MILFORD PLANNING

Appendix 6

Premise

CAMM LAND PTY LTD

CLEVELAND BAY INDUSTRIAL PARK LOT 20

STORMWATER QUALITY MANAGEMENT PLAN

Report No: CBI-0004/R01
Rev: A
29 September 2022

DOCUMENT AUTHORISATION					
Revision	**Revision Date**	**Report Details**			
A	29/09/22	For Review			
Prepared By		**Reviewed By**		**Authorised By**	
Katie De Lacey		Zac Strogusz		Adam Pease	

CONTENTS

APPENDICES

1. INTRODUCTION

Premise Australia Pty Ltd has been commissioned by Camm Land Pty Ltd to prepare a Stormwater Quality Management Plan for the Cleveland Bay Industrial Park – Internal Subdivision Development (Part of Existing Stage 3), serviced via Townsville Port Road/Ron McLean Drive, in Stuart. This report addresses the Stormwater Quality objectives of Lot 20.

2. EXISTING SITE

The subject site is currently vacant with bulk earthworks having been completed. The development site is zoned as Special Purpose by Townsville City Council. Running between boundaries of lot 20 and 6, is an open drain which is not part of this Stormwater Quality Analysis.

3. PROPOSED DEVELOPMENT

Cleveland Bay Industrial Park, Lot 20, a concrete plant, will comprise of the following components:

- Loading bays, silos, aggregate bins, mobile batch plant, workshop and control room, heavy vehicle workshop, parking, a precast layout. It has been treated as a lumped industrial lot with a standard 90% fraction impervious for the purposes of this report. Only the heavy vehicle workshop will be roofed.

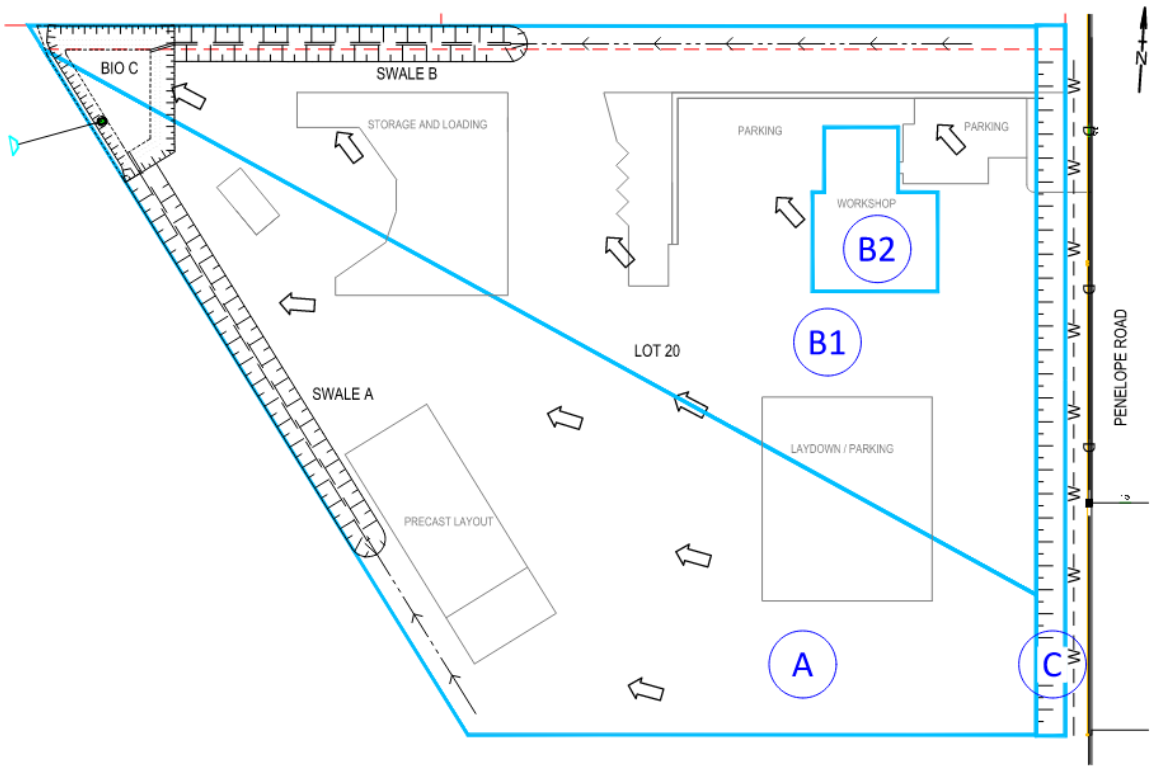
Figure 1 – Locality of Lot 20

4. STORMWATER DRAINAGE

The proposed subject site catchments are shown in Figure 2.

The proposed catchments for Lot 20 (catchments A, B1, and B2) grade toward the north and west into swales and eventually into a bioretention basin. The flows leave the site via an outlet in the northwest and drain to an existing watercourse. The swales are pervious, and most of the rest of the site will be impervious. This is in line with a 90% fraction impervious suggested by TCC for lumped industrial sites. Catchment C grades toward the road and it is undecided if this shall be vegetated land or not. As such it has been treated as lumped industrial to be conservative. While catchment C does not receive treatment, the catchment area is included in the calcs to ensure as a whole, the site meets the required targets.

Figure 2 – Proposed catchments of subject site – Lot 20



5. STORMWATER QUALITY

5.1 Stormwater Quality Treatment (Construction Phase)

During the construction phase various pollutants are generated which can find their way into the stormwater runoff. These pollutants can affect the quality of the stormwater runoff and hence pollute both the site and the downstream receiving environment. Table 1 below outlines the major sources of pollutants.

Table 1 – Typical Construction Phase Pollutants

Construction Phase Pollutants
Litter from construction packaging, paper, food packaging, off cuts, etc.
Sediment from erosion of exposed soils and stockpiles.
Hydrocarbons - from fuel and oil spills, leaks from construction equipment.
Toxic Materials - cement slurry, solvents, cleaning agents, wash waters.
pH altering substances - cement slurry, wash waters.

Erosion and sediment control measures used during the construction phase of the development will be designed and installed in accordance with International Erosion Control Association (Australasia) - "Best Practice Erosion & Sediment Control – for building and construction sites" November 2008 as well as the TCC Development Guidelines for Erosion and Sediment Control.

5.2 State Planning Policy Compliance

The latest SPP (2017) Stormwater Management Design Objectives (SMDO's) have been adopted for the operational phases of the development and is detailed in Table 2 below.

Table 2 – Stormwater Quality Objective

Pollutant	Reductions in Mean Annual Load from unmitigated development (%)
Suspended Solids	80
Total Phosphorus	65
Total Nitrogen	40
Gross Pollutants	90

5.3 Stormwater Quality Modelling

Stormwater Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC), version 6.3.0, adhering to the prescribed Water by Design MUSIC modelling guidelines Version 3.0, 2018 (WBDMG).

The following data was used as input for the MUSIC model:

- Long term rainfall data was obtained from the Townsville AERO pluviometer (gauge number 032040) at a six (6) minute data interval for a representative period from 1990-1999;
- Monthly aerial potential evapotranspiration data from the Townsville Aero pluviometer;
- The Values for typical Impervious Fractions used have been conservatively calculated from areas on the design plans, and/or adopted from Table 3.7 and are in line with TCC City Plan SC6.4.4.4 Attachment A – Design AEPs and fraction impervious for land use zones;
- Pollutant export parameters have been adopted from Table 3.8 and 3.9 in the Healthy Land and Water (2018) MUSIC Modelling Guidelines Version 3.0, 2018, for a land use type of Industrial.

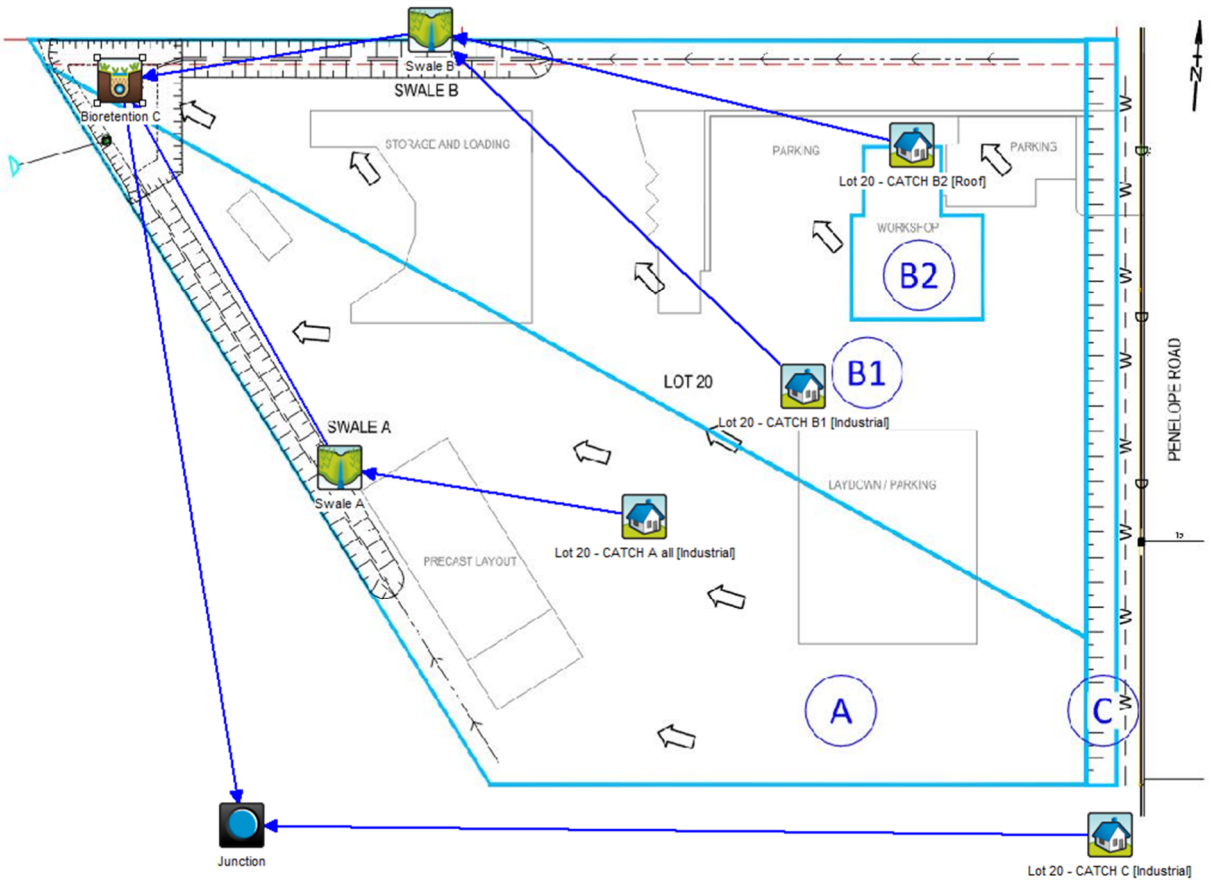
Details of Catchment assumptions can be seen in Table 3.

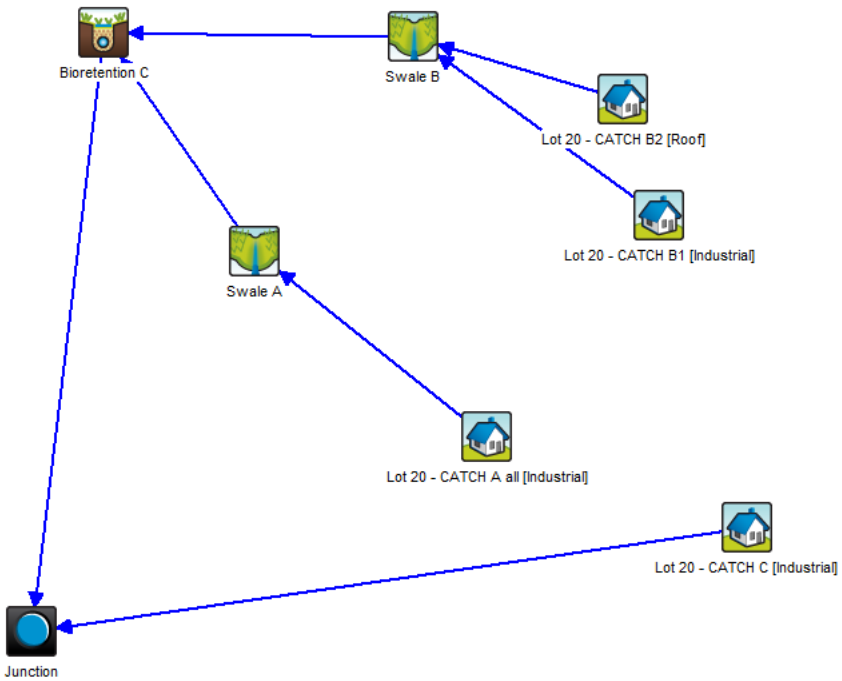
Table 3 – MUSIC Model Catchment Parameters

Catchment ID	Land Use	Node Type	Total Area (ha)	Fraction Impervious	TREATMENTS	
A	**Lumped** Catchment-Industrial	Urban	1.15	90%	Swale A	Bioretention Basin C
B1	**Lumped** Catchment-Industrial	Urban	1.20	90%	Swale B	
B 2	Roof - Industrial	Urban	0.08	100%		
C	**Lumped** Catchment-Industrial	Urban	0.09	90%	untreated	

A snapshot of the MUSIC model setup can be seen below (Figure 3). See also Appendix B.

Figure 3 – MUSIC Model Layout





5.4 Other Treatment Nodes

Overall treatment devices which form part of the overall treatment train are shown in Table and Table 5 (below).

Table 4 – Treatment Device Parameters – Bioretention Basins

		BIO C
Inlet Properties	Low Flow Bypass (m^3/s)	0
	High Flow Bypass (m^3/s)	100
Storage Properties	Extended Detention Depth (EDD) (m)	0.4
	Surface Area (m^2)	311
Filter And Media Properties	Filter Area (m^2)	240
	Unlined Filter Area Perimeter (m)	67
	Saturated Hydraulic conductivity (mm/hr)	180
	Filter Depth (m)	0.5
	TN Content of Filter material (mg/kg)	600
	Orthophosphate content of Filter media (mg/kg)	30
Infiltration Properties	Exfiltration rate (mm/hr)	3.6

Table 5 – Treatment Device Parameters – Swales

		Swale A lot 20	Swale B lot 20
Inlet Properties	Low Flow Bypass (m^3/s)	0	0
Storage Properties	Length (m)	90	70
	Bed Slope (%)	0.1	0.1
	Base width (m)	0.5	0.5
	Top Width (m)	7.5	7.5
	Depth (m)	0.70	0.70
	Vegetation height (m)	0.1	0.1
	Exfiltration rate (mm/hr)	0	0
	Side slopes (1 in …)	5	5

5.5 Treatment Train Effectiveness

Table 6 outlines the effectiveness of the overall MUSIC Model Treatment Train in achieving the set Stormwater Management Design Objectives (SMDO's) for pollutant reduction for the subject lot 20.

Table 6 – Treatment Train Effectiveness – Final Receiving Node

Pollutant	Sources	Residual Load	Reduction (%)	Target Reduction (%)
Suspended Solids (TSS)	3090	333	**86.7**	80
Total Phosphorus (TP)	8.07	2.71	**65.2**	65
Total Nitrogen (TN)	53.1	24.9	**51.7**	40
Gross Pollutants (GP)	430	13.7	**96.8**	90

The overall site meets the Pollutant reduction objectives as shown in Table 6.

6. STORMWATER QUALITY MAINTENANCE

Prior to commencement of construction, an Erosion and Sediment Control Plan (ESCP) will be prepared and implemented to minimise the impacts on stormwater quality. The plan will address site and catchment specific erosion control measures, generally adhering to the following control measures.

6.1 Pre-Construction

Before construction the following measures will be established and maintained for any to be disturbed:

- Stockpile areas to be designated to minimise impacts on site runoff.
- Provision of shakedown pit for any entry/exit points to the site; and
- Toolbox talk to inform any regular site personnel

6.2 During Construction

- Construction related activities will be contained within the subject site where possible to minimise areas of disturbance
- Topsoil retention for site rehabilitation.
- Regular inspection of sediment control measures; and
- Dynamic response to any changing site conditions

6.3 Post-Construction

Following construction any disturbed areas will be stabilised through revegetation which is to be maintained until established.

7. CONCLUSION

The Stormwater Quality Improvement Device (SQID's) proposed for the development include BioBasins and Swales to provide stormwater quality treatment.

The MUSIC modelling of the proposed treatment train demonstrates the SPP's Pollutant Load SMDO's are achieved. On this basis we recommend acceptance of the proposed treatment solution.

8. QUALIFICATIONS

Our analysis and overall approach have been specifically catered for the requirements of Camm Land Pty Ltd and may not be applicable beyond this scope. For this reason, any other third parties are not authorised to utilise this report without further input and advice from Premise.

9. RPEQ CERTIFICATION

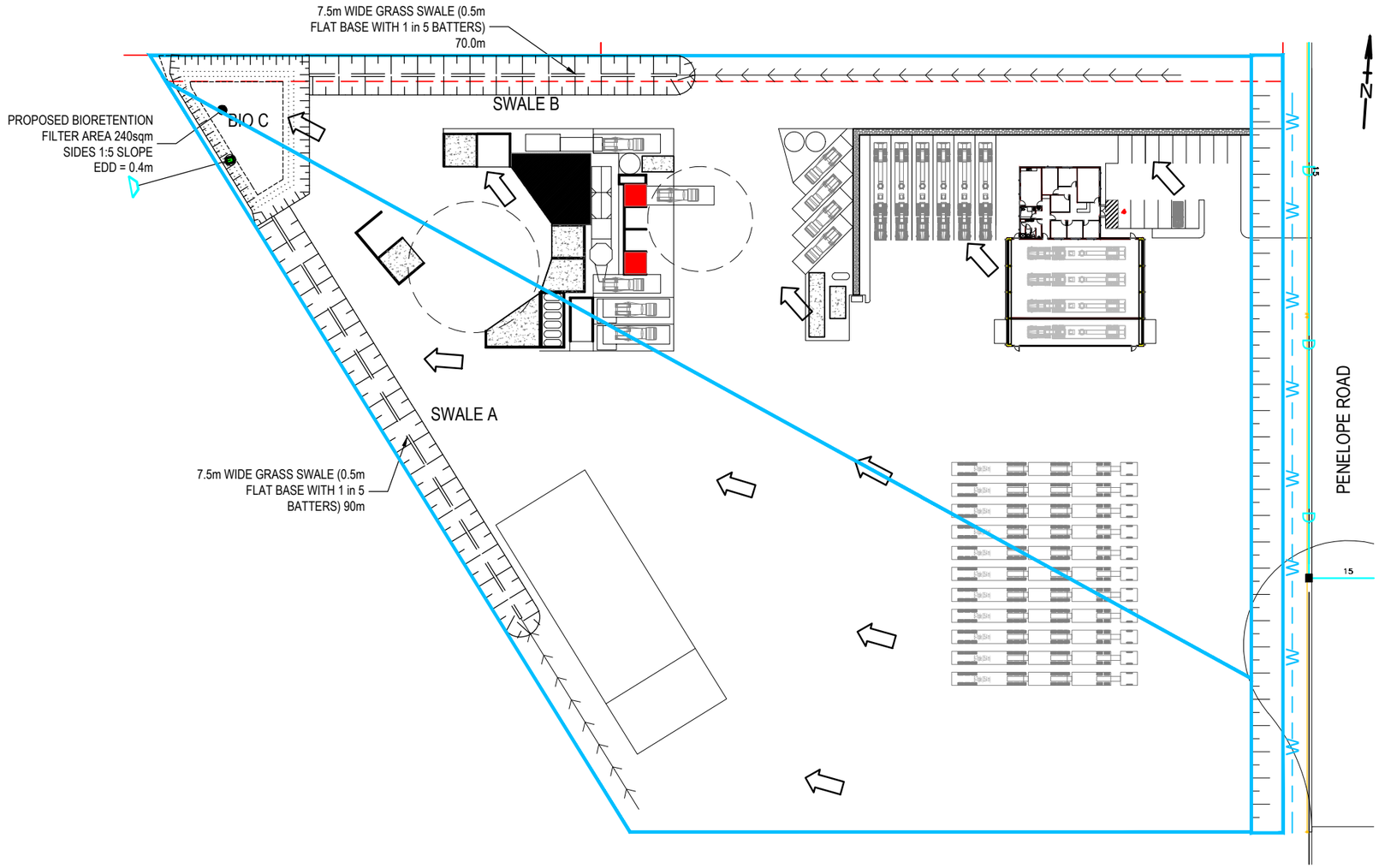
As Registered Professional Engineer of Queensland (RPEQ) for this project, on behalf of Premise Australia Pty Ltd, I certify that the modelling undertaken as part of this assessment has been undertaken in accordance with current engineering best practice as recommended in the State Planning Policy.

Name: **Adam Pease** RPEQ No: **22556** Date: **23rd September 2022**

Signature: _____

APPENDIX A

MUSIC MODEL LAYOUT


7.5m WIDE GRASS SWALE (0.5m
FLAT BASE WITH 1 in 5 BATTERS)
70.0m
SWALE B
PROPOSED BIORETENTION
FILTER AREA 240sqm
SIDES 1:5 SLOPE
EDD = 0.4m
BIO C
SWALE A
7.5m WIDE GRASS SWALE (0.5m
FLAT BASE WITH 1 in 5
BATTERS) 90m
PENELOPE ROAD
15
N

APPENDIX B

MUSIC MODEL INFORMATION

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DESCRIPTION

CBI-0004 lot 20 industrial

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VersionNumber	205
MeteorologicalTemplate	C:\Program Files (x86)\eWater\MUSIC 6 6.2.1.1576 HL\Met Data\Townsville 6 minutes (1990 - 1999).mlb
MUSIC-link - Music Version	6.3 build 0.1908
	C:\12dS\data\12dSynergy\CBI-0004 CBIP - Lot 20 SQMP_14832\11. Engineering - Civil\07. MUSIC\CBI-0004

Node Type	**UrbanSourceNode**			
Zoning Surface Type	Industrial	Industrial	Roof	Industrial
Node Name	**Lot 20 - CATCH A all**	**Lot 20 - CATCH B1**	**Lot 20 - CATCH B2**	**Lot 20 - CATCH C**
Node ID	16	17	22	23
General - Location	Lot 20 - CATCH A all	Lot 20 - CATCH B1	Lot 20 - CATCH B2	Lot 20 - CATCH C
General - Flux unit	mm	mm	mm	mm
Areas - Total Area (ha)	1.15	1.2	0.08	0.08
Areas - Impervious (%)	90	90	100	90
Areas - Pervious (%)	10	10	0	10
Rainfall-Runoff - Impervious Area - Rainfall Threshold (mm/day)	1	1	1	1
Rainfall-Runoff - Pervious Area - Soil Storage Capacity (mm)	250	250	120	250
Rainfall-Runoff - Pervious Area - Initial Storage (% of Capacity)	30	30	25	30
Rainfall-Runoff - Pervious Area - Field Capacity (mm)	100	100	80	100
Rainfall-Runoff - Pervious Area - Infiltration Capacity Coefficient - a	200	200	200	200
Rainfall-Runoff - Pervious Area - Infiltration Capacity Exponent - b	1	1	1	1
Rainfall-Runoff - Groundwater Properties - Initial Depth (mm)	10	10	10	10
Rainfall-Runoff - Groundwater Properties - Daily Recharge Rate (%)	4	4	25	4
Rainfall-Runoff - Groundwater Properties - Daily Baseflow Rate (%)	2	2	5	2
Rainfall-Runoff - Groundwater Properties - Daily Deep Seepage Rate (%)	0.4	0.4	0	0.4

Total Suspended Solids - Base Flow Concentration - Mean (log mg/L)	0.78	0.78	0	0.78
Total Suspended Solids - Base Flow Concentration - Std Dev (log mg/L)	0.45	0.45	0.45	0.45
Total Suspended Solids - Base Flow Concentration - Estimation Method		Stochastically generated		
Total Suspended Solids - Base Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Total Suspended Solids - Storm Flow Concentration - Mean (log mg/L)	1.92	1.92	1.3	1.92
Total Suspended Solids - Storm Flow Concentration - Std Dev (log mg/L)	0.44	0.44	0.44	0.44
Total Suspended Solids - Storm Flow Concentration - Estimation Method		Mean		
Total Suspended Solids - Storm Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Total Phosphorus - Base Flow Concentration - Mean (log mg/L)	-1.11	-1.11	0	-1.11
Total Phosphorus - Base Flow Concentration - Std Dev (log mg/L)	0.48	0.48	0.48	0.48
Total Phosphorus - Base Flow Concentration - Estimation Method		Stochastically generated		
Total Phosphorus - Base Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Total Phosphorus - Storm Flow Concentration - Mean (log mg/L)	-0.59	-0.59	-0.89	-0.59
Total Phosphorus - Storm Flow Concentration - Std Dev (log mg/L)	0.36	0.36	0.36	0.36
Total Phosphorus - Storm Flow Concentration - Estimation Method		Stochastically generated		
Total Phosphorus - Storm Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Total Nitrogen - Base Flow Concentration - Mean (log mg/L)	0.14	0.14	0	0.14
Total Nitrogen - Base Flow Concentration - Std Dev (log mg/L)	0.2	0.2	0.2	0.2
Total Nitrogen - Base Flow Concentration - Estimation Method		Stochastically generated		

Total Nitrogen - Base Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Total Nitrogen - Storm Flow Concentration - Mean (log mg/L)	0.25	0.25	0.25	0.25
Total Nitrogen - Storm Flow Concentration - Std Dev (log mg/L)	0.32	0.32	0.23	0.32
Total Nitrogen - Storm Flow Concentration - Estimation Method		Stochastically generated		
Total Nitrogen - Storm Flow Concentration - Serial Correlation (R squared)	0	0	0	0
Import Flow Properties - Import Flow Enabled	1	1	1	1
Import Flow Properties - Import Flow File				
Import Flow Properties - Header lines	0	0	0	0
Import Flow Properties - Baseflow Column	0	0	0	0
Import Flow Properties - Impervious Stormflow Column	0	0	0	0
Import Flow Properties - Pervious Stormflow Column	0	0	0	0
Import Flow Properties - Unit		m3/s		
Import Flow Properties - Catchment Area for GP (ha)	1	1	1	1

Node Type	**BioRetentionNodeV4**
Node Name	**Bioretention C**
Node ID	19
Coordinates	557.303688905265:-427.987797486639
General - Location	Bioretention C
General - Notes	
General - Fluxes	
General - Flux File Timestep (in seconds)	360
Inlet Properties - Low Flow By-pass (cubic metres per sec)	0
Inlet Properties - High Flow By-pass (cubic metres per sec)	100
Storage Properties - Extended Detention Depth (metres)	0.4
Storage Properties - Surface Area (square metres)	311
Filter and Media Properties - Filter Area (square metres)	240
Filter and Media Properties - Unlined Filter Media Perimeter (metres)	67
Filter and Media Properties - Saturated Hydraulic Conductivity (mm/hr)	180

Filter and Media Properties - Filter Depth (metres)	0.5	
Filter and Media Properties - TN Content of Filter Media (mg/kg)	600	
Filter and Media Properties - Orthophosphate Content of Filter Media (mg/kg)	30	
Infiltration Properties - Exfiltration Rate (mm/hr)	3.6	
Lining Properties - Base Lined	no	
Vegetation Properties - Vegetation Properties	Vegetated with Effective Nutrient Removal Plants	
Outlet Properties - Overflow Weir Width (metres)	5	
Outlet Properties - Underdrain Present	0	
Outlet Properties - Submerged Zone With Carbon Present	0	
Outlet Properties - Submerged Zone Depth (metres)	0.35	
Advanced Properties - Total Suspended Solids - k (m/yr)	8000	
Advanced Properties - Total Suspended Solids - C* (mg/L)	20	
Advanced Properties - Total Phosphorus - k (m/yr)	6000	
Advanced Properties - Total Phosphorus - C* (mg/L)	0.13	
Advanced Properties - Total Nitrogen - k (m/yr)	500	
Advanced Properties - Total Nitrogen - C* (mg/L)	1.4	
Advanced Properties - Filter Media Soil Type	1	{Index from 0 to 4 for "Sand" | "Loamy Sand" | "Sandy Loam" | "Silt Loam" | "Loam"}
Advanced Properties - Weir Coefficient	1.7	
Advanced Properties - Pet Scaling Factor	2.1	
Advanced Properties - Number of CSTR Cells	3	
Advanced Properties - Porosity of Filter Media	0.35	
Advanced Properties - Porosity of Submerged Zone	0.35	
Advanced Properties - Horizontal Flow Coefficient	3	

Node Type	SwaleNode	
Zoning Surface Type		
Node Name	**Swale A**	**Swale B**
Node ID	15	18
General - Location	Swale A	Swale B
General - Notes		
General - Fluxes		
General - Flux File Timestep (in seconds)	360	360
Inlet Properties - Low Flow By-pass (cubic metres per sec)	0	0
Storage Properties - Length (metres)	90	70
Storage Properties - Bed Slope (%)	0.1	0.1
Storage Properties - Base Width (metres)	0.5	0.5
Storage Properties - Top Width (metres)	7.5	7.5
Storage Properties - Depth (metres)	0.7	0.7
Storage Properties - Vegetation Height (metres)	0.1	0.1
Storage Properties - Exfiltration Rate (mm/hr)	0	0
Advanced Properties - Number of CSTR Cells	10	10
Advanced Properties - Total Suspended Solids - k (m/yr)	8000	8000
Advanced Properties - Total Suspended Solids - C* (mg/L)	20	20
Advanced Properties - Total Suspended Solids - C** (mg/L)	14	14
Advanced Properties - Total Phosphorus - k (m/yr)	6000	6000
Advanced Properties - Total Phosphorus - C* (mg/L)	0.13	0.13
Advanced Properties - Total Phosphorus - C** (mg/L)	0.13	0.13
Advanced Properties - Total Nitrogen - k (m/yr)	500	500
Advanced Properties - Total Nitrogen - C* (mg/L)	1.4	1.4
Advanced Properties - Total Nitrogen - C** (mg/L)	1.4	1.4
Advanced Properties - Threshold Hydraulic Loading for C** (m/yr)	3500	3500

Node Type	JunctionNode						
Node Name	**Junction**						
Node ID	20						
General - Location	Junction						
General - Notes							
Link Name			Drainage Link				
Source Node ID	16	17	18	15	19	23	22
Target Node ID	15	18	19	19	20	20	18
Notes							
Routing			Not Routed				
Muskingum K	30	30	30	30	30	30	30
Muskingum Theta	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Secondary Outflow Components							


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