GEO-ENVIRONMENTAL SOLUTIONS

# COASTAL EROSION VULNERABILITY ASSESSMENT

## PROJECT:

Proposed Dwelling

## Site Address:

48 Derwent Ave,
Margate
TAS 7054

CLIENT:

EMAC Systembuilt Group

DATE:

6/02/2026

# DOCUMENT CONTROL

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| Project Type: | Coastal Vulnerability Assessment | |
| Client: | EMAC Systembuilt Group | |
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## FIGURES



## TABLES

# EXECUTIVE SUMMARY

Geo-Environmental Solutions Pty Ltd (GES) were contracted EMAC Systembuilt Group to prepare a coastal vulnerability assessment for a proposed dwelling at Margate, Tasmania. The project area consists of a single cadastral title (CT 169532/4) located at 48 Derwent Avenue, Margate TAS 7054. (The Site).
An application to conduct construction works has triggered the assessment in accordance with the Kingborough Council Interim Planning Scheme (IPS) 2015. A coastal vulnerability assessment is required given that part of the site is in the coastal erosion hazard overlay.

GES have undertaken this assessment using available scientific literature and datasets. Estimations are determined by approximation with appropriate regional information applied where appropriate to site specific information. Data collection and site-specific modelling was undertaken in assessment of the site.

Based on the coastal erosion assessment considering a 50-year lifetime of the proposed development, the following can be concluded:

- The proposed works are for a new dwelling to be located on the southeast portion of the site within a very sheltered part of North West Bay.
- The project area is not situated on an actively mobile dune system, indicating a relatively stable landform.
- After reviewing a historical imagery and aerial photos there are no signs that the shoreline changes since 1988.
- It is recommended that the proposed development be founded on the underlying bedrock. In the event of extreme weather conditions causing sea levels and tides to reach the estimated 1.93 m AHD by 2076, soft sediments may be eroded until the underlying rock is exposed; however, this erosion is unlikely to affect the proposed dwelling.
- GES has established from the qualitative risk assessment that the proposed development works at the site are acceptable and compliant with the coastal erosion code of IPS – Kingborough Council.

## List of Abbreviations

| | |
|---|---|
| AHD (83) | Australian Height Datum |
| AEP | Annual Exceedance Probability |
| ARI | Average Reoccurrence Interval |
| CEM | Coastal Engineering Model |
| CEHC | Coastal Erosion Hazards Code |
| DCP | Dynamic Cone Penetrometer |
| DEM | Digital Elevation Model |
| DPAC | Department of Premier and Cabinet |
| ERMP | Erosion Risk Management plan |
| GES | Geo-Environmental Solutions Pty Ltd |
| GIS | Geographical Information System |
| IPAC | Inundation Prone Areas Code |
| IPCC | Intergovernmental Panel on Climate Change |
| IPS | Interim Planning Scheme |
| LiDAR | Light Detection And Ranging |
| LIST | Land and Information System, Tasmania |
| MRT | Mineral Resources Tasmania |
| NCCOE | National Committee on Coastal and Ocean Engineering |
| SB | Soil Bore |
| SPM | Shoreline Protection Manual |
| SSP | Surf Similarity Parameter |
| SWAN | Simulating Waves Nearshore |
| TAFI | Tasmanian Aquiculture and Fisheries Institute |
| WRL | Water Research Laboratory (University of New South Wales) |

# 1 INTRODUCTION

Geo-Environmental Solutions Pty Ltd (GES) were contracted EMAC Systembuilt Group to prepare a coastal vulnerability assessment for a proposed dwelling at Margate, Tasmania. The project area consists of a single cadastral title (CT 169532/4) located at 48 Derwent Avenue, Margate TAS 7054. (The Site).
An application to conduct construction works has triggered the assessment in accordance with the Kingborough Council Interim Planning Scheme (IPS) 2015. A coastal vulnerability assessment is required given that part of the site is in the coastal erosion hazard overlay.

A coastal vulnerability assessment is required given that part of the site is in the coastal erosion hazard overlay. A detailed site specific hydrodynamic and sediment erosion assessment has been conducted to further assess the future geotechnical stability of the site and any proposed development.

GES have undertaken this assessment using available scientific literature and datasets. Estimations are determined by approximation with appropriate regional information applied where appropriate to site specific information. Data collection and site-specific modelling was undertaken in assessment of the site.

# 2 OBJECTIVES

The objective of the site investigation is to:

- Conduct a literature review of all geological, geomorphologic, hydrodynamic information and any erosion assessments which are relevant to the site;
- Review hydrodynamic assessments of the local area to determine projected sea level rise, storm tides and site-specific hydrodynamic conditions and where applicable, GES's site-specific soil investigation findings;
- Conduct a detailed erosion assessment of site erosion vulnerability in terms of long term beach recession and short-term storm erosion.
- Conduct a site risk assessment for the proposed development ensuring relevant performance criteria are addressed; and
- Where applicable, provide recommendations on methods and design approach to reduce inundation and erosion impact.

# 3 SITE DETAILS

## 3.1 Project Area Land Title

The land studied in this report is defined by the following title reference:

- CT 169532/4

the 'Site' and/or the 'Project Area' in this report.

## 3.2 Project Area

The project area is located at 48 Derwent Avenue in the coastal township of Margate (Figure 1), approximately 20 km south of Hobart on the western margin of the Derwent Estuary in southern Tasmania. The site is situated within a very sheltered part of North West Bay and is set back approximately 25 m from the coastline. It is separated from the gravel beach by a vegetated slope supporting trees, native bushland species, and with a shallow intertidal waters at its base.


Figure 1 - Location of the site

### 3.2.1 Proposed Works

The project area is occupied with an exciting shed on land block approximately 2955m² in size. The proposed works involves a new dwelling on the southeast portion of the site. The access driveway will remain the same via Derwent Ave. The topography of the site is approximately 5m AHD. Plans for the proposed works have been provided to GES from EMAC Systembuilt Group (Project No: 2014 Dated: 27/01/2025). The plans are presented in Figure 2.

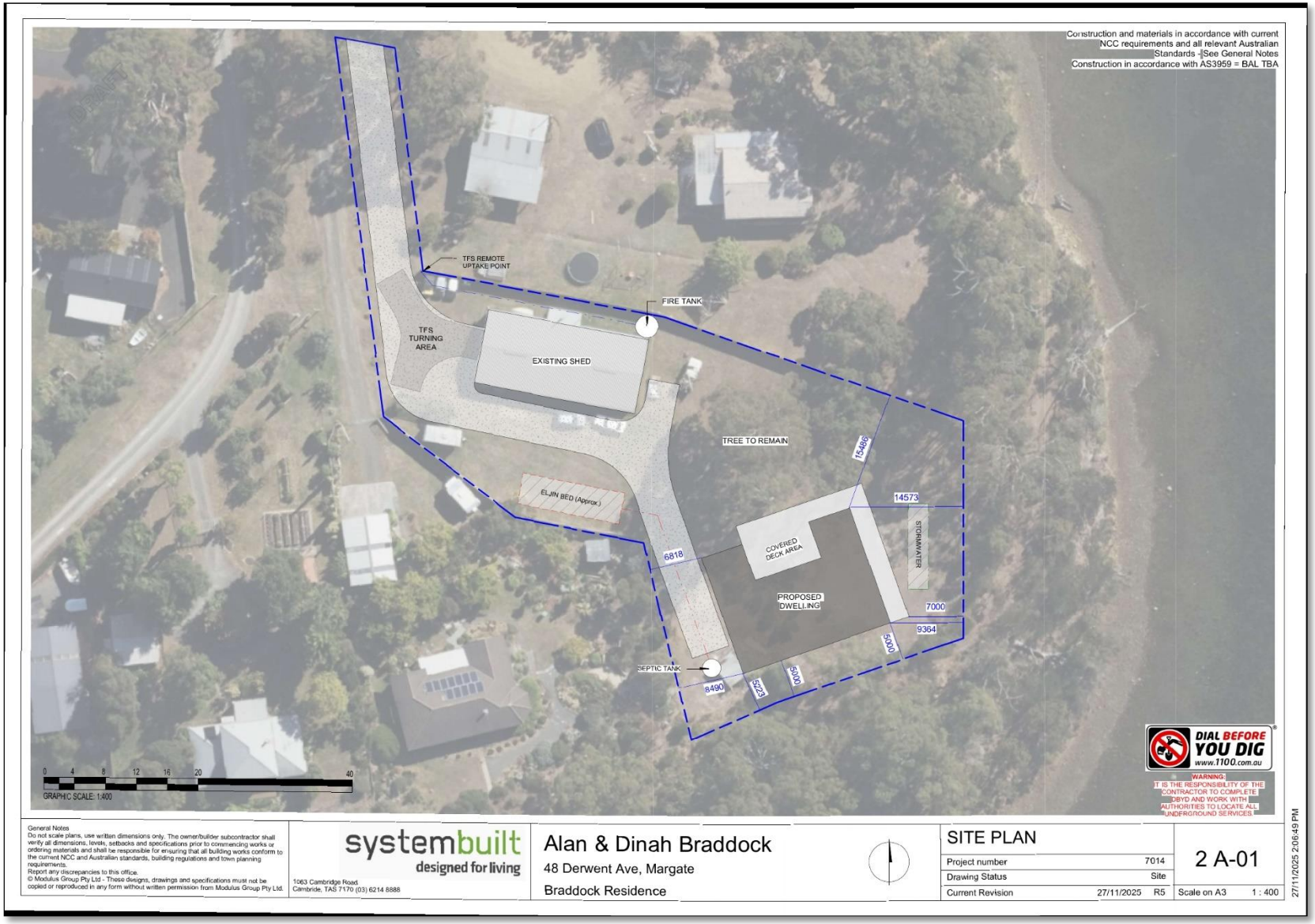



Figure 2 - Site Plan of the site

# 4 PLANNING

## 4.1 Australian Building Code Board

This report presents a summary of the overall building construction risk to coastal erosion and inundation processes. This assessment has been conducted a 'normal' building design life category based on a 2023 baseline (ABCB 2015).

*'The design life of buildings should be taken as 'Normal" for all building importance categories unless otherwise stated.'*

As per Table 3-1, the following sub systems are identified for the proposed development:

- Building foundations subsystems are considered not accessible or economical to repair and therefore are to be designed with a 50-year life till 2073; and
- Wastewater subsystems are considered to have moderate ease of access but difficult or costly to replace or repair and are therefore to be designed with a 15-year life till 2038.

**Table 3-1 Design life of building and plumbing installations and their components**

| *Building Design Life Category* | *Building Design Life (years)* | *Design life for components or sub systems readily accessible and economical to replace or repair (years)* | *Design life for components or sub systems with moderate ease of access but difficult or costly to replace or repair (years)* | *Design life for components or sub systems not accessible or not economical to replace or repair (years)* |
|---|---|---|---|---|
| Short | 1 < dl < 15 | 5 or dl (if dl<5) | dl | dl |
| Normal | 50 | 5 | 15 | 50 |
| Long | 100 or more | 10 | 25 | 100 |

Note: Design Life (dl) in years

## 4.2 The Tasmanian Building Regulations 2016

The Tasmanian Building Regulations are regulated by the Consumer, Building and Occupation Services (CBOS) department and are formed from the Tasmanian Building Act 2016. New state-wide planning and building requirements are being implemented for hazardous areas. These include areas potentially subject to landslip, bushfire, flooding, coastal erosion, & costal inundation. Details of the Tasmanian Building Regulations are presented in Appendix 2.

## 4.3 Interim Planning Scheme Overlay

### 4.3.1 Coastal Erosion Hazard Code Overlay (CEHC)

The proposed works fall within Low and Medium Coastal Erosion Hazard Overlay (Figure 3).

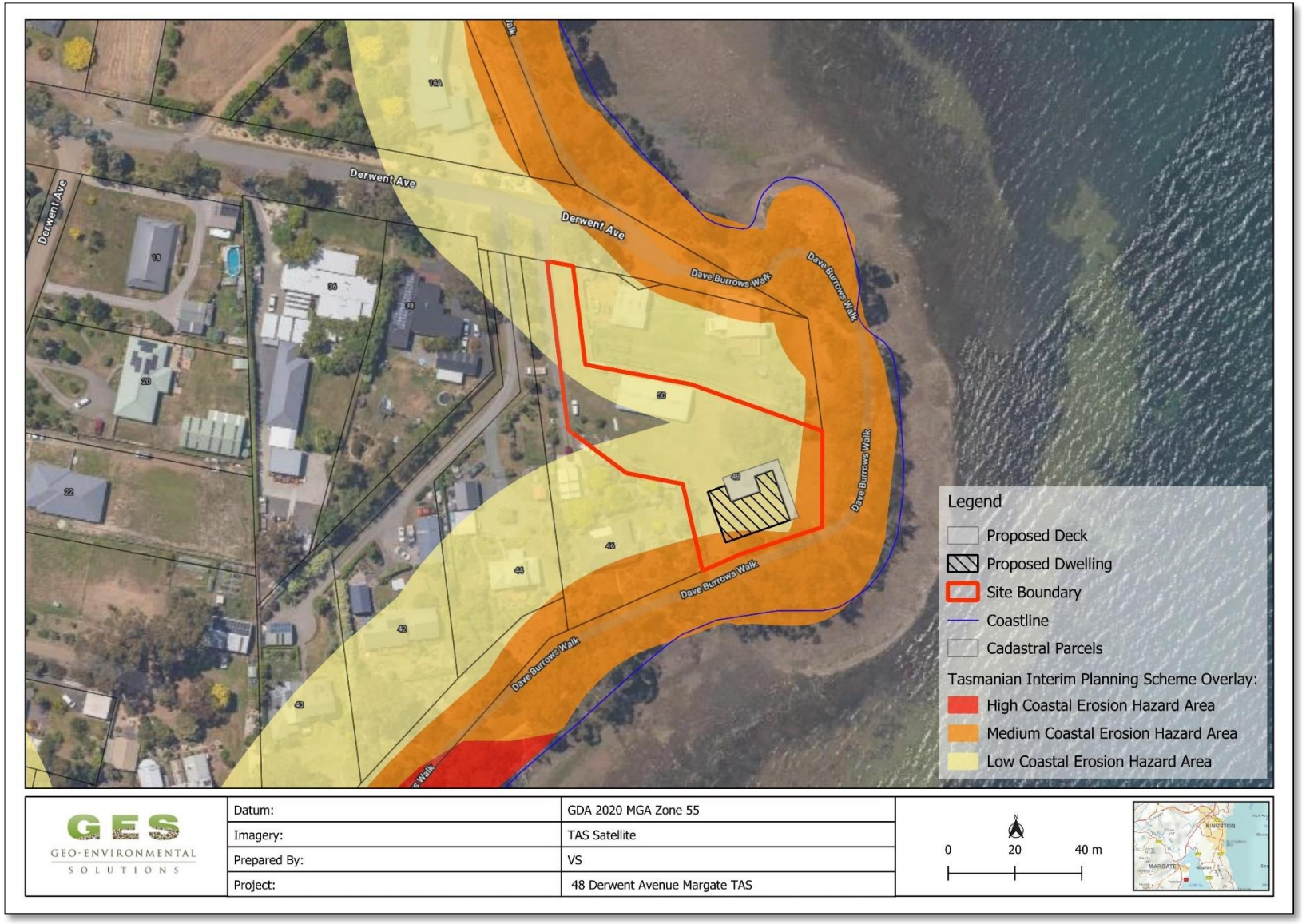



Figure 3 – Coastal Erosion Hazard Overlay (Source: The List)

### 4.4 Development & Works Acceptable Solutions

Where applicable, the need for further performance criteria compliance is outlined in Appendix 1.

#### 4.4.1 Coastal Erosion Hazard Code (CEHC)

*E16.7.1 A1 Buildings and works.*

*Given that part of the proposed works resides in the CEHC Area, and there are no acceptable solutions for buildings and works in a CEHC Area, the E16.7.1 P1 performance criteria will need to be addressed.*

## 5 SITE MAPPING

To assist in determination of the vulnerability of the site to erosion from coastal processes, it is important to determine the geological and geomorphological characteristics of the site.

### 5.1 Geological Mapping

The geological map for the site has been presented in Figure 4. Based on the MRT 1:25,000 scale geology map 'Blackmans Bay", indicates the site is underlain by the following geological unit:

- *Triassic (Map Unit: TQhs) –* Deposits of extremely weathered dolerite and Parmeener clasts pebble to small boulder size and with clayey matrix.

### 5.2 Site Soils

A number of bore holes were completed to identify the distribution and variation of the soil materials at the site, bore hole locations are indicated on the site plan. See soil profile conditions presented below in Table 1. Tests were conducted across the site to obtain bearing capacities of the material at the time of this investigation.

Soils on site are developing from Tertiary Sediments. The soils consist of silty sand topsoils on over clay dominant subsoils. The clay horizons will exhibit moderate ground surface movement with moisture fluctuations.

The site has been classified as Class H1 (40-60mm Ys range). The site has been classified as Class H-1, the profile is highly reactive and is expected to exhibit significant ground surface movement. Design and construction should be made in accordance with this classification.

**Table 1 Soil Profile Summary**

| BH 1 Depth (m) | BH 2 Depth (m) | BH 3 Depth (m) | USCS | Description |
|---|---|---|---|---|
| 0.00- 0.20 | 0.00-0.20 | 0.00-0.20 | SM | Silty SAND: Fine grained, brown-grey, slightly moist, medium dense. |
| 0.20 – 1.30 | 0.20-1.10 | 0.20-0.80 | CI | Silty CLAY (CI): Medium plasticity, brown-grey, slightly moist, stiff. |
| 1.30 – 2.10 | 1.10-1.40 | 0.80-1.00 | CL | Sandy CLAY (CL) with gravels: Low plasticity, pale brown, slightly moist, very stiff, refusal on rock. |

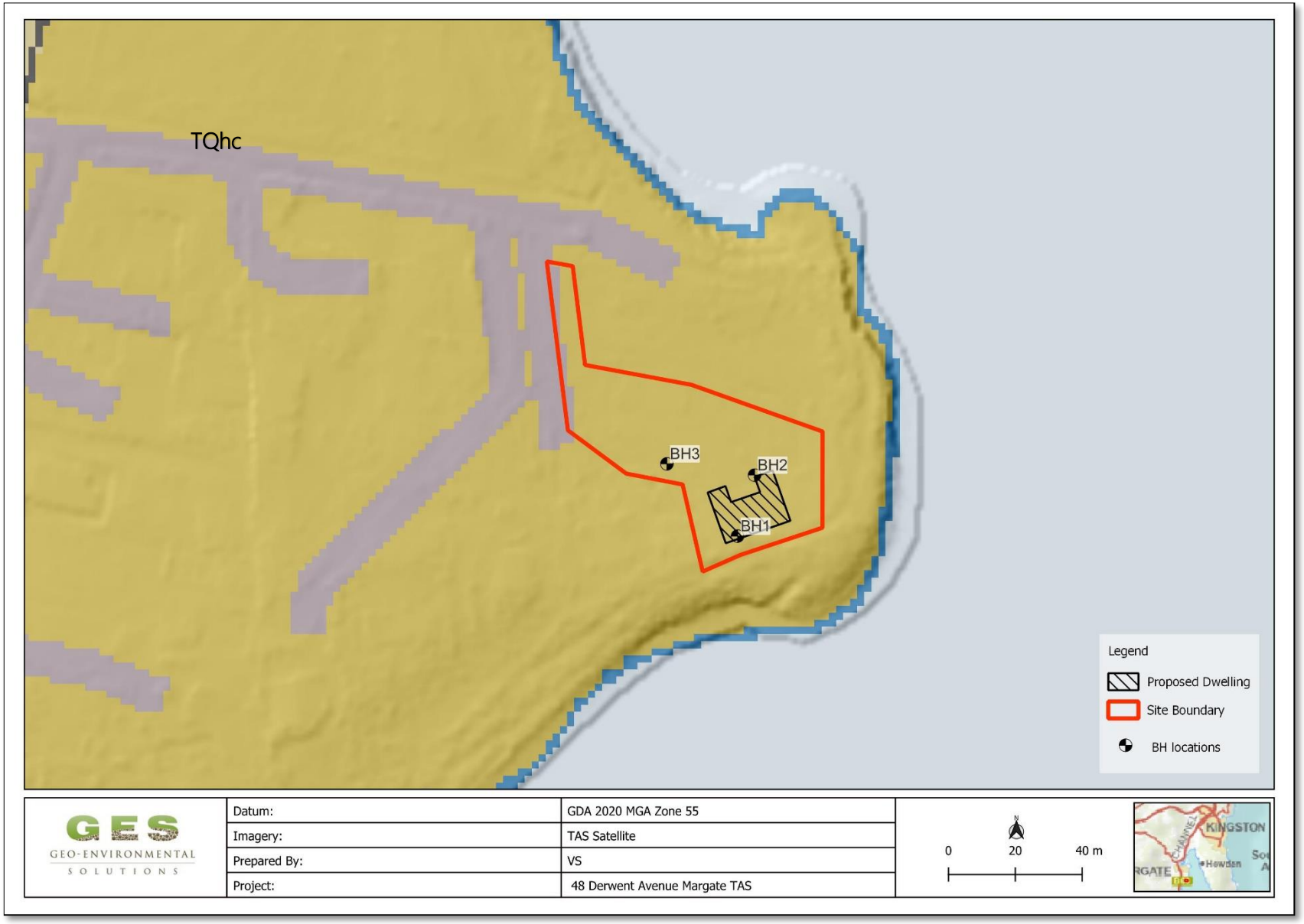



Figure 4 - Mapped Geology (Source: MRT Mapping Blackmans Bay 1:25,000) and BH Locations

# 6 COASTAL PROCESSES

In order to evaluate coastal hazards accurately, it is essential to gain an understanding of the coastal processes specific to the study area. These processes directly contribute to the occurrence of coastal hazards, which can impact both human safety and the built environment.

The following coastal processes are particularly relevant to this investigation and will be assessed in subsequent sections:

## 6.1 Water Levels

The site assessment of water levels involves analysing tides, storm surges, and other factors that affect the overall water level along the coast.

### 6.1.1 Sea Level Rise

The IPS – Kingborough Valley SLR adopted 0.8m rise by 2100. However, the GES has adopted the most recently published following sea level rise estimates-based Canute 3.0, IPCC AR6 projections (very high RCP8.5 climate scenario):

- 0.60m rise by 2076.

### 6.1.2 Storm Tide

Storm tide events may be defined in terms of the culmination of astronomical tide and storm surge events. Maximum storm tide inundation levels have been adopted for the site based on a 1% AEP that an inundation event will occur. GES obtained data for storm tide levels from Canute 3.0. taking in account greenhouse gas emission scenario - very high RCP 8.5, Climate Model Ensemble Percentile Upper (95th), IPCC Version AR6 (Baseline 1995 -2014). (Source: Canute 3.0)

- The storm tide level adopted for the site is 1.23m AHD.

### 6.1.3 Wave and Wind

The project area is not directly exposed to significant swells. While it is possible for swells to reach the North West Bay end, their power diminishes as they travel through the D'Entrecasteaux Channel due to various obstructions along the way. Furthermore, the site is situated in a highly sheltered bay, which minimizes its vulnerability to local wind fetch. Consequently, it is unlikely for the site to experience high waves exceeding 0.5 meters.

- Wave setup – 0.1m

## 6.2 Stillwater Levels

A summary of the site inundation levels based on 1% AEP still water, wave run-up (based on Ru 2%) and wave setup inundation levels for 2073 RCP8.5 scenarios.

Water levels for the site are presented below:

- Stillwater elevations including wave set up – 1.93m AHD.
- Wave Run up Elevations Based on (Van Der Meer 1992) – 2.16m AHD.

# 7 COASTAL EROSION ASSESSMENT

Coastal erosion is the process of gradual wearing a way of land by water, wind, and general weather conditions (DPIPWE 2008). It includes both short term erosion that may occur in a single erosion event or cluster of events (referred to as a 'storm bite,'), and coastal recession, the progressive, ongoing retreat of a shoreline due to multiple erosion events for a period of years or decades (Sharples et al. 2013).

## 7.1 Previous Studies

Table 2 Summary of Coastal Vulnerability Attributes Relevant to the Site (The LIST)

| Aspect | Description |
|---|---|
| Coastal Vulnerability0 | Intertidal or shallow subtidal flats - grainsize undetermined |
| Coastal Erosion Vulnerability | Low profile soft clayey-gravelly shore |
| Coastal Vulnerability | Rocky (bedrock) shore covered by in situ bedrock breakdown material |
| Backshore Type Coastal Vulnerability | Bedrock (may include soil) |

## 7.2 Site Erosion Potential

The site is located along a low-profile shoreline composed of soft clayey and gravelly materials. To assess the current condition of the shoreline, a site inspection was undertaken. Figures 5 and 6 present photographs taken on-site, providing an overview of the bay area. The shoreline is characterised by exposed rock and gravel with areas of native vegetation. Storm erosion has been assessed for the site based a review of historical aerial photography. The aerial images from 2005 to the present have been thoroughly reviewed to analyse erosion patterns both along and in proximity to the site boundary. The assessment revealed no evidence of observed wave runup erosion within the bay adjacent to the site, indicating a low likelihood of such erosion occurring. Instead, erosion near the site boundary is anticipated to be primarily influenced by extreme rainfall events that lead to inundation of the nearby river system. A detailed analysis of aerial photography was conducted, specifically targeting known instances of extreme rainfall events, to assess any potential erosional damage. Based on the observed site conditions, the estimated potential erosion during a storm event is approximately 3 $m^3/m$ of topsoil material, which is likely to naturally recover over time through sediment redistribution

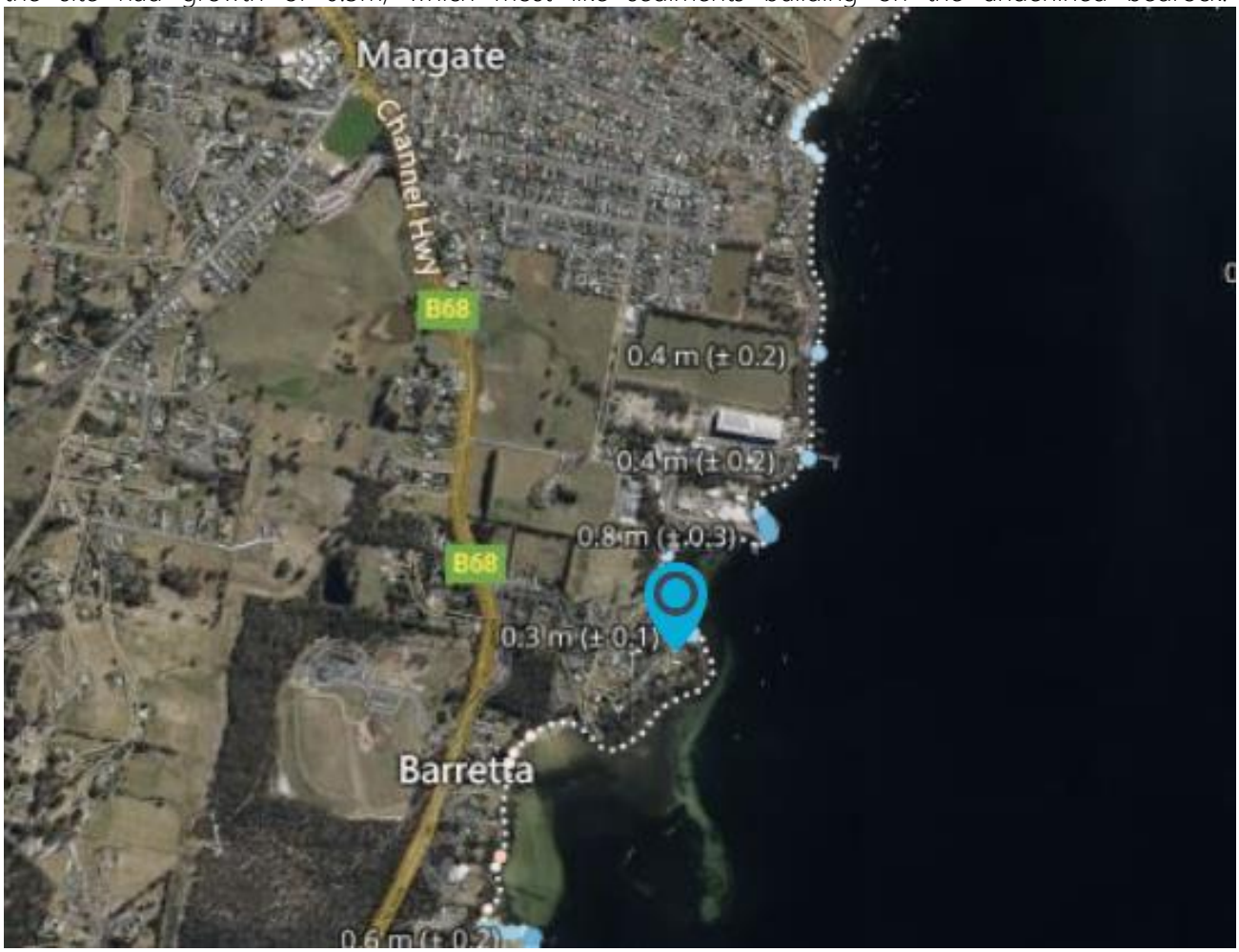
Figure 5 Shoreline of the site

Figure 6 - Shoreline near the site

### 7.2.1 DEA Coastlines

Digital Earth Australia Coastlines (DEA Coastlines) is a continental dataset that includes annual shorelines and rates of coastal change along the entire Australian coastline from 1988 to the present. The product combines satellite data from Geoscience Australia's Digital Earth Australia program with tidal modelling to map the typical location of the coastline at mean sea-level for each year. The product allows trends of coastal erosion and growth to be examined annually at both a local and continental scale, and for patterns of coastal change to be mapped historically and updated regularly as satellite data continues to be acquired. This allows current rates of coastal change to be compared with that observed in previous years or decades. But with interannual variability, presumably in response to specific storm events.

The shoreline near the site has remained stable without any significant trend of retreat. The shoreline near the site had growth of 0.3m, which most like sediments building on the underlined bedrock.




### 7.2.2 Future Recession

The site is vulnerable to erosion from river meandering, which may occur as a result of changes in water levels within the river system due to sea level rise affecting the topsoils. However, it is very unlikely that this would impact the proposed dwelling, as both the site and shoreline are underlain by rock, which has very low erosion rates.

# 8 RISK ASSESSMENT

The qualitative risk assessment criteria have been developed to identify key risks that may arise from building works in areas that are vulnerable to coastal erosion hazard. The risk assessment based on year 2073, 0.60m AHD high SLR scenario projected life of the building.

The criteria are based on a risk assessment matrix consistent with Australian Standard AS4360 on Risk Management (AS4360). The qualitative assessment of risk severity and likelihood were used to help provide a qualitative risk assessment based upon the coastal vulnerability assessment completed for the site.

A detailed risk assessment addressing the performance criteria is presented in Appendix 4 GES has established from the risk assessment that the level of risk is acceptable for the proposed development works.

# 9 CONCLUSIONS AND RECOMMENDATIONS

GES has established from the qualitative risk assessment that the proposed development works at the site are acceptable. It is recommended that the proposed development be founded on the underlying bedrock. Based upon the estimates of possible erosion and the setback of the proposed works it is considered that the risk posed from future erosion to the property within the life of the development and use is low and acceptable.

# 10 LIMITATIONS STATEMENT

The following limitations apply to this report:

- Climate Futures Light Detection and Ranging (LIDAR) digital elevation model is used for the site modelling;
- The values estimated in this report provide an order of magnitude for assessing climate change impacts and in particular climate change induced sea level rise impacts. The information is based on a collation of existing information and data, with some site specific modelling for planning purposes.

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# APPENDIX 1 – ACCEPTABLE SOLUTIONS

## *Coastal Erosion Hazard Code (CEHC) Areas*

| Standard | Code | Acceptable Solution | | Performance Criteria |
|---|---|---|---|---|
| Use | E16.6<br>Change of Use | A1 | A1 No Acceptable solution | P1 |
| Development | E16.7.1<br>Buildings & Works | A1 | A1 No Acceptable solution | P1 |
| | E16.7.2<br>Dependent on a Coastal Location | A1 | A1 An extension to an existing boat ramp, car park, jetty, marina, marine farming shore facility or slipway must be no more than 20% of the size of the facility existing at the effective date. | P1 |
| | | A2 | A2 No Acceptable Solution for dredging and reclamation. | P2 |
| | | A3 | A3 No Acceptable Solution for coastal protection works initiated by the private sector. | P3 |
| Subdivision | E16.8.1 CEHC Area | A1 | No Acceptable solution | P1 |
| | | A2 | No Acceptable solution | P2 |
| | Dependent on a Coastal Location | A1 | No Acceptable solution | P1 |

# APPENDIX 2 – TASMANIAN BUILDING REGULATIONS 2016

*Division 4 - Coastal erosion*

## 57. Coastal erosion hazard areas

1) For the purposes of the Act, land is a coastal erosion hazard area if –
    a. the land is shown on a planning scheme overlay map as being land that is within a coastal erosion hazard area; and
    b. the land –
        i. is classified as land within a hazard band of a coastal erosion hazard area; or
        ii. is shown on a planning scheme overlay map as being land in an investigation area for a coastal erosion hazard area and the land has not been subsequently classified as being an acceptable risk.
2) For the purposes of the definition of hazardous area in section 4(1) of the Act –
    a. classification under a coastal erosion determination as being land that is within a hazard band of a coastal erosion hazard area is a prescribed attribute; and
    b. a coastal erosion hazard area is a hazardous area.

## 58. Works in coastal erosion hazard areas

1) A person must not perform work in a coastal erosion hazard area unless he or she is authorised to do so under the Act.
2) If a person intends to perform work in an investigation area of a coastal erosion hazard area, the person must, before performing the work, ensure that the land is classified in accordance with the coastal erosion determination –
    a. as being an acceptable risk; or
    b. into a hazard band for the coastal erosion hazard area.
3) A responsible person for work being performed in a coastal erosion hazard area must ensure that the work is being performed in accordance with the Act and the coastal erosion determination.
4) A person performing work in a coastal erosion hazard area must ensure that the work complies with the Act and the coastal erosion determination.

# APPENDIX 3 - QUALITATIVE RISK ASSESSMENT TABLES

## Consequence Index

| Consequence | Details - Storm Erosion and Inundation | Details – Waterways and Coastal Protection |
|---|---|---|
| Catastrophic | Loss of life, loss of significant environmental values due to a pollution event where there is not likely to be recovery in the foreseeable future. | Very serious environmental effects with impairment of ecosystem function. Long term, widespread effects on significant environment (eg. RAMSAR Wetland) |
| Major | Extensive injuries. Complete structural failure of development, destruction of significant property and infrastructure, significant environmental damage requiring remediation with a long-term recovery time. | Serious environmental impact effects with some impairment of ecosystem function. Relatively widespread medium-long term impacts. |
| Moderate | Treatment required, significant building or infrastructure damage i.e. loss of minor outbuildings such as car ports, garages and the like. Replacement of significant property components. linings, hard paved surfaces, cladding, flooring. Moderate environmental damage with a short-term natural or remedial recovery time. | Moderate effects on biological or physical environment (air, water) but not affecting ecosystem function. Moderate short term widespread impacts (e.g. significant spills) |
| Minor | Medium loss – repair of outbuildings and repair and minor replacement of building components of buildings. Replacement of floor/window coverings, some furniture through seepage (where applicable). Minor environmental damage easily remediated. | Minor effects on biological or physical environment. Minor short-term damage to small area of limited significance. |
| Insignificant | No injury, low loss – no replacement of habitable building components, some remediation of garden beds, gravel driveways etc. Environment can naturally withstand and recover without remediation. Inundation of the site, but ground based access is still readily available and habitable buildings are not inundated, including incorporated garages. | Limited damage to minimal area of low significance. |

## Likelihood Index

| Level | Descriptor | Description | Guideline |
|---|---|---|---|
| A | Almost Certain | Consequence is expected to occur in most circumstances. | Occurs more than once per month. |
| B | Likely | Consequence will probably occur in most circumstances. | Occurs once every 1 month – 1 year. |
| C | Occasionally | Consequence should occur at some time. | Occurs once every 1 year - 10 years. |
| D | Unlikely | Consequence could occur at some time. | Occurs once every 10 years – 100 years. |
| E | Rare | Consequence may only occur in exceptional circumstances. | Occurs less than once every 100 years. |

Source: AS/NZS 4360:2004 Risk Management

## Qualitative Risk Matrix

| Likelihood of the Consequence | Maximum Reasonable Consequence | | | | |
|---|---|---|---|---|---|
| | (1) Insignificant | (2) Minor | (3) Moderate | (4) Major | (5) Catastrophic |
| (A) Almost certain | 11 High | 16 High | 20 Extreme | 23 Extreme | 25 Extreme |
| (B) Likely | 7 Moderate | 12 High | 17 High | 21 Extreme | 24 Extreme |
| (C) Occasionally | 4 Low | 8 Moderate | 13 High | 18 Extreme | 22 Extreme |
| (D) Unlikely | 2 Low | 5 Low | 9 Moderate | 14 High | 19 Extreme |
| (E) Rare | 1 Low | 3 Low | 6 Moderate | 10 High | 15 High |

Source: AS/NZS 4360:2004 Risk Management

# APPENDIX 4 – QUANTITATIVE RISK ASSESSMENT

## BUILDING AND WORKS WITHIN A COASTAL EROSION HAZARD AREA

| Performance Criteria E16.7.1 P1<br><br>Buildings and works must satisfy all of the following: | Relevance | Management Options | Preliminary Risk Assessment (where relevant) | | | Further Assessment Required |
|---|---|---|---|---|---|---|
| | | | Consequence | Likelihood | Risk | |
| (a) not increase the level of risk to the life of the users of the site or hazard for adjoining or nearby properties or public infrastructure; | The proposed structure is beyond the modelled 2073 1% AEP coastal erosion hazard area. | | Minor (2) | Unlikely (D) | Low (5) | No |
| (b) erosion risk arising from wave run-up, including impact and material suitability, may be mitigated to an acceptable level through structural or design methods used to avoid damage to, or loss of, buildings or works; | No wave runup likely to reach the proposed dwelling | | Insignificant (1) | Rare (E) | Low (1) | No |
| (c) erosion risk is mitigated to an acceptable level through measures to modify the hazard where these measures are designed and certified by an engineer with suitable experience in coastal, civil and/or hydraulic engineering; | No mitigation required | | Insignificant (1) | Rare (E) | Low (1) | No |
| (d) need for future remediation works | No remediation works required | | Minor (2) | Unlikely (D) | Low (5) | No |
| (e) health and safety of people is not placed at risk | Not within building design life | | Minor (2) | Unlikely (D) | Low (5) | No |
| (f) important natural features are adequately protected | Not Applicable | | | | | No |
| (g) public foreshore access is not obstructed where the managing public authority requires it to continue to exist | Not Applicable | | | | | No |
| (h) access to the site will not be lost or substantially compromised by expected future erosion whether on the proposed site or off-site | Not within building design life expectancy | | Insignificant (1) | Rare (E) | Low (1) | No |
| (i) provision of a developer contribution for required mitigation works consistent with any adopted Council Policy, prior to commencement of works. | No works required | | Insignificant (1) | Rare (E) | Low (1) | No |
| (j) not be located on an actively mobile landform | Not actively mobile | | Insignificant (1) | Rare (E) | Low (1) | No |