge of seawater	
MM-ME17	**Monitor rates and characteristics of all FSRU wastewater discharges** The flow rate, temperature and residual chlorine concentration of all discharges from the FSRU (excluding fire water, water curtain and ballast water) either from the refinery or directly from the FSRU into Corio Bay will be monitored and recorded. Monitoring will be conducted to keep a record of all discharges, confirm that the discharge rate, temperature and chlorine concentration are within the values stipulated in the licence	FSRU Refinery	EPA Development Licences and Operating Licences	Operation	Chlorine and temperature impacts related to use and discharge of seawater	

	conditions of the refinery EPA Licence (No. 46555) and FSRU EPA Licence and, if not, provide the trigger for remedial action.					
MM-ME19	**Monitoring of the effects of wastewater discharges on the marine environment** Monitoring will be undertaken to determine the effects of wastewater discharges from the FSRU (whether via the Refinery or directly from the FSRU into Corio Bay) on marine biota and communities. The monitoring will include but not necessarily be limited to seagrasses, macroalgae and marine fauna (such as mussels and sea squirts). Temperature profiles (and inferred chlorine concentrations) will be recorded at the ecological monitoring sites. The monitoring program should be designed to be sufficiently sensitive to detect potential impacts on ecosystem components such as seagrass, should they occur. The monitoring will map impacts on the ecosystem including seasonal variations, using the baseline monitoring of the impacts of existing discharges from the refinery undertaken under MM-ME17a ~~(undertaken in the Supplementary Statement in accordance with the recommendations in Table 1 of the Minister's Directions) to identify suitable thresholds~~. Assess the implications of any impacts detected by the monitoring for the Corio Bay ecosystem.	FSRU	EPA Development Licences and Operating Licences	Operation	Chlorine and temperature impacts related to use and discharge of seawater	Changes made in response to EPA Amended Recommendation 2 (Document 68).
MM-ME21	**Monitoring the effects of entrainment by the FSRU on plankton** Monitoring will be undertaken to determine the effects of entrainment by the FSRU on plankton. Twelve months of monthly plankton monitoring will be conducted prior to, and following, commencement of operation of the FSRU. Relevant water quality data should be collected alongside the plankton monitoring, including consideration of continuous chlorophyll (Chl a) fluorescence monitoring.	FSRU	EPA Development Licences and Operating Licences	Operation	Impacts of entrainment	New mitigation measure in response to EPA Amended Recommendation 2 (Document 68).

	Plankton monitoring undertaken in the EES will also be used to identify suitable thresholds.					

Appendix F Recommended Incorporated Document

Tracked Added

~~Tracked Deleted~~

Note: Only clauses for which the IAC recommends changes are included. The IAC has used the Proponent's Day 2 version (D100) as the base.

Viva Energy Gas Terminal Project

Incorporated Document
July 2024 [update]

...

4.6 ENVIRONMENTAL MANAGEMENT FRAMEWORK

4.6.1 Prior to the commencement of development (excluding preparatory buildings and works under Clause 4.10.1), an EMF must be prepared to the satisfaction of the Minister for Planning, in consultation with the Council and Department of Energy, Environment and Climate Action.

4.6.2 The EMF must include the mitigation measures that are outlined within the Minister's Assessment, dated [day month 2025], applicable to the design, construction and operation of the Project and address the following areas and any other relevant matters:

a) Aboriginal cultural heritage
b) Air quality
c) Climate change
d) Contamination and acid sulfate soils (onshore)
e) Greenhouse gas
f) Groundwater
g) Historical heritage
h) Landscape and visual
i) Light spill
j) Marine ecology and water quality
k) Noise and vibration
l) Safety, hazard and risk
m) Social and business
n) Surface water
o) Terrestrial ecology impact assessment
p) Transport
q) Underwater noise.

4.6.3 The EMF must set out the process and timing for development of:

a) a Construction Environmental Management Plan (CEMP)
b) an Operations Environmental Management Plan (OEMP)
c) other plans and procedures required by the Mitigation Measures as relevant to any stage of the Project; and
d) an overview of the process and timing for consultation with the relevant stakeholders, including Council, the Department of Energy, Environment and Climate Action, Energy Safe Victoria, the Roads Corporation, Melbourne Water, Heritage Victoria, First Peoples – State Relations, the

Registered Aboriginal Party for the Project Land, WorkSafe Victoria, the Environment Protection Authority, Geelong Grammar School, GeelongPort and local community representatives as relevant.

4.6.4 The CEMP must be prepared to the satisfaction of the Minister for Planning and in consultation with the Council, the Department of Energy, Environment and Climate Action, GeelongPort and Geelong Grammar School as relevant and must include:

a) A summary of key construction methodologies.

b) An overarching framework for site works or specific measures to reduce and manage environmental and amenity effects during construction of the Project, including management plans in respect of:

i) Air quality

ii) Hazardous substances management, including contaminated land and waste management

iii) Noise and vibration

iv) Sediment, erosion and water quality (including surface water and groundwater)

v) Traffic and transport

vi) Acid Sulfate Soil

vii) Marine and terrestrial ecology.

c) A summary of the consultation that informed the preparation of the CEMP and a summary of the proposed ongoing engagement activities with Council, Geelong Grammar School, GeelongPort, the community and other stakeholders during construction of the Project and enquiries and complaints management.

d) A summary of performance monitoring and reporting processes, including auditing, to ensure environmental and amenity effects are reduced and managed during construction of the Project.

4.6.5 The OEMP must be prepared to the satisfaction of the Minister for Planning and in consultation with the Council, the Department of Energy, Environment and Climate Action, GeelongPort and Geelong Grammar School as relevant and must include:

a) An overarching framework for managing environmental and amenity effects during operation of the Project, including management plans in respect of:

i) Air quality

ii) Hazardous substances management, including contaminated land and waste management

iii) Noise and vibration (based on the adjusted Project Noise Criteria extracted in Figure 11 in the IAC's report dated 12 March 2025)

iv) Sediment, erosion and water quality (including surface water and groundwater)

v) Marine monitoring

vi) Native vegetation offset management

vii) Traffic and transport

b) A statement of anticipated annual LNG cargoes.

c) A summary of the consultation that informed the preparation of the OEMP and a summary of the proposed ongoing engagement activities with Council, Geelong Grammar School, GeelongPort, the community and other stakeholders during operation of the Project and enquiries and complaints management.

d) A summary of performance monitoring and reporting processes, including auditing, to ensure environmental and amenity effects are reduced and managed during operation of the Project. The summary of performance monitoring and reporting processes will include the monitoring and reporting frequencies and will identify the relevant agencies to which monitoring reports will be provided.

4.6.6 The EMF must include 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*.

4.6.~~6~~7 The EMF may be amended from time to time, to the satisfaction of the Minister for Planning.

4.6.~~7~~8 The use and development of the Project must be carried out in accordance with the approved EMF including the mitigation measures and all plans and procedures required by them.

...