



**Yumbah Nyamat Works Approval Application  
October 2018**

**Appendix K Environmental Risk Assessment**



# Yumbah Nyamat Environmental Risk Assessment

October 2018

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# 1. Introduction

## 1.1 Proposed Aquaculture farm

Yumbah Aquaculture Ltd. (Yumbah) propose to develop land situated on Lot 1 and 8 315 Dutton Way Bolwarra to establish a new abalone farm, approximately 6 km from Portland on Victoria's south-west coast. The new abalone farm will be known as Yumbah Nyamat.

The proposed farm will have similar infrastructure to that of Yumbah's Narrawong farm. Seawater will be pumped ashore, direct from Portland Bay to support the abalone farm.

The proposed development will feature:

- Breeding and hatchery
- Nursery
- Grow out tanks
- Seawater in-flow and outflow pipelines

The land-based aquaculture farm will be designed to have a capacity to grow 1000 tonnes of abalone per annum doubling the value of Victoria's aquaculture production.

## 1.2 Purpose of this report

This report is an environmental risk assessment (ERA) completed to support the approvals documents for the proposed abalone farm at Dutton Way, Bolwarra. This ERA has been framed by an aspects / impacts register that identifies the risk pathways relevant to the proposed farm's activities and the controls / procedures identified to manage the risks.

## 1.3 Objectives

The objectives of the risk assessment were to:

- identify risks to the environment as a consequence of the design, construction and operation of the farm, whereby 'environment' includes ecological, cultural, social, heritage, public health and safety and business aspects
- use a common approach to assessing risk across all specialist investigations provide a summary of the comparative risks across the projects and understand at which stage of the project the risks are likely to occur
- identify areas that may require either further impact assessment or additional environmental management in order to reduce the extent, magnitude or duration of impacts, thereby reducing risks to the environment.

## 1.4 Assessment framework

A systematic risk based approach was applied to understand the existing environment, potential impacts of the farm and how to avoid, minimise or manage the risk of impacts to an acceptable level.

An initial risk assessment was undertaken to assess potential risks to the environment arising from the implementation of the project. The initial risk levels assume that the initial controls and practices were in place to manage and mitigate risk. Where risks were medium or above, further mitigation was explored. If further mitigation was identified, controls and practices were updated and risks were re-assessed to determine the residual risk. The residual risk levels assume that the final controls and practices are in place to manage and mitigate risks.

The risk assessment considered risks to the environment from potential farm impacts within the following areas:

- Noise and odour
- Surface water
- Biosecurity and disease
- Aboriginal cultural heritage
- Coastal hazard and sea level rise
- Traffic
- Social amenity
- Landscape and visual
- Marine and terrestrial ecology
- Contamination and spoil management
- Groundwater
- Project funding

## 2. Method

### 2.1 Overview

A semi quantitative approach to risk assessment has been adopted for the Yumbah Nyamat project. This approach was selected because it is able to assess risks associated with social, environmental, public health and safety and economic assets on a relatively even basis. It therefore provides a means to focus effort in terms of impact assessment and mitigation.

The approach to risk assessment is consistent with AS/NZS ISO 31000:2009 *Risk Management Process* and involves the following steps:

- establishment of the context of the risk assessment
- risk identification
- risk analysis
- risk evaluation
- risk treatment.

The process is designed to be iterative, as shown in Figure 1. The identification, analysis and evaluation of risks were conducted in a series of workshops.

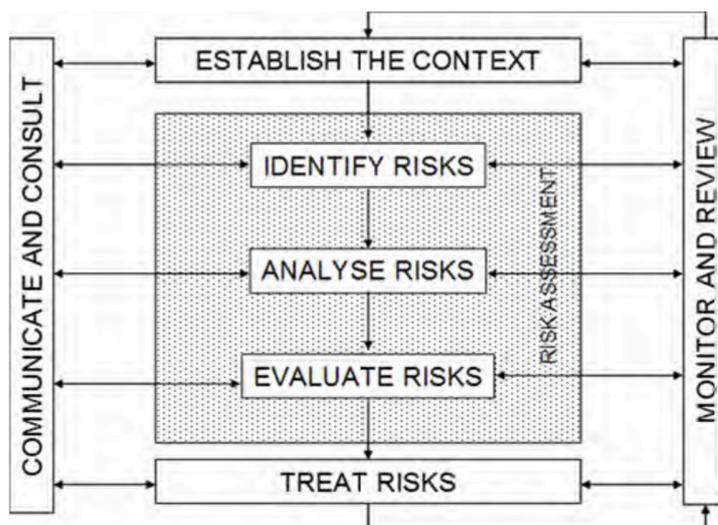


Figure 1 AS/NZS ISO 31000:2009 risk management process

#### 2.1.1 What is risk

In AS/NZS ISO 31000:2009 *Risk Management Principles and Guidelines*, risk is defined as ‘the effect of uncertainty on objectives’. In the context of this ERA, this definition refers to the ability of the farm to achieve the defined evaluation objectives. More specifically, and more relevant to this report, risk can also be defined as the condition resulting from the prospect of an event occurring and the magnitude of its consequences.

Therefore, risk is an intrinsic combination of:

- the likelihood of an event and its associated consequences occurring (this incorporates the likelihood of the event and the likelihood of the consequences occurring each time the event occurs)
- the magnitude of potential consequences of the event.

In quantitative terms, 'risk' is defined by a risk 'level', which is:

$$\text{Risk level} = \text{Likelihood} \times \text{Consequence}$$

The risk level is therefore a numerical value that describes the level of risk posed by an event.

The methodology for estimating likelihoods and consequences in this risk assessment is described below.

### 2.1.2 Risk Management Process

As outlined in the *Victorian Government Risk Management Framework* (March 2015), the key elements of a risk management process are as follows:

- *Establish the context* means understanding the objectives, defining internal and external factors that could be a source of uncertainty, helping identify risk and setting the scope and risk criteria for the remaining risk management process.
- *Risk identification* determines what, where, when, why and how risks could arise, and the effect this would have on the ability to achieve the required objectives
- *Risk analysis* determines the risk level against the risk criteria by understanding how quickly a risk can occur, the sources and cause of a risk, the consequences and likelihood of those consequences. Analysis takes into account the effectiveness of existing controls. Risk evaluation compares the level of risk against the risk criteria and considers the need for treatment. The approach to risk evaluation should follow a typical risk assessment process of applying a consequence and likelihood matrix. Assessing the risks in relation to each other supports prioritisation and highlights differences. Mitigation strategies can be taken into account to derive the residual risk.
- *Risk treatment* involves assessing and selecting one or more options for modifying risks by changing the consequences or likelihood and implementing selected options through a treatment plan.
- *Communication and consultation* takes place throughout the risk management process with all identified stakeholders to ensure those accountable for implementing the risk management process and stakeholders understand the basis on which decisions are made.
- *Monitoring and review* confirms that risk and the effectiveness of control and risk treatments are monitored and reported to ensure that changing context and priorities are managed and emerging risks identified<sup>1</sup>.

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<sup>1</sup> Standards Australia, 'Australian/New Zealand Risk Management Standard: AS/NZS ISO 31000: 2009', pp13 – 21, clause 5.

## 2.2 Risk assessment

This risk assessment aligns with AS/NZS ISO 31000:2009 Risk *Management Process* and involves four steps including: problem formulation, risk analysis, risk characterisation and risk management (Figure 2).

The risk assessment involves:

- **Identification** of the potential risks to environmental segments posed by the discharge.
- **Analysis of the risks**
  - Assessing the risks to the receiving environment (particularly aquatic ecosystems) based on potential harm of detriment to the surface water environment, with the first consideration being the risk associated with the proposed licensed discharges. The risk assessment aspects of this project follow EPA Publication 1287 *Guidelines for Risk Assessment of Wastewater Discharges to Waterways*. This considers the requirements of the State Environment Protection Policies (SEPPs) and EPA guidelines relevant to the site.
  - The risks that contamination of the discharges (such as ammonia) will result from the aquaculture operations will identify how contamination could occur and the magnitude and frequency of the contamination events. The risk analysis step will assess the consequence and likelihood of the event occurring.
- **Evaluation** of risks to prioritise the risks identified. The risk evaluation process considers factors such as the objectives of Yumbah and planned activities, in addition to the overall environmental cost and benefit of addressing some risks over others. The outcome of the evaluation is to determine the works and management actions that are will achieve an acceptable level of risk (in particular to meet the requirements of the proposed Licence), and recommendations and their priority will be made accordingly. In general, higher risks will accord a higher level of priority.

The results of the risk assessments and the corresponding recommendations are tabulated in summary form.

The risk assessment was conducted in three phases:

**Phase 1** – Problem Formulation – Establishing the context, review of beneficial uses, threats and risk identification and development of the risk analysis method

**Phase 2** – Risk analysis – conduct the risk analysis

**Phase 3** – Risk Characterisation

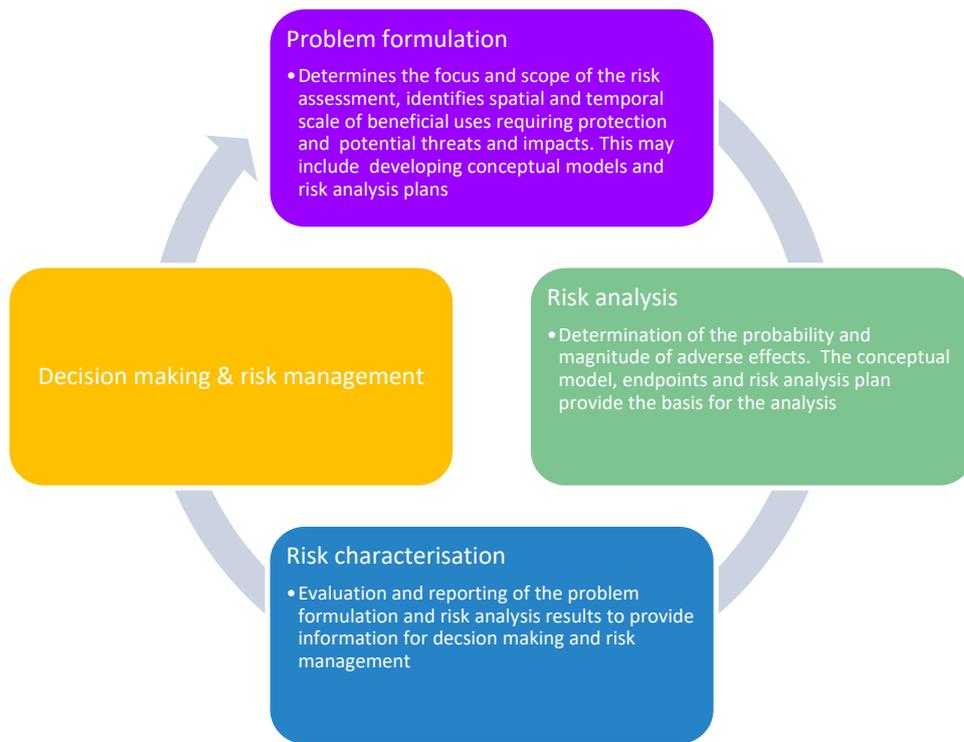


Figure 2 EPA Risk Assessment Framework (Publication 1287)

### 2.2.1 Risk Criteria

A five-point likelihood and consequence assessment system has been adopted for this risk assessment. The following definitions have been applied:

**Likelihood** - the potential frequency at which a threat could be expected to occur at a significant level (based on the available data) that causes an effect. Likelihood is defined as ranging from rare to certain and in the context of this risk analysis relates to the frequency (time) at which the threat is likely to cause the effect (**Error! Reference source not found.**). Likelihood scores provide an indication of the potential for a potential stressor to impact a beneficial use or value.

**Consequence** - A risk assessment consequence is the potential impact of a threat on a value, and can provide a measure of possible change to communities and species. Consequence descriptions have been applied to both environmental aspects and risk to aquatic ecosystems, but also social aspects, as the local community are likely to derive benefits from a healthy ecosystem. Consequence descriptors have been provided on a scale of 1 to 5, where 1 represents little or no impact and 5 represent an extreme impact. The consequence descriptors used to assess the potential impact for each possible risk are provided in Table 3.

The consequence descriptor provides an indication of the specific impact at the study site, taking into consideration existing background conditions. Consequence scores consider the potential extent (spatial) and severity (duration and magnitude) of the possible effects caused by the stressors, if the effect were to occur. Application of the consequence descriptors is guided by the

previous information generated for the farm, and additional information reviewed to provide guidance on the condition, values and beneficial uses within the site and also the broader area.

## 2.2.2 Risk calculation

The level of risk is calculated based upon the chance (or probability) of the threat occurring and causing harm or loss. Risk is estimated from the likelihood and consequence of the threat. The matrix below (Table 1) was used to calculate the risk for each combination. It is calibrated prior to use based on context to ensure that various threat/consequence combinations give a risk that is sensible for the project.

Table 1 Likelihood risk criteria

Likelihood of impact		
	Level	Frequency
<b>A</b>	<b>Certain</b>	Will occur as a result of the construction &/or operations.
<b>B</b>	<b>Almost Certain</b>	Very likely to occur during the life of the proposed construction and operation period.
<b>C</b>	<b>Likely</b>	Likely to occur more than once during the life of the proposed construction and operation period.
<b>D</b>	<b>Unlikely</b>	Unlikely to occur within the life of the Project or duration of construction and operation.
<b>E</b>	<b>Rare</b>	To rarely occur but theoretically possible

Table 2 Risk matrix

<b>Likelihood</b>	<b>A</b>	<b>M</b>	<b>H</b>	<b>VH</b>	<b>VH</b>	<b>VH</b>
	<b>B</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>VH</b>	<b>VH</b>
	<b>C</b>	<b>L</b>	<b>M</b>	<b>M</b>	<b>H</b>	<b>H</b>
	<b>D</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>M</b>	<b>M</b>
	<b>E</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Consequence</b>						
	<b>VH</b>	<b>Very High Risk</b>				
	<b>H</b>	<b>High Risk</b>				
	<b>M</b>	<b>Medium Risk</b>				
	<b>L</b>	<b>Low Risk</b>				

Table 3 Consequence descriptors determining the risks of impacts to values

CONSEQUENCE LEVEL		Negligible	Minor	Moderate	Major	Extreme
		Minimal, if any impact for some communities. Potentially some impact for a small number (<10) of individuals.	Low level impact for some communities, or high impact for a small number (<10) of individuals.	High level of impact for some communities, or moderate impact for communities area-wide.	High level of impact for communities area-wide.	High level of impact.
		Very localised scale	Zone of influence is tens of metres or more than one habitat	Zone of influence is several kilometres or multiple habitats	Zone of influence is several kilometres and more than one habitat	Zone of influence is several kilometres and more than one habitat
		1	2	3	4	5
Environmental	Habitat, communities and / or assemblages	Alteration or disturbance to habitat within natural variability. Less than 5% of the area of habitat affected or removed.	5-10% of the area of habitat affected in a major way or removed	10 to 30% of the area of habitat affected in a major way or removed.	30 to 70% of the area of habitat affected in a major way or removed.	Greater than 70% of the area of habitat affected in a major way or removed.
	Species and / or groups of species (including protected species)	Less than 5% impact on abundance No detectable change in abundance	5-10% impact on abundance Detectable change in abundance but no effect on viability	10-30% impact on abundance - Obvious change in abundance and detectable change in viability	30-70% impact on abundance Obvious change in abundance and in viability	>70% impact on abundance Major change in abundance and in viability
Social	Amenity - Sensory / Perception (visual, noise, odour).	Small area impacts that alter perception of area as a place to visit. Region still seen as attractive place to visit.	Localised impacts that alter perception of area as a place to visit. Region not locally seen as attractive place to visit.	Regional impacts that alter perception of area as place to visit. Region not widely seen as attractive place to live.	Community perception that the area is significantly damaged.	Community perception that the area has experienced major damage and is a place to be avoided. .
	Amenity – Access, Recreation	Limited interruptions in accessibility and recreational use	Activities restricted in a localised area.	Restriction on whole or parts of communities to accessibility and pursue personal recreational pursuits when visiting the area.	Long term inability for whole communities to accessibility and pursue personal recreational pursuits when visiting the area	Long-term inability for the general community to accessibility and pursue personal recreational pursuits when visiting the area
	Aboriginal Heritage	No measureable change in existing natural and human processes impacting on Aboriginal heritage sites	Partial and localised impact on one or more Aboriginal heritage sites.	Substantial damage / destruction / removal of a single site.	Complete destruction / removal of multiple sites in a localised area.	Complete destruction / removal of sites across multiple areas.
Economic	Commercial fishing and agriculture	No detectable change in activity. Limited impacts localised and not area wide. No significant impact on regional businesses.	Minimal reduction in activity.	Significant reduction (5-30%) in aquaculture capacity.	Permanent significant reduction (30-90%) in sustainable yield of the fishery and / or agriculture industry. Impact area wide.	Commercial fishing and agriculture completely and permanently prohibited or destroyed across the whole area.
	Tourism	Limited and short term reduction in tourist visitation. Limited impacts localised and not area wide. No significant impact on tourism businesses. Region still seen as attractive place to visit.	Short term reduction in tourism use. Recovery in less than 1 year.	Substantial reduction in tourism use. Recovery in 2-10 years.	Permanent reduction in visitation with changes in character of visitors. Impact area wide. Business viability compromised across wide range of sectors with substantial business failure in both	Permanent loss of icon tourism assets of national significance. Significant flow on affects to supporting businesses.

		Negligible	Minor	Moderate	Major	Extreme
CONSEQUENCE LEVEL		Minimal, if any impact for some communities. Potentially some impact for a small number (<10) of individuals.	Low level impact for some communities, or high impact for a small number (<10) of individuals.	High level of impact for some communities, or moderate impact for communities area-wide.	High level of impact for communities area-wide.	High level of impact.
		Very localised scale	Zone of influence is tens of metres or more than one habitat	Zone of influence is several kilometres or multiple habitats	Zone of influence is several kilometres and more than one habitat	Zone of influence is several kilometres and more than one habitat
		1	2	3	4	5
					direct and flow on sectors. Impact noticed on region.	

## 3. Context of the risk assessment

### 3.1 Introduction

This section provides an overview of the extent of the project area. This section also describes the key design, construction and operational assumptions, including project duration, upon which the risk assessment is based. Finally this section provides a description of the environmental context within which the risk assessment was undertaken.

### 3.2 Project Area

The proposed aquaculture farm will be located at Lot 1 and 8 315 Dutton Way Bolwarra. This site has been selected because it has a similar low pumping head as Yumbah's Narrawong site, meaning its current energy costs per kilogram of abalone produced are one third of that of alternative farms in South Australia and Tasmania. The low-lying land is protected by a rock armour seawall providing significant mitigation of risk from future impacts such as the rising sea level.

### 3.3 Extent of study area

The risk assessment considers the study area assessed for each technical study detailed further in the Works Approval application. The study area considers the zone of influence within which impacts could occur.

For example, for the purpose of the landscape and visual impact assessment, the study area is considered to be the area within 500 metres of the proposed infrastructure. Beyond this area, it is anticipated that the combined effects of distance, intervening landform, built form and vegetation will combine to render landscape and visual effects negligible.

### 3.4 Project design

The proposal is to establish a new abalone farm in Dutton Way, approximately 6 km from Portland in an area called Bolwarra, on Victoria's south-west coast. The land-based aquaculture facility will be designed to have a capacity to grow 1000 tonnes of abalone per annum doubling the value of Victoria's aquaculture production.

The farm is intended to be developed on 63 hectares of land currently used for rural grazing which is zoned Rural Living Zone (RLZ) in accordance with the Glenelg Shire Council planning scheme.

### 3.4.1 Project construction

The key construction activities for the aquaculture farm include:

- site establishment including:
  - clearing of vegetation and ground levelling
  - demolition of existing buildings and structures
  - establishment of site fencing, staff facilities and temporary construction areas
- protection and/or relocation of utility services
- excavation for piling, foundations, drains, lagoons and pipelines
- construction of coastal seawalls at the four easements
- on site waste management including removal, management and appropriate disposal of excavated soil, rock, stormwater and groundwater
- transport of spoil and excavated material offsite
- construction of roadways and carparking areas
- erection of abalone nursery, hatchery and grow out sheds
- installation of solar panels, including connection to the existing electricity grid
- landscaping and site clean up.
- Dutton Way will be periodically closed to allow for the subsurface installation of the intake and outlet pipes. There will be approximately twenty intake pipes laid below ground, extending 400 m offshore.

### 3.4.2 Routine Operation

The new farm proposed in Dutton Way will be established with similar infrastructure successfully in operation in Yumbah Narrawong. Seawater will be pumped ashore, direct from Portland Bay to support the abalone farm.

The proposed Yumbah Nyamat project will be developed on 63 hectares of rural land and will feature the following:

- Breeding and hatchery facilities
- Growout sheds, divided into four sections totalling 181,655 m<sup>2</sup>
- Seawater in-flow and outflow pipelines
- Pump station divided into four sections, each section with five pumps and a backup generator, and workshop
- Sediment collection channels and recirculation lagoons
- Stormwater retention pond
- Staff amenities and administration offices, including car parking
- Pip retrieval station
- Aquafeed storage
- Abalone mortality and storage facility
- Workshop and storage sheds
- Ancillary solar system
- Emergency pump house
- Diesel fuel storage

## 4. Results of Yumbah Nyamat Environmental Risk Assessment

The environmental risk assessment completed for the proposed Yumbah Nyamat abalone farm confirmed that there are a number of risks associated with both the construction and operation of the farm. The application of best practice to both construction and operation contributes to ensuring that the potential environmental impacts are prevented or minimised, as far as practicable.

As identified by the risk assessment and outlined in the risk register, presented as Appendix A of this document, there are a range of risks that may occur if adequate and effective mitigation is not applied to reduce or eliminate risks. The risk assessment identified potential risks to the environment, predominantly associated with the construction and operation of the abalone farm. These risks include both site specific and also generic risks standard to abalone farming.

### 4.2 Design

A total of six risks were identified for the design of Yumbah Nyamat. These were based on timelines, budget, site works and pre-mobilisation. The design of Yumbah Nyamat has been an intensive process and will continue until the site has been fully established. Adequate mitigation will be a high priority to ensure the project achieves best practice to minimise or eliminate risk.

### 4.3 Construction

A total of 56 risks were identified for Yumbah Nyamat that relate to the construction of the project. These risks are concentrated on the following:

- Surface water, including stormwater, onsite water and marine waters,
- Land and groundwater management including impact from trenching/drilling, acid sulfate soils, fuel and chemical spills, and dewatering
- Coastal Crown land, including seawall and intertidal area
- Terrestrial ecology, including disturbing vegetation, habitat loss on and off site
- Cultural heritage, including disturbance to registered and uncovered sites
- Marine ecology, including protected fauna, pipe placement
- Air quality, including noise, dust and vibration
- Traffic, including traffic volumes and disturbance to roads
- Social, including amenity, potential disruption and accessibility
- Project timelines, including peak visitor periods

## 4.3 Operation

The operation of the Yumbah Nyamat contributed the largest number of risks with 104 identified. These are largely focussed on the standard operating practices associated with farming abalone. These risks concentrated on the following:

- Abalone cultivation, including broodstock, water supply and temperature, grow out modules and abalone feed
- Crown land, including seawall integrity, landscaping, sea level rise and erosion
- Biosecurity and disease, including disease outbreaks
- Seawater supply, including pumping power, biofouling, seabed
- Marine environment, including marine animals, pipes and discharge water quality
- Wastewater treatment, including drains and settlement chambers
- Power, including supply
- Air quality, including odour
- Stormwater, including capacity
- Amenity, including traffic and noise

## 5. Conclusion

All the risks identified can be managed by implementing appropriate mitigation measures, and adequate procedures and practices in all aspects of Yumbah Nyamat. A Construction Environmental Management Plan will be developed prior to the works commencing on site, to the satisfaction of the approving agencies. Once the abalone farm is operational, Yumbah will have a number of strategies and procedures that will be applied to ensure all operational risks are minimised and/or avoided.

Best practice and a system of continuous improvement will be at the forefront of all of Yumbah Nyamat's activities including the construction of the proposed abalone farm and operation. The extent, magnitude and duration of impact associated with Yumbah Nyamat will be assessed on an ongoing basis to identify and minimise potential, perceived or actual risks.

## Appendix A – Yambah Nyamat Risk Register

Project Phase	Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
<b>Design</b>	Timelines	Design	Conceptual design of the project does not meet relevant criterion for approval	Economic	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Relevant reviews and cross checks are completed for all engineering plans and designs. Plans are submitted with environment and planning approvals for review	Moderate	Rare	ModerateRare	LOW
	Timelines	Approvals	Delay in gaining relevant approvals to commence work	Economic	Major	Likely	MajorLikely	HIGH	Yumbah maintains regular contact with approval agencies to understand internal timelines and potential constraints to processing approvals	Major	Likely	MajorLikely	HIGH
	Budget	Financial funding	Funding for project is delayed	Economic	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Project is being constructed in stages. This will provide the conduit for funding to be released and allocated in line with the stages of development.	Major	Unlikely	MajorUnlikely	MEDIUM
	Site works	Contractors	Contractors are not available to commence project work at relevant times	Economic	Moderate	Likely	ModerateLikely	MEDIUM	Tentatively book contractors to commence project construction, once approvals are submitted. Maintain regular contact with the approvals agencies once applications are submitted to understand progress, hurdles, impediments to approvals being issued	Major	Unlikely	MajorUnlikely	MEDIUM
	Pre-mobilisation	Site personal responsible for construction	Site contractors are not aware of their responsibilities in accordance with the planning and environment approvals	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	Ensure all contracting firms and contractors are familiar with their obligations, responsibilities and requirements while working on site. All work must be conducted in accordance with the CEMP	Moderate	Unlikely	ModerateUnlikely	MEDIUM
	Pre-mobilisation	Site personal responsible for construction	Site contractors do not have adequate skills or training	Economic	Major	Likely	MajorLikely	HIGH	All tickets, training, and certification relevant for contractor activities on site must be submitted to the site superintendent.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
<b>Construction</b>	Surface water	Earthworks and stockpiling on site	Sediment discharge to waterways resulting from soil erosion or spoil from earthworks, impacting on surface water ecosystems	Environment	Minor	Likely	MinorLikely	MEDIUM	Sediment and erosion controls will be put in place around stockpiles and construction areas until the completion of works. The controls will be put in place prior to commencement of works.	Minor	Unlikely	MinorUnlikely	LOW
	Surface water	Stormwater run off during offsite construction	Discharge of runoff to surrounding waterways, particularly Portland Bay impacting on surface water quality and ecosystems	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Offsite construction works will be undertaken to minimise disturbance. Controls will be put in place to limit sediment movement from the disturbance area.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
	Surface water	Stormwater run off during onsite construction	Discharge of runoff into onsite stormwater drains impacts adjacent properties	Environment	Minor	Likely	MinorLikely	MEDIUM	Sediment and erosion controls will be put in place around all exposed areas during construction at the construction perimeter and kept in place until soil is stabilised.	Minor	Unlikely	MinorUnlikely	LOW
	Surface water	Stormwater run off during onsite construction	Turbidity reduces light penetration through the water column, affecting seagrass, algae and plankton growth rates. Can smother seagrass and algae.	Environment	Minor	Likely	MinorLikely	MEDIUM	Sediment and erosion controls will be put in place around all exposed areas during construction at the construction perimeter and kept in place until soil is stabilised and the work site is reinstated.	Minor	Unlikely	MinorUnlikely	LOW
	Surface water	Onsite Storage of fuels, oils or chemicals	Significant rainfall event mobilises fuel/chemical/contaminated sediment impacting on surface water ecosystems	Environment	Minor	Likely	MinorLikely	MEDIUM	Spill kits will be available on site during construction. Fuels and chemicals stored on site will be contained in bunded areas and volumes will be kept to a minimal. Areas of construction in the vicinity of sensitive surface water ecosystems will be silt fenced and zone of impact will be minimised.	Minor	Unlikely	MinorUnlikely	LOW
	Surface water	Inline drilling	Drilling to establish pipe infrastructure creates drilling mud, cutting and contaminated materials that may run off into Portland Bay resulting in sedimentation and/or water pollution	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Drilling methods will be applied that remove sediment from the landward side of drilling activities. Qualified and experienced contractors, with a proven track record, will be engaged to complete the works.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
	Seabed	Pipe construction	Placement of pipes in marine environment damages seabed	Environment	Moderate	Certain	ModerateCertain	HIGH	Pipes will be placed carefully to minimise disturbance to seabed. Suitably qualified and experienced contractors will be engaged to install the network of pipe. On water works will be kept to a minimum, and will be completed in a controlled manner. Weather and coastal conditions will be monitored prior to works commencing and during works.	Moderate	Likely	ModerateLikely	MEDIUM
	Surface water	Pipe construction	Physical impact and/or disturbance to finfish during onwater works	Environment	Minor	Almost Certain	MinorAlmost Certain	MEDIUM	Activity will be minimised while installing pipes to limit disturbance to the marine environment.	Minor	Likely	MinorLikely	MEDIUM
	Surface water	Pipe construction	Establishing pipe infrastructure in marine environment resulting in loss of habitat, disruption to fish movement (up or down stream), excessive sand displacement due to increased / altered water movement	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	Pipes will be put in place with minimal movement and to minimise disturbance to seabed. The seabed has been exposed to significant changes in coastal processes over the years. The seabed has been adaptive to significant sand movements and hydrodynamic changes.	Moderate	Likely	ModerateLikely	MEDIUM
	Land & groundwater management	Hazardous materials	Significant rainfall event mobilising fuel/chemical/contaminated sediment impacting on terrestrial ecosystems	Environment	Minor	Almost Certain	MinorAlmost Certain	MEDIUM	Fuels and chemical storage will be minimised on site. In the event that storage is required, storage will be within bunds to reduce the chance of rainfall washing residue into waterways	Minor	Likely	MinorLikely	MEDIUM
	Land & groundwater management	Stormwater run off during onsite construction	Discharge of runoff into onsite stormwater drains impacting adjacent properties	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	Stormwater runoff from construction areas will be channelled into onsite drains and will not exit the site in an uncontrolled manner	Moderate	Unlikely	ModerateUnlikely	MEDIUM
	Land & groundwater management	Inline drilling	Inline drilling to establish pipe infrastructure creates drilling mud, cutting and contaminated materials that may run off into adjacent properties resulting in land pollution	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	The construction program will be created, that will outline a schedule for each phase of work. Construction activities to install the infrastructure adjacent to adjoining properties will be conducted with adequate erosion and sediment control methods. Activities proposed off site will be completed with a quick turnaround. Equipment chosen to complete the works on or adjacent to the adjoining properties will be fit for purpose.	Moderate	Likely	ModerateLikely	MEDIUM
	Land & groundwater management	Borehole Drilling, Inline Drilling, Excavation and Earthworks	Strike unknown service (water main / sewer / gas pipe) resulting in release of substance	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Location of services and utilities will be confirmed across the entire construction area prior to any works commencing.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
	Land & groundwater management	Borehole Drilling, Inline Drilling, Excavation and Earthworks	Sides of trenches collapse	Social - Health and Safety	Negligible	Certain	NegligibleCertain	MEDIUM	Work areas that require deep excavation will be managed by appropriately qualified site personnel	Moderate	Likely	ModerateLikely	MEDIUM
Land & groundwater management	Waste management	Contaminated spoil uncovered during construction	Environment	Minor	Unlikely	MinorUnlikely	LOW	Visual and aesthetic characteristics of contaminated soils will be communicated to site personnel involved in stripping and excavation to facilitate identification of contamination. Soil stockpiles will be located away from watercourse and drains, and will be bunded.	Minor	Unlikely	MinorUnlikely	LOW	

Construction

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Land & groundwater management	Earthworks	Disruption of utilities/services	Social - Amenity	Moderate	Certain	ModerateCertain	HIGH	Services and utilities will be disrupted in isolated instances in order to connect the site to necessary infrastructure. The construction program will be created, that will outline a schedule for each phase of work. Utilities disruption will be scheduled to avoid peak seasons. Impacted community will be contacted in advance of works commencing to advise of any impacts and timing.	Major	Unlikely	MajorUnlikely	MEDIUM
Land & groundwater management	Refuelling, Onsite Storage of fuels, oils or chemicals	Fuel spill resulting in ground or water pollution or environmental harm	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Large volumes of fuels will not be stored on site. Any storage will be within a bunded area. Spill kits will be available on machinery and in designated, easily accessible areas across the construction site in the event of spills and leaks	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Land & groundwater management	Dewatering	Groundwater dewatering liquid may be turbid and contain dissolved contaminants.	Environment	Minor	Likely	MinorLikely	MEDIUM	Dewatered groundwater will not be discharged directly to sensitive surface water bodies and will be directed to on site drainage and sediment ponds prior to discharge off site. Groundwater reuse will be considered in beneficial purposes such as dust suppression	Minor	Unlikely	MinorUnlikely	LOW
Land & groundwater management	Dewatering	Large volumes of groundwater requires dewatering	Environment	Minor	Certain	MinorCertain	MEDIUM	Dewatered groundwater will be required in areas of deep excavation. Groundwater will not be discharged directly to sensitive surface water bodies and will be directed to on site drainage and sediment ponds prior to discharge off site. Groundwater reuse will be considered in beneficial purposes such as dust suppression	Minor	Certain	MinorCertain	MEDIUM
Land & groundwater management	Groundwater	Spills and leaks of chemicals result in impacts to groundwater quality	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Bulk storage of fuels and chemicals is to be avoided on site where possible. Where bulk storage of fuels and chemicals does occur, it must be in a bunded area. Spill kits will be available on machinery and in designated, easily accessible areas across the construction site in the event of spills and leaks	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Coastal crown land	Removal of existing seawall	Excess seawall debris stockpiled on coastal crown land, creating hazard for public land users	Social - Health and Safety	Moderate	Certain	ModerateCertain	HIGH	The zone of impact during foreshore works will be minimised. The CEMP will outline areas for stockpiling material. The extent of works to the seawall will be minimised to reduce potential environmental and safety hazards. Material removed from the existing seawall will be reused for reconstruction	Moderate	Likely	ModerateLikely	MEDIUM
Coastal crown land	Removal of existing seawall	Removal of existing seawall causes instability and/or collapse in areas beyond zone of works	Environment	Major	Likely	MajorLikely	HIGH	The construction program will be created, that will outline a schedule for each phase of work including demolition and reconstruction of the seawall. Intensive impact activities will be scheduled to avoid peak seasons. Large sections of the seawall will not be removed at once, small sections will be removed as the pipeline easements are created. Weather and coastal conditions will be closely monitored to ensure conditions are favourable for seawall removal, and erosion of exposed banks is avoided.	Major	Unlikely	MajorUnlikely	MEDIUM
Coastal crown land	Borehole Drilling, Inline Drilling, Excavation and Earthworks	Construction activities to remove the sea wall cause slope instability and/or collapse of excavation and impact marine surface water quality	Environment	Moderate	Likely	ModerateLikely	MEDIUM	The zone of impact during foreshore works will be minimised. The CEMP will outline the staged seawall construction activities. The extent of works to the seawall will be minimised to reduce potential environmental and safety hazards. Silt curtains and floating booms will be placed in the marine waters around the zone of impact to reduced extent of impact to marine waters	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Terrestrial ecology	Earthworks	Introduction and spread of weed species from construction vehicles and machinery on site	Environment	Minor	Likely	MinorLikely	MEDIUM	The construction EMP will outline the weed management procedures to control the spread of weeds. The weed management principles will consider the CALP Act. All plant, vehicles and equipment that are involved in the stripping, handling or contact with external soils will be wash downed between sites	Minor	Unlikely	MinorUnlikely	LOW
Terrestrial ecology	Earthworks	Spread of existing weeds off-site	Environment	Minor	Likely	MinorLikely	MEDIUM	The construction EMP will outline the weed management procedures to control the spread of weeds. The weed management principles will consider weeds and invasive animals declared under the CALP Act, as a minimum.	Minor	Unlikely	MinorUnlikely	LOW
Terrestrial ecology	Earthworks	Inadvertent injury to threatened terrestrial flora and fauna.	Environment	Minor	Likely	MinorLikely	MEDIUM	A detailed assessment has been completed to understand the extent of terrestrial flora and fauna that may be present in the construction area. Vegetation to be removed will be in accordance with a planning permit and offsets have been approved by DELWP. There have been no registered siting's of threatened terrestrial fauna. The zone of influence will be minimised in the area of construction.	Minor	Unlikely	MinorUnlikely	LOW
Terrestrial ecology	Earthworks	Habitat loss on the crown land foreshore area	Environment	Minor	Certain	MinorCertain	MEDIUM	A detailed assessment has been completed to understand the extent of terrestrial flora and fauna that may be present in the construction area. Vegetation in the foreshore coastal crown land has been identified as modified and degraded, and is unlikely to provide significant habitat for fauna. The foreshore area will be reinstated in accordance with a landscape plan at the completion of easement construction.	Minor	Certain	MinorCertain	MEDIUM
Terrestrial ecology	Earthworks	Inadvertent destruction of threatened terrestrial flora and fauna	Environment	Minor	Unlikely	MinorUnlikely	LOW	A detailed assessment has been completed to understand the extent of terrestrial flora and fauna that may be present in the construction area. Vegetation to be removed will be in accordance with a planning permit and offsets have been approved by DELWP. There have been no registered siting's of threatened terrestrial fauna. The zone of influence will be minimised in the area of construction. The Latham's Snipe (near threatened in Victoria) has been sighted in and around the site. The CEMP will outline management actions to protect fauna from inadvertent injury or death during construction.	Negligible	Unlikely	NegligibleUnlikely	LOW

Construction

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Aboriginal cultural heritage	Earthworks	Disturbing registered cultural heritage sites, resulting in loss of heritage value	Social - Heritage	Major	Certain	MajorCertain	CRITICAL	A number of assessments at the site have been completed by qualified archaeologists and a number of cultural heritage have been identified. It is unlikely that any further significant heritage will be found. The CHMP outlines appropriate methods that need to be adhered to in the case that further heritage items are found. An approved salvage operation will provide for the removal and protection of identified cultural heritage	Moderate	Likely	ModerateLikely	MEDIUM
Aboriginal cultural heritage	Earthworks	Disturbing cultural heritage sites not previously registered, resulting in loss of heritage value	Social - Heritage	Major	Likely	MajorLikely	HIGH	A number of assessments at the site have been completed by qualified archaeologists and a number of cultural heritage have been identified. It is unlikely that any further significant heritage will be found. The CHMP outlines appropriate methods that need to be adhered to in the case that further heritage items are found. An approved salvage operation will provide for the removal and protection of identified cultural heritage	Major	Unlikely	MajorUnlikely	MEDIUM
Marine ecology	Pipe construction	Increased turbidity in the marine environment due to onwater works, e.g. Prop wash, pipes being laid, placement of concrete weights	Environment	Minor	Likely	MinorLikely	MEDIUM	The seabed will be impacted in localised areas along the intake and discharge pipe alignments. The zone of impact will be minimised to ensure turbidity is not reduced across a wide area.	Minor	Likely	MinorLikely	MEDIUM
Marine ecology	Pipe construction	Placement of pipes in marine environment damages seabed and results in disturbance to seabed ecology	Environment	Moderate	Certain	ModerateCertain	HIGH	The seabed will be impacted in localised areas along the intake and discharge pipe alignments. The zone of impact will be minimised to ensure the seabed is not impacted outside the intended pipe alignments.	Minor	Certain	MinorCertain	MEDIUM
Marine ecology	Pipe construction	Impact to protected pelagic species, e.g. Ghost shrimps, syngathids, during construction and installation of the intake and discharge pipes.	Environment	Minor	Likely	MinorLikely	MEDIUM	The zone of impact during marine works will be minimised to reduce the potential disturbance to marine ecology. Once construction techniques are confirmed the extent of impact appropriate mitigation will be better understood	Minor	Likely	MinorLikely	MEDIUM
Marine ecology	Pipe construction	Physical impact and/or disturbance to cetaceans during onwater works	Environment	Major	Likely	MajorLikely	HIGH	On water activities to install the marine infrastructure will be completed outside of the period (July - September) when cetaceans frequent Portland Bay. Pipes will be put in place in locations to minimise disturbance to seabed. On water works will be kept to a minimum, and will be completed in a controlled manner. Weather and coastal conditions will be monitored prior to works commencing and during works.	Major	Unlikely	MajorUnlikely	MEDIUM
Marine ecology	Pipe construction	Physical impact and/or disturbance from works i.e. vessels, laying of pipes, to pelagic marine species, i.e., penguins, fish, seals, dolphins during onwater works	Environment	Minor	Likely	MinorLikely	MEDIUM	On water activities to install the marine infrastructure will be completed in a short period. On water works will be kept to a minimum, and will be completed in a controlled manner by qualified and experienced contractors. The work area will be regularly surveyed prior to works to ensure marine animals are not in the area.	Major	Unlikely	MajorUnlikely	MEDIUM
Marine ecology	Drilling, excavation and earthworks	Disturbance to seabed during trenching and drilling, and construction of seawall will impact benthic biota	Environment	Minor	Certain	MinorCertain	MEDIUM	The seabed will be impacted in localised areas along the intake and discharge pipe alignments. The zone of impact will be minimised to ensure the seabed is not impacted outside the intended pipe alignments.	Minor	Almost Certain	MinorAlmost Certain	MEDIUM
Marine ecology	Vibration	Disturbance to aquatic fauna, particularly mammals, i.e.. Whales, seals, dolphins during marine works, particularly trenching or drilling in the foreshore land and reconstruction of the seawall	Environment	Minor	Likely	MinorLikely	MEDIUM	The construction program will be created, that will outline a schedule for each phase of work. Construction activities to install the foreshore and marine infrastructure will be completed outside of known periods where mammals frequent the area. Activities proposed off site will be completed with a quick turnaround. Equipment chosen to complete the works on or adjacent to the marine environment will be fit for purpose.	Minor	Certain	MinorCertain	MEDIUM
Waste	Waste management	Potential for poor recycling practices and inappropriate disposal of resources during construction.	Environment	Moderate	Certain	ModerateCertain	HIGH	All rubbish generated on site during construction will be disposed of and stored in a lidded bin, to avoid waste material escaping. Appropriate waste bins will be available on site to dispose of the various waste streams created during construction	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Waste	Waste management	Litter from construction activities and personnel (plastic, cigarette butts, paper, off-cuts, hazardous chemicals) entering waterways or offsite land	Environment	Minor	Almost Certain	MinorAlmost Certain	MEDIUM	All rubbish generated on site during construction will be disposed of and stored in a lidded bin, to avoid waste material escaping. Site litter will be managed and there will not be any litter existing the site.	Minor	Unlikely	MinorUnlikely	LOW
Waste	Acid sulphate soils	Potential acid sulphate soils are unearthed during excavation and require stockpiling on site	Environment	Minor	Likely	MinorLikely	MEDIUM	Soil stockpiles will be located away from watercourse and drains, and will be banded. Visual and aesthetic characteristics of Potential acid sulphate soil (PASS) will be communicated to site personal involved in stripping and excavation to facilitate identification of PASS. PASS will be managed in accordance with EPA guidelines.	Moderate	Likely	ModerateLikely	MEDIUM
Air Quality	Earthworks	Day-time noise during construction causes increase to existing noise levels resulting in a loss of amenity at sensitive receptors.	Social - Amenity	Moderate	Certain	ModerateCertain	HIGH	The construction program will be created, that will outline a schedule and proposed work methods for each phase of project. Activities that will result in excessive noise at sensitive receptors, and will occur directly adjacent to neighbouring properties will be concentrated to occur during periods of the day to reduce impact. Plant and equipment will be fitted with noise attenuating fittings. Construction activities directly adjacent to neighbouring properties will be concentrated into short timeframes, and will not occur for extended periods of time, i.e.. months, along property boundaries	Moderate	Almost Certain	ModerateAlmost Certain	HIGH
Air Quality	Earthworks	Night-time noise during construction exceeds limits causing loss of amenity at sensitive receptors.	Social - Amenity	Moderate	Unlikely	ModerateUnlikely	MEDIUM	The construction program will be created, that will outline a schedule and proposed work methods for each phase of project. night time construction will not be scheduled unless necessary and prior approval has been granted by Council and or EPA. Any night time construction will be communicated to the local community in advance in the event that night-time activity is required.	Minor	Unlikely	MinorUnlikely	LOW

**Construction**

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Air Quality	Earthworks	Noise and vibration from the excavation machinery result in loss of amenity to local residents	Social - Amenity	Moderate	Almost Certain	Moderate/Almost Certain	HIGH	The construction program will be created, that will outline a schedule and proposed work methods for each phase of project. Activities that will result in noise and vibration impacts to sensitive receptors, and are to occur directly adjacent to neighbouring properties will be concentrated to occur during periods of the day when impact is minimal. Plant and equipment will be fitted with noise attenuating fittings.	Moderate	Likely	Moderate/Likely	MEDIUM
Air Quality	Plant operation	Consumption of fossil fuel / carbon based energy resulting in greenhouse gas and other emissions	Environment	Minor	Certain	Minor/Certain	MEDIUM	Construction EMP will be developed that will include all activities to minimise impact and reduce risk	Minor	Certain	Minor/Certain	MEDIUM
Traffic	Pipeline construction	Construction reduces road capacity and/or increase traffic volumes resulting in delays and increased travel time during the pipeline installations	Social - Amenity	Moderate	Almost Certain	Moderate/Almost Certain	HIGH	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons and will be staged to minimise traffic restrictions. In the event that Dutton Way requires demolition, the options to construct as alternative temporary access road will be considered. Activities proposed off site will be completed with a quick turnaround.	Moderate	Likely	Moderate/Likely	MEDIUM
Traffic	Pipeline construction	Demolition of the asphalt along sections of Dutton Way to install intake and discharge pipes decreases accessibility and results in delays and increased travel time	Social - Amenity	Moderate	Certain	Moderate/Certain	HIGH	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons and will be staged to minimise traffic restrictions. In the event that Dutton Way requires demolition, the options to construct as alternative temporary access road will be considered. Activities proposed off site will be completed with a quick turnaround.	Minor	Likely	Minor/Likely	MEDIUM
Traffic	Earthworks	Plant deposit construction debris on Dutton Way, leading to dust generation and perceived loss of amenity and public health and safety issues	Social - Amenity	Minor	Likely	Minor/Likely	MEDIUM	Impacted community will be contacted if work is to occur during peak visitor periods. All work during peak periods will be avoided to the maximum extent possible.	Minor	Unlikely	Minor/Unlikely	LOW
Traffic	Vehicle movements	Increased traffic entering and exiting Dutton Way during construction.	Social - Amenity	Moderate	Certain	Moderate/Certain	HIGH	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons and times during the day when peak traffic movements occur along Dutton Way, to the maximum extent practicable. Activities proposed off site will be completed with a quick turnaround. Local residents will be notified prior to intensified construction activities that could impact local traffic.	Moderate	Likely	Moderate/Likely	MEDIUM
Traffic	Boating	Disruption to recreational boats/vessels during on water activity to install marine infrastructure	Social - Amenity	Minor	Likely	Minor/Likely	MEDIUM	Impacted community will be contacted if work is to occur during peak visitor periods. Works on water will be minimised to the maximum extent possible and will be concentrated to occur outside of peak periods.	Minor	Unlikely	Minor/Unlikely	LOW
Social	Tourism	Loss of amenity and impact to tourists and visitors to caravan parks and holiday homes	Social - Amenity	Moderate	Certain	Moderate/Certain	HIGH	Marine infrastructure installed, i.e.. Pipes, will not be obvious and will be placed sub surface in terrestrial alignments and beneath sea level in the marine environment. Pipes will extend >100 m offshore and will not be obvious at the surface. The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons. Activities proposed off site will be completed with a quick turnaround. Impacted community will be contacted if work is to occur during peak visitor periods. All work during peak periods will be avoided to the maximum extent possible.	Moderate	Unlikely	Moderate/Unlikely	MEDIUM
Social	Access	Members of the public accessing the site (unauthorised) during construction activities and injuring themselves	Social - Health and Safety	Moderate	Likely	Moderate/Likely	MEDIUM	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons. Activities proposed off site will be completed with a quick turnaround. Impacted community will be contacted in advance of works commencing to advise of any impacts. The impacted areas will have restricted site access for the duration of the works and will be appropriately signed. Work areas will be securely fenced and signed, advising of restricted access. Trenches will not be left open for extended periods.	Moderate	Likely	Moderate/Likely	MEDIUM
Social	Lack of amenity	Community perception of degraded environment and lack of amenity during construction	Social - Amenity	Moderate	Certain	Moderate/Certain	HIGH	Community will be advised of periods of work, and proposed construction activities in advance of work commencing. Intrusive offsite works will be avoided during peak holiday periods. The impacted areas will be reinstated with vegetation and in accordance with a landscape plan. A CEMP will outline the work practices, particularly programs to minimise impacts to the range of sensitive receptors	Moderate	Likely	Moderate/Likely	MEDIUM
Social	Access	Members of the public are not able to access the surrounding area during construction, particularly in the foreshore Crown land	Social - Health and Safety	Moderate	Certain	Moderate/Certain	HIGH	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons. Activities proposed off site will be completed with a quick turnaround. Impacted community will be contacted in advance for works commencing to advise this of the impacts. The impacted areas will have restricted site access for the duration of the works and will be appropriately signed.	Minor	Certain	Minor/Certain	MEDIUM

	Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
<b>Construction</b>	Social	Health and Safety	Construction staff are injured during on site works	Social - Health and Safety	Major	Certain	MajorCertain	<b>CRITICAL</b>	Site workers will be appropriately trained and qualified in their intended work practices. Site meetings will be regularly convened to discuss work practices and potential risks identified. All near misses and incidences will be reported and logged	Major	Unlikely	MajorUnlikely	<b>MEDIUM</b>
	Social	Health and Safety	Construction staff are killed during on site works	Social - Health and Safety	Extreme	Certain	ExtremeCertain	<b>CRITICAL</b>	Site workers will be appropriately trained and qualified in their intended work practices. Site meetings will be regularly convened to discuss work practices and potential risks identified. All near misses and incidences will be reported and logged	Extreme	Rare	ExtremeRare	<b>HIGH</b>
	Project timeline	Economic	Project construction extending into peak visitor periods (Nov to Easter)	Social - Amenity	Major	Likely	MajorLikely	<b>HIGH</b>	The construction program will be created, that will outline a schedule for each phase of work. Intensive impact activities will be scheduled to avoid peak seasons. Activities proposed off site will be completed with a quick turnaround. Impacted community will be contacted if work is to occur during peak visitor periods. All work during peak periods will be avoided to the maximum extent possible.	Major	Likely	MajorLikely	<b>HIGH</b>

Operation

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Broodstock	Hatchery	Unproductive broodstock	Economic	Major	Unlikely	MajorUnlikely	MEDIUM	A large number of broodstock are available on site, in the case where some stock is not spawning. Conditioning of broodstock will prepare them for productivity and optimise their performance	Moderate	Rare	ModerateRare	LOW
Broodstock	Hatchery	Water supply ceases to broodstock tanks	Economic	Moderate	Likely	ModerateLikely	MEDIUM	Broodstock can survive for 24 hr without a constant water supply. There will be a back up water supply to the hatchery in the instance that water is off, or alternatively broodstock will be moved to a section of the farm that has a healthier supply.	Moderate	Rare	ModerateRare	LOW
Health	Hatchery	Temperature of water supply is too hot, creating increased incidence of bacteria	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	System will be designed to effectively regulate temperature. Broodstock will be routinely checked for signs of poor health	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Hatchery	Temperature of water supply is too hot, reducing growth rates	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	System will be designed to effectively regulate temperature. Disease	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Hatchery	Temperature of water supply is too cold	Environment	Minor	Rare	MinorRare	LOW	System will be designed to effectively regulate temperature	Minor	Rare	MinorRare	LOW
Productivity	Hatchery	Water supply to hatchery ceases during spawning season	Environment	Minor	Unlikely	MinorUnlikely	LOW	Hatchery manager is frequently monitoring water supply during spawning and larval rearing.	Minor	Rare	MinorRare	LOW
Productivity	Hatchery	Temperature of water supply is too hot	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Larvae can tolerate wide temp regime, larvae reared in summer and temperature can fluctuate	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Hatchery	Temperature of water supply is too cold	Environment	Moderate	Rare	ModerateUnlikely	MEDIUM	larvae can tolerate wide temp regime, larvae reared in summer and temperature should not get too cold during the rearing season	Moderate	Rare	ModerateUnlikely	MEDIUM
Feed supply	Nursery	Seeding microalgae is unsuccessful	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Extra seed sheets will be available to reseed nursery in the case that seeding is unsuccessful in the first attempt	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Feed supply	Nursery	Microalgae is not growing on the nursery plates	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Frequent fertilisation of tanks is conducted to maintain adequate growth	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Nursery	Microalgae is consumed too quickly	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Maintain appropriate stocking density of juvenile abalone	Moderate	Likely	ModerateLikely	MEDIUM
Productivity	Nursery	Water supply to nursery ceases	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Regular tank checks will be conducted during operational hours. Maintain awareness of farm water alarm during off peak hours.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Nursery	Temperature of water supply is too hot	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Juvenile can tolerate a wide temperature range	Major	Unlikely	MajorUnlikely	MEDIUM
Productivity	Nursery	Temperature of water supply is too cold	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Juvenile can tolerate a wide temperature range	Major	Unlikely	MajorUnlikely	MEDIUM
Water supply	Grow out	Water supply to growout modules ceases	Environment	Major	Likely	MajorLikely	HIGH	Back up generators and back up pumps are on standby at all times, farm alarms are monitored after hours, during normal operational hours staff regularly monitor water fows	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Growout	Temperature of water supply is too cold reducing growth rates	Environment	Minor	Unlikely	MinorUnlikely	LOW	Growth rates of abalone during winter are typically reduced so expectation of reduced growth during colder season	Minor	Unlikely	MinorUnlikely	LOW
Productivity	Growout	Temperature of water supply is too hot	Environment	Major	Likely	MajorLikely	HIGH	Summer mortality is a typical occurrence during warmer months, stocking density is important, feed rates, reducing feed rates and stocking density can reduce summer mortalities	Major	Unlikely	MajorUnlikely	MEDIUM
Productivity	Growout	Air temperature is too hot, causing mortality	Environment	Major	Likely	MajorLikely	HIGH	Air temperature is not the primary concern, water temp is a greater priority. Air temp in Portland is cooler than other locations and the temperate climate makes extreme heat events unlikely. Summer mortality typically occurs during warmer months. Stocking density will be reduced if abalone show signs of temperature stress, feed rates will be changed to reduce bacterial growth. Tipper cleaning will be increased to flush abalone with water	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Productivity	Growout	Air temperature is too hot, impacting staff	Social - Amenity	Major	Likely	MajorLikely	HIGH	Design of growout provides for ventilation to reduce temp in growout, regular breaks for staff, flexible working hours, drinking water stations and staff amenities located around growout modules	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Infrastructure	Growout	Tippers are not effectively flushing the growout tanks	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Tipper design aligned with Narrawong and performance has been optimised. Tippers will be regularly checked for performance	Minor	Unlikely	MinorUnlikely	LOW
Productivity	Growout	Staff are not effectively cleaning the growout tanks	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Appropriate training of staff, awareness of responsibilities, regular monitoring of tanks and staff performance	Minor	Unlikely	MinorUnlikely	LOW
Water supply	Growout	Tanks leak water through the concrete, e.g. Concrete cracking, ground foundation may be compromised through waterlogging impacting tanks in the area	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	Regular monitoring of water in and around tanks, and repairs will be scheduled when tanks are destocked	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Infrastructure	Growout	Shadecloth is damaged	Economic	Negligible	Almost Certain	NegligibleAlmost Certain	MEDIUM	Regular checks of shadecloth integrity during shifts, repairing minor damage to prevent major damage	Negligible	Likely	NegligibleLikely	LOW
Feed supply	Growout	Abalone are overfed, resulting in excess feed promoting bacteria and reduced water quality	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Abalone are deliberately overfed to ensure adequate food consumption. Growout tanks will be effectively cleaned by tippers every morning during summer and every second morning during cooler months	Negligible	Likely	NegligibleLikely	LOW
Feed supply	Growout	Abalone are underfed, resulting in reduced growth rates	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Staff will be adequately trained on feeding practices, tanks will be monitored for left over feed and feeding rates will be adjusted to overfeed rather than underfeed	Moderate	Rare	ModerateRare	LOW
Feed supply	Growout	Aquafeed is unavailable	Environment	Major	Likely	MajorLikely	HIGH	Feed on site will not be permitted to run out, regular communication of staff about feed on site and also communication with Yumbah's own feed company	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Feed supply	Growout	Aquafeed is in short supply	Environment	Minor	Unlikely	MinorUnlikely	LOW	Yumbah monitors feed requirements for all its sites and produces excess to requirements. Other feed suppliers are available in Yumbah feed is in short supply	Minor	Unlikely	MinorUnlikely	LOW
Feed supply	Growout	Stability of feed is not appropriate and feed breaks down in the growout tanks, resulting in reduced feeding efficiency of abalone	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Feed is engineered with specific consideration to stability in water column, and growout tanks	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Feed supply	Growout	FCR is not correct and optimal growth of abalone is not achieved		Moderate	Unlikely	ModerateUnlikely	MEDIUM	Extensive research into FCR is prevalent across the industry and FCR is the a primary of abalone farming	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Crown Land	Seawall integrity	Seawall is not correctly engineered and fails	Social - Health and Safety	Extreme	Likely	ExtremeLikely	HIGH	Appropriately qualified design engineers have been engaged for seawall. Also, DELWP will review the design for the seawall.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Crown Land	Seawall integrity	Seawall is not correctly constructed and fails	Social - Health and Safety	Extreme	Likely	ExtremeLikely	HIGH	Appropriate contractors will be responsible for construction, with experience, qualified, proven track record based on engineered requirements	Major	Unlikely	MajorUnlikely	MEDIUM

Operation

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Crown Land	Seawall maintenance	Increased maintenance is required of the seawall in excess to what was predicted	Economic	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Engineering design has outlined that minimal maintenance with be required. Seawall will be constructed in accordance with the design	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Crown Land	Vegetation	Landscape vegetation damaged by weather	Environment	Negligible	Likely	NegligibleLikely	LOW	Plant appropriate vegetation aligned with EVC	Negligible	Unlikely	NegligibleUnlikely	LOW
Crown Land	Sand drift	Reduction in littoral sand drift because of pipelines impact the beach areas along the coastline	Social - Amenity	Moderate	Likely	ModerateLikely	MEDIUM	Regularly check the location of the pipes and the effectiveness of weights to maintain pipes in their correct location, particularly beneath the seabed	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Crown Land	Sea level rise	Sea level rise creates a risk to Yumbah's operations	Economic	Major	Unlikely	MajorUnlikely	MEDIUM	Sea-level rise predictions indicate parts of the site will be inundated and the complete Dutton Way area will be underwater. Sea-level rise will be addressed incrementally as risks become more apparent. The life of the abalone farm is estimated to be 40-50 years, until 2058-2068	Major	Unlikely	MajorUnlikely	MEDIUM
Crown Land	Erosion	Increased erosion of the Dutton Way and Henty Bay coastline occurs as a consequence of the pipelines	Economic	Major	Likely	MajorLikely	HIGH	Coastline is dynamic and subject to continued erosion. Pipes will be constructed and installed subsurface to minimise sand accretion in the direct vicinity of the pipes. Larger area of Portland Bay subject to widely dispersed erosivity	Major	Unlikely	MajorUnlikely	MEDIUM
Disease	Biosecurity	Diseased abalone are evident in waters offshore	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	No wild stock will be brought on site, biosecurity protocols enforced for staff and visitors. Communication and monitoring of issues with Fisheries Vic, and commercial and rec divers. Increased monitoring of farmed abalone will be conducted to identify any early onset of disease. Regular communication with Fisheries Victoria will be maintained.	Negligible	Almost Certain	NegligibleAlmost Certain	MEDIUM
Disease	Biosecurity	Waterborne disease outbreak offshore, enters via inlet water	Environment	Major	Likely	MajorLikely	HIGH	The farm will be established with recirculation ponds that will provide the opportunity to recirculate water in a closed system. The ponds can isolate the farm water supply, reducing reliance on ambient waters. In the event of a disease outbreak in the farm, accredited aquatic veterinarians will be referred to. VFA will be contacted immediately.	Major	Likely	MajorLikely	HIGH
Disease	Growout	Disease outbreak occurs in growout tanks, e.g. Bacteria, Perkinsis, tube worm (Sabellid)	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	Biosecurity protocols enforced for staff and visitor. Recirculation of water from settlement chambers can isolate farm water supply, reducing reliance on ambient waters. Tanks hygiene increased. Regular cleaning, staff training, staff awareness, increase water supply, decrease feed rates.	Major	Likely	MajorLikely	HIGH
Disease	Growout	AVG outbreak occurs in growout tanks	Environment	Extreme	Unlikely	ExtremeUnlikely	HIGH	Biosecurity protocols in place, regular communication with Fisheries Victoria, disease workshops. Regular cleaning, staff training, staff awareness	Extreme	Unlikely	ExtremeUnlikely	HIGH
Disease	Nursery	Disease outbreak occurs in nursery tanks, e.g. Bacteria, Perkinsis, tube worm (Sabellid)	Economic	Major	Almost Certain	MajorAlmost Certain	HIGH	Biosecurity protocols enforced for staff and visitor. Recirculation of water from settlement chambers can isolate farm water supply, reducing reliance on ambient waters. Tanks hygiene increased. Regular cleaning, staff training, staff awareness, increase water supply, decrease feed rates.	Major	Likely	MajorLikely	HIGH
Disease	Hatchery	AVG outbreak occurs in the hatchery impacting larvae	Economic	Negligible	Rare	NegligibleRare	LOW	Hatchery can be isolated, shut water off, dispose larvae batch, sanitise hatchery, Biosecurity protocols enforced for staff and visitor	Negligible	Rare	NegligibleRare	LOW
Disease	Broodstock	Broodstock entering the farm are diseased	Environment	Minor	Rare	MinorRare	LOW	Broodstock sourced from known suppliers, i.e.. Narrawong. Vet certificate for any broodstock sourced from offsite. No wild stock broodstock, sourced solely from onshore abalone farms	Minor	Rare	MinorRare	LOW
Disease	Broodstock	Broodstock housed at the farm are diseased	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Broodstock are held in isolated tanks, with greater biosecurity. Held at reduced stocking densities, temperature regulated. Regular supply of broodstock, Numbers can be restocked from existing farm stock	Moderate	Likely	ModerateLikely	MEDIUM
Disease	Escapees	Abalone escapees exit the farm with discharged water, mixing with wild populations	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Adequate controls in place to minimise escapees. Several points along the farm that limit escapee journey, travel path very long. Staff awareness, removal of all escapees from the drains and areas outside tanks	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Disease	Biosecurity	Visitors entering the farm introduce contamination or diseases	Environment	Major	Likely	MajorLikely	HIGH	Biosecurity protocols are reinforced, footbaths, visitor sign in, security gates, no unauthorised access by people, vehicles, pets not permitted	Major	Unlikely	MajorUnlikely	MEDIUM
Seawater supply	Pumping infrastructure	Power is cut off to the pumphouses	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	Alarms, enough back up generators and pumps to service the entire farm, night check, sufficient on site diesel supply to service all pumps and entire farm	Major	Unlikely	MajorUnlikely	MEDIUM
Seawater supply	Pumping infrastructure	Individual pumps fail	Environment	Moderate	Certain	ModerateCertain	HIGH	Back up pumps on site for immediate replacement, back up emergency pumps. Redundancy in each pumphouse with at least one pump on standby as backup, 35% redundancy applied in each pumphouse	Moderate	Likely	ModerateLikely	MEDIUM
Seawater supply	Intake pipes	Intake pipes are biofouled, reducing water supply	Environment	Moderate	Certain	ModerateCertain	HIGH	Appropriate pigging regime and frequency, where piggin will be scheduled every 3mths	Minor	Certain	MinorCertain	MEDIUM
Seawater supply	Intake pipes	Entrained biota block intake pipes	Environment	Minor	Certain	MinorCertain	MEDIUM	Screens and seacages around the intake pipes to minimise biota entering the pipes	Minor	Certain	MinorCertain	MEDIUM
Seawater supply	Seabed	Seabed is scoured at intake locations	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Intake pipets will be installed off the seabed. Intake pipes are laid on sandy seabed and not reef	Moderate	Likely	ModerateLikely	MEDIUM
Seawater supply	Seabed	Footprint of intake pipes change the seabed bathymetry and increase sand drift	Environment	Moderate	Almost Certain	ModerateAlmost Certain	HIGH	Intake pipes will be installed subsurface to the maximum depth and length feasible, extending offshore. Sand accumulation will be monitored	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Seawater supply	Intake pipes	Intake pipes become disconnected	Social - Health and Safety	Major	Unlikely	MajorUnlikely	MEDIUM	Pipes and equipment have been designed to remain connected, and design and construction has considered extreme storm events	Major	Unlikely	MajorUnlikely	MEDIUM
Seawater supply	Intake pipes	Intake pipes move from their established location	Social - Health and Safety	Moderate	Likely	ModerateLikely	MEDIUM	Pipes and equipment have been designed to remain on the seabed, and will be anchored with concrete weights and other methods to remain in place. Design and construction has considered extreme storm events	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Seawater supply	Intake pipes	Intake pipes become exposed at the surface of the water	Social - Health and Safety	Moderate	Likely	ModerateLikely	MEDIUM	Pipes and equipment have been designed to remain on the seabed, and will be anchored with concrete weights and other methods to remain in place. Design and construction has considered extreme storm events	Moderate	Unlikely	ModerateUnlikely	MEDIUM

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Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Seawater supply	Discharge pipes	Seabed is scoured at discharge locations	Environment	Moderate	Certain	ModerateCertain	HIGH	Discharge pipes will be directed away for the seabed	Moderate	Likely	ModerateLikely	MEDIUM
Seawater supply	Discharge pipes	Discharge pipes change the seabed bathymetry and increase sand drift	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	Discharge pipes will be buried to the maximum extent possible.	Moderate	Likely	ModerateLikely	MEDIUM
Marine environment	Injury	Whales are injured on the intake pipes	Environment	Major	Likely	MajorLikely	HIGH	The pipes will be designed to reduce injury to whales	Major	Unlikely	MajorUnlikely	MEDIUM
Marine environment	Injury	Fish are injured on the intake pipes	Environment	Minor	Unlikely	MinorUnlikely	LOW	The pipes will be designed to reduce injury to fish, and screens will be placed at the pipe heads to reduce risk of entrainment	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Injury	Seals are injured on the intake pipes	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	The pipes will be designed to reduce injury to seals	Major	Unlikely	MajorUnlikely	MEDIUM
Marine environment	Injury	Dolphins are injured on the intake pipes	Environment	Major	Almost Certain	MajorAlmost Certain	HIGH	The pipes will be designed to reduce injury to dolphins. This incidence of dolphins in Portland Bay is minimal	Major	Unlikely	MajorUnlikely	MEDIUM
Marine environment	Injury	Whales are injured on the discharge pipes	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	The pipes will be designed to reduce injury to whales.	Major	Unlikely	MajorUnlikely	MEDIUM
Marine environment	Injury	Fish are injured on the discharge pipes	Environment	Minor	Unlikely	MinorUnlikely	LOW	The pipes will be designed to reduce injury to fish, and the velocity of the discharge water will limit fish moving into close proximity of the outlets	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Injury	Seals are injured on the discharge pipes	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	The pipes will be designed to reduce injury to seals, and the velocity of the discharge water will limit fish moving into close proximity of the outlets	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Marine environment	Injury	Dolphins are injured on the discharge pipes	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	The pipes will be designed to reduce injury to dolphins. This incidence of dolphins in Portland Bay is minimal. The velocity of the discharge water will limit fish moving into close proximity of the outlets	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Marine environment	Discharge water	Discharge water impacts whales	Environment	Minor	Unlikely	MinorUnlikely	LOW	The quality of the discharge water will be significantly less than aquatic toxicity guidelines and is not likely to impact marine animals. Whales are motile and are not expected to stay in the direct vicinity of the outlets. The concentration of nutrients have been predicted to effectively dilute within the mixing zone to achieve background concentrations	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Discharge water impacts seals	Environment	Minor	Unlikely	MinorUnlikely	LOW	The quality of the discharge water will be significantly less than aquatic toxicity guidelines and is not likely to impact marine animals. Seals are motile and are not expected to stay in the direct vicinity of the outlets. The concentration of nutrients have been predicted to effectively dilute within the mixing zone to achieve background concentrations	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Discharge water impacts fish	Environment	Minor	Unlikely	MinorUnlikely	LOW	The quality of the discharge water will be significantly less than aquatic toxicity guidelines and is not likely to impact marine animals. Fish are motile and are not expected to stay in the direct vicinity of the outlet. The concentration of nutrients have been predicted to	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Discharge water impacts dolphins	Environment	Minor	Unlikely	MinorUnlikely	LOW	The quality of the discharge water will be significantly less than aquatic toxicity guidelines and is not likely to impact marine animals. Whales are motile and are not expected to stay in the direct vicinity of the outlets. The concentration of nutrients have been predicted to	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Nitrogen concentrations are elevated above EPA licence limits	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Feed rates will be controlled so that excess feed is not washed out of the growout tanks and phosphorous will be regularly monitored in the discharge water	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Phosphorous concentrations are elevated above EPA licence limits	Environment	Negligible	Likely	NegligibleLikely	LOW	Feed rates will be controlled so that excess feed is not washed out of the growout tanks and phosphorous will be regularly monitored in the discharge water	Negligible	Likely	NegligibleLikely	LOW
Marine environment	Discharge water	DO in abalone growout tanks is elevated above EPA licence limits	Environment	Minor	Likely	MinorLikely	MEDIUM	Velocity of seawater entering the tanks provides for oxygenation of the seawater as it moves over the abalone	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Ammonia in discharge water is elevated above EPA licence limits	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Feed rates will be controlled so that excess feed is not washed out of the growout tanks. The settlement chamber will be regularly cleaned out	Minor	Unlikely	MinorUnlikely	LOW
Marine environment	Discharge water	Eutrophication of Portland Bay r excessive algal growth, smothering reefs occurs due to increased loads of nutrients discharge	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Discharge concentrations will be within licence limits and are not predicted to impact waters beyond the mixing zone. Regular water quality monitoring will continuously assess performance of wastewater treatment system in order to achieve licence limits.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Marine environment	Discharge water	Discharge water is not compliant with EPA licence conditions	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Discharge concentrations will be within licence limits and are not predicted to impact waters beyond the mixing zone. Regular water quality monitoring will continuously assess performance of wastewater treatment system in order to achieve licence limits. An open dialogue will EPA will provide for easy communication and issues management in the case of issues with water quality	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Marine environment	Discharge water	Ammonia exceed 0.5mg/L and causes toxicity to aquatic biota	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Feed rates will be carefully monitored to reduce excess feeding and discharge from the growout tanks	Major	Rare	MajorRare	MEDIUM
Marine environment	Discharge water	Ammonia exceeds 0.1mg/L and impacts aquaculture species, i.e.. Abalone via re-entrainment	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Feed rates will be carefully monitored to reduce excess feeding and discharge from the growout tanks	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Marine environment	Discharge water	Re-entrainment of wastewater results in elevated nutrient concentrations entering the farm	Environment	Major	Likely	MajorLikely	HIGH	Adequate distances between the discharge pipes and intake pipes have been incorporated into the design. ANZECC Aquaculture criteria of 0.1 mg/L NHx will be achieved in the intake waters. Intake and discharge waters will be will regularly analysed to monitor nutrient concentrations entering and exiting the farm.	Major	Unlikely	MajorUnlikely	MEDIUM

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Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Marine environment	Discharge water	Elevated concentrations in discharge water extend beyond the mixing zone	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Discharge concentrations will be within licence limits and are not predicted to impact waters beyond the mixing zone. Regular water quality monitoring will continuously assess performance of wastewater treatment system in order to achieve licence limits	Major	Unlikely	MajorUnlikely	MEDIUM
Wastewater treatment	Discharge water	Lateral internal drains are not effective at removing solid waste	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Wastewater treatment processes have been designed to effectively remove sediment and nutrients across a series of design elements. The performance of the system will be continuously assessed and optimised, where required.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Wastewater treatment	Discharge water	Solids settling channels silt up quicker than estimated	Environment	Major	Likely	MajorLikely	HIGH	Wastewater treatment processes have been designed to effectively remove sediment and nutrients across a series of design elements. The performance of the system will be continuously assessed and optimised, where required.	Major	Unlikely	MajorUnlikely	MEDIUM
Wastewater treatment	Discharge water	Increased rate of sediment accretion in the Southern Collection Channel	Environment	Major	Likely	MajorLikely	HIGH	Wastewater treatment processes have been designed to effectively remove sediment and nutrients across a series of design elements. The performance of the system will be continuously assessed and optimised, where required.	Major	Unlikely	MajorUnlikely	MEDIUM
Wastewater treatment	Discharge water	Increased concentration of fine organic particles are discharged and settle out in the mixing zone, smothering the seabed	Environment	Moderate	Likely	ModerateLikely	MEDIUM	The wastewater treatment process has been designed to remove the majority of particulates prior to discharge of water. Any fine organic particles discharged will be rapidly dispersed in the dynamic marine environment of Portland Bay. Abalone faeces is light and fluffy in nature and is expected to solubilise in either the treatment and discharge network or in the marine environment. Faeces has a reduced settling rate and is expected to be close to neutral buoyancy. Given the reduced settling rate, any undissolved faeces is likely to take at least 15 minutes to settle 1 m at 0.1 cm/sec. The most likely scenario is that faeces will mostly stay in suspension until dissolved.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Power	Supply	Failure of electricity supply to the farm	Economic	Extreme	Almost Certain	ExtremeAlmost Certain	CRITICAL	Back up generators will be available with enough capacity to maintain pumps. Diesel will be available on site to supply the generators. The solar ancillary system will provide a subsequent power supply and adequately sized batteries will be available to provide sufficient backup power provision.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Power	Supply	Inadequate power supplied from ancillary solar source	Economic	Moderate	Unlikely	ModerateUnlikely	MEDIUM	the ancillary solar system has been designed to provide additional power to the site. During detailed design the solar system will be configured to provide power to supplement 30% of the supply.	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Power	Emergency power	Diesel generators do not work	Environment	Major	Unlikely	MajorUnlikely	MEDIUM	Generators will be serviced regularly and the number of generators available will be in excess to meet demand	Major	Rare	MajorRare	MEDIUM
Power	Greenhouse gas	Excessive greenhouse gas emissions during normal operation	Environment	Minor	Unlikely	MinorUnlikely	LOW	Energy efficient equipment will be used within the farm, and all equipment will be regularly serviced and checked to optimise performance.	Minor	Unlikely	MinorUnlikely	LOW
Air quality	Odour	Plant, process and equipment (within normal operations) on site generates excessive odour at the property boundary	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Odour generating activities will be conducted away from sensitive receptors. Odour generating activities will be conducted during appropriate settings, such as time of day, weather dependent conditions (wind)	Minor	Rare	MinorRare	LOW
Air quality	Odour	Plant, process and equipment (within emergency operations) generates excessive odour	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Odour generating activities will be conducted away from sensitive receptors. All emergency activities that have the potential to create odour will be completed as efficiently as possible. Regular communication with stakeholders will be maintained in the likelihood of extended emergency events	Minor	Unlikely	MinorUnlikely	LOW
Air quality	Odour	Dead abalone collected from grow out modules create odour	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Dead abalone will be collected daily from the grow out tanks and immediately transferred to the mortality chiller before being transported offsite	Negligible	Rare	NegligibleRare	LOW
Air quality	Odour	Accumulated sediment in wastewater treatment process becomes anoxic and smells	Environment	Moderate	Likely	ModerateLikely	MEDIUM	Accumulated sediment will be removed from the treatment network at regular intervals and either dried on site, or transported offsite to an appropriate disposal facility	Minor	Unlikely	MinorUnlikely	LOW
Stormwater	Retention basin	Large deluge of rain creates volumes that exceed capacity of stormwater basin	Environment	Minor	Certain	MinorCertain	MEDIUM	The design of the stormwater system provides for a 1 in 100 yr storm. Once the stormwater basin is at a certain level (to be confirmed), storm water will enter the settlement lagoons and be discharged via the 8 discharge pipes. The system will drain well before it is full. The system will be regularly serviced and maintained	Minor	Unlikely	MinorUnlikely	LOW
Stormwater	Retention basin	Pipes become blocked, causing basin to exceed capacity	Environment	Moderate	Likely	ModerateLikely	MEDIUM	The design of the stormwater system provides for a 1 in 100 yr storm. Once the stormwater basin is at a certain level (to be confirmed), storm water will enter the settlement lagoons and be discharged via the 8 discharge pipes. The system will drain well before it is full. The system will be regularly serviced and maintained	Minor	Unlikely	MinorUnlikely	LOW
Chemicals	Onsite storage	Storage and use of hazardous materials can result in leaks and spills resulting in the release of chemicals to environment	Environment	Minor	Likely	MinorLikely	MEDIUM	All hazardous materials will be stored in banded areas away from surface water and sensitive receptors. MSDS will be maintained on site. Staff will be trained in appropriate handling of hazardous materials. Spill kits will be located around the site	Minor	Unlikely	MinorUnlikely	LOW
Chemicals	Onsite storage	Flammable nature of some products (e.g. fuel) resulting in fire and run-off of firewaters and ash	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Flammable products will be located in dedicated bunds, fire extinguishers and fire controlling equipment will be located around the site	Moderate	Unlikely	ModerateUnlikely	MEDIUM
Chemicals	Anaesthetics	Use of anaesthetics results in excessive concentrations released to the environment, i.e.. Marine water	Environment	Moderate	Unlikely	ModerateUnlikely	MEDIUM	Use of 2PE at Nyamat, preferential anaesthetic to benzocaine is used in controlled concentrations and not used in excess. Any anaesthetics used for abalone farming will be applied in accordance with permits and instructions on use. Only anaesthetics approved in abalone farming will be applied.	Minor	Unlikely	MinorUnlikely	LOW
Chemicals	Antibiotics	Use of antibiotics results in excessive concentrations released to the environment, i.e.. Marine water	Environment	Moderate	Rare	ModerateRare	LOW	Antibiotics will not be used on site except in extreme scenarios. Any potential use will be discussed with the Fisheries Victoria aquatic veterinarian prior to application.	Moderate	Rare	ModerateRare	LOW
Chemicals	Chlorine	Use of chlorine results in excessive concentrations released to the environment, i.e.. Marine water	Environment	Minor	Unlikely	MinorUnlikely	LOW	Concentrations of chlorine will be controlled and excessive concentrations will not be used. Staff will be trained and aware of dosing rates	Moderate	Unlikely	ModerateUnlikely	MEDIUM

**Operation**

Risk	Project Activity	Specific Impact	Receptor	Consequence	Likelihood	Category	Pre-mitigation Risk Rank	Proposed Mitigation/Comments	Consequence	Likelihood	Category	Residual Risk Rank
Amenity	Traffic	Ingress and egress to external roads are ineffective	Social - Amenity	Moderate	Unlikely	ModerateUnlikely	<b>MEDIUM</b>	The roads have been designed to cater for traffic loads well in excess of predicted volumes and vehicle weights that will be required to service the site	Minor	Unlikely	MinorUnlikely	<b>LOW</b>
Amenity	Traffic	Excessive traffic on Princes Hwy, beyond its design capacity	Social - Amenity	Moderate	Unlikely	ModerateUnlikely	<b>MEDIUM</b>	Roads are designed for a far greater volume of traffic than what it currently supports. Yumbah will maintain an open dialogue with VicRoads	Minor	Unlikely	MinorUnlikely	<b>LOW</b>
Amenity	Traffic	Excessive traffic on Dutton Way, beyond its design capacity	Social - Amenity	Minor	Unlikely	MinorUnlikely	<b>LOW</b>	Roads are designed for a far greater volume of traffic than what it currently supports. Yumbah will maintain an open dialogue with VicRoads	Minor	Unlikely	MinorUnlikely	<b>LOW</b>
Amenity	Community	Community complaints received	Social - Amenity	Moderate	Likely	ModerateLikely	<b>MEDIUM</b>	Complaints procedure will be kept on site, and all staff will be aware of protocols for receiving complaints. Complaints will be received and managed by appropriately trained staff.	Minor	Unlikely	MinorUnlikely	<b>LOW</b>
Amenity	Noise	Operation of plant and equipment (within normal operations) results in generation of excessive noise, impacting sensitive receptors	Environment	Major	Likely	MajorLikely	<b>HIGH</b>	Noise mitigation and controls will be incorporated into the design of equipment and processes. Any potential noisy equipment required at for operation will be limited to the middle of the day. Noisy equipment will be located away from sensitive receptors to the maximum extent possible	Minor	Unlikely	MinorUnlikely	<b>LOW</b>
Amenity	Noise	Operation of plant and equipment (within emergency operations) results in generation of excessive noise	Environment	Major	Almost Certain	MajorAlmost Certain	<b>HIGH</b>	Emergency equipment will be fitted with noise attenuation devices, and located away from sensitive receptors to the maximum extent possible. Noise mitigation and controls will be included in the design and/or choice of equipment.	Moderate	Unlikely	ModerateUnlikely	<b>MEDIUM</b>

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