Water Cycle Management Plan to Support DA Application for New Nursing Home

45 Hillview Street Woy Woy

Prepared for Thompson Health Care

Our Ref: 16077_LO_01/VFC

5 June 2018

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Table of Contents

1 Executive Summary 3
2 Background Information 4
3 Site Context 4
4 Proposed Development 5
5 Water Cycle Management Objectives 6
6 Constraints and Opportunities 6
6.1 Constraints 6
6.2 Opportunities 6
7 Water Conservation 6
7.1 Water Conservation Target 6
7.2 Water Retention Target 7
8 Stormwater Management 8
8.1 Site Discharge Index (SID) 8
8.2 Stormwater Quality Target 8
8.3 MUSIC Water Quality Model 8
8.4 DRAINS On-Site Detention Model 10
8.5 Local Overland Drainage 11
8.6 Flooding Targets 11
8.7 Drainage Black Spots on the Peninsula 12
9 Operation and Maintenance Plan 12
10 References 13
A. Cubo drawings 16077 – CI-001, CI-010, CI-011, CI-012, CI-015, CI-026 & CI-026 14
B. Project Survey 15
C. MUSIC Model Output 16
D. Enviropod Data 17
E. Drains Modelling Data 18

1 Executive Summary

Cubo Consulting Pty Ltd has been engaged by Thrum Architects on behalf of Thompson Health Care to undertake a preliminary water cycle management plan to be incorporated in the DA application for the proposed new nursing home at 45 Hillview St Woy Woy.

The report concludes that: -

1) A combined rainwater and on-site detention tank serving the development can be installed to achieve water quantity control target intents of the DCP.
2) The use of Enviropods and infiltration may best treat the water quality discharging from the site.
3) Water conservation targets can be achieved by adopting water efficient fixtures and recycling water.

Yours Faithfully

Vince Cubis
Senior Engineer

2 Background Information

This document presents the Water Cycle Management Plan for submission to Central Coast Council to support the DA application for the proposed new nursing home at Lot 20 DP1123934 - 45 Hillview St Woy Woy.

As the work proposed exceeds 2,000 square metres (approximately 3,000) the development is considered to be Type 2 – Significant Developments under Chapter 6.7 – Water Cycle Management of Gosford City Council's Development Control Plan 2013 (DCP 2013).

3 Site Context

The development is bound to the north by residential properties, to the east by Hillview Street, to the south by a small adjacent lot next to Veron Rd and to the west by a drainage reserve.

The site has an area of approximately 11,658 square metres.

The existing site has a very slight fall from east to west at an average grade of 0.5%. Nearby soil samples indicate underlying soils of clays overlain by sandy loams with moderate infiltration rates and run-off potential.

Aerial photography of the existing site is presented below.

Existing site (Source – Sixmaps)

4 Proposed Development

The proposed development will consist of a three-storey nursing home. The details of the development are contained within the attached Thrum Architects design drawings.

5 Water Cycle Management Objectives

The objectives of this water cycle management plan align with the purpose of Gosford City Council's Chapter 6.7 (Water Cycle Management) from DCP 2013. These include to:

1) Maintain and restore natural water balance whilst reducing the cost of providing and maintaining water infrastructure in a sustainable and efficient manner.
2) Reduce risk to life and damage to property by restricting and controlling building and other development so that it minimises risks to residents and those involved in rescue operations during floods.
3) Reduce nuisance and high level flooding and the cost of providing and maintaining flood mitigation infrastructure whilst improving water quality in streams and groundwater.
4) Reduce potable water demand by using stormwater as a resource.
5) Protect and enhance natural water systems (creeks, rivers, wetlands, estuaries, lagoons and groundwater systems).
6) Protect and enhance the water quality, by improving the quality of stormwater runoff from the urban catchments.
7) Integrate stormwater management systems into the landscape in a manner that provides multiple benefits, including water quality protection, stormwater retention and detention, public open space and recreational and visual amenity.

6 Constraints and Opportunities

6.1 Constraints

Site constraints include the following –

- The site is relatively flat and is situated on natural high permeable sands.
- Limited access to the site area due to environmental zones requiring to be protected restricting the ability to install bio-retention or other water quality devices which may require access by plant.

6.2 Opportunities

The proposed development has the opportunity to adopt and embrace proprietary treatment devices. When suitably sized, proprietary devices provide effective treatment and can occupy a relatively small footprint when compared to traditional treatment devices. A critical issue will be the ability to provide access to any proprietary devices for cleaning.

7 Water Conservation

7.1 Water Conservation Target

In accordance with DCP 2013, Section 6.7.7.1.1 the target for potable water reduction is 40%.

The development will meet the 40% reduction in potable water by ensuring that the following WELS rated devices are installed:

- 4 star dual-flush toilets
- 3 star showerheads
- 4 star taps (for all taps other than bath outlets and garden taps)

- Water efficient washing machines and dishwashers, wherever possible.

Dual Plumbing

As noted in Section 7.2 below of this report, rainwater reuse is proposed for some toilet flushing and landscape irrigation.

7.2 Water Retention Target

The minimum Stormwater Retention Volume (SRV) as required by DCP 2013, Section 6.7.7.2.4 is calculated from the following formula.

$SRV = 0.01A(0.02F)^2$ where: SRV = stormwater retention volume (m^3)

A = total site area (m^2) 11,658 sq.m

F = fraction impervious (%)

Developed site imperviousness is estimated to be **60%**.

Thus the required stormwater retention volume is as follows: -

Stormwater Retention Volume (SRV) = 167.9 m^3

Water studies on nursing homes (Sydney Water on Blue Haven Nursing Home and Hostel Kiama) have indicated the following water consumption per person per day: -

1. Laundry – 42 L/person/day
2. Toilet Flushing – 23 L/person/day
3. Irrigation 12 L/person/day

Based on the above figures and a roof area of 4,000 square metres, and an occupation of 165 beds, the demand figures are as follows: -

1. Laundry – 48,510 L/week
2. Toilet Flushing – 26,565 L/week
3. Irrigation 13,860 L/week

The roof area of the building is approximately 3,380 sq.m and at a yield of 5 L/sq.m/week provides an approximate useable yield of 16,900 L/week.

Reviewing the usage rates above it is considered that a reasonable reuse target would be for the irrigation and toilet flushing for any common toilet fixtures. Based on the above, we have allowed for roof rainwater tank volumes of 40,000 L (2 x 20,000 L).

We have prepared a MUSIC model to simulate water reuse.

Preparation of the MUSIC model, its base assumptions and input data are included in Section 8.3 of this report.

For discussion regarding the interaction of the water reuse tank and the on-site detention tank refer to Section 8.4 of this report. Refer also to the arrangement on drawing 16077-CI-011.

8 Stormwater Management

8.1 Site Discharge Index (SID)

The Site Development Index (SID) as described in Section 6.7.7.3.3 of DCP 2013 is calculated from the following equation:

$$SID = \frac{\text{Area of Impervious Site Directly Connected to Street } (m^2)}{\text{Total Site Area } (m^2)}$$

The proposed development connects the entire impervious area of the developed site to the proposed site treatment devices.

The development's SID is therefore:

Site Development Index (SID) = 0.01

DCP 2013, Section 6.8.7.3.4 requires the SID to be less than 0.1. The development's SID is therefore in compliance with this requirement.

8.2 Stormwater Quality Target

DCP 2013, Section 6.7.7.3.3 requires, as a minimum, the following reductions in total pollutant load, compared to untreated runoff from the developed site.

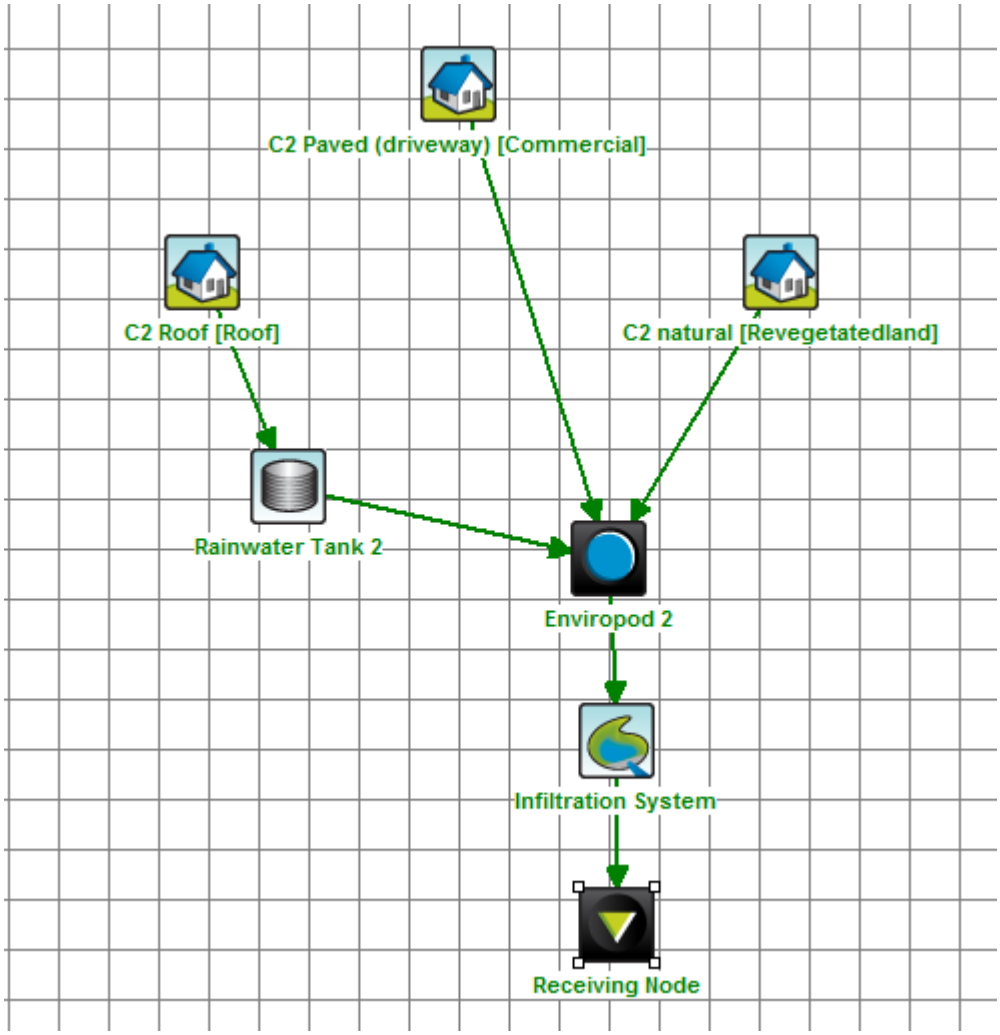
Minimum pollutant reduction targets

Pollutant	Minimum Reduction
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%
Gross Pollutants	80%

8.3 MUSIC Water Quality Model

Section 6.7.7.3.3 of DCP 2013 discusses various options to achieve compliance with the minimum pollutant reduction targets as discussed in Section 8.1, above. The options are discussed as an area of specified treatment per 100m² of impervious area.

In order to optimise the treatment train while still demonstrating compliance with Section 6.7.7.3.3 of DCP 2013, a MUSIC model was prepared for the development site. The model arrangement is shown below.



Base Information

The MUSIC model was prepared in computer model Version 6.2.

Meteorological stations near the development site were reviewed in reference to distance from the development site, completeness of data record, dates of data record and type of data record.

Historical pluviograph data was taken from SYDNEY.

Music modelling parameters were adopted using Upland parameters from Wyong Council.

Treatment Nodes

Two treatments nodes are proposed as part of the water cycle treatment train:

1. First flush system before rainwater tank (not modelled)
2. Rainwater tank
3. Enviropod pit insert
4. Infiltration system (Atlantis Cell)

Rainwater Tank

The proposed stormwater retention tank as required by Section 6.7.7.2 of DCP 2013 was modelled as a ‘rainwater tank’ in the MUSIC model. The tank was sized as 2 x 20,000 L tanks.

Stormwater reuse was assumed to be used for the following:

1. Toilet flushing
2. Landscape irrigation

Water reuse was set as discussed in section 7.2 above.

The site's assumed 3,378 m² of roof area is directed to the rainwater tanks.

The Atlantis Cell detention system will allow water infiltration into the sandy soils and this has been modelled as ***Stormwater360 Enviropod Pits.***

A Stormwater360 Enviropod Pits stormwater treatment device is proposed to treat stormwater runoff from rainwater tanks, paved and landscape areas.

Results

Results of the MUSIC model show the nominated treatment train exceeds the pollutant removal targets outlined in DCP 2013. The table below presents a summary of the MUSIC model results.

Summary of MUSIC model results

Pollutant	Minimum Reduction	Achieved Reduction	Comments
Flow		97%	
Total Suspended Solids (TSS)	80%	96%	Treatment is more than minimum
Total Phosphorus (TP)	45%	96%	Treatment is more than minimum
Total Nitrogen(TN)	45%	97%	Treatment is more than minimum
Gross Pollutants	80%	100%	Treatment is more than minimum

The above results demonstrate that compliance with the reduction in all criteria detailed in Section 6.7.7.3.2 of DCP 2013.

8.4 DRAINS On-Site Detention Model

Section 6.7.7.4.4 of DCP 2013 requires on-site detention to ensure that post developed flows from a development site do not exceed pre-development flows for all storm events up to and including the 1% AEP storm events.

A DRAINS computer model (Version 2017.03) was developed to demonstrate compliance with DCP 2013.

Base Information

The DRAINS computer model was prepared in accordance with the requirements of Gosford City Council's Design Specification for Survey, Road and Drainage Works, August 2008. Rainfall data was adopted from BoM website specifically for the site.

Catchments

The existing site was modelled as impervious with a time of concentration estimated at 6 minutes from the Kinematic wave equation.

The roof area of the developed site is assumed to drain to the rainwater tank then to the on-site detention system.

Rainwater Tank

Both of the 20,000 L rainwater tanks were modelled at 50% empty.

Results

The DRAINS model includes a 136 m^3 (302 m^2 x 0.45 m deep) southern OSD tank and a 25 m^3 (104 m^2 x 0.24 m deep) northern OSD tank. Discharge from the southern OSD tank is controlled via a 300 mm diameter stainless steel, sharp edged orifice at centreline level RL3.52 m AHD. Discharge from the northern OSD tank is controlled via a 180 mm diameter stainless steel, sharp edged orifice at centreline level RL3.47 m AHD.

Results of peak outflows from the DRAINS model are summarised below.

Summary of DRAINS Peak Outflows Discharge

Storm Event	Predeveloped Flows	Developed Flows (With OSD)	Comments
5 year ARI (20% AEP)	89 L/s	75 L/s	Developed flows less than predeveloped
10 year ARI (10% AEP)	107 L/s	83 L/s	Developed flows less than predeveloped
20 year ARI (5% AEP)	131 L/s	92 L/s	Developed flows less than predeveloped
50 year ARI (2% AEP)	150 L/s	101 L/s	Developed flows less than predeveloped
100 year ARI (1% AEP)	171 L/s	110 L/s	Developed flows less than predeveloped

Whilst the results do not strictly comply with the DCP the results are reasonable and achieve the intent of the DCP in restricting peak flows. The site is constrained by the environmental area and addition infiltration area is not available.

The MUSIC model shows that the % reduction in the developed site runoff will be reduced by 96.9% by the rainwater reuse and the infiltration system. Predeveloped flows for minor storms are non-existent for high permeable soils and realistically cannot be practically achieved. The minor flows and considered acceptable for the large catchments.

8.5 Local Overland Drainage

Suitable upstream drainage exists to the development site and therefore Section 6.7.7.5 of DCP 2013 is not applicable.

8.6 Flooding Targets

Predevelopment meetings minutes advised of flood levels for the site. These were subsequently revised in an email dated 25 November 2016 by Phill Coon, copy below.

With regard to PMP, we have referred to the DHI Woy Woy Peninsular Flood Study dated March 2010 and particularly the flood levels for the area in a PMP event. We note that the site is adjacent to point 22 in the flood report and this shows the flood levels as follows: -

1. PMP flood level of 3.26 m AHD.
2. An increase for 0.55 m sea-level rise will provide an increase of 0.33 m in flood levels. Council have adopted in March 19 2015 a 0.2 m increase to 2050. Therefore a 0.12 m increase in water level at this location appears appropriate.
3. Therefore PMP flood level is 3.38 m AHD.

4. An increase of flood level of 1.62 m if **full** blockage of the culverts is concurrent with the peak events together with a 0.05 m drop for High Groundwater.

We note the DCP2013 in section 6.7 Table 4 requires “flood target matrix” to comply with appendix F.

This Appendix needs to have access above the PMP calculated with 50% culvert blockage. This means that the Flood Planning Level would be the PMP plus half of the full blockage and other sensitivity figures.

This would mean the PMP flood level would be 3.38 + 0.81 - 0.05 = 4.14 m AHD. Footpath levels in the street are generally approximately 4.5 m AHD.

Based on these levels access to the site is not subject to flooding and therefore Section 6.7.7.6 of DCP 2013 is not applicable.

Fri 25/11/2016 10:31 AM
Phill Coon <Phill.Coon@centralcoast.nsw.gov.au>
FW: 45 Hillview St Woy Woy DA30219/2006
To vince.cubis@cubo.net.au
You forwarded this message on 25/11/2016 11:34 AM.

Record of Pre Applicati...
362 KB

Vince

Thank you for information and our discussion of today.

As discussed I have confirmed with Council’s Flood Engineer R Baker the flood level requirements for the 45 Hillview site. The site 1% flood level is 4.0m AHD.

Please be advised that the following level of 4.5m AHD applies to the following:

- Minimum habitable or non-habitable Floor levels at or above the level of 4.5m AHD.
- All access roads and driveways, and external parking areas are to be at or above the level of 4.5m AHD.
- Minimum roadway crest level of access to basement car parking to be 4.5m AHD.

Please disregard levels as advised in Council’s Record of Pre Application meeting of 6 September 2016.

Regards
Phill Coon | Engineer Development Assessment | 25/11/2016

Phill Coon
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8.7 Drainage Black Spots on the Peninsula

The development site is located in Woy Woy but outside the area and therefore Section 6.7.8 of DCP 2013 is satisfied.

9 Operation and Maintenance Plan

Following approval of the Development Application, an operation and maintenance plan will be prepared in conjunction with the detailed design for the water cycle management elements.

All operation and maintenance works on proprietary devices, such as the Stormwater360 Enviropods will be undertaken in accordance with the manufacturer’s recommendations.

It is expected that all operation and maintenance works will be undertaken at regular intervals and following significant rainfall events.

Refer to attached Enviropod maintenance requirements in **Appendix D**.

10 References

BMT WBM Pty Ltd, Draft New South Wales MUSIC Modelling Guidelines, August 2010

Gosford City Council, Gosford Development Control Plan (DCP) 2013, February 2014

Stormwater360, Enviropod technical information.

APPENDIX A

A. Cubo drawings 16077 – CI-001, CI-010, CI-011, CI-012, CI-015, CI-026 & CI-026

APPENDIX B

B. Project Survey

APPENDIX C

C. MUSIC Model Output

APPENDIX E

D. Enviropod Data

APPENDIX E

E. Drains Modelling Data