

17 December 2018

Stormwater management plan for the proposed new industrial development at 130 Old Pittwater Road

1.0 Executive Summary

mgp was engaged to assess the proposed new industrial development at 130 Old Pittwater Road, Brookvale (130 OPR) for construction of a new industrial/warehouse building including parking, in reference to stormwater quantity and quality.

The stormwater development works propose:

- The relocation of an existing open channel (SPO 1223) and connection into the proposed drainage culvert on the adjacent lot (138-140 Old Pittwater Road). Refer to SW-231 for a layout of the existing council stormwater assets.
- Construction of a 100 kl on-site detention (OSD) system with a high early discharge (HED) arrangement, and associated stormwater quality improvement devices (Stormwater360 (SW360) Stormfilter cartridges and pit baskets).

Stormwater Quantity and Conveyance

The development is serviced by a series of pits and pipes connected to an OSD system located below the proposed structure. The OSD discharge is piped to a proposed headwall outlet structure in the north of the site. An overflow weir is provided within the OSD allowing for a safe overflow path directly to the outlet structure on the adjacent lot.

The proposed development's stormwater system and disposal philosophy is consistent with Northern Beaches Council (formerly Warringah Council) – *"On-site Stormwater Technical Specification, s4.2.3 Full Computational Method"*. In this regard the post-development peak stormwater discharge:

- does not exceed the pre-development peak discharge for flows up to the 0.5 EY event,
- piped flow is restricted to the 0.2 EY event state of nature case for flows up to the 1% AEP event, and;
- piped and overland flow is restricted to the pre-developed state of nature case for flows up to the 1% AEP event.

Stormwater Quality

The following stormwater quality improvement devices (SQIDs) are proposed and located within the OSD system:

- 4 off SW360 690mm PSorb cartridges
- 2 off SW360 Enviropod pit baskets

The proposed stormwater quality improvement strategy was modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software package and has been prepared in accordance with the following documents:

- Northern Beaches Council (Warringah) PL 850 WATER – *"Water Management Policy (2017)"*
- Northern Beaches Council – *"WSUD & MUSIC Modelling Guidelines"*

The proposed stormwater management plan as described in this report and the attached plans (Appendix B) is recommended as a safe a practical stormwater solution to support the proposed development.

2.0 Introduction

mgp was engaged to assess the proposed new industrial development at 130 Old Pittwater Road, Brookvale (130 OPR) for construction of a new industrial/warehouse building including parking in reference to stormwater quantity and quality.

The purpose of this report and supporting drawings is to provide a summary of the proposed stormwater systems and show feasibility of the proposed development with regard to on-site stormwater management. The design is not intended as a detailed construction document.

3.0 Existing Development

Lot A, DP 402556 known as 130 Old Pittwater Road consists of a single 13,500 m² trapezoidal lot. Current development of the lot consists of two warehouse buildings at the front of the site and associated access driveway along the southern and northern boundaries. The rear of the lot extending west toward Allenby Park Parade is currently vacant and in a natural state. The natural section of the site is bisected by an open channel (SPO 01223) servicing Council's stormwater drainage infrastructure in Allenby Park Parade to the west. The open channel terminates at a headwall adjacent to the southern boundary of the site within the adjacent lot (Lot 11, DP 703489) before entering a 900mm RCP (SPI 13420) ultimately draining to Manly Lagoon.

4.0 Proposed Development

The proposed works are shown in the architectural drawings prepared by Leech Harmon Architects, refer (Appendix A).

The development proposes construction of a 3-storey industrial complex cut into the hillside and partly suspended above the existing structure toward the rear of the site and diversion of the existing open channel (SPO 01223) bisecting the site. The development involves excavation into the existing hillside to construct the proposed building, access to the development is provided through the adjacent lot 138-140 Old Pittwater Road.

5.0 Stormwater Management Plan

5.1 Performance Criteria

The proposed development's stormwater system and disposal philosophy is consistent with Northern Beaches Council (formerly Warringah Council) – *"On-site Stormwater Technical Specification, s4.2.3 Full Computational Method" PL850 Table 4 (Hydrology)*. In this regard:

- the post-development peak discharge must not exceed the pre-development peak discharge for flows up to the 0.5 EY rain event,
- peak piped stormwater flows from the development are restricted to the 0.2 EY rain event state of nature case for all storms up to and including the 1% AEP rain event, and;
- peak stormwater discharge from the site (piped and overland) is restricted to the pre-developed state of nature case for all storms up to and including the 1% AEP rain event.

Drainage components for the site have been sized and designed in accordance with Table 1.

Table 1 - Design rain event for drainage components

Drainage Component	Design Rain Event
Roof drainage system	5% AEP
On-site detention (OSD) system	1% AEP
Pits and pipes draining to the OSD	1% AEP
Channels, culverts and overflow paths	1% AEP

5.2 Existing Stormwater System

Existing development at the front of the site drains to Council's drainage infrastructure in Old Pittwater Road.

The undeveloped upper reach of the site is predominantly bushland and is bisected by an existing open channel (SPO 01223) servicing Council's stormwater drainage infrastructure in Allenby Park Parade to the west. The open

channel terminates at a headwall adjacent to the southern boundary of the site within the adjacent lot (Lot 11, DP 703489) before entering a 900mm RCP (SPI 13420) ultimately draining to Manly Lagoon.

5.3 Proposed stormwater system

The development proposes the relocation of the existing open channel (SPO 01223) and construction of a 50kl OSD system. Stormwater collected on the development is directed to the OSD system located below the proposed structure using a network of pits and pipe. The OSD discharge is piped to the proposed headwall outlet structure on the adjacent site (Lot 11, DP 703489) to the south of the OSD. An overflow weir is provided within the OSD allowing for a safe overflow path directly to the outlet structure.

No change to the stormwater drainage system servicing the existing development is proposed.

The proposed stormwater management plan is attached in Appendix B.

5.4 OSD Design and Modelling

The proposed stormwater system was designed using DRAINS Hydrologic and Hydraulic Urban Catchment modelling. Rainfall data was derived from BOM IFD based on latitude/longitude for the site. The following design parameters were adopted:

- soil type = 2.5
- antecedent moisture content, AMC = 3
- infiltration rates: initial paved = 1 mm, grassed = 5 mm
- hardstand areas retardance coefficient 'n': 0.012
- pervious areas retardance coefficient 'n': 0.15 (sparse vegetation)

The design process undertaken for this project within DRAINS is outlined below:

1. Determine pre-development peak flows for 20% and 1%AEP rain events
2. Match pre and post development 20% and 1%AEP peak flows by adjusting the OSD arrangement
3. Check 5%AEP rainfall events to ensure compliance
4. Check piped flow from the OSD < 20%AEP pre-developed peak flow for the site
5. Check post-development peak discharge is less than or equal to pre-development peak discharge for flows up to the 50% AEP.

Development Catchment Area

For the purpose of calculating the effect that the proposed development would have on peak discharge from the site, the existing development's drainage system has been excluded and only the proposed development area is considered. The footprint of the proposed development is calculated to be 1,878 m². Any areas outside of this footprint remain unchanged post-development and will not impact on the peak flows discharged by the site.

On this basis flows generated outside of the development footprint are assumed constant and have not been modelled.

Refer to SW-001 for post-development catchments.

State of Nature

- The state of nature case for the site was modelled as:
 - a. Bushland 1,878m² (100% pervious)
- Catchment slopes and flow path lengths were determined from survey data

Pre-Development

- The pre-development case for the site was modelled as:
 - a. Existing hardstand 1,801m² (100% impervious)
 - b. Bushland 1,875m² (100% pervious)

- Catchment slopes and flow path lengths were determined from survey data

Post-Development

- The post-development case was modelled as:
 - OSD bypass 324m² (100% pervious)
 - Development to OSD 3352m² (100% impervious)
- Catchment slopes and flow path lengths were determined from architectural plans and survey data

5.5 Results

The properties of the final OSD system modelled that met the performance criteria outlined in s5.1 is shown in Figure 1 below. The storage vs. elevation graph for the system is shown in Figure 2.

Figure 1 – OSD modelling properties (DRAINS)

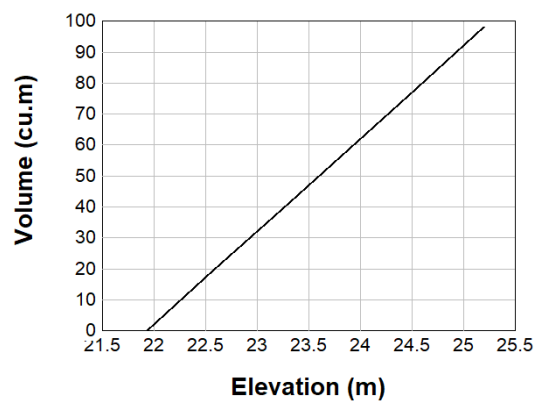


Figure 2 – Storage vs. elevation for the proposed OSD

The runoff from the site after development will not exceed the runoff from the total site prior to the development, for the modelled durations during 0.2 EY, 5% AEP and 1% AEP storm events as described in Table 2.

Table 2 – State of nature and post-development peak flows

RAIN EVENT	STATE OF NATURE	POST-DEVELOPMENT		
	100% PERVIOUS (l/s)	IMPERVIOUS FROM OSD - PIPED (l/s)	PERVIOUS BYPASS (l/s)	TOTAL (l/s)
0.2 EY	88	76	8	82
5% AEP	153	76	14	90
1% AEP	217	77	19	96

Additionally, post-development peak discharge was checked for the 0.5 EY storm event in accordance the hydrology requirement of NBC PL 850 – Table 4 - General Stormwater Quality Requirements. Table 3 demonstrates that during the 0.5 EY stormwater the post-development peak discharge does not exceed the pre-development peak discharge.

Table 3 – Pre-development and post-development peak flow check for water quality (0.5EY rain event)

RAIN EVENT	PRE-DEVELOPMENT		POST-DEVELOPMENT		
	49% PERVIOUS (l/s)	TOTAL (l/s)	IMPERVIOUS FROM OSD - PIPED (l/s)	PERVIOUS BYPASS (l/s)	TOTAL (l/s)
0.5 EY	81	81	75	5	80

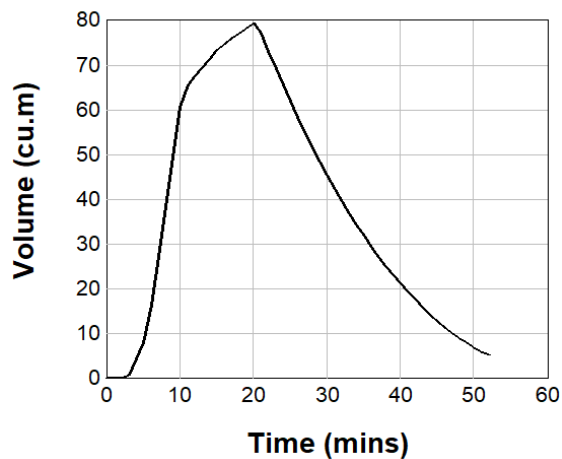


Figure 3 – Storage Volume, 1% AEP, 20min burst, Storm 2

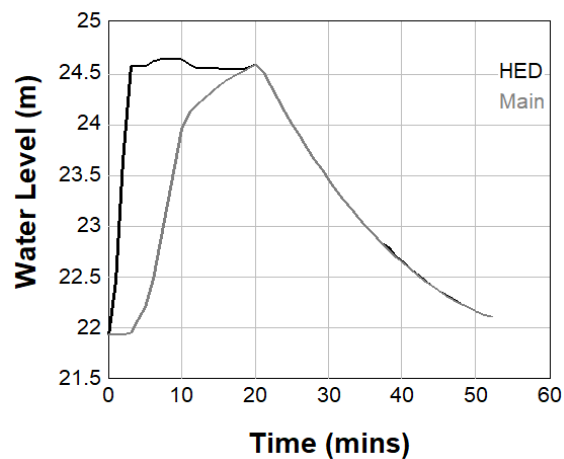


Figure 4 – Water Level, 1% AEP, 20min burst, Storm 2

Figure 3 and Figure 4 above show the peak storage volume and water level during the 1% AEP critical storm event. Additionally, these figures demonstrate that the proposed OSD system is sufficiently sized so as not to overflow during the 1% AEP critical storm event and provides 300mm freeboard to the top of the tank.

The proposed OSD system meets the performance criteria outlined in s5.1 and is described on drawing SW-220, refer Appendix B.

6.0 Stormwater Quality

6.1 Performance Criteria

The proposed Water Quality Management Strategy has been designed in accordance with Northern Beaches Council (Warringah) PL 850 WATER – Water Management Policy (2017) including:

- 90% reduction in the post development mean annual load of Gross Pollutants
- 85% reduction in the post development mean annual load of Total Suspended Solids (TSS)
- 65% reduction in the post development mean annual load of Total Phosphorus (TP)
- 45% reduction in the post development mean annual load of Total Nitrogen (TN)

7.0 Proposed development and WSUD Measures

Details of the proposed development are outlined above in 4.0.

The following stormwater quality improvement devices (SQIDs) are proposed and located within the OSD system:

- 4 off SW360 690mm PSorb cartridges
- 2 off SW360 Enviropod pit baskets

7.1 Performance of Proposed Strategy

Conceptual water quality modelling using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.3.0 was undertaken to estimate the effectiveness of the proposed stormwater management strategy at removing pollutants, particularly sediment, phosphorous and nitrogen, over the long term.

The procedures and assumptions outlined Northern Beaches Council (NBC) “*WSUD & MUSIC Modelling Guidelines*” have been followed in the preparation of MUSIC modelling for this site including the use of the following:

- Continuous rainfall data (6 minute) from Sydney Rainfall Station (Bureau of Meteorology station no. 66062)
- Recommended settings by NBC “*WSUD & MUSIC Modelling Guidelines*” for:
 - a. Average Monthly Potential Evapotranspiration (PET)
 - b. Rainfall-Runoff Parameters and Pollutant Generation Parameters

c. MUSIC source nodes

7.2 Model Configuration

Figure 5 shows the setup and layout of the MUSIC model for the proposed stormwater treatment measures.

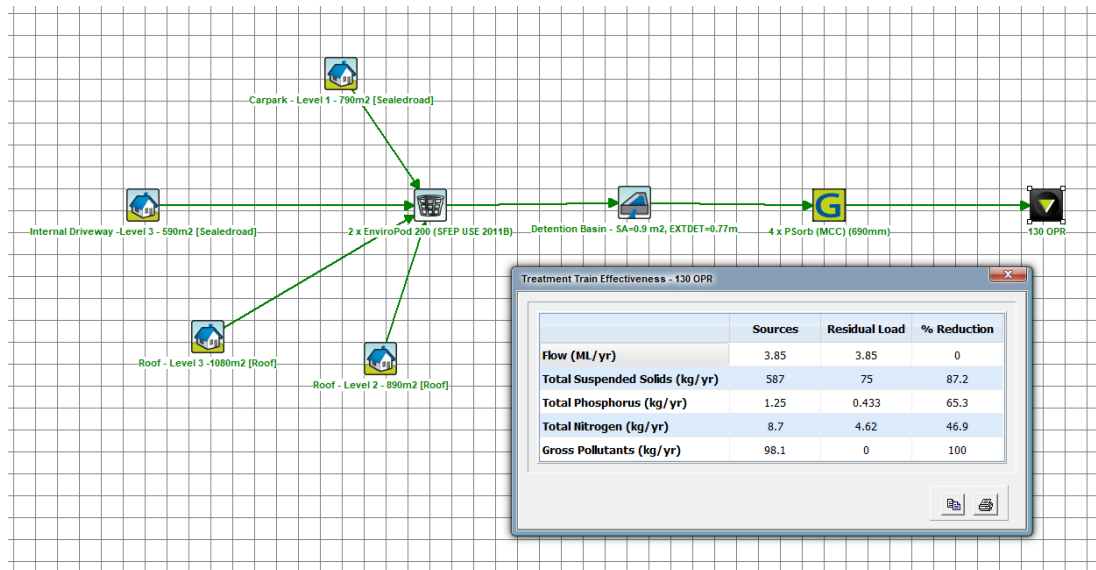


Figure 5 - MUSIC model configuration

7.3 Results

The MUSIC model results showed that the proposed Water Quality Management Strategy provides a reduction in post development loads of Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants by 87%, 65%, 47% and 100% respectively (see Table 4).

This exceeds Council's pollution reduction targets outlined in NBC PL850 Water.

Table 4 - Effectiveness of Proposed Water Quality Management Scheme

Pollutant	Generated by development	Residual load	Reduction (%)
Total Suspended Solids (kg/yr)	587	75	87.2
Total Phosphorus (kg/yr)	1.25	0.43	65.3
Total Nitrogen (kg/yr)	8.7	4.62	46.9
Gross Pollutants (kg/yr)	98.1	0	100

7.4 Operation and Maintenance Plan

Refer to Appendix C.

7.5 Findings and Recommendations

MUSIC modelling was used to assess the performance of the Water Quality Management Strategy for the proposed development at 130 Old Pittwater Road, Brookvale.

The proposed scheme includes Stormwater360 EnviroPods (pit baskets) and PSorb Stormfilter cartridges located in the OSD system.

The MUSIC model results showed that the proposed Water Quality Management Strategy can achieve Council's pollution reduction targets.

8.0 Conclusion

Stormwater Quantity and Conveyance

The proposed development's stormwater system and disposal philosophy is consistent with Northern Beaches Council (formerly Warringah Council) – *“On-site Stormwater Technical Specification, s4.2.3 Full Computational Method”*. In this regard the post-development peak stormwater discharge:

- does not exceed the pre-development peak discharge for flows up to the 0.5 EY rain event,
- piped flow is restricted to the 0.2 EY rain event state of nature case for flows up to the 1% AEP rain event, and;
- piped and overland flow is restricted to the pre-developed state of nature case for flows up to the 1% AEP rain event.

Stormwater Quality

The proposed stormwater quality improvement strategy was modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software package and has been prepared in accordance with the following documents:

- Northern Beaches Council (Warringah) PL 850 WATER – *“Water Management Policy (2017)”*
- Northern Beaches Council – *“WSUD & MUSIC Modelling Guidelines”*

The proposed Water Quality Management Strategy provides a reduction in post development loads of Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants by 87%, 65%, 47% and 100% respectively when compared to no treatment measures. The MUSIC model results showed that the proposed stormwater quality improvements measures can achieve Council's pollution reduction targets outlined in PL850.

The proposed stormwater management plan as described in this report and the attached plans (Appendix B) is recommended as a safe a practical stormwater solution to support the proposed development.

Please contact me if you have any questions regarding this report.

Kind regards,



Author

Logan English-Smith
Engineer



Reviewed

Ian Warren
Principal Engineer (NER 3705882)

REFERENCES

Northern Beaches Council (formerly Warringah Council) – *“On-site Stormwater Technical Specification”*

Northern Beaches Council (formerly Warringah Council) – *“PL-850 Water Management Policy”*

Northern Beaches Council (formerly Warringah Council) – *“WSUD & MUSIC Modelling Guidelines”*

Appendix A

Architectural Plans
by Leech Harmon Architects

Drg #	Title	Rev	Date
DA01	SITE PLAN		20.09.2018
DA02	EXCAVATION PLAN		20.09.2018
DA03	LEVEL 1 FLOOR PLAN		20.09.2018
DA04	LEVEL 1 MEZZANINE PLAN		20.09.2018
DA05	LEVEL 2 FLOOR PLAN		20.09.2018
DA06	LEVEL 2 MEZZANINE PLAN		20.09.2018
DA07	LEVEL 2A FLOOR PLAN		20.09.2018
DA08	LEVEL 3 FLOOR PLAN		20.09.2018
DA09	LEVEL 3 MEZZANINE FLOOR PLAN		20.09.2018
DA10	ROOF PLAN		20.09.2018
DA11	ELEVATIONS SHEET 1		20.09.2018
DA12	ELEVATIONS SHEET 2		20.09.2018
DA13	ELEVATIONS SHEET 3		20.09.2018
DA14	SECTIONS SHEET 1		20.09.2018
DA15	SECTIONS SHEET 2		20.09.2018
DA16	3D VIEWS SHEET 1		20.09.2018
DA17	3D VIEWS SHEET 2		20.09.2018
DA18	PERSPECTIVES		20.09.2018
DA19	SHADOW DIAGRAMS		20.09.2018
DA20	SITE PLAN – SHADED DA		20.09.2018

Table 5 - Architectural Plans

Appendix B

Stormwater Management Plan

by mgp

Drg #	Title	Rev	Date
<u>GENERAL</u>			
SW-000	COVER SHEET	1	17.12.2018
SW-001	SITE PLAN	1	17.12.2018
SW-140	SEDIMENT & EROSION CONTROL PLAN	1	17.12.2018
<u>138-140 OLD PITTWATER ROAD</u>			
SW-100	LEGEND	1	17.12.2018
SW-110	PIPE LAYOUT, GROUND FLOOR	1	17.12.2018
SW-111	PIPE LAYOUT, LEVEL 1	1	17.12.2018
SW-112	PIPE LAYOUT, LEVEL 2	1	17.12.2018
SW-113	PIPE LAYOUT, LEVEL 2A	1	17.12.2018
SW-114	PIPE LAYOUT, LEVEL 3	1	17.12.2018
SW-115	ROOF LAYOUT	1	17.12.2018
SW-120	OSD DETAILS	1	17.12.2018
SW-130	CATCH DRAIN LAYOUT	1	17.12.2018
SW-131	CATCH DRAIN CALCS	1	17.12.2018
<u>138-140 OLD PITTWATER ROAD</u>			
SW-200	LEGEND	1	17.12.2018
SW-210	PIPE LAYOUT, GROUND FLOOR	1	17.12.2018
SW-211	PIPE LAYOUT, LEVEL 1	1	17.12.2018
SW-212	PIPE LAYOUT, LEVEL 2A	1	17.12.2018
SW-213	PIPE LAYOUT, LEVEL 3	1	17.12.2018
SW-214	ROOF LAYOUT	1	17.12.2018
SW-220	OSD DETAILS	1	17.12.2018
SW-230	CATCH DRAIN LAYOUT	1	17.12.2018
SW-230	CATCH DRAIN CALCS	1	17.12.2018
<u>SEDIMENT & EROSION CONTROL PLAN (COMBINED)</u>			
SW-140	SEDIMENT & EROSION CONTROL PLAN	1	17.12.2018

Table 6 – Stormwater Management Plans

Appendix C

WSUD Operation and Maintenance Plan

Site description

130 Old Pittwater Road, Brookvale

Construction of a new industrial/warehouse building including parking

Site access description

Access from Old Pittwater Road and 138-140 Old Pittwater Road

Likely pollutant types, sources and estimated loads

Stormwater contains both particulate and dissolved or liquid pollutants. Particulate pollutants include litter, debris, and sediment or soil particles. Dissolved and liquid pollutants include oils, nutrients, toxic chemicals such as pesticides and heavy metals. To remove these pollutants a “treatment train” is used. This requires:

- Particulate pollutants to be removed by interception and sedimentation (i.e. pit baskets, gross pollutant trap, SW360 Stormfilter media.)
- Dissolved particulates to be removed through chemical and biological processes (i.e. SW 360 Stormfilter media)

Locations, types and descriptions of measures proposed:

Refer to attached stormwater management plan (Appendix B)

Operation and maintenance responsibility (council, developer or owner)

At this stage it is envisaged that on-site WSUD measures would be maintained by the Developer and/or Owner

Inspection methods

Visual inspection – both routine and inspection after large rain events to check for blockages.

Maintenance Schedule

Refer schedule below and in addition, inspection of system elements will also be required after large rain events to check for blockages.

Item	Maintenance	
	Description	Frequency
OSD	Inspect and clean inlet screen	1/six months
	Inspect base of tank and remove sediment/sludge	1/annum
	Inspect and test pumps	1/six months
SW 360 Enviropod (pit baskets)	Inspect for blockages	1/quarter
	Clean out enviropods	1/six months
StormFilters (maintenance by Stormwater 360 or equivalent Contractor)	Inspect for blockages	1/quarter
	Clean and replace cartridges	1/annum

Table 7: Maintenance schedule for proposed WSUD measures.