DEVELOPMENT APPLICATION

PDPLANPMTD-2026/061086

PROPOSAL: Outbuilding, Driveway Additions & Alterations (Single Dwelling)

LOCATION: 58 Pipe Clay Esplanade, Cremorne

RELEVANT PLANNING SCHEME: Tasmanian Planning Scheme - Clarence

ADVERTISING EXPIRY DATE: 30/09/2026 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 30/09/2026 00:00:00. In addition to legislative requirements, plans and documents can also be viewed at 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. Representations must be received by Council on or before 30/09/2026 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 or at the Council offices.

City of Clarence
38 Bligh St Rosny Park
PO Box 96
Rosny Park TAS, 7018

03 6217 9500
clarence@ccc.tas.gov.au
ccc.tas.gov.au

Planning Application

Use this form to obtain planning approval for the use and development of land, including change of use, subdividing land into smaller lots, lot consolidation, or signage.

Please refer to the Planning Application checklist on the following pages to determine what documentation must be submitted with your application.

Proposal: Proposed Shed & Driveway

Location: 58 Pipe Clay Esplanade, Cremorne

Personal Information Removed

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:

n/a

Current use of site: Residential

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

Planning Application 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.

RESULT OF SEARCH

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
248991	1
EDITION	DATE OF ISSUE
3	28-Aug-2015

SEARCH DATE : 03-May-2026
SEARCH TIME : 01.09 pm

DESCRIPTION OF LAND

City of CLARENCE
Lot 1 on Plan 248991
Derivation : Part of 213 acres Gtd to E Grimsey.
Prior CT 3072/85

SCHEDULE 1

M522108 TRANSFER to JAMES ANDREW POLANOWSKI and REBECCA ANNE HILL Registered 28-Aug-2015 at noon

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
BENEFITING EASEMENT: a right of carriage way over the roadways shown in D55662
140822 FENCING CONDITION AND OTHER CONDITIONS in Transfer
E13020 MORTGAGE to Commonwealth Bank of Australia Registered 28-Aug-2015 at 12.01 pm

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

ORIGINAL – NOT TO BE REMOVED FROM TITLES OFFICE

R.P. 1469

TASMANIA

REAL PROPERTY ACT, 1862, as amended

NOTE—REGISTERED FOR OFFICE CONVENIENCE TO REPLACE

Cert. of Title Vol. 830 Fol. 17

CERTIFICATE OF TITLE

Register Book

Vol.	Fol.
3372	85

I certify that the person described in the First Schedule is the registered proprietor of an estate in fee simple in the land within described together with such interests and subject to such encumbrances and interests as are shown in the Second Schedule. In witness whereof I have hereunto signed my name and affixed my seal.

Recorder of Titles.

DESCRIPTION OF LAND

TOWN OF CREMORNE
ONE ROOD TEN PERCHES AND SEVEN TENTHS OF A PERCH
on the Plan hereon

FIRST SCHEDULE (continued overleaf)

MINNE BROUWER of Howrah, Manager and

HENRIETTA CLARA BROUWER his wife.

SECOND SCHEDULE (continued overleaf)

TOGETHER WITH a right of carriage way over the roadways shown in Diagram No. ~~180/3~~

TRANSFER NO. 140822 was made SUBJECT TO fencing condition and other conditions.

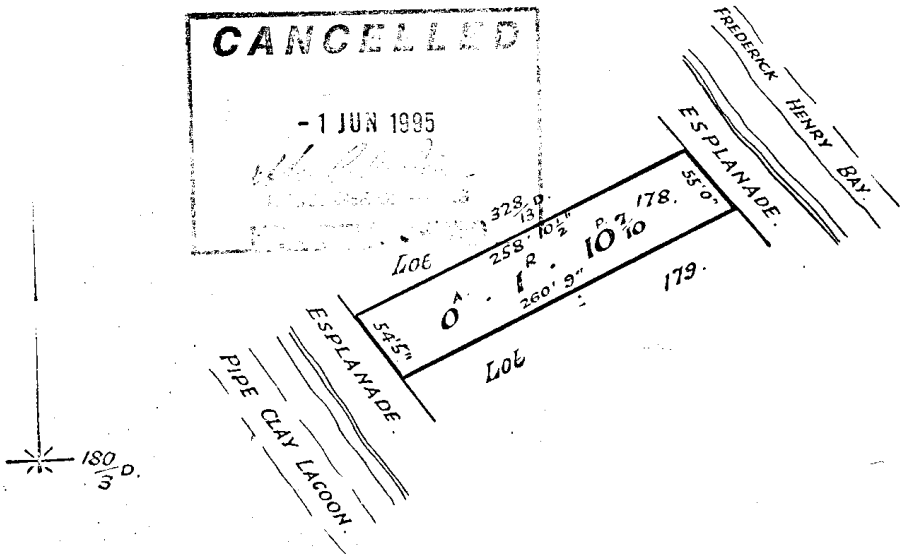
NO. A309132 MORTGAGE to Christina Susie Mathers.
Registered 25th March, 1969 at 12.2p.m.
(Sgd.) T.E. HUTCHINSON.
Recorder of Titles.

DISCHARGED A479670 (10.4.1975)

Recorder of Titles.

CANCELLED

- 1 JUN 1995



REGISTERED NUMBER 248991

Lot 1 of this plan consists of all the land comprised in the above-mentioned cancelled folio of the Register

Part of 213 Acres. - Gtd. to E. Grimsey - Meas. in ft. & ins.

FIRST Edition. Registered 180/3D.

Derived from C.T. Vol.830.Fol.17. Transfer A309131 C.S. Mathers.

PROJECT DETAILS		
TITLE REFERENCE		
VOLUME/CERTIFICATE FOLIO	248991 / 1	
PID	5228004	
FLOOR AREAS		
EXISTING SITE AREA	1283	m^2
EXISTING HOUSE	100.4	m^2
EXISTING SHED	34.4	m^2
PROPOSED GARAGE (ROOFED)	93	m^2
DESIGN WIND CLASSIFICATION	TBC	
SOIL CLASSIFICATION	P	
CLIMATE ZONE	7	
BAL RATING	NIL	
ALPINE AREA	N/A	
CORROSION ENVIRONMENT	C5	
OTHER HAZARDS	N/A	

DRAWING SCHEDULE – ARCHITECTURAL			
		.	.
DRAWING NUMBER	TITLE		
A00	Cover Sheet & Location Plan		
A01	Site Plan – Existing		
A02	Site Plan – Demolition		
A03	Site Plan – Proposed		
A04	Floor Plan – Proposed		
A04–A	Floor Plan – Proposed		
A05	Roof Plan – Proposed		
B01	Elevation Proposed		
B02	Elevation Proposed		

LOCATION PLAN
N/A

RAD

LUTRUWITA/TASMANIA
CONTACT@STUDIO-RAD.COM
0439 849 433

PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024
CLIENT
JAMES & BEC

TITLE
COVER & LOCATION PLAN

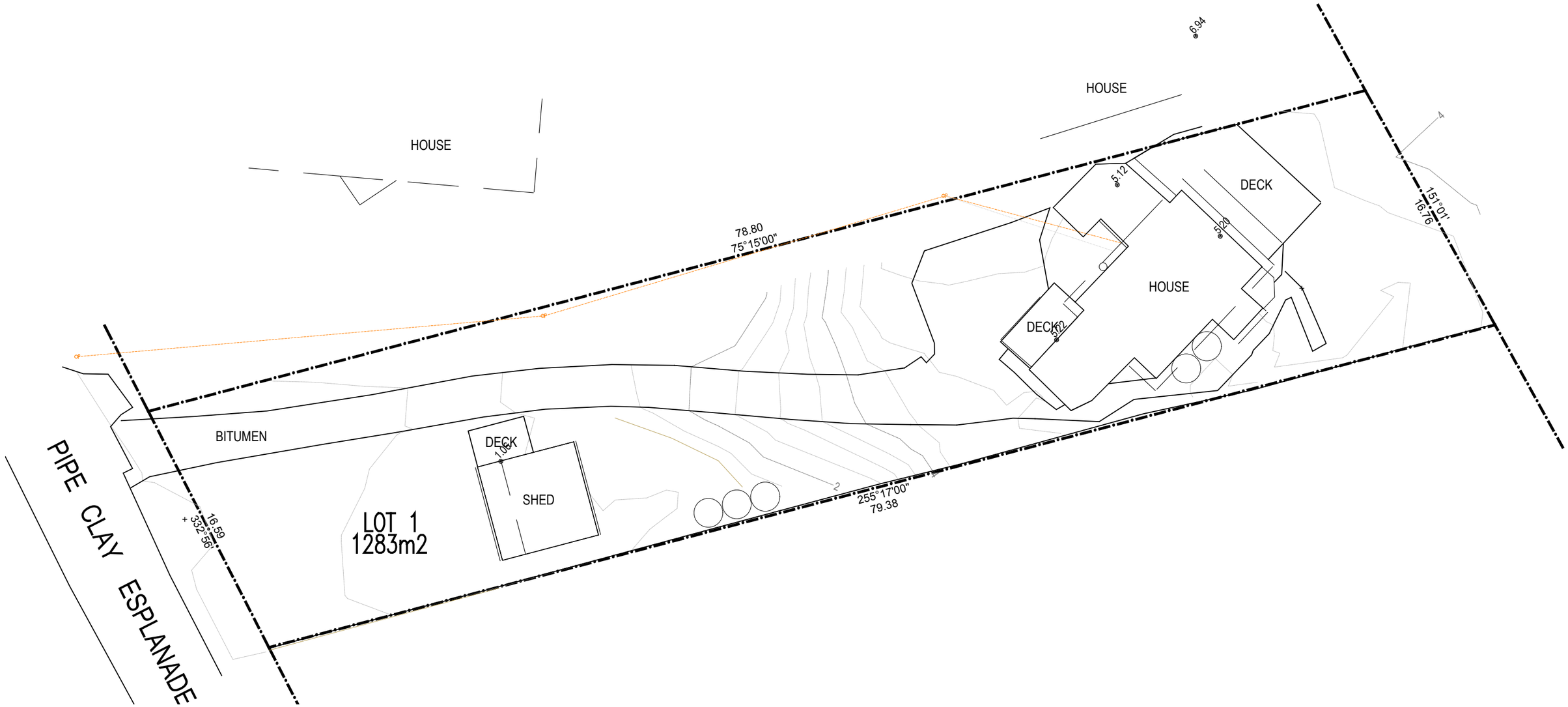
REV. No.	DESCRIPTION	DATE

DRAWING No. A00 REVISION No. -

DATE	03/05/2026
SCALE	N/A
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M



SITE PLAN – EXISTING
1:250

RAD

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0439 849 433

PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024

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JAMES & BEC

TITLE
SITE PLAN – EXISTING

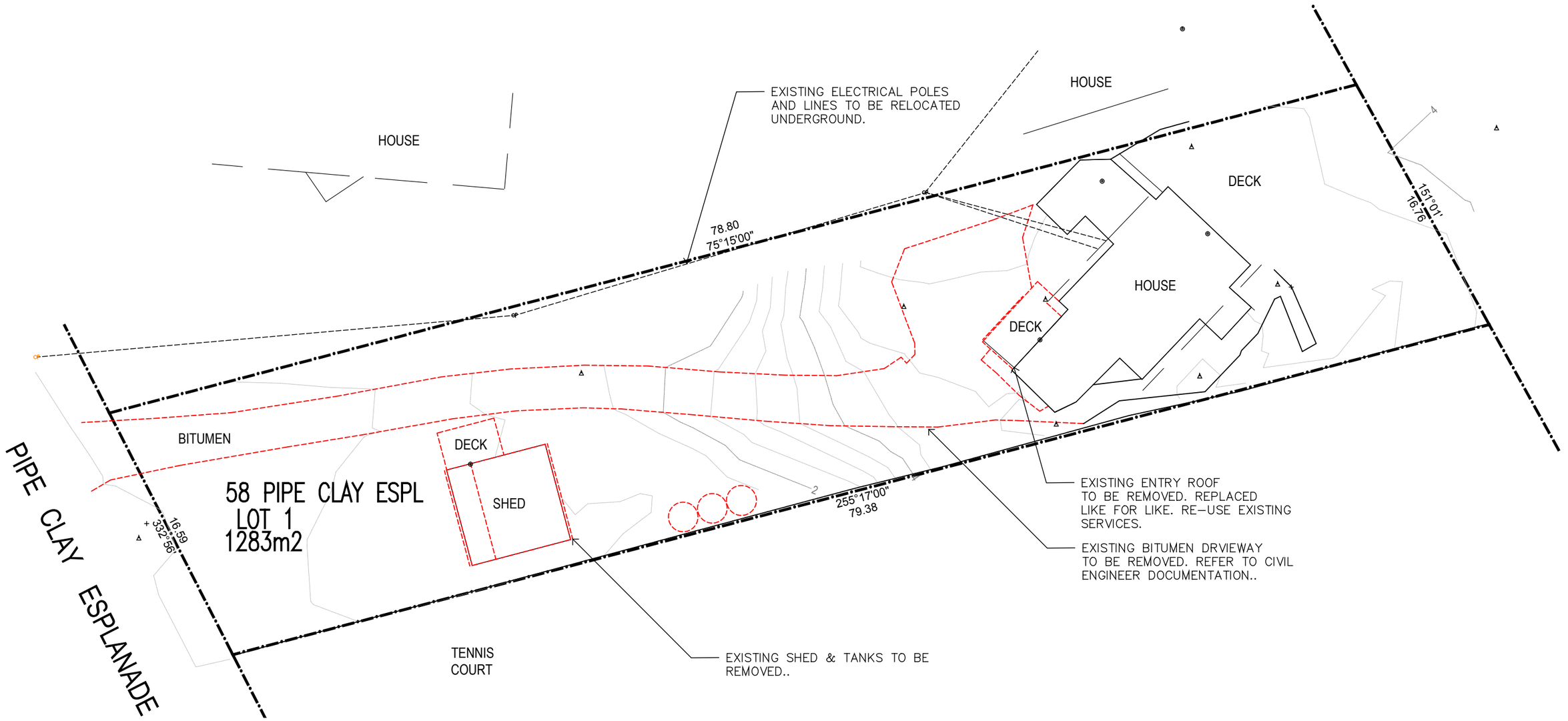
REV. No.	DESCRIPTION	DATE

DRAWING No. A01 REVISION No. -

DATE	03/05/2026
SCALE	1:250
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M



NOTE:
DEMOLITION SHOWN RED.

SITE PLAN – DEMO
1:250

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TITLE
SITE PLAN – DEMOLITION

REV. No.	DESCRIPTION	DATE

DRAWING No. A02 REVISION No.-

DATE	03/05/2026
SCALE	1:250
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

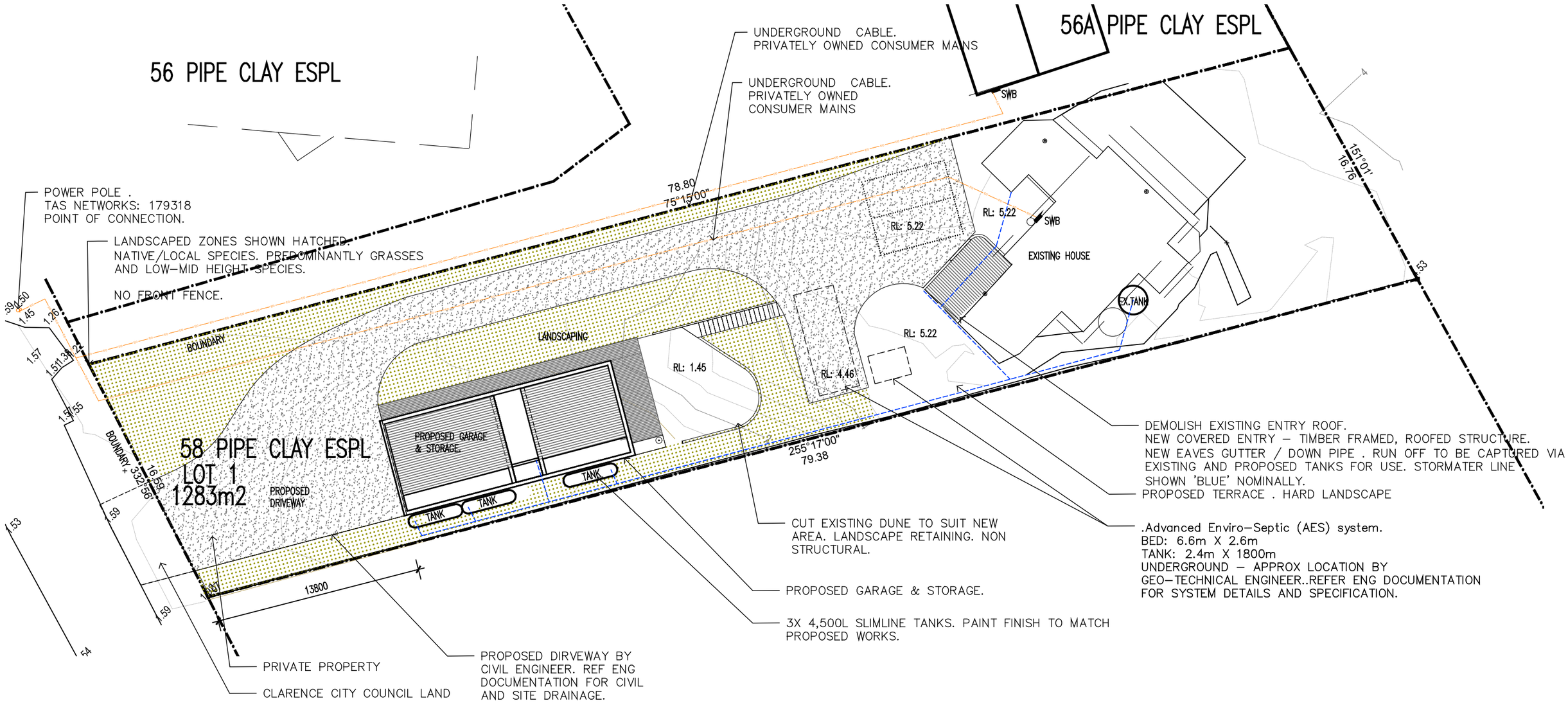
Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M

GENERAL NOTES

BUILDING CLASS: 10A

DO NOT SCALE. ALL DIMENSIONS ARE NOMINAL ONLY. DIMENSIONS ARE TO FINISHED SURFACES UNLESS OTHERWISE NOTED. DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED. VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORK WITH THE ARCHITECT.



SITE PLAN – PROPOSED
1:250

RAD

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0 4 3 9 8 4 9 4 3 3

PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
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TITLE
SITE PLAN – PROPOSED

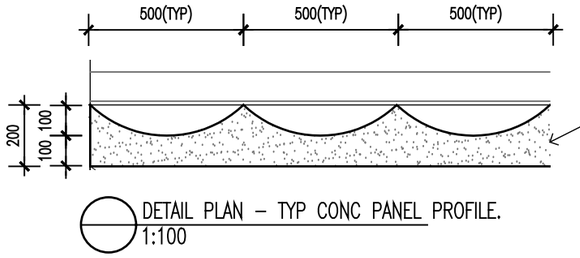
REV. No.	DESCRIPTION	DATE

DRAWING No. A03 REVISION No.-

DATE	31/08/2026
SCALE	1:250
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M



SITE CAST CONCRETE
WALL PANEL. CONCAVE PROFILE.
50MM / 500MM AS SHOWN.
100MM STRUCTURAL MIN DEPTH.
200mm TOTAL.
ENG TO CONFIRM FINAL DETAIL AND REINFORCEMENT.

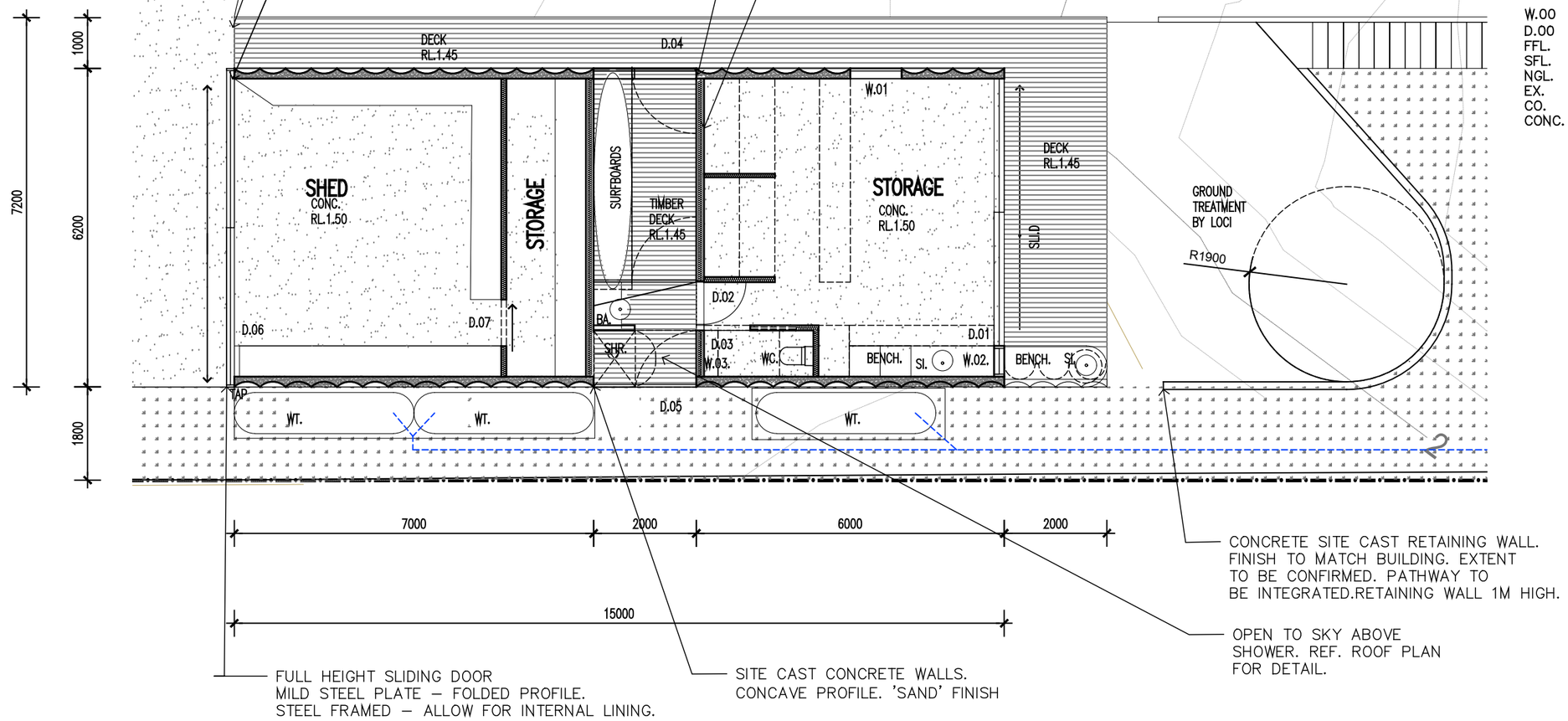
DETAIL PLAN – TYP CONC PANEL PROFILE.
1:100

JUNCTION OF CONC. SLAB TO PATH..

INDEPENDENT HEAVY DUTY SLIDING DOOR. STEEL FRAME. TOP HUNG.

INDEPENDENT SLIDING SCREEN DOOR. TIMBER FULL HEIGHT. DARK–TIMBER VERTICAL SCREEN

TIMBER FRAMED WALL.
INTERNAL LINING – MARINE PLY.
IN BUILT STORAGE.



CONCRETE SITE CAST RETAINING WALL.
FINISH TO MATCH BUILDING. EXTENT TO BE CONFIRMED. PATHWAY TO BE INTEGRATED.RETAINING WALL 1M HIGH.

OPEN TO SKY ABOVE
SHOWER. REF. ROOF PLAN FOR DETAIL.

FULL HEIGHT SLIDING DOOR
MILD STEEL PLATE – FOLDED PROFILE.
STEEL FRAMED – ALLOW FOR INTERNAL LINING.

SITE CAST CONCRETE WALLS.
CONCAVE PROFILE. 'SAND' FINISH

FLOOR PLAN– PROPOSED
1:100

GENERAL NOTES

BUILDING CLASS: 10A

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LEGEND

WALLS:

TIMBER FRAMED WALL.

DS DOUBLE STUD

GENERAL

W.00	WINDOW (REF. SCHED)
D.00	DOOR (REF.SCHED)
FFL.	FINISHED FLOOR LEVEL
SFL.	STRUCTURAL FLOOR LEVEL
NGL.	NATURAL GROUND LINE
EX.	EXISTING
CO.	COLUMN
CONC.	CONCRETE

RAD
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CONTACT@STUDIO-RAD.COM
0 4 3 9 8 4 9 4 3 3

PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024
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JAMES & BEC

TITLE
FLOOR PLAN – PROPOSED

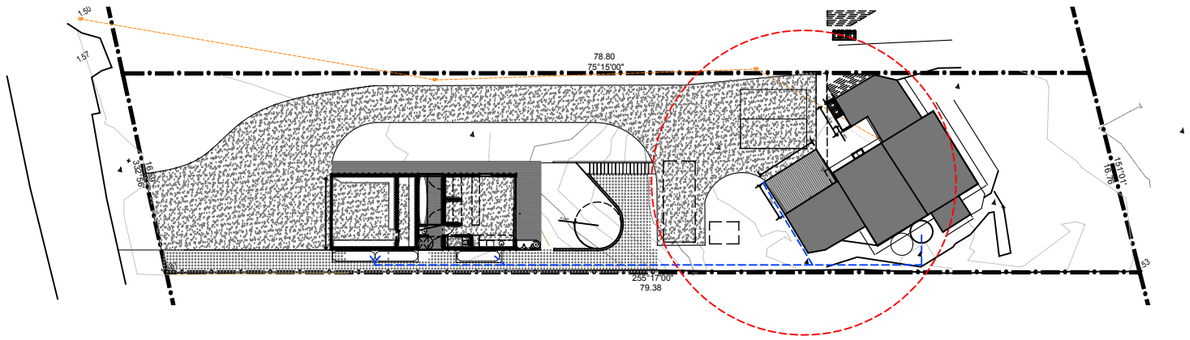
REV. No.	DESCRIPTION	DATE

DRAWING No. A04 / REVISION No.-

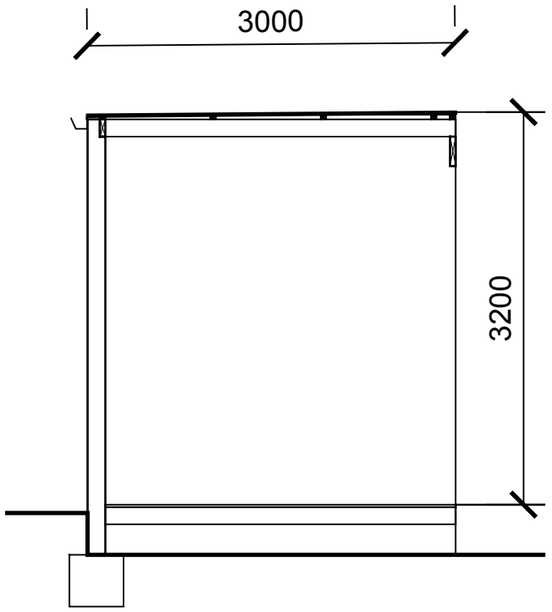
DATE	03/05/2026
SCALE	1:100
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

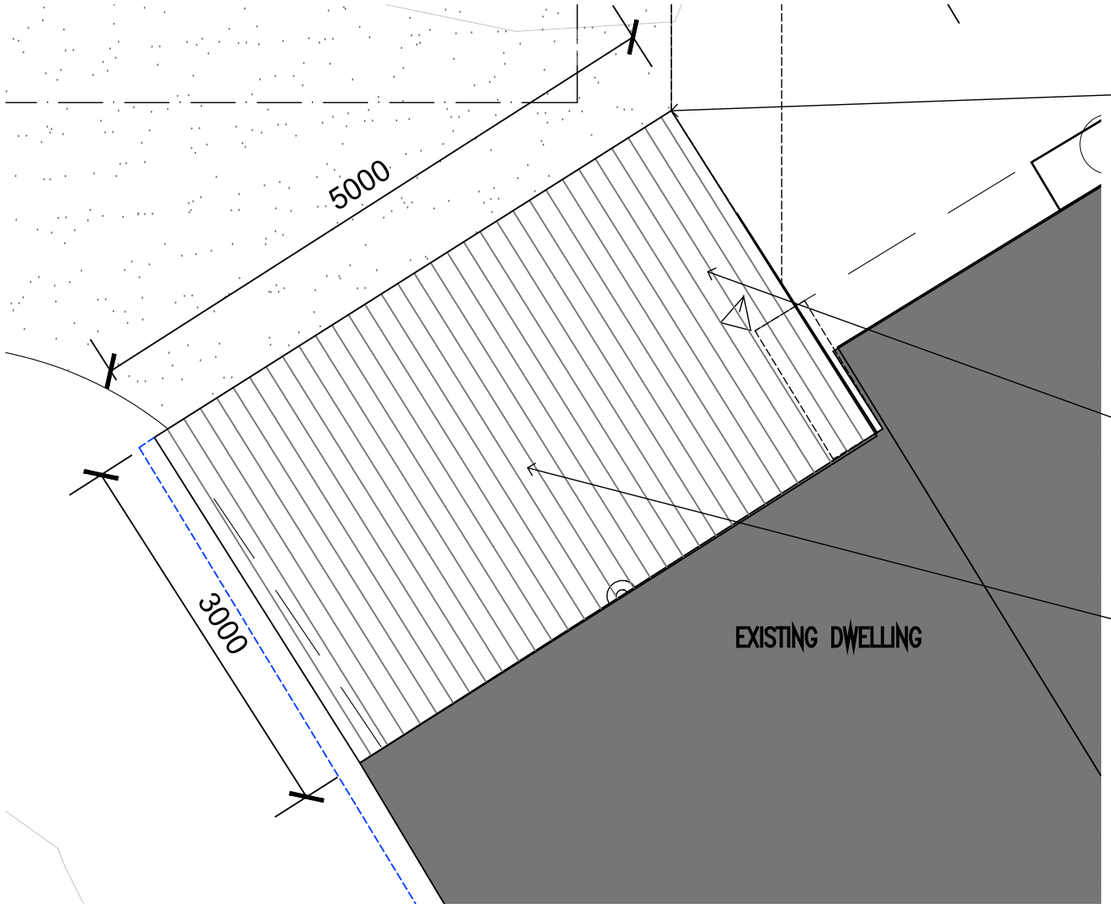
0 1 3 5 7M



SITE PLAN – ENTRY
1:500



SECTION – COVERED ENTRY
1:100



NEW EAVES GUTTER AND DP.
TO DISCHARGE TO PROPOSED
STORMWATER.

CLEAR AMPELITE ROOFING.
FINAL PROFILE TO BE CONFIRMED BY ARCHITECT.

NEW ROOFED AREA.(TO REPLACE EXISTING)
3 X 5M. TIMBER FRAMED
TO CONNECT TO EXISTING STRUCTURE.
VIA LEDGER.
ENGINEER TO PROVIDE SPEC.

FLOOR PLAN– PROPOSED
1:100

GENERAL NOTES

BUILDING CLASS: 10A

DO NOT SCALE. ALL DIMENSIONS ARE NOMINAL ONLY. DIMENSIONS ARE TO FINISHED SURFACES UNLESS OTHERWISE NOTED. DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED. VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORK WITH THE ARCHITECT.

LEGEND

WALLS:

TIMBER FRAMED WALL.

DOUBLE STUD
DS

GENERAL

W.00	WINDOW (REF. SCHED)
D.00	DOOR (REF.SCHED)
FFL.	FINISHED FLOOR LEVEL
SFL.	STRUCTURAL FLOOR LEVEL
NGL.	NATURAL GROUND LINE
EX.	EXISTING
CO.	COLUMN
CONC.	CONCRETE

RAD
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PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024
CLIENT
JAMES & BEC

TITLE
FLOOR PLAN – ENTRY

REV. No.	DESCRIPTION	DATE

DRAWING No. A04–A REVISION No.-

DATE	16/07/2026
SCALE	1:50
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M

GENERAL NOTES

BUILDING CLASS: 10A

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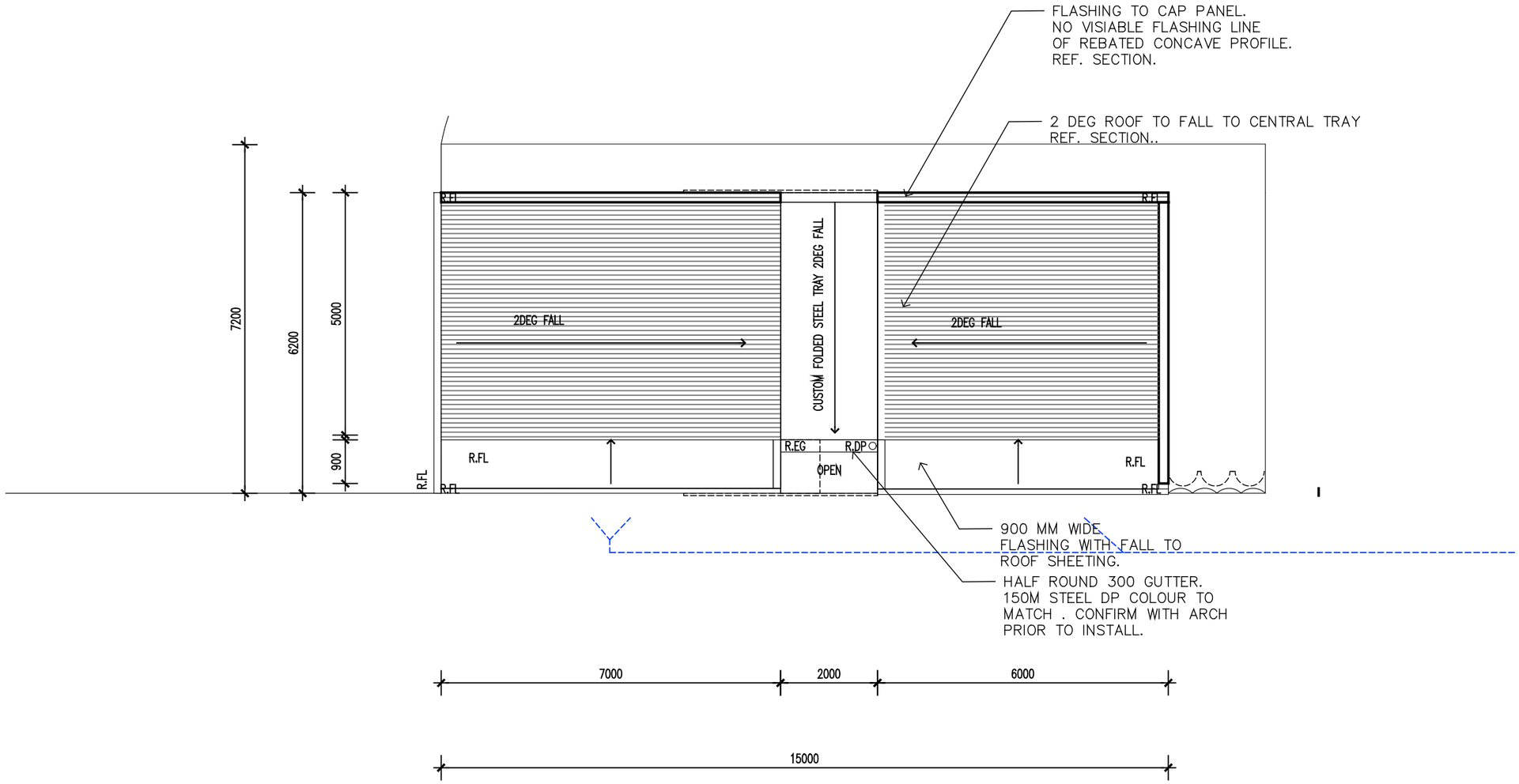
LEGEND

ROOF::

R.CO.	LYSAGHT CUSTOM ORB 0.42
R.EG.	EAVES GUTTER – CUSTOM
R.FL.	FOLDED FLASHING – CUSTOM
R.EX	PENETRATION TO ROOF (TBC)
R.CH	PENETRATION – CHIMNEY
R.DP	DOWNPIPE MIN 90DIA TYP
R.WT	RAINWATER TANK
SK.00	FIXED SKYLIGHT



FLOOR PLAN– PROPOSED
1:100

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0 4 3 9 8 4 9 4 3 3

PROJECT
PROPOSED GARAGE + AMENITY
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TITLE
ROOF PLAN – PROPOSED

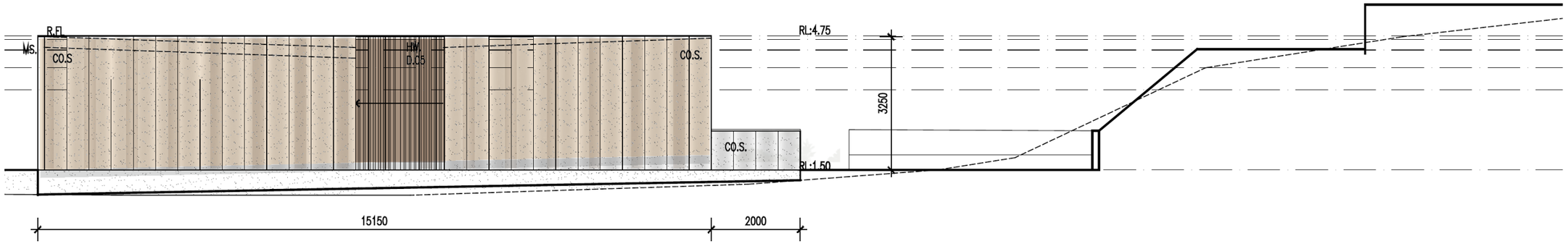
REV. No.	DESCRIPTION	DATE

DRAWING No. A05 REVISION No.-

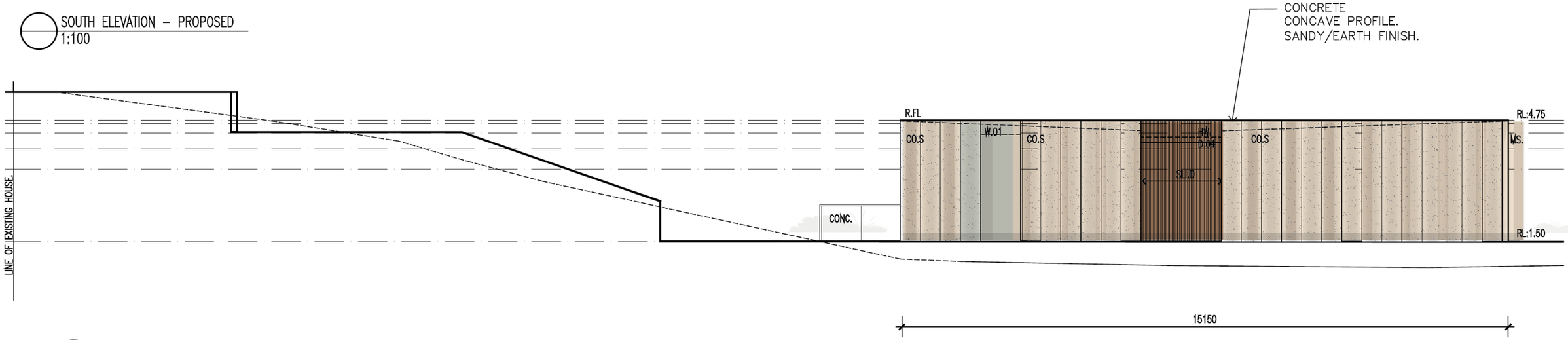
DATE	29/07/2026
SCALE	1:100
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M



SOUTH ELEVATION – PROPOSED
1:100



NORTH ELEVATION – PROPOSED
1:100

GENERAL NOTES

BUILDING CLASS: 10A

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LEGEND

WALLS:

TIMBER FRAMED WALL. MIN MGP10. INSULATED MIN R.2.0

DS DOUBLE STUD

GENERAL

W.00	WINDOW (REF. SCHED)
D.00	DOOR (REF.SCHED)
FFL.	FINISHED FLOOR LEVEL
SFL.	STRUCTURAL FLOOR LEVEL
NGL.	NATURAL GROUND LINE
EX.	EXISTING

GENERAL

CO.S	SITE CAST CONCRETE – SAND
MS	MILD STEEL – NATURAL
HW	HARDWOOD
CONC.	CONCRETE
COL.	COLUMN

RAD

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0439 849 433

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58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024

CLIENT
JAMES & BEC

TITLE
ELEVATIONS – PROPOSED

REV. No.	DESCRIPTION	DATE

DRAWING No. B01 REVISION No.-

DATE	03/05/2026
SCALE	1:100
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

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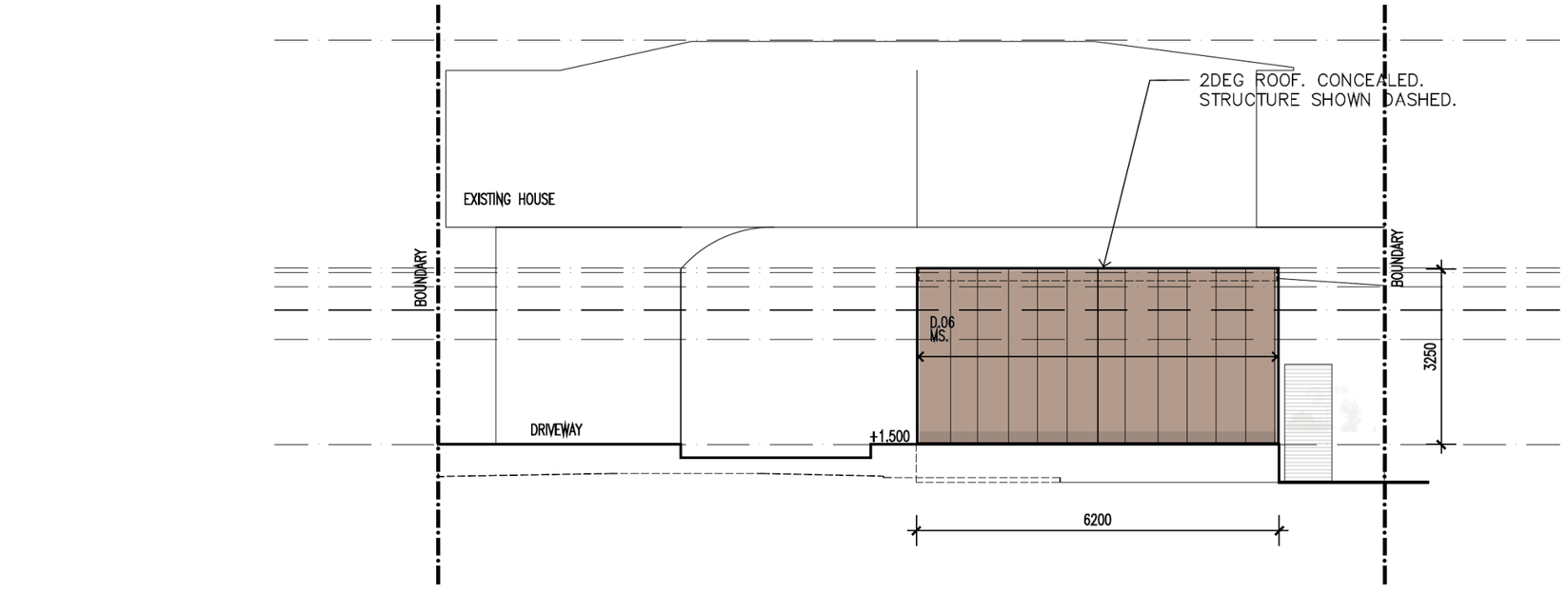
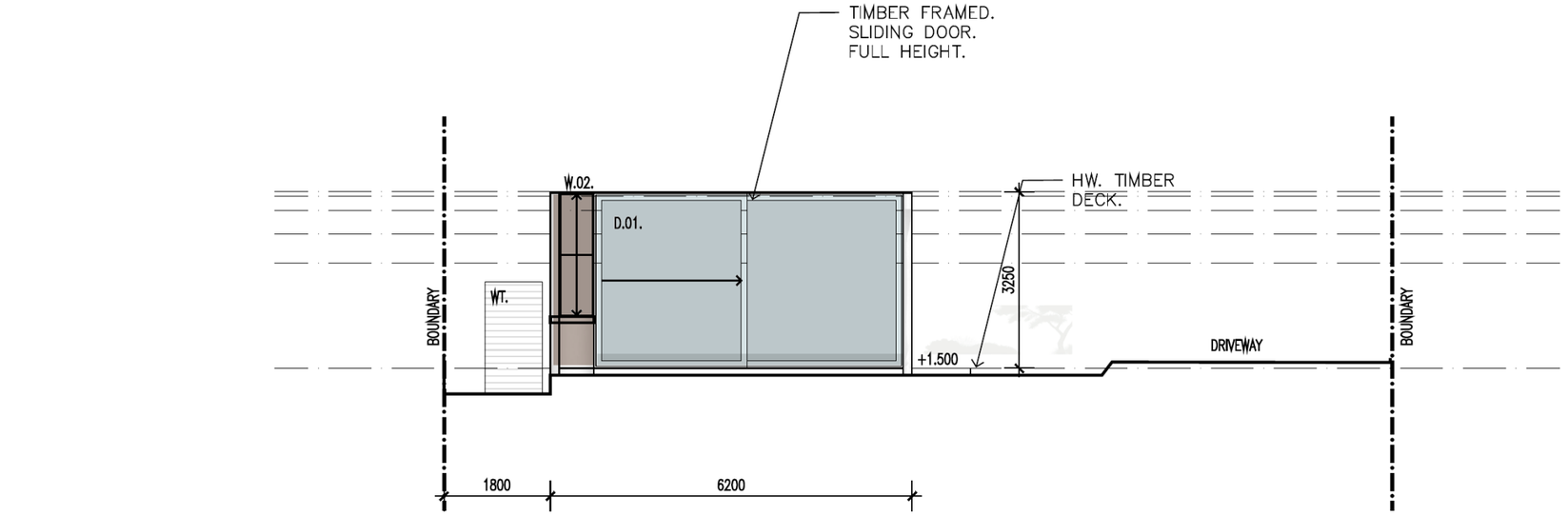
0 1 3 5 7M



WEST ELEVATION – PROPOSED
1:100



EAST ELEVATION – PROPOSED
1:100

GENERAL NOTES

BUILDING CLASS: 10A

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LEGEND

WALLS:

TIMBER FRAMED WALL. MIN MGP10. INSULATED MIN R.2.0

DS DOUBLE STUD

GENERAL

W.00	WINDOW (REF. SCHED)
D.00	DOOR (REF.SCHED)
FFL.	FINISHED FLOOR LEVEL
SFL.	STRUCTURAL FLOOR LEVEL
NGL.	NATURAL GROUND LINE
EX.	EXISTING

GENERAL

CO.S	SITE CAST CONCRETE – SAND
MS	MILD STEEL – NATURAL
HW	HARDWOOD
CONC.	CONCRETE
COL.	COLUMN

RAD

LUTRUWITA/TASMANIA
CONTACT@STUDIO-RAD.COM
0 4 3 9 8 4 9 4 3 3

PROJECT
PROPOSED GARAGE + AMENITY
58 PIPE CLAY ESPLANADE
CREMORNE, TAS, AUS, 7024

CLIENT
JAMES & BEC

TITLE
ELEVATIONS – PROPOSED

REV. No.	DESCRIPTION	DATE

DRAWING No. B02 REVISION No.-

DATE	03/05/2026
SCALE	1:100
PROJECT CODE	2509
APPROVAL	DEVELOPMENT APPLICATION

Figured dimensions take precedence to scale readings. Verify all dimensions on site. Report any discrepancies to the Architect for decision before proceeding with the work.

0 1 3 5 7M

CIVIL DRAWINGS
DRIVEWAY UPGRADE
58 PIPE CLAY ESPLANADE
CREMORNE

C001	COVER	C	1/05/2026
C101	OVERALL PLAN	C	1/05/2026
C102	SITE PLAN	C	1/05/2026
C105	TURNPATH PLAN	C	1/05/2026
C201	DRIVEWAY LONGITUDINAL SECTION	C	1/05/2026

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A	PRELIMINARY	04/03/2026	VERIFIED:	-

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ALDANMARK CONSULTING ENGINEERS
Lower Ground
199 Macquarie Street
Hobart TAS 7000
03 6234 8666
mail@aldanmark.com.au
www.aldanmark.com.au

PROJECT: DRIVEWAY UPGRADE

ADDRESS: 58 PIPE CLAY ESPLANADE
CREMORNE

CLIENT: JAMES & REBECCA POLANOWSKI

SHEET: COVER

SCALE: AS INDICATED

TOTAL SHEETS: 5

SIZE: A1

PROJECT No: 25E99-227

SHEET: C001

REV: C

OVERALL PLAN

SCALE 1:500 (A1)

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www.aldanmark.com.au

PROJECT: DRIVEWAY UPGRADE

0 5 10 15 20 25 30 35 40 45 50m

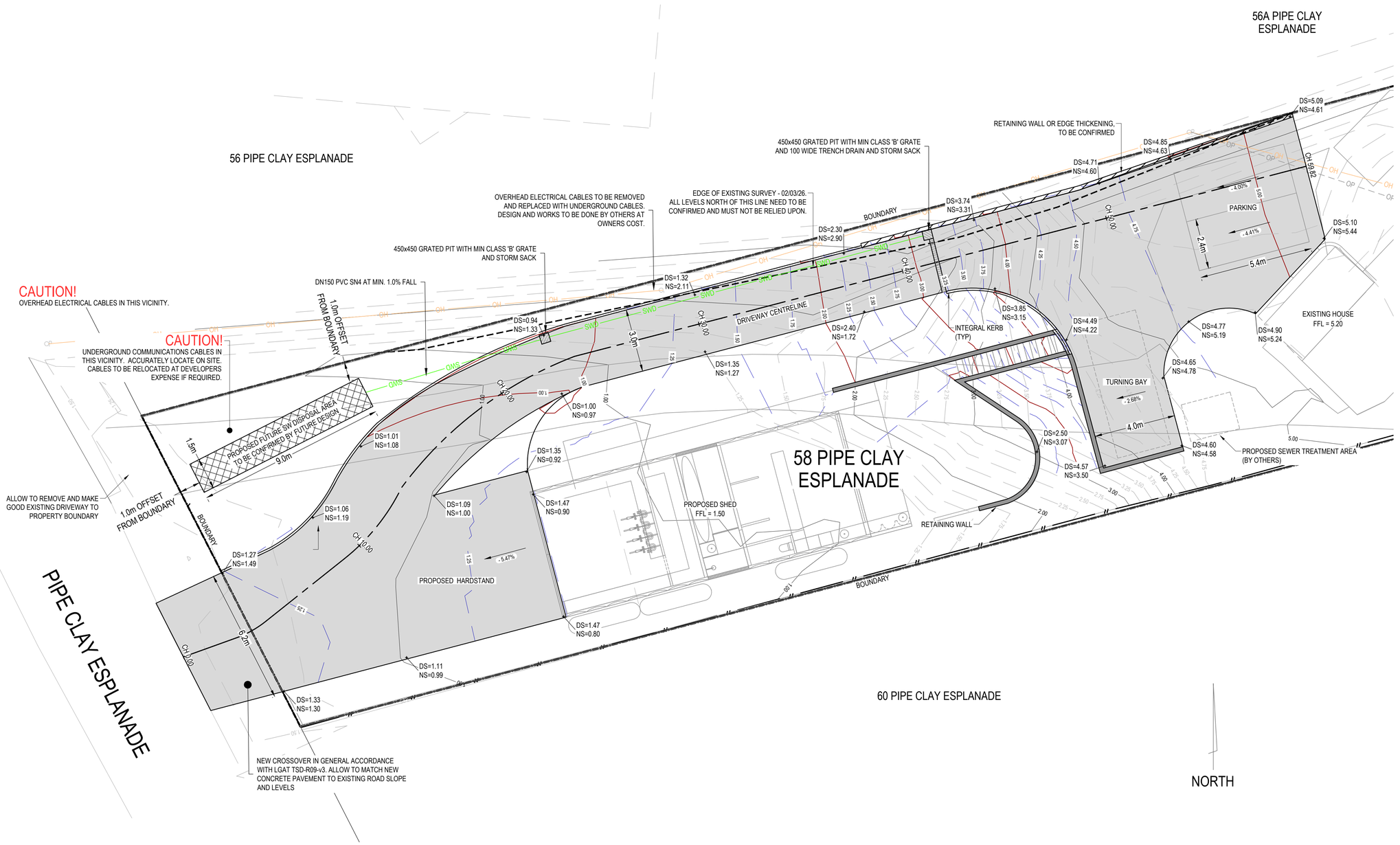
ADDRESS: 58 PIPE CLAY ESPLANADE
CREMORNE

CLIENT: JAMES & REBECCA POLANOWSKI

SHEET: OVERALL PLAN

SCALE: 1:500 | TOTAL SHEETS: 5 | SIZE: A1

PROJECT No: 25E99-227 | SHEET: C101 | REV: C



STORMWATER LEGEND

SWD	PVC STORMWATER DN150 SN8 U.N.O.
SSD	SLOTTED PVC AG DRAIN

SITE & EXISTING SERVICES LEGEND

26.0	DESIGN SURFACE CONTOUR (MAJ/MIN)
26.0	EXISTING SURFACE CONTOUR (MAJ/MIN)
	BOUNDARY
	EASEMENT
	EXISTING FENCE
OH	EXISTING OVERHEAD POWER
OP	EXISTING TELSTRA
FOC	EXISTING NBN

PAVEMENT LEGEND

	CONCRETE DRIVEWAY

NOTES

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HOLD POINTS / CONSTRUCTION TOLERANCES

THE BUILDER IS TO ALLOW TO ENGAGE ALDANMARK ENGINEERS TO UNDERTAKE INSPECTIONS AT THE FOLLOWING HOLD POINTS OF A CIVIL WORKS NATURE:
1. SUBGRADE AND FORMATION LEVEL OF DRIVEWAY PAVEMENT INCLUSIVE OF PROOF ROLL
2. DRIVEWAY REINFORCEMENT AND JOINTING PRIOR TO CONCRETE POUR

THE FOLLOWING TOLERANCES APPLY TO CONSTRUCTION OF THE DRIVEWAY:
- DRIVEWAY CENTRELINE GRADIENTS NOT TO EXCEED A MAXIMUM OF 28% ON STRAIGHT SECTIONS
- INNER WHEEL RADIUS GRADIENT NOT TO EXCEED A MAXIMUM OF 25% IN CURVES
- FORMATION LEVEL OF DRIVEWAY TO BE WITHIN +/- 20mm OF DESIGN LEVELS
- FINISHED SURFACE LEVELS OF DRIVEWAY TO BE WITHIN:
  - +/- 10mm OF DESIGN LEVELS ON STRAIGHT SECTIONS
  - +/- 5mm OF DESIGN LEVELS ON VERTICAL TRANSITIONS

SETOUT FOR DRIVEWAY ALIGNMENT, FORMATION LEVELS AND FINISHED SURFACE LEVELS MUST BE PERFORMED BY A REGISTERED SURVEYOR AND EVIDENCE PROVIDED TO ALDANMARK PRIOR TO DRIVEWAY POUR. ALDANMARK TAKE NO RESPONSIBILITY FOR CONSTRUCTION OR REGULATORY ISSUES DUE TO INACCURATE SET-OUT OR CONSTRUCTION TOLERANCES BEYOND LIMITS NOTED ABOVE.

BUILDER TO ALLOW TO ENGAGE SURVEYOR FOR AN AS-CONSTRUCTED SURVEY OF DRIVEWAY FOR REVIEW BY ALDANMARK.

AS CONSTRUCTED SERVICES DRAWINGS MUST BE PROVIDED TO ALDANMARK UPON PROJECT COMPLETION.

WHERE DRIVEWAY GRADIENT EXCEEDS 28% THE DRIVEWAY SURFACE MUST BE A COARSE BROOMED FINISH. ALL OTHER SECTIONS OF DRIVEWAY SURFACE MAY HAVE A WOODEN FLOAT OR COARSE BROOMED FINISH. DRIVEWAY AGGREGATE MUST BE ANGULAR DOLERITE. ROUNDED STONE AGGREGATE IS NOT ACCEPTABLE.

SITE PLAN

SCALE 1:100 (A1)

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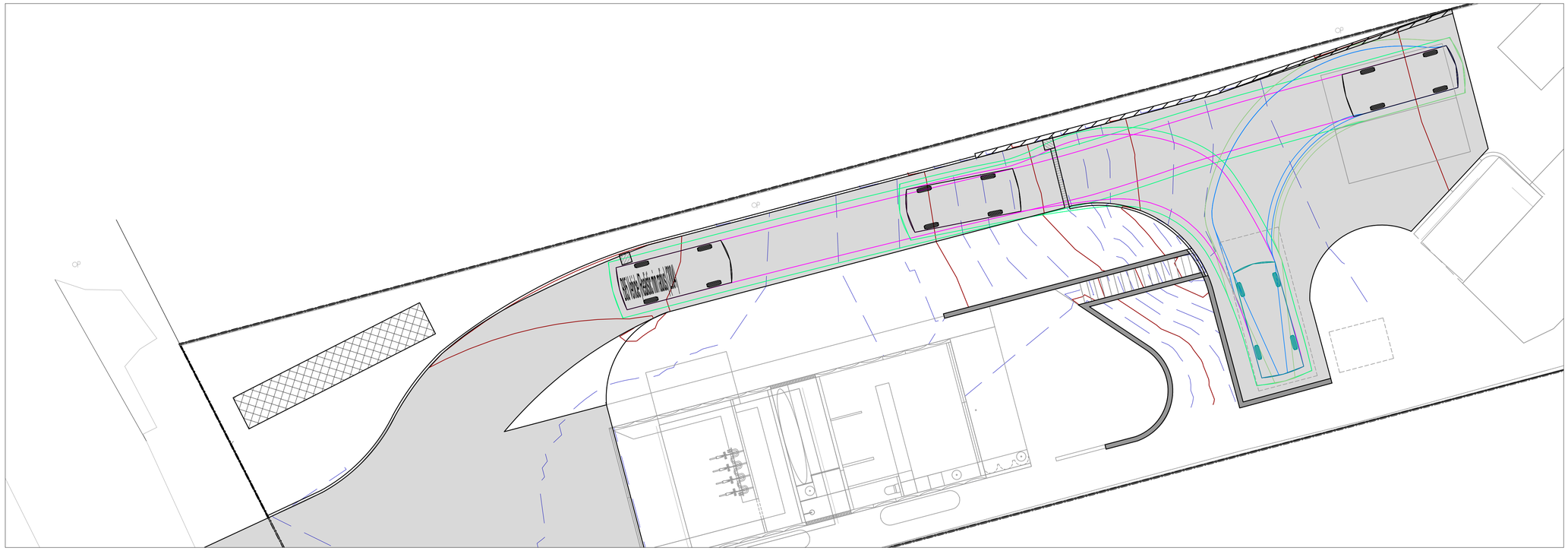
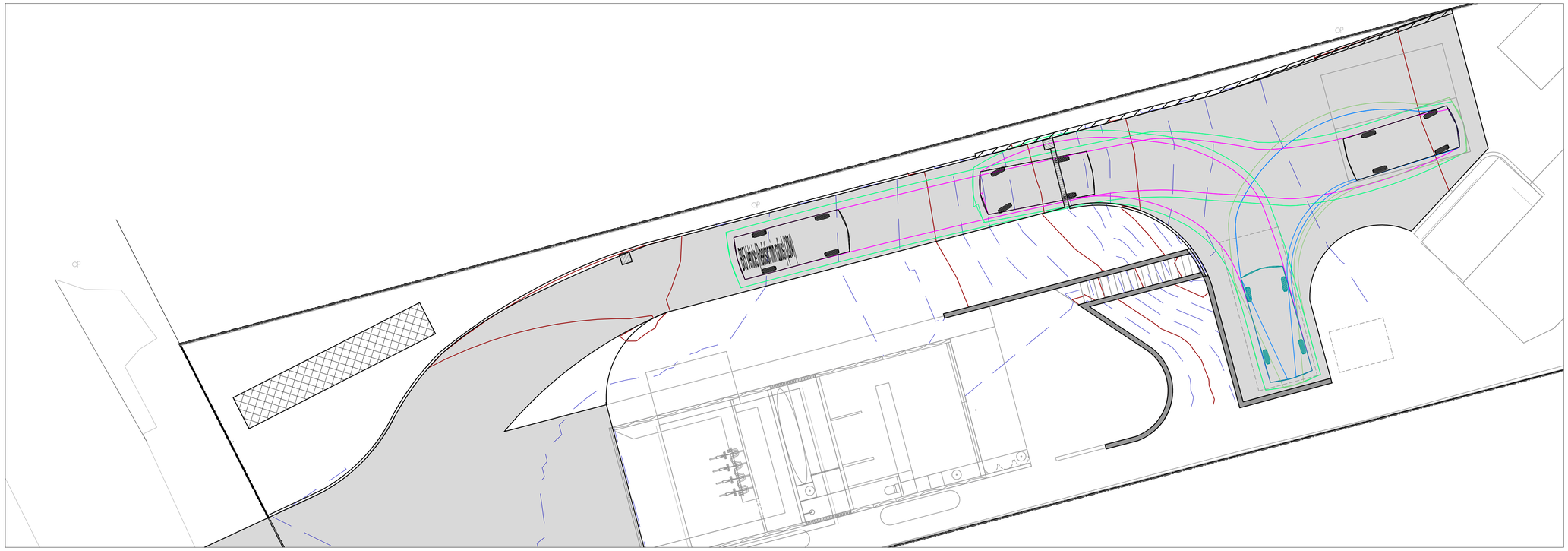
Hobart TAS 7000
03 6234 8666
mail@aldanmark.com.au
www.aldanmark.com.au

0 1 2 3 4 5 6 7 8 9 10m

PROJECT:	DRIVEWAY UPGRADE	ADDRESS:	58 PIPE CLAY ESPLANADE CREMORNE	SHEET:	SITE PLAN
CLIENT:	JAMES & REBECCA POLANOWSKI	SCALE:	1:100	TOTAL SHEETS: 5	SIZE: A1
		PROJECT No:	25E99-227	SHEET: C102	REV: C





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TURNPATH PLAN

SCALE 1:100 (A1)

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A	PRELIMINARY	24/03/2026	VERIFIED:	-

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0 1 2 3 4 5 6 7 8 9 10m

PROJECT:	DRIVEWAY UPGRADE	ADDRESS:	58 PIPE CLAY ESPLANADE CREMORNE	SHEET:	TURNPATH PLAN
CLIENT:	JAMES & REBECCA POLANOWSKI	SCALE:	1:100	TOTAL SHEETS: 6	SIZE: A1
		PROJECT No:	25E99-227	SHEET: C105	REV: C

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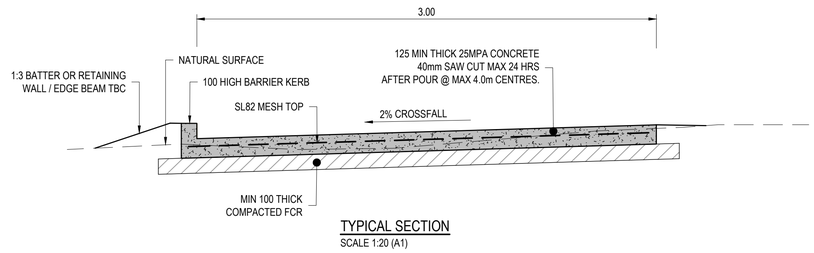
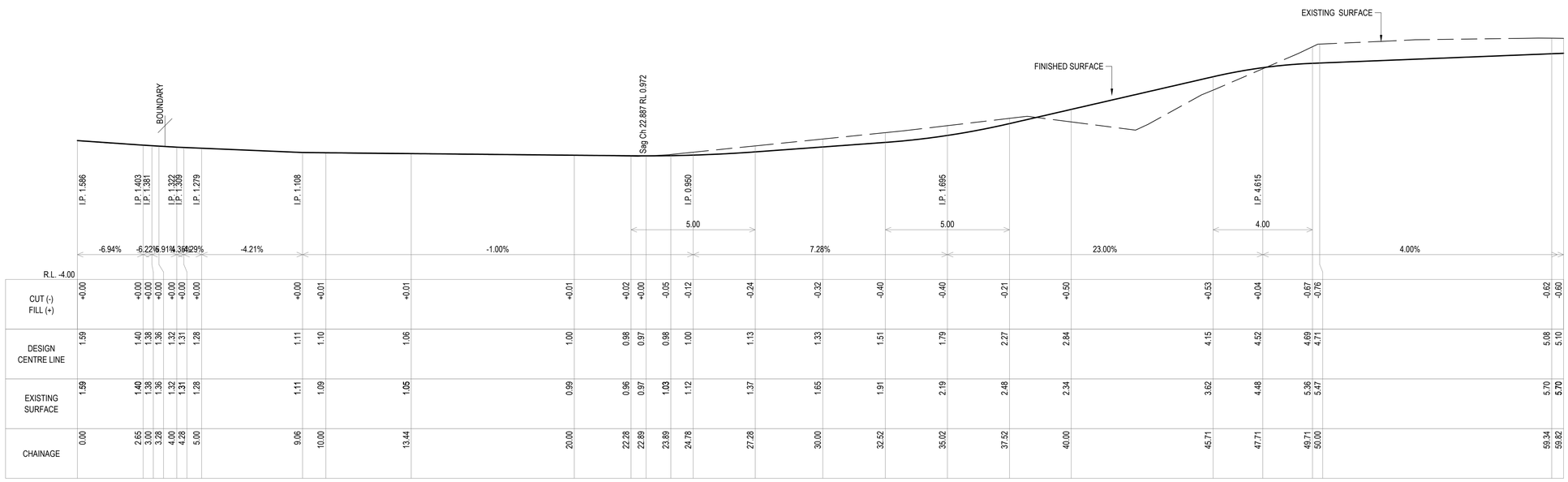


TYPICAL SECTION
SCALE 1:20 (A1)



From 0.000m To 59.816m Scales: H 1:100 V 1:100

DRIVEWAY CENTRELINE

DRIVEWAY LONGITUDINAL SECTION

AS INDICATED

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PROJECT: DRIVEWAY UPGRADE

0 1 2 3 4 5m
H1:100
V1:100

ADDRESS: 58 PIPE CLAY ESPLANADE
CREMORNE

CLIENT: JAMES & REBECCA POLANOWSKI

SHEET: DRIVEWAY LONGITUDINAL SECTION

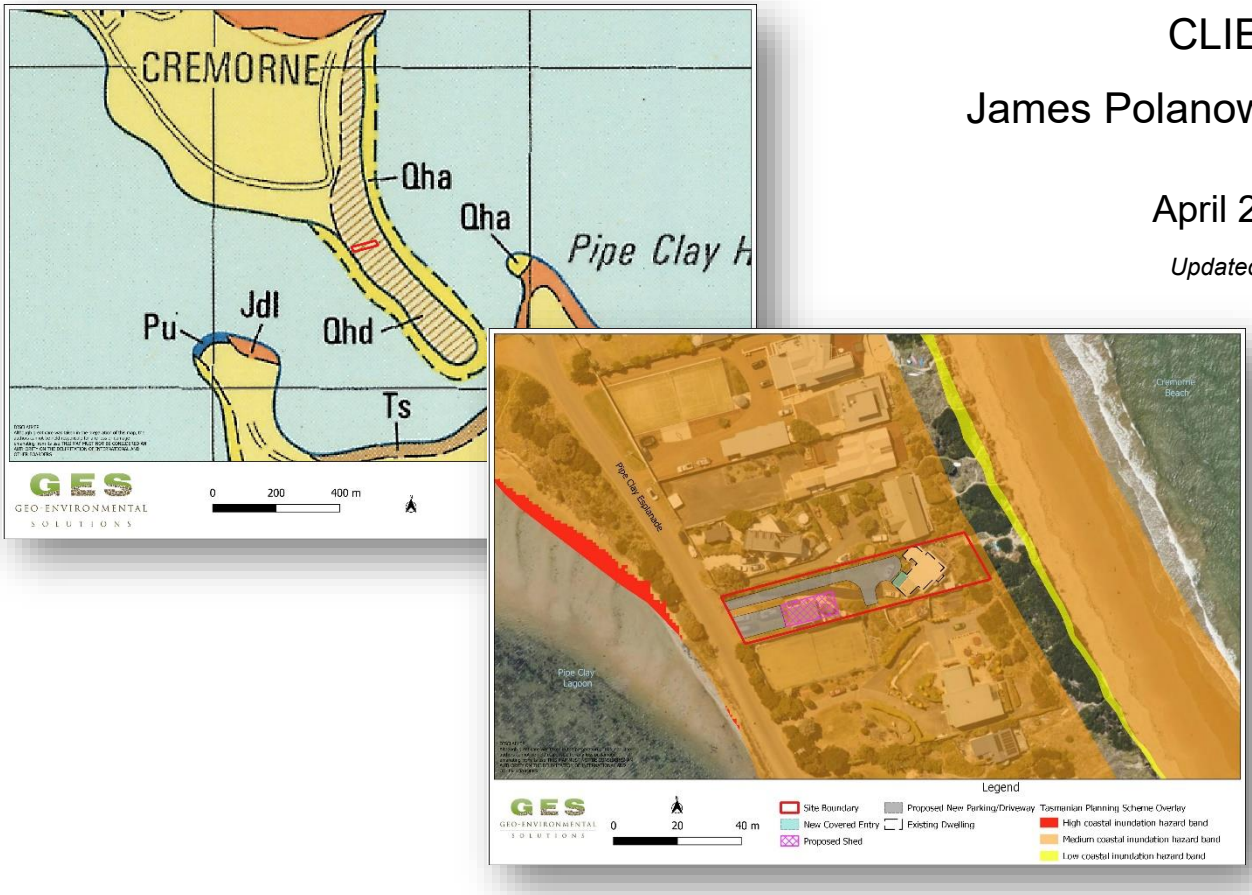
SCALE: AS INDICATED | TOTAL SHEETS: 5 | SIZE: A1

PROJECT No: 25E99-227 | SHEET: C201 | REV: C

GEO-ENVIRONMENTAL SOLUTIONS

COASTAL VULNERABILITY ASSESSMENT

58 Pipe Clay Esplanade, Cremorne



CLIENT

James Polanowski

April 2022

Updated:2026

Geo-Environmental Solutions P/L 29 Kirksway Place Battery Point 7004. Ph 6223 1839 Fax 6223 4539

Document Control

Title	Version	Date	Reviewed By
Coastal Vulnerability Assessment: 58 Pipe Clay Esplanade Cremorne	Version 1	April 2022	JP Cumming
Coastal Vulnerability Assessment: 58 Pipe Clay Esplanade Cremorne	Version 2	April 2026	V. Gupta

Tables

Figures

Executive Summary

Geo-Environmental Solutions (GES) were contracted by James Polanowski to prepare a coastal erosion and inundation hazard assessment for a proposed shed extension and driveway at Cremorne Beach. The project area consists of a single cadastral title CT 248991/1 located at 58 Pipe Clay Esplanade, with an area of approximately 1308 m^2 (The Site).

An application to conduct construction works has triggered the assessment in accordance with the Tasmanian Planning Scheme - Clarence Council (TPS) 2021.

GES have conducted a coastal hydrodynamic assessment which involved site specific modelling to further assess the site inundation risks. An erosion assessment has also been considered at the site.

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

Based on aerial photograph history, sediment budget analysis, coastal erosion and recession models, and lagoon erosion assessments, GES infer that the site is unlikely to be at unacceptable risk from coastal erosion processes based on 2100 high emissions scenarios, tidal currents, and storm erosion processes. As a result, no site modifications are deemed necessary to comply with the erosion hazard overlay.

GES have conducted site specific modelling to ascertain the inundation risks associated with the proposed new ancillary dwelling.

- Non-habitable buildings may be constructed to ground level provided there is an awareness of modelled 2100 1% AEP levels.
- If foundations are enclosed at ground level, hydrostatic forces need to be considered.
- Based on a 1% AEP scenario for 2100, solid enclosed structures built at ground level will need to allow for up to 0.8 m of hydrostatic pressure.
- Enclosed buildings with direct coastal frontage will need to consider for the following:
    - Wave runup inundation levels of up to 2.2 m AHD
    - Wave forcing estimated at 0.3 N/m; and
    - Negligible wave scour around the footings
- It is recommended a soil and water management plan is put in place.

The proposed development presents an acceptable solution to managing potential site risks provided the recommendations in this report are adhered to in building and engineering design.

List of Abbreviations

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

1 Introduction

Geo-Environmental Solutions (GES) were contracted by James Polanowski to prepare a coastal erosion and inundation hazard assessment for a proposed shed at Cremorne Beach. The project area consists of a single cadastral title CT 248991/1 located at 58 Pipe Clay Esplanade (The Site).

An application to conduct construction works has triggered the assessment in accordance with the Tasmanian Planning Scheme - Clarence Council (TPS 2021).

GES have conducted a coastal hydrodynamic assessment which involved site specific modelling to further assess the site inundation risks. An erosion assessment has also been considered at the site.

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

2 Objectives

The objective of the site investigation is to:

- Identify which codes need to be addressed in terms of coastal vulnerability and identify the relevant performance criteria relevant to the project which need addressing;
- Conduct a literature review of all geological, geomorphologic, hydrodynamic information and any 'First or Second Pass Assessments' which are relevant to the site;
- Conduct an inundation and hydrodynamic assessment to determine projected sea level rise, storm tides and site-specific hydrodynamic conditions and where applicable, GES's site-specific soil investigation findings;
- Use historical aerial imagery to projected storm erosion and coastline recession based on the design life of the proposed structure.
- Conduct a site risk assessment for the proposed development ensuring relevant performance criteria are addressed; and
- Where applicable, provide recommendations on methods and design approach to reduce inundation and erosion impact.

3 Site Details

3.1 Project Area Land Title

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

- CT 248991/1

This parcel of land is referred to as the 'Site' and/or the 'Project Area' in this report.

3.2 Project Area Regional Coastal Setting

The Project Area is located at Cremorne on Tasmania's South-East Coast approximately 28 km by road (20 km directly to the southeast) from Hobart (Figure 1). The site is near beachfront property, and is located behind and to the west of the foredunes of Cremorne Beach (Figure 2). Cremorne Beach opens up into Fredrick Henry Bay to the east, which in turn opens up to Storm Bay and the Southern Ocean where ocean swell is generated. Cremorne Beach is bounded by Pipe Clay Head 650 m to the south and the foothills of Calvert's Hill, 300 m to the north. The southern half of Cremorne Beach comprises a spit which is protected from swell by Pipe Clay Head. Pipe Clay Head also forms the southern flanks of the channel entrance to the tide dominated Pipe Clay Lagoon.

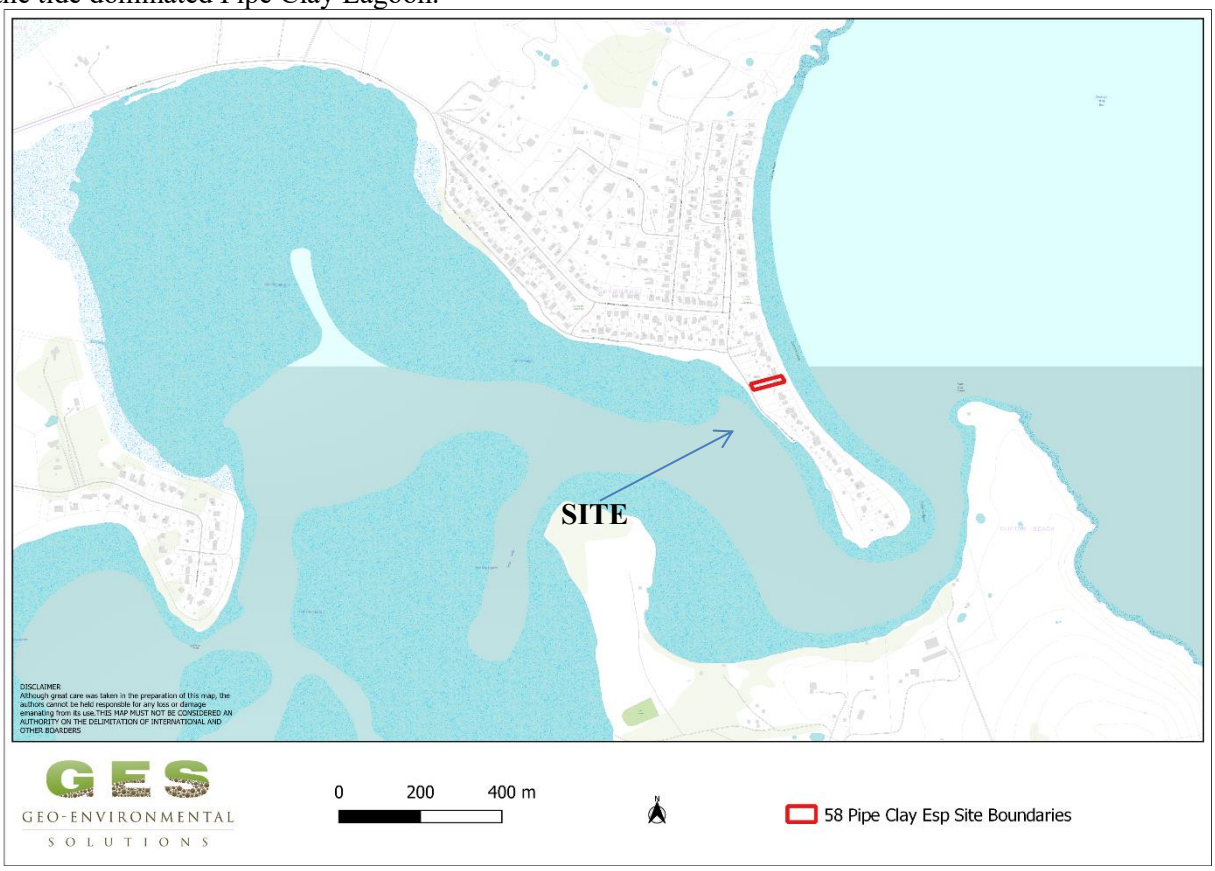


Figure 1 Regional Location of Project Area - The Land and Information System, Tasmania (LIST)

3.3 Project Area Local Setting

The site is setback approximately 16 m from the 0 m AHD water mark on the west side of the site. The Pipe Clay Esplanade to the south-west separates Pipe Clay Lagoon from the site. There are residential properties located to the west, and east. A council-maintained road lays between the site and Pipe Clay Lagoon (Figure 2). The 2013 Greater Hobart LiDAR elevations were used in this analysis. The LiDAR model indicates that the property has an elevation of approximately 1m to 5 m AHD.

Figure 2 Site Local Setting (The LIST)

4 Planning

4.1 Australian Building Code Board

This report presents a summary of the overall building construction risk to coastal erosion and inundation processes. This assessment has been conducted a 'normal' building design life category based on a 2021 baseline (ABCB 2015).

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

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

- Building foundations subsystems are considered not accessible or economical to repair and therefore are to be designed with a 50-year life till 2071; and
- Wastewater subsystems are considered to have moderate ease of access but difficult or costly to replace or repair and are therefore to be designed with a 15-year life till 2036.

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

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

Note: Design Life (dl) in years

4.2 Tasmanian Building Regulations 2016

The Tasmanian Building Regulations are regulated by the Consumer, Building and Occupation Services (CBOS) department and are formed from the Tasmanian Building Act 2016. New state-wide planning and building requirements are being implemented for hazardous areas. These include areas potentially subject to landslip, bushfire, flooding, coastal erosion, & costal inundation. Details of the Tasmanian Building Regulations are presented in Appendix 1.

4.2.1 Coastal Inundation Hazard Areas

According to the building regulations:

> 'A person must not perform building work on a building on land that is subject to coastal inundation unless the floor level of each habitable room of the building being erected, re-erected or added as part of the work, is at least 300 millimetres above the defined flood level for the land.'

4.2.2 Coastal Erosion Hazard Areas

According to the building regulations:

> 'If a person intends to perform work in an investigation area of a coastal erosion hazard area, the person must, before performing the work, ensure that the land is classified in accordance with the coastal erosion determination –
>
> a. as being an acceptable risk; or
> b. into a hazard band for the coastal erosion hazard area.'

4.3 Tasmania Planning Scheme Overlays – Clarence Council

4.3.1 Waterways & Coastal Protection Areas (WCPA) Overlay

The west and east parts of the site fall within of the Waterways & Coastal Protection Areas (WCPA) overlay (Figure 3).

Figure 3 WCPA Overlay near the Site (The LIST)

4.3.2 Inundation Prone Areas Code (IPAC) Overlay

The entire site falls within the Coastal Inundation Medium Hazard Code (CIHC) overlay (Figure 4).

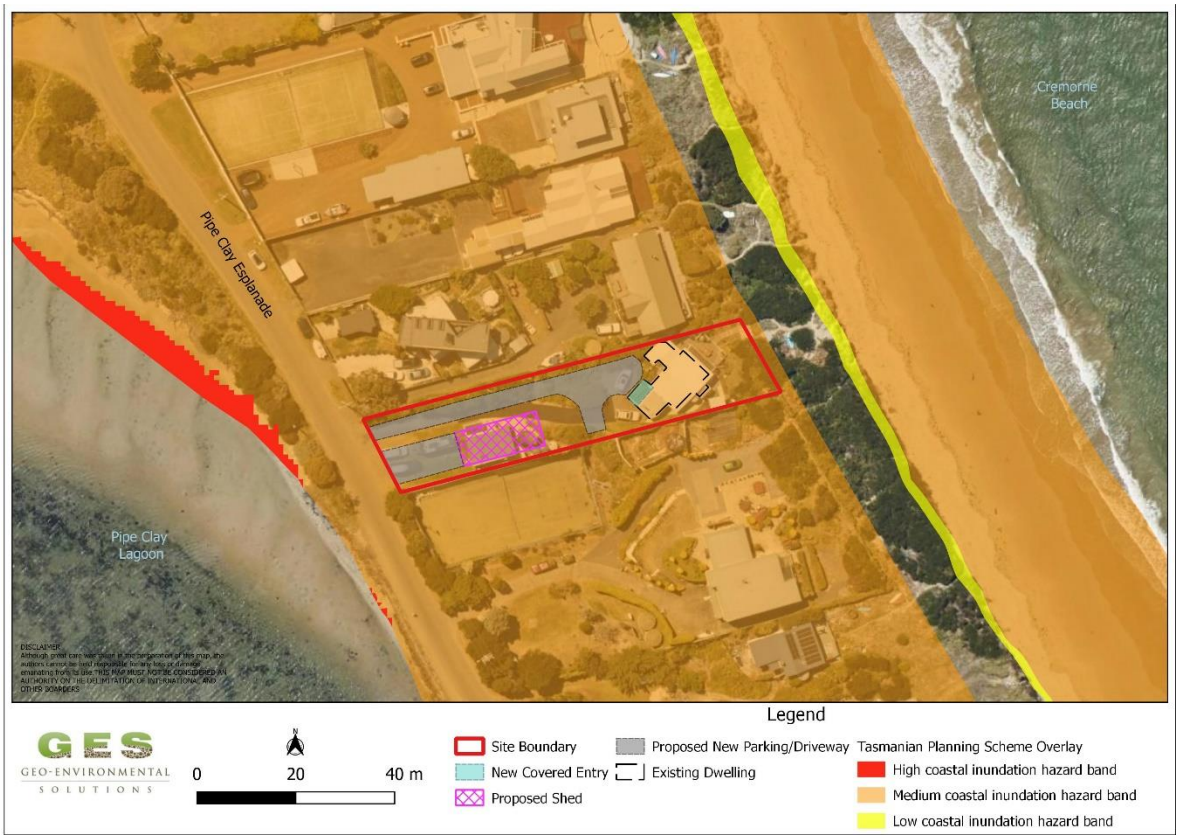


Figure 4 CIHC Overlay

4.3.3 Coastal Erosion Hazards Code (CEHC) Overlay

The proposed works falls within the Low Coastal Erosion Hazards Code (CEHC) overlay (Figure 5). The small part of the west side of the site falls in High Erosion Hazard Overlay

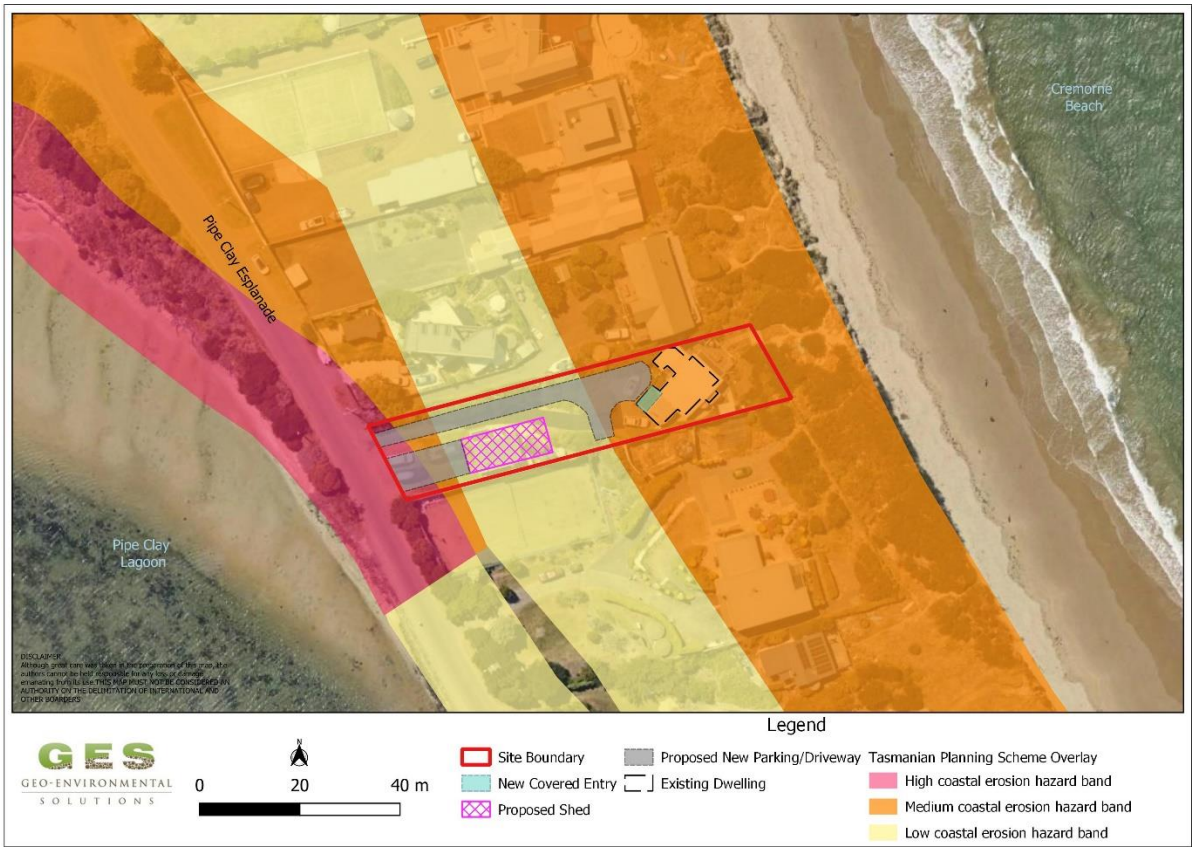


Figure 5 CEHC Overlays

4.4 Proposed Development

Currently, the site is occupied by an existing residential dwelling on the eastern side and a shed on the western side (Figure 6). The proposed works involve an extension to the existing shed. Access to the site is via Pipe Clay Esplanade, through a bitumen driveway located near the northern boundary. A new driveway is proposed along the northern boundary, extending around the existing dwelling to a new parking area adjacent to the proposed shed.

The plans for proposed works have been provided to GES from the RAD (Dated 14/01/2026). The plans are presented in Figure 6.

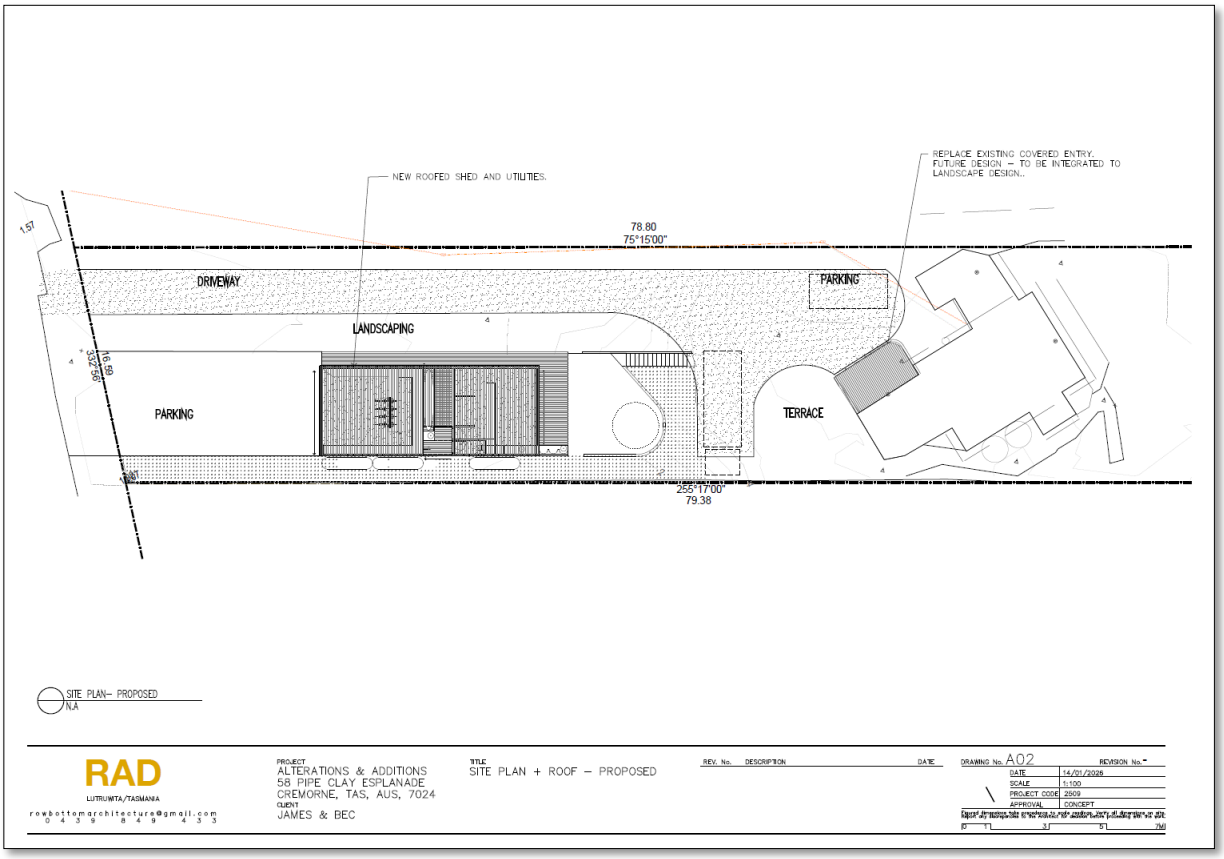


Figure 6 Proposed Site Development

4.5 Acceptable Solutions

Where applicable, the need for further performance criteria compliance is outlined in Appendix 2.

4.5.1 Waterways and Coastal Protection Overlay (WCPA)

C7.6.1 P1.1 Building and Works

As the proposed building and works is within a WCPC overlay area under this planning scheme, and there are no acceptable solutions for the buildings and works in a WCPA Area, the C7.6.1 P.1.1 performance criteria will need to be addressed.

4.5.2 Inundation Prone Areas Code (CIHC)

C11.6.1. Buildings and works

Given that the entire site resides in the TPS overlay, and there are no acceptable solutions for buildings and works in a CIHC Area, the C11.6.1 performance criteria will need to be addressed.

The following performance criteria need to be addressed:

Provided all C11.6.1 P1 performance solutions can be adequately addressed, a proposed building may be built provided the finished floor level is at or above an elevation of 2.5 m AHD and/or the risk is acceptable.

4.5.3 Coastal Erosion Hazards Code (CEHC)

C10.6.1 Buildings and works

The proposed ancillary development fall within the TPS overlay and there are no acceptable solutions for buildings and works in a CEHC Area., the C10.6.1 P1.1 and P1.2 performance criteria will need to be addressed.

4.6 Performance Criteria

The following performance criteria are to be addressed through a risk assessment:

- *C7.6.1 P1.1*
- *C11.6.1 P1.1*
- *C10.6.1 P1.1*

5 Site Physical Setting

5.1 NRM South Mapping

Foreshore natural resource values relevant to the site are presented in Table 1 (Appendix 3).

Table 1 NRM South Natural Values Assessment

Feature	Description
Segment ID	18343
Coastal Vulnerability Mapping	Re-entrant sandy shore backed by low-lying sandy plain Sandy beach or shoreline - fine to med grainsize Intertidal or shallow subtidal sand flats
Backshore Type	Sediment flats, unconsolidated or unlithified
Conservation Significance SE Strategy	Area of sufficient significance to warrant highest level of protection
Actual Habitat Listed Significant SPP	One or more shorebird or seabird species present (contact Birds Tasmania for further detail)
Geovalue	1 (high value foreshore)
Natural Value Index	1 (high geoconservation priority)

5.2 Site Geology

To assist in determination of the vulnerability of the site to erosion from coastal processes, the geological and geomorphological characteristics of the site, Cremorne Beach spit and Pipe Clay Lagoon have been assessed. Geological mapping of surface geology is available from Mineral Resources Tasmania Hobart Engineering Geology 1:50,000 Series Sheet 8412 S (Figure 7). According the MRT mapping, the site is underlain by windblown sand sheet deposits and/or stable or mobile dunes sands. The underlying basement geology comprises gentle west dipping Permian sedimentary rocks which are exposed to the west of Pipe Clay Lagoon. It is apparent that a dolerite sill has intruded within the Permian basement rock. The sill pinches out to the south and thickens to the north underneath the site and is exposed in the headlands to the north of Cremorne Beach. Soil boring results and sediment analysis indicate that the site is not located on a frontal dune deposit.

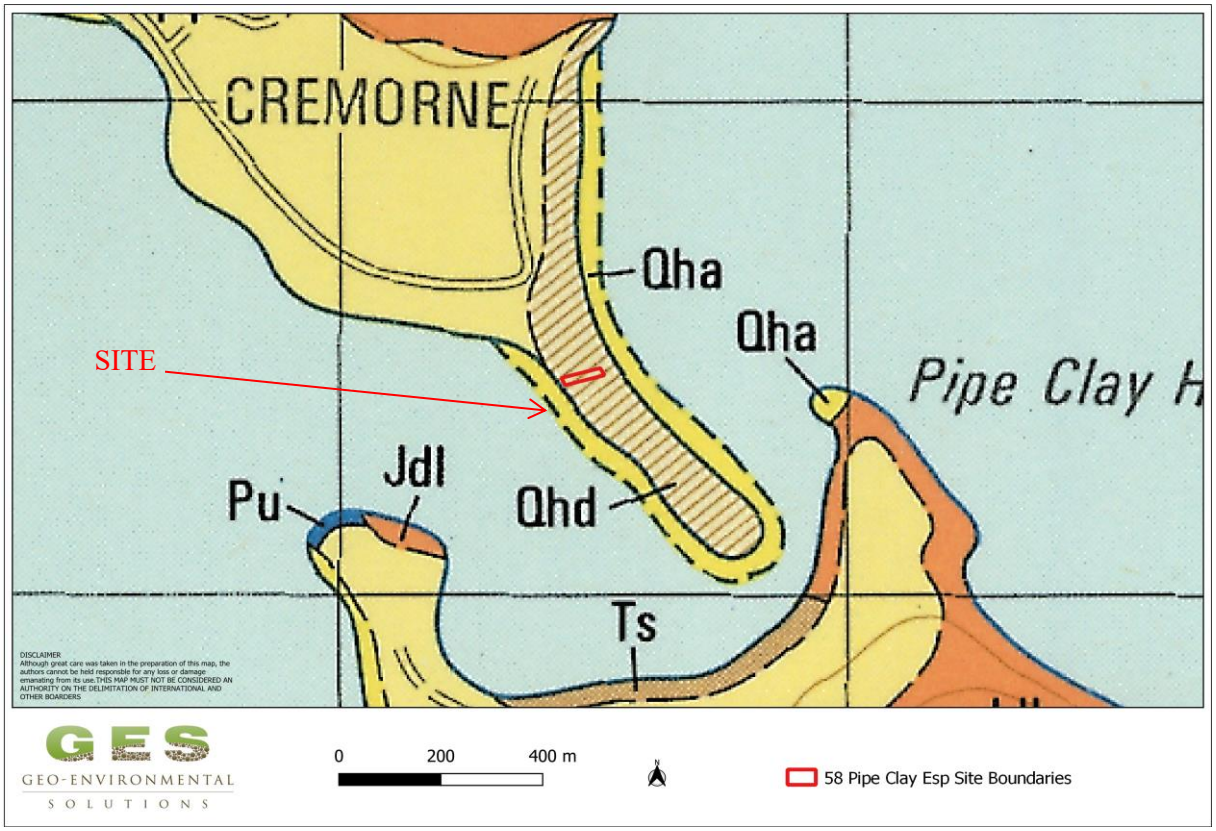


Figure 7 Geology (Mineral Resources Tasmania Hobart Engineering Geology 1:50,000 Series Sheet 8412 S)

5.3 Site Geomorphology

The site topography is detailed in Figure 8. The proposed work area is flat 1 m AHD to gently sloping up 5m AHD to the east and southeast where the existing residential dwelling located. The site is located on windblown sand deposits on the back side of the dunes associated with Cremorne Beach. Pipe Clay Esplanade at 1 m AHD elevation forms a council-maintained hardstand between the site and the lagoon. Along the shoreline is a 1.0 to 1.5 m high escarpment that is densely vegetated with low lying grass and shrub species with few large mature eucalypts. The centre of the thalweg of Pipe Clay Lagoon is located approx. 280 m to the south of the site. The shallow tidal platform of Pipe Clay Lagoon extends to approx. 240 m south of the proposed development.

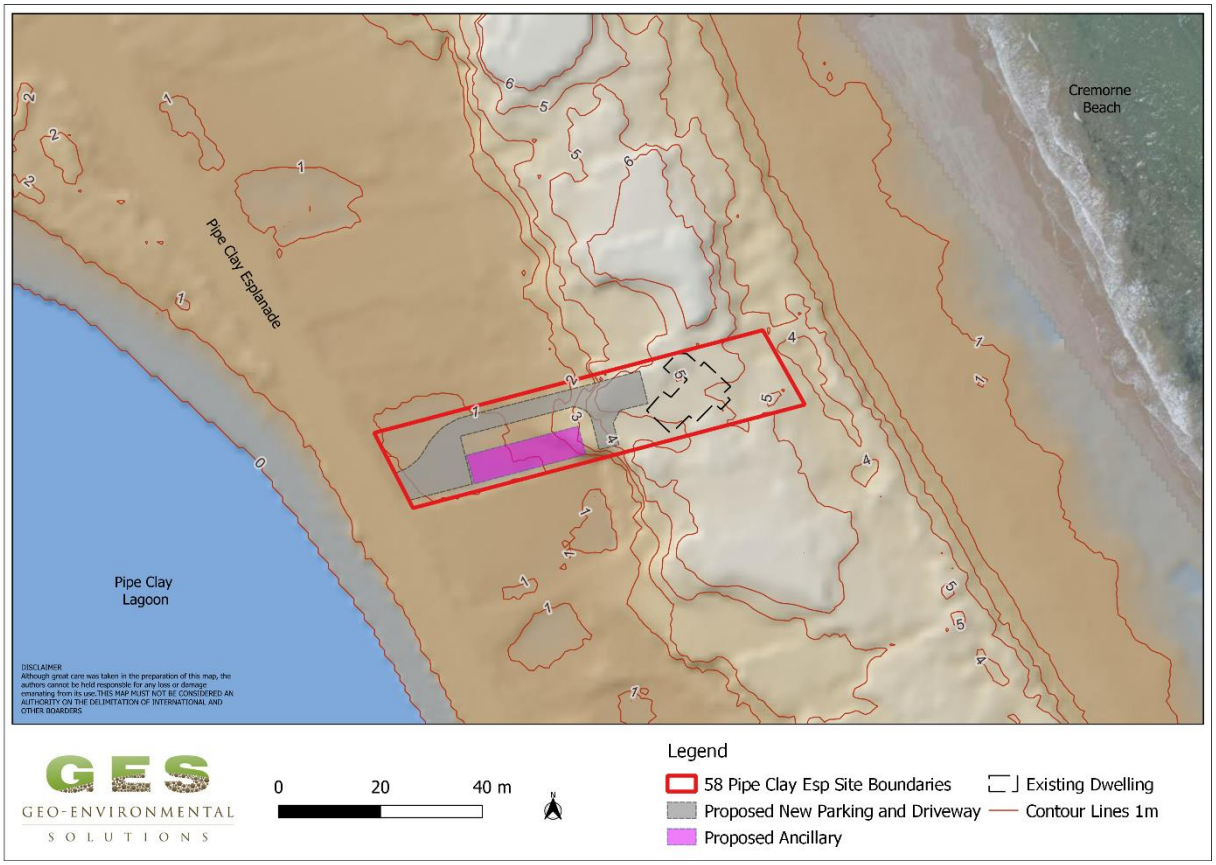


Figure 8 Site Topography

5.4 Summary

The following can be summarised from the physical site assessment:

- The site comprises of sandy sediments which are vulnerable to erosion.
- The site itself is vegetation stabilised and is not considered to be actively eroding.
- The shoreline escarpment, road and potentially the site is not considered to be vulnerable to storm tide erosion and recession; and
- As Pipe Clay Esplanade is a council-maintained asset, it is fair to assume protection works would be implemented should significant erosion occur.

6 Hydrodynamic Assessment

6.1 Previous Studies

Carley et. al. (2008) conducted detailed hydrodynamic modelling for Frederick Henry Bay coastline. GES have conducted an assessment for Pipe Clay Lagoon to determine likely sediment budgets.

6.2 Scope of Works

GES have conducted a site-specific hydrodynamic assessment. The following assessment scope of works has been adopted for the site:

- Drawing on localised 1% AEP information made available in the TPS (2021) to understand site still water levels for year 2050 and 2100 and where applicable translate these to time frames to be more relevant to the design life of the proposed site works;
- Use extreme inundation levels and bathymetry to develop a comprehensive site-specific wave model for the site based on methods outlined in the Shoreline Protection Manual SPM (1984) and the Coastal Engineering Model (CEM 2008) which will provide site specific information on actual inundation levels and site erosion potential;

- To identify short term hydrodynamics based on site specific 1% Annual Exceedance Probability (AEP) astronomical tide, barometric low (storm), wave runup, wave setup and wind setup (where applicable) conditions; and
- Assess how changing hydrodynamic conditions including water currents at the site will impact on the proposed development with implications for site stability and flooding for a given period.

6.3 Site Hydrodynamics

Coastal process hydrodynamics were assessed at the site. Information collected is used to assist in interpreting site specific:

- Maximum site inundation levels for a given time period and 1% AEP event;
- Effects of storm inundation levels on site erosion; and
- Longer term recession trends.

Without consideration of site hydrodynamic wave models, these potential hazards cannot be addressed. Depending on the planning requirements and the level of site risk, this information may or may not have been utilised in the site inundation and/or erosion model. It is recognised however, that a site-specific coastal processes study is imperative in any coastal vulnerability assessment which seeks to identify the potential hazards and potential risks to assets and life.

6.3.1 Methods

Some of the information obtained for the models is extracted directly from the IPS (2015) inundation level tables. Other information has been collected from historical models such as Simulating Waves Nearshore (SWAN) significant offshore swell wave height models (Carley *et. al.* 2008). The wind fetch wave model has been developed based on the CEM (2008) and SPM (1984) formulations which interpret site bathymetry, topography and wind speeds (Appendix 5).

Hydrodynamic risks are measured in terms of 1% AEP events. Site specific processes considered in this section include but are not limited to the following:

- Wave runup;
- Wave setup; and
- Wind setup.

A 300 mm freeboard value has been adopted by the PPS (2021) to account to for the Tasmanian Building Act 2000 regulations. Site hydrodynamic factors are included within this 300 mm freeboard zone which essentially defines any hydrodynamic inundation processes which are above the adopted still water levels. The 300 mm value will tend to overestimate inundation levels at some sites and underestimate inundation levels at other sites.

Given that hydrodynamic processes are largely site specific, GES develop hydrodynamic models for the specific sites of interest which are based on the following information:

- Tasmanian Aquaculture and Fisheries Information (TAFI) bathymetry data,
- Formulations in the CEM (2008), the SPM (1984) and;
- Local wind conditions (AS/NZS 1170.2:2011).

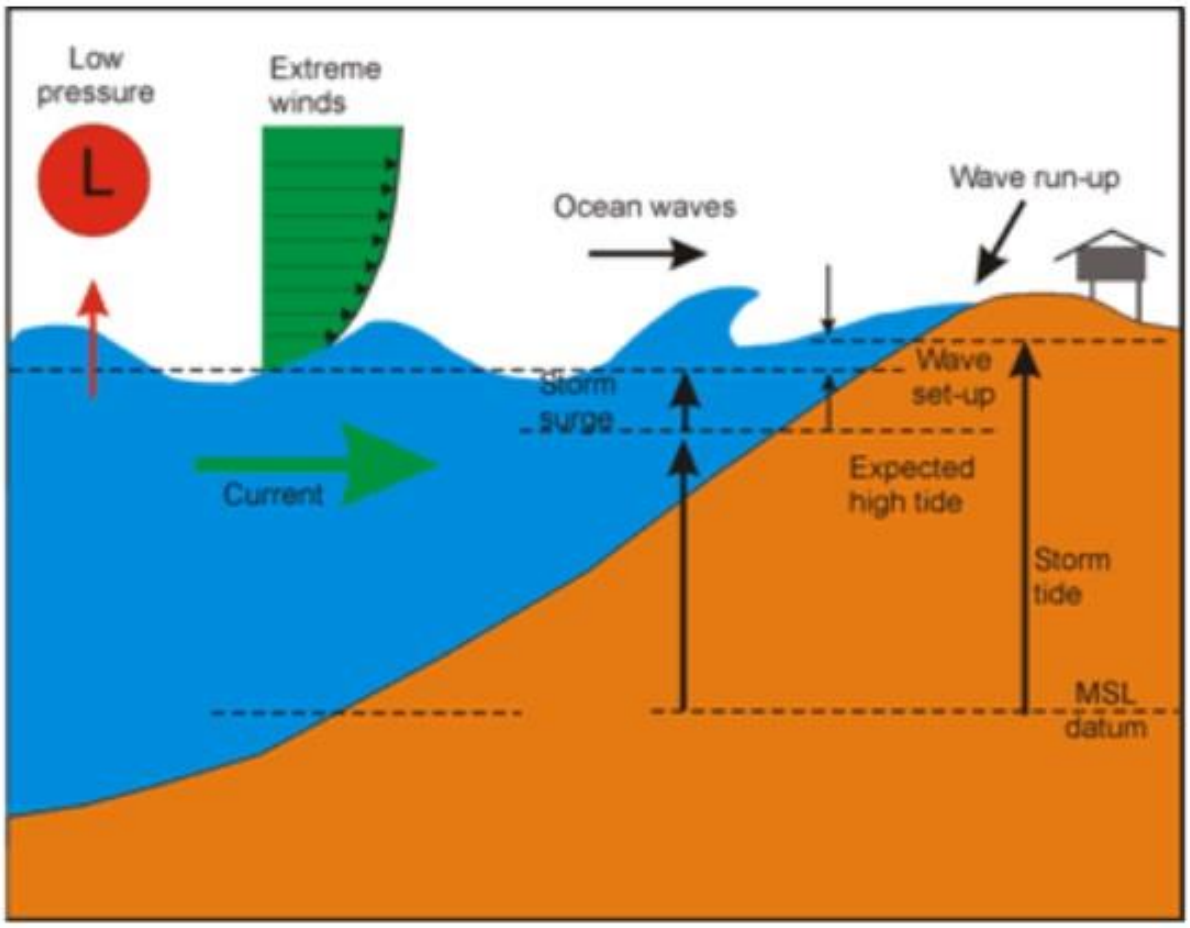


Figure 9 Hydrodynamic Parameters Associated with Storm Surge Events

As wind setup, wave setup and wave runup normally occur simultaneously during storm surge events, these components are combined with extreme tide and storm surge predictions to provide maximum inundation levels for the site. Wave models have been generated for the site to define the site-specific hazards.

6.3.2 Storm Tide

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

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The storm tide level adopted for the site is 1.24 m AHD

6.3.3 Sea Level Rise

Conservatively, the effects of storm tide inundation of the lagoon system will be assumed to be approximately the same as the storm tide levels at the lagoon entrance. The TPS (2021) has adopted the following sea level rise estimates based DPAC projections with reference to a 2010 baseline:

- 0.2 m rise by 2050; and
- 0.8 m rise by 2100.

6.4 Bathymetry and Fetch

Bathymetry depths have been determined based on ARI 100 extreme tide and barometric lows as well as maximum sea level rise predictions for 2100 (where they affect bathymetry). Consideration is also given to the erosion of the lagoon which has been factored into the fetch and bathymetry interpretation. The model

takes into account for retention of the headland in Pipe Clay Lagoon to the south of Cremorne township. If the headland next to Bens Gutter (Bens Gutter Headland) does erode, much larger waves will impact the inside of the spit as a result of wind fetch increasing from 0.7 km to 3.2 km given SSW winds. Bathymetry and fetch were determined for the lagoon based on these water levels and taking into account for inferred erosion. 9 separate radials were generated for each of the 8 dominant wind directions Figure 10 presents inferred worst case scenario inundation levels based on 2100 high emissions sea levels and storm tide and radials used to determine localise wave conditions. Figure 10 presents inferred worst case scenario inundation levels based on 2100 high emissions sea levels and storm tide and radials used to determine localise wave conditions

Each radial was separated by 5 degrees giving a total of 45 degrees for each wind direction. The average bathymetry depth and fetch was determined for each set of radials to come up with averages for each wind direction (Table 2).

Table 2 Summary of 0 m AHD bathymetry and fetch parameters applicable to study site

Direction	S	SW	W
Fetch (km)	0.4	1.0	1.1
Bathymetry Depth (m)	3.4	3.8	3.8

.

Figure 10 Inferred inundation levels based on 2100 high emissions sea levels and storm tide

3.1.1 *Wind Waves*

The design for determining wind waves is based on 60 second gust speeds for terrain category 2 (AS 1170.2:2002) from a height of 10 m requires no additional adjustment for wind speed (Table 3).

Table 3 Design parameters used in wind wave calculations

Parameter	Design
Terrain Category:	Terrain Cat 2
Terrain Height:	10m
Adobted Mz, cat Multiplier	1.00
V ARI	100
Region	A
Vr (m/s)	41
Wind Duration Factor	V60s
Wind Duration Multiplier	0.60

The region A wind velocities have been applied based on a 1 in 100 ARI resulting in a Vr of 41 m/s. A V60s wind duration factor has been applied, resulting in a wind duration multiplier of 0.60 which have been applied to Equations 3-39, and 3-40 from the SPM 1984. Directional multipliers from AS 1170.2:2002 have been applied to determine wave height and period generated for each main wind direction. Resulting wave period and wave heights are presented in Table 6. Based on the below results, significant 1/100 ARI wind waves generated at the site originates from the west with a wave height of 0.5 m and wave period of 2.0 seconds

Table 4 Summary of calculated wave height and wave period for each main wind direction based on the spit integrity scenario (calculated from high 2100 SWL)

Wind Direction	S	SW	W
Wind Fetch (km)	0.4	1.0	1.1
Average Bathymetry Depth (m)	3.4	3.8	3.8
Direction Multiplier	0.8	0.9	0.9
Wave Height (m)	0.3	0.5	0.5
Wave Period (s)	1.3	1.8	2.0

6.4.1 Wind Setup

Wind setup has been determined for the site based on methods outlined in Dean and Dalrymple (1991). The particular method selected is based the closed water body procedure, which is most applicable for the site based on the geometry of the coastline. Wind, fetch, bathymetry and coastline geometry were used to discern the wind direction which delivers the largest wind setup for the site which is determined to be from the west.

The adopted wind setup for the site is approximatley 0.06 m for 2100

6.4.2 Nearshore Hydrodynamics

Wave energy dissipates at the breaker zone and shore face resulting in a signature beach profile representative of hydrodynamic conditions and sediment characteristics. The nearshore profile is expected to be largely influenced by how tidal currents within the lagoon are influencing nearshore zone. Due to anthropogenic influences, near shore hydrodynamic conditions are expected to be largely altered within the Pipe Clay Lagoon environment. A more detailed assessment of tidal flow hydrodynamics is assessed in a later section of this report

3.1.2 Breaking Wave Details

Breaker zone wave transformation calculations have been applied to the site based on procedures detailed in Dean & Darymple (1991). The dominant south to westerly driven wind waves will approach towards the site at the angle indicated in Table 7. Based on interpretation of projected local bathymetry given the 2100 high emissions sea levels, the nearshore zones are inferred to have a gradient of approximately 2.0 %. The largest modelled wave height to intercept the beach forms as a result of wind waves generated from the south-west. In the event that Bens Gutter Spit to the south is to erode, larger breaker heights from the southwest are expected.

Table 5 Details of primary 1 in 100 ARI significant wave used to model extreme wave conditions at the site

Dominant Wave Direction	W	SW	S
Wave Type	2.0	2.0	2.0
Nearshore gradient (%)	0.5	0.5	0.3
Breaker Depth (m)	0.4	0.4	0.3
Angle of Breaker to Shoreline (degrees)	27	0	31
Surf Similarity Parameter	0.17	0.18	0.24

Based on the surf similarity parameter, the primary wave approaching the site will break by spilling. In spilling breakers, the wave crest becomes unstable and cascades down the shoreward face of the wave producing a foamy water surface. Spilling breakers will tend to occur for high steepness waves on gently sloping beaches.

6.4.3 Wave Setup

Wave setup has been calculated based on procedures outlined in the SPM 1984 in order to determine additional inundation heights relevant to the site. Wave setup is the superelevation of the water surface over normal tide and surge elevation due to onshore mass transport of the water by wave action alone. Parameters used in calculating wave setup include deep water wave characteristics, breaker zone depths and shore gradients.

The maximum wave setup for the site is calculated to be 0.05 m for 2072 and 0.08 m for 2100

6.4.4 Wave Runup

Wave runup is considered an additional factor to be assessed on top of the inundation factors presented above (Carley et al. 2008). Wave runup is attributed to the transformation of wave energy as a result of the landward thrusting of water up the beach face. The wave runup at the site is expected to be highly variable at the site and will depend on the steepness of the objects the waves hit, with maximum wave runup expected to be in the order of 0.3 m AHD.

6.4.5 Tidal Flow

Preliminary calculations indicate that the full effect of tidal flow will be in the order of 0.2 m per second between Bens Gutter Headland and the neighbouring headland in the lagoon given a 1.44 m tidal event. This flow rate does not take into account for variations in water velocity between the channel and the shallow water areas where landward obstructions buffer the full flow potential. The following flow rates for Cremorne township areas are interpreted from the results:

- ~ 0.02 m/s for 0 to 1 m water depths
- ~ 0.1 m/s for 1 to 2 m water depths
- ~0.2 m/s for 2 to 3 m water depths

Considerably faster flow rates are anticipated for the channel areas, these flow rates indicated above are considered reasonable estimates, particularly given the obstructions expected in these inhabited areas. Channel flow areas in this case are inferred on the southern side of Pipe Clay Esplanade where the road embankment is expected to retain the majority of the flow. Figure 11 presents a worst case scenario for a 1 in 100 year ARI storm given 2100 high emissions scenario.

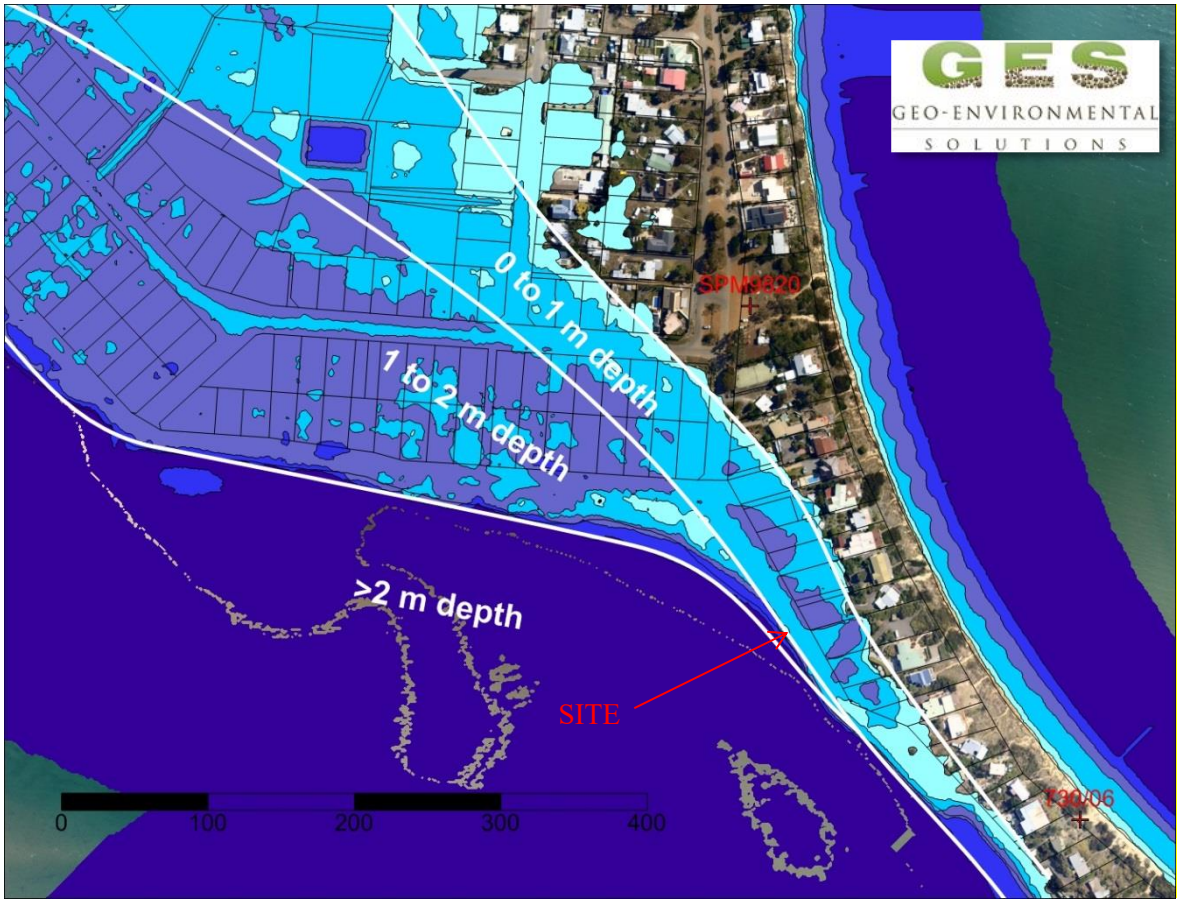

Figure 11 Depth of Flood Waters Given an Extreme 1 in 100 ARI Storm and 2100 High Seas Event

The area where the proposed development is located is within the 0 to 1 m floodwater zone where water velocities of up to 0.02 m/s are expected. The floodwater encroachment and retreat is expected to be gradual and have impact on the proposed ancillary development in the 0 to 1 m depth areas. The proposed extension deck area will be elevated at the rear of the property and is not expected to hinder the floodwater advance. The main issue would be the garage area of the ancillary dwelling which has the proposed finished floor level at 1.33m at this stage. As floor levels of the proposed habitable ancillary building are to be greater than 2.8 m AHD (approx. 4.6m AHD), the proposed development is expected be greater than 0.3 m above the maximum flood levels for 2100 given the 1 in 100 year ARI storm event. The proposed garage and storage area (non habitable) is at an elevation of approximately 1.3m and would be inundated to a depth of over 1m in a 2100 1:100 year event under high emission scenario modelling. Thought must be given to design and construction methods to enable structural integrity for any future flooding in the lower garage level.

6.5 Site Inundation Levels

Table 6 presents a summary of the site inundation levels based on 1% AEP still water, wind setup where applicable, wave runup and wave setup inundation levels for 2100 building design life scenarios.

Table 6 Site Coastal Inundation Levels by 2100 (1% AEP Scenario)

	2100
Sea Level Rise (m)	0.8
Tidal influence & Barometric Low Influence (m)	1.24
Wave Setup (m)	0.08
Wind Setup (m)	0.06
Summary (m AHD)	**2.18**

7 Erosion Assessment

7.1 Aerial Photography Recession Assessment

The coastline positions from nineteen (19) separate historical aerial images dating back to 2007. The coastline position near the site were plotted against projected 2050 and 2100 sea levels based on a 2010 baseline specific for Clarence City Council region as presented in DPAC (2016).

Photography and shoreline positions were obtained for the project area based on the following aerial photography:1948, 1957, 2011, 2012 & 2016.

Assessment of the imagery was undertaken by orthorectifying the 1948 and 1957 aerial photo to a precision of approximately 1 m. The Nearmaps imagery has been modified to a precision of 1 m. The vegetation line has been compared between 1948, 1957, 2011 & 2012 photographic events (Figure 12, Figure 13 & Figure 14). Where the vegetation line is less clear cut, more bias has been drawn towards greater recession over the time period rather than less. Where the vegetation line is irregular (indicating tendency towards progradation) and less clearly defined, the boundary lines have been drawn with a tendency towards less progradation than more.

7.1.1 1948 to 1957

Figure 12 presents a 1948 aerial photograph of the coastline which shows recession (red) and progradation (green) trends between 1948 and 1957. Erosion is expected to have been occurring within the lagoon prior to the onset of any major sea level rise. This may be demonstrated in the erosion of the northern banks of the lagoon system. Leading up to 1957, north Cremorne Beach may have been prograding possibly because of an extended period without any major storm events. It is known that a relatively large storm and high seas event occurred between these dates but there is little evidence of this impact. The lack of any distinctive erosion on Cremorne Beach may indicate that the storm was generated from strong easterly winds which have hit Cremorne Beach directly with limited erosion impact. The eastern parts of the spit are prograding as is the western tip of the spit.

Figure 12 Orthorectified 1948 aerial photograph showing 1948 to 1957 erosion (red) and progradation (green) trends

7.1.2 1957 to 2011

There is considerable sediment accumulation in sections of the spit on the eastern side and well as along the central part of the spit between the swash bar and the terminal lobe (Figure 13). Accumulation of sand along these sections is likely to be attributed to an oversupply of sediment within the lagoon which is deposited across the swash platform. The influence of wave action in combination with the ebb tide Coriolis is expected to deliver sediment onto the beach as wind action further enforces its placement along the foreshore banks. The entrance to the lagoon is expected to widen in response to an increasing tidal prism due to sea level rise.

Figure 13 Orthorectified 2011 aerial photograph showing 1957 to 2011 erosion (red) and progradation (green) trends

7.1.3 2011 to 2012

Figure 14 demonstrates the response of Cremorne Beach to the large storm event which occurred in the winter of 2011. The storm had a relatively large impact on parts of the coastline which are vulnerable to a strong southerly generated swell. The swell did not combine with a significantly large tidal event, and therefore the impact is less discernible in the Pipe Clay Lagoon tidal environment.

As detailed in Section 11.5.5, there are minor effects of littoral drift on Cremorne Beach. Much of the erosion indicated in Figure 10 may be demonstrated in the way that wave action will transport sediments both southward along the swash platform towards the lagoon entrance and marginally northward where it is transported to the north away from Cremorne Beach. The southward directed sediments are anticipated to have been redistributed by the:

- Ebb tide current:
  - eastwards towards and beyond the marginal bar and into the deeper nearshore zone
  - northwards towards and beyond the terminal lobe
- Flood tide current:
  - westwards towards and beyond the flood tile delta

It is expected that in Figure 14, the localised lack of storm erosion around the terminal lobe is attributed to the supply of sediments from Pipe Clay Lagoon which have met the storm erosion demand.

Figure 14 Orthorectified 2011 aerial photograph showing 2011to 2012 erosion (red) and progradation (green) trends

7.1.4 2012 to 2016

Areas of shoreline erosion and accretion are not illustrated in Figure 15 as there has been very little chance in the shoreline between 2012 and 2016. The most discernible difference between the images is the growth of the wind wave swash platform on the northern side of the lagoon. It is difficult to determine the source of the sand, however the process which is allowing the accumulation is causes by flood tide deposition which is effectively expanding the lagoon terminal lobe. The norther side of the lagoon appears to be deepening as expected which may be supplying sediment.

Figure 15 Orthorectified Aerial Photograph from 2016 (The LIST)

7.2 Site Erosion Vulnerability

There is no evidence of coastline recession near the site. Between 1957 and 2011, the shoreline near the site has witnessed progradation (i.e. grown) in the supratidal zone, and a channel has formed within the subtidal zone.

Scour near the site is likely to cease given the presence of hard substrate at the base of the escarpment beside Pipe Clay Esplanade. **Based upon the historical evidence it is considered unlikely the shoreline at the site will experience erosion that may affect the site, or the site access**. As such, a recession model is not considered necessary for the site.

7.3 Sediment Budgets

A model has been established to account for the recent evolution of Pipe Clay Lagoon in order to understand erosion hazards which may impact the availability of sand on Cremorne Beach. The following conclusions can be drawn about Pipe Clay Lagoon:

- Pipe Clay Lagoon is determined to have been in a steady state process of expansion over the more recent Holocene period through silt and sand erosion processes;
- The lagoon is likely to be relatively young, and as a result there is ample sediment supply which has been gradually eroding and feeding the ebb tide delta on the southern end of Cremorne Beach;

- There is evidence that sand is being deposited near the site since 1957 with an overall progradation trend apparent; and
- The oyster farms are beneficial in the sense that they are buffering the rates of erosion particularly on the northern shores but are also trapping sediment which may have ordinarily been distributed to the ebb tide delta. GES do not believe that the oyster farming will cause any significant impact to the lagoon sediment budgets.

7.4 Storm Erosion Demand

Based on available information and the visible progradation of the wave wash platform at the site, there is a low risk that storm events will have any significant impact on the proposed development.

7.5 Stable Foundation Zone

It is determined that any proposed development at the site will remain in the stable foundation zone given the unlikely 10 m of coastal recession by 2100.

7.6 Summary

The following can be concluded from the coastal erosion assessment:

- A regional sediment budget analysis has been conducted for Pipe Clay Lagoon. **There is no erosion trend evident at the site in historical aerial photographs dating back to 1948**.
- The extent of further sea level rise induced recession and storm erosion is dependent on the resilience of the foreshore structures (namely Pile Clay Esplanade) and sediment accumulation near the site.
- The proposed extensions at the site will reside in the stable foundation zone based on the design life of any building structure.
- The modelling also indicates that the access to the site will not be compromised within the life of the building.

8 Risk Assessment

The qualitative risk assessment criteria have been developed to identify key risks that may arise from building works in areas that are vulnerable to erosion or inundation hazards. The risk assessment is based on 2072 projected life of the building.

The criteria are based on a risk assessment matrix consistent with Australian Standard AS4360 on Risk Management (AS4360). The qualitative assessment of risk severity and likelihood (Appendix 6) were used to help provide a qualitative risk assessment based upon the coastal vulnerability assessment completed for the site.

A detailed risk assessment addressing the performance criteria is presented in Appendix 7. GES has established that the level of risk is acceptable within the lifetime of the proposed development works provided all recommendations presented herein are adhered too.

9 Conclusions and Recommendations

Erosion and inundation risk at the site can be effectively managed through adequate placement of the proposed ancillary dwelling. From the investigation undertaken the following can be concluded:

- The proposed works are situated in the medium coastal inundation and low coastal erosion hazard overlays.
- The proposed works are non-habitable and, therefore, should be designed with a minimum floor level of 2.20 m AHD.
- Given the projected site water depths for worst case scenario inundation, it is determined that the flood and ebb tide flow rates will be in the order of 0.02 metres per second which is expected to have negligible impact on any proposed solid construction.
- At the site location, there has been no coastline recession observed since 1948. The shoreline in front of the site has experienced progradation with up to 10m of growth since 1948. In the unlikely event conditions in the lagoon change significantly erosion modelling has been undertaken which indicates up to 10m of recession over the life of the building which will return the beach to 1948 conditions. Erosion back to 1948 conditions will not impact the site or building stability.
- It has been established from this investigation, that the site will remain within the stable foundation zone and site access and wastewater infrastructure will not be compromised by potential erosion; and
- If foundations are enclosed at ground level, hydrostatic forces need to be considered.
- Based on a 1% AEP scenario for 2100, solid enclosed structures built at ground level will need to allow for up to 0.8 m of hydrostatic pressure.
- Enclosed buildings with direct coastal frontage will need to consider for the following:
    - Wave runup inundation levels of up to 2.2 m AHD
    - Wave forcing estimated at 0.3 N/m; and
    - Negligible wave scour around the footings
- It is recommended a soil and water management plan is put in place.

The proposed development presents an acceptable solution to managing potential site risks provided the recommendations in this report are adhered to in building and engineering design.

10 Limitations

The following limitations apply to this report:

- Wave modelling in accordance with the CEM (2008), the SPM (1984) and wind parameters from AS/NZS 1170.2:2011;
- Published SWAN swell modelling information where available;
- Published water current information;
- Navionics, TAFI, Geoscience Australia and Australia Hydrographic Service bathymetry;
- Light Detection And Ranging (LIDAR) digital elevation model is calibrated or assessed to the closest ground control point for determining relative accuracy;
- Storm surge observations where applicable
- The LIST cadastral information
- Photogrammetric modelling of historic coastal recession and/or progradation for the site was not undertaken. However, historic aerial photographs for the project area were reviewed and incorporated into a geographic information system enabling preliminary measurements of dune variations.
- The values estimated in this report provide an order of magnitude for assessing climate change impacts and in particular climate change induced sea level rise impacts. The information is based on a collation of existing information and data, with some site specific modelling for planning purposes.

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Appendix 1 TASMANIAN BUILDING REGULATIONS 2016

Division 4 - Coastal erosion

57. Coastal erosion hazard areas

1) For the purposes of the Act, land is a coastal erosion hazard area if –

    a. the land is shown on a planning scheme overlay map as being land that is within a coastal erosion hazard area; and

    b. the land –

        i. is classified as land within a hazard band of a coastal erosion hazard area; or

        ii. is shown on a planning scheme overlay map as being land in an investigation area for a coastal erosion hazard area and the land has not been subsequently classified as being an acceptable risk.

2) For the purposes of the definition of hazardous area in section 4(1) of the Act –

    a. classification under a coastal erosion determination as being land that is within a hazard band of a coastal erosion hazard area is a prescribed attribute; and

    b. a coastal erosion hazard area is a hazardous area.

58. Works in coastal erosion hazard areas

1) A person must not perform work in a coastal erosion hazard area unless he or she is authorised to do so under the Act.

2) If a person intends to perform work in an investigation area of a coastal erosion hazard area, the person must, before performing the work, ensure that the land is classified in accordance with the coastal erosion determination –

    c. as being an acceptable risk; or

    d. into a hazard band for the coastal erosion hazard area.

3) A responsible person for work being performed in a coastal erosion hazard area must ensure that the work is being performed in accordance with the Act and the coastal erosion determination.

4) A person performing work in a coastal erosion hazard area must ensure that the work complies with the Act and the coastal erosion determination.

DIRECTORS DETERMINATION & BUILDING REGULATIONS 2016 - COASTAL EROSION HAZARD REPORTING

Coastal Erosion Hazard Assessment

This coastal erosion hazard report has been prepared in general accordance with methodology specified in the Directors Determination – Coastal Erosion Hazard Areas pursuant to section 20(3)(b) of the Building Act 2016 and regulation 51 of the Building Regulations 2016 (Document Version 1.2 Dated 27 September 2021).

This report has been prepared by Vinamra Gupta who has more than 7 years' experience as a Geotechnical Engineer. Vinamra has a master's degree in civil engineering. In his role at GES, he prepares technical reports such as Geotechnical Reports in accordance with AS1726 including Coastal Vulnerability Assessments, Stormwater Assessment, Landslip Assessments in Accordance Australian Geomechanics Guidelines (AGS 2007) and Site Classification Reports as per AS2870.

Practices used in this assessment are developed from recent literature, including regional public domain remote sensing, wave, sea level, and storm tide modelling data obtained through various government agencies. This data is refined to a local (site scale) using detailed bathymetry models and methods within the coastal engineering manual (CEM) as well as equations obtained from recent publications to determine wind setup, wave setup, and wave runup which is specific to the coastal setting.

Specific determinations regarding coastal hazard reporting as presented in the Director's Determination - Coastal Erosion Hazard Areas, Division 2, Section 4 'Coastal Hazard Reporting' are presented in the Table below.

Signature

Vinamra Gupta
Senior Geotechnical Engineer

Works in a Coastal Erosion Hazard Area

According to this director's determination, the following regulations are applicable for the works in a coastal erosion hazard area:

(1) The AS 2870 site classification of any land located in a coastal erosion hazard area must be Class P, on the basis that it may be subject to coastal erosion.

(2) A coastal erosion hazard report must be prepared.

(3) The design of the building footing system must be prepared by an engineer-civil.

(4) The building design (including footing system) must take into account the coastal erosion hazard report.

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

> (a) take into account the coastal erosion hazard report and any relevant coastal erosion management plan; and
>
> (b) be satisfied that the proposed work will not cause or contribute to coastal erosion on the site or on adjacent land; and
>
> (c) be satisfied that the proposed work can achieve and maintain a tolerable risk for the intended life of the building without requiring any specific coastal erosion protection measures; and
>
> (d) be satisfied that the proposed work will not be located on actively mobile landforms, except where the work relates to protection measures or remediation works to protect land, property or human life.

(6) In determining an application for a permit, the permit authority must take into account the coastal erosion hazard report and any relevant coastal erosion management plan.

Report Determination Criteria	Coastal Erosion Hazard Report Compliance Checklist	Compliance	Specific Comments
4. (1)	Geotechnical practitioner with experience and competence in the preparation of coastal erosion hazard reports	Yes	
4. (1) (a)	Signed Declaration	Yes	Report Author:
4. (1) (b)	A report of a geotechnical site investigation undertaken consistent with AS 1726	Yes	The AS 1726 geotechnical model presented herein is based on deep sand profiles which are mapped at the site. No further information was required in the assessment given the site conditions are known.
4. (1) (c)	Conclusions based on consideration of the proposed work as to:		
4. (1) (c) (i)	whether the work is likely to cause or contribute to coastal erosion on the land or on adjacent land;	Yes	Given the recommendations herein are adhered to, the works will not cause or contribute to coastal erosion on the land or on adjacent land within the proposed building design life.
4. (1) (c) (ii)	whether work is proposed on actively mobile landforms;	Yes	The proposed building site and works area is not regarded as being actively mobile.
4. (1) (c) (iii)	whether the work can achieve and maintain a tolerable risk for the intended life of the building having regard to:		
	• the nature, intensity and duration of the use;	Yes	This assessment has been conducted with measures put in place to ensure that within the building's design life, the risks are tolerable in line with sites typical of residential use and with typical intensity of use. This assessment is based on the intended use as outlined in the development application. Other aspects not considered in this assessment include site or foreshore disturbance as the result of the development of vehicle access tracks, unauthorised clearing of vegetation, and unauthorised pedestrian access tracks.
	• the type, form and duration of any development;	Yes	The proposed development is adequately set back from the beach dune to achieve tolerable risk. The design of the building footing system must be prepared by an engineer-civil. Beyond the design life of the development, it is always recommended that consideration is given to a footing system which will allow for greater ease for any future underpinning works, allowance for building retreat and allowance for future cross bracing if required.
	• the likely change in the risk across the intended life of the building;	Yes	Consideration is given to projected coastline recession based on site specific modelling, regionally specific sea level rise forecasts, and geotechnical foundation considerations consistent with a site-specific slope stability assessment (Neilsen et. al. 1992).
	• the ability to adapt to a change in the risk;	Yes	Additional buffer allowances are accounted for in the assessment.
	• the ability to maintain access to utilities and services;	Yes	The site will retain full access to utilities and services within the design life of the proposed development.
	• the need for specific coastal erosion hazard reduction or protection measures on the site;	Yes	Coastal erosion hazard reduction or protection measures are recommended on the site as part of the site engineering design for civil works and the risk is deemed tolerable

	• the need for coastal erosion hazard reduction or protection measures beyond the boundary of the site; and	NA	Coastal erosion hazard reduction or protection measures are not recommended beyond the boundary of the site based on the projected lifetime of the proposed development.
	• any coastal erosion management plan in place for the site and/or adjacent land.	NA	A coastal erosion management plan is not required to mitigate risks to the site within the lifetime of the proposed development.
4. (2)	protection measures for any hazardous chemical used, handled, generated or stored on the site, taking into consideration the potential risks of the hazardous chemical to human health and safety as a consequence of coastal erosion on the site or adjacent land.	Yes	Overall risks associated with the storage of hazardous chemicals at the site will not be heightened beyond what has been assessed as low risk based on recommendations . No additional protection measures are recommended for the storage of hazardous chemicals at the site.
4. (4)	The declaration format for a coastal erosion hazard report must contain:		
4. (4) (a)	details of, and be signed by, the person who prepared or verified the report;	Yes	
4. (4) (b)	confirmation they have the appropriate qualifications, expertise and level of current indemnity insurance;	Yes	
4. (4) (c)	confirmation that the report has been prepared in accordance with the specified methodology.	Yes	

Works in a Coastal Inundation Hazard Area

According to this director's determination, the following regulations are applicable for the works in a coastal inundation hazard area:

(1) For the purposes of this Determination and regulation 56(3) of the Building Regulations 2016, the defined flood level is the level above the 0 metre Australian Height Datum with a one percent probability of being exceeded in a storm surge flooding event in the year 2100, as specified in the Coastal Inundation Hazard Band Levels List for the relevant locality in the relevant Local Provisions Schedule of the Tasmanian Planning Scheme.

(2) Where land is not located in a specified locality, the defined flood level for the relevant municipal area average applies.

(3) A coastal inundation hazard report must be prepared.

(4) The design of the building footing system must be prepared by an engineer-civil.

(5) The building design (including the footing system) must take into account the coastal inundation hazard report.

(6) In determining an application for a Certificate of Likely Compliance, 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 for the intended life of the building without requiring any specific coastal inundation protection measures.

(7) In determining an application for a permit, the permit authority must take into account the coastal inundation hazard report and any relevant coastal inundation management plan.

Report Determination Criteria	Coastal Inundation Hazard Report Compliance Checklist	Compliance	Specific Comments
4. (1)	Report is prepared by a specified practitioner being a practitioner with relevant qualifications, experience and competence in the preparation of coastal inundation hazard reports	Yes	Up to date models, literature and methods are used in this assessment, which draw on regional and site-specific information to determine present day and forward projected site hazards.
4. (1) (a)	Signed Declaration	Yes	
4. (1) (b)	Conclusions based on consideration of the proposed work as to:	Yes	
4. (1) (b) (i)	whether the work is likely to cause or contribute to coastal inundation on the land or on adjacent land or of public infrastructure;	Yes	
4. (1) (b) (iii)	whether the work can achieve and maintain a tolerable risk for the intended life of the building having regard to:	Yes	Modelling has been conducted with measures put in place to ensure that by the end of the building's lifetime, the risks are tolerable in line with the sites typical residential use and typical intensity of this use. This assessment is based on the intended use as outlined in the development application. All potential and site-specific inundation factors are considered to assess tolerable risks which include: • Government sea level projections which are calibrated to the Local Government Authority area and scaled to the building design life (DPAC 2016), • Storm tide projections (combined 1% AEP storm surge and tides) which are calculated on a local scale (0.5 km accuracy) • Wind setup conditions specific to the site which are calculated from all wind fetch directions • Wave setup and wave runup based on detailed wave modelling which has been conducted, specific to the site: o Localised wind generated waves based on dominant wind fetch incidents and calculated based on 1% AEP wind velocity and durations. Nearshore wave parameters determined based on sea level compensated water depths (to building design life) and bathymetry attenuation.
	• the nature, intensity and duration of the use;	Yes	The risk assessment herein is based on the highest intensity of use. Full occupancy duration is considered over the lifetime of the development. The full inundation extent is based on a 1% AEP event occurring at the end of the buildings design life.
	• the type, form and duration of any development;	Yes	This assessment is based on the specific plans as outlined in the development application, with the duration based on the building design life as defined herein. Particularly where wave runup is concerned, consideration is given to the presence of solid walls on ground versus buildings elevated above ground on piers, with both scenarios affecting the wave runup height against the building. Where necessary, consideration may need to be given to reinforcing the structure against the wave force load which is to be calculated.
	• the likely change in the risk across the intended life of the building;	Yes	As indicated in 4. (1) (b) (iii), consideration is given to risk in the most adverse of modelled consecutive 1% AEP storm conditions for the projected end life of the building. Where deemed necessary, a 0.3 m freeboard 'buffer' is to be applied to design 1% AEP stillwater level for the building end of life.
	• the ability to adapt to a change in the risk;	Yes	Engineering solutions may be applied if it is so desired to reduce the risk through hazard reduction. Increased risk may occur as a result of increased user vulnerability beyond what is

			modelled as a tolerable risk in this assessment. Eg. Changed site layout meaning reduced access during a floodwater event. Hazard reduction may include onsite wave attenuation structures such as wave breaker walls and/or revetments.
	• the ability to maintain access to utilities and services;	Yes	
	• the need for specific coastal inundation hazard reduction or protection measures on the site;	Yes	Coastal inundation hazard reduction or protection measures are not recommended on the site based on the projected lifetime of the proposed development.
	• the need for coastal inundation hazard reduction or protection measures beyond the boundary of the site;	NA	Coastal inundation hazard reduction or protection measures are not recommended beyond the boundary of the site based on the projected lifetime of the proposed development.
	• any coastal inundation management plan in place for the site and/or adjacent land.	NA	Where necessary, a coastal inundation management plan may be developed where mitigation is deemed to be effective against adverse erosion conditions.
4. (2)	protection measures for any hazardous chemical used, handled, generated or stored on the site, taking into consideration the potential risks of the hazardous chemical to human health and safety as a consequence of coastal erosion on the site or adjacent land.	Yes	GES are not aware of any proposal for hazardous chemicals to be used, handled, generated or stored on the site. It is recommended that if such chemicals are to be stored within the proposed extension, they are elevated above the designated inundation level.
4. (4)	The declaration format for a coastal inundation hazard report must contain:		
4. (4) (a)	details of, and be signed by, the person who prepared or verified the report;	Yes	
4. (4) (b)	confirmation they have the appropriate qualifications, expertise and level of current indemnity insurance;	Yes	
4. (4) (c)	confirmation that the report has been prepared in accordance with the specified methodology.	Yes	

Appendix 2 Acceptable Solutions

Waterways and Coastal Protection Areas (WCPA)

C7.6.1 Buildings and works within a waterway and coastal protection area or a future coastal refugia area

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.

Acceptable Solutions	Performance Criteria
A1 Buildings and works within a waterway and coastal protection area must: (a) be within a building area on a sealed plan approved under this planning scheme; (b) in relation to a Class 4 watercourse, be for a crossing or bridge not more than 5m in width; or (c) if within the spatial extent of tidal waters, 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.	**P1.1** Buildings and works within a waterway and coastal protection area must avoid or minimise adverse impacts on natural assets, having regard to: (a) impacts caused by erosion, siltation, sedimentation and runoff; (b) impacts on riparian or littoral vegetation; (c) maintaining natural streambank and streambed condition, where it exists; (d) impacts on in-stream natural habitat, such as fallen logs, bank overhangs, rocks and trailing vegetation; (e) the need to avoid significantly impeding natural flow and drainage; (f) the need to maintain fish passage, where known to exist; (g) the need to avoid land filling of wetlands; (h) the need to group new facilities with existing facilities, where reasonably practical; (i) minimising cut and fill; (j) building design that responds to the particular size, shape, contours or slope of the land; (k) minimising impacts on coastal processes, including sand movement and wave action; (l) minimising the need for future works for the protection of natural assets, infrastructure and property; (m) the environmental best practice guidelines in the *Wetlands and Waterways Works Manual*; and (n) the guidelines in the *Tasmanian Coastal Works Manual*.

Coastal Erosion Hazard Code (CEHC) Areas

C10.6.1 Buildings and works, excluding coastal protection works, within a coastal erosion hazard area

Objective:

That:

(a) building and works, excluding coastal protection works, within a coastal erosion hazard area, can achieve and maintain a tolerable risk from coastal erosion; and

(b) buildings and works do not increase the risk from coastal erosion to adjacent land and public infrastructure.

Acceptable Solutions	Performance Criteria
A1 No Acceptable Solution.	**P1.1** Buildings and works, excluding coastal protection works, within a coastal erosion hazard area must have a tolerable risk, having regard to: (a) whether any increase in the level of risk from coastal erosion requires any specific hazard reduction or protection measures; (b) any advice from a State authority, regulated entity or a council; and (c) the advice contained in a coastal erosion hazard report. **P1.2** A coastal erosion hazard report demonstrates that: (a) the building and works: (i) do not cause or contribute to any coastal erosion on the site, on adjacent land or public infrastructure; and (ii) can achieve and maintain a tolerable risk from a coastal erosion event in 2100 for the intended life of the use without requiring any specific coastal erosion protection works; (b) buildings and works are not located on actively mobile landforms, unless for engineering or remediation works to protect land, property and human life.

Inundation Prone Areas Code (IPAC)

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

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.

Acceptable Solutions	Performance Criteria
A1 No Acceptable Solution.	**P1.1** Buildings and works, excluding coastal protection works, within a coastal inundation hazard area must have a tolerable risk, having regard to: (a) whether any increase in the level of risk from coastal inundation requires any specific hazard reduction or protection measures; (b) any advice from a State authority, regulated entity or a council; and (c) the advice contained in a coastal inundation hazard report. **P1.2** A coastal inundation hazard report also demonstrates that the building or works: (a) do not cause or contribute to coastal inundation on the site, on adjacent land or public infrastructure; and (b) 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 coastal inundation protection works.

Appendix 3 NRM Mapping

Feature	
Segment Id	18343
Segment Length (m)	100
Minimum Vulnerability: Coastal Vulnerability Mapping	Not a minimal vulnerability shoreline
Cliff Vulnerability: Coastal Vulnerability Mapping	Not a cliffed shoreline
Unclassified Vulnerability: Coastal Vulnerability Mapping	Not an unclassified vulnerability shoreline
Erosion Vulnerability: Coastal Vulnerability Mapping	Not a soft clayey-gravelly or colluvial shoreline
Sandy Vulnerability: Coastal Vulnerability Mapping	Re-entrant sandy shore backed by low-lying sandy plain
Muddy Vulnerability: Coastal Vulnerability Mapping	Not a muddy shoreline
Coastal Vulnerability0	Sandy beach or shoreline - fine to med grainsize
Coastal Vulnerability	Intertidal or shallow subtidal sand flats
Backshore Type Coastal Vulnerability	Sediment flats, unconsolidated or unlithified
Artificial Shore	No
Industry1 500M	No industry present within 500m
Industry2 500M	No industry present within 500m
Industry3 500M	No industry present within 500m
Industry1 1Km	Marine Lease
Industry2 1Km	
Industry3 1Km	
Foreshore Structure1	No structure present
Structure1 Use Frequency	NA
Foreshore Structure2	No structure present
Structure2 Use Frequency	NA
Foreshore Structure3	No structure present
Structure3 Use Frequency	NA
Foreshore Structure4	No structure present
Structure4 Use Frequency	NA
Construction Level 100M	1 – 25 %
Construction Level 500M	NA
Cleared Level 100M	76 - 100%
Cleared Level 500M	NA
Recreation Use1	Walking
Recreation Use1 Use Frequency	Medium use
Recreation Use2	Dog exercise
Recreation Use2 Use Frequency	Medium use
Recreation Use3	
Recreation Use3 Use Frequency	
Biological Feature Sigvalue	
Protected Area	
Access1	Access Road
Access2	
Access3	
Access4	
Access5	
Vegetation Viability Coastal Values	Not assessed
Vegetation Significance Coastal Values	Not assessed
Coastal Values	Not assessed
Vegetation Condition Coastal Values	Not assessed
Habitat Condition SE Strategy	Not assessed
Conservation Significance SE Strategy	Area of sufficient significance to warrant highest level of protection
Reserve Class CAR	

Public Land Classification	
Coastal Zone Type PWS	
Marine Reserve	
LGA Reserve	
WHA	
Classification	
Zoning	Passive Recreation
Geomorphic Condition	Significantly disturbed
Actual Habitat Listed Significant SPP	One or more shorebird or seabird species present (contact Birds Tasmania for further detail)
Potential Habitat Listed Significant SPP	
Geovalue	1
Sensitivity TGD	
Geomorphic Value	2
Tourism Use	No listed tourism use
European Heritage	No listed European heritage values
Carcinus Maenas	Unlikely
Crassostrea Gigas	Likely
Spartina Anglica	Absent
Undaria Pinnatifida	Unlikely
A Arenaria	Present
A Populifolia	Unknown
E Paralias	Unknown
E Villosa	Unknown
T Junceiforme	Unknown
Pollution Source1 500M	No pollution sources within 500m
Pollution Source2 500M	No pollution sources within 500m
Pollution Source3 500M	No pollution sources within 500m
Pollution Source1 1Km	Aquaculture (land and/or marine operations)
Pollution Source2 1Km	
Pollution Source3 1Km	Rural runoff
Biology Attribute Value	1
Geomorphic Attribute Value	2
Natural Value Index	1
Amenities Attribute Value	5
Recreational Tourism Value	2
Value0	
Human Use Value Index	3
Eco Disturbance Attribute Condition	3
Geomorphic Attribute Condition	4
Introduced Species Attribute Condition	3
Condition Index	3
Anthropogenic Modification Attribute Pressure	3
Pollution Attribute Pressure	2
Recreational Tourism Attribute Pressure	5
Pressure	5
Introduced Species Attribute Pressure	2
Pressure Index	4
Further Information	An explanatory report accompanies this dataset and can be obtained from http://www.aquenal.com.au/reports.htm or by emailing coastal.enquiries@environment.tas.gov.au

Natural Values Index

Foreshores within or directly adjacent to protected natural areas are assumed to have a higher degree of naturalness compared to those adjacent to developed areas. This indicator aims to identify foreshores that are part of wider natural functioning systems, rather than focussing on individual ecological elements. High value protected areas are selected based on reservation status and the associated restrictions on activities.

Natural Value Index of 1

Significant community or habitat present.

Foreshores assigned the highest value score (i.e. a score of 1) under this indicator are those within or directly adjacent to a dedicated formal reserve equivalent to IUCN (International Union for Conservation of Nature) protected area management categories i, ii, iii, iv, or vi (see IUCN Guidelines for Applying Protected Area Management Categories (Dudley 2008) for Shore Base: A Coastal Management Tool Aquenal Pty Ltd 96 further detail). Formal reserves include National Parks, State Reserves, Game Reserves, Nature Reserves, Historic sites, Forest Reserves, Conservation areas, and areas with a Conservation Covenant.

Natural Value Index of 2

Medium Integrated Conservation Value (CFEV)

High value foreshores (i.e. those assigned a score of 2) are those within or directly adjacent to areas not listed under IUCN equivalents but included in other Informal Reserves, and State or Forestry Managed Land.

Geomorphic Attribute Value (Geomorphology)

Geomorphic value is derived from a calculation of geoconservation priority (Geovalue) and the sensitivity category applied to sites of geoconservation significance by the Tasmanian Geoconservation Database (TGD). Geovalues (Sharples and Mowling 2006) are designed to highlight coastal segments which are most likely to warrant management attention regarding the maintenance of geoconservation value.

Geovalue of 1

Indicates high geoconservation priority, with coastal segments having either the highest sensitivity to disturbance, and/or the most natural condition.

Geovalue of 2

Indicate moderate geoconservation priority.

Geovalue of 3

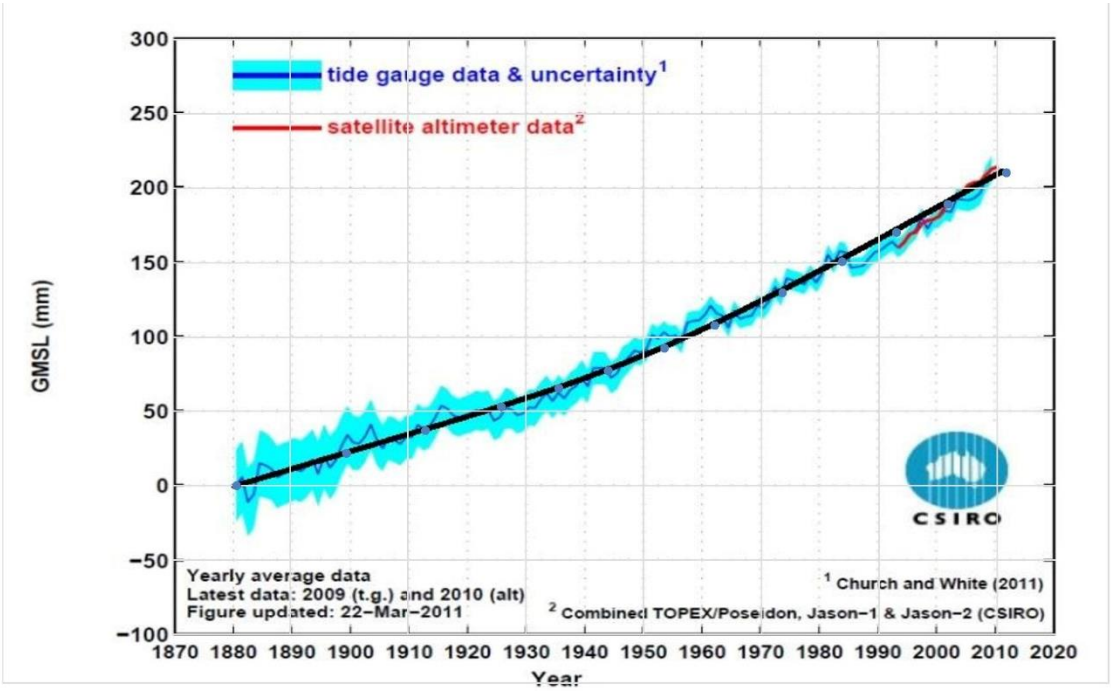
Indicate moderate to low geoconservation priority.

Geovalue of 4

Indicates lowest geoconservation priority where coastal segments are of low sensitivity to disturbance, yet are significantly disturbed. This mainly refers to hard rock shores that have been extensively modified.

See Sharples and Mowling (2006) for further information on calculation of Geovalues.

Appendix 4 Hydrodynamic& Inundation Model



Correlation Data

Year	Years Since 1880	SLR (m)
1880.89	0.00	0.00
1899.53	18.64	21.77
1912.94	32.05	37.11
1925.84	44.95	52.96
1935.59	54.70	65.50
1943.95	63.06	77.18
1953.54	72.65	92.51
1962.07	81.18	107.67
1973.57	92.68	129.79
1983.68	102.79	150.52
1992.91	112.02	170.21
2001.62	120.73	189.20
2011.55	130.66	210.28

Polynomical Trend Analysis - Historical Sea Level Rise (1880 baseline)

X5	X4	X3	X^2	X
-2.79511E-09	2.9134E-07	7.04316E-05	-0.005162952	1.246008027

Polynomial Trend Analysis - RCP8.5 for Clarence (DPAC 2016)

X^2	X
7.38889E-05	0.002794444

Year	Relative to 1880 Years Since	Sea Level 1880 Baseline (mm)	Relative to 2010 Years Since	Sea Level 2010 Baseline (m)	Sea Level (m AHD) (m)	
1972	91.11	126.46		-0.08	0.00	m AHD Baseline
2010	129	207		0.000	0.081	DPAC Baseline

Aerial Photograph Analysis

2010			0.180	0.001	0.081
2011			1	0.002	0.083
2011			1	0.003	0.083
2012			2	0.005	0.085
2013			3	0.009	0.090
2013			3	0.009	0.090
2013			3	0.010	0.090
2014			4	0.012	0.092
2014			4	0.012	0.093
2015			5	0.016	0.096
2015			5	0.016	0.097
2015			5	0.017	0.098
2016			6	0.018	0.098
2016			6	0.020	0.100
2016			6	0.020	0.101
2017			7	0.022	0.103
2017			7	0.024	0.104
2018			8	0.027	0.108
2019			9	0.033	0.113

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Appendix 5 Qualitative Risk Assessment Tables

Consequence Index

Consequence	Erosion
Catastrophic	Loss of life, loss of significant environmental values due to a pollution event where there is not likely to be recovery in the foreseeable future.
Major	Extensive injuries. Complete structural failure of development, destruction of significant property and infrastructure, significant environmental damage requiring remediation with a long-term recovery time.
Moderate	Treatment required, significant building or infrastructure damage i.e. loss of minor outbuildings such as car ports, garages and the like. Replacement of significant property components. linings, hard paved surfaces, cladding, flooring. Moderate environmental damage with a short-term natural or remedial recovery time.
Minor	Medium loss – repair of outbuildings and repair and minor replacement of building components of buildings. Replacement of floor/window coverings, some furniture through seepage (where applicable). Minor environmental damage easily remediated.
Insignificant	No injury, low loss – no replacement of habitable building components, some remediation of garden beds, gravel driveways etc. Environment can naturally withstand and recover without remediation. Inundation of the site, but ground based access is still readily available and habitable buildings are not inundated, including incorporated garages.

Likelihood Index

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

Source: AS/NZS 4360:2004 Risk Management

Qualitative Risk Matrix

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

Source: AS/NZS 4360:2004 Risk Management

Appendix 6 Quantitative Risk Assessment

Building and Works in a WCPA

Performance Criteria E11.7.1 P1 **Buildings and works within a waterway and coastal protection area must avoid or minimise adverse impacts on natural assets, having regard to:**	**Relevance**	**Management Options**	**Managed Risk Assessment (where relevant)**			**Further Assessment Required**
			Consequence	**Likelihood**	**Risk**	
(a) impacts caused by erosion, siltation, sedimentation and runoff;	The local area has a Natural Value Index of 1 indicating that it is a high conservation value area. The site is largely modified with introduced flora.	A soil and water management plan is recommended at the site	Insignificant (1)	Rare (E)	Low (1)	No
((b) impacts on riparian or littoral vegetation;	Not applicable					
(c) maintaining natural streambank and streambed condition, where it exists;	Not applicable					
(d) impacts on in-stream natural habitat, such as fallen logs, bank overhangs, rocks and trailing vegetation;	Not applicable					
(e) the need to avoid significantly impeding natural flow and drainage;	Not applicable					
(f) the need to maintain fish passage, where known to exist;	Not applicable					
(g) the need to avoid land filling of wetlands;	Not applicable					
(h) the need to group new facilities with existing facilities, where reasonably practical;watercourses or wetlands is avoided.	Not applicable	.				
(i) minimising cut and fill;						
(j) building design that responds to the particular size, shape, contours or slope of the land;	Not applicable					
(k) minimising impacts on coastal processes, including sand movement and wave action;	Not applicable					
(l) minimising the need for future works for the protection of natural assets, infrastructure and property;	Not applicable					

(m) the environmental best practice guidelines in the Wetlands and Waterways Works Manual; and		Works are undertaken generally in accordance with 'Wetlands and Waterways Works Manual' (DPIWE, 2003) and "Tasmanian Coastal Works Manual" (DPIPWE, Page and Thorp, 2010), and the unnecessary use of machinery within watercourses or wetlands is avoided	Insignificant (1)	Rare (E)	Low (1)	No
(n) the guidelines in the Tasmanian Coastal Works Manual. (b) mitigate and manage adverse erosion, sedimentation and runoff impacts on natural values			Insignificant (1)	Rare (E)	Low (1)	No

Buildings and works within a coastal erosion hazard area

Performance Criteria C10.6.1 P1.1 **Buildings and works, excluding coastal protection works, within a coastal erosion hazard area must have a tolerable risk, having regard to:**	**Relevance**	**Management Options**	**Managed Risk Assessment (where relevant)**			**Further Assessment Required**
			Consequence	**Likelihood**	**Risk**	
(a) whether any increase in the level of risk from coastal erosion requires any specific hazard reduction or protection measures	The proposed works will not increase level of the risk		Insignificant (1)	Rare (E)	Low (1)	No
(b) any advice from a State authority, regulated entity or a council; and	N/A					
(c) the advice contained in a coastal erosion hazard report	Refer to recommendations		Insignificant (1)	Rare (E)	Low (1)	No

Building and works within a coastal inundation hazard area

Performance Criteria C11.6.1 P1.1 **Buildings and works, excluding coastal protection works, within a coastal inundation hazard area must have a tolerable risk, having regard to:**	**Relevance**	**Management Options**	**Managed Risk Assessment (where relevant)**			**Further Assessment Required**
			Consequence	**Likelihood**	**Risk**	
(a) whether any increase in the level of risk from coastal inundation requires any specific hazard reduction or protection measures;	Proposed development will require to have FFL at least 2.2m to reduce inundation risk.		Insignificant (1)	Rare (E)	Low (1)	No
(b) any advice from a State authority, regulated entity or a council; and	N/A					
(c) the advice contained in a coastal inundation hazard report.	Refer to recommendations		Insignificant (1)	Rare (E)	Low (1)	No

Appendix 7 Site Photos