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Development Application < 80m ²	\$285 – Minimum Fee + advertising fee
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Receipt No.
Receipt Date:
Fee \$

PLANNING PERMIT APPLICATION
APPLICATION FOR PLANNING APPROVAL UNDER SECTION 51,
LAND USE PLANNING & APPROVALS ACT 1993

1. Development Address 13 and 15 Hepples Road, Boat Harbour
2. Full Name of Applicant(s) 6ty° Pty Ltd
3. Postal Address of Applicants(s) PO Box 63 Riverside TAS 7250
- Would you like this address recorded for all Council correspondence Yes No.....
- Email Address gwalker@6ty.com.au
- Telephone – Day (03) 6332 3300 Mobile 0417 921 661

WHERE THE APPLICANT IS NOT THE OWNER

In accordance with Section 52 of the *Land Use Planning and Approvals Act 1993* if the applicant for the permit is not the owner of the land in respect of which the permit is required, the applicant must include in the application for the permit, a declaration that the applicant has notified the owner of the intention to make the application.

In the event that the property is owned or managed by the Crown or Council, this application is to be signed by the relevant Crown Minister responsible, or General Manager of the Council, and accompanied by written permission of the Minister/General Manager to the making of this application.

4. Name of Property Owner (see authorisation below)

Full Name C J and R S Kelly G A Medwin and D R Medwin

Address PO Box 780 Devonport TAS 7310 PO Box 3025 Burnie TAS 7320

Telephone – Home Work/Business 0418 140 029

Applicant's Notification to Owner

I George Walker

Full Name of Applicant(s) 6ty° Pty Ltd

of Applicant's Address

Declare that I/we have notified the owner(s) of the property(ies) of the intention to make this application.

I/We understand that in accordance with Section 52(2) of the *Land Use Planning and Approvals Act 1993* a person must not obtain or attempt to obtain a permit by wilfully making, or causing to be made, any false representation or declaration either orally or in writing.

Applicant's Signature(s) George Walker 3 May 2018

5. Proposed Development (Fully describe intended use of land or premises)

Demolition of existing dwelling, replacement dwelling and construction of retaining walls.

6. Supporting Information if necessary to explain special features of the proposal.

(Attach separate sheet if required)

Please refer to the planning submission.

To include –

(a) Two Copies (+ electronic copy if available) of any plan(s) and/or specification(s) for the proposed development, showing where applicable:

- ☐ i. Sufficient information to demonstrate compliance with all applicable standards, purpose statements in applicable zones and codes, any relevant local area objectives or desired future character statements;
- ☐ ii. a full description of the proposed use or development;
- ☐ iii. a full description of the manner in which the use or development will operate;
- ☐ iv. a site analysis and site plan at an acceptable scale;
- ☐ v. a detailed layout plan of the proposed buildings with dimensions at a scale of 1:100 or 1:200;
- ☐ vi. a plan of the proposed landscaping;
- ☐ vii. car parking facilities and capacity;
- ☐ viii. area of clearing of trees and bushland;
- ☐ ix. size, position, colour, illumination, fixing or support and other design details of advertising sign(s).

(b) A FULL COPY OF YOUR TITLE SHALL ALSO ACCOMPANY THE APPLICATION.

Title Certificate ☐ Title Plan ☐ Schedule of Easements ☐

(c) RELEVANT ENGINEERING APPROVALS

Access ☐ Stormwater ☐

7. Present use of site and/or buildings – full description

Residential

8. Car Parking

Floor Area

Site Area

Existing on site	Existing	111 m ²	268.5 m ²
Total no. proposed	Proposed	80 m ²	
	Total	80 m ²	

Questions 9 to 12 relate to Commercial and Industrial Uses and Developments only

9. What days and hours of operation are proposed?

Monday to Friday: From a.m. to p.m.

Saturday: From a.m. to p.m.

Sunday: From a.m. to p.m.

10. Number of Employees?

Existing

Proposed

11. Vehicles visiting or delivering to or from the site?

Type	No.	Trips per day
.....		
.....		

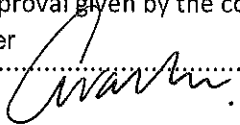
12. What type of machinery is to be installed or used?

Type	No.
.....	
.....	

DECLARATION BY APPLICANT (mandatory)

I declare that the information given is a true and accurate representation of the proposed development. I understand that the information and materials provided with the development application may be made available to the public. I understand that the Council may make such copies of the information and materials as in its opinion are necessary to facilitate a thorough consideration of the Permit Application. I have obtained the relevant permission of the copyright owner for the communication and reproduction of the plans accompanying the development application for the purposes of assessment of that application. I indemnify the Waratah-Wynyard Council for any claim or action taken against it in respect of breach of copyright in respect of any of the information or material provided.

I/We hereby acknowledge that Section 20(a) of the *Local Government Act 1993* provides the power for persons authorised by the General Manager to enter land without notice in relation to an application by the owner or occupier for a licence, permit or other approval given by the council.

Signature(s) George Walker 

Date ~~3 May 2018~~ 22 / 5 / 2018.

OFFICE USE ONLY

14. Application Taken on By
15. Application given o.k. to process By
- 16 Use Class
17. Zoning of Property.....
18. Proposal
19. Permit Type Advertisement Date
19. Discretion
.....
20. Notice on Property by at am/pm
On(see declaration attached)
21. Immediate Adjoining Property Owner(s) Notified on
22. Gas Pipeline Checked By
23. Heritage Listed..... Checked By
24. Assessment Committee for Dam Construction..... Checked By
- 25 Prime Agricultural Land Checked By
26. Land Hazard
Low ☐ Medium ☐ Medium-Active ☐ High ☐ Checked By
27. Landslip A ☐ Landslip B ☐ Landslip Susceptibility ☐ Checked By
28. Clock Started..... Day
Clock Stopped..... Day
Clock Restarted..... Day
29. 42 Days run out on: Checked By
30. Extension of Time Until
31. Application - Approved/Refused
32. Decision Date.....
33. Applicant(s) Notified.....
34. Representor(s) Notified.....

7 June 2018

Enquiries: Townplanner
Phone: (03) 6443 8305
Our Ref: 7087735 & DA 53/2018

6ty Pty Ltd
PO Box 63
RIVERSIDE TAS 7250

Dear George,

**ADDITIONAL INFORMATION REQUIRED
DEVELOPMENT APPLICATION – Demolition of existing dwelling,
replacement dwelling and retaining walls
15 Hepples Road and 13 Hepples Road BOAT HARBOUR BEACH**

I advise that under Section 54 of the Land Use Planning and Approvals Act 1993 Council seeks further information in relation to application DA 53 for a Demolition of existing dwelling, replacement dwelling and retaining walls at 15 Hepples Road and 13 Hepples Road BOAT HARBOUR BEACH. In order to progress the assessment of your application, please provide the following:-

- Proposal drawings of new replacement dwelling at an appropriate scale at an A3 Page size. Current drawings provided are dimensioned and in proportion but not at a measureable scale.
- Proposal drawings showing a new retaining wall are not clearly marked with an appropriate scale. Please provide details with an elevation view and section of all retaining walls at an appropriate scale. No details have been provided to date for the retaining wall crossing the boundary of 13 and 15 Hepples Road.
- Demonstration of compliance with clause 12.4.1 (P2) Suitability of a site or lot for use or development of *the Waratah-Wynyard Interim Planning Scheme 2013*. Furthermore, how is the site to be accessed for the development works?
- Demonstration of compliance with 12.4.1 A3/P3 Suitability of a site or lot for use or development of *the Waratah-Wynyard Interim Planning Scheme 2013*. Please confirm arrangements for water.
- Demonstration of compliance with 12.4.3 A1/P1 and A2/P2 Location and configuration of development of the *Waratah-Wynyard Interim Planning Scheme 2013*, in relation to the retaining walls. The retaining walls are treated as building works under the Act.

- Demonstration of compliance with the Hazard Management Code of the *Waratah-Wynyard Interim Planning Scheme 2013*, in relation to the works proposed and occurred to date. The subject Geotechnical report must indicate the proposed development can achieve and maintain a tolerable level of risk for the duration of the development. The current report states that no development drawings had been considered as they had not yet been provided. This report will need to take into consideration the demolition works, retaining walls, earthwork, and the proposed new dwelling as detailed in the drawings provided.
- Demonstration of compliance with clause E4.6.1 A1/P1 Change in existing ground level or natural ground level of the *Waratah-Wynyard Interim Planning Scheme 2013*. Supporting documentation in the current Geotechnical report suggests cuts ranging from approximately 1.5m to 1 story have occurred. Sections through the site (lots) to demonstrate cut and fill and proposed levels with section marks identifying the cuts on the site plan would assist a response to this clause. Please provide details in relation to any Part V agreement arrangements if unable to achieve compliance with A1 (g).
- Demonstration of compliance with clause E10.6.2 P1 Development in a shoreline area of the *Waratah-Wynyard Interim Planning Scheme 2013*, as the proposed dwelling replacement is located within 30m of the mean high tide water mark.

Your application has been placed on hold until all relevant documentation has been received to the satisfaction of the Planning Authority.

If you have any queries or require further information, please do not hesitate in contacting myself, on (03) 6443 8305.

Yours faithfully



Mathew Jamieson
ACTING MANAGER DEVELOPMENT & REGULATORY SERVICES





Planning Submission

Residential Dwelling

13 and 15 Hepples Road, Boat Harbour

Prepared for:

Waratah-Wynyard Council



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Issue	02
Date	13 February 2019
Project Name	Hepples Road Dwelling
Project Number	17.077
Author	George Walker
Document	Response to Council Request for Further Information

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Appendix A

Certificate of Title

Appendix B

Development Plans

Appendix C

Landslide Risk Assessment

1.0 Introduction

Planning approval is sought to demolish an existing dwelling and construct a new dwelling and retaining walls on land located at 13 and 15 Hepples Road, Boat Harbour (the site - refer to Figure 1). This planning submission provides relevant details of the application and an assessment against the applicable provisions of the Waratah-Wynyard Interim Planning Scheme 2013 (the Scheme).

Figure 1 - aerial image identifying the site.



Source: base image and data from the LIST (www.thelist.tas.gov.au) © State of Tasmania.

1.1 Planning Overview

Element	Overview
Location	13 and 15 Hepples Road, Boat Harbour
Title Information	143923/32 and 143923/31
Land Area	568.1m ²
Planning Instrument	<i>Waratah-Wynyard Interim Planning Scheme 2013 (the Scheme)</i>
Proposed Use	Residential
Proposed Development	Demolition of an existing dwelling and construction of a new dwelling and retaining walls

Zone(s)	12.0 - Low Density Residential
Applicable Code(s)	E4.0 - Change in Ground Level Code E6.0 - Hazard Management Code E9.0 - Traffic Generating Use and Parking Code E10.0 - Water and Waterways Code
Status of Application	Discretionary

1.2 Background

Aspects of the proposed development have been carried out without obtaining relevant planning and building approvals which include partial demolition of the existing dwelling, partial construction of the new dwelling and construction of the two new retaining walls (refer to Figures 2 and 3). Retrospective planning approval is therefore sought for development that has occurred without obtaining the necessary planning approvals.

Figure 2 - photograph showing the extent of partial demolition of the existing dwelling and construction of the new dwelling that has already occurred.



Figure 3 - photograph showing the as constructed 'verti-block' retaining wall.



1.3 Proposed Use and Development

The application seeks approval to demolish an existing residential dwelling and construct a new dwelling and two retaining walls at the site. Details of the proposed use and development are summarised below.

Demolition of existing dwelling

The existing dwelling is split level with an overall height of approximately 5.6m above existing ground level. It has a skillion roof which slopes downwards toward the south-west. The ground floor level is approximately 14m² in area and comprises two bedrooms. The first floor level is approximately 111m² in area and comprises an open plan kitchen, dining and living area, two bedrooms, bathroom and laundry. A deck extends around the north-western and north-eastern sides of the dwelling. The deck abuts the north-western boundary. A stair case is located on the south-eastern side of the deck which provides access between the two levels. It is proposed to demolish the entire dwelling.

Construction of new dwelling

The proposed dwelling will be two storey and will be constructed over a similar footprint as the existing dwelling. The ground floor level will have an area of approximately 88m² and will comprise a family room, two bedrooms, bathroom and an outdoor patio which will be located below the first floor level. An internal staircase will be located at the south-western end of the building which will provide access between the two levels.

The first floor level will have an area of approximately 117m² and will comprise an open plan living dining and kitchen area and master bedroom which will include an ensuite. A deck will extend around the north-western and north-eastern elevations with access to be provided via a glass sliding door from the open plan living area. It will be constructed to the north-western boundary.

The proposed dwelling will have a gabled roof which will result in an overall building height of 7.1m above existing ground level. The external walls of the ground floor level will be formed of poured concrete panels with the external walls of the first floor level to be clad with fibre cement sheeting or horizontal weatherboards. The deck will be timber framed and will incorporate a glazed balustrade. Privacy screens will be located along the north-western and south-eastern ends of the deck. A stair case is located on the south-eastern side of the deck to provide external access between the ground floor and first floor levels.

Retaining walls

The existing pedestrian access which runs below Hepples Road adjacent to the established concrete crib retaining wall has been modified. The retaining wall incorporates bored piers and has been cast in no fines concrete with a beam placed on top of the structure which forms the footpath. The concrete retaining wall continues parallel to the north-western boundary for the length of the dwelling. The wall be setback 1m from the north-western boundary.

A 'verti-block' retaining wall extends diagonally from the south-eastern corner of the retaining wall that contains the pedestrian walkway. It is constructed of pre-cast concrete mass blocks. Approximately 4m of the retaining wall extends into the adjacent lot to the south-east which is addressed as 13 Hepples Road.

2.0 Location

2.1 Subject Site

The site is located on the eastern (lower) side of Hepples Road and is approximately 568.1m² in area. It comprises two (2) separate lots. 13 Hepples Road (CT 143923/32) is 308.2m² in area and has a 13.5m wide frontage to Hepples Road. It contains an existing dwelling. No works are proposed to this dwelling. Approximately 4m of the 'verti-block' retaining wall will be located on this lot.

15 Hepples Road (CT 143923/31) is 268.5m² in area and has a 18m wide frontage to Hepples Road. A pipeline easement 1m in width runs parallel to the north-western boundary of the lot. The majority of works proposed will occur on this lot.

Land within the site drops away acutely from Hepples Road. The surface level of the existing dwellings is therefore approximately 7.5m below the pavement of Hepples Road. An existing concrete crib retaining wall is located along the frontage of the site which supports Hepples Road above.

Due to the acute level change between the road and the lot, vehicular access and parking is unable to be provided. Existing pedestrian access is provided in the south-eastern corner of the site via a concrete walkway which abuts the crib retaining wall.

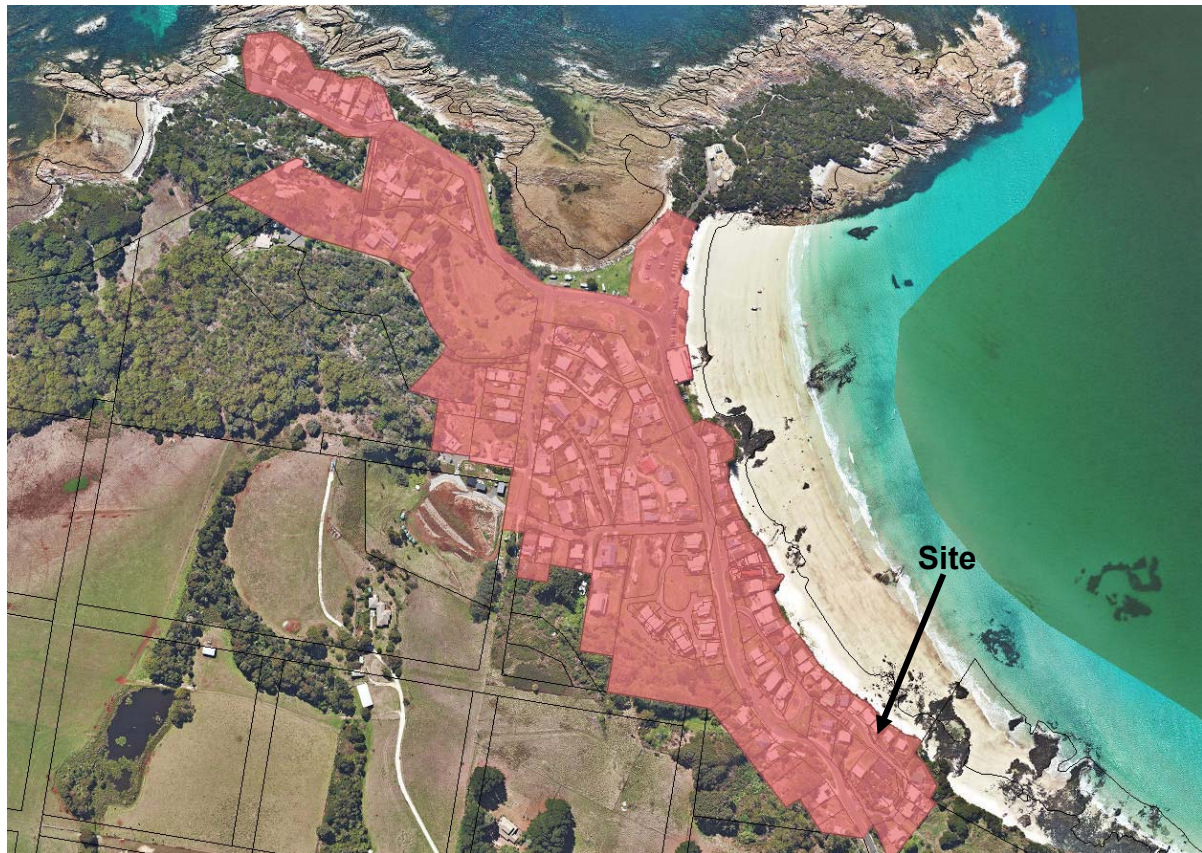
The site adjoins similar sized lots to the north-west and south-east which both contain dwellings. The Boat Harbour Beach coastal reserve adjoins the north-eastern-boundary of the site.

2.2 Description of the Surrounding Area

The site is located within the south-eastern section of the Boat Harbour Beach coastal settlement which is zoned Low Density Residential (refer to Figure 4). The settlement is located within a band of land that lies between the coastline to the north and north-east and escarpment to the west. The site is located at the south-eastern end of the settlement area.

The settlement is primarily characterised by residential use and development. It also includes a surf lifesaving club in the northern half adjacent to the main beach. A public car park and toilet block are located to the north of the surf lifesaving club.

Figure 4 - aerial image showing the extent of the Boat Harbour Beach settlement area which is zoned Low Density Residential and the location of the site.



Source: base image and data from the LIST (www.thelist.tas.gov.au) © State of Tasmania.

2.3 Natural Values and Hazards

The site has been substantially modified to accommodate the established residential dwelling and is therefore cleared of significant native vegetation. TASVEG 3.0 mapping identifies the development areas within the settlement area as 'urban'. The site is not within an area that is subject to coastal inundation, erosion or recession on the Scheme overlay maps.

The site is located within a proclaimed landslip area. Accordingly a Landslide Risk Assessment has been prepared by Tasman Geotechnics for the purposes of addressing the Hazard Management Code of the Scheme. The risk assessment has determined that there will be no increase in the landslip risk profile as a result of the proposed development.

2.4 Site Servicing

The new dwelling will utilise existing water, stormwater and sewerage connections.

2.5 Site Access

The site has frontage to Hepples Road which is a local road under the authority of Council. However, due to the acute change in surface level between the road and the body of the lot, vehicular access is not available. Existing pedestrian access is

provided in the south-eastern corner of the site. Large and more cumbersome construction materials will be transferred from Hepples Road to the site by crane with smaller construction materials to be carried down the pedestrian access.

3.0 Planning Assessment

The following assessment addresses the applicable zone and code provisions and identifies whether the relevant acceptable solutions are satisfied. The relevant performance criteria are addressed in Section 4.

For the purposes of the assessment against the zone provisions, the site represents 15 Hepples Road. The length of retaining wall that extends into 13 Hepples Road has not been considered within the following assessment. Further, the assessment is based on the state of the site prior to the illegal works being undertaken.

3.1 Low Density Residential Zone

Residential use for a single dwelling is identified as 'permitted' in the Low Density Residential zone. The proposed development meets the acceptable solutions for most of the standards in the zone that are relevant, as identified in the following table.

12.4 Development Standards			
Requirement/s		Assessment	Compliance
12.4.1 Suitability of a site or lot for use or development			
A1	<p>A site or each lot on a plan of subdivision must –</p> <ul style="list-style-type: none"> (a) have an area of - <ul style="list-style-type: none"> (i) not less than 500m² excluding any access strip; (ii) if in a locality shown in the Table to this clause, not less than the site area shown for that locality; and (b) contain a building area of not less than 10.0m x 15.0m - <ul style="list-style-type: none"> (i) clear of any applicable setback from a frontage, side or rear boundary; (ii) clear of any applicable setback from a zone boundary; 	<p>The site has an area of 268.5m² and is unable to contain a building area¹ of not less than 10m by 15m in a location that is clear of applicable side and rear setbacks.</p>	<p>Relies on performance criteria.</p>

¹ In accordance with clause 4.1 of the Scheme, building area means the area shown on a plan or plan of subdivision to indicate where all buildings will be located.

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	<ul style="list-style-type: none"> (iii) clear of any registered easement; (iv) clear of any registered right of way benefitting other land; (v) clear of any restriction imposed by a utility; (vi) not including an access strip; (vii) accessible from a frontage or access strip; and (viii) if a new residential lot, with a long axis within the range 30o east of north and 20o west of north. 		
A2	<p>A site or each lot on a subdivision plan must have a separate access from a road –</p> <ul style="list-style-type: none"> (a) across a frontage over which no other land has a right of access; and (b) if an internal lot, by an access strip connecting to a frontage over land not required as the means of access to any other land; or (c) by a right of way connecting to a road - <ul style="list-style-type: none"> (i) over land not required as the means of access to any other land; and (ii) not required to give the lot of which it is a part the minimum properties of a lot in accordance with the acceptable solution in 	<p>The site has access across an existing frontage to Hepples Road which is 18m in width. Advice from Council, being the relevant road authority for Hepples Road, is sought in conjunction with the development application.</p>	<p>Complies with acceptable solution.</p>

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	<p>any applicable standard; and</p> <p>(d) with a width of frontage and any access strip or right of way of not less than -</p> <p>(i) 3.6m for single dwelling development; or</p> <p>(ii) 6.0m for multiple dwelling development or development for a non-residential use; and</p> <p>(e) the relevant road authority in accordance with the Local Government (Highways) Act 1982 or the Roads and Jetties Act 1935 must have advised it is satisfied adequate arrangements can be made to provide vehicular access between the carriageway of a road and the frontage, access strip or right of way to the site or each lot on a proposed subdivision plan.</p>		
A3	<p>A site or each lot on a plan of subdivision must be capable of connecting to a water supply –</p> <p>(a) provided in accordance with the Water and Sewerage Industry Act 2008; or</p> <p>(b) from a rechargeable drinking water system [R4] with a storage capacity of not less than 10,000 litres if–</p> <p>(i) there is not a reticulated water supply; and</p>	<p>The site has an existing connection to a water supply which has been provided in accordance with the <i>Water and Sewerage Industry Act 2008</i>.</p>	<p>Complies with acceptable solution.</p>

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	(ii) development is for – a. a single dwelling; or b. a use with an equivalent population of not more than 10 people per day.		
A4	A site or each lot on a plan of subdivision must be capable of draining and disposing of sewage and liquid trade waste – (a) to a sewerage system provided in accordance with the Water and Sewerage Industry Act 2008; or (b) by on-site disposal if – (i) sewage or liquid trade waste cannot be drained to a reticulated sewer system; and (ii) the development– a. a single dwelling; or b. provides for an equivalent population of not more than 10 people per day; or c. creates a total sewage and waste water flow of not more than 1,000l per day; and (iii) the site has capacity for on-site disposal of domestic waste water in accordance with AS/NSZ1547:2012 On-site domestic-wastewater	The site was an existing connection to a sewerage system which has been provided in accordance with the <i>Water and Sewerage Industry Act 2008</i> .	Complies with acceptable solution.

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	management clear of defined building area or access strip.		
A5	<p>A site or each lot on a plan of subdivision must be capable of draining and disposing of stormwater –</p> <p>(a) to a stormwater system provided in accordance with the Urban Drainage Act 2013; or</p> <p>(b) if stormwater cannot be drained to a stormwater system -</p> <p>(i) for discharge to a natural drainage line, water body, or watercourse; or</p> <p>(ii) for disposal within the site if –</p> <p>a. the site has an area of not less than 5000m²;</p> <p>b. the disposal area is not within any defined building area;</p> <p>c. the disposal area is not within any area required for the disposal of sewage;</p> <p>d. the disposal area is not within any access strip; and</p> <p>e. not more than 50% of the site is impervious surface; and</p> <p>(iii) the development is for a single dwelling.</p>	<p>The site has an existing connection to a stormwater system which has been provided in accordance with the <i>Urban Drainage Act 2013</i>.</p>	
12.4.2 Dwelling density			

12.4 Development Standards			
Requirement/s		Assessment	Compliance
A1	<p>The site area per dwelling must –</p> <ul style="list-style-type: none"> (a) be not less than 500m² if the site has – <ul style="list-style-type: none"> (i) connection to a reticulated water supply; (ii) connection to a reticulated sewer system; and (iii) connection to a stormwater system; or (b) if the site is in a locality shown in the Table to this Clause, not less than the site area for that locality. 	The site area per dwelling is 268.5m ² .	Relies on performance criteria.
12.4.3 Location and configuration of development			
A1	<p>The wall of a building must be setback from a frontage –</p> <ul style="list-style-type: none"> (a) not less than 4.5m from a primary frontage; and (b) not less than 3.0m from any secondary frontage; or (c) not less than and not more than the setbacks for any existing building on each of the immediate adjoining sites; (d) not less than for any building retained on the site; (e) in accordance with any building area shown on a sealed plan; or (f) if the site abuts a road shown in the Table to this Clause, the setback specified for that road. 	The adjoining lots contain dwellings that are setback from the Hepples Road frontage 1.2m on the lot to the north-east (17 Hepples Road) and 7.7m on the lot to the south-east (13 Hepples Road). The proposed dwelling will be setback a minimum of 3.05m from the same frontage.	Complies with acceptable solution A1 (c).

12.4 Development Standards		
Requirement/s	Assessment	Compliance
<p>A2 All buildings must be contained within a building envelope determined by-</p> <ul style="list-style-type: none"> (a) the applicable frontage setback; (b) if the site is in a locality shown in the Table to this Clause, not less than the setback distance specific from the feature specified; (c) projecting a line at an angle of 45° from the horizontal at a height of 3.0m above natural ground level at each side boundary and at a distance of 4.0m from the rear boundary to a building height of not more than 8.5m above natural ground level if walls are setback - <ul style="list-style-type: none"> (i) not less than 1.5m from each side boundary; or (ii) less than 1.5m from a side boundary if wall height is not more than 3.0m; and – <ul style="list-style-type: none"> a. built against an existing wall of an adjoining building; or b. the wall or walls - <ul style="list-style-type: none"> i. have the lesser of a total length of 9.0m or one-third of the boundary with the adjoining land; ii. there is no door or window in the wall of 	<p>The sections of the proposed dwelling along the north-western (side) and north-eastern (rear) boundary will be located outside the building envelope prescribed by the acceptable solution.</p>	<p>Relies on performance criteria.</p>

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	<p>the building; and</p> <p>iii. overshadowing does not result in -</p> <p>a. less than 2 hours of continuous sunlight to a required minimum private open space area in an adjacent dwelling between 9.00am and 3.00pm on 21st June; or</p> <p>b. a further reduction in continuous sunlight to a required minimum private open space area in an adjacent dwelling if already less than 2 hours between 9.00am and 3.00pm on 21st June; or</p>		

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	(d) in accordance with any building envelope shown on a sealed plan.		
A3	<p>Site coverage must -</p> <p>(a) not be more than 50%; or</p> <p>(b) if the site is in a locality shown in the Table to this Clause, not more than the site coverage for that locality; and</p> <p>(c) not include any part of a site required for the disposal of sewage or stormwater; or</p> <p>(d) be not more than any building area shown on a sealed plan.</p>	Site coverage of the proposed dwelling has been calculated to be approximately 31%.	Complies with acceptable solution.
A4	A garage, carport or an external car parking area and any area for the display, handling, or storage of goods, materials or waste, must be located behind the primary frontage of a building.	No garage, carport, external parking areas are proposed. Waste storage areas are capable of being located behind the frontage setback of the new dwelling.	Complies with acceptable solution.
A5	<p>Total width of openings in the frontage elevation of a garage or carport (whether freestanding or part of any other building) must be the lesser of -</p> <p>(a) 6.0m; or</p> <p>(b) half the width of the frontage.</p>	No garages or carports are proposed.	Not applicable.
A6	If on a site at Boat Harbour, a building on the lower side of a road must be single storey on the road elevation.	The dwelling will be located on the lower side of Hepples Road and will be two storey on the road elevation.	Relies on acceptable solution.
12.4.4 Visual and acoustic privacy for residential development			
A1	A door or window to a habitable room, or any part of a balcony, deck, roof garden, parking space or carport of a building must –	The north-western, north-eastern and south-eastern walls of the first floor all	Complies with acceptable solution.

12.4 Development Standards

Requirement/s	Assessment	Compliance
<p>(a) if the finished floor level is more than 1.0m above natural ground level -</p> <ul style="list-style-type: none"> (i) be not less than 6.0m from any door, window, balcony, deck, or roof garden in a dwelling on the same site; (ii) be not less than 3.0m from a side boundary; (iii) be not less than 4.0m from a rear boundary; and (iv) if an internal lot, be not less than 4.5m from the boundary abutting a rear boundary of an adjacent frontage site; or <p>(b) if less than the setbacks in clause A1(a) -</p> <ul style="list-style-type: none"> (i) be off-set by not less than 1.5m from the edge of any door or window in another dwelling; (ii) have a window sill height of not less than 1.8m above finished floor level; (iii) have fixed and durable glazing or screening with a uniform transparency of not more than 25% in that part of a door or window less than 1.7m above finished floor level; or (iv) have fixed and durable external screen other than vegetation of not less than 1.8m height above the finished floor 	<p>contain windows to habitable rooms.</p> <p>The north-eastern boundary of the site adjoins the coastal reserve and constitutes the rear boundary. All habitable rooms windows on the first floor facing this boundary will be setback a minimum of 5m from the boundary.</p> <p>The north-western boundary of the site is a side boundary. All habitable room windows on the first floor facing this boundary will be within 3m of the boundary. The south-eastern wall of the adjoining dwelling does not contain any windows. Windows of the adjoining dwelling are located on the north-eastern and south-western walls. Windows of the proposed dwelling will therefore be off-set a minimum of 1.5m from the edge of any door or window of the adjoining dwelling.</p> <p>The south-eastern boundary of the site is a side boundary. The south-eastern elevation of the first floor will contain one habitable room window which corresponds with the master bedroom. This window will have a minimum sill height of 1.7m above finished floor level.</p> <p>The north-eastern and south-eastern elevations of the deck will include a screening structure that will have a minimum height of</p>	

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	level and with a uniform transparency of not more than 25% located for the full width of the door, window, balcony, deck, roof garden, parking space, or carport.	1.7m above finished floor level and a minimum transparency of 25%.	
A2	An access strip or shared driveway, including any pedestrian pathway and parking area, must be separated by a distance of not less than 1.5m horizontally and 1.5m vertically from the door or window to a dwelling or any balcony, deck, or roof garden in a dwelling.	The site does not contain an access strip or shared driveway.	Not applicable.
12.4.5 Private open space for residential use			
A1	<p>Each dwelling must provide private open space –</p> <ul style="list-style-type: none"> (a) if a dwelling with a floor level of not more than 2.5m above finished ground level, a ground level area - <ul style="list-style-type: none"> (i) located adjoining the rear or side of the dwelling; (ii) accessible from the dwelling; (iii) of not less than 25m²; (iv) with a minimum dimension of 4.0m; (v) on a single level; and (vi) with a gradient of not more than 1 in 10; and (b) if a dwelling with a floor level of more than 2.5m above finished ground level, as an alternative to a ground level area, a private balcony, deck, terrace or roof garden – 	An existing levelled area of private open space will remain to the north-east of the dwelling between the dwelling and rear boundary. It has a minimum area of 25m ² and minimum horizontal dimensions of 4m. It is accessible from the ground floor of the dwelling.	Complies with acceptable solution.

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	(i) of not less than 25m ² ; (ii) with a minimum dimension of 4.0m; and (iii) accessible from the dwelling.		
A2	The required minimum private open space area must be capable of receiving at least 3 hours of sunlight between 9.00am and 3.00pm on 21st June.	The designated area of private open space is located to the north-east of the dwelling adjacent to the coastal reserve. It is therefore capable of receiving a minimum of 3 hours of sunlight between 9:00am and 3:00pm on 21 st June.	Complies with acceptable solution.
A3	Unless there is a ground level private open space area directly accessible at grade to a shared driveway or pedestrian pathway, each dwelling in a multiple dwelling development must have access to a waste storage area – (a) located behind the applicable frontage setback; (b) of not less than 1.5m ² per dwelling; (c) screened to view from the frontage and any dwelling by a wall of height not less than 1.2m above finished ground level; and (d) not less than 6.0m from a window, door, balcony, deck, roof garden or private open space area of a dwelling.	Multiple dwelling development is not proposed.	Not applicable.
12.4.6 Frontage fences			
A1	The height of a fence, including any supporting retaining wall, on a frontage or within a frontage setback must be –	No frontage fences are proposed.	Not applicable.

12.4 Development Standards			
Requirement/s		Assessment	Compliance
	(a) not more than 1.2m if the fence is solid; or (b) not more than 1.8m provided that part of the fence above 1.2m has openings that provide a uniform transparency of not less than 30%.		
12.4.7 Setback of development for sensitive use			
A1	A building containing a sensitive use must be contained within a building envelope determined by – (a) the setback distance from the zone boundary as shown on the Table to this clause; and (b) projecting upward and away from the zone boundary at an angle of 45° above the horizontal from a wall height of 3.0m at the setback distance from the zone boundary.	The site does not adjoin a zone listed within Table 12.4.7 A1.	Not applicable.
A2	Development for a sensitive use must be not less than 50m from – (a) a major road identified in the Table to this clause; (b) a railway; (c) land designated in the planning scheme for future road or rail purposes; or (d) a proclaimed wharf area.	The proposed dwelling will be setback greater than 50m from a major road, railway (including land designated for future road and rail purposes) and proclaimed wharf area.	Complies with acceptable solution.

3.2 Change in Ground Level Code

Cut is required directly below the south-western section of the first floor level of the existing dwelling between the ground floor level and existing walkway. The cut will have a maximum depth of approximately 2.3m at the south-western end and will taper to existing ground level at the north-eastern end. The cut will be located 1m from the north-western boundary, 3m from the frontage boundary and 2.9m from the south-

eastern boundary. The cut will be supported by a retaining wall located within 1m of the north-western boundary and 3m from the frontage boundary. The retaining wall will have a maximum height of approximately 2.2m. The cut does not satisfy the exemption in Clause E4.4.1 (b) (i) and (ii). Assessment against the Code is therefore required.

E4.6 Development Standards			
Requirement/s		Assessment	Compliance
E4.6.1 Change in existing ground level or natural ground level			
A1	<p>Cut or fill must -</p> <ul style="list-style-type: none"> (a) not be on land within the Environmental Living zone or the Environmental Management zone; (b) be required to - <ul style="list-style-type: none"> (i) provide a construction site for buildings and structures; (ii) facilitate vehicular access; (iii) mitigate exposure to a natural or environmental hazard; (iv) facilitate provision of a utility; (v) assist the consolidation or intensification of development; or (vi) assist stormwater management; (c) not result in a modification of surface stormwater water flow to increase – <ul style="list-style-type: none"> (i) surface water drainage onto adjacent land; (ii) pooling of water on the site or on adjacent land; or (iii) the nature or capacity of discharge from land upstream in a natural or artificial drainage channel; 	<ul style="list-style-type: none"> (a) the site is zoned Low Density Residential. (b) the cut is required to provide a construction site for a building and associated structures. (c) all surface water will be collected from hard impervious surfaces and discharged to the public stormwater system. (d) the cut will be supported by an engineered retaining wall. The retaining wall will be located along the exposed face of the cut and backfilled. The retaining wall will be designed to bear load from adjoining properties to ensure existing buildings on adjacent land remain stable. (e) the retaining walls will include a drainage system at the base of the wall that will collect intersected ground water and discharge it to the public stormwater system. (f) the retaining wall system will include an ag-pipe wrapped in geotextile fabric with a permeable drainage layer above. This will catch and filter 	Complies with acceptable solution.

E4.6 Development Standards		
Requirement/s	Assessment	Compliance
<p>(d) not destabilise any existing building or increase the requirements for construction of any potential building on adjacent land;</p> <p>(e) manage disposal of intersected ground water;</p> <p>(f) safeguard the quality of receiving waters through measures to minimise erosion and release of sediments and other contaminants during each of the site preparation, construction and rehabilitation phase in accordance with Soil and Water Management on Building and Construction Sites 2009;</p> <p>(g) not require a retaining or support structure that would result in an area of influence within the boundary of adjacent land; and</p> <p>(h) not encroach upon or expose, disturb, or reduce cover over an underground utility to less than 1.0m unless the relevant regulatory entity has advised –</p> <p>(i) it is satisfied the cut or fill will not result in harm to the utility; and</p> <p>(ii) any condition or requirement it determines are appropriate to protect the utility.</p>	<p>sediments from water before it is discharged to the public stormwater system once it becomes operational.</p> <p>Soil and water management plans will be implemented during the construction to minimise the release of sediments from the site.</p> <p>(g) the cut will be supported by retaining walls. Bearing pressure exerted on the ground at the surface of the cut and the retaining wall will come from the adjoining property to the north-west and Hepples Road to the south-west. The footings of the retaining wall will be engineered to ensure bearing pressure from adjacent land will not impact the structural integrity of the wall.</p> <p>The cut and associated retaining wall will not impact the structural integrity of a retaining wall on adjacent land to the north-west and south-west.</p> <p>(h) the cut will not expose, disturb, encroach upon, or reduce cover over the sewerage pipe located within the easement parallel to the north-western boundary of the site.</p>	

3.3 Hazard Management code

E6.5 Use Standards		
Requirement/s	Assessment	Compliance
E6.5.2 Use likely to be exposed to a natural hazard		
<p>A1 If a use is on land within an area of risk from exposure to a natural hazard as shown on a map forming part of this planning scheme -</p> <ul style="list-style-type: none"> (a) use must not be for a critical use, a hazardous use, or a vulnerable use; (b) use must not be residential use if the level of risk is medium or higher; and (c) a hazard risk assessment must demonstrate a tolerable level of risk can be achieved and maintained for the nature and duration of the use. 	<p>The proposed development is associated with an established residential use. The replacement dwelling will not intensify the existing residential use.</p>	<p>Not applicable in accordance with clause 7.4.2(b) of the Scheme.</p>

E6.6 Development Standards		
Requirement/s	Assessment	Compliance
E6.6.2 Development on land exposed to a natural hazard		
<p>A1 If the site is within an area of risk shown on a natural hazard map forming part of this planning scheme –</p> <ul style="list-style-type: none"> (a) a hazard risk assessment must determine - <ul style="list-style-type: none"> (i) there is an insufficient increase in risk to warrant any specific hazard reduction or protection measure; or (ii) a tolerable level of risk can be achieved for the type, form, scale and duration of the development; and 	<p>A hazard risk assessment has determined that there is an insufficient increase in risk to warrant specific hazard reduction or protection measure.</p> <p>Acceptable solution A1(b) is not applicable to the proposed development.</p>	<p>Complies with acceptable solution A1 (a)(i).</p>

E6.6 Development Standards		
Requirement/s	Assessment	Compliance
(b) if a hazard risk assessment established need to involve land on another title for hazard management consistent with the objective, the consent in writing of the owner of that land must be provided to enter into a Part 5 agreement to be registered on the title of the land and providing for the effected land to be managed in accordance with recommendations for hazard management.		

3.4 Traffic Generating Use and Parking Code

E9.5 Use Standards		
Requirement/s	Assessment	Compliance
E9.5.1 Provision for parking		
A1 Provision for parking must be - (a) the minimum number of on-site vehicle parking spaces must be in accordance with the applicable standard for the use class as shown in the Table to this Code.	Table E9.1 requires a dwelling in a zone other than the General Residential zone to provide 2 car parking spaces. The existing dwelling does not provide any on-site parking spaces. The site is unable to provide feasible parking spaces due to the topographical constraints. The proposal is for a replacement dwelling and will not provide parking. It will not increase the demand for parking spaces. The application therefore does not affect issues dealt with by the code directly. The Code is not considered applicable to the application	Not applicable.

E9.5 Use Standards			
Requirement/s		Assessment	Compliance
		in accordance with clause 7.4.2(b) of the Scheme.	

3.5 Water and Waterways Code

E10.6 Development Standards			
Requirement/s		Assessment	Compliance
10.6.2 Development in in a shoreline area			
A1	There is no acceptable solution.	There is not acceptable solution.	Relies on performance criteria.

4.0 Performance Criteria Assessment

The proposed development relies on several performance criteria which are addressed below.

4.1 Clause 12.4.1 Suitability of a site or lot for use or development - Performance Criteria P1

12.4.1 Suitability of a site or lot for use or development	
<p>Objective:</p> <p>The minimum properties of a site and of each lot on a plan of subdivision are to –</p> <ul style="list-style-type: none"> (a) provide a suitable development area for the intended use; (b) provide access from a road; and (c) make adequate provision for a water supply and for the drainage and disposal of sewage and stormwater. 	
Acceptable Solutions	Performance Criteria
<p>A1</p> <p>A site or each lot on a plan of subdivision must –</p> <ul style="list-style-type: none"> (a) have an area of - <ul style="list-style-type: none"> (i) not less than 500m² excluding any access strip; or (ii) if in a locality shown in the Table to this clause, not less than the site area shown for that locality; and (b) contain a building area of not less than 10.0m x 15.0m - <ul style="list-style-type: none"> (i) clear of any applicable setback from a frontage, side or rear boundary; (ii) clear of any applicable setback from a zone boundary; (iii) clear of any registered easement; 	<p>P1</p> <p>A site or each lot on a plan of subdivision must -</p> <ul style="list-style-type: none"> (a) be of sufficient area for the intended use or development without likely constraint or interference for – <ul style="list-style-type: none"> (i) erection of a building if required by the intended use; (ii) access to the site; (iii) use or development of adjacent land; (iv) a utility; and (v) any easement or lawful entitlement for access to other land; and (b) if a new residential lot, be orientated to maximise opportunity for solar access to a building area.

(iv)	clear of any registered right of way benefitting other land;	
(v)	clear of any restriction imposed by a utility;	
(vi)	not including an access strip;	
(vii)	accessible from a frontage or access strip; and	
(viii)	if a new residential lot, with a long axis within the range 30° east of north and 20° west of north.	

Response

The site has an area of 268.5m² and is unable to contain a building area of not less than 10m by 15m in a location that is clear of applicable side and rear setbacks. Assessment against the performance criteria is therefore required.

Performance Criteria Assessment

The site is of sufficient area to support the replacement dwelling without likely constrain or interference to adjacent land, public infrastructure and the environment having regard to the following:

- (a) the site is capable of providing a building area suitable for residential use which is demonstrated by the presence of the existing dwelling;
- (b) the established pedestrian access from Hepples Road will be retained;
- (c) the proposed development will not substantially alter the established relationship with existing residential development on adjacent land to the north-west and south-east. The relationship is characterised by small lots that contain compact single dwelling development proximate to side boundaries;
- (d) the site will not constrain or interfere with a utility;
- (e) the building area of the existing dwelling and for the replacement dwelling is clear of the registered easement which is 1m in width and runs parallel to the north-western boundary; and
- (f) no new residential lots will be created.

The application complies with the performance criteria.

4.2 Clause 12.4.2 Dwelling density - Performance Criteria P1

12.4.2 Dwelling density	
Residential dwelling density is to –	
<ul style="list-style-type: none"> (a) make efficient use of land for housing; (b) optimise utilities and community services; and (c) be consistent with any constraint on suitability of the land for residential use. 	
Acceptable Solutions	Performance Criteria
A1 The site area per dwelling must – <ul style="list-style-type: none"> (a) be not less than 500m² if the site has – <ul style="list-style-type: none"> (i) connection to a reticulated water supply; (ii) connection to a reticulated sewer system; and (iii) connection to a stormwater system; or (b) if the site is in a locality shown in the Table to this Clause, not less than the site area for that locality. 	P1 The number of dwellings on a site must be consistent with the capability of the land for residential use in terms of – <ul style="list-style-type: none"> (a) a suitable building area; (b) access from a road; (c) provision of a water supply; (d) disposal of sewage; (e) disposal of stormwater; and (f) a tolerable level of risk from a natural hazard.

Response

The site area per dwelling is 268.5m². Assessment against the performance criteria is therefore required.

Performance Criteria Assessment

The proposal is for single dwelling use and development. The site is capable of supporting a single dwelling having regard to the following:

- (a) the site is capable of providing a building area suitable for residential use which is demonstrated by the presence of the existing dwelling;
- (b) the site has 18m frontage to Hepples Road. The established pedestrian access to the site from Hepples Road will be retained;

- (c) the site has an existing connection to a water supply;
- (d) the site has an existing connection to a sewage system;
- (e) the site has an existing connection to a stormwater discharge point;
- (f) the hazard risk assessment has determined that there is an insufficient increase in risk to warrant specific hazard reduction or protection measure with respect to landslip hazards.

The application complies with the performance criteria.

4.3 Clause 12.4.3 Location and configuration of development - Performance Criteria P2

12.4.3 Location and configuration of development	
<p>Objective:</p> <p>The location and configuration of development is to –</p> <ul style="list-style-type: none"> (a) be consistent with land capability; (b) provide a consistent separation between the development area on adjacent sites and between development and a road; (c) provide consistency in the apparent scale, bulk, massing, and proportion of adjacent buildings; (d) provide sufficient site area for open space, utilities, and vehicle parking; (e) provide for the facade of a residential building to remain the dominant architectural element in the streetscape; and (f) separate adjacent buildings to provide reasonable opportunity for daylight and sunlight to habitable rooms and to private open space areas. 	
Acceptable Solutions	Performance Criteria
<p>A2</p> <p>All buildings must be contained within a building envelope determined by-</p> <ul style="list-style-type: none"> (a) the applicable frontage setback; (b) if the site is in a locality shown in the Table to this Clause, not less than the setback distance specific from the feature specified; 	<p>P2</p> <p>Building height and location of a building in relation to a frontage and site boundaries must -</p> <ul style="list-style-type: none"> (a) minimise likelihood for overshadowing of a habitable room or a required minimum area of private open space in any adjacent dwelling;

<p>(c) projecting a line at an angle of 45° from the horizontal at a height of 3.0m above natural ground level at each side boundary and at a distance of 4.0m from the rear boundary to a building height of not more than 8.5m above natural ground level if walls are setback -</p> <ul style="list-style-type: none"> (i) not less than 1.5m from each side boundary; or (ii) less than 1.5m from a side boundary if wall height is not more than 3.0m; and – <ul style="list-style-type: none"> a. built against an existing wall of an adjoining building; or b. the wall or walls - <ul style="list-style-type: none"> i. have the lesser of a total length of 9.0m or one-third of the boundary with the adjoining land; ii. there is no door or window in the wall of the building; and iii. overshadowing does not result in - <ul style="list-style-type: none"> a. less than 2 hours of continuous sunlight to a required minimum private open space area in an adjacent dwelling between 9.00am and 3.00pm on 21st June; or 	<ul style="list-style-type: none"> (b) minimise the apparent scale, bulk, massing and proportion relative to any adjacent building; (c) be consistent with the streetscape; (d) respond to the effect of the slope and orientation of the site; and (e) provide separation between buildings to attenuate impact.
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<p>b. a further reduction in continuous sunlight to a required minimum private open space area in an adjacent dwelling if already less than 2 hours between 9.00am and 3.00pm on 21st June; or</p> <p>(d) in accordance with any building envelope shown on a sealed plan.</p>	
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Response

The north-western wall of the replacement dwelling will be setback between 1m and 1.3m from the boundary. The wall will have a maximum length of 8.9m. Upper sections of the wall and part of the roof extend outside the 45° envelope on this side. The north-eastern wall of the dwelling and sections of the deck will be within 4m of the rear boundary.

Assessment against the performance criteria is therefore required.

Performance Criteria Assessment

The height and location of the proposed replacement dwelling in relation to the frontage and site boundaries will be appropriate with respect to minimising impacts on the amenity of adjacent residential uses and compatibility with the built form and character of the area, having regard to the following:

- (a) the replacement dwelling will be located to the south-east of the adjoining dwelling to the north-west. The south-eastern wall of the adjoining dwelling is built to the boundary and does not contain any windows or other openings. Likelihood for overshadowing to occur to habitable room windows and private open space of the adjoining dwelling to the north-west is therefore minimised by these factors;

The replacement dwelling will be contained within the prescribed building envelope with respect to the south-eastern boundary. The degree of any overshadowing to the adjacent dwelling to the south-east is therefore assessed as being acceptable.

The rear boundary of the site adjoins the Boat Harbour beach coastal reserve and is therefore not adjacent to residential use and development.

- (b) the bulk, massing and proportion of the replacement dwelling will be similar to the existing dwelling to be demolished. The primary difference between the existing dwelling and replacement dwelling will be the inclusion of a gable roof from a skillion roof which will increase the roof height from 5.6m to 7.1m (+1.5m). The footprint of the replacement will be similar to the two dwellings to the south-east on the same side as Hepples Road. The footprint will be smaller than the adjacent dwelling to the north-west and other dwellings further along.

The apparent scale, bulk and massing of the replacement dwelling relative to adjacent dwellings will be minimised by:

- keeping a similar building footprint, wall height and appearance as the existing dwelling to be replaced which will minimise the perceived spatial change from adjacent dwellings and within the streetscape and along the coastal reserve;
 - retaining similar (if not the same) separation distances from adjacent dwellings to the north-west and south-east; and
 - aligning the gable of the roof north-east to south-west which will ensure the highest point of the roof recesses into the site relative to side boundaries which will assist in minimising the apparent scale and form of the building when viewed from adjacent dwellings.
- (c) the setbacks and height of the replacement dwelling will be compatible with surrounding residential development. It has therefore been designed having regard to established streetscape qualities;
- (d) the building area will have a level surface and will not be impacted by topographical constraints;
- (e) the replacement dwelling will retain established separation distances relative to adjacent and nearby dwellings.

The application complies with the performance criteria.

4.4 Clause 12.4.3 Location and configuration of development - Performance Criteria P6

12.4.3 Location and configuration of development

Objective:

The location and configuration of development is to –

- (a) be consistent with land capability;
- (b) provide a consistent separation between the development area on adjacent sites and between development and a road;

<p>(c) provide consistency in the apparent scale, bulk, massing, and proportion of adjacent buildings;</p> <p>(d) provide sufficient site area for open space, utilities, and vehicle parking;</p> <p>(e) provide for the facade of a residential building to remain the dominant architectural element in the streetscape; and</p> <p>(f) separate adjacent buildings to provide reasonable opportunity for daylight and sunlight to habitable rooms and to private open space areas.</p>	
Acceptable Solutions	Performance Criteria
<p>A6</p> <p>If on a site at Boat Harbour, a building on the lower side of a road must be single storey on the road elevation.</p>	<p>P6</p> <p>If on a site at Boat Harbour a building on the lower side of a road must be located within the site and be of a mass and height that does not result in an unreasonable loss of outlook from the immediately adjacent site on the high side of the road.</p>

Response

The replacement dwelling will be located on the lower side of Hepples Road and will be two storeys. Assessment against the performance criteria is therefore required.

Performance Criteria Assessment

The existing ground level of the building area is situated approximately 7m below the pavement of Hepples Road at the high side of the road. The replacement dwelling will have a building height of 7.1m which is measured to the ridge of the gabled roof. The building will therefore marginally extend above the surface of Hepples Road at certain points.

The immediately adjacent site on the high side of Hepples Road is currently vacant. Its natural ground level is approximately 1m above the pavement of Hepples Road at the frontage. It continues to rise toward the rear boundary where natural ground level is approximately 10m above the pavement of Hepples Road.

Accordingly, the height and mass of the proposed dwelling will not result in an unreasonable loss of outlook from the immediately adjacent site on the high side of Hepples Road when considering the topography of the adjacent site and extent of the replacement dwelling that will extend above the pavement of Hepples Road.

The application complies with the performance criteria.

4.5 Clause E10.6.2 Development in a shoreline area - Performance Criteria P1

E10.6.2 Development in a shoreline area	
<p>Objective:</p> <p>Coastal waters and the shoreline area are protected against likely impact of development within 30m of or located in, over, on or under the coastal waters or shoreline area on economic, ecological, scenic, cultural, and recreation values, and for processes of the coast while facilitating use dependent for operational efficiency on a coastal location.</p>	
Acceptable Solutions	Performance Criteria
<p>A1</p> <p>There is no acceptable solution.</p>	<p>P1</p> <p>Development must –</p> <ul style="list-style-type: none"> (a) be required to locate in, over, on or under the shoreline, sea or tidal waters for operational efficiency; (b) avoid unreasonably or unnecessarily impact on existing or potential access by the public to shoreline land or waters; (c) minimise impact on scenic quality of the sea-shore area; (d) minimise impact on amenity or aesthetic appearance of the sea-shore area as a result of – <ul style="list-style-type: none"> (i) nature and operational characteristics of the development; (ii) location; (iii) bulk, size, and overall built form of any building or work; (iv) overshadowing; or (v) obstruction of views from a public place; and (e) minimise immediate or cumulative adverse effect for –

	<ul style="list-style-type: none"> (i) tidal, wave, current, or sediment movement processes; (ii) coastal landforms, seabed, and other geomorphic features, including sand dunes and mobile landforms; (iii) vulnerability to erosion and recession; (iv) natural cycles of deposition and erosion; (v) conservation of biodiversity and marine habitat, including during critical lifecycle stages of individual and migratory species; (vi) drainage from a water course, wetland, ground water, flood, stormwater, or tidal water; (vii) coastal water quality; (viii) likely interference or constraint on use of public areas; (ix) any scientific, architectural, aesthetic, historic or special cultural value; (x) exposure to or increased risk from a natural hazard, including sea level rise, storm surge, or inundation as a result of climate change; (xi) coastal protection and rehabilitation works required to address erosion, instability, regression, or inundation; (xii) collection, treatment, and disposal of waste, including bilge waters and excavated or dredged sediment;
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	<p>(xiii) economic activity dependent for operational efficiency on a sea-shore location;</p> <p>(xiv) public safety and emergency services;</p> <p>(xv) marine navigation and communication systems;</p> <p>(xvi) safety of recreational boating; and</p> <p>(xvii) be consistent with the current edition of Tasmanian Coastal Works Manual DPIPWE 2011.</p>
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Response

The site is located within 30m of the high water mark of a shoreline to an ocean. There is not acceptable solution. The application therefore relies on the performance criteria.

Performance Criteria Assessment

The shoreline area adjacent to the site will be protected against potential adverse impacts of the proposed development, having regard to the performance criteria, on the following basis:

- (a) all development will be located a minimum of 22m from the mapped mean high water mark of Boat Harbour Beach and will be contained entirely within the boundaries of the site. The development will therefore not be located in, over, on or under the shoreline;
- (b) the proposed development will not impact on the existing public access to the beach in proximity to the site which is located approximately 35m to the south-east;
- (c) and (d) Boat Harbour is a small beachside settlement characterised by relatively high density development along the foreshore of Boat Harbour beach. The pattern of development along Boat Harbour beach between 276 Port Beach Road and 9 Hepples Road is particularly compact, being characterised by small lot sizes with an average size of 350m² and down to 188m². As a result of the smaller lot sizes, buildings are typically located close to the foreshore and close to lot boundaries and adjoining buildings.

The replacement dwelling will be located within a similar footprint as the existing dwelling and will be of a form and scale that that will be consistent with existing buildings located along the foreshore. The setback from the foreshore boundary on the site established by the existing building will not be significantly altered by

the replacement dwelling. Further the proposed setback will be greater than the setback of buildings relative to the foreshore boundary on adjoining and nearby lots to the north.

The replacement dwelling will be located on the lower side of Hepples Road and will be constructed to a height that is equal to the surface level of Hepples Road. This will ensure views from Hepples Road and other public areas that are on the high side of the site are not obstructed.

Accordingly, the replacement dwelling will be consistent with the established scenic quality, amenity and aesthetic appearance of the sea-shore area.

- (e) the replacement dwelling will be located within a similar footprint as the existing dwelling. The footprint is located approximately 22m from the mean high water mark of Boat Harbour Beach. The replacement dwelling will not introduce a new use or substantially intensify the existing residential use. The proposed development is therefore not expected to result in immediate or cumulative adverse effects for coastal processes and functions, vulnerability to erosion and recession, or coastal protection. No changes to existing coastal water quality is expected as a result of the proposed development. The site does not contain any significant natural values or marine habitat. Further, the proposed development will not interfere or constrain on use of the public foreshore, safety and emergency services, marine navigation and communication systems, and recreational boating.

The application complies with the performance criteria.

5.0 Conclusion

The proposed development involves the demolition of an existing dwelling, construction of a replacement dwelling and construction of new retaining walls. It relates to land located at 13 and 15 Hepples Road, Boat Harbour which is subject to the Low Density Residential zone.

The preceding assessment has determined that the proposed use and development complies with the applicable Scheme standards in the Low Density Residential zone and relevant code provisions, including the following performance criteria:

- **Clause 12.4.1 Suitability of a site or lot for use or development - Performance Criteria P1;**
- **Clause 12.4.2 Dwelling density - Performance Criteria P1;**
- **Clause 12.4.3 Location and configuration of development - Performance Criteria P2 and P6; and**
- **Clause E10.6.2 Development in a shoreline area - Performance Criteria P1.**

It is therefore submitted that a discretionary permit can be issued for the proposed use and development in accordance with Section 51 and 57 of the *Land Use Planning and Approvals Act 1993*.

Appendix A

Certificate of Title

OWNER G.L. & M.J. TREVERTON , J.G. & C.A.
QUILLIAM AND THE CROWN

FOLIO REFERENCE
C.T.56030-7 & 8

GRANTEE
PART OF LOT 6411 GTD. TO
JOSEPH THOMAS ALEXANDER & WHOLE OF
LOTS 27-34, 103 & 107 THE CROWN

PLAN OF SURVEY
BY SURVEYOR CRAIG B. ROGERSON
120 CAMBRIDGE ROAD ROSNY PARK 7018
PH 6244-6256 FAX 6244-6221 MOB. 0418-120-796

LOCATION
LAND DISTRICT OF WELLINGTON
PARISH OF SHEKLETON

SCALE 1: 1000 LENGTHS IN METRES

REGISTERED NUMBER
P143923

APPROVED - 3 JUN 2005
EFFECTIVE FROM
Alice Kavan
Recorder of Titles

MAPSHEET MUNICIPAL CODE No.	LAST UPI No.	LAST PLAN No.	ALL EXISTING SURVEY NUMBERS TO BE CROSS REFERENCED ON THIS PLAN
--------------------------------	--------------	------------------	--

COUNCIL DELEGATE	DATE
------------------	------

SEARCH OF TORRENS TITLE

VOLUME 143923	FOLIO 32
EDITION 4	DATE OF ISSUE 27-Aug-2007

SEARCH DATE : 22-May-2018

SEARCH TIME : 12.22 PM

DESCRIPTION OF LAND

Parish of SHEKLETON Land District of WELLINGTON

Lot 32 on Plan 143923 (Section 27A of the Land Titles Act.)

Derivation : Whole of Lot 32 on Plan 143923 Gtd. to The Crown

SCHEDULE 1

C572360 TRANSFER to GRANT ANTHONY MEDWIN and DEAN ROBERT
MEDWIN as tenants in common in equal shares
Registered 02-Nov-2006 at noon

SCHEDULE 2

C617489 Land is limited in depth to 15 metres, excludes
minerals and is subject to reservations relating to
drains sewers and waterways in favour of the Crown

C572360 Land is limited in depth to 15 metres, excludes
minerals and is subject to reservations relating to
drains sewers and waterways in favour of the Crown

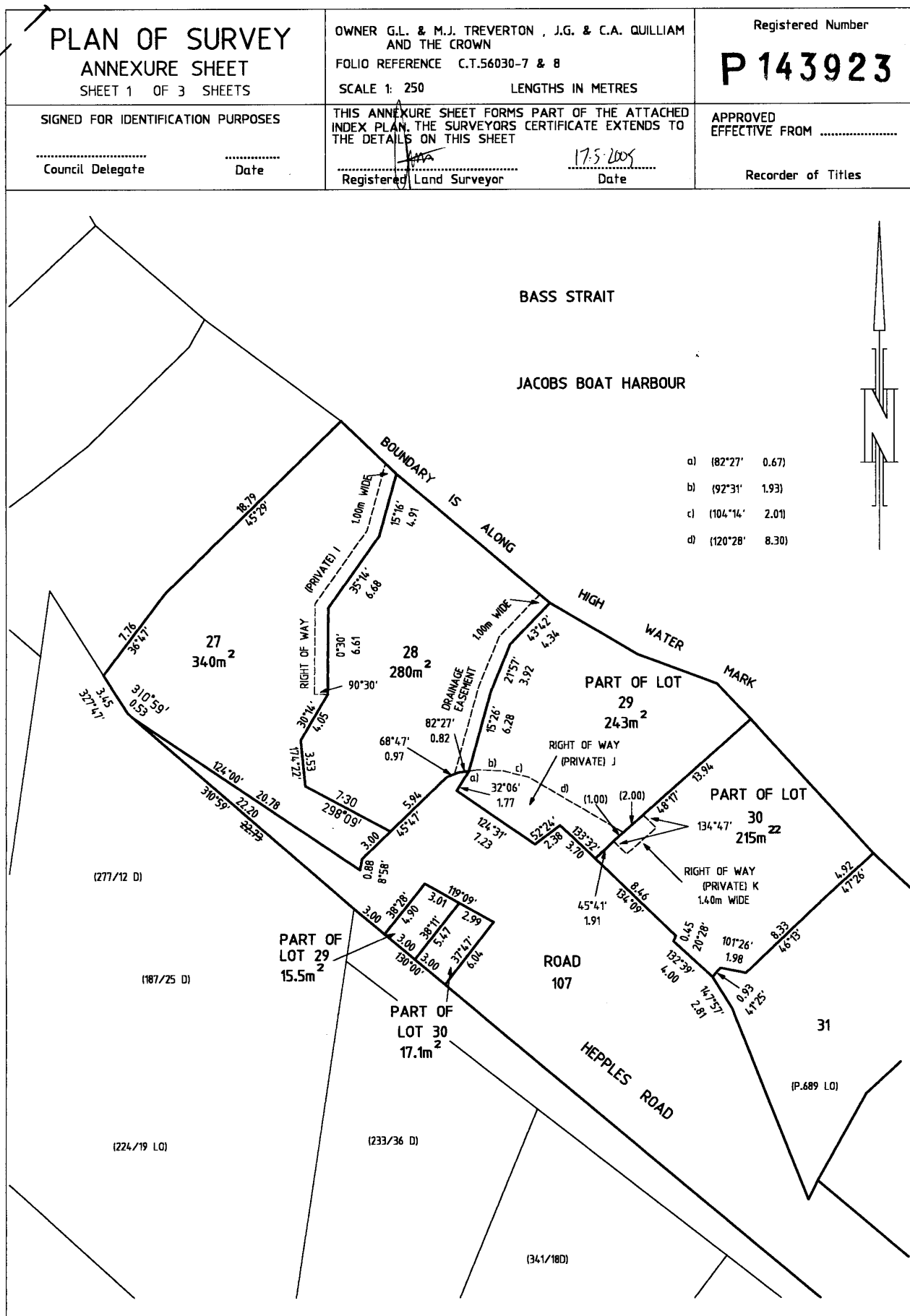
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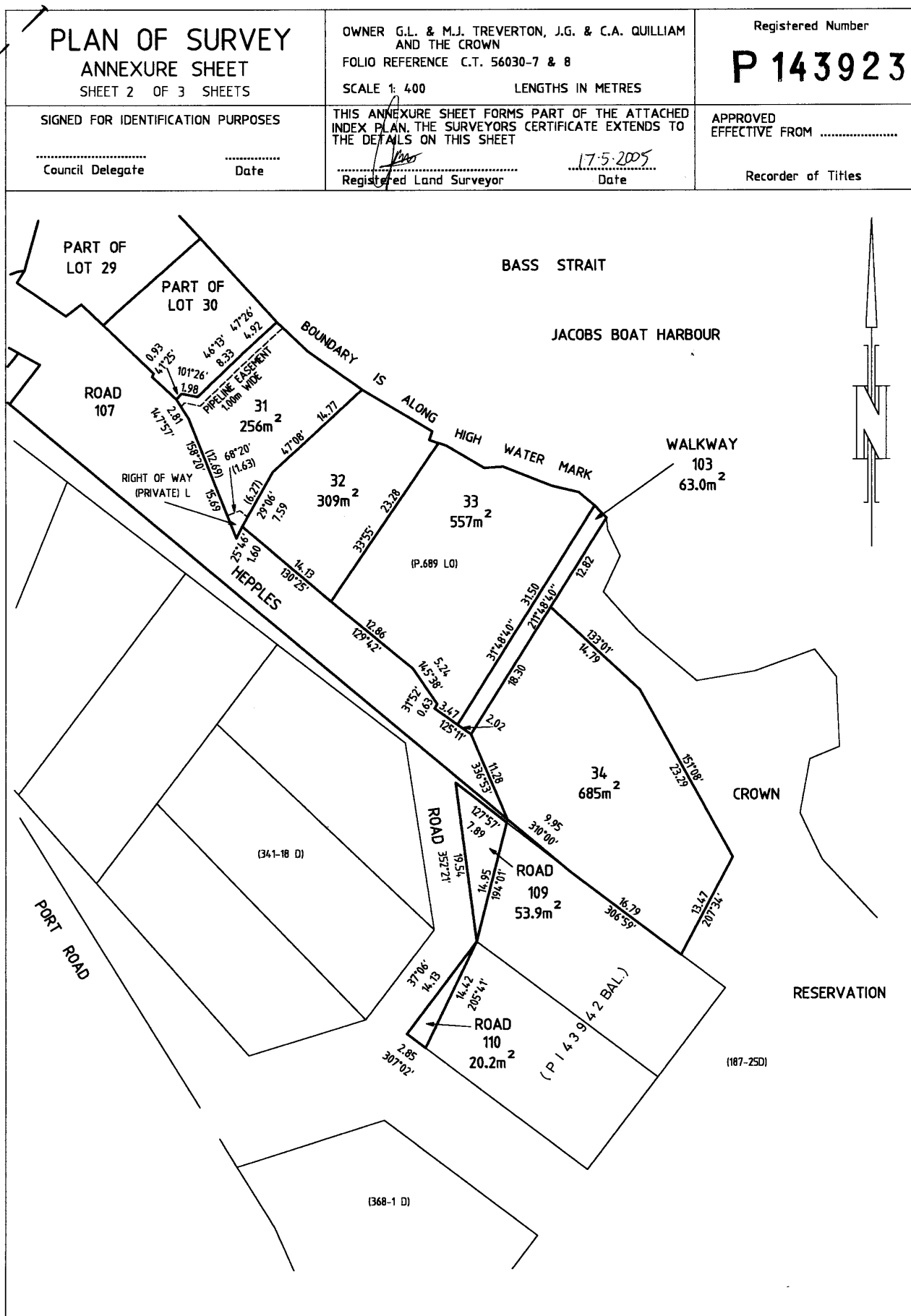
C617576 EASEMENTS set forth in Order

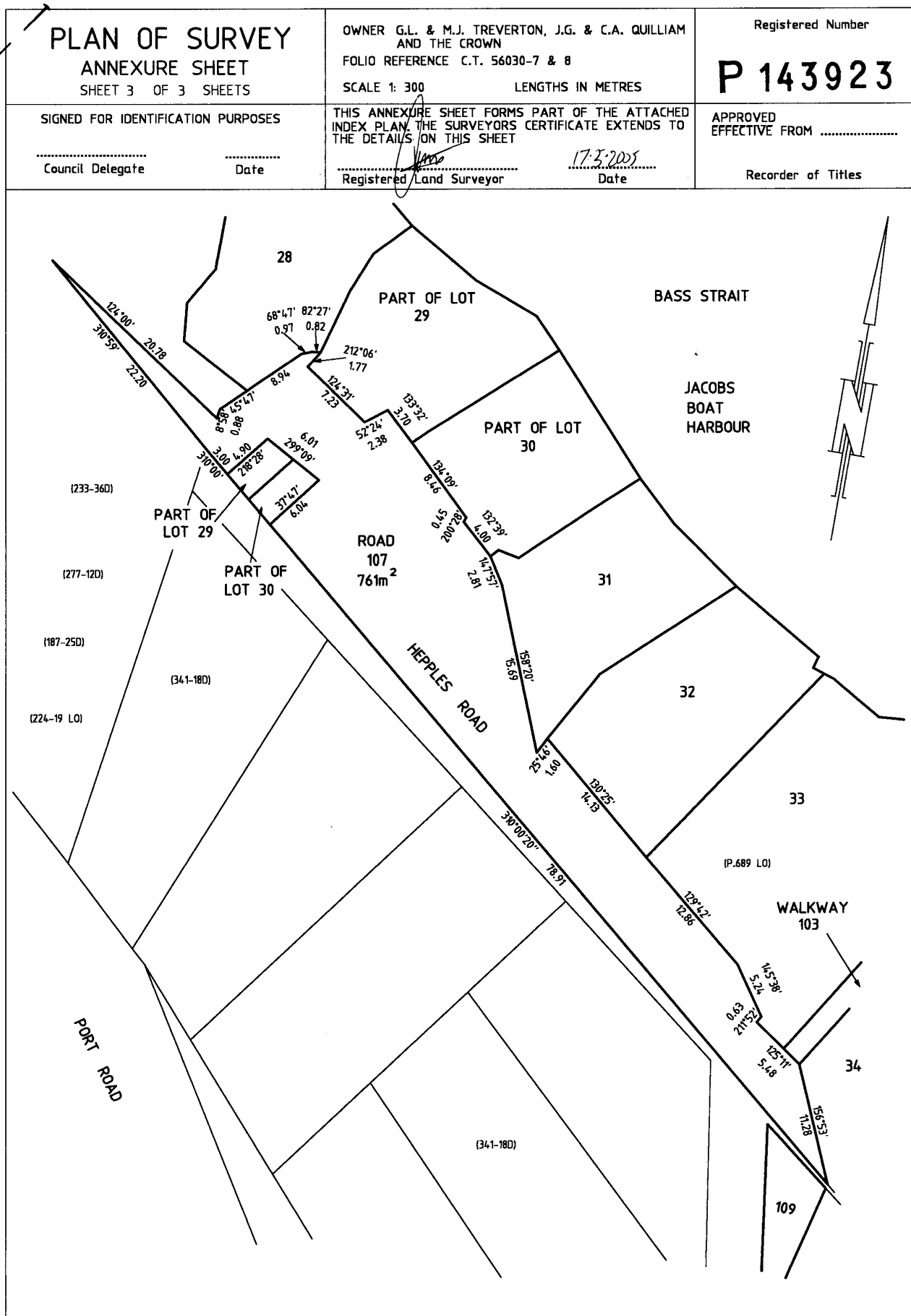
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(Wynyard) Order 1975 (Statutory Rules 1975 No. 286).
Registered 10-Dec-2010 at noon

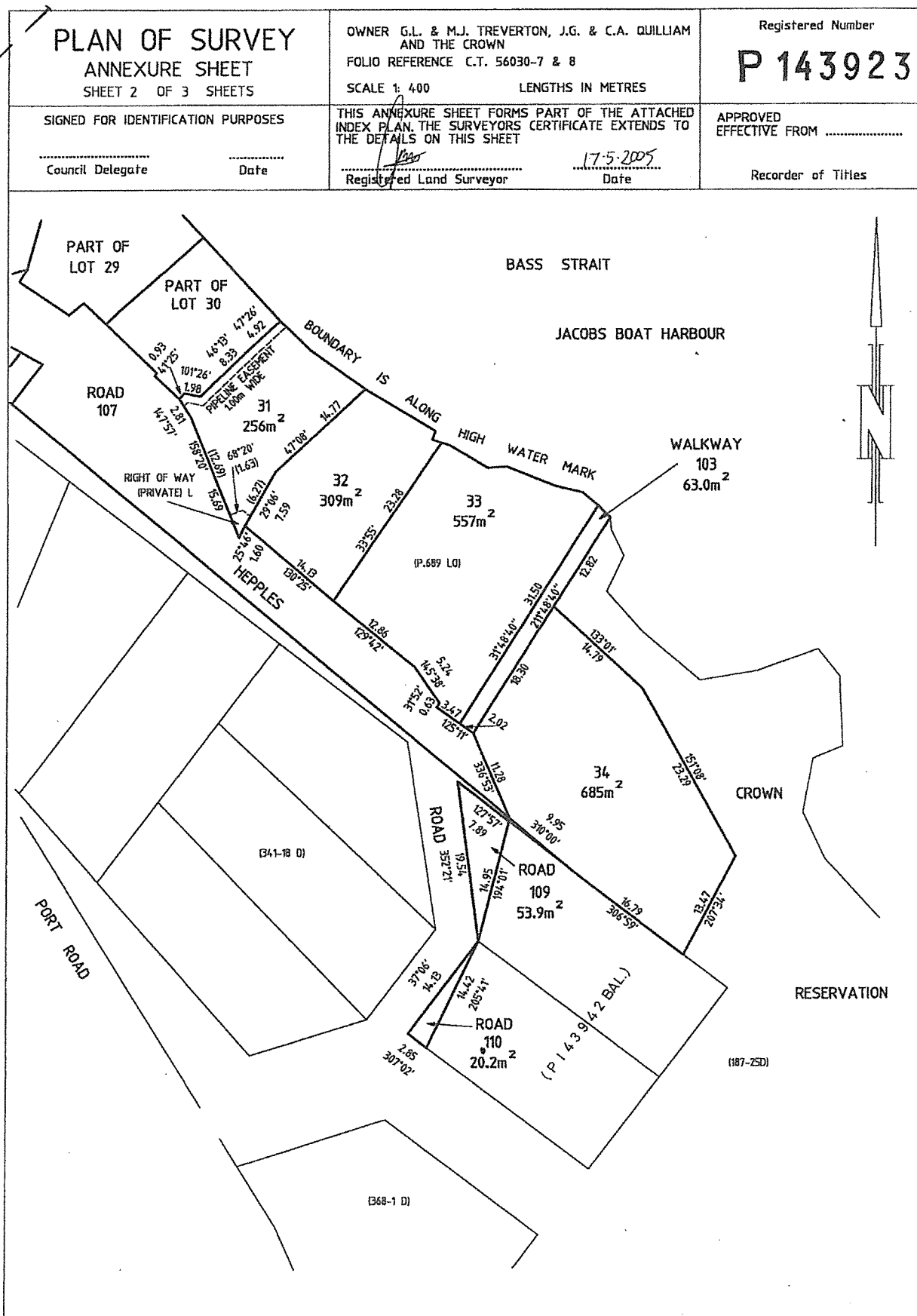
UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations









(31)

SEARCH OF TORRENS TITLE

VOLUME 143923	FOLIO 31
EDITION 5	DATE OF ISSUE 10-Jan-2013

SEARCH DATE : 23-Oct-2017

SEARCH TIME : 12.43 PM

DESCRIPTION OF LAND

Parish of SHEKLETON Land District of WELLINGTON

Lot 31 on Plan 143923 (Section 27A of the Land Titles Act.)

Derivation : Whole of Lot 31 on Plan 143923 Gtd. to The Crown

SCHEDULE 1

C742596 TRANSFER to CLARENCE JOHN KELLY and ROBYN SUZANNE
KELLY Registered 08-Jan-2007 at noon

SCHEDULE 2

C617489 Land is limited in depth to 15 metres, excludes
minerals and is subject to reservations relating to
drains sewers and waterways in favour of the Crown

C742596 Land is limited in depth to 15 metres, excludes
minerals and is subject to reservations relating to
drains sewers and waterways in favour of the Crown

C742596 FENCING PROVISION in Transfer

C617576 EASEMENTS set forth in Order

C979804 Proclamation: The above land is affected by Landslip
(Wynyard) Order 1975 (Statutory Rules 1975 No. 286).
Registered 10-Dec-2010 at noon

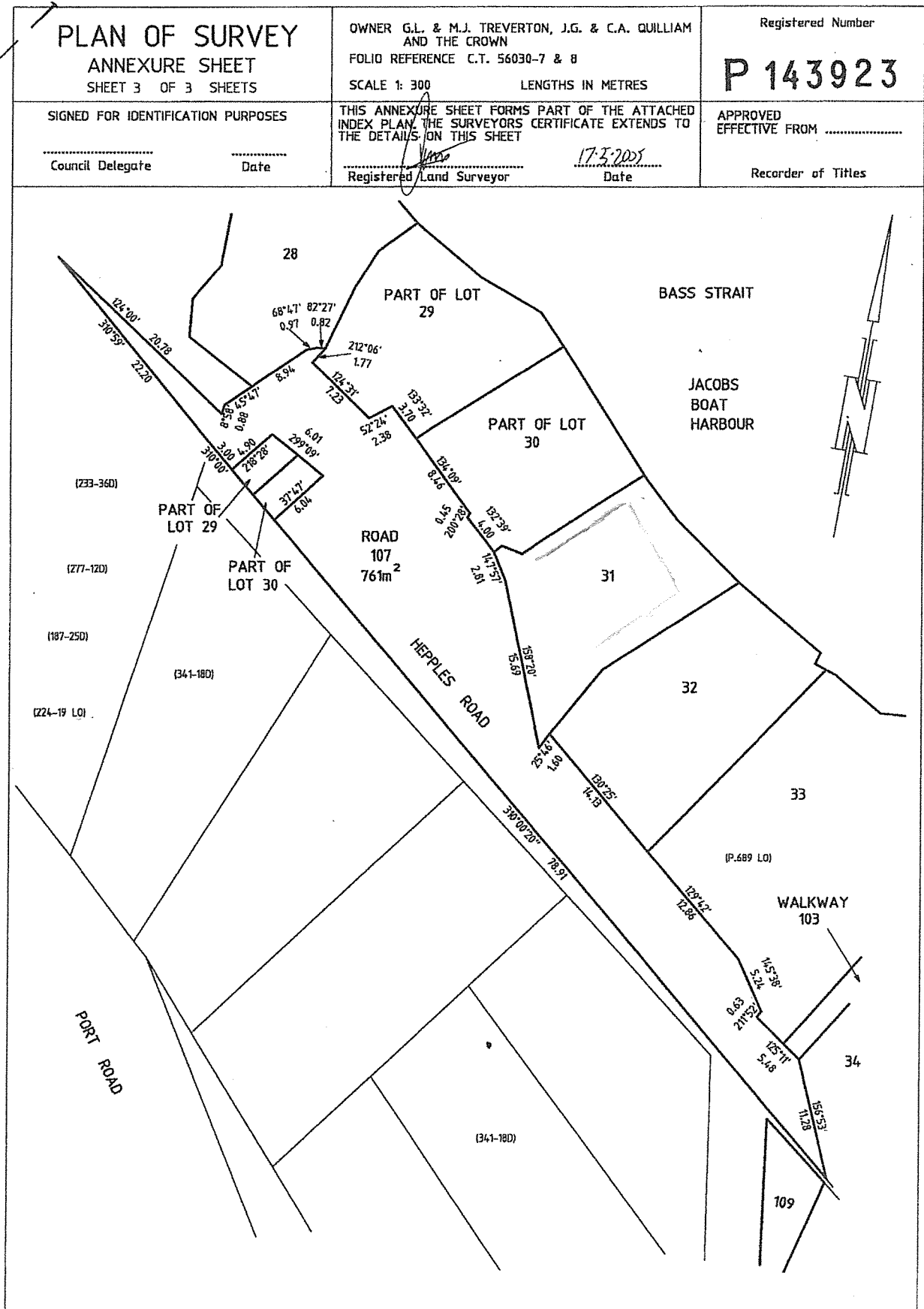
UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

<p>OWNER G.L. & M.J. TREVERTON, J.G. & C.A. QUILLIAM AND THE CROWN</p> <p>FOLIO REFERENCE C.T.56030-7 & 8</p> <p>GRANTEE PART OF LOT 6411 GTD. TO JOSEPH THOMAS ALEXANDER & WHOLE OF LOTS 27-34, 103 & 107 THE CROWN</p>	<p>PLAN OF SURVEY</p> <p>BY SURVEYOR CRAIG B. ROGERSON 120 CAMBRIDGE ROAD ROSNY PARK 7018 PH 6244-6256 FAX 6244-6221 MOB. 0418-120-796</p> <p>LOCATION LAND DISTRICT OF WELLINGTON PARISH OF SHEKLETON</p> <p>SCALE 1: 1000 LENGTHS IN METRES</p>	<p>REGISTERED NUMBER P143923</p> <p>APPROVED EFFECTIVE FROM - 3 JUN 2005</p> <p><i>Alice Kenna</i> Recorder of Titles</p>	
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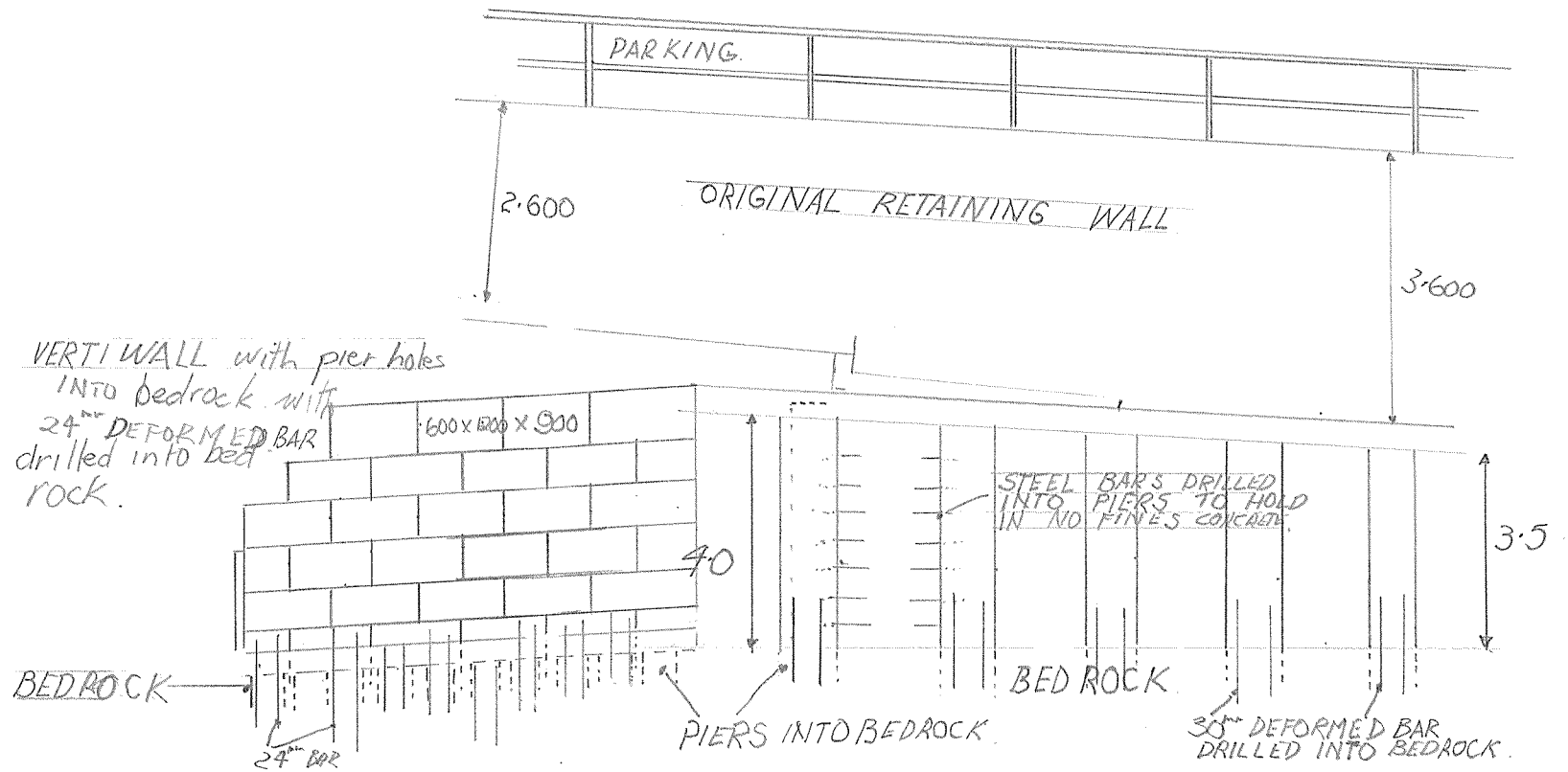
INDEX PLAN NOT EXAMINED

.....
COUNCIL DELEGATE DATE



Appendix B

Development Plans



PLANS SHOWING NEW RETAINING WALLS.

⑦

SEWAGE & GREY WATER PUMPED
UP TO SEWER LINE.

GREY WATER
& SEWAGE
TANK

GROUND WATER & STORM WATER TO BEACH.

4000

5.250

5.350

600

2.700

150

150

600

1.200

4.720

1500

1300

1900

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

1200

ORIGINAL RETAINING WALL

NO FINES WALL

VERTI BLOCK WALL.
NO FINES CONCRETE
BACKFILL

WATER PROOFED CONCRETE
35MPA & 24" DEFORMED
BAR WITH PIER DOWN
INTO THE BEDROCK

PLAN SHOWING NEW
RETAINING WALLS &
PLUMBING PLAN
FOR 15 HEPPLES ROAD

RENOVATED HOUSE FOR CHAS & ROBIN KELLY,

15 HEPPLES RD. BOATHABOUR. 7321

LANDTITLE REF. P143923 / 31

DESIGN WIND SPEED N3

SOIL CLASSIFICATION CLASS

CLIMATE ZONE 7

CORROSION ENVIRONMENT HIGH

BUSHFIRE ATTACK LEVEL N/A

DRAWING INDEX

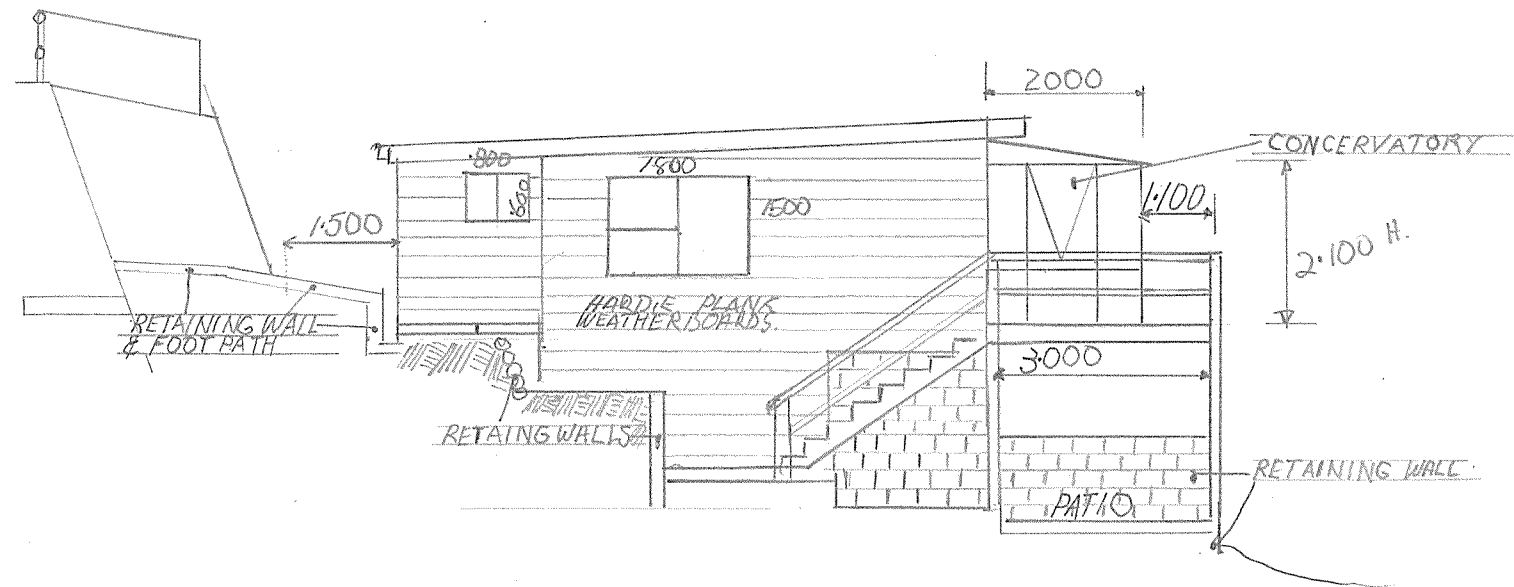
FLOOR PLANS & ELEVATIONS

SECTION

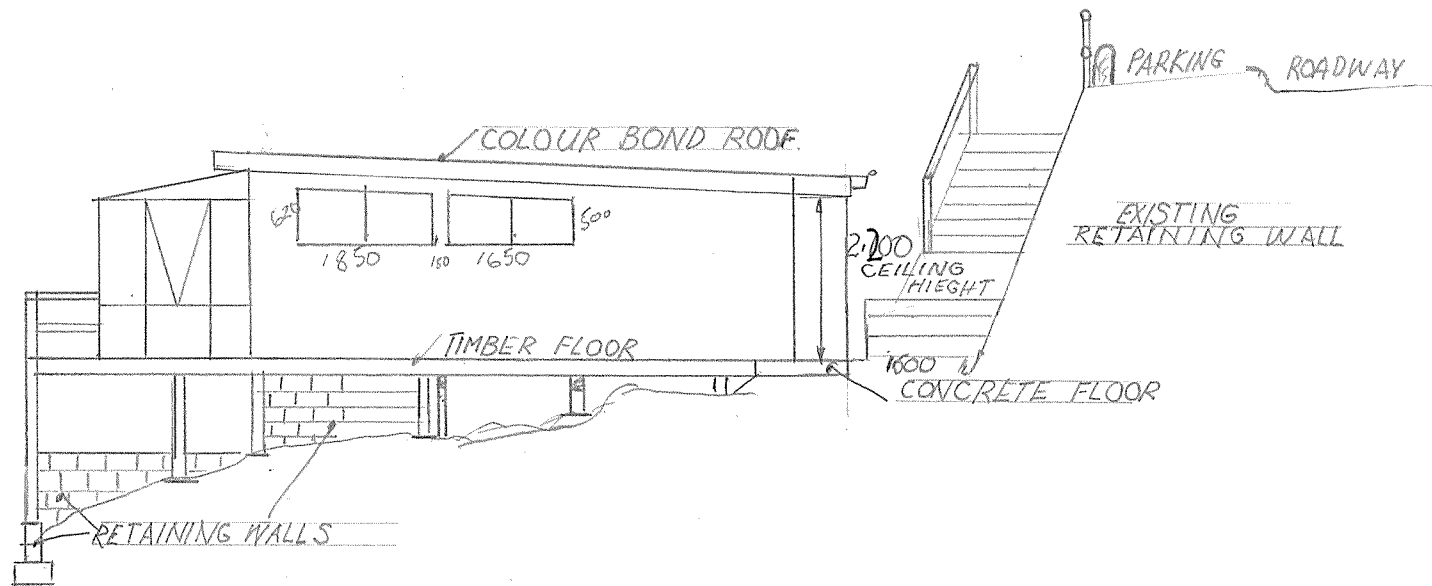
ROOF FRAMING PLAN

STORMWATER & DRAINAGE

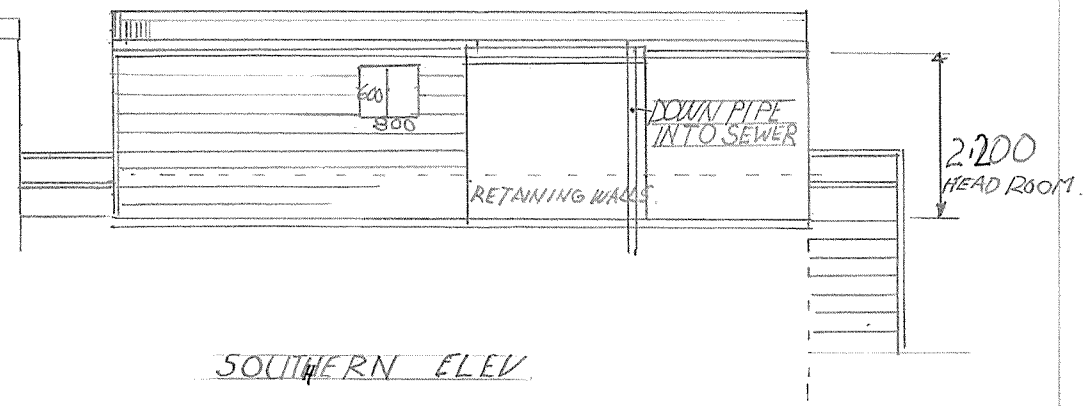
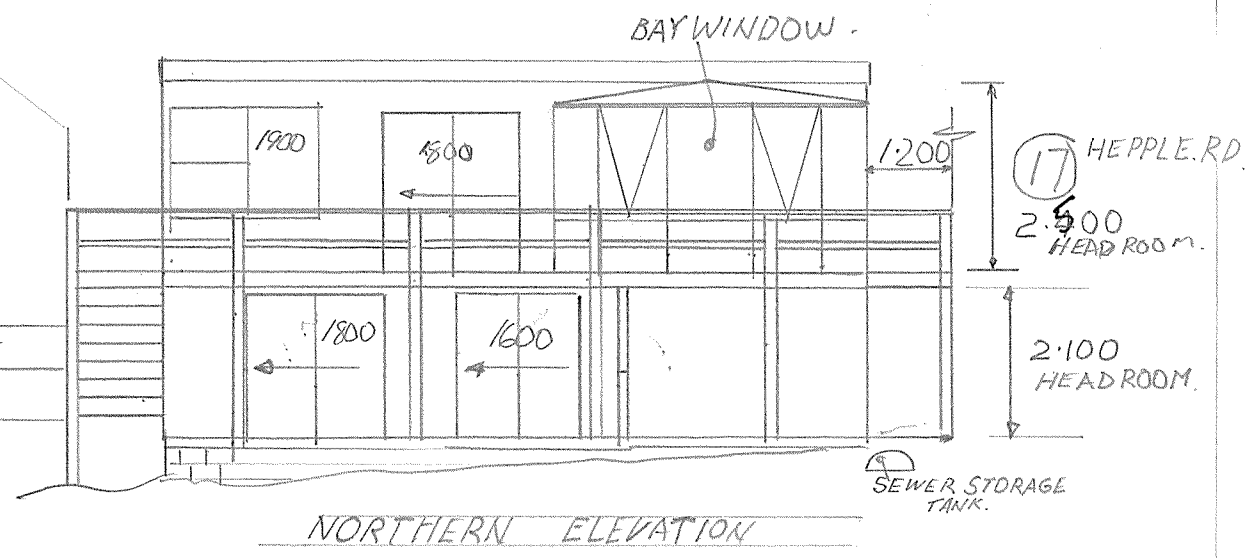
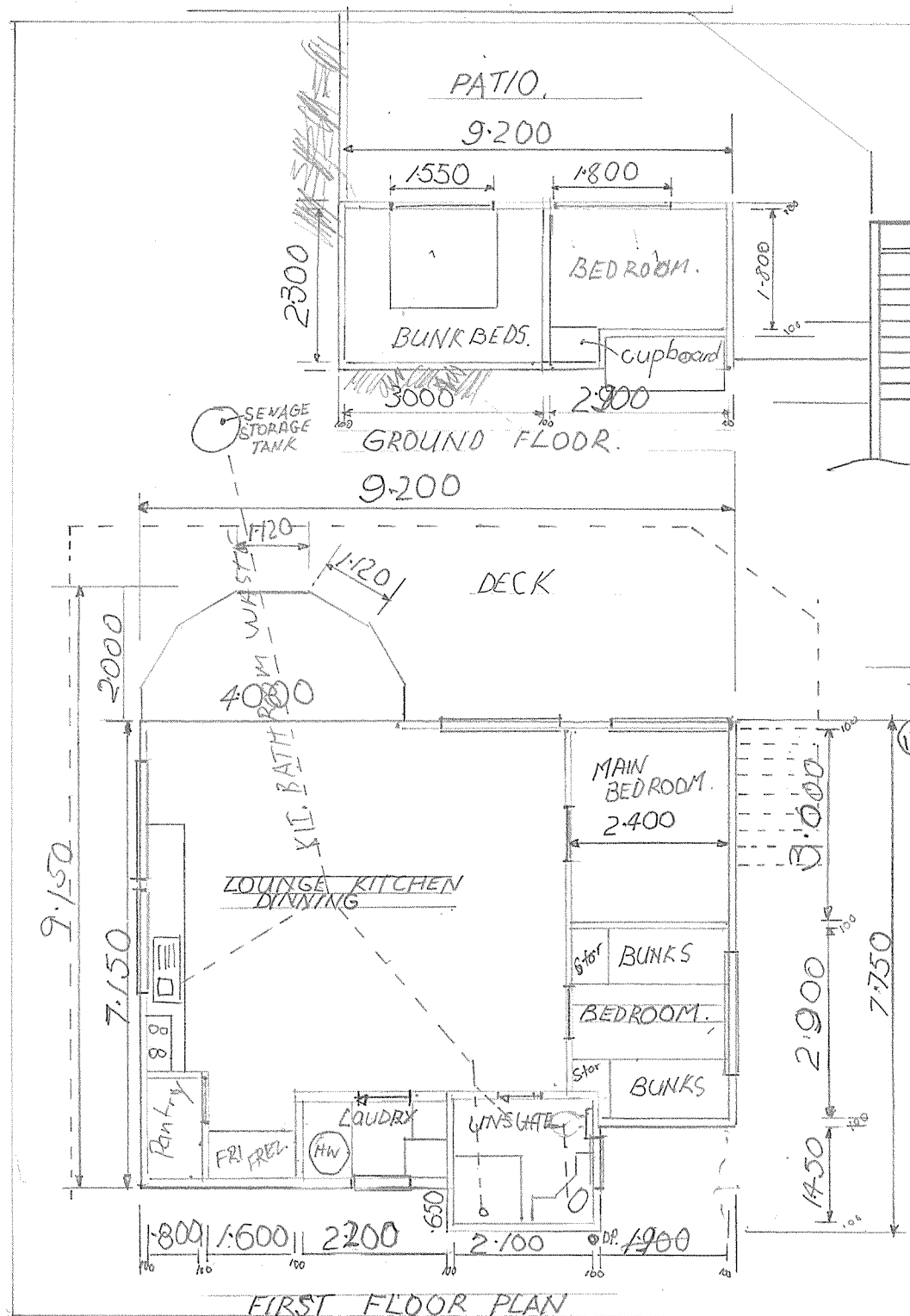
DRAWN BY JANN INGLIS	
P.O. BOX 868, ULVERSTONE TAS 7315	
LICENCE N° CC2451X	RENOVATED HOUSE FOR
phone 0364251867	CHAS & ROBIN KELLY
mobile 0400743873	15 HEPPLES RD
dated 5-12-2017	BOAT HARBOUR. TAS 7321



EASTERN ELEV.

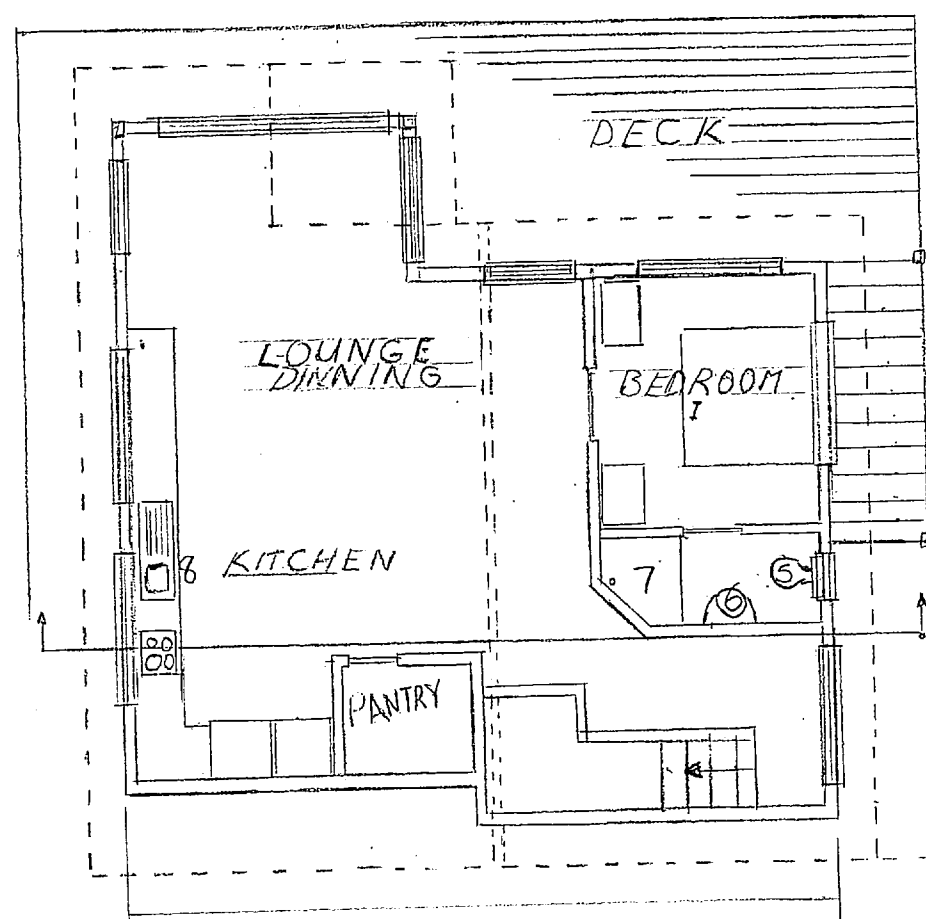
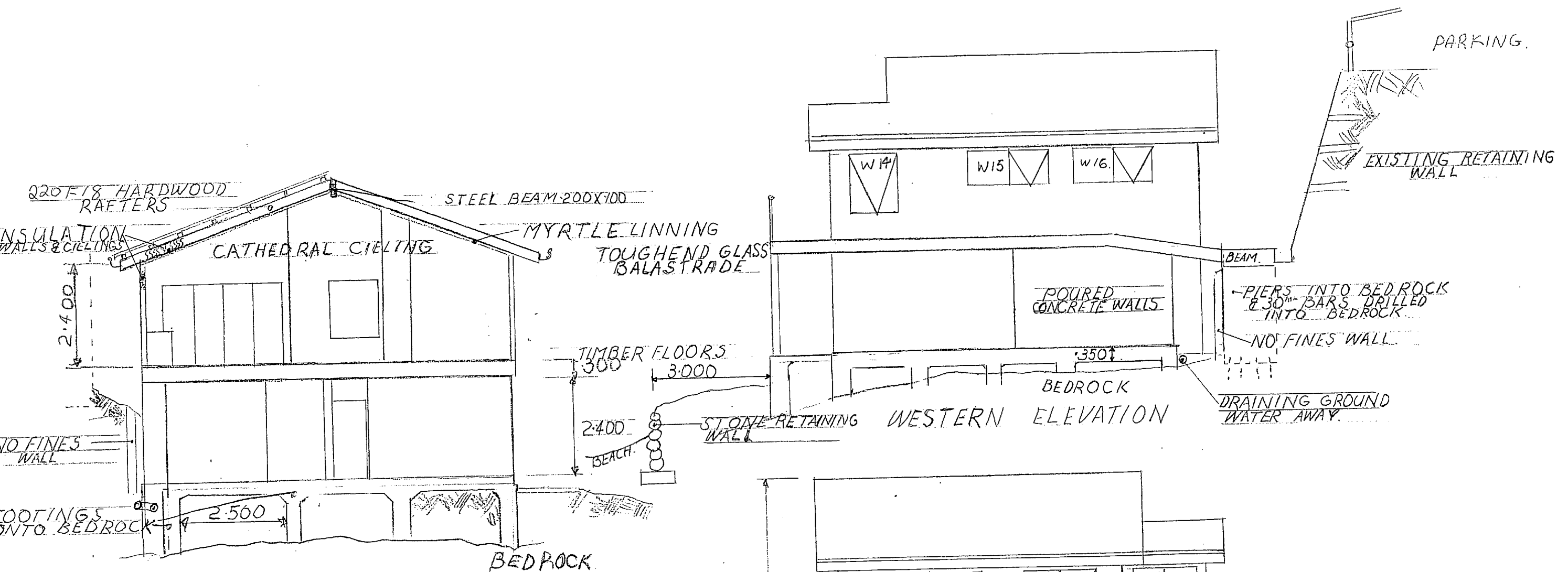


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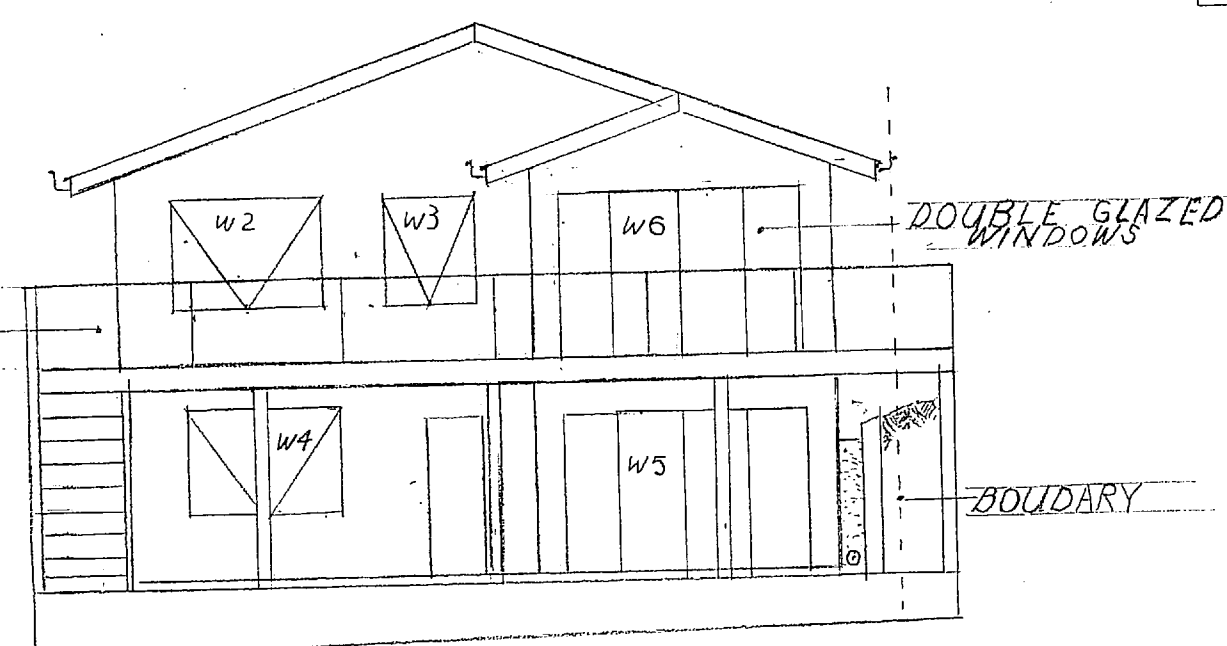
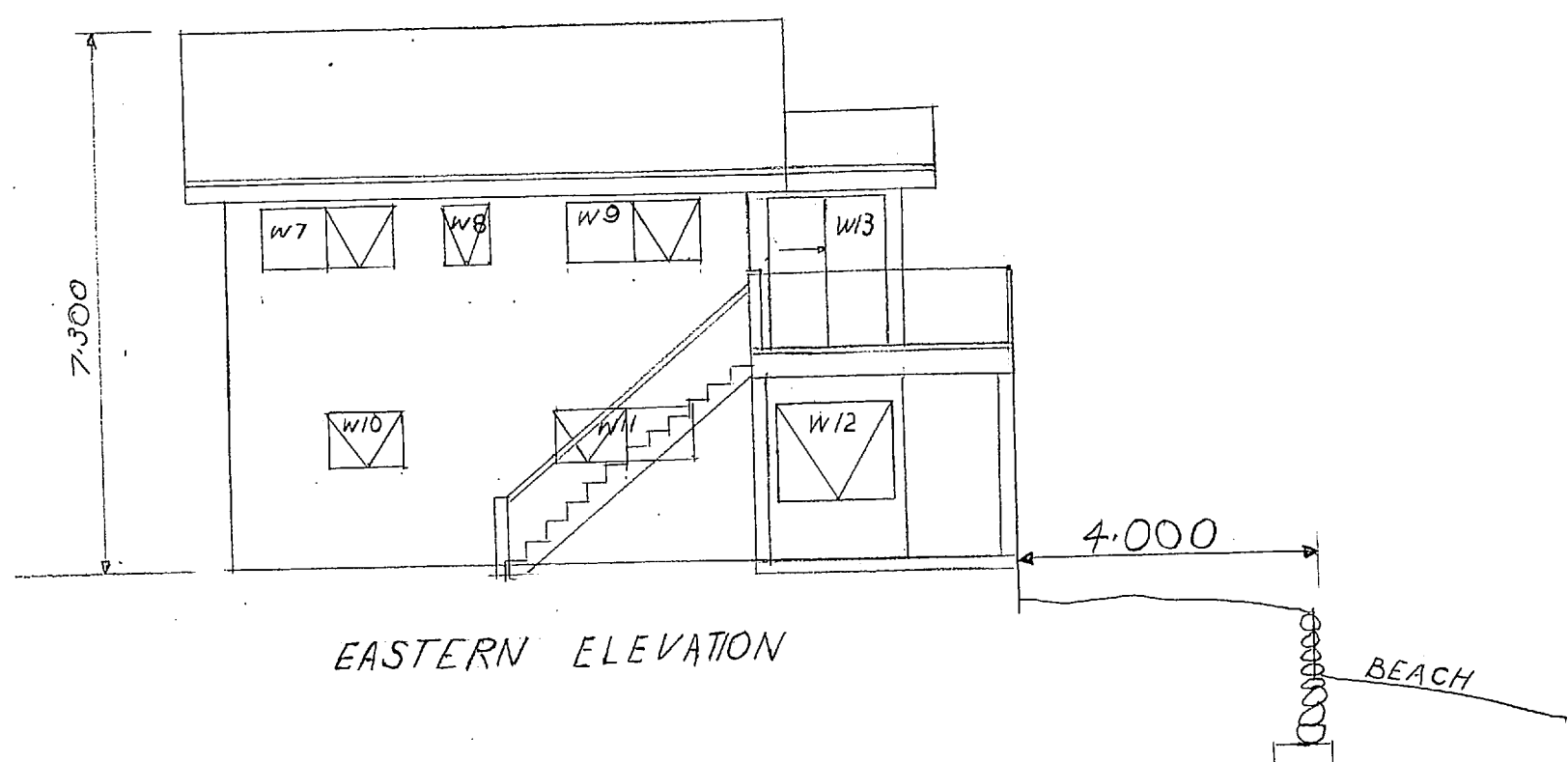
ORIGINAL HOUSE PLAN
FOR 15 HEPPLES ROAD
BOAT HARBOUR

STR 1. EXTERIOR - SMD

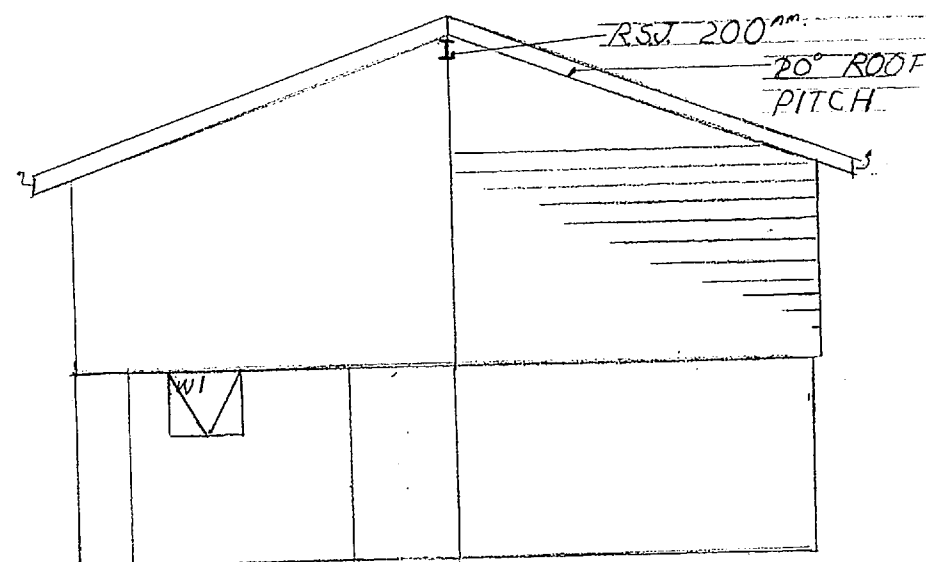


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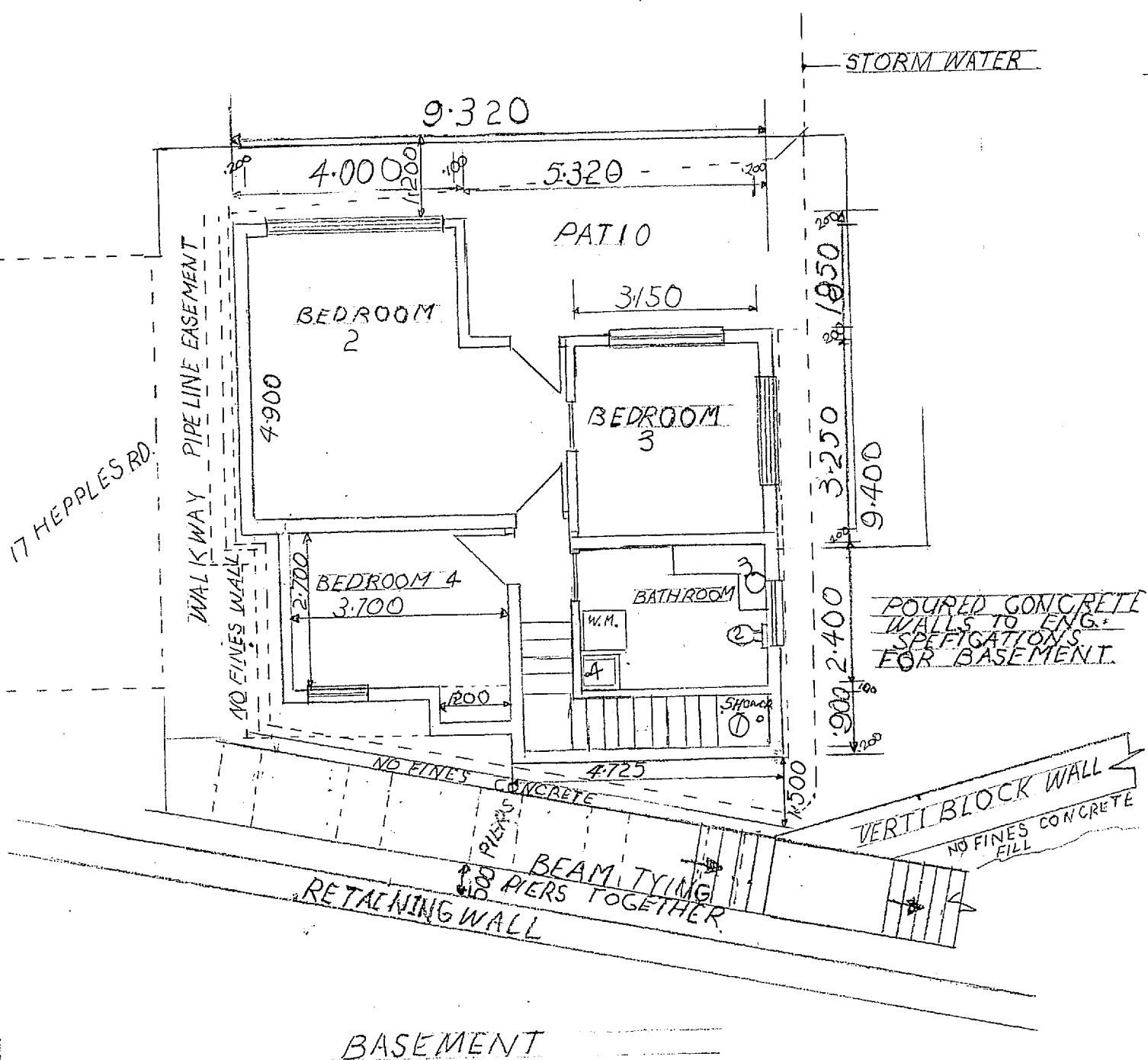
TOUGHEND GLASS BALASTRADE



NORTHERN ELEVATION



SOUTHERN ELEVATION



CODE	SPAN	SIZE
W1	1.000	140 X 35
W2	2.000	190 X 35
W3	2.000	140 X 35
W4	2.000	190 X 35
W5	3.200	240 X 4
W6	1.800	190 X 35
W7	1.700	120 X 35
W8	1.000	140 X 35
W9	1.000	140 X 35
W10	1.800	190 X 35
W11	1.000	140 X 35
W12	1.600	" "
W13	" "	" "
W14	1.200	140 X 35
W15	2.000	190 X 35
W16	" "	" "

KEY FOR PLUMBING
1 SHOWER
2 WATER CLOSET
3 VANITY
4 TROUGH
5 WATER CLOSET
6 VANITY
7 SHOWER
8 KITCHEN SINK

REBUILDING OF HOLIDAY HOME FOR CHAS & ROBI KELLY OF 15 HEPPLES ROAD BOATHABOUR

DRAWN BY JANN INGLIS Lic N° CC2451X

Scale 1:100

Project: **PROPOSED RESIDENCE
RE-BUILD**

Measured form and function



At: **15 HEPPLES ROAD
BOAT HARBOUR 7321**

For: **CHAS & ROBIN KELLY**

Project: 17.077

Drawings:

	Cover Sheet
Ap01	SITE PLAN
Ap02	DEMOLITION, FLOOR & ROOF PLANS
Ap03	ELEVATIONS

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6ty Pty Ltd
ABN 27 014 609 900

Architectural
ABP No. CC4874f
Structural / Civil
ABP No. CC1633i

Tamar Suite 103
The Charles
287 Charles Street
Launceston Tasmania
P (03) 6332 3300

57 Best Street
Devonport Tasmania
P (03) 6424 7161



DEVELOPMENT APPROVAL

Issue date: 17-09-2018

PROJECT No. 17.077 DRAWING No. Ap01 REV. -



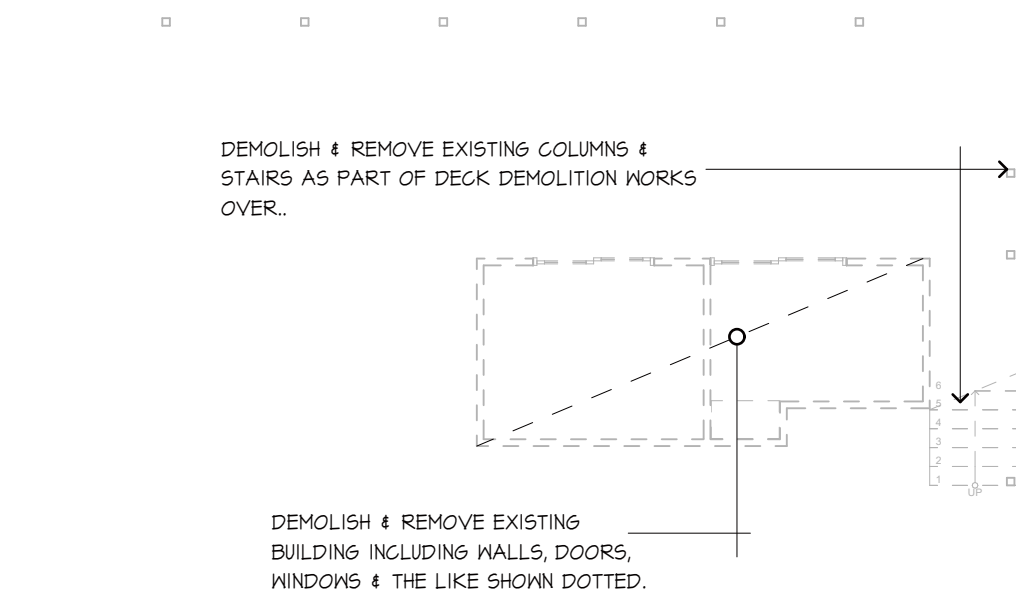
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PO Box 63
Riverside
Tasmania 7250
W 6ty.com.au
E admin@6ty.com.au

6ty Pty Ltd
ABN 27 014 609 900

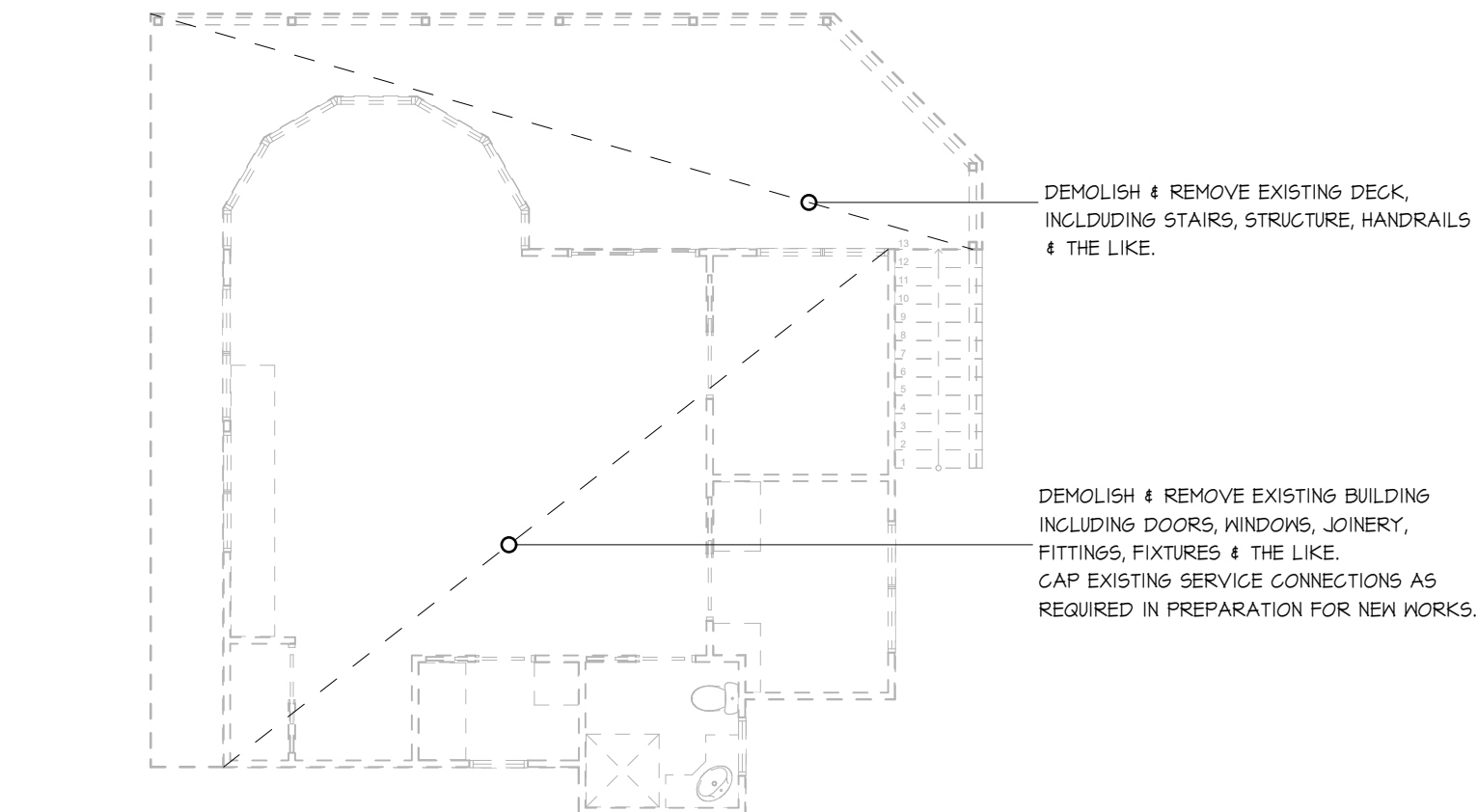
Architectural
ABP No. CC4874f
Structural / Civil
ABP No. CC1633i

Tamar Suite 103
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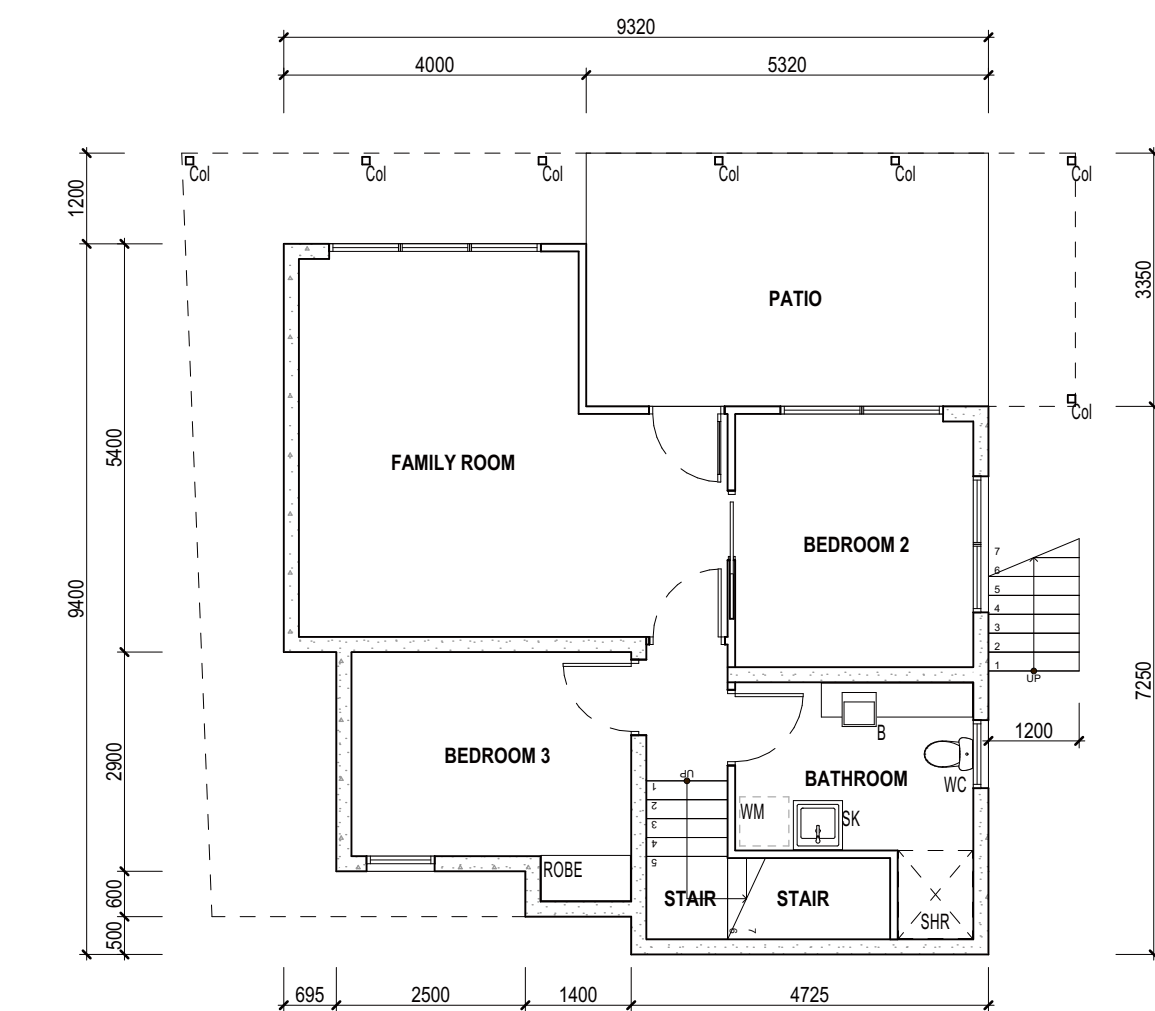
57 Best Street
Devonport Tasmania
P (03) 6424 7161



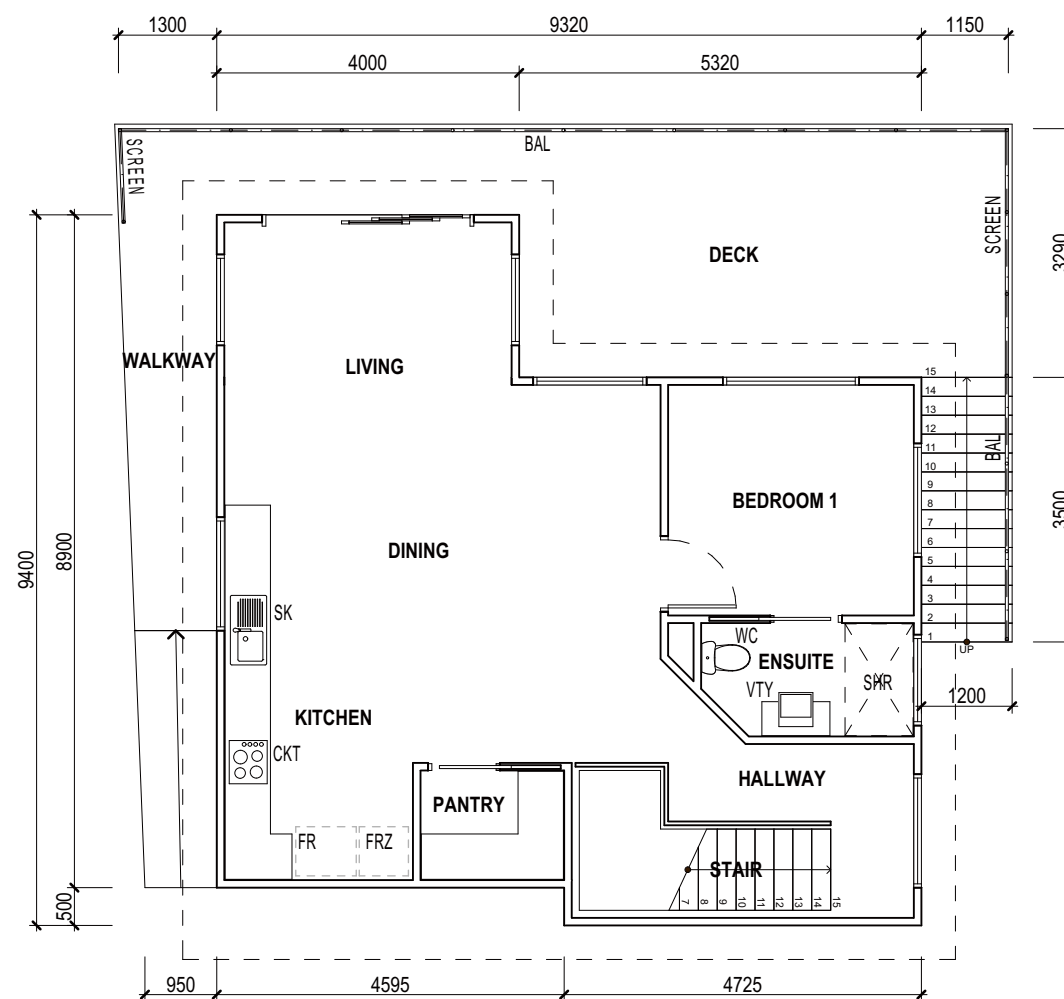
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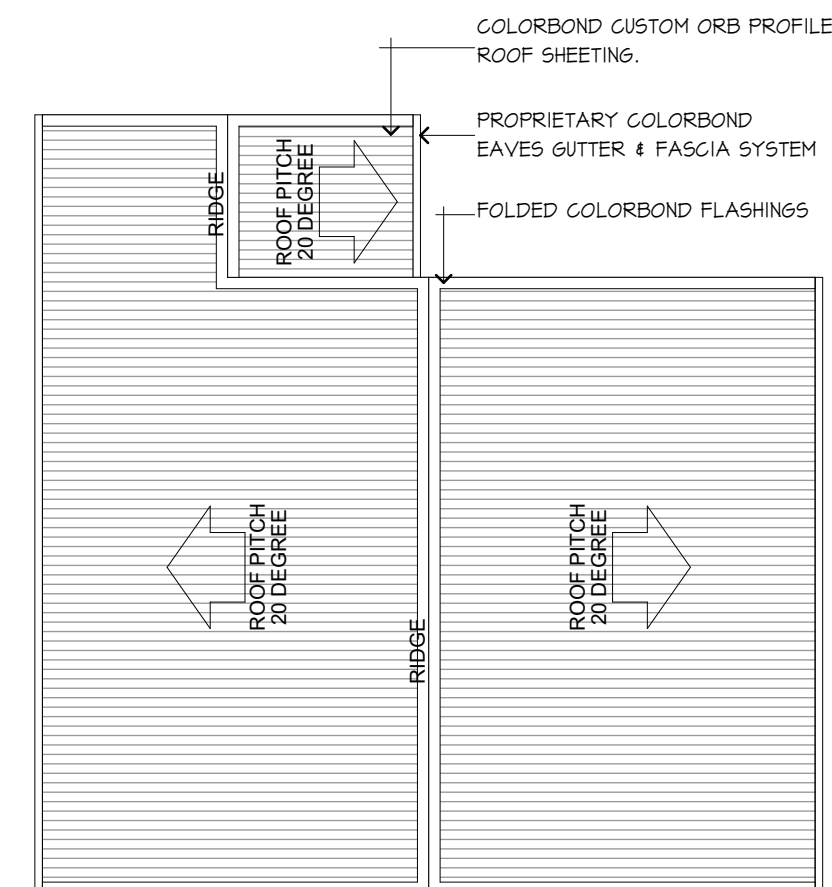
PROPOSED FIRST FLOOR DEMOLITION PLAN
SCALE 1:100



PROPOSED FLOOR PLAN
SCALE 1:100



PROPOSED FIRST FLOOR PLAN
SCALE 1:100



PROPOSED ROOF PLAN
SCALE 1:100

PLANNING DOCUMENT

ISSUE	DATE	ISSUED FOR	REV.
01	17-09-18	DEVELOPMENT APPROVAL	-
02	17-01-19	DEVELOPMENT APPROVAL	-

DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE. CHECK AND VERIFY ALL DIMENSIONS ON SITE. REFER DISCREPANCIES TO THE SUPERINTENDENT. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH: BUILDING CODE OF AUSTRALIA, APPLICABLE AUSTRALIAN STANDARDS & LOCAL AUTHORITY REQUIREMENTS.

PROJECT: **PROPOSED RESIDENCE RE-BUILD**
AT: **15 HEPPLES ROAD**
BOAT HARBOUR 7321
FOR: **CHAS & ROBIN KELLY**
DRAWING: **DEMOLITION, FLOOR & ROOF PLANS**

DESIGNED: DVG DRAWN: ADB CHECKED: DVG

SCALES: 1:100 AT A2 SIZE DRAWING SHEET

PROJECT No. **17.077** DRAWING No. **Ap02** REV. **-**

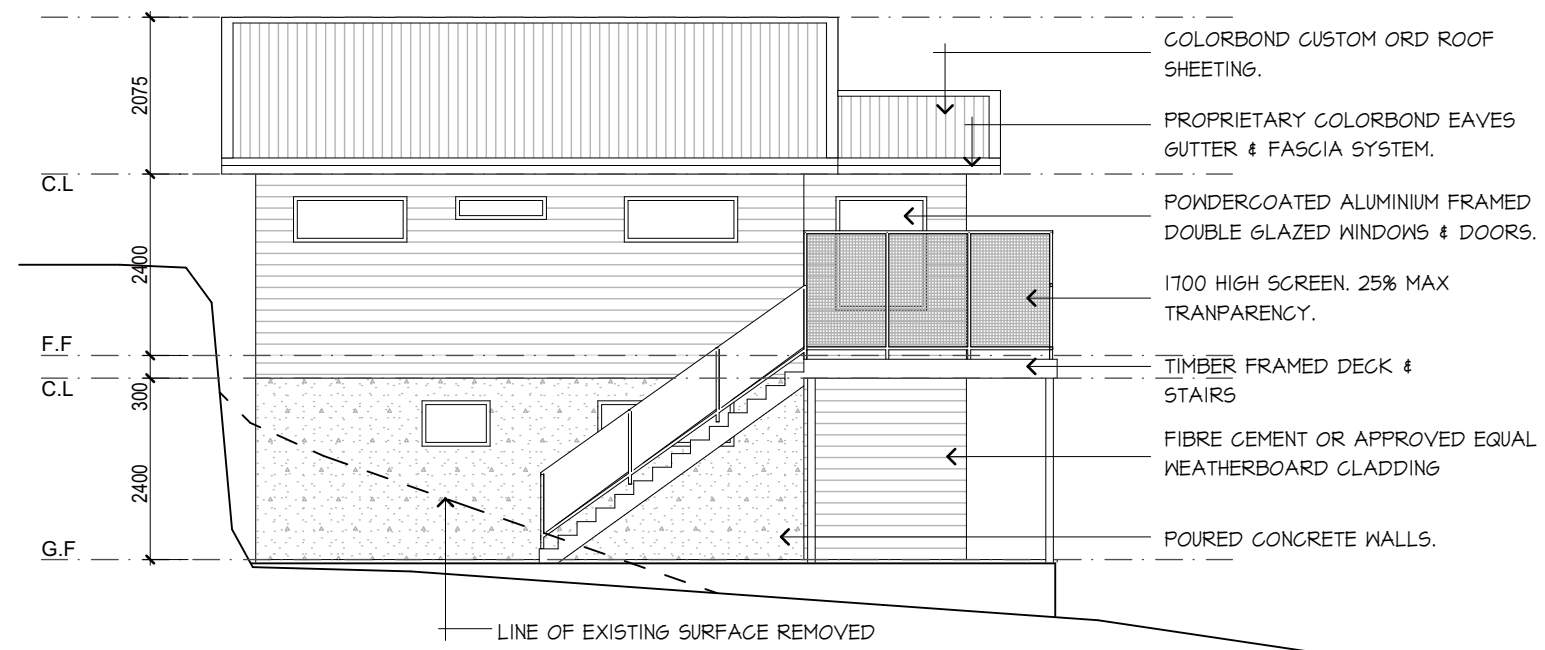
Postal Address
PO Box 63
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E admin@6ty.com.au

6ty Pty Ltd
ABN 27 014 609 900

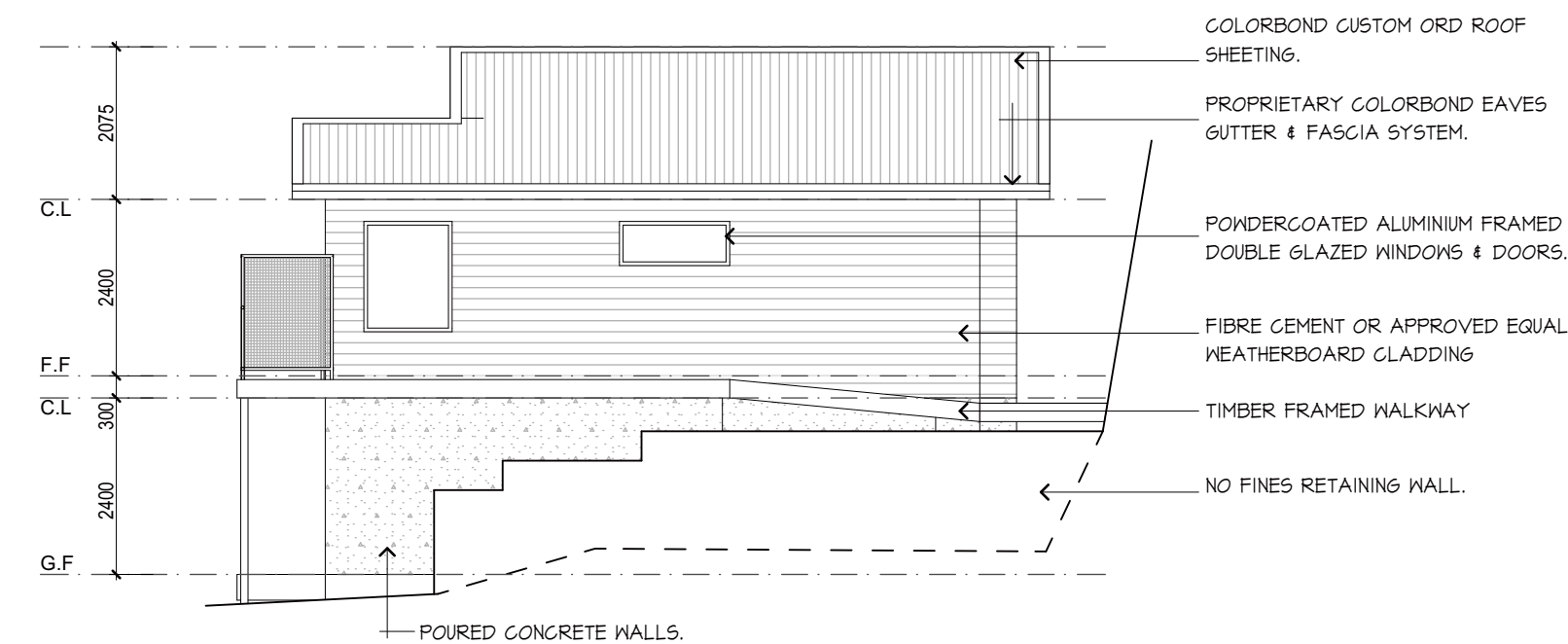
Architectural
ABP No. CC4874f
Structural / Civil
ABP No. CC1633i

Tamar Suite 103
The Charles
287 Charles Street
Launceston Tasmania
P (03) 6332 3300

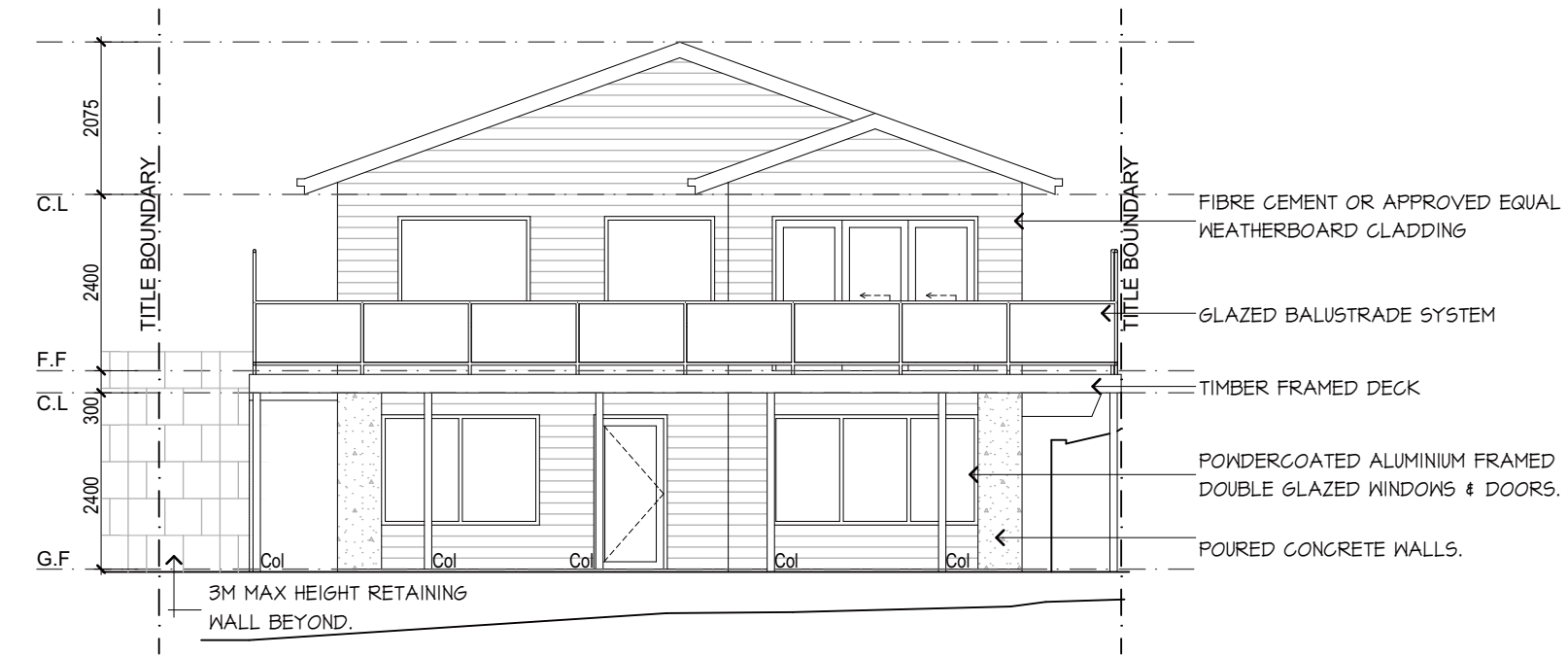
57 Best Street
Devonport Tasmania
P (03) 6424 7161



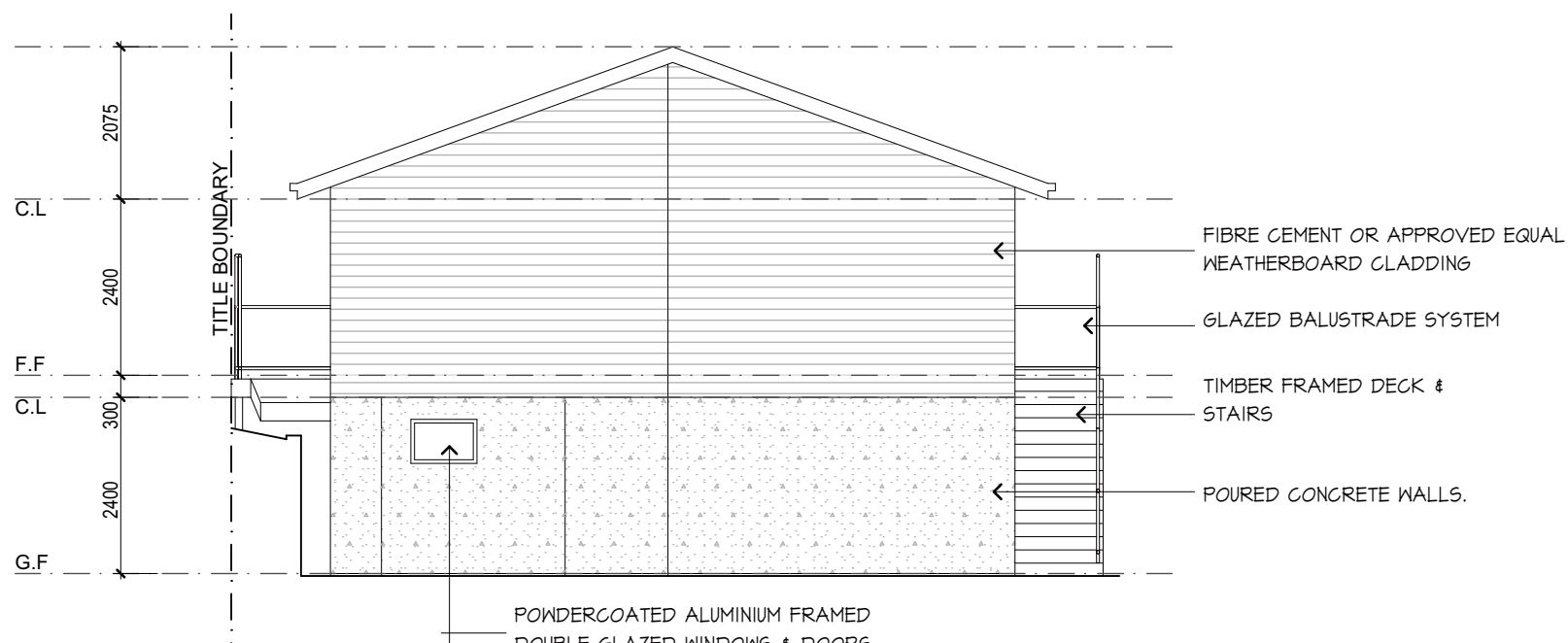
PROPOSED EAST ELEVATION
SCALE 1:100



PROPOSED WEST ELEVATION
SCALE 1:100



PROPOSED NORTH ELEVATION
SCALE 1:100



PROPOSED SOUTH ELEVATION
SCALE 1:100

PLANNING DOCUMENT

ISSUE	DATE	ISSUED FOR	REV.
01	17-09-18	DEVELOPMENT APPROVAL	-
02	17-01-19	DEVELOPMENT APPROVAL	-

DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE. CHECK AND VERIFY ALL DIMENSIONS ON SITE. REFER DISCREPANCIES TO THE SUPERINTENDENT. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH: BUILDING CODE OF AUSTRALIA, APPLICABLE AUSTRALIAN STANDARDS & LOCAL AUTHORITY REQUIREMENTS.

PROJECT: **PROPOSED RESIDENCE RE-BUILD**

AT: **15 HEPPLER ROAD**
BOAT HARBOUR 7321

FOR: **CHAS & ROBIN KELLY**

DRAWING: **ELEVATIONS**

DESIGNED: **DVG** DRAWN: **ADB** CHECKED: **DVG**

SCALES: **1:100** AT A2 SIZE DRAWING SHEET

PROJECT No. **17.077** DRAWING No. **Ap03** REV. **-**

Appendix C

Landslide Risk Assessment



**LANDSLIDE RISK ASSESSMENT
MODIFICATIONS TO DWELLING
15 HEPPLES ROAD, BOAT HARBOUR**

Prepared for: **6ty**

Date: 9 April 2019

Document Reference: TG17185/1 - 02report Rev01

Tasman Geotechnics Pty Ltd ABN 96 130 022 589
16 Herbert Street, Invermay
PO Box 4026, Invermay TAS 7248
T 6338 2398
E wayne@tasmangeotechnics.com.au

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	2.2 Regional Setting	2
	2.3 Geology	3
	2.4 Landslide Inventory	3
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Important information about your report

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Figure 1	Landslip A and B Zones at Boat Harbour
Figure 2	MRT Geology Map Extract
Figure 3	MRT Landslide Inventory Map Extract
Figure 4	MRT Landslide Morphology Map Extract
Figure 5	MRT Landslide Susceptibility Map Extract
Figure 6	Site Layout and Site Observations
Figure 7	Interpreted Geotechnical Cross Section
Figure 8	Regional Geotechnical Cross Section
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Appendices

Appendix A	Development Drawings
Appendix B	Landslip Survey Data
Appendix C	Rainfall Data
Appendix D	Selected Site Photographs
Appendix E	Engineering Borehole Logs
Appendix F	Laboratory Test Certificate
Appendix G	Landslide Risk Matrix
Appendix H	Risk to Life

Version	Date	Prepared by	Reviewed by	Distribution
Original	7 February 2019	Dr Alan Chester	Dr Wayne Griffioen	Electronic
Rev 01	9 April 2019	Dr Alan Chester	Dr Wayne Griffioen	Electronic

1 INTRODUCTION

Tasman Geotechnics previously provided a Landslide Risk Assessment for the site at 15 Hepples Road, Boat Harbour title reference 143923/31 (report TG17185/1 – 01report, dated 23 March 2018).

The assessment was required as part of the Planning Application process, as the owner was issued an issues paper for:

1. Undertaking development without obtaining the necessary planning and building approvals; and
2. Building works being located within an A Landslip area.

However, no details of the proposed dwelling were available at the time.

On 7 June 2018, the Waratah-Wynyard Council requested additional information in relation to Development Application DA53/2018 for the demolition of an existing dwelling, replacement dwelling and retaining walls at 15 Hepples Road. The request for information noted that the Landslide Risk Assessment report “*will need to take into consideration the demolition works, retaining walls, earthworks, and the proposed new dwelling...*”.

A set of drawings prepared by 6ty° was provided to Tasman Geotechnics as part of the current assessment: project 17.077, drawing Ap01, Ap02 and Ap03, dated 17 September 2018, as well as a drawing showing the pre-development survey and as-constructed bored piers under one of the retaining walls. The drawings are included in Appendix A of this report.

This revised report is a stand-alone document, and contains the information presented in our previous Landslide Risk Assessment.

Our scope of work consisted of:

- Reviewing maps and reports in the public domain (eg MRT website) and by direct discussions with MRT personnel;
- Carrying out a site walkover to note geomorphological features associated with landslide activity at the site, and of geological features in the larger Boat Harbour area;
- Drilling one borehole (BH1) using a track mounted drill rig to determine subsurface conditions at the site;
- Using results from our previous investigation on Hepples Road (with permission from Waratah-Wynyard Council).
- Performing a Landslide Risk Assessment.

The assessment is consistent with the Landslide Risk Assessment guidelines published by the Australian Geomechanics Society (2007).

2 BACKGROUND INFORMATION

2.1 Implications of Landslip A Zone

The extent of Landslip A and B zones at Boat Harbour is shown in Figure 1, and shows the existing site is wholly within Landslip A Zone.

It is our understanding that the provisions of the Building Act 2000 and Building Regulations 2014 remain applicable until the new Tasmanian Planning Scheme comes into effect.

For an A landslip area, the Tasmanian *Building Act 2000* states that

- (1) *A person must not erect, alter or add to a building in an A landslip area except in accordance with subsection (2)*
- (2) *The minister, on the recommendation of a general manager, may permit a person to –*

(a) Erect, in an A landslide area-

(i) A shed; or

(j) An insubstantial building; or

(b) Carry out building work, other than erections, in respect of a building in an A landslide area; or

(c) Erect a building within the boundaries of a wharf in an A landslide area.

The Building Regulations stipulate that a person may only erect, alter or add to a building in a B landslide area if the total floor area will not exceed 200m² when the building work is completed. The Building Regulations also state that a permit may be issued for a building with more than 200m² floor area, if a certificate is given by a geotechnical engineer confirming that:

- i) the erection, alteration or addition can be carried out safely, and
- ii) the building will be structurally sound, and
- iii) the completed building will not affect the stability of the land.

In landslide areas, a person may only (Clause 13, Building Regulations 2014):

- a) Excavate or deposit, material in a landslide if the excavation or deposition is carried out in such a manner as to allow rainwater or seepage to drain from the site; or*
- b) Permanently excavate or deposit any material for, or in connection with, building work in a landslide are if –*
 - i. The excavation is not more than 600 millimetres in depth; and*
 - ii. The material, when deposited, is not more than one metre in height above ground level and is compacted and graded so as not to aggravate existing landslide conditions; or*
- c) Backfill a trench or hole in a landslide area if the trench or hole is backfilled with well compacted material which was previously removed from the trench or hole; or*
- d) Fell or remove trees or other vegetation for, or in connection with, building work on land in a landslide area if the person has obtained the written agreement of a permit authority; or*
- e) Use any earth-moving or vibrating compaction equipment for, or in connection with, building work on land in a landslide area if the person has obtained the written agreement of a permit authority.*

Thus, the works carried out to date have contravened a number of limitations relating to an A landslide area:

- Adding or altering a house
- Carrying out building work
- Permanently excavating more than 600mm of soil

2.2 Regional Setting

Boat Harbour is a seaside town built at the base of a steep coastal escarpment with a sheltered beach as the main attraction. Many of the houses were initially holiday shacks and still display their origins.

A prominent headland, Table Cape is situated to the east of the town and a rugged rocky coastline extends to the west. To the south a steep escarpment rises to a plateau approximately 120m above sea level.

The site is at the base of a steep escarpment facing north east and located at the edge of Boat Harbour Beach. At high tide water laps the front boundary of the property.

The township of Boat Harbour has been built over a complex of landslides and the site subject to this investigation is built at the toe of an active landslide.

2.3 Geology

The Mineral Resources Tasmania (MRT) 1:25,000 Series Digital Geological map, Wynyard Sheet, shows the site to be mapped on Tertiary aged, weathered basalt. Quaternary aged landslide deposits are mapped immediately north of the site (17 Hepples Road).

An extract of the MRT geology map is presented on Figure 2.

2.4 Landslide Inventory

In 2010, MRT published the *"Tasmanian Landslide Hazard Series"* maps which includes 6 maps for the Wynyard area. Of particular interest is the Landslide Inventory map, which shows 7 landslides of different scale in the Boat Harbour township and another 5 along the access road (Port Road).

The site is located on an active landslide that is located on the toe of a larger (dormant) landslide that extends from the escarpment to the beach. For the purposes of this report this is referred to as the "Hepples Road Complex". A larger dormant complex is located 250m north of the site and this is termed as the "Town Complex". The 5 landslides along Port Road are referred to collectively as the "Port Road Slide". Two smaller, probably dormant, landslides are located on the escarpment between the "Hepples Road complex" and "Town complex", and these are referred to as "escarpment slides".

The Landslide Inventory Map also shows that there have been reports of damage to dwellings in the Boat Harbour township.

An extract of the MRT landslide inventory map is shown in Figure 3.

2.5 Geomorphology

A geomorphology map is included as part of the *"Tasmanian Landslide Hazard Series"* maps. The hill slope around Boat Harbour township has several distinct geomorphological features as shown in Figure 4.

- An abandoned coastal cliff (Ce), marked by a major convex break in slope
- Several midslope benches (Db)
- A narrow alluvial fan (Af)
- A narrow marine terrace at 15m above sea level (Cmt15) with a clearly defined terrace riser, and
- Beach.

There are no dunes in the bay. A number of landslides (identified in Section 2.4) have covered the original morphology.

The toe of the landslide is characterized by a convex break in slope, that is mapped immediately above the site.

2.6 Landslide Susceptibility Mapping

For the basalt soils of the North-West coast of Tasmania, MRT have identified two scales of landslides:

- Deep-seated rotational landslides; and
- Shallow slides or debris flows.

Landslide susceptibility maps for both scales of land sliding have been developed by MRT, and extracts are presented in Figure 5.

Susceptibility zones for first time deep-seated failures were developed by MRT by statistical analysis of slope geometry and geological material of known landslides, and are mapped as possible source, regression and runout areas associated with potential landslide movement. For the Tertiary basalts, threshold values of source, regression and runout areas are 14°, 20° and 16° respectively.

For shallow slides and debris flows, the susceptibility for source area is also based on slope angle:

- High: greater than 20°
- Moderate: between 10° and 20°
- Low: between 6° and 10°
- Very Low: less than 6°

The Wynyard Deep-seated Landslide Susceptibility Map shows that the site is located on a source area. The area is also mapped as Moderate to High susceptibility for shallow slides and debris flow.

2.7 Previous Investigations

Boat Harbour has had a history of landslides some of which have damaged buildings and others damaged roads and other infrastructure. A search of the MRT website identified 5 reports on landslides in the Boat Harbour Beach area. Three of these were considered relevant to the present investigation: Jennings (1965), Matthews (1972) and Matthews (1974). In addition, we obtained a copy of a Coffey Geosciences report (dated 2001), commissioned by DPIPWE and Waratah-Wynyard Council. We also used information from an investigation carried out by Tasman Geotechnics at Hepples Road for Waratah-Wynyard Council in 2016 (report TG16160/1 – 01report, dated 10 March 2017).

Jennings (1965) identified the risks for Port Road crossing a landslide and recommended that an alternative route be found to access the town. Jennings also stated that the use of septic tanks and careless disposal of drainage water was aggravating an already dangerous situation in relation to landslides.

Matthews (1972) explained that the risk of landslides in Boat Harbour area were due to deeply weathered basalt forming clays which when saturated were liable to move. Matthews mapped the Hepples Road Complex.

A comprehensive report on the landslide crossing Hepples Road by Matthews (1974) identifies some of the issues that characterize the area;

- Groundwater flow through the basalt talus appearing as springs above the basalt bedrock near the foreshore,
- Subsidence by 1m of a 128m long section of road, and
- Identification of a landslide extending about 230m uphill from the beach, that was active in 1969.

Coffey Geosciences (2001) undertook an investigation for the Department of Primary Industries Water and Environment and Waratah-Wynyard Council to provide a landslide risk assessment for the town. In this report Coffey Geosciences defined geomorphological units and described the existing landslides. The mapping produced by Coffey Geosciences is very similar to the landslide maps produced by MRT in 2010. The risk of loss of life for landslides was assessed to be very low. Coffey Geosciences also stated that movement on the landslide crossing Port Road was “Almost Certain” which has proved to be true.

The Tasman Geotechnics investigation in 2016 involved drilling 2 boreholes through Hepples Road with a truck mounted rig, using both hollow stem augers and diamond drilling (boreholes TGBH1 and TGBH2). Piezometers were installed in the boreholes to allow measurement of groundwater levels. One undisturbed soil sample (U63) was submitted to Chadwick Geotechnics to determine effective strength parameters by triaxial testing. Results of the 2016 investigation are included in the discussion in Section 4.

Waratah-Wynyard Council provided survey data gathered by PDA Surveyors of survey markers placed in the Hepples Road/Fenton Crescent area. The markers were placed and surveyed in 2004, and re-surveyed in 2009, 2016 and 2018. The data is presented in Appendix B and shows two markers on Hepples Road have moved around 400mm between 2009 and 2018, equivalent to approximately 45mm/yr.

2.8 Rainfall

As rainfall is often a trigger for landslide movement, we obtained monthly rainfall records for Boat Harbour (opened in August 2012). The data for Boat Harbour is relatively recent, so we also obtained data for Mawbanna (opened since 1981). The data are presented in Appendix C.

Comparison of the monthly rainfall between 2012 and 2018 at the two stations shows is a strong linear correlation, with Mawbanna reporting up to 70% more rainfall than Boat Harbour. The typical ratio is 20%.

Similarly, the annual rainfall for Mawbanna is higher than Boat Harbour. Gaps in the monthly data mean that there are no pairs of years with complete rainfall data. Thus, the correlation for the annual rainfall is not as strong as the monthly rainfall data.

Nevertheless, the strong linear correlation for the monthly rainfall data means that the rainfall from Mawbanna can be used to interpret landslide movements at Boat Harbour.

The rainfall data shows that the driest month is February (46mm mean rainfall for Mawbanna) and the wettest month is July (177mm mean rainfall for Mawbanna). At Mawbanna there have been 3 occasions since records commenced in 1982 where the monthly rainfall has been more than 300mm ("significant rainfall"), and twice where it was marginally less than 300mm. Table 1 compares the corresponding rainfall at the two stations for these occasions.

Table 1. Monthly rainfall over 300mm for Mawbanna

Month	Mawbanna (mm)	Boat Harbour (mm)
July 1996	292	No data
May 2007	298	No data
August 2009	331	No data
August 2013	423	356
July 2016	346	258

Figure B1 in Appendix B shows the movement at the survey markers along Hepples Road and the "significant rainfall" events. It is noteworthy that very little movement occurred between 2004 and 2009, despite a monthly rainfall close to 300mm at Mawbanna in May 2007. Therefore, the "significant rainfall" events in August 2009 and August 2013 more than likely caused in movement between 2009 and 2016. There is a definite increase in rate of movement after the July 2016 rainfall event.

2.9 Proposed Development

The original building at the site comprised a light weight structure, about 9m x 9m in plan. The floor level of the building was about 3m above the rock wall located along the beach. Due to the sloping nature of the site, two small rooms had been constructed under the main part of the building, creating the appearance of a 2 storey building. A survey of the original building is included in Appendix A and selected photographs of the original building are presented in Appendix D.

The new dwelling has a similar footprint as the original building, but is double-storey for the whole footprint. Thus, a significant volume of soil has been excavated: as much as 2m on the road-side of the house and along the boundary with 17 Hepples Road.

At the time of our fieldwork in September 2017, the ocean-side of the original dwelling was still present, while the road-side part had been reconstructed.

Two new retaining walls have been constructed at the road-side of the property; one from no-fines concrete and the second from pre-cast verti-blocks. Photographs supplied by 6ty° show a number of bored piers were installed below the no-fines concrete retaining wall. The piers are reportedly 3m deep. A drawing with the as-constructed piers is included in Appendix A.

In addition, a no-fines concrete retaining wall is located along the boundary with 17 Hepples Road.

We do not know if subsoil drainage was installed behind the walls.

Floor and walls for a new development have been constructed from concrete and consist of two rooms. From the presence of plumbing fittings it would appear one room is intended to be a bathroom. The building is located about 0.3m away from the new retaining wall.

We understand no additional work has been carried out at the site since September 2017.

3 FIELD INVESTIGATION

The fieldwork was carried out by an Engineering Geologist from Tasman Geotechnics on 21 September 2017. The fieldwork involved the following:

- Inspection of the site to determine the extent of works carried out,
- Inspection of the surroundings to note features relevant to landslip in the area around the site,
- Taking photographs of the site, and
- Drilling one borehole (BH1) to 5m below ground level using a track mounted rig to determine sub-surface conditions below the site. Due to the limited area on the site it was not possible to drill more than one borehole.

Selected photographs are presented in Appendix D. The borehole log for BH1 as well as the borehole logs for the Hepples Road investigation (TGBH1 and TGBH2) are presented in Appendix E, together with a photographs of the core. Surface features relevant to this investigation and locations of current and previous boreholes by Tasman Geotechnics are shown on Figure 6.

No soil samples were taken during the investigation as the sub-surface soil was a mixture of rock fragments and soil, unsuitable for testing. Nevertheless, some laboratory testing was reported by Tasman Geotechnics from the investigation at Hepples Road. The results of the laboratory testing are discussed in Section 4.3.

4 RESULTS

4.1 Surface Conditions

Most of the observations described here are shown in Figure 6.

Substantial works have been done on the site so very little natural topography is present. The only piece of natural topography may be the small grassed area that extends from the front of the existing dwelling to the beach. However a rock retaining wall has been built along the beach boundary so much of this ground could be fill.

The borehole was located on the eastern side of the dwelling on ground which appears to have been excavated approximately 1.5m below the natural topography. This estimate is based on the level of apparently natural ground beneath the existing original dwelling. This excavation was probably carried out at the time the original shack was constructed.

The south western boundary of the property adjoins Hepples Road. A no-fines concrete retaining wall has recently been constructed along half of this boundary. This wall is approximately 3m high. It would appear to be founded on talus. Photographs provided by 6ty° indicate bored piers were installed below the retaining wall and joined with a ground beam. The piers are reportedly 3m deep. The wall was constructed in front of a 5m high crib wall. The crib wall continues above the concrete wall, and was originally constructed to support Hepples Road.

A verti-block wall has recently been constructed along the other half of the south western boundary. No foundation or drainage details are known for the wall.

On the uphill side of Hepples Road there is a block retaining wall. The grassed areas uphill of this wall have a hummocky appearance indicative of landslip.

Houses adjacent to 15 Hepples Road (to each side and uphill) have been damaged by landslide movement as indicated by buckled walls, leaning columns supporting verandahs, misaligning doors and windows. A photograph of 15 Hepples Road before the current reconstruction works also shows gaps in the external walls.

The following observations were made of the slopes uphill of the site:

- The surface of Hepples Road and concrete kerbing has cracks and undulations indicative of ground movement.
- Tension cracks were observed in the grass at 2 and 10 Hepples Road in 2016.
- Port Road, immediately uphill of 1 Fenton Crescent, has a small step (<100mm high) that was repaired in 2018.
- Large basalt boulders are present on the vacant lot adjacent to 237 Port Road.
- The head scarp of the Hepples Road Complex is located near an outcrop of basalt rock, about 200m inland and at 70m above sea level. A backward rotated block forms an area of internal drainage that collects surface runoff.

4.2 Subsurface Conditions

Excavations under the existing dwelling show a profile of talus for the exposed 2.0m on the western side. On the eastern side a talus profile of at least 1.5m is exposed.

BH1 was advanced to 1.3m using auger drilling, where the auger refused on boulders. The borehole was continued using diamond drilling (HQ coring) to a final depth of 5m below the current ground level.

The subsurface profile at BH1 comprised:

- Talus (clay with occasional cobbles) to 1.3m below current ground level, overlying
- Boulders and cobbles within a silty clay matrix to 2.7m below current ground level, overlying
- Fractured basalt bedrock, black, high strength to at least 5m below ground level.

The subsurface conditions under Hepples Road, based on the investigation by Tasman Geotechnics in 2016 (TGBH1 and TGBH2), are as follows:

- FILL, comprising layers of road base, gravelly sand, and clayey sand, to 1.6m below road level, overlying
- TALUS: SILTY CLAY, high plasticity, red/brown, with basalt boulders and cobbles to 3.5m below road level in TGBH1 and 5.7m below road level in TGBH2, overlying
- RESIDUAL SOIL, presenting as gravelly clay, high plasticity, brown, to 4.6m in TGBH1 and 6.8m in TGBH2, overlying
- BASALT BEDROCK, fine grained, black/blue, highly to distinctly weathered, medium rock strength, fractured. The highly weathered basalt has very low rock strength, while the distinctly weathered basalt has medium rock strength.

The basalt bedrock encountered in the present investigation was similar to that encountered in the 2016 investigations.

While standpipe piezometers were installed in TGBH1 and TGBH2, no groundwater was measured in them (dry to 5.5m below road level). Photographs supplied by 6ty show there was water in the bottom of the bored piers after they were excavated. Due to the drilling method used for the present investigation (diamond drilling), no groundwater level could be measured in BH1.

Based on photographs provided by 6ty°, we understand that bored piers were installed below the no-fines concrete retaining wall to 3m below the footing level. From our borehole profile, we expect this is at the top of the basalt bedrock. Therefore, the piers are not embedded in the rock.

Talus is resting on steeply sloping bedrock consisting of basalt in turn overlying quartzite. As ground water is seeping out at beach level over the top of basalt bedrock we assume the talus is

sliding on the bedrock, particularly when the groundwater level is elevated, as is the case after high rainfall events.

A schematic cross section from the beach to Hepples Road is presented in Figure 7.

4.3 Soil Properties

While no laboratory testing was carried out for the present investigation, laboratory results were reported by Tasman Geotechnics for the investigation of Hepples Road:

- Atterberg Limits and field moisture content testing was carried out by Tasman Geotechnics. Although not a NATA accredited laboratory, the testing was carried out in accordance with Australian Standard methods,
- Triaxial testing (consolidated undrained with pore pressure measurement, CUPP) was carried out by Chadwick Geotechnics, a NATA accredited laboratory in Victoria. The laboratory certificate is presented in Appendix F.

Laboratory results for the Atterberg Limits are presented in Table 2.

Table 2. Laboratory Test Results

Material	Clay	Clay (residual soil)
Depth (m)	TGBH2: 2.0-2.2	TGBH1: 3.1-3.3
Liquid Limit (%)	66	77
Plastic Limit (%)	33	33
Plasticity Index (%)	33	44
Linear Shrinkage (%)	16	18

Thus, the natural clay is high plasticity clay (Unified Soil Classification Symbol CH).

The field moisture content of various samples are summarized in Table 3.

Table 3. Soil Moisture Contents

Depth (m below road level)	TGBH1	TGBH2
2 to 2.2	-	55
3.1 to 3.2	57	64
3.9 to 4.1	49	59
5.5 to 5.6	-	36

Thus, the field moisture contents are generally above 50% and approaching the Liquid Limit shown in Table 2. In TGBH2, the moisture content at 5.5m depth is close to the Plastic Limit. However, this is interpreted to reflect the gravelly nature of the soil.

The triaxial test was carried out on a sample from TGBH1 at 2.45m to 2.95m depth. The test provides effective strength parameters, ϕ' and c' , that are typically used to analyse the long-term stability of slopes. The sample tested for this investigation showed $\phi' = 27^\circ$, and $c' = 0\text{kPa}$. As the sample is of the talus, it is likely to have been subject to previous landslide movement. Therefore, the strength parameters probably represent “remoulded” conditions.

5 GEOTECHNICAL MODEL

5.1 Geological History

To understand why landslides are a particular problem in Boat Harbour it is necessary to understand the geological history of the site and its surrounds. A brief summary of the geological history of Boat Harbour area follows.

The basement rocks, now quartzite, were deposited as sandy sediments on the floor of a shallow sea during Mesoproterozoic times. Ripple marks still evident in some beds can be used to determine depositional depths below wave base. Age determinations have been based on radiometric dating of detrital zircons. Later sedimentation included siltstone and dolomite sequences which can now be seen west of Boat Harbour.

Orogenic movements caused folding and faulting at intervals, early Neoproterozoic to Cryogenian and again Ediacaran to Cambrian. A major fault known as the Boat Harbour Fault, prominent between Boat Harbour and Sister's Beach, probably occurred during the Wickham Orogeny at approximately 760Ma.

Unconformities are present at a number of levels indicating periods of erosion.

Major folding occurred due to a terrane collision during the Cambrian. The terrane boundary is marked by the Arthur Lineament which runs from the north coast just east of Boat Harbour to Ahrberg Bay on the west coast. Rocks within the lineament are intensely folded and high pressure metamorphic affects are prominent.

Further deposition and erosion occurred after the Cambrian but the next major event of significance to landslide activity was the opening of Bass Strait. This subjected the underlying quartzite to further erosion and wave cut activity at times. The sea levels rose and fell so that wave cut platforms developed at a number of levels. Steep slopes formed on the tilted quartzite beds and sharp ridges formed due to the hard rock.

Volcanic activity occurred at approximately 13Ma (basalt date from Tollymore Road, just south of Boat Harbour) and Table Cape was a major volcanic centre which poured basalt lava across the pre-Tertiary landscape. Lava flowed towards and past Boat Harbour and flowed down over the steep faces of the underlying rock forming the basement of what is now an escarpment.

In the time since the volcanic activity ceased the basalt has weathered into deep clays. The clay surrounding Boat Harbour is resting on steep flat surfaces offering very little frictional resistance to sliding so that when the clay becomes saturated it generates landslides.

Earthquake activity continues to occur on the northwest coast. A search of the GeoScience Australia database returned 9 earthquake events that occurred between 2002 and 2016 and were located between Devonport and King Island, with magnitudes ranging from 2.1 to 4.5. The 4.5 event occurred in February 2002 near King Island, and was felt at Burnie, Smithton and Strahan. Two events (magnitude 2.5 and 3.4) occurred northeast of Wynyard in January 2013.

5.2 Landslide Morphology

A number of landslides have been mapped close to the study site as indicated in Section 2.4. The Hepples Road Complex, located immediately north of 15 Hepples Road is directly relevant to the site. The landslide is known to have been active in 1969 (Matthews, 1974).

The head scarp for the Hepples Road Complex is mapped about 200m south west of the site, near the crest of the plateau. A backward rotated block forms an area of internal drainage that collects surface runoff and likely causes elevated groundwater levels within the landslide.

At Hepples Road the landslide exhibits creep, approximately 45mm/year. A number of houses, as well as Hepples Road and Port Road are affected by the creep. The house damage includes lateral movement and rotation of footings which in turn leads to gaps or jamming of windows and doors. Walls have buckled and retaining walls have started to lean and in some cases have broken. Hepples Road has developed tension cracks and small scarps. Tension cracks were observed in the grass at 2 and 10 Hepples Road. There is a small bump in Port Road where the landslide crosses it.

The head scarp has a typical slope of 31°, while the main body has a slope of about 24°. The toe (from Port Road to the beach) has an average slope of 13°. A cross section of the Hepples Road complex is shown in Figure 8.

Port Road appears to mark the boundary between the zone of depletion (on the uphill side) and the zone of accumulation (on the downhill side). The landslide is about 70m wide. Based on borehole drilling, the zone of rupture is about 5m to 7m below ground level. The landslide volume is estimated to be about 100,000m³.

The landslide toe is located at the high water mark. Three boreholes at the landslide toe have confirmed basalt bedrock. Basalt rock outcrop also occurs at beach level. It is postulated that the basalt bedrock is steeply dipping from the rock outcrop near the head scarp to the beach.

Low retaining walls (less than 1m high) have been constructed along the shore line, and the high water mark is at these walls. Thus, the soils in the landslide toe can become saturated. Nevertheless, the base of the slide is not subject to erosion activity.

Two substantial retaining walls (greater than 3m high) have been constructed along the south western boundary of 15 Hepples Road. One of these, a no-fines concrete wall, has 3m long bored piers. However, the piers are not founded in the basalt bedrock, merely on the rock. No construction details are available for the other, a verti-block wall.

It appears that groundwater flows through the clay overlying the bedrock, and forms springs at beach level immediately above the rock surface.

The response of groundwater levels to rainfall has not been investigated or established. Nevertheless, monthly rainfall data since 1982 from the weather station at Mawbanna shows that “significant rainfall” events (ie more than 300mm per month) occurred in August 2009, August 2013 and July 2016, and that the survey markers installed since 2004 started moving after the August 2009 rainfall event.

6 LANDSLIDE RISK ASSESSMENT

6.1 General

Risk assessment and management principles applied to slopes can be interpreted as answering the following questions;

- What might happen? (HAZARD IDENTIFICATION).
- How likely is it? (LIKELIHOOD).
- What damage or injury might result? (CONSEQUENCE).
- How important is it? (RISK EVALUATION).
- What can be done about it? (RISK TREATMENT).

The risk is a combination of the likelihood and the consequences for the hazard in question. Thus both likelihood and consequences are taken into account when evaluating a risk and deciding whether treatment is required.

The qualitative likelihood, consequence and risk terms used in this report for risk to property are given in Appendix G and are based on the Landslide Risk Management Guidelines, published by Australian Geomechanics Society (AGS, 2007). The risk terms are defined by a matrix that brings together different combinations of likelihood and consequence. Risk matrices help to communicate the results of risk assessment, rank risks, set priorities and develop transparent approaches to decision making.

6.2 Potential Hazards

Based on the site observations, borehole data and available information discussed in the sections above, the following landslide hazards are identified for the site. Figure 9 illustrates the landslide hazards.

Deep-seated “Hepples Road” landslide. This landslide extends 200m from the beach to the crest of the plateau. The main body of the landslide appears to be relatively stable, with movement confined to the toe. The rate of movement is assessed to be slow. However, the likelihood of movement for the main body of the landslide is assessed to be “Likely”.

Movement of existing active landslide. Based on the historical information and MRT mapping, the new dwelling is located near the toe of an active landslide. We infer that the failure mechanism of the slide is due to talus sliding on the steep slope of underlying bedrock when lubricated by high groundwater levels. While there is no erosion at the toe of the slide, the soils are periodically wetted by high tides, resulting in softening of the soils. Seismic activity could also trigger landslide events, and recent minor earthquakes have occurred in the area. High rainfall events resulting in elevated groundwater levels at a regional scale almost certainly instigated the landslide movements. Impeded groundwater drainage or increased surface infiltration possibly combined with extensive excavation/erosion at the toe could lead to rapid movement. The rate of movement is currently about 45mm/year. The likelihood of movement of the existing landslide is assessed to be Almost Certain.

Small scale landslides (up to about 3m deep). Such landslides can occur where slopes are locally steep, or have been steepened by earthworks (cut or fill) and would involve up to 1,000 m³ of soil. Small scale landslides may also occur due to localized soil erosion (eg from poor control of surface runoff) and locally elevated groundwater levels (eg, seepage water collected in fill embankment).

Groundwater levels at the site are close to the surface at the beach, and approximately 2m below the floor level of the new construction.

The new construction is located in a cut which is about 2m below the original ground surface, this cut being within talus material. A no-fines concrete wall has been constructed along the steep slope below Hepples Road. While bored piers have been installed below the strip footing, the piers are not embedded in the basalt bedrock and have minimal reinforcement. The piers are not designed to resist shear forces or bending moments, and therefore do not provide resistance to sliding over the bedrock. Nevertheless, a crib wall is located immediately upslope of the no-fines concrete

The likelihood of a small scale slide in the slope between the road and house is assessed to be Unlikely, given the substantial retaining wall recently constructed. However, a small scale landslide may extend from Hepples Road below the bored piers. The likelihood of such a landslide is assessed to be Possible.

The identification of the potential hazards considers both the site and nearby properties, and is necessary to address stability issues that may negatively impact upon the site and influence the risk to property.

6.3 Risk to Property

The following table summarizes the risk to property of the landslide events in relation to the pre-demolition dwelling and the current development as described in Section 2.9.

Table 4. Landslide risk profiles

Scenario		Likelihood	Consequence	Risk Profile
Deep-seated landslide	previous dwelling	Likely	Medium: moderate damage to a number of properties	Very High
	new dwelling and retaining walls	Likely	Medium: moderate damage to a number of properties	Very High
Movement of existing active landslide	previous dwelling	Almost Certain during/after high rainfall events	Medium: moderate damage to a number of properties over a period of time	Very High
	new dwelling and retaining walls	Almost Certain during/after high rainfall events	Medium: moderate damage to a number of properties over a period of time	Very High
Medium scale slide in road embankment	previous dwelling	Possible	Major: extensive damage to house and road	High
	new dwelling and retaining walls	Unlikely	Minor: while concrete walls will limit damage to the house, the road will require reconstruction	Low
Medium scale rotational landslide from road under house	previous dwelling	Possible	Major: extensive damage to house and road	High
	new dwelling and retaining walls	Possible for failure of road under bored piers.	Major: extensive damage to house and road	High

The above assessment shows that the risk profile for the property with the previous dwelling was Very High to High. The risk profile for the property with the new dwelling and retaining walls is Very High to Low.

The Waratah-Wynyard Planning Scheme stipulates (Clause E6.6.2) that:

"If the site is within an area of risk shown on a natural hazard map...

- (a) a hazard risk assessment must determine –*
 - (i) there is an insufficient increase in risk to warrant any specific hazard reduction or protection measure; or*
 - (ii) a tolerable level of risk can be achieved for the type, form, scale and duration of the development..."*

The risk assessment shows that there is no increase in risk profile for the individual landslides at the property given the new retaining wall and dwelling. At the same time, we note that owners of existing houses at Boat Harbour are generally aware of landslide issues. Therefore, no specific hazard reduction or protection measures are required. Thus, the requirements of Clause E6.6.2 are satisfied.

6.4 Risk to Life

The calculation of risk to life requires a quantitative assessment. Here, we have used an event tree approach to assess the risk to life for the person most at risk, a resident at the house.

Two event trees showing a possible sequence of events is presented in Appendix H for i) a medium scale landslide causing collapse of the road-side retaining wall, and ii) the deep-seated landslide causing distortion and collapse/failure of the house. The risk assessment shows that the Risk to

Life for such those landslides and assuming management measures are incorporated in the design and construction of the house, is 9.7×10^{-5} /annum.

AGS (2007c) suggests the tolerable loss of life for individual most at risk should be 10^{-5} /annum for new constructed slopes or new development, and 10^{-4} /annum for existing slopes. Thus, the calculated risk to life is marginally lower than the tolerable loss of life for an existing slope.

7 CONCLUSIONS

The landslide risk assessment presented here has shown that there are three landslides that could impact the site:

- The large scale active landslide
- A medium scale landslide in the road embankment
- A medium scale landslide of the road and under the bored piers

The risk profile for the property with the new dwelling and retaining walls is Very High to Low.

The risk assessment has shown that there is no increase in risk profile for the individual landslides at the property given the new retaining wall and dwelling. Therefore the requirements of Clause E6.6.2 are satisfied.

The risk to life for individual most at risk is shown to be 9.7×10^{-5} /annum, where AGS (2007c) suggests the tolerable loss of life for individual risk should be 10^{-5} /annum for a new development or 10^{-4} /annum for an existing slope.

8 REFERENCES

- Coffey Geosciences (2001) *Landslide Risk Assessment for Boat Harbour Beach*, (report HO9/1 – AJ) prepared for Department of Primary Industries, Water and Environment and Waratah-Wynyard Council.
- Jennings (1965) Preliminary report on landslips on the Boat Harbour Road, *Tech Rep. Dept. Mines Tas.*, 9:107-108 (2 pages)
- Matthews W.L. (1972) Examination of property at Boat Harbour Beach, *Unpubl Rep.* 1972-06 (1 page)
- Matthews W.L. (1974) Land stability at Boat Harbour Beach. *Tech Rep. Dept. Mines Tas.*, 17:116-119 (5 pages)
- Tasman Geotechnics (2016), *Landslide Investigation, Hepples Road, Boat Harbour Beach*, report TG16160/1 – 01report (draft), dated 10 March 2017.



Important information about your report

These notes are provided to help you understand the limitations of your report.

Project Scope

Your report has been developed on the basis of your unique project specific requirements as understood by Tasman Geotechnics at the time, and applies only to the site investigated. Tasman Geotechnics should be consulted if there are subsequent changes to the proposed project, to assess how the changes impact on the report's recommendations.

Subsurface Conditions

Subsurface conditions are created by natural processes and the activity of man.

A site assessment identifies subsurface conditions at discrete locations. Actual conditions at other locations may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time.

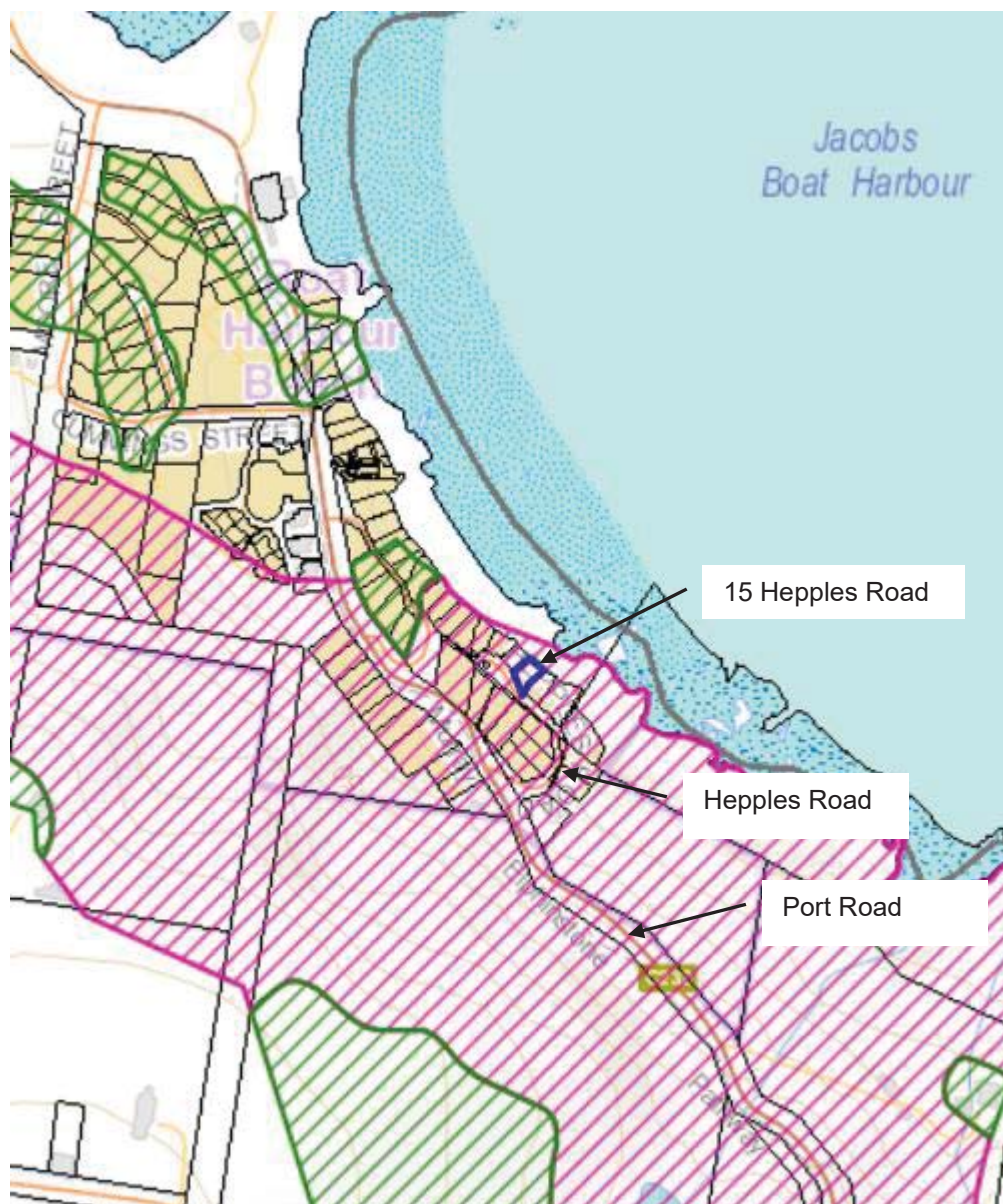
Nothing can be done to change the conditions that exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, the services of Tasman Geotechnics should be retained throughout the project, to identify variable conditions, conduct additional investigation or tests if required and recommend solutions to problems encountered on site.

Advice and Recommendations

Your report contains advice or recommendations which are based on observations, measurements, calculations and professional interpretation, all of which have a level of uncertainty attached.

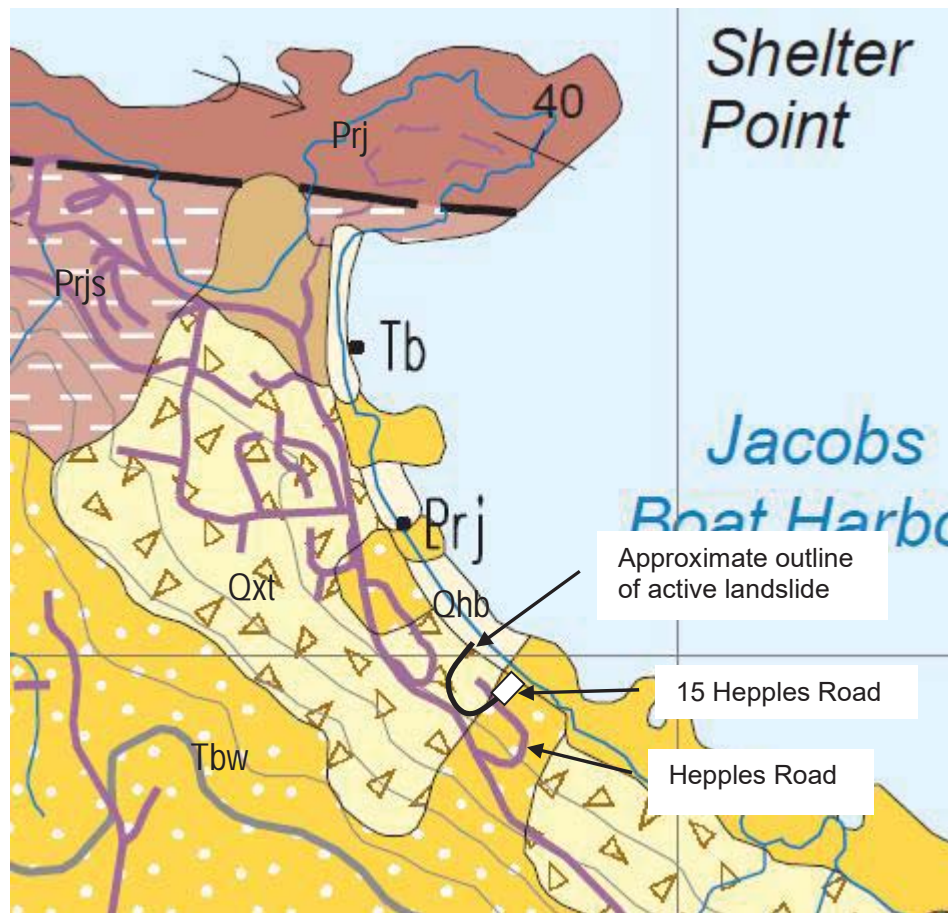
The recommendations are based on the assumption that subsurface conditions encountered at the discrete locations are indicative of an area. This can not be substantiated until implementation of the project has commenced. Tasman Geotechnics is familiar with the background information and should be consulted to assess whether or not the report's recommendations are valid, or whether changes should be considered.

The report as a whole presents the findings of the site assessment, and the report should not be copied in part or altered in any way.




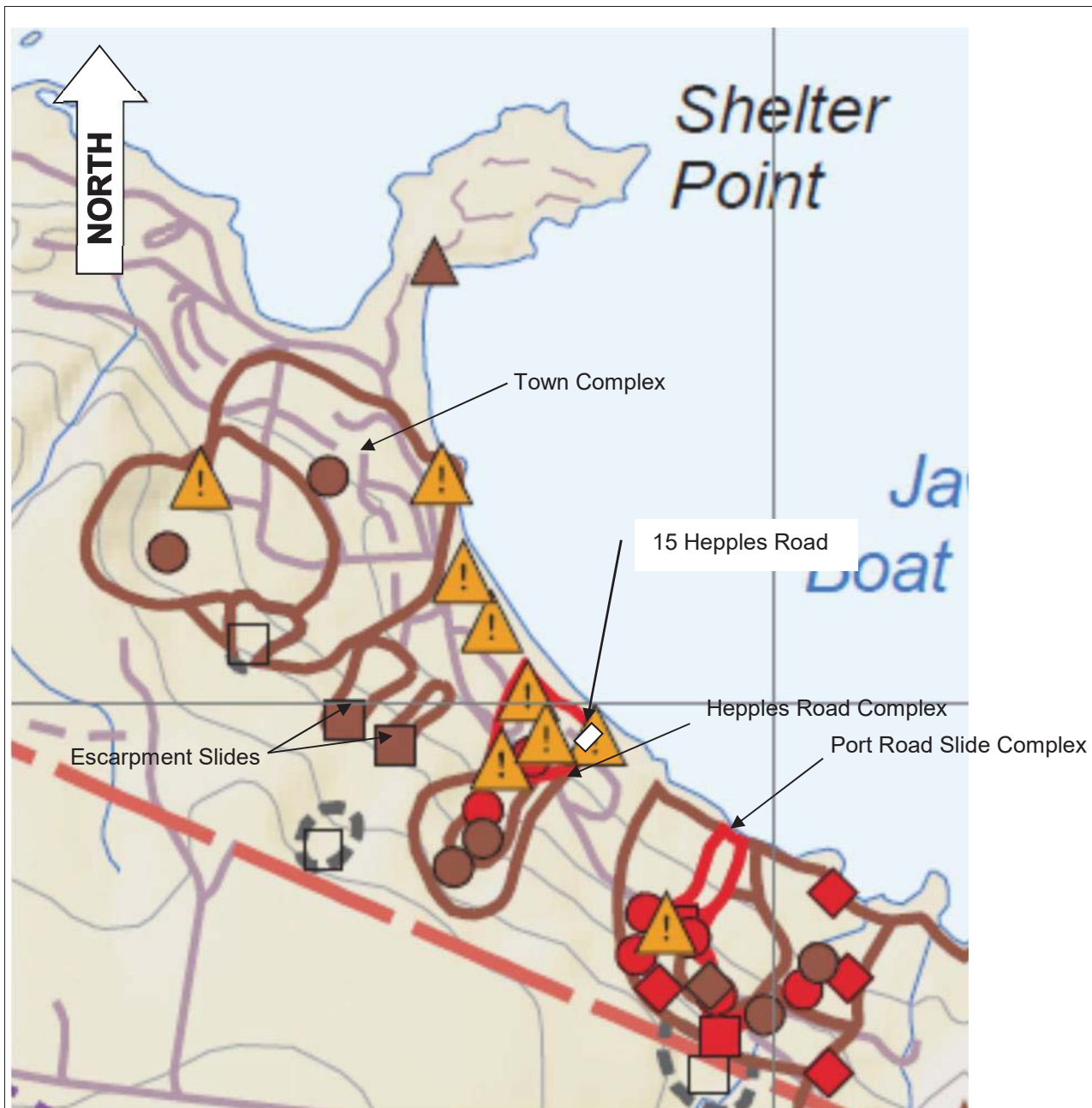
-  Zone A
-  Zone B

drawn	WG	 TASMAN geotechnics	client:	6ty°	
approved	WG		project:	Landslip Risk Assessment 15 Hepples Road, Boat Harbour	
date	6/2/2019		title:	Landslip A and B Zones at Boat Harbour	
scale	NTS		project no:	TG17185/1 – 02report	figure no: FIGURE 1
original size	A4				

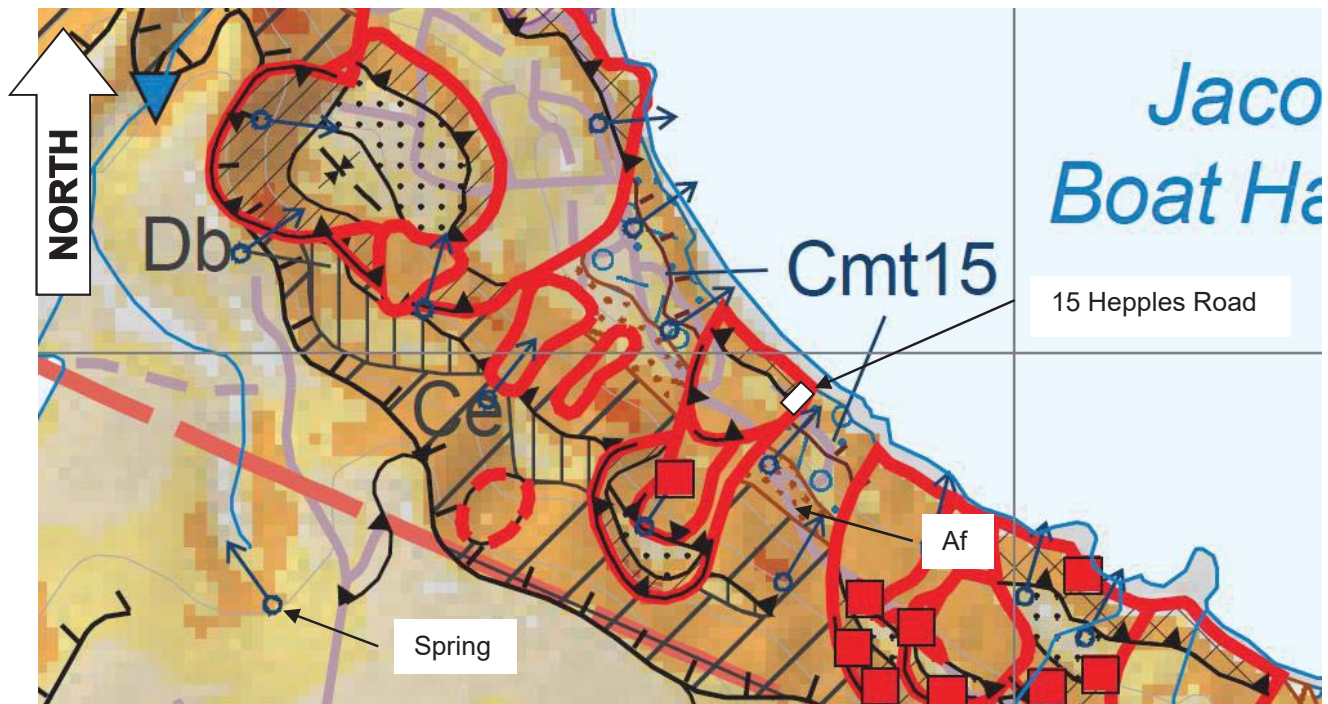


Qhb	Beach sand (Qhb).
Qxt	Landslide deposits predominantly derived from weathered Tertiary rocks (Qxt).
Tbw	Predominantly deeply-weathered basalt (Tbw).
Prjs	Interbedded shaly black siltstone and thinly bedded quartzite (Prjs).
Prj	Well-bedded, cross-bedded, mostly medium to coarse-grained orthoquartzite (Prj). (Jacob Quartzite).

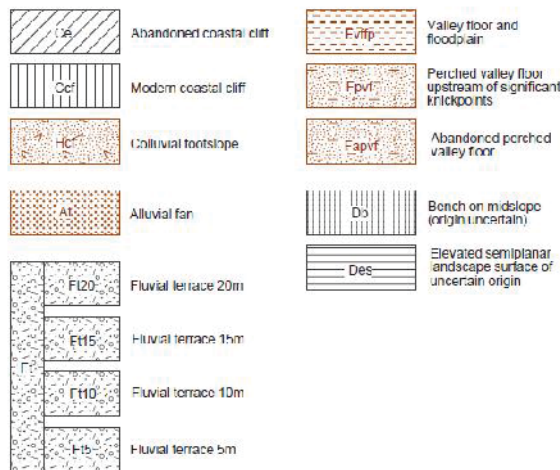
drawn	WG	 TASMAN geotechnics	client:	6ty°
approved	WG		project:	Landslide Risk Assessment 15 Hepples Road, Boat Harbour
date	4/12/2017		title:	MRT Geological Map Extract
scale	NTS		project no:	TG17185/1 – 02report
original size	A4		figure no:	FIGURE 2



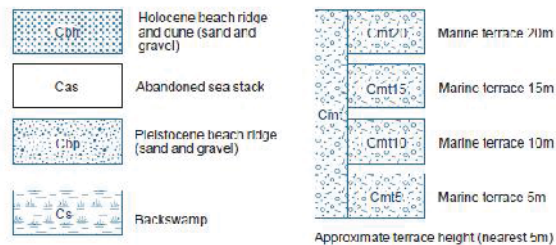
drawn	WG	 TASMAN geotechnics	client:	6ty°
approved	WG		project:	Landslide Risk Assessment 15 Hepples Road, Boat Harbour
date	4/12/2017		title:	MRT Landslide Inventory Map Extract
scale	NTS		project no:	TG17185/1 – 02report
original size	A4		figure no:	FIGURE 3



Hill Country Units

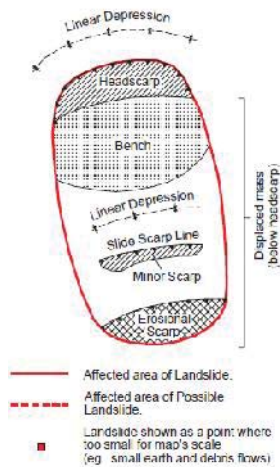


Coastal Units



Note:
 - Mapped marine and fluvial terrace units may include both accretional and erosional surfaces.
 - Units labelled with a question mark (?) indicate uncertainty.

Landslide Components

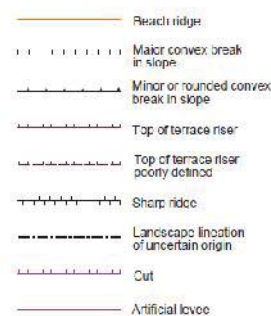


Slope Categories



Note: The techniques used to create the slope layer tend to underestimate values along cliffs

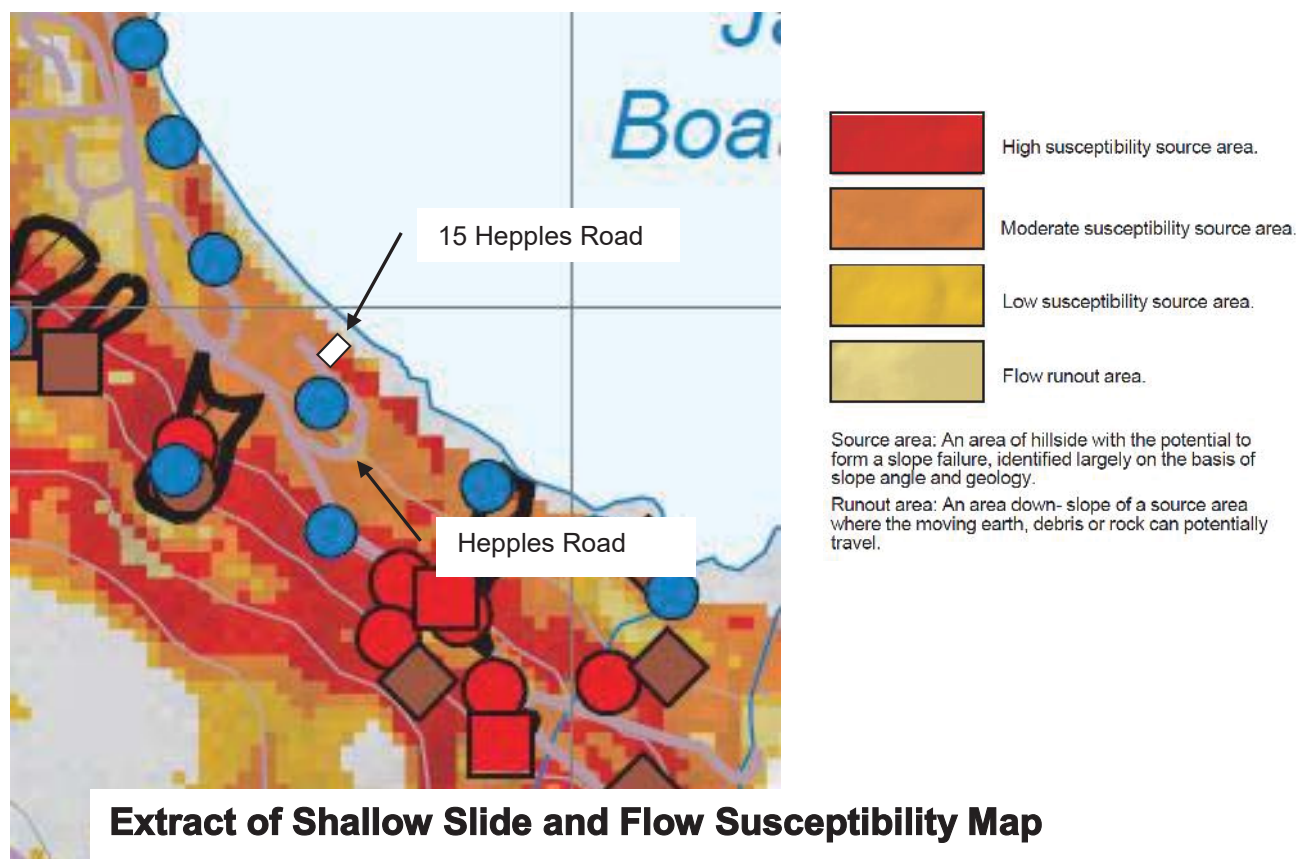
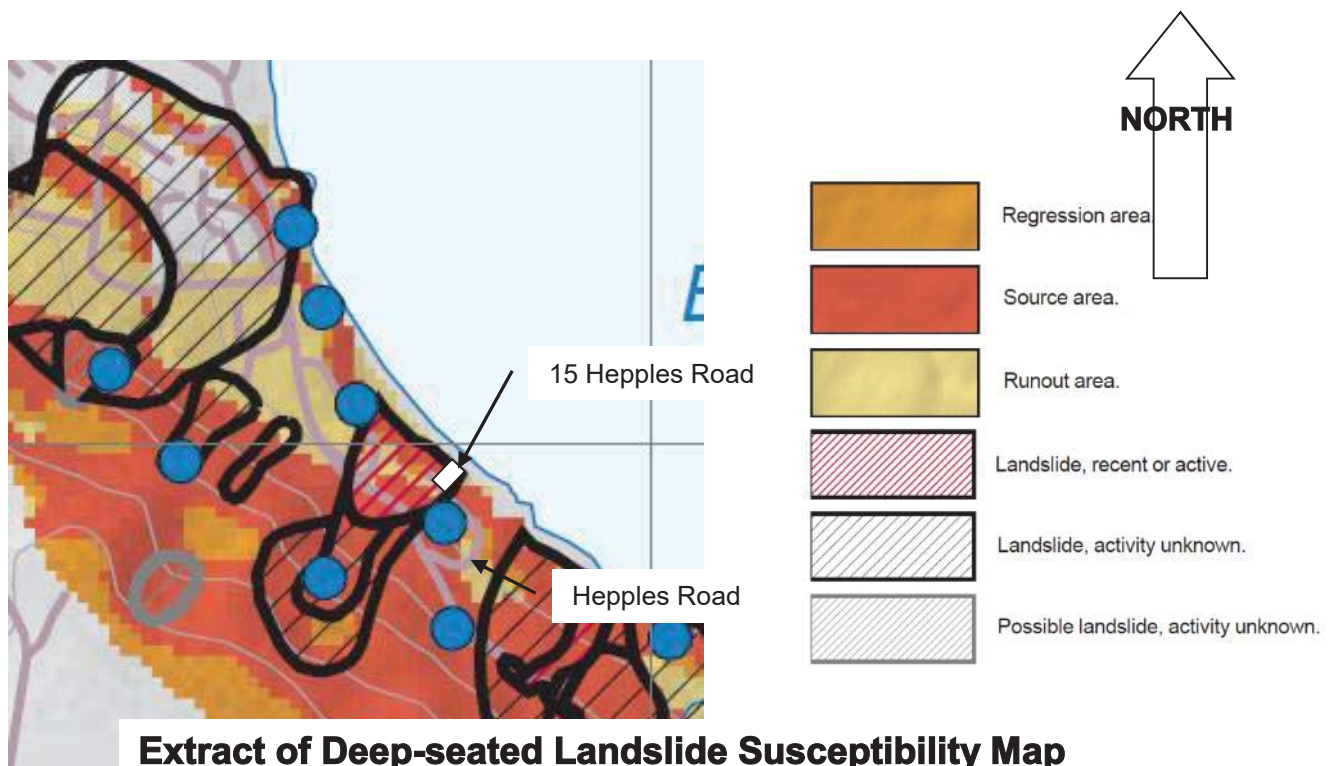
Linear Geomorphic Features



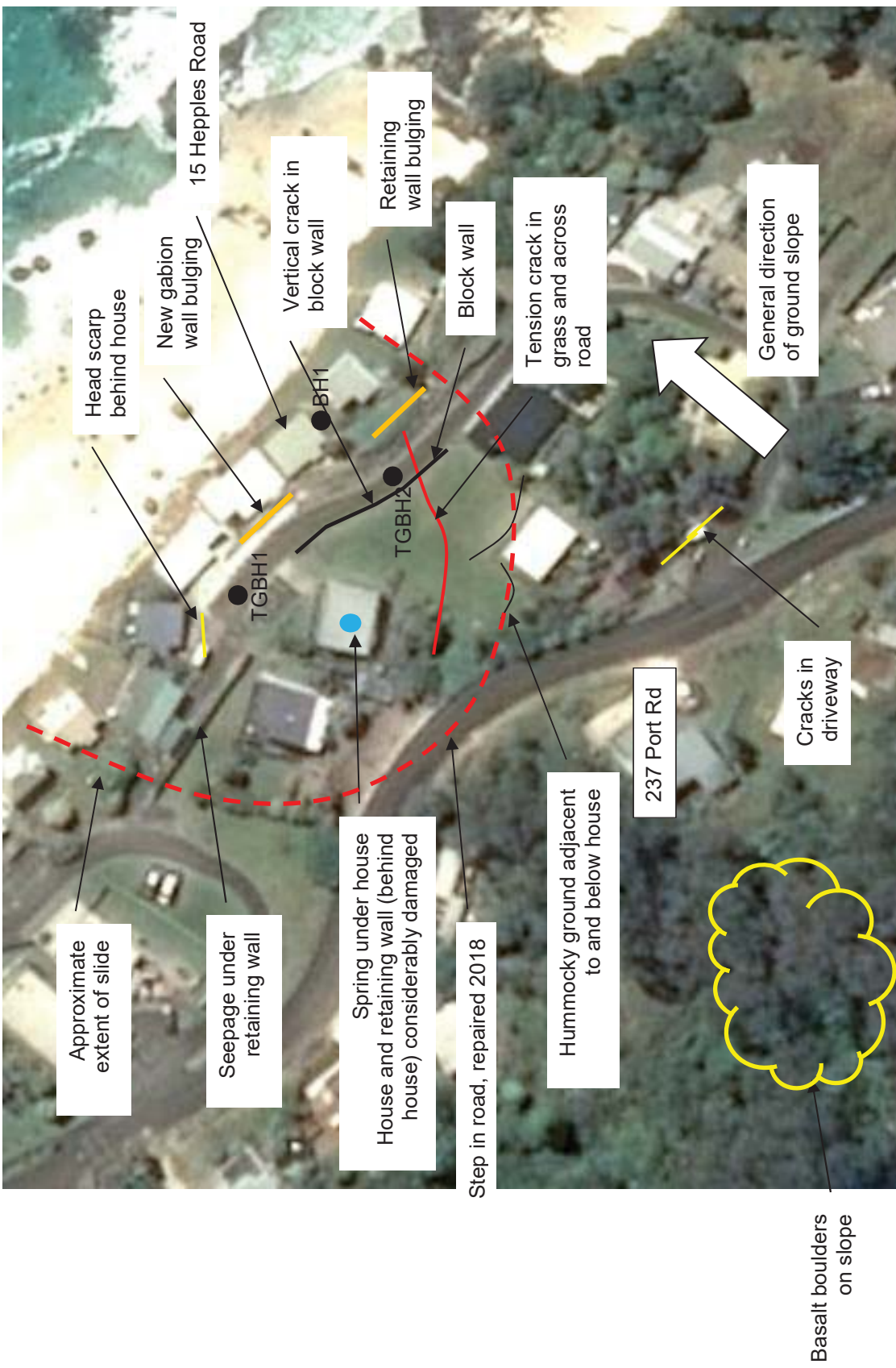
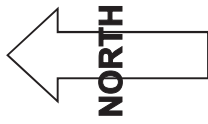
drawn	WG
approved	WG
date	21/1/2019
scale	NTS
original size	A4




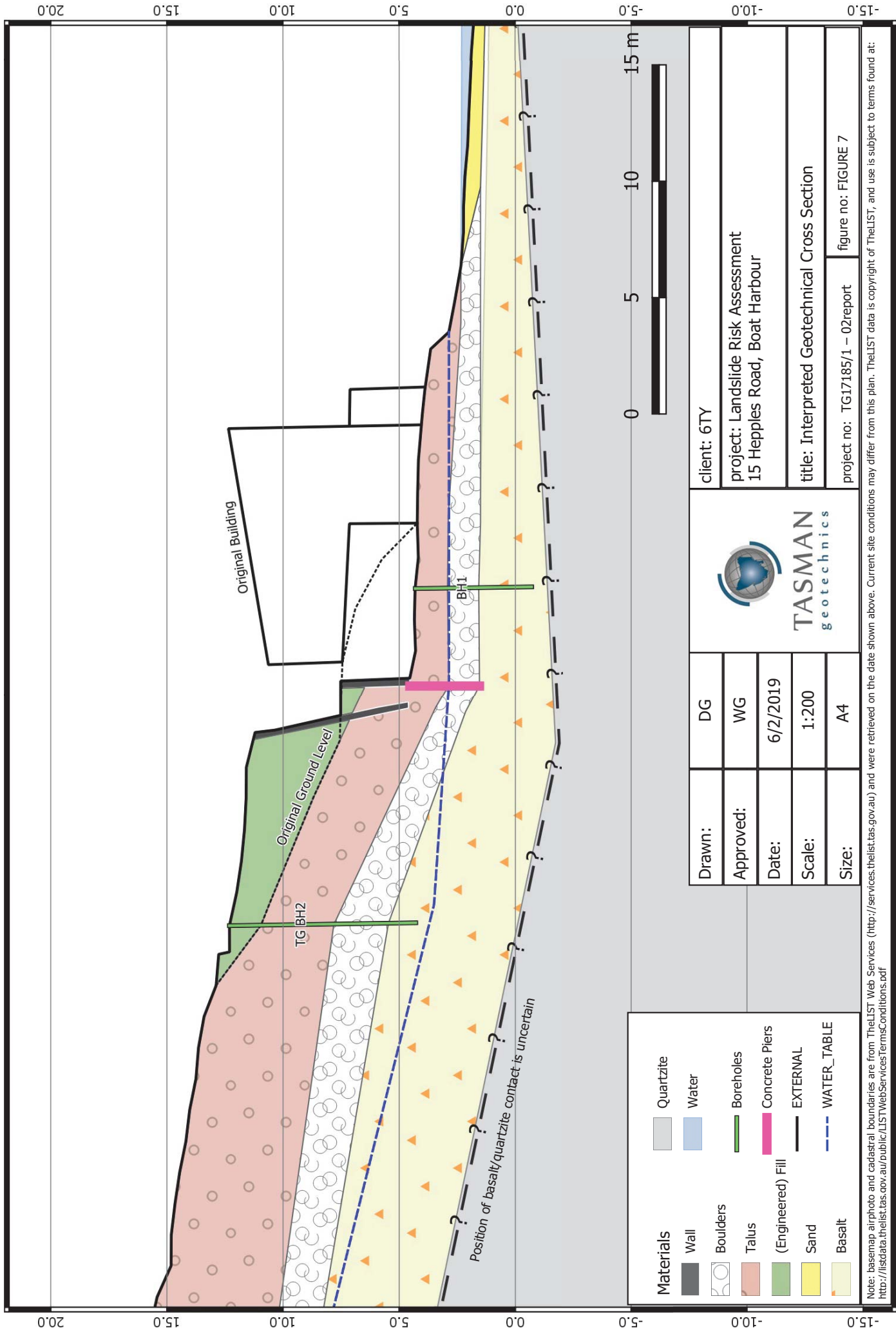
client:	6ty°	
project:	Landslide Risk Assessment 15 Hepples Road, Boat Harbour	
title:	MRT Geomorphology Map Extract	
project no:	TG17185/1 – 02report	figure no: FIGURE 4

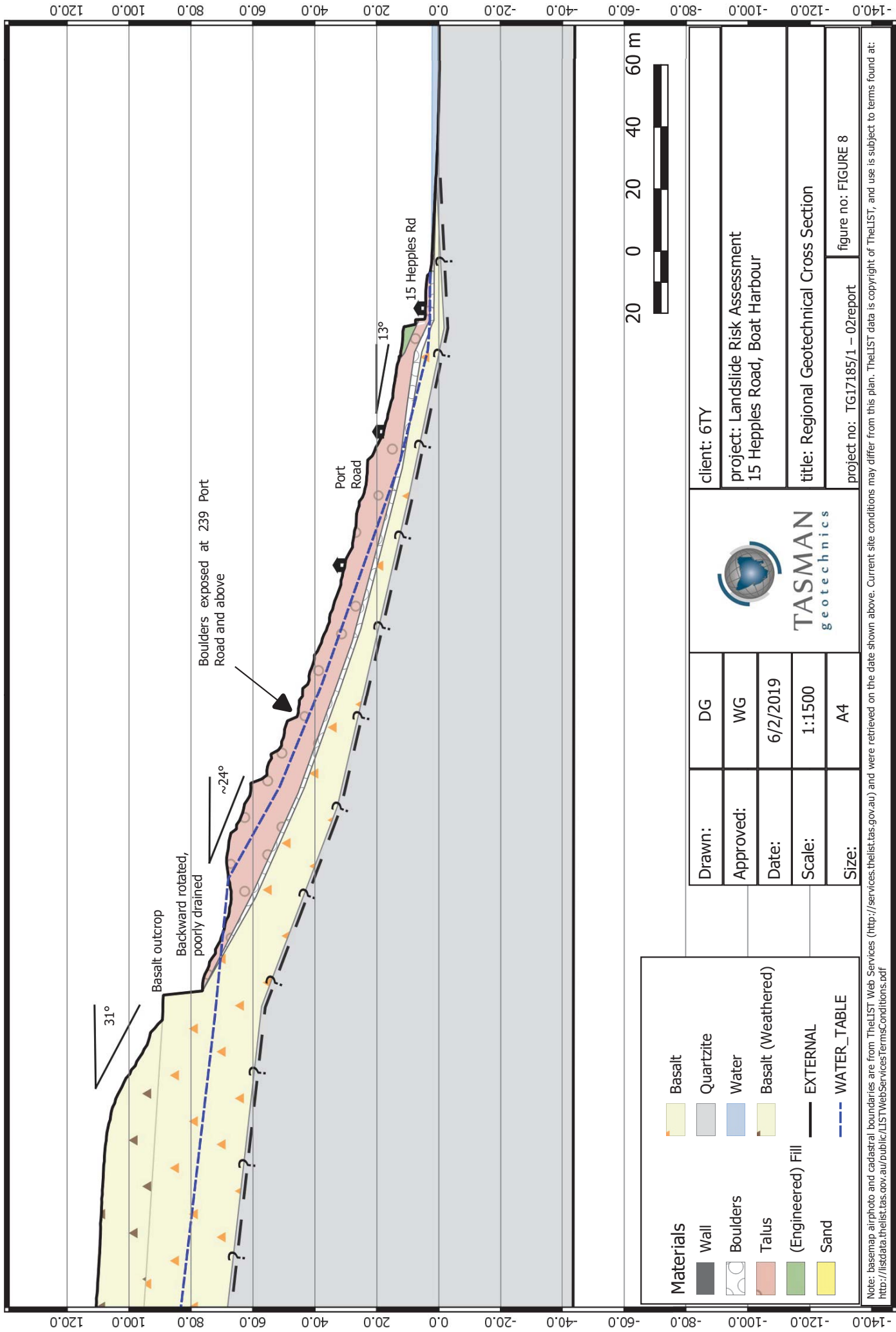


drawn	WG		client:	6ty°	
approved	WG		project:	Landslide Risk Assessment 15 Hepples Road, Boat Harbour	
date	21/1/2019		title:	MRT Landslide Susceptibility Map Extracts	
scale	NTS		project no:	TG17185/1 – 02report	figure no: FIGURE 5
original size	A4				



<div><div>TASMAN geotechnics</div></div>	drawn	WG	client:	6ty°	
	approved	WG	project:	Landslide Risk assessment 15 Hepples Road, Boat Harbour	
	date	4/10/2017	title:	Site Layout and Site Observations	
	scale	NTS	project no:	TG17185/1 – 02report	figure no: FIGURE 6
	original size	A4			





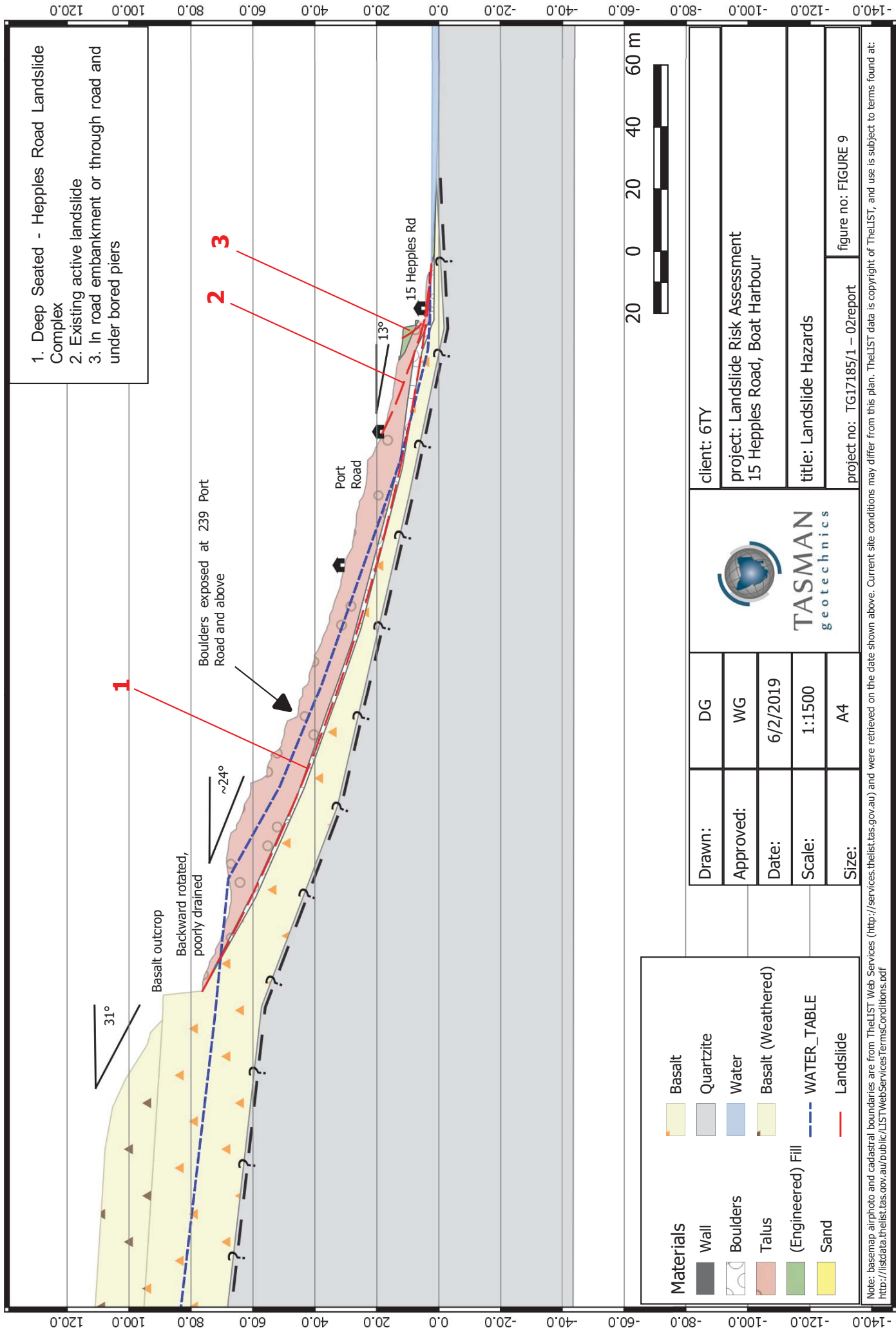
client: 6TY		project: Landslide Risk Assessment 15 Hepples Road, Boat Harbour	
title: Regional Geotechnical Cross Section		project no: TG17185/1 – 02report	
figure no: FIGURE 8			



Drawn:	DG
Approved:	WG
Date:	6/2/2019
Scale:	1:1500
Size:	A4

Materials	Basalt
Wall	Quartzite
Boulders	Water
Talus	Basalt (Weathered)
(Engineered) Fill	EXTERNAL
Sand	WATER_TABLE

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>



- 1. Deep Seated - Hepples Road Landslide Complex
- 2. Existing active landslide
- 3. In road embankment or through road and under bored piers



client: 6TY

project: Landslide Risk Assessment
15 Hepples Road, Boat Harbour

title: Landslide Hazards

project no: TG17185/1 – 02:report

figure no: FIGURE 9

Drawn: DG

Approved: WG

Date: 6/2/2019

Scale: 1:1500

Size: A4

- Materials**
- Basalt
 - Quartzite
 - Water
 - Basalt (Weathered)
 - (Engineered) Fill
 - Sand
- Wall**
- Boulders**
- Talus**
- WATER_TABLE**
- Landslide**

Note: basemap airphoto and cadastral boundaries are from TheLIST Web Services (<http://services.thelist.tas.gov.au>) and were retrieved on the date shown above. Current site conditions may differ from this plan. TheLIST data is copyright of TheLIST, and use is subject to terms found at: <http://listdata.thelist.tas.gov.au/public/LISTWebServicesTermsConditions.pdf>

Appendix A

Development Drawings



BOAT HARBOUR



BOUNDARY IS ALONG
HIGH WATER MARK

PIPELINE EASEMENT 1.00 M WIDE

31
256m²
(FR.143923/31)

HEPPLES ROAD

RIGHT OF WAY
(PRIVATE) L

NOTES:

DATUM
Horizontal : P143923

Vertical : AHD per SPM 9472 with reputed AHD level of 4.155

Contour interval : 0.10m

While all reasonable effort has been made to locate all visible above ground services, there may be other services which were not located during the field survey.

The title boundaries as shown on this plan were not marked at the time of the survey and have been determined by original survey dimensions only and not by field survey and as a result are considered approximate only.

Prior to any demolition, excavation, final design or construction on this site, a site inspection should be conducted by the relevant engineers.



CLARENCE AND ROBYN KELLY
DETAIL SURVEY

15 HEPPLES ROAD
BOAT HARBOUR BEACH
TAS 7321

Surveyors | Planners | Project Managers
A | 2-37 Tasma Street
| North Hobart Tasmania 7000
T | 03 6232 0400 F | 03 6231 2844
E | info@lesterrfranks.com.au
W | www.lesterrfranks.com.au

NO	DATE	DRN	CHKD	AJ	DETAIL SURVEY	DESCRIPTION
1	28-07-17	JL	AJ			
This plan is not intended for attachment to sale contract documents						

OUR REF: 051 D15128 30 0001.1			
CONTOUR INTERVAL: 0.10m			
DATUM: P.143923 / AHD			
SCALE: 1:200		ORIGINAL SHEET SIZE: A3	
DATE OF SURVEY: 27/07/17		SURVEYOR: AJ/GG	
DRW NO. D15128 D01-1		REV 1	SHEET No: 1 of 1

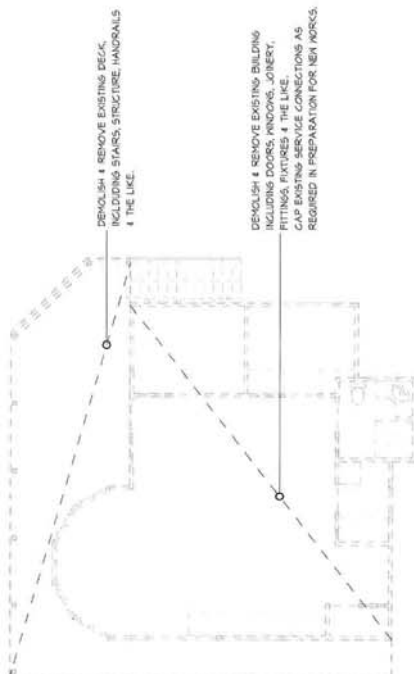
Postal Address
PO Box 63
Riverside
W 6ty.com.au
E admin@6ty.com.au

6ty Pty Ltd
ABN 27 014 659 900
Architectural
ASP No. CC48741
Structural / Civil
ASP No. CC16339

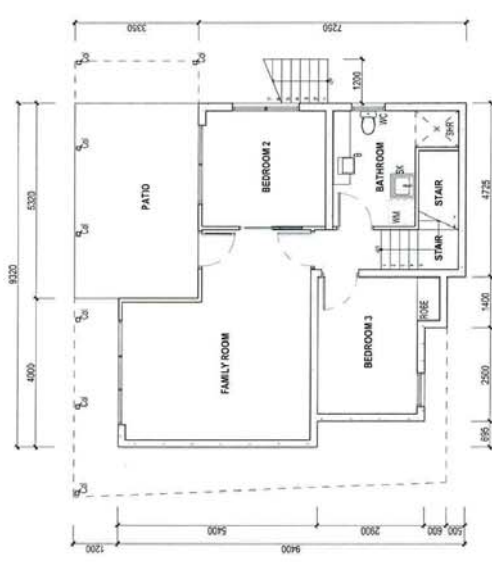


Tenair Suite 103
The Charles
287 Charles Street
Launceston Tasmania
P (03) 6331 3300

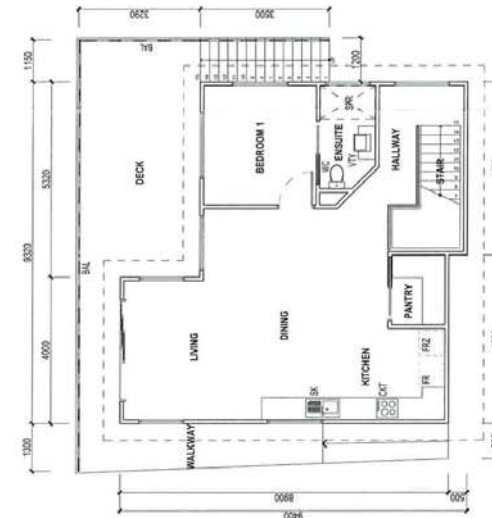
57 Best Street
Devonport Tasmania
P (03) 6424 7161



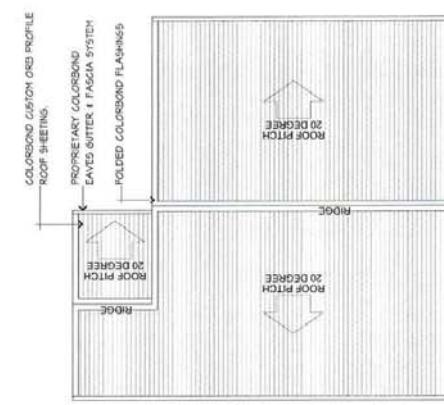
PROPOSED GROUND FLOOR DEMOLITION PLAN SCALE 1:100



PROPOSED FIRST FLOOR PLAN SCALE 1:100



PROPOSED FIRST FLOOR PLAN SCALE 1:100



PROPOSED ROOF PLAN SCALE 1:100

PLANNING DOCUMENT

ISSUE	DATE	ISSUED FOR	REV
01	17-09-18	DEVELOPMENT APPROVAL	-

DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE. CHECK AND VERIFY ALL DIMENSIONS AND AREAS. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE BUILDING CODE OF AUSTRALIA, APPLICABLE AUSTRALIAN STANDARDS & LOCAL AUTHORITY REQUIREMENTS.

PROPOSED RESIDENCE RE-BUILD

AT 15 HEPPLES ROAD
BOAT HARBOUR 7321
CHAS & ROBIN KELLY

DEMOLITION, FLOOR & ROOF PLANS

DESIGNED	DVG	DRAWN	ADB	CHECKED	DVG
SCALE	1:100	A74 SIZE DRAWING SHEET			

PROJECT No. 17.077 DRAWING No. Ap02 -

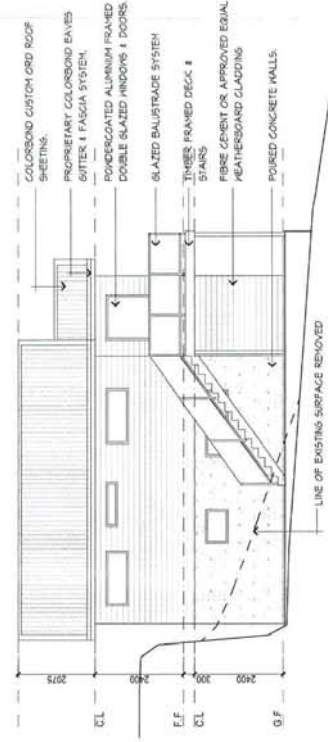
Postal Address
Gtyo Pty Ltd
PO Box 103
Rosedale
Tasmania 7250
W Gtyo.com.au
E admin@Gtyo.com.au

95 Gtyo Ltd
ABN 27 014 609 990
Architectural
ABP No. CC4874/
Architectural
ABP No. CC1633

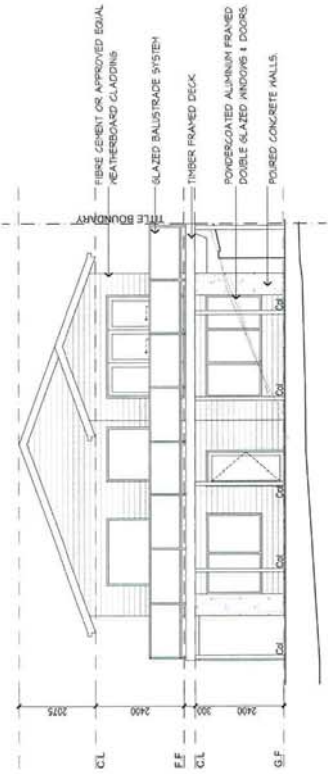


Tamar Suite 103
The Charles
187 Charles Street
Launceston Tasmania
P (03) 8332 3300

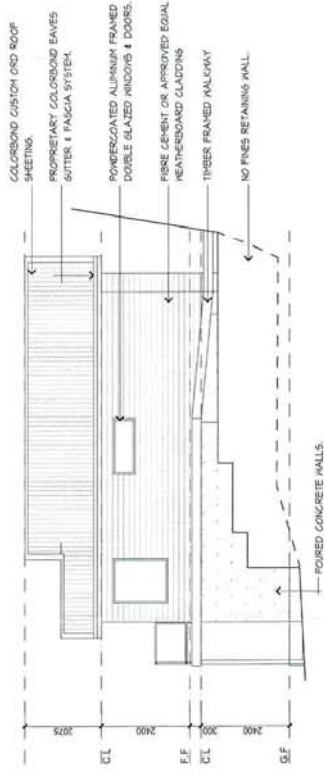
57 Boat Street
Devonport Tasmania
P (03) 8424 7161



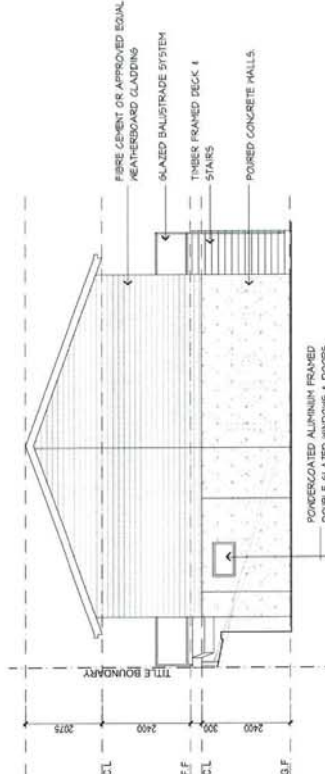
PROPOSED EAST ELEVATION
SCALE 1:100



PROPOSED NORTH ELEVATION
SCALE 1:100



PROPOSED WEST ELEVATION
SCALE 1:100



PROPOSED SOUTH ELEVATION
SCALE 1:100

PLANNING DOCUMENT

ISSUE	DATE	ISSUED FOR	REV
01	17-09-18	DEVELOPMENT APPROVAL	

DIMENSIONS ARE IN MILLIMETRES. DO NOT SCALE. CHECK AND VERIFY ALL DIMENSIONS ON SITE. REFER DISCREPANCIES TO THE SUPERINTENDENT. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH: BUILDING CODE OF AUSTRALIA, APPLICABLE AUSTRALIAN STANDARDS & LOCAL AUTHORITY REQUIREMENTS.

PROPOSED RESIDENCE RE-

BUILD

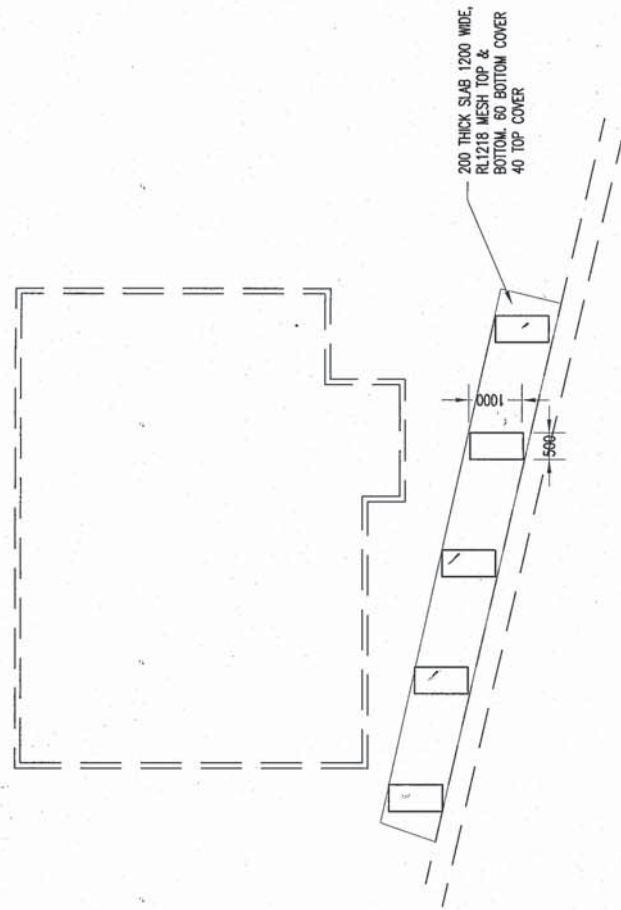
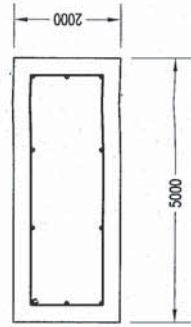
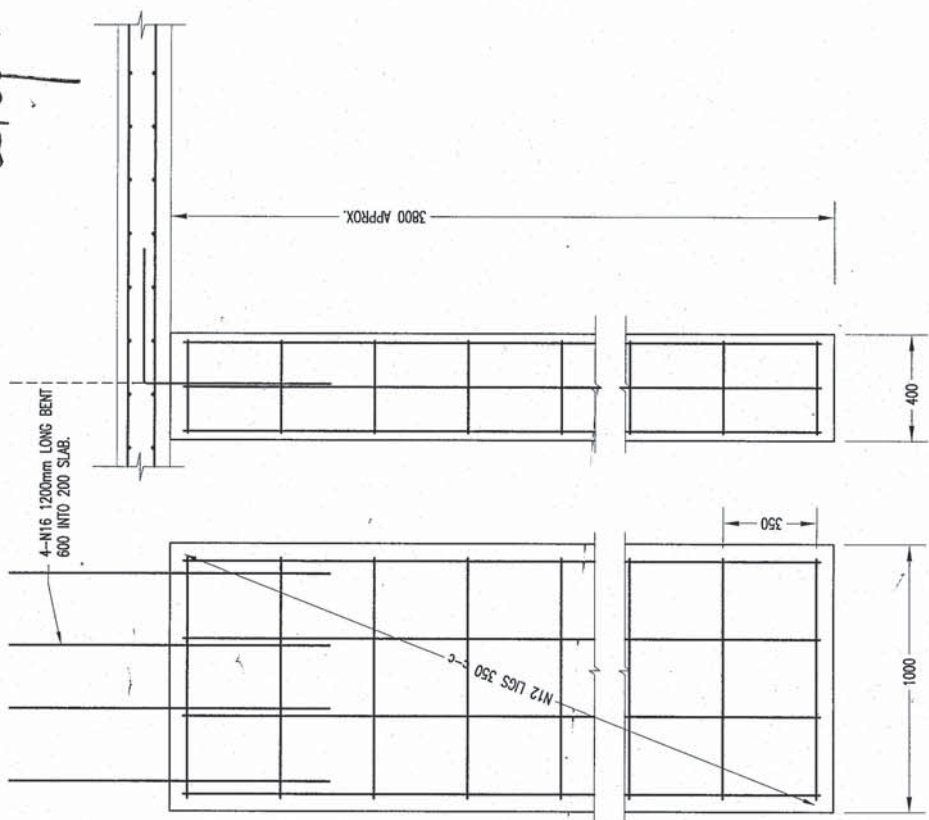
AT 15 HEPPLES ROAD
BOAT HARBOUR 7321
FOR CHAS & ROBIN KELLY

ELEVATIONS

DESIGNED DVG DRAWN ADB CHECKED DVG
SCALE 1:100
AT A4 SIZE DRAWING SHEET

PROJECT No. 17.077 DRAWING No. Ap03 -

40. Lig
600
2400



PLAN

GENERAL CONCRETE NOTES

CONCRETE WORK TO BE IN ACCORDANCE WITH AS 2870, & 3600 CONCRETE STRUCTURES. CONCRETE SUPPLY TO BE IN ACCORDANCE WITH AS 2870, & 1379 READY MIXED CONCRETE.

CONCRETE STRENGTH 15MPa

BUNDLING STRUCTURAL CONCRETE 32MPa 20MM AGGREGATE

REINFORCING STEEL GRADE 230 ROUND BARS OR GRADE 410 DEFORMED BARS IN ACCORDANCE WITH AS1302 OR AS1303. WELDED WITH FABRIC GRADE 500 TO AS1304.

PER REINFORCING: N12 BOTH DIRECTIONS U.N.O.

REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION.

REINFORCING COVER - 65 mm EXPOSED EDGE

MINIMUM LAP LENGTH FOR TRENCH MESH-500mm

LAPS FOR FABRIC SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

MINIMUM BEARING PRESSURE 100 kPa

EXCAVATION TO BE INSPECTED TO CONFIRM COMPLIANCE OF FOUNDING MATERIAL IMMEDIATELY AFTER FOOTINGS ARE EXCAVATED A MINIMUM OF 50mm OF BUNDLING CONCRETE SHALL BE PLACED TO THE REQUIRED LEVELS.

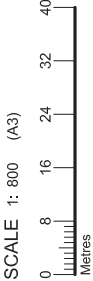
PIER PLAN SECTION PIER LONG SECTION PIER CROSS SECTION DRAFT

REFERENCE DRAWING NUMBERS				****			
				CHECKED : .	ACCREDITATION No. : .	Mr C KELLY	
				PH.No. : .	MOBILE : .	15 HEPPLES Rd.	
				Email: 1111	DATE: 11.11.15	BOAT HARBOUR	
				SHEET SIZE: A3	ENGINEER: N. A.	PIERS-AS DESCRIBED BY CLIENT	
					SCALE 1:100	DWG.No. 156778-1 Rev. 0	

NOT ALL ITEMS ARE DRAWN TO SCALE.
DRAWINGS ARE NOT TO BE SCALED ASK IF IN DOUBT

Appendix B

Landslip Survey Data



ID	Mark Type	2004		2009		Δ to 2004		2016		Δ to 2009	
		Easting	Northing	Easting	Northing	Displacement		Easting	Northing	Displacement	
A	Nail in lawn	383826.867	5467876.266	383826.859	5467876.263	0.008	0.001	383826.859	5467876.263	0.001	0.001
B	Nail at back of kerb	383842.562	5467913.578	383842.561	5467913.576	0.001	0.002	383842.562	5467913.577	0.003	0.003
C	Nail in kerb	383820.081	5467940.270	383820.083	5467940.271	0.002	0.057	383820.080	5467940.271	0.321	0.257
D	Nail in driveway	383788.243	5467964.815	383788.268	5467964.866	0.025	0.050	383788.431	5467965.142	0.002	0.002
E	Nail at back of kerb	383782.869	5467974.357	383782.896	5467974.399	0.027	0.001	383783.018	5467974.625	0.002	0.002
F	Nail in kerb	383732.681	5468013.691	383732.680	5468013.691	0.001	0.001	383732.682	5468013.690	0.002	0.002
G	Nail in manhole	383889.167	5467976.106	383889.183	5467976.097	0.016	0.009	383889.183	5467976.097	0.009	0.009
H	Nail in rock										

NOTES:

Date of Survey: 14 September 2016

Horizontal Coordinate Datum is planar based on GDA94, MGA zone 55

Coordinate origin SPM9472, with coordinates (2009) of
E: 383593.427
N: 5468418.012

If there are a questions relating to the datum of this survey PDA Surveyors should be contacted.

The data shown on this plan was recorded on 13/09/2016 and has been compared to registered surveys P143922 (2004) and SIO159620 (2009). PDA Surveyors accepts no responsibility for the measurements shown on P143922 and SIO159620. Arrows denote the approximate bearing of (D) & (E) displacement.

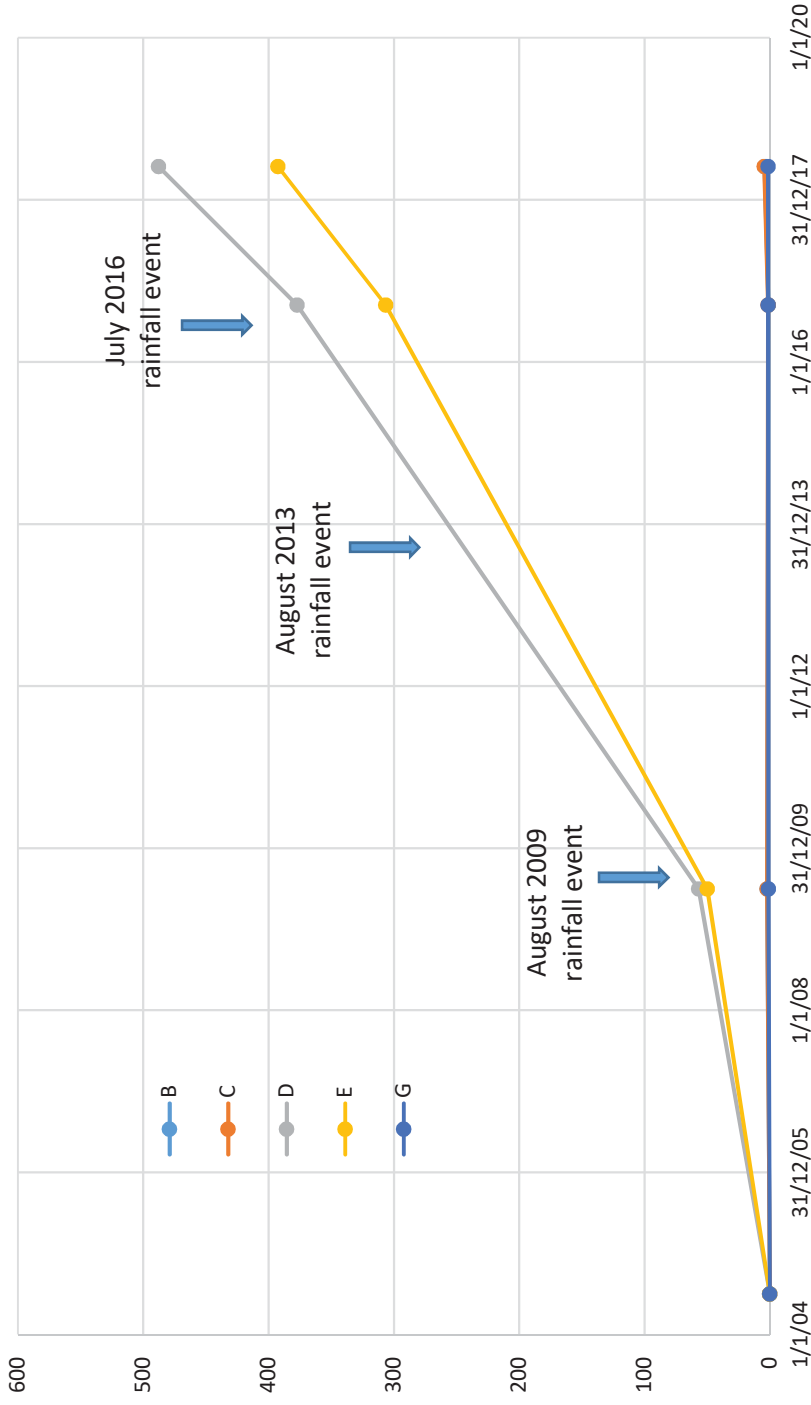
SIO159620 has been used as the common datum for comparison, with this survey and P143922 both fitted using a Helmert Transformation at (B), (C) & (F). Points (A) and (G) were not observed by SIO159620.

Background Imagery is from Google Earth.

COORDINATE COMPARISONS				PDA Surveyors		Surveying, Engineering & Planning		16 Queen Street Bentley, Alice Springs Launceston & Kington		SCALE 1: 800		PAPER (A3)	
HEPPLES ROAD				JM		JM		www.pda.com.au		JOB NUMBER		JOB NUMBER	
BOAT HARBOUR BEACH				AE		AE		6847 217 006 035		DRAWING		DRAWING	
FOR WARATAH WYNYARD COUNCIL				14 SEPTEMBER 2016		14 SEPTEMBER 2016		PHONE: + 61 08 8431 4400		B16617 - 1		B16617 - 1	
								EMAIL: pda.pda@pda.com.au					

Point	1/07/2004	1/07/2009	14/09/2016	31/05/2018
B	0	2.24	1.00	4.24
C	0	2.24	1.41	4.47
D	0	56.80	377.19	487.83
E	0	49.93	306.63	392.59
F	0	0.00	0.00	0.00
G	0	1.00	1.41	1.41

Total movement (mm), Hepples Road

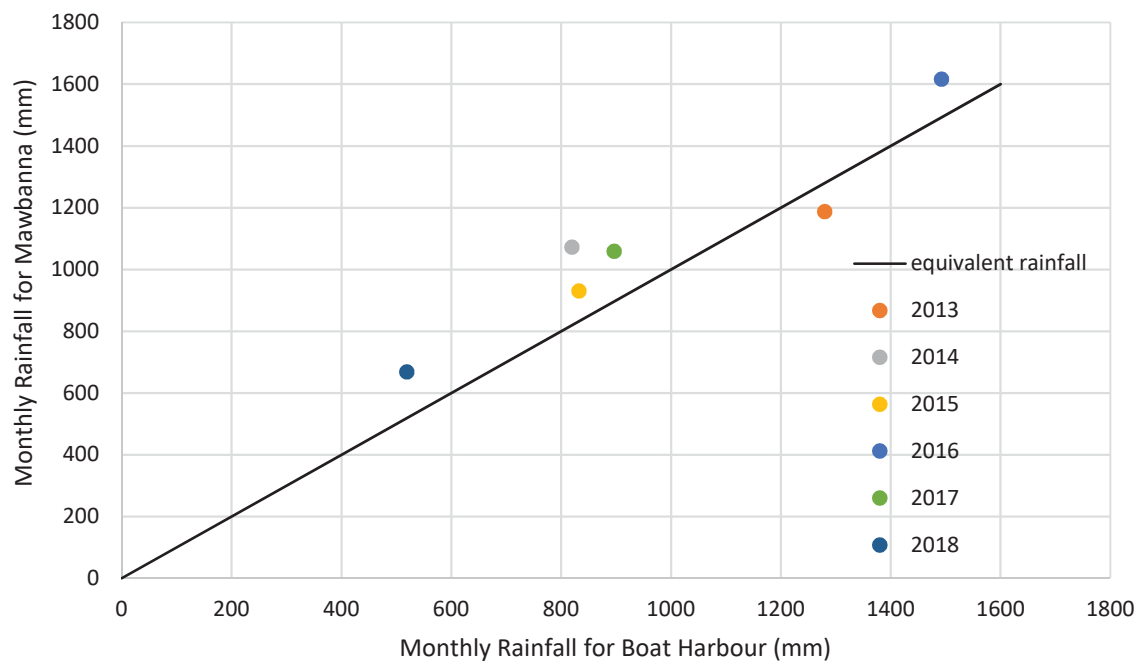
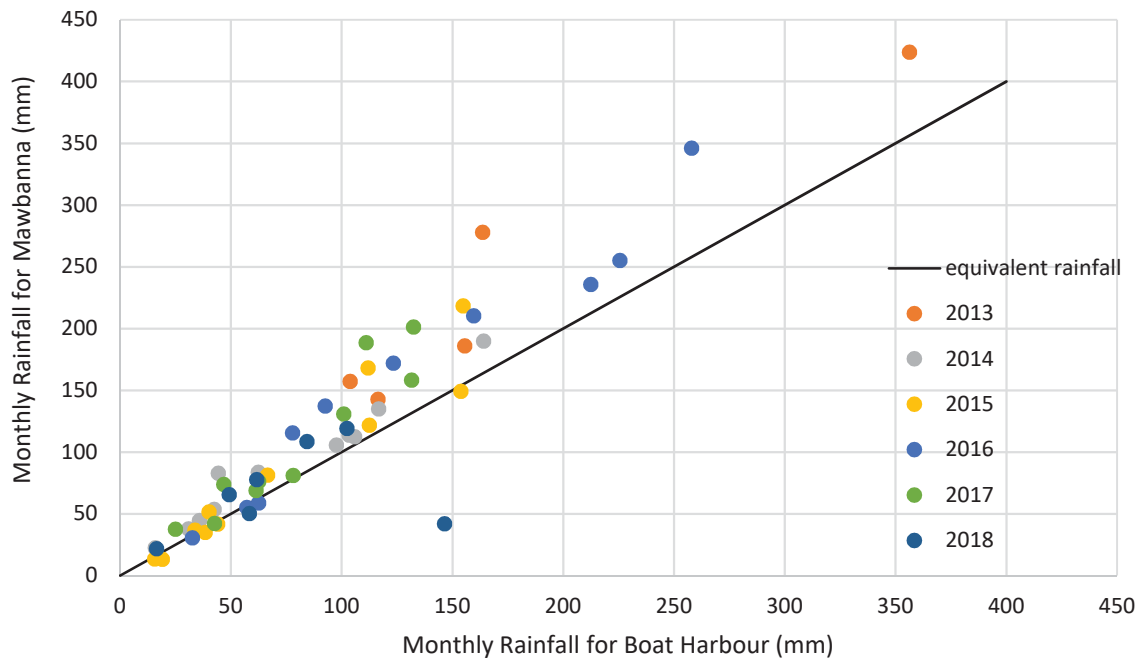


Drawn	WG
approved	WG
date	21/01/2019
scale	NTS
original size	A4

Client	6ty°
Project	Landslide Investigation 15 Hepples Road
Title	Survey Results of Landslide Movement
Project No:	TG17185/1 - 02report
Figure:	Figure B1

Appendix C

Rainfall Data



Drawn	WG		Client	6ty°	
Approved	WG		Project	Landslide Investigation	
Date	4/02/2019			15 Hepples Road	
Scale	NTS		Title	Rainfall Data Mawbanna and Boat Harbour	
Original size	A4		Project No:	TG17185/1 - 02report	Figure: Figure C1

Monthly Rainfall (millimetres)

BOAT HARBOUR

Station Number: 091364 · State: TAS · Opened: 2012 · Status: Open · Latitude: 40.93°S · Longitude: 145.60°E · Elevation: 184 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2012									177.3	31.8	37.7	100.4	
2013	29.8	23.0	59.8	52.0	107.0	38.8	163.7	356.3	155.6	103.8	116.4	73.8	1280.0
2014	35.8	15.9	42.4	103.4	116.7	105.9	164.1	44.3		97.7	30.9	62.4	
2015	41.7	38.4	112.5	19.0	154.8	66.6	153.8	112.0	44.0	15.6	33.8	40.2	832.4
2016	32.6	57.2	62.6	43.9	225.6	212.5	258.0	123.4	159.6	146.8	92.6	77.8	1492.6
2017	61.4	25.0	42.6	78.2	132.4	46.8	111.0	101.0	131.5	85.8	18.5	62.5	896.7
2018	16.5	61.7	84.4	58.4	49.2	102.4		146.5	59.2	37.0	86.9	105.9	

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown



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Monthly Rainfall (millimetres)

BOAT HARBOUR

Station Number: 091364 · State: TAS · Opened: 2012 · Status: Open · Latitude: 40.93°S · Longitude: 145.60°E · Elevation: 184 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Lowest	16.5	15.9	42.4	19.0	49.2	38.8	111.0	44.3	44.0	15.6	18.5	40.2	832.4
Highest	61.4	61.7	112.5	103.4	225.6	212.5	258.0	356.3	177.3	146.8	116.4	105.9	1492.6

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

<http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml>.

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Monthly Rainfall (millimetres)

MAWBANNA (HARBY HILLS)

Station Number: 091241 · State: TAS · Opened: 1981 · Status: Open · Latitude: 40.97°S · Longitude: 145.37°E · Elevation: 212 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1981											68.0	43.3	
1982	45.5	52.9	64.4	104.9	137.8		99.8	78.4	133.5				
1983	59.0	4.0	66.0	126.5	91.5	124.5	192.5	154.0	149.0	44.5	84.5	11.1	1107.1
1984	44.0	16.0	122.0	102.0	106.0	18.6	172.8	243.2	157.4	97.8	76.4	135.2	1291.4
1985	70.0	24.6	64.4	74.8	169.5	183.9	121.1	149.4	22.4	132.6	83.6	165.6	1261.9
1986	50.6	34.4	17.6	136.0	97.6	111.0	227.4	104.2	175.1	223.4	58.4	148.2	1383.9
1987	83.2	45.0	75.0	34.4	204.0	107.0	120.4	81.4	82.2	68.2	126.6	72.6	1100.0
1988	27.6	18.4	10.0	79.6	249.0	164.6	258.2	135.2	158.2	245.8	111.1	83.5	1541.2
1989	88.2	25.0	97.4	249.2	137.9	130.2	168.6	75.6	194.0	163.4	40.4	64.2	1434.1
1990	26.0	137.4	44.8	64.4	72.4	154.6	143.8	174.2	121.2	117.6	107.0	81.8	1245.2
1991	84.2	13.8	75.0	75.0	23.6	269.4	189.4	299.0	134.4			58.8	
1992	66.0	57.8	26.4	267.4	163.2	111.0	227.8	199.6	155.0	168.0	150.8	80.0	1673.0
1993	66.8	108.8	64.4	55.6	77.6	90.0	152.8	184.0	94.6	117.2	102.6	175.4	1289.8
1994	89.8	55.6	3.6	83.6	216.2	133.6	170.2	72.6	105.0	102.4	122.6	21.4	1176.6
1995	27.0	45.8	66.2	134.6	84.2	177.0	280.8	138.2	46.0	81.0	65.6	63.4	1209.8
1996	145.2	52.8	133.8	130.6	46.6	211.0	292.4	200.0	206.6	83.2	113.0	53.0	1668.2
1997	115.4	44.0	50.6	59.4	204.8	62.2	91.0	124.6	141.0	69.4	92.8	74.4	1129.6
1998	31.0	63.4	45.0	103.0	89.4	139.2	168.8	104.0		169.4	135.2	81.6	
1999	5.6	111.2	43.4	47.6	193.0	72.8	113.4		92.4	103.4	72.6		
2000	40.4	58.2		88.8	123.0	124.6	242.5	75.6	190.6	127.4	74.4	67.6	
2001	44.4	35.4	145.2	50.4	42.6	173.4	53.2	274.8	173.0	224.8	90.6	71.2	1379.0
2002	74.3	50.8		31.8	83.8	149.6	187.0	160.6	191.6	133.7	50.8	50.4	
2003	65.6	7.4	82.4	131.2	65.0	197.4	185.7	206.2	196.0	79.6	14.4	67.6	1298.5
2004	131.3	31.8	45.8	67.8	153.4	205.6	156.0	129.3	70.1	86.2	100.4	66.2	1243.9
2005	38.0	47.4	29.0	84.8	78.4	108.0	169.4	222.8	141.0	183.8	108.8	147.8	1359.2
2006	38.0	36.4	43.4	145.8	91.9	116.1	125.6	74.4	110.0	54.0	44.0	40.0	919.6
2007	81.5	9.0	51.8	27.2	298.0	54.8	113.0	197.6	164.2	108.0	11.6	113.3	1230.0
2008	9.0	36.8	57.8	73.6	99.0	135.2	171.0	124.6	128.7	28.8	101.2	106.7	1072.4
2009	47.6	11.2	122.6	151.4	131.8	105.4	220.0	331.4	169.0	49.0	78.4	57.6	1475.4
2010	15.0	53.2	123.0	126.0	129.0	152.0	140.6	197.6	180.0	133.6	124.5	149.8	1524.3
2011	199.4	83.6		63.6	53.0		172.4	210.0	89.8	90.2	140.2	46.8	
2012	79.6	78.4	138.8	77.4	114.6	139.2	103.4						
2013							277.9	423.6	186.0	157.2	142.8		
2014	44.6	22.4	53.5	113.6	135.0	112.4	189.8	82.8	91.4	105.6	37.8	83.6	1072.5
2015		35.0	121.6	13.2	218.4	81.2	149.2	168.0	41.8	13.4	36.8	51.5	
2016	30.6	55.2	58.8		255.0	235.6	345.9	172.0	210.4		137.2	115.6	
2017	68.8	37.6	42.2	81.0	201.2	73.8	188.6	130.8	158.2			76.2	
2018	21.8	77.6	108.4	50.1	65.4	119.0	183.4	42.0					

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown



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Monthly Rainfall (millimetres)

MAWBANNA (HARBY HILLS)

Station Number: 091241 · State: TAS · Opened: 1981 · Status: Open · Latitude: 40.97°S · Longitude: 145.37°E · Elevation: 212 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	61.6	46.6	69.5	94.5	130.6	133.6	177.5	164.0	137.1	114.9	88.0	82.6	1295.3
Lowest	5.6	4.0	3.6	13.2	23.6	18.6	53.2	42.0	22.4	13.4	11.6	11.1	919.6
5th percentile	13.2	8.6	14.6	30.4	45.6	59.6	98.0	73.9	44.5	36.7	27.8	32.6	1072.4
10th percentile	23.5	12.5	26.9	39.7	59.0	73.1	109.2	75.6	73.7	49.0	38.3	44.0	1080.8
Median	50.6	44.5	64.4	81.0	118.8	127.4	171.0	154.0	145.0	105.6	90.6	72.6	1275.8
90th percentile	105.2	81.0	122.9	141.9	217.3	203.1	266.1	262.2	193.3	183.8	136.8	148.1	1536.1
95th percentile	135.5	109.4	135.8	180.7	250.5	219.6	283.1	308.7	199.7	224.1	141.2	156.1	1649.2
Highest	199.4	137.4	145.2	267.4	298.0	269.4	345.9	423.6	210.4	245.8	150.8	175.4	1673.0

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

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Appendix D

Selected Site Photographs



Photo 1. View of Hepples Road showing damage to kerb and hummocky slope above retaining wall (Sept 2016)



Photo 2. Condition of 15 Hepples Road in Sept 2016



Photo 3. View of crib wall behind 15 Hepples Road (Sept 2016)



Photo 4. Formwork for strip footing joining bored piers at base of crib wall (image supplied by 6ty°)

Tasman Geotechnics
Reference: TG17185/1 - 02report



Photo 5. Looking at the site from Hepples Road (sept 2017)



Photo 6. Detail of new construction and old building (sept 2017)



Photo 7. Verti-block wall at rear of new construction (sept 2017). Note crib wall above verti-blocks



Photo 8. New no-fines concrete retaining wall (Sept 2017)



Photo 9. View of site from beach (Sept 2017)



Photo 10. Cut face showing talus (Sept 2017)



Photo 11. Original (deformed) wall of lower level (Sept 2017)

Appendix E

Engineering Borehole Logs

ROCK DESCRIPTION EXPLANATION SHEET

Page 1 of 2



The descriptive terms used by Tasman Geotechnics are given below. They are consistent with AS1726-1993

Definitions	
Substance	Effectively homogeneous material, may be isotropic or anisotropic
Defect	Discontinuity or break in the continuity of a substance or substances
Mass	Any body of material which is not effectively homogenous. It can consists of two or more substances without defects, or one or more substances with one or more defects.
In engineering terms, rock substance is any naturally occurring aggregate of minerals and organics material which cannot be disintegrated or remoulded by hand in air or in water. Other material is described using soil descriptive terms.	

SUBSTANCE DESCRIPTIVE TERMS

Rock Name	Simple rock names are used rather than precise geological classification		
Particle Size	Coarse grained	0.6mm to 2mm	
	Medium grained	0.2mm to 0.6mm	
	Fine grained	0.06mm to 0.2mm	
Fabric	Terms for layers or penetrative fabric (e.g. bedding cleavage)		
	Massive	No layering of penetrative fabric	
	Poorly Developed	Layers or fabric just visible. Little effect on properties.	
	Well Developed	Layering or fabric distinct. Rock breaks more easily parallel to layering or fabric.	

BLOCK SHAPE TERMS

Blocky	Approximately equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, Is_{50} (MPa)	Field Guide to Strength
Very Low	VL	<0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30m thick can be broken by finger pressure.
Low	L	0.1 to 0.3	Easily scored with a knife; indentation 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	0.3 to 1	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	1 to 3	A piece of core 150mm long by 50mm diameter can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>1	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer



CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered	XW	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Fabric of original rock still visible.
Distinctly Weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly Weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no signs of decomposition or staining.

COMMON DEFECTS IN ROCK MASSES

Term	Definition
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering or a planar anisotropy in the rock substance. May be open or closed.
Joint	A surface or crack across which the rock has little or no tensile strength but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.
Sheared Zone	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.
Sheared Surface	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.
Crushed Seam	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint. Infilled seams less than 1mm thick may be described as veneer or coating on joint surface.
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formed by weathering of the rock substance in places.

DEFECT ROUGHNESS TERMS

Slickensided (SI)	Grooved or striated surface; usually polished
Polished (Po)	Shiny smooth surface
Smooth (Sm)	Smooth to touch; few or no surface irregularities
Rough (Ro)	Many small surface irregularities (amplitude generally less than 1mm); feels like fine to coarse sandpaper
Very Rough (VR)	Many large surface irregularities (amplitude generally more than 1mm); feels like, or coarser than, very coarse sandpaper

DEFECT COATING TERMS

Clean (CI)	No visible coating
Stained (St)	No visible coating but surfaces are discoloured
Veneer (Ve)	A visible coating of soil or mineral too thin to measure; may be patchy
Coating (Co)	A visible coating up to 1mm thick. Thicker soil material is described using appropriate defect terms (e.g. infilled seam). Thicker rock strength material is usually described as a vein.

DEFECT SHAPE TERMS

Planar (PI)	The defect does not vary in orientation
Curved (Cu)	The defect has a gradual change in orientation
Stepped (Sp)	The defect has one or more well defined steps
Irregular (Ir)	The defect has many sharp changes in orientation
Undulating (Un)	The defect has a wavy surface

Soils are described in accordance with the Unified Soil Classification System (USCS), as shown in the following table.

FIELD IDENTIFICATION

COARSE GRAINED SOILS more than 65% of material less than 63mm is larger than 0.075mm	GRAVELS	GW	Well graded gravels and gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
	GRAVELLY SOILS	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
		GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS	SW	Well graded sands and gravelly sands, little or no fines
		SP	Poorly graded sands and gravelly sands, little or no fines
	SANDY SOILS	SM	Silty sand, sand-silt mixtures, non-plastic fines
		SC	Clayey sands, sand-clay mixtures, plastic fines

				DRY STRENGTH	DILATANCY	TOUGHNESS	
FINE GRAINED SOILS	more than 35% of material less than 63mm is less than 0.075mm	SILT & CLAY, liquid limit less than 50%	ML	Inorganic silts, very fine sands or clayey fine sands	None to low	Quick to slow	None
			CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays and silty clays	Medium to high	None to very slow	Medium
			OL	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low
		SILT & CLAY, liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts	Low to medium	Slow to none	Low to medium
			CH	Inorganic clays of high plasticity, fat clays	High	None	High
			OH	Organic clays of medium to high plasticity	Medium to high	None to very slow	Low to medium
PEAT		Pt	Peat muck and other highly organic soils				

Particle size descriptive terms

Name	Subdivision	Size
Boulders		>200mm
Cobbles		63mm to 200mm
Gravel	coarse	20mm to 63mm
	medium	6mm to 20mm
	fine	2.36mm to 6mm
Sand	coarse	600µm to 2.36mm
	medium	200µm to 600µm
	fine	75µm to 200µm

Moisture Condition

Dry (D)	Looks and feels dry. Cohesive soils are hard, friable or powdery. Granular soils run freely through fingers.
Moist (M)	Soil feels cool, darkened in colour. Cohesive soils are usually weakened by moisture presence, granular soils tend to cohere.
Wet (W)	As for moist soils, but free water forms on hands when sample is handled

Cohesive soils can also be described relative to their plastic limit, ie: <Wp, =Wp, >Wp

The plastic limit is defined as the minimum water content at which the soil can be rolled into a thread 3mm thick.

Consistency of cohesive soils

Term	Undrained strength	Field guide
Very soft VS	<12kPa	A finger can be pushed well into soil with little effort
Soft S	12 - 25kPa	Easily penetrated several cm by fist
Firm F	25 - 50kPa	Soil can be indented about 5mm by thumb
Stiff St	50-100kPa	Surface can be indented but not penetrated by thumb
Very stiff VSt	100-200kPa	Surface can be marked but not indented by thumb
Hard H	>200kPa	Indented with difficulty by thumb nail
Friable Fb	-	Crumbles or powders when scraped by thumb nail

Density of granular soils

Term	Density index
Very loose	<35%
Loose	15 to 35%
medium dense	35 to 65%
Dense	65 to 85%
Very dense	>85%

Minor Components

Term	Proportions	Observed properties
Trace of	Coarse grained: <5% Fine grained: <15%	Presence just detectable by feel or eye. Soil properties little or no different to general properties of primary component.
With some	Coarse grained: 5-12% Fine grained: 15-30%	Presence easily detected by feel or eye. Soil properties little different to general properties of primary component.

ENGINEERING CORED BOREHOLE LOG



TASMAN
geotechnics

Borehole no. BH1

Sheet no. 1 of 1

Job no. TG17185/1

Client : 6TY
Project : LRA
Location : 15 Hepples Road
Boat Harbour

Date : 21/09/2017
Logged By : AC

Drill model : Posi Trak SR-70 ASV

Barrel type : NQTT

fluid: mud

Slope :

Bearing :

deg


deg

RL Surface:

Datum :

[illegible]



Drawn	EO	 TASMAN geotechnics	Client	6TY
approved	WG		Project	Landslide Risk Assessment
date	20/12/2017			15 Hepples Road, Boat Harbour
scale	NTS		Title	Core Photo
original size	A4		Project No:	TG17185/1 - 01report
				Figure: Figure BH1

Sheet no. 1 of 1
Job no. TG16160/1

TASMAN
geotechnics


Date : 8/09/2016
Logged By : EB

Slope : deg
Bearing : deg

RL Surface :
Datum :

[illegible]



drawn	WG	 TASMAN geotechnics	client:	Waratah Wynyard Council	
approved	WG		project:	Landslide Investigation Hepples Road, Boat Harbour	
date	8/3/2017		title:	TGBH1 Core Photographs	
scale	NTS		project no:	TG16160/1 – 01report	figure no: FIGURE TGBH1
original size	A4				

ENGINEERING CORED BOREHOLE LOG



Borehole no. TGBH2

Client : Waratah Wynyard Council
Project : Landslide Investigation
Location : Hepples Road, Boat Harbour

TASMAN
geotechnics

Sheet no. 1 of 1
Job no. TG16160/1

Date : 8/09/2016
Logged By : EB

Drill model : Gemco
Barrel type : HQT

fluid: mud


Slope : deg
Bearing : deg

RL Surface :
Datum :

Drilling information					Rock substance					Rock mass defects				
Method	Case-lift	Water	Notes Samples Tests	Water	Graphic Log	Substance Description rock type, grain characteristics, colour, structure, minor components	Weathering	Strength Is(50)					Defect Spacing (mm)	Defect Description thickness, type, inclination, planarity, roughness, coating
								VL	L	M	H	VH	EH	
								30	100	300	1000	>3000		particular general
HQT			no recovery			FILL: GRAVELLY SAND, fine grained, white								
					1.00									
			no recovery			TALUS: BOULDERS in GRAVELLY CLAY matrix, high plasticity, reddish brown, soft to firm clay								
					2.00									
			80% recovery											
					3.00									
			100% recovery											
					4.00									
			75% recovery											
					5.00									
			25% recovery											
					6.00									
			100% recovery			RESIDUAL SOIL (BASALT), presenting as CLAYEY GRAVEL, red/black/brown, angular	RS							
			80% recovery											
					7.00									
			100% recovery			BASALT, fine grained, massive, dark blue	DW							
					8.00									

Terminated at 8.0m



drawn	WG	 TASMAN geotechnics	client:	Waratah Wynyard Council	
approved	WG		project:	Landslide Investigation Hepples Road, Boat Harbour	
date	8/3/2017		title:	TGBH2 Core Photographs	
scale	NTS		project no:	TG16160/1 – 01report	figure no: FIGURE TGBH2
original size	A4				

Appendix F

Laboratory Test Certificate

Head Office
25 Metcalf Street
DANDENONG SOUTH VIC 3175

Ph: +61 3 8796 7900
Fax: +61 3 8796 7944



Undrained Triaxial Test with measurement of pore water pressure

Customer: Tasman Geotechnics Pty Ltd
Customer Address: PO Box 4026, Invermay, Tasmania 7248
Project: Hepples Road, Boat Harbour
Location: Tasmania
Customer Order No: TG16160/1

Report Number: 1000572
Report Date: 28/09/2016
Request No: -
Test Method: AS1289.6.4.2
Page: 1 of 5

-1

Testing performed and reported at our Dandenong South Laboratory

Sample No.:	1610775	Test method:	AS1289.6.4.2
Borehole:	BH01	Normal Stress:	25, 50, 100
Depth:	2.45 - 2.95m	Pore pressure:	600
Sample Date:	12/09/2016	Sample dimensions (mm):	63 x 127mm
Sample Type:	U63	Date tested:	19 - 24/09/2016

Results Summary

Dry density (t/m^3):	1.39	Cohesion c' :	0
Initial Moisture content (%)	34.0	Angle of shear resistance Φ' :	27
Final Moisture content (%)	39.3	Mode of failure:	no visible failure mode

	Stage 1	Stage 2	Stage 3
Axial strain rate:	0.02	0.02	0.02
Strain at failure:	0.38	0.6	1.5
Minor stress σ_{3f}	13	26	47
Major Stress σ_{1f}	26.9	68.7	131.4
Corr Dev Stress	14	43	84

Failure criteria: Max Stress Ratio

Remarks:

Page 1 of 5



Accredited for compliance with ISO/IEC 17025. The results of tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

APPROVED SIGNATORY

A Catton

Form No.: CG336.000

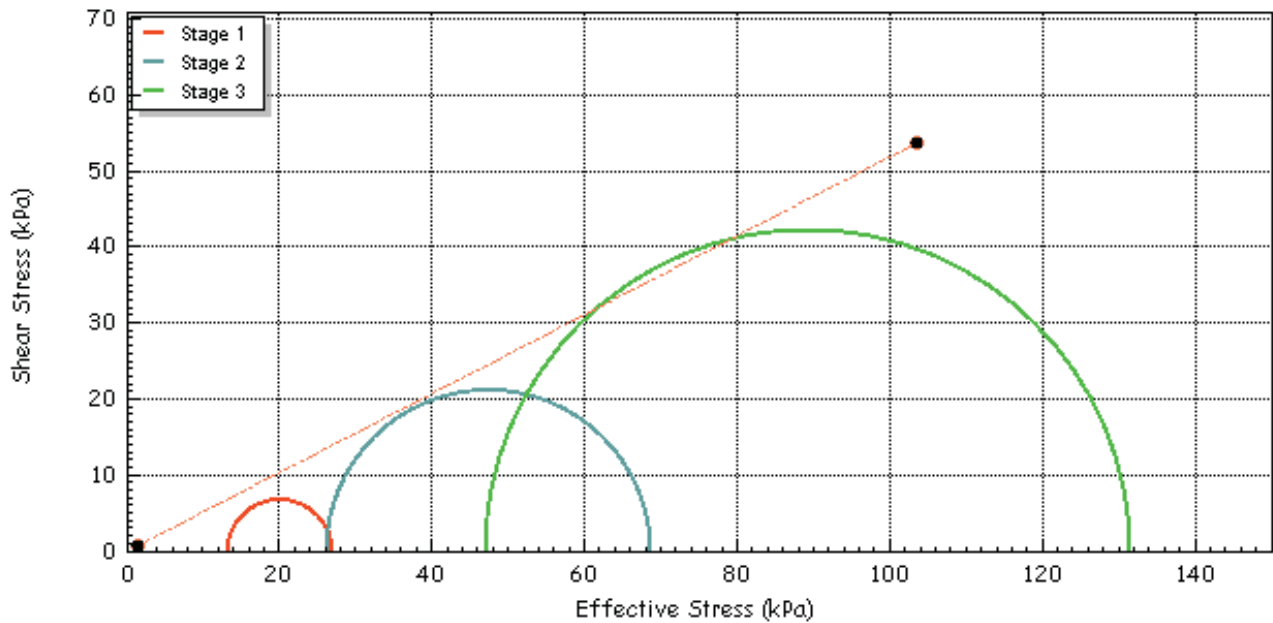
Issue Date: 19/02/2013

Effective Stress Triaxial Compression

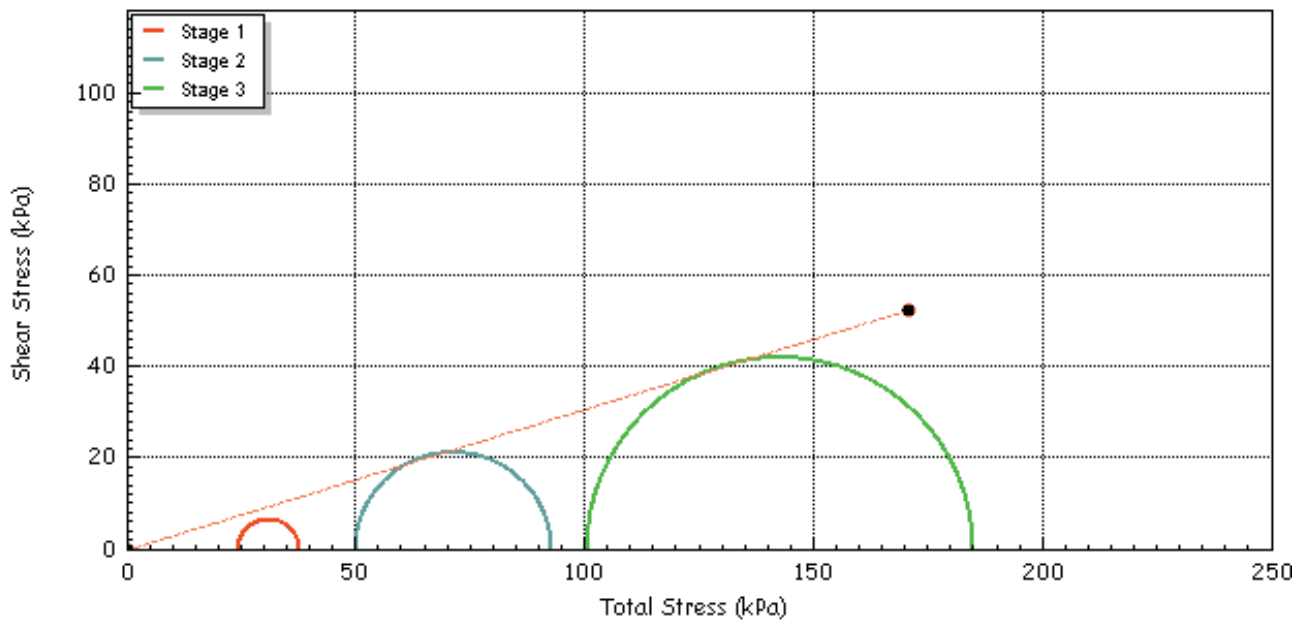
Consolidated Undrained


Shear Stage Plots

Effective Cohesion	c'	(kPa)	0.00
Effective Friction	ϕ'	(deg)	27.4



Total Cohesion	c	(kPa)	0.00
Total Friction Angle	ϕ	(deg)	17.0



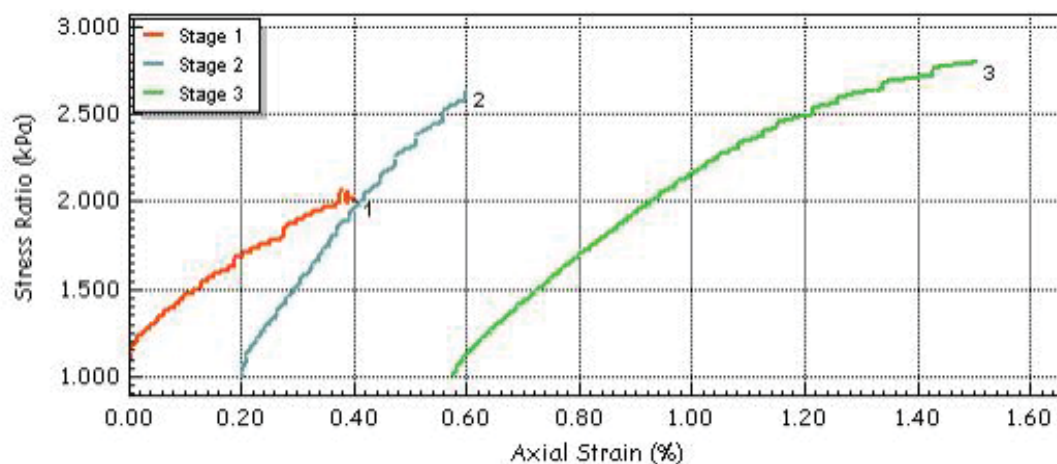
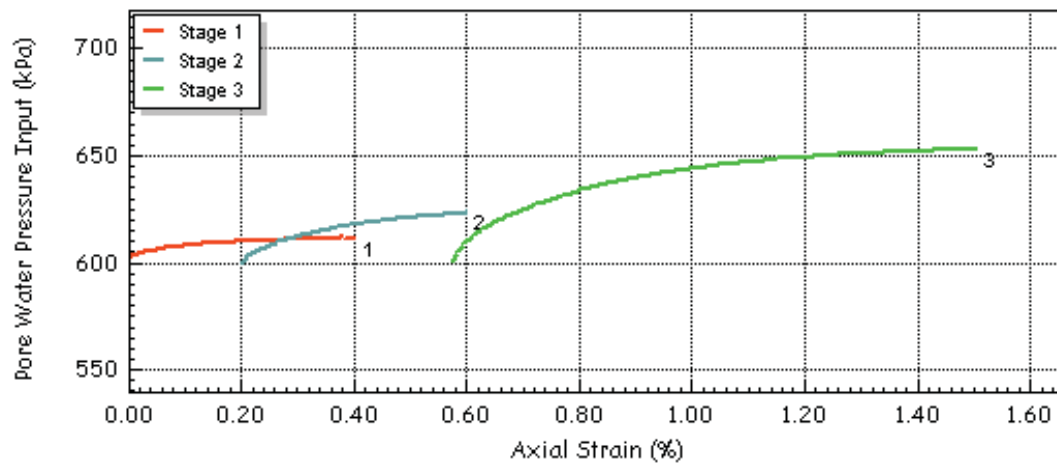
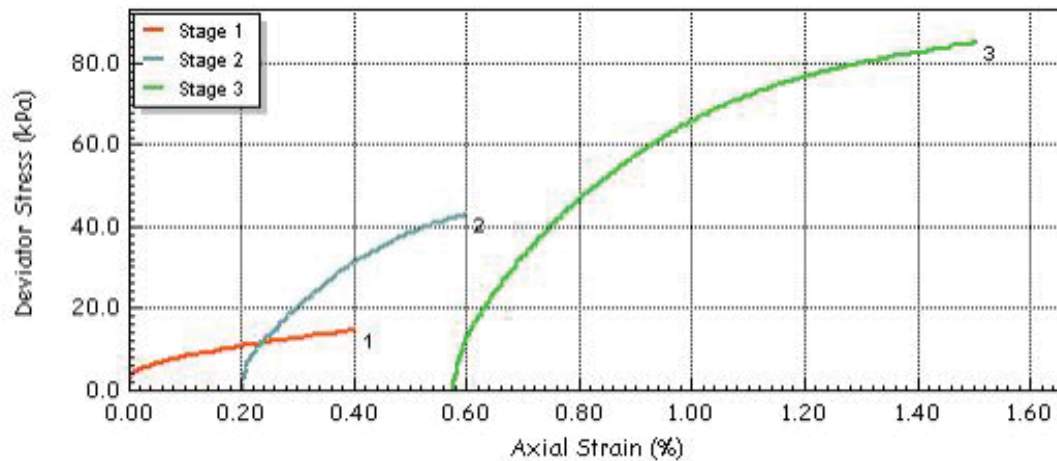
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	Site Reference	1000572		Database:	.\SQLEXPRESS \ Chadwick2	
	Jobfile	Hepples Road Boat Harbour		Test Date	19/09/2016	
	Client	Tasman Geotechnics		Sample	1610775	
	Operator	TRA	Checked	ARCC	Borehole	BH01 2.45 - 2.95m
		Approved	ARCC			

Dandenong South - NATA 12719

Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots



Test Method	AS1289.6.4.2 - 1998	Test Name	CUPP 0775
		Database:	.\SQLEXPRESS \ Chadwick2
Site Reference	1000572	Test Date	19/09/2016
Jobfile	Hepples Road Boat Harbour	Sample	1610775
Client	Tasman Geotechnics	Borehole	BH01 2.45 - 2.95m
Operator	TRA	Checked	ARCC
		Approved	ARCC

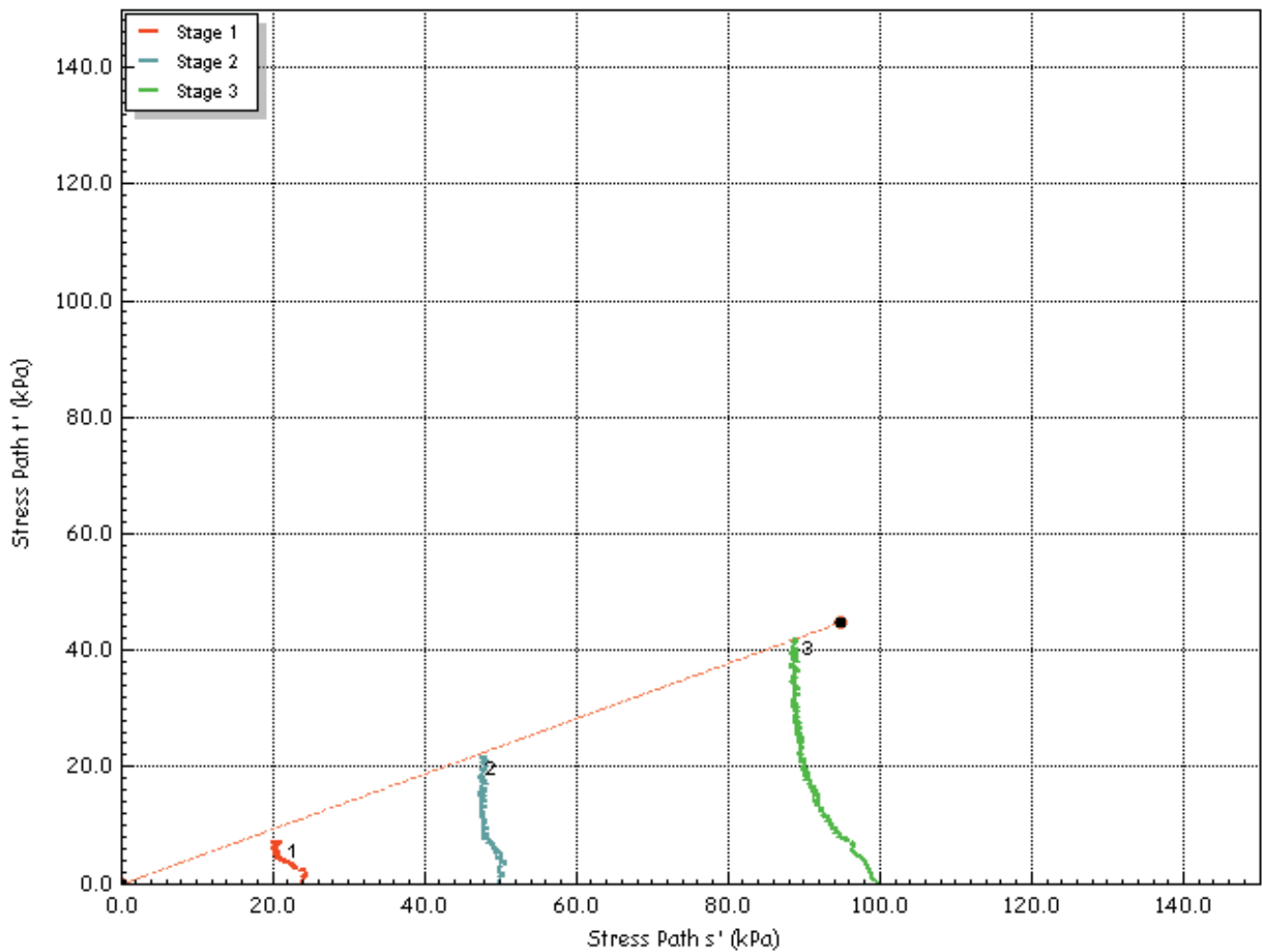
Dandenong South - NATA 12719


Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective Cohesion	c'	(kPa)	0.00
Effective Friction Angle	ϕ'	(deg)	28.2
Stress Path Intercept	t_0'	(kPa)	0.00
Stress Path Inclination	θ	(deg)	25.3



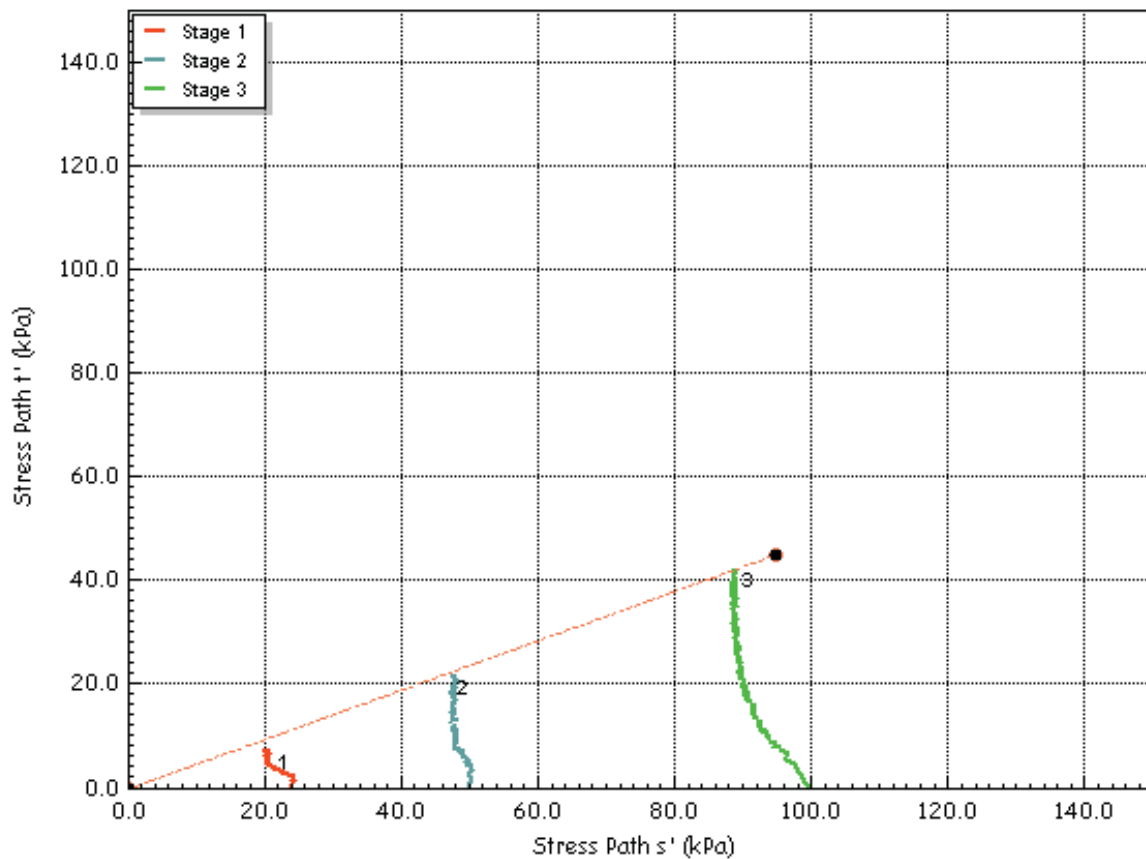
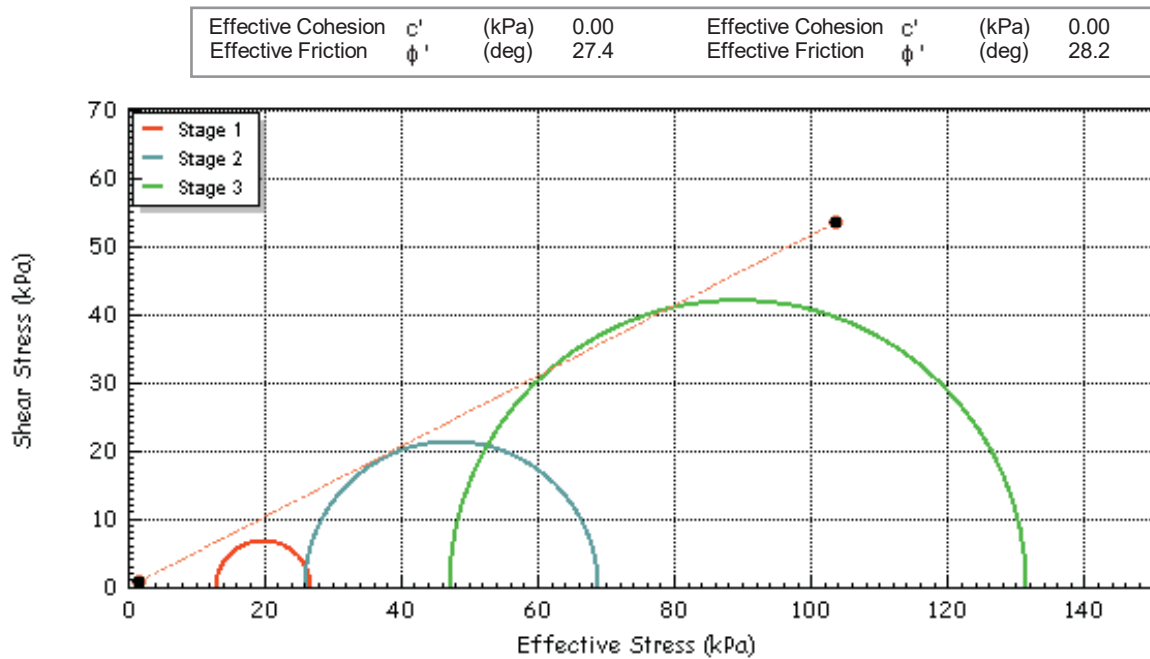
 CHADWICK GEOTECHNICS	Test Method		AS1289.6.4.2 - 1998		Test Name		CUPP 0775	
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	Site Reference		1000572		Test Date		19/09/2016	
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	Client		Tasman Geotechnics		Borehole		BH01 2.45 - 2.95m	
	Operator		TRA		Checked		ARCC	
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Dandenong South - NATA 12719

Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots



 CHADWICK GEOTECHNICS	Test Method		AS1289.6.4.2 - 1998		Test Name		CUPP 0775		
					Database:		.\SQLEXPRESS \ Chadwick2		
	Site Reference		1000572		Test Date		19/09/2016		
	Jobfile		Hepples Road Boat Harbour		Sample		1610775		
	Client		Tasman Geotechnics		Borehole		BH01 2.45 - 2.95m		
	Operator		TRA		Checked		ARCC		
						Approved		ARCC	

Dandenong South - NATA 12719

Appendix G
Landslide Risk Matrix

Terminology for use in Assessing Risk to Property

These notes are provided to help you understand concepts and terms used in Landslide Risk Assessment and are based on the “Practice Note Guidelines for Landslide Risk Management 2007” published in *Australian Geomechanics* Vol 42, No 1, 2007.

Likelihood Terms

The qualitative likelihood terms have been related to a nominal design life of 50 years. The assessment of likelihood involves judgment based on the knowledge and experience of the assessor. Different assessors may make different judgments.

Approximate Annual Probability	Implied indicative Recurrence Interval	Description	Descriptor	Level
10^{-1}	10 years	The event is expected to occur over the design life	Almost Certain	A
10^{-2}	100 years	The event will probably occur under adverse conditions over the design life	Likely	B
10^{-3}	1000 years	The event could occur under adverse conditions over the design life	Possible	C
10^{-4}	10,000 years	The event might occur under very adverse conditions over the design life	Unlikely	D
10^{-5}	100,000 years	The event is conceivable but only under exceptional circumstances over the design life	Rare	E
10^{-6}	1,000,000 years	The event is inconceivable or fanciful for the design life	Barely Credible	F

Qualitative Measures of Consequence to Property

Indicative Cost of Damage	Description	Descriptor	Level
200%	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequential damage.	Catastrophic	1
60%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequential damage	Major	2
20%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequential damage.	Medium	3
5%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works	Minor	4
0.5%	Little damage.	Insignificant	5

The assessment of consequences involves judgment based on the knowledge and experience of the assessor. The relative consequence terms are value judgments related to how the potential consequences may be perceived by those affected by the risk. Explicit descriptions of potential consequences will help the stakeholders understand the consequences and arrive at their judgment.

Qualitative Risk Analysis Matrix – Risk to Property

Likelihood		Consequences to Property				
	Approximate annual probability	1: Catastrophic	2: Major	3: Medium	4: Minor	5: Insignificant
A: Almost Certain	10^{-1}	VH	VH	VH	H	L
B: Likely	10^{-2}	VH	VH	H	M	L
C: Possible	10^{-3}	VH	H	M	M	VL
D: Unlikely	10^{-4}	H	M	L	L	VL
E: Rare	10^{-5}	M	L	L	VL	VL
F: Barely credible	10^{-6}	L	VL	VL	VL	VL

NOTES:

1. The risk associated with Insignificant consequences, however likely, is defined as Low or Very Low
2. The main purpose of a risk matrix is to help rank risks and set priorities and help the decision making process.

Response to Risk

In general, it is the responsibility of the client and/or regulatory and/or others who may be affected to decide whether to accept or treat the risk. The risk assessor and/or other advisers may assist by making risk comparisons, discussing treatment options, explaining the risk management process, advising how others have reacted to risk in similar situations and making recommendations. Attitudes to risk vary widely and risk evaluation often involves considering more than just property damage (eg environmental effects, public reaction, business confidence etc).

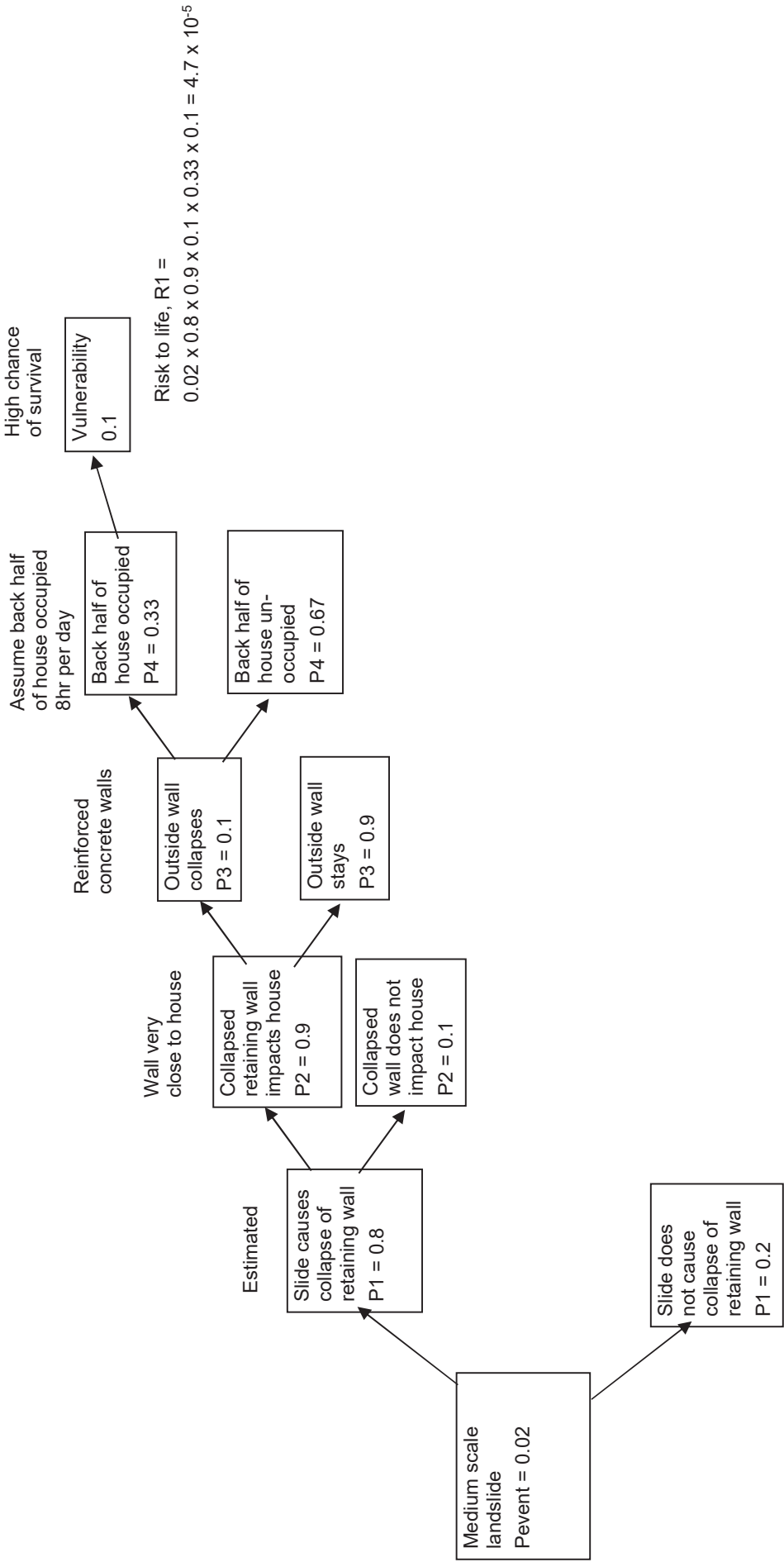
The following is a guide to typical responses to assessed risk.

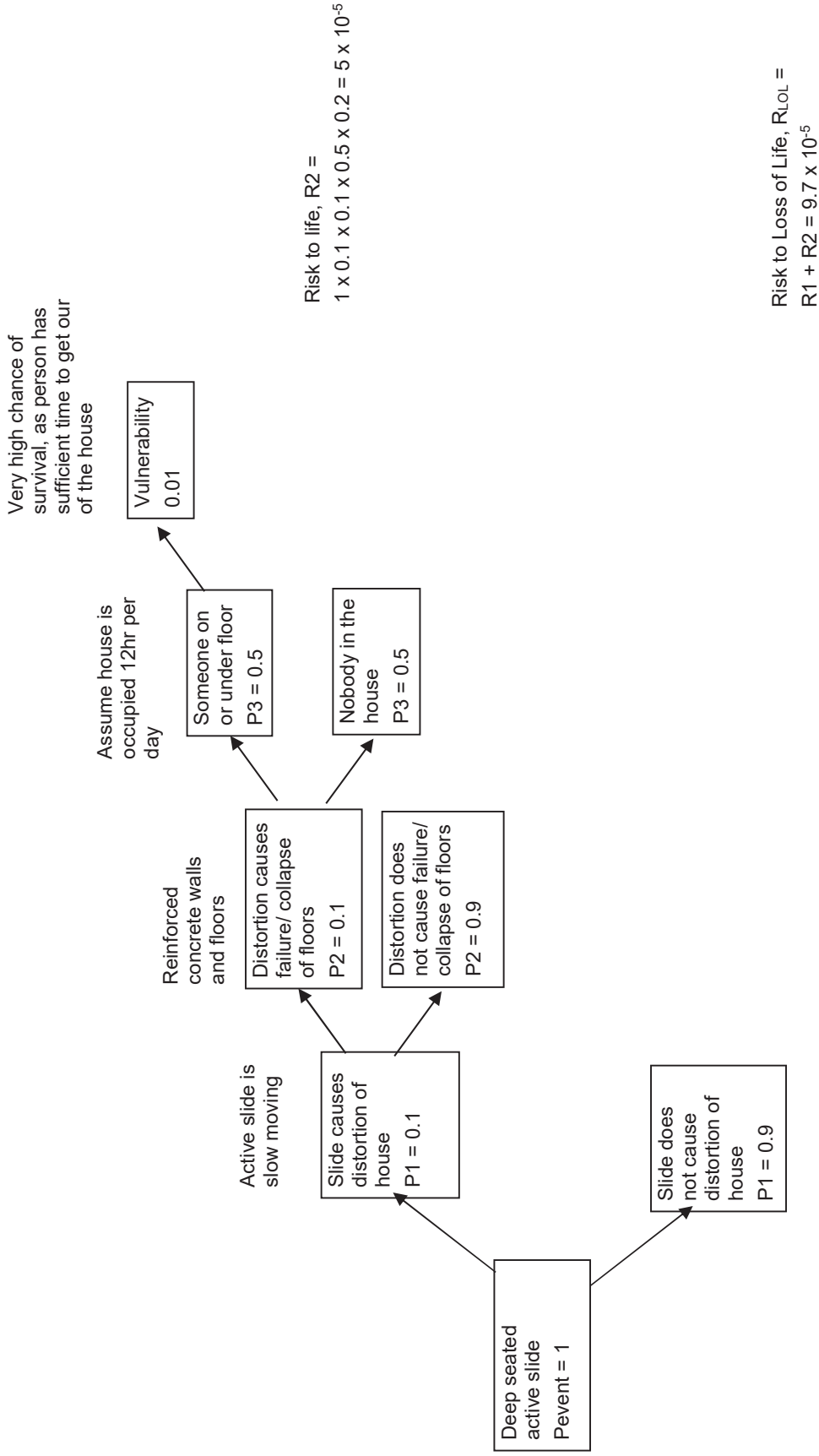
Risk Level		Example Implications
VH	Very High	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than the value of the property.
H	High	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	Moderate	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	Low	Usually accepted by regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	Very Low	Acceptable. Manage by normal slope maintenance procedures

Appendix H

Risk to Life

Event Tree – Risk to Life, with management measures where recommended





11 April 2019

Ms Rebecca Plapp
Town Planner
Waratah Wynyard Council
By Email: rplapp@warwyn.tas.gov.au

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Riverside
Tasmania 7250
W 6ty.com.au
E admin@6ty.com.au

Tamar Suite 103
The Charles
287 Charles Street
Launceston 7250
P (03) 6332 3300

Dear Rebecca,

57 Best Street
PO Box 1202
Devonport 7310
P (03) 6424 7161

SUPPORTING INFORMATION - HAZARD MANAGEMENT CODE (E6) - DA 53/2018 - 13 AND 15 HEPPLES ROAD, BOAT HARBOUR

Thank you for the opportunity to provide further information in support of development application DA 53/2018 prior to the commencement of the public exhibition period.

The purpose of this letter is to provide an analysis of the Landslide Risk Assessment prepared by Tasman Geotechnics against the applicable standards of the Hazard Management Code.

In preparing the Landslip Risk Assessment (LRA), Tasman Geotechnics carried out field investigations and have reviewed the submitted drawings, survey plan, photographs and engineered schematic designs of the as constructed retaining walls. The LRA therefore considers all aspects of the proposed use and development, including works that have been undertaken without obtaining relevant planning and building approvals.

Standard E6.5.2 Use likely to be exposed to a natural hazard

The proposed use does not meet acceptable solution E6.5.2 A1 (b) which requires residential use to be located on land where risk from exposure to a natural hazard is medium or less.

Performance criteria E6.5.2 P1 (a)¹ requires a hazard risk assessment to demonstrate that a tolerable level of risk can be achieved and maintained for the nature and duration of the proposed use.

For the purposes of this analysis, risk to 'use' is considered to mean the same as risk to 'life' and is distinct from risk to 'development' or 'property'.

For the purposes of hazards pertaining to landslip, a hazard risk assessment is a landslide risk assessment which the planning scheme defines as an assessment and report prepared by a suitably qualified person, in accordance with the Australian Geomechanics Society - Practice Note Guidelines for Landslide Risk Management 2007 ('AGS Guidelines'). The LRA has been prepared in accordance with the AGS Guidelines.

¹ Performance criteria E6.5.2 P1 (b) is not applicable to the proposal because it is not for a critical, hazardous or vulnerable use.

The AGS Guidelines defines 'tolerable risk' as:

"a risk within a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if possible"

The AGS Guidelines also provides criteria to quantify tolerable risk. The criteria is detailed in the table below.

Situation	Suggested Tolerable Loss of Life Risk for the person most at risk
Existing Slope (1) / Existing Development (2)	10^{-4} / annum
New Constructed Slope (3) / New Development (4) / Existing Landslide	10^{-5} / annum

The LRA, at section 6.4, provides an analysis of the risk to life from landslide events in accordance with the tolerable risk criteria set out in the AGS Guidelines. The analysis included the preparation of probability event trees which are detailed in Appendix H of the LRA. The analysis concluded that provided the management measures recommended within the first event tree are complied with, the calculated risk to life is marginally lower than the tolerable loss of life for an existing slope.

As such, it is considered that performance criteria E6.5.2 P1 (a) can be met on the basis that the LRA has demonstrated that a tolerable level of risk can be achieved and maintained for the residential use subject to complying with the recommended management measures.

Standard E6.6.2 Development on land exposed to a natural hazard

The proposed development is only required to meet one of the acceptable solution provisions listed under clause E6.6.2 A1 (a) due to the presence of the disjunctive "or" after clause E6.6.2 A1 (a) (i).

The LRA, at section 6.3, concludes that the proposal meets the requirements of clause E6.6.2 A1 (a) (i) insofar as no specific hazard reduction or protection measures are required.

Acceptable solution E6.6.2 A1 (b) is not applicable to the proposal because it does not require land on another lot, outside of the site, for hazard management purposes.

Please do not hesitate to contact me should any further clarification be required.

Yours faithfully,
6ty° Pty Ltd



George Walker
Planning Consultant

07/05/19

Rebecca Plapp
Town Planner
Waratah Wynyard Council
PO Box 168
Wynyard Tasmania 7325

RE: Peer Review of Landslide Risk Assessment Report – 15 Hepples Road Boat Harbour

Rebecca, following review of the Landslide Risk Assessment Report prepared by Tasman Geotechnics dated the 9th of April 2019, I am able to report the following.

The report confirms that the site at 15 Hepples Road Boat Harbour is located on a mapped active landslide, and that the site is within a declared landslip A zone. The report represents a good snapshot of the geological conditions in the area, site observations, and a risk assessment to support the proposal.

There are a number of observations made in the report which are of particular cause for concern:

- *“Houses adjacent to 15 Hepples Road (to each side and uphill) have been damaged by landslide movement as indicated by buckled walls, leaning columns, misaligning doors and windows”.*
- *“A photograph of 15 Hepples Road before current reconstruction works also shows gaps in the external walls”*
- *“The ground surface of Hepples Road and concrete curbing has cracks and undulations indicative of ground surface movement”*
- *“Tension cracks were observed in the grass at 2 and 10 Hepples Road in 2016”*
- *At Hepples Road the landslide exhibits creep, approximately 45mm/year”*

In relation to the recent works on the property there are a number of additional causes for concern noted in the report, with the following observation *“we understand that bored piers were installed below the no-fines concrete retaining wall to 3m below the footing level. From our borehole profile, we expect this is at the top of the basalt bedrock. Therefore, the piers are not embedded in rock”* followed by the interpretation of the geology *“Talus is resting on steeply sloping bedrock consisting of basalt overlying quartzite. As groundwater is seeping out at beach level over the top of the basalt bedrock, particularly when groundwater is elevated, as is the case after high rainfall events”*. The two statements combined can lead to only one logical conclusion, that the retaining wall piers are not sufficiently embedded into bedrock to resist the sliding movement of the talus deposits promoted by groundwater flows. In relation to a second retaining wall on the property the report only states that *“No construction details are available for the*

other, a verti-block wall". As neither of the walls have been constructed with engineering designs or certification, they cannot be relied upon to provide long term stability to the site, especially when the Hepples Road landslide exhibits creep at approximately 45mm per year.

The above points in relation to the lack of engineering design and certification in the construction are of particular importance to the risk assessment completed in the report which states "*The risk assessment shows that the risk to life for such those landslides and **assuming management measures are incorporated in the design and construction of the house** is $9.7 \times 10^{-5}/\text{annum}$* ". From the earlier conclusions in the report that construction of the retaining walls is either unknown or have foundations not embedded into rock would suggest that the design and construction does not have adequate management measures, and as a result the risk assessment is fundamentally flawed. The actual risk to life and capital at the site is likely to be in the tolerable to unacceptable range, and would require significant specialised investigation, design, and certification to be acceptable.

Of what is most concern to the development is the content of Building Act 2000 and the building regulations 2004 in relation to building works in a declared landslip A area. Building works including erection of a house or alterations and additions to a building are prohibited on the property at 15 Hepples Road Boat Harbour as it falls within a declared landslip A area. The risk assessment report concludes that:

" Thus, the works have carried out to date have contravened a number of limitations relating to an A landslip area:

- *Adding or altering a house*
- *Carrying out building work*
- *Permanently excavating more than 600mm of soil"*

The recent works on the site and the completion of any further works outlined in the development application will be in clear contravention of the Building Act., and it is my understanding that a permit authority must not grant development approval for works that would directly contravene another relevant Act in the state of Tasmania. As a result, the only conclusion I can logically reach from review of the report is that the proposed development on the site involves significant risk, is in direct contravention of the Building Act, and should be refused.

Kind regards,

A handwritten signature in blue ink, appearing to read 'Dr John Paul Cumming', with a stylized flourish at the end.

Dr John Paul Cumming PhD CPSS GAICD
Director

The General Manager

PO Box 168, Wynyard 7325

Waratah Wynyard Council

DA 53/2018

LOCATION 13 & 15 Hepples Road, Boat Harbour Beach

Land Use Planning and Approvals Act 1993

I Object to the Development Approval – Discretionary Matter

My objection/concerns are in green print

I believe that Suitability of the Site for the proposed development does not meet or cannot meet Acceptable Solutions v Performance Criteria for the following reasons;-

12.4.1(a) P1 Provide a suitable development area for the intended use

The land/property size is well below 500m square and the topography of the site further limits the available suitable land for a development site. Given consideration to normal setbacks from boundaries and the site being adjacent to the high water mark in normal circumstances and prone to yearly high and ebb tides, such set backs would make the proposed development too large and unsuitable for the site

The site is also located in a designated Landslip A area – refer to below documentation;-

Landslide Assessment for Boat Harbour Beach, Coffey Geosciences, March 2001. □ Land stability at Boat Harbour beach, WL Matthews (Mineral Resources Tasmania MRT report TR17_116_119) date January 1974. □ Preliminary report on landslides on the Boat Harbour Road by I B Jennings (MRT report designated TR9_107_108) date January 1965.

12.4.2

12.4.1 (b) Provide access from a road – the acceptable solution cannot be met because of the prevailing topography of the site both northern boundary (tidal beach) and southern boundary – a road in active landslip area. (As Above)

Re access road –

Considerable pre-approval works which included large amounts and volume of cut and fill, that have taken place from 2016 onwards have affected the site with considerable land movement and specifically affected the main access road (Hepples Road) in the immediate area that adjoins the sites, specifically the site 15 Hepples Road

**A site visit can immediately confirm this comment. The road has an engineering marker that is currently under observation by the Council's Engineering Department.

This site cannot be deemed a suitable development area for the intended use?

The northern boundary of the property is beachfront and subject to tides that prevent any access to the site, except at absolute low tide and the beach not able to provide access for large trucks for building materials, concrete, windows etc.

12.4.2 Dwelling density

Make efficient use of land for housing –

(a) suitable building area – no – as above

12.4.2 (b) – Utilities and community services – no water supply, no storm water provisions, no sewerage – given scale of proposed building v site size

Where can provision for water supply occur without any setbacks from boundaries adhered to.

12.4.3 -

(b) Adjacent home on Western boundary already with approx 1 m from current building. Given the High tide mark, on boundary as per the applicants drawings – house setback from Hightide mark, neighbouring building (western

Boundary) not sufficient land size to allow development, setbacks cannot be observed with the size and scale of the proposed development.

E4.6.1

Change in existing ground level – Landslip A – no criteria met

I object

**Cut and fill and considerable excavation for footings have already taken place and considerable and current land movement still being observed. (As previously commented under 12.4.1

Does/would Retrospective approval cover the following:-

Have geotechnical engineers/surveyors approved the works that have already taken place and observed any technical and detailed plans and drawings of said work, is it/can it be confirmed these works have meet all possible engineering and building criteria and are they satisfied the work has work performed to acceptable standards as to not further acerbate the nature/topography of the site and most specifically that of the adjoining road, Hepples Road.

Is Council satisfied that all criteria has been met and can guarantee that works that have taken place and works that are listed in the Application will not further acerbate the viability of Hepples Road.

Signed, *W. M. Andrusko*

Wendy M Andrusko

8 Hepples Road,

Boat Harbour Beach

Agreement for Extension of Time

In accordance with Section 57 (6) of the *Land Use Planning and Approvals Act 1993* I

6ty Pty Ltd

of

PO Box 63
RIVERSIDE TAS 7250

hereby grant the Planning Authority an extension of time until the 24th day of May 2019,

Ref. No. 7087735 & DA 53/2018

Signed



(Applicant)

GEORGE WALKER

(Applicant)

8 - 4 - 2019

(Date)

Signed



DANIEL SUMMERS, *per Council delegation*

(Director of Infrastructure & Development Services)

14.03.2019

(Date)