
MUSIC Auditor Training

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E2DESIGNLAB

Agenda

- / MUSIC as a compliance tool
- / Assessing a MUSIC model
 - What the assessor needs to do
 - How the MUSIC Auditor can help
 - How the MUSIC Auditor works
 - Parameter range checks
 - Upper and lower limits
- / Reviewing climate data
- 15 minute break at 11:45
- / Reviewing catchment data
 - Area and impervious fraction
 - Soil parameters
 - Pollutant concentrations
- / Reviewing treatment data
 - Wetland case study
 - Bioretention case study
 - Guideline and recommended ranges
 - Interpreting results
 - Warnings vs hard limits
 - Justification of variations
- / Q&A

MUSIC as a compliance tool

MUSIC as a compliance tool

	Policy and regulatory framework	MUSIC Modelling	Detailed design
South Australia	<ul style="list-style-type: none"> • Planning, Development and Infrastructure Act 2016 • Environment Protection Act 1993 • Environment Protection (Water Quality) Policy 2015 • Water sensitive urban design - Creating more liveable and water sensitive cities in South Australia 2013 	<ul style="list-style-type: none"> • SA MUSIC Modelling Guidelines 	<ul style="list-style-type: none"> • Water Sensitive Urban Design Technical Manual for the Greater Adelaide Region 2009
Other		<ul style="list-style-type: none"> • eWater MUSIC User Manual • Melbourne Water 2018 MUSIC Guidelines • Healthy Land and Water 2018 MUSIC Modelling Guidelines 	<ul style="list-style-type: none"> • Melbourne Water Wetland Design Manual 2017 • Design Guide – Bioretention systems in Melbourne Water Development Services Schemes 2019 • Healthy Land and Water Draft Wetland Technical Design Guidelines 2017 • Healthy Land and Water Bioretention Technical Design Guidelines 2014 • Melbourne Water WSUD Engineering Procedures: Stormwater 2005 • Australian Runoff Quality 2007

MUSIC as a compliance tool

Water Conservation

Demonstrated compliance with SA residential building requirements for water efficiency

Non-residential: Water efficient techniques in commercial, industrial and other non-residential urban settings

Irrigated open spaces: Best practice irrigation management in outdoor irrigated open spaces

Stormwater Runoff Quality

45%

Retention of typical annual urban load of total nitrogen

60%

Retention of typical annual urban load of total phosphorus

80%

Retention of typical annual urban load of suspended solids

Waterway Protection

Rate of runoff discharged from the site does not exceed the pre-urban development for the 1 in year average recurrence interval (ARI) peak flow

Flood Management

Capacity of the existing drainage system is not exceeded

No increase in the 5 year ARI peak flow compared to existing conditions

No increase in flood risk for 100 year ARI peak flow, compared to existing conditions

When is MUSIC likely to be used?

- / Development planning assessments
- / Stormwater management plans
- / WSUD retrofits

Demonstrate compliance with relevant stormwater quality objectives


Draft South Australia MUSIC Guidelines (2020)

- Provide guidance on typical usage and support consistency while allowing for innovation
- Applicants should explain and justify any variations from guidelines
- Refer Water Sensitive Urban Design Technical Manual for the Greater Adelaide Region (2009) for design guidance where available

Assessing a MUSIC Model

Assessing a MUSIC Model

[HOME](#) [MUSIC AUDITOR](#) [PAST AUDITS](#) [WSUD AUDIT GUIDELINES](#) [WETLAND ANALYSIS TOOL](#) [FAQ](#) [USEFUL LINKS](#) [ABOUT](#)



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[Home](#) » [MUSIC Auditor](#)

MUSIC Auditor

Please select the authority you will be performing the audit for.

Authority

MUSIC Auditor supports MUSIC version 6.3

Please select the summary report file that MUSIC has generated.

[How do I generate a summary report file?](#)

Choose a file to upload: No file chosen

Please press submit once you have selected a file.

Assessing a MUSIC Model?

- / Assessing a MUSIC model
 - What the assessor needs to do
 - How the MUSIC Auditor can help
 - How the MUSIC Auditor works
 - What the MUSIC Auditor does not do
 - Parameter range checks
 - Upper and lower limits

What the assessor needs to do

- Review the MUSIC model to determine whether
 - The model complies with the MUSIC Guidelines
 - The model layout and inputs are consistent with the proposed design and best practice approaches
 - The model is a realistic and reasonable model representation of the proposed design and anticipated constructed assets
 - The designer has provided adequate explanation and justification of the assumptions and inputs used

How the MUSIC Auditor can help

- / 'Audits' input parameters
 - Guideline ranges
 - Checks parameters are defaults where changes are not expected or
 - Checks that inputs are typical or reasonable to identify obvious errors

Source Nodes				
Parameter	User Input	Check	Guideline	
Urban (Node 4) Music Help				
Field Capacity (mm)	80	not equal	20	Use of 20 mm (suitable MW guidelines. Variati
Soil Storage Capacity (mm)	120	not equal	30	Use of 30 mm (suitable MW guidelines. Variati
Initial storage (% of Capacity)	30	not equal	25	Default expected, varia
Urban (Node 5) Music Help				
Field Capacity (mm)	80	not equal	20	Use of 20 mm (suitable MW guidelines. Variati
Soil Storage Capacity (mm)	120	not equal	30	Use of 30 mm (suitable MW guidelines. Variati
Initial storage (% of Capacity)	30	not equal	25	Default expected, varia
Agricultural (Node 6) Music Help				
Node Type	Agricultural	not	Urban	Only urban source nod

How the MUSIC Auditor can help

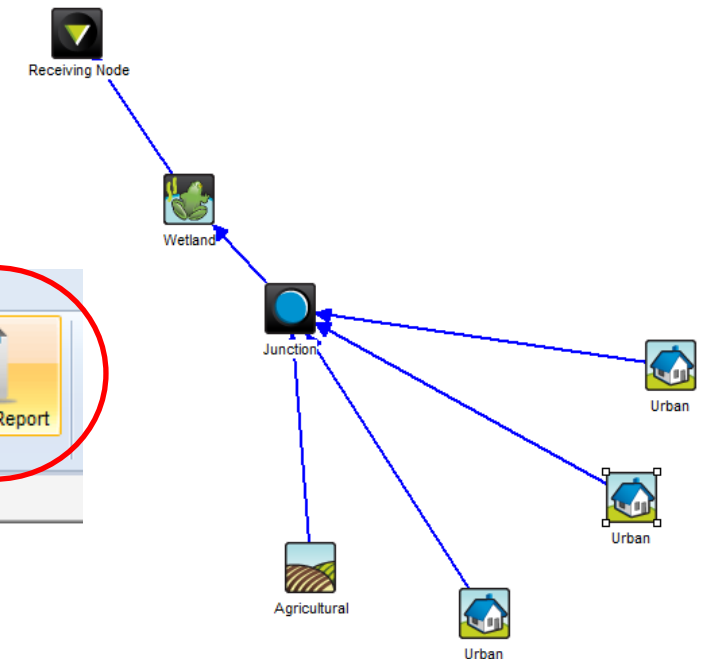
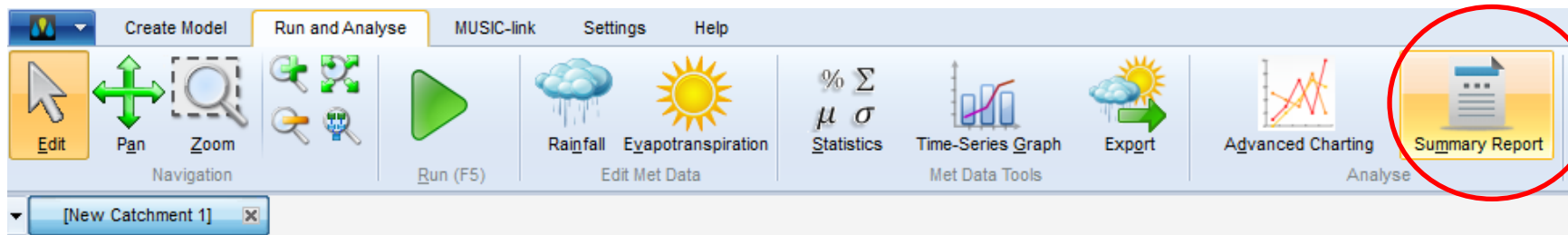
- / A quick screen to draw attention to the main parameters likely to require attention and identify obscure changes
- / Quickly checks all parameters, so you can focus on the key issues and parameters
- / The Auditor tool provides processing power and information to support decisions
- / The assessor ultimately needs to decide whether parameters used are realistic and compliant with the guidelines or are reasonable assumptions given the context and justification provided.

Source Nodes				
Parameter	User Input	Check	Guideline	
Residential (Node 1) Music Help				
Field Capacity (mm)	50	not equal	30	Use of 30 mm recommended reference to eWater Modeller calibrations by Goyder either based on Tables 1 and 2 of the calibrated model representation of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended reference to eWater Modeller calibrations by Goyder either based on Tables 1 and 2 of the calibrated model representation of the area of interest.
Residential (Node 4) Music Help				
Field Capacity (mm)	50	not equal	30	Use of 30 mm recommended reference to eWater Modeller calibrations by Goyder either based on Tables 1 and 2 of the calibrated model representation of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended reference to eWater Modeller calibrations by Goyder either based on Tables 1 and 2 of the calibrated model representation of the area of interest.

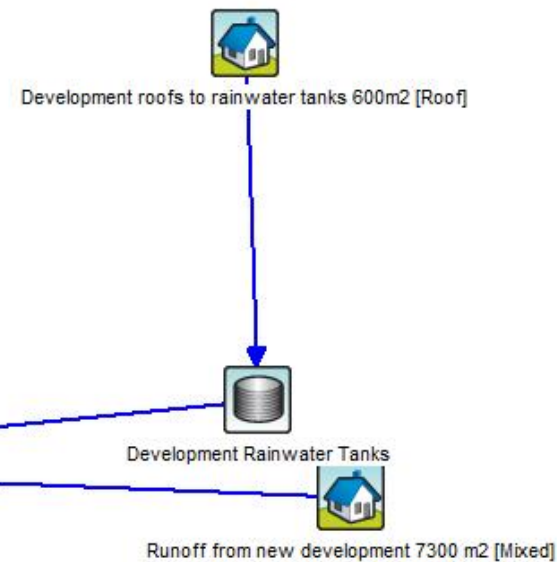
Creating a summary report in MUSIC

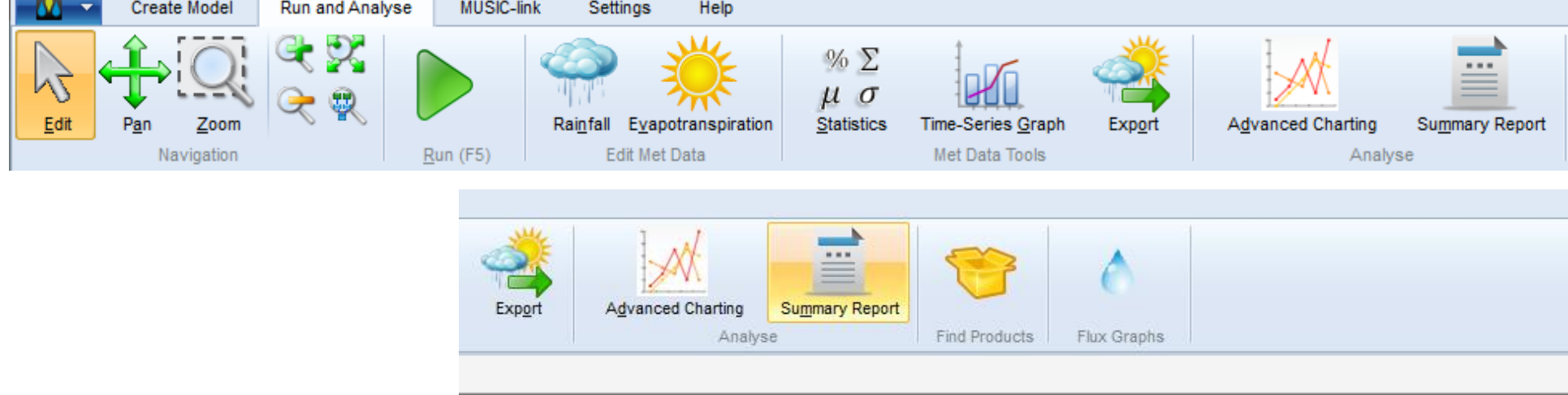
Creating a summary report file in MUSIC

- Open the model in MUSIC
- Run the model (optional)
- Generate a summary report
(Run and analyse menu : Summary Report)



Open example model in MUSIC (Example 1)

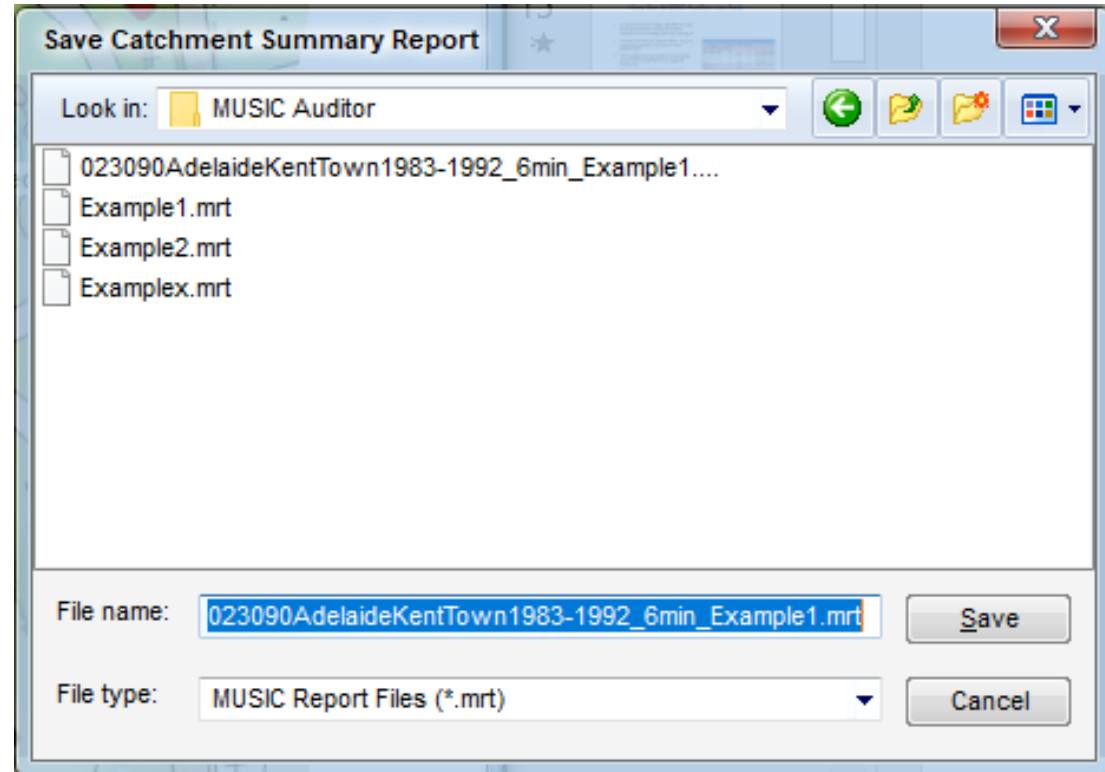




Select 'Summary Report'
from the 'Run and Analyse'
Menu



Save the Summary Report (* .mrt file)




Using the MUSIC Auditor

MUSIC Auditor

/ Go to www.musicauditor.com.au

MUSIC Auditor

[HOME](#)[WSUD AUDIT GUIDELINES](#)[ABOUT](#)




[Water Sensitive SA MUSIC Auditor Training](#)

The MUSIC Auditor is being extended to support South Australia and is currently in beta.

The South Australia MUSIC Guidelines are also now well progressed although details are still being finalised.

Join us on Wednesday 28th October with Water Sensitive SA for training on the MUSIC Auditor
<https://www.watersensitivesa.com/tribeevent/music-auditor-training/>

 **Posted By** dbrowne [read more](#)

USER LOGIN

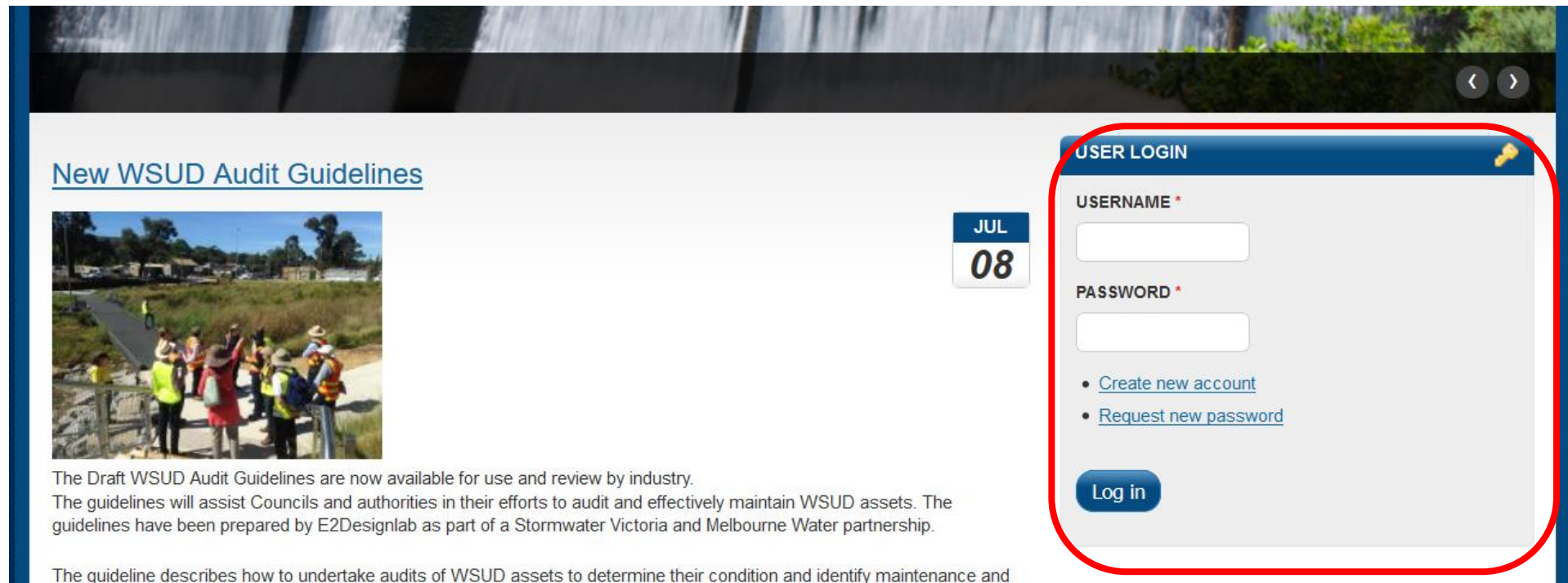
USERNAME *

PASSWORD *

- [Create new account](#)
- [Request new password](#)

MUSIC Auditor

/ Register a new user account



The screenshot displays the MUSIC Auditor website interface. On the left, a news article titled "New WSUD Audit Guidelines" is featured, accompanied by a photo of a group of people in high-visibility vests standing near a waterway. Below the photo, text states: "The Draft WSUD Audit Guidelines are now available for use and review by industry. The guidelines will assist Councils and authorities in their efforts to audit and effectively maintain WSUD assets. The guidelines have been prepared by E2Designlab as part of a Stormwater Victoria and Melbourne Water partnership." A date widget shows "JUL 08". On the right, a "USER LOGIN" form is highlighted with a red border. The form includes fields for "USERNAME *" and "PASSWORD *", a "Log in" button, and links for "Create new account" and "Request new password".

New WSUD Audit Guidelines

JUL 08

The Draft WSUD Audit Guidelines are now available for use and review by industry. The guidelines will assist Councils and authorities in their efforts to audit and effectively maintain WSUD assets. The guidelines have been prepared by E2Designlab as part of a Stormwater Victoria and Melbourne Water partnership.

The guideline describes how to undertake audits of WSUD assets to determine their condition and identify maintenance and

USER LOGIN

USERNAME *

PASSWORD *

[Create new account](#)

[Request new password](#)

Log in

MUSIC Auditor

- / Register a new user account
- / Record your email, username and password

USER LOGIN

USERNAME *

PASSWORD *

[Create new account](#)

[Request new password](#)

Log in

Home » [User account](#) » User account

User account

[Create new account](#) [Log in](#) [Request new password](#)

USERNAME *

Spaces are allowed; punctuation is not allowed except for periods, hyphens, apostrophes, and underscores.

E-MAIL ADDRESS *

A valid e-mail address. All e-mails from the system will be sent to this address. The e-mail address is not made public and will not be used for any other purpose.

AUTHORITY *

- Select a value -

Please select which water authority / municipality you will be doing the majority of your auditing for.

CONTACT NUMBER

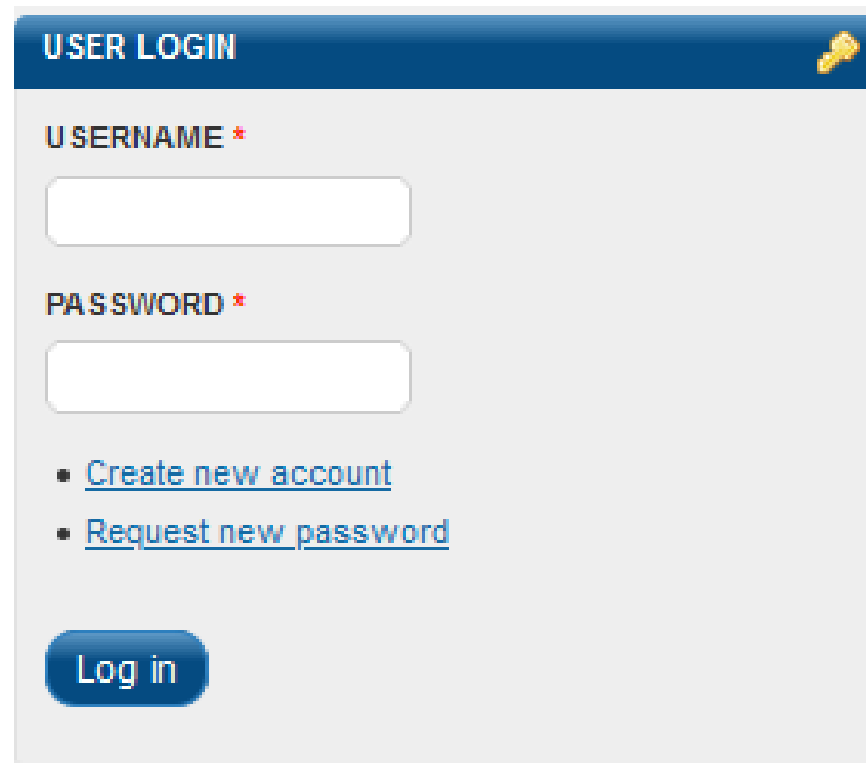
Please provide a business contact number.

COMPANY NAME *

Create new account

MUSIC Auditor

/ Log in using the username and password created



The image shows a 'USER LOGIN' form with a blue header bar containing the title and a key icon. Below the header, there are two input fields: 'USERNAME *' and 'PASSWORD *', both with red asterisks indicating required fields. Below the password field, there are two links: 'Create new account' and 'Request new password'. At the bottom left, there is a blue 'Log in' button.

USER LOGIN

USERNAME *

PASSWORD *

- [Create new account](#)
- [Request new password](#)

Log in

[My account](#) | [Log out](#)[Home](#) » [MUSIC Auditor](#)

MUSIC Auditor

Please select the authority you will be performing the audit for.

Authority

MUSIC Auditor supports MUSIC version 6, 6.1, 6.2 and 6.3

Please select the summary report file that MUSIC has generated.

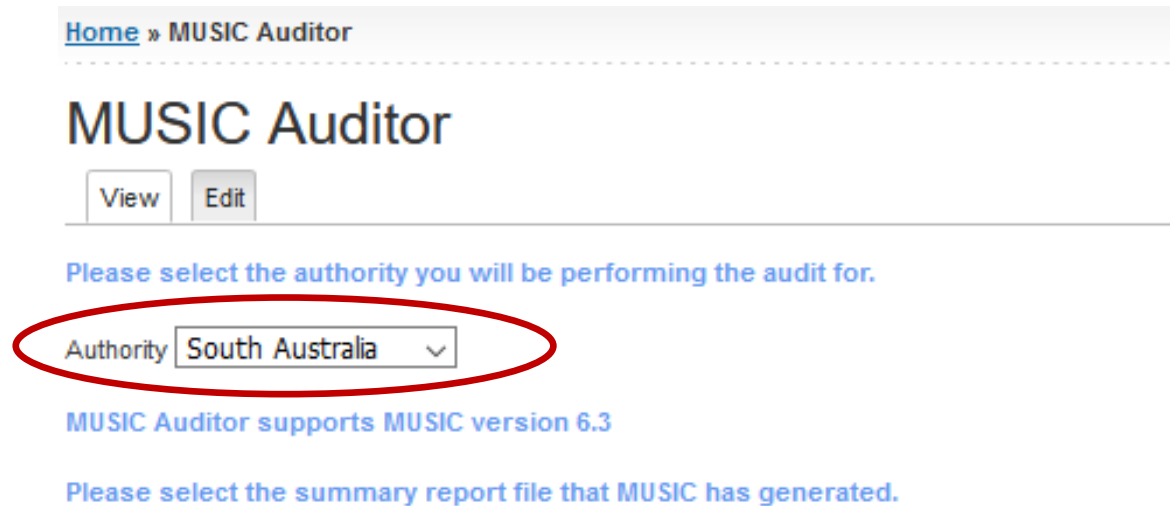
[How do I generate a summary report file?](#)

Choose a file to upload: No file selected.

Please press submit once you have selected a file.

Running the MUSIC Auditor

- / Click the 'MUSIC Auditor' tab
- / Select your Authority as South Australia



Running the Auditor

/ Select your Summary Report (*.mrt file)

My account | Log out |

[Home](#) » MUSIC Auditor

MUSIC Auditor

Please select the authority you will be performing the audit for.

Authority

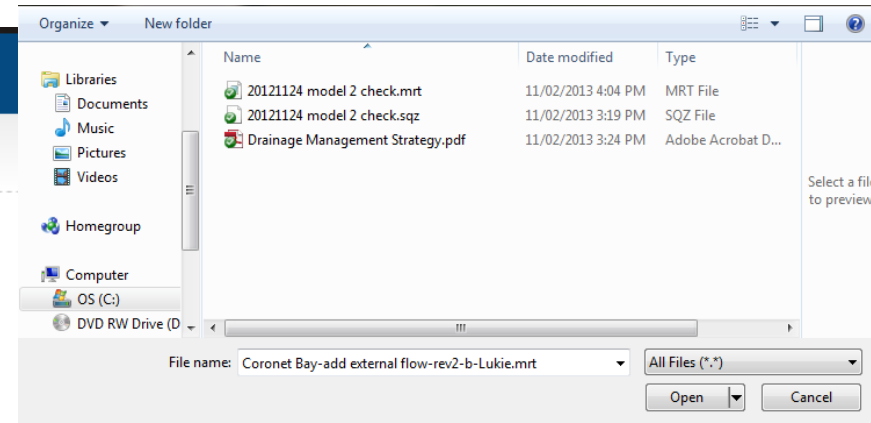
2016 Guidelines support MUSIC versions 6, 6.1 and 6.2

Please select the summary report file that MUSIC has generated.

[How do I generate a summary report file?](#)

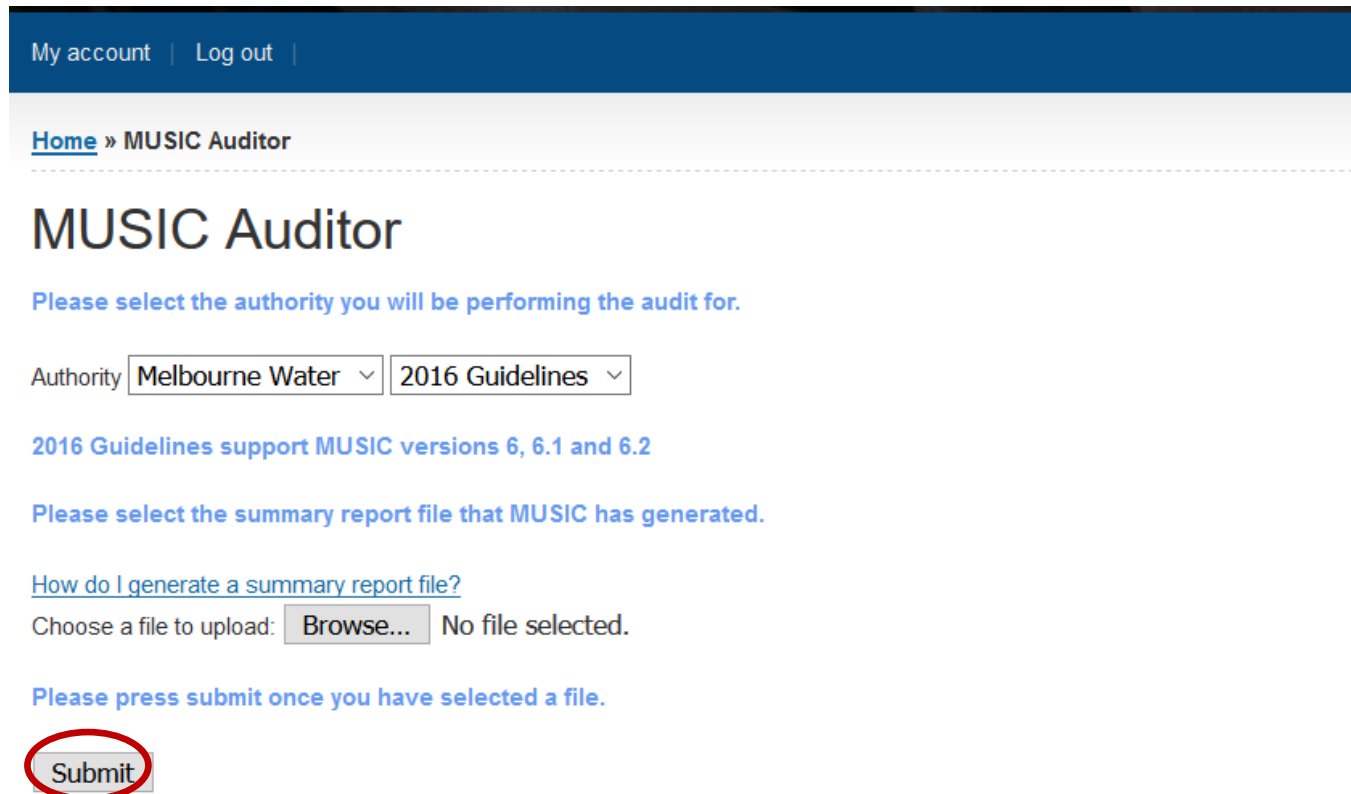
Choose a file to upload: No file selected.

Please press submit once you have selected a file.



Running the Auditor

- / Select your Authority as South Australia
- / Select your Summary Report (*.mrt file)
- / Click the “Submit” button
- / You should now see the results report



The screenshot shows the MUSIC Auditor web interface. At the top, there is a dark blue header with links for "My account" and "Log out". Below this is a breadcrumb trail: "Home » MUSIC Auditor". The main heading is "MUSIC Auditor". A blue instruction text says "Please select the authority you will be performing the audit for." Below this, there are two dropdown menus: "Authority" with "Melbourne Water" selected, and "2016 Guidelines" with an arrow pointing down. A blue note states "2016 Guidelines support MUSIC versions 6, 6.1 and 6.2". Another blue instruction text says "Please select the summary report file that MUSIC has generated." Below this, there is a link "How do I generate a summary report file?". A text input area says "Choose a file to upload:" followed by a "Browse..." button and the text "No file selected." A blue instruction text says "Please press submit once you have selected a file." At the bottom, there is a "Submit" button, which is circled in red.

My account | Log out |

[Home](#) » MUSIC Auditor

MUSIC Auditor

Please select the authority you will be performing the audit for.

Authority

2016 Guidelines support MUSIC versions 6, 6.1 and 6.2

Please select the summary report file that MUSIC has generated.

[How do I generate a summary report file?](#)

Choose a file to upload: No file selected.

Please press submit once you have selected a file.

Results



Date Completed: 26-10-20
 MUSIC Guideline Audited: 2020 Guideline
 MUSIC Version Audited: 6.2 or 6.3
 Filename is 023090AdelaideKentTown1983-
 1992_6min_Example1.mrt
[PDF Download](#)

Source Nodes				
Parameter	User Input	Check	Guideline	Comments
Node Runoff from new development 7300 m2 does not have any errors. (Node 1)				
Development roofs to rainwater tanks 600m2 (Node 8) Music Help				
Field Capacity (mm)	80	not equal	30	Use of 30 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest. FAQ
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224	Should be default unless published data. FAQ
Node Neil St north does not have any errors. (Node 10)				
Node Neil Street South does not have any errors. (Node 12)				
Playground (Node 13) Music Help				

How it works



How it works

/ MUSIC Guidelines have recommended parameter values or ranges:

- Guideline requirement (Usually design requirement from another source or modelling requirement)
- Internal guideline requirement
- Recommendation – Common or typical usage or preferred approach

/ MUSIC Auditor compares all parameter values from input file with reference values or ranges

Parameter	Recommendation	Source of guidance
Inlet properties		
Low Flow Bypass	0 m ³ /s unless design specifies otherwise	Recommendation
High Flow Bypass	Calculated as the capacity of the balance pipe from the sediment pond. This should be based on the design flow for the wetland, generally the 4EY flow Set to 100m ³ /s if wetland has perched sediment basin/s or bypass is achieved using an overflow weir*	Guideline requirement
Inlet Pond Volume	Volume of inlet pond, usually sized to remove 95% coarse sediment (>125 µm) for 4 EY event. Set to 0 if wetland has separate upstream sediment pond	Guideline requirement
Storage properties		
Surface Area	User defined macrophyte zone area at NWL. Iteratively sized in MUSIC to meet performance objectives.	N/A
Extended Detention	0.2 - 0.35m Deeper extended detention depths increase the risk of plant failure due to stress from extended periods of excessively deep water. Note: The default value for the extended detention depth of 1.0 m is not acceptable.	Internal guideline requirement (<0.35m)
Permanent Pool Volume	Generally, 0.35 to 0.4 m x Surface Area, that is the average depth in the macrophyte zone should be 0.35 - 0.4m.	Internal guideline requirement (<0.4m)
Initial Volume	Set equal to Permanent Pool Volume (assumed full)	Recommendation
Exfiltration	0 mm/hr. Exceptions only for specifically designed ephemeral wetlands. This shall be supported by geotechnical information on exfiltration rates for wetland subsoils and a wetland	Guideline requirement

How it works

- / MUSIC Auditor compares all parameter values from input file with reference values or ranges
 - Equal or not equal to a value
 - Greater than or less than
 - Within a range
- / Anything outside is flagged for consideration by assessor
- / Comment provided to assist assessment

Parameter	Recommendation	Source of guidance
Inlet properties		
Low Flow Bypass	0 m ³ /s unless design specifies otherwise	Recommendation
High Flow Bypass	Calculated as the capacity of the balance pipe from the sediment pond. This should be based on the design flow for the wetland, generally the 4EY flow Set to 100m ³ /s if wetland has perched sediment basin/s or bypass is achieved using an overflow weir*	Guideline requirement
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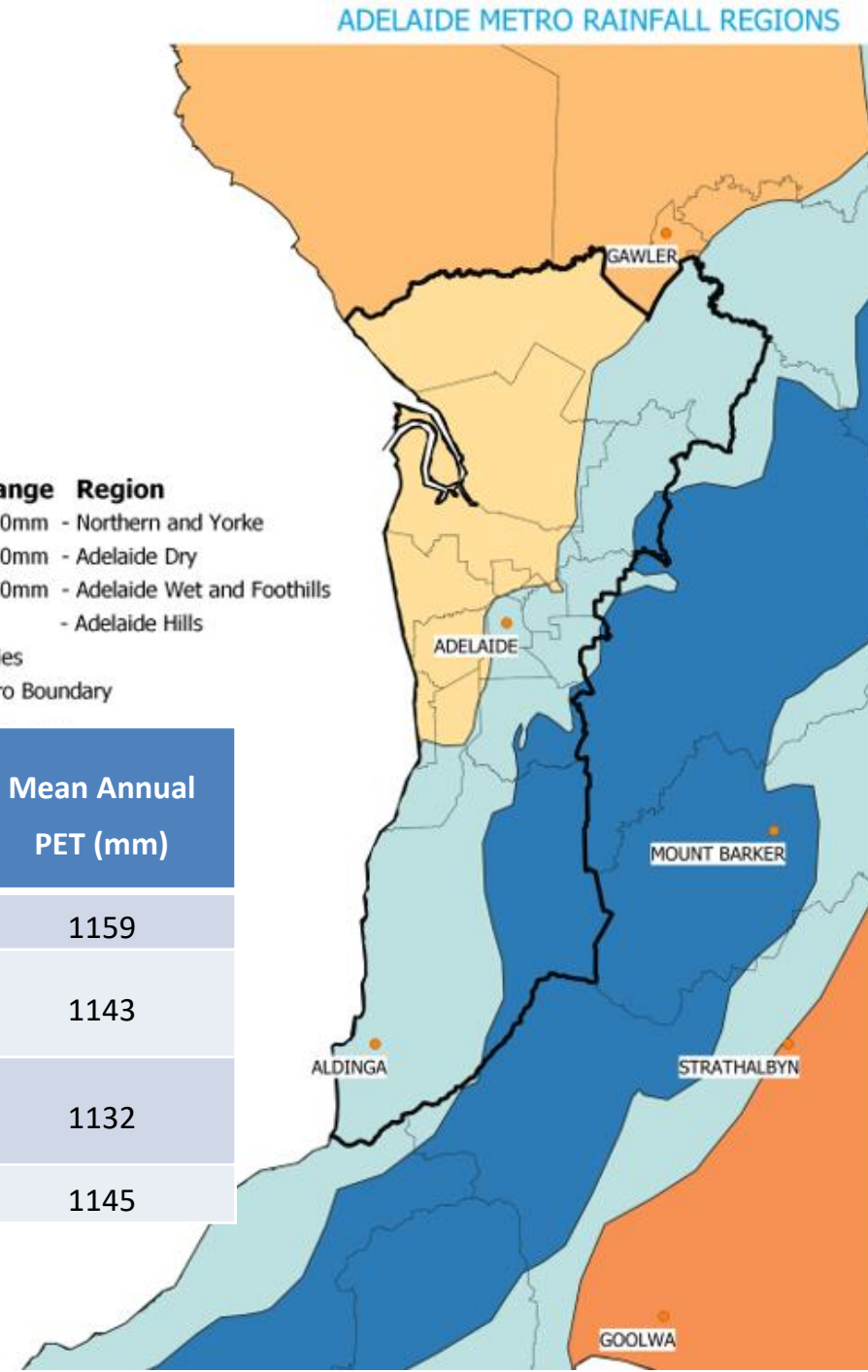
Interpreting results



Climate data

/ MUSIC Auditor expects one of the following climate templates will be used

Region	Rainfall band (mm)	Rainfall station	Period	Period mean annual rainfall (mm)	Mean Annual PET (mm)
Adelaide Dry	300 – 500	23013 Parafield Airport	1979-1988	450	1159
Adelaide Wet and Foothills	500 - 700	23090 Adelaide Kent Town	1983-1992	585	1143
Adelaide Hills	700 +	23875 Parawa (Second Valley AWS)	2001-2010	866	1132
Northern Yorke	300 – 500	23122 Roseworthy AWS	2001-2010	404	1145



Climate data

Checks whether rainfall and evapotranspiration data match a recognised South Australia rainfall template

- / Start and end dates
- / Rainfall station
- / Timestep (6 minute)
- / Rainfall total
- / Evapotranspiration total

Catchment Details				
Parameter	User Input	Check	Guideline	Comments
Node 023090AdelaideKentTown1983-1992_6min_Example1 does not have any errors. (Node 6 Minutes)				

Climate data

- / If a different template has been used usually all the climate checks will fail.
- / Will also pick up small variations e.g. mean annual rainfall doesn't match even though the period was correct

Catchment Details				
Parameter	User Input	Check	Guideline	Comments
Start Date	1/01/1970	not one of	1/01/1979;1/01/1983;1/01/2001;1/01/2001	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
End Date	31/12/1970 11:54:00 PM	not one of	31/12/1988 11:54:00 PM;31/12/1992 11:54:00 PM;31/12/2010 11:54:00 PM;31/12/2010 11:54:00 PM	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
Rainfall Station	23034 ADELAIDE	not one of	023013 PARAFIELD; 023090 ADELAIDE; 023875 PARAWA; 023122 ROSEWORTHY	Should be one of the recommended South Australia regional templates unless an alternative period is provided and justified as being well suited for the site taking into consideration relevant climate conditions. This should generally be based on a weighted average mean annual rainfall of multiple daily rainfall stations in proximity of the site or region of interest with an appropriate corresponding period of mostly complete 6 minute data chosen. Standard templates are available on Water Sensitive South Australia's website. Note: Templates from website should be used rather than raw data as rainfall has been infilled.
Mean Annual Rainfall (mm)	409	not one of	450;585;866;404	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
Mean Annual ET (mm)	1129	not one of	1159;1143;1132;1145	Should be based one of the recommended South Australia Water regional templates unless an alternative period is provided and justified. Note that the PET station nearest or most representative of the site may be chosen in in this case.

Climate data

When are variations ok?

- / Region where no registered template available
- / Consultant has done their homework
 - Calculated mean annual rainfall for site or region for long term (or a long recent period)
 - Chosen a representative period in terms of mean annual rainfall and other statistics, preferably 10 or 20 years
 - Checked for gaps and/or infilled

Catchment Details				
Parameter	User Input	Check	Guideline	Comments
Start Date	1/01/1970	not one of	1/01/1979;1/01/1983;1/01/2001;1/01/2001	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
End Date	31/12/1970 11:54:00 PM	not one of	31/12/1988 11:54:00 PM;31/12/1992 11:54:00 PM;31/12/2010 11:54:00 PM;31/12/2010 11:54:00 PM	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
Rainfall Station	23034 ADELAIDE	not one of	023013 PARAFIELD; 023090 ADELAIDE; 023875 PARAWA; 023122 ROSEWORTHY	Should be one of the recommended South Australia regional templates unless an alternative period is provided and justified as being well suited for the site taking into consideration relevant climate conditions. This should generally be based on a weighted average mean annual rainfall of multiple daily rainfall stations in proximity of the site or region of interest with an appropriate corresponding period of mostly complete 6 minute data chosen. Standard templates are available on Water Sensitive South Australia's website. Note: Templates from website should be used rather than raw data as rainfall has been infilled.
Mean Annual Rainfall (mm)	409	not one of	450;585;866;404	Should be based one of the recommended South Australia regional templates unless an alternative period is provided and justified.
Mean Annual ET (mm)	1129	not one of	1159;1143;1132;1145	Should be based one of the recommended South Australia Water regional templates unless an alternative period is provided and justified. Note that the PET station nearest or most representative of the site may be chosen in this case.

Catchments (Source nodes) – What gets checked

- / Catchment \neq 1 ha (not default) – Because few catchments are the default of 1 ha
- / Soil moisture storage capacity = 40 (Proposed guideline)
- / Field capacity = 30 (Proposed guideline)
- / All other soil parameters are defaults
- / All pollutant concentration parameters are defaults or correspond to a surface type in the guidelines
- / Legacy models:
 - Initial storage capacity default is 30 (v4 was 25)
 - Serial correlations should be zero (v4 defaults were non-zero)

Catchments – Source nodes

/ Guidelines allow for:

- Lumped or land use approach; or
- Split surface type approach

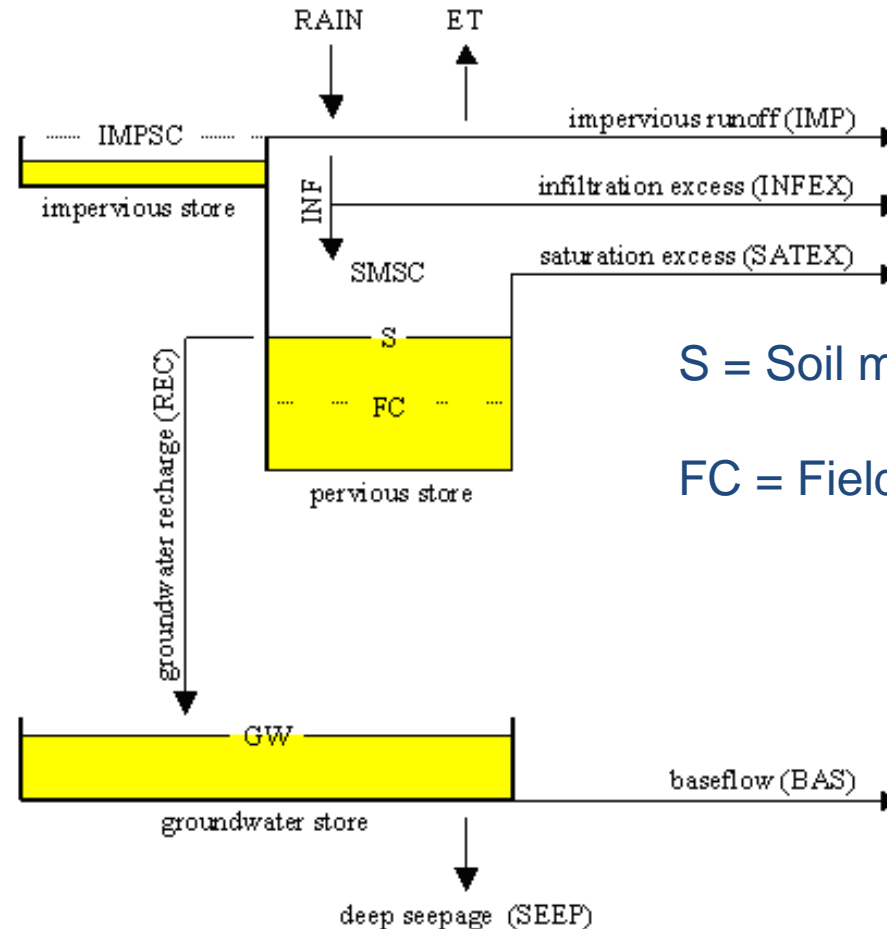
Surface Type/Land use	Surface type / pollutant generation parameters for:
<u>Land Use / Zoning (lumped approach)</u>	
Urban residential zones	Urban
Commercial	Urban
Industrial	Urban
Schools	Urban
Urban parks	Urban
National parks/ Protected land	Forest
Rural residential	Urban
Rural grazing	Agriculture
Nurseries, horticulture	Agriculture

Surface type	Description
Roof	<ul style="list-style-type: none">• Building roofs• Split roof areas where some areas drain to a rainwater tank and others direct to drainage
Road	<ul style="list-style-type: none">• Roads and carparks• The impervious fraction should be used to account for impervious roads and pavements relative to vegetated road verges or landscaping
All other urban	<ul style="list-style-type: none">• Any remaining area that is not a road or roof• Includes parks, backyards, <u>landscaping</u> and small impervious areas such as patios, walkways, paving, pergolas and residential driveways

Source nodes – soil parameters

MUSIC rainfall runoff model

Impervious Area Properties	
Rainfall Threshold (mm/day)	<input type="text" value="1.00"/>
Pervious Area Properties	
Soil Storage Capacity (mm)	<input type="text" value="40"/>
Initial Storage (% of Capacity)	<input type="text" value="25"/>
Field Capacity (mm)	<input type="text" value="30"/>
Infiltration Capacity Coefficient - a	<input type="text" value="200.0"/>
Infiltration Capacity Exponent - b	<input type="text" value="1.00"/>
Groundwater Properties	
Initial Depth (mm)	<input type="text" value="10"/>
Daily Recharge Rate (%)	<input type="text" value="25.00"/>
Daily Baseflow Rate (%)	<input type="text" value="5.00"/>
Daily Deep Seepage Rate (%)	<input type="text" value="0.00"/>



S = Soil moisture storage capacity

FC = Field capacity

Catchments and source nodes

/ Soil properties



Date Completed: 26-10-20
MUSIC Guideline Audited: 2020 Guideline
MUSIC Version Audited: 6.2 or 6.3
Filename is 023090AdelaideKentTown1983-
1992_6min_Example1.mrt
[PDF Download](#)

Guideline

Soil storage capacity = 40 mm

Field capacity = 30 mm

All other soil parameters = default values

Source Nodes				
Parameter	User Input	Check	Guideline	Comments
Node Runoff from new development 7300 m2 does not have any errors. (Node 1)				
Development roofs to rainwater tanks 600m2 (Node 8) Music Help				
Field Capacity (mm)	80	not equal	30	Use of 30 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest. FAQ
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224	Should be default unless published data. FAQ

Guideline soil parameters

- / eWater parameters for Adelaide
 - Soil moisture storage capacity 40
 - Field capacity 30
- / Goyder calibrations (2 catchments)
 - Soil moisture storage capacity ~50
 - Field capacity ~40
- / Note: These are lower than results for calibrations in Melbourne
 - Soil moisture storage capacity 120
 - Field capacity 50
- / Would really like to see more calibrations done in SA to provide a stronger basis for soil parameterisation

Soil parameters

- / Refine soil parameters for context where pervious runoff likely to be significant:
 - Impervious fraction <30%
 - Sandy soils
- / Choose soil parameters corresponding to catchment soil conditions
- / Tables in guideline adopted from WaterNSW MUSIC Guidelines 2019 which in turn are an interpretation of Macleod 2008

Dominant soil description	Root zone soil depth (0.5 m)	
	Soil moisture store capacity (mm)	Field capacity (mm)
Sand	175	74
Loamy sand	139	69
Clayey sand	107	75
Sandy loam	98	70
Loam	97	79
Silty loam	100	87
Sandy clay loam	108	73
Clay loam	119	99
Clay loam, sandy	133	89
Silty clay loam	88	70
Sandy clay	142	94
Silty clay	54	51
Light clay	98	73
Light-medium clay	90	67
Medium clay	94	70
Medium-heavy clay	94	70
Heavy clay	90	58

Soil parameters

Dominant soil description	Soil rainfall-runoff parameters ¹				
	Infiltration capacity coefficient – a (mm/d)	Infiltration capacity exponent - b	Daily recharge rate (%)	Daily baseflow rate (%)	Daily seepage rate (%)
Sand, loamy sand	360	0.5	100	50	0
Clayey sand, sandy loam, loam, silty loam, sandy clay loam	250	1.3	60	45	0
Clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay	180	3.0	25	25	0
Light clay, light medium clay, medium clay, medium heavy clay, heavy clay	135	4.0	10	10	0

Source Nodes



- / Soil/Pervious Area Parameters
 - Soil moisture storage capacity: 40
 - Field capacity: 30
 - All other parameters left unchanged

- / Expect different parameters where:
 - Soil parameters adjusted to be representative of site soils
 - A calibrated model has been used
 - Useful reference: Dotto, 2009
 - Document and justify these where they are used

Source nodes

/ Soil properties

Playground (Node 13) Music Help				
Field Capacity (mm)	80	not equal	30	Use of 30 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest. FAQ

- / In this case the user should adopt '40' and '30' as recommended in the guideline not the MUSIC defaults of '120' and '80' for a node with pervious areas

Source nodes

- Soil properties – roof

Development roofs to rainwater tanks 600m2 (Node 8) Music Help				
Field Capacity (mm)	80	not equal	30	Use of 30 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest.
Soil Storage Capacity (mm)	120	not equal	40	Use of 40 mm recommended in SA MUSIC guidelines based on reference to eWater MUSIC manual and consideration of limited calibrations by Goyder Institute. Variations should be justified and either based on Tables 4-6 and 4-7 of the guidelines or based on a calibrated model representative of the catchment, soils and climate of the area of interest. FAQ

- There is no pervious area runoff from a roof so this has no effect
- Can safely accept if roof impervious fraction is 100% (which it is)

Wizard - Page 1 of 5

Location: Development roofs to rainwater tanks 600m2

Areas

Total Area (ha): 0.060

Zoning/Surface Type: Roof

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

Pervious 0 %

☐ Import Flow

Fluxes... Notes...

Cancel Back Next

Surface type pollutant concentrations

Land use	Flow type	Total suspended solids (TSS)		Total Phosphorus (TP)		Total Nitrogen (TN)	
		Mean (log mg/L)	SD (log mg/L)	Mean (log mg/L)	SD (log mg/L)	Mean (log mg/L)	SD (log mg/L)
Road	Baseflow	0.96	0.401	-0.731	0.36	0.346	0.309
	Stormflow	2.431	0.333	-0.301	0.242	0.342	0.205
Roof	Baseflow	n/a*	n/a	n/a	n/a	n/a	n/a
	Stormflow	1.301	0.333	-0.886	0.242	0.301	0.205
All other urban	Baseflow	0.96	0.401	-0.731	0.36	0.346	0.309
	Stormflow	1.882	0.333	-0.68	0.242	0.224	0.205

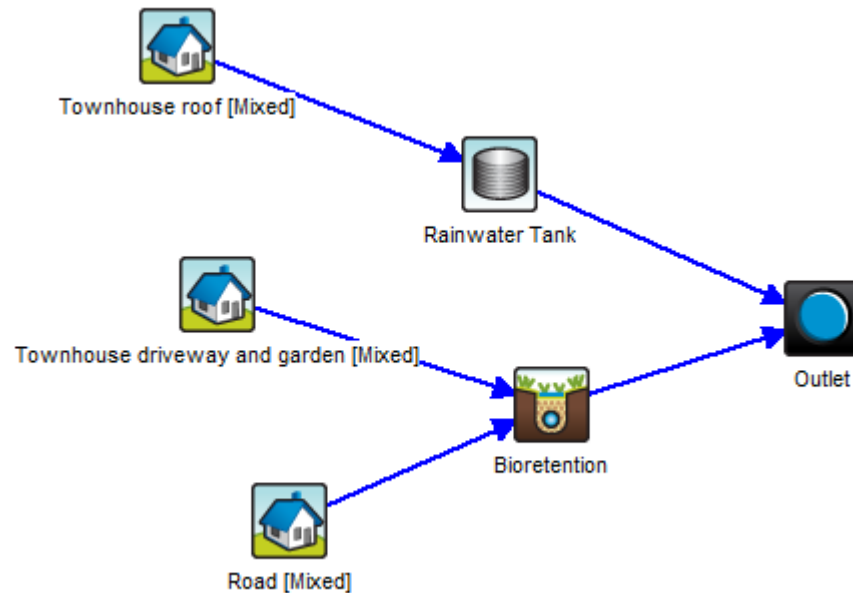
Land use pollutant concentrations

Land use	Flow type	Total suspended solids (TSS)		Total Phosphorus (TP)		Total Nitrogen (TN)	
		Mean (log mg/L)	SD (log mg/L)	Mean (log mg/L)	SD (log mg/L)	Mean (log mg/L)	SD (log mg/L)
Mixed urban	Baseflow	1.100	0.170	-0.820	-0.450	0.320	0.420
	Stormflow	2.200	0.320	0.190	0.250	0.120	0.190
Urban residential	Baseflow	1	0.34	-0.97	0.31	0.2	0.2
	Stormflow	2.18	0.39	-0.47	0.32	0.26	0.23
Commercial	Baseflow	0.78	0.39	-0.6	0.5	0.32	0.3
	Stormflow	2.16	0.38	-0.39	0.34	0.37	0.34
Industrial	Baseflow	0.78	0.45	-1.11	0.48	0.14	0.2
	Stormflow	1.92	0.44	-0.59	0.36	0.25	0.32
Rural residential	Baseflow	0.53	0.24	-1.54	0.38	-0.52	0.39
	Stormflow	2.26	0.51	-0.56	0.28	0.32	0.3
Agriculture	Baseflow	1	0.13	-1.155	0.13	-0.155	0.13
	Stormflow	2.477	0.31	-0.495	0.3	0.29	0.26
Forest	Baseflow	0.51	0.28	-1.79	0.28	-0.59	0.22
	Stormflow	1.9	0.2	-1.1	0.22	-0.075	0.24

Example – Guideline concentrations

/ Townhouse

- Split surface types
- Pollutant concentrations entered as per guidelines

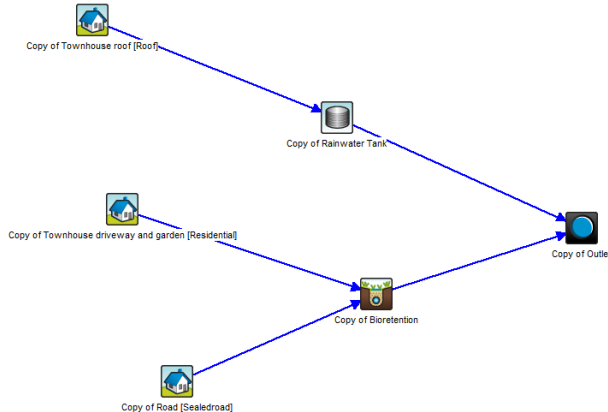


Source Nodes				
Parameter	User Input	Check	Guideline	Comments
Townhouse roof (Node 1) Music Help				
Total Area (ha)	1	=	1	Check catchment area correct, default
Node Townhouse driveway and garden does not have any errors. (Node 2)				
Node Road does not have any errors. (Node 3)				

Follow along and upload:
023031_Parafield_TownhouseSurfaceTypes.mrt

Example – Non guideline concentrations

/ Pollutant concentrations not matching Urban (Mixed) or any of the road, roof, general surface types



Source Nodes				
Parameter	User Input	Check	Guideline	Comments
Copy of Townhouse roof (Node 1) Music Help				
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224	Should be default unless published data. FAQ
Copy of Townhouse driveway and garden (Node 2) Music Help				

Follow along and upload:
023031_Parafield_TownhouseSurfaceTypesNonCompliant.mrt



Pollutant concentrations

- Default MUSIC ('Mixed') Better to use this when demonstrating compliance
- Roof
- Road
- General urban

These should be used together to represent a catchment where the breakdown is known

Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2	1.301	2.431, 1.9	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45	-0.886, -0.301	-0.700	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.4	0.301	0.342, 0.243	Should be default unless published data. FAQ

- This is roof – just some rounding differences so ok – but careful as rounding log values can make a difference

Source nodes – when are variations ok?

/ Soil parameters

- When adopting a specific soil type based on geotechnical testing for the site/catchment
- A calibrated model to observed flow data may be used to justify variations (needs to have a mostly pervious catchment or events large enough to generate pervious area runoff)

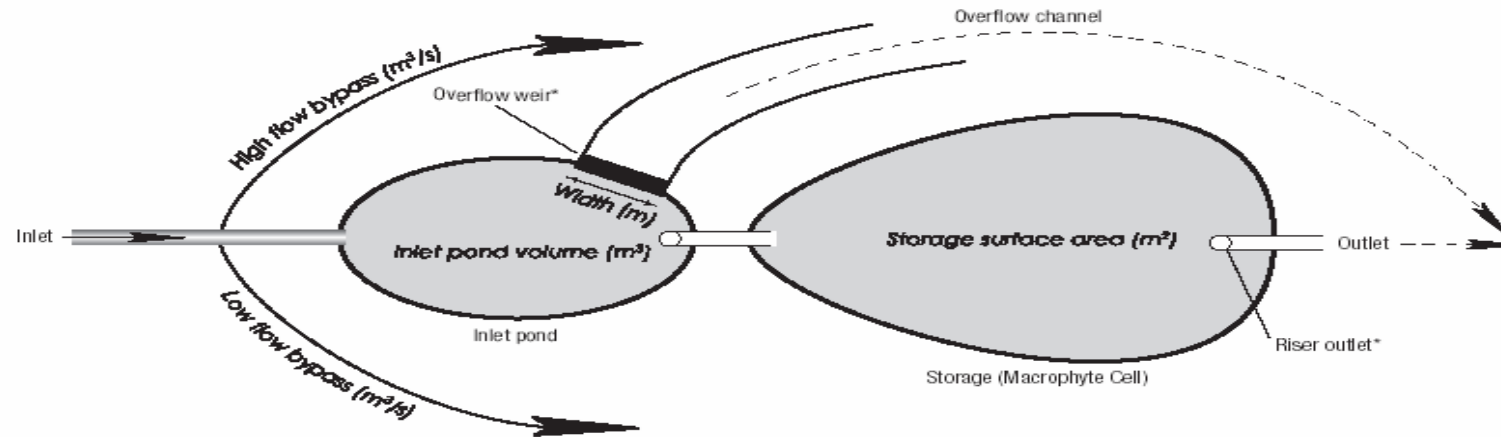
/ Pollutant concentrations

- When using the land use parameters in the guideline (currently not checked due to the number of them but we will aim to add these)
- When representing specific land uses outside guidance (e.g. quarry)
- When published data is available and will be more accurate

Treatments

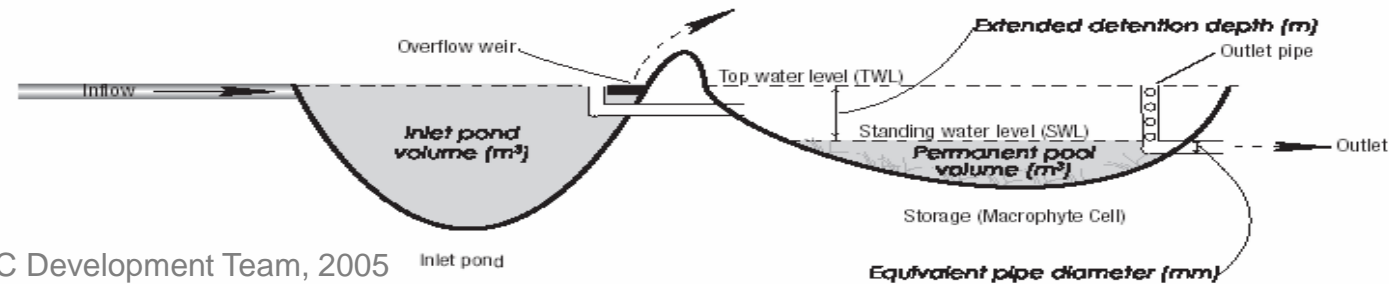
Wetland parameters

Plan View



*Crest reduced level (RL) set at crest RL of riser outlet

Longitudinal Section



MUSIC Development Team, 2005

Wetland parameters

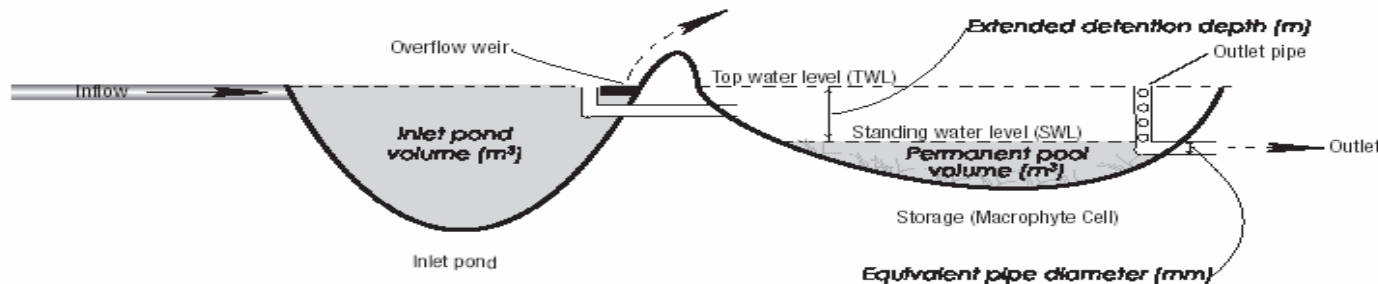
Extended detention depth

0.2 m recommended $< \text{EDD} < 0.35$ m guideline

Overflow weir

Use real if available, if too small can cause unrealistic depths
 ≥ 10 m

Longitudinal Section



Permanent pool depth

$0.2 \text{ m} < \text{PP} < 0.4 \text{ m}$
 $\leq 0.4 \text{ m}$ preferred
 $\sim \leq 0.5 \text{ m}$ guideline

Outlet pipe equivalent pipe diameter

Size for 72 hour detention time

Use a pipe with orifices or slot sized to achieve this flow rate (the constructed pipe will be larger)

$70 \text{ hours} < \text{Detention time} < 80 \text{ hours}$
(minimum 48 hour, reduce below 72 hours for retrofit systems ONLY)

Wetland parameters

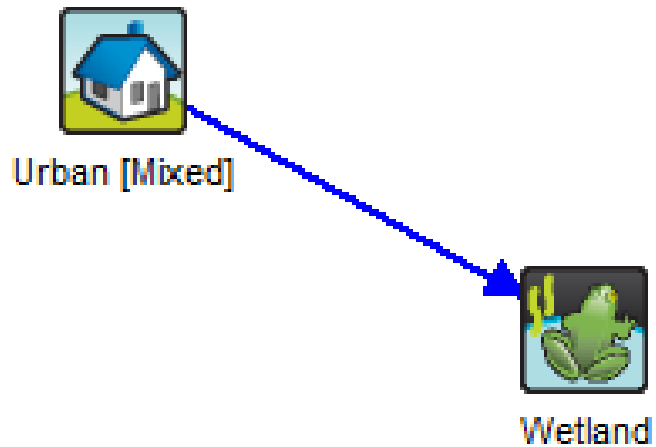
Parameter	Recommendation	Source of guidance
Inlet properties		
Low Flow Bypass	0 m ³ /s unless design specifies otherwise	Recommendation
High Flow Bypass	Calculated as the capacity of the balance pipe from the sediment pond. This should be based on the design flow for the wetland, generally the 4EY flow Set to 100m ³ /s if wetland has perched sediment basin/s or bypass is achieved using an overflow weir*	Guideline requirement
Inlet Pond Volume	Volume of inlet pond, usually sized to remove 95% coarse sediment (>125 um) for 4 EY event. Set to 0 if wetland has separate upstream sediment pond	Guideline requirement
Storage properties		
Surface Area	User defined macrophyte zone area at NWL. Iteratively sized in MUSIC to meet performance objectives.	N/A
Extended Detention	0.2 - 0.35m Deeper extended detention depths increase the risk of plant failure due to stress from extended periods of excessively deep water. Note: The default value for the extended detention depth of 1.0 m is not acceptable.	Internal guideline requirement (<0.35m)
Permanent Pool Volume	Generally, 0.35 to 0.4 m x Surface Area, that is the average depth in the macrophyte zone should be 0.35 - 0.4m.	Internal guideline requirement (<0.4m)
Initial Volume	Set equal to Permanent Pool Volume (assumed full)	Recommendation
Exfiltration	0 mm/hr. Exceptions only for specifically designed ephemeral wetlands. This shall be supported by geotechnical information on exfiltration rates for wetland subsoils and a wetland inundation frequency analysis demonstrating plants will not dry out excessively and is subject to approval by the relevant authority. Exfiltrated water shall be directed to outlet for calculation of pollutant loads.	Guideline requirement
Evaporative Loss	125% of PET (default)	Default

Outlet properties		
Equivalent Pipe Diameter	For planning and concept design of wetlands, set the equivalent pipe diameter so that notional detention time is as close to 72 hrs as possible for all new development and not less than 48 hours (retrofit assets only)	Recommendation
Notional Detention Time	As close to 72 hours as practical, a range of 72 – 80 hours is acceptable for all new development. Not less than 48 hours (retrofit assets only where a higher notional detention time is not practical)	Guideline requirement

Overflow Weir Width	For functional and detailed design, the overflow weir width should be calculated with a suitable weir equation to convey the design flow (typically 0.2 or 1 EY event). Note that for a wetland with an inlet pond the overflow weir is positioned at the inlet pond. NB: An undersized overflow weir results in water backing up, effectively adding extended detention depth in the model so it is better for this parameter to be over-estimated than under-estimated.	Recommendation
Custom Outflow and Storage Relationships	User defined. These may be used optionally by the user to <u>more realistically represent the stage-storage-discharge relationship of the wetland</u> . This is useful for assessing wetland inundation patterns and corresponding plant health and survival. It is recommended the reviewer check the hydraulic calculations (which shall be provided separately) are suitable for the proposed outlet structures with reference to a hydraulic engineering textbook and are correct. If used, the orifice and weir dimensions and coefficients become redundant.	Recommendation
Advanced properties		
Orifice Discharge Coefficient	Default required unless justification for changing. The default is suitable for a circular outlet orifice and most models. Where a different shaped outlet is used a modified coefficient matching the proposed shape may be adopted based on suitable hydraulic textbook reference – or replace with a custom outflow relationship.	Default Guideline requirement
Weir Coefficient	Default required unless justification for changing. The default is suitable for a sharp crested weir and most models. May be modified for different overflow weir types – or replace with a custom outflow relationship.	Default Guideline requirement
Number of CSTR Cells	4	Default Guideline requirement
Total Suspended Solids	K (m/yr) = default, C* (mg/L) = default	Default Guideline requirement
Total Phosphorous	K (m/yr) = default, C* (mg/L) = default	Default Guideline requirement
Total Nitrogen	K (m/yr) = default, C* (mg/L) = default	Default Guideline requirement

Wetland parameters

Example wetland



Follow along and upload: 02301_Parafield_Wetland1.mrt



Wetland results

Treatment Nodes				
Parameter	User Input	Check	Guideline	Comments
Wetland (Node 2) Music Help				
Hi-flow bypass rate (cum/sec)	100	=	100	High flow bypass rate set to default of 100 m ³ /s so all flows reaching inlet will pass through treatment. This should usually be based on the design flow for the wetland, generally the 4EY flow and matches the capacity of the balance pipe from the sediment pond. 100m ³ /s acceptable if wetland has perched sediment basin/s with bypass or bypass is achieved using overflow weir. Confirm this is intended or there is upstream bypass with a secondary link bypassing high flows around this treatment.
Extended detention depth (m)	0.5	>	0.35	Internal guideline requirement. Deep average depth. A depth of no more than 0.35 m is recommended as good design guidance to support healthy plant growth and is a design requirement for the MUSIC Guidelines. Designer to confirm vegetation design consistent with expected inundation frequency if depth exceeds 0.35 m for exceptional circumstances only. See the wetland hydrologic analysis tool for preparation of an inundation frequency curve. FAQ
Permanent pool volume (m ³)	4500	>	0.4 * 7000 = 2800	Internal guideline requirement. Deep permanent pool given area. Depth should not exceed 0.35 within shallow and deep marsh areas (80% of macrophyte zone) and 1.5 m within deep pools (<=20% of macrophyte zone). Usually average depths will be less than this to allow for batters. Designer should confirm vegetation design is consistent with expected inundation frequency if average depth exceeds 0.4 m. FAQ

Wetland – Extended detention depth

No specific guidance in WSUD Technical Manual

Consider best practice from other jurisdictions –
e.g. constraints of MW Wetland Guidelines

- Must be less than or equal to 0.35 m
- If greater than 0.35 m an inundation frequency analysis should be undertaken – but must have a really good reason why the wetland EDD needs to be deeper (that has nothing to do with just fitting the wetland into a smaller space)
 - Should usually be coupled with a shallower than usual permanent pool



Wetland – Permanent pool volume

No specific guidance in WSUD Technical Manual

Consider best practice from other jurisdictions – e.g. constraints of MW Wetland Guidelines

- No specific restriction, but $\geq 80\%$ of wetland must be vegetated marsh (with depth up to 0.4 m), and $\leq 20\%$ for submerged marsh or open water, also consider requirements for safety benches etc
- Therefore unlikely to be greater than ~0.4 or 0.5 m



Wetland results

Overflow weir width (m)	3	<	10	Warning - check is large enough to ensure wetland can overflow freely, if not may result in system filling to unrealistic depths. For functional and detailed design, the overflow weir width should be calculated with a suitable weir equation to convey the design flow (typically 0.2 or 1 EY event). FAQ
Notional Detention Time (hrs)	41	<	70	Guideline requirement. Detention time should usually be as close to 72 hours as practical, a range of 72 – 80 hours is acceptable for all new development. Not less than 48 hours (retrofit assets only where a higher notional detention time is not practical with evidence wetland is adequately sized for the catchment or is constrained and has an acceptable inundation frequency.
Weir coefficient	1.6	not equal	1.7	Guideline requirement. Should be default unless based on published data.
Number of CSTR cells	6	not equal	4	Guideline requirement. Should be default unless based on published data. FAQ
Exfiltration Rate (mm/hr)	24	not equal	0	Generally, wetlands should be lined or have minimal infiltration to sustain a permanent pool of water to support fish and other aquatic species. Exceptions allowed for specifically designed ephemeral wetlands. Where this occurs exfiltrated water must be redirected to outlet for pollutant load calculations using a secondary drainage link. Use of an exfiltration rate greater than 0 mm/hr is subject to prior agreement by the relevant authority and must be supported by geotechnical information and a wetland inundation frequency analysis demonstrating an appropriate pattern will be maintained without excessive drying out. FAQ

Wetland – Notional detention time

Consider WSUD Technical Manual

/ Preferably 72 hours (and not less than 48 hours) to remove nutrients effectively

Notional Detention Time (hrs)	41	<	70	Guideline requirement. Detention time should usually be as close to 72 hours as practical, a range of 72 – 80 hours is acceptable for all new development. Not less than 48 hours (retrofit assets only where a higher notional detention time is not practical with evidence wetland is adequately sized for the catchment or is constrained and has an acceptable inundation frequency.
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Wetland – Infiltration (Exfiltration in MUSIC)

/ Seepage Loss

- Usually minimise infiltration for wetlands to maintain a permanent pool of water for aquatic life
- If using, demonstrate assumptions are reasonable – geotechnical investigation for infiltration rates, c.f. ‘standard’ values
- See ARQ Ch. 10 for comments on measured vs long term infiltration rates
- Check inundation frequency for extended dry spells
- Must consider implications for groundwater – is recharge sustainable?
- Check that exfiltrated pollutant loads routed back to outlet to account for potential loads reaching groundwater



Advanced parameters

- Number of CSTR's
 - Default is 4 for v5 on which is relatively generous (see basin shapes)
 - Usually allow, seek to improve design if obvious short-circuiting or poor flow distribution
- Weir Coefficient
 - Standard weir equation for sharp crested weir, adjust if known for a specific weir design
- Orifice Discharge Coefficient
 - Standard, may adjust if known for specific design
- K and C* - Typically use defaults unless published data

Generally no changes to these

Weir coefficient	1.6	not equal	1.7	Guideline requirement. Should be default unless based on published data.
Number of CSTR cells	6	not equal	4	Guideline requirement. Should be default unless based on published data. FAQ

Location: Wetland

Inlet Properties

Low Flow By-pass (cubic metres per sec)	0.020
High Flow By-pass (cubic metres per sec)	0.300
Inlet Pond Volume (cubic metres)	300.0

Storage Properties

Surface Area (square metres)	2900.0
Extended Detention Depth (metres)	0.50
Permanent Pool Volume (cubic metres)	1264.0
Vegetation Cover (% of surface area)	50.0
Exfiltration Rate (mm/hr)	0.00
Evaporative Loss as % of PET	125.00

Outlet Properties

Equivalent Pipe Diameter (mm)	58
Overflow Weir Width (metres)	3.0
Notional Detention Time (hrs)	72.7

☐ Use Custom Outflow and Storage Relationship

☐ Define Custom Outflow and Storage Not Defined

Re-use... Fluxes... Notes... Less

Advanced Properties

Orifice Discharge Coefficient	0.60
Weir Coefficient	1.70
Number of CSTR Cells	5

	k (m/yr)	C* (mg/L)	C** (mg/L)
Total Suspended Solids	1500	6.000	6.000
Total Phosphorus	1000	0.060	0.060
Total Nitrogen	150	1.000	1.000
Threshold Hydraulic Loading for C** (m/yr)			3500

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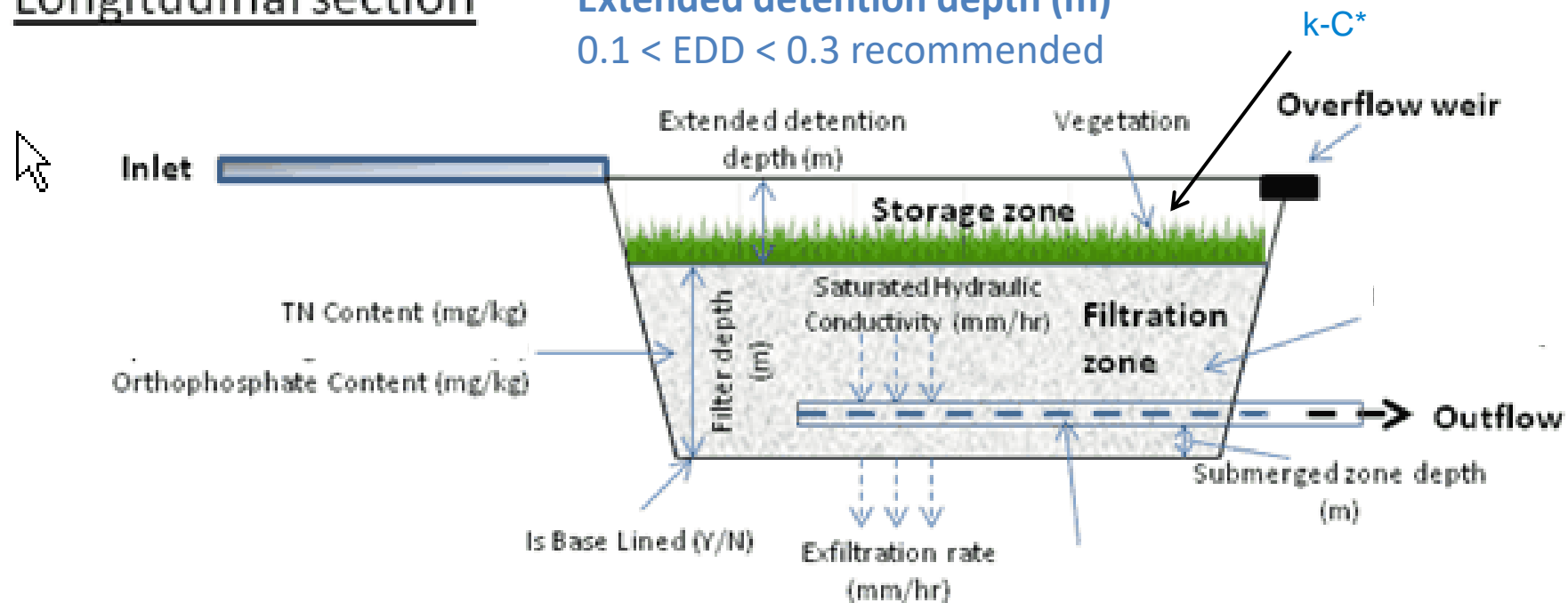
Bioretention



Bioretention

Longitudinal section

Extended detention depth (m)
 $0.1 < \text{EDD} < 0.3$ recommended



TN content (mg/kg)

$400 < \text{TN content} < 1000$
 $\neq 800$ also flagged

Orthophosphate content (mg/kg)

$30 < \text{TP content} < 50$

Filter depth (m)

$0.4 < \text{Filter depth} < 1$

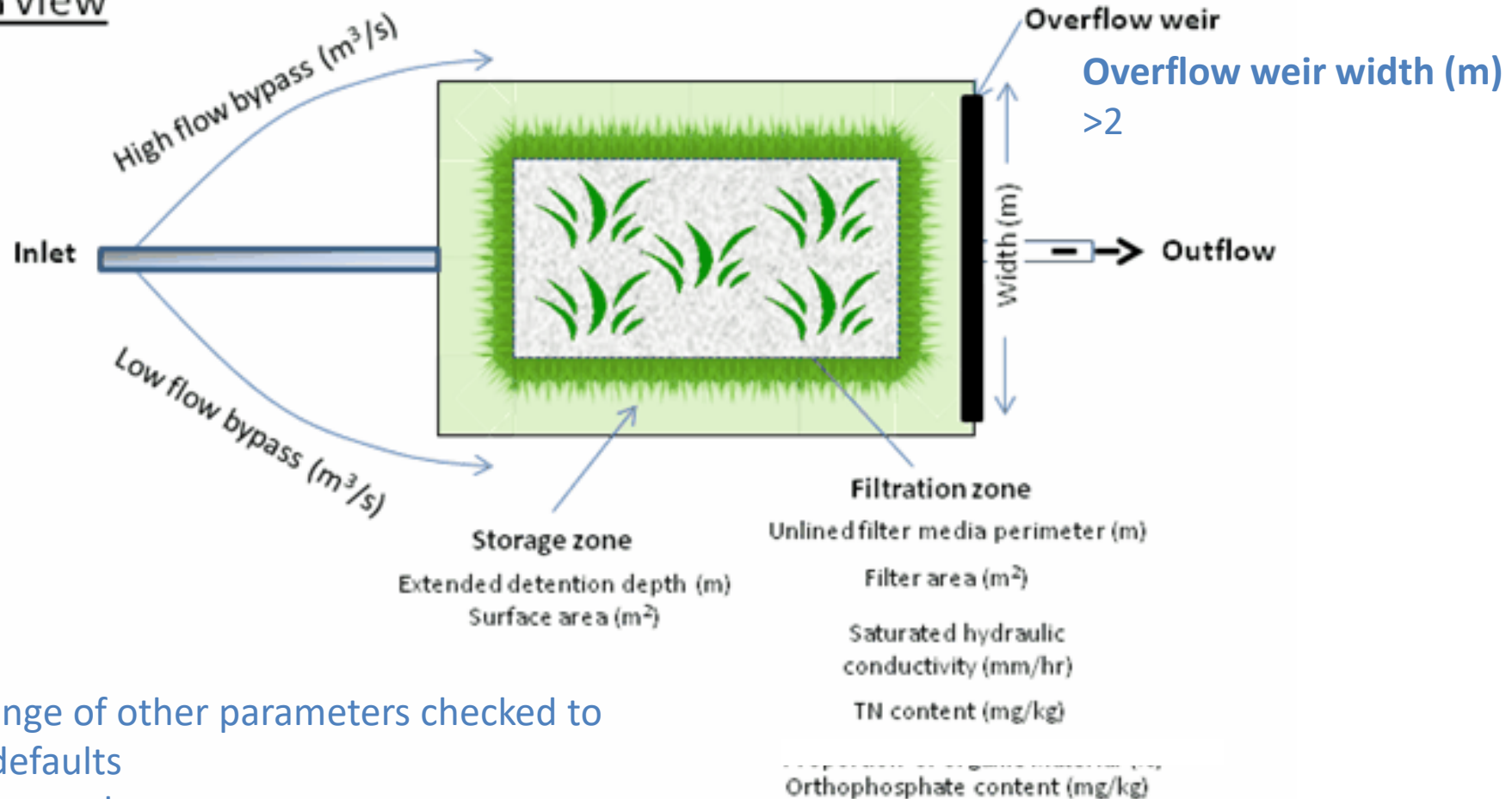
Saturated hydraulic conductivity (mm/hr)

$100 < K_s < 300$

MUSIC Development Team, 2009

Bioretention

Plan view



A range of other parameters checked to be defaults
-Advanced parameters

Townhouse model

Parameter	User Input	Check	Guideline	Comments
Bioretention (Node 6) Music Help				
Extended detention depth (m)	0.5	>	0.3	A deep extended detention depth may indicate an asset area is undersized for its inflows and subject to high hydraulic and sediment loading rates. Check treatment to catchment area ratio is reasonable, asset has upstream sediment treatment and saturated hydraulic conductivity is conservative. Extended periods of wetting may result in poor plant survival and soil compaction. Review soil moisture frequency analysis. FAQ
Filter depth (m)	0.3	<	0.4	A shallow filter depth may mean there is inadequate soil moisture being available for plants. This can result in plant loss and poor performance. Review design to determine whether filter depth can be increased or a submerged zone, modified soils, irrigation or controlled inflows are used to support plants. These should be detailed and justified.
Saturated hydraulic conductivity (mm/hr)	500	>	300	Recommended range for design is 100-300 mm/hr as per CRCWSC guidelines. Should preferably be modelled at 100 mm/hour to allow for some variations and clogging. If design saturated hydraulic conductivity is >200 mm/hr the designer should check that: (a) the system is adequately sized to minimise risk of clogging and (b) has provision for adequate soil moisture to avoid drying out excessively given the climate and design, e.g. by using a submerged zone. Higher infiltration rates should only be considered for areas with consistent high rainfall or irrigation. FAQ
Orthophosphate Content in Filter (mg/kg)	20	<	30	It is recommended that an orthophosphate content in the range 30-50 mg/kg is used. This is usually readily achieved for most filter media. The specified and supplied filter media must have a lower orthophosphate content than that modelled.
Exfiltration Rate (mm/hr)	3.6	not equal	0	Check seepage rate is reasonable given soil type or infiltration rate measurements. FAQ

Follow along and upload: 023031_Parafield_TownhouseSurfaceTypes.mrt

Bioretention parameters

- / What are we checking:
- / EDD 100-300 mm
- / Filter depth \geq 400 mm
- / Saturated hydraulic conductivity 100-300 mm/hour (CRCWSC), <500 with 150-350 recommended (Technical manual)
- / Submerged zone 200-400 mm if rainfall <500 mm/year
- / TN content 400-1,000 mg/kg
- / Orthophosphate 30-50 mg/kg
- / Advanced parameters at defaults



Infiltration parameters

- / What are we checking:
- / EDD 100-300 mm
- / Filter depth \geq 400 mm
- / Saturated hydraulic conductivity 100-300 mm/hour (CRCWSC), <500 with 150-350 recommended (Technical manual)
- / Submerged zone 200-400 mm if rainfall <500 mm/year
- / TN content 400-1,000 mg/kg
- / Orthophosphate 30-50 mg/kg
- / Advanced parameters at defaults

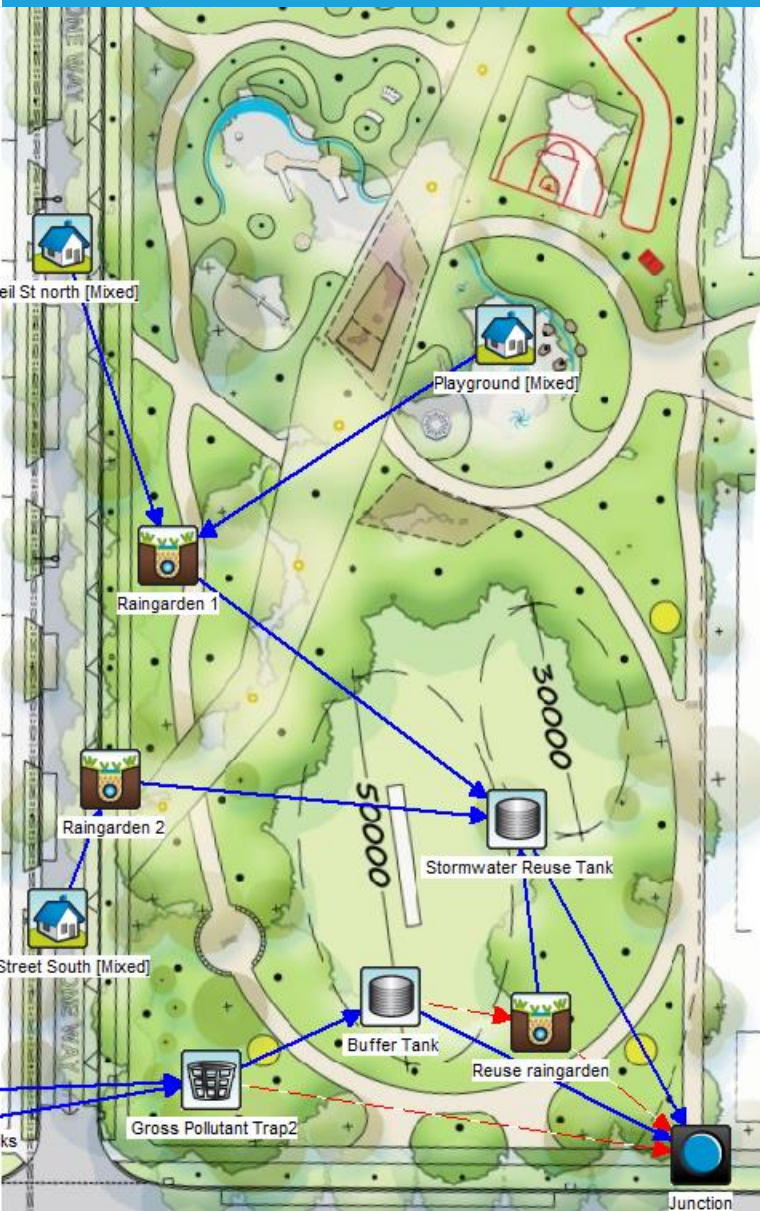
Rainwater tank parameters

What are we checking:

- / High flow bypass \neq 100 (Set to 5% AEP)
- / EDD 100-1,000 mm (higher depths only likely for on-site detention)
- / Overflow pipe >5 mm (90 mm typical residential)
 - Stormwater harvesting – Check is appropriately sized
- / Reuse demands – Check if used (should be)
- / Annual demand = Pet – Rain, monthly distribution also ok but need review
- / Custom demands – Need to review if used
- / Advanced parameters at defaults
- / Mostly recommendations for typical usage or defaults expected as little existing design guidance.
- / Expect demands used to be documented



Assessment



023090AdelaideKent

Source Nodes			
Parameter	User Input	Check	Guideline
Node Runoff from new development 7300 m2 does not have any errors. (Node 1)			
Development roofs to rainwater tanks 600m2 (Node 8) Music Help			
Field Capacity (mm)	80	not equal	30 Use of 30 mm recomm based on reference to e consideration of limite Variations should be ju 4-6 and 4-7 of the guid representative of the ca area of interest. FAQ
Soil Storage Capacity (mm)	120	not equal	40 Use of 40 mm recomm based on reference to e consideration of limite Variations should be ju 4-6 and 4-7 of the guid representative of the ca area of interest. FAQ
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882 Should be default unles
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680 Should be default unles
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224 Should be default unles

Node Neil St north does not have any errors. (Node 10)

Treatment Nodes			
User Input	Check	Guideline	Comments
Node 2) Music Help			
100	=	100	Calculated as the capacity of the inlet to the usually be set to the 5% Annual Exceedance flow as per AS3500.3. May be set to default upstream node regulates flow into tank.
0.05	<	0.1	Shallow average depth, recommended some air gap above invert of overflow pipe and to calculations. FAQ
100	>	2 * 30 = 60	Guidelines for depths. Deep active storage there is sufficient head and depth to ground tanks. FAQ
1.361	not equal		Check reuse demands are justified and reason
Node 4) Music Help			
100	=	100	Calculated as the capacity of the inlet to the usually be set to the 5% Annual Exceedance flow as per AS3500.3. May be set to default upstream node regulates flow into tank.
0.05	<	0.1	Shallow average depth, recommended some air gap above invert of overflow pipe and to calculations. FAQ
	not one of	PETSubRain;	It is recommended that PET - Rain is gener to PET based distribution for systems where will shut off during rain. PET may be used systems without rain detection. A monthly c used in place of PET - Rain where the syste part of the year or a user distribution prefer this should be checked.
0.6048	not equal		Check reuse demands are justified and reason
Node 7) Music Help			
100	=	100	Calculated as the capacity of the inlet to the usually be set to the 5% Annual Exceedance flow as per AS3500.3. May be set to default upstream node regulates flow into tank.
	not one of	PETSubRain;	It is recommended that PET - Rain is gener to PET based distribution for systems where will shut off during rain. PET may be used

Objectives of assessment

WSUD assets will:

- / Meet planning objectives and requirements
- / Protect the environment
- / Be sustainable and durable

Assessment process:

- / Fair and objective (applicants should be treated equally)
- / Recognise that modelling is not an exact science but there need to be clear expectations.
- / Clear laws and requirements need to be balanced with competent judgement and common sense for grey areas, variations and innovation.

Guideline requirements and recommendations

Guideline requirement (Red flag, stop!)

- / Expect compliance with these most of the time
- / Variations should be rare and need a very good justification

Internal guideline requirement

- / Current best practice
- / These are provided in absence of clear guidance for SA. Draw on guidelines from other jurisdictions and expert judgement
- / Variations may be accepted but consider whether asset is likely to be sustainable

Recommendation (Yellow flag, proceed with caution)

- / Preferred approach; or
- / Typical or common practice
- / Variations reasonably common with justification subject to agreement by responsible authority

Assessing a model

What we recommend an assessor checks but the MUSIC Auditor does not do for you:

- / Catchment and drainage layout makes sense
- / Catchment areas match design plans
- / Whole catchment in model (all areas upstream of treatment measures)
- / **Impervious fractions are reasonable**
- / Selection or order treatments forms a suitable treatment train
- / Treatment asset dimensions and assumptions reasonable and match design plans
- Gross pollutant traps and generic treatment nodes
- Link routing

Data Submission

Applicant should provide the following to support the WSUD response for a development.

- Design report and plans, report should summarise model inputs and results
- Should specify rainfall location, timestep used etc
- Results presented as Treatment Train Effectiveness for development to outlet
- Model itself (electronic copy) must be submitted. Ideally include a summary report or MUSIC Auditor report
- Explain and justify any variations from guidelines or parameters flagged by Auditor

MUSIC Guidelines and versions

Currently supported

- \ Proposed South Australia MUSIC Guidelines
- \ MUSIC Version 6.2 and 6.3 (functionally the same)

Planned

- \ Future guideline revisions (current and previous version will be supported)
- \ MUSIC X (current and previous version will be supported)
- \ Climate templates for other locations

Wetland Analysis Tool

- / Web service available through the MUSIC Auditor website
- / Calculates the inundation frequency curve
- / Allows user to select plants

www.musicauditor.com.au



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Wetland Analysis Tool

Welcome to the Wetland Analysis Tool for checking compliance with the Melbourne Water Constructed Wetland Manual. user to assess wetland depths relative to plant heights and the wetland residence time.

Please enter the '[Shallow marsh zone planting depth](#)' and '[Deep marsh zone plating depth](#)'.

Shallow Planting Depth m

Deep Planting Depth m

Please enter the permanent pool volume.

Permanent Pool Volume m³

Please select the [daily flux file](#) generated in MUSIC for a wetland.
The file must be generated with MUSIC Version 6 and be a 'DAILY' flux file. [?](#)

No file selected.

Wetland Analysis Tool

- Inundation frequency graph
- Compares results with plant heights
- Compares selected plant heights with depth exceeded for 20% of time to check if they are likely to survive
- Effective normal water level – is it significantly above normal water level?
- Residence time – is 90th percentile residence time at least 90 days?

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No file selected.

Q&A



A dragonfly nymph is perched on a green reed stem in the center of the image. The background features a pond, more reeds, and a clear blue sky.

THANK YOU

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