ESSO AUSTRALIA PTY LTD

Hastings Generation Project

Development License Application

Rev	Date	Description	Prepared
A	3-Sep-2021	Draft	WP
B	10-Oct-2021	For Review	WP
C	18-Oct-2021	Comments from Team Review incorporated	WP
0	29-Nov -2021	Updated for endorsement	BL

ENDORSED BY:

Title	Name	Signature	Date
SSHE Manager	Sarah Sheales	Endorsement provided via email	29-Nov-2021
Senior Legal Council	Amy Pate	Endorsement provided via email	29-Nov-2021
Public & Government Affairs Manager	Andrew Murphy	Endorsement provided via email	29-Nov-2021

APPROVED BY:

Title	Name	Signature	Date
LIP Plant Manager	David McCord	DocuSigned by: David McCord 150704B3DE2A47D...	December 6, 2021

Contents

1.0 PRIMARY INFORMATION

1.1. Approval Type

Application type

New

Permission type

Development Licence

Estimated project cost

$ 112,000,000

1.2. Company Legal Entity

Choose permission applicant type

Applicant type

Registered company

ACN

000018566

Organisation details

Billing email address

EAPL.Regulatory@exxonmobil.com

Registered office address

Street

Level 9, 644 Collins Street

City

Docklands

State

Victoria

Postcode

3008

Country

Australia

× ✓ **Mailing address is the same as registered office address**

Mailing address

Street

GPO Box 400

City

Melbourne

State

Victoria

Postcode

3001

Country

Australia

CEO (or equivalent) details

First name

Geoffrey

Last name

Humphreys

Email

EAPL.Regulatory@exxonmobil.com

Contact number

+61 (0) 3 9261 0000

Signatory details

× ✓ **Signatory has the same details as CEO**

First name

Geoffrey

Last name

Humphreys

Email

EAPL.Regulatory@exxonmobil.com

Contact number

+61 (0) 3 9261 0000

Key contact person details

× ✓ **Key contact has the same details as CEO**

First name

Stuart

Last name

Fisher

Email

EAPL.Regulatory@exxonmobil.com

Contact number

+61 (0) 3 9261 0000

1.3. Applicant

Applicants

Applicant name
ESSO AUSTRALIA PTY LTD
ABN
49000018566
ACN
000018566

Primary applicant

ESSO AUSTRALIA PTY LTD

1.4. Suitability to hold a permission / Track record

Upload your forms and supporting evidence

- Fit and proper person declaration (Publication F1017)
- Prohibited person declarations (Publication F1018)

1.4.1. Have you ever held a permission from the EPA for this activity at the same location?

No.

1.4.2. Do you currently hold a permission or authorisation from EPA for this activity at the same location?

No

1.4.3. Do you currently hold an exemption for this activity at the same location?

No

1.4.4. Have you received any notices from the EPA related to this location or activity?

No

1.5. Local Government Area

Municipal council

Mornington Peninsula Council

Address for service of notices

GPO BOX 400, Melbourne Victoria 3001

1.6. Application fee

Refer to EPA fees | Environment Protection Authority Victoria for details on how to pay

Application fee is prescribed in section 172 of the Environment Protection Regulations 2021, being the greater of:

1. 1% of the estimated cost of the prescribed development activity, not exceeding 4,500 fee units; or
2. 81.83 fee units

Fee unit for 2021-2022 is $15.03

Fee calculation

1% of Project Cost	81.83 Fee units	4,500 Fee units
$112,000.00	$1,229.90	$67,635

2.0 SCHEDULED PERMISSION ACTIVITY

Select relevant activity category

K01 – Power Generation

L01 – General Emissions to Air

Summary of scheduled activity (1000 word limit)

Oil and gas from the Bass Strait field is sent to Longford for processing into crude oil, natural gas and other gas liquids. The natural gas liquids (ethane, propane and butane) are sent to Long Island Point Fractionation Plant (LIP) for further processing prior to LPG being exported via trucks or ships and the ethane being transported via pipeline to a downstream customer in Altona.

Changing business conditions with the ethane customer will result in the current ethane disposition methods no longer being available from 2022. As a result, Esso require an alternative use for the undersubscribed ethane produced.

Esso are planning to install three small, low emissions, efficient power generation units at a site, adjacent to LIP. These will be capable of converting ethane into 35-40 megawatts of electricity to power Victorian homes, while ensuring we can maintain our reliable supply of natural gas liquids across the east coast.

As the demand for natural gas declines, so too will the quantity of ethane gas requiring disposition. It is anticipated that this facility will be in operation from 2023 to 2033.

3.0 ACTIVITY LOCATIONS

Activity location

×	Fixed
	Mobile

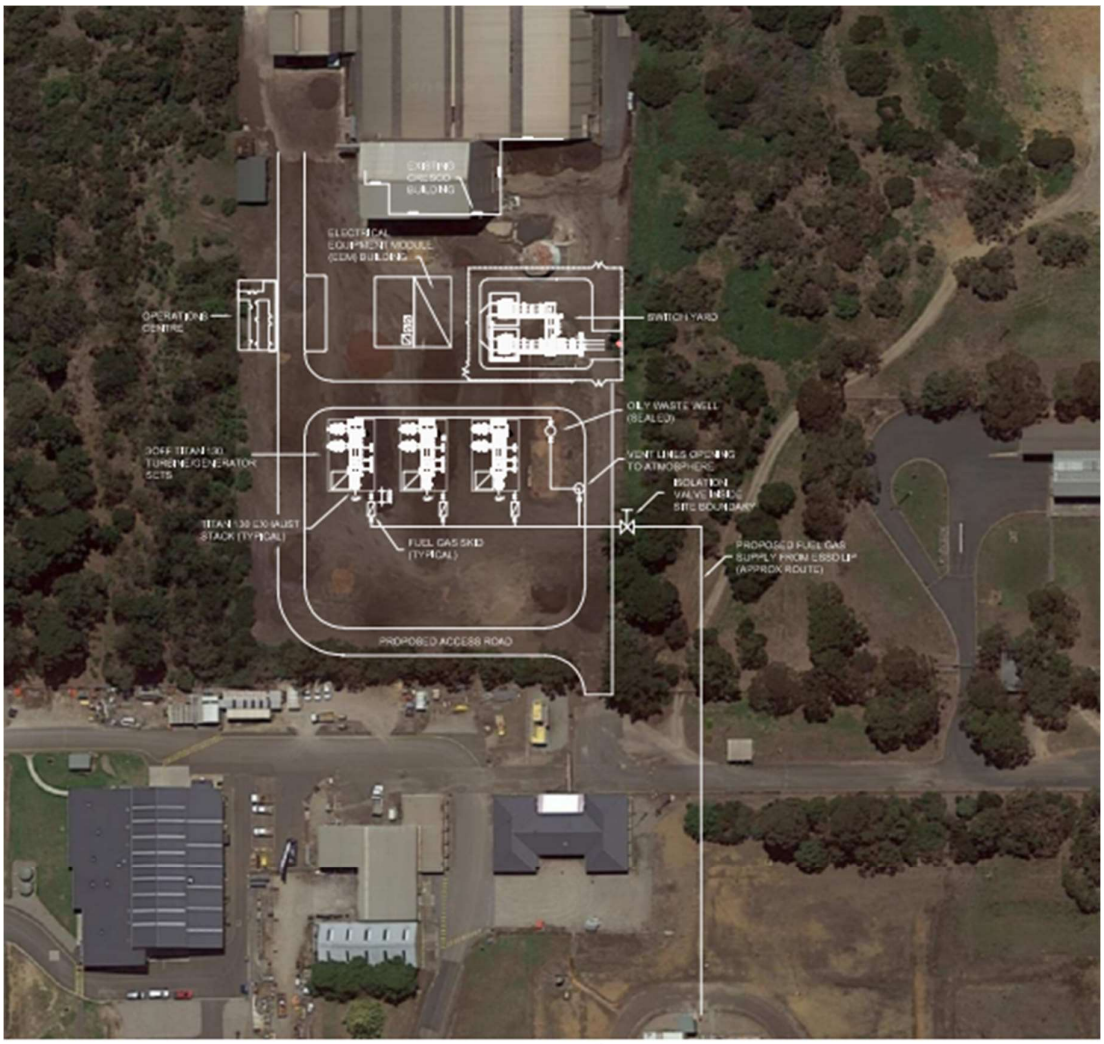
Activity address (if fixed)

11 Bayview Road, Hastings Victoria 3915

Site map identifying location of activity and its relationship to surrounding area.

Describe key factors for selecting the location, including consideration of risks to human health and the environment.

Figure 1: Hastings Generation Project Layout



The Hastings Generation Project (Project) has four key design objectives to minimise the environmental footprint, being:

- locating the proposed power plant next to the Esso Long Island Point facility (LIP), thus minimizing the length of new piping that is required to transport ethane gas
- locating the proposed facility onto land already zoned for industrial use
- placing the power plant in an area previously cleared
- placing the power plant in an area already connected to the existing electrical transmission system.

The proposed site lies next to LIP and is owned by Esso Australia Pty Ltd (Esso) and BHP Petroleum (Bass Strait) Pty Ltd. This land is zoned Special Use Zone 1, which is suitable for port and industrial use. Long Island Point is a predominantly industrial area, with some commercial activities, agriculture and a very small number of residential properties (all of which are located to the south-southwest (SSW) side of LIP).

It is currently being used for the manufacture of garden supply products.

The close proximity of the Project to LIP enables ethane gas to be transferred to the power generators with minimal impact upon the environment. The pipework will be installed on land that has been previously cleared.

The electricity generators and transformers will be placed in an area already cleared.

Any further clearing of vegetation will be limited to a small number of shrubs/trees for the purposes of:

- Piping installation;
- Placement of the control room / office / kitchen;
- Stormwater culvert maintenance;
- Fence access and maintenance; or
- For bushfire management.

Some soil movements will be required in the piping installation and foundations works. Surplus soil resulting from construction activities will be stockpiled temporarily. Soil analysis will be conducted on the surplus soil to determine waste classification. If the surplus soil is classified as “clean fill” it will be reused on site for landscaping; otherwise it will be disposed of off-site at a lawful place. Surplus soil stored on site will not be stored in quantities greater than 1000 m^3.

The site is connected to the Victoria electricity network via a 22 kV transmission line. An additional 66 kV line is planned to be installed beside the existing line as part of the project. Note that all works and approvals associated with the transmission line in the road reserve are being undertaken by United Energy, and are outside of the scope of this application.

Potable water and firefighting water are already available on site via an existing water main that connects to LIP. Some refurbishment of these utilities will be required.

Sewerage (black and grey waters from the kitchen / toilets) generated from the site during the operations phase of the development will be discharged to LIP’s sewerage treatment system, through an existing sewerage line that connects the site to LIP.

The closest residential neighbours to the Project area are approximately 700 m to the south-south-west, on the other side of the LIP facility.

4.0 WASTE INFORMATION

Are you applying for a waste-related permission?

✓	No	×	Yes

5.0 LAND USE

5.1. Planning and other approvals

5.1.1. Detail any engagement with other regulatory authorities, other than EPA, related to this activity

DELWP – pipeline licence and EES

DELWP and Mornington Peninsula Council – planning permit and bushfire management

WorkSafe Victoria – dangerous goods and major hazard facilities classification

County Fire Authority – bushfire management

5.1.2. Do you require any other planning permits or other approvals for this activity?

Yes – see Table 1, below.

Table 1: Hastings Generation Regulatory Approvals

Legislative Instrument		Type of Approval Required	Approving Authority	Approval Decision
Environment and Planning 1987	Hastings Generation Plant is situated in Zone SUZ1 – Special Use Zone 1. Overlays that apply: • Bushfire Management Overlay	Planning approval required for an energy generation facility with an installed capacity of 1 MW or greater. Planning Permit is required to construct a building or carry out works. Planning Permit must consider and approve a Bushfire Management Plan	DELWP	Submission pending
Environmental Effects Act 1978	Project undertook an Environmental Effects Statement Self-Assessment	The project did not trigger any of the criteria requiring an Environmental Effects Statement. Project has submitted the EES Self Assessment to the DELWP for consideration and advise on the need to lodge a referral.	DELWP	Advice pending

Environmental Protection and Biodiversity Conservation Act 1999	A review of the matters of environmental significance as listed under the Environment Protection and Biodiversity Conservation Act was undertaken.	The project does not trigger any of the criteria requiring a Referral under the Environment Protection and Biodiversity Conservation Act is required.	Department of Agriculture, Water and Environment (Commonwealth)	Not applicable
Aboriginal Heritage Act 2006	Project has undertaken a cultural heritage due diligence assessment.	No triggers for undertaking a Cultural Heritage Management Plan were identified.	Department of Premier and Cabinet	Not applicable
Occupational Health and Safety Regulations 2017	An assessment was conducted to determine if the site is Major Hazard Facility (MHF)	The project does not trigger MHF or require notification, as it does not store any chemicals listed in Schedule 14 in excess of 10% of the threshold quantity.	Work Safe Victoria	Not applicable
Pipeline Act 2005	Pipeline exemption applies for pipeline that is entirely on land owned by a licensee	In discussion with DELWP. Preliminary advice is that a pipeline licence is not required for the new ethane piping.	DELWP	Awaiting formal notification from DELWP

5.1.3. Do you currently hold a planning permit or other approvals for this activity?

✓	No	×	Yes

6.0 COMMUNITY ENGAGEMENT

Have you engaged with the community and other third parties regarding the activity?

Yes

Summarise any planned or completed consultation, as well as concerns raised and the approach to address them.

Esso have been operating at Long Island Point since 1970, during that time they have been an active and engaged member of the local community.

Esso engages with the community through a number of forums being involvement in community programmes; regular update meetings and communications through the company's website.

The Project has built on this existing community consultation platform with the development of:

- A Project specific Stakeholder Register,
- A central database that maintains a record all consultation undertaken.

Table 2, summarises the community consultation undertaken by the Project to date.

Table 2: Community Engagement

Consultation Type	Stakeholder	Concerns Raised	Approach to address concerns
Project briefings	DELWP – Energy:	• The use of gas storage • Generator running times • What the alternatives were? • Was there the possibility for reinjection of gas • Need for a pipeline licence	• There will be no gas storage • Operations will be 24 hours a day • Refer to section on Choice of Process and Technology. It details the alternatives the project examined. • Clarification was sought from DELWP – Pipelines about the need for the pipeline licence
Project briefings	DELWP - Pipelines	• Need for a pipeline licence	As noted earlier the Project is in discussion with DELWP, preliminary indication is that a pipeline licence would not be required for the ethane piping between LIP and Hastings Generator Facility.
Project briefings	Work Safe	• Introduction to the Project – no concerns were raised	No concerns identified
Project briefing	Mornington Peninsula Council	• Introduction to the Project – no concerns were raised	No concerns identified
Project briefings	EPA – approvals metropolitan and regional	• Cogeneration potential • Climate change impacts to be addressed in Development Licence application	Addressed in Development Licence application, Project Alternatives (Attachment 3) and Environmental

		• Could the electricity be used at LIP, instead of exporting it to the grid • Development of a stakeholder engagement plan • The use of open cycle design for a base load facility • Job creation	Management Plan (Attachment 5) Attachment 13 - Stakeholder Engagement Plan
Long Island Point Community & Stakeholder Meeting 2021	Community members, EPA, Mornington Peninsula Council, Westernport Biosphere Foundation, BlueScope Steel, Hastings Seafarers Centre, Port of Hastings Development Authority, Rotary Club	• Job creation	The Project will generate 60 jobs during the construction phase and 5 long term position during the operations phase.
Letter drop	28 Neighbouring residents, businesses and local indigenous group	• Purpose was to provide local community with information of the upcoming project	No concerns identified
Article in Western Port News	Local community	• LIP Plant Manager column focused on operations through the pandemic and Hastings Generation Project	No concerns identified
Project briefing	BlueScope Steel	• Introduction to the Project	No concerns identified
Project briefing	Committee for Mornington Peninsula	• Introduction to the Project	No concerns identified
Website	Public	• https://www.exxonmobil.com.au/Energy-and-environment/Energy-resources/Upstream-operations/Long-Island-Point	No concerns identified

The Project will continue to engage the community through the life of the Project through:

- Community meetings / engagement to advise of upcoming activities and progress, as required
- Updating the company website with Project progress details
- Stakeholder meetings, as needed
- Ongoing use of email consultation@exxonmobil.com for community member to get in touch whether it is for a general enquiry, a specific request, or advise of any issues.

7.0 CHOICE OF PROCESS AND TECHNOLOGY

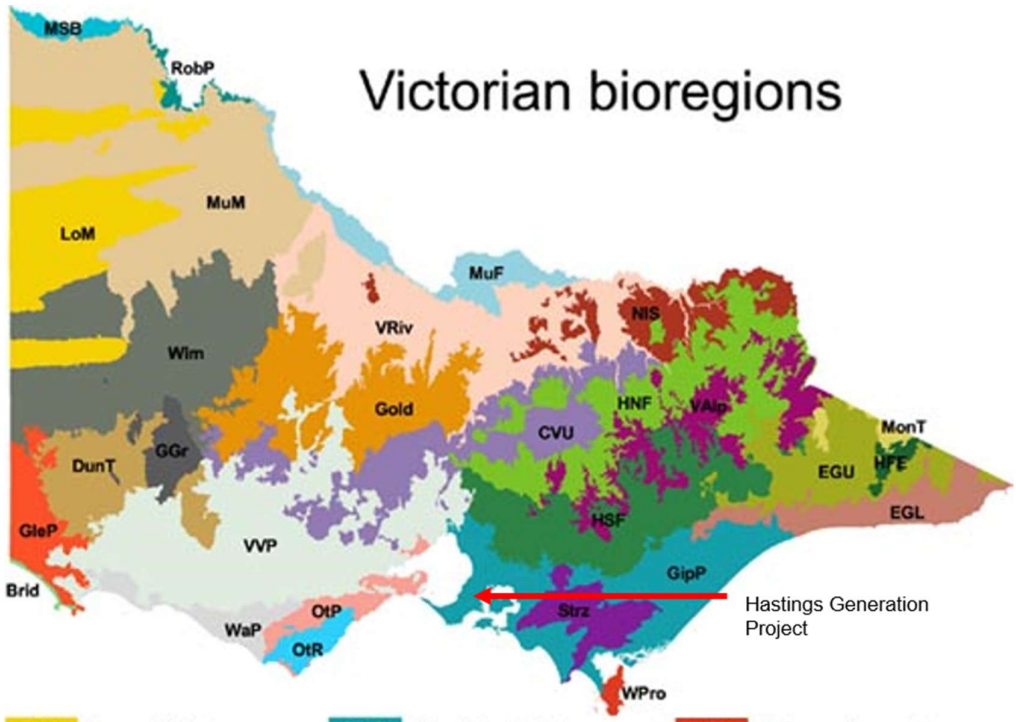
7.1. Environmental Conditions

7.1.1. Summary of the background environmental conditions – include siting consideration and surrounding sensitive receptors

Topography / Landform

The Project area is located within the Gippsland Plain Bioregion (Figure 2), which is characterised by flat to gently undulating terrain (MPS, 2015). The Project area is flat with an elevation of less than 20 metres above sea level (VRO, 2021). Recent geotechnical survey has shown the site to have a rise of approximately 1.5 metres from the centre of the Project area to the sides (Blacks Geotechnical, 2021).

Figure 2: Bioregions of Victoria



LoM	Lowan Mallee	GipP	Gippsland Plain	WPro	Wilsons Promontory
MuM	Murray Mallee	OtP	Otway Plain	HSF	Highlands - Southern Fall
Wim	Wimmera	WaP	Warrnambool Plain	HNF	Highlands - Northern Fall
GleP	Glenelg Plain	Gold	Goldfields	OtR	Otway Ranges
Brid	Bridgewater	CVU	Central Victorian Uplands	Strz	Strzelecki Ranges
VVP	Victorian Volcanic Plain	GGr	Greater Grampians	MonT	Monaro Tablelands
VRiv	Victorian Riverina	DunT	Dundas Tablelands	HFE	Highlands - Far East
MSB	Murray Scroll Belt	NIS	Northern Inland Slopes	VAlp	Victorian Alps
RobP	Robinvale Plains	EGL	East Gippsland Lowlands		
MuF	Murray Fans	EGU	East Gippsland Uplands		

Geology / Soil

Sites of geological and geomorphological significance either represent a specific characteristic of the region or include an outstanding, rare or unique geological or geomorphological feature. The Department of Jobs, Precincts and Regions (DJPR) have identified 72 sites of international, national, state, regional or local significance around Western Port Bay (Victorian Resources Online, 2021). None of these sites are located at or in close proximity to the Project area (refer to Attachment 2a). The closest being the Yaringa Mangrove sedimentation (approximately 2.5 kilometres to the north) and Tyabb Baxter Formation (approximately 5 kilometres to the north).

The Geological Survey of Victoria's 1:63 360 Scale Western Port Sheet indicates the site is underlain by the Tertiary Age Baxter Group, comprising ferruginous sandstone, sand and sandy clay with occasional gravels (Victorian Environmental Assessment Council, 2010).

An analysis of soil samples taken at the Project site found the ground conditions to comprise between 0.15 metres and 2.7 metres depth of fill, overlaying natural silty clay and sandy clays. The fill consisted of imported silty sandy gravels (crushed rock) and reworked local natural soils comprising gravelly silts, sands, silty clays and sandy clays (Douglas Partners, 2014).

VRO have mapped the soil pH in the Project area as between 6.1 and 7.4, slightly acidic to neutral (refer to Attachment 2a). There is the possibility of coastal acid sulphate soils (CASS) along the coastline (700 metres east of the Project area). However, soil analysis of the site has identified pH of soils to be between 5.6 and 11.6 with an average pH of 9.0 indicating generally alkaline soil conditions. The presence of CASS was not encountered on site.

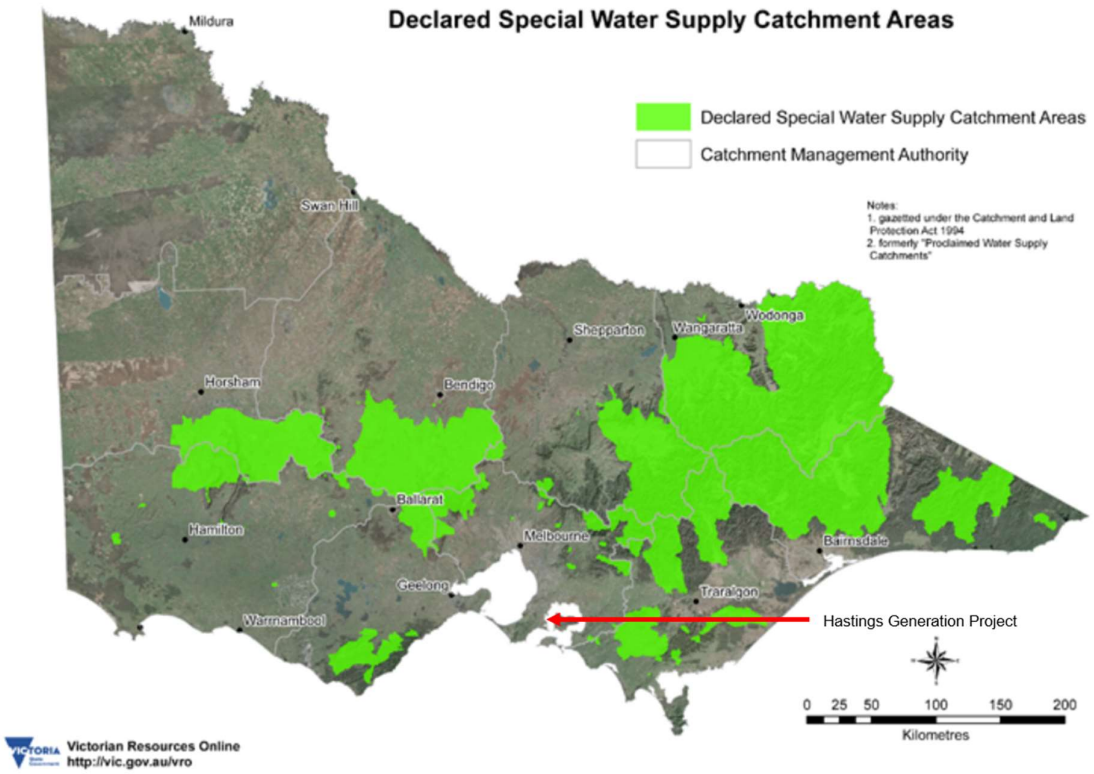
Waterways

Surface Waters - No surface water is present at the Project site. The closest freshwater source is Olivers Creek, approximately 1.5 kilometres to the west.

The Project site does not lie within a special water supply catchment area, as outlined in Schedule 5 of the Catchment and Land Protection Act 1994 (refer to Figure 3)[1].

Figure 3: Declared Special Water Supply Catchments of Victoria

[1] Under the *Development Licence Application Guidance* , Table 2 - an application may be refused if waste water discharges are made to surface waters in a special water supply catchment area as set out in Schedule 5 of the *Catchment and Land Protection Act 1994.*



Groundwater - According to the Victorian Groundwater Beneficial Use Map Series, South Western Victoria Water Table Aquifers (DELWP, 2014), groundwater underlying the site is likely to be part of Segment B of the groundwater environment (i.e. having a salinity of between 1,201 mg/L to 3,100 mg/L). Under Table 5.2 of the Environmental Reference Standard, the protected beneficial uses for Segment B are:

- Water dependent ecosystems and species;
- Potable mineral water supply;
- Agriculture and irrigation;
- Stock watering;
- Industrial and commercial use;
- Traditional owner's cultural values;
- Buildings and structures; and
- Geothermal properties.

Based on the published geology, groundwater is expected within clays and sands of the Baxter Sandstone. Based on the location of local surface water bodies (Westernport Bay approximately 700 m east and approximately 1000 m south of the site), groundwater is expected to be flowing to the south or east discharging into the marine environment of Western Port Bay.

WBM Oceanics Australia (2002), have identified groundwaters in the Olivers Creek drainage sub-catchment as having a moderate value.

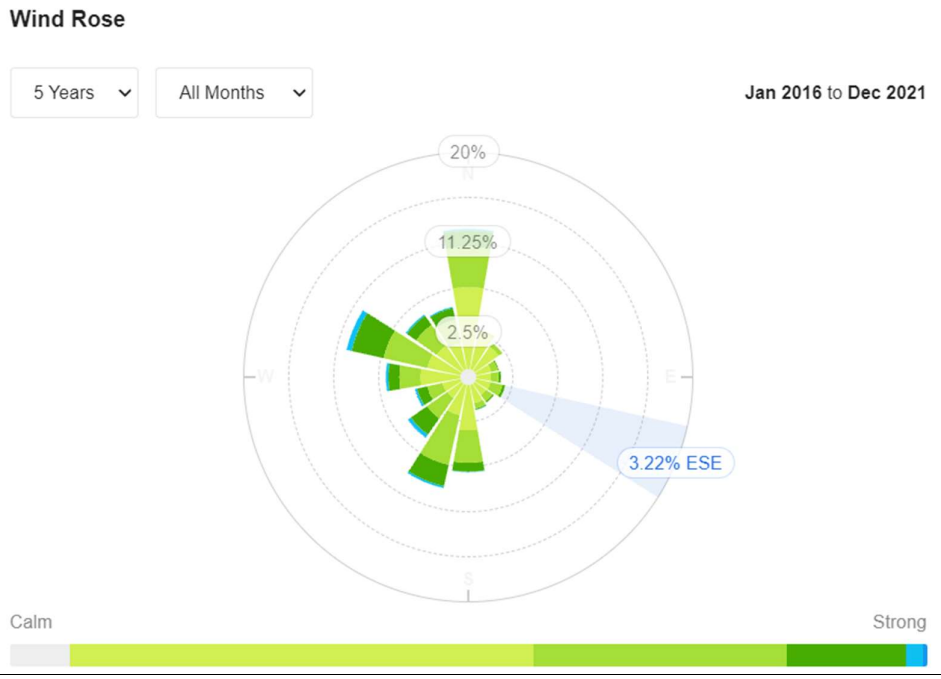
Site geotechnical works encountered groundwater at a depth of between 10 to 12 metres.

Climate

Climatic data is recorded at the Cerberus weather station, located 6.5 km from Hastings. The climate is considered warm and temperate.

Temperature – The average annual temperature is 14.7°C (Climate-data.org, 2021). While the average monthly temperatures, for the Hastings area, over the last 34 years show a July low of 9.9°C to a February high of 18.9°C. With the highest recorded temperature of 45.8°C in February 2009; and the lowest at -3.2°C in May 1991 (Willyweather, 2021).

Wind – Winds are predominantly from the north (12% of the time); west-north-west (11% of the time); and south-south-west (10% of the time). With the strongest winds predominately coming from the west.



Average monthly wind speeds over the last 34 years show it to be fairly consistent, varying between 11.5 km/h and 14.2 km/h. The highest recorded wind speed was in September 2007 at 103.7 km/h (Willyweather, 2021)

Rainfall – Hastings has a significant amount of rainfall during the year averaging 741 mm (Climate-data.org, 2021). Regional rainfall data shows the monthly averages for the last 35 years to vary from a low of 37 mm in February to a high to 73 mm in August.

Stormwater - The site lies within the Olivers Creek Drainage Sub-catchment. Stormwaters from this sub-catchment flow into local receiving environments with very high environmental values. With the coastline identified as being of state and regional significance for its flora and bird habitat. The coast line lies on Western Port Bay, which has been declared a Ramsar Site. Western Port Bay is located 700 metres to the east and 1000 metres to the south of the Project area.

Under the Planning Scheme for the Mornington Peninsula, the site does not lie within an area of inundation or a flood zone. This is confirmed by employees at LIP who have indicated that flooding is not an issue at the Project site. In addition, the Project area sits approximately 2.5 metres higher than the surrounding LIP facilities.

Changing Climate – Victoria's climate is changing under the influence of both natural variability and global warming (DELWP, 2019). The average temperature has increased across the state by 1.0°C since 1910. DELWP (2019) have noted that on the Mornington Peninsular temparatures have increase from between 1.2 and 1.4°C since 1950. It is anticipated that temperatures will continue to increase by between 0.55°C and 1.3°C by 2030, depending on the emissions scenario modelled (low to high) (DELWP, 2019). Not only is the temperature getting hotter but it is expected that the number of days Victoria experiences extreme heat (greater than 35°C) will increase from 8.3 days per year now to an average 14.0-16.4 days per year in 2050 (DELWP, 2019)

Cool season rainfall has declined in the last 30 years and this decline is expected to continue. Since 1950 the annual rainfall on the Mornington Peninsula has decreased by 0-100 mm (DELWP, 2019). By 2030 declining winter, spring and autumn rainfall is expected. It should be noted however, that rainfall projections have larger uncertainties than temperature. DELWP (2019) have suggested that the Mornington Peninsula is expected to see an 11% reduction in rainfall by 2050. There is also expected to be an increase the intensity of extreme rainfall events.

Mean sea levels have risen approximately 11 cm since 1966 (based on records at Williamstown). By 2030, sea levels are expected to rise by another 12 cm.

The number of high fire danger days in Victoria is expected to increase in the future, but an approximate percentage is not known for the Mornington Peninsula. It should be noted that over the last 70 years, Victoria has seen an increase in length and severity of the fire season.

The PPWCMA Regional Catchment Strategy, examines the potential impact of climate change on environmental values in the Region. The findings specific to the project area are:

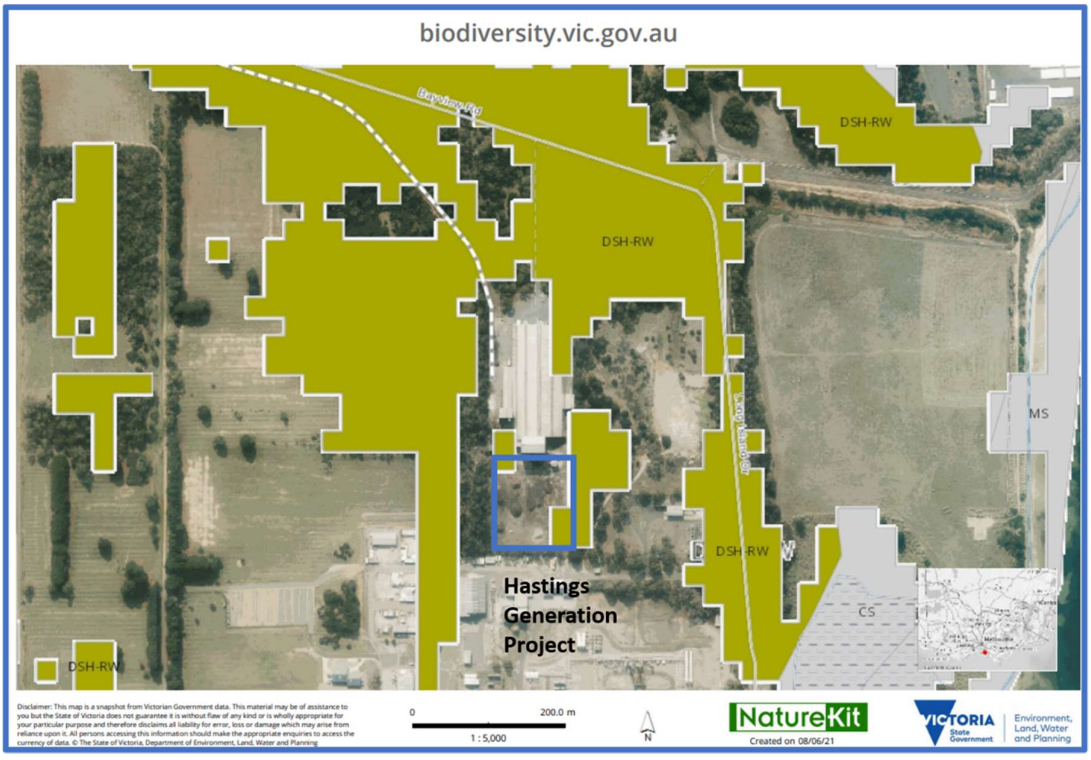
- No impact on natural vegetation
- No impact on waterways
- No impact on land and soil

Biodiversity

The majority of construction and operation activities are to be conducted in previously cleared areas on the site.

There are stands of vegetation along the fence lines and north of the Project area. From a visual inspection the vegetation on site is a mix of introduced species and native vegetation. Under the Victorian biodiversity atlas, the majority of this vegetation is classified as Damp Sands Herb-rich Woodlands (EVC 3). Figure 4 highlights the mapped locations of EVCs present in and around the Project area. While the photographs in Attachment 2b show the current vegetation surrounding the existing, cleared construction area.

Figure 4: Ecological Vegetation Classes Present in the Project Area



Threatened Flora

No threatened flora species have been identified at the site through the Victorian Biodiversity Atlas.

A study conducted for LIP (Nature Advisory, 2019) identified ten species listed under the EPBC Act or FFG Act that were considered likely to occur in the area. Field studies identified no threatened species. None of the threatened species identified in the LIP study have the potential to occur in the area (refer to Attachment 9).

Threatened Fauna

Nature Advisory (2019) identified ten listed fauna species that are likely to occur or have the potential to occur at LIP. Of these species, two would be unlikely to be found in the Project area, based on their dependence of mangrove habitats, which are not present. The eight species likely to be found in the Project area are detailed in Attachment 9 and summarised below.

1. Non-Migratory Birds

There are two listed non-migratory bird species that are considered to have the potential to occur in the Project area. They are unlikely to be significantly impacted by the Project's activities, as shown below.

- Little Egret – This species is likely to forage in the intertidal mudflats of Western Port Bay and has potential to roost in mangroves. No mangrove habitat exists on the site and surrounding mangrove habitat will be unaffected by the Project's activities.
- White-bellied Sea-eagle – This species forages over Western Port Bay where it hunts for fish. It has the potential to fly over the study area. Any trimming of vegetation in the Project area is unlikely to pose significant impact upon the species.

2. Migratory Birds

Three listed migratory bird species have the potential to occur in the study area.

- Rufous Fantail and Satin Flycatcher – These species are summer visitors to south-east Australia. They live in wet and dry forest/woodland and coastal scrub/woodland. There is suitable habitat for these species in the study area. Large amounts of suitable habitat exist within the surrounding regions that support these species. While there is no planned large-scale removal of vegetation, the removal of small amounts of vegetation as a result of the transmission line upgrade, piping installation or earthworks will not have a significant impact upon these species.
- White-throated Needletail – this species spends the majority of its life on the wing, only coming down to land when nesting in Asia. It migrates to south-eastern Australia in the Summer. This species is unlikely to be in the area during the construction phase of this Project.

3. Mammals

One listed mammal species is considered to have the potential to occur in the Project area. The Southern Brown Bandicoot was last recorded in the area in 1970. This species is known to occur in coastal scrub habitats and around Western Port Bay further north near Warneet and Tooradin. It is considered unlikely that this species is still present in the Project area.

4. Reptiles

One listed reptile species is considered to have the potential to occur in the Project area. The Swamp Skink occurs in saltmarsh habitat south of Hastings and from swamp scrub habitat along King Creek near Hastings. A record from 2010, located this species in saltmarsh at Long Island Point. This species is likely to occur in the area. Saltmarsh is found on intertidal mudflats. Inland components consist almost entirely of low, succulent herbs, grasses and sedges often interspersed with salt-water, brackish or freshwater. A search of DELWP's Nature Kit tool has not identified any saltmarsh occurring in the project area.

5. Frogs and Invertebrates

No listed frog or invertebrate species are considered to have the potential to occur in the study area

Community

The Project is located within an industrial hub of Hastings that has a mix of large industry, commercial properties and agriculture. There are a small number of residential properties to the SSW, with the nearest being approximately 700m away. These are summarised in Table 3 and shown in the Figure 5 and in Attachment 2.

Table 3: Summary of Neighbouring Community Locations

ID	Easting	Northing	Description
1	343758	5759223	11 Cemetery Road
2	343696.6	5759299	34 Cemetery Road
3	343621.5	5759054	7 Beach Road
4	343511.9	5759110	Crib Point Engineering
5	344358	5760209	Scout Hall and LIP Emergency Centre
6	344470.2	5760240	Hydrogen Pilot Plant
7	344982.1	5760323	Jetty Infrastructure
8	343613.8	5760465	BlueScope Steel
9	343953.7	5760583	BlueScope Steel
10	342620	5759600	Olivers Creek
11	344860	5759600	Western Port

The Project site area is bounded by Bayview Road to the north and Long Island Drive to the east.

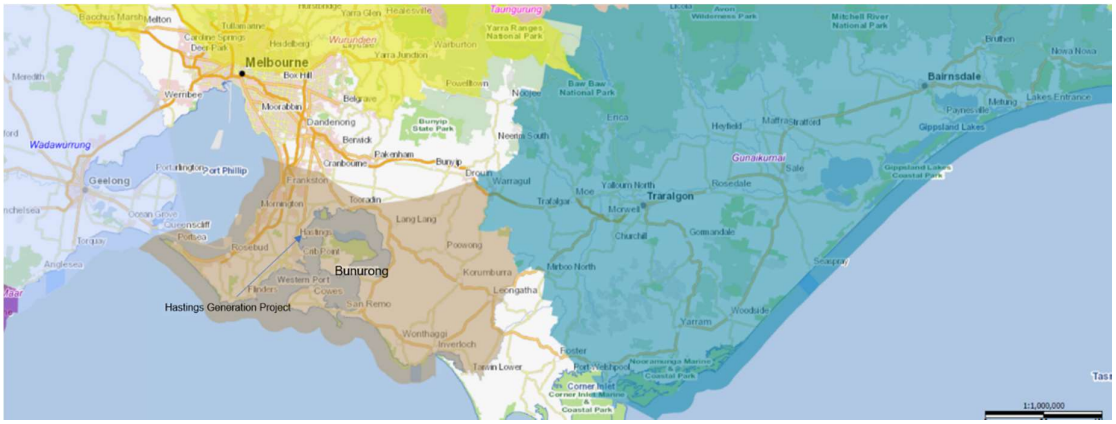
Figure 5: Sensitive Receptors in Proximity to the Project

Vic Roads (Department of Transport, 2021) have estimated that the average daily traffic volume for Bayview Road is 3,900 vehicles, including 232 trucks, per day.

Cultural Heritage

The Project area is located in the traditional lands of the Bunurong language group (refer to Figure 6). Language groups were comprised of collections of neighbouring clans who shared a common dialect as well as mutual economic and political interests. They were also communally connected to specific areas of land through their spirituality, including as association with topographic features linked to deities and other mythical beings (BHM, 2021).

Figure 6: Registered Aboriginal Party



The Project has undertaken a cultural heritage due diligence desktop review as part of the Planning Permit Application (refer to Attachment 8) to determine the likelihood for the presence of aboriginal cultural heritage at the site.

The Cultural Heritage Due Diligence Assessment found that the project area:

- did not lie inside any areas identified as having cultural heritage sensitivity (refer to Figure 7, extracted from ACHRIS).

- has undergone significant ground disturbance
- there are no aboriginal cultural heritage places within 200 metres
- the distribution of aboriginal cultural heritage places, in the geographic region, are associated with watercourses (predominantly Olivers, Warrangine and Kings Creek)
- previous archaeological assessments in the geographical region have indicated that aboriginal cultural heritage places are likely to be located on high ground (sandy dunes adjacent to swamps and watercourses
- given the level of ground disturbance that has occurred previously, the potential for discovering aboriginal cultural heritage is low.

Figure 7: Aboriginal Cultural Heritage Sensitivity in the Project Area

A report prepared by Andrew Long and Associates for the Department of Transport, examined cultural heritage in the vicinity of the project area. This study identified 43 previously registered Aboriginal cultural heritage places located with the Port of Hastings Development Project study area. The closest, an artefact scatter, lying over one kilometre to the north-west of the Project area.

The Andrew Long study undertook predictive modelling to ascertain the likelihood of aboriginal cultural heritage places being present. This modelling took into account:

- geomorphology;
- flora and fauna;
- cultural heritage historical records; and
- historical land use and development records

From this modelling the Project area was identified as being least likely to having Aboriginal cultural heritage, this is based predominantly on the level of prior disturbance (Andrew Long + Associates, 2014).

Heritage

A review of the Heritage Register has identified no places listed within the Project Area (Heritage Council Victoria, 2021). The closest registered place is Denham Road Farmhouse (H7921-0119), located at 28 Bayview Road (refer to Attachment 10). The Projects activities will have no impact upon this site.

7.2. Process and Technology

7.2.1. Is the construction, installation or modification of plant or equipment required?

Yes

7.2.2. Describe the required plant or equipment to be constructed or installed.

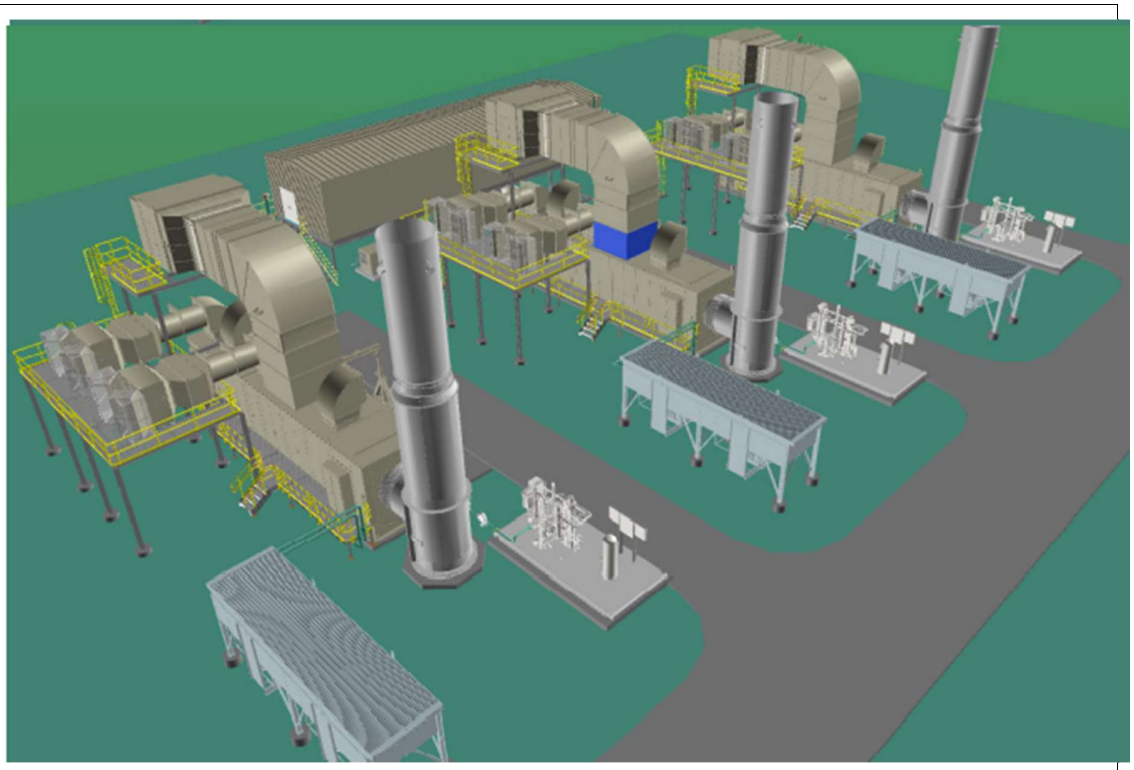
The project will be a power generation facility with four primary components:

1. Installing ethane supply piping from the LIP site to the Project site.
2. Installing 3 x Solar Titan 130 gas turbine generators (inclusive of associated equipment such as fuel gas conditioning skids, instrument air compressors, stacks, etc).
3. Installing associated equipment rooms and electrical infrastructure to enable power export of 66 kV power
4. Installing facilities so that the new equipment on the Project site can be suitably operated and maintained (e.g. crib rooms, offices, etc).

The total area of the power plant is approximately 1800 m^2. Attachment 1, shows the gas plant layouts.

The Project is a small-scale electricity provider, generating approximately 40MW (at its peak) of power to the existing Victoria electricity generation market. Generating power from ethane, will enable Esso to safely and reliably utilise undersubscribed ethane, thus avoiding the need to flare this gas at LIP or reduce natural gas production for the south east Australian gas market. When gas and ethane production rates reduce, so will the power generated by the Facility. Figure 8 shows a preliminary 3D model of what the facility will look like at completion.

Figure 8: Hastings Generation Project General Arrangement 3D Model



1. Piping Design and Engineering

The 150mm diameter pipe will be fully welded steel pipe, coming into the Project area from the LIP tank loading facility; located to the east. Refer to Figure 1 .

There is an existing flowmeter and shutdown valve located prior to the new ethane piping take-off point. Additional isolation valves will be added on the power plant end of the piping.

2. Power Generation – Engineering and Design

The Solar Titan 130 (SoLoNOx) gas turbine generators have been selected for the power generation facility. The key design criteria are:

- Service: Ethane
- Flowrate: Annual average of 189 t/d to generators
- Fuel gas pressure: 3450 kPag max.
- Fuel gas temperature: 28 °C superheat above dew point temperature
- Generator power: Max power output 13.5 MW per generator
- Gas storage: No gas storage facilities to be installed
- Air Emissions: Less than 25 ppm NOx and 25 ppm CO during steady state operations (50-100% load).
- Greenhouse Gas Emissions: Less than 200,000 t CO_{2e}/year.

Each Solar Titan 130 package comes with the following scope:

- Gas turbine
- Start system
- Fuel system
- Reduction-drive gearbox
- Generator

- Lubricating oil system
- Turbotronic 5 control system
- Onskid electrical wiring
- Skid with drip pans
- Piping and manifolds
- Package acoustic enclosures with: ventilation system; fire detection and suppression system; and combustible gas detection

The power plant will be built to conform to the following Australian Standards and International Standards:

- AS 1210 Pressure Equipment / Pressure Vessels
- AS 3000 Wiring Rules
- AS 60079.14 Explosive atmospheres – Electrical installations design, selection and erection
- AS 3814 Industrial and Commercial Gas Fired Appliances
- ISO 12100: 2010 Safety of machinery – general principle for design risk assessments and risk reduction
- ISO 21789: 2009 Gas turbine applications - Safety

3. Construction Schedule

The construction activities will take approximately six to nine months to complete. Commissioning and start-up are likely to take a further month. Construction work will take place between 7.00 am and 6.00 pm Monday to Saturday, for the majority. Some work may be required outside of these working times.

Construction activities from site preparations to commissioning are intended to occur between second quarter (2Q) 2022 and first quarter (1Q) 2023.

4. Piping Construction

Piping construction would comply with all relevant codes and standards. The construction would also be guided by the environmental requirements to be specified in the Project Environmental Management Plan (EMP) (Attachment 5).

The piping route has been designed to avoid native vegetation removal as far as practicable.

4.1 Construction Laydown and Pipe Stockpiling Areas

The construction laydown area and pipe stockpiling area will be located within the power generation facility area, in an area that causes minimal disturbance to other construction activities.

At the completion of construction, all temporary construction equipment/plant will be removed from the construction site.

4.2 Piping Construction

The majority of the new ethane piping shall be installed below ground, via trenching.

The ethane pipe will be isolatable from LIP by a valve and will be installed within a trench. The first section from the LIP fence will be underground and backfilled with soil. This will protect the piping from site road traffic. It is anticipated that the underground section of piping will be approximate 10 metres. The remaining section of pipe to the gas conditioning skids (approximately 50 m) will be laid within an open concrete culvert that is covered by a grating.

Some piping will be installed between equipment and the relief blow down vent. This piping will be installed on pipe supports with concrete foundations at a depth of at least 500 mm and spacing of approximately 5 metres.

Pipe footings will be a mix of precast footings and in-situ casting. Final design will determine the construction technique to be used.

The trenches will be excavated using excavators. The material removed from the trench will be set aside for later use as backfill.

Any trees or shrubs that are removed as part of the installation activities will be chipped and stockpiled for re-use during rehabilitation.

4.3 Hydrotesting and Commissioning

Given the small section of piping to be installed, hydrotesting will be undertaken prior to delivery at site. If any further pressure testing is required on site this will be done using inert gas.

5. Power Generation Plant Construction

Construction of the power generation facility would be undertaken by specialist crews across key distinct phases of works. These include initial earthworks and civil construction and assembly of the modular power plant packages (as described in Table 4).

The Titan 130 gas turbine generator sets are supplied as a modular power plant. The equipment will be mechanically and electrically completed prior to shipping, then assembled on site as described in Table 4. Commissioning can proceed after connections and interfaces are made on site.

Some advantages to the modular system are:

- Design and fabrication in a controlled shop environment
- Small team required for site assembly
- Installation reduced to assembly tasks

Table 4: Hastings Generation Facility Construction Activities

Construction Sequence	Activity	Description
1	Site set-up	Site set up within the construction footprint is required to provide a safe and efficient area for construction activities. This includes site offices and site facilities (toilets, lunch rooms etc.), prepping lay down areas, clearing vegetation or degradable non-soil material, such as mulch that may be remaining from previous activities. (if required), and relocating existing services if required. Any removed material will be stockpiled for reuse. The site is already fenced and has pre-existing haulage roads.
2	Earthworks	Existing ground levels would be excavated/built up and levelled to the required design levels. The existing or exposed subgrade will then be proof rolled. Backfill and/or fill material will be laid during this process to meet the design criteria for concrete foundations and stormwater management.
3	Civil works	Strip or pad footings will be embedded to a depth of 1-1.15 metres to allow for a proportioned allowable bearing pressure of 100 kPa. The concrete will be poured in two separate pours – 1) slab footings and 2) the slab. Steel reinforced concrete foundations will be poured into pre-built formwork. The hardstand areas will be constructed to include bunding and a sump. Attachment

		1 shows the site layout including the hardstand arrangements. Upon the hardstand areas the permanent buildings, modular power plant, equipment and supports would sit on and be fixed to.
4	Assembly	Once the concrete foundations are installed, the modular power plant packages will be assembled. This involves ensuring equipment is level and can be bolted up without over-stressing connections. Specialist crews would install structural supports, mechanical equipment, electrical equipment, cabinets and panels, cabling, instrumentation (sensors etc.), buildings, tie-in piping and walkways for each of the three packages.
5	Testing and commissioning	Mechanical and electrical equipment are mechanically and electrically tested to make sure they have been installed correctly and are ready for commissioning. Pre-commissioning involves leak testing pressure containing piping using inert gas and function testing instrumentation. Commissioning involves fine tuning of equipment and instrumentation by running the facilities through various operating ranges. Commissioning will include validation that the exhaust emissions meet the 25 ppm limit for NOx and CO; and the 85 dB(A) noise limit as detailed in the design standards. Once the facility passes all checks per the commissioning plan, it is ready to be handed over to Operations and start generating electricity.
6	Roads, landscaping and reinstatement	Final touches within the final facility such as permanent roads, kerbs, pavement and landscaping would be constructed. Reinstatement of construction areas which are not part of the final facility would also be finished to leave the facility in its finished state.

5.1 Power Plant Equipment Packages

The following sections provide more detail on the individual equipment packages that make up the Hastings Generation power plant. Figure 9 and Figure 10 show preliminary 3D modelling of the gas turbine packages once installed.

Figure 9: Preliminary 3D Model of Installed Titan 130 Gas Turbine Generator

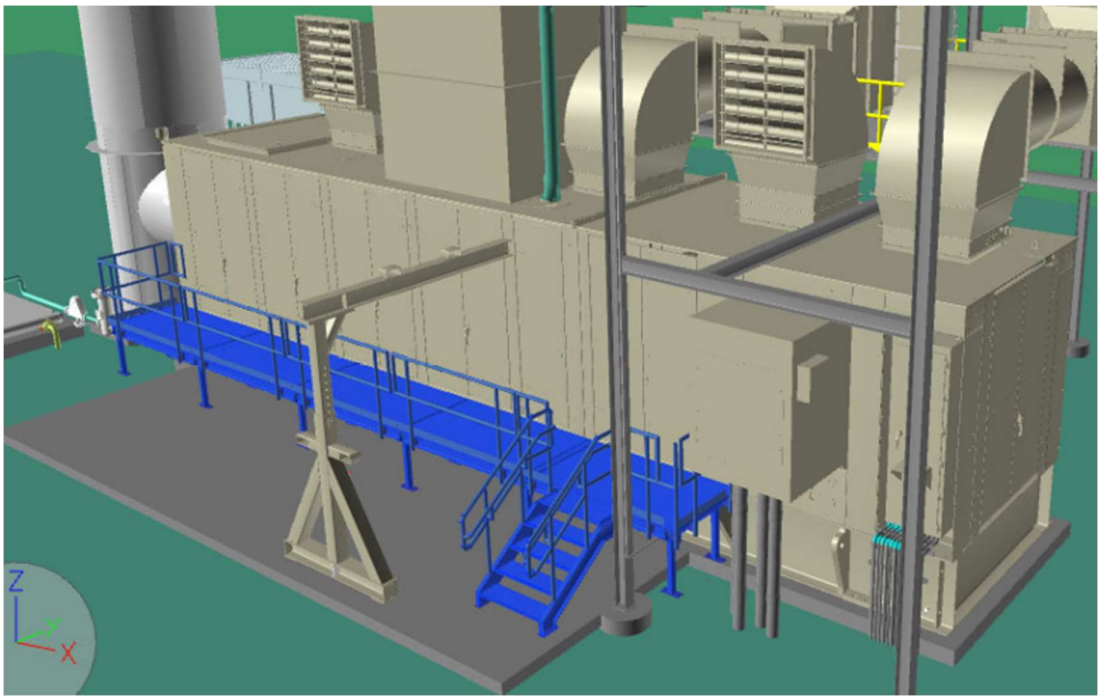
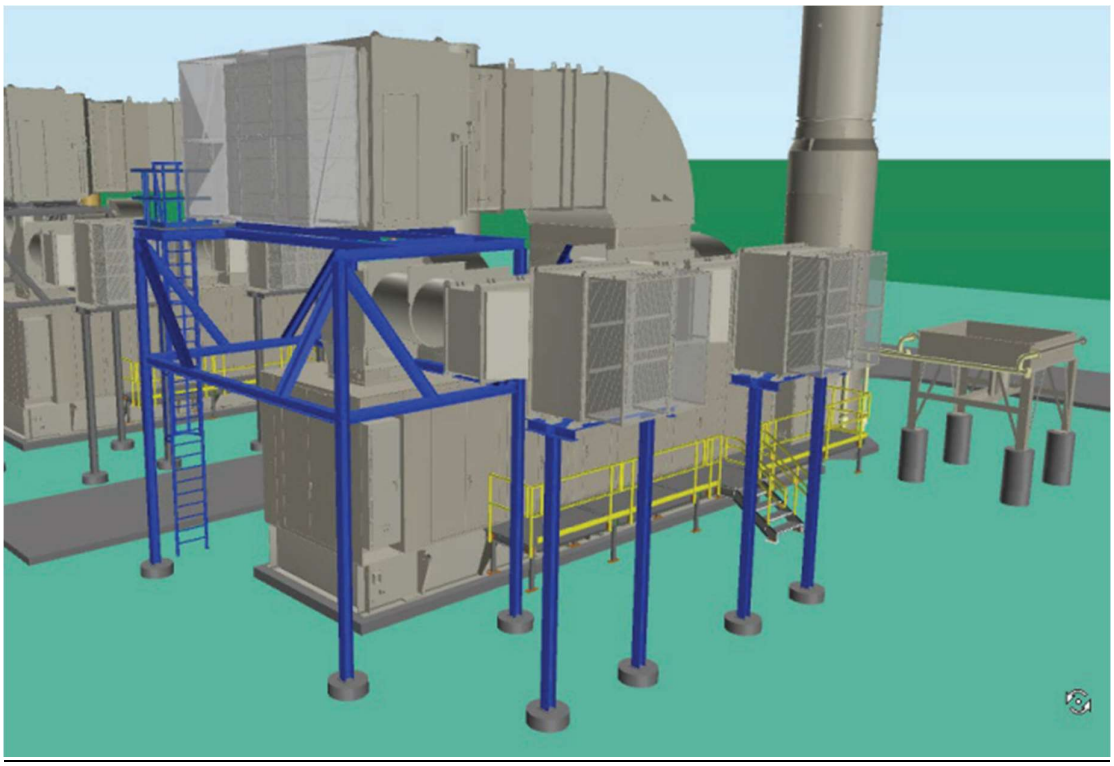


Figure 10: Preliminary 3D Model of Titan 130 Gas Turbine Generator, Including Air Inlet Filter & Enclosure Vent Filter, Access Platforms and Support Structures

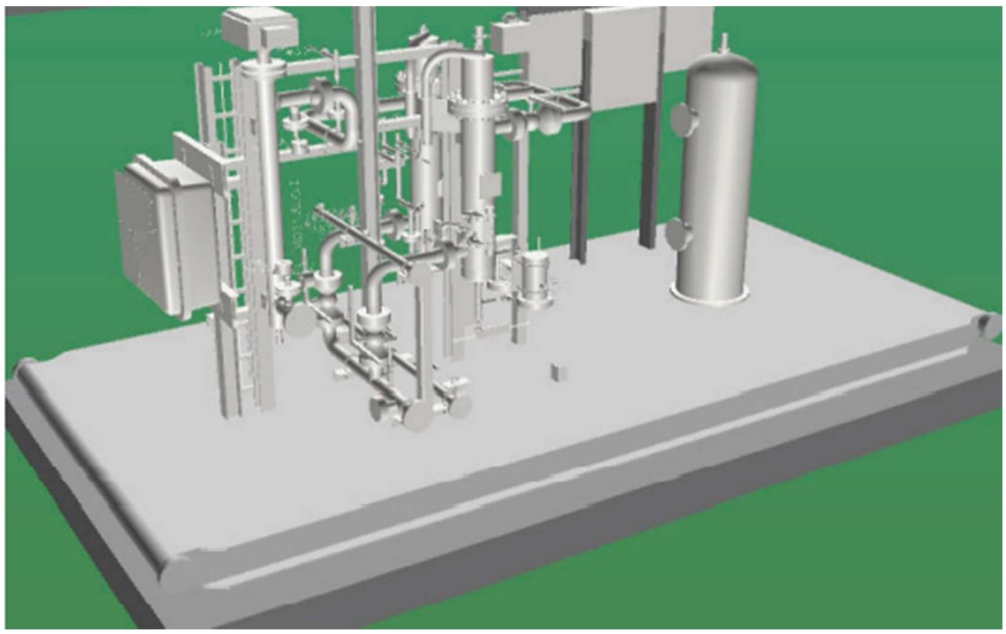


5.1.1 Fuel Gas Condition Skid

Ethane will be distributed to each of the three gas turbine generators. Before reaching the gas turbines, the ethane will flow through a fuel gas conditioning skid (Figure 11). This skid will include a filter coalescer, liquids knockout vessel and a heater so as to ensure that the fuel gas contains no

liquids, no particulates and is of a suitable feed temperature. After fuel gas conditioning the ethane will flow directly into the gas turbine.

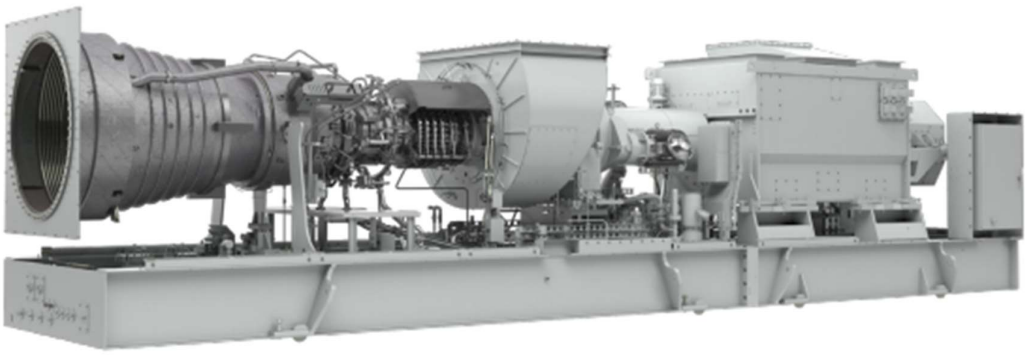
Figure 11: Fuel Gas Conditioning Skid



5.1.2 Gas Turbines

The Titan 130 gas turbine generator set consists of an axial-flow gas turbine engine, generator, and reduction-drive gearbox (Figure 12). These components are installed in-line on a heavy-steel base frame referred to as the skid. The skid is a structural steel assembly with beam sections and cross members welded together. The two sections of the skid are separated to facilitate handling and shipment but when bolted together they form a rigid structure suitable for three-point mounting. The gearbox is bolted directly to the engine. Drip pans are installed in the skid to collect any potential liquid leakage.

Figure 12: Solar Titan 130 Gas Turbine Generator Skid



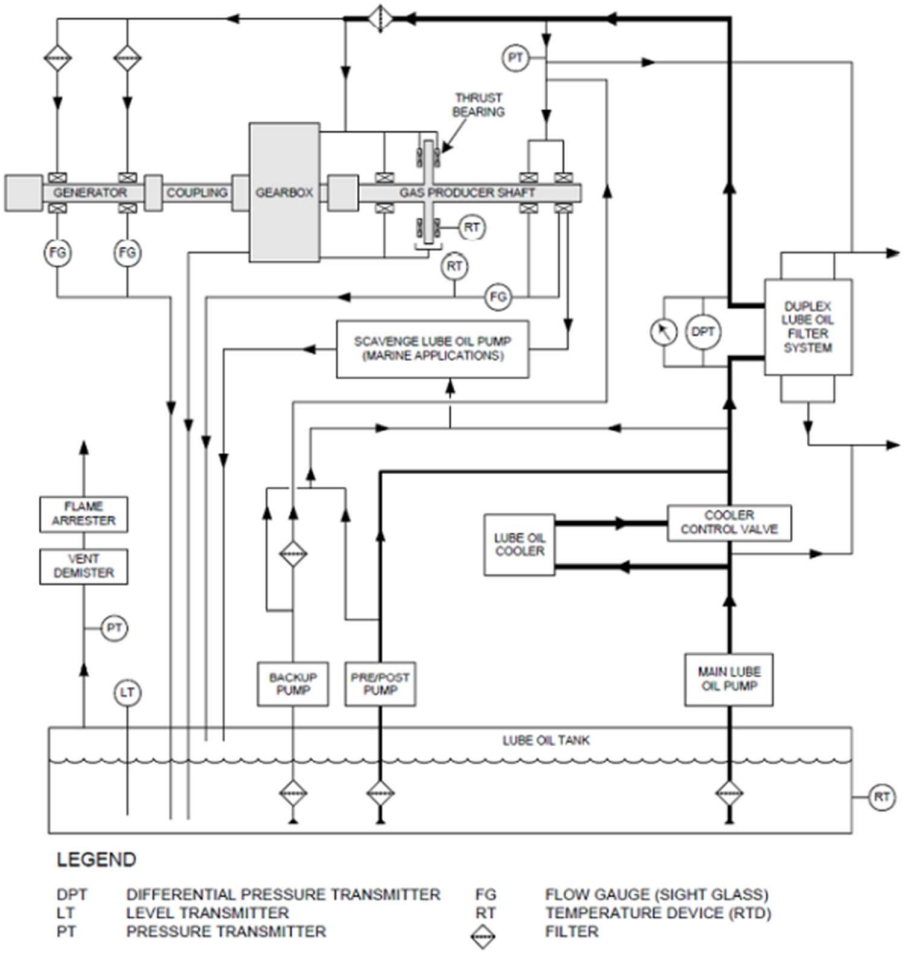
Each gas turbine generator package is enclosed in a completely self-contained, weather proof, insulated and sound-attenuated system. The enclosure is mounted on the skid package. The enclosure panels are treated with fiberglass material for sound attenuation and thermal insulation. The enclosure ventilation openings are equipped with silencers.

5.1.3 Lubricating System

The lubrication system circulates oil under pressure to the gas turbine and driven equipment. Lube oil is supplied from the lube oil tank located in the driver skid. An off-skid lube oil vent coalescer

removes oil vapour from the lube oil tank vent airflow. The coalescer drains trapped oil vapour back to the lube oil tank and allows the remaining vent airflow to exhaust to atmosphere. The lube oil tank will be located within the bunded area that is sized to hold 110% of lube oil tank contents. A layout of the lubricating system is provided in Figure 13. It is not anticipated that the lube oil will need replacing during the life of the project. This will eliminate the need to store large quantities of oil on site. If oil is required to supplement the oil in the lubricating system, oil will be delivered to site at the time.

Figure 13: Lube Oil System



5.1.4 Controls System

A control system provides automatic starting, acceleration to operating speed, sequencing control, engine and driven equipment monitoring during operation, and normal and malfunction shutdown. Additional controls include:

- Vibration control – monitors vibration levels, and will shut the system down in the event of unacceptable levels being generated.
- Backup shutdown system
- Fire and gas system – enclosed packages require fire and gas control protection. If a fire is detected, an extinguishing watermist is released into the turbine enclosure.

5.1.5 Hydrocarbon Drainage System and Sump

Liquid hydrocarbons will be drained to a common sump as and when needed. The expectation is that this sump will only be used for lube oil type materials. All wastes collected in this sump will be removed by vacuum pump for disposal at a lawful place[2], by an accredited waste removal company.

5.1.6 Relief Blowdown System

All hydrocarbon piping will be able to be depressurised to a relief and blowdown system. The relief location will be an atmospheric vent (not flares). The release vent is a single vent at height. The release of unburnt hydrocarbons will be minimized by minimizing volumes required to be depressurised during regular maintenance activities and generator trips. Bulk depressurisation of the facility during a prolonged shutdown (inclusive of the ethane supply piping from LIP) will be managed from the LIP facility end so that the unburnt hydrocarbon is not released to atmosphere but is routed back into the LIP system. The volume of ethane sent to the vent during generator shutdown as production fluctuates is expected to be in the order of 1 litre (less than 1/2kg ethane) per event.

Ethane will also be routed to the relief blowdown system during periods of emergency shutdown. It is anticipated that the volume of gas vented during this time would be approximately 10 kilograms; and it is estimated that not more than one emergency shutdown would eventuate in a year.

During a routine shut down for maintenance a small quantity of ethane would be sent to vent, again in the order of 1 litre per shutdown.

5.1.7 Electricity Transmission

The power plant will connect into the Victorian Grid via two new 60 MVA transformers and a 66 kV transmission line. A 66 kV line runs between the Tyabb transformer station and BlueScope Steel (located at 28 Bayview Road). From BlueScope Steel a 22 kV transmission line runs down Bayview Road, then into Long Island Drive, finally connecting to the Project area (refer to Attachment 2). A 66 kV transmission line will be constructed parallel to the existing 22 kV line (approximately 3.3 kilometres). The transmission lines located in the Project area are currently operational at 22 kV. The transmission line changes will be undertaken by United Energy. The new electrical transformer will transfer the electricity produced at the power plant to the regional electricity transmission and distribution system.

5.1.8 Electricity Switchyard / Transformer

The proposed location of the new electrical switchyard and transformers is shown in the site layout, in Attachment 1.

The power plant's transformer system will consist of f 2 x 40/60MVA, 11/66kV generator transformers, each capable of supporting the power station's full load capacity of 40.5MW. A normally open bus tie is located between the 11kV switchboards to enable 100% of load to be transferred to either of the Generator Transformers if required.

Two 2MVA, 0.415kV/11kV auxiliary transformers will also be provided. Each auxiliary transformer is capability of supporting the full load capacity if required. The auxiliary transformers service the auxiliaries for the three turbine generators.

The transformers are designed in accordance with AS 60076 and shall be designed to be capable of withstanding various operational and extraneous stresses such as rapid temperature change, fault currents and the various electromagnetic forces. It shall also be able to sustain continuous operation at any tapping position for all service conditions.

[2] A "lawful place" is defined as somewhere authorized to receive industrial waste.

The transformer system will be installed on a concrete slab with anti-vibration pads between the structural foundations and oil tank.

The 66kV and 11 kV transformers will be installed in a bunded area.

5.1.9 Vehicle Access

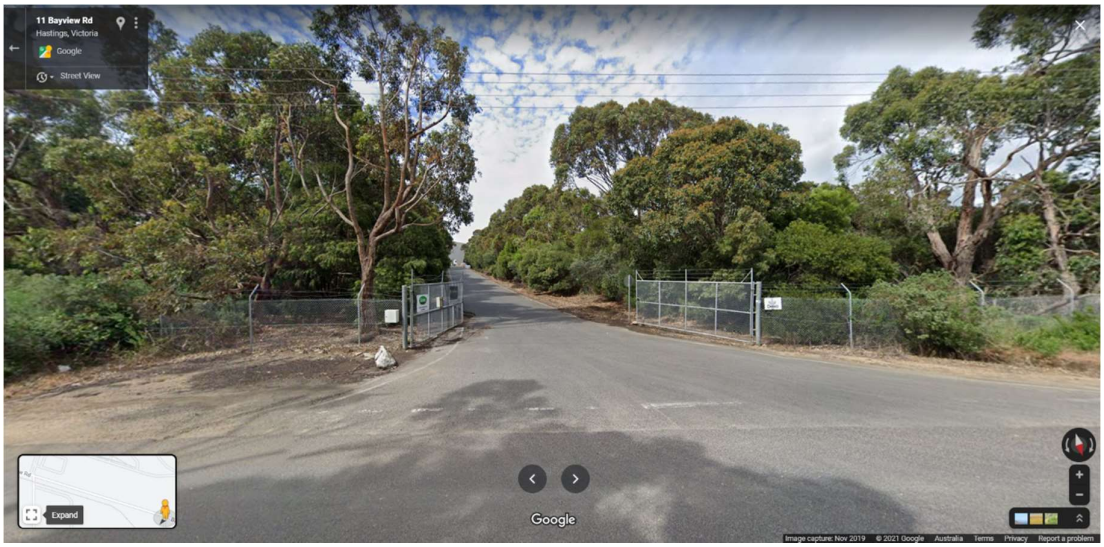
The Project will be accessed via Bayview Road, in addition, there is an access road through LIP, via Long Island Drive. Access through LIP will only be undertaken in emergency situations or with prior LIP approval.

Bayview Road currently provides access to BlueScope Steel and a number of smaller commercial and industrial facilities. Long Island Drive provides access to LIP. Both roads are capable of carrying oversized trucks with heavy loads, such as those expected during the construction, operation and closure phase of the project.

The road/ drive way entering 11 Bayview Road, is sealed with bitumen and is able to carry heavy wide loads (refer to Figure 14). Parking and turn arounds are available on site for all construction and operation vehicles. There is no anticipated impact on the public roads from the Project's activities.

Workforce parking, both during construction and operations, will be provided on-site.

Figure 14: Entrance to Hastings Generation Facility



5.2 Construction Workforce

The construction is expected to employ a construction workforce of approximately 60 people at its peak. They would generally work between 7 am and 6 pm, Monday to Friday.

5.3 Commissioning

Solar will commission the turbine generators in their manufacturing plant in the USA, prior to shipping to Esso. This testing will be performed on methane gas, in accordance with their standard commissioning practices. Testing undertaken by Solar, has shown that under steady state operations, the turbines are able to meet emissions levels of 25 ppm NOx and CO, while burning ethane gas.

Once assembly has been completed at Hastings, the turbine generators will be commissioned with ethane gas. As noted in the *Project Alternatives* report (Attachment 3), ethane gas is more reactive than natural gas.

During the commissioning of the low emissions combustion system on ethane there may be short periods where NOx emissions are up to 100 ppm. This will be temporary while each power generation

unit is being correctly tuned to minimise diffusion pilot. Once commissioning is complete higher rates of diffusion pilot should only be needed during large process upsets and will automatically reduce within 2-3 minutes.

Air modelling has been conducted to evaluate the impact of these increased emissions during the commissioning period. The modelling has been based on the maximum annual average of 189 tonnes of ethane per day, 100% high pilot flame conditions. Modelling has shown that air emissions remain well below criteria both onsite and at sensitive receptors.

6. Associated Construction Activities

6.1 Use and Storage of Hazardous Materials and Substances

It is anticipated that little to no hazardous substances will need to be stored on site. Lubricating oils will be delivered to site when needed.

Any oil, fuel, chemicals and other hazardous materials requiring storage on site will be temporarily stored and contained in designated areas in accordance with the Victorian WorkSafe *Code of Practice on the Storage and Handling of Dangerous Goods*, Australian Standards and Safety Data Sheets (SDS).

A hazardous substances register will be developed for the construction activities.

6.2 Water Supply

Currently water to the LIP facility is provided at a connection near to the Truck Loading Facility. Water to the Project site is fed from this system.

Water required for construction and dust suppression will be obtained from the existing mains water supply.

For the operational phase, water quality testing will be carried out on this supply prior to construction commencing to determine if it will meet the turbine specifications for washdown water. If it is unsuitable a reverse osmosis water purification system will be installed.

6.3 Stormwater System

Existing stormwater drains run down the east and west side of the Project area. These open drains then connect with the LIP stormwater drain system. Refer to the site layout in Attachment 1.

At present the stormwater drains are heavily overgrown with vegetation. As part of the bushfire mitigation study, it was deemed advisable to clear the drains of vegetation. This will be undertaken during the civil works of the construction activities.

6.4 Power Supply

The site is already connected to mains power and will meet all the electrical requirements for construction. This includes 240 V power for occupied buildings and 415 V power for the generators to enable turbine start up. There is no expectation that portable diesel generators will be required.

6.5 Waste

6.5.1 Construction Waste

The following construction waste materials are likely to be generated:

- Rock and soil overburden from pipe laying;
- Rock and soil from site leveling and foundation preparation;
- Scrap piping and other construction scrap;
- Packaging.

Waste materials will be reused and recycled on site, where possible. As mentioned earlier, surplus soil will be analysed to determine waste classification. If classified as clean fill, the surplus soil will be reused on site. Otherwise, soil will be removed from site for disposal at a licenced lawful place and tracked through the EPA's waste tracker system.

Waste materials will be handled and stored so as to prevent offsite release. Materials that cannot be reused or recycled on site will be placed in designated bins for offsite disposal at an approved facility.

6.5.2 General Wastes

Domestic waste consisting of sewage, grey water and putrescible kitchen scraps, packaging materials, and other non-hazardous waste generated by site-based construction personnel at the site office location will be temporarily stored on site and periodically removed to an EPA licensed waste facility.

Solid waste materials will be separated, where possible, for recycling. Wastes will be stored in a manner that prevents the uncontrolled release of waste materials or access for vermin.

- Sewerage

  An existing sewerage line runs between LIP and the Project site. The current occupants of the property have not been using this sewerage line, instead employing temporary facilities, which will be removed at the end of the lease.

  During construction the Project will adopt temporary ablution facilities. Temporary ablution facilities will be pumped out on a regular basis by an appropriately licensed waste transport and disposal contractor to be disposed at a lawful place.

  During the operational phase of the Project, the site control room/ office / kitchen / toilet building will be connected to the existing septic line.

6.6 Instrument Air

Instrument air is required for the generators and the associated fuel gas conditioning skid. Two instrument air compressors (one standby) will be installed as part of the power plant package.

6.7 Telecommunications

Phone and internet will be installed.

6.8 Fire Water

The site is currently connected to LIP's fire water mains. The integrity of the system is still be determined, and will repaired or replaced, as necessary. A fire safety study will be commissioned prior to construction.

6.9 Existing Buildings Onsite

Two storage sheds are present on the site. The Project may utilise these for storage of equipment if they are deemed suitable for use.

7. Construction Traffic

Solar are responsible for delivery of the modular power plant packages to site, and as such will be responsible for ensuring delivery is in accordance with the Department of Transport's Code of Practice – Traffic Management[3].

For all other traffic movement, the Construction Contractor will develop a Traffic Management Plan (TMP) for the project; which complies with the requirements of DoT's Code of Practice – Traffic Management. Construction Contractor will maintain responsibility for implementation of the TMP during construction. The TMP will describes the requirements for all project, including subcontractor, transportation, plant, vehicles and their attending personnel travelling to and from the project site and movements within site. The TMP details requirements for traffic management to prevent traffic accidents, minimise disruption to traffic flow, ensure safe passage of the general public and emergency services through construction zones and ensure the safety of construction personnel. In summary, the TMP includes the following requirements:

[3] http://www.gazette.vic.gov.au/gazette/Gazettes2010/GG2010S351.pdf

- All heavy vehicle arrival / departure times must be planned, both inbound and outbound to ensure they do not impede existing peak traffic periods.
- Road and vehicle hygiene requirements
- Heavy vehicle movements and restrictions.
- Working hours for Monday to Friday.
- Traffic control plans.

7.2.3. Describe the processes or systems you will develop to perform the activity.

1. Overview

The Project's aim is to utilise ethane that would otherwise require alternative methods of disposition, to generate electricity for the Victorian grid.

This section provides a summary of the project process to support information provided previously; along with an examination of the project alternatives.

As described previously, the Project is a base load power station designed to operate continuously at maximum or as close to maximum output as the ethane supply allows. The power plant would only shut down for maintenance outages.

Ethane gas is supplied from the adjacent LIP, into three 13.5 MW turbine generators in an open cycle configuration as shown in Figure 15.

The Project has an overall efficiency of approximately 34.5% at full load, meaning 34.5% of the total energy is converted to electrical energy sent out to the electrical grid.

2. Process and Technology Choices

The Project undertook an assessment of Project alternatives (Esso, 2021), which examined the different technologies available and the rational for the selections made. Refer to Attachment 3.

The Project is proposing to install three Solar Titan 130 generators, in an open or simple cycle configuration; and adopt a lean-mix, dry low NOx control system. The Titan 130 is the most efficient gas turbine available within this power range.

2.1 Alternatives to the Project

Six alternatives were examined for ethane disposition, evaluating feasibility, timing, environmental implications and cost. These alternatives are summarised in Table 5 and examine in further detail in Attachment 3.

Table 5: Alternative Development Options

Ethane Disposition Option	Conclusions of Assessment
Increasing ethane consumption at either LIP or Longford Gas Plant	Approximately 20 tonnes per day of additional ethane can be consumed at LIP. This volume is incorporated into Project production forecasts. Further consumption is unlikely and cannot consume sufficient ethane to avoid requiring additional alternatives or resulting in flaring excess
Incorporating a higher percentage of ethane gas into the sales gas	While this option is feasible, it would require the construction of a new pipeline. This would have greater environmental and social impacts than current proposal.

	Timing for completion would be end of 2024, resulting in increased flaring at LIP.
Alternative end use (i.e petrochemicals)	At this point an alternative market is not available.
Decreasing production of Bass Strait fields	Ethane gas is a by-product of natural gas. The supply of natural gas from the Longford Plant to the state of Victoria is considered to be an essential service under the Essential Services Act 1958, and this will remain the case for the near future. This option is currently unavailable.
Reinjection	Esso reinjects surplus gas at the Bream Platform from Longford Gas Plant. Ethane is separated from natural gas liquids at LIP. Ethane would need to be sent back to Longford, which would require building a new 187 km pipeline between LIP and Longford. Leading to greater environmental and social impacts and flaring excess ethane until pipeline built.
Flaring / do nothing	Doing nothing would result in continuous flaring of excess ethane at LIP. This would result in Esso: • exceeding its current EPA licence to operate; • Not achieving its social obligations; and • Not achieving its corporate commitment to reduce routine flaring by 2030, under the World Bank Zero Routine Flaring initiative.

2.2 Choice of Gas Turbine System

The Project assessed both the open cycle gas turbines (OCGT) (Figure 15) and combined cycle gas turbine (CCGT) options. This comparison is summarised in Table 6. Cogeneration was not considered for this Project as LIP does not have a need for additional steam or heated oil.

Figure 15: Open / Simple Cycle Gas Turbine Process

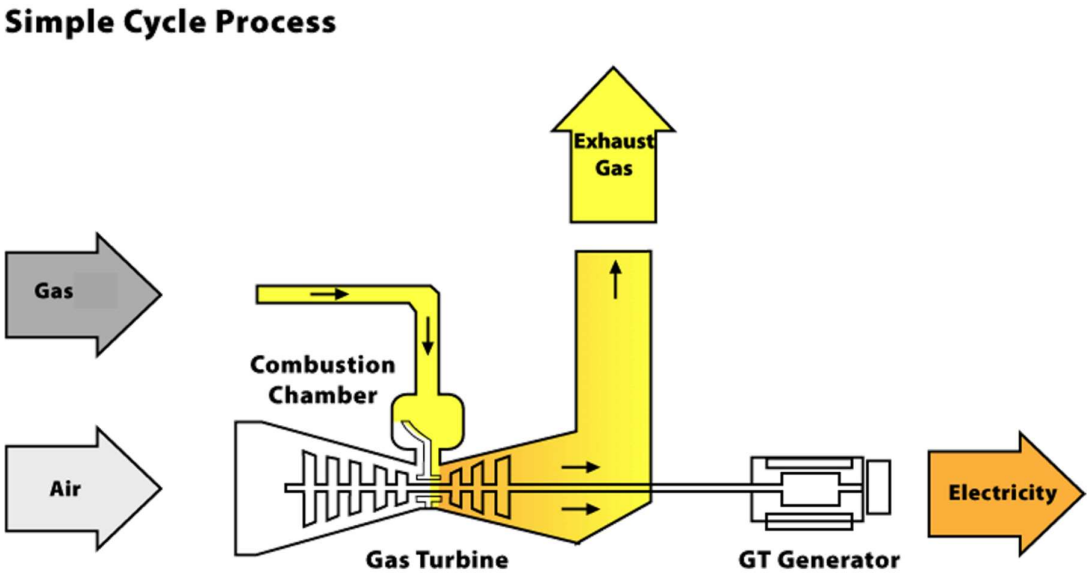


Table 6: Comparison of OCGT and CCGT

Criterion	Open Cycle Gas Turbine	Combined Cycle Gas Turbine
Thermodynamic cycle	Gas turbine generates electricity, with exhaust heat being discharged to atmosphere	Gas turbine generates electricity and waste heat is used to make steam to generate additional electricity via a steam turbine.
Availability	Units readily available	Delivery periods significantly longer than OCGT
Installation time frame required	Shorter - has the least equipment to install, commission, maintain and operate.	For the required start-up time frame to be met, the installation, by necessity is required to be a 2-stage process, due to the availability of waste heat recovery units (WHRU). 1) OCGT in 2022 2) WHRU in 2024 at which time the gas turbines will need to be shut down for retrofitting for 3 periods of 45 days, resulting in 70 tonnes/day of ethane flared each time (worst case scenario)
Capital costs for this Project*	$98 million	$150 million
Start-up ramping period to achieve full loading	Less than 30 minutes	30-180 minutes This may result in flaring while this occurs.
Efficiency	30-35%	50-60%
Emissions intensity for this Project*	560 g CO_{2e} per kWh	470 g CO_{2e} per kWh
NOx emissions	25 ppm	25 ppm ^
Power capacity for this Project*	40 MW	48 MW
Total power generated over the life of the project	1,897,084 MWh	2,163,253 MWh # (an additional 266,169 MWh will be produced over the life of the project with installation of WHRU)
Flexibility	Very flexible and can ramp up and down very quickly. A requirement for managing the hour-to-hour ethane production swings resulting from market demand for Longford supplied natural gas.	Less flexible. Cannot stop and start as easily as an OCGT. Will be less likely to handle large, sudden fluctuations in gas flow and pressure, resulting in the potential for more NOx emissions.

Footprint for this Project*	~ 1,800 m^2	Sizing will depend on configuration but generally, land requirements for CCGT are twice that of OCGT.
Delivery Schedule for this Project*	2Q 2022	4Q 2023

Note: * - based on a maximum annual average consumption of 189 tonnes of ethane per day

- based on being a 2-year delay to install the waste heat recovery unit (WHRU). The extra power generated by the WHRU is equivalent to 1 extra year's operation.

^ - NOx emissions are generated in both the gas turbines and the duct burners of the WHRU.

Table 7, provides the expected ethane production volumes over the life of the Project.

Table 7: Ethane Production Quantities over the life of the Project

Year	Annual Average Ethane to Generators (tonnes/day)	Ethane to Generators (tonnes/year)	Power from Generators (MWh/year)
2023	182	66,390	282,984
2024	182	66,453	283,253
2025	168	61,368	261,578
2026	189	69,135	294,686
2027	174	63,449	270,452
2028	95	34,744	148,094
2029	90	32,885	140,173
2030	58	21,037	89,670
2031	50	18,317	78,074
2032	23	8,234	35,098
2033	8	3,054	13,019

Daily production fluctuations resulting from fluctuating natural gas demand could be significant enough to impact the normal running of the gas turbines. These transients are expected to be short-lived in nature. However, fluctuations in product volumes, pressure and quality have a greater impact on CCGT performance.

The generators will be set to generate maximum power output (13.5 MW per machine) and they will consume as much ethane as required, given ambient air temperature conditions to achieve this. When there is less ethane available than can be consumed by the turbines, the gas pressure will drop until the generator can self-regulate its power output to ensure a minimum ethane fuel gas pressure is maintained.

The three turbines will operate 24 hours a day, seven days a week, to provide continuous ethane disposition. The gas turbine generators will operate as an open cycle power generator facility, as there is no identified uses for the waste heat recovered from the generator exhaust stack (e.g. into the LIP hot oil belt).

2.3 Emissions Control Options

Technologies used to control air turbine emissions are:

- Exhaust after treatment;
- Combustion control
- Fuel gas treatment; and efficiency improvement

a) *Exhaust After Treatment*

- Particulate matter (PM) filtration is commonly used to reduce particulates on heavier fuels, such as diesel or coal fired machines. Gas turbines fired on gas do not produce significant amounts of PM.

Particulates may also result from contaminants in the air stream entering the turbines. The Project will install high specification filters that will minimise the ingress of contaminants (such as dust particles) into the turbine.

The combination of high specification filters on the turbine air inlets and high quality ethane fuel gas source to these turbines means that the generators will not require filtration to be installed to remove particulate matter from the turbine exhaust streams.

- Selective catalytic reduction (SCR) systems are often used to reduce NOx. SCR employs a metal catalyst which stimulates a reaction between NOx and added ammonia or urea, reducing the NOx to nitrogen and water. As the temperature of exhaust gases from an OCGT are in excess of 480°C, they are considered too hot for the metal catalyst.

  The Project is not looking to install a SCR system, due to the incompatibility between SCR and the preferred operating process of OCGT. In addition, the installation of SCR would require the storage and handling of ammonia.

  The Project's selection of NOx control is discussed below.

b) Combustion Control

NOx emissions are generated during the combustion process. The amount of NOx produced is directly related to the temperature at which combustion takes place. The higher the temperature, the more NOx generated.

Ethane rich feedstock have a higher combustion temperature than a methane rich feedstock, resulting in higher NOx emissions.

CO emissions are produced at low flame temperatures and so lean premix combustion is a technique of optimising the combustion process to minimise both CO and NOx emissions.

- **Dry Low NOx** (DLN) - In a conventional combustor, the fuel and air are introduced directly into the combustion zone; and fuel/air mixing and combustion take place simultaneously. Under this scenario wide variations in the air to fuel ratio (AFR) exist and combustion of localised fuel rich pockets produce significant levels of NOx emissions.

  In a DLN system, the air and fuel are premixed with a very lean AFR prior to being introduced into the combustion zone. The excess air in the lean mixture acts as a heat sink, which lowers combustion temperatures. Premixing results in a homogenous mixture, which minimises localised fuel-rich zones.

  To stabilise and ensure complete combustion; and minimise CO emissions, a pilot flame is incorporated into the combustor. The relatively small amounts of air and fuel supplied to this pilot flame is not premixed, so the pilot flame temperature is relatively high. As a result, NOx emissions from the pilot flame are higher than from the lean premixed combustion.

  The proposed Titan 130 has been shown to produce emissions in the range of 25 ppm NOx under normal operating conditions, including the use of the pilot flame.

  Figure 16 and Figure 17 illustrate the DLN system and control system used by Solar Titan 130.

Figure 16: Solar Dry Low NOx System

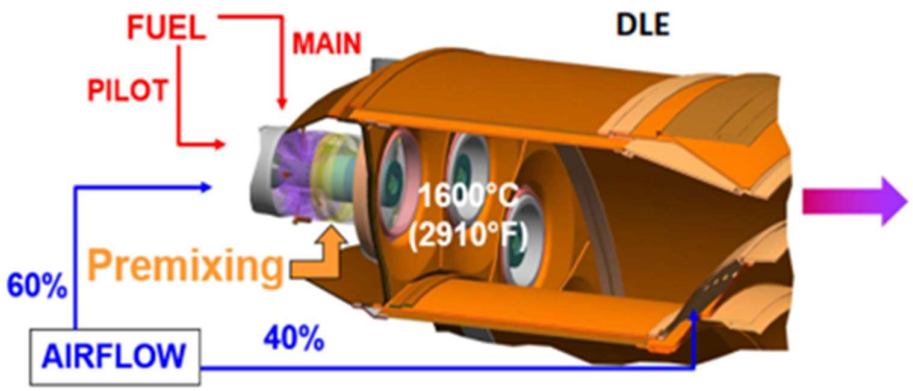
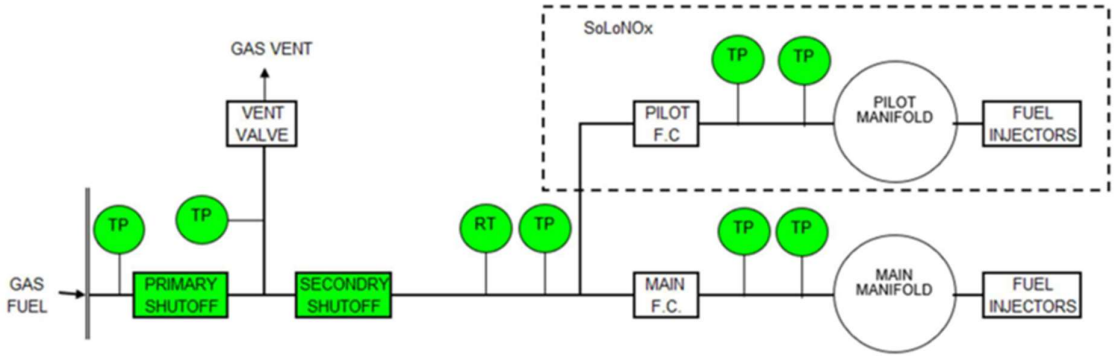


Figure 17: Independent Control of Pilot and Main Fuel System



- **Wet Low NOx** (WLN) - Injecting water into the flame area of a turbine combustor provides a heat sink that lowers the flame temperature and thereby reduced thermal NOx formation.

  Water purity is essential to prevent or mitigate erosion and/or the formation of deposits in the hot section of the turbine.

Table 8 compares the two types of emission's control that were evaluated for this Project.

Table 8: Comparison of Air Emissions Control Equipment for Project

Criteria	No NOx Control	Dry Low NOx	Wet Low NOx
NOx	99-450 ppm^	25 ppm	25 ppm
CO		25 ppm	> 25 ppm
Water usage	0 L / MW	0 L / MW	150 L / MW #
Maintenance Inspections		8,000 hours	6,500 hours

Note: # Based on 40MW, the Project would expect to consume approximately 50 ML/year of water

^ Source – US EPA (1993) Alternative Control Techniques Document – NOx Emissions for Stationary Gas Turbines (EPA-453/R-93-007)

The Project has chosen to adopt DLN technology. DLN is also considered best in class technology for gas fired turbines.

c) Fuel Treatment

Fuel treatment for emissions reduction is focused on the reduction of sulphides within the gas to minimise the production of sulphur oxides (SOx). Sour gas is treated at LIP prior to entering the piping

to the power plant. The "sweet gas" delivered to the power plant has negligible quantities of sulphur dioxide (SO_2) (0.00001%).

Table 9: Composition of LIP Ethane Supply

Component	Composition (%)
Methane (CH_4)	0.56
Ethane (C_2H_6)	99.1
Propane (C_3H_8)	0.35
i-Butane (C_4H_{10})	0.001
Sulphur Dioxide (SO_2)	0.0001
Total	100.00
LHV (MJ/m^3)	59.02

Further sulphides removal, prior to combustion is not required.

d) Efficiency Improvements

The Solar Titan 130 (SoLoNOx) gas turbine generator is the most efficient gas turbine in this power range. Seven percent between it and its nearest rival the Mars 100.

Reducing the amount of fuel directly translates to a lower exhaust flow rate. Therefore, the higher the efficiency of the equipment and work practices can translate to lower air emissions. This is highly beneficial when trying to extend the life of project with a fixed fuel quantity. However, for this Project the quantity of gas available will vary in accordance to the field production rates and how much will be consumed within LIP prior to transporting to the power plant. The total quantity of CO_2 emission will not be reduced by improving efficiency, however it will lower the emissions intensity.

This Project is looking to generate a maximum of 40 MW, with an average of 20 MW over the life of the project. AEMO have recorded that as of July 2021, Victoria has 7,298 MW of power being produced from fossil fuel fired power plants, or 52% of the total electricity produced in Victoria, currently. A further 3,890 MW is in the planning process, making a total of 11,188 MW of fossil fuel derived electricity (AEMO, 2021). This Project would represent a 0.36% increase in the total existing and planned fossil fuelled power produced in Victoria, at its peak; and 0.09% of the total electricity generated (renewables and non-renewables). By adding a waste heat recovery unit onto the gas-fired turbine, this Project's contribution to the state's electricity will increase to 0.4% (a 0.04% increase) of fossil fuelled electricity generation.

Waste heat recovery does not improve the volume of greenhouse gases emitted from the Project.

2.4 Emissions Monitoring

Emissions can be monitored continuously or via a predictive monitoring system. The Project has chosen to install a continuous emissions monitoring system (CEMS) that will monitor the three exhaust stacks. The CEMS will consist of an online process analyser that is capable of continuously monitoring concentrations of carbon monoxide and oxides of nitrogen.

Data from the analyser will be transmitted to a data acquisition system which will calculate total weighted averages among other parameters and will also archive the data.

The CEMS will comply with AS 4323.1 Stationary Source Emissions – Selection of Sampling Positions.

In addition to the above-mentioned measurements, stack gas flow, pressure and temperature will be measured.

2.5 Fire Control

The site is laid out in accordance with ExxonMobil Global Practice to allow adequate access for safety and firefighting requirements. In addition, Project is undertaking a site fire safety study. The site is

connected to the LIP firewater mains with fire hydrants and firefighting equipment already present on site. The purpose of the site fire safety study is identifying the best positioning of fire control equipment and determine what upgrades or repairs are required to existing systems.

The existing site buildings which may be used for incidental storage during project life, if they are deemed suitable.

New site occupied buildings will be fitted with smoke detection and sprinkler system. Site electrical equipment rooms will be fitted with VESDA systems and be rated for 2 hour fire protection.

The gas turbine generator modules are fitted with fire and gas protection. The fire and gas detection system is able to detect combustible gas and/or fire inside the enclosure based on inputs from gas, thermal and optical flame detectors. If a fire is detected, the system trips the turbine, isolates and blowdown the fuel gas to vent and releases an extinguishing agent into the enclosure.

The extinguishing agent is a water mist fire suppression system consisting of a single high pressure distribution system to provide approximately 10 minutes of continuous water discharge. The water mist skid consists of one high pressure nitrogen cylinder used as a propellant and three water bottles. The system complies with the National Fire Protection Association Standards 750 (NFPA, 2019).

The turbine combustion air and ventilation air inlets will be fitted with gas detection which will trip the engine, isolate and vent the fuel gas supply on 2 out of 3 voting. The instrument air compressors will also be fitted with gas detection and trip functionality on air intakes.

Gas detection will be located at the gas filter skids

The transformers will be fitted with surge protection, circuit breakers, earth and lighting protection and high temperature trip protection.

7.2.4. Is this a new activity or a modification of an existing activity?

New activity

7.2.5. Outline your experience and competency in performing the activity

Esso Australia's experience in running gas turbines is extensive. Esso commenced operations in the Gippsland Basin over 50 years ago. During this time Esso has deployed more than 80 gas turbines of various sizes and various manufacturers both Offshore on 14 operational platforms and Onshore at the Longford Gas Plant and Long Island Point facilities.

There are 16 units at Longford Gas Plant, 8 of these are Solar Machines including 2 x Taurus 70 Generators (6MW), 2 x Mars 90 Compressor drives (8MW). There is also 4 x GE Frame 3 Turbines (8MW each) in generator and compressor drive service.

LIP has 5 x Solar turbines (700kW each), operating pump and compressor drives.

The Solar Titan 130s would be among Esso's largest machines, rated at 13.5MW each, but despite their size, Esso Australia has all the relevant experience in managing gas turbines, in generation and grid connection. Esso have engineers, operators and maintenance staff well used to managing and maintaining gas turbines. In addition, Esso have local support and a longer term (10 year) Alliance service agreement in place with Solar, who are based in Rowville, less than an hour away from the Project site.

7.2.6. Provide a summary of measures considered as best available techniques or technology

The Project's approach to identification and implementation of Best Practice consisted of:

1. Review of current technology and practices.
2. Identity the Project's environmental impacts and investigate how these could be minimised through implementation of Best Practice.

3. Adopting an integrated Project team focused on optimizing the design of the Project.

The following summarises the best available techniques or technology adopted by the Project.

a) Utilizing ethane for electricity

ExxonMobil, Esso's parent company, has joined with the World Bank on its Global Gas Flaring Reduction Partnership. As part of this collaboration the World Bank launched an initiative called Zero Routine Flaring by 2030 (World Bank, 2015).

This Project complies with ExxonMobil's commitment to eliminate routine flaring by 2030.

b) Energy Efficiency

Project is looking to run the gas turbines in an open cycle process. This is considered best technology for peak electricity loading, but not base loading.

The Project will be providing electricity continuously, thereby providing base load electricity. Given that ethane gas is a by-product of natural gas, the Project's gas supply will vary upon product demand for natural gas. Natural gas demand is in a constant state of change, and this will have an impact upon the gas turbines. Therefore, the turbines will perform more like a peaking system.

Combined cycle systems do not cope as well with changing conditions as open cycle, hence why they are better suited for traditional base load systems.

OCGT is best practice for peaking conditions.

Further information is provided in Attachment 3.

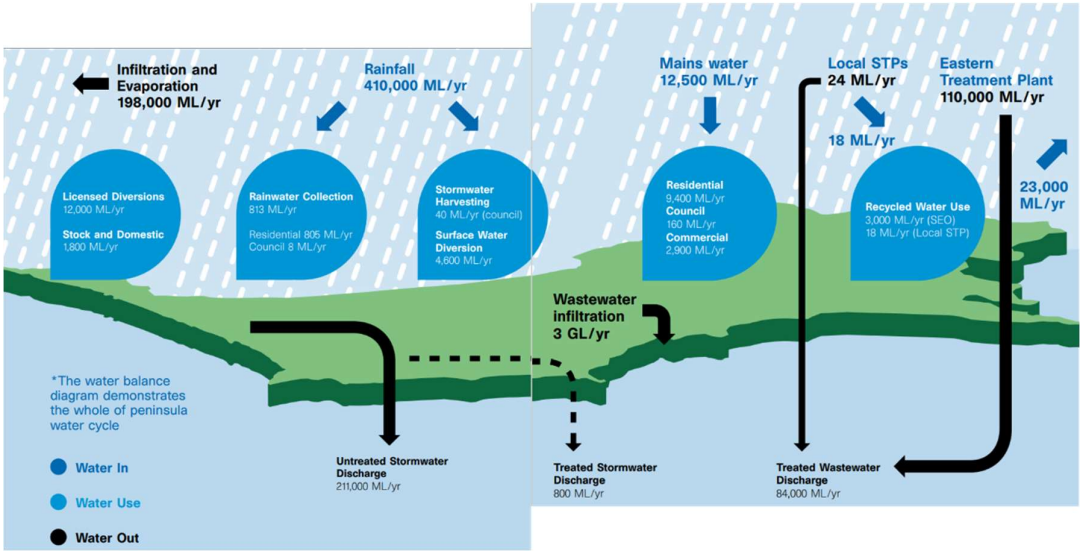
c) Emissions control

Dry low NOx emissions control is considered best in class for gas fired power stations.

The Project examined other emissions control technology, such as wet low NOx (WLN) and selective catalytic reduction (SCR), both were deemed unsuitable. This was based on:

- WLN – Would not meet the design specification of 25 ppm for CO. In addition, for a system generating 40 MW fitted with a wet low NOx, approximately 50 megalitres of potable water per year would be required, for a single use cooling system; discharging to atmosphere. Based on the water balance provided by Mornington Peninsula Shire (2018) (Figure 18), the Region supplies 2,900 ML of mains water to commercial premises. The Project's water needs would equate to an additional 2%. While this may be a small percentage of the Regions water consumption it was considered by the Project to be an unacceptable use of this valuable resource.

Figure 18: Mornington Peninsula Water Balance for 2018



- SCR - The temperature of exhaust gases from the Project's gas turbines is too high for a SCR system. In addition, SCR systems utilize ammonia or urea, a hazardous substance. At the volumes required for a SCR system, the Project would need to install storage facilities and would be designated a Major Hazards Facility. SCR systems also require stable operating conditions, fluctuating loads can lead to a phenomenon called ammonia slippage. This is where unused ammonia passes through the catalyst and discharged to atmosphere.

The review of emissions control systems can be found in Attachment 3.

d) Emissions monitoring

Monitoring of emissions can occur either through a predictive emissions monitoring systems or through a continuous emissions monitoring system (CEMS). The Project has adopted a CEMS that will monitor the three stacks. The Environmental Reference Standard identified CEMS as best available technology.

e) Noise management

The Project will adopt the best noise attenuation options being: acoustic enclosures; and mufflers or silencers in intake and exhaust channels to ensure plant personnel noise exposure levels are within current recommended limits; and noise levels at the closest sensitive receptors will meet the 45 dB(A) night time limit set in the Environmental Reference Standards.

The Project will install a modular power package that is fully enclosed, fitted with insulation and sound attenuated system (enclosure panels are treated with fiberglass material). The enclosure ventilation openings are equipped with silencers.

The modular power packages have been designed for a sound pressure limit of 85 dB(A) at 1 m.

f) Water quality management

Routine liquid discharges from site will be negligible, however, given the Project's proximity to high value, sensitive environments the following measures will be adopted to minimise so far as reasonably practicable pollutants entering the environment.

- The lube oil tanks and gas turbines will be housed within an enclosed module that is fitted with a drip pan to collect any spills that may occur. The drip pans drain to a sump which can be pumped out and sent to a lawful place for disposal. This sump is not connected to the stormwater drain system.

- The fuel conditioning skids, the gas turbine generators (including lube oil cooling system) modules, the electrical equipment modules and the transformers will all be installed upon bunded concrete pads. Contaminated discharge is collected within a sump, that can be pumped out and sent to a lawful place for disposal when necessary.
- All maintenance, involving the use of lubricants will be conducted within the bunded concrete pads, so far as reasonably practicable. Where it is not practicable, temporary containment will be set up around the maintenance area to minimize migration of contaminants.

During operations it is anticipated that a maximum of five people will be on site. A single kitchen and ablution facilities will be installed next to the control room. Sewerage from the kitchen and ablutions will sent to LIP's sewerage system via an existing sewerage line.

g) Site construction

The turbine generators will be manufactured and factory commissioned in the USA, prior to being shipped to Hastings. Upon arrival at site, the turbines will be assembled. Assembly will be overseen by experienced Solar technicians.

This method of construction within a factory environment allows for greater control over emissions generated and reduces the amount of time required on site before commencing operations.

h) Lube oil system

The turbines will be delivered in Australia after being pre-run and factory tested in the USA. Prior to shipping the lube oil system will be fully drained (for shipping). Upon completion of the turbine assembly, the machines will be filled with synthetic oil and circulated.

The Titan 130 gas turbine generators, utilising synthetic oil, are unlikely to require an oil change over their projected 15 year operational life. The oil will breakdown over time, but regular oil analysis and condition montoring will identify if the oil deteriorates outside of tolerance settings.

i) Transformer oil

It is unlikely that the transformer oil will need to be replaced during the life of the Project. As with the turbine generator oil, above, the transformer oil may breakdown over time. To ensure the oil stays within specifications, it will be tested annually for deterioration. If the oil deteriorates outside of tolerance settings fresh oil may be added to the system, or the oil could be drained and replaced. If it is replaced it will be sent off site for appropriate disposal in an approved facility.

j) Engine refurbishment

It is anticipated that the turbine engines will require refurbishment every 30,000 hours of operations (approximately 3.5 years). Solar have developed a system of removing the engines and refurbishing them in a controlled factory condition. Thus minimising the potential for release of contaminants into the environment from onsite maintenance.

Downtime is minimised through a system of replacement engines being installed, when the engine is removed. The total time expected to replace an engine is 5 days. Waste generation is anticipated to be limited to minor quantities of oily rags and consumables (such as WD40).

Solar also has a system of refurbishing valves, lube oil pumps and other parts; similar to the system used for the engines. This significantly reduces waste generation.

7.2.7. Is the proposed activity a research, development or demonstrating activity as part of a Pilot Project?

No

7.2.8. Summary of measures used to comply with the general environment duty

It is ExxonMobil Corporation's policy to conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates. Esso as part of ExxonMobil is committed to continuous efforts to improve environmental performance throughout its operations. A part of ExxonMobil's Safety, Security Health and Environment Mission Statement is to deliver world-class environmental, regulatory, and socioeconomic performance.

In developing oil and natural gas resources ExxonMobil is committed to employing the highest industry safety, environmental, and social standards. To achieve this goal, ExxonMobil has introduced a set of Upstream Environmental Standards that establish environmental and social performance expectations that provide an additional layer of protection to the applicable host country regulatory requirements. This ensures that it operates in an environmentally responsible manner and provides a balance with the business needs of the host country and local communities.

The strategic objectives of these standards include:

- Avoiding adverse environmental and/or health impacts based on risk-based analyses.
- Embedding within project processes an awareness of the standards to provide clarity for early project decision-making.
- Utilizing available and economical technologies.
- Addressing full life cycle risks and reducing overall costs.

To demonstrate the proposal will not harm the environment or human health, the Project considers compliance with the following Environmental Policies, Guidelines and Standards:

- Environmental Reference Standard
- EPA Publication 824 – Protocol of Environmental Management of Greenhouse Gas and Energy Efficiency
- EPA Publication 1517 – Demonstrating Best Practice
- EPA Publication 1518 – Separation Distances for Industrial Residual Air Emissions
- EPA Publication 1695 – Assessment and Controlling Risk: Guide for Business
- EPA Publication 1826 – Noise Limit and Assessment Protocol
- EPA Publication 1827 – Waste Classification Assessment Protocol
- EPA Publication 1834 – Civil Construction Building and Demolition Guide
- EPA Publication 1851 – Implementing the General Environmental Duty: A guide for licence holders
- EPA Publication 1893 – Erosion, Sediment and Dust Treatment Train
- EPA Publication 1894 – Manage Soil Disturbance
- EPA Publication 1985 – Manage Stockpiles
- EPA Publication 1961 – Guideline for Assessment and Minimising Air Pollution
- EPA Publication 1968 – Guide to Classifying Industrial Waste
- EPA Publication 1915 – Contaminated Land Policy
- EPA Publication 1940 – Contaminated Land: Understand section 35 of the Environment Protection Act 2017
- EPA Publication 1977 – Assessing and Controlling Contaminated Land Risks
- Best Practice Erosion & Sediment Control. International Erosion Control Association (IECA) Australasia Chapter, 2008
- IWRG 621 – Soil Hazard Categorisation and Management
- Environmental, Health and Safety Guidelines for Thermal Power Plants – World Bank Publication 2017
- National Environment Protection (Assessment of Site Contamination) Measure 1999
- ANZEC Guideline for Fresh and Marine Water Quality – Default Guideline Values

Specifically, the Project has undertaken the following measures to ensure compliance with the general environmental duty:

- A Human Health and Environmental Risk Assessment was conducted by the Project Team to identify and eliminate or minimize risk. This involved representatives from management, engineering, construction and SSHE[4].
- Outcomes from the risk assessment have been incorporated into the design of the Project and equipment specifications.
- An Environmental Management Plan (Attachment 5) has been developed for the project outlining the control measures to be put in place, this includes:
    - an assessment of the potential environmental impacts that may arise from facility operations and identifies control measures that have been implemented to minimise potential impacts on the environment.
    - assesses the risk involved with the environmental impacts and identifies mitigation measures for each of these risks.
    - establishes environmental performance objectives and identifies strategies to achieve these objectives, this includes monitoring and reporting.
    - outlines responsibilities and communication measures to be implemented.

[4] SSHE – safety, security, health and environment

8.0 GREENHOUSE GAS EMISSIONS

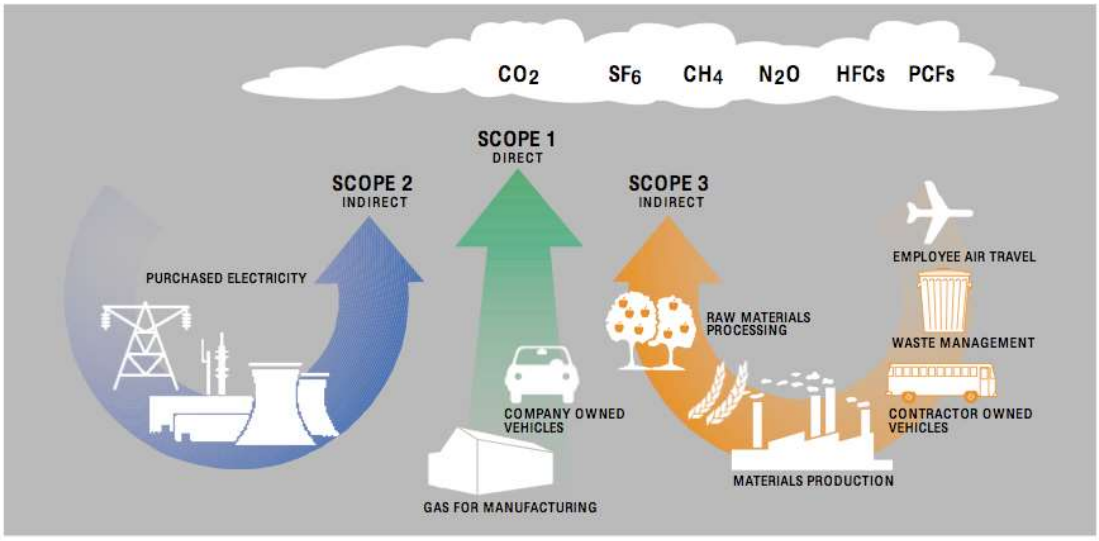
8.1.1. Summary of greenhouse gas emissions generated from this activity

A Greenhouse Gas Assessment (AECOM, 2021) was undertaken in accordance with the Protocol of Environmental Management (PEM) (Attachment 4).

Greenhouse gas (GHG) emissions have been split into three categories, known as 'Scopes' (refer to Figure 19). These are defined as:

- Scope 1 – direct emissions of greenhouse gas from sources that are owned or operated by a reporting organization (examples include combustion of diesel in vehicles, plant or equipment)
- Scope 2 – indirect emissions associated with the import of energy from another sources (examples include import of electricity from the grid)
- Scope 3 – other indirect emissions other than energy imports, which are a direct result of operations of the organization, but from sources not owned or operated by them and due to upstream or downstream activities (examples include direct upstream emissions associated with extractions, production and transport of purchased construction materials)

Figure 19: Greenhouse Gas Emission Scopes



1. Construction

Greenhouse gases could potentially be emitted as a result of the following construction activities:

- Energy use, as fuel to operate plant and equipment, and as electricity consumed at site;
- Vegetation clearing;
- Emissions embodied in materials used for construction, such as carbon dioxide (CO_2) generated during cement manufacture, or energy consumed in steel production.

The key direct emission source during construction of the power station would be diesel consumed to operate plant and equipment. It is estimated that during construction the total greenhouse gas emissions (Scope 1, 2 and 3) would be 357 tonnes of carbon dioxide equivalent (CO_{2e}). This is summarised in Table 10.

Table 10: Summary of GHG Emissions Associated with Construction

Emission Source	Project Activity	Total Emissions (t CO_{2e})		
		Scope 1	Scope 2	Scope 3

Stationary energy	Fuel consumed by construction plant / equipment	32.5	-	1.67
Transport	Fuel consumed by transport of construction materials and generators to site	-	-	1
Transport	Transport fuel consumed on site	61	-	3
Embodied carbon	Construction materials for ethane piping	-	-	13
Embodied carbon	Construction materials for generators	-	-	241
Waste	Transport of waste from construction site	-	-	0
Land use, land-use change and forestry (LULUCF)	Carbon sequestration lost due to clearing land during construction	5	-	-
Total		98	-	259

2. Operations

Emissions would result from the direct combustion of ethane within the gas turbines. The Project's ethane usage and greenhouse gas emissions (Scope 1) are shown in **Error! Reference source not found.**.

Table 11: Greenhouse Gas Emissions

Year	Annual Average Ethane to Generators (tonnes/day)	Ethane to Generators (tonnes/year)	Power from Generators (MWh/year)	Greenhouse Gas Emissions (t CO_{2e}/year)
2023	182	66,390	282,984	187,883
2024	182	66,453	283,253	188,061
2025	168	61,368	261,578	173,671
2026	189	69,135	294,686	195,652
2027	174	63,449	270,452	179,562
2028	95	34,744	148,094	98,325
2029	90	32,885	140,173	93,065
2030	58	21,037	89,670	59,535
2031	50	18,317	78,074	51,836
2032	23	8,234	35,098	23,303
2033	8	3,054	13,019	8,644
Average	111	40,461	172,462	114,503
Total				1,260,874

The total operational emissions (Scope 1, 2 and 3) are shown in Table 12.

Table 12: Summary of Greenhouse Gas Emissions Generated During Annual Operation

Emission Source	Project Activity	Total Annual Emissions (t CO_{2e})		
		Scope 1	Scope 2	Scope 3
Average Annual Emissions				
Stationary energy	Generator fuel use	114,503.0	-	-
Stationary energy	Facility electricity use	-	109.3	12.5
Fugitive emissions	Fugitive emissions from the transmission piping	-	-	0.1
Total		114,503.0	109.3	12.6
Maximum Annual Emissions				
Stationary energy	Generator fuel use	195,652	-	-
Stationary energy	Facility electricity use	-	109.3	12.5
Fugitive emissions	Fugitive emissions from the transmission piping	-	-	0.1
Total		195,652	109.3	12.6

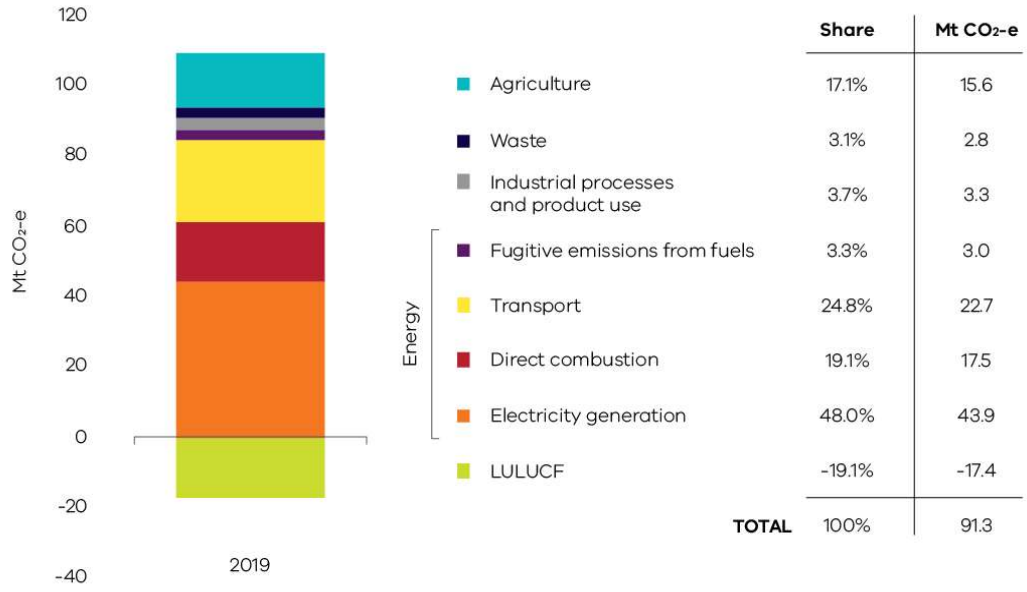
3. Comparison with Victorian emissions

In the State and Territory Greenhouse Gas Inventories 2019 report[5], Victoria's total greenhouse gas emissions were 91.33 million tonnes of carbon dioxide equivalent (Mt CO_{2e}) (DISER, 2021). Of Victoria's emissions; 86.99 Mt CO_{2e} were related to energy (being the energy industry, transportation, fugitive emissions and other energy activities) (DISER, 2021).

The Victorian Greenhouse Gas Emissions Report 2019 (DELWP, 2021) have illustrated the greenhouse gas emissions as shown in Figure 20. Electricity generation made up 48 percent of all emissions or 43.9 million tonnes of CO_{2e}.

Figure 20: Victorian Greenhouse Gas Emissions for 2019

[5] The 2019 greenhouse gas data is the latest figures available at the time of preparing this submission.



The project's total emissions (Scope 1, 2 and 3) in comparison to Victoria's total greenhouse gas emissions are summarised in Table 13.

Table 13: Comparison of the Project's Greenhouse Gas Emissions to Victoria's Annual Emissions

Emissions Source	Total GHG Emissions (tonnes CO_{2e}/year)	Percentage of Victoria's Annual Total Emissions (%)
Victoria 2019 (Scope 1 & 2)	91,330,000	100
Hastings Generation Project – Construction Phase (Scope 1, 2, 3)	357	0.0004
Average Hastings Generation Project – Operations Phase (Scope 1, 2, 3)	114,625	0.126
Maximum Hastings Generation Project – Operations Phase (Scope 1, 2, 3)	195,774	0.214

3.1 Victorian Emissions Targets

Under the Climate Change Act (2017), Victoria has set the following emissions reduction targets, based on 2005 emissions:

- 28-33% by 2025
- 45-50% by 2030
- net zero by 2050

Victoria's emissions in 2019 were 24.8% below 2005 emissions[6], exceeding the 2020 target of 15-20 percent reduction on 2005 emission values.

The Project will be reaching peak production around 2025, contributing an additional 0.2 percent to Victoria's total greenhouse gas emissions.

Production will have markedly reduced by 2030 and it is expected that the Project's emissions will contribute 0.06 percent to Victoria's total greenhouse gas emissions.

3.1.1 Energy Sector Targets

The Victorian Government has pledged to reduce energy sector emissions by an estimated 2.2 million tonnes of CO_{2e} by 2025 and 3.7 million tonnes of CO_{2e} by 2030 (DELWP, 2021). It is proposing to achieve this through:

- Renewable energy investment – including:
  - fuel switching options as outlined in the Gas Substitution Road Map; and
  - moving to zero emissions vehicles
- transforming energy demand, by:
  - improving energy efficiency in homes
  - reduce energy costs in business
- expanding the clean energy workforce; and
- empowering communities to take action

The Project's impact on Victoria achieving these targets is discussed further, in the following sections.

3.1.1a Electricity Generation

Under the *Victoria's Climate Change Strategy* (DELWP, 2021) a target has been set to have 50 percent of electricity generated in Victoria to be sourced from renewables by 2030. In 2020, renewables accounted for 26.6 percent of Victoria's electricity, exceeding the 2020 target of 25 percent. DELWP (2021) have stated that currently only 8 percent of Victoria's electricity demands are being met by gas fired power stations or 2,612,066 MWh. This equates to 1.7 percent of Victoria's total greenhouse gas emissions, as shown in Figure 21 (DELWP, 2021)

Figure 21: Electricity production and emissions from Victorian brown coal-fired stations and large and medium gas-powered generators in 2019

Facility		Electricity production (MWh)	Total direct emissions (Mt CO_2-e)	Share of Victoria's net greenhouse gas emissions
Brown coal power stations	Loy Yang A	15,959,544	18.5	20.3%
	Yallourn	10,133,040	13.3	14.6%
	Loy Yang B	8,443,824	9.6	10.5%
	Sub-total	34,536,408	41.4	45.3%
Large and medium GPG#		2,612,066	1.5	1.7%
TOTAL		37,148,474	42.9	47.0%*

Source: Analysis based on *Greenhouse and energy information for designated generation facilities 2018-19* (CER 2020)

* Total of 47% varies from the total of 48% presented in **Figure 15** due to the exclusion of small electricity generators in **Table 2** (e.g. generation from liquid fuels).

Excludes small-scale GPG which is below the threshold for NGER reporting

Note – numbers may not sum to totals due to rounding

Source Victorian Greenhouse Gas Emissions Report 2019 (DELWP, 2021)

[6] Victoria's greenhouse gas emissions (climatechange.vic.gov.au)

This Project is looking to generate a maximum of 294,686 MWh/year, with an average of 172,462 MWh/year over the life of the project. This equates to approximately an 11 percent increase in current gas powered generation for 2026, when the maximum power generation is expected or 6.6 percent increase on 2019 gas powered generation per year.

AEMO[7] have recorded that as of July 2021, Victoria has 7,298 MW of power being produced from fossil fuel fired power plants. A further 3,890 MW is in the planning process, making a total of 11,188 MW of fossil fuel derived electricity. This Project would represent a 0.36% increase in the total existing and planned fossil fuelled power produced in Victoria, at its peak; and 0.09% of Victoria's total electricity generated (renewables and non-renewables).

The Project is expected to peak production in 2026, with a marked decline from 2028 onwards. By 2030 the Project is expected to be producing 89,670 MWh per year or 0.02 percent of the Victoria's electricity supply.

As such the Project should not impact negatively on Victoria meeting its energy reduction targets of 50 percent renewables by 2030.

3.1.1b Natural Gas Usage

Natural gas is used by around 2 million Victorian households for heating and cooking, and is a key resource for industry, business, agriculture and essential services such as hospitals. The Victorian government is committed to ensure that gas reliability and security are maintained for all Victorians, while exploring sustainable alternatives. A Gas Substitution Roadmap is currently being developed, due for publication in late 2021. It details the transition pathways to achieve net-zero emissions and identify opportunities for households and businesses that use natural gas to become more energy efficient and switch to lower emissions energy sources (DELWP, 2021).

Successful implementation of the Gas Substitution Roadmap will reduce Victoria's demand for natural gas, and subsequently will reduce the volume of ethane gas requiring disposition.

4. Benchmarking greenhouse gas intensity

Gas-fired turbines generate less greenhouse gases than traditional coal-fired generators. An examination of National Greenhouse and Energy Report (NGER) data shows that the Latrobe Valley coal-fired power stations are generating, on average, 1.36 tonnes of CO_{2e} for each megawatt of electricity produced (Clean Energy Regulator, 2021). While the Project is expected to produce 0.66 tonnes of CO_{2e} per megawatt.

Ethane is presently used in the manufacture of ethylene to produce plastics (polyethylene) and resins. For every tonne of ethane gas consumed, approximately 800 kg of ethylene is produced. A review of National Greenhouse and Energy Reporting shows that 2.15 tonnes of CO_{2e} are generated for each tonne of ethylene produced (Clean Energy Regulator, 2021).

Table 14, compares the amount of greenhouse gas emissions from ethane fired gas turbines against emissions from current electricity providers and ethane use.

Table 14: Greenhouse Gas Emissions based on Maximum Annual Average Production Rate of 189 tonnes of Ethane per day

Product	Throughput (t/ day)	Throughput (t/ year)	Emissions Intensity (t CO_{2e}/ t product)	Electricity (MW/year)	Emissions Intensity (t CO_{2e}/ MW)	Emissions (t CO_{2e}/ year)
Ethane	189	68,985	2.83	294,686	0.66	195,228
Coal				294,686	1.36	400,773
Ethylene	151*	55,188	2.15^			118,654

[7] AEMO | Generation information

Note: * Approximately 800 kilograms of ethylene is produced from each tonne of ethane gas, therefore for 189 tonnes of ethane, 151 tonnes of ethylene will be produced.

^ Emissions intensity is calculated from Qenos NGER annual report of 978,936 tonnes of CO_{2e} generated for 455,000 tonnes of ethylene produced (Clean Energy Regulator, 2021).

At the Project's peak, it will replace 119 kt of CO_{2e} per year from ethylene production, resulting in a net increase of 76 kt of CO_{2e} per year. To produce the same quantity of electricity from coal-fired power stations would emit 401 kt of CO_{2e} per year or an additional 206 kt of CO_{2e} per year.

8.1.2. Summary of systems and processes to prevent or minimise greenhouse gas emissions

Esso is a member of the World Bank Global Gas Flaring Reduction Partnership. This initiative seeks to reduce flaring by exploring new technologies, sharing best practices and supporting development of appropriate, country-specific gas flaring reduction (ExxonMobil, 2019).

The purpose for the Project, is to find an alternative use for ethane gas. If an alternative method for ethane disposition is not sourced this would result in routine flaring.

An assessment of best practice, consistent with the requirements in the EPA Publication 1517 – Demonstrating Best Practice is summarised in Table 15.

Table 15: Summary of Best Practice Consideration to Minimise GHG Emissions

Project Phase	Mitigation Measure	Action Taken by Project
Project Rational	**Do nothing** Ethane gas is a by-product of natural gas and oil production. Esso currently sells ethane to a chemical manufacturer. This disposition method is changing in 2022. Doing nothing would result in the ethane gas being sent to the flare at LIP. The GHG emission would be essentially the same as for the Project, except there would be no net benefit achieved of providing electricity to Victoria.	The Project examine a number of alternatives – refer to Attachment 3 The generation of electricity was deemed the best option in the time frame available.
Design	**Increase turbine efficiency** The Project is proposing to operate the gas turbines in an open cycle configuration, resulting in an efficiency of approximate 35%. Capturing the exhaust heat and putting it through a waste heat recovery unit would enable heat recovery and increase efficiency to approximately 50%	Refer to Attachment 3 – Project Alternatives. Ethane gas for the power plant is dependent upon natural gas demands for South East Australia. This option would have no benefit to GHG emissions generated.
Design and construction	**Minimise embodied and transport emissions of materials** Low embodied energy and locally sourced materials should be considered and used where	The top ten gas turbine manufacturers in world are located in Japan, USA, Germany and the Netherlands. The turbines are being manufactured as a modular package which allows

	practicable to minimise embodied and transport emissions.	efficiency of resources and only assembly on site.
Construction	**Managing quality of materials** Materials that are low maintenance and durable should be selected to avoid unnecessary replacement.	Maintenance / refurbishment of the turbines to be conducted in accordance with manufacturing specification (expected to be approximately once every 3.5 years.)
Construction	**Source local plant and equipment** Locally sourced plant and equipment (i.e. within Victoria) should be considered and used where practicable to reduce emissions associated with transport.	Where possible, the Project will locally source plant and equipment.
Construction	**Coordination of construction activities** Construction activities should be coordinated to reduce unnecessarily extending the construction period and to avoid inefficient use of equipment	Construction is expected to take 6-9 months.
Construction	**Sustainable procurement and resource management practices** Sustainable procurement and resource management practices should be adopted to avoid the inefficient use of materials, fossil fuels, and electricity. The proponent should refer to ISO 20400:2017 Sustainable procurement which provides guidance on integrating sustainability within procurement.	The company aims to integrate sustainability considerations in the purchase of third-party goods and services and to minimize environmental impacts in our supply chain. Suppliers may be asked about their sustainability practices related to energy efficiency, water and resource usage in our commercial activities. We seek to work with innovative suppliers to support the continuous efforts to improve environmental performance throughout our operations.
Construction and operation	**Local workforce** Local workforce should be engaged where possible. Interstate and international travel should be minimised and where appropriate replaced by virtual engagement.	Local workforce will be engaged where possible.
Construction and operation	**Plant and equipment fuel efficiency** Selection of plant and equipment should incorporate consideration of fuel efficiency to reduce the consumption of fossil fuels. The proponent should include energy efficiency performance standards for the tendering of works associated with plant and equipment.	Equipment reliability and maintenance standards are stipulated in contract terms.
Design, construction and operation	**Waste – avoid, reduce, reuse** Design should reduce the total quantum of materials required through design refinement and	The gas turbine generators will be manufactured in USA, thus only requiring assembly onsite.

	incorporate reuse materials during construction and operation of the project.	All engines, valves, lube pumps are returned to Solar for refurbishment. This ensure refurbishment is undertaken in a controlled environment, where wastes can be managed. Waste generation will be minimal and management is detailed in the Project Environment Management Plan
Operation	**Implementation of Energy Management Systems** An energy management system should be implemented in accordance with the International Organisation for Standardisation (ISO) 50001 Energy Management Systems (ISO 50001) for the operation of the FSRU. The ISO 50001 provides a framework for organisations to take a systematic approach to achieve continual improvement of energy performance and efficiency and reductions in greenhouse gas emissions. This framework is considered global best practice, and involves: • developing energy use baselines • developing energy management plans • identifying performance indicators • setting targets for improvement. Progress will be regularly monitored, reported, and reviewed. Implementation of this system will also involve external certification by ISO-accredited auditors (typically on a three-year cycle) in which both compliance with the ISO standard and performance improvement will need to be demonstrated to maintain certification	The Facility will develop an energy management system to meet the appropriate Regulatory reporting requirements. This system will involve: ▪ Conducting an energy audit (Level 2) and estimate energy consumption ▪ Estimate direct greenhouse gas emissions ▪ Identify opportunities to reduce greenhouse gas emissions To be document as a GHG Action Plan, this may be included with the facility's EMP or be a standalone document. Identified opportunities will be tracked by the business and communicated to key stakeholders, as appropriate.
Operation	**Emergency management procedures** Safety controls and emergency management practices should be put in place in the case of unplanned activities, incidents, and emergencies (i.e. unplanned maintenance or venting) to minimise the release of fugitive greenhouse gas emissions	Emergency management procedures will be developed for the facility.
Construction and operation	**Certified carbon offsets** The project could consider purchasing certified carbon offset to compensate	Carbon offsets will be examined as part of the energy management system.

	for emissions produced during construction and annual emissions produced during operation. A strategy to offset certain emissions could be implemented (e.g. offsetting all Scope 1 and 2 emissions).	

8.1.3. Summary of potential impacts from climate change on the activity and related adaptation methods

Over the life of the Project (2023 – 2033) predictions provided by DELWP (2019) in the Climate Science Report suggest that the Mornington Peninsula could see:

- temperature increases in the order of 0.55 - 1.3°C, with more days of temperatures above 35°C
- sea level increases of 12 cm and an increase in wave intensity
- reduction in rainfall, and an increase in storm intensity
- increase in length of bushfire season and the severity of bush fires.

The greatest risk of climate change on the Project is the increased occurrence of bushfires and their intensity. As a result, a Bushfire Management Plan has been developed as part of Planning Permit Application. This plan examines how bushfires are mitigated and what controls will need to be put in place to manage any bushfires that eventuate. Part of this work involved undertaking a landscape bushfire risk assessment, which assessed the Project area as having a landscape risk of the lowest level due to the excellent access and egress opportunities. The most likely bushfire attack method would be from ember attack and radiant heat. Suggested control measures to reduce bushfire risk included:

- undertaking a weed removal program on all boundaries and within 100 metres of the facility
- increase the vegetation separation along the driveway from Bayview Road to the existing facilities, to provide a fuel break of at least 20 metres.
- Remove all weeds from the drainage line along the eastern side of the existing building.

9.0 RISK ASSESSMENT

9.1. Human health and the environment

9.1.1. Summary of the risk assessment identifying risks to human health and the environment

Esso has an established risk management governance framework with supporting processes and performance requirements that provide an overarching and consistent approach for the identification, assessment and management of risks (ExxonMobil, 2012). This process has been developed to be consistent with AS/ISO 31000-2018 Risk Management Guidelines, ISO 14001, ISO 31000.

This process was applied to conduct an updated integrated evaluation of environmental risk impacts for the Project.

Environmental risks have been considered as part of the project development process, including taking into account outcomes from the ongoing consultation and stakeholder engagement process, consideration of environmental assessments and studies conducted in Development Licence approvals process, and the historical results of existing environmental monitoring and inspection programs.

Risk Identification

A workshop was held to consider the environmental and human health risks associated with the Project, the results of which are presented in Attachment 11.

Risks for the power plant and piping construction were identified in consultation with engineering, materials, electrical, construction and SSHE[8] personnel through consideration of the following:

- Construction and commissioning (planned) activities associated with the power plant and piping facilities;
- Consideration of possible unplanned events (accidents/incidents);
- Consideration of cumulative impacts;

Environmental risks associated with the power plant and piping construction identified as a result of this process are as follows:

- Air emissions:
- Greenhouse gas emissions;
- Noise
- Odour
- Lighting and visual impacts
- Impacts to flora and fauna communities;
- Impacts on drainage and associated erosion;
- Bushfire;
- Waste management and storage handling;
- Community, including traffic;
- Cultural heritage; and

[8] SSHE – safety, security, health and environment

- Loss of containment.
- Cumulative impacts

Risk Methodology

The Esso Safety Health and Environment (SHE) risk matrix was used for the risk assessment. The key risk descriptors are the likelihood of a risk occurring and the consequence if it does occur.

Environmental consequences are assessed by consideration of the environmental effect in terms of duration, size and intensity, and environmental sensitivity in terms of irreplaceability, vulnerability and influence.

The resultant assessed risk is based upon the likelihood of occurrence of an event occurring with that particular consequence severity. Table 16 provides definition of the risk rating categories.

Table 16: Esso SHE Risk Severity Definitions

Risk Rating	Definition
Category 1	A higher risk where specific controls should be established in the short term and should, when possible, be reduced to a Category 2 risk or below. Continued operation requires annual review and approval by the Production Manager or equivalent.
Category 2	A medium risk that should be reduced unless it is not "reasonably practicable" to do so.
Category 3	A medium risk that should be reduced if "lower cost" options exist to do so.
Category 4	A lower risk that is expected to be effectively managed and therefore typically requires "No Further Action." Risk mitigation measures that are in place to manage the risk to Category 4 should be continued.

Project Environmental Risks

The human health and environmental risk assessment identified 67 residual risks. The risk assessment identified:

- Category 1 risks – 0
- Category 2 risks – 1
- Category 3 risks – 0
- Category 4 risks – 66

Performance objectives, controls and mitigation measures and monitoring for each of the risks identified is outlined in the Project Environmental Management Plan (Attachment 5).

9.1.2. Summary of how you're eliminating or reducing identified risks as far as reasonably practicable

For the construction phase, the results of the risk assessment found that all environmental and human health risks were low (category 4) in accordance with the Esso risk matrix. Controls that will be in place to manage environmental risk during the construction phase to manage risk to a low level include:

- Construction EMP (Attachment 5)

- Preservation of site boundary native vegetation as far as practicable whilst allowing construction and management for bushfire protection requirements. Weeds to be removed from culverts and drains
- On site vehicle selection and maintenance to minimize air pollution and greenhouse gas emissions
- Soil movement and stockpiling to minimize soil disturbance, cross contamination and dust generation
- Restriction on noise generating construction activities to standard working hours
- Site stormwater management to protect the integrity of the nearby Ramsar wetland
- All construction grey/black water will be collected on site and removed by vacuum truck for disposal at a lawful place
- Any hazardous liquids held on site as part of the construction programme will be appropriately bunded and stored in accordance with the Dangerous Goods regulations
- A construction waste management plan will be developed
- Site personnel will be inducted and trained in the environment management procedures applicable to their work activity.

The Human Health and Environment risk assessment for the operation of the Facility found all risks except greenhouse gas emissions to be low (category 4). Controls planned to manage environmental risk are as follows:

- Air emissions to the atmosphere are reduced as far as practicable by the use of best in class for gas fired turbines, dry low NOx technology
- Water use is minimized by the use of dry low NOx technology rather than water injection which is discharged via the exhaust stream
- Site location is as close as possible to the source of ethane and electricity connection to minimize construction impacts and localized loss of amenity
- The generators have been designed with a sound pressure level of 85 dB(A) at 1 metre to minimize impact to surrounding residents
- The site drainage system will be designed to ensure that no contaminated run-off can enter the stormwater system and hence enter the nearby Ramsar wetland
- Levels of chemicals held on site will be minimal in line with the type of operation, and will be held in bunded locations in accordance with Dangerous Goods Regulations

Greenhouse gas risk was assessed to be category 2 due to the burning of ethane to produce electricity. Risk is managed to be as low as practicable based on

- Ensuring steady state operations and appropriate maintenance so that generators run as efficiently as possible
- Site design to minimize the amount of piping venting as far as practicable whilst maintaining appropriate levels of safety

9.2. Environmental management

9.2.1. Summary of environmental management systems used to prevent or minimise impact on the environment.

Esso is committed to conducting its business in a manner that is compatible with the environmental and economic needs of all communities in which it operates and in a way that protects the safety, health and security of its employees, those involved in its operations, its customers and the public.

These commitments are documented in its safety, health, environmental, product safety and security policies. These policies are put into practice through a disciplined management framework.

Environmental management is addressed within the management framework. Esso's Environmental Management System fully meets the requirements of the International Organisation for Standardisation (ISO) 14001: Environmental Management Systems, the recognised international standard for Environmental Management Systems.

The Environmental Management System objectives relevant to operations at the Project are as follows:

- Environmental aspects are addressed and controlled consistent with policy, regulatory requirements and business plans.
- Emissions, discharges and waste are tracked, managed and minimised consistent with policy, regulatory requirements and performance objectives.
- Environmental Management Plan (EMP) provides input to business planning so that environmental considerations are fully integrated into Esso's planning and stewardship process. A copy of the EMP for the Project is presented in Attachment 5.

The key processes for environmental management addressed in the Project EMP to achieve the system objectives are as follows:

- Environmental policy
- Environmental management planning
- Identifying environmental focus areas and targets / objectives
- Identifying regulatory and other environmental obligations
- Identifying / assessing environmental aspect
- Preparing situational analysis
- Identifying environmental Projects, programs and improvement initiatives
- Setting discretionary environmental improvement priorities
- Implementation and operation.

The EMP is designed to meet the corporate requirements for EMP's and to ensure operations are in accordance with good environmental practice at all times, to take opportunities to minimise waste and continuously improve environmental performance.

The Project EMP:

- Details the applicable legislation, operational activities, local environmental characteristics and environmental emissions related to the facility operation.
- Provides an assessment of the potential environmental impacts that may arise from facility operations and identifies control measures that have been implemented to minimise potential impacts on the environment.
- Assesses the risk involved with the environmental impacts and identifies mitigation measures for each of these risks.
- Establishes environmental performance objectives and identifies strategies to achieve these objectives.

The Project EMP will be updated and revised over the life of the Project

Construction and commissioning

Day to day management of work performed on the Project construction site will be performed by the engineering, procurement and construction contractor[9] using the contractor's management system. The contractor's management system will comply with:

- AS/NZS ISO 14001: 2004 - Environmental Management System
- AS/NZA ISO 9001: 2000 - Quality Management System
- AS/NZS 4801:2001 - Occupational Health & Safety Management System

In addition, the engineering, procurement and construction contractor will prepare a Construction Environment Management Plan (CEMP) which shall be reviewed by Esso before construction work commences at the Project site. The CEMP will include the following:

- How the engineering, procurement and construction contractor will identify environmental hazards and risks associated with the works including those identified during the Environmental, Socioeconomic and Health Risk Assessment.
- A description of how environmental risks will be managed to reduce the risk so far as reasonably practicable and demonstration of the use of best practice where applicable.
- Information about how environmental controls will be implemented and monitored for ongoing compliance.
- Roles and responsibilities for managing environmental risk.
- A schedule of audits and inspections.
- Incident notification and investigation.
- Demonstration of an understanding of all regulatory obligations and details about how compliance with these will be achieved.

During construction and commissioning, Esso will maintain oversight of activities through routine supervision and on a periodic basis through a formal audit and inspection programme.

Esso will also retain control of communication with the neighbours and management of any complaints.

Operations

Prior to Operations commencing, the Project EMP will be reviewed and updated to meet the needs of the facility during the operations phase.

9.2.2. Will you undertake an environmental audit related to the activity?

×	No	✓	Yes

A compliance monitoring program will be implemented by Esso during construction of the Project. The objectives of the compliance monitoring will be to:

- Assess Construction Contractor's performance for:
  - Compliance with the Construction Contractor's EMP.
  - Construction Contractor's systems and procedures are effective in the environmental management of the construction.
  - Rehabilitation is completed satisfactorily.
- Assess overall compliance with this document.

[9] Contractor's scope of work includes commissioning

The compliance monitoring program will involve:

- Review of pre-construction commitments (e.g., inductions and environmental awareness). Participation at relevant construction meetings.
- Regular review of the Construction Contractor's records (environmental inspection checklists, induction records, environment related registers (e.g., waste), complaints, non-compliance records, incident reports).
- Periodic field inspections with the Construction Contractor to ensure compliance with environmental commitments.
- Management review of Esso's EMP compliance.

9.2.3. Summary of post-closure plans, including aftercare management, decommissioning and rehabilitation

The Hastings Generation Project is anticipated to operate until 2033 when ethane supply is insufficient to operate the generators. At this time, the majority of equipment, i.e the generators will be removed by the supplier and reconditioned for use elsewhere. Site buildings will be removed from site for possible reuse elsewhere.

ExxonMobil has developed a decommissioning plan for all Victorian EPA licenced sites, refer Attachment 12. The decommissioning plan outlines the governing principles and methodology that will be used to manage environmental risks associated with the decommissioning, cleaning and demolition of equipment. Particular emphasis will be placed on managing the handling and disposal of potentially contaminated materials, including requirements for a contaminated land assessment. As this decommissioning plan applies to all ExxonMobil Australia sites, there will be aspects of this plan that are not relevant to the Project.

10.0 RISK MANAGEMENT

10.1. Air

10.1.1. Summary of the activity's emissions to air

Air emission sources

The Project is expected to be in operation for 11 years, with a maximum annual average daily production of 189 tonnes of ethane per day. It is anticipated that this rate will significantly reduce from 2028 onwards. In addition to the volume of ethane varying from year-to-year, over the life of the project; the volumes are expected to vary from month-to-month, day-to-day and hour-to-hour as driven by natural gas demand and ambient weather conditions. Seasonally the ethane volume will peak in winter, to correspond with the peak in gas demand; and then subsequently falling in summer. This seasonal variation is expected to be in the order of 50 tonnes per day from winter to summer.

The Project will not be installing any gas storage facilities, and the gas turbines will ramp up and down in response to changes in gas flowrate

The following details the air emissions generated in association with the Project's activities.

1) Construction activities

Air emissions associated with the construction activities are related to vehicle movements, earthworks and materials handling. Pollutants of interest include particulates (include PM_{10} and $PM_{2.5}$) and vehicle exhaust emissions.

Potential dust emission magnitudes for the construction project are summarise in Table 17.

Table 17: Dust Emission Magnitudes in Accordance with IAQM Guidance

Activity	Potential Dust Emission Magnitude[1]	Justification
Demolition	**Small** Total building volume <20,000 m^3, construction material with low potential for dust release (metal and wood), demolition activities <10 m above ground	• No demolition proposed during construction phase
Earthworks	**Small** Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, total material moved <20,000 tonnes	• Clearing of vegetation less than 0.2 hectares, and bushfire management understorey clearing of approximately 2 hectares • Trenching excavation volume = 1.0 x 2.0 x 50 m = 100 m^3 = 160 tonnes at 1.6 t/m^3 density • Decommissioning phase expected to require less earthworks than construction
Construction	**Small** Total building volume <25,000 m^3, construction material with low potential for dust release	• Construction of site office and installation of generators and infrastructure • Assumed construction materials have low dust generating potential (e.g. steel, cladding)

Trackout	**Small** <10 heavy duty vehicle (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m	• Plant and spoil trucks leaving site • Total number of outward heavy truck movements is not expected to exceed 5 per day at any particular worksite during construction or decommissioning

[1] Definition for potential dust emission magnitude are defined in IAQM guidance.

2) Point source emission assessment

Each of the three gas turbine generators will be fitted with an exhaust stack. A summary of the physical stack emissions parameters is provided in Table 18.

Table 18: Point Source Emissions Parameters

Stack ID	Stack Height (m)	Stack Diameter (m)	Velocity (m/s)	Temp. (°C)	Emissions Rate (g/s)				
					NOx	CO	PM_{10}	SOx	VOC
Gen 1	11	1.83	40.0	494	1.74[1] 6.96[2]	1.052	0.194	0.011	0.607
Gen 1	11	1.83	40.0	494	1.74[1] 6.96[2]	1.052	0.194	0.011	0.607
Gen 1	11	1.83	40.0	494	1.74[1] 6.96[2]	1.052	0.194	0.011	0.607

[1] NOx emissions rate at 25 ppm

[2] NOx emissions rate at 100 ppm

3) Commissioning

Solar will commission the turbine generators in their manufacturing plant in the USA, prior to shipping to Esso. This testing will be performed on natural gas, in accordance with their standard commissioning practices. Testing undertaken by Solar, has shown that under steady state operations, the turbines are able to meet emissions levels of 25 ppm NOx and CO, while burning ethane gas.

During the commissioning of the low emissions combustion system on ethane there may be short periods where NOx emissions are up to 100 ppm. This will be temporary while each power generation unit is being correctly tuned to minimise diffusion pilot. Once commissioning is complete higher rates of diffusion pilot should only be needed during large process upsets and will automatically reduce within 2-3 minutes.

Air modelling has been conducted to evaluate the impact of these increased emissions during the commissioning period. The modelling has been based on the maximum annual average of 189 tonnes of ethane per day, 100% high pilot flame conditions. Modelling has shown that air emissions remain well below criteria both onsite and as sensitive receptors.

Air quality modelling report

An Air Quality Assessment (Attachment 6) was undertaken in support of the EPA Development License Application.

No site-specific background monitoring data was available for this assessment; therefore, background concentrations were adopted from areas which have a greater pollution potential as a function of population and industrial emissions and is considered to be very conservative; and these are listed in Table 19.

Table 19: Adopted Background Concentrations

Pollutant	Averaging Period	Adopted Background Pollutant Concentrations	
		Ppm	µg/m³*
NO_2	1 hour	0.021	39.5
	Annual	0.006	11.3
CO	8 hour	0.5	570
PM_{10}	24 hour	-	24.1
	Annual	-	19.9
$PM_{2.5}$	24 hour	-	10.2
	Annual	-	7.9
SO_2	1 hour	0.0003	7.9

Note * - Gas volumes are expressed at 25°C and at an absolute pressure of one atmosphere (1013 hPa)

The results of the Air Quality Assessment are summarised in

Table 21.

Table 20: Air Model Used

Model used	AERMOD
Met file used	Given the limitations of EPA monitoring stations and the potential emission sources from Esso LIP facility, background data has been sourced from the following sites: • 1 hour and annual NO2 data was sourced from Geelong • 8 hour CO data was sourced from Alphington • 1 hour SO2 data was sourced from Alphington and Geelong • 24 hour PM10 data was sourced from Dandenong • Annual PM10 data was sourced from Geelong • 24 hour and annual PM2.5 data was sourced from Alphington The background concentrations measured by the EPA are expected to be generally higher than those near the project location and their use as the background data in the assessment is considered conservative

Table 21: Comparison between Project's predicted ground level concentrations (GLCs) of emitted pollutants and design criteria

Indicator	Predicted maximum GLC (projected) µg/m³	Background concentration µg/m³	Predicted maximum GLCs (total) µg/m³	Criterion µg/m³	Project Design criteria
NOx 1-hour average 99.9th percentile	5.1	39.5	44.6	150	25 ppm

NOx 1-hour average 99.9th percentile	20.2	39.5	59.7	150	100 ppm – during commissioning
NO_2 annual average	0.17	11.3	11.47	28	25 ppm
NO_2 annual average	0.69	11.3	11.99	28	100 ppm – during commissioning
CO 8-hour average	7.8	570	577.8	10,310	25 ppm
SO_2 1-hour 99.9th percentile	0.11	7.9	8.0	260	
$PM_{2.5}$ max 24-hour average	0.82	10.2	11.0	25	
$PM_{2.5}$ max annual average	0.05	7.9	7.95	8	
VOC 1-hour 99.9th percentile	5.9	-	5.9	-	

The results from this study demonstrate no predicted exceedances of EPA Environmental Reference Standards, Ambient Air Quality criteria as detailed in the Guideline for Assessing and Minimising Air Pollution in Victoria (EPA Publication 1961) or State Environment Protection Policy (Air Quality Management) criteria for carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particular matter less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$).

Cumulative Impacts

Given the Project's close proximity to LIP, an assessment was undertaken of the Project's emissions in conjunction with LIP's to determine impact upon sensitive receptors; and this is summarised in Table 22.

Table 22: Comparison of combined LIP and Project predicted ground level concentrations (GLCs) of emitted pollutants and design criteria

Indicator	Predicted maximum GLC (projected) Project + LIP µg/m³	Background concentration µg/m³	Predicted maximum GLCs (total) Project + LIP µg/m³	Criterion µg/m³	Project Design criteria
NOx 1-hour average	54.1	39.5	93..6	150	25 ppm

99.9th percentile					
NOx 1-hour average 99.9th percentile	54.1	39.5	93.6	150	100 ppm – during commissioning
NO_2 annual average	1.58	11.3	12.88	28	25 ppm
NO_2 annual average	2.10	11.3	13.40	28	100 ppm – during commissioning
CO 8-hour average	125.2	570	695.2	10,310	25 ppm
SO_2 1-hour 99.9th percentile	15.4	7.9	23.3	260	

The cumulative emissions from the Project and LIP still show no predicted exceedances of EPA Environmental Reference Standards, Ambient Air Quality criteria as detailed in the Guideline for Assessing and Minimising Air Pollution in Victoria (EPA Publication 1961) or State Environment Protection Policy (Air Quality Management) criteria for carbon monoxide (CO), sulphur dioxide (SO_2), and nitrogen dioxide (NO_2).

10.1.2. Summary of the systems and processes to prevent or minimise impacts from air emissions

Construction Impacts

As there are no sensitive receptors located within 350 metres of the project construction works and estimated dust emission magnitudes are classified as 'small', unmitigated dust impacts due to construction of the project are expected to be 'negligible'. Therefore, further quantitative assessment of construction dust impacts is not deemed necessary.

Dust management measures shall be incorporated into the Construction EMP, with reference made to the EPA Publication 1834 *Civil construction, building and demolition guide.*

Operational Air quality

The gas turbine generators have been designed to meet the following specifications under steady state conditions:

- NOx – 25 ppm
- CO – 25 ppm

This will be achieved through the use of a lean pre-mix combustion and dry low NOx emissions control.

Air quality monitoring

The Project will install a continuous emissions monitoring system (CEMS) that will monitor the three exhaust stacks for CO and NOx.

The Facility will be required to undertake NPI reporting as it meets the reporting threshold for category 2a and 2b substances as it exceeds burning more than 1 tonne per hour of fuel, as outlined in the National Environmental Protection (National Pollutant Inventory) Measure 1998. The Hastings Power

Generation Plant is classified as a reporting facility, as it meets the ANZSIC code 2611 – electricity generation using mineral gas, including coal gas; for NPI reporting.

The Facility will report greenhouse gas emissions, annually as part of the National Greenhouse and Energy Reporting (NGER).

10.2. Noise

10.2.1. Summary of the activity's noise emissions

The Hastings Generation Facility will be located within the Melbourne major urban area as defined in the *Noise Limit and Assessment Protocol* (EPA, 2021). This states operating time periods as shown in Table 23.

Table 23: Operating Time Periods

Period	Details
Day	0700 – 1800 Monday to Saturday (excluding public holidays)
Evening	1800 – 2200 Monday to Saturday 0700 – 2200 Sunday and public holidays
Night	2200 – 0700 Monday to Sunday

An Environmental Noise Impact Assessment (Attachment 7) was conducted examining the noise impacts from construction and operations activities associated with the facility.

1. Construction

During construction various activities will generate noise and vibrations, being:

- Haul trucks
- Compaction equipment
- Excavators
- Ancillary plant and equipment
- Earthworks
- Reversing beepers
- Light vehicles
- Concrete crushing (if required)

Guidance was sought from the *Civil construction, building and demolition guide* (EPA, 2021) for construction noise limits; recommendations are provided in Table 24

Table 24: Construction Noise Working Hours

Period	Working Hours	Description
Normal working hours	0700 – 1800 Monday to Friday 0700 – 1330 Saturday	No noise level guidelines apply
Weekend / evening	1800 – 2200 Monday to Saturday 1300 – 2200 Saturday 0700 – 2200 Sunday and public holidays	Construction noise levels should not exceed the background LA90 level by: • 10 dB(A) or more for up to 18 months after project commencement • 5 dB(A) or more, after 18 months after project commencement

Night	2200 – 0700 Monday to Sunday (including public holidays)	Noise to be in audible within a habitable room of any residential premises

Due to the transient and dynamic nature of construction noise, noise modelling of construction noise was not undertaken. It is anticipated given the nature of activities to be undertaken during construction, that noise levels generated will not adversely impact the noise sensitive receptors.

2. Noise Modelling

Modelling of noise levels from the project was undertaken at the four closest sensitive receptors to the Project. All four locations are residential premises and can be seen highlighted in yellow in Figure 22.

Figure 22: Noise Sensitive Receptors

The background noise levels were compared to the night-time zoning levels and the applicable night-time noise limits have been calculated in accordance with the *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, Part 1A, Section 1. Noise Limits – urban area method, Clause 5. The Project's noise limits are shown in Table 25.

Table 25: Project's Night-time Noise Limits

Noise Sensitive Receptor	Background Noise Level dB(A)	Night-time Zoning Level dB(A)	Night-time Noise Limit dB(A)
1	37	55	49
2	35	41	41
3	37	42	42
4	37	43	43

Noise emissions have been predicted under adverse weather conditions favourable for noise propagation from the facility to the nearest residences, as outlined in Table 26.

Table 26: Meteorological Model Inputs for Adverse Weather Conditions

Input	Adverse Conditions
Wind speed (m/s)	3
Wind direction	Source to receiver
Pasquill-Gifford stability class (atmospheric stability)	F
Humidity (%)	50
Temperature (degrees Celsius)	15
Air pressure (mbar)	1013.3

3. Operations

During operations noise is expected to be generated from the following equipment:

- Solar Titan 130 power generation package, including enclosure; enclosure ventilation; turbine air system; and combustion outlet system
- Lube oil cooler
- Fuel gas skid
- Instrument air compressor
- Water purification pumps
- transformers

Noise levels that would be generated at the noise sensitive receptors during adverse weather conditions is summarised in Table 27.

Table 27: Predicted Noise Levels

Noise Sensitive Receptor	Night-time Noise Limit, dB(A)	Predicted Noise Level, dB(A)
1	49	46
2	41	34
3	42	34
4	43	31

It can be seen that during adverse weather conditions, or worst-case scenario, the Project's noise levels will cause negligible intrusion into the nearest noise sensitive receptors or residential properties; and will comply with EPA noise limits.

10.2.2. Summary of the systems and processes to prevent or minimise impacts from noise emissions

1. Construction

Night construction works are not anticipated to involve the use of significant mobile or fixed plant noise sources. Any additional power and lighting required by construction activities will be powered by existing power sources, eliminating the need for portable generators. Therefore, it is anticipated that The Project will meet the EPA's guidelines for noise levels for construction works undertaken outside the normal working hours.

Under the Hastings Generation Project Environment Management Plan (Attachment 5) the following management strategies are proposed to manage risks associated with construction noise:

1. High noise level construction activities to be limited to 7am – 6 pm Monday to Friday; Saturday 9 am – 1 pm
2. Work outside of hours listed above, must have prior approval from Construction Person in Charge

3. Schedule noisy works together, as far as practicable, to reduce the overall duration of exposure and limit to time periods determined in point 1, above
4. Construction vehicles travelling to site to be planned to arrive during normal operating hours, where possible.
5. Maintain vehicles in good condition
6. Provide onsite parking for workforce and onsite truck waiting areas

2. Operations

The modelled noise levels fall below the most stringent noise limits at all noise sensitive receivers identified in the assessment.

Operational noise levels are controlled through:

1. Design specification for the gas turbine generators and associated equipment is to meet a noise level of 85 dB(A) at 1 metre for rotary equipment.
2. Turbine generators to be fully enclosed, with enclosures being fitted with noise attenuation materials.
3. The enclosure ventilation openings are to be equipped with silencers.
4. Noise mitigation design including:
   a) Acoustic blankets
   b) Cladding on web of skid beam; and
   c) Additional enclosure door seals.

10.3. Water

10.3.1. Summary of the activity's emissions to surface waters

Process Water Discharges

The Facility does not use water in normal operations and there will be no planned discharges to surface water.

Water is used in small quantities (not continuous operations) to either aid cleaning the compressor or to purge liquid fuel passages in dual fuel injectors during fuel transfers and liquid fuel shutdown.

It is anticipated that approximately 200 litres of water would be used to wash the turbine blades for each turbine. Washing of turbine blades is expected to occur once every five years.

The dirty water generated from each of these operations will be directed to sump for collection and offsite disposal at a licenced lawful place.

Sewerage

The maximum number of people expected to be at site is:

- 60 people during construction; and
- 5 people during the operations phase.

During construction, temporary kitchen facilities and toilets will be utilised. The grey water (waste water from the offices and kitchens) will be collected in a holding tank that will then be pumped out and sent offsite for disposal. The black water (water from the toilets) will be collected separately. This water will also be sent offsite for disposal at a lawful place.

A permanent control/office/kitchen/toilet building will be installed for the operations phase. All sewerage waters will be sent to LIP, through an existing sewerage line, for treatment at the LIP facility.

Stormwater Management

Existing stormwater drains run along the east and west boundary of the Project area. These drains, drain into an existing LIP stormwater drain that flows from east to west (to Long Island Drive). Refer to Attachment 1 – Site Layout drawings.

Stormwaters from the Project areas are directed to the existing stormwater drainage system.

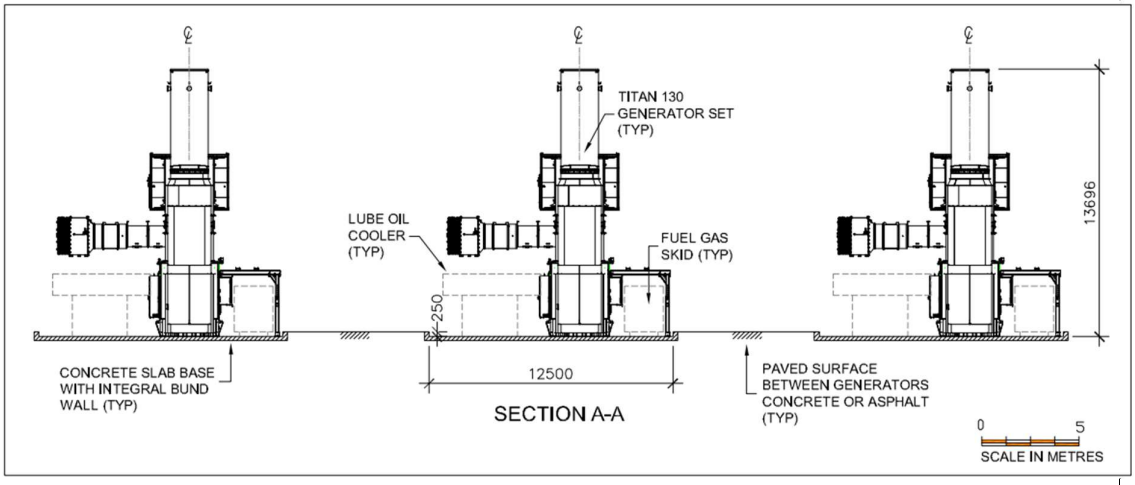
10.3.2. Summary of the systems and processes to prevent or minimise impacts to surface water

Discharges to surface waters, either directly or via the stormwater system are not planned.

To prevent contamination of the stormwater system the following measures will be implemented:

- The lube oil tanks and gas turbines will be housed within an enclosed module that is fitted with a drip pan to collect any spills that may occur. The drip pans drain to a sump which can be pumped out and sent to a lawful place for disposal. This sump is not connected to the stormwater drain system.
- The fuel conditioning skids, the gas turbine generators (include lube oil cooling system) modules, the electrical equipment modules and the transformers will all be installed upon bunded concrete pads. Contaminated discharge is collected within a sump, that can be pumped out and sent to a lawful place for disposal when necessary (refer to Figure 23).
- All maintenance, involving the use of lubricants will be conducted within the bunded concrete pads, so far as reasonably practicable. Where it is not practicable, temporary containment will be set up around the maintenance area to minimize migration of contaminants.

Figure 23: Concrete Slab Layout for Gas Turbine Generators, including Bunding



Stormwater drainage for the Project area is contained with the Olivers Creek sub-catchment. A review of stormwater management in this sub-catchment found the highest risks are posed from poor waste management practices; lack of sediment and erosion control and poor site management (WBM Oceanics Australia, 2002).

An Environmental Management Plan (EMP) (Attachment 5) has been prepared for the Project. The Principal Contractor will be required to develop their own Construction EMP that complies with the Project EMP. The Project EMP will be updated over the life of the facility.

The civil contractor will ensure that all civil works comply with EPA Publication 1834 *Civil construction, building and demolition guide* to ensure that sediments or litter are not entering the stormwater system.

Under the Hastings Generation Project Environment Management Plan (Attachment 5) the following management strategies are proposed to manage risks associated with stormwater management during construction activities:

1. Construction Contractor to assess risks of stormwater management hazards associated with activities and include mitigation measures in the Construction Environmental Management Plan.
2. Barriers to be employed around stormwater drains to prevent litter and sediment entering during any dewatering activities
3. Construction site Person-in-Charge / SSHE Lead to approve any discharge of water offsite
   a. Potentially contaminated stormwater must be analysed for the chemicals or substances known to contaminate the site to determine disposal methods
4. Have adequate drainage and flood control measures in place at all times of construction
5. Divert stormwater away from soil stockpiles
6. All concrete to be supplied as a premix
7. Construction Contractor to develop site procedures to manage and prevent the release of contaminants into the environment, for:
   a. the handling, use, storage and disposal of hazardous substances;
   b. waste; and
   c. refuelling, maintenance and servicing activities

10.4. Land and groundwater

10.4.1. Summary of the activity's emissions to land or groundwater

There will be no planned discharge to land or groundwater.

10.4.2. Summary of the systems and processes to prevent or minimise impacts to land or groundwater

Systems & Processes in place to prevent or minimise impact to land or groundwater

1. The new equipment is located on concrete pads and where there is risk of a spill the equipment is located in a bunded area or with drip trays. These are fully segregated from stormwater drains in a concrete sump, minimizing any potential for soil contamination
2. The quantity of chemicals held on site is expected to be minimal and will be appropriately stored in accordance with the Safety Data Sheet and Dangerous Goods requirements.
3. Operational procedures will minimize the risk of a spill during maintenance by appropriate management of the worksite, including ensuring the presence of bunding, availability of spill kits.
4. All wastes will be appropriately segregated and stored to minimize the risk of contamination.

Current Assessment of Soils & Groundwater

1. Soil Assessment

Geotechnical consultants were commissioned to test the in-situ soils prior to excavation. In addition, the site has been tested in the past as part of Esso's leasing arrangements. Since 2008 a total of 61 bores have been sampled for soil contaminants, within the Project area. Attachment 2a illustrates the sampling locations for all soil investigations carried out at the site since 2008. Further end of lease testing is planned prior to the Project commencing any excavation works.

1.1 Contamination Assessment Criteria

Soils were tested for analytes comprising the EPA IWRG 702 Soil Analysis suite by a NATA accredited laboratory. The results have been reviewed against the criteria listed in the National

Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM) and EPA Publication 1828 *Waste disposal categories – characteristics and thresholds.*

Soil assessment criteria (SAC) were derived from Health Investigation Level (HIL) and Environmental Investigation Level (EIL) from Schedule B1 of the NEPM.

1.1.1 Health Soil Assessment Criteria

The HILs are scientifically based, generic assessment criteria designed to be used in the first stage of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use scenarios. Given the past and expected future industrial land use at the site, HIL-D criteria, applicable for commercial/industrial premises, have been adopted.

Consideration of HSLs has also been given to evaluating vapour intrusion risks for any hydrocarbon contaminated soil, using criteria taken directly from Table 1A(5) of the NEPM Schedule B1. HSL-D (commercial/industrial) criteria for sandy soils (coarse textured soil) 0 m to <1 m deep have been adopted.

1.1.2 Environmental Soil Assessment Criteria

The use of EILs for selected metals are applicable for assessing risk to terrestrial ecosystems. ESLs are used to assess the risk to terrestrial ecosystems from selected organic compounds. EILs and ESLs apply to the top 2 m of the soil profile, which essentially corresponds to the root zone and habitation zone of most species.

Generic EILs and ESLs for different land use settings are available for various contaminants in the NEPM. EILs and ESLs applicable to an industrial land use have been adopted directly from Tables 1B(5) and Table 1B(6) of the NEPM Schedule B1.

1.1.3 Management Limits

The NEPM provides management limits for petroleum hydrocarbons, which are designed to address the risk of the formation of light non-aqueous phase liquids, fire and explosive hazards, and effects on buried infrastructure. When management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed. Management limits were taken directly from Table 1B (7) of NEPM.

1.1.4 EPA Waste Classification

To determine the waste classification of surplus soil, the soil samples were compared against the total concentration limits as listed in Table 2 of the Waste Disposal Categories – Characteristics and Thresholds (Publication 1823).

1.2. Soil Analysis

1.2.1 Comparison with Human Health Soil Assessment Criteria

One sample exceeded the Human Health Industrial criteria for $TPH_{C10-C16}$. However, this isolated exceedance is less than 2.5 times the adopted criterion.

1.2.2 Comparison with Environmental Soil Assessment Criteria

A total of 36 boreholes recorded exceedances of the adopted EIL criteria for one or more of the following:

- total chromium,
- copper,
- manganese,
- zinc and
- $TPH_{C10-C16}$.

While some of the individual samples did exceed the SAC by more than 2.5 times (copper and $TPH_{C10-C16}$), all of the arithmetic mean values were below the EIL criteria.

1.2.3 Comparison with Management Levels

A total of five samples collected exceeded the Management Level criteria for $TPH_{C10-C16}$ and $TPH_{C16-C34}$. None of the individual results exceed the criteria level by more than 2.5 times and the arithmetic mean was less than the criteria level.

1.2.4 Waste Classification

The samples were compared against the waste classification limits and a small number were found to exceed the clean fill criteria for:

- Copper
- Molybdenum
- Mercury
- Nickel
- Tin, and
- Zinc.

All soil samples meet the Waste Category D classification.

1.3. Summary of Findings

Table 28 summarises the soil contaminants that exceeded any of the assessment criteria (human health SAC, environment SAC, management level or waste classification).

Table 28: HGP Site Soil Analysis

Contaminant	National Environment Protection (Assessment of Site Contamination) Measure 1999, Schedule B1			EPA Waste Classification (Publication 1823)	
	>EIL (industrial)	>HIL D	> Management Level	> Clean Fill Category	> Category D Waste
Chromium (total)	✓				
Copper	✓			✓	
Manganese	✓				
Mercury (inorganic)				✓	
Molybdenum				✓	
Nickel				✓	
Tin				✓	
Zinc	✓			✓	
TPH C6-C10			✓		
TPH C10-C16	✓	✓	✓		
TPH C16-C34			✓		

1.3.1 Groundwater

Groundwater analysis was not undertaken as part of the geotechnical work conducted in 2021. Previous studies, undertaken by Douglas and Partners (2014), sampled four bores, two upgradient wells and two wells within the activity area. All four bores sampled showed the groundwater recorded exceedances of the groundwater assessment criteria for cobalt, copper, nickel and zinc, aluminium, iron and manganese. Concentrations of organic analytes including hydrocarbons and phenols were all below the laboratory detection limits for all wells for both investigations.

Although some degree of variation in metal concentrations is noted between the 2008 and 2013 investigations, in general the metal concentrations are not markedly higher within down gradient wells relative to the up-gradient wells. It was therefore considered that the site was not contributing to the elevated levels of metals detected in site groundwater and that the recorded metal concentrations most likely represent regional background levels (Douglas and Partner, 2014).

No odours, sheens or free phase hydrocarbon contaminants were identified within the groundwater and the site groundwaters were not considered to require any remediation or ongoing management.

1.4 Conclusion

Douglas and Partners (2014) concluded that soil contamination at the site:

- Was not considered to pose an unacceptable risk to future risk users under a heavy industrial site usage;
- Was not migrating from or onto the site;
- Had not resulted in a free phase contamination within groundwater that needed to be managed or remediated; or
- Did not require remediation or further assessment works to render the site suitable for a heavy industrial use.

AMAL Analytical (2021) concluded from the sampling undertaken in 2021, that contamination was below levels of concern and soil movements could follow typical site earthworks management.

2. Land Contamination

Section 35 of the Environment Protection Act (2017) states that "*land is contaminated if waste, a chemical substance or a prescribed substance is present on or under the surface of the land, and the waste, chemical substance or prescribed substance –*

a) is present in a concentration above background level; and

b) created a risk of harm to human health or the environment."

EPA Publication 2008: *Notifiable contamination guideline* outlines notification of contaminated land criteria.

A preliminary evaluation would be that the site is classified as contaminated land, but risk of harm is at an acceptable level, no action required (e.g. contamination levels not migrating or likely to migrate and levels safe for current use).

However, further assessment will be undertaken prior to civil work commencing to determine if the site requires notification.

This assessment will also identify what control measures, beyond those listed below, are required to manage the site in accordance with EPA Publication 1977 – *Assessing and controlling contaminated land risks: A guide to meeting the duty to manage for those in management or control of land.*

3. Soil Management

Soil will be excavated from the Project site during the civil works, as part of the construction activities. Some of the excavated soil will be reused as backfill or for the roadway construction. All of this soil movement will remain in the same general area. These areas will be covered with hardstand or road base, thus minimising the potential for offsite migration of contaminants.

Any surplus soil[10] not used in the civil works will be stockpiled and analysed to determine the waste category. If the soil is classified as clean fill it will be reused on site. Otherwise it will be disposed of offsite at a lawful place, certified to accept that category of waste soil.

Under the Hastings Generation Project Environment Management Plan (Attachment 5) the following management strategies are proposed to manage risks associated with soil movements.

1. Construction Contractor to prepare and implement an Erosion and Sediment Control Plan
2. Erosion and sediment control measures to be installed prior to commencing disturbance works

[10] Soil becomes surplus is it can not be used by the project during the construction activities, in the area it was removed from. If used elsewhere on site, it will be classified as surplus soil and therefore a waste material.

3. Works to be planned to minimise the extent and duration an area remains exposed or unstabilised.
4. Manage vehicle movements to designated roads and access areas.
5. Surplus soils are to be collected for temporary storage on site and tested prior to disposal in accordance with waste category or reuse
6. Utilise dust suppression measures, such as water sprays or coverings, as needed
7. Construction personnel to wear PPE, as instructed when handling contaminated soil
8. Construction Contractor to identify the planned movement and traffic routes of vehicles on site and develop a traffic management plan
9. Use dust suppressants on roads, as needed

10.5. Odour

10.5.1. Summary of the activity's emissions of odour

The Project, will be using an ethane rich fuel for the gas-fired turbines. Ethane is a by-product of natural gas and crude oil production. The ethane is treated at LIP to remove any impurities, including hydrogen sulphide. The "sweet" gas supplied to the power plant has very low concentrations of sulphur dioxide (0.0001%). As a result, odour omissions should be negligible.

Air modelling of the Project's expected emissions showed that sulfur dioxide concentrations from the plant are negligible and well below the criteria (260 µg/m^3). The maximum ground level concentration, which was found onsite was less than 1 µg/m^3 (AECOM, 2021).

Odours may also result from the volatile organic compounds (VOC) found in hydrocarbons. Again, air modelling results showed that total VOC concentrations from the project were negligible and well below the criteria (benzene – 580 µg/m^3, formaldehyde 1-hour 87 µg/m^3). The Project's predicted maximum ground level concentrations of VOC are expected to be 33.1 µg/m^3.

As a result, it is not anticipated that odours will be present beyond the facilities boundary or pose a nuisance to the workforce.

10.5.2. Summary of the systems and processes to prevent or minimise impacts from odour emissions

Utilising sweet ethane gas.

10.6. Waste

10.6.1. Summary of how you're managing waste in line with the waste management hierarchy

Minimal quantities of waste materials will be produced either during construction or operations. The largest volume of waste expected is surplus soil generated during the civil works. A summary of all wastes compared against the waste management hierarchy is provided in Table 29.

Table 29: Summary of Wastes and Potential Wastes against the Waste Management Hierarchy

Waste Stream	Waste Hierarchy					
	Avoidance	Reuse	Recycling	Recovery of Energy	Containment	Disposal
Surplus soil	The only soil to be	Following soil testing, if				If soil is classified as a Category D

	removed during the construction phase will be that which is necessary for the placement of the piping and site preparation for the power plant.	soil is classified as Clean Fill, it will be reused on site for landscaping.				reportable waste or higher, will be disposed off site at a lawful place
Water vapour – from wet low NOx system	Utilising DLN instead. Water not required for emissions control					
Turbine engines, valves, lube pumps, etc	Avoid disposal through refurbishment	Will be refurbished by manufacturer for reuse.				
Lube oil – for lube oil cooling system	The system and oil chosen limits the need to replace oil during the life of the machine (15 years)					
Turbine washing	By using a clean fuel and using high performance filters turbines are anticipated to only require washing every 5 years, using approx. 200L per turbine					Turbine washings disposed offsite at lawful place
Metal			Scrap metal will be segregated and sent for recycling			

			where possible			
Sewerage						Treated in LIP sewerage treatment system

10.6.2. Detail the systems and processes used to minimise risks of harm to human health and the environment from handling, storage, use and transportation of substances

Surplus soil will be analysed for contaminants to determine the waste classification. The surplus soil will then be reused (if clean fill) or disposed of offsite to a lawful place. Refer to previous section on Land and Groundwater.

All other solid wastes will be managed in accordance with the management strategies outlined in the Environment Management Plan (Attachment 5), being:

1. Construction Contractor is to develop and implement a Waste Management Plan. Plan is to include procedures for collection, segregation, storage, transportation and disposal.
2. Provide covered storage of waste materials to prevent:
   a. the accidental release of waste materials (ie litter), or
   b. access by wildlife or vermin
   c. rainwater ingress, creating a leachate to be disposed of
3. Waste storage areas to be kept clear of stormwater drains
4. Hazardous waste storage areas to be bunded
5. Provide temporary toilets throughout the construction period, that are clearly signposted and appropriately sized for the number of personnel expected to be onsite.
6. Regularly service temporary toilet facilities.
7. Only suitably licenced waste transport contractor may remove waste from site

10.6.3. Does your activity include management or control of industrial waste, priority waste and/or reportable priority waste?

Yes

10.6.4. Detail the type, quantity and treatment of waste.

Various waste materials will be produced during the earthworks and construction activities associated with the Project. The types of waste generated during construction are shown in Table 31, and during operations in Table 30.

Table 31: Waste Generation – Construction Phase

Waste Stream	Quantity	Management
Surplus Soil Spoil	Approximately 2,000 m^3.	The soil to be retained on site, will comprise of existing hard stand / fill material and underlying natural basaltic soils and regolith. The hard stand is generally a basaltic gravel and is similar to the underlying natural material. Spoil will be excavated to install piping and prepare the foundations for the power plant. Any spoil not classified Clean Fill will be disposed of offsite at a lawful place.
Non-hazardous industrial waste	3 x Industrial Waste skip bins / week	Includes paper, cardboard, food waste, packaging materials, scrap metals. Waste materials will be segregated, as far as practicable,

		and disposed of with other non-hazardous wastes generated at the site.
Reportable priority wastes, including hydrocarbon contaminated waste	1 x Reportable Priority Waste skip bins / month	Includes contaminated PPE, oily rags. Will be segregated and managed via disposal in prescribed waste bins. Waste disposal will be conducted via a licensed waste transporter, to a lawful place. EPA Waste Tracker will be utilised to track waste movements.
Sewage / ablution facilities	5,400 L / d based on max 60 people	It will be necessary to obtain ablution facilities. These will be sourced from licensed operators; and maintained and emptied on a regular basis to ensure there is no spillage of sewage waste.

Table 32: Waste Generation – Operations Phase

Type of waste generated	Volume	Disposal destination
Non-hazardous / industrial waste	1 x 240 L bin / week	Land fill
Industrial waste - Turbine filters	1 skip / year	Landfill
Reportable priority waste – oil filters	1 x 200 L bin / 2 years	Lawful place
Reportable priority waste – oil rags, contaminated packaging	1 x 240 L bin / month	Lawful place
Reportable priority waste - Spent lubricating/transformer oil	0[1]	Lawful place
Reportable priority waste - Oilly water collected in the sumps	Following a spill	Lawful place
Sewerage	450 L / day	LIP sewerage system

[1] It is not anticipated that lubrication / transformer oil will need replacing during the life of the Project. Oil will breakdown over time, but there will be regular oil analysis and condition monitoring to determine the oil's condition. If the oil deteriorates beyond tolerance limits it will be replaced.

10.6.5. Is the proposed activity included in a relevant schedule of a Regional Waste and Resource Recovery Implementation Plan?

✓	No	×	Yes

10.6.6. Please describe the estimated future industrial waste generation.

10.7. Human health

10.7.1. Summary of the activity's potential human health impacts

The Project is not expected to impact human health either during construction or operations.

Air (Attachment 6) and Noise (Attachment 7) studies have shown that the Project's emissions do not exceed criteria for sensitive receptors.

10.7.2. Summary of the systems and processes to prevent or minimise impacts to human health

The following systems and process have been adopted to prevent or minimise impacts to human health both within the Project and the community beyond.

- When compared with electricity generated from coal production, the Project will provide a net reduction of 206 kt of CO_{2e} per year at the Project's peak generation
- Plant layout to ensure loss prevention in accordance with ExxonMobil Global Practice and design to appropriate API, ASME and Australian Standards requirements
- Areas of hazard and ignition source (turbine exhausts and transformers) will be located at a distance from areas of potential gas release and vent stack, as per Hazardous Area Classification API RP 505 and AS 60076.
- Hot turbine exhaust surfaces and facility vent stack (in case of ignition) will be located away from the tree line to manage bushfire risk
- Bushfire risk assessment undertaken for the project
- Design of the depressuring system is such that it minimises volume of gases to be vented for the differing levels of emergency shutdown whilst at the same time allowing adequate level of safety to minimize risk of an escalation in the event of a fire
- Gas detection at leak points and ESD push buttons located on site
- Turbines protected by heat, gas and flame detectors and water mist extinguishing system with ESD on confirmed detection
- Gas detectors are mounted to the air inlets to the turbine and air compressors with trip on detection
- Layout to allow safe usage and emergency escape
- Site is protected by a fire main and fire hydrants, fires can be attacked from two different aspects
- Site can be accessed from main entrance from the north and from LIP from the south in the event of an emergency

11.0 OTHER APPROVALS

11.1. Financial Assurance

11.1.1. Do you require financial assurance?

✓	No	×	Yes

11.2. Commissioning / proof of Performance

11.2.1. Do you require a proof of performance testing plan?

×	No	✓	Yes

11.2.2. Summarise the proof of performance testing plan for this activity

Prior to arrival on site the majority of equipment, such as the generators, transformers and air compressors, instrumentation, and relief valves will have undergone factory assessment tests at site witnessed by Esso personnel.

Piping will be hydrotested (pressure tested) offsite.

Following construction as a part of pre-commissioning pressure containing equipment will be leak checked with inert gas prior to the introduction of hydrocarbons. In addition, control loops and plant trip functionality will be tested to ensure appropriate control response and safety protections.

Solar will commission the turbine generators in their manufacturing plant in the USA, prior to shipping to Esso as part of factory acceptance testing (FAT). This testing will be performed on natural gas, in accordance with their standard commissioning practices. Previous demonstration testing undertaken by Solar, has shown that under steady state operations, these types of turbines fitted with dry low NOx technology are able to meet emissions levels of 25 ppm NOx and CO, while burning ethane gas.

Once assembly has been completed at Hastings, the turbine generators will be commissioned with ethane gas. Solar Engineers will commission the generators alongside Esso personnel to provide assurance of optimal combustion of ethane to provide the safest efficient application of the Dry Low NOx technology. Commissioning will also be undertaken on the LIP control system directing flow to the plant to ensure a smooth transition of flow as ethane flowrates change in concert with natural gas flowrates change in accordance with consumer demand.

During the commissioning of the low emissions combustion system on ethane there may be short periods where NOx emissions are up to 100 ppm. This will be temporary while each power generation unit is being correctly tuned to minimise diffusion pilot. Once commissioning is complete higher rates of diffusion pilot should only be needed during large process upsets and will automatically reduce within 2-3 minutes.

Air modelling has been conducted to evaluate the impact of these increased emissions during the commissioning period. The modelling has been based on the maximum annual average of 189 tonnes of ethane per day, 100% high pilot flame conditions. Modelling has shown that air emissions remain well below criteria both onsite and as sensitive receptors.

Esso and Solar will develop a suite of pre-commissioning and commissioning procedures for the Project, together with Job Safety Analysis (JSA) and Step Back 5x5 to cover the activities.

12.0 SUPPORTING EVIDENCE

12.1. Supporting documentation

12.1.1. What supporting documentation is required?

Attachment Number	Document Title
1a	Hastings Generation Facility Layout
1b	Hastings Generation Facility Plot Plan
1c	Site Layout Superimposed upon Aerial Photograph
2	Figures and Maps
2a	Geological and Geomorphological Figures
2b	Site Vegetation
3	Project Alternatives
4	Greenhouse Gas Assessment
5	Environment Management Plan
6	Air Quality Assessment
7	Environmental Noise Impact Assessment
8	Hastings Generation Project: Cultural Heritage Assessment
9	Threatened Flora and Fauna Likely to Occur in the Project Area
10	Heritage Register Review
11	Human Health and Environment Risk Register
12	Decommissioning Plan
13	Stakeholder Engagement Plan

12.1.2. References

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12.2. Declaration

I declare that I have made all necessary enquiries and the information provided in this application (including any attachments) is true and correct. I understand that it is an offence to intentionally or negligently provide incorrect or misleading information to the Environment Protection Authority or to conceal information from the Authority.

I agree

I declare that I will perform my activity in accordance to the general environmental duty

I agree

I declare that I will perform my activity to ensure that all substances are handled, stored, used or transported in a manner that minimises risk of harm to human health and the environment from pollution and waste

I agree

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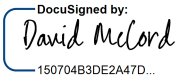
David McCord david.mccord@exxonmobil.com LIP Plant Manager ExxonMobil General Security Level: Email, Account Authentication (None)	DocuSigned by:  150704B3DE2A47D... Signature Adoption: Pre-selected Style Using IP Address: 103.111.183.213	Sent: December 6, 2021 | 03:11 Viewed: December 6, 2021 | 17:11 Signed: December 6, 2021 | 17:11

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