



30 CHINBIBLE AVENUE,
MULLUMBIMBY, NSW 2482

17TH JUNE 2024

STORMWATER
MANAGEMENT
PLAN

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1. INTRODUCTION

Ingen Consulting P/L has been engaged by Callum Sked from Sked No.2 Pty Ltd to prepare a Stormwater Management Plan (SMP) to accompany a Development Application for a multi dwelling housing and strata subdivision of proposed Lot 7 under DA10.2024.151.1 at 30 Chinbible Avenue in Mullumbimby NSW 2482.

1.1. Scope

The purpose of this report is to address stormwater management requirements of Byron Shire Council outlined in Byron Shire Council's 'Comprehensive Guidelines for Stormwater Management' and chapter B3 of the 2014 Development Control Plan. In particular:

- Lawful point of discharge
- Stormwater treatment
- Stormwater detention

1.2. Site description

The subject site is situated in Mullumbimby. Its address is at 30 Chinbible Avenue, Mullumbimby NSW 2482, with Lot/Plan number registered as Lot 159 DP 755687, and the original has an area of 12,340 m² (measurement based on detail survey provided by Usher & Co) in total fronting Brunswick River, Chinbible Avenue and Garden Avenue, as shown in Figure 1. The subject precinct is limited to proposed Lot 7 under DA10.2024.151.1. Proposed Lot 7 provides an area of 8716.8m².

The land generally grades from the northwest to the southeast as indicated by the contours shown on the survey plans. There are no known water courses traversing the site. Site drainage is generally towards Garden Road, which has a kerb and gutter drainage system but no pit and pipe network along the frontage of the site.

The site currently contains a residential dwelling, with some sheds, two driveways, horse stables and a paddock (Figure 2).

A separate Development Application has been submitted for the torrens title subdivision of the original lot to create 6 additional torrens title lots as shown in Figure 3 (DA10.2024.154.1).

Proposed lot 7 is the subject lot of this current Development Application for a strata title subdivision.

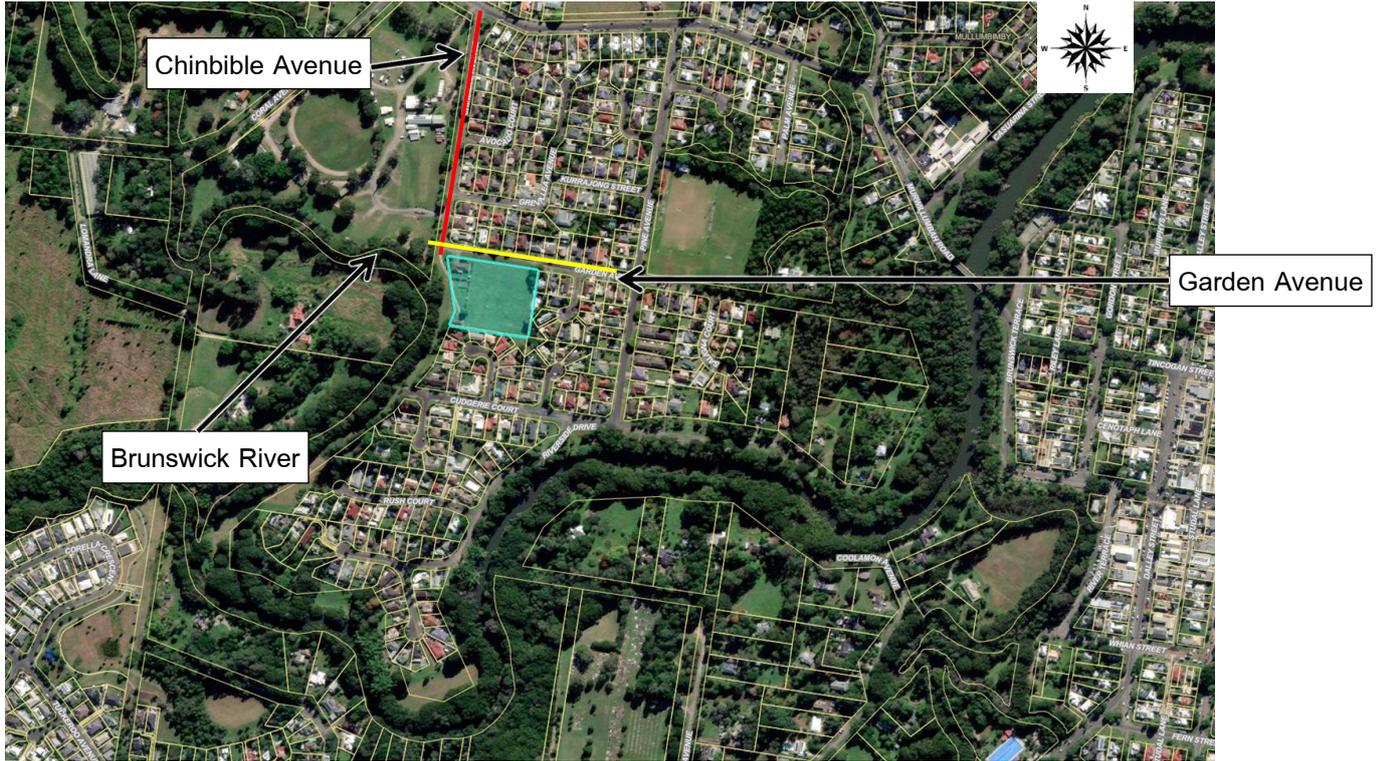


Figure 1 | Site location, Source of the map: Byron Shire Council Online Map Tools



Figure 2 | Subject site aerial image, Source: Usher & Co



Figure 3 | Previous subdivision DA, Source: Usher & Company 2024

1.3. Proposed development

The proposed development is the construction of multi dwelling housing comprising 25 detached townhouses and the strata subdivide of those dwellings over two stages. The proposed layout is shown in Figure 4.

It is proposed to construct an entry driveway off Garden Avenue on the eastern part of the site, and an exit driveway west of the existing dwelling, near the horizontal curve into Chinbible Avenue. The blue arrows in Figure 4 show the direction of travel. The majority of the internal road will be one way. Only a short section on the eastern side will be two-way to provide access to the four lots fronting that dead-end road section.

The development will be staged with 12 strata lots and dwellings in Stage 1 and 13 lots and dwellings in Stage 2.

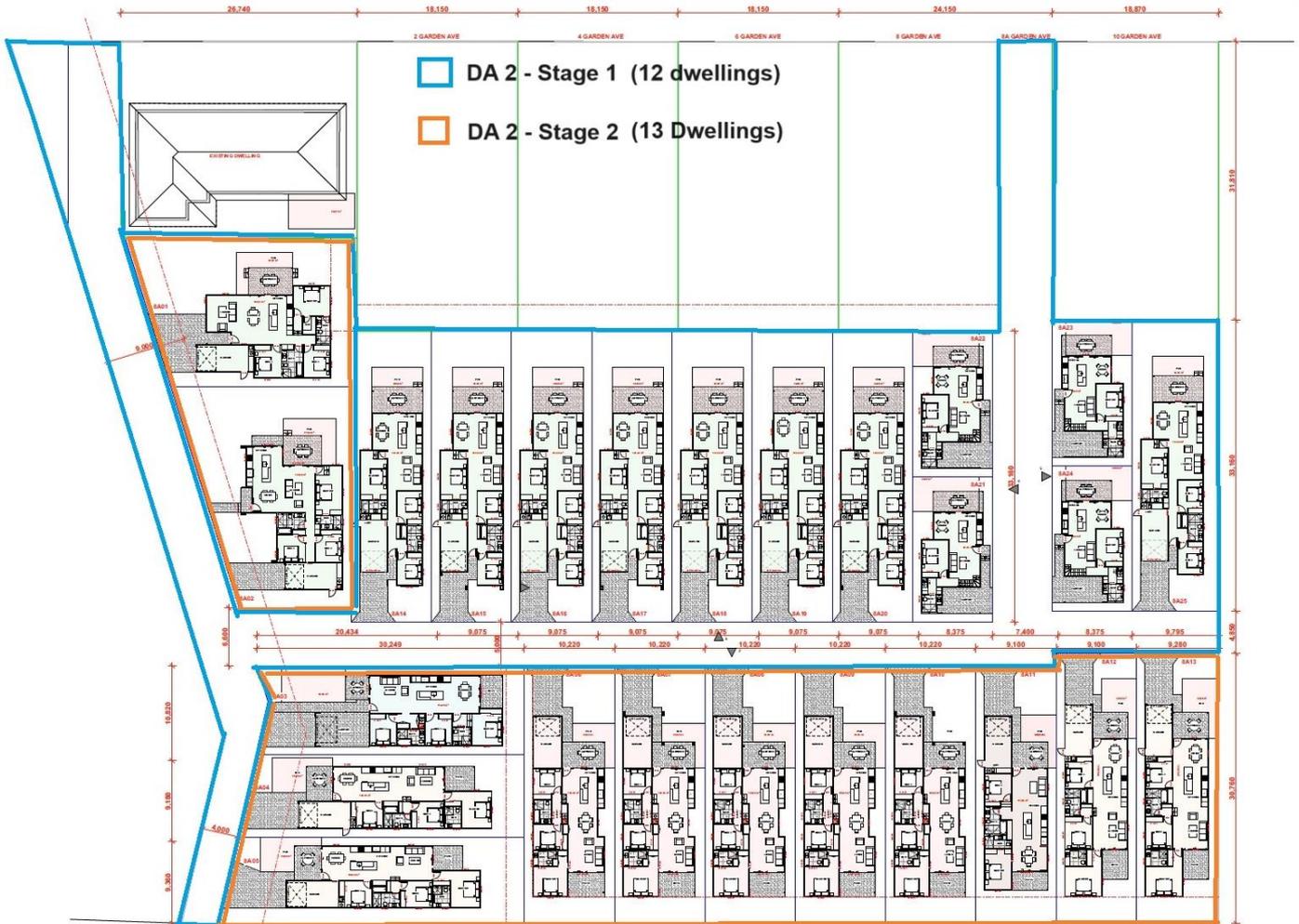


Figure 4 | Proposed development, Source: Story Design Collective

2. LAWFUL POINT OF DISCHARGE

The following lawful points of discharge are available:

- Stormwater pit in Chinbible Avenue, northwest of the site
- Stormwater pit adjacent Rosewood Court, 55m northeast of the site
- The new mountable kerb proposed under a separate DA10.2024.151.1 for this site.
- The underground stormwater infrastructure proposed to be constructed under DA10.2024.151.1, that drains to the Garden Avenue stormwater network.

Connection to the stormwater pit south of the site would require an upgrade of the line to Nightcap Court, due to the fact this pit is very shallow (0.24m) and the outlet pipe is undersized for the development catchment. The northwestern pit is uphill from the site and therefore has limited suitability. The most suitable point of discharge is driveway stormwater pit that was proposed under DA10.2024.154.1, which directs all stormwater to the Garden Avenue stormwater drainage system. The reason for directing all stormwater to Garden Avenue rather than a portion to Nightcap Court is that this avoids duplication of stormwater infrastructure works and thus minimises impacts on neighbouring properties during the construction phase.

Single point pipe discharges to the new Garden Avenue kerb shall not exceed 30 L/s per 15m of kerb and the total piped site discharge to the kerb shall not exceed 60 L/s per lot frontage. (as per section 4.2 of Council's Comprehensive Guidelines for Stormwater Management). This has been achieved for all stages as there no site discharge proposed to the kerb via pipes and kerb adaptors – all impervious areas are connected to tanks and pits, conveying stormwater via a proposed new underground stormwater drainage system.

3. STORMWATER DETENTION

3.1. Criteria

The Byron Shire Council Comprehensive Guidelines for Stormwater Management specify the following performance criterion for on-site detention:

“The peak flow from the proposed development for the 5, 10, 20, 50 and 100 year ARI events, for a durations from 5 mins to 3 hours, must not exceed the existing peak flow from the site ...”

3.2. Catchments

The lumped catchment areas are summarised in Table 1.

Table 1 | Lumped catchment areas, m²

Description	Pre-development	Post-development (Stage 1)	Post-development (Stage 1 + Stage 2)
Roof area	0	1776	4019
Paved area	108	1788	2070
Vegetated area	8609	5153	2629
Total area on site	8717	8717	8717
External to site but within catchment	700.45	700.45	700.45
Grand total			

3.3. Detention design

Stormwater detention is proposed to limit post-development peak runoff to pre-development volumes for the storm events from the 0.2EY to the 1% AEP (5 mins to 3hr duration) as per the requirements of the Byron Shire Comprehensive Guidelines for Stormwater Management. This will be achieved using onsite detention (OSD) tanks collecting the roof water from the existing and the proposed dwellings, and gradually releasing the collected stormwater through orifice plates, achieving 2kL on-site stormwater detention per lot.

We have prepared a DRAINS model, which includes a 5,000L slimline tank for each unit, with a 50mm low-level orifice plate at 1.302m above the invert of the tank (based on Duraplas SL5000UR Slimline

Tank dimensions), achieving 3000kL reuse and 2000kL on-site detention, and a 100mm high level outlet pipe 100mm below the top of the tank.

The pre- and post- development site discharge peak runoff volumes for each modelled storm event per stage are provided below.

Table 2 | Peak runoff flow summary (m3/s)

Storm event	Stage 1		Stage 1 + Stage 2	
	Pre-development	Post-development mitigated	Pre-development	Post-development mitigated
0.2 EY	0.276	0.197	0.309	0.173
10% AEP	0.338	0.258	0.370	0.271
5% AEP	0.393	0.335	0.429	0.344
2% AEP	0.465	0.346	0.498	0.375
1% AEP	0.519	0.426	0.552	0.443

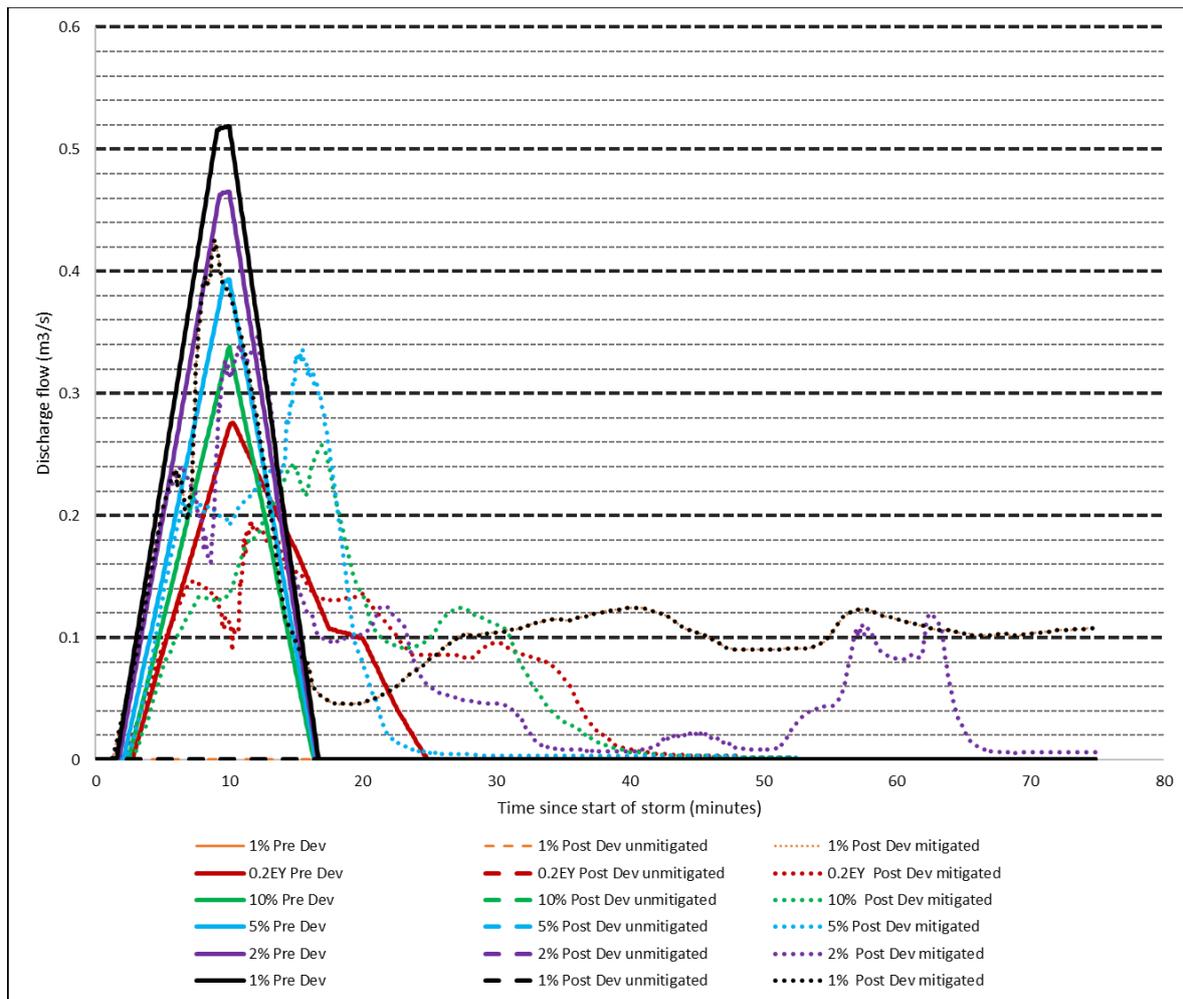


Figure 5 | Stage 1 hydrographs

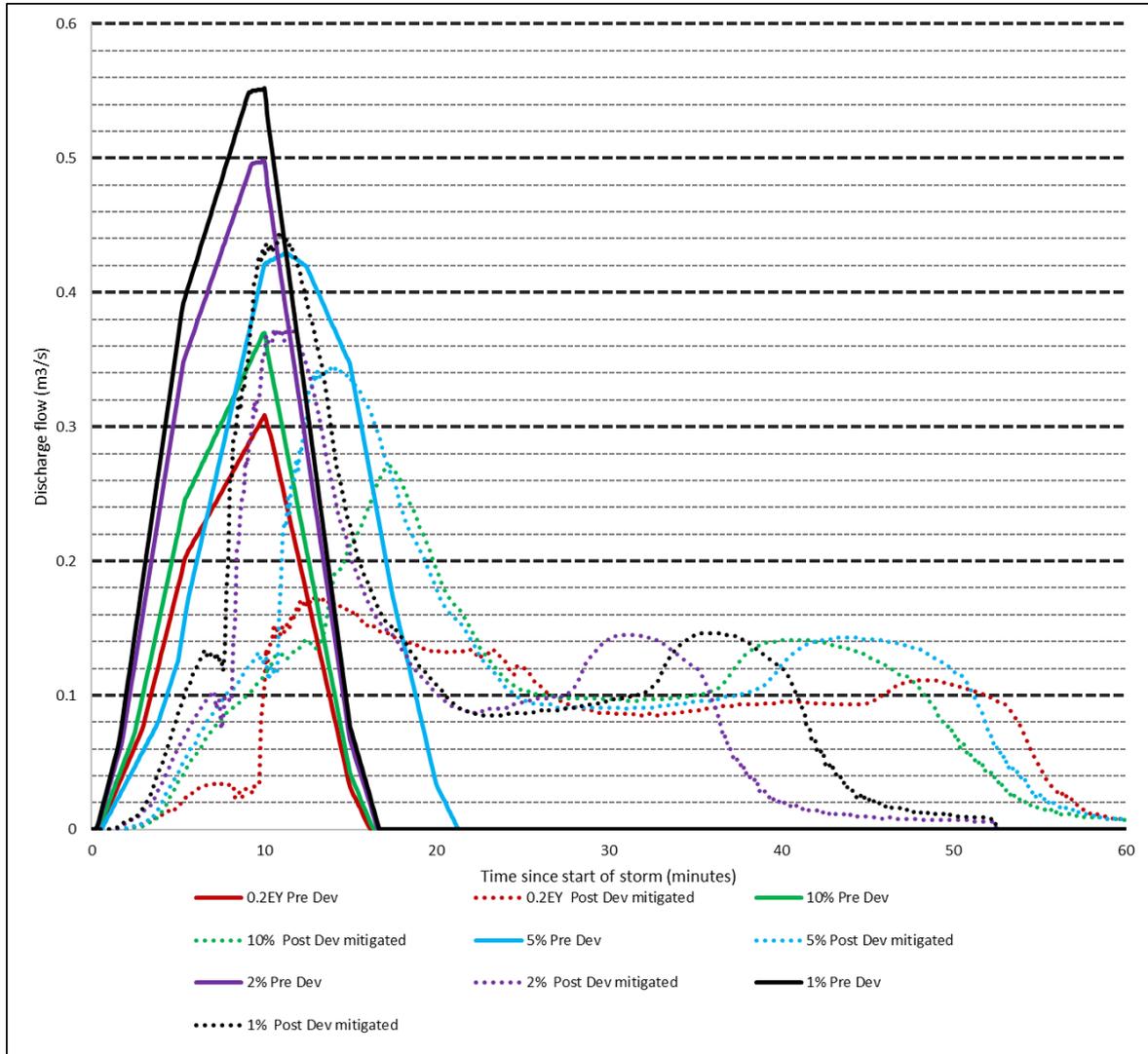


Figure 6 | Stage 1 + Stage 2 hydrographs

The storm events were modelled up to and including the 3 hour event. We have not shown the hydrographs to 3 hours as it would result in less detail in the first 20 minutes, which is where most of the peaks are.

The modelling results show compliance with Council's on-site stormwater detention requirements if the detention system is installed as described in this report.

4. STORMWATER TREATMENT

4.1. Criteria

The 2014 Byron Shire DCP chapter B3, clause B3.2.3-7b states that subdivisions and developments involving an area of land greater than 2,500m² must address the “key” pollutants in accordance with Table B3.2 of the DCP. The affected land area is greater than 2,500m² in area and therefore these key pollutants need to be addressed.

For the design of the treatment train, the contributing catchments of the torrens title DA (separate application) are included, as the proposed treatment device treats runoff from both precincts. Based on Table B3.1 from the DCP (see a copy in Figure 7), the torren title subdivision (separate DA) needs to address litter, total phosphorus and total nitrogen. The medium density development that is the subject of this proposal needs to address litter, coarse sediment, fina particles, total phosphorus and total nitrogen. The MUSIC modelling software captures this by modelling Total Suspended Solids (TSS), Total Phosphorus (TP), Total Nitrogen (TN) and Gross Pollutants (GP), where GP represents litter and TSS represents fina particles and coarse sediment. The relevant criteria are provided in Figure 8.

Table B3.1 – Key pollutants in stormwater flows to be addressed

Development Type	Litter	Coarse Sediment	Fine Particles	Total Phosphorous	Total Nitrogen	Hydrocarbons, motor fuels, oils & grease
Low Density Residential ¹ . bed and breakfast accommodation & farm stay accommodation	Y	N	N	Y	Y	N
Medium Density Residential ² & tourist and visitor accommodation (excluding bed and breakfast accommodation & farm stay accommodation)	Y	Y	Y	Y	Y	N
Commercial, Shopping & Retail Outlets	Y	Y	Y	N	N	N
Industrial	Y	Y	Y	?	?	Y
Car Parks, Service Stations & Wash Bays	Y	Y	Y	N	?	Y

- Y - Key pollutant, needs to be addressed.
- ? - Variable, requires site specific assessment.
- N - Not significant.

(Source: Adapted from the *Byron Shire Urban Stormwater Management Plan*)

- 1. - "Low Density Residential" development refers to dual occupancies, dwelling houses, rural workers' dwellings, secondary dwellings, shop top housing comprising 2 or less dwellings and semi-detached dwellings.
- 2. - "Medium Density residential" development refers to attached dwellings, boarding houses, group homes, hostels, multi dwelling housing, residential flat buildings, seniors housing and shop top housing comprising 3 or more dwellings.

Figure 7 | Key pollutants to be addressed, Source: BSC DCP B3

Table B3.2 – Pollutants and Retention Criteria

Pollutant / Issue	Retention Criteria
Litter	70% of 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 & grease	90% of average annual load.

- c) Runoff from all areas (including roofs and paved areas) needs to be treated. Significant water quality improvements can be achieved by configuring a sequence of treatment measures (a 'treatment train'). Such measures may include roofwater tanks, infiltration devices, filtration & bio-retention devices, porous paving, grassed swales, better landscape practices, ponds & wetlands and stormwater tanks. The suitability of treatment measures will depend largely on site conditions. For example, infiltration devices are not suitable in areas with heavy clay soils and subsoils.

Figure 8 | Retention criteria, Source: BSC DCP B3

4.2. MUSIC modelling input

Stormwater quality modelling has been undertaken using MUSIC (Modelling Urban Stormwater Improvement Conceptualization) to assess the generated pollutants for the conceptual site layout. Rainfall-runoff and pollutant export parameters have been adopted from SEQ MUSIC Modelling Guidelines – water by design (2010) by Healthy Waterways for industrial areas as shown in Table 3 and Table 4. Rainfall and evaporation data have been taken from Alstonville Tropical Fruit Research Station (Station No. 58131) between the years 1997 and 2006.

Table 3 | MUSIC rainfall-runoff parameters

Parameter	Industrial
Rainfall threshold (mm)	1
Soil storage (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity – coefficient a	211
Infiltration capacity – exponent b	5
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily deep seepage rate (%)	0

Table 4 | MUSIC Pollutant Export

Flow Type	Surface Type	TSS log ¹⁰ values		TP log ¹⁰ values		TN log ¹⁰ values	
	Residential	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Baseflow parameters	Roof	0	0	0	0	0	0
Stormflow parameters		1.3	0.39	-0.89	0.31	0.26	0.23
Baseflow parameters	Driveway	1	0.34	-0.97	0.31	0.2	0.2
Stormflow parameters		2.43	0.39	-0.3	0.31	0.26	0.23

4.3. Treatment train design (Stage 1)

A compliant treatment train is achieved using the following system:

- All roofs to drain to a rainwater tank that includes 3kL of reuse, with an assumed reuse rate of 100 Litres per day
- All roofwater and surface runoff to be collected in pits and pipes and drain to an Atlan FlowFilter with 14 cartridges.

This treatment train is depicted in Figure 11 and the treatment train effectiveness is shown in Figure 10, with compliance demonstrated in Table 5.

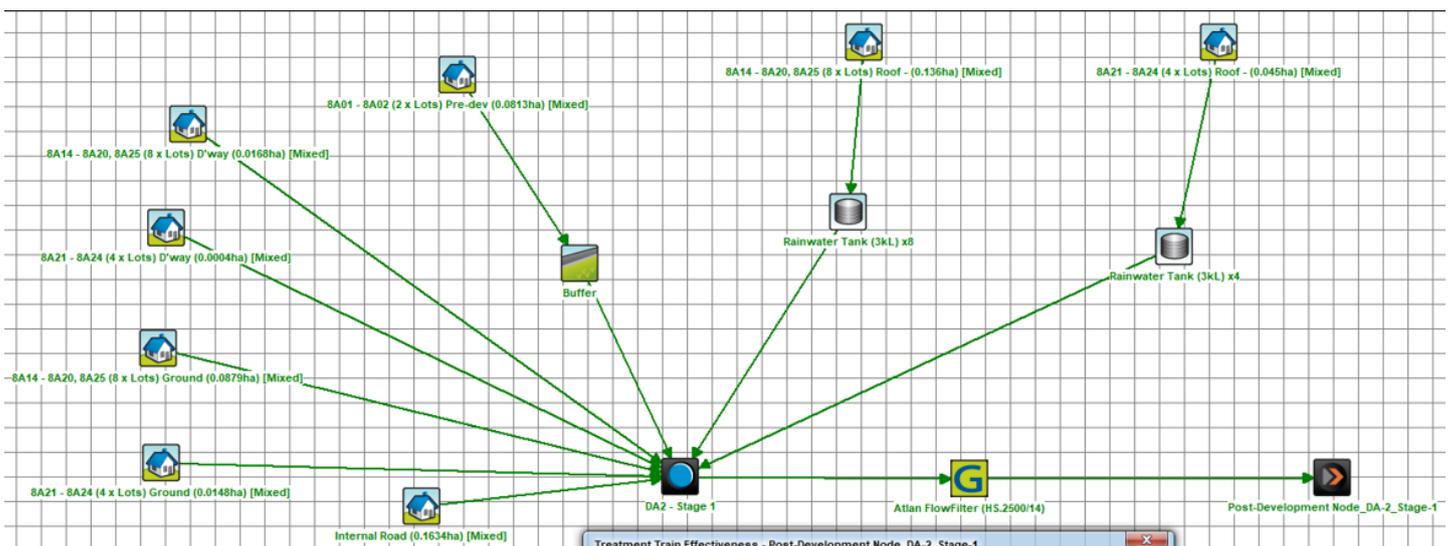
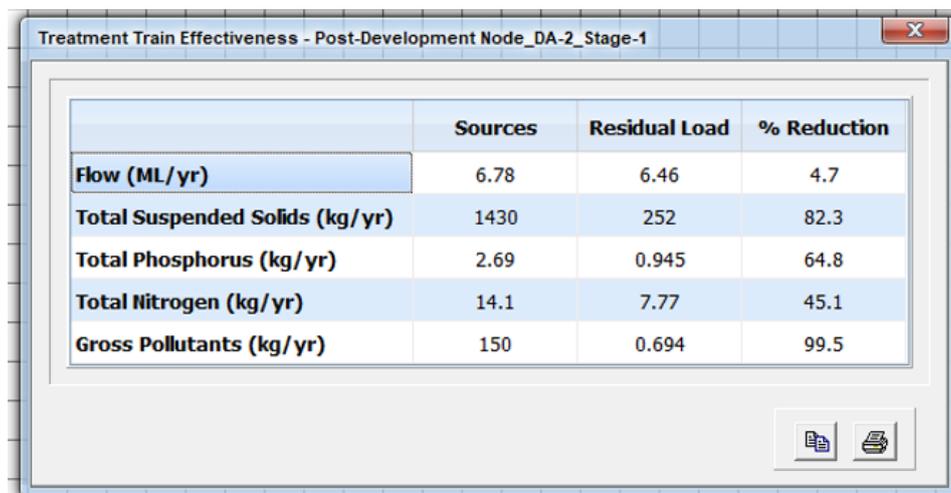


Figure 9 | WSUD treatment train



	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.78	6.46	4.7
Total Suspended Solids (kg/yr)	1430	252	82.3
Total Phosphorus (kg/yr)	2.69	0.945	64.8
Total Nitrogen (kg/yr)	14.1	7.77	45.1
Gross Pollutants (kg/yr)	150	0.694	99.5

Figure 10 | Treatment train effectiveness

Table 5 | Treatment train compliance

Pollutant Parameter	MUSIC Reduction Results (%)	Byron Shire Council Reduction Targets (%)	Compliant
Gross Pollutant	99.5	70	✓
Total Suspended Solids	82.3	80	✓
Total Phosphorus	64.8	45	✓
Total Nitrogen	45.1	45	✓

4.4. Treatment train design (Stage 1 + 2)

A compliant treatment train is achieved using the following system:

- All roofs to drain to a rainwater tank that includes 3kL of reuse, with an assumed reuse rate of 100 Litres per day
- All roofwater and surface runoff to be collected in pits and pipes and drain to an Atlan FlowFilter with (14+11 =) 25 cartridges.
- All internal driveway pits to be fitted with a SPEL StormSack or similar.

This treatment train is depicted in Figure 11.

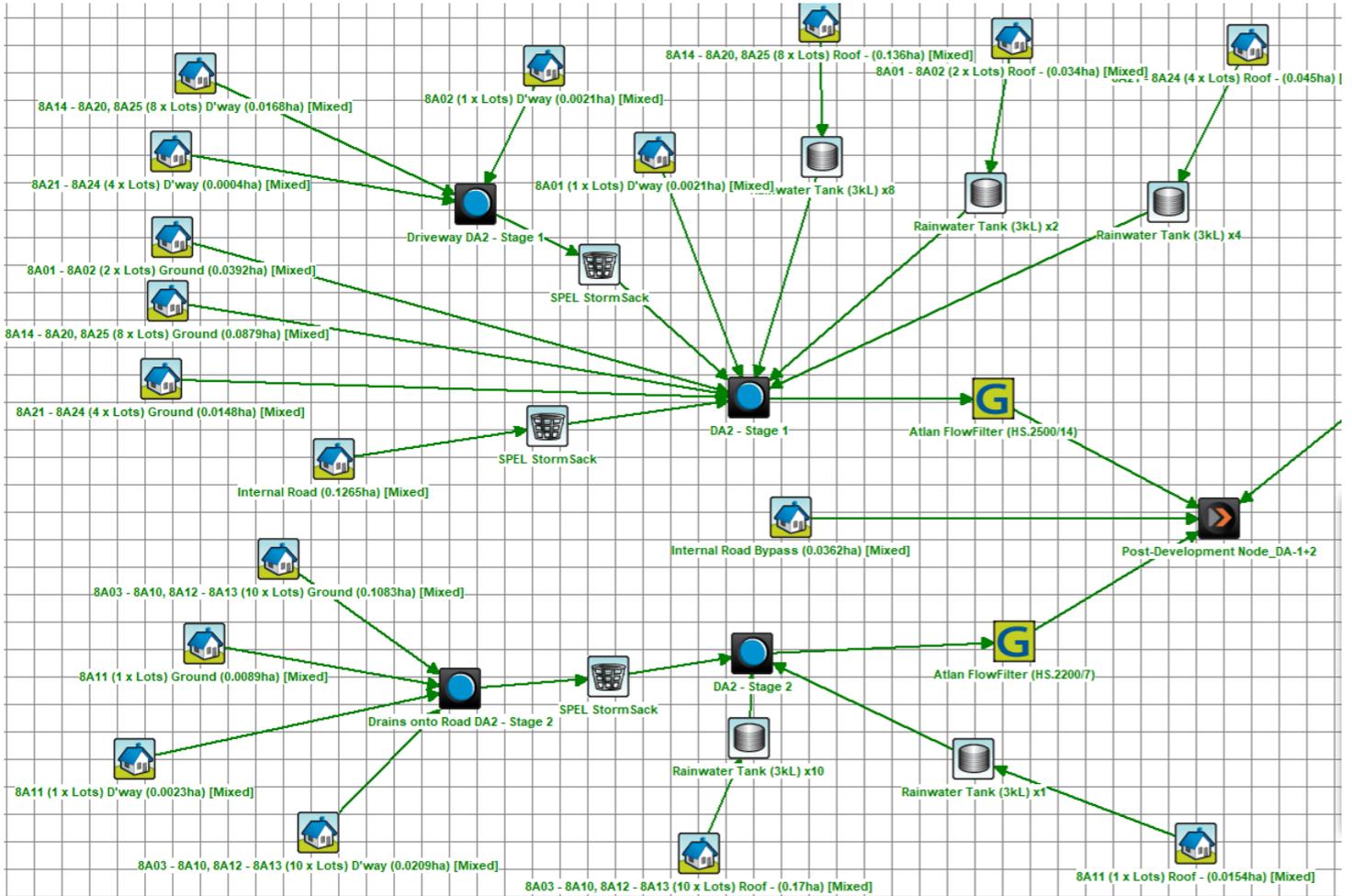


Figure 11 | WSUD treatment train

4.5. Treatment train check including DA10.2024.154.1

To ensure the combined treatment train including DA10.2024.154.1 works, since the same Atlan Flowfilter is used for both DA's and both stages, only cartridges are added as the development proceeds, we have also prepared a MUSIC model for the completed project, including the current DA and DA10.2024.154.1. The results are shown to comply below.

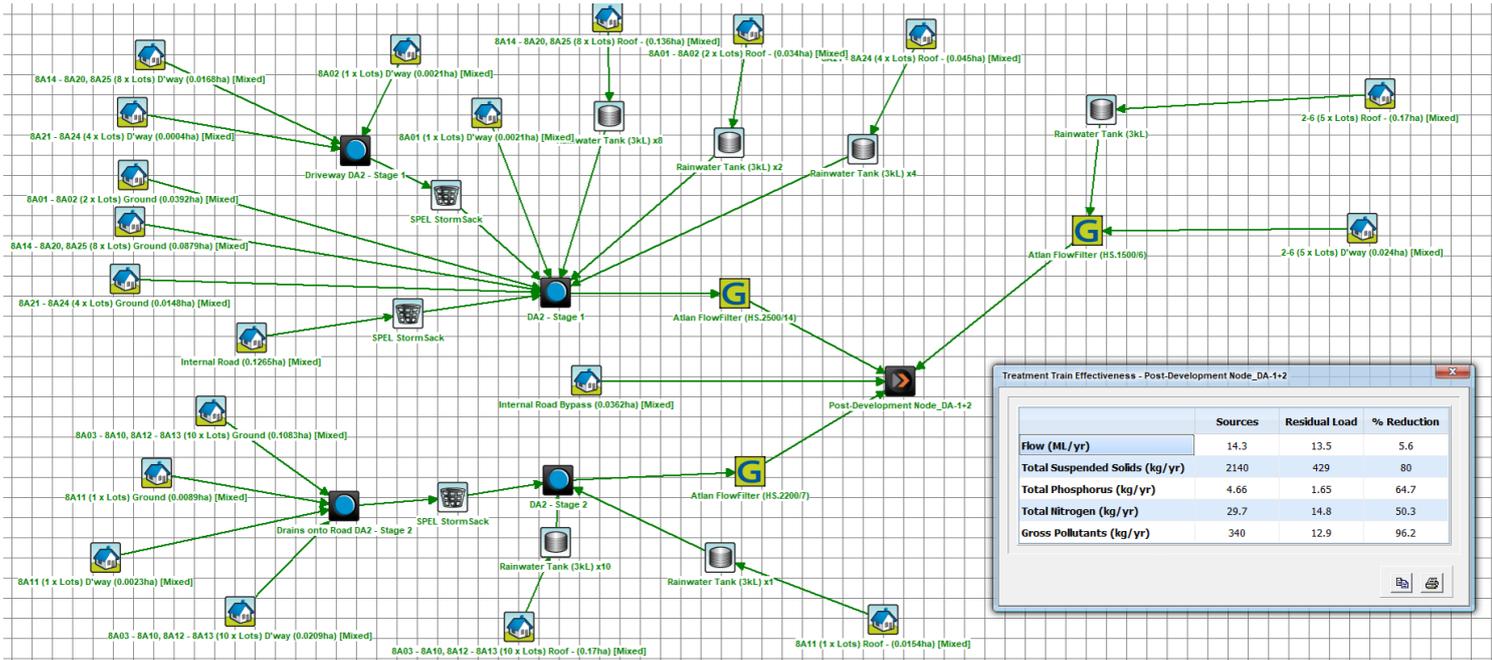


Figure 12 | Overall WSUD treatment train

	Sources	Residual Load	% Reduction
Flow (ML/yr)	14.3	13.5	5.6
Total Suspended Solids (kg/yr)	2140	429	80
Total Phosphorus (kg/yr)	4.66	1.65	64.7
Total Nitrogen (kg/yr)	29.7	14.8	50.3
Gross Pollutants (kg/yr)	340	12.9	96.2

Figure 13 | Treatment train effectiveness

Table 6 | Treatment train compliance

Pollutant Parameter	MUSIC Reduction Results (%)	Byron Shire Council Reduction Targets (%)	Compliant
Gross Pollutant	96.2	70	✓
Total Suspended Solids	80	80	✓
Total Phosphorus	64.7	45	✓
Total Nitrogen	50.3	45	✓

5. CONCLUSIONS AND RECOMMENDATIONS

This Stormwater Management Plan has been prepared in accordance with Byron Shire Council's requirements. We have carried out an assessment and design of the stormwater management network for the proposed development and draw the following conclusions:

- Lawful point of discharge is achieved by draining to the pit and pipe network that is proposed to be constructed under DA10.2024.151.1. DA 10.2024.151.1 includes connection to the existing pit and pipe network in Garden Avenue. To achieve this a new stormwater pipe is proposed to be constructed behind the new kerb of Garden Avenue to reach the stormwater pit at the intersection with Rosewood Ct.
- Detention requirements are met using 2kL of OSD storage per dwelling in stage 1 and 2kL of OSD storage per dwelling in stage 2.
- Stormwater quality treatment targets are met using a combination of 3kL reuse per dwelling and an Atlan FlowFilter with 14 cartridges in stage 1 and an additional 11 cartridges in stage 2 and SPEL StormSacks or similar to be fitted to all internal driveway pits.

Based on the assessment undertaken in this report, Development Application is recommended for approval from a Stormwater Management perspective.

REFERENCES

Comprehensive Guidelines for Stormwater Management, Byron Shire Council

Byron Shire Development Control Plan 2014 Chapter B3 Services

APPENDIX A – STORMWATER CONCEPT PLAN

Refer to the Engineering Drawings supplied with this DA