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STORM WATER MANAGEMENT PLAN

103 PATTERSON ST, BYRON BAY

CLIENT: PLANIT CONSULTING on behalf of the proponent

RESIDENTIAL DEVELOPMENT

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Report	Tom Harrington	Sean Richardson	18/03/2021	C

Project Details

Project Name	Stormwater Management Plan – 103 Patterson Street, Byron Bay
Client	Planit Consulting on behalf of the proponent
Authors	Tom Harrington
Checked by	Sean Richardson
SCG Consulting Engineer reference	30089(SWM).RevC

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1.0 INTRODUCTION

SCG Consulting Engineers have been commissioned by Planit Consulting on behalf of the proponent to complete a Stormwater Management plan for a residential development at 103, Lot 101 Patterson Street, Byron Bay.

The proposed development involves the construction of 14 townhouse dwellings. The objective of this stormwater management plan is to demonstrate that the following measures will be incorporated into the design and construction of the development:

- Maintain stormwater quality – Protect receiving waters (during and post construction)
- Manage stormwater peak flow rates of runoff and existing flow path characteristics
- Protect against flooding
- Adopt Water Sensitive Urban Design (WSUD) principles throughout
- Implement Stormwater Harvesting and re-use.

This report should be read in conjunction with our detailed site stormwater management plans (Appendix C drawing (No.) SCG 30089 -OW7.1.B, SW1.1.B, SW1.2.A & SW1.3.A).

The development has been assessed against the following guidelines and planning documents:

- Queensland Urban Drainage Manual 2013 (QUDM)
- Water by Design – Deemed to Comply Solutions
- Byron Shire Council Development Control Plan (DCP)
- AS/NZS 3500.3:2018 – Plumbing and Drainage Part 3 – Stormwater Drainage
- NSW Development Design Specification – Chapter D5 Stormwater Drainage Design
- Byron Shire Council – Comprehensive Guidelines for Stormwater Management.

2.0 EXISTING SITE DESCRIPTION

The allotment is described as Lot 101 on DP839601 and is within Byron Bay Shire Council and approximately 3816m^2 (0.38ha) in area. Access to the site is off Patterson Street, which bounds the north western property boundary (refer to figure 2.1), for a locality plan and Appendix B for a detailed site survey. The site is currently occupied by a two storey residential building located in the front half of the site. The rear of the site is covered by short grass and scattered trees.

The site generally falls from the front boundary on Patterson Street (Approx. RL 15-16 AHD) down towards the rear boundary (Approx.RL 5.3 AHD). Surface grades in the front half of the site are in the order of 16% and then flatten out to approximately 2% for the rear half of the site (Approx. 70m). A Council's stormwater drainage reserve runs along the south eastern (rear) boundary of the property which contains an open grass swale drain and underground low flow pipe and are all contained within an existing easement.

Figure 2.1 – Locality Plan

3.0 PROPOSED DEVELOPMENT

A residential development is proposed for the allotment comprising of 14, two storey residential townhouse dwellings.

The proposed development plans are detailed in Chris Clout Designs drawings C0.1 – C7.1 RevD (refer Appendix A). The development includes the following features;

- 4 visitor and 25 private carparking spaces
- Bin storage and washdown area
- Single property driveway access to Patterson Street
- Bio retention basin for stormwater quality
- Landscaping areas across the site
- Private swimming pools
- Padmount transformer.

Figure 3.1 – Proposed Development

4.0 EXISTING DRAINAGE

4.1 Existing Drainage and Infrastructure

A Catchment Flood Study prepared by Floodworks which is accompanied with a detailed site survey prepared by Ardill Payne and Partners (Appendix B), confirms the following drainage infrastructure along the rear boundary of the site;

- A series of side entry pits connected to an underground pipe network within the drainage easement of the subject site.
- A series of underground RCP's varying in size located within the drainage easement.
- An inter-allotment major overland flow path consisting of a grassed swale.

4.2 Lawful Point of Discharge

The lawful point of discharge is described in Section 3.4 of QUDM 2013. The two-point test may be helpful in assessing whether a lawful point of discharge exists at a particular location. The test consists of being satisfied that:

1. The location of the discharge is under the lawful control of the Local Government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement.

2. In discharging to that location, the discharge will not cause an actionable nuisance i.e. a nuisance for which the current or some future neighbouring proprietor may bring an action or claim for damages arising out of the nuisance), or environmental or property damage.

If the proposed development maintains pre-development flow conditions, the lawful point of discharge for the subject site is the existing underground pipe network and grassed swale stormwater infrastructure located along the south eastern (rear) boundary of the site.

5.0 STORMWATER QUALITY

In the absence of adequate controls, urban development can increase both stormwater runoff volumes and peak discharge rates. In addition, this urban development has the potential for increased creek erosion and the stressing of in-stream aquatic ecosystems. The use of stormwater detention or retention systems aims at reducing these threats by limiting property flooding to acceptable levels and also filtering stormwater runoff through a vegetated soils media layer, thus reducing the threats caused by urban development. For the proposed development we have suggested to incorporate water sensitive urban design (WSUD) principles in the landscaping for the proposed development to treat stormwater before it exists the site. A series of vegetated swales, bio retention bed and a detention tank have been incorporated into the proposed development.

5.1 Water By Design Assessment

The following factors have been identified as potential contributors which can adversely affect stormwater quality draining from the site:-

- Silt and sediment erosion
- Gross Pollutants
- Hydrocarbon runoff
- Nutrient runoff

The proposed development has been assessed against the Water By Design (Stormwater Quality Deemed to Comply Solutions – 2010).

The proposed residential development involves a land area greater than the trigger value of 2500m^2 for stormwater quality measures as required in the Water By Design - Stormwater Quality Deemed to Comply Solutions - 2010.

5.2 Construction Phase

Sediment generated during the construction phase shall be controlled in accordance with The Erosion and Sediment Control (ESC) Plan and kept on site throughout construction (refer Appendix F).

5.2.1 Silt and Sediment Erosion

A potential for sediment mobilization/transportation exists during and beyond the construction of the proposed development. This can elevate turbidity levels of stormwater runoff.

A RUSLE assessment of the site confirms proposed development is a Low Risk for soil loss (< 150 Tonnes).

Potential Causes

- Stormwater scour and erosion of excavated or stripped surfaces and stockpiled soils.
- Wind borne transportation of sediments.
- Disturbance/breakup of soil profile via vehicular traffic followed by stormwater scour and erosion.
- Transportation of sediments from site via excavation vehicles.

Mitigating Measures

- Construction of silt fences around the development site located to cut off all runoff.
- Construction of a sediment basin throughout construction at a low point of the development site.
- Provide 80-100mm crushed rock (no fines) hardstand under all vehicle paths expected during construction. Generally, this would be provided from the existing crossover and extended to a distance within the site that would accommodate the maximum delivery vehicle length expected.
- Provide rumble grates at exit points from the site for passing earthmoving vehicles.
- Where possible maintain existing landscaping/grasses downslope from construction areas to act as buffer/silt trap.
- Install temporary downpipes from completed roof structures and ensure runoff passes through silt fences.
- Minimise concentrating surface flows.
- Place silt barriers around council stormwater pits that the site drains to.
- Cover soil stockpiles with hessian or similar.

5.2 Completed Development

We are proposing to use a combination of active and passive stormwater treatment measures. Active measures will include a Bio-Retention bed and passive measures via gross pollutant inserts into stormwater pits within paved areas that receive runoff from areas prone to gross pollutants.

5.2.1 Water Quality Objectives

Water quality objectives for Byron Bay are outlined in the Byron Shire DCP 2014 Chapter B3 Table B3.2 and are displayed in Table 5.1. These reductions are achieved by adopting best practice techniques in accordance with the abovementioned guidelines.

Table 5.1: Pollutants and Retention Criteria

POLLUTANT / ISSUE	RETENTION CRITERIA
Litter	70% if average annual load greater than 5mm
Coarse Sediment	80% of average annual load for particles 0.5mm or less
Fine Particles	50% of average annual load for particles 0.1mm or less
Total Phosphorous	45% of average annual load
Total Nitrogen	45% of average annual load
Hydrocarbons, motor fuels, oils and grease	90% of average annual load

5.3.2 Sources of Contaminants

Gross Pollutants

Gross pollutants include litter, grit and heavier sediments which can be mobilised from within or from neighbouring sites.

Potential Causes

- Unsecured refuse areas.
- Unlandscaped areas prone to stormwater scour.

- Insufficient drainage for surface runoff from within the site.
- Wind Bourne transportation.

Mitigating Measures

- Well established refuse areas with ample storage bins. Fenced off where deemed necessary.
- Provision of ample litter bins across the commercial footprints of the site. Particularly in any outdoor dining or areas of congregation.
- Promotion of stormwater surface runoff through landscaped areas or similar sediment traps.
- Promotion of stormwater surface runoff through landscaped areas or similar sediment buffering strips/traps.
- Provide stormwater pits outside paved areas that receive runoff from areas prone to gross pollutants with surrounding buffering measures, such as stone pitching.
- Provide gross pollutant inserts into stormwater pits within paved areas that receive runoff from areas prone to gross pollutants.

Hydrocarbon Runoff**:**

Hydrocarbons can be mobilised and transported in stormwater runoff from the site. This can contaminate stormwater runoff compromising Water Quality Objectives.

Potential Causes

- Leaks from parked vehicles within the completed development.
- Washing of vehicles within the completed development.

Mitigating Measures

- Fall driveways and parking areas towards adjacent landscaped strips, vegetated swales and the bioretention bed.

Nutrient Runoff:

Nutrients such as Nitrogen and Phosphorus can be mobilized and transported in Stormwater runoff from the site. This can compromise Water Quality Objectives.

Potential Causes

- Runoff from hard surfaces within the site.
- Detergents used in car washing and similar activities.
- Fertilisers used in propagation of landscaped areas.
- Embodied nutrients contained in silt (topsoil) runoff.
- Embodied nutrients contained in runoff.

Mitigating Measures

- Fall vehicles pavement areas towards landscaping areas and the bioretention bed.
- Implement management plan for landscaping propagation. Use stable organically bound fertilizers cultivated immediately prior to turf placement. Mulch over areas of exposed topsoil.
- Construction of silt fences during construction and maintained beyond completion of landscaping.
- Drain stormwater runoff through the Bio Basin.
- Capture roof runoff and store for re-use.

5.3.3 Proposed Treatment Measures

Following the water quality objectives for the site mentioned above, to ensure that on-site stormwater management facilities can be economically maintained, it was deemed the most appropriate method for treatment is the use of a bio-retention basin. Roof and surface runoff will be collected by an internal drainage network and directed to the on onsite bio retention basin prior to the lawful point of discharge.

5.3.4 Pollutant Modelling:

The impact of the stormwater quality management strategy of runoff discharged from the site has been assessed using the Pollutant Export Model, Model for Urban Stormwater Improvement Conceptualisation (MUSIC).

For our model we have routed all of the captured roof and driveway runoff through the bioretention bed. Rear of allotment areas are drained via a series of catch pits which also drain into eh bioretention bed.

Figure 5.1 displays a print screen of the MUSIC Model Schematic for the proposed development and Figure 5.2 displays the annual pollutant loads that will be discharged from the proposed development.

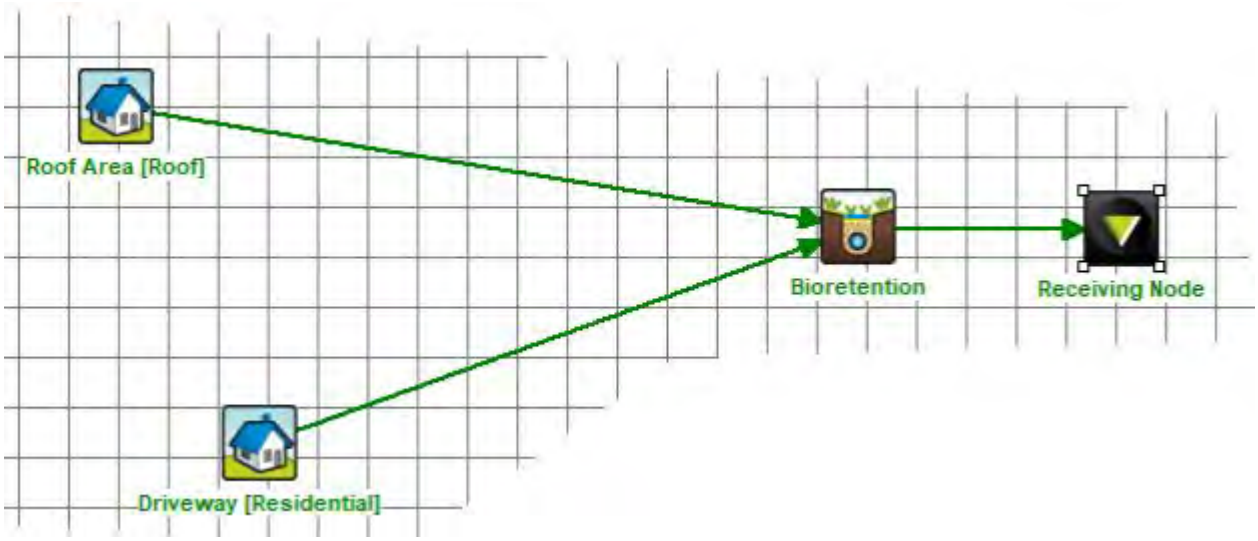
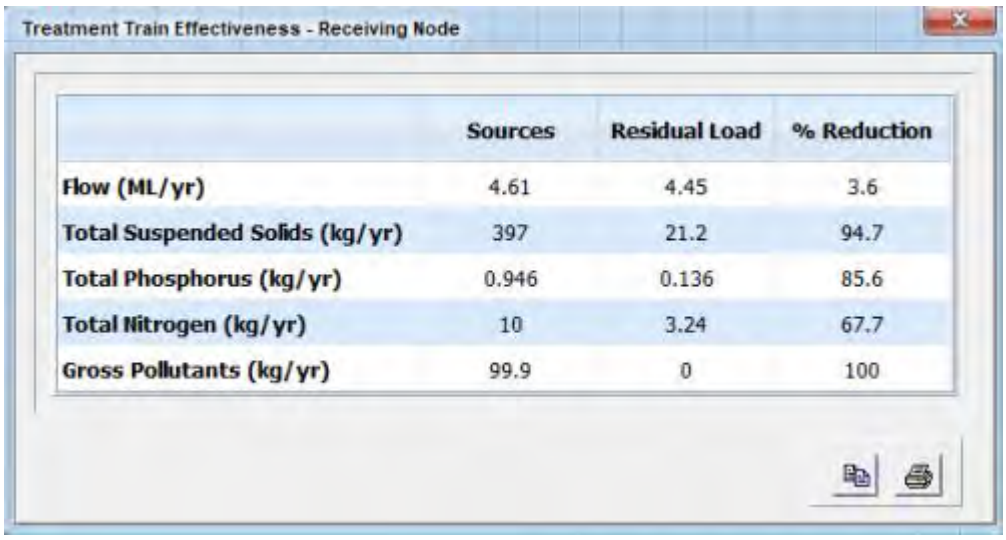


Figure 5.1 – Music Model Schematic



	Sources	Residual Load	% Reduction
Flow (ML/yr)	4.61	4.45	3.6
Total Suspended Solids (kg/yr)	397	21.2	94.7
Total Phosphorus (kg/yr)	0.946	0.136	85.6
Total Nitrogen (kg/yr)	10	3.24	67.7
Gross Pollutants (kg/yr)	99.9	0	100

Figure 5.2 – Music Modelling Results

The modelling results show the pollutant reduction objectives are met for all contaminants listed in Table 5.1. Details of the proposed bio-retention basin are provided in the Stormwater Management Plan drawing no: SCG 30089-SW1.1.B, SW1.2.A & SW1.3.A (Appendix C).

The Music Model was set up in accordance with the Water By Design Music Modelling Guidelines for South East Queensland.

6.0 STORMWATER QUANTITY

Byron Bay Shire Council's DCP require post development peak flows leaving the development site are not to exceed the pre-development peak flow rates for the required design storms. Peak flow increases will be minimised by the provision of an Onsite Detention Tank (OSD) fitted with a low flow orifice plate to detain a portion of the runoff from the site and limit the peak flow rates of pre-development levels.

6.1 Rational Method

To calculate the peak discharges for the site under existing (pre-development) and proposed (post-development) conditions the rational method has been used in accordance with QUDM 2013.

6.1.1 Design Storms

The Handbook of Stormwater Drainage Design – D5 – Stormwater Drainage Design outlines the following design storms.

1. Minor Drainage System - 20% AEP (ARI 5 years)
2. Major Drainage - 1% AEP (ARI 100 years)

6.1.2 Rainfall Intensity

Rainfall intensities were obtained from Byron Bay Shire Council's Comprehensive Guidelines for Stormwater Management. Rainfall Intensity Frequency Duration (IFD) for Byron Bay and Bangalow.

A2 **Byron Shire Council** *(Reference BSC Development Control Plan 2002 – Part N5)*

Byron Bay & Bangalow

Duration	LPIII Intensity (mm/hr) for Average Recurrence Interval (Years)						
	1	2	5	10	20	50	100
5 min	128	160	190	215	240	260	300
6 min	120	150	180	200	222	250	280
10 min	98	125	150	165	180	210	235
20 min	72	90	110	125	140	155	170
30 min	60	75	90	100	115	130	140
1 hr	40	50	63	70	80	90	100
2 hrs	26	34	42	47	54	62	78
3 hrs	20	26	34	38	43	50	54
6 hrs	12	16	21	24	28	32	34
12 hrs	8	10	14	15	18	21	22
24 hrs	5.5	7.7	9	10.5	12.5	14.5	16
48 hrs	3.5	4.6	6.5	7.5	8.7	10.8	12
72 hrs	2.7	3.6	5.1	6	7.2	9.2	10.5

Figure 6.1 – Byron Shire Council IFD Data

6.1.3 Time of Concentration

Times of Concentration (T_c) were calculated as defined in QUDM –

Table 6.1 – T_c Values

Existing (T_c) (mins)		Post Development (T_c) (mins)
15		15

6.1.4 Runoff Coefficient (C_{10})

The 10 year runoff coefficients (C_{10}) were calculated as defined in QUDM.

Table 6.2: C_{10} Values

Condition	C_{10}
Existing Site	0.74
Post-development	0.84

6.1.5 Peak Flows

Table 6.3 below displays a summary of major and minor discharge rates for pre and post development conditions.

Table 6.3: Pre and Post Development Peak Flow Rates

Condition	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{20} (m^3/s)	Q_{100} (m^3/s)
Pre-development	0.112	0.129	0.148	0.217
Post-development	0.127	0.147	0.168	0.237

6.2 Proposed Drainage

The proposed site drainage is detailed in drawings SCG 30089-SW1.1.B, SW1.2.A & SW1.3.A (Appendix C) and is discussed below.

6.2.1 Catchments

Roof Catchment

Runoff from the roof catchment will flow via downpipes to an internal drainage network where it will be directed to an underground detention tank. Runoff will then flow to the onsite bioretention basin prior to discharge to the lawful point of discharge.

Ground Catchment

Driveway surface runoff will be directed to a series of entry pits and an underground pipe network to the on-site bio retention basin. The treated runoff is then discharged to the lawful point of discharge.

6.2.2 Peak Flow Mitigation

As shown in Table 6.3 Stormwater peak discharge will increase by 20Lt/s as a result of the proposed development. Therefore, it is proposed to utilise an OSD system to mitigate the peak stormwater discharge rates from the proposed development prior to discharging to the lawful point of discharge as discussed in section 4.2.

6.2.3 Hydraulic Modelling:

Hydraulic modelling has been undertaken using the Laurenson Runoff Routing Method. This requires the catchment to be divided into pervious and impervious portions.

Using the software package XP-STORM Hydraulic Model, we have modelled the site to establish existing and proposed stormwater drainage characterisitics.

Rainfall Data:

Rainfall data accompanied with Initial Loss (IL) and Continuing Loss (CL) was sourced from the Australian Rainfall and Runoff (ARR) data hub and were imported into the model.

Configuration:

Figure 6.2 shows the configuration of the XP-STORM Model. The site was divided into several small sub-catchments to mirror the Stormwater Management Plan drawing no: SCG 30089-SW1.1.B detention tank was also included for the upper driveway and roof catchments.

To mitigate the peak flow increase from the developed site, 4 x 7,000lt/s detention tanks were modelled in XP-STORM fitted with a 135mm diameter orifice plate and a 225 diameter overflow pipe. A schematic of the XP-STORM model is shown in Figure 6.1 below.

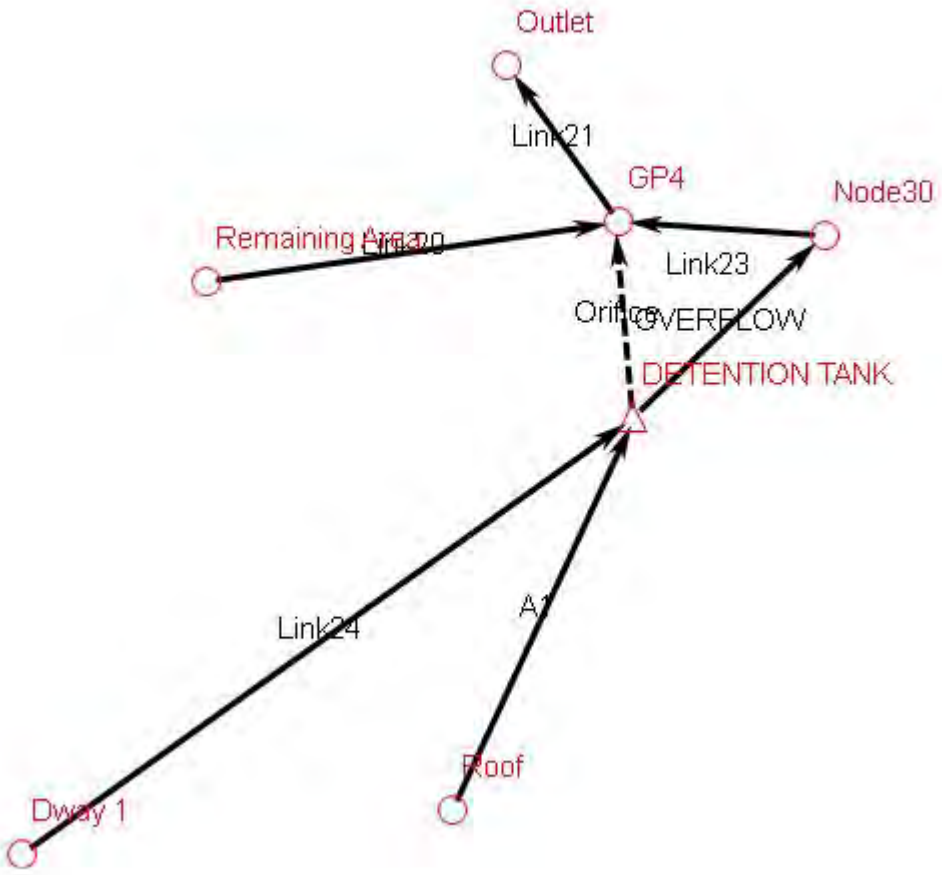


Figure 6.1 – XP-STORM Model

Results:

10 temporal pattens were assessed for each duration for the above design events. A box and whisker plot has been used to determine the critical storm duration and design discharge, this displays appropriate information about the range, mean, median and quartiles of the results. As there is a large amount of data this plot is also useful to display any outliers in the data set.

Figure 6.2 & 6.3 below shows the highest post development mitigated median storm duration for the 5 year & the 100 year ARI is the 10min storms, producing peak discharges of 0.103 m^3/s and 0.190 m^3/s respectively. This controlled peak flow rate is less than the existing site of 0.112 m^3/s & 0.237 m^3/s which is considered a satisfactory solution. The arrangement of the detention tanks is shown in the Stormwater Management Plan SCG 30089-SW1 (Appendix C).

A full export of XP-STORM results is shown in Appendix E.

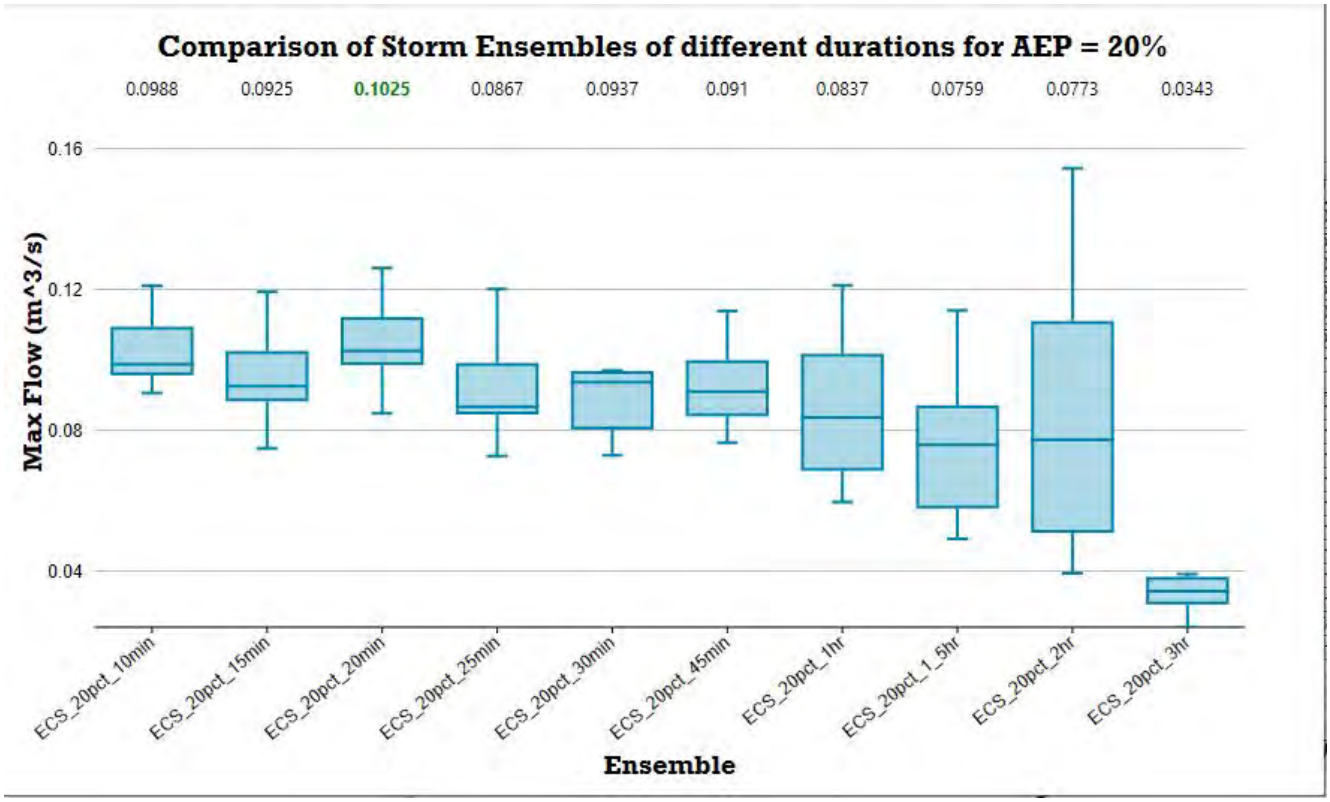


Figure 6.2 – 20% (Q5) Box and whisker plot of ensemble results

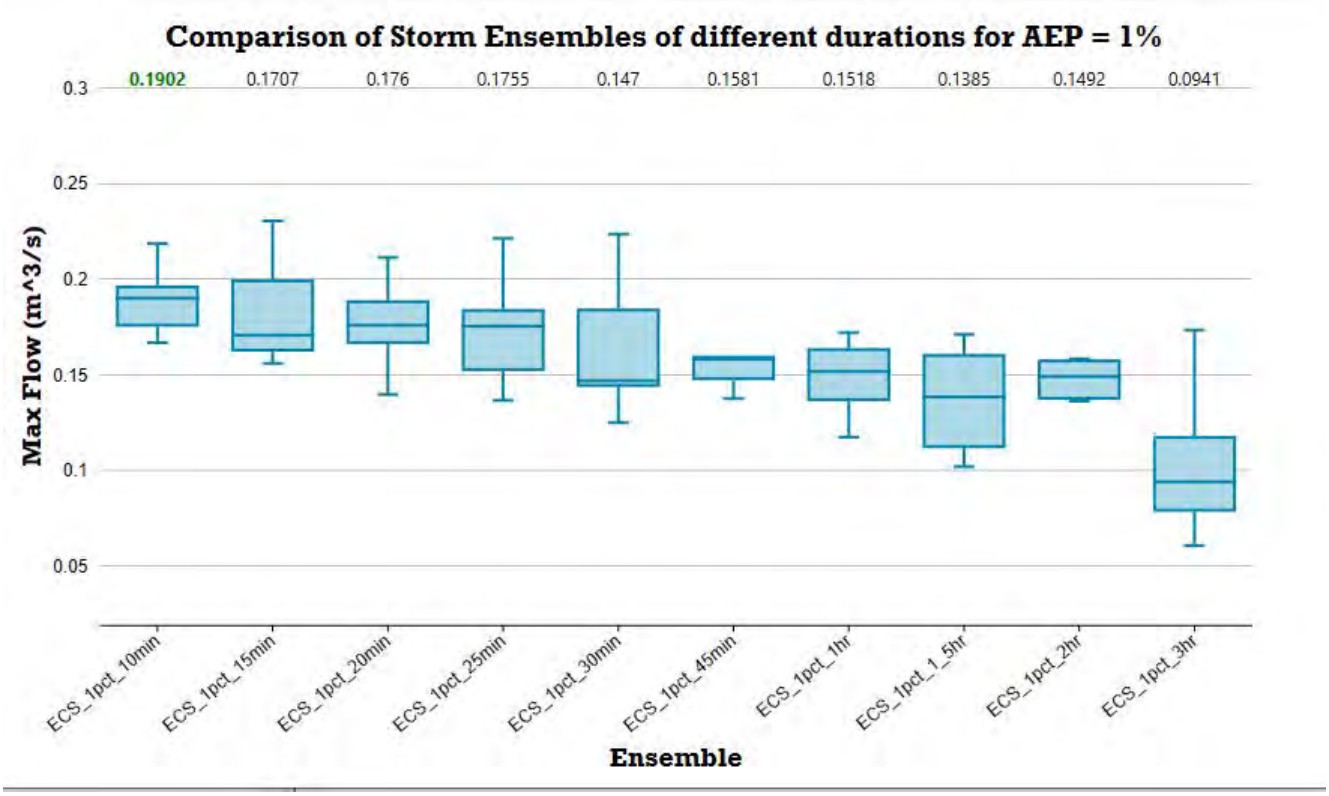


Figure 6.3 – 1% (Q100) Box and whisker plot of ensemble results

Comparison to Rational Method:

The rational method has been used as a means to compare XP-STORM calculations of the design discharge. Table 6.4 summarises the comparison of the rational method for the site at the legal point of discharge.

Table 6.4 – (Post Development) XP-STORM and Rational Method Peak Discharge

Design Storm	XP-STORM (Apr 2016) (m^3/s)	Rational Method (m^3/s)
Q_5	0.130	0.127
Q_{10}	0.146	0.147
Q_{20}	0.166	0.168
Q_{100}	0.224	0.237

6.2.4 Manage Allotment and Cross Allotment Flows:

To mitigate the worsening and nuisance of flooding to the neighbouring properties adjoining Shelly Drive. In accordance with The Hydraulic Impact Assessment Report (No. FW0036 Revision 4). Existing upslope flows from the site will be captured within Patterson Street road reserve to existing Council infrastructure.

Neighbouring sites on both sides of the site appear to drain from front to back with no visible/noticeable cross allotment flows into or from the subject site.

The independent commissioned flood study for the project has identified the improvement of existing nuisance flooding of neighbours directly north of the subject site by the inclusion of a new 16m wide x 0.5m depth shallow drain is proposed to direct water from Shelly Drive to the existing drainage easement to the south. Additionally, a portion of the lower end of the site is to be suspended on piers to allow for emergency overland flow relief.

7.0 FLOODING

The Hydraulic Impact Assessment Report (No. FW0036 Revision 4) provided by Floodworks indicates the 1% maximum flood level of approximately 6.0 AHD. Therefore, the flood planning level in accordance with Byron Shire DCP 2014 Chapter 2: "Areas Affected By Flood" for Habitable Dwellings is 6.5 AHD (6.0 AHD + 500mm = 65 AHD).

Due to the proposed filling and retaining wall surrounding the site to mitigate any nuisance of flooding in neighbouring properties a new 16m wide x 0.5m shallow drain to direct runoff from Shelly drive to the existing drainage channel to the south. This is also accompanied with a small increase to the height of the left bank of the existing open channel to contain stormwater within the easement. Preliminary concept details are provided in drawing 30089-OW7.1.B (Appendix C).

Copies of this report are available upon request.

8.0 CONCULSION

The stormwater management report demonstrates under the detailed plans the proposed residential development at Lot 103, 101 Patterson Street, Byron Bay meets the quantity and quality stormwater requirements as described in this report.

The proposed development will maintain pre-development drainage patterns via the use of on-site detention. The developed site will discharge to a lawful point of discharge within the existing stormwater infrastructure that exists along the south eastern boundary of the site.

Sediment generated during the construction phase is to be dealt with via the use of silt fences, rumble grates and the inclusion of onsite sediment basin as represented in our Silt and Sediment Control plan drawing no: SCG 30089 OW2.1 (Appendix F).

The proposed development triggers the Water by Design stormwater quality treatment objectives. An on-site bio-retention basin has been incorporated into the proposed development to meet the prescribed water quality objectives.

The subject site is affected by localized flooding and requires a minimum flood planning level of 6.5 AHD with a 500mm freeboard allowance as per Byron Shire DCP 2014..

A new 16m wide x 0.5m shallow drain from Shelly drive and a small increase to the height of the left bank of the existing open channel drain is proposed to direct and contain runoff in the existing drainage channel to the south. Preliminary concept details are provided in drawing 30089-OW7.1.B (Appendix C).

APPENDIX A - Proposed Architectural Plans

SHEET ISSUE - FOR APPROVALS A3						
SHEET NUMBER	REV	SHEET NAME	STATUS	REV ID	LATEST REVISION DATE	ISSUE DATE
C1.0	D	EXISTING SITE	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.1	D	PROPOSED SITE - ABORIST	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.2	D	PROPOSED SITE / ROOF PLAN	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.2.1	D	GROUND FLOOR PLAN	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.2.2	D	UPPER FLOOR PLAN	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.3	D	SOLSTICE 9AM	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.4	D	SOLSTICE 12PM	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.5	D	SOLSTICE 3PM	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.6	D	SOLTICE (FENCE ONLY)	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.7	D	LANDSCAPING PLAN	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C1.8	D	DEEP SOIL AREAS	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C4.1	D	SITE ELEVATIONS - H1-H7	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C4.2	D	SITE ELEVATIONS - T1-T7	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.0	D	SITE LONG SECTIONS - HEIGHT LIMIT - NORTH	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.1	D	SITE LONG SECTION - HEIGHT LIMIT - SOUTH	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.2	D	NORTHERN SECTIONS	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.3	D	NORTHERN SECTIONS	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.4	D	SOUTHERN SECTIONS	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C5.5	D	SOUTHERN SECTIONS	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C7.1	D	ADAPTABLE HOUSING REFERENCE T3,4 & 5	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021
C7.2	D	ADAPTABLE HOUSING REFERENCE H3	FOR APPROVALS	RFI RESPONSE	25.02.2021	22.03.2021

CHRISCLOUTDESIGN

PATERSON STREET

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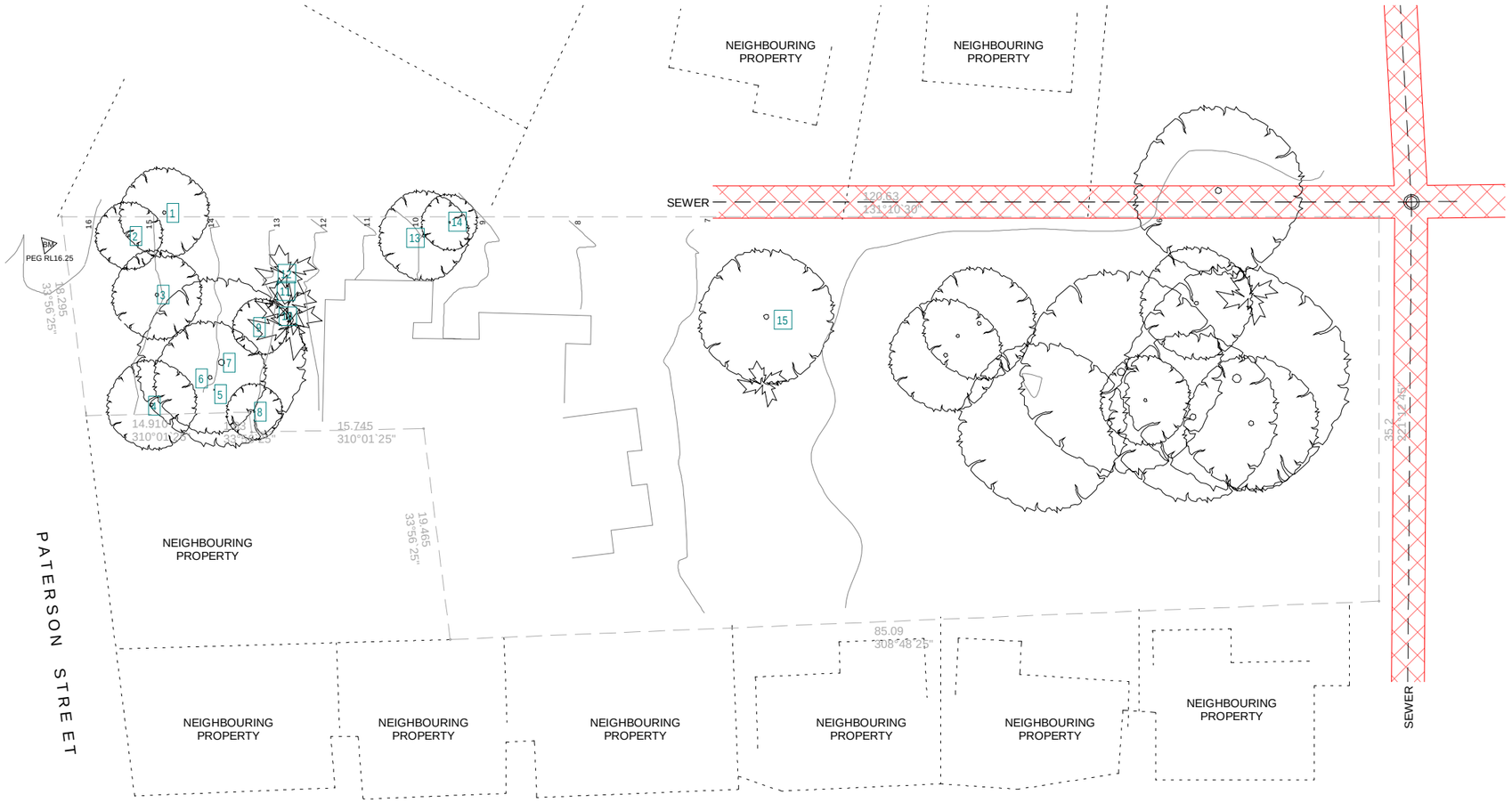
GENERAL NOTES:
Use written dimensions only. DO NOT scale drawings. Contractors to verify all dimensions on site prior to commencing works. Site location in accordance with engineers details. These drawings are to be read in conjunction with engineers design and details, the accompanying building specification and schedule of finishes. If in doubt, please request clarification. DO NOT ASSUME.

CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SHEET ISSUE
DRAWING DATE: 04.03.2021 SCALE: @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C0.1 - C



LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: EXISTING SITE
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.0 - D

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR = **764.5m²**

SITE NET TOTAL - UPPER FLOOR = **1074.3m²**

GRAND NET TOTAL = **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

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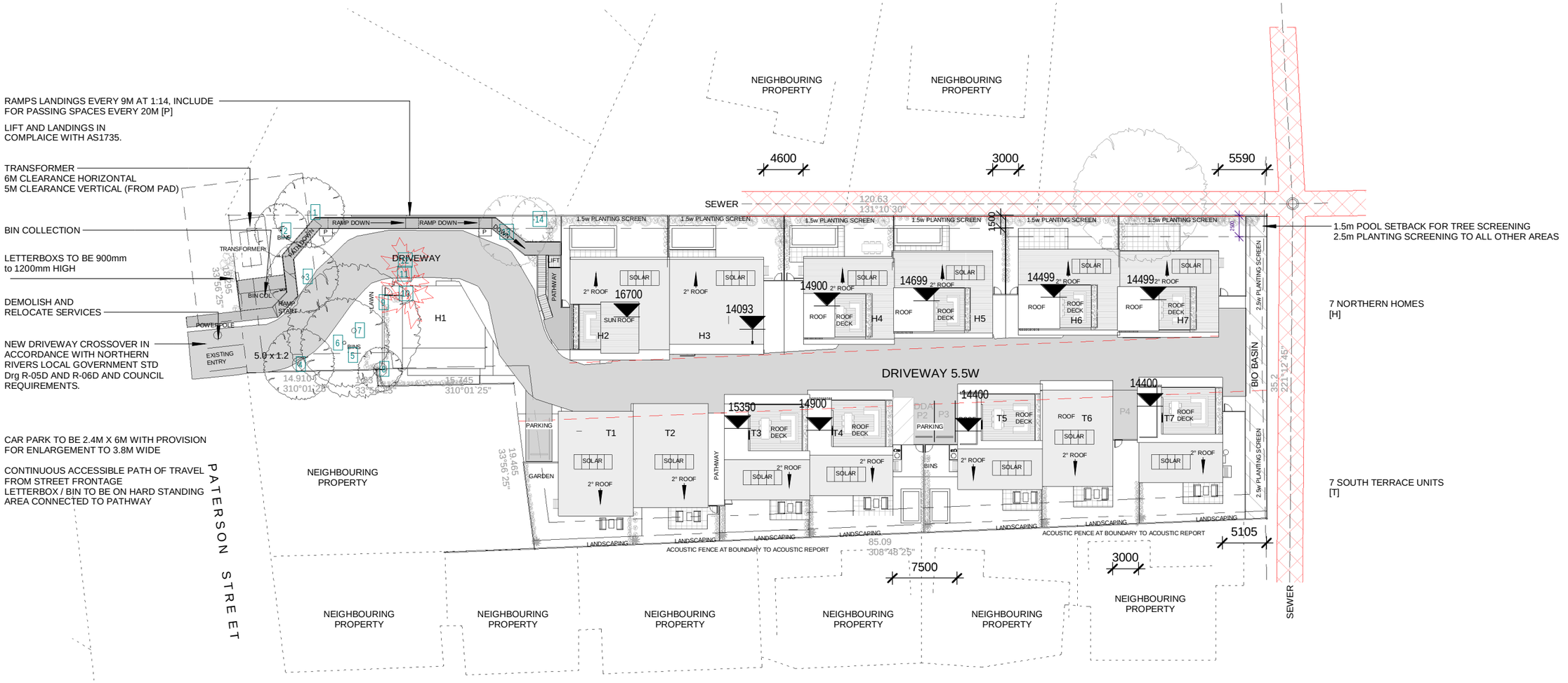
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: PROPOSED SITE - ABORIST
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.1 - D



LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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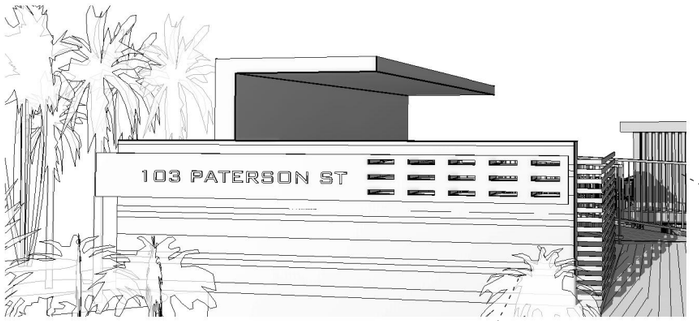
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: PROPOSED SITE / ROOF PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2 - D



PATERSON STREET RESIDENCE ENTRY GATEWAY

LETTERBOXS TO BE 900mm to 1200mm HIGH

LIFT AND LANDINGS IN COMPLAICE WITH AS1735.

RAMPS LANDINGS EVERY 9M AT 1:14, INCLUDE FOR PASSING SPACES EVERY 20M [P]

H3 ADAPTABLE HOUSING IF REQUIRED

POOL EDGE TO BOUNDARY

SEWER

120.63
131°10'30"

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

DRIVEWAY

RAMP DOWN

RAMP DOWN

DOWN

ELEC TRANS

BINS

BIN COLL

HWS

PATHWAY

LAWN

RL 13450

RL 8300

RL 8200

RL 7800

RL 6700

RL 6500

RL 6500

RL 6500

H1 OVER

H1 LOWER

RL 9100

H2

H3

4600

H4 GARAGE1.5

H5

H6

H7

3000

EXISTING ENTRY

18.295
33°56'25"

14.910
310°01'25"

123
33°56'25"

15.745
310°01'25"

DRIVEWAY

7500

3000

BIO BASIN 2.5W

35.2
221°12'45"

P1 2.5 x 4.8

T1

T2

T3

T4

DDA P2 4.8 x 5.4

P3 2.4 x 4.8

T5

T6

P4

T7

RL 8200

RL 7900

RL 7450

RL 7000

RL 6500

RL 6500

RL 6500

EOP

19.465
33°56'25"

PATERSON STREET

NEIGHBOURING PROPERTY

ACOUSTIC FENCE AT BOUNDARY TO ACOUSTIC REPORT

85.09
308°48'25"

ACOUSTIC FENCE AT BOUNDARY TO ACOUSTIC REPORT

SEWER

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

NEIGHBOURING PROPERTY

T3,T4,T5
ADAPTABLE HOUSING
IF REQUIRED

PARKING TO AS2890.6:2009

1 C5.0

8 C5.1

2 C5.2

3 C5.2

4 C5.3

5 C5.3

6 C5.3

7 C5.3

1 C5.4

2 C5.4

3 C5.4

4 C5.4

5 C5.5

6 C5.5

7 C5.5

GROUND FLOOR PLAN

SCALE: 1 : 500

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

SETBACK DIMS

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR = **764.5m²**

SITE NET TOTAL - UPPER FLOOR = **1074.3m²**

GRAND NET TOTAL = **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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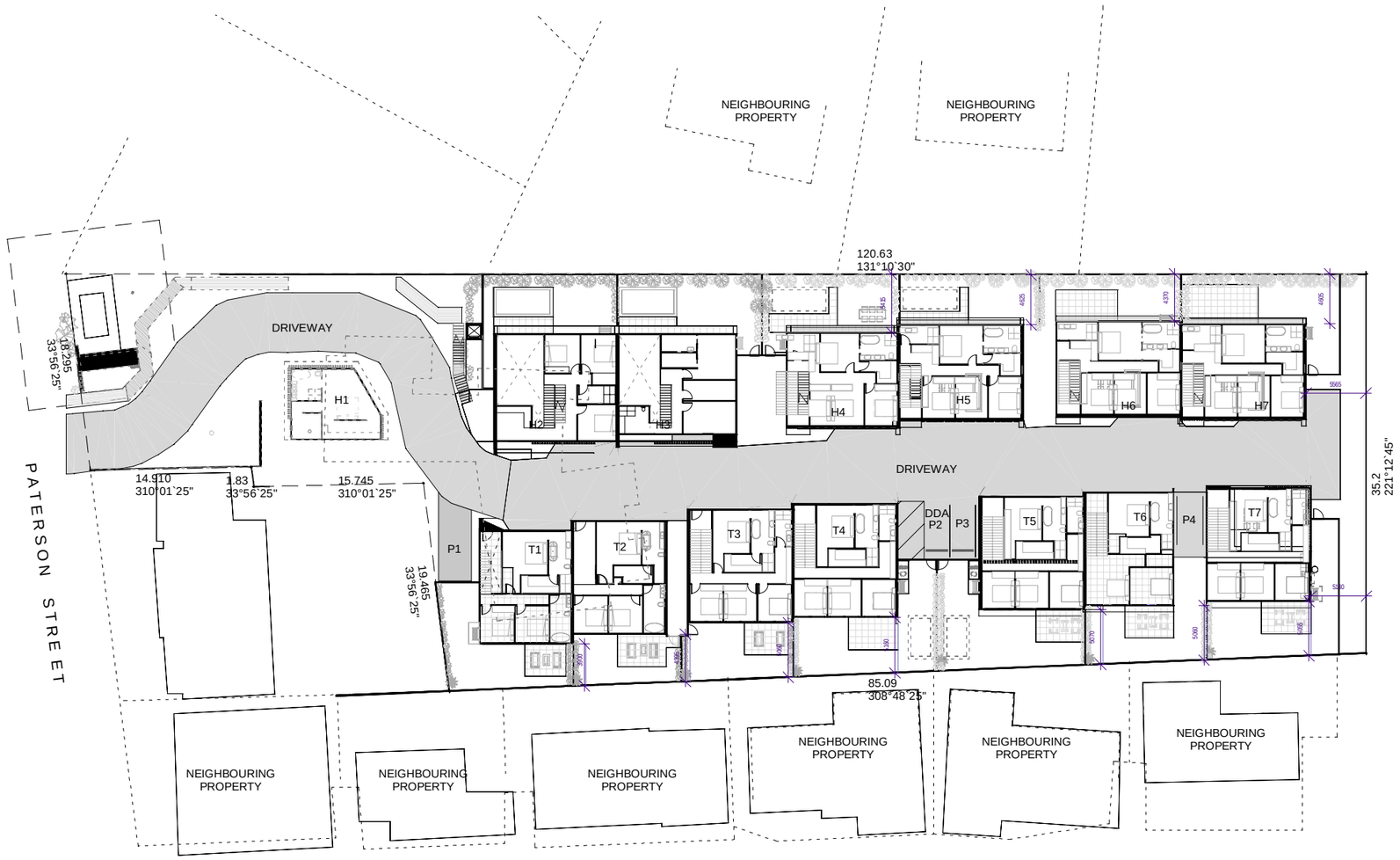
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: GROUND FLOOR PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2.1 - D



UPPER FLOOR PLAN

SCALE: 1 : 500

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

SETBACK DIMS

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR = **764.5m²**

SITE NET TOTAL - UPPER FLOOR = **1074.3m²**

GRAND NET TOTAL = **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: UPPER FLOOR PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.2.2 - D

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

9AM SHADOW WINTER SOLSTICE

SCALE: 1 : 500

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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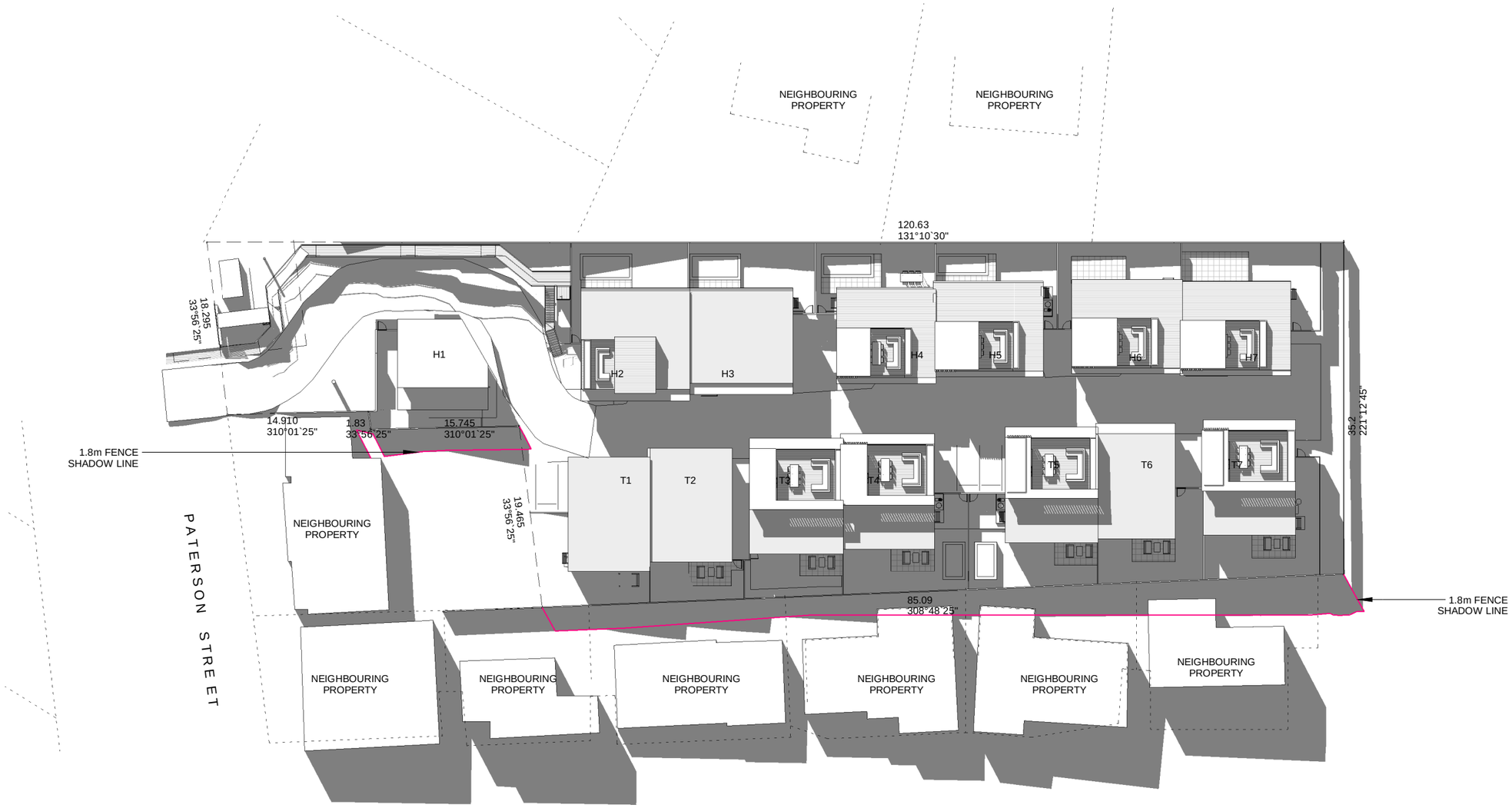
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOLSTICE 9AM
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.3 - D



LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

12PM SHADOW WINTER SOLSTICE

SCALE: 1 : 500

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOLSTICE 12PM
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.4 - D

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

3PM SHADOW WINTER SOLSTICE

SCALE: 1 : 500

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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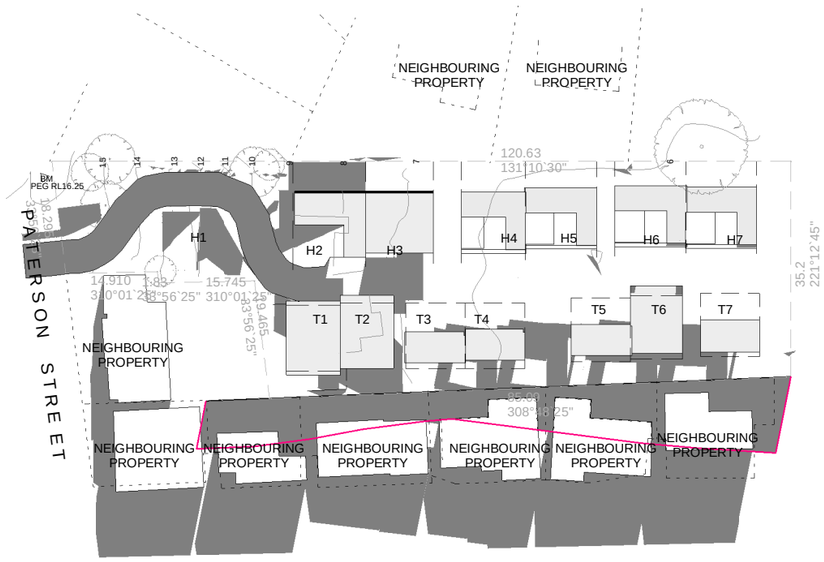
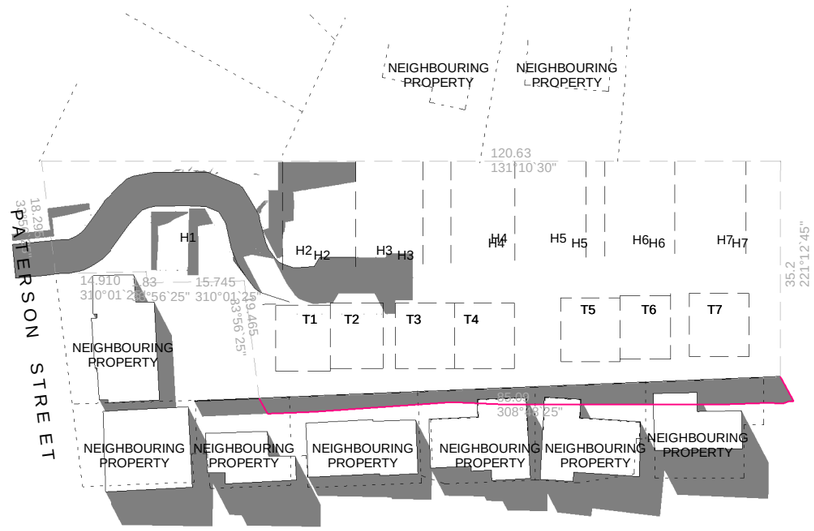
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOLSTICE 3PM
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.5 - D



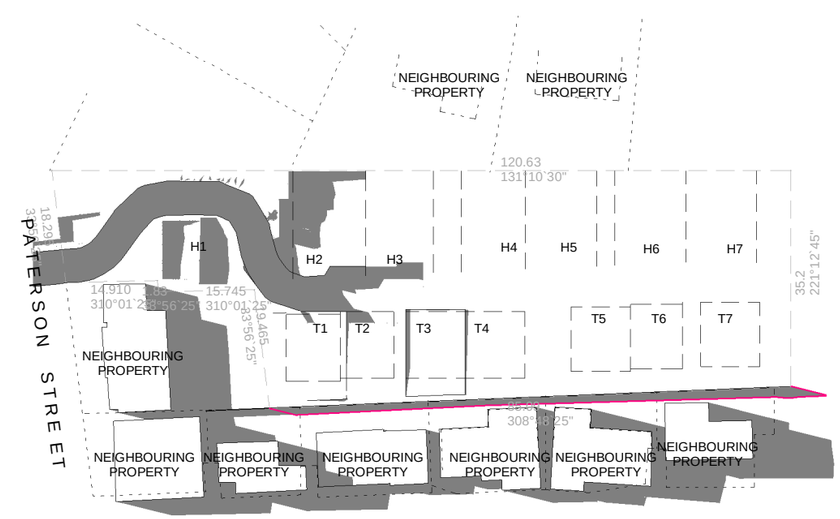
GROUND FLOOR (6M) 9AM SHADOW FENCE ONLY

SCALE: 1 : 1000



GROUND FLOOR (6M) 12PM SHADOW FENCE ONLY

SCALE: 1 : 1000



GROUND FLOOR (6M) 3PM SHADOW FENCE ONLY

SCALE: 1 : 1000

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOLTICE (FENCE ONLY)
DRAWING DATE: 04.03.2021 SCALE: 1 : 1000 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.6 - D

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

1519m² COMMON LANDSCAPE AREA

REQUIREMENTS:

COMMON LANDSCAPED AREA = 840m²

DEEP SOIL ZONE = 630m²

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR	= **764.5m²**
SITE NET TOTAL - UPPER FLOOR	= **1074.3m²**
GRAND NET TOTAL	= **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: LANDSCAPING PLAN
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C1.7 - D

LOT 101 in DP839601
NO.103 PATERSON STREET,
BYRON BAY

647m² DEEP SOIL ZONE **= 16.9%**

REQUIREMENTS:

COMMON LANDSCAPED AREA = 840m²

DEEP SOIL ZONE = 630m²

TOTAL SITE AREA

SITE AREA = 3816m²

FSR = 0.488

SITE NET AREAS

SITE NET TOTAL - GROUND FLOOR = **764.5m²**

SITE NET TOTAL - UPPER FLOOR = **1074.3m²**

GRAND NET TOTAL = **1859.8m²**

TERRACE & HOUSE AREAS ON SITE

PRIVATE OPEN SPACE SITE TOTAL = **545.4m²**

NORTH

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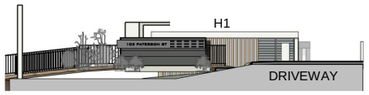
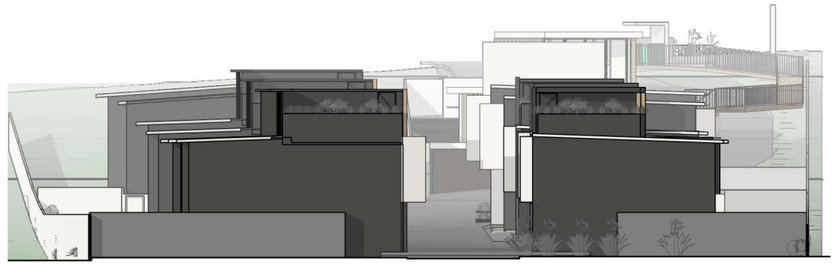
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: DEEP SOIL AREAS
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: Author
ISSUE: FOR APPROVALS

C1.8 - D



WEST ELEV
SCALE: 1 : 300



T1-7 DRIVEWAY H1-7

EAST ELEV
SCALE: 1 : 300

FRONT OF NORTHERN ASPECT
SCALE: 1 : 300

NORTH ELEV - REAR OF HOUSES
SCALE: 1 : 300

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SITE ELEVATIONS - H1-H7
DRAWING DATE: 04.03.2021 SCALE: 1 : 300 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C4.1 - D

FRONT OF SOUTHERN TERRACES.

SCALE: 1 : 300

SOUTH ELEV - REAR OF TERRACES

SCALE: 1 : 300

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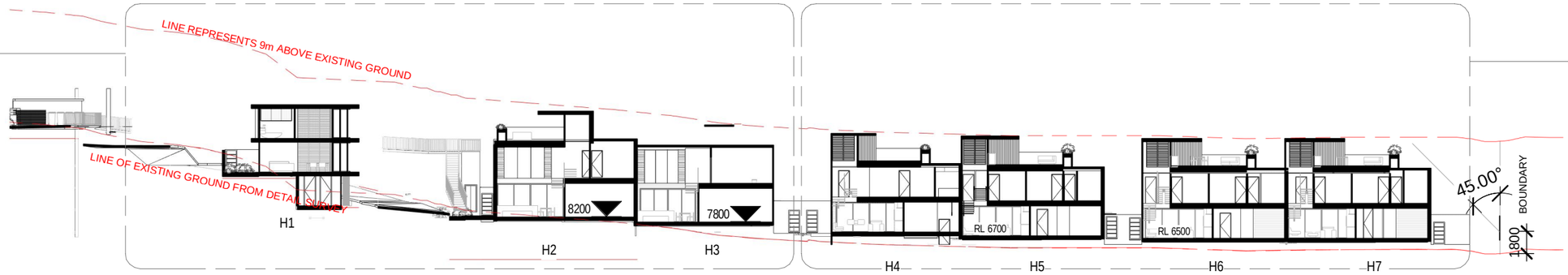
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SITE ELEVATIONS - T1-T7
DRAWING DATE: 04.03.2021 SCALE: 1 : 300 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C4.2 - D

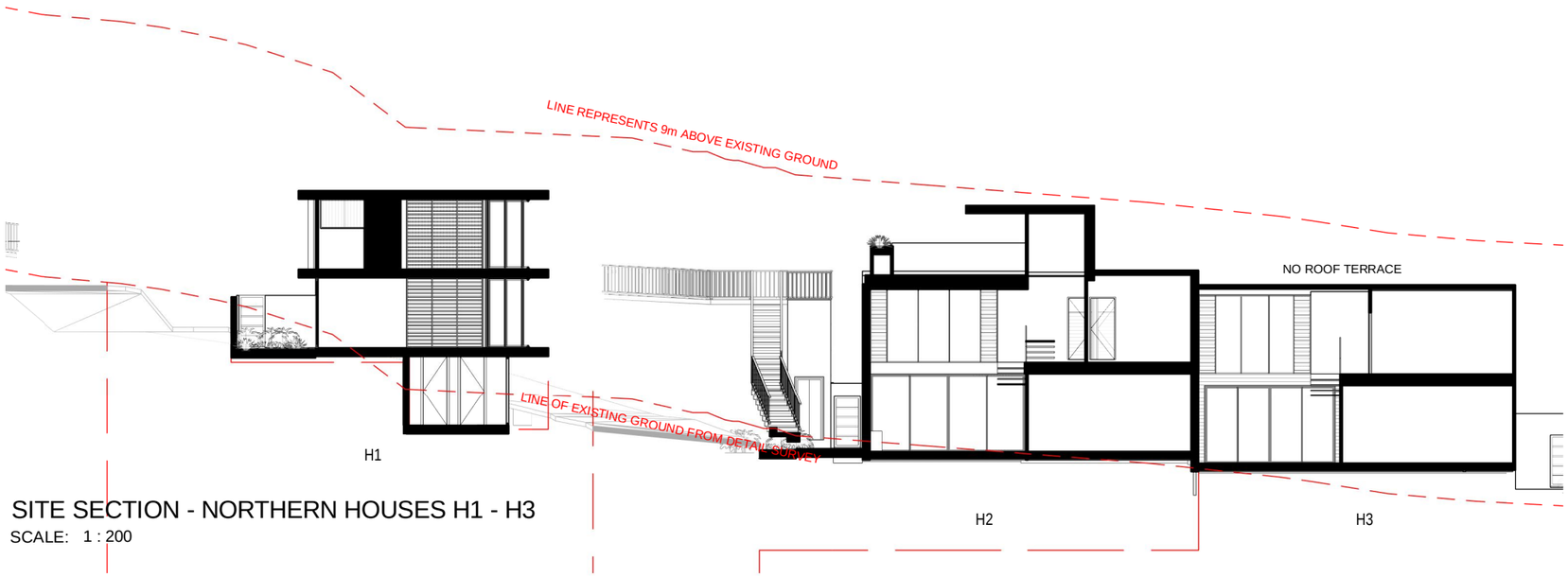
2
C5.0

3
C5.0



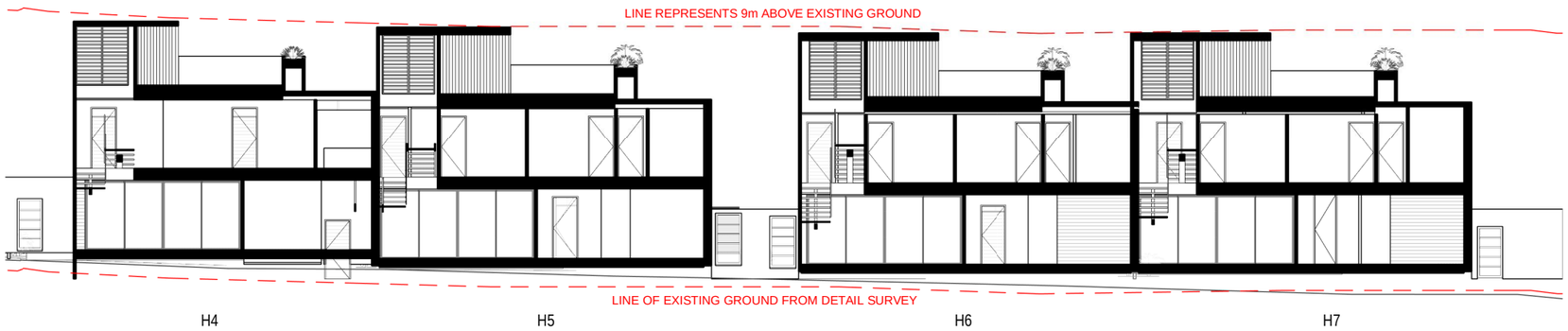
SITE SECTION - NORTHERN HOUSES

SCALE: 1 : 400



SITE SECTION - NORTHERN HOUSES H1 - H3

SCALE: 1 : 200



SITE SECTION - NORTHERN HOUSES H4 - H7

SCALE: 1 : 200

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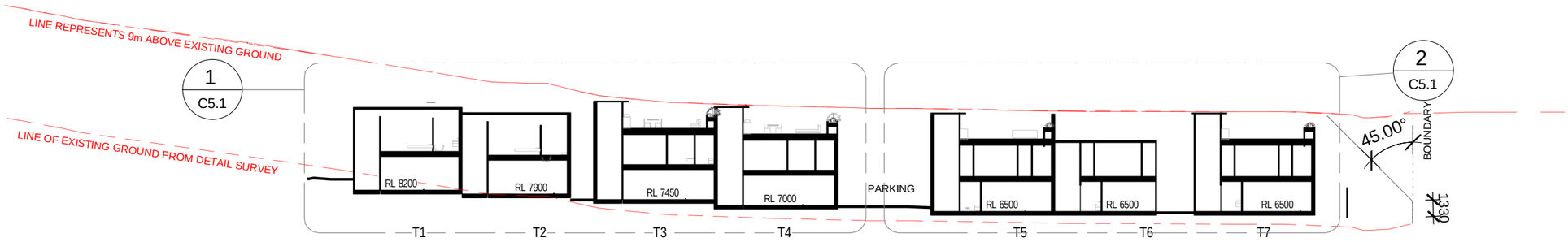
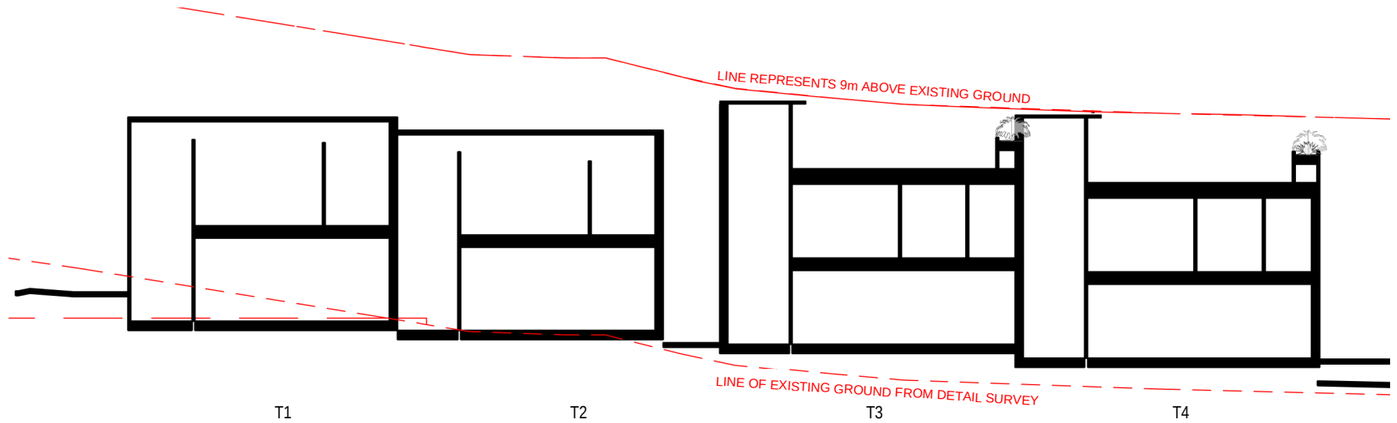
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SITE LONG SECTIONS - HEIGHT LIMIT - NORTH
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.0 - D



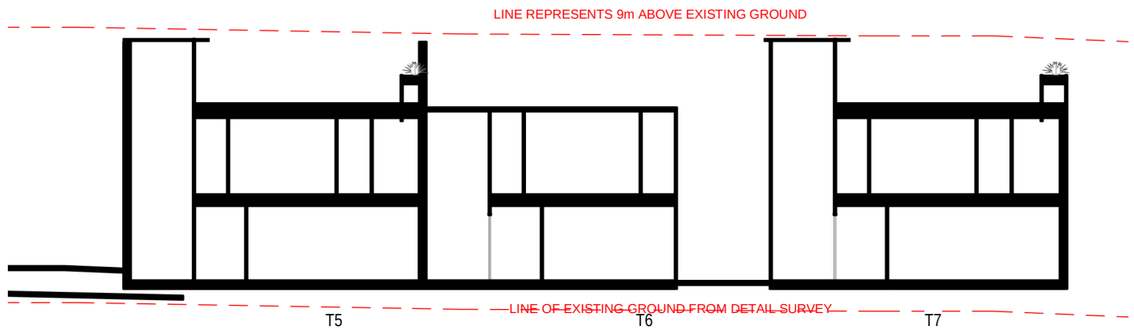
SITE SECTION - SOUTHERN HOUSES

SCALE: 1 : 400



SITE SECTION - SOUTHERN HOUSES - T1 -T4

SCALE: 1 : 200



SITE SECTION - SOUTHERN HOUSES - T5 -T7

SCALE: 1 : 200

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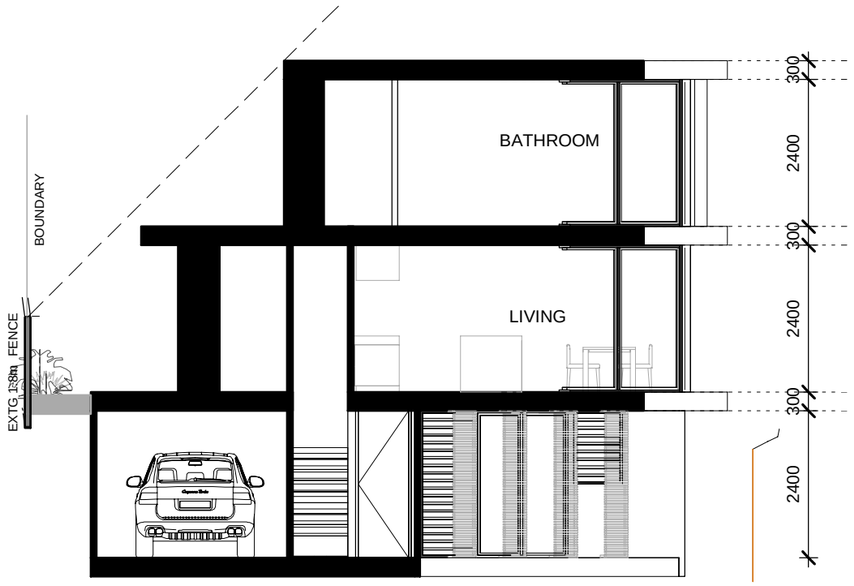
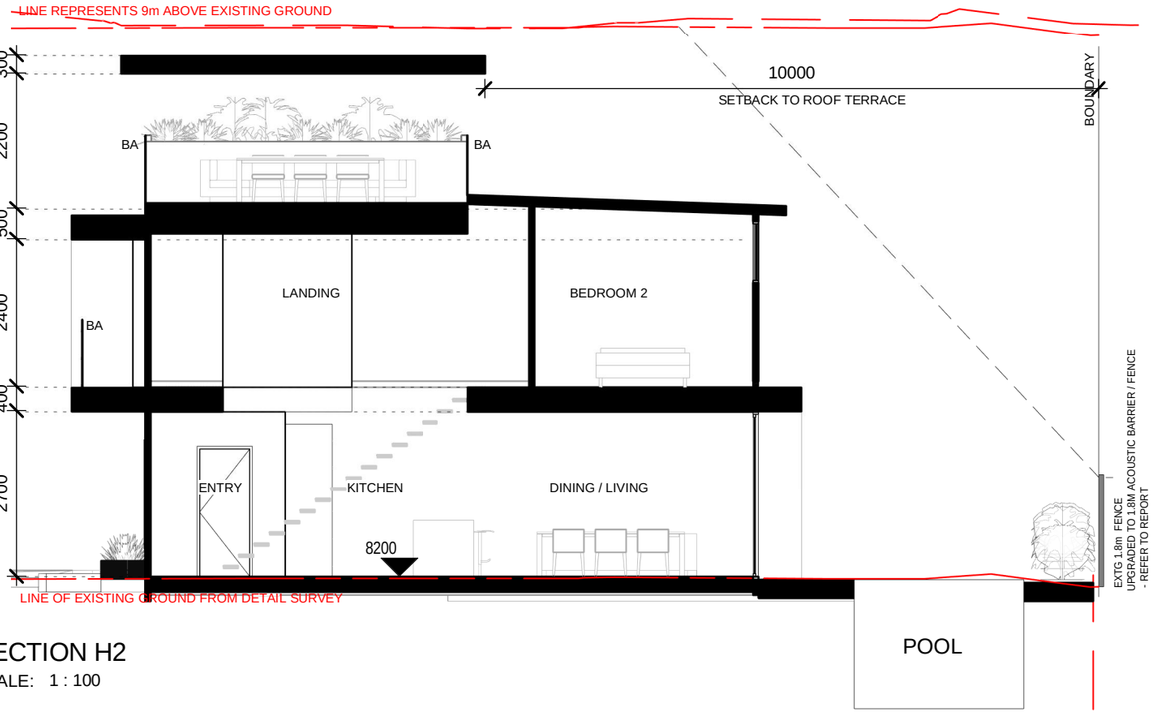
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SITE LONG SECTION - HEIGHT LIMIT - SOUTH
DRAWING DATE: 04.03.2021 SCALE: As indicated @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.1 - D



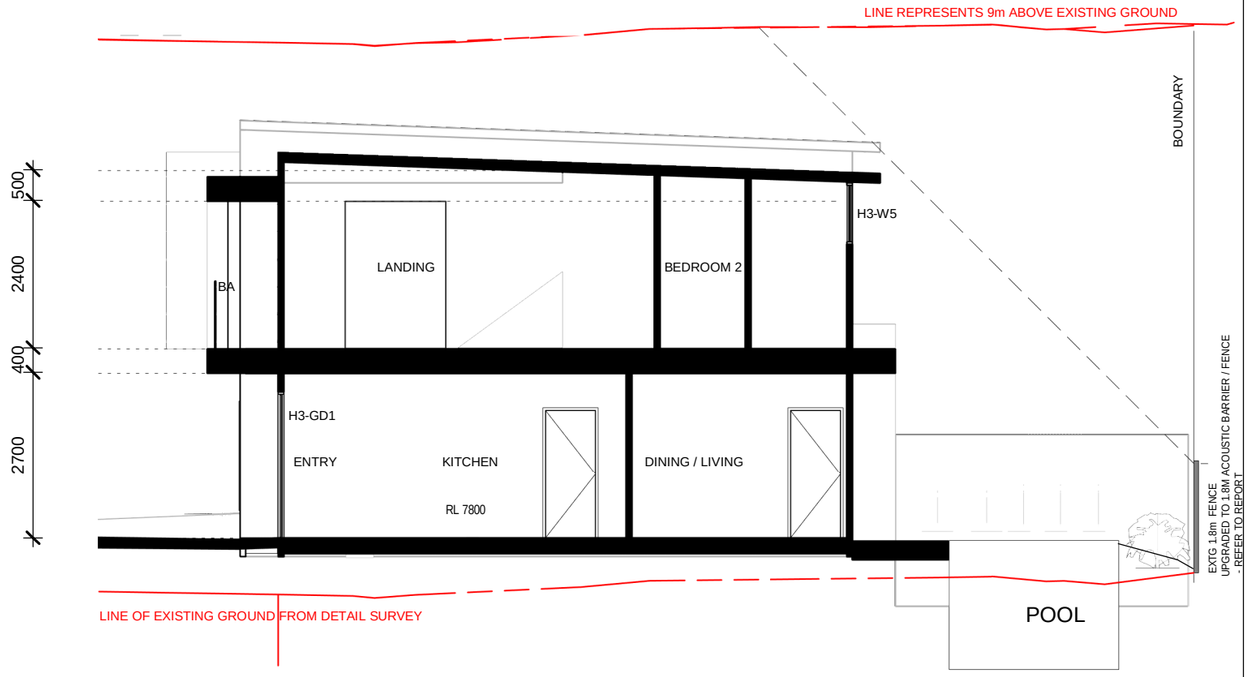
SECTION H1

SCALE: 1 : 100



SECTION H2

SCALE: 1 : 100



SECTION H3

SCALE: 1 : 100

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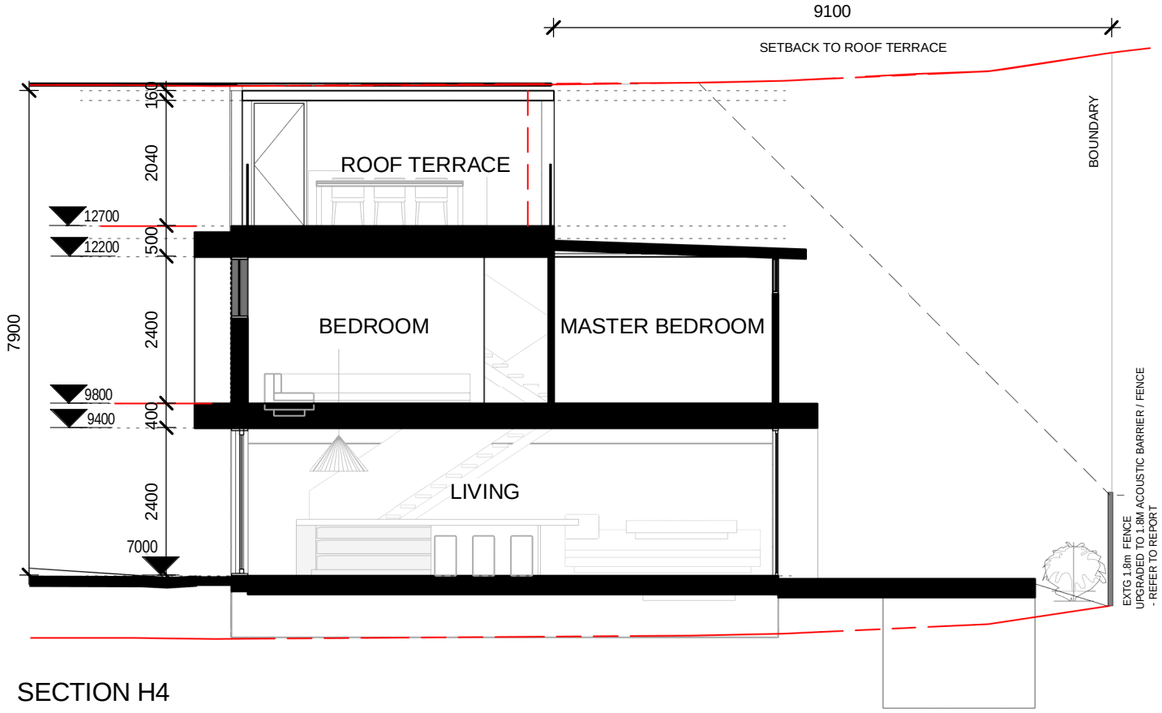
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: NORTHERN SECTIONS
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.2 - D



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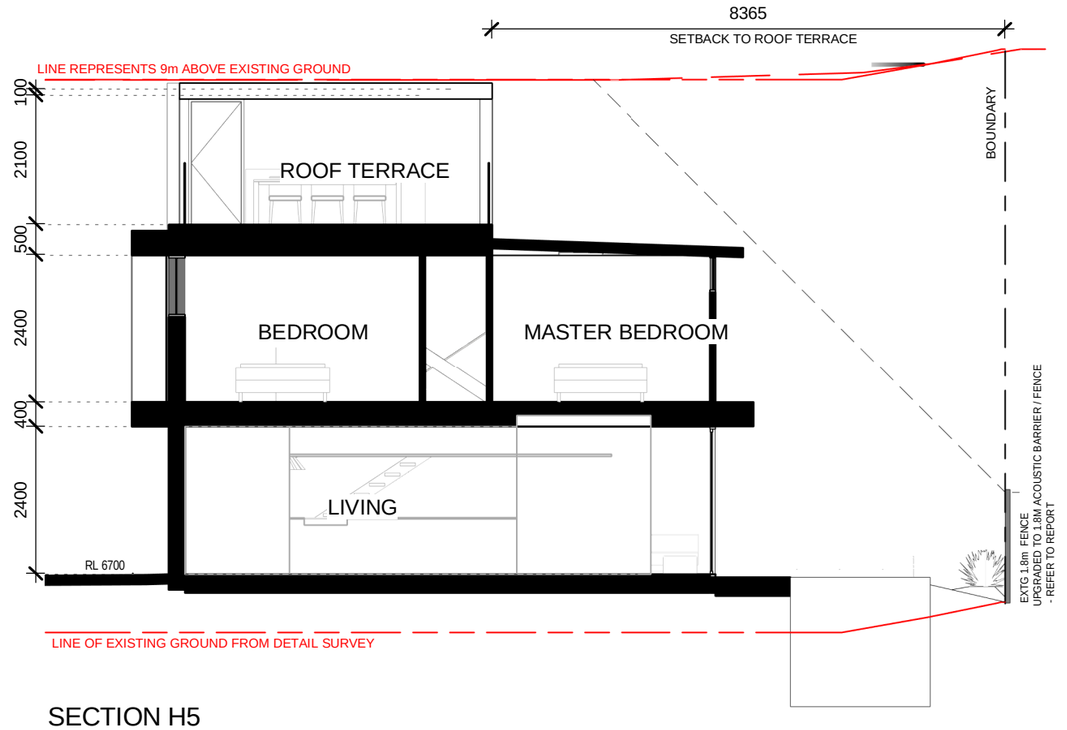

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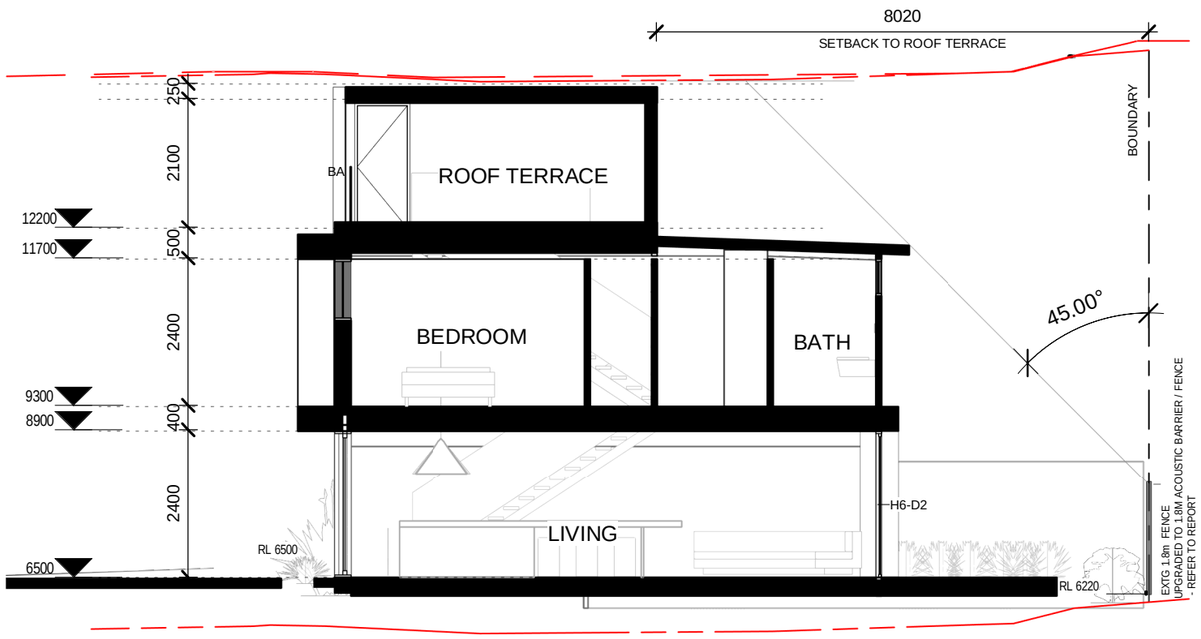

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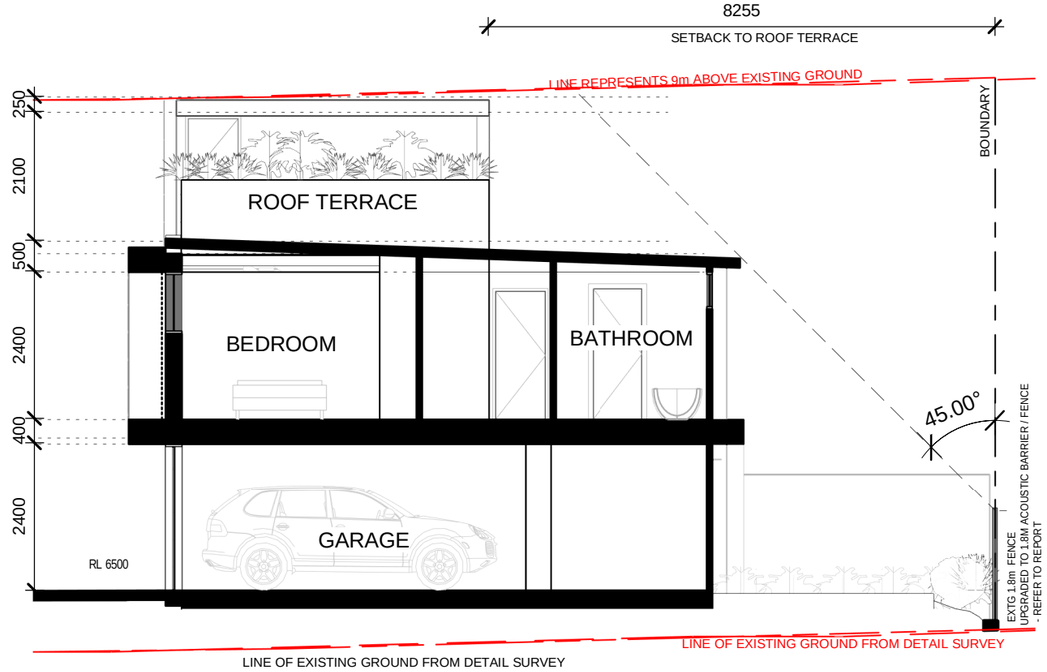

SECTION H7

SCALE: 1 : 100

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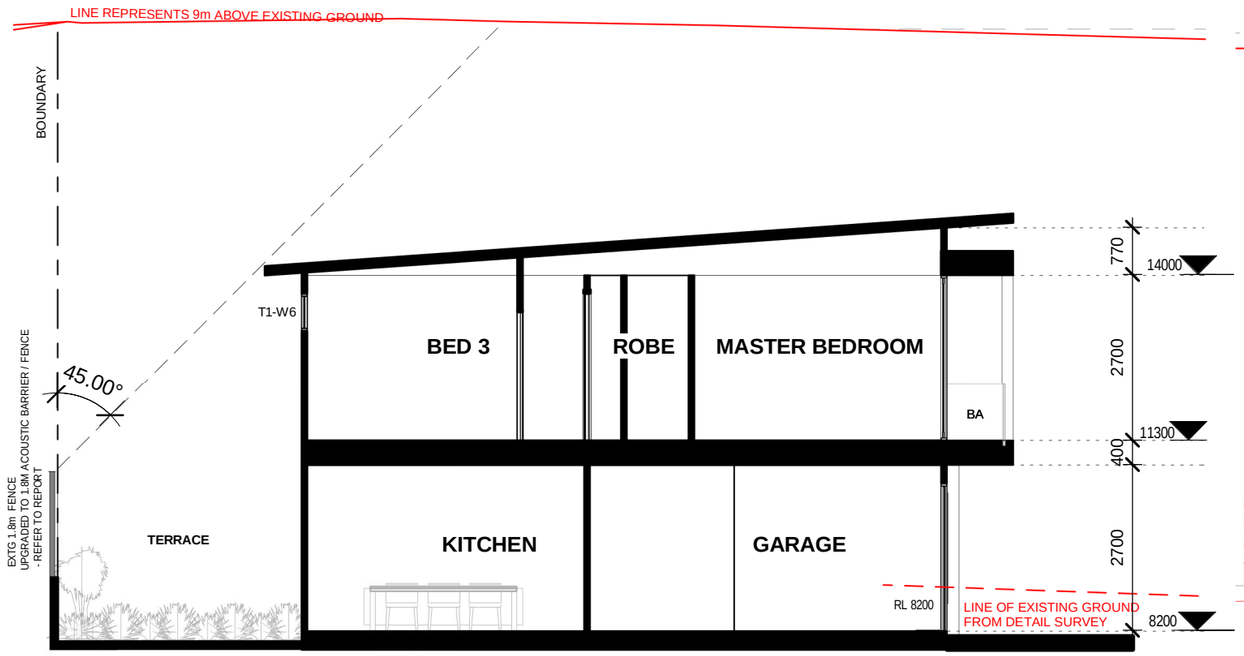
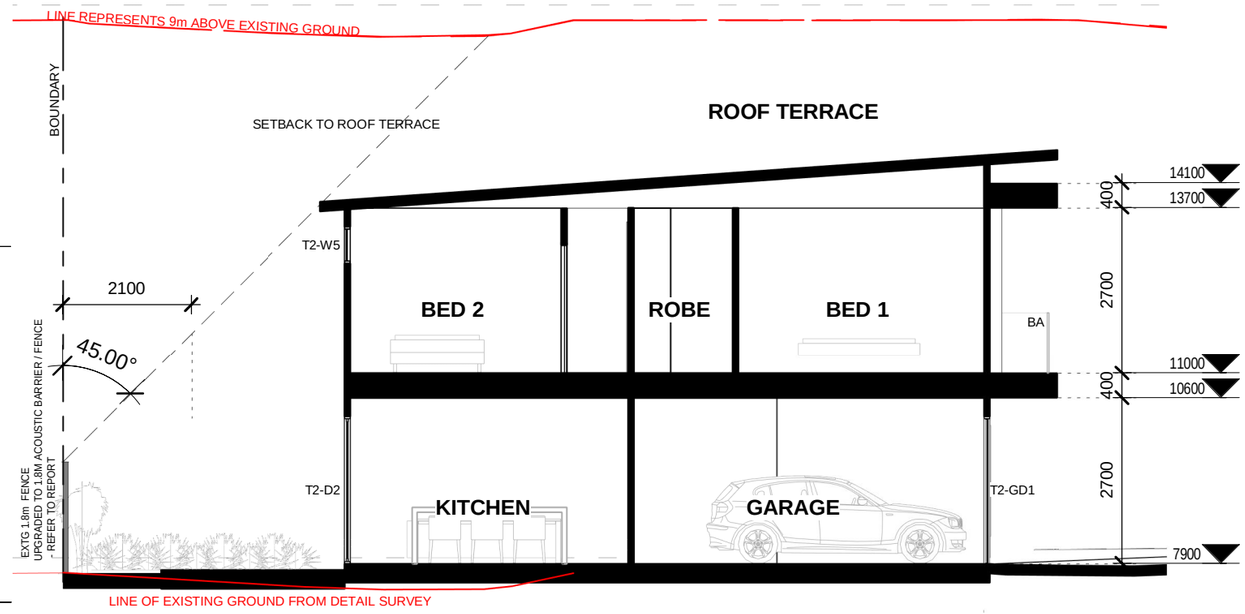
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: NORTHERN SECTIONS
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.3 - D



SECTION T1

SCALE: 1 : 100



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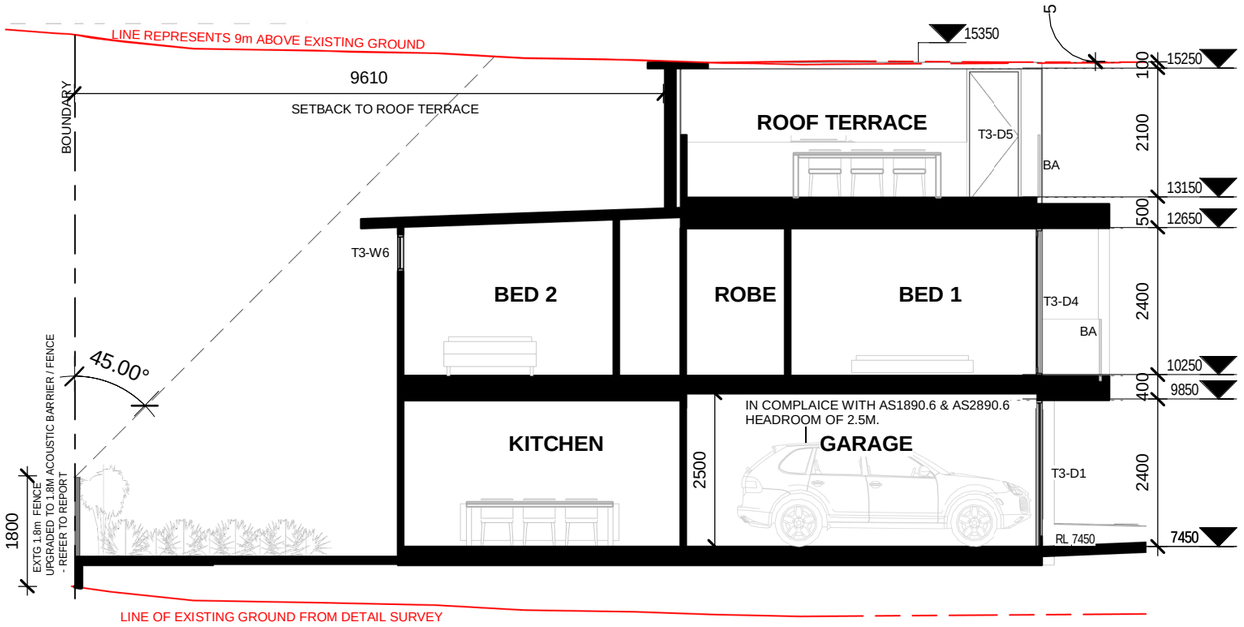

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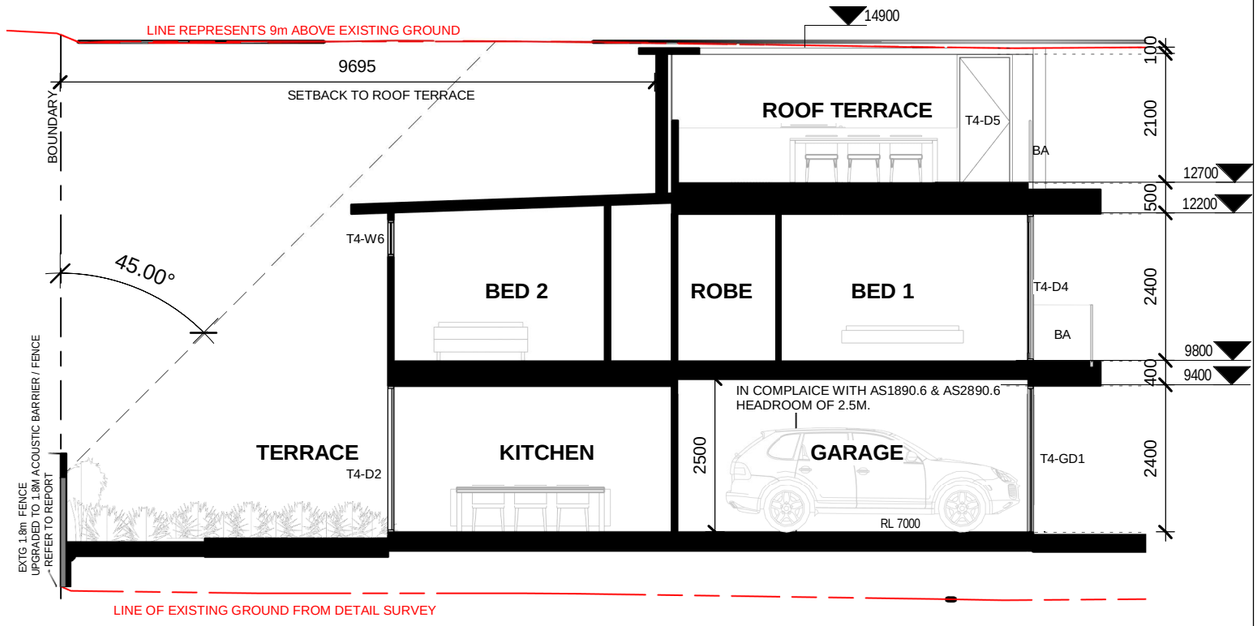

SECTION T4

SCALE: 1 : 100

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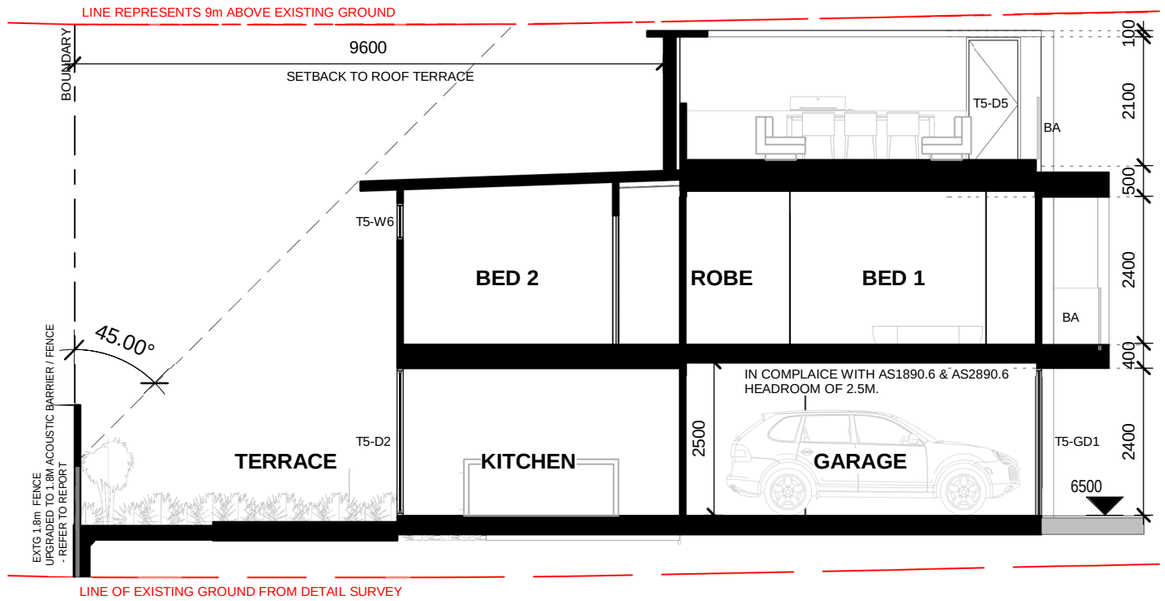
CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOUTHERN SECTIONS
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.4 - D



SECTION T5

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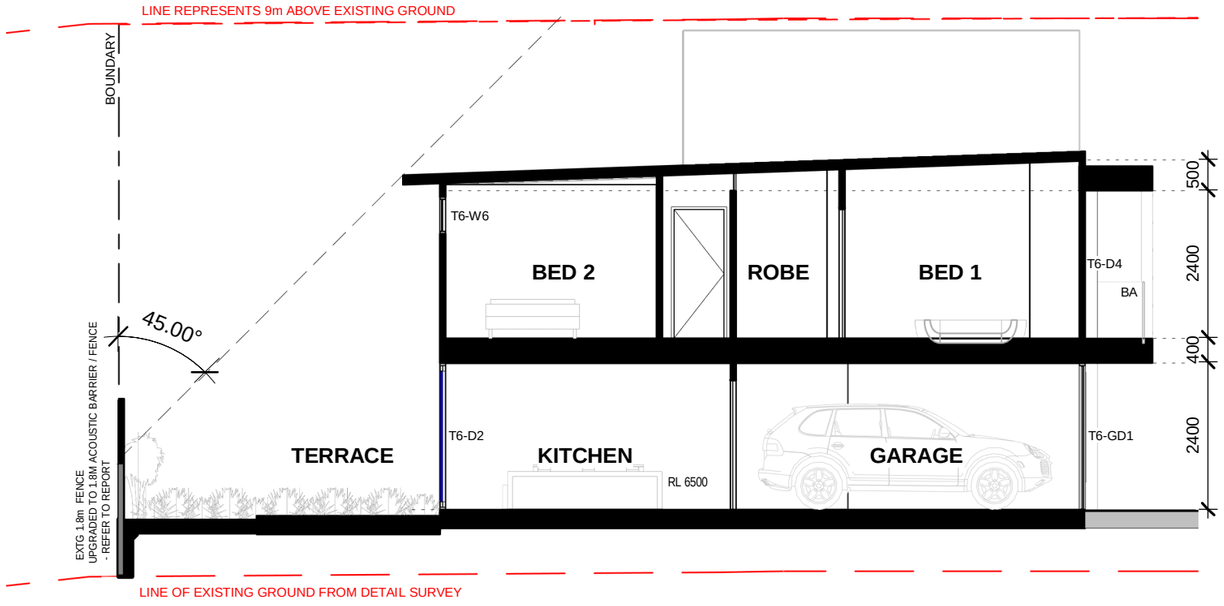

SECTION T6

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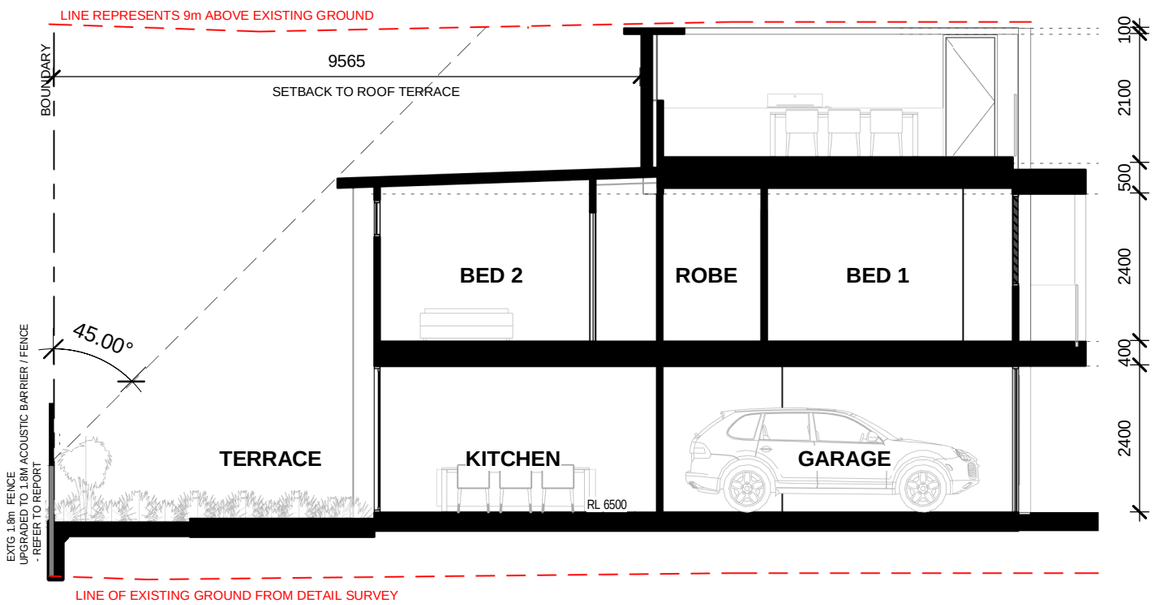

SECTION T7

SCALE: 1 : 100

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: SOUTHERN SECTIONS
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C5.5 - D

ADAPTABLE HOUSING:

[1] - 1550mm BETWEEN OPPOSING FACES OF CUPBOARDS

[2] - THE KITCHEN SHOULD BE DESIGNED WITH MINIMUM OF 2.7 BETWEEN ANY FACING WALLS

[3] - PROVISION FOR ENTIRE KITCHEN BENCH TO DROP & SINK CUPBOARD BE CHANGED AS PER ADAPTABLE REQUIREMENTS

[4] - 2.25 DIAMTER CIRCULATION SPACE FOR LIVING

[5] - ALLOW FOR LIGHTING TO MIN ILLUMINATION LEVEL 300LUX IN LIVING / DINING

[6] - SLIP RESISTANT FLOOR SURFACES PROVIDED 1550mm BETWEEN OPPOSING FACES OF CUPBOARDS

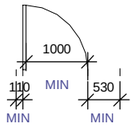
[7] - DOORWAY TO AS1428.1:2009
RAMP MAX 1:40 SLOPE TO DOORWAY THRESHOLDS
ENTRY LIGHTING TO COMPLY WITH AUSTRALIAN STANDARD

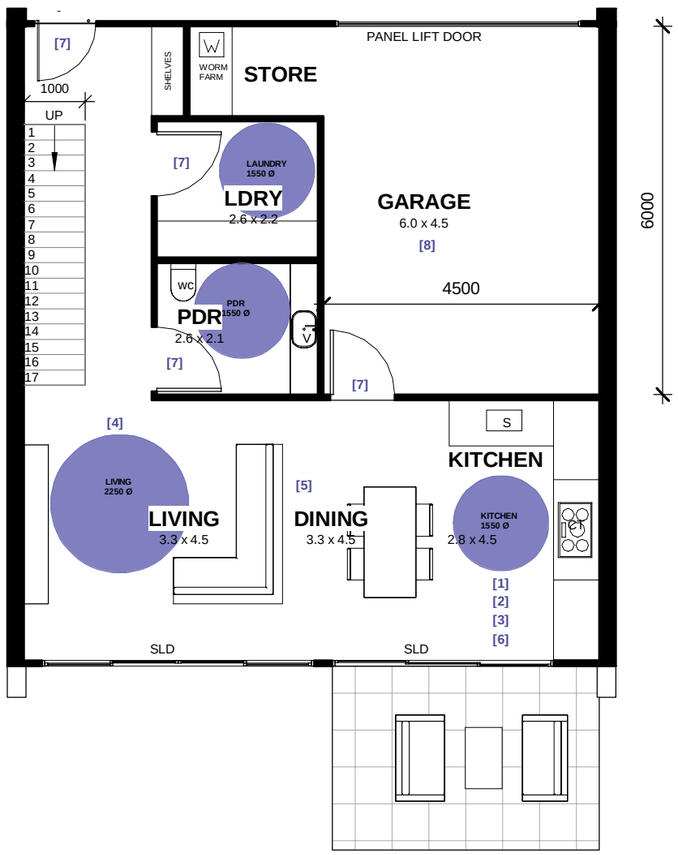
[8] - THE RECOMMENDED INTERNAL WIDTH OF A CARPORT OR GARAGE IS 3.8M WITH A CEILING HEIGHT OF 2.5M AND AN INTERNAL LENGTH OF 6M THROUGHOUT - COMPLIANCE WITH AS2890.6 / AS4299

SITE AND HOUSE IN GENERAL:

- SLIP RESISTANT FLOOR SURFACES REQUIRED
- WINDOW AND DOOR TYPES , LOCKS AND HINGES TO COMPLY WITH AUSTRALIAN STANDARD
- CONTINUOUS ACCESSIBLE PATH OF TRAVEL FROM STREET FRONTAGE
LETTERBOX / BIN TO BE ON HARD STANDING AREA CONNECTED TO PATHWAY
- CAR PARK TO BE 2.4M X 6M WITH PROVISION FOR ENLARGEMENT TO 3.8M WIDE [NOTED ON SITE PLAN

[7] DOORS TO AS 1428.1:2009





TERRACE 3,4 & 5 - GROUND - ADAPTABLE

SCALE: 1 : 100

ADAPTABLE HOUSING:

[1] - HALLWAY CLEARANCE TO BE MIN 1m WIDE / STAIRWAY MIN 1M WIDE

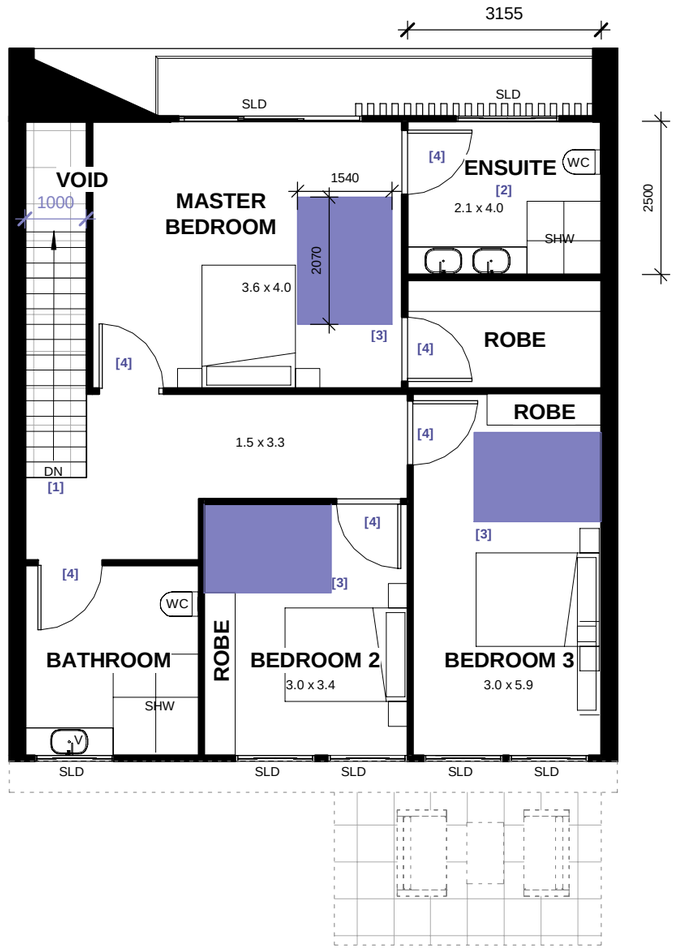
[2] - 2.4 x 2.4 PROVISION FOR ADAPTABLE BATHROOM

[3] - 2.07 X 1.55 MINIMUM UNOBSTRUCTED AREA, FREE OF FURNITURE

[4] - DOORS AS AS1428.1:2009

HOUSE IN GENERAL:

- ELECTRICIAN TO ALLOW FOR DOUBLE GPO & PHONE OUTLET TO BEDSIDE



TERRACE 3,4 & 5 - UPPER - ADAPTABLE

SCALE: 1 : 100

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: ADAPTABLE HOUSING REFERENCE T3,4 & 5
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: CCD
ISSUE: FOR APPROVALS

C7.1 - D

ADAPTABLE HOUSING:

[1] - 1550mm BETWEEN OPPOSING FACES OF CUPBOARDS

[2] - THE KITCHEN SHOULD BE DESIGNED WITH MINIMUM OF 2.7 BETWEEN ANY FACING WALLS

[3] - PROVISION FOR ENTIRE KITCHEN BENCH TO DROP & SINK CUPBOARD BE CHANGED AS PER ADAPTABLE REQUIREMENTS

[4] - 2.25 DIAMTER CIRCULATION SPACE FOR LIVING

[5] - ALLOW FOR LIGHTING TO MIN ILLUMINATION LEVEL 300LUX IN LIVING / DINING

[6] - SLIP RESISTANT FLOOR SURFACES PROVIDED 1550mm BETWEEN OPPOSING FACES OF CUPBOARDS

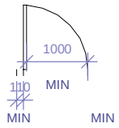
[7] - DOORWAY TO AS1428.1:2009
RAMP MAX 1:40 SLOPE TO DOORWAY THRESHOLDS
ENTRY LIGHTING TO COMPLY WITH AUSTRALIAN STANDARD

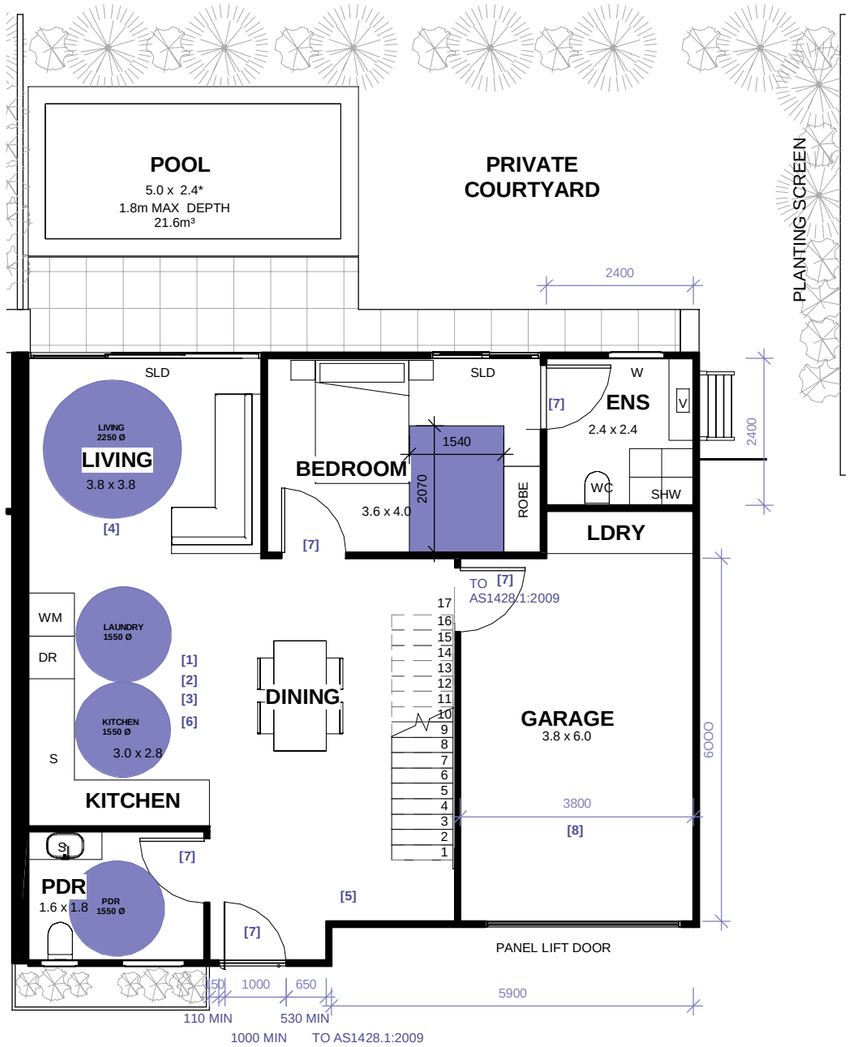
[8] - THE RECOMMENDED INTERNAL WIDTH OF A CARPORT OR GARAGE IS 3.8M WITH A CEILING HEIGHT OF 2.5M AND AN INTERNAL LENGTH OF 6M THROUGHOUT - COMPLIANCE WITH AS2890.6 / AS4299

SITE AND HOUSE IN GENERAL:

- SLIP RESISTANT FLOOR SURFACES REQUIRED
- WINDOW AND DOOR TYPES , LOCKS AND HINGES TO COMPLY WITH AUSTRALIAN STANDARD
- CONTINUOUS ACCESSIBLE PATH OF TRAVEL FROM STREET FRONTAGE
  LETTERBOX / BIN TO BE ON HARD STANDING AREA CONNECTED TO PATHWAY
- CAR PARK TO BE 2.4M X 6M WITH PROVISION FOR ENLARGEMENT TO 3.8M WIDE [NOTED ON SITE PLAN

[7] DOORS TO AS 1428.1:2009





H3 - GROUND FLOOR - ADAPTABLE HOUSING

SCALE: 1 : 100

ADAPTABLE HOUSING:

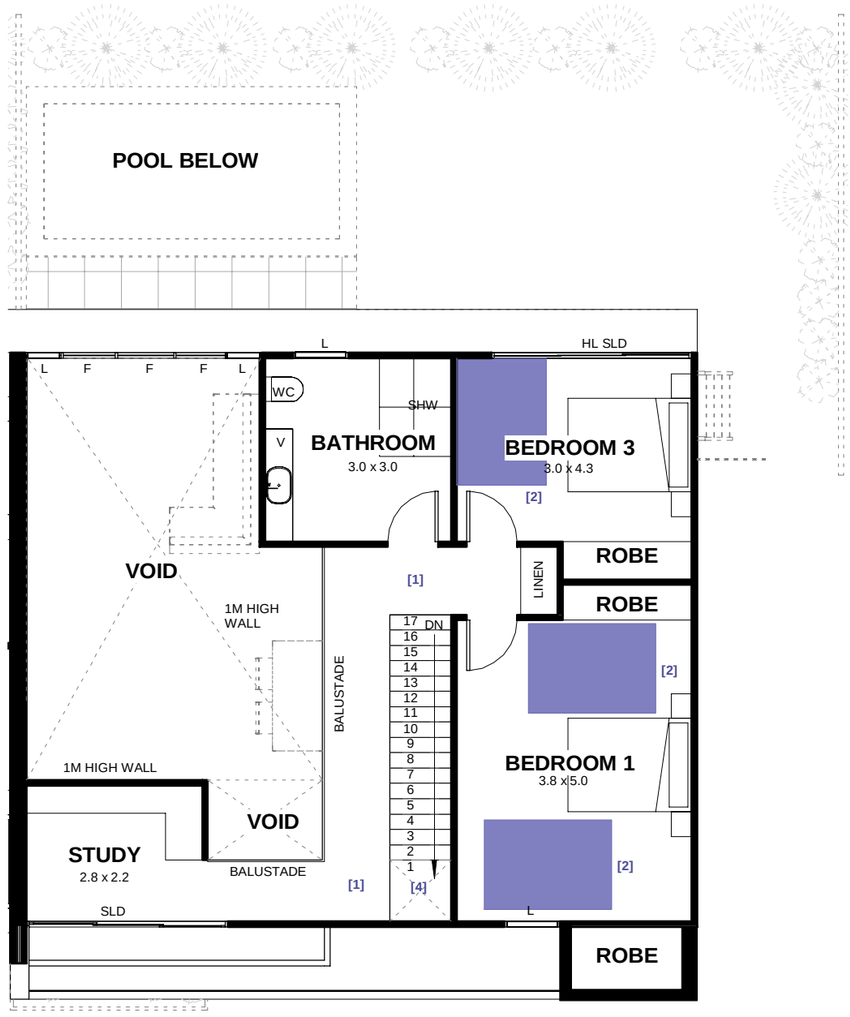
[1] - HALLWAY CLEARANCE TO BE MIN 1m WIDE

[2] - 2.07 X 1.55 MINIMUM UNOBSTRUCTED AREA, FREE OF FURNITURE

[3] - STAIRWAY MIN 1M WIDE

HOUSE IN GENERAL:

- ELECTRICIAN TO ALLOW FOR DOUBLE GPO & PHONE OUTLET TO BEDSIDE



H3 - LEVEL 1 ADAPTABLE HOUSING

SCALE: 1 : 100

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CLIENT NAME: Planit Consulting on behalf of the proponent
PROJECT NAME: PATERSON STREET
SITE ADDRESS: 103 PATERSON STREET
DRAWING TITLE: ADAPTABLE HOUSING REFERENCE H3
DRAWING DATE: 04.03.2021 SCALE: 1 : 100 @ A3 DRAWN BY: Author
ISSUE: FOR APPROVALS

C7.2 - D

APPENDIX B – Detailed Site Plan

NOTES

Survey Intent

This detail survey was undertaken to locate the visible site features, including the topography & improvements thereon. It is not a "Land Survey" as defined by the Surveying and Spatial Information Act, 2002. As such, no boundary fixation was undertaken to accurately determine the parcel boundaries, the available land area or it's dimensions. The dimensions shown have been derived from the relevant registered plans held by the Land Titles Office. No work was undertaken to verify these dimensions. Should accurate boundary locations be required such as in work relying on critical setbacks from the street or boundaries, further survey work would need to be undertaken to accurately locate the boundaries, which may include the registration of a survey redefining the property.
The Certificate of Title has not been investigated. Encumbrances may exist which are not identified on this plan, and therefore, a full investigation should be undertaken to assess any possible implications.

Underground Services

The location of the services shown hereon have been derived from a combination of field survey of visible components and records obtained from the appropriate authority. The exact location of these services, and any others may therefore vary and should be verified with the relevant authorities and or the "Dial before you Dig" service prior to any works being undertaken. Should any work be undertaken on or adjacent to the site to which this survey refers it is the responsibility of the person doing the work to locate any service that may be affected by that work. Numerous services including optic fibre cable may exist in the area and not all services may have been shown in our plan. Whilst due care was used in compiling this information, no responsibility can be accepted or taken by Ardill Payne & Partners for any inaccuracies or omissions shown or not shown hereon.

Level Datum

Level Datum: AHD Origin: PM42198 (RL 17.514 AHD) Contour Interval: 0.25m
Do not Scale Heights

NOTE: For Surveyed Points, Including Tree Details, refer to Autocad Layers: "X-MARK" "X-CODE" & "X-RL"

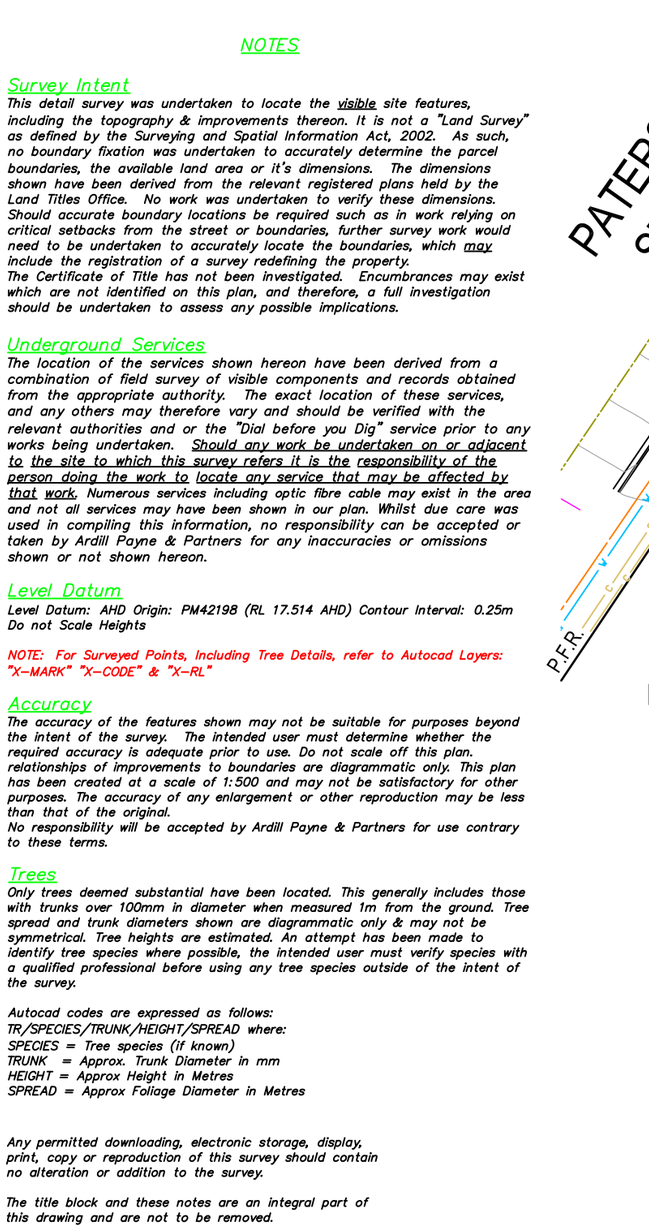
Accuracy

The accuracy of the features shown may not be suitable for purposes beyond the intent of the survey. The intended user must determine whether the required accuracy is adequate prior to use. Do not scale off this plan. relationships of improvements to boundaries are diagrammatic only. This plan has been created at a scale of 1:500 and may not be satisfactory for other purposes. The accuracy of any enlargement or other reproduction may be less than that of the original.
No responsibility will be accepted by Ardill Payne & Partners for use contrary to these terms.

Trees

Only trees deemed substantial have been located. This generally includes those with trunks over 100mm in diameter when measured 1m from the ground. Tree spread and trunk diameters shown are diagrammatic only & may not be symmetrical. Tree heights are estimated. An attempt has been made to identify tree species where possible, the intended user must verify species with a qualified professional before using any tree species outside of the intent of the survey.

Autocad codes are expressed as follows:
TR/SPECIES/TRUNK/HEIGHT/SPREAD where:
SPECIES = Tree species (if known)
TRUNK = Approx. Trunk Diameter in mm
HEIGHT = Approx Height in Metres
SPREAD = Approx Foliage Diameter in Metres



5 20 40
0 10 30 50m
SCALE 1:500

LEGEND

SYMBOLS

- WATER METER
- WATER TAP
- WATER VALVE
- WATER FIRE HYDRANT
- SEWER MANHOLE
- STORMWATER PIT
- STORMWATER GRATE
- KERB INLET PIT (Rear Entry)
- ELECTRICITY POLE
- COMMS PIT
- BENCH MARK
- TREE (Spread approx. to scale)
- PALM (Spread approx. to scale)
- SIGN
- GATE
- LETTERBOX

LINE TYPES

- WATER RETIC
- SEWER MAIN
- ELECTRICITY OVER HEAD
- STORMWATER RETIC
- COMMS
- BANK TOP
- ROAD CENTRELINE
- FENCE
- BOUNDARY SUBJECT
- BOUNDARY OTHER
- RET WALL BOTTOM
- RET WALL TOP
- PAVING
- TABLE DRAIN
- EAVE

P.F.R.: Plotted From Records

Project:
103 Paterson St, Byron Bay
Lot 101 in DP839601

Do not scale drawing. Use written dimensions only

Client:
Planit Consulting on behalf of the proponent

Title:
Contour & Detail Survey

ARDILL PAYNE
& Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
A.B.N. 51 808 558 977 e-mail: info@ardillpayne.com.au

Surveyed	BM	Scale at A3	1:500
Drawn	BM	Datum	A.H.D.
Date	16/1/20	Acad File	10185S01
Checked	RJJ	Approved	
Job No.	10185	Dwg No.	S01
		Issue	

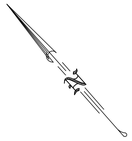
APPENDIX C – Stormwater Management Plan

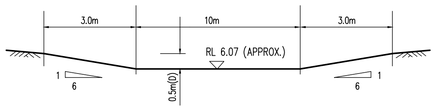
DRAWING SIZE – A1

HEIGHT DATUM

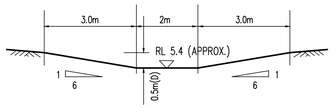
LOT 101 ON DP 839601
Level Datum AHD
Level Origin PM421198, RL 17.514m

Survey information provided by
Ardill Payne & Partners





FORMED OVERLAND FLOW PATH DETAIL
TYPICAL SECTION A–A



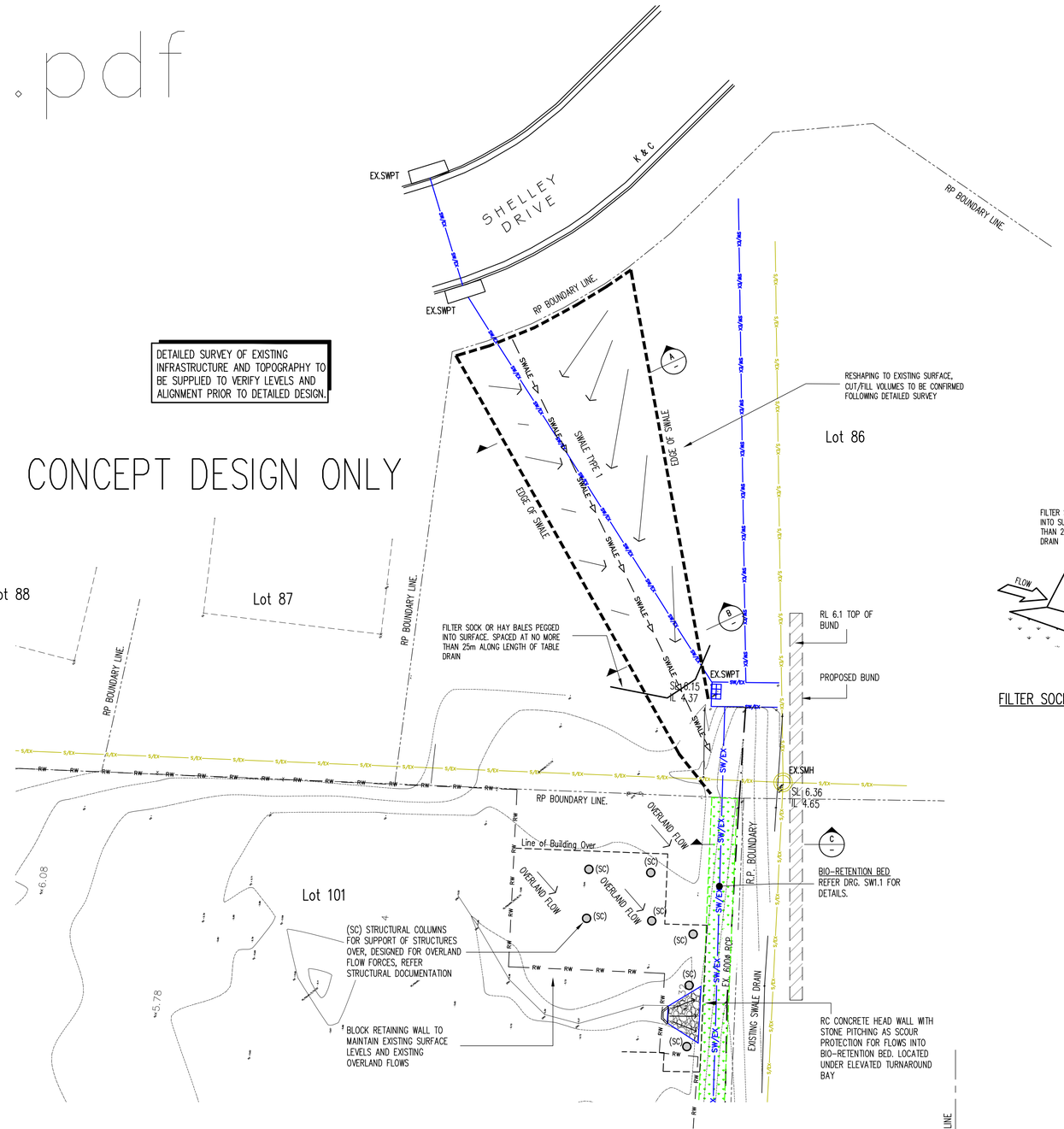
FORMED OVERLAND FLOW PATH DETAIL
TYPICAL SECTION B–B

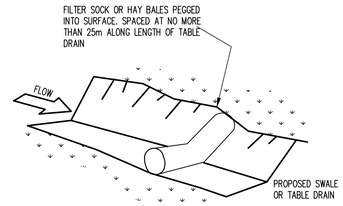
ALL SWALES ACHIEVE MIN 1:100 FALL, TO BE VERIFIED WITH DETAILED SURVEY

.pdf

DETAILED SURVEY OF EXISTING INFRASTRUCTURE AND TOPOGRAPHY TO BE SUPPLIED TO VERIFY LEVELS AND ALIGNMENT PRIOR TO DETAILED DESIGN.

CONCEPT DESIGN ONLY





FILTER SOCK CHECK DAM DETAIL

CONSTRUCTION NOTES

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS IN MILLIMETRES
3. SETTING OUT DIMENSIONS ARE TO BE OBTAINED FROM THE ARCHITECTURAL DRAWINGS.
4. ANY DISCREPANCIES BETWEEN THESE DRAWING AND THE ARCHITECTURAL DRAWINGS ARE TO BE REFERRED TO THE ENGINEER IMMEDIATELY.
5. THE BUILDER IS RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN AND ADJACENT THE ALLOTMENT AND SHALL ENSURE THAT ALL NEW WORKS ARE IN ACCORDANCE WITH THE ATTACHED CRITICAL DEPTH LINE DIAGRAM.

HYDRAULICS

1. HYDRAULIC SERVICES SHOWN ARE DIAGRAMATIC ONLY. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF FIXTURES.
2. ALL SANITARY HYDRAULICS AND WATER RETICULATION WITHIN THE ALLOTMENT BOUNDARY TO BE IN ACCORDANCE WITH AS3500.
3. ALL WORK SHALL COMPLY WITH THE REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION, AFTER OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
4. THE CONTRACTOR IS TO CONFIRM THE POSITION OF ALL EXISTING SERVICES AS INDICATED ON THESE AND ASSOCIATED PLANS PRIOR TO THE COMMENCING OF WORK.
5. STORMWATER DRAINAGE PIPES SHALL BE CLASS SH UPVC OR RUBBER RING JOINTED REINFORCED CONCRETE PIPE LAID AT A MINIMUM GRADE OF 1 IN 100 U.N.O. JOINS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS.
6. SEWERS 100mm DIAM. UPVC U.N.O. AND LAID AT A MINIMUM GRADE OF 1 IN 60.
7. WATER SUPPLY PIPEWORK BELOW GROUND IS TO BE ;
   63MM DIAM. OR LESS – HIGH DENSITY TYPE 50 CLASS 12 POLYETHYLENE
8. ALL ABOVE GROUND AND INTERNAL WATER SUPPLY PIPEWORK TO BE TYPE B COPPER.
9. WATER SERVICES ARE NOT PERMITTED IN GROUND SLABS AND ALL JOINS AND CONNECTIONS SHALL BE MADE ABOVE THE SLAB.
10. FIRE HYDRANTS ARE TO BE INSTALLED ARE TO BE INSTALLED IN ACCORDANCE WITH AS2419.1. HOSE REELS ARE TO BE INSTALLED IN ACCORDANCE WITH AS2441.
11. CLEAN–OUTS, INSPECTION OPENINGS AND CLOSING CAPS SITUATED IN VEHICULAR OR PEDESTRIAN PAVEMENTS ARE TO BE FITTED WITH EITHER BRASS OR CAST–IRON COVERS.
12. ALL IN–GROUND VALVES SHALL BE IN ACCORDANCE IN APPROVED CONCRETE PATH BOXES.
13. ALL WASTE PIPES AND WATER SERVICES PENETRATING SLABS TO BE WRAPPED IN AN APPROVED FLEXIBLE JOINT JOINT WRAPPING.
14. THE TERM 'SERVICE' REFERS TO THE MINIMUM INTERNAL PIPE DIAMETER UNLESS NOTED OTHERWISE.

KEY

EX. SWPT	EXISTING STORMWATER PIT
RC. HW.	REINFORCED CONCRETE HEADWALL
EX. SMH	EXISTING SEWER MANHOLE
EX. SCP	EXISTING SEWER CONNECTION POINT
E.O.B.	EXISTING EDGE OF BITUMEN
K & C	EXISTING KERB & CHANNEL
N.S.L.	NATURAL SURFACE LEVEL
F.H.	FIRE HYDRANT
T.P	TELSTRA PIT
E.P.	ELECTRICAL POWER POLE
KERB	EXISTING KERBING

LEGEND

18.0	INDICATES PROPOSED SURFACE CONTOURS AND LEVELS TO AHD.
FALL	INDICATES DIRECTION OF FALL TO FINISHED SURFACE LEVELS.
S.L. 12.50 / I.L. 12.00	INDICATES PROPOSED FINISHED SURFACE/INVERT LEVELS OF NOMINATED SW PITS.
E	INDICATES OVERHEAD ELECTRICITY SUPPLY LINE
S/EX	INDICATES EXISTING SEWER LINE
W	INDICATES WATER MAIN APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
T	INDICATES TELSTRA LINE APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
SW	INDICATES STORMWATER DRAIN PROPOSED AS NOTED MIN 1 IN 100 FALL UNLESS NOTED OTHERWISE
R–SW	INDICATES ROOF STORMWATER DRAINAGE LINE TO HYDRAULIC DESIGNERS DETAILS.
SW/EX	INDICATES STORMWATER DRAIN EXISTING AS NOTED
SWALE	INDICATES ALIGNMENT OF SWALE AND DIRECTION OF FLOW, REFER Drg. SW1.2 FOR TYPICAL SWALE DETAILS.
RW	INDICATES POSITION OF RETAINING WALL. REFER REFER TO STRUCTURAL DETAILS.

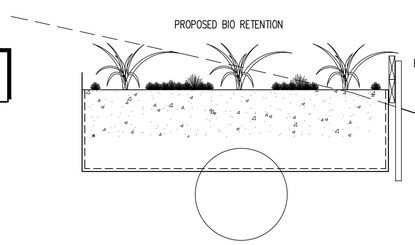
www.dialbeforeyoudig.com.au
DIAL 1100 BEFORE YOU DIG

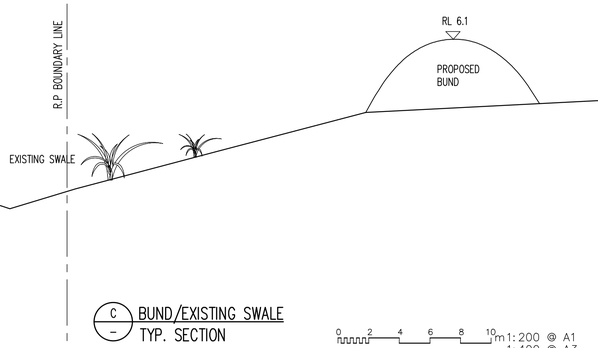
SITE PLAN – PROPOSED SWALE DESIGN

Scale 1 : 200

ALL SERVICES SHOWN ON THIS PLAN INDICATIVE ONLY CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORKS ON SITE. ALL SERVICES ARE TO BE PROTECTED IN ACCORDANCE WITH THE AUTHORITY RESPONSIBLE FOR THE SERVICE

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE STORMWATER MANAGEMENT REPORT BY SCG CONSULTING ENGINEERS (No. 30089(SWM)





C BUND/EXISTING SWALE TYP. SECTION

0 2 4 6 8 10m 1:200 @ A1 1:400 @ A3

Revision	Description	Date
B	NEW BUND AND SECTIONS	12.03.2021
A	COORDINATION	08.07.2020

Issue: FOR APPROVAL

DO NOT SCALE FROM THIS DRAWING

SCG CONSULTING ENGINEERS
Unit 1/11 Project Ave, Noosa Heads
Ph (07) 5455 5604
email:admin@scg-engineers.com
web:www.scg-engineers.com
ABN 40 096 481 668

Title: SWALE CONCEPT DESIGN

Project: 103 Patterson Street, Byron Bay

Date:	Drawn	Design
June 20	TH	TH

Checked: RPEQ 5835 S Richardson

Drg No. 30089–0W7.1 Rev. B

DRAWING SIZE – A1

www.dialbeforeyoudig.com.au
DIAL 1100 BEFORE YOU DIG

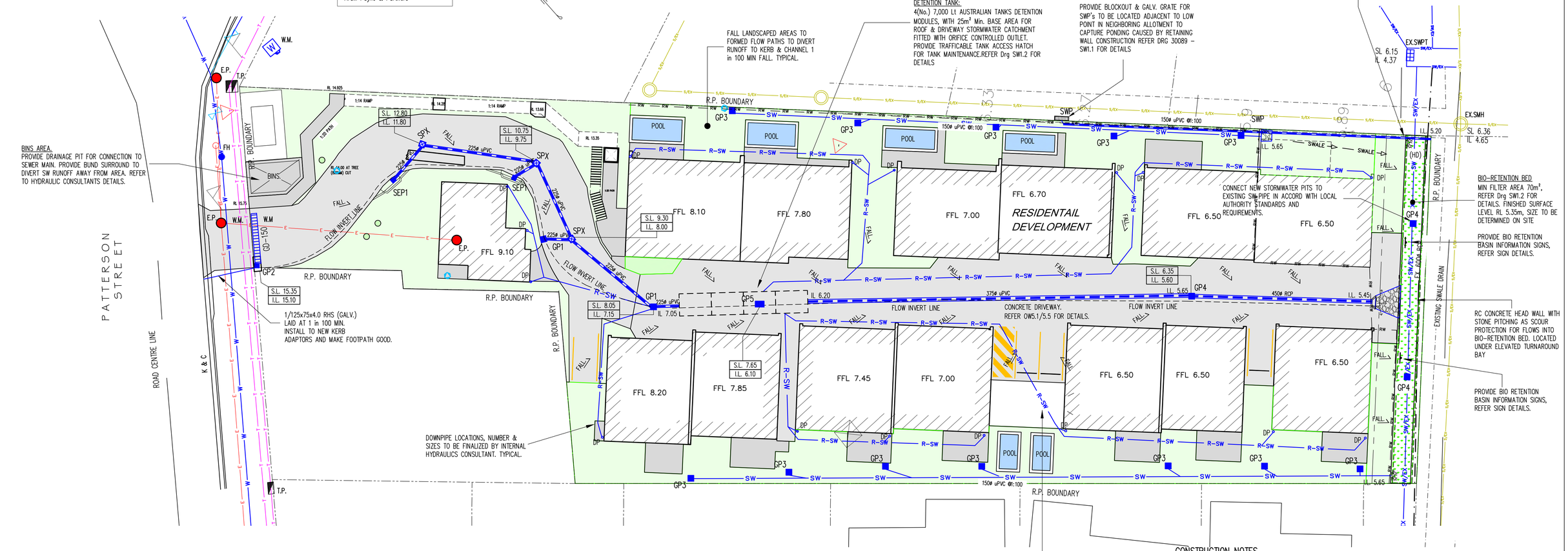
ALL STORMWATER PIPES TO BE LAID AT 1:100 MIN. UNO.

HEIGHT DATUM

LOT 101 ON DP 839601
Level Datum AHD
Level Origin PM421198, RL 17.514m

Survey information provided by
Ardill Payne & Partners

BUILDER TO POT HOLE LOCATE AND CONFIRM EXISTING SERVICES LOCATIONS & LEVELS BEFORE ANY EARTHWORKS ARE CARRIED OUT. REPORT ANY DISCREPANCIES TO THIS FIRM.



LEGEND

- 18.0 — INDICATES PROPOSED SURFACE CONTOURS AND LEVELS TO AHD.
- FALL → — INDICATES DIRECTION OF FALL TO FINISHED SURFACE LEVELS.
- S.L. 12.50 / I.L. 12.00 — INDICATES PROPOSED FINISHED SURFACE/INVERT LEVELS OF NOMINATED SW PITS.
- GP1 — 600Sq FIELD INLETS, PRE-CAST CONCRETE WITH HEAVY DUTY GRATE WHERE INSTALLED IN PAVED AREAS, FITTED WITH OCEANGUARD PIT BASKETS, REFER DETAIL ON DRG SW1.2
- GP2 — 450Sq FIELD INLETS, PRE-CAST CONCRETE WITH GRATE WHERE INSTALLED IN LANDSCAPING. FITTED WITH OCEANGUARD PIT BASKETS, REFER DETAIL ON DRG SW1.2
- GP3 — 450Sq FIELD INLETS, POLY WITH GRATE WHERE INSTALLED IN LANDSCAPING.
- GP4 — 900Sq FIELD INLET, PRE-CAST CONCRETE WITH RAISED GRATE TO BE INSTALLED IN BIO-RETENTION BED-B.
- GP5 — 600 x 900 ACCESS LID, PRE-CAST CONCRETE WITH HEAVY DUTY GRATE.FITTED WITH OCEANGUARD PIT BASKETS, REFER DETAIL ON DRG SW1.2
- SEP1 — 2.4m SMALL LINTEL ON GRADE KERB PIT IN ACCORDANCE WITH IPWEA STD DRG DS-060.
- GD-150 — 150(W) GRATED DRAIN WITH HEAVY DUTY GRATE.
- SWP — STORWATER SIDE WALL PITS TO BOUNDARY WALLS TO DRAIN NEIGHBOURING ALLOTMENTS. REFER DETAIL.
- E — INDICATES OVERHEAD ELECTRICITY SUPPLY LINE
- S/EX — INDICATES EXISTING SEWER LINE
- W — INDICATES WATER MAIN APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
- T — INDICATES TELSTRA LINE APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
- SW — INDICATES STORMWATER DRAIN PROPOSED AS NOTED MIN 1 IN 100 FALL UNLESS NOTED OTHERWISE
- R-SW — INDICATES ROOF STORMWATER DRAINAGE LINE TO HYDRAULIC DESIGNERS DETAILS.
- DP — INDICATES DOWNPIPES FROM ROOF. REFER HYDRAULIC CONSULTANT FOR DETAILS
- SW/EX — INDICATES STORMWATER DRAIN EXISTING AS NOTED
- SWALE — INDICATES ALIGNMENT OF SWALE AND DIRECTION OF FLOW, REFER Drg. SW1.2 FOR TYPICAL SWALE DETAILS.
- RW — INDICATES POSITION OF RETAINING WALL. REFER REFER TO STRUCTURAL DETAILS.

SITE PLAN – STORMWATER MANAGEMENT

Scale 1 : 200

FINISHED SITE DRAINAGE IN ACCORDANCE WITH HYDRAULICS CONSULTANTS DOCUMENTATION.

ALL SERVICES SHOWN ON THIS PLAN INDICATIVE ONLY CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORKS ON SITE. ALL SERVICES ARE TO BE PROTECTED IN ACCORDANCE WITH THE AUTHORITY RESPONSIBLE FOR THE SERVICE

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE STORMWATER MANAGEMENT REPORT BY SCG CONSULTING ENGINEERS (No. 30089(SWM)

NOTE:
THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION.

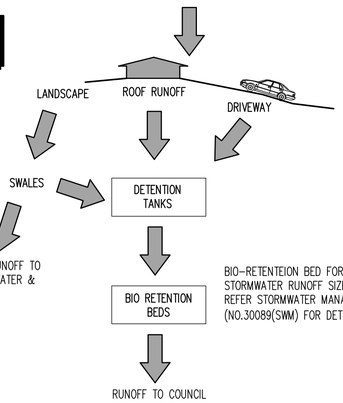
REFER Drg SW1.3 FOR BIO-RETENTION MAINTENANCE REQUIREMENTS.

ALL PIPES TO BE LAID AT 1 IN 100 MIN. UNLESS NOTED

BIO–RETENTION BASIN

THIS BIO–RETENTION BASIN REDUCES THE POLLUTION OF OUR WATERWAYS BY REDUCING THE AMOUNT OF HEAVY METALS, LITTER, SUSPENDED SOLIDS AND NUTRIENTS DISCHARGED INTO OUR WATERWAYS.

BIO – RETENTION SIGN



BIO–RETENTEION BED FOR TREATMENT OF STORMWATER RUNOFF SIZED USING MUSIC MODEL, REFER STORMWATER MANAGEMENT REPORT (NO.30089(SWM) FOR DETAILS.

WATER CYCLE DIAGRAMATIC

BINS AREA.
PROVIDE DRAINAGE PIT FOR CONNECTION TO SEWER MAIN. PROVIDE BUND SURROUND TO DIVERT SW RUNOFF AWAY FROM AREA. REFER TO HYDRAULIC CONSULTANTS DETAILS.

CONSTRUCTION NOTES

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RC. HW.	REINFORCED CONCRETE HEADWALL
EX. SMH	EXISTING SEWER MANHOLE
EX. SCP	EXISTING SEWER CONNECTION POINT
E.O.B.	EXISTING EDGE OF BITUMEN
K & C	EXISTING KERB & CHANNEL
N.S.L.	NATURAL SURFACE LEVEL
F.H.	FIRE HYDRANT
T.P	TELSTRA PIT
E.P.	ELECTRICAL POWER POLE
KERB	EXISTING KERBING

Revision	Description	Date
B	REVISED DESIGN	12.03.21
A	H1 FLOOR LEVEL & DRIVEWAY LEVELS	06.07.20

Issue: FOR APPROVAL

SCG CONSULTING ENGINEERS
Unit 1/11 Project Ave, Noosa Heads
Ph (07) 5455 5604
email:admin@scg-engineers.com
web:www.scg-engineers.com
ABN 43 096 481 896

Title: STORMWATER MANAGEMENT

Project: 103 Patterson Street, Byron Bay

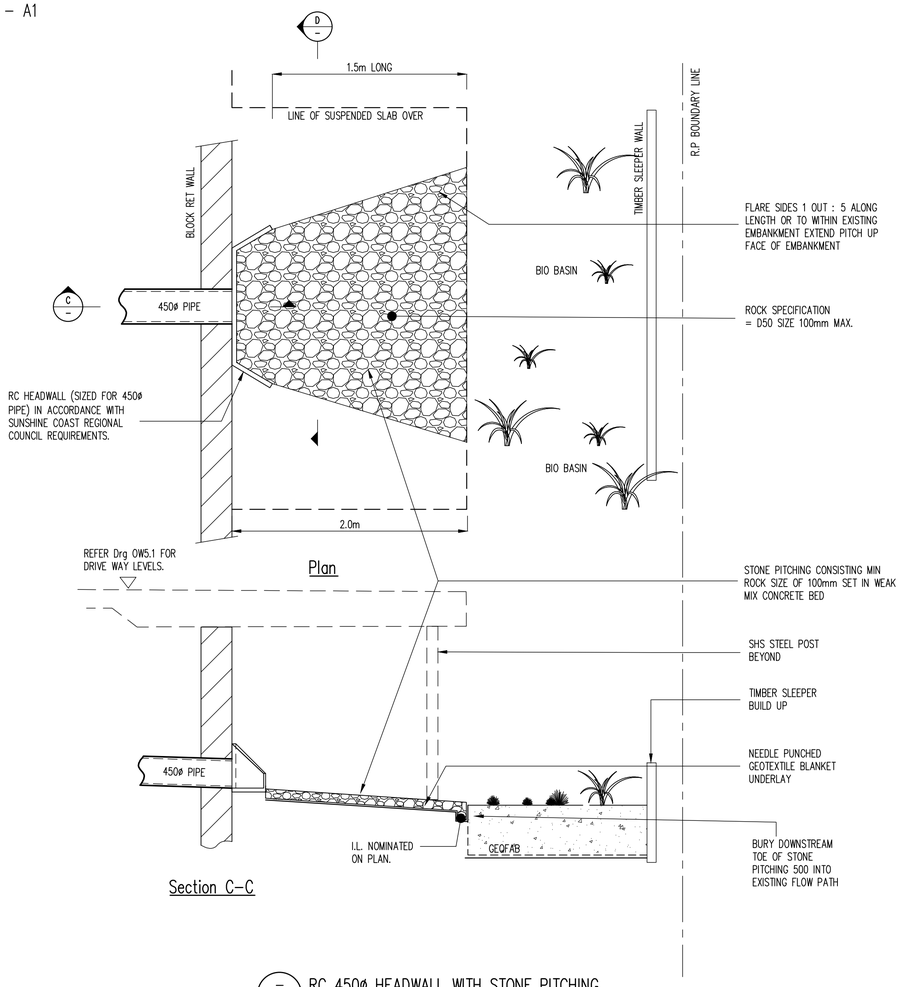
Date: June 20 | Drawn TH | Design TH

Checked: RPEQ 5835 S Richardson

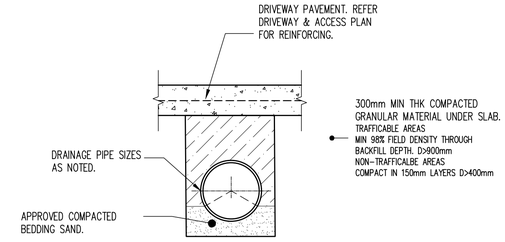
Drg No. 30089–SW1.1 | Rev. B

0 2 4 6 8 10 m
1:200 @ A1
1:400 @ A3

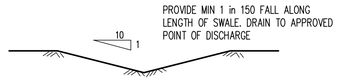
DRAWING SIZE – A1



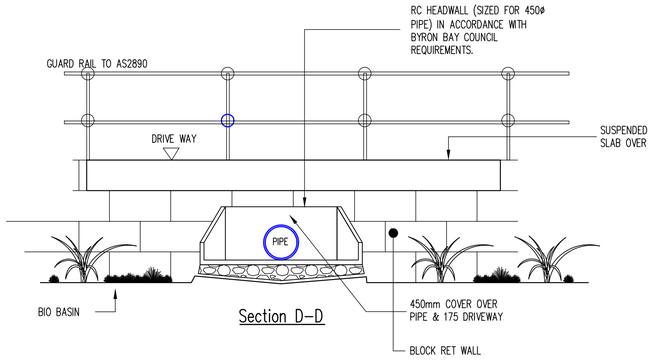
– / – RC 450ø HEADWALL WITH STONE PITCHING
TYPICAL DETAIL

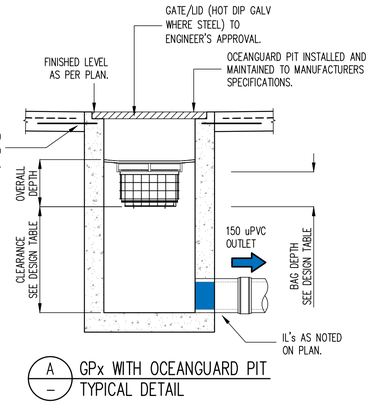


– / – SW PIPE TRENCH/PIPE BEDDING & BACKFILLING
TYPICAL SECTION

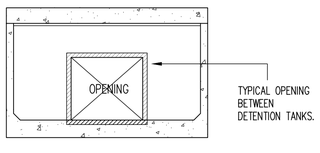


TYPICAL SECTION OPEN GRASS SWALE

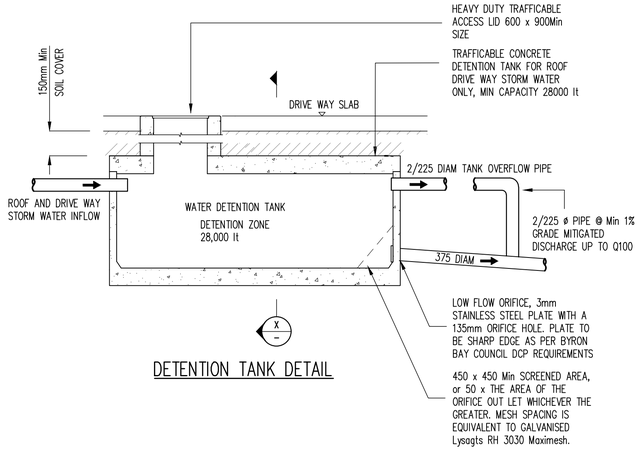




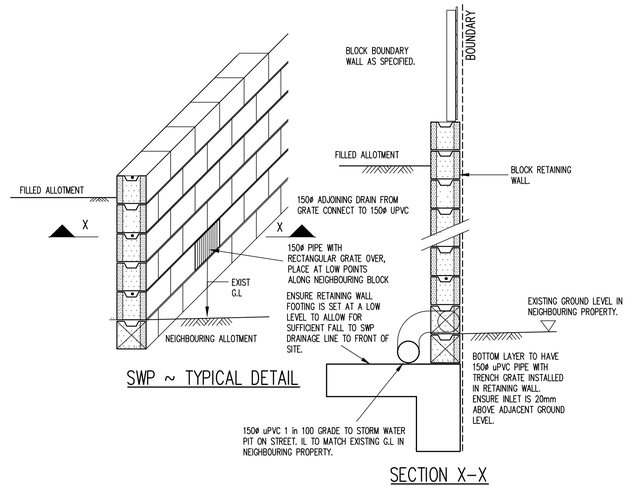
A / – GPx WITH OCEANGUARD PIT
TYPICAL DETAIL



X / – DETENTION TANK CONNECTION OPENING.
TYP. SECTION



DETENTION TANK DETAIL



SWP ~ TYPICAL DETAIL

SECTION X–X

Revision	Description	Date
A	SUSPENDED CAR PARK SLAB	12.03.2021

Issue: FOR APPROVAL

SCG CONSULTING ENGINEERS
DOMICILO T/A
Unit 1/11 Project Ave, Noosa Heads
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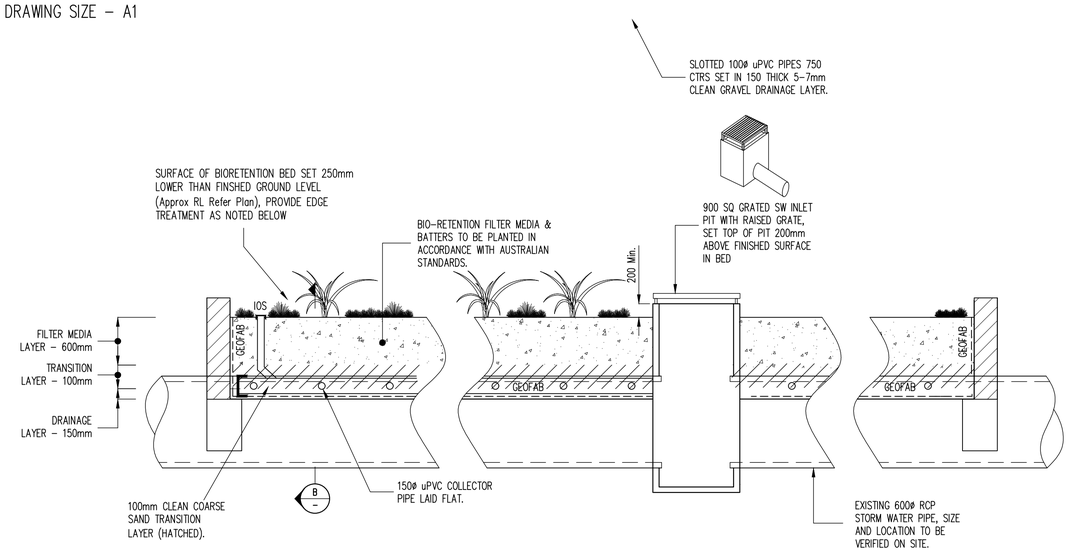
email:admin@scg-engineers.com
web:www.scg-engineers.com
ABN 40 098 481 899

Title: STORMWATER DETAILS SHEET

Project: 103 Patterson Street, Byron Bay

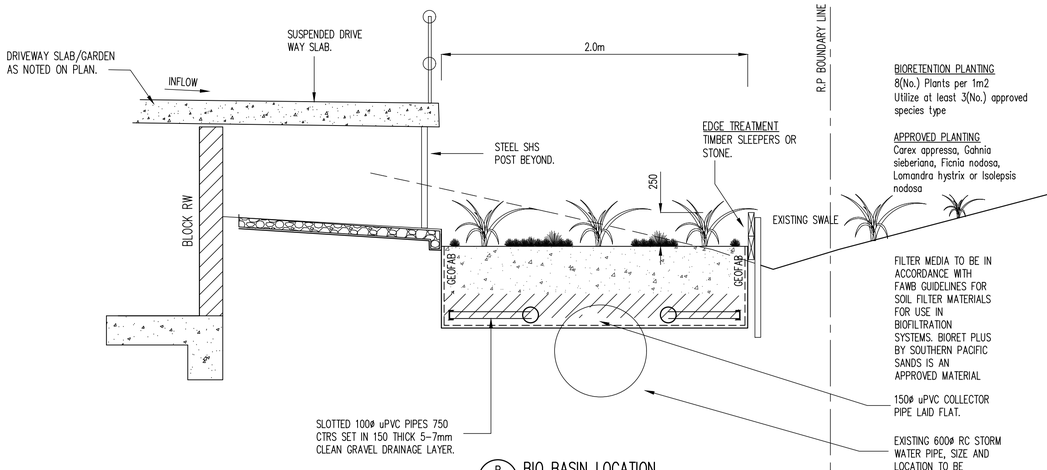
Date: June 20	Drawn TH	Design TH
Checked: RPEQ 5835 S Richardson	Drg No. 30089–SW1.2	Rev. A

DRAWING SIZE – A1



A – BIO–RETENTION PIT DETAIL (Refer IPWEA STD Drg DS–070) SECTION

AS PER PLAN



B – BIO BASIN LOCATION TYP. SECTION

BIO–RETENTION BED MAINTENANCE REQUIREMENTS

Vegetation plays a key role in maintaining the porosity of the filter media of a bioretention basin and a strong healthy growth of vegetation is critical to its performance. Therefore the most intensive period of maintenance is during the plant establishment period (first two years) when weed removal and replanting may be required.

Inflow systems and overflow pits require careful monitoring, as these can be prone to scour and litter build up. Debris can block inlets or outlets and can be unsightly, particularly in high visibility areas. Inspection and removal of debris should be done regularly, and debris should be removed whenever it is observed on a site. Where sediment forebays are adopted, regular inspection of the forebay is required (3 monthly) with remove of accumulated sediment undertaken as required.

For larger bioretention basins, it is essential that a maintenance access point is designed for and maintained in the bioretention basin. The size and complexity of the system will guide its design and may involve provision of a reinforced concrete ramp/ pad for truck or machinery access.

2005 Edition
Amended June 2007
Policy 11: Land Development Guidelines
Section 13.6 –Bioretention Basins
27 of 43

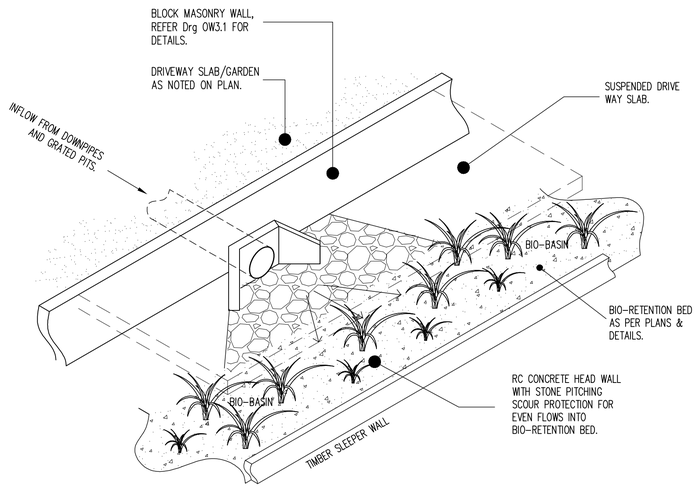
Typical maintenance of bioretention basin elements will involve:

- routine inspection of the bioretention basin profile to identify any areas of obvious increased sediment deposition, scouring from storm flows, rill erosion of the batters from lateral inflows,damage to the profile from vehicles and clogging of the bioretention basin (evident by a 'boggy' filter media surface);
- routine inspection of inflows systems, overflow pits and under–drains to identify and clean any areas of scour, litter build up and blockages;
- removal of sediment where it is smothering the bioretention basin vegetation;
- where a sediment forebay is adopted, removal of accumulated sediment;
- repairing any damage to the profile resulting from scour, rill erosion or vehicle damage by replacement of appropriate fill (to match onsite soils) and revegetating;
- tilling of the bioretention basin surface, or removal of the surface layer, if there is evidence of clogging;
- regular watering/ irrigation of vegetation until plants are established and actively growing;
- removal and management of invasive weeds (herbicides should not be used);
- removal of plants that have died and replacement with plants of equivalent size and species as detailed in the plant schedule;
- pruning to remove dead or diseased vegetation material and to stimulate growth;
- vegetation pest monitoring and control.

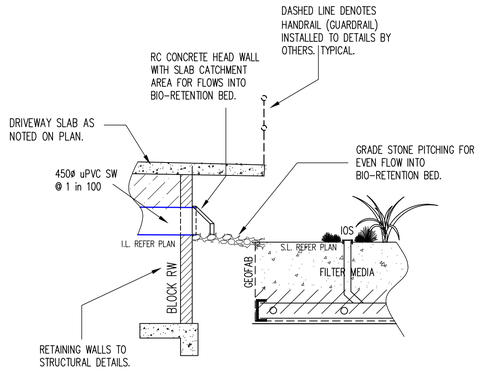
Resetting (ie. complete reconstruction) of the bioretention basin will be required if the system fails to drain adequately after tilling of the surface. Maintenance should only occur after a reasonably rain free period when the soil in the bioretention system is dry. Inspections are also recommended following large storm events to check for scour and other damage.

All maintenance activities must be specified in a maintenance plan (and associated maintenance inspection forms) to be documented and submitted to Council as part of the Development Approval process. Maintenance personnel and asset managers will use this plan to ensure the bioretention basins continue to function as designed. An example operation and maintenance inspection form is included in the checking tools provided in Section 13.6.7. These forms must be developed on a site specific basis as the nature and configuration of bioretention basins varies significantly.

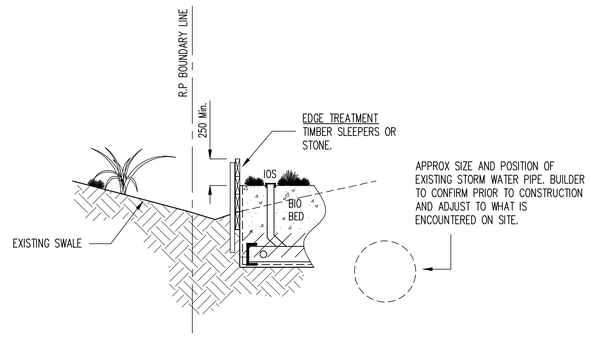
For Detailed Maintenance Requirements & Scheduling Checklist refer to "Water by Design – Maintaining Vegetated Stormwater Assets."



SW FLOW DISPERTION – RC HEADWALL



FLOW DISPERSION – RC HEAD WALL



BIO–BED EDGE TREATMENT ADJ. LANDSCAPED AREAS

Revision	Description	Date
A	SUSPENDED DRIVEWAY ADDED	12.03.21

Issue: FOR APPROVAL

SCG CONSULTING ENGINEERS
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Title: BIO BASIN DETAILS SHEET

Project: 103 Patterson Street, Byron Bay

Date:	Drawn	Design
June 20	TH	TH

Checked: RPEQ 5835 S Richardson

Drg No. 30089–SW1.3 Rev. A.

APPENDIX D – Rational Method Calculations

STORMWATER RUNOFF ASSESMENT
BYRON BAY SITE

Calculates existing and developed flow rates in accordance with QUDM 2013 for sites located along the coastal strip of the Byron Bay

Address	**103 Patterson St, Byron Bay**	Site Area	3816	m^2
SCG Job No.	**30089**			

Pre-Development sub-catchments			**Post Development sub-catchments**		
Pervious Area	3086	m^2	Pervious Area	1146	m^2
Impervious area	730	m^2	Impervious area	2670	m^2
TOTAL	3816	m^2	TOTAL	3816	m^2

STORM DATA

Time of Concentration	14	min
10 yr 1 hr Storm I		mm/hr
5min Rainfall Intensities		
5yr	150	mm/hr
10yr	165	mm/hr
20yr	180	mm/hr
100yr	235	mm/hr

		Coefficient of Runoff			
Fraction Impervious		**C5**	**C_{10}**	**C_{20}**	**C_{100}**
Pervious Area*	0	0.67	0.7	0.74	0.84
Impervious Area	1	0.86	0.9	0.95	1.00

*Pervious area considered good grass cover with med. Soil permeability as per QUDM

Q = C x I x A / 360

	Q - Pre-Development				**Q - Post-Development**				**INCREASED**	
ARI	**Pervious**	**Imperv.**	**TOTAL**		**Pervious**	**Imperv.**	**TOTAL**		**RUNOFF**	
5	0.0856	0.0260	0.1116	m^3/s	0.0318	0.0952	0.1270	m^3/s	0.0154	m^3/s
10	0.0991	0.0301	0.1292	m^3/s	0.0368	0.1102	0.1470	m^3/s	0.0178	m^3/s
20	0.1135	0.0345	0.1480	m^3/s	0.0421	0.1263	0.1684	m^3/s	0.0204	m^3/s
100	0.1694	0.0477	0.2170	m^3/s	0.0629	0.1744	0.2373	m^3/s	0.0203	m^3/s

APPENDIX E – XP-Storm Results

Object: Link21 Result Type: Max Flow (m^3/s)

Object type: Link

	Ensemble Name	AEP	Mean	Mean Storm	Median	Median Storm	Min	Min Storm	Max	Max Storm
1	ECS_20pct_10min	20%	0.10496	ECS_20pct_10min_10	0.09878	ECS_20pct_10min_8	0.09057	ECS_20pct_10min_5	0.13859	ECS_20pct_10min_9
2	ECS_20pct_15min	20%	0.09570	ECS_20pct_15min_3	0.09249	ECS_20pct_15min_6	0.07488	ECS_20pct_15min_7	0.11929	ECS_20pct_15min_10
3	ECS_20pct_20min	20%	0.10493	ECS_20pct_20min_9	0.10249	ECS_20pct_20min_8	0.08484	ECS_20pct_20min_4	0.12612	ECS_20pct_20min_10
4	ECS_20pct_25min	20%	0.09481	ECS_20pct_25min_7	0.08670	ECS_20pct_25min_1	0.07266	ECS_20pct_25min_8	0.14489	ECS_20pct_25min_10
5	ECS_20pct_30min	20%	0.09549	ECS_20pct_30min_3	0.09370	ECS_20pct_30min_10	0.07293	ECS_20pct_30min_2	0.13445	ECS_20pct_30min_6
6	ECS_20pct_45min	20%	0.09255	ECS_20pct_45min_3	0.09100	ECS_20pct_45min_4	0.07650	ECS_20pct_45min_6	0.11392	ECS_20pct_45min_1
7	ECS_20pct_1hr	20%	0.08551	ECS_20pct_1hr_5	0.08363	ECS_20pct_1hr_5	0.05958	ECS_20pct_1hr_4	0.12116	ECS_20pct_1hr_9
8	ECS_20pct_1_5hr	20%	0.07609	ECS_20pct_1_5hr_5	0.07592	ECS_20pct_1_5hr_5	0.04916	ECS_20pct_1_5hr_8	0.11395	ECS_20pct_1_5hr_9
9	ECS_20pct_2hr	20%	0.08305	ECS_20pct_2hr_10	0.07730	ECS_20pct_2hr_10	0.03942	ECS_20pct_2hr_2	0.15442	ECS_20pct_2hr_6
10	ECS_20pct_3hr	20%	0.04209	ECS_20pct_3hr_7	0.03432	ECS_20pct_3hr_6	0.02411	ECS_20pct_3hr_1	0.09454	ECS_20pct_3hr_2
11	ECS_10pct_10min	10%	0.12107	ECS_10pct_10min_10	0.11920	ECS_10pct_10min_5	0.11110	ECS_10pct_10min_9	0.13690	ECS_10pct_10min_2
12	ECS_10pct_15min	10%	0.12814	ECS_10pct_15min_10	0.12976	ECS_10pct_15min_10	0.10658	ECS_10pct_15min_8	0.14776	ECS_10pct_15min_3
13	ECS_10pct_20min	10%	0.12111	ECS_10pct_20min_3	0.11652	ECS_10pct_20min_4	0.09227	ECS_10pct_20min_5	0.17413	ECS_10pct_20min_9
14	ECS_10pct_25min	10%	0.11861	ECS_10pct_25min_3	0.11144	ECS_10pct_25min_6	0.08095	ECS_10pct_25min_5	0.14908	ECS_10pct_25min_1
15	ECS_10pct_30min	10%	0.10760	ECS_10pct_30min_1	0.10778	ECS_10pct_30min_1	0.08833	ECS_10pct_30min_2	0.13078	ECS_10pct_30min_9
16	ECS_10pct_45min	10%	0.10775	ECS_10pct_45min_10	0.09656	ECS_10pct_45min_8	0.07937	ECS_10pct_45min_3	0.14130	ECS_10pct_45min_9
17	ECS_10pct_1hr	10%	0.10243	ECS_10pct_1hr_2	0.10710	ECS_10pct_1hr_6	0.05721	ECS_10pct_1hr_4	0.12659	ECS_10pct_1hr_9
18	ECS_10pct_1_5hr	10%	0.09176	ECS_10pct_1_5hr_4	0.09435	ECS_10pct_1_5hr_2	0.06541	ECS_10pct_1_5hr_8	0.13108	ECS_10pct_1_5hr_9
19	ECS_10pct_2hr	10%	0.09225	ECS_10pct_2hr_4	0.08844	ECS_10pct_2hr_4	0.05092	ECS_10pct_2hr_8	0.12708	ECS_10pct_2hr_9
20	ECS_10pct_3hr	10%	0.06041	ECS_10pct_3hr_3	0.06418	ECS_10pct_3hr_2	0.03342	ECS_10pct_3hr_9	0.08289	ECS_10pct_3hr_8
21	ECS_5pct_10min	5%	0.13955	ECS_5pct_10min_8	0.13568	ECS_5pct_10min_5	0.12970	ECS_5pct_10min_3	0.16067	ECS_5pct_10min_2
22	ECS_5pct_15min	5%	0.14717	ECS_5pct_15min_4	0.14841	ECS_5pct_15min_4	0.12025	ECS_5pct_15min_8	0.17017	ECS_5pct_15min_3
23	ECS_5pct_20min	5%	0.13926	ECS_5pct_20min_10	0.13425	ECS_5pct_20min_4	0.10437	ECS_5pct_20min_5	0.20277	ECS_5pct_20min_9
24	ECS_5pct_25min	5%	0.13658	ECS_5pct_25min_3	0.12849	ECS_5pct_25min_6	0.09584	ECS_5pct_25min_5	0.17020	ECS_5pct_25min_10
25	ECS_5pct_30min	5%	0.12566	ECS_5pct_30min_8	0.12507	ECS_5pct_30min_8	0.10156	ECS_5pct_30min_7	0.15261	ECS_5pct_30min_9
26	ECS_5pct_45min	5%	0.12711	ECS_5pct_45min_10	0.11270	ECS_5pct_45min_8	0.09466	ECS_5pct_45min_3	0.16717	ECS_5pct_45min_9
27	ECS_5pct_1hr	5%	0.12152	ECS_5pct_1hr_2	0.12935	ECS_5pct_1hr_6	0.06731	ECS_5pct_1hr_4	0.14843	ECS_5pct_1hr_9
28	ECS_5pct_1_5hr	5%	0.11040	ECS_5pct_1_5hr_4	0.11424	ECS_5pct_1_5hr_10	0.08112	ECS_5pct_1_5hr_8	0.15211	ECS_5pct_1_5hr_9
29	ECS_5pct_2hr	5%	0.11025	ECS_5pct_2hr_4	0.10809	ECS_5pct_2hr_4	0.06269	ECS_5pct_2hr_8	0.14784	ECS_5pct_2hr_9
30	ECS_5pct_3hr	5%	0.07374	ECS_5pct_3hr_3	0.07800	ECS_5pct_3hr_2	0.03918	ECS_5pct_3hr_9	0.09775	ECS_5pct_3hr_8
31	ECS_2pct_10min	2%	0.16916	ECS_2pct_10min_8	0.17048	ECS_2pct_10min_5	0.14962	ECS_2pct_10min_3	0.19951	ECS_2pct_10min_9
32	ECS_2pct_15min	2%	0.16555	ECS_2pct_15min_3	0.15343	ECS_2pct_15min_2	0.13960	ECS_2pct_15min_5	0.21071	ECS_2pct_15min_9
33	ECS_2pct_20min	2%	0.16583	ECS_2pct_20min_5	0.15834	ECS_2pct_20min_1	0.12434	ECS_2pct_20min_6	0.24778	ECS_2pct_20min_9
34	ECS_2pct_25min	2%	0.15447	ECS_2pct_25min_1	0.15553	ECS_2pct_25min_1	0.12179	ECS_2pct_25min_8	0.19880	ECS_2pct_25min_9
35	ECS_2pct_30min	2%	0.14905	ECS_2pct_30min_1	0.13257	ECS_2pct_30min_3	0.11250	ECS_2pct_30min_8	0.19952	ECS_2pct_30min_7
36	ECS_2pct_45min	2%	0.14041	ECS_2pct_45min_2	0.13874	ECS_2pct_45min_3	0.12203	ECS_2pct_45min_4	0.16803	ECS_2pct_45min_10
37	ECS_2pct_1hr	2%	0.13491	ECS_2pct_1hr_2	0.13511	ECS_2pct_1hr_2	0.10526	ECS_2pct_1hr_4	0.18623	ECS_2pct_1hr_1
38	ECS_2pct_1_5hr	2%	0.12606	ECS_2pct_1_5hr_8	0.12146	ECS_2pct_1_5hr_9	0.09040	ECS_2pct_1_5hr_4	0.20270	ECS_2pct_1_5hr_7
39	ECS_2pct_2hr	2%	0.13209	ECS_2pct_2hr_2	0.13225	ECS_2pct_2hr_2	0.07717	ECS_2pct_2hr_3	0.19466	ECS_2pct_2hr_4
40	ECS_2pct_3hr	2%	0.09040	ECS_2pct_3hr_7	0.08193	ECS_2pct_3hr_1	0.05228	ECS_2pct_3hr_5	0.15248	ECS_2pct_3hr_3
41	ECS_1pct_10min	1%	0.18849	ECS_1pct_10min_8	0.19021	ECS_1pct_10min_5	0.16686	ECS_1pct_10min_3	0.21868	ECS_1pct_10min_9
42	ECS_1pct_15min	1%	0.18312	ECS_1pct_15min_3	0.17069	ECS_1pct_15min_2	0.15608	ECS_1pct_15min_5	0.23060	ECS_1pct_15min_9
43	ECS_1pct_20min	1%	0.18331	ECS_1pct_20min_5	0.17599	ECS_1pct_20min_1	0.13978	ECS_1pct_20min_6	0.26946	ECS_1pct_20min_9
44	ECS_1pct_25min	1%	0.17248	ECS_1pct_25min_5	0.17549	ECS_1pct_25min_4	0.13674	ECS_1pct_25min_8	0.22142	ECS_1pct_25min_9
45	ECS_1pct_30min	1%	0.16610	ECS_1pct_30min_1	0.14694	ECS_1pct_30min_3	0.12501	ECS_1pct_30min_8	0.22366	ECS_1pct_30min_7
46	ECS_1pct_45min	1%	0.15848	ECS_1pct_45min_3	0.15811	ECS_1pct_45min_3	0.13758	ECS_1pct_45min_7	0.19069	ECS_1pct_45min_10
47	ECS_1pct_1hr	1%	0.15320	ECS_1pct_1hr_2	0.15183	ECS_1pct_1hr_2	0.11741	ECS_1pct_1hr_4	0.21497	ECS_1pct_1hr_1
48	ECS_1pct_1_5hr	1%	0.14369	ECS_1pct_1_5hr_8	0.13847	ECS_1pct_1_5hr_9	0.10205	ECS_1pct_1_5hr_4	0.23598	ECS_1pct_1_5hr_7
49	ECS_1pct_2hr	1%	0.14965	ECS_1pct_2hr_2	0.14915	ECS_1pct_2hr_2	0.08704	ECS_1pct_2hr_3	0.21792	ECS_1pct_2hr_4
50	ECS_1pct_3hr	1%	0.10402	ECS_1pct_3hr_7	0.09407	ECS_1pct_3hr_8	0.06061	ECS_1pct_3hr_5	0.17352	ECS_1pct_3hr_3

Object: DETENTION TANK Result Type: Max Water Depth (m)

Object type: Node

	Ensemble Name	AEP	Mean	Mean Storm	Median	Median Storm	Min	Min Storm	Max	Max Storm
1	ECS_20pct_10min	20%	0.86265	ECS_20pct_10min_10	0.85674	ECS_20pct_10min_8	0.84830	ECS_20pct_10min_5	0.89556	ECS_20pct_10min_9
2	ECS_20pct_15min	20%	0.85330	ECS_20pct_15min_3	0.85042	ECS_20pct_15min_6	0.83139	ECS_20pct_15min_7	0.87680	ECS_20pct_15min_10
3	ECS_20pct_20min	20%	0.86254	ECS_20pct_20min_9	0.86045	ECS_20pct_20min_8	0.84277	ECS_20pct_20min_4	0.88337	ECS_20pct_20min_10
4	ECS_20pct_25min	20%	0.85204	ECS_20pct_25min_7	0.84450	ECS_20pct_25min_1	0.82875	ECS_20pct_25min_8	0.90036	ECS_20pct_25min_10
5	ECS_20pct_30min	20%	0.85126	ECS_20pct_30min_3	0.84853	ECS_20pct_30min_9	0.82898	ECS_20pct_30min_2	0.89135	ECS_20pct_30min_6
6	ECS_20pct_45min	20%	0.84742	ECS_20pct_45min_4	0.84760	ECS_20pct_45min_4	0.82697	ECS_20pct_45min_6	0.87183	ECS_20pct_45min_1
7	ECS_20pct_1hr	20%	0.82939	ECS_20pct_1hr_3	0.83065	ECS_20pct_1hr_3	0.78987	ECS_20pct_1hr_7	0.86520	ECS_20pct_1hr_9
8	ECS_20pct_1_5hr	20%	0.80792	ECS_20pct_1_5hr_4	0.81894	ECS_20pct_1_5hr_10	0.71159	ECS_20pct_1_5hr_8	0.85973	ECS_20pct_1_5hr_1
9	ECS_20pct_2hr	20%	0.80785	ECS_20pct_2hr_10	0.81937	ECS_20pct_2hr_4	0.71966	ECS_20pct_2hr_2	0.88891	ECS_20pct_2hr_6
10	ECS_20pct_3hr	20%	0.58537	ECS_20pct_3hr_3	0.54587	ECS_20pct_3hr_8	0.34807	ECS_20pct_3hr_1	0.82816	ECS_20pct_3hr_2
11	ECS_10pct_10min	10%	0.87860	ECS_10pct_10min_10	0.87661	ECS_10pct_10min_5	0.86861	ECS_10pct_10min_9	0.89524	ECS_10pct_10min_2
12	ECS_10pct_15min	10%	0.88565	ECS_10pct_15min_10	0.88688	ECS_10pct_15min_10	0.86442	ECS_10pct_15min_8	0.90640	ECS_10pct_15min_3
13	ECS_10pct_20min	10%	0.87733	ECS_10pct_20min_10	0.87327	ECS_10pct_20min_4	0.85004	ECS_10pct_20min_5	0.93160	ECS_10pct_20min_9
14	ECS_10pct_25min	10%	0.87384	ECS_10pct_25min_6	0.86899	ECS_10pct_25min_6	0.83795	ECS_10pct_25min_5	0.90637	ECS_10pct_25min_1
15	ECS_10pct_30min	10%	0.86373	ECS_10pct_30min_1	0.86403	ECS_10pct_30min_1	0.84598	ECS_10pct_30min_2	0.88312	ECS_10pct_30min_9
16	ECS_10pct_45min	10%	0.85710	ECS_10pct_45min_9	0.85047	ECS_10pct_45min_4	0.83166	ECS_10pct_45min_6	0.89120	ECS_10pct_45min_2
17	ECS_10pct_1hr	10%	0.84751	ECS_10pct_1hr_10	0.85742	ECS_10pct_1hr_2	0.80189	ECS_10pct_1hr_4	0.86841	ECS_10pct_1hr_5
18	ECS_10pct_1_5hr	10%	0.83401	ECS_10pct_1_5hr_4	0.83572	ECS_10pct_1_5hr_10	0.79893	ECS_10pct_1_5hr_8	0.86493	ECS_10pct_1_5hr_1
19	ECS_10pct_2hr	10%	0.83312	ECS_10pct_2hr_6	0.84084	ECS_10pct_2hr_10	0.78034	ECS_10pct_2hr_8	0.87474	ECS_10pct_2hr_1
20	ECS_10pct_3hr	10%	0.74183	ECS_10pct_3hr_1	0.79807	ECS_10pct_3hr_6	0.41519	ECS_10pct_3hr_9	0.81585	ECS_10pct_3hr_8
21	ECS_5pct_10min	5%	0.89687	ECS_5pct_10min_8	0.89282	ECS_5pct_10min_5	0.88599	ECS_5pct_10min_9	0.92055	ECS_5pct_10min_2
22	ECS_5pct_15min	5%	0.90431	ECS_5pct_15min_2	0.90492	ECS_5pct_15min_10	0.87764	ECS_5pct_15min_8	0.93251	ECS_5pct_15min_3
23	ECS_5pct_20min	5%	0.89424	ECS_5pct_20min_10	0.88865	ECS_5pct_20min_4	0.86226	ECS_5pct_20min_5	0.95875	ECS_5pct_20min_9
24	ECS_5pct_25min	5%	0.88968	ECS_5pct_25min_9	0.88311	ECS_5pct_25min_6	0.84943	ECS_5pct_25min_5	0.92934	ECS_5pct_25min_1
25	ECS_5pct_30min	5%	0.87942	ECS_5pct_30min_1	0.87865	ECS_5pct_30min_1	0.85941	ECS_5pct_30min_7	0.89961	ECS_5pct_30min_9
26	ECS_5pct_45min	5%	0.87284	ECS_5pct_45min_8	0.86818	ECS_5pct_45min_10	0.84342	ECS_5pct_45min_6	0.91001	ECS_5pct_45min_2
27	ECS_5pct_1hr	5%	0.86276	ECS_5pct_1hr_10	0.87211	ECS_5pct_1hr_2	0.81926	ECS_5pct_1hr_4	0.88751	ECS_5pct_1hr_5
28	ECS_5pct_1_5hr	5%	0.85046	ECS_5pct_1_5hr_2	0.84870	ECS_5pct_1_5hr_10	0.81814	ECS_5pct_1_5hr_8	0.89425	ECS_5pct_1_5hr_1
29	ECS_5pct_2hr	5%	0.84958	ECS_5pct_2hr_10	0.85542	ECS_5pct_2hr_10	0.80072	ECS_5pct_2hr_8	0.89414	ECS_5pct_2hr_1
30	ECS_5pct_3hr	5%	0.78169	ECS_5pct_3hr_7	0.81125	ECS_5pct_3hr_6	0.52121	ECS_5pct_3hr_9	0.82895	ECS_5pct_3hr_8
31	ECS_2pct_10min	2%	0.92998	ECS_2pct_10min_5	0.93110	ECS_2pct_10min_8	0.90551	ECS_2pct_10min_3	0.96534	ECS_2pct_10min_9
32	ECS_2pct_15min	2%	0.92280	ECS_2pct_15min_3	0.91027	ECS_2pct_15min_2	0.89533	ECS_2pct_15min_5	0.96621	ECS_2pct_15min_9
33	ECS_2pct_20min	2%	0.91783	ECS_2pct_20min_3	0.91090	ECS_2pct_20min_5	0.87542	ECS_2pct_20min_6	1.00133	ECS_2pct_20min_9
34	ECS_2pct_25min	2%	0.90251	ECS_2pct_25min_1	0.90595	ECS_2pct_25min_1	0.85975	ECS_2pct_25min_8	0.93917	ECS_2pct_25min_3
35	ECS_2pct_30min	2%	0.89624	ECS_2pct_30min_9	0.88881	ECS_2pct_30min_3	0.85930	ECS_2pct_30min_6	0.94729	ECS_2pct_30min_7
36	ECS_2pct_45min	2%	0.87580	ECS_2pct_45min_3	0.87778	ECS_2pct_45min_3	0.85325	ECS_2pct_45min_7	0.89438	ECS_2pct_45min_9
37	ECS_2pct_1hr	2%	0.87047	ECS_2pct_1hr_5	0.86234	ECS_2pct_1hr_3	0.84253	ECS_2pct_1hr_9	0.91486	ECS_2pct_1hr_1
38	ECS_2pct_1_5hr	2%	0.86545	ECS_2pct_1_5hr_1	0.85970	ECS_2pct_1_5hr_2	0.82498	ECS_2pct_1_5hr_4	0.95827	ECS_2pct_1_5hr_7
39	ECS_2pct_2hr	2%	0.87065	ECS_2pct_2hr_9	0.86656	ECS_2pct_2hr_6	0.81317	ECS_2pct_2hr_7	0.94079	ECS_2pct_2hr_5
40	ECS_2pct_3hr	2%	0.82338	ECS_2pct_3hr_7	0.81473	ECS_2pct_3hr_8	0.78126	ECS_2pct_3hr_5	0.87051	ECS_2pct_3hr_4
41	ECS_1pct_10min	1%	0.95075	ECS_1pct_10min_5	0.95405	ECS_1pct_10min_8	0.92143	ECS_1pct_10min_3	0.99171	ECS_1pct_10min_9
42	ECS_1pct_15min	1%	0.94218	ECS_1pct_15min_3	0.92919	ECS_1pct_15min_2	0.90864	ECS_1pct_15min_1	0.99189	ECS_1pct_15min_9
43	ECS_1pct_20min	1%	0.93548	ECS_1pct_20min_3	0.92712	ECS_1pct_20min_4	0.88611	ECS_1pct_20min_6	1.02751	ECS_1pct_20min_9
44	ECS_1pct_25min	1%	0.91835	ECS_1pct_25min_1	0.92125	ECS_1pct_25min_1	0.86939	ECS_1pct_25min_8	0.96050	ECS_1pct_25min_3
45	ECS_1pct_30min	1%	0.91055	ECS_1pct_30min_9	0.90172	ECS_1pct_30min_3	0.86917	ECS_1pct_30min_6	0.96611	ECS_1pct_30min_7
46	ECS_1pct_45min	1%	0.88834	ECS_1pct_45min_3	0.89042	ECS_1pct_45min_3	0.86348	ECS_1pct_45min_7	0.90936	ECS_1pct_45min_9
47	ECS_1pct_1hr	1%	0.88387	ECS_1pct_1hr_5	0.87394	ECS_1pct_1hr_3	0.85258	ECS_1pct_1hr_9	0.93799	ECS_1pct_1hr_1
48	ECS_1pct_1_5hr	1%	0.88051	ECS_1pct_1_5hr_1	0.87238	ECS_1pct_1_5hr_2	0.83516	ECS_1pct_1_5hr_4	0.99098	ECS_1pct_1_5hr_7
49	ECS_1pct_2hr	1%	0.88661	ECS_1pct_2hr_9	0.87980	ECS_1pct_2hr_6	0.83313	ECS_1pct_2hr_7	0.96634	ECS_1pct_2hr_5
50	ECS_1pct_3hr	1%	0.83526	ECS_1pct_3hr_7	0.82530	ECS_1pct_3hr_8	0.79338	ECS_1pct_3hr_5	0.88512	ECS_1pct_3hr_3

APPENDIX F – Silt & Sediment Control Plan

DRAWING SIZE – A1

HEIGHT DATUM

LOT 101 ON DP 839601
Level Datum AHD
Level Origin PM421198, RL 17.514m

Survey information provided by
Ardill Payne & Partners

CONSTRUCTION NOTES

GENERAL:
1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS IN MILLIMETRES
3. SETTING OUT DIMENSIONS ARE TO BE OBTAINED FROM THE ARCHITECTURAL DRAWINGS.
4. ANY DISCREPANCIES BETWEEN THESE DRAWING AND THE ARCHITECTURAL DRAWINGS ARE TO BE REFERRED TO THE ENGINEER IMMEDIATELY.
5. THE BUILDER IS RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN AND ADJACENT THE ALLOTMENT AND SHALL ENSURE THAT ALL NEW WORKS ARE IN ACCORDANCE WITH THE ATTACHED CRITICAL DEPTH LINE DIAGRAM.

KEY

EX. SWPT	EXISTING STORMWATER PIT
EX. RCEW	EXISTING REINFORCED CONCRETE END WALL
EX. SMH	EXISTING SEWER MANHOLE
EX. SCP	EXISTING SEWER CONNECTION POINT
E.O.B.	EXISTING EDGE OF BITUMEN
K & C	EXISTING KERB & CHANNEL
N.S.L.	NATURAL SURFACE LEVEL
F.H.	FIRE HYDRANT
T.P	TELSTRA PIT
E.P.	ELECTRICAL POWER POLE
KERB	EXISTING KERBING

EXISTING SHALLOW WATER MAIN TO BE RELOCATED PRIOR TO HEAVY VEHICLE LOADING.

EXISTING CROSSOVER RETAINED FOR SITE EARTHWORKS, REMOVED AND REPLACED WITH NEW CROSSOVER & KERB & CHANNEL ONCE EARTHWORKS COMPLETED

MAINTAIN EXISTING PAVEMENT FOR SITE ACCESS DURING EARTHWORKS PHASE.

PATTERSON STREET

ROAD CENTRE LINE

K & C

W.M.

E.P.

T.P.

R.P. BOUNDARY

33°56'25" 18.295

131°10'30" 120.63

310°01'25" 14.91

33°56'25" 1.83

310°01'25" 15.745

19.465 33°56'25"

85.09 308°48'25"

PROVIDE RUMBLE GRATES DURING SITE BULK EARTHWORKS.

80–120mm ROCK (NO FINES) HARD STAND OVERLAY FOR DELIVERY'S DURING CONSTRUCTION. TYPICAL.

CREATE BUNDING IN TEMPORARY HARDSTAND FOR DIVERISION INTO SILT FENCES. TYPICAL.

EXISTING STRUCUTRE TO BE DEMOLISHED AND REMOVED.

SILT

FL 9.16

FL 9.19

6.78

6.08

7.54

5.64

5.78

5.32

5.46

5.53

5.88

6.34

38.11

38.36

S.L. 6.15
I.L. 4.37

EX.SWPT

SL 6.15
IL 4.37

EX.SMH

SL 6.36
IL 4.65

S.L. 6.36
I.L. 4.65

SEDIMENT BED TO DETAIL

FALL

PROFILE EXCAVATED GROUND TO CREATE SITE FALL TOWARDS SEDIMENT BED

BATTER SITE BACK DOWN FROM LOW SIDE BOUNDARY TO PROMOTE RUNOFF TOWARDS THE SEDIMENT BED

EX. 600ø RCP

EXISTING SWALE DRAIN

35.2 – 221°12'45"

LEGEND

- 18.0 — INDICATES PROPOSED SURFACE CONTOURS AND LEVELS TO AHD.
- 5.0% — INDICATES FINISHED SURFACE GRADE
- +18.0 — EXISTING SURFACE SPOT LEVELS.
- RAMP — INDICATES DIRECTION OF RAMP UP OR DOWN AS INDICATED
- E — INDICATES OVERHEAD ELECTRICITY SUPPLY LINE
- S/EX — INDICATES EXISTING SEWER LINE
- W — INDICATES WATER MAIN APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
- T — INDICATES TELSTRA LINE APPROX ALIGNMENT, BUILDER TO CONFIRM EXACT LOCATION PRIOR TO WORKS
- SW/EX — INDICATES STORMWATER DRAIN EXISTING AS NOTED
- SILT — SILT RETENTION FENCE TO DETAIL
- INDICATES ALIGNEMENT AND DIRECTION OF FALL FOR OPEN SWALE WITHIN CONSTRUCTION SITE DRAINING TO THE APPROVED POINT OF DISCHARGE, REFER TO DETAIL

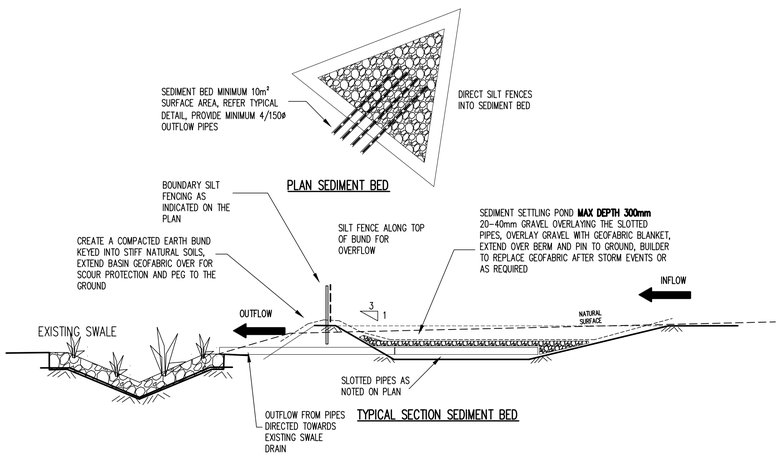
SITE PLAN – SILT & SEDIMENT EROSION PLAN

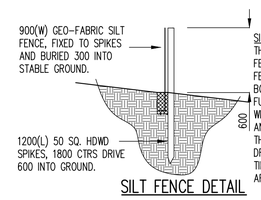
Scale 1 : 200

ALL SERVICES SHOWN ON THIS PLAN INDICATIVE ONLY CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORKS ON SITE. ALL SERVICES ARE TO BE PROTECTED IN ACCORDANCE WITH THE AUTHORITY RESPONSIBLE FOR THE SERVICE

SITE DRAINAGE – CONSTRUCTION
ENSURE GROUND PROFILE DURING CONSTRUCTION FALLS TOWARDS THE CENTRE OF THE ALLOTMENT THEN TOWARDS THE REAR BOUNDARY WHERE RUNOFF WILL DRAIN THROUGH THE SILT POND & SILT FENCES. IN NO INSTANCE SHALL THE ALLOTMENT DRAIN INTO NEIGHBOURING ALLOTMENTS.

SITE DRAINAGE – CONSTRUCTION
CONSTRUCTED STORM WATER PITS WITHIN THE SITE ARE TO BE COVERED UNTIL THE SITE IS COMPLETED OR TO BE FITTED WITH SILT PROTECTION MEASURES TO THE APPROVAL OF THE ENGINEER





SILT RETENTION

THE CONTRACTOR IS TO INSTALL APPROVED SILT RETENTION FENCES PRIOR TO COMMENCING ANY EARTHWORKS. THE FENCE IS TO BE CONSTRUCTED ALONG THE LOWEST BOUNDARY AND RETURNED UP SIDE BOUNDARIES TO ENSURE FULL STORMWATER ENTRAPMENT. SURFACE RUNOFF FROM WITHIN THE ALLLOTMENT MUST DRAIN TOWARDS THE FENCE AND SHALL NOT ENTER NIEGHBOURING ALLOTMENTS THROUGH THE USE OF SURFACE BUNDING OR SCOUR PROTECTED DRAINS. THE FENCE MUST REMAIN IN PLACE UNTIL SUCH TIME THAT FINISHED LANDSCAPING AND DRAINAGE MEASURES ARE INSTALLED

MAINTENANCE OF SILT PROTECTION

SITE FOREMAN TO MAINTAIN ALL SILT AND SEDIMENT PROTECTION MEASURES THROUGHOUT THE DURATION OF THE PROJECT. ANY BREACHING OF THE PROTECTION MEASURES MUST BE REMEDIATED IMMEDIATELY AND REPORTED TO THE ENGINEER FOR CORRECTION MEASURES. SILT RUNOFF PROTECTION IS TO BE MAINTAINED UNTIL SUCH POINT THAT LANDSCAPING IS COMPLETED AND NOT SUSCEPTABLE TO STORMWATER SCOUR.

DUST MOBILISATION FROM WIND ACTION

SITE CONTROL TO INCLUDE PROTECTION AGAINST THE CARRIAGE OF SOIL SEDIMENT FROM WIND ACTIONS. SITE FOREMAN TO COVER ALL STOCKPILES WITH HESION OR SIMILIAR, PROVIDE SILT FENCING AROUND BASE OF STOCKPILES

0 2 4 6 8 10m 1:200 @ A1
1:400 @ A3

www.dialbeforeyoudig.com.au
DIAL 1100 BEFORE YOU DIG

Revision	Description	Date
.	.	.

Issue: FOR APPROVAL

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Ph (07) 5455 5604
email:admin@scg-engineers.com
web:www.scg-engineers.com
ABN 40 598 481 899

Title: SITE SILT AND SEDIMENT PLAN

Project: 103 Patterson Street, Byron Bay

Date:	Drawn	Design
June 20	TH	TH

Checked: RPEQ 5835 S Richardson

Drg No. 30089-0W2.1

Rev. .

APPENDIX G – Hydraulic Assessment Report

REPORT

103 PATERSON STREET, BYRON BAY, NSW

HYDRAULIC IMPACT ASSESSMENT

Planit Consulting on behalf of the proponent

Our Ref: FW00036

Date: 24 February 2021

Revision 4

Contact us to design the sustainable towns and cities of tomorrow.

FLOODWORKS

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e derek.mackenzie@floodworks.com.au
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Version Register

Version	Status	Author	Reviewer	Change from Previous Version	Authorised for Release	
					Signature	Date
4	For Issue	DM/TP	AR/VS	Change of retaining wall location. Remove of spoon drain.	D. Mackenzie	24/02/21

Transmission Register

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Name	Email Address
Konstantinos Nisiotis	kosta@hunterhopkins.com.au

Table of Contents

Figures

Tables

1. Introduction

Planit Consulting on behalf of the proponent has requested a hydraulic assessment of 103 Paterson Street, Byron Bay (the subject site).

The land area is approximately 3826m^2, with a drainage reserve to the east of the subject site. There is a large upstream catchment that contributes to the eastern drainage reserve (including a piped system and open channel) and will need to be considered in the hydraulic assessment. Site based stormwater falls from Paterson Street to the south east.

The hydraulic assessment will cover both the existing case and developed case scenarios and will determine any potential impacts upon the subject site, neighbouring properties. Guidance will be provided on the hydraulic function affecting the site such as peak heights, localised velocities, extents of inundation and hazard assessment.

The key objectives of this investigation is:

- Understand the 1% AEP (100 year ARI) hydraulic function of the site
- This assessment will identify existing maximum water levels, maximum depths, maximum hazards, maximum velocity and maximum inundation extents for the existing and developed case
- Minimise the potential impacts of the proposed development upon the subject site and neighbouring properties is to be provided.

A detailed 1D/2D modelling has been undertaken to confirm the above objectives.

See Figure 1 below showing the location of the study site.

Figure 1 Subject Site

2. Hydrology

2.1. Methodology

The XP-SWMM runoff-routing model has been used to estimate design flood discharges within the study area. The model represents the sub-catchments as a network of nodes linked to either the 1D pipe drainage network or the 2D Digital Terrain Model (DTM) geometric base. The node is defined by its pervious and impervious areas, fraction impervious and average catchment slope. The net rainfall is routed through the network after appropriate losses (initial and continuing) and roughness factors are applied, resulting in a surface runoff hydrograph for each sub-catchment.

The XP-SWMM model was used to estimate the 100 year ARI design runoff with all hydrologic assessment using Australian Rainfall and Runoff 2019 (ARR2019) methodologies.

A numerical check has been undertaken using the Regional Flood Frequency Estimation model (https://rffe.arr-software.org/) and compared to the XP-SWMM results.

2.2. Hydrologic Model

2.2.1. Configuration

Figure 2 illustrates the extent of the XP-SWMM model. There are 7 sub-catchments (total area is 21.55ha) used to represent the runoff contributing to the study area. These catchments were delineated to accurately represent the inflow location and its impact on the subject site.

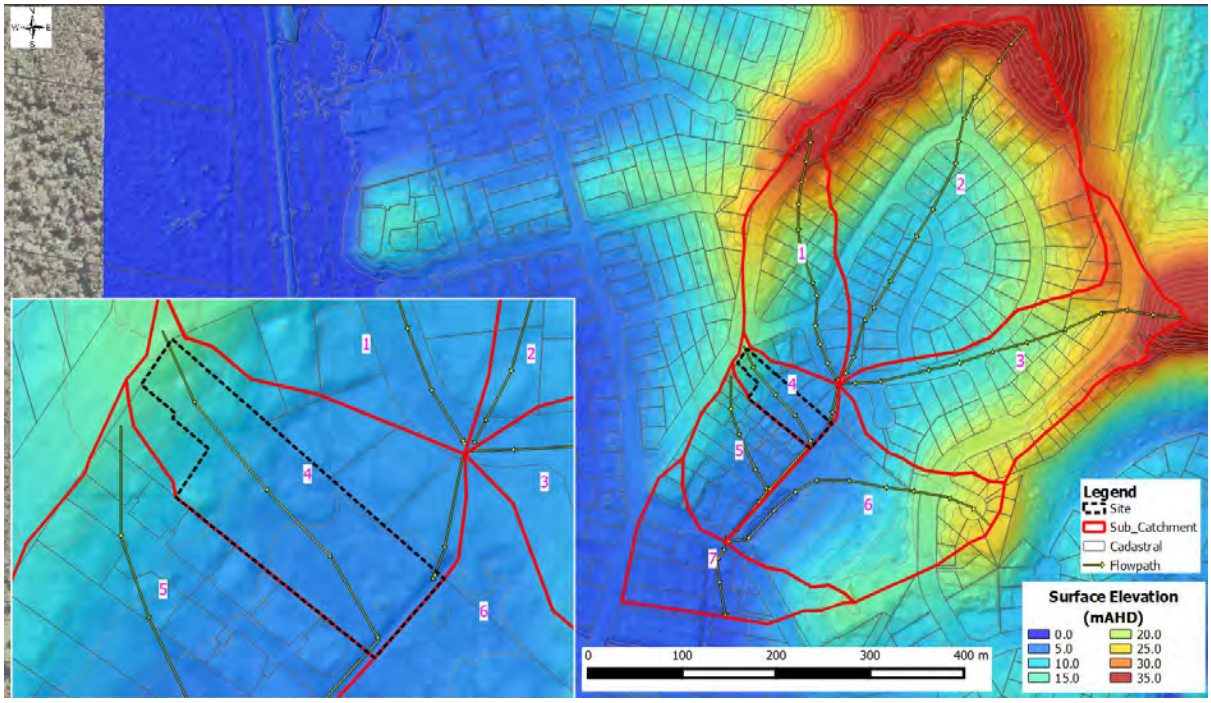


Figure 2 XP-SWMM Model Extents

2.2.2. Hydrologic Routing

Hydrologic modelling has been undertaken using the Laurenson runoff routing method. The Laurenson method requires the catchment to be divided into pervious (undeveloped) and impervious (developed) portions. A fraction impervious of 0% has been applied to the undeveloped portion and 100% to the developed portion.

2.2.3. Manning's Roughness

Manning's roughness (n) values are applied to represent the undeveloped and developed portions of the catchment. XP-SWMM allows a range to be applied to represent the varied degree of roughness that was observed within the catchment.

2.2.4. Rainfall Losses

Initial Loss (IL) and Continuing Losses (CL) were sourced from the Australian Rainfall and Runoff (ARR) Data Hub (*http://data.arr-software.org/*) and were applied to the modelling.

2.2.5. Existing Conditions Parameters

Table 1 summarises the XP-SWMM parameters adopted for the existing catchment conditions. The catchments equal area slope was calculated directly from the Digital Terrain Model for the Catchment.

The total contributing catchment is 21.55 ha. The hydrologic factors adopted have been summarised in Table 1.

Table 1 XP-SWMM Hydrologic Model Parameters

Sub-Catchment	Area (Ha)	Pervious Area (Ha)	Impervious (Ha)	Equal Area Slope (%)
Cat_1	2.283	1.207	1.076	7.52
Cat_2	8.158	4.472	3.685	4.95
Cat_3	4.143	1.973	2.171	6.97
Cat_4	0.670	0.467	0.203	4.44
Cat_5	1.340	0.734	0.607	4.92
Cat_6	3.261	1.398	1.864	5.05
Cat_7	1.692	1.018	0.674	3.69

2.3. ARR 2016 Hydrologic Results

The XP-SWMM ARR Storm Generator allows importation of the ARR Data Hub information, including rainfall global database, infiltration global database, and global storm definitions, into XP-SWMM. Information such as the ARR Data Hub, ARR Temporal Patterns Increments File, and Bureau of Meteorology (BOM) IFD table files are used to produce the Annual Exceedance Probability (AEP) and all of the durations for the given location, which are then analysed in the application.

Ten (10) temporal patterns were assessed per duration for each design event with the results statistically assessed using a box and whisker plot to determine the critical storm duration and

temporal pattern for the catchment. The box and whisker plot displays information about the range, median, and quartiles of the results. This plot can easily demonstrate whether a distribution is skewed and whether there are potential outliers in the data set, especially for a large number of observations.

Figure 3 below demonstrates that the highest median storm duration for the 100 year ARI is the 20min storm using the standard temporal pattern 3, and producing a peak discharge of **7.61 m^3/s**.

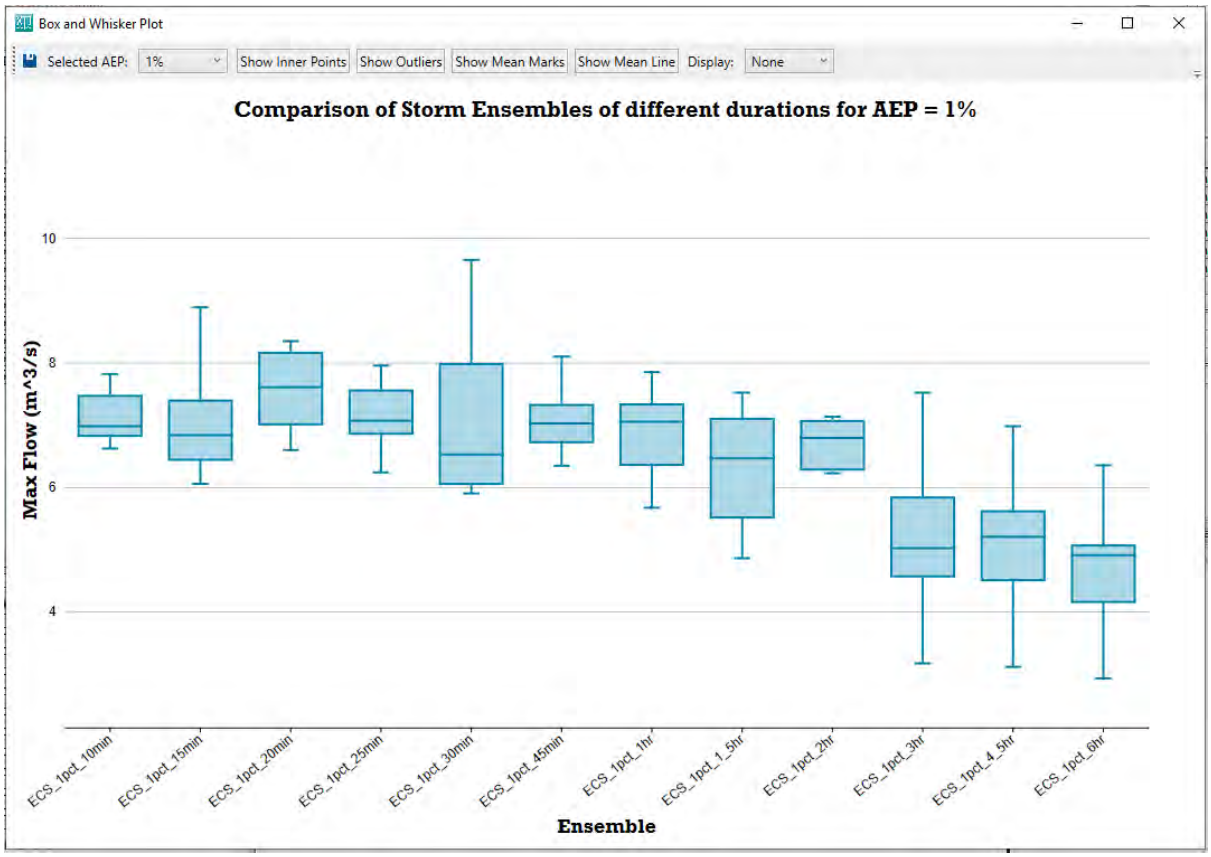


Figure 3 1% AEP Box and whisker plot of Ensemble results

2.4. Flood Frequency Analysis Comparison

ARR Regional Flood Frequency Estimation (RFFE) tool has replaced the rational method as a means to compare XPSWMM's calculation of design discharges for the 100 Year ARI developed conditions at legal points of discharge for the catchment.

The tool requires the geographical coordinates of the catchment centroid and outlet. Based on regional rainfall data at gauged locations near the site the tool produces a statistical estimate of the peak discharge.

The tool has the following limitations:

- The RFFA tool cannot be used for urban catchments, areas where large scale land clearing has occurred or where Dams or other significant Hydraulic controls have significantly affected the natural hydrology (ARR).
- RFFA is not accurate for catchments smaller than 0.5 km^2 or larger than 1000 km^2.
- Catchments that are located more than 300 km from a gauging station used by the tool.

Table 2 and Figure 4 summarises the comparison of the RFFA tool and XP-SWMM peak discharges for the sub-catchment at outlet. Whilst accuracy is reduced for catchments less than 0.5km^2, the RFFE is still a useful tool for checking purposes.

Table 2 XP-SWMM and RFFA Peak Discharge

Event	Regional Estimation Tool			XP_SWMM (ARR2019)
	Discharge (m3/s)	Lower Confidence Limit (5%) (m3/s)	Upper Confidence Limit (95%) (m3/s)	
1% AEP	8.23	2.48	27	7.61

** Based off Medium Ensemble Storm*

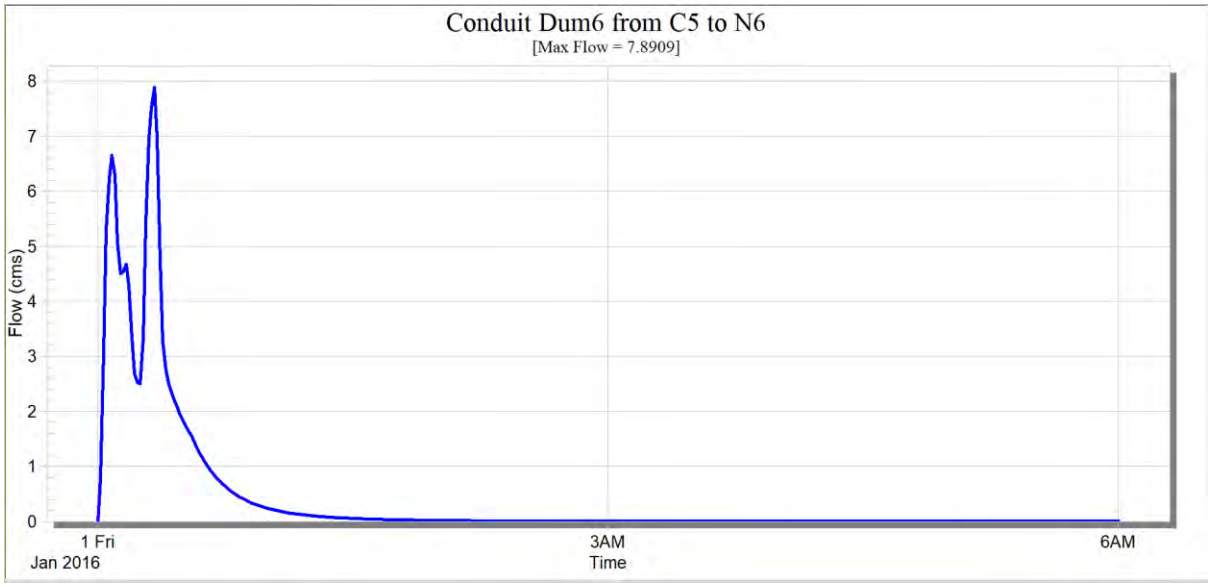


Figure 4 Critical Storm Duration and Temporal Pattern for The Outlet Catchment

3. Overland Flow Hydraulic Assessment

3.1. Objectives

The objective of this hydraulic impact assessment is to demonstrate that the fill pad associated with the proposed development does not significantly increase risk within the floodway or on neighbouring properties.

A 1D/2D TUFLOW has been used for this analysis. The TUFLOW software models the design terrain (i.e., Digital Terrain Model) of the study area as a series of grids (2D cells). This allows flows in excess of channel capacity or pipe network, to break out and continue along the floodway in the 2D domain, as the topography dictates. The hydraulic structures (i.e. the minor culvert network) have been represented as 1D elements (ESTRY) which is dynamically linked to the 2D elements. The TUFLOW model computes the capacity of the 1D element and once exceeded, the surcharged flow is transferred to the 2D model. Flood levels, discharge and velocity can be extracted from the model as functions of time at required locations.

TUFLOW is an industry standard two-dimensional hydraulic analysis model used to estimate flood characteristics such as flood level, velocity, depth and flood hazard and any impacts arising from the proposed development has on the surrounding properties.

3.2. 2D Model Set Up

3.2.1. Model Extent

The model extents for the TUFLOW model are presented in Figure 5. The extents were set at an appropriate distance from the subject site to properly assess the impacts of the proposed development.

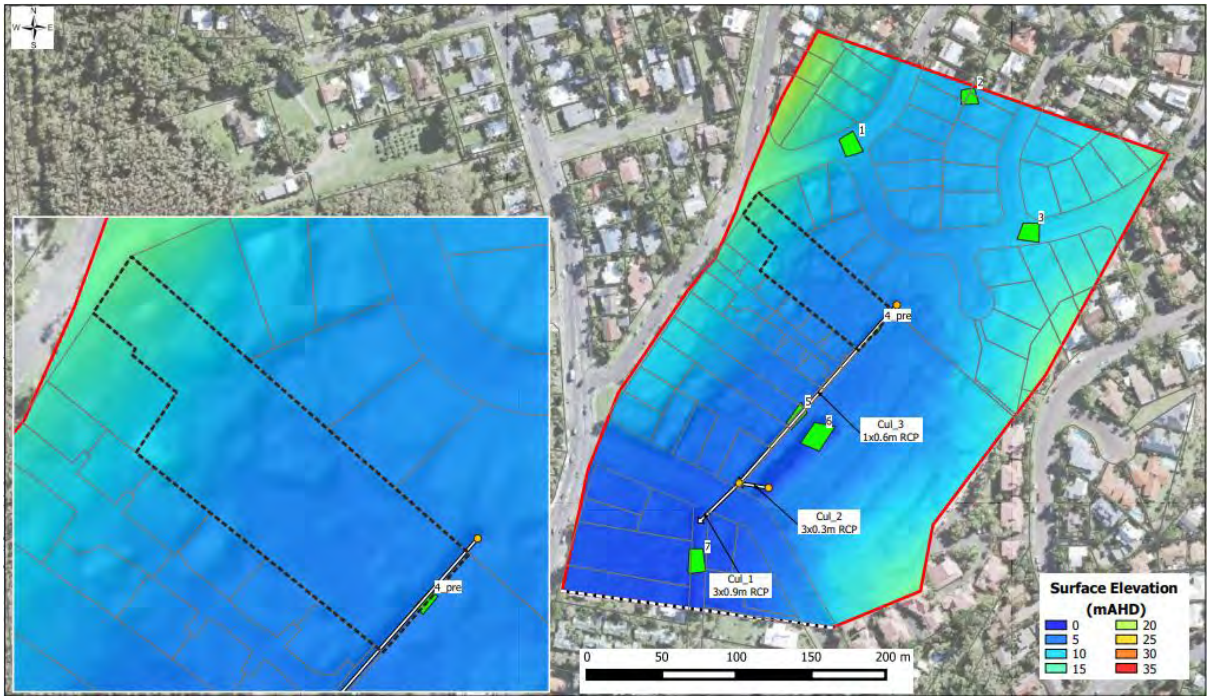


Figure 5 TUFLOW Model Extents

3.2.2. Resolution and Time Step

A grid size of 1m and time step 0.5s were used in the TUFLOW model for all scenarios. The grid size is based on model efficiency and size constraints for the extents of the model.

3.2.3. Topography Pre-Development

Lidar 1m (2010) and survey data around the subject site were used as the base topography for TUFLOW model. The topography used in the pre-development scenario is shown in Figure 6.

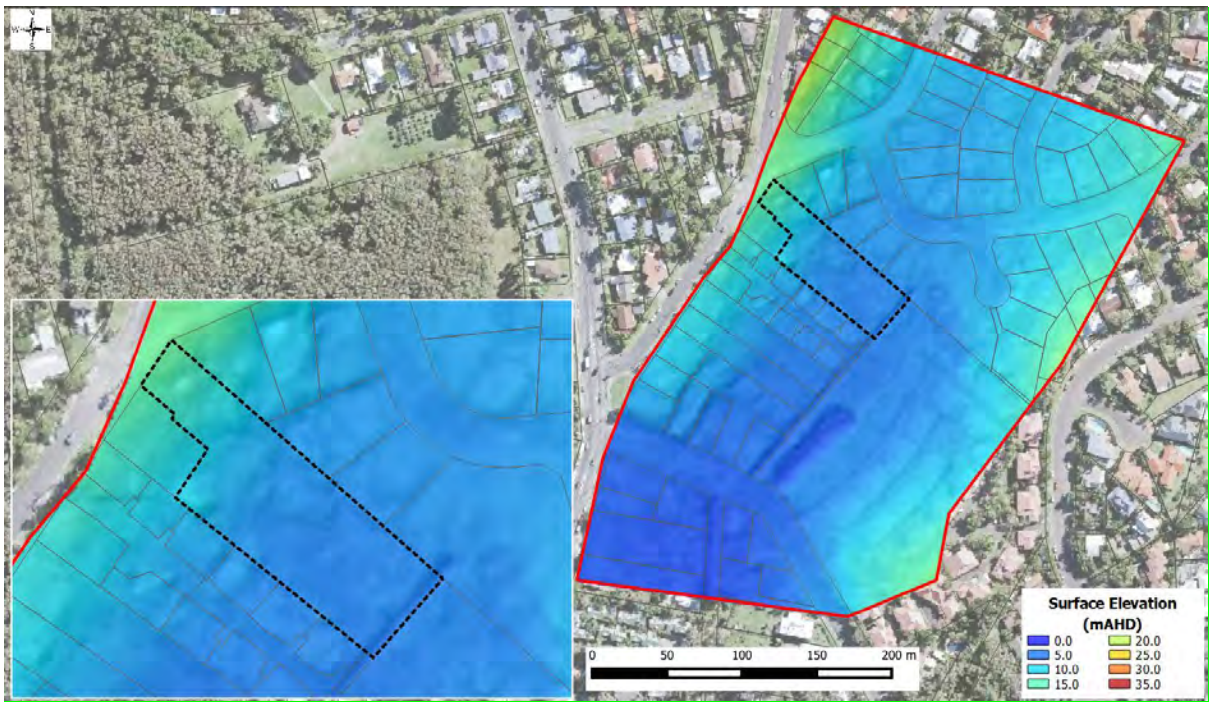


Figure 6 Surface Elevation Data

3.2.4. Topography Post-Development

For the post development scenario, the changes to the topography due to the proposed development are demonstrated in Figure 7.

The level of the proposed fill pad (on site) was raised to be completely flood free in 1% AEP peak water level.

A portion of the site is to be raised on piers or suspended slab. Refer to Civil drawing set for further detail.

A new 16m wide x 0.5m x 1:6 shallow drain is proposed to direct water from Shelly drive to an existing drainage easement to the south. These measures will help alleviate existing nuisance flooding of properties adjoining Shelly drive.

A small increase to the height of the left bank of the existing open channel is proposed to contain water within the drainage easement. Refer Figure 7 below for typical sections.

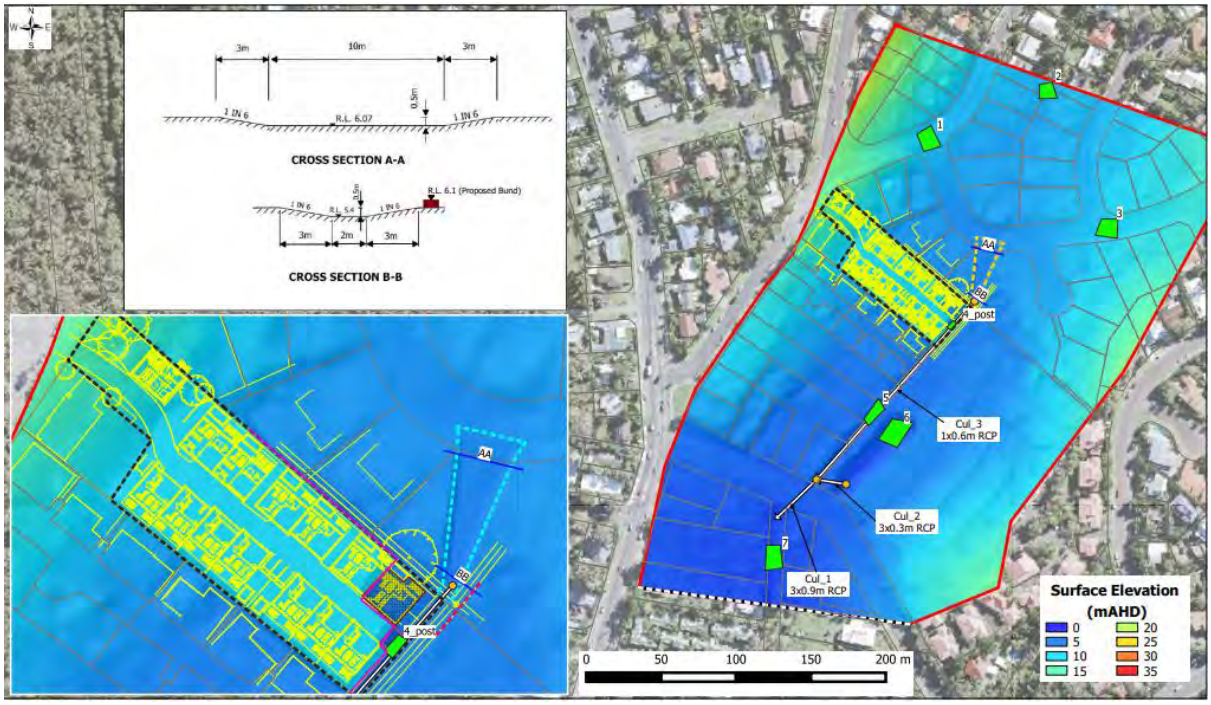


Figure 7 Design Surface Elevation Data

3.2.5. Roughness

Figure 8 and Figure 9 show the roughness adopted in the hydraulic impact assessment model.

Figure 8 Pre Development Roughness Map

Figure 9 Post Development Roughness Map

3.2.6. Inflows

The inflows within the TUFLOW model were extracted directly from XPSWMM Hydrology model (ARR2016). See Figure 5 for inflows location.

3.3. Pre-Development Case

The Pre-Development case includes existing low flow pipes as per Figure 5. The pipe roughness was set at Manning n = 0.014.

1% AEP peak water level, depth, velocity and hazard are shown below in Figure 10, Figure 11 Figure 12 and Figure 13 respectively.

The Flood Planning Level (FPL) shall be as per *Byron Shire Development Control Plan 2014 Chapter C2 Areas Affected by Flood*:

- Habitable dwellings - 6.5m AHD (6.0m AHD + 500mm = 6.5m AHD)
- Non Habitable buildings (carports etc) – 10% AEP + 300mm
    - All internal roads and non-habitable buildings set > 1% AEP.

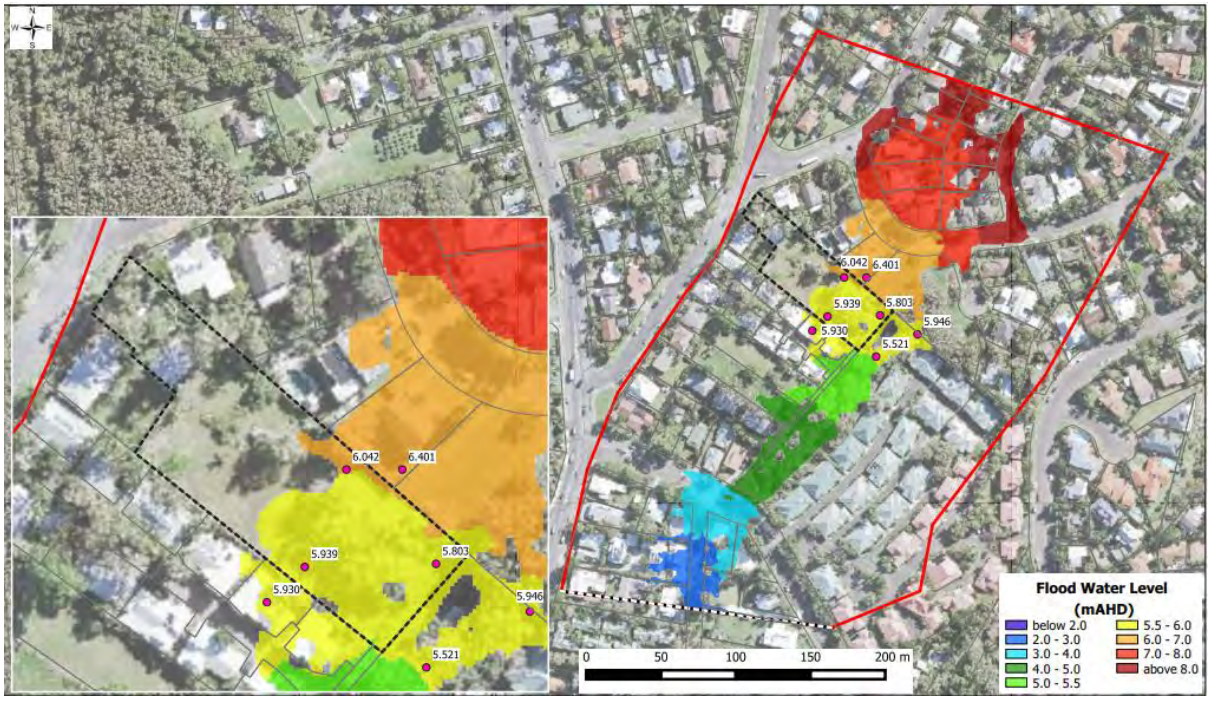


Figure 10 Pre-Development Maximum Water Level – 1% AEP

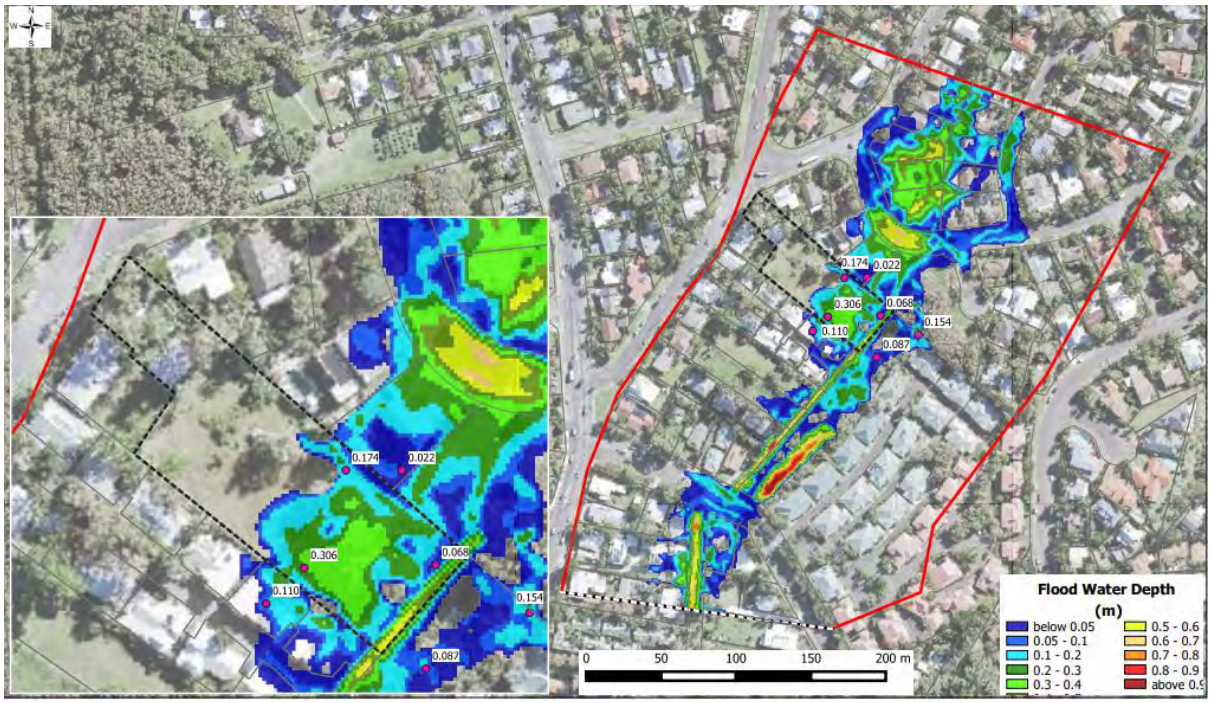


Figure 11 Pre-Development Maximum Depth – 1% AEP

Figure 12 Pre-Development Maximum Velocity – 1% AEP

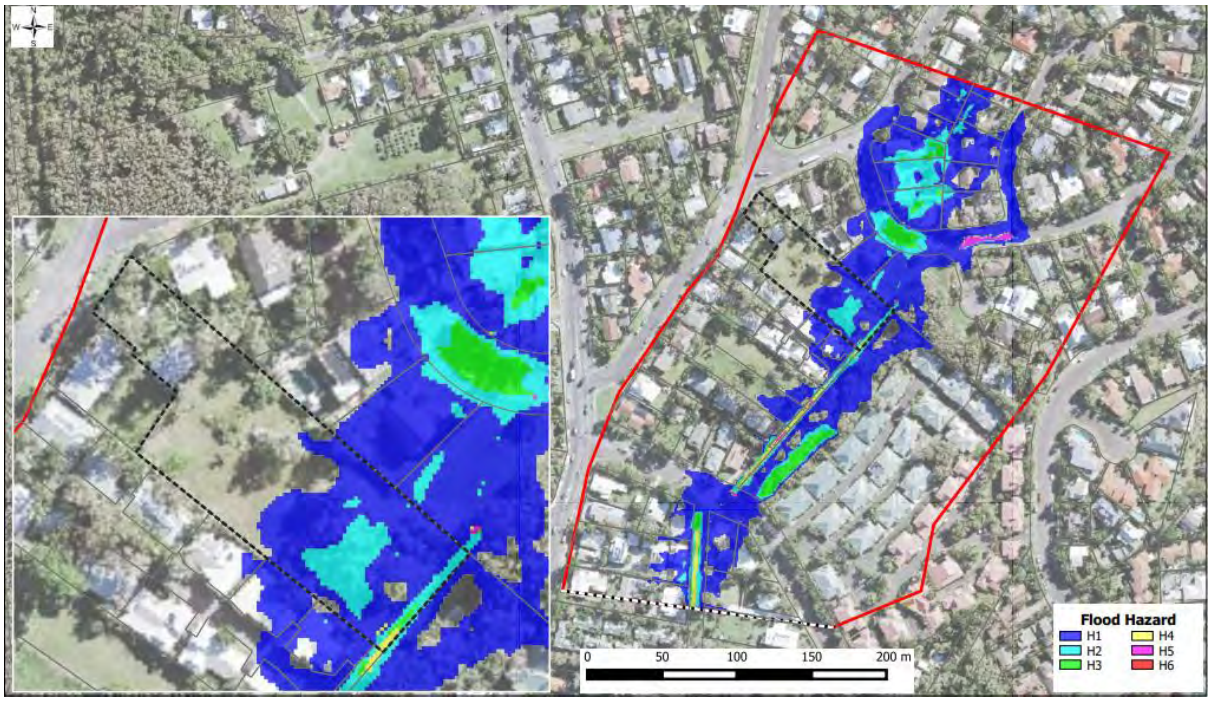


Figure 13 Pre-Development Maximum Hazard – 1% AEP

3.4. Post-Development Case

The modifications in the post-developed case include:

- The filling of proposed pad (within the site) to > 6.5m AHD Flood Planning Level
- A new 16m wide x 0.5m x 1:6 shallow drain is proposed to direct water from Shelly drive to an existing drainage easement to the south

- A portion of the site is to be raised on piers or suspended slab. Refer to Civil drawing set for further detail.
- A small increase to the height of the left bank of the existing open channel is proposed to contain water within the drainage easement.

Figure 14, 15, 16 and 17 below show the maximum water level, depth and velocity, hazard.

Figure 14 Post-Development Maximum Water Level – 1% AEP

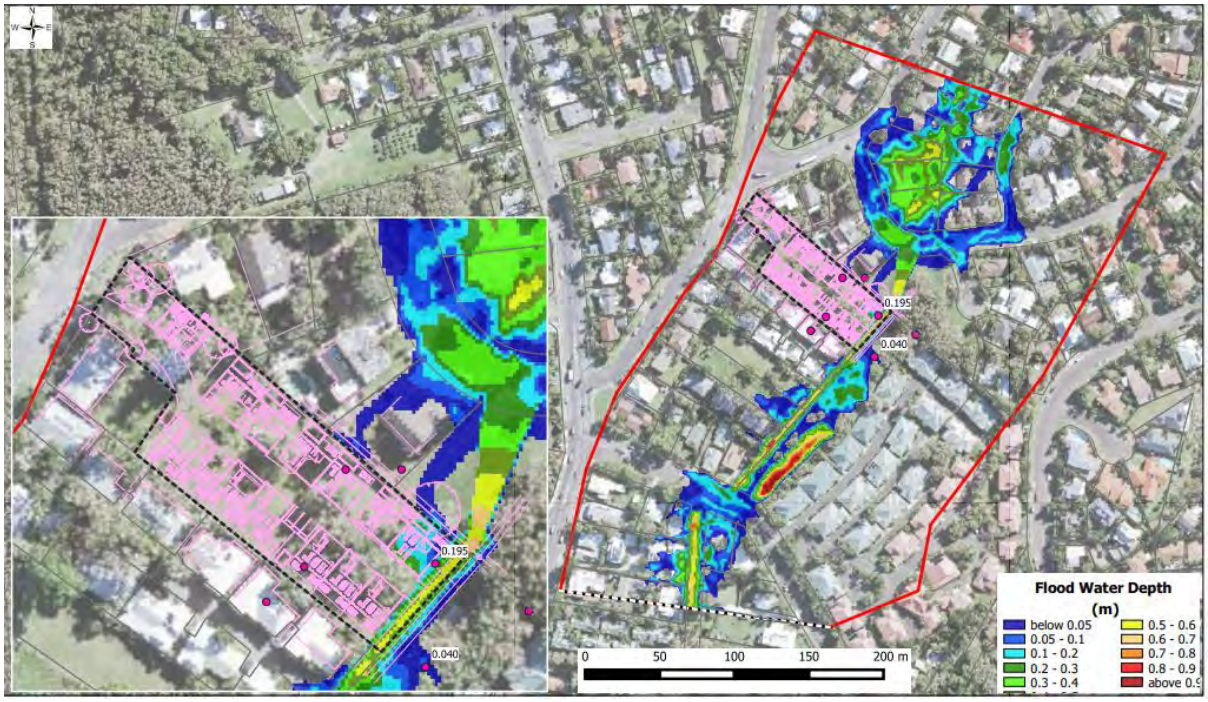


Figure 15 Post-Development Maximum Depth – 1% AEP

Figure 16 Post-Development Maximum Velocity – 1% AEP

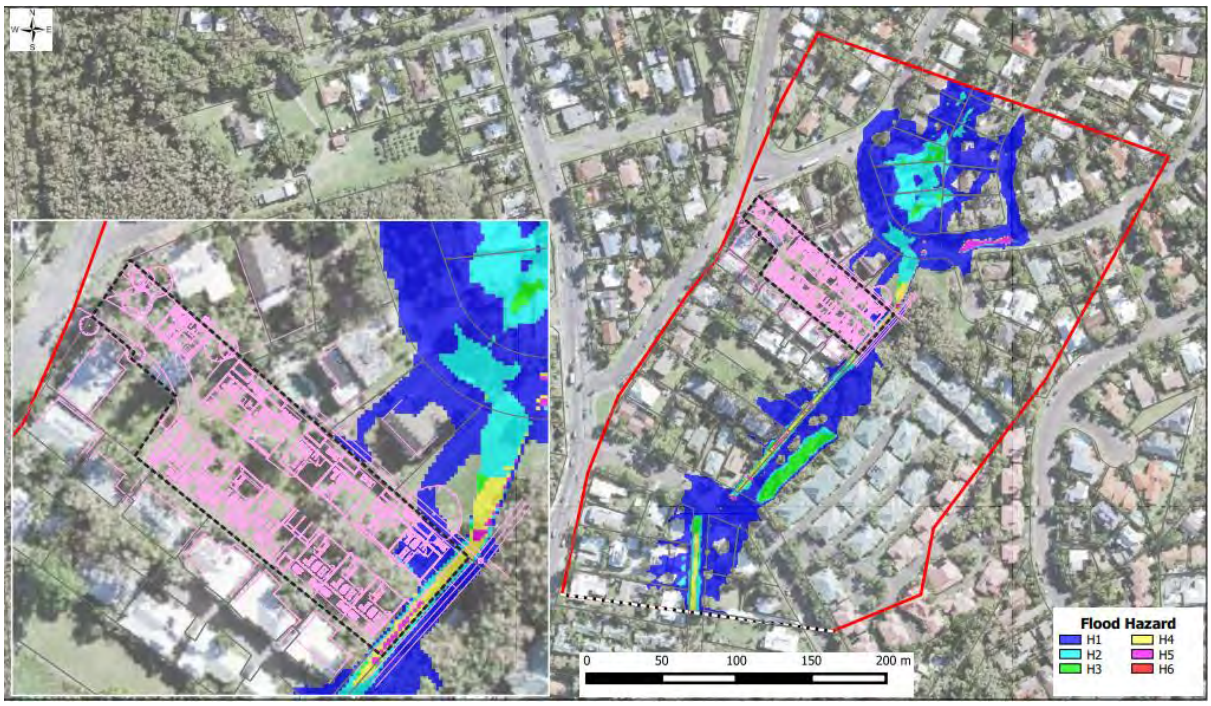


Figure 17 Post-Development Maximum Hazard – 1% AEP

3.4.1. Impact Assessment

Figure 18 below shows the difference in peak water levels, and Figure 19 below shows the difference in peak water velocity resulting from the proposed development.

The 1% AEP hydraulic assessment has resulted in:

- Generally, the 1% AEP water level afflux is less than 10mm for much of the study area and is considered non-actionable.
- There are some localised increases in maximum water level within subject site, the drainage reserve and a small portion of the park reserve immediately upstream of the drainage reserve of > 120mm
- There are some localised increases in maximum water level immediately downstream of the subject site, within the drainage reserve of 0 - 20mm, and 20 – 40mm.
- There is some localised reduction in maximum water levels of up to -47mm within the drainage reserve.
- Generally, the 1% AEP water velocity afflux is less than 0.1m/s for much of the study area and is considered non-actionable.
- There are some localised areas within the proposed design channel linking Shelly Drive to the drainage easement that has velocity increases of greater than 0.5 m/s
- There are some localised increases in maximum velocity within the drainage reserve of 0.567m/s

Benefits of providing a design channel linking Shelly Drive to the existing drainage reserve include:

- Improvement of existing nuisance flooding of neighbours directly to the north of the subject site. Current legacy flow paths convey water directly through the neighbouring properties to the north and also the subject site

- Formalising an existing conveyance path from the sag pit at Shelly Drive to the existing drainage reserve. Currently stormwater in excess of the minor system overtops the kerb at Shelly Drive as uncontrolled overland flow utilising legacy pathways which currently direct flows through neighbouring properties to the north and also the subject site before reconnecting to the existing drainage reserve
- A similar outcome could not have been achieved by maintaining the informal uncontrolled legacy drainage paths through the neighbouring properties to the north and also the subject site
- Reshaping of the public reserve to the north using low batters and shallow depth will improve visual amenity and usability. Currently the ground levels of the public reserve to the north is uneven in nature and not usable in its current form. Reshaping this area will improve usability.

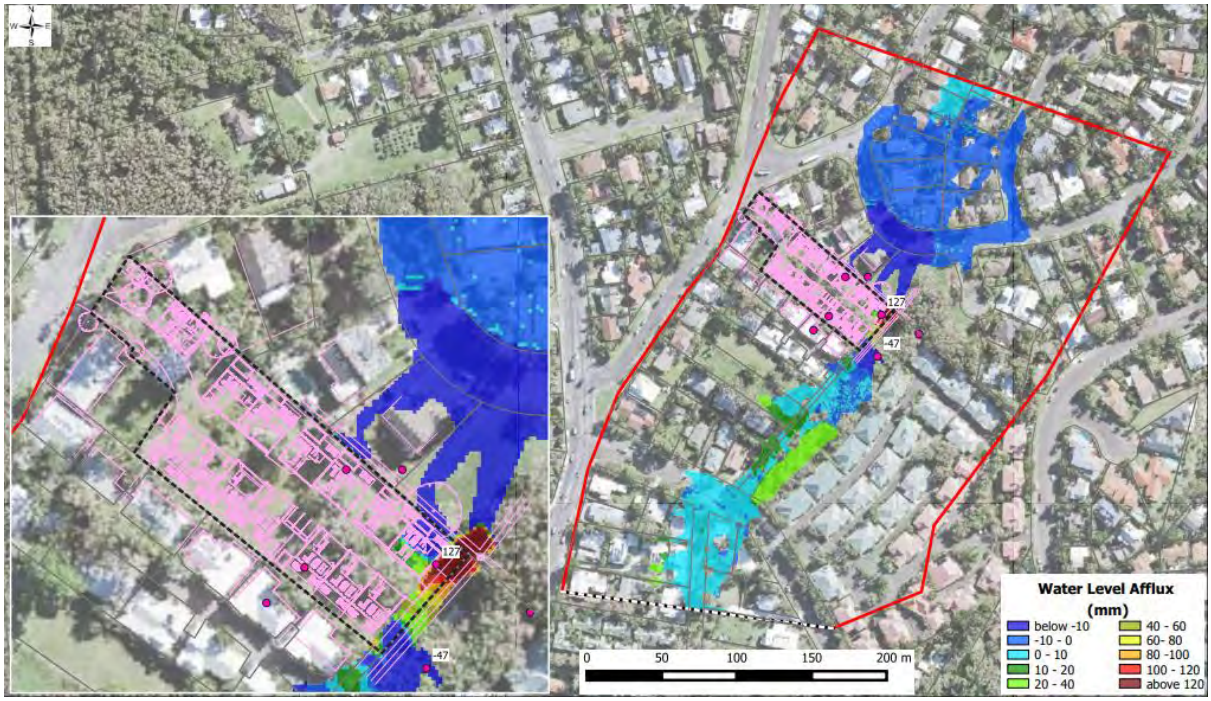


Figure 18 Water Level Afflux Map – 1% AEP

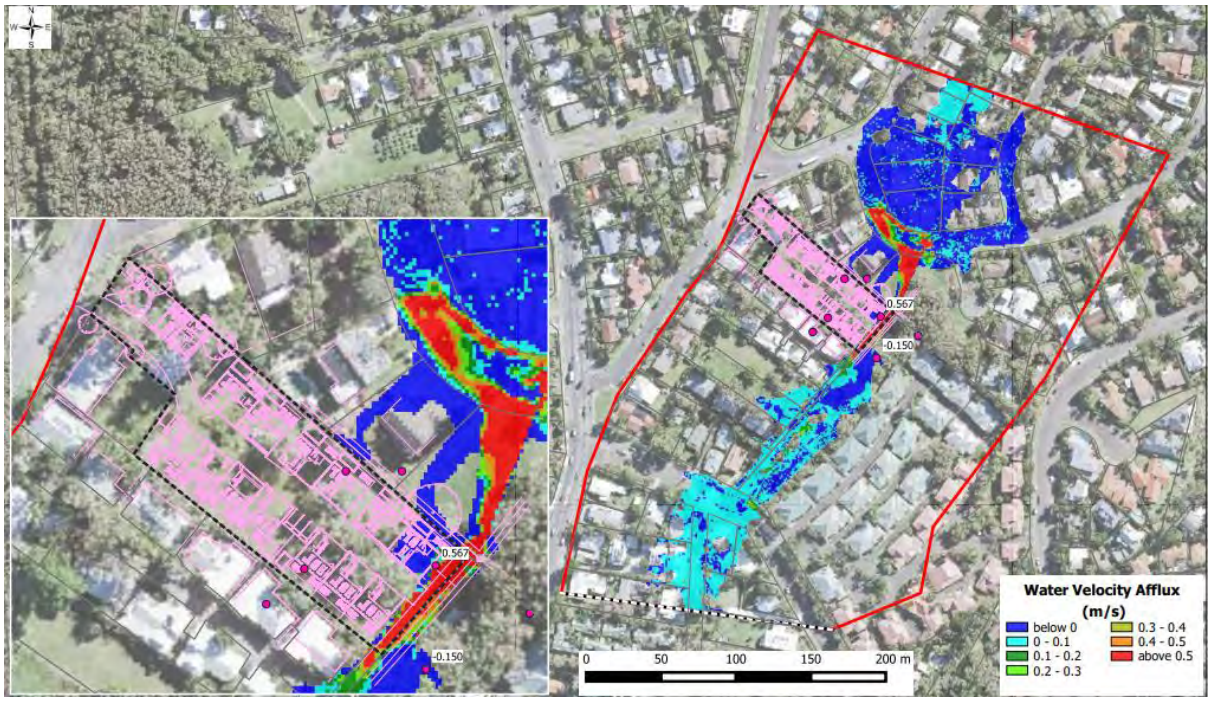


Figure 19 Water Velocity Afflux Map – 1% AEP

4. Summary

Floodworks has completed a hydraulic assessment for the subject site 103 Patterson St Byron Bay. As part of this assessment a dynamic 1D/2D linked TUFLOW flood model was developed for both the existing case and developed case.

A hydrologic assessment of the 1% AEP design flows using XP-SWMM has been completed for the subject site. All hydrologic assessment has been completed to the Australian Rainfall and Runoff 2019 (ARR2019) methodologies, with results comparing well to the Regional Flood Frequency Estimation tool.

The Flood Planning Level (FPL) shall be as per *Byron Shire Development Control Plan 2014 Chapter C2 Areas Affected by Flood*:

- Habitable dwellings – 6.5m AHD (6.0m AHD + 500mm = 6.5m AHD)
- Non-habitable buildings (carports etc) – 10% AEP + 300mm.
    - All internal roads and non-habitable buildings set > 1% AEP.

The 1% AEP hydraulic assessment has resulted in:

- Generally, the 1% AEP water level afflux is less than 10mm for much of the study area and is considered non-actionable.
- There are some localised increases in maximum water level within subject site, the drainage reserve and a small portion of the park reserve immediately upstream of the drainage reserve of > 120mm
- There are some localised increases in maximum water level immediately downstream of the subject site, within the drainage reserve of 0 - 20mm, and 20 – 40mm.
- There is some localised reduction in maximum water levels of up to -47mm within the drainage reserve.
- Generally, the 1% AEP water velocity afflux is less than 0.1m/s for much of the study area and is considered non-actionable.
- There are some localised areas within the proposed design channel linking Shelly Drive to the drainage easement that has velocity increases of greater than 0.5 m/s
- There are some localised increases in maximum velocity within the drainage reserve of 0.567m/s

Benefits of providing a design channel linking Shelly Drive to the existing drainage reserve include:

- Improvement of existing nuisance flooding of neighbours directly to the north of the subject site. Current legacy flow paths convey water directly through the neighbouring properties to the north and also the subject site
- Formalising an existing conveyance path from the sag pit at Shelly Drive to the existing drainage reserve. Currently stormwater in excess of the minor system overtops the kerb at Shelly Drive as uncontrolled overland flow utilising legacy pathways which currently direct flows through neighbouring properties to the north and also the subject site before reconnecting to the existing drainage reserve
- A similar outcome could not have been achieved by maintaining the informal uncontrolled legacy drainage paths through the neighbouring properties to the north and also the subject site

- Reshaping of the public reserve to the north using low batters and shallow depth will improve visual amenity and usability. Currently the ground levels of the public reserve to the north is uneven in nature and not usable in its current form. Reshaping this area will improve usability.

5. References

- BOM (2018) Rainfall IFD Data System
- IPWEA 2013, Queensland Urban Development Manual (QUDM)
- All data (tin, gis data etc) has been sourced from Elevation - Foundation Spatial Data from http://elevation.fsdf.org.au/

Appendix A Results

Appendix B Australian Rainfall & Runoff Data Hub – Results

River Region

Division	South East Coast (NSW)
River Number	2
River Name	Brunswick River

ARF Parameters

$$ARF = Min\left\{1, \left[1 - a\left(Area^{b} - c\log_{10}Duration\right)Duration^{-d} + eArea^{f}Duration^{g}\left(0.3 + \log_{10}AEP\right) + h10^{iArea^{\frac{Duration}{1440}}}\left(0.3 + \log_{10}AEP\right)\right]\right\}$$

Zone	a	b	c	d	e	f	g	h	i
East Coast North	0.327	0.241	0.448	0.36	0.00096	0.48	-0.21	0.012	-0.0013

Short Duration ARF

$$ARF = Min\left[1, 1 - 0.287\left(Area^{0.265} - 0.439\log_{10}(Duration)\right).Duration^{-0.36} + 2.26\ \mathrm{x}\ 10^{-3}\ \mathrm{x}\ Area^{0.226}.Duration^{0.125}\left(0.3 + \log_{10}(AEP)\right) + 0.0141\ \mathrm{x}\ Area^{0.213}\ \mathrm{x}\ 10^{-0.021\frac{(Duration-180)^{2}}{1440}}\left(0.3 + \log_{10}(AEP)\right)\right]$$

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Note: As this point is in NSW the advice provided on losses and pre-burst on the NSW Specific Tab of the ARR Data Hub is to be considered. In NSW losses are derived considering a hierarchy of approaches depending on the available loss information. The continuing storm loss information from the ARR Datahub provided below should only be used where relevant under the loss hierarchy (level 5) and where used is to be multiplied by the factor of 0.4.

ID	11934.0
Storm Initial Losses (mm)	27.0
Storm Continuing Losses (mm/h)	2.1

Interim Climate Change Factors

	RCP 4.5	RCP6	RCP 8.5
2030	**0.869 (4.3%)**	0.783 (3.9%)	**0.983 (4.9%)**
2040	**1.057 (5.3%)**	1.014 (5.1%)	**1.349 (6.8%)**
2050	**1.272 (6.4%)**	1.236 (6.2%)	**1.773 (9.0%)**
2060	**1.488 (7.5%)**	1.458 (7.4%)	**2.237 (11.5%)**
2070	**1.676 (8.5%)**	1.691 (8.6%)	**2.722 (14.2%)**
2080	**1.810 (9.2%)**	1.944 (9.9%)	**3.209 (16.9%)**
2090	**1.862 (9.5%)**	2.227 (11.5%)	**3.679 (19.7%)**

Probability Neutral Burst Initial Loss

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	24.2	13.2	12.3	12.0	10.8	7.7
90 (1.5)	25.1	14.7	13.3	12.0	10.2	8.3
120 (2.0)	22.4	13.4	13.0	11.1	10.3	6.1
180 (3.0)	21.9	13.7	12.6	10.2	9.6	5.2
360 (6.0)	19.9	12.8	12.2	10.9	11.1	3.5
720 (12.0)	21.9	15.3	15.0	12.2	13.8	4.5
1080 (18.0)	25.8	19.1	19.6	14.9	16.7	5.4
1440 (24.0)	29.9	21.7	21.4	16.5	14.3	5.9
2160 (36.0)	35.3	26.4	24.8	19.6	17.9	6.2
2880 (48.0)	37.4	27.7	26.6	23.7	23.2	7.0
4320 (72.0)	42.3	32.6	32.1	29.6	27.3	11.7

Baseflow Factors

Downstream	0
Area (km2)	500.181472
Catchment Number	7577
Volume Factor	0.233508
Peak Factor	0.051066

Appendix C Box and Whisker Plots

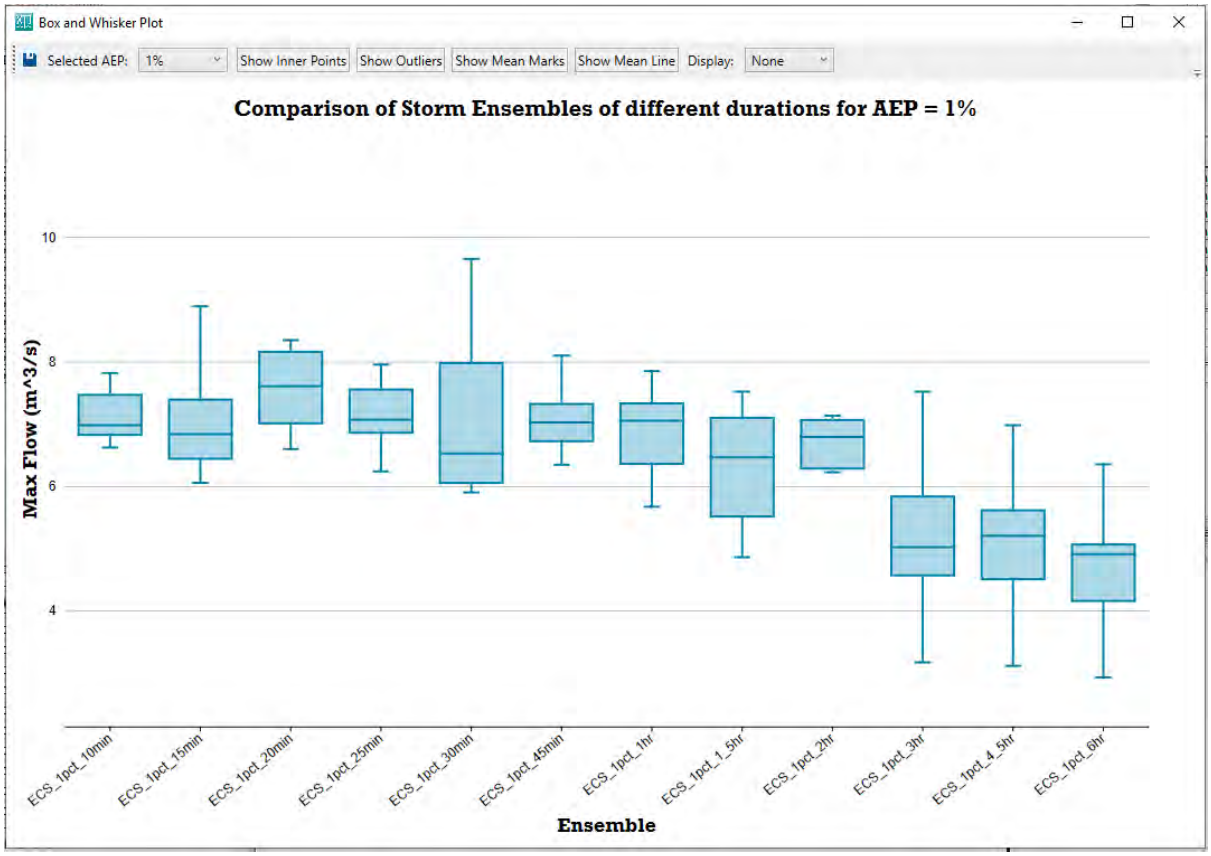
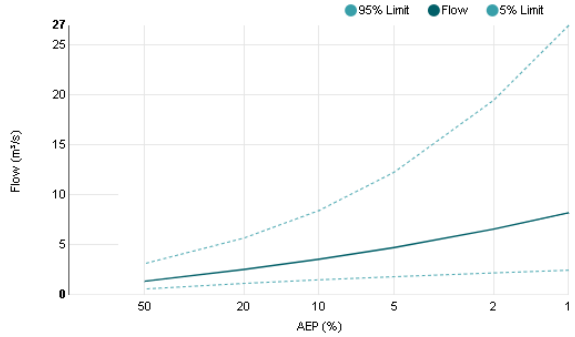


Figure 20 100 Year ARI Box and whisker plot of Ensemble results

Appendix D Regional Flood Frequency Estimation (ARR2016)

Results | Regional Flood Frequency Estimation Model



*The catchment is outside the recommended catchment size of 0.5 to 1,000 km^2. Results have lower accuracy and may not be directly applicable in practice.

AEP (%)	Discharge (m^3/s)	Lower Confidence Limit (5%) (m^3/s)	Upper Confidence Limit (95%) (m^3/s)
50	1.38	0.600	3.14
20	2.56	1.16	5.70
10	3.58	1.52	8.46
5	4.75	1.83	12.3
2	6.59	2.21	19.5
1	8.23	2.48	27.0

Input Data	
Date/Time	2020-06-16 12:49
Catchment Name	Catchment1
Latitude (Outlet)	-28.65783726
Longitude (Outlet)	153.6170879
Latitude (Centroid)	-28.65502436
Longitude (Centroid)	153.6192878
Catchment Area (km^2)	0.2162*
Distance to Nearest Gauged Catchment (km)	12.81
50% AEP 6 Hour Rainfall Intensity (mm/h)	13.005735
2% AEP 6 Hour Rainfall Intensity (mm/h)	31.279358
Rainfall Intensity Source (User/Auto)	Auto
Region	East Coast
Region Version	RFFE Model 2016 v1
Region Source (User/Auto)	Auto
Shape Factor	0.82
Interpolation Method	Natural Neighbour
Bias Correction Value	-0.246

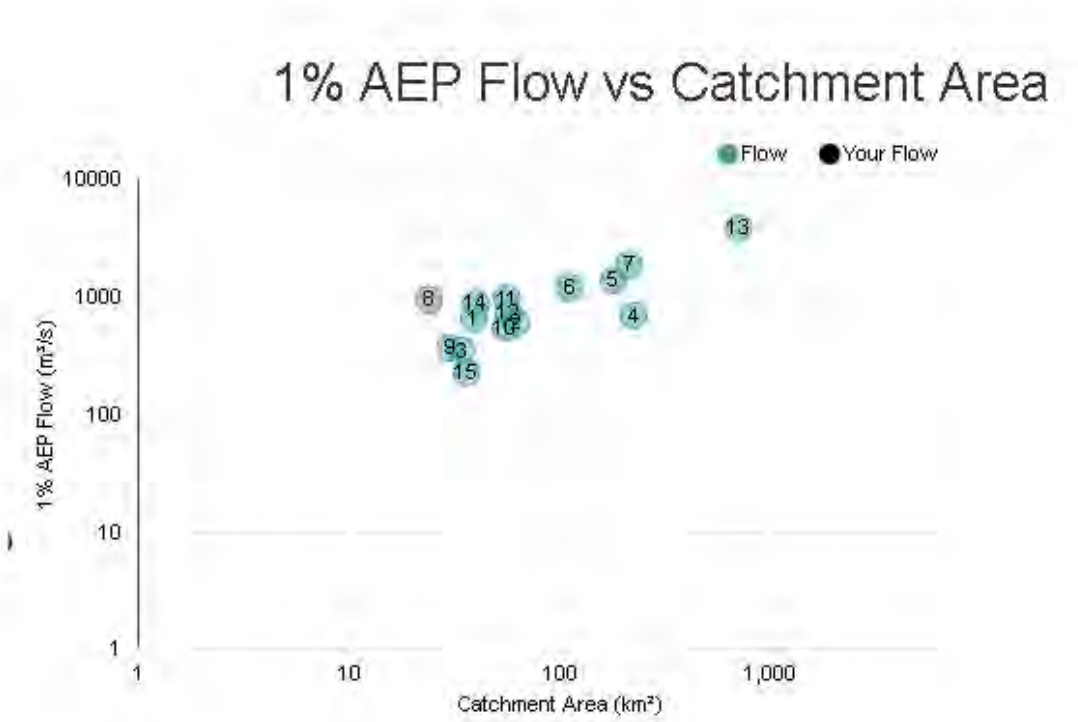
Statistics

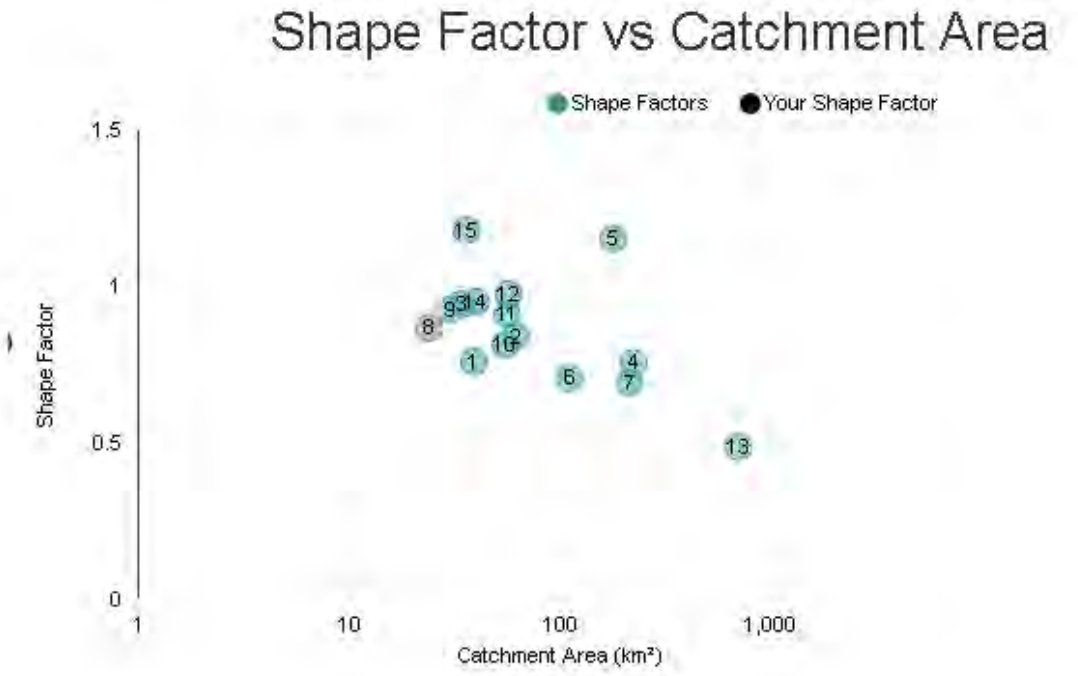
Variable	Value	Standard Dev
Mean	0.162	0.529
Standard Dev	0.642	0.303
Skew	0.074	0.029

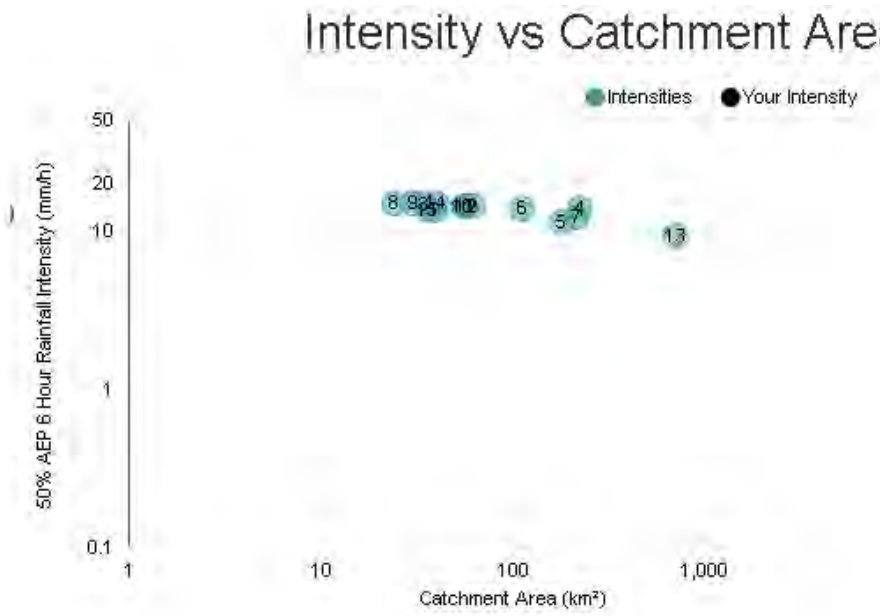
Note: These statistics come from the nearest gauged catchment. Details.

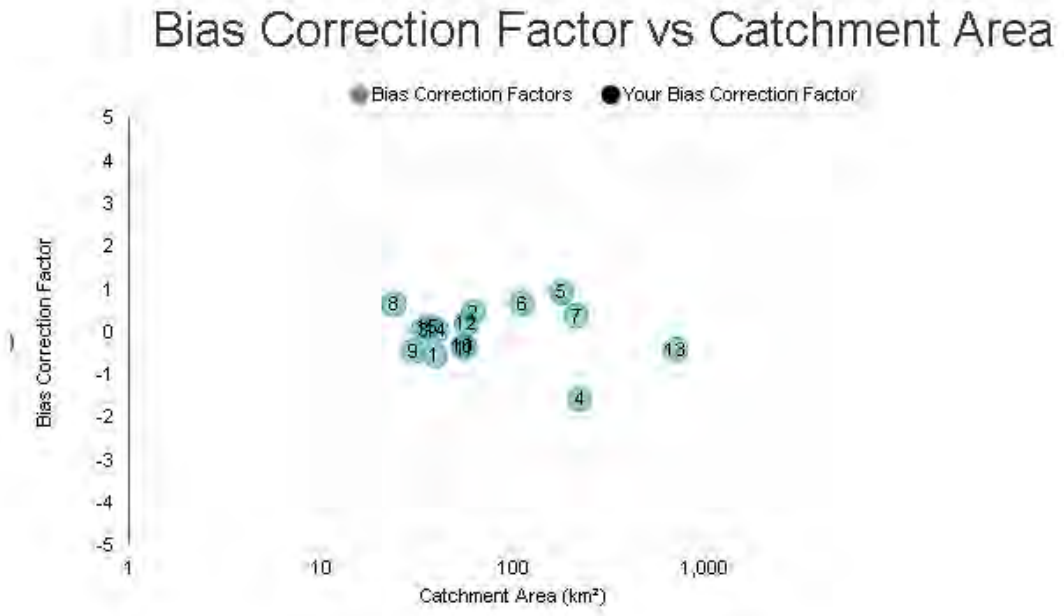
Correlation		
1.000		
-0.330	1.000	
0.170	-0.280	1.000

Note: These statistics are common to each region. Details.


1% AEP Flow vs Catchment Area
Flow
Your Flow
10000
1000
100
10
1
1% AEP Flow (m³/s)
1
10
100
1,000
Catchment Area (km²)


Shape Factor vs Catchment Area
Shape Factors
Your Shape Factor
1.5
1
0.5
0
Shape Factor
1
10
100
1,000
Catchment Area (km²)


Intensity vs Catchment Area
Intensities
Your Intensity
50% AEP 6 Hour Rainfall Intensity (mm/h)
50
20
10
1
0.1
1
10
100
1,000
Catchment Area (km²)


Bias Correction Factor vs Catchment Area
Bias Correction Factors
Your Bias Correction Factor
Bias Correction Factor
5
4
3
2
1
0
-1
-2
-3
-4
-5
1
10
100
1,000
Catchment Area (km²)