

REFERRAL OF A PROJECT FOR A DECISION ON THE NEED FOR ASSESSMENT UNDER THE *ENVIRONMENT EFFECTS ACT 1978*

REFERRAL FORM

The *Environment Effects Act 1978* provides that where proposed works may have a significant effect on the environment, either a proponent or a decision-maker may refer these works (or project) to the Minister for Planning for advice as to whether an Environment Effects Statement (EES) is required.

This Referral Form is designed to assist in the provision of relevant information in accordance with the *Ministerial Guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Seventh Edition, 2006). Where a decision-maker is referring a project, they should complete a Referral Form to the best of their ability, recognising that further information may need to be obtained from the proponent.

It will generally be useful for a proponent to discuss the preparation of a Referral with the Impact Assessment Unit (IAU) at the Department of Environment, Land, Water and Planning (DELWP) before submitting the Referral.

If a proponent believes that effective measures to address environmental risks are available, sufficient information could be provided in the Referral to substantiate this view. In contrast, if a proponent considers that further detailed environmental studies will be needed as part of project investigations, a more general description of potential effects and possible mitigation measures in the Referral may suffice.

In completing a Referral Form, the following should occur:

- Mark relevant boxes by changing the font colour of the 'cross' to black and provide additional information and explanation where requested.
- As a minimum, a brief response should be provided for each item in the Referral Form, with a more detailed response provided where the item is of particular relevance. Cross-references to sections or pages in supporting documents should also be provided. Information need only be provided once in the Referral Form, although relevant cross-referencing should be included.
- Responses should honestly reflect the potential for adverse environmental effects. A Referral will only be accepted for processing once IAU is satisfied that it has been completed appropriately.
- Potentially significant effects should be described in sufficient detail for a reasonable conclusion to be drawn on whether the project could pose a significant risk to environmental assets. Responses should include:
 - a brief description of potential changes or risks to environmental assets resulting from the project;
 - available information on the likelihood and significance of such changes;
 - the sources and accuracy of this information, and associated uncertainties.
- Any attachments, maps and supporting reports should be provided in a secure folder with the Referral Form.
- A CD or DVD copy of all documents will be needed, especially if the size of electronic documents may cause email difficulties. **Individual documents should not exceed 2MB as they will be published on the Department's website.**

- A completed form would normally be between 15 and 30 pages in length. Responses should not be constrained by the size of the text boxes provided. Text boxes should be extended to allow for an appropriate level of detail.
- The form should be completed in MS Word and not handwritten.

The party referring a project should submit a covering letter to the Minister for Planning together with a completed Referral Form, attaching supporting reports and other information that may be relevant. This should be sent to:

Postal address

**Minister for Planning
GPO Box 2392
MELBOURNE VIC 3001**

Couriers

**Minister for Planning
Level 20, 1 Spring Street
MELBOURNE VIC 3001**

In addition to the submission of the hardcopy to the Minister, separate submission of an electronic copy of the Referral via email to ees.referrals@delwp.vic.gov.au is required. This will assist the timely processing of a referral.

PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Name of Proponent:	AGL Wholesale Gas Limited (AGL)
Authorised person for proponent: Position: Postal address: Email address: Phone number: Facsimile number:	Phaedra Deckart General Manager – Energy Supply and Origination 699 Bourke St, Docklands VIC 3000 pdeckart@agl.com.au 03 8633 6023 N/A
Person who prepared Referral: Position: Organisation: Postal address: Email address: Phone number: Facsimile number:	Shelley Ada Senior Environmental Consultant Jacobs Group (Australia) Pty Ltd 452 Flinders St, Melbourne VIC 3000 Shelley.Ada@jacobs.com 03 8668 3417 N/A
Available industry & environmental expertise: (areas of 'in-house' expertise & consultancy firms engaged for project)	<p>The AGL group has over 180 years' history in the energy industry, operating across the supply chain with investments in energy retailing, thermal electricity generation, and renewable projects. AGL owns and operates two gas storage facilities – Newcastle Gas Storage and Silver Springs Gas Storage Facility and is one of Australia's largest retailers of gas and electricity with more than 3.6 million customers in Victoria, NSW, South Australia, WA and Queensland. AGL has engaged suitably qualified consultants to undertake a range of investigations relevant to the AGL Gas Import Jetty Project (the Project).</p> <p>Jacobs Group (Australia) Pty Ltd (Jacobs) has been engaged to project manage the environmental and planning assessments for the Project.</p> <p>Jacobs has prepared the following specialist studies:</p> <ul style="list-style-type: none"> • Jacobs 2018a, Aboriginal Heritage Due Diligence Assessment (Attachment 1) • Jacobs 2018b, Air Quality Impact Assessment (Attachment 2) • Jacobs 2018c, Contaminated Land Assessment (Attachment 3) • Jacobs 2018d, Environmental Noise Assessment (Attachment 4) • Jacobs 2018e, Flora and Fauna Assessment (Attachment 5)

	<ul style="list-style-type: none"> • Jacobs 2018f, Greenhouse Gas Emissions Assessment (including Climate Change) (Attachment 6) • Jacobs 2018g, Historic Heritage Assessment (Attachment 7) • Jacobs 2018h, Hydrology Impact Assessment (Attachment 8) • Jacobs 2018i, Desktop Social Impact Assessment (Attachment 9) <p>CEE - Consulting Environmental Engineers and Scientists (sub-consultant to Jacobs) has extensive experience in the marine environment and has been responsible for preparing the following assessments:</p> <ul style="list-style-type: none"> • CEE 2018a, Plume Modelling of Discharge from LNG Facility (Attachment 10A) • CEE 2018b, Chlorine in Seawater Heat Exchange Process at Crib Point (attachment 10b) • cee 2018c, assessment of effects of cold-water discharge on marine ecosystem (Attachment 10C) • CEE 2018d, Modelling and Assessment of Biological Entrainment into Seawater Heat Exchange System (Attachment 10D) • CEE 2018e, Marine Ecosystem Protected Matters Assessment (Attachment 10E) • CEE 2018f, Effects of LNG Facility on Sea Level and Seabed at Crib Point Jetty (Attachment 10F) <p>Ethos Urban (sub-consultant to Jacobs) has extensive knowledge on landscape and visual impact assessments and has been responsible for preparing the following assessment:</p> <ul style="list-style-type: none"> • Ethos Urban 2018, Landscape and Visual Impact Assessment (Attachment 11) <p>AGL has separately undertaken Community Consultation for the Project and has prepared the following report to summarise the consultation activities completed to date.</p> <ul style="list-style-type: none"> • AGL 2017-18, AGL Gas Import Jetty Consultation Summary, July 2017 to August 2018. (Attachment 12) <p>In assessing both the potential cumulative and indirect impacts associated with the overall proposals being referred under the EE Act and those specifically associated with the Crib Point Pakenham Pipeline Project (Pipeline Project), AGL has also relied upon specialist environmental and planning assessments carried out by AECOM. AECOM is a specialist consulting firm with expertise across the planning and environmental disciplines.</p>
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2. Project – brief outline

<p>Project title:</p> <p>AGL Gas Import Jetty Project</p>																					
<p>Project location: (describe location with AMG coordinates and attach A4/A3 map(s) showing project site or investigation area, as well as its regional and local context)</p> <p>The Project is located at the Crib Point Jetty, 65 km south-east of Melbourne on the Mornington Peninsula (Project Site) (Map A). The Project Site is situated in the Shire of Mornington Peninsula on land leased and managed by the Port of Hastings Development Authority (PoHDA) (allotment 2040, The Esplanade, Crib Point). The site is industrial in nature and is on land designated for Port related activities in the Port of Hastings. The Mornington Peninsula Planning Scheme identifies the land as being in the Port Zone. The location of the Project Site and surrounding area, including key features, is provided in Map B.</p> <p>The Project is located within Western Port, a large tidal bay opening into Bass Strait which incorporates around 260 km of coastline. Western Port features two large islands; French Island to the north which is predominantly agricultural (where the land is freehold), and Phillip Island to the south which is known for its tourism industry.</p> <p>Key urban centres on the coastline of Western Port and in the vicinity of the Project Site include the township of Crib Point (approximately 1.5 km from the Project Site), the township of Bittern (approximately 3.7 km from the Project Site) and the township of Hastings (approximately 4 km from the Project Site). For more than 50 years, these areas have hosted a number of industrial activities, including petroleum refining and storage as well as gas and steel processing facilities. Hastings also features the main boat landing point in Western Port. A decommissioned submarine, HMAS Otama, is moored near Crib Point. The Royal Australian Navy base HMAS Cerberus is located further to the south of Crib Point and the Victorian Maritime Museum is also in Crib Point, opposite the gated entrance to the Project's landside component.</p> <p>The AMG coordinates for the Project Site boundaries are listed in Table 1.</p> <p>Table 1: Project Site AMG coordinates</p> <table border="1"> <thead> <tr> <th>Project Location</th> <th>Easting</th> <th>Northing</th> </tr> </thead> <tbody> <tr> <td>North west extent</td> <td>344088.4</td> <td>5754046</td> </tr> <tr> <td>South west extent</td> <td>344.090.4</td> <td>5753890</td> </tr> <tr> <td>North east extent</td> <td>344911.4</td> <td>5754122</td> </tr> <tr> <td>South east extent</td> <td>344964.3</td> <td>5753437</td> </tr> <tr> <td>Far east (top)</td> <td>344986.6</td> <td>5753916</td> </tr> <tr> <td>Far east (bottom)</td> <td>345008.9</td> <td>5753591</td> </tr> </tbody> </table> <p>A Project Site layout is provided in Map C, which shows a limited land disturbance footprint within the Project Site, but assessment of the broader Project Site has been undertaken in the specialist studies which support this referral.</p> <p>The Project will use Berth 2 of the Crib Point Jetty (the southern berth), which is currently not in use. The northern most berth (Berth 1) is used by United Petroleum Australia (United), which operates the Berth 1 jetty head under a licence from the PoHDA for the purpose of petroleum imports.</p>	Project Location	Easting	Northing	North west extent	344088.4	5754046	South west extent	344.090.4	5753890	North east extent	344911.4	5754122	South east extent	344964.3	5753437	Far east (top)	344986.6	5753916	Far east (bottom)	345008.9	5753591
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<p>Short project description (few sentences):</p> <p>AGL is proposing to develop a Liquefied Natural Gas (LNG) import facility, using a Floating Storage and Regasification Unit (FSRU), to be located at Crib Point. The Project, known as the "AGL Gas Import Jetty Project" (the Project), comprises:</p>																					

- The continuous mooring of an FSRU at the existing Crib Point Jetty, which will receive LNG carriers of approximately 300 m in length;
- The construction of ancillary topside jetty infrastructure (Jetty Infrastructure) including high pressure gas unloading arms and a high pressure gas flowline mounted to the jetty and connecting to a flange on the landside component to allow connection to the Pipeline Project.

The FSRU will receive LNG from visiting LNG carriers (that will moor directly adjacent to the FSRU), store the LNG and re-gasify it as required to meet demand within the eastern Australian gas market. The Project life is anticipated to be approximately 20 years, however it may be extended pending security and stability of gas supply to south-eastern Australia.

3. Project description

Aim/objectives of the project (what is its purpose / intended to achieve?):

Victoria, and the other States - South Australia, New South Wales and Tasmania - that rely heavily on gas production from Victoria, continue to have a threat to security of supply and exposure to a gas shortfall from 2021, if there is not a significant discovery of, or significant investment in, new sources of supply coming to market. The forecast gas supply shortfalls raises the prospect of higher and more volatile prices for Australian customers, reflecting competition for scarcer domestic gas supplies. In addition, there is now the potential for an increased need for gas-powered generation due to weather related or contingency events that could still adversely impact this forecast and tighten the supply demand balance once again. In seeking to maintain security and stability of gas supply, and keep downward pressure on prices, AGL is actively working on securing gas supplies from alternative sources, including the Project.

Accordingly, the purpose of the Project is to facilitate the development of a new source of LNG supply into south-eastern Australia. The new LNG supply would then be available, following regasification, for supply as high-pressure gas into the eastern Australian gas market.

The Project will play an important role in the gas market, in three ways:

1. **Liquidity** - Additional supply from a new supply source will have the effect of capping gas prices at international LNG prices and keep downward pressure on prices – historically, we have seen prices in Victoria and New South Wales exceed international LNG prices at times of scarcity, for example in on 13 July 2016 we saw gas spot prices at the unprecedented level of \$43.55/GJ (6am price) due to a shortage of supply during that period. The Melbourne population is forecast to grow and continues to rely on gas for heating, hot water and cooking, the LNG import terminal will allow additional gas supply to be imported on a flexible basis to meet the needs of this population growth if required;
2. **Security & Reliability** - LNG imports will provide a new source of supply in the market, providing additional storage capacity during times of short supply and additional emergency back-up supply, in addition to that supplied by the Iona Storage facility, developed to provide security of supply post the Longford explosion at the Exxon Mobil operated facility that occurred on 25 September 1998. At present 80% of Victoria's gas supply is provided by the Esso-BHP supply injected into the Longford to Melbourne Pipeline. While AGL's Project will also utilise the same pipeline to inject gas from Crib Point to Pakenham it will provide diversity of supply, reducing the existing single source supply risk that exists today and provide additional system stability and line pack services into the Victorian Transmission System.
3. **Capacity & Flexibility** - Gas for peaking generation requires a different method of delivery, the market wants shaped gas or peak shaving gas, LNG imports is intended to give the National Electricity Market the gas supply it needs in the way it needs it and ultimately allows consumers to have a secure stable source of energy supply as the energy supply mix transitions to an increasing penetration of renewables. The Project also provides the ability to contract both short term supply and longer term supply – and if the market needs further gas – the ability to bring spot cargos in at short notice. Gas will become a critical element in balancing the market at a time when there is a looming shortfall and the next

tranche of gas to be developed is least able to carry the additional capital costs of providing gas supply flexibility & swing. Gas can and is playing a crucial role in providing stability to the electricity market and providing firm and flexible back-up electricity generation.

Background/rationale of project (describe the context / basis for the proposal, e.g for siting):

In March 2018 the Australian Energy Market Operator (AEMO) Gas Statement of Opportunities reported Victoria would experience significant gas shortages within three years based on its gas forecast report. The AEMO report found that, despite falling gas consumption in the state, Victoria was on track to have a shortfall of up to 36 terajoules on a very cold winter day in 2021, increasing to a 220 shortfall on a severe winter day in 2022.

The report said this was driven by a 38 per cent fall in annual gas production from the Gippsland Basin in Bass Strait below 2018 production forecasts and a 68 per cent fall from Port Campbell, mostly due to some offshore fields ceasing production.

AGL and its related entities have historically sourced natural gas from Australian production basins in Victoria, South Australia and Queensland. Many of these supply sources in the southern states are in decline and in order to meet the needs of the market from 2021 significant investment in upstream development in the southern states needed to occur years ago to ensure gas was available when the market needed it.

AEMO published another forecast report in June 2018 which said commitments from producers to increase domestic gas supplies after government threats to curtail exports will hold off gas shortages until at least 2030. However, AEMO's report shows many of the supply sources AGL has relied upon to meet the needs of the market and its customers are in decline with future production reliant on contingent and prospective resources that have yet to be proven technically or commercially viable or have development plans attached to them to come to market (Figure 1).

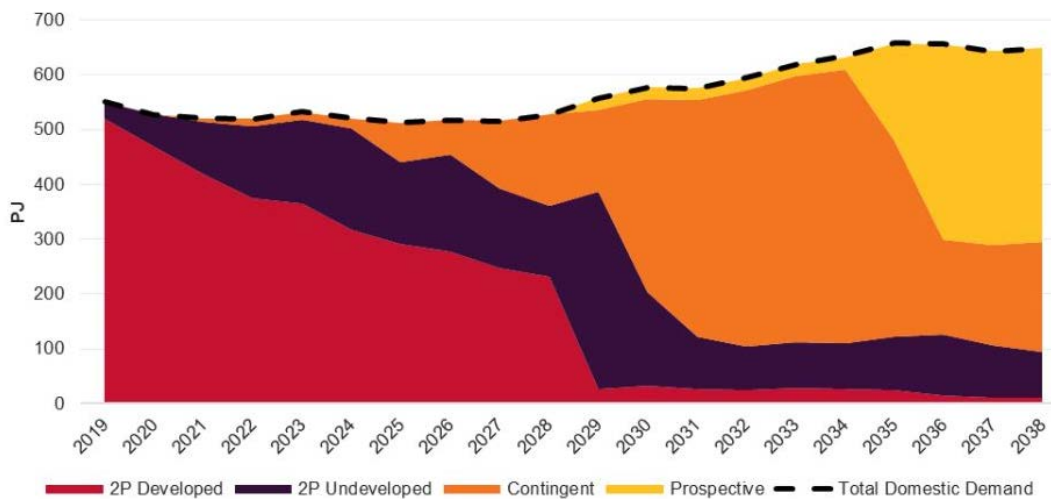


Figure 1: AEMO's latest gas forecast report relies on contingent and prospective reserves (AEMO, June 2018)

Therefore, in order to maintain the security and stability of gas supply in south-eastern Australia, AGL is actively working on securing gas supplies from non-traditional sources, including LNG imports.

Liquefaction of methane to make LNG provides for highly efficient transportation and storage as LNG occupies 1/600th of the volume of methane in its gaseous form. The LNG shipping industry has been operating for over 50 years with a strong safety record. Currently there are 95 LNG import terminals in operation with 12 more under construction.

AGL investigated several potential LNG re-gasification sites in eastern Australia and determined that Victoria, and in particular Crib Point and its adjoining land, is the preferred location for the Project. Crib Point offers:

- An existing berth in a deep water port within a sheltered bay
- An existing under-utilised jetty of a suitable size to accommodate the FSRU at a dedicated berth and receive a double berthed LNG Ship approximately 300 m length overall (LOA) alongside
- An existing operational industrial marine facility, providing a sound context for the further development of maritime industry activities
- Proximity to the existing high pressure gas transmission grid
- Proximity to AGL's largest gas demand centre, which is Victoria.

The Project will contribute to the following benefits for Victoria:

- Ability to provide gas supplies to meet peak demand during the Victorian winter and for gas fired electricity generation
- Additional security of supply to the Victorian gas market during peak periods or outages.
- Once connected to the Victorian gas network, the Project can also provide long term security of supply to south eastern states, leveraging AGL's contracted capacity on the existing pipeline network with minimal modification required to that pipeline network.
- Provide additional supply to complement AGL's contracted storage capacity at the Iona Gas Plant (Port Campbell in south-west Victoria).

AGL assessed the potential for an onshore terminal for the regasification and storage of LNG, however there were several factors which favoured a FSRU:

- FSRUs are a proven and an increasingly adopted technology, with 26 facilities in operation.
- An onshore terminal could utilise a large single tank whereas the FSRU will be a double-hulled vessel, with a number of segregated internal tanks.
- The FSRU will be moored at the end of the jetty further from communities, providing a larger noise and safety buffer zone. For a FSRU, an ignition exclusion zone would be over the water away from land and vegetation.
- The FSRU can be built, commissioned and all safety and production systems verified for optimal operating parameters prior to being brought to site.
- If any safety or operational issues arise, the FSRU will be capable of departing the berth and returning to a ship yard for maintenance or an alternate vessel can be sourced.
- The time to construct an onshore terminal is typically 27-36 months compared to a typical 18 months for the conversion of a vessel to an FSRU (Songhurst 2017). Construction of an onshore terminal would necessarily involve more significant environmental impacts on the Project Site and the community during the construction phase than the mooring of the FSRU.
- An onshore terminal can typically cost 100% more than the cost of a new FSRU (Songhurst 2017).
- Use of an FSRU avoids the impact of building large above ground infrastructure onshore – an onshore terminal would consist of large scale regasification plant and storage tanks. As the FSRU is an operating ship, when the Project concludes the FSRU can be relocated elsewhere and there is no major aboveground infrastructure remaining to manage or decommission and remove. At the end of the Project life, the FSRU may move to another location (anywhere in the world) to be reused.

Main components of the project (nature, siting & approx. dimensions; attach A4/A3 plan(s) of site layout if available):

Landside component of the Project Site

The landside component of the Project Site ('landside component') is located within Crown Allotment 2040, Parish of Bittern (SPI: 2040\PP2159) and situated at The Esplanade, Crib Point, which is Crown land vested to the PoHDA. During construction, temporary construction laydown and vehicle parking areas will be established on the areas already cleared of vegetation within the landside component, which has been defined as the indicative landside disturbance footprint as shown in Map C.

The permanent infrastructure of the Project will consist of the flange and gas flowline as part of the Jetty Infrastructure located within the landside component of the Project Site, connecting to the Pipeline Project. The Jetty Infrastructure is also shown on Map C.

Floating Storage and Regasification Unit (FSRU)

The Project will use a FSRU vessel continuously moored at Berth 2 of the Crib Point Jetty. LNG will be delivered to the facility by an LNG carrier double berthed directly adjacent to the FSRU.

The FSRU will store the LNG at approximately -162°C in cryogenic storage tanks. The cold temperature keeps the LNG cargo in its liquid state until it is required for the gas network. Heat is required to return the LNG to a gaseous state. The preliminary design of the FSRU includes the supply of heat from seawater, which will be drawn into the FSRU through the vessel sea chest or dedicated ports in the hull and circulated through heat exchangers. A daily volume of up to $450,000\text{ m}^3$ (450 ML/day) of seawater from Western Port will be pumped at a rate of $5.2\text{ m}^3/\text{s}$ through heat exchangers in the FSRU. A daily volume of up to $450,000\text{ m}^3$ (450 ML/day) will also be returned to Western Port. The temperature drop from the seawater intake to the point of exit is estimated to be 7°C cooler than the ambient seawater temperature prior to mixing back to ambient temperature.

To prevent the growth of marine organisms in the heat exchange system on the FSRU, the seawater intake will be subject to an electrolysis process (electric current through seawater) to produce chlorine and hypochlorite. The seawater discharged from the FSRU heat exchange process will contain short-lived residual chlorine at a concentration of 100 parts per billion or 0.1 mg/L at the point of exit and prior to any blending or decay.

The regasification system will be capable of delivering 500 million standard cubic feet per day (mmscf/d) (a unit of measurement for gases) of "firm" gas at high reliability and up to 750mmscf/d on an "as available" basis with lower reliability. This is the equivalent to more than the current Victorian natural gas market. The daily seawater intake volume of up to $450,000\text{ m}^3$ (450 ML/day) (referred to herein) is based upon the higher regasification rate of 750mmscf/d. However, it is unlikely to operate at this maximum operating output unless there was a requirement to fill short term supply shortfalls in the gas market. Therefore, a seawater flow-through rate of $300,000\text{ m}^3/\text{day}$ (300 ML/day) corresponding to a lower regasification rate of 500mmscf/day is more likely.

Jetty Infrastructure

The existing concrete jetty at Crib Point (Figure 2) was constructed as part of BP's refinery infrastructure in the 1960s. The refinery closed in 1986 and the southernmost berth (Berth 2) at the jetty was decommissioned. The jetty is approximately 970 m in length (total), running west to east (approximately 530 m), with a berthing head running north to south (approximately 440 m). Berth 1 was designed for ships up to 100,000 DWT. Berth 2 was originally designed for ships up to 20,000 DWT but was upgraded by the addition of supplementary mooring dolphins and assessed for vessels of 60,000 DWT.

The northern most berth (Berth 1) remains in operation for the import of liquid fuel by United, which operates the Berth 1 jetty head under a license from the PoHDA.

In consultation with the PoHDA, the pilots, the harbourmaster and the Victorian Regional Channels Authority (VRCA), Berth 2 at Crib Point was selected as the berthing location for the FSRU (Figure 3). Arriving LNG carriers will berth into the ebb tide facing north, with the cargo transfer occurring via the port side of the LNG carrier. LNG carriers will depart via the existing deep-water swing basin.

The infrastructure mounted on the Jetty (Jetty Infrastructure) includes high pressure gas unloading arms and a high pressure gas flowline. Gas will be discharged from the FSRU and then transmitted through the gas flowline, which will connect to a flange on the landside component to allow connection to the Pipeline Project. A firefighting system will also be installed to provide cooling and safe coverage for the wharf and wharf personnel.



Figure 2: View of Crib Point Jetty from the west



Figure 3: View of Crib Point jetty from the south-east

Ancillary components of the project:

N/A

Key construction activities:

There are no construction activities required for the FRSU component of the Project. The key construction activities relate to the construction of the Jetty Infrastructure as outlined below. These works are typical for these types of infrastructure.

Preparatory Works (landside and Jetty):

- Construction laydown area for temporary construction purposes only, including the storage of pipes, construction machinery and equipment
- Relocation of utility services
- Establishment of hard stand areas in pre-existing cleared areas
- Civil / site establishment works including the installation of temporary site fencing, storage areas and site offices/amenities
- Establishment of environmental controls such as fencing to cordon off no-go areas (vegetation) and bunding
- Service connections and relocations.

Installation of Jetty Infrastructure:

- New gas unloading arms

- The installation of the unloading arms will be undertaken from the water using a barge with crane. Two loading arms will be mounted onto a prefabricated steel structure, grillage platform that will be anchored to the existing pier head deck. To allow the installation of the new unloading arms, a new gas manifold will be installed around the middle of the pier head.
- Gas flow line mounted to the jetty
 - Pipe lengths (18 m or 12 m lengths) will either be transported onto the jetty via crane and placed in position or alternatively placed in position by a barge and crane. The pipe lengths will be welded into position and attached to the jetty along a pipe rack.
 - The gas flow line from the jetty will connect to a flange within the landside component (to connect to the Pipeline Project's "End of Line facilities").
- Fire Fighting System:
 - Currently, there is no firefighting capability on Berth 2. A firefighting system, similar to that on Berth 1, will be designed and installed to provide cooling and safe coverage for the wharf and wharf personnel. All pumping systems, fire towers and supporting platforms will be installed via a crane mounted barge.

Key operational activities:

- The FSRU will be continuously moored at Berth 2 of the Crib Point Jetty as shown in Figure 2. The FSRU will remain as an operational ship and able to be moved as required, such as in extreme weather events or for maintenance activities.
- A LNG carrier will transport LNG to the Crib Point Jetty and berth adjacent to the FSRU. LNG will be offloaded to the FSRU over a period of approximately 24 hours. The LNG carrier will then depart from alongside the FSRU.
- Delivered LNG will be procured from a range of suppliers in the Asia Pacific region and globally. LNG will be transferred from the LNG carrier to the FSRU by flexible hoses between the vessels, at a combined rate expected to be in the order of 8,000 to 11,000m³/hr. LNG will be pressurised and then vaporised in a regasification system on board the FSRU to deliver high pressure gas to the jetty via high pressure gas unloading arms.
- The FSRU will store the LNG and re-vaporise it as required to meet demand. The FSRU will include a regasification process that takes in and returns seawater, manages boil off gas from the LNG cargo tanks, and will include power generation and the operation of four (4) reciprocating gas engines.
- The four (4) reciprocating gas engines on board the FSRU, will have a total capacity of 38.5MW and maximum fuel demand of 6.8 TJ/d used to provide all the power required on board for regasification operations, i.e. for driving the compressors, pumps, ventilation fans, general utility, etc. The engines will also provide electric power for propulsion of the FSRU.
- Boil off gas from the LNG cargo tanks within the FSRU will be compressed for recovery and use. Excess boil-off gas can be burned either in a disposal combustor or a minimum send out compressor installed to allow delivery of gas to the transmission network.
- The gas will be transferred from the FSRU via a high pressure flowline along Crib Point Jetty to a flange, which will connect to the End of Line facilities for the Pipeline Project.

Key decommissioning activities (if applicable):

The Project life is anticipated to be approximately 20 years. However, it may be extended to address security and stability of gas supply to south eastern Australia. When the Project is complete, the FSRU will leave Western Port.

The upgraded jetty will remain as an operational jetty, under the ownership and management of PoHDA.

Is the project an element or stage in a larger project?

No Yes If yes, please describe: the overall project strategy for delivery of all stages and components; the concept design for the overall project; and the intended scheduling of the design and development of project stages).

Outlined below are the other proposed activities and works that are related to the AGL Gas Import Jetty Project, which are being considered as part of the overall proposal being referred under the EE Act. However, note these different projects/works will be constructed, operated and owned by different companies.

The initial purpose of the Pipeline Project is to enable the connection of the Jetty Project to the Victorian Transmission System (VTS). While the APA Pipeline Project is the subject of a separate referral form and associated technical assessments, it is to be considered as part of this referral to enable an overall assessment of the proposals under the EE Act. AGL and APA are submitting their respective referral documentation to enable consideration of all the components of the proposals and the corresponding direct, indirect and cumulative impacts. This will enable a comprehensive, integrated and transparent assessment of the overall proposals (including the AGL Gas Import Jetty Project) under the EE Act.

The Pipeline Project consists of the following components:

- Approximately 56 km of high pressure gas transmission pipeline with a nominal diameter of 600mm, within a construction right-of-way (ROW) of 30m in width and an operational easement of 15m in width;
- Two mainline valves (MLVs), which will be situated along the route of the pipeline and either remotely or manually operated. MLVs are provided as a means to isolate the pipeline in segments for emergency management, maintenance, repair and/or operation;
- A cathodic protection system is to be provided via a combination of cross-bonds to existing cathodic protection system and the installation of an impressed current system at either of the MLVs which will be determined during detailed design. The system will be designed to use both impressed current and sacrificial anodes;
- Crib Point Receiving Facility situated at landside of the Crib Point Jetty and include metering, pigging facility, nitrogen storage and injection, odourant plant, gas analysers and a vent stack;
- Pakenham Delivery Facility situated adjacent to the Pakenham East Rail Depot, which is within land owned by Public Transport Victoria and include a scraper station, filtration, metering, heating, pigging facility and a vent stack; and
- An underground scraper/delivery station on the Longford Dandenong Pipeline and the Bunyip to Pakenham Pipeline (collectively referred to as the Longford Dandenong Pipeline) where the proposed pipeline connects to them. This station, which will be within the area of the permanent easement, will consist of a number of fittings that will allow for the future connection of temporary pig traps to inspect the internal lining of the pipeline during operations.

The design life of the pipeline and pipeline valves and assemblies (excluding scraper traps) is 60 years. Other station equipment, piping fixtures and instrumentation have a design life of between 10 and 40 years and will require maintenance and replacement during the pipeline design life. With ongoing integrity management, and subject to appropriate commercial drivers, the operational life of the pipeline is expected to be longer.

The potential relevant indirect and cumulative effects of the Project arising from these related activities are set out in section 19 'Other activities' below.

Is the project related to any other past, current or mooted proposals in the region?

No Yes If yes, please identify related proposals.

- Jetty Upgrade works are being undertaken by PoDHA, including the refurbishment of the existing Crib Point Jetty and construction of new mooring and berthing dolphins to provide an

upgraded berth for shipping. A consent under the *Coastal Management Act 1995* (Coastal Management Act consent) has been issued to the PoHDA for this work.

- Flattening of the seabed: The movement of vessels of various sizes through Western Port has resulted in the creation of a high spot on the seabed in the vicinity of the southern end of the existing Berth 2 wharf infrastructure. VRCA, as part of their routine maintenance activities for maintaining operation of the jetty, will be flattening the high spot. This is also required to accommodate ships like the FSRU and LNG carriers. A Coastal Management Act consent has been issued for this work.

4. Project alternatives

Brief description of key alternatives considered to date (e.g. locational, scale or design alternatives. If relevant, attach A4/A3 plans):

The following alternatives in technology, design and site location were considered and assessed by AGL:

Studies identified as potential sites for AGL to import gas included Crib Point in Victoria, Port Adelaide in South Australia and Port Kembla in New South Wales. (Other sites including Newcastle, Geelong and Port of Melbourne were evaluated and ruled out due to a lack of suitable berths, lack of market or shipping channel access.)

The evaluation process considered several factors including access to key gas markets, the cost of incremental pipeline transmission, the availability of suitable land for onshore facilities, the cost of existing or new build pipelines, existing investments within AGL's wholesale gas portfolio, marine and port suitability including minimising any requirements for dredging and operations in already congested ports, stakeholder feedback and regulatory approval timelines and their impact on the project timeline.

The Port Adelaide site was assessed as less optimal for this project compared to the Crib Point location for the following reasons:

- The Port Adelaide site would require extensive dredging to create a new berth at the Outer Harbour, immediately west of Pelican Point power station.
- The location provides access to existing pipelines at Torrens Island via a new 6 km pipeline. However, access to the wider market requires a significantly higher cost due to extensive pipeline network modifications (estimated to exceed A\$100M). These modifications include the reversal of the Moomba to Adelaide Pipeline and the South-East Gas Pipeline and an interconnect between the pipelines.
- The Port Adelaide location has constraints to access a broader market, which limit the ability of the project to supply more generally the east coast gas market.

The NSW Port location (Port Kembla) was assessed as less optimal for this project than the Crib Point location for the following reasons:

- Marine operations – The berth identified as unutilised is adjacent to the breakwater; this gives rise to issues associated with the vessels being unable to depart from the berth unassisted. The rock armour increases the risk of damage to LNG ships due to the potential effects of passing ships and ocean swell.
- Pipeline modifications – The Port Kembla site requires two export pipeline routes to connect into the Moomba to Sydney Pipeline (which is bi-directional) and to connect into the Eastern Gas Pipeline (EGP), which will also need to be modified to allow for bi-directional flow.
- Significant pipeline modifications would be required to transport gas to other demand centres.

- The Port Kembla location also has constraints to access a broader market, which limit the ability of the project to supply more generally the east coast gas market.

Onshore Terminal

An onshore terminal for the regasification and storage of LNG, as an alternative to a FSRU, was not favoured for the following key reasons:

- An onshore terminal could utilise a large single tank whereas the FSRU will be a double-hulled vessel, with a number of segregated internal tanks.
- The FSRU will be moored at the end of the jetty further from communities, providing a larger noise and safety buffer zone. For a FSRU, ignition exclusion zone would be over the water away from land and vegetation.
- The FSRU can be built, commissioned and all safety and production systems verified for optimal operating parameters prior to being brought to site.
- If any safety or operational issues arise, the FSRU will be capable of departing the berth and returning to a ship yard for maintenance or an alternate vessel can be sourced.
- The time to construct an onshore terminal is typically 27-36 months compared to a typical 18 months for the conversion of a vessel to an FSRU (Songhurst 2017).
- An onshore terminal can typically cost 100% more than the cost of a new FSRU (Songhurst 2017).
- Utilisation of an FSRU avoids the impact of building large aboveground infrastructure onshore – an onshore terminal would consist of large scale regasification plant and storage tanks. As the FSRU is an operating ship, when the Project concludes the FSRU can be relocated elsewhere, and there is no major above ground infrastructure remaining to manage or decommission and / or remove. The FSRU may then move to another location (anywhere in the world) to be reused.

Regasification Alternatives

A number of methods for regasification are available. However, the selection of an optimum process is dependent upon various factors including plant site location, climatic conditions, throughput capacities, energy efficiency and emissions and regulatory approvals.

A range of worldwide studies have examined the current regasification processes and summarised the relative merits of each. In summary:

- Open loop - For an open loop system, seawater typically passes once through a heat exchange system and does not come in to direct contact with the LNG. The energy used to pump the seawater through the heat exchanger consumes about 1.5% of the send out gas for power generation, similar to onshore terminals (Songhurst 2017). Seawater is generally used as a heat source for vaporising and warming LNG, except in cold climates Patel et al. (n.d). Open loop is the most commonly used system globally for FSRUs.
- Closed loop - A closed loop system uses steam with water/glycol circulating within a heat exchange system. The water/glycol mixture is pre-heated by steam from boilers installed on the FSRU. This method uses a further 1% of the send out gas to heat the circulating fluid to vaporise the LNG i.e. a total consumption of 2.5% (Songhurst 2017). This contributes to a significant increase in greenhouse gas emissions and reduces the plant output. This operating mode requires additional capital investment in boilers and additional operating costs. Due to the environmental and economic implications, closed loop systems are becoming less commonly used.
- Intermediate fluid vaporisation process (IFV) – IFV involves a two-stage vaporisation process – the first using propane and the second with the seawater or other heating medium. IFV reduces the risk of freezing by not contacting the LNG with seawater and can also use

compact heat exchangers reducing weight and size, however the major disadvantage is the introduction of highly flammable propane on to the FSRU (Songhurst 2017).

- Ambient air heating – Air, as another source of heat is used in warmer climates through ambient air vaporisation (AAV). AAV will avoid the use of fuel gas and the generation of greenhouse gas, and will have less potential impact on marine environments as it does not involve discharge of cooled seawater. In cooler climates, a heat system will be required to supplement the AAV process. Such technology is better suited to warmer climates, where there are higher ambient temperatures all year round and therefore not suitable for Crib Point. In addition, AAV often requires larger infrastructure and can produce vapour fogs.

A study on LNG vaporizer selection by Patel et al. (n.d) concluded that “for fuel savings and minimizing greenhouse gas emissions, use of “free heat” from ambient air or seawater is the most desirable”. Further, Songhurst (2017) concludes that “to meet the varying needs of different locations and provide flexibility there is a trend for new build vessels to have both open and closed loop capability”. This is referred to as “combined mode” operation.

The preliminary design of the FSRU allows for heat to be provided in open loop mode (no boiler support).

Discharge Port Design Alternatives

The marine assessments undertaken by CEE considered single, double and six-port discharge arrangements for the return of the water from the FSRU heat exchange system. The preferred design for discharge is through a six-port discharge arrangement. This optimises dilution of the discharge and results in a smaller temperature difference closer to the discharge point.

Brief description of key alternatives to be further investigated (if known):

No other options are under further consideration.

5. Proposed exclusions

Statement of reasons for the proposed exclusion of any ancillary activities or further project stages from the scope of the project for assessment:

There are several other separate proposed works/ activities that are related to but not a direct ancillary part of the Project (as outlined above in section3). These works will be constructed and operated independently of the AGL Gas Import Jetty.

The Jetty Upgrade and flattening of the seabed are excluded from the scope of the AGL Gas Import Jetty Project because these activities are occurring independent of the Project.

The Jetty Upgrade works include the refurbishment of the existing Crib Point Jetty and construction of new mooring and berthing dolphins to provide an upgraded berth for shipping. A consent under the *Coastal Management Act 1995* (Coastal Management Act consent) has been issued to the PoHDA for this work.

Flattening of the seabed in the vicinity of the existing wharf infrastructure is required for ships like the FSRU and LNG carriers. This will be undertaken by the VRCA, as part of their routine maintenance activities for maintaining operation of the jetty. A marine biological assessment did not identify any significant issues associated with this work. A Coastal Management Act consent has been issued to VRCA for this work.

6. Project implementation

<p>Implementing organisation (ultimately responsible for project, ie. not contractor): AGL</p>	
<p>Implementation timeframe: Construction of the Jetty Infrastructure is anticipated to commence in the 1st quarter of 2019 with an anticipated construction timeframe of approximately 6 to 12 months. Operation is expected to commence in 2020.</p>	
<p>The overall implementation timeframe is as follows:</p>	
<ul style="list-style-type: none"> • Site identification / shortlisting • Project scope and economic analysis <ul style="list-style-type: none"> ○ Preferred project structure, vessel requirements, connection to market etc ○ Quantify potential for accelerated schedule ○ Determine assessment / approvals required • Select preferred site • Regulatory Assessment (process start) • Commence negotiating binding agreements <ul style="list-style-type: none"> ○ LNG procurement ○ Vessel contract ○ Jetty lease and refurbishment • Submit all planning and environmental approvals • Commence construction <ul style="list-style-type: none"> ○ Construction of Jetty Infrastructure (approx. 6-12 months) • Operation start-up • Decommissioning (indicative) 	<ul style="list-style-type: none"> • June 2017 • 2nd-3rd Qtr 2017 • 3rd Qtr 2017 • 3rd Qtr 2017 • 1st Qtr 2018 • 3rd Qtr 2018 • 1st Qtr 2019 • 1st Half 2020 • approximately 20 years
<p>Proposed staging (if applicable): N/A</p>	

7. Description of proposed site or area of investigation

<p>Has a preferred site for the project been selected? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If no, please describe area for investigation. If yes, please describe the preferred site in the next items (if practicable).</p>
<p>General description of preferred site, (including aspects such as topography/landform, soil types/degradation, drainage/ waterways, native/exotic vegetation cover, physical features, built structures, road frontages; attach ground-level photographs of site, as well as A4/A3 aerial/satellite image(s) and/or map(s) of site & surrounds, showing project footprint):</p> <p><u>Geology, Geomorphology and Topography</u></p> <p>The Project Site incorporates the existing Crib Point Jetty and the landside component of 3.81 ha located adjacent to the jetty. The Project Site is located in a low-lying area comprising tall shrublands, mangroves, coastal wetlands, riparian vegetation and coastal woodlands.</p> <p>The broader surrounding area, north of Bittern, of tertiary alluvium has been formed by the emergence of the sea floor during Pliocene and early Pleistocene times. The topography of the area is very flat and low-lying, with the vast majority of the Crib Point Jetty lying between elevations of 10 m and 20 m above sea level.</p>

Landform/ Built Structures

The Crib Point Jetty is located in a commercial trading port with the existing jetty being constructed specifically for petroleum related activities. There are existing pipelines and a number of associated support buildings on and adjacent to the Crib Point Jetty. The site is a working industrial site, which is reflected in the Port Zone which has been applied to the land by the Mornington Peninsula Planning Scheme. The Port Zone seeks to facilitate port operations and activities associated with the port.

The landside component of the Project Site is flat. The site is accessed from The Esplanade via an existing entry point, which leads to a road which bisects the site to the west of the jetty. The existing cleared area, particularly to the north of the jetty is covered with a large amount of stone, broken brick, steel reinforcement and other building materials.

Port

The jetty is located in an existing deep water port in a bay with a maintained shipping channel and a berth depth of approximately 14 m. The jetty is within the Port waters of the Port of Hastings. The Port of Hastings is a commercial trading port with facilities which include the Stony Point jetty and depot, the Crib Point liquid berths, the Long Island liquid berth and the Blue Scope Steel Wharves.

Western Port Ramsar Site

The jetty is also located within the defined boundary of the Western Port Ramsar Site. Designated as a wetland of international significance in 1982, the Ramsar site covers 59,950 ha of Western Port including Crib Point. Western Port is one of eleven Ramsar sites in Victoria and is the third most important area for wading birds in Victoria. The environmental, social and economic value of Western Port is recognised further through the declaration of Western Port as an UNESCO Biosphere reserve and the presence of three Marine National Parks within it (Churchill Island, French Island and Yaringa).

Western Port is a diverse but compact marine environment covering an area of approximately 680 km² with an estimated volume of 0.8 km³. It comprises vast intertidal mudflats with saltmarsh, seagrass and mangrove habitats as well as steep subtidal sloping banks with seagrass and deep channels that connect the north of the bay with the oceanic waters of Bass Strait in the south.

The ecosystem components associated with the habitats are closely connected by their relatively close spatial proximity and the strong tidal currents that transport water back and forth through the channels and over and off the intertidal flats.

These characteristics contribute to the listing of a large part of Western Port as a Ramsar wetland of international significance and the allocation of distinct areas within Western Port as National Parks. Many of the animal and plant species are not specifically protected or listed for conservation value, but the combination of mangroves and seagrasses, saltmarsh, fish, birds, crustaceans, worms and other invertebrates all form the Western Port marine ecosystem.

Soil and Groundwater

Previous investigations at the Project Site have identified the contamination of soil, sediment and groundwater beneath the Project Site. Fill soil is present across the site up to depths of approximately 1 m, with some contamination identified in isolated areas. Groundwater is present at depths around 6.8 m to 7.5 m.

Drainage/waterways

The landside component is within a 'Designated Flood Prone Area' as identified by Mornington Peninsula Shire Council for the purposes of assessing any building permit requirements.

No waterways pass through the Project Site or its surrounds with the topography of the region resulting in a small upstream catchment. There are also no inland waterbodies in the vicinity of the Project Site that may be impacted (excluding Ramsar area).

Native Vegetation

The landside component has been previously cleared but contains areas of native vegetation regrowth covering approximately 2 ha (in total) and comprises native Heathy Dry Woodland and scattered native trees.

Site area (if known):

The Project Site totals 8.34 ha. This comprises:

- An indicative landside disturbance footprint of 1.31 ha
- A jetty footprint of 4.5 ha

Current land use and development:

The Crib Point Jetty is located at Crib Point within the Port of Hastings on the Shire of Mornington Peninsula. The land is Crown land and is leased to the PoHDA.

The jetty is an existing structure constructed for the BP oil refinery in the 1960s and continues to be used to provide facilities for bulk liquid fuel ships. The jetty consists of two jetty heads, each accessed via a Road Neck and a Pipe Neck. The jetty heads are serviced by a shared access jetty. The jetty currently has two mooring berths.

Berth 1 is managed by PoHDA and currently utilised by United Petroleum to transfer liquid fuel via a flexible hose and pipeline along the jetty that is connected by a buried pipeline to its onshore storage facility located near Hastings. Berth 2 is currently vacant.

Description of local setting (e.g. adjoining land uses, road access, infrastructure, proximity to residences & urban centres):

The Project is located at the Crib Point Jetty, 65 km south-east of Melbourne on the Mornington Peninsula (Map A). The Project Site and surrounding area, including key features is provided in Map B.

The site is located in an industrial setting and is identified in the *Port of Hastings Land Use and Transport Strategy* (Port of Hastings Corporation 2009) as being retained in the long term for use as a liquid bulk terminal.

The western perimeter of the landside component is approximately 880 m long and provides access to the site from The Esplanade. The Esplanade is a municipal road managed by Council. The Crib Point Jetty connects to the eastern edge of the landside component, extending into Western Port.

The public land to the north is used as a park, which runs along the coast line to the north and is heavily vegetated. There are walking tracks leading to the coast from The Esplanade in this area, including to a maritime viewing deck overlooking a submarine moored nearby. There are five houses approximately 600 m north of the landside component of the Project Site. The next nearest residential development is located approximately 1 km to the south-west of the landside component of the Project Site.

Land to the west, on the opposite side of The Esplanade, is occupied by the Victorian Maritime Centre, which is housed in the former BP Refinery Administration Building. Land beyond this contains the decommissioned BP oil refinery. Some tanks remain on the site.

Woolleys Beach Reserve is located to the south of the Project Site and contains a carpark, BBQ and picnic facilities and a boardwalk. Woolley's Cool Room is located beyond this to the south.

The waters of Western Port cover an area of 680 sq km of which 270 sq km are exposed as mud flats at low tide. The bay features two large islands; French Island (located approximately 4.3 km west of Crib Point Jetty) used for predominantly agriculture; and Phillip Island (located approximately 11 km south of Crib Point Jetty), known for its tourism industry. The Royal Australian Naval Base, HMAS Cerberus, is located 3.6 km to the south of Crib Point.

Planning context (e.g. strategic planning, zoning & overlays, management plans):

The jetty and landside component, including the jetty's existing mooring berths, are located in the Port Zone, and are therefore subject to the relevant provisions of the Mornington Peninsula Planning Scheme. Land in Western Port not within the Port Zone immediately surrounding the jetty is located outside the bounds of the planning scheme.

The following clauses of the planning scheme are relevant to this Project:

Planning Policy Framework

- Clause 12.01 (Biodiversity) provides for the protection of biodiversity and native vegetation management and seeks to assist in the protection and conservation of Victoria's biodiversity and to ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation. The Clause also gives effect to the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017).
- Clause 12.02 (Coastal Areas) requires consideration to be given to the protection of coastal areas, the development of coastal land and appropriate development on coastal Crown land, coastal tourism as well as bays including Western Port.

Clause 12.03 (Waterbodies and Wetlands) seeks to protect and enhance river corridors, waterways, lakes and wetlands. Strategies of relevance to the Project relate to protection of the environmental, cultural and landscape values of all water bodies and wetlands, ensuring development responds to and respects the significant environmental, conservation, cultural, aesthetic, open space, recreation and tourism assets of water bodies and wetlands and that development is sensitively designed and sited to maintain and enhance environmental assets, significant views and landscapes along river corridors and waterways and adjacent to lakes and wetlands.

- Clause 12.05 (Significant Environments and Landscapes) provides for the protection and conservation of environmentally sensitive areas in Victoria of which Western Port is identified as one.
- Clause 13 (Environmental risks and amenity) identifies issues such as climate change impacts (such as coastal inundation and erosion), air quality, contaminated land, noise, bushfires as well as general amenity as matters that require consideration.
- Clause 17.01 (Employment) seeks to strengthen and diversify the economy. Strategies to achieve this are:
 - *Protect and strengthen existing and planned employment areas and plan for new employment areas.*
 - *Facilitate regional, cross-border and inter-regional relationships to harness emerging economic opportunities.*
 - *Facilitate growth in a range of employment sectors, including health, education, retail, tourism, knowledge industries and professional and technical services based on the emerging and existing strengths of each region.*
 - *Improve access to jobs closer to where people live.*
 - *Support rural economies to grow and diversify*
- Clause 18.03 (Ports) seeks:

To support the effective and competitive operation of Victoria's commercial trading ports at local, national and international levels and to facilitate their ongoing sustainable operation and development.

Strategies relevant to this Project are:

- *Provide for the ongoing development of ports at Melbourne, Geelong, Hastings and Portland in accordance with approved Port Development Strategies.*

- *Identify and protect key transport corridors linking ports to the broader transport network.*
- *Manage any impacts of a commercial trading port and any related industrial development on nearby sensitive uses to minimise the impact of vibration, light spill, noise and air emissions from port activities.*

The *Port of Hastings Land Use and Transport Strategy* (Port of Hastings Corporation 2009) is identified as a strategy which must be considered. The Strategy identifies Crib Point as being retained in the long term for a liquid bulk terminal.

- Clause 19.01 (Energy) seeks to facilitate appropriate development of energy supply infrastructure, including supporting the development of energy facilities in appropriate locations where they take advantage of existing infrastructure and provide benefits to industry and the community. In relation to pipeline infrastructure, it specifically seeks to ensure that gas, oil and other substances are safely delivered to users and to and from port terminals at minimal risk to people, other critical infrastructure and the environment.
- Clause 21.02 (Profile of the Mornington Peninsula) states:

The Port of Hastings is Victoria's largest bulk liquid cargo port, accounting for 57 per cent of the State's bulk liquid trade.

The port channel is Victoria's deepest, with a guaranteed minimum depth of 14.3 metres.

The Port of Hastings is served by four jetty complexes, — the Crib Point Oil Terminal Jetty, Long Island Point Pier, the BHP Steel Industries Roll On-Roll Off Wharf and the Stony Point Port Services Complex.

It also notes the acknowledged regional, national and international significance of natural areas and habitats located on the Peninsula and adjoining marine areas, including Western Port.

Western Port is a fragile ecosystem and most of the Bay is nominated under international treaties for the protection of migratory bird habitats (the Ramsar Convention on Wetlands and the JAMBA and CAMBA treaties) with extensive areas of zoological, botanical or geomorphological significance. The Peninsula is, therefore, a critical area for achieving State environmental and biodiversity objectives.

- Clause 21.03 (Mornington Peninsula – Regional Role and Local Vision) states

This section of the Municipal Strategic Statement is intended to highlight the policy context of the Peninsula, from both a regional and local perspective. In effect, this provides a statement of community values. This enables an evaluation of the challenges and opportunities that face the Peninsula and provides the basis for setting strategic objectives.

In relation to environmental values it states

The Mornington Peninsula contains many environmentally significant areas, including conservation reserves of international, national and state significance. It also accounts for a substantial section of the catchment and coastline of both Western Port and Port Phillip Bay. It is State Planning Policy that environmentally sensitive areas which play an important recreational role, including Western Port and the Mornington Peninsula, Western Port and Port Phillip Bays and their foreshores should be protected from development which would diminish their environmental, conservation or recreational value.

In relation to Port activity it states;

Western Port boasts major deep-water port facilities, including Victoria's largest bulk liquid cargo port. The State Planning Policy Framework directs that:

- *Land resources adjacent to ports should be protected to preserve their value for uses which are dependent upon or gain substantial economic advantage from proximity to the port's particular shipping operations.*
- *Planning for the use of land should aim to achieve and maintain a high standard of environmental quality, be integrated with policies for the protection of the environment generally and of marine environments in particular and take into account planning for adjacent areas and the relevant catchment.*
- *Port and industrial development should be physically separated from sensitive urban development by the establishment of appropriate buffers, which reduce the impact of vibration, intrusive lighting, noise and air emissions from port activities.*

State policy requires that planning for the Hastings port area should have regard to the Statement of Planning Policy No 1 - Western Port and is to be undertaken in accordance with the Hastings Port Industrial Area Land Use Structure Plan.

It also states that:

Coastal management is a core issue for the Peninsula and the relatively narrow coastal strip is the focus of multiple land use pressures. Sustainable use of the Peninsula's foreshores, offers major social, environmental and economic benefits but requires careful planning and coordination.

Western Port is an area of high environmental value and sensitivity; however, the potential for further port and port related development is seen as key strength. Realising this potential presents a number of challenges. These include:

- *Ensuring adequate protection of the Bay, its catchment and environmental systems.*
- *Proper management of the port land resource and the establishment of the infrastructure necessary to support port related uses.*
- *Avoiding land use conflicts by maintaining separation between port development and sensitive township areas.*

These factors must be properly managed to ensure that port development gains the support of both industry and the community.

- Clause 21.04 (Mornington Peninsula Strategic Framework Plan) identifies Crib Point for major industrial shipping.
- Clause 21.08 (Foreshores and Coastal Areas) recognises the importance of coastlines to the Shire of Mornington Peninsula and seeks to enhance and protect it as appropriate.

Objective 2 seeks to achieve coordinated development of public and private facilities that increases the sustainable social, economic and recreational value of the coast and foreshore to the community.

Strategies of relevance to achieve these objectives include:

- *Consolidate all new development within identified activity nodes which are compatible with the long-term protection of the coastal environment and which strengthen the physical and functional connection between existing township areas and the foreshore.*
- *Ensure that coastal development is designed and constructed in a manner which respects and enhances the coastal environment and the experience and enjoyment of the coast by the community.*
- *Limit the number of structures within foreshore areas to that necessary to meet demonstrated community needs. The preferred option is to investigate the re-use of existing buildings and the multi use of buildings and structures and the upgrading of existing facilities in preference to a proliferation of separate buildings and structures.*

- Clause 21.10 (Managing Port Area Development) recognises the importance of the Port of Hastings to the Victorian economy stating

The Port of Hastings makes an important contribution to the Victorian economy and has a number of significant competitive advantages including:

- *Shorter shipping times than the Port of Melbourne.*
- *Sheltered anchorage's and a deep water channel requiring minimal maintenance dredging.*
- *Readily developed land and accessible infrastructure, including pipelines.*
- *Major road links to Melbourne's existing industrial and manufacturing centres.*

On the basis of these factors planning for Western Port has been directed towards maintaining long term port potential.

Western Port has also been the subject of a number of environmental and planning studies, including the major Western Port Bay Environmental Study (1975). This work has identified the Bay and its surrounds as an area of environmental significance and sensitivity. Planning has therefore placed special emphasis on "finding the balance"—meeting the need to pursue the economic advantages of the area, whilst ensuring the protection of the environment.

The Hastings Port Industrial Area Land Use Structure Plan (1996) provides a comprehensive assessment of the land-use issues associated with port development at Western Port. It is used as the basis for the more detailed planning provisions of the Mornington Peninsula Planning Scheme, in accordance with the requirements of the State Planning Policy Framework.

Key issues of relevance are:

- *Need to ensure that land in proximity to the port area remains available for port related development and is not compromised by short term development decisions.*
- *Port and port related development must be carefully planned and managed to avoid damage to the environment or to the amenity of existing residential communities.*
- *Need to promote the provision of major infrastructure, including main road improvements, necessary to support port related development and to limit impacts on the environment and township areas.*

Objective 1 seeks to protect the long term value of Western Port for selected port and industrial purposes that depend upon or gain significant economic advantage from proximity to natural deep water channels.

Strategies to achieve these objectives include:

Provide for the development in appropriate locations of industries which are directly dependent on or gain significant economic advantage from a location adjacent to deep water port facilities, or are directly associated with such a use, while also having regard to the protection and enhancement of the biodiversity of the area.

- *Ensure the provision of adequate land for wharfage and industry dependent on the deep water port facilities in accordance with the recommendations of the Hastings Port Industrial Area Land Use Structure Plan.*
- *Prevent industrial development that is not directly dependent on access to the port from locating in the port related development area.*
- *Support the provision of connections by road, rail and pipeline between the port and established areas of manufacturing and distribution.*

Objective 2 seeks to ensure that port and port related development does not adversely affect or compromise the ecosystems and recreational resources of Western Port.

Strategies to achieve these objectives include:

- *Ensure that planning for the use and development of land takes into account the protection of inter-tidal wetlands, identified areas of conservation significance, native flora and fauna, areas of important fish habitat and the whole Western Port catchment.*
- *Ensure that the environmental impact of port development and industrial development nearby is carefully assessed, particularly if it involves land reclamation or channel dredging programs or is likely to have a detrimental impact on native flora or fauna.*
- *Require that all development is designed to ensure the protection of the air environment, land, waterways and groundwater resources from polluting discharges and activities in accordance with State environment protection policies and relevant best practice environmental management guidelines. Identify and protect areas of significant nature conservation value in and adjacent to foreshores, streams and wetlands.*
- *Require the provision of drainage, sewerage and other waste disposal facilities, utilities and other services in keeping with the special demands and constraints on the port area and the special significance and susceptibility of Western Port.*
- *Require appropriate building design, siting and landscaping to ensure that port and industrial development is visually integrated with the landscape and seascape.*

Zones and Overlays

The Project Site (jetty and landside component) is located in the Port Zone and covers the jetty's existing mooring berths. A new mooring dolphin will be procured by PoHDA to the south of the existing jetty, outside of the Port Zone and of the bounds of the planning scheme. The FSRU will also be located adjacent to, but outside of the Port Zone and therefore outside the area included in the planning scheme.

The Port Zone has purposes which include:

- *To recognise the significant transport, logistics and prime maritime gateway roles of Victoria's commercial trading ports in supporting Victoria's economy.*
- *To provide for shipping, road and railway access and the development of each of Victoria's commercial trading ports as key areas of the State for the interchange, storage and distribution of goods.*
- *To provide for uses which derive direct benefit from co-establishing with a commercial trading port.*
- *To provide for the ongoing use and development of Victoria's commercial trading ports that support the relevant port development strategy prepared pursuant to the Port Management Act 1995.*

As shown in Map D, Planning Zones, the land to the north of the site is in the Public Conservation and Resource Zone. There are five houses, approximately 600 m north of the northern extent of the landside component of Project Site, in the Low Density Residential Zone. The Esplanade is located within the Road Zone, Category 2. To the west of The Esplanade, land is in the Special Use Zone (Schedule 1 - Port Related Uses).

Adjacent land to the south of the site is in the Public Use Zone (Schedule 7 - Other Public Use).

The Project does not require permission for use of the land, given that a permit is not required for use of the land as a wharf under Clause 37.09-1. The wharf is an existing structure that is currently used to provide facilities for bulk liquids. It is currently used by United Petroleum to transfer liquid fuel via a pipeline along the wharf to its onshore storage facility. The FSRU will similarly be a ship discharging cargo at the wharf, albeit on a more continuous basis. The new flowline will constitute a utility installation land use, which is ancillary to the use of the land as a wharf.

Clause 37.09-4 (Buildings and works) of the Port Zone of the Mornington Peninsula Planning Scheme states:

A permit is required to construct a building or construct or carry out works. This does not apply to a building or works which:

- *Provide for a Wharf or Shipping container storage and other storage and handling facilities (other than tanks for bulk liquid storage), navigational beacons and aids, terminals and associated facilities.*

The construction of topside jetty infrastructure (high pressure gas unloading arms and a high pressure gas flowline mounted to the jetty and running to a flange on the landside component) falls within the scope of this exemption in Clause 37.09-4.

As the Project comprises the continuous mooring of the FSRU and construction of topside jetty infrastructure, the Project does not require a planning permit under the Port Zone (note a Works Approval is being sought under the *Environment Protection Act 1970*).

The landside component and an extensive area to the north, west and south is in the Bushfire Management Overlay. The Project works do not trigger the permit requirements of the Bushfire Management Overlay, however, AGL's SEMP will include fire management processes which will integrate with the Pipeline Project. There are no other overlays which apply to the Project Site.

Local government area(s):

Mornington Peninsula

8. Existing environment

Overview of key environmental assets/sensitivities in project area and vicinity

(cf. general description of project site/ under section 7):

- The existing Crib Point Jetty is situated within the defined boundary of the Western Port Ramsar site, designated as a wetland of international significance in 1982. The Ramsar site covers 59,950 ha of Western Port and is listed in the Australian Wetlands Database.
- The Crib Point Jetty (and hence the Project Site) is located outside of the defined 'wetlands' area of the Western Port Ramsar Site and therefore outside of the more ecologically significant areas of Western Port (see Figure 4).

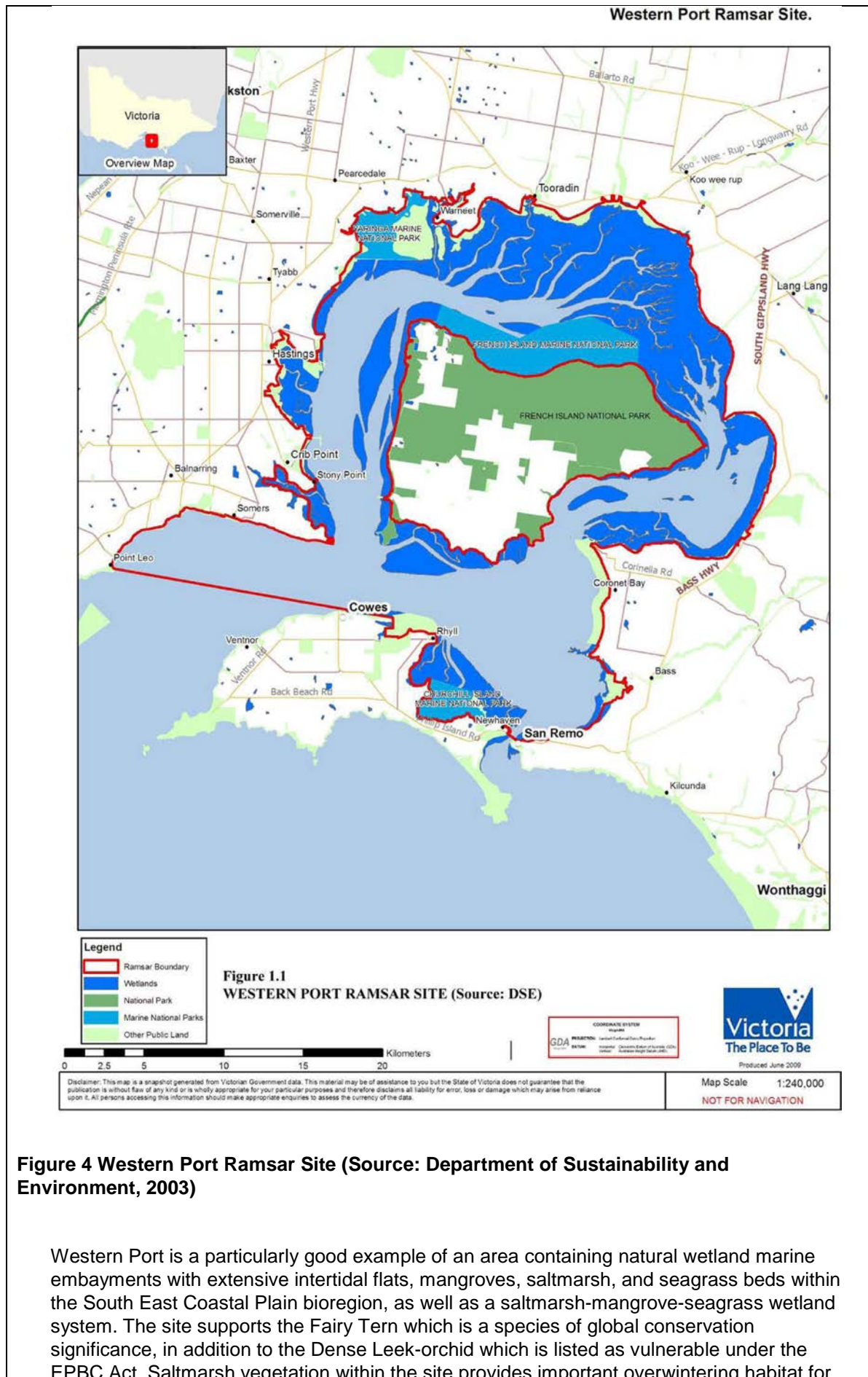


Figure 4 Western Port Ramsar Site (Source: Department of Sustainability and Environment, 2003)

Western Port is a particularly good example of an area containing natural wetland marine embayments with extensive intertidal flats, mangroves, saltmarsh, and seagrass beds within the South East Coastal Plain bioregion, as well as a saltmarsh-mangrove-seagrass wetland system. The site supports the Fairy Tern which is a species of global conservation significance, in addition to the Dense Leek-orchid which is listed as vulnerable under the EPBC Act. Saltmarsh vegetation within the site provides important overwintering habitat for

the Orange-bellied Parrot, listed as critically endangered under the EPBC Act. Western Port is one of the three most important areas in southeast Australia for migratory waders in total numbers and density. The Ramsar Site regularly supports about 10,000 – 15,000 migratory waders, and periodically supports 1,000 - 3,000 ducks and 5,000 - 10,000 Black Swans, as well as more than 1 % of the estimated flyway population of five wader species and internationally significant numbers of several non-wader species. It also supports seagrass and mangrove communities that are characteristic of the marine embayments of Southern Victoria. Seagrass beds within the Ramsar Site are known to provide important nursery habitat for a number of fish species, including commercially significant species.

- The landside component of the Project Site contains areas of native vegetation covering approximately 2 ha (in total) and comprises Heathy Woodland, Swamp Scrub (derived) and Coastal Dune Scrub. The assessment area is bisected by the jetty access road. To the north of the road, the land was cleared in the 1960s for the development of the jetty. It was subsequently planted with a mix of Australian natives and has also been re-colonised by locally indigenous native flora and a range of woody weeds. While low in quality and generally lacking a tree canopy, this area qualifies as native vegetation as defined by the Mornington Peninsula Planning Scheme. Land south of the jetty access road was also impacted in the 1960s, however not all vegetation was removed and a number of trees onsite predate this period. This area contains a moderate quality patch of Heathy Woodland. One EPBC listed threatened flora species, Dense Leek-orchid, has the potential to occur within the native vegetation in the south of the assessment area in this area. The Dense Leek-orchid is also listed under the Victorian *Flora and Fauna Guarantee Act 1988*.
- Five houses are located approximately 600 m north of the northern extent of the landside component of the Project Site.
- Adjacent land outside that within the Port Zone immediately north of the site is heavily vegetated. This land was never impacted by the original port work so it is generally of much high quality in terms of both floristics and fauna habitat. No specific survey has been undertaken of this land.
- Adjacent land outside that within the Port Zone to the south of the site is known as Woolleys Beach Reserve and is vegetated in part. It contains a carpark, BBQ and picnic facilities, and a boardwalk. It also contains heritage items, including a Cool Room built in 1903, which is listed on the Heritage Overlay of the Mornington Peninsula Planning Scheme. The reserve is visited by many walking groups, naturalists and members of the local community who enjoy the amenity of the area. While some of the land has been cleared, the vegetation on the site constitutes intact bushland, albeit with some woody weed invasion, and is assumed to be high quality habitat for a range of flora and fauna.
- Within the vicinity of the Project Site, the Former BP Refinery Administration Building is listed on the Victorian Heritage Register (VHR), the Schedule to the Heritage Overlay of the Mornington Peninsula Planning Scheme, and the Register of the National Estate (RNE). The Building, which now houses the Victorian Maritime Centre, is located opposite to the Project Site.

9. Land availability and control

Is the proposal on, or partly on, Crown land?

No Yes If yes, please provide details.

The Crib Point Jetty is located on Crown land, with a sea-bed lease from DELWP to PoHDA.

- Crown Allotment 89D, Parish of Bittern (SPI: 89D\PP2159) – this is the seaward end containing the berths.
- Crown Allotment 89C, Parish of Bittern (SPI: 89C\PP2159) – this is the landward end connecting to the landside component.

<p>Current land tenure (provide plan, if practicable):</p> <p>The landside component is located on Crown Allotment 2040, Parish of Bittern (SPI: 2040\PP2159). The landside component of the Project Site is Crown land, leased to the PoHDA.</p> <p>The entire Project Site is managed by PoHDA. The current site is an operating port which does not provide public access.</p>
<p>Intended land tenure (tenure over or access to project land):</p> <p>The site will continue to operate as a port and no changes to land tenure will occur, other than a lease and easement between AGL and the PoHDA.</p>
<p>Other interests in affected land (e.g. easements, native title claims):</p> <p>There are no other known interests in the Project Site, other than berth 1 of the Crib Point Jetty which is leased by PoHDA and currently utilised by United Petroleum.</p>

10. Required approvals

<p>State and Commonwealth approvals required for project components (if known):</p> <p>Table 2 summarises the regulatory decisions understood to be required for the Project and to which AGL will be responsible.</p> <p>Table 2: Summary of Legislative Assessments / Permitting</p>			
Legislation	Agency	Approval / Permit / Licence	Reason
Commonwealth			
<i>EPBC Act 1999</i>	Department of the Environment and Energy (DoEE)	Referral, and if applicable controlled action, assessment and approval under the EPBC Act	<p>Potential impacts of matters of National Environmental Significance</p> <ul style="list-style-type: none"> Proximity to Western Port Ramsar Wetland Potential presence of EPBC listed species and communities
State			
<i>Aboriginal Heritage Act 2006</i>	Registered Aboriginal Party	Cultural Heritage Management Plan (CHMP)	<p>Project is partially located within an area of cultural heritage sensitivity (Western Port Ramsar Wetland). However, the works do not constitute a high impact activity and occur on land which has been subject to significant ground disturbance, therefore a mandatory CHMP is not required.</p> <p>Given the extent of documented disturbance within the landside component, there is also low potential for unknown Aboriginal cultural heritage to be impacted by the Project. As a result, a CHMP is not required to be prepared.</p>
<i>Environment Protection Act 1970</i>	EPA	Works Approval and Licence	<p>Based on the current assessments, emissions of NO_x, CO and VOCs are predicted to exceed the thresholds prescribed for classification as a scheduled premises (Type L01 – general emissions to air). Consequently, under the Regulations the proposal meets the definition of a L01 (emissions to air) scheduled premises. A licence under the <i>Environment Protection Act 1970</i> is required to regulate the discharge of these air emissions.</p> <p>The discharge of any water from the FSRU heat exchange process will also be regulated under a</p>

			<p>Works approval and Licence under the <i>Environment Protection Act 1970</i>, as applicable. Any discharge to water associated with the construction and operation of the Project will be subject to the State Environment Protection Policy (Waters of Victoria), including Schedule F8 of the SEPP - Waters of Western Port and Catchment, as applicable.</p> <p>In this regard, the works (installation of the FSRU) where a licence is required for the scheduled premises, requires a Works Approval under the Act.</p>
<i>Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act 2010</i>	National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA)	Infrastructure Licence not required	AGL understands that the <i>Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act 2010</i> (and supporting regulations) do not apply to the Project, given that the FSRU will be located within Victoria's Internal Waters.
<i>Pipelines Act 2005</i>	DELWP	Pipeline licence not required	The Project's gas flowline (mounted to the jetty) is entirely within the Port of Hastings and therefore is exempt from the Act.
<i>Planning and Environment Act 1987</i> Mornington Peninsula Planning Scheme	Mornington Peninsula Shire Council	Planning Permit not required for 'Building and works' under Clause 37.09-4 of the Mornington Peninsula Planning Scheme	The wharf is an existing structure and is currently used to provide facilities for bulk and container ships. The new gas flowline will constitute a utility installation land use, which is ancillary to the use of the land as a wharf. The Project constitutes a "wharf and ancillary activities" under the Planning Scheme and accordingly, it will not require planning permission for use of the land or for the works to install the Jetty Infrastructure.
<i>Port Management Act 1995</i>	PoHDA (Port Authority)	Port Authority approval required	Licence from PoHDA will be required for the Project under the <i>Port Management Act 1995</i> for use of the berth to continuously moor the FSRU

Have any applications for approval been lodged?

No Yes If yes, please provide details.

Approval agency consultation (agencies with whom the proposal has been discussed):

AGL has consulted with the following State and Commonwealth agencies and regulators:

Commonwealth

- Department of the Environment and Energy
- National Offshore Petroleum Safety and Environmental Management Authority
- Australian Marine Safety Authority

State

- Aboriginal Victoria
- Department of Premier and Cabinet
- Department of Economic Development, Jobs, Transport and Resources
- Department of Environment, Land, Water and Planning
- Department of Treasury and Finance
- Energy Safe Victoria
- Environment Protection Authority

- Marine Safety Victoria
- Mornington Peninsula Shire Council
- Parks Victoria
- Port of Hastings Development Authority
- Transport Safety Victoria
- Victorian Regional Channels Authority
- WorkSafe Victoria

Other agencies consulted:

All agencies consulted to date are listed above.

PART 2 POTENTIAL ENVIRONMENTAL EFFECTS

11. Potentially significant environmental effects

Overview of potentially significant environmental effects (identify key potential effects and comment on their significance and likelihood, as well as key uncertainties):

An examination of the potential environmental effects was undertaken through specialist environmental assessments and found no significant environmental effects. The assessments have studied the Project Site as an 'assessment area'. However, in some cases the study called for a wider assessment area (e.g. the Flora and Fauna Assessment extended beyond the Project Site) or a broader study area (e.g. Environmental Noise assessment studied noise impacts in and around Crib Point). The findings of the environmental impact assessments were used to inform the size and location of the disturbance footprint to avoid sensitivities such as native vegetation and to understand broader environmental impacts. As shown in Map C, the indicative landside disturbance footprint is a smaller proportion of the Project Site originally assessed. A summary of the findings is provided below.

Marine ecosystem effects

The operation of the FSRU heat exchange processes involves: pumping up to 450,000m³ per day (450 ML/day) of seawater into the FSRU to heat the liquefied natural gas; generation of short-lived chlorine and hypochlorite, as a biofouling inhibitor in the heat exchange pipework, by subjecting intake seawater to an electrolysis process; and; discharge of the cold (initially 7°C cooler than ambient seawater temperature), chlorinated (0.1mg Cl₂/L) water back into Western Port at Crib Point. These environmental pathways have been described and modelled in separate reports on hydrodynamic and discharge mixing modelling (Attachment 10A), chlorine behaviour investigation and toxicity modelling (Attachment 10B), cold-seawater discharge effects (Attachment 10C), heat exchange seawater entrainment modelling (Attachment 10D), marine ecosystem protected matters (Attachment 10E) and prediction of sea level change as a result of the floating storage and regasification unit (Attachment 10F). Measures to mitigate the effects of those processes on the marine ecosystem also have been described in these reports.

A summary of the assessment findings related to each of these impact pathways is provided below.

- *Biological Entrainment*

The biological entrainment effects of the seawater drawn into the FSRU heat exchange system have been studied (refer to Attachment 10D).

The conceptual model of the FSRU (located in the shipping basin, approximately 500 m offshore from the inshore seagrass beds) shows that seagrasses will not be affected by entrainment.

Seawater drawn into the FSRU heat exchange system may entrain small marine organisms, drifting eggs and larvae where they are in the central part of the water column adjacent to the intake. These organisms once entrained will not survive as a result of mechanical damage and exposure to chlorine for anti-fouling. The conceptual model of the marine ecosystem in the vicinity of Crib Point shows that the FSRU will be relatively remote from intertidal and nearshore marine ecosystem components and is located in an area of the channel characterised by plankton and pelagic marine species.

The assessment suggests that the design of the FSRU water intake will minimise the direct risk of biological entrainment and operation on many ecosystem components. For immobile plankton that are dispersed over the water column, the entrainment rate is about 10% for sites on the western edge of the channel (including the adjacent mudflats) within about 750 m of Crib Point, but entrainment was less than 1% over the whole of North Arm. Overall, the proportion of larvae entrained from populations of widespread biota in Western Port is less than 1% and the effect is likely to be undetectable. This is predominately due to the proportion of intake volume in relation to total water flows within the bay, as well as the FSRU siting (i.e. siting of the facility in relation to adjacent key marine habitats, such as intertidal seagrass beds and mangroves stands) and seawater intake system design measures (i.e. the location of the intake point on the FSRU

designed to avoid surface and seabed seawater). However, it is unlikely to operate at this maximum operating output unless there was a requirement to fill supply short term shortfalls in the gas market. The seawater intake volume required for the regasification rate of 500mmscf/day is 300,000m³/day and therefore the biological entrainment rates will reduce by approximately one third.

- *Cold-water discharge*

The behaviour of the cold-water discharge from the FSRU heat exchanger was modelled using known and quantified physical fluid dynamics processes, the characteristics of seawater in the North Arm of Western Port and tidal current characteristics at Crib Point (refer to Attachment 10C).

The modelling predicted that for the preferred six-port discharge, the cold-water discharge will produce a body of water 0.3°C cooler than the ambient seawater with the spatial extent likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point. There will be a gradient of decreasing cold water from 7°C to 0.3°C cooler than the ambient seawater within this area and the predicted difference in temperature beyond 200 m from the discharge point is within the natural daily temperature variation of the receiving environment.

The model determined that key marine habitats in shallow waters adjacent to the FSRU (i.e. saltmarsh, mangroves, mudflats, seagrass beds and channel slope communities) will not be impacted. Further, the differences in temperature between the discharge and ambient seawater is not expected to impact on benthic species on the seabed (e.g. benthic invertebrate infauna, epifauna and demersal fish species) adjacent to the facility given that this temperature difference is well within the natural variation of the receiving environment, as well as the physical tolerances of such species.

- *Residual chlorine concentration in seawater discharge*

Chlorine concentration modelling and analysis has been undertaken to determine the potential implications to the marine ecosystem of any residual chlorine in the seawater discharge from the FSRU (refer to Attachment 10B).

The chlorine concentration modelled on AGL's preferred six-port discharge design determined that the concentration of residual chlorine within the discharge water would reach the interim working value in the ANZECC guidelines at a distance of approximately 200 m north and south and 60 m east and west of the discharge point. This reduction is due to the initial 'near-field' mixing as well as the natural chemical breakdown of chlorine within the surrounding seawater. Noting that as there is no defined trigger level for chlorine in seawater under the ANZECC guidelines, the low reliance value of 0.003mg/L has been adopted.

Section 12 and Section 13 provide further information on the marine ecosystem effects.

Marine flora and fauna

CEE has reviewed marine ecosystem information with respect to relevant Commonwealth and Victorian legislation for marine protected areas, protected marine species and listed processes that may be relevant to the Project (refer to Attachment 10E). Various marine species, habitats and ecological communities are protected by the Commonwealth EPBC Act and the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act). Threatened species that may occur in the vicinity of the Project Site were identified and assessed in terms of potential risks posed by the Project.

The review identified 33 threatened marine species (excluding birds¹) and one marine community that the EPBC Act and FFG Act list may occur in Western Port. Many of these species were relatively widely distributed and Western Port was shown to represent a small component of their range. Additionally, Western Port was not recognised as a significant aggregation, breeding or feeding location or migratory path for most EPBC identified species and many FFG listed species (excluding water birds).

¹ Water birds are assessed as part of the Flora and Fauna Assessment (Jacobs 2018e)
Version 5: July 2013

Of the 33 threatened marine species identified as potentially occurring in the Western Port region, the EPBC listed species included four endangered species and four vulnerable species:

- Endangered marine species: Blue Whales, Southern Right Whales, Leatherback Turtles and Loggerhead Turtles. Assessment against the EPBC Act Policy Statement 1.1 - Significant Impact Guidelines, determined that the Project risk to these endangered species is very low as there are no direct or indirect pathways that are likely to affect population size; area of occupancy; population continuity; critical habitat, breeding cycle; or species recovery of any of those species.
- Vulnerable marine species: Humpback Whales; White Shark, Australian Grayling and Green Turtle. There are no apparent direct or indirect pathways related to the Project that may affect Humpback Whales, White Sharks, or Green Turtles: population size; area of occupancy; population continuity; critical habitat, breeding cycle; or species recovery
 - Humpback Whale: Considering the infrequent and small number of Humpback Whales that may occur in the area, the extremely small proportion of the population that those individuals represent and the low consequence of interaction with the Project, the risk to these whales is very low.
 - White Shark: The key threats to the White Shark (also known as Great White Shark) populations are commercial fishing, recreational fishing, shark control activities (beach meshing), trade (fins, jaws and teeth) and tourism (FFG Action Statement No. 185). The Project does not involve these threats, and no indirect effects of the Project that could detrimentally affect the White Shark individuals that may occur in Western Port or populations in general have been identified.
 - Green Turtle: Threats to the Green Turtle primarily relate to disturbance of nesting and foraging sites, collisions with boats and ships, habitat disturbance and by-catch in fishing operations. The Project does not involve significant change to any of these threats in Western Port and the likelihood of Green Turtles presence in Western Port is extremely low. Therefore, the risk of impacts to the Project to Green Turtle populations is negligible.
 - Adult populations of Australian Grayling are distributed widely in Victorian coastal streams between the New South Wales border and the Hopkins River in western Victoria, including streams entering the northwest of Western Port. The Project does not include any of the threatening processes listed in the National Recovery Plan for the Australian Grayling, which focuses on environmental processes in freshwater streams. However, it was recognised that Project heat exchange seawater processes had potential to effect larval and juvenile dispersion and migration in Western Port. For this reason, further study of the Australian Grayling was undertaken which indicated that adult populations and larvae of this species were not exposed to significant impact pathways from the Project.

The review identified an additional three FFG listed marine species that may occur in Western Port in the region of the Project:

- Pale Mangrove Goby (*Mugilogobius paludis*): listed under the FFG Act as threatened and has been recorded near Crib Point. The formal status of this species is uncertain and it is possible that the species is synonymous with a more common species (*M. platynotus*). The species distribution was considered to overlap with potential Project impact processes and boundaries related to heat exchange operations on the FSRU. For this reason, further study of the Pale Mangrove Goby was undertaken (also reported in Attachment 10E) which indicated that adult populations and larvae of this species were unlikely to be exposed to impact pathways from the Project.
- Western Port ghost shrimp (*Pseudocalliax tooradin*): is only known from a total of five individuals. Four were collected subtidally in grab samples offshore from Crib Point in 1965 (refer to Figures 15 and 26 in Attachment 10E) and since then have not been recorded in Western Port. The habitat where it was found at Crib Point comprised shallow, subtidal fine sand. The species distribution was considered to overlap with potential Project impact processes and boundaries related to heat exchange operations on the FSRU. Hence, the key

processes were examined in greater detail and the interaction with this species was further assessed (as reported in Attachment 10E). The key findings are presented in Section 12 and Section 13 of this Referral.

- Small-gilled ghost shrimp (*Michelea microphylla*): is known from only one specimen collected in sandy gravel in 19 m water depth offshore from Crib Point in 1965 (refer to Figures 16 and 26 in Attachment 10E). The shrimp has not been found anywhere else since 1965, including via a comprehensive sampling program for the Western Port Bay Environmental Study in the 1970s. The species distribution was considered to overlap with potential Project impact processes and boundaries related to heat exchange operations on the FSRU. Hence, the key processes were examined in greater detail and the interaction with this species was further assessed (as reported in Attachment 10E). The key findings are presented in Section 12 and Section 13 of this Referral.

Section 12 and Section 13 provide further information on marine flora and fauna and the water environments potentially impacted by the Project and mitigation measures to manage these potential impacts.

Air Quality

An air quality impact assessment (refer to Attachment 2) was undertaken to assess compliance with State Environment Protection Policy (Air Quality Management) (SEPP(AQM)). Substantial air quality modelling of the operation of the FSRU and LNG carrier was undertaken using AERMOD. Modelling covered two operational scenarios: natural-gas fuelled FSRU; and Liquid (diesel) fuelled FSRU. Worst case scenarios for discharge of air emissions (diesel fuel) and environmental conditions were used for the study.

The modelling of both FSRU operational scenarios demonstrated there were no exceedances of SEPP(AQM) Design Criteria at any of the sensitive receptors, for any of the pollutants.

The modelling of both FSRU operational scenarios demonstrated there were no exceedances of SEPP(AQM) Design Criteria for nearly all grid points over land, with the only exceedances occurring around the FSRU and off-shore. These results for 'low risk', primarily off-shore exceedances were obtained for the pollutants: NO₂, SO₂, PM₁₀, and PM_{2.5}. There were no exceedances for any of the grid receptors for any of the higher risk VOCs tested by modelling; benzene, formaldehyde, and PAHs.

The general conclusion of the air quality modelling assessment was that there is a low risk of air quality impact from the Project's FSRU and LNG carrier operations for on-shore sensitive receptors near Crib Point. EPA has confirmed an EPA Works Approval and EPA Licence is required and the Works Approval Application is being prepared by AGL.

Section 15 describes the air emission modelling assessment and results.

Noise

An assessment of the construction and operational noise impacts associated with the Project has been undertaken (refer to Attachment 4). The noise criteria for construction and operation have been determined in accordance with EPA Noise Control Guidelines (Publication 1254) and Noise from Industry in Regional Victoria (NIRV) (Publication 1411), respectively. A SoundPlan noise model was created to predict the environmental noise impact of operational noise at the Noise Sensitive Areas surrounding the Project Site. The operational scenarios modelled included the mooring of the visiting LNG carrier, FSRU regasification operations and the Pipeline Project End of Line Facilities.

The conclusions of the assessment of noise due to operations are presented below:

- Operations of the AGL Gas Import Jetty Project and the End of Line Facilities comply with the NIRV Recommended Noise Levels at all time periods. Activities include:
 - Mooring of LNG carrier
 - FSRU operation including regasification process

- Injection and offloading of nitrogen at End of Line Facilities
- There may be instances that the existing United operations on the jetty occur simultaneously with the proposed AGL operations. Assuming that United are operating at the threshold limits of NIRV Recommended Noise Levels during day, evening and night periods at each of the Noise Sensitive Areas, the following can be concluded:
 - Operations of the AGL Project and End of Line Facilities will not increase the existing noise levels when United is operating simultaneously.
 - The residents surrounding the Project Site are unlikely to perceive a change in noise levels when AGL Project and End of Line Facilities commence operation.

Section 15 describes the noise emissions modelling assessment and results.

Social

A desktop social impact assessment (Attachment 9) examined the potential positive and negative social impacts associated with the Project for the community of Crib Point, the Shire of Mornington Peninsula and the State of Victoria more generally.

The key potential social benefits include:

- Maintain security and stability of gas supply to the south- east Australian market, to keep downward pressure on gas prices
- Increase in employment with up to 40 direct ongoing roles created for the Project at the site, in addition to the employment created during construction and ongoing indirect employment.

The potential impacts that can be adequately managed are:

- Reduced amenity for local residents and visitors to the foreshore during construction and operation
- Concerns about safety associated with increased traffic levels during construction
- Impacts on parking for visitors to the foreshore and the Victorian Maritime Centre
- Impacts on recreational boaters, anglers and on surface users of Western Port associated with the small increase in ship movements
- Community concerns about the impact on the environmental values of Western Port.

Section 15 describes the outcomes of the social impact assessment.

12. Native vegetation, flora and fauna

Native vegetation

Is any native vegetation likely to be cleared or otherwise affected by the project?

NYD No Yes If yes, answer the following questions and attach details.

The area disturbed for this Project is confined to the land disturbance footprint (as shown on Map C). This area contains a mixture of exotic pasture grasses such as Brown-top Bent *Agrostis capillaris* and broad-leaf weeds amongst native species such as Burgan and Prickly Tea-tree that are kept low through regular slashing. This area represents approximately 0.44 ha of native vegetation and will require removal for the Project. For the purposes of Clause 52.17 (native vegetation) of the Mornington Peninsula Planning Scheme, it is considered this vegetation is regeneration less than 10 years old and removal is exempt from the need for planning approval.

What investigation of native vegetation in the project area has been done? (briefly describe)

The following assessments of native vegetation have been conducted of the landside component of the Project Site.

- Jacobs 2018e, AGL Gas Import Jetty Project, Flora and Fauna Assessment. Prepared for AGL.
 - The Flora and Fauna Assessment (Attachment 5) comprised of a desktop assessment and field survey to assess the existing terrestrial flora and fauna attributes of the landside component of the Project Site.
 - The report submits that the landside component of the Project Site contains areas of native vegetation covering approximately 2 ha (in total), comprising native Heathy Dry Woodland and scattered native trees; and a cleared parcel of land of approximately one hectare. However, the native vegetation impacted by the Project would be limited to approximately 0.44 ha.
- PKA 2015. Ecological (Flora & Fauna) Assessment Crib Point Jetty, Port of Hastings. Prepared for Port of Hastings.
 - PKA was commissioned by PoHDA to prepare an ecological assessment of the landside area adjacent to the Crib Point Jetty (i.e. the landside area of the Project Site but excluding an approximate 0.5 ha area in the southern portion of the site).
 - The vegetation and habitat quality of the area is relatively low as a consequence of prior site management. The vegetation is a mix of planted mostly native (not necessarily indigenous) vegetation combined with natural regeneration of species that are indigenous to the site. The site is unlikely to contain any threatened species of flora due to modification.
 - The assessment determined that four separate Habitat Zones are located on site, each with a habitat score ranging from 25 – 29 (a relatively low scoring against a possible 75 – 100). It is noted vegetation to the south of the existing pipelines was not assessed at the time but will presumably have similar scores. Based on historical photography presented within the report the site was cleared of vegetation in the early 1960's. Despite being regrowth, the vegetation is greater than ten years old so still subject to the requirements of the regulations. The vegetation in the study area is predominantly regrowth from the previous clearing in 1964 – 1965.
- CEE 2018e. Marine Ecosystem Protected Matters Assessment. Prepared for AGL.
 - A marine ecosystem regulatory review and assessment of threatened species has been undertaken of relevant Commonwealth and Victorian legislation for marine protected areas, protected marine species and listed processes that may be relevant to the Project. (Attachment 10E)
 - The seabed around the Crib Point Jetty comprises unconsolidated sediments. Mangroves grow on the upper intertidal mudbanks north and south of Crib Point; seagrasses grow on the muddy and sandy seabed from the mid-tide mark to a maximum water depth of 7 m, which is approximately 500 m inshore of the proposed location of the FSRU. The sediments of the seabed beyond 7 m deep are bare of marine vegetation due to insufficient light penetration.
 - Marine vegetation (mangroves, seagrass or macroalgae) will not be removed during Project works.
 - The seabed within 500 m landward and more than 1 km seaward of the FSRU is bare of vegetation. Hence benthic marine vegetation is not expected to be impacted by the Project.

What is the maximum area of native vegetation that may need to be cleared?

NYD Estimated area: 0.44 ha

How much of this clearing would be authorised under a Forest Management Plan or Fire Protection Plan?

N/A approx. percent (if applicable)

Which Ecological Vegetation Classes may be affected? (if not authorised as above)

NYD Preliminary/detailed assessment completed. If assessed, please list.

Native vegetation within the Project Site consists solely of a highly modified form of the Heathy Woodland Ecological Vegetation Class (EVC 48).

Have potential vegetation offsets been identified as yet?

NYD Yes N/A If yes, please briefly describe.

The area of native vegetation proposed for removal is considered exempt, being regrowth less than 10 years old.

Other information/comments? (e.g. accuracy of information)

NYD = not yet determined

Flora and fauna**What investigations of flora and fauna in the project area have been done?**

(provide overview here and attach details of method and results of any surveys for the project & describe their accuracy)

Terrestrial Flora and Fauna

Terrestrial flora and fauna investigations include both desktop and ecological surveys of the Project Site as outlined below. Overall the vegetation and habitat quality of the Project Site is relatively low as a consequence of prior clearing and site management and therefore potential for significant impact is considered low for threatened flora and fauna species.

- Jacobs 2018e, AGL Gas Import Jetty Project, Flora and Fauna Assessment. Prepared for AGL.
 - The Flora and Fauna Assessment (Attachment 5) assessed the existing terrestrial flora and fauna attributes of the landside component of the Project Site.
 - Seven threatened flora species were deemed to have a moderate likelihood of occurring within the Project Site, however the impact assessment determined the potential for significant impact to be low for all species.
 - For the fauna species previously recorded within a 5 km radius of the Project Site and deemed as having a moderate or low likelihood of presence within the Project Site, the surveys and assessment determined the potential for significant impact to be low for all species.
 - The report concludes that the Project Site has the potential to support a number of threatened species within the areas of native vegetation (habitat) remaining, but due to the previously disturbed nature of most of the site is unlikely to support any threatened ecological communities.
- PKA 2015. *Ecological (Flora & Fauna) Assessment Crib Point Jetty*, Port of Hastings. Prepared for Port of Hastings.
 - PKA was commissioned by PoHDA to prepare an ecological assessment of the landside component of the Project Site. This assessment investigated the flora and fauna significance of the site and any ecological constraints on development of the site for port purposes including fire protection.
 - The assessment determined that four separate Habitat Zones are located within the Project Site, each with a habitat score ranging from 25 – 29, which is relatively low scoring against a possible 75 – 100. The vegetation and habitat quality of the area is relatively low as a consequence of prior site management. It is dominated by a range of native and exotic vegetation. The Project Site is unlikely to contain any threatened species of flora due to modification.

- The assessment also concluded that the state of the vegetation at the time of survey (2015) provided sub optimal habitat for several species of relatively common fauna.
- PKA 2016. Southern Brown Bandicoot (*Isoodon obesulus obesulus*) survey at Crib Point Jetty, Port of Hastings. Prepared for PoHDA.
 - Targeted surveys of the Southern Brown Bandicoot (SBB) were undertaken within the PoHDA landside component at the Crib Point Jetty (i.e. the landside component of the Project Site). The assessment included a desktop search for SBB records in the local area using the 2015 Victorian Biodiversity Atlas (VBA) and the SBB Sub-regional Species Strategy (SRS) (DEPI, 2014) was reviewed for any additional records.
 - The survey utilised four infrared cameras positioned within potentially suitable vegetation on the PoHDA landside component at the Crib Point Jetty (i.e. the landside component of the Project Site). The surveying was conducted for 16 days in February 2016 and an additional 21 days in April 2016. Prior to each deployment, a zoologist walked the Project Site searching for potential signs of SBB activity.
 - The PoHDA landside component was considered to provide potential habitat for the species, with sufficient dense vegetation cover to provide suitable protection from predators. Native vegetation observed was considered to represent a highly modified form of the Heathy Woodland EVC.
 - Site walkovers detected no obvious signs of SBB habitation. Diggings were prevalent but were considered to have been caused by European Rabbit. No SBBs were detected during the 36 nights that the cameras were deployed on site.

Marine Flora and Fauna

- CEE 2018e. AGL Gas Import Jetty Project, Marine Ecosystem Protected Matters Assessment. Prepared for AGL.
 - A marine ecosystem regulatory review and assessment of threatened species) has been undertaken of relevant Commonwealth and Victorian legislation for marine protected areas, protected marine species and listed processes that may be relevant to the Project. (Attachment 10E).
 - Through an assessment of marine EPBC Act matters of national environmental significance and FFG Act listed species, it was identified that 33 threatened marine species (excluding birds) and one threatened marine community may occur in Western Port.
 - The review found that many of the marine species listed under the EPBC Act and FFG Act were relatively widely distributed, that Western Port represented a small component of their range and that Western Port was not recognised as a significant aggregation, breeding or feeding location or migratory path for most EPBC identified species and many FFG listed species (excluding water birds).
 - The report identifies the impact pathways of the Project and assesses the risks to threatened marine fauna species. The assessment draws on modelling and assessment conducted in separate reports, as described previously.

Have any threatened or migratory species or listed communities been recorded from the local area?

NYD No Yes If yes, please:

- List species/communities recorded in recent surveys and/or past observations.
- Indicate which of these have been recorded from the project site or nearby.

A number of threatened or migratory species or listed communities have been recorded from the local area.

Victorian Biodiversity Atlas (VBA) Search Results

A review of the VBA was conducted by Jacobs in November 2017 to identify threatened or migratory species or listed communities previously recorded within 5 km of the Project Site. The full review is presented in Appendix A and Appendix B of the Flora and Fauna Assessment (Attachment 5), and a summary of the findings presented below.

The VBA identified 12 threatened terrestrial flora species previously recorded within 5 km of the Project Site, however none of these have previously been recorded specifically within the bounds of the Project Site, nor were they observed during field surveys undertaken at the site. Seven of these species were deemed to have a moderate likelihood of occurring within the Project Site:

- Purple Diuris (*Diuris punctata* var. *punctata*)
- Nodding Baeckea (*Euryomyrtus ramosissima* subsp. *prostrata*)
- Coast Ballart (*Exocarpos syrticola*)
- Dense Leek-orchid (*Prasophyllum spicatum*)
- Crested Sun-orchid (*Thelymitra X irregularis*)
- Crimson Sun-orchid (*Thelymitra X macmillanii*)
- Merran's Sun-orchid (*Thelymitra X merraniae*)

For these seven species, the Jacobs (2018e) impact assessment determined the likelihood of significant impact to be low for all species.

The VBA identified 67 threatened fauna species (51 birds, 2 fish, 2 frogs, 12 mammals) previously observed within a 5 km radius of the Project Site. None of these species were observed during field surveys undertaken on the landside component.

Jacobs reported that of the 67 threatened species:

- None were deemed to have a high likelihood of occurring within the Project Site
- Three (3) species, Swift Parrot, SBB and Grey Headed Flying Fox (all EPBC listed species) were deemed to have a moderate likelihood of occurring within the Project Site. The SBB has suitable habitat present within and around the Project Site, however, a previous targeted survey by PKA (2016) failed to reveal the species at the time of survey within suitable habitat at the site.
- 20 species (a mix of EPBC listed species, FFG listed species and Victorian Advisory Lists species) were deemed to have a low likelihood of occurring within the Project Site.
- The Project is not expected to impact on migratory birds due to the lack of suitable habitat within the Project Site.

For the threatened fauna species previously recorded within a 5 km radius of the Project Site and deemed as having a moderate or low likelihood of presence within the Project Site, the Jacobs impact assessment determined the likelihood of significant impact to be low for all species.

The VBA did not identify FFG-listed communities within the search area and Jacobs concluded that the landside component is unlikely to support any FFG-listed communities. At the desktop level, the presence of FFG-listed threatened communities is indicated by the modelled presence of their corresponding EVCs. No EVCs modelled as occurring within the Project Site correspond to any FFG-listed communities. The closest marine community listed in the FFG Act, the 'San Remo Marine Community' is located approximately 23 km from the Project Site. Given the distance to the Project Site, there is unlikely to be any direct or indirect disturbance to the San Remo Marine community.

Protected Matters Search Tool – Marine Species

The Protected Matters Search Tool (PMST) was used by CEE in September 2017 to identify matters of national environmental significance within a 10 km radius of the Project Site. A 10 km search radius (as opposed to the 5 km radial search area for the terrestrial based VBA search) was considered to be a conservative area for potential extent of the project impact pathways on development components at Crib Point on the marine environment. The assessment identified 33

threatened marine species (excluding birds²) and one marine community that the Acts list may occur within 10 km of Western Port.

Of the 33 threatened marine species identified as potentially occurring within 10 km of Western Port, the following EPBC listed species were identified:

- Four endangered marine species: Blue Whales, Southern Right Whales, Leatherback Turtles and Loggerhead Turtles.
- Four vulnerable marine species: Humpback Whales; Great White Shark, Australian Grayling and Green Turtle.
- 12 migratory marine species: Blue Whale, Southern Right Whale, Humpback Whale, Bryde's Whale, Pygmy Right Whale, Dusky Dolphin, Killer Whale, Porbeagle Shark and White Shark and three turtle species (Leatherback Turtles and Loggerhead Turtles Green Turtle) may occur in the Western Port region.

The assessment of potential impacts to these species has been discussed in Section 11 of this Referral.

The review identified an additional three FFG listed species as follows:

- Pale Mangrove Goby (*Mugilogobius paludis*)
- Western Port ghost shrimp (*Pseudocalliax TooradinTooradin*)
- Small gilled ghost shrimp (*Michelea microphylla*)

The assessment determined that Project Site is unlikely to support any EPBC-listed threatened ecological communities. At a desktop level, the presence of EPBC-listed threatened ecological communities is indicated using PMST (DoEE, 2017a). EPBC-listed threatened ecological communities modelled as potentially occurring within the Project Site by the PMST are presented in Table 3. The likelihood of each EPBC-listed threatened ecological community occurring within the Project Site has been assessed by Jacobs, where each species was determined to have a low likelihood of occurrence.

Table 3: EPBC-listed threatened ecological communities modelled as potentially occurring within the Project Site

Threatened ecological community	EPBC conservation status	PMST-modelled likelihood of occurrence	Jacobs-determined likelihood of occurrence
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community may occur within area	Low: The Project Site is not modelled to support grassland habitat types.
Subtropical and Temperate Coastal Salt Marsh	Vulnerable	Community may occur within area	Low: The Project Site is not modelled to support any areas of saltmarsh.

If known, what threatening processes affecting these species or communities may be exacerbated by the project? (e.g. loss or fragmentation of habitats). Please describe briefly.

Potentially threatening processes are identified below.

Construction activities

Given the nature and proven controls, the potential impacts associated with construction activities would be relatively localised and short-term. Environmental risks associated with construction activities will be identified and managed in accordance with the Construction Environmental Management Plan.

² Water birds are assessed as part of the Flora and Fauna Assessment (Jacobs 2018e)
Version 5: July 2013

Entrainment associated with seawater intake

It is proposed that seawater will be drawn into the FSRU heat exchange system for the warming of the LNG. The water intakes are positioned part way down the side of the hull to minimise entrainment. The entrainment effects have been studied by CEE (2018d) and a summary of the findings is provided below.

The FSRU will be located at Berth 2 at the southern end of Crib Point Jetty, in the shipping basin approximately 500 m offshore from the inshore seagrass beds (Figure 5). The conceptual model shows that at that distance, seagrasses will not be affected by entrainment.



Figure 5 Natural marine ecosystem components at Crib Point

Seawater drawn into the FSRU heat exchange system may entrain small marine organisms (very small fish, zooplankton and phytoplankton), drifting eggs and larvae where they are in the central part of the water column adjacent to the intake. These organisms, once entrained, will not survive due to mechanical damage and exposure to chlorine for anti-fouling. The conceptual model of the marine ecosystem in the vicinity of Crib Point (Figure 6) shows that the FSRU will be relatively remote from intertidal and nearshore marine ecosystem components and is located in an area of the channel characterised by plankton and pelagic marine species.

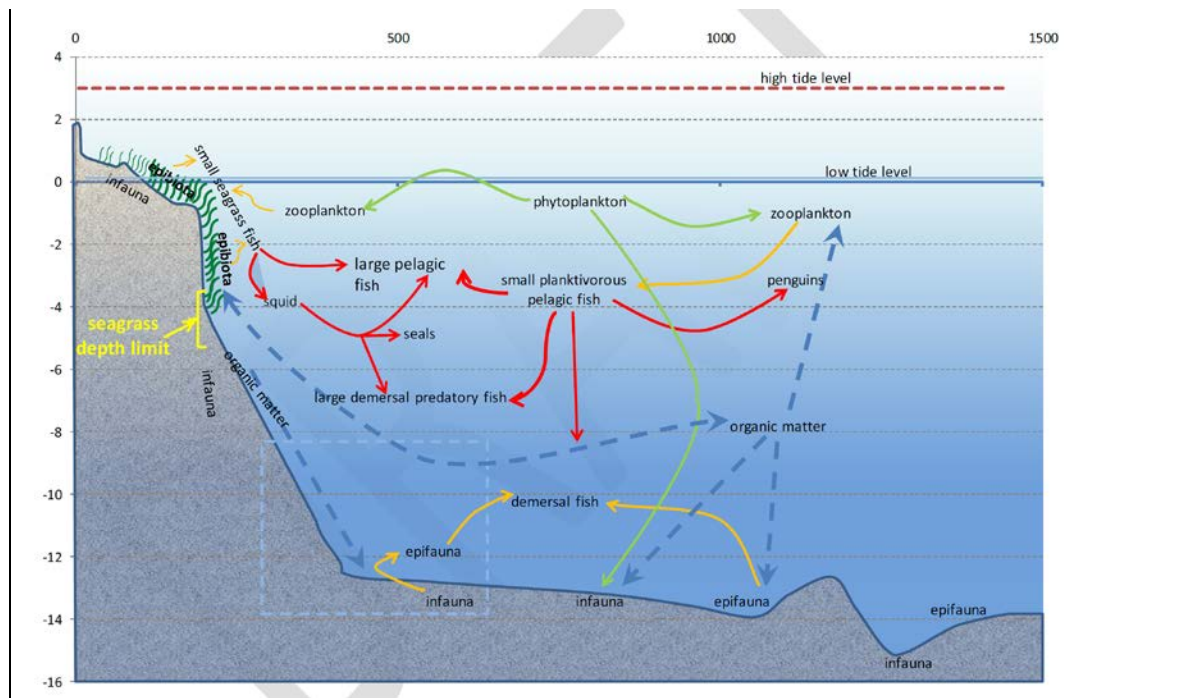


Figure 6 Conceptual model of Western Port marine ecosystem in Crib Point area

Cold-water effects of FSRU discharge

A daily volume of up to 450,000 m³ (450 ML/day) if operating at full capacity, of seawater used to warm the LNG in the FSRU will be returned to Western Port.

An assessment has been conducted by CEE (2018c) to examine the cold-water ecosystem effects on the marine environment resulting from the FSRU water discharge. The report integrates near and mid-field modelling outputs with information on ecosystem characteristics and provides guidance on the impact pathways and extent of effect of the cold-water plume on the marine environment.

The water discharged from the FSRU heat exchanger will initially be 7°C cooler than ambient seawater temperature at the point of discharge but within seconds, the descending plume will be close to the seabed and will have mixed with sufficient surrounding seawater to reduce the temperature. For the six-port discharge (AGL preferred design) the temperature difference near the seabed will be 0.3°C cooler than the ambient seawater temperature.

The six-port discharge temperature differential, mixing with currents, will produce a body of water 0.3°C cooler than the ambient seawater temperature with the spatial extent likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point. A stable cold-water pool never forms for the six-port discharge. The only location that will be constantly exposed to cool seawater will be the water column and seabed within the fall line of the descending cool plume next to the FSRU. Refer to Figure 6a showing the extent of the cold water discharge before reaching a temperature difference of 0.3°C cooler than the ambient temperature.

Modelling demonstrates that the cold-water discharge from the FSRU rapidly descends to the seabed, due to its higher density. The behaviour of the discharge means that key marine habitats in shallow waters adjacent to the FSRU (i.e. saltmarsh, mangroves, mudflats, seagrass beds and channel slope communities) will not be impacted.

The predicted differences in temperature between the discharge and ambient seawater (0.3°C cooler for a six-port discharge), is not expected to have an impact on benthic species on the seabed (e.g. benthic invertebrate infauna, epifauna and demersal fish species) adjacent to the facility given that this temperature difference is well within the natural daily variation of the receiving environment, as well as the physical tolerances of such species.

Generation of Chlorine for prevention of bio-fouling

Seawater contains a range of marine biota and propagules that can attach to the pipes and grow into larger individuals that can block the heat exchanger pipes. To prevent this marine growth, the seawater intake will be subject to an electrolysis process (electric current through seawater) to produce chlorine and hypochlorite.

The seawater discharged from the FSRU heat exchange process will contain short-lived residual chlorine (100 ppb or 0.1 mg/L) and this is recognised as a potential risk to marine environmental values in the immediate vicinity of the discharge points of the FSRU. A study by CEE (2018b) considered these effects, taking into account chlorine chemistry and behaviour in seawater, marine ecosystem toxicity information, chlorine guidance values for protection of marine ecosystem values and assessed the extent of effects of the chlorine content of the seawater discharge options.

Table 4 compiles the regulatory guidance concentrations and the calculated free chlorine concentrations for the Project. The process of initial dilution from the six-port discharge port/s will reduce the concentration of free chlorine residual from 0.1 mg Cl₂/L at the outlet to 0.005 Cl₂/L at the seabed, slightly above the ANZECC interim working value of 0.003 mg/L.

Further mixing with tidal currents within 200 m downstream of the discharge point will reduce the chlorine concentration in seawater at ambient temperature of 12°C is to 0.003 Cl₂/L, while in warmer seawater (16°C to 18°C) the chlorine concentration is estimated to reduce to 0.001 mg Cl₂/L within the same distance. Refer to Figure 7 showing the extent of the chlorine discharge before reaching acceptable levels.

Table 4: Compiled environmental guidance and project chlorine concentrations (calculated)

Condition	Free chlorine, mg Cl ₂ /L
ANZECC and USEPA ecosystem protection guidance values for Total Residual Chlorine (TRC)	
ANZECC 2000 (95% species protection freshwater) Indicative interim working value for marine waters	0.003
USEPA (4 day)	0.0075
USEPA (1 hour)	0.013
FSRU discharge	
FSRU discharge	0.1
After initial dilution and 20 sec chemical reduction:	
Six-port discharge	0.005
After initial dilution and 6 hours chemical reduction:	
Six-port discharge	0.001

* The guidelines provide a trigger value of 3 µg Cl/ L (0.003 mg/L) for 95 % freshwater ecosystem protection and 1 µg Cl/L (0.001 mg/L) for 99 % ecosystem protection. However, there is no trigger value for chlorine in marine (seawater) environments. ANZECC further states that the 3 µg Cl/ L for 95 % ecosystem protection trigger for freshwater was considered of low reliability but was “*adopted as a marine low reliability trigger value, to be used only as an indicative interim working value.*” No value was discussed for 99 % marine species protection, and no total residual chlorine values are listed for marine waters in ANZECC Table 3.4.1 Trigger Values for Toxicants.

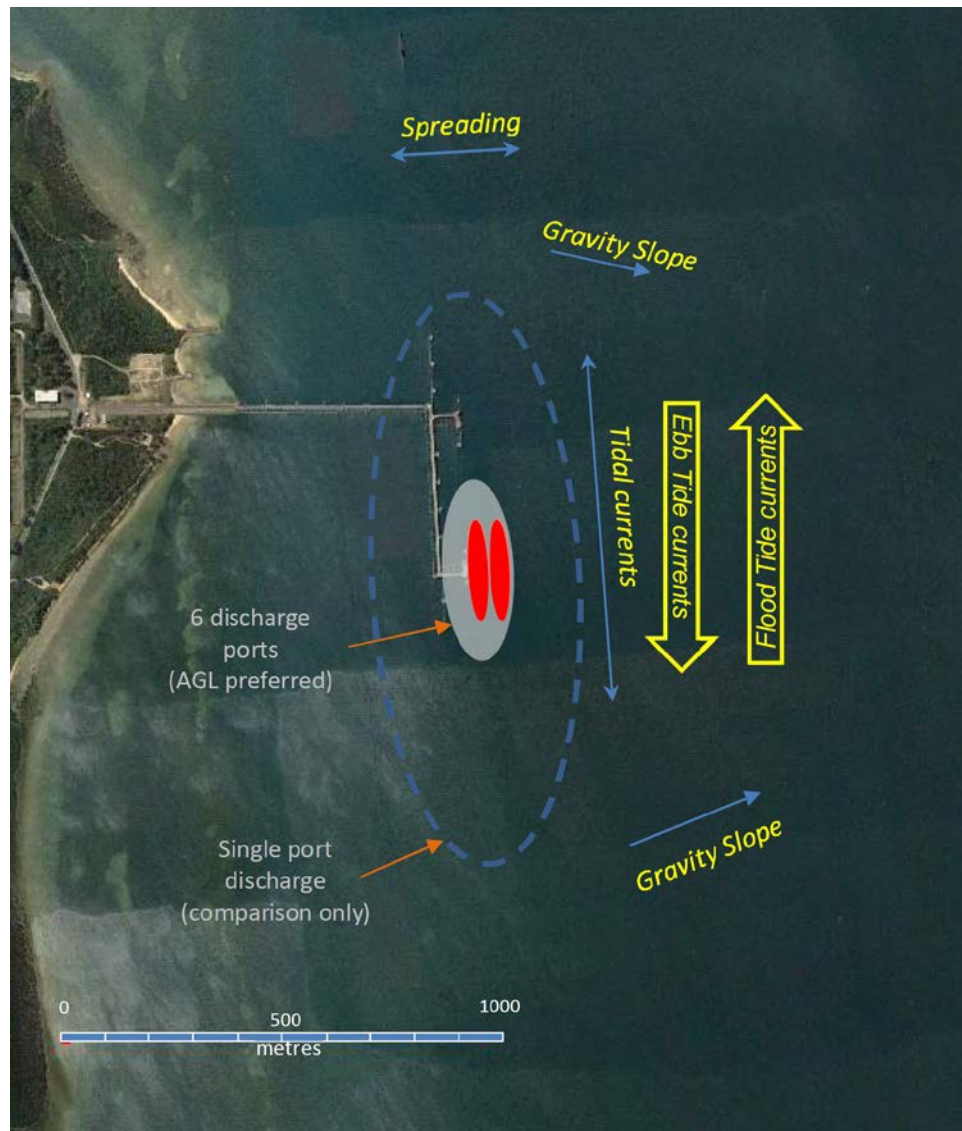


Figure 7 - extent of mixing for Cold Water and Chlorine based upon 6 port discharge

Are any threatened or migratory species, other species of conservation significance or listed communities potentially affected by the project?

NYD No Yes If yes, please:

- List these species/communities:
- Indicate which species or communities could be subject to a major or extensive impact (including the loss of a genetically important population of a species listed or nominated for listing) Comment on likelihood of effects and associated uncertainties, if practicable.

Whilst there is potential for threatened or migratory species, other species of conservation significance or listed communities to be affected by the Project, this is considered unlikely.

The Flora and Fauna Assessment (Attachment 5) concluded that native vegetation within the landside component of the Project Site is unlikely to be critical to any of the threatened species with the potential to be present due to its limited extent. Further, the Project is not expected to impact on migratory birds due to the lack of suitable habitat within the Project Site.

An assessment of the potential operational impacts to marine birds is provided the Appendix C to the Flora and Fauna Assessment (Attachment 5). Fifty-eight marine birds have been identified that may utilise the Project area. The scale of the proposed impacts and the known information

regarding usage of the Project area by marine birds suggests that there are unlikely to be significant impacts to threatened and migratory marine birds.

A search of the PMST identified 33 threatened marine species with potential to occur in the Project vicinity. Of these, the following four species potentially affected by the Project required further investigation to determine the potential impacts:

- Australian Grayling *Prototroctes maraena*: EPBC Act 'Vulnerable'; FFG listed
- Pale Mangrove Goby *Mugilogobius paludis*: FFG listed
- Western Port ghost shrimp *Paraglypturus tooradin*: FFG listed
- Small-gilled ghost shrimp *Michelea microphylla*: FFG listed

The potential impact pathways of this Project on these four species were identified as:

- Entrainment of larvae (all four species) or juveniles (Grayling) into the heat exchange system of the regasification process on the FSRU
- Temperature effects of the water discharge from the FSRU to the waters of Western Port in the vicinity of Crib Point
- Toxicity effects of chlorine related chemicals in the water discharge from the FSRU to the waters of Western Port in the vicinity of Crib Point.

Examination of information on the Australian Grayling and the Pale Mangrove Goby indicated that adult populations and larvae of these species were not exposed to significant impact pathways from the Project.

The Western Port ghost shrimp *Paraglypturus tooradin* and the small gilled ghost shrimp *Michelea microphylla* are known from collections near Crib Point more than 50 years ago. The Western Port ghost shrimp *Paraglypturus tooradin* is known from a total of five records, and the ghost shrimp *Michelea microphylla* is known from only one specimen. No further records of these ghost shrimp species have been recorded since 1965 in Western Port or elsewhere (with the exception of Western Port ghost shrimp with one additional record outside of Western Port in 1982). This is despite a comprehensive sampling program for the Western Port study in the 1970s (Coleman et al, 1978). Examination of information on both ghost shrimp species indicated that they had restricted distributions in Western Port.

The VRCA is responsible for maintaining navigational water depths into Geelong, Western Port and Portland. VRCA intended to level 95 m² of isolated high points at Berth 2 of Crib Point Jetty and engaged CEE to investigate the presence of threatened ghost shrimps in the vicinity of the high points (CEE 2018g). The investigation was designed by experienced marine biologists from CEE in consultation with Dr J Watson (Marine Science and Ecology) and Dr G Poore from the Museums of Victoria. The area was surveyed on 13 July 2018. No threatened species of ghost shrimp were found during the survey.

Is mitigation of potential effects on indigenous flora and fauna proposed?

NYD No Yes If yes, please briefly describe.

The potential for the Project to impact indigenous flora and fauna has been reduced by the selection of a location offering access to existing industrial marine facilities and a previously cleared landside component rather than establishment of a greenfield site.

The potential indirect effects to indigenous flora and fauna will be mitigated through the implementation of a Construction Environmental Management Plan. The Construction Environmental Management Plan will describe how construction impacts on indigenous flora and fauna will be minimised and managed (e.g fencing off no-go areas where vegetation is to be protected; clearly identifying designated lay down areas for the Project, a procedure for dealing with unexpected threatened species).

Mitigation of potential effects on marine flora and fauna through the following measures:

- The seawater intake on the FSRU will be positioned and designed to minimise the entrainment of fish and other small marine animals. The design of the intake has been informed by the CEE studies. The key design mitigations (or alternative designs that are demonstrated to achieve the same effect) are recommended:
 - The intake opening be designed so that seawater is drawn into the intake in a horizontal plane at a speed < 0.15 m/s and oriented parallel to the ambient tidal currents.
 - The seawater intake be positioned in the water column layer between 5 m to 10 m above the seabed.
 - The intake be fitted with bar grills (either 100 mm horizontal by 100 mm vertical or 50 mm horizontal spacing of vertical bars) to reduce the likelihood of larger mobile marine animals and drifting debris from entering the seawater heat exchange system.
- The residual chlorine concentration at the outlet point will be monitored and operations maintained to ensure the concentration does not exceed 100 ppb (0.1 mg/L).
- Adopt a six-port water discharge to minimise impacts to marine ecology from the cold-water and chlorine toxicity effects. The research by CEE (2018a) has indicated that a FSRU designed with a six-port discharge will:
 - Maintain a high enough water velocity to facilitate mixing of cooler water and returning it to 0.3°C below ambient seawater temperature near the seabed (e.g. 19.7°C instead of 20°C in summer, or 9.7°C instead of 10°C in winter).
 - Facilitate prompt mixing of residual chlorine to encourage decay and mixing to environmentally safe concentrations

Other information/comments? (e.g. accuracy of information)

Information to inform assessments have been compiled from various sources including State and Commonwealth government web sites and publications and information from other development projects in the region.

Two previous studies by Royal Haskoning study (2015) and Water Technology (2017) modelled water movement in Western Port:

- The Royal Haskoning study (2015) undertaken for the Port of Hastings indicates that net water movement in Western Port is predominately in a clockwise (northerly) direction. However, persistent strong winds can reverse the direction of the net flow from clockwise to anticlockwise (southerly) (Hinwood, 1979).
- The Water Technology (2017) study predicted a strong southerly drift past Crib Pint, in contrast to previous models and literature (Hinwood, 1979), which would facilitate flushing out towards Bass Strait.

In relation to how this affects the chlorine and cold-water modelling predictions:

- The nearfield, initial dilution models outputs are relatively robust compared to mid to farfield models. The initial dilution models are process models that include some current speed inputs from the mid/farfield models.
- The peak and minimum speeds are relatively consistent between the two models, and these are the inputs to the nearfield models.
- The net current directions differ between the two models. The chlorine and cold-water modelling predictions for the Project have included net directions to the north or the south, hence the predicted dilutions within 500 m of the FSRU are conservative, meaning the difference in the two water movement models does not have a material impact.

13. Water environments

Will the project require significant volumes of fresh water (e.g. > 1 Gl/yr)?

NYD No Yes If yes, indicate approximate volume and likely source.

The Project will not require significant volumes (e.g. > 1Gl/yr) of fresh water for construction or operation.

During construction, water may be required for dust suppression of the construction lay down area and vehicle movements on the landside component. The quantity of water for dust suppression is dependent upon a number of factors including recent precipitation, road material, humidity and vehicle intensity. During dry months, dust generation may increase and as a result may require 1 to 2 litres of water per square metre per hour (based on a typical unsealed road, Global Road Technologies, n.d.). It is estimated that for a 1 ha construction laydown area, over an 8-hour day will equate to approximately 16 kL/day of water for dust suppression.

Based on these estimates, it is expected that the volume of required water will be less than 1 Gl/yr.

The FSRU may use fresh water from time to time for cleaning or removal of natural accumulation of salt. The volume of water used in cleaning is minimal and will not impact the surrounding environment. (The site is expected to have access to mains water. The FRSU will most likely generate its own freshwater on board.)

Will the project discharge waste water or runoff to water environments?

NYD No Yes If yes, specify types of discharges and which environments.

The Project will discharge waste water and runoff to water environments however the effects of this will be minimal within the context of the Western Port environment.

FSRU water discharge

The Project will involve the intake of seawater to the FSRU for warming during the regasification process. Up to 450,000 m³ (450 ML/day) of seawater will be used to heat the LNG to return to a gaseous state. The seawater intake will be drawn into the FSRU through the vessel sea chest or dedicated ports in the hull. An electrolysis process (electric current through seawater) will produce chlorine and hypochlorite to prevent marine growth within the pipes of the heat exchange system. However, it is unlikely to operate at this maximum operating output unless there was a requirement to fill supply short term shortfalls in the gas market. The seawater intake volume required for the regasification rate of 500mmscf/day is 300,000m³/day.

Following the heating process, the resultant cooled seawater will be discharged (at the same rate of up to 450 ML/day) from the FSRU in the vicinity of the Crib Point Jetty. The residual chlorine concentration at the outlet will be monitored and maintained at a concentration of 100 ppb (0.1 mg/L).

A range of marine studies have been undertaken to assess the potential effect of the FSRU water discharge on the marine environment of Western Port.

Studies by CEE (2018b, 2018c) have confirmed that a six-port discharge design for the FSRU will provide suitable mitigation of the cold water and short-lived residual chlorine.

Ballast water

At Crib Point, the FSRU will take local ballast from Western Port and return ballast to Western Port as necessary to control the stresses on the ship's hull. However, as it will be continuously in a 'harbour condition' it will not be exposed to seagoing stresses, hence will not need to take full ballast so the intake volume and discharge volume are reduced compared to a normal seafaring ship.

LNG carriers will arrive full of LNG and will not need to discharge ballast water. As all ships' ballast water may contain an un-pumpable volume of ballast spread across all the ballast tanks, this will be managed by ballast water exchange at sea (at least 200 miles offshore and in greater than 200 m water depth) to ensure any aquatic organisms have been pumped out and tanks are backfilled with clean ballast.

Wastewater

The FSRU is expected to have a sewage treatment plant. Greywater is evaporated and sludge resulting from the treatment process will be removed by barge.

Are any waterways, wetlands, estuaries or marine environments likely to be affected?

NYD No Yes If yes, specify which water environments, answer the following questions and attach any relevant details.

An area of wetlands, estuaries or marine environments are likely to be affected by the Project however the effects of this will be localised and are not expected to be significant, especially within the broader context of the Western Port environment.

Marine Environment

The Project Site is located within the Western Port Ramsar site. However, the Crib Point Jetty (and hence the Project Site) is located outside of the defined 'wetlands' area of the Western Port Ramsar Site and therefore outside of the more ecologically significant areas of Western Port (see Figure 4).

The following assessments have been conducted to determine the potential effects on the marine environment:

- Plume Modelling of Discharge from LNG Facility (Attachment 10A)
- Chlorine in Seawater Heat Exchange Process at Crib Point (Attachment 10B)
- Assessment of Effects of Cold-water Discharge on Marine Ecosystem (Attachment 10C)
- Modelling and Assessment of Biological Entrainment into Seawater Heat Exchange System (Attachment 10D)
- Marine Ecosystem Protected Matters Assessment (Attachment 10E)
- Effects of LNG Facility on Sea Level and Seabed at Crib Point Jetty (Attachment 10F)

The potential effects on Western Port as reported in these studies is summarised in the following sections.

Watercourses / Inland water bodies

No waterways pass through or within vicinity of the Project Site with the topography of the region resulting in a small upstream catchment.

Any discharge from the landside component will be limited to stormwater runoff which will be subject to appropriate site management, under a Construction Environmental Management Plan.

Are any of these water environments likely to support threatened or migratory species?

NYD No Yes If yes, specify which water environments.

Western Port supports a number of water environments likely to support threatened or migratory species however the effects of the Project will be minimal within the context of the Western Port environment.

CEE has undertaken a marine ecosystem review (Attachment 10E) covering relevant Commonwealth and Victorian legislation for marine protected areas, protected marine species and listed processes that may be relevant to the Project. The review examined marine species, habitats and ecological communities protected by the EPBC Act and the FFG Act. A review of threatened and migratory fauna species and habitat likely to occur within the Project Site was also assessed as part of the Jacobs Flora and Fauna Assessment (Attachment 5).

The CEE assessment identified 33 threatened and migratory marine species (excluding birds, see below) listed under the EPBC Act and the FFG Act (Table 5). The assessment was based on a PMST search within a 10 km buffer of the Project Site. These findings which are generated from modelled (rather than derived data) highlight the potential presence of threatened species: meaning that threatened species lists derived from the Victorian Biodiversity Atlas (VBA) searches (DELWP) are considered more accurate.

CEE concluded that many of the identified species were relatively widely distributed and Western Port was shown to represent a small component of their range. Additionally, Western Port was not recognised as a significant aggregation, breeding or feeding location or migratory path for most EPBC identified species and many FFG listed species.

Table 5: Protected species in region of Crib Point Jetty (at September 2017)

Common name	Scientific name	EPBC	FFG
Mammals			
Blue Whale	<i>Balaenoptera musculus</i>	Endangered, Migratory	Listed
Southern Right Whale	<i>Eubalaena australis</i>	Endangered, Migratory	Listed
Humpback Whale	<i>Megaptera novaeangliae</i>	Vulnerable, Migratory	Listed
Brydes Whale	<i>Balaenoptera edeni</i>	Migratory	
Pygmy Right Whale	<i>Caperea marginata</i>	Migratory	
Killer Whale	<i>Orcinus orca</i>	Migratory	
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	Migratory	
Burruran Dolphin	<i>Tursiops australis</i>	Listed marine (NA)	Listed
Sharks			
White shark	<i>Carcharodon carcharias</i>	Vulnerable, Migratory	Listed
Grey nurse shark	<i>Carcharius taurus</i>		Listed
Mackerel Shark	<i>Lamna nasus</i>	Migratory	
Freshwater/Marine Migratory Fish			
Australian grayling	<i>Prototroctes maraena</i>	Vulnerable	Listed
Australian mudfish	<i>Neochanna cleaveri</i>		Listed
Marine Fish			
Mangrove Goby	<i>Mugilogobius platynotus</i> <i>M paludis**</i>		Listed
Southern Bluefin Tuna	<i>Thunnus maccoyii</i>		Listed
Australian Whitebait	<i>Lovettia sealii</i>		Listed
Reptiles			
Leatherback Turtle	<i>Dermodochelys coriacea</i>	Endangered, Migratory	Listed
Loggerhead Turtle	<i>Caretta caretta</i>	Endangered, Migratory	
Green Turtle	<i>Chelonia mydas</i>	Vulnerable, Migratory	
Marine Invertebrates			
Southern hooded shrimp	<i>Athanopsis australis</i>		Listed
Ghost shrimp	<i>Pseudocalliax</i> <i>TooradinTooradin</i>		Listed
Ghost shrimp	<i>Michelea microphylla</i>		Listed
Brittle star	<i>Amphiura triscacantha</i>		Listed
Sea-cucumber	<i>Apsolidium densum</i>		Listed
Sea-cucumber	<i>Apsolidium handrecki</i>		Listed
Brittle star	<i>Ophiocomina australis</i>		Listed
Sea-cucumber	<i>Pentocnus bursatus</i>		Listed
Sea-cucumber	<i>Thyone nigra</i>		Listed

Sea-cucumber	<i>Trochodota shepherdii</i>	Listed
Chiton	<i>Bassethullia glypta</i>	Listed
Opisthobranch	<i>Platydoris galbana</i>	Listed
Opisthobranch	<i>Rhodope genus</i>	Listed
Stalked Hydroid	<i>Ralpharia coccinea</i>	Listed

* Pipefish and seahorses that occur in lists in the EPBC Act are not relevant to this project. The list applies only to Commonwealth waters and Commonwealth agency proponents.

**Flatback or Pale mangrove goby is listed as *Mugilogobius paludis* in FFG but is more correctly known as *M. platynotus*.

The Jacobs Flora and Fauna Assessment (Attachment 5) reported PMST findings which identified 54 listed migratory species for consideration. Migratory species included under the EPBC Act as MNES are species that migrate through Australia and are identified in an international agreement approved by the Minister.

Of the Migratory species identified in the PMST report, 21 are marine species that are not impacted by the proposed works within the assessment area. Five are terrestrial, some of which may utilise the assessment area for foraging, but this is expected to be very rare and it is not considered significant habitat for these species. Twenty-eight (28) are wetland bird species. The assessment area provides minimal habitat values for these species. Although some species such as the plovers and sandpipers may occasionally visit, it is not considered to be significant habitat. In summary, the landside component of the Project is not expected to impact on migratory species listed under the EPBC Act due to the lack of significant habitat within the assessment area. Some of the migratory species have the potential to occasionally visit parts of the assessment area, however, given the assessment area's limited habitat values these species are not likely to be impacted by the landside component of the Project.

Increased activity associated with ships, FSRU and landside operations may result in some localised impacts on migratory fauna through increased human presence, light and noise. It is not expected this will be significant for terrestrial species given the existing use of the site and limited habitat available in proximity of the Project. Further discussion about the operational impacts of the facility on marine birds (pelagic and non-pelagic) is provided in Appendix C of the Jacobs Flora and Fauna Assessment.

A preliminary assessment of FFG listed marine species and communities determined that most of the marine species and communities listed under the FFG Act are not present at the Crib Point and the possible risk to those species and communities from development and operation of the natural gas facility at Crib Point is negligible. Further work has been undertaken on the Pale mangrove goby *Mugilogobius paludis* and the two species of ghost shrimp: the Western Port ghost shrimp *Pseudocalliax tooradin* and the small-gilled ghost shrimp *Michelea microphylla*. These findings are presented in Attachment 10E and summarised below:

Pale mangrove goby or flatback mangrove goby

The pale mangrove goby lives mostly in burrows among mangrove roots in the upper intertidal zone. Goby species vary considerably in their reproductive characteristics. Eggs may remain close to the position they are laid and fertilised, where they may be protected by the male. Hatched larvae, however, disperse from the mangrove habitats and have multiple stages that drift with ambient currents for weeks or months before they return to occupy suitable habitat as adults.

The location and positioning of the intake in the mid-water column will minimise entrainment of larvae if they have a preference for dispersal along natural boundaries.

Ghost shrimps

The potential effects of entrainment, cold-water and chlorine toxicity on the ghost shrimp species from the FSRU seawater intake and discharge are described below:

- *Assessment of entrainment effect*

Both of these shrimps may have planktonic larvae with planktonic durations that could result in their susceptibility to entrainment. For example, some species of ghost shrimps in Western

Port related to *Pseudocalliax tooradin* and *Michelea microphylla* have larval periods totalling more than 15 days, while others have larval periods totalling less than 14 days, while others have been estimated at six weeks (Butler, Reid and Bird, 2009). The behaviour of larvae in the water column is not known.

The adults of *Pseudocalliax tooradin* and *Michelea microphylla* have distributions that are restricted to the proximity of Crib Point. Preliminary modelling of biological entrainment by CEE for this Project (CEE, 2018d) shows that up to 10% of larvae released on the western edge of the channel (including the adjacent mudflats) within about 750m of Crib Point may be entrained into the heat exchange system of the FSRU. As noted above these species have not been observed for over 50 years. These levels may represent a significant proportion for these species if they are present within the Crib Point region.

- *Assessment of cold water and chlorine toxicity effect*

Pseudocalliax tooradin was found at 5 m depth in Western Port and 2 m depth in Swan Bay. This would indicate that the species may be restricted to depths shallower than the cold water plume. Hence it may not be affected by temperature or chlorine toxicity effects. However, its distribution is only known from two samples over 50 years ago. Hence, if present it may occur sparsely over a greater depth range.

Michelea microphylla is known from only one specimen, found approximately 2.4 km north of Crib Point Jetty, in gravelly seabed, at 19 m depth in the main North Arm channel. Its proximity to the FSRU, its presence close to the footprint of the cold-water pool and its occupancy of burrows indicates that it may be susceptible to the cold-water discharge and residual chlorine toxicity exposure if located in the shallower area susceptible to the 0.3°C temperature differential.

The impact of the discharge to seabed biota is mitigated by discharge through a six-port discharge (AGL preferred design). This design disperses water more broadly and therefore will increase rate of mixing of the discharge and reduce the extent of possible toxicity effects.

- *Combined effect and recommendation*

The combined effect of the cold-water discharge (including residual chlorine) and entrainment may be sufficient to affect populations of benthic species in the immediate proximity of the discharge. However, the presence of threatened ghost shrimp species in the channels of Western Port, including North Arm, has not been verified for more than 50 years. AGL is proposing a targeted survey for these particular ghost shrimps (as well as infauna and epifauna in general) to document the present status of threatened species and character of the benthic invertebrate community and to guide further assessment of the effects of the proposal on the marine ecosystem habitat of the channel soft sediment seabed.

Are any potentially affected wetlands listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'?

NYD No Yes If yes, please specify.

The Western Port is a wetland of International Importance listed under the Ramsar Convention and protected under the EPBC Act.

The Port of Hastings, its port facilities, shipping channels and dredged shipping berths including the existing Crib Point Jetty are located within the boundary of the Western Port Ramsar Site. As such, the proposed Jetty Infrastructure and the FSRU will be located within the boundary of the Ramsar Site, but outside the defined area of wetlands (as shown in Figure 3). The landside component is not located within the boundary of the Ramsar Site but is directly adjoined to the north, south and east by the Ramsar Site.

Ecological character is the combination of the ecosystem components, processes and benefits/services that characterise the wetland at the time of designation as a Ramsar Site. The Western Port Ramsar Wetland Ecological Character Description identifies the critical components, processes, benefits and services for Western Port.

Western Port meets seven of the nine criteria for designation as a Ramsar Site, as reviewed in the Western Port Ramsar Wetland Ecological Character Description by KBR (2010) and DELWP (2017a), and these are listed in the Australian Wetlands Database. These criteria are considered below in relation to potential impacts of the Project on the values described by these criteria.

Criterion 1: Representative, rare, or unique example of a natural or near-natural wetland type.

- Western Port is a particularly good example of a natural wetland marine embayment with extensive intertidal flats, mangroves, saltmarsh, and seagrass beds within the South East Coastal Plain bioregion. Western Port is also a very good example of a saltmarsh-mangrove-seagrass wetland system.
- The Project does not involve any construction works that will cause physical disturbance to Western Port as Project activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to the seabed with sufficient momentum to form a local depression in the seabed within the shipping berth. This will have negligible effect outside the shipping basin and will not impact on Ramsar values.
- The Project will not involve any removal of mangroves, saltmarsh or seagrass beds or physical disturbance of intertidal flats.
- Biological entrainment modelling indicates that mangrove seeds and other propagules (e.g. seagrass fragments) that drift or travel on the water surface or near the seabed should not be entrained due to the positioning of the FSRU intake at least 4 m above the seabed and at least 5 m below the water surface.

Criterion 2: Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

- The Ramsar site supports the fairy tern, which is a species of global conservation significance; and the Dense Leek-orchid which is listed as vulnerable under the EPBC Act. Saltmarsh vegetation within the Ramsar site provides important habitat for the orange-bellied parrot, listed as critically endangered under the EPBC Act.
- The Project will not impact on any threatened communities listed under the EPBC Act or *Flora and Fauna Guarantee Act 1988* (FFG Act) and is not likely to have a significant impact on any listed threatened species as described elsewhere in this Referral.
- The Project will not impact on areas of Coastal Dune Scrub along the foreshore, which may provide some low-moderate quality habitat for the Australian Fairy Tern. The Project Site is not considered to provide significant habitat for the Orange-bellied Parrot.
- Suitable habitat for the Dense Leek-orchid may occur within moderate quality Heathy Woodland, an area of which (0.5 ha) is located within the Project Site. Although the species has not been encountered on this site during field survey, AGL has modified the land disturbance footprint of the Project Site (to the footprint as shown in Figure 4 of Attachment 1) to avoid disturbance of this potentially sensitive area. Therefore, no vegetation will be impacted on this section of land.
- The PMST lists 23 EPBC-listed threatened marine birds as potentially occurring within a 5 km buffer of the Project Site and an additional 17 migratory marine birds. The Victorian Biodiversity Atlas (VBA) lists a further 18 threatened marine birds. This provides for a total of 58 marine birds that may use the Project area. From an operational perspective, the impacts to these birds have been considered in the Jacobs Flora and Fauna Assessment (Attachment 6). Information is also presented by CEE (2018d and 2018e) to identify that changes to feeding resources will not be impacted. Given the existing port use, the scale of the proposed impacts associated with the Project and the known information regarding use of the area by marine birds there are unlikely to be significant impacts to threatened and migratory marine birds.
- The water discharge from the FSRU has the potential for localised effects on the Western Port Ghost Shrimp (*Pseudocalliax tooradin*) and Small-gilled Ghost Shrimp (*Michelea*

microphylla) (FFG Act listed species) if they are present, as well as other invertebrate species living in the seabed greater than 12 m depth in the near proximity of the discharge. Effects may be a result of the cold-water and residual chlorine characteristics of the water discharge, however any potential effects to these species (if they are present) would be confined to a relatively small part of the seabed (approximately 200 m north and south and 60 m east and west of the discharge point). This effect would be contained within the shipping berth area of the Ramsar site. The potential impact on any EPBC Act listed threatened or migratory species will be low to very low.

- Both of the FFG Act listed ghost shrimps may have planktonic larvae with planktonic durations that could result in their susceptibility to entrainment. The adults of *Pseudocalliax tooradin* and *Michelea microphylla* have distributions that are potentially in the proximity of Crib Point. Preliminary modelling of biological entrainment for the Project shows a probability of up to 10 per cent of larvae released on the western edge of the channel (including the adjacent mudflats) within about 750 m of Crib Point may be entrained. These levels may represent a significant proportion for these species, if these are present in the Project area.
 - *Pseudocalliax tooradin* have been recorded at 5 m depth in Western Port and 2 m depth in Swan Bay, which would indicate that this species may be restricted to depths shallower than the cold-water plume and therefore may not be affected by temperature or residual chlorine toxicity effects. However, its distribution is only known from two samples and it may occur sparsely over a greater depth range.
 - *Michelea microphylla* have been recorded approximately 2.4 km north of Crib Point Jetty, in gravelly seabed, at 19 m depth in the main North Arm channel. If the species is present in the Project area, given its presence close to the footprint of the cold-water plume (i.e. >12.5 m depth) and its occupancy of seabed burrows indicates that this species may be susceptible to cold-water discharge and residual chlorine toxicity exposure.
- Mitigation measures incorporated into the design of the Project to minimise potential effects on the marine ecosystem include:
 - The marine assessments undertaken by CEE considered single, double and six-port discharge arrangements for the return of the water from the FSRU heat exchange system. The preferred design for discharge is through a six-port discharge arrangement. This optimises dilution of the discharge and results in a smaller temperature difference closer to the discharge point.
 - The seawater intake on the FSRU is designed to minimise the entrainment of large marine organisms, mammals and fish, through the use of appropriate screens and the optimum positioning of the intake vertically within the water column layer, avoiding surface and seabed waters, where movements of biota are most likely to be concentrated.

Criterion 3: Supports populations of plant and/or animal species important for maintaining the biological diversity.

- Western Port is one of the most important areas for migratory waders in south-east Australia with wader surveys indicating that the Ramsar site supports up to 39 species, and includes 10,000 - 15,000 summer migrants (approximately 12 to 16 % of the Victorian population). It also supports seagrass and mangrove communities that are characteristic of the marine embayments of Southern Victoria.
- Of the Migratory species identified in the PMST report, 21 are marine species that are not impacted by the proposed works. Five are terrestrial, some of which may use the landside component for foraging, but this is expected to be very rare and the site is not considered significant habitat for these species. Twenty-eight (28) are wetland species. The assessment area provides minimal habitat values for these species and it is not considered to be significant habitat.
- The Project will not involve any direct removal of seagrass or mangroves communities and is not expected to indirectly impact on these communities as a result of FSRU discharge, given that cooler seawater and any potential toxicity effects will only be present in the deeper

channel of North Arm at water depths greater than 12.5 m and within an area of approximately 200 m north and south and 60 m east and west of the discharge point. There is potential for localised effects on channel soft seabed communities.

Criterion 4: Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

- The Ramsar site is one of the three most important areas in southeast Australia for migratory waders in total numbers and density. The Ramsar site provides important overwintering habitat for the orange-bellied parrot. It also provides a number of important high tide roosts and breeding habitat.
- The Project Site is not considered to provide significant habitat for the Orange-bellied Parrot.
- All of the intertidal mudflats of Western Port are considered to be suitable foraging areas for waterbirds. The Project will not involve any direct physical disturbance of intertidal flats and is not expected to indirectly impact on these communities as a result of noise or FSRU water discharge.
- The Project Site does not contain any identified roosting sites or primary foraging areas for waterbirds. The nearest roosting sites are located more than 4 km from Crib Point at Long Island Point to the north, or across North Arm at Fairhaven on French Island and are not expected to be impacted by noise or light from the FSRU. The next closest roosting site is located at Sandy Point more than 6 km south of Crib Point. The nearest primary foraging areas extend over the intertidal mudflats to the north of Crib Point and south of Long Island Point.
- The Project may affect some plankton and planktonic life stages of some marine invertebrate species through biological entrainment, exposure to cooler seawater and residual chlorine from the FSRU discharge. However, these effects would be limited to a confined part of the North Arm, within the Ramsar site but outside the defined wetland areas and are unlikely to affect marine invertebrate populations or EPBC Act listed threatened species.
- Biological entrainment modelling indicates that larvae that can maintain position in preferred nearshore habitats, such as mangroves, seagrasses and shallow nearshore waters, are unlikely to be entrained; and larvae, eggs and other propagules (e.g. mangrove seeds / propagules) that drift or travel on the water surface or near the seabed are unlikely to be entrained.

Criterion 5: Regularly supports 20,000 or more waterbirds.

- The Ramsar site regularly supports about 10,000 - 15,000 migratory waders, and periodically supports 1,000 - 3,000 ducks and 5,000 - 10,000 Black Swans.
- As for Criterion 2, there are 58 marine birds that may use the Project area, however the scale of the proposed impacts associated with the Project and the known information regarding use of the area by marine birds suggests that there are unlikely to be significant impacts to threatened and migratory marine birds.
- All of the intertidal mudflats of Western Port are considered to be suitable foraging areas for waterbirds.
- The Project will not involve any direct physical disturbance of intertidal flats and is not expected to indirectly impact on these communities as a result of noise or FSRU water discharge, given that cooler seawater will only be present in the deeper channel of North Arm at water depths greater than 12.5 m.
- The Project Site does not contain any identified roosting sites or primary foraging areas for waterbirds. The nearest roosting sites are located more than 4 km from Crib Point at Long Island Point to the north, or across North Arm at Fairhaven on French Island. The next closest roosting site is located at Sandy Point more than 6 km south of Crib Point. The nearest primary foraging areas extend over the intertidal mudflats to the north of Crib Point and south of Long Island Point.
- Of the Migratory species identified in the PMST report, 21 are marine species that are not impacted by the proposed works. Five are terrestrial, some of which may utilise the landside

component for foraging, but this is expected to be very rare and the site is not considered significant habitat for these species. Twenty-eight (28) are wetland species. The assessment area provides minimal habitat values for these species and it is not considered to be significant habitat.

- In summary, the Project is unlikely to directly affect waterbirds in North Arm and most unlikely to affect waterbirds elsewhere in Western Port.

Criterion 6: Regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

- The Ramsar site regularly supports more than one per cent of the estimated flyway population of five wader species. The Ramsar site also regularly supports internationally significant numbers of several non-wader species.
- Refer to response to Criterion 5.

Criterion 7: Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and contributes to global biological diversity.

- Not considered applicable to Western Port in KBR (2010) and DELWP (2017a) reviews.

Criterion 8: Important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

- Seagrass beds within the Ramsar site are known to provide important nursery habitat for a number of fish species, including commercially significant species.
- The Project will not involve any removal of mangroves, saltmarsh or seagrass beds or physical disturbance of intertidal flats.
- The discharge modelling demonstrates that the cold-water discharge from the FSRU rapidly descends to the seabed (approximately 1414 m), due to its higher density. The behaviour of the discharge means that key marine habitats in shallow waters adjacent to the FSRU (i.e. saltmarsh, mangroves, mudflats, seagrass beds and channel slope communities) are not predicted to be impacted.
- As per response in Criterion 4, there may be possible effects on plankton and planktonic life stages of some marine invertebrate species.
- Species that occupy habitats in water depths greater than 1414 m in the vicinity of the discharge may be exposed to a seawater temperature 0.3°C cooler than ambient seawater temperature. However, this temperature difference is well within the natural daily variation of the receiving environment. Biological entrainment modelling undertaken for the Project indicates that no significant impacts on local biota are likely to occur as a result of biological entrainment through the FSRU seawater intake, as described in Section 2.6.2 of this Referral.

Criterion 9: Regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

- Not considered applicable to Western Port in KBR (2010) and DELWP (2017a) reviews.

Summary: Based on the above, there is negligible risk to five of the seven applicable Ramsar criteria. There is negligible risk in relation to direct effects on waterbird populations. There is possible interaction of the Project (cold-water discharge, residual chlorine and entrainment pathways) in relation to four of the five Ramsar criteria due to potential localised effects on the planktonic life stages of some marine invertebrate species. However, this interaction will occur within a confined part of North Arm less than 1% within the larger Ramsar site.

Environmental risks associated with construction and operational activities will be identified and managed as per sections previously described, and in accordance with the Construction Environmental Management Plan and an Operation Environmental Management Plan, respectively.

Could the project affect streamflows?

NYD No Yes If yes, briefly describe implications for streamflows.

There are no waterways in the vicinity of the Project Site.

Could regional groundwater resources be affected by the project?

NYD No Yes If yes, describe in what way.

Regional groundwater resources will not be affected by the Project.

Groundwater is present at approximately 6.8 m to 7.5 m below ground level and is tidally influenced and is therefore likely to have a strong hydraulic connection with waters of Western Port.

As the FSRU seawater intake/discharge is a 'loop', it intakes seawater and returns it to the sea. As such, no impact on groundwater is expected.

There are no registered extractive uses of groundwater in the vicinity of the site, therefore the Project is unlikely to affect resources which are in use.

Could environmental values (beneficial uses) of water environments be affected?

NYD No Yes If yes, identify waterways/water bodies and beneficial uses (as recognised by State Environment Protection Policies)

Western Port supports a number of environmental values (beneficial uses) as identified in SEPP (Waters of Victoria) - Schedule F8 Waters of Western Port and Catchment. The Project may affect beneficial uses (largely unmodified aquatic ecosystems) within the close proximity to the point of discharge, however is not expected to affect the beneficial uses within the greater marine environment in the vicinity of Crib Point and the wider North Arm area of Western Port.

An assessment of the proposed water discharge from the FSRU heat exchange system in the context of the prescribed beneficial uses for the Entrance and North Arm segment of Western Port specified within the State Environment Protection Policy (Waters of Victoria) is provided in Table 6.

Table 6: Prescribed Beneficial Uses and corresponding assessment of the FSRU seawater discharge against those beneficial uses

Beneficial Uses to be protected in North Arm	Assessment of the FSRU seawater discharge
Largely unmodified aquatic ecosystems	<p>A range of technical modelling studies have been undertaken in order to assess the impact of the FSRU water discharge on the receiving environment within the Entrances and North Arm segment of Western Port.</p> <p>Predictive modelling studies have indicated that the nature of the water discharge and the engineering design controls proposed will result in no discernible effect on the unmodified nature of the aquatic ecosystems, outside of a small area of mixing immediately adjacent to the discharge points. Specifically, the modelling predicted that for the preferred six-port discharge option, the water discharge will produce a body of water 0.3°C cooler than the ambient seawater temperature with the spatial extent likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point. There will be a gradient of decreasing cold water from 7°C to 0.3°C cooler than the ambient seawater temperature within this area and the predicted difference in temperature beyond 200 m from the discharge point is within the natural daily temperature variation of the receiving environment.</p> <p>Residual chlorine will be present in the water discharge, as the seawater intake will be subject to an electrolysis process (similar to saltwater pool chlorinators used domestically, but at lower concentrations) - to produce chlorine and hypochlorite. This will prevent the growth of marine organisms in the heat exchange system on the FSRU. The residual chlorine concentration in the water discharge will be managed at less than 0.1 mg/L. Similarly, to the temperature effects, chlorine concentrations in the water discharge will also decrease along a gradient from</p>

	<p>the points of discharge and will reach national and international guideline objectives³ within 200 m of the points of discharge. An assessment of the residual chlorine chemistry and behaviour in the discharge as it relates to potential ecotoxicological impacts on marine biota within the receiving environment was undertaken (CEE 2018c). The study notes that there is no guideline value for residual chlorine in the marine environment in the ANZECC guidelines which sets a level for marine ecosystem protection. The ANZECC guidelines do reference the levels in freshwater as being able to be used as a "marine low reliability trigger value, to be used only as an indicative interim working value".</p> <p>The study determined that the concentration of residual chlorine within the water discharge was predicted to reach the interim working value at a distance of approximately 200 m north and south and 60 m east and west of the discharge point due to the initial 'near-field' mixing as well as the natural rapid chemical breakdown of chlorine within the surrounding seawater.</p> <p>The effects of both residual chlorine and cold water will decrease with distance from the discharge points, therefore the beneficial uses with respect to aquatic ecosystems will be protected beyond 200 m from the discharge points.</p>
Passage for native fish or other aquatic biota	<p>The North Arm at the Crib Point area is greater than 5 km wide and predictive modelling studies have indicated that the maximum width of the mixing area at the points of discharge is 120 m, which represents less than 2.5 % of the width of North Arm. Hence, the nature of the water discharge and the engineering design controls proposed will result in negligible effect on the passage of native fish or aquatic biota through North Arm and Western Port.</p>
Water suitable for primary contact recreation and secondary contact recreation	<p>It is noted that beneficial uses of the waters of North Arm include primary and secondary contact recreation.</p> <p>Predictive modelling and assessment of the FSRU water discharge has demonstrated that there is no risk to these beneficial uses as a result of the operation of the facility. Residual chlorine will be present in the water discharge, as the seawater intake will be subject to an electrolysis process (similar to saltwater pool chlorinators) - to produce chlorine and hypochlorite. This will prevent the growth of marine organisms in the heat exchange system on the FSRU. The residual chlorine concentration in the water discharge will be managed at less than 0.1 mg/L, which is substantially below the 1 mg/L minimum limit for swimming pools (Health (Infectious Diseases) Regulations 2001). Furthermore, this level of residual chlorine is well below the Australian Drinking Water Guideline value of <5 mg/l (NHMRC 2017) and as such poses no risk to the beneficial uses of primary or secondary contact recreation.</p> <p>Similarly, the predicted difference in temperature between the water discharge after initial mixing and the ambient seawater is well within the natural daily temperature variation of the receiving environment and as such it is considered that the beneficial use will not be impacted.</p> <p>The FSRU will be moored at the Crib Point Jetty, more than the 700 m offshore from the nearest accessible shoreline. The Crib Point Jetty currently has an exclusion zone around it (to prohibit recreational uses) for operations of the United Energy berth (Berth 1) and this is enforced by the Port of Hastings Development Authority. The continuous mooring of the FSRU at the jetty would see a more rigid enforcement of exclusion zones than currently exists although the final make-up of the exclusion zone has not been determined. Overall, therefore, the FSRU will operate in an existing industrial port area that is remote from, and relatively unattractive and unsuitable for primary and secondary contact recreational activities.</p>
Water suitable for aesthetic enjoyment	<p>As stated above, the nature of the FSRU facility is such that the only chemical that will be discharged as part of routine operations will be residual chlorine. The only physical change to the properties of the water discharge will be a lower temperature, when compared to the ambient seawater temperature. There will be no changes to the physical appearance of the water discharge and therefore the beneficial use of the water for aesthetic enjoyment will not be impacted.</p>

³ ANZECC 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

USEPA 1985. Ambient Water Quality Criteria for Chlorine -1984. EPA 440/5-84-030 January 1985. US Environmental Protection Agency.

<p>Water suitable for aquaculture, industrial and commercial use, navigation and shipping, consumption of fish, crustacean and molluscs for recreational purposes or commercial purposes.</p>	<p>As stated above, modelling and assessment of the proposed water discharge from the FSRU facility has indicated that there will be no reduction in ambient water quality that may have a subsequent impact on these beneficial uses of the waters off Crib Point. The determined water quality effects associated with the water discharge (i.e. residual chlorine levels and reduced water temperature) are predicted to occur only within a small area (approximately 200 m north and south and 60 m east and west of the discharge point), with background levels achieved outside of this area of initial mixing.</p>
<p>Could aquatic, estuarine or marine ecosystems be affected by the project? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, describe in what way.</p> <p>An area of aquatic, estuarine or marine ecosystems could be affected by the Project, however the effects of this will be localised and will not be significant, especially within the context of the Western Port environment.</p> <p>A range of marine studies have been undertaken to assess the potential effect of the FSRU water discharge on the marine ecosystem. The key impact pathways and marine ecosystem effects associated with the Project have been identified by CEE (2018e) as follows.</p> <ul style="list-style-type: none"> • Entrainment of larvae (Australian Grayling, Pale Mangrove Goby, Western Port Ghost Shrimp and Small-gilled Ghost Shrimp) or juveniles (Australian Grayling) into the heat exchange system of the regasification process on the FSRU • Cold water effects of the water discharge from the FSRU to the waters of Western Port in the vicinity of Crib Point • Toxicity effects of chlorine related chemicals in the discharge from the FSRU to the waters of Western Port in the vicinity of Crib Point <p>These pathways have been described and modelled in separate reports as described previously.</p> <p>Further examination of information about the Australian Grayling and the Pale Mangrove goby indicated that adult populations were unlikely to be exposed to impact pathways and that the proportion of larvae of these species that might be affected by Project processes was low.</p> <p>There is evidence of the Western Port ghost shrimp <i>Paraglypturus tooradin</i> and the small-gilled ghost shrimp <i>Michelea microphylla</i> being known near Crib Point more than 50 years ago. The Western Port ghost shrimp <i>Paraglypturus tooradin</i> is known only from a total of five records, and the ghost shrimp small-gilled <i>Michelea microphylla</i> from only one specimen. Further examination of information on both ghost shrimps indicated that they had restricted distributions in Western Port that may indicate susceptibility to entrainment, cold-water and chlorine toxicity effects of the FSRU seawater heat exchange processes if still present in the area.</p> <p>The FSRU will be moored continuously at Crib Point and it is expected that over time the hull and propeller will become overgrown with marine biota. It is envisaged the hull and propeller will need to be cleaned every five years for inspection. AGL is investigating options for hull and propeller cleaning which will include the development of an Environmental Management Plan in consultation with PoHDA, the harbourmaster and the EPA.</p>	
<p>Is there a potential for extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If yes, please describe. Comment on likelihood of effects and associated uncertainties, if practicable.</p> <p>As outlined in the attached reports, the potential for impact has been evaluated in terms of intensity, geographic area and persistence and determined there is no potential for extensive or</p>	

major effects on the health or biodiversity of aquatic or marine ecosystems for any of these criteria over the long-term.

The following assessment has been undertaken to determine whether an action is likely to have an extensive or major effect on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term:

Areas of the wetland being destroyed or substantially modified:

- No areas of Western Port will be destroyed or substantially modified.
- The Project does not involve any construction works that will cause physical disturbance to Western Port as Project activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site).
- Operationally, the water discharge will descend to the seabed with sufficient momentum to form a local depression in the seabed at the shipping berth, however it will have a negligible effect outside the shipping basin and will not impact on Ramsar values. The Project will not involve any removal of mangroves, saltmarsh or seagrass beds or physical disturbance of intertidal flats.

A substantial and measurable change in the hydrological regime of the wetland:

- There will be no substantial and measurable change in the hydrological regime to Western Port.
- An assessment by CEE (2018f) of the predicted sea level change as a result of the Project showed there would be a very small reduction in water level (approximately 0.3 mm) in the upper part of Western Port due to the constriction in flow caused by any two ships berthed abreast at Crib Point. This reduction is considered to be insignificant in relation to tidal and monthly variations in sea level in Western Port.
- The Project does not involve any construction works that will cause physical disturbance to Western Port as Project activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to the seabed with sufficient momentum to form a significant local depression in the seabed.
- The Project will not involve any removal of mangroves, saltmarsh or seagrass beds or physical disturbance of intertidal flats.

The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected:

- Native species dependent on Western Port are not expected to be significantly impacted.
- The Project may affect some plankton and planktonic life stages of some marine invertebrate species through biological entrainment, exposure to cooler seawater and residual chlorine from the FSRU discharge. However, these effects would be limited to a confined part of the North Arm within the Ramsar site - the extent of cold-water and chlorine toxicity effects are likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point in water depth from approximately 12.5 m to 17 m. This represents an area of approximately 5 ha, which is less than 0.5 % of the seabed in North Arm⁴. Entrainment of up to 10 percent of some plankton and larvae may extend to 750 m north and south from the FSRU, but overall entrainment in North Arm is expected to be less than 1 percent over the whole of North Arm.
- As discussed earlier, there is negligible risk in relation to direct effects on waterbird populations.

A substantial and measurable change in the water quality of the wetland

⁴ Percentage based on the area of North Arm which is greater than 10 m depth.
Version 5: July 2013

- There will be no substantial and measurable change to the water quality of Western Port.
- The determined water quality effects associated with the water discharge (i.e. residual chlorine levels and reduced water temperature) are likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point, with background levels achieved outside of this area of initial mixing.
- There will be no changes to the physical appearance of the water discharge and therefore use of the water for aesthetic enjoyment will not be impacted.
- The residual chlorine concentration in the water discharge will be managed at less than 0.1 mg/L, which is substantially below the 1 mg/L minimum limit for swimming pools (Health (Infectious Diseases) Regulations 2001). Furthermore, this level of residual chlorine is well below the Australian Drinking Water Guideline value of <5 mg/l (NHMRC 2017) and as such poses no risk to primary or secondary contact recreation.
- The predicted difference in temperature between the water discharge after initial mixing and the ambient seawater is well within the natural daily temperature variation of the receiving environment and as such it is considered that the beneficial use will not be impacted.
- A program of further investigation of the marine effects is proposed as detailed in section 1.14 of this Referral.

An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread):

- Ships entering Western Port must comply with the Commonwealth *Biosecurity Act 2015*.
- The environmental and economic threat posed by marine pests to Western Port is recognised by the PoHDA and Parks Victoria. The PoHDA prohibits in-water cleaning of ship hulls and propellers. The discharge of ballast waters is prohibited in port waters (PoHDA, 2017). LNG carriers entering Australian waters must manage ballast water according to the Australian Ballast Water Management Requirements which align with the International Convention for the Control and Management of Ships Ballast Water and Sediments 2004.

The Marine Ecosystem Protected Matters Assessment (Attachment 10E) identified the impact pathways of the Project and these pathways have been described and modelled in separate reports as described previously. Measures to mitigate the effects on the marine ecosystem are described below.

Is mitigation of potential effects on water environments proposed?

NYD No Yes If yes, please briefly describe.

Mitigation of potential effects on water environments is proposed.

Seawater intake design

An assessment of seawater intake parameters has been undertaken by CEE (2018d) to inform design considerations for minimising the adverse effects on marine organisms arising from entrapment and entrainment. The report is provided in Attachment 10D.

The water depth at the site is approximately 14 m from seabed to sea surface at lowest astronomical tide, with an additional 3 m depth at highest tides. To reduce the effect of the intake of seawater on ecosystem components, the seawater intake will be positioned in the water column layer approximately between 5 m to 10 m above the seabed, as shown in Figure 7.

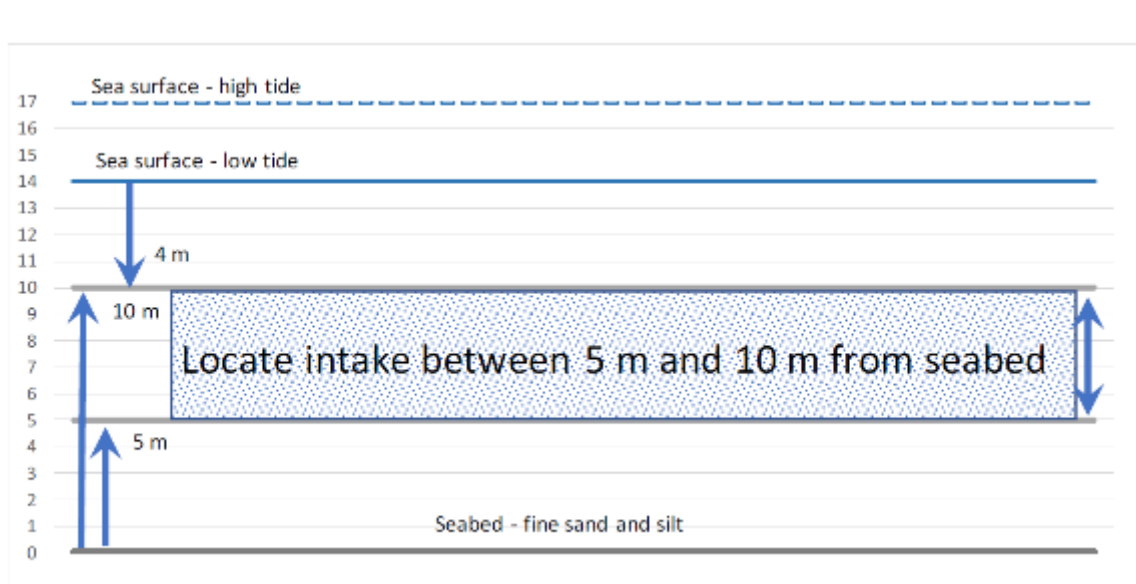


Figure 8: Critical water depths at Crib Point for FSRU seawater intake

The intake opening should be designed so that water is drawn into the intake in a horizontal plane at a speed < 0.15 m/s (Figure 8). The intake should be oriented parallel to the ambient tidal currents.

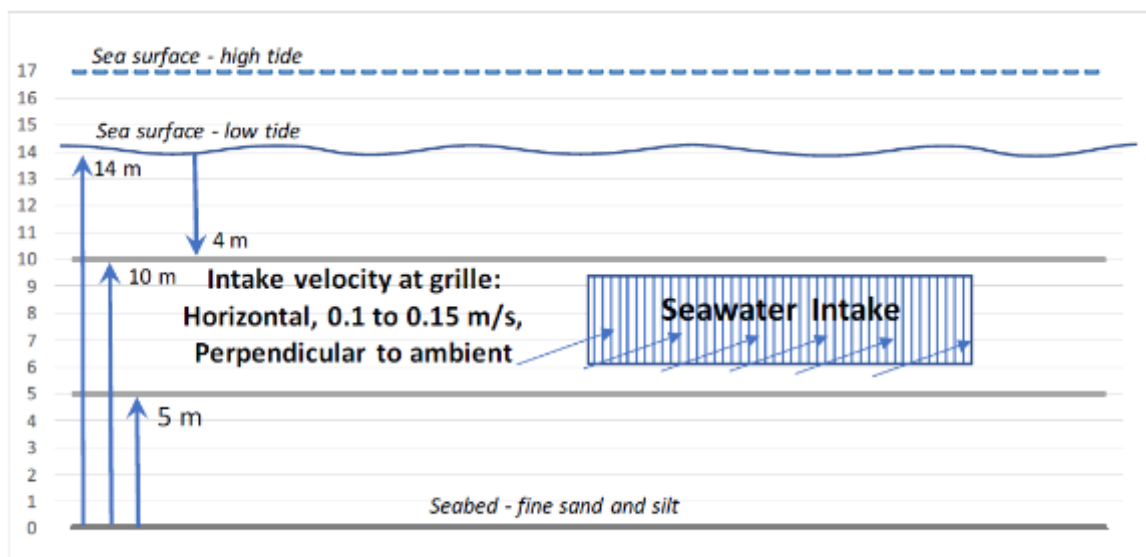


Figure 9: Seawater intake environmental parameters

The intake will be fitted with bar grills to reduce the likelihood of larger mobile marine animals and drifting debris from entering the seawater heat exchange system. These should be either 100 mm horizontal by 100 mm vertical or 50 mm horizontal spacing of vertical bars. The operator of the FSRU should provide for suitable finer screens to prevent entrainment of drifting debris and include the ability to clear the fine screens regularly.

Seawater outlet design:

The design of the FSRU will utilise a six-port discharge (AGL preferred design) for the return of up to 450,000m³ (450 ML) of seawater per day, initially at 7°C below ambient seawater temperature and containing short-lived residual chlorine.

The research by CEE (2018a, 2018b and 2018c) has indicated that a FSRU fitted with a six-port discharge (the preferred design) will minimise impacts to marine ecology such that the extent of cold-water and chlorine toxicity effects are likely to be restricted to an area approximately 200 m north and south and 60 m east and west of the discharge point. The six-port discharge will:

- Maintain a high enough water velocity to facilitate mixing of cooler water and returning it to 0.3°C below ambient seawater temperature near the seabed (e.g. 19.7°C instead of 20°C in summer, or 9.7°C instead of 10°C in winter).
- Facilitate prompt mixing of residual chlorine to encourage decay and mixing to environmentally safe concentrations.

14. Landscape and soils

Landscape

Has a preliminary landscape assessment been prepared?

No Yes If yes, please attach.

A Landscape and Visual Impact Assessment (LVIA) was undertaken by Ethos Urban to establish a baseline understanding of the Crib Point Jetty, onshore land adjacent to the jetty required by the Project, and areas in proximity to the Project Site within a strategic policy context. The LVIA is provided in Attachment 11.

Is the project to be located either within or near an area that is:

• **Subject to a Landscape Significance Overlay or Environmental Significance Overlay?**

NYD No Yes If yes, provide plan showing footprint relative to overlay.

• **Identified as of regional or State significance in a reputable study of landscape values?**

NYD No Yes If yes, please specify.

The Project Site is not identified as having regional or State significance landscape values. The LVIA (Ethos Urban 2018, Attachment 11) reports on the Coastal Spaces Landscape Assessment Study (Planisphere, 2016) which assesses the landscape character and significance of Victorian coastal areas. Whilst the Coastal Spaces Landscape Assessment Study excludes the Crib Point area, the eastern coastline of Western Port is defined as the 'Western Port Lowlands Character Area' and is 'likely to extend around Western Port Bay outside the Project Site for some distance north and west'. This diverse and natural coastline of Western Port within the Character Area is considered of local significance.

• **Within or adjoining land reserved under the *National Parks Act 1975*?**

NYD No Yes If yes, please specify.

• **Within or adjoining other public land used for conservation or recreational purposes?**

NYD No Yes If yes, please specify.

Land to the north of the Project Site is in the Public Conservation and Resource Zone. This land runs along the coast line to the north.

Woolleys Beach Reserve is located to the south of the Project Site and is in the Public Use Zone (Schedule 7 - Other Public Use).

The *Port of Hastings Land Use and Transport Strategy* states

Zoning of the Crib Point jetty, within the ownership of the POHC, is currently a mix of PUZ7 (Public Use Zone (Other Public Use) [sic] and PCRZ (Public Conservation and Resource Zone). As this parcel is the only foreshore access point for port uses available at Crib Point it should be wholly zoned for port uses to PUZ7.

Is any clearing vegetation or alteration of landforms likely to affect landscape values?

NYD No Yes If yes, please briefly describe.

No landforms will be altered as a result of the Project.

The Project Site is located within an industrial setting. Vegetation removal will occur on the Project Site; however, the extent of vegetation removal is yet to be confirmed for the Pipeline Project. Once detailed design is complete for the Pipeline Project, the LVIA for the Crib Point site will be updated to assess the Pipeline Project End of Line facilities. It is expected that the landscape values, that is the industrial setting, are not expected to be impacted.

Is there a potential for effects on landscape values of regional or State importance?

NYD No Yes Please briefly explain response.

Is mitigation of potential landscape effects proposed?

NYD No Yes If yes, please briefly describe.

The LVIA (Ethos Urban 2018, Attachment 11) concludes that the existing maritime infrastructure already installed at Crib Point, including the Victorian Maritime Centre and jetty, provides an existing context for the further development of appropriate and consistent maritime uses. Ethos Urban (2018) recommends that the finish and colour of the FSRU and Jetty Infrastructure be muted in tone and non-reflective and comprise a colour scheme that complements existing infrastructure and other marine vessels that frequent Western Port and the existing jetty. This will assist in maintaining the existing landscape character of the area and minimise the overall views of the Project.

Other information/comments? (e.g. accuracy of information)

The exact dimensions of the FSRU and LNG Carriers (length and width) will not be known until procurement tenders are complete. Therefore, the typical height and general bulk and scale of other vessels with the same or similar size and purpose based on a sample of 80,000 deadweight tonnage trading vessel dimensions used in other parts of the world was used. These have been rounded up so the figures in this report are based on "not to exceed" calculations.

The LVIA considered the indirect and cumulative effects of all infrastructure in the area. An area was delineated for the proposed Pipeline Project infrastructure at the Crib Point Project Site. As the final detail of the infrastructure is not known, it has been assumed that the bulk and scale of the facility will have a maximum height of 8 m, which is considered to be the worst case scenario. Once detailed design is complete for the Pipeline Project, the LVIA for the Crib Point site will be updated to assess the Pipeline Project End of Line facilities.

Soils

Is there a potential for effects on land stability, acid sulphate soils or highly erodible soils?

NYD No Yes If yes, please briefly describe.

No land forms will be altered as a result of the Project.

A contaminated land assessment which included the landside component of the Project Site has been conducted by Jacobs. The report is provided in Attachment 3.

Based on the proposed development and low potential for acid sulfate soils to be present, it is not considered that there will be effects on acid sulfate soils.

Groundwater is present at depths of 6.8 m to 7.5 m and is unlikely to be encountered. However, if disturbance extend to these depths, further investigation for the presence of acid sulfate soils will be undertaken to quantify management measures required.

The Project Site is not within an Erosion Management Overlay and there is no evidence of highly erodible soils or land stability issues on the landside component.

Are there geotechnical hazards that may either affect the project or be affected by it?

NYD No Yes If yes, please briefly describe.

There are no geotechnical hazards on the Project Site or its surroundings which will affect the Project or be affected by it.

PoHDA has previously undertaken geotechnical investigations on the Project Site. The site consists of fill overlying silty sands followed by silty clay, as well as Silty/sandy gravel and clay fill and sand fill to depths between 0.4 m and 1.0 m below ground level. The strength, density and potential for settlement across the Project Site will be assessed as part of detailed design.

Other information/comments? (e.g. accuracy of information)

Contaminated Soils

The contaminated land assessment reports on the presence of contaminated soil, sediment and groundwater beneath the Project Site (Attachment 3).

Previous investigations have identified contamination of soil, sediment and groundwater beneath the Project Site. This is predominantly related to metals, with some hydrocarbons and perfluoralkyl substances (as perfluoro octane sulfonic acid) which is located in fill in isolated areas.

The nature of the onshore works, means that minimal disturbance will occur. However, a Construction Environmental Management Plan will be developed and implemented, which includes appropriate mitigation measures for protection of the environment and human health.

15. Social environments

Is the project likely to generate significant volumes of road traffic, during construction or operation?

NYD No Yes If yes, provide estimate of traffic volume(s) if practicable.

The road traffic generated by construction will be typical of a construction project and limited in its duration. Construction activity will be expected to be contained to normal construction working hours (Monday to Friday, during the day and Saturday mornings).

During operation, the Project will employ approximately 40 full time staff. Associated traffic impacts with staff accessing the site are not seen as significant

Is there a potential for significant effects on the amenity of residents, due to emissions of dust or odours or changes in visual, noise or traffic conditions?

NYD No Yes If yes, briefly describe the nature of the changes in amenity conditions and the possible areas affected.

There will be no potential significant effects on the amenity of residents (during construction or operation), due to emissions of dust or odours or changes in visual, noise or traffic conditions. The Project is located in an operational port, where there is existing port infrastructure and maritime and industrial activities associated with the Crib Point Jetty and is in the Port Zone which encourages port related activities. The nearest dwellings are located in excess of 600 m north of the northern extent of the Project Site. The activities proposed by AGL are appropriate and contextual within their environment.

Construction

All construction works are typical and limited to the existing jetty and adjacent landside component. The Construction Environmental Management Plan will address the following:

- Noise – Construction will be conducted during Normal Working Hours. While there are no Guideline Noise Levels for this period, work will be conducted under a Construction Environmental Management Plan and lowest noise work practices and equipment will be used.
- Dust – Dust will be managed through sealing of surfaces where appropriate and dust suppression measures (e.g. water spraying).
- Traffic – Traffic management for the construction workforce will be governed by a traffic management plan.

Operation

During operation, the continuous mooring of the FSRU may impact on amenity for local residents and visitors to areas such as Woolleys Beach Reserve, and for recreational users and tourism operators in Western Port. However, this impact is occurring within the context of the industrial setting of the Project Site and the existing maritime activities already undertaken at the Crib Point Jetty and the surrounding area, operated by the PoHDA. The potential effects on the amenity on the five dwellings to the north are described below.

- *Landscape and Visual*

Visually sensitive receptors with an unimpeded view of the Project Site generally also have a clear view of the existing port infrastructure and activities at Crib Point.

The Project will involve up to one ship docking every week. As the Project Site is located in an existing industrial and maritime setting and includes an operational jetty, the movement of this ship will have a minor amenity impact. The FSRU will be continuously moored at the Crib Point Jetty but will remain operational to enable it to be moved if required (e.g. for maintenance or in an extreme weather event).

- *Noise Emissions*

An assessment of the construction and operational noise impacts associated with the Project has been undertaken (refer to Attachment 4). The noise criteria for construction and operation have been determined in accordance with EPA Noise Control Guidelines (Publication 1254) and Noise from Industry in Regional Victoria (NIRV) (Publication 1411), respectively...A SoundPlan noise model was created to predict the environmental noise impact of operational noise at the Noise Sensitive Areas surrounding the Project Site. The operational scenarios modelled included the mooring of the visiting LNG carrier, FSRU regasification operations and the Pipeline Project End of Line Facilities.

The assessment concluded that operations of the Project and the End of Line Facilities (part of the Pipeline Project) comply with the NIRV Recommended Noise Levels at all time periods. There may be instances when the existing United operations on the jetty occur simultaneously with Project operations. Assuming that United are operating at the threshold limits of NIRV Recommended Noise Levels during day, evening and night periods at each of the Noise Sensitive Areas, the following can be concluded:

- Operations of the Project and End of Line Facilities will not increase the existing noise levels when United is operating simultaneously.
- The residents surrounding the Project Site are unlikely to perceive the change in noise levels when the Project and End of Line Facilities start operation.

- *Air Quality*

The air quality impact assessment (Attachment 2) concluded that there is a low risk of air quality impacts from the FSRU and LNG carrier operations for on-shore sensitive receptors near Crib Point.

- *Traffic*

Traffic associated with staff accessing the site are not seen as significant within the context of the existing traffic conditions on The Esplanade.

Is there a potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport?

NYD No Yes If yes, briefly describe the hazards and possible implications.

There is some limited potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport. The risks posed by air emissions have been assessed as low.

Air Emissions

The air quality impact assessment was undertaken for the Project in accordance with the SEPP(AQM) and EPA guidelines for the use of the regulatory model, 'AERMOD'. This assessment is provided in Attachment 2.

Key components of the modelling approach included the creation of AERMOD meteorological data including the use of a five-year, dataset of hourly meteorological parameters and adoption of

conservative measures. Senior EPA air quality specialists were consulted about the data and methodology to be used for the assessment.

Air dispersion modelling was conducted for two operational scenarios:

- 1) Natural-gas fuelled FSRU; and
- 2) Liquid (diesel) fuelled FSRU.

The AERMOD modelling assessment of the FSRU scenarios demonstrated there were no exceedances of SEPP(AQM) Design Criteria for nearly all grid points over land including sensitive receptors, with the only exceedances occurring around the FSRU, and off-shore. These results for 'low risk', primarily off-shore exceedances were obtained for the pollutants: NO₂, SO₂, PM₁₀, and PM_{2.5}. There were no exceedances for any of the grid receptors for any of the higher risk VOCs tested by modelling; benzene, formaldehyde, and PAHs.

The general conclusion of the air quality modelling assessment is there is a low risk of air quality impact from the Project's FSRU and LNG carrier operations for on-shore sensitive receptors near Crib Point.

EPA have confirmed a Works Approval and Licence are required. A Works Approval Application is currently being prepared by AGL.

Transport of Liquefied Natural Gas (LNG)

LNG is natural gas (predominantly methane, CH₄, with some mixture of ethane C₂H₆) that has been converted to liquid form by chilling for ease of storage or transport. LNG carriers will transport LNG to Crib Point in a liquid state (chilled to -162°C to maintain in a liquid state). LNG will be transferred onto the FSRU in its liquid state and only re-gasified on demand and transferred onshore via a high pressure gas pipeline.

LNG contains large amounts of energy, however, in its liquid state it cannot explode or burn. Only in its gaseous state, and mixed with the correct amount of oxygen, can it ignite (Methane needs to be diluted to between 5-15% concentration in the atmosphere for ignition).

An explosion could only occur if the methane gas had leaked into a confined space prior to igniting. LNG carriers are some of the most sophisticated ships in the world and are equipped with automated leak detection and emergency shut down systems. While unlikely to occur, the most likely fire scenario is a vapour cloud fire or pool fire (where some escaped gas settled on water). These fires would be lethal to those caught within the burn zone. However, while intense, methane fires burn inward at a rapid pace and there would be limited impact on those outside the burn zone. Natural gas (methane) must reach 540°C for initiation to occur, which is approximately double the ignition temperature of liquids fuels such a gasoline and diesel.

Very few incidents have ever occurred at LNG import terminals and there are currently around five hundred LNG ships and LNG terminals safely operating, so these risks are well understood and can be managed. More than 50,000 voyages have taken place since LNG transportation began in 1964 and there have been no fatalities or significant damage to tanks on LNG carriers. The FSRU and the ships that transport LNG have advanced safety features as will the jetty itself.

Double hulls increase the structural strength of the hull and provide additional protection for the cargo tanks in the case of an accidental collision, grounding of the vessel or a deliberate attack. All containment systems include cargo monitoring, measuring, control and safety systems designed to operate at cryogenic temperatures. Nitrogen gas is used to purge the spaces between the tanks, the insulation and the hull. Nitrogen is an inert non-flammable gas used to displace oxygen in those spaces and prevent fire.

All FSRUs and LNG carriers are equipped with Emergency Shut Down (ESD) Systems. The ESD system is programmed to automatically stop the transfer of LNG or methane gas and close isolating valves should an issue arise. If the ship and/or the FSRU moved out of position during cargo transfer, for example or if the FSRU tanks are accidentally overfilled by the LNG carrier then emergency shutdown occurs before any damage can be done.

The siting of the FSRU at Crib Point has been selected with strict separation distances from potential ignition points, and isolated from other facilities.

Input was also obtained from DNV GL, a global quality assurance and risk management company that provides classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. This work considered a broad range of facility failure scenarios with consideration of factors such as the location, nature of the facilities and frequency of LNG cargo transfer. The initial outputs of these studies did not identify any areas of concern.

Additional studies will be conducted once the FSRU is selected and the results incorporated into the operating procedures for the facility.

The operating procedures applying to the FSRU while berthed will include:

- PoHDA's whole of port Safety and Environment Management Plan (SEMP) and Health, Safety and Environment System (HSE);
- A specific SEMP and HSE System for the FSRU; and
- The requirement for POHDA and the Harbour Master to approve ship to ship cargo transfer under the Dangerous Cargo requirements in the Port of Hastings Operating Handbook, which includes compliance with the international Ship to Ship Transfer Guide (Liquefied Gas).

A variety of other safety controls apply to the FSRU and LNG ships while at sea, in Port and during the FSRU's gas operations, and a summary of these safety regulatory arrangements can be found at

<https://www.agl.com.au/-/media/aglmedia/documents/about-agl/how-we-source-energy/crib-point/regulatory-arrangements.pdf?la=en&hash=096A072FFC3FFF3F99E27189C7E9C798098538A0>.

Is there a potential for displacement of residences or severance of residential access to community resources due to the proposed development?

NYD No Yes If yes, briefly describe potential effects.

Are non-residential land use activities likely to be displaced as a result of the project?

NYD No Yes If yes, briefly describe the likely effects.

The landside component of the Project is situated on property leased by PoHDA and used for Port purposes. There are no existing land use activities associated with Berth 2 that will be displaced by the Project.

Do any expected changes in non-residential land use activities have a potential to cause adverse effects on local residents/communities, social groups or industries?

NYD No Yes If yes, briefly describe the potential effects.

The landside component of the Project is situated on property leased by PoHDA and used for Port purposes. Land use activities associated with the Project at the Crib Point Jetty will not cause adverse effects on local residents/communities, social groups or industries.

Is mitigation of potential social effects proposed?

NYD No Yes If yes, please briefly describe.

Given, the potential benefits of increased security and stability of gas supply, the Project will be positive for the wider community in Victoria and beyond.

Given the industrialised nature of the site and its distance from residential areas, only minor localised social effects are expected. These will be managed and mitigated by:

- Ongoing community and stakeholder engagement. AGL is already engaging with key stakeholders and the community about the Project (refer to Attachment 12) AGL will continue

<p>to provide accurate and timely information to stakeholders with an interest in the Project. This will reduce the potential for miscommunication and community uncertainty about the Project.</p> <ul style="list-style-type: none"> • The use of local labour / contractors. This will diversify the local labour market and provide an opportunity to attract or retain working age people within Shire of Mornington Peninsula. • Construction Management Plan to manage things such as workforce parking etc.
<p>Other information/comments? (e.g. accuracy of information)</p>

Cultural heritage

<p>Have relevant Indigenous organisations been consulted on the occurrence of Aboriginal cultural heritage within the project area?</p> <p><input checked="" type="checkbox"/> No If no, list any organisations that it is proposed to consult.</p> <p><input checked="" type="checkbox"/> Yes If yes, list the organisations so far consulted.</p>
<p>What investigations of cultural heritage in the project area have been done? (attach details of method and results of any surveys for the project & describe their accuracy)</p> <p>The following cultural heritage assessments have been conducted of the Project Site:</p> <ul style="list-style-type: none"> • Jones, 2015. Allotment 2040, The Esplanade, Crib Point: Cultural Heritage Assessment and Implications for development. Prepared for PoHDA. The assessment determined that the “area has undergone significant ground disturbance as defined by the Aboriginal Heritage Regulations 2007”. It was also reported that no surface evidence of Aboriginal cultural remains was observed, and therefore it is unlikely that Aboriginal cultural material exists on the site. • Jacobs 2018a. AGL Gas Import Jetty Project, Aboriginal Heritage Due Diligence Assessment. Prepared for AGL. <ul style="list-style-type: none"> - This was a desktop assessment of the Project Site to determine known and predicted Aboriginal cultural heritage values, constraints and subsequent requirements for the Project. The report is provided in Attachment 1. - A review of the Victorian Aboriginal Heritage Register determined that no Aboriginal Places were located within the Project Site. - In accordance with Regulation 43(3) of the Aboriginal Heritage Regulations 2007, the continuous mooring of the FSRU and the construction of the Jetty Infrastructure does not constitute a high impact activity. The connection of the gas flow line from the jetty to a flange within the landside component is not works that will result in significant ground disturbance, or will take place in an area that is already subject to significant ground disturbance. As such, a mandatory CHMP for the works is not required under the <i>Aboriginal Heritage Act 2006</i>. - Given the extent of documented disturbance within the landside component, there is low potential for unknown Aboriginal cultural heritage to be impacted by the Project. As a result, a voluntary CHMP is not required. • Jacobs 2018g. AGL Gas Import Jetty Project, Historic Heritage Assessment. Prepared for AGL. <ul style="list-style-type: none"> - This was a desktop assessment of the historic heritage values and constraints associated with the Project. The report is provided in Attachment 7. - The Former BP Refinery Administration Building is located opposite the Project Site, on The Esplanade. It is listed on the Register of the National Estate (RNE 103692), Victorian Heritage Register (VHR H1016) and in the Schedule to the Heritage Overlay of the Mornington Peninsula Planning Scheme (HO240). - There are three historical heritage sites within 1 km of Project Site:

<ul style="list-style-type: none"> ▪ Heritage Overlay of the Mornington Peninsula Planning Scheme - Woolley's Cool Room (HO322); ▪ Victorian Heritage Inventory – William (Bill) Woolley's Homestead (H7921-0112); ▪ National Trust register – HMAS Otama (B6683). <p>- There are no places within or in proximity to the Project Site on the Commonwealth Heritage List (CHL), the National Heritage List (NHL) or the World Heritage List (WHL).</p>
<p>Is any Aboriginal cultural heritage known from the project area? <input type="checkbox"/> NYD <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If yes, briefly describe:</p> <ul style="list-style-type: none"> • Any sites listed on the AAV Site Register • Sites or areas of sensitivity recorded in recent surveys from the project site or nearby • Sites or areas of sensitivity identified by representatives of Indigenous organisations <p>There are no Aboriginal Places located within the Project Site. A single Aboriginal Place is located within 3 km (Jacks Beach; VAHR 7921-0369), which includes shell midden and surface scatter components.</p> <p>The Project Site is within:</p> <ul style="list-style-type: none"> • 200 m of the high water mark of Western Port (in relation to the connection to the “End of Line facilities” on the landside component); and • the defined boundary of the Western Port Ramsar Wetland. <p>Therefore, it is in an area of cultural heritage sensitivity, as defined in the Aboriginal Heritage Regulations 2007, Division 3.</p> <p>The proposed works on the jetty for installation of the Jetty Infrastructure fall within the defined boundary of the Western Port Ramsar Wetland. Given that it is not possible to establish significant ground disturbance, the works on the jetty are regarded to be within an area of cultural heritage sensitivity.</p> <p>The works on the landside component, however, are located entirely within areas that have been subject to significant ground disturbance. This disturbance was established during a site inspection documented by Jones (2015). The landside works are not considered to be within an area of cultural heritage sensitivity.</p>
<p>Are there any cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the <i>Heritage Act 2017</i> within the project area? <input type="checkbox"/> NYD <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If yes, please list.</p> <p>There are no cultural heritage places listed on the Heritage Register or the Archaeological Inventory within the Project Site.</p> <p>Is mitigation of potential cultural heritage effects proposed? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please briefly describe.</p> <p>While the Project Site is situated outside the boundary of the Former BP Refinery Administration Building, there is the potential for indirect impacts from construction of infrastructure across the road. Depending on the method of construction and details of the proposed works, there is the potential for damage from vibration, and from dust and construction materials blowing onto the Administration Building.</p> <p>To avoid any direct impact to this site, works must not take place within the heritage place boundary. If works need to take place within this boundary, then approval will be sought from Heritage Victoria under the <i>Heritage Act 1995</i>.</p> <p>In order to minimise the potential for impacts from vibration, an assessment of the proposed methods of construction should be undertaken in accordance with the Victorian EPA <i>Noise Control Guidelines</i> (Publication 1254, Oct. 2008) and <i>Environmental Guidelines for Major Construction Sites</i> (Publication 480, Feb. 1996).</p>

Due to the distance between the Project Site and the other historical heritage places identified in the vicinity of the Project Site, there are unlikely to be any impacts on Woolley's Cool Room (HO322), William (Bill) Woolley's Homestead (VHI H7921-0112), or HMAS Otama (NT B6683).

Other information/comments? (e.g. accuracy of information)

The conclusions drawn by Jacobs for both the Aboriginal Heritage Due Diligence Assessment (Attachment 1) and Historical Heritage Assessment (Attachment 7) were based on previous studies, review of proposed Project activities, a review of land use history and a search of relevant heritage registers. No site inspection was made of the Project activity area. The landside site had previously been subject to a detailed inspection, including survey and auger testing (Jones 2015) as part of an Aboriginal Cultural Heritage Assessment.

16. Energy, wastes & greenhouse gas emissions

What are the main sources of energy that the project facility would consume/generate?

- Electricity network. If possible, estimate power requirement/output.....
- Natural gas network. If possible, estimate gas requirement/output.....
- Generated on-site. If possible, estimate power capacity/output
- Other. Please describe.

Please add any relevant additional information.

The main source of energy consumed will be gas however it will be generated onsite.

Four reciprocating gas engines, located on the FSRU, will be used provide all the power required on board, i.e. for driving the compressors, pumps, ventilation fans, general utility, etc. The engines will also provide electric power for propulsion of the FSRU. Information about the gas engines are provided in Table 7.

The engines are modern high efficiency 4-stroke, non-reversible engines with indirect injection of gas fuel. Natural gas will fuel each of the gas engines. When there is no gas send-out, only one engine will operate continuously (at approximately 50-75% capacity) to support the utility power needs of the FSRU. The other three engines will not be operational. In this scenario, for the purposes of the GHG assessment, the upper capacity of 75% of one engine has been used to estimate GHG emissions as a 'worst case' scenario.

During gas send out, all four engines will operate at varying capacities to support the gas vaporisation, pressurisation and export processes. The operating capacities will depend on the gas send out rate.

Table 7: Reciprocating gas engines

Gas engine parameter	MGE No.1	MGE No.2	MGE No.3	MGE No.4
Make & Model	Wärtsilä 6L50DF	Wärtsilä 12V50DF	Wärtsilä 12V50DF	Wärtsilä 12V50DF
Power (kW)	5,500	11,000	11,000	11,000
Rotational Speed	514	514	514	514
Fuel Type (Gas / Liquid)	Gas / Liquid	Gas / Liquid	Gas / Liquid	Gas / Liquid

There will also be two auxiliary boilers and an emergency diesel generator. These will only be used for back-up power requirements when MGE No.1 or other engines are off-line for maintenance.

What are the main forms of waste that would be generated by the project facility?

- Wastewater. Describe briefly.
- Solid chemical wastes. Describe briefly.
- Excavated material. Describe briefly.
- Other. Describe briefly.

Please provide relevant further information, including proposed management of wastes.

The main form of waste (in the form of seawater) that would be generated by the Project will be from the operation of the FSRU facility, which will discharge up to 450,000 m³ of water per day. This water will be initially 7°C colder than the ambient seawater temperature and contain short-lived residual chlorine as a result of hypochlorite generation in the seawater intake. However, it is unlikely to operate at this maximum operating output unless there was a requirement to fill supply short term shortfalls in the gas market. The seawater intake volume required for the regasification rate of 500mmscf/day is 300,000m³/day.

What level of greenhouse gas emissions is expected to result directly from operation of the project facility?

- Less than 50,000 tonnes of CO₂ equivalent per annum
- Between 50,000 and 100,000 tonnes of CO₂ equivalent per annum
- Between 100,000 and 200,000 tonnes of CO₂ equivalent per annum

✘ More than 200,000 tonnes of CO₂ equivalent per annum
Please add any relevant additional information, including any identified mitigation options.

The Project will emit between 100,000 and 200,000 tonnes of CO₂ equivalent per annum.

An assessment of greenhouse gas (GHG) emissions (Attachment 6) estimates has been carried out to meet the requirements of the State Environment Protection Policy (Air Quality Management) 2001 (SEPP (AQM)) and the requirements of the Protocol for Environmental Management – Greenhouse gas emissions and energy efficiency in industry 2002 (PEM).

The key GHG emissions for the FSRU facility are related to the consumption of natural gas by four reciprocating engines on board the FSRU. The engines will provide all power for the facility, i.e. general utility power, as well as for gas processing equipment. Other GHG emission sources associated with the FSRU are the supply and transport of LNG (consumed on board the FSRU), fugitive emissions (potential leaks), and the disposal (by others, off site) of waste streams.

The actual emission profile of the vessel will be driven by the gas send out volumes required to meet market demand. As there is uncertainty in the market demand for gas, three annual usage scenarios (representing worst case scenarios) have been considered for the Project:

- **Scenario A:** no gas send-out during the year with all boil-off gas used as fuel for the power generation units, and the excess gas burnt at the combustor
- **Scenario B:** continuous year-round operation of the FSRU in Open Loop mode at an average of 382mmscf/d high pressure gas send-out requiring 40 LNG carrier deliveries. Under this scenario two regasification units would be utilised
- **Scenario C:** operation of the FSRU in Open Loop mode for 50.6% of the year at an average of 750mmscf/d high pressure gas send out, requiring 40 LNG carrier deliveries. For the balance of the year the FSRU would remain idle. Under this scenario, three regasification units would be utilised.

A summary of the calculated (Scope 1) direct emissions from sources that are owned or operated and (Scope 3) indirect emissions (other than Scope 2 emissions) are summarised in Table 8. There is no planned electricity to be imported for the Project, so there are no anticipated Scope 2 – indirect emissions. There may be instances when electricity is required but this will not result in any material Scope 2 emissions.

Table 8: Total GHG emissions associated with FSRU operation

GHG scope emissions	Units	Scenario A	Scenario B	Scenario C
Energy related:				
Scope 1 GHG emissions	t CO ₂ -e/yr	104,486	49,366	88,224
Scope 3 GHG emissions	t CO ₂ -e/yr	1313,286	66,231	1111,184
Total GHG emissions (energy related):	t CO ₂ -e/yr	117,772	55,596	9999,408
Non-energy related:				
Scope 1 GHG emissions	t CO ₂ -e/yr	2,500		
Scope 3 GHG emissions	t CO ₂ -e/yr	47		
Total GHG emissions	t CO ₂ -e/yr	2,547		
Total GHG emissions – Project related	t CO₂-e/yr	120120,319	5858,143	101,955

As reported in the State and Territory Greenhouse Gas Inventories report (DoEE, 2017b), the total GHG emissions for Victoria in 2015 were 119.6 Mt CO₂-e. The estimated emissions for Scenario A to C represent less than 0.111% of the total state emissions

17. Other environmental issues

Are there any other environmental issues arising from the proposed project?

No Yes If yes, briefly describe.

18. Environmental management

What measures are currently proposed to avoid, minimise or manage the main potential adverse environmental effects? (if not already described above)

Siting: Please describe briefly

The Crib Point Jetty and the adjacent landside area which comprise the Project Site is in an area designated for Port related activities and is within the Port Zone of the Mornington Peninsula Planning Scheme. The *Port of Hastings Land Use and Transport Strategy* (Port of Hastings Corporation 2009) is identified as a strategy which must be considered. The Strategy identifies Crib Point as being retained in the long-term for liquid bulk terminal.

The Project Site is also an existing operational marine facility, providing sound context for the further development of maritime industry and related activities.

The Project Site is surrounded by a flat, well vegetated landscape offering very few vantage points of the Project Site. The visual impact of the continuously moored FSRU and visiting LNG carrier is considered to have an acceptable landscape and visual impact. The majority of sensitive receptors are well setback from the Project Site, or are partially screened by vegetation.

Design: Please describe briefly

The design of the project incorporating an FSRU, avoids the impact of building large infrastructure onshore. As the FSRU is an operating ship, when the Project concludes, the FSRU can be relocated elsewhere, and there is no major aboveground infrastructure remaining to manage or decommission and remove.

The FSRU also allows AGL to manage gas demand through high and low demand periods such as winter peak demand requirements. Gas can immediately be discharged into the network to cover network needs, be stored on board until it is required or sent to existing onshore storage facilities and more LNG imported to the FSRU. The timing and volume of LNG imported can be adjusted to meet market needs.

Importantly, importing LNG by ship allows AGL to access gas supply from other Australian States and internationally, providing certainty of supply to the south-eastern states.

Environmental management: Please describe briefly.

The Project will comply with the environmental management requirements of all environmental approvals, including the Works Approval and the EPA Licence.

The Project will be undertaken in accordance with AGL's Environment Policy (Attachment 13) and environmental management framework and other associated procedures.

The AGL Environment Policy is signed by the AGL Chief Executive Officer and is applicable to all AGL's employees, contractors, products, services and AGL operational and joint venture sites. The Environment Policy outlines AGL's vision to "protect the environment and minimise our environmental footprint in the areas we operate, in collaboration with our stakeholders".

AGL has a Health, Safety and Environment Management System (HSEMS), that forms the framework to the principles in the Environment Policy. The HSEMS provides the

framework and tools to meet AGL's standards as part of the construction and operation of the facility.

AGL's Environmental Standards in the HSEMS include:

- Land
- Surface Water
- Groundwater
- Air Emissions
- Greenhouse Gas Emissions
- Biodiversity
- Noise Emissions
- Waste
- Cultural Heritage

Environmental management of the operation of FSRU and Jetty Infrastructure will be in accordance with the AGL HSEMS minimum controls, which will be incorporated into the Project Environmental Management Plan (to be prepared).

As a construction contractor for the Jetty Infrastructure is not yet engaged for the Project, it will be a requirement of the contractor's contract with AGL to prepare a Construction Environmental Management Plan and prepare activity-specific work method statements prior to the commencement of works.

The Construction Environmental Management Plan will be developed in alignment with AGL HSEMS requirements.

AGL HSEMS will integrate with the whole of Port of Hastings SEMP and HSE System to regulate the environmental aspects of the FSRU during the operational phase. LNG transfer operations will occur in accordance with the Port of Hastings Operating Handbook.

X Other: Please describe briefly

AGL plans to undertake marine monitoring studies/activities to further define the effects within North Arm of the Western Port Ramsar site and inform the EPA works approval application, which will include:

- i. **Particle entrainment modelling:** involving the development of a fit-for-purpose base hydrodynamic model if required (or potentially refining one of the existing models) for estimation of entrainment. The objective of the modelling will be to:
 - a) Provide water current vectors at key meaningful sites in North Arm; and
 - b) Provide simplified entrainment percentage contours around the FSRU.
- ii. **Plankton and larval sampling program:** A medium-term plankton and larval sampling program will be designed and implemented to validate concepts of larval and plankton distribution and dispersion models presented in the referral and support the effectiveness of the intake design to mitigate entrainment effects. The program will also provide further information for lower intensity monitoring of the spatial and temporal variations in plankton populations in North Arm during the initial phases of operation. Sampling may negate the need for additional modelling if the results are conclusive in determining plankton and larval distribution and impact.
- iii. **Investigations of the benthic habitats:** An investigation will be undertaken to verify the understanding of the benthic habitats and invertebrate community in the North Arm channel within approximately 5 km of Crib Point. The spatial and temporal distributions of marine fauna and flora in the vicinity of the FSRU will be documented. The investigation will be a one-off sampling program prior to commencement of

operation. The results of the investigations will inform the scope of potential EPA license compliance monitoring requirements.

- iv. **Seawater monitoring:** Documentation and understanding of short (hour) and long-term (seasons/years) temporal and spatial variation in ambient seawater temperature is a key input to assessing the extent of potential cold-water differential and chlorine concentration effects of the discharge on the marine ecosystem. A long term water quality data set exists at an EPA monitoring site approximately 2 km north of Crib Point Jetty which provides record of seasonal and inter-annual variations but does not provide information on short term variations due to tidal influences. AGL proposes to undertake monitoring of short and long-term water temperature and salinity (to identify correlations between temperature and salinity and hence density variation) at depths of approximately 2 m and 10 m above the seabed. Monitoring will be undertaken using an in situ water quality monitoring station (i.e. a multi parameter data logger) positioned in the water continuously for a period of 12 months. The logger will be serviced and data downloaded at 6 week intervals. Field measurements will also be undertaken at 6-weekly intervals to capture water profiles of salinity, temperature, turbidity, dissolved oxygen and depth at a range of monitoring sites along the main channel within 4 km of Crib Point.
 - v. **Ghost shrimp study:** The study will aim to deliver an updated understanding of the potential presence and distribution of ghost shrimp at Crib Point, given the species has not been observed for over 50 years. These shrimp are likely to be found buried deeper in the seabed than can be sampled by standard grab methods, so a small 'venturi' sampler will be used to sample the indicative presence of these species at multiple sites along the seawater dispersion pathway around Crib Point and at reference sites.
- NOx monitoring within the local community for 12-36 months' post commencement of operation with a decision on the merits for continuation to be made after 12 months.
 - The contractor's contract will include requirements to undertake monitoring and auditing of Project construction activities to ensure compliance with the Construction Environmental Management Plan and Project approvals.
 - AGL will complete regular audits of the contractor's compliance with the CEMP and applicable environmental compliance obligations (e.g. conditions of approvals).

DELWP and other statutory authorities may inspect and audit the project at any time to ensure that it is completed in accordance the information provided in this referral.

19. Other activities

Are there any other activities in the vicinity of the proposed project that have a potential for cumulative effects?

NYD No Yes If yes, briefly describe.

The purpose of this cumulative impact assessment is to evaluate the potential indirect and cumulative impacts of the Project as required in accordance with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (DSE 2006) (the Guidelines). This includes an evaluation of the potential impacts of the Pipeline Project as an indirect impact of the AGL Gas Import Jetty Project, and the potential cumulative impacts of both projects collectively. For the full Cumulative Impact Assessment prepared by AECOM (2018a), refer to Attachment 14.

Two other activities are occurring within, or in proximity to, the footprint of the AGL Gas Import Jetty Project and the Pipeline Project at Crib Point:

- Jetty Upgrade works to be undertaken by PoHDA to refurbish the existing Crib Point Jetty to provide an upgraded berth for shipping
- Flattening of high spots on the seabed to be undertaken by VRCA to maintain operation of the Crib Point Jetty.

These two activities have not been considered within this cumulative impact assessment as they are not dependent on the AGL Gas Import Jetty Project or the Pipeline Project, are point in time activities that will not substantially overlap with the AGL Gas Import Jetty Project or the Pipeline Project and the effects from these activities have been addressed by other, separate statutory mechanisms (specifically consents under the *Coastal Management Act 1995* that have already been issued).

The relevant potential effects of the Pipeline Project as an indirect effect of the AGL Gas Import Jetty Project, and the potential cumulative impacts of both projects combined have been considered, as set out in relevant supporting documents including the Cumulative Impact Assessment Report (Attachment 14).

Based on this assessment, the Pipeline Project will not result in significant additive effects to the AGL Gas Import Jetty Project due to its predominantly onshore location. Further detail on the assessment of potential cumulative impacts of the AGL Gas Import Jetty Project and the Pipeline Project is provided below.

An initial screening assessment was undertaken to assess where the AGL Gas Import Jetty Project and the Pipeline Project, when combined, had the potential for cumulative impacts to occur. This screening included determining the spatial and temporal boundaries of the potential effects and a recommendation on whether a more detailed assessment was required to identify potential cumulative impacts.

As a result of the screening assessment, it was found that further assessment was required for the following potential cumulative impacts:

- Residential amenity, which may be impacted by project related infrastructure at Crib Point (specifically, operational noise emissions)
- Significant landscapes and natural features and key viewpoints at and around Crib Point
- Operational greenhouse gas emissions
- Ecological considerations, including native vegetation and the Western Port Ramsar site.

Operational noise

The environmental noise assessment (Attachment 4) modelled the indirect and cumulative effect of proposed noise emissions from both projects which comprised:

AGL Gas Import Jetty Project:

- Mooring activities
- Regasification

Crib Point Receiving Facility (part of the Pipeline Project):

- Nitrogen offloading – day and night time operation
- Nitrogen injection – day and night time operation.

The cumulative impact assessment found that for all combinations of scenarios, the predicted cumulative levels were compliant with the NIRV Recommended Maximum Levels. The assessment found that the cumulative levels were slightly higher at some receivers than the levels for the Jetty Project only, but residents surrounding the connection point of the two projects at Crib Point are unlikely to perceive the change in noise levels when the two projects start

operation. As a result, the cumulative noise impacts are not likely to have a significant effect on amenity or the local community and further noise mitigation measures are not required.

Landscape and visual

The LVIA prepared by Ethos Urban (2018) (Attachment 11) considered the potential impacts of the AGL Gas Import Jetty Project (including the FSRU ship, LNG carrier and its movements and the Jetty Infrastructure), in addition to the Receiving Facility (which forms part of the Pipeline Project). The Crib Point Pakenham Pipeline is predominantly located underground, and as such, no assessment of its operational landscape character or visual impact is required.

The LVIA found that there was no substantial change to the overall landscape character as a result of the cumulative landscape effects. On this basis, the cumulative impact on landscape values and at sensitive receptors overall remains of Low to Moderate significance (depending on the selected viewpoint).

Minor changes to the visual impact at key viewpoints were identified in the LVIA. However, many of the existing viewpoints have had views of the existing industrial and maritime land uses on the Crib Point headland for many years. While there is some visual impact from several viewpoints as a result of the AGL Gas Import Jetty Project and the Pipeline Project, the cumulative visual impact is considered overall to be of Low to Moderate significance due to the longstanding presence of maritime industry at this location and its part in the existing landscape.

Ecology

The cumulative impact assessment considered potential impacts on two key ecological components:

- Total combined area of native vegetation to be cleared
- Cumulative impact on the character of the Western Port Ramsar site.

The total combined extent of native vegetation clearance resulting from the AGL Gas Import Jetty Project and Pipeline Project is 8.691 ha.

The majority of native vegetation clearance will result from the Pipeline Project, comprising:

- 3.291 ha of Endangered EVCs (Swamp Scrub, Swampy Riparian Woodland and Grassy Woodland)
- 2.444 ha of Vulnerable EVCs (Damp Heathy Woodland)
- 1.098 ha of Least Concern EVCs (Coastal Saltmarsh and Heathy Woodland).
- 37 scattered trees within the construction footprint equating to an additional 1.418 ha of vegetation clearance.

There is a cumulative vegetation clearance impact when the Pipeline Project is added to the AGL Gas Import Jetty Project with the AGL Gas Import Jetty Project contributing 0.44 ha of Heathy Woodland proposed to be cleared. This area of Heathy Woodland associated with the landside component of the AGL Gas Import Jetty Project has been identified as an area of regeneration less than 10 years old and its removal is considered exempt from the need for a permit under the Mornington Peninsula Planning Scheme (Jacobs 2018e).

As an indication, the overall amount of vegetation clearance from the AGL Gas Import Jetty Project and the Pipeline Project is below the Guidelines level deemed sufficiently significant for an EES referral to be required. The criteria for referral require potential clearing of 10 ha or more of native vegetation that is identified as endangered or of very high conservation significance. It is also below the combination referral criteria of potential clearing of 10 ha or more of native vegetation. Monarc Environmental (2018) and Jacobs (2018e) have assessed the respective impacts of the Pipeline Project and the Jetty Project on native vegetation including impacts on flora and fauna and ecological communities.

The potential cumulative impacts of the AGL Gas Import Jetty Project and the Pipeline Project on the Western Port Ramsar wetland values have been assessed against the Ecological Character Description described in the Western Port Ramsar Wetland Ecological Character Description (KBR 2010). The Ecological Character Description provides an account of the benefits and services that Ramsar wetlands provide and the critical components, processes and services that contribute to those benefits and services.

The assessment concluded that the Pipeline Project will not result in significant additive effects to the AGL Gas Import Jetty Project due to its predominantly onshore location. Most of the potential impacts on wetland values are associated with the AGL Gas Import Jetty Project and a number of specific studies have been undertaken to assess the potential impacts of this project. The Pipeline Project will not directly impinge on the waters or shoreline of Western Port, and as such, will not have an additive effect on the main potential impacts on wetland values associated with the Jetty Project. There is minor potential for cumulative sedimentation impacts from the Pipeline Project resulting from construction activities proximal to watercourses draining into Western Port. However, these impacts would be readily manageable due to the temporary nature of the works associated with construction of the Pipeline Project, timing of the activities (i.e. during summer) and the implementation of suitable environmental controls such as horizontal directional drilling (HDD) and the establishment of sediment controls. The potential for substantial fluid loss during HDD is unlikely to occur given the depth of the HDD and the geological conditions; however suitable monitoring procedures and contingency planning will be implemented in the event of a loss of drilling mud.

Greenhouse Gas Emissions

Greenhouse gas emissions were assessed separately for the AGL Gas Import Jetty Project (Jacobs, 2018f) and the Pipeline Project (AECOM, 2018b). The AGL Gas Import Jetty Project is predicted to have the highest GHG emissions of the two projects, primarily Scope 1 emissions associated with gas consumption. In combination the two projects are expected to emit 123,348 tonnes CO₂ equivalent per annum. This is under the 200,000 t CO_{2-e} per annum threshold specified in the Guidelines and therefore, collectively, impacts on GHG emissions are not considered significant.

Conclusion

Based on this assessment, the Pipeline Project will not result in significant additive effects to the Jetty Project due to its predominantly onshore location.

20. Investigation program

Study program

Have any environmental studies not referred to above been conducted for the project?

No Yes If yes, please list here and attach if relevant.

Has a program for future environmental studies been developed?

No Yes If yes, briefly describe.

As described in Section 18 of this Referral, AGL plans to undertake an assurance and monitoring program both prior to and post commencement of the Project. This includes:

- Particle entrainment modelling
- Plankton and larval sampling program
- Investigations of the benthic habitats
- Seawater quality monitoring and studies
- Ghost shrimp study
- NO_x monitoring within the local community

Consultation program

Has a consultation program conducted to date for the project?

No Yes If yes, outline the consultation activities and the stakeholder groups or organisations consulted.

AGL has a Stakeholder Engagement Plan, predicated on transparency and the sharing of information, that is used to develop consultation planning and capture feedback from interested parties. AGL have engaged with various local residents and special interest groups since the announcement of Crib Point as the preferred location, to ascertain the local community's sentiment toward the Project and identify any emerging issues they might have with the proposed development. Consultation activities commenced with key community stakeholders in July 2017 prior to the preferred site selection being announced. A consultation summary report is provided in Attachment 12.

All community interactions from consultation activities are being recorded in the stakeholder management program, Consultation Manager summations of issues are included in Attachment 12.

Community consultation sessions:

- **23 August 2017:** Project Presentation Crib Point Community House
- **30 August 2017:** Project Presentation Crib Point Community House
- **16 October 2017:** AGL French Island Community Presentation
- **22 January 2018:** A community drop in session in Hastings was held with representatives of AGL and APA, and AGL's environmental and marine consultants Jacobs and CEE Environment in attendance.
- **15 March 2018:** A community Drop in session in Cowes was held with representatives of AGL, and Jacobs and AGL's environmental and marine consultants Jacobs and CEE Environment in attendance. Approximately 13 people attended
- **19 March:** Neil Burgess MP hosted a Public Meeting in Hastings. AGL was invited to present at this meeting.
- **28 March:** AGL hosted a 'Technical Forum' in Hastings attended by AGL and the technical experts who produced the regulatory reports that will support AGL's referral.
- **4 April:** AGL and APA held a town hall style presentation in Hastings
- **19 April:** Neil Burgess MP hosted a Public Meeting in Blind Bight which AGL and APA attended.
- **2 May:** Crib Point Action Group hosted a public meeting in Crib Point. 40 people attended
- **17 May:** APA hosted a community drop in session in Cardinia which AGL also attended
- **22 May:** APA hosted a community drop in session in Na Goon which AGL also attended
- **25 June** Balnarring Community Presentation

Project Briefings were provided to:

- Hastings Yacht Club
- Balnarring Yacht Club
- Victorian Maritime Centre (Western Port Oberon Society)
- Nepean Greens representative Paul Saunders
- Phillip Island Tourism and Business Association
- Dolphin Research Centre

- Wildlife Coast Cruises
- Port Phillip Conservation Council
- Western Port and Peninsula Protection Council
- Westernport Seagrass Partnership
- Seafarers Association
- Dolphin Research Centre
- the Committee for Gippsland
- Phillip Island Conservation Society
- Biosphere
- Preserve Western Port
- Phillip Island Nature Parks
- Crib Point Action Group
- Crib Point Foreshore Committee
- Residents living in the immediate vicinity of the Jetty
- Bass Coast Shire Council
- Mornington Peninsula Shire Council
- Cardinia Shire Council
- City of Casey

Key community inputs and outputs

- Background noise monitoring extended to French Island and additional Crib Point areas following community consultation.
- Representatives from Port Phillip Conservation Council, Western Port and Peninsula Protection Council, Westernport Seagrass Partnership, Phillip Island Conservation Society, Western Port Biosphere, Dolphin Research Centre and Phillip Island Nature Parks were provided consultation drafts for review and comment during draft stage.
- AGL published draft environmental assessment reports on its project website. Community members, Environment Groups and science-based research organisations were invited to provide comment on the reports in advance of submission of this Referral. Comments are included in the Consultation Summary in Attachment 12.
- AGL is funding an Independent peer review of technical work being organised through Balnarring residents with Save Western Port and Western Port and Peninsula Protection Council invited to participate.
- Western Port Seagrass Partnership provided input and peer review into design of monitoring follow up studies.
- Dolphin Research Centre published an article on their website supporting the conclusions of the technical reports.
- Independent Peer review of an inaccurate online article on FSRU BLEVE explosions undertaken and provided to the community.
- Property report providing 30 years of property price trend data for suburbs with similar facilities provided to community in response to questions on property price impacts.

AGL will continue to proactively work with the community so they are kept informed of Project updates and to address concerns as they arise. The consultation summary report provided in Attachment 12 outlines planned activities for remainder of 2018.

Has a program for future consultation been developed?

NYD No Yes If yes, briefly describe.

Further community consultation sessions are planned in Crib Point, Hastings and French Island, with a focus on the expected operations (frequency of ship arrivals, operating capacities) and the environmental monitoring program to provide a good indication of what the first five years of operation will look like. The intention is to continue to engage with the previously listed environmental groups through the sharing of information and stakeholder briefings.

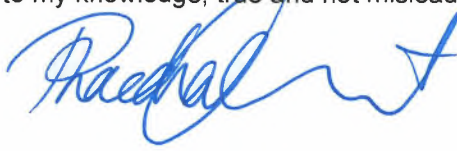
AGL will continue to respond to all queries on the Project and meet with interested community stakeholders up until a financial decision on the Project.

If the Project receives final investment decision approval, a Community Advisory Group will be established to provide a formal conduit for communication between the project and the community managed by community representatives. AGL also intends to establish a community fund to support local initiatives in the area. It is the intent of the Project for the application of the community fund to be a community designed and led initiative.

Authorised person for proponent:

I, Phaedra Deckart, General Manager – Energy Supply and Origination (AGL), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature




Date 10 SEP 2018

Person who prepared this referral:

I, Shelley Ada, Senior Environmental Consultant (Jacobs), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature



Date 10/09/2018

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APPENDICES**MAPS**

Map A	Location Overview
Map B	Project Site and Key Features
Map C	Project Site Layout
Map D	Planning Zones

ATTACHMENTS

Attachment 1	Aboriginal Heritage Due Diligence Assessment
Attachment 2	Air Quality Impact Assessment
Attachment 3	Contaminated Land Assessment
Attachment 4	Environmental Noise Assessment
Attachment 5	Flora and Fauna Assessment
Attachment 6	Greenhouse Gas Emissions Assessment (including Climate Change)
Attachment 7	Historic Heritage Assessment
Attachment 8	Hydrology Impact Assessment
Attachment 9	Desktop Social Impact Assessment
Attachment 10A	Plume Modelling of Discharge from LNG Facility
Attachment 10B	Chlorine in Seawater Heat Exchange Process at Crib Point
Attachment 10C	Assessment of Effects of Cold-water Discharge on Marine Ecosystem
Attachment 10D	Modelling and Assessment of Biological Entrainment into Seawater Heat Exchange System
Attachment 10E	Marine Ecosystem Protected Matters Assessment
Attachment 10F	Effects of LNG Facility on Sea Level and Seabed at Crib Point Jetty
Attachment 11	Landscape and Visual Impact Assessment
Attachment 12	AGL Gas Import Jetty AGL Gas Import Jetty Consultation Summary, July 2017 to August 2018
Attachment 13	AGL Environment Policy
Attachment 14	Cumulative Impact Assessment