

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL



Approval no: DEV2020/1161

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Appendix A – Stormwater Quality Management Plan

1. Pollutants of Concern

The Townsville City Council Stormwater Quality Guidelines provide guidance on the types of pollutants likely to be generated from different developments. The Water Quality Objectives for Townsville are listed in Table 2. The pollutants most likely to be of concern for Residential and Commercial developments are identified in Table 1 below.

Table 1 Pollutants Likely to be of Most Concern

Pollutant	Development Phase	
	Construction	Operation
Litter	✓	✓
Sediment	✓	unlikely
Hydrocarbons (including oil and grease)	✓	✓
Toxic materials (e.g. cement slurry, asphalt primer, solvents)	✓	unlikely
pH altering substances (e.g. cement slurry and wash waters)	✓	unlikely
Oxygen demanding substances (organic and chemical matter)	possibly	unlikely
Nutrients (nitrogen and phosphorus)	✓	✓
Pathogens / Faecal coliforms (bacteria and viruses)	possibly	unlikely
Heavy metals (often associated with fine sediment)	unlikely	unlikely
Surfactants (e.g. detergents from car washing)	unlikely	possibly
Thermal pollution (heat)	unlikely	unlikely

2. Design Objectives for Water Management

The Environmental Protection (Water) Policy 1997 provides a framework for identifying environmental values and associated water quality objectives; this framework is consistent with the efficient use of resources and best practice environmental management and involves the community through consultation and consideration of economic and social impact assessment. Environmental Values (EV) are a reflection of the qualities of a catchment that the community believes to be important. As such, environmental values are established through community consultation rather than through a scientific process. Once EV are established for a catchment, Water Quality Objectives (WQO) can be defined, which are meant to protect these values.

Table 2 Water Quality Objectives for Townsville

Parameter	Statistic	Load Based Reduction	Water Quality Objectives
Total Suspended Solids (TSS)	Mean Range	80%	Less than 5mg/L
Total Phosphorous (TP)	Mean Range	65%	Less than 0.01 to 0.05mg/L
Total Nitrogen (TN)	Mean Range	40%	Less than 0.2 to 0.5mg/L
PH	Mean Range	-	Between 7 and 8
Dissolved Oxygen	Mean	-	Greater than 80% saturation during daytime
Gross Pollutants	-	90%	Retention of litter greater than 50mm for flows up to the 3-month ARI peak flow
Coarse sediment	-	-	Retention of sediment coarser than 0.125mm for peak flows up to the ARI 3-month peak flow

While load based reduction targets focus on performance of a stormwater quality management system within the urban footprint, concentration based WQO's are concerned with median flow concentrations as they enter downstream receiving water.

3. Proposed Stormwater Treatment Train Analysis

The proposed development site has ample area available to dedicate to stormwater treatment devices. Roof water will discharge via downpipes either to the landscaped areas or directly to the field inlet pits. These will be fitted with Stormceptor Enviropod 200 filter baskets (or equivalent) for the removal of gross pollutants. The landscaped areas and pavements also discharge directly to the field inlet pits.

The pits are then piped to a Stormwater 360 Stormfilter units (8 x 690mm cartridges, treatment capacity 7.2L/s), or equivalent, located underground. Discharge will be directly to the existing stormwater pit located in the north-east corner of the site.

4. MUSIC Modelling

Model Parameters

Table 3 Basic MUSIC Model Parameters

Input	Data Used
Rainfall Station	32040 TOWNSVILLE
Rainfall Period	01/01/1970 – 31/12/1983
Mean Annual Rainfall (mm)	1165mm
Evapotranspiration	1856mm
Model Timestep	6 minutes
Rainfall Runoff Parameters*	Urban Residential
Pollutant Parameters*	Urban Residential (Split)

Rainfall & Runoff Parameters

Table 4 Adopted MUSIC Quantity Parameters

Parameter	Roof/ Road/Ground Level
Rainfall Threshold (mm/day)	1
Soil Storage Capacity (mm)	120
Soil Initial Storage (% of Capacity)	25
Field Capacity (mm)	80
Infiltration Capacity coefficient - a	200
Infiltration Capacity exponent - b	1
Initial Depth (mm)	10
Daily Recharge Rate (%)	25
Daily Baseflow Rate (%)	5
Daily Deep Seepage Rate (%)	0

Pollutant Generation

In MUSIC stormwater quality is characterized by event mean concentrations (EMC) for storm flows and base flows. In this study, the EMC were adopted from the Townsville City Council MUSIC Modelling Guidelines. The pollutants of concern that were assessed include total suspended solids (TSS), total phosphorous (TP) and total nitrogen (TN). The quality of stormwater runoff is characterised by inputting event mean concentrations (EMC) for storm flow and base flow conditions as well as the standard deviation of each EMC.

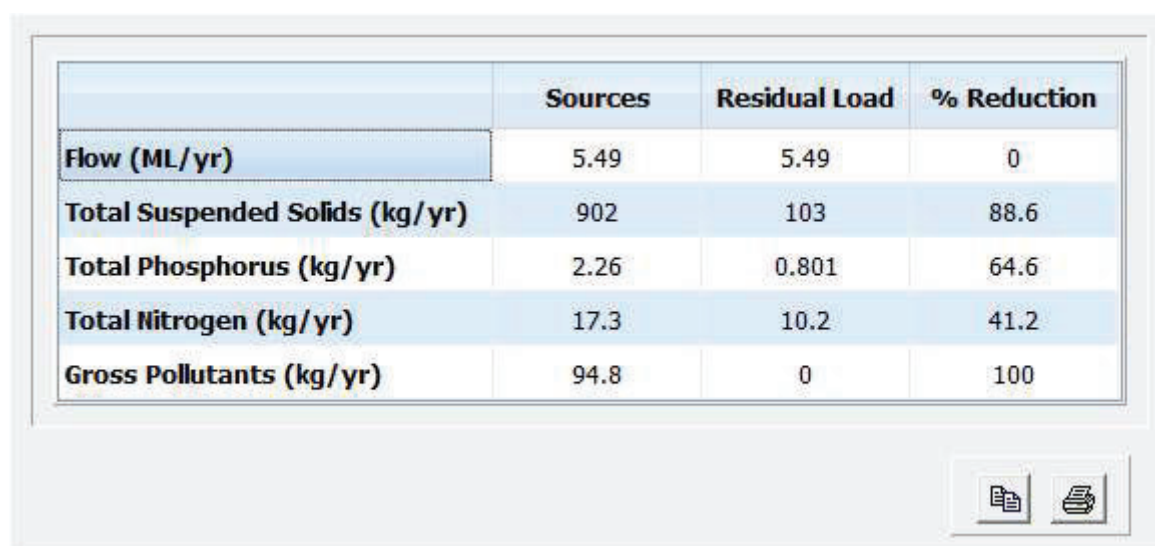
Pollutant concentrations are based on Urban Residential land use parameters.

Table 5 Adopted MUSIC Quality Parameters Urban Residential

Flow Type	Surface Type	TSS (log ₁₀ values)		TP (log ₁₀ values)		TN (log ₁₀ values)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Baseflow	Roof	1.10	0.17	-0.82	0.19	0.32	0.12
	Roads	1.20	0.17	-0.85	0.19	0.11	0.12
	Ground level	1.15	0.17	-1.22	0.19	-0.05	0.12
Stormflow	Roof	1.30	0.32	-0.89	0.25	0.30	0.19
	Roads	2.43	0.32	-0.30	0.25	0.34	0.19
	Ground level	1.95	0.32	-0.66	0.25	0.30	0.19

Results

The indicative layout of the MUSIC model, treatment train parameters and results are shown below.

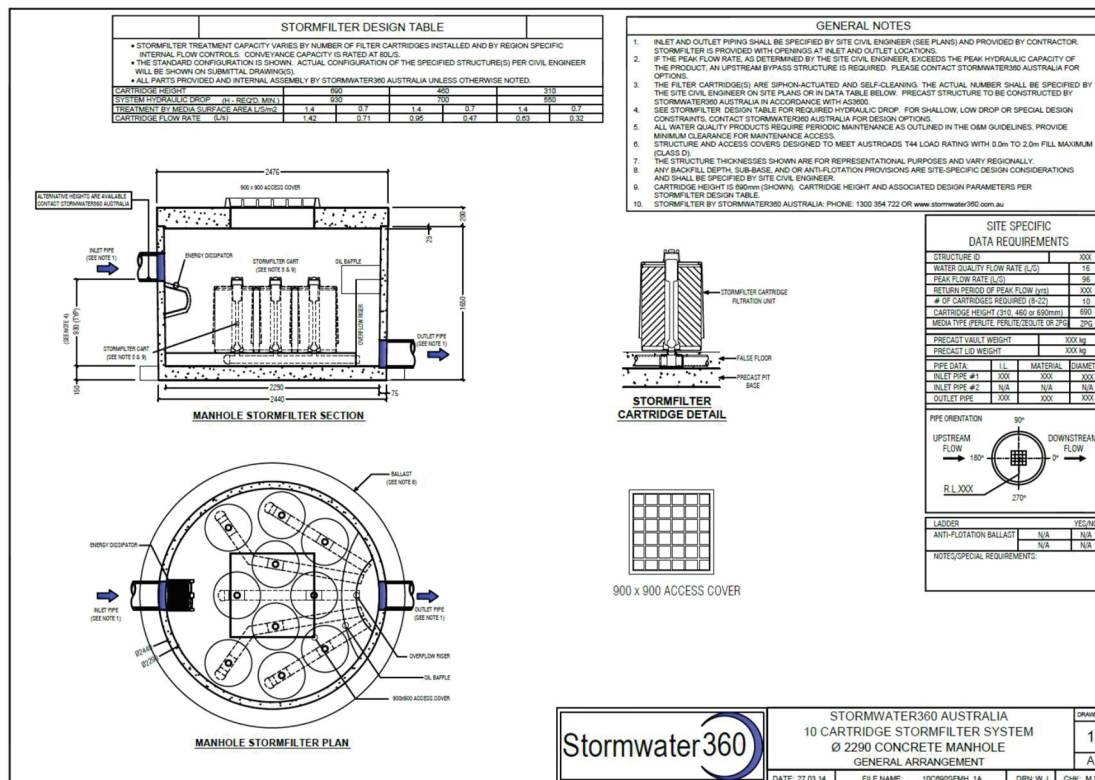


	Sources	Residual Load	% Reduction
Flow (ML/yr)	5.49	5.49	0
Total Suspended Solids (kg/yr)	902	103	88.6
Total Phosphorus (kg/yr)	2.26	0.801	64.6
Total Nitrogen (kg/yr)	17.3	10.2	41.2
Gross Pollutants (kg/yr)	94.8	0	100

As demonstrated, the proposed treatment train will reduce pollutant loadings in accordance with the Townsville City Council Stormwater Quality Guidelines.



Proposed stormwater treatment train.



Proposed stormwater treatment chamber.