NORTHROP

CIVIL

Stormwater Management Strategy

for

Iron Arena, Taree

for Public Works Advisory

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

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Public Works Advisory
Robert Spampinato
Public Works Advisory
North Coast Region New South Wales

Dear Robert,

Re: Iron Arena, Taree

Northrop Consulting Engineers have been engaged by the Public Works Advisory to provide concept design plans suitable for Development Approval submission for the proposed development at Iron Arena, located on the corner of Bligh Street and Recreation Drive, Taree.

The purpose of this engineering report is to address civil engineering and stormwater items associated with the proposed development of the site, in particular:

- Water cycle management, including:
  - Stormwater collection.
  - Stormwater quantity control.
  - Stormwater quality control.

This report has been prepared with consideration to and generally in accordance with the Great Lakes Development Control Plan (DCP) 2014, in particular 'Chapter 11 – Water Sensitive Design' and the MidCoast Council (MCC) Guidelines for Water Sensitive Design Strategies (October 2019).

Contained herein is a description of the subject site and development, and a summary of the stormwater quality and quantity assessment. This document should be read in accordance with the engineering drawings NL170290/ DA Series. This report intends to discuss items relating to the site at a level appropriate for a Development Application submission. It does not attempt to provide detailed design solutions to all issues, rather it will investigate the feasibility of solutions based on information that we have gathered to date from various sources and provide outcomes which will be developed further at Construction Certificate and Construction phases of the project.

		Date
Prepared by	EG	04/02/2022
Checked by	KS	04/02/2022
Admin	KS	04/02/2022

Site and Project Description

The site, which covers approximately 19.38 ha, is located on the corner of Bligh Street and Recreation Drive, Taree. The site generally grades towards the Dawson River located on the northern boundary. The site is currently developed, containing existing buildings, carpark, hockey fields and a bike track. An aerial of the area is shown in Figure 1, with the subject site highlighted in yellow.

Figure 1 - Site Schematic

The development consists primarily of an extension to the existing basketball stadium and modifications to the pedestrian access and pavement. The works will also necessitate the existing downpipes and pit/pipe network located under the proposed building to be diverted to a new pit and pipe network outside the building extent.

Stormwater Management

The following stormwater management strategy has been completed in accordance with the Great Lakes DCP, in particular 'Chapter 11 – Water Sensitive Design' and the MCC Guidelines for Water Sensitive Design Strategies (October 2019) to address the following items:

- Stormwater Quality Management.
- Stormwater Quantity Management.

This document combined with the civil drawings intends to satisfy the abovementioned requirements. In general, it is proposed to convey roof water runoff to an above ground reuse tank located on the northern side of the building via a charged downpipe system. All downpipes are to be connected to a first flush device prior to the tank inlet. Overflow from the tank and runoff from the majority of the new pavement will flow into a biofiltration basin located on the northern end of the site. Outflow from the basin will connect to the existing drainage network which ultimately discharges to Dawson River, Existing downpipes and pit and pipe network located under the proposed building extension will be diverted to a new network outside the building extent.

TOTAL SITE AREA	= 19.4Ha
EXISTING IMPERVIOUS AREA	= 3.3 Ha (17% IMPERVIOUS APPROX.)
NEW IMPERVIOUS AREA	= 4020 m^2 (2.1% INCREASE)
TOTAL ROOF AREA TO REUSE TANK AND BIO	= 3442 m^2 (100% OF NEW ROOF)

TOTAL NEW FOOTPATH/PAVEMENT TO TREATMENT (BUFFER + BIO) = 354 m^2

TOTAL NEW FOOTPATH/PAVEMENT BYPASS TREATMENT = 224 m^2

Stormwater Quality Management Strategy

The site stormwater quality management has been modelled in MUSIC 6.3 to ensure the proposed treatment train for the development meets Council's stormwater pollution reduction targets. Modelling was completed in accordance with "Guidelines for Water Sensitive Design Strategies" (MCC, October 2019) and "NSW MUSIC Modelling Guidelines" (BMT WBM, 2015). The catchment area included only the new proposed impervious area

Treatment Train

Stormwater runoff from new roof areas is proposed to be conveyed to a 10kL rainwater tank, with harvested water to be reticulated internally for use in the toilets of the associated extension, as well external landscaping irrigation. Overflow from the rainwater tank will be conveyed to a proposed bio-filtration basin located at the northern end of the sporting facility with a minimum filter media of 150m^2.

Runoff from new site hardstand and landscape areas will be captured by a pit and pipe network and conveyed to the proposed biofiltration basin. A section of the southern paved area bypasses the treatment measures and discharges to the existing carpark as per the existing drainage regime.

For the purpose of MUSIC modelling, it was assumed the sporting facility is already substantially irrigated, and therefore only a small portion of the site would require irrigation. This was inputted as a highly managed site in accordance with the MUSIC Modelling Guidelines with a resulting annual irrigation of 246.38kL/year. The internal demand was determined to be 0.144kL/day. This assumed 8 new internal toilets within the proposed extension and 40 flushes per day based on the anticipated usage of the facility during typical operation. This is equivalent to 2.6 residential dwellings per the MCC "Guidelines for Water Sensitive Design Strategies".

Figure 2 depicts the proposed stormwater treatment train and effectiveness for the development as modelled in MUSIC. For the purpose of the MUSIC modelling, buffers were implemented to represent the overland flow to the pit and pipe network. These are assumed to be accepted by the Council as 'vegetated filter strips'.

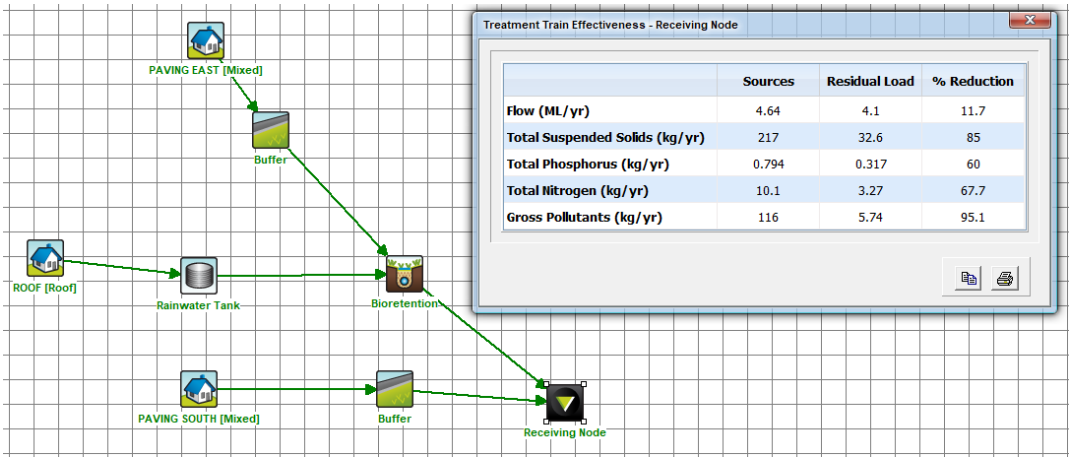

Figure 2 - MUSIC Treatment Train and Effectiveness

Table 1 summarises the results for the resulting MUSIC model and compares the modelled reduction in pollutants to the council reduction targets.

Table 1 – MUSIC Modelling Results

Pollutant	Sources (kg/ yr)	Residual load (kg/ yr)	Reduction (%)	Council Reduction Target (%)
Total Suspended Solids (TSS)	217	32.6	85.0	80
Total Phosphorus (TP)	0.794	0.317	60.0	60
Total Nitrogen (TN)	10.1	3.27	67.7	45
Gross Pollutants (GP)	116	5.74	95.1	90

Table 1 shows that the treatment train modelled in MUSIC is effective in meeting Council's reduction targets. A copy of the MUSIC model has been included for Council review. Note geotechnical testing will be undertaken during the detailed design phase to confirm the subgrade conditions at the location of the basin. Similarly detailed site survey will be undertaken at this time to confirm basin levels.

Note the water quality treatment measures shall be installed as part of Stage 1. Biofiltration media will not be installed until the end of Stage 1 works, following stabilisation of the catchment. Access will be achievable to the basin for Council vehicles to undertake routine maintenance. Maintenance requirements will be as per other biofiltration basins in the LGA. A detailed operation and maintenance plans can be provided with CC documentation if required.

Sensitivity Analysis

A sensitivity analysis was performed on the MUSIC model to determine the optimal tank and biofiltration basin size. These treatment measures were varied within the MUSIC model, with the aim of achieving both Council's reduction targets and tank efficiency.

Figure 3 presents the rainwater tank efficiency curve based on the storage volume and resultant reuse demand met.

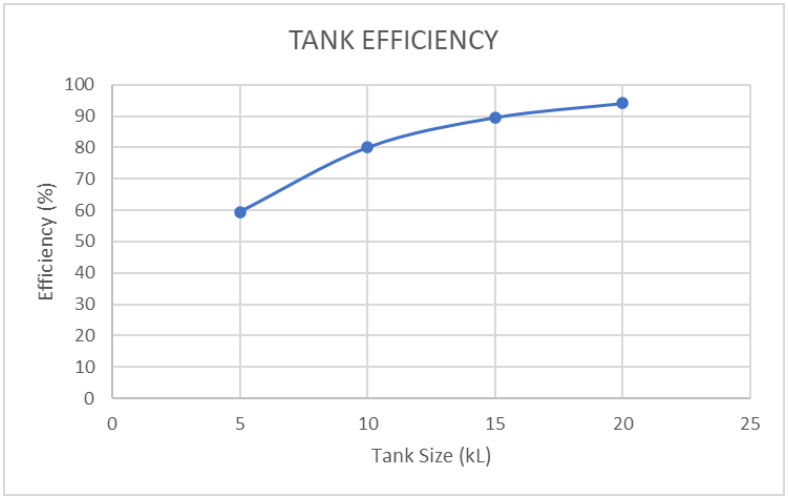

Figure 3 - Rainwater Tank Efficiency Curve

Figure 3 shows that a 10kL tank meets 80.04% reuse demand which is generally an industry accepted minimum. If the volume were to be doubled to 20kL, an increase in efficiency of only 14.11% is predicted which is not an efficient outcome. Further to this, it is likely a portion of the existing roof will also be conveyed to the tank as such the re-use demand met will be higher than that is shown (note existing roof not included in model as not required to be treated). Therefore, 10kL has been adopted.

Figure 4 presents the Total Phosphorus (TP) reduction quality results with increasing biofiltration filter areas. TP was determined to be the critical quality target (60%) in the design and consequently used as the control variable.

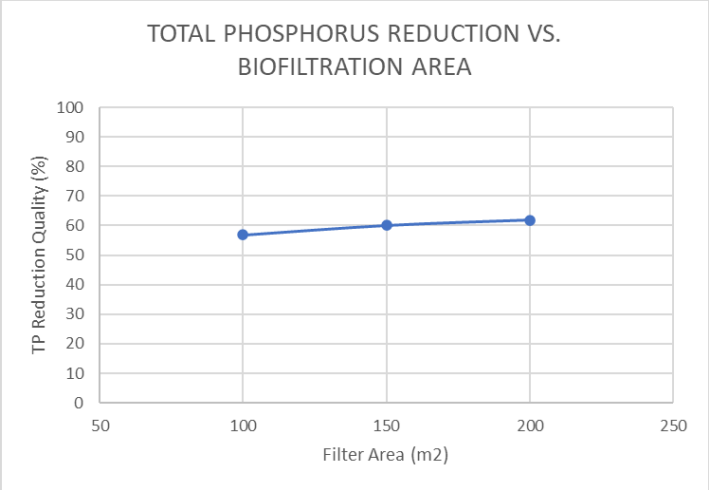

Figure 4 - Total Phosphorus (TP) Reduction Based on Biofiltration Filter Area

Figure 4 shows that despite increasing the biofiltration basin's filter area by 100m^2(i.e. from 100-200m^2), only a 5% increase in TP reduction is predicted to occur. If a biofiltration basin with a 100m^2 filter area is provided, a 56.8% TP reduction is expected and therefore, does not meet Council requirements, therefore 150m^2 has been adopted.

Council Requirements

The proposed MUSIC model design features a biofiltration basin with 250mm of extended detention. The MCC's Standard Drawing for a residential dwelling raingarden, dictates an extended detention of 150mm. If this case is modelled within MUSIC, a basin with a filter area of 200m^2 is required to achieve the Council's reduction targets. Given the site is public recreation (i.e. non-residential), a deeper extended detention is assumed acceptable per the MCC Guidelines for Water Sensitive Design Strategies (October 2019).

It is recognised that Council's preference is to provide a pre-treatment forebay to protect the bioretention basin from infrequent high flows conveying high sediment loads. However, given majority of the flow entering the basin is 'clean water' runoff from the roof areas, a forebay is not considered necessary.

Stormwater Quantity Management Strategy

The proposed development will result in minimal increase in impervious area relative to the overall site size (2.1%). Given the site is flood prone, On-Site Detention (OSD) will be ineffective. The site also discharges directly to Dawson River, as such is not proposed. However, as previously outlined, a minimum 10kL rainwater tank is proposed which will limit peak stormwater discharge from the site and reduce potable water demand.

Conclusion

Given the above investigations, it is reasoned the development meets MCC's requirements for stormwater management as outlined in Council's DCP.

I trust the above meets your requirements; however, should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Yours faithfully,

Emma Gearing
Graduate Civil Engineer
BEng (Civil)

Kane Sinclair
Associate | Civil Engineer
BEng (Civil)

Limitation statement

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