ST KILDA MARINA REDEVELOPMENT

ENVIRONMENTAL AND COASTAL REQUIREMENTS

Prepared for **Port Phillip City Council**

13 March 2019

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St Kilda Marina Redevelopment

Environmental and Coastal Requirements

Client: City of Port Phillip

ABN: N/A

Prepared by

AECOM Australia Pty Ltd
Level 10, Tower Two, 727 Collins Street, Melbourne VIC 3008, Australia
T +61 3 9653 1234 F +61 3 9654 7117 www.aecom.com
ABN 20 093 846 925

13-Mar-2019

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Quality Information

Document St Kilda Marina Redevelopment

Ref 60585834

Date 13-Mar-2019

Prepared by Sian Willmott/Stuart Bettington

Reviewed by Pablo Sepulveda/Sian Willmott

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	29-Jan-2019	Draft		
1	13-Mar-2019	Final		

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1.0 Introduction

1.1 Background

The redevelopment of the St Kilda Marina must have sustainability at the forefront to achieve best practice ecological sustainable design (ESD) outcomes for the marina lease area and the broader site context.

This document is intended to provide the sustainability pathway and implementation plan necessary to embed best practice sustainability and coastal engineering into the St Kilda Marina redevelopment procurement process.

The information herein was formed on the basis of existing policies and plans, community consultation and industry best practice.

1.2 Vision and Objectives

In 2018, the City of Port Phillip released the St Kilda Marina Site Vision and Objectives Final (CoPP 2018) and the St Kilda Marina Project Opportunities and Constraints (CoPP 2018).

The vision for the redevelopment is to create ***"A special place on the foreshore for everyone that welcomes a diversity of sustainable uses anchored by a working Marina."***

The vision contains five key objectives around place identity, social and cultural improvements, economic benefit, financial sustainability and a net positive environmental contribution.

Ensure a net positive environmental outcome for the site and surrounds through:

- Building resilience to climate change and considering coastal vulnerability and landscape and waterside infrastructure and management
- Seeing opportunities to support the achievement of flood mitigation objectives for the area through an integrated water management approach and landscape and waterside infrastructure and management
- Incorporating progressive environmentally sustainable design principles in built form and landscape and waterside infrastructure and management
- Protecting and seeking opportunities to enhance the natural environment

1.3 Existing Policy/Plan Alignment

There are several existing policies and plans that will impact the redevelopment of the marina; at both a State and Local level.

1.3.1 Victorian Government

Several plans at a state level recognise the importance of protecting our coast; particularly in the face of a changing climate. These plans are echoed within the City of Port Phillip policies and plans which are localised to their environment.

- Victorian Coastal Strategy Implementation Plan 2014
- Central Region Boating Coastal Action Plan
- Victorian Climate Change Adaptation Plan 2017-2020
- Victoria's Marine and Coastal Reforms – Final Transition Plan 2017

1.3.2 City of Port Phillip

The City of Port Phillip aspires to be an international leader in sustainability. The City of Port Phillip Council Plan 2017-27 demonstrates commitment to this aspiration; with 1 of 6 areas of focus on

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sustainability ***"We have smart solutions for a sustainable future."*** The Council has published multiple sustainability strategies; including:

- Act and Adapt Sustainable Environment Strategy 2018-28
- Don't Waste It! Waste Management Strategy 2018-28

It also has governed planning scheme requirements to prevent environmental degradation; including:

- Clause 22.13 – Environmentally Sustainable Development
- Clause 22.12 - Water Sensitive Urban Design planning policy

These strategies and policies outline objectives around:

- A greener, cooler, more liveable City; to reduce the impacts of heat and improve enjoyment of public spaces
- A City with lower carbon emissions; to reduce the environmental footprint of Council and community
- A City that is adapting to be resilient and better manage the impacts of a changing climate
- A water sensitive City that will enable Council to maintain parks and sports fields while reducing pollutants entering the bay
- A sustained reduction in waste, adapting to changes in the industry and managing waste more efficiently

Specific targets within these documents include:

- Zero net emissions for Council operations by 2027; including 100% electricity from renewables. 50% electricity from renewable sources within the community
- Potable water use reduced by 15% by 2027 for council operations and 27% for the community
- Reduction of pollutants through water sensitive urban design
- Planning for a Sea Level Rise (SLR) of 0.8m by 2100
- Targeting tenant energy consumption, cleaning and waste management through green lease provisions
- 10% increase in canopy cover in open spaces
- Increased sustainable transport through increased bike, walking and public transport connections
- By 2022, a 20% reduction in waste per Council employee and 58% and 85% landfill diversion targets for council buildings and public bins respectively
- By 2028, 50% diverted food waste from landfill for Council and commercial buildings and a total landfill diversion target of 85% for council buildings and public bins

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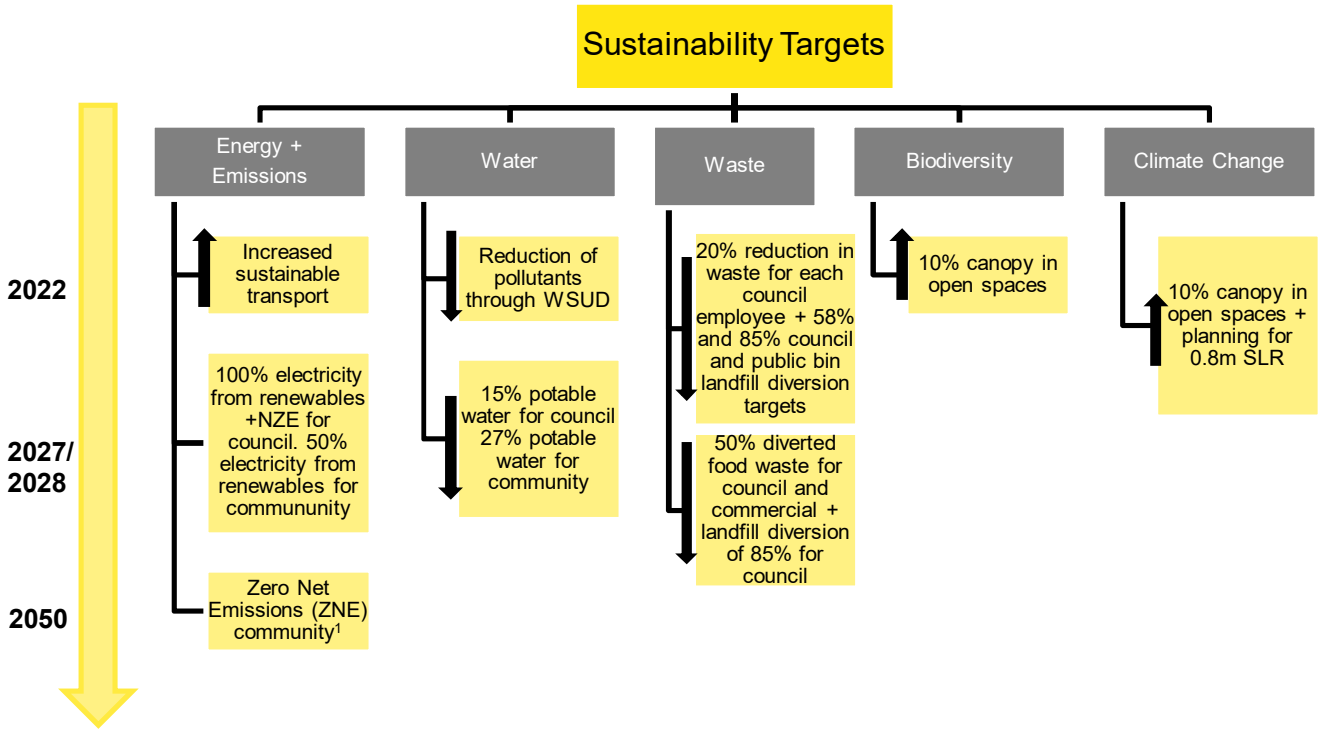
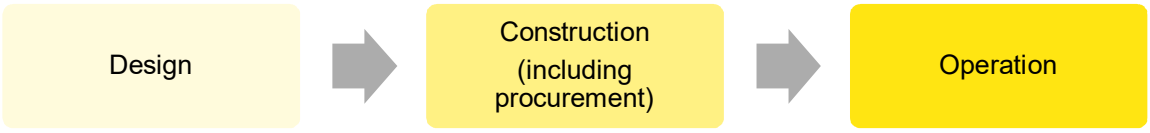


2.0 Environmental Performance Criteria

The environmental performance criteria for the proposed redevelopment have been considered in accordance with the total development lifecycle across the precinct and individual building typologies:



The criteria have been considered across each currently proposed building typology, as well as at a precinct level. It's important to have both targets at the precinct and building level given the difference in materiality and operation of each development type.

2.1 Precinct

The precinct can be considered as the culmination of all development on site; including non-occupied structures, the operational marina and surrounding infrastructure and green space. The precinct must also be considered in relation to the surrounding sites and neighbourhoods; and synergies between these should be considered in both design and operation.

[1] A Net Zero Emissions community aligns with the Victorian State Government's Greenhouse Gas emissions target per the Victorian Climate change Act 2017

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The overarching precinct targets include:

	Design	*Construction*	*Operation*
Energy and Emissions	- Solar PV to be provided to a minimum 50% of all roof area on site - Exploration of on-site energy storage if financially viable - Development to be powered by 100% electricity. - Exploration of microgrid for compatibility from date of operation or in the future - Exploration of off-site renewable energy options such as Power Purchasing Agreements (PPAs) should on-site net zero not be achievable or should the site over-generate its requirements - LED lighting to meet lighting requirements - A Green Travel Plan must be provided - Design allowance for operational requirements	- site offices must be provided with a master switch at the entrance to ensure non-essential power can be switched off at the end of the day - appliances purchased for use in site offices must have a star rating no lower than two stars from the highest available on energyrating.gov.au - Exploration of renewable energy options for site offices and biodiesel for on-site generators or construction equipment	- zero net emissions for precinct - Ensure operational requirements of Green Travel Plan are included as part of the sustainability requirements of the lease
Water	- Any new landscape design to be 100% native (Victorian) or xeriscape (existing palms and figs may be retained). Should non-native species be required to meet micro-climate amenity provisions suitable for the Marina, this is to be discussed and signed-off by council - All external potable water uses to be metered, with data to be connected back to central operating system - Any landscape watering requirements to be sourced from non-potable water - The post-development peak Average Recurrence Internal (ARI) event discharge from the site must not exceed the pre-development peak ARI event discharge - Stormwater discharged from site must be reduced by: - Total Suspended Soils (TSS) – 80% - Gross Pollutants – 90% - Total Nitrogen (TN) – 45% - Total Phosphorus (TP) – 60% - Total Petroleum Hydrocarbons – 90% - Free Oils – 90% (preference for treatment to be via organic means – e.g. bioswales, infiltration sand etc.). Note that this requirement is for the marina site only; and there is no expectation that treatment would be required to the existing trunk	- Site office amenities to have a WELS rating of 3 Stars or higher (WCs, taps, showers)	

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	Design	Construction	Operation
	stormwater outside of the marina site. - Design allowance for operational requirements		
Waste	- Consideration of centralised on-site waste treatment facility - Design allowance for operational requirements (size, number of bins and waste streams)	- Construction waste sent to landfill to meet the following targets: - no more than 10% of total waste - no more than 10kg/m2 Gross Floor Area (GFA)	- 100% of organic waste treated on-site (estimated to be approximately 13% of the total production); through natural or mechanical means (e.g. through composting, use of a food dehydrator etc.) - Landfill diversion of 85% - Public waste bins provided as part of precinct to be separated into general, commingled recycling and organic as a minimum. Any specialised waste from the Marina operation (boats and associated entities) that is unable to be catered for within waste bins outlined above are required to be provided for (i.e. black water waste) - Consideration of resource efficiency/circular economy[2]
Biodiversity	- An increase in on-land biodiversity by a minimum of 5% - A minimum of 2 points are achieved using the most current Green Star Ecological Value Calculator - Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light sensors where not required to maintain a level of security.	- Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light sensors where not required to maintain a level of security.	
Climate Change	- Precinct specific climate adaptation plan projecting at least 2 future climate scenarios and addressing all medium to very-high risk items - Design for a sea level rise (SLR) of 0.8m by 2100		- If climate adaptation initiatives require operational action, ensure that these are included as part of the lease requirements
Other	- Exploration of other Sustainability initiatives across categories outlined above; including concepts for governance - Development of a Sustainability Management Plan (SMP) that explores and includes sustainability initiatives and required maintenance and management strategies for facility operation - Develop and adopt a materials red list for material specification to avoid materials that emit toxic chemicals in manufacture, construction or in-situ through off	- Managing contractor/ developer must have a best practice Environmental Management Plan as outlined within the NSW Environmental Management System Guidelines. An ISO14001 certified environmental management system is also required.	- Ensure lease has provisions to include relevant maintenance and management strategies as included in the SMP. I.e. if raingardens are proposed to mitigate pollutants to stormwater, then the lease agreement should require maintenance of these. - Achieve at least 85% of available points of the Clean Marina Program Level 3 Accreditation (Level 3 certification equivalent) to encourage marine wildlife to the area.

[2] A circular economy is an economic system aimed at minimising waste and making the most of resources. The aim of the circular system is to reduce resource input, waste, and emissions by slowing, closing, and narrowing energy and material loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, recycling, and upcycling.

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	Design	Construction	Operation
	gassing. - Ensure Urban Heat Island Effect (UHIE) is not increased between pre and post development - Design allowance for operational requirements		

2.2 Building Targets

2.2.1 Office

The following targets relate specifically to buildings design as Class 5 Office Spaces:

	Design	Construction	Operation
Energy and Emissions	- 5 Star NABERS Energy Rating - PV integration in roofs: > 50% - Development to be powered by 100% electricity	- site offices must be provided with a master switch at the entrance to ensure non-essential power can be switched off at the end of the day - appliances purchased for use in site offices must have a star rating no lower than two stars from the highest available on energyrating.gov.au - Exploration of renewable energy options for site offices and biodiesel for on-site generators or construction equipment	- zero net emissions
Water	- 4.5 Star NABERS Water Rating - Rain water harvesting from all non-accessible roofs for reuse in non-potable areas	- Site office amenities to have a WELS rating of 3 Stars or higher (WCs, taps, showers)	
Waste	- Consideration of centralised storage - Design allowance for operational requirements	- Construction waste sent to landfill to meet the following targets: - no more than 10% of total waste - no more than 10kg/m2 GFA	- 100% of organic waste treated on-site (estimated to be >10% of the total production) - Landfill diversion of 85% - Waste bins to be separated into general and commingled recycling as a minimum. Organic waste should go straight to on-site treatment
Biodiversity	- Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light sensors where not required to maintain a level of security.	- Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light sensors where not required to maintain a level of security.	
Climate Change	- Building specific climate adaptation plan projecting at least 2 future climate scenarios and addressing all medium to very-high risk items (this may form part of the precinct plan)		- Ensure operational mitigations to climate change (adaptation initiatives) are included as part of green lease requirements

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	Design	Construction	Operation
Other	- Exploration of other Sustainability initiatives across categories outlined above; including concepts for governance - Development of a Sustainability Management Plan (SMP) that explores and includes sustainability initiatives and required maintenance and management strategies for facility operation - Develop and adopt a materials red list for material specification to avoid materials that emit toxic chemicals in manufacture, construction or in-situ through off gassing. - Design allowance for operational requirements	- Managing contractor/ developer must have a best practice Environmental Management Plan as outlined within the NSW Environmental Management System Guidelines. An ISO14001 certified environmental management system is also required.	- Ensure lease has provisions to include relevant maintenance and management strategies as included in the SMP

2.2.2 Retail

The following targets relate specifically to buildings design as Class 6 Retail Spaces (including showroom and food and beverage areas):

	Design	Construction	Operation
Energy and Emissions	- 5 Star NABERS Energy Rating - PV integration in roofs: > 50% - Development to be powered by 100% electricity. Alternate fuel (bio) could be considered for food and beverage (stove) if necessary.	- site offices must be provided with a master switch at the entrance to ensure non-essential power can be switched off at the end of the day - appliances purchased for use in site offices must have a star rating no lower than two stars from the highest available on energyrating.gov.au - Exploration of renewable energy options for site offices and biodiesel for on-site generators or construction equipment	- zero net emissions
Water	- 4.5 Star NABERS Water Rating - Rain water harvesting from all non-accessible roofs for reuse in non-potable areas	- Site office amenities to have a WELS rating of 3 Stars or higher (WCs, taps, showers)	
Waste	- Consideration of centralised storage - Design allowance for operational requirements	- Construction waste sent to landfill to meet the following targets: - no more than 10% of total waste - no more than 10kg/m2 GFA	- 100% of organic waste treated on-site (estimated to be >10% of the total production) - Landfill diversion of 85% - Waste bins to be separated into general and commingled recycling as a minimum. Organic waste should go straight to on-site treatment
Biodiversity	- Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light	- Upward light output ratio must be less than 5% for all external lighting. It is expected that lights will be dimmed or on time/light	

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	Design	Construction	Operation
	sensors where not required to maintain a level of security.	sensors where not required to maintain a level of security.	
Climate Change	- Building specific climate adaptation plan projecting at least 2 future climate scenarios and addressing all medium to very-high risk items (this may form part of the precinct plan)		- Ensure operational mitigations to climate change (adaptation initiatives) are included as part of green lease requirements
Other	- Exploration of other Sustainability initiatives across categories outlined above; including concepts for governance - Development of a Sustainability Management Plan (SMP) that explores and includes sustainability initiatives and required maintenance and management strategies for facility operation - Develop and adopt a materials red list for material specification to avoid materials that emit toxic chemicals in manufacture, construction or in-situ through off gassing. - Design allowance for operational requirements	- Managing contractor/ developer must have a best practice Environmental Management Plan as outlined within the NSW Environmental Management System Guidelines. An ISO14001 certified environmental management system is also required.	- Ensure lease has provisions to include relevant maintenance and management strategies as included in the SMP

3.0 Coastal Requirements

3.1 Background

St Kilda Marina breakwater, located on the north eastern foreshore of Port Phillip Bay, is sited in the active coastal zone, with dynamic intertidal sandy foreshores. The breakwater acts to protect the marina and provides high amenity foreshore lands and habitat values. As part of the redevelopment of the site, the breakwater is to be upgraded to withstand extreme design conditions in a climate change impacted future, improve amenity and preserve ecological characteristics.

Coastal processes in the area drive sand toward the north. The sand movement is linked to the ecological values and impacts the performance of the structures, particularly the marina due to siltation. The proposed works are not intended to cause a significant disruption or altering of the present-day processes. Coastal processes are revealed in Figure 1 below. The short groyne near the entrance to the marina controls the location of the near shore bar that has developed under the dominant south west waves that drive the longshore sand transport to the north.

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Figure 1 Schematic of Coastal Setting

3.2 Current conditions

An Environmental & Coastal Hazard Assessment for the St Kilda Marina was prepared by WaterTech as part of Stage 02. It identifies that:

- The marina is a tidal, dredged marina with dredged entrance channel (St Kilda beach south: 1:70 profile)
- Sea wall is generally 1.5-2mAHD (highest part of the site is the southern carpark at 2.2mAHD)
- The marina's western breakwater, the short groyne and the seawalls to the south of the marina are in poor repair and are not adequate for the existing marine conditions
- The western seawall is in poor condition and requires immediate repair work
- A site survey of marina habitat was done in December 2017 identifying four general habitats:
  - outside the marina - sandy seabed; and rocky reef/boulders
  - inside the marina - soft sand/silt seabed; and artificial hard substrates (piles, pontoons, walls)
- There is a northerly movement of sand and risks associated with inundation, coastal recession and SLR (sea level rise)
- The 2100 1% AEP storm tide levels show major inundation of the boat sheds, carpark and hardstand area.

Into the future the increased depths of water will worsen the impact of the marine forces (mostly waves) with both erosive forces and overtopping issues increasing.

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3.3 Scope of works and function

The proposed works are to achieve the following outcomes:

- Upgrade the armoured revetments of breakwater and westernseawall
- Upgrade crest (top of seawall) to achieve a high amenity setting that restricts overtopping characteristics to an accepted standard of safety and property damage
- Maintain intertidal habitats into the future (accounting for sea level rise) to accommodate bird roosting. The expectation is that the intertidal areas not be less than present day extent for the life of the asset. In doing so minimising impacts on areas of rocky reef to the south

3.3.1 Revetment Upgrade

At this stage it is envisaged that the existing revetment upgrade can be achieved by topping up the revetment with new rock armour to achieve the desired design criteria.

3.3.2 Crest Upgrade (overtopping)

The crest of the revetments shall be upgraded to include features that both enhance the amenity and mitigate risks from overtopping. At this stage it is envisaged that a wave return wall may be required to achieve the design criteria.

It is noted that overtopping issues are an area of interpretation. The adopted solution needs to consider both the amenity issues and the likelihood of the threat being realised.

3.3.3 Intertidal Areas

To preserve the intertidal areas, it is anticipated that the groyne will need to be raised/lengthened. The studies to inform this shall provide sufficient confidence to the designers that they can forecast the anticipated changes to the coastal morphology and the expansion of the beach footprint. As a minimum this will include an assessment of the wave climate and coastal morphology.

3.4 Design Life

Given the proposed function of the breakwater and ancillary elements such as groynes, the structure is deemed to be a normal maritime structure. Guidance in AS 4997 – 2005 (Guidelines for the design of maritime structures) indicates that an appropriate design life for normal structures is **50 years**. This design life means structures shall be designed to last until 2070 and meet design criteria for the anticipated conditions at that time.

3.5 Design Criteria

3.5.1 Revetments

Assessment of armour stability can be achieved using desktop methods Physical modelling can be undertaken to enhance the design, potentially saving in materials and risk. In the absence of physical modelling, revetment stability will be assessed using Van der Meer's equation. Revetment performance will be assessed based on the level of damage level parameter 'Sd'.

$$S_d = {}^{A_e}/_{D_{n50}}$$

Where A_e is the cross-sectional area eroded from the face and D_{n50} is the nominal diameter of the rock armour.

3.5.1.1 Ultimate design Event

The loading of the ultimate design event the rock armour revetment can sustain damage but must retain functionality. For the purposes of design this equates to an S_d = 6.

For the determination of appropriate design criteria, the structure has been assessed as posing neither an unusually low or high threat to life or property and can be assessed as having a normal level of functionality. Based on the definition provided in AS4997-2005 this equates to a Function Category 2

and for a design life of 50 years this equates to an ultimate design event with a 0.2% Annual Exceedance Probability (500year Average Recurrence Interval).

3.5.1.2 No Damage Criteria

A second criteria adopted in recognition that the structure should not require regular maintenance is that the design shall assume that the probability of damage over the design life should be no more than approximately 50%. To achieve this the revetments shall be designed to suffer minimal damage 2% Annual Exceedance Probability (50year Average Recurrence Interval).

No damage criteria shall be defined as $S_d \leq 2$.

3.5.2 Crest Design (overtopping)

Overtopping rates shall be assessed utilising methods stipulated in industry standard guides including the EuroTop Manual. As with the revetment design physical modelling can be used to obtain more refined results.

3.5.2.1 Pedestrian Safety (behind the seawall crest)

Pedestrian safety is assumed to be compromised when the mean discharge (q) exceeds 1 l/m/s or the maximum volume (V_{max}) exceeds 600 l/m.

It is assumed that pedestrian or vehicle access would be restricted or self-regulated if conditions were severe. For pedestrian safety assume that people would be on the structure up to an event with an annual exceedance of 10% (10year ARI).

3.5.2.2 Property Damage

Property damage relating to both vessels in the marina and infrastructure behind the crest shall be compromised when the mean discharge (q) exceeds 5 l/m/s or the maximum volume (V_{max}) exceeds 3000 l/m.

For property protection a 1% Annual Exceedance Event (100year ARI) shall be adopted.

3.5.3 Intertidal Areas

The area of intertidal areas in front of the revetments shall be preserved for the design water levels in 2070.

3.6 Design Inputs

A range of design inputs are available in the “St Kilda Marina Environmental & Coastal Hazard Assessment”, however, the study does not provide comprehensive design data. As a result, the design inputs shall be prepared by the designer to satisfy themselves that they have a sufficient appreciation of the loads.

3.6.1 Met-ocean

Met-ocean conditions for the project will need to be determined by the designer. Combined probability events up to 0.2%AEP are required. This is to include:

- Over water winds
- Water Levels
  - Tides
  - Storm Tides
- Waves
  - Ambient
  - Extreme
- Combined probability of waves and water levels.

3.6.2 Climate Change Allowance

Adopted sea level rise allowances for project are set out in Table 1

Table 1 Adopted Sea Level Rise Allowance (high estimates)

Year	2040	2070	2100
Sea Level Rise	0.2 m	0.4 m	0.8 m

The sea level rise to 2070 shall be adopted for design. The level in 2040 can be considered for staged solutions. The level in 2100 shall be considered for design elements that are likely to remain functional beyond 2100 and are difficult to retrofit (e.g. rock armour).

3.6.3 Morphology and coastal processes

An appreciation of the coastal processes to allow the designer to determine:

- Scour depths
- Beach behaviour
  - Beach plan form for common tidal levels
  - Beach toe footprint extent (reef burial)
  - Impact on adjacent coasts and the marina siltation.

These studies will required data on sediment characteristics and an appreciation of ambient wave conditions.

3.6.4 Bathymetry

Bathymetric data sufficient to inform the assessment of wave conditions and morphology.

3.6.5 Geotechnical

The extent and depth of erodible profiles over rock is required to inform design of revetments.