UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

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File: 23172

FUNCTIONAL SERVICING REPORT

4257 MONTROSE ROAD

March 2024

INTRODUCTION

This report is to address the servicing needs and requirements for the 10 townhouse units, located at 4257 Montrose Road, in the City of Niagara Falls. Historically, the property has been occupied by a residential building with gravel driveway, and currently it is a vacant land.

The development site is approximately 0.48 hectares and shall consist of 10 townhouse units. The site shall include associated asphalt parking lot, concrete curbs, catch basins, storm sewers, sanitary service, and water service.

The objectives of this study are as follows:

i. Identify domestic and fire protection water service needs for the site;
2. Identify sanitary servicing needs for the site; and,
3. Identify stormwater management needs for the site.

WATER SERVICING

There is an existing Municipal 150mm diameter watermain connected to an existing 300mm diameter watermain located on the east side of Montrose Road. It is proposed to connect to the 300mm diameter municipal watermain with a 150mm diameter water service to provide domestic water supply.

There is an existing fire hydrant located across Montrose Road at the north east corner of the proposed development. In addition to the existing fire hydrant, it is proposed to install a fire private hydrant within the site to provide adequate full fire protection. As per Fire Underwriters Survey, Table 8, the suggested required fire flow is 6,000 L/m for Row Housing with exposure distances between 10.1 to 30 meters.

Therefore, it is expected that the 300mm diameter municipal watermain fronting the proposed development will provide sufficient water supply and fire protection to the site.

SANITARY SERVICING

There is an existing 250mm diameter sanitary sewer on Montrose Road conveying flows northerly. It is proposed to connect a 150mm diameter sanitary service from the proposed development to the existing sanitary sewer on Montrose Road.

The 0.48 hectares proposed development was included in the sanitary drainage area plan for the sanitary sewer design of the 250mm diameter sanitary sewer on Montrose Road, as shown in the Sanitary Drainage Area Plan 86-CB-30, attached in Appendix A.

The existing 250mm diameter sanitary sewer on Montrose Road has a full flow capacity of approximately 39.24L/s. The proposed 10 townhouse unit development, shall service a population of approximately 18 persons and will generate a peak sanitary flow of 0.35L/s. This usage will occupy 0.9% of the existing 250mm diameter sanitary sewer on Montrose Road. Sanitary sewer calculations can be found in Appendix A.

Therefore, it is expected that this will be an acceptable addition to the current capacity of the existing 250mm diameter sanitary sewer on Montrose Road.

STORMWATER MANAGEMENT

As part of the site development, the following is a summary of the stormwater management plan. The criteria provided by the City of Niagara Falls for this development includes the requirement to control stormwater flows from this site to allowable levels up to and including the 5 year design storm event, and provide stormwater quality controls to MECP Normal Protection (70% TSS removal) levels before discharging from the site.

There is an existing 900mm diameter stormwater sewer along the N.S. & T. Right-of-Way. As shown in Figure 1, attached in Appendix B. The drainage area being collected by the site is 0.48 hectares with an imperviousness of 5%. Under the existing conditions, the stormwater flow generated from the site is conveyed to the N.S. & T. Right-of-Way and collected via catch basin, and directed to the existing 900mm diameter stormwater sewer flowing west, which ultimately outlets to Shiner's Creek.

Figure 2, attached in Appendix B, shows the proposed drainage area with a proposed imperviousness of 60%. It is proposed to connect a 300mm diameter stormwater sewer to the existing 900mm diameter stormwater sewer along the N.S. & T. Right-of-Way.

A stormwater analysis has been conducted using MIDUSS computer modelling program to determine the peak flows and storage volume required for the 5 year storm event as shown in the

Appendix B. From the analysis, Table 1 shows the comparison of the existing, proposed and allowable stormwater peak flows permitted to discharge to the N.S. & T. Right-of-Way.

Table 1. Comparison of Stormwater Flows

Design Storm (Return Period)	Peak Flows (L/s)			Depth (m)	Storage (m^3)
	Allowable	Proposed without SWM	Proposed with SWM		
5 Year	27	75	27	1.07	52.0

As shown in Table 1, the allowable outflow to the existing 900mm diameter storm sewer on N.S. & T. Right-of-Way is 27L/s. The required stormwater storage to control to the proposed outflow of 27L/s is 49.0m^3. The proposed stormwater quantity control structure includes a minimum sized orifice of 110mm. The stormwater storage is provided in underground super pipes, where 55m of 975mm diameter storm sewer, 3-1800mm diameter CBMH's and a CB and lead are providing 52.0m^3 of storage. As shown in the Underground Superpipe Stage-Storage-Discharge Curve attached in Appendix B. The major flows from the site roads and driveways will be directed via overland sheet flow to Montrose Road.

As shown in Table 1, the allowable outflow to the existing 900mm diameter storm sewer on N.S. & T. Right-of-Way is 27 L/s. The required stormwater storage to control the proposed outflow of 27 L/s is 49.0 m^3. The proposed stormwater quantity control structure includes a minimum-sized orifice of 110 mm. The stormwater storage is provided in underground super pipes, where 55 m of 975 mm diameter storm sewer, 3-1800 mm diameter CBMHs, and a CB and lead are providing 52.0 m^3 of storage. This information is illustrated in the Underground Superpipe Stage-Storage-Discharge Curve attached in Appendix B. The major flows from the site roads and driveways will be directed via overland sheet flow to Montrose Road.

To improve stormwater quality, an oil/grit MH system will be used to provide Normal Quality Protection (70% TSS Removal) for this development. It is proposed to provide an oil/grit separator to provide the required stormwater quality controls prior to discharging to the existing 900mm diameter storm sewer.

It is proposed to install HydroStorm HS4 oil/grit separator to provide Normal stormwater quality protection. The site area is 0.48 hectares and has an imperviousness of 60%. The analysis of a HydroStorm oil/grit separator has shown that 100% of the stormwater flows are captured, and provides a TSS removal of 85%, which exceeds the 70% TSS required for normal stormwater quality protection. An approved oil/grit separator may replace the designed HydroStorm HS4. Design calculations and output files have been enclosed within Appendix B.

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CONCLUSIONS AND RECOMMENDATIONS

Therefore, based on the above comments and design calculations provided for this site, the following summarizes the servicing for this site.

1. The existing municipal 300mm diameter watermain on Montrose Street will have sufficient capacity to provide water supply.

2. The existing municipal fire hydrant on Montrose Street and the private fire hydrant will have sufficient capacity to provide fire protection.

3. The existing 250mm diameter sanitary sewer on Montrose Road will have adequate capacity for the proposed residential development.

4. Storm quantity controls are being provided on site to the allowable capacity of the existing East Main Street and Wallace Avenue storm sewer.

5. Stormwater quality controls will be provided to MECP Normal Protection (70% TSS removal) levels prior to discharge from the site.

In conclusion, there exists adequate municipal infrastructure to service the proposed development. We trust the above comments and enclosed calculations are satisfactory for approval. If you have any questions or require additional information, please do not hesitate to contact our office.

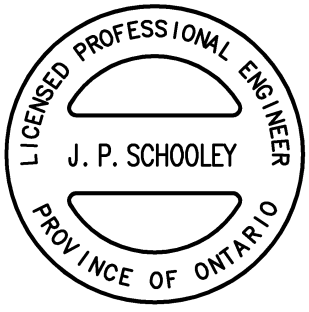
Yours very truly,

Prepared By:

Roberto A. Duarte, B. Eng.

Reviewed by:

Jason Schooley, P.Eng.



Encl.

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APPENDICES

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APPENDIX A

Sanitary Drainage Area Plan 86-CB-30 City of Niagara Falls
Sanitary Sewer Design Sheet

QUEEN ELIZABETH WAY

KENT AVENUE

INDUSTRIAL STREET

GALLINGER STREET

MONTROSE ROAD

ROBIN AVE.

BLOCK 204

KEVIN DR.

DONLEE DR.

CHOROZY ST.

ORIOLE DR.

SWAN ST.

STONE ROAD

COLLARD AVE.

THOROLD ROAD

PAMELA DR.

ALPINE DR.

FIELD STONE AVENUE

PRESTON AVE.

ROAD 57

NO.	REVISION	DATE	INIT.
3	ADDED MONTROSE RD. SEWER BTWN. 0100 TO 0120	FEB 5, 96	BES.
2	ADDED GALLINGER ST. & MONTROSE SAN. TO MH 0110	DEC. 22, 94	N.H.
1	ADD'D MH'S TO PAMELA & ALPINE DR.'s	AUG 10, 87	BES

NOTES

A 0.989 DENOTES AREA, and HECTARES

100-250 ø DENOTES PROPOSED MHs, SEWER LENGTH, SIZE & DIRECTION.

LEGEND

		UNDERGROUND UTILITIES	
OLS	LIGHT STANDARD	H	HYDRO CABLES
OTL	TRAFFIC LIGHT	W	WATERMAINS
OS	SIGN	G	GASMAINS
OB	BELL POLE	B	BELL CABLES
OHY	HYDRO POLE		CAP OR PLUG
OHYD	HYDRANT	300 SAN.	SANITARY SEWER
	GUY AND ANCHOR	300 STM.	STORM SEWER
	MANHOLE EXISTING	300 COMB.	COMBINED SEWER
	MANHOLE PROPOSED		
	CATCHBASIN EXISTING		
	CATCHBASIN PROPOSED		
OSIB	STAINDARD IRON BAR		

DRAFTING R. Craddock

DESIGN R. Craddock

CHECKED BY

PROJ. SUPVR.

REGISTERED PROFESSIONAL ENGINEER — CIVIL — N. A. WOODGATE

N. A. WOODGATE P. ENG.
DESIGN & CONST. ENG.

The City of Niagara Falls

WESTWAY ESTATES SUBDIVISION
WESTMEADOW SUBDIVISION PHASE 1

SANITARY DRAINAGE AREA

BENCH MARK DATUM

FIELD NOTES

DATE JANUARY 30, 1986

SCALE 1:2000

DWG. No.

MUN. REF. No. 86-CB-30

REV. 3

UPPER CANADA CONSULTANTS
3-30 HANNOVER DRIVE
ST.CATHARINES, ONTARIO
L2W 1A3

DATE: FEBRUARY 2024

DESIGN FLOWS

RESIDENTIAL:	255	LITRES/PERSON/DAY (AVERAGE DAILY FLOW)
INFILTRATION RATE:	0.286	L / s / ha (M.O.E FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28 L / s / ha)
POPULATION DENSITY:	1.81	PERSONS /TOWNHOUSE UNIT
	2.59	PERSONS / SINGLE UNIT

SEWER DESIGN

PIPE ROUGHNESS:	0.013	FOR MANNING'S EQUATION
PIPE SIZES:	1.016	IMPERIAL EQUIVALENT FACTOR
PERCENT FULL:		TOTAL PEAK FLOW / CAPACITY

MUNICIPALITY: CITY OF NIAGARA FALLS
PROJECT : 4257 MONTROSE ROAD
PROJECT NO: 23172

SANITARY SEWER DESIGN SHEET

Peaking Factor= $M = 1 + \frac{14}{4 + P^{0.5}}$ Where P = design population in thousands

LOCATION			AREA		POPULATION			ACCUMULATED PEAK FLOW				DESIGN FLOW					
Location and Description	From M.H	To M.H.	Increment (hectares)	Accumulated (hectares)	Number of Units	Population Increment	Total Population Served	Peaking Factor	Flow (L/s)	Infiltration Flow L/s	Total Peak Flow (L/s)	Pipe Diameter (mm)	Pipe Length (m)	Pipe Slope (%)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Percent Full
PROP DEVELOPMENT	MH	MH 110	0.48	0.48	10	18	18	4.00	0.21	0.14	0.35	150	12.4	1.00	0.87	15.89	2.2%
MONTROSE ROAD	MH 110	MH 100									0.35	250	110.0	0.40	0.77	39.24	0.9%

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APPENDIX B

Existing Drainage Area Plan (Figure 1)
Proposed Drainage Area Plan (Figure 2)
Underground Superpipe Stage-Storage Curve
MIDUSS Output Files
Hydroworks Output File

LEGEND

- A0 / 0.00 / 0.00 — DRAINAGE AREA NUMBER / DRAINAGE AREA IN HECTARES / PERCENT IMPERVIOUS
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW ROUTE

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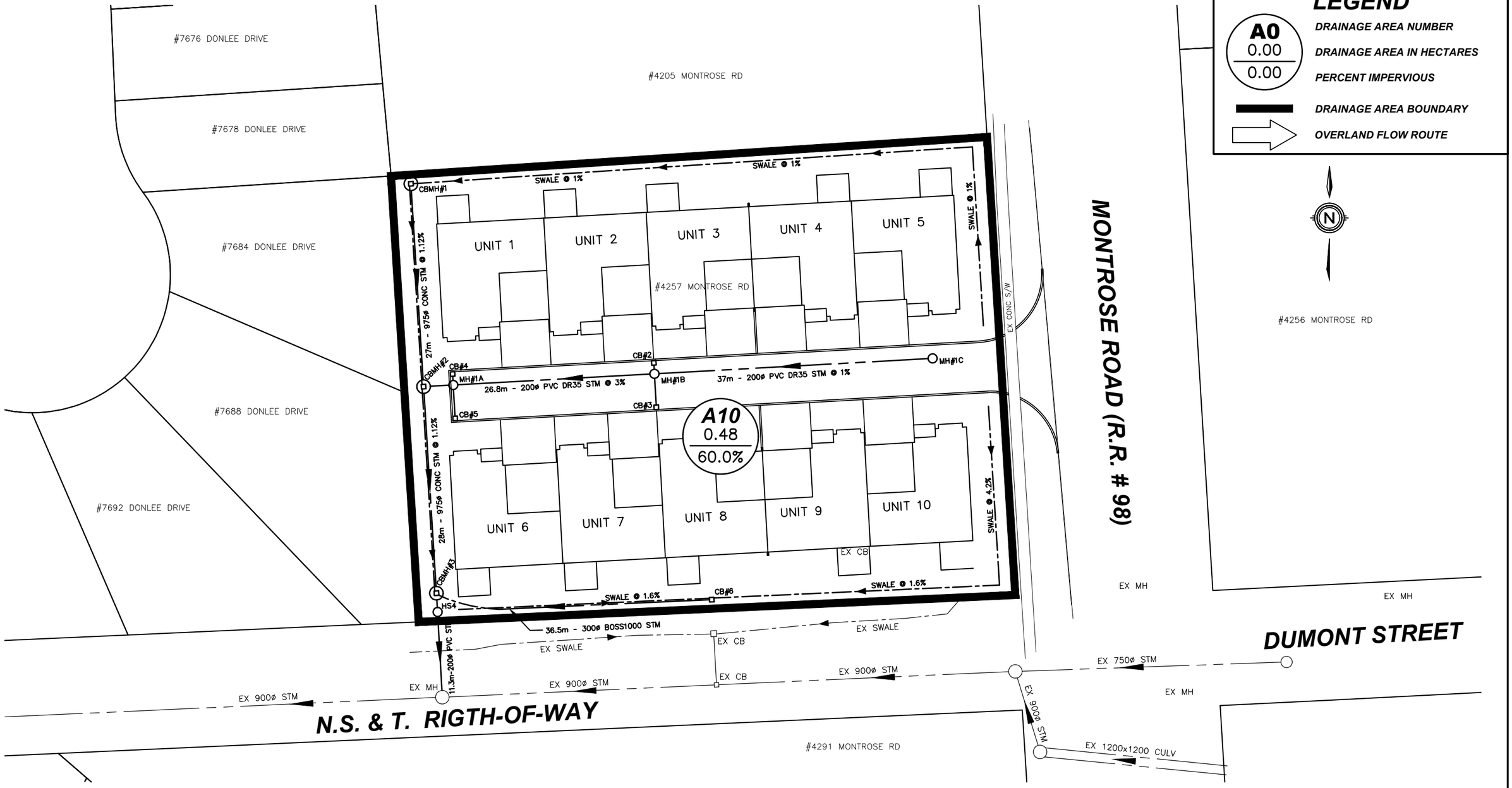
4257 MONTROSE ROAD (R.R. #98)
CITY OF NIAGARA FALLS

EXISTING STORM DRAINAGE AREA

DATE	2024–02–28
SCALE	1:400 m
REF No.	.
DWG No.	FIGURE 1

DRAWING FILE: F:\23172\SWM\23172_FIGURES.dwg PLOTTED: Mar 04, 2024 – 10:56am PLOTTED BY: roberto



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4257 MONTROSE ROAD (R.R. #98)
CITY OF NIAGARA FALLS

PROPOSED STORM DRAINAGE AREA

DATE	2024-02-28
SCALE	1:400 m
REF No.	.
DWG No.	FIGURE 2

DRAWING FILE: F:\23172\SWM\23172_FIGURES.dwg PLOTTED: Mar 04, 2024 - 10:55am PLOTTED BY: roberto

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Existing Conditions

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Output File (4.7) EX.OUT       opened 2024-02-29  12:04
          Units used are defined by G =    9.810
              36    60     5.000        are MAXDT MAXHYD & DTMIN values
          Licensee: UPPER CANADA CONSULTANTS
   35     COMMENT
         3     line(s) of comment
          4257 MONTROSE ROAD NIAGARA FALLS
          STORMWATER MANAGEMENT PLAN
          EXISTING CONDITIONS
   35     COMMENT
         1     line(s) of comment
          ********** 5 YEAR DESIGN STORM **********
    2     STORM
              1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
         719.500     Coefficient  a
           6.340     Constant  b    (min)
            .769     Exponent  c
            .400     Fraction to peak  r
         180.000     Duration ó  180 min
                    38.751 mm     Total depth
    3     IMPERVIOUS
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
            .015     Manning "n"
          98.000     SCS Curve No or C
            .100     Ia/S Coefficient
            .518     Initial Abstraction
    4     CATCHMENT
           1.000     ID No.ó 99999
            .480     Area in hectares
           5.000     Length (PERV) metres
           2.000     Gradient (%)
           5.000     Per cent Impervious
           5.000     Length (IMPERV)
            .000     %Imp. with Zero Dpth
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
            .240     Manning "n"
          80.000     SCS Curve No or C
            .100     Ia/S Coefficient
           6.350     Initial Abstraction
              1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
                 .027       .000       .000       .000 c.m/s
                 .280       .825       .307     C perv/imperv/total
   15     ADD RUNOFF
                 .027       .027       .000       .000 c.m/s
   14     START
         1     1=Zero; 2=Define
```

UPPER CANADA CONSULTANTS
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Future Conditions

```
Output File (4.7) SWM.OUT      opened 2024-03-01  16:26
          Units used are defined by G =    9.810
              36    60     5.000        are MAXDT MAXHYD & DTMIN values
          Licensee: UPPER CANADA CONSULTANTS
   35     COMMENT
         3     line(s) of comment
          4257 MONTROSE ROAD NIAGARA FALLS
          STORMWATER MANAGEMENT PLAN
          FUTURE CONDITIONS
   35     COMMENT
         1     line(s) of comment
          ********** 5 YEAR DESIGN STORM **********
    2     STORM
              1     1=Chicago;2=Huff;3=User;4=Cdn1hr;5=Historic
         719.500     Coefficient  a
          6.340     Constant  b    (min)
            .769     Exponent  c
            .400     Fraction to peak  r
         180.000     Duration ó  180 min
                    38.751 mm     Total depth
    3     IMPERVIOUS
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
            .015     Manning "n"
          98.000     SCS Curve No or C
            .100     Ia/S Coefficient
            .518     Initial Abstraction
    4     CATCHMENT
         10.000     ID No.ó 99999
            .480     Area in hectares
         10.000     Length (PERV) metres
          1.000     Gradient (%)
         60.000     Per cent Impervious
         10.000     Length (IMPERV)
            .000     %Imp. with Zero Dpth
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt; 4=Repeat
            .230     Manning "n"
         87.000     SCS Curve No or C
            .100     Ia/S Coefficient
          3.795     Initial Abstraction
              1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD; 4=Lin. Reserv
                 .075       .000       .000       .000 c.m/s
                 .430       .853       .684     C perv/imperv/total
   15     ADD RUNOFF
                 .075       .075       .000       .000 c.m/s
   10     POND
         7 Depth - Discharge - Volume sets
          188.630        .000          .0
          188.860      .00210         1.5
          189.060       .0115        11.9
          189.260       .0161        24.0
          189.460       .0197        36.6
          189.660       .0227        48.2
          189.860       .0253        55.4
          Peak Outflow    =      .023 c.m/s
          Maximum Depth   =   189.679 metres
          Maximum Storage =       49. c.m
                 .075       .075       .023       .000 c.m/s
   14     START
         1     1=Zero; 2=Define
```

Underground Superpipe Stage Storage Discharge Calculations

Project Name: 4257 MONTROSE ROAD, NIAGARA FALLS
Project No.: 23172
Date: FEBRUARY 2024

		CBMH 3 TO CBMH 2		CBMH 2 TO CBMH 1		CBMH 1	CBMH 3 TO CB 6		TOTAL STORAGE VOLUME	Orifice	Total Outflow
Controlling Rim Elev:	**189.86**	Pipe	CBMH 3	Pipe	CBMH 2	CBMH 1	Pipe	CB 6		Dia (m) = 0.11	
Invert:		188.80	188.63	188.87	188.85	188.92	188.80	188.91		Cd = 0.60	
Pipe Diameter:		0.975		0.975			0.300				
Structure/Pipe Length:		28	1800	27	1800	1800	36.5	600		Invert (m) = 188.78	
											DISCHARGE
Elevation (m)		(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	Total (m^3)	Orifice (m^3/s)	(L/s)
189.86		20.91	3.13	20.16	2.57	2.39	2.58	0.34	52.1	0.0272	27.2
189.85	**5Y**	**20.91**	**3.10**	**20.16**	**2.54**	**2.37**	**2.58**	**0.34**	**52.0**	**0.0270**	**27.0**
189.76		20.84	2.88	19.30	2.32	2.14	2.58	0.31	50.4	0.0258	25.8
189.66		19.52	2.62	17.50	2.06	1.88	2.58	0.27	46.4	0.0243	24.3
189.56		17.48	2.37	15.25	1.81	1.63	2.58	0.23	41.4	0.0228	22.8
189.46		15.06	2.11	12.76	1.55	1.37	2.58	0.20	35.6	0.0211	21.1
189.36		12.42	1.86	10.15	1.30	1.12	2.58	0.16	29.6	0.0193	19.3
189.26		9.70	1.60	7.53	1.04	0.87	2.58	0.13	23.4	0.0172	17.2
189.16		7.01	1.35	5.03	0.79	0.61	2.58	0.09	17.5	0.0150	15.0
189.06		4.48	1.09	2.77	0.53	0.36	2.38	0.05	11.7	0.0123	12.3
188.96		2.24	0.84	0.93	0.28	0.10	1.40	0.02	5.8	0.0087	8.7
188.86		0.53	0.59	-	0.03	-	0.37	-	1.5	0.0017	1.7
188.76		-	0.33	-	-	-	-	-	0.3	-	-
188.63		-	-	-	-	-	-	-	0.0	-	-

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Hydroworks

```
*************************************************
*      Storm Water Management Sizing Model      *
*               Hydroworks, LLC                 *
*                Version 4.4                    *
*                                               *
*        Continuous Simulation Program          *
*              Based on SWMM 4.4H               *
*              Hydroworks, LLC                  *
*               Graham Bryant                   *
*                2003 - 2021                    *
*************************************************
                  Developed by
*************************************************
*               Hydroworks, LLC                 *
*             Metcalf & Eddy, Inc.              *
*            University of Florida              *
*       Water Resources Engineers, Inc.         *
*      (Now Camp Dresser & McKee, Inc.)         *
*              Modified SWMM 4.4                *
*************************************************
         Distributed and Maintained by
*************************************************
*                                               *
*                Hydroworks, LLC                *
*                 888-290-7900                  *
*              www.hydroworks.com               *
*                                               *
*************************************************

*************************************************
*     If any problems occur executing this      *
*     model, contact Mr. Graham Bryant at       *
*     Hydroworks, LLC by phone at 888-290-7900  *
*     or by e-mail: support@hydroworks.com      *
*************************************************

*************************************************
*     This model is based on EPA SWMM 4.4       *
*  "Nature is full of infinite causes which     *
*   have never occurred in experience" da Vinci *
*************************************************

*************************************************
* Entry made to the Rain Block                  *
* Created by the University of Florida - 1988   *
* Updated by Oregon State University, March 2000  *
*************************************************

4257 Montrose Road
Niagara Falls
HydroStorm Simulation

 ########################################
 #  Precipitation Block Input Commands  #
 ########################################
Station Name.........................  St. Catherines A
Station Location.....................  Ontario
Station, ISTA........................    7287
Beginning date, IYBEG (Yr/Mo/Dy).....  1971/ 1/ 1
Ending date, IYEND (Yr/Mo/Dy).........  2005/12/31
Minimum interevent time, MIT.........     1
Number of ranked storms, NPTS.........    10
NWS format, IFORM (See text).........     1
Print storm summary, ISUM (O-No 1-Yes)     0

Print all rainfall, IYEAR (O-No 1-Yes)     0
Save storm event data on NSCRAT(1)....     0
(IFILE =0 -Do not save, =1 -Save data)
IDECID 0 - Create interface file
       1 - Create file and analyze
       2 - Synoptic analysis.........     2
Plotting position parameter, A........  0.40
Storm event statistics, NOSTAT........  1100

KODEA (from optional group B0)........     2
 = 0, Do not include NCDC cumulative values.
 = 1, Average NCDC cumulative values.
 = 2, Use NCDC cumulative value as inst. rain.

KODEPR (from optional group B0).......     0
 Print NCDC special codes in event summary:
 = 0, only on days with events.
 = 1, on all days with codes present.
 Codes: A = accumulated value, I = incomplete value,
        M = missing value,     O = other code present

*******************************************************
*  Precipitation output created using the Rain block  *
*  Number of precipitation stations...        1       *
*******************************************************
```

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Location Station Number
-------- --------------
1. 7287

STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID = 7287 CHECK TO BE SURE THEY MATCH.

$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only. Data placed on interface file
are at correct 15-min. intervals.
$$$

##
Entry made to the Runoff Block, last updated by
Oregon State University, and Camp, Dresser and
McKee, Inc., March 2002.
##
"And wherever water goes, amoebae go along for
the ride" Tom Robbins
##

Snowmelt parameter - ISNOW..... 0
Number of rain gages - NRGAG..... 1
Horton infiltration equation used - INFILM..... 2
Maximum infiltration volume is limited to RMAXINF input on subcatchment lines.
Infiltration volume regenerates during non rainfall periods.
Quality is simulated - KWALTY..... 1
IVAP is negative. Evaporation will be set to zero
during time steps with rainfall.
Read evaporation data on line(s) F1 (F2) - IVAP.. 1
Hour of day at start of storm - NHR..... 1
Minute of hour at start of storm - NMN..... 1
Time TZERO at start of storm (hours)..... 1.017
Use Metric units for I/O - METRIC..... 1
===> Ft-sec units used in all internal computations
Runoff input print control... 0
Runoff graph plot control.... 1
Runoff output print control.. 0
Print headers every 50 lines - NOHEAD (0=yes, 1=no) 0
Print land use load percentages -LANDUPR (0=no, 1=yes) 0
Limit number of groundwater convergence messages to 10000 (if simulated)
Month, day, year of start of storm is: 1/ 1/1971
Wet time step length (seconds)..... 300.
Dry time step length (seconds)..... 900.
Wet/Dry time step length (seconds)... 450.
Simulation length is..... 20051231.0 Yr/Mo/Dy
Percent of impervious area with zero detention depth 25.0
Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ... 0.01000

****
* Processed Precipitation will be read from file *
****

##############################
Data Group F1
Evaporation Rate (mm/day)
##############################

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
0.00	0.00	0.00	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0.00	0.00

****
* C H A N N E L A N D P I P E D A T A *
****

Input equen umber	NAMEG: Channel ID #	Drains to NGTO:	Channel Type	Width (m)	Length (m)	Invert Slope (m/m)	L Side Slope (m/m)	R Side Slope (m/m)	Intial Depth (m)	Max Depth (m)	Mann- ings "N"	Full Flow (cms)
1	201	200	Dummy	0.0	0.0	0.0000	0.0000	0.0000	0.0	0.0	0.0000	0.00E+00

****
* S U B C A T C H M E N T D A T A *
****

NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS

	SUBCATCH- MENT NO.	CHANNEL OR INLET	WIDTH (M)	AREA (HA)	PERCENT IMPERV.	SLOPE (M/M)	RESISTANCE IMPERV.	FACTOR PERV.	DEPRES. IMPERV.	STORAGE(MM) PERV.	INFILTRATION RATE(MM/HR) MAXIMUM	INFILTRATION RATE(MM/HR) MINIMUM	DECAY RATE (1/SEC)	GAGE NO.	MAXIMUM VOLUME (MM)
1	300	200	69.28	0.48	60.00	0.0200	0.015	0.250	0.510	5.080	63.50	10.16	0.00055	1	101.60000

TOTAL NUMBER OF SUBCATCHMENTS... 1
TOTAL TRIBUTARY AREA (HECTARES). 0.48
IMPERVIOUS AREA (HECTARES)..... 0.29
PERVIOUS AREA (HECTARES)..... 0.19
TOTAL WIDTH (METERS)..... 69.28
PERCENT IMPERVIOUSNESS..... 60.00


```
*********************************************************
*      U P S T R E A M   S T O R A G E   D A T A        *
*********************************************************

     Storage        Flow
      (m3)         (m3/s)
         0.        0.000
         6.        0.009
        24.        0.017
        50.        0.024
        58.        0.027

*********************************************************
*      G R O U N D W A T E R   I N P U T   D A T A      *
*********************************************************
```

SUB-CATCH NUMBER	CHANNEL OR INLET	GROUND (M)	BOTTOM (M)	STAGE (M)	BC (M)	TW (M)	A1 (MM/HR-M^B1)	B1	A2 (MM/HR-M^B2)	B2	A3 (MM/HR-M^2)
		ELEVATIONS					FLOW CONSTANTS				
0	602	3.05	0.00	0.00	0.61	0.61	3.484E-04	2.600	0.000E+00	1.000	0.00E+00

```
*********************************************************
* G R O U N D W A T E R   I N P U T   D A T A (CONTINUED) *
*********************************************************
```

SUBCAT. NO.	POROSITY	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	WILTING POINT	FIELD CAPACITY	INITIAL MOISTURE	MAX. DEEP PERCOLATION (mm/hr)	PERCOLATION PARAMETERS HCO	PCO	ET PARAMETERS DEPTH OF ET (m)	FRACTION OF ET TO UPPER ZONE
	SOIL PROPERTIES									
0	.4000	127.000	.1500	.3000	.3000	5.080E-02	10.00	4.57	4.27	0.350

```
*********************************************************
*    Arrangement of Subcatchments and Channel/Pipes     *
*********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
*********************************************************

   Channel
   or Pipe
      201     No Tributary Channel/Pipes
              No Tributary Subareas.....

    INLET
      200     Tributary Channel/Pipes...        201
              Tributary Subareas........        300

*********************************************************
* Hydrographs will be stored for the following   1 INLETS *
*********************************************************
          200

##################################################
#              Quality Simulation                #
##################################################
#      General Quality Control Data Groups       #
##################################################

 Description                          Variable       Value
 -----------                          --------       -----
 Number of quality constituents.....    NQS.......       1
 Number of land uses................  JLAND.......       1
 Standard catchbasin volume.........  CBVOL.......    1.22 cubic meters
 Erosion is not simulated.........    IROS........       0
 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......    3.00 DAYS
 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......    5.00 DAYS
 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......   0.300
 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS..................... KLNBGN.......     120
 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS..................... KLNEND.......     270

##########################################
#     Land use data on data group J2     #
##########################################
```

AND USE LNAME)	BUILDUP EQUATION TYPE (METHOD)	FUNCTIONAL DEPENDENCE OF BUILDUP PARAMETER(JACGUT)	LIMITING BUILDUP QUANTITY (DDLIM)	BUILDUP POWER (DDPOW)	BUILDUP COEFF. (DDFACT)	CLEANING INTERVAL IN DAYS (CLFREQ)	AVAIL. FACTOR FRACTION (AVSWP)	DAYS SINCE LAST SWEEPING (DSLCL)
Urban De	EXPONENTIAL(1)	AREA(1)	2.802E+01	0.500	67.250	30.000	0.300	30.000

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```
##############################################
#     Constituent data on data group J3      #
##############################################

                                Total Su
                                --------
Constituent units.........      mg/l
Type of units.............           0
KALC......................           2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH.....................           0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT....................           1
Dependence of buildup....         AREA(1)
LINKUP....................           0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).         28.020
Buildup param 2 (QFACT2).          0.500
Buildup param 3 (QFACT3).         67.250
Buildup param 4 (QFACT4).          0.000
Buildup param 5 (QFACT5).          0.000
Washoff power (WASHPO)...          1.100
Washoff coef. (RCOEF)....          0.086
Init catchb conc (CBFACT)        100.000
Precip. conc. (CONCRN)...          0.000
Street sweep effic (REFF)          0.300
Remove fraction (REMOVE).          0.000
1st order QDECAY, 1/day..          0.000
Land use number..........              1

************************************************
* Constant Groundwater Quality Concentration(s) *
************************************************

 Total Susp has a concentration of..    0.0000   mg/l

************************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                *
************************************************

  CHANNEL/   CONSTITUENT
     PIPE Total Susp
----------  --------
       201     0.000

******************************************************
*     Subcatchment surface quality on data group L1 *
******************************************************

                                Total   Number   Input
                          Land    Gutter     of    Loading
                Land      Use    Length   Catch-  load/ha
          No.  Usage     No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.14     2.00  0.0E+00
   Totals (Loads in kg or other)    0.14     2.00  0.0E+00

    ***********************
    *    DATA GROUP M1    *
    ***********************

TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES.....               0        0

    ***********************
    *    DATA GROUP M3    *
    ***********************
CHANNEL/INLET PRINT DATA GROUPS......       -200

          ****************************************
          * Rainfall from Nat. Weather Serv. file  *
          * in units of hundredths of an inch      *
          ****************************************

Rainfall Station    St. Catherines A
State/Province      Ontario

Rainfall Depth Summary (mm)

Year      Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Total
1971.      31.    0.    0.    0.    0.    0.  126.   93.   52.   60.   29.    0.    391.
1972.       0.    0.    0.   47.   65.  100.   39.  115.   63.   90.    1.    0.    521.
1973.       0.    0.    0.  103.   77.   71.   53.   29.   63.  139.    0.    0.    534.
1974.       0.    0.    0.   67.  105.   62.   50.   31.   74.   37.  110.    0.    536.
1975.       0.    0.    0.    0.    0.   94.   78.   76.   73.   56.   59.    6.    442.
1976.       0.    0.    0.  119.  136.   87.  101.   60.   72.   73.   13.    1.    662.
1977.       0.    0.    0.   94.   29.   69.   57.  150.  230.   71.    0.    1.    701.
1978.       0.    0.    0.   72.   43.   72.   43.   86.  156.   95.    0.    0.    567.
1979.       0.    0.    0.   84.   92.   33.   91.   88.   84.  129.   71.    0.    673.
1980.       0.    0.    0.   81.   39.  122.   60.   32.   79.   96.   45.    0.    554.
1981.       0.    0.    0.   91.   71.  106.  122.   61.  123.   91.   84.    0.    749.
1982.       0.    0.    0.   28.   65.   97.   36.   66.   82.   25.  143.    0.    544.
1983.       0.    0.    0.   78.  100.   65.   55.  106.   75.  122.   92.    0.    694.
1984.       0.    0.    0.   31.  113.  136.   19.   51.  144.   24.   44.    0.    562.
```

1985.	0.	0.	67.	32.	52.	64.	40.	94.	42.	109.	0.	1.	501.
1986.	0.	0.	0.	93.	113.	60.	85.	83.	98.	80.	43.	65.	719.
1987.	0.	2.	11.	77.	42.	80.	122.	97.	99.	71.	94.	34.	730.
1988.	0.	0.	41.	71.	42.	21.	110.	82.	70.	68.	75.	5.	585.
1989.	0.	0.	13.	63.	137.	108.	36.	45.	89.	73.	84.	0.	647.
1990.	0.	2.	38.	99.	124.	44.	68.	95.	56.	112.	96.	0.	735.
1991.	0.	0.	86.	124.	67.	31.	85.	57.	79.	64.	61.	28.	682.
1992.	0.	0.	29.	127.	56.	92.	185.	116.	77.	47.	103.	38.	869.
1993.	3.	0.	7.	83.	56.	86.	32.	61.	71.	92.	80.	38.	610.
1994.	0.	0.	44.	88.	105.	124.	48.	77.	117.	15.	0.	15.	633.
1995.	112.	23.	16.	48.	37.	60.	123.	66.	8.	137.	94.	0.	724.
1998.	0.	0.	0.	0.	51.	54.	64.	29.	9.	0.	1.	0.	207.
1999.	0.	0.	0.	79.	59.	35.	61.	58.	116.	78.	0.	0.	487.
2000.	0.	0.	0.	123.	134.	216.	51.	0.	0.	0.	10.	0.	534.
2001.	0.	0.	0.	56.	88.	45.	25.	30.	81.	129.	0.	0.	454.
2002.	0.	0.	0.	73.	104.	64.	53.	49.	52.	65.	8.	0.	468.
2003.	0.	0.	0.	10.	163.	77.	81.	64.	67.	73.	2.	0.	537.
2004.	0.	0.	0.	131.	126.	99.	115.	40.	88.	17.	0.	0.	616.
2005.	0.	0.	0.	38.	42.	78.	53.	120.	112.	0.	0.	0.	443.

Total Rainfall Depth for Simulation Period 19310. (mm)

Rainfall Intensity Analysis (mm/hr)

(mm/hr)	(#)	(%)	(mm)	(%)
2.50	21481	74.6	6454.	33.4
5.00	3585	12.4	3088.	16.0
7.50	1973	6.8	2886.	14.9
10.00	575	2.0	1233.	6.4
12.50	389	1.4	1070.	5.5
15.00	194	0.7	660.	3.4
17.50	210	0.7	846.	4.4
20.00	66	0.2	306.	1.6
22.50	92	0.3	487.	2.5
25.00	39	0.1	232.	1.2
27.50	37	0.1	246.	1.3
30.00	34	0.1	245.	1.3
32.50	29	0.1	228.	1.2
35.00	5	0.0	42.	0.2
37.50	10	0.0	90.	0.5
40.00	10	0.0	97.	0.5
42.50	12	0.0	124.	0.6
45.00	9	0.0	99.	0.5
47.50	1	0.0	12.	0.1
50.00	3	0.0	37.	0.2
>50.00	49	0.2	829.	4.3

Total # of Intensities 28803

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

```
************************************************
*      End of time step DO-loop in Runoff      *
************************************************

Final Date (Mo/Day/Year)   =                  1/ 1/2006
Total number of time steps =                    2056358
Final Julian Date  =                            2006001
Final time of day  =                                 3. seconds.
Final time of day  =                              0.00   hours.
Final running time =                         306816.0000   hours.
Final running time =                          12784.0000    days.

************************************************
*     Extrapolation Summary for Watersheds     *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls     *
************************************************
```

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6158271	1560153						


```
************************************************
*     Extrapolation Summary for Channel/Pipes    *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls       *
************************************************

Chan/Pipe   # Steps   # Calls Chan/Pipe   # Steps   # Calls Chan/Pipe   # Steps   # Calls
 --------   -------   -------  --------   -------   -------  --------   -------   -------
      201         0         0

*********************************************
*       Continuity Check for Surface Water   *
*********************************************
                                                          Millimeters over
                                                cubic meters  Total Basin
Total Precipitation (Rain plus Snow)                 92460.     19263.
Total Infiltration                                   36808.      7669.
Total Evaporation                                     5456.      1137.
Surface Runoff from Watersheds                       50792.     10582.
Total Water remaining in Surface Storage                 0.         0.
Infiltration over the Pervious Area...               36808.     19171.
                    --------
Infiltration + Evaporation +
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........               93056.     19387.
Total Precipitation + Initial Storage.               92460.     19263.

The error in continuity is calculated as
*************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-----------------------------------*
* Precipitation + Initial Snow Cover  *
*************************************
Error.................................       -0.646 Percent

*********************************************
*       Continuity Check for Channel/Pipes   *
*********************************************
                                                          Millimeters over
                                                cubic meters  Total Basin
Initial Channel/Pipe Storage.................            0.         0.
Final Channel/Pipe Storage...................            0.         0.
Surface Runoff from Watersheds...............        50792.     10582.
Baseflow.....................................            0.
Groundwater Subsurface Inflow................            0.         0.
Evaporation Loss from Channels...............            0.         0.
Channel/Pipe/Inlet Outflow...................        50792.     10582.
Initial Storage + Inflow.....................        50792.     10582.
Final Storage + Outflow......................        50792.     10582.
*****************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
*****************************************
Error.........................................      0.000 Percent

*************************************************
*     Continuity Check for Subsurface Water      *
*************************************************

                                                 Millimeters over
                                       cubic meters  Subsurface Basin

Total Infiltration                                0.         0.
Total Upper Zone ET                               0.         0.
Total Lower Zone ET                               0.         0.
Total Groundwater flow                            0.         0.
Total Deep percolation                            0.         0.
Initial Subsurface Storage                     4389.       914.
Final Subsurface Storage                       4389.       914.
Upper Zone ET over Pervious Area                  0.         0.
Lower Zone ET over Pervious Area                  0.         0.

*****************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
*****************************************
Error ........................................     0.000 Percent
```

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SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	TOTAL SIMULATED RAINFALL (MM)	PERVIOUS AREA TOTAL RUNOFF DEPTH (MM)	PERVIOUS AREA TOTAL LOSSES (MM)	PERVIOUS AREA PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA RUNOFF DEPTH (MM)	IMPERVIOUS AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA PEAK UNIT RUNOFF (MM/HR)
300	200	0.48	60.01	9262.47	91.708********		0.05817	571.936	0.157	10579.843	0.215	162.730

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				0.22				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
##################################################
#             Runoff Quality Summary Page        #
# If NDIM = 0 Units for:   loads    mass rates   #
#             METRIC = 1    lb        lb/sec     #
#             METRIC = 2    kg        kg/sec     #
# If NDIM = 1 Loads are in units of quantity     #
#             and mass rates are quantity/sec    #
# If NDIM = 2 loads are in units of concentration#
#             times volume and mass rates have units#
#             of concentration times volume/second #
##################################################

Total Su NDIM =  0
METRIC =  2
```

	Total Su
Inputs	
1. INITIAL SURFACE LOAD.....	10.
2. TOTAL SURFACE BUILDUP.....	7722.
3. INITIAL CATCHBASIN LOAD.....	0.
4. TOTAL CATCHBASIN LOAD.....	0.
5. TOTAL CATCHBASIN AND SURFACE BUILDUP (2+4).....	7722.
Remaining Loads	
6. LOAD REMAINING ON SURFACE...	5.
7. REMAINING IN CATCHBASINS....	0.
8. REMAINING IN CHANNEL/PIPES..	0.
Removals	
9. STREET SWEEPING REMOVAL.....	719.
10. NET SURFACE BUILDUP (2-9)...	7003.
11. SURFACE WASHOFF.....	6997.
12. CATCHBASIN WASHOFF.....	0.
13. TOTAL WASHOFF (11+12).....	6997.
14. LOAD FROM OTHER CONSTITUENTS	0.
15. PRECIPITATION LOAD.....	0.
15a.SUM SURFACE LOAD (13+14+15).	6997.
16. TOTAL GROUNDWATER LOAD.....	0.
16a.TOTAL I/I LOAD.....	0.
17. NET SUBCATCHMENT LOAD (15a-15b-15c-15d+16+16a)....	6997.
>>Removal in channel/pipes (17a, 17b):	
17a.REMOVE BY BMP FRACTION.....	0.
17b.REMOVE BY 1st ORDER DECAY...	0.
18. TOTAL LOAD TO INLETS.....	6997.
19. FLOW WT'D AVE.CONCENTRATION mg/l (INLET LOAD/TOTAL FLOW).....	138.
Percentages	
20. STREET SWEEPING (9/2).....	9.
21. SURFACE WASHOFF (11/2).....	91.
22. NET SURFACE WASHOFF(11/10)..	100.
23. WASHOFF/SUBCAT LOAD(11/17)..	100.
24. SURFACE WASHOFF/INLET LOAD (11/18).....	100.
25. CATCHBASIN WASHOFF/ SUBCATCHMENT LOAD (12/17)...	0.
26. CATCHBASIN WASHOFF/ INLET LOAD (12/18).....	0.
27. OTHER CONSTITUENT LOAD/ SUBCATCHMENT LOAD (14/17)...	0.

28. INSOLUBLE FRACTION/
    INLET LOAD (14/18)..... 0.
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)... 0.
30. PRECIPITATION/
    INLET LOAD (15/18)..... 0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)... 0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18)..... 0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17).. 0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18)..... 0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17).. 0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17).. 0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17..... 0.

CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals. Buildup is only performed at beginning of
wet steps or for street cleaning.

****
* TSS Particle Size Distribution *
****

Diameter (um)	%	Specific Gravity	Settling Velocity (m/s)	Critical Peclet Number
20.	20.0	2.65	0.000267	0.265721
60.	20.0	2.65	0.002319	0.363168
150.	20.0	2.65	0.012234	0.444443
400.	20.0	2.65	0.047806	0.531443
2000.	20.0	2.65	0.180097	0.674200

****
* *
* Summary of TSS Removal *
* *
****

TSS Removal based on Lab Performance Curve

Model #	Low Q Treated (cms)	High Q Treated (cms)	Runoff Treated (%)	TSS Removed (%)
Unavailabl	0.019	0.097	99.5	79.6
HS 4	0.033	0.097	99.8	84.9
HS 5	0.041	0.097	99.8	90.3
HS 6	0.050	0.097	99.8	93.3
Unavailabl	0.069	0.097	99.9	94.9
HS 8	0.089	0.097	99.9	96.1
HS 10	0.097	0.097	99.9	98.2
HS 12	0.097	0.097	99.9	99.5

****
* *
* Summary of Annual Flow Treatmnet & TSS Removal *
* *
****

HS 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS In (kg)	TSS Rem (kg)	TSS Out (kg)	TSS Byp (kg)	Flow Treated (%)	TSS Removal (%)
1971.	5302.	5148.	138.	115.	23.	0.	97.1	83.1
1972.	6755.	6426.	186.	156.	29.	0.	95.1	84.0
1973.	6740.	6740.	194.	164.	30.	0.	100.0	84.6
1974.	6872.	6872.	207.	182.	25.	0.	100.0	87.8
1975.	5820.	5820.	178.	149.	29.	0.	100.0	83.6
1976.	8644.	8644.	226.	191.	35.	0.	100.0	84.6
1977.	9268.	9268.	223.	180.	43.	0.	100.0	80.6
1978.	7430.	7430.	208.	173.	36.	0.	100.0	82.9
1979.	8836.	8836.	240.	206.	35.	0.	100.0	85.6
1980.	7154.	7154.	220.	187.	33.	0.	100.0	84.8
1981.	9890.	9890.	249.	215.	34.	0.	100.0	86.2
1982.	6960.	6960.	201.	174.	27.	0.	100.0	86.8
1983.	9182.	9182.	258.	220.	38.	0.	100.0	85.3
1984.	7392.	7392.	201.	168.	33.	0.	100.0	83.5
1985.	6453.	6453.	195.	167.	28.	0.	100.0	85.5
1986.	9401.	9401.	268.	231.	37.	0.	100.0	86.3
1987.	9726.	9726.	270.	230.	40.	0.	100.0	85.1
1988.	7797.	7797.	225.	195.	30.	0.	100.0	86.6
1989.	8564.	8564.	221.	192.	29.	0.	100.0	86.9
1990.	9706.	9706.	276.	240.	36.	0.	100.0	87.1
1991.	9090.	9090.	259.	222.	37.	0.	100.0	85.9
1992.	11556.	11556.	305.	255.	50.	0.	100.0	83.7
1993.	7864.	7864.	250.	221.	30.	0.	100.0	88.2
1994.	8427.	8364.	212.	175.	37.	0.	99.3	82.6
1995.	9769.	9769.	252.	210.	42.	0.	100.0	83.4
1998.	2546.	2546.	93.	79.	14.	0.	100.0	84.7
1999.	6220.	6220.	191.	161.	29.	0.	100.0	84.6
2000.	7142.	7142.	171.	136.	35.	0.	100.0	79.5
2001.	5661.	5661.	156.	138.	18.	0.	100.0	88.6
2002.	5913.	5913.	182.	157.	25.	0.	100.0	86.4
2003.	6723.	6723.	189.	159.	30.	0.	100.0	84.4
2004.	8066.	8066.	196.	163.	33.	0.	100.0	83.2
2005.	5843.	5843.	149.	121.	29.	0.	100.0	80.7


```
**************************************************
*  Summary of Quantity and Quality Results at    *
*  Location        200  INFlow in cms.           *
*  Values are instantaneous at indicated time step *
**************************************************

     Date     Time         Flow   Total Su
 Mo/Da/Year  Hr:Min         cum/s  mg/l
 ----------  -------    -------  --------
Flow wtd means.....         0.001      138.
Flow wtd std devs..         0.002      153.
Maximum value......         0.215     1901.
Minimum value......         0.000        0.
Total loads........        50596.     6989.
                         Cub-Met  KILOGRAM

===> Runoff simulation ended normally.

===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.

**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... February   29, 2024               *
*          Time...          15:57:23.796             *
*   Ending Date... February   29, 2024               *
*          Time...          15:57:27.280             *
*  Elapsed Time...               0.058 minutes.      *
*  Elapsed Time...               3.484 seconds.      *
**************************************************
```