



## **DEVELOPMENT APPLICATION**

**PDPLANPMTD-2025/054890**

**PROPOSAL:** Outbuilding (Domestic Animal Breeding, Boarding or Training)

**LOCATION:** 81 Richardsons Road, Sandford

**RELEVANT PLANNING SCHEME:** Tasmanian Planning Scheme - Clarence

**ADVERTISING EXPIRY DATE:** 01/04/2026 00:00:00

The relevant plans and documents can be inspected at the Council offices, 38 Bligh Street, Rosny Park, during normal office hours until 01/04/2026 00:00:00. In addition to legislative requirements, plans and documents can also be viewed at [www.ccc.tas.gov.au](http://www.ccc.tas.gov.au) during these times.

Any person may make representations about the application to the Chief Executive Officer, by writing to PO Box 96, Rosny Park, 7018 or by electronic mail to [clarence@ccc.tas.gov.au](mailto:clarence@ccc.tas.gov.au). Representations must be received by Council on or before 01/04/2026 00:00:00.

To enable Council to contact you if necessary, would you please also include a day time contact number in any correspondence you may forward.

Any personal information submitted is covered by Council's privacy policy, available at [www.ccc.tas.gov.au](http://www.ccc.tas.gov.au) or at the Council offices.

## Application for Development / Use or Subdivision

---

Use this form to obtain planning approval for developing or using land, including subdividing it into smaller lots or lot consolidation.

Proposal: **New Farm Shed**

---

Location: **81 Richardsons Road, Sandford**

**Personal Information Removed**

Is the property on the Tasmanian Heritage Register? Yes  No

If yes, we recommend you discuss your proposal with Heritage Tasmania prior to lodgement as exemptions may apply which may save you time on your proposal.

If you had pre-application discussions with City of Clarence, please provide planner's name:

Current use of site: **Vacant land**

Does the proposal involve land administered or owned by the Crown or Council? Yes  No

**Declaration**

- I have read the Certificate of Title and Schedule of Easements for the land and am satisfied that this application is not prevented by any restrictions, easements or covenants.
- I authorise the provision of a copy of any documents relating to this application to any person for the purposes of assessment or public consultation. I agree to arrange for the permission of the copyright owner of any part of this application to be obtained. I have arranged permission for Council's representatives to enter the land to assess this application
- I declare that, in accordance with Section 52 of the Land Use Planning and Approvals Act 1993, that I have notified the owner of the intention to make this application. Where the subject property is owned or controlled by Council or the Crown, their signed consent is attached.
- I declare that the information in this declaration is true and correct.

**Acknowledgement**

- I acknowledge that the documentation submitted in support of my application will become a public record held by Council and may be reproduced by Council in both electronic and hard copy format in order to facilitate the assessment process; for display purposes during public consultation; and to fulfil its statutory obligations. I further acknowledge that following determination of my application, Council will store documentation relating to my application in electronic format only.

**Personal Information Removed**

Please refer to the development/use and subdivision checklist on the following pages to determine what documentation must be submitted with your application.



## Development/use or subdivision checklist

---

### Mandatory Documents

This information is required for the application to be valid. We are unable to proceed with an application without these documents.

---

- Details of the location of the proposed use or development.
- A copy of the current Certificate of Title, Sealed Plan, Plan or Diagram and Schedule of Easements and other restrictions for each parcel of land on which the use or development is proposed.
- Full description of the proposed use or development.
- Description of the proposed operation. May include where appropriate: staff/student/customer numbers; operating hours; truck movements; and loading/unloading requirements; waste generation and disposal; equipment used; pollution, including noise, fumes, smoke or vibration and mitigation/management measures.
- Declaration the owner has been notified if the applicant is not the owner.
- Crown or Council consent (if publically-owned land).
- Any reports, plans or other information required by the relevant zone or code.
- Fees prescribed by the City of Clarence.

Application fees (please phone 03 6217 9550 to determine what fees apply). An invoice will be emailed upon lodgement.

---

### Additional Documents

In addition to the mandatory information required above, Council may, to enable it to consider an application, request further information it considers necessary to ensure that the proposed use or development will comply with any relevant standards and purpose statements in the zone, codes or specific area plan, applicable to the use or development.

---

- Site analysis and site plan, including where relevant:
    - Existing and proposed use(s) on site.
    - Boundaries and dimensions of the site.
    - Topography, including contours showing AHD levels and major site features.
    - Natural drainage lines, watercourses and wetlands on or adjacent to the site.
    - Soil type.
    - Vegetation types and distribution, and trees and vegetation to be removed.
- 



- Location and capacity of any existing services or easements on/to the site.
  - Existing pedestrian and vehicle access to the site.
  - Location of existing and proposed buildings on the site.
  - Location of existing adjoining properties, adjacent buildings and their uses.
  - Any natural hazards that may affect use or development on the site.
  - Proposed roads, driveways, car parking areas and footpaths within the site.
  - Any proposed open space, communal space, or facilities on the site.
  - Main utility service connection points and easements.
  - Proposed subdivision lot boundaries.
- Where it is proposed to erect buildings, detailed plans with dimensions at a scale of 1:100 or 1:200 showing:
- Internal layout of each building on the site.
  - Private open space for each dwelling.
  - External storage spaces.
  - Car parking space location and layout.
  - Major elevations of every building to be erected.
  - Shadow diagrams of the proposed buildings and adjacent structures demonstrating the extent of shading of adjacent private open spaces and external windows of buildings on adjacent sites.
  - Relationship of the elevations to natural ground level, showing any proposed cut or fill.
  - Materials and colours to be used on rooves and external walls.
- Where it is proposed to erect buildings, a plan of the proposed landscaping showing:
- Planting concepts.
  - Paving materials and drainage treatments and lighting for vehicle areas and footpaths.
  - Plantings proposed for screening from adjacent sites or public places.
- Any additional reports, plans or other information required by the relevant zone or code.

---

This list is not comprehensive for all possible situations. If you require further information about what may be required as part of your application documentation, please contact City of Clarence Planning team on (03) 6217 9550.



SEARCH OF TORRENS TITLE

|                  |                              |
|------------------|------------------------------|
| VOLUME<br>184625 | FOLIO<br>2                   |
| EDITION<br>2     | DATE OF ISSUE<br>29-Apr-2025 |

SEARCH DATE : 08-Aug-2025

SEARCH TIME : 11.27 AM

DESCRIPTION OF LAND

City of CLARENCE

Lot 2 on Sealed Plan 184625

Derivation : Part of 2000 Acres Loc. to Robert Mather & Part of 720 Acres Gtd. to Alexander McLeod

Prior CTs 136228/1 and 136228/2

SCHEDULE 1

N247403 TRANSFER to SUANNE JOY LAWRENCE Registered  
29-Apr-2025 at noon

SCHEDULE 2

Reservations and conditions in the Crown Grant if any

SP184625 COVENANTS in Schedule of Easements

SP184625 FENCING PROVISION in Schedule of Easements

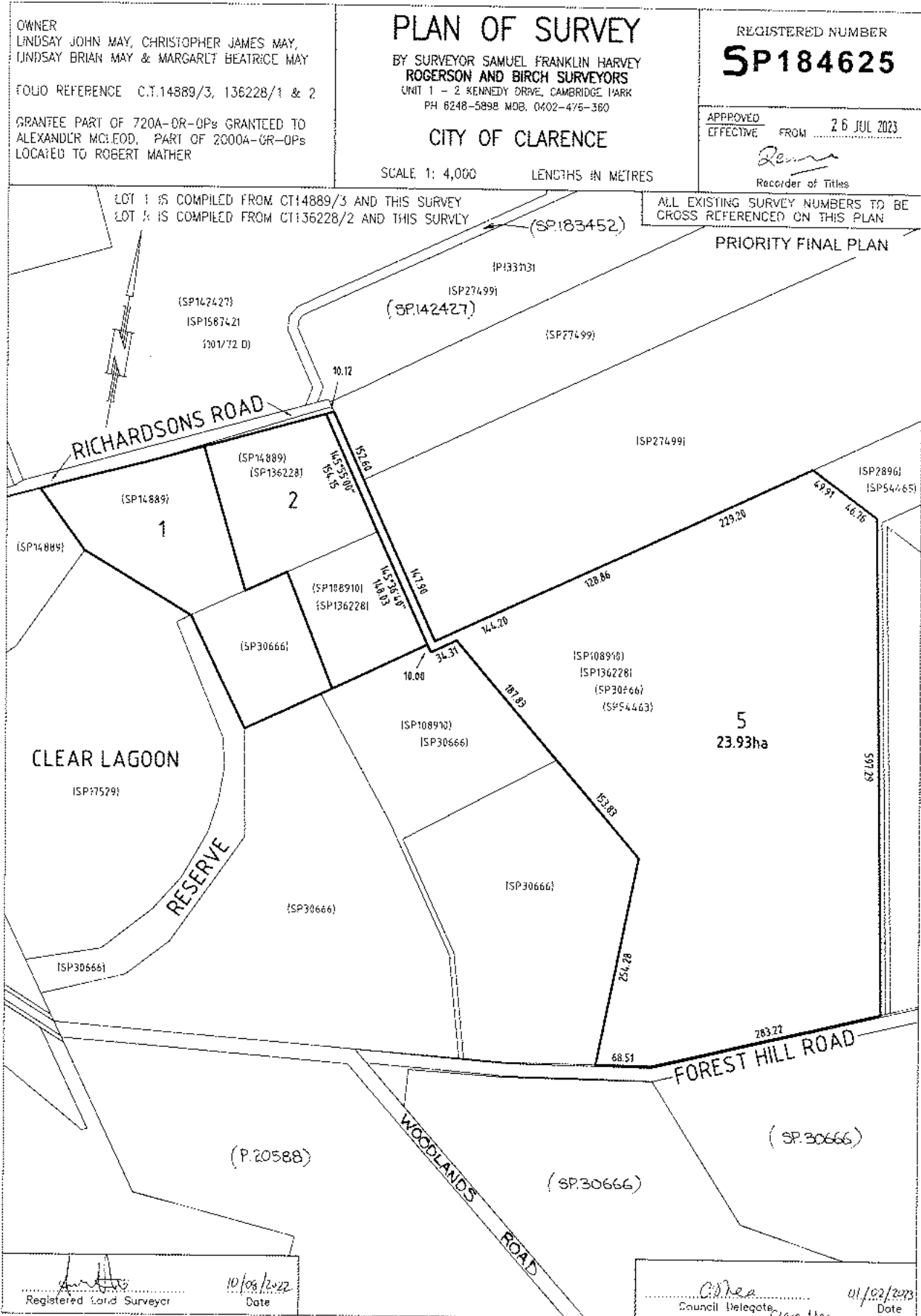
SP14489, SP30666, SP108910 & SP136228 COVENANTS in Schedule of Easements

SP30666 & SP54463 FENCING PROVISION in Schedule of Easements

SP30666, SP54463 & SP108910 COUNCIL NOTIFICATION under Section 468(12) of the Local Government Act 1962

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations





|  |                   |
|--|-------------------|
| <b>SCHEDULE OF EASEMENTS</b>   | Registered Number |
| <b>NOTE:</b> THE SCHEDULE MUST BE SIGNED BY THE OWNERS & MORTGAGEES OF THE LAND AFFECTED. SIGNATURES MUST BE ATTESTED. | SP. 184625        |

PAGE 1 OF 2 PAGE/S

EASEMENTS AND PROFITS

Each lot on the plan is together with:-

- (1) such rights of drainage over the drainage easements shown on the plan (if any) as may be necessary to drain the stormwater and other surplus water from such lot; and
- (2) any easements or profits a prendre described hereunder.

Each lot on the plan is subject to:-

- (1) such rights of drainage over the drainage easements shown on the plan (if any) as passing through such lot as may be necessary to drain the stormwater and other surplus water from any other lot on the plan; and
- (2) any easements or profits a prendre described hereunder.

The direction of the flow of water through the drainage easements shown on the plan is indicated by arrows.

**Easements**

No easements are created by this schedule of easements.

**Covenants**

Those parts of Lots 1, 2 and 5 on the Plan which formerly comprised parts of lots in Sealed Plan 30666 are subject to the covenants created and more fully set forth in Sealed Plan 30666 (subject to the conditions (if any) more fully set forth in that Sealed Plan).

Those parts of Lots 1, 2 and 5 on the Plan which formerly comprised parts of lots in Sealed Plan 14889 are subject to the covenants created and more fully set forth in Sealed Plan 14889 (subject to the conditions (if any) more fully set forth in that Sealed Plan).

Those parts of Lots 1, 2 and 5 on the Plan which formerly comprised parts of lots in Sealed Plan 108910 are subject to the covenants created and more fully set forth in Sealed Plan 108910 (subject to the conditions (if any) more fully set forth in that Sealed Plan).

Those parts Lot 5 on the Plan which formerly comprised parts of lots in Sealed Plan 54463 are subject to the covenants created and more fully set forth in Sealed Plan 54463 (subject to the conditions (if any) more fully set forth in that Sealed Plan).

Those parts of Lots 1, 2 and 5 on the Plan which formerly comprised parts of lots in Sealed Plan 136228 are subject to the covenants created and more fully set forth in Sealed Plan 136228 (subject to the conditions (if any) more fully set forth in that Sealed Plan).

*Lindsay May* ..... *Christopher James May* ..... *Lindsay John May* ..... *Brian May* .....

T-12499334-2 (USE ANNEXURE PAGES FOR CONTINUATION)

|  |  |
|--|--|
| SUBDIVIDER: Christopher James May, Lindsay John May, Lindsay Brian May and Margaret Beatrice May | PLAN SEALED BY: Clarence City Council  |
| FOLIO REF: 14889/3, 136228/1 and 136228/2  | DATE: 1 <sup>st</sup> February 2023  |
| SOLICITOR & REFERENCE: Dobson Mitchell Allport<br>Ref AB: 22002204                               | PP PLAN MTD - <i>Clare Shea</i><br>REF NO. 2021/024699<br>Council Delegate<br>Clare Shea |

**NOTE:** The Council Delegate must sign the Certificate for the purposes of identification.

|   |  |
|---|--|
| <b>ANNEXURE TO<br/>SCHEDULE OF EASEMENTS</b><br>PAGE 2 OF 2 PAGES   | Registered Number<br><b>SP. 184625</b> |
| SUBDIVIDER: Christopher James May, Lindsay John May, Lindsay Brian May and Margaret Beatrice May<br>FOLIO REFERENCE: 14889/3, 136228/1 and 136228/2 |  |

PAGE 2 OF 2 PAGE/S

**Fencing Provision**

In respect of each Lot shown on the plan the Vendors (Christopher James May, Lindsay John May, Lindsay Brian May and Margaret Beatrice May) will not be required to fence.

Signed by **Lindsay John May** in the presence of: Lindsay May  
 of: \_\_\_\_\_

Witness signature: [Signature]  
 Full name (print): Adele M.H. Giblin  
 Witness address: 12 Garth Ave, Sandy Bay Tas

Signed by **Christopher James May** in the presence of: [Signature]  
 of: \_\_\_\_\_

Witness signature: [Signature]  
 Full name (print): PHYLLIS LEONG  
 Witness address: 200 COLLIN STREET, HOBART

Signed by **Lindsay Brian May** in the presence of: Brian May  
 of: \_\_\_\_\_

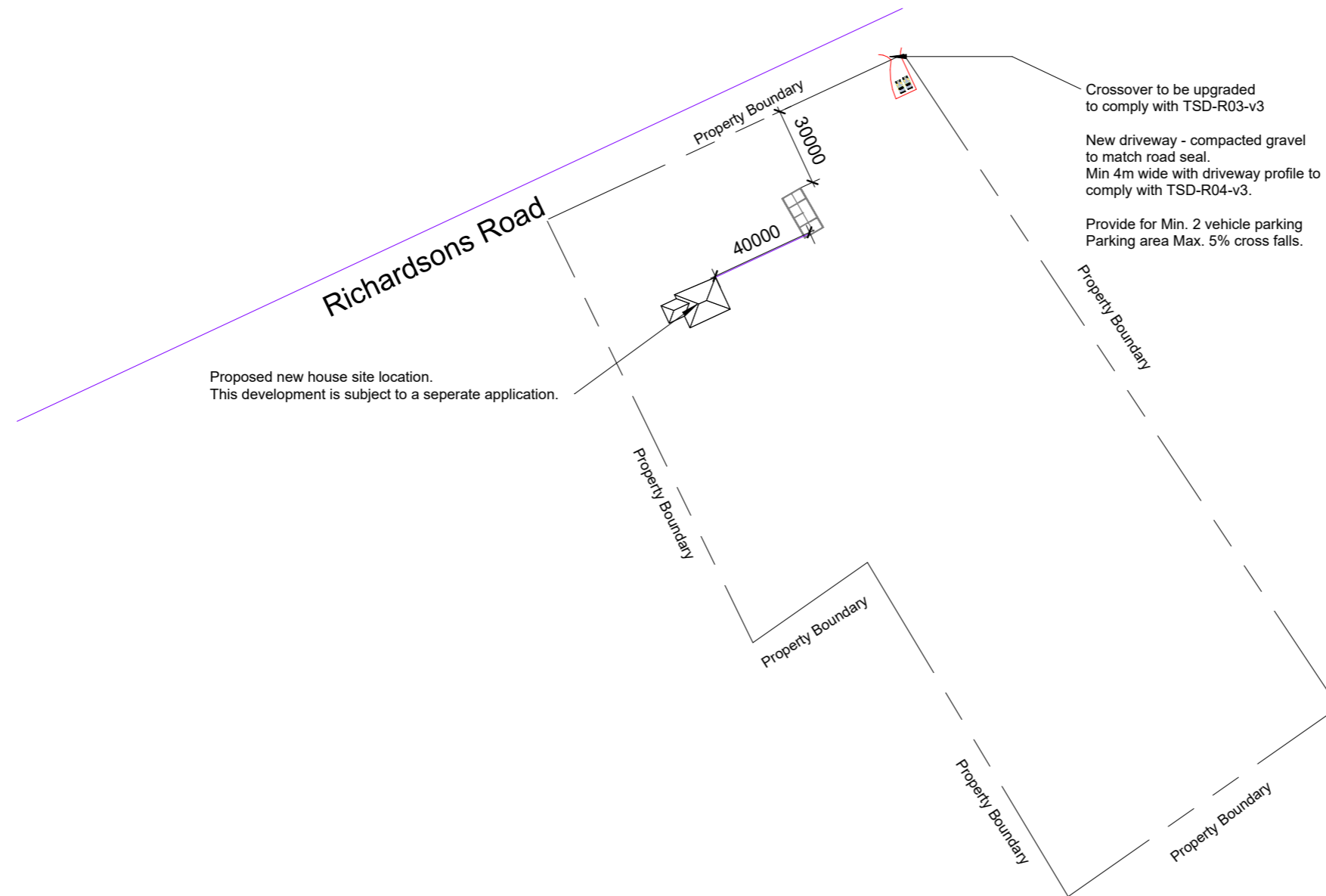
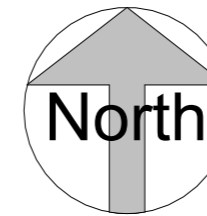
Witness signature: [Signature]  
 Full name (print): Gregory Lewis May  
 Witness address: 310 Forest Hill Rd Sandford

Signed by **Margaret Beatrice May** in the presence of: Margaret May  
 of: \_\_\_\_\_

Witness signature: [Signature]  
 Full name (print): Gregory Lewis May  
 Witness address: 310 Forest Hill Rd Sandford

1-72499534-2 **NOTE:** Every annexed page must be signed by the parties to the dealing or where the party is a corporate body be signed by the persons who have attested the affixing of the seal of that body to the dealing.

Ⓞ



**DIMENSION NOTE:**

Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setouts and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

**DRAWING NOTE:**

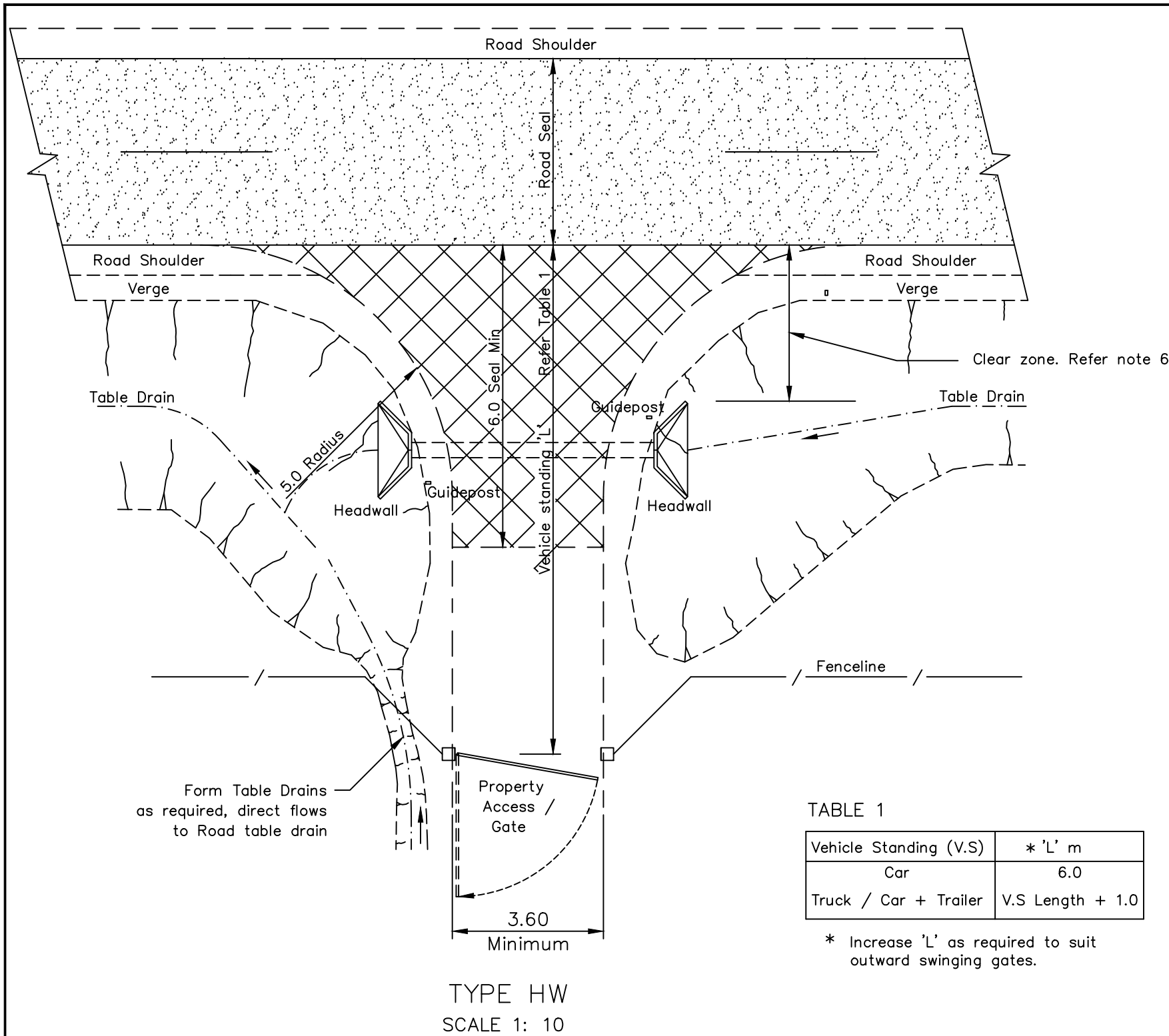
This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.



57 Cove Hill Road  
Bridgewater TAS 7030  
(03) 6263 6545  
hobart@shedsnhomes.com.au

BLST Pty Ltd  
ABN 52 660 422 159

|  |  |                                      |                   |                      |
|--|--|--------------------------------------|-------------------|----------------------|
| CLIENT NAME<br>Suanne Joy Lawrence               |  | DRAWING TITLE<br>SITEPLAN WHOLE SITE |                   |                      |
| PROJECT ADDRESS<br>81 Richardsons Road, Sandford |  | DATE<br>08/08/2025                   | SCALE<br>1 : 2000 | DRAWN BY<br>SH       |
| PROJECT<br>New Farm Shed                         |  | REVISION No.                         | SHEET SIZE<br>A3  | JOB No.<br>SNH25-035 |
|  |  |                                      |                   | SHEET No.<br>C2.1    |



Form Table Drains as required, direct flows to Road table drain

TYPE HW  
SCALE 1: 10

KEY  
HW - Head Wall  
DCE - Driveable Culvert Endwall

TABLE 1

| Vehicle Standing (V.S) | * 'L' m          |
|------------------------|------------------|
| Car                    | 6.0              |
| Truck / Car + Trailer  | V.S Length + 1.0 |

\* Increase 'L' as required to suit outward swinging gates.

NOTES

- Property Access Seal Types:
  - Adopt the seal type on the adjacent road (Asphalt / hot Sprayed bituminous surfacing).
  - Seal is not required for property access off unsealed roads.
- Offset property entrance gate to provide adequate vehicle standing area clear of road edge, as required.
- Install guideposts at :
  - culvert end walls.
  - the start of the access ('nearside' lane approach only).
- Pipe Culvert.
  - Pipe size, type, class, cover and grade shall be determined by consideration of the drainage catchment, rainfall I.F.D. data and road grade for an AEP 10 years (min).
  - Minimum pipe size - 300 dia.
  - Minimum grade - 1 in 100 (1%).
- Shallow dish crossing may be used as an alternative.
- Refer to Department of State Growth Road Hazard Management Guide - Figures 6 and 7 for clear zone determination. Headwalls inside clear zone are to be driveable.

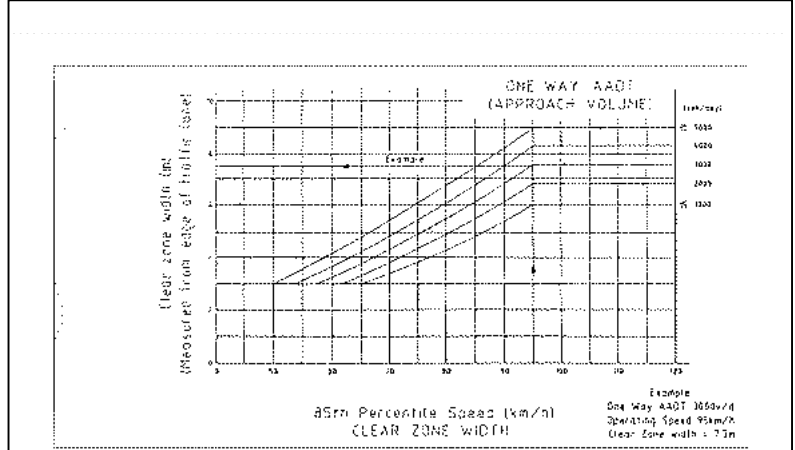


Figure 6: Clear zonewidth chart (Austroads 2003b)

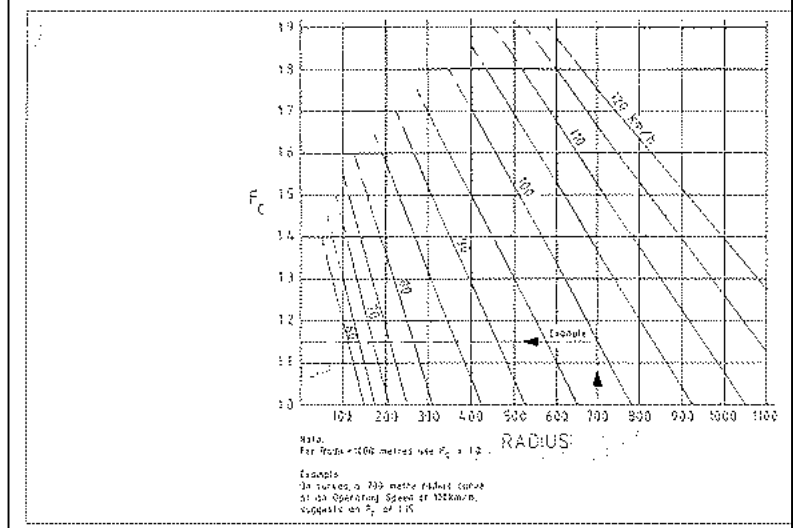


Figure 7: Curve adjustment factors for clear zones (Austroads 2003b)

SCALES: AS SHOWN  
(All scales are correct at A3)

XRef File: TSD-R03-v3.dwg

REFERENCES

© 2020  
This drawing and the information it contains is, and remains the property of the Local Government Association of Tasmania, and may only be used for the purpose of which it was intended. Reproduction of this drawing or its content in any format other than printed hard copies or PDF is strictly prohibited.  
It is the users responsibility to ensure this drawing is the current version. The current version can be downloaded from: [www.lgat.tas.gov.au](http://www.lgat.tas.gov.au)

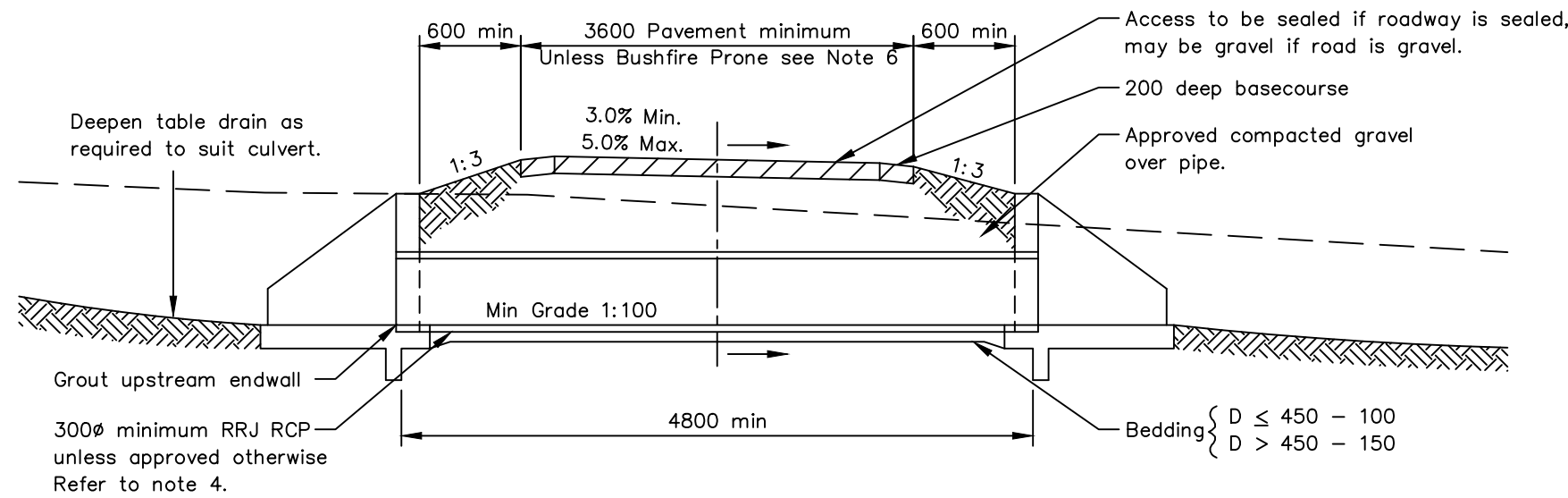
TAS Division  
**IPWEA**  
INSTITUTE OF PUBLIC WORKS  
ENGINEERING AUSTRALASIA

**LGAT**  
Local Government  
Association  
Tasmania

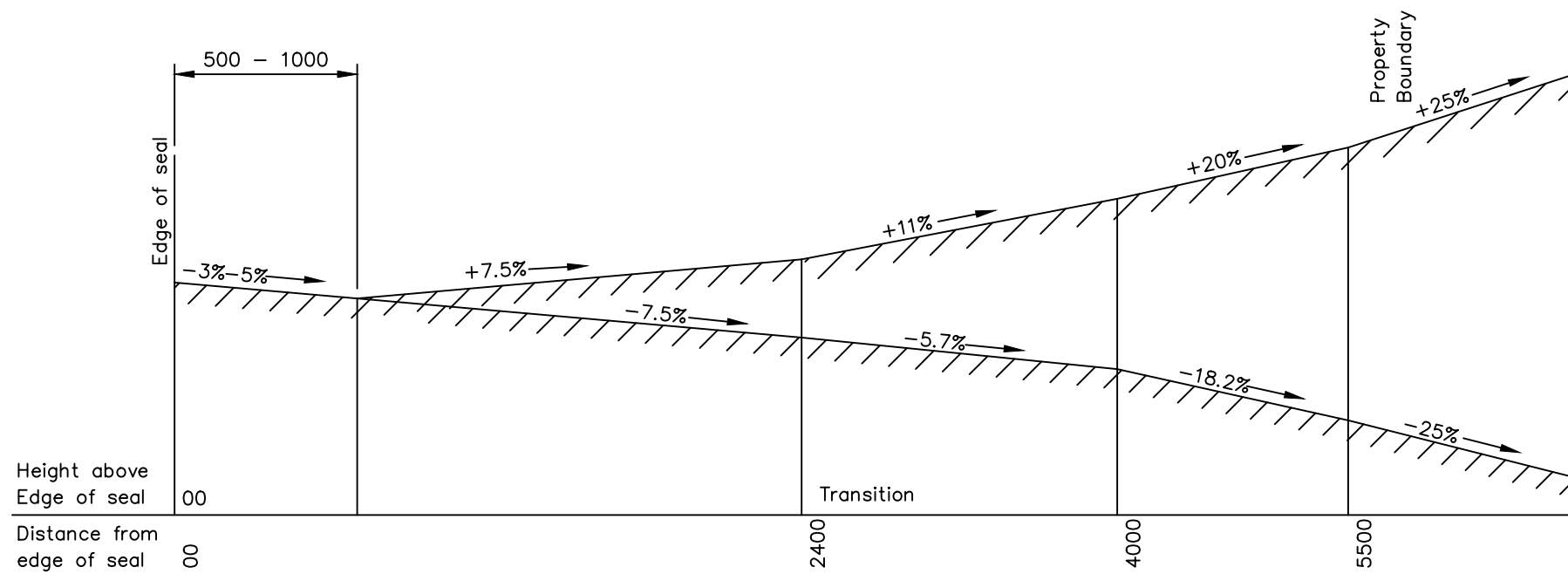
**STANDARD DRAWING**  
RURAL ROADS  
TYPICAL PROPERTY ACCESS

GPO Box 1521, Hobart Tasmania 7001 | 326 Macquarie Street, Hobart Tasmania 7000  
T: 03 6233 5966 F: 03 6233 5986 Email: [admin@lgat.tas.gov.au](mailto:admin@lgat.tas.gov.au)

ISSUE DATE: 18-09-2020 DWG No. TSD-R03-v3



CROSS SECTION



DRIVEWAY PROFILE

Culvert removed for clarity

NOTES

- All dimensions in millimetres (mm) unless noted
- Precast endwall to be winged type or other approved type.
- Shallow dish crossing may be used as an alternative
- Min clear cover over driveway culverts shall be:
 

|                     |            |
|---------------------|------------|
| Pipe Class:         | Min Cover: |
| -Class 2 (Concrete) | 600        |
| -Class 3 (Concrete) | 400        |
| -Class 4 (Concrete) | 300        |

 (All other pipes refer to manufacturers recommendations.)
- Install guideposts at culvert ends.
- Minimum pavement width of 4 metres where access is required for a fire appliance. Additional width may be required for the provision of passing bays.

SCALES: AS SHOWN  
(All scales are correct at A3)

XRef File: TSD-R04-v3.dwg

REFERENCES

© 2020

This drawing and the information it contains is, and remains the property of the Local Government Association of Tasmania, and may only be used for the purpose of which it was intended. Reproduction of this drawing or its content in any format other than printed hard copies or PDF is strictly prohibited.

It is the users responsibility to ensure this drawing is the current version. The current version can be downloaded from: [www.lgat.tas.gov.au](http://www.lgat.tas.gov.au)



**IPWEA**

INSTITUTE OF PUBLIC WORKS  
ENGINEERING AUSTRALASIA

TAS Division



**STANDARD DRAWING**  
RURAL ROADS  
TYPICAL DRIVEWAY PROFILE

GPO Box 1521, Hobart Tasmania 7001 | 326 Macquarie Street, Hobart Tasmania 7000  
T: 03 6233 5966 F: 03 6233 5986 Email: [admin@lgat.tas.gov.au](mailto:admin@lgat.tas.gov.au)

ISSUE DATE: 18-09-2020

DWG No.

TSD-R04-v3

# CONSTRUCTION

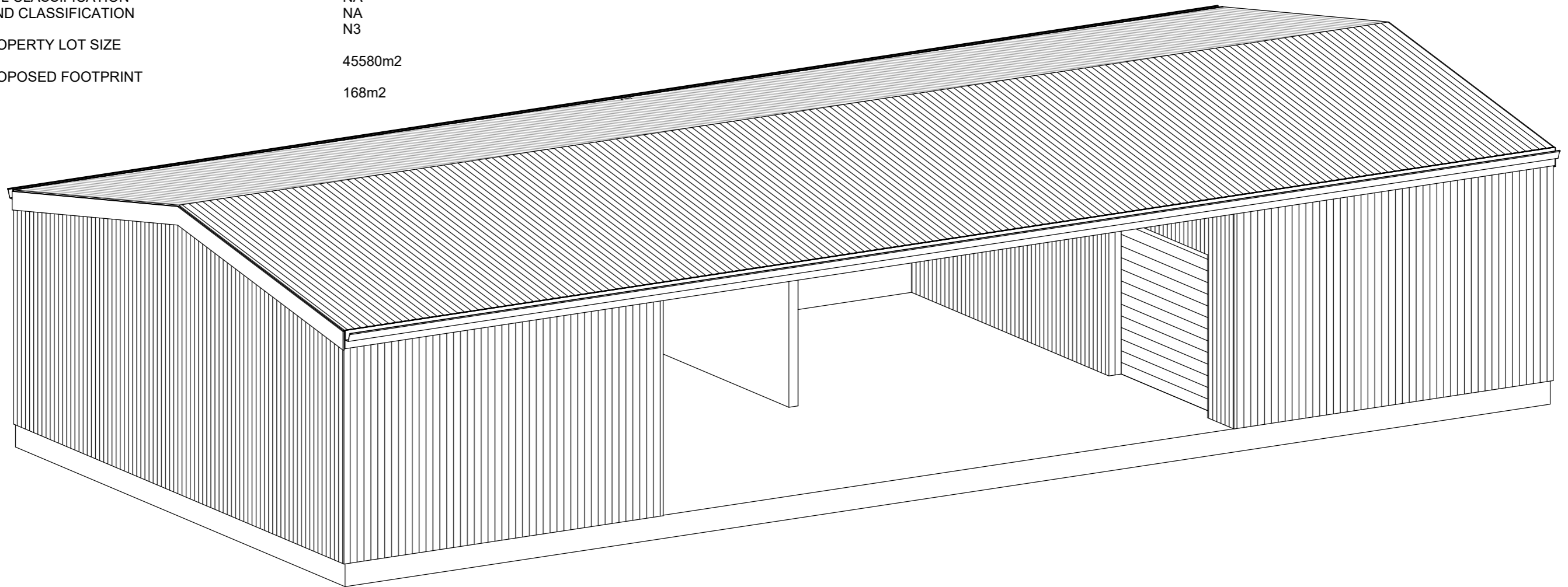
# NEW FARM SHED

CLASS 10A  
SNH25-035

## CONTENTS

|      |                     |
|------|---------------------|
| A1.0 | COVER PAGE          |
| A2.0 | SITEPLAN            |
| A2.1 | SITEPLAN WHOLE SITE |
| A3.0 | FLOORPLAN           |
| A4.0 | ELEVATIONS          |
| A4.1 | ELEVATIONS          |

|                                |   |
|--------------------------------|---|
| CLIENT                         | Suanne Joy Lawrence   |
| PROPERTY ADDRESS               | 81 Richardsons Road, Sandford   |
| PROPERTY TITLE REFERENCE       | 184625/2  |
| PROPERTY IDENTIFICATION NUMBER | 9823852   |
| LOCAL AUTHORITY                | Clarence  |
| PLANNING ZONE                  | Rural   |
| OVERLAYS                       | Airport Obstacle Limitation Area, Low Coastal inundation hazard band, medium coastal inundation hazard band, Future Coastal refugia area, |
| BUSHFIRE ATTACK LEVEL          | Flood-Prone areas, Bushfire Prone areas   |
|                                | NA  |
| CORROSION ENVIRONMENT          | NA  |
| SOIL CLASSIFICATION            | NA  |
| WIND CLASSIFICATION            | N3  |
| PROPERTY LOT SIZE              | 45580m2   |
| PROPOSED FOOTPRINT             | 168m2   |



**DIMENSION NOTE:**

Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setbacks and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

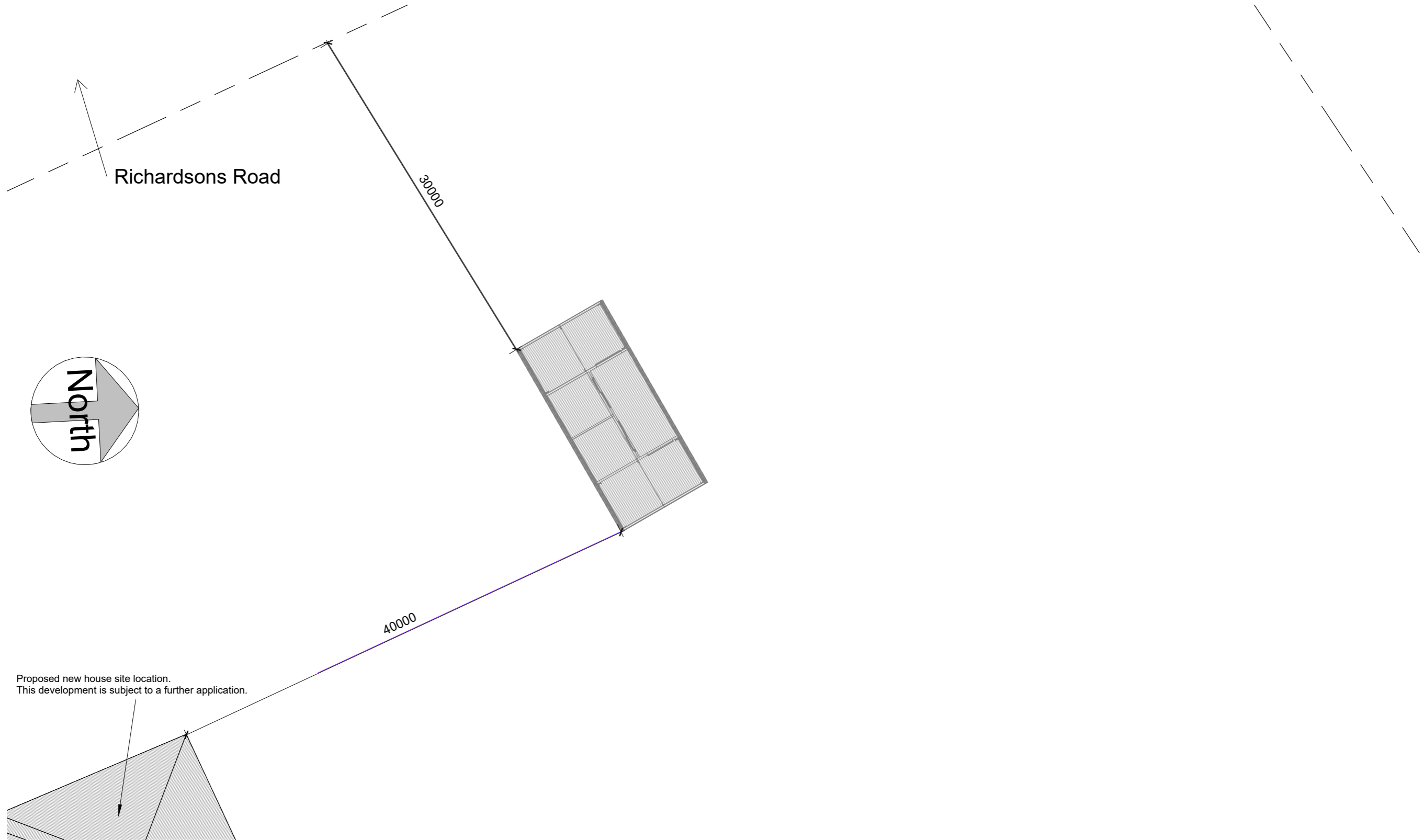
**DRAWING NOTE:**

This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.



57 Cove Hill Road  
Bridgewater TAS 7030  
(03) 6263 6545  
hobart@shedsnhomes.com.au  
BLST Pty Ltd  
ABN 52 660 422 159

|  |  |                             |                  |                     |
|--|--|-----------------------------|------------------|---------------------|
| CLIENT NAME<br>Suanne Joy Lawrence               |  | DRAWING TITLE<br>COVER PAGE |                  |                     |
| PROJECT ADDRESS<br>81 Richardsons Road, Sandford |  | DATE<br>08/08/2025          | SCALE            | DRAWN BY<br>SH      |
| PROJECT<br>NEW FARM SHED                         |  | REVISION No                 | SHEET SIZE<br>A3 | JOB No<br>SNH25-035 |
|  |  |                             |                  | SHEET No<br>A1.0    |



Proposed new house site location.  
This development is subject to a further application.

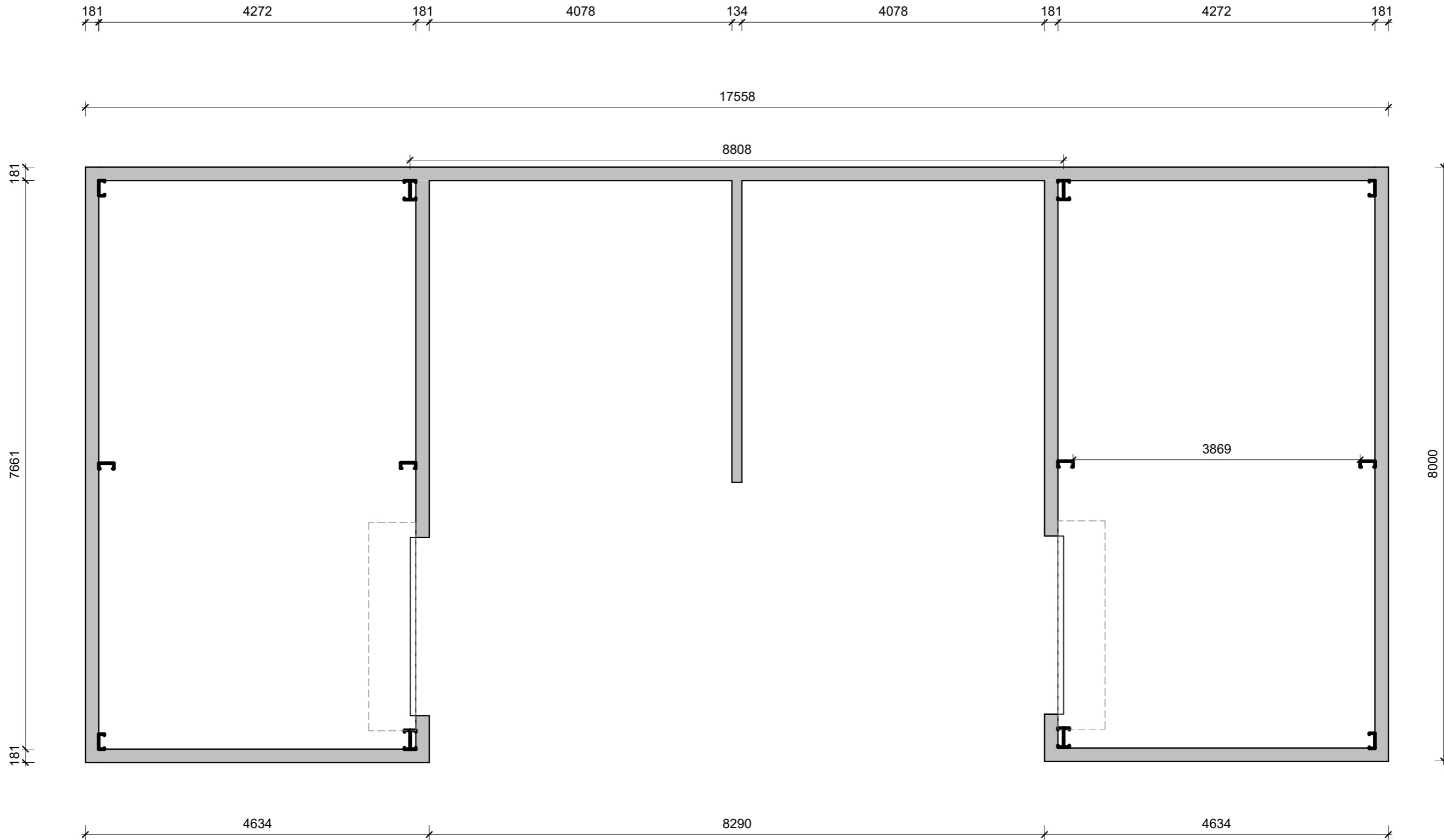
**DIMENSION NOTE:**  
Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setouts and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

**DRAWING NOTE:**  
This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.



57 Cove Hill Road  
Bridgewater TAS 7030  
(03) 6263 6545  
hobart@shedsnhomes.com.au  
BLST Pty Ltd  
ABN 52 660 422 159

|  |  |                           |                  |                     |
|--|--|---------------------------|------------------|---------------------|
| CLIENT NAME<br>Suanne Joy Lawrence               |  | DRAWING TITLE<br>SITEPLAN |                  |                     |
| PROJECT ADDRESS<br>81 Richardsons Road, Sandford |  | DATE<br>08/08/2025        | SCALE<br>1 : 300 | DRAWN BY<br>BH      |
| PROJECT<br>New Farm Shed                         |  | REVISION No               | SHEET SIZE<br>A3 | JOB No<br>SNH25-035 |
|  |  |                           |                  | SHEET No<br>C2.0    |



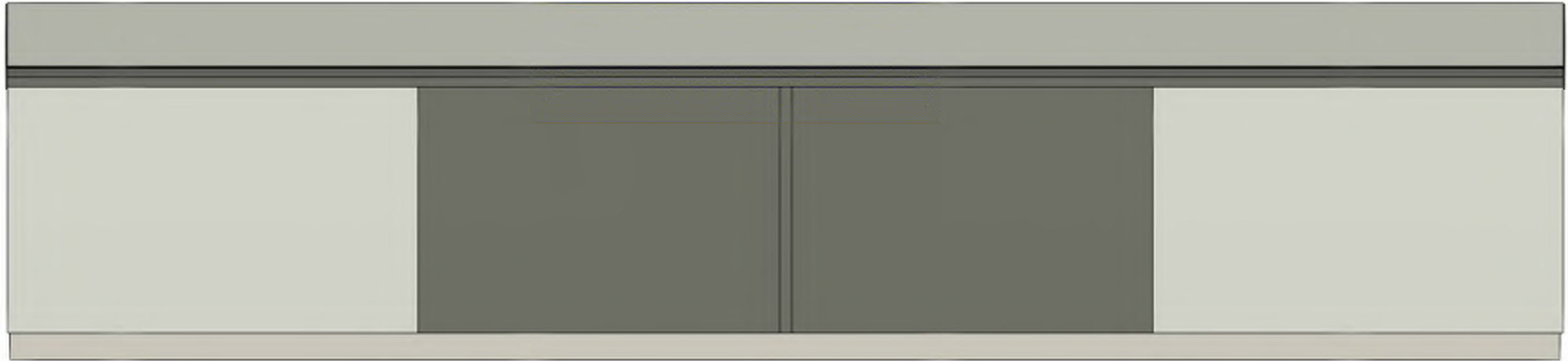
**DIMENSION NOTE:**  
 Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setbacks and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

**DRAWING NOTE:**  
 This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.



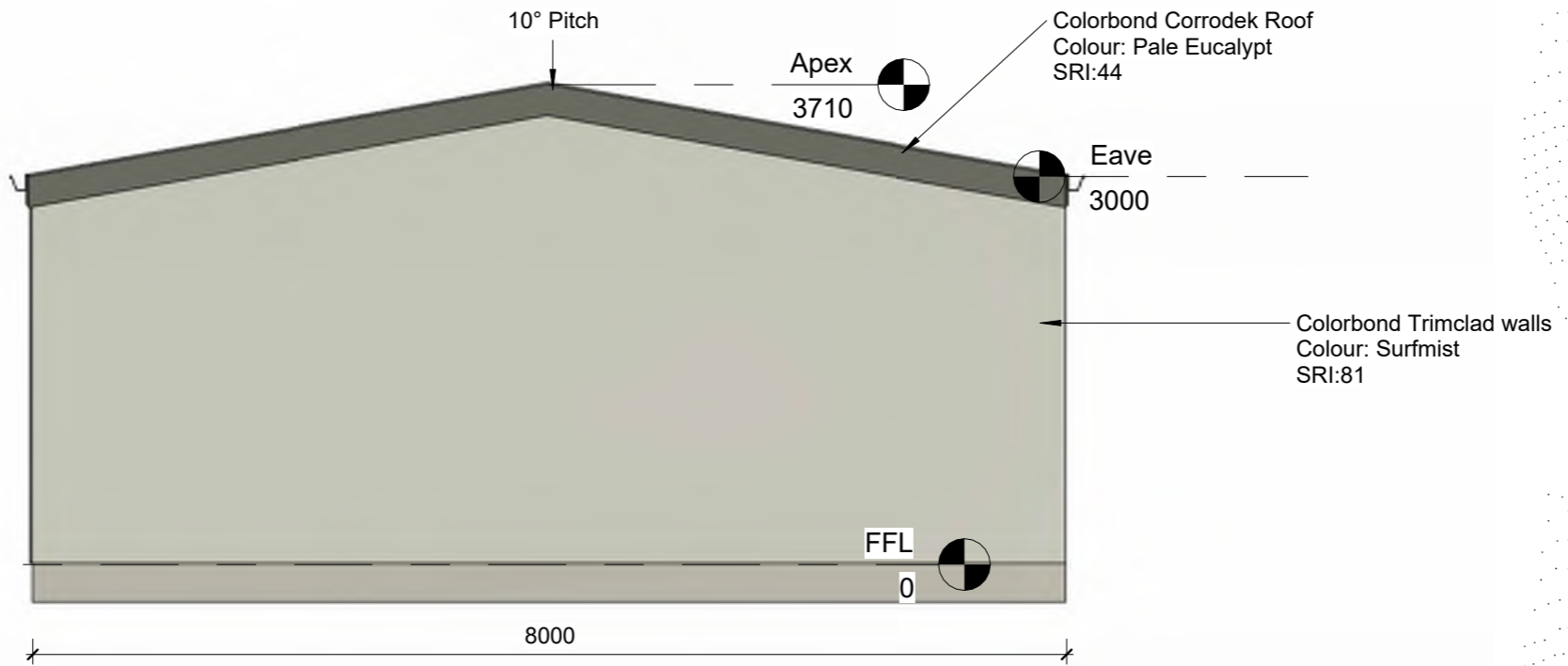
57 Cove Hill Road  
 Bridgewater TAS 7030  
 (03) 6263 6545  
 hobart@shedsnhomes.com.au  
 BLST Pty Ltd  
 ABN 52 660 422 159

|  |  |                            |                  |                      |
|--|--|----------------------------|------------------|----------------------|
| CLIENT NAME<br>Suanne Joy Lawrence               |  | DRAWING TITLE<br>FLOORPLAN |                  |                      |
| PROJECT ADDRESS<br>81 Richardsons Road, Sandford |  | DATE<br>08/08/2025         | SCALE<br>1 : 50  | DRAWN BY<br>SH       |
| PROJECT<br>NEW FARM SHED                         |  | REVISION No.               | SHEET SIZE<br>A3 | JOB No.<br>SNH25-035 |
|  |  |                            |                  | SHEET No.<br>A3.0    |



**2** North  
1 : 50

17558



**1** East  
1 : 50

**DIMENSION NOTE:**  
Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setbacks and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

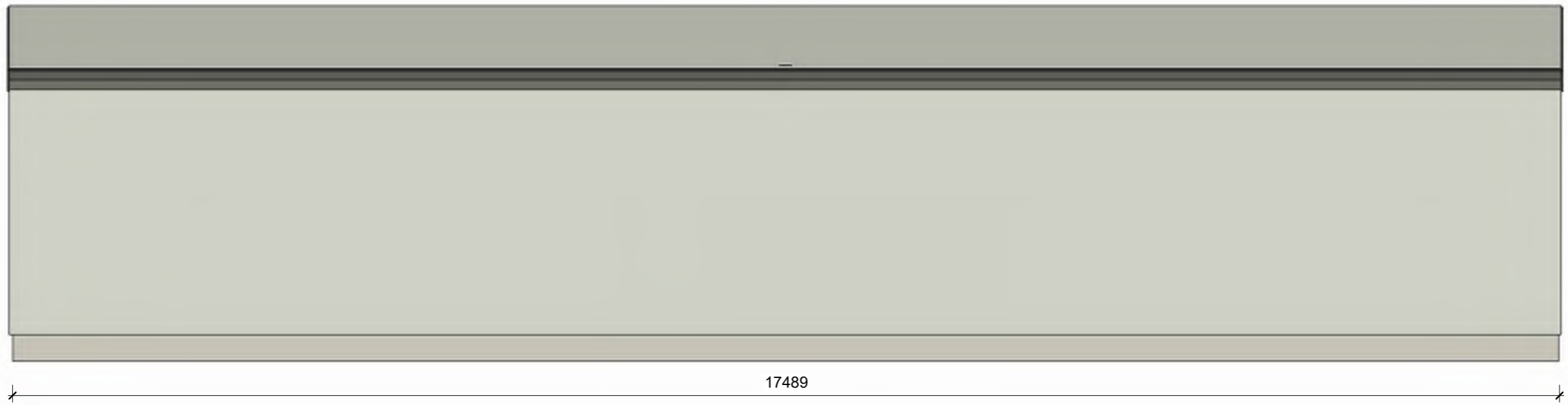
**DRAWING NOTE:**  
This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.

**SHEDS HOMES**  
SHEDS. MADE TOUGH

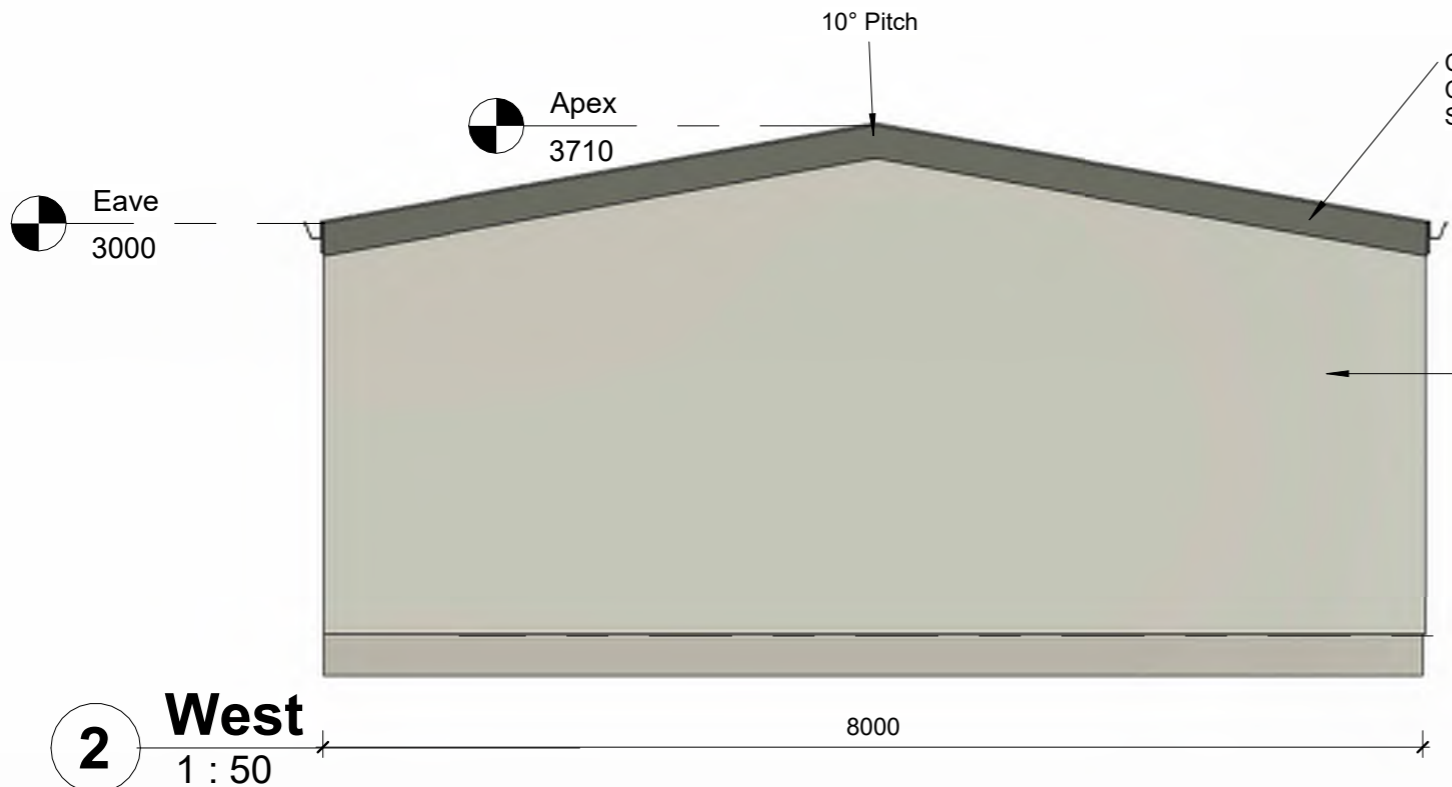
57 Cove Hill Road  
Bridgewater TAS 7030  
(03) 6263 6545  
hobart@shedsnhomes.com.au

BLST Pty Ltd  
ABN 52 660 422 159

|                 |                               |           |               |        |            |  |
|-----------------|-------------------------------|-----------|---------------|--------|------------|--|
| CLIENT NAME     | Suanne Joy Lawrence           |           | DRAWING TITLE |        | ELEVATIONS |  |
| PROJECT ADDRESS | 81 Richardsons Road, Sandford |           | DATE          | SCALE  | DRAWN BY   |  |
| PROJECT         | NEW FARM SHED                 |           | 08/08/2025    | 1 : 50 | SH         |  |
| REVISION No     | SHEET SIZE                    | JOB No    | SHEET No      |        |            |  |
|                 | A3                            | SNH25-035 | A4.0          |        |            |  |



**1 South**  
1 : 50



**2 West**  
1 : 50

Colorbond Corrodek roof  
Colour: Pale Eucalypt  
SRI:44

Colorbond Trimclad walls  
Colour: Surfmist  
SRI:81

FFL  
0

**DIMENSION NOTE:**  
Use written dimensions only. Do not scale from drawings. All figured dimensions are to be used as a guide only. It is imperative that all dimensions, setbacks and levels be confirmed onsite by the builder, Surveyor or Sub Contractor prior to the commencement of work, manufacture or installation; and the Builder, Sub Contractor and/or manufacturer ensures a full set of plans are on hand and reference has been made to the general notes

**DRAWING NOTE:**  
This drawing & design shown is the property of BLST Pty Ltd and shall not be copied nor reproduced in part or in whole in any form without the written permission of BLST Pty Ltd and shall be used only by the client of BLST Pty Ltd for the project for which it was provided.



57 Cove Hill Road  
Bridgewater TAS 7030  
(03) 6263 6545  
hobart@shedsnhomes.com.au  
BLST Pty Ltd  
ABN 52 660 422 159

|  |                             |                  |                      |
|--|-----------------------------|------------------|----------------------|
| CLIENT NAME<br>Suanne Joy Lawrence               | DRAWING TITLE<br>ELEVATIONS |                  |                      |
| PROJECT ADDRESS<br>81 Richardsons Road, Sandford | DATE<br>08/08/2025          | SCALE<br>1 : 50  | DRAWN BY<br>SH       |
| PROJECT<br>NEW FARM SHED                         | REVISION No.                | SHEET SIZE<br>A3 | JOB No.<br>SNH25-035 |
|  |                             |                  | SHEET No.<br>A4.1    |

## COASTAL INUNDATION HAZARD ASSESSMENT



### LOT 2 81 RICHARDSONS ROAD - SANDFORD PROPOSED DWELLINGS AND SHED

Client: Suanne Lawrence

Certificate of Title: 184625/2

Investigation Date: 26/09/2025

**Refer to this Report As**

Enviro-Tech Consultants Pty. Ltd. 2025. Coastal Inundation Hazard Assessment Report for a Proposed Dwellings And Shed, Lot 2 81 Richardsons Road - Sandford. Unpublished report for Suanne Lawrence by Enviro-Tech Consultants Pty. Ltd., 26/09/2025.

**Report Distribution**

This report has been prepared by Enviro-Tech Consultants Pty. Ltd. for the use by parties involved in the proposed residential development of the property named above. It is to be used only to assist in managing any existing or potential inundation hazards relating to the Site and its development.

Permission is hereby given by Enviro-Tech Consultants Pty. Ltd., and the client, for this report to be copied and distributed to interested parties, but only if it is reproduced in colour, and only distributed in full. No responsibility is otherwise taken for the contents.

**Reporting Declaration –Coastal Erosion**

This Hazard Assessment Report includes a Geotechnical Site Investigation which has been prepared in accordance with AS1726 and the Tasmanian Planning Scheme, and the Director's Determination and reviewed by a geotechnical practitioner with experience and competence in the preparation of coastal vulnerability assessment reports (see Attachment 30 for signed declaration & verification).

**Reporting Declaration – Coastal Inundation**

This Hazard Assessment Report includes an inundation assessment which has been prepared in accordance with the Tasmanian Planning Scheme and the Director's Determination – Coastal Inundation Hazard Areas and supervised by an environmental and engineering geologist with more than 10 years of experience and competence in coastal inundation modelling (see Attachment 30 for signed declaration & verification).

**Limitations of this report - Inundation**

No responsibility is accepted for subsequent activities onsite by owners including but not limited to placement of fill, uncontrolled earthworks or altered drainage conditions.

This report has been prepared based on provided plans detailed herein. Should there be any significant changes to these plans, then this report should not be used without further consultation. This report should not be applied to any project other than indicated herein.

## Executive Summary

Enviro-Tech Consultants Pty. Ltd. (Envirotech) were contracted by Benjamin Harris of Sheds n Homes, on behalf of Suanne Lawrence, to prepare a Coastal Inundation Assessment for a proposed dwelling at Lot 2, 81 Richardsons Road, Sandford, which is herein defined as the Site.

The proposal involves the construction of a single dwelling, a non-habitable shed and an internal access driveway within a defined building and works area located on elevated ground within the Lot. The dwelling is proposed to achieve a mandatory minimum finished floor level of 3.0 m AHD, in accordance with the requirements of the Tasmanian Planning Scheme for development within coastal inundation hazard areas.

The Lot is mapped within the Medium Coastal Inundation Hazard Band and the Future Coastal Refugia Overlay under the Tasmanian Planning Scheme. Accordingly, the proposal has been assessed against the Natural Assets Code (C7) and the Coastal Inundation Hazard Code (C11), as well as the relevant Director's Determination relating to coastal inundation risk, finished floor levels and tolerable risk for the intended life of development.

The Lot comprises previously disturbed agricultural land with generally low relief. Ground elevations across the defined building and works area (The Site) range from approximately 1.8 m AHD to 2.2 m AHD, while lower-lying portions of the Lot occur outside the development footprint. The Site is inland, approximately 800 m from the coast, and is hydrologically separated from coastal and marine systems by intervening lagoon environments and natural topographic barriers. Regional geology and soil conditions are typical of the Sandford area and do not present constraints to the proposed development when appropriate siting and earthworks controls are applied.

A detailed coastal inundation assessment was undertaken, incorporating stillwater storm-tide assessment for Ralphs Bay, hydrodynamic assessment of Pipe Clay Lagoon and Rushy Lagoon, and a conservative groundwater rise assessment for 2100 1% annual exceedance probability (AEP) conditions. The assessment demonstrates that the limiting inundation condition at the Site is groundwater rise, with a conservative design groundwater elevation of approximately 1.73 m AHD. No surface inundation of the defined building and works area is predicted under the assessed scenarios, and all proposed buildings are located above modelled inundation levels.

Natural values and future coastal refugia were also assessed in accordance with Code C7. While the Lot is mapped within the Future Coastal Refugia Overlay at a strategic level, site-specific assessment demonstrates that the building and works area does not function as, nor is it required to accommodate, future coastal refugia or landward migration of coastal habitats. Clear Lagoon is an inland, hydrologically isolated saline system with no tidal influence, and no threatened flora, threatened vegetation communities or freshwater ecosystem values occur within the Site. The proposed development will not constrain future coastal processes or natural asset function.

A qualitative risk assessment was undertaken in accordance with AS/NZS ISO 31000, adopting a consequence–likelihood matrix consistent with the Director’s Determination. The likelihood of inundation affecting the Site is assessed as Barely Credible, with potential consequences limited to Minor impacts on non-habitable structures only under highly unlikely conditions. The resulting overall risk is classified as Very Low, which is considered acceptable and does not require specific hazard reduction or protection measures.

In summary, the proposed development satisfies the intent and requirements of the Natural Assets Code (C7), the Coastal Inundation Hazard Code (C11) and the relevant Director’s Determination under the Tasmanian Planning Scheme. The Site can achieve and maintain a tolerable level of risk from coastal inundation for the intended life of the development, will not increase risk to adjacent land or public infrastructure, and is considered suitable for the proposed use.

For the purposes of the Natural Assets Code C7.6.1 P2.1, it is established that the proposed building and works are for a use that relies upon the location to fulfil its purpose, having regard to the need to access a specific on-site resource. The dwelling is required to enable the ongoing keeping and care of horses, which is a land-dependent rural use that relies on access to on-site pasture, stock infrastructure and groundwater resources that are inherently location-specific. This use is consistent with, and comparable to, the established equestrian and rural land uses on neighbouring properties, all of which rely on the same on-site resources. Given the inland setting of the Lot and the absence of any credible coastal inundation influence, the proposed development does not depend on a coastal location, but rather on access to these site-specific rural resources, thereby satisfying the intent and requirements of C7.6.1 P2.1.

# 1 Introduction

## 1.1 Background

Enviro-Tech Consultants Pty. Ltd. (Envirotech) were contracted by Suanne Lawrence to prepare a Coastal Inundation Assessment for a proposed dwelling and shed at Lot 2 81 Richardsons Road, Sandford which is herein defined as the Site (Map 1).

Envirotech have assessed risks based on the supplied Site plans for the proposed development, modelling constraints stipulated within the Directors Determination, the Tasmanian Planning Scheme, and the 2016 Tasmanian Building Regulations (TPS)

## 1.2 Scope

The scope of the Site investigation is to:

- Identify which overlay codes apply to the Site to determine development constraints including planning scheme exemptions, acceptable solutions, performance criteria as well as directors' determinations and building regulations specific to the identified hazards.
- Prepare a desktop review of relevant geomorphologic, hydrological and natural asset information for the Lot, Site and proposed development, including interpretation of available aerial imagery and topographic data.
- Complete an invasive Site investigation comprising installation and gauging of a groundwater monitoring point to support inundation modelling and Site characterisation.
- Using available geographic information system (GIS) data, construct a hydrodynamic, and coastal process model for the Site to interpret present and future Site conditions and how the proposed development may influence and be influenced by future Site inundation and natural assets.
- Model coastal inundation inflow from Ralph's Bay, Pipe Clay Lagoon and localised groundwater based on 1% AEP events for the year 2100.
- Prepare a risk assessment for the proposed development in terms of coastal inundation hazards ensuring relevant building regulations, Directors Determination, and where applicable performance criteria are addressed; and
- Where applicable, provide recommendations on methods and design approach to adapt to Site hazards.

## 1.3 Cadastral Title

The land studied in this report is defined by the title 184625/2

## 1.4 Site Setting

The Project Area and Site location plans are presented in Map 2, Attachment 1. The Site is positioned on a gently undulating coastal plain in Sandford, located approximately 800 m north of Rushy Lagoon and about 800 m southeast of Ralphs Bay. The surrounding landscape comprises low-relief terrain typical of the South Arm Peninsula, with local drainage and shallow groundwater influenced by nearby coastal and lagoonal systems.

## 1.5 Proposed Development

Table 1 summarises the provided design documents from which this assessment is based with plans presented in Attachment 2 with the Site outlay presented in Map 3.

**Table 1 Project Design Drawings**

| Drafted By    | Project ID | Date Generated | Pages |
|---------------|------------|----------------|-------|
| Sheds & Homes | SNH25-035  | 08/08/2025     | C2.1  |

The proposal involves the development of a dwelling and shed towards the northern side of the block. Envirotech will be providing recommended finished floor levels as part of this assessment.

## 2 Hazard Overlays

Planning code overlay mapping is presented in Attachment 1.

### 2.1 Planning

Planning code overlay descriptions, objectives and acceptable solutions are addressed in Attachment 4.

Individual performance criteria are addressed in Attachment 11 and Attachment 12.

#### 2.1.1 Natural Assets Code C7

Coastal natural asset (future coastal refugia) overlay mapping are presented in Map 3. Planning details are presented in Attachment 3, with a natural asset assessment presented in Attachment 8 and code performance criteria addressed in Attachment 11. The following relevant codes have been addressed:

- C7.6.1A2 acceptable solution is not met given the Site is within the mapped future coastal refugia area but is not located within a building area on a sealed plan approved under this planning scheme. Performance criteria C7.6.1 P2.1 and C7.6.1 P2.2 have therefore been addressed.
- Performance criteria C7.6.1 P2.1 has been assessed in Attachment 8
- In addressing Performance criteria C7.6.1 P2.1, it has been established that the buildings and works are for a use that relies upon the location to fulfil its purpose with the need to access a specific resource at the location.

#### 2.1.2 Coastal Inundation Code C11

Coastal inundation hazard overlay mapping are presented in Map 4 and coastal inundation planning codes are addressed in more detail in Attachment 4 with the following codes addressed:

- **C11.5.2 A1** There are no acceptable solutions to uses located within a non-urban (rural) zone and within a medium coastal inundation hazard band:
  - **C10.5.2 P1.1** To address erosion hazards and tolerable risks from a coastal erosion event in 2100 and the potential need for hazard reduction or protection measures.
  - **C10.5.2 P1.2** modelling is conducted to ensure the use can achieve and maintain a tolerable risk<sup>1</sup> from a 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the use without requiring any specific hazard reduction or protection measures.
- **C11.6.2 A1** As there are no acceptable solutions to C11.6.2 A1, the proposed development is assessed against performance criteria C11.6.2 P1

<sup>1</sup> Tolerable risk means the lowest level of likely risk from coastal inundation from a defined flood event to secure the benefits of a use or development in a coastal inundation hazard area, and which can be managed through routine regulatory measures or by specific hazard management measures for the intended life of each use or development.

## 2.2 Building

### 2.2.1 Coastal Inundation Hazard Overlay

The director's determination specifies (Division 2.2.1) that the defined flood level is above the 0 metres Australian Height Datum (AHD) level with a one per cent probability of being exceeded in a storm surge flooding event in the year 2100, as specified in the Coastal Inundation Hazard Band Levels List (which includes the Site) at:

#### 2.7 m AHD for Sandford

### 2.2.2 Proposed Dwelling

According to the director's determination and the Tasmanian Building Regulations 2016, buildings with *habitable rooms*<sup>2</sup> including residential structures (Class 1) within a coastal inundation hazard area must have finished floor level of at least 300 millimetres above the *defined flood level* for the land (which includes the Site) at or above:

#### 3.0 m AHD for Sandford

### 2.2.3 Proposed Shed

Given Class 10 structures do not have habitable rooms, Class 10 structures are to be assessed in terms of *tolerable risks only*. *The ground level near the shed ranges from 1.9 to 2.1m AHD with an average ground level of 2.0m and an estimated FFL of 2.1m AHD.*

### 2.2.4 Coastal Inundation Risk Assessment (outbuilding or class 10 structure) tolerable risks

This coastal inundation assessment goes above and beyond the building design life (2075) scenario and extends the inundation model criteria out to include 2100 sea levels. Therefore, the tolerable risks assessed herein as part of the Directors Determination are covered in the Tasmanian Planning Scheme Assessment.

---

<sup>2</sup> habitable rooms "means any room of a dwelling other than a bathroom, laundry, toilet, pantry, walk-in wardrobe, corridor, stair, hallway, lobby, clothes drying room and other space of a specialised nature occupied neither frequently nor for extended periods."

## 3 Desktop Summary

### 3.1 Topography

The Site ranges in elevation from approximately 1.8 m AHD to 2.1 m AHD and is near-level, consistent with the low-lying coastal plain of the South Arm Peninsula. The shallow relief allows overland flow to disperse slowly and makes the Site sensitive to elevated coastal water levels and localised ponding during high-rainfall or tidal-inundation events.

### 3.2 Published Geology

According to the 1:250,000 geological mapping by Mineral Resources Tasmania (MRT), as presented in Map 12, the geology of the Project Area comprises:

- Undifferentiated Quaternary sediment.

## 4 Inundation Assessment

### 4.1 Assessment Methods

The assessment focuses on determining future inundation levels near the proposed development in order to adequately address both the Tasmanian Planning Scheme and relevant Director's Determinations.

#### 4.1.1 Ralphps Bay Storm-Tide Inundation and Coastal Overtopping Assessment

Potential coastal inundation from Ralphps Bay was assessed using a conservative 2100 1% AEP storm-tide scenario incorporating astronomical tide, storm surge, projected sea-level rise (RCP8.5) and wind setup, with wave setup and run-up excluded due to the inland setting of the Site. Modelled stillwater levels were applied to regional LiDAR-derived topography to evaluate the potential for marine inundation or overtopping to propagate landward toward the Site, having regard to intervening topographic controls between Ralphps Bay and the lagoon system.

#### 4.1.2 Pipe Clay Lagoon and Rushy Lagoon Inlet Hydrodynamic Assessment

Potential inundation via Pipe Clay Lagoon and Rushy Lagoon was assessed using an inlet-controlled hydrodynamic approach based on a time-varying 2100 storm-tide boundary condition combining astronomical tide, extreme barometric low-pressure effects and projected sea-level rise, with wind setup excluded due to the scale of the water body. Hydraulic exchange through the Rushy Lagoon inlet was assessed by analysing tidal and barometric low pressure exceedance of the inlet control elevation, calculating inflow and outflow volumes during exceedance periods, and applying these volumes to a storage–elevation relationship derived from a 2 m hydrographic digital elevation model to estimate lagoon water levels under extreme conditions, including a conservative rainfall allowance.

#### 4.1.3 Groundwater Rise Assessment for 2100 Conditions

Groundwater inundation potential was assessed by extrapolating groundwater levels recorded during site inspection to projected 2100 conditions using conservative assumptions regarding groundwater recharge and long-term climatic variability. This involved estimating future groundwater depths relative to ground level, converting these to elevations relative to Australian Height Datum, and applying an additional buffer to define a conservative design groundwater level for subsequent comparison with Site elevations and proposed building platforms.

## 4.2 Findings

### 4.2.1 Ralphps Bay Storm-Tide Inundation and Coastal Overtopping Assessment

Stillwater levels for Ralphps Bay under a 2100 1% AEP storm-tide event were calculated by summing projected sea-level rise, local 1% AEP storm tide and wind setup.

- Projected 2100 sea-level rise = 0.93 m AHD
- Local 1% AEP storm tide = 1.35 m
- Wind setup = 0.13 m
- Total 2100 stillwater level =  $0.93 + 1.35 + 0.13 = 2.41$  m AHD

Spatial comparison of this level against regional LiDAR topography demonstrates that a natural elevated barrier between Ralphps Bay and the lagoon system prevents overtopping or landward propagation of marine inundation, with the mapped inundation extent remaining approximately 430 m from the Site. Accordingly, no direct coastal inundation pathway from Ralphps Bay to the Site is identified under the 2100 1% AEP scenario.

### 4.2.2 Pipe Clay Lagoon and Rushy Lagoon Inlet Hydrodynamic Assessment

Stillwater levels for Pipe Clay Lagoon under a 2100 1% AEP storm-tide event were calculated without wind setup due to the limited fetch and scale of the waterbody.

- Projected 2100 sea-level rise = 0.93 m AHD
- Local 1% AEP storm tide = 1.35 m
- Wind setup = 0.00 m
- Total 2100 stillwater level =  $0.93 + 1.35 = 2.27$  m AHD

Hydraulic exchange between Pipe Clay Lagoon and Rushy Lagoon is controlled by an inlet bed elevation of approximately 1.2 m AHD. Analysis of the adjusted 2100 tidal time series identified exceedance periods where ocean levels surpassed this control, enabling potential inflow into Rushy Lagoon. A critical inflow-dominant period of approximately 100 hours was isolated, during which cumulative inflow exceeded cumulative outflow.

Using inlet cross-sectional geometry and lagoon storage–elevation relationships derived from a 2 m hydrographic DEM:

- Net inflow volume during the critical period  $\approx 4.81 \times 10^5$  m<sup>3</sup>
- Corresponding lagoon water level  $\approx 1.52$  m AHD

A conservative rainfall allowance was then applied:

- Design rainfall = 200 mm
- Runoff coefficient = 0.5
- Estimated rainfall contribution  $\approx 1.0 \times 10^6$  m<sup>3</sup>

When rainfall inflow is added to the storm-tide-driven inflow, the combined volume corresponds to a conservative peak Rushy Lagoon water level of approximately 1.7 m AHD. This represents the controlling surface-water inundation level at the Site under extreme 2100 conditions.

In addition, the ground elevation separating Rushy Lagoon and Clear Lagoon was assessed to determine the potential for onward overtopping into Clear Lagoon under extreme conditions. The lowest point along this intervening saddle occurs at approximately 1.67 m AHD, resulting in a maximum potential head difference of approximately 30 mm relative to the conservatively modelled peak Rushy Lagoon water level of  $\sim 1.7$  m AHD. Any overtopping across this low point would be tidally controlled, short-duration and coincident only with peak storm-tide conditions, and is conservatively estimated to occur for less than approximately 30 minutes. Based on the limited head difference, short duration and low flow depths, the resulting saline inflow to Clear Lagoon would be very small, conservatively estimated to be less than 3 KL.

Given the volume and storage capacity of Clear Lagoon, this magnitude of inflow would have a negligible effect on lagoon water levels and would not represent a sustained or meaningful inundation mechanism.

#### 4.2.3 Groundwater Rise Assessment for 2100 Conditions

Groundwater levels recorded during the October 2025 site inspection were measured at 1.71 m below ground level, corresponding to a groundwater elevation of 0.44 m AHD. For the 2100 assessment, a conservative reduction in groundwater depth was adopted to reflect increased recharge and long-term climatic influences.

- Adopted 2100 groundwater depth = 0.79 m below ground level
- Corresponding groundwater elevation = 1.23 m AHD

An additional buffer of 0.5 m was applied to account for climatic variability and long-term groundwater fluctuations.

- 2100 design groundwater elevation = 1.23 + 0.5 = 1.73 m AHD

This value represents the conservative upper bound groundwater inundation level at the Site for planning and risk assessment purposes.

#### 4.2.4 Summary of Controlling Inundation Levels at the Site

Based on the combined assessments:

- Ralps Bay coastal overtopping: No inundation pathway to the Site
- Rushy Lagoon surface water inundation (2100 1% AEP + rainfall): ~1.7 m AHD
- Groundwater inundation (2100 design level): ~1.73 m AHD

The defined building and works area is located at and above approximately 1.8 m AHD, above all modelled extreme inundation levels.

#### 4.2.5 Floodwater Depths and Finished Floor Level Assessment

In accordance with the Tasmanian Planning Scheme Local Provisions Schedule and the Statewide Planning Provisions, habitable rooms within the Sandford area are required to achieve a minimum finished floor level of 3.0 m AHD, based on the defined 2100 1% AEP coastal inundation level plus freeboard. This mandatory finished floor level has been adopted for the proposed dwelling.

Ground levels within the defined building and works area range from approximately 1.8 m AHD to 2.2 m AHD, with the dwelling platform located on the higher portion of the Site. The proposed shed is located on ground levels ranging from approximately 1.9 m AHD to 2.1 m AHD, with an average ground elevation of approximately 2.0 m AHD; allowing for slab construction, the finished shed floor level is anticipated to be approximately 2.1 m AHD.

The limiting inundation condition at the Site is groundwater rise, with a conservative 2100 design groundwater elevation of 1.73 m AHD. This level remains below existing ground levels across the entire building and works area, including beneath the proposed dwelling and shed footprints. As a result, the modelled floodwater depth at ground surface is 0 m, and no surface inundation of the Site occurs under the assessed 2100 1% AEP scenario.

Given the dwelling finished floor level of 3.0 m AHD, the vertical separation between habitable floor levels and the controlling inundation level exceeds 1.25 m, providing a substantial safety margin. The proposed shed floor level of approximately 2.1 m AHD also remains above the design groundwater level, and therefore is not subject to inundation. Accordingly, no inundation of buildings or the building and works area is anticipated under extreme future conditions, and floodwater depths across the Site are effectively nil.

## 5 Natural Values Assessment

The Lot is mapped within the Future Coastal Refugia Overlay at a strategic planning scale due to the presence of inland saline wetland systems within the broader landscape, most notably Clear Lagoon. However, site-specific assessment demonstrates that the Lot does not function as, nor is it likely to become, land required to accommodate future coastal refugia or the landward migration of coastal habitats.

Future coastal refugia within this landscape are constrained by elevation and hydrological setting and are expected to be limited to areas at or below approximately 1.1 m AHD, where saline influence and groundwater conditions may persist under sea-level rise scenarios. While a small proportion of the Lot reaches a minimum elevation of approximately 1.2 m AHD, the defined building and works area is located on elevated land at and above approximately 1.8 m AHD, well above the inferred future coastal refugia extent.

Clear Lagoon is an inland saline lake that is hydrologically isolated from tidal and marine processes and does not support regular tidal inundation or active landward migration of coastal habitats. Modelling indicates that any potential overtopping between adjacent lagoon systems under extreme future conditions would be short-duration, very low probability and negligible in volume, and would not result in sustained saline inundation or expansion of coastal or halophytic vegetation onto the Lot or the building and works area.

The Lot comprises previously disturbed agricultural land and does not contain coastal landforms, wetlands, saltmarshes, riparian vegetation or native vegetation of conservation significance. Natural Values Atlas mapping confirms that no threatened flora, threatened vegetation communities or freshwater ecosystem values occur on the Lot, with the nearest sensitive vegetation community confined to the margins of Clear Lagoon and not extending onto the land.

Accordingly, while the Future Coastal Refugia Overlay applies at a strategic level to the Lot, the building and works area is not required to accommodate landward transgression of coastal or wetland habitats. The proposed development will not constrain future coastal processes or natural asset function and is compatible with the intent and outcomes of the Natural Assets Code and the Future Coastal Refugia provisions of the Tasmanian Planning Scheme.

## 6 Risk Assessment

Qualitative risk evaluation criteria have been created to determine fundamental risks that may occur due to development in areas that are vulnerable to erosion or inundation hazards.

This qualitative risk assessment technique is based on AS/NZS ISO 31000:2009 and relies on descriptive or comparative characterisation of consequence, likelihood, and the level of risk comparative (rather than using absolute numerical measures).

A risk consequence/likelihood matrix has been selected which is consistent with AS/NZS ISO 31000:2009 guidelines.

Consequence/likelihood criteria have assisted in determining if any risk management measures are required at the Site to mitigate any potential hazards. Adopted consequence/likelihood criteria are presented in Attachment 10.

Based on the outcomes of the site-specific coastal, surface water and groundwater inundation modelling, the probability of inundation affecting the building and works area is assessed as Barely Credible. In accordance with the adopted qualitative descriptors, a Barely Credible event is one that is considered inconceivable or fanciful over the design life of the development, noting that even under a conservative 2100 1% AEP scenario, modelled inundation levels remain below the ground surface across the building and works area.

The consequence to property has been assessed as Minor, recognising that the proposed dwelling is elevated to a mandatory finished floor level of 3.0 m AHD and would not be affected under any assessed inundation scenario. In the highly unlikely event that inundation were to occur at the upper bounds of modelling uncertainty, any potential impacts would be limited to non-habitable ancillary structures only and would not result in structural damage to the dwelling or loss of property function.

When assessed using the adopted consequence–likelihood risk matrix, the combination of Barely Credible likelihood and Minor consequence results in an overall Very Low Risk classification. A Very Low Risk is considered acceptable and does not require specific mitigation, hazard reduction or protection measures beyond standard regulatory controls.

Accordingly, the proposed development is assessed as achieving and maintaining a tolerable level of risk from inundation for the intended life of the buildings, with no requirement for additional risk management measures at the Site.

## **7 Recommendations**

Based on the outcomes of the coastal inundation, groundwater, natural values and risk assessments, the following recommendations are provided to guide development of the Lot.

### **7.1 Finished Floor Levels – Dwelling**

Habitable rooms within the proposed dwelling must achieve a minimum finished floor level of 3.0 m AHD, in accordance with the mandatory requirements of the Tasmanian Planning Scheme and Statewide Planning Provisions for the Sandford area. This may be achieved through controlled filling within the immediate dwelling footprint, anticipated to be on the order of 700–800 mm, together with slab construction. Filling should be confined to the defined building envelope to minimise land disturbance.

### **7.2 Finished Floor Levels – Shed**

As a non-habitable structure, the shed is not subject to prescribed minimum finished floor level requirements. It is recommended that the shed be founded on existing ground levels ranging from approximately 1.9 m to 2.1 m AHD, with only minor localised cut and fill to achieve a practical construction level. Allowing for gravel base and slab thickness, a finished floor level of approximately 2.1 m AHD is anticipated, which remains comfortably above the modelled inundation and groundwater levels.

### **7.3 Earthworks and Site Management**

Earthworks should be minimised across the Lot, with filling limited to the dwelling footprint and any minor levelling required for the shed and access driveway. To support protection of future coastal refugia values, it is recommended that a small, low-lying portion of the Lot below approximately 1.4 m AHD be excluded from horse access, thereby avoiding unnecessary disturbance of areas with potential future ecological sensitivity.

### **7.4 Stormwater and Roof Water Management**

Roof water from the dwelling and shed should be collected in tanks for reuse, with overflow directed to shallow, gravel-filled absorption trenches to promote infiltration and maintain existing diffuse drainage patterns. These trenches do not need to be substantial and are anticipated to be approximately 0.5 m deep, lined with geofabric to prevent soil migration while allowing infiltration.

### **7.5 Driveway Construction and Drainage**

The internal access driveway should be constructed using a free-draining gravel or road-base material, which is well suited to the Site's conditions. If an impervious surface is proposed, any resulting runoff should be managed locally using shallow absorption trenches constructed along the downslope edge of the driveway. A slight longitudinal fall along the driveway alignment can be used to direct runoff into these trenches, which can be modest in size given the low catchment area and favourable drainage conditions.

## 7.6 Erosion and Sediment Control

Implementation of the above stormwater and driveway drainage measures will ensure a low likelihood of erosion, sediment mobilisation or off-site impacts, and no additional erosion control structures are anticipated to be required beyond standard construction practices.

## 8 Concluding Statement

The Lot is mapped within the Future Coastal Refugia Overlay at a strategic level; however, site-specific assessment confirms that the building and works area does not function as future coastal refugia and is not required to accommodate landward migration of coastal or wetland habitats.

- Future coastal refugia overlay (C7.6.1) addressed, with the proposed building and works envelope consolidated on higher ground within the Lot and designed to avoid impacts on natural assets or future coastal processes (P2.1 a–j).
- Future coastal refugia “coastal location” addressed by noting the Lot is ~800 m inland and the proposed dwelling is required to access and manage location-specific rural resources on the Lot (horse care/pasture/stock infrastructure and groundwater), consistent with surrounding rural/equestrian properties (P2.2, principally (a); (b)–(f) not applicable).
- Coastal inundation hazard “coastal location” (C11.5.2 P1.1) addressed by confirming the use is not coastal-dependent and by relying on the coastal inundation hazard assessment findings that extreme 2100 1% AEP conditions do not inundate the defined building and works area (P1.1 (a) and (h)), with no applicable triggers for marine/coastal uses (P1.1 (b)–(f)) and no contrary agency/council advice identified (P1.1 (g)).
- C11.5.2 P1.2 satisfied because the coastal inundation hazard report demonstrates very low risk (barely credible likelihood with minor consequence) and that no specific hazard reduction or protection measures are required (P1.2 (a)), and the use can achieve and maintain tolerable risk for a 2100 1% AEP event without protection works (P1.2 (b)).
- Buildings and works tolerable risk (C11.6.1 P1.1) satisfied because modelling and the risk assessment indicate no increase in risk requiring protection measures (P1.1 (a)), no agency/council advice requiring mitigation (P1.1 (b)), and the coastal inundation hazard report supports tolerable risk for the intended life (P1.1 (c)).
- Director’s Determination matters addressed by confirming the proposed building and works are unlikely to cause or contribute to coastal inundation on the Lot or adjacent land, and by demonstrating tolerable risk for the intended life having regard to use intensity/duration, development form, change in risk, adaptation capacity, utility/service continuity, no need for protection measures on the Lot or beyond it, no applicable coastal inundation management plan requirement, and no hazardous chemicals proposed that would elevate consequence during an event.



Kris Taylor BSc (hons) | Environmental & Engineering Geologist

Director

Enviro-Tech Consultants Pty. Ltd.

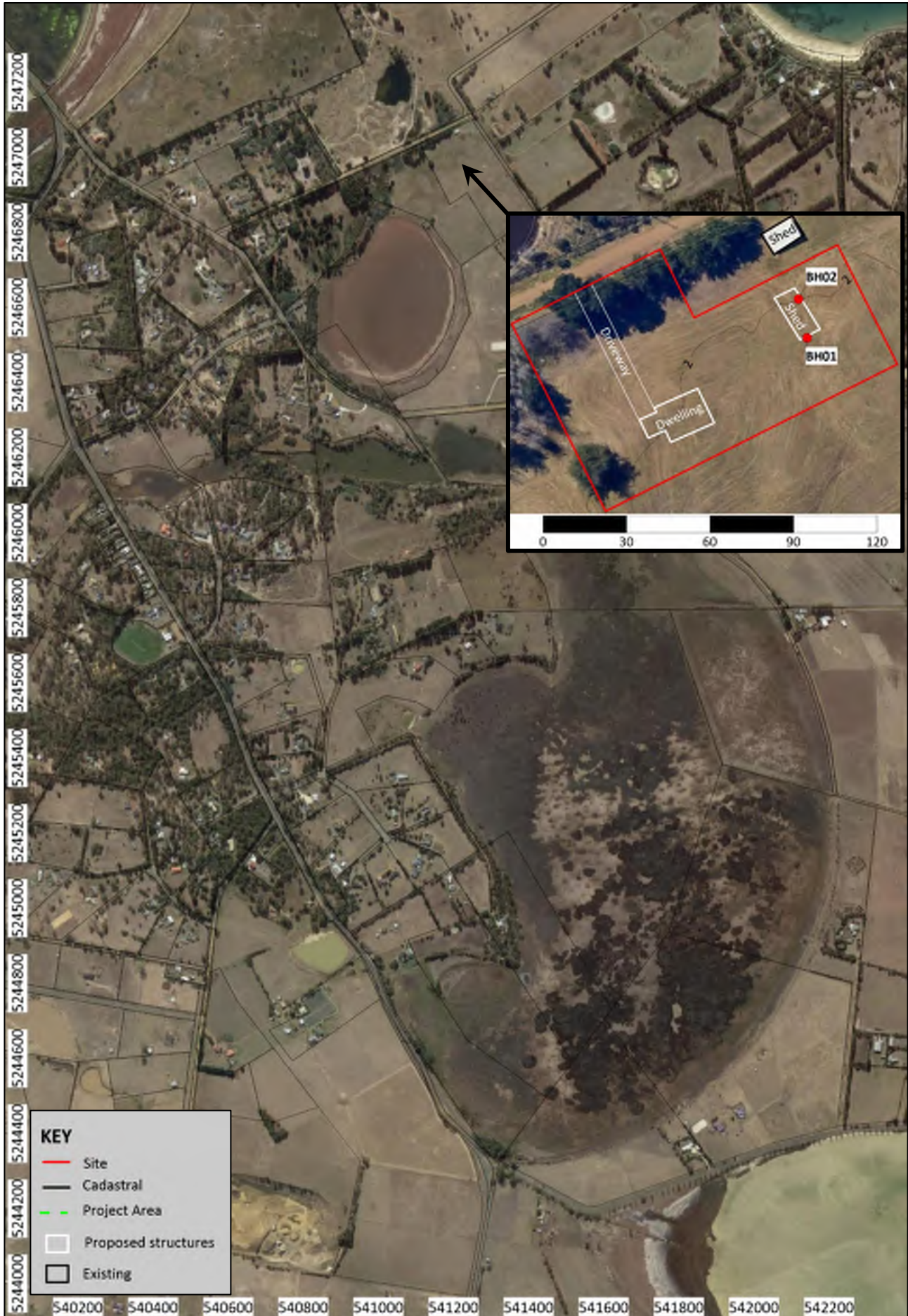
# Attachment 1 Maps

## Map 1



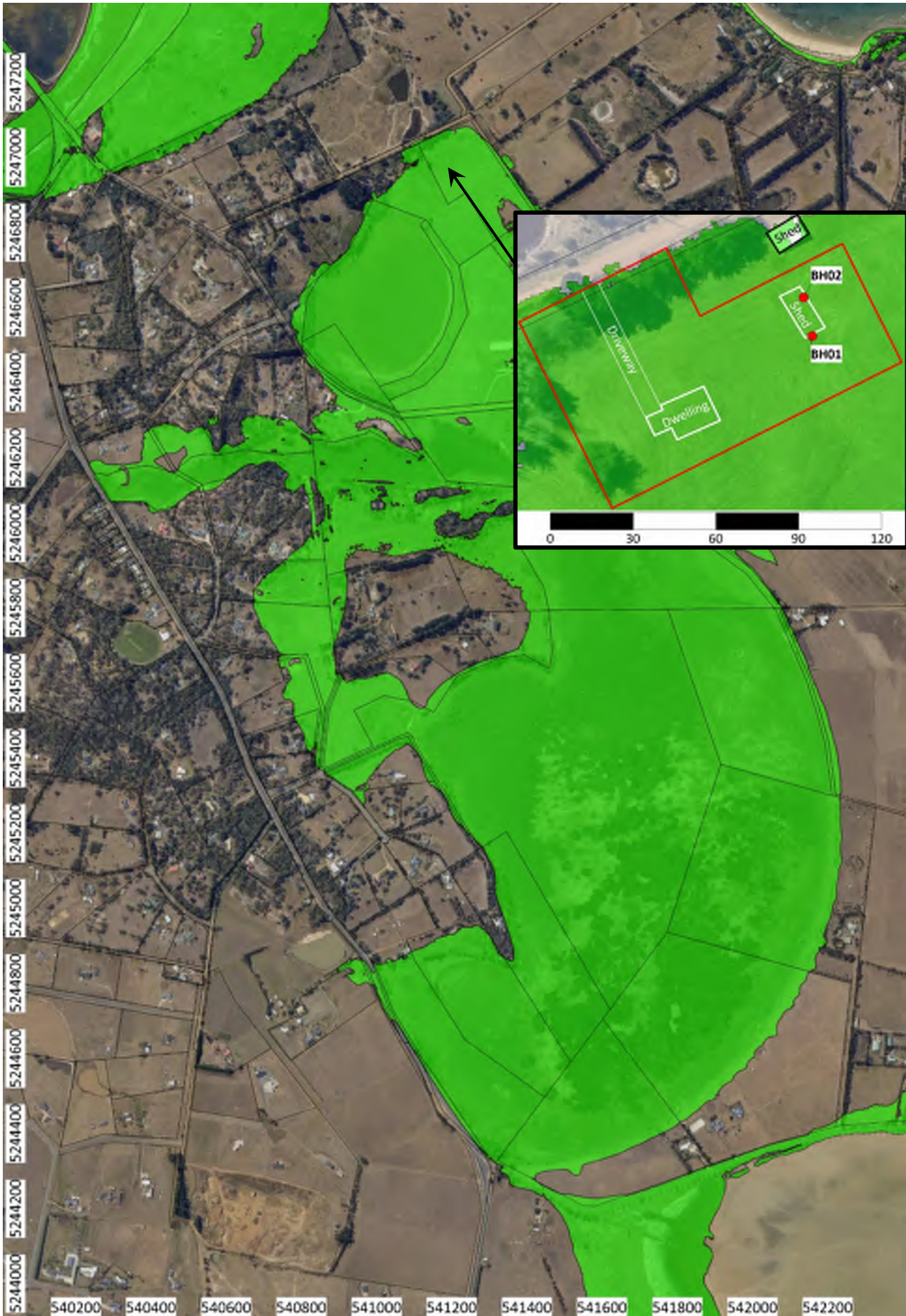
**Map 1 Site regional setting (The LIST)**

## Map 2



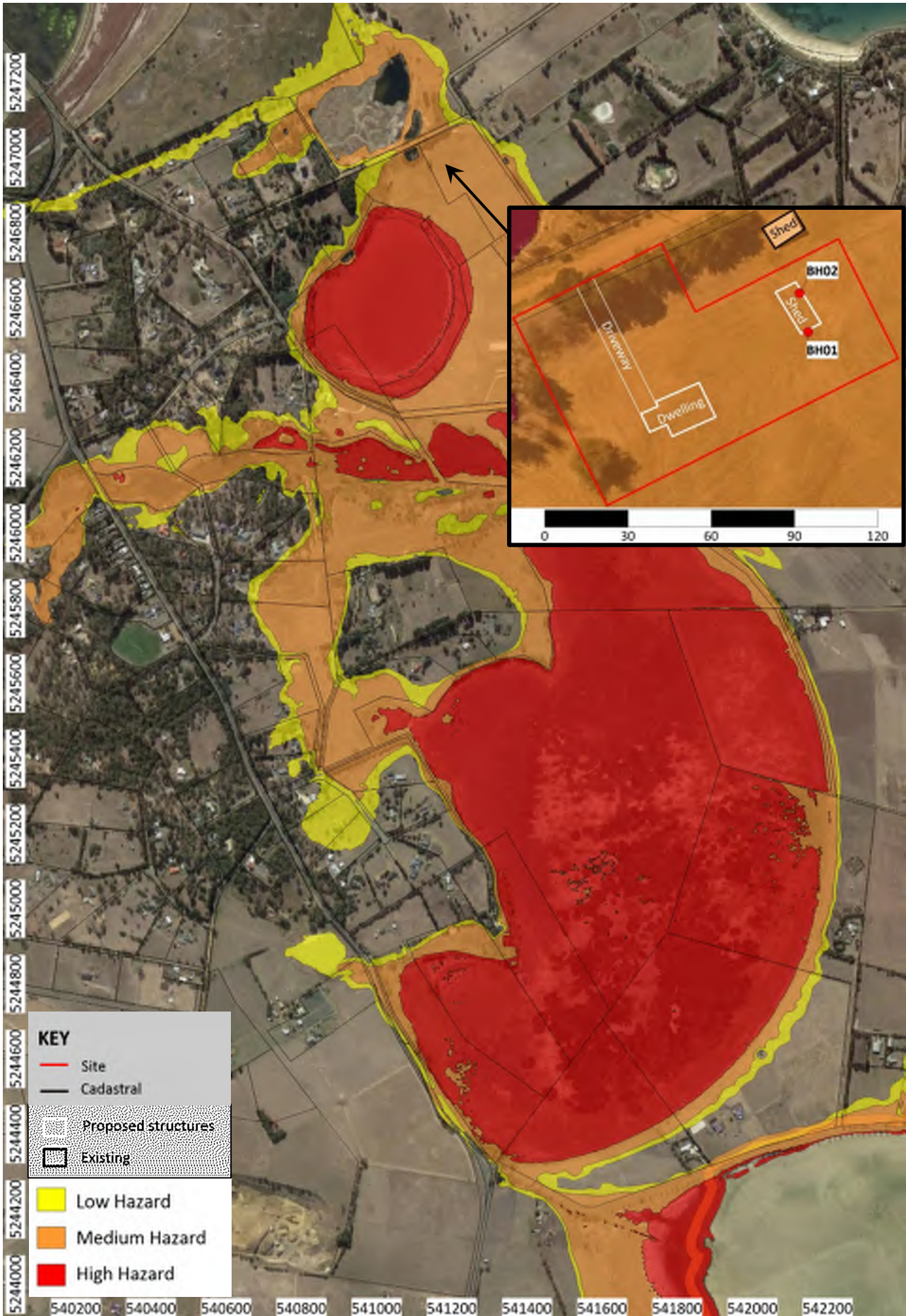
Map 2 Site and Project Area local setting

### Map 3



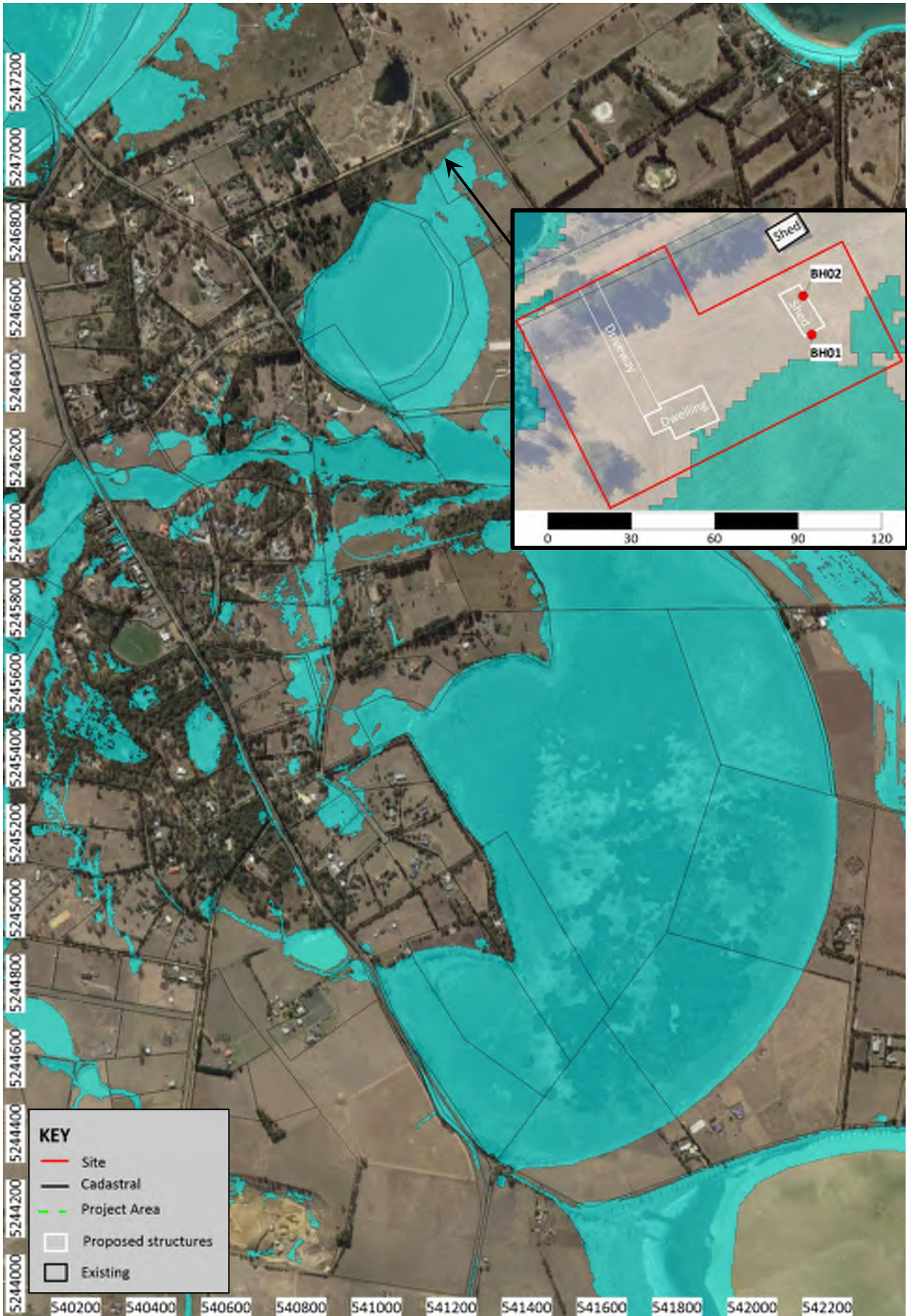
**Map 3 Future Coastal Refugia**

**Map 5**



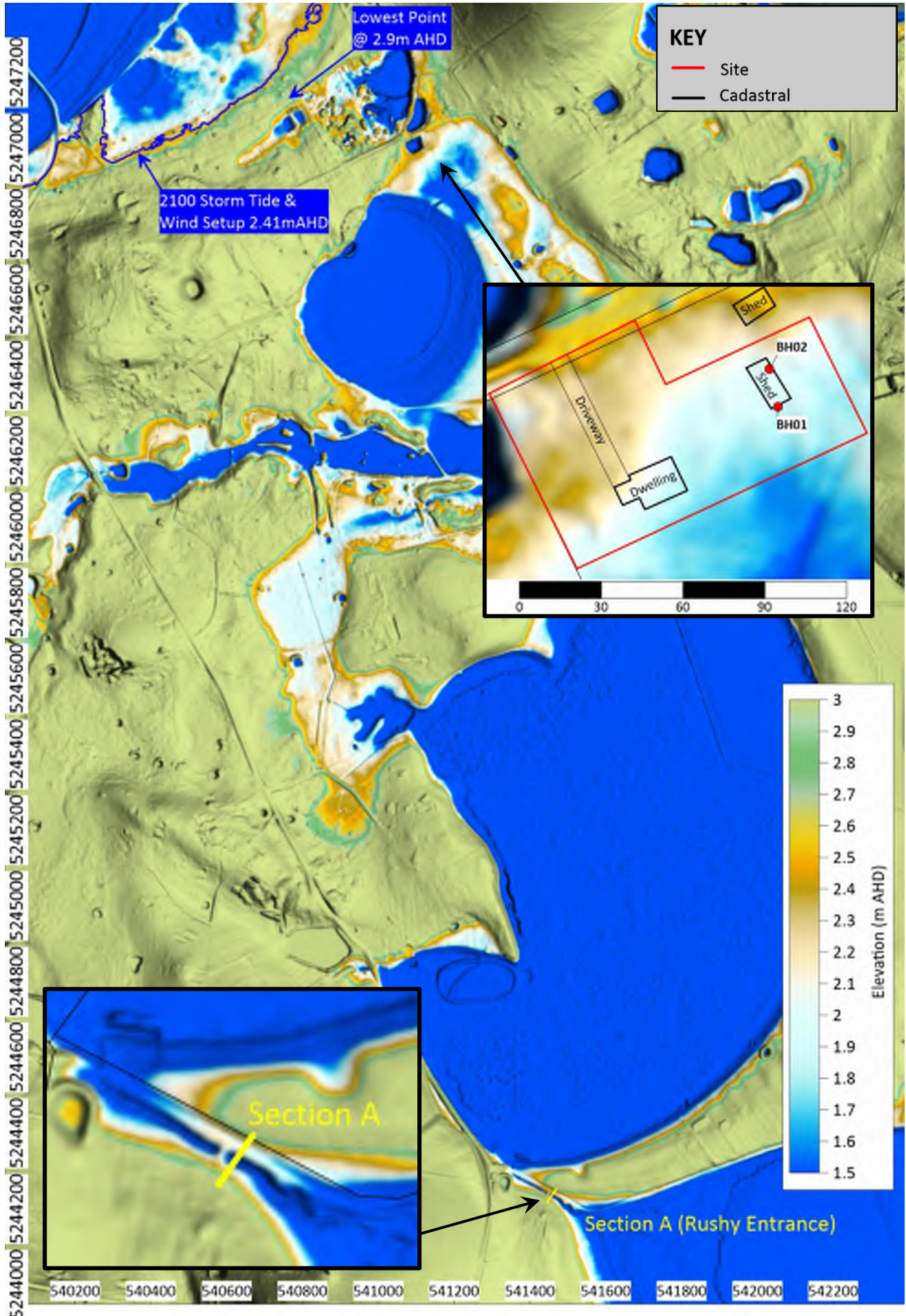
**Map 4 Coastal inundation overlay**

**Map 6**



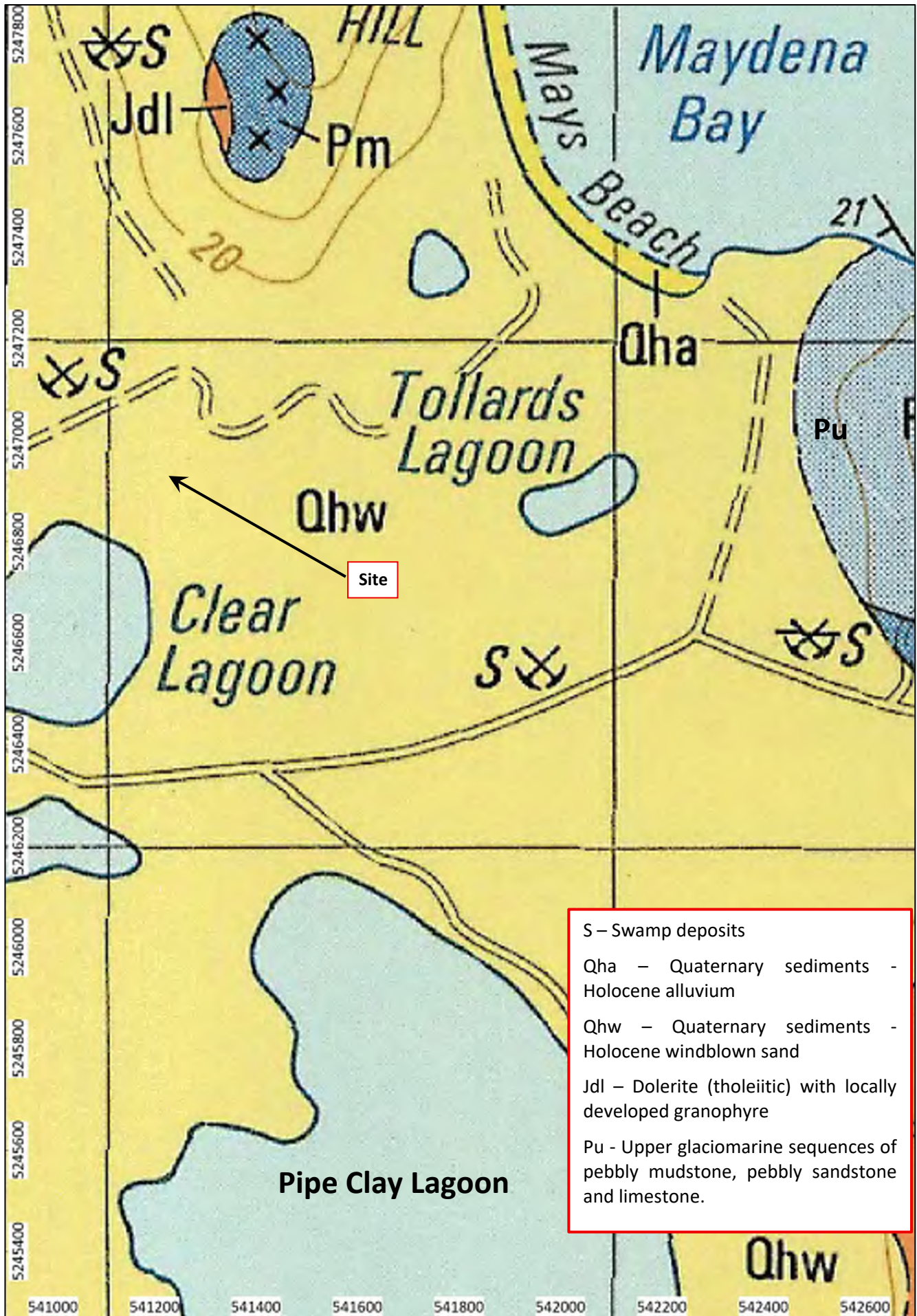
**Map 5 Flood prone areas overlay**

**Map 7**



**Map 6 Regional digital elevation model based on 2013 LIDAR and section A location**

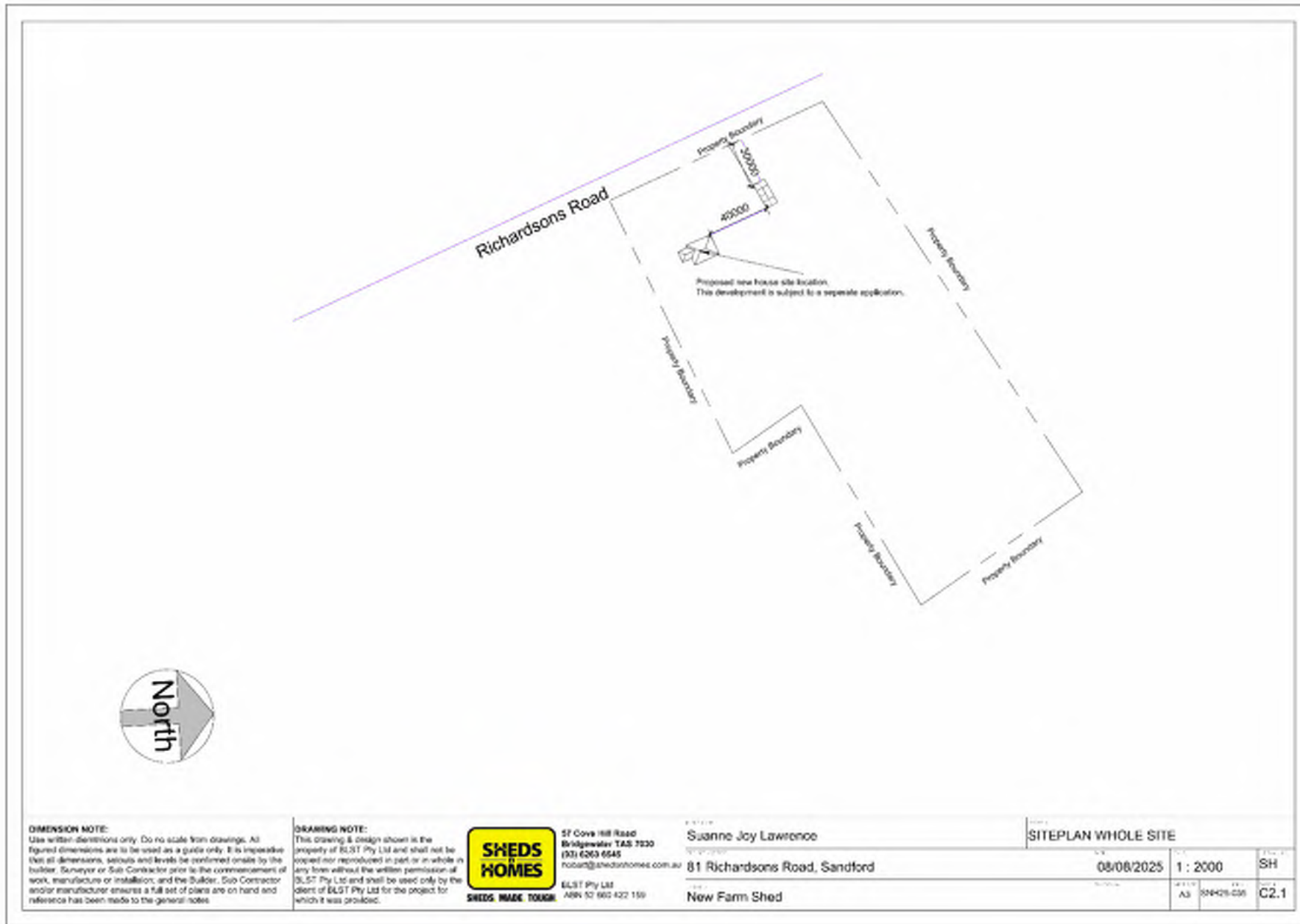
**Map 8**



S – Swamp deposits  
 Qha – Quaternary sediments - Holocene alluvium  
 Qhw – Quaternary sediments - Holocene windblown sand  
 Jdl – Dolerite (tholeiitic) with locally developed granophyre  
 Pu - Upper glaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone.

**Map 7 1:250,000 Scale Mineral Resources Tasmania geology mapping**

## Attachment 2 Preliminary Design Concept Plans



## Attachment 3 Planning and Building Regulations

### Tasmanian Planning Scheme – Acceptable Solutions

#### Natural Assets Code

##### Tasmanian Planning Scheme C7.0

The proposed building and works fall within the following Natural Assets Code C7.6.1 overlays:

- Future coastal refugia overlay (Map 3).

##### ***C7.0 Natural Assets Code Exemptions***

C7.4.1 The following use or development is exempt from this code:

- (a) works by or on behalf of the Crown, State authority, or council to remedy an unacceptable risk to public or private safety or to mitigate or prevent environmental harm;
- (e) works by or on behalf of the Crown, State authority, or council for the protection of a water supply, watercourse, lake, wetland, or tidal waters or coastal assets as part of an endorsed or approved management plan;
- (f) coastal protection works by or on behalf of the Crown, State authority, or council that have been designed by a suitably qualified person;

The Site is within the Future Coastal Refugia Overlay and the proposed works are not exempt under C7.4.1, so assessment against the Natural Assets Code is required.

##### ***C7.6. Development Standards for Building and Works***

###### **C7.6.1 Objective**

That buildings and works within a waterway and coastal protection area or future coastal refugia area will not have an unnecessary or unacceptable impact on natural assets.

### C7.6.1 Codes

The proposed development is to be assessed with respected to future coastal refugia area overlay code C7.6.1 acceptable solutions presented in Table 2.

**Table 2 Natural Asset Code Development Standards for Building and Works Acceptable Solutions**

| Natural Asset Code | Acceptable Solution   | Over-lay    | Performance Solution       | Performance Solution to be Addressed | Justification  |
|--------------------|---|-------------|----------------------------|--------------------------------------|--|
| C7.6.1 A1 (a)      | be within a building area on a sealed plan approved under this planning scheme;   | WCPA        | C7.6.1 P1.1                | No                                   | <b>Does meet acceptable solution.</b><br>The Site and lot do not fall within the waterways and costal protection overlay.  |
| C7.6.1 A1 (b)      | in relation to a Class 4 watercourse, be for a crossing or bridge not more than 5m in width; or   | WCPA        | C7.6.1 P1.1                | No                                   | <b>Not applicable</b><br>waterway and coastal protection area  |
| C7.6.1 A1 (c)      | if within the spatial extent of tidal waters <sup>3</sup>   | WCPA        | C7.6.1 P1.2                | No                                   | <b>Not applicable</b><br>waterway and coastal protection area  |
| C7.6.1 A2          | Buildings and works within a future coastal refugia area must be located within a building area on a sealed plan approved under this planning scheme.                             | FCR         | C7.6.1 P2.1<br>C7.6.1 P2.2 | <b>Yes</b>                           | <b>Does not meet acceptable solution</b> — the Site is within the mapped future coastal refugia area but is not located within a building area on a sealed plan approved under this planning scheme. |
| C7.6.1 A3          | Development within a waterway and coastal protection area or a future coastal refugia area must not involve a new stormwater point discharge into a watercourse, wetland or lake. | FCR or WCPA | C7.6.1 P3                  | No <sup>4</sup>                      | A stormwater discharge point may be required for the Site but is outside of the scope of this investigation.   |
| C7.6.1 A4          | Dredging or reclamation must not occur within a waterway and coastal protection area or a future coastal refugia area.  | FCR or WCPA | C7.6.1 P4.1<br>C7.6.1 P4.1 | No                                   | <b>No applicable – No dredging or reclamation</b>  |
| C7.6.1 A5          | Coastal protection works or watercourse erosion or inundation protection works must not occur within a waterway and coastal protection area or a future coastal refugia area.     | FCR or WCPA | C7.6.1 P5                  | No                                   | <b>No applicable – No coastal protection works</b>   |

<sup>3</sup> be an extension to an existing boat ramp, car park, jetty, marina, marine farming shore facility or slipway that is not more than 20% of the area of the facility existing at the effective date.

<sup>4</sup> Not within the scope of this assessment

### **C7.6.1 A2 Acceptable Solutions (Future Coastal Refugia)**

The proposed development does not meet C7.6.1 A2 given that the development is not within a building area on a sealed plan approved under this planning scheme. C7.6.1 P2.1 & P2.2 performance solutions therefore needs to be addressed.

### **C7.6.1 P2 Performance Criteria**

Performance criteria C7.6.1 P2.1 is to be assessed with performance solutions in Attachment 25

In addressing performance criteria C7.6.1 P2.2, there is a requirement that buildings and works within a future coastal refugia area must be for a use that relies upon a coastal location to fulfil its purpose, having regard to:

- (a) **the need to access a specific resource in a coastal location;**
- (b) the need to operate a marine farming shore facility;
- (c) the need to access infrastructure available in a coastal location;
- (d) the need to service a marine or coastal related activity;
- (e) provision of essential utility or marine infrastructure; and
- (f) provision of open space or for marine-related educational, research, or recreational facilities.

In this case, the development is located on privately owned land zoned Rural and is not intended to support marine or coastal-dependent activities. The proposal is for a dwelling to enable the ongoing keeping and care of horses, which is an established and accepted rural use within the locality. The effective care of horses requires a permanent on-lot presence to ensure appropriate animal welfare, land management and maintenance of rural infrastructure. The lot also contains a groundwater resource, consistent with neighbouring properties, which is intended to be used for stock watering and general rural purposes. Access to and management of this resource is inherently location-specific and cannot be undertaken remotely. Accordingly, the proposed dwelling is necessary to enable the reasonable and lawful use of the land in a manner consistent with its zoning, surrounding land uses and established rural character.

# Coastal Inundation Hazards C11

## Code Overlay Reporting Requirements

The Site falls within The LIST Coastal Inundation Hazard Overlay (medium hazard band) as presented in Map 7.

The proposed development reporting requirements are summarised in Table 3 with the following to be addressed:

- Tasmanian Planning Scheme (TPS) Code C11 Coastal Inundation Hazard Code.
- Part 5 (Work in Hazardous Areas) of the Building Regulations 2016; Division 5 – Coastal Inundation
- Directors Determination – Coastal Inundation Hazard Areas.

The proposed development is not exempt from C11 Coastal Inundation Hazard Code on the basis that the proposal will involve uses located within a non-urban zone and within a medium coastal inundation hazard band.

**Table 3 Coastal Inundation Hazard Reporting Requirements Framework**

|  |   |
|--|---|
| <b>Council</b>   | Clarence  |
| <b>Planning Scheme</b>   | Tasmanian Planning Scheme   |
| <b>Critical use, hazardous use, or vulnerable use</b>  | No  |
| <b>Low or medium coastal inundation hazard band</b>  | Medium  |
| <b>Parts of the Site are located within a high coastal inundation hazard band</b>  | No  |
| <b>Located within a non-urban zone</b>   | Yes   |
| <b>Requires inundation protection works</b>  | No  |
| <b>Exemption from TPS Code C11</b>   | No, on the basis that the proposed development is located within a non-urban (Rural 20) zone and within a medium coastal inundation hazard band   |
| <b>Coastal inundation reporting requirements</b>   | Coastal Inundation Hazard Assessment in accordance with directors' determination and C11.0 Codes  |
| <b>Coastal inundation code to be addressed</b>   | C11.5.2 Uses located within a non-urban zone and within a medium coastal inundation hazard band<br>C11.6.1 Buildings and works, excluding coastal protection works, within a coastal inundation hazard area |
| <b>Defined inundation level</b>  | 2.7m AHD. Based on 1% AEP for year 2100 - as per Tasmanian Planning Scheme Local Provisions Schedule Table C11.1 Sandford   |
| <b>Minimum habitable room finished floor level based on the defined inundation level plus 0.3m freeboard (Tasmanian Building Regulations 2016)</b> | 3m AHD  |
| <b>Risk assessment modelling criteria</b>  | 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the use factoring in sea levels, astronomical tides, barometric low, wave setup, wave runup and wind setup       |
| <b>In a coastal inundation investigation area</b>  | No  |
| <b>Coastal inundation investigation area report required</b>   | No  |
| <b>Located within a flood-prone area hazard code overlay</b>   | Yes   |
| <b>Flood-prone area hazard code overlay to be addressed</b>  | Not in areas where the proposed building and works are located within the coastal inundation hazard overlay, but the Directors Determination still needs to be addressed                                    |

## Directors Determination

### ***Certificate of Likely Compliance***

In determining an application for a Certificate of Likely Compliance (2 (6), the building surveyor must:

- (a) take into account the coastal inundation hazard report and any relevant coastal inundation management plan; and
- (b) be satisfied that the proposed work will not cause or contribute to coastal inundation on the Site, on adjacent land or of public infrastructure; and
- (c) be satisfied that the proposed work can achieve and maintain a ***tolerable risk<sup>5</sup> for the intended life of the building*** without requiring any specific coastal inundation protection measures.

### ***Residential structures and outdoor structures***

Although a coastal inundation hazard assessment report may not be required for planning purposes, according to the director's determination, a coastal inundation hazard report must be prepared addressing tolerable risks for proposed residential structures (Class 1) and outdoor structures (Class 10).

### ***Coastal Inundation Risk Assessment Addressing the Directors Determination***

To comply with the determination, this report assesses whether the proposed use or development can achieve and maintain a ***tolerable risk*** for the intended life of the use or development without requiring any specific coastal inundation protection measures. This risk assessment is two tiered and includes an assessment of tolerable risks associated with a:

- Defined floor level (local inundation levels set out in the local provisions schedule)
- *1% AEP flooding event within the building design life (50 year)*

Enviro-Tech have undertaken site-specific inundation modelling for the 2100 1% AEP storm-tide scenario, including astronomical tide, storm surge, wind setup, barometric pressure effects, groundwater elevations and inlet-controlled hydraulic behaviour.

### ***Class 1 Structures***

Buildings with habitable rooms<sup>6</sup> including residential structures (Class 1) within a coastal inundation hazard area must be assessed in terms of tolerable risks and have finished floor level of at least 300 millimetres above the *defined flood level* for the land.

### ***Class 10 Structures***

Given Class 10 structures do not have habitable rooms, finished floor levels are not regulated and Class 10 structures are to be assessed in terms of *tolerable risks* only.

### ***Defined Flood Level***

For the purposes of the Directors Determination – Coastal Inundation Hazard Areas and regulation 56(3) of the Building Regulations 2016, the defined flood level is the level above the 0 metres Australian Height Datum with a *one per cent probability of being exceeded in a storm surge flooding event in the year 2100*, as specified in the Local Provisions Schedule of the Tasmanian Planning Scheme.

---

<sup>5</sup> Tolerable risk means the lowest level of likely risk from coastal inundation from a defined flood event to secure the benefits of a use or development in a coastal inundation hazard area, and which can be managed through routine regulatory measures or by specific hazard management measures for the intended life of each use or development

<sup>6</sup> habitable rooms “means any room of a dwelling other than a bathroom, laundry, toilet, pantry, walk-in wardrobe, corridor, stair, hallway, lobby, clothes drying room and other space of a specialised nature occupied neither frequently nor for extended periods.”

### ***Site Defined Flood Level***

The defined flood level for the Site is based on TPS Table C11.1 Coastal Inundation Hazard Bands AHD Levels for 2100 with the following 1% annual exceedance probability of inundation:

- 2.7 m AHD for Sandford

## **Coastal Inundation Risk Modelling**

### ***Tasmanian Building Regulations 2016***

#### **Habitable Room Finished Floor Levels**

Tasmanian Building Regulations 2016, residential structures (Class 1) within a coastal inundation hazard area must have finished floor level of *habitable rooms*<sup>7</sup> at least 300 millimetres above the *defined flood level* for the land (which includes the Site) at or above:

**3.0 m AHD for Sandford**

### ***Coastal Inundation Risk Assessment Addressing TPS Code C11***

Where the determination requires an inundation risk assessment in terms of the defined flood level as well as 50 year building design life scenario, where the proposed development is not exempt from TPS Code C11, the development requires an **additional** level of inundation risk modelling based on 2100 sea level scenarios.

To comply with C11 performance codes, this report assesses whether the proposed work can achieve and maintain a **tolerable risk**<sup>8</sup> from coastal inundation from a **1% annual exceedance probability coastal inundation event in 2100** for the intended life of the use or development without requiring any specific coastal inundation protection measures.

This report includes a site-specific assessment of 2100 1% AEP storm-tide flooding, incorporating astronomical tide, storm surge, barometric pressure, wind setup, and inlet-controlled hydraulic behaviour.

### ***C11.6 Development Standards for Buildings and Works***

#### **C11.6.1 Buildings and works, excluding coastal protection works, within a coastal inundation hazard area**

##### C11.6.1 Objective

That:

- (a) building and works, excluding coastal protection works, within a coastal inundation hazard area, can achieve and maintain a tolerable risk from coastal inundation; and
- (b) buildings and works do not increase the risk from coastal inundation to adjacent land and public infrastructure.

---

<sup>7</sup> habitable rooms “means any room of a dwelling other than a bathroom, laundry, toilet, pantry, walk-in wardrobe, corridor, stair, hallway, lobby, clothes drying room and other space of a specialised nature occupied neither frequently nor for extended periods.”

<sup>8</sup> Tolerable risk means the lowest level of likely risk from coastal inundation from a defined flood event to secure the benefits of a use or development in a coastal inundation hazard area, and which can be managed through routine regulatory measures or by specific hazard management measures for the intended life of each use or development

### **C11.6.1 A1 Acceptable Solutions**

As there are no acceptable solutions to C11.6.1 A1, and therefore the proposed development is to be assessed against performance criteria.

### **C11.6.1 P1 Performance Criteria**

Modelling is conducted to ensure the use can achieve and maintain a tolerable risk from a 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the use without requiring any specific hazard reduction or protection measures.

C11.6.1 P1.1 and C11.6.1 P1.1 performance criteria is addressed based on the hazard modelling and a risk assessment of performance criteria presented in Attachment 12.

### ***C11.6.2 Coastal protection works within a coastal inundation hazard area***

#### **C11.6.2 Objective**

That coastal protection works located within a coastal inundation hazard area are kept to a minimum, appropriately located, fit for purpose and do not increase the likely risks from coastal inundation to adjacent land.

#### **C11.6.2 A1 Acceptable Solutions**

As there are no acceptable solutions to C11.6.2 A1, the proposed development is to be assessed against performance criteria.

#### **C11.6.2 P1 Performance Criteria**

Coastal protection works within a coastal inundation hazard area must be appropriately located, fit for purpose and kept to a minimum, having regard to:

- (a) if within a non-urban zone, the works are for the protection of a use that relies upon a coastal location to fulfil its purpose;
- (b) the advice contained in a coastal inundation hazard report that:
  - (i) there will not be an increased risk of coastal inundation from a 1% annual exceedance probability coastal inundation event in 2100 on the site, on adjacent land or public infrastructure; and
  - (ii) the risks from coastal inundation in a 1% annual exceedance probability coastal inundation event in 2100 can be mitigated;
- (c) the need for arrangements to be made, including with the applicant, to meet the cost of construction and ongoing maintenance of the coastal protection works; and
- (d) any advice from a State authority, regulated entity or a council.

## **Flood-Prone Area Hazard Code**

### **Tasmanian planning scheme C12.0**

The site is located within the Clarence Council mapped 1% Annual Exceedance Probability (AEP) inland flooding hazard area (Map 8).

#### ***C12.2 Application of this Code***

##### **C12.2.5**

The proposed development is exempt from C12.0 Flood-Prone Area Hazard Code planning on the basis that the code does not apply to land subject to the Coastal Inundation Hazard Code (C12.2.5).

## Attachment 4 Coastal Hydrodynamics

### Stillwater Levels Assessment Method

Stillwater levels influencing coastal processes within the Project Area are calculated from the combination of the following factors:

- **Storm Tide** - Present day astronomical tides combined with barometric low-pressure influence (coined storm tide). Storm tide inundation levels are adopted from 1% annual exceedance probability (AEP) modelling (McInnes O’Grady 2016).
- **Sea Levels** - are projected based on IPCC RCP8.5 scenarios which have been locally modelled for local government area (DPAC 2016) based on McInnes et. al. (2016). An allowance has been made for present sea level heights relative to Australian Height Datum (AHD). Projections are based on 2100 scenarios which are all compiled from a 2010 baseline.
- **Wind Setup** – are calculated based on procedures outlined in Kamphuis (2000) with 100-year ARI wind data adapted from AS1170 based on a 0.2 s wind gust of 41 m/s with 0.85 to 1.00 directional multipliers. Wind setup was calculated for Ralphs Bay but not for Pipe Clay Lagoon.

### Findings

Project Area Stillwater levels are presented in Table 4 (**Ralph Bay**) & Table 5 (**Pipe Clay Lagoon**). The following is concluded:

- **Ralph Bay: 1% AEP Stillwater inundation level of 2.41 m AHD for 2100**
- **Pipe Clay Lagoon: 1% AEP Stillwater inundation level of 2.27 m AHD for 2100**

**Table 4 Project Area 1% AEP Stillwater Levels at Ralph Bay**

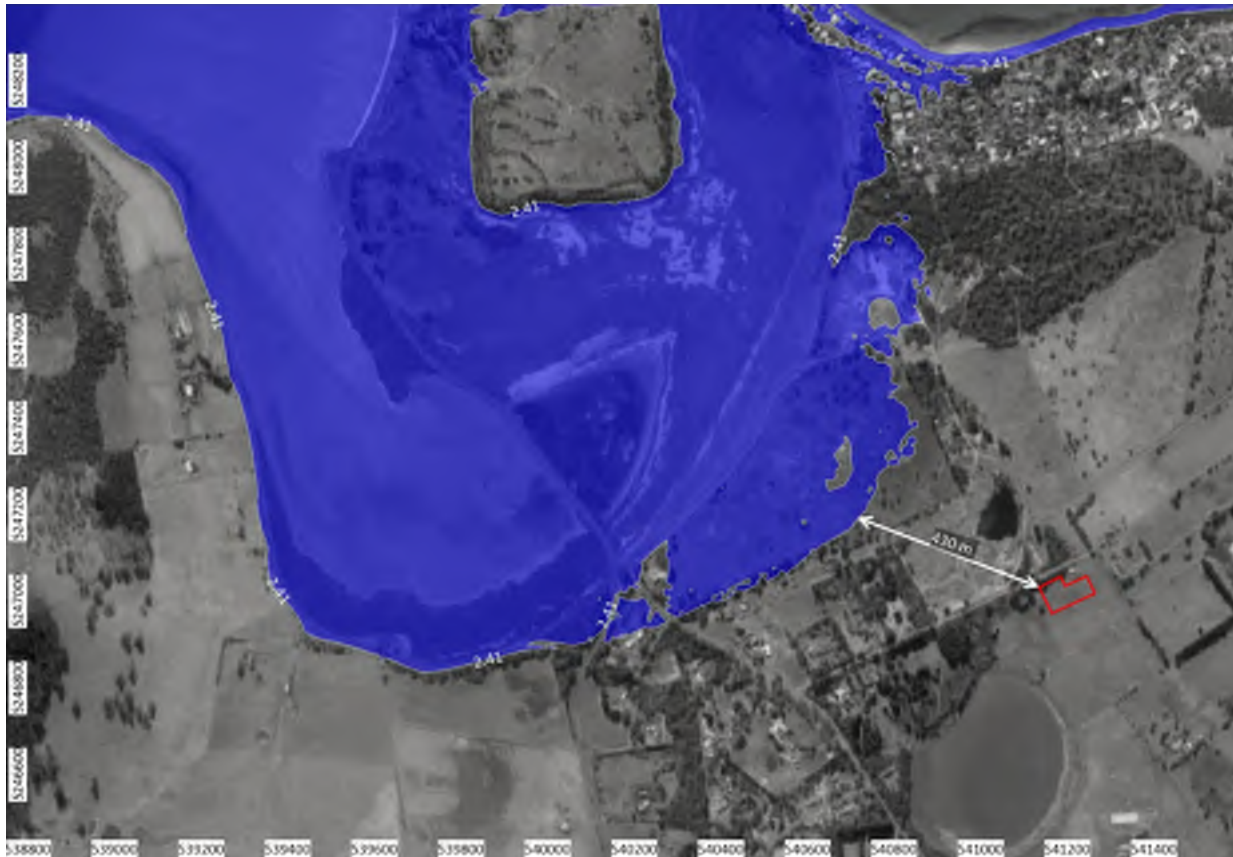
| Parameter               | Units | Scenario |      |      |
|-------------------------|-------|----------|------|------|
|                         |       | 2026     | 2050 | 2100 |
| Sea Levels              | m AHD | 0.14     | 0.23 | 0.93 |
| Local 1% AEP Storm Tide | m     | 1.35     | 1.35 | 1.35 |
| Wind Setup              | m     | 0.14     | 0.14 | 0.13 |
| Total                   | m AHD | 1.64     | 1.72 | 2.41 |

**Table 5 Project Area 1% AEP Stillwater Pipe Clay Lagoon**

| Parameter               | Units | Scenario |      |      |
|-------------------------|-------|----------|------|------|
|                         |       | 2026     | 2050 | 2100 |
| Sea Levels              | m AHD | 0.14     | 0.23 | 0.93 |
| Local 1% AEP Storm Tide | m     | 1.35     | 1.35 | 1.35 |
| Wind Setup              | m     | 0.00     | 0.00 | 0.00 |
| Total                   | m AHD | 1.50     | 1.58 | 2.27 |

## Attachment 5 Coastal Overtopping Assessment: From Ralphs Bay

The modelling completed for the 2100 1% AEP storm-tide event—which includes astronomical tide, storm surge, projected 2100 sea-level rise and wind setup—indicates a peak water level of 2.41 m AHD within Ralphs Bay. A natural elevated barrier exists between Ralphs Bay and the Site, and this barrier prevents marine water from overtopping or entering the lagoon. The mapped inundation extent remains approximately 430 m from the development site, and no encroachment toward the site occurs even under the extreme 2100 conditions. The figure below illustrates the modelled 2.41m AHD inundation extent relative to the site.



**Figure 1 Maximum extent of 2100 1% AEP storm-tide inundation (2.41 m AHD) from Ralphs Bay, shown relative to the development site. The peak inundation remains approximately 430 m from the site**

## Attachment 6 Rushy Lagoon Inlet Hydrodynamic Simulation

### ***Background and Model Basis***

Rushy Lagoons is connected to Pipe Clay Lagoon through a shallow tidal inlet near the South Arm Highway and Cremorne Avenue intersection. The inlet is hydraulically controlled by a channel bed elevation of approximately 1.2 m AHD, which limits tidal exchange under present conditions.

To represent future behaviour, a time-varying 2100 storm-tide boundary was developed for Pipe Clay Lagoon. This boundary combines astronomical tide data, an observed extreme barometric low-pressure event, and projected 2100 sea-level rise and storm-tide allowances. The influence of wind setup has not been included in this analysis given the small size of the water body. The resulting dataset provides realistic future ocean water levels against which potential inflow conditions into Rushy Lagoons can be assessed.

### ***Scope and Objectives***

This investigation assesses the extent to which elevated 2100 ocean water levels in Pipe Clay Lagoon can drive inflow into Rushy Lagoons and raise internal lagoon levels.

The objectives are to:

- Determine the ocean water level at which inflow into the lagoon can commence, given the controlling 1.2 m AHD inlet elevation.
- Identify whether and under what conditions ocean water levels may exceed this control and allow Rushy Lagoon inflow to surpass Pipe Clay Lagoon outflow.
- Quantify potential net water transfer through the inlet using hydraulic calculations.
- Estimate the resulting lagoon water level using the established storage–elevation relationship for Rushy Lagoons as derived from a volumetric analysis using the 2m hydrographic digital elevation model (LIDAR).

### ***Methodology***

Identify an extreme tidal anomaly from the past year and plot the corresponding hourly water levels from the Hobart tide gauge in metres AHD.

Adjust the mean level of the four-month tidal record so that its average aligns with the projected 2100 mean sea level of 0.93 m AHD.

Incorporate an extreme barometric low-pressure event from this year into the tide record and align its peak with the peak astronomical tide.

Scale the combined tidal and barometric series so that its maximum water level matches the projected 2100 1% AEP storm-tide height of 2.27 m AHD.

Scan the adjusted four-month series to identify all periods where the ocean level exceeds the 1.2 m AHD inlet threshold.

From these exceedance periods, isolate any intervals where cumulative inflow exceeds cumulative outflow through the inlet channel.

Use the inflow-dominant interval to calculate hourly inflow volume, hourly outflow volume and the total net inflow volume entering Rushy Lagoon. Assumptions include inferring the initial water levels in Rushy Lagoon are at 1.2m AHD.

Estimate rainfall runoff and accumulation within Rushy Lagoon over a 72 hour period and likely influence on water levels within Rushy Lagoon for the duration of the storm tide anomaly interval.

## **Rushy Lagoon Hydraulic Analysis**

### **Storm Tide Analysis**

To establish a realistic 2100 boundary condition for Pipe Clay Lagoon, the astronomical tide record was first adjusted to the projected future mean sea level of +0.93 m AHD, providing the baseline tidal signal for the analysis (Figure 2). Incorporating the observed extreme barometric low-pressure event into this record produced a combined water-level series that captures the amplified tidal response associated with the pressure minimum, with the 2100 still-water height of 2.27 m AHD forming the upper calibration target for subsequent storm-tide scaling (Figure 3).

Using this combined boundary, a 600-point section of the time series was examined to determine when ocean levels exceed the 1.2 m AHD control elevation at Cross Section A (Table 6, Figure 4 with location in Map 6), which governs whether flow can enter the Rushy Lagoons system. This assessment identified alternating periods where inflow or outflow would dominate, depending on whether boundary levels were above or below the inlet threshold (Figure 5). From within this dataset, a distinct 100-point (100 hour) inflow-dominant window was identified—representing the period during which elevated ocean levels persist long enough to enable net water transfer into Rushy Lagoon.

100-point sequence, representing the critical period for hydraulic assessment is shown in Figure 6. During this interval, ocean levels remained above the inlet control elevation across multiple tidal cycles, enabling the calculation of hourly inflow/outflow and the resulting net volume entering Rushy Lagoon. This extracted sequence forms the basis for the subsequent hydraulic computations that quantify the total inflow volume associated with the 2100 scenario.

A simplified hydraulic simulation was performed using the geometric relationships defined from the 2m Hydrographic DEM surfaces. Key relationships are charted in Figure 7 and include:

- Lagoon Volume vs Lagoon Water Level (1.2–2.3 m AHD); and
- Channel Cross-Sectional Area vs Sea Level across the inlet.

### **Rushy Lagoon 1% AEP Storm Tide Inundation for 2100**

The modelling demonstrates that, under a 2100 sea-level scenario with static barometric low pressure but no wind setup:

- The maximum lagoon water level is projected to reach approximately 1.52 m AHD.
- This peak represents a hydraulic response damped by the Section A inlet geometry, consistent with physical expectations for a narrow, friction-dominated channel.

### **Rainfall Buffer Allowance**

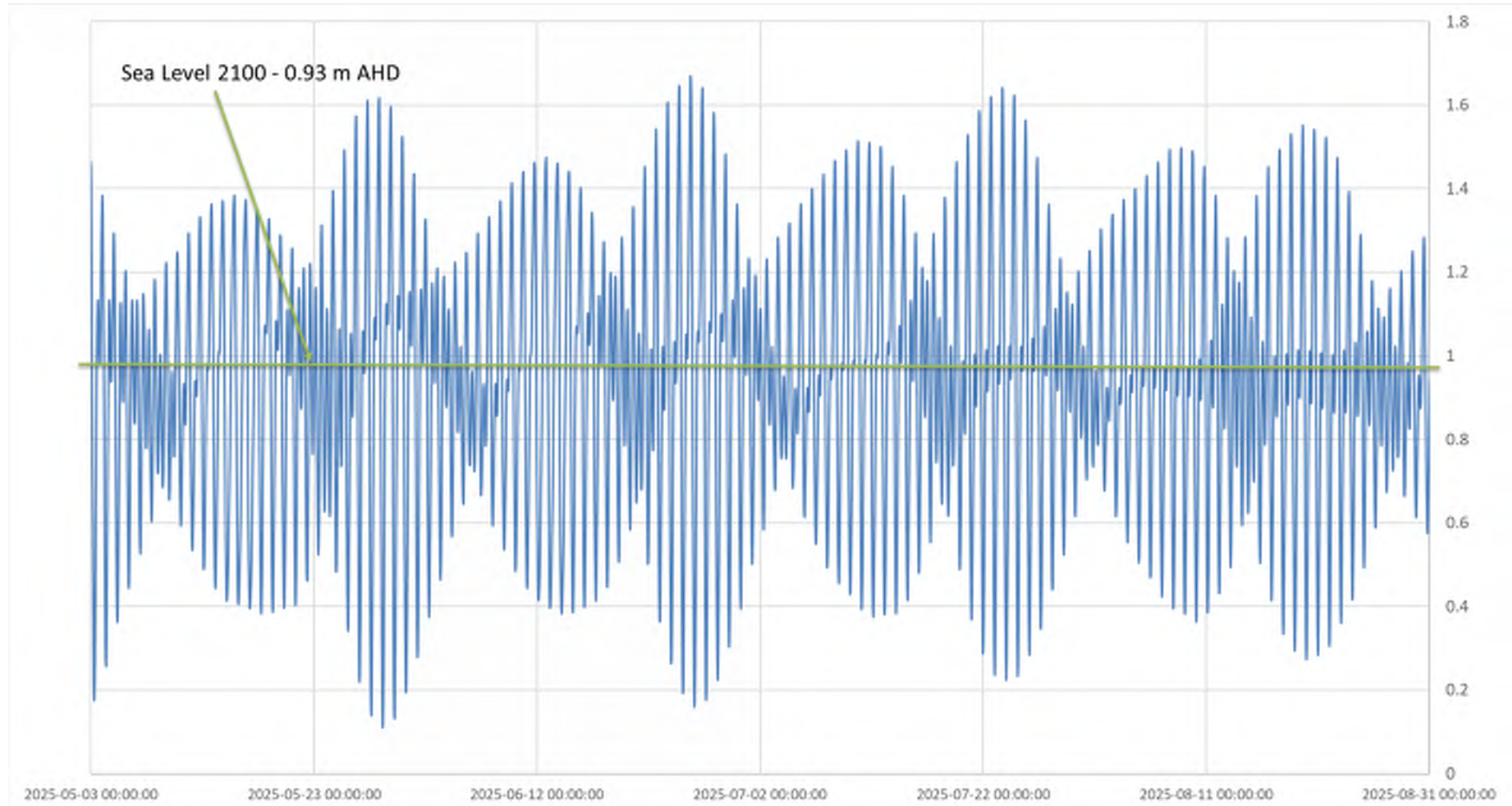
- A conservative rainfall buffer was applied by adding the runoff from a 200 mm design rainfall event (runoff coefficient 0.5), contributing an additional  $\sim 1.0 \times 10^6$  m<sup>3</sup> of inflow to the lagoon.

### **Final Modelled 2100 Inundation level for Rushy Lagoon**

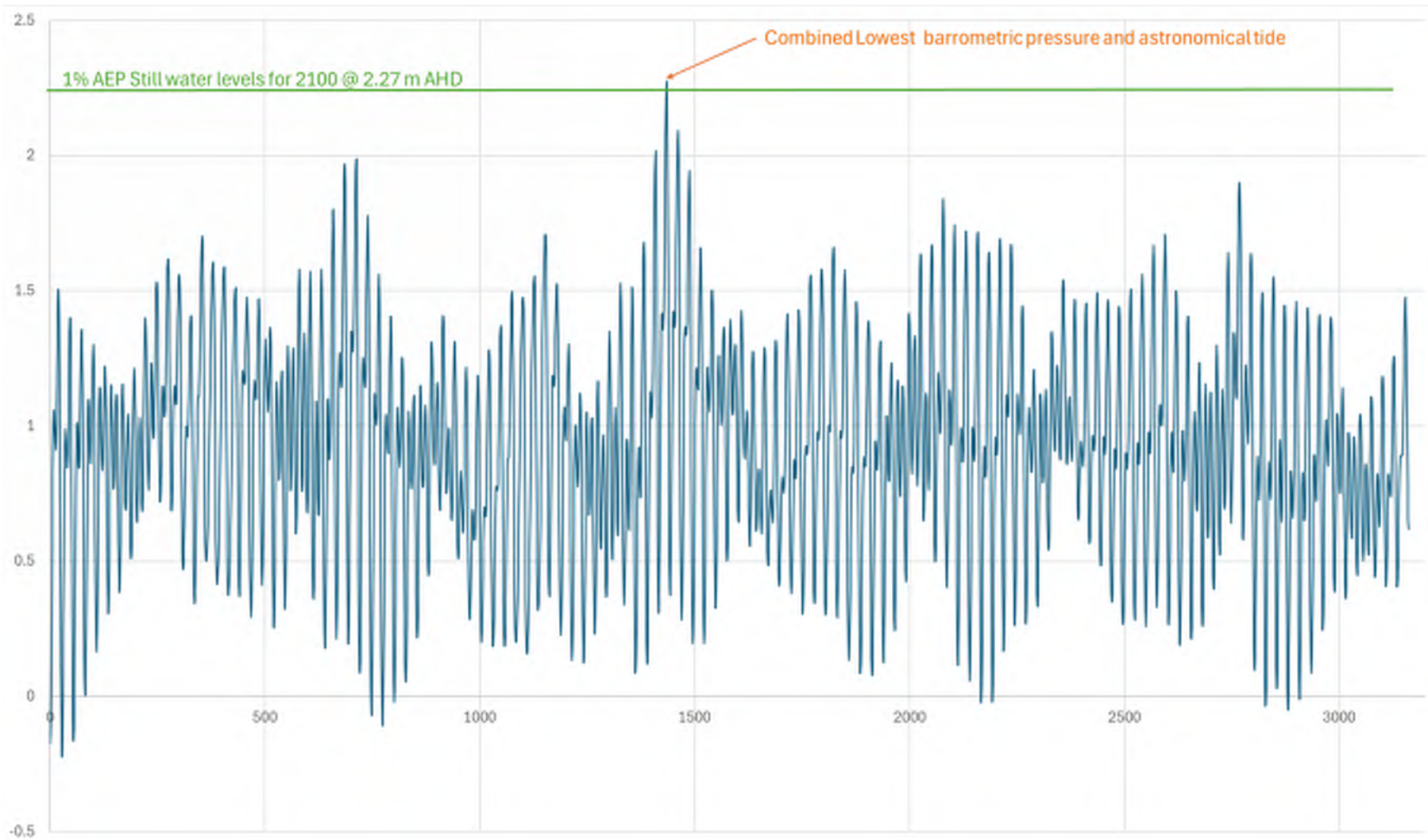
- When a conservative rainfall allowance is included the combined inflow increases the estimated lagoon level to approximately 1.7 m AHD.

### **Site 2100 Inundation level**

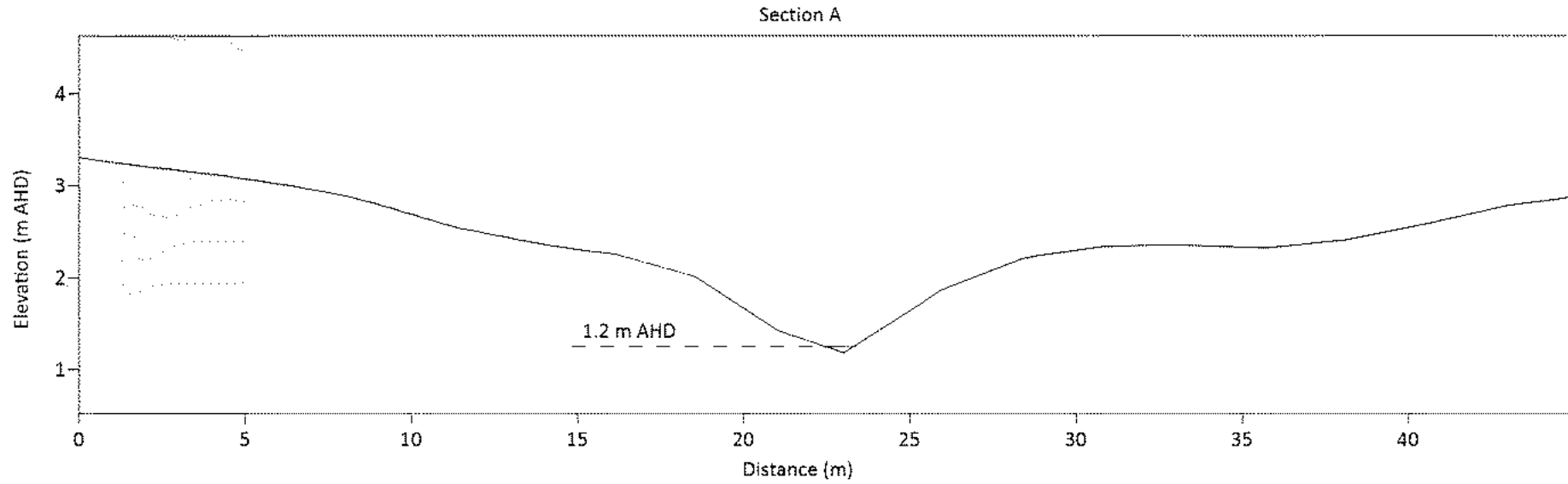
- It's been established that under worst case scenario conditions inundation levels at the site have the potential to reach elevations of up to **1.7 metres AHD** with a very low probability that the world levels will exceed this limit by 2100.



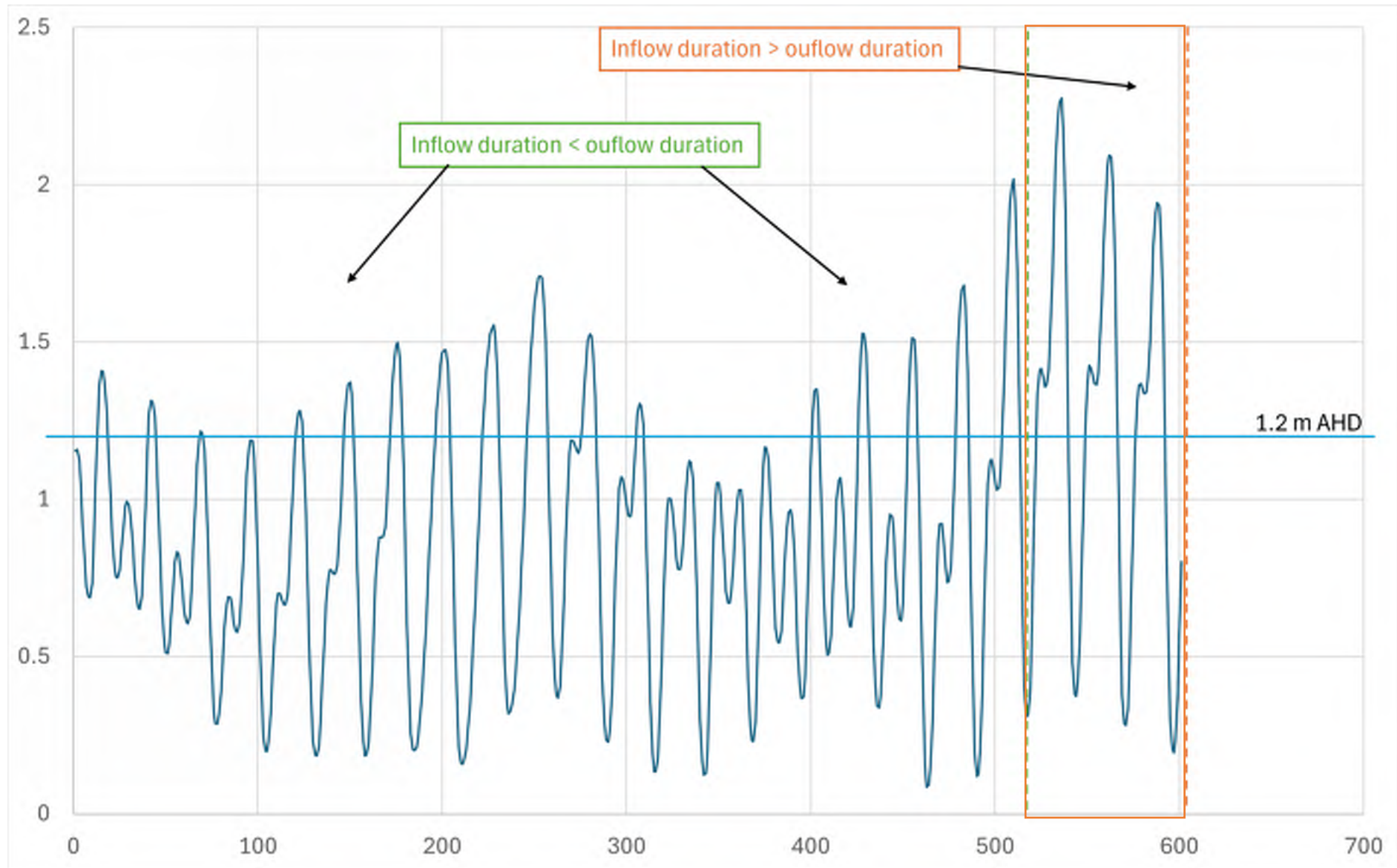
**Figure 2** Astronomical tide series adjusted to 2100 mean sea level (+0.93 m AHD).



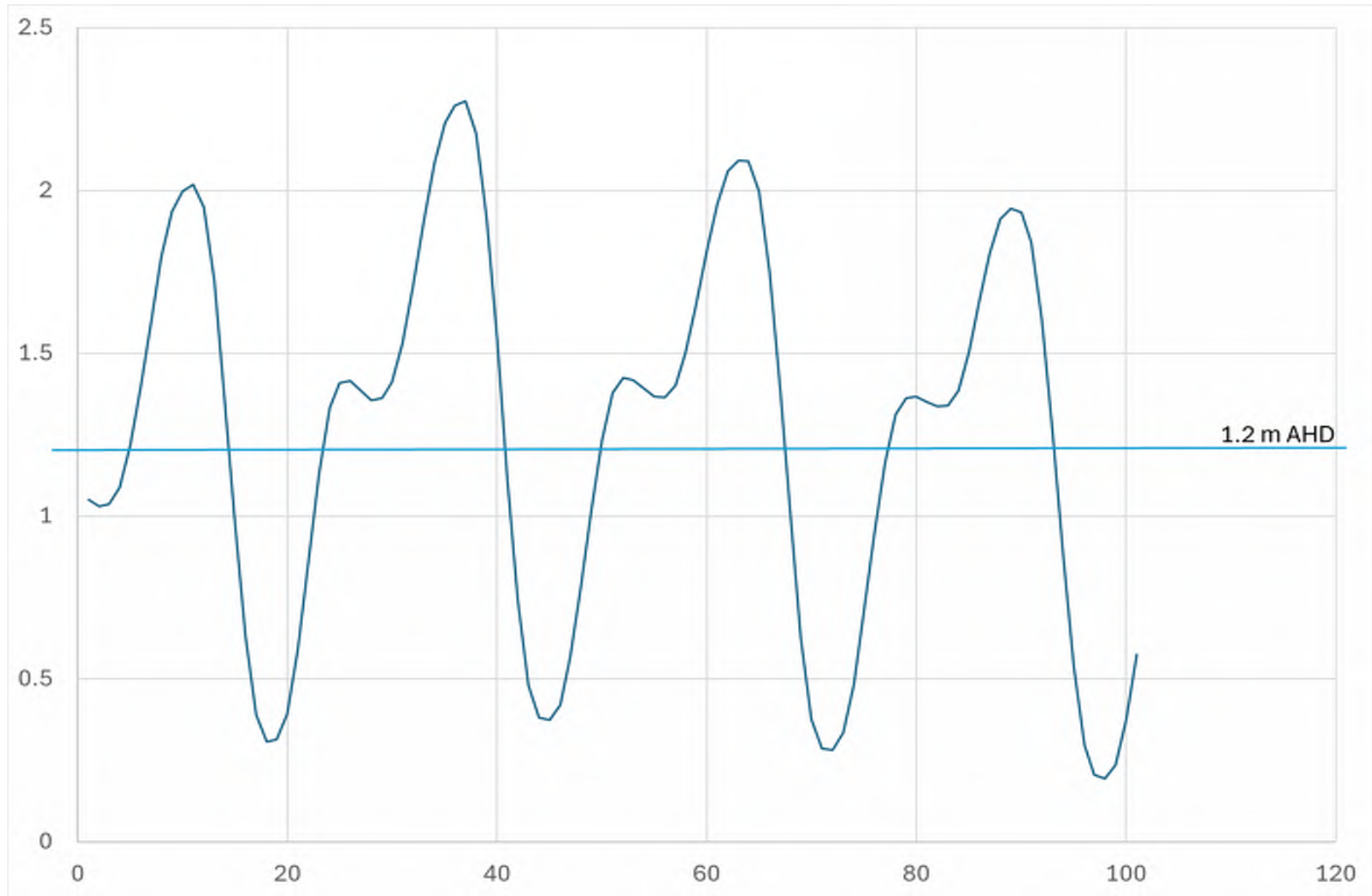
**Figure 3 Astronomical tide series combined with a barometric pressure event, adjusted to the 1% AEP still-water level for 2100 (2.27 m AHD).**



**Figure 4 Cross-section A showing the inlet bed elevation (~1.2 m AHD) that controls hydraulic exchange between Pipe Clay Lagoon and Rushy Lagoons.**



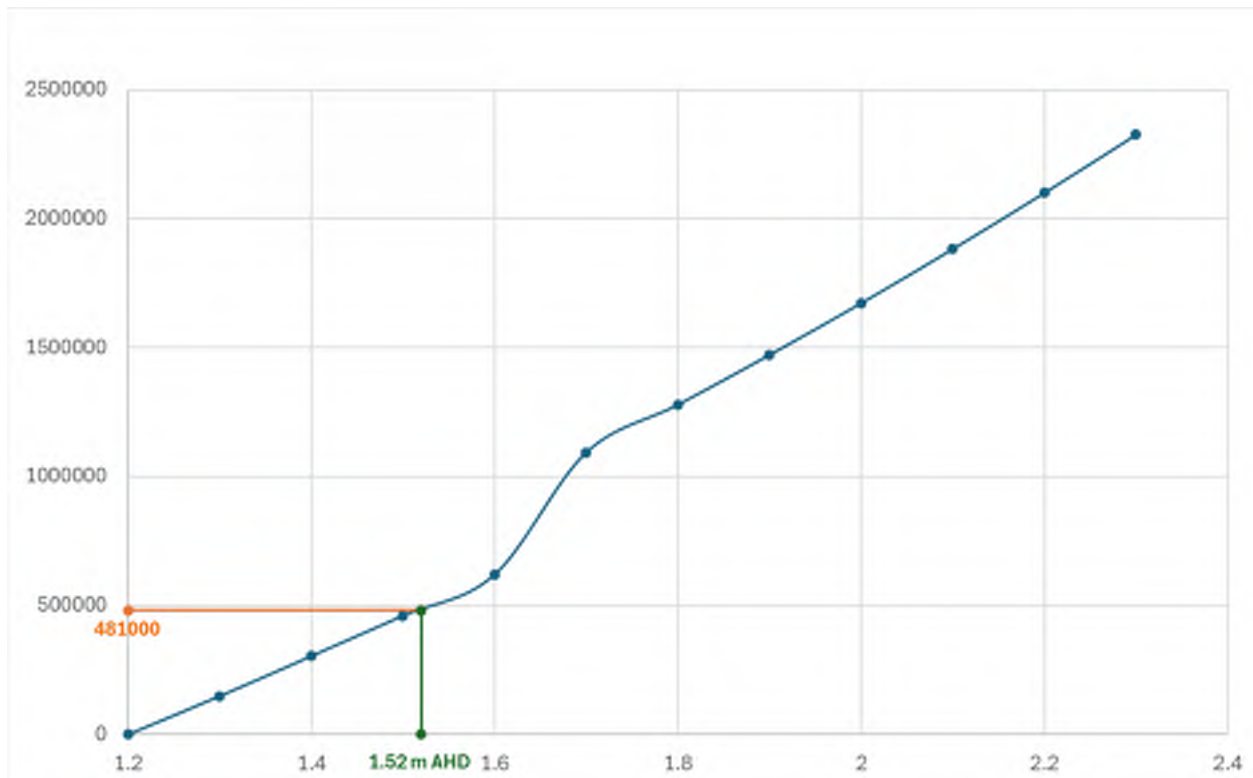
**Figure 5** Portion of the combined water-level series showing periods where the ocean exceeds the 1.2 m AHD inlet control, highlighting intervals of inflow-dominant and outflow-dominant behaviour.



**Figure 6 Critical 100-point segment where the inflow rate exceeds the outflow rate allowing for infilling of Rushy Lagoon.**

**Table 6 Lagoon Volume and Cross-Sectional Area, 1.2–2.3 m AHD**

| Sea Level | Lagoon Volume (m <sup>3</sup> ) | Channel Cross Section Area (m <sup>2</sup> ) |
|-----------|---------------------------------|--|
| 1.2       | 1306971                         | 0  |
| 1.3       | 1456000                         | 0.004  |
| 1.4       | 1611222                         | 0.2  |
| 1.5       | 1767898                         | 0.53   |
| 1.6       | 1927275                         | 0.92   |
| 1.7       | 2401087                         | 1.43   |
| 1.8       | 2586382                         | 2.01   |
| 1.9       | 2779928                         | 2.69   |
| 2         | 2980201                         | 3.45   |
| 2.1       | 3190589                         | 4.37   |
| 2.2       | 3408185                         | 5.44   |
| 2.3       | 3633379                         | 6.77   |



**Figure 7 Storage–elevation curve for Rushy Lagoons showing that the modelled net inflow volume ( $4.81 \times 10^5 \text{ m}^3$ ) corresponds to a peak lagoon level of approximately 1.52 m AHD.**

## Attachment 7 Groundwater Considerations for 2100

Groundwater was recorded at a depth of 1.71 m below ground level during the October 2025 site inspection, corresponding to a groundwater elevation of 0.44 m AHD. For the 2100 assessment, a conservative groundwater depth of 0.79 m below ground level was adopted, giving a projected groundwater elevation of 1.23 m AHD. An additional 0.5 m buffer was applied to account for climatic variability and potential long-term groundwater rise, resulting in a 2100 design groundwater elevation of 1.73 m AHD, as summarised in (Table 7).

**Table 7 Groundwater depth and projected 2100 groundwater level.**

| Parameter  | meters | Cumulative m AHD |
|--|--------|------------------|
| Groundwater depths at the time of investigation (Oct 2025)       |        | 0.44             |
| 2100 Projected Groundwater Depth                                 | 0.79   | 1.23             |
| Additional groundwater level buffer allowing for climatic cycles | 0.5    | 1.73             |
| <b>2100 Design Groundwater Elevation (Site Inundation Level)</b> |        | <b>1.73</b>      |

## Attachment 8 Natural Assets Assessment

### ***Mapped Future Coastal Refugia Extent***

The Site is mapped within the Future Coastal Refugia Overlay at a strategic level due to the presence of inland saline wetland systems within the broader landscape, most notably Clear Lagoon. However, site-specific assessment demonstrates that the land does not function as, nor is it likely to become, future coastal refugia.

Future coastal refugia within this landscape are constrained by elevation and hydrological setting. Based on current saline influence and projected groundwater responses under sea-level rise scenarios, potential future coastal refugia are expected to be limited to land at or below approximately 1.1 m AHD. While a small portion of the lot reaches a minimum elevation of approximately 1.2 m AHD, the proposed building sites are located on elevated ground at and above approximately 1.8 m AHD, well above the inferred future coastal refugia extent.

Clear Lagoon is an inland saline lake that is hydrologically isolated from tidal and marine processes. Unlike coastal environments where sea-level rise facilitates landward migration of coastal habitats through regular tidal inundation, projected future conditions for Clear Lagoon are expected to result in dilution of salinity through increased meteoric groundwater inputs rather than expansion of saline or coastal habitats.

The Site comprises previously disturbed agricultural land and does not contain riparian, littoral or coastal vegetation. A Natural Values Atlas (NVA) search accessed on 12 December 2025 confirms that no threatened flora, flora of conservation significance, threatened vegetation communities, freshwater ecosystem values or riparian or littoral vegetation occur on the Site. As summarised in Table 8 the only mapped sensitive vegetation community within 200 m is Succulent Saline Herbland (ASS), which is confined to the margin of Clear Lagoon and does not extend onto the Site.

Accordingly, while the Future Coastal Refugia Overlay applies at a strategic mapping scale, site-specific conditions demonstrate that the Site—and in particular the proposed building locations—are not required to accommodate landward migration of coastal or wetland habitats. The proposed development will not constrain future coastal processes or natural asset function and is compatible with the intent of the Future Coastal Refugia provisions.

**Table 8 Summary of natural values atlas report findings.**

| Natural Values Attribute                          | Site                    | 100 m Radius   | 200 m Radius   |
|---|-------------------------|--|--|
| Threatened Flora                                  | None                    | None   | None   |
| Non-Threatened Flora of Conservation Significance | None                    | None   | None   |
| Threatened Communities (TNVC 2020)                | None                    | None   | None   |
| Freshwater ecosystem values                       | None                    | None   | None   |
| Reserves  | None                    | None   | None   |
| TASVEG 4.0 Communities within 200 metres          | (FAL) Agricultural land | (ASS) Succulent Saline Herbland<br>(FAL) Agricultural land | (ASS) Succulent Saline Herbland<br>(FAL) Agricultural land |
| Geoconservation Sites                             | None                    | None   | None   |

## ***Allowing for the Landward Transgression of Coastal Habitats***

### Relevant Code Criteria:

- P2(a): Allowing for the landward transgression of sand dunes and the landward colonisation of wetlands, saltmarshes and other coastal habitats from adjacent areas.

### Assessment

The Site is mapped within the Future Coastal Refugia Overlay at a strategic level; however, site-specific assessment demonstrates that it does not function as land required to accommodate the landward transgression of coastal habitats. Future coastal refugia within this landscape are constrained to elevations of approximately 1.1 m AHD, based on current saline influence and projected groundwater responses under sea-level rise scenarios. The lowest point on the Site occurs at approximately 1.2 m AHD, and the proposed building sites are located on elevated ground at and above approximately 1.8 m AHD, well above the inferred future coastal refugia extent.

Clear Lagoon is an inland saline lake that is hydrologically isolated from tidal and marine processes. Unlike coastal systems, it does not support tidal inundation or active landward migration of coastal habitats. Projected future conditions are expected to result in dilution of salinity through increased meteoric groundwater inputs rather than expansion of coastal or halophytic vegetation. The Site does not contain coastal landforms, wetlands, saltmarshes or dune systems, and there is no mechanism by which coastal habitats could migrate landward onto the land.

Accordingly, the proposed development will not constrain or impede the landward transgression of coastal habitats, and the intent of C7.6.1 P2(a) is satisfied.

## ***Avoiding the Creation of Barriers or Drainage Networks Preventing Future Tidal Inundation***

### Relevant Code Criteria:

- P2(c): Allowing the coastal processes of sand deposition or erosion to continue to occur.

### Assessment

The Site is not tidally influenced and is hydrologically isolated from coastal and marine systems. There are no existing tidal inundation pathways across the Site, and no surface or subsurface drainage connections linking the land to tidal waters. Clear Lagoon is an inland saline lake with no tidal connectivity, and tidal inundation processes do not occur within or adjacent to the Site.

The proposed development does not involve the construction of embankments, levees, drainage channels, culverts or other structures that could impede tidal flows. Stormwater generated by the dwelling and associated infrastructure will be managed on-site using infiltration-based measures that maintain existing diffuse drainage patterns and do not alter natural hydrology.

Accordingly, the proposal will not create barriers or drainage networks that would prevent future tidal inundation, and the requirements of C7.6.1 P2(b) are satisfied.

## ***Grouping New Facilities with Existing Facilities (Where Practical)***

### Relevant Code Criteria:

- P2.1(d): Similar grouping requirement in coastal refugia.

### Assessment

The proposed development has been deliberately designed to consolidate all buildings and associated infrastructure within a single, defined development envelope on the higher, well-drained portion of the Site. The dwelling, shed and internal access driveway are grouped together and located on elevated land

at approximately 2.0–2.3 m AHD, avoiding low-lying areas and minimising the spatial extent of development.

The driveway alignment has been selected to directly service the grouped building footprint and does not traverse or dissect other parts of the Site. This approach avoids unnecessary extension of infrastructure, reduces land disturbance and maintains the continuity of the surrounding landscape.

By clustering development in this manner, the proposal minimises fragmentation of land and avoids introducing barriers that could affect future environmental processes. Accordingly, the development satisfies the intent of C7.6.1 P2(d) by grouping new facilities where reasonably practicable.

### ***Impacts on Native Vegetation***

#### Relevant Code Criteria:

- P2(e): The impacts on native vegetation.

#### Assessment

The Site comprises previously disturbed agricultural land and does not contain native or priority vegetation within the proposed development footprint. A Natural Values Atlas search accessed on 12 December 2025 confirms that no threatened flora, flora of conservation significance or threatened vegetation communities occur on the Site. As summarised in Table 9, the only nearby sensitive vegetation community, Succulent Saline Herbland, is confined to the margin of Clear Lagoon and does not extend onto the property.

The proposed dwelling, shed and access driveway are located on elevated, well-drained pasture at and above approximately 1.8 m AHD, well separated from low-lying areas that could potentially support halophytic vegetation. No clearing or disturbance of native vegetation is required to facilitate the development.

Accordingly, the proposal will not result in adverse impacts on native vegetation, and the requirements of C7.6.1 P2(e) are satisfied.

### ***Minimising Cut and Fill***

#### Relevant Code Criteria:

- P1.1(i): Minimising cut and fill.
- P2.1(f): Minimising cut and fill in future coastal refugia.

#### Assessment

The proposed development has been designed to minimise earthworks and avoid unnecessary modification of the existing landform. No cutting is proposed anywhere on the Site. Earthworks are limited to minor, localised filling within the building envelopes and for construction of the internal access driveway.

The dwelling is required to achieve a minimum finished floor level of 3.0 m AHD, which will be achieved through confined filling within the immediate building footprint. The shed is located at approximately 2.0 m AHD and requires only minimal construction tolerance fill, while the driveway will be constructed using a free-draining road-base material requiring only shallow fill to achieve a stable surface.

Overall, earthworks are limited to the minimum extent necessary to meet planning and flood resilience requirements. Filling is confined to defined development areas, and the proposal satisfies the intent of C7.6.1 P2(f) by minimising cut and fill.

## ***Building Design Responding to Site Size, Shape, Contours or Slope***

### Relevant Code Criteria:

- P2.1(g): Similar requirement in future coastal refugia.

### Assessment

The proposed building design responds appropriately to the size, shape and topography of the Site. The property has an area of approximately 4.57 hectares, and the combined footprint of the proposed dwelling, shed and associated access infrastructure occupies only a very small proportion of the overall Site. As a result, the development does not result in over-development or crowding and is well accommodated within the available land area.

The Site is broadly flat and low-lying, with minimal variation in contours and no steep slopes or topographic constraints. The proposed buildings are located on naturally level ground, avoiding the need for significant landform modification. No cutting is required, and only minor, localised filling is proposed within the immediate building envelopes to achieve compliant finished floor levels. Any platform construction will be limited in extent and proportionate to the scale of the buildings, particularly when considered in the context of the overall Site area.

The design avoids geotechnically unstable areas, does not require excavation into slopes, and results in only minimal vegetation removal within previously disturbed pasture. Visual impacts are low, as the scale, form and siting of the buildings are consistent with surrounding rural development and existing building patterns in the locality. The buildings will sit comfortably within the landscape and will not introduce visually dominant or intrusive elements.

Overall, the proposed building design is well suited to the Site's size, shape and contours, requires only minor and necessary earthworks, and minimises impacts on landform, vegetation and visual amenity. The proposal therefore satisfies the intent and requirements of C7.6.1 P1.1(j).

## ***Impacts of Sea-Level Rise on Natural Coastal Processes and Coastal Habitat***

### Relevant Code Criteria:

- P2(h): The impacts of sea-level rise on natural coastal processes and coastal habitat.

### Assessment

The Site is inland and not influenced by tidal or coastal processes, and it is hydrologically isolated from coastal and marine systems. Modelling undertaken for extreme future conditions indicates that, under a 1% AEP storm-tide event by the year 2100, peak water levels on the coastal side of the hydraulic barrier between Rushy Lagoon and Clear Lagoon may reach approximately 1.7 m AHD. The hydraulic control separating the two systems occurs at 1.67m AHD, and while theoretical overtopping is possible under these extreme conditions, the overtopping rate has not been calculated and would be extremely low, given the small differential in water levels (on the order of approximately 100 mm).

Any overtopping that may occur would be short-duration, likely lasting only a matter of ½ an hour maximum during the peak of an extreme event, and would not represent a sustained or recurring process. Importantly, this scenario reflects a very low-probability event, being a 1% AEP condition under 2100 sea-level rise assumptions. There is no mechanism for persistent saline inundation, landward migration of coastal habitats, or establishment of coastal processes within Clear Lagoon or across the Site.

Accordingly, the probability of coastal processes influencing Clear Lagoon or the Site as a result of sea-level rise is very low, and the proposed development will not adversely affect natural coastal processes or coastal habitat under future climate scenarios. The intent of C7.6.1 P2(h) is therefore satisfied.

### ***Consistency with Environmental Best Practice Guidelines (Wetlands & Waterways Works Manual)***

#### Relevant Code Criteria:

- P2(i): The environmental best practice guidelines in the Wetlands and Waterways Works Manual.

#### Assessment

The proposed development does not involve works within wetlands, waterways or drainage features. Nevertheless, the design and construction of the development have had regard to the principles and environmental best practice measures outlined in the Wetlands and Waterways Works Manual, particularly those relating to minimising disturbance, managing earthworks, and protecting natural hydrological processes.

Construction activities will be confined to the defined building envelopes and access driveway, and standard best-practice measures will be implemented to prevent erosion, sediment mobilisation and off-site impacts. Stormwater will be managed on-site using infiltration-based measures appropriate to the Site's soil conditions, ensuring post-development drainage behaviour is consistent with existing conditions.

Accordingly, the proposal is consistent with the intent of the Wetlands and Waterways Works Manual and satisfies the requirements of C7.6.1 P2(i).

### ***Consistency with the Tasmanian Coastal Works Manual***

#### Relevant Code Criteria:

- P2(j): The guidelines in the Tasmanian Coastal Works Manual.

#### Assessment

The proposed development is not located within an active coastal environment and does not involve works within tidal waters, coastal landforms or areas subject to coastal processes. Nevertheless, the principles of the Tasmanian Coastal Works Manual have been considered, particularly those relating to avoiding interference with natural coastal processes and minimising the need for future protective works.

The Site's inland setting, lack of tidal influence and separation from coastal sediment systems mean that the proposal will not affect coastal stability, sediment transport or shoreline dynamics. No coastal protection structures, shoreline modifications or coastal engineering works are proposed as part of the development.

Accordingly, the proposed development is consistent with the intent of the Tasmanian Coastal Works Manual and satisfies the requirements of C7.6.1 P2(j).

### ***Justification for Coastal Location (Where Applicable)***

#### Relevant Code Criteria:

- P1.2(a-f) and P2.2(a-f): Development requiring coastal proximity.

#### Assessment

In this case, the Site is privately owned and zoned Rural, and it is reasonable and appropriate that the landowner be afforded the opportunity to use the land for lawful rural purposes consistent with the established character of the locality. The land is proposed to be used for the keeping and care of horses, which is a well-established and prevalent rural land use within Sandford and the surrounding area. Many

neighbouring properties are similarly utilised for equestrian purposes and rely on on-site occupation to enable appropriate animal care and land management.

The keeping of horses is inherently land-dependent and requires a permanent on-site presence to ensure proper animal welfare and effective day-to-day management. Activities such as feeding, watering, monitoring animal health, maintaining fencing and shelters, managing pasture and responding promptly to animal welfare issues cannot reasonably be undertaken remotely. The Site also contains a groundwater resource consistent with those accessed by surrounding properties, which is intended to support stock watering and general rural use. Access to and management of this resource is location-specific and requires ongoing oversight. A dwelling is therefore fundamental to enabling the responsible use of the land for horse keeping, rather than incidental to it. Denying on-site occupation would unreasonably constrain the lawful and established rural use of the land, despite the activity being low-intensity and consistent with the surrounding rural and equestrian character.

# Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

**Reference:**

**Requested For:**

**Report Type:** Summary Report

**Timestamp:** 01:24:33 PM Friday 12 December 2025

**Threatened Flora:** buffers Min: 100m Max: 500m

**Threatened Fauna:** buffers Min: 100m Max: 500m

**Raptors:** buffers Min: 100m Max: 500m

**Tasmanian Weed Management Act Weeds:** buffers Min: 100m Max: 500m

**Priority Weeds:** buffers Min: 100m Max: 500m

**TASVEG:** buffer 200m

**Threatened Communities:** buffer 200m



The centroid for this query GDA94: 541245.0, 5246951.0 falls within:

**Property:** 9823852

\*\*\* No threatened flora found within 100 metres \*\*\*

\*\*\* No threatened flora found within 500 metres \*\*\*

Threatened fauna within 100 metres

541663\_1247428



140823\_1246438

Please note that some layers may not display at all reported map scales



### Threatened fauna within 100 metres

Legend: Verified and Unverified observations

● Point Verified

▬ Line Unverified

● Point Unverified

▭ Polygon Verified

▬ Line Verified

▭ Polygon Unverified

Legend: Cadastral Parcels



## Threatened fauna within 100 metres

### Threatened fauna within 100 metres (based on Range Boundaries)

| Species                                       | Common Name                  | SS | NS | BO  | Potential | Known | Core |
|---|------------------------------|----|----|-----|-----------|-------|------|
| <i>Lathyrus discolor</i>                      | swift parrot                 | e  | CR | mbc | 1         | 0     | 1    |
| <i>Antipodia chaostola</i>                    | chaostola skipper            | e  | EN | ac  | 1         | 0     | 0    |
| <i>Pseudemoia paggenstecheri</i>              | tussock skink                | v  |    | n   | 1         | 0     | 0    |
| <i>Scopula schroa</i>                         | salmarsh looper moth         | v  |    | ac  | 1         | 0     | 0    |
| <i>Tyto novaehollandiae subsp. castaneops</i> | Tasmanian masked owl         | e  | VU | e   | 1         | 0     | 1    |
| <i>Haliaeetus leucogaster</i>                 | white-bellied sea-eagle      | v  |    | n   | 2         | 0     | 0    |
| <i>Dasyurus maculatus subsp. maculatus</i>    | spotted-tailed quoll         | r  | VU | n   | 1         | 0     | 0    |
| <i>Amelora acontistica</i>                    | chevron looper moth          | v  |    |     | 1         | 0     | 0    |
| <i>Litoria raniformis</i>                     | green and gold frog          | v  | VU | ac  | 1         | 0     | 0    |
| <i>Accipiter novaehollandiae</i>              | grey goshawk                 | e  |    | n   | 1         | 0     | 0    |
| <i>Sarcophilus harrisii</i>                   | tasmanian devil              | e  | EN | e   | 1         | 0     | 0    |
| <i>Pardaliparus quadragintus</i>              | forty-spotted pardalote      | e  | EN | e   | 1         | 0     | 0    |
| <i>Chrysolarentia decisaria</i>               | tunbridge looper moth        | e  |    | ac  | 1         | 0     | 0    |
| <i>Perameles gunnii</i>                       | eastern barred bandicoot     |    | VU | n   | 1         | 0     | 1    |
| <i>Aquila audax subsp. foryi</i>              | tasmanian wedge-tailed eagle | e  | EN | e   | 1         | 0     | 0    |
| <i>Dasyurus viverrinus</i>                    | eastern quoll                |    | EN | n   | 0         | 0     | 1    |

For more information about threatened species, please contact Threatened Species Enquiries.

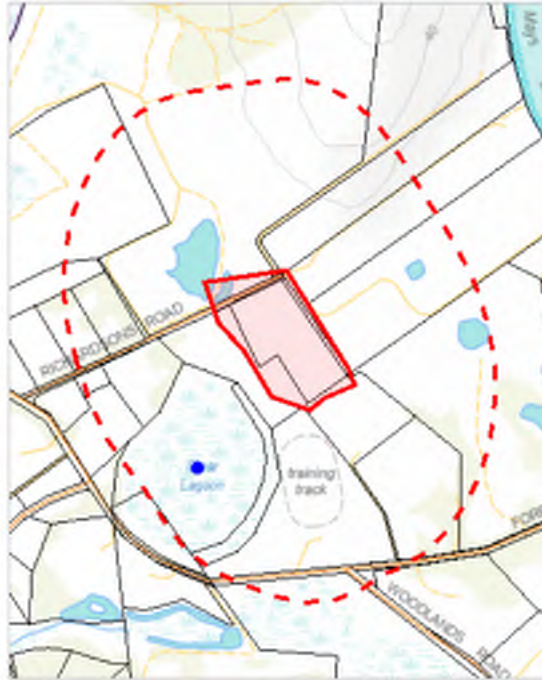
Telephone: 1300 368 550

Email: [ThreatenedSpeciesEnquiries@nre.tas.gov.au](mailto:ThreatenedSpeciesEnquiries@nre.tas.gov.au)

Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened fauna within 500 metres

541958, 5247828



140127, 1246017

Please note that some layers may not display at all reported map scales



### Threatened fauna within 500 metres

Legend: Verified and Unverified observations

● Point Verified

▬ Line Unverified

● Point Unverified

▭ Polygon Verified

▬ Line Verified

▭ Polygon Unverified

Legend: Cadastral Parcels



## Threatened fauna within 500 metres

### Verified Records

| Species                   | Common Name            | SS | NS | Bio | Observation Count | Last Recorded |
|---------------------------|------------------------|----|----|-----|-------------------|---------------|
| <i>Calidris acuminata</i> | sharp-tailed sandpiper |    | VU | n   | 2                 | 24-Oct-2011   |

### Unverified Records

No unverified records were found!

## Threatened fauna within 500 metres (based on Range Boundaries)

| Species                                       | Common Name                  | SS | NS | BO  | Potential | Known | Core |
|---|------------------------------|----|----|-----|-----------|-------|------|
| <i>Lathamus discolor</i>                      | swift parrot                 | e  | CR | mbe | 1         | 0     | 1    |
| <i>Actipodia chaostola</i>                    | chaostola skipper            | e  | EN | ae  | 1         | 0     | 0    |
| <i>Pseudomola pagenstecheri</i>               | tussock skink                | v  |    | n   | 1         | 0     | 0    |
| <i>Scopula achroa</i>                         | saltmarsh looper moth        | v  |    | ae  | 1         | 0     | 0    |
| <i>Tyto novaehollandiae subsp. castaneops</i> | Tasmanian masked owl         | e  | VU | e   | 1         | 0     | 1    |
| <i>Haliaeetus leucogaster</i>                 | white-bellied sea-eagle      | v  |    | n   | 2         | 0     | 0    |
| <i>Dasyurus maculatus subsp. maculatus</i>    | spotted-tailed quoll         | r  | VU | n   | 1         | 0     | 0    |
| <i>Amelora aconitifolia</i>                   | chevron looper moth          | v  |    |     | 1         | 0     | 1    |
| <i>Litoria raniformis</i>                     | green and gold frog          | v  | VU | ae  | 1         | 0     | 0    |
| <i>Accipiter novaehollandiae</i>              | grey goshawk                 | e  |    | n   | 1         | 0     | 0    |
| <i>Sarcophilus harrisi</i>                    | tasmanian devil              | e  | EN | e   | 1         | 0     | 0    |
| <i>Pardaliparus quadragintus</i>              | forty-spotted pardalose      | e  | EN | e   | 1         | 0     | 0    |
| <i>Chrysolarentia decisaria</i>               | turbridge looper moth        | e  |    | ae  | 1         | 0     | 0    |
| <i>Perameles gunni</i>                        | eastern barred bandicoot     |    | VU | n   | 1         | 0     | 1    |
| <i>Aquila audax subsp. flozyl</i>             | tasmanian wedge-tailed eagle | e  | EN | e   | 1         | 0     | 0    |
| <i>Dasyurus viverrinus</i>                    | eastern quoll                |    | EN | n   | 0         | 0     | 1    |

For more information about threatened species, please contact Threatened Species Enquiries.

Telephone: 1300 368 550

Email: [ThreatenedSpecies.Enquiries@nre.tas.gov.au](mailto:ThreatenedSpecies.Enquiries@nre.tas.gov.au)

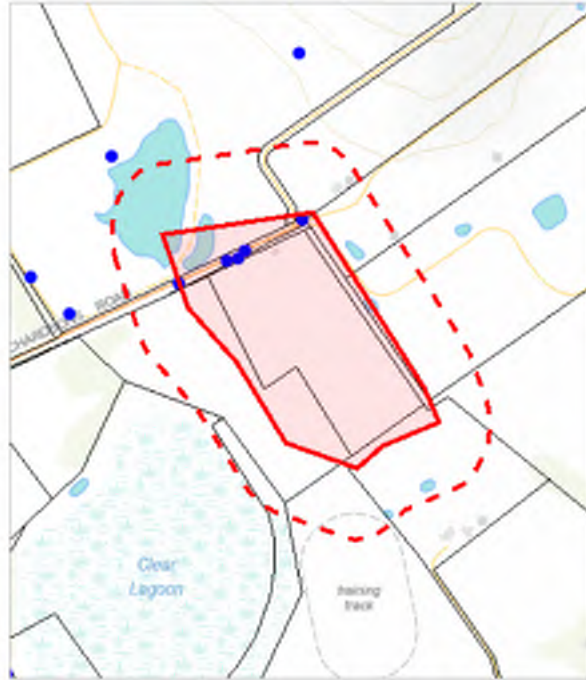
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

\*\*\* No Raptor nests or sightings found within 100 metres. \*\*\*

\*\*\* No Raptor nests or sightings found within 500 metres. \*\*\*

Tas Management Act Weeds within 100 m

541663\_1247428



140823\_1246438

Please note that some layers may not display at all reported map scales



### Tas Management Act Weeds within 100 m

Legend: Verified and Unverified observations

● Point Verified

▬ Line Unverified

● Point Unverified

▭ Polygon Verified

▬ Line Verified

▭ Polygon Unverified

Legend: Cadastral Parcels



## Tas Management Act Weeds within 100 m

### Verified Records

| Species                       | Common Name                       | Observation Count | Last Recorded |
|-------------------------------|-----------------------------------|-------------------|---------------|
| <i>Genista monspessulana</i>  | montpellier broom or canary broom | 1                 | 10-May-2009   |
| <i>Lycium ferocissimum</i>    | african boxthorn                  | 3                 | 10-May-2009   |
| <i>Myriophyllum aquaticum</i> | parrotfeather                     | 1                 | 13-Oct-1986   |

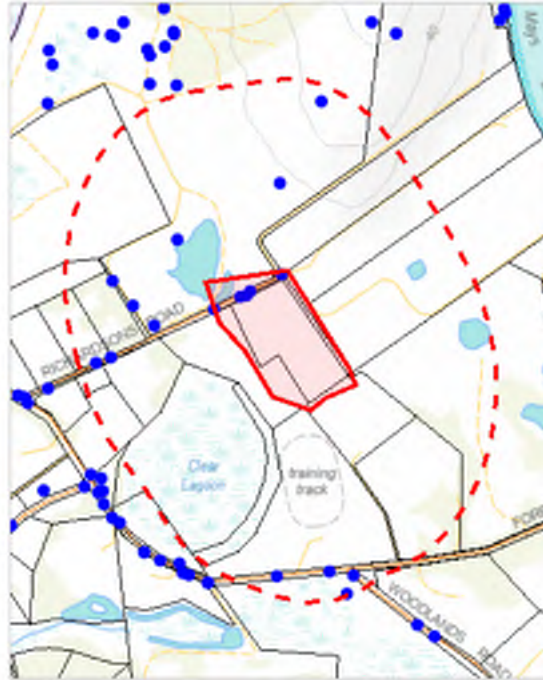
### Unverified Records

For more information about introduced weed species, please visit the following URL for contact details in your area:

<https://www.nre.tas.gov.au/invasive-species/weeds>

Tas Management Act Weeds within 500 m

541958, 5247828



140127, 1246017

Please note that some layers may not display at all reported map scales.



## Tas Management Act Weeds within 500 m

Legend: Verified and Unverified observations

● Point Verified

▬ Line Unverified

● Point Unverified

▭ Polygon Verified

▬ Line Verified

▭ Polygon Unverified

Legend: Cadastral Parcels



## Tas Management Act Weeds within 500 m

### Verified Records

| Species   | Common Name                       | Observation Count | Last Recorded |
|---|-----------------------------------|-------------------|---------------|
| <i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i> | boneseed                          | 2                 | 17-Jul-2012   |
| <i>Genista monspeliensis</i>                                | montpellier broom or canary broom | 2                 | 29-Jun-2016   |
| <i>Lycium ferocissimum</i>                                  | african baobab                    | 9                 | 10-May-2009   |
| <i>Myriophyllum aquaticum</i>                               | parrotfeather                     | 1                 | 13-Oct-1986   |
| <i>Nassella trichosoma</i>                                  | serrated tussock                  | 5                 | 29-Nov-2019   |
| <i>Rubus fruticosus</i>                                     | blackberry                        | 1                 | 29-Nov-2019   |

### Unverified Records

For more information about introduced weed species, please visit the following URL for contact details in your area:

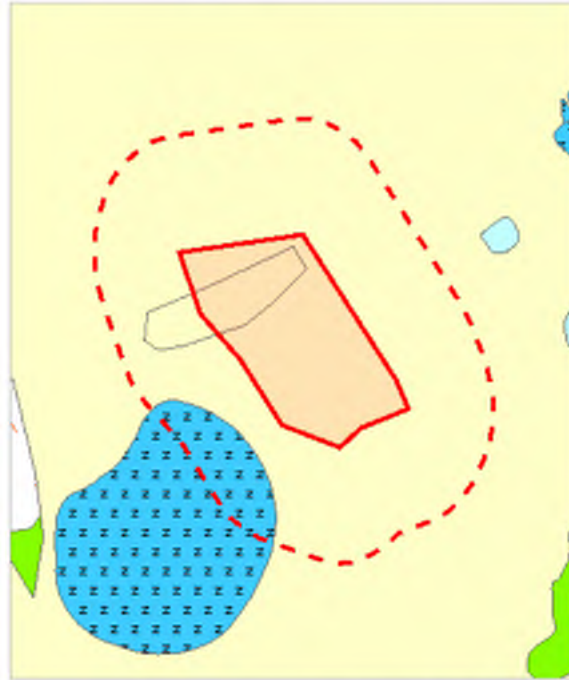
<https://www.nre.tas.gov.au/invasive-species/weeds>

**\*\*\* No Priority Weeds found within 100 metres \*\*\***

**\*\*\* No Priority Weeds found within 500 metres \*\*\***

TASVEG 5.0 Communities within 200 metres

541737\_5247328



540195\_1246338

Please note that some layers may not display at all reported map scales.
































































## TASVEG 5.0 Communities within 200 metres

**Legend: TASVEG 5.0**

-  (DAC) Eucalyptus amygdalina coastal forest and woodland
-  (DAD) Eucalyptus amygdalina forest and woodland on dolerite
-  (DAM) Eucalyptus amygdalina forest on mudstone
-  (DAS) Eucalyptus amygdalina forest and woodland on sandstone
-  (DAZ) Eucalyptus amygdalina inland forest and woodland on Cainozoic deposits
-  (DBA) Eucalyptus barberi forest and woodland
-  (DCO) Eucalyptus coccifera forest and woodland
-  (DCR) Eucalyptus cordata forest
-  (DDE) Eucalyptus delegatensis dry forest and woodland
-  (DDP) Eucalyptus dalrympleana - Eucalyptus pauciflora forest and woodland
-  (DFP) Furneaux peppermint forest
-  (DGL) Eucalyptus globulus dry forest and woodland
-  (DGW) Eucalyptus gunnii woodland
-  (DKW) King Island Eucalypt woodland
-  (DMO) Eucalyptus morrisbyi forest and woodland
-  (DMW) Midlands woodland complex
-  (DN) Eucalyptus nitida dry forest and woodland
-  (DOB) Eucalyptus obliqua dry forest
-  (DOV) Eucalyptus ovata forest and woodland
-  (DOW) Eucalyptus ovata healthy woodland
-  (DPD) Eucalyptus pauciflora forest and woodland on dolerite
-  (DPE) Eucalyptus perriniana forest and woodland
-  (DPO) Eucalyptus pauciflora forest and woodland not on dolerite
-  (DPU) Eucalyptus pulchella forest and woodland
-  (DRI) Eucalyptus risdonii forest and woodland
-  (DRO) Eucalyptus rodwayi forest and woodland
-  (DSC) Eucalyptus amygdalina - Eucalyptus obliqua damp sclerophyll forest
-  (DSG) Eucalyptus sieberi forest and woodland on granite
-  (DSO) Eucalyptus sieberi forest and woodland not on granite
-  (DTE) Eucalyptus tenuramis forest and woodland on dolerite
-  (DTG) Eucalyptus tenuramis forest and woodland on granite
-  (DTO) Eucalyptus tenuramis forest and woodland on sediments
-  (DVC) Eucalyptus viminalis - Eucalyptus globulus coastal forest and woodland
-  (DVF) Eucalyptus viminalis Furneaux forest and woodland
-  (DVG) Eucalyptus viminalis grassy forest and woodland
-  (DCH) Alpine coniferous heathland
-  (DHC) Cushion moorland
-  (DHE) Eastern alpine heathland
-  (DHW) Western alpine heathland
-  (DSE) Eastern alpine sedgeland
-  (DSW) Western alpine sedgeland/herbland
-  (DHE) Eastern alpine vegetation (undifferentiated)
-  (FAC) Improved pasture with native tree canopy
-  (FAL) Agricultural land
-  (FMG) Marram grassland
-  (FPE) Permanent easements
-  (FPF) Pteridium esculentum fernland
-  (FPH) Plantations for silviculture - hardwood
-  (FPS) Plantations for silviculture - softwood
-  (FPU) Unverified plantations for silviculture
-  (FRG) Regenerating cleared land
-  (FSM) Spartina marshland
-  (FUM) Extra-urban miscellaneous
-  (FUR) Urban areas
-  (FWU) Weed infestation
-  (MBE) Eastern buttongrass moorland
-  (MBP) Pure buttongrass moorland
-  (MBR) Sparse buttongrass moorland on slopes
-  (MBS) Buttongrass moorland with emergent shrubs



## TASVEG 5.0 Communities within 200 metres

|   |  |
|---|--|
|    | (MBU) Buttongrass moorland (undifferentiated)                      |
|    | (MBW) Western buttongrass moorland                                 |
|    | (MDS) Subalpine Diplarrena latifolia rushland                      |
|    | (DMGH) Highland grassy sedgeland                                   |
|    | (MRR) Restionaceae rushland  |
|    | (MSW) Western lowland sedgeland                                    |
|    | (GCL) Lowland grassland complex                                    |
|    | (GHC) Coastal grass and herbfield                                  |
|    | (GPH) Highland Poa grassland                                       |
|    | (GPL) Lowland Poa labillardierei grassland                         |
|    | (GRP) Rockplate grassland  |
|    | (GSL) Lowland grassy sedgeland                                     |
|    | (GTL) Lowland Themeda triandra grassland                           |
|    | (NAD) Acacia dealbata forest                                       |
|    | (NAF) Acacia melanoxylon swamp forest                              |
|    | (NAL) Allocasuarina littoralis forest                              |
|    | (NAR) Acacia melanoxylon forest on rises                           |
|    | (NAV) Allocasuarina verticillata forest                            |
|    | (NBA) Bursaria - Acacia woodland                                   |
|    | (NBS) Banksia serrata woodland                                     |
|    | (NCR) Callitris rhomboidea forest                                  |
|    | (NLA) Leptospermum scoparium - Acacia mucronata forest             |
|    | (NLE) Leptospermum forest  |
|    | (NLM) Leptospermum lanigerum - Melaleuca squarrosa swamp forest    |
|    | (NLN) Subalpine Leptospermum nitidum woodland                      |
|   | (NME) Melaleuca ericifolia swamp forest                            |
|  | (OAQ) Water, sea   |
|  | (ORO) Uchen lithosere  |
|  | (OSM) Sand, mud  |
|  | (RCC) Coastal rainforest   |
|  | (RFE) Rainforest fernland  |
|  | (RFS) Nothofagus gunnii rainforest scrub                           |
|  | (RHP) Lagarostrobos franklinii rainforest and scrub                |
|  | (RKF) Athrotaxis selaginoides - Nothofagus gunnii short rainforest |
|  | (RKP) Athrotaxis selaginoides rainforest                           |
|  | (RKS) Athrotaxis selaginoides subalpine scrub                      |
|  | (RKO) Highland rainforest scrub with dead Athrotaxis selaginoides  |
|  | (RML) Nothofagus - Leptospermum short rainforest                   |
|  | (RMS) Nothofagus - Phyllocladus short rainforest                   |
|  | (RMT) Nothofagus - Atherosperma rainforest                         |
|  | (RMU) Nothofagus rainforest (undifferentiated)                     |
|  | (RPF) Athrotaxis cupressoides - Nothofagus gunnii short rainforest |
|  | (RPP) Athrotaxis cupressoides rainforest                           |
|  | (RPW) Athrotaxis cupressoides open woodland                        |
|  | (RSH) Highland low rainforest and scrub                            |
|  | (AAP) Alkaline pans  |
|  | (AHF) Freshwater aquatic herbland                                  |
|  | (AHL) Lacustrine herbland  |
|  | (AHS) Saline aquatic herbland                                      |
|  | (ARS) Saline sedgeland / rushland                                  |
|  | (ASF) Freshwater aquatic sedgeland and rushland                    |
|  | (ASP) Sphagnum peatland  |
|  | (ASS) Succulent saline herbland                                    |
|  | (AUS) Saltmarsh (undifferentiated)                                 |
|  | (AWU) Wetland (undifferentiated)                                   |
|  | (SAL) Acacia longifolia coastal scrub                              |
|  | (SBM) Banksia marginata wet scrub                                  |
|  | (SBR) Broad-leaf scrub   |
|  | (SCA) Coastal scrub on alkaline sands                              |
|  | (SCH) Coastal heathland  |
|  | (SCL) Heathland on calcareous substrates                           |

Department of Natural Resources and Environment Tasmania

Page 16 of 18

## TASVEG 5.0 Communities within 200 metres

-  (SED) Eastern scrub on dolerite
-  (SHS) Subalpine heathland
-  (SHW) Wet heathland
-  (SKA) Kunzea ambigua regrowth scrub
-  (SLG) Leptospermum glaucescens heathland and scrub
-  (SLL) Leptospermum lanigerum scrub
-  (SLS) Leptospermum scoparium heathland and scrub
-  (SMM) Melaleuca squamea heathland
-  (SMP) Melaleuca pustulata scrub
-  (SMR) Melaleuca squarrosa scrub
-  (SRE) Eastern riparian scrub
-  (SRF) Leptospermum with rainforest scrub
-  (SRH) Rookery halophytic herbland
-  (SSC) Coastal scrub
-  (SSK) Scrub complex on King Island
-  (SSW) Western subalpine scrub
-  (SSZ) Spray zone coastal complex
-  (SWR) Western regrowth complex
-  (SWW) Western wet scrub
-  (WBR) Eucalyptus brookeriana wet forest
-  (WDA) Eucalyptus dalrympleana forest
-  (WDB) Eucalyptus delegatensis forest with broad-leaf shrubs
-  (WDL) Eucalyptus delegatensis forest over Leptospermum
-  (WDR) Eucalyptus delegatensis forest over rainforest
-  (WDU) Eucalyptus delegatensis wet forest (undifferentiated)
-  (WGX) Eucalyptus globulus King Island forest
-  (WGL) Eucalyptus globulus wet forest
-  (WNL) Eucalyptus nitida forest over Leptospermum
-  (WNR) Eucalyptus nitida forest over rainforest
-  (WNU) Eucalyptus nitida wet forest (undifferentiated)
-  (WOB) Eucalyptus obliqua forest with broad-leaf shrubs
-  (WOL) Eucalyptus obliqua forest over Leptospermum
-  (WOR) Eucalyptus obliqua forest over rainforest
-  (WOU) Eucalyptus obliqua wet forest (undifferentiated)
-  (WRE) Eucalyptus regnans forest
-  (WSU) Eucalyptus subcrenulata forest and woodland
-  (WVI) Eucalyptus viminalis wet forest

Legend: Cadastral Parcels



### TASVEG 5.0 Communities within 200 metres

| Code | Community                       | Notable Tree  |
|------|---------------------------------|---------------|
| ASS  | (ASS) Succulent saline herbland |               |
| FAL  | (FAL) Agricultural land         | (EO) E. ovata |
| FAL  | (FAL) Agricultural land         |               |

For more information contact: Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.

Telephone: (03) 6165 4320

Email: TVMMPsupport@nre.tas.gov.au

Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

**\*\*\* No threatened Communities (TNVC 2020) found within 200 metres \*\*\***

## Attachment 9 Inundation Risk Assessment

Summary of inundation levels within the Project Area based on modelled criteria.

### Tasmanian Planning Scheme Coastal Inundation Modelling

Modelling has been conducted for Tasmanian Planning Scheme purposes and specifically to determine that the use, building and works 'can achieve and maintain a tolerable risk from a 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the use without requiring any specific hazard reduction or protection measures'. This risk assessment therefore is based on tolerable risks associated with the defined floor level.

#### Floor Inundation Probability

Inundation hazards at the Site are determined by the results obtained in Attachment 5, Attachment 6 and Attachment 7 and summarised in Table 9.

**Table 9 Projected coastal and groundwater inundation levels compared with Site ground levels**

| Model  | Modelled Inundation Level at the Site (m AHD) | Limiting Site inundation levels (m AHD) |
|--|---|---|
| Coastal Overtopping Assessment: Ralphs Bay to Rushy Lagoon | N/A <sup>9</sup>                              | 0                                       |
| Rushy Lagoon Inlet Hydrodynamic Simulation                 | 1.70  | 1.80                                    |
| Groundwater Considerations for 2100                        | 1.73  | 1.80                                    |

Based on 2100 Rushy Lagoon Inlet Hydrodynamic Simulation inundation levels modelled at 1.7 m AHD and groundwater levels modelled at 1.73m AHD, given the stipulated local provision schedule dwelling finished floor levels at 3.0 m AHD:

- The chance of flooding reaching habitable dwelling floors by 2100 in a 1% AEP event is very low.
- The chance of flooding reaching non habitable building floors (shed level at or greater than 1.9m, AHD) by 2100 in a 1% AEP event is very low.

**Table 10 Summary of 1% AEP Site Floodwater Depths & Estimated Velocities**

| Location | Floodwater depth based on 2019 LIDAR (m) | Floodwater Velocity Estimates (m/s) |
|----------|--|-------------------------------------|
| Dwelling | 0m                                       | 0                                   |
| Shed     | 0m                                       | 0                                   |

<sup>9</sup> Based on the modelling conducted inundation from Ralphs Bay is not expected

## Attachment 10 Risk Assessment Qualitative Terminology

| DESCRIPTOR      | QUALITATIVE MEASURES OF LIKELIHOOD  |
|-----------------|---|
| ALMOST CERTAIN  | The event is expected to occur over the design life                                     |
| LIKELY          | The event will probably occur under adverse conditions over the design life             |
| POSSIBLE        | The event could occur under adverse conditions over the design life                     |
| UNLIKELY        | The event might occur under very adverse circumstances over the design life.            |
| RARE            | The event is conceivable but only under exceptional circumstances over the design life. |
| BARELY CREDIBLE | The event is inconceivable or fanciful over the design life.                            |

| DESCRIPTOR    | QUALITATIVE MEASURES OF CONSEQUENCES TO PROPERTY  |
|---------------|---|
| CATASTROPHIC  | Structure(s) completely destroyed and/or large-scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage.           |
| MAJOR         | Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage. |
| MEDIUM        | Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage.                 |
| MINOR         | Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.  |
| INSIGNIFICANT | Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a notional boundary of 0.1%. See Risk Matrix.)   |

| LIKELIHOOD      | CONSEQUENCES TO PROPERTY |       |        |       |               |
|-----------------|--------------------------|-------|--------|-------|---------------|
|                 | CATASTROPHIC             | MAJOR | MEDIUM | MINOR | INSIGNIFICANT |
| ALMOST CERTAIN  | VH                       | VH    | VH     | H     | L             |
| LIKELY          | VH                       | VH    | H      | M     | L             |
| POSSIBLE        | VH                       | H     | M      | M     | VL            |
| UNLIKELY        | H                        | M     | L      | L     | VL            |
| RARE            | M                        | L     | L      | VL    | VL            |
| BARELY CREDIBLE | L                        | VL    | VL     | VL    | VL            |

| RISK LEVEL |                | EXAMPLE IMPLICATIONS  |
|------------|----------------|---|
| VH         | VERY HIGH RISK | 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 value of the property.             |
| H          | HIGH RISK      | Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low.  |
| M          | MODERATE RISK  | 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 RISK       | Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing management is required.   |
| VL         | VERY LOW RISK  | Acceptable. Manage by management procedures.  |

## Attachment 11 Performance Criteria – Natural Assets Code

### C7.6.1 P2.1 - Buildings and works – refugia area

| <b>Performance Criteria C7.6.1 P2.1</b><br><b>Buildings and works within a <i>future coastal refugia</i><sup>10</sup> area must allow for natural coastal processes to continue to occur and avoid or minimise adverse impacts on natural assets, having regard to:</b> | <b>Relevance</b>  | <b>Management Options</b> |
|---|---|---------------------------|
| (a) allowing for the landward transgression of sand dunes and the landward colonisation of wetlands, saltmarshes and other coastal habitats from adjacent areas;  | The Site is inland, hydrologically isolated and above the inferred future coastal refugia elevation, and therefore does not function as land required to accommodate landward transgression of coastal or wetland habitats. | NA                        |
| (b) avoiding the creation of barriers or drainage networks that would prevent future tidal inundation;  | The development does not introduce embankments, levees or drainage infrastructure and will not create barriers that could prevent future tidal inundation, noting the Site is not tidally influenced.                       | NA                        |
| (c) allowing the coastal processes of sand deposition or erosion to continue to occur;  | No coastal landforms or sediment systems occur on or adjacent to the Site, and the proposal will not interfere with coastal sand deposition or erosion processes.   | NA                        |
| (d) the need to group new facilities with existing facilities, where reasonably practical;  | The dwelling, shed and access driveway are consolidated within a single defined development envelope, grouping new facilities where reasonably practicable.   | NA                        |
| (e) the impacts on native vegetation;   | The Site comprises previously disturbed agricultural land and the proposal will not impact native vegetation or vegetation of conservation significance.  | NA                        |
| (f) minimising cut and fill;  | Earthworks are minimised, with minimal cutting proposed (<0.2m) and only minor, localised fill confined to building footprints and the access driveway.   | NA                        |
| (g) building design that responds to the particular size, shape, contours or slope of the land;   | The building design responds appropriately to the Site's size, shape and generally flat topography, avoiding unstable areas and minimising landform modification.   | NA                        |
| (h) the impacts of sea-level rise on natural coastal processes and coastal habitat;   | The Site is inland and not subject to coastal processes, and sea-level rise will not influence coastal habitats or natural coastal processes on the land.   | NA                        |
| (i) the environmental best practice guidelines in the Wetlands and Waterways Works Manual; and  | The proposal is consistent with the principles of the Wetlands and Waterways Works Manual by minimising disturbance, managing stormwater on-site and protecting existing hydrological conditions.                           | NA                        |
| (j) the guidelines in the Tasmanian Coastal Works Manual.   | The development is consistent with the Tasmanian Coastal Works Manual as it does not involve coastal works or interfere with coastal processes or landforms.  | NA                        |

<sup>10</sup> means land where coastal processes are likely to occur naturally and can continue to occur, including the landward transgression of sand dunes, wetlands, saltmarshes, and other sensitive coastal habitats due to sea-level rise.

**C7.6.1 P2.2 - Buildings and works – refugia area**

| <b>Performance Criteria C7.6.1 P2.2</b><br><b>Buildings and works within a <i>future coastal refugia</i><sup>10</sup> area must be for a use that relies upon a coastal location to fulfil its purpose, having regard to:</b> | <b>Relevance</b>   | <b>Management Options</b> |
|---|--|---------------------------|
| (a) the need to access a specific resource in a coastal location;   | Although mapped within the Future Coastal Refugia Overlay, the proposed development is located approximately 800 m inland from the coast and is not situated in a coastal location or associated with coastal or marine processes. The dwelling is required to enable ongoing access to and management of location-specific rural resources on the Site, including pasture and stock infrastructure used for the keeping and care of horses, consistent with surrounding properties. Effective use of these resources requires a permanent on-site presence to ensure animal welfare, land management and maintenance of rural infrastructure. The Site also contains a groundwater resource used for stock watering and general rural purposes, access to which is inherently location-dependent and necessitates on-site occupation in the same manner as neighbouring rural landholdings. | NA                        |
| (b) the need to operate a marine farming shore facility;  | NA   | NA                        |
| (c) the need to access infrastructure available in a coastal location;  | NA   | NA                        |
| (d) the need to service a marine or coastal related activity;   | NA   | NA                        |
| (e) provision of essential utility or marine infrastructure; or   | NA   | NA                        |
| (f) provisions of open space or for marine-related educational, research, or recreational facilities.   | NA   | NA                        |

## Attachment 12 Performance Criteria - Inundation Hazards

### Tasmanian Planning Scheme – Coastal Inundation – Use Standards

#### C11.5.2 Uses located within a non-urban zone and within a medium coastal inundation hazard band

Objective:

To ensure that a use located within a non-urban zone and within a medium coastal inundation hazard band:

- (a) is reliant on a coastal location; and
- (b) can achieve and maintain a tolerable risk from exposure to coastal inundation.

#### C11.5.2 P1.1

| Performance Criteria C11.5.2 P1.1<br>A use within a non-urban zone and within a medium coastal inundation hazard band must be for a use which relies upon a coastal location to fulfil its purpose, having regard to: | Relevance  | Management Options | Further Assessment Required |
|---|--|--------------------|-----------------------------|
| (a) the need to access a specific resource in a coastal location;   | Although mapped within a medium coastal inundation hazard band, the Site is approximately 800 m inland and not coastal in nature. Detailed coastal inundation modelling based on a conservative 2100 1% AEP scenario indicates that extreme worst-case inundation levels at the Site would be limited to approximately 1.73 m AHD, with any coastal overtopping (30mm head difference) occurring at very low probability and for short duration (<0.5 hours) only. The defined building and works area is located at and above approximately 1.8 m AHD, above the modelled inundation extent, and the dwelling relies on access to location-specific rural resources on the land rather than a coastal location. |                    | No                          |
| (b) the need to operate a marine farming shore facility;  | NA   |                    | No                          |
| (c) the need to access infrastructure available in a coastal location;  | NA   |                    | No                          |
| (d) the need to service a marine or coastal related activity;   | NA   |                    | No                          |
| (e) provision of an essential utility or marine infrastructure;   | NA   |                    | No                          |
| (f) provision of open space or for marine-related educational, research, or recreational facilities;  | NA   |                    | No                          |
| (g) any advice from a State authority, regulated entity or a council; and   | No advice from a State authority, regulated entity or Council has identified any requirement for the Site to be used for a coastal-dependent purpose.  |                    | No                          |
| (h) the advice obtained in a coastal inundation hazard report.  | The coastal inundation hazard report demonstrates that under a conservative 2100 1% AEP scenario, potential inundation at the Site is limited, low-probability and does not introduce coastal processes, supporting the suitability of the proposed use.   |                    | No                          |

#### C11.5.2 P1.2

| <b>Performance Criteria C11.5.2 P1.2</b><br>A coastal inundation hazard report also demonstrates that:  | <b>Relevance</b>   | <b>Management Options</b> | <b>Likelihood</b> | <b>Consequence</b> | <b>Risk</b> | <b>Further Assessment Required</b> |
|---|--|---------------------------|-------------------|--------------------|-------------|------------------------------------|
| (a) any increase in the level of risk from coastal inundation does not require any specific hazard reduction or protection measures; or   |  | NA                        | BARELY CREDIBLE   | MINOR              | VERY LOW    | NO                                 |
| (b) the use can achieve and maintain a tolerable risk from a 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the use without requiring any specific hazard reduction or protection measures. | The coastal inundation hazard report demonstrates that the proposed use can achieve and maintain a tolerable level of risk from a 1% AEP coastal inundation event in 2100 for the intended life of the development, without requiring any specific hazard reduction or protection measures, as the building and works area is located above the modelled extreme inundation level of approximately 1.73 m AHD. | NA                        | BARELY CREDIBLE   | MINOR              | VERY LOW    | NO                                 |

## Tasmanian Planning Scheme – Coastal Inundation – Building and Works

### **C11.6.1 Buildings and works, excluding coastal protection works, within a coastal inundation hazard area**

Objective:

To ensure that

- (a) building and works, excluding coastal protection works, within a coastal inundation hazard area, can achieve and maintain a tolerable risk from coastal inundation; and
- (b) buildings and works do not increase the risk from coastal inundation to adjacent land and public infrastructure.

#### **C11.6.1 P1.1**

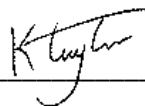
| <b>Performance Criteria C11.6.1 P1.1</b><br>Buildings and works, excluding coastal protection work, within a coastal inundation hazard area must have a tolerable risk, having regard to: | <b>Relevance</b>   | <b>Management Options</b> | <b>Likelihood</b> | <b>Consequence</b> | <b>Risk</b> | <b>Further Assessment Required</b> |
|---|--|---------------------------|-------------------|--------------------|-------------|------------------------------------|
| (a) whether any increase in the level of risk from coastal inundation requires any specific hazard reduction or protection measures;  | The proposed buildings and works do not increase coastal inundation risk and do not require any specific hazard reduction or protection measures, as the development is located above the modelled 2100 1% AEP inundation level of approximately 1.73 m AHD. |                           | BARELY CREDIBLE   | MINOR              | VERY LOW    | NO                                 |
| (b) any advice from a State authority, regulated entity or a council; and   | No advice from a State authority, regulated entity or Council has identified any requirement for hazard mitigation or protection measures in relation to coastal inundation at the Site.   |                           | BARELY CREDIBLE   | MINOR              | VERY LOW    | NO                                 |
| (c) the advice contained in a coastal inundation hazard report.   | The coastal inundation hazard report confirms that the proposal can achieve and maintain a tolerable level of risk from coastal inundation for the intended life of the development.   |                           | BARELY CREDIBLE   | MINOR              | VERY LOW    | NO                                 |

## Attachment 13 Director's Determination Declaration – Coastal Inundation

| Coastal Inundation Hazard Reporting  | Application  |
|--|--|
| whether the development is likely to cause or contribute to coastal inundation on the Site or on adjacent land.                                  | There is a low likelihood that the proposed building and works will contribute to coastal inundation on the site or adjacent land.   |
| whether the proposed work can achieve and maintain a <i>tolerable risk</i> <sup>11</sup> for the intended life of the building having regard to: | <b>Application/Management</b>  |
| nature, intensity and duration of the use  | The proposed use is a low-intensity, permanent residential dwelling associated with rural land management, with continuous occupation but minimal exposure to coastal inundation risk due to its location above the modelled 2100 1% AEP inundation level.   |
| type, form and duration of the development   | The development comprises a single dwelling and ancillary rural structures of modest scale, designed for long-term use and sited on elevated land to avoid inundation.   |
| change in risk across the intended life of the building  | Coastal inundation risk is not expected to materially increase over the life of the building, as conservative 2100 climate change scenarios have been adopted and the development is located above the modelled extreme inundation level.  |
| adaptation to any potential changes in risk  | The elevated siting of the building and defined development envelope provide inherent resilience to future changes in coastal inundation risk without the need for retrofitting or adaptive works.   |
| ability to maintain access to utilities and services   | Utilities and services can be maintained during extreme events due to the elevated building location and absence of reliance on infrastructure within inundation-prone areas.  |
| the need for specific coastal inundation hazard reduction or protection measures on the Site;  | The need for specific coastal inundation hazard reduction or protection measures on the Site<br>No specific coastal inundation hazard reduction or protection measures are required on the Site, as the development is located above the modelled inundation extent.   |
| the need for coastal inundation hazard reduction or protection measures beyond the boundary of the Site; and                                     | The need for coastal inundation hazard reduction or protection measures beyond the boundary of the Site<br>The proposal does not necessitate any hazard reduction or protection measures beyond the Site boundary and will not increase risk to adjacent land.   |
| any coastal inundation management plan in place for the Site and/or adjacent land.   | Any coastal inundation management plan in place for the Site and/or adjacent land<br>There is no coastal inundation management plan applicable to the Site, and none is required given the low and tolerable level of risk.  |
| hazardous chemical used, handled, generated, or stored on the Site,  | Hazardous chemicals used, handled, generated or stored on the Site<br>No hazardous chemicals are proposed to be used, handled, generated or stored on the Site that would increase risk during a coastal inundation event.   |
| Details of the person who prepared or verified this report:  | This coastal inundation hazard report has been prepared in accordance with a methodology specified in the Director's Determination - Coastal Inundation Hazard Area by a suitably qualified practitioner with relevant qualifications, experience and competence in the preparation of coastal inundation hazard reports.                            |
| Qualifications   | Bachelor of Science with first class honours in geology  |
| Expertise  | Kris Taylor has over 10 years of experience in coastal inundation modelling with several reports externally reviewed by parties including the University of New South Wales Water Research Lab. Reports written include Crown Land pilot studies several reports for councils, and over 200 coastal inundation assessments for planning and building |
| Level of current indemnity insurance   | Current indemnity insurance of \$2,000,000 (\$4,000,000) Underwriters at Lloyd's covers <b>coastal geomorphology, natural hazard, hydrology and environmental coastal inundation hazard assessments.</b>   |

Kris Taylor

Signed



**CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE  
ITEM**

**Section 321**

To:  Owner /Agent  
 Address  
  Suburb/postcode

Form **55**

**Qualified person details:**

Qualified person:   
Address:  Phone No:   
  Fax No:   
Licence No:  Email address:

Qualifications and Insurance details:  (description from Column 3 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

Speciality area of expertise:  (description from Column 4 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)

**Details of work: Coastal Inundation Assessment**

Address:  Lot No:   
  Certificate of title No:

The assessable item related to this certificate:  (description of the assessable item being certified)  
Assessable item includes –  
- a material;  
- a design  
- a form of construction  
- a document  
- testing of a component, building system or plumbing system  
- an inspection, or assessment, performed

**Certificate details:**

Certificate type:  (description from Column 1 of Schedule 1 of the Director's Determination - Certificates by Qualified Persons for Assessable Items n)

This certificate is in relation to the above assessable items, at any stage, as part of – (tick one)

building work, plumbing work or plumbing installation or demolition work

OR

a building, temporary structure or plumbing installation

In issuing this certificate the following matters are relevant –

Documents:

Enviro-Tech Consultants Pty. Ltd. 2025. Coastal Inundation Hazard Assessment Report for a Proposed Dwellings And Shed, Lot 2 81 Richardsons Road - Sandford. Unpublished report for Suanne Lawrence by Enviro-Tech Consultants Pty. Ltd., 26/09/2025.

Relevant calculations:

References:

- Director's Determination - Coastal Inundation Hazard Areas
- Tasmanian Planning Scheme - State Planning Provisions 2023
- Part 5 (Work in Hazardous Areas) of the Building Regulations 2016; Division 5 – Coastal Inundation

*Substance of Certificate: (what it is that is being certified)*

- An assessment of building or demolition work in coastal inundation hazard areas in accordance with the Directors Determination
- To ensure that use or development subject to risk from coastal inundation is appropriately located and managed (TPS)

*Scope and/or Limitations*

Where exempt from planning, includes an assessment of tolerable risks based on a defined flood event based on the level above 0 meters Australian Height Datum with a one per cent probability of being exceeded in a storm surge flooding event in the year 2100 without requiring any specific coastal inundation protection measures.

Where not exempt from planning, includes an assessment of tolerable risk from a 1% annual exceedance probability coastal inundation event in 2100 for the intended life of the building without requiring any specific coastal inundation protection measures.

I certify the matters described in this certificate.

Qualified person:

Signed:



Certificate No:



Date:

26/09/2025

## FOUNDATION CLASSIFICATION



### **LOT 2 81 RICHARDSONS RD - SANDFORD PROPOSED DWELLINGS AND SHED**

**Client: Suanne Lawrence**

**Certificate of Title: 184625/2**

**Investigation Date: 26/09/2025**

## Refer to this Report As

Enviro-Tech Consultants Pty. Ltd. 2025. Foundation Classification Report for a Proposed Dwellings And Shed, Lot 2 81 Richardsons Rd - Sandford. Unpublished report for Suanne Lawrence by Enviro-Tech Consultants Pty. Ltd., 26/09/2025.

## Report Distribution

This report has been prepared by Enviro-Tech Consultants Pty. Ltd. (Envirotech) for the use by parties involved in the proposed development of the property named above.

Permission is hereby given by Envirotech and the client, for this report to be copied and distributed to interested parties, but only if it is reproduced in colour, and only distributed in full. No responsibility is otherwise taken for the contents.

## Limitations of this report

In some cases, variations in actual Site conditions may exist between subsurface investigation boreholes. This report only applies to the tested parts of the Site at the Site of testing, and if not specifically stated otherwise, results should not be interpreted beyond the tested areas.

The Site investigation is based on the observed and tested soil conditions relevant to the inspection date and provided design plans (building footprints presented in Attachment A). Any site works which has been conducted which is not in line with the Site plans will not be assessed. Subsurface conditions may change laterally and vertically between test Sites, so discrepancies may occur between what is described in the reports and what is exposed by subsequent excavations. No responsibility is therefore accepted for any difference in what is reported, and actual Site and soil conditions for parts of the investigation Site which were not assessed at the time of inspection.

This report has been prepared based on provided plans detailed herein. Should there be any significant changes to these plans, then this report should not be used without further consultation which may include drilling new investigation holes to cover the revised building footprint. This report should not be applied to any project other than indicated herein.

No responsibility is accepted for subsequent works carried out which deviate from the Site plans provided or activities onsite or through climate variability including but not limited to placement of fill, uncontrolled earthworks, altered drainage conditions or changes in groundwater levels.

Footing exposure classification is presented on a layer-by-layer basis. In practice, some layers may be removed during excavation or replaced as part of site cuts and fills, while others may be incorporated within the building envelope. The information should therefore be regarded as guidance only, and the designer must assess the actual founding conditions and make the final determination of concrete strength, curing and cover requirements.

At the time of construction, if conditions exist which differ from those described in this report, it is recommended that the base of all footing excavations be inspected to ensure that the founding medium meets that requirement referenced herein or stipulated by an engineer before any footings are poured.

## Investigation Summary

### Site Classification

In accordance with AS2870 – 2011 and after thorough consideration of the known details pertaining to the proposed building and associated works (hereafter referred to as the Site), the geology, soil conditions, soil properties, and drainage characteristics of the Site have been classified as follows:

**CLASS S** is based on soil profiles around the proposed building envelope being classified as slightly reactive to soil moisture variation, with test locations potentially subject to surface movement ranging from 0 to 20 mm.

### Foundations

It is recommended that edge or internal beam or strip footings of slabs are founded at 0.3 m depth or greater with an allowable bearing capacity of 120 kPa. See the bearing capacity table herein for further details.

### Wind Load Classification

The AS 4055-2021 Wind loads for Housing classification is summarised.

|  |     |
|--|-----|
| Region:                                  | A   |
| Terrain category:                        | TC1 |
| Shielding Classification:                | NS  |
| Topographic Classification:              | T0  |
| Wind Classification:                     | N3  |
| Design Wind Gust Speed ( $V_{h,u}$ ) m/s | 50  |

I recommend that during construction, I and/or the design engineer are notified of any major variation in the foundation conditions as predicted in this report.



Kris Taylor, BSc (hons)

Environmental & Engineering Geologist

Director

## Site Investigation

The Site investigation is summarised in Table 1.

*Table 1 Summary of Site Investigation*

|   |  |
|---|--|
| <b>Client</b>                                   | <b>Suanne Lawrence</b>   |
| <b>Project Address</b>                          | Lot 2 81 Richardsons Road - Sandford   |
| <b>Council</b>                                  | Clarence   |
| <b>Planning Scheme</b>                          | Tasmanian Planning Scheme  |
| <b>Inundation, Erosion or Landslip Overlays</b> | Medium Coastal Inundation Hazard Code; Flood-prone Hazard Areas Code   |
| <b>Proposed</b>                                 | Dwellings And Shed   |
| <b>Investigation</b>                            | Fieldwork was carried out by an Engineering Geologist on the 26/9/2025   |
| <b>Site Topography</b>                          | The building site has a near level gradient of approximately 1% (0°) to the southwest  |
| <b>Site Drainage</b>                            | The site receives overland flow runoff directly from the northeast.  |
| <b>Soil Profiling</b>                           | Two investigation holes were direct push sampled from surface level around the proposed dwellings and shed (Appendix A):   |
| <b>Investigation Depths</b>                     | The target excavation depth was estimated at 2.3 m. Borehole BH01 was direct push sampled to 2.2 m and borehole BH02 was direct push sampled to 2.2 m (both ending on ). Borehole logs and photos are presented in Appendix B & C. |
| <b>Soil moisture and groundwater</b>            | All recovered soil at the site ranged from slightly moist to wet. Groundwater was encountered at 1.6 m below ground surface.   |
| <b>Geology</b>                                  | According to 1:250,000 Mineral Resources Tasmania geological mapping (accessed through The LIST), the geology comprises of: Quaternary Undifferentiated Quaternary sediments. and  |

## Soil Profiles

The geology of the site has been documented and described according to Australian Standard AS1726 for Geotechnical Site Investigations, which includes the Unified Soil Classification System (USCS). Soil layers, and where applicable, bedrock layers, are summarized in Table 2.

Table 2 Soil Summary Table

| #  | Layer       | Details   | USCS  | BH01              | BH02              |
|----|-------------|---|-------|-------------------|-------------------|
| 1  | SAND        | TOPSOIL: SAND, very dark greyish brown, poorly sorted, fine to medium grained sand, trace roots, trace silt/clay, 5 % roots, VL-L | SP-SM | 0-0.3<br>DS@0.1   | 0-0.1             |
| 2  | SAND        | SAND, white, poorly sorted, fine grained sand, trace roots, trace silt/clay, 5 % roots, VL-MD                                     | SP-SM |                   | 0.1-0.4<br>DS@0.2 |
| 3  | SAND        | SAND trace silt/clay, olive brown, poorly sorted, fine grained sand, MD   | SP-SM | 0.3-0.6<br>DS@0.4 |                   |
| 4  | SAND        | SAND, very dusky red, poorly sorted, medium grained sand, trace roots, trace silt, 5 % roots, MD                                  | SP    |                   | 0.4-0.6<br>DS@0.5 |
| 5  | SAND        | SAND with silt, trace clay, light yellowish brown, poorly sorted, fine grained sand, MD   | SM    | 0.6-0.9<br>DS@0.7 |                   |
| 6  | SAND        | SAND trace silt, white, poorly sorted, fine to medium grained sand, L-MD  | SP    |                   | 0.6-1<br>DS@0.8   |
| 7  | SAND        | SAND with silt, trace clay, yellowish brown, poorly sorted, fine grained sand, L-D  | SM    | 0.9-1.3<br>DS@1.2 |                   |
| 8  | SAND        | SAND with silt, trace clay, dark greyish brown, poorly sorted, fine grained sand, L-MD  | SM    |                   | 1-1.4<br>DS@1.1   |
| 9  | Silty SAND  | Silty SAND with clay, light olive brown, poorly sorted, fine to medium grained sand, MD-D   | SM    |                   | 1.4-2.1<br>DS@1.7 |
| 10 | Clayey SAND | Clayey SAND trace silt, dark grey, poorly sorted, fine to medium grained sand, MD   | SC    | 1.3-1.7<br>DS@1.6 |                   |
| 11 | SAND        | SAND trace silt/clay, dark grey, poorly sorted, fine to medium grained sand, D  | SP-SM | 1.7-2.2<br>DS@2.0 | 2.1-2.2           |

**Consistency<sup>1</sup>** VS Very soft; S Soft; F Firm; St Stiff; Vst Very Stiff; H Hard. Consistency values are based on soil strengths AT THE TIME OF TESTING and is subject to variability based on field moisture condition

**Density<sup>2</sup>** VL Very loose; L Loose; MD Medium dense; D Dense; VD Very Dense

**Rock Strength** EL Extremely Low; VL Very Low; L Low; M Medium; H High; VH Very High; EH Extremely High

**PL** Point load test (lump)

**DS** Disturbed sample

**PV** Pocket vane shear test

**FV** Downhole field vane shear test

**U50** Undisturbed 48mm diameter core sample collected for laboratory testing.

**REF** Borehole refusal

**INF** DCP has continued through this layer and the geology has been inferred.

<sup>1</sup> Soil consistencies are derived from a combination of field index, DCP and shear vane readings.

<sup>2</sup> Soil density descriptions presented in engineering logs are derived from the DCP testing.

## Recommendations

### Dispersive soil Management

#### Findings

The results presented in Appendix E indicate:

- Shallow soil Layers 1 to 6 are considered either not dispersive (Class 4 or greater) or only slightly dispersive (Class 3) to depths of greater than 0.1 m.
- Deeper soil Layers 7 to 11 comprises Emerson Class 1 category soils which are considered severely dispersive

#### Site specific recommendations

- No specific recommendations apply to manage soil dispersion.
- It is discerned that dispersive soils are unlikely to be exposed considering the gradient and proposed development plans.

### Soil Exposure Classification

The soil has been tested for salinity impacts on footings in accordance with AS2870, as well as preliminary pH testing as a proxy to potential sulphate aggressivity.

- With a minimum surface soil (to 0.5m) exposure classification of A1, at a minimum, 20 MPa concrete is generally recommended with 40 mm cover. A minimum curing time of 3 days is recommended.

### Plumbing

Refer to hydraulic design drawings for detailed plumbing advice and requirements.

Refer to Table 3 to assess soil movement (Ys) around pipework for different depth ranges.

*Table 3 Millimetres soil movement (Ys) for determining plumbing requirements for various soil depths \**

| Building | Profiles  | P* | E<br>Ys >75 | H2<br>Ys 60-75 | H1<br>Ys 40-60 | M<br>Ys 20-40 | S<br>Ys 0-20 | A<br>Ys 0 |
|----------|-----------|----|-------------|----------------|----------------|---------------|--------------|-----------|
| Shed     | BH01 BH02 | No |             |                |                |               | 0-2.1        | 2.1-3     |

\* Depths in this table are based on surfaces at the time of testing and do not allow for the influence of any additional fill added to the soil profile unless the I<sub>ss</sub> calculation depth has been modified based on the proposed cut and fill (see 'Footings Minimum Target Depths'). Where additional fill is proposed (and not indicated in the attached plans) Envirotech are to be advised of final FFL's so the Site classification can be recalculated according to the specific fill reactivity and thickness used in the design.

#### Class A and S

When pipework service trench busses fall within Class A to S depth range as shown in Table 5, and all plumbing recommendations herein have been implemented, the drainage system does not require any additional protection and should be installed following the AS/NZS 3500 series standards.

## Filling Works

- In the case where either of the following conditions occur, the Site is classified as Class P (AS2870 Clauses 2.5.2 and 2.5.3), in which case footings are to be designed in accordance with engineering specifications:
  - FILL OTHER THAN SAND exceeds 0.4 m depth.
  - SAND FILL exceeds 0.8 m depth.
- It is recommended that footing (edge beams, internal beams, and load support thickenings) concentrated loads are transferred through the fill to target founding layers.
- Subject to engineering advice, edge beams, internal beams, and load support thickenings may need to be founded on natural ground.
- SAND or FCR is always recommended rather than fill containing SILT or CLAY.
- Compacted CLAY or SAND FILL on well drained slopes should not exceed 1V:2H unless supported by an engineered retaining wall.
- Compacted SILT fill on well drained slopes should not exceed 1V:4H unless supported by an engineered retaining wall.
- Compacted stable rock fill on well drained slopes should not exceed 2V:3H unless supported by an engineered retaining wall.
- Any proposed filling works must be in accordance with AS3798 'Earthworks for Residential and Commercial Developments'.
- Before placing fill for landscaping, all topsoil should be removed from the filled area.
- Ideally, the fill should be free draining and placed to prevent water ponding. The fill should be placed in layers no greater than 150mm height and suitably compacted.

## Building Pad Preparation

Any organic matter or other deleterious materials will need to be removed from the building envelope.

Topsoil containing grass roots must be removed from the area on which the footing will rest.

Earthworks should be carried out in accordance with AS3798 'Earthworks for Residential and Commercial Developments'. Unsuitable materials in structural fill are listed in AS2870 Section 4.3.

The base of the excavation must be generally level but may slope not more than 1:40 to allow excavations to drain.

## Pad Preparation - Compaction

It is recommended that any crushed rock, sand or granular soils across the building pad, filled areas and the base of the footing excavations are compacted with several passes with a medium weight (~80 kg) plate compactor.

## Footing Preparation

Footing excavations must be free of loose earth, tree roots, mud or debris immediately before pouring concrete, ensuring the footing is appropriately seated on the target layer.

## Foundation Maintenance

Details on appropriate site and foundation maintenance practises from the CSIRO BTF 18 Foundation Maintenance and Footing Performance: A Homeowner's Guide are presented in Appendix G of this report.

A handwritten signature in black ink, appearing to read 'Kris Taylor'.

Kris Taylor, BSc (hons)

Environmental & Engineering Geologist

## Notes About Your Assessment

The Site classification provided and footing recommendations including foundation depths are assessed based on the subsurface profile conditions present at the time of fieldwork and may vary according to any subsequent *Site works* carried out. *Site works* may include changes to the existing soil profile by cutting more than 0.5 m and filling more than 0.4 to 0.8 m depending on the type of material and the design of the footing. All footings must be founded through fill *other than* sand not exceeding 0.4 m depth or sand not exceeding 0.8 m depth, or otherwise a Class P applies (AS2870 Clauses 2.5.2 and 2.5.3).

For reference, borehole investigation depths relative to natural soil surface levels are stated in borehole logs where applicable.

In some cases, variations in actual Site conditions may exist between subsurface investigation boreholes. At the time of construction, if conditions exist which differ from those described in this report, it is recommended that the base of all footing excavations be inspected to ensure that the founding medium meets the requirement referenced herein or stipulated by an engineer before any footings are poured.

The site classification assumes that the performance requirements as set out in Appendix B of AS 2870 are acceptable and that site foundation maintenance is carried out to avoid extreme wetting and drying.

It is the responsibility of the homeowner to ensure that the soil conditions are maintained and that abnormal moisture conditions do not develop around the building. The following are examples of poor practises that can result in abnormal soil conditions:

- The effect of trees being too close to a footing.
- Excessive or irregular watering of gardens adjacent to the building.
- Failure to maintain Site drainage.
- Failure to repair plumbing leaks.
- Loss of vegetation near the building.

The pages that make up the last six pages of this report are an integral part of this report. The notes contain advice and recommendations for all stakeholders in this project (i.e. the structural engineer, builder, owner, and future owners) and should be read and followed by all concerned.

## References

AS 1289.6.3.2-2003 Soil strength and consolidation tests - Determination of the penetration resistance of a soil - 9 kg dynamic cone penetrometer test, Standards Australia, Sydney, Retrieved from SAI Global

AS 1289.7.1.1-2003 Methods of testing soils for engineering purposes Method 7.1.1: Soil reactivity tests—Determination of the shrinkage index of a soil—Shrink-swell index, Standards Australia, Sydney, Retrieved from SAI Global

AS 1726-2017, Geotechnical Site investigations, Standards Australia, Sydney, Retrieved from SAI Global

AS 2870-2011, Residential slabs and footings, Standards Australia, Sydney, Retrieved from SAI Global

AS4055 (2021). Australian Standard. Prepared by Committee BD-099, Wind Loads for Housing. Approved on behalf of the Council of Standards Australia on 1st June 2021 and published on 25th June 2021.

DPIPWE 2009. Dispersive Soils and their Management. Technical Reference Manual. Sustainable Land Use Department of Primary Industries Water and Environment.


Webster, S.L., Brown, R.W. and Porter, J.R. (1994) Force Projection Site Evaluation Using the Electric Cone Penetrometer (ECP) and the Dynamic Cone Penetrometer (DCP). Technical Report No. GL-94-17, Air Force Civil Engineering Support Agency, US Air Force, Tyndall Air Force Base, FL.

# Appendix A Mapping



Figure 1 Site Borehole Locations

# Appendix B Borehole Logs

|   |         | <b>ASSESSMENT:</b> Foundation Classification<br><b>STRUCTURE:</b> Dwellings And Shed<br><b>EASTING:</b> 541216 <b>HORIZONTAL</b><br><b>NORTHING:</b> 5247032.5 <b>ACCURACY:</b> 0.64m |       |                                    |                | <b>HOLE ID NO.:</b> BH01<br><b>DATE TESTED:</b> 26/09/2025<br><b>LOGGED BY:</b> T. Gallagher<br><b>ELEVATION:</b> 2.00 |         |      |          |                           |                    |             |    |    |  |  |
|--|---------|---|-------|------------------------------------|----------------|--|---------|------|----------|---------------------------|--------------------|-------------|----|----|--|--|
|  |         | <b>LOCATION:</b> Lot 2 81 Richardsons Rd - Sandford<br><b>CLIENT:</b> Suanne Lawrence   |       |                                    |                | <b>EQUIPMENT:</b> AMS Powerprobe 9120 RAP<br><b>NATURAL SURFACE (RL):</b>  |         |      |          |                           |                    |             |    |    |  |  |
| DEPTH (m)  | GRAPHIC | DESCRIPTION   | LAYER | DENSITY<br>CONSISTENCY<br>STRENGTH | MOISTURE       |  | SAMPLES | TEST | Cu (kPa) | UCS (kg/cm <sup>2</sup> ) | BLOW COUNT         | DCP         |    |    |  |  |
|  |         |   |       |                                    | INDEX          | %  |         |      |          |                           |                    | blows/100mm |    |    |  |  |
| 0.0  | SP      | TOPSOIL: SAND, very dark greyish brown, poorly sorted, fine to medium grained sand, trace roots, trace silt/clay, 5 % roots   | 1     | very loose to loose                | Slightly Moist | 5  | DS      |      |          |                           | 2.0                |             |    |    |  |  |
| 0.5  | SP      | SAND trace silt/clay, olive brown, poorly sorted, fine grained sand   | 3     | medium dense                       | Slightly Moist | 6  | DS      |      |          |                           | 2.9                |             |    |    |  |  |
|  | SM      | SAND with silt, trace clay, light yellowish brown, poorly sorted, fine grained sand   | 5     |                                    | Slightly Moist | 13   | DS      |      |          |                           | 6.0                |             |    |    |  |  |
| 1.0  | SM      | SAND with silt, trace clay, yellowish brown, poorly sorted, fine grained sand   | 7     | loose to dense                     | Wet            | 15   | DS      |      |          |                           | 1.8                |             |    |    |  |  |
|  | SC      | Clayey SAND trace silt, dark grey, poorly sorted, fine to medium grained sand   | 10    |                                    |                |  |         |      |          |                           | medium dense       | Wet         | 21 | DS |  |  |
| 2.0  | SP      | SAND trace silt/clay, dark grey, poorly sorted, fine to medium grained sand   | 11    | dense                              | Wet            | 23   | DS      |      |          |                           | 11.0               |             |    |    |  |  |
| Borehole Ended At Target Depth<br>End of borehole at 2.2m depth.   |         |   |       |                                    |                |  |         |      |          |                           |                    |             |    |    |  |  |
| <b>GROUNDWATER:</b> Encountered at 1.6 m Below Ground Surface<br><b>TESTING:</b> Penetrometer: AS 1289.6.3.2<br>Where blows per 100mm are less than 1, distance travelled per penetrometer blow is measured and converted to blows per 100mm.<br>DS - Disturbed Sample; U50 - Undisturbed 50mm Core; FV - Field Vane (Ø2mm); PP - Pocket Penetrometer; CBR - Californian Bearing Ratio; PV - Pocket Vane |         |   |       |                                    |                |  |         |      |          |                           | <b>PAGE 1 of 1</b> |             |    |    |  |  |

**LOCATION:** Lot 2 81 Richardsons Rd - Sandford  
**CLIENT:** Suanne Lawrence

**EQUIPMENT:** AMS Powerprobe 9120 RAP  
**NATURAL SURFACE (RL):**

| DEPTH (m)                      | GRAPHIC | DESCRIPTION   | LAYER | DENSITY CONSISTENCY STRENGTH | MOISTURE       |    | SAMPLES | TEST | Cu (kPa) | UCS (kg/cm <sup>2</sup> ) | BLOW COUNT | DCP         |  |  |  |  |  |
|--------------------------------|---------|---|-------|------------------------------|----------------|----|---------|------|----------|---------------------------|------------|-------------|--|--|--|--|--|
|                                |         |   |       |                              | INDEX          | %  |         |      |          |                           |            | blows/100mm |  |  |  |  |  |
| 0.0                            | SP      | TOPSOIL: SAND, very dark greyish brown, poorly sorted, fine to medium grained sand, trace roots, trace silt/clay, 5 % roots | 1     | very loose                   | Slightly Moist |    |         |      |          |                           | 1.0        |             |  |  |  |  |  |
|                                | SP      | SAND, white, poorly sorted, fine grained sand, trace roots, trace silt/clay, 5 % roots                                      | 2     | very loose to medium dense   | Slightly Moist | 5  | DS      |      |          |                           | 1.0        |             |  |  |  |  |  |
| 0.5                            | SP      | SAND, very dusky red, poorly sorted, medium grained sand, trace roots, trace silt, 5 % roots                                | 4     | medium dense                 | Slightly Moist | 12 | DS      |      |          |                           | 2.9        |             |  |  |  |  |  |
|                                | SP      | SAND trace silt, white, poorly sorted, fine to medium grained sand  | 6     | loose to medium dense        | Moist          | 4  | DS      |      |          |                           | 4.0        |             |  |  |  |  |  |
| 1.0                            | SM      | SAND with silt, trace clay, dark greyish brown, poorly sorted, fine grained sand  | 8     |                              | Wet            | 14 | DS      |      |          |                           | 4.0        |             |  |  |  |  |  |
| 1.5                            | SM      | Silty SAND with clay, light olive brown, poorly sorted, fine to medium grained sand   | 9     | medium dense to dense        | Wet            | 21 | DS      |      |          |                           | 6.0        |             |  |  |  |  |  |
| 2.0                            | SP      | SAND trace silt/clay, dark grey, poorly sorted, fine to medium grained sand   | 11    | dense                        | Wet            |    |         |      |          |                           | 7.0        |             |  |  |  |  |  |
| Borehole Ended At Target Depth |         |   |       |                              |                |    |         |      |          |                           |            |             |  |  |  |  |  |
| End of borehole at 2.2m depth. |         |   |       |                              |                |    |         |      |          |                           |            |             |  |  |  |  |  |

**GROUNDWATER:** Encountered at 1.6 m Below Ground Surface

**TESTING:** Penetrometer: AS 1289.6.3.2

Where blows per 100mm are less than 1, distance travelled per penetrometer blow is measured and converted to blows per 100mm.

DS - Disturbed Sample; U50 - Undisturbed 50mm Core; FV - Field Vane (20mm); PP - Pocket Penetrometer; CBR - Californian Bearing Ratio; PV - Pocket Vane

# Appendix C Core Photographs

## BH01



## BH02



\* 1 metre core tray length

# Appendix D Explanatory Notes



## USCS Soil Classification Methodology

Soil classification was undertaken in accordance with the Unified Soil Classification System (USCS) and AS 1726 – Geotechnical Site Investigations, using a combination of particle size distribution and plasticity assessment. This process was applied consistently to all soil layers encountered.

### 1. Particle Size Distribution (Wet Sieve Analysis)

Particle size analysis was performed by wet sieving in accordance with Australian Standard sieve sizes:

- Gravel fraction: >2.36 mm
- Sand fraction: 0.075 mm to 2.36 mm
- Fines fraction (silt + clay): <0.075 mm

Samples were soaked (often overnight) to fully disperse fines prior to sieving. Wet sieving is particularly effective for Tasmanian soils, which are often dispersive, ensuring accurate quantification of the fines fraction. The oversize fraction (>63 mm) was excluded from the mass percentages before classification.

### 2. Plasticity Assessment

Plasticity of the fines fraction was determined using:

- Laboratory Atterberg limits, where available, with liquid limit (WL) and plasticity index (PI) plotted on the Plasticity Chart (AS 1726) to determine the fines classification (silt vs clay) and plasticity level (low, medium, high).
- Field index tests (where Atterberg limits were not available), following Table 1 & Table 2:
  - Dry strength – resistance of dried soil to crushing.
  - Dilatancy – reaction of a moist soil pat to shaking.
  - Toughness – resistance of a soil thread near the plastic limit.

**Table 1 Field Assessment of Fine-Grained Soils (adapted from AS 1726 Table 7)**

| Dry Strength |   | Dilatancy (reaction to shaking) |   | Toughness (consistency near plastic limit) |  |
|--------------|---|---------------------------------|---|--|--|
| None         | The dry specimen crumbles into powder with mere pressure of handling.   | None                            | No visible reaction or change in the specimen.  | Low  | Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft. |
| Low          | The dry specimen crumbles into powder with some finger pressure.  | Slow                            | Water appears slowly on the surface of the specimen during shaking and does not disappear during squeezing. |  | Medium   |
| Medium       | The dry specimen breaks into pieces or crumbles with considerable finger pressure.  |                                 |   | Rapid                                      |  |
| High         | The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface. |                                 |   |  |  |
| Very High    | The dry specimen cannot be broken between the thumb and a hard surface.   |                                 |   |  |  |

**Table 2 Identification of Fine-Grained Soils by Visual-Tactile Methods (adapted from AS 1726 Table 8)**

| Soil description                                     | Identification of inorganic fine-grained soils |               |                                |
|--|--|---------------|--------------------------------|
|  | Dry Strength                                   | Dilatancy     | Toughness and Plasticity       |
| SILT   | None to low                                    | Slow to rapid | Low or thread cannot be formed |
| Clayey SILT — Clay/silt mixtures of low plasticity   | Low to medium                                  | None to slow  | Low to medium                  |
| Silty CLAY — Silt/clay mixtures of medium plasticity | Medium to high                                 | None to slow  | Medium                         |
| High plasticity CLAY                                 | High to very high                              | None          | High                           |

### 3. Classification Hierarchy

#### 3.1 Fine- vs Coarse-Grained determination

- Fine-grained soils: More than 35% (by mass) passes the 0.075 mm sieve → classify using Table 3
- Coarse-grained soils: More than 65% (by mass) is retained on the 0.075 mm sieve → classify using Table 4.

#### 3.2 Coarse-grained soils (Table 4):

##### 1. Determine Gravel vs Sand:

- Gravel (G\*) – more than 50% of the coarse fraction is retained on the 2.36 mm sieve.
- Sand (S\*) – less than 50% of the coarse fraction is retained on the 2.36 mm sieve.

##### 2. Assign fines modifiers:

- ≤5% fines: “Clean” gravels/sands (GW, GP, SW, SP).
- 5–12% fines: Dual classification (e.g., SP-SM, GW-GM).
- ≥12% fines: Silty or clayey modifiers (GM, GC, SM, SC) based on fines plasticity from Atterberg limits or field index tests.

#### 3.3 Fines classification for coarse-grained soils

When coarse-grained soils contain ≥12% fines, the fines fraction is classified as silty or clayey based on:

- Atterberg limits where available; or
- Field index tests (Table 1 & Table 2) where Atterberg limits are not available.

#### 3.4 Fine-grained soils (Table 3)

Fine-grained soils are those with >35% (by mass) passing the 0.075 mm sieve.

- With Atterberg limits available: WL and PI are plotted on the Plasticity Chart (AS 1726) to determine plasticity level (low, medium, or high) and USCS classification (ML, CL/CI/CH, MH, OL, OH).
- Where Atterberg limits are not available: The fines are classified directly in accordance with Table 3 by comparing field index test results (dry strength, dilatancy, toughness) to the criteria given for each USCS group. This allows direct assignment of ML, CL/CI/CH, MH, or OL/OH without reference to the A-line.

Organic soils (OL, OH) are identified based on colour, odour, and fibrous texture in addition to field index characteristics.

#### 4. Integration of Results

The final USCS group symbol for each layer was determined by integrating:

- The proportion of gravel, sand, and fines from wet sieve analysis.
- The classification of the fines fraction using either Atterberg limits or field index methods.
- The classification hierarchy in Table 3 & Table 4.

This combined approach ensures that soil classification is both quantitatively accurate and fully compliant with AS 1726, while allowing consistent classification whether laboratory Atterberg limit testing is available.

**Table 3 Classification of Fine-Grained Soils (adapted from AS 1726 Table 10)**

| Major Division                              | Group Symbol | Typical names  | Field classification of silt and clay |                   |               | Laboratory classification |
|---|--------------|--|---------------------------------------|-------------------|---------------|---------------------------|
|   |              |  | Dry strength                          | Dilatancy         | Toughness     | % <0.075                  |
| SILT and CLAY (low to medium plasticity, %) | ML           | Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity | None to low                           | Slow to rapid     | Low           | Below A line              |
|   | CL, CI       | Inorganic clay of low to medium plasticity, gravelly clay, sandy clay                                | Medium to high                        | None to slow      | Medium        | Above A line              |
|   | OL           | Organic silt   | Low to medium                         | Slow              | Low           | Below A line              |
| SILT and CLAY (high plasticity)             | MH           | Inorganic silt   | Low to medium                         | None to slow      | Low to medium | Below A line              |
|   | CH           | Inorganic clay of high plasticity  | High to very high                     | None              | High          | Above A line              |
|   | OH           | Organic clay of medium to high plasticity, organic silt  | Medium to high                        | None to very slow | Low to medium | Below A line              |
| Highly organic soil                         | Pt           | Peat, highly organic soil  | —                                     | —                 | —             | —                         |

**Table 4 Classification of Coarse-Grained Soils (adapted from AS 1726 Table 9)**

| Major Division  | Group Symbol | Typical names  | Field classification of sand and gravel  | Laboratory classification             |
|---|--------------|--|--|---------------------------------------|
| GRAVEL (more than half of coarse fraction is larger than 2.36 mm) | GW           | Gravel and gravel-sand mixtures, little or no fines                  | Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength    | ≤5% fines, $C_u > 4$ , $1 < C_c < 3$  |
|   | GP           | Gravel and gravel-sand mixtures, little or no fines, uniform gravels | Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength | ≤5% fines, fails to comply with above |
|   | GM           | Gravel-silt mixtures and gravel-sand-silt mixtures                   | 'Dirty' materials with excess of non-plastic fines, zero to medium dry strength  | ≥12% fines, fines are silty           |

| Major Division   | Group Symbol | Typical names  | Field classification of sand and gravel  | Laboratory classification             |
|--|--------------|--|--|---------------------------------------|
|  | GC           | Gravel–clay mixtures and gravel–sand–clay mixtures               | 'Dirty' materials with excess plastic fines, medium to high dry strength   | ≥12% fines, fines behave as clay      |
| SAND (more than half of coarse fraction is smaller than 2.36 mm) | SW           | Sand and gravel–sand mixtures, little or no fines                | Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength    | ≤5% fines, $C_u > 6$ , $1 < C_c < 3$  |
|  | SP           | Sand and gravel–sand mixtures, little or no fines, uniform sands | Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength | ≤5% fines, fails to comply with above |
|  | SM           | Sand–silt mixtures   | 'Dirty' materials with excess of non-plastic fines, zero to medium dry strength  | ≥12% fines, fines are silty           |
|  | SC           | Sand–clay mixtures   | 'Dirty' materials with excess plastic fines, medium to high dry strength   | ≥12% fines, fines are clayey          |

## **Standard Methodology for Determination of Soil Reactivity and Index of Shrink–Swell (Ips) for SIFE Investigations**

### **1. Introduction**

This methodology outlines the procedures adopted by Enviro-Tech Consultants Pty. Ltd. for determining soil reactivity and deriving the Index of Shrink–Swell (Ips) for each soil layer in accordance with the principles of AS 2870. The method combines Australian Standard testing procedures with enhanced correlation techniques developed from an extensive dataset of over 2,000 field and laboratory tests.

The approach ensures consistent, accurate classification of soil reactivity across a wide range of soil types. By combining standard and modified testing procedures, it enables calculation of profile movement for complex soil profiles, accounting for groundwater levels, bedrock depth, and particle size distribution.

### **2. Sampling and Preparation**

#### **2.1 Undisturbed Sampling**

Undisturbed samples are collected using a thin-wall sampler to preserve natural soil structure and in-situ moisture conditions when performing shrink–swell testing. A 45 mm diameter core sampler is used for these tests to ensure uniformity and comparability between results. Most other laboratory testing is carried out on disturbed samples, which is one of the advantages of the linear shrinkage and modified linear shrinkage testing methods.

#### **2.2 Sample Identification**

All samples are assigned a Unified Soil Classification System (USCS) code using accurate laboratory and field identification techniques in accordance with AS 1726 (detailed procedure included herein). This classification underpins the correlation methods described in later sections.

#### **2.3 Moisture Content Measurement**

Field moisture content is recorded at the time of sampling, providing baseline data for correlation to laboratory shrink–swell results.

### **3. Standard Testing Procedures**

#### **3.1 Shrink–Swell Testing**

Shrink–swell testing is performed on cohesive soils in accordance with the relevant Australian Standard method for determining the shrink–swell index. This test provides the primary Ips value for these soil types.

#### **3.2 Linear Shrinkage Testing**

Linear shrinkage testing is carried out in accordance with the Australian Standard method, which determines shrinkage from a soil prepared at its liquid limit. This standard approach typically excludes a proportion of the sandy fraction.

### **4. Secondary Modified Linear Shrinkage Method**

#### **4.1 Rationale**

In practice, the relationship between shrink–swell test results and standard linear shrinkage results is often inconsistent, particularly for non-cohesive or marginally cohesive soils. To improve correlation, a secondary modified linear shrinkage method has been developed.

## 4.2 Modified Moisture Basis

Instead of preparing samples solely at the liquid limit, this method uses a “modified moisture” content representative of upper-range field moisture conditions for each USCS soil type. These values are derived from a dataset of over 2,000 samples collected predominantly during winter or immediately thereafter, representing the highest seasonal moisture levels without crossing into “abnormal moisture conditions” as defined in AS 2870.

## 4.3 Application to Non-Cohesive Soils

This approach enables reactivity assessment of sandy and silty soils that are unsuitable for shrink–swell testing due to their inability to remain intact during testing, but which still display measurable reactivity.

## 5. Gravel and Cobble Fraction Adjustments

### 5.1 Gravel Fraction

For all materials, the sand fraction is retained in testing, and the gravel fraction is re-added into the calculation. Because gravel has negligible moisture absorption, its proportion is used to adjust shrinkage values downwards.

### 5.2 Cobbles

Where cobbles are present:

- 0–35% cobbles: shrinkage is scaled according to the proportion of soil matrix between cobbles.
- 35% cobbles: shrinkage is considered negligible, as the soil matrix is insufficient to impart meaningful reactivity.

## 6. Correlation and Calibration

### 6.1 Dataset Development

Extensive correlation has been undertaken between:

- Standard shrink–swell results
- Standard linear shrinkage results
- Modified linear shrinkage results

### 6.2 USCS-Based Correlation

Accurate USCS classification is the key input variable. Once correlations are established for each USCS class,  $I_p$  values can be assigned to future samples based solely on classification and moisture parameters, without requiring repeated shrink–swell testing.

## 7. Predictive Modelling and Database Search Method

Enviro-Tech Consultants maintains a large and continuously expanding database of soil test results, including shrink–swell, linear shrinkage, particle size distribution, USCS classification, and detailed field descriptions (e.g., colour, texture, structure).

When assessing a new Site, we search this database for comparable sites using multiple parameters:

- Geology – parent material type and origin
- USCS classification – precise laboratory classification

- Soil colour and descriptive features – matching field logging records
- Particle size distribution – percentage gravel, sand, and fines

This multi-parameter search allows us to identify highly similar soils and adopt Ips values from past testing at those sites with confidence. The approach reduces the need for repeated shrinkage or shrink–swell testing where soils are well represented in the database, while still meeting the requirements for reliable reactivity estimation.

## **8. Compliance with AS 2870 – Clause 2.3.2 (C2 & C3)**

Our predictive approach aligns directly with the requirements of AS 2870 Clause 2.3.2:

c (ii): We maintain and utilise a database of past test results to estimate soil reactivity for sites with similar soil and geological conditions.

C (iii): Testing is repeated at regular intervals to ensure correlations remain valid. At minimum, reactivity testing is conducted once every 50 sites, but in practice we test far more frequently – typically at least once every 20 sites, and rarely more than six months between tests. On average, new verification testing is undertaken approximately monthly.

This compliance ensures that our methods are both technically robust and standards-compliant, providing clients with defensible, high-quality results.

## **9. Calculation of Profile Movement**

### **9.1 Ips Values per Layer**

An Ips value is determined for each soil layer based on test results or correlations.

### **9.2 Adjustment for Groundwater and Bedrock**

Where groundwater or bedrock occurs within the profile, Ips values are reduced for the affected layers in accordance with AS 2870 principles.

### **9.3 Design Suction Change Depth (Hs)**

Given the lack of statewide, high-resolution climatic data for Tasmania, a conservative Hs value of 3.0 m is adopted for all sites, in preference to regionalised values. This ensures a cautious approach where actual depth of suction change cannot be accurately modelled.

### **9.4 Surface Suction Change ( $\Delta u_s$ )**

A standard surface suction change of 1.2 is applied in calculations, in line with AS 2870.

## **10. Advantages of the Modified Method**

- Allows for reactivity assessment across all soil types, including non-cohesive sands and silts.
- Provides consistent correlation between laboratory and field methods.
- Enables accurate whole-profile movement estimation based on standardised USCS classification.
- Incorporates gravel and cobble fraction corrections for more realistic movement predictions.
- Reduces reliance on repeat laboratory shrink–swell testing for every sample.
- Fully compliant with AS 2870 Clause 2.3.2 (C2 & C3).

## 11. Limitations

- The method assumes accurate USCS classification and field moisture determination.
- The modified linear shrinkage method requires prior calibration for each USCS type.
- Adoption of a conservative  $H_s$  value may slightly overestimate movement in some locations.

## 12. Conclusion

This methodology blends rigorous Australian Standard test procedures with enhanced, data-driven correlation techniques, enabling Enviro-Tech Consultants Pty. Ltd. to deliver accurate, consistent, and site-specific soil reactivity assessments across Tasmania. The inclusion of >2,000 test results, gravel and cobble adjustments, predictive modelling from a comprehensive database, and modified moisture testing provides a robust basis for predicting profile movement in varied geological conditions, while maintaining strict compliance with AS 2870.

## Appendix E Soil and Rock Testing

### Dynamic Cone Penetrometer (DCP)

Dynamic cone penetrometer (DCP) testing was conducted according to AS 1289.6.3.2 with the results presented in Appendix B.

### Soil Characterisation

Table 4 summarises the soil classification results for each layer encountered, including particle size distribution, plasticity assessment, and the assigned USCS group symbol.

Classifications were undertaken in accordance with AS 1726 – Geotechnical Site Investigations using the methodology provided in the Explanatory Notes section of this report.

Particle size distributions were determined by wet sieve analysis, and fines classifications were based on Atterberg limits where available, or on field index tests (dry strength, dilatancy, toughness) in accordance with AS 1726 Tables 7, 8, 9, and 10.

Full explanatory notes and reference tables are provided in Explanatory Notes section of this report.

*Table 4 Summary of the Soil Characterisation*

| Layer | Soil        | Borehole | Depth From (m) | Field Moisture % | Gravel % | Sand % | Fine % | Analysed Plasticity | Assigned USCS |
|-------|-------------|----------|----------------|------------------|----------|--------|--------|---------------------|---------------|
| 1     | SAND        | BH01     | 0.1            | 5.4              | 0        | 86     | 14     | L                   | SM            |
| 2     | SAND        | BH02     | 0.2            | 4.9              | 0.1      | 86.6   | 13.3   | L                   | SM            |
| 3     | SAND        | BH01     | 0.4            | 5.9              | 0.1      | 89.5   | 10.4   | L                   | SM            |
| 4     | SAND        | BH02     | 0.5            | 12.3             | 0.3      | 88.9   | 10.8   | L                   | SM            |
| 5     | SAND        | BH01     | 0.7            | 12.5             | 0.1      | 85.9   | 14     | L                   | SM            |
| 6     | SAND        | BH02     | 0.8            | 4.4              | 0.4      | 93.8   | 5.8    | L                   | SM            |
| 7     | SAND        | BH01     | 1.2            | 14.6             | 0.3      | 83.6   | 16.1   | L                   | SM            |
| 8     | SAND        | BH02     | 1.1            | 14.2             | 0        | 84.4   | 15.6   | L                   | SM            |
| 9     | Silty SAND  | BH02     | 1.7            | 20.6             | 1        | 70.1   | 28.9   | L                   | SM            |
| 10    | Clayey SAND | BH01     | 1.6            | 20.7             | 0.1      | 78     | 21.9   | M                   | SC            |
| 11    | SAND        | BH01     | 2.0            | 23.1             | 0.4      | 90.7   | 8.9    | L                   | SM            |

## Soil Dispersion (Emerson aggregate test)

Select soil samples were tested for dispersion susceptibility using the Emerson Class number method according to AS1289.3.8.1. The results presented in Table 5 demonstrate that:

- Shallow soil Layers 1 to 6 are considered either not dispersive (Class 4 or greater) or only slightly dispersive (Class 3) to depths of greater than 0.1 m.
- Deeper soil Layers 7 to 11 comprises Emerson Class 1 category soils which are considered severely dispersive

Table 5 Summary of the Emerson class results.

| Layer | Soil                       | Depth | Sample ID | Emersion Class | Date Tested | Water   | pH  |
|-------|----------------------------|-------|-----------|----------------|-------------|---------|-----|
| 1     | TOPSOIL: SAND              | 0.1   | BH01 0.1  | Class >4       | 1/10/2025   | DI 16°C | 6.5 |
| 2     | SAND                       | 0.2   | BH02 0.2  | Class >4       | 1/10/2025   | DI 16°C | 5.9 |
| 3     | SAND trace silt/clay       | 0.4   | BH01 0.4  | Class >4       | 1/10/2025   | DI 16°C | 7.7 |
| 4     | SAND                       | 0.5   | BH02 0.5  | Class >4       | 1/10/2025   | DI 16°C | 5.4 |
| 5     | SAND with silt, trace clay | 0.7   | BH01 0.7  | Class >4       | 1/10/2025   | DI 16°C | 7.1 |
| 6     | SAND trace silt            | 0.8   | BH02 0.8  | Class >4       | 1/10/2025   | DI 16°C | 5.7 |
| 7     | SAND with silt, trace clay | 1.2   | BH01 1.2  | Class 1        | 1/10/2025   | DI 16°C | 6.5 |
| 8     | SAND with silt, trace clay | 1.1   | BH02 1.1  | Class 1        | 1/10/2025   | DI 16°C | 6.5 |
| 9     | Silty SAND with clay       | 1.7   | BH02 1.7  | Class 1        | 1/10/2025   | DI 16°C | 6.0 |
| 10    | Clayey SAND trace silt     | 1.6   | BH01 1.6  | Class 1        | 1/10/2025   | DI 16°C | 6.6 |
| 11    | SAND trace silt/clay       | 2     | BH01 2.0  | Class 2        | 1/10/2025   | DI 16°C | 7.1 |

## Soil Aggressivity Testing (Footing Exposure Classification)

Soil samples from across the Site were assessed for potential aggressivity to concrete in accordance with the requirements of AS 2870:2011 – Residential Slabs and Footings (Clauses 5.5.1–5.5.3). Testing was undertaken to determine the salinity exposure class and provide an indicative assessment of sulphate soil potential.

The results are summarised in

Table 6 which presents the sampling depth and location, soil texture classification, electrical conductivity (EC1:5), salinity factor (K), calculated saturated extract electrical conductivity (ECe), and the corresponding salinity exposure class (Table 5.1, AS 2870). Soil pH values were also measured and used as a conservative indicator of potential sulphate aggressivity, together with the assigned soil condition class, to derive an indicative sulphate exposure class (Table 5.2, AS 2870).

It is noted that the sulphate assessment has been undertaken on the basis of pH values only, and therefore represents a conservative assumption. Where soils exhibit  $\text{pH} < 5.5$  or are otherwise classified within B or C exposure classes, confirmatory laboratory testing of sulphate concentrations may be warranted to refine the exposure classification and confirm appropriate concrete durability requirements.

Salinity testing has been undertaken in accordance with the relevant guidelines and provides a direct basis for assigning salinity exposure classification.

Where aggressive soils are discerned, detailed recommendations for the management of aggressive soils, including concrete strength, curing and reinforcement cover requirements, are presented in

Appendix F.

Table 6 Soil Aggressivity Assessment in Accordance with AS 2870:2011

| Layer    | Location | Depth | Saline Soil Determination |       |      |       |                | Sulphate Soil Potential <sup>^</sup> |                      |                 |
|----------|----------|-------|---------------------------|-------|------|-------|----------------|--------------------------------------|----------------------|-----------------|
|          |          |       | USDA Soil Texture Class   | EC1:5 | K*   | Ece   | Exposure Class | pH1:5                                | Soil Condition Class | Exposure Class  |
|          |          | mS/cm |                           | dS/m  |      |       |                |                                      |                      |                 |
| From (m) |          |       |                           |       |      |       |                |                                      |                      |                 |
| 1        | BH01     | 0.1   | Sand                      | 0.05  | 13.5 | 0.68  | A1             | 6.5                                  | B                    | A1              |
| 2        | BH02     | 0.2   | Sand                      | 0.03  | 13.5 | 0.41  | A1             | 5.9                                  | B                    | A1              |
| 3        | BH01     | 0.4   | Sand                      | 0.1   | 13.5 | 1.35  | A1             | 7.7                                  | B                    | A1              |
| 4        | BH02     | 0.5   | Sand                      | 0.07  | 13.5 | 0.95  | A1             | 5.4                                  | A                    | B1 <sup>^</sup> |
| 5        | BH01     | 0.7   | Sand                      | 0.12  | 13.5 | 1.62  | A1             | 7.1                                  | B                    | A1              |
| 6        | BH02     | 0.8   | Sand                      | 0.38  | 13.5 | 5.13  | A2             | 5.7                                  | A                    | A2              |
| 7        | BH01     | 1.2   | Sand                      | 0.52  | 13.5 | 7.02  | A2             | 6.5                                  | B                    | A1              |
| 8        | BH02     | 1.1   | Sand                      | 0.19  | 13.5 | 2.57  | A1             | 6.5                                  | B                    | A1              |
| 9        | BH02     | 1.7   | Loamy sand                | 0.6   | 13.0 | 7.80  | A2             | 6.0                                  | B                    | A1              |
| 10       | BH01     | 1.6   | Sandy loam                | 1.02  | 11.0 | 11.22 | B1             | 6.6                                  | B                    | A1              |
| 11       | BH01     | 2.0   | Sand                      | 1.09  | 13.5 | 14.72 | B1             | 7.1                                  | B                    | A1              |

<sup>^</sup> Preliminary findings based on soil pH only. Further sulphate testing required to rule out sulphate soil exposure risks

\*Electrical conductivity of the 1:5 soil–water extract (EC1:5) was measured at 25 °C and converted to an equivalent saturated paste extract (ECe) using texture-based conversion factors ( $EC_e = k \times EC_{1:5}$ ) following Slavich, P.G. & Patterson, R.A. (1990). Estimating the electrical conductivity of saturated paste extracts from 1:5 soil:water suspensions and texture. Australian Journal of Soil Research, 28, 453–463.

# Appendix F Geotechnical Interpretation

## Footing Minimum Target Depths

Footing design for the proposed structures are to consider the depths of limiting layers at the base of potentially problematic soils. Where practical/allowable, thickened beams may be deepened through problematic soil layers according to engineering specifications (Table 7). Table 8 should be referred to where only 50kPa allowable bearing capacity is required.

Table 7 also presents a summary of the estimated soil depths and associated layers where less than 5mm of vertical soil movement can be expected due to soil moisture fluctuations from normal seasonal wetting and drying cycles. Where 5mm tolerances are required, concentrated loads including but not limited to slab edge or internal beam or strip footings shall be supported directly on piers in accordance with minimum target layer depths presented in Table 7, with considerations given to required bearing capacities in accordance with Table 8.

All footing depth, soil movement, and bearing capacity calculations presented in this section are based on interpretive  $I_{PS}$  or  $I_{SS}$  values derived from field and laboratory data, as outlined in the Explanatory Notes section of this report. These values are used to infer soil reactivity in the absence of direct measurement, in accordance with industry best practice.

*Table 7 Soil characteristic surface movements and recommended footing minimum target depths*

| Footing design parameters   | BH01              | BH02              |
|---|-------------------|-------------------|
| Ys Calculation Depth  | 0m <sup>^</sup>   | 0m <sup>^</sup>   |
| Surface movement Ys (mm)  | 5                 | 10                |
| Soil reactivity class   | S                 | S                 |
| Base of problem soil layer (m)*                                   | 1.1               | 1.1               |
| Layer at base of problem soil*                                    | 7                 | 8                 |
| Footing minimum target depth (m) <sup>#</sup>                     | >0.3 <sup>^</sup> | >0.3 <sup>^</sup> |
| footing minimum target layer <sup>#</sup>                         | 1                 | 1                 |
| Allowable bearing capacity at min target depth (kPa) <sup>#</sup> | 120               | 120               |

- No problem layers encountered

<sup>^</sup> Calculations relative to surface of borehole at the time of investigation

~ Calculated based on revised soil profile depth/thickness following indicative cut and fill. Inferred fill reactivity indicated ( $I_{SS}$  value) which is typically based on more reactive soils expected to be encountered within inferred cut.

\* Base of problematic soil layer depth below top of borehole surface at the time of testing to achieve 100 kPa allowable bearing capacity or greater.

<sup>#</sup> Target soil layer depth where Ys values from normal wetting and drying cycles are estimated at less than 5mm vertical movement. >minimum bored pier depths (see bearing capacity table for bored pier design depths).

## Soil and Rock Allowable Bearing Capacity & End Bearing Capacity

Soil allowable bearing capacity was calculated from correlations with DCP blow counts. A recommended safety factor of 3 is applied in accordance with AS2870. Where high clay and silt content is observed in the soil, soil allowable bearing capacity is determined from undrained shear strengths using field vane correlated DCP values. Interpretive bearing capacity values are presented in Table 8.

Table 8 Soil allowable bearing capacities and problematic ground conditions.

| Depth below investigation surface (m) | Allowable Bearing Capacity (kPa) |      |
|---------------------------------------|----------------------------------|------|
|                                       | BH01                             | BH02 |
| 0                                     | 90~                              | 50~  |
| 0.1                                   | 90~                              | 50~  |
| 0.2                                   | 50~                              | 50~  |
| 0.3                                   | 120*                             | 120* |
| 0.4                                   | 260                              | 170  |
| 0.5                                   | 210                              | 170  |
| 0.6                                   | 260                              | 170  |
| 0.7                                   | 300                              | 300  |
| 0.8                                   | 170                              | 170  |
| 0.9                                   | 80~                              | 80~  |
| 1                                     | 80~                              | 80~  |
| 1.1                                   | 350                              | 260  |
| 1.2                                   | 300                              | 300  |
| 1.3                                   | 170                              | 170  |
| 1.4                                   | 130                              | 130  |
| 1.5                                   | 260                              | 210  |
| 1.6                                   | 300                              | 300  |
| 1.7                                   | >400                             | 350  |
| 1.8                                   | >400                             | 350  |
| 1.9                                   | >400                             | 350  |

Correlations drawn from DCP and vane shear testing.

REF - Penetrometer Refusal

^ Footings to be founded through the FILL

~ Problematic soil layer attributed to loose, soft, or low allowable bearing capacity soil (<100 kPa)

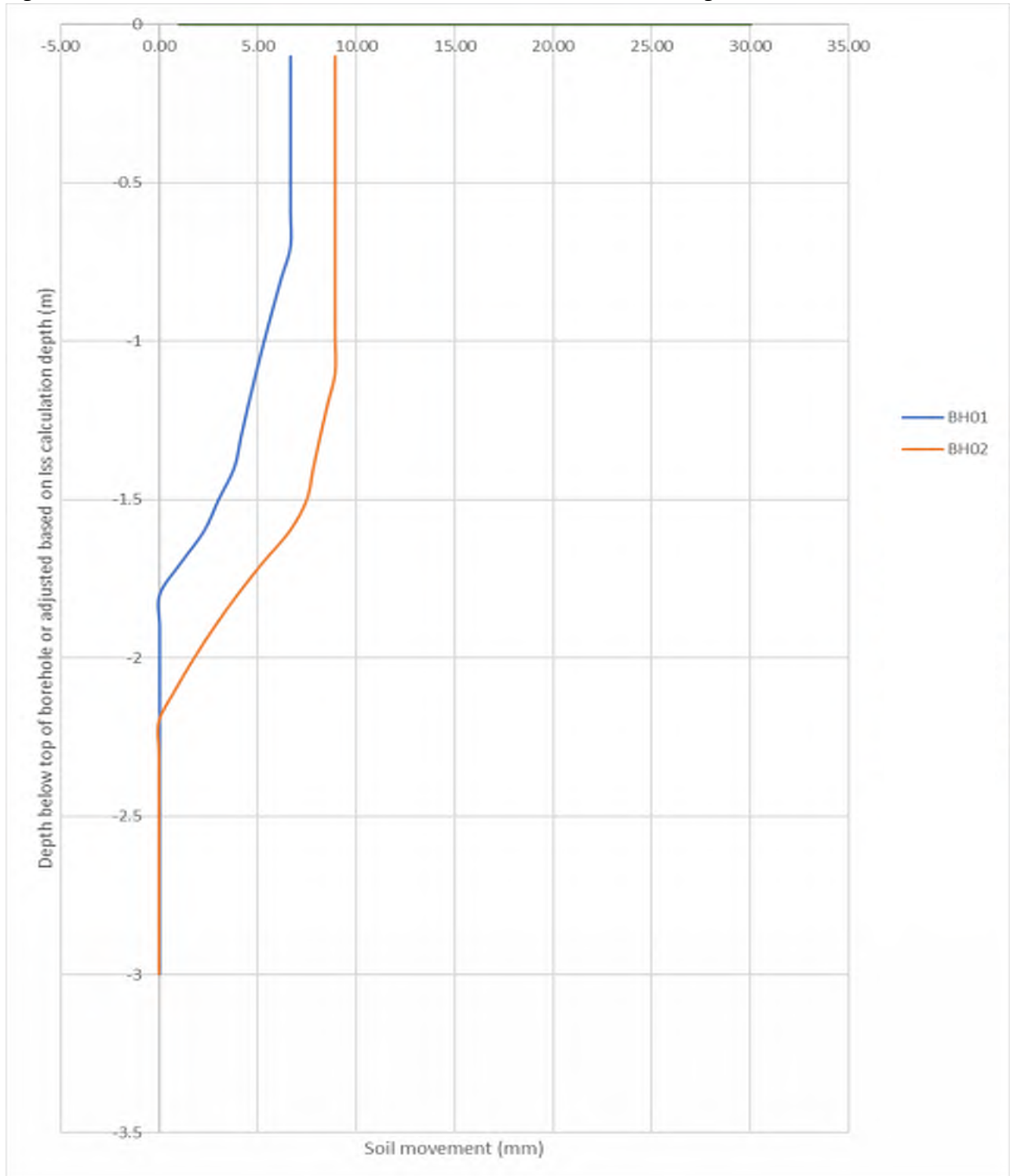
\*Soil layer expected at the base of problematic soil layers at test location (or at surface where problematic soils not encountered) to achieve 100 kPa allowable bearing capacity or greater.

## Characteristic Soil Movement (Ys)

The characteristic soil movement (soil reactivity) from wetting and drying cycles is calculated according to AS 2870 Section 2.3. The calculations are based on Iss % testing results or correlations with linear shrink data and are based on complete soil profiles for boreholes drilled within the building Site. In the case of where cut and fill are proposed and building finished floor levels (FFL) are made available, the Iss value is recalculated based on the FFL and estimated cut and fill as per Table 7.

According to AS 2870 Section 2.3, calculations consider the depth of groundwater and bedrock. Soil characteristic movements based on lab testing are presented in Figure 2.

Figure 2 Calculated Characteristic Soil Movement Based on Soil Testing



## Concrete Durability Requirements

The soil aggressivity testing results presented in

Table 6 have been interpreted in Table 9 to provide indicative requirements for minimum concrete strength, curing duration and reinforcement cover in accordance with AS 2870:2011. This table builds on the previous classification summary by applying the relevant durability provisions to each individual soil layer encountered across the Site.

From these results presented in Table 9, it is generally discerned that in all investigated areas of the Site:

- With a minimum surface soil (to 0.5m) exposure classification of A1, at a minimum, 20 MPa concrete is generally recommended with 40 mm cover. A minimum curing time of 3 days is recommended.

*Table 9 Interpretation of Soil Aggressivity Results – Minimum Concrete Strength, Curing and Cover*

| Layer | Location | Depth    | Exposure Classification |           | Minimum Concrete    | Minimum Days Curing | Cover~   |
|-------|----------|----------|-------------------------|-----------|---------------------|---------------------|----------|
|       |          | From (m) | Salinity                | Sulphate^ | Strength f'c (MPa)^ |                     |          |
| 1     | BH01     | 0.1      | A1                      | A1        | 20                  | 3                   | 40       |
| 2     | BH02     | 0.2      | A1                      | A1        | 20                  | 3                   | 40       |
| 3     | BH01     | 0.4      | A1                      | A1        | 20                  | 3                   | 40       |
| 4     | BH02     | 0.5      | A1                      | B1^       | 20-32^              | 3-7^                | 40-60^ ' |
| 5     | BH01     | 0.7      | A1                      | A1        | 20                  | 3                   | 40       |
| 6     | BH02     | 0.8      | A2                      | A2        | 25                  | 3                   | 45-50# ' |
| 7     | BH01     | 1.2      | A2                      | A1        | 25                  | 3                   | 45-40#   |
| 8     | BH02     | 1.1      | A1                      | A1        | 20                  | 3                   | 40       |
| 9     | BH02     | 1.7      | A2                      | A1        | 25                  | 3                   | 45-40#   |
| 10    | BH01     | 1.6      | B1                      | A1        | 32                  | 7                   | 50-40#   |
| 11    | BH01     | 2.0      | B1                      | A1        | 32                  | 7                   | 50-40#   |

^Sulphate class is conservatively estimated from soil pH and further testing is required on soil samples to confirm if the low pH is attributed to sulphate or other cations within the soil. If pH conditions are attributed primarily to sulphate, then the indicated exposure classification is expected to be reliable but subject to sulphate concentration threshold presented in AS2870.

# Where a damp-proofing membrane is installed, the minimum reinforcement cover in saline (non A1) soils may be reduced to 30 mm

' Where a damp-proofing membrane is installed, the minimum reinforcement cover in sulphate (non A1) soils may be reduced by 10 mm.

# Foundation Maintenance and Footing Performance: A Homeowner's Guide



CSIRO

BTF 18  
replaces  
Information  
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

## Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

## Causes of Movement

### Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

### Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

### Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

### Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

### Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

| GENERAL DEFINITIONS OF SITE CLASSES |   |
|-------------------------------------|---|
| Class                               | Foundation  |
| A                                   | Most sand and rock sites with little or no ground movement from moisture changes  |
| S                                   | Slightly reactive clay sites with only slight ground movement from moisture changes   |
| M                                   | Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes   |
| H                                   | Highly reactive clay sites, which can experience high ground movement from moisture changes   |
| E                                   | Extremely reactive sites, which can experience extreme ground movement from moisture changes  |
| A to P                              | Filled sites  |
| P                                   | Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise |

#### Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

#### Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

#### Effects of Uneven Soil Movement on Structures

##### Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpend).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

##### Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

##### Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

##### Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

##### Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

#### Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

#### Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

### Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.

Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.

- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

### Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C.1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

### Prevention/ Cure

#### Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

#### Ground drainage

In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

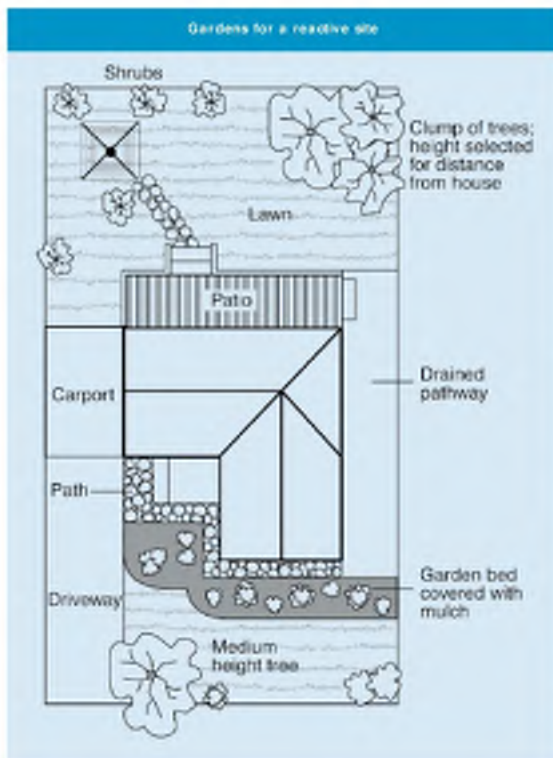
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

#### Protection of the building perimeter

It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

| CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS  |   |                 |
|---|---|-----------------|
| Description of typical damage and required repair   | Approximate crack width limit (see Note 3)                | Damage category |
| Hairline cracks   | <0.1 mm   | 0               |
| Fine cracks which do not need repair  | <1 mm   | 1               |
| Cracks noticeable but easily filled. Doors and windows stick slightly   | <5 mm   | 2               |
| Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired   | 5-15 mm (or a number of cracks 3 mm or more in one group) | 3               |
| Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted | 15-25 mm but also depend on number of cracks              | 4               |



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

#### Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

**Warning:** Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

#### The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

#### Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

#### Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

#### Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

#### Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

**This BTF was prepared by John Lawer FAIB, MIAMA, Partner, Construction Diagnosis.**

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

Distributed by

CSIRO PUBLISHING PO Box 1139, Collingwood 3066, Australia

Free call 1800 645 051 Tel (03) 9662 7666 Fax (03) 9662 7555 www.publish.csiro.au

Email: publishing.sales@csiro.au

© CSIRO 2018. Unauthorised copying of this Building Technology file is prohibited

**CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE  
ITEM**

**Section 321**

Form **55**

To:  *Owner /Agent*  
 *Address*  
  *Suburb/postcode*

**Qualified person details:**

Qualified person:   
Address:     
Licence No:   *Email address:*  
Phone No:   
Fax No:

Qualifications and Insurance details:  *(description from Column 3 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)*

Speciality area of expertise:  *(description from Column 4 of the Director's Determination - Certificates by Qualified Persons for Assessable Items)*

**Details of work: Foundation Classification**

Address:     
Lot No:   
Certificate of title No:

The assessable item related to this certificate:  *(description of the assessable item being certified)*  
*Assessable item includes –*  

- a material
- a design
- a form of construction
- a document
- testing of a component, building system or plumbing system
- an inspection, or assessment, performed

**Certificate details:**

Certificate type:  *(description from Column 1 of Schedule 1 of the Director's Determination - Certificates by Qualified Persons for Assessable Items n)*

This certificate is in relation to the above assessable items, at any stage, as part of – *(tick one)*

building work, plumbing work or plumbing installation or demolition work

OR

a building, temporary structure or plumbing installation

In issuing this certificate the following matters are relevant –

Documents:

\*Enviro-Tech Consultants Pty. Ltd. 2025. Foundation Classification Report for a Proposed Dwellings And Shed, Lot 2 81 Richardsons Road - Sandford. Unpublished report for Suanne Lawrence by Enviro-Tech Consultants Pty. Ltd., 26/09/2025.

Relevant calculations:

References:

AS2870-2011 Residential Slabs and Footings  
AS1726-2017 Geotechnical site investigations  
AS1289-2014 Methods of testing soils for engineering purposes  
CSIRO Building technology file – 18.

*Substance of Certificate: (what it is that is being certified)*

Foundation classification consistent with AS2870-2011.

*Scope and/or Limitations*

The classification applies to the Site as inspected and does not account for future alteration to foundation conditions as a result of earth works, placement of fill, uncontrolled earthworks, drainage condition changes, variations in site maintenance other than indicated in supplied plans.

\*This report contains soil classification information prepared in accordance with AS2870 as well as AS2870 extracts which may be used as general guidance for plumbing design. The hydraulic designer is to use their own judgment in the application of this information and this report must be read in conjunction with hydraulic plans prepared for the proposed development.

I certify the matters described in this certificate.

Qualified person:


Signed:



Certificate No:

Date:

26/09/2025



Dear Ryan. Thank you again for meeting with me today. In response for additional information:  
Rural Zone 20.3.1 Discretionary Uses - Use is domestic animal boarding.  
C7.6.1 - Use, as stated in the Coastal Inundation Hazard Assessment (p3) by EnvironTech  
Consultants, is not a coastal location.  
C11.5.2 - Based on the Assessment provided, this is not a coastal location.

