2310005

WATER CYCLE MANAGEMENT PLAN

CENTRAL COAST COUNCIL DCP CHAPTER 3.11 – WATER CYCLE MANAGEMENT

PLAN PREPARED FOR:
LINA GUO
PROPOSED MULTI DWELLING OCCUPANCY AT
135 PATON STREET
WOY WOY

PLAN PREPARED BY:

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This plan has been prepared to address the requirements of former GCC DCP Chapter 6.7 Water Cycle Management, now CCC 3.11 for the development project at 135 Paton Street Woy Woy.

PURPOSE

Water Cycle Management aims to facilitate the application of water sensitive urban design to manage and restore the water balance, reduce risk to life and damage due to flooding, reduce potable water use and protect and enhance natural water systems.

The development at 135 Paton Street Woy Woy is a residential development and is required to address the following components of the DCP.

- Water conservation
- Retention
- On site detention
- Stormwater Quality
- Local Overland drainage
- Flooding

The development area of the site is less than 2000 square metres and therefore the deemed to comply solutions may be used.

The following information is provided to support compliance with the above requirements.

WATER CONSERVATION

The water conservation aspects of this development is covered by Basix requirements.

WATER RETENTION

The intent of the water retention target is to mimic the natural catchment hydrology form development sites in terms of Quantity (Volume) , Rate (Peak flow) and Response (time it takes for rain to run off the site).

Using the deemed to comply requirements of DCP Chapter 3.11 the required retention volume is estimated as follows:

$V = 0.01A(0.02F)^2 = 0.01 \times 670.4 (0.02 \times 68)^2$

Retention required using this method is 12.4 cubic metres.

Rainwater Reuse.

The proposed development is a residential development therefore the guidelines in the DCP can be used to estimate rainwater reuse.

Rainwater reuse based on the deemed to comply formula is as follows:

Reuse for toilet laundry and landscape watering yields 50% of the 35l/sq metre weekly use rate.

Reuse volume weekly is 35x0.5x296 = 5180litres
Rainwater tanks totaling a minimum of 5200 litres are therefore recommended for the site. Architectural drawings show 8000 litre tanks which complies with the above requirement.

The rainwater reuse is therefore not sufficient to meet the total retention required on the site and an infiltration trench is required. The required retention in an infiltration system is 7.22 cubic meters using the deemed to comply method

Infiltration trenches totalling of 28.7 cubic metres are provided on site. The 30 minute infiltration volume is estimated as 8.1 cubic metres using values of 8.8m/day, the measured average infiltration rate in the infiltration assessment included in the report by Larry Cook.

Infiltration trenches on this site have been sized to manage flows from up to the 1% AEP event to reduce runoff. This is because the site is noted as being in a drainage blackspot area.

The development has been designed to incorporate the following parameters. Infiltration trenches have been designed to accommodate full infiltration of runoff from the development for storms of 100year recurrence up to 2 hours in duration using excel spreadsheet and average rainfall criteria. This is based on average infiltration rates measured by geotechnical methods. At times of extended duration it is known for groundwater in the Woy Woy area to rise to the surface and at these times infiltration may be of limited value. The driveway levels have been set so that overflow of the system can safely occur down the driveway to the street in extreme events. In addition the rear units and the side paths beside the garage have been kept at natural levels to allow overland flow from adjoining properties to pass unimpeded and to allow for the temporary ponding (flood storage) to occur at the rear of the site without impacting other properties.

STORMWATER QUALITY TARGET

All stormwater from the developed area (including the driveway) will pass through either the rainwater tank or the infiltration trenches.

Flows from the rainwater tank system will overflow to infiltration trenches. The site discharge index is therefore 0.00 which complies with the DCP requirement of 0.1.

Flooding

The flood information certificate issued by Central Coast Council on 5th October 2023 has identified this lot as a flood control lot with a minimum required floor level of 4.75m based on the PMF event. None of the complying development exclusionary categories have been applied therefore fill is possible on the site.

Council's on line flood mapping however shows the rear yard as flood storage together with a dunal swale depression which extends across several lots. Drainage of the site to street drainage is not considered feasible without filling the entire site which would cause issue for the building to be retained on site together with the adjoining properties which are low lying and form a flood storage area. The site is located in an area where the previous Gosford Council identified restrictions on development in Drainage Black Spots unless provision could be made for the 1% AEP event.

The site is shown as flood affected on Councils on line flooding maps and is noted as flood storage. Council has nominated no flood related development controls with the exception of specifying a minimum floor level for the new buildings. The new buildings are required to meet a minimum habitable floor level of 4.75mAHD. A proposed level of 4.85m AHD has been nominated on the approved plans for the units with 4.68 nominated for the garages. This means that all new buildings will be above the flood planning level and use of flood compatible materials above floor level is not required. The concrete foundations proposed are considered flood compatible.

Deep ponding as shown on the flood study may still occur in a 1% AEP event around in the rear yard with shallow ponding up to 100mm in the driveway.

The development has been designed with significant infiltration areas to minimize the time that ponding takes place in the driveway. At times when the driveway is experiencing ponding the roadway would also be expected to have some surface water present and residents are less likely to be wanting to be mobile. The flooding in this area generally results from gradual rising of the water table in

prolonged stormwater events which then ponds in low lying areas until it can dissipate into the ground. Overflow occurs once ponding reaches levels where flows can pass down roadways or through private property to lower lying land. Flood water is generally of minimal velocity therefore evacuation on foot remains an option even when depths exceed that recommended for motor vehicles.

Overland Flooding

It is likely that Council will require kerb and gutter for the site frontage together with fill in the road reserve to the site boundary. An infiltration trench will be provided in conjunction with the proposed kerb and gutter to minimize ponding in the roadway because no council drainage exists in this locality.

Overland flow on the subject site will be maintained in the following manner:

- The low points on both side boundaries, towards the rear of the development has been kept at natural levels to allow overland flow between the properties and sharing of flood flows/local ponding should it occur.
- Stormwater trenches have been sized for the 1% AEP event using conservative infiltration values to minimize runoff from the site

ON SITE DETENTION

In accordance with Section 6.7.7.4.3 of the GCC DCP On site detention (OSD) is required to be provided in conjunction with this development.

The usual requirements for OSD relate to storms of 5 year to 100 year average recurrence interval.

The site located within the Woy Woy rainfall area. Although the site previously 3.11 runoff post development is required not to exceed the undeveloped (grassed) runoff.

In accordance with the DCP requirement it is proposed to provide on-site detention of stormwater to limit post development peak flows from the site to the pre development peak flows for storm events up to and including the 1% AEP storm event.

The proposed detention system has been modelled using a runoff routing model, “Drains”. Woy Woy rainfall data (1987 ARR) with a soil type of 1 and antecedent moisture content of 3 was used for modelling purposes.

The onsite detention system has been modelled as a dual tank system including the credit from the rainwater tanks and the infiltration storage. Minor surface storage is provided within driveway pavements. Infiltration rates through the trench are modelled using a small diameter orifice. Infiltration flows are not included in the reported flow rates because the water is retained on site and does not flow to Councils stormwater system.

This model predicts that stormwater flow to the drainage system will be less than or equal to the predeveloped flows for peak storms of recurrence intervals from 5 to 100 years. The model also predicts that 1% AEP events of up to 30 minutes duration will result in no runoff from the developed site based on the provided infiltration rates.

ON-SITE DETENTION STORAGE CALCULATIONS

Site Area 670.4 sq metres

Pre-Development Parameters

The site falls towards a local depression within the site and the adjacent properties, tc of the order of 8 minutes

Post-Development
Total 453 square metres (68% impervious)

Detention Storage
Two systems are proposed with split catchments to allow for maximum soil exposure for infiltration

The rear of the site has a site catchment of 420 square metres and has been modelled as 71% impervious. This system is provided with the following items
Rainwater Tank - Minimum 4 cubic metres, provided 2 cum credit claimed
Infiltration trench Storage (24 double stormbrick cells located below the driveway) 21 cubic metres
Surface storage inclusive of pits 3. cubic metres

Total Detention Storage - 27 cubic metres inclusive of pits – this system overflows by weir flow to the lower system.

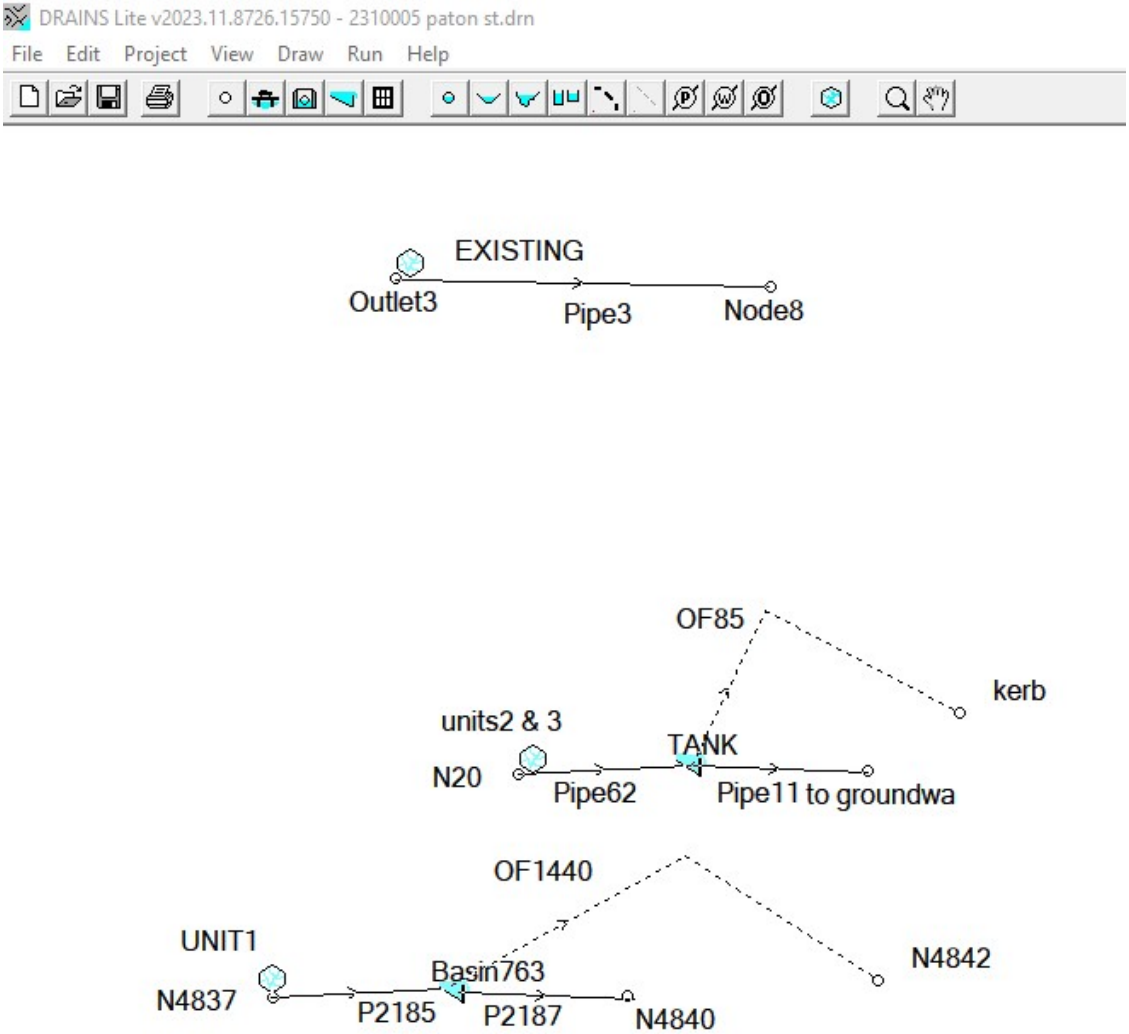
The front of the site has a site catchment of 250 square metres and has been modelled as 61% impervious. This system is provided with the following items
Rainwater Tank - Minimum 4 cubic metres, provided 2 cum credit claimed
Infiltration trench Storage (36 double cells) 7.74 cubic metres
Surface storage inclusive of pits 1 cubic metres

Total Detention Storage - 11.0 cubic metres inclusive of pits

Model Results

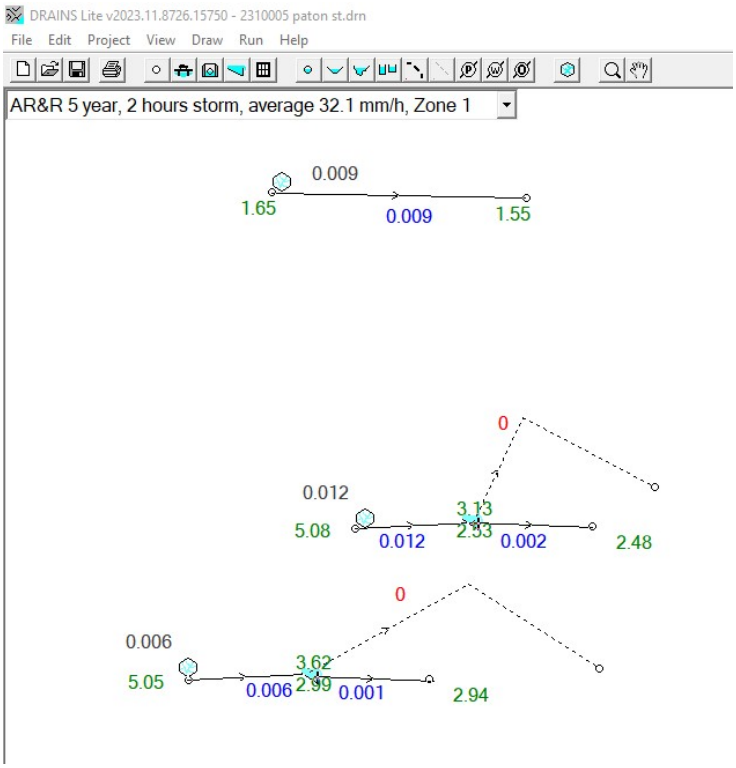
The existing and proposed system has been modelled using run off routing software (Drains) based on an Ilsax model (ARR1987 method and rainfall used). Storms for each recurrence interval of durations ranging from 5 minutes to 2 hours were modelled.

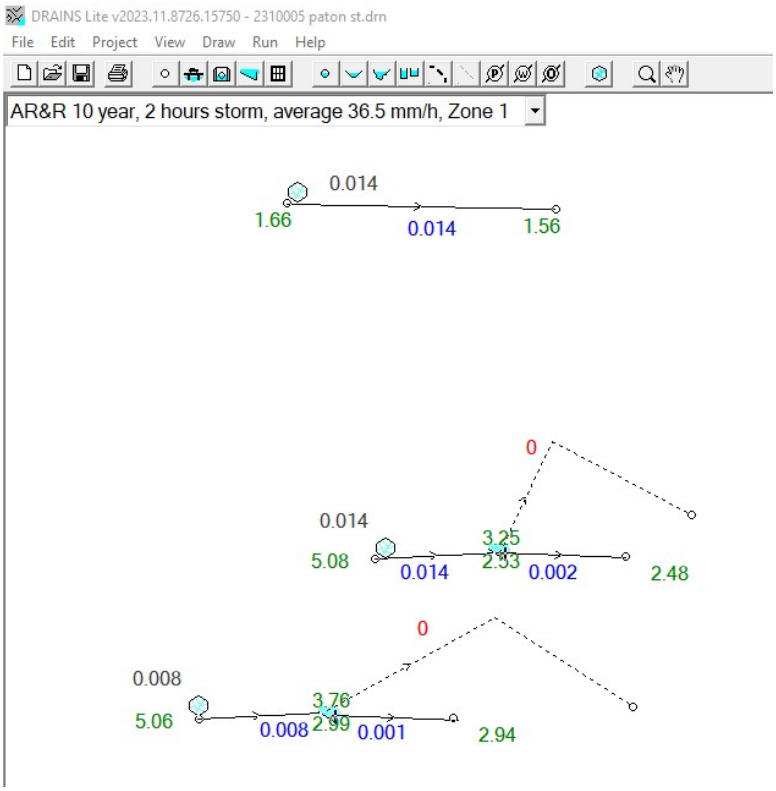
Drains outputs are appended to this document. The model used is represented below:

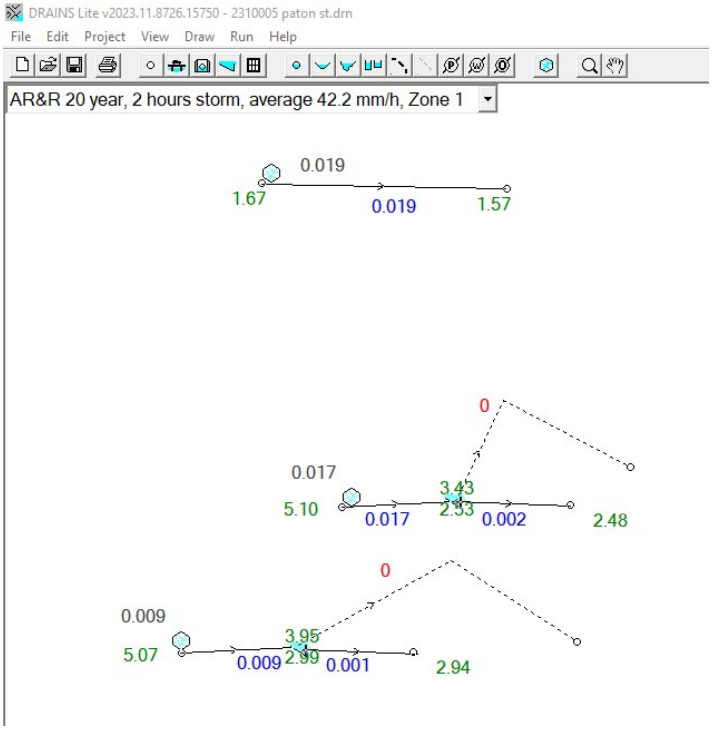


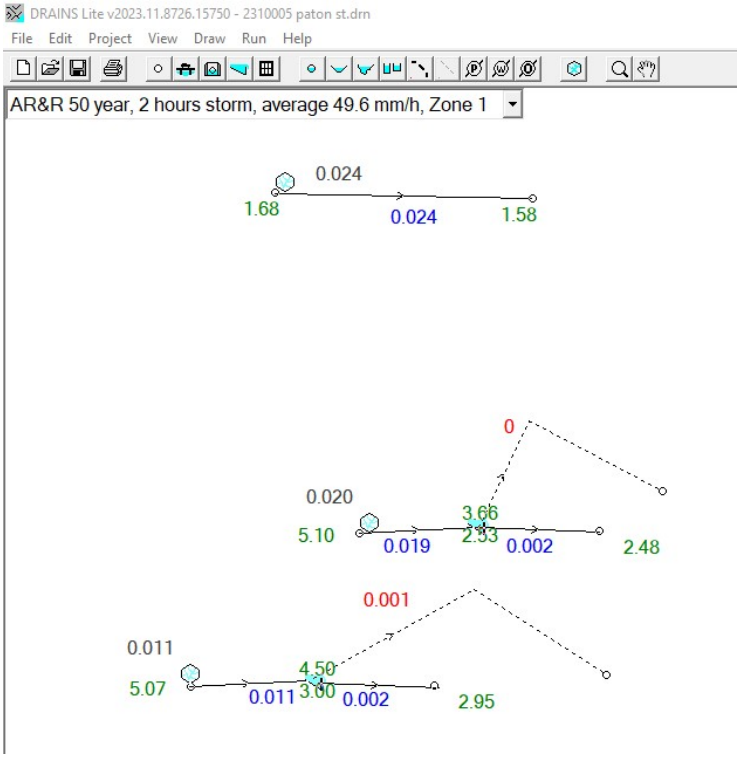
The modeled system achieves peak flows for each recurrence interval which do not exceed the natural site peak flows.

Drains outputs for the system as modeled are shown below.






DRAINS Lite v2023.11.8726.15750 - 2310005 paton st.drn
File Edit Project View Draw Run Help
AR&R 20 year, 2 hours storm, average 42.2 mm/h, Zone 1
0.019
1.67
0.019
1.57
0
0.017
3.43
5.10
0.017
2.33
0.002
2.48
0
0.009
3.95
5.07
0.009
2.99
0.001
2.94


DRAINS Lite v2023.11.8726.15750 - 2310005 paton st.drn
File Edit Project View Draw Run Help
AR&R 50 year, 2 hours storm, average 49.6 mm/h, Zone 1
0.024
1.68
0.024
1.58
0
0.020
3.66
5.10
0.019
2.33
0.002
2.48
0.001
0.011
4.50
5.07
0.011
3.60
0.002
2.95

UMMARY OF DRAINS FLOWS

Storm	Predevelopment flow l/s	Post development flow with retention l/s
5 yr 5 min	1	0
10 minute	3	0
25 minute	7	0
30 minute	6	0
1 hour	6	0
1.5 hour	8	0
2 hour	9	0
10 yr 5 min	3	0
10 minute	6	0
25 minute	11	0
30 minute	9	0
1 hour	11	0
1.5 hours	13	0
2 hours	14	0
20 yr 5 min	6	0
10 minute	10	0
25 minute	17	0
30 minute	15	0
1 hour	16	0
1.5 hour	18	0
2 hour	19	0
50 yr 5 min	10	0
10 minute	16	0
25 minute	22	0
30 minute	20	0
1 hour	19	0
1.5 hours	22	0
2 hours	24	1
100 yr 5 min	13	0
10 minute	21	0
25 minute	30	0
30 minute	24	0
1 hour	22	3
1.5 hours	25	2
2 hours	28	5

For design purposes infiltration rates of 8.8m/day were used for the trench outflows. This is indicative of the finer slow draining sands found in the upper portion of the core holes. Coarser grained sand located deeper in the soil profile is likely to have improved infiltration capacity. Testing carried out is reported by Larry Cook Consulting, Ref 23126-A has nominated average infiltration rates of 6.8mm/day for the two bore holes tested on site.

The modelling demonstrates that with the proposed controls installed in conjunction with this development runoff from the site can be expected to be significantly reduced below existing values and improve the existing ponding in this location. At times of extended rainfall groundwater is known to rise to the surface in landlocked low lying areas such as this site. At those times the infiltration trenches will not work as designed however the situation will be no different from the existing development where local ponding occurs on this and the adjacent sites. All efforts have been made in conjunction with this development to achieve a responsible design which manages off site impacts.