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File: 1308
August 7, 2025

FUNCTIONAL SERVICING STUDY

SECOND MILE
2203 NIAGARA STONE ROAD (Regional Road 55)
Town of Niagara-on-the-Lake

INTRODUCTION

The proposed development of 2203 Niagara Stone Road (Regional Road 55) is located on the southerly side of Niagara Stone Road (Regional Road 55), adjacent to 2 Mile Creek, and southwesterly of Anderson Lane.

The development site is 0.33 hectares and the proposed development will consist of two townhouse blocks with 9 units, and a private access from Niagara Stone Road. The private access will include concrete curbs, asphalt surface, storm sewers, sanitary and water systems.

The objectives of this functional servicing report are to address the primary servicing for the site and the connection with adjacent infrastructure, including:

1. Sanitary systems;
2. Stormwater systems, and;
3. Water systems.

SANITARY SERVICING

Due to the topography of the area and the location of the site, it is not feasible to construct gravity sanitary sewers to service the proposed development. Therefore, it is proposed to construct a 50mm diameter HDPE sanitary forcemain from the existing sanitary maintenance hole (MH) located at Anderson Lane and Niagara Stone Road (Regional Road 55) to service the site. Each unit will be serviced with an individual indoor low-pressure sewage pump system (E-One or equivalent) and a 30mm diameter service and sewage curb stop that is connected to the 50mm diameter sanitary forcemain noted above.

The previously completed upgrade to the Dorchester Street sanitary sewer shall have adequate capacity for the 0.4 L/s sanitary flows from the 9 proposed units.

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STORMWATER MANAGEMENT PLAN

The stormwater quality improvement criteria for this development includes the requirement to improve stormwater quality levels to MECP Enhanced Protection (80% TSS removal) levels before discharging to the adjacent 2 Mile Creek watershed, which is classified as a Type 1 Fish Habitat.

As proposed development is at a downstream location within the 2 Mile Creek watershed, it is not recommended to implement stormwater quantity controls for the proposed development. The peak flows in the 2 Mile Creek Watershed at the location of this proposed development occurs much later than the peak flows exiting the site under existing conditions, due the size of the watershed. Detaining the future flows from the proposed development will only increase the contribution to the overall peak flows in the 2 Mile Creek Watershed.

The stormwater drainage from the proposed site will outlet into the 2 Mile Creek Watershed, which is identified as a Type 1 Fish Habitat and would require quality improvement to MECP Enhanced Protection or 80% TSS removal. It is proposed to construct an oil/grit separator to provide stormwater quality improvement to the front half of the site, where the 0.20 hectare - 65% imperviousness drainage includes the private access, unit driveways and the front half of the unit roof area. A Hydroworks HG 4 oil/grit separator can provide 96% TSS removal and capture of approximately 99% of the site stormwater. The stormwater from the rear yard areas of the units shall be directed directly to 2 Mile Creek via a grassed swale and is considered clean stormwater from the rear grassed yards and roof water.

Therefore, the proposed oil/grit separator can provide MECP Enhanced Protection. See Appendix A for the Hydroworks sizing software output.

DOMESTIC WATER SERVICING

There are existing 400mm and 450mm diameter Regional watermains along Niagara Stone Road (Regional Road 55). It is proposed to connect a new municipal fire hydrant with a 150mm watermain to the existing fire hydrant lead on the east side of Niagara Stone Road, just north of this site to provide adequate fire protection in a deficient area of Niagara Stone Road. This additional fire hydrant will provide adequate fire protection to the proposed development. To provide domestic water to the proposed development, a 50mm diameter water service will be connected to the proposed 150mm diameter hydrant lead.

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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.

- The site will be serviced by a 50mm diameter sewage forcemain along Niagara Stone Road (Regional Road 55) and individual unit private low-pressure sewage pumps.
- The previously upgraded Dorchester Street sanitary sewer provides adequate capacity for the proposed development.
- Stormwater quantity controls are not considered necessary for the proposed development.
- Stormwater quality controls will be provided by an oil/grit separator. The proposed oil grit separator (Hydroworks HG 4) will provide 96% TSS Removal and exceeds the 80% requirement for MECP Enhanced protection levels.
- The existing 150mm diameter hydrant lead will have sufficient capacity to provide both domestic and fire protection water supply.

Should you have any questions or concerns regarding the information provided, please do not hesitate to contact our office.

Yours very truly,

Adam Keane, P.Eng.

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APPENDICES

UPPER CANADA CONSULTANTS
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APPENDIX A

Stormwater Management Quality Structure Output

```
         ************************************************
         *      Storm Water Management Sizing Model     *
         *               Hydroworks, LLC                *
         *                Version 4.4                   *
         *                                              *
         *        Continuous Simulation Program         *
         *              Based on SWMM 4.4H              *
         *              Hydroworks, LLC                 *
         *               Graham Bryant                  *
         *                2003 - 2013                   *
         ************************************************
                          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              *
         *                                              *
         ************************************************
         ************************************************
         *     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  *
************************************************

         2203 Niagara Stone Road, NOTL
         Copyright Hydroworks, LLC, 2019

     ########################################
     #  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        *
*******************************************************

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 = ..........................................   0.25400
```

```
**********************************************************
*   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   NAMEG:      Drains                          Invert  L Side   R Side  Intial     Max  Mann-   Full
equen  Channel       to      Channel  Width  Length   Slope   Slope    Slope   Depth   Depth   ings   Flow
umber    ID #       NGTO:     Type     (m)    (m)     (m/m)   (m/m)    (m/m)    (m)     (m)   "N"   (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-  CHANNEL      WIDTH    AREA  PERCENT    SLOPE    RESISTANCE  FACTOR    DEPRES. STORAGE(MM) INFILTRATION   DECAY RATE GAGE  MAXIMUM
       MENT NO.  OR INLET       (M)    (HA)  IMPERV.    (M/M)     IMPERV.     PERV.    IMPERV.    PERV.      RATE(MM/HR)    (1/SEC)    NO.  VOLUME
                                                                                                          MAXIMUM MINIMUM                      (MM)
 ---  --------   -------- --------- -------- -----   -------  --------  ------  ------  ------  ------- -------  ------ -------
  1       300        200     44.72     0.20  65.00    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).             0.20
IMPERVIOUS AREA (HECTARES)......             0.13
PERVIOUS AREA (HECTARES)........             0.07
TOTAL WIDTH (METERS)............            44.72
PERCENT IMPERVIOUSNESS..........            65.00

**********************************************************
*     G R O U N D W A T E R   I N P U T   D A T A        *
**********************************************************
    SUB-     CHANNEL     ========== E L E V A T I O N S ========  =========== F L O W   C O N S T A N T S ============
    CATCH         OR      GROUND  BOTTOM   STAGE     BC      TW       A1         B1        A2         B2        A3
    NUMBER     INLET        (M)     (M)     (M)     (M)     (M) (MM/HR-M^B1)          (MM/HR-M^B2)          (MM/HR-M^2)
    ------     -----     -------  ------  ------  ------  ------ -----------  ------- -----------  ------- -----------
         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) *
**********************************************************
             S O I L   P R O P E R T I E S
                     SATURATED                                        PERCOLATION     E T  P A R A M E T E R S
       SUBCAT.         HYDRAULIC  WILTING  FIELD   INITIAL     MAX. DEEP   PARAMETERS          DEPTH  FRACTION OF ET
       NO.   POROSITY CONDUCTIVITY  POINT  CAPACITY MOISTURE  PERCOLATION   HCO    PCO        OF ET  TO UPPER ZONE
                        (mm/hr)                                 (mm/hr)                       (m)
      ----   ------     -------    ------  ------  ------    ----------  ------  ------      ------      ------
         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      #
###########################################
                                                                  LIMITING                          CLEANING  AVAIL.    DAYS SINCE
                                                                  BUILDUP   BUILDUP  BUILDUP  INTERVAL  FACTOR      LAST
AND USE   BUILDUP EQUATION TYPE   FUNCTIONAL DEPENDENCE OF       QUANTITY  POWER    COEFF.   IN DAYS   FRACTION   SWEEPING
LNAME)          (METHOD)          BUILDUP PARAMETER(JACGUT)     (DDLIM)   (DDPOW)  (DDFACT) (CLFREQ)  (AVSWP)    (DSLCL)
------  ---------------------   -------------------------     --------  -------  -------- --------  -------    ---------
Urban De  EXPONENTIAL(1)                  AREA(1)             2.802E+01     0.500    67.250    30.000     0.300     30.000
```

```
##############################################
#     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          0.09     2.00  0.0E+00
   Totals (Loads in kg or other)     0.09     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 = 2056299
Final Julian Date = 2006001
Final time of day = 0. 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	6097130	1544822						

****
* 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 *
****

	cubic meters	Millimeters over Total Basin
Total Precipitation (Rain plus Snow)	38525.	19263.
Total Infiltration	13434.	6717.
Total Evaporation	2389.	1194.
Surface Runoff from Watersheds	23018.	11509.
Total Water remaining in Surface Storage	0.	0.
Infiltration over the Pervious Area...	13434.	19191.

Infiltration + Evaporation + Surface Runoff + Snow removal + Water remaining in Surface Storage + Water remaining in Snow Cover.....	38840.	19421.
Total Precipitation + Initial Storage.	38525.	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..... -0.819 Percent

****
* Continuity Check for Channel/Pipes *
****

	cubic meters	Millimeters over Total Basin
Initial Channel/Pipe Storage.....	0.	0.
Final Channel/Pipe Storage.....	0.	0.
Surface Runoff from Watersheds.....	23018.	11509.
Baseflow.....	0.	
Groundwater Subsurface Inflow.....	0.	0.
Evaporation Loss from Channels.....	0.	0.
Channel/Pipe/Inlet Outflow.....	23018.	11509.
Initial Storage + Inflow.....	23018.	11509.
Final Storage + Outflow.....	23018.	11509.

****
* 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 *
****

	cubic meters	Millimeters over 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	1829.	914.
Final Subsurface Storage	1829.	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

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	PERVIOUS AREA: 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	0.20	65.01	9262.47	75.86********	0.02517	662.812	0.071	11507.382	0.096	174.406	

*** 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				0.10				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.....	4.
2. TOTAL SURFACE BUILDUP.....	3391.
3. INITIAL CATCHBASIN LOAD.....	0.
4. TOTAL CATCHBASIN LOAD.....	0.
5. TOTAL CATCHBASIN AND SURFACE BUILDUP (2+4).....	3391.
Remaining Loads	
6. LOAD REMAINING ON SURFACE...	2.
7. REMAINING IN CATCHBASINS....	0.
8. REMAINING IN CHANNEL/PIPES..	0.
Removals	
9. STREET SWEEPING REMOVAL.....	298.
10. NET SURFACE BUILDUP (2-9)...	3093.
11. SURFACE WASHOFF.....	3091.
12. CATCHBASIN WASHOFF.....	0.
13. TOTAL WASHOFF (11+12).....	3091.
14. LOAD FROM OTHER CONSTITUENTS	0.
15. PRECIPITATION LOAD.....	0.
15a.SUM SURFACE LOAD (13+14+15).	3091.
16. TOTAL GROUNDWATER LOAD.....	0.
16a.TOTAL I/I LOAD.....	0.
17. NET SUBCATCHMENT LOAD (15a-15b-15c-15d+16+16a)....	3091.
>>Removal in channel/pipes (17a, 17b):	
17a.REMOVE BY BMP FRACTION.....	0.
17b.REMOVE BY 1st ORDER DECAY...	0.
18. TOTAL LOAD TO INLETS.....	3091.
19. FLOW WT'D AVE.CONCENTRATION mg/l (INLET LOAD/TOTAL FLOW).....	134.
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	0.076000
30.	10.0	2.65	0.000597	0.112500
50.	10.0	2.65	0.001629	0.182500
100.	20.0	2.65	0.006044	0.340000
250.	20.0	2.65	0.026615	0.662500
1000.	20.0	2.65	0.111334	0.675000

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

TSS Removal based on Exponential Lab Performance Curve
 Model      Low Q Treated  High Q Treated     Runoff Treated        TSS Removed
   #           (cms)          (cms)               (%)                 (%)
 HG 4         0.019          0.146               98.8                95.9
 HG 5         0.023          0.146               99.2                97.6
 HG 6         0.028          0.146               99.5                98.5
 HG 7         0.038          0.153               99.8                99.0
 HG 8         0.043          0.153               99.8                99.3
 HG 9         0.049          0.153               99.9                99.7
 HG 10        0.062          0.153               99.9                99.8
 HG 12        0.076          0.153              100.0                99.9

**************************************************
*  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.....        0.000      134.
Flow wtd std devs..        0.001       65.
Maximum value......        0.096      292.
Minimum value......        0.000        0.
Total loads........       23016.     3093.
                        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... September  23, 2020               *
*          Time...          14:23:38.362             *
*   Ending Date... September  23, 2020               *
*          Time...          14:23:41.377             *
*  Elapsed Time...               0.050 minutes.      *
*  Elapsed Time...               3.015 seconds.      *
**********************************************************
```