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17 May 2023

**Wu Properties**
Charles Hong
C/O Bureau SRH
4 Minna Close
Belrose NSW 2085

**Our Ref:** LTR-001-02-Stormwater Letter.docx

**Attention:** Emmy Omagari **Email:** eo@bureausrh.com

Dear Emmy,

**RE: 4 MINNA CLOSE, BELROSE – STORMWATER MANAGEMENT**

# 1. Stormwater Management

## 1.1. OSD Requirement

As per Northern Beaches Council's (NBC) Development Control Plan (DCP), On-Site Detention (OSD) is required for the proposed development. The subject site falls within 'Stormwater Region 2' – as per the DCP the requirement within this region is that the site discharge from post-developed site shall not exceed the site discharge from the pre-developed 'state of nature' site for the 20% AEP, 5% AEP and 1% AEP storm events. The table below presents the results of the DRAINS analysis, showing that this requirement is satisfied with the proposed OSD (volume 56m$^3$). OSD details are provided in Drawing DAC042 within Appendix A.

| Storm Event (AEP) | Pre-Development Site Discharge (m$^3$/s) | Post-Development Site Discharge (m$^3$/s) |
|---|---|---|
| 20% | 81 | 80 |
| 5% | 132 | 129 |
| 1% | 193 | 166 |

**Table 1: DRAINS Results**

## 1.2. Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design (WSUD) encompasses all aspects of urban water cycle management, including water supply, wastewater and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle and to achieve more sustainable forms of urban development.

The majority of stormwater runoff from the landscape, building and hardstand areas will be directed into water quality treatment devices.

Proprietary treatment devices will treat the water to satisfy NBC's water quality requirements. These devices have been modelled as Ocean Protect Stormfilters and Ocean Protect Oceanguards. By utilising these treatment

devices, stormwater draining from the development will meet the required NBC water quality treatment rates before discharging into Council's stormwater network on Minna Close.

A summary of the required number and position of the treatment devices is indicated within the stormwater drainage plans within Appendix A.

### 1.2.1. WSUD Modelling - Music Model

The MUSIC Model for Urban Stormwater Improvement Conceptualisation (MUSIC X) was used to evaluate pollutants loads from the site. As per NBC's Water Management Policy, the subject site is classified as a high-quality catchment and also falls within the Sydney Harbour Catchment which is regulated by the State of Environmental Planning Planning Policy Amendments (Water Catchments) 2022. This requires the development to show that there is neutral or beneficial effect (NorBE) to the water quality from the pre-developed scenario. The results of the MUSIC analysis shown on Table 7 demonstrate that this requirement has been met via the proposed water quality measures proposed on site.

A conceptual view of the MUSIC model used in this report can be found in Appendix B.

**Catchment Areas and Music Parameters as per NBC WSUD and MUSIC Modelling Guidelines**

MUSIC model input parameters for this site included rainfall-runoff, base-flow concentration and storm-flow concentration parameters. The parameters used for the catchment area(s) can be seen in Table 2.

| | | Urban Mixed | Urban Sealed Road | Urban Roof |
|---|---|---|---|---|
| **Parameter** | **Unit** | **Figure** | **Figure** | **Figure** |
| Rainfall Threshold | mm/day | 1.50 | 1.50 | 0.30 |
| Soil Storage Capacity | mm | 108 | 108 | 108 |
| Initial Storage | % of Capacity | 30 | 30.00 | 30.00 |
| Field Capacity | mm | 73 | 73 | 73 |
| Infiltration Capacity Coefficient | a | 250 | 250 | 250 |
| Infiltration Capacity Coefficient | b | 1.3 | 1.3 | 1.3 |
| Initial Depth (Ground Water) | mm | 10.00 | 10.00 | 10.00 |
| Daily Recharge Rate | % | 60 | 60 | 60 |
| Daily Baseflow Rate | % | 45 | 45 | 45 |
| Daily Seepage Rate | % | 0.00 | 0.00 | 0.00 |

**Table 2 - Rainfall-Runoff Parameters**

| Pollutant | Baseflow Concentration Parameter – Mean (log mg/L) | Baseflow Concentration Parameter – Std Dev (log mg/L) | Stormflow Concentration Parameters – Mean (log mg/L) | Stormflow Concentration Parameters – Std Dev (log mg/L) |
|---|---|---|---|---|
| TSS | 1.200 | 0.170 | 2.150 | 0.320 |
| Phosphorus | -0.850 | 0.190 | -0.600 | 0.250 |
| Nitrogen | 0.110 | 0.120 | 0.300 | 0.190 |

**Table 3: Base Flow/Stormflow Concentration Parameters – Urban Mixed Areas**

| Pollutant | Baseflow Concentration Parameter – Mean (log mg/L) | Baseflow Concentration Parameter – Std Dev (log mg/L) | Stormflow Concentration Parameters – Mean (log mg/L) | Stormflow Concentration Parameters – Std Dev (log mg/L) |
|---|---|---|---|---|
| TSS | - | - | 2.430 | 0.320 |
| Phosphorus | - | - | -0.300 | 0.250 |
| Nitrogen | - | - | 0.340 | 0.190 |

**Table 4: Base Flow/Stormflow Concentration Parameters – Urban Sealed Road Areas**

| Pollutant | Baseflow Concentration Parameter – Mean (log mg/L) | Baseflow Concentration Parameter – Std Dev (log mg/L) | Stormflow Concentration Parameters – Mean (log mg/L) | Stormflow Concentration Parameters – Std Dev (log mg/L) |
|---|---|---|---|---|
| TSS | - | - | 1.30 | 0.320 |
| Phosphorus | - | - | -0.89 | 0.250 |
| Nitrogen | - | - | 0.30 | 0.190 |

**Table 5: Base Flow/Stormflow Concentration Parameters – Urban – Roof**

**MUSIC model properties**

MUSIC model input parameters for the SF Chamber and StormFilter are shown in below.

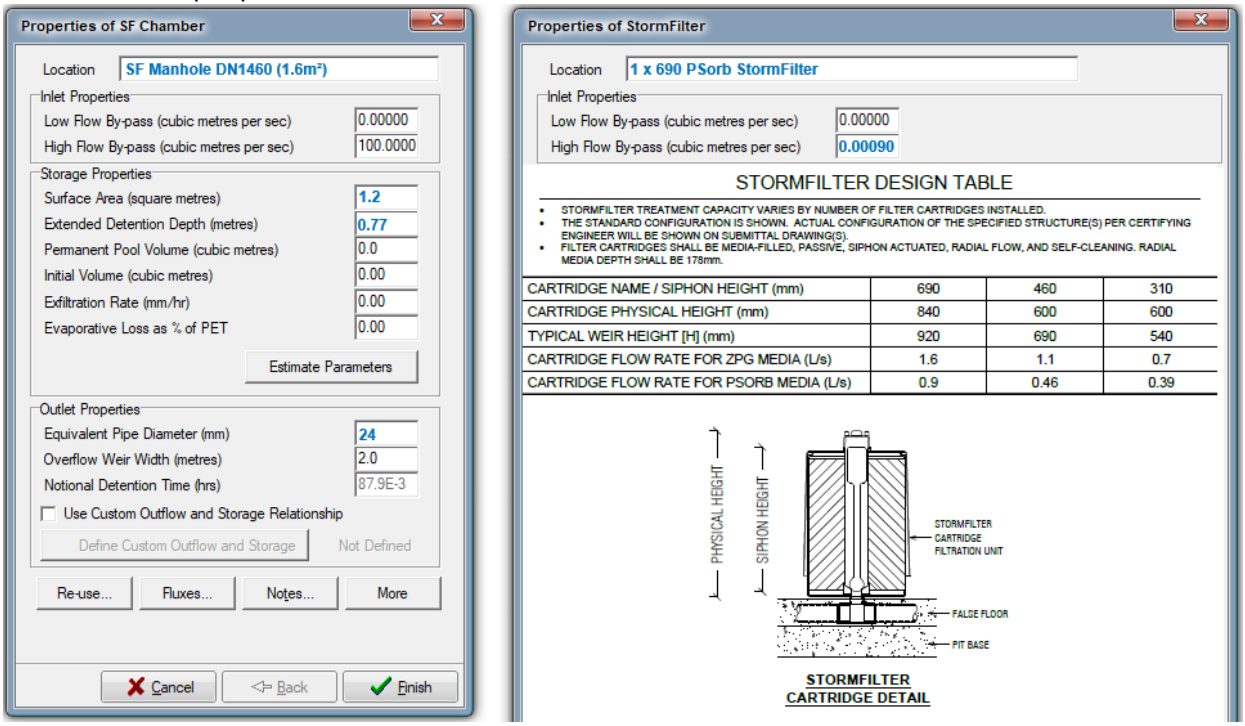



**Figure 1: OceanGuard StormFilter Properties**

**Results**

MUSIC modelling results for each stage are presented as mean annual loads at the receiving node indicate that adopted target reductions (as per the NBC DCP) are achieved, as shown in Table 6.

| Pollutant | Sources (Kg/yr) | Residual Load (Kg/yr) | Reduction (%) | Target Reduction (%) |
|---|---|---|---|---|
| Total Suspended Solids | 289.5496 | 18.5968 | 93.58 | 85 |
| Total Phosphorus | 0.7808 | 0.1374 | 82.40 | 65 |
| Total Nitrogen | 8.6102 | 3.1396 | 63.54 | 45 |
| Gross Pollutants | 93.3024 | 0.6756 | 99.28 | 90 |

**Table 6 – Overall Site Pollutant Loads**

| NorBe | Pre-Development Load (kg/yr) | Post-Developmnet Load (kg/yr) | Reduction (%) |
|---|---|---|---|
| Flow (ML/yr) | 1.845 | 3.816 | -106.8% |
| Total Suspended Solids (kg/yr) | 149.650 | 18.597 | **87.6%** |
| Total Phosphorus (kg/yr) | 0.388 | 0.137 | **64.6%** |
| Total Nitrogen (kg/yr) | 3.180 | 3.140 | **1.3%** |
| Gross Pollutants (kg/yr) | 5.607 | 0.676 | **88.0%** |

**Table 7 – Neutral or Better (NorBe) Results**

In conclusion, the proposed development at 4 Minna Close, Belrose will meet Council's stormwater management requirements by limiting site discharge to under pre-development flows, and by satisfying the water quality targets as specified in the DCP.

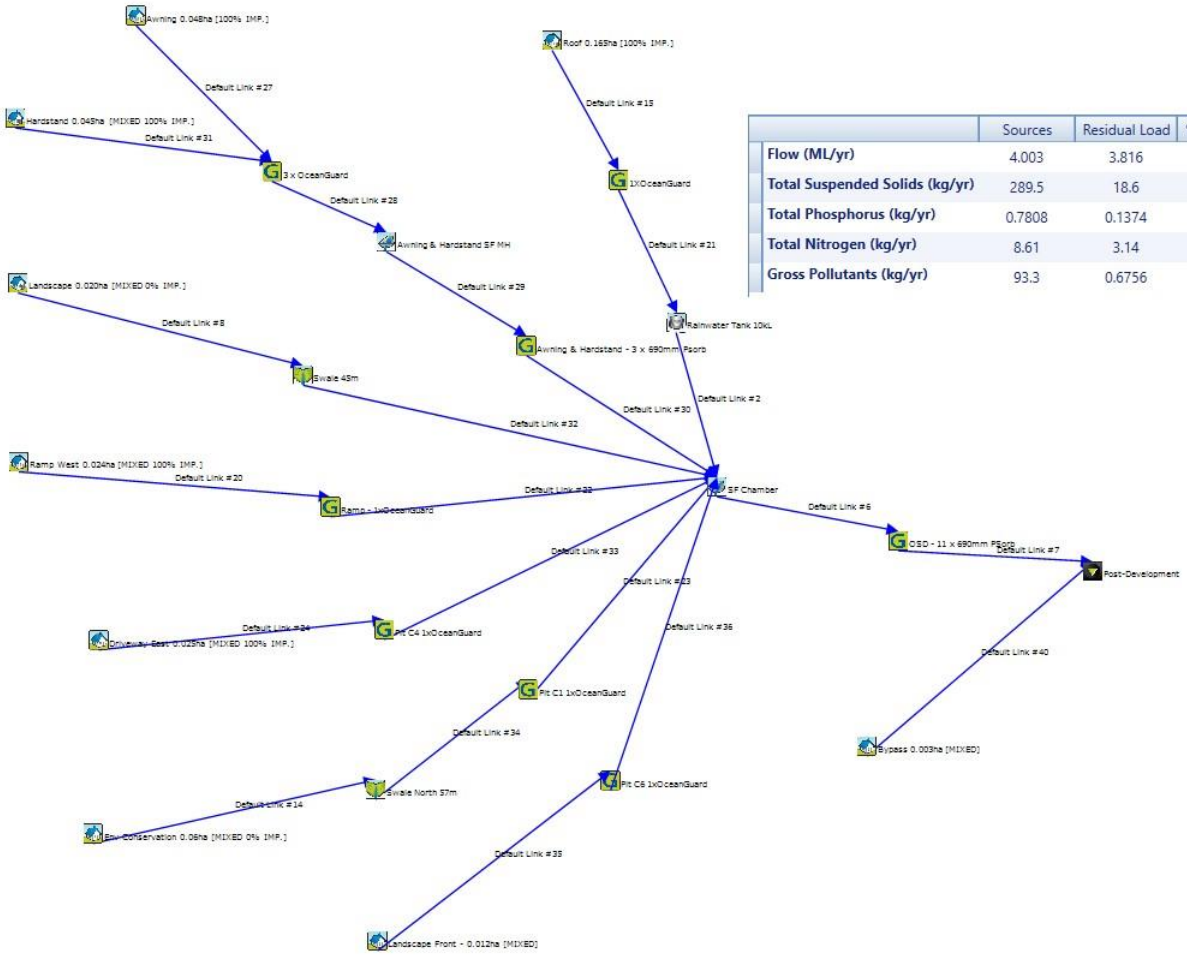
Should you have any questions, please don't hesitate to contact the undersigned.

Yours sincerely,

**Suzanne Mustafa**
Senior Civil Engineer

# APPENDIX A CIVIL DEVELOPMENT APPLICATION DRAWINGS

# APPENDIX B MUSIC X SNAPSHOT AND RESULTS




| | Sources | Residual Load | % Reduction |
|---|---|---|---|
| Flow (ML/yr) | 4.003 | 3.816 | 4.66 |
| Total Suspended Solids (kg/yr) | 289.5 | 18.6 | 93.58 |
| Total Phosphorus (kg/yr) | 0.7808 | 0.1374 | 82.4 |
| Total Nitrogen (kg/yr) | 8.61 | 3.14 | 63.54 |
| Gross Pollutants (kg/yr) | 93.3 | 0.6756 | 99.28 |