C.C. Tatham & Associates Ltd.
Consulting Engineers

10 LOUISA STREET - THORNBURY

Town of The Blue Mountains

Stormwater Management Report

prepared by:

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prepared for

2521311 Ontario Inc.

January 2018

CCTA File 117258

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1 Introduction

1.1 Objectives

C.C. Tatham & Associates Ltd. (CCTA) was retained by 2521311 Ontario Inc. to prepare a Stormwater Management (SWM) Report in support of a proposed townhouse condominium development in the community of Thornbury, within the Town of The Blue Mountains.

The primary objective of this report is to demonstrate the proposed development will not adversely affect local water resources and surface water quality and quantity conditions. This will be accomplished by evaluating the effect of the development on local drainage conditions and where necessary, providing solutions to mitigate any adverse impacts.

1.2 Background and Guidelines

This report was prepared recognizing the pertinent background reports in support of the proposed development and Municipal and Provincial guidelines on water resources and the environment including the following publications;

- *Functional Servicing Report*. C.C. Tatham & Associates Ltd., dated January 2018;
- *Geotechnical Investigation*, prepared by GeoPro Consulting Ltd. Dated December 4, 2017;
- *Low Impact Development Stormwater Management Planning and Design Guide.* Toronto and Regional Conservation Authority, Credit Valley Conservation Authority (version 1.0, 2010);
- *Engineering Standards*. Town of The Blue Mountains (April 2009); and
- *Stormwater Management Practices Planning and Design Manual.* Ministry of the Environment (2003).

1.3 Design Criteria

1.3.1 Stormwater Quality Control

Water quality controls shall be provided to satisfy the *SWM Planning and Design Manual (MOE, 2003).* Georgian Bay is the receiving tributary for site drainage which is identified as a cold water fishery, therefore, enhanced water quality protection, which corresponds to 80% long term total suspended solids (TSS) removal, is required.

1.3.2 Stormwater Quantity Control

Post-development peak flow rates shall be controlled to pre-development rates for the 2-year through 100-year event to ensure no adverse impacts on downstream landowners and the receiving watercourse. Safe conveyance shall be provided for the Regulatory Storm event (i.e. the greater of the Timmins Storm or the 100-year design storm).

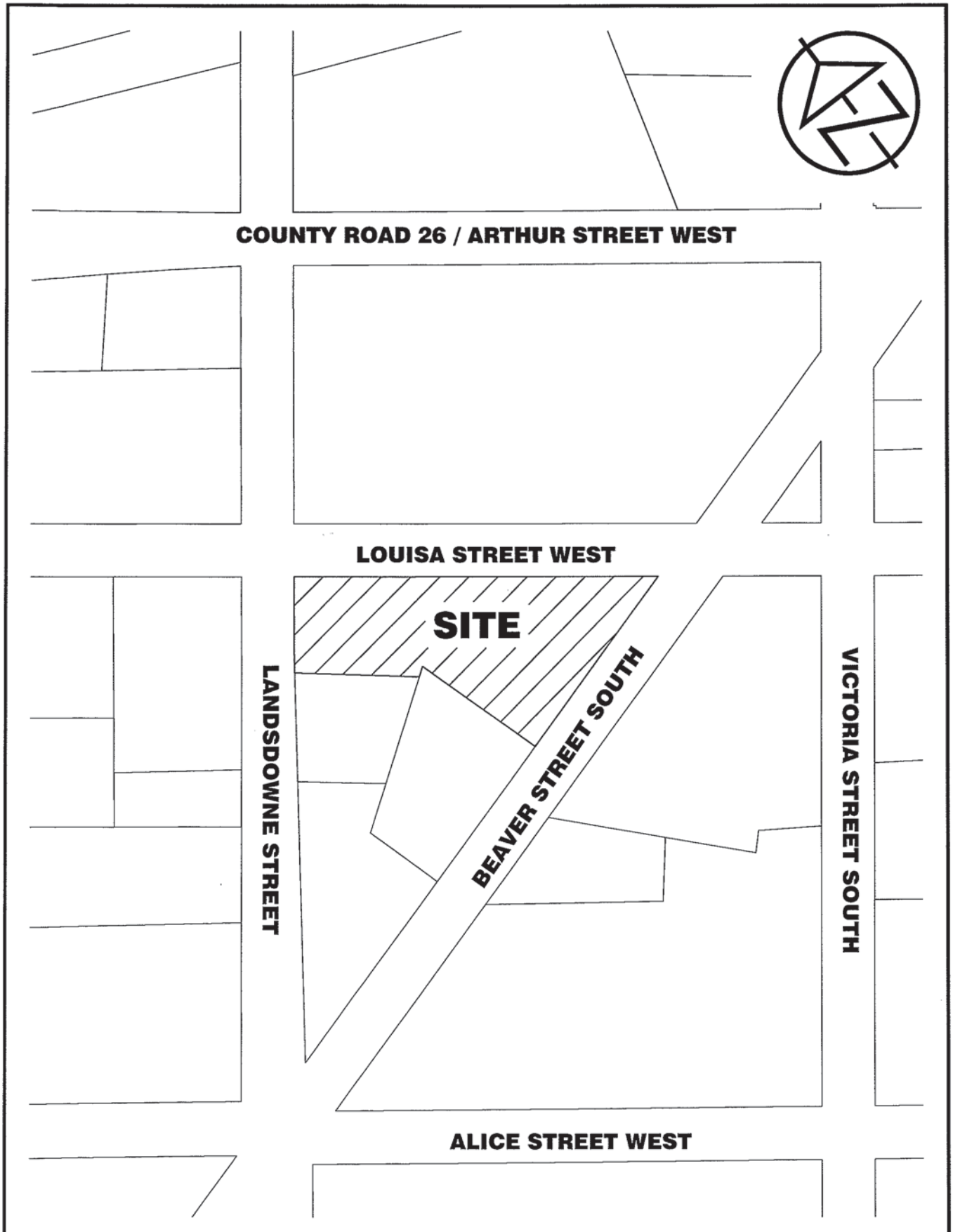
2 Existing Drainage Conditions

2.1 Site Description

The property is approximately 0.58 ha (1.43 ac) with the legal description being Town Plot, Part of Lot 10 Louisa Registered Plan 16R1213, Part 4. The property is bounded by Louisa Street to the northeast, Beaver Street South to the southeast, Landsdowne Street South to the northwest, and two residential lots to the southwest. The location of the property is shown on Figure 1 provided overleaf.

Existing site topography, ground cover, land use, and drainage patterns on-site were established through site visitation, interpretation of the available topographic maps, aerial photography, and a site topographic survey. The property is currently a vacant field within the primary settlement area of the Grey County Official Plan.

A Geotechnical investigation has been prepared by GeoPro Consulting Ltd., the soil stratigraphy underlying the site consists of topsoil ranging between 80 mm to 240 mm over fill material and clayey silt and silty clay. The groundwater levels as measured at the time the boreholes were drilled ranged between 1.1 m to 3.7 m below existing grade. Four monitoring wells were installed with initial groundwater elevations in the wells ranging from 2.31 m to 1.55 m below existing grade. Infiltration testing was also carried out for the site which showed infiltration rates between 12 mm/hr and 19 mm/hr for the native soil.



C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie Ottawa

10 LOUISA STREET – THORNBURY
TOWN OF THE BLUE MOUNTAINS
SITE LOCATION PLAN

SCALE: N.T.S.	DATE: DEC/17	DWG NO. FIG–1

2.2 Drainage Path

The majority of the site drains via overland sheet flow northeast to the road side ditch along the south side of Louisa Street. The remainder of the property drains by overland sheet flow to the roadside ditch along the northwest side of Beaver Street South. Both roadside ditches drain to the south west intersection of Louisa Street and Beaver Street where they merge and drain under Louisa Street via a 500 mm CSP culvert. North of Louisa Street, the drainage ditch is directed north east along the roadside ditch for Beaver Street South and drains to a double ditch inlet catchbasin. The storm sewer is directed north along Victoria Street and then west along Arthur Street where it outlets to the Little Beaver River Tributary under Arthur Street via a 1,200 mm diameter concrete culvert. The tributary watercourse outlets north crossing both the Georgian Trail via a 1,500 mm diameter CSP culvert and King Street West via a 1,120 mm diameter CSP culvert. The watercourse then traverses to the east roadside ditch along Lansdowne Street North and crosses west via a 750 mm diameter CSP culvert under Landsdown Street North and a 700 mm x 1300 mm CSPA culvert south of Huron Street West. The watercourse merges with the Little Beaver River which outlets directly to Georgian Bay.

2.3 Drainage Outlet

The 500 mm dia. culvert at the south west corner of the intersection of Louisa Street and Beaver Street shall be considered the drainage outlet for calculating pre and post development peak flows.

A Pre-Development Drainage Plan (Drawing DP-1) illustrating the existing drainage conditions is included in Appendix A and should be referenced when reviewing the following sections.

2.4 Modelling

A hydrologic model was prepared using Visual OTTHYMO to determine peak runoff from the site. Calculations for time to peak can be found attached in Appendix A along with a summary output of the model. Table 1 below summarizes the pre development peak flows to the drainage outlet.

Table 1: Summary of Pre Development Peak Flows to the Site Outlet

Storm Event	24 hr SCS Storm Peak Flow (m^3/s)	4 hr Chicago Storm Peak Flow (m^3/s)
25 mm	-	0.006
2 year	0.021	0.013
5 year	0.035	0.022
10 year	0.046	0.029
25 year	0.059	0.039
50 year	0.070	0.048
100 year	0.081	0.056
Timmins Storm	-	0.053

3 Stormwater Management Plan

3.1 Proposed Development

The proposed site plan includes 23 townhouse units with access to the site off Lansdowne Street via a dead end private road.

The site will be graded to drain to the north east where quality and quantity controls will include an infiltration trench, an oil grit separator (OGS) and underground storage respectively. The drainage plan includes catchment 201 which makes up the majority of the site (0.53 ha) and drains overland to catchbasins and storm sewers directed to the OGS unit and underground storage located in the northeast corner of the site. Drainage catchment 202 (0.05 ha) includes sodded area and will drain uncontrolled north east to the outlet. A post development drainage plan (Drawing DP-2) is included in Appendix B and should be referenced while reviewing this report.

3.2 Stormwater Quantity

Stormwater quantity control will be achieved via an underground storage system and an engineered outlet system to control peak flows from the site to pre development levels for the 2-year through 100 year storm event. The preliminary proposed underground storage system is comprised of 4 hydraulically connected 40,000 L concrete tanks (5.8 m x 3 m x 3 m) for a total storage volume of approximately 156 m^3. Alternative underground storage facilities including Cultec / Brentwood systems will be considered during the detailed design stage. Table 2 below summarizes peak flows from the site. A summary Visual OTTHYMO output file is also attached in Appendix B along with a percent impervious calculation.

Table 2: Summary of Post Development Peak Flows to the Site Outlet

Storm Event	24 hr SCS Storm Peak Flow (m^3/s)	4 hr Chicago Storm Peak Flow (m^3/s)
25 mm	-	0.008 (0.006)
2 year	0.013 (0.021)	0.012 (0.013)
5 year	0.027 (0.035)	0.015 (0.022)
10 year	0.039 (0.046)	0.025 (0.029)
25 year	0.051 (0.059)	0.038 (0.039)
50 year	0.059 (0.070)	0.046 (0.048)
100 year	0.076 (0.081)	0.053 (0.056)
Regional (Timmins)	-	0.054 (0.053)

Note: The number in brackets indicates the pre development peak flow

Table 3 below outlines the peak discharge, storage volume, and water depth for the proposed underground storage system during the 25 mm through Regional storm events. Detailed underground storage tank calculations are included in Appendix C.

Table 3: Peak Discharge, Storage, and Depth for the Proposed Underground Storage System

Storm Event	Peak Flow Rate (m^3/s)		Storage Volume (m^3)		Depth of Water (m)	
	24 hr SCS	4 hr Chicago	24 hr SCS	4 hr Chicago	24 hr SCS	4 hr Chicago
25 mm	-	0.008	-	22	-	0.38
2-year	0.013	0.011	52	39	0.89	0.67
5-year	0.026	0.014	79	65	1.35	1.11
10-year	0.038	0.024	93	78	1.59	1.33
25-year	0.049	0.036	111	91	1.90	1.56
50-year	0.056	0.044	127	103	2.17	1.76
100-year	0.073	0.050	141	115	2.41	1.97
Regional (Timmins)	-	0.050	-	114	-	1.95

3.3 Stormwater Quality

The majority of the site, catchment 201, will drain to the proposed OGS which will manage water quality for the site. The proposed OGS unit is located in the north east corner of the site as shown on drawing PP-1 included at the back of this report. Water quality objectives for the site have been designed in accordance with MOECC Guidelines for Enhanced water quality control in the form of 80% total suspended solids (TSS) removal and 90% total volume treatment. This will be satisfied by a Stormceptor STC-750 unit connected upstream of the underground storage facility. The STC-750 will provide 83% TSS removal and treat 97% of runoff volume. Stormceptor sizing information is included in Appendix D.

In addition to the OGS unit treating runoff from the site, drainage from the northwest half of the access road will be directed to the OGS unit via a grassed swale and infiltration trench (LID) which will provide pre-treatment. At the detailed design stage, the feasibility of implementing LIDs into the proposed SWM design will be further evaluated.

4 Siltation and Erosion Control

Siltation and erosion control will be implemented for all construction activities within the development site, including vegetation clearing, topsoil stripping, road construction and stockpiling of materials. The basic principles considered to minimize erosion and sedimentation and resultant negative environmental impacts include:

- Minimize disturbance activities where possible;
- Expose the smallest possible land area to erosion for the shortest possible time;
- Institute erosion control measures as-required immediately;
- Implement sediment control measures before the outset of construction activities; and
- Carry out regular inspections of erosion/sediment control measures and repair or maintain as necessary.

Detailed siltation and erosion control measures will be implemented during and after construction and will include the following:

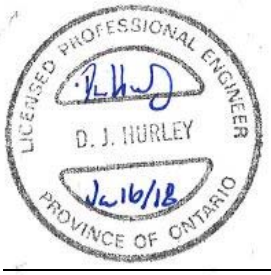
- Heavy duty silt fences will be erected around the perimeter of the site before any grading operations commence to control sediment movement;
- A construction vehicle entrance will be constructed and maintained consisting of a stone mud mat to reduce off-site tracking of materials; and
- Straw bale flow check dams will be installed within swales and ditches to prevent the movement of sediment downstream.

5 Conclusions

The proposed development will consist of 23 townhouse units and existing drainage patterns will generally be maintained with stormwater runoff directed to the proposed SWM facility.

The proposed SWM plan utilizes underground storage for water quantity control and an OGS for water quality. Additional water quality controls such as infiltration trenches and grasses swales will also be considered. Water quantity control will be provided such that post-development peak flow rates do not exceed pre-development conditions. Siltation and erosion control will be provided with the proper construction mitigation efforts.

We trust the above presentation of this SWM Report is sufficient in support of the proposed development.



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Intern Engineer

Reviewed by: Dan Hurley B.A.Sc., P.Eng., LEED AP
Vice President,
Manager – Water Resources Engineering

APPENDIX A:
EXISTING CONDITIONS CALCULATIONS

C.C.Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

Project:	10 Louisa Street
Date:	December, 2017
File No.:	117258
Designed By:	AO
Checked By:	
Subject:	Hydrologic Model Schematic

HYDROLOGIC MODEL SCHEMATIC: PRE-DEVELOPMENT CONDITIONS

Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

C.C. Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

Project:	10 Louisa Street
File No.:	117258
Date:	December 5, 2017
Designed By:	AO
Checked By:	
Subject:	CN Calculator

10 Louisa Street
CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

CONDITIONS

Catchment 101 **Area** 0.58 ha

WEIGHTED CN VALUE																								
Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
				Type	Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
		BC	Loam or Silt Loam	2	0.58	1	0		67	0.58	1	74	0		71	0		78	0		100	0		50	74
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
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				Totals	**0.58**	**1**	**0**	**0**		**0.58**	**1**		**0**	**0**		**0**	**0**		**0**	**0**		**0**	**0**		**74.0**

Time of Concentration Calculations

Initial Abstraction	**5 mm**

Wetlands	12
Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	194.98	m
Minimum Catchment Elevation	189.12	m
Catchment length	169	m
Catchment Slope	3%	
Catchment Area	0.58	ha
Time of Concentration (Minutes)	**7.93**	
Time of Concentration (Hours)	**0.13**	
Time to Peak (2/3 x Time of Concentration)	**0.09**	

Time to Peak	**0.26 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	194.98	m
Minimum Catchment Elevation	189.12	m
Catchment length	169	m
Catchment Slope	3%	
Catchment Area	0.58	ha
Time of Concentration (Minutes)	**23.06**	
Time of Concentration (Hours)	**0.38**	
Time to Peak (2/3 x Time of Concentration)	**0.26**	

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	0	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.28	#N/A	#N/A	#N/A	#N/A

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*								

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 V  V    I     SS    U   U  AAAAA  L
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                                  min     ha   '  cms   hrs     mm          cms

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      --------------------
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    [ Ptot=109.47 mm ]
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        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\1297d4
d6-025d-4316-b7c5-55cc98256354\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\1297d4
d6-025d-4316-b7c5-55cc98256354\scena


DATE: 12/06/2017                          TIME: 02:58:13

USER:

COMMENTS: _____________________________________________________________
```



```
  ****************************
  ** SIMULATION NUMBER:   6 ** 100 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot=120.44 mm ]
*
 ** CALIB NASHYD         0101  1  5.0    0.58    0.08 11.83  65.06 0.54   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.26]
*
 FINISH

================================================================================
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```

```
================================================================================
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```

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\52df0a1b-724e-49c0-9055-d179c7e1b3f7\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\52df0a1b-724e-49c0-9055-d179c7e1b3f7\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

```
  ****************************
  ** SIMULATION NUMBER:   1 ** 25 mm Storm
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                6.0
    [ Ptot= 24.97 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\e36195f8-dbcd-46cf-9f46-0
    remark: OWEN SOUND 25 mm (from a 2 year-4hr storm)

*
 ** CALIB NASHYD         0101  1  5.0    0.58    0.01  2.17   3.65 0.15   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.26]
*
================================================================================
======================
```



```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\f3ed32d6-78fa-4b18-a903-46184cb9b8c7\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\f3ed32d6-78fa-4b18-a903-46184cb9b8c7\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

```
  ****************************
  ** SIMULATION NUMBER:   2 ** 2 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                6.0
    [ Ptot= 33.75 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\1fc4b7c4-fa6e-4b79-99d3-4
    remark: OWEN SOUND 2 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0101  1  5.0    0.58    0.01  2.17   7.00 0.21   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.26]
*
================================================================================
======================

       V    V   I    SSSSS  U   U    A    L
```

```
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\975c8b42-4e9f-4452-b50a-2844fa4c4efc\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\975c8b42-4e9f-4452-b50a-2844fa4c4efc\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 ** 5 year
****

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
READ STORM		6.0						
[Ptot= 44.07 mm]								
fname : C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\2a8555b4-e8d8-40cd-b966-0								
remark: OWEN SOUND 5 YEAR 4 HOUR DURATION CHICAGO STORM								
*								
** CALIB NASHYD	0101	1 5.0	0.58	0.02	2.17	11.89	0.27	0.000
[CN=74.0]								
[N = 3.0:Tp 0.26]								
*								

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
```


```
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```
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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\68ed3962-d801-4874-95e0-b45dd75ef831\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\68ed3962-d801-4874-95e0-b45dd75ef831\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 ** 10 year
****

W/E COMMAND	HYD ID	DT min	AREA ha	' Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
READ STORM		6.0						
[Ptot= 50.59 mm]								
fname : C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\77e62c86-76cd-4d3a-b141-a								
remark: OWEN SOUND 10 YEAR 4 HOUR DURATION CHICAGO STORM								
*								
** CALIB NASHYD	0101	1 5.0	0.58	0.03	2.17	15.40	0.30	0.000
[CN=74.0]								
[N = 3.0:Tp 0.26]								
*								

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
```

```
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\afa70f
73-22a7-465e-ace0-85193a0cf0cc\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\afa70f
73-22a7-465e-ace0-85193a0cf0cc\scena


DATE: 12/06/2017                          TIME: 02:59:22

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   5 ** 25 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                 6.0
    [ Ptot= 59.08 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\0c3ed1a1-
8b3c-463d-929b-e
    remark: OWEN SOUND 25 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0101  1  5.0    0.58    0.04  2.17  20.39 0.35   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.26]
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
                                  Page 5
```

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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\3d9616
75-5883-4a9f-92cc-c71c74b3f62c\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\3d9616
75-5883-4a9f-92cc-c71c74b3f62c\scena


DATE: 12/06/2017                          TIME: 02:59:22

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   6 ** 50 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                 6.0
    [ Ptot= 65.65 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\63e2064a-
1835-4049-9aa7-4
    remark: OWEN SOUND 50 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0101  1  5.0    0.58    0.05  2.17  24.53 0.37   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.26]
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                                  Page 6
```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\53b95e
ef-b504-43f3-ac0b-3539548fce89\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\53b95e
ef-b504-43f3-ac0b-3539548fce89\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 7 ** 100 year
****

W/E	COMMAND	HYD ID	DT min	AREA ha	'	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs									
	READ STORM			6.0						
	[Ptot= 71.77 mm]									
	fname : C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\87476f36-d8b0-477f-a860-c									
	remark: OWEN SOUND 100 YEAR 4 HOUR DURATION CHICAGO STORM									
*										
**	CALIB NASHYD	0101	1	5.0		0.58	0.06	2.17	28.55 0.40	0.000
	[CN=74.0]									
	[N = 3.0:Tp 0.26]									
*										

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======================

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\eb5a73
7d-90df-4967-b3d6-f1891fcfa92b\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\eb5a73
7d-90df-4967-b3d6-f1891fcfa92b\scena

DATE: 12/06/2017 TIME: 02:59:22

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 8 ** Regional Timmins Storm
****

W/E	COMMAND	HYD ID	DT min	AREA ha	'	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs									
	READ STORM			60.0						
	[Ptot=193.00 mm]									
	fname : C:\Users\aoverholt\AppData\Local\Temp\4ddfb092-fd9d-434e-8634-6b753dda365a\97871330-c2fe-427f-bdab-8									
	remark: REGIONAL STORM TIMMINS - 12 hour storm									
*										
**	CALIB NASHYD	0101	1	5.0		0.58	0.05	7.00	127.40 0.66	0.000
	[CN=74.0]									
	[N = 3.0:Tp 0.26]									
*										

FINISH

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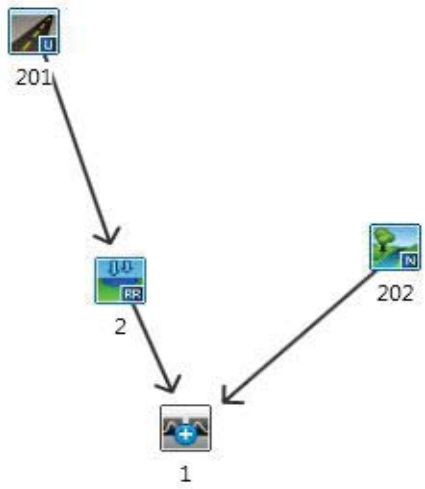
APPENDIX B:
PROPOSED CONDITIONS CALCULATIONS

C.C.Tatham & Associates Ltd.
Consulting Engineers
Collingwood Bracebridge Orillia Barrie

Project:	10 Louisa Street
Date:	December, 2017
File No.:	117258
Designed By:	AO
Checked By:	
Subject:	Hydrologic Model Schematic

HYDROLOGIC MODEL SCHEMATIC: POST DEVELOPMENT CONDITIONS



Nashyd		Route Pipe		Duhyd	
Standhyd		Route Channel		Diverthyd	
Addhyd		Route Reservoir			

C.C. Tatham & Associates Ltd. Consulting Engineers Collingwood Bracebridge Orillia Barrie	Project: 10 Louisa Street	Date: Nov. 29, 2017
	File No.: 117258	Designed: AO
	Subject: % Impervious Calculator	Checked:

Catchment	Area (m^2)	Building Area	Driveway Area	Road Area (m^2)	Total Impervious Area (m^2)	% Impervious
201	**5,300**	**1605**	**258**	**1,083**	**2,946**	**56**

C.C. Tatham & Associates Ltd. Consulting Engineers Collingwood Bracebridge Orillia Barrie	**Project:**	10 Louisa Street
	File No.:	117258
	Date:	December 5, 2017
	Designed By:	AO
	Checked By:	
	Subject:	CN Calculator

10 Louisa Street
CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

CONDITIONS

Catchment 202 **Area** 0.05 ha

WEIGHTED CN VALUE																									
Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
				Type	Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
		BC	Loam or Silt Loam	2	0.05	1	0		67	0.05	1	74	0		71	0		78	0		100	0		50	74
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
	#N/A	#N/A	#N/A	#N/A	0		0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0		#N/A	0
				Totals	**0.05**	**1**	**0**	**0**		**0.05**	**1**		**0**	**0**		**0**	**0**		**0**	**0**		**0**	**0**		**74.0**

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4			**For Runoff Coefficients less than 0.4**		
Bransby-Williams Formula			**Airport Method**		
Maximum Catchment Elevation	190.5	m	Maximum Catchment Elevation	190.5	m
Minimum Catchment Elevation	189.5	m	Minimum Catchment Elevation	189.5	m
Catchment length	19.8	m	Catchment length	19.8	m
Catchment Slope	5%		Catchment Slope	5%	
Catchment Area	0.05	ha	Catchment Area	0.05	ha
Time of Concentration (Minutes)	**1.10**		**Time of Concentration (Minutes)**	**6.97**	
Time of Concentration (Hours)	**0.02**		**Time of Concentration (Hours)**	**0.12**	
Time to Peak (2/3 x Time of Concentration)	**0.01**		**Time to Peak (2/3 x Time of Concentration)**	**0.08**	

Time to Peak	**0.08 hrs**

Initial Abstraction	**5 mm**

Wetlands	12
Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	0	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.28	#N/A	#N/A	#N/A	#N/A

```
================================================================================
======================
```

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M  M  O   O
        OOO     T      T    H   H    Y    M   M  OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\1ca7e6e6-e585-4713-b139-f8e4818c0252\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\1ca7e6e6-e585-4713-b139-f8e4818c0252\scena

DATE: 12/12/2017 TIME: 11:52:18

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 ** 2 year
****

W/E	COMMAND	HYD ID	DT min	AREA ha	'	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs									
	MASS STORM		15.0							
	[Ptot= 54.24 mm]									
*										
**	CALIB NASHYD	0202	1 5.0	0.05		0.00	11.75	16.51	0.30	0.000
	[CN=74.0]									
	[N = 3.0:Tp 0.08]									
*										
*	CALIB STANDHYD	0201	1 5.0	0.53		0.05	11.75	32.34	0.60	0.000
	[I%=25.0:S%= 2.00]									
*										
	RESRVR [2: 0201]	0002	1 5.0	0.53		0.01	12.17	32.25	n/a	0.000
	{ST= 0.01 ha.m }									
*										
	ADD [0002+ 0202]	0001	3 5.0	0.58		0.01	11.75	30.89	n/a	0.000


```
================================================================================
======================
```

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M  M  O   O
        OOO     T      T    H   H    Y    M   M  OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\b7e4f222-bde4-4533-90a7-cc4e617614bf\scena
Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\b7e4f222-bde4-4533-90a7-cc4e617614bf\scena

DATE: 12/12/2017 TIME: 11:52:18

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 2 ** 5 year
****

W/E	COMMAND	HYD ID	DT min	AREA ha	'	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs									
	MASS STORM		15.0							
	[Ptot= 72.18 mm]									
*										
**	CALIB NASHYD	0202	1 5.0	0.05		0.01	11.75	27.21	0.38	0.000
	[CN=74.0]									
	[N = 3.0:Tp 0.08]									
*										
*	CALIB STANDHYD	0201	1 5.0	0.53		0.08	11.75	47.36	0.66	0.000
	[I%=25.0:S%= 2.00]									
*										
	RESRVR [2: 0201]	0002	1 5.0	0.53		0.03	12.00	47.28	n/a	0.000
	{ST= 0.01 ha.m }									
*										
	ADD [0002+ 0202]	0001	3 5.0	0.58		0.03	12.00	45.55	n/a	0.000

```
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\a08089
ed-96a6-4f15-9b94-aeca13720d32\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\a08089
ed-96a6-4f15-9b94-aeca13720d32\scena


DATE: 12/12/2017                          TIME: 11:52:18

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COMMENTS: ____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   3 ** 10 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 83.85 mm ]
*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01 11.75  34.89 0.42   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.08]
*
  *  CALIB STANDHYD       0201  1  5.0    0.53    0.10 11.75  57.55 0.69   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.04 11.92  57.46  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.04 11.92  55.51  n/a   0.000
                                      Page 3
```

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*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\07ea76
40-2f51-4c16-b346-117603e9cc1d\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\07ea76
40-2f51-4c16-b346-117603e9cc1d\scena


DATE: 12/12/2017                          TIME: 11:52:18

USER:


COMMENTS: ____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   4 ** 25 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 98.60 mm ]
*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01 11.75  45.20 0.46   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.08]
*
  *  CALIB STANDHYD       0201  1  5.0    0.53    0.12 11.75  70.77 0.72   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.05 11.92  70.67  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.05 11.92  68.48  n/a   0.000
                                      Page 4
```

```
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M  M  O   O
        OOO     T      T    H   H    Y    M   M  OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\c7a0d3
67-205a-4a2c-b8b5-997291ef867e\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\c7a0d3
67-205a-4a2c-b8b5-997291ef867e\scena


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COMMENTS: ____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   5 ** 50 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM               15.0
    [ Ptot=109.47 mm ]
*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01 11.75  53.15 0.49   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.08]
*
  *  CALIB STANDHYD       0201  1  5.0    0.53    0.14 11.75  80.68 0.74   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.06 11.92  80.59  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.06 11.83  78.23  n/a   0.000
                                      Page 5
```

```
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U A   A  L
         VV     I    SSSSS  UUUUU A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M  M  O   O
        OOO     T      T    H   H    Y    M   M  OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\388d6b
9f-9fee-4cce-b2c8-cf1a3737ae03\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\388d6b
9f-9fee-4cce-b2c8-cf1a3737ae03\scena


DATE: 12/12/2017                          TIME: 11:52:18

USER:


COMMENTS: ____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   6 ** 100 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM               15.0
    [ Ptot=120.44 mm ]
*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01 11.75  61.42 0.51   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.08]
*
  *  CALIB STANDHYD       0201  1  5.0    0.53    0.16 11.75  90.82 0.75   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.07 11.92  90.73  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.08 11.92  88.20  n/a   0.000
                                      Page 6
```

```
*
 FINISH
```

```
================================================================================
======================
```

```
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\e6066a
9d-10aa-4d94-bd80-e9b81b09206c\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\e6066a
9d-10aa-4d94-bd80-e9b81b09206c\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   1 ** 25 mm Storm
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                6.0
    [ Ptot= 24.97 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\679635cc-
dd8d-4d87-a4d3-0
    remark: OWEN SOUND 25 mm (from a 2 year-4hr storm)

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.00  1.92   3.44 0.14   0.000
    [CN=74.0        ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.03  1.92  10.87 0.44   0.000
    [I%=25.0:S%= 2.00]
```



```
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.01  2.42  10.78  n/a   0.000
      {ST=  0.00 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.01  2.33  10.15  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\5cef03
49-ace1-44f4-81a4-33b54ff6abd2\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\5cef03
49-ace1-44f4-81a4-33b54ff6abd2\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   2 ** 2 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                6.0
    [ Ptot= 33.75 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\c5dd421b-
a852-4dd8-940d-0
    remark: OWEN SOUND 2 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.00  1.92   6.60 0.20   0.000
```

```
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.04  1.92  16.74 0.50   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.01  2.42  16.66  n/a   0.000
      {ST=  0.00 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.01  2.33  15.79  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\8de514
bf-1612-4ed6-9f6e-dcade889ee0a\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\8de514
bf-1612-4ed6-9f6e-dcade889ee0a\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   3 ** 5 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                 6.0
    [ Ptot= 44.07 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\83106825-
                                    Page 3
```

```
db14-49b1-b3d5-2
    remark: OWEN SOUND 5 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.00  1.92  11.22 0.25   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.06  1.92  24.33 0.55   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.01  2.42  24.24  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.02  2.33  23.11  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\5c2f43
b4-d87c-4bbb-875a-62f2501cc559\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\5c2f43
b4-d87c-4bbb-875a-62f2501cc559\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   4 ** 10 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
                                    Page 4
```

```
     --------------------
    READ STORM                 6.0
    [ Ptot= 50.59 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\abfdb942-
60d6-43c8-a916-f
    remark: OWEN SOUND 10 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.00  1.92  14.54 0.29   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.08  1.92  29.42 0.58   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.02  2.33  29.33  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.03  2.25  28.06  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\0088f6
dc-c568-4f69-937e-9d44a8013815\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\0088f6
dc-c568-4f69-937e-9d44a8013815\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________


  ***************************
  ** SIMULATION NUMBER:   5 ** 25 year
  ***************************
```



```
  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    READ STORM                 6.0
    [ Ptot= 59.08 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\c256a9c8-
5297-479e-9f19-d
    remark: OWEN SOUND 25 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01  1.92  19.24 0.33   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.10  1.92  36.30 0.61   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.04  2.25  36.21  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.04  2.25  34.75  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\fe9ebc
e5-1d49-4097-a81b-63d49dca2182\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\fe9ebc
e5-1d49-4097-a81b-63d49dca2182\scena


DATE: 12/12/2017                          TIME: 11:51:26

USER:


COMMENTS: _____________________________________________________________
```

```
  ****************************
  ** SIMULATION NUMBER:   6 ** 50 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha    '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    READ STORM                 6.0
    [ Ptot= 65.65 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\dbb20cbc-
ed76-4882-8423-d
    remark: OWEN SOUND 50 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01  1.92  23.15 0.35   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.11  1.92  41.79 0.64   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.04  2.25  41.71  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.05  2.17  40.11  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\4af686
aa-dc11-4ef8-b923-e8b8f3a4df9f\scena
  Summary filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\4af686
aa-dc11-4ef8-b923-e8b8f3a4df9f\scena


DATE: 12/12/2017                          TIME: 11:51:26
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USER:


COMMENTS: _____________________________________________________________


  ****************************
  ** SIMULATION NUMBER:   7 ** 100 year
  ****************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha    '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    READ STORM                 6.0
    [ Ptot= 71.77 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\220e7137-
b2ed-44f4-97b1-f
    remark: OWEN SOUND 100 YEAR 4 HOUR DURATION CHICAGO STORM

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.01  1.92  26.95 0.38   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.13  1.92  47.01 0.65   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.05  2.25  46.92  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.05  2.17  45.20  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\7ddf72
4c-f43b-4814-9e0a-0d86f606b98f\scena
  Summary filename:
```

C:\Users\aoverholt\AppData\Local\CEG\VO3\fe801c07-d710-47d8-94f2-8e34bb922100\7ddf724c-f43b-4814-9e0a-0d86f606b98f\scena

DATE: 12/12/2017 TIME: 11:51:26

USER:

COMMENTS: _____

```
  ***************************
  ** SIMULATION NUMBER:   8 ** Regional Timmins Storm
  ***************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    READ STORM                60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\aoverholt\AppData\Local\Temp\0d7703b0-789a-4c42-a34f-cd5d4692bdee\97871330-
c2fe-427f-bdab-8
    remark: REGIONAL STORM TIMMINS - 12 hour storm

*
 ** CALIB NASHYD         0202  1  5.0    0.05    0.00  7.00 120.26 0.62   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.08]
*
 *  CALIB STANDHYD       0201  1  5.0    0.53    0.06  7.00 159.75 0.83   0.000
    [I%=25.0:S%= 2.00]
*
    RESRVR [ 2:  0201]   0002  1  5.0    0.53    0.05  7.08 159.66  n/a   0.000
      {ST=  0.01 ha.m }
*
    ADD [  0002+  0202]  0001  3  5.0    0.58    0.05  7.00 156.27  n/a   0.000
*
 FINISH

================================================================================
======================
```

APPENDIX C:
UNDERGROUND STORAGE CALCULATIONS

40,000 LITRE PRECAST WASTEWATER HOLDING TANK MODEL H40S

WILKINSON HEAVY PRECAST LIMITED
DUNDAS, ONTARIO 905-628-5611
www.wilkinsonheavyprecast.com

CONSTRUCTION DETAILS *

Concrete: 35 MPa at 28 Days, 5 to 8% Air Entrainment.

Reinforcing: 15 M bars at 300 mm centres each way in walls, floor and roof.
Eight extra 15 M bars around each roof access opening.
Minimum cover over reinforcing steel - 25 mm.

Weight:
Top Section 13,300 kg
Bottom Section 16,500 kg
Total 29,800 kg

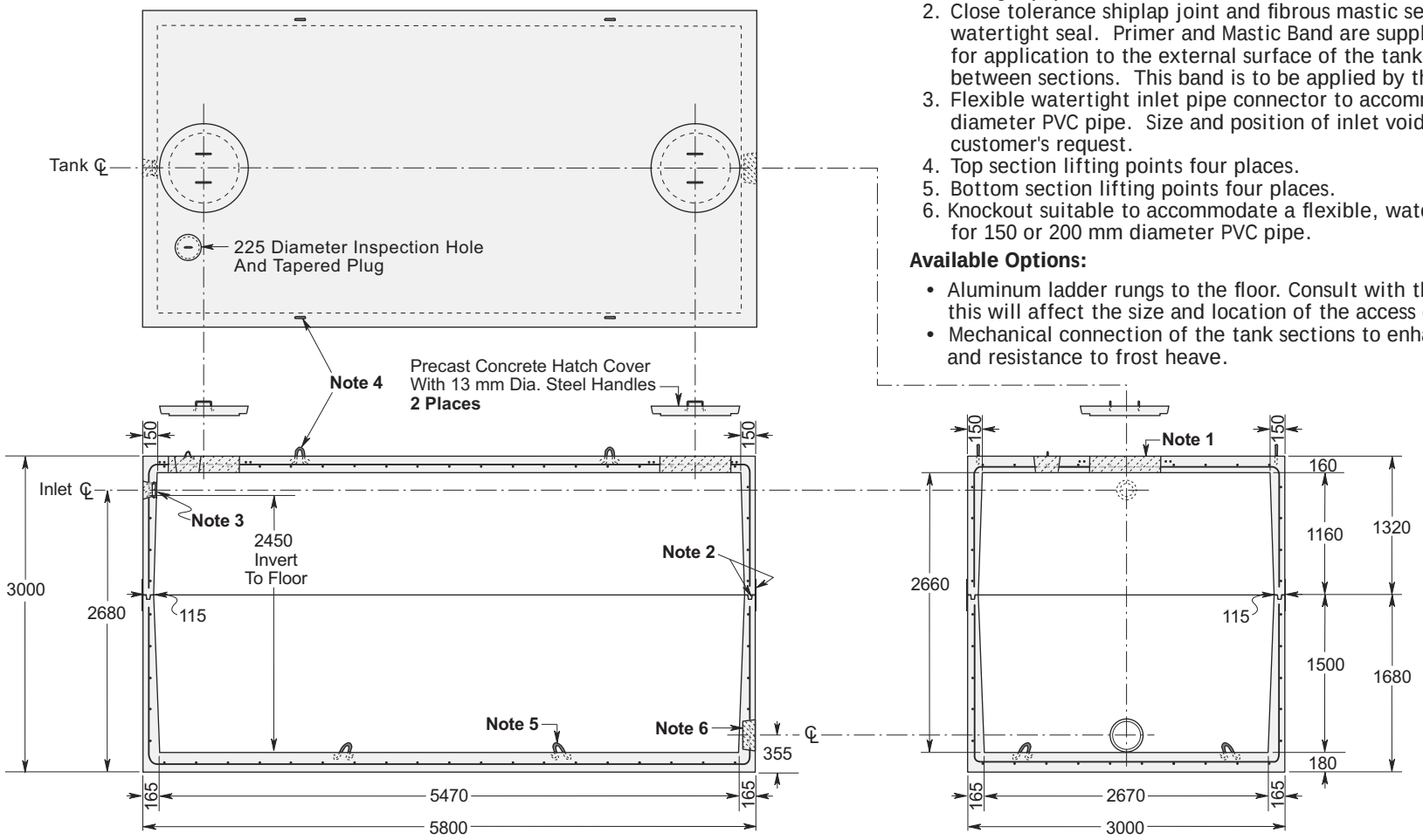
Actual Capacity: 15,068 Litres Per Vertical Metre.
40,082 Litres to Underside of Roof.
37,067 Litres to Invert of Inlet.

NOTES

1. Large 685 mm diameter roof access openings facilitate tank maintenance. Unless otherwise specified/ordered this tank will be shipped with 840 mm diameter concrete hatch covers. Please note that each cover weighs approximately 125 kg and must be handled only with suitable mechanical lifting equipment. See Access Riser section for available options.
2. Close tolerance shiplap joint and fibrous mastic sealant ensures a solid watertight seal. Primer and Mastic Band are supplied with each tank for application to the external surface of the tank over the joint between sections. This band is to be applied by the installing contractor.
3. Flexible watertight inlet pipe connector to accommodate 100 mm diameter PVC pipe. Size and position of inlet void can be modified at customer's request.
4. Top section lifting points four places.
5. Bottom section lifting points four places.
6. Knockout suitable to accommodate a flexible, watertight pipe connector for 150 or 200 mm diameter PVC pipe.

Available Options:

- Aluminum ladder rungs to the floor. Consult with the factory as to how this will affect the size and location of the access opening.
- Mechanical connection of the tank sections to enhance water tightness and resistance to frost heave.



Dimensions in mm
N.T.S.

* Commensurate with a **1.2 Metre** burial over the top slab in firm soil away from any area of vehicular traffic.

For recommended installation procedures refer to Wilkinson Installation Guidelines and Lifting and Assembly Instructions.

WARNING ! IMPROPER INSTALLATION ESPECIALLY IN UNSTABLE SOILS CAN RESULT IN THE STRUCTURAL FAILURE OF THIS PRODUCT

14 April 2011

10 LOUISA STREET
UNDERGROUND STORAGE VOLUME TABLE

Elev. (m)	Depth (m)	Area (m^2)	Volume (m^3)	Accum. Total (m^3)	Accum. Total (ha-m)
100.00	0	58.4	0.0	0	0.0000
100.20	0.20	58.4	11.7	12	0.0012
100.40	0.40	58.4	11.7	23	0.0023
100.60	0.60	58.4	11.7	35	0.0035
100.80	0.80	58.4	11.7	47	0.0047
101.00	1.00	58.4	11.7	59	0.0059
101.20	1.20	58.4	11.7	70	0.0070
101.40	1.40	58.4	11.7	82	0.0082
101.60	1.60	58.4	11.7	94	0.0094
101.80	1.80	58.4	11.7	105	0.0105
102.00	2.00	58.4	11.7	117	0.0117
102.20	2.20	58.4	11.7	129	0.0129
102.40	2.40	58.4	11.7	140	0.0140
102.60	2.60	58.4	11.7	152	0.0152
102.66	2.66	58.4	3.5	156	0.0156

Underground Storage Discharge Table

ORIFICE/PIPE CONTROL 1			ORIFICE/PIPE CONTROL 2			ORIFICE/PIPE CONTROL 3		
Subdrain			Outlet Pipe			Outlet Pipe		
diameter =	80	mm	diameter =	130	mm	diameter =	130	mm
area =	0.0050	m^2	area =	0.0133	m^2	area =	0.0133	m^2
Orifice C =	0.63		Orifice C =	0.63		Orifice C =	0.63	
Invert =	100.00	m	Invert =	101.20	m	Invert =	102.20	m

Q = flow rate (cms)
C = constant
A = area of opening(sq. m)
H = net head on the orifice
g = Acceleration due to gravity

Q = flow rate (cms)
C = constant
A = area of opening(sq. m)
H = net head on the orifice
g = Acceleration due to gravity

	Outlet Pipe 1		**Outlet Pipe 2**		**Outlet Pipe 3**		Total
Water Level	**Head**	**Discharge**	**Head**	**Discharge**	**Head**	**Discharge**	**Discharge**
(m)	**(m)**	**(cms)**	**(m)**	**(cms)**	**(m)**	**(cms)**	**(cms)**
100.00	0.00	0.000	0.00	0.000	0.00	0.000	0.000
100.20	0.16	0.006	0.00	0.000	0.00	0.000	0.006
100.40	0.36	0.008	0.00	0.000	0.00	0.000	0.008
100.60	0.56	0.010	0.00	0.000	0.00	0.000	0.010
100.80	0.76	0.012	0.00	0.000	0.00	0.000	0.012
101.00	0.96	0.014	0.00	0.000	0.00	0.000	0.014
101.20	1.16	0.015	0.00	0.000	0.00	0.000	0.015
101.40	1.36	0.016	0.14	0.014	0.00	0.000	0.030
101.60	1.56	0.018	0.34	0.021	0.00	0.000	0.039
101.80	1.76	0.019	0.54	0.027	0.00	0.000	0.046
102.00	1.96	0.020	0.74	0.032	0.00	0.000	0.051
102.20	2.16	0.021	0.94	0.036	0.00	0.000	0.056
102.40	2.36	0.022	1.14	0.039	0.14	0.014	0.075
102.60	2.56	0.022	1.34	0.043	0.34	0.021	0.087
102.66	2.62	0.023	1.39	0.044	0.39	0.023	0.090

APPENDIX D:
STORMCEPTOR SIZING DESIGN SHEET

Detailed Stormceptor Sizing Report – 10 Louisa Street

Project Information & Location			
Project Name	10 Louisa Street	**Project Number**	5452
City	Town of The Blue Mountains	**State/ Province**	Ontario
Country	Canada	**Date**	12/6/2017
Designer Information		**EOR Information (optional)**	
Name	Andrew Overholt	**Name**	
Company	C.C. Tatham & Associates Ltd.	**Company**	
Phone #	705-444-2565	**Phone #**	
Email	aoverholt@cctatham.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	10 Louisa Street
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	OWEN SOUND MOE

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	75	91
STC 750	83	97
STC 1000	85	97
STC 1500	85	97
STC 2000	88	99
STC 3000	89	99
STC 4000	91	100
STC 5000	92	100
STC 6000	93	100
STC 9000	95	100
STC 10000	95	100
STC 14000	97	100
StormceptorMAX	Custom	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	4492
Rainfall Station Name	OWEN SOUND MOE	**Total Rainfall (mm)**	18531.0
Station ID #	6132	**Average Annual Rainfall (mm)**	463.3
Coordinates	44°35'N, 80°56'W	**Total Evaporation (mm)**	894.8
Elevation (ft)	580	**Total Infiltration (mm)**	9040.9
Years of Rainfall Data	40	**Total Rainfall that is Runoff (mm)**	8595.3

Notes
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. • Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.58
Imperviousness %	51.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	Yes
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	10 Louisa Street

Site Details

Drainage Area

Total Area (ha)	0.58
Imperviousness %	51.0

Surface Characteristics

Width (m)	152.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

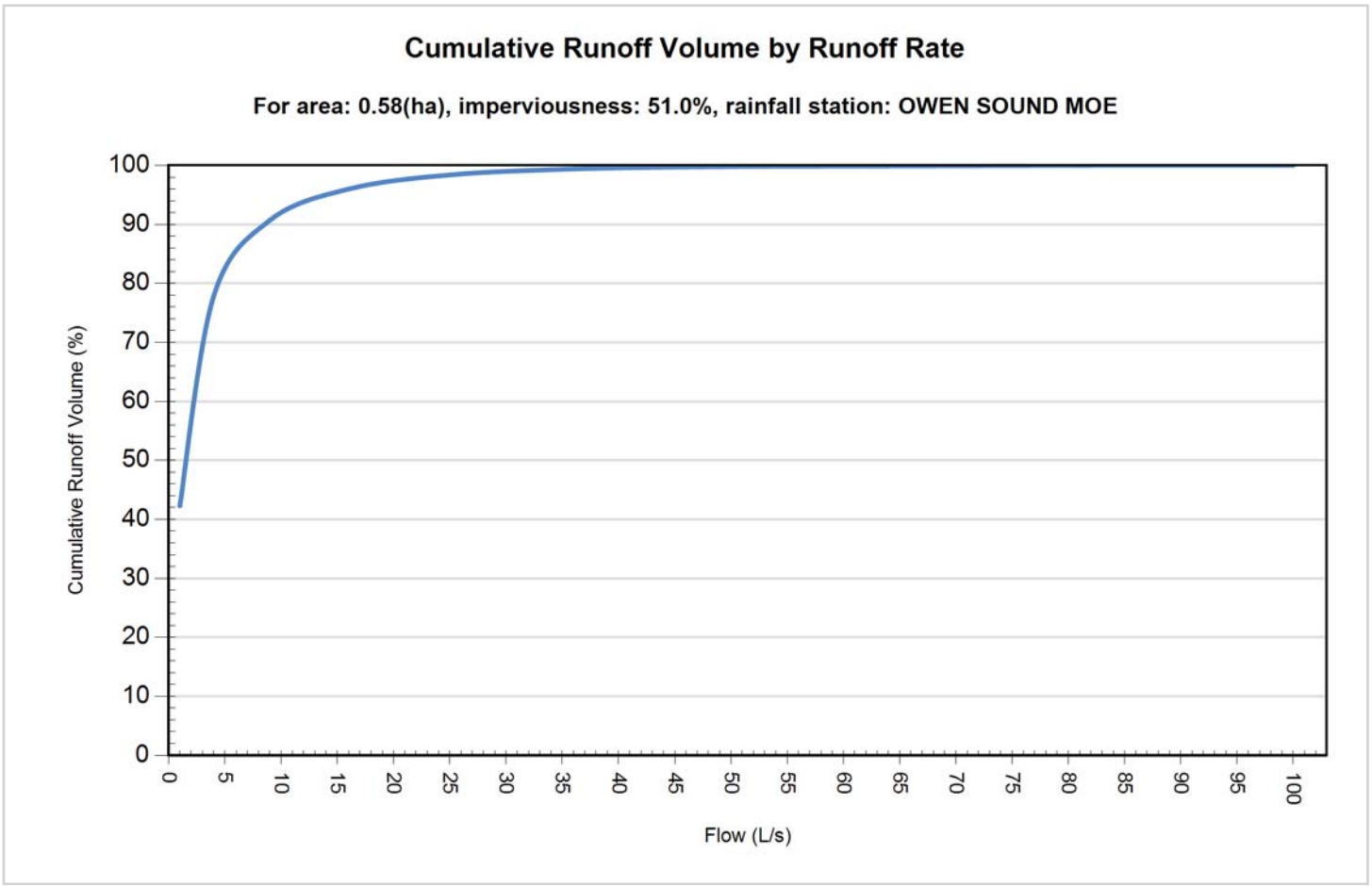
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

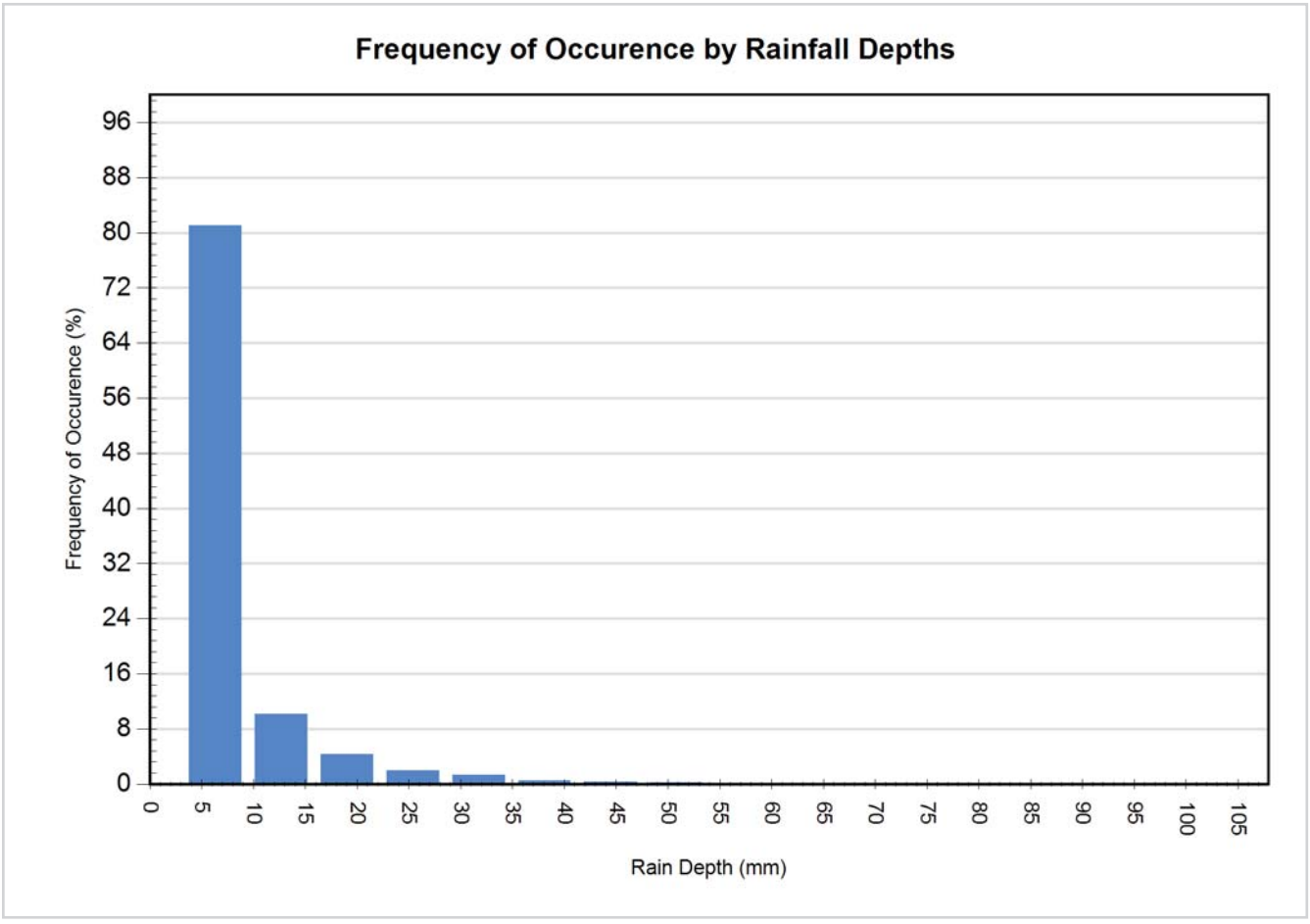
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	21266	28955	42.3
4	39103	11120	77.8
9	45538	4689	90.7
16	48227	2001	96.0
25	49442	787	98.4
36	49916	313	99.4
49	50134	95	99.8
64	50194	35	99.9
81	50221	8	100.0
100	50229	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3645	81.1	5719	30.9
12.70	458	10.2	4102	22.1
19.05	191	4.3	2957	16.0
25.40	89	2.0	1936	10.5
31.75	57	1.3	1599	8.6
38.10	23	0.5	800	4.3
44.45	12	0.3	501	2.7
50.80	10	0.2	472	2.5
57.15	4	0.1	219	1.2
63.50	1	0.0	63	0.3
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	1	0.0	79	0.4
88.90	1	0.0	84	0.5
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications