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Water Quality Control Report for 49 Gibbes Street, Regentville

1 Introduction

It is proposed to construct a child care centre and associated parking facilities. A water quality treatment of the site runoff and a compliance with Council's WSUD requirements have been requested by the Council to comply Council's WSUD Technical Guidelines December 2013 & July 2014. Site area 1393sqm.

The site runoff is to be collected, treated, detained and then released to the environment.

The runoff contains pollutants generated on the site depending on the land use.
A description of the various areas is given in the table below:

Description	To treatment
Total Area (m2)	1393
Driveways & parking (m2)	680
Roof area (m2)	340
Landscaped area (m2)	320
Area bypassing treatment (m2)	20 pervious 40 impervious

2 General

The water quality modelling software program MUSIC has been used to establish the effectiveness of the water quality treatment proposal. MUSIC has been developed by the Cooperative Research Centre for Catchment Hydrology, and is designed as a planning tool for water quality treatment trains for catchment runoff.

The model provided for submission and approval is:

- *49 gibbes.sqz*

The program MUSIC is able to model pollutant loads present in stormwater runoff from a catchment and assess the effectiveness of different treatment devices in terms of pollutant load reduction.

3 Pollutant Loading

The following pollutant loads were used (PCC pollutant loads used) to simulate pollutant export from various surfaces such as roofs, driveways and landscaped areas.

MUSIC nodes for Roof, Driveway and landscaped areas were used in this study.

	Roof Areas	Road Areas	Other Impervious	Impervious Area
Impervious Area Properties				
Rainfall Threshold (mm)	1.4	1.4	1.4	1.4
Pervious Area Properties				
Soil Storage Capacity (mm)	105	105	105	105
Initial Storage (% of Capacity)	30	30	30	30
Field Capacity (mm)	70	70	70	70
Infiltration Capacity Coefficient a	150	150	150	150
Infiltration Capacity Coefficient b	3.5	3.5	3.5	3.5
Groundwater properties				
Initial Depth (mm)	10	10	10	10
Daily Recharge Rate (%)	25	25	25	25
Daily Baseflow Rate (%)	10	10	10	10
Daily Seepage Rate (%)	0	0	0	0
Total Suspended Solids Baseflow Concentrations				
Mean (log mg/L)	1.30	2.43	1.2	1.2
Std Dev (log mg/L)	0.32	0.32	0.17	0.17
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	1.3	2.43	2.15	2.15
Std Dev (log mg/L)	0.32	0.32	0.32	0.32
Serial Correlation (R squared)	0	0	0	0
Total Phosphorus Baseflow Concentrations				
Mean (log mg/L)	-0.89	-0.30	-0.85	-0.85
Std Dev (log mg/L)	0.25	0.25	0.19	0.19
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	-0.89	-0.3	-0.6	-0.6
Std Dev (log mg/L)	0.25	0.25	0.25	0.25
Serial Correlation (R squared)	0	0	0	0
Total Nitrogen Baseflow Concentrations				
Mean (log mg/L)	0.30	0.34	0.11	0.11
Std Dev (log mg/L)	0.19	0.19	0.12	0.12
Serial Correlation (R squared)	0	0	0	0
Stormflow Concentration Parameters				
Mean (log mg/L)	0.3	0.34	0.3	0.3
Std Dev (log mg/L)	0.19	0.19	0.19	0.19
Serial Correlation (R squared)	0	0	0	0

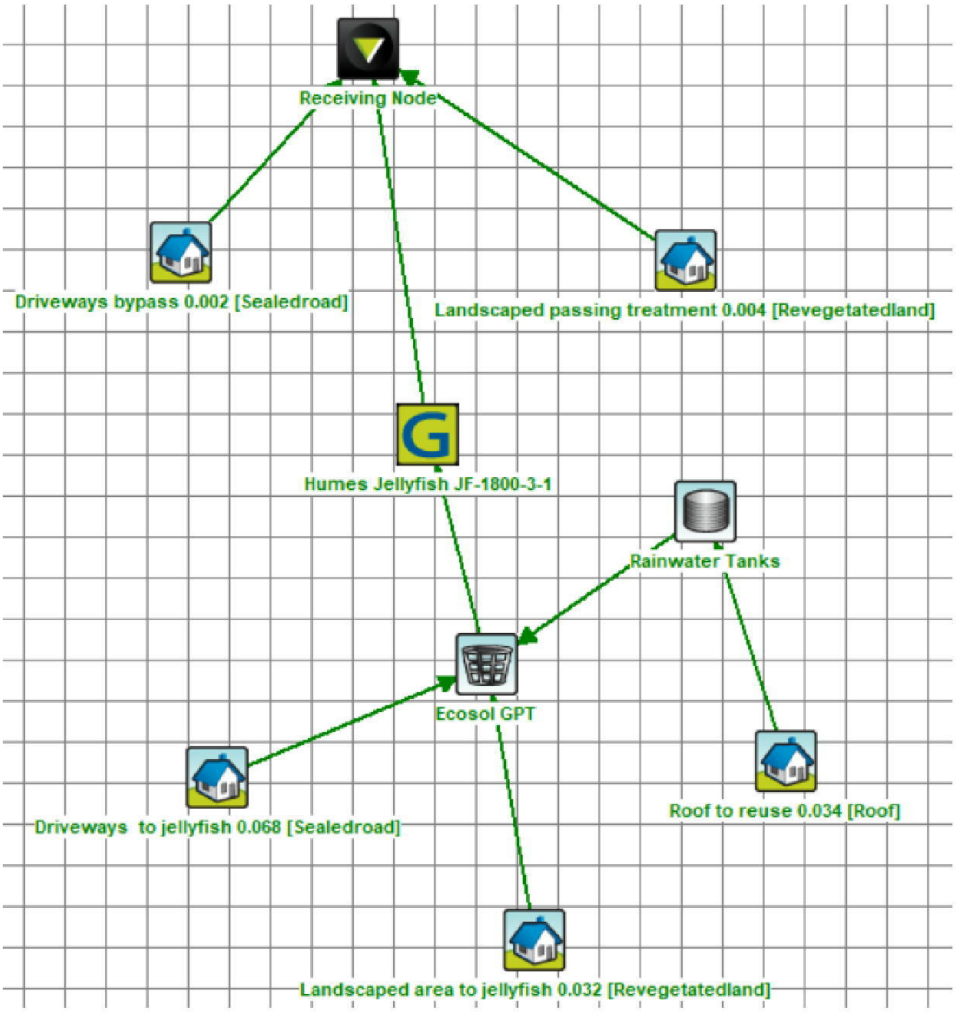
4 Water Quality Treatment Proposal

Stormwater carries pollutants that it has picked up from the surfaces it has come into contact with. This creates a risk of contamination to downstream habitats. A treatment train can be implemented to protect against this risk of contamination. A treatment train consists of more than one mechanism that removes pollution; in our case a series of treatment devices are used. The treatment train is effective because the different treatment devices in series overlap in the pollutants they remove thus providing a more thorough treatment with redundancies along the treatment train.
The water quality treatment train has been designed to ensure that pollutant removal rates satisfy the Council's requirements for Stormwater Quality Control Policy.

Pollution Retention Criteria			
Priority	Pollutant	Description	Retention Criteria for Development Sites
1	Fine Sediment	Contaminant particles 0.1mm or less	85% of the total annual load.
2	Gross Pollutants	Trash litter and vegetation larger than 5mm	90% of the total annual load.
3	Coarse sediment	Contaminant particles between 0.1mm and 5mm	85% of the total annual load.
4	Nutrients	Total phosphorus and total nitrogen	60% for TP and 45% for TN

The following treatment train is proposed:

Collect all runoff from the site and screen it from litter and sediments. Treat the screened water through proprietary devices (reuse tank, Gross Pollutant interception device and the Jellyfish unit) and dispose it to the existing drainage system. An On Site Detention is required for the site, however, it's contribution to the removal of the pollutants was not modelled to remain on a conservative side.



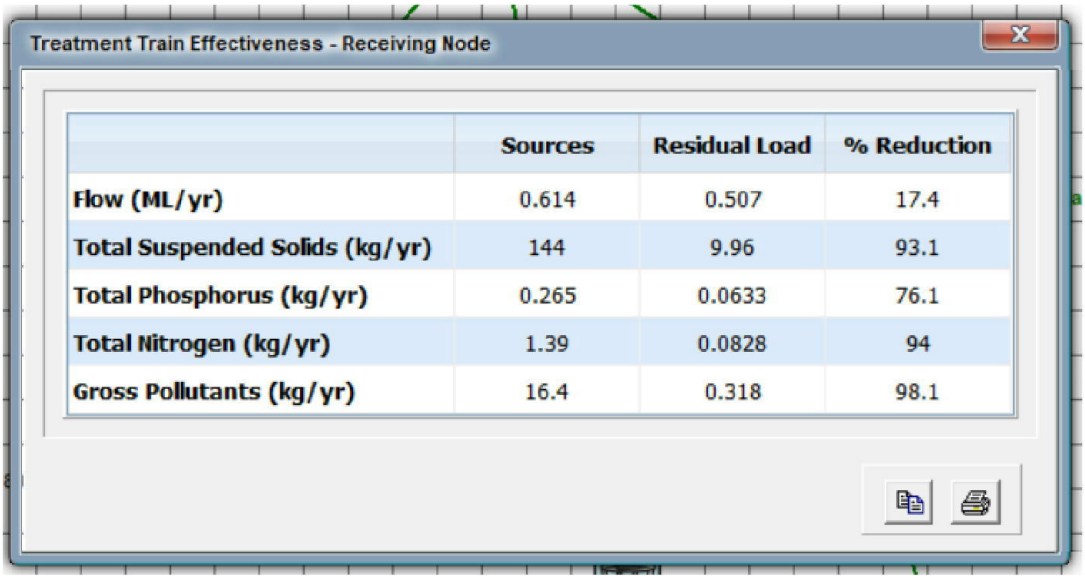
Treatment 1. Rainwater reuse tank.

Treatment 2. Gross pollutant device.

Treatment 3. Jellyfish device

5 Modelling Results

The modelling has been completed with the intention to model the post developed water quality runoff condition and ensure that pollutant removal rates satisfy the water quality requirements. The results for the treatment train effectiveness can be seen below.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.614	0.507	17.4
Total Suspended Solids (kg/yr)	144	9.96	93.1
Total Phosphorus (kg/yr)	0.265	0.0633	76.1
Total Nitrogen (kg/yr)	1.39	0.0828	94
Gross Pollutants (kg/yr)	16.4	0.318	98.1

As it can be seen from the above table that the treatment train has been successful in achieving the Council's environmental stormwater objectives.

6 Conclusion

The modelling results above have been determined using the MUSIC program (with PCC pollutant loads). A treatment train consisting of rainwater tank, the gross pollutant trap and a water quality device would provide the required pollution removal for the developed site.

7 Operation and Maintenance

The 3 main parts of the treatment train are the gross pollutant trap, the Jellyfish and the rainwater reuse.

It is preferable that the operation and maintenance of the above three components is undertaken by one contractor who would inspect, clean and if necessary repair the relevant parts of the system. The contractor would have to inspect the system at least every 6 months & clean the sediment and litter arrestor pit, the high early discharge pit and the Jellyfish device.

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				p/annum KL	daily KL	KL/sqm/yr
49 gibbes			area sqm			
non potable usage rates				na		
bioretention filter area		1 KL/year/sqm		na		
toilet/urinal		0.1 KL/day/toilet				
	system A	9		282	0.1	
	system B	0		0	0.1	
landscaped areas	system A	0.4 KL/year/sqm	53	21.2	0.06	0.4
	system B	0.4 KL/year/sqm	0	0	0.00	0.4
	system A	total		303		
	systemB	total		0		
truck wash	site	5 KL/week say 50 weeks allow for holidays		na		

system A

where 53 sqm is landscaping at front & along perimeters within frontage