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STORMWATER MANAGEMENT PLAN FOR PROPOSED REDEVELOPMENT AT 40 MYOORA ROAD, TERREY HILLS NSW 2084

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1.0 INTRODUCTION

Richmond and Ross Pty Ltd, Consulting Engineers, have been engaged to prepare a Stormwater Management Plan for the proposed development at 40 Myoora Road, Terrey Hills, NSW 2084. No responsibility to third parties under the law of contract, tort or otherwise for any loss or damage is accepted.

The purpose of this assessment is to provide advice with respect to stormwater management for the proposed development. The results of this study are limited to this scope.

This assessment has been prepared by reviewing published topographic maps, physical land survey, hydraulic and hydrological calculations, available Ariel photography of the site and in accordance with Northern Beaches Council Policies below:

- Water Management for Development Policy 2021
- WSUD & MUSIC Modelling Guidelines 2016

2.0 SITE LOCATION AND DESCRIPTION

The subject site is located at 40 Myoora Road, Terrey Hills, NSW 2084 lot 180 of DP752017. The total area of the lot is approximately 1.6Ha (15,802m²). The current site generally slopes to the Northwest towards Myoora Road. There are existing kerb inlet pits located along Myoora Road as part of Council's stormwater network.

Figure 1. Site Boundary Satellite View (Extract from Nearmap)

3.0 DEVELOPMENT PROPOSAL

The plan is to develop the current lot into a single storey hospitality development with basement car park and vehicular access from Myoora Road, three separate restaurant areas with total GFA of approx. 3,650m² and ancillary office to support operation of restaurants, as well as outdoor landscaping and children's play area. The total impervious area (buildings, pathways, roofs, and carparks) have an area of approximately 7,290m² accounting for 46% of the total site area. The remaining area will be pervious landscaping.

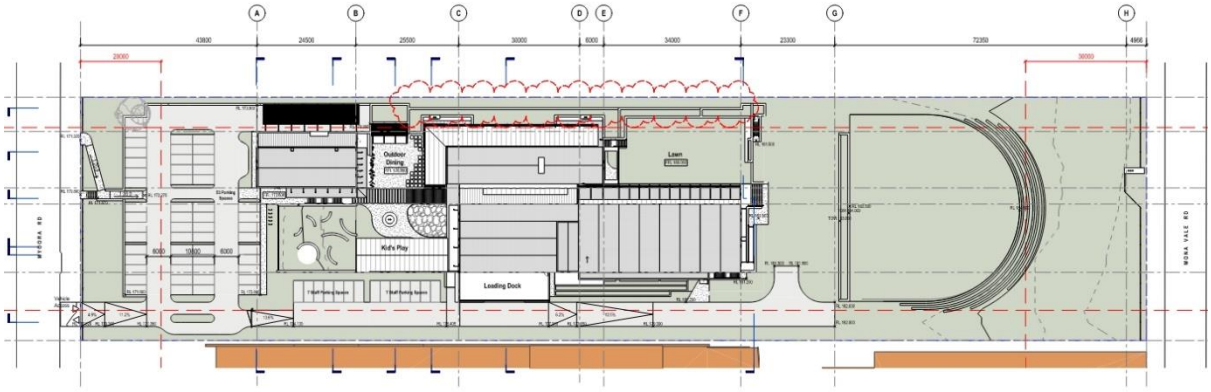


Figure 2. Proposed Development Plan (Extract from Architectural Plan)

4.0 EXISTING STORMWATER NETWORK

The site currently drains via surface overland flow towards Myoora Road. There are two council owned kerb inlet pits located in front of the site along Myoora Road.

5.0 PROPOSED STORMWATER NETWORK

It is proposed to construct a new stormwater network to convey stormwater from the site on the following principles:

- A new network of pits and pipes is proposed to convey the runoff from the site to a stormwater treatment train prior to exiting the site towards the existing kerb inlet pit. The underground network has been sized for 1% AEP storm event.
- The On-Site Detention (OSD) Tank has been sized and designed to meet Council's requirements for storage and permissible site discharge for the proposed development based on pre- vs post-development flows. See stormwater quantity management in section 6 for more details.
- Proposed roof area is approx. 2,423m². All runoff from the roof will be directed to the stormwater network for treatment and storage.
- A system consisting of Ocean Guard pit inserts and StormFilter Cartridges is proposed to treat the stormwater runoff prior to discharge from the site. Analysis from MUSIC indicates the treatment targets are achieved by the proposed treatment train. See stormwater quality management in section 7 for more details.

6.0 STORMWATER QUANTITY MANAGEMENT

6.1. On-site Stormwater Detention (OSD)

The proposed development site is subject to On-Site Detention (OSD) requirements as per the Northern Beaches Council – Water Management for Development Policy. The subject site is located in region 2 and therefore OSD requirements were taken from section 9.3.2 - Onsite Stormwater disposal Requirements Region 2 – Central Catchments of the policy. Given that the site is not a single dwelling and is larger than 1,200 m² in area, a full computation Method using DRAINS was created in line with section 9.3.2.5 of the policy. Pre- and post-development flows were calculated using the Horton/ILSAX method in DRAINS as per Section 9.9.1 of the policy for the 20%, 5% and 1% AEP storm events.

Based on analysis in DRAINS, the required OSD volume was calculated to be 140m^3. A combination of Ø450mm orifice and weir is used to control the peak discharge rate from the OSD tank. It should be noted that flows (9.9 L/s (0.9 L/s/cartridge)) from the StormFilter treatment devices bypass the orifice and weir. The discharge from the orifice and weir has been adjusted to ensure the combined discharge is within acceptable rates.

As per Council requirements, the total pipe flow from the site to Council drainage must not exceed the maximum 20% AEP pre-development runoff. The post-development piped flow from the 1% AEP storm event is 242L/s which is less than the 20% AEP pre-development runoff of 346 L/s. Council also required the total piped and overland discharge to be less than the 1% AEP pre-development runoff. The total discharge is 868 L/s (overland and piped) which is less than the 1% AEP pre-development runoff of 888L/s (Full results can be seen in Table 1). The flows for the 1% AEP storm event from DRAINS can be seen below in figure 4, see Appendix B for 5% and 20% AEP flows.

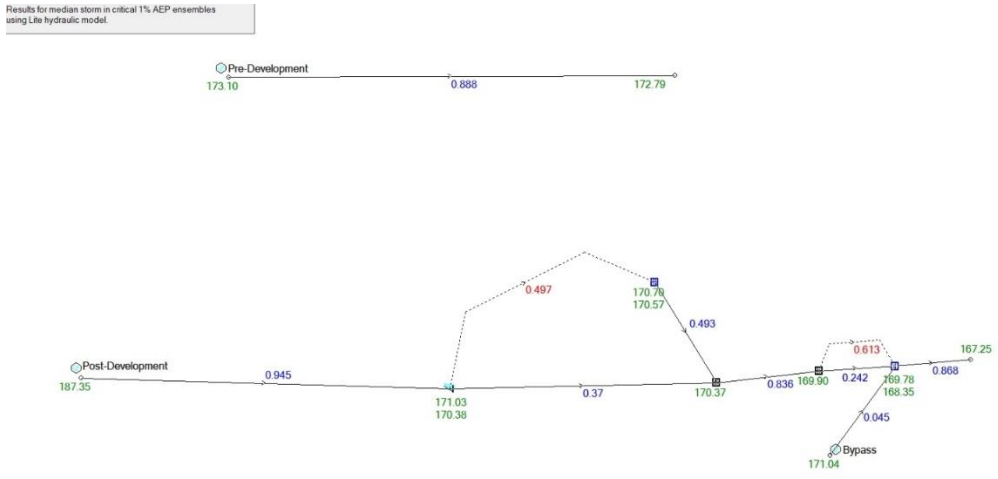


Figure 4. 1% AEP Flows through Detention Tank (Extract from DRAINS)

Table 1. Pre- and post-development flows (Calculated in DRAINS)

Storm Event (AEP)	Total Flow (L/s)		Reduction (%)
	Pre-development	Post-development	
1%	888	877.9	1.1
5%	632	368.9	41.6
20%	346	330.9	4.4

7.0 STORMWATER QUALITY MANAGEMENT

A stormwater treatment train is proposed based on Northern Beaches Council's Water Management for Development Policy 2021 – section 4: Protecting the Environment and WSUD & MUSIC Modelling Guidelines 2016 for the development within the site boundary. Based on Table 5 – General Stormwater Quality requirements, the following reduction percentage targets were used in the MUSIC Model. Total Suspended Solids (TSS): 85%, Total Phosphorus (TP): 60%, Total Nitrogen (TN): 45% and Gross Pollutants (GP): 90%. The stormwater treatment train comprises of the following components.

7.1. Gross Pollutant Traps (GPT)

Ocean Guard pit inserts are proposed in all inlet pits that directly collect stormwater. The stormwater is filtered via direct screening through the filtration bag liner ensuring that any debris larger than the openings in the filtration bag are captured and retained. During large storm events the water elevation in the filtration bag can rise and peak flows are internally bypassed through slots created in the flow diverter which has no moving parts that may prematurely fail. At the end of the storm event debris and stormwater rest at the base of the filtration bag where the stored material will start to dry until the next storm event.

A system is proposed using 9 x OceanGuard GPTs.

7.2. Filter Cartridges

The StormFilter, used on site, is a stormwater treatment system using rechargeable, self-cleaning media-filled cartridges to absorb and retain required level of pollutants from stormwater runoff including total suspended solids, hydrocarbons, nutrients, soluble heavy metals, and other common pollutants. The filter cartridges clean stormwater through a passive filtration system and removes pollutants.

A system is proposed using 11 x 690mm-PSorb StormFilter Cartridges, installed within two separate $5m^2$ StormFilter Treatment Chambers within the OSD Tank.

7.3. Water Quality Outcome – MUSIC Model

A MUSIC model was prepared for the proposed treatment train. The model was prepared using pluviograph data provided by the software manufacturer. See figure 5 below for treatment train as modelled in MUSIC and shown in Appendix A for more details. The meteorological data utilised in the modelling was extracted from the Pluviograph Rainfall Data toolkit from eWater at the closest rainfall station detailed as follows:
Station No: 066142
Station Name: Duffy's Forest (Namba Rd)

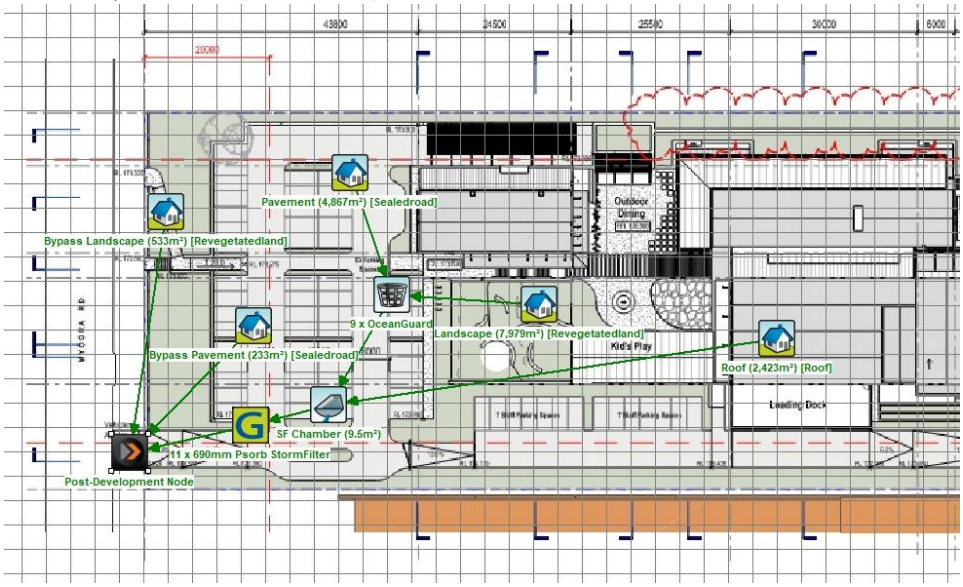


Figure 5. Treatment train and pollution removal as modelled in MUSIC

	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.83	7.83	0
Total Suspended Solids (kg/yr)	1600	192	88
Total Phosphorus (kg/yr)	2.98	0.974	67.3
Total Nitrogen (kg/yr)	16.7	8.97	46.4
Gross Pollutants (kg/yr)	162	4.97	96.9

Figure 6. Treatment train effectiveness as modelled in MUSIC

The overall pollutant removal for the site has been summarised in Table 2 below. An improvement in discharged water quality can be expected by installing the proposed treatment train.

Table 2 Treatment levels for the site

	SOURCES	RESIDUAL LOAD	% REDUCTION	
			Target	*Actual*
Total Suspended Solids [TSS] (kg/yr)	1600	192	85.0	88.0
Total Phosphorus [TP] (kg/yr)	2.98	0.974	65.0	67.3
Total Nitrogen [TN] (kg/yr)	16.7	8.97	45.0	46.4
Gross Pollutants [GP] (kg/yr)	162	4.97	90.0	96.9

8.0 OVERLAND FLOW PATHS

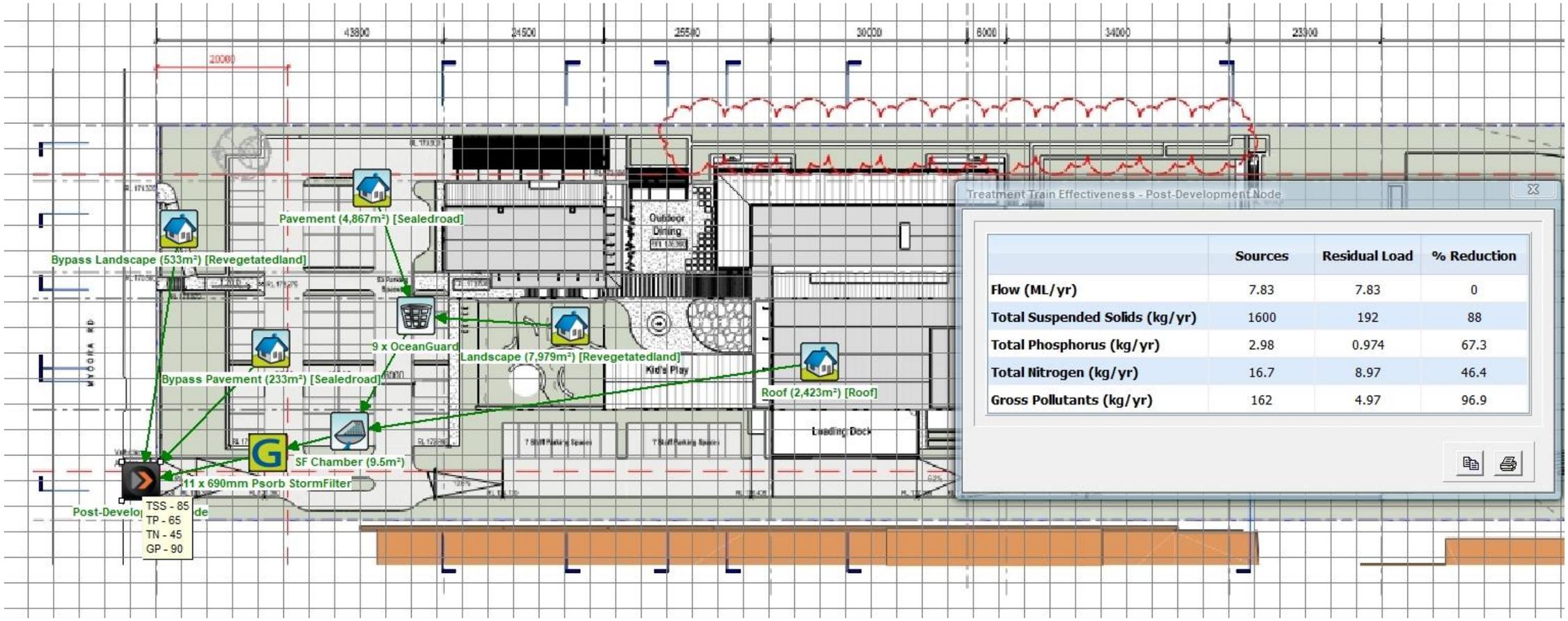
If storms higher than the design storm occur, the site is graded to allow an overland flow path to form which protects the buildings. The peak 1% AEP storm event discharge from the OSD tank is 877.9 L/s (868 L/s + 9.9 L/s). However, council street drainage comprises of a Ø375 stormwater pipe which cannot drain the 877.9 L/s. Therefore, a Ø300mm pipe is proposed as the connection to council drainage. Any excess flows will surcharge out at pit 1.J in the driveway and drain to the street via surface overland flow. This will also ensure that total piped flows are less than the 20% pre-development peak flow. This configuration has been modelled in DRAINS in addition to setting the bottom of the OSD tank above the street kerb and gutter level to ensure the OSD is not affected by tailwater.

9.0 CONCLUSION

A system has been proposed for the control of stormwater on the subject site, which considers the requirements for water pollution control and water sensitive urban design.

The proposed system will result in adequate environment protection and reduction in water pollutant loads based on modelling. We believe the system satisfies the requirements of the Northern Beaches Council.

APPENDIX A – MUSIC MODEL



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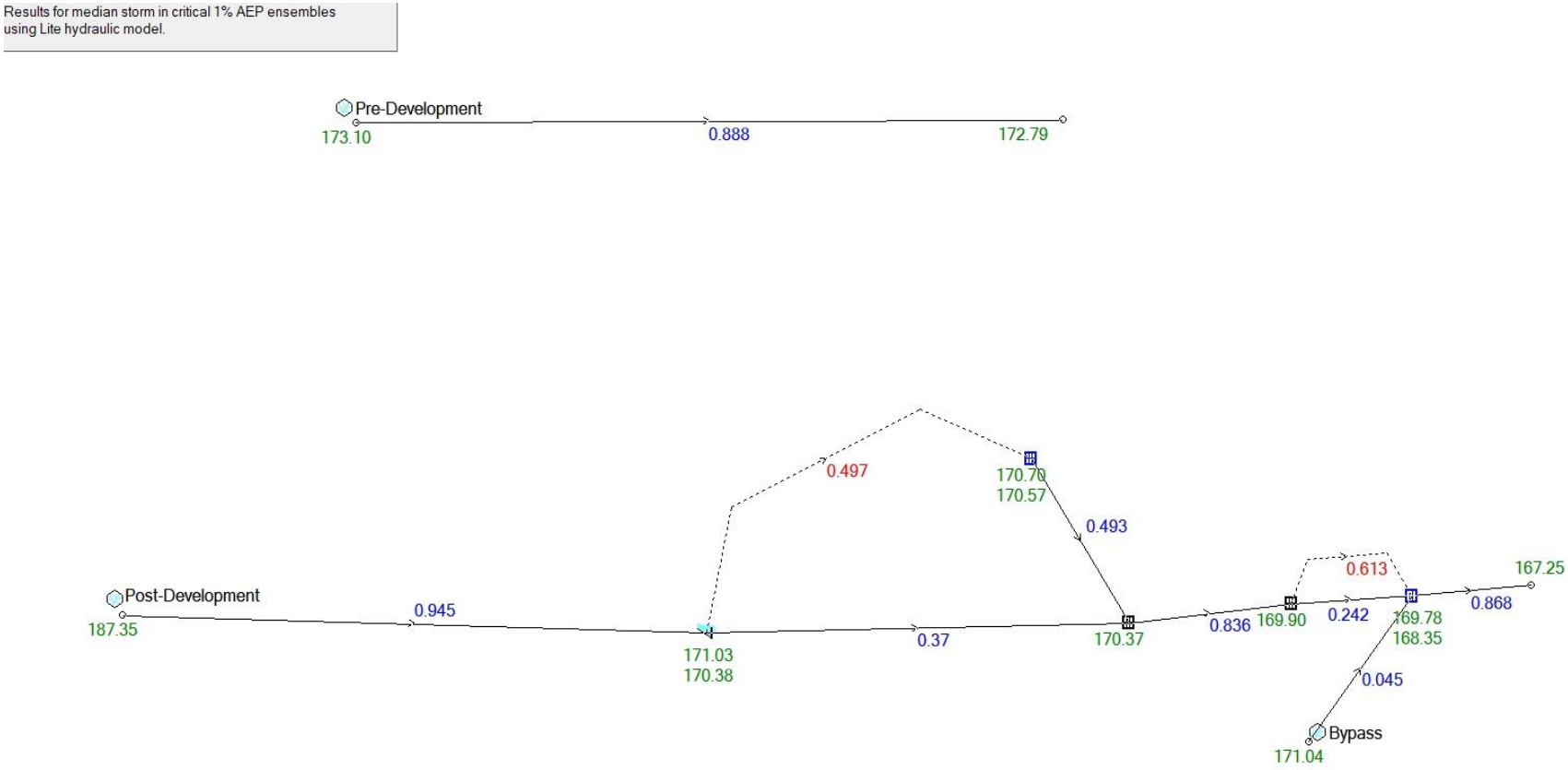
Gross Pollutants (kg/yr)	162	4.97	96.9

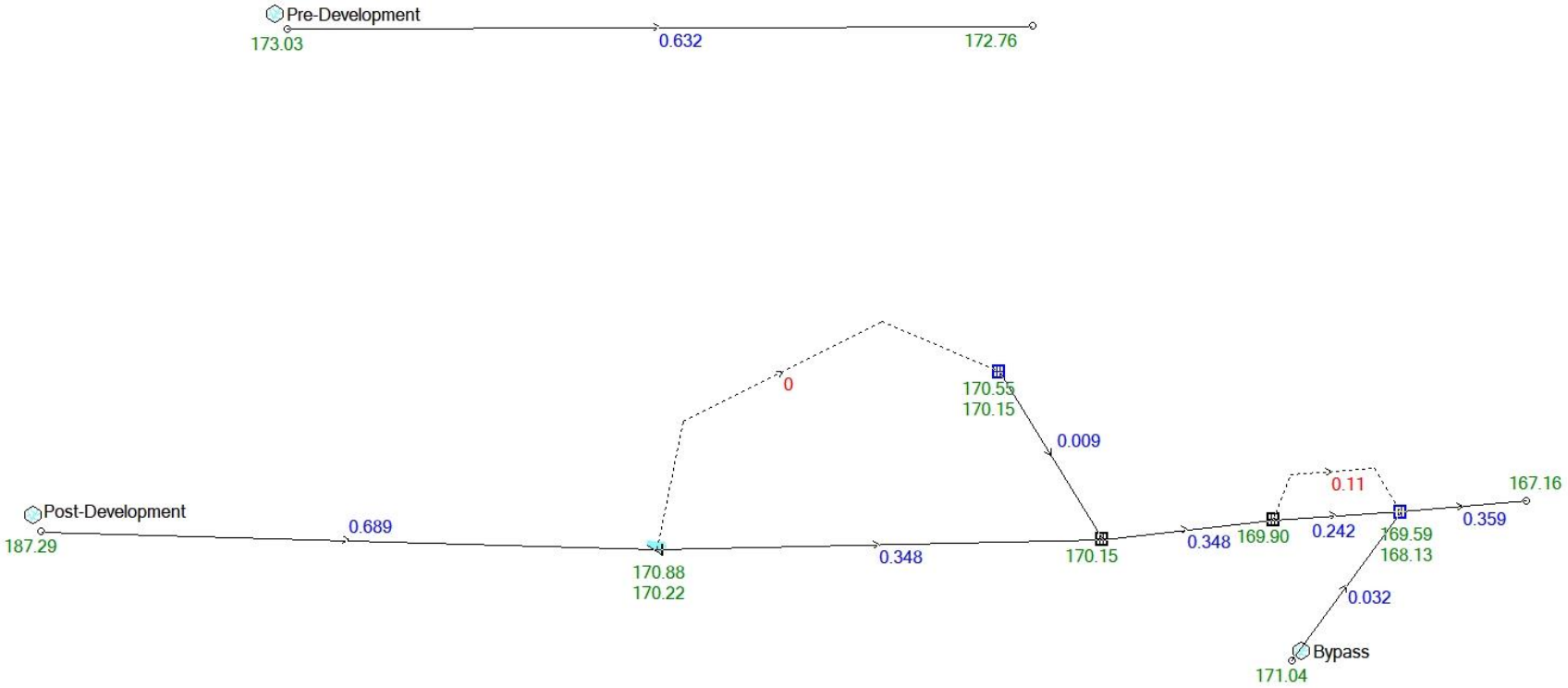
APPENDIX B – DRAINS MODEL RESULTS (1%, 5% AND 20% AEP)

B.1 - 1% AEP

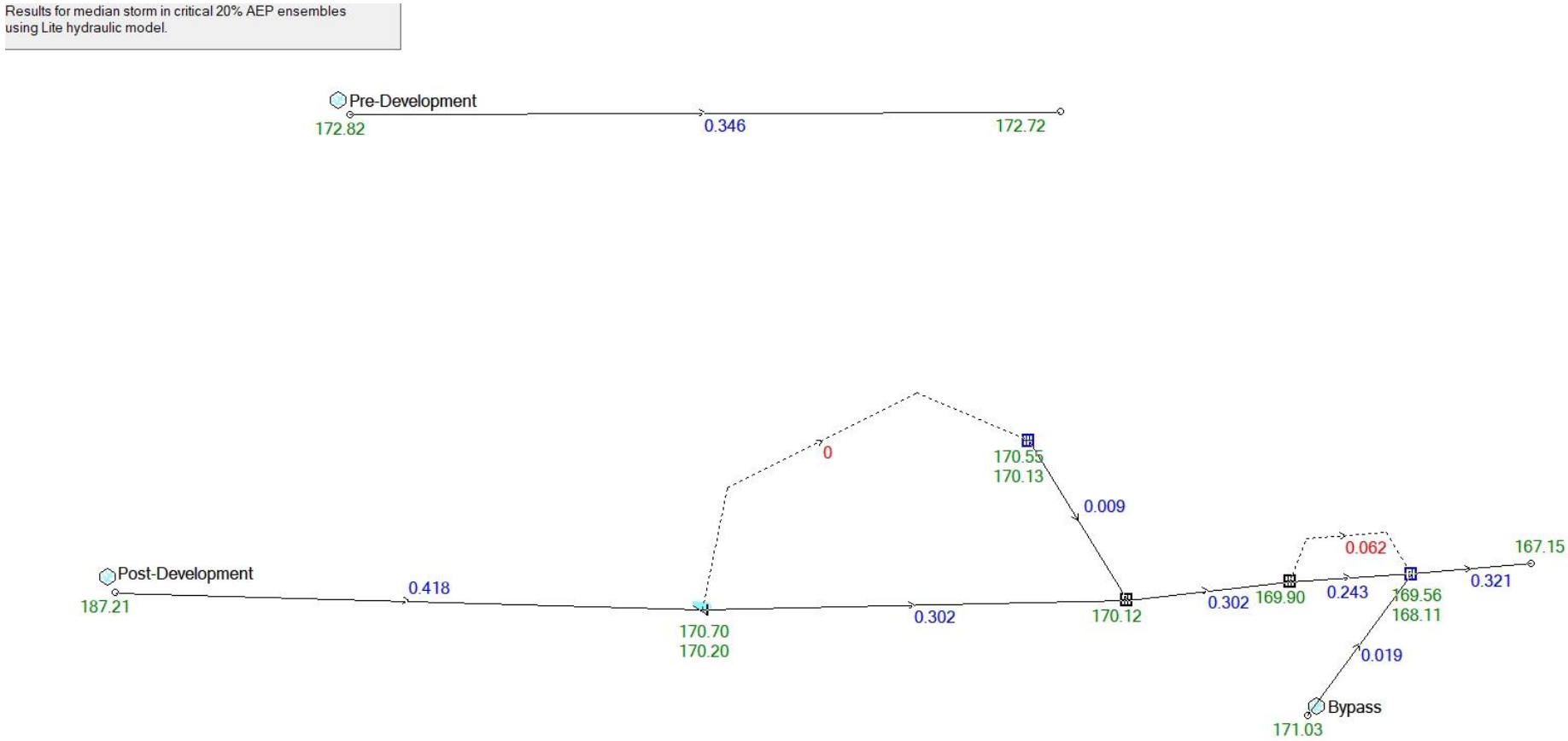


B.2 - 5% AEP

Results for median storm in critical 5% AEP ensembles using Lite hydraulic model.



B.3 - 20% AEP


Results for median storm in critical 20% AEP ensembles using Lite hydraulic model.
Pre-Development
172.82
0.346
172.72
0
170.55
170.13
0.009
Post-Development
187.21
0.418
170.70
170.20
0.302
170.12
0.302
169.90
0.062
0.243
169.56
168.11
167.15
0.321
0.019
Bypass
171.03