NORTHROP

CIVIL

Engineering Design Report

for Palm Lake Works Pty Ltd

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

Contents

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1. Introduction

1.1. Background

Northrop Consulting Engineers Pty Ltd have been engaged by Palm Lake Works Pty Ltd to prepare a stormwater management plan for a proposed clubhouse, located at 42 Lewis Street, Old Bar on Lot F DP420085, herein known as “the Site”.

Figure 1 – The Site and Development Area

1.2. Site Description

The Site is located approximately 11km southeast of the Taree township and is bordered by existing residential lots on the northeastern boundary and the proposed Palm Lake Resort on the southwest, which is currently undeveloped. The site is coastal, with the southeastern side being a part of Old Bar Beach and approximately 1720m^2 is subject to erosion. The total site is approximately 5130m^2, with only 3410m^2 being appropriate for construction. It is currently undeveloped land, and grades towards the southeastern boundary at approximately 2% within the developable land. Levels on site range from approximately 7.5m AHD at the road frontage to 5m AHD at the erosion boundary.

A geotechnical assessment conducted by Regional Geotechnical Solutions on 4th June 2024 (Ref: RGS03511.1-AB) concluded that a minimum of the top 4.5m of soil is sand.

1. Proposed Development

1.1. General

The proposed development consists of a multistorey clubhouse with associated outdoor recreational areas, generally as shown below in **Figure 2**.

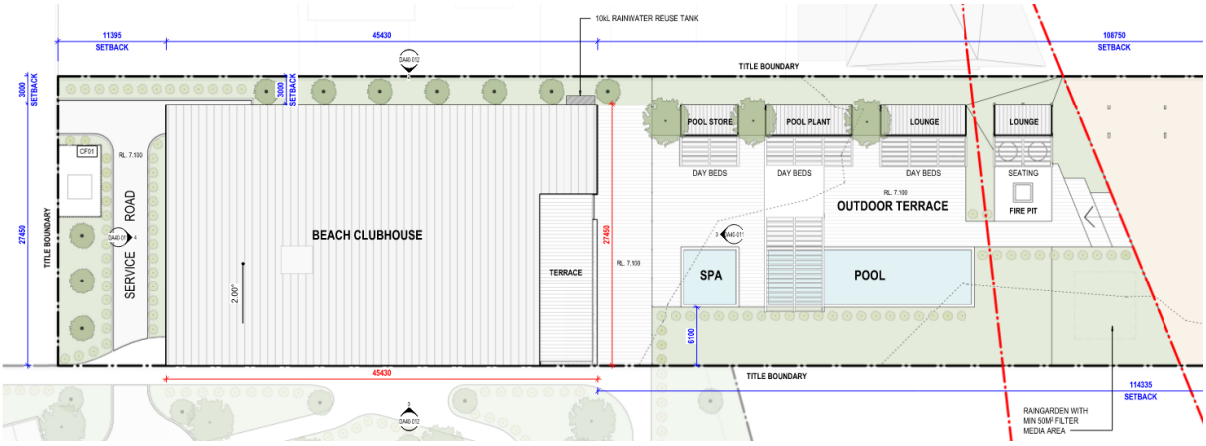

Figure 2 - Proposed Development Masterplan

Stormwater treatment is proposed for the site. It is understood that the site runoff is directed towards the ocean and as such detention would not be beneficial.

2. Stormwater Quality Management Strategy

2.1. General Philosophy

Water quality is to be managed by a treatment train consisting of the following:

- A 10kL rainwater reuse tank connected to the clubhouse roof for internal and external reuse.
- A gross pollutant trap to collect gross pollutants prior to discharge into the raingarden.
- A raingarden with a minimum 50m^2 filter media area located at the back of the site to provide tertiary treatment. Due to sandy soils, surface water is intended to infiltrate into the sand layer below.
- Due to the high infiltration, it has been assumed only 50% of the pervious (landscaped) area will reach the stormwater network, and so 50% has been modelled as bypass.

2.2. Stormwater Quality

Water quality treatment has been assessed in accordance with Mid Coast Council's Development Control Plan and Technical Manuals. To substantiate the effectiveness of the proposed water quality control measures, stormwater quality modelling was undertaken using the Model for Urban Stormwater Improvement and Conceptualisation (MUSIC) V6.3.0.

2.2.1. Treatment Targets

According to Mid Coast Council Stormwater Assessment Procedure, non-residential developments within the Coastal Drainage Area are to meet reduction targets outlined in Table 1. MCC's online mapping tool provides only the Coastal Drainage Area for the Great Lakes Region and so excludes this site. However, the site drains directly into the ocean rather than via an estuarine system. As such, it is reasonable to consider the site to fit the definition of the Coastal Drainage Area.

Table 1 - Reduction Targets for Pollutants

Pollutant	Reduction Target
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

Neutral or Beneficial Effect (NorBE) targets were also investigated. However, as the site comprises of a deep layer of sand, providing high infiltration, the pre-developed site pollutants are too low to be realistically achieved using MidCoast Council's recommended treatment measures.

2.2.2. MUSIC Parameters

The MUSIC model was developed using recommended parameters presented in MCC's Guidelines for Water Sensitive Design Strategies (2019) and the NSW MUSIC Guidelines (BMT WBM, 2015). The MCC Rainfall Template was used to import rainfall and potential evapotranspiration data.

Geotechnical data and MCC WSD Guidelines were used to determine pervious area parameters and groundwater properties. The Geotechnical Assessment conducted by Regional Geotechnical Solutions in 2024 (Ref: RGS03511.1-AB) noted that at a minimum the top 4.5m of soil is sand. Based on Figure 4-9 from MCC WSD Guidelines, sand falls within Soil Hydrologic Group A. Pervious area

parameters and groundwater properties for Group A were adopted for all source nodes within Catchment 2 (see Table 4-2 from MCC WSD Guidelines).

The high flow bypass for each treatment node was set at a flow rate that results in a maximum of 90% of the modelled flow volume passing through the measure. This was determined using a generic treatment node and modifying the high flow bypass rate until 10% of the inflow bypassed the node.

Pre-Developed Catchment

In accordance with the MCC WSD Guidelines, source nodes for the pre-developed catchments were based on the predominant land use over the previous five years. A rural source node was adopted, based on aerial imagery and site inspections.

Developed Catchments

Each precinct was divided into multiple source nodes to be modelled in MUSIC. The urban source nodes adopted to represent the development were Roof, Commercial, Revegetated Land and Sealed Road. The source nodes were modelled as follows:

- Road –The roads were modelled as Sealed Road with a percentage impervious of 100%.
- Roof – The roofs were modelled with a percentage impervious of 100%.
- Terrace – The terrace and pool were modelled as commercial with a percentage impervious of 100%.
- Landscaping – landscaping was modelled as Revegetated Land with a percentage impervious of 10%.

2.2.3. Stormwater Treatment Train

The proposed stormwater treatment train is described below:

- Rainwater Reuse Tank – Roof runoff from the clubhouse is to be directed to a 10kL rainwater tank. It is to be fitted with a proprietary first flush device, which capture the first portion of roof runoff, effectively removing initial sediment and attached pollutants. The rainwater harvesting system has been modelled with both internal and external reuse including toilet flushing and landscape irrigation, respectively. The Clubhouse was modelled with a daily reuse rate of 550L (for toilet flushing) and annual reuse of 144kL (for garden irrigation), assuming four times midcoast council recommendations for residential reuse (MCC WSD Guidelines 2019).
- Raingarden - The minor stormwater network will direct stormwater runoff to the raingarden where, through infiltration, the runoff will be treated before infiltrating into the existing sand. The raingarden was modelled with a filter media area of 50m^2, a filter depth of 0.4m and an extended detention depth of 0.2m. Parameters for the biofiltration swales were adopted in accordance with the NSW MUSIC Guidelines (BMT WBM, 2015).

A schematic of the MUSIC model can be seen in **Figure 3**.

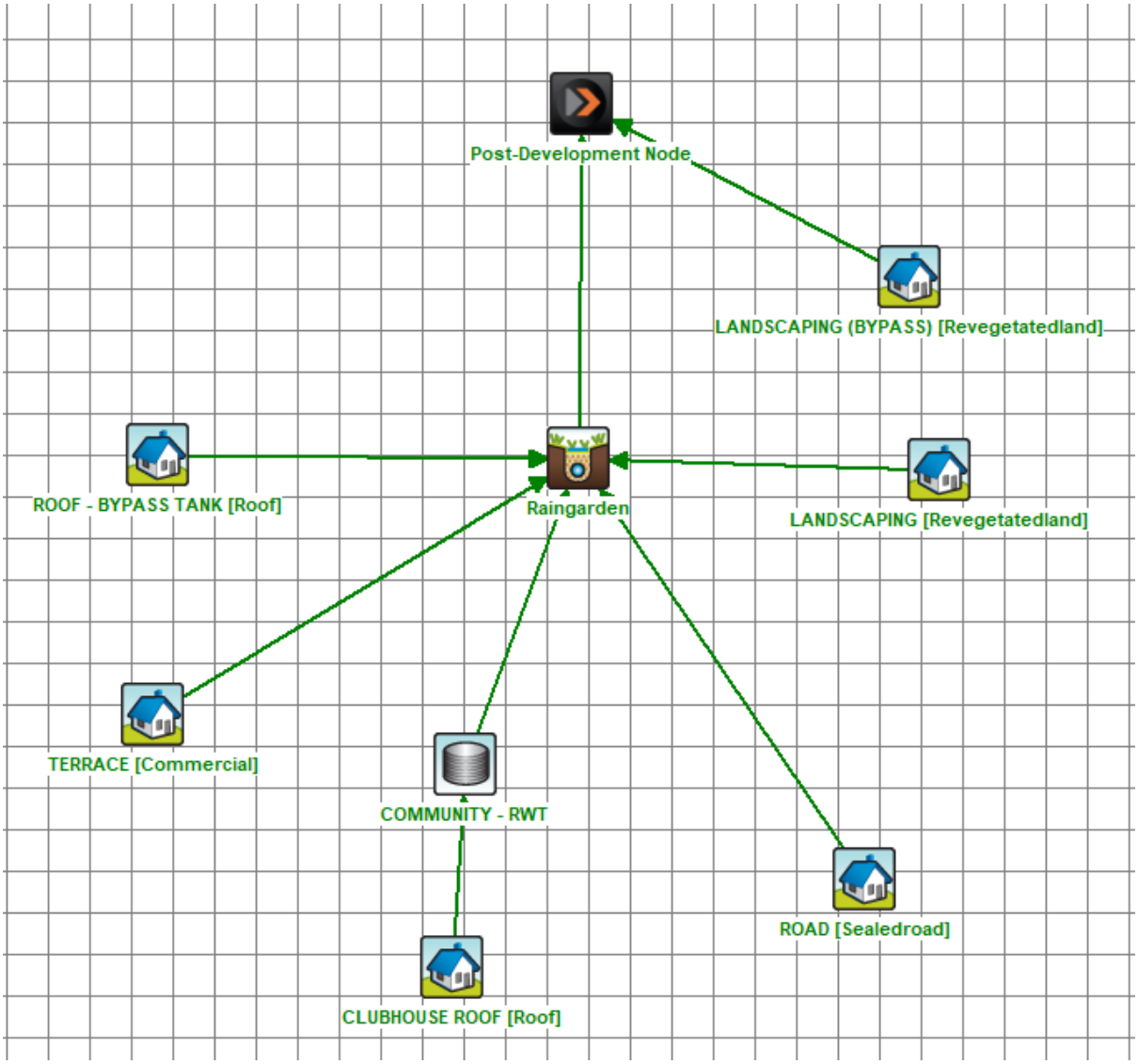

Figure 3 - MUSIC Model Layout Schematic

2.2.4. MUSIC Results

The results from the site analysis are shown in the tables below.

Table 2 - MUSIC results

POLLUTANTS		SOURCES	RESIDUAL LOAD	REDUCTION (%)	TARGET REDUCTION (%)
TSS	kg/yr	338	63.8	81.1	80
TP	kg/yr	0.73	0.288	60.6	60
TN	kg/yr	6.84	3.04	55.6	45
GP	kg/yr	73.7	5.45	92.6	90

Through adoption of the above measures it is considered that the proposed treatment train will effectively meet the design intent of MCC's water quality requirements. Ongoing maintenance of the implemented measures throughout the occupational phase of the development will be required to ensure the devices continue to operate as intended.

3. Conclusion

Based on our assessment we believe that the proposed design achieves the required objectives and considers MCC's DCP, Australian Standards, and industry best practice. The proposed development can adequately meet the legislative requirements and is considered appropriate for the intended development and use.

We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions commensurate with a conceptual design suitable for modification to an existing Development Application assessment.

Should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Yours faithfully,

Chris Piper
Principal | Civil Engineer
BEng (Civil) MIEAus CPEng NER
On Behalf of Northrop Consulting Engineers Pty Ltd

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Appendix A – Design Drawings