Community Coast Country

NOTICE OF PROPOSED DEVELOPMENT

Notice is hereby given that an application has been made for planning approval for the following development:

SITE: 11A Blackwood Drive, Forcett

PROPOSED DEVELOPMENT:

ADDITIONS TO DWELLING

The relevant plans and documents can be inspected at the Council Offices at 47 Cole Street, Sorell during normal office hours, or the plans may be viewed on Council's website at www.sorell.tas.gov.au until **Monday 26th May 2025.**

Any person may make representation in relation to the proposal by letter or electronic mail (sorell.council@sorell.tas.gov.au) addressed to the General Manager. Representations must be received no later than **Monday 26th May 2025.**

APPLICANT: **Duo Design**

APPLICATION NO: **DA 2025 /47 1**
DATE: **09 May 2025**

Part B: Please note that Part B of this form is publicly exhibited.

Full description of Proposal:	*Use:* RESIDENTIAL	
	Development: PROPOSED ADDITIONS TO EXISTING DWELLING (CARPORT + HOME GYM)	
	Large or complex proposals should be described in a letter or planning report.	
Design and construction cost of proposal:	$ 75,000	

Is all, or some the work already constructed:	No: ☑ Yes: ☐

Location of proposed works:	Street address: 11A BLACKWOOD DRIVE Suburb: FORCETT Postcode: 7173 Certificate of Title(s) Volume: 166028 Folio: 1

Current Use of Site	RESIDENTIAL DWELLING

Current Owner/s:	Name(s) KEVIN MEDHURST

Is the Property on the Tasmanian Heritage Register?	No: ☑ Yes: ☐	*If yes, please provide written advice from Heritage Tasmania*
Is the proposal to be carried out in more than one stage?	No: ☑ Yes: ☐	*If yes, please clearly describe in plans*
Have any potentially contaminating uses been undertaken on the site?	No: ☑ Yes: ☐	*If yes, please complete the Additional Information for Non-Residential Use*
Is any vegetation proposed to be removed?	No: ☑ Yes: ☐	*If yes, please ensure plans clearly show area to be impacted*
Does the proposal involve land administered or owned by either the Crown or Council?	No: ☑ Yes: ☐	*If yes, please complete the Council or Crown land section on page 3*

If a new or upgraded vehicular crossing is required from Council to the front boundary please complete the Vehicular Crossing (and Associated Works) application form
https://www.sorell.tas.gov.au/services/engineering/

Sorell Council
Development Application: 5.2025.47.1 - Development Application - 11a Blackwood Drive Forcett - P1.pdf
Plans Reference:P1
Date Received:27/02/2025

Part B continued: Please note that Part B of this form is publicly exhibited

Declarations and acknowledgements

- I/we confirm that the application does not contradict any easement, covenant or restriction specified in the Certificate of Title, Schedule of Easements or Part 5 Agreement for the land.
- I/we consent to Council employees or consultants entering the site and have arranged permission and/or access for Council's representatives to enter the land at any time during normal business hours.
- I/we authorise the provision of a copy of any documents relating to this application to any person for the purposes of assessment or public consultation and have permission of the copyright owner for such copies.
- I/we declare that, in accordance with s52(1) of the *Land Use Planning and Approvals Act 1993*, that I have notified the owner(s) of the intention to make this application.
- I/we declare that the information in this application is true and correct.

Details of how the Council manages personal information and how you can request access or corrections to it is outlined in Council's Privacy Policy available on the Council website.

- I/we 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 exhibition, 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.

- Where the General Manager's consent is also required under s.14 of the *Urban Drainage Act 2013*, by making this application I/we also apply for that consent.

Applicant Signature:	Signature: Mark Day .... Date: 27/2/2025 ....

Crown or General Manager Land Owner Consent

If the land that is the subject of this application is owned or administered by either the Crown or Sorell Council, the consent of the relevant Minister or the Council General Manager whichever is applicable, must be included here. This consent should be completed and signed by either the General Manager, the Minister, or a delegate (as specified in s52 (1D-1G) of the *Land Use Planning and Approvals Act 1993*).

Please note:

- If General Manager consent if required, please first complete the General Manager consent application form available on our website www.sorell.tas.gov.au
- If the application involves Crown land you will also need a letter of consent.
- Any consent is for the purposes of making this application only and is not consent to undertaken work or take any other action with respect to the proposed use or development.

I ____ being responsible for the

administration of land at ____

declare that I have given permission for the making of this application for

____

Sorell Council
Development Application: 5.2025.47.1 - Development Application - 11a Blackwood Drive Forcett - P1.pdf
Plans Reference:P1
Date Received:27/02/2025

Signature of General Manager, Minister or Delegate:	Signature: .... Date: ....

155 Fergusson Road, Brighton TAS 7030
03 6268 0063
0409 537 337 or 0434 147 747
duodesign@bigpond.com or mday.duodesign@gmail.com

Response to Request for Additional information

FURTHER INFORMATION REQUEST
RE:
DA 2025 / 47 1AT 11A Blackwood Drive, Forcett

Planning:
1. Dispersive Soils Report – Provide a dispersive soils report prepared by a suitably qualified and experienced person consistent with the definition provided in clause SOR-S1.7.1 of SOR-S1.0 Dispersive Soils Specific Area Plan. This Specific Area Plan is part of the State Planning Provisions, Tasmanian Planning Scheme – Sorell & Local Provisions Schedule (LPS) (https://planningreform.tas.gov.au/planning/scheme/state_planning_provisions)

A written statement (may be included within the report above) that addresses and respond to the 'Performance Criteria' of SOR-S1.7 Development Standards for building and works of the Sorell Local Provisions Schedule (LPS).

DUO RESPONSE: Attached Dispersive Soils Report by Enviro-Tech dated 20/3/2025

2. A written statement and associated amended plans that address and respond to the 'Performance Criteria' of the Rural Living Zone – 11.4.1 P1 Site Coverage, Development Standards for Building and Works of the Scheme.

11.4 Development Standards for Buildings and Works
11.4.1 Site coverage

P1
The site coverage must be consistent with that existing on established properties in the area, having regard to:
(a) the topography of the site;
(b) the capacity of the site to absorb runoff;
(c) the size and shape of the site;
(d) the existing buildings and any constraints imposed by existing development;
(e) the need to remove vegetation; and
(f) the character of development existing on established properties in the area.

DUO RESPONSE:

THE PROPOSAL IS CONSISTANT WITH OTHER DWELLINGS IN THE SUUROUNDING AREA. TOTAL PROPOSED SITE COVERAGE IS 531.50m2.

COMPARISIONS: (O/A SITE COVERAGE)

1. No. 1 BLACKWOOD DRIVE FORCETT : HOUSE AND SHEDS = 540m2 +/-

2. No. 3 BLACKWOOD DRIVE FORCETT : HOUSE AND SHEDS = 506m2 +/-
3. No. 2 CHERRY CRT FORCETT : HOUSE AND SHEDS = 590m2 +/-

THE LOT SIZE IS CONSISTANT WITH OTHER PROPERTIES IN THE SUBDIVISION. IT SITS AT A LOWER ELEVATION THAN THE MAJORITY OF THE SUBDIVISION.
THE PROPOSAL SITE IS 1.229HA IN AREA WITH LARGE OPEN AREAS AWAY FROM AND DOWNSLOPE FROM THE PROPOSAL. STORMWATER FROM THE PROPOSAL IS TO BE COLLECTED, STORED AND RE-USED ON SITE AND OVERFLOW MEASURES TO BE DETERMINED BY SUITABLY QUALIFIED PERSONS. i.e. GEO TECHNICAL

THE PROPOSAL IS AN ADDITION TO THE EXISTING BUILDING WITH EXTENTION OF THE ROOFLINE. THE TOTAL DWELLING COVERAGE OF 409m2 IN KEEPING WITH THE SCALE AND DESIGN OF NEIGHBOURING PROERTIES IN THE SUBDIVISION.

THE PROPOSAL DOES NOT REQUIRE THE REMOVAL OF ANY VEGETATION APART FROM THE RELOCATION OF SMALL TO MEDIUM EXOTIC PLANTED BY THE OCCUPANTS. NO NATIVE VEGETATION IS TO BE REMOVED & ALL GROUND COVER IS TO REMAIN

WE HOPE THIS SATISFIES YOUR REQUEST

ANY FURTHER QUESTIONS PLEASE DON'T HESITATE TO MAKE CONTACT WITH OUR OFFICE

REGARDS

BELINDA WESTON & MARK DAY

DATE : 28/04/2025

enviro•tech
CONSULTANTS
Geotechnical & Environmental Services

Sorell Council
Development Application: 5.2025.47.1 - Response to Request For information - 11a Blackwood Drive, Forcett - P2.pdf
Plans Reference: P2
Date received: 5/05/2025

GEOTECHNICAL SITE INVESTIGATION

11A BLACKWOOD DRIVE - FORCETT

PROPOSED ADDITION AREA

Client: Kevin Medhurst

Certificate of Title: 166028/1

Investigation Date: 20/03/2025

Refer to this Report As

Enviro-Tech Consultants Pty. Ltd. 2025. Geotechnical Site Investigation Report for a Proposed Addition Area, 11A Blackwood Drive - Forcett. Unpublished report for Kevin Medhurst by Enviro-Tech Consultants Pty. Ltd., 20/03/2025.

Report Distribution

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

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

Limitations of this report

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

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

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

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

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

Site Investigation

The Site investigation is summarised in Table 1.

Table 1 Summary of Site Investigation

Client	**Kevin Medhurst**
Project Address	11A Blackwood Drive - Forcett
Council	Sorell
Planning Scheme	Tasmanian Planning Scheme
Inundation, Erosion or Landslip Overlays	None
Proposed	Addition Area
Investigation	Fieldwork was carried out by an Engineering Geologist on the 20/3/2025
Site Topography	The building site has a near level gradient of approximately 1% (1°) to the northeast
Site Drainage	The site receives overland flow runoff directly from the southwest.
Soil Profiling	Two investigation holes were direct push sampled around the proposed addition area (Appendix A):
Investigation Depths	The target excavation depth was estimated at 2.3 m. Borehole BH01 was direct push sampled to 1.5 m and borehole BH02 was direct push sampled to 1.5m. Borehole logs and photos are presented in Appendix B & C.
Soil moisture and groundwater	All recovered soil at the site ranged from dry to slightly moist. Groundwater was encountered at 0.9 to 1 m below ground surface.
Geology	According to 1:250,000 Mineral Resources Tasmania geological mapping (accessed through The LIST), the geology comprises of: Permian Upper glaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone.

Soil Profiles

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

Table 2 Soil Summary Table

#	Layer	Details	USCS	BH01	BH02
1	SAND	FILL: SAND trace silt/clay, black, well sorted, medium grained sand	SW-SM		0-0.1 DS@0.0
2	Silty CLAY	TOPSOIL: Silty CLAY, very dark grey, medium plasticity, with sand, trace roots, 5 % roots	CI	0-0.1 DS@0.0	
3	Silty CLAY	Silty CLAY, dark greyish brown, medium plasticity, fine to medium grained sand, with sand, trace roots, 5 % roots	CI	0.1-0.5 DS@0.3	
4	Sandy CLAY	Sandy CLAY, light olive brown, well sorted, medium plasticity, fine to medium grained sand	CI	0.5-0.9 DS@0.8	
5	Silty CLAY	Silty CLAY, very dark olive brown, medium plasticity, fine grained sand	CI	0.9-1.5 DS@1.2	
6	Silty CLAY	Silty CLAY, very dark grey, medium plasticity, fine grained sand, with sand, trace roots, 5 % roots	CI		0.1-0.3 DS@0.2
7	Silty Sandy CLAY	Silty Sandy CLAY, dark olive grey, medium plasticity, fine grained sand, trace roots, 5 % roots	CI		0.3-0.6 DS@0.4
8	Silty Sandy CLAY	Silty Sandy CLAY, very dark olive brown, medium plasticity, fine to medium grained sand	CI		0.6-1 DS@0.8
9	Sandy SILT	Sandy SILT, dark greyish brown, low plasticity, fine grained sand	ML		1-1.5 DS@1.2

Consistency[1]	**VS** Very soft; **S** Soft; **F** Firm; **St** Stiff; **Vst** Very Stiff; **H** Hard. Consistency values are based on soil strengths AT THE TIME OF TESTING and is subject to variability based on field moisture condition
Density[2]	**VL** Very loose; **L** Loose; **MD** Medium dense; **D** Dense; **VD** Very Dense
Rock Strength	**EL** Extremely Low; **VL** Very Low; **L** Low; M Medium; **H** High; **VH** Very High; **EH** Extremely High
PL	Point load test (lump)
DS	Disturbed sample
PV	Pocket vane shear test
FV	Downhole field vane shear test
U50	Undisturbed 48mm diameter core sample collected for laboratory testing.
REF	Borehole refusal
INF	DCP has continued through this layer and the geology has been inferred.

Recommendations

Dispersive soils

Findings

The results presented in Appendix D indicate:

- With the exception for shallow soil Layers 1 and 2, all of the soil tested at the Site is Class 1 and considered severely dispersive.
- Given the Site is observed to have a gradient of 1°, cut and fill is expected be in the order of 0.1m
- The nondispersive soil layers only extend to 0.1 m and the fore it is reasonable to presume the dispersive soils will be exposed within building pad cut and possibly the road cut.

[1] Soil consistencies are derived from a combination of field index, DCP and shear vane readings.
[2] Soil density descriptions presented in engineering logs are derived from the DCP testing.

Site specific recommendations

- It is generally a geotechnical requirement to strip topsoil from beneath building pads and road surfaces.
- In this instance removing Layers 1 and 2 will expose the severely dispersive soils and make the Site susceptible to erosion.
- The following is recommended:
    - Topsoiil beneath the road surface is NOT paved with an impervious surface and NOT stripped (topsoil retained) before applying the road base.
    - The topsoil layer at the Site is not disturbed unless it is coated with either lime or gypsum at the rates indicated in Appendix E and either:
        - Immediately covered with a non-permeable barrier. A non-permeable barrier includes a building or shed pad or a courtyard paving utilising a plastic liner
        - The soil is removed and replaced with a liner and imported loam where swale drain contouring is proposed.
    - Adding 100mm of sand or loam to the surface of the site is encouraged in areas where erosion may be of concern or where heavy trafficking is proposed.
    - Absorption trenches are not recommended at the Site. Stormwater is best drained to the dam or waterway provided the outlet is designed to prevent erosion.

Non site-specific guidance, and general recommendations are presented in Appendix E.

Sorell local provisions schedule - SOR-S1.7.1 Development on dispersive soils

Objective

That buildings and works with the potential to disturb dispersive soil are appropriately located or managed:

(a) to minimise the potential to cause erosion; and

(b) to reduce risk to property and the environment to an acceptable level.

Acceptable Solutions

Given the proposed development involves disturbance of soils and is not for a habitable building or an extension less than 100 m^2, the building and works do not meet LPS acceptable solutions, and performance solution SOR-S1.7 is to be addressed.

Kris Taylor, BSc (hons)

Environmental & Engineering Geologist

Performance Criteria

Performance Criteria	Recommendations
Building and works must be designed, sited and constructed to minimise the risks associated with dispersive soil to property and the environment, having regard to:	
(a) the dispersive potential of soils in the vicinity of proposed buildings, driveways, services and the development area generally;	Either retaining the topsoil or placing an impermeable barrier over the top of gypsum or lime.
(b) the potential of the development to affect or be affected by erosion, including gully and tunnel erosion;	With the management recommendations, risks are considered LOW.
(c) the dispersive potential of soils in the vicinity of water drainage lines, infiltration areas and trenches, water storages, ponds, dams and disposal areas;	Recommendations for reducing concentrated flow where possible. Additional sand and gypsum/lime can be applied to the surface of the Site where overland flow is notably concentrating/ponding. Overall risks are considered low given the Site relatively low gradient. Risks from septic absorption trenches are low provided the trenches have been lined with geofabric. Stormwater trenches are not recommended at the Site.
(d) the level of risk and potential consequences for property and the environment from potential erosion, including gully and tunnel erosion;	The Site is very low gradient, and measures are to be put in place to reduce the concentration of water flow.
(e) management measures that would reduce risk to an acceptable level; and	Risks can be managed to ensure risks are comparable with current risks.
(f) the advice contained in a dispersive soil management plan.	

References

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

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

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

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

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

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

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

Appendix A Mapping

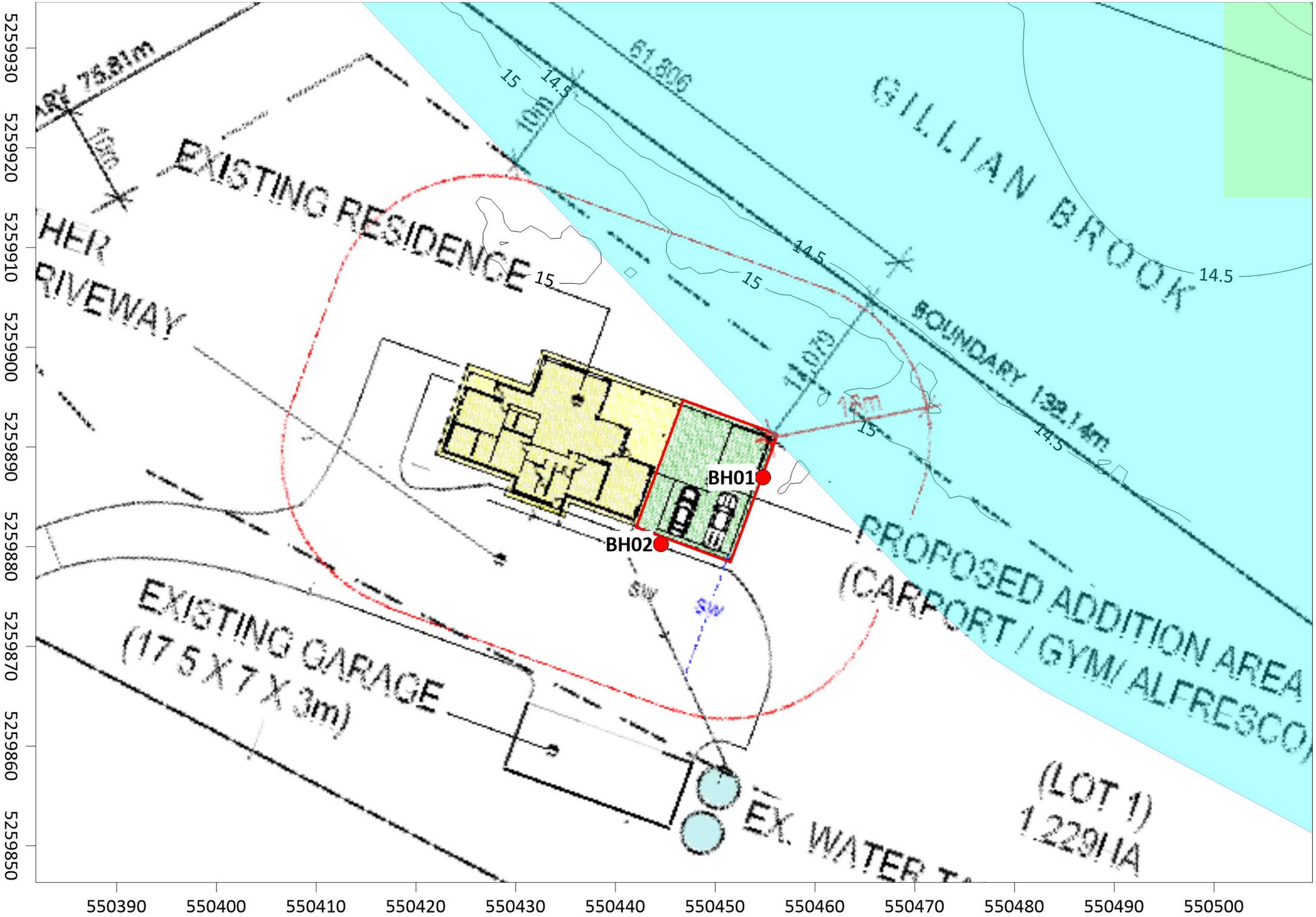


Figure 1 Planning Scheme Landslip Hazard Overlay Mapping, Proposed Building and Works & Photo Locations

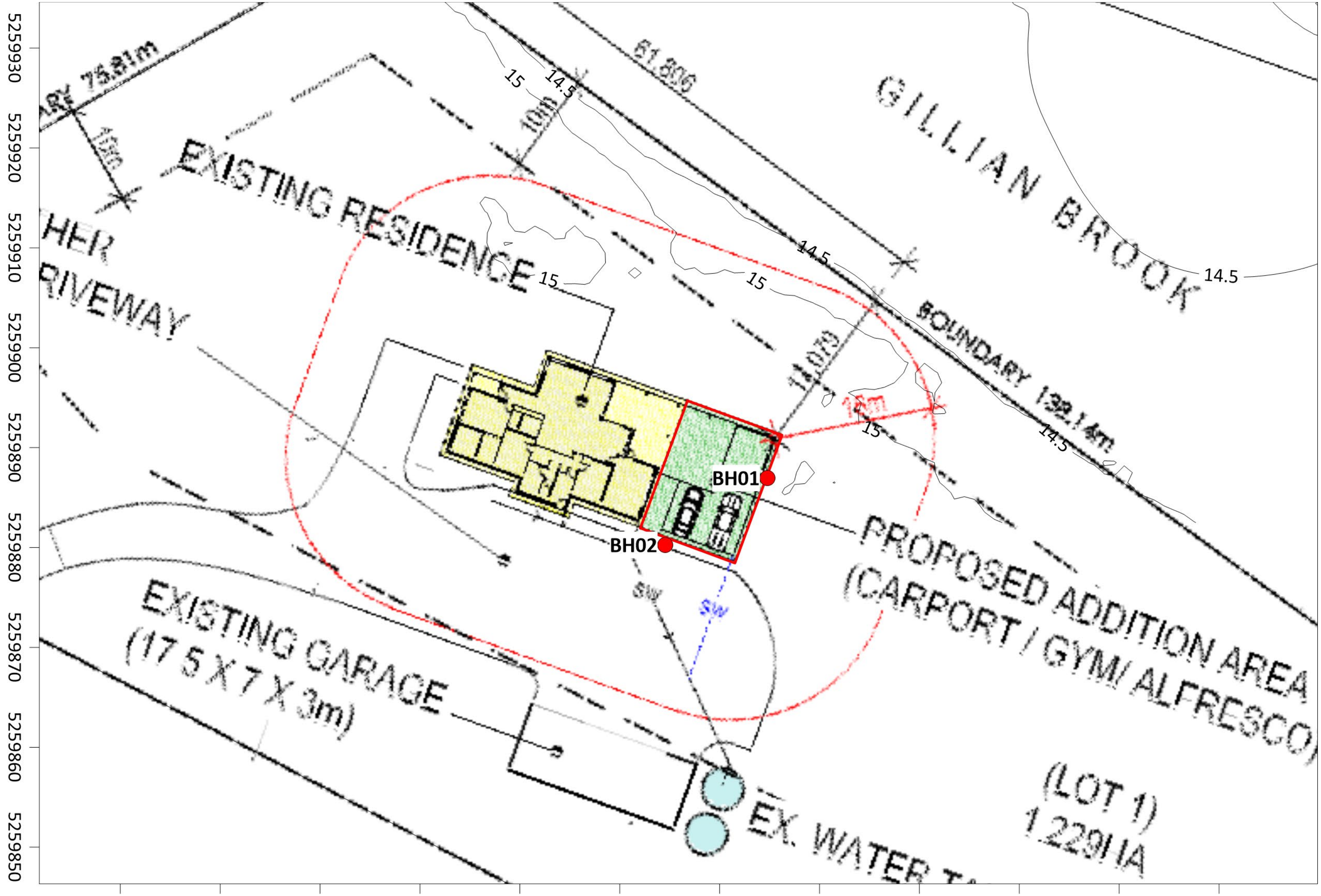


Figure 2 Site Borehole Locations

Appendix B Borehole Logs

enviro·tech CONSULTANTS

Positioning: GDA94 & mAHD

ASSESSMENT: Geotechnical Site Investigation
STRUCTURE: Addition Area
EASTING: 550455 **ACCURACY**
NORTHING: 5259887 **HORIZ:** 1m **VERT:** ~0.1m

Borehole : BH01
DATE TESTED: 20/03/2025
LOGGED BY: M. Scalisi
ELEVATION: 15

LOCATION: 11A Blackwood Drive - Forcett
CLIENT: Kevin Medhurst

EQUIPMENT: AMS Powerprobe 9120 RAP
ESTIMATED GROUND m (m AHD):

DEPTH (m)	GRAPHIC	DESCRIPTION	DENSITY CONSIST. STRENGTH	LAYER	ELEVATION (mAHD)	MOISTURE Index	%	Well	SAMPLE	TEST	Cu (kPa)	UCS (kg/cm²)	(IS50 MPa) NSPT 0 10 20 30 40	NDCP/100mm 0 5 10 15 20
0.0	CI	TOPSOIL: Silty CLAY, very dark grey, medium plasticity, with sand, trace roots, 5 % roots		2	14.9	Dry	20		DS					
	CI	Silty CLAY, dark greyish brown, medium plasticity, fine to medium grained sand, with sand, trace roots, 5 % roots		3	14.7	Dry	10		DS					
0.5	CI	Sandy CLAY, light olive brown, well sorted, medium plasticity, fine to medium grained sand		4	14.5, 14.3	Slightly Moist	12		DS					
1.0	CI	Silty CLAY, very dark olive brown, medium plasticity, fine grained sand		5	14.1, 13.9, 13.7	Wet	25		DS					
1.5		Refusal in , very dark olive brown Silty CLAY End of borehole at 1.5m depth.			13.5									

GROUNDWATER: Encountered at 0.9 m Below Ground Surface

PAGE 1 of 1

TESTING:

DS: disturbed sample; PV: pocket vane; PP: pocket penotrometer; FV: downhole field vane; U50: undisturbed 50mm sample; REF: DCP refusal enviro·tech CONSULTANTS

Positioning: GDA94 & mAHD

ASSESSMENT: Geotechnical Site Investigation
STRUCTURE: Addition Area
EASTING: 550445
NORTHING: 5259880
ACCURACY
HORIZ: 1m **VERT:** 1m

Borehole : BH02
DATE TESTED: 20/03/2025
LOGGED BY: M. Scalisi
ELEVATION: 15

LOCATION: 11A Blackwood Drive - Forcett
CLIENT: Kevin Medhurst
EQUIPMENT: AMS Powerprobe 9120 RAP
ESTIMATED GROUND m (m AHD):

DEPTH (m)	GRAPHIC	DESCRIPTION	DENSITY CONSIST. STRENGTH	LAYER	ELEVATION (mAHD)	MOISTURE Index	MOISTURE %	Well	SAMPLE	TEST	Cu (kPa)	UCS (kg/cm²)	(IS_{50} MPa) NSPT 0 10 20 30 40	NDCP/100mm 0 5 10 15 20
0.0	SW	FILL: SAND trace silt/clay, black, well sorted, medium grained sand		1	14.9	Dry	3		DS					
	CI	Silty CLAY, very dark grey, medium plasticity, fine grained sand, with sand, trace roots, 5 % roots		6	14.7	Slightly Moist	24		DS					
0.5	CI	Silty Sandy CLAY, dark olive grey, medium plasticity, fine grained sand, trace roots, 5 % roots		7	14.5	Moist	19		DS					
	CI	Silty Sandy CLAY, very dark olive brown, medium plasticity, fine to medium grained sand		8	14.3 / 14.1	Moist	17		DS					
1.0	ML	Sandy SILT, dark greyish brown, low plasticity, fine grained sand		9	13.9 / 13.7	Wet	23		DS					
1.5		Refusal in , dark greyish brown Sandy SILT End of borehole at 1.5m depth.			13.5									

GROUNDWATER: Encountered at 1 m Below Ground Surface

PAGE 1 of 1

TESTING:

DS: disturbed sample; PV: pocket vane; PP: pocket penotrometer; FV: downhole field vane; U50: undisturbed 50mm sample; REF: DCP refusal

Appendix C Core Photographs

BH01

BH02

*** 1 metre core tray length**

Appendix D Geotechnical Testing

Soil Dispersion (Emerson aggregate test)

Select soil samples were tested for sodicity using the Emerson Class number method according to AS1289.3.8.1. The results presented in Table 3 demonstrate that:

- With the exception for shallow soil Layer 2, all of the soil tested at the Site is Class 1 and considered severely dispersive.

Table 3 Summary of the Emerson class results.

Layer	Soil	Depth	Sample ID	Emersion Class	Date Tested	Water	pH
2	Silty CLAY	0	BH01 0.0	Class 3	24/03/2025	DI 18°C	6.01
6	Silty CLAY	0.2	BH02 0.2	Class 1	24/03/2025	DI 18°C	6.55
3	Silty CLAY	0.3	BH01 0.3	Class 1	24/03/2025	DI 18°C	5.79
7	Silty Sandy CLAY	0.4	BH02 0.4	Class 1	24/03/2025	DI 18°C	6.5
4	Sandy CLAY	0.8	BH01 0.8	Class 1	24/03/2025	DI 18°C	7.34
8	Silty Sandy CLAY	0.8	BH02 0.8	Class 1	24/03/2025	DI 18°C	6.76
5	Silty CLAY	1.2	BH01 1.2	Class 1	24/03/2025	DI 18°C	6.9
9	Sandy SILT	1.2	BH02 1.2	Class 1	24/03/2025	DI 18°C	6.98

Appendix E Class 1 Dispersive Soil Management

The Site may be susceptible to tunnel erosion if drainage conditions are not adequately managed. Tunnels typically initiate in cuts but can also initiate due to broken pipes or poorly managed stormwater. Tunnels will extend in an upslope direction, expanding due to dissolution of the more susceptible Class 1 and 2 soil layers with erosion of surrounding soils which may be less susceptible to dispersion but vulnerable to subsidence from undermining. Tunnel damage can extend to neighbouring properties and cause harm to infrastructure such as buildings and roads. The following document (DPIPWE 2009) provides some background information on the management of Emerson Class 1 soil.

Dispersive soils are to be managed by measures including but not limited to overland flow management, managed cut and fill, and in worst case scenarios through construction of sand barriers. Gypsum and lime can assist in stabilising batters and preventing tunnel erosion where dispersive soils are exposed with application rate guidance in accordance with Emerson Class numbers presented in Table 4.

Gypsum and hydrated lime have been proven effective in controlling erosion by displacing sodium ions in clay and replacing them with calcium, which enhances soil structure, shear strength, and erosion resilience. Higher application rates of gypsum are required for soils with higher cation exchange capacity, higher pH, and lower Emerson Class numbers.

Table 4 Prescribed gypsum and hydrated lime application rates – see Emerson soil testing results

Dispersive soil Emerson class	Gypsum/Hydrated Lime Application Rate pH < 7.5	Gypsum Application Rate pH > 7.5
Class 3	0 to 0.3 kg/m2	0.2 – 0.5 kg/m2
Class 2	0.5 kg/m2	1.0 kg/m2
Class 1	1.0 kg/m2	1.5 kg/m2

Where possible, vehicle driveway and parking areas should be situated on level or gently sloping land to avoid causing unnecessary deep cuts and disturbance to dispersive soils identified at the Site.

General Recommendations

It is recommended that the following measures are put in place to limit the disturbance to CLASS 1 soils:

- Site drainage control involving construction of soil cut off mounds and/or trenches in non-dispersive soil no deeper than 0.2m above class 1 dispersive soils. Drains are to be placed upslope of any proposed cuts.
- Apply gypsum or hydrated lime where severely dispersive soils are exposed to surface water movement including but not limited to freshly cut embankments, filled areas, service trenches, and areas where topsoil has been removed
- Surfacing all severely dispersive soils with paving or non-dispersive topsoil.
- Placing nondispersive topsoil over freshly cut batters.
- Where tunnels have already established, natural and manmade drainage gullies will need further attention including but not limited to creating sand barriers and in extreme cases drainage rock and geotextile barriers. If correctly designed, barriers will assist in bringing water the surface, where is can be channelled away from areas at risk.

Permanent Cuts

- Surface water drainage can erode dispersive soils in embankment cuts. Groundwater discharge may worsen tunnel erosion.
- The initial step in earthworks is usually to remove nondispersive topsoil layers, which often protects underlying dispersive soils from erosion.
- If cuts are necessary, a measure for managing dispersive soil is to create a barrier:
  - prepare a sand barrier over the cut;
  - instate an earth retaining wall in front of the cut.
- These management measures must be implemented immediately after excavation to prevent tunnel formation.
- Low height retaining walls (e.g., sleepers) at the base of cuts can help retain eroding sand to assist in maintaining sand barrier.

Sand Barriers

- Gypsum or hydrated lime at a rate indicated in Table 4.
- At least 100mm thickness of SAND
- Topsoil to retain the underlying sand
- Effective erosion control (see erosion control section)

Retaining Walls

- It is advised to build retaining walls on bedrock or non-dispersive soils. Gypsum or hydrated lime helps to reduce erosion.
- When retaining walls are proposed, freshly cut surfaces in Class 1 soils should be stabilized with gypsum or hydrated lime at the rate indicated in Table 4.
- Apply a 0.2 m sand layer on the cuts before adding drainage cloth and aggregate

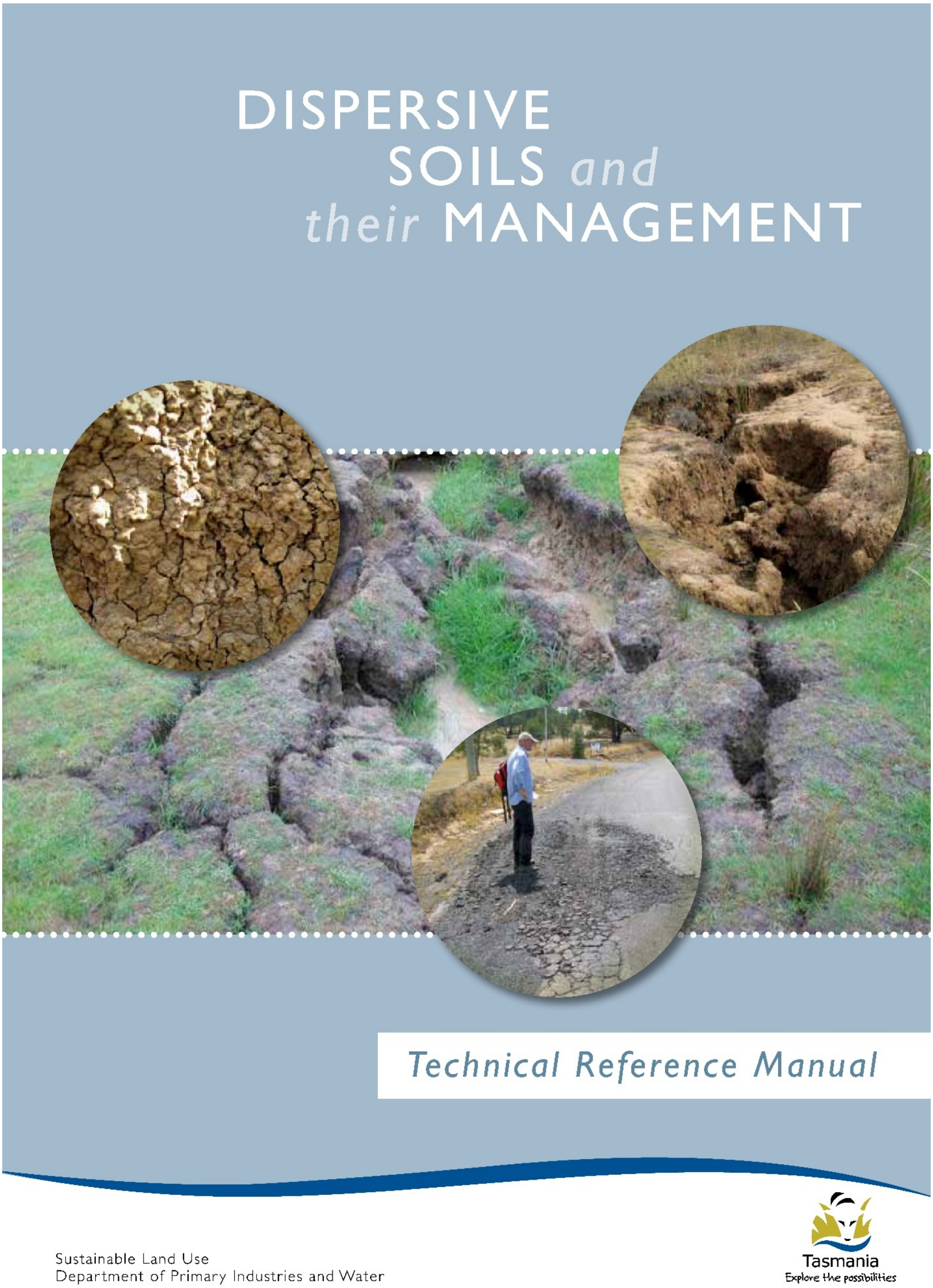
Drainage

- Divert surface water and groundwater from the crest and toe of cuts.
- A sealed drain at the toe is crucial to stop water from crossing freshly cut dispersive soil and moving through dispersive fill layers beneath paved areas.
- For optimal surface drainage on Class 1 soils, concrete spoon drains are recommended rather than earthen swale drains.
- For earthen swale drains, apply gypsum or hydrated lime to Class 1 soils at a rate based on the soil pH. A liner such as a 20mm layer of bentonite may be placed beneath topsoil and grass to prevent water ingress.
- Subsurface drains in Class 1 soils are required to be backfilled with a mixture of sand and 2% gypsum or hydrated lime.
- Divert water from groundwater discharge points using a non-perforated drainage pipe.

Filling

- Dispersive soil used as fill on a site is susceptible to tunnel erosion.
- Groundwater can move along the FILL layer base, causing dispersive soils to erode.
- Any proposed filling, especially in areas near building structures, should be carefully managed. This can be achieved by either completely removing the Class 1 soil from the building footprint or treating the dispersive soil by applying gypsum or hydrated lime to the surface of the compacted soil layers.
- If choosing the gypsum or hydrated lime treatment option, 300mm lifts should be managed according to the application rates shown in Table 4. If 150mm lifts are proposed, the gypsum or hydrated lime application rate should be halved.
- Ensure all soil at the site is well compacted, especially around planned building structures, and close to the optimum moisture content.
- Paving filled surfaces greatly reduces tunnel erosion risks if cut-off drains are installed to prevent water seepage through the fill base.
- Where permissible, pavement and spoon drains at the toe of cut batters should intersect with nondispersive soil or bedrock. This ensures that all surface water is intercepted, thereby preventing any migration of water beneath the pavement.
- Topsoil is usually removed before adding fill. If the topsoil is slightly dispersive (Class 3) or non-dispersive (Class 4+), it may be replaced with a liner or non-dispersive soil.

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



4.1 MANAGEMENT OPTIONS FOR TUNNEL EROSION

Past efforts to repair tunnel erosion in agricultural landscapes have relied on mechanical destruction of the tunnel system by deep ripping, contour furrowing, and contour ripping. Unfortunately many of these techniques either failed or resulted in tunnel re-emergence in an adjacent areas (Floyd 1974, Boucher 1995). The use of these 'agricultural' techniques is inappropriate in peri-urban areas where tunnel repair requires a low incidence of re-failure due to the potential for damage to infrastructure. Experience with the construction of earth dams using dispersive clays, demonstrates that repair and prevention of tunnel erosion in urban and peri-urban environments is best achieved using a combination of,

» Identification and avoidance of dispersive soils.

» Precise re-compaction.

» Chemical amelioration.

» Sand blocks and barriers.

» Topsoil, burial and revegetation.

4.2 IDENTIFICATION AND AVOIDANCE OF DISPERSIVE SOILS

The risk of tunnel erosion resulting from construction activities on dispersive soils can often be reduced or eliminated by identifying and avoiding areas containing dispersive soils. The presence and severity of dispersive soils can vary enormously over short distances (Figure 13). In many instances, large scale (ie 10 x 10 or 20 x 20 meter grid) soil survey and screening of soils for dispersion, (using the Emerson crumb test - section 3, Appendix I) can be used to site dwellings and infrastructure away from dispersive soils. Advice should be sought from a suitably qualified and experienced engineer or soil professional.

Figure 13. The severity (or sodium content) and depth of dispersive subsoils can vary considerably over short distances. (a). At this site highly dispersive subsoils exist meters away from (b) non-dispersive soils.

4.3 COMPACTION

Ritchie (1965) demonstrated that the degree of compaction within the dam wall was the single most important factor in reducing dam failure from piping (tunnel erosion). A high degree of compaction reduces soil permeability, restricting the movement of water and dispersed clay through the soil matrix, which decreases the severity of dispersion and restricts tunnel development (Vacher *et al.* 2004). However, dispersive soils can be difficult to compact as they lose strength rapidly at or above optimum moisture content, and thus may require greater compactive force than other soils (McDonald *et al.* 1981). Bell & Bryun (1997) and Bell and Maud (1994) suggest that dispersive clays must be compacted at a moisture content 1.5 -2% above the optimum moisture content in order to achieve suficent density to prevent piping (Elges 1985).

> Construction of structures such as earth dams and footings for buildings with dispersive soils require geotechnical assessment and advice from a qualified and experienced engineer, in order to determine compaction measures such as the optimal moisture content, number of passes, and maximum thickness of compacted layers.

Normal earth moving machinery including bull-dozers, excavators and graders do not provide sufficient compactive force to reduce void spaces or achieve adequate compaction in dispersive soils. A sheepsfoot roller of appropriate weight is usually required to compact dispersive soils. By comparison a D6 dozer applies only 0.6 kg/cm^2 pressure compared to 9.3 kg/cm^2 for a sheepsfoot roller (Sorensen 1995).

4.4 CHEMICAL AMELIORATION

Initiation of tunnel erosion is predominantly a chemical process, so it makes sense to use chemical amelioration strategies when attempting to prevent or repair tunnel erosion in dispersive soils. Despite the widespread use of gypsum and lime to treat sodic soils in agriculture, the use of gypsum and lime to treat tunnel affected areas has been relatively rare (Boucher 1990).

Hydrated lime (calcium hydroxide) has been widely used to prevent piping in earth dams. Rates of application have varied depending on soils and degree of compaction used in construction. Laboratory testing usually indicates that only around 0.5 – 1.0% hydrated lime is required to prevent dispersion, however difficulties with application and mixing necessitate higher rates of application (Moore *et al.* 1985). Moore *et al.* (1985) cite examples of the use of hydrated lime to control piping in earth dams at rates between 0.35% (N.S.W. Australia) and 4% (New Mexico). Elgers (1985), and McElroy (1987) recommend no less than 2% hydrated lime (by weight of the total soil material) to prevent dispersion within dam embankments, while Bell and Maud (1994) suggest that 3% - 4% by mass of hydrated lime should be added to a depth of 0.3m on the upper face of embankments. In alkaline (pH >7.0) soils (most sodic subsoils in Tasmania are neutral or alkaline) the effectiveness of hydrated lime is reduced by the formation of insoluble calcium carbonate (Moore *et al.* 1985), such that gypsum is preferred to hydrated lime. It is important to note that agricultural lime (calcium carbonate) is not a suitable substitute for hydrated lime due to its low solubility (McElroy 1987). Also note that excessive applications of lime may raise soil pH above levels required to sustain vigorous plant growth.

Gypsum (calcium sulphate) is more effective than lime for the treatment of dispersive soils as it increases the electrolyte concentration in the soil solution as well as displacing sodium with calcium within the clay structure (Raine and Loch 2003). Gypsum is less commonly used than hydrated lime in dam construction and other works due to its lower solubility, and higher cost. Elges (1985) recommends that in construction, a minimum of 2% by mass of gypsum be used. Bell and Maud (1994) present a means of calculating the amount of gypsum required to displace excess sodium and bring ESP values within desired limits (normally < 5). Be aware that application of excessive amounts of gypsum may cause soil salinity to temporarily rise beyond the desired level for plant growth.

NOTE:

- Use of gypsum in Tasmania is covered under the Fertiliser Act 1993, which has established the allowable limit for cadmium and lead at 10 mg/kg and 5 mg/kg for mercury.
- Gypsum is usually imported into Tasmania from Victoria or South Australia, which have different standards for allowable heavy metal content.
- Purchasers of gypsum should check with suppliers to ensure that gypsum imported into Tasmania is compliant with current regulations.

Alum (aluminium sulphate) has been effectively used to prevent dam failure and protect embankments from erosion. Application rates are not well established. Limited data suggests mixtures of 0.6 – 1.0% (25% solution of aluminium sulphate) (Bell and Bruyn 1997, McElroy 1987) to 1.5% (Ouhadi, and Goodarzi 2006) of the total dry weight of soil may be appropriate. Alum is however highly acidic (pH 4-5), and thus alum treated soils will need to be capped with topsoil in order to establish vegetation (Ryker 1987). Soil testing is required to establish appropriate application rates for Tasmanian soils.

Long chain polyacrylamides have been shown to increase aggregate stability, reduce dispersion and maintain infiltration rates in dispersive soils (Levy *et al.* 1992, Raine and Loch 2003). However the effect is highly variable between various polyacrylamide products and the chemical and physical properties of the soil. The benefit of polyacrylamides is generally short due to their rapid degradation (Raine and Loch 2003). Further advice and laboratory testing should be conducted before using polyacrylamides to protect earth dams from piping failure.

Note that appropriate application rates for gypsum, hydrated lime, alum and polyacrylamides have not been established for dispersive soils in Tasmania. Extensive laboratory assessment of materials used for the construction of dams or embankments is required before locally relevant 'rules of thumb' can be established for the use of these products.

4.5 SAND BLOCKS AND SAND BARRIERS

Sand filters were first developed to prevent piping in earth dams. Sand filters prevent dam failure by trapping entrained sand and silt, blocking the exit of the tunnel and preventing further tunnel development (Sherard *et al.* 1977). Following the work of Sherard *et al.* (1977), Richley (1992 and 2000) developed the use of sand blocks to prevent tunnel erosion during installation of an optical fibre cable in highly dispersive soils near Campania, Tasmania. The sand blocks work slightly differently to the sand filters in that they allow the free water to rise to the surface through the sand. The use of sand blocks has recently been modified by Hardie *et al.*, (2007) to prevent re-initiation of tunnel erosion along an optical fibre cable near Dunalley. Modifications to the original technique developed by Richley (1992 and 2000) include (Figure 14 &15);

- » Upslope curved extremities to prevent the structure from being by-passed.
- » Geotextile on the downslope wall to prevent collapse or removal of sand following settlement or erosion.
- » Application of gypsum (around 5% by weight) to ensure infiltrating water contains sufficiently electrolyte to prevent further dispersion.
- » Earth mound upslope of the structure to prevent run-on entering the sand blocks.

Figure 15. (a) Installation of sandblock perpendicular to a service trench. Note securing of geotextile to the optical fibre cable to prevent water flowing past the sand block. (b) Sandblock before final topsoiling.

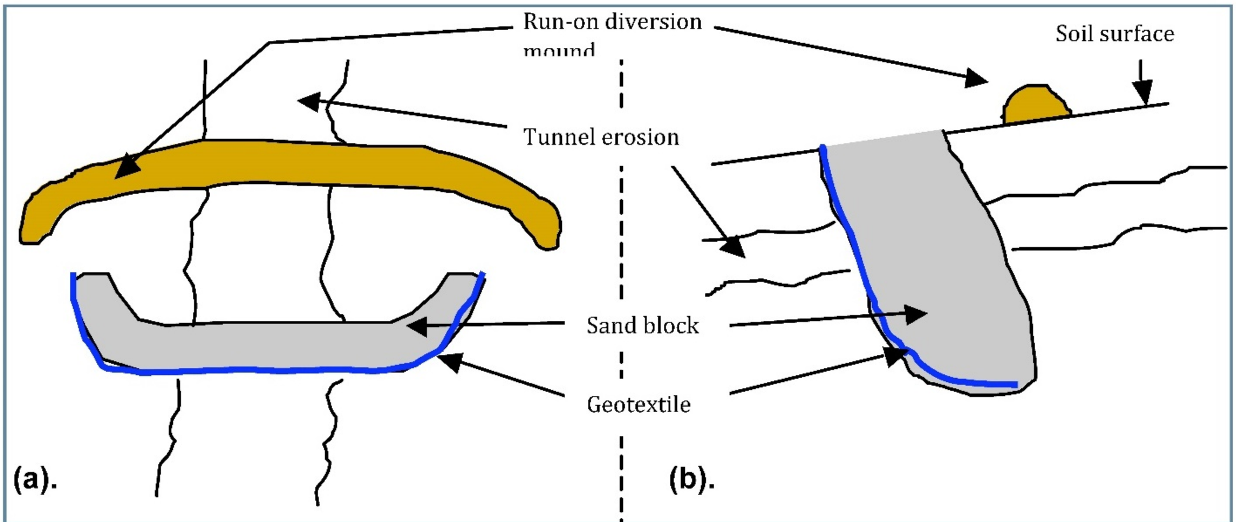


Figure 14. Modified sand block design. (a) plan view, (b) cross section view. The depth of the sand block is determined by the depth of dispersive soils or tunnel erosion. The span length of the structure is determined by the width of the tunnelling.

4.6 USE OF TOPSOIL / BURIAL AND REVEGETATION

Topsoil or burial of exposed dispersive soils reduces the likelihood of subsoil dispersion and initiation of tunnel erosion by;

- Providing a source of salt to increase the electrolyte content of infiltration water.
- Preventing desiccation and subsoil cracking.
- Promoting even infiltration.
- Providing a protective cover from raindrop impact.
- Providing a suitable medium for revegetation.

Topsoil minimises the interaction between water and dispersive clays by providing both a physical and chemical barrier. Topsoil also reduces soil desiccation and development of surface cracks (Sorensen 1995). It is suggested that exposed dispersive subsoils be covered with at least 150mm of non dispersive topsoil and sown with an appropriate mix of grass species. In some cases it will be necessary to protect the topsoil from erosion with 'jute' cloth or similar product.

The suitability of planting trees in tunnel affected areas is influenced by the amount of annual rainfall and frequency of soil cracking resulting from desiccation. Boucher (1995) recommends the preferred option for revegetation of reclaimed tunnel erosion is a widely spaced tree cover in association with a combination of perennial and annual pastures, rather than a dense stand of trees or pasture alone. Experience in Tasmania suggests that in low rainfall areas, or areas in which existing trees or shrubs cause soil drying and cracking, the preferred option for revegetating tunnel affected land is a dense healthy pasture. In high rainfall areas, dense plantings of trees have been successfully used to repair or stabilise tunnel erosion for example Colclough (1973) successfully used Pinus radiata to stabilise tunnel-gully affected land in a moderate rainfall area near Tea Tree, Tasmania.

5.0 ACTIVITIES THAT INCREASE THE RISK OF EROSION ON DISPERSIVE SOILS

ACTIVITIES THAT INCREASE RISK OF INITIATING TUNNEL EROSION, INCLUDE;

» Removal of topsoil.

» Soil excavation or expose of subsoils to rainfall.

» Supply of services via trenches.

» Construction of roads and culverts in dispersive subsoils.

» Installation of sewage and grey water disposal systems in dispersive subsoils.

» Dam construction from dispersive soils.

OPTIONS FOR REDUCING THE RISK OF TUNNEL EROSION DURING CONSTRUCTION AND DEVELOPMENT WORKS ON DISPERSIVE SOILS INCLUDE,

» Where possible do not remove or disturb topsoil or vegetation.

» Ensure that dispersive subsoils are covered with an adequate layer of topsoil.

» Avoid construction techniques that result in exposure of dispersive subsoils.

» Use alternatives to 'cut and fill' construction such as pier and post foundations.

» Where possible avoid the use of trenches for the supply of services ie water & power.

» If trenches must be used, ensure that repacked spoil is properly compacted, treated with gypsum and topsoiled.

» Consider alternative trenching techniques that do not expose dispersive subsoils.

» Ensure runoff from hard areas is not discharged into areas with dispersive soils.

» If necessary create safe areas for discharge of runoff.

» If possible do not excavate culverts and drains in dispersive soils.

» Consider carting non-sodic soil to create appropriate road surfaces and drains without the need for excavation.

» Ensure that culverts and drains excavated into dispersive subsoils are capped with non-dispersive clays mixed with gypsum, topsoiled and vegetated.

» Avoid use of septic trench waste disposal systems; consult your local council about the use of alternative above ground treatment systems.

» Where possible do not construct dams with dispersive soils, or in areas containing dispersive soils.

» If dams are to be constructed from dispersive clays, ensure you consult an experienced, qualified civil engineer to conduct soil tests before commencing construction.

» Construction of dams from dispersive soils is usually possible, using one or a combination of: precise compaction, chemical amelioration, capping with non-dispersive clays, sand filters and adequate topsoiling.

With all forms of construction on dispersive soils, ensure you obtain advice and support from a suitably experienced and qualified engineer or soil professional before commencing work.

Foundation Maintenance and Footing Performance: A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

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

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

Soil Types

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

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

Causes of Movement

Settlement due to construction

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

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

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

Erosion

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

Saturation

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

Seasonal swelling and shrinkage of soil

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

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

Shear failure

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

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

GENERAL DEFINITIONS OF SITE CLASSES

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

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

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

Unevenness of Movement

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

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

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

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

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

Effects of Uneven Soil Movement on Structures

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

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

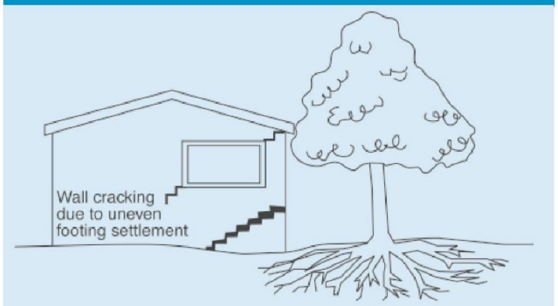
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

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

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

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

Trees can cause shrinkage and damage



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

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

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

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

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

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

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

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

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

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

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

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

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

Water Service and Drainage

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

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

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

Prevention/Cure

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

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

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

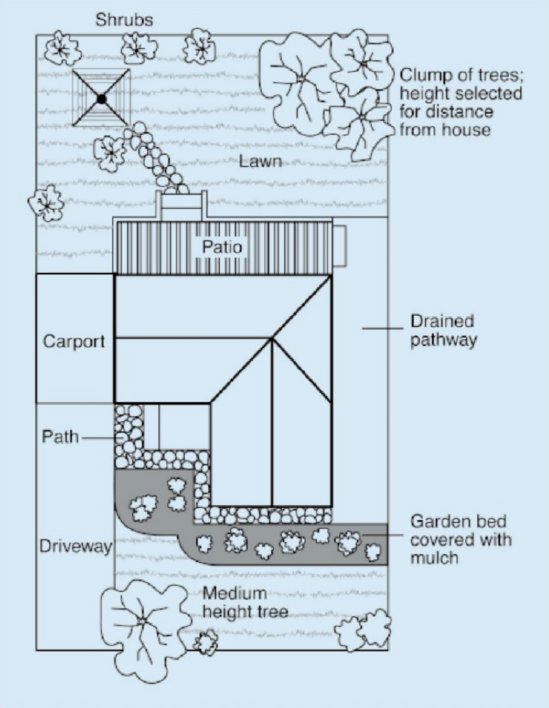
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

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

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

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

Gardens for a reactive site



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

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

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

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

Condensation

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

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

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

The garden

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

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

Existing trees

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

Information on trees, plants and shrubs

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

Excavation

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

Remediation

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

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

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

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CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE ITEM

Section 321

Form 55

To: Kevin Medhurst — *Owner /Agent*

11A Blackwood Dr — *Address*

Forcett TAS 7173 — *Suburb/postcode*

Qualified person details:

Qualified person: Kris Taylor

Address: 162 Macquarie Street, Hobart 7000

Phone No: 036224 9197

Fax No:

Licence No: NA

Email address: office@envirotechtas.com.au

Qualifications and Insurance details: Bachelor of Science with Honours in Geology. Lloyd's Underwriters: soil and rock mechanics, soil and rock testing

(description from Column 3 of the Director's Determination - Certificates by Qualified Persons for Assessable Items

Speciality area of expertise: Geo-technical Reports

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

Details of work: Geotechnical Site Investigation

Address: 11A Blackwood Drive, Forcett 7173

Lot No: 1

Certificate of title No: 166028/1

The assessable item related to this certificate: Geotechnical Site Investigation written in accordance with AS1726 by a geotechncial practitioner with appropriate experience, training and qualifications.*

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

Certificate details:

Certificate type: Geotechnical including landslide risk assessment in accordance with "Practice Note Guidelines for Landslide Risk Management 2007" published by the Australian Geomechanics Society.*

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

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

(●) building work, plumbing work or plumbing installation or demolition work

OR

( ) a building, temporary structure or plumbing installation

In issuing this certificate the following matters are relevant –

Documents:	Enviro-Tech Consultants Pty. Ltd. 2025. Geotechnical Site Investigation for a Proposed Addition Area, 11A Blackwood Drive - Forcett. Unpublished report for Kevin Medhurst by Enviro-Tech Consultants Pty. Ltd., 20/03/2025.
Relevant calculations:	
References:	- AS1726-2017 Geotechnical Site Investigations

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

- An assessment of:
- Foundations for proposed building structures.*

Scope and/or Limitations

The Geotechnical Site Investigation applies to the Site and Project Area as inspected and does not account for future alteration to foundation conditions as a result of earth works, drainage condition changes or variations in site maintenance which are not included within the provided plans.

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

I certify the matters described in this certificate.

	Signed:	*Certificate No:*	*Date:*
Qualified person:			20/03/2025

Sorell Council

Development Application: 5.2025.47.1 - Development Application - 11a Blackwood Drive Forcett - P1.pdf
Plans Reference:P1
Date Received:27/02/2025

DWG: 00 - CONCEPTUAL 3D IMAGES

JOB: ALTERATIONS AND ADDITIONS
ADDRESS: 11A BLACKWOOD DRIVE FORCETT 7173
CLIENT : KEVIN MEDHURST

ISSUE : DEVELOPMENT APPLICATION

TITLE REF: 166028/1

DRAWING INDEX:

Belinda Weston
Mark Day

155 Fergusson Rd,
Brighton. TAS. 7030

Ph : 03 62680063

M : 0409 537 337
or 0434 147 747

Email : duodesign@bigpond.com

DUO DESIGN

BUILDER MUST VERIFY ALL DIMENSIONS AND LEVELS PRIOR TO COMMENCING CONSTRUCTION

USE WRITTEN DIMENSIONS-DO NOT SCALE

ALL CONSTRUCTION WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE STATE BUILDING REGULATIONS LOCAL COUNCIL BY-LAWS AND CURRENT NCC

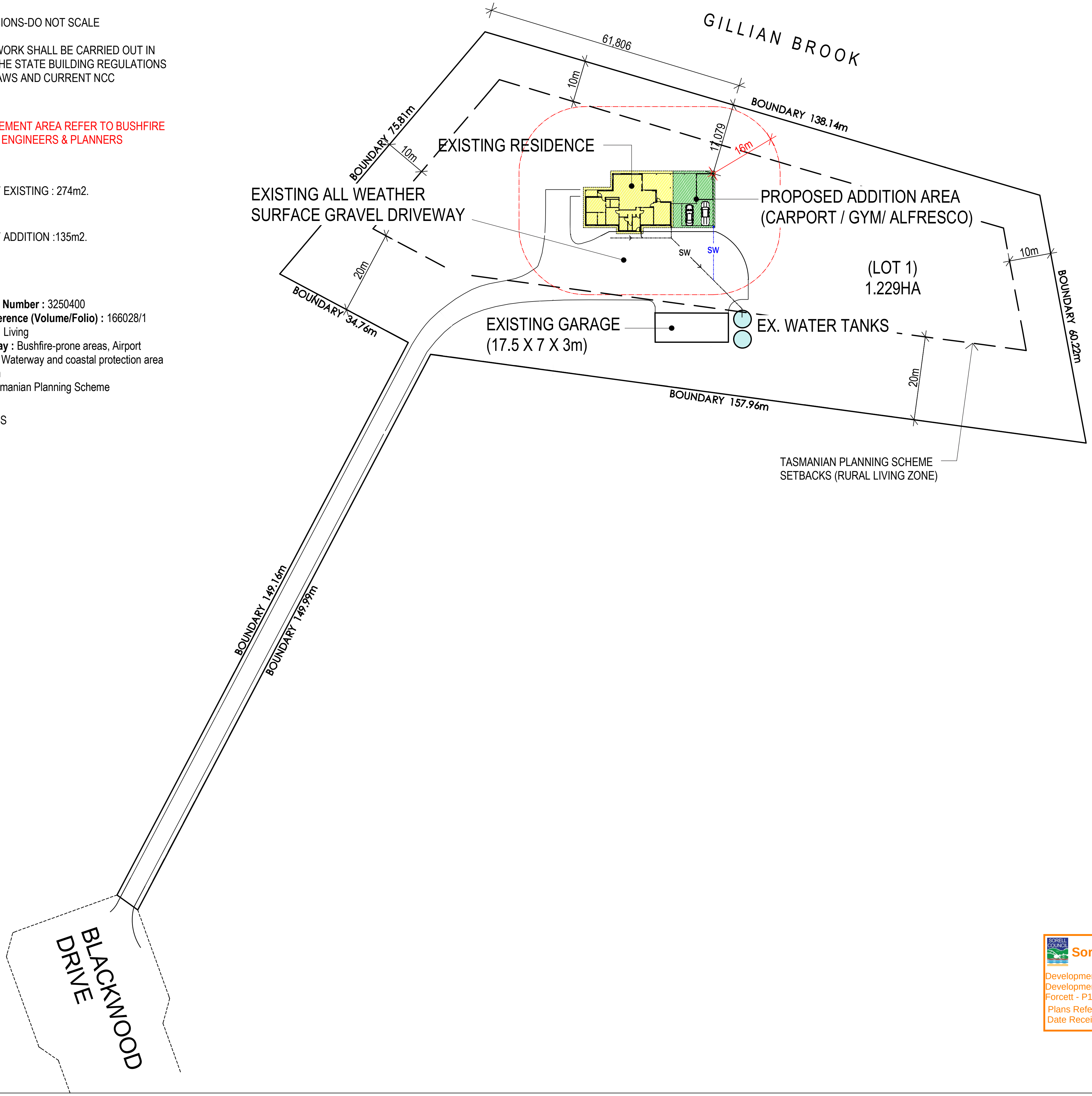
16m MIN. FIRE MANAGEMENT AREA REFER TO BUSHFIRE ASSESSMENT BY JMG ENGINEERS & PLANNERS

ROOF AREA OF EXISTING : 274m2.

ROOF AREA OF ADDITION :135m2.

Property Identification Number : 3250400
Certificate of Title Reference (Volume/Folio) : 166028/1
Planning Zones : Rural Living
Planning Codes Overlay : Bushfire-prone areas, Airport obstacle limitation area, Waterway and coastal protection area
Total Area : 12290 sqm
Planning Scheme : Tasmanian Planning Scheme

CAR PARKING SPACES
EXISTING : 3
PROPOSED : 2
TOTAL : 5



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JOB : PROPOSED ALTERATIONS & ADDITIONS

AT : 11A BLACKWOOD DRIVE FORCETT TAS 7173

FOR : KEVIN MEDHURST

DRAWING TITLE :

SITE PLAN

DRAWN:	DATE:	DWG NO. :
MJD	14.2.2025	01
SCALE: 1:1000	ISSUE: DA	

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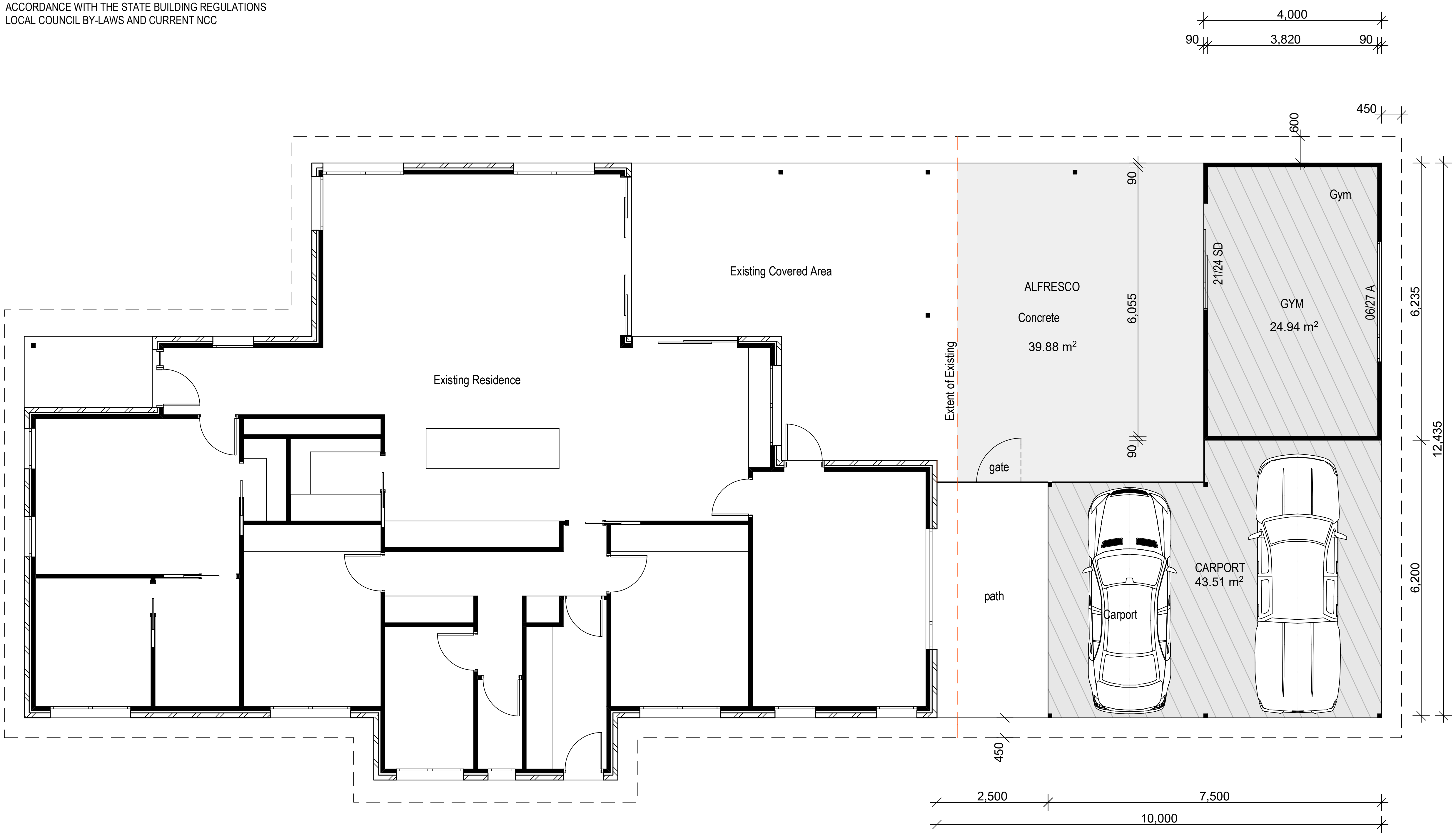

FLOOR AREAS
EXISTING RESIDENCE : 197.50 m2, 21.25 Squares

PROPOSED CARPORT : 43.51m2
PROPOSED GYM : 24.94m2
PROPOSED AFLRESCO : 39.88m2

Sorell Council
Development Application: 5.2025.47.1 - Development Application - 11a Blackwood Drive Forcett - P1.pdf
Plans Reference:P1
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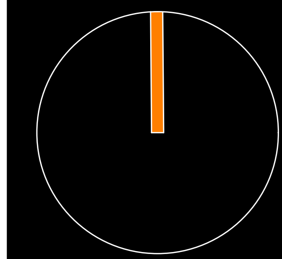

JOB : PROPOSED ALTERATIONS & ADDITIONS

AT : 11A BLACKWOOD DR FORCETT 7173

FOR : KEVIN MEDHURST

DRAWING TITLE :

PROPOSED FLOOR PLAN

DRAWN:	DATE:	DWG NO. :
BJW	14.02.2025	02
SCALE:A3	ISSUE:	
1:100	DA	

DUO DESIGN

BUILDER MUST VERIFY ALL DIMENSIONS AND LEVELS
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USE WRITTEN DIMENSIONS-DO NOT SCALE

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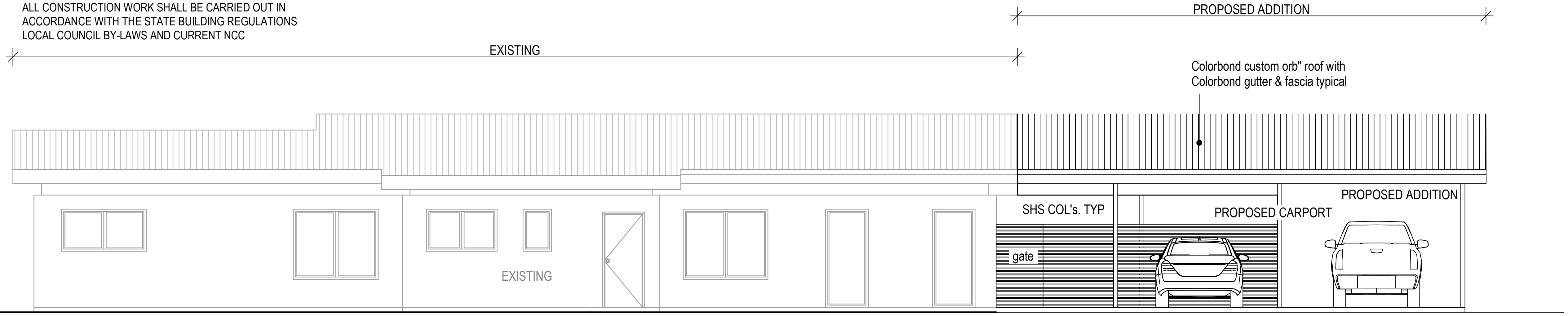
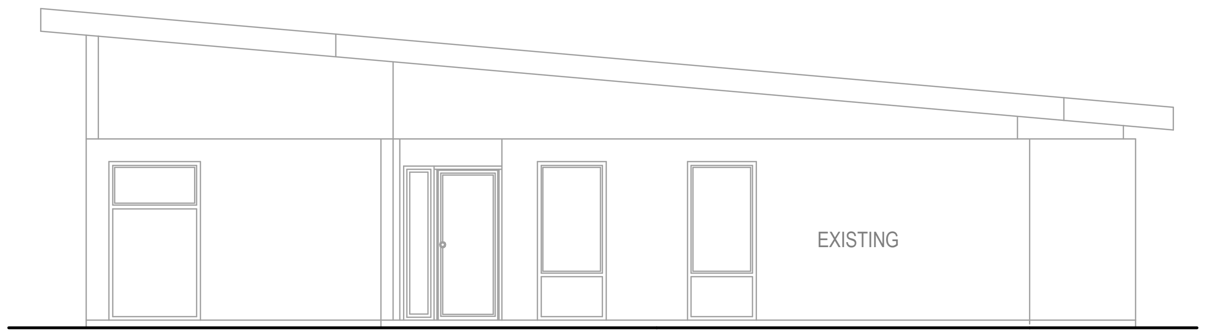
LOCAL COUNCIL BY-LAWS AND CURRENT NCC

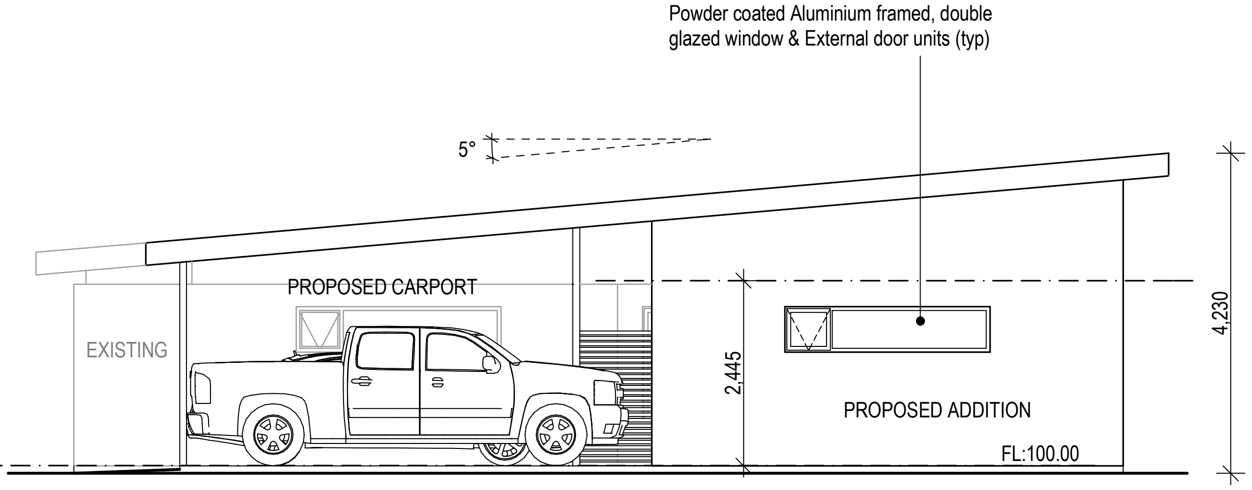
PROPOSED COLOURS:-
ROOF: MID. GREY OR EQUIVALENT TO MATCH EXISTING
WALLS: LIGHT GREY OR EQUIVALENT TO MATCH EXISTING



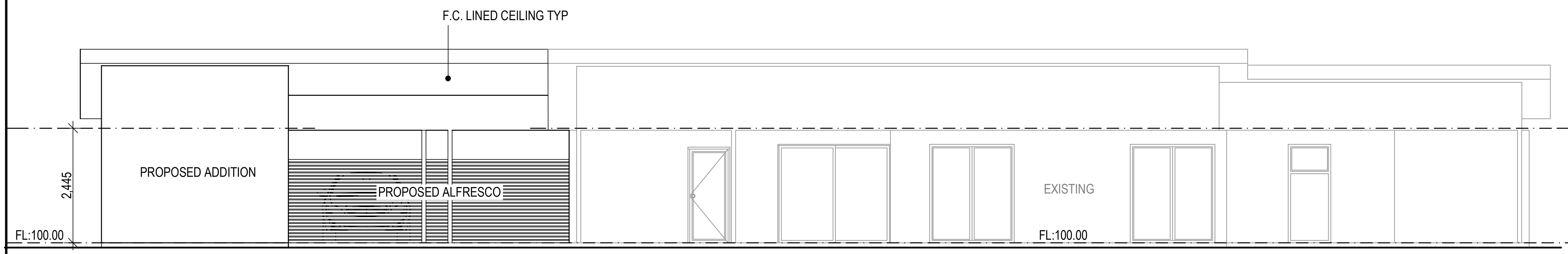
SOUTH - ELEVATION



WEST - ELEVATION



EAST - ELEVATION



NORTH - ELEVATION

Sorell Council
Development Application: 5.2025.47.1 -
Development Application - 11a Blackwood Drive
Forcett - P1.pdf
Plans Reference:P1
Date Received:27/02/2025

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JOB : PROPOSED ALTERATIONS & ADDITIONS

AT : 11A BLACKWOOD DR FORCETT 7173

FOR : KEVIN MEDHURST

DRAWING TITLE :

ELEVATIONS

DRAWN:	DATE:	DWG NO. :
BJW	14.02.2025	03
SCALE:A3	ISSUE:	
1:100	DA	

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