

# MUSIC MODEL ASSESSMENT & DRAINAGE CONCEPT REPORT

# Proposed Two Storey Medium Density Development Lot 32 DP9299 & Lots 141-142 DP531051 1–5 Rainbow Rd Mittagong

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Prepared on Behalf of: Robsea Nominees Pty Ltd and Bilgola Beach Pty Ltd

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2	12/9/22	Revised layout plan	R D Anderson	R D Anderson
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## 1. Assessment Summary and Recommendations – Water Quality

This report has been prepared to accompany a development application to demonstrate the expected effect on water quality to satisfy the requirements of *State Environmental Planning Policy (Biodiversity and Conservation) 2021* 

This report has been prepared on behalf of Robsea Nominees Pty Ltd and Bilgola Beach Pty Ltd to accompany a development application for a proposed medium density development on Lot 32 DP9299 & Lots 141-142 DP531051 known as 1-5 Rainbow RD Mittagong.

The report details the assessment of the effect of the proposed development on water quality and provides recommendations to satisfy the requirements of Chapter 6 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*. In accordance with the SEPP, the consent authority cannot grant development consent unless it is satisfied the development will achieve a neutral or beneficial effect on water quality.

The results of the assessment and modelling conceptually indicate that a Neutral or Beneficial Effect on Water Quality can be achieved for the proposed development if the following recommended treatment measures are implemented as part of the development:

- 1. Gross Pollutant trap to treat roof and hardstand areas
- 2. A 40m2 bio- retention area to be provided to capture and treat run off from each of the buildings and developed areas of the site

# 2. Site and Development Summary

## 2.1 Site Description

The site is an amalgamation of 3 residential properties being 1-5 Rainbow Rd Mittagong. They are located on the northern side of the road at the eastern end of the street.

The site is adjoined by low density residential to the east & west. The site is Zoned R3 medium density residential under WLEP 2010.

The site contains 3 separate residential dwellings and associated sheds / garages with 3 separate access points to Rainbow Rd.

The site generally slopes from the South to North and there are no watercourses or overland flow paths on the site.



Figure 1 Site Location (Google Maps)



Figure 2 Aerial Image of the Site – (SIX Maps)

## 2.2 Proposed Development

The development will contain:

- 50 units in total, a common lounge room.
- Access driveway and basement carpark
- Landscape and garden areas

Refer plans prepared by Coble Stephens Architects provided with the application.

## 3. MUSIC Model Input

#### 3.1 Catchment Details

The catchment area for the purpose of the assessment is defined as the area of land which comprises the development. As all drainage will ultimately discharge into the existing drainage system within the Old Hume Highway corridor all post development nodes have been directed to a single Post Development receiving node. Upstream flow through the site will be limited as there are no significant flow paths through the site therefore have not been considered in the MUSIC model

Sub-catchment areas have been defined primarily considering the drainage flow paths, locations of proposed treatment measures and surface type distribution. The site has been defined as one catchment for the pre-development case. Sub-catchments for the post-development case have been identified to represent the roof areas, hardstand and landscaped areas of the development.

#### Table 1 – Site Characteristics

Site Location	Mittagong
Drinking Water Sub Catchment	Nattai
Rainfall and PET Zone	3
Total Catchment Area	0.515 Ha
Developed Catchment Area	0.515 Ha
Pre-development site gradient	1-10%
Existing Watercourse	No
Overland flow draining onto site	No
Soils suitable for infiltration	Limited potential

Pre Development Details			
Existing development characteristics	Residential		
Existing land uses and areas	Residential Dwellings and maintained gardens		

Post Development Details			
Proposed development characteristics	50 unit medium density development		

Table 2 – Site Development Summary

Node	Total Area (ha)	Impervious (%)	Pervious (%)
Predeveloped	0.514	17	83
Roof	0.210	100	0
Residual Area (Urban)	0.304	10	90
TOTAL	0.514		



Figure 3 – Site Layout

#### 3.2 Source Nodes and Associated Parameters for Pre and Post Development Cases

Parameters used for the input to MUSIC were determined for the site adopting the values outlined Sydney Catchment Authority's MUSIC Guidelines.

For the pre-developed case, one source node was adopted to account for the current residential area to be developed taking into account the current development of the site.

For the post-development model it was assumed that the roof areas have 100% Effective Impervious Area (EIA). The remaining areas of the site were calculated as a percentage of impervious/pervious with the driveway area assumed to be completely "direct" impervious and the remaining areas to be assumed mostly pervious.

The pre-development and post development case stormwater pollutant concentration parameters were adopted from Table 4.1.4 for urban and roof land uses. The post-development case was modelled by separating the site into individual surfaces and pollutant concentration parameters for each surface type were adopted from the Table.

#### 3.3 Proposed Treatment Measures for Post Development Cases

A conceptual plan of the proposed layout of treatment measures is shown on CDS drawing 2210CD01 Iss F Sheets 1-5

#### 3.3.1 Gross Pollutant Trap

The model incorporates 1 x GPT nodes to treat run off prior to entering the bio retention basin. The generic treatment parameters contained within Table 5.5 of the Water NSW Music Guidelines have been used to model the GPT

#### 3.3.2 Bio-retention Systems

A Bio-retention basin will be located at ground level adjacent to the southern boundary of the site. The filter outlet is to discharge to an inlet pit which will be directly connected to a pipe system discharging via a headwall located on the Old Hume Highway. Refer to the concept drainage plan for details and locations (see figure 4).

An easement will be required through 180 Old Hume Highway for the proposed discharge pipe.

The bio-retention area is to have the following specification:

#### **Bioretention Basin**

- extended depth of 0.3m
- filter depth of 0.4m
- under-drain below filter
- filter area of 38m2
- overflow width of 1m

The Bio retention System is to be constructed in accordance with Adoption Guidelines for Stormwater Biofiltration Systems Version 2 (Payne et al, 2015, Melbourne, CRC for Water sensitive cities),



Figure 4 Drainage Layout – discharge arrangement

# 4. Music Modelling & Assessment Results

#### 4.1 Climate Data

Climate Template Data used for the MUSIC modelling was taken from Water NSW climate data.

## 4.2 MUSIC Model

The pre and post development MUSIC model is illustrated below in Figure 5.



Figure 5 – MUSIC Model for pre and post development

### 4.3 Results

The model results for the pollutant loads are presented in the table below.

	Pre	Post	Reduction
Total Suspended Solids (kg/yr)	247	38.8	84%
Total Phosphorus (kg/yr)	0.415	0.271	35%
Total Nitrogen (kg/yr)	3.12	2.75	12%

The cumulative frequency graphs for the various pollutants are shown below in *Figures 6, 7 and 8.* 



Figure 6 - Pre and Post development Cumulative Frequency Graphs Total Suspended Solids



Figure 7 - Pre and Post development Cumulative Frequency Graphs Total Phosphorus



Figure 8 - Pre and Post development Cumulative Frequency Graphs Total Nitrogen

## 5. Proposed On Site Detention Arrangement

It is proposed to restrict the flow from the point of discharge for the site from the bio retention basin area such that post developed flows do not exceed pre developed flows for the 10% and 1% AEP peak events in order to comply with councils' policies for on-site detention

A conceptual DRAINS model has been completed to determine suitable size and depth detention storage in order to achieve this outcome. – Refer figure 9

Based on the proposed floor levels of the site and the potential discharge level of the outlet pipe we have proposed a basin storage area as follows:

- Top Area = 40m2
- Depth of storage (above bio retention detention depth) = 1.3m
- Control Orifice outlet diameter in discharge pit = 180mm



Figure 9 – DRAINS model

Predeveloped Flow 10% AEP – 0.092 m3/sec Post Developed Flow 10% AEP with detention – 0.082 m3/sec

Predeveloped flow 1% AEP - 0.194 m3/sec Post Developed Flow 10% AEP with detention – 0.106 m3/sec

Detail design of the proposed drainage system and basin arrangement would be completed as part of the construction certificate documentation.

Refer to CDS drawing 2210CD01 Iss A Sheet 1 for location of detention storage.

#### **Consideration for Basement Drainage Arrangements**

We note that the proposed outlet arrangement should be suitable for allowing drainage of the basement level via the proposed easement to Old Hume Highway without need for a pump out system - subject to suitable detail design.

## 6. Soil and Water Management

Prior to works commencing detailed drawings should be prepared in conjunction with the engineering design drawings to comply with "Landcom (2004), Managing Urban Stormwater, Soils and Construction Volume 1, 4th Edition".

The following general measures are to be implemented to prevent erosion and transport of sediment from the site as a result of construction works:

- Upslope earth bank runoff diversion bunds for diversion of clean stormwater around disturbed / construction areas.
- Sediment fences downslope of disturbed areas
- Temporary soil stockpiling in nominated stockpiling areas with sediment fences located downhill of all stockpiles.
- Temporary stabilised access constructed at the entrance to the site
- Progressive stabilisation following completion of each work area.

## 7. Conclusion

The MUSIC model results conceptually show the Neutral or Beneficial Effect criteria would be achieved for the proposed post development scenario given the treatment measures described in sections 2.1 and 2.2.

The modelled post development TSS, TP, TN and gross pollutant loads are a minimum 10% less than pre development conditions.

98<sup>th</sup> percentile TSS, TP, TN concentrations for the post development scenario are lower than the pre development conditions.

These results indicate conceptually that the overall water quality of this catchment will experience a Neutral or Beneficial Effect in accordance with the guidelines prepared by the Water NSW.

The drainage concept plans prepared to accompany the application show how the conveyance of stormwater water from the site can be achieved and how on-site detention can be conceptually achieved within the development site

## 8. References

• A Guide to the Use of MUSIC in Sydney's Drinking Water Catchments - Water NSW 2019