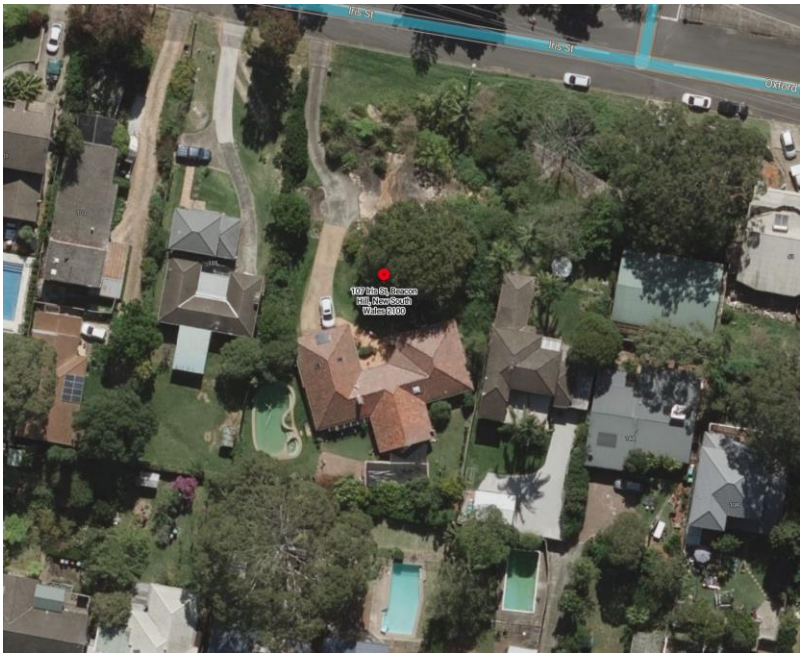
# REF: SW 152-2307

# STORMWATER MANAGEMENT REPORT, AUG-2023
# TORRENS SUBDIVISION OF ONE LOT INTO FOUR LOTS

## Development Site:

Lot 18 DP19022, 107 Iris Street, Beacon Hill, NSW 2100



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# Stormwater Management Report

for

Development Site at:

107 Iris Street, Beacon Hill, NSW 2100

| | | |
|---|---|---|
| **Project** | TORRENS SUBDIVISION OF ONE LOT INTO FOUR LOTS | **Ref. No.** SW152_2307 |
| **Client** | Maree Jaloussis Hayes | |
| **Prepared By:** | C Shrestha<br>PhD (Hydraulics), MEM, BEng (Civil)<br>MIEAust, CPEng, NER | |

| Issue | Description | Date |
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| A | ISSUED FOR DA | 11/08/2023 |
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**Date: 11/09/2023**

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# 1.0 INTRODUCTION

HECARD Consult was commissioned to prepare stormwater concept plan for the proposed development proposal at Lot 18 DP19022, 107 Iris Street, Beacon Hill, NSW 2100

This report is prepared to ensure that the proposal can be carried out while meeting the requirements for stormwater management. The location of proposed development is shown in Figure 1 below.


***Figure 1. 1 Location of Site (Source: Department of Lands - Six Maps)***

This report contains the stormwater concept for the development of the site and provides strategy for the development.

The highlighted site given in Figure 1.1 is the proposed development site. The site has an overall area of approximately 2252.3 sqm.

## 1.1 Site Description

The site is located at southern side of Iris Street The site survey plan indicated that the site is sloping towards north-east corner of the site with an elevation difference of about 11.5 m. Currently there is a single storey residential dwelling existing within the site.

## 1.2 Objective

The main aim of this report is to propose a satisfactory management of post development stormwater from the site. To fulfil this requirement, the following main objectives are proposed:

- To prepare a concept stormwater management plan
- To conduct the pre and post development stormwater quality analysis.

# 2.0 PROPOSED DEVELOPMENT

The proposed development consists of development of four Torrens title lot. Figure 2.1 shows the site plan for the proposed development.

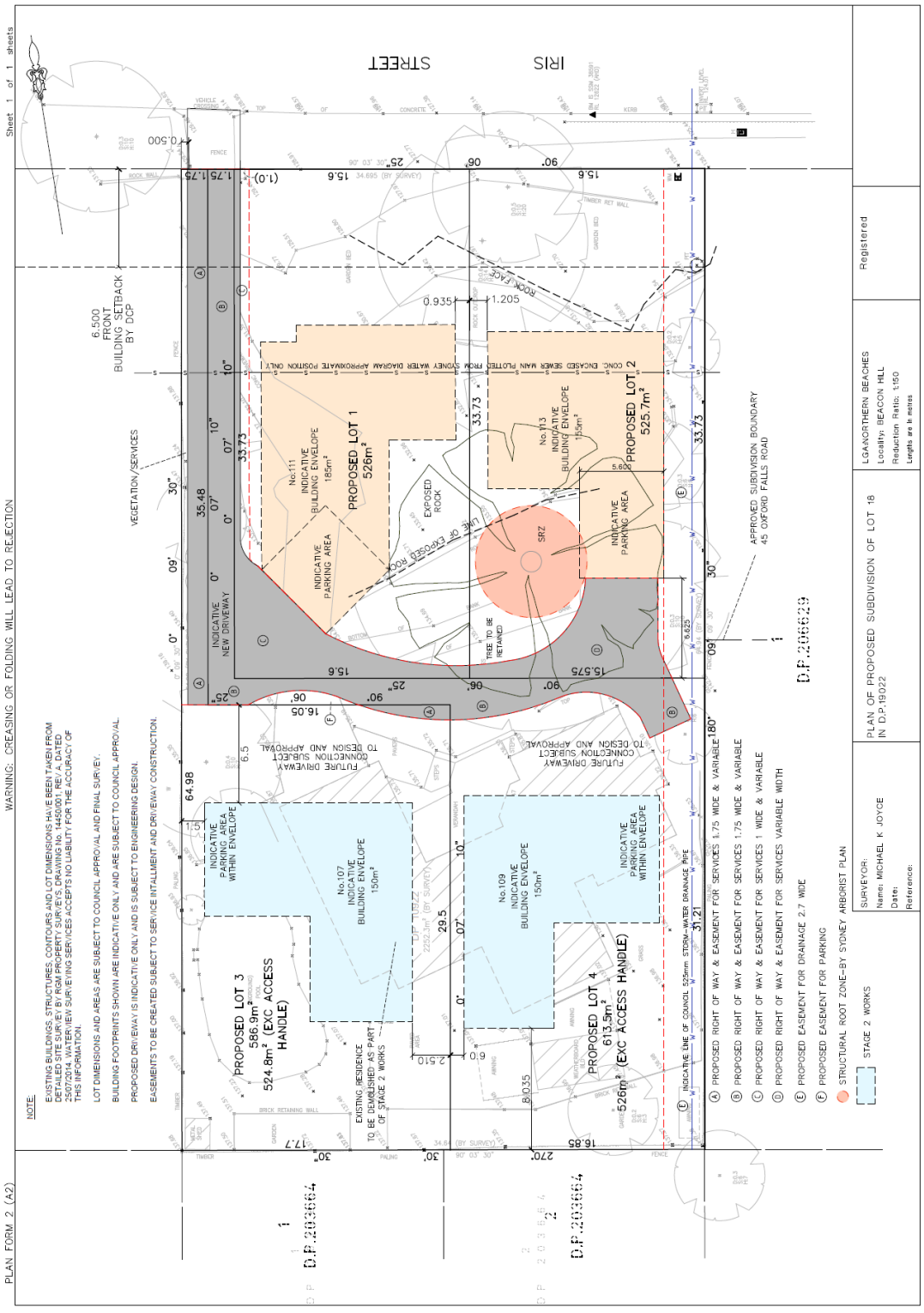



***Figure 2. 1 Site Plan of the Proposed Development***

# 3.0 STORMWATER MANAGEMENT STRATEGY

## 3.1 Flow Contributing Catchments:

For the post development condition, the catchments area contributing flow to the control points are shown in Figure 3.1. The control points are the locations where the onsite detentions (OSDs) have been proposed.

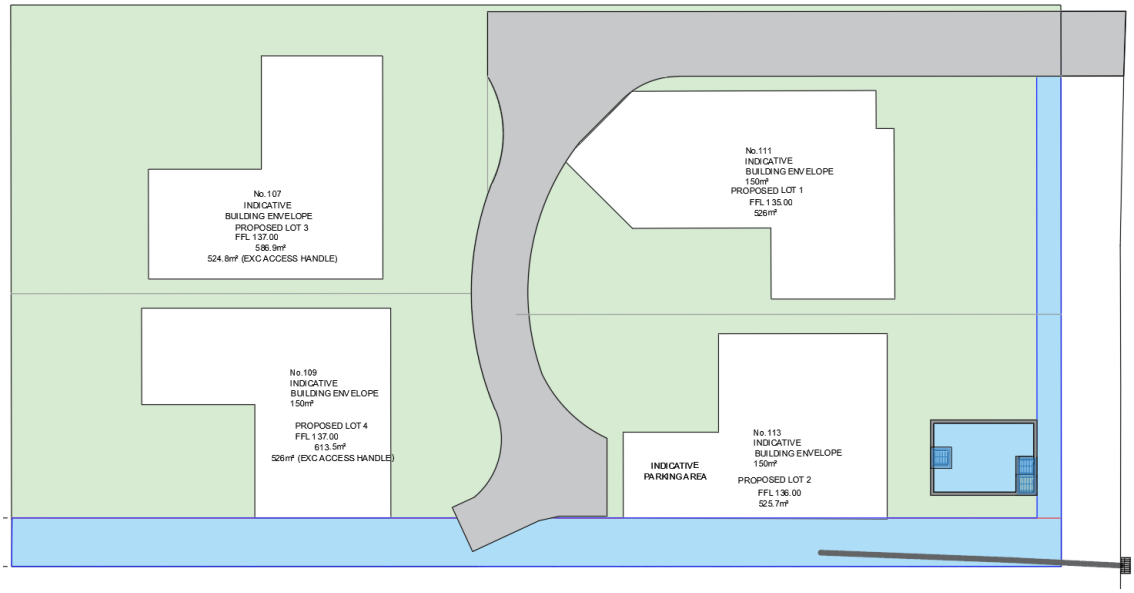



***Figure 3. 1 Catchment contributing post-development flow to the detention basins locations***

Table 3.1 shows the percentage impervious and pervious area of different catchments under pre and post development conditions. The impervious area percentage for the pre development condition was estimated from aerial photography.

***Table 3. 1 Impervious Area Calculation under Pre and Post Development Cases***

| S.N. | Catchment Name | Total Area, Ha | % Impervious | % Pervious |
|---|---|---|---|---|
| **Pre Development Condition** | | | | |
| 1 | Residential | 0.226 | 26 | 74 |
| **Post Development Condition** | | | | |
| **LOT1** | | | | |
| 1 | ROOF | 0.02 | 100 | 0 |
| 2 | Landscape/ Driveway | 0.028 | 33 | 67 |
| **LOT2** | | | | |
| 1 | ROOF | 0.016 | 100 | 0 |
| 2 | Landscape/ Driveway | 0.032 | 40 | 60 |
| **LOT3** | | | | |

| | | | | |
|---|---|---|---|---|
| 1 | ROOF | 0.016 | 100 | 0 |
| 2 | Landscape/ Driveway | 0.037 | 44 | 56 |
| **LOT4** | | | | |
| 1 | ROOF | 0.016 | 100 | 0 |
| 2 | Landscape/ Driveway | 0.035 | 43 | 57 |
| **DRIVEWAY** | | | | |
| 2 | Access Handle | 0.029 | 100 | 0 |

Figure 3.2 shows the stormwater concept plan for the proposed development (See Appendix C for Detail). In the proposal, minimum 5KL rainwater tank has been proposed for each lot. Stormwater runoff from 50% of the roof area of each lot is proposed to connect to rainwater tank. As shown in Figure 3.1, three OSDs have been proposed within the site. Control flow of OSDs and overflow, is finally discharged to the council's drainage system. An interelement drainage easement is proposed along the front boundary of the proposed Lots 1 and 2. Within this stormwater management system as described above, stormwater treatment units such as rainwater tank, Gross Pollutant Trap, Raingarden etc, are employed to improve the quality of stormwater discharging to the council's drainage system.

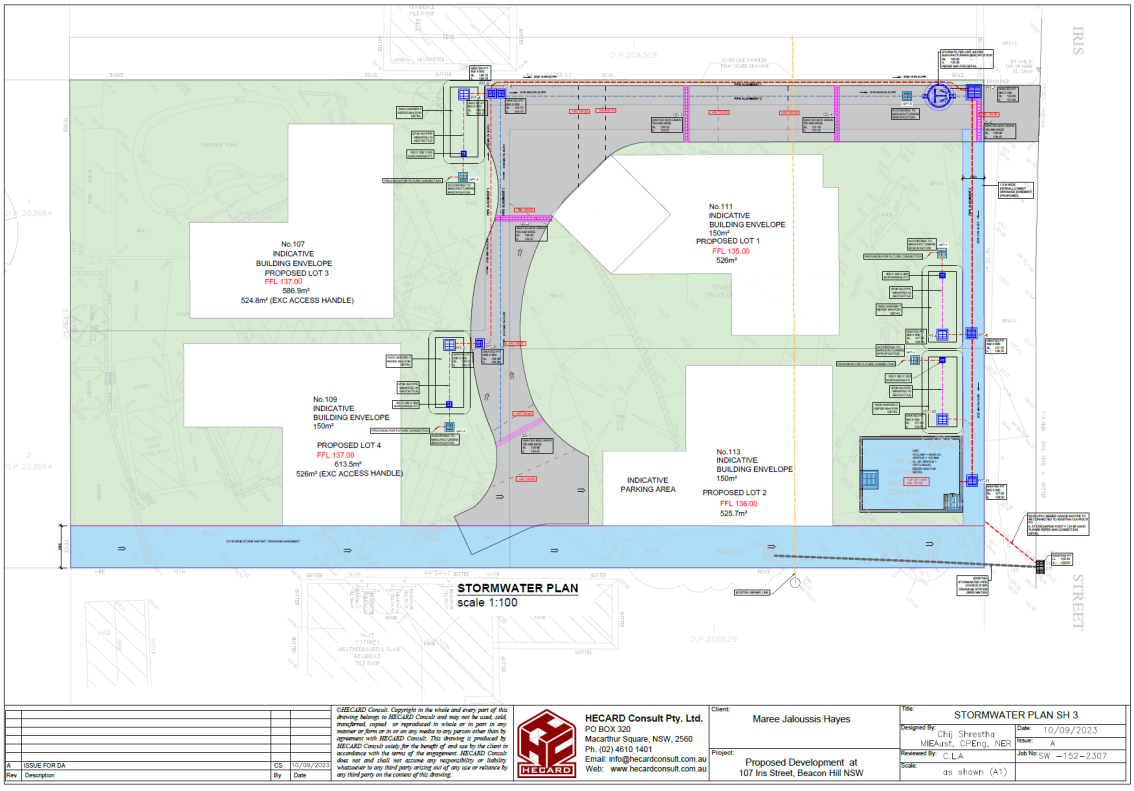



***Figure 3. 2 Stormwater Management Concept Plan***

# 4.0 SITE DISCHARGE

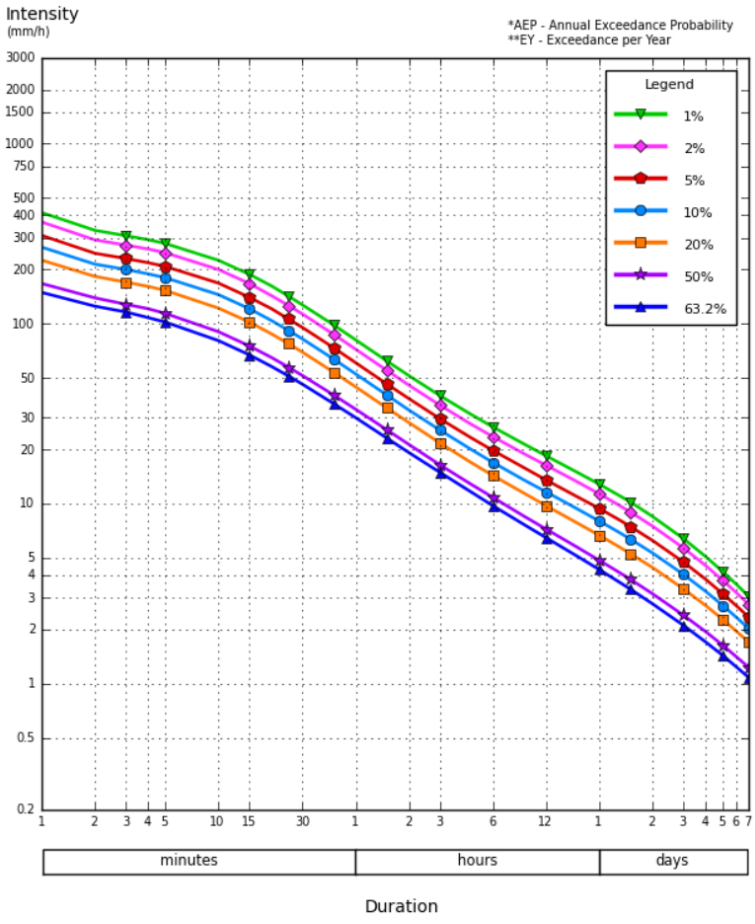
The site has been modelled to ensure that at all storm events from the 20% to the 1% AEP events, the post development discharge from the site does not exceed the pre development (current) conditions.

## 4.1 Drains Modelling

DRAINS software has been used to model the catchment and determined the overland flow rate through the proposed development site for 20%, 5% and 1% AEP storm events. To conduct the hydrological analysis, the following data from different sources have been used:

## 4.2 Infiltration Frequency Duration

Rainfall Data for the proposed development site has been extracted from Intensity Frequency Distribution (IFD) chart published by Bureau of Meteorology. Figures 4.1 a and b show the IFD chart and table respectively.




(a)

| | Annual Exceedance Probability (AEP) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Duration** | **63.2%** | **50%#** | **20%*** | **10%** | **5%** | **2%** | **1%** |
| **1 min** | 149 | 167 | 225 | 266 | 309 | 367 | 414 |
| **2 min** | 125 | 139 | 183 | 214 | 246 | 292 | 330 |
| **3 min** | 116 | 128 | 170 | 200 | 230 | 273 | 308 |
| **4 min** | 108 | 121 | 161 | 189 | 218 | 260 | 293 |
| **5 min** | 102 | 114 | 153 | 180 | 208 | 248 | 279 |
| **10 min** | 80.5 | 90.2 | 122 | 145 | 168 | 200 | 225 |
| **15 min** | 67.0 | 75.1 | 102 | 121 | 140 | 167 | 188 |
| **20 min** | 57.8 | 64.8 | 87.7 | 104 | 121 | 143 | 162 |
| **25 min** | 51.1 | 57.2 | 77.3 | 91.6 | 106 | 126 | 142 |
| **30 min** | 46.0 | 51.4 | 69.3 | 82.1 | 95.1 | 113 | 127 |
| **45 min** | 35.9 | 40.1 | 53.7 | 63.5 | 73.4 | 87.2 | 98.3 |
| **1 hour** | 30.0 | 33.4 | 44.5 | 52.5 | 60.6 | 72.0 | 81.2 |
| **1.5 hour** | 23.1 | 25.7 | 34.0 | 40.1 | 46.2 | 55.0 | 62.0 |
| **2 hour** | 19.2 | 21.3 | 28.2 | 33.1 | 38.3 | 45.5 | 51.4 |
| **3 hour** | 14.9 | 16.4 | 21.7 | 25.6 | 29.6 | 35.2 | 39.8 |
| **4.5 hour** | 11.6 | 12.8 | 16.9 | 20.0 | 23.2 | 27.6 | 31.3 |
| **6 hour** | 9.71 | 10.8 | 14.3 | 16.9 | 19.7 | 23.5 | 26.6 |
| **9 hour** | 7.63 | 8.49 | 11.4 | 13.5 | 15.8 | 18.9 | 21.4 |
| **12 hour** | 6.45 | 7.20 | 9.71 | 11.6 | 13.5 | 16.3 | 18.4 |
| **18 hour** | 5.09 | 5.71 | 7.79 | 9.33 | 10.9 | 13.2 | 14.9 |
| **24 hour** | 4.29 | 4.83 | 6.65 | 7.98 | 9.38 | 11.3 | 12.8 |
| **30 hour** | 3.74 | 4.23 | 5.86 | 7.05 | 8.28 | 9.97 | 11.3 |
| **36 hour** | 3.34 | 3.79 | 5.26 | 6.34 | 7.45 | 8.96 | 10.2 |
| **48 hour** | 2.77 | 3.15 | 4.41 | 5.31 | 6.23 | 7.49 | 8.47 |
| **72 hour** | 2.10 | 2.39 | 3.35 | 4.03 | 4.72 | 5.65 | 6.37 |
| **96 hour** | 1.70 | 1.94 | 2.71 | 3.25 | 3.79 | 4.52 | 5.07 |
| **120 hour** | 1.43 | 1.63 | 2.27 | 2.71 | 3.15 | 3.74 | 4.18 |
| **144 hour** | 1.23 | 1.40 | 1.94 | 2.32 | 2.69 | 3.18 | 3.54 |
| **168 hour** | 1.08 | 1.23 | 1.70 | 2.02 | 2.34 | 2.75 | 3.05 |

Note:
# The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

(b)

***Figure 4. 1 Rainfall intensity in mm/h for various durations and average recurrence interval; a) IFD Chart and b) IFD table (Source: Bureau of Meteorology, Australian Government)***

## 4.3 Hydrological Model Parameters

The ILSAX model has been used in DRAINS software to calculate design flows. The data used in the model are presented in Table 4.1 below.

*Table 4. 1 Hydrological Model Parameters*

| Parameter | Value |
|---|---|
| Design Storm Event: | |
| Minor | 5% AEP |
| Major | 1% AEP |
| Paved (Impervious) area depression storage | 1 mm |
| Grass (Pervious) area depression storage | 5 mm |
| Soil type | 3 (medium infiltration rate) |

The rainfall data were taken from ARR-2019 and ILSAX model has been used to derive design rainfall. The IFD data required for DRAINS is obtained from the BOM website and temporal patterns from the ARR Data Hub, and inputted into DRAINS.

## 4.4 Drains Modelling Result

The catchment of the development site was modelled in DRAINS software using ILSAX model. Table 4.3 below presents pre- development and post development flows from the development site for various storm events. Onsite detention system has been proposed for the temporary storage of stormwater. Modelling results shows that the Volume of OSD required would be 50.17 $m^3$. Total rain water tank offset of 5 $m^3$ has been applied within the system. Therefore, final OSD volume required is calculated as 45.17 $m^3$. In addition, 148 mm dia orifice with its CL at 127.36 mAHD has been proposed in OSD to control the discharge from the site.

*Table 4. 2 Peak Flow for Pre and Post Development Cases*

| **AEP** | **Peak Flow ($m^3/s$)** | | |
|---|---|---|---|
| | **Pre- Development** | **Post Development with Attenuation** | |
| **Catchment A** | | | |
| 20% | 0.091 | 0.059 | |
| 5% | 0.063 | 0.047 | |
| 1% | 0.040 | 0.037 | |

# 5.0 WATER SENSITIVE URBAN DESIGN

To meet the water quality requirements of the Northern Beaches Council, stormwater treatment is required on the site so that the proposed development does not increase the mean annual pollutant load discharged into downstream council's drainage system when compared to Pre-Development site conditions.

Pollution load reduction is one of the major Performance Criteria Stormwater quality requirements for all development types within Northern Beaches Council. The target to annual reduction in pollution load is presented in Table 5.1.

***Table 5. 1 Target to Annual Pollutant Load Reduction***

| **Annual Reduction in Pollution Load** | |
|---|---|
| **Pollutants** | **Reduction Target** |
| Gross Pollutant | 90% |
| Total Suspended Solids (TSS) | 85% |
| Total Phosphorus (TP) | 65% |
| Total Nitrogen (TN) | 45% |

The proposed stormwater treatment system includes rain water tanks, gross pollutant trap (GPT), raingardens and Storm-Filter

## 5.1 Stormwater Quality Modelling

The software used for the water quality modelling is MUSIC 6.3.0. This program is well regarded as industry best practice for analysis of the effectiveness of treatment mechanisms on the quality of stormwater runoff from a development site of this size. MUSIC simulates the performance of stormwater management systems in removing nutrients and sediments from a catchment by evaluating the average annual pollutant load delivered to the receiving waters. It uses both source nodes (produce pollutants) and treatment nodes (remove pollutants) to analyse a stormwater system.

For the proposed development site, Modelling has been performed by assuming **sandy loam soil type**.

### 5.1.1 Soil Data

MUSIC requires the input of both soil data and pollutant concentrations for each node. Pervious and Impervious Area properties have been referenced from Northern Beaches Council- WSUD and MUSIC Modelling Guidelines and Pollutant Load Concentration has been sourced from the MUSIC modelling Guidelines NSW 2015. Those parameters are presented in Tables 5.2 and 5.3

***Table 5. 2 MUSIC Pervious/ Impervious Properties***

| **Impervious Properties** | |
|---|---|
| **Node Type** | **Rainfall Threshold (mm)** |
| Roofs | 0.3 |
| Landscaped Area | 1.5 |
| Driveway / Car Park | 1.5 |
| **Pervious Properties** | **Groundwater Properties** |
| Soil Storage Capacity – 108 mm | Initial Depth – 10mm |
| Initial Storage – 30% | Daily Recharge Rate – 60% |
| Field Capacity – 73 mm | Daily Base Flow Rate – 45% |
| Infiltration Coefficient A - 250 | Daily Seepage Rate – 0% |
| Infiltration Coefficient B – 1.3 | |

***Table 5. 3 MUSIC Pollutant Loads***

| **Node Type** | **Base Flow ($Log_{10}$mg/L)** | **Std Dev ($Log_{10}$mg/L)** | **Storm Flow ($Log_{10}$mg/L)** | **Std Dev ($Log_{10}$mg/L)** |
|---|---|---|---|---|
| **Landscaped Area** | | | | |
| TSS | 1.2 | 0.17 | 2.15 | 0.32 |
| TP | -0.85 | 0.19 | -0.60 | 0.25 |
| TN | 0.11 | 0.12 | 0.30 | 0.19 |
| **Roofs** | | | | |
| TSS | n/a | n/a | 1.3 | 0.32 |
| TP | n/a | n/a | -0.89 | 0.25 |
| TN | n/a | n/a | 0.30 | 0.19 |
| **Driveway / Car Park** | | | | |
| TSS | n/a | n/a | 2.43 | 0.32 |
| TP | n/a | n/a | -0.30 | 0.25 |
| TN | n/a | n/a | 0.34 | 0.19 |

### 5.1.2 Rainfall Data

Rainfall data used in the MUSIC modelling has been taken in accordance with the Council's Music modelling guidelines, which recommends to use the Sydney Observatory 6-minute rainfall data. A six-year period of pluviograph data was selected for the period of 1/1/1981 to 31/12/1985 to be adopted in the MUSIC modelling.

## 5.2 Treatment Devices

The stormwater design for the proposed development will use a combination of at source and conveyance controls to treat the stormwater runoff from the site. The following are the treatment trains proposed for this development.

### 5.2.1 Rainwater Tank

It is required to use non- potable water on all new buildings. In this report, a 5000 L rainwater tank per lot is assumed for the proposed development. Further to this, it is proposed that at least 50% of the roof water is directed to rainwater tanks. The tank is to be fitted with a council approved first flush device. Overflows from rainwater tanks will be directed to the nearest pit from where it is conveyed to raingarden and finally to the onsite detention system.

### 5.2.2 Gross Pollutant Traps (GPT)

In this project, Gross pollutant traps (GPTs) are typically designed to filter stormwater for all events up to the 3-month ARI flow (approximately 50% of the 1-year ARI flow). In a typical urban catchment over a long-term period this will typically result in at least 90% of the long-term runoff volume being filtered through a well-maintained GPT. In the model, the high flow bypass rate is determined using DRAINS (ILSAX model), which is equivalent to 10% of the total flow volume. The MUSIC model is developed adopting assumptions that TP and TN removal efficiencies are zero.

In the project, GPTs are generally used as pre-treatment measure prior to treatment through raingardens. During modelling, EnviroBasins are used as GPTs, which is ISO1400 verified at removing >60% TSS. Figure 5.1 shows the detail of EnviroBasin sourced from manufacturer.

Gross Pollutant Trap (Enviro basin)
(One for each lot and one for driveway)

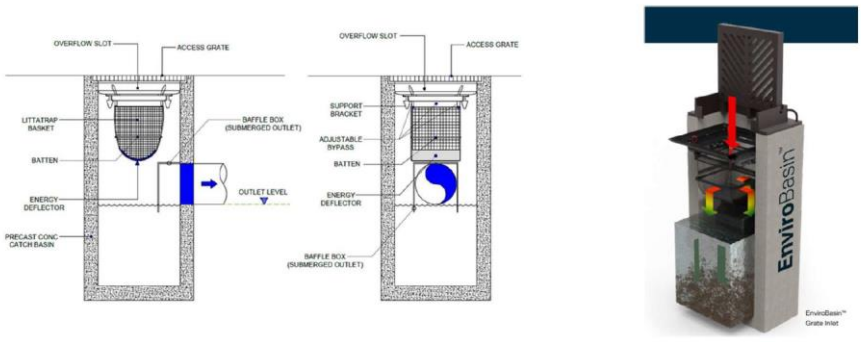



***Figure 5. 1 EnviroBasin Detail***

The properties of Bio-retention basins are presented in Figure 5.2.

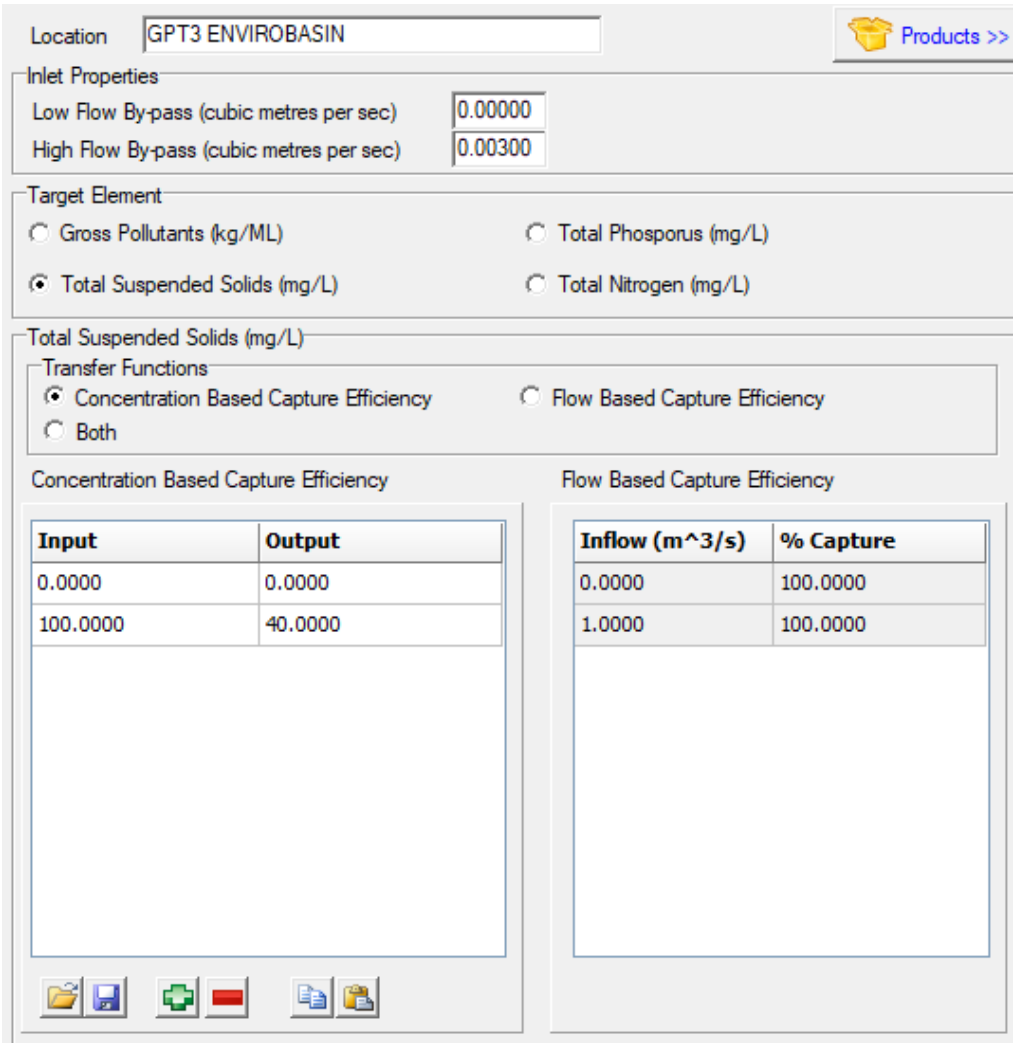



***Figure 5. 2 Properties of GPT used in this Project***

## 5.2.3 Raingarden

In this development proposal, a raingarden for each lot has been proposed. The raingarden will have high flow bypass weir to help safely convey the 1% AEP flow and to treat low flows before they are discharged into the Onsite Detention System. The properties of raingarden are presented in Figure 5.3 and typical schematic of Bio-retention basin is shown in Figure 5.4.

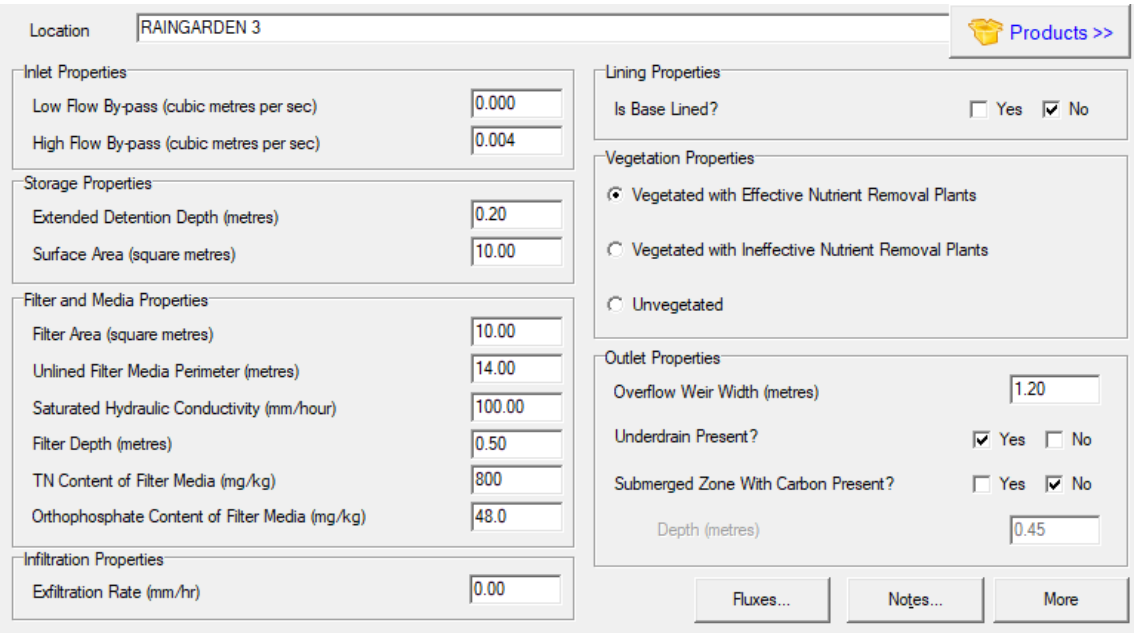



***Figure 5. 3 Properties of Raingarden***

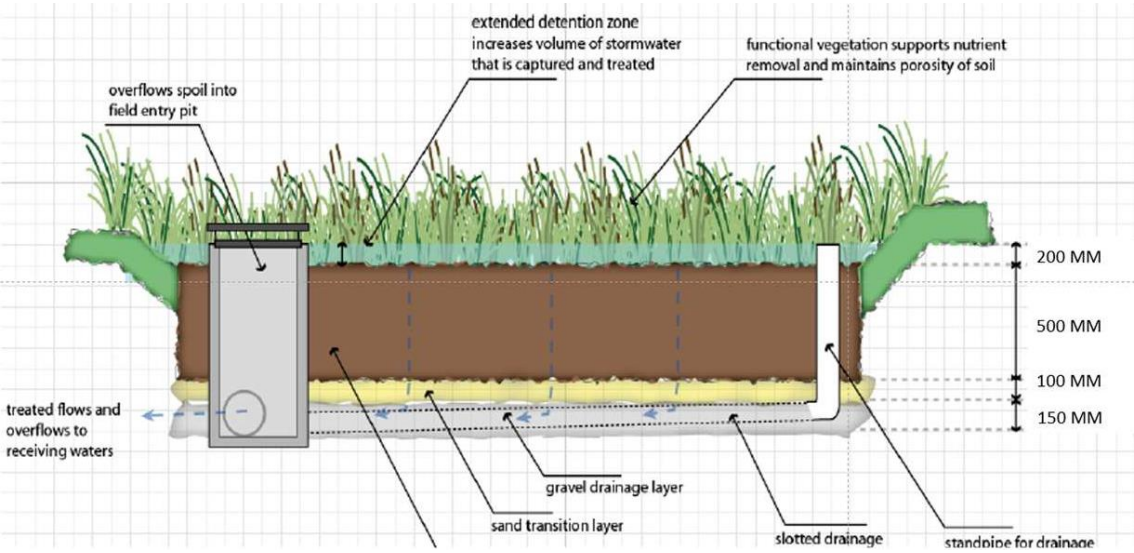



***Figure 5. 4 Typical Schematics of Raingarden***

### 5.2.4 Filter Cartridges (Storm Filter)

In this development the stormwater runoff from the driveway handle is first treated by Standard Filter Cartridges prior to discharge to OSD system. In the MUSIC model, four numbers of Ocean Protect StormFilter (4 X PSorb460) have been proposed. The Ocean Protect StormFilter is an underground stormwater treatment device comprised of one or more structures that house rechargeable, media-filled cartridges that trap particulates and

adsorb pollutants from stormwater runoff such as total suspended solids, hydrocarbons, nutrients, metals, and other common pollutants.

| Cartridge Name / Siphon Height (mm) | 690 | 460 | 310 |
|---|---|---|---|
| Physical Height (H) mm | 840 | 600 | 600 |
| Typical Weir Height from outlet (Head Loss, mm) | 920 | 690 | 540 |
| Flow Rate ZPG (L/s) | 1.60 | 1.10 | 0.70 |
| Flow Rate PSorb (L/s) | 0.90 | 0.46 | 0.39 |

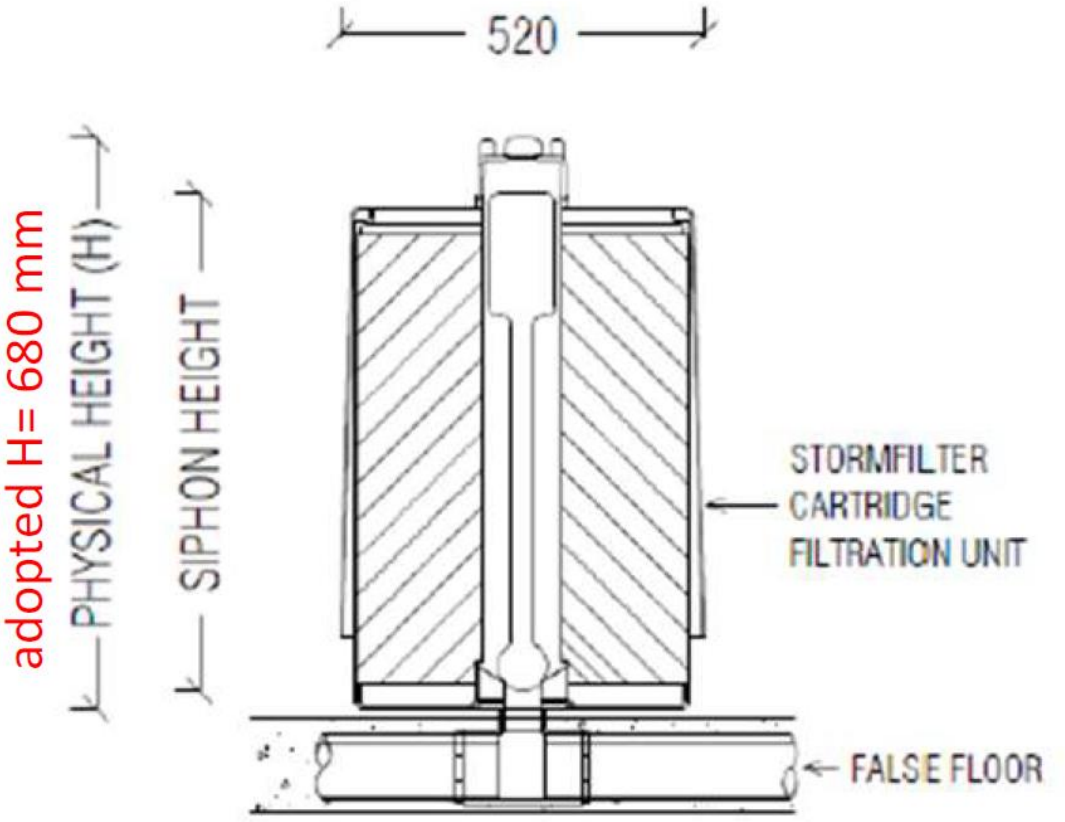



***Figure 5. 5 Typical Schematic detail of PSorb460 StormFilter***

According the application review of PSorb Stormfilter prepared by Ocean Protect, the pollutant removal transfer function values vary across jurisdictions within Australia. Table 5.4 summarises the applied stormwater treatment performance for PSorb StormFilter in Queensland and NSW (as applied to the MUSIC generic treatment node transfer function values).

The treatment performance of PSorb StormFilter used in the current model is referenced from Moreton Bay Regional Councils as shown in Table 5.4.

***Table 5. 4 Applied stormwater treatment performances for PSorb StormFilter in Queensland and NSW*** *(Source: Ocean Protect: A review of the application of StormFilter in Australia 2021)*

| Parameter | % Reduction | | | | Comments |
|---|---|---|---|---|---|
| | GPs | TSS | TP | TN | |
| **Queensland** | | | | | |
| City of Gold Coast | 100% | 93.4 | 86.1 | 46.3 | |
| Moreton Bay Regional Council | 100% | 86.8 | 77.6 | 51.2 | Moreton Bay Regional Council require that StormFilter® apply a Generic Treatment node alone (i.e. no detention basin node) |
| Logan City Council | 100% | 88.3 | 78 | 53 | |
| All other Councils in Queensland (including Brisbane City, Ipswich City and Sunshine Coast Regional Councils) | 100% | 90.4 | 86.1 | 55.9 | |
| **NSW** | | | | | |
| Local governments in NSW* | 100% | 93.4 | 86.1 | 55.9 | |

*: Blacktown City Council approve ZPG StormFilter®, with GP, TSS, TP and TN reductions of 95%, 85%, 59%, and 33% respectively.

## 5.3 MUSIC Model Layout

A screenshot of the MUSIC model of the development site is shown in Figure 5.6

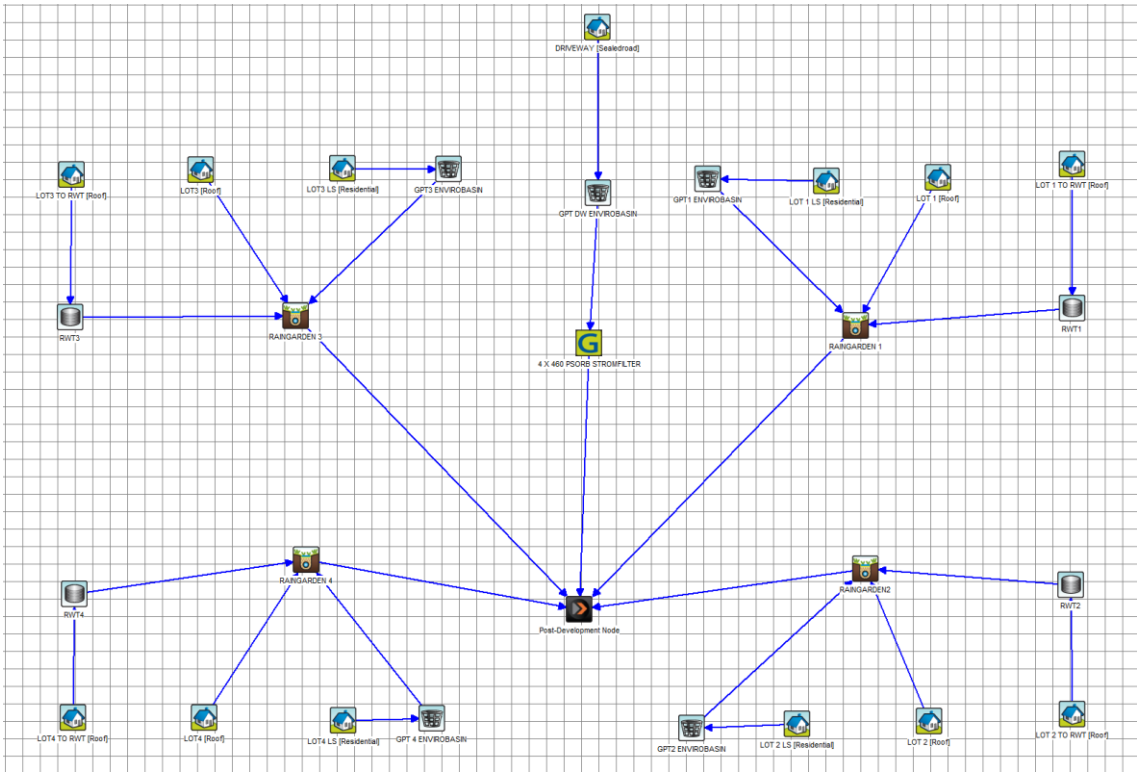



***Figure 5. 6 MUSIC Model Layout for the Proposed Development***

## 5.4 Results and Discussion

Table 5.5 below shows a screen capture from the MUSIC model giving the expected treatment efficiencies for the system before it releases water to council's stormwater drainage system and the corresponding reduction.

***Table 5. 5 MUSIC Results***

| | Sources | | Residual Load | | % Reduction | |
|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post |
| **Flow (ML/yr)** | 1.27 | 2.01 | 1.27 | 1.57 | 0 | 21.9 |
| **Total Suspended Solids (kg/yr)** | 165 | 261 | 165 | 25.2 | 0 | 90.3 |
| **Total Phosphorus (kg/yr)** | 0.313 | 0.543 | 0.313 | 0.19 | 0 | 65 |
| **Total Nitrogen (kg/yr)** | 2.38 | 4.3 | 2.38 | 1.55 | 0 | 64 |
| **Gross Pollutants (kg/yr)** | 27.1 | 50.2 | 27.1 | 1.11 | 0 | 97.8 |

It can be seen from Table 5.5 that the reduction in pollutants; Total Suspended Solids (TSS), Phosphorous, Nitrogen and Gross Pollutant are satisfactorily met by the treatment system.

MUSIC does not explicitly calculate treatment efficiency for hydrocarbons and oils. It is not expected that treatable levels of hydrocarbons will come off the roof and landscaped area as there will be no mechanism for them to be deposited there, the car park and driveway will however accumulate some hydrocarbons and oils. GPT and bio-retention basins are expected to meet any hydrocarbon and oils removal requirement.

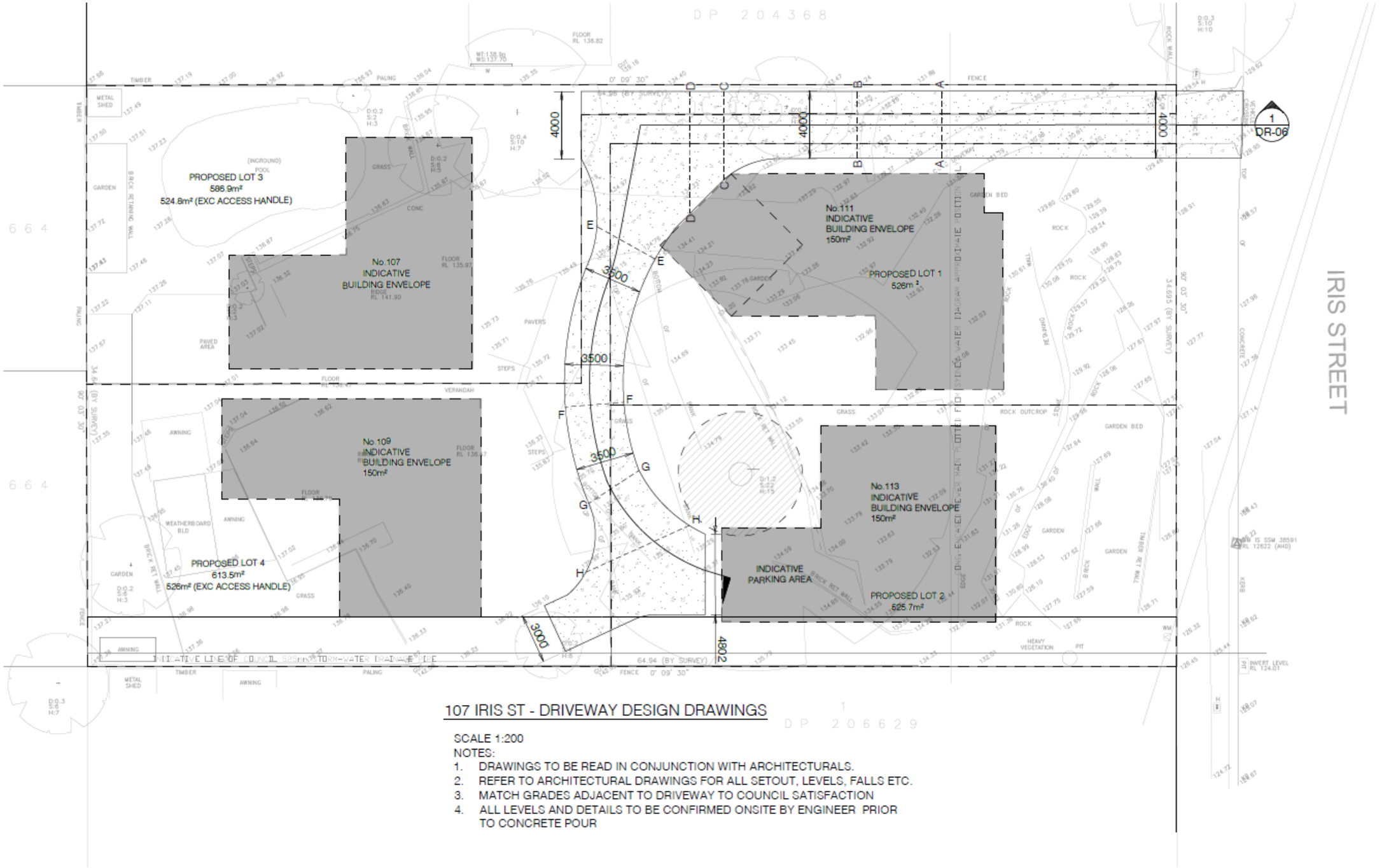
# 6.0 CONCLUSION AND RECOMMENDATION

The concluding remarks drawn out from the proposed stormwater concept plan and modelling results are:

- The proposed development includes four lots Torren Title residential subdivision.
- Onsite detention (OSD) basin is proposed at the lowest point of the site. The capacity of OSD is 45.71 $m^3$ and Orifice size would be 148 mm diameter with its centre at 127.36 mAHD.
- For each lot one raingarden is proposed at upstream side of a OSD. The filter area of each rain garden would be 10 sq m and 750 mm deep filter media. At upstream side of raingarden, a Gross Pollutant Trap (GPT) is proposed.
- A 5000 L rainwater tank for each lot is proposed for future use, non-potable water to be used for toilets and irrigation.
- The proposed treatment devices are effective at reducing total pollutant loads, peaks flows and total volume of flows generated across the proposed site in accordance with Council's requirements.
- The proposed stormwater management strategy can effectively manage stormwater runoff to ensure that the proposed residential subdivision will not result in an increase in pollutants or stormwater flows and will not result in any significant impacts to receiving waterways or downstream infrastructure.

Detailed analysis and investigations will be undertaken at future stages of detailed design so as to confirm and precisely detail the relevant hydraulic analysis and calculations.

# APPENDIX – A: PROPOSED DEVELOPMENT PLAN




## 107 IRIS ST - DRIVEWAY DESIGN DRAWINGS

SCALE 1:200

NOTES:

1. DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURALS.
2. REFER TO ARCHITECTURAL DRAWINGS FOR ALL SETOUT, LEVELS, FALLS ETC.
3. MATCH GRADES ADJACENT TO DRIVEWAY TO COUNCIL SATISFACTION
4. ALL LEVELS AND DETAILS TO BE CONFIRMED ONSITE BY ENGINEER PRIOR TO CONCRETE POUR

TPC Technical Projects Consultants

T: 02 810 49780
E: info@tpc-eng.com.au
A: 13/35 Birch Street, Condell Park NSW 2200
W: www.tpc-eng.com.au



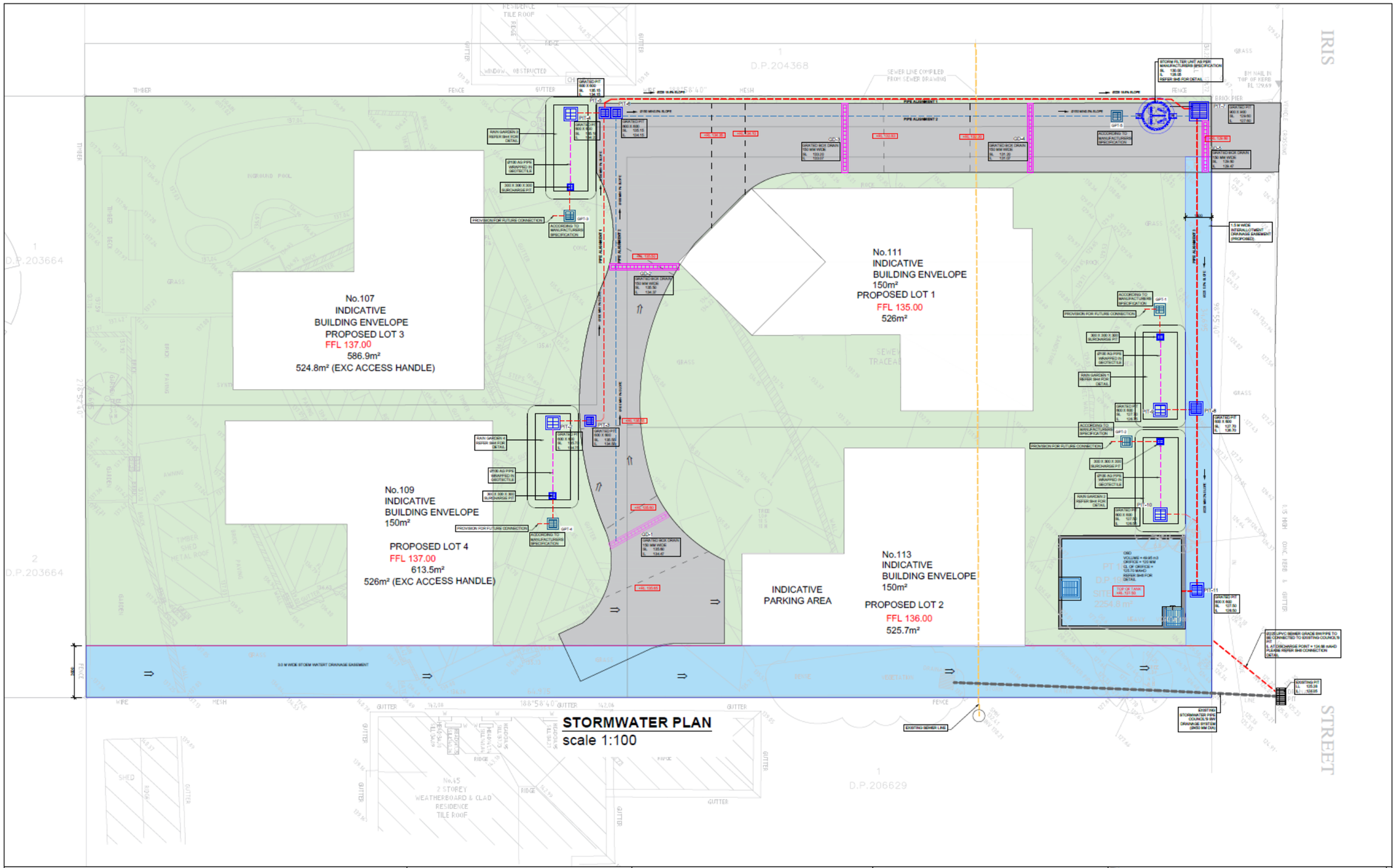
**CONSULTANTS:**

| REV | DATE | DESCRIPTION |
|---|---|---|
| 1 | 14/03/23 | |
| 2 | 31/03/23 | |
| 3 | 14/04/23 | |
| 4 | 31/08/23 | |

**COUNCIL:** Northern Beaches Council
**DRAWN BY:** D.B
**DESIGNED BY:** R.D
**CLIENT:**
**DRAWING TITLE:** Stormwater Drainage Plan

**SITE ADDRESS:** 107 Iris St, Beacon Hill NSW 2100
**LOT:** 18 | **SEC:** - | **DP:** 19022
**ISSUED FOR:** CDC
**PROJECT:** Proposed Dwelling
**SCALE:** 1:150 @ A3 **DATE:** 31/08/23 **REV:** R4 **SHEET NO.:** DR05
**PROJECT NO:** 23-031

# APPENDIX – C: STORMWATER CONCEPT PLAN




| Rev | Description | By | Date |
|---|---|---|---|
| A | ISSUE FOR DA | CS | 10/09/2023 |



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Client: Maree Jaloussis Hayes

Project: Proposed Development at 107 Iris Street, Beacon Hill NSW

Title: STORMWATER PLAN SH 3

Designed By: Chij Shrestha MIEAust, CPEng, NER
Date: 10/09/2023
Reviewed By: C.L.A
Issue: A
Scale: as shown (A1)
Job No: SW –152–2307

# APPENDIX D-MUSIC MODEL LAYOUT

| | Sources | | Residual Load | | % Reduction | |
|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post |
| Flow (ML/yr) | 1.27 | 2.01 | 1.27 | 1.57 | 0 | 21.9 |
| Total Suspended Solids (kg/yr) | 165 | 261 | 165 | 25.2 | 0 | 90.3 |
| Total Phosphorus (kg/yr) | 0.313 | 0.543 | 0.313 | 0.19 | 0 | 65 |
| Total Nitrogen (kg/yr) | 2.38 | 4.3 | 2.38 | 1.55 | 0 | 64 |
| Gross Pollutants (kg/yr) | 27.1 | 50.2 | 27.1 | 1.11 | 0 | 97.8 |