Stormwater Management Plan for Damkar Lands - Senior's Housing

Prepared by:

Westhoff Engineering Resources, Inc.

Land & Water Resources Management Consultants

Stormwater Management Plan for Damkar Lands - Senior's Housing

Issued for Approval
April 14, 2020

Prepared for:

Trico Developments (1990) Ltd.

File: WER120-05

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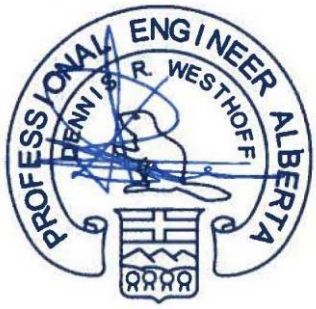

April 14, 2020

Corporate Permit **Responsible Engineer**

Analysis and report preparation by Lotte Veth.

Report reviewed by Dennis Westhoff.

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1 Introduction

Westhoff Engineering Resources, Inc. (Westhoff) has been retained by Trico Developments (1990) Ltd. to prepare a Stormwater Management Plan (SWMP) to support land re-designation for the development of the Damkar Lands into Senior's Housing (Project Site) in Rocky View County (RVC). The proposed development is located west of Twelve Mile Coulee Road NW in the northwest corner of the Bearspaw Watermark Community within SE18-25-2W5 (Figure 1). Figure 2 presents the concept plan.

The Project Site covers an undeveloped area of about 5.4 ha and currently is partially stripped of its vegetative cover and graded. The topography terraces from east to west with slopes up to an average of 7.8%.

1.1 Objectives

This SWMP provides information on the proposed drainage strategy for the Project Site. A preliminary analysis is completed to support the proposed strategy. It is emphasized that the SWMP meets the requirements of the Watermark at Bearspaw Master Drainage Plan. In addition, it recognizes the information of the As-built Drawings (October 2015 by IBI Group) of the Damkar Lands Phase 1, located to the south of the Project Site. The relevant as-built Drawing C5.1 is attached for ease of reference.

1.2 Design Criteria

The design of the onsite stormwater management system follows the criteria below:

- The Project Site will tie into the existing minor system that was developed for Damkar Phase 1 (PL20140115);
- Onsite storage of runoff shall be provided onsite and controlled to the available capacity of the downstream infrastructure that connects to Pond D within the Watermark Community;
- Based on the as-built drawings for Damkar Lands Phase 1 (Drawing C5.1), a total of 3.67 ha of the Project Site can drain to three existing minor system stubs (375mm) with a 1:100 year unit area release rate (UARR) of 120 L/s/ha;
- The remainder area 1.29 ha (runoff coefficient 0.35) drains to a perimeter swale on the west property line and connects to an existing grated top manhole. Part of a 0.58 ha catchment (runoff coefficient 0.25) drains to the same existing grated top manhole.

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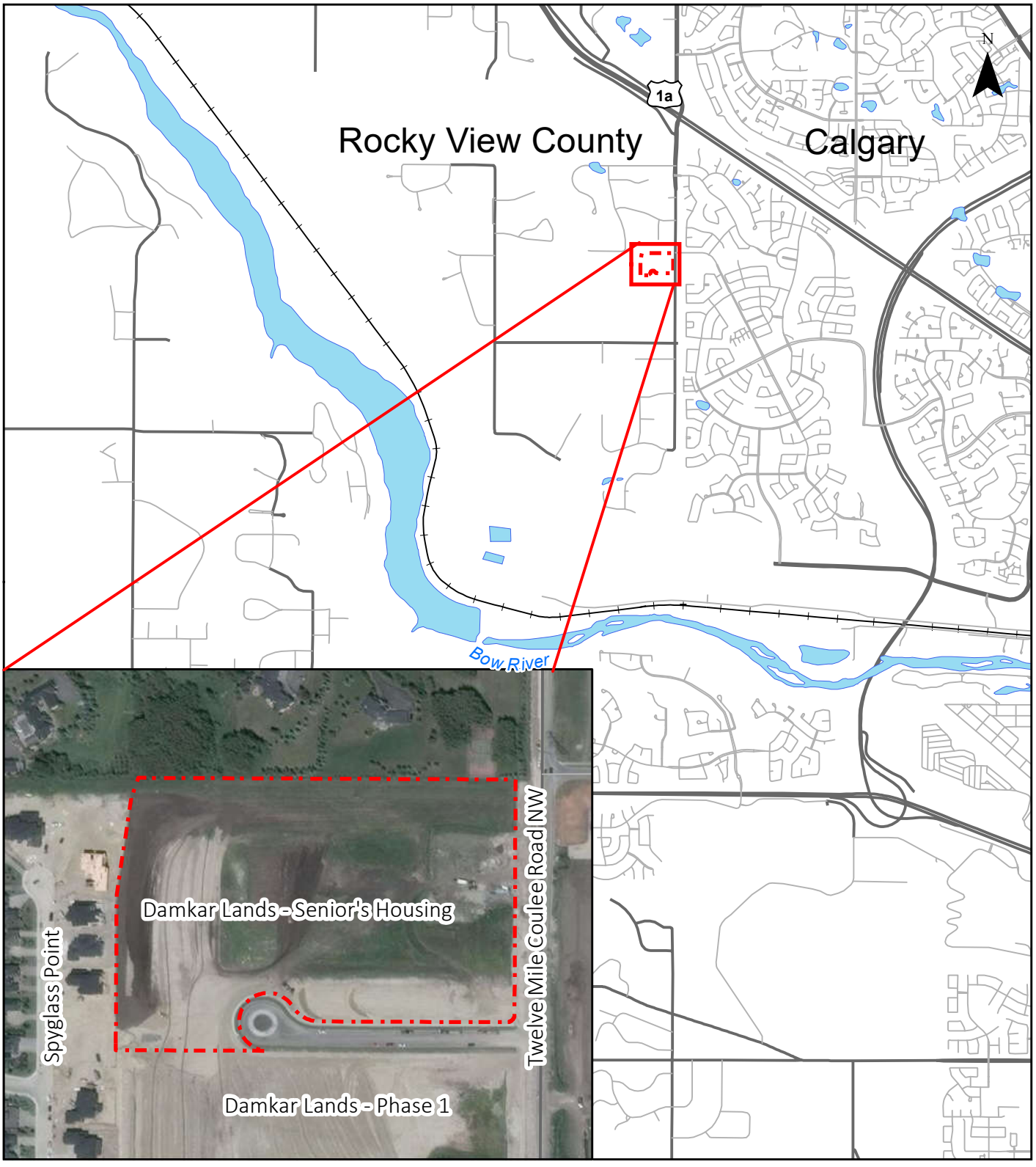

LEGEND

- ProjectSite
- Major Road
- Minor Road
- Railway
- Water

Client:	TRICO DEVELOPMENTS (1990) LTD.
Project:	DAMKAR LANDS - SENIOR'S HOUSING
Title:	PROJECT LOCATION

Date:	Project No.:	Scale:	
26-03-2020	WER120-05	1:50,000	**FIGURE: 1**

Westhoff Engineering Resources, Inc.
Land & Water Resources Management Consultants

1:5000

Mar 23, 2020 - 3:13pm W:\1908-12 Trico Bearspaw Seniors Housing 2019Aug23\5.0 Technical\5.1 Technical Production\5.1.1 AutoCAD\1908-12 - Rendering 2020MAR23.dwg

Trico Bearspaw Seniors Housing

Development Concept

March 2020

2 Stormwater Management Strategies

2.1 Proposed Stormwater Management Concept

The proposed senior's housing development concept, as presented in Figure 2, comprises a total of four buildings accessed by internal roads connected to the existing cul-de-sac road. No external areas are draining into the Project Site as Twelve Mile Coulee Road NW is draining independently.

The size and estimated impervious percentage of the Project Site is summarized in Table 1 based on Figure 2.

Table 1: Summary of Catchment Data

Catchment	Area (ha)	Impervious (%)	Impervious Area (ha)	Pervious Area (ha)
Landscape	3.19	5%	0.16	3.03
Impervious Area (Internal Roads, Buildings and water features)	2.21	100%	2.21	0
Total	5.4	45%*	2.38	3.03

**Overall Site Impervious percentage based on current concept plan*

The proposed stormwater management concept is presented in Figure 3. Storm runoff within the Project Site is managed by an overland drainage system connected to the existing minor system. Water Features will be designed to function as integrated stormwater storage units adding to the courtyard landscaping and amenities. Each water feature will be connected to the existing minor system stubs as shown on Figure 3.

The water features provide temporary detention of the storm runoff and limit the discharge to the downstream to the permissible rate. As it is expected that the development will be constructed by a phased approach, each phase will have to show adequate storage and water quality enhancement.

2.2 Proposed BMPs and LIDs

To enhance the stormwater runoff quality, low impact development strategies (LIDS) and best management practices (BMPs) will be introduced at the time the ultimate stormwater management plan is designed. The integration of LIDS includes routing storm runoff from impervious surfaces to absorbent landscape area to promote vegetation nourishing by infiltration and evapotranspiration within the soil mass. Water quality can also be improved as sediments and surface pollutants within the storm runoff is trapped by the absorbent landscape before entering the water features.

In addition to the aforementioned LIDS, BMPs are introduced by using stormwater for the visual aspects of the water features. Retained stormwater will be recirculated and optionally used for irrigation of landscaped areas. Details will be provided at in the detailed design phase.

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PR/W PLAN 4674JK

2 PUL 1

REMAINDER OF LOT 1

SPYGLASS WY

UR/W PLAN 1311980

12 MILE COULEE RD NW

9.00m UR/W

3.50m UR/W

DAMKAR CT

0.79 ha
SC-1

1.30 ha
SC-2

1.03 ha
SC-3

2.13 ha
SC-4

PROP 6m GRASS SWALE TO BE DESIGNED BY DETAIL DESIGN

ST 375 PVC
L=11.500 S=1.548%.061%
INV N 79.502.502
INV S 79.680.380

ST 600 PVC
L=44.971 S=3.291%

RIP RAP

RIM=73.033
GT MH
NO ICD

71.166

ST 600 PVC
L=30.939 S=2.870%

72.646
RIM=81.059

79.187

ST 375 PVC
L=15.600 S=1.013%
INV S 79.558
INV N 79.401

EX 12.00 GRASS SWALE

ROCK CHECK

TYPE C
ICD R50

85.226

TYPE C
ICD R50

88.209
RIM=91.342

ST 600 PVC
L=63.836 S=9.460%
INV E 85.226
INV W 79.187

ST 525 PVC
L=81.208 S=4.071%

91.515
RIM=93.506

ST 375 PVC
L=20.000 S=0.930%0.929%
INV N 91.874
INV S 91.688

TYPE C
NO ICD

91.675

ST 375 PVC
L=74.842 S=2.430%.431%

93.494
RIM=96.503

ST 375 PVC
L=20.000 S=0.795%
INV N 93.700
INV S 93.541

TYPE C
NO ICD

TYPE C
NO ICD

LEGEND

- PROJECT BOUNDARY
- CATCHMENT AREA BOUNDARY
- EX STORM PIPE
- EX CONTOUR @ 0.50m INTERVAL
- OVERLAND EMERGENCY SPILL ROUTE
- EXISTING GRASS SWALE
- PROP SWALE
- 1.03 ha / SC-1 — CATCHMENT AREA (ha)
- PROP BUILDING
- PROP ROAD
- PROP LANDSCAPE
- PROP CONCEPT STORMWATER FEATURE
- PROP STORM PIPE WITH MH

NOTES:

1. DRAWING UNITS, DIMENSIONS AND ELEVATIONS ARE IN METERS, AND DECIMALS THEREOF. ALL PIPE SIZES ARE IN MILLIMETERS, UNLESS NOTED OTHERWISE.

1:1000

0 10 20 30 40 m

Client: TRICO DEVELOPMENTS (1990) LTD.

Project: DAMKAR LANDS - SENIOR'S HOUSING

Title: CONCEPT STORMWATER MANAGEMENT PLAN

Date:	Project No:	Scale:	Figure No:
31-03-2020	WER120-05	AS SHOWN	FIG 3

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Land & Water Resources Management Consultants

On the west property line, the site borders onto individual lots along Spyglass Point. This strip of development exist shall not be affected by the proposed development. As the Project Site is sloping towards these properties, it is paramount to prevent any overland flows (including emergency) spilling into these lots.

The Overland drainage Plan (C5.1, IBI, October 2015) shows the emergency overland escape route in the southwest corner of the Project Site. During the detailed design, this location and flow conveyance capacity will be confirmed for a safe routing of flows due to a design storm event of 1:500 year.

As the Project Site is sloped up to 7.8%, details will be provided at detailed design on erosion and sediment control, especially at locations where higher flow velocities are identified.

3 Preliminary Analysis and Results

3.1 Catchment Areas

The concept plan is divided in the following catchment areas, based on the existing contours of the site and the concept plan:

- the buildings, internal roads, landscape and parking represent an area of 4.52 ha, with an impervious ratio of approximately 55%;
- the remainder of 0.8 ha landscaping area will drain to the west property line;
- the portion of the Project Site that will drain to the cul-de-sac is about 0.1 ha.

Note that the based on the Storm drainage Area Plan (C5.1, IBI October 2015), the area draining to the existing three PVC 375 mm stubs is 3.67 ha (1.22 ha each) and a total flow capacity of 0.44 m^3/s. The concept plan area draining to the stubs is currently 4.52 ha and has therefor a lower UARR of 97 L/s/ha. At detailed design these numbers will be confirmed and updated with the final architectural and civil plans.

It is emphasized that the future imperviousness for the phases is unknown at this time. Therefore, a sensitivity analysis is undertaken and for the purpose of this SWMP, the imperviousness ratio conditions of 45%, 60% and 75% are analyzed.

3.2 Single Event Analysis

A PCSWMM model is developed and used for sizing the water features and required storage. The input parameters for the PCSWMM model (e.g., depression loss, Manning's roughness, Horton's infiltration parameters) adhere to the County's 2013 Servicing Standards. Where applicable referral is made to the City of Calgary Stormwater Guidelines (2011).

The aforementioned guidelines require that the major drainage system, including storage facilities, shall be designed to accommodate the runoff resulting from a 1:100 year return period storm event. Accordingly, the 24 hour duration, 1:100 year design storm event of the Chicago

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distribution was used for this study. The distribution represents two important characteristics for design purposes:

- The total precipitation of the *Chicago* storm, for any duration, is the same as the total precipitation defined for the 1:100 year event.
- The peak intensity of the *Chicago* storm, for any time increment, is the same as the peak intensity defined for the 1:100 year event.

A total storm duration of 24 hours with 5 minute rainfall increments was used, based on the Intensity-Duration-Frequency (IDF) relationship for The City of Calgary International Airport precipitation data and as provided by Atmospheric Environmental Services (AES).

The following parameters were used to derive the rainfall intensities for this design storm, which are based on the IDF data for The City of Calgary International Airport precipitation data and are applicable in Rocky View County.

a = 663.1 b = 1.87 c = 0.712 r = 0.3

It is emphasized that the stormwater management system is designed to fully contain the aforementioned storm and therefore to comply with the Environmental Protection and Enhancement Act (EPEA) regulations as stipulated by Alberta Environment.

3.3 Single Event Analysis Results

The post-development scenarios analyzed include impervious coverage of 4.53 ha development at 45%, 60% and 75%. Figure 4 shows the resulting Water Feature Storage Requirement versus Impervious Percentage graph. For example, if the Project Site is to be developed with approximately 60% in impervious percentage, the required on-site storage volume is 570 m3. The current concept represents 55% impervious coverage and the three water features cover a total area of approximately 2280 m^2. This would mean storage required for the 1:100 year 24 hour event is 490 m^3 and would raise the water level in these features up by 0.21 m. Thus, the proposed size of the stormwater storage is adequate based on the single event analysis. Details of the model input and output are presented in Appendix A.

At detailed design stage the water features will be designed to be able to store runoff as well as recirculate for water quality enhancement.

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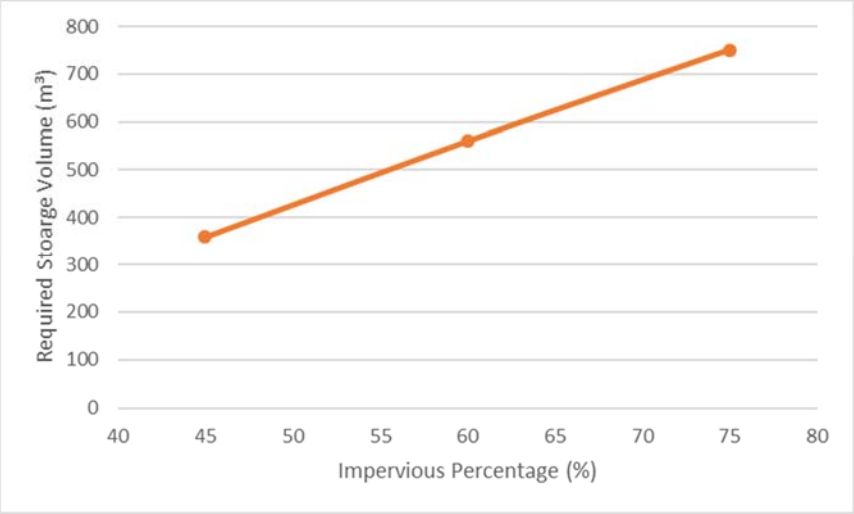
Figure 4: Water Feature Storage Requirement versus Impervious Percentage



3.4 Continuous Simulation

As from the single event analysis it is concluded that traplow storage is sufficient for the site no simulation of the rainfall-runoff process is performed for the Project Site. At the detailed design phase, a continuous simulation will be performed for the operation of the water features and details will be provided how to provide for a functional water features with consideration of water adequacy and water quality.

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4 Conclusions and Recommendations

4.1 Conclusions

- The proposed stormwater management plan is able to meet the permissible UARR at 120 L/s/ha; preliminary computations show that the site runoff is at 97 L/s/ha.
- For the remaining 0.8 ha of landscaped area, a perimeter swale will be required on the west boundary of the Project Site to prevent spill into private property along Spyglass Point.
- The conceptual water features will be able to temporary store runoff up to the 1:100 year 24 hour storm event.

4.2 Recommendations

- The information contained in this document be accepted to support the submission of the Master Planning document while noting that:
- At the detailed engineering stage,
- The water features shall be detailed for size, shape, UARR control and water quality;
- At detailed design a (high back) swale shall be designed to capture the 1:500 year event.
- An Erosion and Sediment Control (ESC) Plan and report shall be prepared to comply with the County's Servicing Standards.
- At the time of the submission of the development permit for works on each individual phase, a detailed Site Specific Stormwater Implementation Plan (SSIP) shall be prepared.

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Appendix A Drawing C5.1 - IBI Group, October 2015

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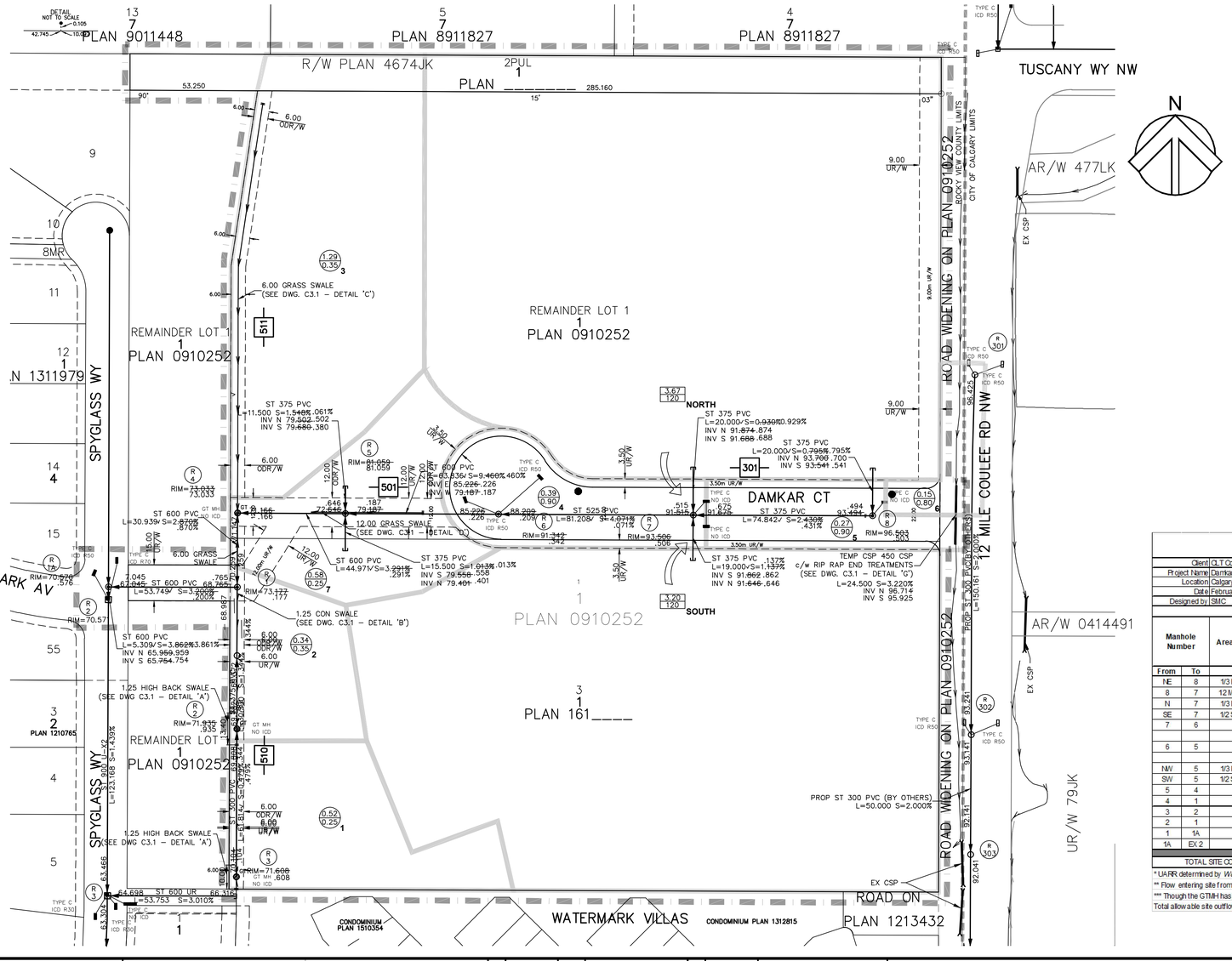

LEGEND

- CONSTRUCTION BOUNDARY
- STORM DRAINAGE AREA BOUNDARY
- ROCKY VIEW COUNTY/CITY OF CALGARY LIMITS
- STORM SEWER MAIN
- CONCRETE DRAINAGE GUTTER
- DITCH / GRASS SWALE
- TYPE 5A MANHOLE — EXISTING
- TYPE 1–S MANHOLE — EXISTING
- CATCH BASIN — EXISTING
- GRATED TOP MANHOLE
- STORM MANHOLE NUMBER c/w RIM ELEV (R 5, 1095.613)
- CATCH BASIN TYPE AND INLET CONTROL DEVICE TYPE (AS PER CITY STD. DWG No. 452.1002.031) (TYPE C / NO ICD)
- DRAINAGE AREA (ha), RELEASE RATE (L/s/ha), SUBCATCHMENT IDENTIFICATION NUMBER (TA 70 / ##)
- DRAINAGE AREA (ha), RUNOFF COEFFICIENT, DRAINAGE AREA NUMBER (TA RC / ##)
- CATCHMENT FLOW DIRECTION
- INDICATES WHERE DRAINAGE AREAS ENTER STORM SYSTEM
- BLOCK PROFILE SHEET NUMBER (302)

NOTES

1. ALL CONSTRUCTION IS TO CONFORM TO ROCKY VIEW COUNTY SPECIFICATIONS UNLESS NOTED OTHERWISE.
2. ALL EXISTING INFORMATION RECEIVED FROM:
   2.1. EXP. DATED SEPTEMBER 11, 2015 AND
   2.2. RICHVIEW ENGINEERING. DATED SEPTEMBER 14, 2015.
3. LEGAL PLAN PROVIDED BY IBI GEOMATICS. DATED MARCH 21, 2016.
4. TOPOGRAPHIC INFORMATION PROVIDED BY IBI GEOMATICS. DATED FEBRUARY 27, 2013.
5. SEWER LENGTHS ON BLOCK PROFILES ARE FROM CL TO CL OF MANHOLE.
6. SEWER LENGTHS FOR QUANTITIES ARE FROM INSIDE MH WALL TO INSIDE MH WALL.
7. CONCRETE FOR STORM SEWER AND APPURTENANT STRUCTURES TO BE MANUFACTURED WITH SULPHATE RESISTANT CEMENT.
8. ALL STORM SEWER PIPE TO BE PVC, BEDDING AS PER A.S.T.M. D 2321 CLASS 1A UNLESS OTHERWISE NOTED.
9. ALL COMPACTION OF UTILITY INSTALLATION OPERATIONS SHALL BE A MINIMUM DENSITY OF 98% OF STANDARD PROCTOR.
10. TO OBTAIN GEODETIC DATUM ADD 1100 TO ELEVATIONS
11. ALL CATCH BASINS ARE TYPE C UNLESS OTHERWISE NOTED.
12. DO NOT TIE CATCH BASIN LEADS TO THE WEEPING TILE DRAIN.
13. ALL STORM SEWER PIPE AND STORM SEWER MANHOLES SHALL HAVE RUBBER GASKETS.

4.3 MINOR SYSTEM TABLE SUMMARY

Client	CLT Contracting Ltd.
Project Name	Damkar Subdivision, Phase 1
Location	Calgary, AB
Date	February, 2015
Designed by	SMC

IBI

Manhole Number		Area Number	Pipe Design Method					Catchbasin Type	Location	ICD Type	Modelling Method						
			Incremental Area	Cumulative Site Area	UARR*	Incremental Site Flow	Cumulative Flow				Incremental Site Inlet Peak Flow	Cummulative Site Inlet Peak Flow			Pipe Capacity	Spare Capacity
From	To		(ha)	(ha)	(L/s/ha)	(L/s)	(L/s)				(L/s)	(L/s)	slope (%)	size (mm)	material	(L/s)	(L/s)
NE	8	1/3 North Site	1.22	1.223	120	146.80	146.80				146.8	146.8	0.800	375.00	0.011	185.33	**39**
8	7	1/2 Mile Coulee	0.15	1.373	120	18.00	146.80				22.0	168.8	2.500	375.00	0.011	327.63	**159**
N	7	1/3 North Site	1.22	1.220	120	146.40	146.40				146.4	146.4	1.100	375.00	0.011	217.32	**71**
SE	7	1/2 South Site	1.60	1.600	120	192.00	192.00				192.0	192.0	1.100	375.00	0.011	217.32	**25**
7	6	5	0.27	4.463	120	32.40	517.60	Type C	N	NO ICD (Flow-by)	23.5						
								Type C	S	NO ICD (Flow-by)	23.5	554.2	4.000	525.00	0.011	1016.51	**462**
6	5	4	0.39	4.853	120	46.80	564.40	Type C	N	R50	29.3						
								Type C	S	R50	36.6	620.1	9.512	600.00	0.011	2238.02	**1618**
NW	5	1/3 North Site	1.22	1.220	120	146.40	146.40				146.4	146.4	1.100	375.00	0.011	217.32	**71**
SW	5	1/2 South Site	1.60	1.600	120	192.00	192.00				192.0	192.0	1.100	375.00	0.011	217.32	**25**
5	4		0.00	7.673	120	0.00	902.80				0.0	958.5	3.300	600.00	0.011	1318.21	**360**
4	1	3, 7	1.87	9.543	120	224.40	1127.20	GTMH	NW	NO ICD	117.0	1075.5	2.600	600.00	0.011	1170.08	**95**
3	2	1	0.52	0.520	120	62.40	62.40	GTMH	W	NO ICD	48.0	48.0	0.350	300.00	0.011	67.61	**20**
2	1	2	0.34	0.860	120	40.80	103.20	GTMH	SW	NO ICD	56.0	104.0	1.200	375.00	0.011	226.99	**123**
1	1A		0.00	10.403	120	0.00	1230.40				0.0	1179.5	3.500	600.00	0.009	1659.25	**480**
1A	EX 2		0.00	10.403	120	0.00	1230.40				0.0	1179.5	5.066	600.00	0.011	1787.22	**608**
TOTAL SITE CONTRIBUTING AREA =			10.403		ALLOWABLE SITE OUTFLOW=		1230.4				SITE=	1179.5					

* UARR determined by *Watermark Phase 1 Stormwater Management Report*, 2011, by Progressive Engineering

** Flow entering site from w est side of 12 Mile Coulee Rd. determined by *12 Mile Coulee Road Upgrade Stormwater Management Report*, 2015, by exp Services Inc.

*** Though the GTMH has the ability to capture 117L/s, the SWMHY MO analysis shows that only 56L/s are captured in the 1:100yr event.

Total allowable site outflow excludes area/flow from 12 Mile Coulee Rd as it is not part of the drainage area to Pond D, though the runoff from this area is taken into consideration in stormanalysis, see report for details.

SUB-CONSULTANT

SUB-CONSULTANT

SEALS

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No.	DATE	APPR.	DESCRIPTION
8			
7			
6			
5			
4			
3			
2	2016-02-05	ST	SUBMITTED FOR SWMR
1	2015-10-14	ST	SUBMITTED FOR SWMR

REVISIONS

No.	DATE	DESCRIPTION
H	2020-02-28	FAC As-Built Submission
G	2018-01-16	As-Built Submission
F	2017-06-29	Surface Construction
E	2017-06-29	Underground Construction
D		Issued for Tender
C	2016-04-15	Third Submission
B	2016-02-19	Second Submission
A	2015-10-01	First Submission

ISSUES

CLIENT

CLT DEVELOPMENTS LTD.
121, 1001-20th AVE P.O. BOX 1419
Didsbury, AB T0M 0W0

PROJECT

DAMKAR SUBDIVISION PHASE 1

RVC FILE NO.: PL20140115

IBI GROUP
500 – Meredith Block,
611 Meredith Road NE
Calgary AB T2E 2W5 Canada
tel 403 270 5600 fax 403 270 5610

PROJECT NO:	33145
DRAWN BY:	RW
CHK'D BY:	ST
SCALE:	1:1000
DATE:	OCTOBER 2015

SHEET TITLE

STORM DRAINAGE AREA PLAN

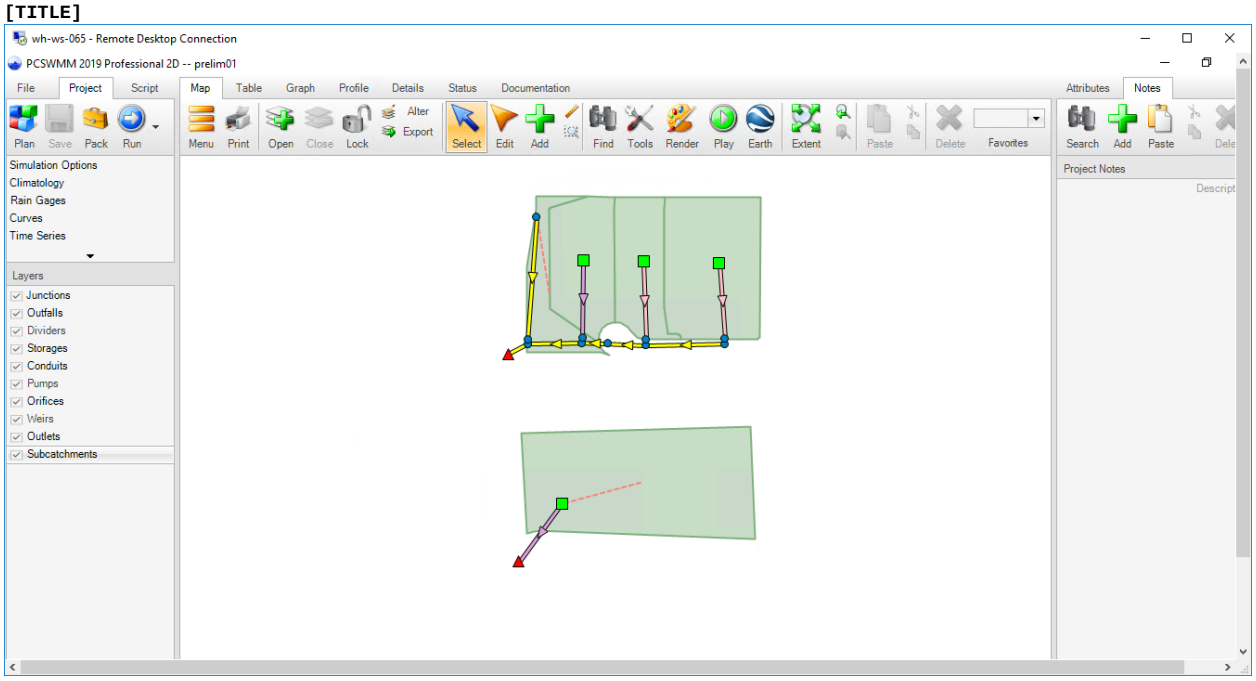
C5.1

SHEET 12 OF 22

File Location: J:\33145_Winnie\Chch\5 Drawings\5Storm\Akbulk\33145-C5.1-STORM AREA.dwg Last Saved: February 29, 2020, by rmuk Plotted: February 29, 2020 12:52:00 PM by Mike Kok

Appendix B Single Event Input and Output

INPUT
[TITLE]



[OPTIONS]

```
;;Options            Value
;;------------------ ------------
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO
START_DATE           3/5/2020
START_TIME           00:00
REPORT_START_DATE    3/5/2020
REPORT_START_TIME    00:00
END_DATE             3/6/2020
END_TIME             00:00
SWEEP_START          1/1
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00
INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
```

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```
THREADS              4

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Calgary_24h_100y INTENSITY 0:05   1.0    TIMESERIES Calgary_24h_100y

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
S1               Calgary_24h_100y J5               0.88     5        170      7.8      0
S2               Calgary_24h_100y P1               1.3      50       170      7.8      0
S3               Calgary_24h_100y P2               1.14     50       170      7.8      0
S4               Calgary_24h_100y P3               2.08     50       170      7.8      0
S5               Calgary_24h_100y SU1              4.52     75       300      7.8      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S1               0.013      0.25       1.6        3.2        0          PERVIOUS   100
S2               0.013      0.25       1.6        3.2        25         PERVIOUS   55
S3               0.013      0.25       1.6        3.2        25         PERVIOUS   55
S4               0.013      0.25       1.6        3.2        25         PERVIOUS   55
S5               0.013      0.25       1.6        3.2        25         PERVIOUS   55

[INFILTRATION]
;;Subcatchment   MaxRate    MinRate    Decay      DryTime    MaxInfil
;;-------------- ---------- ---------- ---------- ---------- ----------
S1               75         7.5        4.14       7          0
S2               75         7.5        4.14       7          0
S3               75         7.5        4.14       7          0
S4               75         7.5        4.14       7          0
S5               75         7.5        4.14       7          0

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
J4               1171.147   1.886      0          0          0
J5               1178.4     0.5        0          0          0
J6               1173.45    0.5        0          0          0
J7               1177.43    1.5        0          0          0
J8               1191.738   1.5        0          0          0
J9               1193.591   1.5        0          0          0
STMH5            1172.646   8.413      0          0          0
STMH6            1185.226   6.116      0          0          0
STMH7            1191.515   1.991      0          0          0
STMH8            1193.494   3.009      0          0          0

[OUTFALLS]
;;               Invert     Outfall      Stage/Table      Tide
;;Name           Elev.      Type         Time Series      Gate Route To
;;-------------- ---------- ------------ ---------------- ---- ----------------
OF1              1170.259   FREE                          NO
OF2              0          FREE                          NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                          Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                         Frac.
Infiltration parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- ----------
-------------
P1               1185     0.3      0        TABULAR    Traplow                  0        0
P2               1193     0.3      0        TABULAR    Traplow                  0        0
P3               1195     0.3      0        TABULAR    Traplow                  0        0
SU1              1        0.3      0        TABULAR    StorageReq_75            0        0

[CONDUITS]
```


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```
;;               Inlet           Outlet                    Manning    Inlet      Outlet     Init.      Max.
;;Name          Node            Node            Length    N          Offset     Offset     Flow       Flow
;;-------------- --------------- --------------- ---------- ---------- ---------- ---------- ---------- ----
------
C1               J5              j6              156.622   0.03       0          0          0          0
C10              J8              STMH7           20        0.011      0          0.173      0          0
C11              J9              STMH8           20        0.011      0          0.047      0          0
C12              STMH6           STMH5           63.836    0.011      0          6.541      0          0
C5               STMH8           STMH7           74.842    0.011      0          0.16       0          0
C6               STMH7           STMH6           81.208    0.011      0          2.983      0          0
C7               STMH5           J4              44.971    0.011      0          0.019      0          0
C8               J4              OF1             30.939    0.011      0          0          0          0
C9               J7              STMH5           20        0.011      0          4.734      0          0

[ORIFICES]
;;               Inlet           Outlet          Orifice      Crest      Disch.     Flap Open/Close
;;Name          Node            Node            Type         Height     Coeff.     Gate Time
;;-------------- --------------- --------------- ------------ ---------- ---------- ---- ----------
C3               P2              J8              SIDE         0          0.6        NO   0
C4               P3              J9              SIDE         0          0.6        NO   0

[OUTLETS]
;;               Inlet           Outlet          Outflow    Outlet           Qcoeff/
Flap
;;Name          Node            Node            Height     Type             QTable           Qexpon
Gate
;;-------------- --------------- --------------- ---------- ---------------- ---------------- ---------- ---
-
C2               P1              j7              0          TABULAR/DEPTH    P1                            NO
OL1              J6              J4              0          TABULAR/DEPTH    GTMH                          NO
OL2              SU1             OF2             0          TABULAR/DEPTH    TotalSite                     NO

[XSECTIONS]
;;Link          Shape        Geom1           Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ --------------- ---------- ---------- ---------- ----------
C1               TRIANGULAR   0.5             6          0          0          1
C10              CIRCULAR     0.375           0          0          0          1
C11              CIRCULAR     0.375           0          0          0          1
C12              CIRCULAR     0.6             0          0          0          1
C5               CIRCULAR     0.375           0          0          0          1
C6               CIRCULAR     0.525           0          0          0          1
C7               CIRCULAR     0.6             0          0          0          1
C8               CIRCULAR     0.6             0          0          0          1
C9               CIRCULAR     0.375           0          0          0          1
C3               CIRCULAR     0.302           0          0          0
C4               CIRCULAR     0.419           0          0          0

[LOSSES]
;;Link          Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------
C10              0          0.2        0.6        NO         0
C11              0          0.2        0.6        NO         0
C9               0          0.2        0.6        NO         0

[CURVES]
;;Name          Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
GTMH             Rating     0          0
GTMH                        0.1        0.05424
GTMH                        0.2        0.0742
GTMH                        0.3        0.0908
GTMH                        0.4        0.1049
GTMH                        0.5        0.1173

P1               Rating     0          0
P1                          0.3        0.156

TotalSite        Rating     0          0
TotalSite                   0.3        0.438

Pond             Storage    0          250
Pond                        1          760
Pond                        1.5        1500

StorageReq_45    Storage    0          1200
StorageReq_45               0.3        1200
```

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```
StorageReq_60    Storage    0          1850
StorageReq_60               0.3        1850

StorageReq_75    Storage    0          2500
StorageReq_75               0.3        2500

Traplow          Storage    0          250
Traplow                     0.3        250

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Calgary_24h_100y design storm, rain interval = 5 minutes, rain units = mm/hr.
Calgary_24h_100y            0:00       0
Calgary_24h_100y            0:05       1.094
Calgary_24h_100y            0:10       1.103
Calgary_24h_100y            0:15       1.113
Calgary_24h_100y            0:20       1.122
Calgary_24h_100y            0:25       1.132
Calgary_24h_100y            0:30       1.143
Calgary_24h_100y            0:35       1.153
Calgary_24h_100y            0:40       1.163
Calgary_24h_100y            0:45       1.174
Calgary_24h_100y            0:50       1.185
Calgary_24h_100y            0:55       1.197
Calgary_24h_100y            1:00       1.208
Calgary_24h_100y            1:05       1.22
Calgary_24h_100y            1:10       1.232
Calgary_24h_100y            1:15       1.245
Calgary_24h_100y            1:20       1.257
Calgary_24h_100y            1:25       1.27
Calgary_24h_100y            1:30       1.284
Calgary_24h_100y            1:35       1.297
Calgary_24h_100y            1:40       1.311
Calgary_24h_100y            1:45       1.326
Calgary_24h_100y            1:50       1.341
Calgary_24h_100y            1:55       1.356
Calgary_24h_100y            2:00       1.372
Calgary_24h_100y            2:05       1.388
Calgary_24h_100y            2:10       1.404
Calgary_24h_100y            2:15       1.421
Calgary_24h_100y            2:20       1.439
Calgary_24h_100y            2:25       1.457
Calgary_24h_100y            2:30       1.476
Calgary_24h_100y            2:35       1.495
Calgary_24h_100y            2:40       1.515
Calgary_24h_100y            2:45       1.535
Calgary_24h_100y            2:50       1.556
Calgary_24h_100y            2:55       1.578
Calgary_24h_100y            3:00       1.601
Calgary_24h_100y            3:05       1.624
Calgary_24h_100y            3:10       1.648
Calgary_24h_100y            3:15       1.674
Calgary_24h_100y            3:20       1.7
Calgary_24h_100y            3:25       1.727
Calgary_24h_100y            3:30       1.755
Calgary_24h_100y            3:35       1.784
Calgary_24h_100y            3:40       1.815
Calgary_24h_100y            3:45       1.846
Calgary_24h_100y            3:50       1.88
Calgary_24h_100y            3:55       1.914
Calgary_24h_100y            4:00       1.95
Calgary_24h_100y            4:05       1.988
Calgary_24h_100y            4:10       2.028
Calgary_24h_100y            4:15       2.07
Calgary_24h_100y            4:20       2.113
Calgary_24h_100y            4:25       2.159
Calgary_24h_100y            4:30       2.208
Calgary_24h_100y            4:35       2.259
Calgary_24h_100y            4:40       2.313
Calgary_24h_100y            4:45       2.371
Calgary_24h_100y            4:50       2.432
Calgary_24h_100y            4:55       2.497
Calgary_24h_100y            5:00       2.566
Calgary_24h_100y            5:05       2.64
```

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Calgary_24h_100y	5:10	2.719
Calgary_24h_100y	5:15	2.805
Calgary_24h_100y	5:20	2.897
Calgary_24h_100y	5:25	2.997
Calgary_24h_100y	5:30	3.105
Calgary_24h_100y	5:35	3.224
Calgary_24h_100y	5:40	3.354
Calgary_24h_100y	5:45	3.497
Calgary_24h_100y	5:50	3.656
Calgary_24h_100y	5:55	3.833
Calgary_24h_100y	6:00	4.033
Calgary_24h_100y	6:05	4.259
Calgary_24h_100y	6:10	4.519
Calgary_24h_100y	6:15	4.821
Calgary_24h_100y	6:20	5.176
Calgary_24h_100y	6:25	5.601
Calgary_24h_100y	6:30	6.12
Calgary_24h_100y	6:35	6.773
Calgary_24h_100y	6:40	7.624
Calgary_24h_100y	6:45	8.785
Calgary_24h_100y	6:50	10.488
Calgary_24h_100y	6:55	13.283
Calgary_24h_100y	7:00	18.961
Calgary_24h_100y	7:05	40.516
Calgary_24h_100y	7:10	168.138
Calgary_24h_100y	7:15	54.372
Calgary_24h_100y	7:20	31.748
Calgary_24h_100y	7:25	23.236
Calgary_24h_100y	7:30	18.66
Calgary_24h_100y	7:35	15.763
Calgary_24h_100y	7:40	13.746
Calgary_24h_100y	7:45	12.251
Calgary_24h_100y	7:50	11.093
Calgary_24h_100y	7:55	10.166
Calgary_24h_100y	8:00	9.405
Calgary_24h_100y	8:05	8.768
Calgary_24h_100y	8:10	8.225
Calgary_24h_100y	8:15	7.756
Calgary_24h_100y	8:20	7.346
Calgary_24h_100y	8:25	6.985
Calgary_24h_100y	8:30	6.664
Calgary_24h_100y	8:35	6.376
Calgary_24h_100y	8:40	6.116
Calgary_24h_100y	8:45	5.88
Calgary_24h_100y	8:50	5.665
Calgary_24h_100y	8:55	5.468
Calgary_24h_100y	9:00	5.287
Calgary_24h_100y	9:05	5.119
Calgary_24h_100y	9:10	4.964
Calgary_24h_100y	9:15	4.819
Calgary_24h_100y	9:20	4.684
Calgary_24h_100y	9:25	4.558
Calgary_24h_100y	9:30	4.44
Calgary_24h_100y	9:35	4.329
Calgary_24h_100y	9:40	4.224
Calgary_24h_100y	9:45	4.125
Calgary_24h_100y	9:50	4.032
Calgary_24h_100y	9:55	3.943
Calgary_24h_100y	10:00	3.859
Calgary_24h_100y	10:05	3.78
Calgary_24h_100y	10:10	3.704
Calgary_24h_100y	10:15	3.631
Calgary_24h_100y	10:20	3.562
Calgary_24h_100y	10:25	3.496
Calgary_24h_100y	10:30	3.433
Calgary_24h_100y	10:35	3.373
Calgary_24h_100y	10:40	3.315
Calgary_24h_100y	10:45	3.259
Calgary_24h_100y	10:50	3.206
Calgary_24h_100y	10:55	3.154
Calgary_24h_100y	11:00	3.105
Calgary_24h_100y	11:05	3.057
Calgary_24h_100y	11:10	3.011
Calgary_24h_100y	11:15	2.967
Calgary_24h_100y	11:20	2.924
Calgary_24h_100y	11:25	2.883

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Calgary_24h_100y	11:30	2.843
Calgary_24h_100y	11:35	2.805
Calgary_24h_100y	11:40	2.767
Calgary_24h_100y	11:45	2.731
Calgary_24h_100y	11:50	2.696
Calgary_24h_100y	11:55	2.662
Calgary_24h_100y	12:00	2.629
Calgary_24h_100y	12:05	2.597
Calgary_24h_100y	12:10	2.566
Calgary_24h_100y	12:15	2.536
Calgary_24h_100y	12:20	2.506
Calgary_24h_100y	12:25	2.478
Calgary_24h_100y	12:30	2.45
Calgary_24h_100y	12:35	2.423
Calgary_24h_100y	12:40	2.396
Calgary_24h_100y	12:45	2.371
Calgary_24h_100y	12:50	2.346
Calgary_24h_100y	12:55	2.321
Calgary_24h_100y	13:00	2.297
Calgary_24h_100y	13:05	2.274
Calgary_24h_100y	13:10	2.252
Calgary_24h_100y	13:15	2.229
Calgary_24h_100y	13:20	2.208
Calgary_24h_100y	13:25	2.187
Calgary_24h_100y	13:30	2.166
Calgary_24h_100y	13:35	2.146
Calgary_24h_100y	13:40	2.126
Calgary_24h_100y	13:45	2.107
Calgary_24h_100y	13:50	2.088
Calgary_24h_100y	13:55	2.069
Calgary_24h_100y	14:00	2.051
Calgary_24h_100y	14:05	2.034
Calgary_24h_100y	14:10	2.016
Calgary_24h_100y	14:15	1.999
Calgary_24h_100y	14:20	1.983
Calgary_24h_100y	14:25	1.966
Calgary_24h_100y	14:30	1.95
Calgary_24h_100y	14:35	1.935
Calgary_24h_100y	14:40	1.919
Calgary_24h_100y	14:45	1.904
Calgary_24h_100y	14:50	1.889
Calgary_24h_100y	14:55	1.875
Calgary_24h_100y	15:00	1.86
Calgary_24h_100y	15:05	1.846
Calgary_24h_100y	15:10	1.833
Calgary_24h_100y	15:15	1.819
Calgary_24h_100y	15:20	1.806
Calgary_24h_100y	15:25	1.793
Calgary_24h_100y	15:30	1.78
Calgary_24h_100y	15:35	1.767
Calgary_24h_100y	15:40	1.755
Calgary_24h_100y	15:45	1.743
Calgary_24h_100y	15:50	1.731
Calgary_24h_100y	15:55	1.719
Calgary_24h_100y	16:00	1.707
Calgary_24h_100y	16:05	1.696
Calgary_24h_100y	16:10	1.685
Calgary_24h_100y	16:15	1.673
Calgary_24h_100y	16:20	1.663
Calgary_24h_100y	16:25	1.652
Calgary_24h_100y	16:30	1.641
Calgary_24h_100y	16:35	1.631
Calgary_24h_100y	16:40	1.621
Calgary_24h_100y	16:45	1.611
Calgary_24h_100y	16:50	1.601
Calgary_24h_100y	16:55	1.591
Calgary_24h_100y	17:00	1.581
Calgary_24h_100y	17:05	1.572
Calgary_24h_100y	17:10	1.562
Calgary_24h_100y	17:15	1.553
Calgary_24h_100y	17:20	1.544
Calgary_24h_100y	17:25	1.535
Calgary_24h_100y	17:30	1.526
Calgary_24h_100y	17:35	1.517
Calgary_24h_100y	17:40	1.509
Calgary_24h_100y	17:45	1.5

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Calgary_24h_100y	17:50	1.492
Calgary_24h_100y	17:55	1.484
Calgary_24h_100y	18:00	1.476
Calgary_24h_100y	18:05	1.467
Calgary_24h_100y	18:10	1.46
Calgary_24h_100y	18:15	1.452
Calgary_24h_100y	18:20	1.444
Calgary_24h_100y	18:25	1.436
Calgary_24h_100y	18:30	1.429
Calgary_24h_100y	18:35	1.421
Calgary_24h_100y	18:40	1.414
Calgary_24h_100y	18:45	1.407
Calgary_24h_100y	18:50	1.399
Calgary_24h_100y	18:55	1.392
Calgary_24h_100y	19:00	1.385
Calgary_24h_100y	19:05	1.378
Calgary_24h_100y	19:10	1.372
Calgary_24h_100y	19:15	1.365
Calgary_24h_100y	19:20	1.358
Calgary_24h_100y	19:25	1.352
Calgary_24h_100y	19:30	1.345
Calgary_24h_100y	19:35	1.339
Calgary_24h_100y	19:40	1.332
Calgary_24h_100y	19:45	1.326
Calgary_24h_100y	19:50	1.32
Calgary_24h_100y	19:55	1.313
Calgary_24h_100y	20:00	1.307
Calgary_24h_100y	20:05	1.301
Calgary_24h_100y	20:10	1.295
Calgary_24h_100y	20:15	1.289
Calgary_24h_100y	20:20	1.284
Calgary_24h_100y	20:25	1.278
Calgary_24h_100y	20:30	1.272
Calgary_24h_100y	20:35	1.266
Calgary_24h_100y	20:40	1.261
Calgary_24h_100y	20:45	1.255
Calgary_24h_100y	20:50	1.25
Calgary_24h_100y	20:55	1.244
Calgary_24h_100y	21:00	1.239
Calgary_24h_100y	21:05	1.234
Calgary_24h_100y	21:10	1.229
Calgary_24h_100y	21:15	1.223
Calgary_24h_100y	21:20	1.218
Calgary_24h_100y	21:25	1.213
Calgary_24h_100y	21:30	1.208
Calgary_24h_100y	21:35	1.203
Calgary_24h_100y	21:40	1.198
Calgary_24h_100y	21:45	1.193
Calgary_24h_100y	21:50	1.188
Calgary_24h_100y	21:55	1.184
Calgary_24h_100y	22:00	1.179
Calgary_24h_100y	22:05	1.174
Calgary_24h_100y	22:10	1.17
Calgary_24h_100y	22:15	1.165
Calgary_24h_100y	22:20	1.16
Calgary_24h_100y	22:25	1.156
Calgary_24h_100y	22:30	1.151
Calgary_24h_100y	22:35	1.147
Calgary_24h_100y	22:40	1.143
Calgary_24h_100y	22:45	1.138
Calgary_24h_100y	22:50	1.134
Calgary_24h_100y	22:55	1.13
Calgary_24h_100y	23:00	1.125
Calgary_24h_100y	23:05	1.121
Calgary_24h_100y	23:10	1.117
Calgary_24h_100y	23:15	1.113
Calgary_24h_100y	23:20	1.109
Calgary_24h_100y	23:25	1.105
Calgary_24h_100y	23:30	1.101
Calgary_24h_100y	23:35	1.097
Calgary_24h_100y	23:40	1.093
Calgary_24h_100y	23:45	1.089
Calgary_24h_100y	23:50	1.085
Calgary_24h_100y	23:55	1.081
Calgary_24h_100y	24:00	1.077

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```
[REPORT]
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -18379.5172455138 5665801.40364705 -18028.1462676987 5666310.90800737
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
J4               -18338.906       5666100.698
J5               -18327.635       5666262.007
J6               -18338.716       5666105.777
J7               -18269.372       5666109.021
J8               -18188.905       5666106.176
J9               -18089.135       5666107.192
STMH5            -18270           5666101.96
STMH6            -18238.035       5666101.186
STMH7            -18188.868       5666098.856
STMH8            -18088.672       5666100.63
OF1              -18363.546       5666087.329
OF2              -18350.224       5665824.563
P1               -18268.227       5666206.146
P2               -18191.972       5666204.372
P3               -18095.766       5666202.156
SU1              -18295.469       5665897.958

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
S1               -18310.292       5666273.608
S1               -18310.109       5666272.289
S1               -18311.875       5666272.298
S1               -18311.631       5666151.083
S1               -18311.621       5666146.438
S1               -18311.62        5666145.732
S1               -18310.628       5666145.743
S1               -18248.94        5666102.576
S1               -18248.205       5666099.698
S1               -18246.724       5666096.375
S1               -18244.705       5666093.349
S1               -18242.206       5666090.706
S1               -18239.297       5666088.522
S1               -18236.062       5666086.858
S1               -18246.588       5666090.293
S1               -18276.381       5666090.423
S1               -18334.711       5666090.676
S1               -18340.712       5666090.302
S1               -18340.442       5666167.825
S1               -18340.35        5666199.537
S1               -18329.219       5666273.107
S1               -18328.955       5666287.749
S1               -18263.225       5666287.453
S1               -18310.292       5666273.608
S2               -18229.954       5666272.582
S2               -18228.615       5666146.248
S2               -18228.446       5666128.264
S2               -18228.834       5666128.279
S2               -18232.133       5666127.85
S2               -18232.441       5666127.81
S2               -18235.918       5666126.74
S2               -18239.165       5666125.099
S2               -18242.089       5666122.936
S2               -18244.607       5666120.312
S2               -18246.648       5666117.3
S2               -18248.153       5666113.989
```

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S2	-18249.079	5666110.471
S2	-18249.399	5666106.848
S2	-18249.105	5666103.222
S2	-18248.94	5666102.576
S2	-18310.628	5666145.743
S2	-18311.62	5666145.732
S2	-18311.875	5666272.298
S2	-18310.109	5666272.289
S2	-18310.292	5666273.608
S2	-18263.225	5666287.453
S2	-18228.69	5666287.298
S2	-18229.954	5666272.582
S3	-18145.164	5666107.814
S3	-18145.287	5666106.908
S3	-18172.36	5666107.005
S3	-18189.717	5666107.081
S3	-18193.21	5666107.358
S3	-18196.625	5666108.152
S3	-18199.883	5666109.444
S3	-18202.912	5666111.206
S3	-18205.647	5666113.398
S3	-18208.062	5666116.022
S3	-18210.107	5666118.942
S3	-18212.41	5666121.758
S3	-18215.154	5666124.146
S3	-18218.26	5666126.039
S3	-18221.641	5666127.381
S3	-18224.397	5666127.965
S3	-18225.2	5666128.135
S3	-18228.446	5666128.264
S3	-18228.615	5666146.248
S3	-18229.954	5666272.582
S3	-18228.69	5666287.298
S3	-18164.784	5666287.011
S3	-18165.764	5666272.581
S3	-18165.737	5666146.236
S3	-18161.792	5666113.83
S3	-18150.75	5666113.816
S3	-18149.84	5666113.727
S3	-18148.957	5666113.493
S3	-18148.121	5666113.12
S3	-18147.357	5666112.619
S3	-18146.682	5666112.002
S3	-18146.115	5666111.285
S3	-18145.67	5666110.486
S3	-18145.358	5666109.627
S3	-18145.188	5666108.728
S3	-18145.164	5666107.814
S4	-18049.745	5666106.521
S4	-18050.786	5666106.413
S4	-18051.83	5666106.481
S4	-18063.866	5666106.533
S4	-18072.726	5666106.572
S4	-18122.106	5666106.787
S4	-18136.779	5666106.878
S4	-18137.862	5666106.882
S4	-18145.287	5666106.908
S4	-18145.164	5666107.814
S4	-18145.188	5666108.728
S4	-18145.358	5666109.627
S4	-18145.67	5666110.486
S4	-18146.115	5666111.285
S4	-18146.682	5666112.002
S4	-18147.357	5666112.619
S4	-18148.121	5666113.12
S4	-18148.956	5666113.493
S4	-18149.84	5666113.727
S4	-18150.75	5666113.816
S4	-18161.792	5666113.83
S4	-18165.737	5666146.236
S4	-18165.764	5666272.581
S4	-18164.784	5666287.011
S4	-18044.118	5666286.468
S4	-18044.679	5666120.055
S4	-18044.705	5666112.421
S4	-18044.826	5666111.382

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```
S4               -18045.12        5666110.377
S4               -18045.578       5666109.437
S4               -18046.188       5666108.586
S4               -18046.933       5666107.851
S4               -18047.791       5666107.251
S4               -18048.737       5666106.803
S4               -18049.745       5666106.521
S5               -18347.894       5666987.663
S5               -18056.644       5665995.818
S5               -18050.819       5665853.688
S5               -18322.264       5665864.173
S5               -18332.749       5665863.008
S5               -18340.904       5665860.678
S5               -18347.894       5665987.663

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

OUTPUT

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
  --------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 5
  Number of nodes ........... 16
  Number of links ........... 14
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                  Data       Recording
  Name                 Data Source                Type       Interval
  ---------------------------------------------------------------------
  Calgary_24h_100y     Calgary_24h_100y           INTENSITY    5 min.


  ********************
  Subcatchment Summary
  ********************
  Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
  ------------------------------------------------------------------------------------------------
  S1                          0.88    170.00      5.00    7.8000 Calgary_24h_100y     J5
  S2                          1.30    170.00     50.00    7.8000 Calgary_24h_100y     P1
  S3                          1.14    170.00     50.00    7.8000 Calgary_24h_100y     P2
  S4                          2.08    170.00     50.00    7.8000 Calgary_24h_100y     P3
  S5                          4.52    300.00     75.00    7.8000 Calgary_24h_100y     SU1


  ************
  Node Summary
  ************
                                        Invert      Max.    Ponded    External
  Name                 Type               Elev.     Depth      Area    Inflow
  ------------------------------------------------------------------------------
  J4                   JUNCTION         1171.15      1.89       0.0
  J5                   JUNCTION         1178.40      0.50       0.0
  J6                   JUNCTION         1173.45      0.50       0.0
  J7                   JUNCTION         1177.43      1.50       0.0
  J8                   JUNCTION         1191.74      1.50       0.0
  J9                   JUNCTION         1193.59      1.50       0.0
  STMH5                JUNCTION         1172.65      8.41       0.0
  STMH6                JUNCTION         1185.23      6.12       0.0
  STMH7                JUNCTION         1191.52      1.99       0.0
  STMH8                JUNCTION         1193.49      3.01       0.0
  OF1                  OUTFALL          1170.26      0.60       0.0
  OF2                  OUTFALL             0.00      0.00       0.0
  P1                   STORAGE          1185.00      0.30       0.0
```

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P2	STORAGE	1193.00	0.30	0.0
P3	STORAGE	1195.00	0.30	0.0
SU1	STORAGE	1.00	0.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J5	J6	CONDUIT	156.6	3.1621	0.0300
C10	J8	STMH7	CONDUIT	20.0	0.2500	0.0110
C11	J9	STMH8	CONDUIT	20.0	0.2500	0.0110
C12	STMH6	STMH5	CONDUIT	63.8	9.5028	0.0110
C5	STMH8	STMH7	CONDUIT	74.8	2.4312	0.0110
C6	STMH7	STMH6	CONDUIT	81.2	4.0744	0.0110
C7	STMH5	J4	CONDUIT	45.0	3.2928	0.0110
C8	J4	OF1	CONDUIT	30.9	2.8713	0.0110
C9	J7	STMH5	CONDUIT	20.0	0.2500	0.0110
C3	P2	J8	ORIFICE			
C4	P3	J9	ORIFICE			
C2	P1	J7	OUTLET			
OL1	J6	J4	OUTLET			
OL2	SU1	OF2	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRIANGULAR	0.50	1.50	0.25	6.00	1	3.50
C10	CIRCULAR	0.38	0.11	0.09	0.38	1	0.10
C11	CIRCULAR	0.38	0.11	0.09	0.38	1	0.10
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	2.24
C5	CIRCULAR	0.38	0.11	0.09	0.38	1	0.32
C6	CIRCULAR	0.53	0.22	0.13	0.53	1	1.03
C7	CIRCULAR	0.60	0.28	0.15	0.60	1	1.32
C8	CIRCULAR	0.60	0.28	0.15	0.60	1	1.23
C9	CIRCULAR	0.38	0.11	0.09	0.38	1	0.10

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 03/05/2020 00:00:00
Ending Date 03/06/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001524 m

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```
**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.889        89.577
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.404        40.724
Surface Runoff ...........         0.481        48.489
Final Storage ............         0.008         0.848
Continuity Error (%) .....        -0.540

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.481         4.808
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.443         4.425
Flooding Loss ............         0.037         0.366
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.002         0.017
Continuity Error (%) .....        -0.025


************************
Highest Continuity Errors
************************
Node J6 (1.14%)


**************************
Time-Step Critical Elements
**************************
Link C9 (1.55%)
Link C8 (1.14%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.18 sec
Average Time Step           :     4.98 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


**************************
Subcatchment Runoff Summary
**************************

  ---------------------------------------------------------------------------------------------------------------
-----------------
                          Total      Total      Total      Total     Imperv       Perv      Total       Total
Peak  Runoff
                         Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff      Runoff
Runoff   Coeff
  Subcatchment             mm         mm         mm         mm         mm         mm         mm    10^6 ltr
CMS
  ---------------------------------------------------------------------------------------------------------------
-----------------
  S1                     89.58       0.00       0.00      67.20       4.40      22.84      22.84        0.20
0.12   0.255
```


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```
  S2                       89.58       0.00       0.00      44.95      44.19      24.46      44.35       0.58
0.30   0.495
  S3                       89.58       0.00       0.00      44.91      44.18      24.52      44.40       0.51
0.28   0.496
  S4                       89.58       0.00       0.00      45.14      44.23      24.21      44.11       0.92
0.41   0.492
  S5                       89.58       0.00       0.00      31.26      66.41      27.83      57.72       2.61
1.13   0.644
```

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J4	JUNCTION	0.04	0.24	1171.39	0 07:27	0.24
J5	JUNCTION	0.01	0.14	1178.54	0 07:16	0.14
J6	JUNCTION	0.01	0.25	1173.70	0 07:28	0.25
J7	JUNCTION	0.05	0.47	1177.90	0 07:17	0.46
J8	JUNCTION	0.04	0.26	1191.99	0 07:16	0.25
J9	JUNCTION	0.06	0.32	1193.91	0 07:15	0.32
STMH5	JUNCTION	0.04	0.21	1172.85	0 07:18	0.21
STMH6	JUNCTION	0.02	0.11	1185.34	0 07:17	0.11
STMH7	JUNCTION	0.03	0.15	1191.66	0 07:17	0.15
STMH8	JUNCTION	0.03	0.14	1193.64	0 07:15	0.14
OF1	OUTFALL	0.04	0.24	1170.50	0 07:27	0.24
OF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
P1	STORAGE	0.01	0.30	1185.30	0 07:17	0.30
P2	STORAGE	0.04	0.30	1193.30	0 07:16	0.30
P3	STORAGE	0.04	0.30	1195.30	0 07:14	0.30
SU1	STORAGE	0.02	0.30	1.30	0 07:30	0.30

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J4	JUNCTION	0.000	0.414	0 07:27	0	1.83	0.031
J5	JUNCTION	0.117	0.117	0 07:20	0.201	0.201	-1.130
J6	JUNCTION	0.000	0.119	0 07:17	0	0.203	1.153
J7	JUNCTION	0.000	0.156	0 07:18	0	0.542	-0.007
J8	JUNCTION	0.000	0.073	0 07:16	0	0.404	0.014
J9	JUNCTION	0.000	0.102	0 07:14	0	0.68	0.013
STMH5	JUNCTION	0.000	0.331	0 07:18	0	1.63	-0.016
STMH6	JUNCTION	0.000	0.175	0 07:17	0	1.08	0.009
STMH7	JUNCTION	0.000	0.175	0 07:16	0	1.08	0.016
STMH8	JUNCTION	0.000	0.102	0 07:15	0	0.68	0.020
OF1	OUTFALL	0.000	0.414	0 07:27	0	1.83	0.000
OF2	OUTFALL	0.000	0.438	0 07:30	0	2.6	0.000
P1	STORAGE	0.301	0.301	0 07:15	0.576	0.576	-0.064
P2	STORAGE	0.276	0.276	0 07:15	0.506	0.506	-0.121
P3	STORAGE	0.406	0.406	0 07:15	0.917	0.917	-0.020
SU1	STORAGE	1.134	1.134	0 07:15	2.61	2.61	0.001

Node Surcharge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J7	JUNCTION	0.32	0.095	1.030

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****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
P1	0.15	0.123	0 07:17	0.034	0.000
P2	0.32	0.195	0 07:16	0.099	0.000
P3	0.50	0.304	0 07:15	0.233	0.000
SU1	0.01	0.006	0 07:30	0.000	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
P1	0.003	4	0	0	0.075	100	0 07:17	0.156
P2	0.009	12	0	0	0.075	100	0 07:16	0.073
P3	0.011	14	0	0	0.075	100	0 07:14	0.102
SU1	0.053	7	0	0	0.750	100	0 07:30	0.438

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	98.84	0.023	0.414	1.826
OF2	99.00	0.032	0.438	2.599
System	98.92	0.054	0.438	4.425

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.119	0 07:17	1.26	0.03	0.38
C10	CONDUIT	0.074	0 07:16	1.06	0.71	0.60
C11	CONDUIT	0.102	0 07:15	1.17	0.98	0.74
C12	CONDUIT	0.175	0 07:17	4.71	0.08	0.19
C5	CONDUIT	0.102	0 07:15	2.59	0.32	0.39
C6	CONDUIT	0.175	0 07:17	3.54	0.17	0.28
C7	CONDUIT	0.331	0 07:18	3.74	0.25	0.35
C8	CONDUIT	0.414	0 07:27	3.92	0.34	0.40
C9	CONDUIT	0.156	0 07:18	1.51	1.51	0.89
C3	ORIFICE	0.073	0 07:16			0.99
C4	ORIFICE	0.102	0 07:14			0.72
C2	DUMMY	0.156	0 07:18			
OL1	DUMMY	0.083	0 07:28			
OL2	DUMMY	0.438	0 07:30			

****
Flow Classification Summary

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****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.30	0.00	0.00	0.59	0.11	0.00	0.00	0.02	0.00
C10	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C11	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C12	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C7	1.00	0.01	0.00	0.00	0.00	0.03	0.00	0.96	0.02	0.00
C8	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.61	0.00
C9	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C9	0.01	0.32	0.01	0.41	0.01

Analysis begun on: Wed Mar 25 22:29:32 2020
Analysis ended on: Wed Mar 25 22:29:32 2020
Total elapsed time: < 1 sec

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