PROPOSED UNITS

SHEET INDEX

PAGE:	DRAWING TITLE:
	COVER SHEET
1	SITE PLAN
2	GROUND AND FIRST FLOOR PLAN U7-10
3	SECOND FLOOR AND ROOF PLAN U7-10
4	ELEVATIONS UNITS 7 AND 8
5	SECTIONS UNITS 7 AND 8
6	ELEVATIONS UNITS 9 AND 10
7	SECTIONS UNITS 9 AND 10

IMPORTANT NOTICE:

1. All work is to be completed in accordance with the current Building Codes (BCA), Australian Standards (AS), Local authority by-laws, workplace health and safety standards & in accordance with the recognised building industry standard of good building practice.

2. All materials, finishes & equipment to be installed in accordance with the manufacturers specifications.

3. Written dimensions are preferred to scaling. All dimensions are to be verified on site prior to setout, construction and fabrication.

4. Any discrepancy, ambiguity and any contradictory information in these documents and any obvious omissions are to be brought to the attention of the Architect immediately as they become apparent.

5. All ground levels are approximates only.

6. All plumbing and draining is to comply with standard sewerage by-laws and requirements of the local authority.

7. Stormwater system to local council requirements.

8. All stairs are to be 190mm maximum risers and 240 minimum goings.

9. All fixtures, appliance & plumbing symbols are diagrammatic only & to be selected by clients.

10. Driveways, paths, clothes lines, storm water lines, landscaping, letter box, hot water system and ground sumps are diagramatic only.

11. Whilst every care has been taken in the preperation of this document the client should undertake their own review of the documentation in order to satisfy themselves as to the accuracy of the details.

PROJECT NOTES:

LOCAL AUTHORITY:	Launceston City Council
BUILDING CLASS:	1a
BUILDING ZONE:	General Residental
PREVAILING WINDS:	N/W
DESIGN WIND SPEED:	Region A1-A5, N1
SOIL CLASSIFICATION:	Refer to engineers documents where applicable
CLIMATIC ZONE:	7
BAL:	Low. No unmaintained open spaces or bushland within 100m

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED

ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
COVER

SCALE: 1:1 @ A3

CLIENT:
ANDREW MCCULLUGH

DATE:
MAR 2015

REV.	DATE	AMENDMENTS
1.	06.07.16	f.i.r- DA0618/2015: Prescribed building envelopes altered to suit corner lot. Parking and turning templates added to site plan. Rubbish bin collection locations added. Driveway altered. Existing driveway and services shown. U7&8 Shadow analysis on U5&6. refer to planning analysis.

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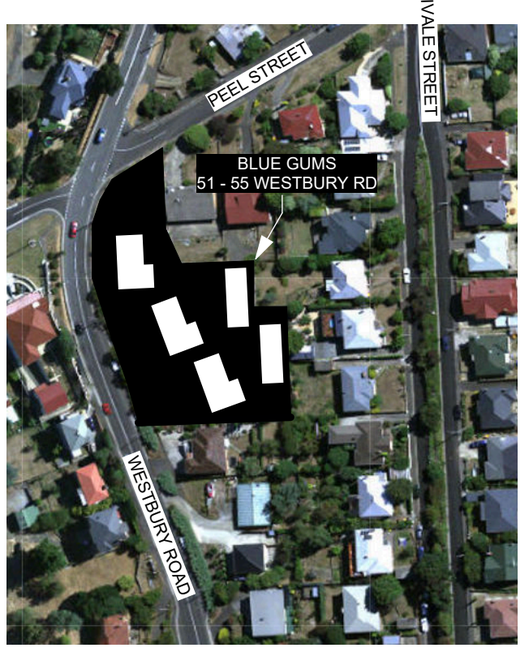
DA 1510.1

SP134959

TITLE REFERENCE- 169594/1
PROPERTY ID- 2042829



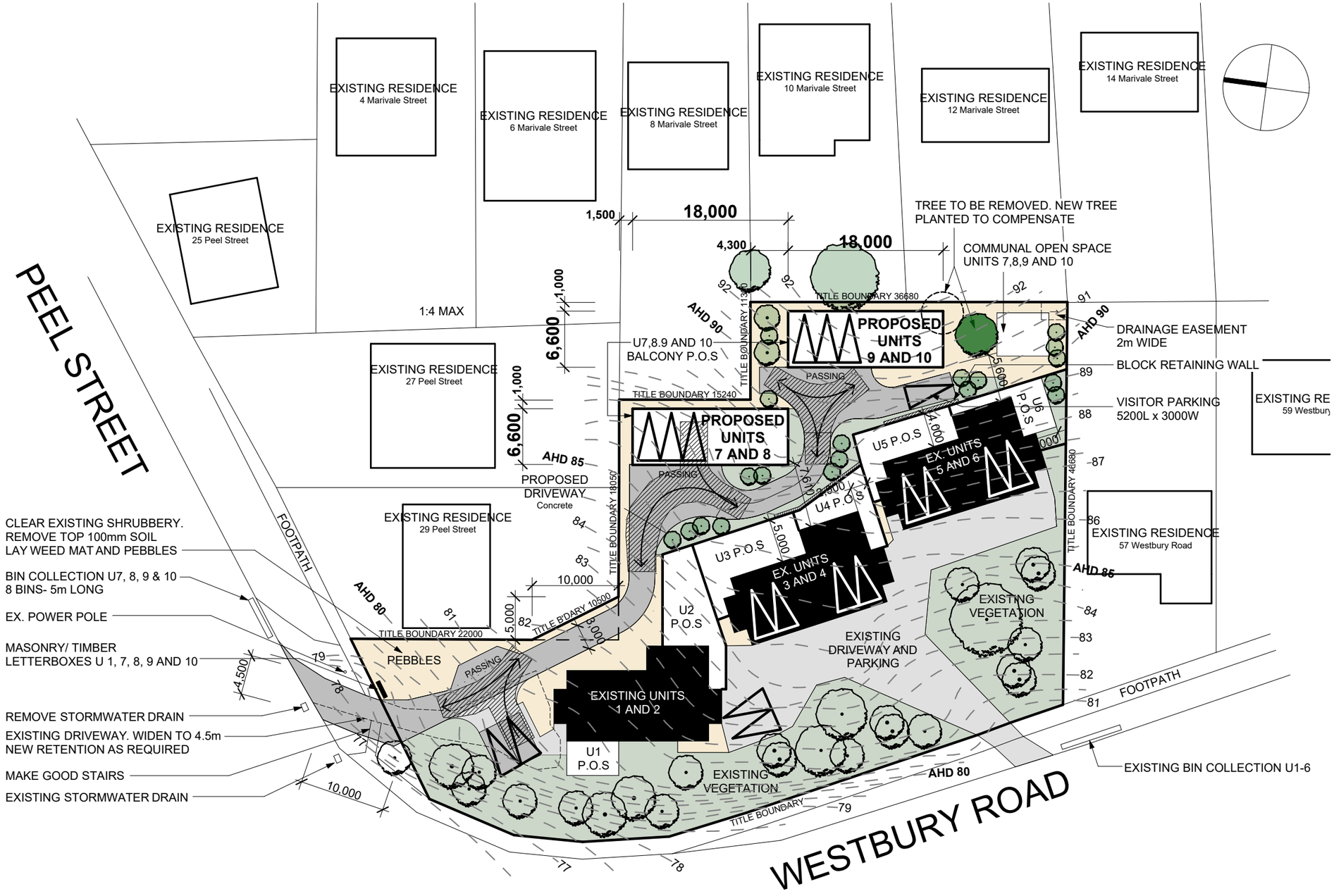
NTS
LOCATION PLAN

AREAS:

TOTAL SITE: 3269.4m² / 10 = 326.94m² per UNIT
SITE COVERAGE: 22.14 %
PERVIOUS SURFACES: 51.49%
UNIT 7, 8, 9, 10 FLOOR AREA inc. stairs and balcony: 106m²
BALCONY: 15.9m² P.O.S / UNIT
STAIRS: 6.8m²
UNITS 7-10 GARAGE FLOOR AREA: 90m²

B99 TURNING PATH

NOTE: CONTOUR LINES @ APPROX. 0.5m INTERVALS



PROJECT: **PROPOSED UNITS- 2x 2 BED AND 2x 1 BED** ADDRESS: **51-55 WESTBURY ROAD, SOUTH LAUNCESTON**	DRAWING TITLE: **LOCATION AND SITE PLAN** SCALE: 1:500 @ A3	CLIENT: ANDREW MCCULLUGH DATE: MAR 2015	REV. 1.	DATE 06.07.16	AMENDMENTS f.i.r- DA0618/2015: Prescribed building envelopes altered to suit corner lot. Parking and turning templates added to site plan. Rubbish bin collection locations added. Driveway altered. Existing driveway and services shown. U7&8 Shadow analysis on U5&6. refer to planning analysis.

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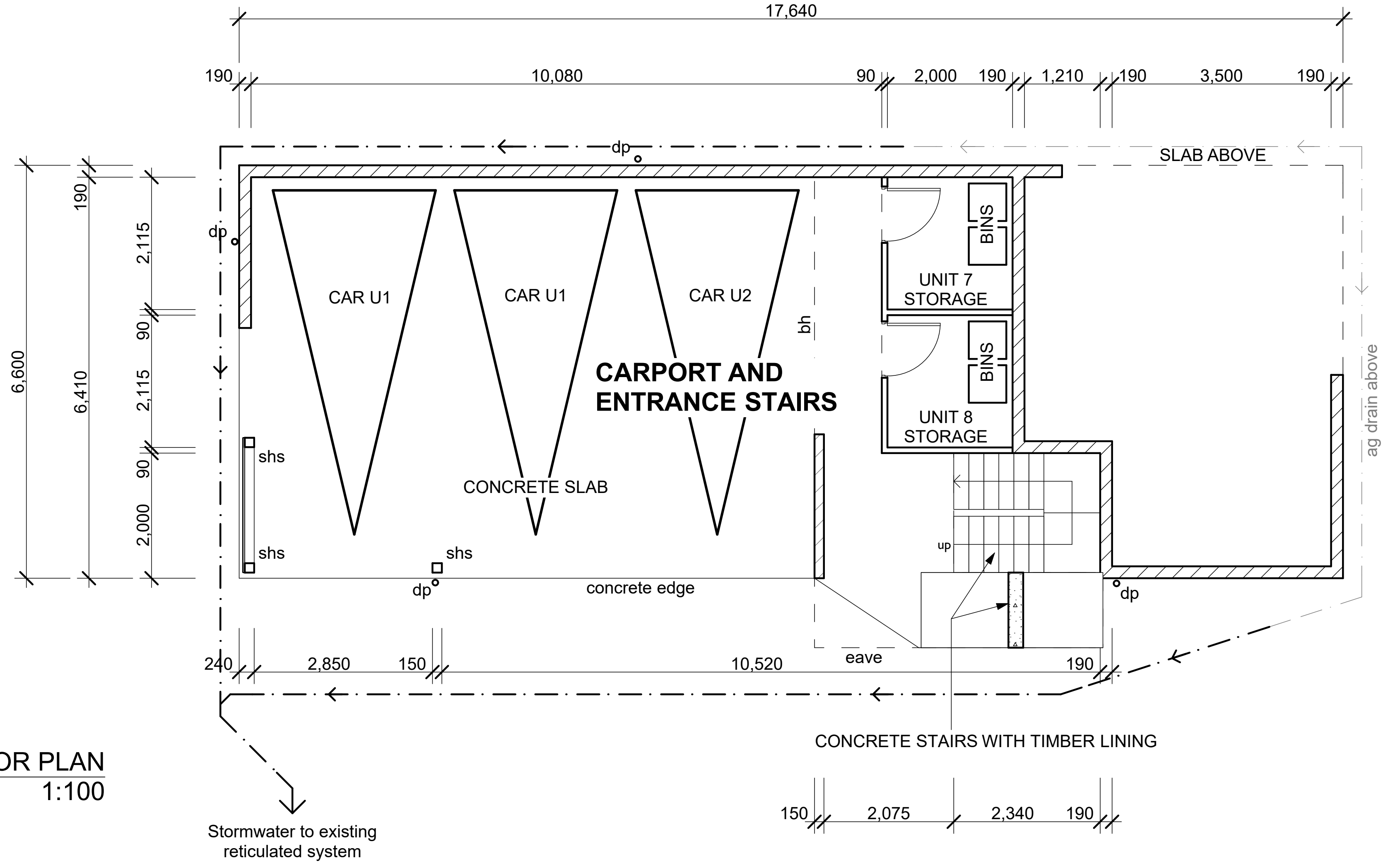
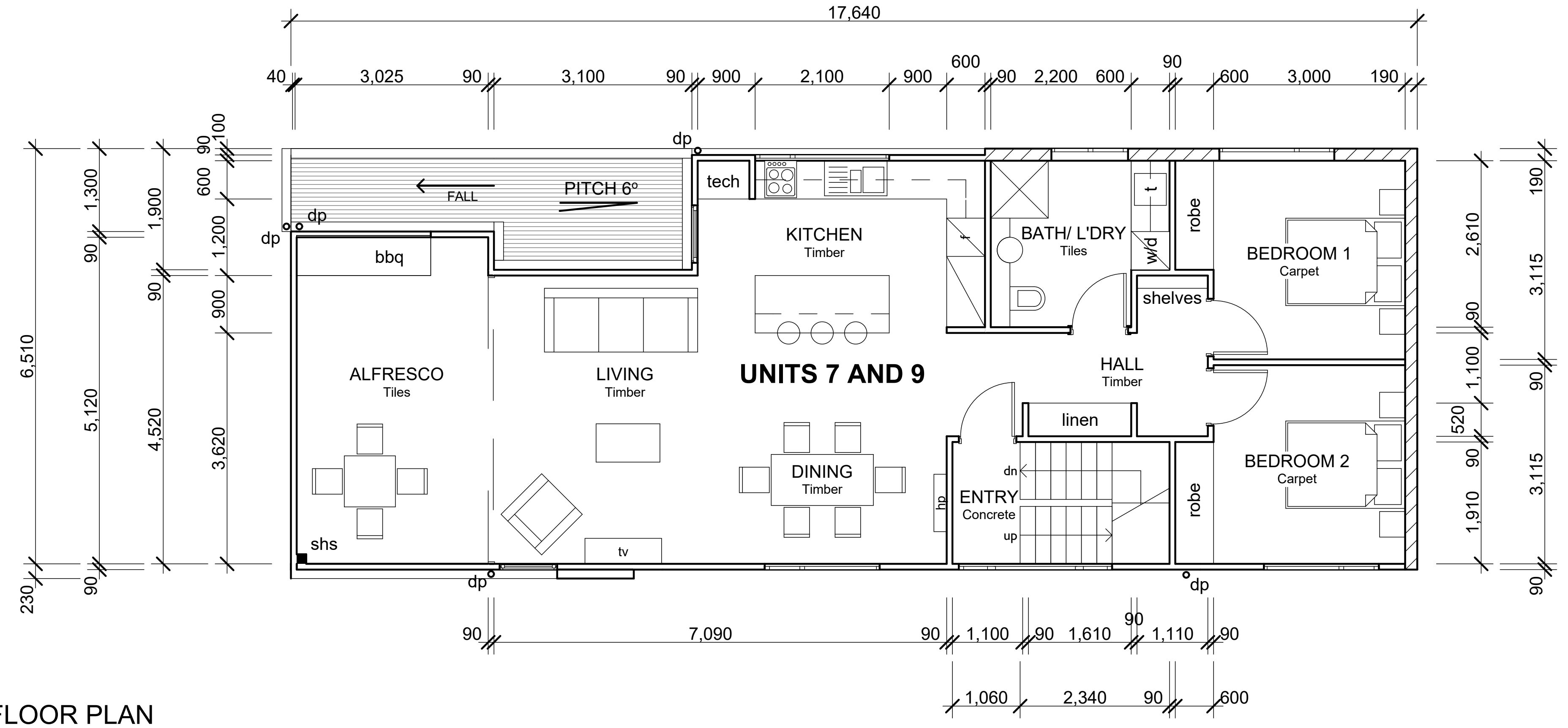
SOS DA 1510.1-01



GROUND FLOOR PLAN
1:100



FIRST FLOOR PLAN
1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
GROUND AND FIRST FLOOR PLANS
SCALE: 1:100 @ A3

CLIENT:
ANDREW MCCULLUGH
DATE:
MAR 2015

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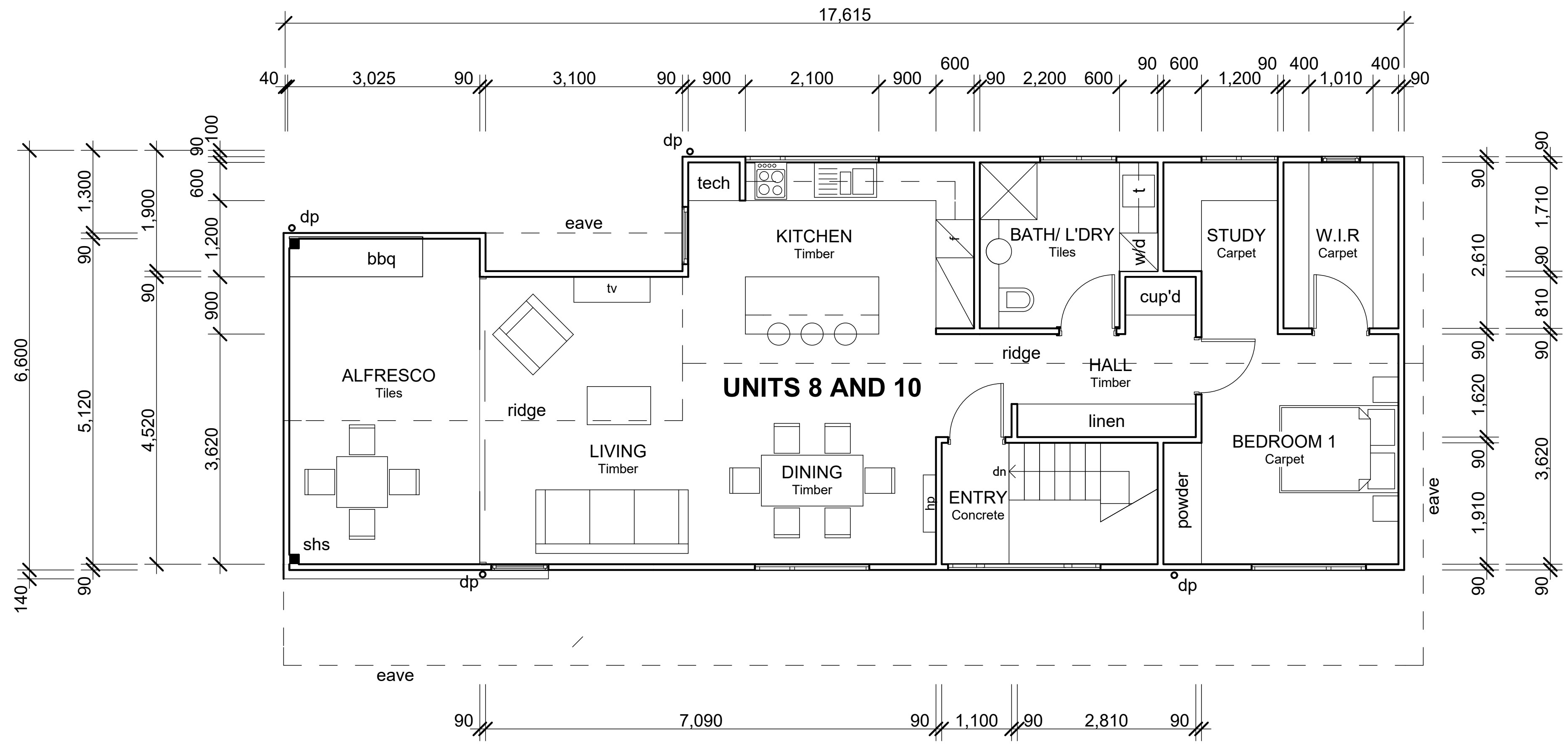
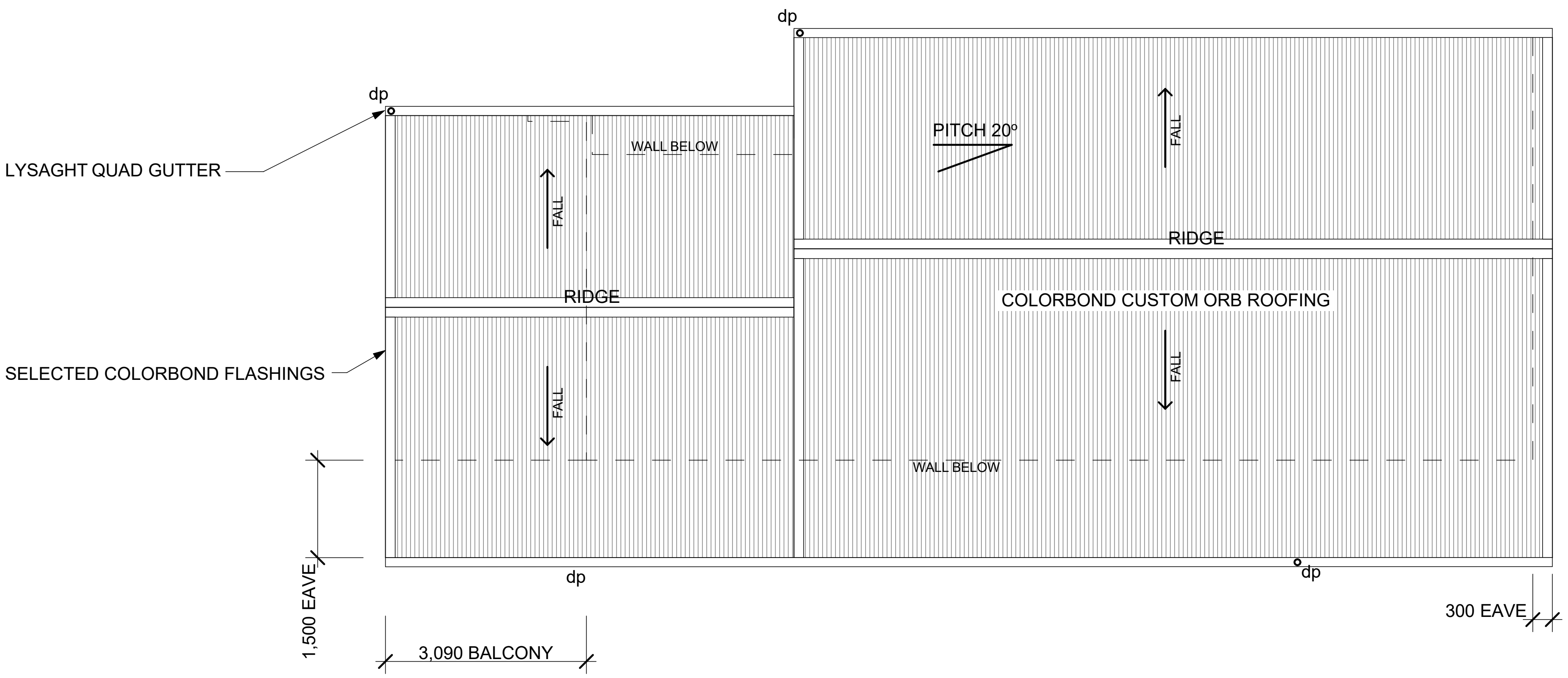
DA 1510.1-02



SECOND FLOOR PLAN
1:100



ROOF PLAN
1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
SECOND FLOOR AND ROOF PLAN
SCALE: 1:100 @ A3
0 1 2 3

CLIENT:
ANDREW MCCULLUGH
DATE:
MAR 2015

REV.	DATE	AMENDMENTS
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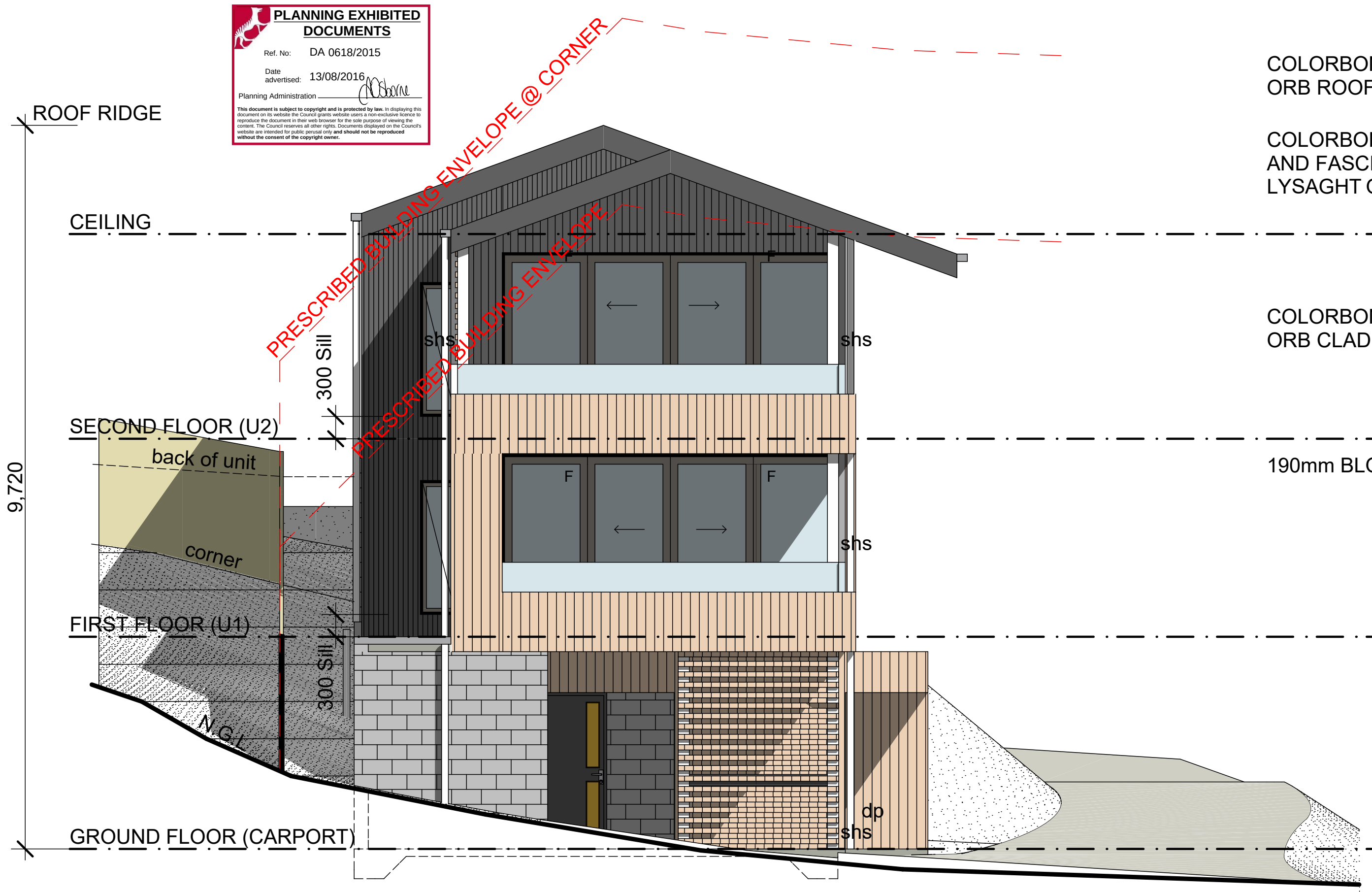
SOS
DA 1510.1-03

PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0618/2015

Date advertised: 13/08/2016

Planning Administration



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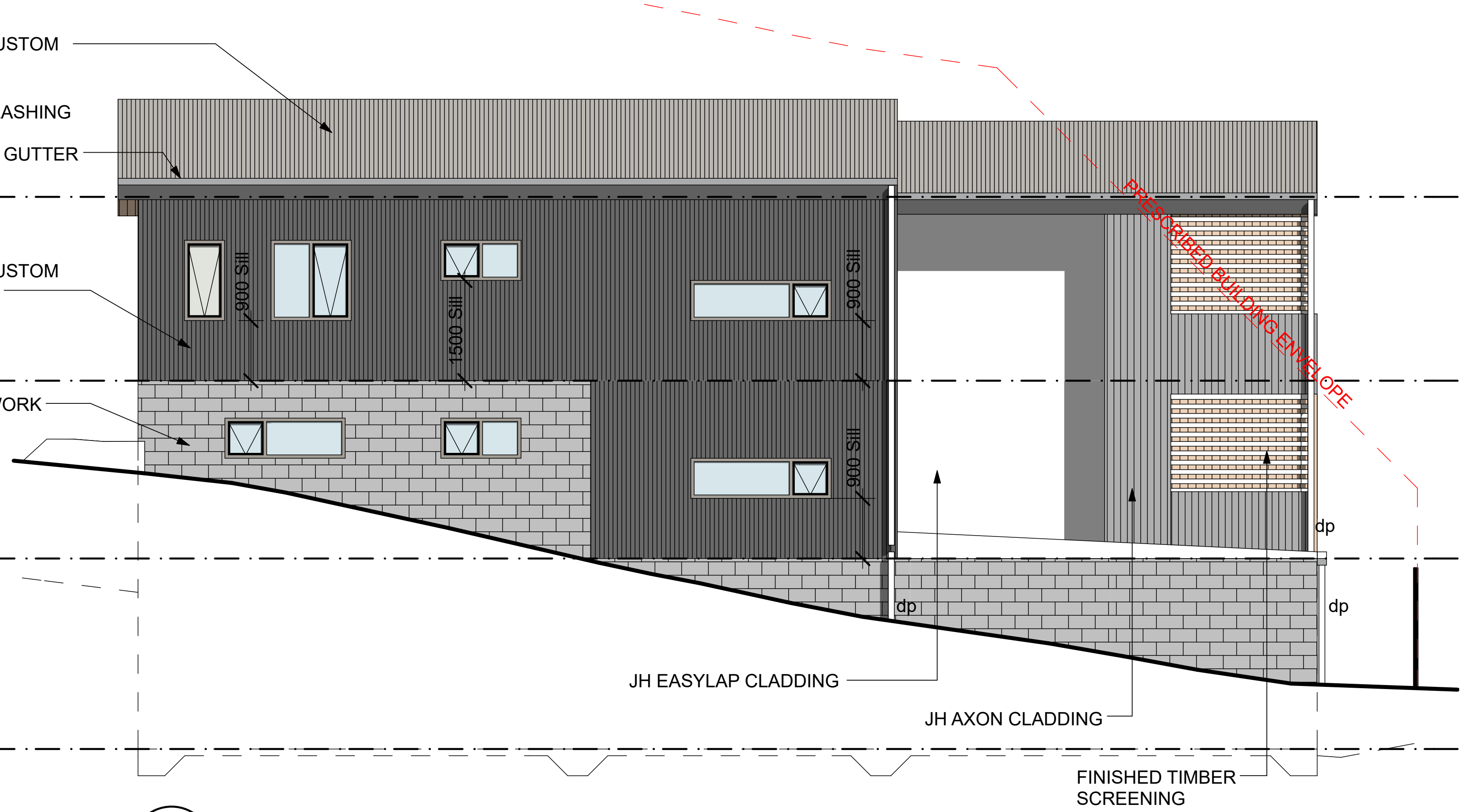

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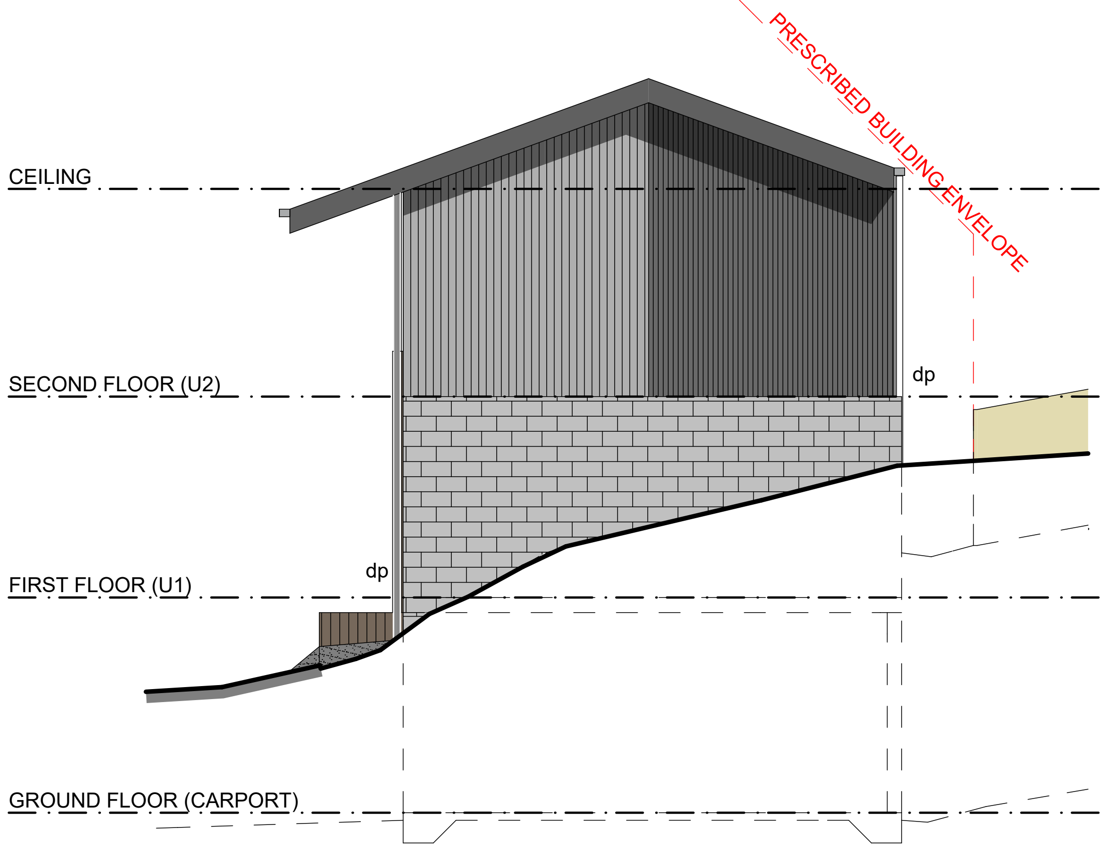

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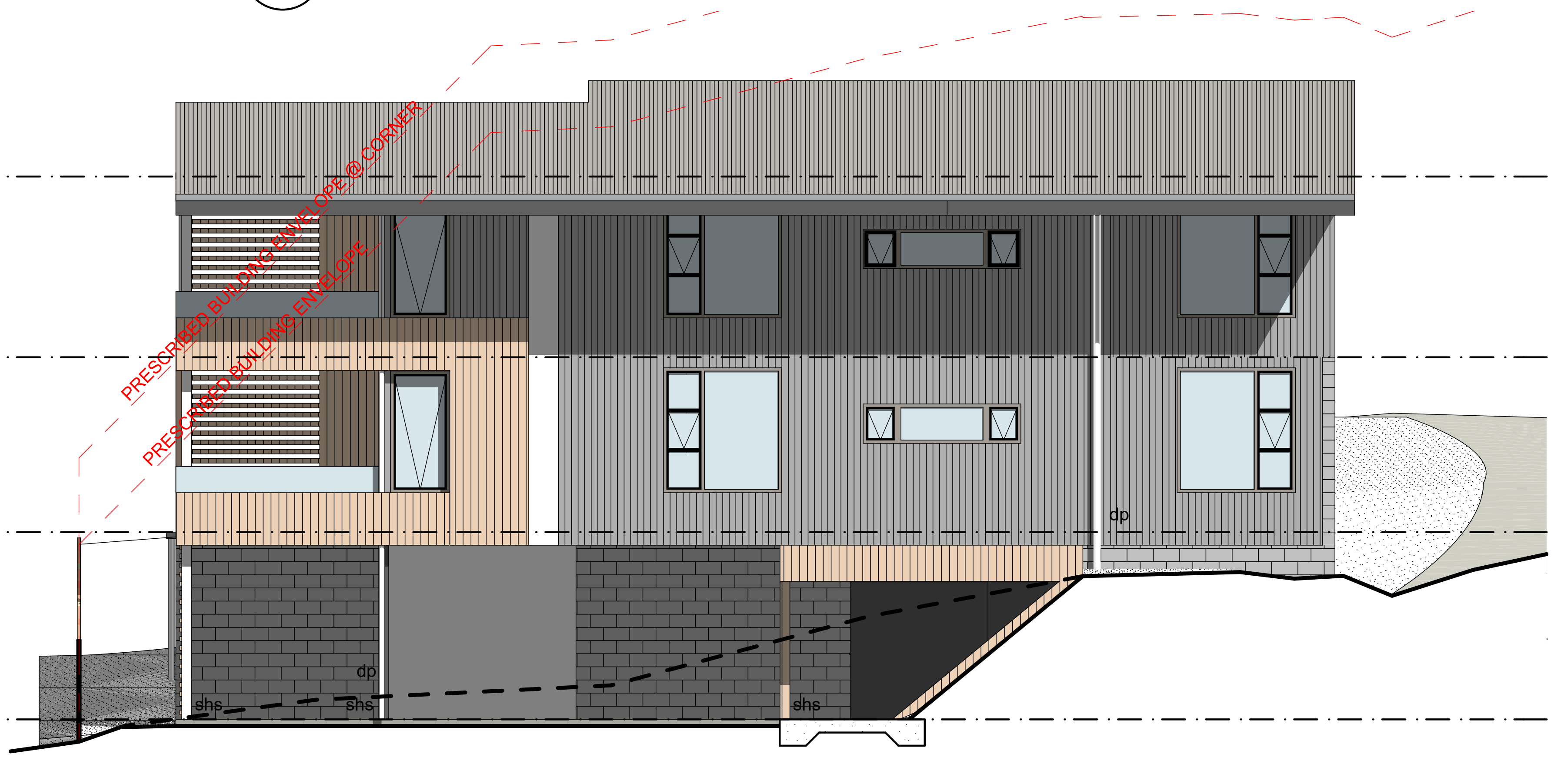

E04 WEST ELEVATION 1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
ELEVATIONS- UNITS 7 AND 8

SCALE: 1:100 @ A3

0 1 2 3

CLIENT:
ANDREW MCCULLUGH

DATE:
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REV.	DATE	AMENDMENTS
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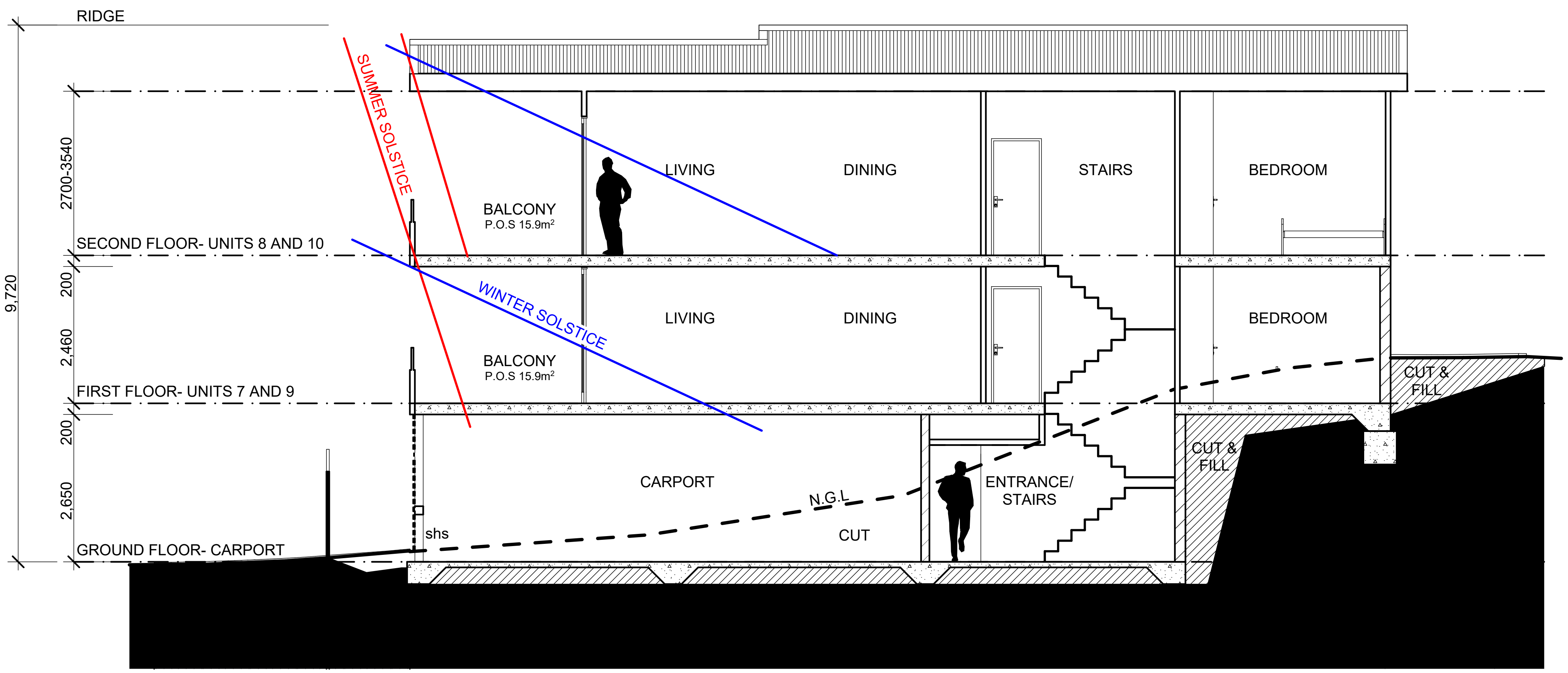
Document Set ID: 3367510
Version: 3, Version Date: 12/08/2016



S01 N/S CROSS SECTION
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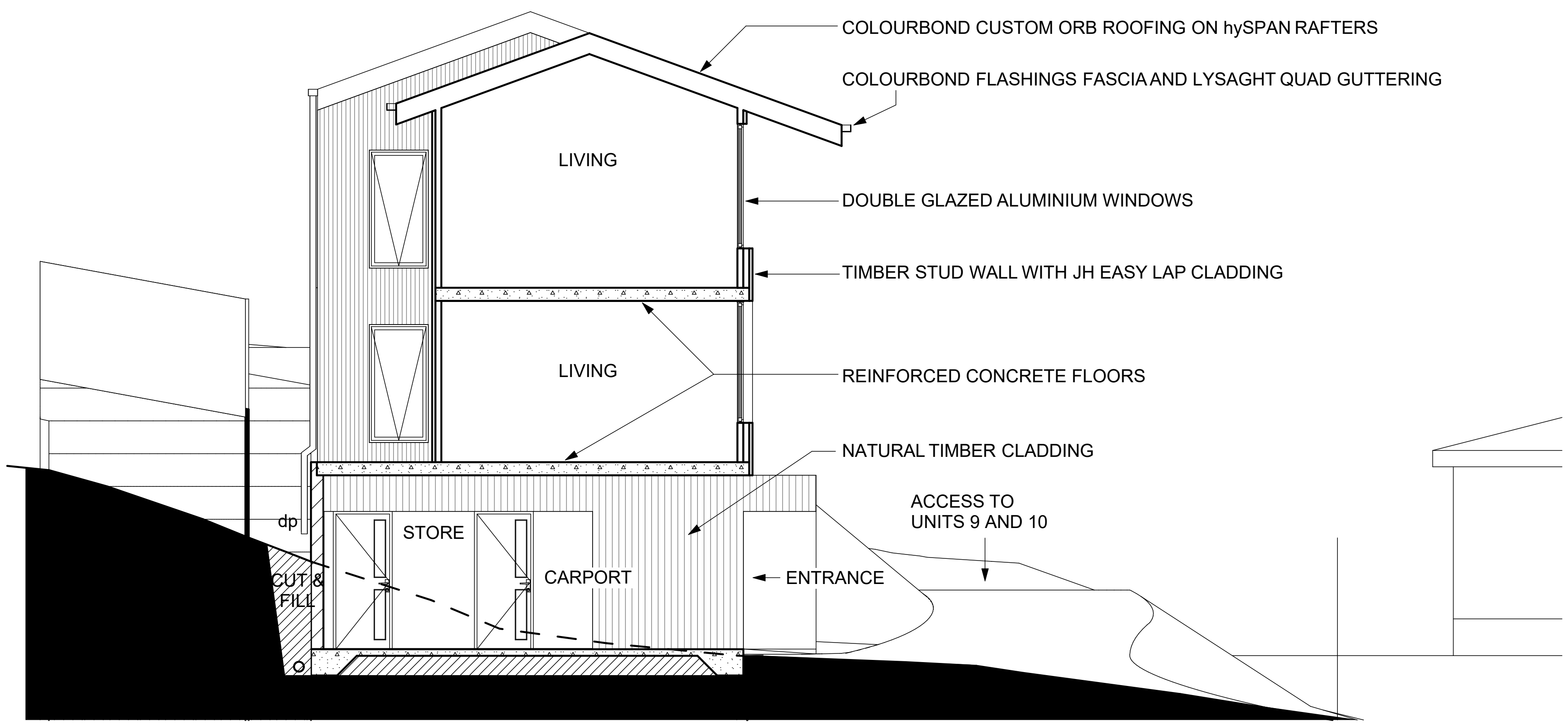
PLANNING EXHIBITED DOCUMENTS
Ref. No: DA 0618/2015
Date advertised: 13/08/2016
Planning Administration



S02 E/W CROSS SECTION
1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
SECTIONS- UNITS 7 AND 8
SCALE: 1:100 @ A3
0 1 2 3

CLIENT:
ANDREW MCCULLUGH
DATE:
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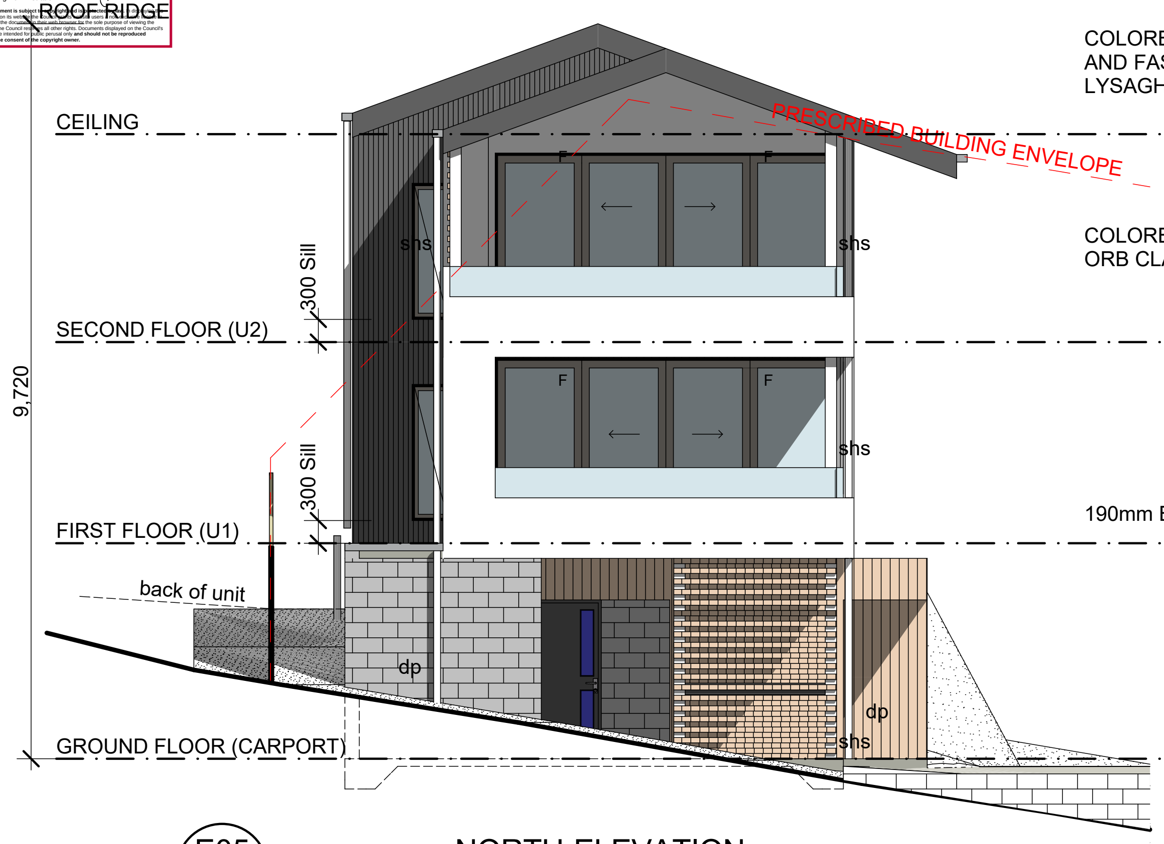
DA 1510.1-05



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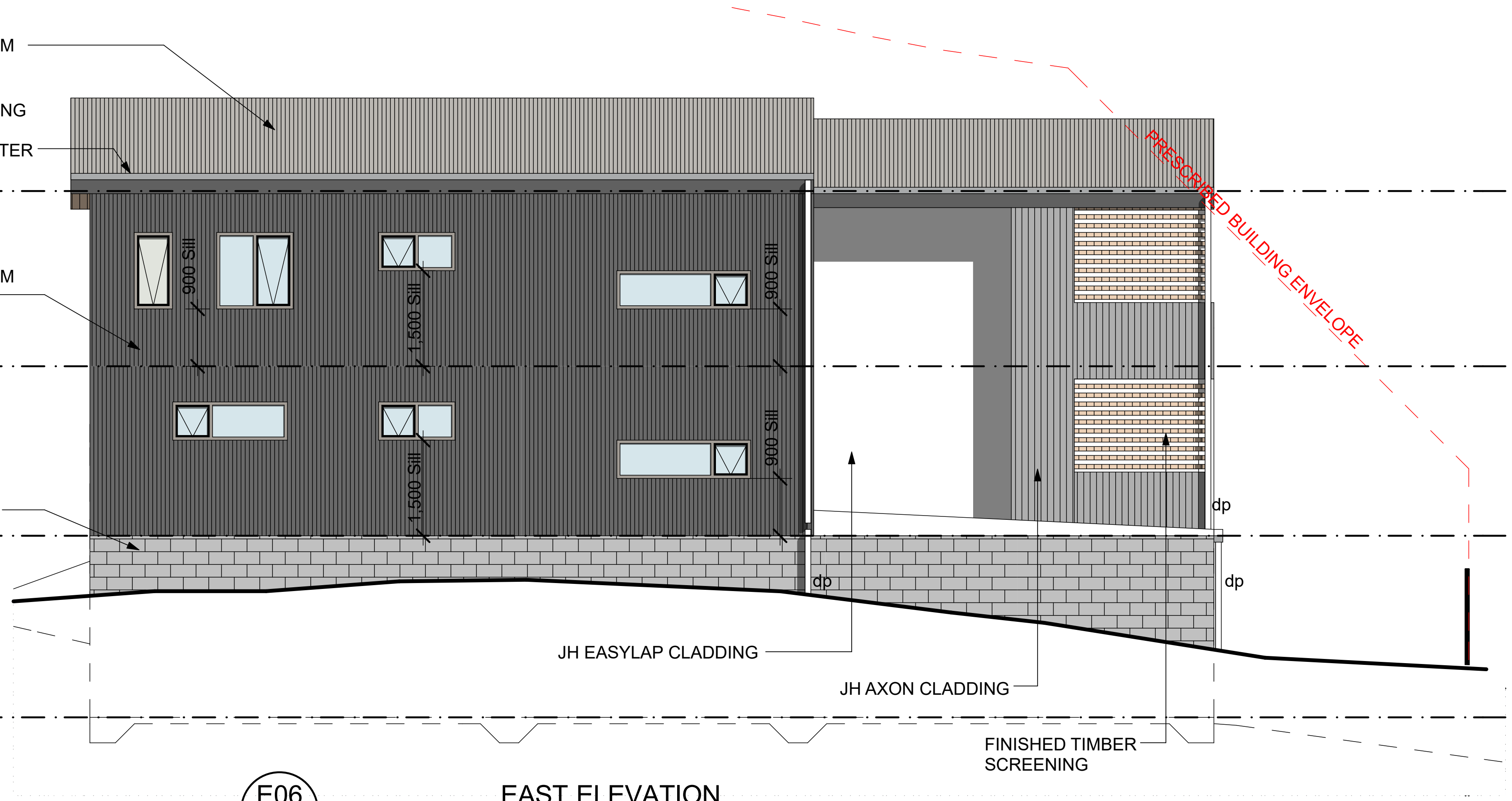
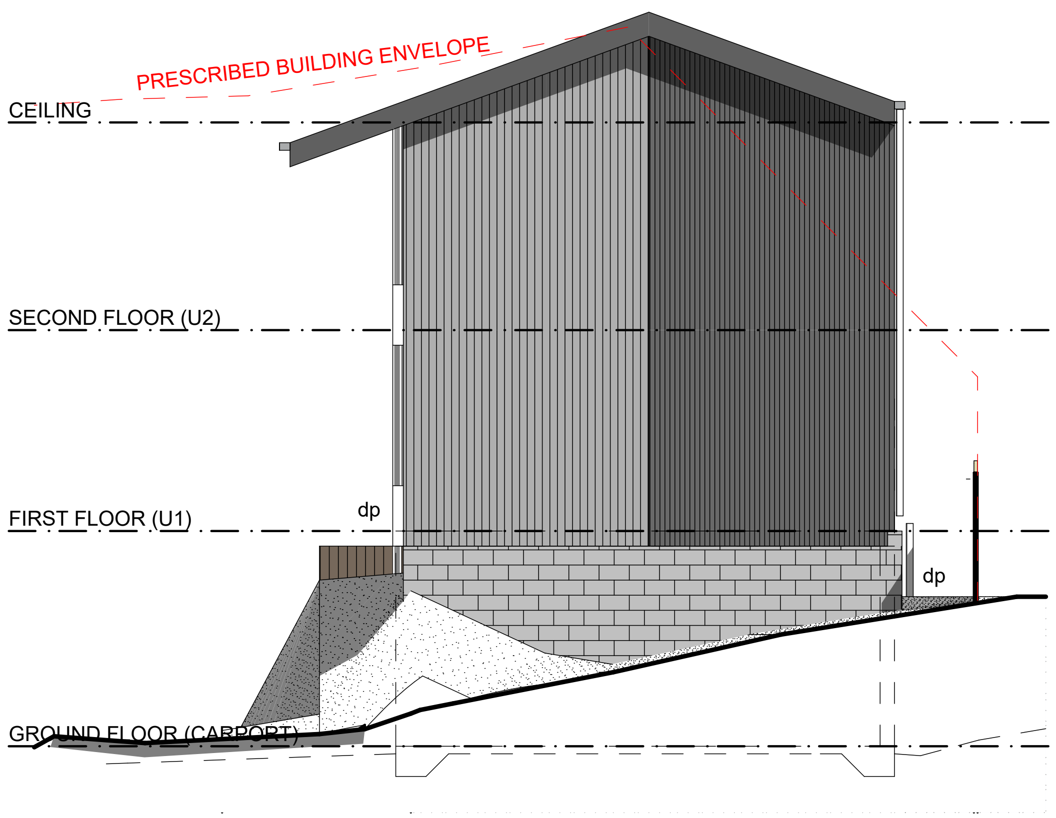


E06 EAST ELEVATION 1:100



E07 SOUTH ELEVATION 1:100

E08 WEST ELEVATION 1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
ELEVATIONS- UNITS 9 AND 10
SCALE: 1:100 @ A3

CLIENT:
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DATE:
MAR 2015

REV.	DATE	AMENDMENTS
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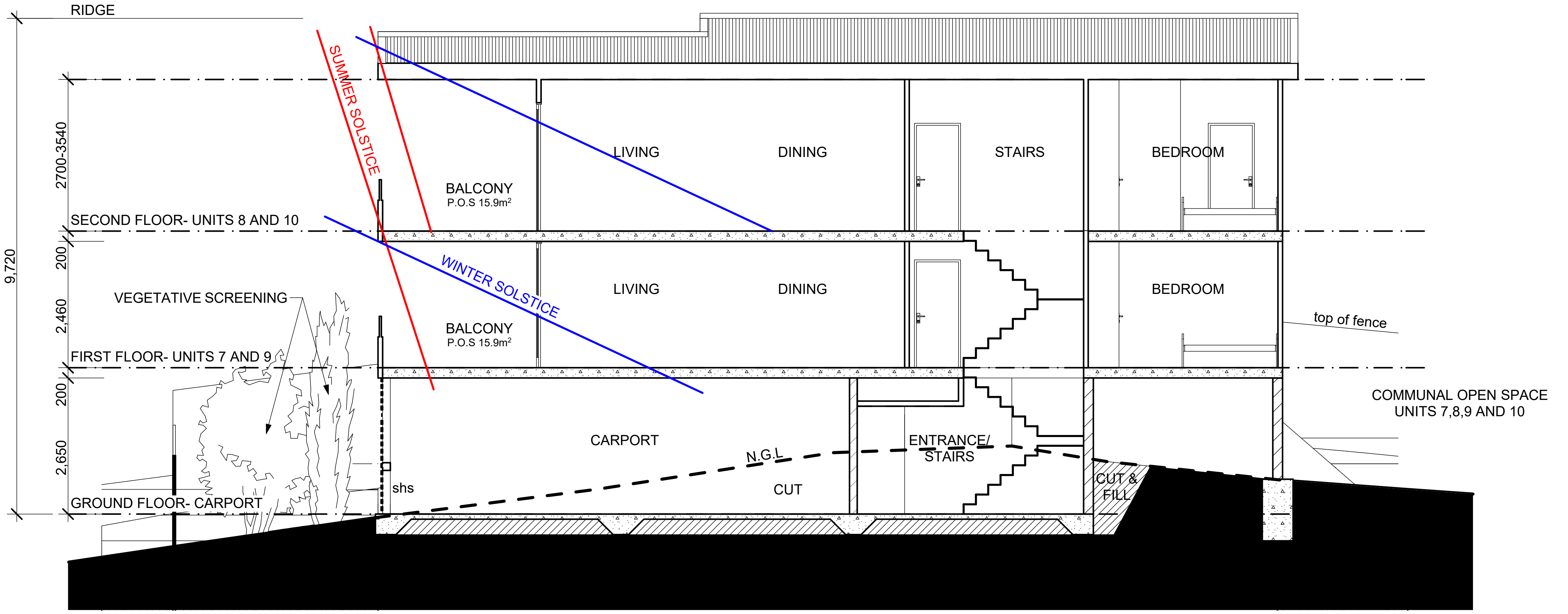
DA 1510.1-06



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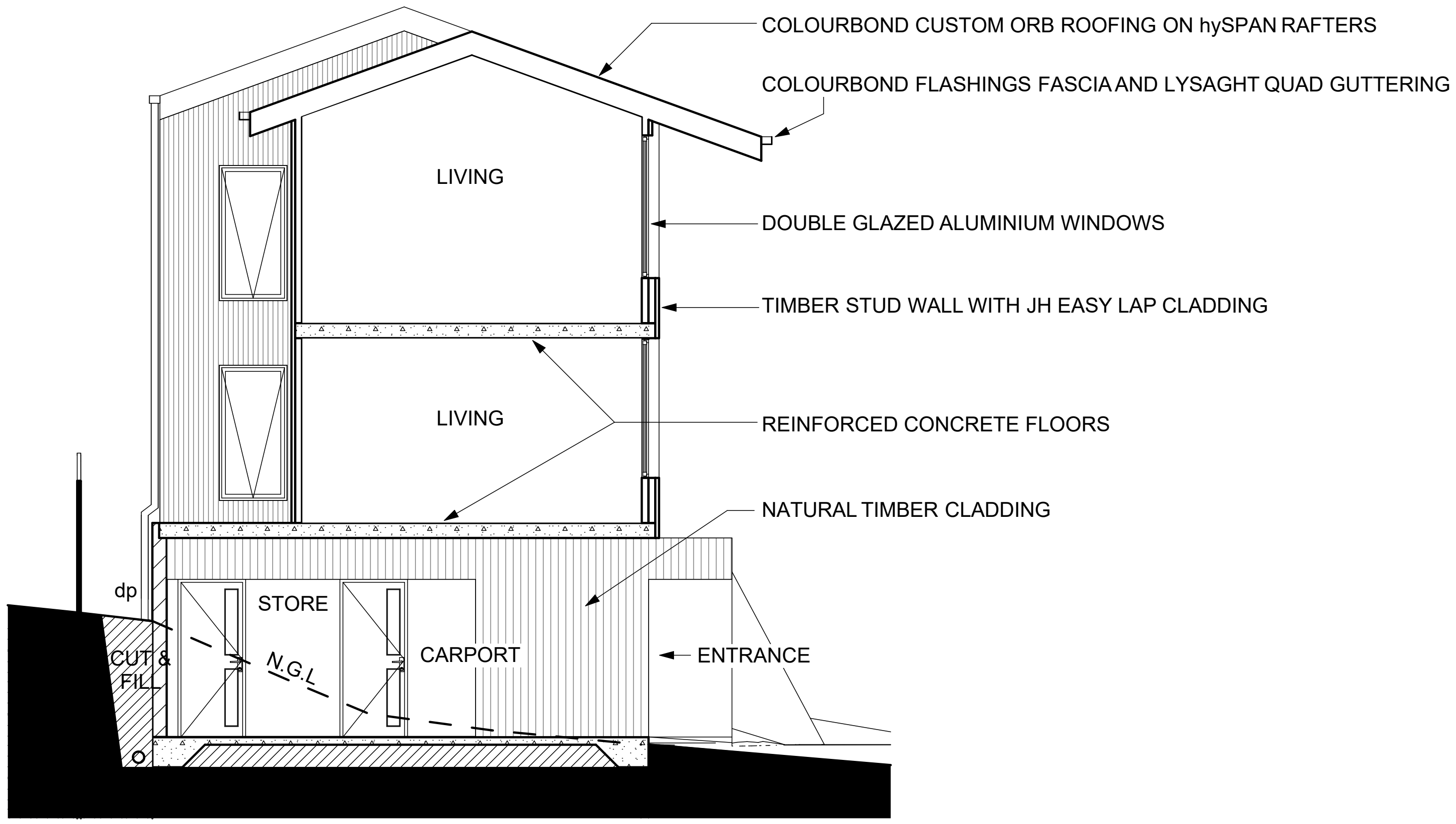

S04 E/W CROSS SECTION
1:100

PROJECT:
PROPOSED UNITS- 2x 2 BED AND 2x 1 BED
ADDRESS:
51-55 WESTBURY ROAD, SOUTH LAUNCESTON

DRAWING TITLE:
SECTIONS- UNITS 9 AND 10
SCALE: 1:100 @ A3

CLIENT:
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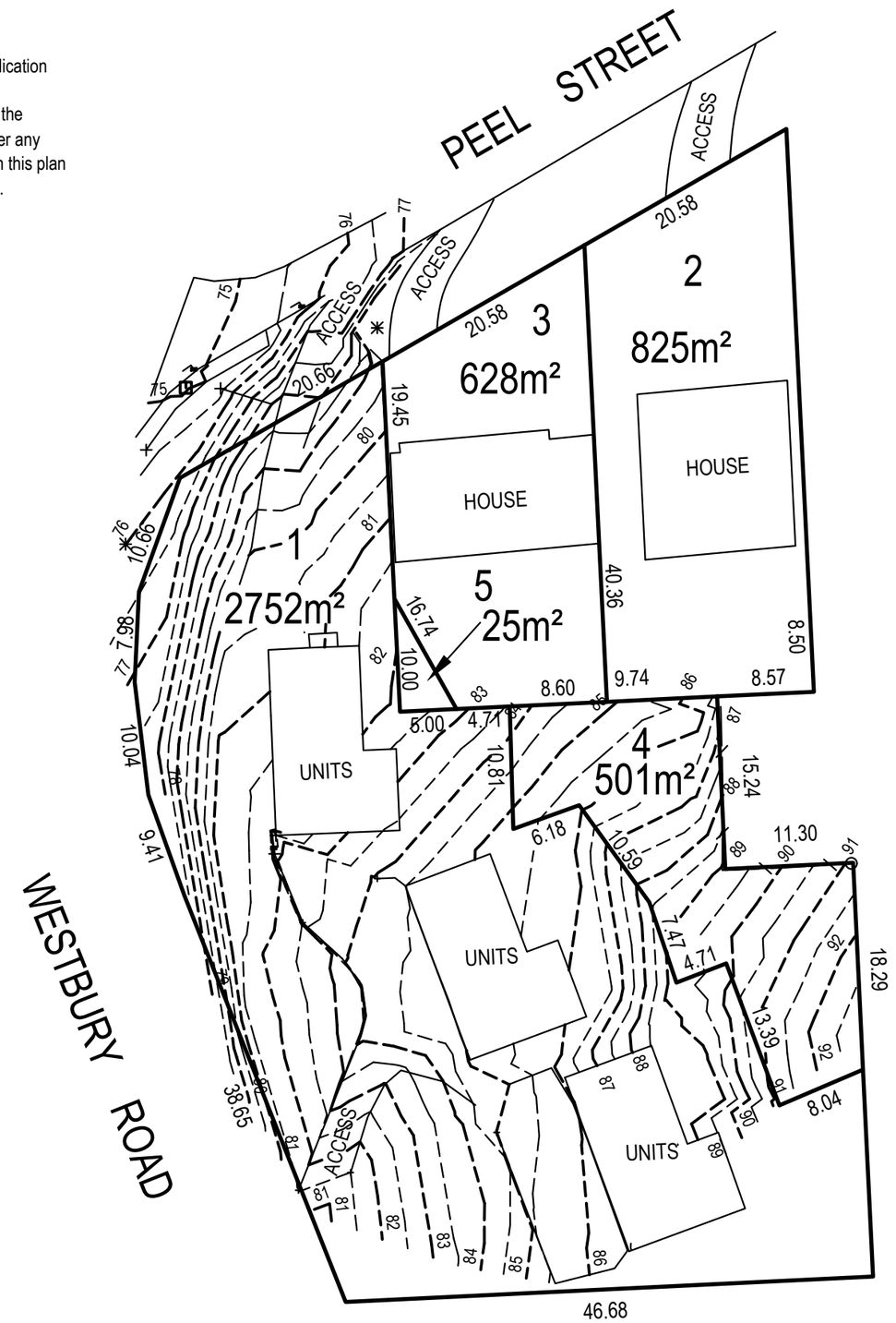
TAS 7248 Australia

DA 1510.1-07

IMPORTANT NOTE

This plan was prepared as a proposed subdivision to accompany a subdivision application to Launceston City Council and should not be used for any other purpose. The dim. areas and total number of lots shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land. This note is an integral part of this plan.



NOTE: LOT 4 & 5 TO BE ADDED TO LOT 1

AMENDMENTS

No.	Revision/Issue	Date

NOEL LEARY & ASSOCIATES
LAND & ENGINEERING SURVEYORS

NOEL LEARY & ASSOCIATES
132 Davey Street, HOBART TAS 7000
P 03 6220 0299 F 03 6220 0290
E nleary@noelleary.com.au

Project Name and Address

51 - 55 WESTBURY ROAD
27 & 29 PEEL STREET
SOUTH LAUNCESTON

Drawing Title

PLAN OF SUBDIVISION

L KOLKA CT 134959 - 1 LOTS 2 & 4. (27 PEEL STREET)
A & A La Monaca CT 58000 - 4 LOTS 3 & 5. (29 PEEL STREET)
STRATA CORPORATION CT 169594 - 0 LOTS 1

SCALE

0 5 10 15 20
1:500 at A3

Contour Interval 0.5 m

Date 12 / 01 / 15

SHEET	1 of 1
DRAWN	ML
CHK'D	ML

FILE REF: 8634

Geocomp Ref	xxxxxx
AutoCAD Ref	xxxxxx
DATUM Horz:	xxxxxx
Vert:	xxxxxx

TASMAN geotechnics

LANDSLIDE RISK ASSESSMENT, 51-55 WESTBURY ROAD, SOUTH LAUNCESTON

Prepared for: **Andrew McCullagh**

Date: 4 July 2016

Document Reference: TG16086/1 - 01report

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E wayne@tasmangeotechnics.com.au

Contents

Important information about your report

Figures

Appendices

Version	Date	Prepared by	Reviewed by	Distribution
Original	4 July 2016	Emily Bartlett	Dr Wayne Griffioen	Electronic

1 INTRODUCTION

Tasman Geotechnics was commissioned by Andrew McCullagh to carry out a Landslide Risk Assessment for a proposed development at 51-55 Westbury Road, South Launceston. We understand that the land is currently part of 27 Peel Street (title reference 134959/2), but will be subdivided for additional units at 51-55 Westbury Road. In this report, we will refer to "the site" as the land to be subdivided for Units 7 to 10.

The development involves the construction of four units (two duplexes), and associated driveway. A site plan showing the locations of the proposed units was provided by the client. Although no information on proposed floor levels was provided, we have assumed up to 1.5m of excavation will likely be required for each unit.

The assessment is required as part of the Planning Application process as the development is mapped within a "Medium" hazard band on the Landslide Planning Map V2 – Hazard Bands overlay on The LIST.

Our scope of work consisted of:

- Carrying out a site walkover to note geomorphological features associated with landslide activity;
- Drilling of two boreholes (BH1 and HA2) to determine subsurface conditions;
- Performing a Landslide Risk Assessment.

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

2 BACKGROUND INFORMATION

2.1 Regional Setting

The site is on the eastern flank of a valley, at the southern end of the Tamar Valley. Slopes in the valley average about 12°.

2.2 Geology

The Mineral Resources Tasmania (MRT) 1:25,000 Series Digital Geological map, Launceston Sheet, shows the site to be mapped on Tertiary aged sediments described as *"Partly consolidated clay, silt, and clayey labile sand with rare gravel and lignite; some iron oxide-cemented layers and concretions; some leaf fossils".*

An extract of the MRT map is presented on Figure 1.

2.3 Landslide Mapping

In 2013, MRT published landslide maps for the Tamar Valley, as part of the Tasmanian Landslide Map Series. Of particular interest is the Launceston Deep-Seated Landslide Susceptibility map.

The susceptibility map shows the site to be located in a possible "Source" area associated with landslide movement. A recent or active landslide is mapped 80m north of the site, and a landslide of activity unknown is mapped 60m southwest of the site. The headscarps of both mapped landslides are mapped along Westbury Road.

An extract of the MRT Slide Susceptibility map is presented on Figure 1.

2.4 Previous Reports

A search of the MRT online database found one report relevant to the present investigation. The report (W.L. Mathews, 1975) investigates the stability of 77-83 Westbury Road with respect to proposed widening of Westbury Road. The report discusses a known slip 200m downhill of 77-83 Westbury Road, which is interpreted to be the recent or active landslide mapped by MRT. The

report concludes that the landslide is a result of clay quarrying operations in the 1950s, and some movement has persisted since. 77-83 Westbury Road did not show signs of movement at the time of reporting.

3 FIELD INVESTIGATION

The fieldwork was carried out by a Geotechnical Engineer and an Environmental Engineer from Tasman Geotechnics. The fieldwork involved the drilling of two boreholes (BH1 and HA2) to depths of 4.0m and 0.9m respectively. BH1 was drilled using a Rockmaster 4WD mounted auger rig, and HA2 was drilled using a hand auger.

The borehole logs are presented in Appendix A and the borehole locations are shown on Figure 2.

One soil sample was analyzed by Tasman Geotechnics for Atterberg Limits. The results are presented in Section 4.3.

4 RESULTS

4.1 Surface Conditions

The site is surrounded by residential units and houses in all directions. The site was accessed from 27 Peel Street (north of the site). Existing units at 51-55 Westbury Road are located west of the site.

The site is vegetated with grass, some low lying shrubs and a tree. The site slopes about 10° northwest, steeping to about 20° west at the center of the block, and flattening at the south end of the block.

No evidence of recent landslide movement, including tension cracks and hummocky topography, was noted on site. No springs were noted on or near the site. The site appeared well drained.

Nearby houses and units did not show signs of landslide movement.

4.2 Subsurface Conditions

The boreholes encountered similar conditions:

- 0.1m of sandy clay FILL (HA2), overlying
- Clayey/silty SAND (to 0.2m below ground level in BH1 and to 0.5m below ground level in HA2), overlying
- High plasticity, grey/orange/red mottled SANDY CLAY to at least 4m below ground level.

The sandy clay was assessed to be Firm to Hard. No groundwater inflow was noted in the boreholes.

4.3 Laboratory Results

Laboratory testing by Tasman Geotechnics on a soil sample from BH1 at 1.9-2.0m below ground level found the following Atterberg Limits:

- Liquid Limit = 80%
- Plastic Limit = 27%
- Plasticity Index = 53%
- Linear Shrinkage = 17%.

Thus, the soil is a high plasticity (sandy) clay.

5 LANDSLIDE RISK ASSESSMENT

5.1 General

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

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

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

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

5.2 Potential Hazards

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

Regression of "active" deep-seated landslide mapped 80m north of site. Field observations indicate that the site is not affected by the "active" landslide. The likelihood of the landslide regressing to the site is assessed to be Barely Credible.

Activation and regression of landslide of unknown activity mapped 60m southwest of site. No evidence suggests that the mapped landslide of unknown activity has been recently activated. The proposed development does not have a significant impact on the overall slope, thus the likelihood of the landslide activating is assessed to be Rare.

Shallow to medium scale slide on steep slopes around units. The probability of such a landslide occurring depends on the strength of the deeper foundation material and the geometry of the (cut or fill) slope. In terms of likelihood, a shallow to medium slide could occur if retaining walls and cuts were poorly designed and executed. For engineered retaining walls with less than 2m depth of cut and less than 1m of fill, the likelihood of shallow slides is assessed to be Unlikely. The consequence of failure is Medium as some stabilization works would be required.

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

Both of the identified landslide hazards involve activation/regression of landslides with the site located above the potentially active areas. Thus, it is important that significant weight is not added to the site as part of the development.

5.3 Risk to Property

The following table summarizes the risk to property of the landslide events in relation to the proposed development as described in Section 2.5, **assuming limitations in Section 6 are incorporated.**

Table 2. Landslide risk profiles

Scenario	Likelihood	Consequence	Risk Profile
Regression of "active" deep-seated landslide	Rare: Landslide would have to regress 80m, regression is likely to be slow	Major: May cause considerable damage to proposed units	Low
Activation of landslide of "unknown activity"	Rare: No evidence of recent activation, development does not have significant impact on site.	Major: May cause considerable damage to proposed units	Low
Shallow to medium scale slide	Unlikely: Engineered retaining wall less than 2m cut, and less than 1m fill	Medium: Some stabilization works may be required	Low

The assessment shows that the proposed development presents a Low level of risk, **provided the limitations listed in Section 6 are incorporated in the design.**

6 DISCUSSION & RECOMMENDATIONS

6.1 Limitations on Development

In order to ensure the proposed development does not change the risk profile above Low for the site, it is recommended that the following limitations be enforced:

- Permanent cut slopes should be designed at 55° (1V:1.4H) or flatter. Cut slopes should be limited to 1m in vertical height. Cuts greater than 1m should be retained by an engineer designed retaining wall. Any proposed cuts greater than 1.5m should be reviewed by a Geotechnical Engineer.
- Retaining walls should be designed to withstand at-rest earth pressures (K_o = 1-sinϕ). A friction angle of 23° should be assumed for the clay. Allowance should also be made for sloping backfill and provision of drainage behind the wall.
- Fill earthworks should be limited to a maximum height of 1m.
- Stormwater from roofs and paved areas should be diverted to council stormwater drains.
- Where possible, vegetation should be maintained on the slopes to prevent erosion of surface soils. As a minimum, vegetation should comprise grass. If trees are planted on the slope, then the site should be managed such that when the trees reach maturity and are removed, they are replaced with new (young) trees.
- Maintenance of surface runoff, vegetation, retaining structures and other measures described above are the responsibility of the site owner.
- Good hillside construction practices should be followed. A copy of Some Guidelines for Hillside Construction are presented in Appendix C.

As exact details of the proposed development are not known at this stage, we recommend architectural and engineering drawings be reviewed by Tasman Geotechnics to ensure compliance with above recommendations.

6.2 Site Classification

Due to the "medium" hazard band mapped across the site, the proposed units have been given a site classification of:

Class P (AS2870 – 2011)

Footings should be designed by a structural engineer from first principals. Some recommendations are given in Section 6.3

Notwithstanding the above, the soil classification for the proposed units is as follows:

CLASS H2 (AS 2870 – 2011)

Characteristic Surface Movement = 65mm

If an excavation greater than 0.5 is carried out for the units, the site classification is Class E, with characteristic surface movement greater than 75mm.

6.3 Footings

An allowable bearing pressure of 100 kPa is available for edge beams, strip and pad footings founded on the high plasticity, orange/grey/red mottled sandy clay.

If the site is filled, it is recommended that no structure be founded across the fill without the footings extending through the fill to the natural soils, allowance made in the structural design for differential settlements or engineer designed pier or pile foundations adopted.

Bored piers founded at least 1m in the sandy clay may be proportioned for an allowable end bearing pressure of 200kPa. The base of bored piers should be inspected to ensure they are clean and free of loose soil prior to pouring concrete.

The site classification presented in Section 6.2 assumes that the current natural drainage and infiltration conditions at the site will not be markedly affected by the proposed site development work. Care should therefore be taken to ensure that surface water is not permitted to collect adjacent to the structure and that significant changes to seasonal soil moisture equilibria do not develop as a result of service trench construction or tree root action.

Attention is drawn to Appendix B of AS 2870 and CSIRO Building Technical File BTF18 “Foundation Maintenance and Footing Performance: A Homeowner’s Guide” as a guide to maintenance requirement for the proposed structure.

Variations in soil conditions may occur in areas of the site not specifically covered by the field investigation. The base of all footing or beam excavations should therefore be inspected to ensure that the founding medium meets the requirements discussed above.

TASMAN geotechnics

Important information about your report

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

Project Scope

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

Subsurface Conditions

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

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

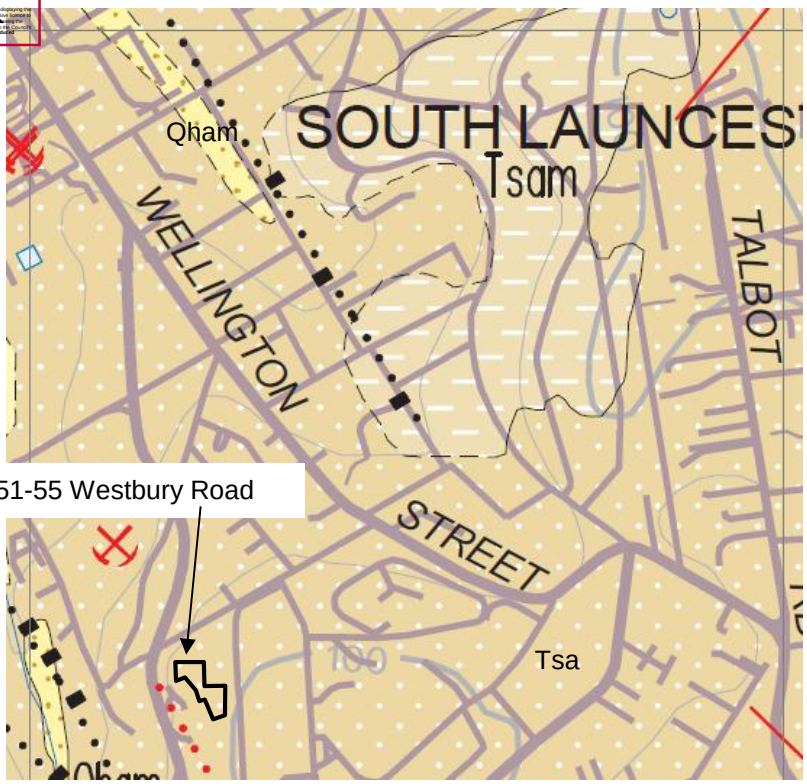
Nothing can be done to change the conditions that exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, the services of Tasman Geotechnics should be retained throughout the project, to identify variable conditions, conduct additional investigation or tests if required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

Advice and Recommendations

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

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

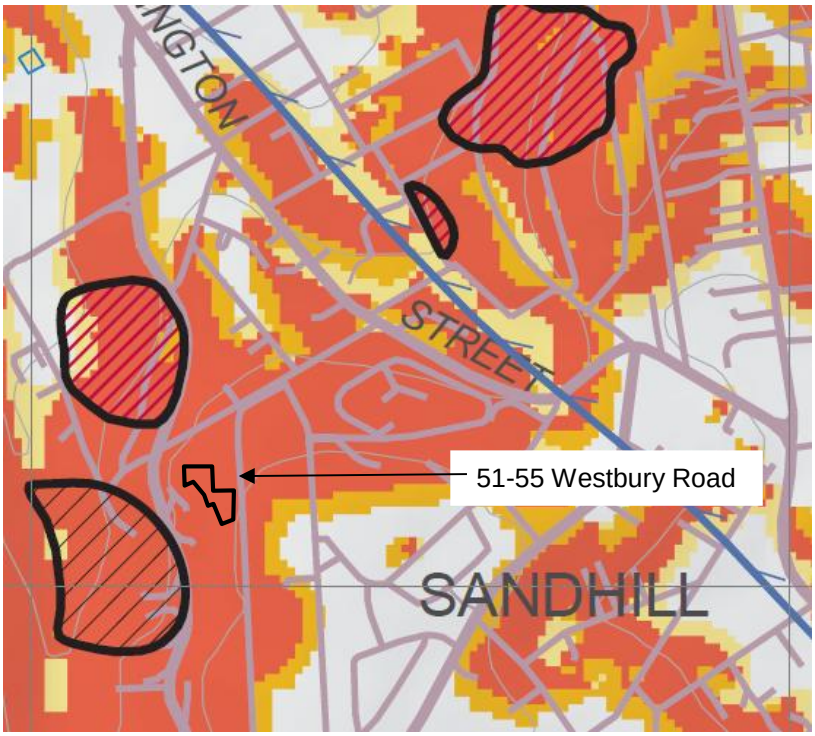
The report as a whole presents the findings of the site assessment, and the report should not be copied in part or altered in any way.

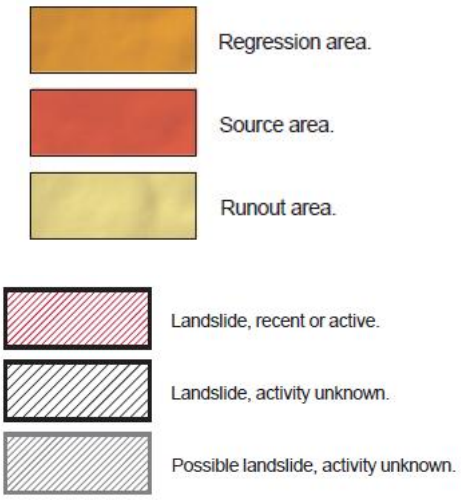


Qham: Quaternary *"Alluvial, and swamp deposits of gravel, sand, silt and clay, commonly with organic-rich top layer"*

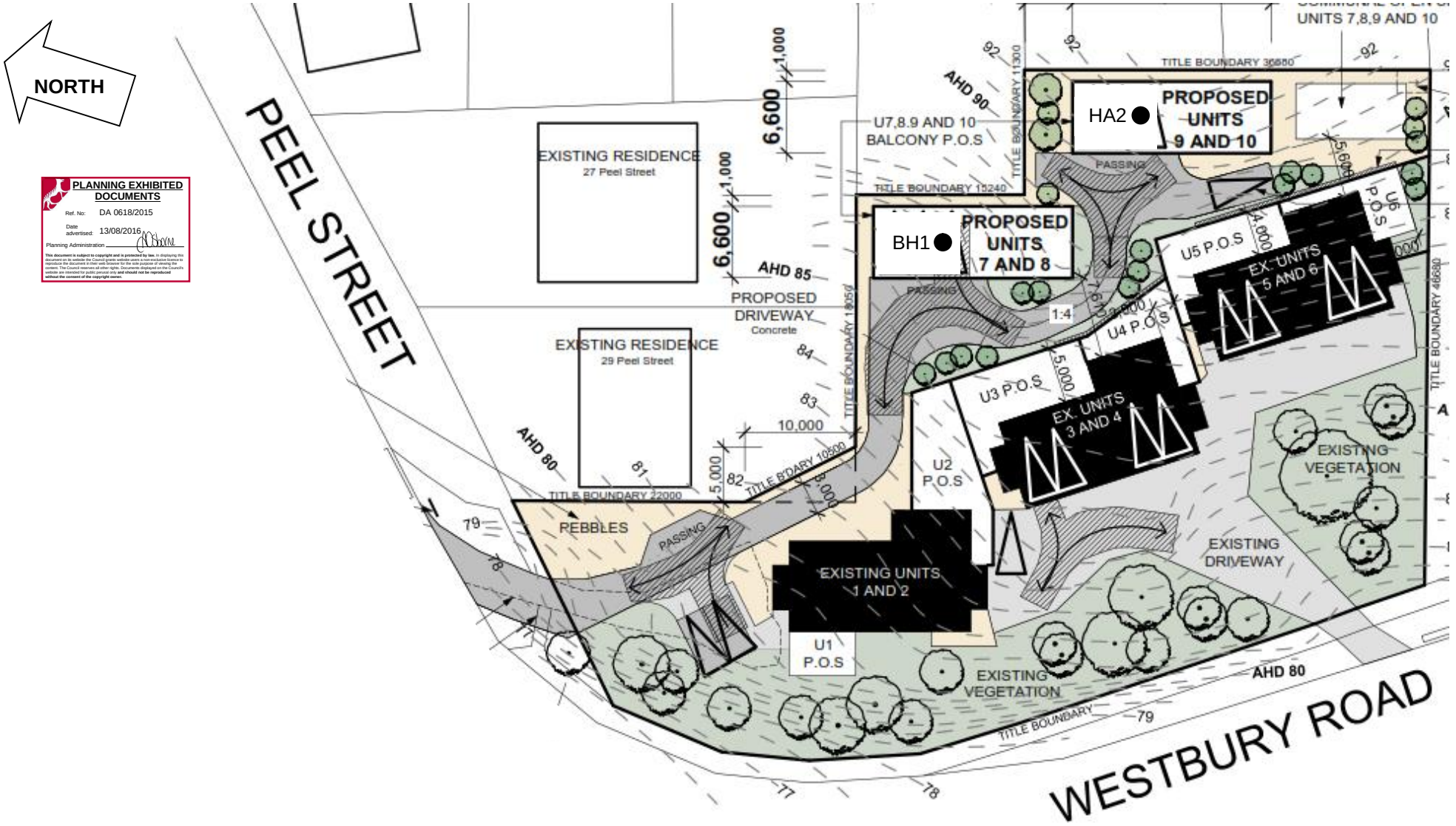
Tsa: Tertiary aged *"Partly consolidated clay, silt, and clayey labile sand with rare gravel and lignite; some iron oxide-cemented layers and concretions; some leaf fossils"*

Tsam: Tertiary aged *"Brown-grey plastic clay, minor silt, clayey sand and ironstone at South Launceston"*





drawn	**EB**	TASMAN geotechnics	client:	**Andrew McCullagh**
approved	**WG**		project:	**Landslide Risk Assessment, 51-55 Westbury Road, South Launceston**
date	**21/06/2016**			
scale	**~1:10,000**		title:	**MRT Geological Mapping**
original size	**A4**		project no: **TG16086/1 – 01report**	figure no: **FIGURE 1**



drawn	**FH**		client:	**Andrew McCullagh**
approved	**WG**		project:	**Landslide Risk Assessment** **51-55 Westbury Road, South Launceston**
date	**15/06/16**			
scale	**NTS**		title:	**Site Layout and Borehole Locations**
original size	**A4**	TASMAN geotechnics	project no: **TG16086/1 – 01report**	figure no: **FIGURE 1**

Appendix A

Engineering Borehole Logs

TASMAN geotechnics

SOIL DESCRIPTION EXPLANATION SHEET

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

FIELD IDENTIFICATION

COARSE GRAINED SOILS	more than 50% of material less than 63mm is larger than 0.075mm	GRAVELS	GW	Well graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELLY SOILS	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
		SANDS	SW	Well graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDY SOILS	SM	Silty sand, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines

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

Particle size descriptive terms

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

Consistency of cohesive soils

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

Moisture Condition

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

Density of granular soils

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

Cohesive soils can also be described relative to their plastic limit, ie: <Wp, =Wp, >Wp
The plastic limit is defined as the minimum water content at which the soil can be rolled into a thread 3mm thick.

Minor Components

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

ENGINEERING BOREHOLE LOG

Borehole no. BH1

Sheet no. 1 of 1
Job no. TG16086/1

TASMAN geotechnics

Client : Andrew McCullagh
Project : LRA
Location : 51-55 Westbury Road, South Launceston
Drill model : Rockmaster
Hole diameter : 120mm

Date : 14/06/2016
Logged By : FH

Slope : deg
Bearing : deg

RL Surface :
Datum :

Method	Penetration 1	2	3	4	Notes Samples Tests	Water		Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Structure, additional observations
Auger									SM	SILTY SAND, fine grained, brown with medium grained, rounded gravel	M	MD	
									CH	SANDY CLAY, high plasticity fines, orange	M	St	
							0.50						
							1.00						
					U50					orange/grey mottled			PP = 100 kPa
							1.50		CH	CLAY, high plasticity, yellow with a trace of sand	M	F	
					D		2.00					St	
							2.50					VSt	
							3.00					H	
							3.50						
							4.00						

Terminated at 4.0m. Still going.

ENGINEERING BOREHOLE LOG

Borehole no. HA2

TASMAN geotechnics

Job no. TG16086/1

Client : Andrew McCullagh
Project : LRA
Location : 51-55 Westbury Road, South Launceston

Date : 14/06/2016
Logged By : EB

Drill model : Hand auger
Hole diameter : 60mm

Slope : deg
Bearing : deg

RL Surface :
Datum :

Method	Penetration (1 2 3 4)	Notes Samples Tests	Water	Depth	Graphic Log	Classification	Material Description	Moisture Condition	Consistency density, index	Structure, additional observations
Auger						CH	FILL: SANDY CLAY, dark and light brown patches	M	F	
						SC	CLAYEY SAND, medium grained, brown	M	MD	
				0.50		CH	SILTY CLAY, high plasticity, orange/red mottled	M	H	
		D				CH	SANDY CLAY, high plasticity, grey/orange/red mottled	M	H	
				1.00			Terminated at 0.9m due to refusal on hard clay			
				1.50						
				2.00						
				2.50						
				3.00						
				3.50						
				4.00						

PLANNING EXHIBITED DOCUMENTS

Ref. No: DA 0618/2015

Date advertised: 13/08/2016

Planning Administration

Appendix B

Landslide Risk Matrix

TASMAN geotechnics

Terminology for use in Assessing Risk to Property

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

Likelihood Terms

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

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

Qualitative Measures of Consequence to Property

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

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

Qualitative Risk Analysis Matrix – Risk to Property

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

NOTES:

1. The risk associated with Insignificant consequences, however likely, is defined as Low or Very Low

2. The main purpose of a risk matrix is to help rank risks and set priorities and help the decision making process.

Response to Risk

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

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

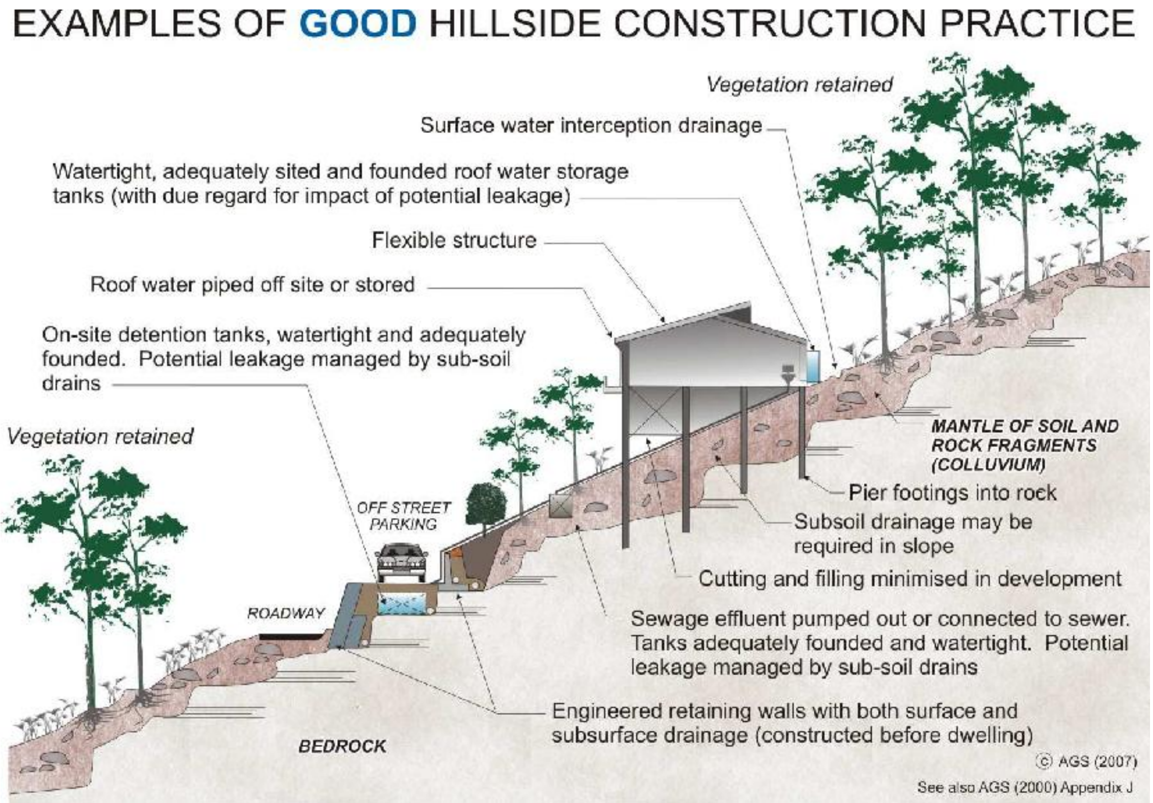
Risk Level		Example Implications
VH	Very High	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than the value of the property.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

Appendix C

Guidelines to Hillside Construction

HILLSIDE CONSTRUCTION PRACTICE

Sensible development practices are required when building on hillsides, particularly if the hillside has more than a low risk of instability (GeoGuide LR7). Only building techniques intended to maintain, or reduce, the overall level of landslide risk should be considered. Examples of good hillside construction practice are illustrated below.



WHY ARE THESE PRACTICES GOOD?

Roadways and parking areas - are paved and incorporate kerbs which prevent water discharging straight into the hillside (GeoGuide LR5).

Cuttings - are supported by retaining walls (GeoGuide LR6).

Retaining walls - are engineer designed to withstand the lateral earth pressures and surcharges expected, and include drains to prevent water pressures developing in the backfill. Where the ground slopes steeply down towards the high side of a retaining wall, the disturbing force (see GeoGuide LR6) can be two or more times that in level ground. Retaining walls must be designed taking these forces into account.

Sewage - whether treated or not is either taken away in pipes or contained in properly founded tanks so it cannot soak into the ground.

Surface water - from roofs and other hard surfaces is piped away to a suitable discharge point rather than being allowed to infiltrate into the ground. Preferably, the discharge point will be in a natural creek where ground water exits, rather than enters, the ground. Shallow, lined, drains on the surface can fulfil the same purpose (GeoGuide LR5).

Surface loads - are minimised. No fill embankments have been built. The house is a lightweight structure. Foundation loads have been taken down below the level at which a landslide is likely to occur and, preferably, to rock. This sort of construction is probably not applicable to soil slopes (GeoGuide LR3). If you are uncertain whether your site has rock near the surface, or is essentially a soil slope, you should engage a geotechnical practitioner to find out.

Flexible structures - have been used because they can tolerate a certain amount of movement with minimal signs of distress and maintain their functionality.

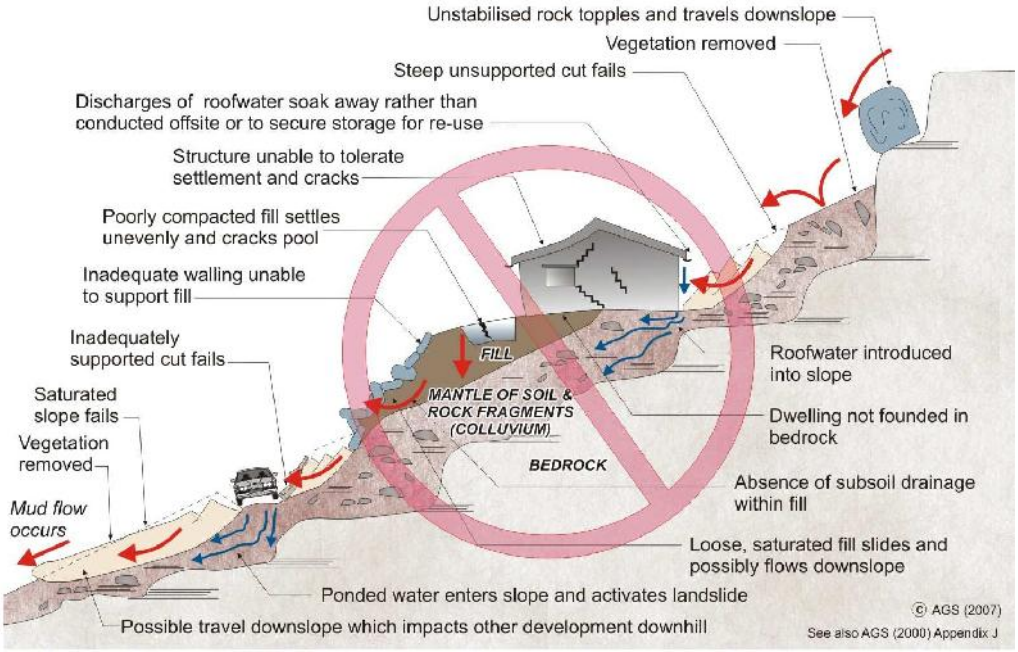
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing can result in a rise in water table with a consequent increase in the likelihood of a landslide (GeoGuide LR5). An exception may have to be made to this rule on steep rock slopes where trees have little effect on the water table, but their roots pose a landslide hazard by dislodging boulders.

Possible effects of ignoring good construction practices are illustrated on page 2. Unfortunately, these poor construction practices are not as unusual as you might think and are often chosen because, on the face of it, they will save the developer, or owner, money. You should not lose sight of the fact that the cost and anguish associated with any one of the disasters illustrated, is likely to more than wipe out any apparent savings at the outset.

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF **POOR** HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

Roadways and parking areas - are unsurfaced and lack proper table drains (gutters) causing surface water to pond and soak into the ground.

Cut and fill - has been used to balance earthworks quantities and level the site leaving unstable cut faces and added large surface loads to the ground. Failure to compact the fill properly has led to settlement, which will probably continue for several years after completion. The house and pool have been built on the fill and have settled with it and cracked. Leakage from the cracked pool and the applied surface loads from the fill have combined to cause landslides.

Retaining walls - have been avoided, to minimise cost, and hand placed rock walls used instead. Without applying engineering design principles, the walls have failed to provide the required support to the ground and have failed, creating a very dangerous situation.

A heavy, rigid, house - has been built on shallow, conventional, footings. Not only has the brickwork cracked because of the resulting ground movements, but it has also become involved in a man-made landslide.

Soak-away drainage - has been used for sewage and surface water run-off from roofs and pavements. This water soaks into the ground and raises the water table (GeoGuide LR5). Subsoil drains that run along the contours should be avoided for the same reason. If felt necessary, subsoil drains should run steeply downhill in a chevron, or herring bone, pattern. This may conflict with the requirements for effluent and surface water disposal (GeoGuide LR9) and if so, you will need to seek professional advice.

Rock debris - from landslides higher up on the slope seems likely to pass through the site. Such locations are often referred to by geotechnical practitioners as "debris flow paths". Rock is normally even denser than ordinary fill, so even quite modest boulders are likely to weigh many tonnes and do a lot of damage once they start to roll. Boulders have been known to travel hundreds of metres downhill leaving behind a trail of destruction.

Vegetation - has been completely cleared, leading to a possible rise in the water table and increased landslide risk (GeoGuide LR5).

DON'T CUT CORNERS ON HILLSIDE SITES - OBTAIN ADVICE FROM A GEOTECHNICAL PRACTITIONER

More information relevant to your particular situation may be found in other Australian GeoGuides:

- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR7 - Landslide Risk
- GeoGuide LR9 - Effluent & Surface Water Disposal
- GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

The Australian GeoGuides (LR series) are a set of publications intended for property owners; local councils; planning authorities; developers; insurers; lawyers and, in fact, anyone who lives with, or has an interest in, a natural or engineered slope, a cutting, or an excavation. They are intended to help you understand why slopes and retaining structures can be a hazard and what can be done with appropriate professional advice and local council approval (if required) to remove, reduce, or minimise the risk they represent. The GeoGuides have been prepared by the Australian Geomechanics Society, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.

PLANNING CODE ANALYSIS

LAUNCESTON CITY COUNCIL INTERIM PLANNING SCHEME 2015

Town Hall St John Street, Launceston, Tasmania, 7250
http://www.iplan.tas.gov.au/default.aspx

PROPOSED UNIT DEVELOPMENT

ADDRESS- 51-55 WESTBURY ROAD, SOUTH LAUNCESTON, TAS

Part D Zones

- **10.0 General Residential Zone**

10.4 Development Standards

•	10.4.1 Residential density for multiple dwellings
•	10.4.2 Setbacks and building envelope for all dwellings
•	10.4.3 Site coverage and private open space for all dwellings
•	10.4.4 Sunlight and overshadowing for all dwellings
•	10.4.5 Width of openings for garages and carports for all dwellings
•	10.4.6 Privacy for all dwellings
•	10.4.7 Frontage fences for all dwellings
•	10.4.8 Waste storage for multiple dwellings
•	10.4.9 Site facilities for multiple dwellings
•	10.4.10 Common property for multiple dwellings
•	10.4.11 Outbuildings, swimming pools and fences
•	10.4.12 Earthworks and retaining walls
•	10.4.13 Location of car parking
•	10.4.14 Development for discretionary uses
•	10.4.15 Lot size and dimensions
•	10.4.16 Frontage and access
•	10.4.17 Discharge of stormwater
•	10.4.18 Water and sewerage services
•	10.4.19 Integrated urban landscape
•	10.4.20 Walking and cycling network
•	10.4.21 Lot diversity
•	10.4.22 Solar orientation of lots
•	10.4.23 Neighbourhood road network
•	10.4.24 Public transport network

ARCHITECTURAL SOS- STUART OATES SERVICES- 0439334417

- 10.4.2 Setbacks and building envelope for all dwellings

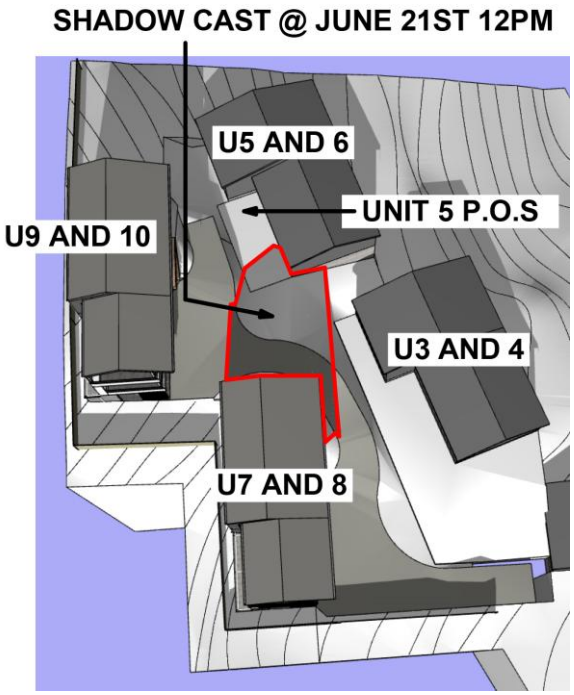
A3 (a) The proposed units 7, 8, 9 and 10 encroach the prescribed building envelope along the boundaries.
The proposed building envelope breaches (refer to elevations) are predominately related to the roof over Unit 8 and 10's balcony.
The proposed units have been located towards the side and rear boundaries to optimise the available space and utilize the site for vehicle manoeuvring, private open space and reduce overshadowing on existing Units 1-6.
As the site falls away from Merivale Street the existing Merivale residences to the east of the proposed are on higher ground reducing over shadowing and viewing .
The peel street residences on the northern side will receive no overshading from the proposed. Over viewing here is a minor issue thou, refer to 10.4.6.
The proposed units are designed to work with the existing contour of the site and cut into the ground where possible to reduce building height. The staggered gable roof contextualises with the existing site units and the narrow mass (5.3m wide near the adjacent residences to the north) helps reduce bulk and scale when viewed from the adjacent lots to the north.
Separation between the proposed dwellings and existing units is compatible with that prevailing in the existing units and surrounding area. The proposed staggers down the site allowing light to penetrate over the other and are separated by the prescribed distances between habitable room and windows outlined in 10.4.6.

A3 (b) Units 7 and 8 encroach prescribed side boundary building envelope when drawing a line 3m up from N.G.L then at an angle of 45^{o} to a height of 8.5m.
According to clause A3 (b) the proposed can have a setback within 1.5m of a side boundary if the dwelling does not exceed a total length of 9m (6.6m) or 1/3 the length of the side boundary.
The Northern face of proposed units 7, 8, 9 and 10 is within the prescribed 9m total allowable length allowing it to be build within 1.5m of the side boundary.
The eastern side of Units 7, 8 and 9, 10 extend 18m long respectively.
The property adjacent to Units 9 and 10 has existing vegetation screening and the majority of the building will be hidden when viewed from adjacent residences reducing the visible bulk of the dwelling. Refer to vegetation image below (E7.0)
The residence adjacent to Units 7 and 8 is approximately 30m away and 8m higher in elevation from the proposed, reducing any direct visual impact.
As the proposed is to the south of all adjacent residences, minimal overshadowing will occur on the existing Peel and Merivale properties.

The height of the proposed dwellings partially exceeds the prescribed 8.5m's by 1.3m at the extremities. Refer to elevations. Regarding P3 part iv, A relaxation of this clause is requested as the buildings are cut into the ground where possible to reduce bulk and scale and only a small percentage of the dwellings are in breach over the balconies.

- 10.4.4 Sunlight and overshadowing for all dwellings

The proposed Units 7 and 8 will have a minimal impact on the level of sunlight required for existing Units 5 and 6. On the Winter Solstice at 12pm the shadow cast from Units 7 and 8 will not penetrate into any habitable room of Units 5 and 6. The private open space for Units 5 will be partially obstructed but still receive more than 3 hours of sunlight to over 50% of the private open space on the Winter Solstice.
Refer to image below highlighting the shadow cast at 12pm on the 21st of June.



- 10.4.6 Privacy for all dwellings

Units 7, 8, 9 and 10 all have a balcony with F.F.L more than 1m above N.G.L. Units 7 and 8 are within 3m (1.5m) of the side northern boundary.
No screening is proposed above the 1m high balustrade. Relaxation of screening performance criteria requested pending advertising representations as it would nullify any view down the river and restrict northern solar gain.
To the eastern side of all unit balconies 50% transparent timber slat screening is proposed 50% transparent timber slat screening from 1m up to ceiling height to reduce overlooking to the east although there is no direct overlooking into any of the Merivale residences as they are elevated 8m above the proposal's natural ground level.
The sill heights of windows on the eastern side are above below 1.7m and therefore require the prescribed obscuring. As the windows do not look directly into any habitable rooms, or the private open spaces directly associated with the dwellings, and have a lower floor level to the Merivale residences, It is requested that a relaxation to this clause be accepted.
The windows to the North have reduced sill heights also to increase natural solar gain and are set back from the boundary a minimum of 4.5m for Units 7 and 8 and 7m for Units 9 and 10. The balconies for the units provide visual screening of the residences to the north when viewed from inside the dwellings.

- 10.4.12 Earthworks and retaining walls

The proposed core filled 190mm block work retaining walls located on the site plan are fitting with the existing topography of the site and to replace an existing embankment that is covered in low shrub vegetation. Refer to image below.
By installing the 2 retaining walls (1 is 9m long and the other 12m, both max 2.1m high) ground is regained and the landslip threat is reduced as the proposed driveway can be founded near a secure edge.

The proposed retaining walls will be planted with creeping vines to reduce visual impacts of the block work and create a scenic context for the existing units.
Ag-drains with geo-fabric filters and compacted gravel back fill will be installed behind the retaining walls to disperse any ground water from behind the wall to a reticulated system.

EXISTING EMBANKMENT COVERED IN LOW SHRUBBERY

Part E Zones

- **E3.0 Landslip Code**

- E3.6.1 Development Standards

Refer to landslide risk management assessment

- **E6.0 Car Parking and Sustainable Transport Code**

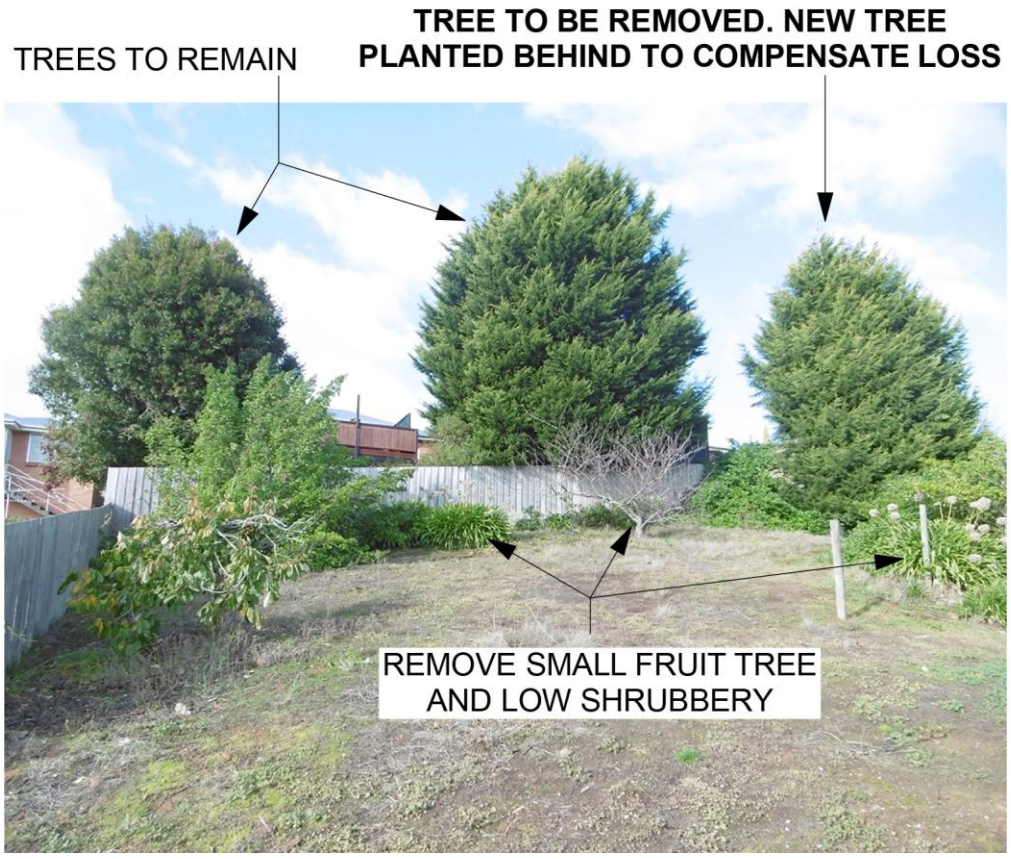
- E6.6 Development Standards

Refer to Site Plan

- **E7.0 Scenic Protection Code**

- E7.6 Development Standards

The proposed will have minimal impact on the surrounding vegetation and streetscape.
Only 1 mature tree is to be removed. Selected low shrubbery to be removed during site clearing. The one tree to be removed is approximately 8m tall and will be compensated by a new tree planted 6m to the south of its current location



VIEW TOWARDS EASTERN BOUNDARY. LOCATION OF UNITS 9 AND 10.