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Burbury Consulting Pty Ltd    ACN 146 719 959
2/2 Gore Street, South Hobart, TAS 7004

P. 03 6223 8007    F. 03 6212 0642
admin@burburyconsulting.com.au
www.burburyconsulting.com.au

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1. Introduction

This Coastal Vulnerability Assessment has been prepared by Burbury Consulting (Burbury) to assess the proposed Bruny Island Ferry Terminal Landside Works with the relevant performance criteria of the Kingborough Council (KC) Interim Planning Scheme. The technical assessment is included as part of a Development Application (DA) to be lodged by the Department of State Growth (Department) for the Bruny Island Ferry Terminal Landside Infrastructure Works.

The existing ferry terminal sites are located at both Kettering and Roberts Point (Bruny Island). The terminals have operated as the Bruny Island ferry terminals since their construction in circa 1983. The original designs for the terminals were based on the MV Harry O'May and MV Mangana vessels that operated the ferry run until the early 1990’s before the MV Mirambeena commenced the ferry run. More recently the MV Bowen and MV Moongalba have provided support to the Mirambeena, particularly during peak demand periods.

SeaLink Bruny Island (SeaLink) commenced operations of the ferry contract in 2018, commissioning the construction of two (2) new purpose built ferries for operations in February 2020 (MV Nairana) and March 2021.

The current ferry terminal requires extensive maintenance to fenders to support the continual operations of the ferry service. The existing terminal is also significantly restrictive to loading and unloading due to the single lane capacity of the ramps originally designed for a service 40 years ago.

Through a detailed review of current and future ferry operations the Department, in conjunction with SeaLink, has developed a refurbishment of the existing ferry terminals through the development of a second ferry berth at both Kettering and Roberts Point. The second ferry berth will allow for dual facilities at either terminal as well as support new ferry operations through improved infrastructure.

The ferry terminal upgrade is described in the Development Application Planning Report and Drawings and incorporates the upgrade of the existing temporary berths at each terminal adjacent to the existing ferry berth as well as landside connections.

This report provides an assessment of the proposed works that occur within the sites and references any potential impacts on the development site. Assessment of the proposal has included reference to the following KC Interim Planning Scheme Part E Codes and is further addressed in the Planning Report:

- E11.0 Waterway and Coastal Protection
  - E11.7.2 Buildings and Works Dependent on Coastal Location;
- E15.0 Inundation Prone Areas
  - E15.7.6 Development Dependent on a Coastal Location;

The report identifies that the proposed development, which has been reviewed and assessed by a coastal engineer, meets the KC Interim Planning Scheme Codes requirements in its design form and proposed usage. Burbury has considerable experience in marine and coastal engineering and have undertaken a number of coastal impact assessments, wave studies, shoreline erosion studies and shore stability assessments for new and existing infrastructure around Tasmania. In particular, and relevant, Burbury have recently completed detailed wave and coastal process modelling for the Margate Marina development site and the Dru Point Esplanade Road, which included preparation of 3D numerical models for the North West Bay and D'Entrecasteaux area.
2. Project Description

The proposed works are to provide ferry terminal and landside upgrade improvements at both Kettering and Roberts Point ferry terminals, refer to Figure 1.

Figure 1 Proposed Works Location

The drawings identify modifications to the shoreline through:

- **Kettering Terminal:**
  - Removal of existing fenders, concrete abutment, ramp and pavements;
  - Placement of rock fill to suit new access to ferry ramp;
  - Installation and improvement to sections of rock armour for coastal protection;
  - New piled platforms and berthing dolphins to aid in ramp functions and vessel berthing and mooring;
  - New concrete abutment and steel ramp; and
  - New access road including services, guard-railing and lighting;
• **Roberts Point Terminal:**
  - Removal of existing fenders, low landing structure, concrete ramp and pavements;
  - Placement of rock fill to suit new access to ferry ramp;
  - Installation and improvement to sections of rock armour for coastal protection;
  - New piled platforms and berthing dolphins to aid in ramp functions and vessel berthing and mooring;
  - New emergency access and public jetty access;
  - New concrete abutment and steel ramp; and
  - New access road including services, guard-railing and lighting;

Additional infrastructure is proposed within the terminals but are outside coastal features and this report.

2.1 **Existing Coastal Features**

The existing shoreline of the site consists typically of a combination of a disturbed foreshore zone, imported rock rip-rap, concrete ramps and adjacent tidal sediments.

Both terminals are highly disturbed from the existing environment and support a highly active environment with daily berthing of the ferries.

An extensive geotechnical investigation has been undertaken to review the sediments and geotechnical profiles for the new structures as well as inspection of the existing shoreline and maritime structures to assess serviceability of these structures over the life of the project.

Both sites are exposed to directional fetch limited wind waves and vessel wakes. A coastal wave assessment of the sites has been undertaken to assess the design requirements for rock protection and design parameters for the terminals.
2.2 Kettering Terminal Proposal

Figure 2 Kettering Terminal – existing infrastructure

Figure 3 Proposed Development Site Plan – Kettering
Key features of the shoreline are provided in the following photograph.

Photo 1  Kettering Terminal

Figure 4  Site Plan Development Area - Kettering
2.3 Roberts Point Terminal Proposal

Figure 5 Existing Site Plan – Roberts Point

Figure 6 Proposed Development Site Plan – Roberts Point
Key features of the shoreline are provided in the following photographs.

Photo 2  Roberts Point Terminal

Figure 7  Site Plan Development Area – Roberts Point
3. Site Assessment

3.1 Introduction

As part of the design works for the project, we undertook a detailed assessment of the wave climate at the site, and its impact on the terminal improvement works over the design life of the project.

The offshore wave climate under varying sea levels and wind speeds was determined and this was transformed to assess the nearshore impact of the waves using computational fluid dynamics software. Wave run-up and overtopping were considered at this stage. Finally, the nearshore design wave was used to design rock armour protection works for the terminal.

The landside reclamation will consist of imported controlled rock with armour rock protection building up to a new pavement and road seal.

The marine structures for the ferry operation are generally consistent with the existing terminal incorporating:

- Reuse of the existing concrete jetty,
- New fendering to that jetty for the new berth;
- New dolphins for berthing adjacent to the existing jetty; and
- New ramp with support towers and abutment.

The above structure will be piled and special purpose marine concrete.

3.2 Coastal Development Areas

The proposed development will incorporate expansion of the terminal ramp footprints with new berthing and mooring infrastructure and new ramp terminal as outlined in the above figures.

The direct areas of expansion have been determined from the existing survey and development drawings. Both terminals had extensive reclamations from the 1983 construction. The approximate area for this new expanded terminal is 400 square metres (both terminals) incorporating similar form of construction and materials to the existing site with rock armour protection, rock filling and new road pavements.

3.3 Sea Level

The wave–shoreline interaction was modelled at Mean High Water (MHW = 0.68m AHD) to give typical high tide conditions based on present water levels. In addition, MHW + 200mm (0.88m AHD) was examined in accordance with the 2050 guidelines from the Tasmanian Climate Change Office for expected sea level rise.

Storm surge can result in sea levels that exceed typical tidal ranges. The current recommended design level for the Annual Exceedance Probability of 1% for this region is a still water level of 1.318m AHD.

The proposed new abutment level of the ramps is 2.60m AHD provides a freeboard of approximately 100mm above the planning scheme low level for 1%AEP and storm surge allowance (2.5m AHD). The nature of the sites with wide open areas and coastal shorelines are such that localised storm surge is likely to be significantly less than the levels nominated in the planning scheme.

3.4 Wave data

Wave data for the wave–shoreline interaction was taken from the outputs from the wind wave analysis. The design significant wave height and period was used to generate an irregular wave series over a time period of 15 minutes. At the analysis boundary, seabed level is -1.1m AHD.
This corresponds to a significant wave height of:

**Kettering:**
$H_{\text{sig}} = 1.0 \text{m}$ and period $T_{\text{peak}} = 3.5 \text{s}$.

**Roberts Point:**
$H_{\text{sig}} = 1.4 \text{m}$ and period $T_{\text{peak}} = 4.5 \text{s}$.

### 3.4.1 Rock Armour Protection Design

Extreme storm surge levels in combination with 1in100 wave events at 2100 water levels were used to determine the required rock armour sizing and thickness.

With a batter slope of 1:1.5, the recommended nominal rock diameter of:

- Kettering – Dn50 = 0.48m, M50 = 300kg
- Roberts Point – Dn50 = 0.66m, M50 = 800kg

### 3.5 Inundation and Coastal Protection Assessment

The figure below highlights the recorded inundation zones across the proposed development site.

**Figure 8 Coastal Inundation Mapping - Kettering**
Figure 9 Coastal Inundation Mapping - Kettering

**LEGEND**

Coastal Inundation Hazard Bands V1

- **LOW** - This area is vulnerable to a 1% AEP storm event in 2100.
- **MEDIUM** - This area is vulnerable to a 1% AEP storm event in 2050 and a 0.8m sea level rise by 2100.
- **HIGH** - The area is vulnerable to the highest astronomical tide now, and to a 0.2 metre sea level rise from the mean high tide by 2050.

The site, in its current form is highlighted as under medium to low risk for inundation across the road in both the terminals.

The increased vertical height of the reclamation for the new terminal access ramp and abutment will entirely reduce and manage the direct risk of inundation. Coupled with the design of the upgrade works, the overall risk from inundation will therefore be improved. The design features will allow for built works to be adaptable to manage predicted sea level rise and increased frequency of storm/high rainfall events if they increase over and above the current predicted levels.

The proposed works do not significantly impact on the waterway in the local areas and will minimise erosion and inundation of the site through installation of upgraded shoreline and rock armour protection. The design and features of rock materials and marine structures are consistent with the existing site will enable expansion of an already highly disturbed and controlled site.
4. Assessment Summary

The proposed development to upgrade the existing Bruny Island Ferry Terminals at Kettering and Roberts Point has been reviewed by Burbury Consulting to assess any potential impacts associated with the proposal against the planning scheme key Codes for coastal inundation and erosion.

The associated DA drawings identify modifications to the works area through:

- **Kettering Terminal:**
  - Installation of expanded terminal ramp footprint with rock armour;
  - Filling to suit new road and access to terminal ramp;
  - New terminal infrastructure including piled fendering and mooring structures as well as ramp support structures.

- **Roberts Point Terminal:**
  - Installation of expanded terminal ramp footprint with rock armour;
  - Filling to suit new road and access to terminal ramp;
  - New terminal infrastructure including piled fendering and mooring structures as well as ramp support structures.

The proposed upgrade works for both Kettering and Roberts Point have been assessed to manage and not increase the risk of inundation or coastal erosion in current form.

The following recommendations for the engineering design and construction are proposed to ensure the potential for impacts are managed and minimised:

- Installation of silt curtain (marine) and silt fencing (land) on the shoreline prior to commencing construction and site earthworks to control sediment discharge into the adjacent bays during earthworks and protection of the construction area;

- Locate toe armour rock on stable and sound material (to engineer’s recommendation) for formation of coastal rock armour structures;

- Place toe or armour rock immediately in front of the shoreline as well as remediated areas impacted through excavation to ensure exposed faces are well protected from wave action and sized and graded to reduce wave energy on the new shoreline;

- Prefabrication of elements off site and delivery to site to minimise site construction times and potential impacts of construction works within the waterways;

- Utilise appropriate materials for marine exposure such as:
  - Concrete – high strength, 70 mm cover and corrosion inhibitors;
  - Steel – protective coatings;
  - Aluminium – marine grade and management of dissimilar metals; and
  - Suitably graded and selected rock

- Control stormwater discharge during construction and access to proposed new works for ongoing maintenance and future works (i.e. sediment and debris collection, sea level rise allowances, etc.).