LIVINGSTONE SHIRE
SEWERAGE INFRASTRUCTURE NETWORK

EPASWMM
COMPUTER MODELLING GUIDELINES

Rev No.	Date	Revision Details	Author	Verifier	Approver
0	18/06/2018	Initial Issue	CW	AW	PM
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CONTENTS

Abbreviations

LSC	Livingstone Shire Council
AICR	Adopted Infrastructure Charges Resolution
CMDG	Capricorn Municipal Development Guidelines
LGIP	Local Government Infrastructure Plan
H2OMap, Infowater	Innovyze Modelling Software
EPANET	US (EPA) Pressure Water Network Modelling Software
SWWM	US (EPA) Stormwater Management Model
ET	Equivalent Tenement – A typical low density residential lot
PDWF	Peak Dry Weather Flow (Gravity Flow)
IF	Infiltration Flow
WWF	Wet Weather Flow
ADWF	Average Dry Weather Flow

PURPOSE & SCOPE

The purpose of this sewerage network modelling guideline is to identify Livingstone Shire Council requirements for sewerage network modelling of sewerage infrastructure projects where LSC is the registered service provider.

The following principles set out guidelines and standards to create consistency upon the development of a gravity reticulated sewerage supply network model in the computer based program, EPASWMM for Livingstone Shire Council.

This guideline takes priority over the CDMG 12 – Design and Construction Sewerage reticulation network and is intended to achieve the Desired Standards of Service as stated in AICR and LGIP.

MODEL REQUIREMENTS

2.1 Scenarios

Where EPASWMM has been chosen to model new sewerage network infrastructure, the model shall be contained in one file.

If different scenarios, stages or options are to be modelled and submitted to council, the modeller shall construct the ultimate design layout for the proposed sewerage network model and appropriate labelling shall accompany each scenario, stages or options for identification purposes.

If the modeller judges the proposed scenarios, stages or options are too difficult to model within one file, approval to submit multiple files shall be requested from the council prior to submission.

2.2 Labelling

The modeller must ensure input boxes such as the Tag and Descriptions categories should contain information regarding the particular object in the property editor in all models submitted to council.

The description input box is utilised for location purposes such as street names for pipes, junctions, pumps and valves. Whereas the tag input box is utilised for the current status of the object, such as existing, future or proposed. The following labelling format provides an example for modelling scenario/staging/options structure.

Pipe Properties:

Description Box – James Street, Opt1 – 100mm uPVC, Opt2 – 200mm PVC-M

Tag Box – Proposed Sewerage Reticulation

2.2.1 File Identification

On submission of the EPASWMM file the following format shall be applied to the naming of the file.

LOCATION (project) - COMPANY NAME - APPLICATION NUMBER (if applicable) - DATE SUBMISSION (dd*mm*yy)

E.g. Lammermor-ABCompany-DA12345678-120518

2.3 Legend

Nodes and Links legends shall follow the standardised colour arrangement below and have specific pre-set limits for flooding and capacity (Figure 1 and Figure 2).

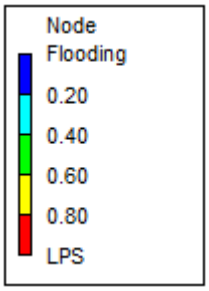

Figure 1: Node Legend with flooding intervals

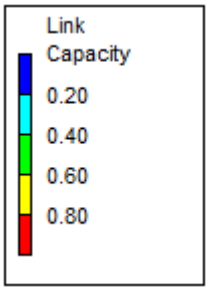

Figure 2: Link Legend with capacity intervals

TECHNICAL SPECIFICATIONS

3.1 Units

Standard International (SI) units shall be used in all sewerage network models.

3.2 Hydraulic Method

The Hazen-Williams hydraulic head loss formula is to be used when modelling. Pipe friction coefficients from Appendix C are to be applied to all models.

3.3 Controls

Simple controls to be used where possible within the model, rule based controls to be used if necessary. The modeller must use existing Council controls and obtain prior approval with Council if any new controls of any form are to be used in the model.

3.4 Pumps Curves

Models containing pumps should utilise the actual pump curve provided by the manufacturer. Single point pump curves may be used when the actual pump curve is not known. For proposed single point pump curves the modeller must be certain the curve can be achieved from commercially available pumps.

3.5 Default Inputs

There are six individual simulation input options available in EPASWMM: *General, Dates, Time Steps, Dynamic Wave, Interface Files and Reporting*. In three of these categories, (General, Time Steps and Dynamic Wave) LSC uses specific parameters and values for each option category. It is up to the modeller to know where to apply these changes in EPASWMM modelling software so they are enabled.

3.5.1 General Options

See Table 4 in Appendix B for details.

3.5.2 Time Steps Options

See Table 2 in Appendix B for details.

3.5.3 Dynamic Wave Options

See Table 3 in Appendix B for details.

LOADING

4.1 General

Design loadings are to be calculated in accordance with *CMDG Sewerage Network D12 Design and Construction Guideline* and Table 10 in the current version of the *Adopted Infrastructure Charges Resolution* (AICR). Loading must be applied utilising the patterns type as stipulated below. Loading patterns that are not listed in Appendix A must be approved by council for usage within sewerage network models.

Council applies loadings to sewerage network models in terms of Equivalent Tenants (ET) rather than L/s.

Table 1: Loading examples

	Loading	Baseline Loading
Example 1	Residential demand of three ET placed on one junction	3
Example 2	Residential demand of ten ET placed on one junction	10

4.2 Loadings Pattern Types

Council typically utilises four load patterns in sewerage network models. Each pattern has an associated pattern curve identification name which is related to the load usage type. The four load patterns are Residential, Residential Weekend, Commercial and School. The use of these names is desirable, however not required. If other curve identification names are used they must be easily distinguishable between each loading pattern. The diurnal sewerage loading patterns can be viewed in Appendix A.

All sewerage network models that are submitted to LSC must ensure the correct patterns loading are being applied throughout the model. On submission of the model the typical loading pattern shall be applied to all input nodes where applicable. LSC will later change the pattern loading to a WWF if required for the ultimate design loading of the sewerage network model.

Livingstone Shire Council utilises a constant WWF flow pattern for a 24 hour period when modelling the ultimate design loading for the sewerage network. The WWF shall be 5 times that of the ADWF.

Table 2: Design flow rates

Flow Pattern	Rate (L/s)
Average Dry Weather Flow	0.00625
Wet Weather Flow	0.03125

ANALYSIS

5.1 Ultimate & Peak Hour Analysis

The peak hour analysis determines if the sewerage network model has met the design criteria requirements. LSC analyses the ultimate design loading for sewerage network models based off the WWF loading pattern. Where models are simulating dry weather peak hour conditions utilising the diurnal sewer loading patterns, the analysis are simulated over a 24 hour period. The peak loading will then be taken as the highest reported value during a specific time step.

APPENDICES

6.1 Appendix A

Table 3 D12.06.03 LSC diurnal sewage loadings ratio patterns

Time	Residential	Residential	Commercial	School
0:00	0.24	1.4	0.528	0
1:00	0.192	1.25	0.408	0
2:00	0.168	1.143	0.288	0
3:00	0.192	0.875	0.24	0
4:00	0.387	0.558	0.24	0
5:00	0.889	0.486	0.24	0
6:00	2.16	0.489	0.264	0
7:00	2.06	0.932	0.48	0
8:00	1.629	1.381	0.888	0
9:00	1.356	1.659	1.32	2.112
10:00	1.163	1.72	1.632	3.792
11:00	1.005	1.592	1.68	3
12:00	0.885	1.525	1.776	3
13:00	0.855	1.404	1.92	3.168
14:00	0.89	1.24	1.872	2.808
15:00	0.977	1.155	1.8	2.4
16:00	1.182	1.041	1.656	1.8
17:00	1.479	0.947	1.44	1.104
18:00	1.787	0.879	1.152	0.408
19:00	1.479	0.88	1.008	0.408
20:00	1.153	0.895	0.936	0
21:00	0.864	0.972	0.84	0
22:00	0.624	1.038	0.768	0
23:00	0.384	1.188	0.624	0

6.2 Appendix B

Simulation Default Options

Table 4: Default General Options

Property	Value
Process Models	Flow Routing
Routing Model	Dynamic Wave
Infiltration Model	Green-Ampt
Miscellaneous	Allow Ponding
Maximum Trials	500
Accuracy	0.1
If Unbalanced	Continue
Default Pattern	Curve4
Loadings Multiplier	0.0354
Emitter Exponent	0.5
Status Report	Yes
CHECKFREQ	2
MAXCHECK	10
DAMLIMIT	0

Table 5: Default Time Steps Options

Property	Value
Reporting	00:00:30
Runoff: Dry Weather	00:00:30
Runoff: Wet Weather	00:00:30
Routing	30 sec
System Flow Tolerance	5%
Lateral Flow Tolerance	5%

Table 6: Default Dynamic Options

Property	Value
Inertial Terms	Dampen
Normal Flow Criterion	Slope & Froude
Force Main Equation	Hazen-Williams
Use Variable Time Steps	Yes
Adjusted BY	75%
Minimum Variable Time Step (sec)	0.5
Time Step For Conduit Lengthening (sec)	0
Minimum Nodal Surface Area (sq. meters)	1.14
Maximum Trials per Time Step	8
Head Convergence Tolerance (meters)	0.0015
Number of Threads	1

6.3 Appendix C

Table 7: Manning's Roughness for Pipe Material

Pipe Material	N-Value
Plastic (uPVC, MPVC, PE, OPVC.)	0.013
Asbestos Cement (AC)	0.013
Concrete	0.013